

# Adams Circle Reconstruction and Infrastructure Upgrade Project

Adams Circle, Devens, Massachusetts

PREPARED FOR

Massachusetts Development Finance Agency  
99 High Street  
Boston, MA 02110  
978.784.2926

PREPARED BY

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120 Front Street, Suite 500  
Worcester, MA 01608  
617.924.1770

February 16, 2026

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# 1

## Introduction

Vanasse Hangen Brustlin, Inc. (VHB) is pleased to file this Request for Determination of Applicability (RDA) on behalf of the Massachusetts Development Finance Agency (MassDevelopment) (Applicant) in support of the proposed Adams Circle Redevelopment and Infrastructure Upgrade Project (Project) along a portion of Adams Circle in Devens, Massachusetts. The Project is located at 100 Adams Circle, Devens, Massachusetts (Assessor's Map 352 Parcel 026.0-0010-0100.0) (Site). A completed "WPA Form 1" is included in Appendix A. The Project is proposed on land owned by Fort Devens. Figure 1 (Appendix B) depicts the extent of the Project on an U.S. Geological Survey (USGS) topographic map.

The proposed Project includes the reconstruction of Adams Circle, including replacement of all stormwater management systems as well as infrastructure improvements adjacent to the existing road such as pervious parking bays, pervious sidewalks, grass buffer strips, and lighting. Most of the proposed work is located outside of aquatic resource areas; however, the Project does propose to construct a new stormwater detention basin with associated fence, grading, and landscaping within a portion of the 100-foot Buffer Zone. Additionally, portions of the proposed roadway improvements are located within 200-foot Riverfront Area (RFA); however, the Project is included under a Massachusetts Environmental Policy Act (M.G.L., C. 30, §§ 61 to 62L) Certificate (Executive Office of Energy Environmental Affairs No. 9116). Therefore, the Project is exempt from the requirements of Riverfront Area under 310 CMR 10.58(6)(e).

Impacts to all other resource areas including Inland Bank, Land Under Water Bodies and Waterways (LUWW), Bordering Vegetated Wetland (BVW), and Land Subject to Flooding (LSF) have been avoided. Additionally, all temporary impacts will be restored following the completion of construction.

This permit has been developed in accordance with the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40) (WPA) and its implementing regulations (310 CMR 10.00 et seq.) as well as the Devens Wetlands Protection Bylaw (Article XII) (Bylaw) and its implementing regulations (974 CMR 4.06).

Two hardcopies and an electronic copy of this NOI are being submitted to the Devens Enterprise Commission (Commission), with an electronic copy also sent to the Commission as well as the Massachusetts Department of Environmental Protection (MassDEP) using the eDEP filing system.

# 2

## Site Description

The Project Site includes Adams Circle, a paved circular road with associated maintained shoulder, sidewalks, and stormwater management features, and landscaping, encompassing a total of approximately 6.66 acres. The topography of the site is generally flat and gently slopes south from a high of elevation (ele.) ±251-feet in the eastern portion of the site to a low of ele. ±249-feet in the western portion.

### 2.1 Soils

According to the Web Soil Survey (Natural Resources Conservation Service [NRCS] 2019), two soil types were mapped within the Project area: Paxton fine sandy loam; Quonset sandy loam, 0 to 3 percent slopes and Quonset sandy loam, 3 to 8 percent slopes. Neither soil is listed as hydric.

### 2.1 Natural Communities

Natural communities on the Site include terrestrial communities as described by Swain (2020) and aquatic communities described by Cowardin et al. (1979).

#### 2.1.1 Cultural Grassland

Cultural grassland occurs throughout most of the Site and includes the areas maintained by frequent mowing such as lawns and other similar areas. These areas are typically mowed at least once per year and usually contain non-native grasses such as timothy (*Phleum pratense*), orchard grass (*Dactylis glomerata*), smooth brome (*Bromus inermis*), and redtop (*Agrostis gigantea*).

#### 2.1.2 Successional Northern Hardwood Forest

Successional northern hardwood forest occurs in the western portion of the Site adjacent to Willow Brook. This community typically consists of a diversified forest with well-developed strata including canopy trees such as quaking aspen (*Populus tremuloides*), white birch (*Betula papyrifera*), yellow birch (*Betula alleghaniensis*), American beech (*Fagus grandifolia*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), black cherry (*Prunus serotina*), white pine (*Pinus strobus*), and oaks (*Quercus* spp.); shade tolerant saplings and shrubs, and various herbaceous species and groundcovers.

#### 2.1.3 Riverine Lower Perennial

Willow Brook, a mapped perennial stream in on the western border of the Site, is classified as a riverine lower perennial, unconsolidated bottom, permanently flooded, excavated (R2UBHx) watercourse. Lower perennial streams are characterized by low gradient, no tidal influence, with year round flow except during periods of extreme drought. Unconsolidated bottom streams

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contain at least 25 percent cover of particles smaller than stones and vegetative cover less than 30 percent. Permanently flooded watercourse means water covers the substrate throughout the year in all years. The excavated modifier identifies this stream having been anthropogenically excavated.

# 3

## Regulated Resource Areas

VHB reviewed multiple mapping resources available from the Massachusetts Bureau of Geographic Information System (MassGIS) and others including, but not limited to, MassDEP mapped wetlands and hydrologic connections, hydrography, aerial imagery, Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs), USGS topographic quadrangles, potential and certified vernal pools, NRCS soils, and Natural Heritage & Endangered Species Program (NHESP) rare species habitat mapping, among others.

VHB completed a Site visit to field-verify and delineate the wetlands and streams on October 9, 2025. Wetlands and streams within approximately 200 feet of the Project area were delineated. VHB utilized pink, fluorescent, polyvinyl surveyor flagging with “Wetland Delineation” printed in black to demarcate the boundaries of each wetland and blue flags to demarcate Bank/Mean Annual High Water (MAHW). Each flag was assigned a unique alphanumeric code in the field.

There was no Bordering Land Subject to Flooding (BLSF) located on site according to the most recent FEMA FIRM mapping (FEMA 2025). The Site plans in Appendix C depict the extents of the on-Site resource areas. The following sections describe the on-Site regulated resource areas.

### 3.1 Resource Area Delineation Methodology

VHB performed a delineation using a multiple parameter method approach following the Massachusetts WPA and its implementing regulations, the methodology described in the *Massachusetts Handbook for Delineation of Bordering Vegetated Wetlands* (Jackson et al. 2022) (Handbook), and the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) and its supplement, the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0* (U.S. Army Corps of Engineers [USACE] 2011).

In accordance with 310 CMR 10.55(2)(c)1., the flagged vegetated wetland boundaries include all areas “within which 50% or more of the vegetational community consists of wetland indicator plants and saturated or inundated conditions exist.” This approach emphasizes the use of hydrophytic vegetation in combination with the presence of either hydrology and/or hydric soils. Under the WPA, wetland indicator ratings for vegetation are defined under the *National List of Plant Species That Occur in Wetlands* (Reed 1988) as well as the vegetation species criterion described in the WPA. It should be noted that some wetland indicator ratings for vegetation have been recently revised for wetlands regulated by the USACE under the *National Wetlands Plant List: Version 3.6* (USACE 2023).

The delineation also included the examination of soils and the methodology described in the Handbook. Identification of hydric soil as an indicator of wetland hydrology followed criteria provided in *Field Indicators of Hydric Soils in the United States, Version 8.2* (U.S. Department of Agriculture [USDA] 2018), *Field Indicators for Identifying Hydric Soils in New England, Version 4* (New England Hydric Soil Technical Committee 2020), as well as the USACE Regional

## Adams Circle Reconstruction and Infrastructure Upgrade Project – Request for Determination of Applicability

Supplement. In accordance with the Handbook, the flagged wetland boundaries included all areas which contained a majority of hydrophytes (i.e.,  $\geq 50\%$ ) and the presence hydric soils, with consideration given to other indicators of wetland hydrology when present.

VHB examined soils, evidence of hydrology, and vegetation to identify limits of the federal and state definition of a jurisdictional wetland, and bankfull indicators to identify limits of the MAHW mark. Hydric soils and hydrophytic vegetation were able to be evaluated since site investigations occurred during the growing season and evidence of hydrology was able to be observed.

## 3.2 Resource Area Results

### 3.2.1 Inland Bank

Inland Bank is the resource area which confines waterways and water bodies. For streams, it extends from the Mean Annual Low Water (MALW) to MAHW. As set forth in 310 CMR 10.54(2)(a)-(c), Inland Bank is defined as, “the portion of the land surface which normally abuts and confines a water body. It occurs between a water body and a BVW and adjacent floodplain, or in the absence of these, it occurs between a water body and an upland. The upper boundary is the first observable break in slope or the MAHW, whichever is lower. The lower boundary is the MALW level.”

Bank on the Site is associated with Willow Brook. The stream originates off-Site to the north and flows south adjacent to the Site to the east before continuing off-Site to the south. Inland Bank is afforded a 100-foot Buffer Zone regulated by the WPA.

### 3.2.2 Buffer Zone

The WPA regulates a 100-foot Buffer Zone associated with Inland Bank and BVW. The 100-foot Buffer Zone within the Project area consists of the undeveloped, forested banks of Willow Branch as well the maintained grass areas between Adams Circle and the stream. Various indicators of previous impacts such as grading and other anthropogenic alterations are present throughout the 100-foot Buffer Zone.

# 4

## Other Environmental Constraints

### 4.1 WPA Aquatic Resource Areas

The only regulated aquatic resource areas that occurred within the Site included Banks and 100-foot Buffer Zone. The Site did not contain any other aquatic resource areas regulated under the WPA or Bylaw including BVW orLSF or other resource areas.

### 4.2 Vernal Pools

VHB biologists reviewed available MassGIS datasets to determine if the Project was located within or near mapped Certified Vernal Pools or Potential Vernal Pools. There were no certified or potential vernal pools mapped within or near the Project according to available MassGIS data (MassGIS 2025 and 2013). In addition, no PVPs were observed during the site visit.

### 4.3 Rare Species Habitat

VHB reviewed the MassGIS database to determine if the Project was located within or adjacent to areas designated as NHESP Priority Habitats of Rare Species (Priority Habitat) or Estimated Habitats of Rare Wildlife (Estimated Habitat). There was no Priority or Estimated Habitat mapped within Site; the closest rare species habitat is mapped south of Robbins Pond Road and Barnum Road, approximately 650 south of the site (MassGIS 2021a and 2021b).

### 4.4 Areas of Critical Environmental Concern

VHB reviewed MassGIS data layers to determine if the Project was located within any Areas of Critical Environmental Concern (ACEC). An ACEC is a designated area in Massachusetts that receives special recognition because of the quality, uniqueness, and significance of its natural and/or cultural resources. ACECs are identified so that they may be protected and maintained. SWCA determined that there were no ACECs within or near the site (MassGIS 2009).

### 4.5 Outstanding Resource Waters

VHB reviewed the MassGIS database to determine if the site was located within Outstanding Resource Waters (ORWs). ORWs are watershed areas that have been classified as such under the Massachusetts Surface Water Quality Standards and are areas that contain surface waters and their tributaries, including certain wetlands, that have been designated for protection based on their outstanding socio-economic, recreational, ecological and/or aesthetic values. These waters have been identified so that the quality of the waters may be protected and maintained. There were no ORWs located within or adjacent to the proposed project area (MassGIS 2010).

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# 5

## Proposed Work and Impacts

The proposed Project will construct two new stormwater management basins in addition to roadway improvements to Adams Circle including pervious parking bays, sidewalks, and grass buffers. Within jurisdictional areas, the Project proposes both temporary and permanent impacts to 100-foot Buffer Zone associated with the proposed stormwater detention basin, fence, grading, and landscaping. Table 1 summarizes the extent of proposed impacts within each resource area.

**Table 1** Resource Area Impact Summary

Impact Type	Permanent Impacts	Temporary Impacts	Total Impacts
Inland Bank	0 lf	0 lf	0 lf
Buffer Zone*	504 sf	7,462 sf	7,966 sf

lf = linear feet, sf = square feet

The Project will comply with the Massachusetts Stormwater Management Standards in accordance with the WPA regulations and the Devens Enterprise Commission rules and regulations for stormwater design and mitigation (974 CMR 4.00). A copy of the Stormwater Report is included as Appendix D.

Under 310 CMR 10.58(6)(e), the Project is exempt from the requirements of Riverfront Area since an EEA Certificate (No. 9116) was issued prior to November 1, 1996.

### 5.1 Inland Bank Impacts

There are no temporary or permanent impacts proposed to Bank.

### 5.2 Buffer Zone Impacts

Both temporary and permanent impacts to the buffer zones on-site are necessary to complete the proposed Project. Approximately 7,462 square feet of temporary impacts and 504 square feet of permanent impacts are required to construct a portion of a new stormwater detention basin, including the associated fence and landscaping, that will collect and treat stormwater runoff from Adams Circle. Temporary impacts will result from grading, installation of stormwater basin infrastructure (e.g., pipes, cleanouts, perforated underdrain, etc.). Permanent impacts will result from the installation of riprap at the spillway and the fence.

Following construction, temporarily impacted areas will be restored to their pre-construction conditions including restoration of grades, seeding with a native upland seed mix, and straw mulch.

# 6

## Avoidance, Minimization, and Mitigation

The Applicant has avoided and minimized impacts to the maximum extent practicable while also being able to achieve the Project goals.

### 6.1 Construction Schedule

Construction is expected to commence in spring 2026 and is anticipated to extend through fall 2026 or spring 2027. The general construction sequence includes:

- › Installation of erosion and sedimentation controls
- › Clear and grub vegetation where necessary
- › Construct and install stormwater management infrastructure
- › Construct porous pavement sidewalks and utility replacements
- › Loam, seed, and mulch exposed soils
- › Remove erosion and sedimentation controls once all disturbed areas are permanently stabilized

### 6.2 Best Management Practices

Where work is proposed within or in proximity to regulated aquatic resource areas or their applicable Buffer Zones, the Applicant proposes to protect these areas and downgradient resource areas through the implementation of construction best management practices (BMPs). The following measures will be implemented to protect and minimize potential adverse impacts to downgradient wetlands and surface waters:

- › Expediting construction and avoiding activities in wetlands and surface waters.
- › Installing erosion and sedimentation (E&S) controls, as depicted in the project site plans provided in Appendix C, to prevent sediment from entering downgradient resource areas or migrating off-Site.
- › Avoiding excessive vegetation removal or areas of exposed soils within and adjacent to resource areas.
- › Repairing and maintaining all E&S controls in a timely manner in accordance with all applicable federal and state regulatory authorizations.
- › Inspecting the work area following fill activities or work located adjacent to jurisdictional resources to ensure post-construction restoration is conducted in a timely manner.
- › Prohibiting long-term parking and refueling of equipment within the 100-foot Buffer Zone.
- › All temporary access areas will be restored to pre-construction conditions.

# 7

## Summary

The Applicant is seeking a Negative Determination from the Commission to complete a full depth pavement reclamation of Adams Circle as well as the construction of five-foot porous pavement sidewalks. The Project also includes utility replacements, existing stormwater drainage upgrades, and stormwater control measures. The proposed improvements will support both existing and future residential growth in the area. The Project will impact portions of 100-foot Buffer Zone. No other resource areas will be impacted. Impacts have been avoided, minimized, and mitigated as much as practicable. Additionally, erosion and sedimentation controls and BMPs will be installed to protect adjacent areas during construction.

# 8

## References

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## Adams Circle Reconstruction and Infrastructure Upgrade Project – Request for Determination of Applicability

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USACE. 2023. 2022 National Wetland Plant List, Version 3.6. U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi.

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A

## WPA Form 1



Massachusetts Department of Environmental Protection  
Bureau of Water Resources - Wetlands

**WPA Form 1 - Request for Determination of Applicability**

Devens  
Municipality

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

**A. General Information**

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



1. Applicant:

Massachusetts Development Finance Agency  
 First Name \_\_\_\_\_ Last Name \_\_\_\_\_  
 99 High Street  
 Address \_\_\_\_\_  
 Boston MA 02110  
 City/Town State Zip Code  
 978.784.2926  
 Phone Number \_\_\_\_\_ Email Address \_\_\_\_\_

2. Property Owner (if different from Applicant):

\_\_\_\_\_  
 First Name \_\_\_\_\_ Last Name \_\_\_\_\_  
 \_\_\_\_\_  
 Address \_\_\_\_\_  
 \_\_\_\_\_  
 City/Town State Zip Code  
 \_\_\_\_\_  
 Phone Number \_\_\_\_\_ Email Address (if known) \_\_\_\_\_

3. Representative (if any)

Chase Bernier  
 First Name Last Name  
 \_\_\_\_\_  
 Company Name  
 120 Front Street; Suite 500  
 Address \_\_\_\_\_  
 Worcester MA 01608  
 City/Town State Zip Code  
 617.607.6301  
 Phone Number \_\_\_\_\_ cbernier@vhb.com  
 Email Address (if known) \_\_\_\_\_

**B. Project Description**

1. a. Project Location (use maps and plans to identify the location of the area subject to this request):

100 Adams Circle Devens  
 Street Address City/Town  
 42.54195 -71.60533  
 Latitude (Decimal Degrees Format with 5 digits after decimal e.g. XX.XXXXX) Longitude (Decimal Degrees Format with 5 digits after decimal e.g. -XX.XXXXX)  
 26 26-10-100  
 Assessors' Map Number Assessors' Lot/Parcel Number

b. Area Description (use additional paper, if necessary):

Please see the attached narrative.

c. Plan and/or Map Reference(s): (use additional paper if necessary)

Adams Circle Roadway Reconstruction & Utility Improvements Feb 2026  
 Title Date  
 \_\_\_\_\_  
 Title Date

How to find Latitude and Longitude

and how to convert to decimal degrees



## B. Project Description (cont.)

2. a. Activity/Work Description (use additional paper and/or provide plan(s) of Activity, if necessary):

Work within jurisdictional areas includes the construction of a stormwater detention basin with  
associated fence and landscaping.

b. Identify provisions of the Wetlands Protection Act or regulations which may exempt the applicant from having to file a Notice of Intent for all or part of the described work (use additional paper, if necessary).

MEPA Certificate EEA No. 9116 in 1995 preempts the requirement to comply with the provisions of 310 CMR 10.58

3. a. If this application is a Request for Determination of Scope of Alternatives for work in the Riverfront Area, indicate the one classification below that best describes the project.

- Single family house on a lot recorded on or before 8/1/96
- Single family house on a lot recorded after 8/1/96
- Expansion of an existing structure on a lot recorded after 8/1/96
- Project, other than a single-family house or public project, where the applicant owned the lot before 8/7/96
- New agriculture or aquaculture project
- Public project where funds were appropriated prior to 8/7/96
- Project on a lot shown on an approved, definitive subdivision plan where there is a recorded deed restriction limiting total alteration of the Riverfront Area for the entire subdivision
- Residential subdivision; institutional, industrial, or commercial project
- Municipal project
- District, county, state, or federal government project
- Project required to evaluate off-site alternatives in more than one municipality in an Environmental Impact Report under MEPA or in an alternatives analysis pursuant to an application for a 404 permit from the U.S. Army Corps of Engineers or 401 Water Quality Certification from the Department of Environmental Protection.

b. Provide evidence (e.g., record of date subdivision lot was recorded) supporting the classification above (use additional paper and/or attach appropriate documents, if necessary.)



**C. Determinations**

1. I request the Devens Conservation Commission make the following determination(s). Check any that apply:

- a. whether the **area** depicted on plan(s) and/or map(s) referenced above is an area subject to jurisdiction of the Wetlands Protection Act.
- b. whether the **boundaries** of resource area(s) depicted on plan(s) and/or map(s) referenced above are accurately delineated.
- c. whether the **Activities** depicted on plan(s) referenced above is subject to the Wetlands Protection Act and its regulations.
- d. whether the area and/or Activities depicted on plan(s) referenced above is subject to the jurisdiction of any **municipal wetlands' ordinance or bylaw** of:

Devens  
Name of Municipality

- e. whether the following **scope of alternatives** is adequate for Activities in the Riverfront Area as depicted on referenced plan(s).

**D. Signatures and Submittal Requirements**

I hereby certify under the penalties of perjury that the foregoing Request for Determination of Applicability and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge.

I further certify that the property owner, if different from the applicant, and the appropriate DEP Regional Office were sent a complete copy of this Request (including all appropriate documentation) simultaneously with the submittal of this Request to the Conservation Commission.

Failure by the applicant to send copies in a timely manner may result in dismissal of the Request for Determination of Applicability.

Signatures:

I also understand that notification of this Request will be placed in a local newspaper at my expense in accordance with Section 10.05(3)(b)(1) of the Wetlands Protection Act regulations.

*John P. McAule*  
Signature of Applicant

Feb. 25, 2026  
Date

*P. Chase Bernier*  
Signature of Representative (if any)

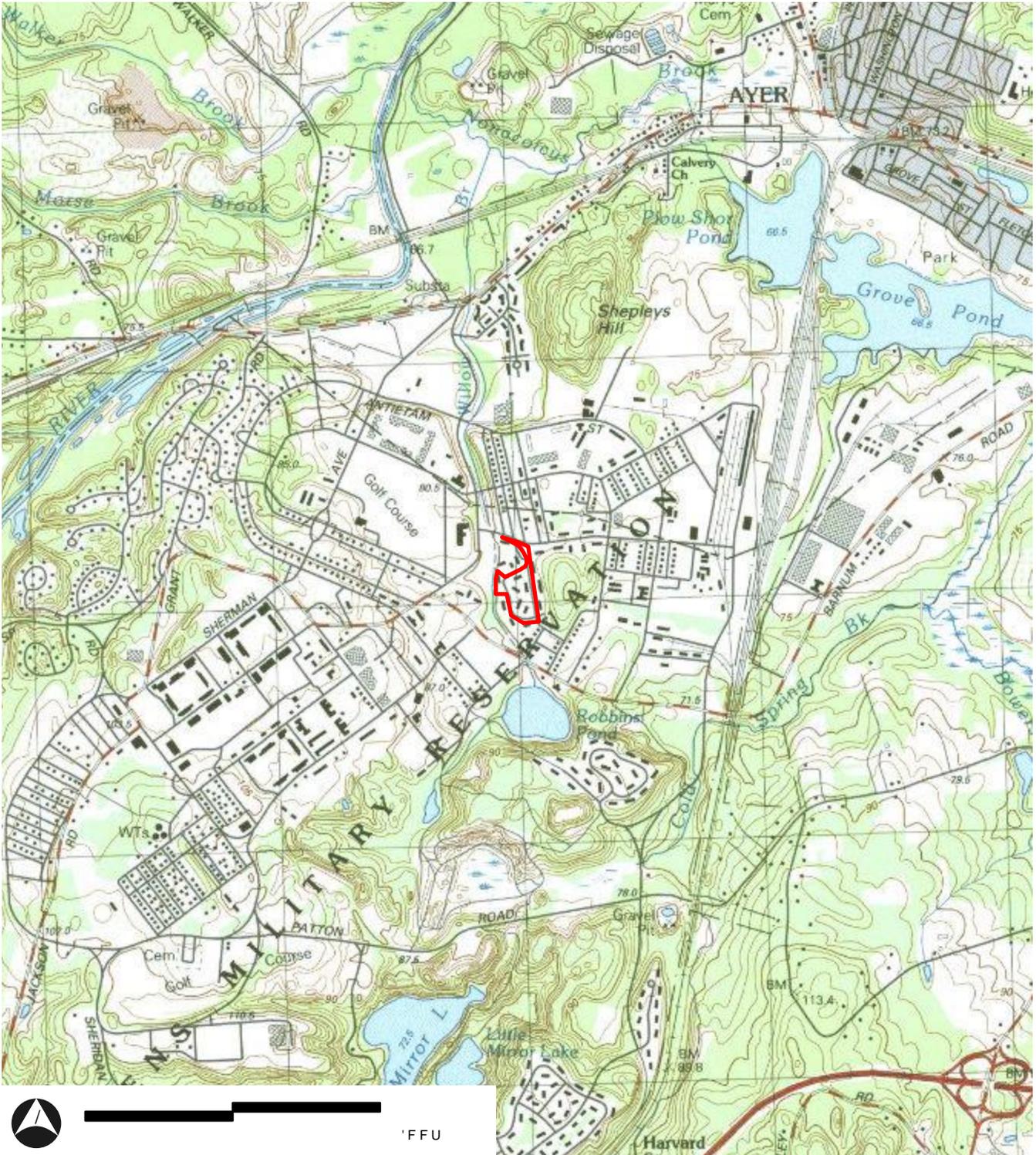
February 17, 2026  
Date



# B

## Figures

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# C

## Site Plans

# ADAMS CIRCLE ROADWAY RECONSTRUCTION & UTILITY IMPROVEMENTS

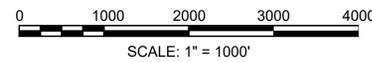
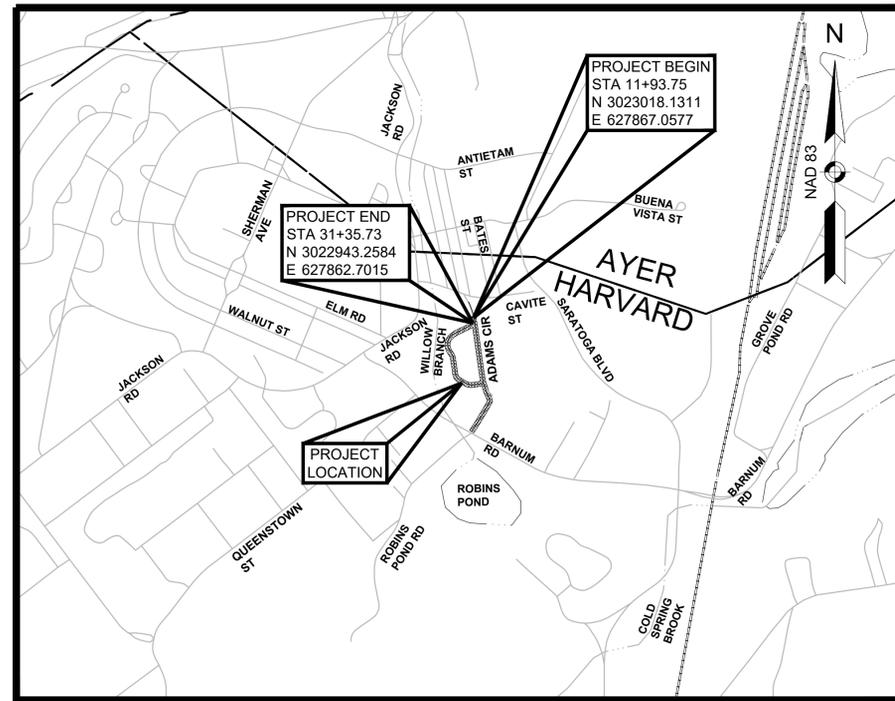
DEVENS (HARVARD), MA  
WORCESTER COUNTY

PREPARED FOR  
MASSACHUSETTS DEVELOPMENT FINANCE AGENCY  
PROJECT NO. 15812.15

THESE PLANS ARE SUPPLEMENTED BY THE LATEST EDITIONS OF THE FOLLOWING PUBLICATIONS, AS IDENTIFIED IN THE CONTRACT SPECIAL PROVISIONS: THE MASSDOT CONSTRUCTION STANDARD DETAILS, THE MASSDOT STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE MASSDOT STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING, THE MASSDOT OVERHEAD SIGNAL STRUCTURE AND FOUNDATION STANDARD DRAWINGS, THE MASSDOT TRAFFIC MANAGEMENT PLANS AND DETAIL DRAWINGS, AND THE ANSI AMERICAN STANDARD FOR NURSERY STOCK.

## INDEX

SHEET NO.	DESCRIPTION
1	TITLE & INDEX
2	LEGEND & ABBREVIATIONS
3	KEY PLAN
4	SITE PREP AND DEMO PLANS
5	TYPICAL SECTIONS
6-10	CONSTRUCTION PLANS
11-13	PROFILES
14-18	GRADING & TIE PLANS
19	TEMPORARY TRAFFIC CONTROL PLANS
20-23	DRAINAGE & UTILITY PLANS
25-24	LIGHTING PLANS
26-27	LIGHTING DETAILS
28-39	CONSTRUCTION DETAILS



LENGTH OF PROJECT = 1942 FEET = 0.368 MILES

### DESIGN DESIGNATION (ADAMS CIRCLE)

DESIGN SPEED	30 MPH
FUNCTIONAL CLASSIFICATION	LOCAL

2/13/2026	FINAL PLANS	2
1/13/2026	PRELIMINARY PLANS	1
11/21/2025	PRELIMINARY PLANS	0
DATE	DESCRIPTION	REV #
OWNER:		
Mass Development Finance Agency 33 Andrews Parkway Devens, MA 01434		
ENGINEER:		
 <b>Vanasse Hangen Brustlin, Inc.</b> 120 Front Street, Suite 500 Worcester, MA 01608 508.752.1001 FAX 508.752.1276		
DESIGNED BY PJB	APPROVED BY GR	SHEET OF 1 39
DRAWN BY YKA	DFTG CHECKED BY SG	VHB CAD FILE NAME 15812.15_HD(TITLE).dwg
CHECKED BY CAC/ELT	DATE FEBRUARY 2026	JOB NO. 15812

**GENERAL SYMBOLS**

EXISTING	PROPOSED	DESCRIPTION
		JERSEY BARRIER
		CATCH BASIN
		CATCH BASIN CURB INLET
		FLAG POLE
		GAS PUMP
		MAIL BOX
		POST SQUARE
		POST CIRCULAR
		WELL
		ELECTRIC HANDHOLE
		FENCE GATE POST
		GAS GATE
		BORING HOLE
		MONITORING WELL
		TEST PIT
		HYDRANT
		LIGHT POLE
		COUNTY BOUND
		GPS POINT
		CABLE MANHOLE
		DRAINAGE MANHOLE
		ELECTRIC MANHOLE
		GAS MANHOLE
		MISC MANHOLE
		SEWER MANHOLE
		TELEPHONE MANHOLE
		WATER MANHOLE
		MASSACHUSETTS HIGHWAY BOUND
		MONUMENT
		STONE BOUND
		TOWN OR CITY BOUND
		TRAVERSE OR TRIANGULATION STATION
		TROLLEY POLE OR GUY POLE
		TRANSMISSION POLE
		UTILITY POLE W/ FIREBOX
		UTILITY POLE WITH DOUBLE LIGHT
		UTILITY POLE W / 1 LIGHT
		UTILITY POLE
		BUSH
		TREE
		STUMP
		SWAMP / MARSH
		WATER GATE
		PARKING METER
		OVERHEAD CABLE/WIRE
		CURBING
		CONTOURS (ON-THE-GROUND SURVEY DATA)
		CONTOURS (PHOTOGRAMMETRIC DATA)
		UNDERGROUND DRAIN PIPE (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND ELECTRIC DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND GAS MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND SEWER MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND TELEPHONE DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND WATER MAIN (DOUBLE LINE 24 INCH AND OVER)
		BALANCED STONE WALL
		GUARD RAIL - STEEL POSTS
		GUARD RAIL - WOOD POSTS
		GUARD RAIL - DOUBLE FACE - STEEL POSTS
		GUARD RAIL - DOUBLE FACE - WOOD POSTS
		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		SEDIMENT BARRIER
		COIR LOG SEDIMENT BARRIER
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF PAVEMENT OR COLD PLANE AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 FT WETLAND BUFFER
		200 FT RIVERFRONT BUFFER
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT

**PAVEMENT MARKINGS SYMBOLS**

EXISTING	PROPOSED	DESCRIPTION
		PAVEMENT ARROW - WHITE
		LEGEND "ONLY" - WHITE
		STOP LINE - WHITE, 12" WIDTH
		CROSSWALK - WHITE, 12" WIDTH

**ABBREVIATIONS**

GENERAL	
AADT	ANNUAL AVERAGE DAILY TRAFFIC
ABAN	ABANDON
ADJ	ADJUST
APPROX.	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
BIT.	BITUMINOUS
BC	BOTTOM OF CURB
BD.	BOUND
BL	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BY OTHERS
BOS	BOTTOM OF SLOPE
BR.	BRIDGE
CB	CATCH BASIN
CBCI	CATCH BASIN WITH CURB INLET
CC	CEMENT CONCRETE
CCM	CEMENT CONCRETE MASONRY
CEM	CEMENT
CI	CURB INLET
CIP	CAST IRON PIPE
CLF	CHAIN LINK FENCE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CSP	CORRUGATED STEEL PIPE
CO.	COUNTY
CONC	CONCRETE
CONT	CONTINUOUS
CONST	CONSTRUCTION
CR GR	CROWN GRADE
DHV	DESIGN HOURLY VOLUME
DI	DROP INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DW	STEADY DON'T WALK - PORTLAND ORANGE
DWY	DRIVEWAY
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
EXIST (or EX)	EXISTING
EXC	EXCAVATION
F&C	FRAME AND COVER
F&G	FRAME AND GRATE
FDN.	FOUNDATION
FLDSTN	FIELDSTONE
GAR	GARAGE
GD	GROUND
GG	GAS GATE
GI	GUTTER INLET
GIP	GALVANIZED IRON PIPE
GRAN	GRANITE
GRAV	GRAVEL
GRD	GUARD
HDW	HEADWALL
HMA	HOT MIX ASPHALT
HOR	HORIZONTAL
HYD	HYDRANT
INV	INVERT
JCT	JUNCTION
L	LENGTH OF CURVE
LB	LEACH BASIN

**ABBREVIATIONS (cont.)**

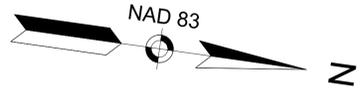
GENERAL	
LP	LIGHT POLE
LT	LEFT
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
M&O	MILL & OVERLAY
NIC	NOT IN CONTRACT
NO.	NUMBER
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PCR	PEDESTRIAN CURB RAMP
P.G.L.	PROFILE GRADE LINE
PI	POINT OF INTERSECTION
POC	POINT ON CURVE
POT	POINT ON TANGENT
PRC	POINT OF REVERSE CURVATURE
PROJ	PROJECT
PROP	PROPOSED
PSB	PLANTABLE SOIL BORROW
PT	POINT OF TANGENCY
PVC	POINT OF VERTICAL CURVATURE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENCY
PVMT	PAVEMENT
PWW	PAVED WATER WAY
R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RDWY	ROADWAY
REM	REMOVE
RET	RETAIN
RET WALL	RETAINING WALL
ROW	RIGHT OF WAY
RR	RAILROAD
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
RT	RIGHT
SB	STONE BOUND
SGC	SLOPED GRANITE CURB
SHLD	SHOULDER
SMH	SEWER MANHOLE
ST	STREET
STA	STATION
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
SW	SIDEWALK
T	TANGENT DISTANCE OF CURVE/TRUCK %
TAN	TANGENT
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
TYP	TYPICAL
UP	UTILITY POLE
VAR	VARIES
VERT	VERTICAL
VC	VERTICAL CURVE
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN
X-SECT	CROSS SECTION

**TRAFFIC SYMBOLS**

EXISTING	PROPOSED	DESCRIPTION
		PULL BOX 12"x12" (OR AS NOTED)
		ELECTRIC HANDHOLE 12"x24" (OR AS NOTED)
		TRAFFIC SIGNAL CONDUIT
		SIGN AND POST

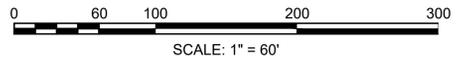
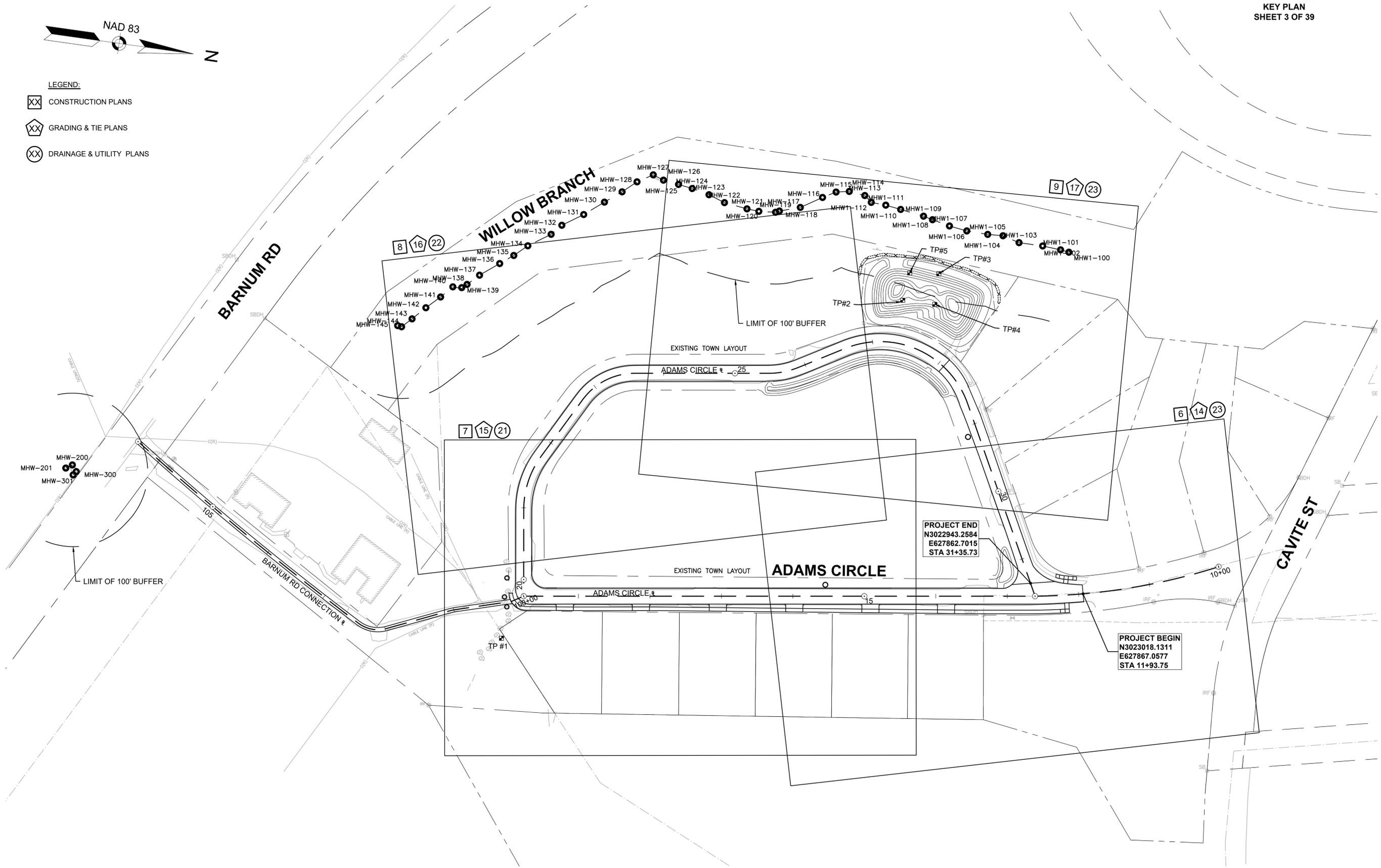
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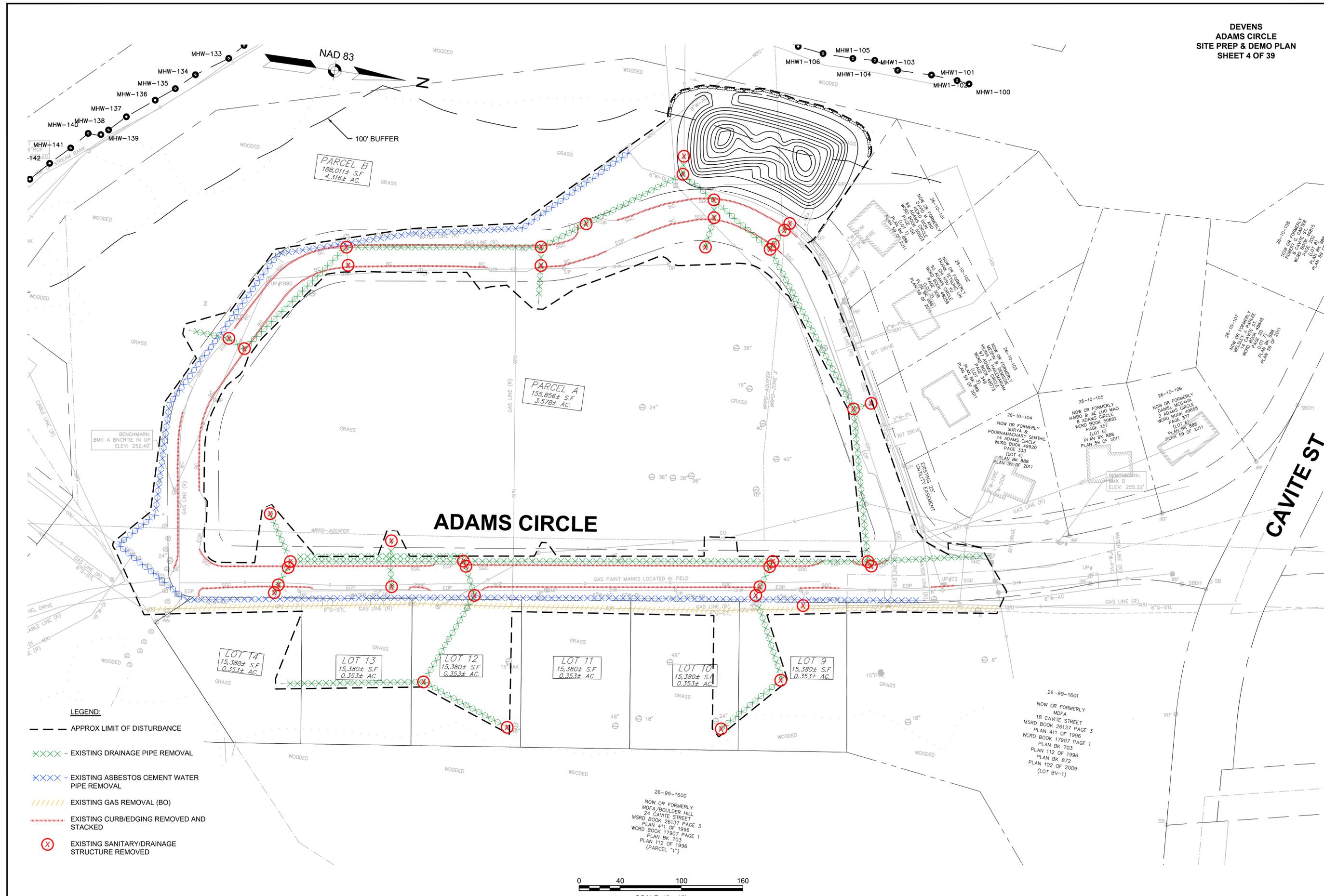
- THE EXISTING CONDITIONS SHOWN ON THIS PLAN WERE COMPILED BASED UPON AN ACTUAL FIELD SURVEY CONDUCTED BY WILLIAMS SALE PARTNERSHIP BETWEEN MAY & JUNE, 2025.
- THE HORIZONTAL CONTROL IS BASED ON THE MASSACHUSETTS MAINLAND STATE PLANE COORDINATE SYSTEM AND THE NATIONAL GEODETIC SURVEY (NAD83). ALL ELEVATION IS US FEET, REFERENCED TO THE NORTH GEODETIC VERTICAL DATUM OF 1929 (NGVD29).
- ALL COORDINATES SHOWN HEREON ARE IN RELATIONSHIP TO THE DEVENS, MA CONTROL NETWORK AND GEOGRAPHIC INFORMATION SYSTEMS (GIS). REFERENCE IS MADE TO THE CONTROL SURVEY AND REPORT ENTITLED, "SURVEY CONTROL REPORT FOR DEVENS, MASSACHUSETTS" PREPARED FOR MASSACHUSETTS DEVELOPMENT FINANCE AGENCY, BY CHAS. H. SELLS, INC DATED APRIL 8, 2002 AND LAST REVISED OCTOBER 23, 2020. ALL COORDINATES ARE ON THE MASSACHUSETTS MAINLAND STATE PLANE SYSTEM (NAD 1983) HORIZONTALLY AND NGVD29 VERTICALLY.
- THE CONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND GRADES IN THE FIELD BEFORE COMMENCING WORK AND PROMPTLY NOTIFY THE ENGINEER OF ANY DISCREPANCIES.
- THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
- PROTECTION OF UNDERGROUND FACILITIES. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE NECESSITY OF MAKING HIS OWN INVESTIGATION IN ORDER TO ASSURE THAT NO DAMAGE TO EXISTING STRUCTURES, DRAINAGE LINES, TRAFFIC SIGNAL CONDUITS, ETCETRA, WILL OCCUR.
- DRAINAGE ELEVATIONS ARE PROVIDED FOR DESIGN PURPOSES ONLY. THE CONTRACTOR SHALL VERIFY BY TEST PIT, THE LOCATIONS OF EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED DRAINAGE DESIGN. ANY FIELD ADJUSTMENTS REQUIRED WILL BE MADE AS APPROVED OR DIRECTED BY THE ENGINEER. ONLY AFTER THE CONTRACTOR VERIFIES ELEVATIONS FOR THE CONSTRUCTABILITY OF THE DRAINAGE SYSTEM SHALL ANY STRUCTURES BE ORDERED. ANY FIELD ADJUSTMENTS TO LINE & GRADE UP TO A DEPTH OF 5' SHALL BE INCLUDED IN THE COST OF THE PIPE. PIPE EXCAVATION GREATER THAN 5' WILL BE PAID UNDER CLASS B TRENCH EXCAVATION.
- THE CONTRACTOR SHALL VERIFY BY TEST PIT, THE LOCATIONS OF EXISTING UTILITIES WHICH MAY CONFLICT WITH PROPOSED CONDUIT AND SIGNAL EQUIPMENT. ANY FIELD ADJUSTMENTS REQUIRED WILL BE MADE AS APPROVED OR DIRECTED BY THE ENGINEER.
- WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.
- THE CONTRACTOR SHALL ALTER THE MASONRY OF THE TOP SECTION OF ALL EXISTING DRAINAGE AND SEWER STRUCTURES AS NECESSARY FOR CHANGES IN GRADE, AND RESET ALL WATER AND DRAINAGE FRAMES, GRATES AND BOXES TO THE PROPOSED FINISH SURFACE GRADE. REQUIRED NEW MASONRY SHALL BE CLAY BRICK.
- THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES.
- EXISTING UTILITY POLES WILL BE REMOVED OR RELOCATED BY OTHERS IF REQUIRED.
- TREES AND SHRUBS WITHIN THE LIMITS OF GRADING SHALL BE REMOVED ONLY UPON APPROVAL OF THE ENGINEER.
- AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT NO EXPENSE TO THE OWNER.
- THE TERM "PROPOSED" (PROP) MEANS WORK TO BE CONSTRUCTED USING NEW MATERIALS OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE AND RESET" (R&R).
- JOINTS BETWEEN NEW ASPHALT CONCRETE ROADWAY PAVEMENT AND SAWCUT EXISTING PAVEMENT SHALL BE THOROUGHLY COATED WITH A HOT APPLIED PAVEMENT JOINT ADHESIVE MEETING THE REQUIREMENTS OF SUBSECTION 450 OF 2024 STANDARD SPECIFICATIONS.
- EXISTING SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS INDICATED OTHERWISE ON THE DRAWINGS.
- PROPOSED BOUNDS SHALL BE PLACED BY A LICENSED PROFESSIONAL SURVEYOR. THE CONTRACTOR SHALL EXERCISE DUE CARE WHEN WORKING AROUND ALL PROPERTY BOUNDS WHICH ARE TO REMAIN. SHOULD ANY DAMAGE TO A BOUND RESULT FROM THE ACTIONS OF THE CONTRACTOR, THE CONTRACTOR SHALL HAVE THE BOUND REPLACED AND/OR REALIGNED BY A LICENSED PROFESSIONAL SURVEYOR AS DIRECTED BY THE ENGINEER AT NO ADDITIONAL COST.
- DISPOSAL OF ALL SURPLUS MATERIAL SHALL BE AS APPROVED BY THE ENGINEER AND OWNER.
- IN INSTANCES WHERE AN EXISTING MANHOLE, HANDHOLE OR OTHER "SURFACE" TYPE STRUCTURE THAT CANNOT BE REMOVED OR RESET IS WITHIN THE PROPOSED OR EXISTING ACCESSIBLE SURFACE, THE STRUCTURE SHALL BE CAREFULLY ADJUSTED SUCH THAT THE TOPMOST SURFACES OR THE STRUCTURE COVER SHALL BE FLUSH WITH THE CURB RAMP SURFACE.
- ALL PROPOSED PAVEMENT MARKINGS SHALL BE THERMOPLASTIC.



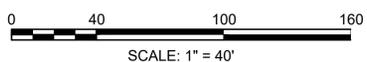
LEGEND:

- CONSTRUCTION PLANS
- GRADING & TIE PLANS
- DRAINAGE & UTILITY PLANS





- LEGEND:**
- APPROX LIMIT OF DISTURBANCE
  - XXXXX - EXISTING DRAINAGE PIPE REMOVAL
  - XXXXX - EXISTING ASBESTOS CEMENT WATER PIPE REMOVAL
  - ////// EXISTING GAS REMOVAL (BO)
  - EXISTING CURB/EDGING REMOVED AND STACKED
  - (X) EXISTING SANITARY/DRAINAGE STRUCTURE REMOVED



**CAVITE ST**

**ADAMS CIRCLE**

PARCEL B  
188,011± S.F.  
4.316± AC.

PARCEL A  
155,856± S.F.  
3.578± AC.

LOT 14  
15,380± S.F.  
0.353± AC.

LOT 13  
15,380± S.F.  
0.353± AC.

LOT 12  
15,380± S.F.  
0.353± AC.

LOT 11  
15,380± S.F.  
0.353± AC.

LOT 10  
15,380± S.F.  
0.353± AC.

LOT 9  
15,380± S.F.  
0.353± AC.

26-99-1600  
NOW OR FORMERLY  
MDF/Boulder Hill  
24 CAVITE STREET  
MSRD BOOK 26137 PAGE 3  
PLAN 411 OF 1996  
WORD BOOK 17907 PAGE 1  
PLAN BK 703  
PLAN 112 OF 1996  
PLAN BK 872  
PLAN 102 OF 2009  
(LOT BV-1)

26-99-1601  
NOW OR FORMERLY  
MDF  
18 CAVITE STREET  
MSRD BOOK 26137 PAGE 3  
PLAN 411 OF 1996  
WORD BOOK 17907 PAGE 1  
PLAN BK 703  
PLAN 112 OF 1996  
PLAN BK 872  
PLAN 102 OF 2009  
(LOT BV-1)

26-10-106  
NOW OR FORMERLY  
DANIEL MCGAHN  
& ADAMS CIRCLE  
WORD BOOK 49668  
PAGE 377  
(LOT 5)  
PLAN BK 888  
PLAN 99 OF 2011

26-10-107  
NOW OR FORMERLY  
WELLS CAVITE  
WORD BOOK 49668  
PAGE 377  
(LOT 5)  
PLAN BK 888  
PLAN 99 OF 2011

26-10-108  
NOW OR FORMERLY  
ROBERT CAVITE  
WORD BOOK 49668  
PAGE 377  
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PLAN BK 888  
PLAN 99 OF 2011

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PLAN 112 OF 1996  
PLAN BK 872  
PLAN 102 OF 2009  
(LOT BV-1)

26-10-102  
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MSRD BOOK 26137 PAGE 3  
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PLAN 112 OF 1996  
PLAN BK 872  
PLAN 102 OF 2009  
(LOT BV-1)

26-10-103  
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MDF/Boulder Hill  
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PLAN 112 OF 1996  
PLAN BK 872  
PLAN 102 OF 2009  
(LOT BV-1)

26-10-104  
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SUZY & SENTHIL  
14 ADAMS CIRCLE  
WORD BOOK 49920  
PAGE 333  
(LOT 4)  
PLAN BK 888  
PLAN 99 OF 2011

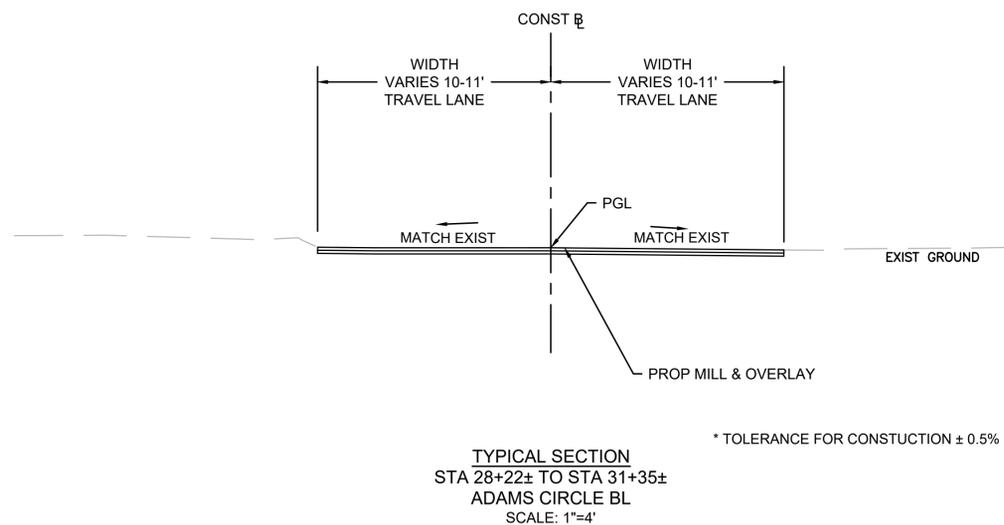
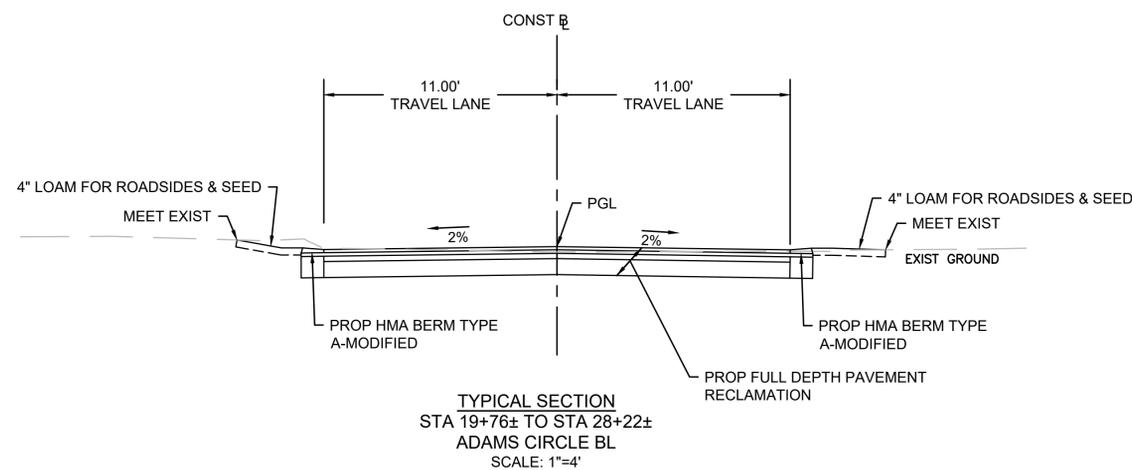
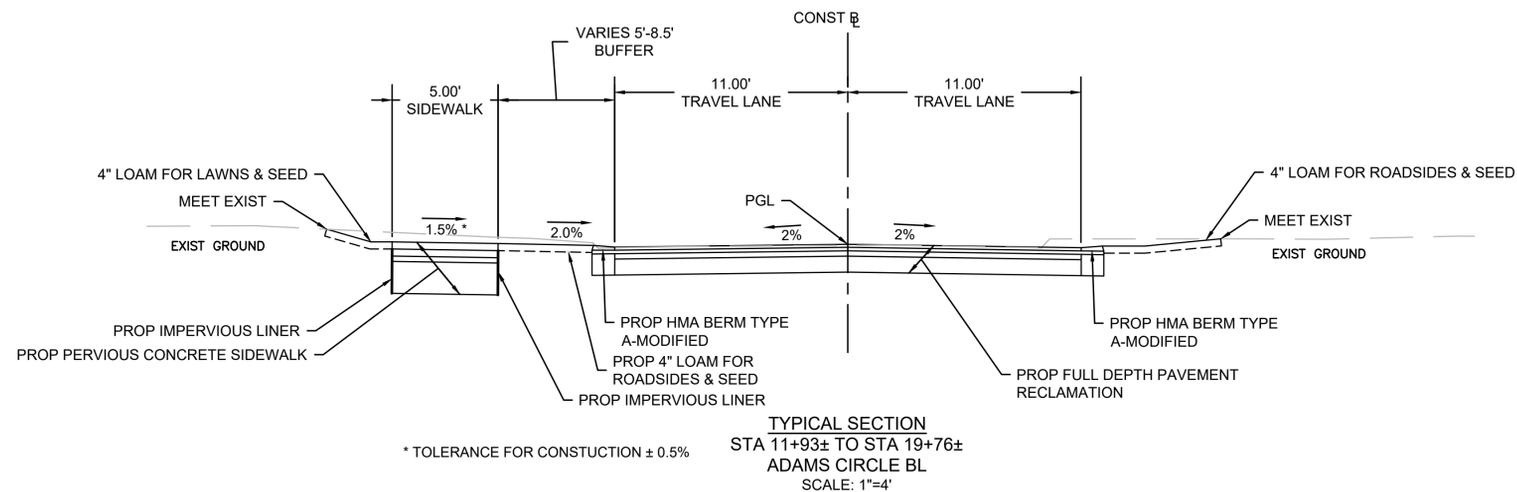
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& ADAMS CIRCLE  
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PLAN BK 888  
PLAN 99 OF 2011

26-10-106  
NOW OR FORMERLY  
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& ADAMS CIRCLE  
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PAGE 377  
(LOT 5)  
PLAN BK 888  
PLAN 99 OF 2011

26-10-107  
NOW OR FORMERLY  
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WORD BOOK 49668  
PAGE 377  
(LOT 5)  
PLAN BK 888  
PLAN 99 OF 2011

26-10-108  
NOW OR FORMERLY  
ROBERT CAVITE  
WORD BOOK 49668  
PAGE 377  
(LOT 5)  
PLAN BK 888  
PLAN 99 OF 2011

26-99-1601  
NOW OR FORMERLY  
MDF  
18 CAVITE STREET  
MSRD BOOK 26137 PAGE 3  
PLAN 411 OF 1996  
WORD BOOK 17907 PAGE 1  
PLAN BK 703  
PLAN 112 OF 1996  
PLAN BK 872  
PLAN 102 OF 2009  
(LOT BV-1)



### PAVEMENT NOTES

#### PROPOSED FULL DEPTH PAVEMENT RECLAMATION

SURFACE: 1.75" SUPERPAVE SURFACE COURSE 12.5 (SSC-12.5) OVER  
 INTERMEDIATE: 2" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5) OVER  
 3" SUPERPAVE INTERMEDIATE COURSE 19 (SIC-19.0) OVER  
 BASE: 9" RECLAIM PAVEMENT BORROW (M1.09.0)  
 SUBBASE: RECLAIM DEPTH 16"

#### PROPOSED MILL & OVERLAY

SURFACE: 1.75" SUPERPAVE SURFACE COURSE - 12.5 (SSC-12.5) OVER  
 MILLING: 1.75" PAVEMENT FINE MILLING

#### PROPOSED PERVIOUS CONCRETE SIDEWALK

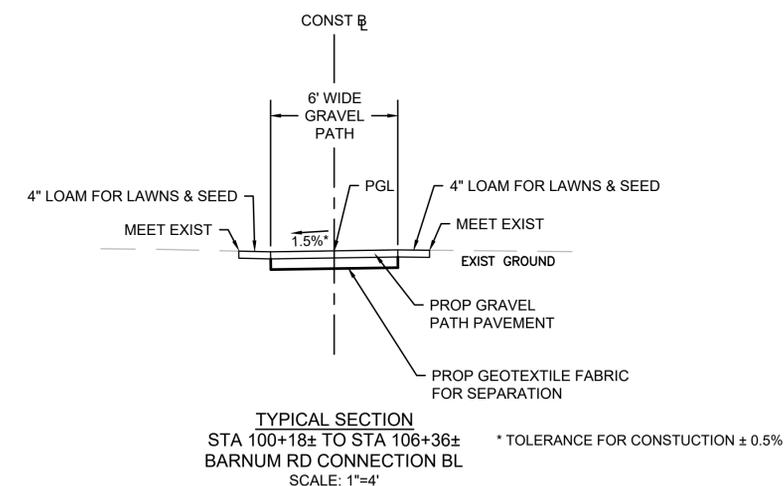
SURFACE: 4" PERVIOUS CONCRETE (PCP), 3/8" AGG.  
 INTERMEDIATE: 4" AASHTO NO. 57 OPEN-GRADED STONE  
 FILTER COURSE: 3" AASHTO NO. 8 OR EQUIVALENT FILTER COURSE  
 RESERVOIR COURSE: 18" AASHTO NO. 3 OPEN-GRADED STONE (≈40% VOID)

#### PROPOSED HOT MIX ASPHALT DRIVEWAY

SURFACE: 1.5" SUPERPAVE SURFACE COURSE 12.5 (SSC-12.5) OVER  
 INTERMEDIATE: 2.5" SUPERPAVE INTERMEDIATE COURSE 19 (SIC-19.0) OVER  
 SUBBASE: 8" GRAVEL BORROW, TYPE b

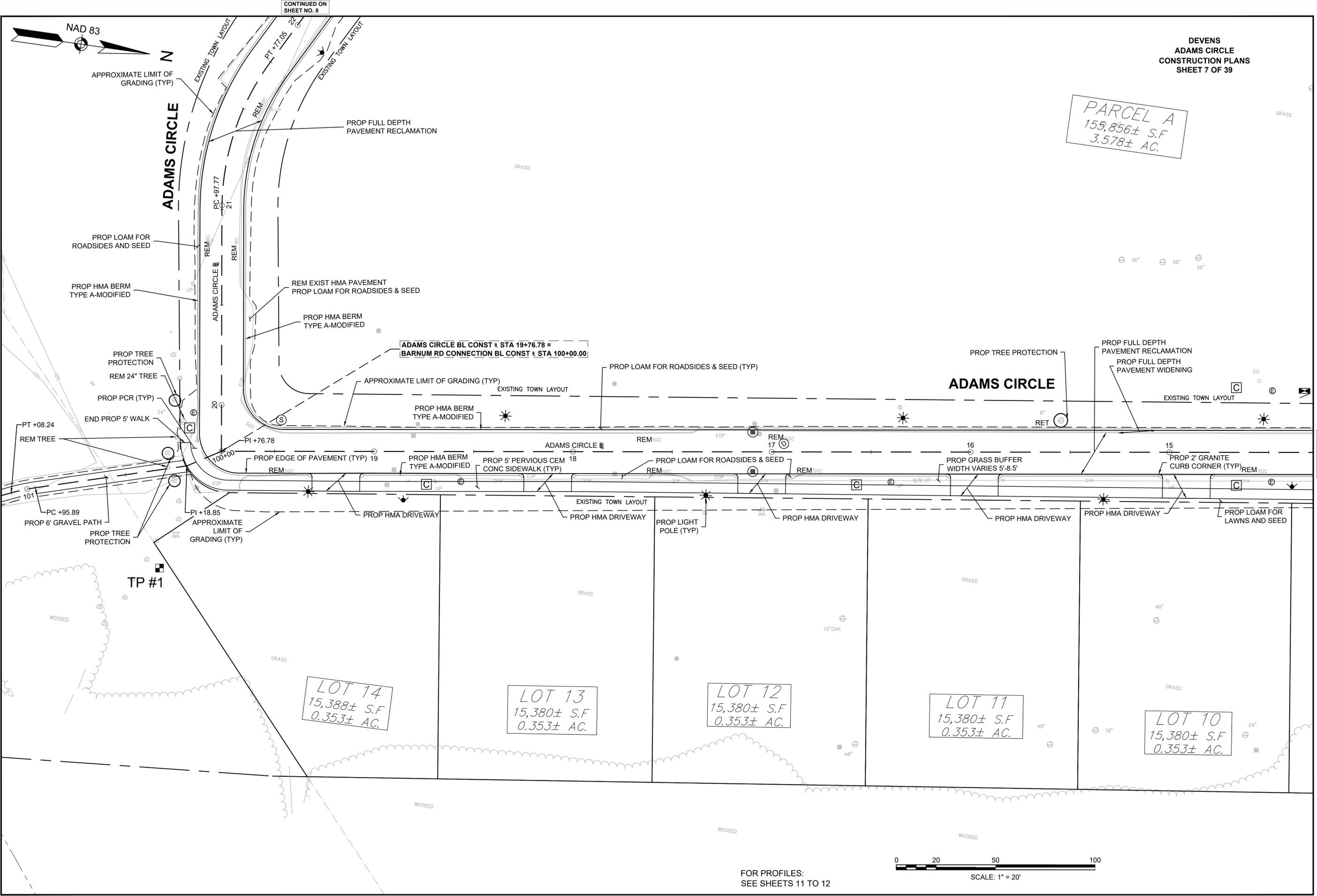
#### PROPOSED GRAVEL PATH PAVEMENT

SURFACE: 4" STONE DUST OVER  
 SUBBASE: 6" DENSE GRADED CRUSHED STONE FOR SUB-BASE OVER  
 SEPARATION: GEOTEXTILE FABRIC FOR SEPARATION





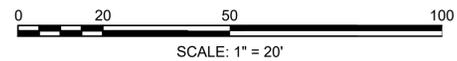
PARCEL A  
155,856± S.F.  
3.578± AC.



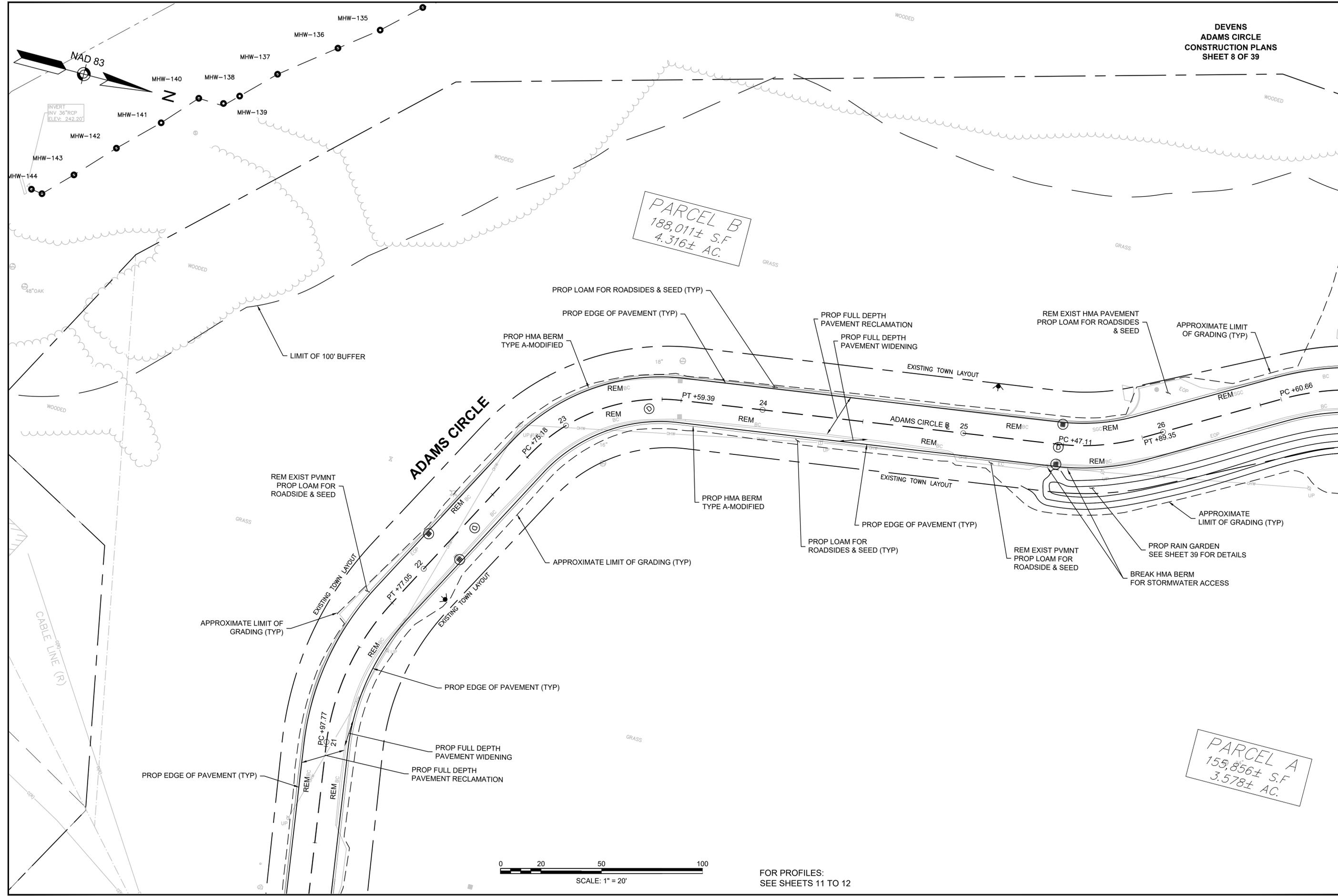
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CONTINUED ON  
SHEET NO. 6

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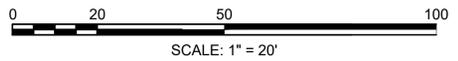


FOR PROFILES:  
SEE SHEETS 11 TO 12



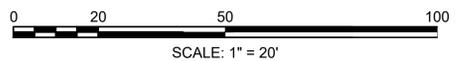
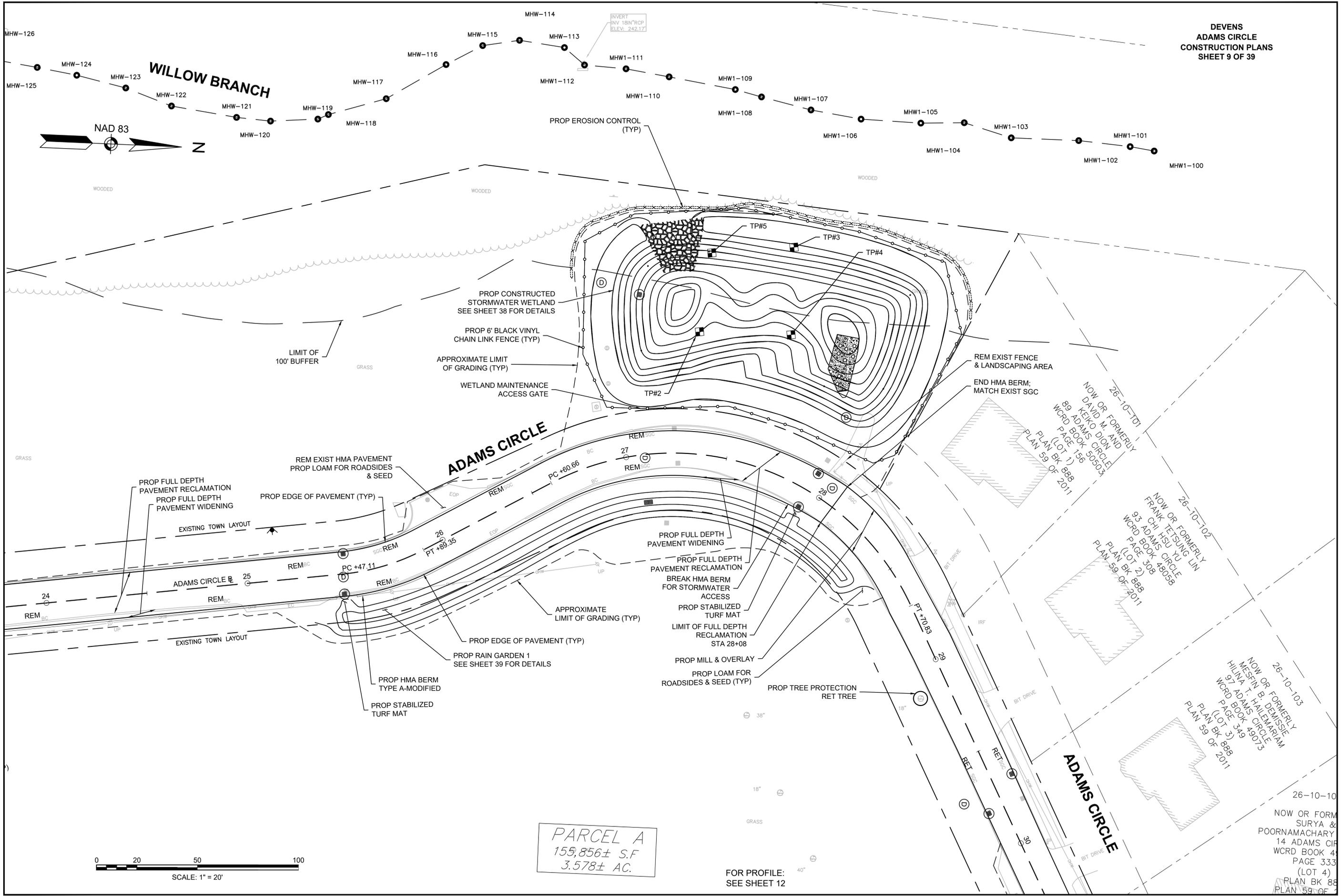
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4.316± AC.

PARCEL A  
155,856± S.F.  
3.578± AC.



FOR PROFILES:  
SEE SHEETS 11 TO 12

CONTINUED ON  
SHEET NO. 7



PARCEL A  
155,856± S.F  
3.578± AC.

FOR PROFILE:  
SEE SHEET 12

CONTINUED ON  
SHEET NO. 6

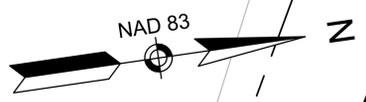
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26-10-10  
NOW OR FORM  
SURYA &  
POORNAMACHARY  
14 ADAMS CIR  
WCRD BOOK 4  
PAGE 333  
(LOT 4)  
PLAN BK 88  
PLAN 59 OF 39

26-10-103  
NOW OR FORMERLY  
MESTIN B. DEMPSIE  
HILINA T. HALEMARIAM  
97 ADAMS CIRCLE  
WCRD BOOK 888  
PAGE 349  
(LOT 3)  
PLAN BK 888  
PLAN 59 OF 2011

26-10-102  
NOW OR FORMERLY  
FRANK TETSUNG LIN  
93 ADAMS CIRCLE  
WCRD BOOK 45058  
PAGE 308  
(LOT 2)  
PLAN BK 888  
PLAN 59 OF 2011

26-10-TD1  
NOW OR FORMERLY  
DAVID M. AND  
KEIKO DION  
89 ADAMS CIRCLE  
WCRD BOOK 50503  
PAGE 156  
(LOT 1)  
PLAN BK 888  
PLAN 59 OF 2011

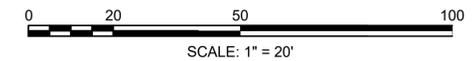


**BARNUM RD**

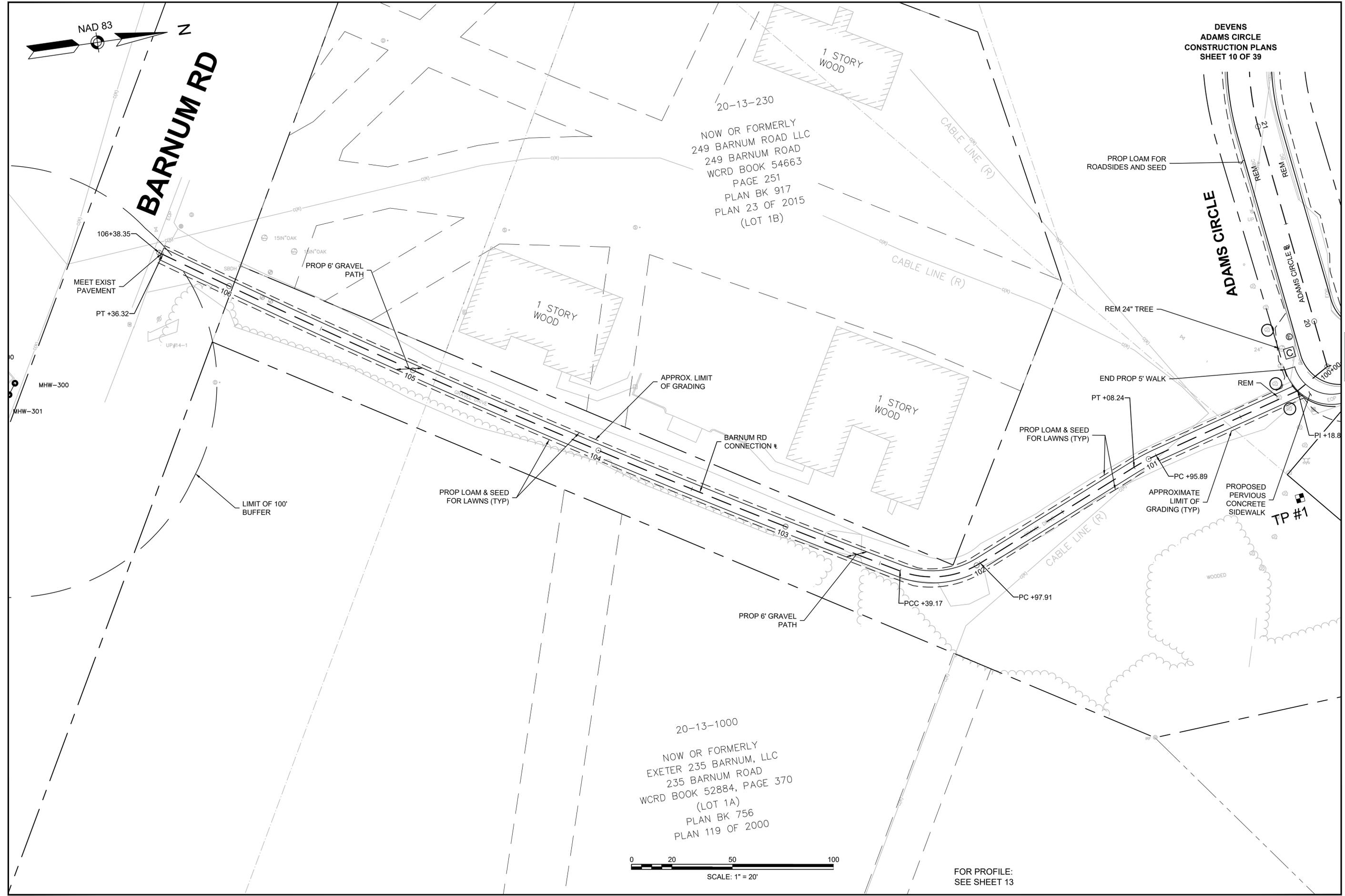
**ADAMS CIRCLE**

20-13-230  
NOW OR FORMERLY  
249 BARNUM ROAD LLC  
249 BARNUM ROAD  
WCRD BOOK 54663  
PAGE 251  
PLAN BK 917  
PLAN 23 OF 2015  
(LOT 1B)

20-13-1000  
NOW OR FORMERLY  
EXETER 235 BARNUM, LLC  
235 BARNUM ROAD  
WCRD BOOK 52884, PAGE 370  
(LOT 1A)  
PLAN BK 756  
PLAN 119 OF 2000

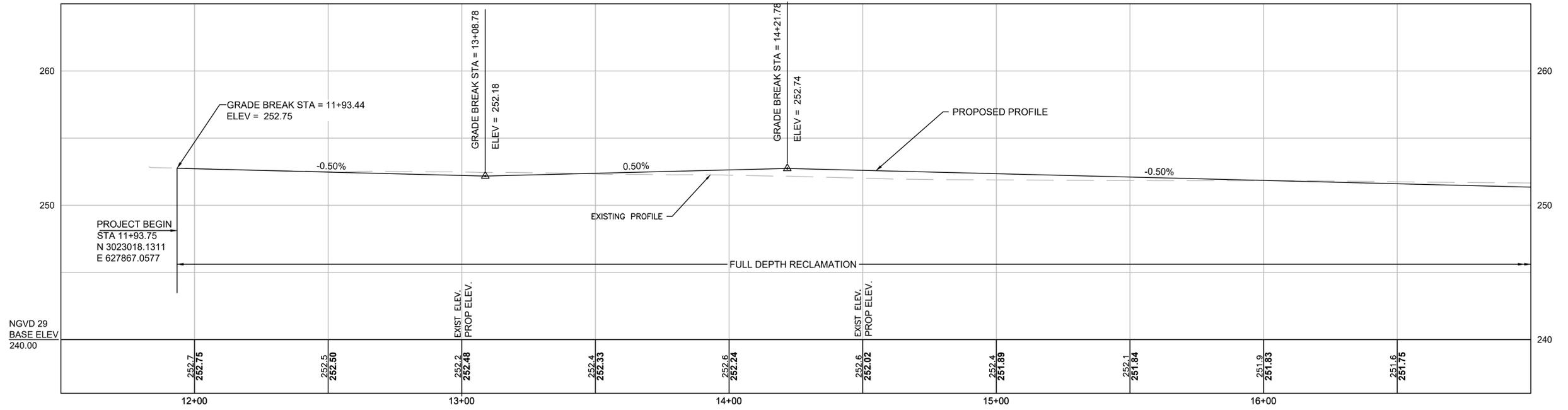


FOR PROFILE:  
SEE SHEET 13



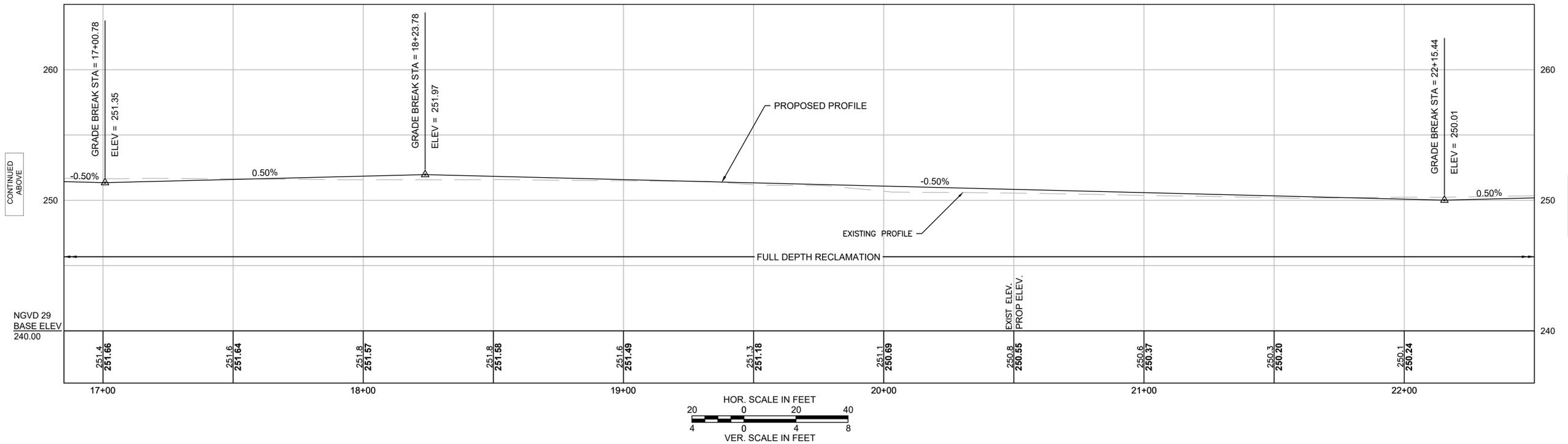
TP #1

ADAMS CIRCLE BL



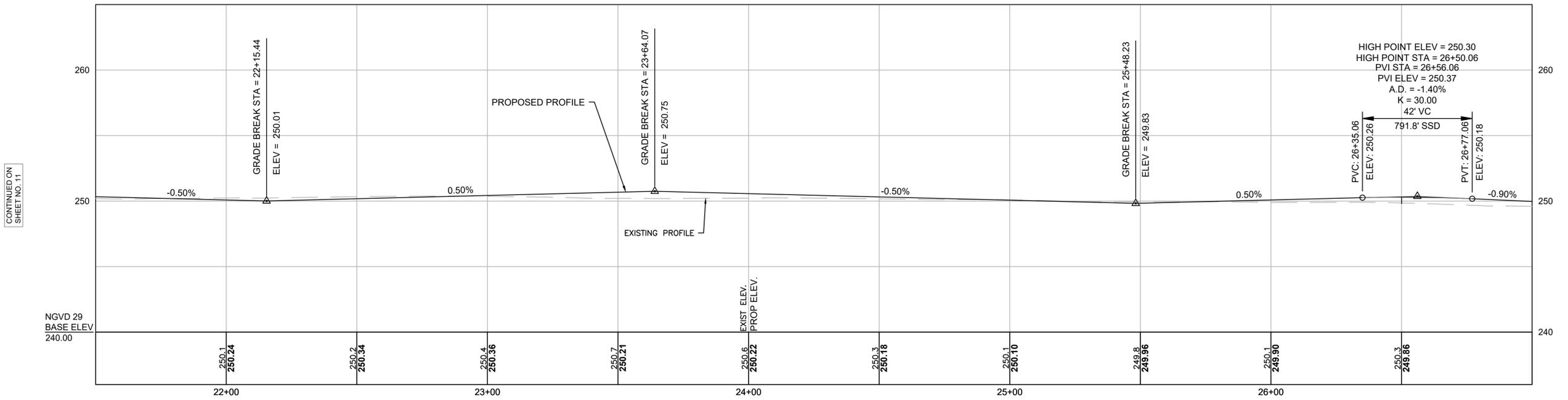
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BELOW

ADAMS CIRCLE BL



CONTINUED ON  
SHEET NO. 12

ADAMS CIRCLE BL

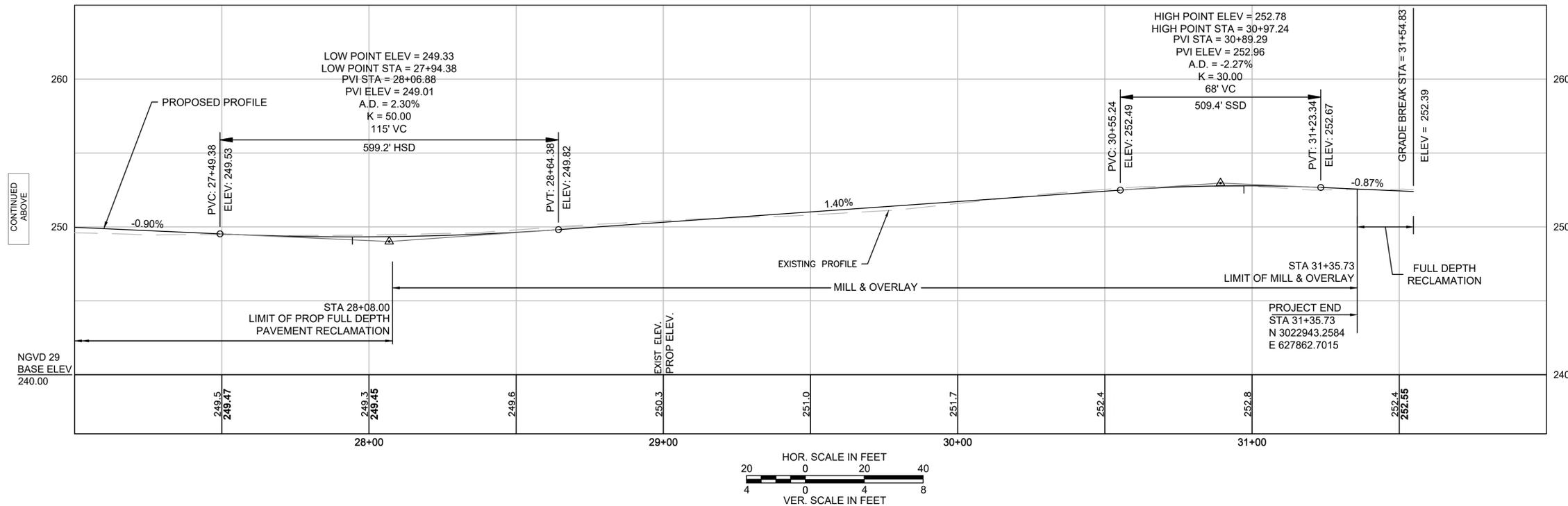


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SHEET NO. 11

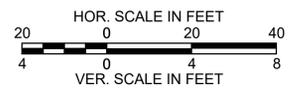
CONTINUED  
BELOW

ADAMS CIRCLE BL

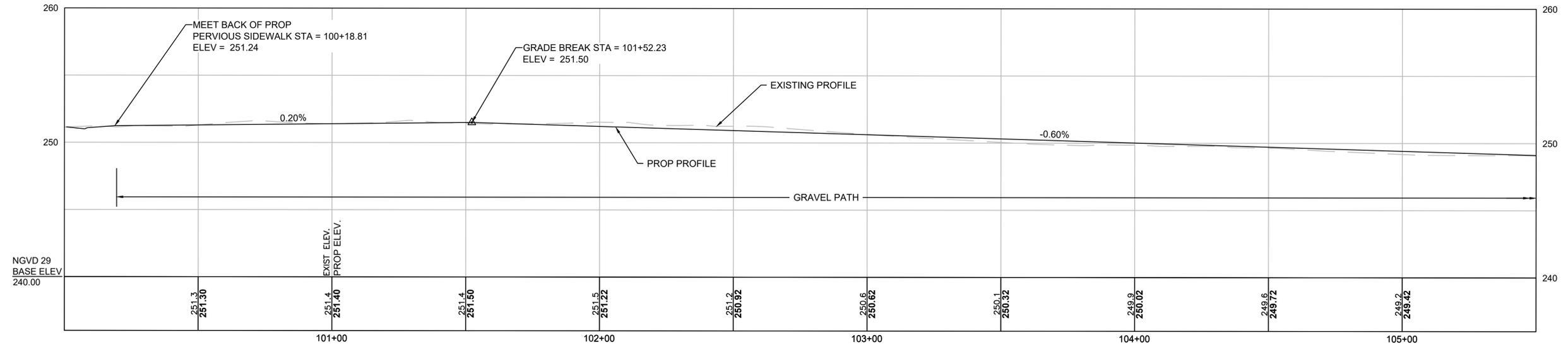
NO VERTICAL GEOMETRIC DESIGN IS PROPOSED WITHIN THE MILL & OVERLAY LIMITS.  
PROPOSED PROFILE IS SHOWN FOR INFORMATIONAL PURPOSES ONLY TO PROVIDE  
CONTINUITY WITH ADJACENT RECLAMATION WORK.



