STORMWATER POLLUTION PREVENTION PLAN

TOWNHOUSES AT 32-34 WASHINGTON AVENUE

32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NEW YORK

Applicant/Operator/ Owner: **CCI Properties, LLC**
914-478-4250

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JMC Project 13180

Date: 08/11/2015
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I. INTRODUCTION

This Stormwater Pollution Prevention Plan has been prepared for the 0.60 acre Washington Avenue Residence site, located in the Hastings-on-Hudson, Westchester County, New York (hereinafter referred to as the "Site"). The site is bordered by Washington Avenue to the north, residential uses to the south and east, and Warburton Avenue to the west. The development has been designed in accordance with the following:

- Chapter 250 "Stormwater Management, Erosion and Water Pollution Control" of the Hastings-on-Hudson Zoning Code
- New York State Stormwater Management Design Manual.

This project entails the redevelopment of the existing property consisting of remains of an old building foundation, a storage building and an 2-1/2 story building will accessory driveway and porch area. This redevelopment will consist of the demolition of the storage structure and remains of old foundation, preservation of foundation wall located along the southern and western property lines, the construction of a new 4,762 sf footprint (9,529 sf floor area), 5-unit townhouse and the renovation of an existing 2-1/2 story, two-family building. The proposed development also includes an expansion of the site's existing parking, the reconstruction of the existing curb cut on Washington Avenue, and a new curb cut onto Warburton Avenue.

II. STORMWATER MANAGEMENT PLANNING

As part of the Hastings-on-Hudson site plan approval process, A Stormwater Pollution Prevention Plan (SWPPP) has been prepared for this project because it is a construction activity that involves the disturbance of 26,126 sf of land, which exceeds the Hastings-on-Hudson threshold of 10,000 sf. This SWPPP includes stormwater management practices (SMP's) from the "New York State Stormwater Management Design Manual," last revised January 2015.

The proposed stormwater facilities have been designed such that the quantity and quality of stormwater runoff during and after construction are not adversely altered or are enhanced when compared to pre-development conditions.

TOWNHOUSES AT 32-34 WASHINGTON AVE

WASHINGTON AVE | HASTINGS-ON-HUDSON

SITE LOCATION MAP

DATE: 08/11/2015 | JMC PROJECT: 13180

FIGURE: SLM-1 | SCALE: 1" = 1,000'

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The Five Step Process for Stormwater Site Planning and Practice Selection

Stormwater management using green infrastructure is summarized in the five step process described below. The five step process was adhered to when developing this SWPPP. Information is provided in this SWPPP which documents compliance with the required process as follows:

Step 1: Site Planning

Implement planning practices that protect natural resources and utilize the hydrology of the site. Strong consideration must be given to reducing impervious cover to aid in the preservation of natural resources including protecting natural areas, avoiding sensitive areas and minimizing grading and soil disturbance.

Step 2: Determine Water Quality Treatment Volume (WQv)

Determine the required WQv for the site based on the site layout, impervious areas and sub-catchments. This initial calculation of WQv will have to be revised after green infrastructure techniques are applied. The following method has been used to calculate the WQv.

- **90% Rule -** According to the New York State Stormwater Design Manual, Section 4.1, the water quality volume is determined from the 90% rule. The method is based on 90% of the average annual stormwater runoff volume, which must be provided due to impervious surfaces. The Water Quality Volume (denoted as the WQv) is designed to improve water quality sizing to capture and treat 90% of the average annual stormwater runoff volume. The WQv is directly related to the amount of impervious cover created at a site. The average rainfall storm depth for 90% of storms in New York State in one year is used to calculate a volume of runoff. The rainfall depth depends on the location of the site within the state. From this depth of rainfall, the required water quality volume is calculated.

The project is a redevelopment and therefore will comply with the strategies outlined within Chapter 9: Redevelopment Projects of the Design Manual. There are different options to control water quality depending on the redevelopment.

Since the redevelopment results in the creation of additional impervious area, Water Quality Treatment Option II will be utilized which requires treatment for 25% of the existing impervious area, plus 100% of the additional, new impervious area.

The plan proposes that a minimum of 25% of the water quality volume (WQv) from the disturbed area is captured and treated by the implementation of standard practices. When utilizing structural stormwater management practices, these practices should be targeted to treat areas with the greatest pollutant generation potential (e.g. parking areas, service stations, etc).

The NYSDEC Redevelopment Standards include specific criteria for the implementation of surface water quality improvements. A combination of standard and non-standard practices are proposed and all facilities will treat the required water quality volume from the entire contributing area. Therefore, Water Quality Treatment Options II & III will be utilized. According to Option III of the Redevelopment Standards, alternative or non-standard practices such as manufactured treatment devices are acceptable if they treat 75% of the water quality volume from the disturbed areas as well as any additional runoff directed to the practice. According to Option II, standard practices such as subsurface infiltration systems can be sized to treat the water quality volume generated from 25% of the existing impervious area plus 100% of the new impervious area. Green practices such as green roofs and porous pavement can be used towards credit in meeting the water quality volume requirements.

Proposed standard SMP’s will effectively treat 100% of the 1 year storm for all existing and new impervious areas and the proposed alternative SMP’s will also treat 100% of the 1 year storm for all existing impervious areas which is above and beyond the water quality requirements for Redevelopment Projects.

Step 3: Runoff Reduction Volumes (RRv) by Applying Green Infrastructure Techniques and Standard SMP's

- RRv is not required for this site because it is a redevelopment. According to Chapter 9 of the stormwater management manual RRv is not required for redevelopment projects. Also, the project does not exceed NYSDEC requirements for developing a SWPPP. This SWPPP is provided because this project's proposed disturbance exceeds the Hastings-on-Hudson threshold. There are no RRv criteria provided in the Hasting-on-Hudson stormwater code.

Green infrastructure techniques or standard SMP's with RRv capacity can potentially reduce the required WQv by incorporating combinations of green infrastructure techniques and standard SMP's within each drainage area on the site.

Green infrastructure techniques are grouped into two categories:

- Practices resulting in a reduction of contributing area such as preservation/restoration of conservation areas, vegetated channels, etc.
- Practices resulting in a reduction of contributing volume such as green roofs, stormwater planters, and rain gardens.

Apply a combination of green infrastructure techniques and standard SMPs with RRv capacity to provide 100% of the WQv calculated in Step 2. If the RRv calculated in this step is greater than or equal to the WQv in Step 2, the RRv requirement has been met and Step 4 can be skipped. If the RRv provided cannot meet or exceed 100% of the WQv, the project must, at a minimum, reduce a percentage of the runoff from impervious areas to be constructed on the site. The percent reduction is based on the Hydrologic Soil Group(s) (HSG) of the site and is defined as Specific Reduction Factor (S).

The following green infrastructure techniques and practices are provided in the Design Manual:

- **Porous Paving**
  - This practice is being utilized at the proposed driveway for the proposed residential building and at the expanded driveway for the existing driveway. Porous pavement can be

used to provide RRv because the soil on-site is classified as hydrologic soil group B. However, no RRv credit is taken by utilizing porous pavement since RRv is not required for this site.

- **Standard Practices with RRv Capacity**
  - **Biofilters and Bioretention Basins –** A bioretention area is proposed to treat and retain runoff from front stair area. However, no RRv credit is taken since RRv is not required for this site.

  - **Infiltration Practices –** A subsurface infiltration system is proposed to treat and retain the runoff from the roof area and the lawn area adjacent to the proposed building. No RRv credit is taken by utilizing this infiltration practice because RRv is not required for this site.

<u>Step 4: Apply Standard Stormwater Management Practices & Green Practices to Address Water Quality Volume</u>

- **Infiltration Practices –** A subsurface infiltration system is proposed to treat and retain runoff from the majority of the site.
- **Filtering Practice –** A bioretention area is proposed to proposed to treat and retain runoff from the proposed building stair area.
- **Porous Pavement –** Porous pavers are proposed at the proposed driveway and the expanded existing driveway to treat and retain runoff from these areas.

<u>Step 5: Apply Volume and Peak Rate Control Practices to Meet Water Quantity Requirements</u>

The Channel Protection Volume (CPv), Overbank Flood Control (Qp) and Extreme Flood Control (Qf) must be met for the plan to be completed. This is accomplished by using practices such as infiltration basins, dry detention basins, etc. to meet water quantity requirements. The following standards must be met:

1. **Stream Channel Protection (CPv)**

Stream Channel Protection Volume Requirements (CPv) are designed to protect stream channels from erosion. In New York State this goal is accomplished by providing 24-hour extended detention of the one-year, 24-hour storm event, remained from runoff reduction. Reduction of runoff for meeting stream channel protection objectives, where site conditions allow, is encouraged and the volume reduction achieved through green infrastructure can be deducted from CPv. Trout waters may be exempted from the 24-hour ED requirement, with only 12 hours of extended detention required to meet this criterion. Detention time may be calculated using either a center of mass method or plug flow calculation method.

- CPv is not required because reduction of the entire CPv volume is achieved at a site through green infrastructure or infiltration systems.
- CPv for a redevelopment project is not required if there is no increase in impervious area or changes to hydrology that increase the discharge rate. This criterion, as defined in Chapter 4 of New York State Stormwater Design Manual, is not based on a pre versus post-development comparison. However, for a redevelopment project this requirement is relaxed. If the hydrology and hydraulic study shows that the post-construction 1-year 24 hour discharge rate and velocity are less than or equal to the pre-construction discharge rate, providing 24 hour detention of the 1-year storm to meet the channel protection criteria is not required.

2. **Overbank Flood (Qp) which is the 10 year storm.**

Overbank control requires storage to attenuate the post development 10-year, 24-hour peak discharge rate (Qp) to predevelopment rates.

The overbank flood control requirement (Qp) does not apply in certain conditions, including:

- The site discharges directly tidal waters or fifth order (fifth downstream) or larger streams.
- A downstream analysis reveals that overbank control is not needed.

- If redevelopment results in an increase in impervious area or changes to hydrology that increase the discharge rate from the site, the ten year criteria does not apply.

3. **Extreme Storm (Qf) which is the 100 year storm.**

   100 Year Control requires storage to attenuate the post development 100-year, 24-hour peak discharge rate (Qf) to predevelopment rates.

   The 100-year storm control requirement can be waived if:

- The site discharges directly tidal waters or fifth order (fifth downstream) or larger streams.
- Development is prohibited within the ultimate 100-year floodplain
- A downstream analysis reveals that 100-year control is not needed.
- If redevelopment results in no increase in impervious area or changes to hydrology that increase the discharge rate from the site the hundred-year criteria does not apply.

Based on the foregoing, this project is eligible for coverage under NYSDEC SPDES General Permit No. GP-0-15-002.

III. STUDY METHODOLOGY

Runoff rates were calculated based upon the standards set forth by the United States Department of Agriculture Natural Resources Conservation Service Technical Release 55, Urban Hydrology for Small Watersheds (TR-55), dated June 1986. The methodology set forth in TR-55 considers a multitude of characteristics for watershed areas including soil types, soil permeability, vegetative cover, time of concentration, topography, rainfall intensity, ponding areas, etc.

The 1, 10, 100 year storm recurrence intervals were reviewed in the design of the stormwater management facilities (see Appendices A & B Existing/Proposed Hydrologic Calculations).

Anticipated drainage conditions were analyzed taking into account the rate of runoff which will result from the construction of buildings, parking areas and other impervious surfaces associated with the site development.

Base Data and Design Criteria

For the stormwater management analysis, the following base information and methodology were used:

1. The site drainage patterns and outfall facilities were reviewed by JMC personnel for the purpose of gathering background data and confirming existing mapping of the watershed areas.

2. An Existing Drainage Area Map was developed from the topographical survey. The drainage area map reflects the existing conditions within and around the project area.

3. A Proposed Drainage Area Map was developed from the proposed grading design superimposed over the topographical survey. The drainage area map reflects the proposed conditions within the project area and the existing conditions to remain in the surrounding area.

4. The United States Department of Agriculture (USDA) Web Soil Survey of the site available on its website at http://websoilsurvey.nrcd.usda.gov.

5. The United States Department of Agriculture Natural Resources Conservation Service National Engineering Handbook, Section 4 - Hydrology", dated March 1985.

6. The United States Department of Agriculture Natural Resources Conservation Service Technical Report No. 55, Urban Hydrology for Small Watersheds (TR-55), dated June 1986.

7. United States Department of Commerce Weather Bureau Technical Release No. 40 Rainfall Frequency Atlas of the United States.

The time of concentration was calculated using the methods described in Chapter 3 of TR-55, Second Edition, June 1986. Manning's kinematics wave equation was used to determine the travel time of sheet flow. The 2-year 24 hour precipitation amount of 3.42 inches was used in the equation for all storm events. The travel time for shallow concentrated flow was computed using Figure 3-1 and Table 3-1 of TR-55. Manning's Equation was used to determine the travel time for channel reaches.

8. All hydrologic calculations were performed with the Bentley PondPack software package version 10.0.

9. The New York State Stormwater Management Design Manual, revised January 2015.

10. New York Standards and Specifications for Erosion and Sediment Control, August 2005.

11. The storm flows for the 1, 10, and 100 year recurrence interval storms were analyzed for the total watershed areas. The Type III distribution design storm for a 24 hour duration was used and the mass rainfall for each design storm was taken from the Extreme Precipitation in New York & New England developed by the Natural Resource Conservation Service (NRCS) and the Northeast Regional Climate Center (NRCC) as follows:

24 Hour Rainfall Amounts

Design Storm Recurrence Interval	Inches of Rainfall
1 Year	**2.82**
10 Year	**5.25**
100 Year	**9.00**

IV. EXISTING CONDITIONS

Under existing conditions this project site consists of a residential dwelling with accessory driveway, storage structure, decks, and walkways. Stone retaining walls and the remnants of an old building foundation surround the site, and a row of cedar trees flank the northwest property line. The site primarily drains from the southeast corner of the lot to the northwest. Stormwater runoff that flows overland off the site travels northwest and is collected via an existing catch basin located along Warburton Avenue.

The following natural features, conservation areas, resource areas and drainage patterns of the project site have been identified and utilized to develop Drawing DA-1 “Existing Drainage Area Map” which is included in Appendix J:

- Forest, vegetative cover
- Topography (contour lines, existing flow paths, steep slopes, etc.)
- Soil (hydrologic soil groups, highly erodible soils, etc.)

Based on the USDA Web soil survey, all on-site soils are classified as Urban land-Riverhead complex, are well drained. The soil types, boundaries and drainage areas/designations are depicted on Drawing DA-1 within Appendix ‘J’.

One Design Point (DP-1) was identified for comparing peak rates of runoff in existing and proposed conditions. Design Point 1 is located at the existing catch basin located along Warburton Avenue just northwest of the site. Similarly, one drainage area (EDA-1) was identified in existing conditions based on the existing drainage divides at the site. The numbers included in the name of each drainage area correspond to the Design Point they drain towards.

The following is a description of each of the drainage areas analyzed in the existing conditions analysis:

<u>Existing Drainage Area 1 (EDA-1)</u> is 0.60 acres in size and encompasses the entire site. This area consists of an asphalt/gravel driveway, two buildings, sidewalks, lawn, retaining walls, and a small wooded area. This drainage area drains towards the northwest corner of the site. Stormwater runoff from this area overland flows off the site and is collected into the existing catch basin located along Warburton Avenue. The Curve Number (CN) and Time of Concentration (Tc) for this drainage area are 70 and 9.54, respectively. Refer to Drawing DA-1 in Appendix ‘J’.

The peak rates of runoff to the design points from the drainage areas for each storm are shown in the table below:

Table 1
Summary of Peak Rates of Runoff in Existing Conditions
(Cubic Feet per Second)

Storm Recurrence Interval	DP-1
1 year	0.31
10 year	1.26
100 year	3.03

The volumes of runoff to DP-1 for each storm are shown in the table below:

Table 2

Summary of Runoff Volumes in Existing Conditions
(Cubic Feet)

Storm Recurrence Interval	DP-1
1 year	1,339
10 year	4,832
100 year	11,598

V. PROPOSED CONDITIONS

Under proposed conditions this site will be redeveloped into a property consisting of the existing residential home and a 5-unit townhome. The proposed improvements consist of renovations to the existing two-family home, an expansion of the existing driveway, demolition of the existing storage structure and remains of old foundation and the development of a new 5-unit townhome with an associated driveway and walkways. The proposed development aims to minimize the impact to existing trees on site as well as existing retaining/foundation walls. Under proposed conditions the site will continue to drain towards the northwest corner of the property and be collected in an existing catch basin on Warburton Avenue, however, the property has been divided into three drainage areas in order to retain and treat the runoff from the proposed site.

The proposed drainage improvements include a variety of stormwater practices, such as a bioretention area, a subsurface infiltration system and the use of porous pavers.

This section describes the design and analysis of the proposed conditions used to demonstrate that the SWPPP meets the requirements of the General Permit.

The Five Step Process For Stormwater Site Planning and Practice Selection

Step 1: Site Planning

The following practices and site features were incorporated in the site design:

- Preserving hydrology - Maintaining drainage divides
- Reduction of impervious surfaces such as:
    i. New and expanded driveways to be porous pavers.
- Forest, vegetative cover – The maximum amount of forest and vegetative cover has been maintained and/or provided.
- Topography (contour lines, existing flow paths, steep slopes, etc.) has been maintained or disturbed to the minimum extent practicable.
- Soil (hydrologic soil groups, highly erodible soils, etc.)
- Bedrock, significant geology features have been accounted for.

Step 2: Determine Water Quality Treatment Volume (WQv)

Water quality calculations and design sheets can be found in Appendix 'E'. The total required water quality volume for the site was calculated based on Chapter 9 of the Stormwater Management Manual (using 25% of Existing Impervious Area and 100% of New Impervious Area) as 935 CF.

This water quality volume will be met using subsurface infiltration chambers, porous pavement and bioretention area.

Step 3: Runoff Reduction Volumes (RRv) by Applying Green Infrastructure Techniques and Standard SMP's

- RRv is not required for this site because it is a redevelopment. According to Chapter 9 of the stormwater management manual RRv is not required for redevelopment projects. Also, the project does not exceed NYSDEC requirements for developing a SWPPP. This SWPPP is provided because this project's proposed disturbance exceeds the Hastings-on-Hudson threshold. There are no RRv criteria provided in the Hasting-on-Hudson stormwater code.

Step 4: Apply Standard Stormwater Management Practices to Address Remaining Water Quality Volume

- **Filtering Practice**

  Bioretention (F-5) - A shallow depression that treats stormwater as it flows through a soil matrix, and is returned to the storm drain system.

- **Non Standard/Alternative SMP's to Address Remaining Water Quality Volume (for Redevelopment Projects)**

  Underground Infiltration Systems – A system of underground chambers that detains the water quality volume and allows it to infiltrate into the ground.

  Porous Pavement- Pervious types of pavements that provide an alternative to conventional paved surfaces, designed to infiltrate rainfall through the surface, thereby reducing stormwater runoff from a site and providing some pollutant uptake in the underlying soils.

Step 5: Apply Volume and Peak Rate Control Practices to Meet Water Quantity Requirements

Underground Infiltration System - A system of underground chambers that detains stormwater runoff and slowing releases water that is not infiltrated into the ground.

Bioretention (F-5) - A shallow depression that treats stormwater as it flows through a soil matrix, and is returned to the storm drain system.

All practices exceed the required elements of SMP criteria as outlined in Chapter 6 of the NYS Stormwater Management Design Manual. A summary of each category is provided below.