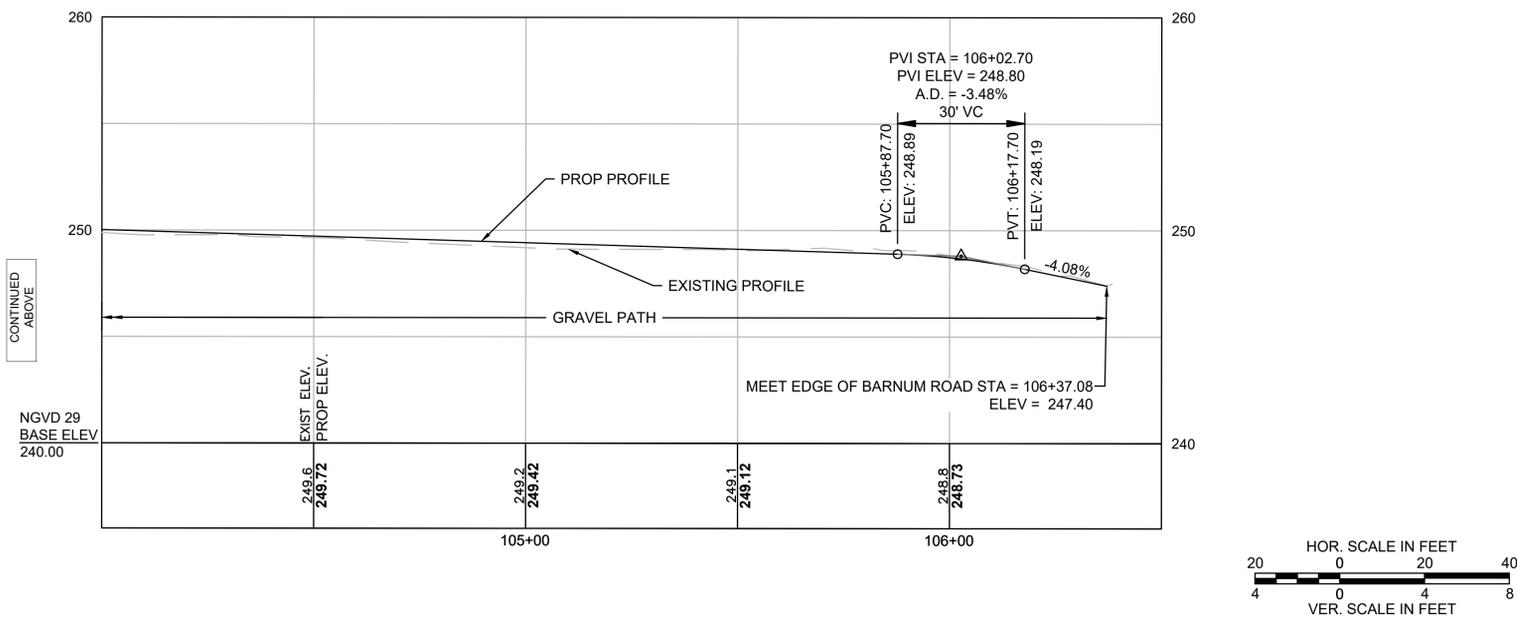
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ABOVE



BARNUM RD CONNECTION BL



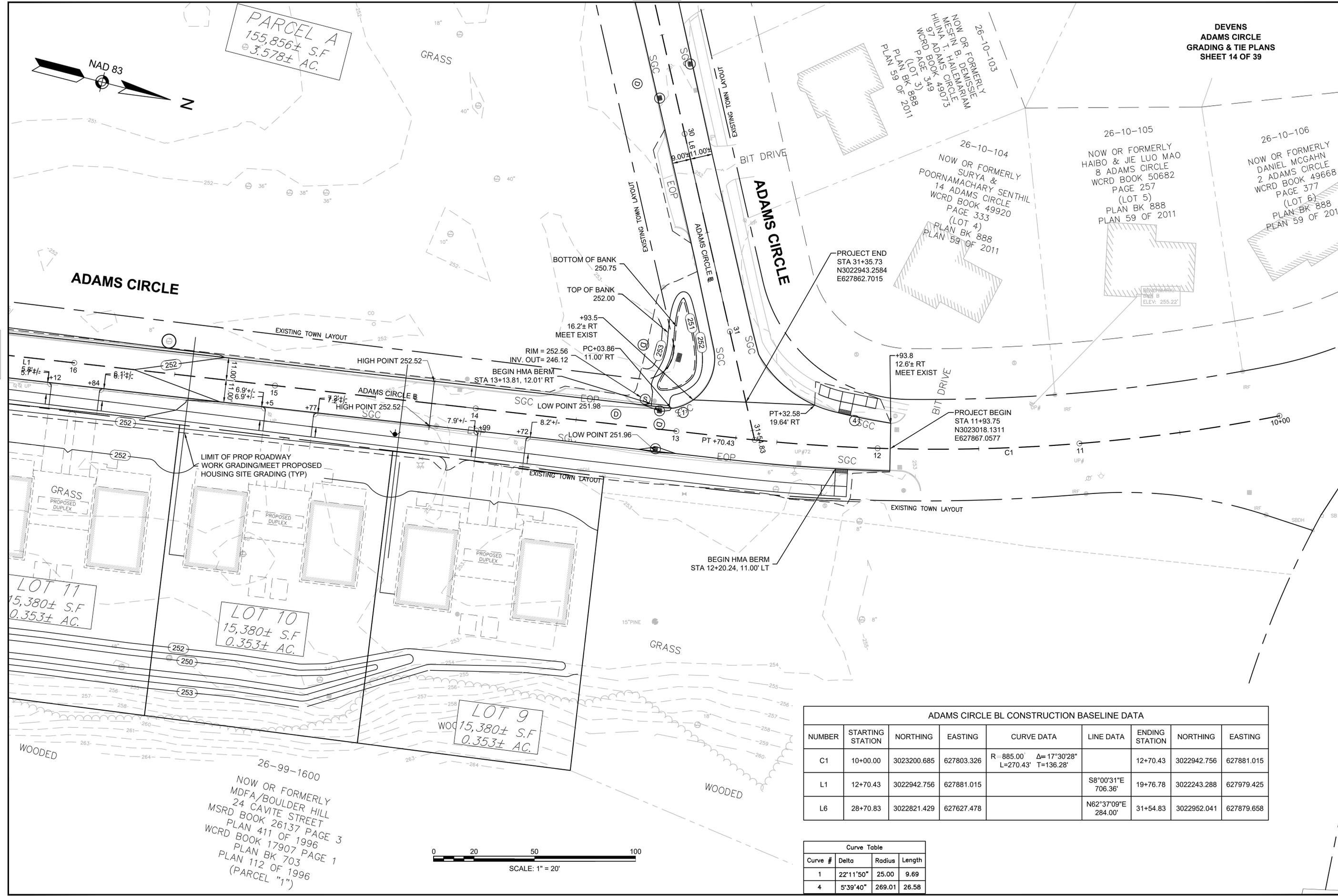
BARNUM RD CONNECTION BL



CONTINUED ON SHEET NO. 17

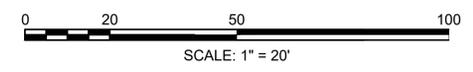
**DEVENS  
ADAMS CIRCLE  
GRADING & TIE PLANS  
SHEET 14 OF 39**

15812.15\_HQ(GRAD).DWG Plotted on 12-Feb-2026 2:56 PM



ADAMS CIRCLE BL CONSTRUCTION BASELINE DATA								
NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
C1	10+00.00	3023200.685	627803.326	R= 885.00' Δ= 17°30'28" L=270.43' T=136.28'		12+70.43	3022942.756	627881.015
L1	12+70.43	3022942.756	627881.015		S8°00'31"E 706.36'	19+76.78	3022243.288	627979.425
L6	28+70.83	3022821.429	627627.478		N62°37'09"E 284.00'	31+54.83	3022952.041	627879.658

Curve Table			
Curve #	Delta	Radius	Length
1	22°11'50"	25.00	9.69
4	5°39'40"	269.01	26.58



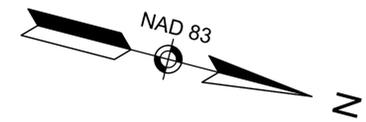
26-99-1600  
NOW OR FORMERLY  
MDF A/BOULDER HILL  
24 CAVITE STREET  
MSRD BOOK 26137 PAGE 3  
PLAN 411 OF 1996  
WCRD BOOK 17907 PAGE 1  
PLAN BK 703  
PLAN 112 OF 1996  
(PARCEL "1")

LOT 11  
15,380± S.F.  
0.353± AC.

LOT 10  
15,380± S.F.  
0.353± AC.

LOT 9  
15,380± S.F.  
0.353± AC.

PARCEL A  
155,856± S.F.  
3.578± AC.



CONTINUED ON SHEET NO. 16

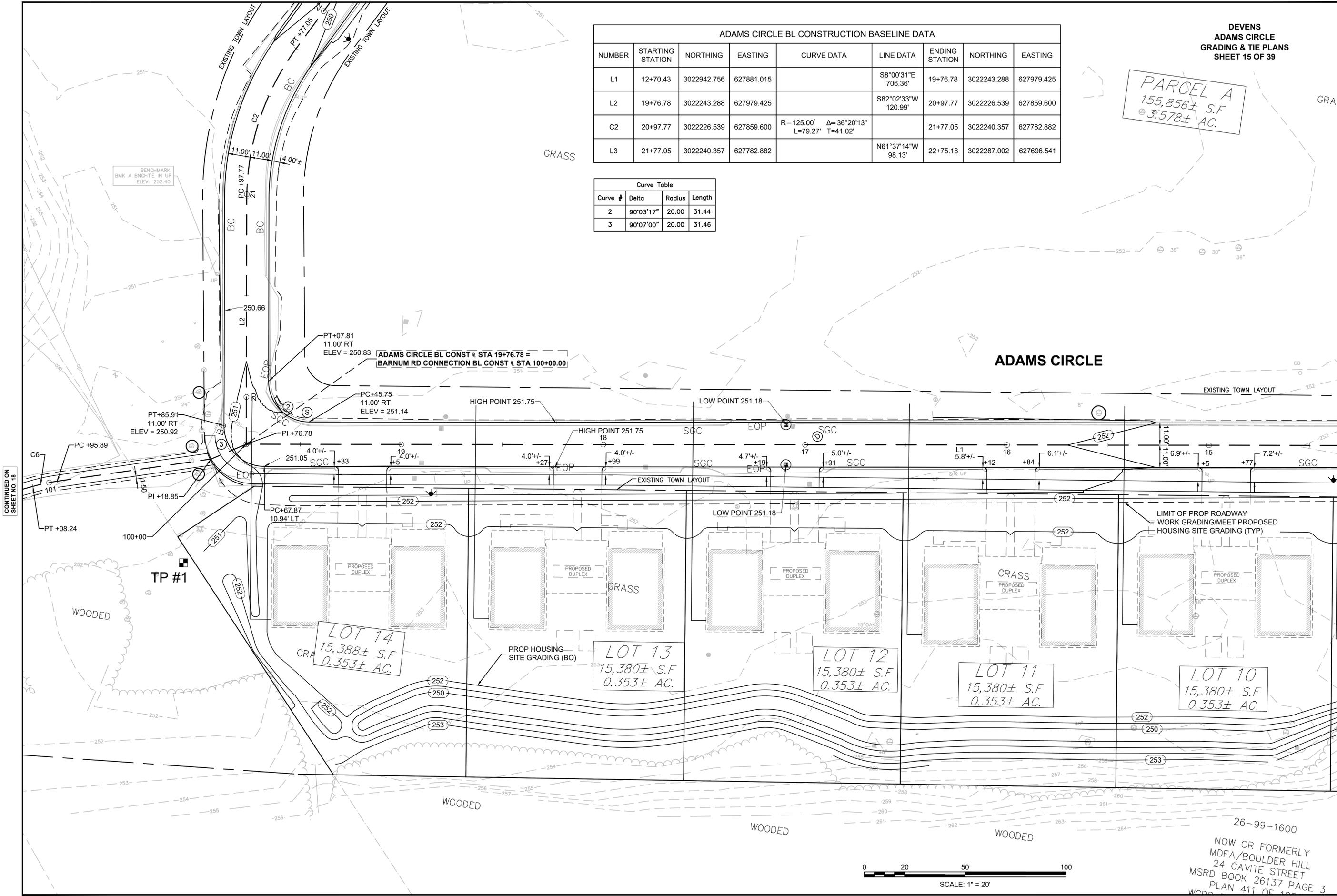
ADAMS CIRCLE BL CONSTRUCTION BASELINE DATA								
NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L1	12+70.43	3022942.756	627881.015		S8°00'31"E 706.36'	19+76.78	3022243.288	627979.425
L2	19+76.78	3022243.288	627979.425		S82°02'33"W 120.99'	20+97.77	3022226.539	627859.600
C2	20+97.77	3022226.539	627859.600	R = 125.00' L = 79.27' Δ = 36°20'13" T = 41.02'		21+77.05	3022240.357	627782.882
L3	21+77.05	3022240.357	627782.882		N61°37'14"W 98.13'	22+75.18	3022287.002	627696.541

Curve Table			
Curve #	Delta	Radius	Length
2	90°03'17"	20.00	31.44
3	90°07'00"	20.00	31.46

DEVENS  
ADAMS CIRCLE  
GRADING & TIE PLANS  
SHEET 15 OF 39

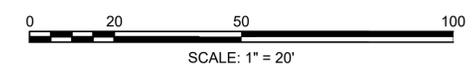
PARCEL A  
155,856± S.F  
@ 3.578± AC.

15812.15\_HD\GRAD.DWG Plotted on 12-Feb-2026 2:56 PM

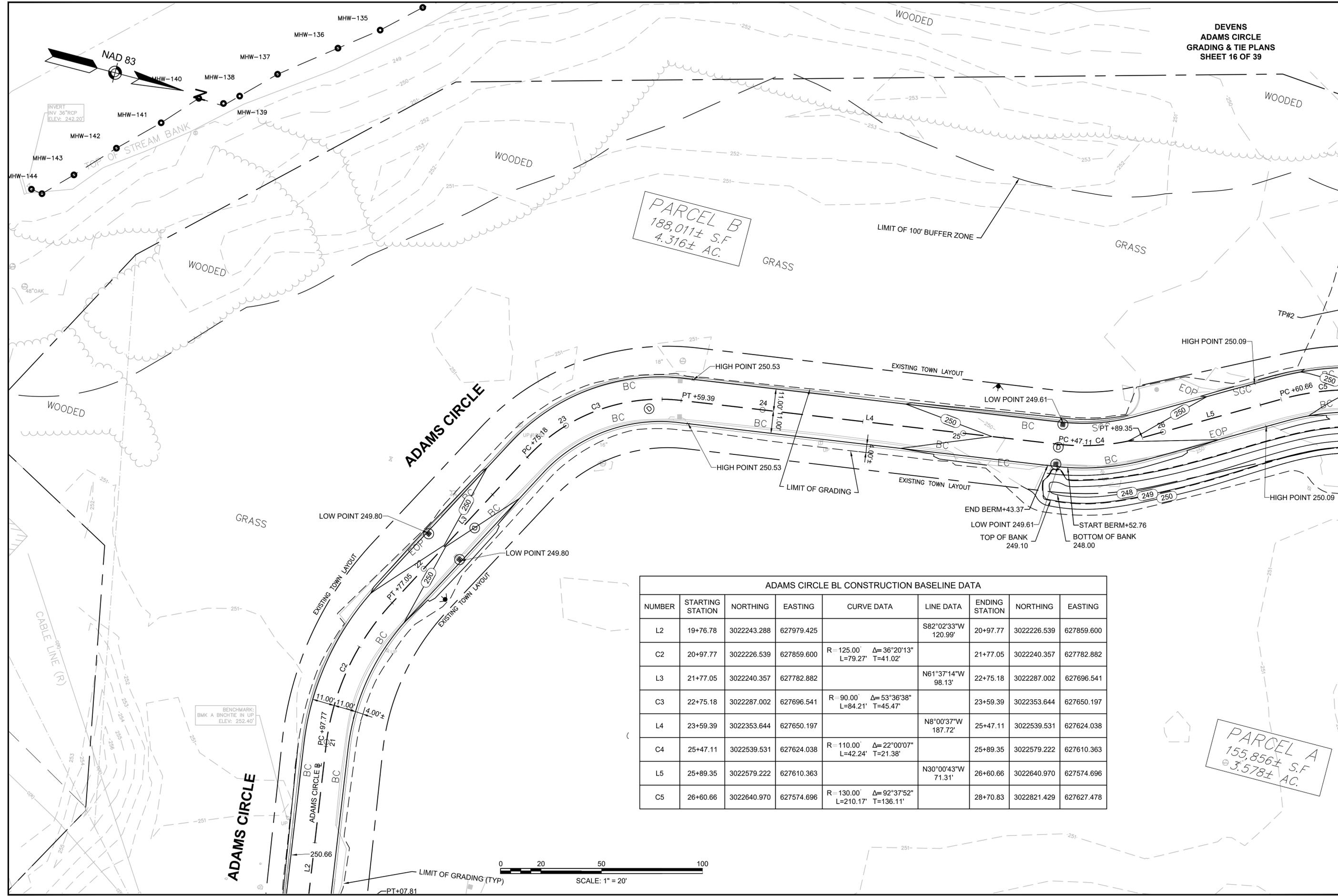


CONTINUED ON SHEET NO. 18

CONTINUED ON SHEET NO. 14



26-99-1600  
NOW OR FORMERLY  
MDFA/BOULDER HILL  
24 CAVITE STREET  
MSRD BOOK 26137 PAGE 3  
PLAN 411 OF 1000

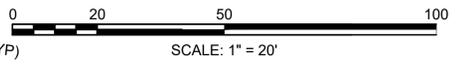


PARCEL B  
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4.316± AC.

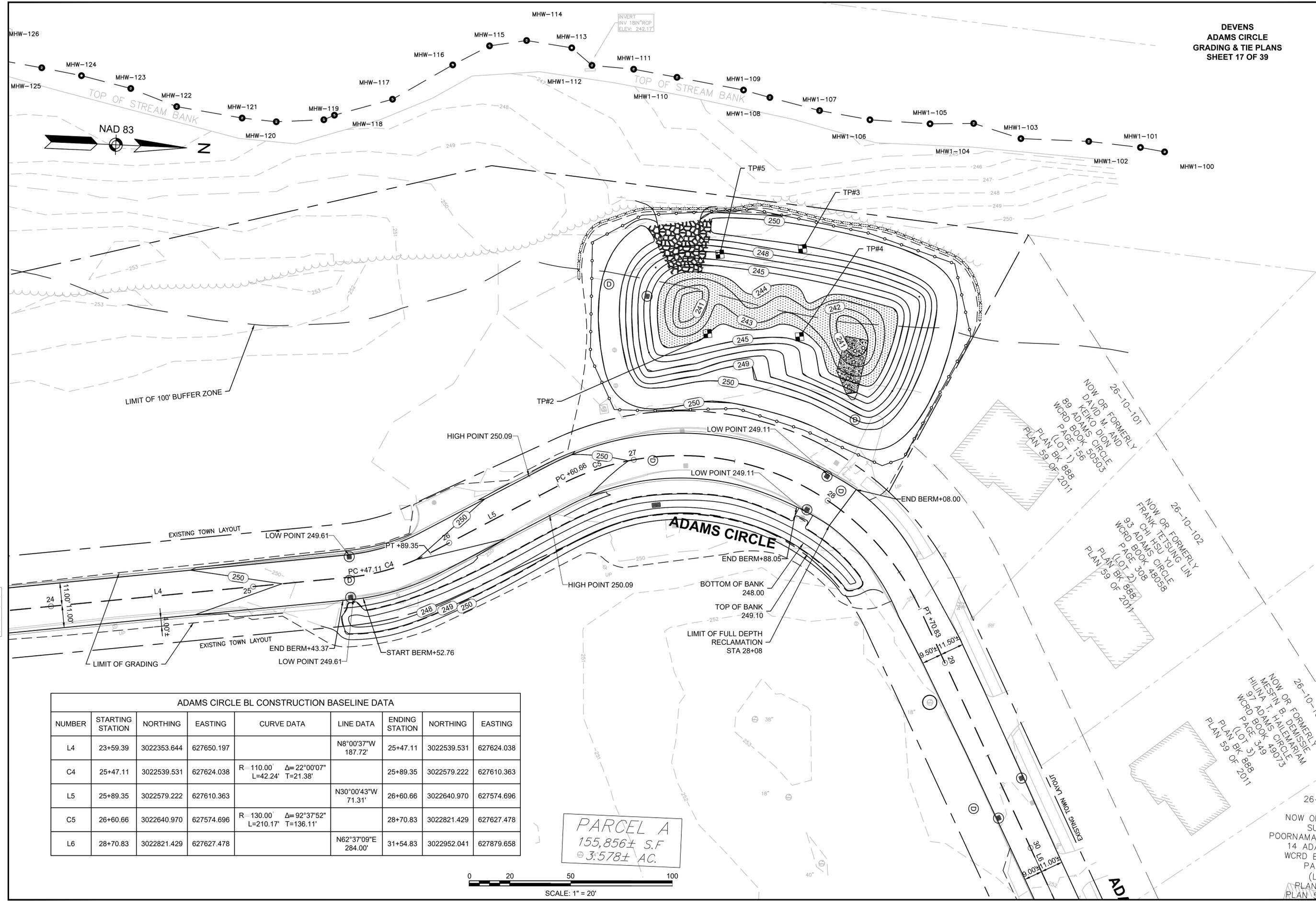
PARCEL A  
155,856± S.F.  
3.578± AC.

ADAMS CIRCLE BL CONSTRUCTION BASELINE DATA

NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L2	19+76.78	3022243.288	627979.425		S82°02'33"W 120.99'	20+97.77	3022226.539	627859.600
C2	20+97.77	3022226.539	627859.600	R=125.00' Δ=36°20'13" L=79.27' T=41.02'		21+77.05	3022240.357	627782.882
L3	21+77.05	3022240.357	627782.882		N61°37'14"W 98.13'	22+75.18	3022287.002	627696.541
C3	22+75.18	3022287.002	627696.541	R=90.00' Δ=53°36'38" L=84.21' T=45.47'		23+59.39	3022353.644	627650.197
L4	23+59.39	3022353.644	627650.197		N8°00'37"W 187.72'	25+47.11	3022539.531	627624.038
C4	25+47.11	3022539.531	627624.038	R=110.00' Δ=22°00'07" L=42.24' T=21.38'		25+89.35	3022579.222	627610.363
L5	25+89.35	3022579.222	627610.363		N30°00'43"W 71.31'	26+60.66	3022640.970	627574.696
C5	26+60.66	3022640.970	627574.696	R=130.00' Δ=92°37'52" L=210.17' T=136.11'		28+70.83	3022821.429	627627.478



CONTINUED ON  
SHEET NO. 15



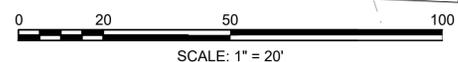
CONTINUED ON  
SHEET NO. 16

CONTINUED ON  
SHEET NO. 14

ADAMS CIRCLE BL CONSTRUCTION BASELINE DATA

NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L4	23+59.39	3022353.644	627650.197		N8°00'37"W 187.72'	25+47.11	3022539.531	627624.038
C4	25+47.11	3022539.531	627624.038	R=110.00' Δ=22°00'07" L=42.24' T=21.38'		25+89.35	3022579.222	627610.363
L5	25+89.35	3022579.222	627610.363		N30°00'43"W 71.31'	26+60.66	3022640.970	627574.696
C5	26+60.66	3022640.970	627574.696	R=130.00' Δ=92°37'52" L=210.17' T=136.11'		28+70.83	3022821.429	627627.478
L6	28+70.83	3022821.429	627627.478		N62°37'09"E 284.00'	31+54.83	3022952.041	627879.658

PARCEL A  
155,856± S.F  
@ 3:578± AC.

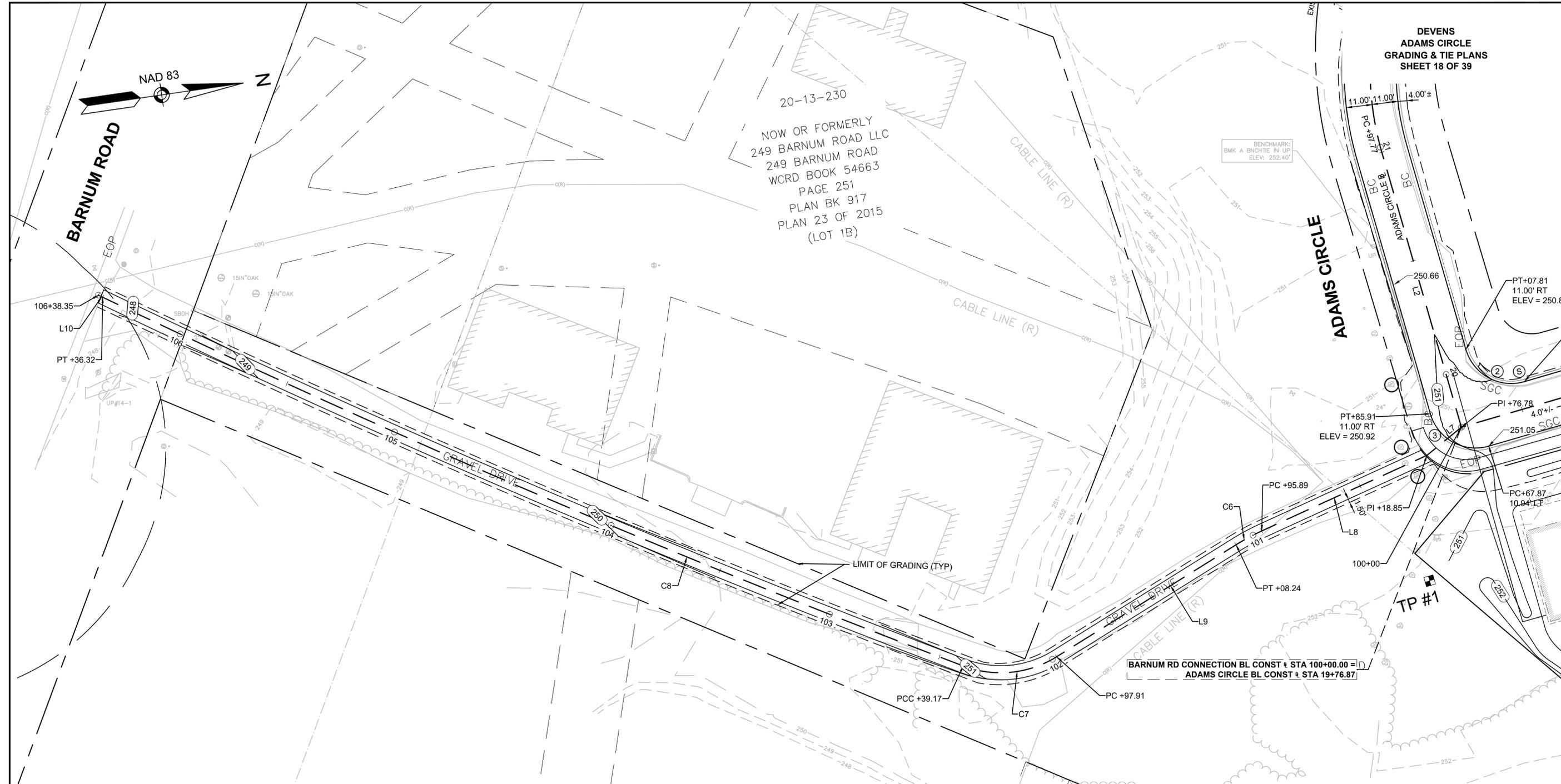


26-10-101  
NOW OR FORMERLY  
DAVID M. AND  
89 ADAMS CIRCLE  
WCRD BOOK 00505  
PAGE 156  
PLAN BK 888  
PLAN 59 OF 2011

26-10-102  
NOW OR FORMERLY  
FRANK TETSUNG LIN  
93 ADAMS CIRCLE  
WCRD BOOK 48058  
PAGE 308  
PLAN BK 888  
PLAN 59 OF 2011

26-10-103  
NOW OR FORMERLY  
MESTIN B. DEMISSIE  
HILINA T. HAILEMARIAM  
97 ADAMS CIRCLE  
WCRD BOOK 349  
PAGE 349  
PLAN BK 888  
PLAN 59 OF 2011

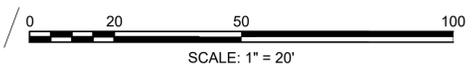
26-10-104  
NOW OR FORM  
SURYA &  
POORNAMACHARY  
14 ADAMS CIR  
WCRD BOOK 4  
PAGE 333  
(LOT 4)  
PLAN BK 88  
PLAN 59 OF 2

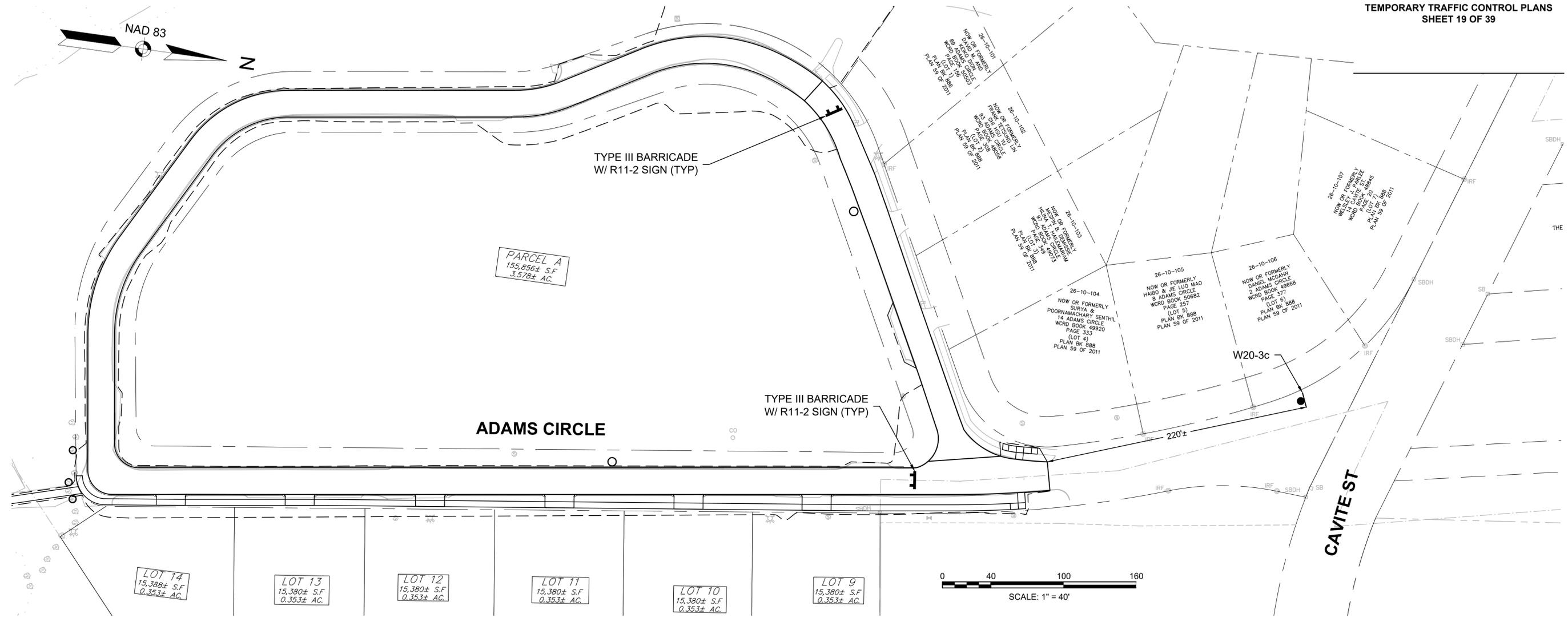


BARNUM RD CONNECTION BL CONSTRUCTION BASELINE DATA

NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L7	100+00.00	3022243.288	627979.425		S30°55'08"E 18.85'	100+18.85	3022227.118	627989.110
L8	100+18.85	3022227.118	627989.110		S16°14'45"E 77.04'	100+95.89	3022153.156	628010.662
C6	100+95.89	3022153.156	628010.662	R = 96.00' Δ = 7°22'13" L = 12.35' T = 6.18'		101+08.24	3022141.555	628014.869
L9	101+08.24	3022141.555	628014.869		S23°36'58"E 89.67'	101+97.91	3022059.391	628050.792
C7	101+97.91	3022059.391	628050.792	R = 45.00' Δ = 52°32'24" L = 41.26' T = 22.21'		102+39.17	3022019.600	628048.948
C8	102+39.17	3022019.600	628048.948	R = 4675.00' Δ = 4°52'03" L = 397.15' T = 198.69'		106+36.32	3021680.561	627842.342
L10	106+36.32	3021680.561	627842.342		S33°47'29"W 2.03'	106+38.35	3021678.877	627841.214

20-13-1000  
NOW OR FORMERLY  
EXETER 235 BARNUM, LLC  
235 BARNUM ROAD  
WCRD BOOK 52884, PAGE 370  
(LOT 1A)  
PLAN BK 756  
PLAN 119 OF 2000

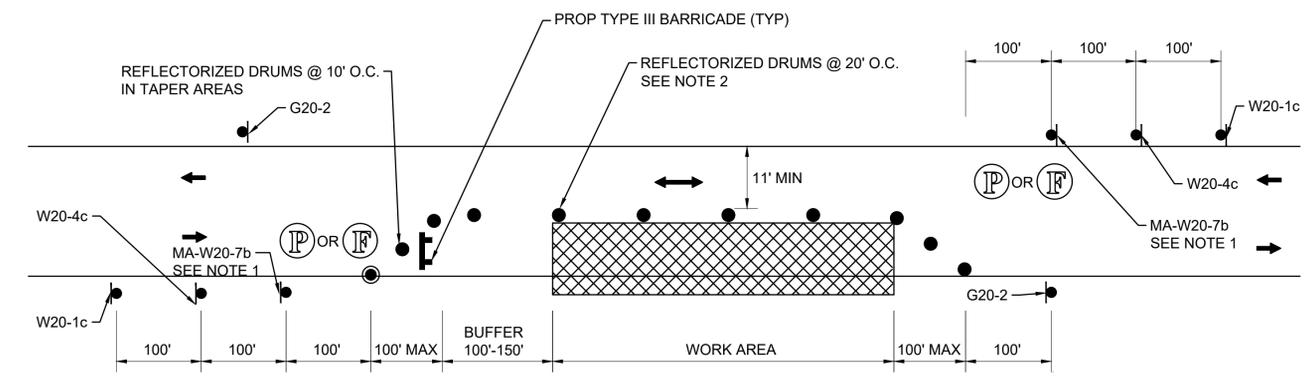




TEMPORARY TRAFFIC CONTROL SIGN SUMMARY

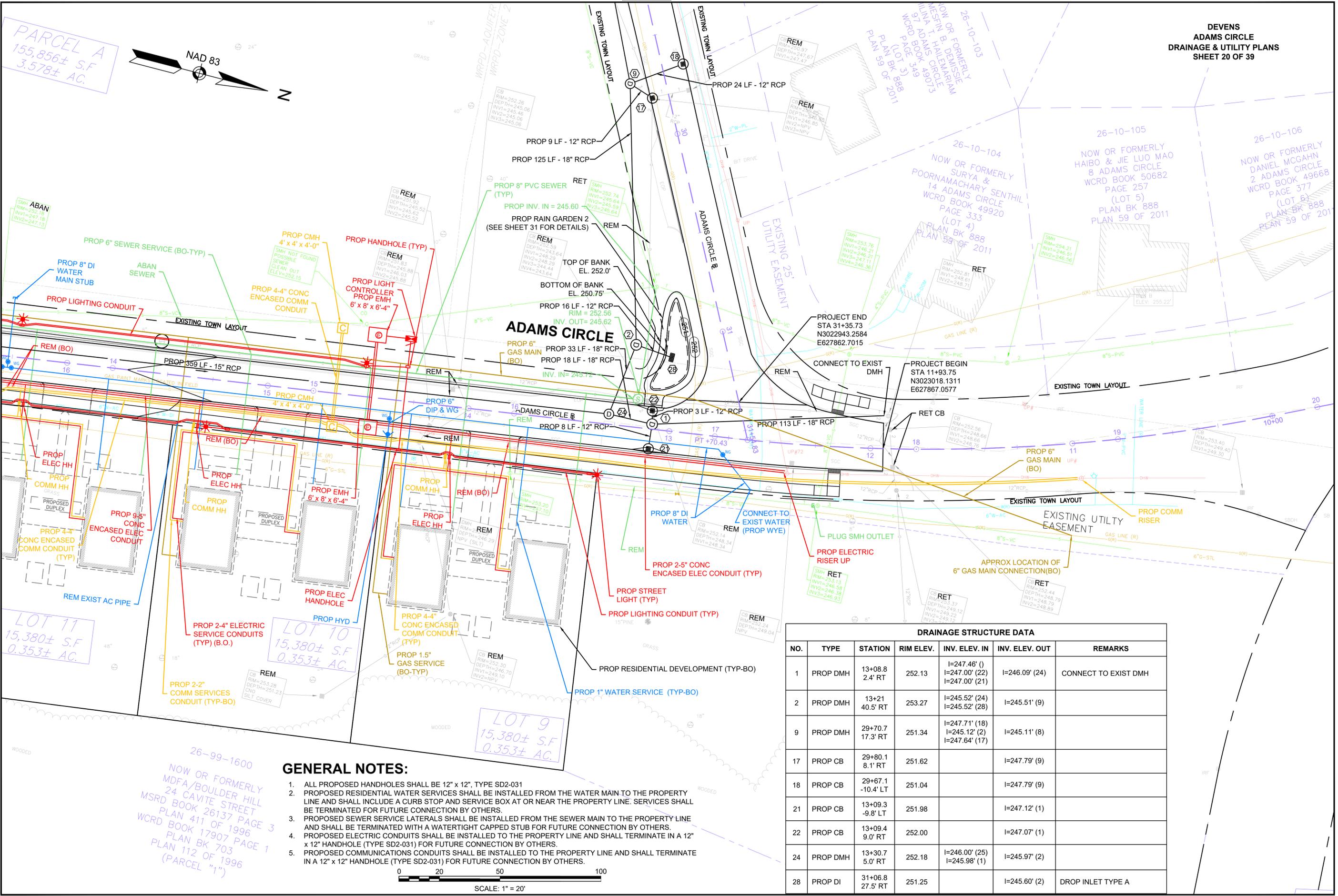
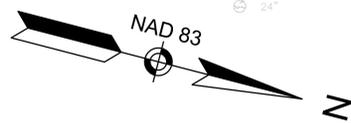
IDENTIFICATION NUMBER	SIZE OF SIGN		TEXT	COLOR			UNIT AREA (S.F.)
	WIDTH	HEIGHT		BACK-GROUND	LEGEND	BORDER	
MA-W20-7b	36"	36"		FLUORESCENT ORANGE	BLACK	BLACK	9.00
G20-2	36"	18"		FLUORESCENT ORANGE WHITE	BLACK	BLACK	4.50
R11-2	48"	30"		WHITE	BLACK	BLACK	10.00
W20-1c	36"	36"		FLUORESCENT ORANGE	BLACK	BLACK	9.00
W20-3c	36"	36"		FLUORESCENT ORANGE	BLACK	BLACK	9.00
W20-4c	36"	36"		FLUORESCENT ORANGE	BLACK	BLACK	9.00

NOTES:  
1. SEE FHWA "STANDARD HIGHWAY SIGNS 2004 EDITION" AS AMENDED, AND MASSDOT SIGN BOOK FOR TEXT DIMENSIONS



- NOTES:
1. W20-7 SIGN TO BE USED WHEN FLAGGERS ARE USED INSTEAD OF POLICE DETAILS
  2. CONES MAY BE USED IN LIEU OF DRUMS OUTSIDE OF TAPER AREAS
  3. CONTRACTOR TO MAINTAIN ABUTTER ACCESS UNLESS OTHERWISE COORDINATED AT LEAST 24 HOURS IN ADVANCE

PARCEL A  
155,856± S.F.  
3.578± AC.

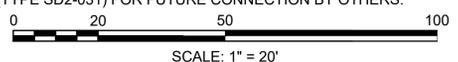


CONTINUED ON SHEET NO. 21

15812.15\_HDU(UTIL).DWG  
Plotted on 12-Feb-2026 2:59 PM

**GENERAL NOTES:**

1. ALL PROPOSED HANDHOLES SHALL BE 12" x 12", TYPE SD2-031
2. PROPOSED RESIDENTIAL WATER SERVICES SHALL BE INSTALLED FROM THE WATER MAIN TO THE PROPERTY LINE AND SHALL INCLUDE A CURB STOP AND SERVICE BOX AT OR NEAR THE PROPERTY LINE. SERVICES SHALL BE TERMINATED FOR FUTURE CONNECTION BY OTHERS.
3. PROPOSED SEWER SERVICE LATERALS SHALL BE INSTALLED FROM THE SEWER MAIN TO THE PROPERTY LINE AND SHALL BE TERMINATED WITH A WATERTIGHT CAPPED STUB FOR FUTURE CONNECTION BY OTHERS.
4. PROPOSED ELECTRIC CONDUITS SHALL BE INSTALLED TO THE PROPERTY LINE AND SHALL TERMINATE IN A 12" x 12" HANDHOLE (TYPE SD2-031) FOR FUTURE CONNECTION BY OTHERS.
5. PROPOSED COMMUNICATIONS CONDUITS SHALL BE INSTALLED TO THE PROPERTY LINE AND SHALL TERMINATE IN A 12" x 12" HANDHOLE (TYPE SD2-031) FOR FUTURE CONNECTION BY OTHERS.



**DRAINAGE STRUCTURE DATA**

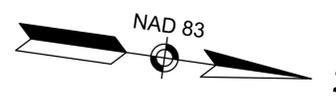
NO.	TYPE	STATION	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
1	PROP DMH	13+08.8 2.4' RT	252.13	I=247.46' ( ) I=247.00' (22) I=247.00' (21)	I=246.09' (24)	CONNECT TO EXIST DMH
2	PROP DMH	13+21 40.5' RT	253.27	I=245.52' (24) I=245.52' (28)	I=245.51' (9)	
9	PROP DMH	29+70.7 17.3' RT	251.34	I=247.71' (18) I=245.12' (2) I=247.64' (17)	I=245.11' (8)	
17	PROP CB	29+80.1 8.1' RT	251.62		I=247.79' (9)	
18	PROP CB	29+67.1 -10.4' LT	251.04		I=247.79' (9)	
21	PROP CB	13+09.3 -9.8' LT	251.98		I=247.12' (1)	
22	PROP CB	13+09.4 9.0' RT	252.00		I=247.07' (1)	
24	PROP DMH	13+30.7 5.0' RT	252.18	I=246.00' (25) I=245.98' (1)	I=245.97' (2)	
28	PROP DI	31+06.8 27.5' RT	251.25		I=245.60' (2)	DROP INLET TYPE A

LOT 11  
15,380± S.F.  
0.353± AC.

LOT 10  
15,380± S.F.  
0.353± AC.

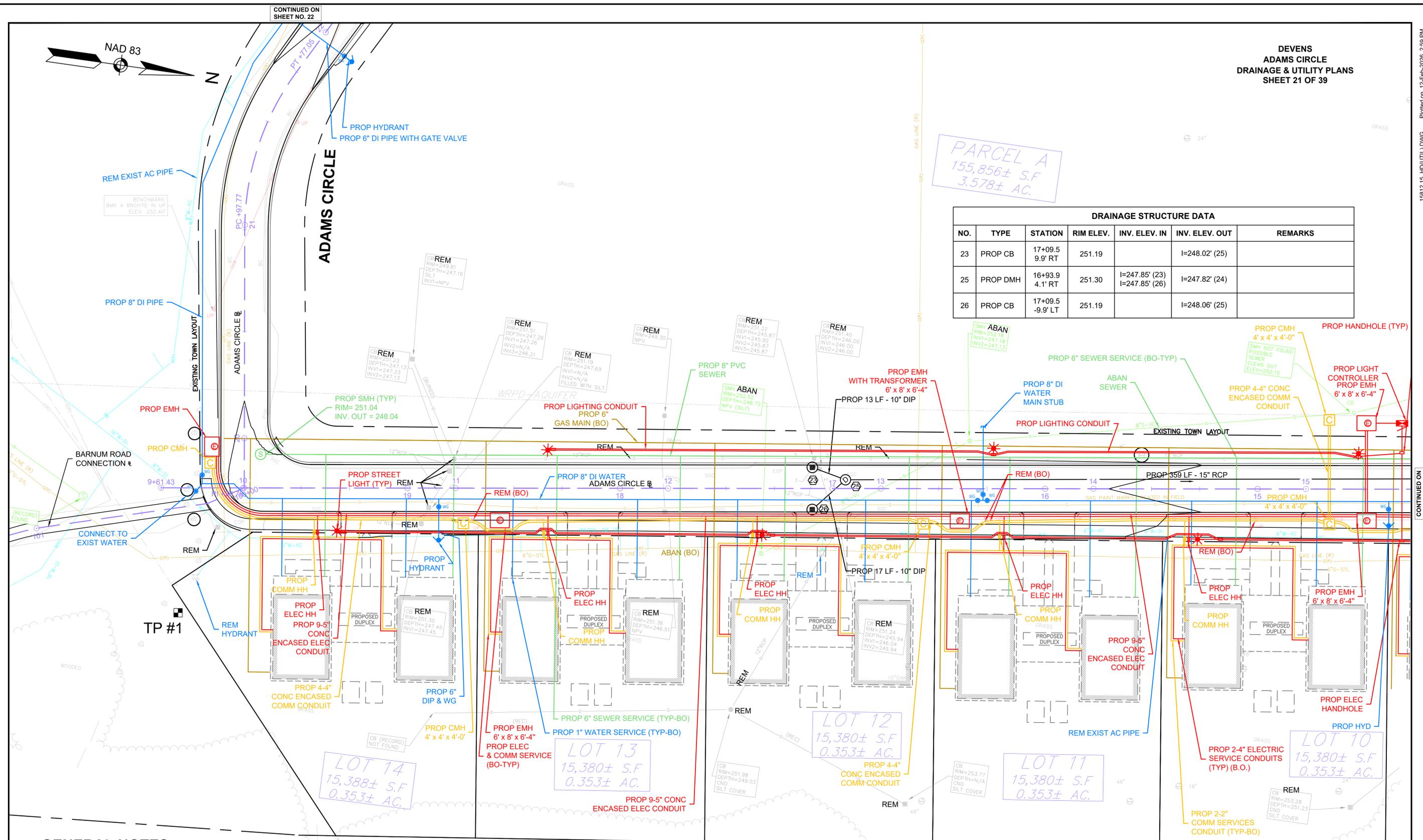
LOT 9  
15,380± S.F.  
0.353± AC.

26-99-1600  
NOW OR FORMERLY  
MDFA/BOULDER HILL  
24 CAVITE STREET  
MSRD BOOK 26137 PAGE 3  
PLAN 411 OF 1996  
WRD BOOK 17907 PAGE 1  
PLAN BK 703  
PLAN 112 OF 1996  
(PARCEL "1")



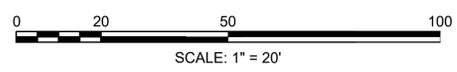
PARCEL A  
155,856± S.F.  
3.578± AC.

DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
23	PROP CB	17+09.5 9.9' RT	251.19		I=248.02' (25)	
25	PROP DMH	16+93.9 4.1' RT	251.30	I=247.85' (23) I=247.85' (26)	I=247.82' (24)	
26	PROP CB	17+09.5 -9.9' LT	251.19		I=248.06' (25)	



**GENERAL NOTES:**

1. ALL PROPOSED HANDHOLES SHALL BE 12" x 12", TYPE SD2-031
2. PROPOSED RESIDENTIAL WATER SERVICES SHALL BE INSTALLED FROM THE WATER MAIN TO THE PROPERTY LINE AND SHALL INCLUDE A CURB STOP AND SERVICE BOX AT OR NEAR THE PROPERTY LINE. SERVICES SHALL BE TERMINATED FOR FUTURE CONNECTION BY OTHERS.
3. PROPOSED SEWER SERVICE LATERALS SHALL BE INSTALLED FROM THE SEWER MAIN TO THE PROPERTY LINE AND SHALL BE TERMINATED WITH A WATERTIGHT CAPPED STUB FOR FUTURE CONNECTION BY OTHERS.
4. PROPOSED ELECTRIC CONDUITS SHALL BE INSTALLED TO THE PROPERTY LINE AND SHALL TERMINATE IN A 12" x 12" HANDHOLE (TYPE SD2-031) FOR FUTURE CONNECTION BY OTHERS.
5. PROPOSED COMMUNICATIONS CONDUITS SHALL BE INSTALLED TO THE PROPERTY LINE AND SHALL TERMINATE IN A 12" x 12" HANDHOLE (TYPE SD2-031) FOR FUTURE CONNECTION BY OTHERS.

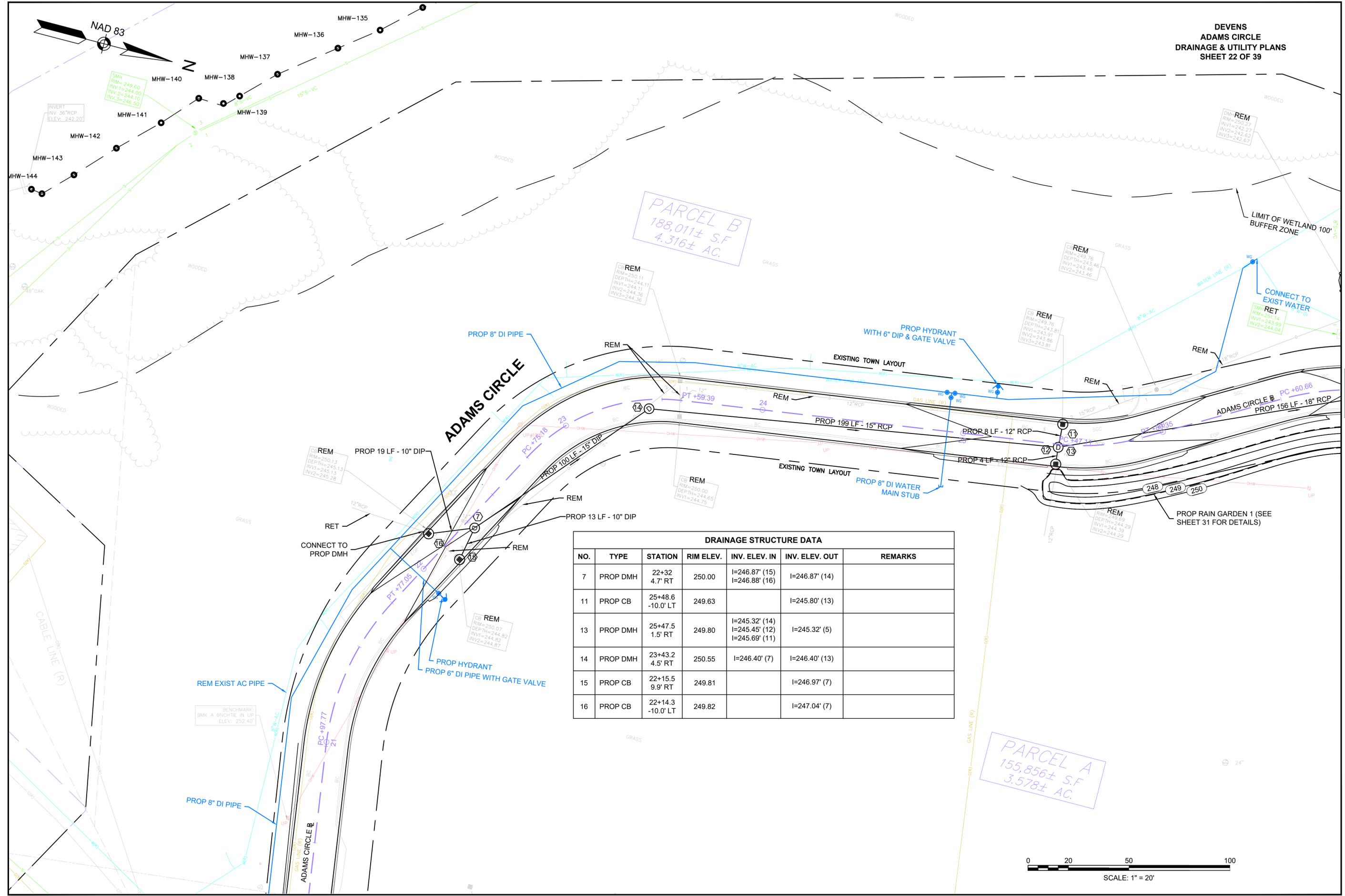


26-99-1600  
NOW OR FORMERLY  
MDFA/BOULDER HILL  
24 CAVITE STREET  
MSRD BOOK 26137 PAGE 3  
PLAN 411 OF 1996  
WORD BOOK

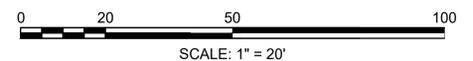
15812.15\_HDU(UTIL).DWG Plotted on 12-Feb-2026 2:59 PM

CONTINUED ON SHEET NO. 20

CONTINUED ON SHEET NO. 22



DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
7	PROP DMH	22+32 4.7' RT	250.00	I=246.87' (15) I=246.88' (16)	I=246.87' (14)	
11	PROP CB	25+48.6 -10.0' LT	249.63		I=245.80' (13)	
13	PROP DMH	25+47.5 1.5' RT	249.80	I=245.32' (14) I=245.45' (12) I=245.69' (11)	I=245.32' (5)	
14	PROP DMH	23+43.2 4.5' RT	250.55	I=246.40' (7)	I=246.40' (13)	
15	PROP CB	22+15.5 9.9' RT	249.81		I=246.97' (7)	
16	PROP CB	22+14.3 -10.0' LT	249.82		I=247.04' (7)	



CONTINUED ON  
SHEET NO. 21







① WIRE SCHEDULE  
4#6 & 1#6 GND

PARCEL A  
155,856± S.F.  
3.578± AC.

ADAMS CIRCLE

L7  
STA 19+33  
20' LT

L6  
STA 18+34  
18' RT

L5  
STA 17+33  
22' LT

L3  
STA 15+28  
24' LT

L4  
STA 16+24  
17' RT

L2  
STA 14+53  
17' RT

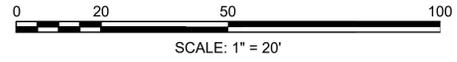
LOT 14  
15,388± S.F.  
0.353± AC.

LOT 13  
15,380± S.F.  
0.353± AC.

LOT 12  
15,380± S.F.  
0.353± AC.

LOT 11  
15,380± S.F.  
0.353± AC.

LOT 10  
15,380± S.F.  
0.353± AC.



26-99-1600  
NOW OR FORMERLY  
MDFA/BOULDER HILL  
24 CAVITE STREET  
MSRD BOOK 26137 PAGE 3  
PLAN 411 OF 1996  
WORD BOOK

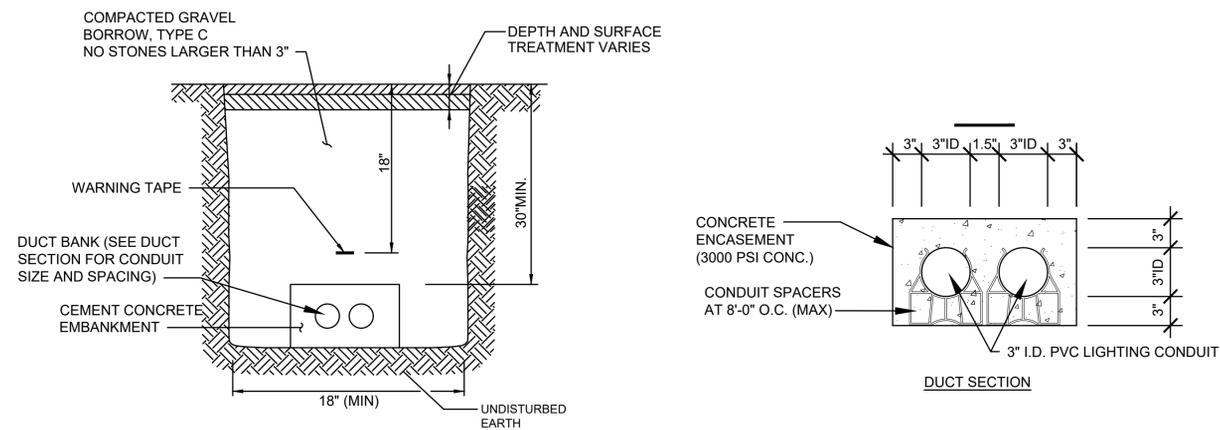
16812.15\_HD(LIGHT).DWG Ploited on 12-Feb-2026 3:02 PM CONTINUED ON SHEET NO. 28

### GENERAL NOTES

- ALL WORK SHALL BE IN ACCORDANCE WITH THE MASSACHUSETTS STATE ELECTRICAL CODE 12.00 CMR, DEVENS INSPECTIONAL STANDARDS AND LOCAL CODES. PAY FOR AND OBTAIN ALL PERMITS.
- ALL MATERIALS AND INSTALLATION FOR ELECTRICAL SERVICE SHALL CONFORM TO THE REQUIREMENTS OF THE SERVING UTILITY. PAY FOR AND OBTAIN ALL PERMITS/FEES.
- ALL MATERIAL SHALL BE NEW. ALL LIGHTING WORK SHALL CONFORM WITH SECTION 800 OF THE STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, MASSACHUSETTS HIGHWAY DEPARTMENT, EXCEPT WHERE OTHERWISE INDICATED
- LIGHT POLE FOUNDATIONS SHALL CONFORM TO THE RELEVANT PROVISIONS OF SECTION 800 OF THE MASSDOT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES EXCEPT AS INDICATED. PROVIDE 1/2" BOND BREAKER BETWEEN FOUNDATION AND CONCRETE WALK. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL PRIOR TO CONSTRUCTION.
- HANDHOLES SHALL CONFORM TO THE RELEVANT PROVISIONS OF SECTION 800 OF THE MASSDOT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL PRIOR TO CONSTRUCTION.
- UNDERGROUND RACEWAY INSTALLATION SHALL CONFORM TO SECTION 800. ROADWAY CROSSING SHALL BE GALVANIZED RIGID STEEL (RM) BURIED 36" BELOW TOP OF ROADWAY AND TERMINATE IN A HANDHOLE ON EACH SIDE OF CROSSING. ALL OTHER RACEWAYS SHALL BE NON-METALLIC (NM) AND BURIED A MINIMUM OF 30" BELOW TOP OF SIDEWALK.
- ALL LIGHT POLES SHALL BE ANCHOR TYPE WITHOUT BREAKAWAY COUPLINGS.
- ALL SPARE RACEWAYS SHALL BE FURNISHED WITH A PULL ROPE.
- THE TOP POLE BRACKET AND ARM SHALL BE ORIENTED 90 DEGREES TO THE BASELINE OF ROADWAY. THE MID POLE BRACKET SHALL BE ORIENTED 180 DEGREES OPPOSITE THE TOP POLE BRACKET. THE CONTRACTOR SHALL COORDINATE POLE BASE PLATE, ANCHOR BOLT PATTERN CONDUIT ENTRY AND FOUNDATION PLACEMENT TO OBTAIN THE REQUIRED ORIENTATION.
- SHOP DRAWINGS SHALL BE SUBMITTED FOR APPROVAL FOR ALL ELECTRICAL AND LIGHTING MATERIALS, EQUIPMENT, COMPONENTS AND TEST RESULTS AND SHALL INCLUDE MANUFACTURER'S PRODUCT CATALOG DATA.
- FINAL POSITION OF LIGHT POLES AND HANDHOLES SHALL NOT BE LOCATED WITHIN THE SIDEWALK TRIM BAND OR TREE PLANTING AREAS. HANDHOLES SHALL NOT BE PLACED IN ROADWAYS, SIDEWALK ACCESSIBILITY RAMPS OR DRIVEWAYS.
- WHERE REQUIRED TO AVOID EXISTING UTILITIES, THE CONTRACTOR SHALL BE PERMITTED IN THE FIELD TO ADJUST THE LOCATION OF LIGHT POLES UP TO 1'-6" IN ANY DIRECTION EXCEPT TOWARD THE CURB. ADJUSTMENTS BEYOND THESE LIMITS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
- WHERE REQUIRED TO AVOID EXISTING UTILITIES, THE CONTRACTOR SHALL BE PERMITTED IN THE FIELD TO ADJUST THE LOCATION OF HANDHOLES UP TO 5'-0" IN ANY DIRECTION FROM THAT INDICATED. ADJUSTMENTS BEYOND THESE LIMITS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
- WHERE CONDUIT INSTALLATION, ADJUSTED FOR EXISTING UTILITIES CANNOT BE SO INSTALLED TO MAINTAIN A MAXIMUM OF 270 DEGREES OF BENDS BETWEEN PULL POINTS (HANDHOLES OR POLE BASES), THE CONTRACTOR SHALL INSTALL AN INTERMEDIATE HANDHOLE.

### ABBREVIATIONS (LIGHTING PLANS)

C	CONDUIT
CU	COPPER
EX	EXISTING
HH	HANDHOLE
LED	LIGHT EMITTING DIODE
LP	LIGHT POLE
MH	MOUNTING HEIGHT
PB	PULLBOX
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED

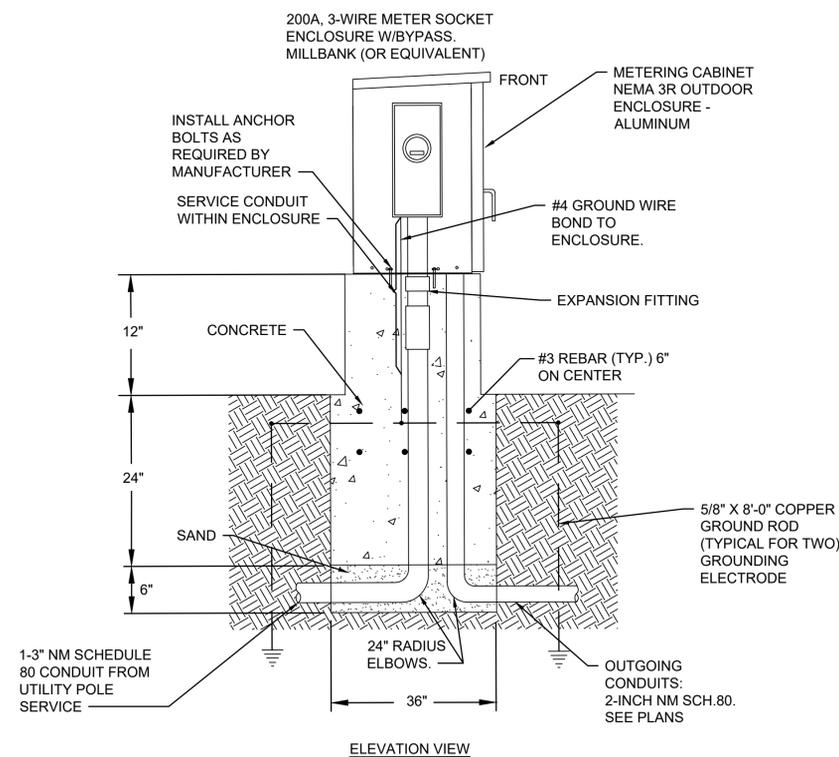


**NOTES:**

- BURIAL DEPTHS FOR CONDUIT SHALL BE MAINTAINED NOT LESS THAN 30" FROM THE TOP OF THE CONCRETE ENCASEMENT TO GRADE DURING ALL PHASES OF CONSTRUCTION.
- USE METALLIC TRACING/WARNING TAPE OVER ALL DUCTS.
- MULTIPLE DUCT BANKS LAID WITHIN THE SAME TRENCH SHALL BE SEPARATED BY AT LEAST A SHEET OF PLYWOOD.

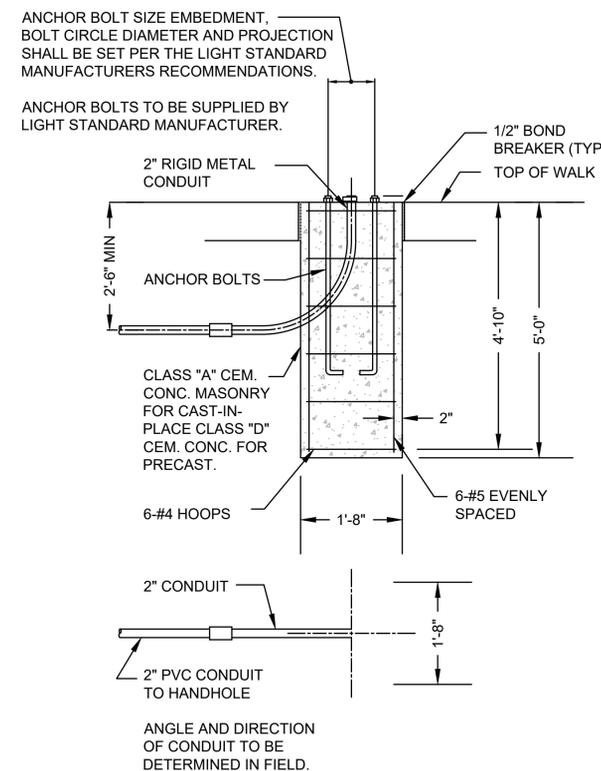
### TYPICAL LIGHTING DUCT BANK TRENCH SECTION

SCALE: NTS



### STREET LIGHT CONTROLLER INSTALLATION DETAIL

SCALE: N.T.S.

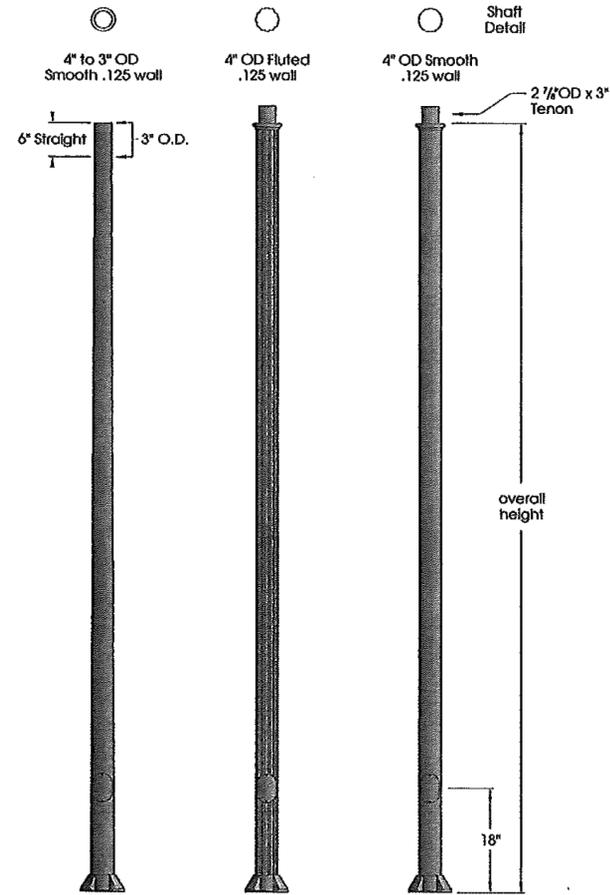


### STREET LIGHT STANDARD FOUNDATION

SCALE: N.T.S.

# 4" Extruded Series

U.1.11.16



APRT4	APFS4	APRS4	Overall Height	Finish	Accessories
APRT4-08	APFS4-08	APRS4-08	8'-0"	BLK	4-COV
APRT4-10	APFS4-10	APRS4-10	10'-0"	CLB	BA18
APRT4-12	APFS4-12	APRS4-12	12'-0"	GBZ	BA24
APRT4-14	APFS4-14	APRS4-14	14'-0"	GRN	FPH-4
APRT4-16	APFS4-16	APRS4-16	16'-0"	GTB	FPH-5
				TBK	GFC1
				TGR	

See next page for more complete accessory options

800 364 0098 • Fax: 281 997 5441 • www.amerlux.com

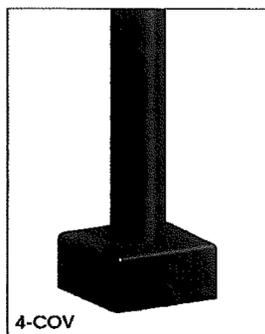
Amerlux reserves the right to change details that do not affect overall function and performance.

- Features:**  
 7 1/2" square cast aluminum base flange  
 Choice of extruded shafts (.125 wall)  
 • 4" to 3" tapered smooth  
 • 4" OD fluted (12 flutes)  
 • 4" OD smooth round

Extruded shaft is circumferentially welded to the base  
 A 2x4" handhole with curved lap style aluminum door and two stainless steel self-lapping screws is standard. A grounding provision incorporating a tapped 1/8" 20NC hole is provided opposite the handhole.

Ground lug provided inside base  
**Materials:**  
 Base - Cast aluminum (356-T6)  
 Shaft - Extruded Aluminum (6063-T6)  
 - Tapered Aluminum (6063-T6)  
 Anchor Bolts - Hot dipped galvanized steel

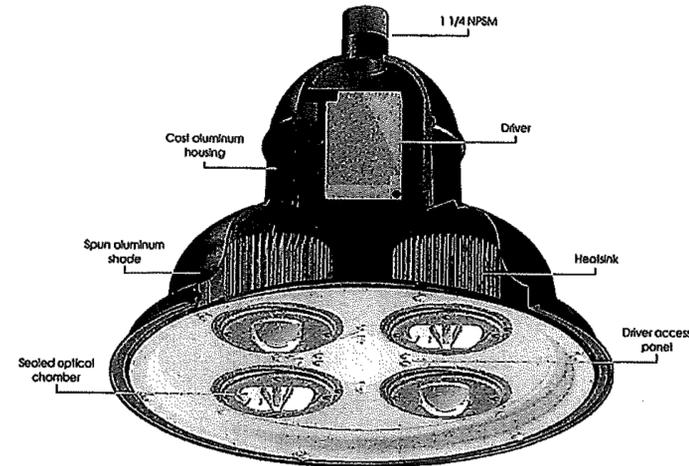
**Finish:**  
 Premium quality thermoset polyester powdercoat for a durable finish.



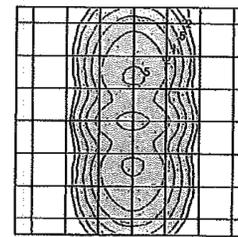
4-COV

Part String

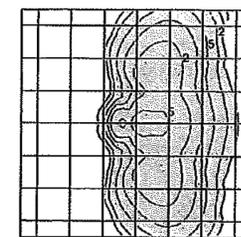
Example: APRT4-10/BLK



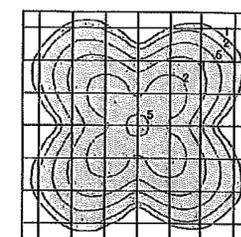
### Typical Photometry



DPS-X/12/3H  
Scale: 1 Unit = 12 Ft.  
Mounting Height = 12.00 Ft

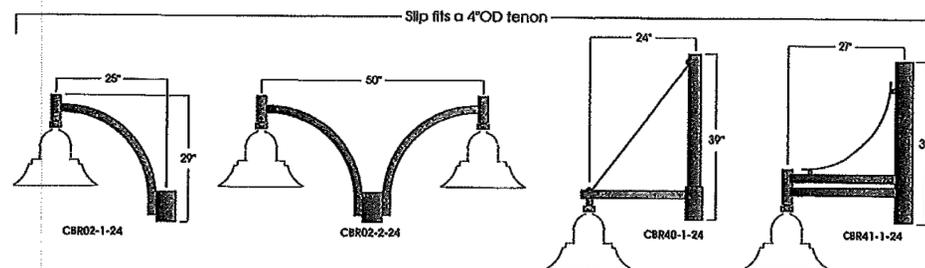
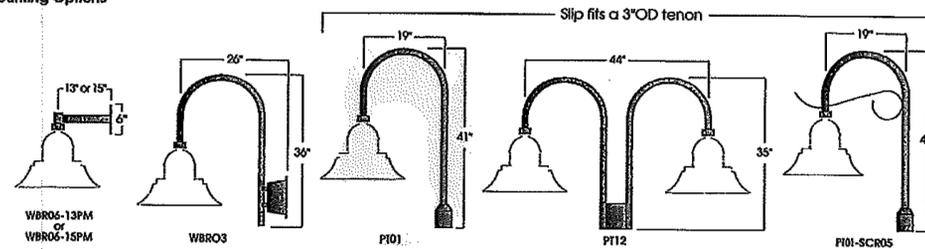


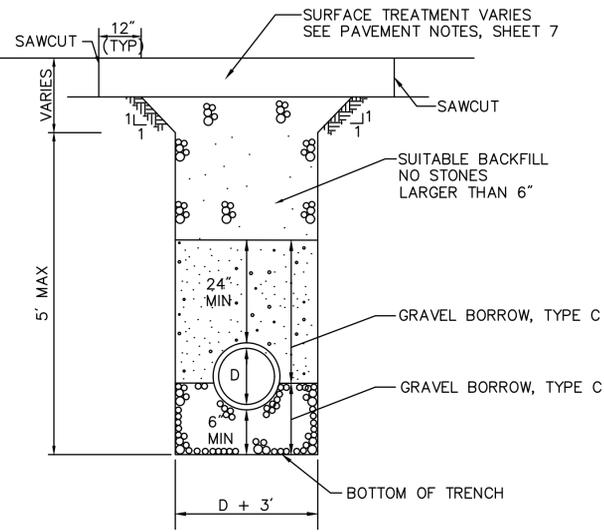
DPS-X/13/3H  
Scale: 1 Unit = 12 Ft.  
Mounting Height = 12.00 Ft



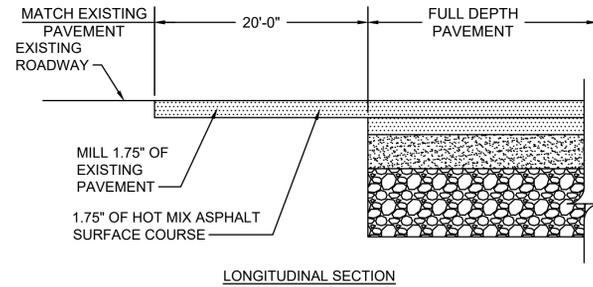
DPS-X/15/3H  
Scale: 1 Unit = 12 Ft.  
Mounting Height = 12.00 Ft

### Mounting Options

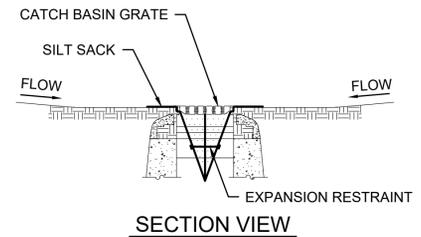
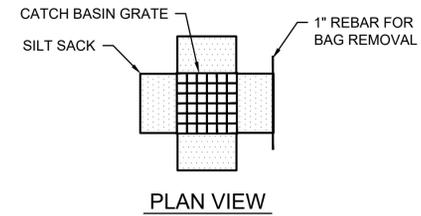




**DRAINAGE/SEWER TRENCH DETAIL - FULL DEPTH PAVEMENT**  
SCALE: N.T.S.

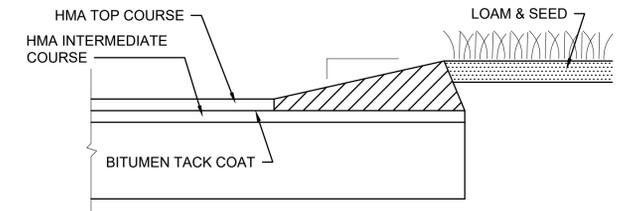


**FULL DEPTH PAVEMENT TRANSITION**  
SCALE: N.T.S. DWG: PVMT-03 DATE: OCT. 2012



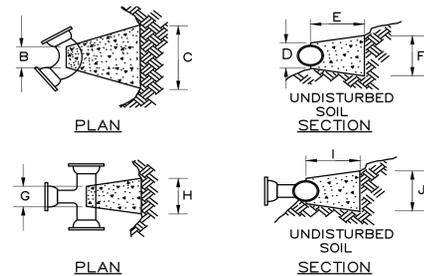
- NOTES:**
1. INSTALL SILT SACK IN EXISTING CATCH BASINS, BEFORE COMMENCING WORK, AND IN NEW CATCH BASINS IMMEDIATELY AFTER INSTALLATION OF STRUCTURE. MAINTAIN UNTIL BINDER COURSE PAVING IS COMPLETE OR A PERMANENT STAND OF GRASS HAS BEEN ESTABLISHED.
  2. GRATE TO BE PLACED OVER SILT SACK.
  3. SILT SACK SHALL BE INSPECTED PERIODICALLY AND AFTER ALL STORM EVENTS AND CLEANING OR REPLACEMENT SHALL BE PERFORMED

**INLET PROTECTION - SILT SACK IN CATCH BASIN**  
SCALE: N.T.S.



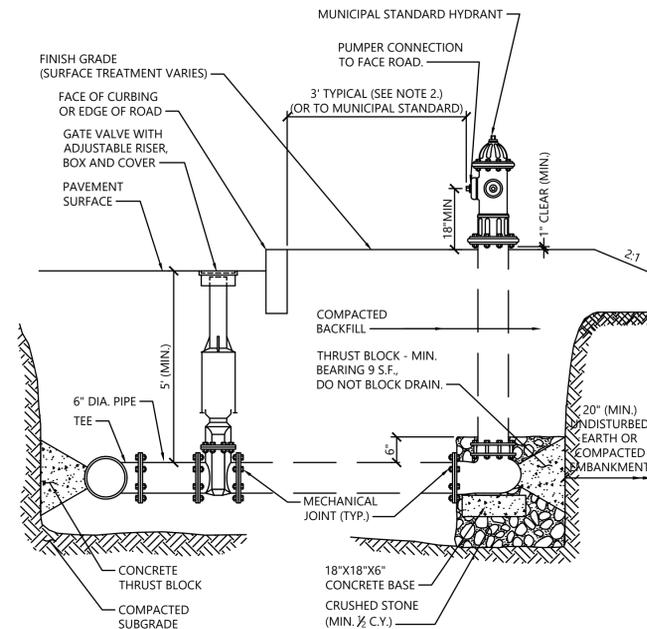
**HMA BERM TYPE A-MODIFIED (USED WITH RECLAIM)**  
SCALE: N.T.S.

BENDS						BENDS					
	B	C	D	E	F		B	C	D	E	F
6"	11-1/4"	8"	15"	12"	24"	6"	45"	8"	30"	12"	14"
8"	22-1/2"	"	19"	"	13"	9"	90"	"	30"	"	27"
10"	11-1/4"	"	20"	"	12"	8"	45"	"	38"	"	24"
12"	22-1/2"	"	22"	"	17"	12"	90"	"	40"	"	40"
12"	11-1/4"	"	35"	"	15"	12"	45"	"	60"	"	52"
12"	22-1/2"	"	35"	"	25"	12"	90"	"	60"	"	52"
TEES						TEES					
	G	H	I	J		G	H	I	J		
6" x 6" x 6"	12"	24"	24"	18"		12" x 12" x 6"	12"	24"	24"	12"	
8" x 8" x 6"	"	"	"	24"		12" x 12" x 8"	"	"	"	24"	
8" x 8" x 8"	"	"	"	24"		12" x 12" x 12"	"	36"	"	36"	



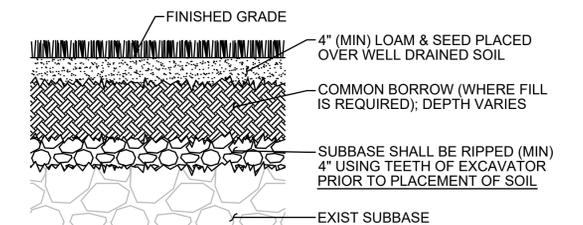
- NOTES:**
1. PROVIDE BLOCKS FOR TAPPING SLEEVES, DEAD ENDS, GATE VALVES AND VERTICAL BENDS, SAME SIZE AS REQUIRED FOR TEES.
  2. PROVIDE ANCHOR RODS AT VERTICAL BENDS AND GATE VALVES
  3. CONCRETE SHALL NOT BE PLACED AGAINST PIPE BEYOND FITTING.

**CONCRETE THRUST BLOCK**  
SCALE: N.T.S.



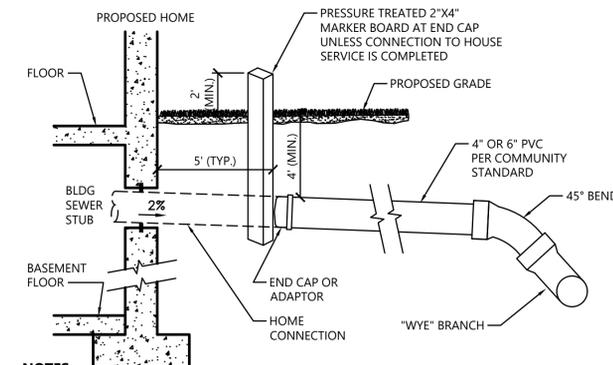
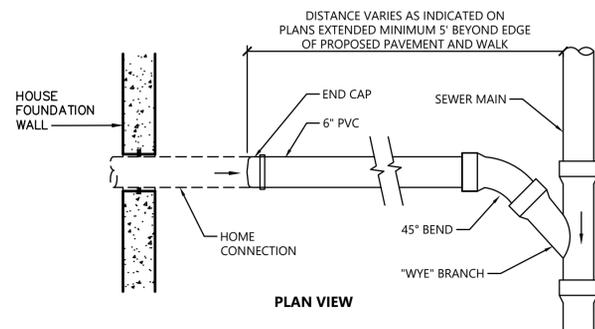
- NOTES:**
1. CONCRETE THRUST BLOCKS TO BE USED ONLY WHERE THEY CAN BEAR ON UNDISTURBED EARTH AS SHOWN. USE CLAMPS AND TIE RODS OR OTHER ACCEPTABLE METHOD OF JOINT RESTRAINT WHERE SOIL CONDITIONS PROHIBIT THE USE OF THRUST BLOCKS.
  2. HYDRANT IN SIDEWALK AREAS TO BE LOCATED TO PROVIDE MINIMUM CLEAR SIDEWALK PASSAGE WIDTH OF 4 FEET AT HYDRANT.
  3. A 36-INCH CLEAR SPACE SHALL BE MAINTAINED AROUND THE CIRCUMFERENCE OF THE HYDRANT UNLESS OTHERWISE APPROVED BY DEVENS WATER DEPARTMENT.

**Hydrant Construction**  
N.T.S. Source: VHB REV 12/19 LD\_250



- NOTE:**
- ALL EXISTING ASPHALT SHALL BE STRIPPED AND REMOVED PROPT TO TILLING. ASPHALT SHALL NOT BE MIXED WITH THE SUBBASE.

**LAWN IN FORMER PAVED AREAS**  
SCALE: N.T.S.



**NOTES**

1. PIPE AND FITTING MATERIALS TO BE PVC SDR35, MEETING ASTM 3034 FOR USE WITH SANITARY SEWER SYSTEMS.
2. ADAPTOR TO BE PREMANUFACTURED UNIT FOR CONNECTION OF PIPE TYPES

**Typical Sewer Wye Connection (Residential)**

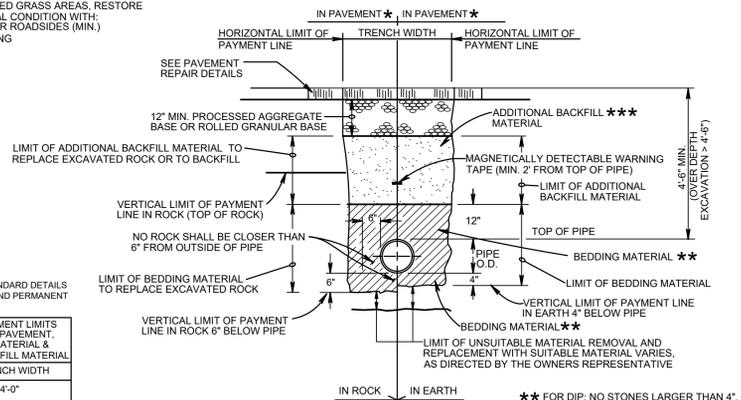
N.T.S. Source: VHB 1/16 LD\_223

\* IN DISTURBED GRASS AREAS, RESTORE TO ORIGINAL CONDITION WITH: 4" LOAM FOR ROADSIDES (MIN.) AND SEEDING

REFER TO THE STANDARD DETAILS FOR TEMPORARY AND PERMANENT PAVEMENT REPAIR

PIPE SIZE	TRENCH WIDTH
6"	4'-0"
8"	4'-0"
12"	4'-0"
16"	4'-0"
20"	5'-0"
24"	5'-0"
30"	6'-0"
36"	6'-0"

NOTE: IF TRENCH BOXES ARE USED ADD 2" TO ALL TRENCH WIDTHS

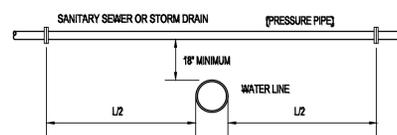


\*\* FOR DIP: NO STONES LARGER THAN 4", NO STONES WITHIN 4" OF PIPE, THOROUGHLY COMPACTED  
FOR HDPE: NO STONES LARGER THAN 3/4", NO STONES WITHIN 4" OF PIPE, THOROUGHLY COMPACTED

\*\*\* (NO STONES LARGER THAN 12") (COMPACTED IN 12" LIFTS)

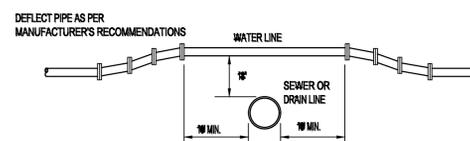
**Water Trench**

N.T.S. Source: VHB



NOTE:  
WHERE WATER LINE PASSES BENEATH SEWER LINE OR STORM DRAIN, THE JOINTS OF THE PIPE SHALL BE A MIN. OF 10' FROM THE POINT OF CROSSING.

**CROSSING OF WATER LINE UNDER SANITARY SEWER OR STORM DRAIN**

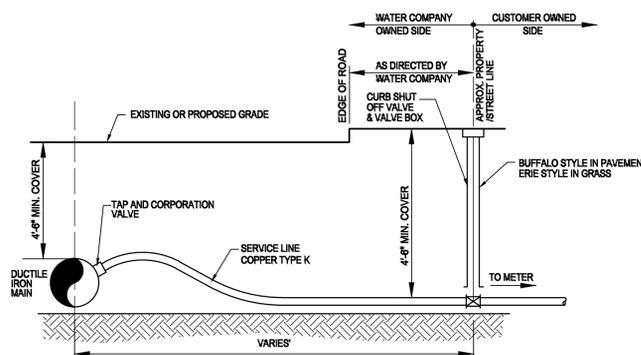


NOTE:  
FOR ANY CONDITIONS OTHER THAN SHOWN ABOVE THE FOLLOWING REQUIREMENTS SHALL BE MET. THE JOINTS OF THE SANITARY SEWER OR STORM DRAIN SHALL BE A MINIMUM OF 10' FROM THE POINT OF CROSSING.

**CROSSING OF WATER LINE OVER SANITARY SEWER OR STORM DRAIN**

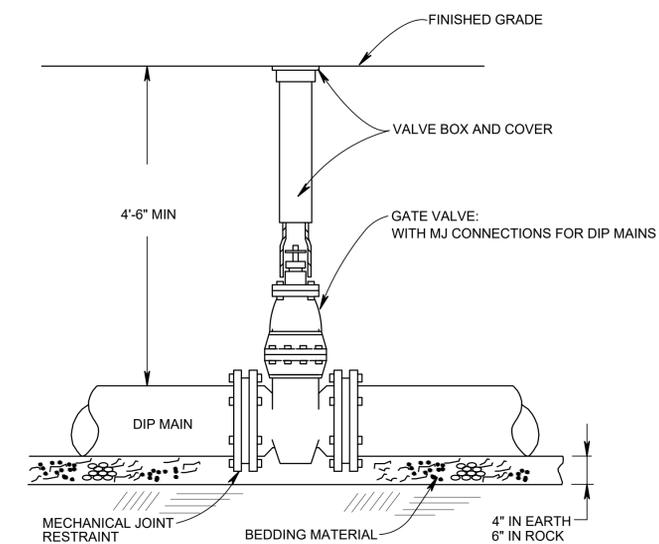
**Utility Crossing**

N.T.S. Source: VHB



**Residential Water Service Connection**

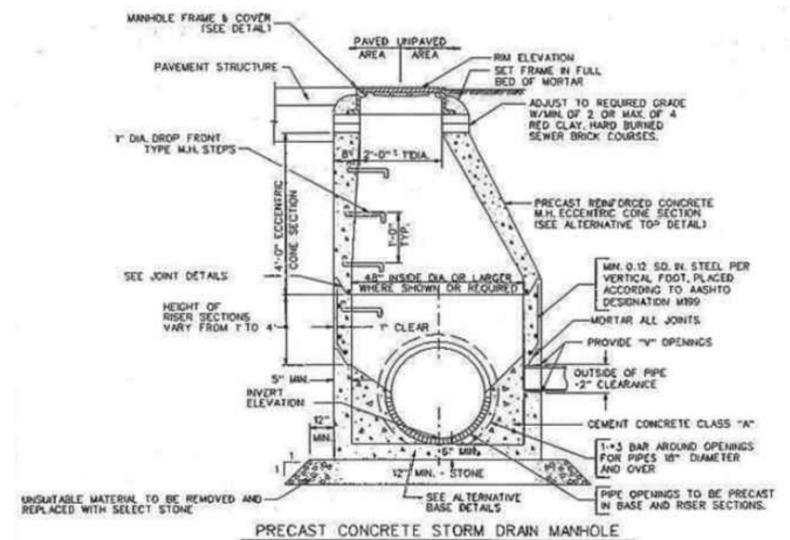
N.T.S. Source: VHB



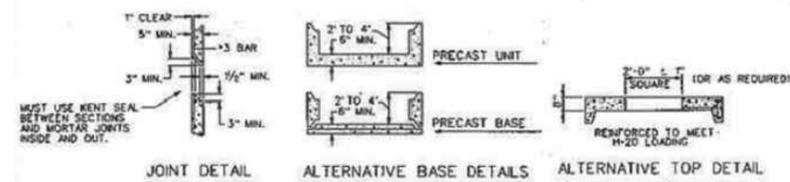
NOTE: ONLY INSTALLED ON MAINS 8" AND SMALLER

**Gate Valve & Gate Box**

N.T.S. Source: VHB

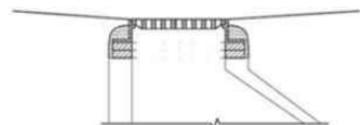


PRECAST CONCRETE STORM DRAIN MANHOLE

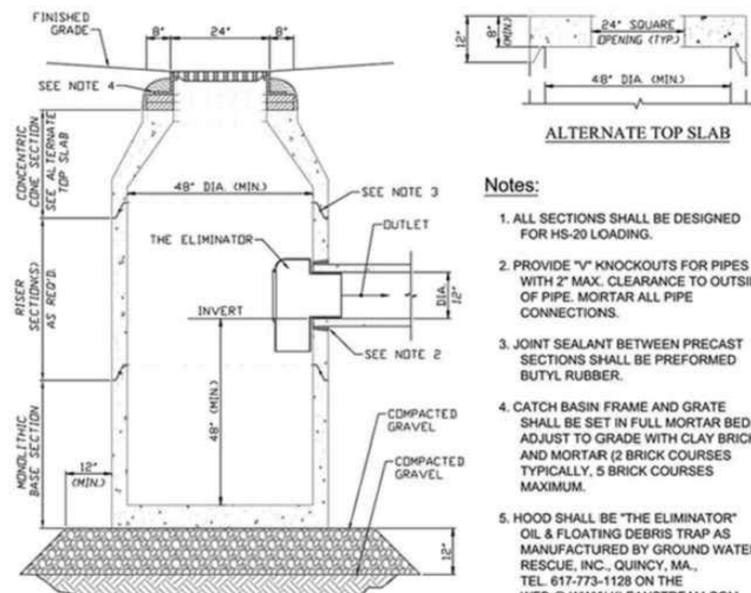


NOTE: THIS DETAIL CAN BE FOUND IN THE DEVENS ENTERPRISE COMMISSION 974 CMR 2.00 SUBDIVISION 2.09: APPENDIX B FIGURE I

PRECAST CONCRETE MANHOLE  
N.T.S.