1. Feasibility – Ponds are designed based upon unique physical environmental considerations noted in the NYS Stormwater Management Design Manual (NYSSMDM) Table 7.2 "Physical Feasibility Matrix".

2. Conveyance – The design conveys runoff to the designed pond in a manner that is safe, minimizes erosion and disruption to natural drainage channel and promotes filtering and infiltration.

3. Pretreatment – All pond provide pretreatment in accordance with NYSSMDM design guidelines.

4. Treatment Geometry – The plan provides water quality treatment in accordance with NYSSMDM guidelines noted Table 6.1 "Water Quality Volume Distributing in Pond Design".

5. Environmental/Landscaping –Extensive landscaping has been provided for each proposed practice to enhance pollutant removal and provide aesthetic enhancement to the property.

6. Maintenance – Maintenance for the environment practices has been provided and is detain the SWPPP Report as required. Maintenance access is provided in the design plans.

In order to determine the post-development rates of runoff generated on-site, the following drainage areas were analyzed in the post-development conditions. These areas are graphically depicted on Drawing DA-2 "Proposed Drainage Area Map" located in Appendix ‘J’.

One Design Point (DP-1) was identified for comparing peak rates of runoff in existing and proposed conditions. Similarly, three drainage areas were identified in proposed conditions based on the proposed drainage divides at the site. The numbers included in the name of each drainage area correspond to the Design Point they drain towards.

The following is a description of each of the drainage areas analyzed in the proposed conditions analysis:

Proposed Drainage Area 1A (PDA-1A) is 0.36 acres in size. This area consists of the existing residential building and associated expanded driveway constructed with porous pavement, reconfigured residential porch area, and a portion of the newly constructed stair and porous pavement entrance to the proposed townhouse complex. This area is also comprised of lawn and wood area. Stormwater runoff from this area overland flows towards the north and is collected at the existing catch basin located at the corner of Washington Avenue and Warburton Avenue. Water quality for this area will be provided by the two proposed porous pavement driveways. Runoff that flows overland onto the porous pavers will slowly dissipate through the porous pavers' infiltration layer into the ground. Runoff from other portions of the site will be over-detained to compensate for runoff that is allowed to leave the site without being detained and treated. The Curve Number (CN) and Time of Concentration (Tc) for this drainage area are 74 and 7.38 minutes, respectively.

Proposed Drainage Area 1B (PDA-1B) is 0.20 acres in size and is located in the southwestern portion of the property. This drainage area includes runoff from the proposed 5-unit townhouse roof and the lawn area adjacent to the building. Stormwater runoff from the lawn area will be collected via drain inlets and runoff from the roof area will be collected via roof drain leaders. Runoff from these areas will be conveyed via a system of 15" HDPE pipes into a manhole with a hood and sump. The runoff will then be discharged into the isolator row of the proposed subsurface infiltration system consisting of 15 chambers (SC-740 StormTech Chambers). The proposed manhole with sump and hood and the isolator row will provide pretreatment for the entire water quality volume. An outlet control structure with a 4" orifice at elevation 86.40 and 0.5 foot weir at elevation 87.75 slowly releases the detained runoff into the proposed underground piping system. This runoff will then be conveyed into the existing underground piping system at Design Point 1. This subsurface infiltration system will help met the required water quality volume for the entire site by infiltrating the water quality volume and the 1 year storm. The infiltration rate used for the design is a conservative rate of 10 in/hr, which has been determined based on soil testing provided by the owner. Soil testing sheets can be found in Appendix 'C'.

The total storage volume for this system is 1,124 CF not including infiltration. The Curve Number (CN) and Time of Concentration (Tc) for this drainage area are 81 and 5.94 minutes, respectively.

Proposed Drainage Area 1C (PDA-1C) is 0.04 acres in size and is in the north western portion of the site. This area consists of the proposed building stair area and adjacent lawn area. Stormwater runoff from the stair away will be collect via a drain along the walkway area and will be conveyed into a rip rap apron. Runoff will slowly dissipate through the rip rap apron and be pretreated. Runoff will daylight through a grass swale into the proposed bioretention area. This Bioretention Area will provide the water quality volume for this drainage area as the water filters through the soil media. The soil media has been designed with an infiltration rate of 0.25 in/hr. The total storage volume for this bioretention is approximately 90 CF not including infiltration. Overflow from the bioretention area will be slowly released from the riser and continue in the same outlet pipe as the released runoff from PDA-1B. This runoff will be conveyed via the proposed underground piping system to the existing underground piping system at Design Point 1. The Curve Number (CN) and Time of Concentration (Tc) for this drainage area are 73 and 5 minutes, respectively.

Refer to Drawing DA-2 in Appendix 'J'.

The peak rates of runoff to the design point of each of the analyzed drainage areas for each storm are shown on the table below:

Table 3
Summary of Proposed Peak Rates of Runoff in Proposed Conditions
(Cubic Feet per Second)

Storm Recurrence Interval	DP-1
1 year	0.26
10 year	0.99
100 year	2.98

The reductions in peak rates of runoff from proposed to existing conditions are shown on the table below:

Table 4
Percent Reductions in Peak Rates of Runoff (Existing vs. Proposed Conditions)
(Cubic Feet per Second)

Design Point	Storm Recurrence Frequency (Years)	Existing Peak Runoff Rate (cfs)	Proposed Peak Runoff Rate (cfs)	Percent Reduction (%)
1	1 year	0.31	0.26	19.2
	10 year	1.26	0.99	27.3
	100 year	3.03	2.93	3.4

As demonstrated in Table 4, the proposed stormwater improvements will result in significant reductions of peak rates of runoff for all storms at the design point analyzed.

The volumes of runoff to each design point are shown in the following Table, as well as the total volume of runoff produced by the entire site area:

Table 5
Summary of Runoff Volumes in Proposed Conditions
(Cubic Feet)

Storm Recurrence Interval	DP-1
1 year	1,026
10 year	3,778
100 Year	9,761

The Reductions in Runoff Volumes when comparing in existing and proposed conditions are shown in the Table 6, below:

Table 6
Summary of Runoff Volumes (Existing & Proposed Conditions)
(Cubic Feet)

Design Point	Storm Recurrence Frequency (Years)	Total Existing Volume (cf)	Total Proposed Volume (cf)	Percent Reduction (%)
1	1 year	1,339	1,026	23.4
	10 year	4,522	3,778	16.5
	100 year	11,407	9,761	14.4

As demonstrated in Table 6, the proposed stormwater improvements will result in significant reductions of runoff volumes for all storms at the design point analyzed.

The hydraulic calculations of the proposed drainage pipe conveyance system within the Pipe Calculations in Appendix 'D' incorporates the 25 year storm outlet flows from the proposed surface infiltration basin and bioretention area as well as runoff from site. The Rational Method was used to demonstrate within a table and profile views that the 25 year flows can be accommodated without flooding.

VI. SOIL EROSION & SEDIMENT CONTROL

A potential impact of the proposed development on any soils or slopes will be that of erosion and transport of sediment during construction. An Erosion and Sediment Control Management Program will be established for the proposed development, beginning at the start of construction and continuing throughout its course, as outlined in the "New York State Standards and Specifications for Erosion and Sediment Control," dated August 2005. A continuing maintenance program will be implemented for the control of sediment transport and erosion control after construction and throughout the useful life of the project.

The Operator shall have a qualified professional conduct an assessment of the site prior to the commencement of construction and certify that the appropriate erosion and sediment controls, as shown on the Sediment & Erosion Control Plans, have been adequately installed to ensure overall preparedness of the site for the commencement of construction. In addition, the Operator shall have a qualified professional conduct one site inspection at least every seven calendar days and at least two site inspections every seven calendar days when greater than five acres of soil is disturbed at any one time.

Prior to the commencement of construction activity, the owner or operator must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP. The owner or operator shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the trained contractor. The owner or operator shall ensure that at least one trained contractor is on site on a daily basis when soil disturbance activities are being performed.
The owner or operator shall have each of the contractors and subcontractors identified above sign a copy of the certification statement provided.

<u>Soil Description</u>
As provided by the United States Department of Agriculture, Soil Conservation Service "Web Soil Survey," soil classifications which exist on the subject site are described below.

Soils are placed into four hydrologic groups: A, B, C, and D. In the definitions of the classes, infiltration rate is the rate at which water enters the soil at the surface and is controlled by the surface conditions. Transmission rate is the rate at which water moves in the soil and is controlled by soil properties. Definitions of the classes are as follows:

A. (Low runoff potential). The soils have a high infiltration rate even when thoroughly wetted. They chiefly consist of deep, well drained to excessively drained sands or gravels. They have a high rate of water transmission.

B. The soils have a moderate infiltration rate when thoroughly wetted. They chiefly are moderately deep to deep, moderately well drained to well drained soils that have moderately fine to moderately coarse textures. They have a moderate rate of water transmission.

C. The soils have a slow infiltration rate when thoroughly wetted. They chiefly have a layer that impedes downward movement of water or have moderately fine to fine texture. They have a slow rate of water transmission.

D. (High runoff potential). The soils have a very slow infiltration rate when thoroughly wetted. They chiefly consist of clay soils that have a high swelling potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. They have a very slow rate of water transmission.

A soil's tendency to erode is also described in the USDA web soil survey. The ratings in this interpretation indicate the hazard of soil loss from unsurfaced areas. The ratings are based on soil erosion factor K, slope, and content of rock fragments. The hazard is described as "slight," "moderate," or "SEVERE." A rating of "slight" indicates that little or no erosion is likely; "moderate" indicates that some erosion is likely, that the temporarily unsurfaced / unstabilized during construction may require occasional maintenance, and that simple erosion-control measures are needed; and "SEVERE" indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that erosion-control measures are needed.

Per the Soil Survey, the following soils listed below are present at the site. Following this list is a detailed description of each soil type found on the property:

SYM.	HYDRO. SOIL GROUP	DESCRIPTION
UvC	**B**	**Urban Land-Riverhead, 8-15% slopes**

This soil consists of loam, sandy loam, and loamy sand. It is composed of 50% urban land, 25% riverhead and similar soils, and 25% minor components. Depth to the top of a seasonal high water table is greater than 80 inches. The available water capacity is 5.95 inches/hour.

Hydrologic group: B
Erosion Hazard Rating: NOT RATED

On-Site Pollution Prevention

There are temporary pollution prevention measures used to control litter and construction debris on site, such as:

- Silt Fence
- Silt Sack
- Excavated Drop Inlet Protection
- Curb Drop Inlet Protection

There will be inlet protection provided for all storm drains and inlets with the use of curb gutter inlet protection structures and stone & block drop inlet protection, which keep silt, sediment and construction litter and debris out of the on-site stormwater drainage system.

Temporary Control Measures

Temporary control measures and facilities will include silt fences, interceptor swales, stabilized construction entrances, temporary seeding, mulching and sediment traps with temporary riser and anti-vortex devices.

Throughout the construction of the proposed redevelopment temporary control facilities will be implemented to control on-site erosion and sediment transfer. Interceptor swales, if required, will be used to direct stormwater runoff to temporary sediment traps for settlement. The sediment traps will be constructed as part of this project will serve as temporary sediment basins to remove sediment and pollutants from the stormwater runoff produced during construction.
Descriptions of the temporary sediment & erosion controls that will be used during the development of the site including silt fence, stabilized construction entrance, seeding, mulching and inlet protection are as follows:

1. Silt Fence is constructed using a geotextile fabric. The fence will be either 18 inches or 30 inches high. The height of the fence can be increased in the event of placing these devices on uncompacted fills or extremely loose undisturbed soils. The fences will not be placed in areas which receive concentrated flows such as ditches, swales and channels nor will the filter fabric material be placed across the entrance to pipes, culverts, spillway structures, sediment traps or basins.

2. Stabilized Construction Entrance consists of AASHTO No. 1 rock. The rock entrance will be a minimum of 50 feet in length by 20 feet in width by 8 inches in depth.

3. Seeding will be used to create a vegetative surface to stabilize disturbed earth until at least 70% of the disturbed area has a perennial vegetative cover. This amount is required to adequately function as a sediment and erosion control facility. Grass lining will also be used to line temporary channels and the surrounding disturbed areas.

4. Mulching is used as an anchor for seeding and disturbed areas to reduce soil loss due to storm events. These areas will be mulched with straw at a rate of 3 tons per acre such that the mulch forms a continuous blanket. Mulch must be placed after seeding or within 48 hours after seeding is completed.

5. Inlet Protection will be provided for all stormwater basins and inlets with the use of curb & gutter inlet protection and stone & block inlet protection structures, which will keep silt, sediment and construction debris out of the storm system. Existing structures within existing paved areas will be protected using “Silt Sacks” inside the structures.

The contractor shall be responsible for maintaining the temporary sediment and erosion control measures throughout construction. This maintenance will include, but not be limited to, the following tasks:

1. For dust control purposes, moisten all exposed graded areas with water at least twice a day in those areas where soil is exposed and cannot be planted with a temporary cover due to construction operations or the season (December through March).

2. Inspection of erosion and sediment control measures shall be performed at the end of each construction day and immediately following each rainfall event. All required repairs shall be immediately executed by the contractor.

3. Sediment deposits shall be removed when they reach approximately ⅓ the height of the silt fence. All such sediment shall be properly disposed of in fill areas on the site, as directed by the Owner's Field Representative. Fill shall be protected following disposal with mulch, temporary and/or permanent vegetation and be completely circumscribed on the downhill side by silt fence.

4. Rake all exposed areas parallel to the slope during earthwork operations.

5. Following final grading, the disturbed area shall be stabilized with a permanent surface treatment (i.e. turf grass, pavement or sidewalk). During rough grading, areas which are not to be disturbed for fourteen or more days shall be stabilized with the temporary seed mixture, as defined on the plans. Seed all piles of dirt in exposed soil areas that will not receive a permanent surface treatment.

Concrete Material and Equipment Management

Concrete washouts shall be used to contain concrete and liquids when the chutes of concrete mixers and hoppers of concrete pumps are rinsed out after delivery. The washout facilities consolidate solid for easier disposal and prevent runoff of liquids. The wash water is alkaline and contains high levels of chromium, which can leach into the ground and contaminate groundwater. It can also migrate to a storm drain, which can increase the pH of area waters and harm aquatic life. Solids that are improperly disposed of can clog storm drain pipes and cause flooding. Installing concrete washout facilities not only prevents pollution but also is a matter of good housekeeping at your construction site.

Prefabricated concrete washout containers can be delivered to the site to provide maintenance and disposal of materials. Regular pick-ups of solid and liquid waste materials will be necessary. To prevent leaks on the job site, ensure that prefabricated washout containers are watertight. A self installed concrete washout facility can be utilized although they are much less reliable than prefabricated containers and are prone to leaks. There are many design options for the washout, but they are preferably built below-grade to prevent breaches and reduce the likelihood of runoff. Above-grade structures can also be used if they are sized and constructed correctly and are diligently maintained. One of the most common problems with self-installed concrete washout facilities is that they can leak or be breached as a result of constant use, therefore the contractor shall be sure to use quality materials and inspect the facilities on a daily basis.

Washouts must be sized to handle solids, wash water, and rainfall to prevent overflow. Concrete Washout Systems, Inc. estimates that 7 gallons of wash water are used to wash one truck chute and 50 gallons are used to wash out the hopper of a concrete pump truck.

For larger sites, a below-grade washout should be at least 10 feet wide and sized to contain all liquid and solid waste expected to be generated in between cleanout periods. A minimum of 12-inches of freeboard must be provided. The pit must be lined with plastic sheeting of at least 10-mil thickness without holes or tears to prevent leaching of liquids into the ground. Concrete wash water should never be placed in a pit that is connected to the storm drain system or that drains to nearby waterways.

An above-grade washout can be constructed at least 10 feet wide by 10 feet long and sized to contain all liquid and solid waste expected to be generated in between cleanout periods. A minimum of 4-inches of freeboard must be provided. The washout structures can be constructed with staked straw bales or sandbags double-or triple lined with plastic sheeting of at least 10-mil thickness without holes or tears.

Concrete washout facilities shall not be located within 50 feet of storm drains, open ditches, or water bodies and should be placed in locations that allow for convenient access for concrete trucks. The contractor shall check all concrete washout facilities daily to determine if they have been filled to 75 percent capacity, which is when materials need to be removed. Both above-and below-ground self-installed washouts should be inspected daily to ensure that plastic linings are intact and sidewalls have not been damaged by construction activities. Prefabricated washout containers should be inspected daily as well as to ensure the container is not leaking or nearing 75 percent capacity. Inspectors should also note whether the facilities are being used regularly. Additional signage for washouts may be needed in more convenient locations if concrete truck operators are not utilizing them.

The washout structures must be drained or covered prior to predicted rainstorms to prevent overflows. Hardened solids either whole or broken must be removed and then they may be reused onsite or hauled away for recycling.

Once materials are removed from the concrete washout, a new structure must be built or excavated, or if the previous structure is still intact, inspect it for signs of weakening or damage and make any necessary repairs. Line the structure with new plastic that is free of holes or tears and replace signage if necessary. It is very important that new plastic be used after every cleaning because pumps and concrete removal equipment can damage the existing liner.

Construction Site Chemical Control

The purpose of this management measure is to prevent the generation of nonpoint source pollution from construction sites due to improper handling and usage of nutrients and toxic substances, and to prevent the movement of toxic substances from the construction site.

Many potential pollutants other than sediment are associated with construction activities. These pollutants include pesticides; fertilizers used for vegetative stabilization; petrochemicals; construction chemicals such as concrete products, sealers, and paints; wash water associated with these products; paper; wood; garbage; and sanitary waste.

Disposal of excess pesticides and pesticide-related wastes should conform to registered label directions for the disposal and storage of pesticides and pesticide containers set forth in applicable Federal, State and local regulations that govern their usage, handling, storage, and disposal.

Pesticides should be disposed of through either a licensed waste management firm or a treatment, storage and disposal (TSD) facility. Containers should be triple-rinsed before disposal, and rinse waters should be reused as product.

Other practices include setting aside a locked storage area, tightly closing lids, storing in a cool, dry place, checking containers periodically for leaks or deterioration, maintaining a list of products in storage, using plastic sheeting to line the storage areas, and notifying neighboring property owners prior to spraying.

When storing petroleum products, follow these guidelines:

- Create a shelter around the area with cover and wind protection;
- Line the storage area with a double layer of plastic sheeting or similar material;
- Create an impervious berm around the perimeter with a capacity of 110 percent greater than that of the largest container;
- Clearly label all products;
- Keep tanks off the ground; and
- Keep lids securely fastened.

Post spill procedure information and have persons trained in spill handling on site or on call at all times. Materials for cleaning up spills should be kept on site and easily available. Spills should be cleaned up immediately and the contaminated material properly disposed of. Maintain and wash equipment and machinery in confined areas specifically designed to control runoff.

Thinners or solvents should not be discharged into sanitary or storm systems when cleaning machinery. Use alternative methods for cleaning larger equipment parts, such as high-pressure, high-temperature water washes, or steam cleaning. Equipment-washing detergents can be used, and wash water may be discharged into sanitary sewers if solids are removed from the solution first. (This practice should be verified with the local sewer authority.) Small parts can be cleaned with degreasing solvents, which can then be reused or recycled.

<u>Solid Waste Management and Portable Sanitary Management</u>

The purpose of this management measure is to prevent the potential for solid waste such as construction debris, trash, etc. from construction sites due to improper handling and storage. Debris and litter should be removed periodically from the BMP's and surrounding areas to prevent clogging of pipes and structures. All construction material shall be stored in designated staging areas. Roll-off containers shall be placed on site and all empty containers, construction debris and litter shall be placed in the containers.

Portable sanitary units may be utilized on-site or bathrooms will be provided within construction trailers. A sanitation removal company will be hired to pump/remove any sanitary waste. In the event that portable sanitary units are used and then cleaned after being emptied, the rinse water may not be disposed of to the storm drain system. It shall be contained for later disposal if it can't be disposed of on-site. Remove paper and trash before cleaning the portable sanitary units. The portable sanitary units shall be located away from the storm drain system if possible. Provide over head cover for wash areas if possible. Maintain spill response material and equipment on site to eliminate the potential for contaminants and wash water from entering the storm drain system.

Permanent Control Measures and Facilities for Long Term Protection

Towards the completion of construction, permanent sediment and erosion control measures will be developed for long term erosion protection. The following permanent control measures and facilities have been proposed to be implemented for the project:

1. Infiltration System (I-2) which is a standard SMP that will be used to treat the runoff volume generated from a portion of the developed area and provide additional water quality and runoff volume reduction. The smaller storms will be retained and the higher storms will be released gradually. Refer to the Proposed Hydrologic Calculations and Runoff Reduction and Water Quality Volume Sizing Calculations, in Appendices 'B' **and 'C'**.

   The StormTech SC-740 Recharge Chambers are domed shaped fully opened bottom corrugated chambers with perforated side walls. Chambers allow stormwater to be stored within the dome void until it can infiltrate into the ground. They are able to be used for residential, commercial or industrial applications and provide an easy way to treat and dispose of stormwater runoff underground. Water is infiltrated into the ground through the chambers and surrounding crushed stone and will replenish the groundwater as a natural condition.

2. Bioretenion areas are a shallow depression that treats stormwater as it flows through a soil matrix, and is returned to the storm drain system. This practice will consist of a rip rap area, grass strip and a layer of mulch, which will enable removal of pollutants and sediment generated by the parking areas.

3. Catch Basins will be used to remove some of the coarse sand and grit sediment before entering the drainage system. Each catch basin will be constructed with an 18 inch deep sump.

4. Seeding of at least 70% perennial vegetative cover will be used to produce a permanent uniform erosion resistant surface. The seeded areas will be mulched with straw at a rate of 2 tons per acre such that the mulch forms a continuous blanket.

Specifications for Soil Restoration

Prior to the final stabilization of the disturbed areas, soil restoration will be required for all vegetated areas to recover the original properties and porosity of the soil. Soil Restoration Requirements are provided on Table 7 below:

Table 7

Soil Restoration Requirements

<table>
<tr><th>Type of Soil Disturbance</th><th colspan="2">Soil Restoration Requirement</th><th>Comments/Examples</th></tr>
<tr><td>No soil disturbance</td><td colspan="2">Restoration not permitted</td><td>Preservation of Natural Features</td></tr>
<tr><td>Minimal soil disturbance</td><td colspan="2">Restoration not required</td><td>Clearing and grubbing</td></tr>
<tr><td rowspan="2">Areas where topsoil is stripped only – no change in grade</td><td>HSG A&B</td><td>HSG C&D</td><td rowspan="2">Protect area from any ongoing construction activities</td></tr>
<tr><td>apply 6 inches of topsoil</td><td>Aerate* and apply 6 inches of topsoil</td></tr>
<tr><td rowspan="2">Areas of cut or fill</td><td>HSG A&B</td><td>HSG C&D</td><td rowspan="2">Clearing and grubbing</td></tr>
<tr><td>Aerate and apply 6 inches of topsoil</td><td>Apply full Soil Restoration**</td></tr>
<tr><td>Heavy traffic areas on site (especially) in a zone 5-25 feet around buildings but not within a 5 foot perimeter around foundation walls)</td><td colspan="2">Apply full Soil Restoration (decompaction and compost enhancement)</td><td></td></tr>
<tr><td>Areas where Runoff Reduction and/or Infiltration practices are applied</td><td colspan="2">Restoration not required, but may be applied to enhance the reduction specified for appropriate practices.</td><td>Keep construction equipment from crossing these areas. To protect newly installed practice from any ongoing construction activities construct a single phase operation fence area.</td></tr>
<tr><td>Redevelopment projects</td><td colspan="2">Soil Restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area.</td><td></td></tr>
</table>

* Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which function like a mini-subsoiler.

** Per "Deep Ripping and De-compaction, DEC 2008."

During periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following full soil restoration steps applied:

1. Apply 3 inches of compost over subsoil.

2. Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor-mounted disc, or tiller, mixing, and circulating air and compost into subsoils.

3. Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site.

Specifications for Final Stabilization of Graded Areas

Final stabilization of graded areas consists of the placement of topsoil and installation of landscaping (unless the area is to be paved, or a building is to be constructed in the location). Topsoil is to be spread as soon as grading operations are completed. Topsoil is to be placed to a minimum depth of six inches on all embankments, planting areas and seeding/sod areas. The subgrade is to be scarified to a depth of two inches to provide a bond of the topsoil with the subsoil. Topsoil is to be raked to an even surface and cleared of all debris, roots, stones and other unsatisfactory material.

Planting operations shall be conducted under favorable weather conditions as follows:

- Permanent Lawns - April 15 (provided soil is frost-free and not excessively moist) to May 15; August 15 to October 15.
- Temporary Lawn Seeding - if outside of the time periods noted above, the areas shall be seeded immediately on completion of topsoil operations with annual ryegrass (Italian rye) at a rate of six pounds per 1,000 square feet. Temporary lawn installation is permitted provided the soil is frost-free and not excessively moist. The permanent lawn is to be installed the next planting season.

On slopes with a grade of 3 horizontal to 1 vertical or greater, and in swales, a geotextile netting or mat shall be installed for stabilization purposes as shown on the Plans. Seeded areas are to be mulched with straw or hay at an application rate of 70-90 pounds per 1,000 s.f. Straw or hay mulch must be spread uniformly and anchored immediately after spreading to prevent wind blowing. Mulches must be inspected periodically and in particular after rainstorms to check for erosion. If erosion is observed, additional mulch must be applied. Netting shall be inspected after rainstorms for dislocation or failure; any damage shall be repaired immediately.

All denuded surfaces which will be exposed for a period of over two months or more shall be temporarily hydroseeded with (a) perennial ryegrass at a rate of 40 lbs per acre (1.0 lb per 1000 square feet); (b) Certified "Aroostook" winter rye (cereal rye) @ 100 lb per acre (2.5 lb/1000 s.f.) to be used in the months of October and November.

Permanent turfgrass cover is to consist of a seed mixture as follows:

(a) <u>Sunny sites</u>

Kentucky Bluegrass	2.0-2.6 pounds/1000 square feet
Perennial Ryegrass	0.6-0.7 pounds/1000 square feet
Fine Fescue	0.4-0.6 pounds/1000 square feet

(b) <u>Shady sites</u>

Kentucky Bluegrass	0.8-1.0 pounds/1000 square feet
Perennial Ryegrass	0.6-0.7 pounds/1000 square feet
Fine Fescue	2.6-3.3 pounds/1000 square feet

All plant materials shall comply with the standards of the American Association Of Nurserymen with respect to height and caliper as described in its publication American Standard for Nursery Stock, latest edition.

VII. CONSTRUCTION PHASE AND POST-CONSTRUCTION MAINTENANCE

During the construction phase and following construction of the project, a number of maintenance measures will be taken with respect to the site maintenance. Measures to be taken included the following:

1. During Construction

A comprehensive sediment and erosion control plan will be in place during the construction period. Maintenance measures for sediment and erosion controls will include:

A qualified professional acceptable to the municipality will be hired by the owner or operator to monitor the installation and maintenance of the sediment and erosion control plans. The qualified professional shall report directly to the Engineering Consultant and shall be responsible for ensuring compliance with the design of the sediment and erosion control plans.

The qualified professional so hired will inspect all sediment and erosion control measures at least every seven calendar days. In the event that there has been a variance with the design of the sediment and erosion control measures so that the ability of the measures to adequately perform the intended function is lessened or compromised and/or the facilities are not adequately maintained, the qualified professional shall be required to report such variance to the Engineering Consultant within 48 hours and shall be empowered to order immediate repairs to the sediment and erosion control measures.

The qualified professional will also be responsible for observing the adequacy of the vegetation growth (trees, shrubs, groundcovers and turfgrasses) in newly graded areas and for ordering additional plantings in the event that the established plant materials do not adequately protect the ground surface from erosion.

2. Following Construction

Site maintenance activities on the property will include:

- Grounds maintenance, including mowing of lawns;

- Planting of trees, shrubs and groundcovers; pruning of trees and shrubs;
- Application of fertilizer and herbicides;
- Maintenance of stormwater management area;

Grounds maintenance on the site will be performed by landscaping contractor.

Fertilizer is typically applied twice in the year - once in the spring and once in the fall. The application of fertilizer is usually necessary to maintain healthy lawn growth due to competition for nutrients with trees and shrubs and since the clippings are often removed. It is not recommended that fertilizer be applied during the summer. It is at this time that lawns are typically dormant.

Fertilizers come in three basic types: (1) Organic; (2) Soluble synthetic and (3) Slow release.

Organic fertilizers are derived from plant or animal waste. Since they are heavier and bulkier than other fertilizers, it is necessary to apply a much greater amount at one time. Soluble synthetic fertilizers are predictable with determining the exact impact on a lawn. However more applications are necessary since their effect is often short term. Slow release fertilizers have a high percentage of nitrogen so quantities that need be handled at one time are smaller. Slow release fertilizers will be utilized by the project.

A complete fertilizer contains all three of the primary nutrients - nitrogen (N), phosphorus (P) and potassium in the form of potash (K). Typically, a 3-1-2 ratio of nutrients (N-P-K) is used for lawn applications.

Fertilizer shall be applied by the landscape contractor in accordance with the manufacturer’s instructions. The application of fertilizer does require some skill on the part of the operator. Should there be a spill of fertilizer, the landscape contractor shall be required to scrape or vacuum it up. The area will then be watered in accordance with the manufacturer’s instructions to ensure that the fertilizer becomes soluble and available to plants and does not run off.

Owner will be responsible for the long-term operation and maintenance of the permanent stormwater management practices. The permanent stormwater management practices shall be maintained in accordance with the Maintenance Inspection Checklists provided in Appendix G.

VIII. CONCLUSION

This Stormwater Pollution Prevention Plan has been prepared to describe the project's pre and post-development stormwater management improvements and its sediment and erosion control improvements to be utilized during construction. The proposed permanent improvements and the interim improvements to be utilized during construction have been designed in accordance with the requirements of the:

- Chapter 250 "Stormwater Management, Erosion and Water Pollution Control" of the Hastings-on-Hudson Zoning Code.
- New York State Stormwater Management Design Manual.

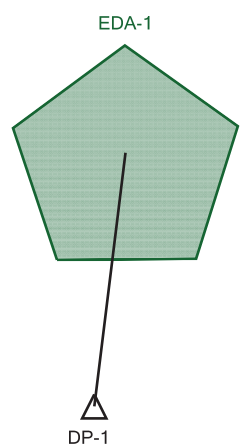
The project employs a variety of practices to enhance stormwater quality and reduce peak rates of runoff associated with the proposed improvements. These measures include porous pavers, a system of subsurface stormwater management/infiltration chambers and a bioretention area. These improvements will also mitigate runoff volumes from the proposed improvements as runoff volumes will be slightly reduced or maintained in all the analyzed storms.

Based on the foregoing, it is our professional opinion that the proposed improvements will provide water quantity and quality enhancements which exceed the above mentioned requirements and are not anticipated to have any adverse impacts to the site or any surrounding areas.

APPENDIX A

EXISTING HYDROLOGIC CALCULATIONS

Scenario: Pre-Development



Project Summary

Title	TOWNHOUSES AT 32-34 WASHINGTON AVENUE
Engineer	EH
Company	JMC
Date	8/11/2015

Notes

Table of Contents

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
EDA-1	Pre-Development-1 yr	1	1,339.000	12.150	0.3073
EDA-1	Pre-Development-10 yr	10	4,522.000	12.150	1.1799
EDA-1	Pre-Development-100 yr	100	11,407.000	12.150	2.9779

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
DP-1	Pre-Development-1 yr	1	1,339.000	12.150	0.3073
DP-1	Pre-Development-10 yr	10	4,522.000	12.150	1.1799
DP-1	Pre-Development-100 yr	100	11,407.000	12.150	2.9779

Time-Depth Curve: 1 YR	
Label	1 YR
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	1 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.1	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.2
6.500	0.2	0.2	0.2	0.2	0.2
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.3	0.3	0.3	0.3	0.3
8.000	0.3	0.3	0.3	0.3	0.4
8.500	0.4	0.4	0.4	0.4	0.4
9.000	0.4	0.4	0.4	0.4	0.5
9.500	0.5	0.5	0.5	0.5	0.5
10.000	0.5	0.5	0.6	0.6	0.6
10.500	0.6	0.6	0.6	0.7	0.7
11.000	0.7	0.7	0.8	0.8	0.8
11.500	0.8	0.9	1.0	1.1	1.2
12.000	1.4	1.6	1.8	1.9	1.9
12.500	2.0	2.0	2.0	2.1	2.1
13.000	2.1	2.1	2.2	2.2	2.2
13.500	2.2	2.2	2.2	2.3	2.3
14.000	2.3	2.3	2.3	2.3	2.3
14.500	2.4	2.4	2.4	2.4	2.4
15.000	2.4	2.4	2.4	2.4	2.4
15.500	2.5	2.5	2.5	2.5	2.5
16.000	2.5	2.5	2.5	2.5	2.5
16.500	2.5	2.5	2.5	2.6	2.6
17.000	2.6	2.6	2.6	2.6	2.6
17.500	2.6	2.6	2.6	2.6	2.6

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
18.000	2.6	2.6	2.6	2.6	2.6
18.500	2.6	2.6	2.6	2.7	2.7
19.000	2.7	2.7	2.7	2.7	2.7
19.500	2.7	2.7	2.7	2.7	2.7
20.000	2.7	2.7	2.7	2.7	2.7
20.500	2.7	2.7	2.7	2.7	2.7
21.000	2.7	2.7	2.7	2.7	2.7
21.500	2.8	2.8	2.8	2.8	2.8
22.000	2.8	2.8	2.8	2.8	2.8
22.500	2.8	2.8	2.8	2.8	2.8
23.000	2.8	2.8	2.8	2.8	2.8
23.500	2.8	2.8	2.8	2.8	2.8
24.000	2.8	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: 10 YR	
Label	10 YR
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.3	0.3	0.3	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.3	0.3	0.4
6.000	0.4	0.4	0.4	0.4	0.4
6.500	0.4	0.4	0.4	0.4	0.4
7.000	0.5	0.5	0.5	0.5	0.5
7.500	0.5	0.5	0.5	0.6	0.6
8.000	0.6	0.6	0.6	0.6	0.6
8.500	0.6	0.7	0.7	0.7	0.7
9.000	0.7	0.8	0.8	0.8	0.8
9.500	0.8	0.9	0.9	0.9	0.9
10.000	1.0	1.0	1.0	1.0	1.1
10.500	1.1	1.1	1.2	1.2	1.2
11.000	1.3	1.3	1.3	1.4	1.4
11.500	1.5	1.6	1.7	1.9	2.1
12.000	2.5	3.0	3.2	3.3	3.5
12.500	3.6	3.6	3.7	3.7	3.8
13.000	3.8	3.8	3.9	3.9	3.9
13.500	4.0	4.0	4.0	4.1	4.1
14.000	4.1	4.1	4.2	4.2	4.2
14.500	4.2	4.2	4.3	4.3	4.3
15.000	4.3	4.3	4.4	4.4	4.4
15.500	4.4	4.4	4.4	4.5	4.5
16.000	4.5	4.5	4.5	4.5	4.5
16.500	4.5	4.6	4.6	4.6	4.6
17.000	4.6	4.6	4.6	4.6	4.6
17.500	4.7	4.7	4.7	4.7	4.7

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
18.000	4.7	4.7	4.7	4.7	4.7
18.500	4.7	4.7	4.8	4.8	4.8
19.000	4.8	4.8	4.8	4.8	4.8
19.500	4.8	4.8	4.8	4.8	4.8
20.000	4.8	4.8	4.9	4.9	4.9
20.500	4.9	4.9	4.9	4.9	4.9
21.000	4.9	4.9	4.9	4.9	4.9
21.500	4.9	4.9	4.9	5.0	5.0
22.000	5.0	5.0	5.0	5.0	5.0
22.500	5.0	5.0	5.0	5.0	5.0
23.000	5.0	5.0	5.0	5.0	5.0
23.500	5.0	5.0	5.0	5.1	5.1
24.000	5.1	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: 100 YR	
Label	100 YR
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.1	0.1	0.1	0.1
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.2	0.2	0.2
2.000	0.2	0.2	0.2	0.2	0.2
2.500	0.2	0.2	0.2	0.3	0.3
3.000	0.3	0.3	0.3	0.3	0.3
3.500	0.3	0.3	0.3	0.4	0.4
4.000	0.4	0.4	0.4	0.4	0.4
4.500	0.4	0.5	0.5	0.5	0.5
5.000	0.5	0.5	0.5	0.5	0.6
5.500	0.6	0.6	0.6	0.6	0.6
6.000	0.6	0.7	0.7	0.7	0.7
6.500	0.7	0.7	0.8	0.8	0.8
7.000	0.8	0.8	0.8	0.9	0.9
7.500	0.9	0.9	0.9	1.0	1.0
8.000	1.0	1.0	1.1	1.1	1.1
8.500	1.1	1.2	1.2	1.2	1.3
9.000	1.3	1.3	1.4	1.4	1.4
9.500	1.5	1.5	1.6	1.6	1.6
10.000	1.7	1.7	1.8	1.8	1.9
10.500	1.9	2.0	2.0	2.1	2.2
11.000	2.2	2.3	2.4	2.5	2.6
11.500	2.7	2.8	3.0	3.3	3.7
12.000	4.4	5.2	5.6	5.9	6.1
12.500	6.2	6.3	6.4	6.5	6.6
13.000	6.7	6.7	6.8	6.9	6.9
13.500	7.0	7.0	7.1	7.1	7.2
14.000	7.2	7.3	7.3	7.3	7.4
14.500	7.4	7.5	7.5	7.5	7.6
15.000	7.6	7.6	7.7	7.7	7.7
15.500	7.8	7.8	7.8	7.8	7.9
16.000	7.9	7.9	7.9	8.0	8.0
16.500	8.0	8.0	8.0	8.1	8.1
17.000	8.1	8.1	8.1	8.1	8.2
17.500	8.2	8.2	8.2	8.2	8.2

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
18.000	8.3	8.3	8.3	8.3	8.3
18.500	8.3	8.3	8.4	8.4	8.4
19.000	8.4	8.4	8.4	8.4	8.4
19.500	8.5	8.5	8.5	8.5	8.5
20.000	8.5	8.5	8.5	8.6	8.6
20.500	8.6	8.6	8.6	8.6	8.6
21.000	8.6	8.6	8.6	8.7	8.7
21.500	8.7	8.7	8.7	8.7	8.7
22.000	8.7	8.7	8.7	8.8	8.8
22.500	8.8	8.8	8.8	8.8	8.8
23.000	8.8	8.8	8.8	8.8	8.9
23.500	8.9	8.9	8.9	8.9	8.9
24.000	8.9	(N/A)	(N/A)	(N/A)	(N/A)