ALTERNATE ECCENTRIC CONE SECTION

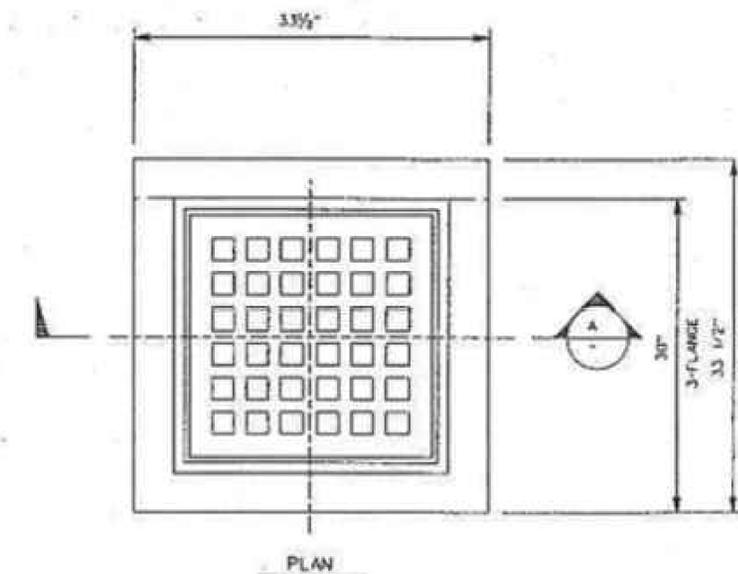


CATCH BASIN (CB) WITH TRAP

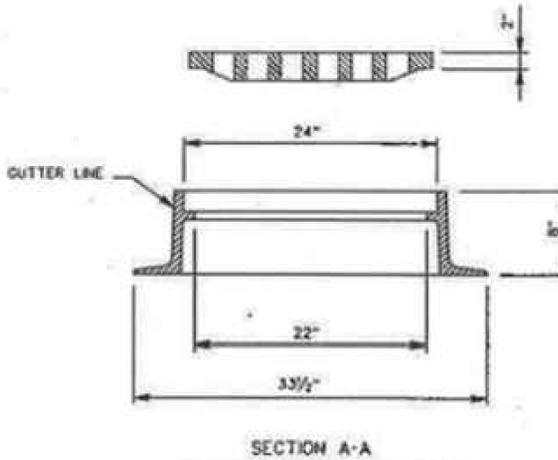
NOTE: THIS DETAIL CAN BE FOUND IN THE DEVENS ENTERPRISE COMMISSION 974 CMR 2.00 SUBDIVISION 2.09: APPENDIX B FIGURE H

Notes:

1. ALL SECTIONS SHALL BE DESIGNED FOR HS-20 LOADING.
2. PROVIDE "V" KNOCKOUTS FOR PIPES WITH 2" MAX. CLEARANCE TO OUTSIDE OF PIPE. MORTAR ALL PIPE CONNECTIONS.
3. JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE PREFORMED BUTYL RUBBER.
4. CATCH BASIN FRAME AND GRATE SHALL BE SET IN FULL MORTAR BED. ADJUST TO GRADE WITH CLAY BRICK AND MORTAR (2 BRICK COURSES TYPICALLY, 5 BRICK COURSES MAXIMUM).
5. HOOD SHALL BE "THE ELIMINATOR" OIL & FLOATING DEBRIS TRAP AS MANUFACTURED BY GROUND WATER RESCUE, INC., QUINCY, MA., TEL. 617-773-1128 ON THE WEB @ WWW.KLEANSTREAM.COM or APPROVED EQUAL



PLAN

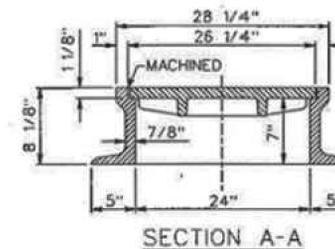
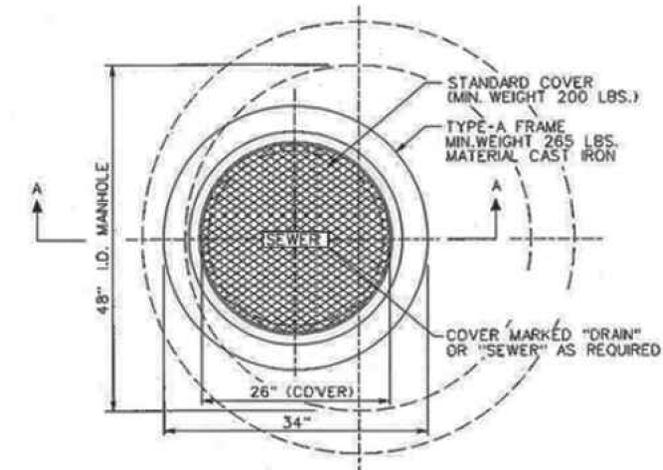


SECTION A-A

LEBARON FOUNDRY CAT. NO. LF248-2 OR APPROVED EQUAL (FOUR OR THREE FLANGE DEPENDANT UPON CONSTRUCTION)

CATCH BASIN FRAME AND GRATE DETAIL  
N.T.S.

NOTE: THIS DETAIL CAN BE FOUND IN THE DEVENS ENTERPRISE COMMISSION 974 CMR 2.00 SUBDIVISION 2.09: APPENDIX B FIGURE F



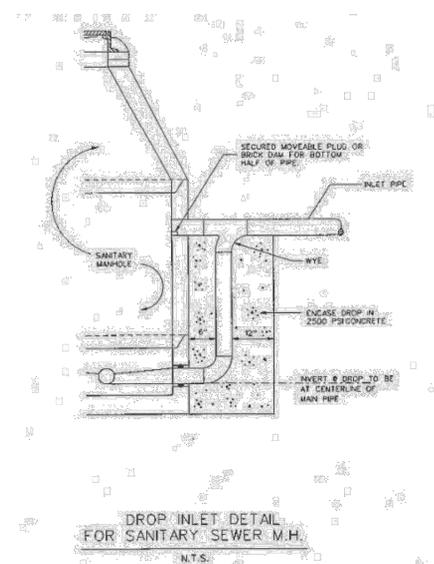
SECTION A-A

STANDARD MANHOLE FRAME & COVER  
N.T.S.

NOTE: THIS DETAIL CAN BE FOUND IN THE DEVENS ENTERPRISE COMMISSION 974 CMR 2.00 SUBDIVISION 2.09: APPENDIX B FIGURE J

974 CMR: DEVENS ENTERPRISE COMMISSION

2.09: Appendix B - Figure K-1

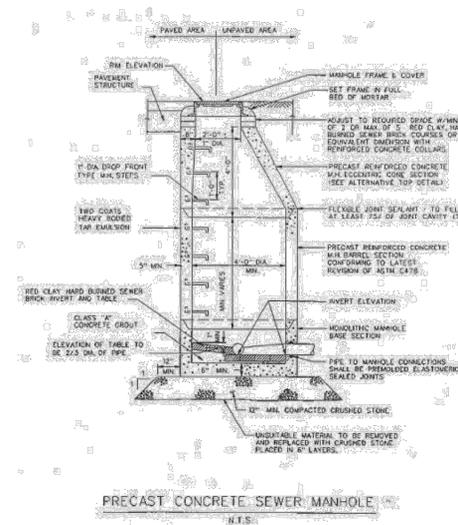


Note: Contact Devens Utilities Department for additional details/requirements.

NOTE: THIS DETAIL CAN BE FOUND IN THE DEVENS ENTERPRISE COMMISSION 974 CMR 2.00 SUBDIVISION 2.09: APPENDIX B FIGURE K-1

974 CMR: DEVENS ENTERPRISE COMMISSION

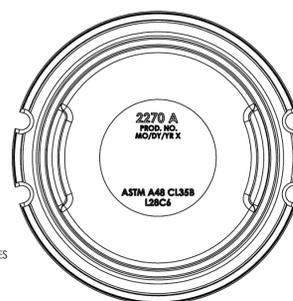
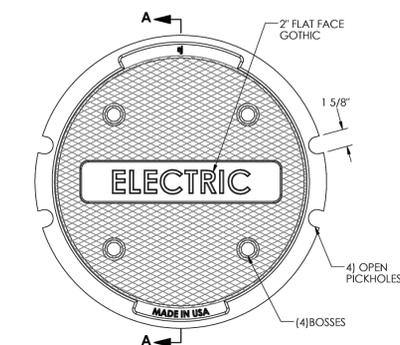
2.09: Appendix B - Figure K-2



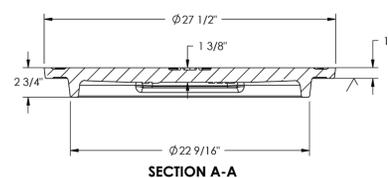
Note: Contact Devens Utilities Department for additional details/requirements.

NOTE: THIS DETAIL CAN BE FOUND IN THE DEVENS ENTERPRISE COMMISSION 974 CMR 2.00 SUBDIVISION 2.09: APPENDIX B FIGURE K-2

2270 Cover



BOTTOM VIEW



SECTION A-A



**Product Number**  
00227029

**Design Features**

- Materials  
Gray Iron (CL35B)
- Design Load  
Extra Heavy Duty
- Open Area  
n/a
- Coating  
Undipped
- √/ Designates Machined Surface

**Certification**

- ASTM A48
- Country of Origin: USA

**Drawing Revision**

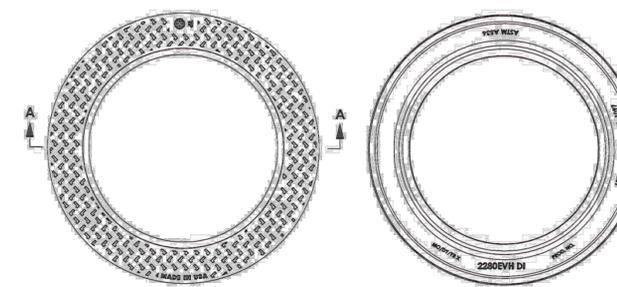
3/9/2010 Designer: JJJ  
9/10/2013 Revised By: DAE

**Disclaimer**  
Weights (Bskg), dimensions (inch/mm) and drawings provided for your guidance. We reserve the right to modify specifications without prior notice.

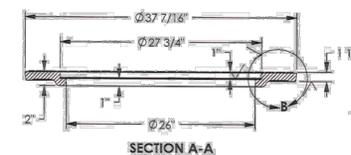
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**Contact**  
800 626 4653  
ejco.com

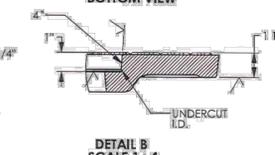
2280EVH Cover



BOTTOM VIEW



SECTION A-A



DETAIL B  
SCALE 1 : 4



**Product Number**  
00228061

**Design Features**

- Materials  
Ductile Iron (70-60-03)
- Design Load  
Heavy Duty
- Open Area  
n/a
- Coating  
Undipped
- √/ Designates Machined Surface

**EST WT:**  
165 LBS

**Certification**

- ASTM A536
- Country of Origin: USA

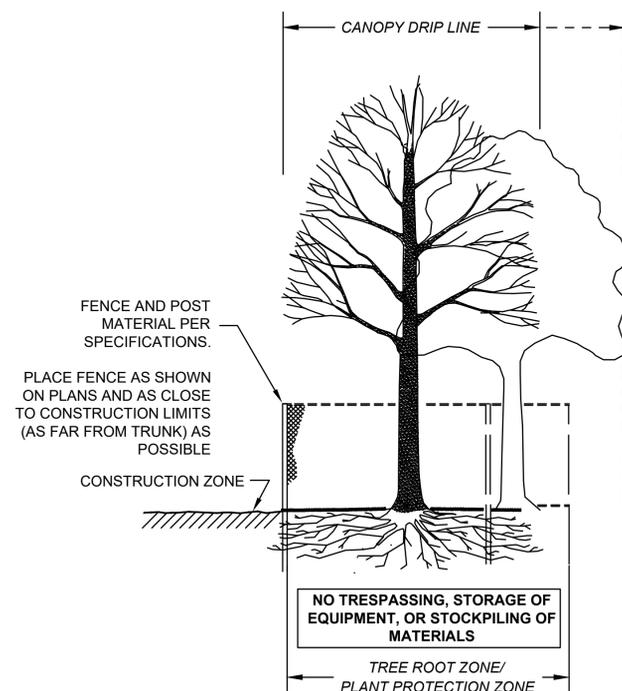
**Drawing Revision**

10/29/2008 Designer: DEW  
08/24/2012 Revised By: DEF

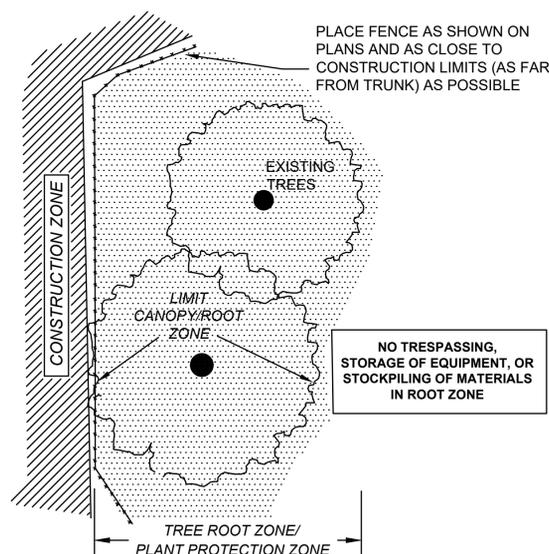
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Weights (Bskg), dimensions (inch/mm) and drawings provided for your guidance. We reserve the right to modify specifications without prior notice.

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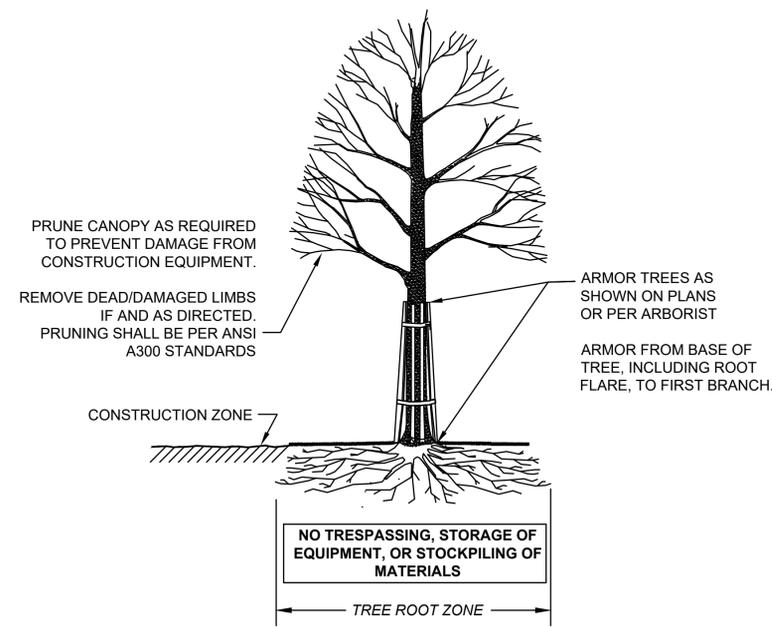
**Contact**  
800 626 4653  
ejco.com



SECTION - FENCE PROTECTION OF ROOT ZONE



PLAN VIEW - FENCE PROTECTION OF ROOT ZONE

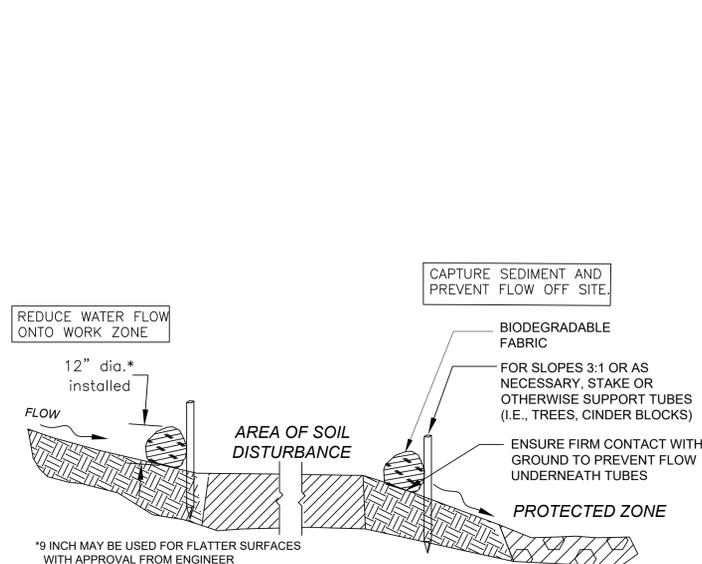


SECTION - TRUNK ARMORING & PRUNING

TREE PROTECTION TRUNK

TREE PROTECTION ROOT ZONE

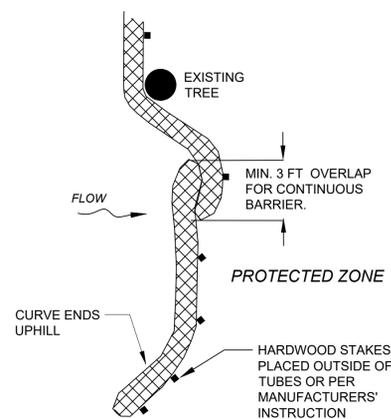
NOT TO SCALE



SECTION

SEDIMENT BARRIERS - COMPOST FILTER TUBES

NOT TO SCALE



PLACE TUBE ALONG CONTOURS AND PERPENDICULAR TO FLOW.

PLACE AS CLOSE TO LIMIT OF SOIL DISTURBANCE AS POSSIBLE

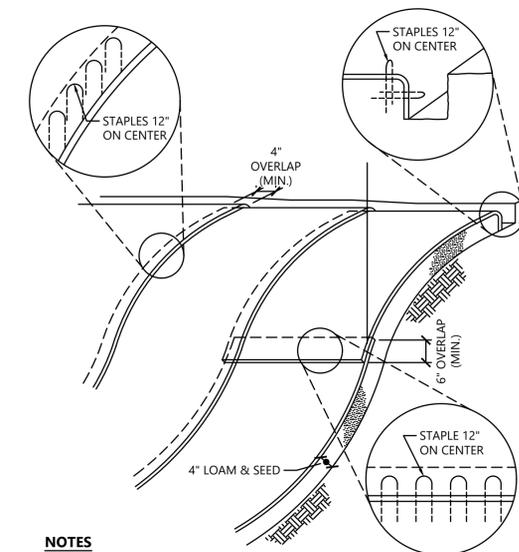
ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

PLACE STAKES AS NEEDED TO SECURE TUBES IN PLACE.

PLAN VIEW

SEDIMENT BARRIERS

NOT TO SCALE



NOTES

- BEGIN AT THE TOP OF BLANKET INSTALLATION AREA BY ANCHORING BLANKET IN A 6" DEEP TRENCH BACKFILL AND COMPACT TRENCH AFTER STAPLING.
- THE EDGES OF BLANKETS MUST BE FASTENED WITH APPROX. 6 INCH OVERLAP WHERE 2 OR MORE STRIP WIDTHS ARE REQUIRED.
- WHEN BLANKETS MUST BE SPLICED DOWN THE SLOPE, PLACE UPPER BLANKET END OVER LOWER END WITH 6 INCH (MIN.) OVERLAP AND STAPLE BOTH TOGETHER.
- METHOD OF INSTALLATION SHALL BE AS PER MANUFACTURER'S RECOMMENDATIONS.
- EROSION CONTROL BLANKETS SHALL BE 100% BIODEGRADABLE WITH MINIMUM 1/4" OPENINGS.
- ANCHORING DEVICES SHALL CONSIST OF MINIMUM 8" BIO-DEGRADABLE STAKES.
- EROSION CONTROL BLANKETS SHALL BE USED IN ALL AREAS WHERE SLOPES EXCEED 3:1.

Stabilized Turf Mat

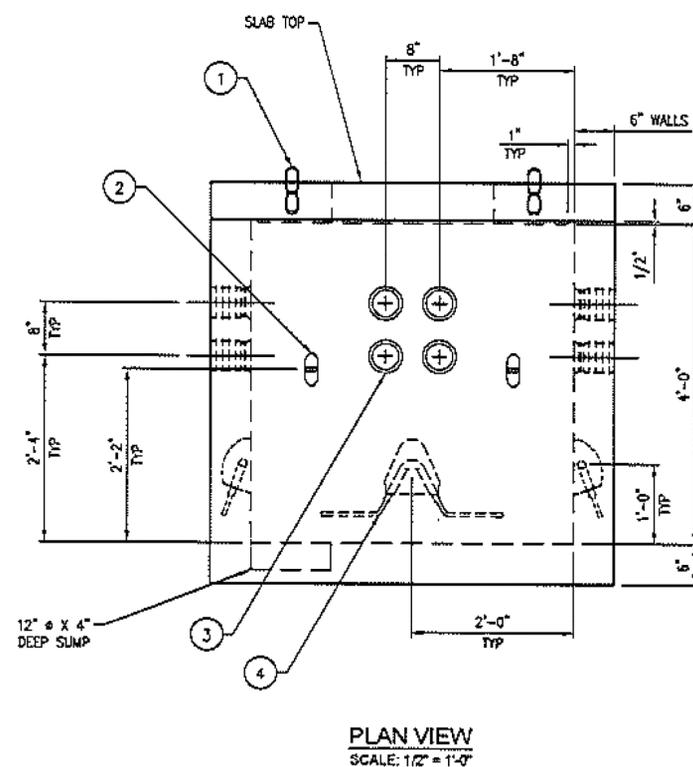
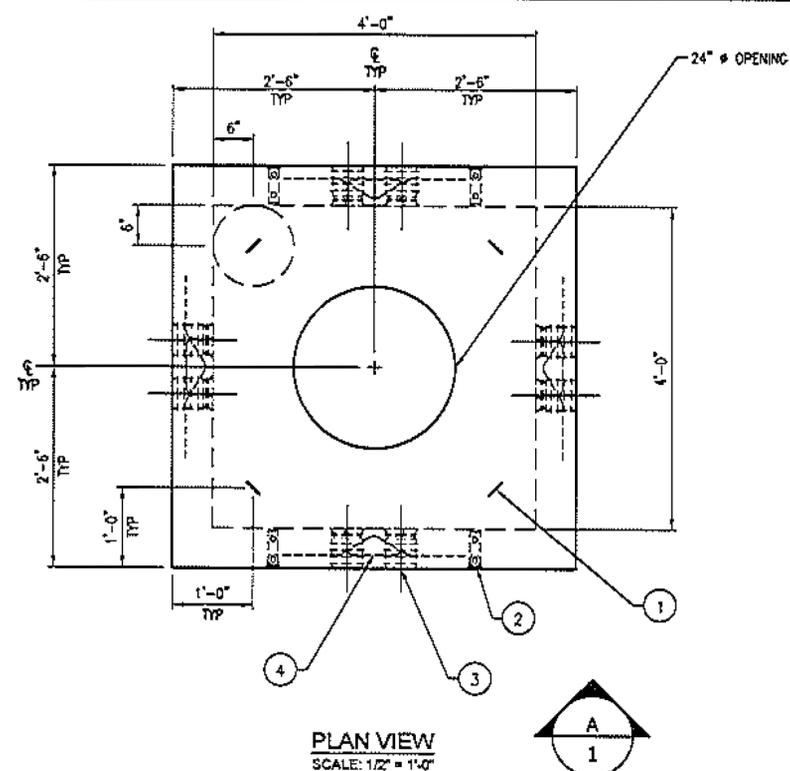
N.T.S.

Source: VHB

REV

10/20

LD\_680



ALL WALLS ARE THE SAME

BILL OF MATERIALS ~ TOP SLAB			
#	QTY	DESCRIPTION	ITEM CODE #
1	4	RED TAG LIFTER	
	0.4 CY	5000 PSI CONCRETE MIX # 32	5005010

BILL OF MATERIALS ~ BOTTOM SECTION			
#	QTY	DESCRIPTION	ITEM CODE #
2	4	BURKE 4 TON TECH ANCHOR w/ 48" LG. #4 BAR	5401020
3	16	5" Ø TERMADUCT	5447400
4	4	PLASTIC RECESSED PULLEYE	5413100
	1.8 CY	5000 PSI CONCRETE MIX # 32	5005010

MATERIAL NOTES  
CONCRETE MINIMUM STRENGTH - 5000 PSI @ 28 DAYS  
STEEL REINFORCEMENT - ASTM A615, GRADE 60  
COVER TO STEEL - 1" OR AS OTHERWISE NOTED

APPROX. WT. TOP SLAB = 0.8 TONS  
APPROX. WT. BOTTOM SECTION = 3.7 TONS

**Oldcastle Precast**  
NEW ENGLAND - ALBANY, ME - ANDOVER, CT - FREDERICKTOWN, VA  
PHONE: 800-226-7200 FAX: 603-226-7707

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**4' X 4' X 4'-0" COMMUNICATION VAULT**  
4' X 4' X 4'-0", GEOMETRY DETAILS

CUSTOMER: STOCK

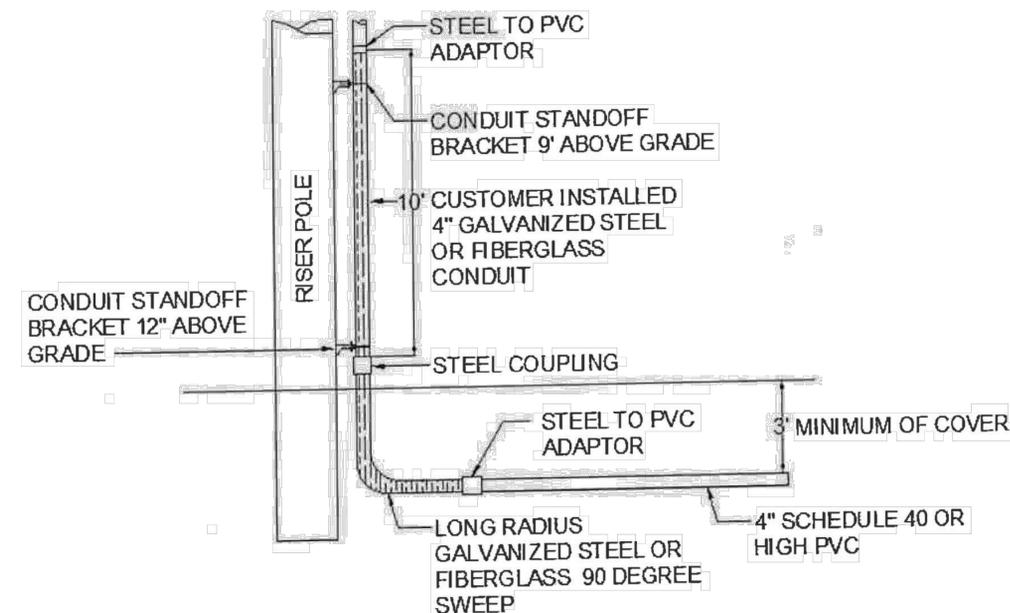
DATE	SOLD BY	DRAWN	DESIGNED	CHECKED	SCALE
3/28/12	N.Y.	B.E.	C.F.	B.E.	S04M4

DRAWING NUMBER: 324-S04M4-001

REVISION: REVDATE: 1 OF 1

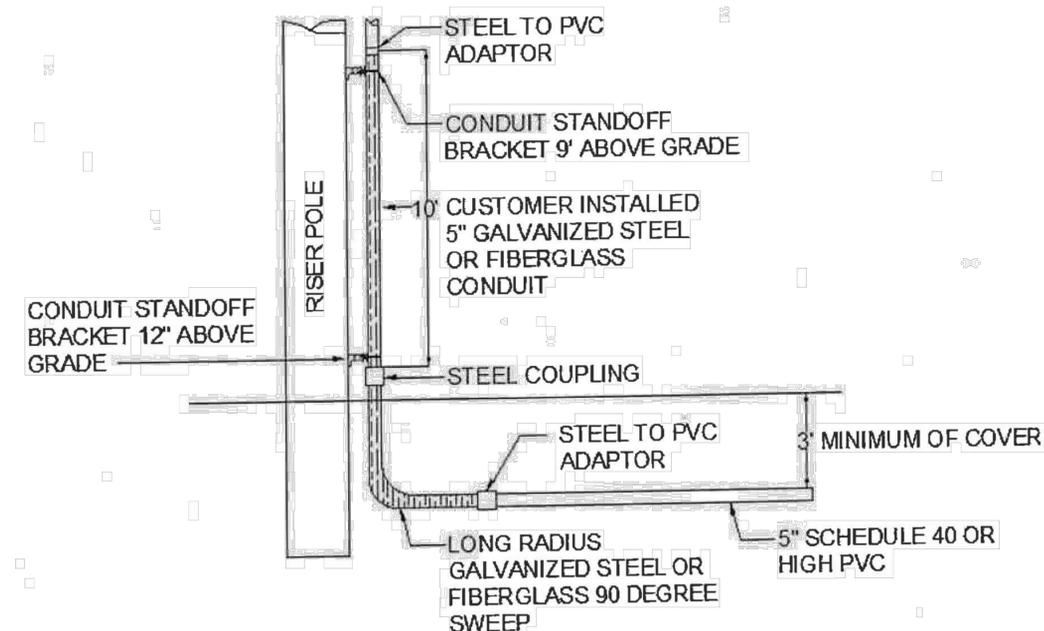
**Appendix O- Riser Pole Specification (continued)**

**SINGLE PHASE PRIMARY RISER  
- 4" CONDUIT**



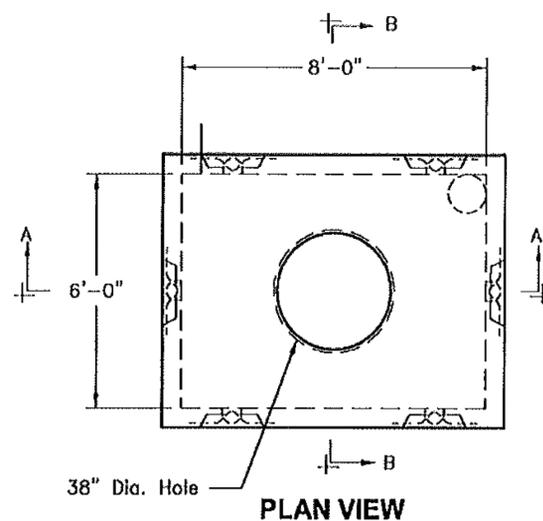
**Appendix O- Riser Pole Specification**

**THREE PHASE PRIMARY RISER  
- 5" CONDUIT**



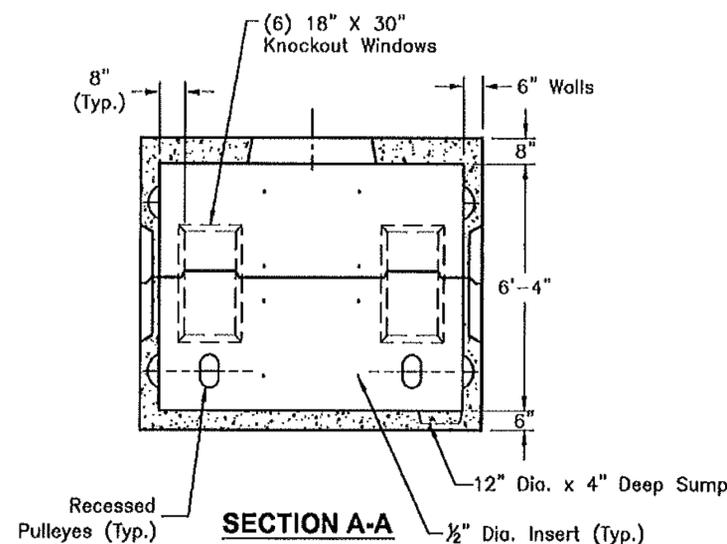
**NOTES:**

1. Concrete : 5,000 P.S.I  
Minimum Strength @ 28 Days
2. Steel Reinforcing- ASTM A-615,  
Grade 60.
3. Cover to Steel-1" Minimum
4. Vault are Designed to Meet ASTM  
C858 and ACI 318 with AASHTO  
HS-20 Loading
5. Construction Joint-Sealed with  
Butyl Rubber Resin or Equivalent
6. Approx. Wt. Top Pc. = 6.7 Tons  
Approx. Wt. Bottom Pc. = 5.9 Tons

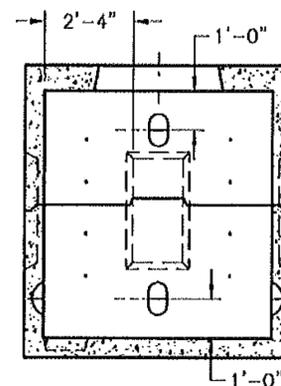


38" Dia. Hole

**PLAN VIEW**



**SECTION A-A**



**SECTION B-B**



**MH6X8X64**

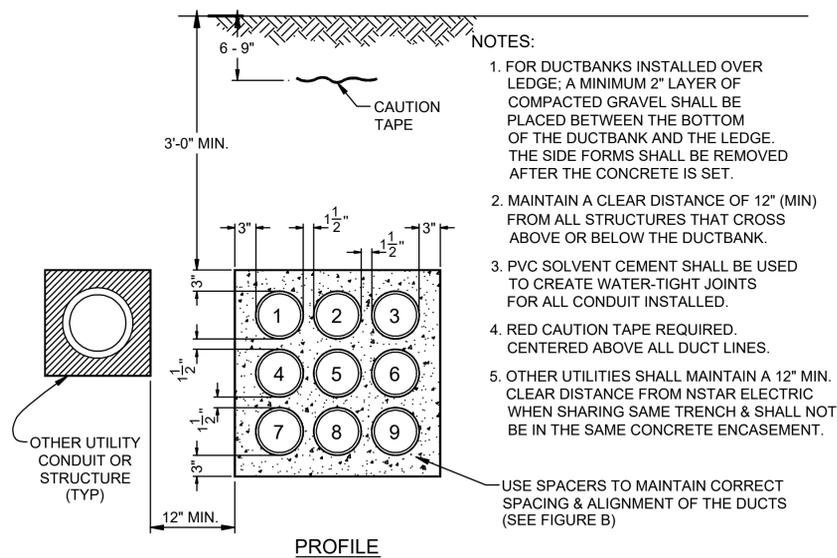
**6'-0" x 8'-0" x 6'-4" I.D.  
Utility Vault**

FILE NAME: 324UEEMH6X8X64\_DET.DWG

ISSUE DATE: January, 2008

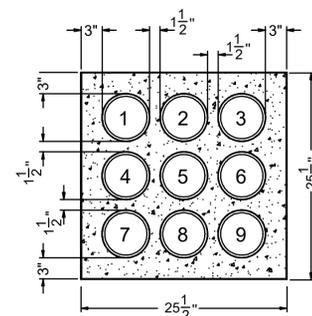
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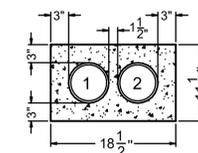
**STANDARD UNREINFORCED CONCRETE DUCTBANK CONSTRUCTION DETAILS**

SCALE: N.T.S.



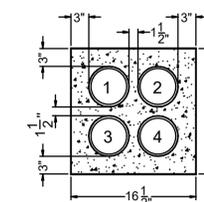
**9-5" CONCRETE ENCASED ELECTRIC CONDUITS**

SCALE: N.T.S.



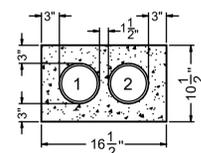
**2-5" CONCRETE ENCASED ELECTRIC CONDUITS**

SCALE: N.T.S.



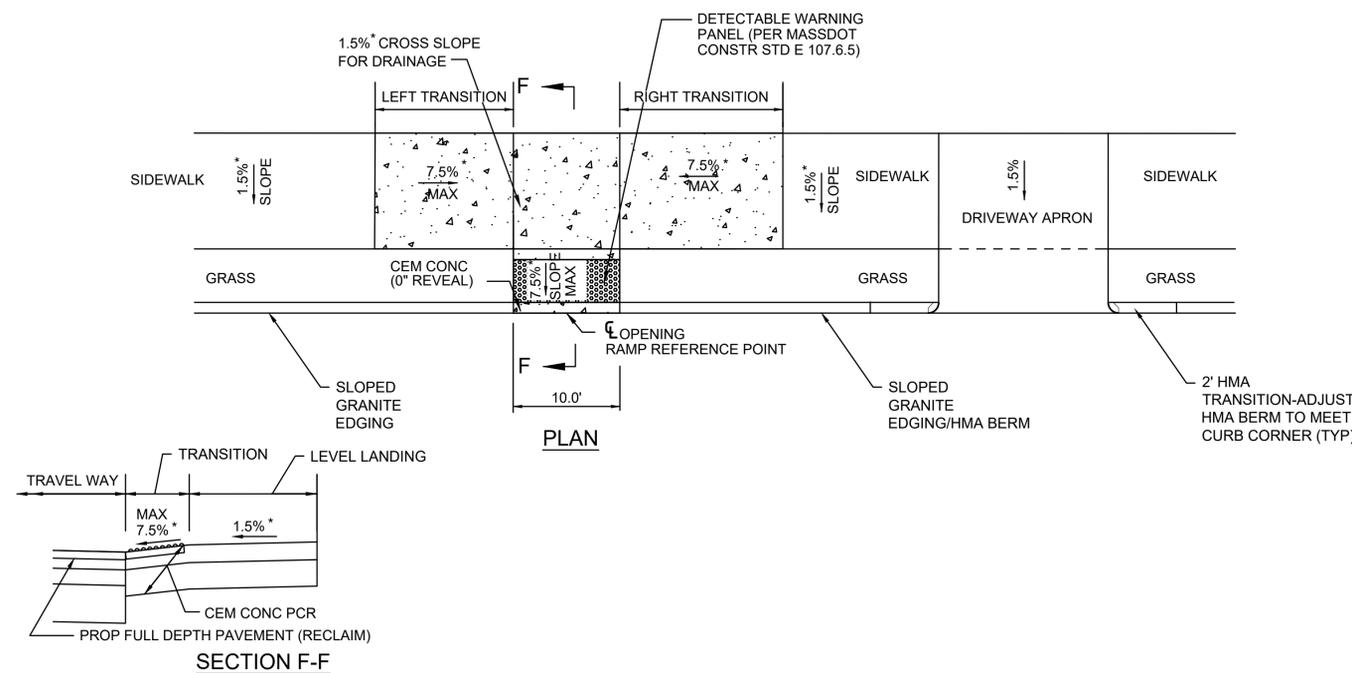
**4-4" CONCRETE ENCASE COMMUNICATION CONDUITS**

SCALE: N.T.S.

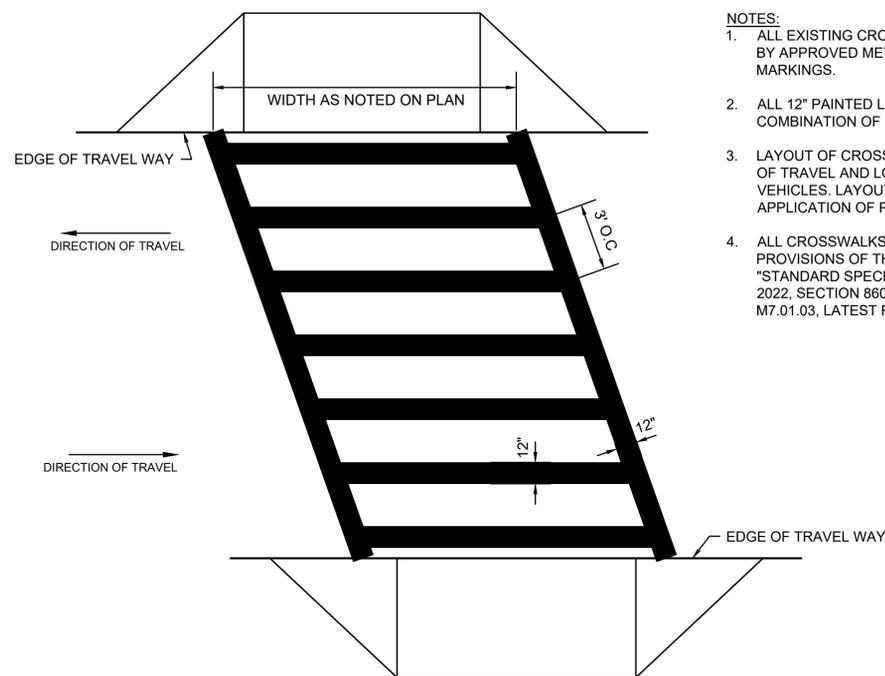
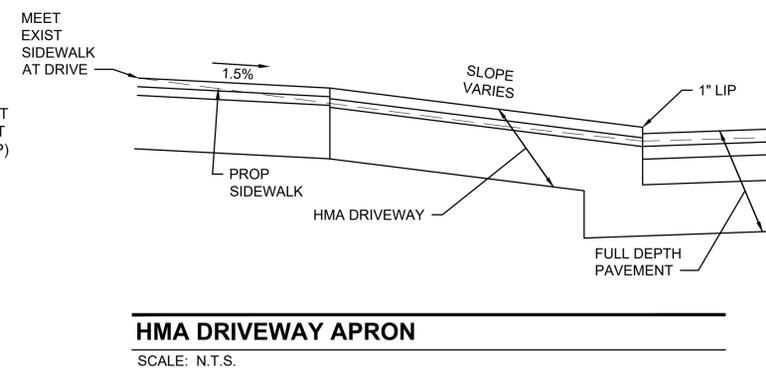


**2-4" ELECTRIC SERVICE CONDUITS**

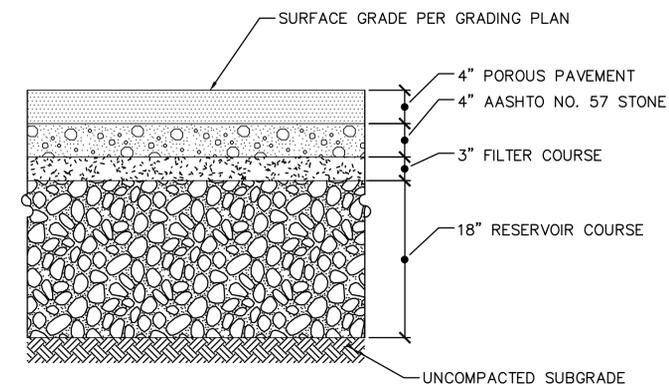
SCALE: N.T.S.



**PEDESTRIAN CURB RAMP WITH GRASS STRIP**



- NOTES:**
1. ALL EXISTING CROSSWALK MARKINGS SHALL BE FULLY ERADICATED BY APPROVED METHOD PRIOR TO THE APPLICATION OF PROPOSED MARKINGS.
  2. ALL 12" PAINTED LINES SHALL BE APPLIED IN ONE APPLICATION, NO COMBINATION OF LINES (e.g., TWO - 6" LINES) WILL BE ACCEPTED.
  3. LAYOUT OF CROSSWALKS SHALL BE ORIENTATED IN THE DIRECTION OF TRAVEL AND LOCATED OUTSIDE OF THE WHEEL PATH OF VEHICLES. LAYOUT SHALL BE APPROVED BY THE TOWN PRIOR TO APPLICATION OF PAINT.
  4. ALL CROSSWALKS INSTALLED SHALL CONFORM TO THE RELEVANT PROVISIONS OF THE MASSACHUSETTS HIGHWAY DEPARTMENT "STANDARD SPECIFICATION FOR HIGHWAY AND BRIDGES" DATED 2022, SECTION 860 FOR REFLECTORIZED LINE (PAINTED) & MATERIAL M7.01.03, LATEST REVISIONS.



- NOTES**
1. PROVIDE IMPERMEABLE LINER ON VERTICAL SIDES OF EXCAVATION AS INDICATED ON GRADING AND UTILITY PLAN AND IN DETAILS.
  2. UNLESS OTHERWISE INDICATED, INSTALL ALL UTILITY PIPES, CONDUIT, AND DUCT BANKS BELOW POROUS PAVEMENT SECTION.

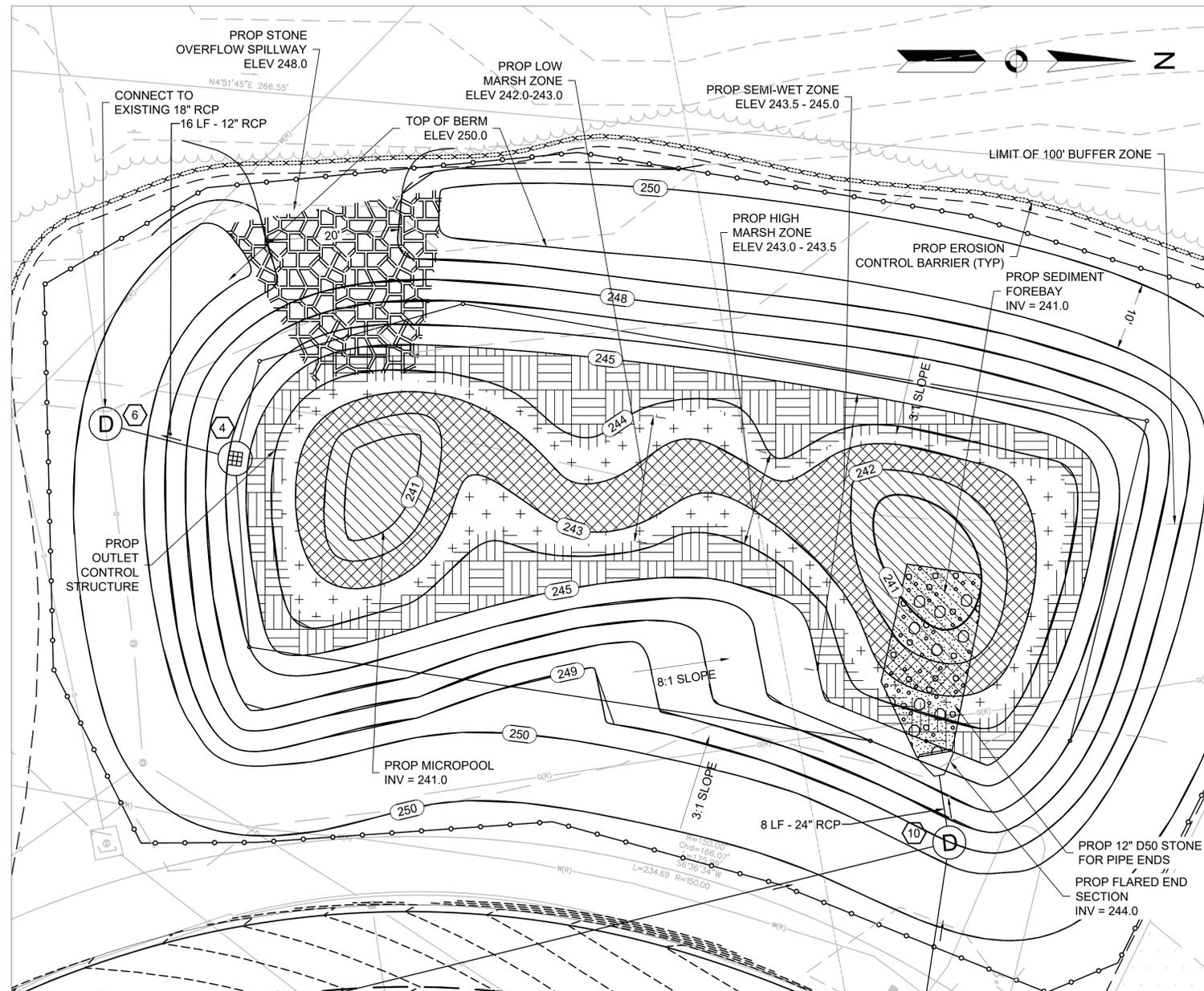
**POROUS SIDEWALK PAVEMENT SECTION**  
SCALE NTS

**CONTINENTAL-STYLE CROSSWALK - 12" WIDE LINES**

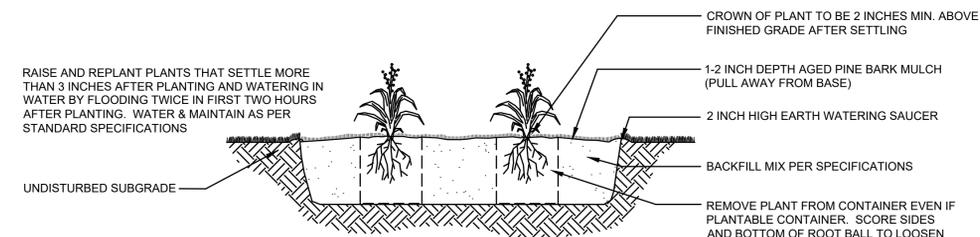
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DWG: PM-27

DATE: NOVEMBER 2022



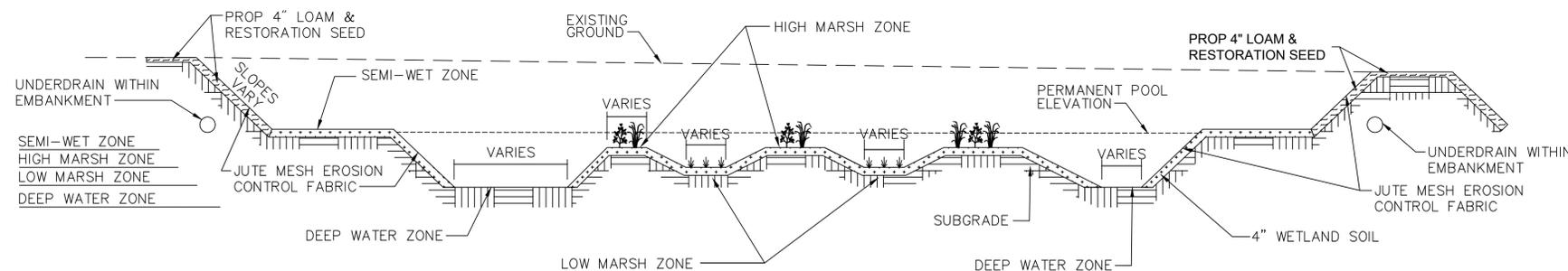
PROP CONSTRUCTED STORMWATER WETLAND  
SCALE 1" = 10'



PERENNIAL PLANTING

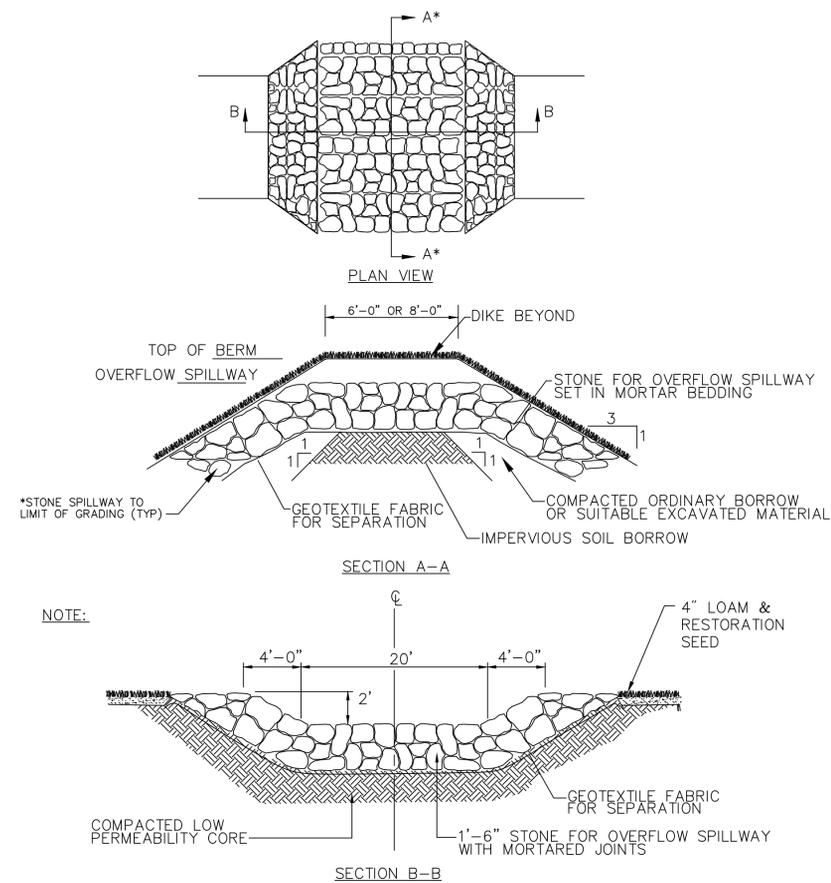
NOT TO SCALE

PLANTING/SEEDING SCHEDULE - "F"			
QTY.	COMMON NAME	BOTANICAL NAME	PLANT MATERIAL
LOW MARSH ZONE (PLANT 24-INCHES ON CENTER)			
281	ARROW ARUM	PELTANDRA VIRGINICA	BARE ROOT
281	ARROWHEAD DUCK POTATO	SAGITTARIA LATIFOLIA	BARE ROOT
281	WATER PLANTAIN	ALISMA TRIVIALE	BARE ROOT
281	PICKEREL WEED	PONTERDERIA CORDATA	BARE ROOT
HIGH MARSH ZONE (PLANT 24-INCHES ON CENTER)			
83	BLUE FLAG IRIS	IRIS VERSICOLOR	BARE ROOT
83	THREE SQUARE RUSH	SCIRPUS AMERICANUM	BARE ROOT
83	SOFT-STEM BULRUSH	SCIRPUS VALIDUS	BARE ROOT
83	BUR-REED	SPARGANIUM EURYCARPUM	BARE ROOT
SEMI-WET ZONE			
SEED WITH WET MEADOW AND DETENTION BASIN MIX AT A RATE OF 20 POUNDS PER ACRE (1 POUND PER 2,200 SQ FT)			

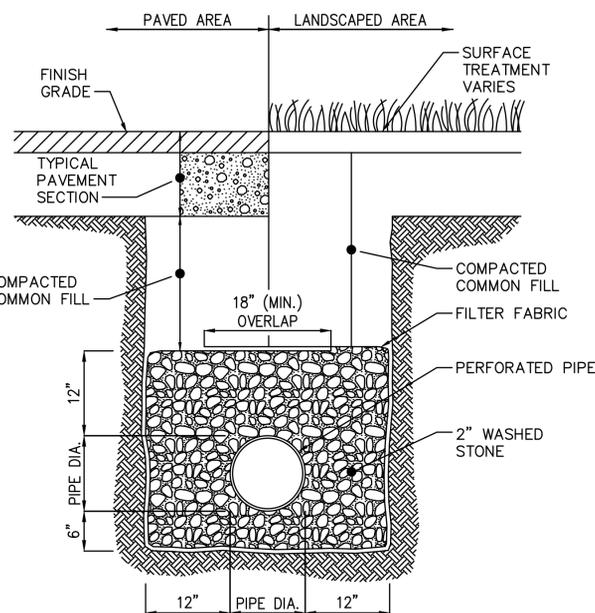


PROP CONSTRUCTED STORMWATER WETLAND CROSS-SECTION  
SCALE NTS

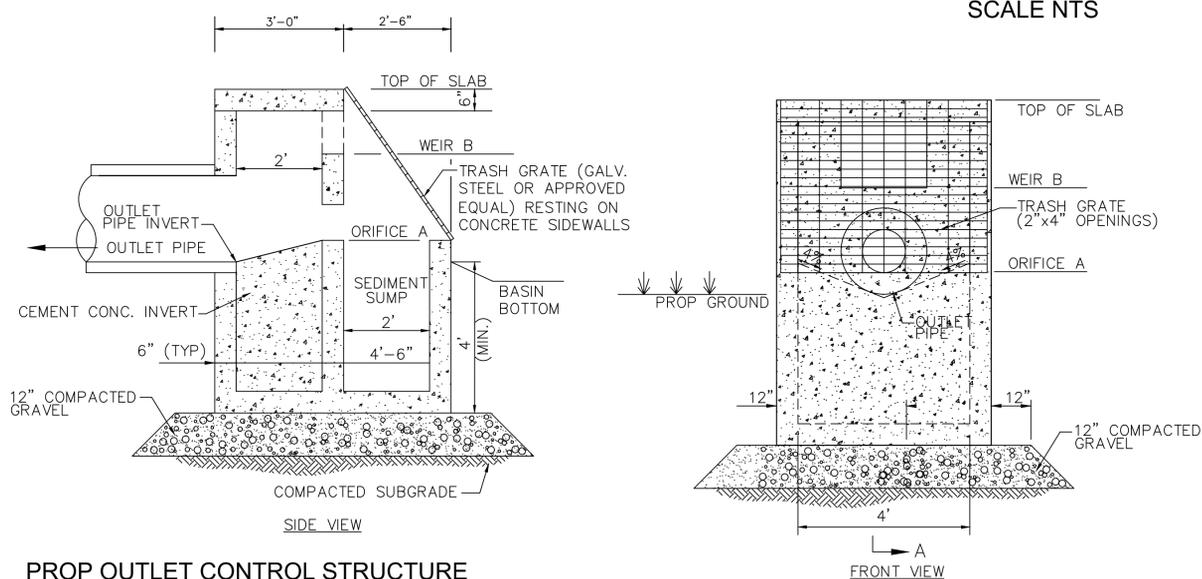
WETLAND AREA ALLOCATION				
SYMBOL	DEPTH ZONE	ELEVATION	SURFACE AREA	% ALLOCATION
[Symbol]	SEMI-WET ZONE	243.50-245.00	1,949 SF	40%
[Symbol]	HIGH MARSH ZONE	243.50-243.00	896 SF	19%
[Symbol]	LOW MARSH ZONE	243.00-242.00	1,141 SF	24%
[Symbol]	DEEP WATER ZONE	<242.00	794 SF	17%



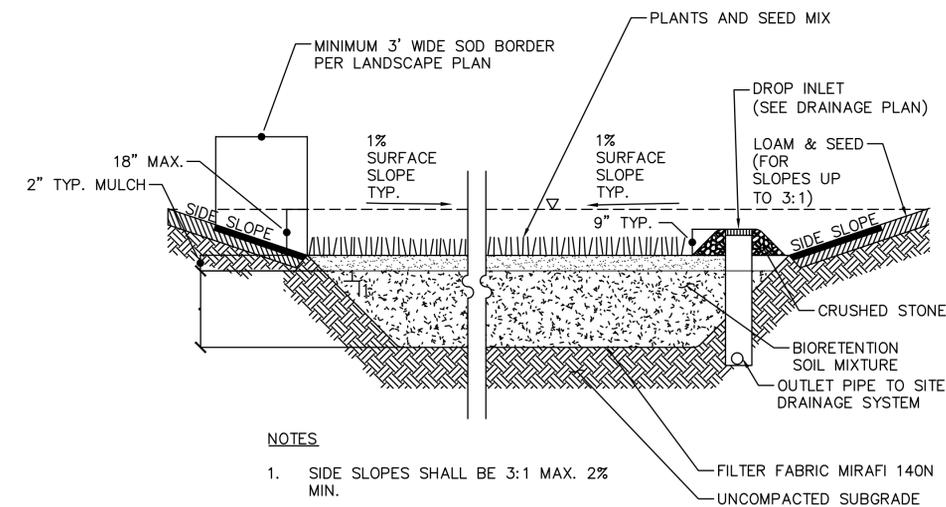
**PROP STONE OVERFLOW SPILLWAY  
SCALE NTS**



**UNDERDRAIN  
SCALE NTS**



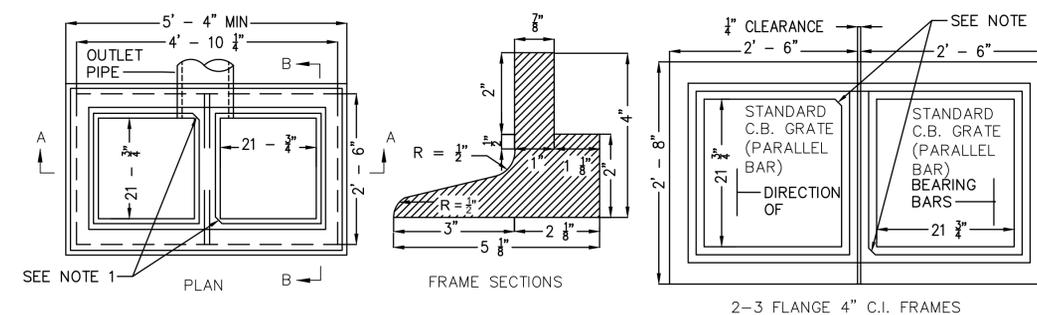
**PROP OUTLET CONTROL STRUCTURE  
SCALE NTS**



**NOTES**

- SIDE SLOPES SHALL BE 3:1 MAX. 2% MIN.

**RAIN GARDEN  
SCALE NTS**



SEE NOTE 1

PLAN

FRAME SECTIONS

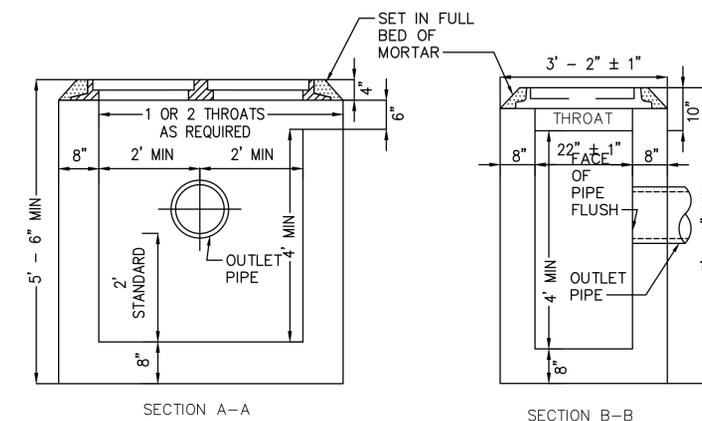
2-3 FLANGE 4" C.I. FRAMES

**NOTES:**

- STANDARD PARALLEL BAR GRATES TO BE USED. SEE DETAILS ON MASSDOT CONSTRUCTION STANDARDS 222.2.1.
- MINIMUM C.I. FRAME MASS - 205 LBS. EACH
- FOR DESCRIPTIONS, MATERIALS, AND CONSTRUCTION METHODS SEE LATEST STANDARD SPECIFICATIONS

Concrete shall be

- 4000 PSI - 1 1/2" 565 LB
- THIS DROP INLET IS NOT TO BE USED AT ANY LOCATION WHERE IT MAY PRESENT A HAZARD TO VEHICLES THAT RUN OFF THE ROAD.



SECTION A-A

SECTION B-B

**DROP INLET TYPE A: PRECAST CONCRETE  
SCALE NTS**



# D

## Stormwater Report

STORMWATER REPORT

# Adams Circle Reconstruction & Infrastructure Design

Devens, Massachusetts

PREPARED FOR

---

MassDevelopment  
33 Andrews Parkway  
Devens, MA 01434  
978.784.2900

PREPARED BY



260 Arsenal Place #2  
Watertown, MA 02472  
617.924.2286

January 2026

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# Checklist for Stormwater Report



# Checklist for Stormwater Report

## A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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



# Checklist for Stormwater Report

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## B. Stormwater Checklist and Certification

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

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

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

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### Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

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Signature and Date

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## Checklist

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

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



# Checklist for Stormwater Report

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## Checklist (continued)

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

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

### Standard 1: No New Untreated Discharges

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



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 2: Peak Rate Attenuation

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

### Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
  - Static
  - Simple Dynamic
  - Dynamic Field<sup>1</sup>
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
  - Site is comprised solely of C and D soils and/or bedrock at the land surface
  - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
  - Solid Waste Landfill pursuant to 310 CMR 19.000
  - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 3: Recharge (continued)

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

### Standard 4: Water Quality

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

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



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 4: Water Quality (continued)

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

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

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

### Standard 6: Critical Areas

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



# Checklist for Stormwater Report

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## Checklist (continued)

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

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

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

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

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



# Checklist for Stormwater Report

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## Checklist (continued)

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

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

### Standard 9: Operation and Maintenance Plan

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

### Standard 10: Prohibition of Illicit Discharges

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



## Stormwater Report Narrative

This Stormwater Report has been prepared to demonstrate compliance with the Massachusetts Stormwater Management Standards in accordance with the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00) and the Devens Enterprise Commission (DEC) rules and regulations for stormwater design and mitigation per 974 CMR 4.00 Industrial Performance Standards and General Regulations Section 4.08 General: Stormwater Management.

Under the Massachusetts Stormwater Management Standards, the Project is considered a redevelopment project because it involves maintenance and improvement of an existing roadway, including widening less than a single lane, and correcting substandard intersections and drainage. The project has been designed to comply with the Stormwater Management Standards and additional standards as required by DEC regulations.

### Project Description

The Applicant, MassDevelopment, is proposing a full depth pavement reclamation of Adams Circle in Devens, Massachusetts, as well as the construction of 5-ft porous pavement sidewalks (the Project). The Project also includes utility replacements, existing stormwater drainage upgrades and stormwater control measures (SCMs). The proposed improvements will support both existing and future residential growth in the area. The Project is not considered a Land Use with Higher Potential Pollutant Loads (LUHPPL).

## Site Description

The Project site is the Adams Circle loop. The Project sits within a grass pasture plateau adjacent Willow Branch which is tributary to the Nashua River, approximately 1.2 miles downstream. The Project site is approximately 6.66 acres and includes the existing Adams Circle loop and the encompassed interior parcel. See Figure 1, Site Locus Map. Stormwater from the surrounding parcels will be managed by others. There are no floodplains within or adjacent to the site limits.

Wetland Resource Areas on the Site include the following:

**Table 1 Wetland Resource Areas**

Name	Critical Area (yes/no)	Zone 1 or Zone A (yes/no)	ORW or SRW (yes/no)	Zone II or IWPA (yes/no)	Other
Wetland 1 (Willow Branch)*	no	no	no	no	

\*Proposed work within the 100' wetland buffer is subject to approval via Request for Determination of Applicability (RDA).

According to the National Resources Conservation Service (NRCS), surface soils on the Site are primarily Quonset loamy sand, classified as Hydrologic Soil Groups (HSG) A. Test pits were conducted on 10-31-2025, the results of which are provided in Appendix C. The results of the test pits indicate underlying soils are primarily gravelly and loamy sand with rapid infiltration (soils with a saturated hydraulic conductivity greater than 2.4 inches per hour). The test pits also noted the presence of redoximorphic features, indicating seasonal high groundwater (SHGW) at a depth ranging between 74-97", with an average depth of 83".

## Existing Drainage Conditions

Under existing conditions, the Project site is a mix of impervious and pervious surfaces consisting of the existing Adams Circle roadway and the adjacent grass pasture with scattered trees. Topography within the Project site is very flat, with elevations ranging between 252-ft and 249-ft NGVD 29. Figure 2 illustrates the existing drainage patterns on the Site. Table 2, below, outlines the impervious and pervious areas within the Project site.

**Table 2 Existing Drainage Areas (“Green Field” Condition)**

Sub-catchment	Impervious Area (ac)	Pervious Area (ac)	Total Area (ac)
1S: Existing Lots (Interior)	0	3.58	3.42
2S: Existing Sidewalk	0	1.22	1.22
3S: Existing Roadway	0	1.36	1.36
3S: Constructed Wetland Parcel	0	0.50	0.50
<b>1R: Willow Branch (DP-1)</b>	<b>0</b>	<b>6.66</b>	<b>6.66</b>

Stormwater runoff from the existing Project site is divided into multiple drainage areas that convey stormwater runoff to a single design point - DP-1: Willow Branch; the perennial stream west of the site that ultimately drains to the Nashua River. The site topography is graded towards the stream, and DP-1 receives one point discharge from an existing closed drainage system within the Adams Circle roadway. Existing stormwater treatment within the Project site includes one existing oil-water separator along the existing closed drainage system, prior to discharge into Willow Branch.

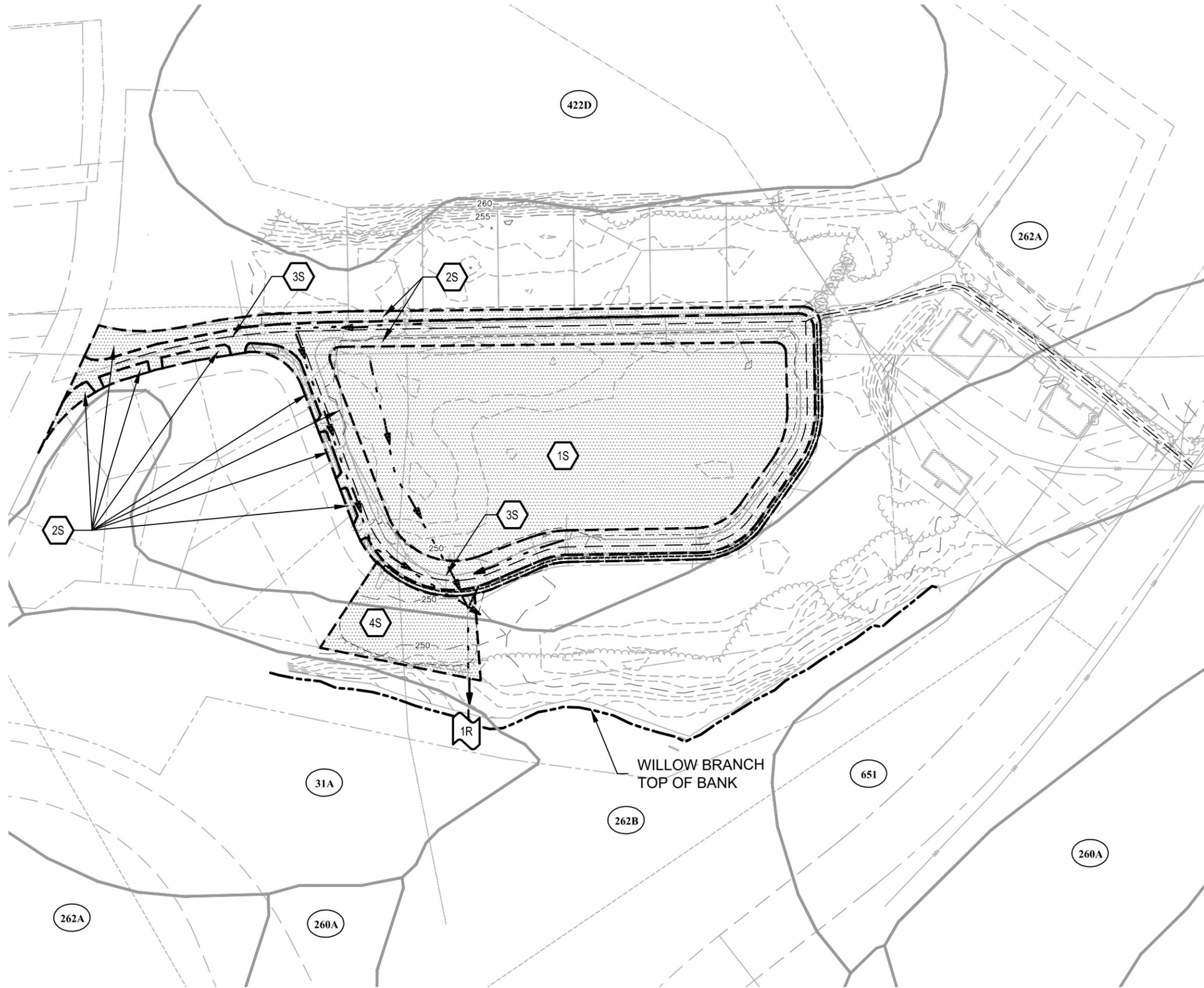
In accordance with the Devens Enterprise Commission Development Rules and Regulations, the pre-development drainage conditions were analyzed in an undeveloped “green field” condition. This analysis resulted in negligible peak discharge flows and runoff volumes from the site due to the assumption of predominately grass pasture ground cover, long times of concentration, and rapidly infiltrating HSG A soils.

**Figure 1: Locus Map**  
Adams Cir | Devens, MA



— Willow Branch

Project Location



# Legend

## SYMBOLS

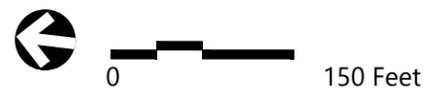
-  DESIGN POINT
-  DRAINAGE AREA DESIGNATION
-  POND

## LINETYPES

-  DRAINAGE AREA BOUNDARY
-  TIME OF CONCENTRATION FLOW LINE
-  SOIL TYPE BOUNDARY
-  PERVIOUS

## SCS SOIL CLASSIFICATIONS

-  WALPOLE SANDY LOAM, 0 TO 3 PERCENT SLOPES, HSG B/D
-  SUDBURY FINE SANDY LOAM, 0 TO 3 PERCENT SLOPES, HSG A
-  QUONSET LOAMY SAND, 0 TO 3 PERCENT SLOPES, HSG A
-  QUONSET LOAMY SAND, 3 TO 8 PERCENT SLOPES, HSG A
-  CANTON FINE SANDY LOAM, 15 TO 35 PERCENT SLOPES, VERY STONY, HSG B
-  UDORTHENTS, SMOOTHED



## Proposed Drainage Conditions

The site design integrates a comprehensive stormwater management system that has been developed in accordance with the Massachusetts Stormwater Handbook, maximizing possible stormwater treatment whilst respecting existing constraints.

In the proposed condition, stormwater runoff from the proposed pavement reclamation of Adams Circle sheet flows into rain gardens where feasible and is otherwise collected by the upgraded closed drainage system via deep-sump catch-basins, before discharging to a constructed stormwater wetland where runoff is treated for TSS and Phosphorus loads. Stormwater runoff within the proposed porous sidewalks is treated and infiltrated. Abutting lots on the outer rim of Adams Circle will be developed by another party and are excluded from this analysis. The lots will be regraded to slope away from the proposed roadway and additional impervious areas will be treated and conveyed by the developer in a separate system.

Table 3, below, outlines the impervious and pervious areas within the Project site.

**Table 3 Proposed Drainage Areas**

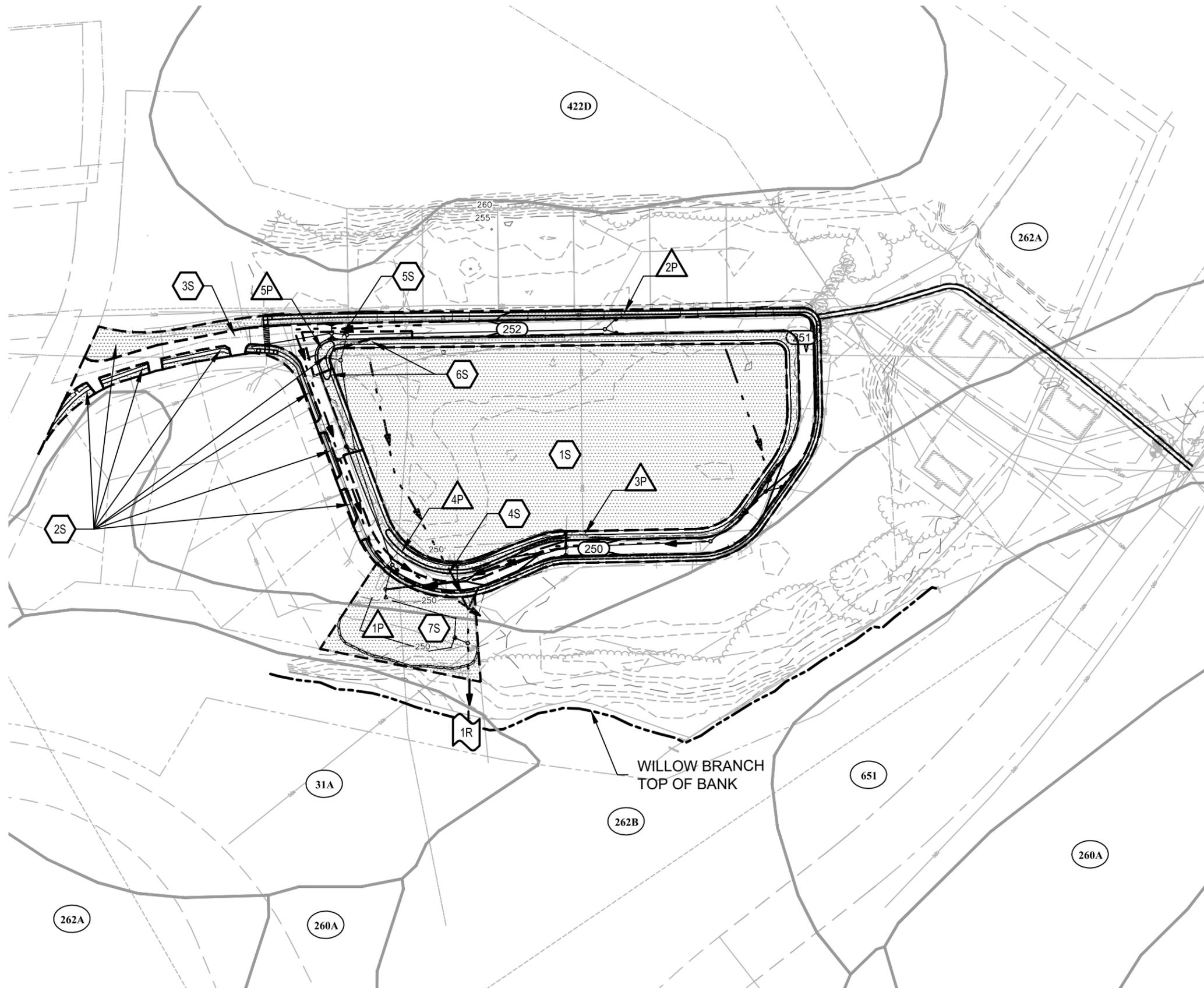
Sub-catchment	Impervious Area (ac)	Pervious Area (ac)	Total Area (ac)
1S: Existing Lots (Interior)	0	3.58	3.58
2S: Outer Sidewalk	0.26	0.47	0.73
3S: Proposed Roadway	1.02	0	1.02
4S: Rain Garden 1	0.15	0.10	0.25
5S: Rain Garden 2	0.06	0.03	0.09
6S: Inner Sidewalk	0.16	0.33	0.49
7S: Constructed Wetland Parcel	0	0.50	0.50
<b>1R: Willow Branch (DP-1)</b>	<b>1.65</b>	<b>5.01</b>	<b>6.66</b>

Low Impact Development (LID) techniques were prioritized as part of the stormwater management strategy for the Project site; the following LID techniques have been implemented:

- › **No disturbance to any wetland resource area:** no work is proposed with the adjacent Willow Branch perennial stream.
- › **Minimizing disturbance to existing trees and shrubs:** the proposed pavement reclamation of Adams Circle follows the same alignment and general width of the existing roadway, and the proposed stormwater management features have been located to avoid disturbance to existing vegetation.
- › **Bioretention Cells:** rain garden opportunities have been explored throughout the roadway corridor, and a rain garden has been proposed at the north-east corner of the Adams Circle loop.
- › **Constructed Stormwater Wetlands:** a constructed stormwater wetland has been proposed to collect and treat discharge from the proposed closed drainage system within the Adams Circle loop.

Due to the presence of seasonal high groundwater (SHGW) approximately 6.9-ft below the existing ground surface and Deven's requirement to maintain at least 4-ft of separation between SHGW and proposed infiltration practices, subsurface infiltration practices such as infiltration basins or leaching basins within the Project site are not feasible. Shallow infiltration practices such as rain gardens and porous sidewalks were explored and utilized where feasible.

Figure 3 illustrates the proposed drainage conditions for the project. As shown, the Site will be divided into multiple drainage areas that discharge treated stormwater to a single design point.



# Legend

## SYMBOLS

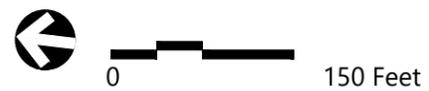
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## SCS SOIL CLASSIFICATIONS

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-  SUDBURY FINE SANDY LOAM, 0 TO 3 PERCENT SLOPES, HSG A
-  QUONSET LOAMY SAND, 0 TO 3 PERCENT SLOPES, HSG A
-  QUONSET LOAMY SAND, 3 TO 8 PERCENT SLOPES, HSG A
-  CANTON FINE SANDY LOAM, 15 TO 35 PERCENT SLOPES, VERY STONY, HSG B
-  UDORTHENTS, SMOOTHED





# Regulatory Compliance

## Massachusetts Department of Environmental Protection (DEP) – Stormwater Management Standards

While the Project is not located within jurisdictional areas subject to the DEP’s Wetlands Protection Act (310 CMR 10.00), the project is required to comply with the DEP Stormwater Management Standards per the Devens Enterprise Commission’s Industrial Performance Standards and General Regulations (974 CMR 4.00). As demonstrated below, the proposed Project has been designed to comply with the DEP Stormwater Management Standards to the maximum extent practicable based on existing site constraints.

### Standard 1: No New Untreated Discharges or Erosion to Wetlands

The Project has been designed to comply with Standard 1.

The Project does not propose any new untreated discharges to wetlands. The Stormwater Control Measures (SCMs) included in the proposed stormwater management system have been designed in accordance with the Massachusetts Stormwater Handbook. Supporting information and computations demonstrating that no new untreated discharges will result from the Project are presented through compliance with Standards 4 through 6.

Outlets from closed drainage systems have been designed with flared end sections and stone protection to dissipate discharge velocities.

### Standard 2: Peak Rate Attenuation

The Project has been designed to comply with Standard 2 at Design Point 1.

The Devens Enterprise Commission requires the pre-development condition to consist of “green fields” only, regardless of previous development. To meet this requirement at DP-1, a constructed stormwater wetland is proposed to collect and attenuate runoff from the proposed pavement reclamation of Adams Circle. As indicated in Table 4, the project meets or reduces peak runoff rates when compared to the “green field” condition. There is an overall increase in impervious area tributary to DP-1 as part of the project, which has been mitigated with a comprehensive evaluation of appropriate SCMs. In all events, the peak runoff from the proposed design is less than or equivalent to the “green field” conditions. A constructed wetland has been proposed to provide significant stormwater retention and water quality treatment. A perforated underdrain within the wetland embankments will drain the stored volume between rainfall events. This will maintain suitable water elevations for vegetation within the constructed wetland. During small storm events, this outflow is negligible within the event period. An outlet control structure will govern peak outflow from larger storm events.

The rainfall-runoff response of the Site under green field pre-development and proposed conditions was analyzed for storm events with recurrence intervals of 2-, 10-, 25-, 50- and 100-years. The results of the analysis are summarized in Table 4 below.

Computations and supporting information regarding hydrologic modeling are included in Appendix B.

**Table 4 Peak Discharge Rates (cfs)**

Design Point	2-year	10-year	25-year	50-year	100-year
<b>Design Point 1: Willow Branch</b>					
"Green Field"	0.0	0.2	0.8	1.8	3.1
Proposed	0.0	0.1	0.8	1.3	1.7

### Standard 3: Stormwater Recharge

The Project has been designed to comply with Standard 3.

In accordance with the Stormwater Handbook, the Required Recharge Volume for the Project is calculated to be 9,451 cubic feet. This is governed by a required recharge volume of 0.6 inches for HSG A and an adjustment factor dependent on the proportion of impervious area on site routed to an infiltration BMP. Computations and supporting information regarding the required recharge volume are included in Appendix C.

**Table 5 Required Recharge Volume**

Hydrologic Soil Group (HSG)	Impervious Area (sf)	Impervious Area Draining to Recharge (sf)	Inches of Runoff (in)	Volume (cf)	Capture Area Adjustment Factor	Required Recharge Volume
<b>Design Point 1: Willow Branch</b>						
A	72,139	27,531	0.60	3,607	2.62	9,451
B	0	0	0.35	0	0	0
C	0	0	0.25	0	0	0
D	0	0	0.10	0	0	0
<b>Proposed</b>	72,139	27,531		3,607		<b>9,451</b>

The project proposes to provide 23,842 cubic feet of recharge using porous pavement sidewalks and two rain gardens. The available recharge volume on site is severely limited by seasonal high ground water (SHGW) and additional requirements from the Devens Enterprise Commission Rules and Regulations. Per 974 CMR 4.08 (4)(f) all stormwater recharge structures should be sited at least 4' above SHGW elevation. Test pits were conducted on-site that indicate the presence of SHGW at approximately 6.9-ft below grade. To comply with the Devens Enterprise Commission stormwater guidance, all infiltration practices must lie within 2.9-ft of the existing ground surface. This shallow depth to proposed surface eliminates many preferred SCM strategies to achieve groundwater recharge.

For example, infiltration basins and offline leaching basins were determined to be unsuitable due to insufficient clearance to SHGW for recharge. A constructed wetland is proposed to mitigate peak rates and provide water quality treatment prior to discharge to the adjacent Willow Branch. However, constructed wetlands do not provide groundwater recharge.

Porous sidewalks were also investigated. Porous sidewalks are proposed across the site to provide water quality treatment along the entire sidewalk area. Rain gardens were investigated, and two rain gardens are proposed in the grass buffer between the Adams Circle loop and the porous sidewalk. Each infiltration SCM has been designed to drain completely within 72 hours. Table 6 below provides a summary of the proposed infiltration SCMs utilized for the Project.

**Table 6 Summary of Recharge Calculations**

Infiltration SCM	Provided Recharge Volume (cubic feet)
Outer Porous Sidewalk 2P	8,958
Inner Porous Sidewalk 3P	12,597
Rain Garden 4P	1,635
Rain Garden 5P	652
<b>Total Provided Recharge</b>	<b>23,842</b>
<b>Total Required Recharge</b>	<b>9,451</b>

Soil evaluation (including Geotechnical Report), computations, and supporting information are included in Appendix C.

### Standard 4: Water Quality

The Project has been designed to comply with Standard 4.

The proposed stormwater management system implements a treatment train of SCMs that has been designed to provide an average weighted 99% TSS removal of stormwater runoff from proposed impervious surfaces discharging to infiltration basins, rain gardens, porous sidewalk, and porous pavement parking bays. Refer to the Local Municipal Rules and Regulations section immediately following the DEP Stormwater Management Standards section for additional information.

This level of treatment exceeds the 80% TSS removal requirement from the Massachusetts Stormwater Standards.

Computations and supporting information, including the Operation and Maintenance Plan, which incorporates the Long-Term Pollution Prevention Plan, are included in Appendix D.

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

The Project is not considered a LUHPPL.

## Standard 6: Critical Areas

The Project will not discharge stormwater near or to a critical area.

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

The project is designed to meet Stormwater Management Standards in full.

Refer directly to each Standard for applicable computations and supporting information demonstrating compliance with each.

## Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls

The Project will disturb more than 1 acre of land and is therefore required to obtain coverage under the Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit. As required under this permit, a Stormwater Pollution Prevention Plan (SWPPP) will be developed and submitted before land disturbance begins. Recommended construction period pollution prevention and erosion and sedimentation controls to be finalized in the SWPPP are included in Appendix E.

## Standard 9: Operation and Maintenance Plan

In compliance with Standard 9, Operation & Maintenance will be performed in accordance with the Devens Stormwater Collection, Treatment and Management Systems Operation and Maintenance Plan The O&M Plan is included in Appendix D.

## Standard 10: Prohibition of Illicit Discharges

The project's stormwater management system, as shown on the plans submitted with this report, has been designed in compliance with Standard 10. The project area does not have any known illicit connections. Any illicit connections to the stormwater management system found in the project limit of work during construction will be removed and/or incorporated into the project. The Operation and Maintenance Plan, which incorporates the Long-Term Pollution Prevention Plan provided in Appendix D, includes measures to prevent illicit discharges.

An Illicit Discharge Compliance Statement is included within the Long-Term Pollution Prevention Plan in Appendix D.

## Local Municipal Rules and Regulations

The stormwater management system was designed in accordance with the Devens Enterprise Commission Rules and Regulations per 974 CMR 4.08 General: Stormwater Management. The stormwater management regulations state "All Applications, regardless of whether the project is subject to the Wetlands Protection Act or not, shall design the stormwater management system in compliance with the Massachusetts DEP Stormwater Management Standards". In addition to compliance with the Standards, the Devens Enterprise Conditions state stormwater management systems shall comply with the following water quantity and water quality requirements.

### Water Quantity

Per 974 CMR 4.08 (2)(d)(iii) drainage calculations for peak rates shall include the "pre-development" condition to be considered "green fields". The HydroCAD analysis provided in Appendix B for Standard 2 compliance includes the pre-development condition as a "green field" condition. As indicated in Table 4, the project meets or reduces peak runoff rates when compared to the "green field" condition. There is an overall increase in impervious area tributary to DP-1 as part of the project. A comprehensive evaluation of LID measures was conducted to propose peak rate attenuation to the maximum extent practicable.

### Water Quality

The stormwater management systems are required to meet an average annual pollutant removal equivalent to 90% of the average annual load of Total Suspended Solids (TSS) related to the total post-construction impervious area on the site AND 60% of the average annual load of Total Phosphorus (TP) related to the total post-construction area on the site per 974 CMR 4.08 (3)(b)(i). The project achieves 99% average annual TSS removal and 80% of the average annual load of TP via structural BMPs and porous pavement. Calculations for TSS removal and TP removal are in Appendix D. TSS and TP removal rates are based on the EPA SCM Performance curves.

---

## Appendix A: Standard 1 Computations and Supporting Information

## Pipe Sizing Calculations

The closed drainage system was designed for the 25-year storm event, in accordance with the Devens Enterprise Commissions Rules and Regulations (974 CMR 4.08 (6)).

Drainage pipes were sized using Manning's Equation for full-flow capacity and the Rational Method.