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	28.00 ft
Manning's n	(N/A)
Slope	0.056 ft/ft
2 Year 24 Hour Depth	3.4 in
Average Velocity	1.66 ft/s
Segment Time of Concentration	0.005 hours

Segment #2: TR-55 Sheet Flow	
Hydraulic Length	122.00 ft
Manning's n	(N/A)
Slope	0.098 ft/ft
2 Year 24 Hour Depth	3.4 in
Average Velocity	0.24 ft/s
Segment Time of Concentration	0.143 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	6.70 ft
Is Paved?	True
Slope	0.043 ft/ft
Average Velocity	4.19 ft/s
Segment Time of Concentration	0.000 hours

Segment #4: TR-55 Shallow Concentrated Flow	
Hydraulic Length	136.00 ft
Is Paved?	False
Slope	0.043 ft/ft
Average Velocity	3.33 ft/s
Segment Time of Concentration	0.011 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.159 hours

==== SCS Channel Flow

Tc =	R = Qa / Wp V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n (Lf / V) / 3600
Where:	R= Hydraulic radius Aq= Flow area, square feet Wp= Wetted perimeter, feet V= Velocity, ft/sec Sf= Slope, ft/ft n= Manning's n Tc= Time of concentration, hours Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =	Unpaved surface: V = 16.1345 * (Sf**0.5) Paved Surface: V = 20.3282 * (Sf**0.5) (Lf / V) / 3600
Where:	V= Velocity, ft/sec Sf= Slope, ft/ft Tc= Time of concentration, hours Lf= Flow length, feet

Subsection: Runoff CN-Area
Label: EDA-1

Return Event: 1 years
Storm Event: 1 YR

Runoff Curve Number Data

Soil/Surface Description	CN	Area (ft²)	C (%)	UC (%)	Adjusted CN
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil B	61.000	17,019.000	0.0	0.0	61.000
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil B	98.000	6,412.000	0.0	0.0	98.000
Woods - fair - Soil B	60.000	2,695.000	0.0	0.0	60.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	26,126.000	(N/A)	(N/A)	69.978

Subsection: Unit Hydrograph Equations

Unit Hydrograph Method (Computational Notes)
Definition of Terms

At	Total area (acres): At = Ai+Ap
Ai	Impervious area (acres)
Ap	Pervious area (acres)
CNi	Runoff curve number for impervious area
CNp	Runoff curve number for pervious area
fLoss	f loss constant infiltration (depth/time)
gKs	Saturated Hydraulic Conductivity (depth/time)
Md	Volumetric Moisture Deficit
Psi	Capillary Suction (length)
hK	Horton Infiltration Decay Rate (time^-1)
fo	Initial Infiltration Rate (depth/time)
fc	Ultimate(capacity)Infiltration Rate (depth/time)
Ia	Initial Abstraction (length)
dt	Computational increment (duration of unit excess rainfall) Default dt is smallest value of 0.1333Tc, rtm, and th (Smallest dt is then adjusted to match up with Tp)
UDdt	User specified override computational main time increment (only used if UDdt is => .1333Tc)
D(t)	Point on distribution curve (fraction of P) for time step t
K	2 / (1 + (Tr/Tp)): default K = 0.75: (for Tr/Tp = 1.67)
Ks	Hydrograph shape factor = Unit Conversions * K: = ((1hr/3600sec) * (1ft/12in) * ((5280ft)**2/sq.mi)) * K Default Ks = 645.333 * 0.75 = 484
Lag	Lag time from center of excess runoff (dt) to Tp: Lag = 0.6Tc
P	Total precipitation depth, inches
Pa(t)	Accumulated rainfall at time step t
Pi(t)	Incremental rainfall at time step t
qp	Peak discharge (cfs) for 1in. runoff, for 1hr, for 1 sq.mi. = (Ks * A * Q) / Tp (where Q = 1in. runoff, A=sq.mi.)
Qu(t)	Unit hydrograph ordinate (cfs) at time step t
Q(t)	Final hydrograph ordinate (cfs) at time step t
Rai(t)	Accumulated runoff (inches) at time step t for impervious area
Rap(t)	Accumulated runoff (inches) at time step t for pervious area
Rii(t)	Incremental runoff (inches) at time step t for impervious area
Rip(t)	Incremental runoff (inches) at time step t for pervious area
R(t)	Incremental weighted total runoff (inches)
Rtm	Time increment for rainfall table
Si	S for impervious area: Si = (1000/CNi) - 10
Sp	S for pervious area: Sp = (1000/CNp) - 10
t	Time step (row) number
Tc	Time of concentration
Tb	Time (hrs) of entire unit hydrograph: Tb = Tp + Tr
Tp	Time (hrs) to peak of a unit hydrograph: Tp = (dt/2) + Lag
Tr	Time (hrs) of receding limb of unit hydrograph: Tr = ratio of Tp

Subsection: Unit Hydrograph Equations

Unit Hydrograph Method
Computational Notes
Precipitation

Column (1)	Time for time step t
Column (2)	D(t) = Point on distribution curve for time step t
Column (3)	Pi(t) = Pa(t) - Pa(t-1): Col.(4) - Preceding Col.(4)
Column (4)	Pa(t) = D(t) x P: Col.(2) x P

Pervious Area Runoff (using SCS Runoff CN Method)

Column (5)	Rap(t) = Accumulated pervious runoff for time step t
	If (Pa(t) is <= 0.2Sp) then use: Rap(t) = 0.0
	If (Pa(t) is > 0.2Sp) then use:
	
	Rap(t) = (Col.(4)-0.2Sp)**2 / (Col.(4)+0.8Sp)

Column (6)	Rip(t) = Incremental pervious runoff for time step t Rip(t) = Rap(t) - Rap(t-1) Rip(t) = Col.(5) for current row - Col.(5) for preceding row.

Impervious Area Runoff

Column (7 & 8)...	Did not specify to use impervious areas.

Incremental Weighted Runoff

Column (9)	R(t) = (Ap/At) x Rip(t) + (Ai/At) x Rii(t) R(t) = (Ap/At) x Col.(6) + (Ai/At) x Col.(8)

SCS Unit Hydrograph Method

Column (10)	Q(t) is computed with the SCS unit hydrograph method using R(t) and Qu(t).

Storm Event	1 YR
Return Event	1 years
Duration	24.000 hours
Depth	2.8 in
Time of Concentration (Composite)	0.159 hours
Area (User Defined)	26,126.000 ft²

Computational Time Increment	0.021 hours
Time to Peak (Computed)	12.150 hours
Flow (Peak, Computed)	0.3075 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.150 hours
Flow (Peak Interpolated Output)	0.3073 ft³/s

Drainage Area

SCS CN (Composite)	70.000
Area (User Defined)	26,126.000 ft²
Maximum Retention (Pervious)	4.3 in
Maximum Retention (Pervious, 20 percent)	0.9 in

Cumulative Runoff

Cumulative Runoff Depth (Pervious)	0.6 in
Runoff Volume (Pervious)	1,342.420 ft³

Hydrograph Volume (Area under Hydrograph curve)

Volume	1,339.000 ft³

SCS Unit Hydrograph Parameters

Time of Concentration (Composite)	0.159 hours
Computational Time Increment	0.021 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	4.2655 ft³/s
Unit peak time, Tp	0.106 hours

SCS Unit Hydrograph Parameters	
Unit receding limb, Tr	0.425 hours
Total unit time, Tb	0.531 hours

Storm Event	1 YR
Return Event	1 years
Duration	24.000 hours
Depth	2.8 in
Time of Concentration (Composite)	0.159 hours
Area (User Defined)	26,126.000 ft²

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.600	0.0002	0.0015	0.0050	0.0110	0.0205
11.850	0.0332	0.0503	0.0798	0.1368	0.2065
12.100	0.2698	0.3073	0.2892	0.2537	0.2259
12.350	0.2049	0.1833	0.1620	0.1385	0.1168
12.600	0.0984	0.0850	0.0769	0.0720	0.0684
12.850	0.0654	0.0625	0.0599	0.0571	0.0546
13.100	0.0525	0.0508	0.0497	0.0489	0.0482
13.350	0.0475	0.0469	0.0462	0.0456	0.0449
13.600	0.0443	0.0436	0.0429	0.0422	0.0415
13.850	0.0408	0.0400	0.0393	0.0385	0.0378
14.100	0.0372	0.0366	0.0362	0.0358	0.0355
14.350	0.0351	0.0348	0.0345	0.0341	0.0337
14.600	0.0334	0.0331	0.0327	0.0323	0.0320
14.850	0.0316	0.0312	0.0308	0.0305	0.0301
15.100	0.0297	0.0293	0.0289	0.0285	0.0281
15.350	0.0277	0.0273	0.0269	0.0265	0.0261
15.600	0.0257	0.0253	0.0248	0.0244	0.0240
15.850	0.0236	0.0231	0.0227	0.0223	0.0219
16.100	0.0215	0.0212	0.0210	0.0207	0.0206
16.350	0.0204	0.0202	0.0200	0.0198	0.0197
16.600	0.0195	0.0193	0.0191	0.0189	0.0187
16.850	0.0185	0.0184	0.0182	0.0180	0.0178
17.100	0.0176	0.0174	0.0172	0.0170	0.0168
17.350	0.0167	0.0164	0.0162	0.0161	0.0159
17.600	0.0157	0.0155	0.0153	0.0151	0.0149
17.850	0.0147	0.0145	0.0143	0.0141	0.0139
18.100	0.0137	0.0136	0.0135	0.0135	0.0134
18.350	0.0133	0.0133	0.0132	0.0132	0.0131
18.600	0.0131	0.0130	0.0130	0.0129	0.0128
18.850	0.0128	0.0127	0.0127	0.0126	0.0126
19.100	0.0125	0.0124	0.0124	0.0123	0.0123
19.350	0.0122	0.0122	0.0121	0.0121	0.0120
19.600	0.0119	0.0119	0.0118	0.0118	0.0117
19.850	0.0117	0.0116	0.0115	0.0115	0.0114
20.100	0.0114	0.0113	0.0113	0.0112	0.0112

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
20.350	0.0111	0.0111	0.0110	0.0110	0.0110
20.600	0.0109	0.0109	0.0108	0.0108	0.0107
20.850	0.0107	0.0107	0.0106	0.0106	0.0106
21.100	0.0105	0.0104	0.0104	0.0103	0.0103
21.350	0.0103	0.0102	0.0102	0.0101	0.0101
21.600	0.0100	0.0100	0.0099	0.0099	0.0099
21.850	0.0098	0.0098	0.0097	0.0097	0.0096
22.100	0.0096	0.0095	0.0095	0.0094	0.0094
22.350	0.0093	0.0093	0.0093	0.0092	0.0092
22.600	0.0091	0.0091	0.0090	0.0090	0.0089
22.850	0.0089	0.0088	0.0088	0.0088	0.0087
23.100	0.0086	0.0086	0.0085	0.0085	0.0085
23.350	0.0084	0.0084	0.0084	0.0083	0.0082
23.600	0.0082	0.0081	0.0081	0.0080	0.0080
23.850	0.0079	0.0079	0.0078	0.0078	(N/A)

Storm Event	10 YR
Return Event	10 years
Duration	24.000 hours
Depth	5.1 in
Time of Concentration (Composite)	0.159 hours
Area (User Defined)	26,126.000 ft²

Computational Time Increment	0.021 hours
Time to Peak (Computed)	12.150 hours
Flow (Peak, Computed)	1.1799 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.150 hours
Flow (Peak Interpolated Output)	1.1799 ft³/s

Drainage Area

SCS CN (Composite)	70.000
Area (User Defined)	26,126.000 ft²
Maximum Retention (Pervious)	4.3 in
Maximum Retention (Pervious, 20 percent)	0.9 in

Cumulative Runoff

Cumulative Runoff Depth (Pervious)	2.1 in
Runoff Volume (Pervious)	4,530.502 ft³

Hydrograph Volume (Area under Hydrograph curve)

Volume	4,522.000 ft³

SCS Unit Hydrograph Parameters

Time of Concentration (Composite)	0.159 hours
Computational Time Increment	0.021 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	4.2655 ft³/s
Unit peak time, Tp	0.106 hours

SCS Unit Hydrograph Parameters	
Unit receding limb, Tr	0.425 hours
Total unit time, Tb	0.531 hours

Storm Event	10 YR
Return Event	10 years
Duration	24.000 hours
Depth	5.1 in
Time of Concentration (Composite)	0.159 hours
Area (User Defined)	26,126.000 ft²

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
9.750	0.0008	0.0015	0.0022	0.0029	0.0037
10.000	0.0046	0.0054	0.0063	0.0073	0.0083
10.250	0.0093	0.0105	0.0117	0.0129	0.0142
10.500	0.0156	0.0170	0.0184	0.0199	0.0215
10.750	0.0231	0.0248	0.0266	0.0284	0.0302
11.000	0.0321	0.0343	0.0369	0.0399	0.0437
11.250	0.0478	0.0524	0.0572	0.0625	0.0680
11.500	0.0740	0.0831	0.0994	0.1231	0.1592
11.750	0.2024	0.2551	0.3136	0.3825	0.4983
12.000	0.7197	0.9533	1.1208	1.1799	1.0528
12.250	0.8845	0.7598	0.6696	0.5857	0.5085
12.500	0.4287	0.3577	0.2985	0.2560	0.2301
12.750	0.2143	0.2023	0.1927	0.1835	0.1751
13.000	0.1664	0.1587	0.1520	0.1467	0.1431
13.250	0.1404	0.1380	0.1358	0.1336	0.1315
13.500	0.1293	0.1272	0.1250	0.1229	0.1207
13.750	0.1185	0.1162	0.1140	0.1117	0.1095
14.000	0.1072	0.1051	0.1031	0.1015	0.1001
14.250	0.0990	0.0978	0.0967	0.0957	0.0946
14.500	0.0935	0.0924	0.0914	0.0903	0.0892
14.750	0.0881	0.0870	0.0859	0.0848	0.0836
15.000	0.0825	0.0814	0.0803	0.0791	0.0780
15.250	0.0769	0.0757	0.0745	0.0734	0.0723
15.500	0.0711	0.0699	0.0687	0.0676	0.0664
15.750	0.0652	0.0640	0.0629	0.0616	0.0604
16.000	0.0592	0.0582	0.0572	0.0564	0.0556
16.250	0.0550	0.0545	0.0540	0.0535	0.0529
16.500	0.0524	0.0520	0.0514	0.0509	0.0504
16.750	0.0499	0.0493	0.0488	0.0483	0.0478
17.000	0.0473	0.0467	0.0462	0.0458	0.0452
17.250	0.0446	0.0441	0.0436	0.0431	0.0425
17.500	0.0420	0.0415	0.0410	0.0404	0.0399
17.750	0.0394	0.0388	0.0383	0.0378	0.0373
18.000	0.0367	0.0362	0.0357	0.0354	0.0352
18.250	0.0350	0.0348	0.0346	0.0345	0.0344

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
18.500	0.0342	0.0340	0.0339	0.0338	0.0336
18.750	0.0334	0.0333	0.0331	0.0330	0.0328
19.000	0.0326	0.0325	0.0323	0.0322	0.0320
19.250	0.0319	0.0317	0.0315	0.0314	0.0313
19.500	0.0311	0.0309	0.0308	0.0306	0.0305
19.750	0.0303	0.0301	0.0300	0.0298	0.0296
20.000	0.0295	0.0294	0.0292	0.0290	0.0290
20.250	0.0289	0.0287	0.0286	0.0284	0.0283
20.500	0.0282	0.0281	0.0280	0.0279	0.0277
20.750	0.0276	0.0275	0.0274	0.0273	0.0271
21.000	0.0271	0.0270	0.0268	0.0267	0.0265
21.250	0.0264	0.0263	0.0262	0.0261	0.0260
21.500	0.0258	0.0256	0.0256	0.0255	0.0253
21.750	0.0252	0.0251	0.0251	0.0249	0.0248
22.000	0.0246	0.0245	0.0244	0.0243	0.0242
22.250	0.0240	0.0238	0.0237	0.0236	0.0235
22.500	0.0234	0.0233	0.0232	0.0231	0.0230
22.750	0.0228	0.0227	0.0225	0.0224	0.0223
23.000	0.0222	0.0221	0.0219	0.0217	0.0217
23.250	0.0216	0.0214	0.0213	0.0212	0.0211
23.500	0.0210	0.0208	0.0207	0.0206	0.0204
23.750	0.0203	0.0202	0.0201	0.0199	0.0197
24.000	0.0196	(N/A)	(N/A)	(N/A)	(N/A)

Storm Event	100 YR
Return Event	100 years
Duration	24.000 hours
Depth	8.9 in
Time of Concentration (Composite)	0.159 hours
Area (User Defined)	26,126.000 ft²

Computational Time Increment	0.021 hours
Time to Peak (Computed)	12.129 hours
Flow (Peak, Computed)	3.0058 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.150 hours
Flow (Peak Interpolated Output)	2.9779 ft³/s

Drainage Area	
SCS CN (Composite)	70.000
Area (User Defined)	26,126.000 ft²
Maximum Retention (Pervious)	4.3 in
Maximum Retention (Pervious, 20 percent)	0.9 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	5.2 in
Runoff Volume (Pervious)	11,423.513 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	11,407.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.159 hours
Computational Time Increment	0.021 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	4.2655 ft³/s
Unit peak time, Tp	0.106 hours

SCS Unit Hydrograph Parameters	
Unit receding limb, Tr	0.425 hours
Total unit time, Tb	0.531 hours

Storm Event	100 YR
Return Event	100 years
Duration	24.000 hours
Depth	8.9 in
Time of Concentration (Composite)	0.159 hours
Area (User Defined)	26,126.000 ft²

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
7.450	0.0008	0.0013	0.0018	0.0024	0.0031
7.700	0.0037	0.0044	0.0050	0.0057	0.0064
7.950	0.0071	0.0079	0.0086	0.0094	0.0103
8.200	0.0112	0.0121	0.0131	0.0142	0.0153
8.450	0.0164	0.0176	0.0188	0.0201	0.0214
8.700	0.0227	0.0241	0.0255	0.0270	0.0285
8.950	0.0301	0.0317	0.0333	0.0350	0.0367
9.200	0.0385	0.0402	0.0421	0.0440	0.0459
9.450	0.0479	0.0499	0.0519	0.0540	0.0561
9.700	0.0583	0.0605	0.0628	0.0650	0.0674
9.950	0.0697	0.0721	0.0746	0.0774	0.0804
10.200	0.0838	0.0874	0.0912	0.0950	0.0990
10.450	0.1030	0.1072	0.1114	0.1158	0.1202
10.700	0.1248	0.1294	0.1342	0.1390	0.1439
10.950	0.1489	0.1540	0.1599	0.1677	0.1771
11.200	0.1890	0.2020	0.2164	0.2309	0.2467
11.450	0.2624	0.2795	0.3069	0.3583	0.4326
11.700	0.5439	0.6714	0.8200	0.9765	1.1527
11.950	1.4463	2.0064	2.5617	2.9107	2.9779
12.200	2.6024	2.1479	1.8166	1.5808	1.3686
12.450	1.1781	0.9868	0.8189	0.6805	0.5815
12.700	0.5209	0.4838	0.4557	0.4330	0.4117
12.950	0.3920	0.3719	0.3542	0.3386	0.3265
13.200	0.3180	0.3115	0.3058	0.3006	0.2954
13.450	0.2904	0.2853	0.2803	0.2752	0.2702
13.700	0.2650	0.2601	0.2548	0.2497	0.2445
13.950	0.2394	0.2341	0.2293	0.2248	0.2211
14.200	0.2180	0.2153	0.2126	0.2102	0.2077
14.450	0.2053	0.2027	0.2002	0.1978	0.1954
14.700	0.1928	0.1903	0.1878	0.1854	0.1828
14.950	0.1803	0.1777	0.1753	0.1727	0.1702
15.200	0.1676	0.1651	0.1625	0.1600	0.1574
15.450	0.1550	0.1523	0.1497	0.1471	0.1446
15.700	0.1420	0.1394	0.1368	0.1343	0.1316
15.950	0.1290	0.1264	0.1241	0.1220	0.1202