## Appendix A: Pipe Sizing Calculations

Manning's Flow Pipe Capacity								Rational Method Pipe Flow					Pipe Capacity Check	
Start Node	Stop Node	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Area	Hydraulic Radius	Capacity (Full Flow) (cfs)	Pervious Area (sf)	Impervious Area (sf)	C-value	Drainage Area (ac)	Design Flow (cfs)	Cumulative Design Flow (cfs)	Percent Full
DMH 7	DMH 14	0.005	15	0.013	1.22718463	0.3125	4.58	9802	15017	0.73	0.57	3.40	3.40	74
DMH 14	DMH 13	0.005	15	0.013	1.22718463	0.3125	4.58	0	0	0.00	0.00	0.00	3.40	74
DMH 13	DMH 5	0.005	18	0.013	1.76714587	0.375	7.45	2813	7632	0.80	0.24	1.57	4.96	67
DMH 5	DMH 10	0.005	18	0.013	1.76714587	0.375	7.45	6615	4795	0.63	0.26	1.35	6.31	85
DMH 25	DMH 1	0.005	15	0.013	1.22718463	0.3125	4.58	4875	14935	0.81	0.45	3.02	3.02	66
DMH 1	DMH 24	0.005	18	0.013	1.76714587	0.375	7.45	1900	14900	0.89	0.39	2.79	5.80	78
DMH 24	DMH 2	0.005	18	0.013	1.76714587	0.375	7.45	0	0	0.00	0.00	0.00	5.80	78
DMH 2	DMH 9	0.005	18	0.013	1.76714587	0.375	7.45	1603	2916	0.75	0.10	0.64	6.44	86
DMH 9	DMH 8	0.005	18	0.013	1.76714587	0.375	7.45	1872	3388	0.75	0.12	0.74	7.18	96
DMH 8	DMH 10	0.005	24	0.013	3.14159265	0.5	16.04	1295	5627	0.85	0.16	1.10	8.28	52
DMH 10	FES 27	0.005	24	0.013	3.14159265	0.5	16.04	0	0	0.00	0.00	0.00	14.59	91

Design Intensity		
Methodology	TP-40	NOAA Atlas 14
25-yr 5-min peak intensity (in/hr)	6.60	8.14

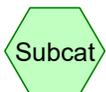
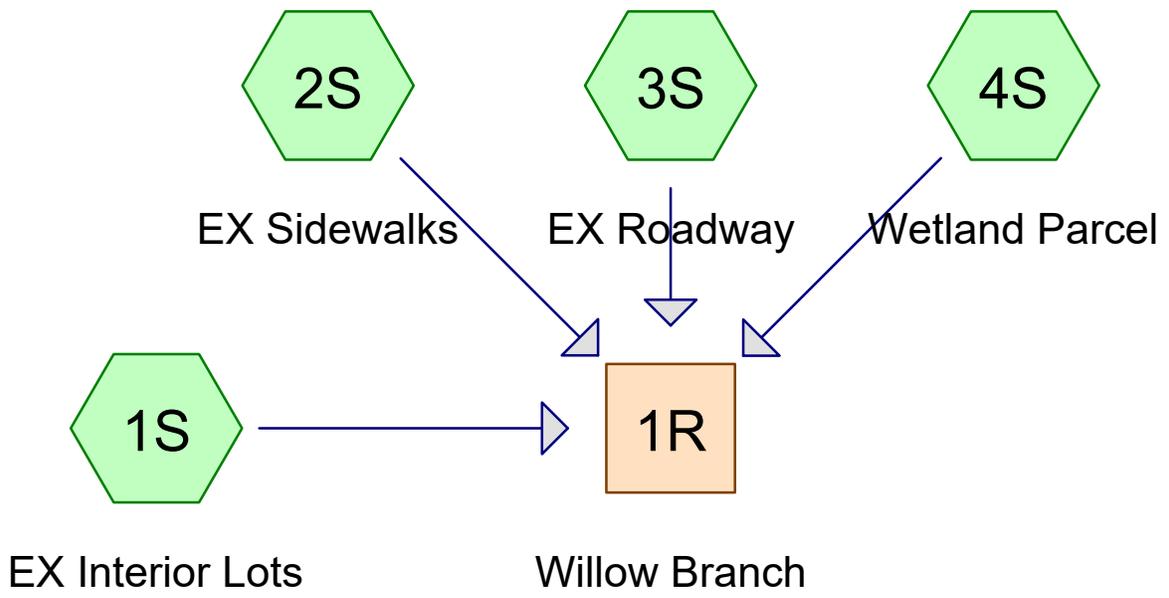
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## Appendix B: Standard 2 Computations and Supporting Information

The rainfall-runoff response of the Site under green field pre-development and proposed conditions was evaluated for storm events with recurrence intervals of 2, 10, 25, 50 and 100-years. Rainfall volumes used for this analysis were based on the Natural Resources Conservation Service (NRCS) Type III, 24-hour storm and NOAA Atlas 14 precipitation depths for the site: 3.13, 4.79, 5.83, 6.60, and 7.43 inches, respectively. Runoff coefficients for the pre- and post-development conditions were determined using NRCS Technical Release 55 (TR-55) methodology as provided in HydroCAD. Drainage areas used in the analyses were described in previous sections and shown on Figures 2 and 3. The HydroCAD model is based on the NRCS Technical Release 20 (TR-20) Model for Project Formulation Hydrology.

# HydroCAD Analysis: Green Field Pre-Development Conditions

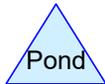
GREEN FIELD  
CONDITION



Subcat



Reach



Pond



Link

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## Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2yr	Type III 24-hr		Default	24.00	1	3.14	2
2	10yr	Type III 24-hr		Default	24.00	1	4.81	2
3	25yr	Type III 24-hr		Default	24.00	1	5.85	2
4	50yr	Type III 24-hr		Default	24.00	1	6.62	2
5	100yr	Type III 24-hr		Default	24.00	1	7.46	2

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**Area Listing (all nodes)**

Area (acres)	CN	Description (subcatchment-numbers)
3.076	39	>75% Grass cover, Good, HSG A (2S, 3S, 4S)
3.582	39	Pasture/grassland/range, Good, HSG A (1S)
<b>6.658</b>	<b>39</b>	<b>TOTAL AREA</b>

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## Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
6.658	HSG A	1S, 2S, 3S, 4S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
<b>6.658</b>		<b>TOTAL AREA</b>

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**Ground Covers (all nodes)**

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
3.076	0.000	0.000	0.000	0.000	3.076	>75% Grass cover, Good	2S
							,
							3S
							,
							4S
3.582	0.000	0.000	0.000	0.000	3.582	Pasture/grassland/range, Good	1S
<b>6.658</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>6.658</b>	<b>TOTAL AREA</b>	

## 2-Year Storm Event – Green Field Pre-Development

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Type III 24-hr 2yr Rainfall=3.14"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: EX Interior Lots**

Runoff Area=156,041 sf 0.00% Impervious Runoff Depth=0.00"  
Flow Length=587' Tc=18.0 min CN=39 Runoff=0.00 cfs 0.000 af

**Subcatchment2S: EX Sidewalks**

Runoff Area=1.216 ac 0.00% Impervious Runoff Depth=0.00"  
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

**Subcatchment3S: EX Roadway**

Runoff Area=59,248 sf 0.00% Impervious Runoff Depth=0.00"  
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

**Subcatchment4S: Wetland Parcel**

Runoff Area=21,779 sf 0.00% Impervious Runoff Depth=0.00"  
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

**Reach 1R: Willow Branch**

Inflow=0.00 cfs 0.000 af  
Outflow=0.00 cfs 0.000 af

**Total Runoff Area = 6.658 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"**  
**100.00% Pervious = 6.658 ac 0.00% Impervious = 0.000 ac**

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Type III 24-hr 2yr Rainfall=3.14"

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**Summary for Subcatchment 1S: EX Interior Lots**

Runoff from this area will be managed by individual lot developers.

Runoff = 0.00 cfs @ 24.13 hrs, Volume= 0.000 af, Depth= 0.00"  
Routed to Reach 1R : Willow Branch

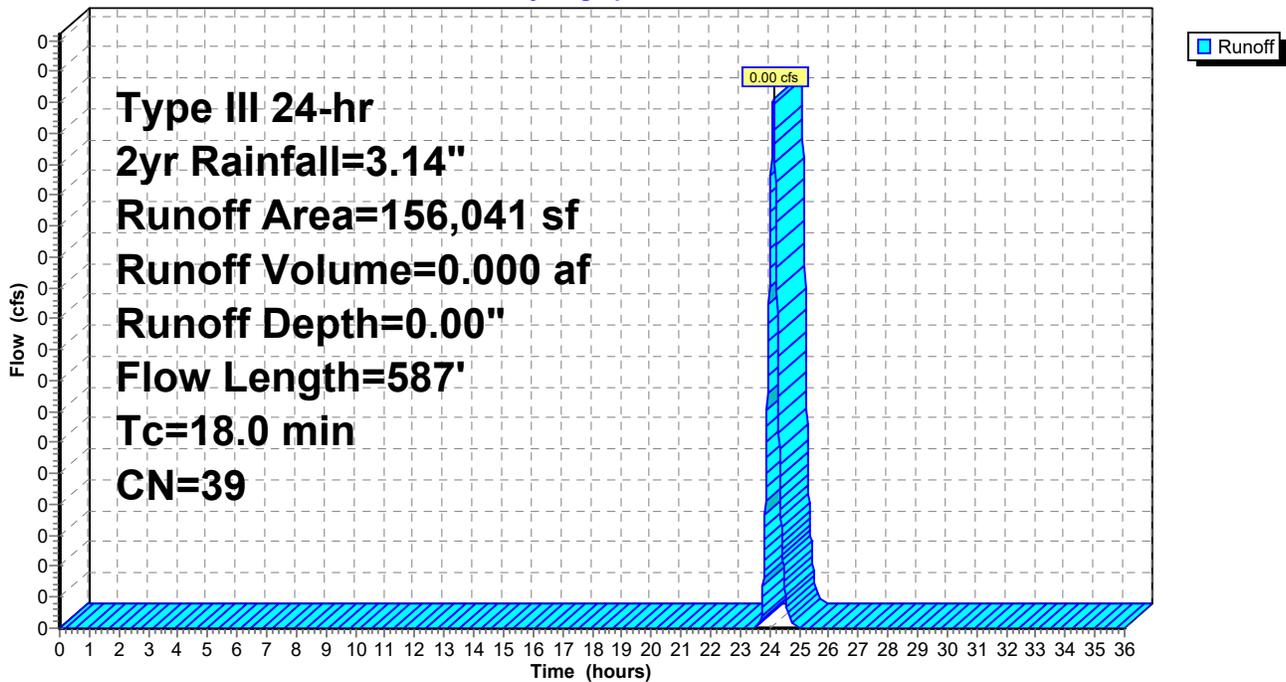
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2yr Rainfall=3.14"

Area (sf)	CN	Description
156,041	39	Pasture/grassland/range, Good, HSG A
156,041		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0560	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.2	537	0.0081	0.63		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
18.0	587	Total			

**Subcatchment 1S: EX Interior Lots**

Hydrograph



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Type III 24-hr 2yr Rainfall=3.14"

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Hydrograph for Subcatchment 1S: EX Interior Lots

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	3.14	0.00	0.00
0.50	0.02	0.00	0.00	26.50	3.14	0.00	0.00
1.00	0.03	0.00	0.00	27.00	3.14	0.00	0.00
1.50	0.05	0.00	0.00	27.50	3.14	0.00	0.00
2.00	0.06	0.00	0.00	28.00	3.14	0.00	0.00
2.50	0.08	0.00	0.00	28.50	3.14	0.00	0.00
3.00	0.10	0.00	0.00	29.00	3.14	0.00	0.00
3.50	0.12	0.00	0.00	29.50	3.14	0.00	0.00
4.00	0.14	0.00	0.00	30.00	3.14	0.00	0.00
4.50	0.16	0.00	0.00	30.50	3.14	0.00	0.00
5.00	0.18	0.00	0.00	31.00	3.14	0.00	0.00
5.50	0.20	0.00	0.00	31.50	3.14	0.00	0.00
6.00	0.23	0.00	0.00	32.00	3.14	0.00	0.00
6.50	0.25	0.00	0.00	32.50	3.14	0.00	0.00
7.00	0.28	0.00	0.00	33.00	3.14	0.00	0.00
7.50	0.32	0.00	0.00	33.50	3.14	0.00	0.00
8.00	0.36	0.00	0.00	34.00	3.14	0.00	0.00
8.50	0.40	0.00	0.00	34.50	3.14	0.00	0.00
9.00	0.46	0.00	0.00	35.00	3.14	0.00	0.00
9.50	0.52	0.00	0.00	35.50	3.14	0.00	0.00
10.00	0.59	0.00	0.00	36.00	3.14	0.00	0.00
10.50	0.68	0.00	0.00				
11.00	0.79	0.00	0.00				
11.50	0.94	0.00	0.00				
12.00	1.57	0.00	0.00				
12.50	2.20	0.00	0.00				
13.00	2.35	0.00	0.00				
13.50	2.46	0.00	0.00				
14.00	2.55	0.00	0.00				
14.50	2.62	0.00	0.00				
15.00	2.68	0.00	0.00				
15.50	2.74	0.00	0.00				
16.00	2.78	0.00	0.00				
16.50	2.82	0.00	0.00				
17.00	2.86	0.00	0.00				
17.50	2.89	0.00	0.00				
18.00	2.91	0.00	0.00				
18.50	2.94	0.00	0.00				
19.00	2.96	0.00	0.00				
19.50	2.98	0.00	0.00				
20.00	3.00	0.00	0.00				
20.50	3.02	0.00	0.00				
21.00	3.04	0.00	0.00				
21.50	3.06	0.00	0.00				
22.00	3.08	0.00	0.00				
22.50	3.10	0.00	0.00				
23.00	3.11	0.00	0.00				
23.50	3.13	0.00	0.00				
24.00	<b>3.14</b>	<b>0.00</b>	<b>0.00</b>				
24.50	3.14	0.00	<b>0.00</b>				
25.00	3.14	0.00	0.00				
25.50	3.14	0.00	0.00				

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Type III 24-hr 2yr Rainfall=3.14"

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**Summary for Subcatchment 2S: EX Sidewalks**

Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"

Routed to Reach 1R : Willow Branch

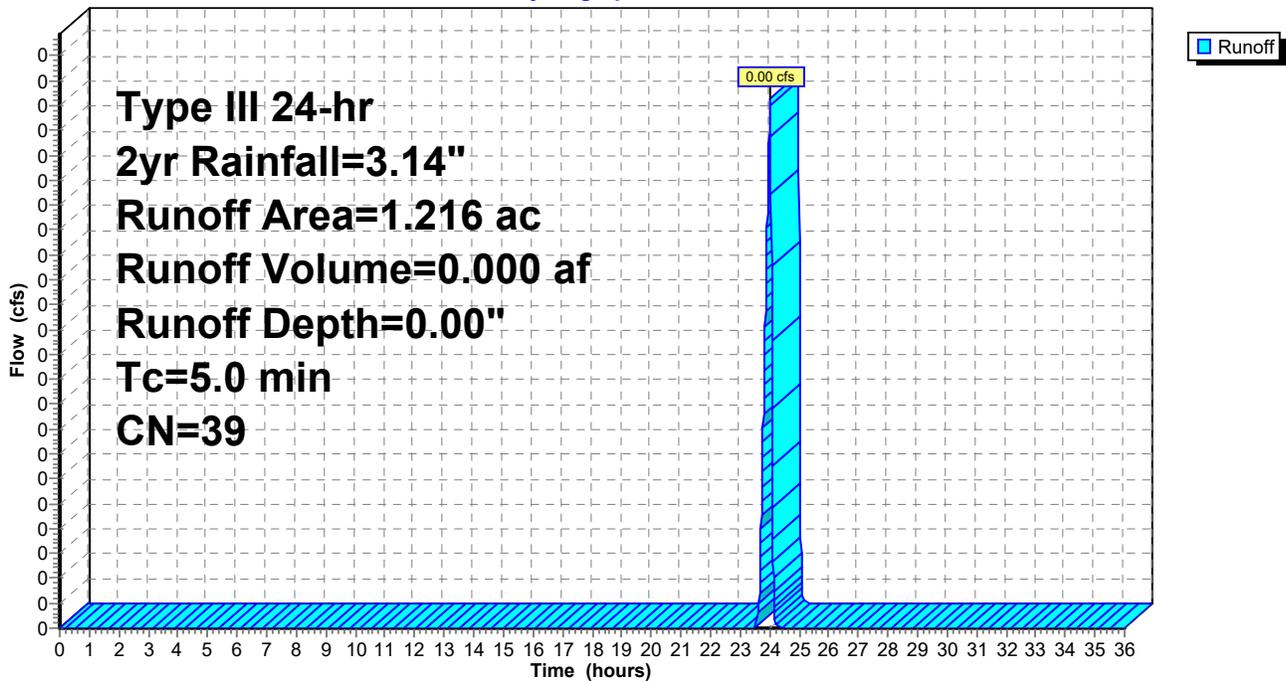
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2yr Rainfall=3.14"

Area (ac)	CN	Description
1.216	39	>75% Grass cover, Good, HSG A
1.216		100.00% Pervious Area

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

**Subcatchment 2S: EX Sidewalks**

Hydrograph



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Type III 24-hr 2yr Rainfall=3.14"

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Hydrograph for Subcatchment 2S: EX Sidewalks

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	3.14	0.00	0.00
0.50	0.02	0.00	0.00	26.50	3.14	0.00	0.00
1.00	0.03	0.00	0.00	27.00	3.14	0.00	0.00
1.50	0.05	0.00	0.00	27.50	3.14	0.00	0.00
2.00	0.06	0.00	0.00	28.00	3.14	0.00	0.00
2.50	0.08	0.00	0.00	28.50	3.14	0.00	0.00
3.00	0.10	0.00	0.00	29.00	3.14	0.00	0.00
3.50	0.12	0.00	0.00	29.50	3.14	0.00	0.00
4.00	0.14	0.00	0.00	30.00	3.14	0.00	0.00
4.50	0.16	0.00	0.00	30.50	3.14	0.00	0.00
5.00	0.18	0.00	0.00	31.00	3.14	0.00	0.00
5.50	0.20	0.00	0.00	31.50	3.14	0.00	0.00
6.00	0.23	0.00	0.00	32.00	3.14	0.00	0.00
6.50	0.25	0.00	0.00	32.50	3.14	0.00	0.00
7.00	0.28	0.00	0.00	33.00	3.14	0.00	0.00
7.50	0.32	0.00	0.00	33.50	3.14	0.00	0.00
8.00	0.36	0.00	0.00	34.00	3.14	0.00	0.00
8.50	0.40	0.00	0.00	34.50	3.14	0.00	0.00
9.00	0.46	0.00	0.00	35.00	3.14	0.00	0.00
9.50	0.52	0.00	0.00	35.50	3.14	0.00	0.00
10.00	0.59	0.00	0.00	36.00	3.14	0.00	0.00
10.50	0.68	0.00	0.00				
11.00	0.79	0.00	0.00				
11.50	0.94	0.00	0.00				
12.00	1.57	0.00	0.00				
12.50	2.20	0.00	0.00				
13.00	2.35	0.00	0.00				
13.50	2.46	0.00	0.00				
14.00	2.55	0.00	0.00				
14.50	2.62	0.00	0.00				
15.00	2.68	0.00	0.00				
15.50	2.74	0.00	0.00				
16.00	2.78	0.00	0.00				
16.50	2.82	0.00	0.00				
17.00	2.86	0.00	0.00				
17.50	2.89	0.00	0.00				
18.00	2.91	0.00	0.00				
18.50	2.94	0.00	0.00				
19.00	2.96	0.00	0.00				
19.50	2.98	0.00	0.00				
20.00	3.00	0.00	0.00				
20.50	3.02	0.00	0.00				
21.00	3.04	0.00	0.00				
21.50	3.06	0.00	0.00				
22.00	3.08	0.00	0.00				
22.50	3.10	0.00	0.00				
23.00	3.11	0.00	0.00				
23.50	3.13	0.00	0.00				
24.00	<b>3.14</b>	<b>0.00</b>	<b>0.00</b>				
24.50	3.14	0.00	<b>0.00</b>				
25.00	3.14	0.00	0.00				
25.50	3.14	0.00	0.00				

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Type III 24-hr 2yr Rainfall=3.14"

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**Summary for Subcatchment 3S: EX Roadway**

Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"

Routed to Reach 1R : Willow Branch

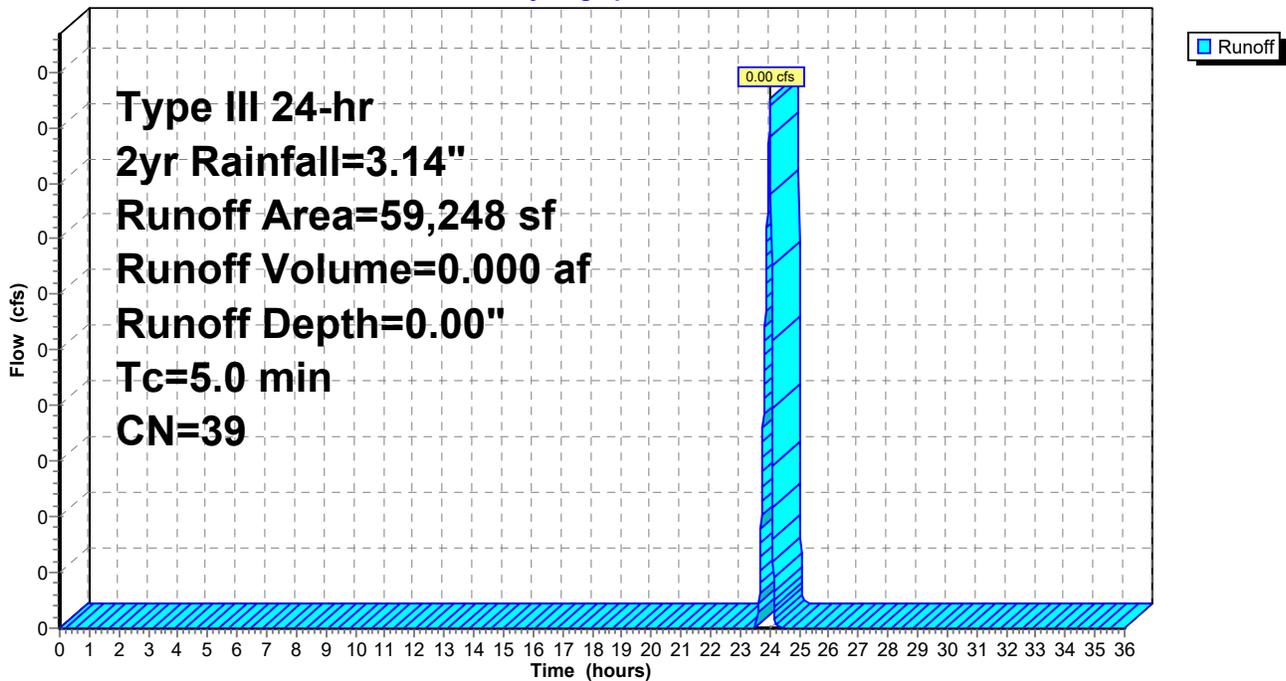
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2yr Rainfall=3.14"

Area (sf)	CN	Description
59,248	39	>75% Grass cover, Good, HSG A
59,248		100.00% Pervious Area

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

**Subcatchment 3S: EX Roadway**

Hydrograph



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Type III 24-hr 2yr Rainfall=3.14"

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Hydrograph for Subcatchment 3S: EX Roadway

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	3.14	0.00	0.00
0.50	0.02	0.00	0.00	26.50	3.14	0.00	0.00
1.00	0.03	0.00	0.00	27.00	3.14	0.00	0.00
1.50	0.05	0.00	0.00	27.50	3.14	0.00	0.00
2.00	0.06	0.00	0.00	28.00	3.14	0.00	0.00
2.50	0.08	0.00	0.00	28.50	3.14	0.00	0.00
3.00	0.10	0.00	0.00	29.00	3.14	0.00	0.00
3.50	0.12	0.00	0.00	29.50	3.14	0.00	0.00
4.00	0.14	0.00	0.00	30.00	3.14	0.00	0.00
4.50	0.16	0.00	0.00	30.50	3.14	0.00	0.00
5.00	0.18	0.00	0.00	31.00	3.14	0.00	0.00
5.50	0.20	0.00	0.00	31.50	3.14	0.00	0.00
6.00	0.23	0.00	0.00	32.00	3.14	0.00	0.00
6.50	0.25	0.00	0.00	32.50	3.14	0.00	0.00
7.00	0.28	0.00	0.00	33.00	3.14	0.00	0.00
7.50	0.32	0.00	0.00	33.50	3.14	0.00	0.00
8.00	0.36	0.00	0.00	34.00	3.14	0.00	0.00
8.50	0.40	0.00	0.00	34.50	3.14	0.00	0.00
9.00	0.46	0.00	0.00	35.00	3.14	0.00	0.00
9.50	0.52	0.00	0.00	35.50	3.14	0.00	0.00
10.00	0.59	0.00	0.00	36.00	3.14	0.00	0.00
10.50	0.68	0.00	0.00				
11.00	0.79	0.00	0.00				
11.50	0.94	0.00	0.00				
12.00	1.57	0.00	0.00				
12.50	2.20	0.00	0.00				
13.00	2.35	0.00	0.00				
13.50	2.46	0.00	0.00				
14.00	2.55	0.00	0.00				
14.50	2.62	0.00	0.00				
15.00	2.68	0.00	0.00				
15.50	2.74	0.00	0.00				
16.00	2.78	0.00	0.00				
16.50	2.82	0.00	0.00				
17.00	2.86	0.00	0.00				
17.50	2.89	0.00	0.00				
18.00	2.91	0.00	0.00				
18.50	2.94	0.00	0.00				
19.00	2.96	0.00	0.00				
19.50	2.98	0.00	0.00				
20.00	3.00	0.00	0.00				
20.50	3.02	0.00	0.00				
21.00	3.04	0.00	0.00				
21.50	3.06	0.00	0.00				
22.00	3.08	0.00	0.00				
22.50	3.10	0.00	0.00				
23.00	3.11	0.00	0.00				
23.50	3.13	0.00	0.00				
24.00	<b>3.14</b>	<b>0.00</b>	<b>0.00</b>				
24.50	3.14	0.00	<b>0.00</b>				
25.00	3.14	0.00	0.00				
25.50	3.14	0.00	0.00				

**Site PRE**

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Type III 24-hr 2yr Rainfall=3.14"

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**Summary for Subcatchment 4S: Wetland Parcel**

Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"  
Routed to Reach 1R : Willow Branch

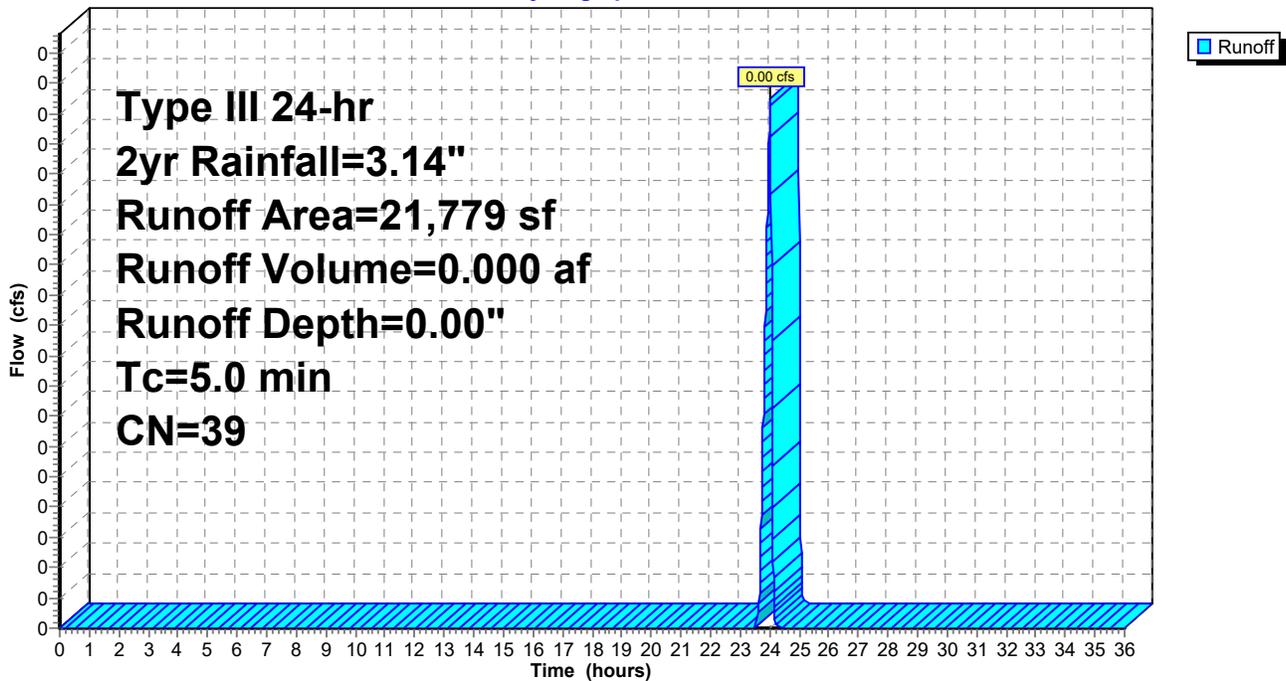
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2yr Rainfall=3.14"

Area (sf)	CN	Description
21,779	39	>75% Grass cover, Good, HSG A
21,779		100.00% Pervious Area

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

**Subcatchment 4S: Wetland Parcel**

Hydrograph



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Type III 24-hr 2yr Rainfall=3.14"

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Hydrograph for Subcatchment 4S: Wetland Parcel

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	3.14	0.00	0.00
0.50	0.02	0.00	0.00	26.50	3.14	0.00	0.00
1.00	0.03	0.00	0.00	27.00	3.14	0.00	0.00
1.50	0.05	0.00	0.00	27.50	3.14	0.00	0.00
2.00	0.06	0.00	0.00	28.00	3.14	0.00	0.00
2.50	0.08	0.00	0.00	28.50	3.14	0.00	0.00
3.00	0.10	0.00	0.00	29.00	3.14	0.00	0.00
3.50	0.12	0.00	0.00	29.50	3.14	0.00	0.00
4.00	0.14	0.00	0.00	30.00	3.14	0.00	0.00
4.50	0.16	0.00	0.00	30.50	3.14	0.00	0.00
5.00	0.18	0.00	0.00	31.00	3.14	0.00	0.00
5.50	0.20	0.00	0.00	31.50	3.14	0.00	0.00
6.00	0.23	0.00	0.00	32.00	3.14	0.00	0.00
6.50	0.25	0.00	0.00	32.50	3.14	0.00	0.00
7.00	0.28	0.00	0.00	33.00	3.14	0.00	0.00
7.50	0.32	0.00	0.00	33.50	3.14	0.00	0.00
8.00	0.36	0.00	0.00	34.00	3.14	0.00	0.00
8.50	0.40	0.00	0.00	34.50	3.14	0.00	0.00
9.00	0.46	0.00	0.00	35.00	3.14	0.00	0.00
9.50	0.52	0.00	0.00	35.50	3.14	0.00	0.00
10.00	0.59	0.00	0.00	36.00	3.14	0.00	0.00
10.50	0.68	0.00	0.00				
11.00	0.79	0.00	0.00				
11.50	0.94	0.00	0.00				
12.00	1.57	0.00	0.00				
12.50	2.20	0.00	0.00				
13.00	2.35	0.00	0.00				
13.50	2.46	0.00	0.00				
14.00	2.55	0.00	0.00				
14.50	2.62	0.00	0.00				
15.00	2.68	0.00	0.00				
15.50	2.74	0.00	0.00				
16.00	2.78	0.00	0.00				
16.50	2.82	0.00	0.00				
17.00	2.86	0.00	0.00				
17.50	2.89	0.00	0.00				
18.00	2.91	0.00	0.00				
18.50	2.94	0.00	0.00				
19.00	2.96	0.00	0.00				
19.50	2.98	0.00	0.00				
20.00	3.00	0.00	0.00				
20.50	3.02	0.00	0.00				
21.00	3.04	0.00	0.00				
21.50	3.06	0.00	0.00				
22.00	3.08	0.00	0.00				
22.50	3.10	0.00	0.00				
23.00	3.11	0.00	0.00				
23.50	3.13	0.00	0.00				
24.00	<b>3.14</b>	<b>0.00</b>	<b>0.00</b>				
24.50	3.14	0.00	<b>0.00</b>				
25.00	3.14	0.00	0.00				
25.50	3.14	0.00	0.00				

### Summary for Reach 1R: Willow Branch

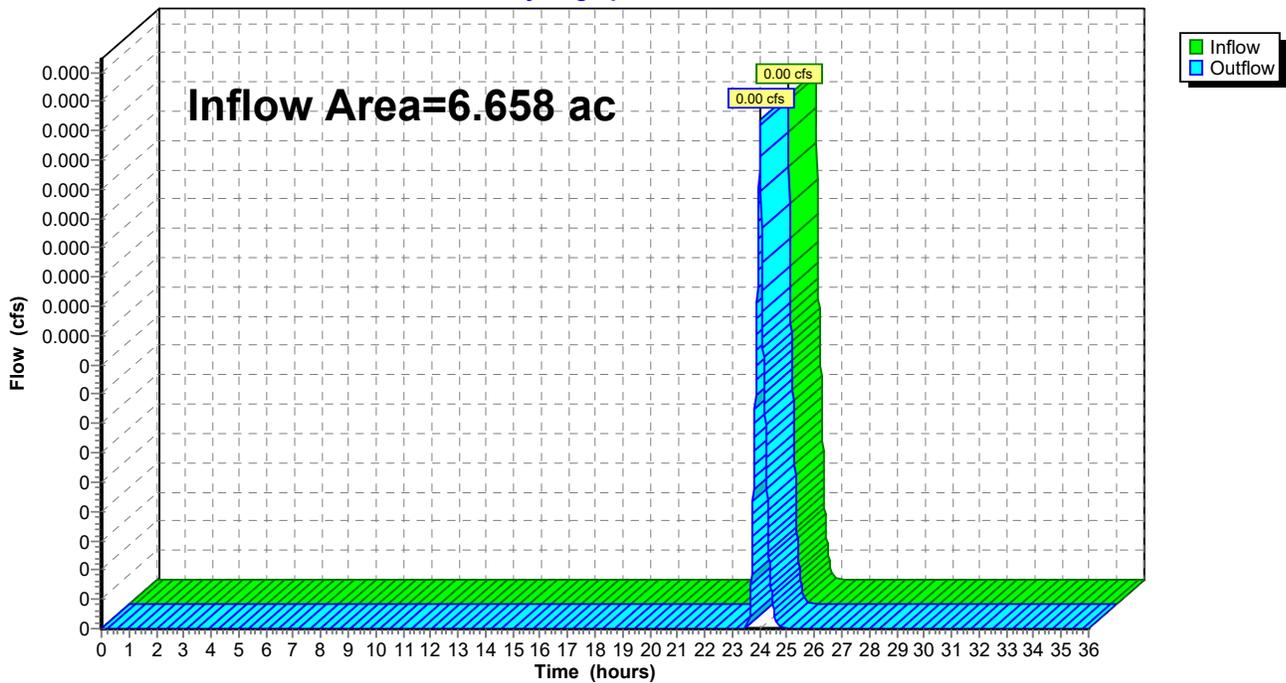
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6.658 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2yr event  
Inflow = 0.00 cfs @ 24.03 hrs, Volume= 0.000 af  
Outflow = 0.00 cfs @ 24.03 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

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

### Reach 1R: Willow Branch

Hydrograph



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Hydrograph for Reach 1R: Willow Branch

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	26.00	0.00		0.00
0.50	0.00		0.00	26.50	0.00		0.00
1.00	0.00		0.00	27.00	0.00		0.00
1.50	0.00		0.00	27.50	0.00		0.00
2.00	0.00		0.00	28.00	0.00		0.00
2.50	0.00		0.00	28.50	0.00		0.00
3.00	0.00		0.00	29.00	0.00		0.00
3.50	0.00		0.00	29.50	0.00		0.00
4.00	0.00		0.00	30.00	0.00		0.00
4.50	0.00		0.00	30.50	0.00		0.00
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00				
11.00	0.00		0.00				
11.50	0.00		0.00				
12.00	0.00		0.00				
12.50	0.00		0.00				
13.00	0.00		0.00				
13.50	0.00		0.00				
14.00	0.00		0.00				
14.50	0.00		0.00				
15.00	0.00		0.00				
15.50	0.00		0.00				
16.00	0.00		0.00				
16.50	0.00		0.00				
17.00	0.00		0.00				
17.50	0.00		0.00				
18.00	0.00		0.00				
18.50	0.00		0.00				
19.00	0.00		0.00				
19.50	0.00		0.00				
20.00	0.00		0.00				
20.50	0.00		0.00				
21.00	0.00		0.00				
21.50	0.00		0.00				
22.00	0.00		0.00				
22.50	0.00		0.00				
23.00	0.00		0.00				
23.50	0.00		0.00				
24.00	<b>0.00</b>		<b>0.00</b>				
24.50	<b>0.00</b>		<b>0.00</b>				
25.00	0.00		0.00				
25.50	0.00		0.00				

## 10-Year Storm Event – Green Field Pre-Development

**Site PRE**

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: EX Interior Lots**

Runoff Area=156,041 sf 0.00% Impervious Runoff Depth=0.16"  
Flow Length=587' Tc=18.0 min CN=39 Runoff=0.08 cfs 0.049 af

**Subcatchment2S: EX Sidewalks**

Runoff Area=1.216 ac 0.00% Impervious Runoff Depth=0.16"  
Tc=5.0 min CN=39 Runoff=0.03 cfs 0.017 af

**Subcatchment3S: EX Roadway**

Runoff Area=59,248 sf 0.00% Impervious Runoff Depth=0.16"  
Tc=5.0 min CN=39 Runoff=0.03 cfs 0.019 af

**Subcatchment4S: Wetland Parcel**

Runoff Area=21,779 sf 0.00% Impervious Runoff Depth=0.16"  
Tc=5.0 min CN=39 Runoff=0.01 cfs 0.007 af

**Reach 1R: Willow Branch**

Inflow=0.15 cfs 0.091 af  
Outflow=0.15 cfs 0.091 af

**Total Runoff Area = 6.658 ac Runoff Volume = 0.091 af Average Runoff Depth = 0.16"**  
**100.00% Pervious = 6.658 ac 0.00% Impervious = 0.000 ac**

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**Summary for Subcatchment 1S: EX Interior Lots**

Runoff from this area will be managed by individual lot developers.

Runoff = 0.08 cfs @ 13.86 hrs, Volume= 0.049 af, Depth= 0.16"  
 Routed to Reach 1R : Willow Branch

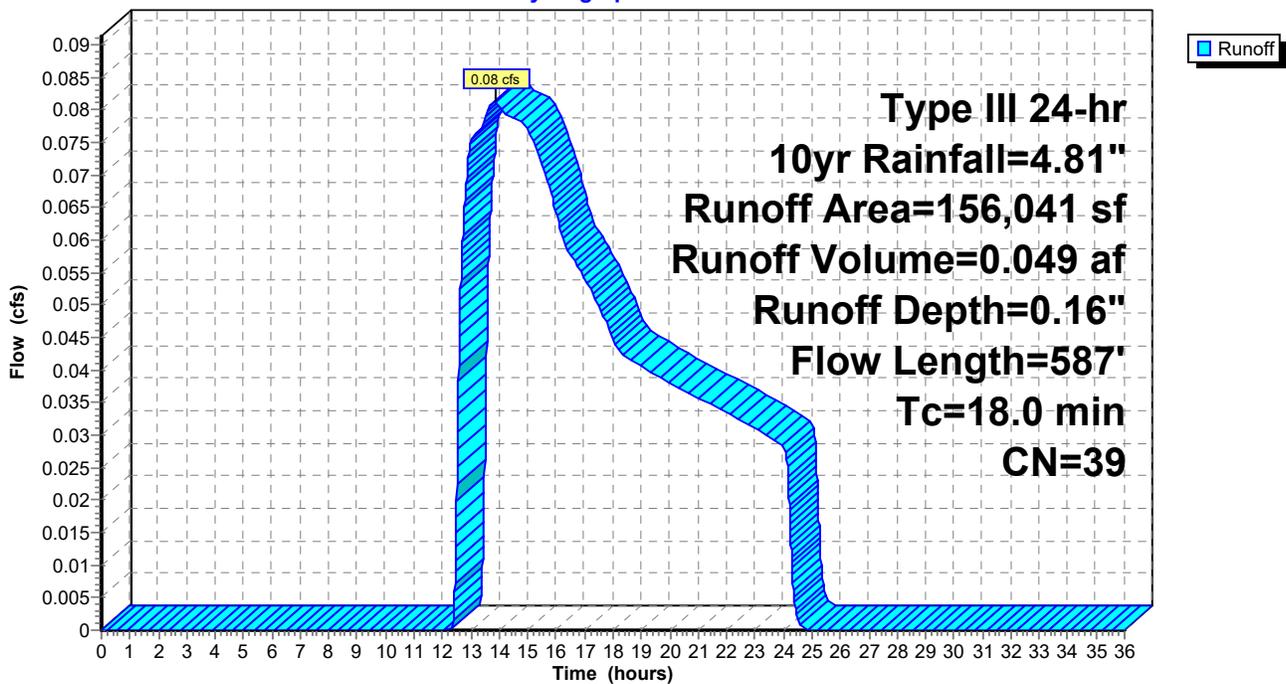
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10yr Rainfall=4.81"

Area (sf)	CN	Description
156,041	39	Pasture/grassland/range, Good, HSG A
156,041		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0560	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.2	537	0.0081	0.63		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
18.0	587	Total			

**Subcatchment 1S: EX Interior Lots**

Hydrograph



**Site PRE**

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Type III 24-hr 10yr Rainfall=4.81"

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**Hydrograph for Subcatchment 1S: EX Interior Lots**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	4.81	0.16	0.00
0.50	0.02	0.00	0.00	26.50	4.81	0.16	0.00
1.00	0.05	0.00	0.00	27.00	4.81	0.16	0.00
1.50	0.07	0.00	0.00	27.50	4.81	0.16	0.00
2.00	0.10	0.00	0.00	28.00	4.81	0.16	0.00
2.50	0.12	0.00	0.00	28.50	4.81	0.16	0.00
3.00	0.15	0.00	0.00	29.00	4.81	0.16	0.00
3.50	0.18	0.00	0.00	29.50	4.81	0.16	0.00
4.00	0.21	0.00	0.00	30.00	4.81	0.16	0.00
4.50	0.24	0.00	0.00	30.50	4.81	0.16	0.00
5.00	0.27	0.00	0.00	31.00	4.81	0.16	0.00
5.50	0.31	0.00	0.00	31.50	4.81	0.16	0.00
6.00	0.35	0.00	0.00	32.00	4.81	0.16	0.00
6.50	0.39	0.00	0.00	32.50	4.81	0.16	0.00
7.00	0.44	0.00	0.00	33.00	4.81	0.16	0.00
7.50	0.49	0.00	0.00	33.50	4.81	0.16	0.00
8.00	0.55	0.00	0.00	34.00	4.81	0.16	0.00
8.50	0.62	0.00	0.00	34.50	4.81	0.16	0.00
9.00	0.70	0.00	0.00	35.00	4.81	0.16	0.00
9.50	0.80	0.00	0.00	35.50	4.81	0.16	0.00
10.00	0.91	0.00	0.00	36.00	4.81	0.16	0.00
10.50	1.04	0.00	0.00				
11.00	1.20	0.00	0.00				
11.50	1.43	0.00	0.00				
12.00	2.40	0.00	0.00				
12.50	3.38	0.00	0.02				
13.00	3.61	0.01	0.08				
13.50	3.77	0.03	<b>0.08</b>				
14.00	3.90	0.04	<b>0.08</b>				
14.50	4.01	0.05	0.08				
15.00	4.11	0.06	0.08				
15.50	4.19	0.07	0.07				
16.00	4.26	0.08	0.06				
16.50	4.32	0.08	0.06				
17.00	4.37	0.09	0.05				
17.50	4.42	0.10	0.05				
18.00	4.46	0.11	0.04				
18.50	4.50	0.11	0.04				
19.00	4.54	0.12	0.04				
19.50	4.57	0.12	0.04				
20.00	4.60	0.13	0.04				
20.50	4.63	0.13	0.04				
21.00	4.66	0.14	0.04				
21.50	4.69	0.14	0.03				
22.00	4.72	0.15	0.03				
22.50	4.74	0.15	0.03				
23.00	4.77	0.16	0.03				
23.50	4.79	0.16	0.03				
24.00	<b>4.81</b>	<b>0.16</b>	0.03				
24.50	4.81	0.16	0.00				
25.00	4.81	0.16	0.00				
25.50	4.81	0.16	0.00				

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Type III 24-hr 10yr Rainfall=4.81"

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**Summary for Subcatchment 2S: EX Sidewalks**

Runoff = 0.03 cfs @ 13.65 hrs, Volume= 0.017 af, Depth= 0.16"  
Routed to Reach 1R : Willow Branch

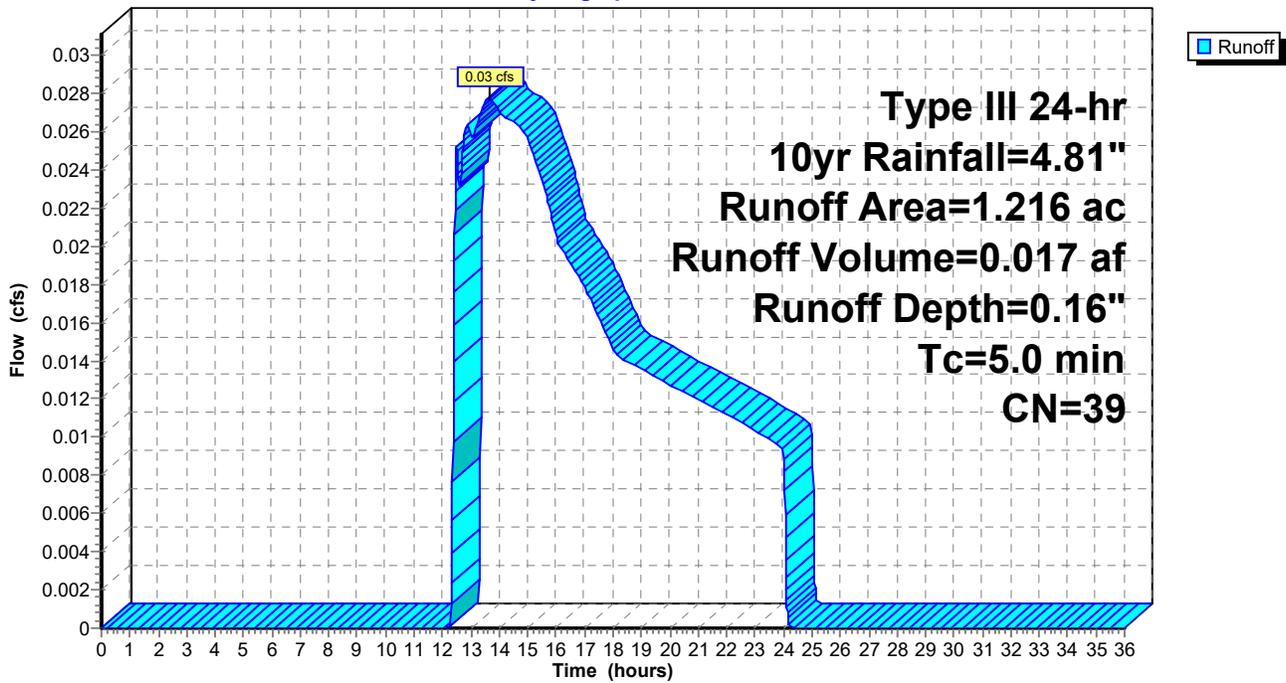
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10yr Rainfall=4.81"

Area (ac)	CN	Description
1.216	39	>75% Grass cover, Good, HSG A
1.216		100.00% Pervious Area

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

**Subcatchment 2S: EX Sidewalks**

Hydrograph



**Site PRE**

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Type III 24-hr 10yr Rainfall=4.81"

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**Hydrograph for Subcatchment 2S: EX Sidewalks**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	4.81	0.16	0.00
0.50	0.02	0.00	0.00	26.50	4.81	0.16	0.00
1.00	0.05	0.00	0.00	27.00	4.81	0.16	0.00
1.50	0.07	0.00	0.00	27.50	4.81	0.16	0.00
2.00	0.10	0.00	0.00	28.00	4.81	0.16	0.00
2.50	0.12	0.00	0.00	28.50	4.81	0.16	0.00
3.00	0.15	0.00	0.00	29.00	4.81	0.16	0.00
3.50	0.18	0.00	0.00	29.50	4.81	0.16	0.00
4.00	0.21	0.00	0.00	30.00	4.81	0.16	0.00
4.50	0.24	0.00	0.00	30.50	4.81	0.16	0.00
5.00	0.27	0.00	0.00	31.00	4.81	0.16	0.00
5.50	0.31	0.00	0.00	31.50	4.81	0.16	0.00
6.00	0.35	0.00	0.00	32.00	4.81	0.16	0.00
6.50	0.39	0.00	0.00	32.50	4.81	0.16	0.00
7.00	0.44	0.00	0.00	33.00	4.81	0.16	0.00
7.50	0.49	0.00	0.00	33.50	4.81	0.16	0.00
8.00	0.55	0.00	0.00	34.00	4.81	0.16	0.00
8.50	0.62	0.00	0.00	34.50	4.81	0.16	0.00
9.00	0.70	0.00	0.00	35.00	4.81	0.16	0.00
9.50	0.80	0.00	0.00	35.50	4.81	0.16	0.00
10.00	0.91	0.00	0.00	36.00	4.81	0.16	0.00
10.50	1.04	0.00	0.00				
11.00	1.20	0.00	0.00				
11.50	1.43	0.00	0.00				
12.00	2.40	0.00	0.00				
12.50	3.38	0.00	0.03				
13.00	3.61	0.01	0.03				
13.50	3.77	0.03	<b>0.03</b>				
14.00	3.90	0.04	<b>0.03</b>				
14.50	4.01	0.05	0.03				
15.00	4.11	0.06	0.03				
15.50	4.19	0.07	0.02				
16.00	4.26	0.08	0.02				
16.50	4.32	0.08	0.02				
17.00	4.37	0.09	0.02				
17.50	4.42	0.10	0.02				
18.00	4.46	0.11	0.01				
18.50	4.50	0.11	0.01				
19.00	4.54	0.12	0.01				
19.50	4.57	0.12	0.01				
20.00	4.60	0.13	0.01				
20.50	4.63	0.13	0.01				
21.00	4.66	0.14	0.01				
21.50	4.69	0.14	0.01				
22.00	4.72	0.15	0.01				
22.50	4.74	0.15	0.01				
23.00	4.77	0.16	0.01				
23.50	4.79	0.16	0.01				
24.00	<b>4.81</b>	<b>0.16</b>	0.01				
24.50	4.81	0.16	0.00				
25.00	4.81	0.16	0.00				
25.50	4.81	0.16	0.00				

**Site PRE**

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Type III 24-hr 10yr Rainfall=4.81"

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**Summary for Subcatchment 3S: EX Roadway**

Runoff = 0.03 cfs @ 13.65 hrs, Volume= 0.019 af, Depth= 0.16"

Routed to Reach 1R : Willow Branch

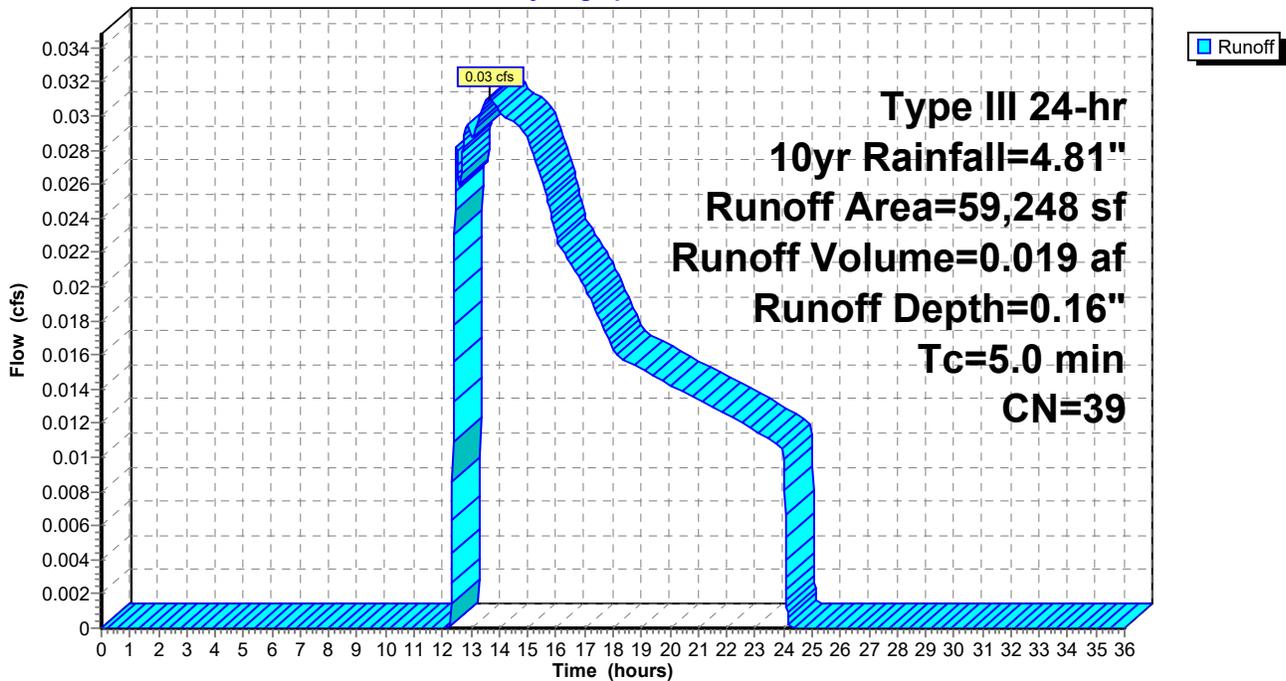
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10yr Rainfall=4.81"

Area (sf)	CN	Description
59,248	39	>75% Grass cover, Good, HSG A
59,248		100.00% Pervious Area

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

**Subcatchment 3S: EX Roadway**

Hydrograph



**Site PRE**

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Type III 24-hr 10yr Rainfall=4.81"

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**Hydrograph for Subcatchment 3S: EX Roadway**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	4.81	0.16	0.00
0.50	0.02	0.00	0.00	26.50	4.81	0.16	0.00
1.00	0.05	0.00	0.00	27.00	4.81	0.16	0.00
1.50	0.07	0.00	0.00	27.50	4.81	0.16	0.00
2.00	0.10	0.00	0.00	28.00	4.81	0.16	0.00
2.50	0.12	0.00	0.00	28.50	4.81	0.16	0.00
3.00	0.15	0.00	0.00	29.00	4.81	0.16	0.00
3.50	0.18	0.00	0.00	29.50	4.81	0.16	0.00
4.00	0.21	0.00	0.00	30.00	4.81	0.16	0.00
4.50	0.24	0.00	0.00	30.50	4.81	0.16	0.00
5.00	0.27	0.00	0.00	31.00	4.81	0.16	0.00
5.50	0.31	0.00	0.00	31.50	4.81	0.16	0.00
6.00	0.35	0.00	0.00	32.00	4.81	0.16	0.00
6.50	0.39	0.00	0.00	32.50	4.81	0.16	0.00
7.00	0.44	0.00	0.00	33.00	4.81	0.16	0.00
7.50	0.49	0.00	0.00	33.50	4.81	0.16	0.00
8.00	0.55	0.00	0.00	34.00	4.81	0.16	0.00
8.50	0.62	0.00	0.00	34.50	4.81	0.16	0.00
9.00	0.70	0.00	0.00	35.00	4.81	0.16	0.00
9.50	0.80	0.00	0.00	35.50	4.81	0.16	0.00
10.00	0.91	0.00	0.00	36.00	4.81	0.16	0.00
10.50	1.04	0.00	0.00				
11.00	1.20	0.00	0.00				
11.50	1.43	0.00	0.00				
12.00	2.40	0.00	0.00				
12.50	3.38	0.00	0.03				
13.00	3.61	0.01	0.03				
13.50	3.77	0.03	<b>0.03</b>				
14.00	3.90	0.04	<b>0.03</b>				
14.50	4.01	0.05	0.03				
15.00	4.11	0.06	0.03				
15.50	4.19	0.07	0.03				
16.00	4.26	0.08	0.02				
16.50	4.32	0.08	0.02				
17.00	4.37	0.09	0.02				
17.50	4.42	0.10	0.02				
18.00	4.46	0.11	0.02				
18.50	4.50	0.11	0.02				
19.00	4.54	0.12	0.02				
19.50	4.57	0.12	0.01				
20.00	4.60	0.13	0.01				
20.50	4.63	0.13	0.01				
21.00	4.66	0.14	0.01				
21.50	4.69	0.14	0.01				
22.00	4.72	0.15	0.01				
22.50	4.74	0.15	0.01				
23.00	4.77	0.16	0.01				
23.50	4.79	0.16	0.01				
24.00	<b>4.81</b>	<b>0.16</b>	0.01				
24.50	4.81	0.16	0.00				
25.00	4.81	0.16	0.00				
25.50	4.81	0.16	0.00				

**Site PRE**

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Type III 24-hr 10yr Rainfall=4.81"

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**Summary for Subcatchment 4S: Wetland Parcel**

Runoff = 0.01 cfs @ 13.65 hrs, Volume= 0.007 af, Depth= 0.16"  
Routed to Reach 1R : Willow Branch

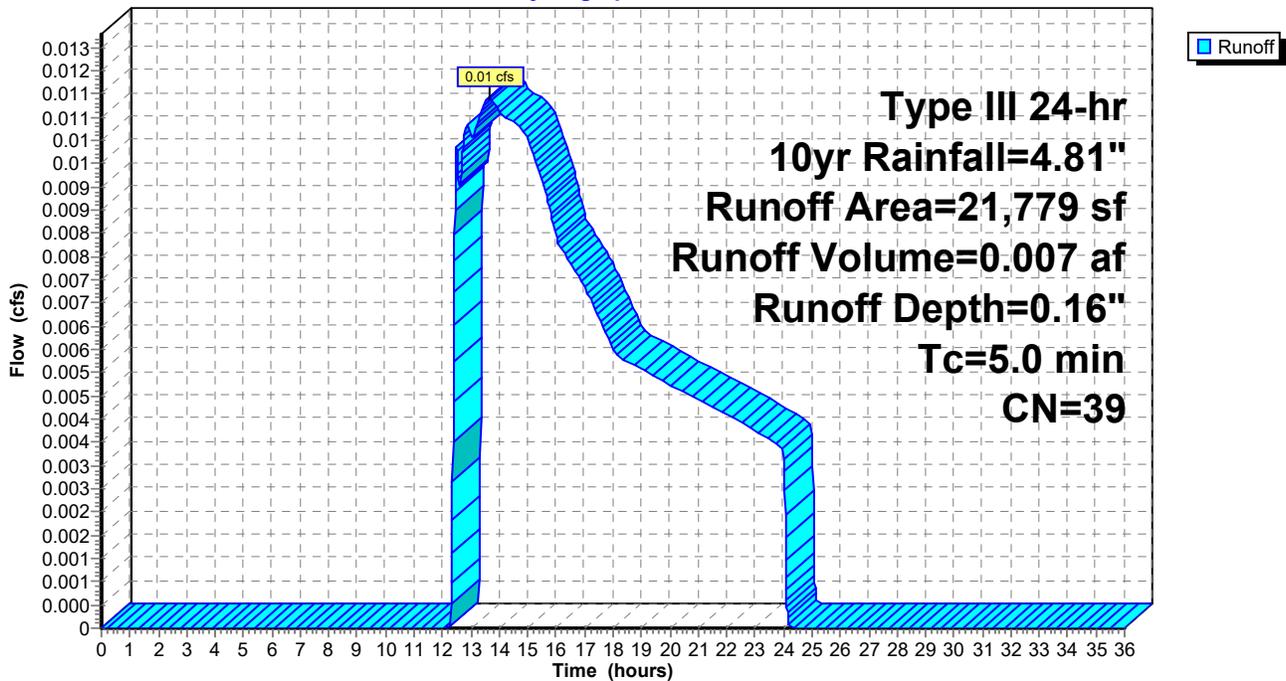
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10yr Rainfall=4.81"

Area (sf)	CN	Description
21,779	39	>75% Grass cover, Good, HSG A
21,779		100.00% Pervious Area

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

**Subcatchment 4S: Wetland Parcel**

Hydrograph



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Type III 24-hr 10yr Rainfall=4.81"

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**Hydrograph for Subcatchment 4S: Wetland Parcel**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	4.81	0.16	0.00
0.50	0.02	0.00	0.00	26.50	4.81	0.16	0.00
1.00	0.05	0.00	0.00	27.00	4.81	0.16	0.00
1.50	0.07	0.00	0.00	27.50	4.81	0.16	0.00
2.00	0.10	0.00	0.00	28.00	4.81	0.16	0.00
2.50	0.12	0.00	0.00	28.50	4.81	0.16	0.00
3.00	0.15	0.00	0.00	29.00	4.81	0.16	0.00
3.50	0.18	0.00	0.00	29.50	4.81	0.16	0.00
4.00	0.21	0.00	0.00	30.00	4.81	0.16	0.00
4.50	0.24	0.00	0.00	30.50	4.81	0.16	0.00
5.00	0.27	0.00	0.00	31.00	4.81	0.16	0.00
5.50	0.31	0.00	0.00	31.50	4.81	0.16	0.00
6.00	0.35	0.00	0.00	32.00	4.81	0.16	0.00
6.50	0.39	0.00	0.00	32.50	4.81	0.16	0.00
7.00	0.44	0.00	0.00	33.00	4.81	0.16	0.00
7.50	0.49	0.00	0.00	33.50	4.81	0.16	0.00
8.00	0.55	0.00	0.00	34.00	4.81	0.16	0.00
8.50	0.62	0.00	0.00	34.50	4.81	0.16	0.00
9.00	0.70	0.00	0.00	35.00	4.81	0.16	0.00
9.50	0.80	0.00	0.00	35.50	4.81	0.16	0.00
10.00	0.91	0.00	0.00	36.00	4.81	0.16	0.00
10.50	1.04	0.00	0.00				
11.00	1.20	0.00	0.00				
11.50	1.43	0.00	0.00				
12.00	2.40	0.00	0.00				
12.50	3.38	0.00	0.01				
13.00	3.61	0.01	0.01				
13.50	3.77	0.03	<b>0.01</b>				
14.00	3.90	0.04	<b>0.01</b>				
14.50	4.01	0.05	0.01				
15.00	4.11	0.06	0.01				
15.50	4.19	0.07	0.01				
16.00	4.26	0.08	0.01				
16.50	4.32	0.08	0.01				
17.00	4.37	0.09	0.01				
17.50	4.42	0.10	0.01				
18.00	4.46	0.11	0.01				
18.50	4.50	0.11	0.01				
19.00	4.54	0.12	0.01				
19.50	4.57	0.12	0.01				
20.00	4.60	0.13	0.01				
20.50	4.63	0.13	0.01				
21.00	4.66	0.14	0.00				
21.50	4.69	0.14	0.00				
22.00	4.72	0.15	0.00				
22.50	4.74	0.15	0.00				
23.00	4.77	0.16	0.00				
23.50	4.79	0.16	0.00				
24.00	<b>4.81</b>	<b>0.16</b>	0.00				
24.50	4.81	0.16	0.00				
25.00	4.81	0.16	0.00				
25.50	4.81	0.16	0.00				

### Summary for Reach 1R: Willow Branch

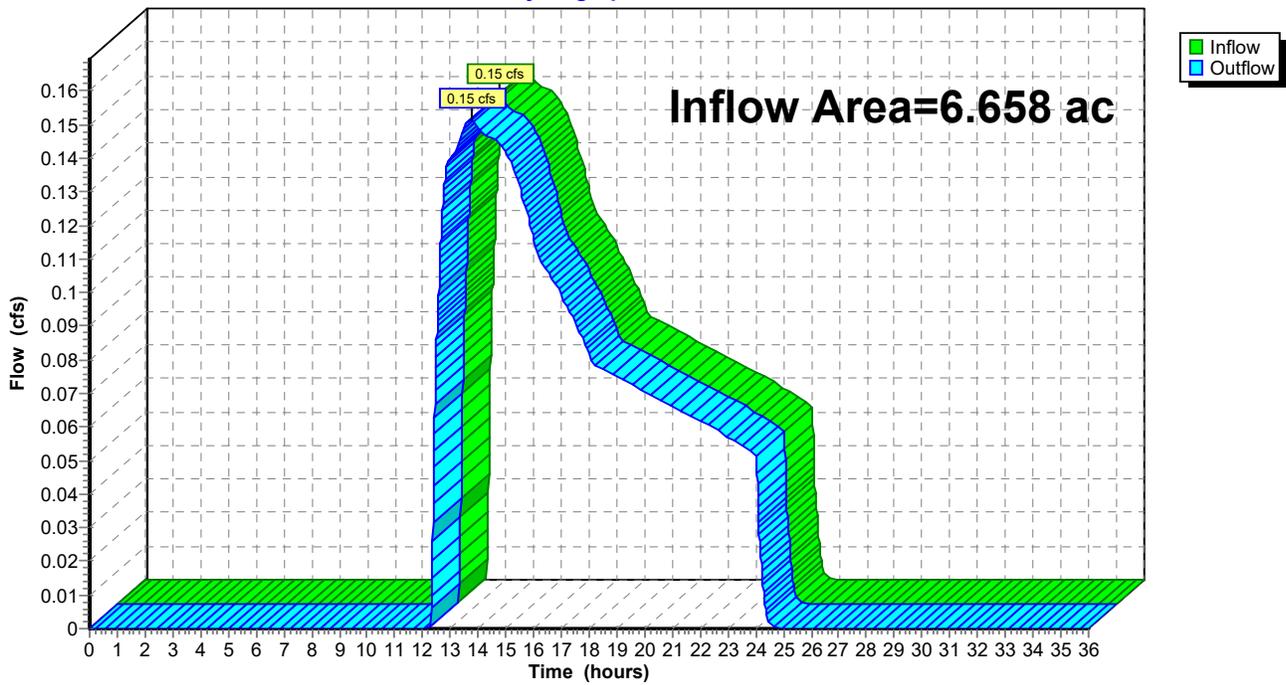
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6.658 ac, 0.00% Impervious, Inflow Depth = 0.16" for 10yr event  
Inflow = 0.15 cfs @ 13.74 hrs, Volume= 0.091 af  
Outflow = 0.15 cfs @ 13.74 hrs, Volume= 0.091 af, Atten= 0%, Lag= 0.0 min

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

### Reach 1R: Willow Branch

Hydrograph



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Hydrograph for Reach 1R: Willow Branch

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	26.00	0.00		0.00
0.50	0.00		0.00	26.50	0.00		0.00
1.00	0.00		0.00	27.00	0.00		0.00
1.50	0.00		0.00	27.50	0.00		0.00
2.00	0.00		0.00	28.00	0.00		0.00
2.50	0.00		0.00	28.50	0.00		0.00
3.00	0.00		0.00	29.00	0.00		0.00
3.50	0.00		0.00	29.50	0.00		0.00
4.00	0.00		0.00	30.00	0.00		0.00
4.50	0.00		0.00	30.50	0.00		0.00
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00				
11.00	0.00		0.00				
11.50	0.00		0.00				
12.00	0.00		0.00				
12.50	0.08		0.08				
13.00	0.14		0.14				
13.50	<b>0.15</b>		<b>0.15</b>				
14.00	<b>0.15</b>		<b>0.15</b>				
14.50	0.15		0.15				
15.00	0.14		0.14				
15.50	0.13		0.13				
16.00	0.12		0.12				
16.50	0.11		0.11				
17.00	0.10		0.10				
17.50	0.09		0.09				
18.00	0.08		0.08				
18.50	0.08		0.08				
19.00	0.07		0.07				
19.50	0.07		0.07				
20.00	0.07		0.07				
20.50	0.07		0.07				
21.00	0.07		0.07				
21.50	0.06		0.06				
22.00	0.06		0.06				
22.50	0.06		0.06				
23.00	0.06		0.06				
23.50	0.05		0.05				
24.00	0.05		0.05				
24.50	0.00		0.00				
25.00	0.00		0.00				
25.50	0.00		0.00				

## 25-Year Storm Event – Green Field Pre-Development

**Site PRE**

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: EX Interior Lots**

Runoff Area=156,041 sf 0.00% Impervious Runoff Depth=0.40"  
Flow Length=587' Tc=18.0 min CN=39 Runoff=0.46 cfs 0.120 af

**Subcatchment2S: EX Sidewalks**

Runoff Area=1.216 ac 0.00% Impervious Runoff Depth=0.40"  
Tc=5.0 min CN=39 Runoff=0.19 cfs 0.041 af

**Subcatchment3S: EX Roadway**

Runoff Area=59,248 sf 0.00% Impervious Runoff Depth=0.40"  
Tc=5.0 min CN=39 Runoff=0.21 cfs 0.046 af

**Subcatchment4S: Wetland Parcel**

Runoff Area=21,779 sf 0.00% Impervious Runoff Depth=0.40"  
Tc=5.0 min CN=39 Runoff=0.08 cfs 0.017 af

**Reach 1R: Willow Branch**

Inflow=0.84 cfs 0.224 af  
Outflow=0.84 cfs 0.224 af

**Total Runoff Area = 6.658 ac Runoff Volume = 0.224 af Average Runoff Depth = 0.40"**  
**100.00% Pervious = 6.658 ac 0.00% Impervious = 0.000 ac**

**Site PRE**

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Type III 24-hr 25yr Rainfall=5.85"

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**Summary for Subcatchment 1S: EX Interior Lots**

Runoff from this area will be managed by individual lot developers.

Runoff = 0.46 cfs @ 12.54 hrs, Volume= 0.120 af, Depth= 0.40"  
 Routed to Reach 1R : Willow Branch

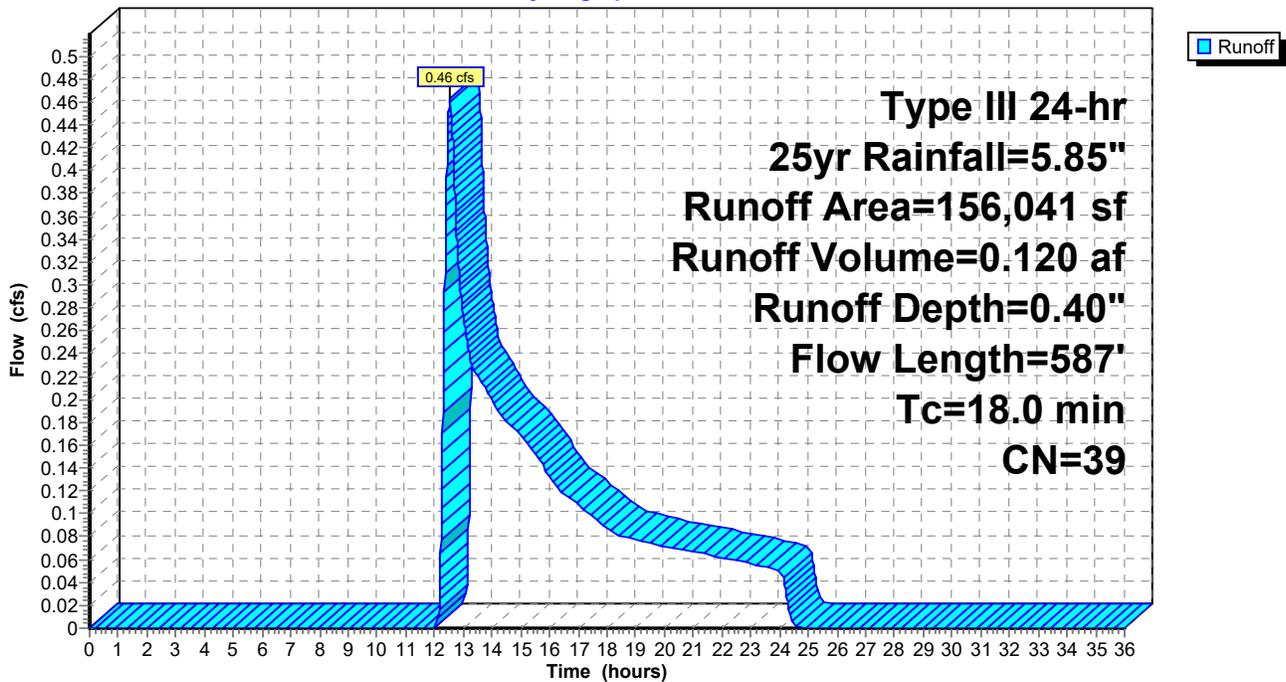
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25yr Rainfall=5.85"

Area (sf)	CN	Description
156,041	39	Pasture/grassland/range, Good, HSG A
156,041		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0560	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.2	537	0.0081	0.63		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
18.0	587	Total			

**Subcatchment 1S: EX Interior Lots**

Hydrograph



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Type III 24-hr 25yr Rainfall=5.85"

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**Hydrograph for Subcatchment 1S: EX Interior Lots**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	5.85	0.40	0.00
0.50	0.03	0.00	0.00	26.50	5.85	0.40	0.00
1.00	0.06	0.00	0.00	27.00	5.85	0.40	0.00
1.50	0.09	0.00	0.00	27.50	5.85	0.40	0.00
2.00	0.12	0.00	0.00	28.00	5.85	0.40	0.00
2.50	0.15	0.00	0.00	28.50	5.85	0.40	0.00
3.00	0.18	0.00	0.00	29.00	5.85	0.40	0.00
3.50	0.21	0.00	0.00	29.50	5.85	0.40	0.00
4.00	0.25	0.00	0.00	30.00	5.85	0.40	0.00
4.50	0.29	0.00	0.00	30.50	5.85	0.40	0.00
5.00	0.33	0.00	0.00	31.00	5.85	0.40	0.00
5.50	0.38	0.00	0.00	31.50	5.85	0.40	0.00
6.00	0.42	0.00	0.00	32.00	5.85	0.40	0.00
6.50	0.47	0.00	0.00	32.50	5.85	0.40	0.00
7.00	0.53	0.00	0.00	33.00	5.85	0.40	0.00
7.50	0.59	0.00	0.00	33.50	5.85	0.40	0.00
8.00	0.67	0.00	0.00	34.00	5.85	0.40	0.00
8.50	0.75	0.00	0.00	34.50	5.85	0.40	0.00
9.00	0.85	0.00	0.00	35.00	5.85	0.40	0.00
9.50	0.97	0.00	0.00	35.50	5.85	0.40	0.00
10.00	1.11	0.00	0.00	36.00	5.85	0.40	0.00
10.50	1.27	0.00	0.00				
11.00	1.46	0.00	0.00				
11.50	1.74	0.00	0.00				
12.00	2.92	0.00	0.00				
12.50	4.11	0.06	<b>0.46</b>				
13.00	4.39	0.09	<b>0.27</b>				
13.50	4.58	0.12	0.22				
14.00	4.74	0.15	0.20				
14.50	4.88	0.18	0.18				
15.00	5.00	0.20	0.17				
15.50	5.10	0.22	0.15				
16.00	5.18	0.24	0.13				
16.50	5.26	0.25	0.12				
17.00	5.32	0.27	0.11				
17.50	5.38	0.28	0.10				
18.00	5.43	0.29	0.09				
18.50	5.47	0.31	0.08				
19.00	5.52	0.32	0.08				
19.50	5.56	0.33	0.07				
20.00	5.60	0.34	0.07				
20.50	5.64	0.35	0.07				
21.00	5.67	0.36	0.07				
21.50	5.71	0.36	0.06				
22.00	5.74	0.37	0.06				
22.50	5.77	0.38	0.06				
23.00	5.80	0.39	0.06				
23.50	5.82	0.40	0.05				
24.00	<b>5.85</b>	<b>0.40</b>	0.05				
24.50	5.85	0.40	0.00				
25.00	5.85	0.40	0.00				
25.50	5.85	0.40	0.00				

**Site PRE**

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Type III 24-hr 25yr Rainfall=5.85"

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**Summary for Subcatchment 2S: EX Sidewalks**

Runoff = 0.19 cfs @ 12.34 hrs, Volume= 0.041 af, Depth= 0.40"  
Routed to Reach 1R : Willow Branch

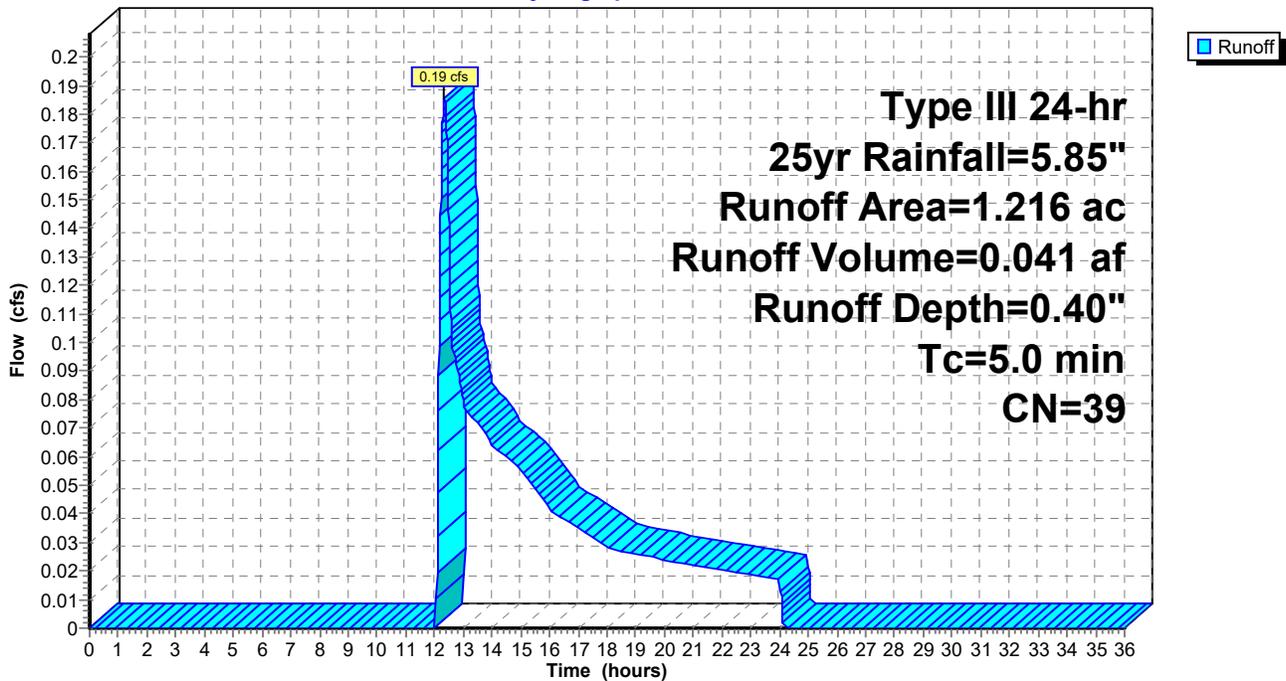
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25yr Rainfall=5.85"

Area (ac)	CN	Description
1.216	39	>75% Grass cover, Good, HSG A
1.216		100.00% Pervious Area

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

**Subcatchment 2S: EX Sidewalks**

Hydrograph



**Site PRE**

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Type III 24-hr 25yr Rainfall=5.85"

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**Hydrograph for Subcatchment 2S: EX Sidewalks**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	5.85	0.40	0.00
0.50	0.03	0.00	0.00	26.50	5.85	0.40	0.00
1.00	0.06	0.00	0.00	27.00	5.85	0.40	0.00
1.50	0.09	0.00	0.00	27.50	5.85	0.40	0.00
2.00	0.12	0.00	0.00	28.00	5.85	0.40	0.00
2.50	0.15	0.00	0.00	28.50	5.85	0.40	0.00
3.00	0.18	0.00	0.00	29.00	5.85	0.40	0.00
3.50	0.21	0.00	0.00	29.50	5.85	0.40	0.00
4.00	0.25	0.00	0.00	30.00	5.85	0.40	0.00
4.50	0.29	0.00	0.00	30.50	5.85	0.40	0.00
5.00	0.33	0.00	0.00	31.00	5.85	0.40	0.00
5.50	0.38	0.00	0.00	31.50	5.85	0.40	0.00
6.00	0.42	0.00	0.00	32.00	5.85	0.40	0.00
6.50	0.47	0.00	0.00	32.50	5.85	0.40	0.00
7.00	0.53	0.00	0.00	33.00	5.85	0.40	0.00
7.50	0.59	0.00	0.00	33.50	5.85	0.40	0.00
8.00	0.67	0.00	0.00	34.00	5.85	0.40	0.00
8.50	0.75	0.00	0.00	34.50	5.85	0.40	0.00
9.00	0.85	0.00	0.00	35.00	5.85	0.40	0.00
9.50	0.97	0.00	0.00	35.50	5.85	0.40	0.00
10.00	1.11	0.00	0.00	36.00	5.85	0.40	0.00
10.50	1.27	0.00	0.00				
11.00	1.46	0.00	0.00				
11.50	1.74	0.00	0.00				
12.00	2.92	0.00	<b>0.00</b>				
12.50	4.11	0.06	<b>0.14</b>				
13.00	4.39	0.09	0.08				
13.50	4.58	0.12	0.07				
14.00	4.74	0.15	0.06				
14.50	4.88	0.18	0.06				
15.00	5.00	0.20	0.06				
15.50	5.10	0.22	0.05				
16.00	5.18	0.24	0.04				
16.50	5.26	0.25	0.04				
17.00	5.32	0.27	0.04				
17.50	5.38	0.28	0.03				
18.00	5.43	0.29	0.03				
18.50	5.47	0.31	0.03				
19.00	5.52	0.32	0.03				
19.50	5.56	0.33	0.02				
20.00	5.60	0.34	0.02				
20.50	5.64	0.35	0.02				
21.00	5.67	0.36	0.02				
21.50	5.71	0.36	0.02				
22.00	5.74	0.37	0.02				
22.50	5.77	0.38	0.02				
23.00	5.80	0.39	0.02				
23.50	5.82	0.40	0.02				
24.00	<b>5.85</b>	<b>0.40</b>	0.02				
24.50	5.85	0.40	0.00				
25.00	5.85	0.40	0.00				
25.50	5.85	0.40	0.00				

**Site PRE**

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Type III 24-hr 25yr Rainfall=5.85"

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**Summary for Subcatchment 3S: EX Roadway**

Runoff = 0.21 cfs @ 12.34 hrs, Volume= 0.046 af, Depth= 0.40"  
 Routed to Reach 1R : Willow Branch

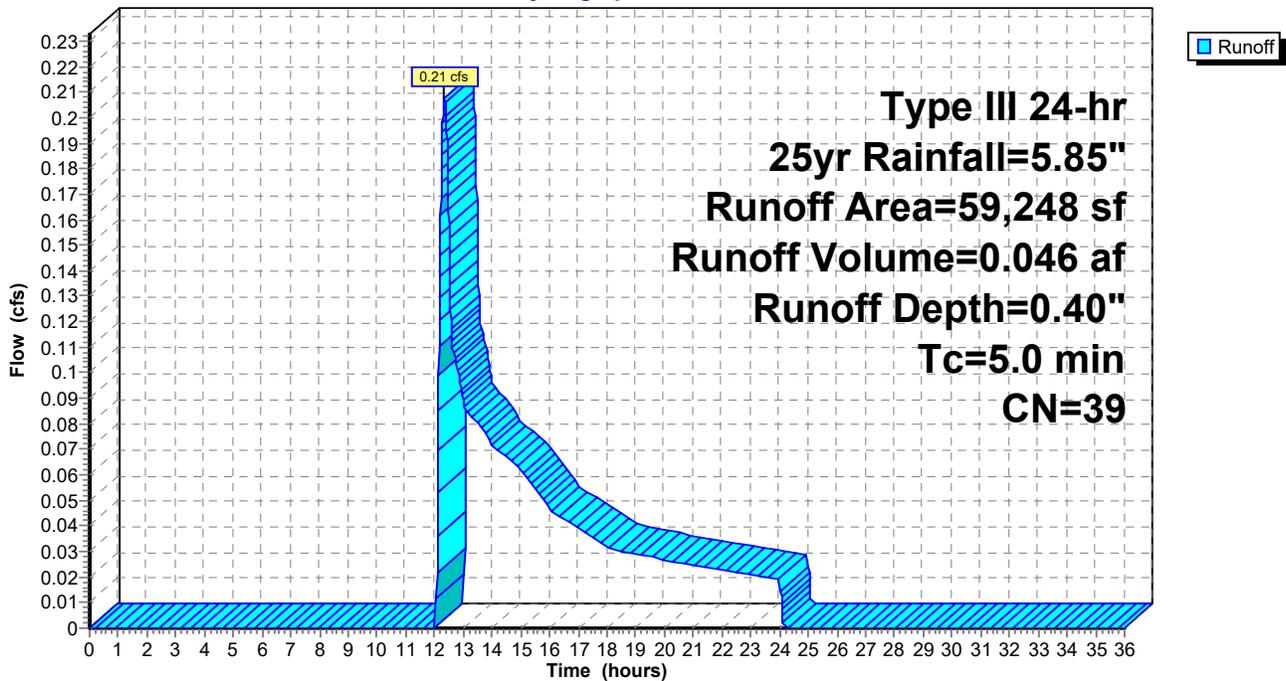
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25yr Rainfall=5.85"

Area (sf)	CN	Description
59,248	39	>75% Grass cover, Good, HSG A
59,248		100.00% Pervious Area

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

**Subcatchment 3S: EX Roadway**

Hydrograph



**Site PRE**

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Type III 24-hr 25yr Rainfall=5.85"

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**Hydrograph for Subcatchment 3S: EX Roadway**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	5.85	0.40	0.00
0.50	0.03	0.00	0.00	26.50	5.85	0.40	0.00
1.00	0.06	0.00	0.00	27.00	5.85	0.40	0.00
1.50	0.09	0.00	0.00	27.50	5.85	0.40	0.00
2.00	0.12	0.00	0.00	28.00	5.85	0.40	0.00
2.50	0.15	0.00	0.00	28.50	5.85	0.40	0.00
3.00	0.18	0.00	0.00	29.00	5.85	0.40	0.00
3.50	0.21	0.00	0.00	29.50	5.85	0.40	0.00
4.00	0.25	0.00	0.00	30.00	5.85	0.40	0.00
4.50	0.29	0.00	0.00	30.50	5.85	0.40	0.00
5.00	0.33	0.00	0.00	31.00	5.85	0.40	0.00
5.50	0.38	0.00	0.00	31.50	5.85	0.40	0.00
6.00	0.42	0.00	0.00	32.00	5.85	0.40	0.00
6.50	0.47	0.00	0.00	32.50	5.85	0.40	0.00
7.00	0.53	0.00	0.00	33.00	5.85	0.40	0.00
7.50	0.59	0.00	0.00	33.50	5.85	0.40	0.00
8.00	0.67	0.00	0.00	34.00	5.85	0.40	0.00
8.50	0.75	0.00	0.00	34.50	5.85	0.40	0.00
9.00	0.85	0.00	0.00	35.00	5.85	0.40	0.00
9.50	0.97	0.00	0.00	35.50	5.85	0.40	0.00
10.00	1.11	0.00	0.00	36.00	5.85	0.40	0.00
10.50	1.27	0.00	0.00				
11.00	1.46	0.00	0.00				
11.50	1.74	0.00	0.00				
12.00	2.92	0.00	<b>0.00</b>				
12.50	4.11	0.06	<b>0.16</b>				
13.00	4.39	0.09	0.09				
13.50	4.58	0.12	0.08				
14.00	4.74	0.15	0.07				
14.50	4.88	0.18	0.07				
15.00	5.00	0.20	0.06				
15.50	5.10	0.22	0.05				
16.00	5.18	0.24	0.05				
16.50	5.26	0.25	0.04				
17.00	5.32	0.27	0.04				
17.50	5.38	0.28	0.04				
18.00	5.43	0.29	0.03				
18.50	5.47	0.31	0.03				
19.00	5.52	0.32	0.03				
19.50	5.56	0.33	0.03				
20.00	5.60	0.34	0.03				
20.50	5.64	0.35	0.03				
21.00	5.67	0.36	0.02				
21.50	5.71	0.36	0.02				
22.00	5.74	0.37	0.02				
22.50	5.77	0.38	0.02				
23.00	5.80	0.39	0.02				
23.50	5.82	0.40	0.02				
24.00	<b>5.85</b>	<b>0.40</b>	0.02				
24.50	5.85	0.40	0.00				
25.00	5.85	0.40	0.00				
25.50	5.85	0.40	0.00				

**Site PRE**

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Type III 24-hr 25yr Rainfall=5.85"

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**Summary for Subcatchment 4S: Wetland Parcel**

Runoff = 0.08 cfs @ 12.34 hrs, Volume= 0.017 af, Depth= 0.40"  
 Routed to Reach 1R : Willow Branch

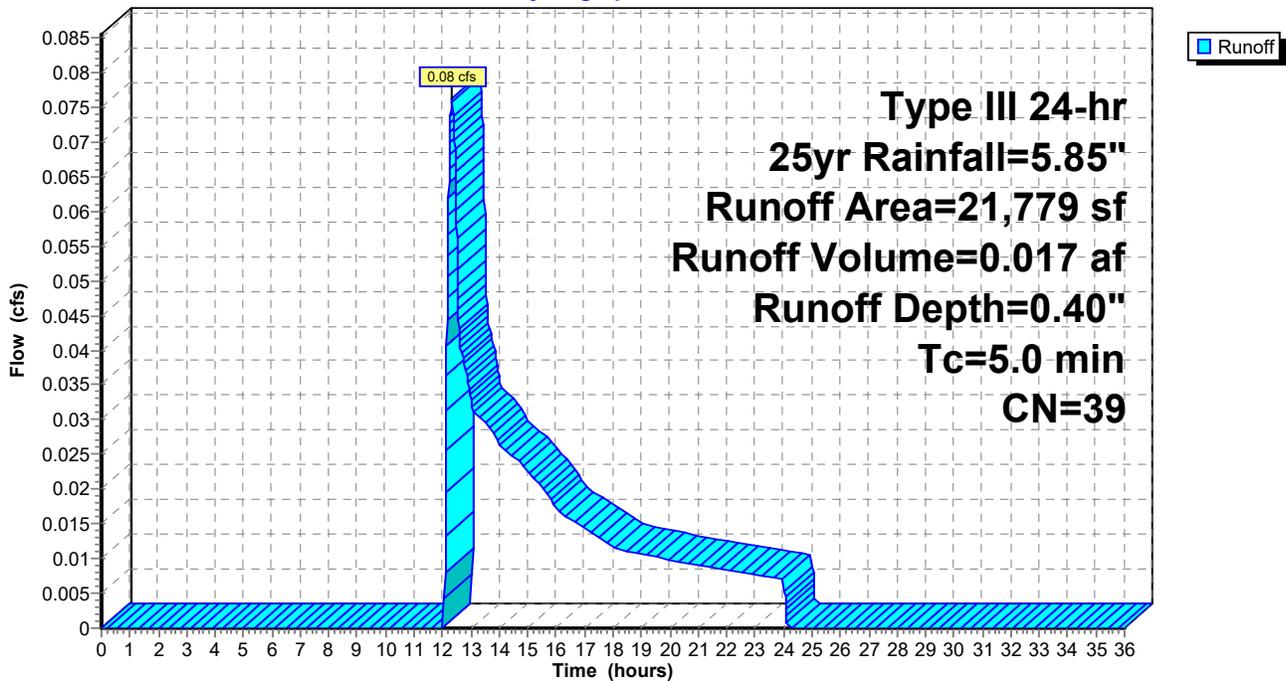
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25yr Rainfall=5.85"

Area (sf)	CN	Description
21,779	39	>75% Grass cover, Good, HSG A
21,779		100.00% Pervious Area

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

**Subcatchment 4S: Wetland Parcel**

Hydrograph



**Site PRE**

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Type III 24-hr 25yr Rainfall=5.85"

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**Hydrograph for Subcatchment 4S: Wetland Parcel**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	5.85	0.40	0.00
0.50	0.03	0.00	0.00	26.50	5.85	0.40	0.00
1.00	0.06	0.00	0.00	27.00	5.85	0.40	0.00
1.50	0.09	0.00	0.00	27.50	5.85	0.40	0.00
2.00	0.12	0.00	0.00	28.00	5.85	0.40	0.00
2.50	0.15	0.00	0.00	28.50	5.85	0.40	0.00
3.00	0.18	0.00	0.00	29.00	5.85	0.40	0.00
3.50	0.21	0.00	0.00	29.50	5.85	0.40	0.00
4.00	0.25	0.00	0.00	30.00	5.85	0.40	0.00
4.50	0.29	0.00	0.00	30.50	5.85	0.40	0.00
5.00	0.33	0.00	0.00	31.00	5.85	0.40	0.00
5.50	0.38	0.00	0.00	31.50	5.85	0.40	0.00
6.00	0.42	0.00	0.00	32.00	5.85	0.40	0.00
6.50	0.47	0.00	0.00	32.50	5.85	0.40	0.00
7.00	0.53	0.00	0.00	33.00	5.85	0.40	0.00
7.50	0.59	0.00	0.00	33.50	5.85	0.40	0.00
8.00	0.67	0.00	0.00	34.00	5.85	0.40	0.00
8.50	0.75	0.00	0.00	34.50	5.85	0.40	0.00
9.00	0.85	0.00	0.00	35.00	5.85	0.40	0.00
9.50	0.97	0.00	0.00	35.50	5.85	0.40	0.00
10.00	1.11	0.00	0.00	36.00	5.85	0.40	0.00
10.50	1.27	0.00	0.00				
11.00	1.46	0.00	0.00				
11.50	1.74	0.00	0.00				
12.00	2.92	0.00	<b>0.00</b>				
12.50	4.11	0.06	<b>0.06</b>				
13.00	4.39	0.09	0.03				
13.50	4.58	0.12	0.03				
14.00	4.74	0.15	0.03				
14.50	4.88	0.18	0.02				
15.00	5.00	0.20	0.02				
15.50	5.10	0.22	0.02				
16.00	5.18	0.24	0.02				
16.50	5.26	0.25	0.02				
17.00	5.32	0.27	0.01				
17.50	5.38	0.28	0.01				
18.00	5.43	0.29	0.01				
18.50	5.47	0.31	0.01				
19.00	5.52	0.32	0.01				
19.50	5.56	0.33	0.01				
20.00	5.60	0.34	0.01				
20.50	5.64	0.35	0.01				
21.00	5.67	0.36	0.01				
21.50	5.71	0.36	0.01				
22.00	5.74	0.37	0.01				
22.50	5.77	0.38	0.01				
23.00	5.80	0.39	0.01				
23.50	5.82	0.40	0.01				
24.00	<b>5.85</b>	<b>0.40</b>	0.01				
24.50	5.85	0.40	0.00				
25.00	5.85	0.40	0.00				
25.50	5.85	0.40	0.00				

### Summary for Reach 1R: Willow Branch

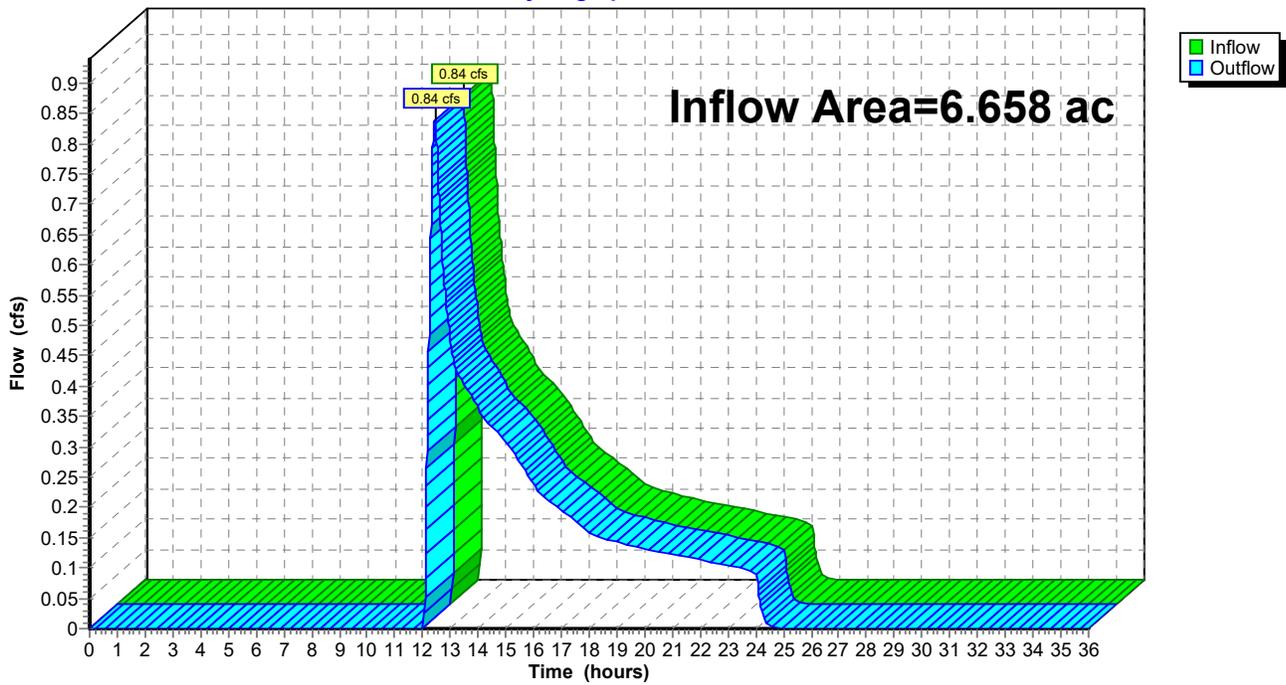
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6.658 ac, 0.00% Impervious, Inflow Depth = 0.40" for 25yr event  
Inflow = 0.84 cfs @ 12.44 hrs, Volume= 0.224 af  
Outflow = 0.84 cfs @ 12.44 hrs, Volume= 0.224 af, Atten= 0%, Lag= 0.0 min

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

### Reach 1R: Willow Branch

Hydrograph



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**Hydrograph for Reach 1R: Willow Branch**

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	26.00	0.00		0.00
0.50	0.00		0.00	26.50	0.00		0.00
1.00	0.00		0.00	27.00	0.00		0.00
1.50	0.00		0.00	27.50	0.00		0.00
2.00	0.00		0.00	28.00	0.00		0.00
2.50	0.00		0.00	28.50	0.00		0.00
3.00	0.00		0.00	29.00	0.00		0.00
3.50	0.00		0.00	29.50	0.00		0.00
4.00	0.00		0.00	30.00	0.00		0.00
4.50	0.00		0.00	30.50	0.00		0.00
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00				
11.00	0.00		0.00				
11.50	0.00		0.00				
12.00	<b>0.00</b>		<b>0.00</b>				
12.50	<b>0.81</b>		<b>0.81</b>				
13.00	0.48		0.48				
13.50	0.40		0.40				
14.00	0.36		0.36				
14.50	0.33		0.33				
15.00	0.31		0.31				
15.50	0.28		0.28				
16.00	0.24		0.24				
16.50	0.21		0.21				
17.00	0.20		0.20				
17.50	0.18		0.18				
18.00	0.16		0.16				
18.50	0.15		0.15				
19.00	0.14		0.14				
19.50	0.14		0.14				
20.00	0.13		0.13				
20.50	0.13		0.13				
21.00	0.12		0.12				
21.50	0.12		0.12				
22.00	0.11		0.11				
22.50	0.11		0.11				
23.00	0.10		0.10				
23.50	0.10		0.10				
24.00	0.09		0.09				
24.50	0.00		0.00				
25.00	0.00		0.00				
25.50	0.00		0.00				

## 50-Year Storm Event – Green Field Pre-Development

**Site PRE**

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Type III 24-hr 50yr Rainfall=6.62"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: EX Interior Lots**

Runoff Area=156,041 sf 0.00% Impervious Runoff Depth=0.64"  
Flow Length=587' Tc=18.0 min CN=39 Runoff=0.95 cfs 0.190 af

**Subcatchment2S: EX Sidewalks**

Runoff Area=1.216 ac 0.00% Impervious Runoff Depth=0.64"  
Tc=5.0 min CN=39 Runoff=0.37 cfs 0.065 af

**Subcatchment3S: EX Roadway**

Runoff Area=59,248 sf 0.00% Impervious Runoff Depth=0.64"  
Tc=5.0 min CN=39 Runoff=0.41 cfs 0.072 af

**Subcatchment4S: Wetland Parcel**

Runoff Area=21,779 sf 0.00% Impervious Runoff Depth=0.64"  
Tc=5.0 min CN=39 Runoff=0.15 cfs 0.027 af

**Reach 1R: Willow Branch**

Inflow=1.75 cfs 0.354 af  
Outflow=1.75 cfs 0.354 af

**Total Runoff Area = 6.658 ac Runoff Volume = 0.354 af Average Runoff Depth = 0.64"**  
**100.00% Pervious = 6.658 ac 0.00% Impervious = 0.000 ac**

**Site PRE**

Prepared by VHB, Inc

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Type III 24-hr 50yr Rainfall=6.62"

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**Summary for Subcatchment 1S: EX Interior Lots**

Runoff from this area will be managed by individual lot developers.