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
16.200	0.1185	0.1172	0.1161	0.1150	0.1138
16.450	0.1126	0.1115	0.1105	0.1093	0.1081
16.700	0.1070	0.1060	0.1048	0.1036	0.1025
16.950	0.1015	0.1002	0.0991	0.0980	0.0970
17.200	0.0957	0.0945	0.0934	0.0924	0.0912
17.450	0.0900	0.0889	0.0878	0.0866	0.0854
17.700	0.0843	0.0833	0.0820	0.0808	0.0797
17.950	0.0787	0.0774	0.0763	0.0753	0.0746
18.200	0.0742	0.0738	0.0734	0.0730	0.0727
18.450	0.0724	0.0720	0.0717	0.0714	0.0711
18.700	0.0707	0.0703	0.0700	0.0697	0.0693
18.950	0.0690	0.0686	0.0683	0.0680	0.0676
19.200	0.0673	0.0670	0.0666	0.0662	0.0659
19.450	0.0656	0.0652	0.0649	0.0646	0.0643
19.700	0.0639	0.0635	0.0632	0.0629	0.0625
19.950	0.0621	0.0618	0.0615	0.0611	0.0608
20.200	0.0607	0.0605	0.0602	0.0598	0.0595
20.450	0.0593	0.0590	0.0588	0.0586	0.0583
20.700	0.0579	0.0576	0.0575	0.0573	0.0570
20.950	0.0567	0.0565	0.0564	0.0561	0.0557
21.200	0.0554	0.0552	0.0549	0.0547	0.0545
21.450	0.0542	0.0538	0.0535	0.0533	0.0532
21.700	0.0529	0.0526	0.0524	0.0523	0.0519
21.950	0.0516	0.0513	0.0510	0.0508	0.0506
22.200	0.0503	0.0501	0.0497	0.0494	0.0492
22.450	0.0490	0.0487	0.0484	0.0483	0.0481
22.700	0.0478	0.0474	0.0471	0.0469	0.0466
22.950	0.0464	0.0462	0.0459	0.0455	0.0452
23.200	0.0450	0.0449	0.0445	0.0442	0.0441
23.450	0.0439	0.0436	0.0433	0.0430	0.0427
23.700	0.0425	0.0422	0.0420	0.0417	0.0413
23.950	0.0410	0.0407	(N/A)	(N/A)	(N/A)

Summary for Hydrograph Addition at 'DP-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EDA-1

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	EDA-1	1,339.057	12.150	0.3073
Flow (In)	DP-1	1,339.057	12.150	0.3073

Summary for Hydrograph Addition at 'DP-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EDA-1

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	EDA-1	4,522.211	12.150	1.1799
Flow (In)	DP-1	4,522.211	12.150	1.1799

Summary for Hydrograph Addition at 'DP-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EDA-1

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	EDA-1	11,406.562	12.150	2.9779
Flow (In)	DP-1	11,406.562	12.150	2.9779

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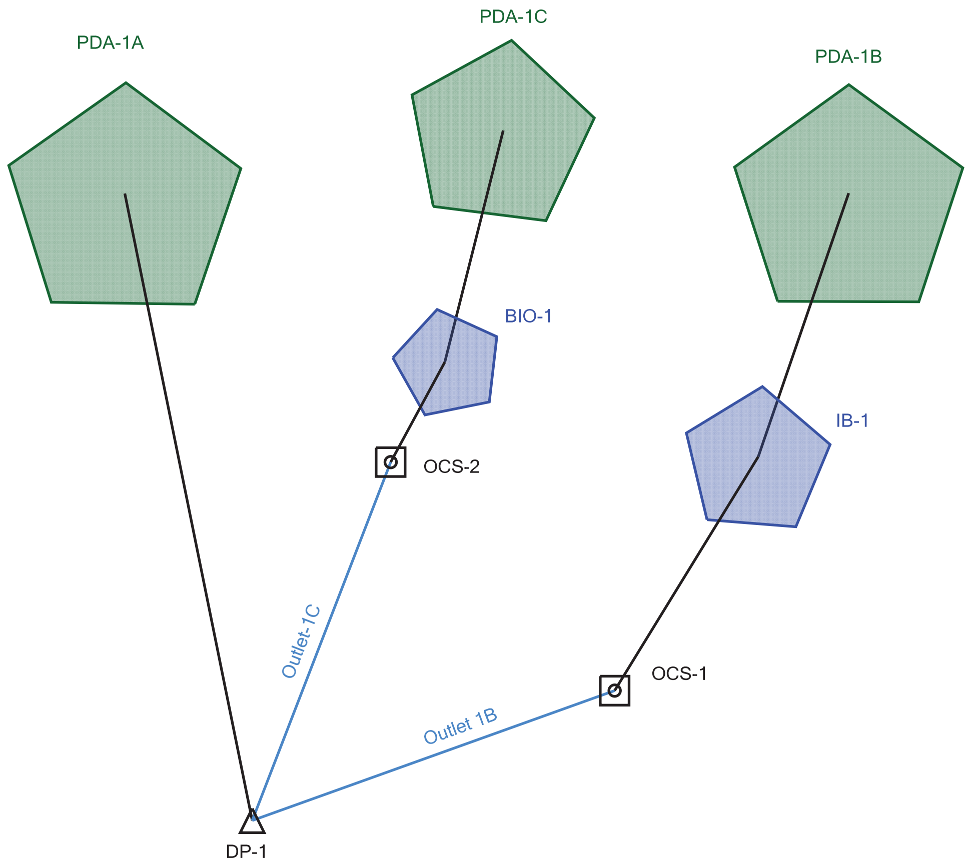
APPENDIX B

PROPOSED HYDROLOGIC CALCULATIONS

Scenario: POST-DEVELOPMENT



Project Summary	
Title	TOWNHOUSES AT 32-34 WASHINGTON AVENUE
Engineer	EH
Company	JMC
Date	10/1/2015

Notes

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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PDA-1A	POST-DEVELOPMENT -1 YR	1	1,020.000	12.150	0.2611
PDA-1A	POST-DEVELOPMENT -10 YR	10	3,286.000	12.100	0.8943
PDA-1A	POST-DEVELOPMENT -100 YR	100	7,469.000	12.100	2.0193
PDA-1B	POST-DEVELOPMENT -1 YR	1	867.000	12.100	0.2425
PDA-1B	POST-DEVELOPMENT -10 YR	10	2,363.000	12.100	0.6598
PDA-1B	POST-DEVELOPMENT -100 YR	100	4,930.000	12.100	1.3329
PDA-1C	POST-DEVELOPMENT -1 YR	1	111.000	12.100	0.0298
PDA-1C	POST-DEVELOPMENT -10 YR	10	371.000	12.100	0.1067
PDA-1C	POST-DEVELOPMENT -100 YR	100	859.000	12.100	0.2430

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
DP-1	POST-DEVELOPMENT -1 YR	1	1,026.000	12.150	0.2611
DP-1	POST-DEVELOPMENT -10 YR	10	3,778.000	12.100	0.9931
DP-1	POST-DEVELOPMENT -100 YR	100	9,761.000	12.150	2.9381

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
BIO-1 (IN)	POST-DEVELOPMENT-1 YR	1	111.000	12.100	0.0298	(N/A)	(N/A)
BIO-1 (OUT)	POST-DEVELOPMENT-1 YR	1	6.000	14.950	0.0016	84.42	66.000
BIO-1 (IN)	POST-DEVELOPMENT-10 YR	10	371.000	12.100	0.1067	(N/A)	(N/A)

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
BIO-1 (OUT)	POST-DEVELOPMENT-10 YR	10	257.000	12.050	0.1115	84.45	71.000
BIO-1 (IN)	POST-DEVELOPMENT-100 YR	100	859.000	12.100	0.2430	(N/A)	(N/A)
BIO-1 (OUT)	POST-DEVELOPMENT-100 YR	100	739.000	12.100	0.2389	84.48	77.000
IB-1 (IN)	POST-DEVELOPMENT-1 YR	1	867.000	12.100	0.2425	(N/A)	(N/A)
IB-1 (OUT)	POST-DEVELOPMENT-1 YR	1	0.000	0.000	0.0000	85.62	153.000
IB-1 (IN)	POST-DEVELOPMENT-10 YR	10	2,363.000	12.100	0.6598	(N/A)	(N/A)
IB-1 (OUT)	POST-DEVELOPMENT-10 YR	10	235.000	12.350	0.1506	86.76	630.000
IB-1 (IN)	POST-DEVELOPMENT-100 YR	100	4,930.000	12.100	1.3329	(N/A)	(N/A)
IB-1 (OUT)	POST-DEVELOPMENT-100 YR	100	1,553.000	12.200	0.8729	88.17	1,057.000

Time-Depth Curve: 1 YR	
Label	1 YR
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	1 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.1	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.2
6.500	0.2	0.2	0.2	0.2	0.2
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.3	0.3	0.3	0.3	0.3
8.000	0.3	0.3	0.3	0.3	0.4
8.500	0.4	0.4	0.4	0.4	0.4
9.000	0.4	0.4	0.4	0.4	0.5
9.500	0.5	0.5	0.5	0.5	0.5
10.000	0.5	0.5	0.6	0.6	0.6
10.500	0.6	0.6	0.6	0.7	0.7
11.000	0.7	0.7	0.8	0.8	0.8
11.500	0.8	0.9	1.0	1.1	1.2
12.000	1.4	1.6	1.8	1.9	1.9
12.500	2.0	2.0	2.0	2.1	2.1
13.000	2.1	2.1	2.2	2.2	2.2
13.500	2.2	2.2	2.2	2.3	2.3
14.000	2.3	2.3	2.3	2.3	2.3
14.500	2.4	2.4	2.4	2.4	2.4
15.000	2.4	2.4	2.4	2.4	2.4
15.500	2.5	2.5	2.5	2.5	2.5
16.000	2.5	2.5	2.5	2.5	2.5
16.500	2.5	2.5	2.5	2.6	2.6
17.000	2.6	2.6	2.6	2.6	2.6
17.500	2.6	2.6	2.6	2.6	2.6

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
18.000	2.6	2.6	2.6	2.6	2.6
18.500	2.6	2.6	2.6	2.7	2.7
19.000	2.7	2.7	2.7	2.7	2.7
19.500	2.7	2.7	2.7	2.7	2.7
20.000	2.7	2.7	2.7	2.7	2.7
20.500	2.7	2.7	2.7	2.7	2.7
21.000	2.7	2.7	2.7	2.7	2.7
21.500	2.8	2.8	2.8	2.8	2.8
22.000	2.8	2.8	2.8	2.8	2.8
22.500	2.8	2.8	2.8	2.8	2.8
23.000	2.8	2.8	2.8	2.8	2.8
23.500	2.8	2.8	2.8	2.8	2.8
24.000	2.8	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: 10 YR	
Label	10 YR
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.2
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.3
4.500	0.3	0.3	0.3	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.4	0.4	0.4
6.000	0.4	0.4	0.4	0.4	0.4
6.500	0.4	0.4	0.4	0.5	0.5
7.000	0.5	0.5	0.5	0.5	0.5
7.500	0.5	0.5	0.6	0.6	0.6
8.000	0.6	0.6	0.6	0.6	0.7
8.500	0.7	0.7	0.7	0.7	0.7
9.000	0.8	0.8	0.8	0.8	0.8
9.500	0.9	0.9	0.9	0.9	1.0
10.000	1.0	1.0	1.0	1.1	1.1
10.500	1.1	1.2	1.2	1.2	1.3
11.000	1.3	1.4	1.4	1.4	1.5
11.500	1.6	1.7	1.8	2.0	2.2
12.000	2.6	3.1	3.3	3.5	3.6
12.500	3.7	3.7	3.8	3.9	3.9
13.000	3.9	4.0	4.0	4.0	4.1
13.500	4.1	4.1	4.2	4.2	4.2
14.000	4.3	4.3	4.3	4.3	4.4
14.500	4.4	4.4	4.4	4.4	4.5
15.000	4.5	4.5	4.5	4.5	4.6
15.500	4.6	4.6	4.6	4.6	4.6
16.000	4.7	4.7	4.7	4.7	4.7
16.500	4.7	4.7	4.7	4.8	4.8
17.000	4.8	4.8	4.8	4.8	4.8
17.500	4.8	4.8	4.8	4.9	4.9

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
18.000	4.9	4.9	4.9	4.9	4.9
18.500	4.9	4.9	4.9	4.9	4.9
19.000	5.0	5.0	5.0	5.0	5.0
19.500	5.0	5.0	5.0	5.0	5.0
20.000	5.0	5.0	5.0	5.0	5.1
20.500	5.1	5.1	5.1	5.1	5.1
21.000	5.1	5.1	5.1	5.1	5.1
21.500	5.1	5.1	5.1	5.1	5.1
22.000	5.1	5.2	5.2	5.2	5.2
22.500	5.2	5.2	5.2	5.2	5.2
23.000	5.2	5.2	5.2	5.2	5.2
23.500	5.2	5.2	5.2	5.2	5.2
24.000	5.3	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: 100 YR	
Label	100 YR
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.1	0.1	0.1	0.1
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.2	0.2	0.2
2.000	0.2	0.2	0.2	0.2	0.2
2.500	0.2	0.2	0.2	0.3	0.3
3.000	0.3	0.3	0.3	0.3	0.3
3.500	0.3	0.3	0.4	0.4	0.4
4.000	0.4	0.4	0.4	0.4	0.4
4.500	0.4	0.5	0.5	0.5	0.5
5.000	0.5	0.5	0.5	0.6	0.6
5.500	0.6	0.6	0.6	0.6	0.6
6.000	0.6	0.7	0.7	0.7	0.7
6.500	0.7	0.7	0.8	0.8	0.8
7.000	0.8	0.8	0.9	0.9	0.9
7.500	0.9	0.9	1.0	1.0	1.0
8.000	1.0	1.0	1.1	1.1	1.1
8.500	1.2	1.2	1.2	1.2	1.3
9.000	1.3	1.3	1.4	1.4	1.5
9.500	1.5	1.5	1.6	1.6	1.7
10.000	1.7	1.7	1.8	1.8	1.9
10.500	1.9	2.0	2.1	2.1	2.2
11.000	2.2	2.3	2.4	2.5	2.6
11.500	2.7	2.8	3.1	3.4	3.7
12.000	4.5	5.3	5.6	5.9	6.2
12.500	6.3	6.4	6.5	6.6	6.7
13.000	6.7	6.8	6.9	6.9	7.0
13.500	7.1	7.1	7.2	7.2	7.3
14.000	7.3	7.3	7.4	7.4	7.5
14.500	7.5	7.5	7.6	7.6	7.7
15.000	7.7	7.7	7.8	7.8	7.8
15.500	7.8	7.9	7.9	7.9	8.0
16.000	8.0	8.0	8.0	8.0	8.1
16.500	8.1	8.1	8.1	8.1	8.2
17.000	8.2	8.2	8.2	8.2	8.3
17.500	8.3	8.3	8.3	8.3	8.3

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
18.000	8.4	8.4	8.4	8.4	8.4
18.500	8.4	8.4	8.4	8.5	8.5
19.000	8.5	8.5	8.5	8.5	8.5
19.500	8.6	8.6	8.6	8.6	8.6
20.000	8.6	8.6	8.6	8.6	8.7
20.500	8.7	8.7	8.7	8.7	8.7
21.000	8.7	8.7	8.7	8.8	8.8
21.500	8.8	8.8	8.8	8.8	8.8
22.000	8.8	8.8	8.8	8.9	8.9
22.500	8.9	8.9	8.9	8.9	8.9
23.000	8.9	8.9	8.9	8.9	9.0
23.500	9.0	9.0	9.0	9.0	9.0
24.000	9.0	(N/A)	(N/A)	(N/A)	(N/A)

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.240
Slope	0.100 ft/ft
2 Year 24 Hour Depth	3.4 in
Average Velocity	0.23 ft/s
Segment Time of Concentration	0.121 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	50.00 ft
Is Paved?	False
Slope	0.200 ft/ft
Average Velocity	7.22 ft/s
Segment Time of Concentration	0.002 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.123 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	22.00 ft
Manning's n	0.240
Slope	0.009 ft/ft
2 Year 24 Hour Depth	3.4 in
Average Velocity	0.06 ft/s
Segment Time of Concentration	0.095 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	19.00 ft
Is Paved?	False
Slope	0.006 ft/ft
Average Velocity	1.22 ft/s
Segment Time of Concentration	0.004 hours

Segment #3: TR-55 Channel Flow	
Flow Area	1.2 ft²
Hydraulic Length	17.00 ft
Manning's n	0.012
Slope	0.133 ft/ft
Wetted Perimeter	3.93 ft
Average Velocity	20.86 ft/s
Segment Time of Concentration	0.000 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.099 hours

==== SCS Channel Flow

Tc =	R = Qa / Wp V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n (Lf / V) / 3600
Where:	R= Hydraulic radius Aq= Flow area, square feet Wp= Wetted perimeter, feet V= Velocity, ft/sec Sf= Slope, ft/ft n= Manning's n Tc= Time of concentration, hours Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =	Unpaved surface: V = 16.1345 * (Sf**0.5) Paved Surface: V = 20.3282 * (Sf**0.5) (Lf / V) / 3600
Where:	V= Velocity, ft/sec Sf= Slope, ft/ft Tc= Time of concentration, hours Lf= Flow length, feet

==== SCS TR-55 Sheet Flow

Tc =	(0.007 * ((n * Lf)**0.8)) / ((P**0.5) * (Sf**0.4))
Where:	Tc= Time of concentration, hours n= Manning's n Lf= Flow length, feet P= 2yr, 24hr Rain depth, inches Sf= Slope, %

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	43.00 ft
Manning's n	0.240
Slope	0.058 ft/ft
2 Year 24 Hour Depth	3.4 in
Average Velocity	0.16 ft/s
Segment Time of Concentration	0.077 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	13.00 ft
Is Paved?	False
Slope	0.038 ft/ft
Average Velocity	3.15 ft/s
Segment Time of Concentration	0.001 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Subsection: Runoff CN-Area
Label: PDA-1A

Return Event: 1 years
Storm Event: 1 YR

Runoff Curve Number Data

Soil/Surface Description	CN	Area (ft²)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil B	98.000	3,572.000	0.0	0.0	98.000
Impervious Areas - Gravel (w/ right-of-way) - Soil B	85.000	201.000	0.0	0.0	85.000
Porous Pavement	91.000	2,392.000	0.0	0.0	91.000
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil B	61.000	6,570.000	0.0	0.0	61.000
Woods - good - Soil B	55.000	2,660.000	0.0	0.0	55.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	15,395.000	(N/A)	(N/A)	73.523