Runoff = 0.95 cfs @ 12.47 hrs, Volume= 0.190 af, Depth= 0.64"  
 Routed to Reach 1R : Willow Branch

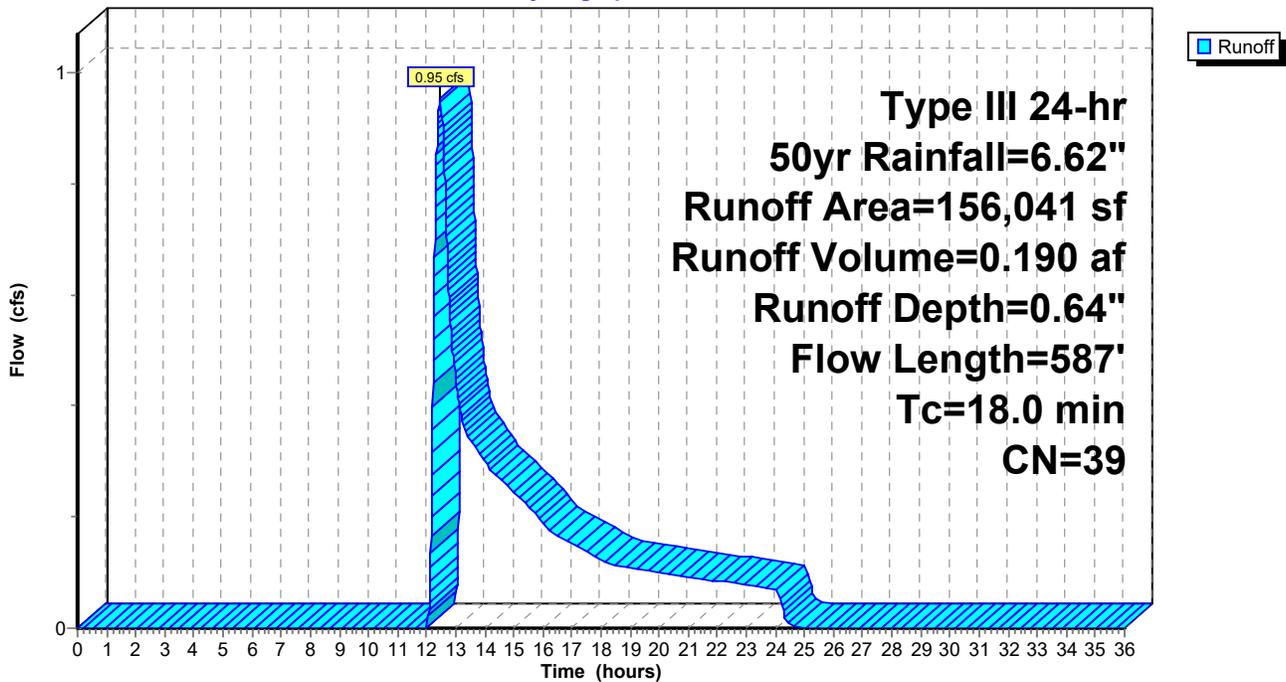
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 50yr Rainfall=6.62"

Area (sf)	CN	Description
156,041	39	Pasture/grassland/range, Good, HSG A
156,041		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0560	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.2	537	0.0081	0.63		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
18.0	587	Total			

**Subcatchment 1S: EX Interior Lots**

Hydrograph



**Site PRE**

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Type III 24-hr 50yr Rainfall=6.62"

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**Hydrograph for Subcatchment 1S: EX Interior Lots**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	6.62	0.64	0.00
0.50	0.03	0.00	0.00	26.50	6.62	0.64	0.00
1.00	0.07	0.00	0.00	27.00	6.62	0.64	0.00
1.50	0.10	0.00	0.00	27.50	6.62	0.64	0.00
2.00	0.13	0.00	0.00	28.00	6.62	0.64	0.00
2.50	0.17	0.00	0.00	28.50	6.62	0.64	0.00
3.00	0.20	0.00	0.00	29.00	6.62	0.64	0.00
3.50	0.24	0.00	0.00	29.50	6.62	0.64	0.00
4.00	0.28	0.00	0.00	30.00	6.62	0.64	0.00
4.50	0.33	0.00	0.00	30.50	6.62	0.64	0.00
5.00	0.38	0.00	0.00	31.00	6.62	0.64	0.00
5.50	0.42	0.00	0.00	31.50	6.62	0.64	0.00
6.00	0.48	0.00	0.00	32.00	6.62	0.64	0.00
6.50	0.53	0.00	0.00	32.50	6.62	0.64	0.00
7.00	0.60	0.00	0.00	33.00	6.62	0.64	0.00
7.50	0.67	0.00	0.00	33.50	6.62	0.64	0.00
8.00	0.75	0.00	0.00	34.00	6.62	0.64	0.00
8.50	0.85	0.00	0.00	34.50	6.62	0.64	0.00
9.00	0.96	0.00	0.00	35.00	6.62	0.64	0.00
9.50	1.10	0.00	0.00	35.50	6.62	0.64	0.00
10.00	1.25	0.00	0.00	36.00	6.62	0.64	0.00
10.50	1.43	0.00	0.00				
11.00	1.66	0.00	0.00				
11.50	1.97	0.00	0.00				
12.00	3.31	0.00	<b>0.00</b>				
12.50	4.65	0.13	<b>0.95</b>				
13.00	4.96	0.19	0.45				
13.50	5.19	0.24	0.34				
14.00	5.37	0.28	0.30				
14.50	5.52	0.32	0.27				
15.00	5.66	0.35	0.25				
15.50	5.77	0.38	0.22				
16.00	5.87	0.41	0.19				
16.50	5.95	0.43	0.17				
17.00	6.02	0.45	0.15				
17.50	6.09	0.47	0.14				
18.00	6.14	0.49	0.12				
18.50	6.20	0.50	0.11				
19.00	6.24	0.52	0.11				
19.50	6.29	0.53	0.10				
20.00	6.34	0.55	0.10				
20.50	6.38	0.56	0.10				
21.00	6.42	0.57	0.09				
21.50	6.46	0.58	0.09				
22.00	6.49	0.60	0.08				
22.50	6.53	0.61	0.08				
23.00	6.56	0.62	0.08				
23.50	6.59	0.63	0.07				
24.00	<b>6.62</b>	<b>0.64</b>	0.07				
24.50	6.62	0.64	0.00				
25.00	6.62	0.64	0.00				
25.50	6.62	0.64	0.00				

**Site PRE**

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Type III 24-hr 50yr Rainfall=6.62"

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**Summary for Subcatchment 2S: EX Sidewalks**

Runoff = 0.37 cfs @ 12.14 hrs, Volume= 0.065 af, Depth= 0.64"  
Routed to Reach 1R : Willow Branch

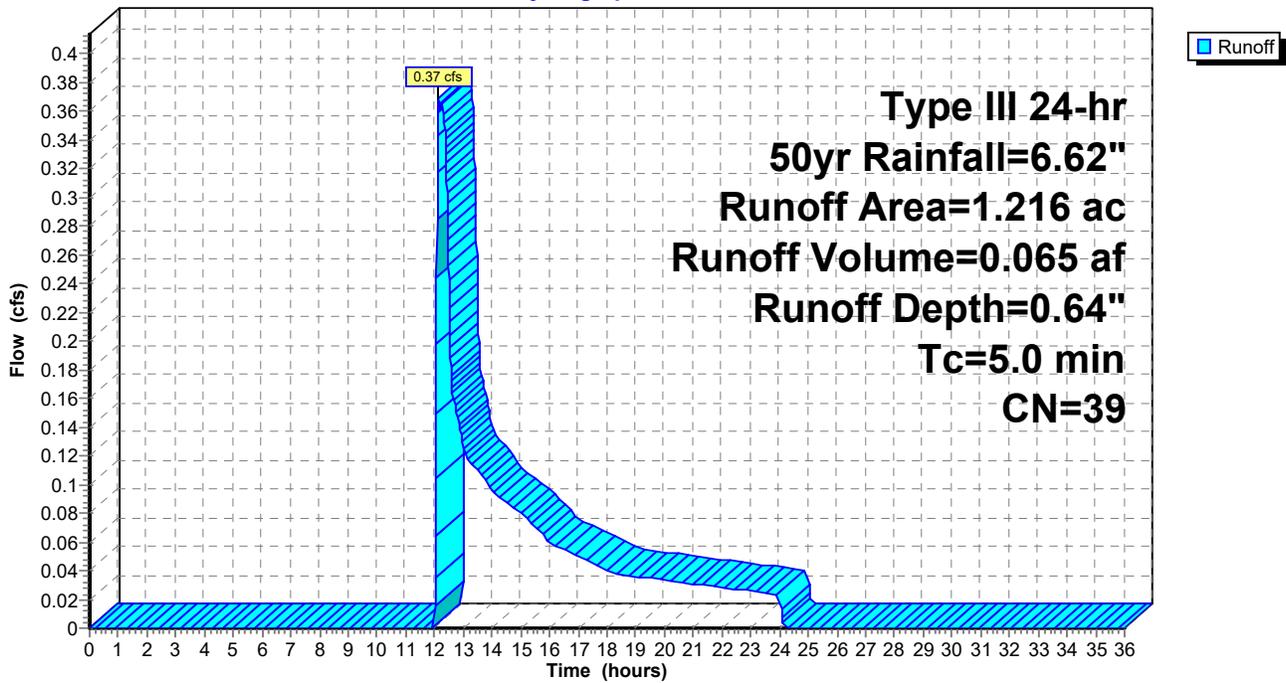
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 50yr Rainfall=6.62"

Area (ac)	CN	Description
1.216	39	>75% Grass cover, Good, HSG A
1.216		100.00% Pervious Area

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

**Subcatchment 2S: EX Sidewalks**

Hydrograph



**Site PRE**

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Type III 24-hr 50yr Rainfall=6.62"

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**Hydrograph for Subcatchment 2S: EX Sidewalks**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	6.62	0.64	0.00
0.50	0.03	0.00	0.00	26.50	6.62	0.64	0.00
1.00	0.07	0.00	0.00	27.00	6.62	0.64	0.00
1.50	0.10	0.00	0.00	27.50	6.62	0.64	0.00
2.00	0.13	0.00	0.00	28.00	6.62	0.64	0.00
2.50	0.17	0.00	0.00	28.50	6.62	0.64	0.00
3.00	0.20	0.00	0.00	29.00	6.62	0.64	0.00
3.50	0.24	0.00	0.00	29.50	6.62	0.64	0.00
4.00	0.28	0.00	0.00	30.00	6.62	0.64	0.00
4.50	0.33	0.00	0.00	30.50	6.62	0.64	0.00
5.00	0.38	0.00	0.00	31.00	6.62	0.64	0.00
5.50	0.42	0.00	0.00	31.50	6.62	0.64	0.00
6.00	0.48	0.00	0.00	32.00	6.62	0.64	0.00
6.50	0.53	0.00	0.00	32.50	6.62	0.64	0.00
7.00	0.60	0.00	0.00	33.00	6.62	0.64	0.00
7.50	0.67	0.00	0.00	33.50	6.62	0.64	0.00
8.00	0.75	0.00	0.00	34.00	6.62	0.64	0.00
8.50	0.85	0.00	0.00	34.50	6.62	0.64	0.00
9.00	0.96	0.00	0.00	35.00	6.62	0.64	0.00
9.50	1.10	0.00	0.00	35.50	6.62	0.64	0.00
10.00	1.25	0.00	0.00	36.00	6.62	0.64	0.00
10.50	1.43	0.00	0.00				
11.00	1.66	0.00	0.00				
11.50	1.97	0.00	0.00				
12.00	3.31	0.00	<b>0.00</b>				
12.50	4.65	0.13	<b>0.24</b>				
13.00	4.96	0.19	0.13				
13.50	5.19	0.24	0.11				
14.00	5.37	0.28	0.10				
14.50	5.52	0.32	0.09				
15.00	5.66	0.35	0.08				
15.50	5.77	0.38	0.07				
16.00	5.87	0.41	0.06				
16.50	5.95	0.43	0.05				
17.00	6.02	0.45	0.05				
17.50	6.09	0.47	0.04				
18.00	6.14	0.49	0.04				
18.50	6.20	0.50	0.04				
19.00	6.24	0.52	0.04				
19.50	6.29	0.53	0.03				
20.00	6.34	0.55	0.03				
20.50	6.38	0.56	0.03				
21.00	6.42	0.57	0.03				
21.50	6.46	0.58	0.03				
22.00	6.49	0.60	0.03				
22.50	6.53	0.61	0.03				
23.00	6.56	0.62	0.03				
23.50	6.59	0.63	0.02				
24.00	<b>6.62</b>	<b>0.64</b>	0.02				
24.50	6.62	0.64	0.00				
25.00	6.62	0.64	0.00				
25.50	6.62	0.64	0.00				

**Site PRE**

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Type III 24-hr 50yr Rainfall=6.62"

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**Summary for Subcatchment 3S: EX Roadway**

Runoff = 0.41 cfs @ 12.14 hrs, Volume= 0.072 af, Depth= 0.64"  
 Routed to Reach 1R : Willow Branch

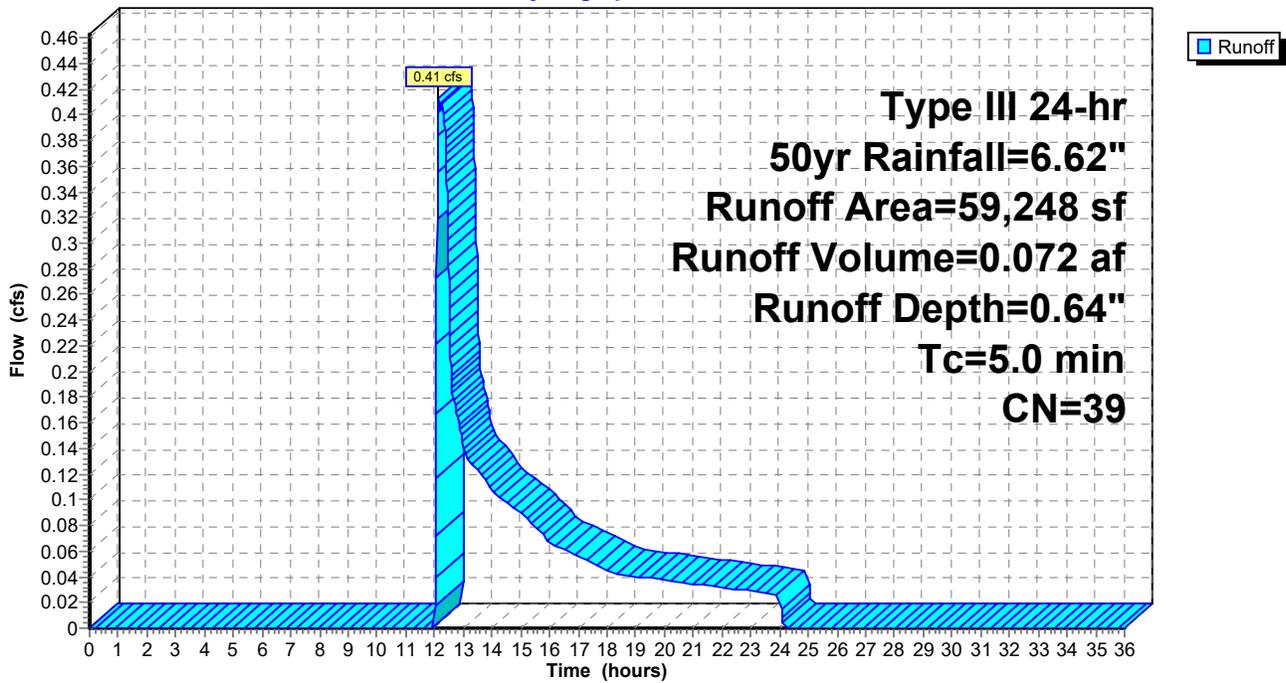
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 50yr Rainfall=6.62"

Area (sf)	CN	Description
59,248	39	>75% Grass cover, Good, HSG A
59,248		100.00% Pervious Area

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

**Subcatchment 3S: EX Roadway**

Hydrograph



Site PRE

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Type III 24-hr 50yr Rainfall=6.62"

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Hydrograph for Subcatchment 3S: EX Roadway

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	6.62	0.64	0.00
0.50	0.03	0.00	0.00	26.50	6.62	0.64	0.00
1.00	0.07	0.00	0.00	27.00	6.62	0.64	0.00
1.50	0.10	0.00	0.00	27.50	6.62	0.64	0.00
2.00	0.13	0.00	0.00	28.00	6.62	0.64	0.00
2.50	0.17	0.00	0.00	28.50	6.62	0.64	0.00
3.00	0.20	0.00	0.00	29.00	6.62	0.64	0.00
3.50	0.24	0.00	0.00	29.50	6.62	0.64	0.00
4.00	0.28	0.00	0.00	30.00	6.62	0.64	0.00
4.50	0.33	0.00	0.00	30.50	6.62	0.64	0.00
5.00	0.38	0.00	0.00	31.00	6.62	0.64	0.00
5.50	0.42	0.00	0.00	31.50	6.62	0.64	0.00
6.00	0.48	0.00	0.00	32.00	6.62	0.64	0.00
6.50	0.53	0.00	0.00	32.50	6.62	0.64	0.00
7.00	0.60	0.00	0.00	33.00	6.62	0.64	0.00
7.50	0.67	0.00	0.00	33.50	6.62	0.64	0.00
8.00	0.75	0.00	0.00	34.00	6.62	0.64	0.00
8.50	0.85	0.00	0.00	34.50	6.62	0.64	0.00
9.00	0.96	0.00	0.00	35.00	6.62	0.64	0.00
9.50	1.10	0.00	0.00	35.50	6.62	0.64	0.00
10.00	1.25	0.00	0.00	36.00	6.62	0.64	0.00
10.50	1.43	0.00	0.00				
11.00	1.66	0.00	0.00				
11.50	1.97	0.00	0.00				
12.00	3.31	0.00	<b>0.00</b>				
12.50	4.65	0.13	<b>0.27</b>				
13.00	4.96	0.19	0.14				
13.50	5.19	0.24	0.12				
14.00	5.37	0.28	0.11				
14.50	5.52	0.32	0.10				
15.00	5.66	0.35	0.09				
15.50	5.77	0.38	0.08				
16.00	5.87	0.41	0.07				
16.50	5.95	0.43	0.06				
17.00	6.02	0.45	0.06				
17.50	6.09	0.47	0.05				
18.00	6.14	0.49	0.04				
18.50	6.20	0.50	0.04				
19.00	6.24	0.52	0.04				
19.50	6.29	0.53	0.04				
20.00	6.34	0.55	0.04				
20.50	6.38	0.56	0.04				
21.00	6.42	0.57	0.03				
21.50	6.46	0.58	0.03				
22.00	6.49	0.60	0.03				
22.50	6.53	0.61	0.03				
23.00	6.56	0.62	0.03				
23.50	6.59	0.63	0.03				
24.00	<b>6.62</b>	<b>0.64</b>	0.03				
24.50	6.62	0.64	0.00				
25.00	6.62	0.64	0.00				
25.50	6.62	0.64	0.00				

**Site PRE**

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Type III 24-hr 50yr Rainfall=6.62"

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**Summary for Subcatchment 4S: Wetland Parcel**

Runoff = 0.15 cfs @ 12.14 hrs, Volume= 0.027 af, Depth= 0.64"  
 Routed to Reach 1R : Willow Branch

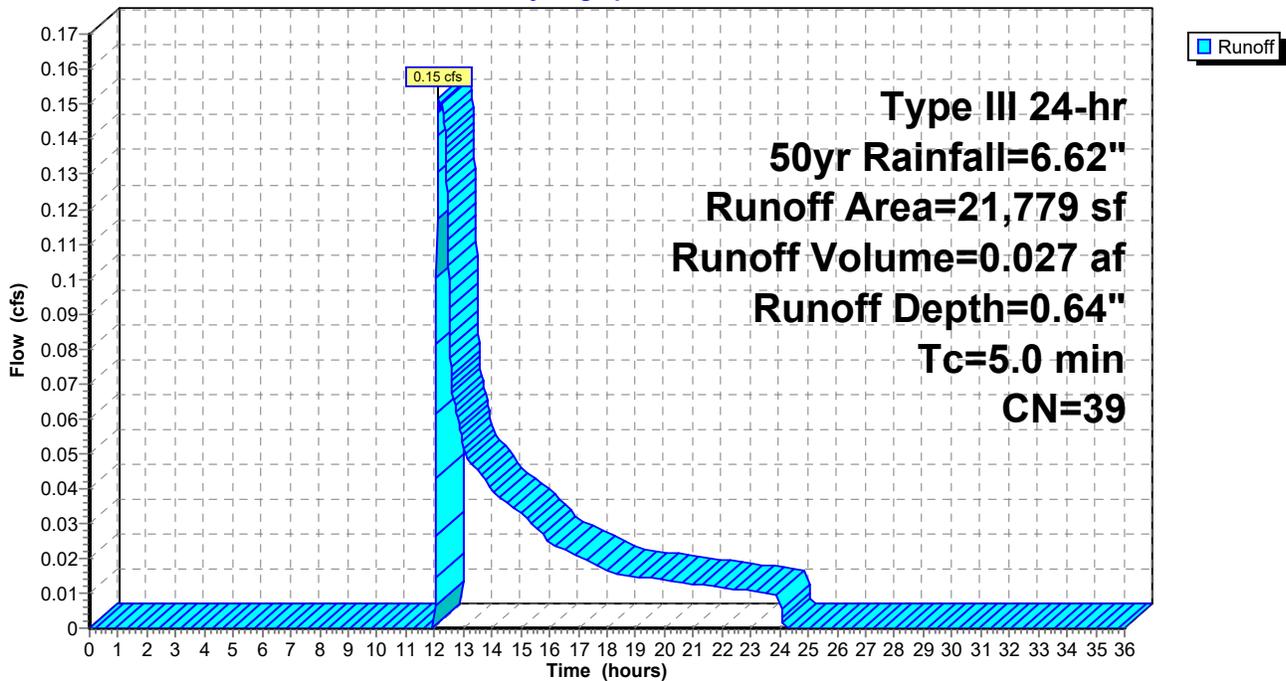
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 50yr Rainfall=6.62"

Area (sf)	CN	Description
21,779	39	>75% Grass cover, Good, HSG A
21,779		100.00% Pervious Area

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

**Subcatchment 4S: Wetland Parcel**

Hydrograph



**Site PRE**

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Type III 24-hr 50yr Rainfall=6.62"

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**Hydrograph for Subcatchment 4S: Wetland Parcel**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	6.62	0.64	0.00
0.50	0.03	0.00	0.00	26.50	6.62	0.64	0.00
1.00	0.07	0.00	0.00	27.00	6.62	0.64	0.00
1.50	0.10	0.00	0.00	27.50	6.62	0.64	0.00
2.00	0.13	0.00	0.00	28.00	6.62	0.64	0.00
2.50	0.17	0.00	0.00	28.50	6.62	0.64	0.00
3.00	0.20	0.00	0.00	29.00	6.62	0.64	0.00
3.50	0.24	0.00	0.00	29.50	6.62	0.64	0.00
4.00	0.28	0.00	0.00	30.00	6.62	0.64	0.00
4.50	0.33	0.00	0.00	30.50	6.62	0.64	0.00
5.00	0.38	0.00	0.00	31.00	6.62	0.64	0.00
5.50	0.42	0.00	0.00	31.50	6.62	0.64	0.00
6.00	0.48	0.00	0.00	32.00	6.62	0.64	0.00
6.50	0.53	0.00	0.00	32.50	6.62	0.64	0.00
7.00	0.60	0.00	0.00	33.00	6.62	0.64	0.00
7.50	0.67	0.00	0.00	33.50	6.62	0.64	0.00
8.00	0.75	0.00	0.00	34.00	6.62	0.64	0.00
8.50	0.85	0.00	0.00	34.50	6.62	0.64	0.00
9.00	0.96	0.00	0.00	35.00	6.62	0.64	0.00
9.50	1.10	0.00	0.00	35.50	6.62	0.64	0.00
10.00	1.25	0.00	0.00	36.00	6.62	0.64	0.00
10.50	1.43	0.00	0.00				
11.00	1.66	0.00	0.00				
11.50	1.97	0.00	0.00				
12.00	3.31	0.00	<b>0.00</b>				
12.50	4.65	0.13	<b>0.10</b>				
13.00	4.96	0.19	0.05				
13.50	5.19	0.24	0.05				
14.00	5.37	0.28	0.04				
14.50	5.52	0.32	0.04				
15.00	5.66	0.35	0.03				
15.50	5.77	0.38	0.03				
16.00	5.87	0.41	0.02				
16.50	5.95	0.43	0.02				
17.00	6.02	0.45	0.02				
17.50	6.09	0.47	0.02				
18.00	6.14	0.49	0.02				
18.50	6.20	0.50	0.02				
19.00	6.24	0.52	0.01				
19.50	6.29	0.53	0.01				
20.00	6.34	0.55	0.01				
20.50	6.38	0.56	0.01				
21.00	6.42	0.57	0.01				
21.50	6.46	0.58	0.01				
22.00	6.49	0.60	0.01				
22.50	6.53	0.61	0.01				
23.00	6.56	0.62	0.01				
23.50	6.59	0.63	0.01				
24.00	<b>6.62</b>	<b>0.64</b>	0.01				
24.50	6.62	0.64	0.00				
25.00	6.62	0.64	0.00				
25.50	6.62	0.64	0.00				

### Summary for Reach 1R: Willow Branch

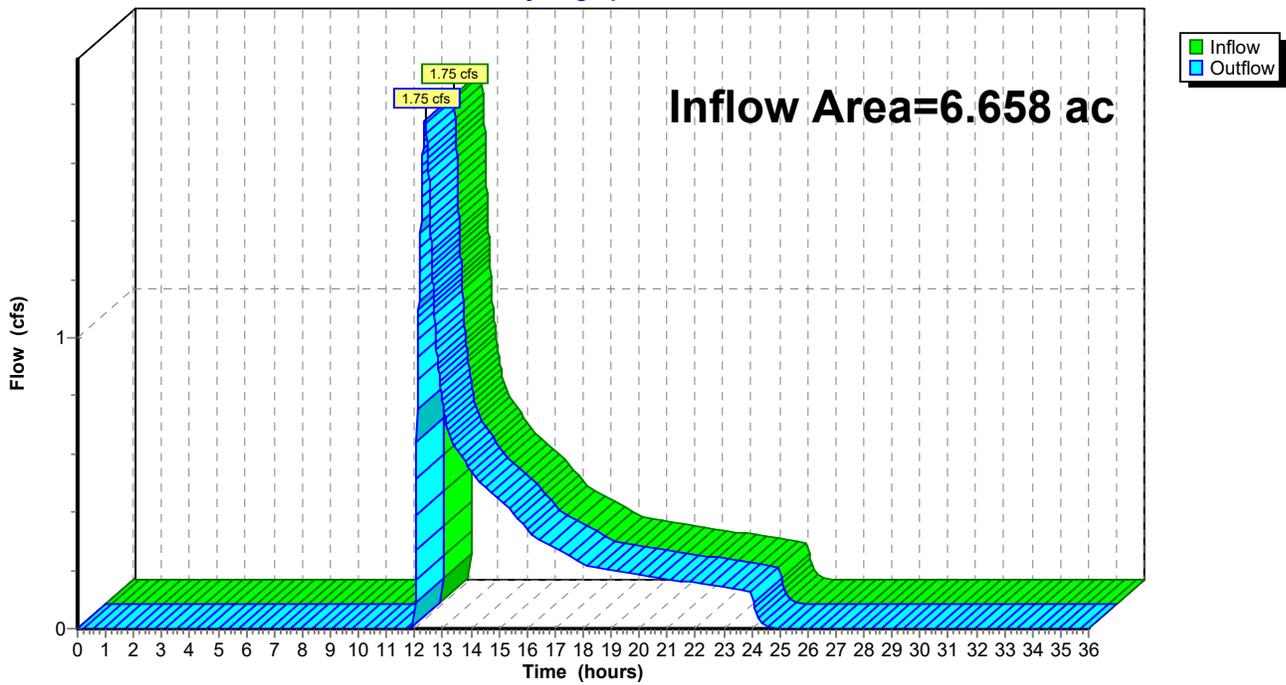
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6.658 ac, 0.00% Impervious, Inflow Depth = 0.64" for 50yr event  
Inflow = 1.75 cfs @ 12.38 hrs, Volume= 0.354 af  
Outflow = 1.75 cfs @ 12.38 hrs, Volume= 0.354 af, Atten= 0%, Lag= 0.0 min

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

### Reach 1R: Willow Branch

Hydrograph



**Site PRE**

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Type III 24-hr 50yr Rainfall=6.62"

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**Hydrograph for Reach 1R: Willow Branch**

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	26.00	0.00		0.00
0.50	0.00		0.00	26.50	0.00		0.00
1.00	0.00		0.00	27.00	0.00		0.00
1.50	0.00		0.00	27.50	0.00		0.00
2.00	0.00		0.00	28.00	0.00		0.00
2.50	0.00		0.00	28.50	0.00		0.00
3.00	0.00		0.00	29.00	0.00		0.00
3.50	0.00		0.00	29.50	0.00		0.00
4.00	0.00		0.00	30.00	0.00		0.00
4.50	0.00		0.00	30.50	0.00		0.00
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00				
11.00	0.00		0.00				
11.50	0.00		0.00				
12.00	<b>0.00</b>		<b>0.00</b>				
12.50	<b>1.57</b>		<b>1.57</b>				
13.00	0.77		0.77				
13.50	0.62		0.62				
14.00	0.54		0.54				
14.50	0.49		0.49				
15.00	0.45		0.45				
15.50	0.40		0.40				
16.00	0.34		0.34				
16.50	0.30		0.30				
17.00	0.28		0.28				
17.50	0.25		0.25				
18.00	0.22		0.22				
18.50	0.21		0.21				
19.00	0.20		0.20				
19.50	0.19		0.19				
20.00	0.18		0.18				
20.50	0.18		0.18				
21.00	0.17		0.17				
21.50	0.16		0.16				
22.00	0.16		0.16				
22.50	0.15		0.15				
23.00	0.14		0.14				
23.50	0.14		0.14				
24.00	0.13		0.13				
24.50	0.00		0.00				
25.00	0.00		0.00				
25.50	0.00		0.00				

## 100-Year Storm Event – Green Field Pre-Development

**Site PRE**

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Type III 24-hr 100yr Rainfall=7.46"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: EX Interior Lots** Runoff Area=156,041 sf 0.00% Impervious Runoff Depth=0.94"  
Flow Length=587' Tc=18.0 min CN=39 Runoff=1.68 cfs 0.280 af

**Subcatchment2S: EX Sidewalks** Runoff Area=1.216 ac 0.00% Impervious Runoff Depth=0.94"  
Tc=5.0 min CN=39 Runoff=0.79 cfs 0.095 af

**Subcatchment3S: EX Roadway** Runoff Area=59,248 sf 0.00% Impervious Runoff Depth=0.94"  
Tc=5.0 min CN=39 Runoff=0.89 cfs 0.106 af

**Subcatchment4S: Wetland Parcel** Runoff Area=21,779 sf 0.00% Impervious Runoff Depth=0.94"  
Tc=5.0 min CN=39 Runoff=0.33 cfs 0.039 af

**Reach 1R: Willow Branch** Inflow=3.08 cfs 0.521 af  
Outflow=3.08 cfs 0.521 af

**Total Runoff Area = 6.658 ac Runoff Volume = 0.521 af Average Runoff Depth = 0.94"**  
**100.00% Pervious = 6.658 ac 0.00% Impervious = 0.000 ac**

**Site PRE**

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Type III 24-hr 100yr Rainfall=7.46"

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**Summary for Subcatchment 1S: EX Interior Lots**

Runoff from this area will be managed by individual lot developers.

Runoff = 1.68 cfs @ 12.38 hrs, Volume= 0.280 af, Depth= 0.94"  
Routed to Reach 1R : Willow Branch

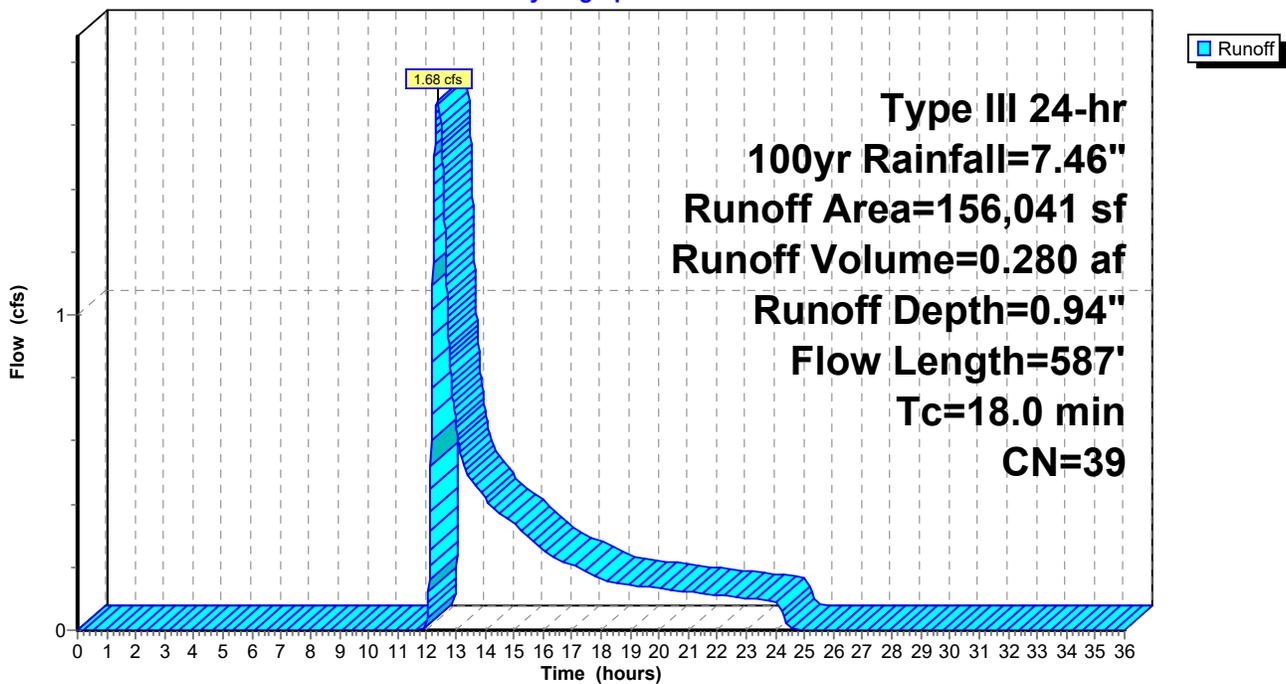
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100yr Rainfall=7.46"

Area (sf)	CN	Description
156,041	39	Pasture/grassland/range, Good, HSG A
156,041		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0560	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.2	537	0.0081	0.63		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
18.0	587	Total			

**Subcatchment 1S: EX Interior Lots**

Hydrograph



**Site PRE**

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Type III 24-hr 100yr Rainfall=7.46"

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**Hydrograph for Subcatchment 1S: EX Interior Lots**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	7.46	0.94	0.00
0.50	0.04	0.00	0.00	26.50	7.46	0.94	0.00
1.00	0.07	0.00	0.00	27.00	7.46	0.94	0.00
1.50	0.11	0.00	0.00	27.50	7.46	0.94	0.00
2.00	0.15	0.00	0.00	28.00	7.46	0.94	0.00
2.50	0.19	0.00	0.00	28.50	7.46	0.94	0.00
3.00	0.23	0.00	0.00	29.00	7.46	0.94	0.00
3.50	0.27	0.00	0.00	29.50	7.46	0.94	0.00
4.00	0.32	0.00	0.00	30.00	7.46	0.94	0.00
4.50	0.37	0.00	0.00	30.50	7.46	0.94	0.00
5.00	0.42	0.00	0.00	31.00	7.46	0.94	0.00
5.50	0.48	0.00	0.00	31.50	7.46	0.94	0.00
6.00	0.54	0.00	0.00	32.00	7.46	0.94	0.00
6.50	0.60	0.00	0.00	32.50	7.46	0.94	0.00
7.00	0.68	0.00	0.00	33.00	7.46	0.94	0.00
7.50	0.76	0.00	0.00	33.50	7.46	0.94	0.00
8.00	0.85	0.00	0.00	34.00	7.46	0.94	0.00
8.50	0.96	0.00	0.00	34.50	7.46	0.94	0.00
9.00	1.09	0.00	0.00	35.00	7.46	0.94	0.00
9.50	1.24	0.00	0.00	35.50	7.46	0.94	0.00
10.00	1.41	0.00	0.00	36.00	7.46	0.94	0.00
10.50	1.62	0.00	0.00				
11.00	1.87	0.00	0.00				
11.50	2.22	0.00	0.00				
12.00	3.73	0.02	<b>0.01</b>				
12.50	5.24	0.25	<b>1.59</b>				
13.00	5.59	0.34	0.66				
13.50	5.84	0.40	0.48				
14.00	6.05	0.46	0.42				
14.50	6.22	0.51	0.37				
15.00	6.37	0.56	0.34				
15.50	6.50	0.60	0.30				
16.00	6.61	0.63	0.26				
16.50	6.70	0.66	0.22				
17.00	6.78	0.69	0.20				
17.50	6.86	0.72	0.19				
18.00	6.92	0.74	0.16				
18.50	6.98	0.76	0.15				
19.00	7.04	0.78	0.14				
19.50	7.09	0.80	0.14				
20.00	7.14	0.82	0.13				
20.50	7.19	0.84	0.13				
21.00	7.23	0.85	0.12				
21.50	7.28	0.87	0.12				
22.00	7.32	0.88	0.11				
22.50	7.36	0.90	0.11				
23.00	7.39	0.91	0.10				
23.50	7.43	0.93	0.10				
24.00	<b>7.46</b>	<b>0.94</b>	0.09				
24.50	7.46	0.94	0.01				
25.00	7.46	0.94	0.00				
25.50	7.46	0.94	0.00				

**Site PRE**

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Type III 24-hr 100yr Rainfall=7.46"

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**Summary for Subcatchment 2S: EX Sidewalks**

Runoff = 0.79 cfs @ 12.11 hrs, Volume= 0.095 af, Depth= 0.94"  
 Routed to Reach 1R : Willow Branch

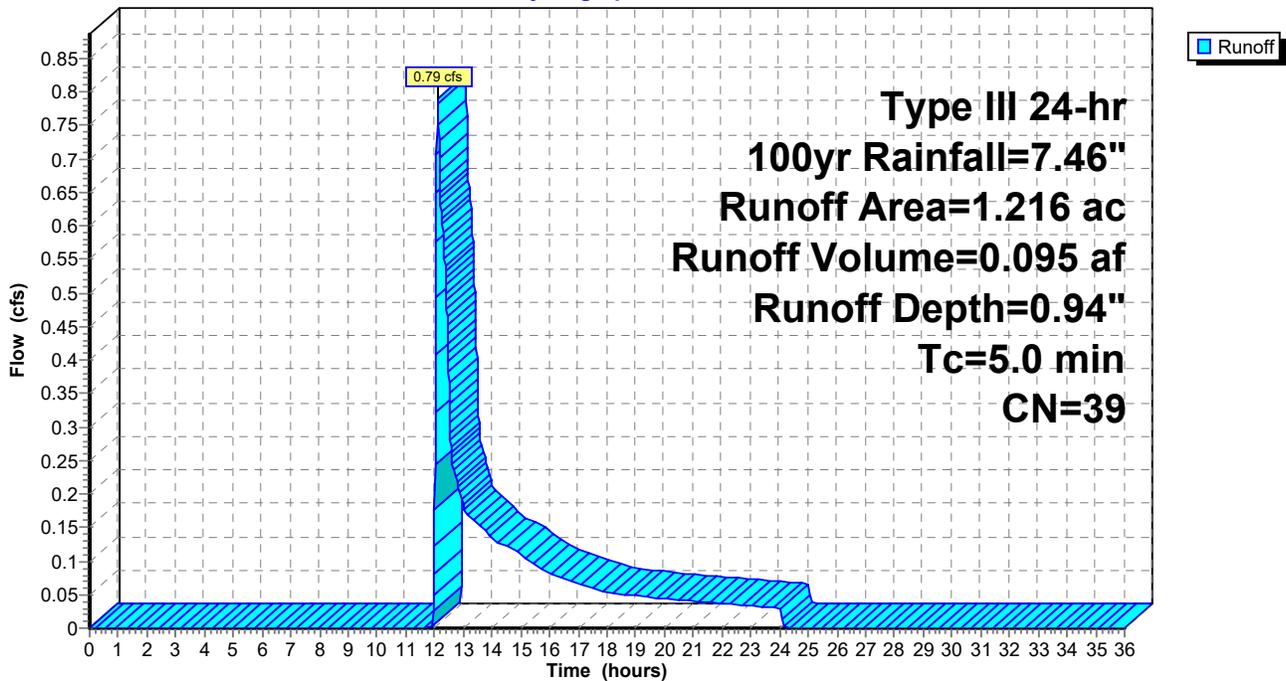
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100yr Rainfall=7.46"

Area (ac)	CN	Description
1.216	39	>75% Grass cover, Good, HSG A
1.216		100.00% Pervious Area

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

**Subcatchment 2S: EX Sidewalks**

Hydrograph



**Site PRE**

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Type III 24-hr 100yr Rainfall=7.46"

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**Hydrograph for Subcatchment 2S: EX Sidewalks**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	7.46	0.94	0.00
0.50	0.04	0.00	0.00	26.50	7.46	0.94	0.00
1.00	0.07	0.00	0.00	27.00	7.46	0.94	0.00
1.50	0.11	0.00	0.00	27.50	7.46	0.94	0.00
2.00	0.15	0.00	0.00	28.00	7.46	0.94	0.00
2.50	0.19	0.00	0.00	28.50	7.46	0.94	0.00
3.00	0.23	0.00	0.00	29.00	7.46	0.94	0.00
3.50	0.27	0.00	0.00	29.50	7.46	0.94	0.00
4.00	0.32	0.00	0.00	30.00	7.46	0.94	0.00
4.50	0.37	0.00	0.00	30.50	7.46	0.94	0.00
5.00	0.42	0.00	0.00	31.00	7.46	0.94	0.00
5.50	0.48	0.00	0.00	31.50	7.46	0.94	0.00
6.00	0.54	0.00	0.00	32.00	7.46	0.94	0.00
6.50	0.60	0.00	0.00	32.50	7.46	0.94	0.00
7.00	0.68	0.00	0.00	33.00	7.46	0.94	0.00
7.50	0.76	0.00	0.00	33.50	7.46	0.94	0.00
8.00	0.85	0.00	0.00	34.00	7.46	0.94	0.00
8.50	0.96	0.00	0.00	34.50	7.46	0.94	0.00
9.00	1.09	0.00	0.00	35.00	7.46	0.94	0.00
9.50	1.24	0.00	0.00	35.50	7.46	0.94	0.00
10.00	1.41	0.00	0.00	36.00	7.46	0.94	0.00
10.50	1.62	0.00	0.00				
11.00	1.87	0.00	0.00				
11.50	2.22	0.00	0.00				
12.00	3.73	0.02	<b>0.12</b>				
12.50	5.24	0.25	<b>0.37</b>				
13.00	5.59	0.34	0.18				
13.50	5.84	0.40	0.16				
14.00	6.05	0.46	0.13				
14.50	6.22	0.51	0.12				
15.00	6.37	0.56	0.11				
15.50	6.50	0.60	0.10				
16.00	6.61	0.63	0.08				
16.50	6.70	0.66	0.07				
17.00	6.78	0.69	0.07				
17.50	6.86	0.72	0.06				
18.00	6.92	0.74	0.05				
18.50	6.98	0.76	0.05				
19.00	7.04	0.78	0.05				
19.50	7.09	0.80	0.05				
20.00	7.14	0.82	0.04				
20.50	7.19	0.84	0.04				
21.00	7.23	0.85	0.04				
21.50	7.28	0.87	0.04				
22.00	7.32	0.88	0.04				
22.50	7.36	0.90	0.04				
23.00	7.39	0.91	0.03				
23.50	7.43	0.93	0.03				
24.00	<b>7.46</b>	<b>0.94</b>	0.03				
24.50	7.46	0.94	0.00				
25.00	7.46	0.94	0.00				
25.50	7.46	0.94	0.00				

**Site PRE**

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Type III 24-hr 100yr Rainfall=7.46"

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**Summary for Subcatchment 3S: EX Roadway**

Runoff = 0.89 cfs @ 12.11 hrs, Volume= 0.106 af, Depth= 0.94"  
 Routed to Reach 1R : Willow Branch

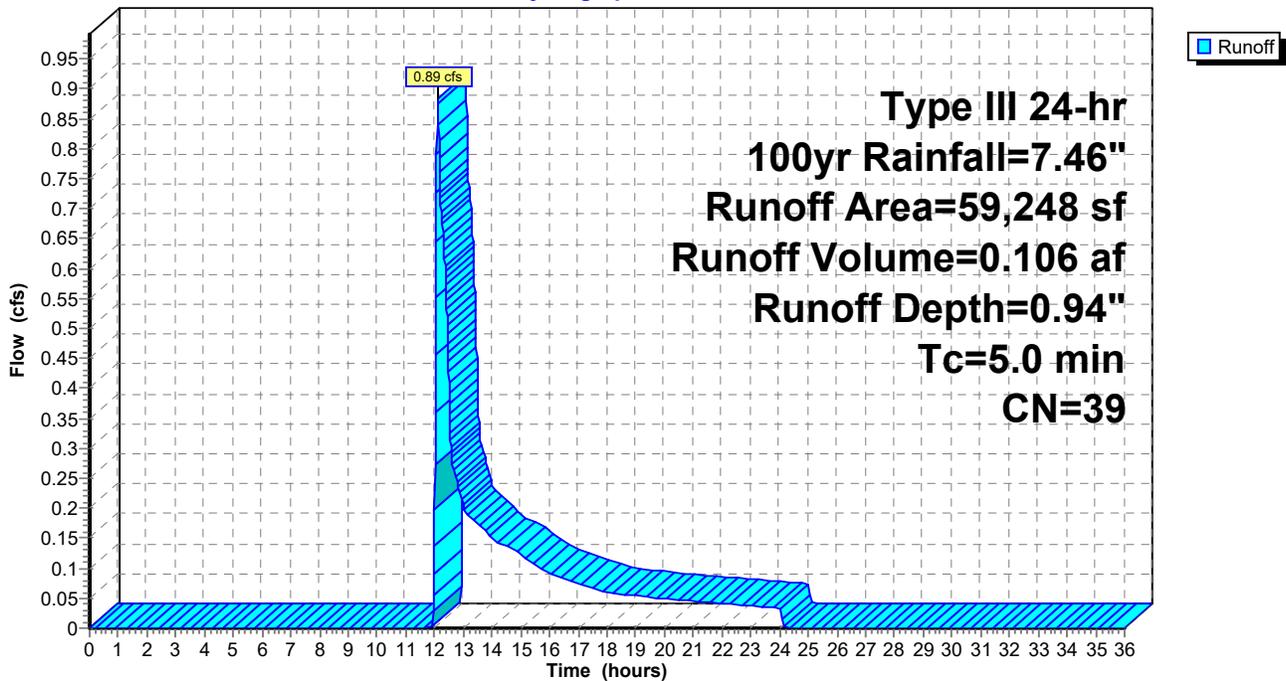
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100yr Rainfall=7.46"

Area (sf)	CN	Description
59,248	39	>75% Grass cover, Good, HSG A
59,248		100.00% Pervious Area

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

**Subcatchment 3S: EX Roadway**

Hydrograph



**Site PRE**

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Type III 24-hr 100yr Rainfall=7.46"

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**Hydrograph for Subcatchment 3S: EX Roadway**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	7.46	0.94	0.00
0.50	0.04	0.00	0.00	26.50	7.46	0.94	0.00
1.00	0.07	0.00	0.00	27.00	7.46	0.94	0.00
1.50	0.11	0.00	0.00	27.50	7.46	0.94	0.00
2.00	0.15	0.00	0.00	28.00	7.46	0.94	0.00
2.50	0.19	0.00	0.00	28.50	7.46	0.94	0.00
3.00	0.23	0.00	0.00	29.00	7.46	0.94	0.00
3.50	0.27	0.00	0.00	29.50	7.46	0.94	0.00
4.00	0.32	0.00	0.00	30.00	7.46	0.94	0.00
4.50	0.37	0.00	0.00	30.50	7.46	0.94	0.00
5.00	0.42	0.00	0.00	31.00	7.46	0.94	0.00
5.50	0.48	0.00	0.00	31.50	7.46	0.94	0.00
6.00	0.54	0.00	0.00	32.00	7.46	0.94	0.00
6.50	0.60	0.00	0.00	32.50	7.46	0.94	0.00
7.00	0.68	0.00	0.00	33.00	7.46	0.94	0.00
7.50	0.76	0.00	0.00	33.50	7.46	0.94	0.00
8.00	0.85	0.00	0.00	34.00	7.46	0.94	0.00
8.50	0.96	0.00	0.00	34.50	7.46	0.94	0.00
9.00	1.09	0.00	0.00	35.00	7.46	0.94	0.00
9.50	1.24	0.00	0.00	35.50	7.46	0.94	0.00
10.00	1.41	0.00	0.00	36.00	7.46	0.94	0.00
10.50	1.62	0.00	0.00				
11.00	1.87	0.00	0.00				
11.50	2.22	0.00	0.00				
12.00	3.73	0.02	<b>0.14</b>				
12.50	5.24	0.25	<b>0.41</b>				
13.00	5.59	0.34	0.20				
13.50	5.84	0.40	0.17				
14.00	6.05	0.46	0.15				
14.50	6.22	0.51	0.14				
15.00	6.37	0.56	0.12				
15.50	6.50	0.60	0.11				
16.00	6.61	0.63	0.09				
16.50	6.70	0.66	0.08				
17.00	6.78	0.69	0.07				
17.50	6.86	0.72	0.07				
18.00	6.92	0.74	0.06				
18.50	6.98	0.76	0.06				
19.00	7.04	0.78	0.05				
19.50	7.09	0.80	0.05				
20.00	7.14	0.82	0.05				
20.50	7.19	0.84	0.05				
21.00	7.23	0.85	0.05				
21.50	7.28	0.87	0.04				
22.00	7.32	0.88	0.04				
22.50	7.36	0.90	0.04				
23.00	7.39	0.91	0.04				
23.50	7.43	0.93	0.04				
24.00	<b>7.46</b>	<b>0.94</b>	0.03				
24.50	7.46	0.94	0.00				
25.00	7.46	0.94	0.00				
25.50	7.46	0.94	0.00				

**Site PRE**

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Type III 24-hr 100yr Rainfall=7.46"

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**Summary for Subcatchment 4S: Wetland Parcel**

Runoff = 0.33 cfs @ 12.11 hrs, Volume= 0.039 af, Depth= 0.94"  
 Routed to Reach 1R : Willow Branch

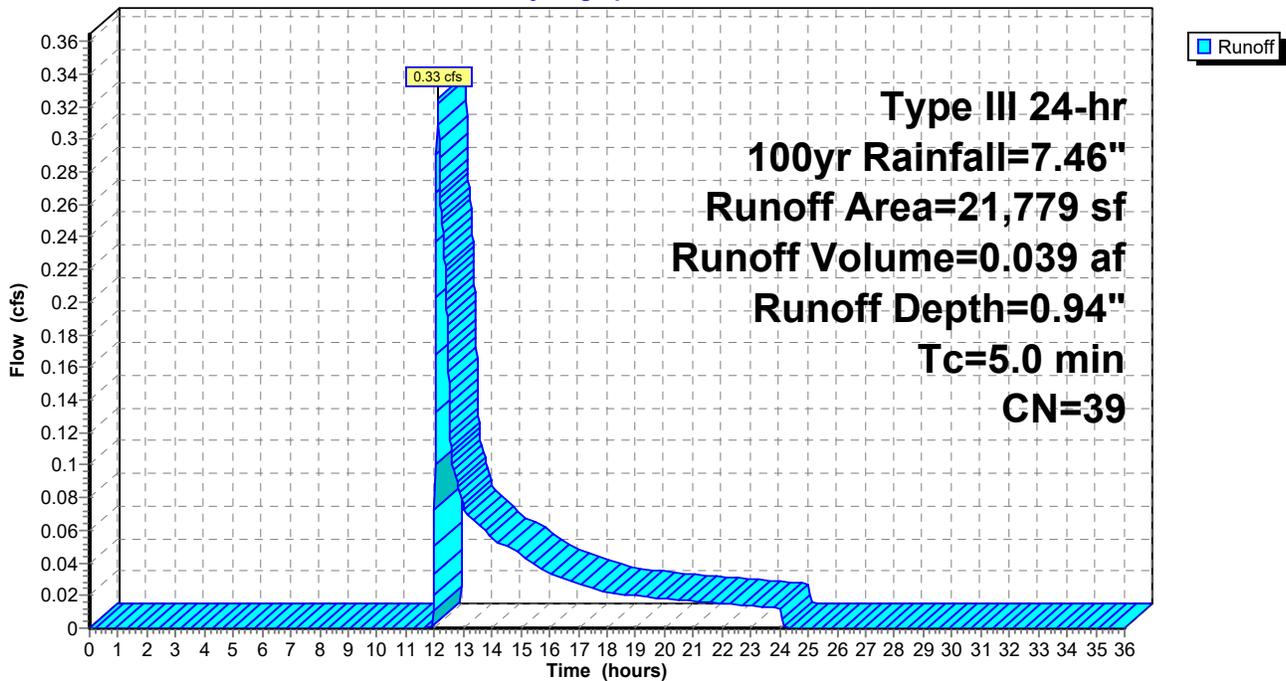
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100yr Rainfall=7.46"

Area (sf)	CN	Description
21,779	39	>75% Grass cover, Good, HSG A
21,779		100.00% Pervious Area

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

**Subcatchment 4S: Wetland Parcel**

Hydrograph



**Site PRE**

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Type III 24-hr 100yr Rainfall=7.46"

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**Hydrograph for Subcatchment 4S: Wetland Parcel**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	26.00	7.46	0.94	0.00
0.50	0.04	0.00	0.00	26.50	7.46	0.94	0.00
1.00	0.07	0.00	0.00	27.00	7.46	0.94	0.00
1.50	0.11	0.00	0.00	27.50	7.46	0.94	0.00
2.00	0.15	0.00	0.00	28.00	7.46	0.94	0.00
2.50	0.19	0.00	0.00	28.50	7.46	0.94	0.00
3.00	0.23	0.00	0.00	29.00	7.46	0.94	0.00
3.50	0.27	0.00	0.00	29.50	7.46	0.94	0.00
4.00	0.32	0.00	0.00	30.00	7.46	0.94	0.00
4.50	0.37	0.00	0.00	30.50	7.46	0.94	0.00
5.00	0.42	0.00	0.00	31.00	7.46	0.94	0.00
5.50	0.48	0.00	0.00	31.50	7.46	0.94	0.00
6.00	0.54	0.00	0.00	32.00	7.46	0.94	0.00
6.50	0.60	0.00	0.00	32.50	7.46	0.94	0.00
7.00	0.68	0.00	0.00	33.00	7.46	0.94	0.00
7.50	0.76	0.00	0.00	33.50	7.46	0.94	0.00
8.00	0.85	0.00	0.00	34.00	7.46	0.94	0.00
8.50	0.96	0.00	0.00	34.50	7.46	0.94	0.00
9.00	1.09	0.00	0.00	35.00	7.46	0.94	0.00
9.50	1.24	0.00	0.00	35.50	7.46	0.94	0.00
10.00	1.41	0.00	0.00	36.00	7.46	0.94	0.00
10.50	1.62	0.00	0.00				
11.00	1.87	0.00	0.00				
11.50	2.22	0.00	0.00				
12.00	3.73	0.02	<b>0.05</b>				
12.50	5.24	0.25	<b>0.15</b>				
13.00	5.59	0.34	0.08				
13.50	5.84	0.40	0.06				
14.00	6.05	0.46	0.06				
14.50	6.22	0.51	0.05				
15.00	6.37	0.56	0.05				
15.50	6.50	0.60	0.04				
16.00	6.61	0.63	0.03				
16.50	6.70	0.66	0.03				
17.00	6.78	0.69	0.03				
17.50	6.86	0.72	0.02				
18.00	6.92	0.74	0.02				
18.50	6.98	0.76	0.02				
19.00	7.04	0.78	0.02				
19.50	7.09	0.80	0.02				
20.00	7.14	0.82	0.02				
20.50	7.19	0.84	0.02				
21.00	7.23	0.85	0.02				
21.50	7.28	0.87	0.02				
22.00	7.32	0.88	0.02				
22.50	7.36	0.90	0.01				
23.00	7.39	0.91	0.01				
23.50	7.43	0.93	0.01				
24.00	<b>7.46</b>	<b>0.94</b>	0.01				
24.50	7.46	0.94	0.00				
25.00	7.46	0.94	0.00				
25.50	7.46	0.94	0.00				

### Summary for Reach 1R: Willow Branch

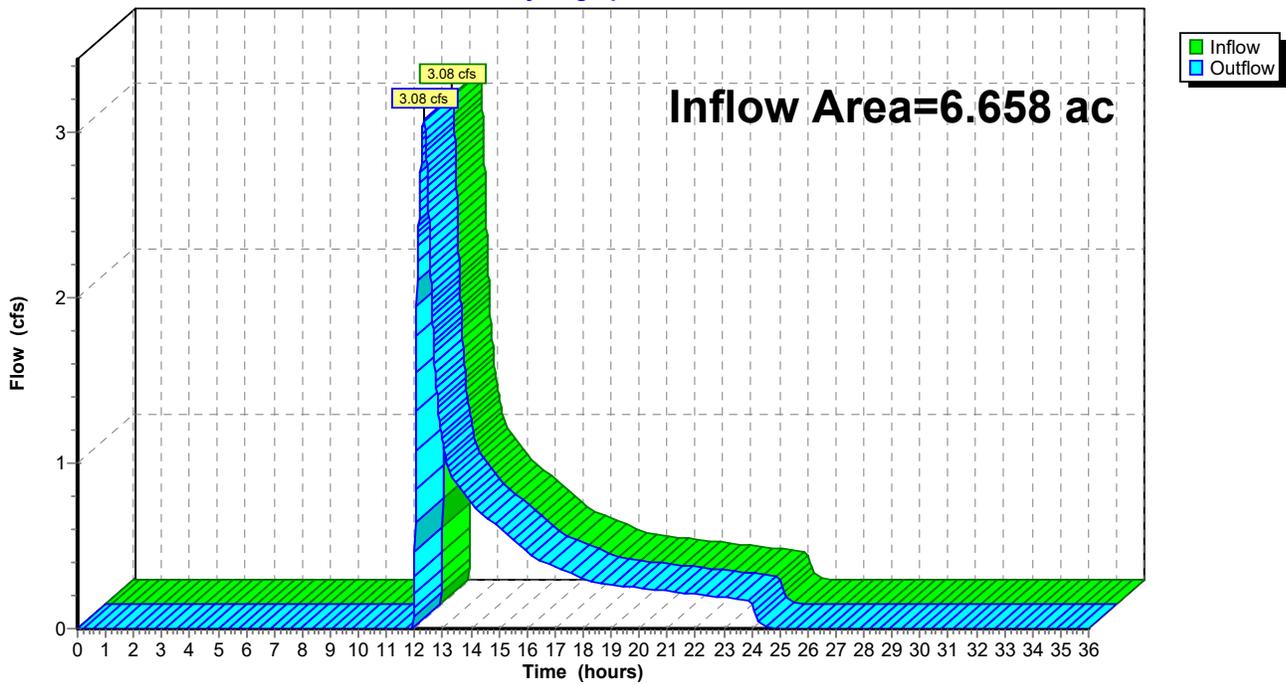
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6.658 ac, 0.00% Impervious, Inflow Depth = 0.94" for 100yr event  
Inflow = 3.08 cfs @ 12.32 hrs, Volume= 0.521 af  
Outflow = 3.08 cfs @ 12.32 hrs, Volume= 0.521 af, Atten= 0%, Lag= 0.0 min

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

### Reach 1R: Willow Branch

Hydrograph



Site PRE

Prepared by VHB, Inc

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Type III 24-hr 100yr Rainfall=7.46"

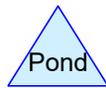
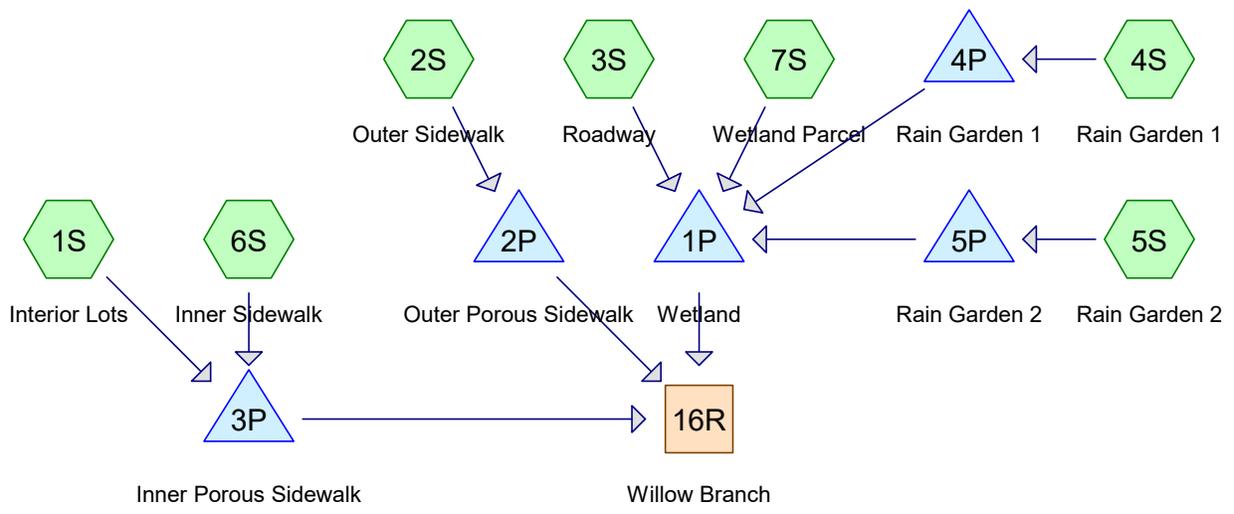
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Hydrograph for Reach 1R: Willow Branch

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	26.00	0.00		0.00
0.50	0.00		0.00	26.50	0.00		0.00
1.00	0.00		0.00	27.00	0.00		0.00
1.50	0.00		0.00	27.50	0.00		0.00
2.00	0.00		0.00	28.00	0.00		0.00
2.50	0.00		0.00	28.50	0.00		0.00
3.00	0.00		0.00	29.00	0.00		0.00
3.50	0.00		0.00	29.50	0.00		0.00
4.00	0.00		0.00	30.00	0.00		0.00
4.50	0.00		0.00	30.50	0.00		0.00
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00				
11.00	0.00		0.00				
11.50	0.00		0.00				
12.00	<b>0.32</b>		<b>0.32</b>				
12.50	<b>2.52</b>		<b>2.52</b>				
13.00	1.12		1.12				
13.50	0.88		0.88				
14.00	0.76		0.76				
14.50	0.68		0.68				
15.00	0.62		0.62				
15.50	0.54		0.54				
16.00	0.46		0.46				
16.50	0.41		0.41				
17.00	0.37		0.37				
17.50	0.34		0.34				
18.00	0.30		0.30				
18.50	0.28		0.28				
19.00	0.27		0.27				
19.50	0.25		0.25				
20.00	0.24		0.24				
20.50	0.23		0.23				
21.00	0.22		0.22				
21.50	0.22		0.22				
22.00	0.21		0.21				
22.50	0.20		0.20				
23.00	0.19		0.19				
23.50	0.18		0.18				
24.00	0.17		0.17				
24.50	0.01		0.01				
25.00	0.00		0.00				
25.50	0.00		0.00				

## HydroCAD Analysis: Proposed Conditions



**Routing Diagram for Site POST**  
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## Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2yr	Type III 24-hr		Default	24.00	1	3.14	2
2	10yr	Type III 24-hr		Default	24.00	1	4.81	2
3	25yr	Type III 24-hr		Default	24.00	1	5.85	2
4	50yr	Type III 24-hr		Default	24.00	1	6.62	2
5	100yr	Type III 24-hr		Default	24.00	1	7.46	2

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## Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.420	39	>75% Grass cover, Good, HSG A (2S, 4S, 5S, 6S, 7S)
3.582	39	Pasture/grassland/range, Good, HSG A (1S)
1.448	98	Paved parking, HSG A (2S, 3S, 6S)
0.208	98	Paved roads w/curbs & sewers, HSG A (4S, 5S)
<b>6.658</b>	<b>54</b>	<b>TOTAL AREA</b>

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**Soil Listing (all nodes)**

Area (acres)	Soil Group	Subcatchment Numbers
6.658	HSG A	1S, 2S, 3S, 4S, 5S, 6S, 7S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
<b>6.658</b>		<b>TOTAL AREA</b>

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**Ground Covers (all nodes)**

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.420	0.000	0.000	0.000	0.000	1.420	>75% Grass cover, Good	2S , 4S , 5S , 6S , 7S
3.582	0.000	0.000	0.000	0.000	3.582	Pasture/grassland/range, Good	1S
1.448	0.000	0.000	0.000	0.000	1.448	Paved parking	2S , 3S , 6S
0.208	0.000	0.000	0.000	0.000	0.208	Paved roads w/curbs & sewers	4S , 5S
<b>6.658</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>6.658</b>	<b>TOTAL AREA</b>	

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**Pipe Listing (all nodes)**

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	1P	243.20	242.95	50.0	0.0050	0.013	0.0	8.0	0.0	

## 2-Year Storm Event – Proposed

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Type III 24-hr 2yr Rainfall=3.14"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: Interior Lots** Runoff Area=156,041 sf 0.00% Impervious Runoff Depth=0.00"  
 Flow Length=587' Tc=18.0 min CN=39 Runoff=0.00 cfs 0.000 af

**Subcatchment 2S: Outer Sidewalk** Runoff Area=31,786 sf 36.00% Impervious Runoff Depth=0.39"  
 Tc=5.0 min CN=60 Runoff=0.19 cfs 0.023 af

**Subcatchment 3S: Roadway** Runoff Area=44,608 sf 100.00% Impervious Runoff Depth=2.91"  
 Flow Length=630' Slope=0.0088 '/' Tc=22.6 min CN=98 Runoff=2.02 cfs 0.248 af

**Subcatchment 4S: Rain Garden 1** Runoff Area=11,158 sf 59.90% Impervious Runoff Depth=1.00"  
 Flow Length=630' Slope=0.0088 '/' Tc=22.6 min CN=74 Runoff=0.18 cfs 0.021 af

**Subcatchment 5S: Rain Garden 2** Runoff Area=3,482 sf 68.47% Impervious Runoff Depth=1.29"  
 Flow Length=630' Slope=0.0088 '/' Tc=22.6 min CN=79 Runoff=0.08 cfs 0.009 af

**Subcatchment 6S: Inner Sidewalk** Runoff Area=21,183 sf 33.14% Impervious Runoff Depth=0.35"  
 Tc=5.0 min CN=59 Runoff=0.10 cfs 0.014 af

**Subcatchment 7S: Wetland Parcel** Runoff Area=21,779 sf 0.00% Impervious Runoff Depth=0.00"  
 Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

**Reach 16R: Willow Branch** Inflow=0.05 cfs 0.103 af  
 Outflow=0.05 cfs 0.103 af

**Pond 1P: Wetland** Peak Elev=245.64' Storage=8,565 cf Inflow=2.02 cfs 0.248 af  
 Outflow=0.05 cfs 0.103 af

**Pond 2P: Outer Porous Sidewalk** Peak Elev=247.51' Storage=14 cf Inflow=0.19 cfs 0.023 af  
 Discarded=0.18 cfs 0.023 af Primary=0.00 cfs 0.000 af Outflow=0.18 cfs 0.023 af

**Pond 3P: Inner Porous Sidewalk** Peak Elev=247.50' Storage=8 cf Inflow=0.10 cfs 0.014 af  
 Discarded=0.10 cfs 0.014 af Primary=0.00 cfs 0.000 af Outflow=0.10 cfs 0.014 af

**Pond 4P: Rain Garden 1** Peak Elev=248.03' Storage=38 cf Inflow=0.18 cfs 0.021 af  
 Discarded=0.15 cfs 0.021 af Primary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.021 af

**Pond 5P: Rain Garden 2** Peak Elev=250.82' Storage=27 cf Inflow=0.08 cfs 0.009 af  
 Discarded=0.05 cfs 0.009 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.009 af

**Total Runoff Area = 6.658 ac Runoff Volume = 0.316 af Average Runoff Depth = 0.57"**  
**75.13% Pervious = 5.002 ac 24.87% Impervious = 1.656 ac**

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Type III 24-hr 2yr Rainfall=3.14"

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**Summary for Subcatchment 1S: Interior Lots**

Runoff from this area will be managed by individual lot developers.

Runoff = 0.00 cfs @ 24.13 hrs, Volume= 0.000 af, Depth= 0.00"  
 Routed to Pond 3P : Inner Porous Sidewalk

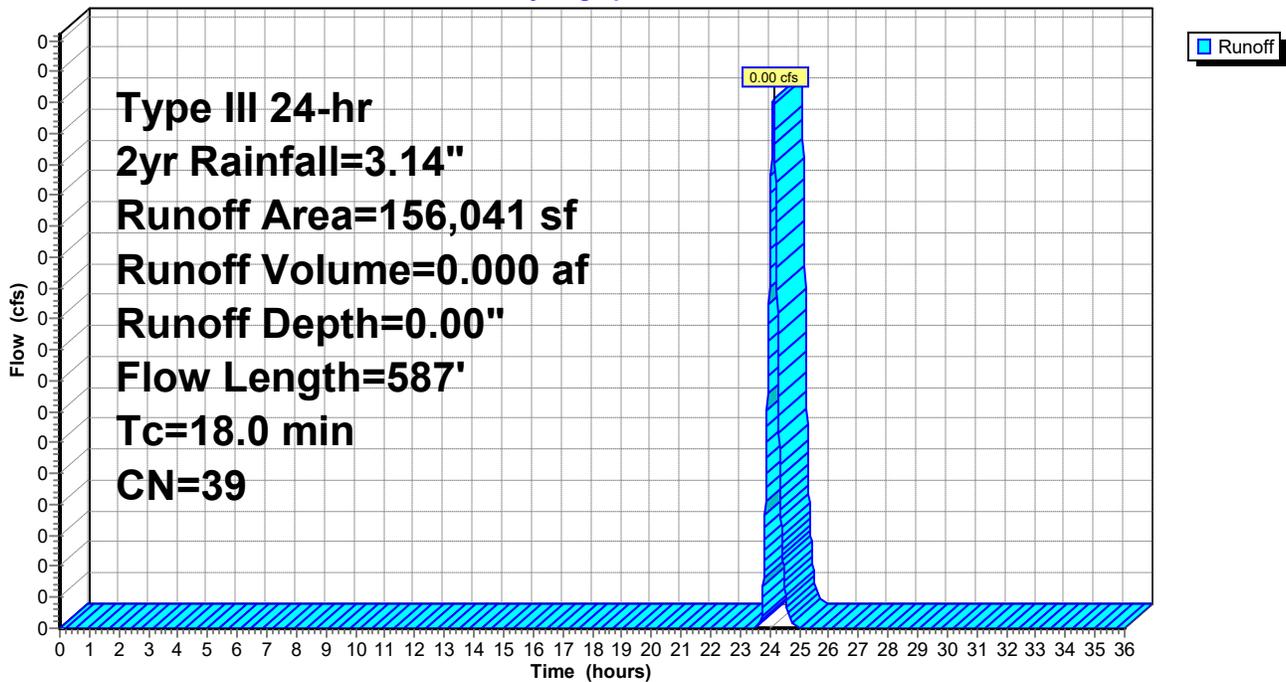
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2yr Rainfall=3.14"

Area (sf)	CN	Description
156,041	39	Pasture/grassland/range, Good, HSG A
156,041		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0560	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.2	537	0.0081	0.63		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
18.0	587	Total			

**Subcatchment 1S: Interior Lots**

Hydrograph



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Type III 24-hr 2yr Rainfall=3.14"

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**Summary for Subcatchment 2S: Outer Sidewalk**

Runoff = 0.19 cfs @ 12.12 hrs, Volume= 0.023 af, Depth= 0.39"  
 Routed to Pond 2P : Outer Porous Sidewalk

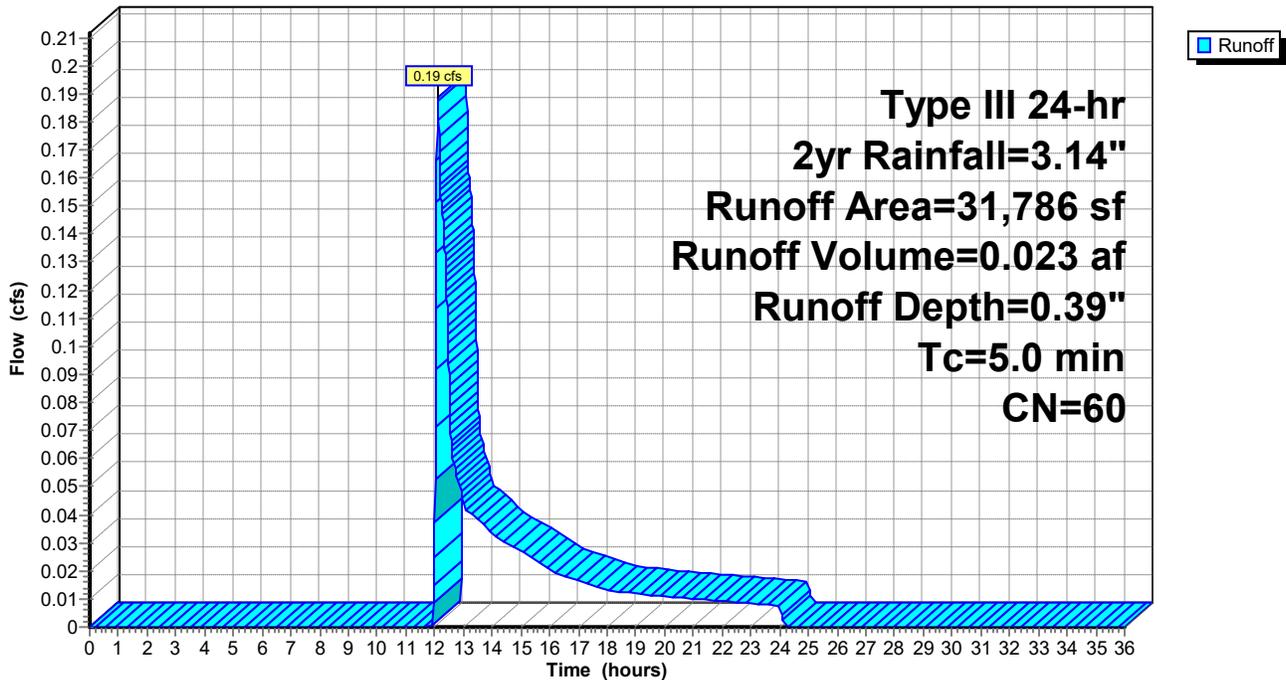
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2yr Rainfall=3.14"

Area (sf)	CN	Description
20,343	39	>75% Grass cover, Good, HSG A
11,443	98	Paved parking, HSG A
31,786	60	Weighted Average
20,343		64.00% Pervious Area
11,443		36.00% Impervious Area

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

**Subcatchment 2S: Outer Sidewalk**

Hydrograph



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Type III 24-hr 2yr Rainfall=3.14"

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**Summary for Subcatchment 3S: Roadway**

Runoff = 2.02 cfs @ 12.29 hrs, Volume= 0.248 af, Depth= 2.91"  
 Routed to Pond 1P : Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2yr Rainfall=3.14"

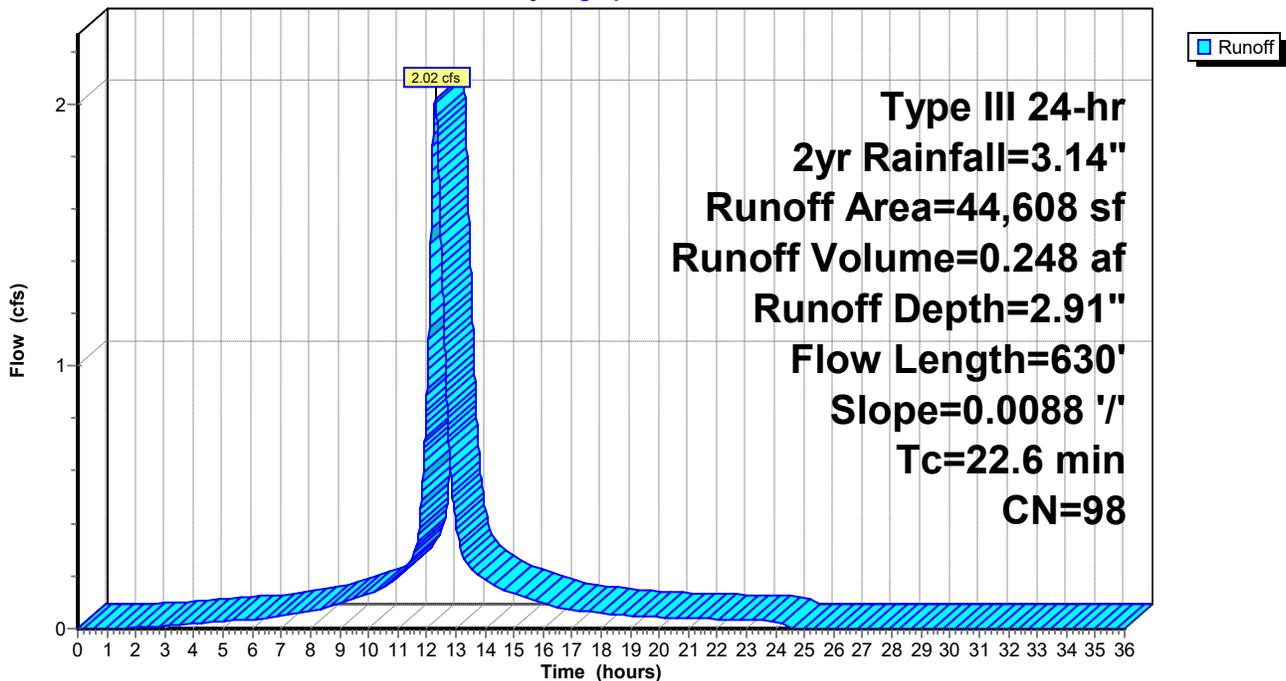
Area (sf)	CN	Description
44,608	98	Paved parking, HSG A
44,608		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0088	0.11		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.7	580	0.0088	0.66		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.6	630	Total			

**Subcatchment 3S: Roadway**

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Type III 24-hr 2yr Rainfall=3.14"

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**Summary for Subcatchment 4S: Rain Garden 1**

Runoff = 0.18 cfs @ 12.33 hrs, Volume= 0.021 af, Depth= 1.00"  
 Routed to Pond 4P : Rain Garden 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2yr Rainfall=3.14"

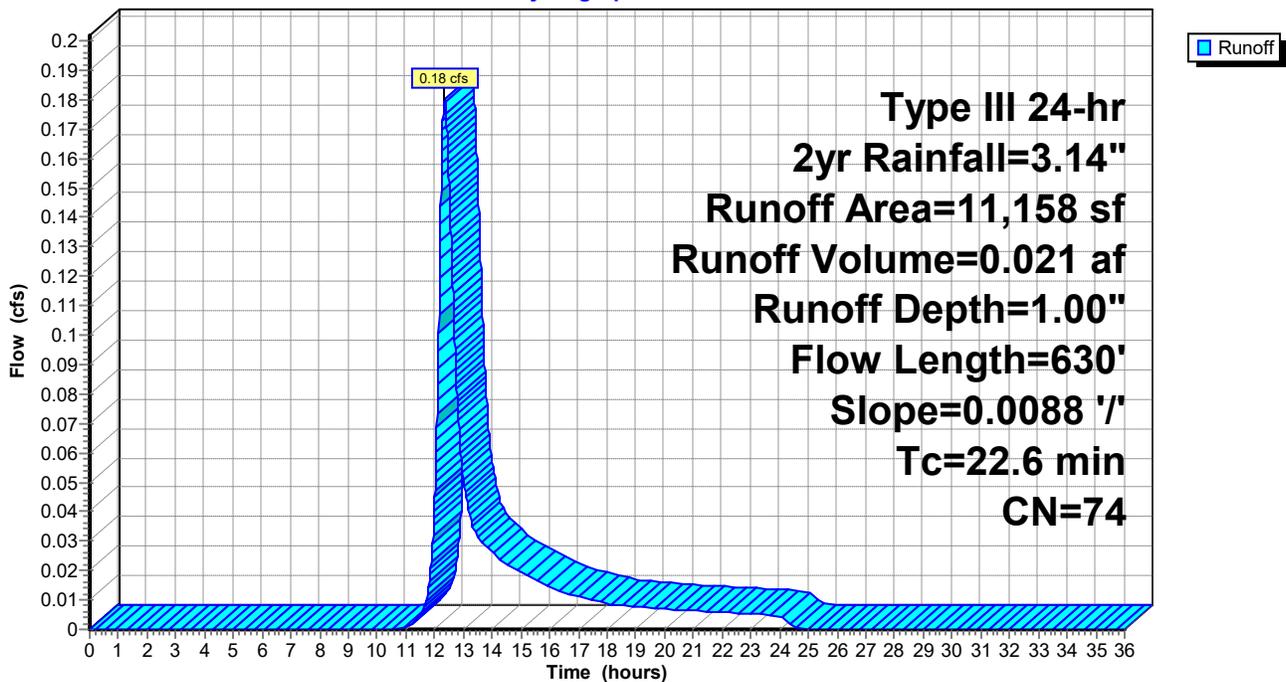
Area (sf)	CN	Description
4,474	39	>75% Grass cover, Good, HSG A
6,684	98	Paved roads w/curbs & sewers, HSG A
11,158	74	Weighted Average
4,474		40.10% Pervious Area
6,684		59.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0088	0.11		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.7	580	0.0088	0.66		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.6	630	Total			

**Subcatchment 4S: Rain Garden 1**

Hydrograph



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Type III 24-hr 2yr Rainfall=3.14"

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**Summary for Subcatchment 5S: Rain Garden 2**

Runoff = 0.08 cfs @ 12.33 hrs, Volume= 0.009 af, Depth= 1.29"  
 Routed to Pond 5P : Rain Garden 2

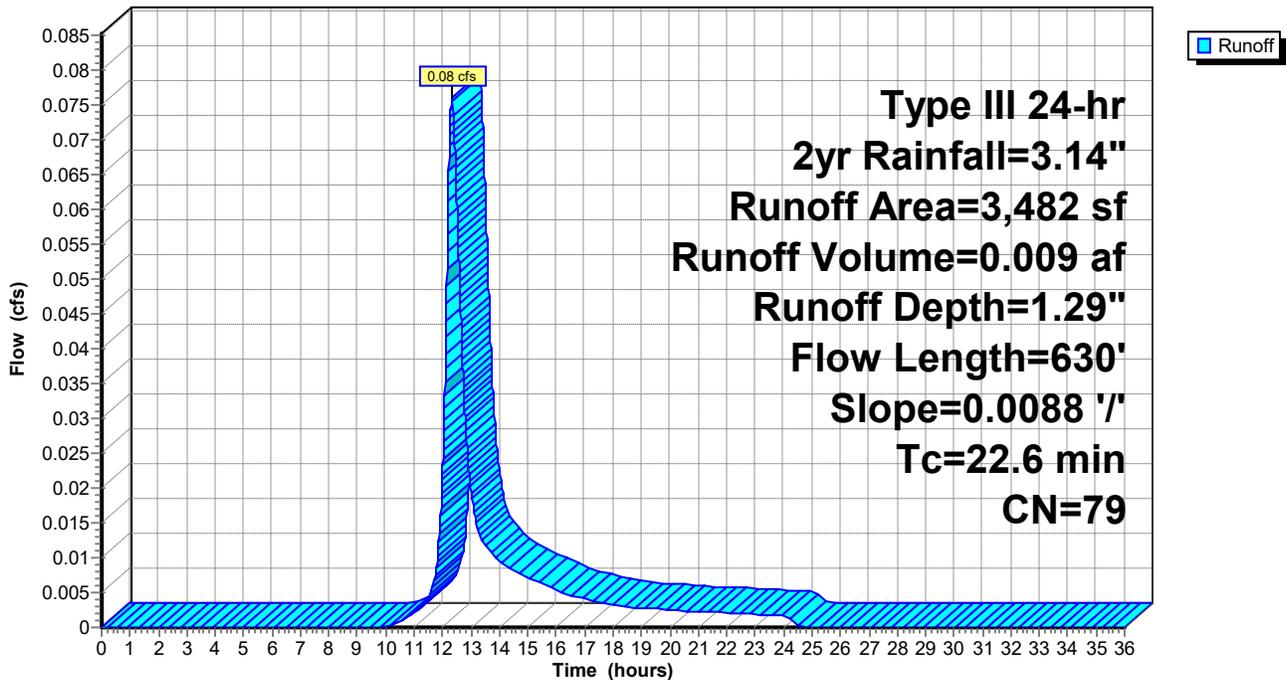
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2yr Rainfall=3.14"

Area (sf)	CN	Description
1,098	39	>75% Grass cover, Good, HSG A
2,384	98	Paved roads w/curbs & sewers, HSG A
3,482	79	Weighted Average
1,098		31.53% Pervious Area
2,384		68.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0088	0.11		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.7	580	0.0088	0.66		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.6	630	Total			

**Subcatchment 5S: Rain Garden 2**

Hydrograph



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Type III 24-hr 2yr Rainfall=3.14"

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**Summary for Subcatchment 6S: Inner Sidewalk**

Runoff = 0.10 cfs @ 12.12 hrs, Volume= 0.014 af, Depth= 0.35"  
 Routed to Pond 3P : Inner Porous Sidewalk

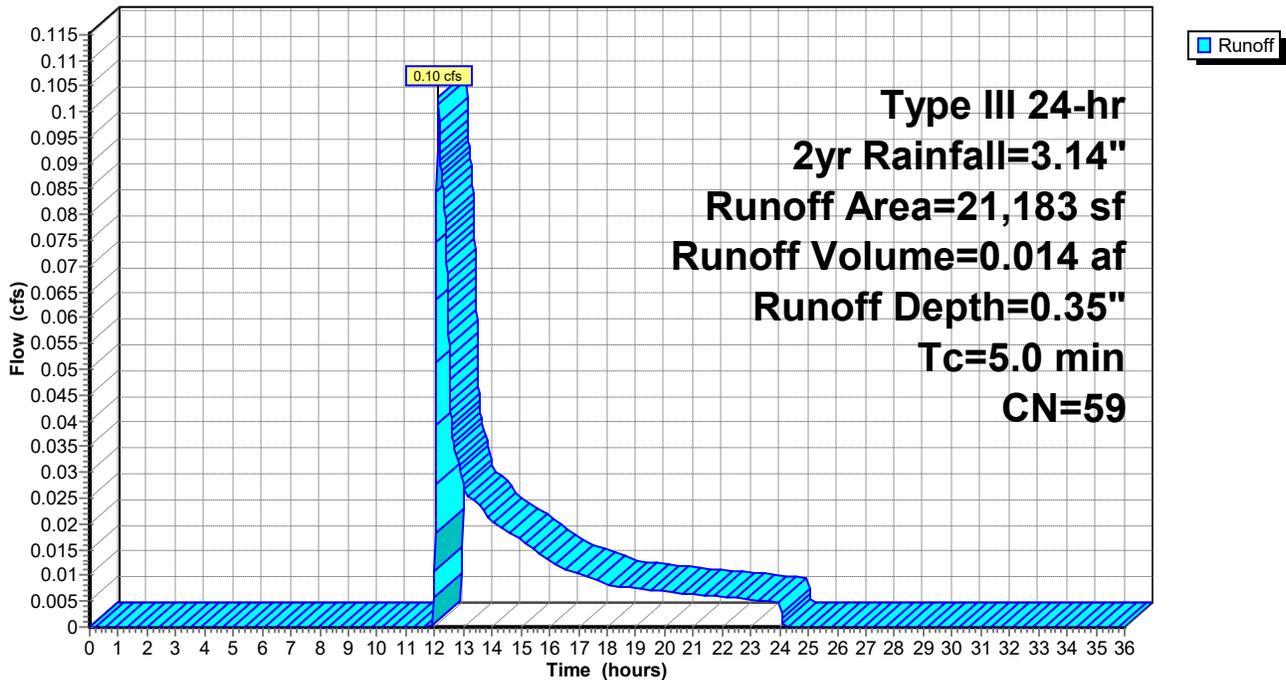
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2yr Rainfall=3.14"

Area (sf)	CN	Description
14,163	39	>75% Grass cover, Good, HSG A
7,020	98	Paved parking, HSG A
21,183	59	Weighted Average
14,163		66.86% Pervious Area
7,020		33.14% Impervious Area

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

**Subcatchment 6S: Inner Sidewalk**

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**Summary for Subcatchment 7S: Wetland Parcel**

Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"  
Routed to Pond 1P : Wetland

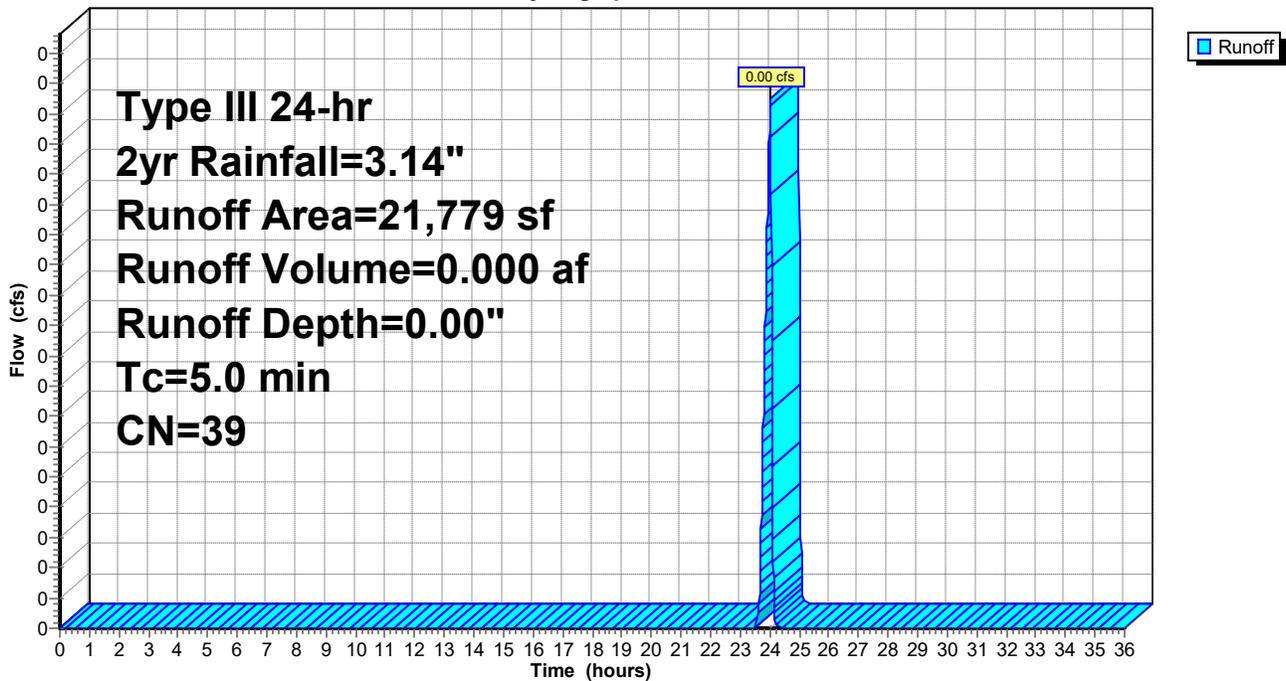
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2yr Rainfall=3.14"

Area (sf)	CN	Description
21,779	39	>75% Grass cover, Good, HSG A
21,779		100.00% Pervious Area

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

**Subcatchment 7S: Wetland Parcel**

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**Summary for Reach 16R: Willow Branch**

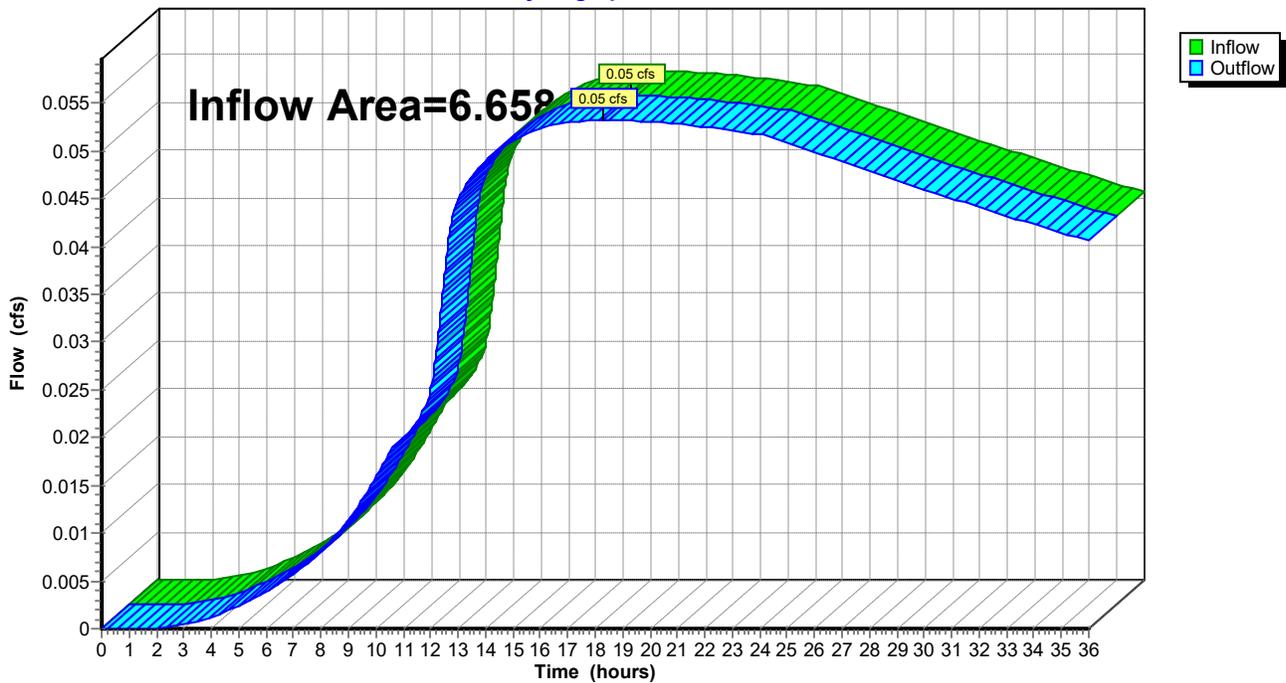
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6.658 ac, 24.87% Impervious, Inflow Depth > 0.18" for 2yr event  
Inflow = 0.05 cfs @ 18.27 hrs, Volume= 0.103 af  
Outflow = 0.05 cfs @ 18.27 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min

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

**Reach 16R: Willow Branch**

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**Summary for Pond 1P: Wetland**

Inflow Area = 1.860 ac, 66.24% Impervious, Inflow Depth = 1.60" for 2yr event  
 Inflow = 2.02 cfs @ 12.29 hrs, Volume= 0.248 af  
 Outflow = 0.05 cfs @ 18.27 hrs, Volume= 0.103 af, Atten= 97%, Lag= 359.0 min  
 Primary = 0.05 cfs @ 18.27 hrs, Volume= 0.103 af  
 Routed to Reach 16R : Willow Branch

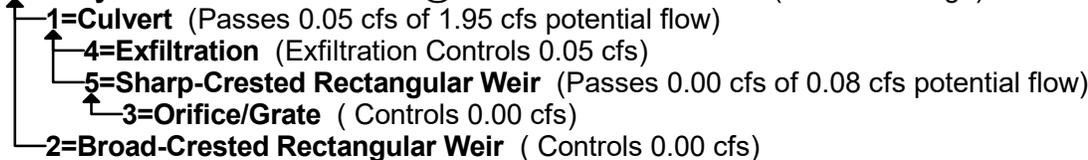
Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 245.64' @ 18.27 hrs Surf.Area= 5,261 sf Storage= 8,565 cf  
 Flood Elev= 250.00' Surf.Area= 10,271 sf Storage= 41,797 cf

Plug-Flow detention time= 740.0 min calculated for 0.103 af (41% of inflow)  
 Center-of-Mass det. time= 594.9 min ( 1,367.1 - 772.2 )

Volume	Invert	Avail.Storage	Storage Description			
#1	243.50'	41,797 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
243.50	2,383	303.0	0	0	2,383	
244.00	3,300	319.0	1,415	1,415	3,190	
245.00	4,662	331.0	3,961	5,376	3,891	
250.00	10,271	441.0	36,421	41,797	10,919	

Device	Routing	Invert	Outlet Devices
#0	Primary	250.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Primary	243.20'	<b>8.0" Round Culvert</b> L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 243.20' / 242.95' S= 0.0050 '/ Cc= 0.900 n= 0.013 Concrete sewer w/manholes & inlets, Flow Area= 0.35 sf
#2	Primary	248.00'	<b>2.0' long + 3.0 ' SideZ x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Device 5	246.55'	<b>1.5" x 1.5" Horiz. Orifice/Grate X 10.00 columns</b> X 10 rows C= 0.600 in 24.0" x 24.0" Grate (39% open area) Limited to weir flow at low heads
#4	Device 1	243.50'	<b>1.000 in/hr Exfiltration over Wetted area above 243.50'</b> Excluded Wetted area = 2,383 sf
#5	Device 1	245.50'	<b>0.5' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Primary OutFlow** Max=0.05 cfs @ 18.27 hrs HW=245.64' (Free Discharge)



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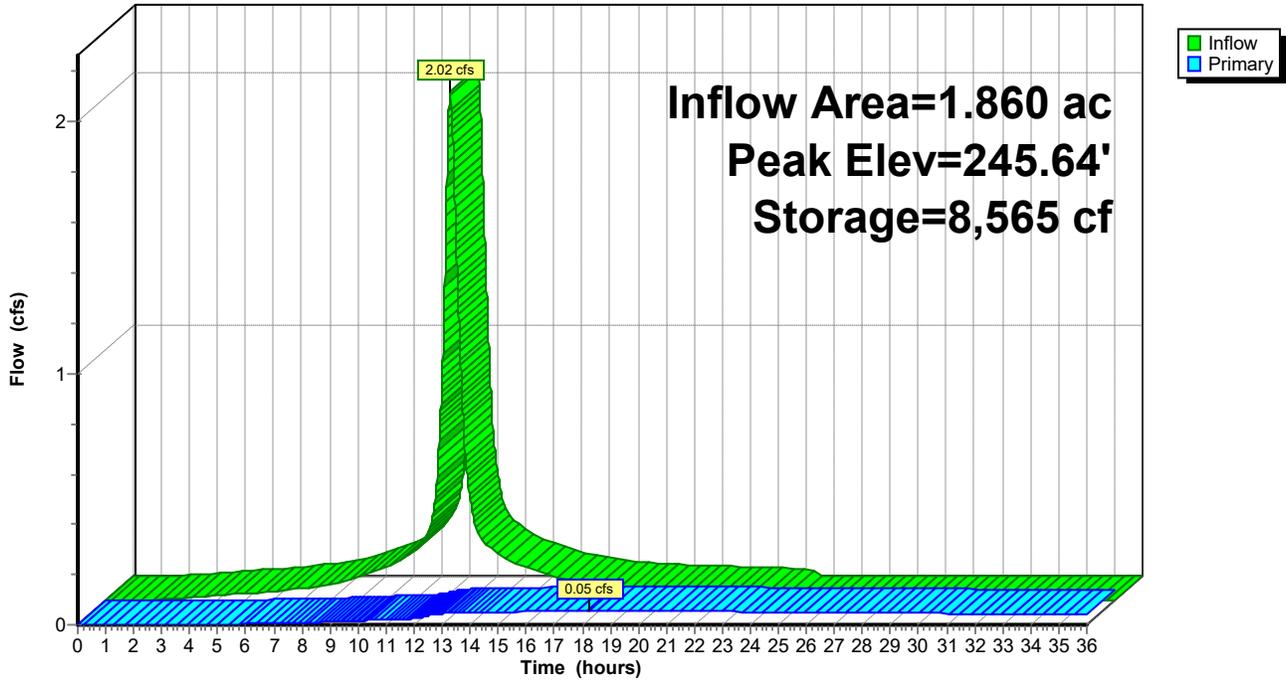
Type III 24-hr 2yr Rainfall=3.14"

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**Pond 1P: Wetland**

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Type III 24-hr 2yr Rainfall=3.14"

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**Summary for Pond 2P: Outer Porous Sidewalk**

Inflow Area = 0.730 ac, 36.00% Impervious, Inflow Depth = 0.39" for 2yr event  
 Inflow = 0.19 cfs @ 12.12 hrs, Volume= 0.023 af  
 Outflow = 0.18 cfs @ 12.14 hrs, Volume= 0.023 af, Atten= 4%, Lag= 1.4 min  
 Discarded = 0.18 cfs @ 12.14 hrs, Volume= 0.023 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Reach 16R : Willow Branch

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 247.51' @ 12.14 hrs Surf.Area= 5,972 sf Storage= 14 cf  
 Flood Elev= 250.00' Surf.Area= 5,972 sf Storage= 3,583 cf

Plug-Flow detention time= 1.3 min calculated for 0.023 af (100% of inflow)  
 Center-of-Mass det. time= 1.3 min ( 923.4 - 922.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	247.50'	3,583 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 8,958 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
247.50	5,972	0	0
249.00	5,972	8,958	8,958

Device	Routing	Invert	Outlet Devices
#0	Primary	249.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	247.50'	<b>5.670 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.78 cfs @ 12.14 hrs HW=247.51' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.78 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=247.50' (Free Discharge)

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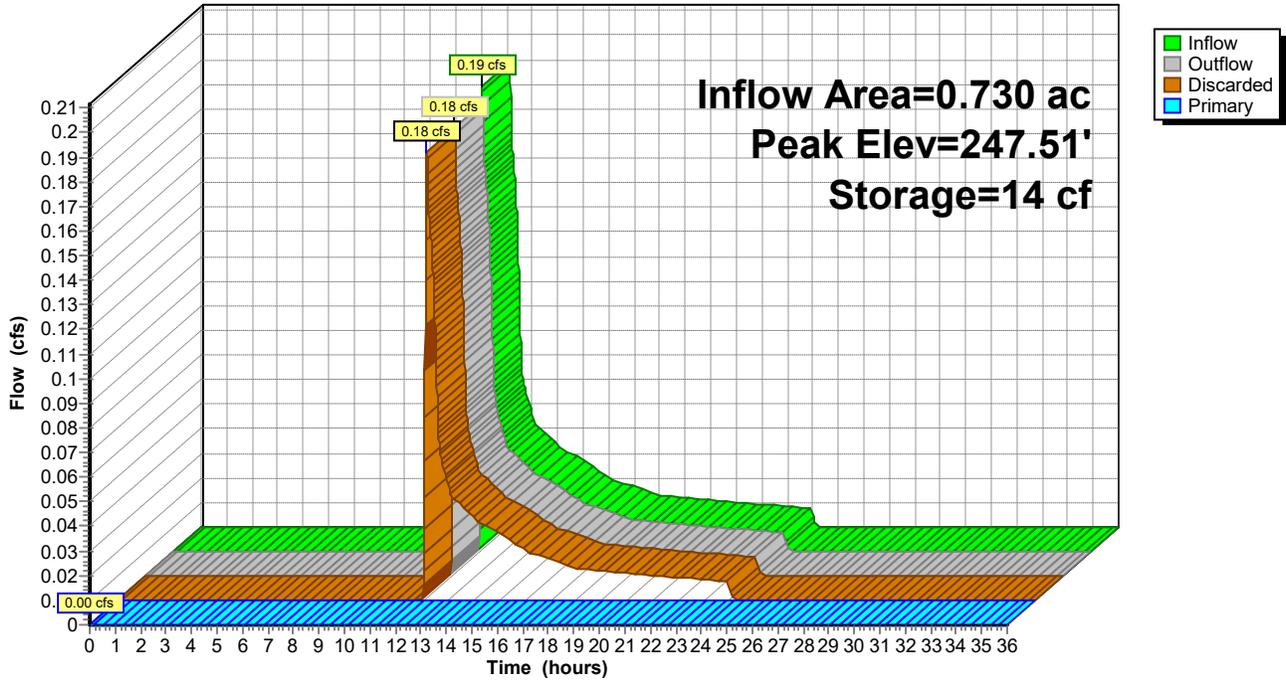
Type III 24-hr 2yr Rainfall=3.14"

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**Pond 2P: Outer Porous Sidewalk**

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**Summary for Pond 3P: Inner Porous Sidewalk**

Inflow Area = 4.069 ac, 3.96% Impervious, Inflow Depth = 0.04" for 2yr event  
 Inflow = 0.10 cfs @ 12.12 hrs, Volume= 0.014 af  
 Outflow = 0.10 cfs @ 12.15 hrs, Volume= 0.014 af, Atten= 4%, Lag= 1.5 min  
 Discarded = 0.10 cfs @ 12.15 hrs, Volume= 0.014 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Reach 16R : Willow Branch

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 247.50' @ 12.15 hrs Surf.Area= 8,398 sf Storage= 8 cf  
 Flood Elev= 250.00' Surf.Area= 8,398 sf Storage= 5,039 cf

Plug-Flow detention time= 1.3 min calculated for 0.014 af (100% of inflow)  
 Center-of-Mass det. time= 1.3 min ( 929.7 - 928.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	247.50'	5,039 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 12,597 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
247.50	8,398	0	0
249.00	8,398	12,597	12,597

Device	Routing	Invert	Outlet Devices
#0	Primary	249.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	247.50'	<b>5.670 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=1.10 cfs @ 12.15 hrs HW=247.50' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 1.10 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=247.50' (Free Discharge)

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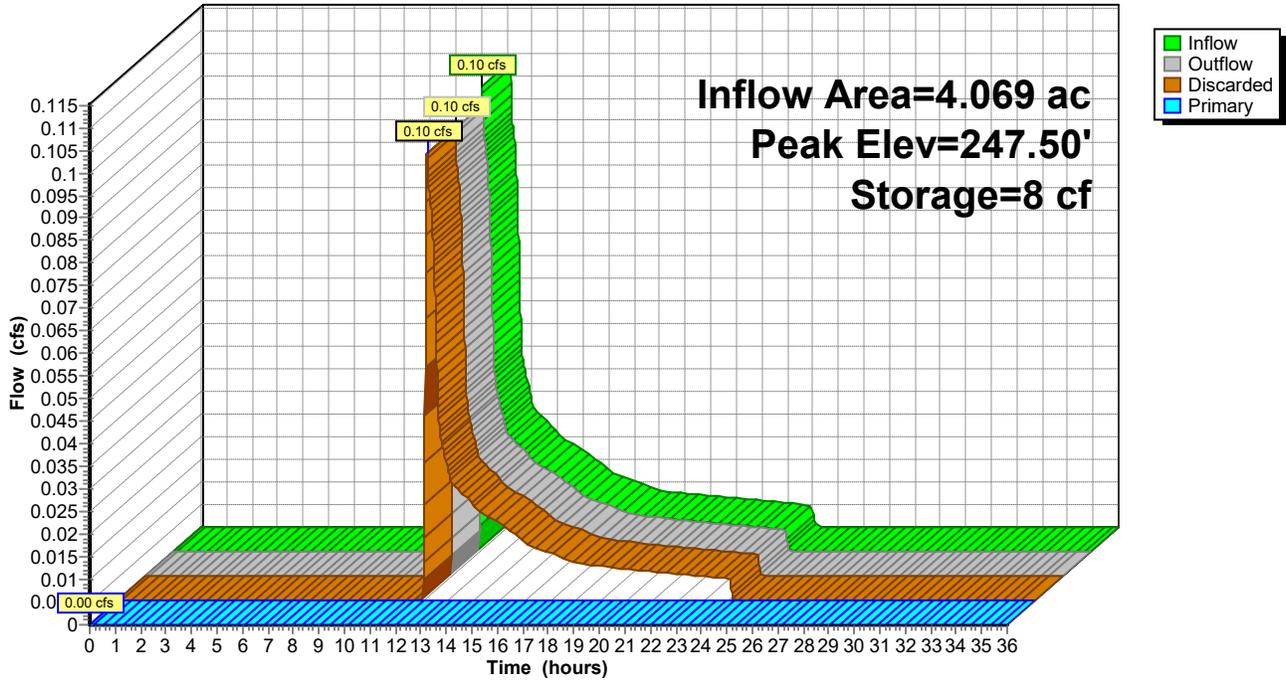
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**Pond 3P: Inner Porous Sidewalk**

Hydrograph



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**Summary for Pond 4P: Rain Garden 1**

Inflow Area = 0.256 ac, 59.90% Impervious, Inflow Depth = 1.00" for 2yr event  
 Inflow = 0.18 cfs @ 12.33 hrs, Volume= 0.021 af  
 Outflow = 0.15 cfs @ 12.50 hrs, Volume= 0.021 af, Atten= 17%, Lag= 10.2 min  
 Discarded = 0.15 cfs @ 12.50 hrs, Volume= 0.021 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Pond 1P : Wetland

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 248.03' @ 12.50 hrs Surf.Area= 1,144 sf Storage= 38 cf  
 Flood Elev= 249.70' Surf.Area= 4,011 sf Storage= 4,222 cf

Plug-Flow detention time= 2.5 min calculated for 0.021 af (100% of inflow)  
 Center-of-Mass det. time= 2.5 min ( 881.2 - 878.7 )

Volume	Invert	Avail.Storage	Storage Description			
#1	248.00'	4,222 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
248.00	1,100	551.0	0.0	0	0	1,100
249.20	3,139	576.0	100.0	2,439	2,439	3,442
249.70	4,011	586.0	100.0	1,783	4,222	4,411

Device	Routing	Invert	Outlet Devices
#0	Primary	249.70'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	248.00'	<b>5.670 in/hr Exfiltration over Surface area</b>
#2	Primary	248.50'	<b>1.5" x 1.5" Horiz. Orifice/Grate X 10.00 columns</b> X 20 rows C= 0.600 in 24.0" x 48.0" Grate (39% open area) Limited to weir flow at low heads

**Discarded OutFlow** Max=0.15 cfs @ 12.50 hrs HW=248.03' (Free Discharge)  
 ↑1=**Exfiltration** (Exfiltration Controls 0.15 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=248.00' (Free Discharge)  
 ↑2=**Orifice/Grate** ( Controls 0.00 cfs)

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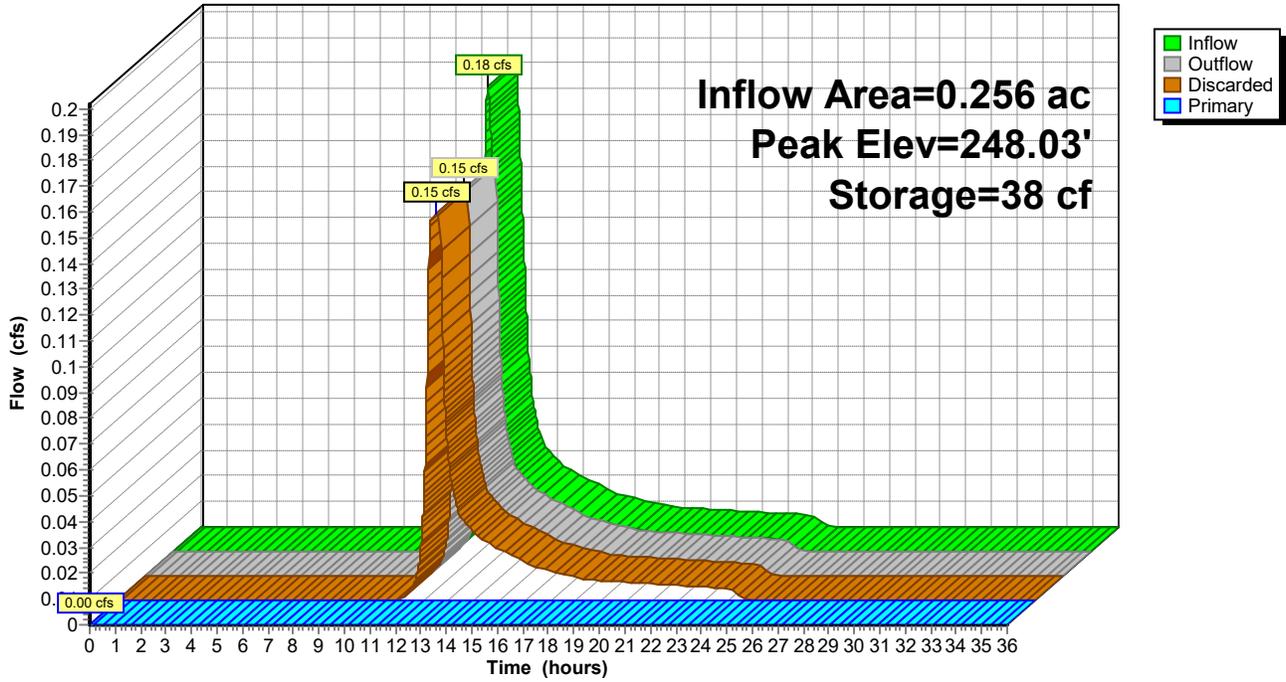
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**Pond 4P: Rain Garden 1**

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**Summary for Pond 5P: Rain Garden 2**

Inflow Area = 0.080 ac, 68.47% Impervious, Inflow Depth = 1.29" for 2yr event  
 Inflow = 0.08 cfs @ 12.33 hrs, Volume= 0.009 af  
 Outflow = 0.05 cfs @ 12.57 hrs, Volume= 0.009 af, Atten= 30%, Lag= 14.7 min  
 Discarded = 0.05 cfs @ 12.57 hrs, Volume= 0.009 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Pond 1P : Wetland

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 250.82' @ 12.57 hrs Surf.Area= 403 sf Storage= 27 cf  
 Flood Elev= 252.00' Surf.Area= 865 sf Storage= 757 cf

Plug-Flow detention time= 3.2 min calculated for 0.009 af (100% of inflow)  
 Center-of-Mass det. time= 3.2 min ( 865.5 - 862.4 )

Volume	Invert	Avail.Storage	Storage Description			
#1	250.75'	757 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
250.75	382	101.0	0.0	0	0	382
251.00	460	106.0	100.0	105	105	468
252.00	865	127.0	100.0	652	757	875

Device	Routing	Invert	Outlet Devices
#0	Primary	252.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	250.75'	<b>5.670 in/hr Exfiltration over Surface area</b>
#2	Primary	251.25'	<b>1.5" x 1.5" Horiz. Orifice/Grate X 10.00 columns</b> X 20 rows C= 0.600 in 24.0" x 48.0" Grate (39% open area) Limited to weir flow at low heads

**Discarded OutFlow** Max=0.05 cfs @ 12.57 hrs HW=250.82' (Free Discharge)  
 ↑1=**Exfiltration** (Exfiltration Controls 0.05 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=250.75' (Free Discharge)  
 ↑2=**Orifice/Grate** ( Controls 0.00 cfs)

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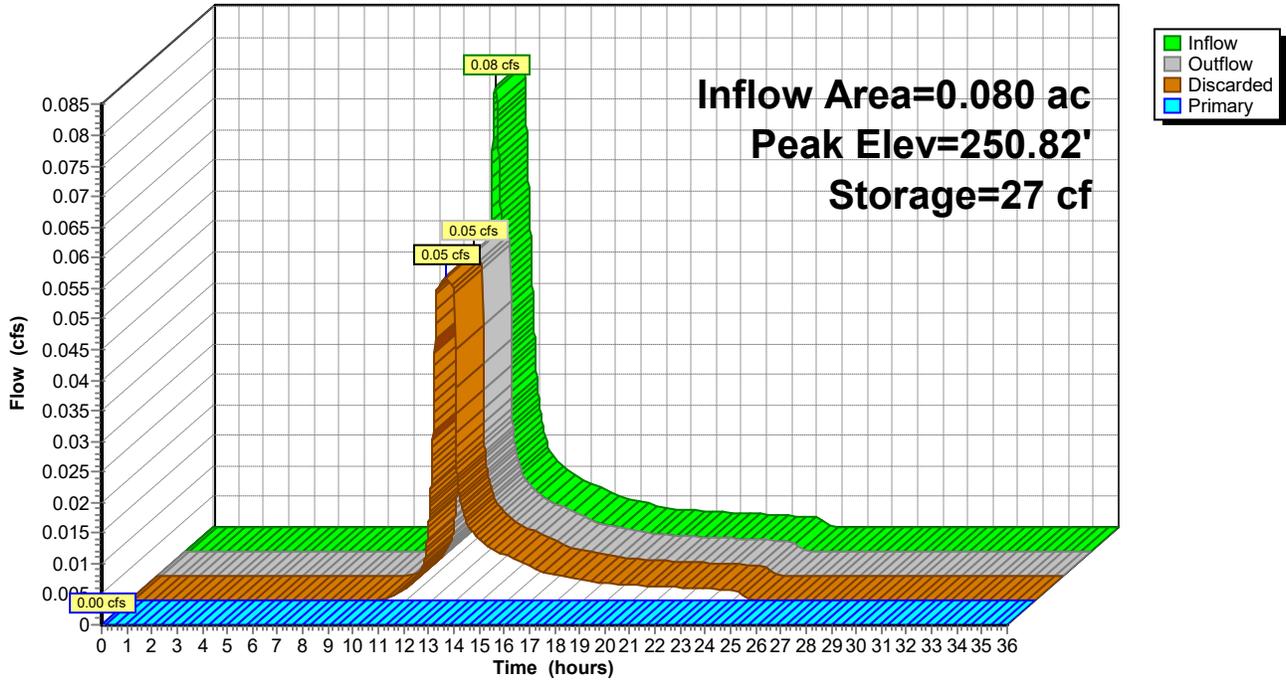
Type III 24-hr 2yr Rainfall=3.14"

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**Pond 5P: Rain Garden 2**

Hydrograph



## 10-Year Storm Event – Proposed

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Type III 24-hr 10yr Rainfall=4.81"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: Interior Lots** Runoff Area=156,041 sf 0.00% Impervious Runoff Depth=0.16"  
 Flow Length=587' Tc=18.0 min CN=39 Runoff=0.08 cfs 0.049 af

**Subcatchment 2S: Outer Sidewalk** Runoff Area=31,786 sf 36.00% Impervious Runoff Depth=1.19"  
 Tc=5.0 min CN=60 Runoff=0.93 cfs 0.072 af

**Subcatchment 3S: Roadway** Runoff Area=44,608 sf 100.00% Impervious Runoff Depth=4.57"  
 Flow Length=630' Slope=0.0088 '/' Tc=22.6 min CN=98 Runoff=3.13 cfs 0.390 af

**Subcatchment 4S: Rain Garden 1** Runoff Area=11,158 sf 59.90% Impervious Runoff Depth=2.21"  
 Flow Length=630' Slope=0.0088 '/' Tc=22.6 min CN=74 Runoff=0.42 cfs 0.047 af

**Subcatchment 5S: Rain Garden 2** Runoff Area=3,482 sf 68.47% Impervious Runoff Depth=2.64"  
 Flow Length=630' Slope=0.0088 '/' Tc=22.6 min CN=79 Runoff=0.16 cfs 0.018 af

**Subcatchment 6S: Inner Sidewalk** Runoff Area=21,183 sf 33.14% Impervious Runoff Depth=1.13"  
 Tc=5.0 min CN=59 Runoff=0.58 cfs 0.046 af

**Subcatchment 7S: Wetland Parcel** Runoff Area=21,779 sf 0.00% Impervious Runoff Depth=0.16"  
 Tc=5.0 min CN=39 Runoff=0.01 cfs 0.007 af

**Reach 16R: Willow Branch** Inflow=0.09 cfs 0.158 af  
 Outflow=0.09 cfs 0.158 af

**Pond 1P: Wetland** Peak Elev=246.55' Storage=13,767 cf Inflow=3.13 cfs 0.397 af  
 Outflow=0.09 cfs 0.158 af

**Pond 2P: Outer Porous Sidewalk** Peak Elev=247.54' Storage=87 cf Inflow=0.93 cfs 0.072 af  
 Discarded=0.78 cfs 0.072 af Primary=0.00 cfs 0.000 af Outflow=0.78 cfs 0.072 af

**Pond 3P: Inner Porous Sidewalk** Peak Elev=247.51' Storage=42 cf Inflow=0.58 cfs 0.094 af  
 Discarded=0.56 cfs 0.094 af Primary=0.00 cfs 0.000 af Outflow=0.56 cfs 0.094 af

**Pond 4P: Rain Garden 1** Peak Elev=248.28' Storage=365 cf Inflow=0.42 cfs 0.047 af  
 Discarded=0.20 cfs 0.047 af Primary=0.00 cfs 0.000 af Outflow=0.20 cfs 0.047 af

**Pond 5P: Rain Garden 2** Peak Elev=251.10' Storage=152 cf Inflow=0.16 cfs 0.018 af  
 Discarded=0.06 cfs 0.018 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.018 af

**Total Runoff Area = 6.658 ac Runoff Volume = 0.629 af Average Runoff Depth = 1.13"**  
**75.13% Pervious = 5.002 ac 24.87% Impervious = 1.656 ac**

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Type III 24-hr 10yr Rainfall=4.81"

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**Summary for Subcatchment 1S: Interior Lots**

Runoff from this area will be managed by individual lot developers.

Runoff = 0.08 cfs @ 13.86 hrs, Volume= 0.049 af, Depth= 0.16"  
 Routed to Pond 3P : Inner Porous Sidewalk

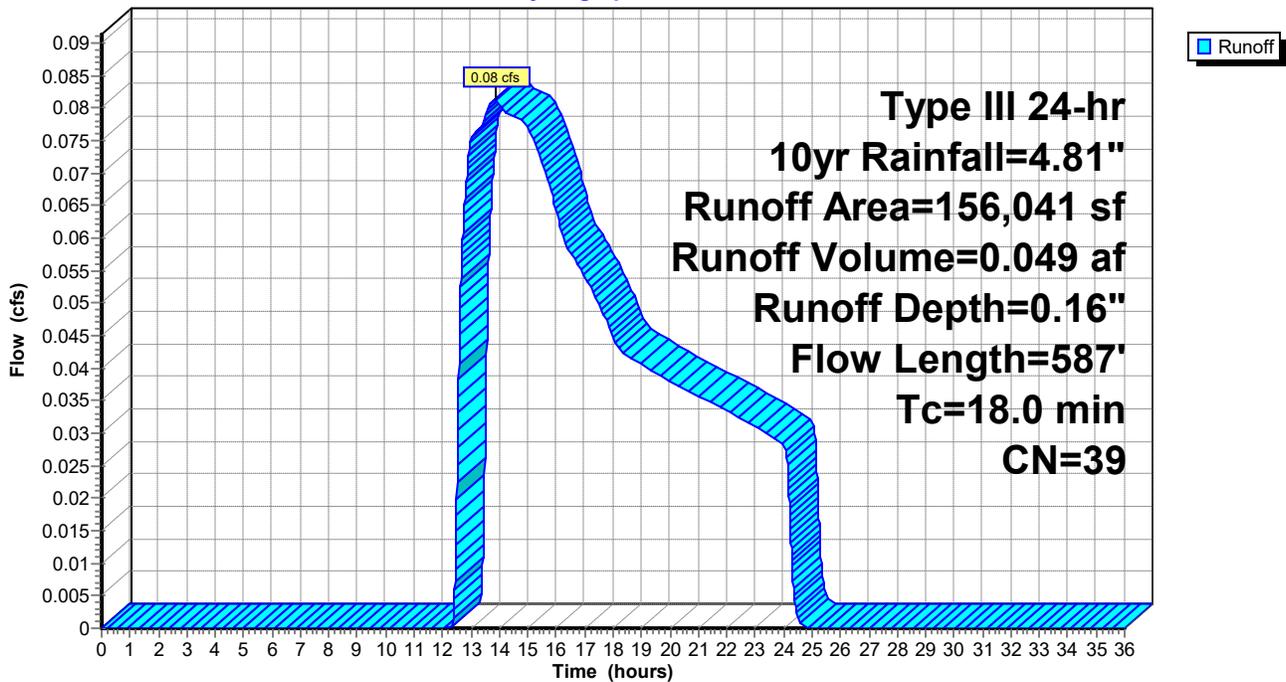
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10yr Rainfall=4.81"

Area (sf)	CN	Description
156,041	39	Pasture/grassland/range, Good, HSG A
156,041		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0560	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.2	537	0.0081	0.63		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
18.0	587	Total			

**Subcatchment 1S: Interior Lots**

Hydrograph



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**Summary for Subcatchment 2S: Outer Sidewalk**

Runoff = 0.93 cfs @ 12.09 hrs, Volume= 0.072 af, Depth= 1.19"  
 Routed to Pond 2P : Outer Porous Sidewalk

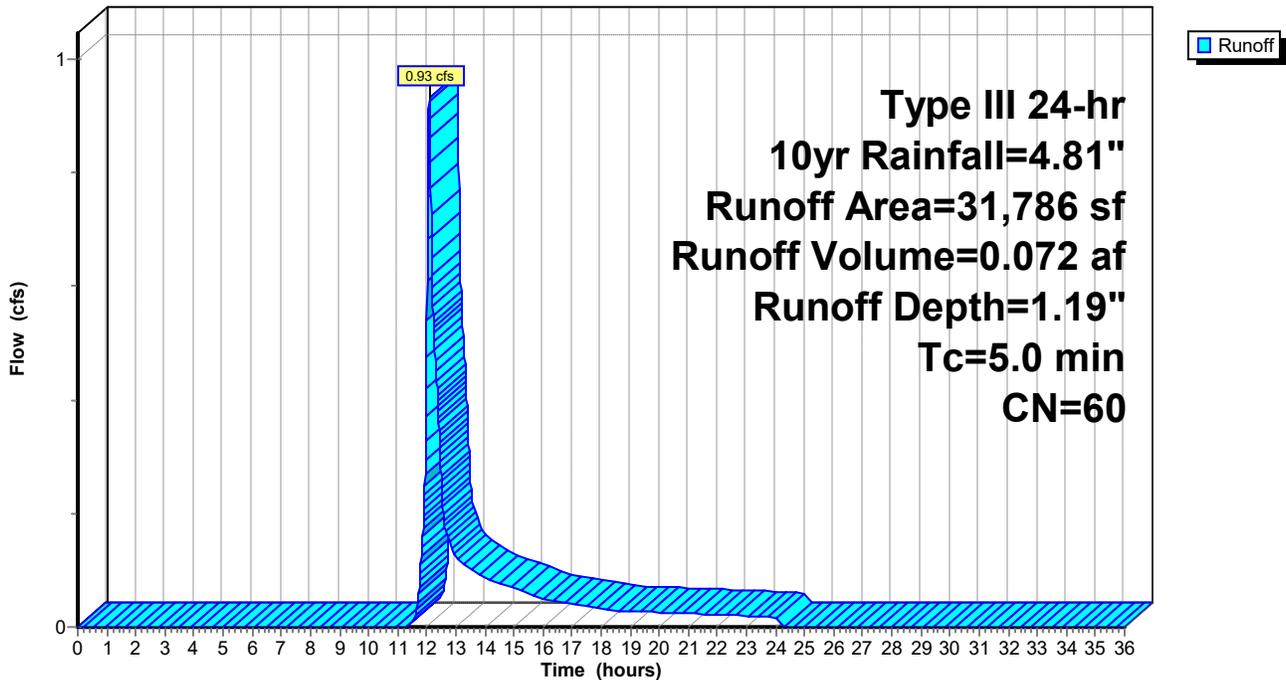
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10yr Rainfall=4.81"

Area (sf)	CN	Description
20,343	39	>75% Grass cover, Good, HSG A
11,443	98	Paved parking, HSG A
31,786	60	Weighted Average
20,343		64.00% Pervious Area
11,443		36.00% Impervious Area

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

**Subcatchment 2S: Outer Sidewalk**

Hydrograph



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**Summary for Subcatchment 3S: Roadway**

Runoff = 3.13 cfs @ 12.28 hrs, Volume= 0.390 af, Depth= 4.57"  
 Routed to Pond 1P : Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10yr Rainfall=4.81"

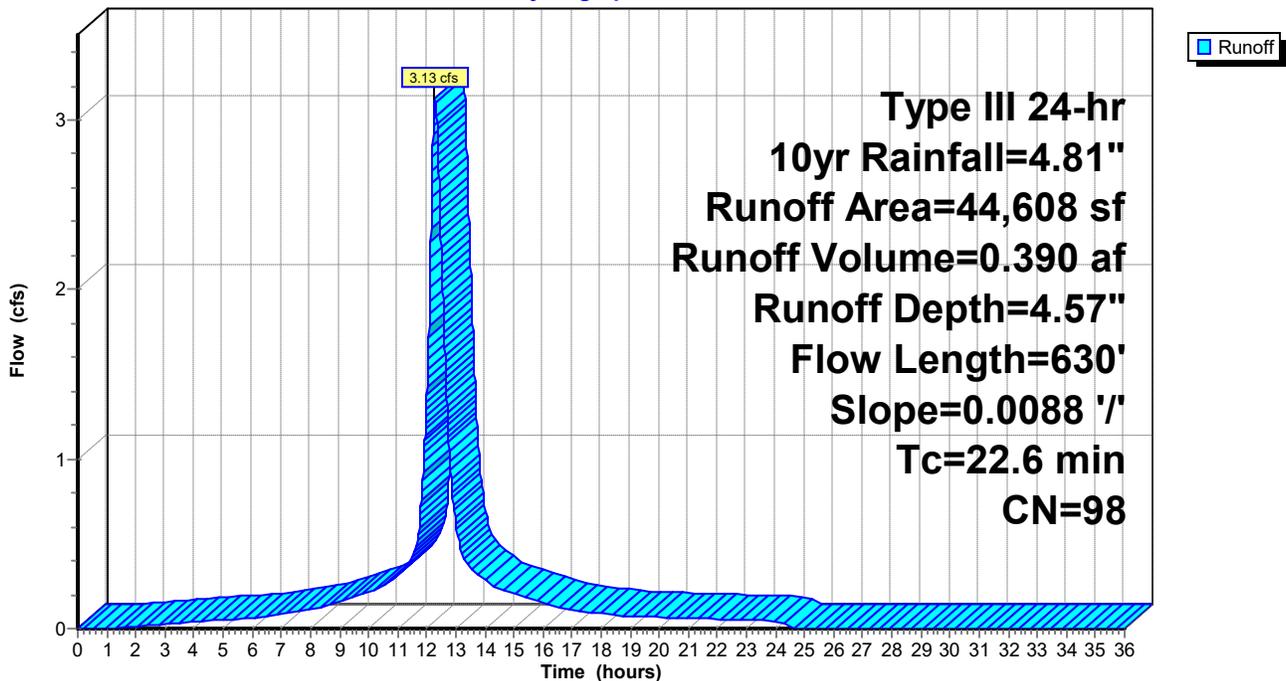
Area (sf)	CN	Description
44,608	98	Paved parking, HSG A
44,608		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0088	0.11		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.7	580	0.0088	0.66		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.6	630	Total			

**Subcatchment 3S: Roadway**

Hydrograph



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**Summary for Subcatchment 4S: Rain Garden 1**

Runoff = 0.42 cfs @ 12.33 hrs, Volume= 0.047 af, Depth= 2.21"  
 Routed to Pond 4P : Rain Garden 1

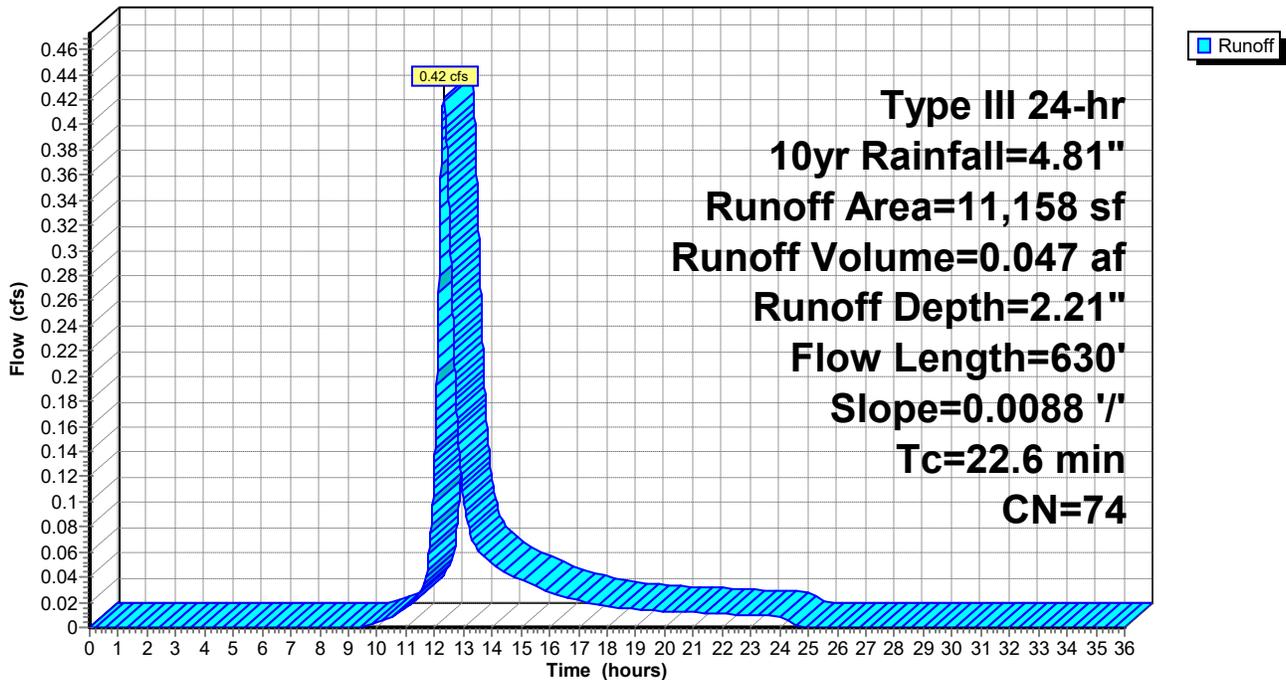
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10yr Rainfall=4.81"

Area (sf)	CN	Description
4,474	39	>75% Grass cover, Good, HSG A
6,684	98	Paved roads w/curbs & sewers, HSG A
11,158	74	Weighted Average
4,474		40.10% Pervious Area
6,684		59.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0088	0.11		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.7	580	0.0088	0.66		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.6	630	Total			

**Subcatchment 4S: Rain Garden 1**

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**Summary for Subcatchment 5S: Rain Garden 2**

Runoff = 0.16 cfs @ 12.32 hrs, Volume= 0.018 af, Depth= 2.64"  
 Routed to Pond 5P : Rain Garden 2

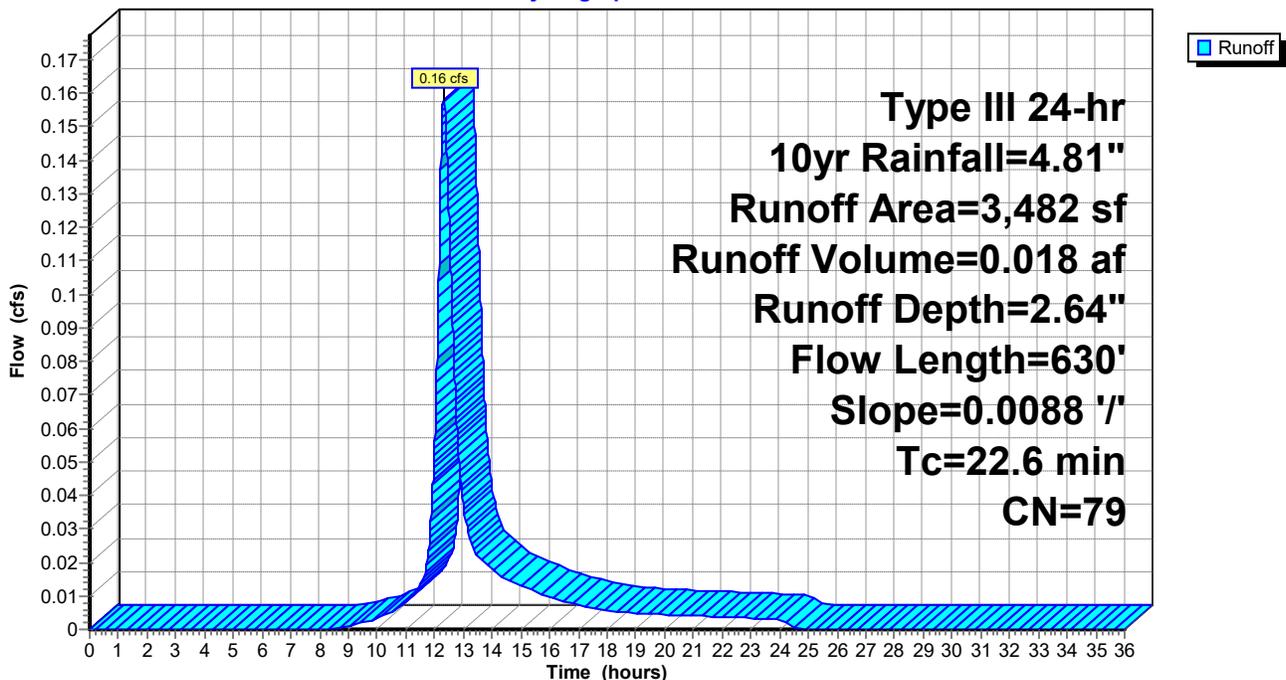
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10yr Rainfall=4.81"

Area (sf)	CN	Description
1,098	39	>75% Grass cover, Good, HSG A
2,384	98	Paved roads w/curbs & sewers, HSG A
3,482	79	Weighted Average
1,098		31.53% Pervious Area
2,384		68.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0088	0.11		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.7	580	0.0088	0.66		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.6	630	Total			

**Subcatchment 5S: Rain Garden 2**

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**Summary for Subcatchment 6S: Inner Sidewalk**

Runoff = 0.58 cfs @ 12.09 hrs, Volume= 0.046 af, Depth= 1.13"  
 Routed to Pond 3P : Inner Porous Sidewalk

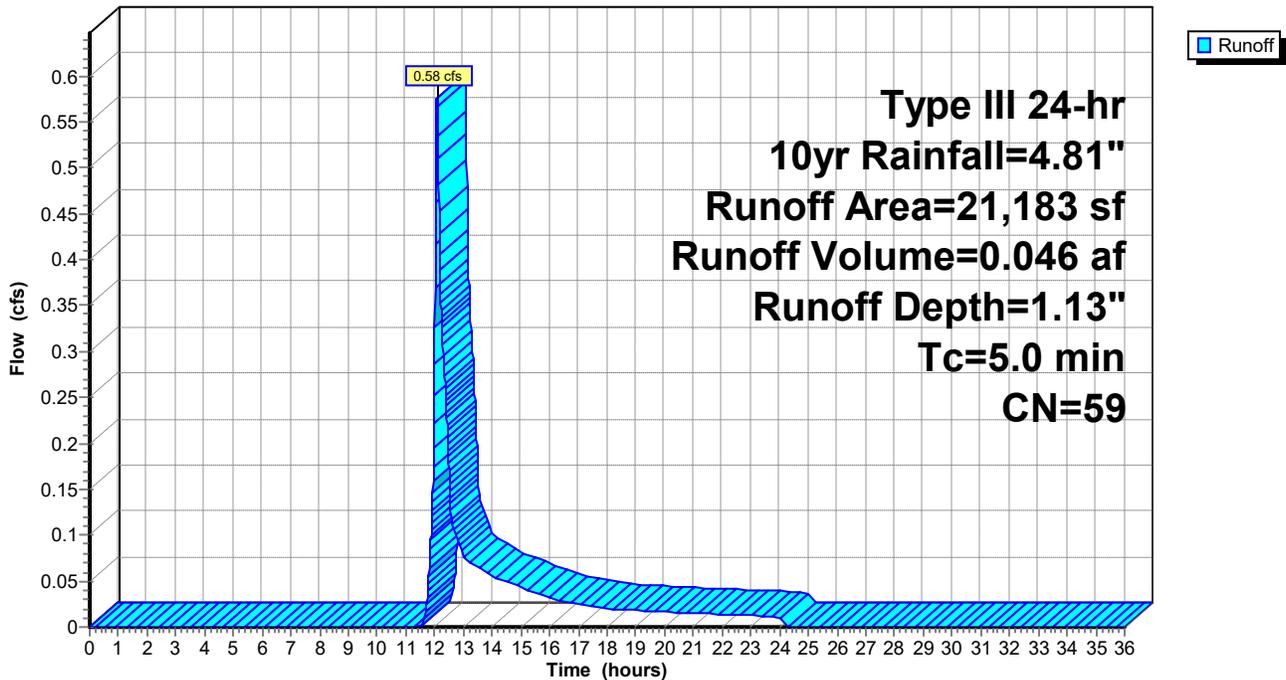
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10yr Rainfall=4.81"

Area (sf)	CN	Description
14,163	39	>75% Grass cover, Good, HSG A
7,020	98	Paved parking, HSG A
21,183	59	Weighted Average
14,163		66.86% Pervious Area
7,020		33.14% Impervious Area

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

**Subcatchment 6S: Inner Sidewalk**

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**Summary for Subcatchment 7S: Wetland Parcel**

Runoff = 0.01 cfs @ 13.65 hrs, Volume= 0.007 af, Depth= 0.16"  
 Routed to Pond 1P : Wetland

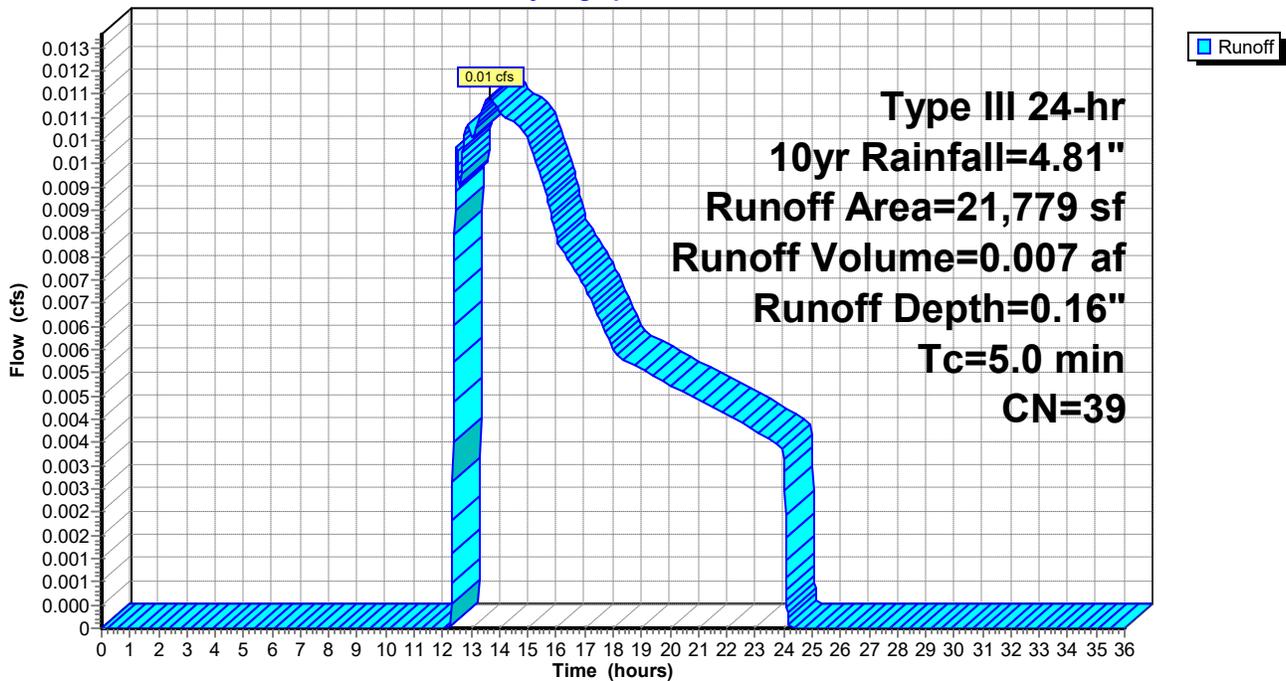
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10yr Rainfall=4.81"

Area (sf)	CN	Description
21,779	39	>75% Grass cover, Good, HSG A
21,779		100.00% Pervious Area

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

**Subcatchment 7S: Wetland Parcel**

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**Summary for Reach 16R: Willow Branch**

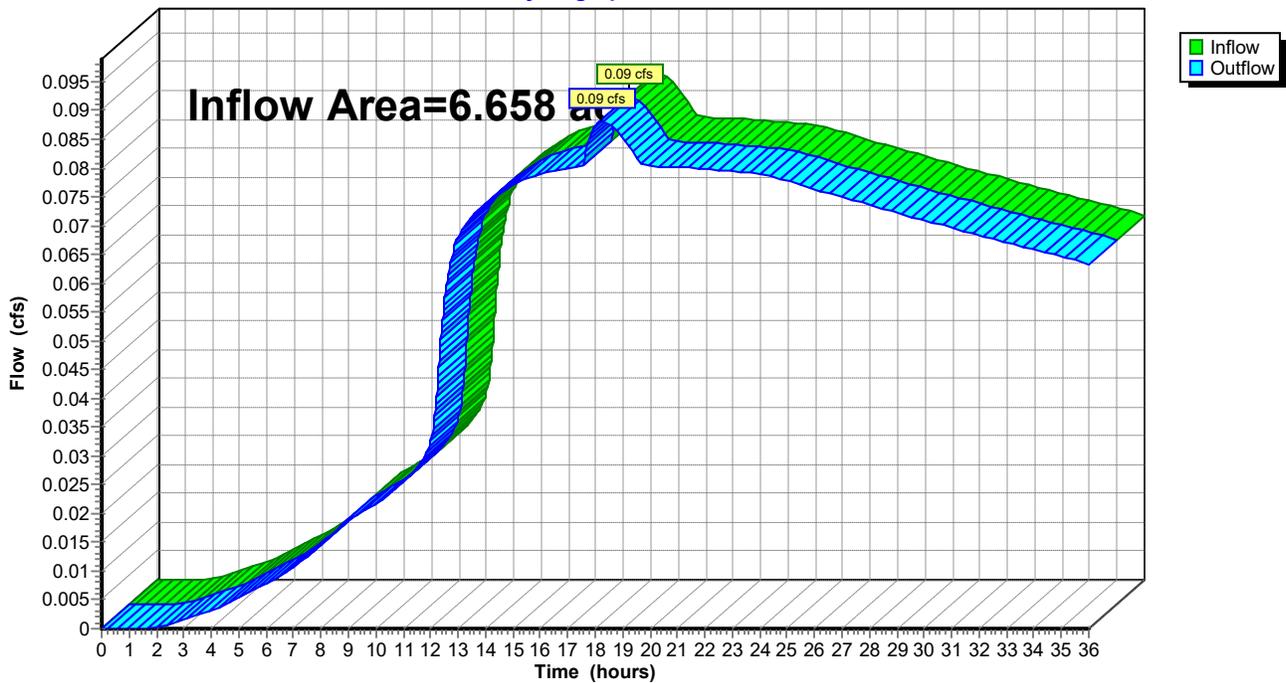
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6.658 ac, 24.87% Impervious, Inflow Depth > 0.28" for 10yr event  
Inflow = 0.09 cfs @ 18.23 hrs, Volume= 0.158 af  
Outflow = 0.09 cfs @ 18.23 hrs, Volume= 0.158 af, Atten= 0%, Lag= 0.0 min

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

**Reach 16R: Willow Branch**

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Type III 24-hr 10yr Rainfall=4.81"

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**Summary for Pond 1P: Wetland**

Inflow Area = 1.860 ac, 66.24% Impervious, Inflow Depth = 2.56" for 10yr event  
 Inflow = 3.13 cfs @ 12.28 hrs, Volume= 0.397 af  
 Outflow = 0.09 cfs @ 18.23 hrs, Volume= 0.158 af, Atten= 97%, Lag= 356.7 min  
 Primary = 0.09 cfs @ 18.23 hrs, Volume= 0.158 af  
 Routed to Reach 16R : Willow Branch

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 246.55' @ 18.23 hrs Surf.Area= 6,171 sf Storage= 13,767 cf  
 Flood Elev= 250.00' Surf.Area= 10,271 sf Storage= 41,797 cf

Plug-Flow detention time= 758.8 min calculated for 0.158 af (40% of inflow)  
 Center-of-Mass det. time= 599.2 min ( 1,367.7 - 768.5 )

Volume	Invert	Avail.Storage	Storage Description			
#1	243.50'	41,797 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
243.50	2,383	303.0	0	0	2,383	
244.00	3,300	319.0	1,415	1,415	3,190	
245.00	4,662	331.0	3,961	5,376	3,891	
250.00	10,271	441.0	36,421	41,797	10,919	

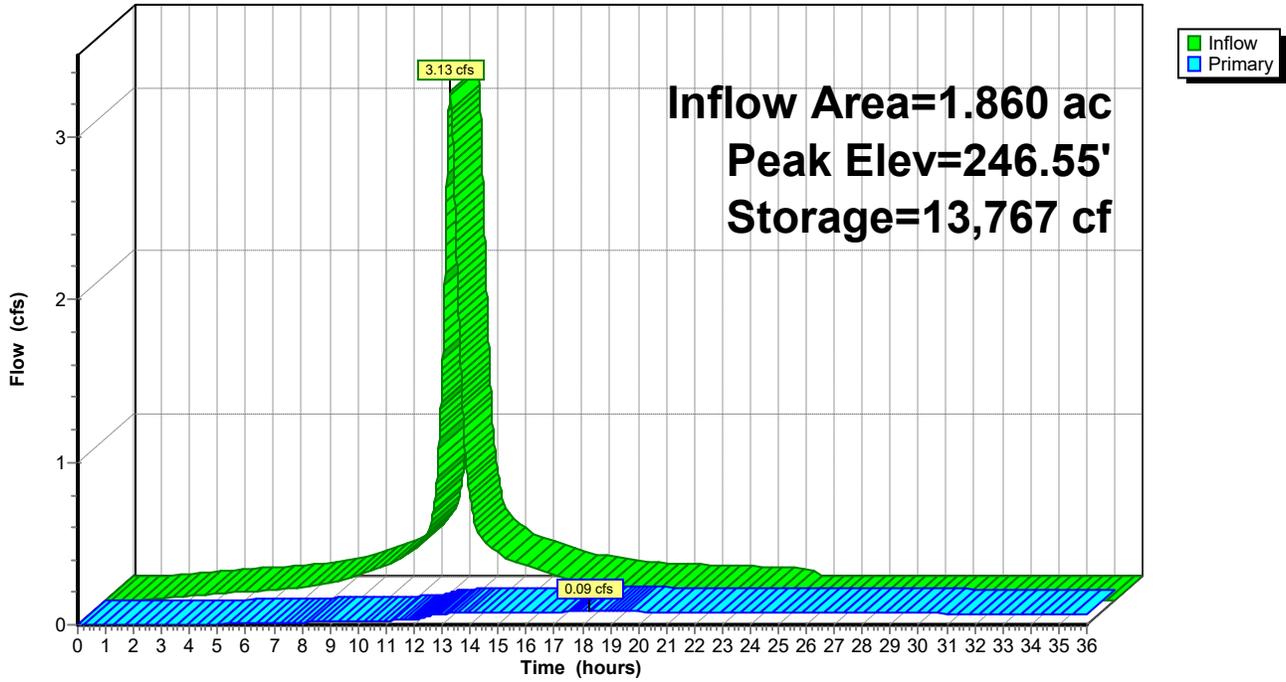
Device	Routing	Invert	Outlet Devices
#0	Primary	250.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Primary	243.20'	<b>8.0" Round Culvert</b> L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 243.20' / 242.95' S= 0.0050' /' Cc= 0.900 n= 0.013 Concrete sewer w/manholes & inlets, Flow Area= 0.35 sf
#2	Primary	248.00'	<b>2.0' long + 3.0' SideZ x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Device 5	246.55'	<b>1.5" x 1.5" Horiz. Orifice/Grate X 10.00 columns</b> X 10 rows C= 0.600 in 24.0" x 24.0" Grate (39% open area) Limited to weir flow at low heads
#4	Device 1	243.50'	<b>1.000 in/hr Exfiltration over Wetted area above 243.50'</b> Excluded Wetted area = 2,383 sf
#5	Device 1	245.50'	<b>0.5' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Primary OutFlow** Max=0.09 cfs @ 18.23 hrs HW=246.55' (Free Discharge)

- 1=Culvert (Passes 0.09 cfs of 2.34 cfs potential flow)
- 4=Exfiltration (Exfiltration Controls 0.08 cfs)
- 5=Sharp-Crested Rectangular Weir (Passes 0.01 cfs of 1.02 cfs potential flow)
- 3=Orifice/Grate (Weir Controls 0.01 cfs @ 0.21 fps)
- 2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

### Pond 1P: Wetland

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**Summary for Pond 2P: Outer Porous Sidewalk**

Inflow Area = 0.730 ac, 36.00% Impervious, Inflow Depth = 1.19" for 10yr event  
 Inflow = 0.93 cfs @ 12.09 hrs, Volume= 0.072 af  
 Outflow = 0.78 cfs @ 12.07 hrs, Volume= 0.072 af, Atten= 16%, Lag= 0.0 min  
 Discarded = 0.78 cfs @ 12.07 hrs, Volume= 0.072 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Reach 16R : Willow Branch

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 247.54' @ 12.14 hrs Surf.Area= 5,972 sf Storage= 87 cf  
 Flood Elev= 250.00' Surf.Area= 5,972 sf Storage= 3,583 cf

Plug-Flow detention time= 1.3 min calculated for 0.072 af (100% of inflow)  
 Center-of-Mass det. time= 1.3 min ( 878.7 - 877.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	247.50'	3,583 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 8,958 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
247.50	5,972	0	0
249.00	5,972	8,958	8,958

Device	Routing	Invert	Outlet Devices
#0	Primary	249.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	247.50'	<b>5.670 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.78 cfs @ 12.07 hrs HW=247.53' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.78 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=247.50' (Free Discharge)

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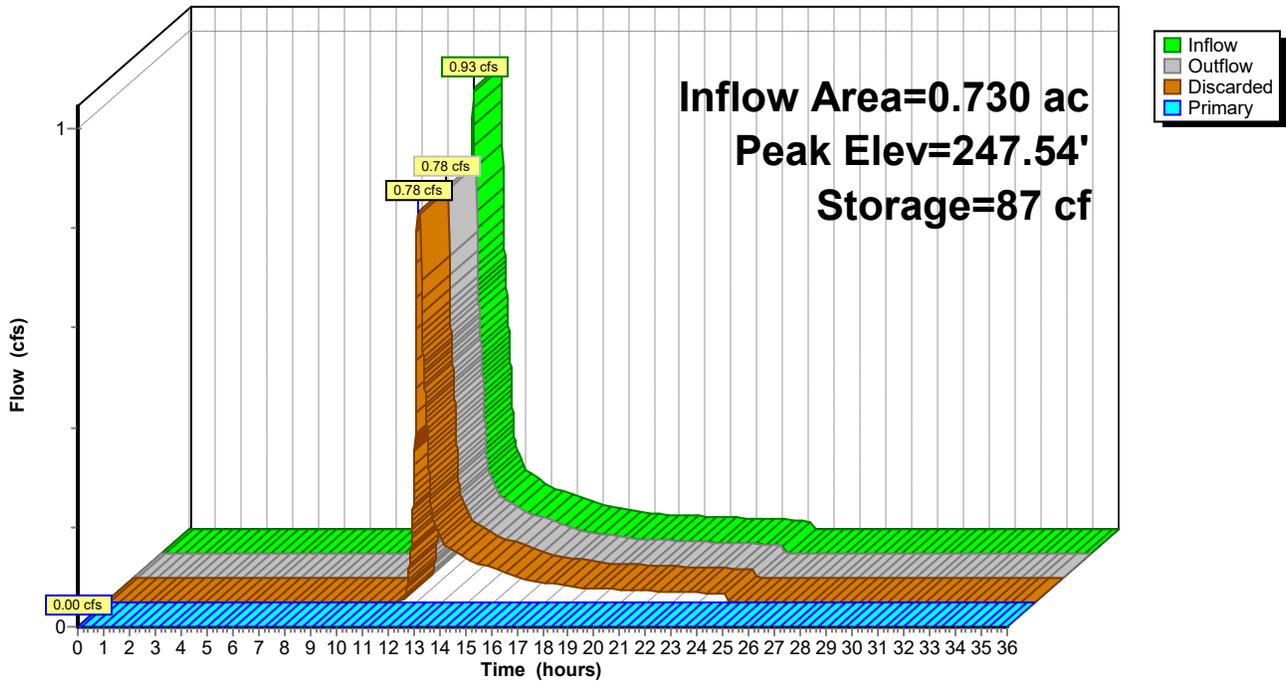
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**Pond 2P: Outer Porous Sidewalk**

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**Summary for Pond 3P: Inner Porous Sidewalk**

Inflow Area = 4.069 ac, 3.96% Impervious, Inflow Depth = 0.28" for 10yr event  
 Inflow = 0.58 cfs @ 12.09 hrs, Volume= 0.094 af  
 Outflow = 0.56 cfs @ 12.11 hrs, Volume= 0.094 af, Atten= 3%, Lag= 1.3 min  
 Discarded = 0.56 cfs @ 12.11 hrs, Volume= 0.094 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Reach 16R : Willow Branch

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 247.51' @ 12.11 hrs Surf.Area= 8,398 sf Storage= 42 cf  
 Flood Elev= 250.00' Surf.Area= 8,398 sf Storage= 5,039 cf

Plug-Flow detention time= 1.3 min calculated for 0.094 af (100% of inflow)  
 Center-of-Mass det. time= 1.3 min ( 962.1 - 960.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	247.50'	5,039 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 12,597 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
247.50	8,398	0	0
249.00	8,398	12,597	12,597

Device	Routing	Invert	Outlet Devices
#0	Primary	249.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	247.50'	<b>5.670 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=1.10 cfs @ 12.11 hrs HW=247.51' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 1.10 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=247.50' (Free Discharge)

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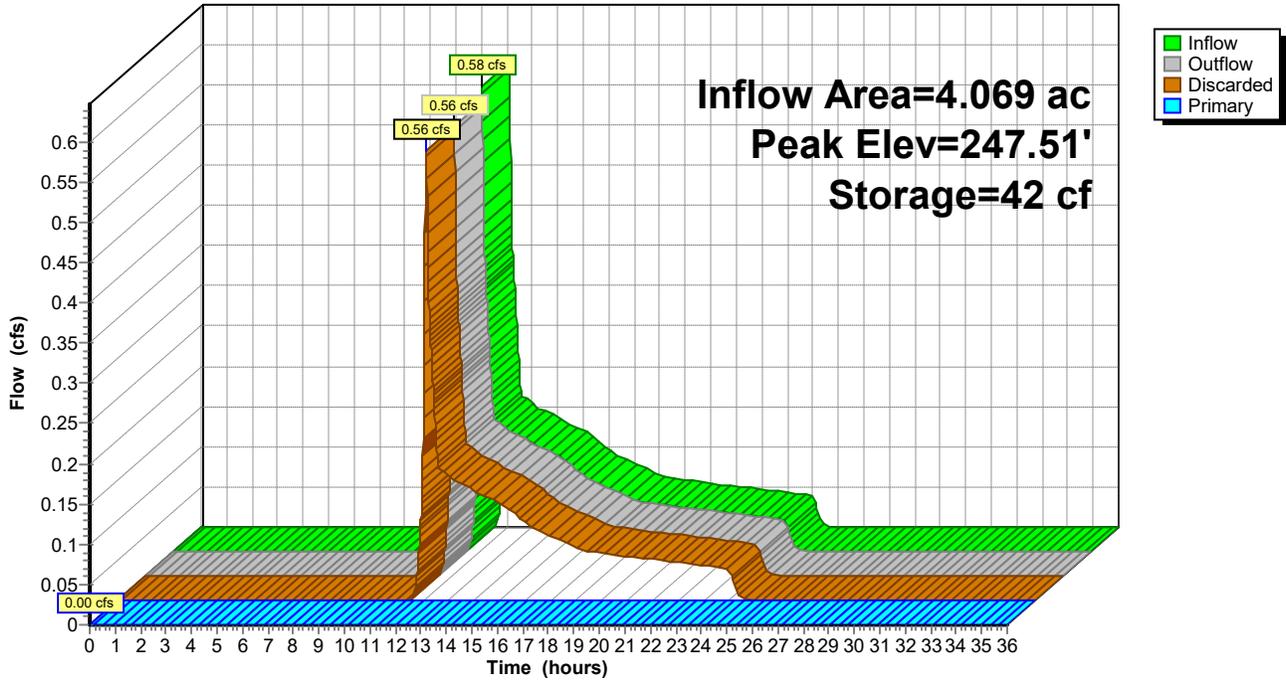
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**Pond 3P: Inner Porous Sidewalk**

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**Summary for Pond 4P: Rain Garden 1**

Inflow Area = 0.256 ac, 59.90% Impervious, Inflow Depth = 2.21" for 10yr event  
 Inflow = 0.42 cfs @ 12.33 hrs, Volume= 0.047 af  
 Outflow = 0.20 cfs @ 12.72 hrs, Volume= 0.047 af, Atten= 54%, Lag= 23.8 min  
 Discarded = 0.20 cfs @ 12.72 hrs, Volume= 0.047 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Pond 1P : Wetland

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 248.28' @ 12.72 hrs Surf.Area= 1,487 sf Storage= 365 cf  
 Flood Elev= 249.70' Surf.Area= 4,011 sf Storage= 4,222 cf

Plug-Flow detention time= 11.9 min calculated for 0.047 af (100% of inflow)  
 Center-of-Mass det. time= 11.9 min ( 866.7 - 854.7 )

Volume	Invert	Avail.Storage	Storage Description			
#1	248.00'	4,222 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
248.00	1,100	551.0	0.0	0	0	1,100
249.20	3,139	576.0	100.0	2,439	2,439	3,442
249.70	4,011	586.0	100.0	1,783	4,222	4,411

Device	Routing	Invert	Outlet Devices
#0	Primary	249.70'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	248.00'	<b>5.670 in/hr Exfiltration over Surface area</b>
#2	Primary	248.50'	<b>1.5" x 1.5" Horiz. Orifice/Grate X 10.00 columns</b> X 20 rows C= 0.600 in 24.0" x 48.0" Grate (39% open area) Limited to weir flow at low heads

**Discarded OutFlow** Max=0.20 cfs @ 12.72 hrs HW=248.28' (Free Discharge)  
 ↑1=**Exfiltration** (Exfiltration Controls 0.20 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=248.00' (Free Discharge)  
 ↑2=**Orifice/Grate** ( Controls 0.00 cfs)

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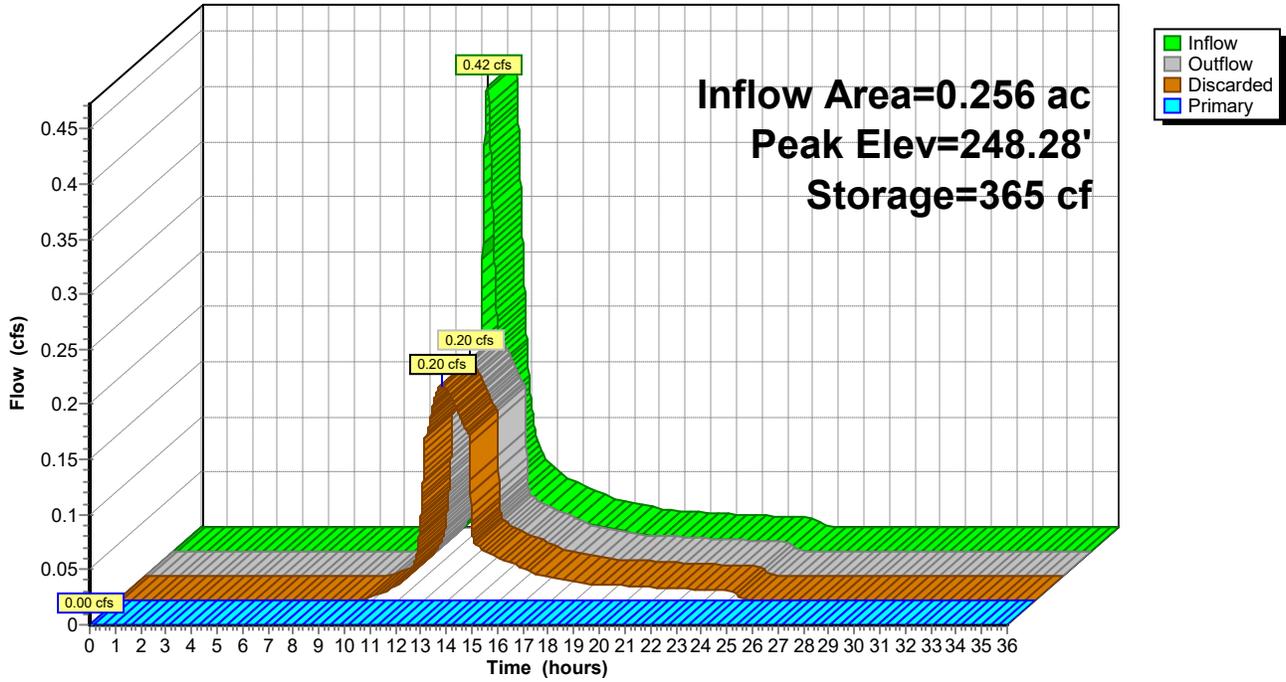
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**Pond 4P: Rain Garden 1**

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**Summary for Pond 5P: Rain Garden 2**

Inflow Area = 0.080 ac, 68.47% Impervious, Inflow Depth = 2.64" for 10yr event  
 Inflow = 0.16 cfs @ 12.32 hrs, Volume= 0.018 af  
 Outflow = 0.06 cfs @ 12.75 hrs, Volume= 0.018 af, Atten= 59%, Lag= 26.0 min  
 Discarded = 0.06 cfs @ 12.75 hrs, Volume= 0.018 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Pond 1P : Wetland

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 251.10' @ 12.75 hrs Surf.Area= 494 sf Storage= 152 cf  
 Flood Elev= 252.00' Surf.Area= 865 sf Storage= 757 cf

Plug-Flow detention time= 14.6 min calculated for 0.018 af (100% of inflow)  
 Center-of-Mass det. time= 14.6 min ( 856.2 - 841.6 )

Volume	Invert	Avail.Storage	Storage Description			
#1	250.75'	757 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
250.75	382	101.0	0.0	0	0	382
251.00	460	106.0	100.0	105	105	468
252.00	865	127.0	100.0	652	757	875

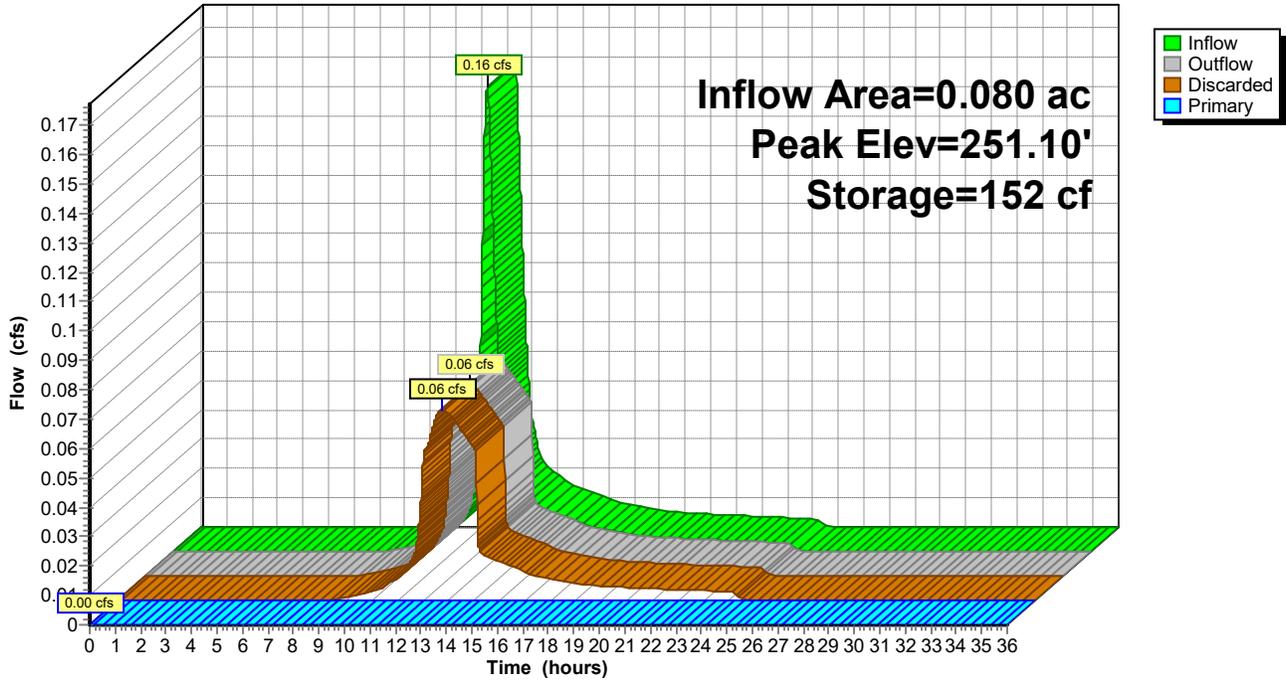
Device	Routing	Invert	Outlet Devices
#0	Primary	252.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	250.75'	<b>5.670 in/hr Exfiltration over Surface area</b>
#2	Primary	251.25'	<b>1.5" x 1.5" Horiz. Orifice/Grate X 10.00 columns</b> X 20 rows C= 0.600 in 24.0" x 48.0" Grate (39% open area) Limited to weir flow at low heads

**Discarded OutFlow** Max=0.06 cfs @ 12.75 hrs HW=251.10' (Free Discharge)  
 ↑1=**Exfiltration** (Exfiltration Controls 0.06 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=250.75' (Free Discharge)  
 ↑2=**Orifice/Grate** ( Controls 0.00 cfs)

### Pond 5P: Rain Garden 2

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## 25-Year Storm Event – Proposed

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: Interior Lots** Runoff Area=156,041 sf 0.00% Impervious Runoff Depth=0.40"  
 Flow Length=587' Tc=18.0 min CN=39 Runoff=0.46 cfs 0.120 af

**Subcatchment 2S: Outer Sidewalk** Runoff Area=31,786 sf 36.00% Impervious Runoff Depth=1.82"  
 Tc=5.0 min CN=60 Runoff=1.52 cfs 0.111 af

**Subcatchment 3S: Roadway** Runoff Area=44,608 sf 100.00% Impervious Runoff Depth=5.61"  
 Flow Length=630' Slope=0.0088 '/' Tc=22.6 min CN=98 Runoff=3.81 cfs 0.479 af

**Subcatchment 4S: Rain Garden 1** Runoff Area=11,158 sf 59.90% Impervious Runoff Depth=3.06"  
 Flow Length=630' Slope=0.0088 '/' Tc=22.6 min CN=74 Runoff=0.59 cfs 0.065 af

**Subcatchment 5S: Rain Garden 2** Runoff Area=3,482 sf 68.47% Impervious Runoff Depth=3.55"  
 Flow Length=630' Slope=0.0088 '/' Tc=22.6 min CN=79 Runoff=0.21 cfs 0.024 af

**Subcatchment 6S: Inner Sidewalk** Runoff Area=21,183 sf 33.14% Impervious Runoff Depth=1.74"  
 Tc=5.0 min CN=59 Runoff=0.96 cfs 0.071 af

**Subcatchment 7S: Wetland Parcel** Runoff Area=21,779 sf 0.00% Impervious Runoff Depth=0.40"  
 Tc=5.0 min CN=39 Runoff=0.08 cfs 0.017 af

**Reach 16R: Willow Branch** Inflow=0.55 cfs 0.253 af  
 Outflow=0.55 cfs 0.253 af

**Pond 1P: Wetland** Peak Elev=246.62' Storage=14,158 cf Inflow=3.88 cfs 0.496 af  
 Outflow=0.55 cfs 0.253 af

**Pond 2P: Outer Porous Sidewalk** Peak Elev=247.66' Storage=386 cf Inflow=1.52 cfs 0.111 af  
 Discarded=0.78 cfs 0.111 af Primary=0.00 cfs 0.000 af Outflow=0.78 cfs 0.111 af

**Pond 3P: Inner Porous Sidewalk** Peak Elev=247.52' Storage=71 cf Inflow=0.96 cfs 0.191 af  
 Discarded=0.93 cfs 0.191 af Primary=0.00 cfs 0.000 af Outflow=0.93 cfs 0.191 af

**Pond 4P: Rain Garden 1** Peak Elev=248.45' Storage=636 cf Inflow=0.59 cfs 0.065 af  
 Discarded=0.23 cfs 0.065 af Primary=0.00 cfs 0.000 af Outflow=0.23 cfs 0.065 af

**Pond 5P: Rain Garden 2** Peak Elev=251.26' Storage=235 cf Inflow=0.21 cfs 0.024 af  
 Discarded=0.07 cfs 0.023 af Primary=0.03 cfs 0.000 af Outflow=0.11 cfs 0.024 af

**Total Runoff Area = 6.658 ac Runoff Volume = 0.887 af Average Runoff Depth = 1.60"**  
**75.13% Pervious = 5.002 ac 24.87% Impervious = 1.656 ac**

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**Summary for Subcatchment 1S: Interior Lots**

Runoff from this area will be managed by individual lot developers.