Subsection: Runoff CN-Area

Label: PDA-1B

Return Event: 1 years

Storm Event: 1 YR

Runoff Curve Number Data

Soil/Surface Description	CN	Area (ft²)	C (%)	UC (%)	Adjusted CN
Impervious	98.000	4,782.385	0.0	0.0	98.000
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil B	61.000	4,067.900	0.0	0.0	61.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	8,850.285	(N/A)	(N/A)	80.994

Unit Hydrograph Method (Computational Notes)
Definition of Terms

At	Total area (acres): At = Ai+Ap
Ai	Impervious area (acres)
Ap	Pervious area (acres)
CNi	Runoff curve number for impervious area
CNp	Runoff curve number for pervious area
fLoss	f loss constant infiltration (depth/time)
gKs	Saturated Hydraulic Conductivity (depth/time)
Md	Volumetric Moisture Deficit
Psi	Capillary Suction (length)
hK	Horton Infiltration Decay Rate (time^-1)
fo	Initial Infiltration Rate (depth/time)
fc	Ultimate(capacity)Infiltration Rate (depth/time)
Ia	Initial Abstraction (length)
dt	Computational increment (duration of unit excess rainfall) Default dt is smallest value of 0.1333Tc, rtm, and th (Smallest dt is then adjusted to match up with Tp)
UDdt	User specified override computational main time increment (only used if UDdt is => .1333Tc)
D(t)	Point on distribution curve (fraction of P) for time step t
K	2 / (1 + (Tr/Tp)): default K = 0.75: (for Tr/Tp = 1.67)
Ks	Hydrograph shape factor = Unit Conversions * K: = ((1hr/3600sec) * (1ft/12in) * ((5280ft)**2/sq.mi)) * K Default Ks = 645.333 * 0.75 = 484
Lag	Lag time from center of excess runoff (dt) to Tp: Lag = 0.6Tc
P	Total precipitation depth, inches
Pa(t)	Accumulated rainfall at time step t
Pi(t)	Incremental rainfall at time step t
qp	Peak discharge (cfs) for 1in. runoff, for 1hr, for 1 sq.mi. = (Ks * A * Q) / Tp (where Q = 1in. runoff, A=sq.mi.)
Qu(t)	Unit hydrograph ordinate (cfs) at time step t
Q(t)	Final hydrograph ordinate (cfs) at time step t
Rai(t)	Accumulated runoff (inches) at time step t for impervious area
Rap(t)	Accumulated runoff (inches) at time step t for pervious area
Rii(t)	Incremental runoff (inches) at time step t for impervious area
Rip(t)	Incremental runoff (inches) at time step t for pervious area
R(t)	Incremental weighted total runoff (inches)
Rtm	Time increment for rainfall table
Si	S for impervious area: Si = (1000/CNi) - 10
Sp	S for pervious area: Sp = (1000/CNp) - 10
t	Time step (row) number
Tc	Time of concentration
Tb	Time (hrs) of entire unit hydrograph: Tb = Tp + Tr
Tp	Time (hrs) to peak of a unit hydrograph: Tp = (dt/2) + Lag
Tr	Time (hrs) of receding limb of unit hydrograph: Tr = ratio of Tp

Unit Hydrograph Method
Computational Notes
Precipitation

Column (1)	Time for time step t
Column (2)	D(t) = Point on distribution curve for time step t
Column (3)	Pi(t) = Pa(t) - Pa(t-1): Col.(4) - Preceding Col.(4)
Column (4)	Pa(t) = D(t) x P: Col.(2) x P

Pervious Area Runoff (using SCS Runoff CN Method)

Column (5)	Rap(t) = Accumulated pervious runoff for time step t
	If (Pa(t) is <= 0.2Sp) then use: Rap(t) = 0.0
	If (Pa(t) is > 0.2Sp) then use:
	
	Rap(t) = (Col.(4)-0.2Sp)**2 / (Col.(4)+0.8Sp)

Column (6)	Rip(t) = Incremental pervious runoff for time step t Rip(t) = Rap(t) - Rap(t-1) Rip(t) = Col.(5) for current row - Col.(5) for preceding row.

Impervious Area Runoff

Column (7 & 8)...	Did not specify to use impervious areas.

Incremental Weighted Runoff

Column (9)	R(t) = (Ap/At) x Rip(t) + (Ai/At) x Rii(t) R(t) = (Ap/At) x Col.(6) + (Ai/At) x Col.(8)

SCS Unit Hydrograph Method

Column (10)	Q(t) is computed with the SCS unit hydrograph method using R(t) and Qu(t).

Storm Event	1 YR
Return Event	1 years
Duration	24.000 hours
Depth	2.8 in
Time of Concentration (Composite)	0.123 hours
Area (User Defined)	15,395.000 ft²

Computational Time Increment	0.016 hours
Time to Peak (Computed)	12.130 hours
Flow (Peak, Computed)	0.2679 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.150 hours
Flow (Peak Interpolated Output)	0.2611 ft³/s

Drainage Area

SCS CN (Composite)	74.000
Area (User Defined)	15,395.000 ft²
Maximum Retention (Pervious)	3.5 in
Maximum Retention (Pervious, 20 percent)	0.7 in

Cumulative Runoff

Cumulative Runoff Depth (Pervious)	0.8 in
Runoff Volume (Pervious)	1,021.389 ft³

Hydrograph Volume (Area under Hydrograph curve)

Volume	1,020.000 ft³

SCS Unit Hydrograph Parameters

Time of Concentration (Composite)	0.123 hours
Computational Time Increment	0.016 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	3.2615 ft³/s
Unit peak time, Tp	0.082 hours

SCS Unit Hydrograph Parameters	
Unit receding limb, Tr	0.327 hours
Total unit time, Tb	0.409 hours

Storm Event	1 YR
Return Event	1 years
Duration	24.000 hours
Depth	2.8 in
Time of Concentration (Composite)	0.123 hours
Area (User Defined)	15,395.000 ft²

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.150	0.0007	0.0012	0.0019	0.0026	0.0034
11.400	0.0043	0.0053	0.0065	0.0082	0.0111
11.650	0.0153	0.0221	0.0301	0.0411	0.0536
11.900	0.0697	0.1006	0.1626	0.2157	0.2554
12.150	0.2611	0.2162	0.1829	0.1609	0.1450
12.400	0.1271	0.1110	0.0917	0.0773	0.0643
12.650	0.0568	0.0528	0.0503	0.0480	0.0462
12.900	0.0440	0.0422	0.0400	0.0384	0.0368
13.150	0.0359	0.0352	0.0347	0.0342	0.0337
13.400	0.0332	0.0328	0.0322	0.0318	0.0312
13.650	0.0308	0.0302	0.0297	0.0291	0.0286
13.900	0.0280	0.0275	0.0269	0.0265	0.0260
14.150	0.0257	0.0254	0.0251	0.0248	0.0246
14.400	0.0243	0.0241	0.0238	0.0236	0.0233
14.650	0.0231	0.0228	0.0225	0.0222	0.0220
14.900	0.0217	0.0214	0.0211	0.0209	0.0206
15.150	0.0203	0.0200	0.0198	0.0194	0.0192
15.400	0.0189	0.0186	0.0183	0.0180	0.0177
15.650	0.0174	0.0171	0.0168	0.0165	0.0162
15.900	0.0159	0.0156	0.0153	0.0150	0.0148
16.150	0.0146	0.0144	0.0143	0.0142	0.0141
16.400	0.0139	0.0138	0.0137	0.0135	0.0134
16.650	0.0133	0.0131	0.0130	0.0129	0.0127
16.900	0.0126	0.0125	0.0123	0.0122	0.0121
17.150	0.0120	0.0118	0.0117	0.0115	0.0114
17.400	0.0113	0.0111	0.0110	0.0109	0.0107
17.650	0.0106	0.0105	0.0103	0.0102	0.0100
17.900	0.0099	0.0098	0.0096	0.0095	0.0094
18.150	0.0093	0.0093	0.0092	0.0092	0.0091
18.400	0.0091	0.0091	0.0090	0.0090	0.0090
18.650	0.0089	0.0089	0.0088	0.0088	0.0088
18.900	0.0087	0.0087	0.0086	0.0086	0.0086
19.150	0.0085	0.0085	0.0084	0.0084	0.0084
19.400	0.0083	0.0083	0.0082	0.0082	0.0082
19.650	0.0081	0.0081	0.0080	0.0080	0.0080

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
19.900	0.0079	0.0079	0.0078	0.0078	0.0077
20.150	0.0077	0.0077	0.0077	0.0076	0.0076
20.400	0.0076	0.0075	0.0075	0.0075	0.0075
20.650	0.0074	0.0074	0.0073	0.0073	0.0073
20.900	0.0073	0.0072	0.0072	0.0072	0.0071
21.150	0.0071	0.0071	0.0070	0.0070	0.0070
21.400	0.0070	0.0069	0.0069	0.0068	0.0068
21.650	0.0068	0.0068	0.0067	0.0067	0.0067
21.900	0.0066	0.0066	0.0066	0.0065	0.0065
22.150	0.0065	0.0065	0.0064	0.0064	0.0063
22.400	0.0063	0.0063	0.0062	0.0062	0.0062
22.650	0.0062	0.0061	0.0061	0.0061	0.0060
22.900	0.0060	0.0060	0.0059	0.0059	0.0058
23.150	0.0058	0.0058	0.0058	0.0057	0.0057
23.400	0.0057	0.0057	0.0056	0.0056	0.0055
23.650	0.0055	0.0055	0.0055	0.0054	0.0054
23.900	0.0053	0.0053	0.0053	(N/A)	(N/A)

Storm Event	10 YR
Return Event	10 years
Duration	24.000 hours
Depth	5.3 in
Time of Concentration (Composite)	0.123 hours
Area (User Defined)	15,395.000 ft²

Computational Time Increment	0.016 hours
Time to Peak (Computed)	12.114 hours
Flow (Peak, Computed)	0.9082 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	0.8943 ft³/s

Drainage Area	
SCS CN (Composite)	74.000
Area (User Defined)	15,395.000 ft²
Maximum Retention (Pervious)	3.5 in
Maximum Retention (Pervious, 20 percent)	0.7 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.6 in
Runoff Volume (Pervious)	3,290.989 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,286.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.123 hours
Computational Time Increment	0.016 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	3.2615 ft³/s
Unit peak time, Tp	0.082 hours

SCS Unit Hydrograph Parameters	
Unit receding limb, Tr	0.327 hours
Total unit time, Tb	0.409 hours

Storm Event	10 YR
Return Event	10 years
Duration	24.000 hours
Depth	5.3 in
Time of Concentration (Composite)	0.123 hours
Area (User Defined)	15,395.000 ft²

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
8.900	0.0009	0.0013	0.0017	0.0021	0.0025
9.150	0.0029	0.0033	0.0038	0.0042	0.0047
9.400	0.0052	0.0057	0.0062	0.0067	0.0073
9.650	0.0078	0.0084	0.0090	0.0096	0.0102
9.900	0.0108	0.0115	0.0121	0.0128	0.0136
10.150	0.0144	0.0153	0.0162	0.0172	0.0182
10.400	0.0193	0.0203	0.0215	0.0226	0.0238
10.650	0.0250	0.0263	0.0275	0.0289	0.0302
10.900	0.0316	0.0330	0.0345	0.0363	0.0386
11.150	0.0413	0.0448	0.0483	0.0523	0.0562
11.400	0.0606	0.0649	0.0698	0.0791	0.0961
11.650	0.1189	0.1540	0.1902	0.2355	0.2805
11.900	0.3356	0.4429	0.6555	0.8069	0.8943
12.150	0.8699	0.6957	0.5716	0.4911	0.4344
12.400	0.3753	0.3242	0.2655	0.2222	0.1838
12.650	0.1616	0.1493	0.1418	0.1348	0.1293
12.900	0.1229	0.1175	0.1110	0.1063	0.1018
13.150	0.0990	0.0968	0.0953	0.0936	0.0923
13.400	0.0907	0.0893	0.0876	0.0862	0.0846
13.650	0.0832	0.0815	0.0801	0.0784	0.0770
13.900	0.0753	0.0738	0.0721	0.0707	0.0694
14.150	0.0684	0.0676	0.0668	0.0660	0.0653
14.400	0.0645	0.0639	0.0630	0.0623	0.0615
14.650	0.0608	0.0600	0.0593	0.0585	0.0578
14.900	0.0569	0.0562	0.0554	0.0547	0.0538
15.150	0.0531	0.0523	0.0515	0.0507	0.0499
15.400	0.0491	0.0484	0.0475	0.0467	0.0459
15.650	0.0452	0.0443	0.0435	0.0427	0.0419
15.900	0.0410	0.0403	0.0394	0.0388	0.0381
16.150	0.0376	0.0372	0.0368	0.0365	0.0362
16.400	0.0357	0.0354	0.0351	0.0348	0.0343
16.650	0.0340	0.0337	0.0334	0.0329	0.0326
16.900	0.0323	0.0319	0.0315	0.0312	0.0309
17.150	0.0305	0.0301	0.0298	0.0294	0.0291
17.400	0.0287	0.0283	0.0280	0.0277	0.0272

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
17.650	0.0269	0.0266	0.0262	0.0258	0.0254
17.900	0.0251	0.0248	0.0243	0.0240	0.0238
18.150	0.0236	0.0235	0.0234	0.0232	0.0231
18.400	0.0230	0.0230	0.0228	0.0227	0.0226
18.650	0.0225	0.0224	0.0223	0.0222	0.0221
18.900	0.0220	0.0219	0.0218	0.0217	0.0216
19.150	0.0214	0.0214	0.0213	0.0211	0.0210
19.400	0.0209	0.0208	0.0207	0.0206	0.0205
19.650	0.0204	0.0203	0.0202	0.0201	0.0200
19.900	0.0198	0.0197	0.0196	0.0196	0.0194
20.150	0.0193	0.0193	0.0192	0.0191	0.0190
20.400	0.0189	0.0189	0.0188	0.0187	0.0186
20.650	0.0185	0.0184	0.0183	0.0183	0.0182
20.900	0.0181	0.0180	0.0180	0.0180	0.0178
21.150	0.0177	0.0176	0.0176	0.0175	0.0174
21.400	0.0173	0.0173	0.0171	0.0170	0.0170
21.650	0.0169	0.0168	0.0167	0.0167	0.0167
21.900	0.0165	0.0164	0.0163	0.0163	0.0162
22.150	0.0161	0.0160	0.0159	0.0158	0.0157
22.400	0.0157	0.0156	0.0155	0.0154	0.0154
22.650	0.0153	0.0152	0.0151	0.0150	0.0150
22.900	0.0149	0.0148	0.0147	0.0146	0.0145
23.150	0.0144	0.0144	0.0143	0.0142	0.0141
23.400	0.0141	0.0140	0.0139	0.0138	0.0137
23.650	0.0136	0.0135	0.0135	0.0134	0.0133
23.900	0.0132	0.0131	0.0130	(N/A)	(N/A)

Storm Event	100 YR
Return Event	100 years
Duration	24.000 hours
Depth	9.0 in
Time of Concentration (Composite)	0.123 hours
Area (User Defined)	15,395.000 ft²

Computational Time Increment	0.016 hours
Time to Peak (Computed)	12.114 hours
Flow (Peak, Computed)	2.0374 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	2.0193 ft³/s

Drainage Area	
SCS CN (Composite)	74.000
Area (User Defined)	15,395.000 ft²
Maximum Retention (Pervious)	3.5 in
Maximum Retention (Pervious, 20 percent)	0.7 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	5.8 in
Runoff Volume (Pervious)	7,478.113 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	7,469.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.123 hours
Computational Time Increment	0.016 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	3.2615 ft³/s
Unit peak time, Tp	0.082 hours

SCS Unit Hydrograph Parameters	
Unit receding limb, Tr	0.327 hours
Total unit time, Tb	0.409 hours

Storm Event	100 YR
Return Event	100 years
Duration	24.000 hours
Depth	9.0 in
Time of Concentration (Composite)	0.123 hours
Area (User Defined)	15,395.000 ft²

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
6.600	0.0008	0.0011	0.0014	0.0017	0.0020
6.850	0.0023	0.0027	0.0030	0.0034	0.0037
7.100	0.0041	0.0045	0.0049	0.0053	0.0057
7.350	0.0061	0.0066	0.0070	0.0074	0.0079
7.600	0.0084	0.0088	0.0093	0.0098	0.0103
7.850	0.0108	0.0113	0.0119	0.0124	0.0130
8.100	0.0136	0.0143	0.0150	0.0158	0.0166
8.350	0.0174	0.0183	0.0192	0.0201	0.0210
8.600	0.0220	0.0230	0.0240	0.0250	0.0261
8.850	0.0272	0.0283	0.0294	0.0306	0.0318
9.100	0.0330	0.0342	0.0355	0.0367	0.0381
9.350	0.0394	0.0408	0.0421	0.0435	0.0449
9.600	0.0464	0.0478	0.0494	0.0508	0.0524
9.850	0.0539	0.0555	0.0571	0.0587	0.0604
10.100	0.0625	0.0646	0.0671	0.0696	0.0723
10.350	0.0749	0.0777	0.0804	0.0834	0.0862
10.600	0.0893	0.0922	0.0953	0.0983	0.1016
10.850	0.1047	0.1081	0.1112	0.1147	0.1189
11.100	0.1250	0.1319	0.1413	0.1503	0.1608
11.350	0.1705	0.1816	0.1919	0.2038	0.2277
11.600	0.2728	0.3320	0.4221	0.5110	0.6196
11.850	0.7218	0.8444	1.0849	1.5600	1.8690
12.100	2.0193	1.9247	1.5167	1.2302	1.0459
12.350	0.9175	0.7875	0.6768	0.5519	0.4604
12.600	0.3798	0.3331	0.3071	0.2912	0.2764
12.850	0.2646	0.2512	0.2398	0.2264	0.2165
13.100	0.2071	0.2011	0.1966	0.1933	0.1897
13.350	0.1868	0.1833	0.1804	0.1770	0.1740
13.600	0.1705	0.1675	0.1641	0.1611	0.1576
13.850	0.1546	0.1510	0.1480	0.1445	0.1417
14.100	0.1389	0.1369	0.1351	0.1336	0.1319
14.350	0.1304	0.1288	0.1273	0.1256	0.1241
14.600	0.1225	0.1211	0.1193	0.1179	0.1162
14.850	0.1148	0.1130	0.1115	0.1099	0.1084
15.100	0.1066	0.1052	0.1035	0.1020	0.1003