Runoff = 0.46 cfs @ 12.54 hrs, Volume= 0.120 af, Depth= 0.40"  
 Routed to Pond 3P : Inner Porous Sidewalk

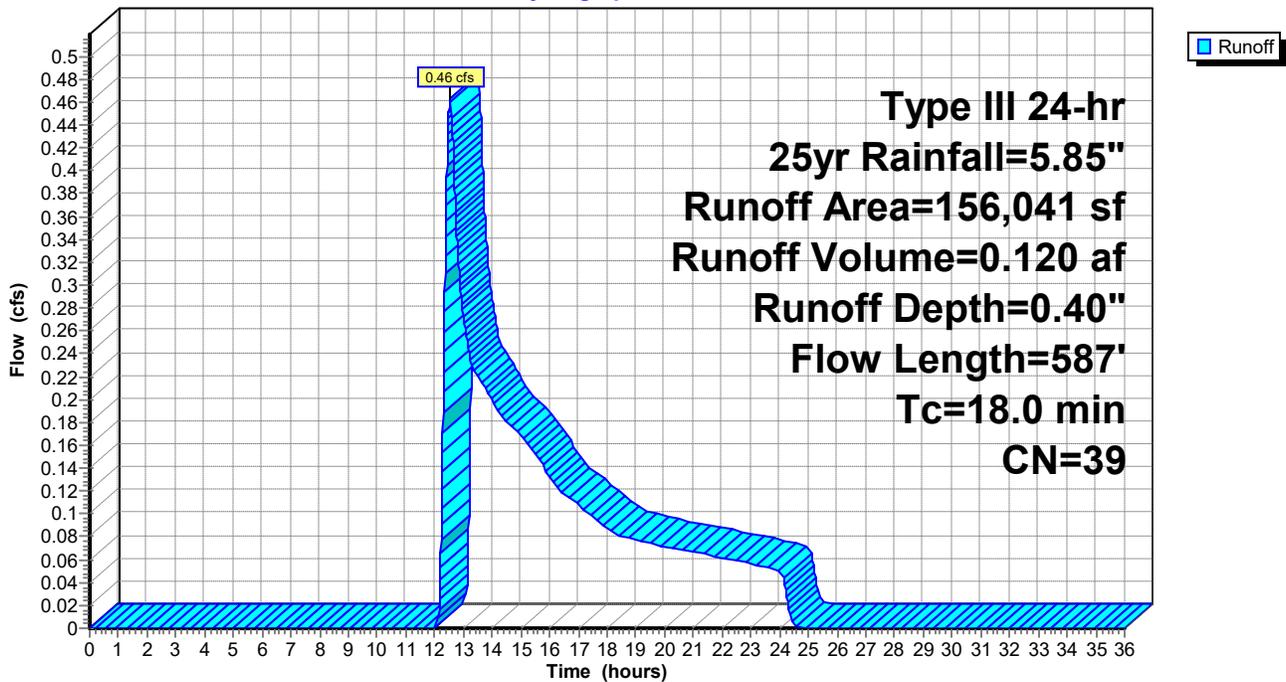
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25yr Rainfall=5.85"

Area (sf)	CN	Description
156,041	39	Pasture/grassland/range, Good, HSG A
156,041		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0560	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.2	537	0.0081	0.63		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
18.0	587	Total			

**Subcatchment 1S: Interior Lots**

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**Summary for Subcatchment 2S: Outer Sidewalk**

Runoff = 1.52 cfs @ 12.08 hrs, Volume= 0.111 af, Depth= 1.82"  
 Routed to Pond 2P : Outer Porous Sidewalk

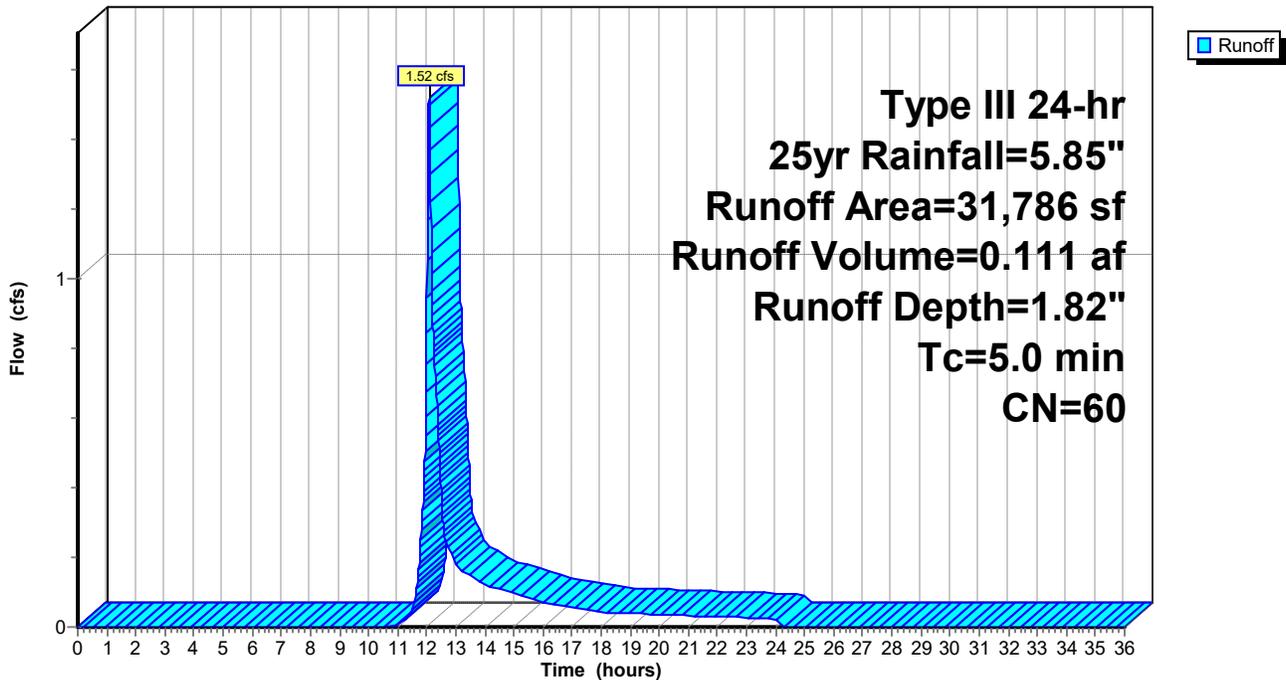
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25yr Rainfall=5.85"

Area (sf)	CN	Description
20,343	39	>75% Grass cover, Good, HSG A
11,443	98	Paved parking, HSG A
31,786	60	Weighted Average
20,343		64.00% Pervious Area
11,443		36.00% Impervious Area

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

**Subcatchment 2S: Outer Sidewalk**

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**Summary for Subcatchment 3S: Roadway**

Runoff = 3.81 cfs @ 12.28 hrs, Volume= 0.479 af, Depth= 5.61"  
 Routed to Pond 1P : Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25yr Rainfall=5.85"

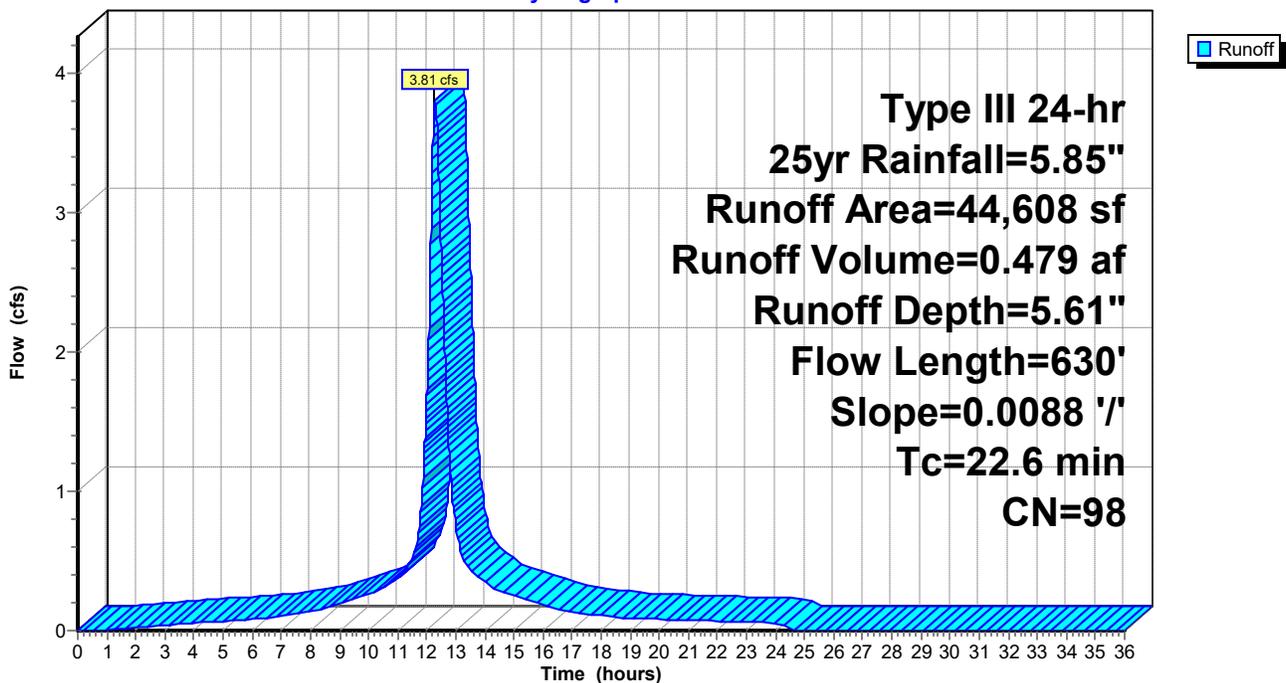
Area (sf)	CN	Description
44,608	98	Paved parking, HSG A
44,608		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0088	0.11		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.7	580	0.0088	0.66		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.6	630	Total			

**Subcatchment 3S: Roadway**

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**Summary for Subcatchment 4S: Rain Garden 1**

Runoff = 0.59 cfs @ 12.32 hrs, Volume= 0.065 af, Depth= 3.06"  
 Routed to Pond 4P : Rain Garden 1

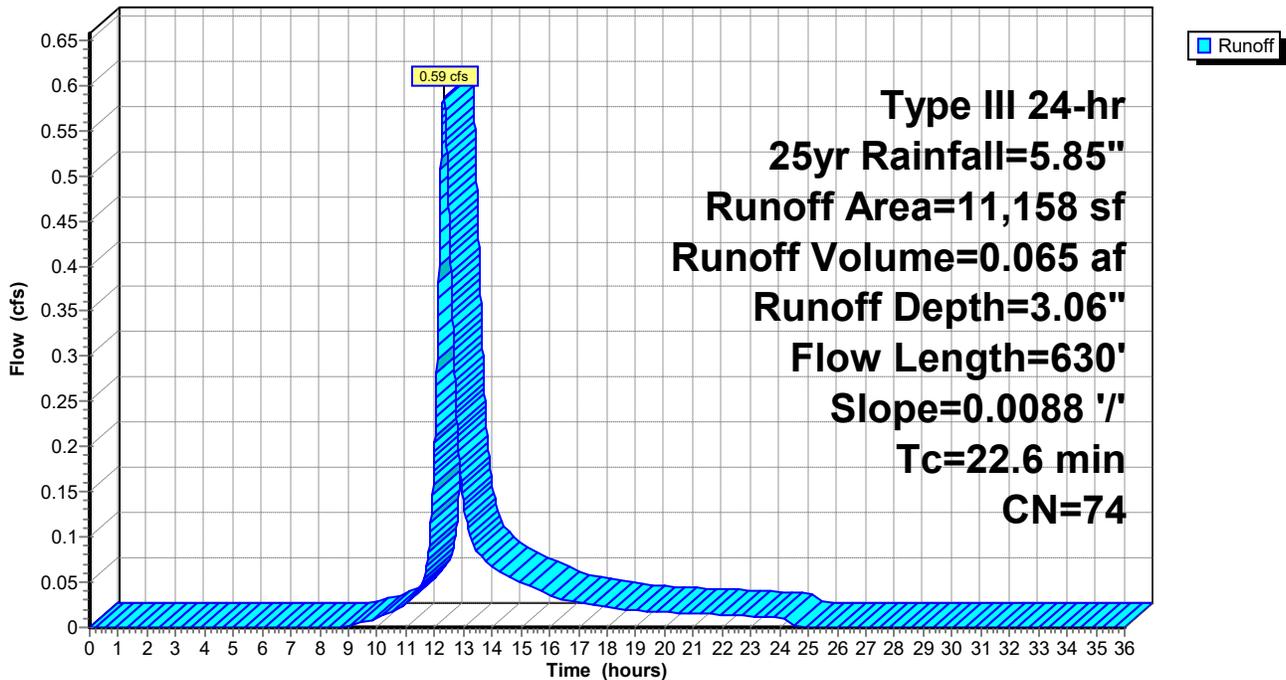
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25yr Rainfall=5.85"

Area (sf)	CN	Description
4,474	39	>75% Grass cover, Good, HSG A
6,684	98	Paved roads w/curbs & sewers, HSG A
11,158	74	Weighted Average
4,474		40.10% Pervious Area
6,684		59.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0088	0.11		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.7	580	0.0088	0.66		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.6	630	Total			

**Subcatchment 4S: Rain Garden 1**

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Type III 24-hr 25yr Rainfall=5.85"

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**Summary for Subcatchment 5S: Rain Garden 2**

Runoff = 0.21 cfs @ 12.31 hrs, Volume= 0.024 af, Depth= 3.55"  
 Routed to Pond 5P : Rain Garden 2

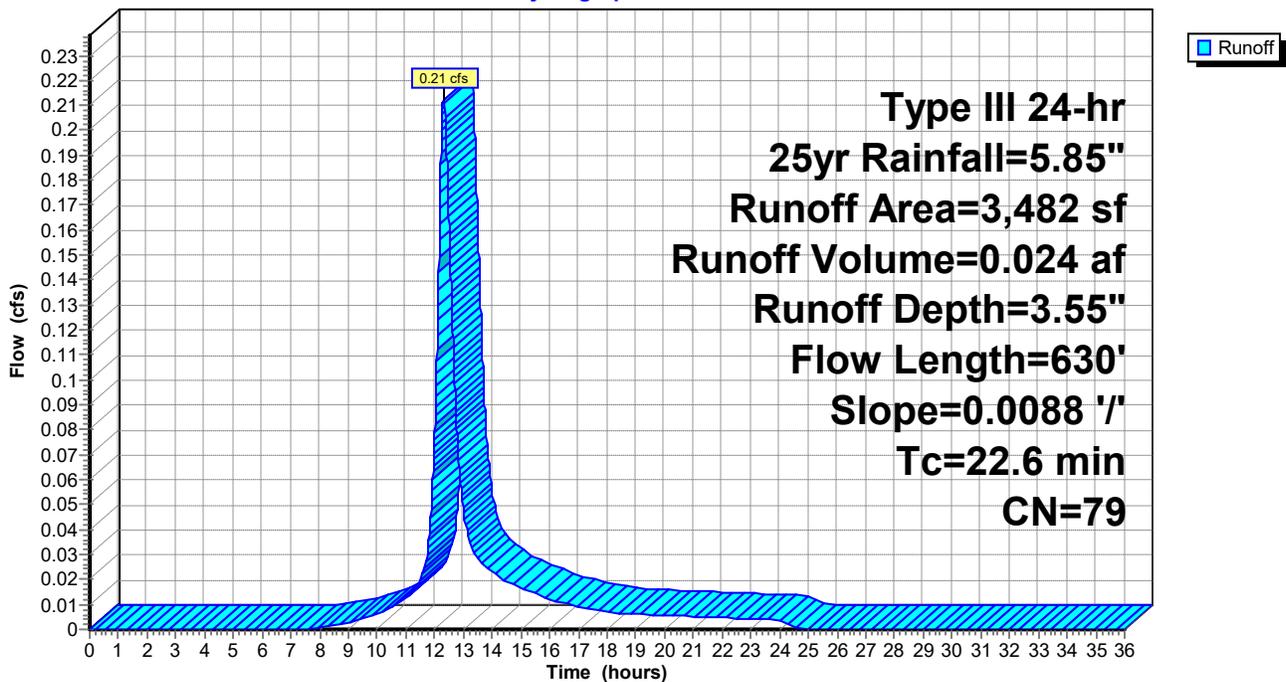
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25yr Rainfall=5.85"

Area (sf)	CN	Description
1,098	39	>75% Grass cover, Good, HSG A
2,384	98	Paved roads w/curbs & sewers, HSG A
3,482	79	Weighted Average
1,098		31.53% Pervious Area
2,384		68.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0088	0.11		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.7	580	0.0088	0.66		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.6	630	Total			

**Subcatchment 5S: Rain Garden 2**

Hydrograph



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Type III 24-hr 25yr Rainfall=5.85"

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**Summary for Subcatchment 6S: Inner Sidewalk**

Runoff = 0.96 cfs @ 12.08 hrs, Volume= 0.071 af, Depth= 1.74"  
 Routed to Pond 3P : Inner Porous Sidewalk

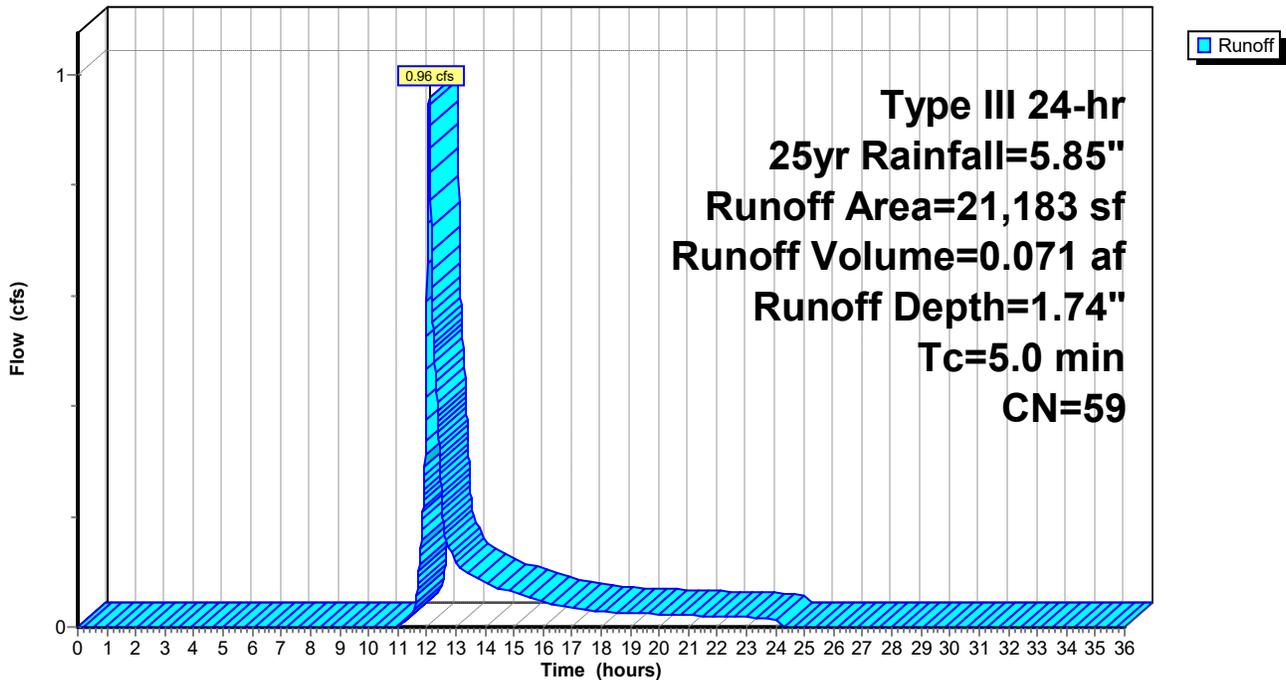
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25yr Rainfall=5.85"

Area (sf)	CN	Description
14,163	39	>75% Grass cover, Good, HSG A
7,020	98	Paved parking, HSG A
21,183	59	Weighted Average
14,163		66.86% Pervious Area
7,020		33.14% Impervious Area

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

**Subcatchment 6S: Inner Sidewalk**

Hydrograph



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Type III 24-hr 25yr Rainfall=5.85"

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**Summary for Subcatchment 7S: Wetland Parcel**

Runoff = 0.08 cfs @ 12.34 hrs, Volume= 0.017 af, Depth= 0.40"  
Routed to Pond 1P : Wetland

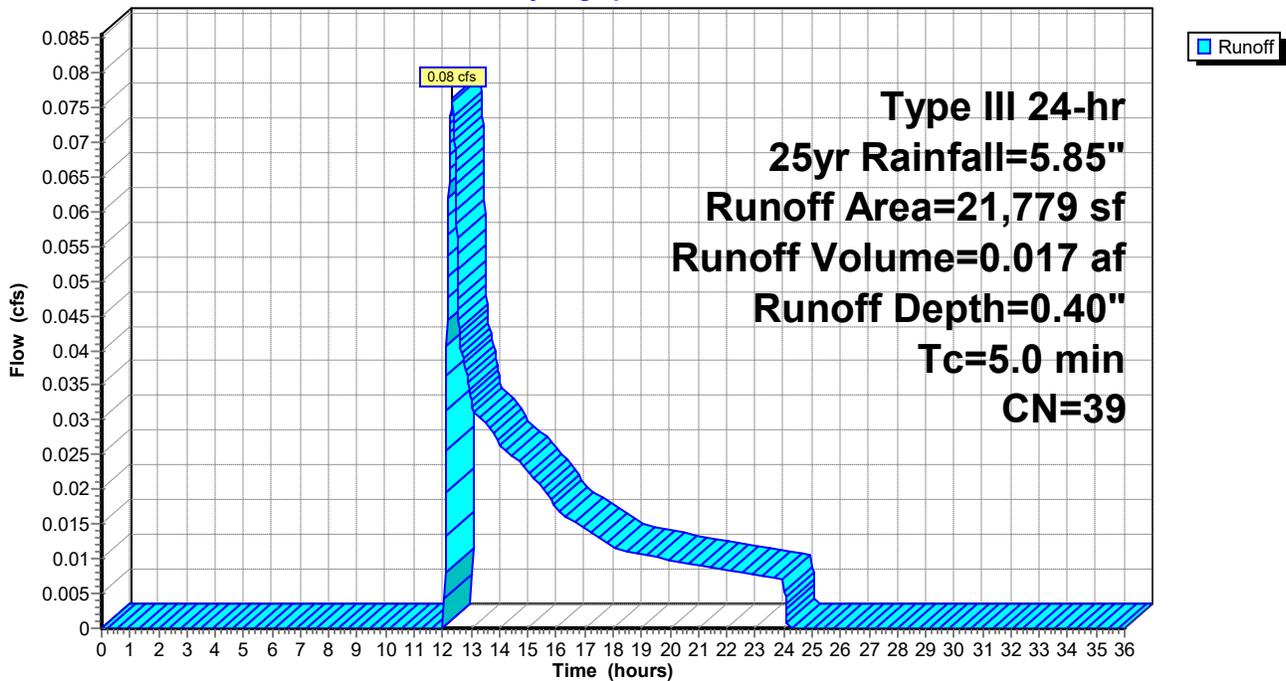
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25yr Rainfall=5.85"

Area (sf)	CN	Description
21,779	39	>75% Grass cover, Good, HSG A
21,779		100.00% Pervious Area

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

**Subcatchment 7S: Wetland Parcel**

Hydrograph



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Type III 24-hr 25yr Rainfall=5.85"

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**Summary for Reach 16R: Willow Branch**

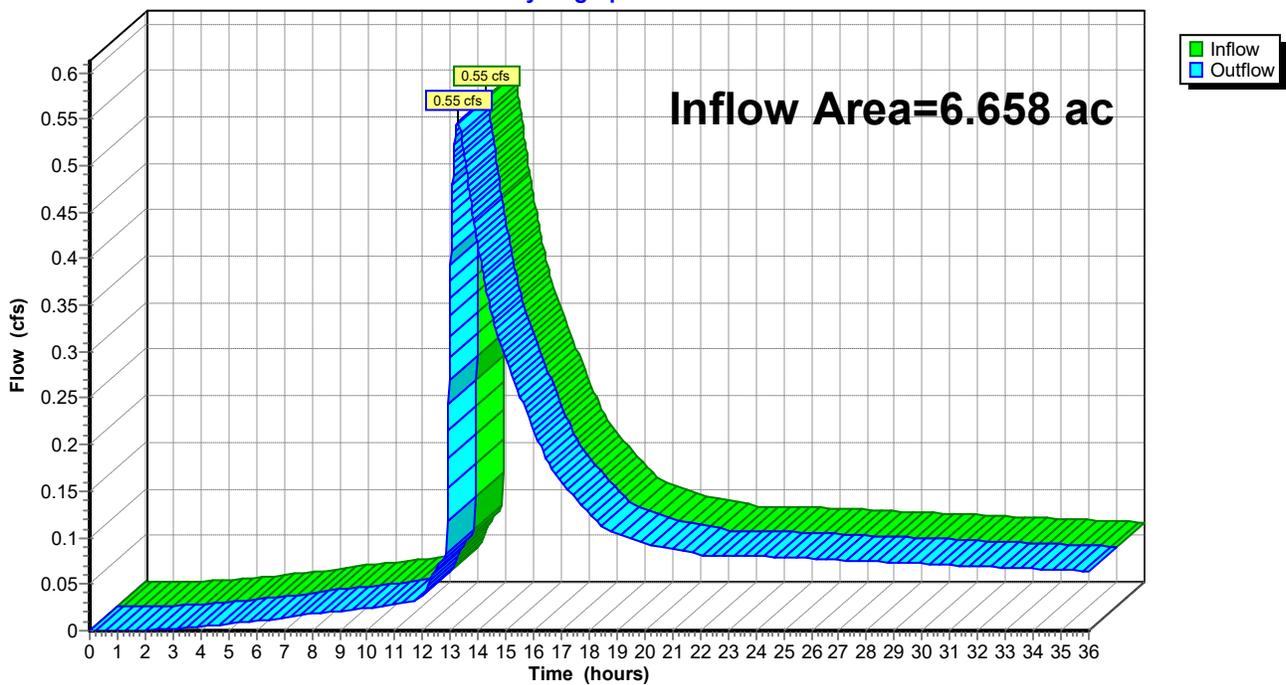
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6.658 ac, 24.87% Impervious, Inflow Depth > 0.46" for 25yr event  
Inflow = 0.55 cfs @ 13.26 hrs, Volume= 0.253 af  
Outflow = 0.55 cfs @ 13.26 hrs, Volume= 0.253 af, Atten= 0%, Lag= 0.0 min

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

**Reach 16R: Willow Branch**

Hydrograph



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Type III 24-hr 25yr Rainfall=5.85"

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**Summary for Pond 1P: Wetland**

Inflow Area = 1.860 ac, 66.24% Impervious, Inflow Depth = 3.20" for 25yr event  
 Inflow = 3.88 cfs @ 12.29 hrs, Volume= 0.496 af  
 Outflow = 0.55 cfs @ 13.26 hrs, Volume= 0.253 af, Atten= 86%, Lag= 58.5 min  
 Primary = 0.55 cfs @ 13.26 hrs, Volume= 0.253 af  
 Routed to Reach 16R : Willow Branch

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 246.62' @ 13.26 hrs Surf.Area= 6,237 sf Storage= 14,158 cf  
 Flood Elev= 250.00' Surf.Area= 10,271 sf Storage= 41,797 cf

Plug-Flow detention time= 553.7 min calculated for 0.253 af (51% of inflow)  
 Center-of-Mass det. time= 420.4 min ( 1,188.2 - 767.8 )

Volume	Invert	Avail.Storage	Storage Description			
#1	243.50'	41,797 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
243.50	2,383	303.0	0	0	2,383	
244.00	3,300	319.0	1,415	1,415	3,190	
245.00	4,662	331.0	3,961	5,376	3,891	
250.00	10,271	441.0	36,421	41,797	10,919	

Device	Routing	Invert	Outlet Devices
#0	Primary	250.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Primary	243.20'	<b>8.0" Round Culvert</b> L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 243.20' / 242.95' S= 0.0050 '/ Cc= 0.900 n= 0.013 Concrete sewer w/manholes & inlets, Flow Area= 0.35 sf
#2	Primary	248.00'	<b>2.0' long + 3.0 ' SideZ x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Device 5	246.55'	<b>1.5" x 1.5" Horiz. Orifice/Grate X 10.00 columns</b> X 10 rows C= 0.600 in 24.0" x 24.0" Grate (39% open area) Limited to weir flow at low heads
#4	Device 1	243.50'	<b>1.000 in/hr Exfiltration over Wetted area above 243.50'</b> Excluded Wetted area = 2,383 sf
#5	Device 1	245.50'	<b>0.5' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Primary OutFlow** Max=0.54 cfs @ 13.26 hrs HW=246.62' (Free Discharge)

- 1=Culvert (Passes 0.54 cfs of 2.37 cfs potential flow)
- 4=Exfiltration (Exfiltration Controls 0.08 cfs)
- 5=Sharp-Crested Rectangular Weir (Passes 0.46 cfs of 1.07 cfs potential flow)
- 3=Orifice/Grate (Weir Controls 0.46 cfs @ 0.85 fps)
- 2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

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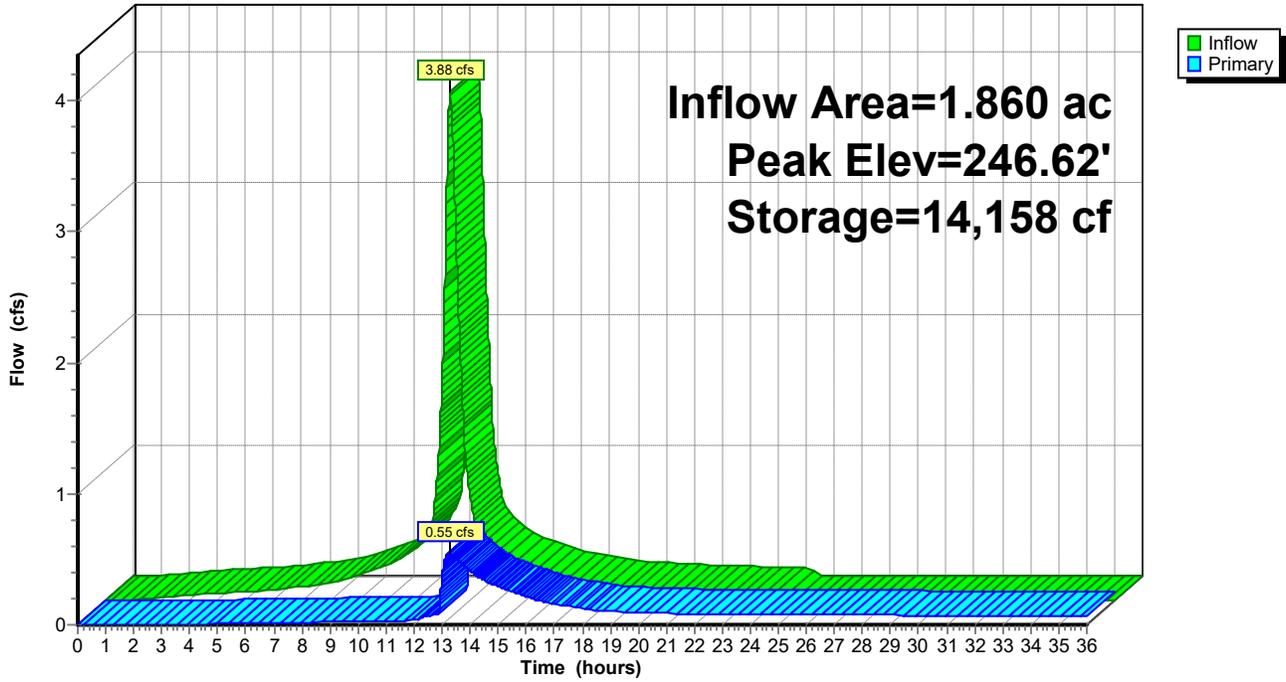
Type III 24-hr 25yr Rainfall=5.85"

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**Pond 1P: Wetland**

Hydrograph



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Type III 24-hr 25yr Rainfall=5.85"

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**Summary for Pond 2P: Outer Porous Sidewalk**

Inflow Area = 0.730 ac, 36.00% Impervious, Inflow Depth = 1.82" for 25yr event  
 Inflow = 1.52 cfs @ 12.08 hrs, Volume= 0.111 af  
 Outflow = 0.78 cfs @ 12.02 hrs, Volume= 0.111 af, Atten= 48%, Lag= 0.0 min  
 Discarded = 0.78 cfs @ 12.02 hrs, Volume= 0.111 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Reach 16R : Willow Branch

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 247.66' @ 12.25 hrs Surf.Area= 5,972 sf Storage= 386 cf  
 Flood Elev= 250.00' Surf.Area= 5,972 sf Storage= 3,583 cf

Plug-Flow detention time= 2.8 min calculated for 0.111 af (100% of inflow)  
 Center-of-Mass det. time= 2.8 min ( 866.4 - 863.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	247.50'	3,583 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 8,958 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
247.50	5,972	0	0
249.00	5,972	8,958	8,958

Device	Routing	Invert	Outlet Devices
#0	Primary	249.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	247.50'	<b>5.670 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.78 cfs @ 12.02 hrs HW=247.53' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.78 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=247.50' (Free Discharge)

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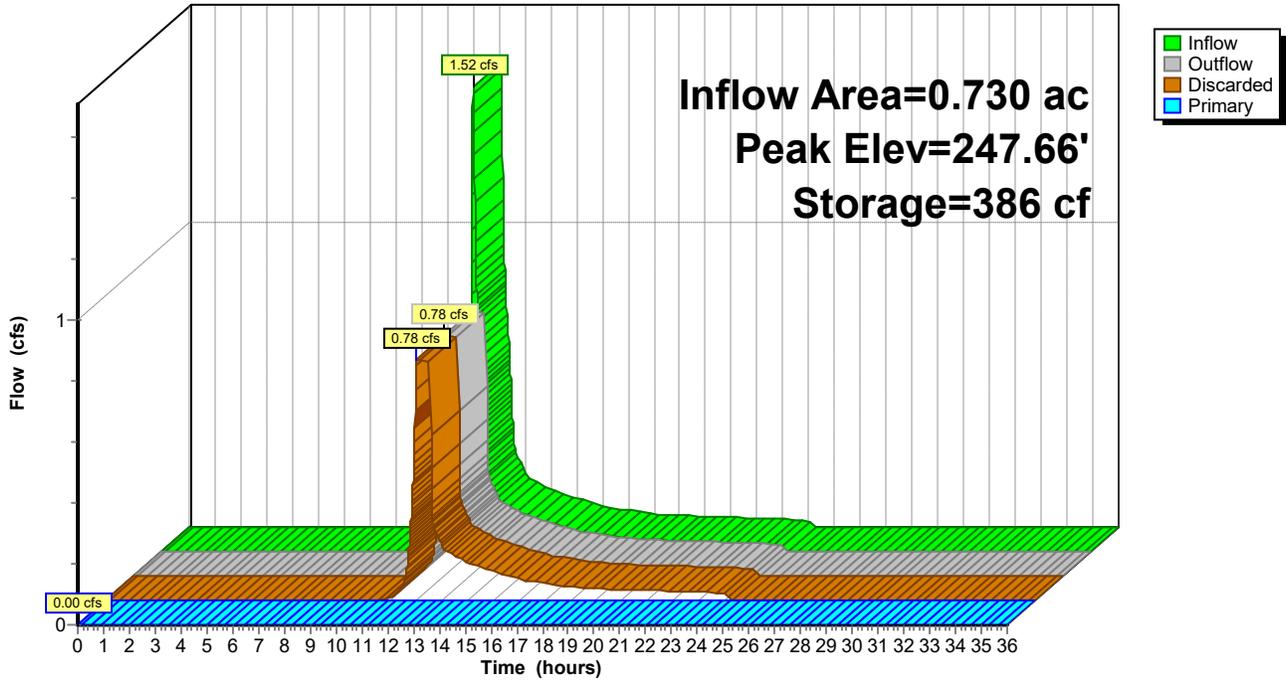
Type III 24-hr 25yr Rainfall=5.85"

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**Pond 2P: Outer Porous Sidewalk**

Hydrograph



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**Summary for Pond 3P: Inner Porous Sidewalk**

Inflow Area = 4.069 ac, 3.96% Impervious, Inflow Depth = 0.56" for 25yr event  
 Inflow = 0.96 cfs @ 12.08 hrs, Volume= 0.191 af  
 Outflow = 0.93 cfs @ 12.10 hrs, Volume= 0.191 af, Atten= 3%, Lag= 1.3 min  
 Discarded = 0.93 cfs @ 12.10 hrs, Volume= 0.191 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Reach 16R : Willow Branch

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 247.52' @ 12.10 hrs Surf.Area= 8,398 sf Storage= 71 cf  
 Flood Elev= 250.00' Surf.Area= 8,398 sf Storage= 5,039 cf

Plug-Flow detention time= 1.3 min calculated for 0.191 af (100% of inflow)  
 Center-of-Mass det. time= 1.3 min ( 937.0 - 935.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	247.50'	5,039 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 12,597 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
247.50	8,398	0	0
249.00	8,398	12,597	12,597

Device	Routing	Invert	Outlet Devices
#0	Primary	249.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	247.50'	<b>5.670 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=1.10 cfs @ 12.10 hrs HW=247.52' (Free Discharge)  
 ↑**1=Exfiltration** (Exfiltration Controls 1.10 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=247.50' (Free Discharge)

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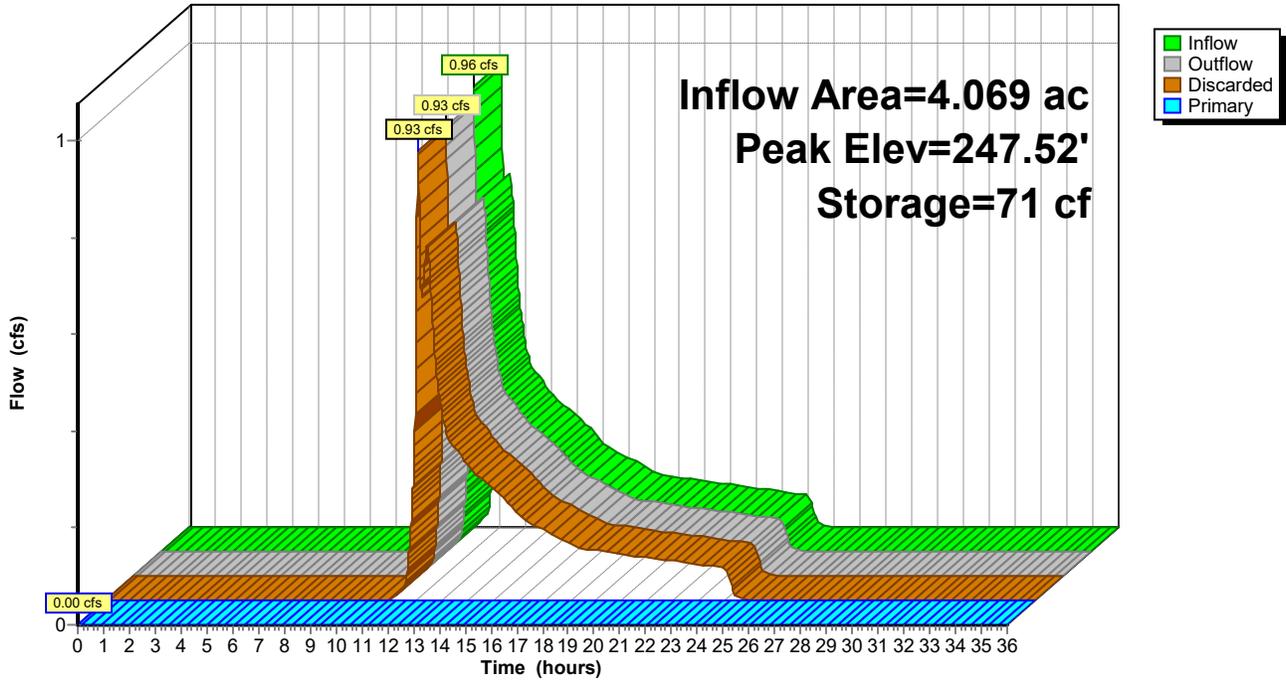
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**Pond 3P: Inner Porous Sidewalk**

Hydrograph



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**Summary for Pond 4P: Rain Garden 1**

Inflow Area = 0.256 ac, 59.90% Impervious, Inflow Depth = 3.06" for 25yr event  
 Inflow = 0.59 cfs @ 12.32 hrs, Volume= 0.065 af  
 Outflow = 0.23 cfs @ 12.77 hrs, Volume= 0.065 af, Atten= 61%, Lag= 27.1 min  
 Discarded = 0.23 cfs @ 12.77 hrs, Volume= 0.065 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Pond 1P : Wetland

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 248.45' @ 12.77 hrs Surf.Area= 1,744 sf Storage= 636 cf  
 Flood Elev= 249.70' Surf.Area= 4,011 sf Storage= 4,222 cf

Plug-Flow detention time= 19.3 min calculated for 0.065 af (100% of inflow)  
 Center-of-Mass det. time= 19.3 min ( 864.6 - 845.4 )

Volume	Invert	Avail.Storage	Storage Description			
#1	248.00'	4,222 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
248.00	1,100	551.0	0.0	0	0	1,100
249.20	3,139	576.0	100.0	2,439	2,439	3,442
249.70	4,011	586.0	100.0	1,783	4,222	4,411

Device	Routing	Invert	Outlet Devices
#0	Primary	249.70'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	248.00'	<b>5.670 in/hr Exfiltration over Surface area</b>
#2	Primary	248.50'	<b>1.5" x 1.5" Horiz. Orifice/Grate X 10.00 columns</b> X 20 rows C= 0.600 in 24.0" x 48.0" Grate (39% open area) Limited to weir flow at low heads

**Discarded OutFlow** Max=0.23 cfs @ 12.77 hrs HW=248.45' (Free Discharge)  
 ↑1=**Exfiltration** (Exfiltration Controls 0.23 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=248.00' (Free Discharge)  
 ↑2=**Orifice/Grate** ( Controls 0.00 cfs)

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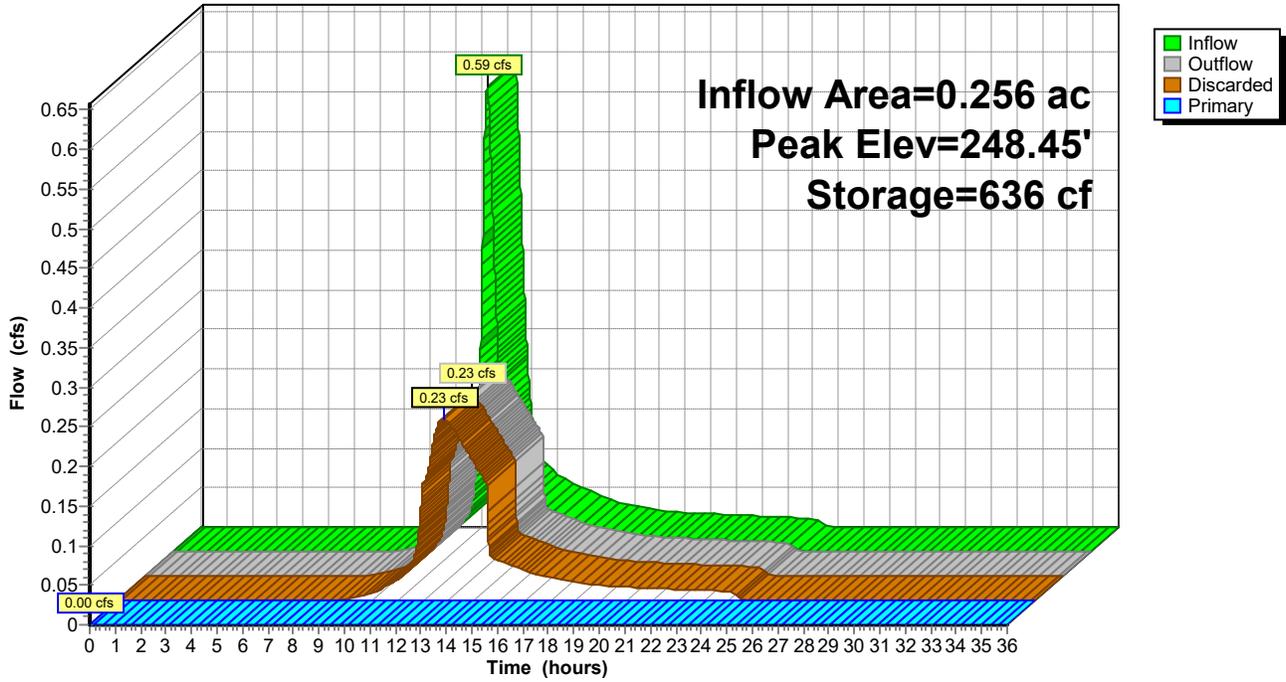
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**Pond 4P: Rain Garden 1**

Hydrograph



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**Summary for Pond 5P: Rain Garden 2**

Inflow Area = 0.080 ac, 68.47% Impervious, Inflow Depth = 3.55" for 25yr event  
 Inflow = 0.21 cfs @ 12.31 hrs, Volume= 0.024 af  
 Outflow = 0.11 cfs @ 12.67 hrs, Volume= 0.024 af, Atten= 50%, Lag= 21.6 min  
 Discarded = 0.07 cfs @ 12.67 hrs, Volume= 0.023 af  
 Primary = 0.03 cfs @ 12.67 hrs, Volume= 0.000 af  
 Routed to Pond 1P : Wetland

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 251.26' @ 12.67 hrs Surf.Area= 552 sf Storage= 235 cf  
 Flood Elev= 252.00' Surf.Area= 865 sf Storage= 757 cf

Plug-Flow detention time= 21.4 min calculated for 0.024 af (100% of inflow)  
 Center-of-Mass det. time= 21.4 min ( 854.5 - 833.1 )

Volume	Invert	Avail.Storage	Storage Description			
#1	250.75'	757 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
250.75	382	101.0	0.0	0	0	382
251.00	460	106.0	100.0	105	105	468
252.00	865	127.0	100.0	652	757	875

Device	Routing	Invert	Outlet Devices
#0	Primary	252.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	250.75'	<b>5.670 in/hr Exfiltration over Surface area</b>
#2	Primary	251.25'	<b>1.5" x 1.5" Horiz. Orifice/Grate X 10.00 columns</b> X 20 rows C= 0.600 in 24.0" x 48.0" Grate (39% open area) Limited to weir flow at low heads

**Discarded OutFlow** Max=0.07 cfs @ 12.67 hrs HW=251.26' (Free Discharge)  
 ↑1=**Exfiltration** (Exfiltration Controls 0.07 cfs)

**Primary OutFlow** Max=0.03 cfs @ 12.67 hrs HW=251.26' (Free Discharge)  
 ↑2=**Orifice/Grate** (Weir Controls 0.03 cfs @ 0.29 fps)

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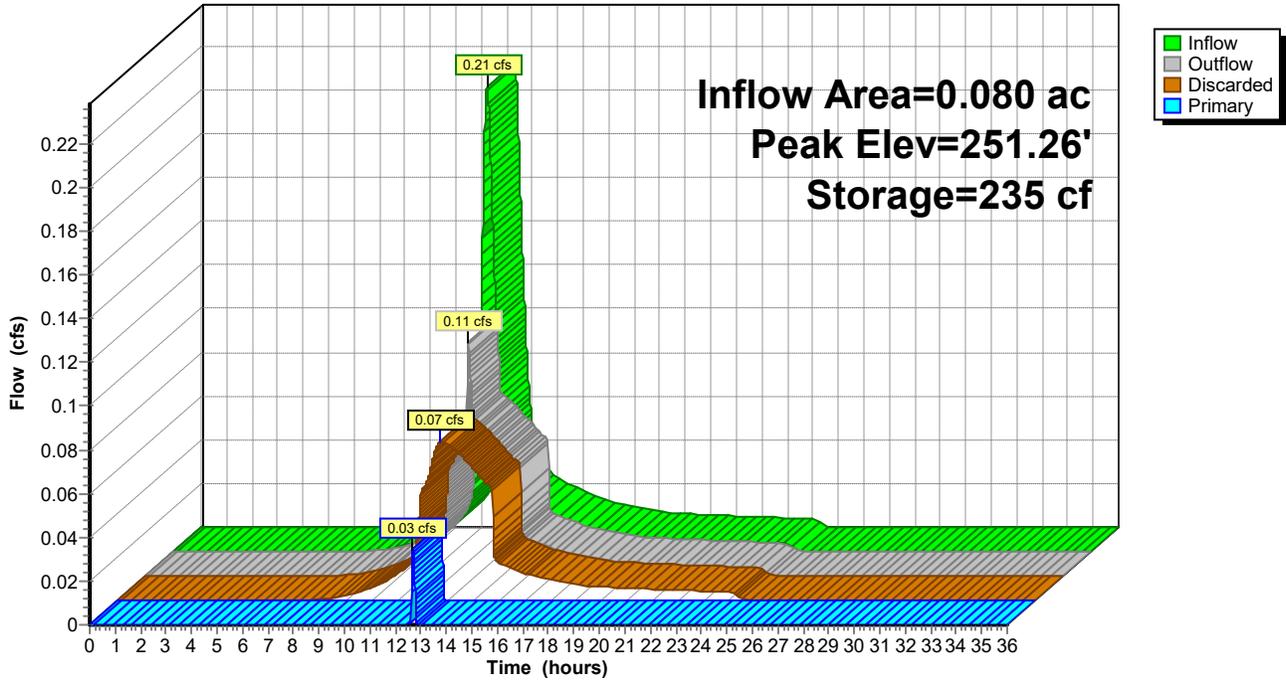
Type III 24-hr 25yr Rainfall=5.85"

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**Pond 5P: Rain Garden 2**

Hydrograph



## 50-Year Storm Event – Proposed

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Type III 24-hr 50yr Rainfall=6.62"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: Interior Lots** Runoff Area=156,041 sf 0.00% Impervious Runoff Depth=0.64"  
 Flow Length=587' Tc=18.0 min CN=39 Runoff=0.95 cfs 0.190 af

**Subcatchment 2S: Outer Sidewalk** Runoff Area=31,786 sf 36.00% Impervious Runoff Depth=2.34"  
 Tc=5.0 min CN=60 Runoff=2.00 cfs 0.142 af

**Subcatchment 3S: Roadway** Runoff Area=44,608 sf 100.00% Impervious Runoff Depth=6.38"  
 Flow Length=630' Slope=0.0088 '/' Tc=22.6 min CN=98 Runoff=4.32 cfs 0.545 af

**Subcatchment 4S: Rain Garden 1** Runoff Area=11,158 sf 59.90% Impervious Runoff Depth=3.71"  
 Flow Length=630' Slope=0.0088 '/' Tc=22.6 min CN=74 Runoff=0.71 cfs 0.079 af

**Subcatchment 5S: Rain Garden 2** Runoff Area=3,482 sf 68.47% Impervious Runoff Depth=4.24"  
 Flow Length=630' Slope=0.0088 '/' Tc=22.6 min CN=79 Runoff=0.25 cfs 0.028 af

**Subcatchment 6S: Inner Sidewalk** Runoff Area=21,183 sf 33.14% Impervious Runoff Depth=2.25"  
 Tc=5.0 min CN=59 Runoff=1.27 cfs 0.091 af

**Subcatchment 7S: Wetland Parcel** Runoff Area=21,779 sf 0.00% Impervious Runoff Depth=0.64"  
 Tc=5.0 min CN=39 Runoff=0.15 cfs 0.027 af

**Reach 16R: Willow Branch** Inflow=1.22 cfs 0.331 af  
 Outflow=1.22 cfs 0.331 af

**Pond 1P: Wetland** Peak Elev=246.74' Storage=14,910 cf Inflow=4.47 cfs 0.576 af  
 Outflow=1.22 cfs 0.331 af

**Pond 2P: Outer Porous Sidewalk** Peak Elev=247.82' Storage=770 cf Inflow=2.00 cfs 0.142 af  
 Discarded=0.78 cfs 0.142 af Primary=0.00 cfs 0.000 af Outflow=0.78 cfs 0.142 af

**Pond 3P: Inner Porous Sidewalk** Peak Elev=247.61' Storage=361 cf Inflow=1.38 cfs 0.281 af  
 Discarded=1.10 cfs 0.281 af Primary=0.00 cfs 0.000 af Outflow=1.10 cfs 0.281 af

**Pond 4P: Rain Garden 1** Peak Elev=248.53' Storage=770 cf Inflow=0.71 cfs 0.079 af  
 Discarded=0.24 cfs 0.076 af Primary=0.16 cfs 0.003 af Outflow=0.41 cfs 0.079 af

**Pond 5P: Rain Garden 2** Peak Elev=251.27' Storage=243 cf Inflow=0.25 cfs 0.028 af  
 Discarded=0.07 cfs 0.026 af Primary=0.12 cfs 0.002 af Outflow=0.19 cfs 0.028 af

**Total Runoff Area = 6.658 ac Runoff Volume = 1.102 af Average Runoff Depth = 1.99"**  
**75.13% Pervious = 5.002 ac 24.87% Impervious = 1.656 ac**

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Type III 24-hr 50yr Rainfall=6.62"

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**Summary for Subcatchment 1S: Interior Lots**

Runoff from this area will be managed by individual lot developers.

Runoff = 0.95 cfs @ 12.47 hrs, Volume= 0.190 af, Depth= 0.64"  
 Routed to Pond 3P : Inner Porous Sidewalk

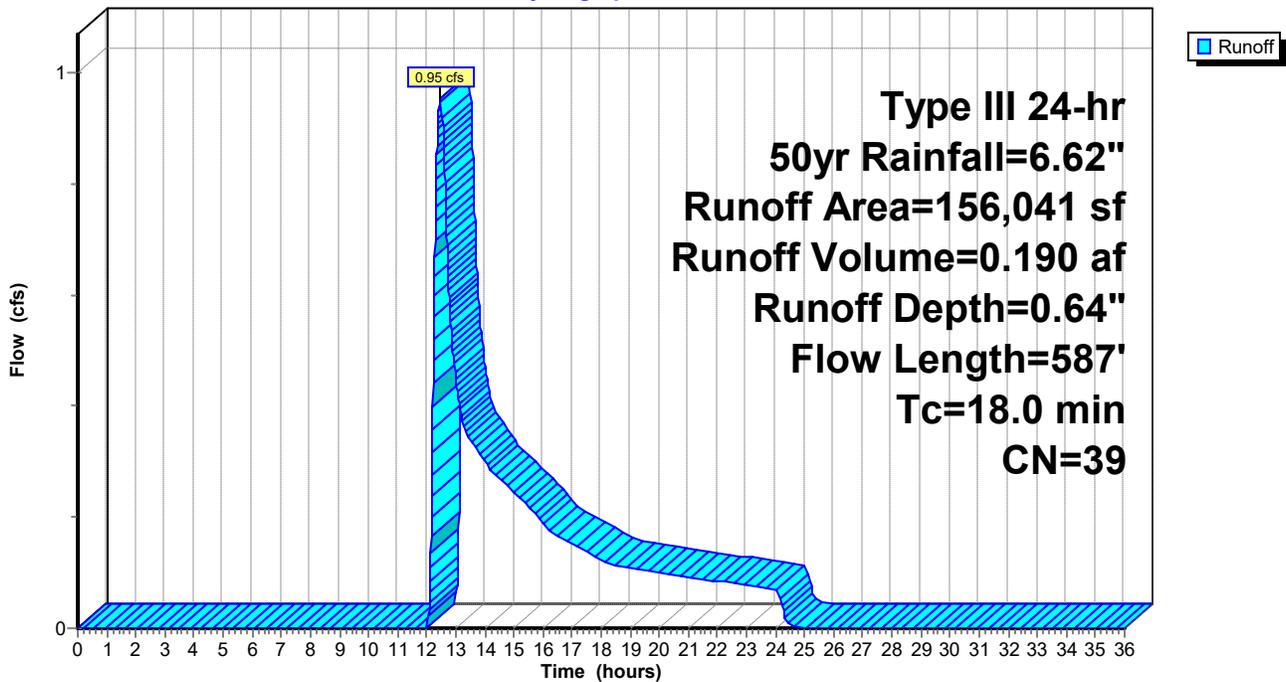
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 50yr Rainfall=6.62"

Area (sf)	CN	Description
156,041	39	Pasture/grassland/range, Good, HSG A
156,041		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0560	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.2	537	0.0081	0.63		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
18.0	587	Total			

**Subcatchment 1S: Interior Lots**

Hydrograph



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Type III 24-hr 50yr Rainfall=6.62"

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**Summary for Subcatchment 2S: Outer Sidewalk**

Runoff = 2.00 cfs @ 12.08 hrs, Volume= 0.142 af, Depth= 2.34"  
Routed to Pond 2P : Outer Porous Sidewalk

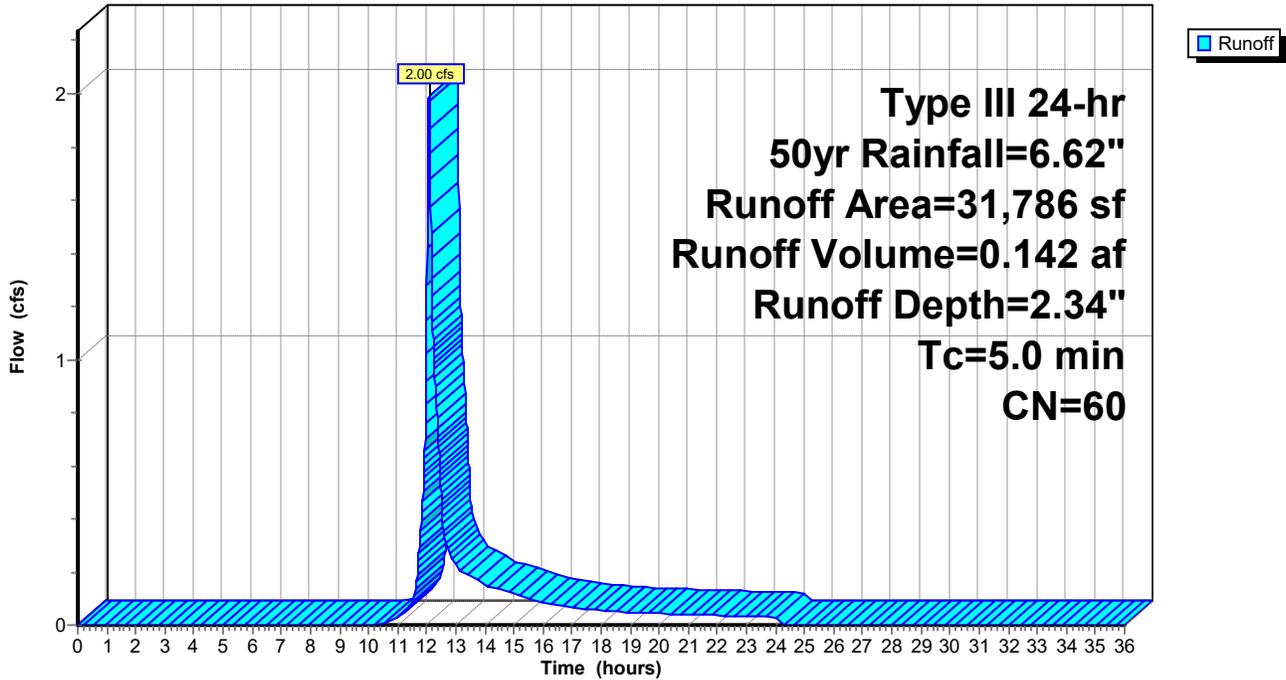
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 50yr Rainfall=6.62"

Area (sf)	CN	Description
20,343	39	>75% Grass cover, Good, HSG A
11,443	98	Paved parking, HSG A
31,786	60	Weighted Average
20,343		64.00% Pervious Area
11,443		36.00% Impervious Area

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

**Subcatchment 2S: Outer Sidewalk**

Hydrograph



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Type III 24-hr 50yr Rainfall=6.62"

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**Summary for Subcatchment 3S: Roadway**

Runoff = 4.32 cfs @ 12.28 hrs, Volume= 0.545 af, Depth= 6.38"  
 Routed to Pond 1P : Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 50yr Rainfall=6.62"

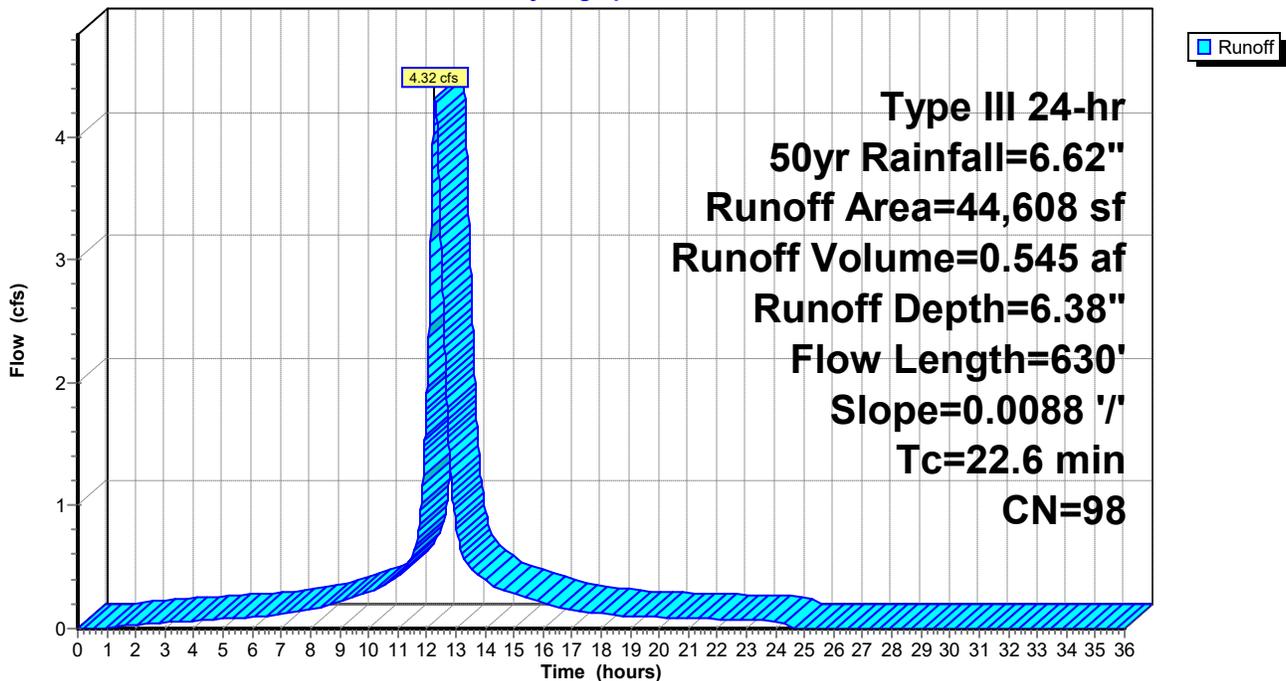
Area (sf)	CN	Description
44,608	98	Paved parking, HSG A
44,608		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0088	0.11		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.7	580	0.0088	0.66		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.6	630	Total			

**Subcatchment 3S: Roadway**

Hydrograph



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**Summary for Subcatchment 4S: Rain Garden 1**

Runoff = 0.71 cfs @ 12.32 hrs, Volume= 0.079 af, Depth= 3.71"  
 Routed to Pond 4P : Rain Garden 1

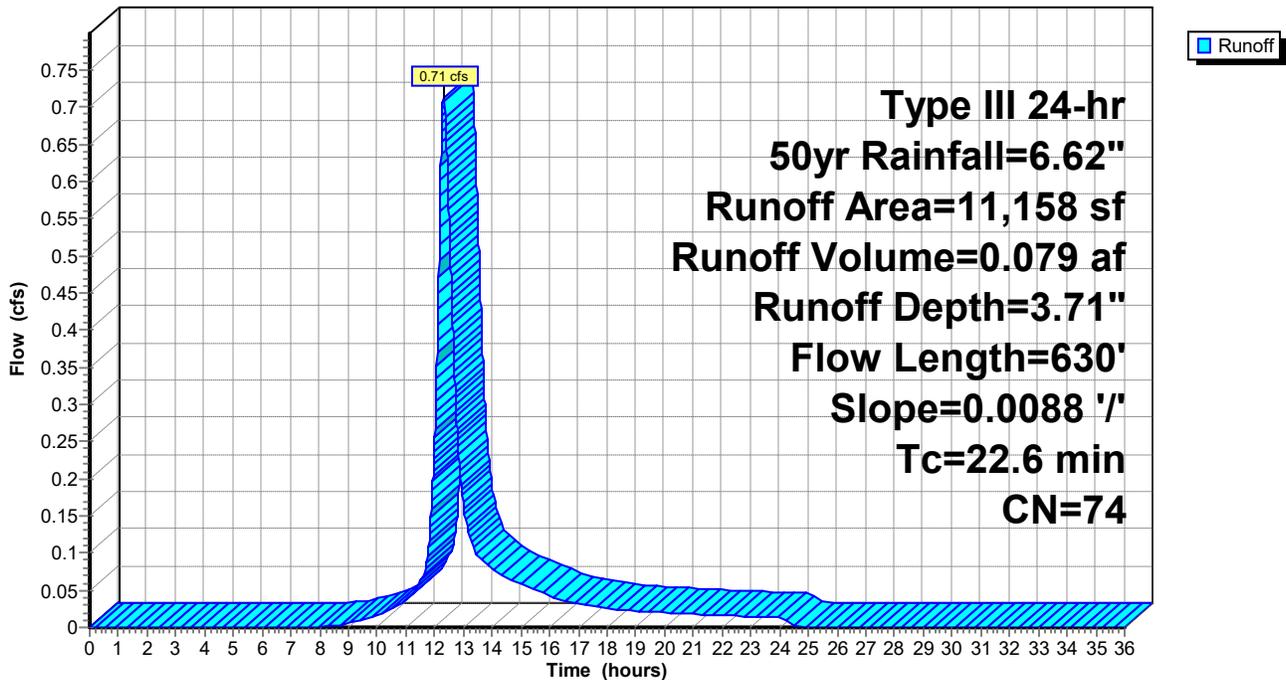
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 50yr Rainfall=6.62"

Area (sf)	CN	Description
4,474	39	>75% Grass cover, Good, HSG A
6,684	98	Paved roads w/curbs & sewers, HSG A
11,158	74	Weighted Average
4,474		40.10% Pervious Area
6,684		59.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0088	0.11		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.7	580	0.0088	0.66		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.6	630	Total			

**Subcatchment 4S: Rain Garden 1**

Hydrograph



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**Summary for Subcatchment 5S: Rain Garden 2**

Runoff = 0.25 cfs @ 12.31 hrs, Volume= 0.028 af, Depth= 4.24"  
 Routed to Pond 5P : Rain Garden 2

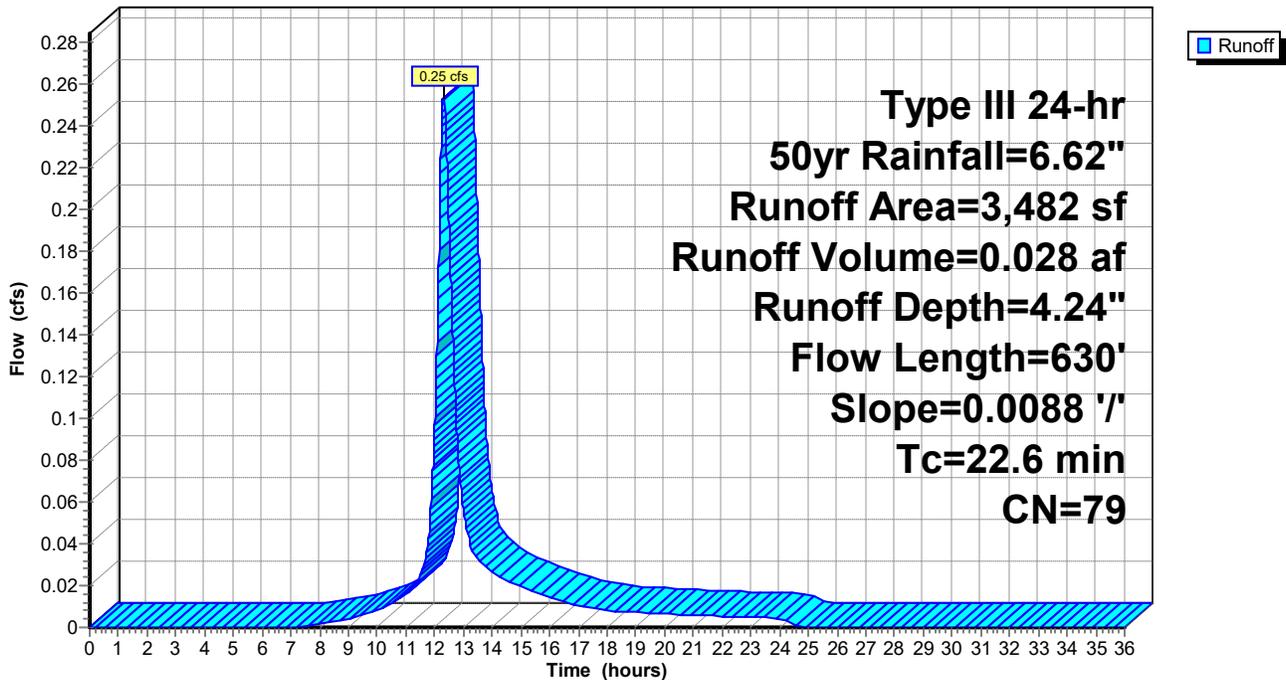
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 50yr Rainfall=6.62"

Area (sf)	CN	Description
1,098	39	>75% Grass cover, Good, HSG A
2,384	98	Paved roads w/curbs & sewers, HSG A
3,482	79	Weighted Average
1,098		31.53% Pervious Area
2,384		68.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0088	0.11		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.7	580	0.0088	0.66		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.6	630	Total			

**Subcatchment 5S: Rain Garden 2**

Hydrograph



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**Summary for Subcatchment 6S: Inner Sidewalk**

Runoff = 1.27 cfs @ 12.08 hrs, Volume= 0.091 af, Depth= 2.25"  
Routed to Pond 3P : Inner Porous Sidewalk

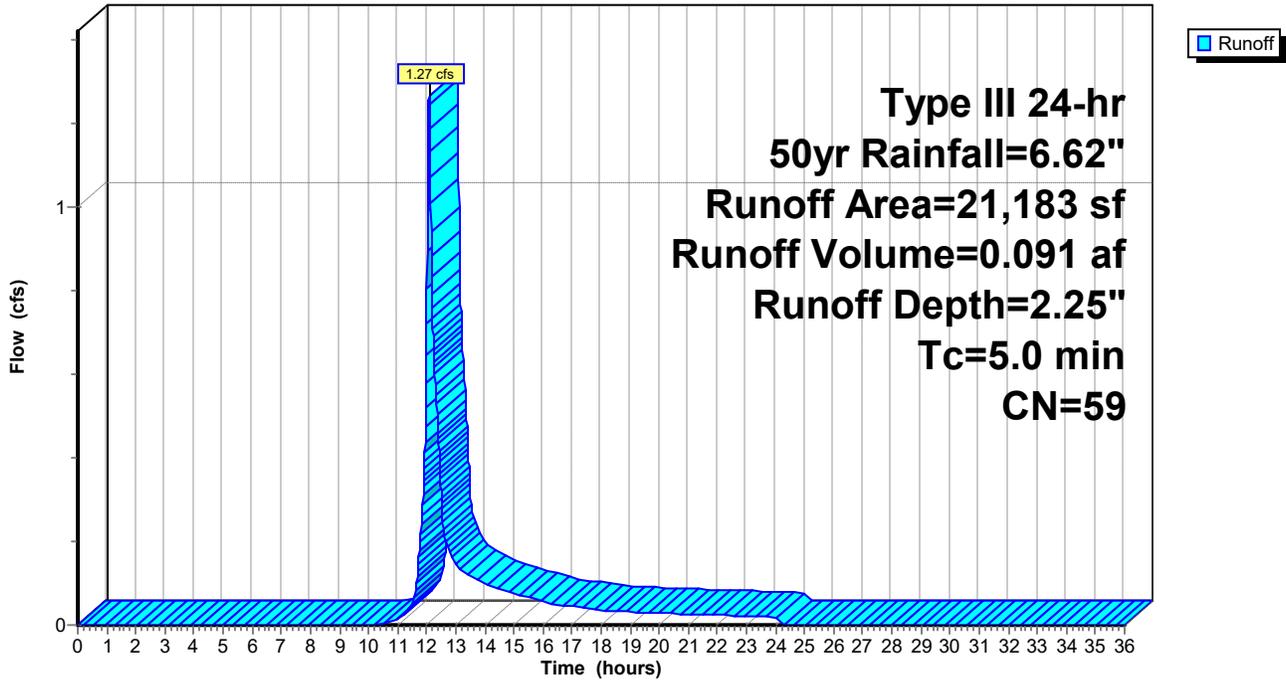
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 50yr Rainfall=6.62"

Area (sf)	CN	Description
14,163	39	>75% Grass cover, Good, HSG A
7,020	98	Paved parking, HSG A
21,183	59	Weighted Average
14,163		66.86% Pervious Area
7,020		33.14% Impervious Area

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

**Subcatchment 6S: Inner Sidewalk**

Hydrograph



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**Summary for Subcatchment 7S: Wetland Parcel**

Runoff = 0.15 cfs @ 12.14 hrs, Volume= 0.027 af, Depth= 0.64"  
 Routed to Pond 1P : Wetland

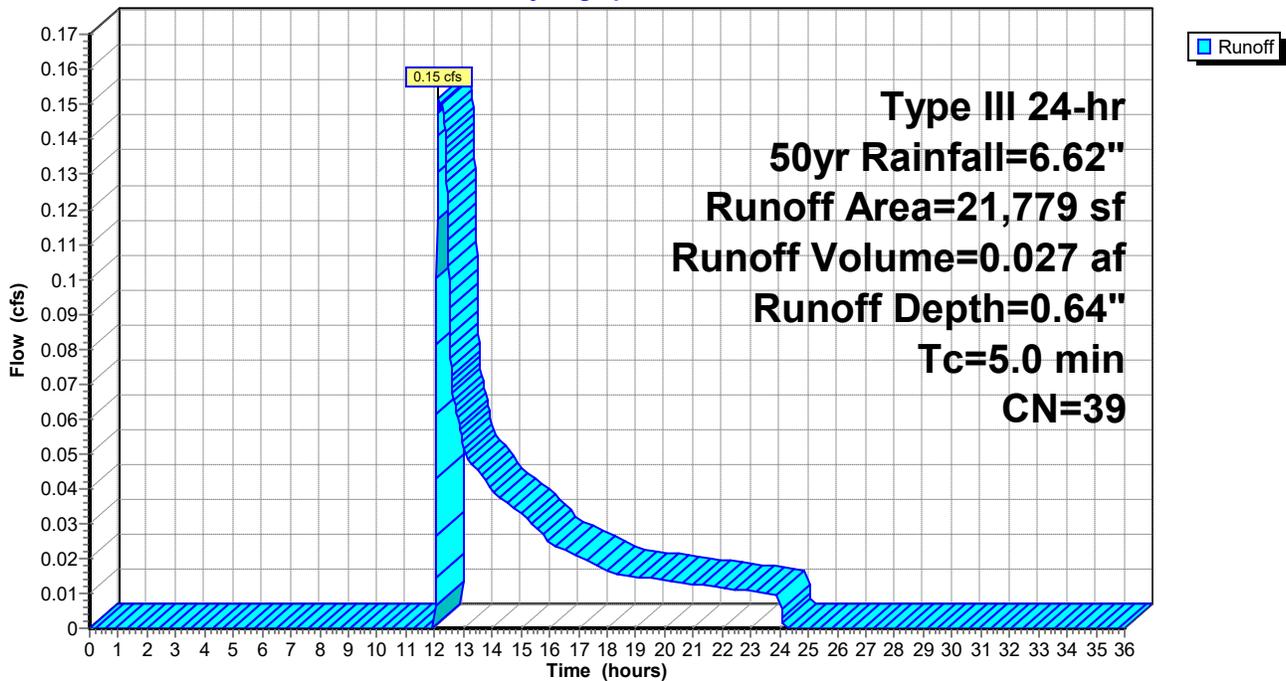
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 50yr Rainfall=6.62"

Area (sf)	CN	Description
21,779	39	>75% Grass cover, Good, HSG A
21,779		100.00% Pervious Area

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

**Subcatchment 7S: Wetland Parcel**

Hydrograph



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**Summary for Reach 16R: Willow Branch**

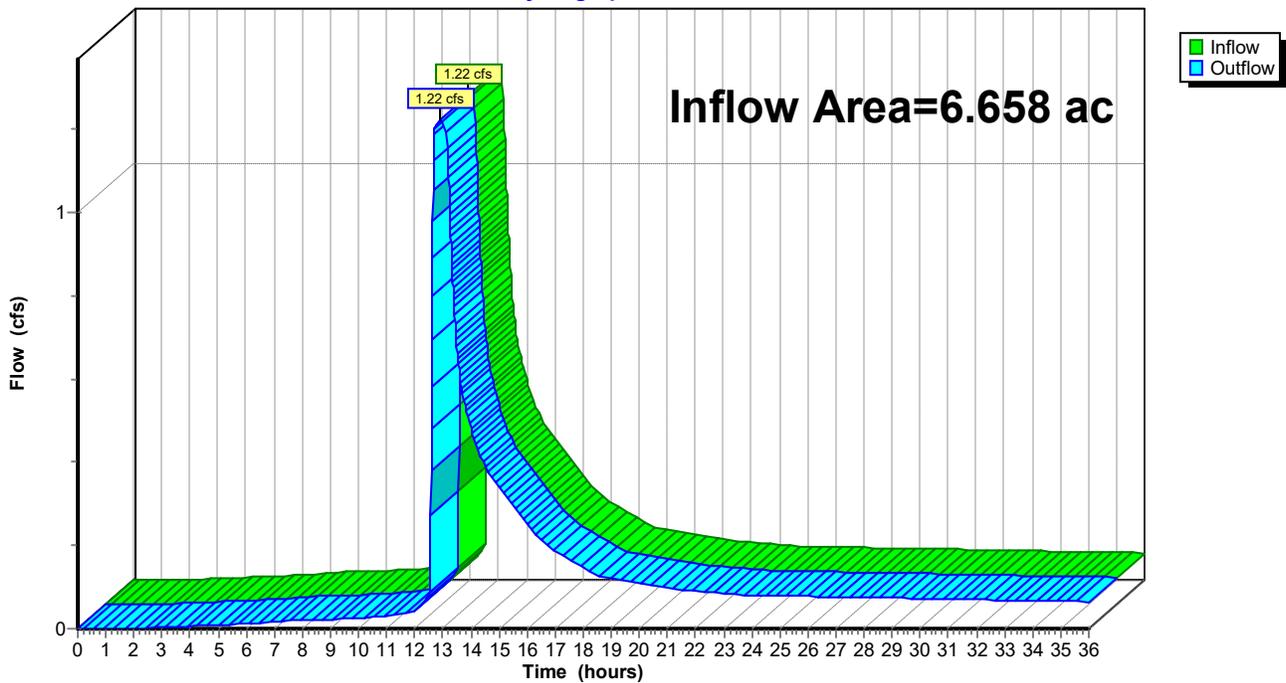
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6.658 ac, 24.87% Impervious, Inflow Depth > 0.60" for 50yr event  
Inflow = 1.22 cfs @ 12.87 hrs, Volume= 0.331 af  
Outflow = 1.22 cfs @ 12.87 hrs, Volume= 0.331 af, Atten= 0%, Lag= 0.0 min

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

**Reach 16R: Willow Branch**

Hydrograph



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Type III 24-hr 50yr Rainfall=6.62"

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**Summary for Pond 1P: Wetland**

Inflow Area = 1.860 ac, 66.24% Impervious, Inflow Depth = 3.72" for 50yr event  
 Inflow = 4.47 cfs @ 12.28 hrs, Volume= 0.576 af  
 Outflow = 1.22 cfs @ 12.87 hrs, Volume= 0.331 af, Atten= 73%, Lag= 34.9 min  
 Primary = 1.22 cfs @ 12.87 hrs, Volume= 0.331 af  
 Routed to Reach 16R : Willow Branch

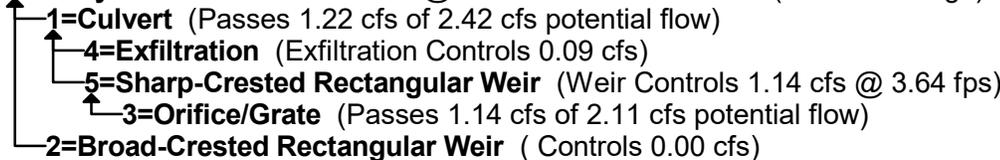
Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 246.74' @ 12.87 hrs Surf.Area= 6,362 sf Storage= 14,910 cf  
 Flood Elev= 250.00' Surf.Area= 10,271 sf Storage= 41,797 cf

Plug-Flow detention time= 456.2 min calculated for 0.331 af (57% of inflow)  
 Center-of-Mass det. time= 336.2 min ( 1,103.6 - 767.4 )

Volume	Invert	Avail.Storage	Storage Description			
#1	243.50'	41,797 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
243.50	2,383	303.0	0	0	2,383	
244.00	3,300	319.0	1,415	1,415	3,190	
245.00	4,662	331.0	3,961	5,376	3,891	
250.00	10,271	441.0	36,421	41,797	10,919	

Device	Routing	Invert	Outlet Devices
#0	Primary	250.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Primary	243.20'	<b>8.0" Round Culvert</b> L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 243.20' / 242.95' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete sewer w/manholes & inlets, Flow Area= 0.35 sf
#2	Primary	248.00'	<b>2.0' long + 3.0 ' SideZ x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Device 5	246.55'	<b>1.5" x 1.5" Horiz. Orifice/Grate X 10.00 columns</b> X 10 rows C= 0.600 in 24.0" x 24.0" Grate (39% open area) Limited to weir flow at low heads
#4	Device 1	243.50'	<b>1.000 in/hr Exfiltration over Wetted area above 243.50'</b> Excluded Wetted area = 2,383 sf
#5	Device 1	245.50'	<b>0.5' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Primary OutFlow** Max=1.22 cfs @ 12.87 hrs HW=246.74' (Free Discharge)



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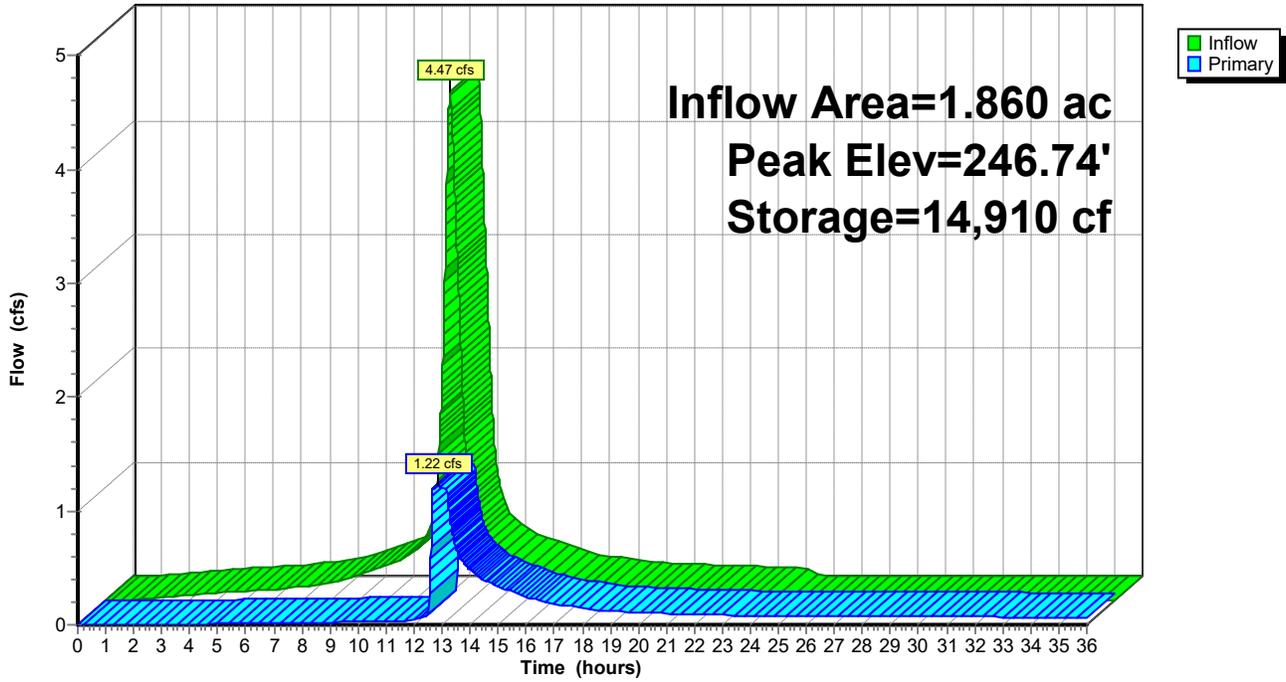
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**Pond 1P: Wetland**

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**Summary for Pond 2P: Outer Porous Sidewalk**

Inflow Area = 0.730 ac, 36.00% Impervious, Inflow Depth = 2.34" for 50yr event  
 Inflow = 2.00 cfs @ 12.08 hrs, Volume= 0.142 af  
 Outflow = 0.78 cfs @ 11.99 hrs, Volume= 0.142 af, Atten= 61%, Lag= 0.0 min  
 Discarded = 0.78 cfs @ 11.99 hrs, Volume= 0.142 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Reach 16R : Willow Branch

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 247.82' @ 12.36 hrs Surf.Area= 5,972 sf Storage= 770 cf  
 Flood Elev= 250.00' Surf.Area= 5,972 sf Storage= 3,583 cf

Plug-Flow detention time= 5.2 min calculated for 0.142 af (100% of inflow)  
 Center-of-Mass det. time= 5.2 min ( 861.0 - 855.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	247.50'	3,583 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 8,958 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
247.50	5,972	0	0
249.00	5,972	8,958	8,958

Device	Routing	Invert	Outlet Devices
#0	Primary	249.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	247.50'	<b>5.670 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.78 cfs @ 11.99 hrs HW=247.53' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.78 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=247.50' (Free Discharge)

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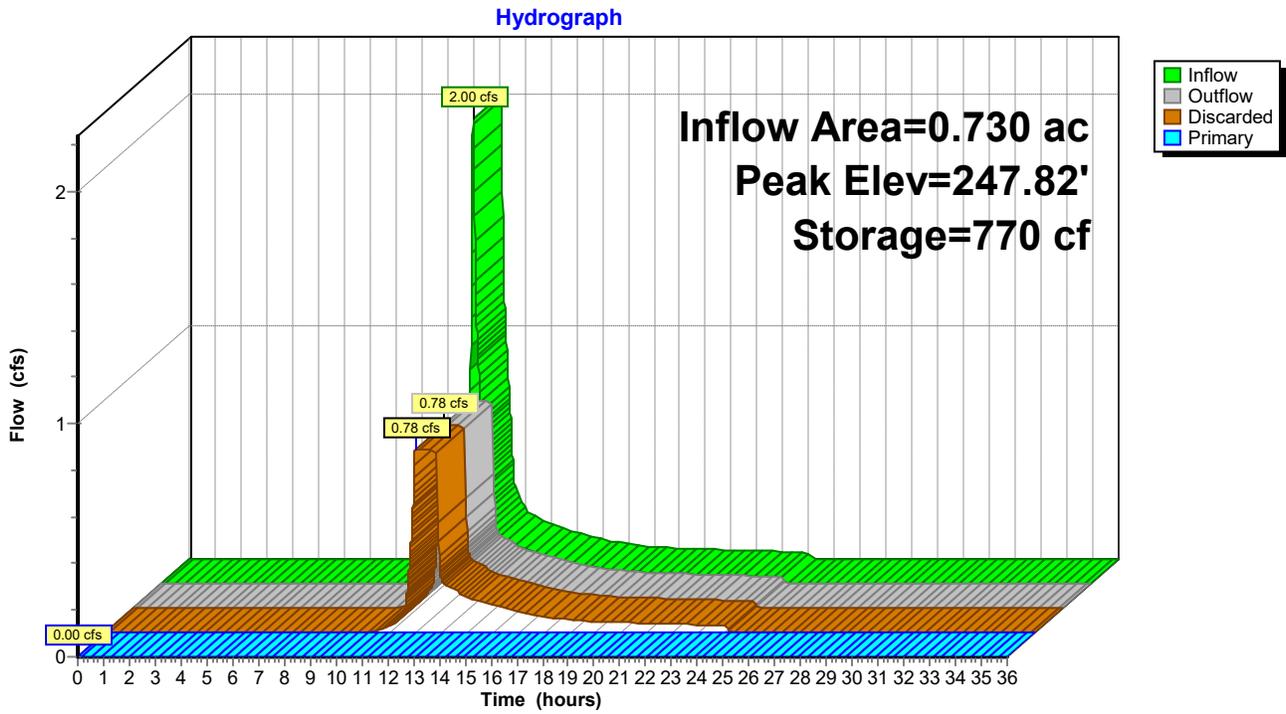
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**Pond 2P: Outer Porous Sidewalk**



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**Summary for Pond 3P: Inner Porous Sidewalk**

Inflow Area = 4.069 ac, 3.96% Impervious, Inflow Depth = 0.83" for 50yr event  
 Inflow = 1.38 cfs @ 12.38 hrs, Volume= 0.281 af  
 Outflow = 1.10 cfs @ 12.07 hrs, Volume= 0.281 af, Atten= 20%, Lag= 0.0 min  
 Discarded = 1.10 cfs @ 12.07 hrs, Volume= 0.281 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Reach 16R : Willow Branch

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 247.61' @ 12.58 hrs Surf.Area= 8,398 sf Storage= 361 cf  
 Flood Elev= 250.00' Surf.Area= 8,398 sf Storage= 5,039 cf

Plug-Flow detention time= 1.8 min calculated for 0.281 af (100% of inflow)  
 Center-of-Mass det. time= 1.8 min ( 923.0 - 921.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	247.50'	5,039 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 12,597 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
247.50	8,398	0	0
249.00	8,398	12,597	12,597

Device	Routing	Invert	Outlet Devices
#0	Primary	249.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	247.50'	<b>5.670 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=1.10 cfs @ 12.07 hrs HW=247.53' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 1.10 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=247.50' (Free Discharge)

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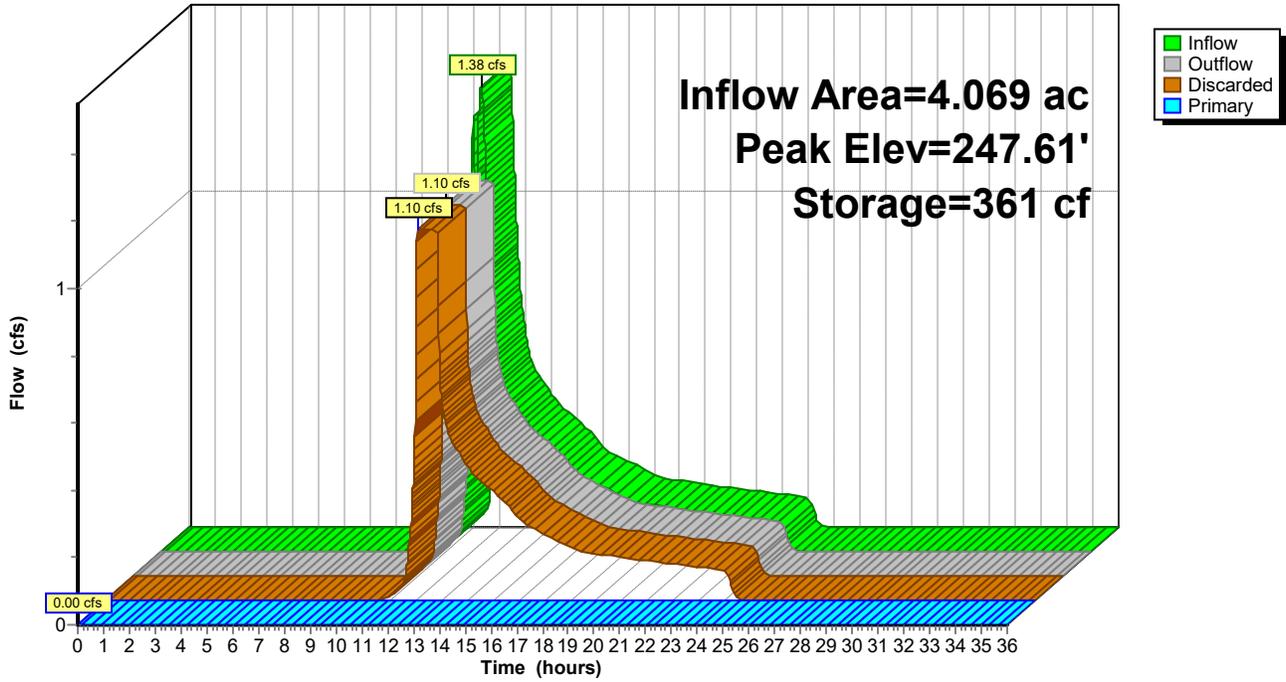
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**Pond 3P: Inner Porous Sidewalk**

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**Summary for Pond 4P: Rain Garden 1**

Inflow Area = 0.256 ac, 59.90% Impervious, Inflow Depth = 3.71" for 50yr event  
 Inflow = 0.71 cfs @ 12.32 hrs, Volume= 0.079 af  
 Outflow = 0.41 cfs @ 12.63 hrs, Volume= 0.079 af, Atten= 43%, Lag= 19.0 min  
 Discarded = 0.24 cfs @ 12.63 hrs, Volume= 0.076 af  
 Primary = 0.16 cfs @ 12.63 hrs, Volume= 0.003 af  
 Routed to Pond 1P : Wetland

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 248.53' @ 12.63 hrs Surf.Area= 1,864 sf Storage= 770 cf  
 Flood Elev= 249.70' Surf.Area= 4,011 sf Storage= 4,222 cf

Plug-Flow detention time= 21.4 min calculated for 0.079 af (100% of inflow)  
 Center-of-Mass det. time= 21.4 min ( 861.2 - 839.8 )

Volume	Invert	Avail.Storage	Storage Description			
#1	248.00'	4,222 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
248.00	1,100	551.0	0.0	0	0	1,100
249.20	3,139	576.0	100.0	2,439	2,439	3,442
249.70	4,011	586.0	100.0	1,783	4,222	4,411

Device	Routing	Invert	Outlet Devices
#0	Primary	249.70'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	248.00'	<b>5.670 in/hr Exfiltration over Surface area</b>
#2	Primary	248.50'	<b>1.5" x 1.5" Horiz. Orifice/Grate X 10.00 columns</b> X 20 rows C= 0.600 in 24.0" x 48.0" Grate (39% open area) Limited to weir flow at low heads

**Discarded OutFlow** Max=0.24 cfs @ 12.63 hrs HW=248.53' (Free Discharge)  
 ↑1=**Exfiltration** (Exfiltration Controls 0.24 cfs)

**Primary OutFlow** Max=0.16 cfs @ 12.63 hrs HW=248.53' (Free Discharge)  
 ↑2=**Orifice/Grate** (Weir Controls 0.16 cfs @ 0.52 fps)

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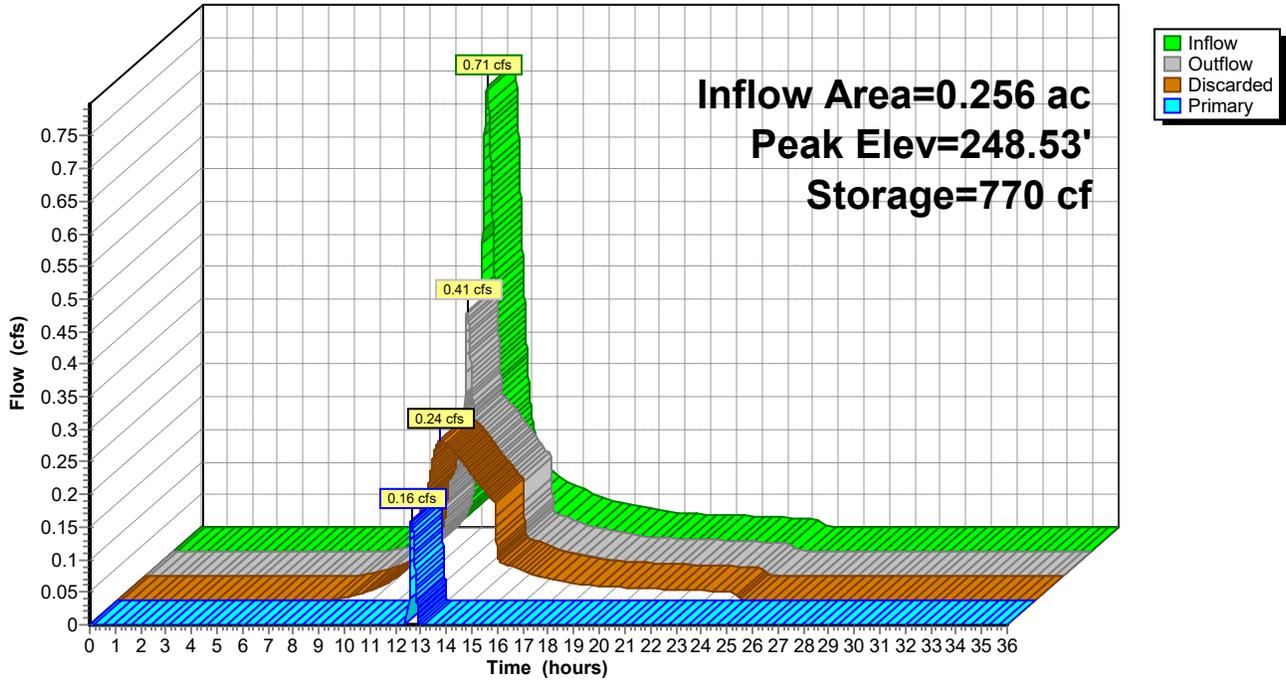
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**Pond 4P: Rain Garden 1**

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**Summary for Pond 5P: Rain Garden 2**

Inflow Area = 0.080 ac, 68.47% Impervious, Inflow Depth = 4.24" for 50yr event  
 Inflow = 0.25 cfs @ 12.31 hrs, Volume= 0.028 af  
 Outflow = 0.19 cfs @ 12.50 hrs, Volume= 0.028 af, Atten= 24%, Lag= 11.4 min  
 Discarded = 0.07 cfs @ 12.50 hrs, Volume= 0.026 af  
 Primary = 0.12 cfs @ 12.50 hrs, Volume= 0.002 af  
 Routed to Pond 1P : Wetland

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 251.27' @ 12.50 hrs Surf.Area= 557 sf Storage= 243 cf  
 Flood Elev= 252.00' Surf.Area= 865 sf Storage= 757 cf

Plug-Flow detention time= 20.5 min calculated for 0.028 af (100% of inflow)  
 Center-of-Mass det. time= 20.5 min ( 848.5 - 828.0 )

Volume	Invert	Avail.Storage	Storage Description			
#1	250.75'	757 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
250.75	382	101.0	0.0	0	0	382
251.00	460	106.0	100.0	105	105	468
252.00	865	127.0	100.0	652	757	875

Device	Routing	Invert	Outlet Devices
#0	Primary	252.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	250.75'	<b>5.670 in/hr Exfiltration over Surface area</b>
#2	Primary	251.25'	<b>1.5" x 1.5" Horiz. Orifice/Grate X 10.00 columns</b> X 20 rows C= 0.600 in 24.0" x 48.0" Grate (39% open area) Limited to weir flow at low heads

**Discarded OutFlow** Max=0.07 cfs @ 12.50 hrs HW=251.27' (Free Discharge)  
 ↑1=**Exfiltration** (Exfiltration Controls 0.07 cfs)

**Primary OutFlow** Max=0.12 cfs @ 12.50 hrs HW=251.27' (Free Discharge)  
 ↑2=**Orifice/Grate** (Weir Controls 0.12 cfs @ 0.47 fps)

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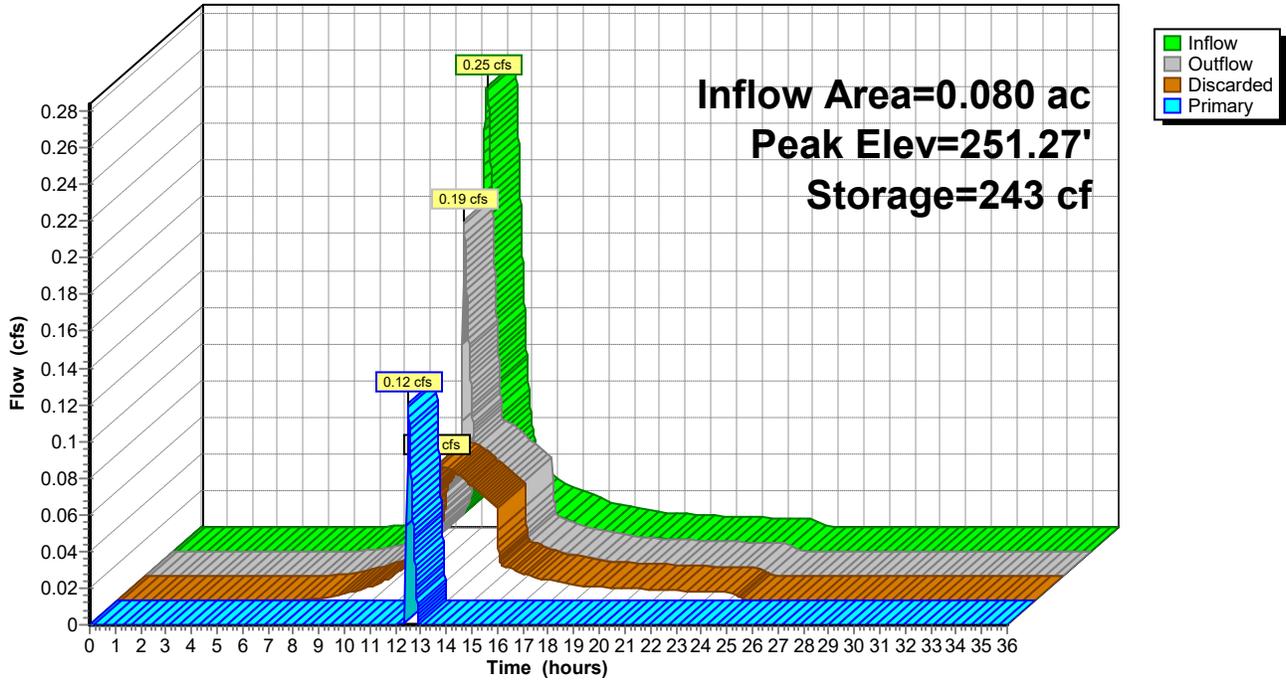
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**Pond 5P: Rain Garden 2**

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## 100-Year Storm Event – Proposed

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Type III 24-hr 100yr Rainfall=7.46"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: Interior Lots** Runoff Area=156,041 sf 0.00% Impervious Runoff Depth=0.94"  
 Flow Length=587' Tc=18.0 min CN=39 Runoff=1.68 cfs 0.280 af

**Subcatchment 2S: Outer Sidewalk** Runoff Area=31,786 sf 36.00% Impervious Runoff Depth=2.93"  
 Tc=5.0 min CN=60 Runoff=2.55 cfs 0.178 af

**Subcatchment 3S: Roadway** Runoff Area=44,608 sf 100.00% Impervious Runoff Depth=7.22"  
 Flow Length=630' Slope=0.0088 '/' Tc=22.6 min CN=98 Runoff=4.87 cfs 0.616 af

**Subcatchment 4S: Rain Garden 1** Runoff Area=11,158 sf 59.90% Impervious Runoff Depth=4.45"  
 Flow Length=630' Slope=0.0088 '/' Tc=22.6 min CN=74 Runoff=0.85 cfs 0.095 af

**Subcatchment 5S: Rain Garden 2** Runoff Area=3,482 sf 68.47% Impervious Runoff Depth=5.01"  
 Flow Length=630' Slope=0.0088 '/' Tc=22.6 min CN=79 Runoff=0.30 cfs 0.033 af

**Subcatchment 6S: Inner Sidewalk** Runoff Area=21,183 sf 33.14% Impervious Runoff Depth=2.83"  
 Tc=5.0 min CN=59 Runoff=1.63 cfs 0.115 af

**Subcatchment 7S: Wetland Parcel** Runoff Area=21,779 sf 0.00% Impervious Runoff Depth=0.94"  
 Tc=5.0 min CN=39 Runoff=0.33 cfs 0.039 af

**Reach 16R: Willow Branch** Inflow=1.58 cfs 0.424 af  
 Outflow=1.58 cfs 0.424 af

**Pond 1P: Wetland** Peak Elev=246.99' Storage=16,555 cf Inflow=5.11 cfs 0.669 af  
 Outflow=1.58 cfs 0.424 af

**Pond 2P: Outer Porous Sidewalk** Peak Elev=248.05' Storage=1,305 cf Inflow=2.55 cfs 0.178 af  
 Discarded=0.78 cfs 0.178 af Primary=0.00 cfs 0.000 af Outflow=0.78 cfs 0.178 af

**Pond 3P: Inner Porous Sidewalk** Peak Elev=248.12' Storage=2,072 cf Inflow=2.32 cfs 0.395 af  
 Discarded=1.10 cfs 0.395 af Primary=0.00 cfs 0.000 af Outflow=1.10 cfs 0.395 af

**Pond 4P: Rain Garden 1** Peak Elev=248.55' Storage=809 cf Inflow=0.85 cfs 0.095 af  
 Discarded=0.25 cfs 0.085 af Primary=0.39 cfs 0.009 af Outflow=0.64 cfs 0.095 af

**Pond 5P: Rain Garden 2** Peak Elev=251.28' Storage=247 cf Inflow=0.30 cfs 0.033 af  
 Discarded=0.07 cfs 0.029 af Primary=0.20 cfs 0.005 af Outflow=0.27 cfs 0.033 af

**Total Runoff Area = 6.658 ac Runoff Volume = 1.357 af Average Runoff Depth = 2.45"**  
**75.13% Pervious = 5.002 ac 24.87% Impervious = 1.656 ac**

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**Summary for Subcatchment 1S: Interior Lots**

Runoff from this area will be managed by individual lot developers.

Runoff = 1.68 cfs @ 12.38 hrs, Volume= 0.280 af, Depth= 0.94"  
Routed to Pond 3P : Inner Porous Sidewalk

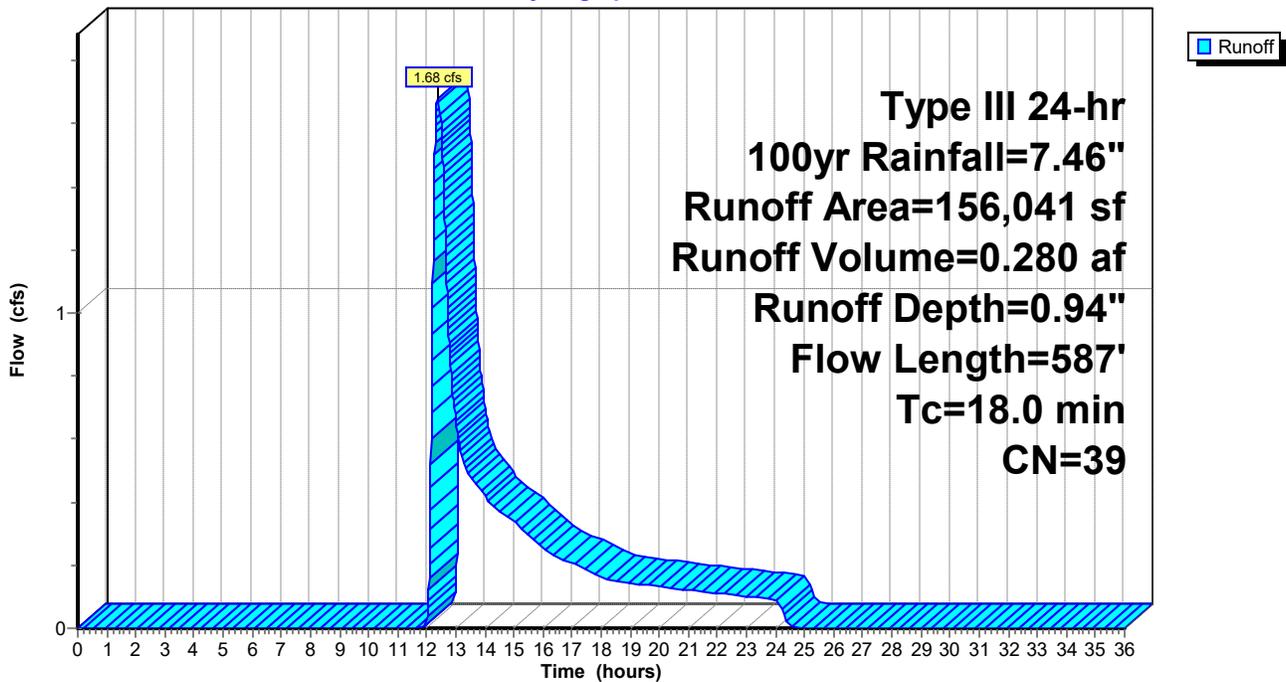
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100yr Rainfall=7.46"

Area (sf)	CN	Description
156,041	39	Pasture/grassland/range, Good, HSG A
156,041		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0560	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.2	537	0.0081	0.63		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
18.0	587	Total			

**Subcatchment 1S: Interior Lots**

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**Summary for Subcatchment 2S: Outer Sidewalk**

Runoff = 2.55 cfs @ 12.08 hrs, Volume= 0.178 af, Depth= 2.93"  
Routed to Pond 2P : Outer Porous Sidewalk

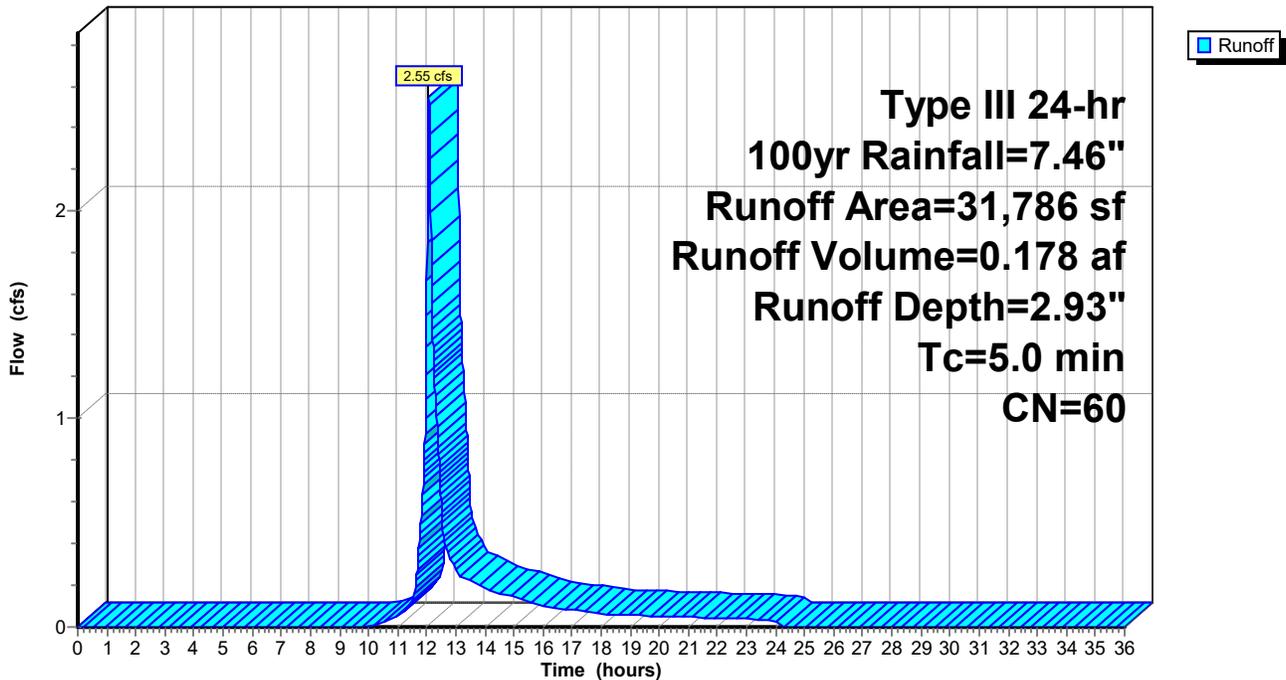
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100yr Rainfall=7.46"

Area (sf)	CN	Description
20,343	39	>75% Grass cover, Good, HSG A
11,443	98	Paved parking, HSG A
31,786	60	Weighted Average
20,343		64.00% Pervious Area
11,443		36.00% Impervious Area

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

**Subcatchment 2S: Outer Sidewalk**

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**Summary for Subcatchment 3S: Roadway**

Runoff = 4.87 cfs @ 12.28 hrs, Volume= 0.616 af, Depth= 7.22"  
 Routed to Pond 1P : Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100yr Rainfall=7.46"

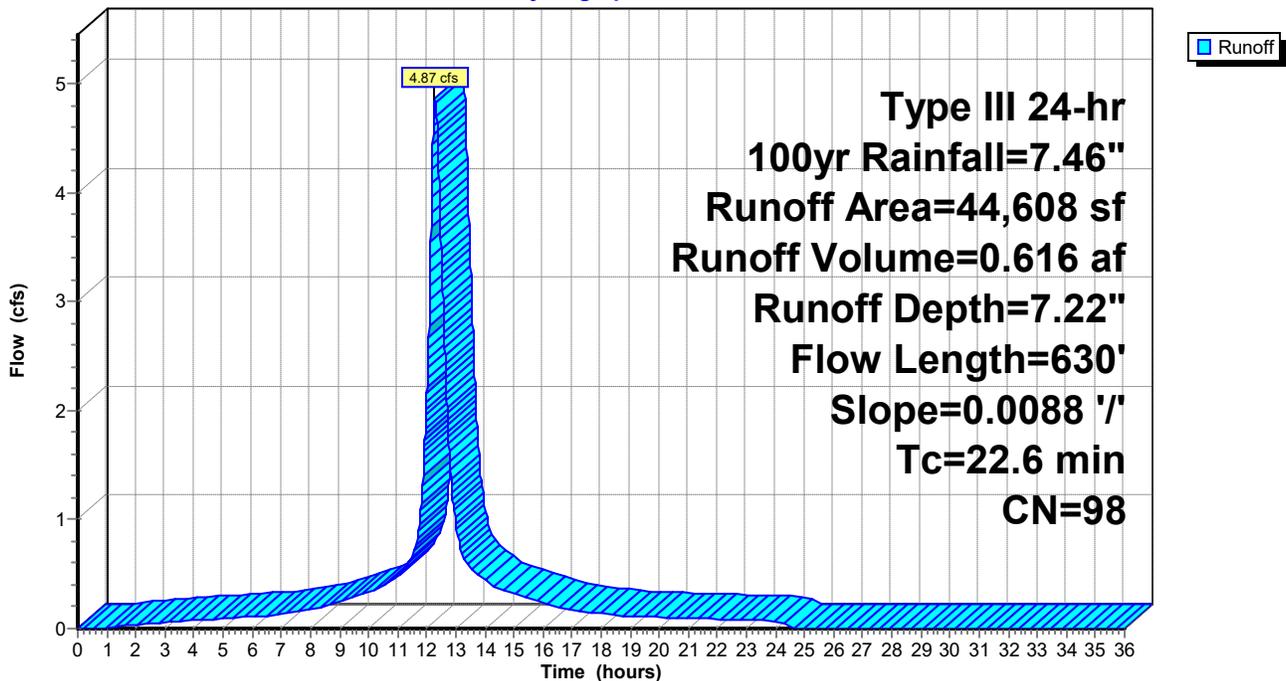
Area (sf)	CN	Description
44,608	98	Paved parking, HSG A
44,608		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0088	0.11		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.7	580	0.0088	0.66		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.6	630	Total			

**Subcatchment 3S: Roadway**

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**Summary for Subcatchment 4S: Rain Garden 1**

Runoff = 0.85 cfs @ 12.31 hrs, Volume= 0.095 af, Depth= 4.45"  
 Routed to Pond 4P : Rain Garden 1

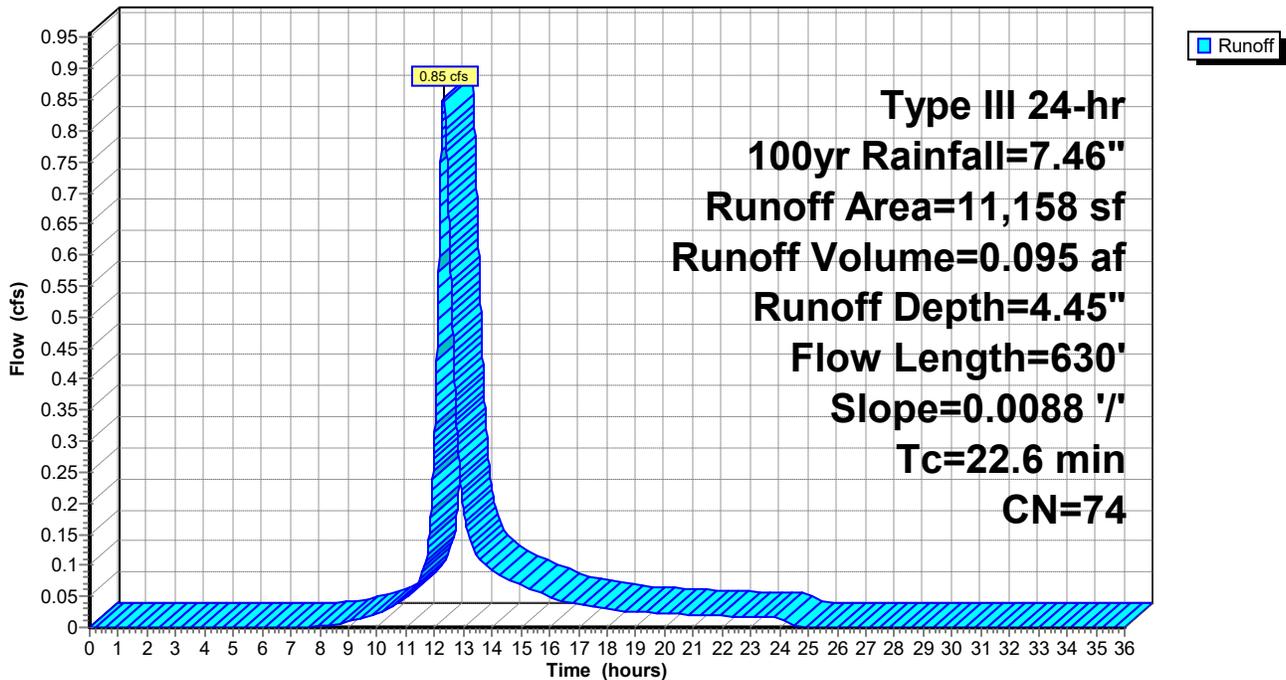
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100yr Rainfall=7.46"

Area (sf)	CN	Description
4,474	39	>75% Grass cover, Good, HSG A
6,684	98	Paved roads w/curbs & sewers, HSG A
11,158	74	Weighted Average
4,474		40.10% Pervious Area
6,684		59.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0088	0.11		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.7	580	0.0088	0.66		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.6	630	Total			

**Subcatchment 4S: Rain Garden 1**

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**Summary for Subcatchment 5S: Rain Garden 2**

Runoff = 0.30 cfs @ 12.30 hrs, Volume= 0.033 af, Depth= 5.01"  
 Routed to Pond 5P : Rain Garden 2

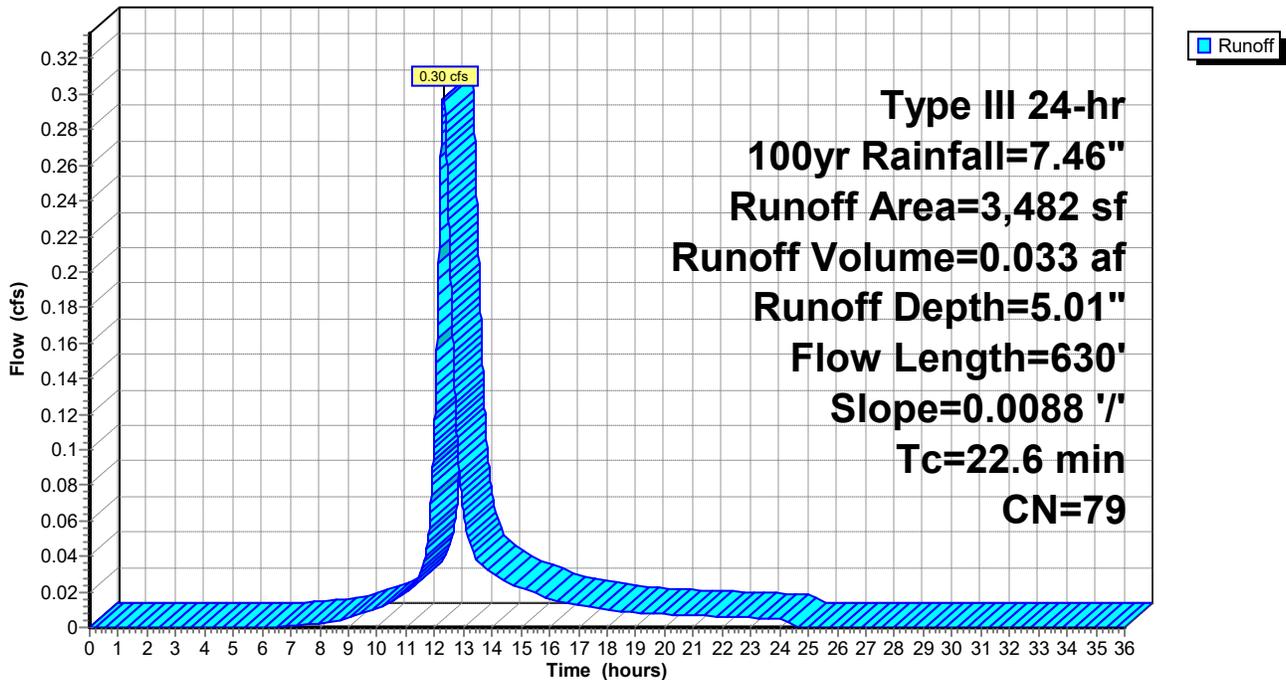
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100yr Rainfall=7.46"

Area (sf)	CN	Description
1,098	39	>75% Grass cover, Good, HSG A
2,384	98	Paved roads w/curbs & sewers, HSG A
3,482	79	Weighted Average
1,098		31.53% Pervious Area
2,384		68.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0088	0.11		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.14"
14.7	580	0.0088	0.66		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.6	630	Total			

**Subcatchment 5S: Rain Garden 2**

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**Summary for Subcatchment 6S: Inner Sidewalk**

Runoff = 1.63 cfs @ 12.08 hrs, Volume= 0.115 af, Depth= 2.83"  
 Routed to Pond 3P : Inner Porous Sidewalk

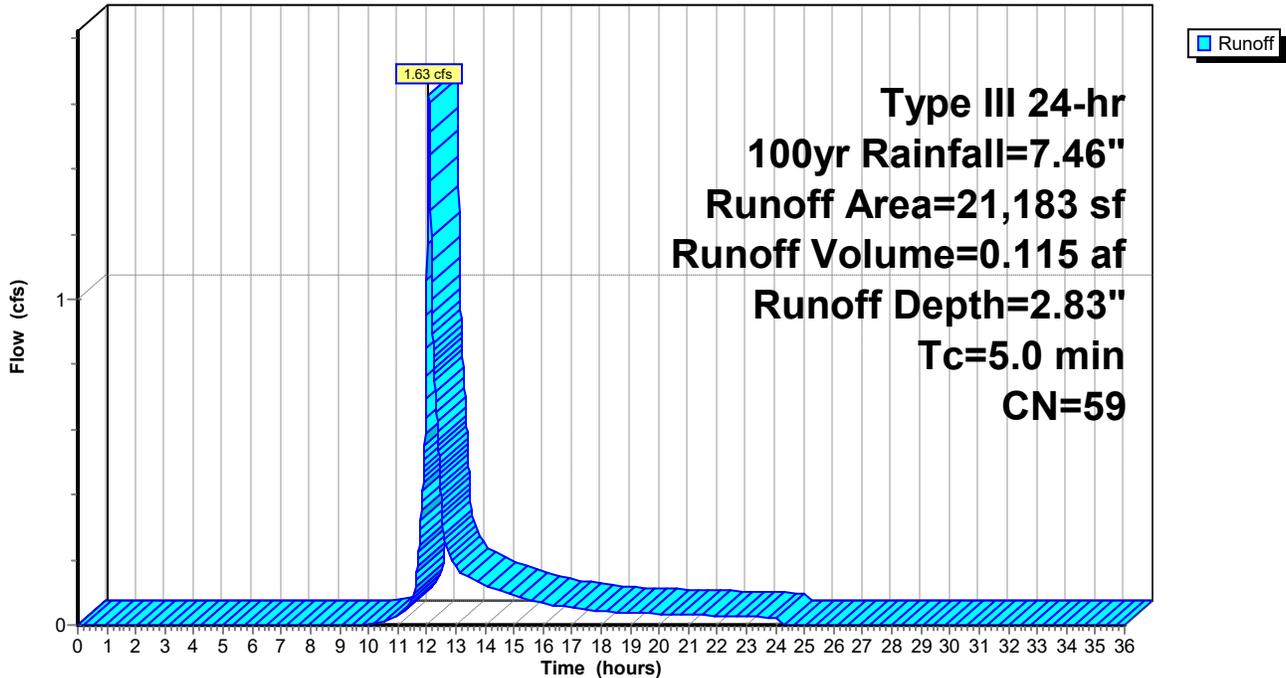
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100yr Rainfall=7.46"

Area (sf)	CN	Description
14,163	39	>75% Grass cover, Good, HSG A
7,020	98	Paved parking, HSG A
21,183	59	Weighted Average
14,163		66.86% Pervious Area
7,020		33.14% Impervious Area

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

**Subcatchment 6S: Inner Sidewalk**

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**Summary for Subcatchment 7S: Wetland Parcel**

Runoff = 0.33 cfs @ 12.11 hrs, Volume= 0.039 af, Depth= 0.94"  
Routed to Pond 1P : Wetland

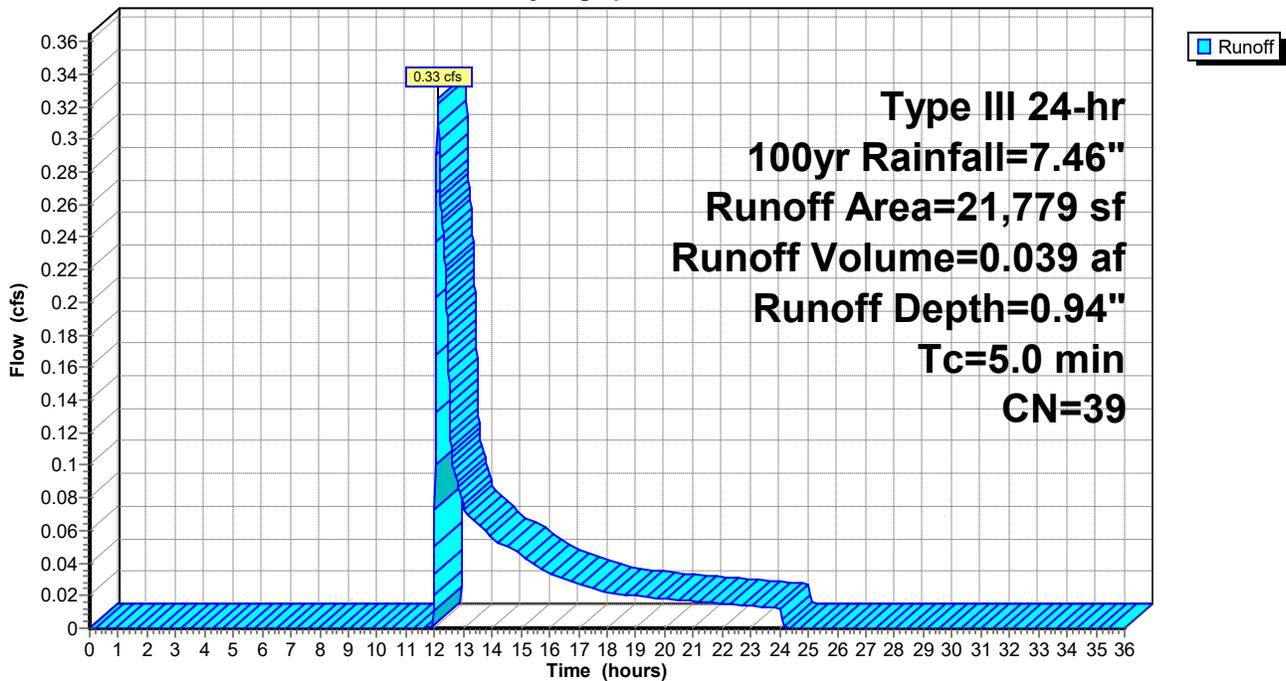
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100yr Rainfall=7.46"

Area (sf)	CN	Description
21,779	39	>75% Grass cover, Good, HSG A
21,779		100.00% Pervious Area

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

**Subcatchment 7S: Wetland Parcel**

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**Summary for Reach 16R: Willow Branch**

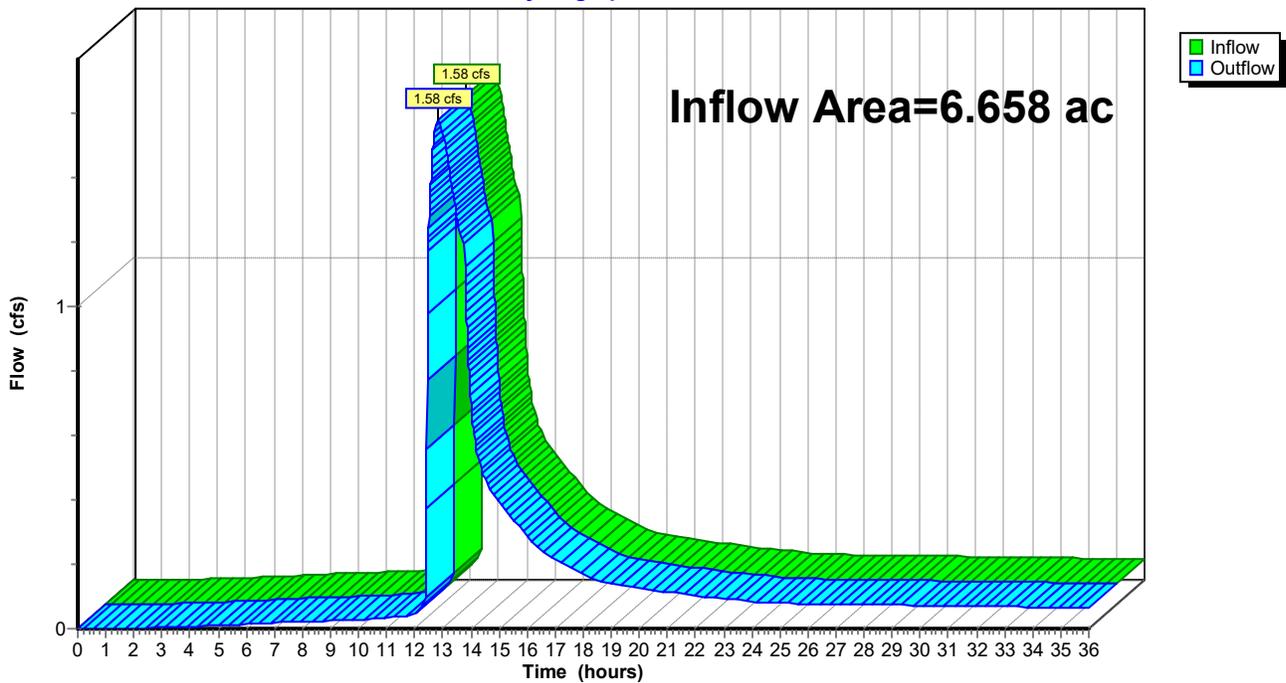
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6.658 ac, 24.87% Impervious, Inflow Depth > 0.76" for 100yr event  
Inflow = 1.58 cfs @ 12.83 hrs, Volume= 0.424 af  
Outflow = 1.58 cfs @ 12.83 hrs, Volume= 0.424 af, Atten= 0%, Lag= 0.0 min

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

**Reach 16R: Willow Branch**

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**Summary for Pond 1P: Wetland**

Inflow Area = 1.860 ac, 66.24% Impervious, Inflow Depth = 4.32" for 100yr event  
 Inflow = 5.11 cfs @ 12.28 hrs, Volume= 0.669 af  
 Outflow = 1.58 cfs @ 12.83 hrs, Volume= 0.424 af, Atten= 69%, Lag= 33.0 min  
 Primary = 1.58 cfs @ 12.83 hrs, Volume= 0.424 af  
 Routed to Reach 16R : Willow Branch

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 246.99' @ 12.83 hrs Surf.Area= 6,632 sf Storage= 16,555 cf  
 Flood Elev= 250.00' Surf.Area= 10,271 sf Storage= 41,797 cf

Plug-Flow detention time= 389.4 min calculated for 0.424 af (63% of inflow)  
 Center-of-Mass det. time= 280.0 min ( 1,046.9 - 767.0 )

Volume	Invert	Avail.Storage	Storage Description			
#1	243.50'	41,797 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
243.50	2,383	303.0	0	0	2,383	
244.00	3,300	319.0	1,415	1,415	3,190	
245.00	4,662	331.0	3,961	5,376	3,891	
250.00	10,271	441.0	36,421	41,797	10,919	

Device	Routing	Invert	Outlet Devices
#0	Primary	250.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Primary	243.20'	<b>8.0" Round Culvert</b> L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 243.20' / 242.95' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete sewer w/manholes & inlets, Flow Area= 0.35 sf
#2	Primary	248.00'	<b>2.0' long + 3.0 ' SideZ x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Device 5	246.55'	<b>1.5" x 1.5" Horiz. Orifice/Grate X 10.00 columns</b> X 10 rows C= 0.600 in 24.0" x 24.0" Grate (39% open area) Limited to weir flow at low heads
#4	Device 1	243.50'	<b>1.000 in/hr Exfiltration over Wetted area above 243.50'</b> Excluded Wetted area = 2,383 sf
#5	Device 1	245.50'	<b>0.5' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Primary OutFlow** Max=1.58 cfs @ 12.83 hrs HW=246.99' (Free Discharge)

- 1=Culvert (Passes 1.58 cfs of 2.51 cfs potential flow)
- 4=Exfiltration (Exfiltration Controls 0.09 cfs)
- 5=Sharp-Crested Rectangular Weir (Weir Controls 1.49 cfs @ 3.99 fps)
- 3=Orifice/Grate (Passes 1.49 cfs of 4.99 cfs potential flow)
- 2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

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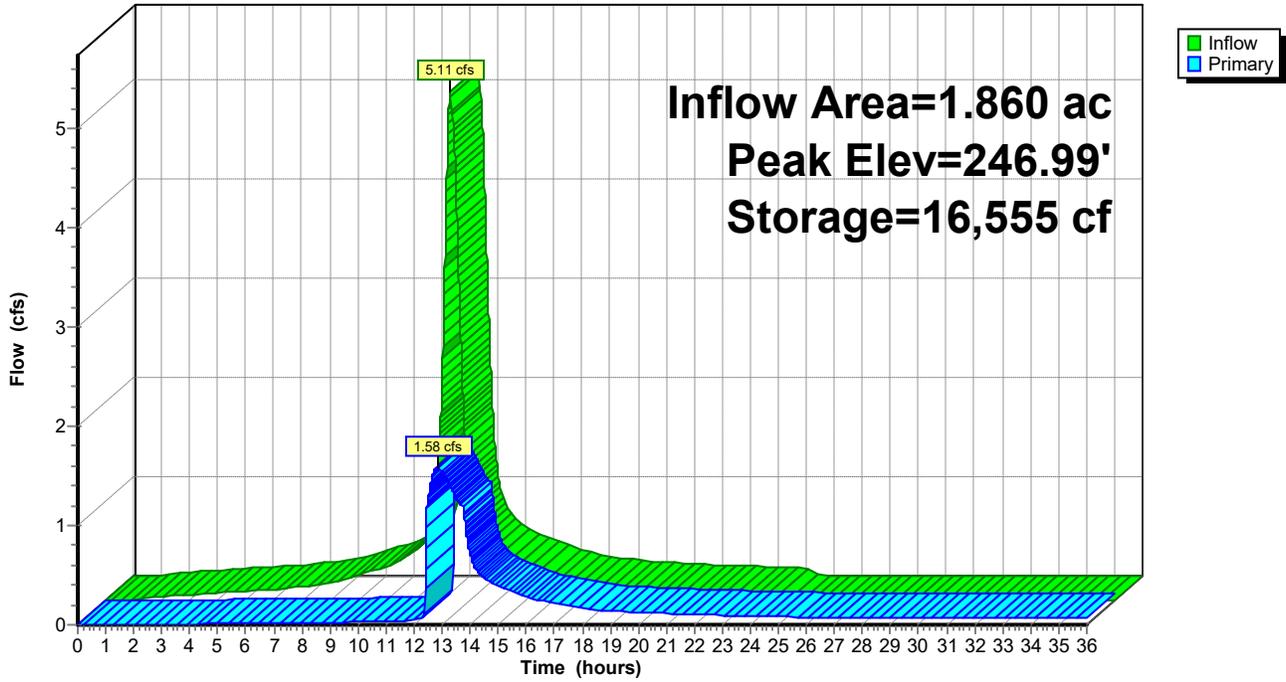
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**Pond 1P: Wetland**

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**Summary for Pond 2P: Outer Porous Sidewalk**

Inflow Area = 0.730 ac, 36.00% Impervious, Inflow Depth = 2.93" for 100yr event  
 Inflow = 2.55 cfs @ 12.08 hrs, Volume= 0.178 af  
 Outflow = 0.78 cfs @ 11.94 hrs, Volume= 0.178 af, Atten= 69%, Lag= 0.0 min  
 Discarded = 0.78 cfs @ 11.94 hrs, Volume= 0.178 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Reach 16R : Willow Branch

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 248.05' @ 12.44 hrs Surf.Area= 5,972 sf Storage= 1,305 cf  
 Flood Elev= 250.00' Surf.Area= 5,972 sf Storage= 3,583 cf

Plug-Flow detention time= 8.7 min calculated for 0.178 af (100% of inflow)  
 Center-of-Mass det. time= 8.7 min ( 857.7 - 849.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	247.50'	3,583 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 8,958 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
247.50	5,972	0	0
249.00	5,972	8,958	8,958

Device	Routing	Invert	Outlet Devices
#0	Primary	249.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	247.50'	<b>5.670 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.78 cfs @ 11.94 hrs HW=247.53' (Free Discharge)  
 ↑**1=Exfiltration** (Exfiltration Controls 0.78 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=247.50' (Free Discharge)

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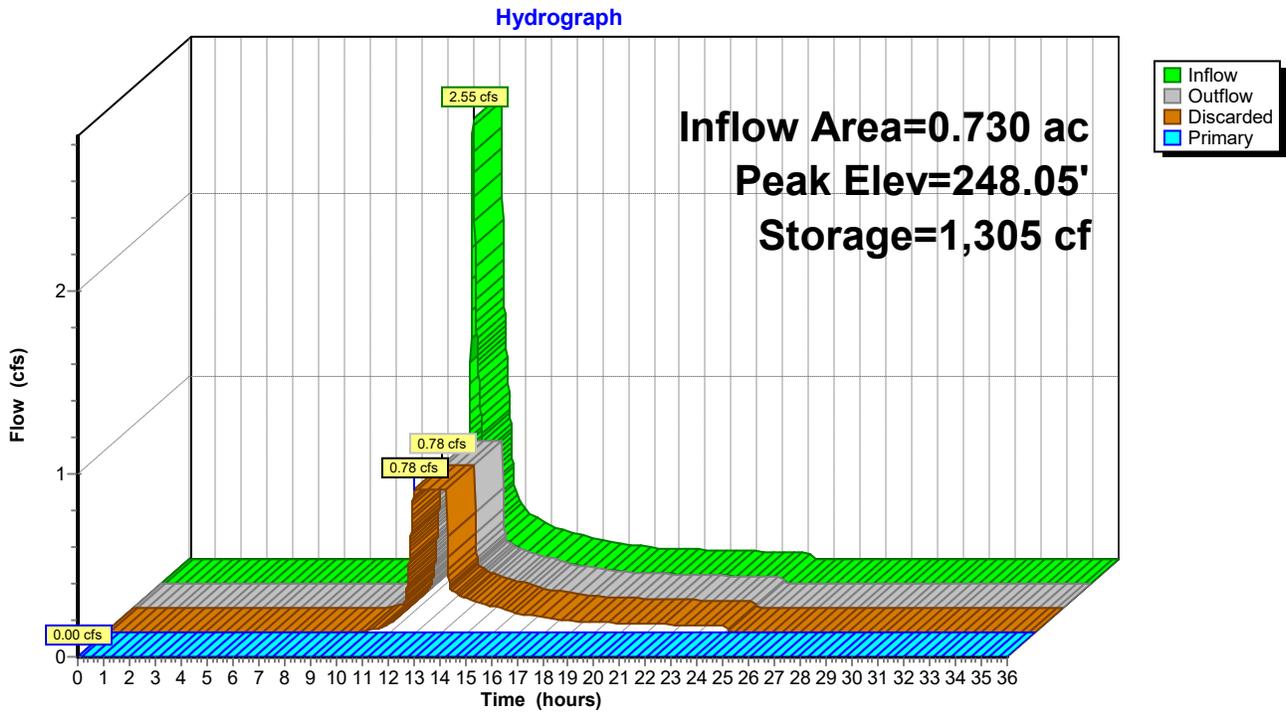
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**Pond 2P: Outer Porous Sidewalk**



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**Summary for Pond 3P: Inner Porous Sidewalk**

Inflow Area = 4.069 ac, 3.96% Impervious, Inflow Depth = 1.17" for 100yr event  
 Inflow = 2.32 cfs @ 12.34 hrs, Volume= 0.395 af  
 Outflow = 1.10 cfs @ 12.04 hrs, Volume= 0.395 af, Atten= 53%, Lag= 0.0 min  
 Discarded = 1.10 cfs @ 12.04 hrs, Volume= 0.395 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Reach 16R : Willow Branch

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 248.12' @ 12.78 hrs Surf.Area= 8,398 sf Storage= 2,072 cf  
 Flood Elev= 250.00' Surf.Area= 8,398 sf Storage= 5,039 cf

Plug-Flow detention time= 9.7 min calculated for 0.395 af (100% of inflow)  
 Center-of-Mass det. time= 9.7 min ( 918.5 - 908.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	247.50'	5,039 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 12,597 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
247.50	8,398	0	0
249.00	8,398	12,597	12,597

Device	Routing	Invert	Outlet Devices
#0	Primary	249.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	247.50'	<b>5.670 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=1.10 cfs @ 12.04 hrs HW=247.53' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 1.10 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=247.50' (Free Discharge)

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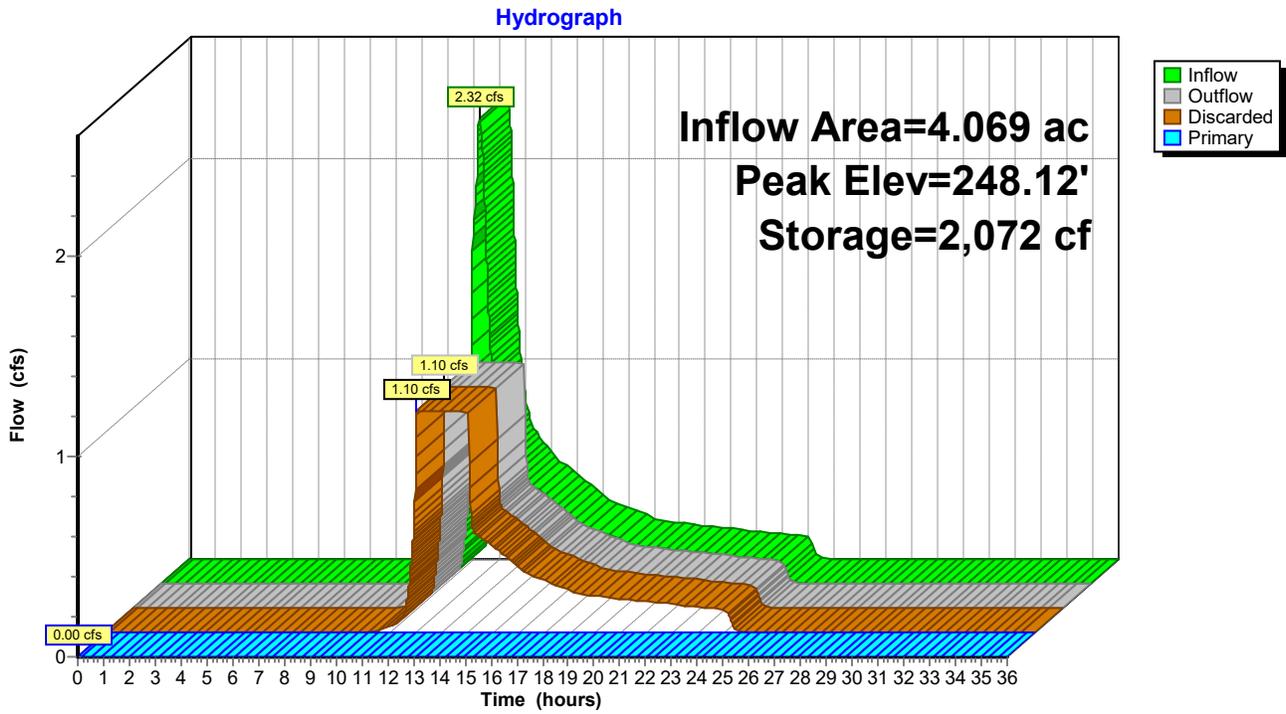
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**Pond 3P: Inner Porous Sidewalk**



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**Summary for Pond 4P: Rain Garden 1**

Inflow Area = 0.256 ac, 59.90% Impervious, Inflow Depth = 4.45" for 100yr event  
 Inflow = 0.85 cfs @ 12.31 hrs, Volume= 0.095 af  
 Outflow = 0.64 cfs @ 12.51 hrs, Volume= 0.095 af, Atten= 25%, Lag= 11.8 min  
 Discarded = 0.25 cfs @ 12.51 hrs, Volume= 0.085 af  
 Primary = 0.39 cfs @ 12.51 hrs, Volume= 0.009 af  
 Routed to Pond 1P : Wetland

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 248.55' @ 12.51 hrs Surf.Area= 1,899 sf Storage= 809 cf  
 Flood Elev= 249.70' Surf.Area= 4,011 sf Storage= 4,222 cf

Plug-Flow detention time= 20.5 min calculated for 0.095 af (100% of inflow)  
 Center-of-Mass det. time= 20.5 min ( 855.1 - 834.6 )

Volume	Invert	Avail.Storage	Storage Description			
#1	248.00'	4,222 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
248.00	1,100	551.0	0.0	0	0	1,100
249.20	3,139	576.0	100.0	2,439	2,439	3,442
249.70	4,011	586.0	100.0	1,783	4,222	4,411

Device	Routing	Invert	Outlet Devices
#0	Primary	249.70'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	248.00'	<b>5.670 in/hr Exfiltration over Surface area</b>
#2	Primary	248.50'	<b>1.5" x 1.5" Horiz. Orifice/Grate X 10.00 columns</b> X 20 rows C= 0.600 in 24.0" x 48.0" Grate (39% open area) Limited to weir flow at low heads

**Discarded OutFlow** Max=0.25 cfs @ 12.51 hrs HW=248.55' (Free Discharge)  
 ↑1=**Exfiltration** (Exfiltration Controls 0.25 cfs)

**Primary OutFlow** Max=0.39 cfs @ 12.51 hrs HW=248.55' (Free Discharge)  
 ↑2=**Orifice/Grate** (Weir Controls 0.39 cfs @ 0.70 fps)

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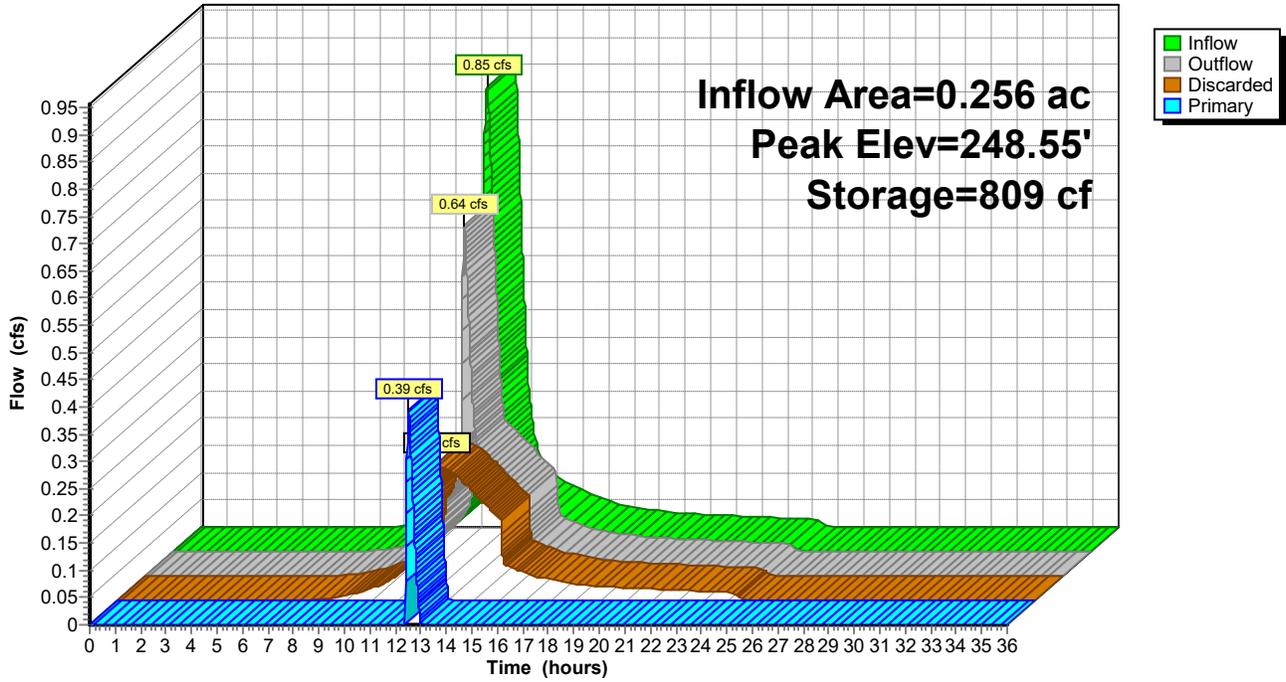
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**Pond 4P: Rain Garden 1**

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**Summary for Pond 5P: Rain Garden 2**

Inflow Area = 0.080 ac, 68.47% Impervious, Inflow Depth = 5.01" for 100yr event  
 Inflow = 0.30 cfs @ 12.30 hrs, Volume= 0.033 af  
 Outflow = 0.27 cfs @ 12.41 hrs, Volume= 0.033 af, Atten= 10%, Lag= 6.4 min  
 Discarded = 0.07 cfs @ 12.41 hrs, Volume= 0.029 af  
 Primary = 0.20 cfs @ 12.41 hrs, Volume= 0.005 af  
 Routed to Pond 1P : Wetland

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 251.28' @ 12.41 hrs Surf.Area= 560 sf Storage= 247 cf  
 Flood Elev= 252.00' Surf.Area= 865 sf Storage= 757 cf

Plug-Flow detention time= 19.5 min calculated for 0.033 af (100% of inflow)  
 Center-of-Mass det. time= 19.5 min ( 842.8 - 823.3 )

Volume	Invert	Avail.Storage	Storage Description			
#1	250.75'	757 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
250.75	382	101.0	0.0	0	0	382
251.00	460	106.0	100.0	105	105	468
252.00	865	127.0	100.0	652	757	875

Device	Routing	Invert	Outlet Devices
#0	Primary	252.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	250.75'	<b>5.670 in/hr Exfiltration over Surface area</b>
#2	Primary	251.25'	<b>1.5" x 1.5" Horiz. Orifice/Grate X 10.00 columns</b> X 20 rows C= 0.600 in 24.0" x 48.0" Grate (39% open area) Limited to weir flow at low heads

**Discarded OutFlow** Max=0.07 cfs @ 12.41 hrs HW=251.28' (Free Discharge)  
 ↑1=**Exfiltration** (Exfiltration Controls 0.07 cfs)

**Primary OutFlow** Max=0.19 cfs @ 12.41 hrs HW=251.28' (Free Discharge)  
 ↑2=**Orifice/Grate** (Weir Controls 0.19 cfs @ 0.56 fps)

**Site POST**

Prepared by VHB, Inc

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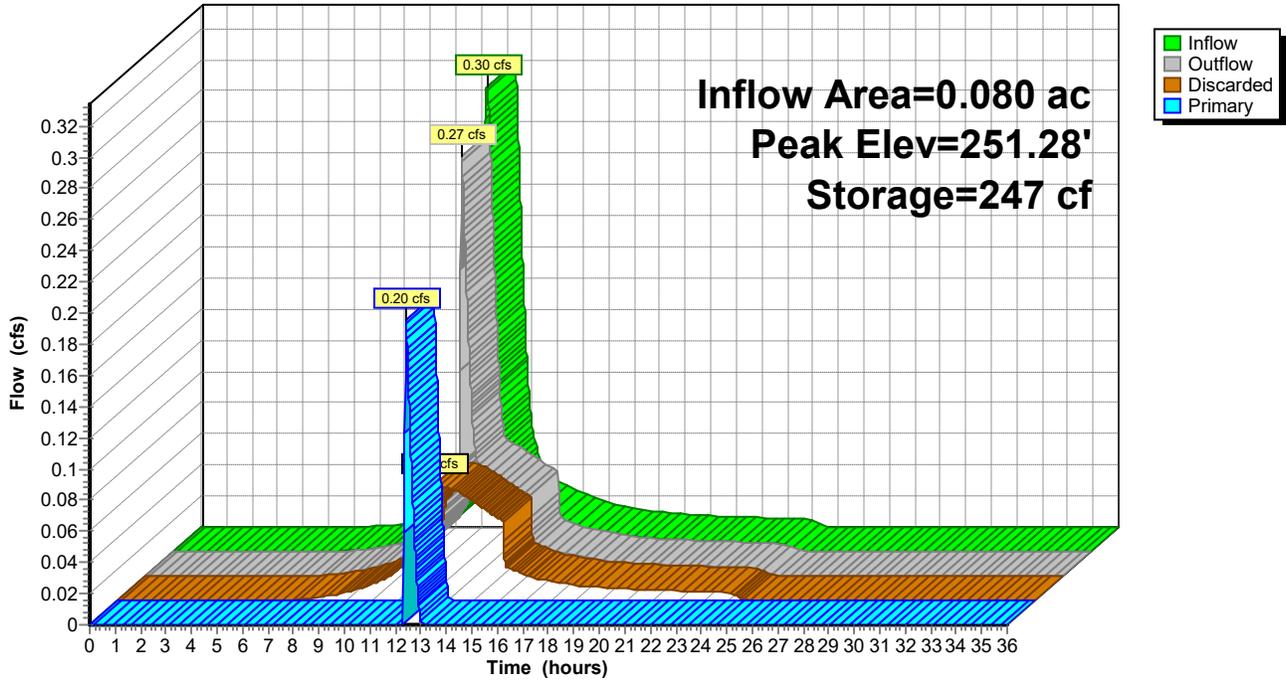
Type III 24-hr 100yr Rainfall=7.46"

Printed 2/12/2026

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**Pond 5P: Rain Garden 2**

Hydrograph



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## Appendix C: Standard 3 Computations and Supporting Documentation

## Soil Evaluation and Analysis



# Field Notes

**Date:** November 4, 2025

**Notes Taken By:** Sean Barry, PE  
Soil Evaluator #14412

**Place:** Township of Devens  
Adam Circle

**Project No.:** 15812.15

**Re:** Test Pit Observation with Township of  
Devens DPW and Mass Development

## Summary of Test Pit Observations

On October 31, 2025, Sean Barry of VHB observed soil test pits in the Township of Devens, MA at Adams Circle. The weather consisted of partly cloudy skies, with temps approximately 50-60°F. In total, five (5) test pits were conducted to determine the depth to estimated seasonal high ground water and general soil characteristics within the location of the proposed stormwater management practices. Their approximate locations are shown in Figure 1 included herein. John Mallin of Mass Development was on site, and the Township of Devens Public Works conducted the excavation.

### Test Pit TP-1 (11:30am)

Test Pit TP-1 soils were observed as outlined below:

Depth <sup>1</sup>	Layer	Texture	Color	Redox
0"-17"	A	Fine Sandy Loam	10YR 4/2	-
17"-29"	Bw	Loamy Sand	10YR 5/6	-
29"-72"	C1	Gravelly Loamy Sand	2.5Y 5/3	-
72"-106"	C2	Fine Sand	2.5Y 5/2	74"

1 All measurements from ground surface

- › No weeping, or standing water;
- › Redox was encountered at approximately 74";
- › C2 layer consisted of blocky wet sand;
- › Please refer to Photo 1 for the test pit location.

### Test Pit TP-2 (9:30am)

Test Pit TP-2 soils were observed as outlined below:

Depth <sup>1</sup>	Layer	Texture	Color	Redox
0"-18"	Fill	Loamy Sand	10YR 4/3	-
18"-43"	Fill	Gravelly Loamy Sand (tight)	2.5Y 4/3	-
43"-123"	Fill	Sand	2.5Y 5/2	82"

1 All measurements from ground surface

- › No weeping, or standing water;
- › Redox was encountered at approximately 82";
- › Please refer to Photo 2 for the test pit soil profile.

### Test Pit TP-3 (8:45am)

Test Pit TP-3 soils were observed as outlined below:

Depth <sup>1</sup>	Layer	Texture	Color	Redox
0"-108"	Fill	Medium Gravelly Sand	2.5Y 4/3	-

1 All measurements from ground surface

- › Bands of fine sand fill at 60"-72";
- › Please refer to Photo 3 for the test pit soil profile.

### Test Pit TP-4 (10:25am)

Test Pit TP-4 soils were observed as outlined below:

Depth <sup>1</sup>	Layer	Texture	Color	Redox
0"-29"	Fill	Loamy Sand	10YR 4/3	-
29"-48"	Fill	Gravelly Loamy Sand (tight)	2.5Y 4/3	-
48"-121"	Fill	Medium Gravelly Sand	2.5Y 5/2	81"

1 All measurements from ground surface

- › No standing water or weeping observed;
- › Redox was encountered at approximately 81";
- › The pit was 35' from TP-3 and 65" from corner CB's on Adams Circle;
- › Please refer to Photo 4 for the test pit soil profile.

### Test Pit TP-5 (11:00am)

Test Pit TP-5 soils were observed as outlined below:

Depth <sup>1</sup>	Layer	Texture	Color	Redox
0"-22"	Fill	Loamy Sand	10YR 4/3	-
22"-67"	Fill	Medium Gravelly Sand (cobbles 5%)	2.5Y 4/3	-
67"-118"	Fill	Medium Gravelly Sand	2.5Y 5/2	97"

1 All measurements from ground surface

- › No standing water or weeping observed;
- › Redox was encountered at approximately 97";
- › The pit was 52' from wetland sign and 43' from TP-3;
- › Please refer to Photo 5 for the test pit soil profile.



**Photo #1: [Test Pit 1 Location](#)**



**Photo #2: Test Pit 2 Soil Profile**



**Photo #3: Test Pit 3 Soil Profile**



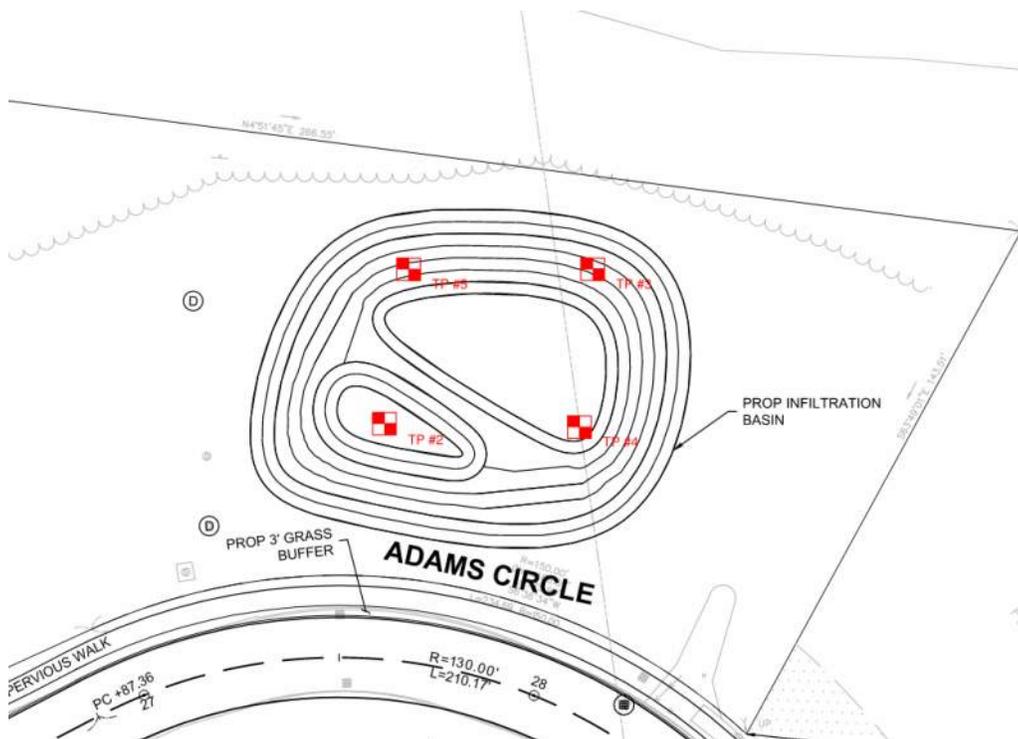
**Photo #4: Test Pit 4 Soil Profile**



**Photo #5: Test Pit 5 Soil Profile**



**Photo #6: Test Pits 2, 3, 4, and 5 Overview Landscape**



**Figure #1: Test Pit Overall Locations for Test Pits 2, 3, 4, and 5**

## Required Recharge Volumes with Capture Area Adjustment and Provided Recharge Volumes with 72-Hour Drawdown Calculations



# Recharge Calculations

Project	Adams Cir Devens, MA	Project #	15812.15
Calculated by	TNK	Date	1/13/2026
Checked by	TD	Date	

## REQUIRED RECHARGE VOLUME

Hydrologic Soil Group (HSG)	Area (ft <sup>2</sup> )	Inches of Runoff (in)	Volume (ft <sup>3</sup> )
A	72,139	0.60	3,607
B	0	0.35	0
C	0	0.25	0
D	0	0.10	0
<b>TOTAL</b>			<b>3,607</b>

## CAPTURE AREA ADJUSTMENT

Required Recharge Volume (ft <sup>3</sup> )	3,607
Total Site Net Impervious Area (ft <sup>2</sup> )	72,139
Total Site Impervious Area Draining to Recharge Facilities (ft <sup>2</sup> )	27,531
Capture Area Adjustment Factor	2.62
<b>Adjusted Required Recharge Volume (ft<sup>3</sup>)</b>	<b>9,451</b>

## PROVIDED RECHARGE VOLUME

### OUTER POROUS SIDEWALK #2P:

Porous Sidewalk

Provided Volume:	Elevation	Area (ft <sup>2</sup> )	Cumulative Volume (ft <sup>3</sup> )
	247.5	5,972	0
	249.0	5,972	<b>8,958</b>

<b>Drawdown:</b>	$(V_{\text{Infiltration}}/A_{\text{Bottom}})/\text{Rawl's Rate}$		
Rawls Recharge Rate:	2.41	(in/hr)	
Drawdown Time:	7	(hours)	



# Recharge Calculations

Project	Adams Cir Devens, MA	Project #	15812.15
Calculated by	TNK	Date	1/13/2026
Checked by	TD	Date	

## INNER POROUS SIDEWALK #3P:

Porous Sidewalk

Provided Volume:	Elevation	Area (ft <sup>2</sup> )	Cumulative Volume (ft <sup>3</sup> )
	247.5	8,398	0
	249.0	8,398	<b><u>12,597</u></b>

<b>Drawdown:</b>	$(V_{\text{Infiltration}}/A_{\text{Bottom}})/\text{Rawl's Rate}$		
Rawls Recharge Rate:	2.41	(in/hr)	
Drawdown Time:	7	(hours)	

## RAIN GARDEN #4P:

Bioretention Basin/Rain Garden

Provided Volume:	Elevation	Area (ft <sup>2</sup> )	Cumulative Volume (ft <sup>3</sup> )
	247.3	1,206	0
	249.3	1,206	538
	250.0	1,206	<b><u>1,635</u></b>

<b>Drawdown:</b>	$(V_{\text{Infiltration}}/A_{\text{Bottom}})/\text{Rawl's Rate}$		
Rawls Recharge Rate:	2.41	(in/hr)	
Drawdown Time:	7	(hours)	



## Recharge Calculations

Project	Adams Cir Devens, MA	Project #	15812.15
Calculated by	TNK	Date	1/13/2026
Checked by	TD	Date	

<b>RAIN GARDEN #5P:</b>			
Bioretention Basin/Rain Garden			
Provided Volume:	Elevation	Area (ft <sup>2</sup> )	Cumulative Volume (ft <sup>3</sup> )
	247.3	815	0
	249.3	815	241
	250.0	815	<b>652</b>
<b>Drawdown:</b> $(V_{\text{Infiltration}}/A_{\text{Bottom}})/\text{Rawl's Rate}$			
	Rawls Recharge Rate:	2.41	(in/hr)
	Drawdown Time:	4	(hours)
<b>RECHARGE VOLUME SUMMARY</b>			
Required Recharge Volume:		<b>9,451</b>	(ft <sup>3</sup> )
Total Recharge Volume Provided:		<b>23,842</b>	(ft <sup>3</sup> )

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## Appendix D: Standard 4 Computations and Supporting Information

# Operations and Maintenance Plan

# **Operation and Maintenance Plan**

## **Stormwater Collection, Treatment and Management Systems**

**Devens, Massachusetts**

## OPERATION AND MAINTENANCE PLAN

This Operation and Maintenance Plan (O&M Plan) describes the regular inspection and maintenance required to ensure the continued functioning of the proposed Hospital Road & Givry Street Intersection Improvements drainage system components.

### Owner:

MassDevelopment  
33 Andrews Parkway  
Devens, MA 01434

Provision: the transfer of responsibilities is understood by future owners

Signature of Owner: \_\_\_\_\_

### Party responsible for operation and maintenance:

Devens DPW  
99 Buena Vista Street  
Devens, MA 01434

### Maintenance Activities and Schedule:

#### Street Sweeping:

All public roads in Devens are to be inspected and swept at least once per year.

#### Deep Sump Catch Basins:

Catch Basins are to be inspected yearly for damage, general wear & Tear, sediment buildup and conditions of oil/debris traps.

Any damage to be repaired upon identification.

Sumps to be cleaned on an as-needed basis, typically once every other year or when sediment accumulation is more than half of the available sump depth.

Access to all deep sump catch basis is available from the public roads.

#### Porous Pavement Surfaces:

Vacuum pavement at least 4x's per year with a commercial cleaning unit.

Use of pavement washing systems or compressed air is not recommended as it may reduce permeability.

#### Rain Gardens/Bioretenention Swales:

Inspect inlets, vegetation, overflow discharge pipes, drain time less than 4 days.

Inspect 4x's during first year of operation and annually after that.

#### Sediment Forebays:

Inspect sediment forebay for accumulated sediment and signs of erosion twice per year. Verify that inlet and outlet are unobstructed. Remove sediment and repair erosion as needed.

When removal of sediment or natural erosion damages the stabilizing grasses, reseed or resod to prevent further erosion. Use tackifier or blankets to temporarily stabilize slopes while the new seeds develop roots.

Mow grass as needed – at least once per year. When mowing, set the blades between 3 and 6 inches high.

#### Constructed Wetlands:

Inspect basins after every storm event for the first three months after completion to ensure the soil has been stabilized and the basin is functioning properly.

Once it has been determined that the basin is functioning, inspect annually and after every large storm event (two-year storms and larger) for:

- settlement
- erosion
- leakage through the embankment
- tree growth on top of the embankment
- condition of overflow weir
- condition of the outlet control structure
- accumulation of sediment
- accumulation of debris
- health of the turf

Mow the basin and side slopes at least twice per year to limit growth of woody plants. Set mower blades between 3 and 6 inches high. Remove excess grass clippings.

Remove any saplings from the embankment.

Remove sediment, trash, and dead vegetation from the basin every year (or more frequently if needed). Wait for the basin soil to dry before performing any work. Use light equipment to avoid compacting the underlying soil. Deeply till the topsoil and reseed immediately.

Mulching, pruning, and fertilization should occur every year to maintain appropriate vegetation conditions. If the basin becomes clogged, deeply till the surface and reseed immediately.

#### **Documentation**

The owner shall submit annual Stormwater Monitoring and Maintenance Reports to the Devens Enterprise Commission. These reports shall include a description of the conditions of the basin, description of the maintenance performed, including photos of the conditions and the maintenance performed. All materials

removed and actions taken will be included in the MS4 annual report.

Annual reports shall be submitted to:

Devens Enterprise Commission  
33 Andrews Parkway  
Devens, MA 01434  
Attn: Devens Municipal Stormwater - Annual Report

## Water Quality Volume Calculations



# Water Quality Volume Calculations

Project	Adams Cir Devens, MA	Project #	15812.15
Calculated by	TNK	Date	1/13/2026
Checked by	TD	Date	

**Constructed Wetland: 1P**

Runoff from subcatchment areas 3S

Water Quality Storm Runoff Depth	(in)	<b>1.0</b>
Total Impervious Area	(ft <sup>2</sup> )	<b>44,608</b>

**BASIN WQV:**

Required Volume:	Runoff Depth to be Treated	Required Volume
	(in)	(ft <sup>3</sup> )
	1.0	<b>3,717</b>

Provided Volume:	Elevation	Area	Cumulative Volume
		(ft <sup>2</sup> )	(ft <sup>3</sup> )
	243.5	327	0
	244.0	683	1,751
	246.0	1,889	11,070
	246.9	3,300	<b>15,964</b>

**FREEBOARD CHECK:**

100-YR Peak Elevation:	<b>246.9</b>
Maximum Basin Elevation:	250.0
Basin Freeboard:	<b>3.1</b>

\* Per MassDEP Treatment Requirement

## TSS and TP Removal Worksheets



# BMP Water Quality Treatment Credit Calculator

Version 1.0  
Release Date: March 2021

This tool has been developed to estimate water quality treatment credit for BMPs using EPA's BMP Performance Curves as outlined in the Massachusetts and New Hampshire MS4 General Permits. This tool is consistent with EPA Region 1's BMP Accounting and Tracking Tool (2016) for post-construction stormwater requirements for new and redevelopment and is also consistent with the MA and NH MS4 Appendix F (TMDLs and Impaired Waters). TSS Reduction values from this calculator can NOT be used for DEP Stormwater Standard 4 Compliance at this time.

- MA MS4 Permit: <https://www.epa.gov/npdes-permits/massachusetts-small-ms4-general-permit>
- NH MS4 Permit: <https://www.epa.gov/npdes-permits/new-hampshire-small-ms4-general-permit>

This tool can be used to calculate:

1. annual pollutant loads for an area when providing information about land use, soil type and impervious area, and
2. annual phosphorus and TSS pollutant reduction credit (percent reductions) for BMPs based on BMP type, size (i.e., design storage volume), and soil type (for infiltrating BMPs).

**This calculator tool is for internal use at VHB only and should not be shared outside of VHB.** This calculator has been developed for knowledgeable professionals designing BMPs for water quality treatment credit.

Instructions:

1. Enter BMP design parameters on the Structural BMP Calculations, Impervious Area Disconnection, and Porous Pavement (w/ underdrain) tabs in the yellow highlighted cells. Enter each BMP once on the appropriate tab.
2. For any untreated areas, enter site characteristics on the Site Summary tab.
3. Use the Site Summary tab to determine if BMPs meet annual load reduction requirements. The table at the top of the Site Summary tab will automatically sum loads and treatment from all tabs within this calculator.

Calculator Notes:

- Cells requiring user input (i.e., BMP design parameters) are highlighted yellow. Grey cells contain formulas and have been locked.
- Click each input column header for more detailed instructions.
- Refer to the BMP Definitions tab for descriptions of how to calculate design storage volume for each BMP type.
- TSS Reduction values from this calculator can NOT be used for DEP Stormwater Standard 4 Compliance at this time.

**Key:**  
User Input  
Calculations (locked)

BMP Notes:

1. Constructed stormwater wetlands are not specifically listed as a BMP type in Appendix F of the MS4. Crediting approach for this BMP type is based on VHB discussions with EPA.
2. Choose the BMP type that most closely matches the function of your BMP (eg. infiltration vs. filtration). If you are unsure of which BMP type to choose for your design please discuss with the VHB WR team.
3. VHB has developed updated performance values for Impervious Area Disconnection as well as performance values for impervious to pervious ratios greater than 1:4 that are not included within the MS4 Permit or this tool. EPA is in the process of incorporating these updated performance values, but they are not formally adopted in MA at this time. VHB can provide supporting technical documentation for these updated performance values if needed for use on a project.

(?) For questions on EPA BMP Performance Curves or how to use this calculator, contact: Theresa McGovern (tmcgovern@vhb.com), Cambria Ung (cung@vhb.com), or Nate Pacheco (npacheco@vhb.com).

Sheet Summary	Sheet	Description
Calculation Tabs (require user input)	Site Summary	Summarizes total site pollutant loads and reduction credits from all tabs within this calculator.
	Untreated Areas	Runs load calculations for untreated site areas.
	Structural BMP Calculations	Runs calculations for structural BMP water quality treatment credits based on entered BMP design parameters (BMP type, design storage volume, soil type etc.).
	Impervious Area Disconnection	Runs calculations for Impervious Area Disconnection water quality treatment credits based on ratio of impervious to pervious area.
	Porous Pavement (underdrained)	Runs calculations for porous pavement (w/ underdrain) water quality treatment credits based on depth of porous pavement filter course. Note: This tab is only relevant for porous pavement systems designed with an underdrain. For porous pavement without an underdrain (that infiltrate), use the BMP Treatment Calculations tab.
Reference Tabs (view only)	BMP Definitions	Summary of BMPs included in MA MS4 Permit (Appendix F, Attachment 3) including brief summaries, applicable EPA water quality curve, and design storage volume definitions.
	EPA Performance Curves	Thumbnails of EPA water quality curves are provided as reference by BMP type showing percent annual reduction in total phosphorus and total nitrogen. For infiltration BMPs, an example soil type is shown.
	Soil Types	Provides a cross walk between HSG group, soil texture class, and infiltration rates.
Example Tabs (view only)	EXAMPLE-Site Summary	Example Site Summary tab.
	EXAMPLE-Untreated Areas	Example Untreated Areas tab.
	EXAMPLE-Structural BMP	Example Structural BMP Calculations tab.
	EXAMPLE-Impervious Disconnect	Example Impervious Area Disconnection tab.





## Site Summary

Project Adams Circle Project # 15812.15  
 Calculated by TNK Date 1/27/2026  
 Checked by TD Date

Treatment Category	Area to Treatment Category (ac)	Impervious Area to Treatment Category (ac)	P Load of Impervious Area (lb/yr)	P Load Removed (lb/yr)	Average Area Weighted P Reduction (%)	TSS Load of Impervious Area (lb/yr)	TSS Load Removed (lb/yr)	Average Area Weighted TSS Reduction (%)
Structural BMPs	5.9	1.7	3.4	2.8	80%	758	783	99%
Impervious Area Disconnection	-	-	-	-	-	-	-	-
Porous Pavement (w/ underdrain)	-	-	-	-	-	-	-	-
Untreated	-	-	-	0	0%	-	0	0%
<b>TOTAL</b>	<b>5.9</b>	<b>1.7</b>	<b>3.4</b>	<b>2.8</b>	<b>80%</b>	<b>758</b>	<b>783</b>	<b>99%</b>





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## Appendix E: Standard 8 Supporting Information

# Recommended Construction Period Pollution Prevention and Erosion and Sedimentation Controls

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## **Erosion and Sedimentation Control Measures**

The following erosion and sedimentation controls are for use during the earthwork and construction phases of the project. The following controls are provided as recommendations for the site contractor and do not constitute or replace the final Stormwater Pollution Prevention Plan that must be fully implemented by the Contractor and owner in Compliance with EPA NPDES regulations.

### **Hay Bale Barriers**

Hay bale barriers will be placed to trap sediment transported by runoff before it reaches the drainage system or leaves the construction site. Bales will be set at least four inches into the existing ground to minimize undercutting by runoff.

### **Silt Fencing**

In areas where high runoff velocities or high sediment loads are expected, hay bale barriers will be backed up with silt fencing. This semi-permeable barrier made of a synthetic porous fabric will provide additional protection. The silt fences and hay bale barrier will be replaced as determined by periodic field inspections.

### **Compost Berms**

### **Catch Basin Protection**

Newly constructed and existing catch basins will be protected with hay bale barriers (where appropriate) or silt sacks throughout construction.

### **Gravel and Construction Entrance/Exit**

A temporary crushed-stone construction entrance/exit will be constructed. A cross slope will be placed in the entrance to direct runoff to a protected catch basin inlet or settling area. If deemed necessary after construction begins, a wash pad may be included to wash off vehicle wheels before leaving the project site.

### **Diversion Channels**

Diversion channels will be used to collect runoff from construction areas and discharge to either sedimentation basins or protected catch basin inlets.

## Temporary Sediment Basins

Temporary sediment basins will be designed either as excavations or bermed stormwater detention structures (depending on grading) that will retain runoff for a sufficient period of time to allow suspended soil particles to settle out prior to discharge. These temporary basins will be located based on construction needs as determined by the contractor and outlet devices will be designed to control velocity and sediment. Points of discharge from sediment basins will be stabilized to minimize erosion.

## Vegetative Slope Stabilization

Stabilization of open soil surfaces will be implemented within 14 days after grading or construction activities have temporarily or permanently ceased, unless there is sufficient snow cover to prohibit implementation. Vegetative slope stabilization will be used to minimize erosion on slopes of 3:1 or flatter. Annual grasses, such as annual rye, will be used to ensure rapid germination and production of root mass. Permanent stabilization will be completed with the planting of perennial grasses or legumes. Establishment of temporary and permanent vegetative cover may be established by hydro-seeding or sodding. A suitable topsoil, good seedbed preparation, and adequate lime, fertilizer and water will be provided for effective establishment of these vegetative stabilization methods. Mulch will also be used after permanent seeding to protect soil from the impact of falling rain and to increase the capacity of the soil to absorb water.

## Maintenance

- The contractor or subcontractor will be responsible for implementing each control shown on the Sedimentation and Erosion Control Plan. In accordance with EPA regulations, the contractor must sign a copy of a certification to verify that a plan has been prepared and that permit regulations are understood.
- The on-site contractor will inspect all sediment and erosion control structures periodically and after each rainfall event. Records of the inspections will be prepared and maintained on-site by the contractor.
- Silt shall be removed from behind barriers if greater than 6-inches deep or as needed.
- Damaged or deteriorated items will be repaired immediately after identification.
- The underside of hay bales should be kept in close contact with the earth and reset as necessary.

- Sediment that is collected in structures shall be disposed of properly and covered if stored on-site.
- Erosion control structures shall remain in place until all disturbed earth has been securely stabilized. After removal of structures, disturbed areas shall be regraded and stabilized as necessary.

The sedimentation and erosion control plan is included in project plan set; a reduced version and Erosion Control Maintenance checklist is included here for quick reference.