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
15.350	0.0988	0.0971	0.0956	0.0938	0.0923
15.600	0.0906	0.0892	0.0874	0.0859	0.0842
15.850	0.0827	0.0809	0.0794	0.0777	0.0764
16.100	0.0751	0.0741	0.0731	0.0724	0.0717
16.350	0.0711	0.0702	0.0696	0.0689	0.0683
16.600	0.0674	0.0668	0.0661	0.0655	0.0646
16.850	0.0639	0.0633	0.0626	0.0618	0.0611
17.100	0.0605	0.0598	0.0590	0.0583	0.0576
17.350	0.0570	0.0561	0.0554	0.0548	0.0541
17.600	0.0533	0.0526	0.0519	0.0513	0.0504
17.850	0.0497	0.0491	0.0484	0.0476	0.0469
18.100	0.0464	0.0461	0.0458	0.0456	0.0454
18.350	0.0452	0.0450	0.0448	0.0445	0.0443
18.600	0.0441	0.0439	0.0437	0.0435	0.0433
18.850	0.0431	0.0428	0.0426	0.0424	0.0422
19.100	0.0420	0.0418	0.0416	0.0414	0.0411
19.350	0.0409	0.0407	0.0406	0.0403	0.0401
19.600	0.0399	0.0397	0.0394	0.0392	0.0390
19.850	0.0388	0.0386	0.0384	0.0382	0.0380
20.100	0.0377	0.0376	0.0375	0.0374	0.0371
20.350	0.0369	0.0368	0.0366	0.0365	0.0363
20.600	0.0362	0.0360	0.0357	0.0356	0.0355
20.850	0.0354	0.0351	0.0350	0.0349	0.0348
21.100	0.0346	0.0344	0.0342	0.0341	0.0339
21.350	0.0338	0.0336	0.0334	0.0332	0.0330
21.600	0.0329	0.0328	0.0326	0.0324	0.0324
21.850	0.0323	0.0320	0.0318	0.0316	0.0315
22.100	0.0313	0.0312	0.0310	0.0309	0.0306
22.350	0.0304	0.0304	0.0302	0.0300	0.0298
22.600	0.0298	0.0297	0.0294	0.0292	0.0290
22.850	0.0289	0.0287	0.0286	0.0284	0.0283
23.100	0.0280	0.0278	0.0278	0.0277	0.0274
23.350	0.0272	0.0272	0.0271	0.0268	0.0266
23.600	0.0264	0.0263	0.0261	0.0260	0.0258
23.850	0.0257	0.0254	0.0252	0.0251	(N/A)

Storm Event	1 YR
Return Event	1 years
Duration	24.000 hours
Depth	2.8 in
Time of Concentration (Composite)	0.099 hours
Area (User Defined)	8,850.285 ft²

Computational Time Increment	0.013 hours
Time to Peak (Computed)	12.121 hours
Flow (Peak, Computed)	0.2452 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	0.2425 ft³/s

Drainage Area	
SCS CN (Composite)	81.000
Area (User Defined)	8,850.285 ft²
Maximum Retention (Pervious)	2.3 in
Maximum Retention (Pervious, 20 percent)	0.5 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.2 in
Runoff Volume (Pervious)	867.866 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	867.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.099 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	2.3222 ft³/s
Unit peak time, Tp	0.066 hours

SCS Unit Hydrograph Parameters	
Unit receding limb, Tr	0.264 hours
Total unit time, Tb	0.330 hours

Storm Event	1 YR
Return Event	1 years
Duration	24.000 hours
Depth	2.8 in
Time of Concentration (Composite)	0.099 hours
Area (User Defined)	8,850.285 ft²

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
9.900	0.0009	0.0011	0.0012	0.0014	0.0016
10.150	0.0018	0.0020	0.0022	0.0024	0.0027
10.400	0.0029	0.0032	0.0035	0.0037	0.0040
10.650	0.0043	0.0046	0.0050	0.0053	0.0056
10.900	0.0060	0.0064	0.0068	0.0072	0.0078
11.150	0.0085	0.0094	0.0102	0.0112	0.0122
11.400	0.0133	0.0143	0.0156	0.0184	0.0228
11.650	0.0291	0.0383	0.0477	0.0597	0.0719
11.900	0.0871	0.1237	0.1856	0.2206	0.2425
12.150	0.2236	0.1693	0.1431	0.1250	0.1118
12.400	0.0964	0.0832	0.0669	0.0566	0.0467
12.650	0.0424	0.0399	0.0383	0.0365	0.0351
12.900	0.0334	0.0319	0.0301	0.0290	0.0278
13.150	0.0272	0.0267	0.0263	0.0259	0.0255
13.400	0.0251	0.0247	0.0243	0.0239	0.0234
13.650	0.0230	0.0226	0.0222	0.0217	0.0213
13.900	0.0209	0.0205	0.0200	0.0197	0.0193
14.150	0.0191	0.0188	0.0187	0.0184	0.0182
14.400	0.0180	0.0178	0.0176	0.0174	0.0172
14.650	0.0170	0.0168	0.0166	0.0164	0.0162
14.900	0.0159	0.0157	0.0155	0.0153	0.0151
15.150	0.0149	0.0146	0.0144	0.0142	0.0140
15.400	0.0138	0.0136	0.0133	0.0131	0.0129
15.650	0.0127	0.0124	0.0122	0.0120	0.0118
15.900	0.0115	0.0113	0.0111	0.0109	0.0107
16.150	0.0106	0.0105	0.0104	0.0103	0.0102
16.400	0.0101	0.0100	0.0099	0.0098	0.0097
16.650	0.0096	0.0095	0.0094	0.0093	0.0092
16.900	0.0091	0.0090	0.0089	0.0088	0.0087
17.150	0.0086	0.0085	0.0084	0.0083	0.0082
17.400	0.0081	0.0080	0.0079	0.0078	0.0077
17.650	0.0076	0.0075	0.0074	0.0073	0.0072
17.900	0.0071	0.0070	0.0069	0.0068	0.0067
18.150	0.0067	0.0067	0.0066	0.0066	0.0066
18.400	0.0065	0.0065	0.0065	0.0064	0.0064

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
18.650	0.0064	0.0064	0.0063	0.0063	0.0063
18.900	0.0062	0.0062	0.0062	0.0062	0.0061
19.150	0.0061	0.0061	0.0060	0.0060	0.0060
19.400	0.0060	0.0059	0.0059	0.0059	0.0058
19.650	0.0058	0.0058	0.0057	0.0057	0.0057
19.900	0.0056	0.0056	0.0056	0.0056	0.0055
20.150	0.0055	0.0055	0.0055	0.0054	0.0054
20.400	0.0054	0.0054	0.0053	0.0053	0.0053
20.650	0.0053	0.0052	0.0052	0.0052	0.0052
20.900	0.0052	0.0051	0.0051	0.0051	0.0051
21.150	0.0050	0.0050	0.0050	0.0050	0.0050
21.400	0.0049	0.0049	0.0049	0.0049	0.0049
21.650	0.0048	0.0048	0.0048	0.0048	0.0047
21.900	0.0047	0.0047	0.0047	0.0046	0.0046
22.150	0.0046	0.0046	0.0045	0.0045	0.0045
22.400	0.0045	0.0045	0.0044	0.0044	0.0044
22.650	0.0044	0.0043	0.0043	0.0043	0.0043
22.900	0.0042	0.0042	0.0042	0.0042	0.0041
23.150	0.0041	0.0041	0.0041	0.0040	0.0040
23.400	0.0040	0.0040	0.0040	0.0039	0.0039
23.650	0.0039	0.0039	0.0038	0.0038	0.0038
23.900	0.0037	0.0037	0.0037	(N/A)	(N/A)

Storm Event	10 YR
Return Event	10 years
Duration	24.000 hours
Depth	5.3 in
Time of Concentration (Composite)	0.099 hours
Area (User Defined)	8,850.285 ft²

Computational Time Increment	0.013 hours
Time to Peak (Computed)	12.107 hours
Flow (Peak, Computed)	0.6626 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	0.6598 ft³/s

Drainage Area

SCS CN (Composite)	81.000
Area (User Defined)	8,850.285 ft²
Maximum Retention (Pervious)	2.3 in
Maximum Retention (Pervious, 20 percent)	0.5 in

Cumulative Runoff

Cumulative Runoff Depth (Pervious)	3.2 in
Runoff Volume (Pervious)	2,365.429 ft³

Hydrograph Volume (Area under Hydrograph curve)

Volume	2,363.000 ft³

SCS Unit Hydrograph Parameters

Time of Concentration (Composite)	0.099 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	2.3222 ft³/s
Unit peak time, Tp	0.066 hours

SCS Unit Hydrograph Parameters	
Unit receding limb, Tr	0.264 hours
Total unit time, Tb	0.330 hours

Storm Event	10 YR
Return Event	10 years
Duration	24.000 hours
Depth	5.3 in
Time of Concentration (Composite)	0.099 hours
Area (User Defined)	8,850.285 ft²

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
7.450	0.0010	0.0011	0.0013	0.0014	0.0015
7.700	0.0017	0.0018	0.0020	0.0021	0.0023
7.950	0.0024	0.0026	0.0028	0.0030	0.0031
8.200	0.0034	0.0036	0.0038	0.0041	0.0043
8.450	0.0046	0.0048	0.0051	0.0054	0.0057
8.700	0.0060	0.0063	0.0066	0.0069	0.0073
8.950	0.0076	0.0080	0.0083	0.0087	0.0091
9.200	0.0095	0.0098	0.0103	0.0107	0.0111
9.450	0.0115	0.0119	0.0124	0.0128	0.0133
9.700	0.0137	0.0142	0.0147	0.0152	0.0157
9.950	0.0161	0.0167	0.0172	0.0179	0.0186
10.200	0.0194	0.0201	0.0210	0.0218	0.0227
10.450	0.0235	0.0244	0.0253	0.0263	0.0272
10.700	0.0282	0.0291	0.0302	0.0312	0.0322
10.950	0.0332	0.0344	0.0359	0.0378	0.0402
11.200	0.0432	0.0461	0.0494	0.0524	0.0560
11.450	0.0592	0.0629	0.0725	0.0881	0.1092
11.700	0.1393	0.1682	0.2036	0.2368	0.2774
11.950	0.3785	0.5445	0.6221	0.6598	0.5922
12.200	0.4393	0.3655	0.3151	0.2790	0.2387
12.450	0.2045	0.1638	0.1380	0.1134	0.1027
12.700	0.0964	0.0923	0.0879	0.0842	0.0799
12.950	0.0763	0.0719	0.0690	0.0661	0.0646
13.200	0.0633	0.0623	0.0612	0.0603	0.0592
13.450	0.0582	0.0571	0.0562	0.0551	0.0541
13.700	0.0530	0.0520	0.0509	0.0499	0.0487
13.950	0.0478	0.0466	0.0458	0.0449	0.0443
14.200	0.0438	0.0433	0.0428	0.0423	0.0418
14.450	0.0413	0.0407	0.0403	0.0397	0.0393
14.700	0.0387	0.0382	0.0377	0.0372	0.0367
14.950	0.0362	0.0357	0.0352	0.0346	0.0341
15.200	0.0336	0.0331	0.0325	0.0320	0.0315
15.450	0.0310	0.0304	0.0299	0.0294	0.0289
15.700	0.0283	0.0278	0.0273	0.0268	0.0262
15.950	0.0257	0.0252	0.0248	0.0244	0.0241

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
16.200	0.0238	0.0236	0.0234	0.0231	0.0229
16.450	0.0227	0.0225	0.0222	0.0219	0.0217
16.700	0.0215	0.0213	0.0210	0.0208	0.0206
16.950	0.0204	0.0201	0.0199	0.0197	0.0195
17.200	0.0192	0.0190	0.0188	0.0185	0.0183
17.450	0.0181	0.0178	0.0176	0.0173	0.0171
17.700	0.0169	0.0167	0.0164	0.0162	0.0160
17.950	0.0158	0.0155	0.0153	0.0151	0.0150
18.200	0.0150	0.0149	0.0148	0.0148	0.0147
18.450	0.0146	0.0145	0.0145	0.0144	0.0144
18.700	0.0143	0.0142	0.0141	0.0141	0.0140
18.950	0.0139	0.0139	0.0138	0.0137	0.0137
19.200	0.0136	0.0135	0.0134	0.0134	0.0133
19.450	0.0133	0.0132	0.0131	0.0130	0.0130
19.700	0.0129	0.0128	0.0128	0.0127	0.0126
19.950	0.0125	0.0125	0.0124	0.0123	0.0123
20.200	0.0123	0.0122	0.0121	0.0121	0.0120
20.450	0.0120	0.0119	0.0119	0.0118	0.0118
20.700	0.0117	0.0116	0.0116	0.0116	0.0115
20.950	0.0115	0.0114	0.0114	0.0113	0.0112
21.200	0.0112	0.0111	0.0111	0.0110	0.0110
21.450	0.0109	0.0108	0.0108	0.0108	0.0107
21.700	0.0106	0.0106	0.0106	0.0106	0.0105
21.950	0.0104	0.0103	0.0103	0.0103	0.0102
22.200	0.0102	0.0101	0.0100	0.0100	0.0099
22.450	0.0099	0.0098	0.0098	0.0098	0.0097
22.700	0.0096	0.0096	0.0095	0.0095	0.0094
22.950	0.0094	0.0093	0.0092	0.0091	0.0091
23.200	0.0091	0.0090	0.0090	0.0089	0.0089
23.450	0.0089	0.0088	0.0087	0.0087	0.0086
23.700	0.0086	0.0085	0.0085	0.0084	0.0083
23.950	0.0083	0.0082	(N/A)	(N/A)	(N/A)

Storm Event	100 YR
Return Event	100 years
Duration	24.000 hours
Depth	9.0 in
Time of Concentration (Composite)	0.099 hours
Area (User Defined)	8,850.285 ft²

Computational Time Increment	0.013 hours
Time to Peak (Computed)	12.107 hours
Flow (Peak, Computed)	1.3355 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	1.3329 ft³/s

Drainage Area

SCS CN (Composite)	81.000
Area (User Defined)	8,850.285 ft²
Maximum Retention (Pervious)	2.3 in
Maximum Retention (Pervious, 20 percent)	0.5 in

Cumulative Runoff

Cumulative Runoff Depth (Pervious)	6.7 in
Runoff Volume (Pervious)	4,934.819 ft³

Hydrograph Volume (Area under Hydrograph curve)

Volume	4,930.000 ft³

SCS Unit Hydrograph Parameters

Time of Concentration (Composite)	0.099 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	2.3222 ft³/s
Unit peak time, Tp	0.066 hours

SCS Unit Hydrograph Parameters	
Unit receding limb, Tr	0.264 hours
Total unit time, Tb	0.330 hours

Storm Event	100 YR
Return Event	100 years
Duration	24.000 hours
Depth	9.0 in
Time of Concentration (Composite)	0.099 hours
Area (User Defined)	8,850.285 ft²

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
5.100	0.0010	0.0011	0.0013	0.0014	0.0016
5.350	0.0017	0.0019	0.0020	0.0022	0.0023
5.600	0.0025	0.0027	0.0028	0.0030	0.0031
5.850	0.0033	0.0035	0.0036	0.0038	0.0040
6.100	0.0041	0.0043	0.0046	0.0048	0.0050
6.350	0.0053	0.0055	0.0057	0.0060	0.0062
6.600	0.0065	0.0068	0.0071	0.0073	0.0076
6.850	0.0079	0.0082	0.0085	0.0088	0.0091
7.100	0.0095	0.0098	0.0101	0.0104	0.0108
7.350	0.0111	0.0114	0.0118	0.0122	0.0125
7.600	0.0129	0.0132	0.0137	0.0140	0.0144
7.850	0.0148	0.0152	0.0156	0.0160	0.0164
8.100	0.0170	0.0175	0.0182	0.0188	0.0195
8.350	0.0202	0.0209	0.0216	0.0224	0.0231
8.600	0.0239	0.0246	0.0254	0.0262	0.0270
8.850	0.0278	0.0287	0.0295	0.0304	0.0312
9.100	0.0321	0.0330	0.0339	0.0348	0.0358
9.350	0.0367	0.0376	0.0386	0.0396	0.0405
9.600	0.0416	0.0425	0.0436	0.0446	0.0456
9.850	0.0466	0.0477	0.0487	0.0498	0.0510
10.100	0.0525	0.0540	0.0559	0.0576	0.0595
10.350	0.0613	0.0633	0.0651	0.0671	0.0690
10.600	0.0711	0.0730	0.0751	0.0771	0.0793
10.850	0.0812	0.0835	0.0855	0.0878	0.0910
11.100	0.0954	0.1006	0.1075	0.1137	0.1210
11.350	0.1276	0.1352	0.1420	0.1498	0.1713
11.600	0.2062	0.2531	0.3194	0.3806	0.4546
11.850	0.5212	0.6019	0.8069	1.1391	1.2781
12.100	1.3329	1.1811	0.8680	0.7163	0.6138
12.350	0.5410	0.4610	0.3938	0.3146	0.2646
12.600	0.2171	0.1963	0.1841	0.1760	0.1674
12.850	0.1603	0.1520	0.1449	0.1365	0.1309
13.100	0.1254	0.1224	0.1199	0.1180	0.1158
13.350	0.1140	0.1118	0.1100	0.1078	0.1059
13.600	0.1038	0.1019	0.0997	0.0979	0.0957

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
13.850	0.0938	0.0916	0.0898	0.0876	0.0860
14.100	0.0843	0.0832	0.0821	0.0812	0.0801
14.350	0.0792	0.0782	0.0773	0.0762	0.0753
14.600	0.0743	0.0734	0.0723	0.0714	0.0704
14.850	0.0695	0.0684	0.0675	0.0665	0.0656
15.100	0.0645	0.0636	0.0626	0.0617	0.0606
15.350	0.0597	0.0586	0.0577	0.0566	0.0557
15.600	0.0547	0.0538	0.0527	0.0518	0.0507
15.850	0.0498	0.0487	0.0478	0.0468	0.0460
16.100	0.0453	0.0447	0.0441	0.0437	0.0434
16.350	0.0429	0.0424	0.0420	0.0416	0.0412
16.600	0.0407	0.0403	0.0399	0.0395	0.0390
16.850	0.0386	0.0382	0.0378	0.0372	0.0369
17.100	0.0365	0.0360	0.0355	0.0351	0.0347
17.350	0.0343	0.0338	0.0334	0.0330	0.0326
17.600	0.0320	0.0317	0.0313	0.0308	0.0303
17.850	0.0299	0.0295	0.0291	0.0286	0.0282
18.100	0.0279	0.0278	0.0277	0.0275	0.0273
18.350	0.0272	0.0271	0.0270	0.0268	0.0267
18.600	0.0266	0.0265	0.0263	0.0262	0.0261
18.850	0.0260	0.0258	0.0257	0.0256	0.0255
19.100	0.0253	0.0252	0.0251	0.0249	0.0248
19.350	0.0247	0.0246	0.0244	0.0242	0.0241
19.600	0.0240	0.0239	0.0237	0.0236	0.0235
19.850	0.0234	0.0232	0.0231	0.0230	0.0229
20.100	0.0227	0.0226	0.0226	0.0225	0.0223
20.350	0.0222	0.0221	0.0220	0.0220	0.0219
20.600	0.0218	0.0217	0.0215	0.0214	0.0214
20.850	0.0213	0.0211	0.0211	0.0210	0.0209
21.100	0.0208	0.0207	0.0206	0.0205	0.0204
21.350	0.0203	0.0202	0.0201	0.0199	0.0199
21.600	0.0198	0.0197	0.0196	0.0195	0.0195
21.850	0.0194	0.0192	0.0191	0.0190	0.0189
22.100	0.0188	0.0187	0.0187	0.0185	0.0183
22.350	0.0183	0.0183	0.0182	0.0180	0.0179
22.600	0.0179	0.0178	0.0176	0.0175	0.0174
22.850	0.0174	0.0173	0.0172	0.0171	0.0170
23.100	0.0168	0.0167	0.0167	0.0166	0.0164
23.350	0.0164	0.0163	0.0162	0.0161	0.0160
23.600	0.0159	0.0158	0.0157	0.0156	0.0155
23.850	0.0154	0.0152	0.0151	0.0151	(N/A)

Storm Event	1 YR
Return Event	1 years
Duration	24.000 hours
Depth	2.8 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	1,825.000 ft²

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.122 hours
Flow (Peak, Computed)	0.0303 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	0.0298 ft³/s

Drainage Area	
SCS CN (Composite)	72.570
Area (User Defined)	1,825.000 ft²
Maximum Retention (Pervious)	3.8 in
Maximum Retention (Pervious, 20 percent)	0.8 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.7 in
Runoff Volume (Pervious)	110.871 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	111.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.5696 ft³/s
Unit peak time, Tp	0.056 hours

SCS Unit Hydrograph Parameters	
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Storm Event	1 YR
Return Event	1 years
Duration	24.000 hours
Depth	2.8 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	1,825.000 ft²

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.600	0.0010	0.0015	0.0022	0.0032	0.0044
11.850	0.0060	0.0078	0.0131	0.0208	0.0257
12.100	0.0298	0.0267	0.0204	0.0180	0.0163
12.350	0.0146	0.0128	0.0109	0.0089	0.0075
12.600	0.0063	0.0058	0.0056	0.0054	0.0052
12.850	0.0050	0.0047	0.0045	0.0043	0.0041
13.100	0.0040	0.0039	0.0039	0.0038	0.0038
13.350	0.0037	0.0037	0.0036	0.0035	0.0035
13.600	0.0034	0.0034	0.0033	0.0033	0.0032
13.850	0.0031	0.0031	0.0030	0.0030	0.0029
14.100	0.0029	0.0028	0.0028	0.0028	0.0028
14.350	0.0027	0.0027	0.0027	0.0026	0.0026
14.600	0.0026	0.0026	0.0025	0.0025	0.0025
14.850	0.0024	0.0024	0.0024	0.0023	0.0023
15.100	0.0023	0.0023	0.0022	0.0022	0.0022
15.350	0.0021	0.0021	0.0021	0.0020	0.0020
15.600	0.0020	0.0019	0.0019	0.0019	0.0018
15.850	0.0018	0.0018	0.0017	0.0017	0.0017
16.100	0.0016	0.0016	0.0016	0.0016	0.0016
16.350	0.0016	0.0015	0.0015	0.0015	0.0015
16.600	0.0015	0.0015	0.0015	0.0015	0.0014
16.850	0.0014	0.0014	0.0014	0.0014	0.0014
17.100	0.0013	0.0013	0.0013	0.0013	0.0013
17.350	0.0013	0.0013	0.0012	0.0012	0.0012
17.600	0.0012	0.0012	0.0012	0.0011	0.0011
17.850	0.0011	0.0011	0.0011	0.0011	0.0011
18.100	0.0010	(N/A)	(N/A)	(N/A)	(N/A)

Storm Event	10 YR
Return Event	10 years
Duration	24.000 hours
Depth	5.3 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	1,825.000 ft²

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.111 hours
Flow (Peak, Computed)	0.1072 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	0.1067 ft³/s

Drainage Area	
SCS CN (Composite)	72.570
Area (User Defined)	1,825.000 ft²
Maximum Retention (Pervious)	3.8 in
Maximum Retention (Pervious, 20 percent)	0.8 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.4 in
Runoff Volume (Pervious)	371.234 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	371.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.5696 ft³/s
Unit peak time, Tp	0.056 hours

SCS Unit Hydrograph Parameters	
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Storm Event	10 YR
Return Event	10 years
Duration	24.000 hours
Depth	5.3 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	1,825.000 ft²

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
9.900	0.0010	0.0011	0.0011	0.0012	0.0013
10.150	0.0014	0.0015	0.0016	0.0017	0.0018
10.400	0.0019	0.0021	0.0022	0.0023	0.0025
10.650	0.0026	0.0027	0.0029	0.0030	0.0032
10.900	0.0033	0.0035	0.0037	0.0039	0.0042
11.150	0.0045	0.0049	0.0053	0.0058	0.0062
11.400	0.0067	0.0072	0.0078	0.0094	0.0114
11.650	0.0149	0.0190	0.0236	0.0287	0.0344
11.900	0.0406	0.0608	0.0874	0.0992	0.1067
12.150	0.0910	0.0672	0.0575	0.0510	0.0450
12.400	0.0391	0.0329	0.0265	0.0223	0.0186
12.650	0.0172	0.0164	0.0157	0.0150	0.0144
12.900	0.0137	0.0130	0.0123	0.0118	0.0114
13.150	0.0112	0.0110	0.0108	0.0106	0.0105
13.400	0.0103	0.0101	0.0100	0.0098	0.0096
13.650	0.0094	0.0093	0.0091	0.0089	0.0087
13.900	0.0085	0.0084	0.0082	0.0080	0.0079
14.150	0.0078	0.0077	0.0076	0.0075	0.0075
14.400	0.0074	0.0073	0.0072	0.0071	0.0070
14.650	0.0069	0.0069	0.0068	0.0067	0.0066
14.900	0.0065	0.0064	0.0063	0.0062	0.0061
15.150	0.0061	0.0060	0.0059	0.0058	0.0057
15.400	0.0056	0.0055	0.0054	0.0053	0.0052
15.650	0.0051	0.0050	0.0050	0.0049	0.0048
15.900	0.0047	0.0046	0.0045	0.0044	0.0044
16.150	0.0043	0.0043	0.0042	0.0042	0.0041
16.400	0.0041	0.0041	0.0040	0.0040	0.0039
16.650	0.0039	0.0039	0.0038	0.0038	0.0037
16.900	0.0037	0.0037	0.0036	0.0036	0.0035
17.150	0.0035	0.0034	0.0034	0.0034	0.0033
17.400	0.0033	0.0032	0.0032	0.0032	0.0031
17.650	0.0031	0.0030	0.0030	0.0030	0.0029
17.900	0.0029	0.0028	0.0028	0.0028	0.0027
18.150	0.0027	0.0027	0.0027	0.0027	0.0027
18.400	0.0027	0.0026	0.0026	0.0026	0.0026

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
18.650	0.0026	0.0026	0.0026	0.0026	0.0025
18.900	0.0025	0.0025	0.0025	0.0025	0.0025
19.150	0.0025	0.0025	0.0024	0.0024	0.0024
19.400	0.0024	0.0024	0.0024	0.0024	0.0024
19.650	0.0024	0.0023	0.0023	0.0023	0.0023
19.900	0.0023	0.0023	0.0023	0.0023	0.0022
20.150	0.0022	0.0022	0.0022	0.0022	0.0022
20.400	0.0022	0.0022	0.0022	0.0022	0.0022
20.650	0.0021	0.0021	0.0021	0.0021	0.0021
20.900	0.0021	0.0021	0.0021	0.0021	0.0021
21.150	0.0020	0.0020	0.0020	0.0020	0.0020
21.400	0.0020	0.0020	0.0020	0.0020	0.0020
21.650	0.0020	0.0019	0.0019	0.0019	0.0019
21.900	0.0019	0.0019	0.0019	0.0019	0.0019
22.150	0.0019	0.0019	0.0018	0.0018	0.0018
22.400	0.0018	0.0018	0.0018	0.0018	0.0018
22.650	0.0018	0.0018	0.0017	0.0017	0.0017
22.900	0.0017	0.0017	0.0017	0.0017	0.0017
23.150	0.0017	0.0017	0.0017	0.0016	0.0016
23.400	0.0016	0.0016	0.0016	0.0016	0.0016
23.650	0.0016	0.0016	0.0016	0.0015	0.0015
23.900	0.0015	0.0015	0.0015	(N/A)	(N/A)

Storm Event	100 YR
Return Event	100 years
Duration	24.000 hours
Depth	9.0 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	1,825.000 ft²

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.100 hours
Flow (Peak, Computed)	0.2430 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	0.2430 ft³/s

Drainage Area

SCS CN (Composite)	72.570
Area (User Defined)	1,825.000 ft²
Maximum Retention (Pervious)	3.8 in
Maximum Retention (Pervious, 20 percent)	0.8 in

Cumulative Runoff

Cumulative Runoff Depth (Pervious)	5.7 in
Runoff Volume (Pervious)	859.643 ft³

Hydrograph Volume (Area under Hydrograph curve)

Volume	859.000 ft³

SCS Unit Hydrograph Parameters

Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.5696 ft³/s
Unit peak time, Tp	0.056 hours

SCS Unit Hydrograph Parameters	
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Storm Event	100 YR
Return Event	100 years
Duration	24.000 hours
Depth	9.0 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	1,825.000 ft²

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
7.850	0.0010	0.0011	0.0011	0.0012	0.0013
8.100	0.0013	0.0014	0.0015	0.0016	0.0017
8.350	0.0018	0.0019	0.0020	0.0021	0.0022
8.600	0.0023	0.0024	0.0025	0.0026	0.0027
8.850	0.0029	0.0030	0.0031	0.0032	0.0034
9.100	0.0035	0.0037	0.0038	0.0039	0.0041
9.350	0.0042	0.0044	0.0046	0.0047	0.0049
9.600	0.0050	0.0052	0.0054	0.0056	0.0057
9.850	0.0059	0.0061	0.0063	0.0065	0.0067
10.100	0.0069	0.0072	0.0075	0.0078	0.0081
10.350	0.0084	0.0087	0.0090	0.0093	0.0097
10.600	0.0100	0.0104	0.0107	0.0111	0.0115
10.850	0.0118	0.0122	0.0126	0.0130	0.0136
11.100	0.0143	0.0153	0.0164	0.0175	0.0187
11.350	0.0199	0.0211	0.0224	0.0236	0.0282
11.600	0.0337	0.0430	0.0537	0.0652	0.0775
11.850	0.0906	0.1043	0.1515	0.2109	0.2322
12.100	0.2430	0.2033	0.1478	0.1249	0.1098
12.350	0.0964	0.0831	0.0697	0.0560	0.0469
12.600	0.0389	0.0359	0.0342	0.0327	0.0313
12.850	0.0298	0.0284	0.0270	0.0255	0.0245
13.100	0.0235	0.0230	0.0226	0.0223	0.0219
13.350	0.0215	0.0212	0.0208	0.0204	0.0200
13.600	0.0197	0.0193	0.0189	0.0185	0.0182
13.850	0.0178	0.0174	0.0170	0.0166	0.0163
14.100	0.0160	0.0158	0.0157	0.0155	0.0153
14.350	0.0151	0.0149	0.0147	0.0146	0.0144
14.600	0.0142	0.0140	0.0138	0.0136	0.0135
14.850	0.0133	0.0131	0.0129	0.0127	0.0125
15.100	0.0123	0.0122	0.0120	0.0118	0.0116
15.350	0.0114	0.0112	0.0110	0.0109	0.0107
15.600	0.0105	0.0103	0.0101	0.0099	0.0097
15.850	0.0095	0.0093	0.0092	0.0090	0.0088
16.100	0.0087	0.0086	0.0085	0.0084	0.0083
16.350	0.0083	0.0082	0.0081	0.0080	0.0079

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
16.600	0.0078	0.0078	0.0077	0.0076	0.0075
16.850	0.0074	0.0074	0.0073	0.0072	0.0071
17.100	0.0070	0.0069	0.0068	0.0068	0.0067
17.350	0.0066	0.0065	0.0064	0.0064	0.0063
17.600	0.0062	0.0061	0.0060	0.0059	0.0058
17.850	0.0058	0.0057	0.0056	0.0055	0.0054
18.100	0.0054	0.0054	0.0054	0.0053	0.0053
18.350	0.0053	0.0053	0.0052	0.0052	0.0052
18.600	0.0052	0.0051	0.0051	0.0051	0.0051
18.850	0.0050	0.0050	0.0050	0.0050	0.0049
19.100	0.0049	0.0049	0.0049	0.0048	0.0048
19.350	0.0048	0.0048	0.0047	0.0047	0.0047
19.600	0.0047	0.0046	0.0046	0.0046	0.0046
19.850	0.0045	0.0045	0.0045	0.0045	0.0044
20.100	0.0044	0.0044	0.0044	0.0044	0.0043
20.350	0.0043	0.0043	0.0043	0.0043	0.0042
20.600	0.0042	0.0042	0.0042	0.0042	0.0042
20.850	0.0041	0.0041	0.0041	0.0041	0.0041
21.100	0.0040	0.0040	0.0040	0.0040	0.0040
21.350	0.0039	0.0039	0.0039	0.0039	0.0039
21.600	0.0039	0.0038	0.0038	0.0038	0.0038
21.850	0.0038	0.0037	0.0037	0.0037	0.0037
22.100	0.0037	0.0036	0.0036	0.0036	0.0036
22.350	0.0036	0.0036	0.0035	0.0035	0.0035
22.600	0.0035	0.0035	0.0034	0.0034	0.0034
22.850	0.0034	0.0034	0.0033	0.0033	0.0033
23.100	0.0033	0.0033	0.0033	0.0032	0.0032
23.350	0.0032	0.0032	0.0032	0.0031	0.0031
23.600	0.0031	0.0031	0.0031	0.0030	0.0030
23.850	0.0030	0.0030	0.0029	0.0029	(N/A)

Summary for Hydrograph Addition at 'DP-1'

Upstream Link	Upstream Node
Outlet-9	IB-1
Outlet-10	BIO-1
<Catchment to Outflow Node>	PDA-1A

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-9	0.000	0.000	0.0000
Flow (From)	Outlet-10	6.273	14.950	0.0016
Flow (From)	PDA-1A	1,019.551	12.150	0.2611
Flow (In)	DP-1	1,025.824	12.150	0.2611

Summary for Hydrograph Addition at 'DP-1'

Upstream Link	Upstream Node
Outlet-9	IB-1
Outlet-10	BIO-1
<Catchment to Outflow Node>	PDA-1A

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-9	234.537	12.350	0.1506
Flow (From)	Outlet-10	257.063	12.050	0.1115
Flow (From)	PDA-1A	3,286.469	12.100	0.8943
Flow (In)	DP-1	3,778.069	12.100	0.9931

Summary for Hydrograph Addition at 'DP-1'

Upstream Link	Upstream Node
Outlet-9	IB-1
Outlet-10	BIO-1
<Catchment to Outflow Node>	PDA-1A

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-9	1,552.539	12.200	0.8729
Flow (From)	Outlet-10	739.271	12.100	0.2389
Flow (From)	PDA-1A	7,469.407	12.100	2.0193
Flow (In)	DP-1	9,761.217	12.150	2.9381

Elevation (ft)	Planimeter (ft^2)	Area (ft^2)	A1+A2+sqr (A1*A2) (ft^2)	Volume (ft^3)	Volume (Total) (ft^3)
84.00	0.0	133.000	0.000	0.000	0.000
85.00	0.0	266.000	587.090	196.000	196.000

Pond Volume Equations

*** Incremental volume computed by the Conic Method for Reservoir Volumes.**

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Subsection: Elevation-Area Volume Curve
Label: BIO-1

Return Event: 10 years
Storm Event: 10 YR

Elevation (ft)	Planimeter (ft²)	Area (ft²)	A1+A2+sqr (A1*A2) (ft²)	Volume (ft³)	Volume (Total) (ft³)
84.00	0.0	133.000	0.000	0.000	0.000
85.00	0.0	266.000	587.090	196.000	196.000

Pond Volume Equations
*** Incremental volume computed by the Conic Method for Reservoir Volumes.**

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Subsection: Elevation-Area Volume Curve

Label: BIO-1

Return Event: 100 years

Storm Event: 100 YR

Elevation (ft)	Planimeter (ft^2)	Area (ft^2)	A1+A2+sqr (A1*A2) (ft^2)	Volume (ft^3)	Volume (Total) (ft^3)
84.00	0.0	133.000	0.000	0.000	0.000
85.00	0.0	266.000	587.090	196.000	196.000

Pond Volume Equations

*** Incremental volume computed by the Conic Method for Reservoir Volumes.**

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Elevation-Volume

Pond Elevation (ft)	Pond Volume (ft^3)
85.00	0.000
85.50	101.000
86.00	320.000
86.25	425.000
86.50	528.000
86.75	628.000
87.00	723.000
87.25	813.000
87.50	895.000
87.75	967.000
88.00	1,022.000
88.25	1,073.000
88.50	1,124.000

Elevation-Volume

Pond Elevation (ft)	Pond Volume (ft^3)
85.00	0.000
85.50	101.000
86.00	320.000
86.25	425.000
86.50	528.000
86.75	628.000
87.00	723.000
87.25	813.000
87.50	895.000
87.75	967.000
88.00	1,022.000
88.25	1,073.000
88.50	1,124.000

Elevation-Volume

Pond Elevation (ft)	Pond Volume (ft^3)
85.00	0.000
85.50	101.000
86.00	320.000
86.25	425.000
86.50	528.000
86.75	628.000
87.00	723.000
87.25	813.000
87.50	895.000
87.75	967.000
88.00	1,022.000
88.25	1,073.000
88.50	1,124.000

Requested Pond Water Surface Elevations	
Minimum (Headwater)	85.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	88.50 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice-1	Forward	Culvert - 1	86.40	88.50
Rectangular Weir	Weir - 1	Forward	Culvert - 1	87.75	88.50
Culvert-Circular	Culvert - 1	Forward	TW	85.50	88.50
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	15.0 in
Length	36.00 ft
Length (Computed Barrel)	36.00 ft
Slope (Computed)	0.010 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.023
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.090
T2 ratio (HW/D)	1.192
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	86.86 ft	T1 Flow	4.8021 ft³/s
T2 Elevation	86.99 ft	T2 Flow	5.4881 ft³/s

Structure ID: Weir - 1
Structure Type: Rectangular Weir

Number of Openings	1
Elevation	87.75 ft
Weir Length	0.50 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Orifice-1
Structure Type: Orifice-Circular

Number of Openings	1
Elevation	86.40 ft
Orifice Diameter	4.0 in
Orifice Coefficient	0.600

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 6.9485 ft³/s
Upstream ID = Orifice-1, Weir - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
85.00	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
85.50	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
86.00	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
86.40	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
86.50	0.0190	85.58	Free Outfall	Free Outfall	0.00	0.0002	(N/A)	0.00
87.00	0.2764	85.79	Free Outfall	Free Outfall	0.00	0.0001	(N/A)	0.00
87.50	0.4042	85.85	Free Outfall	Free Outfall	0.00	0.0008	(N/A)	0.00
87.75	0.4578	85.87	Free Outfall	Free Outfall	0.00	0.0009	(N/A)	0.00
88.00	0.6742	85.96	Free Outfall	Free Outfall	0.00	0.0000	(N/A)	0.00
88.50	1.2748	86.14	Free Outfall	Free Outfall	0.00	0.0000	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
CRIT.DEPTH CONTROL Vh= .018ft Dcr= .054ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .070ft Dcr= .204ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .086ft Dcr= .247ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .092ft Dcr= .263ft CRIT.DEPTH Hev= .00ft
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Weir - 1 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
85.00	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
85.50	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.00	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.40	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.50	0.0000	0.00	0.00	85.58	0.00	0.0000	(N/A)	0.00
87.00	0.0000	0.00	0.00	85.79	0.00	0.0000	(N/A)	0.00
87.50	0.0000	0.00	0.00	85.85	0.00	0.0000	(N/A)	0.00
87.75	0.0000	0.00	0.00	85.87	0.00	0.0000	(N/A)	0.00
88.00	0.1688	88.00	Free Outfall	85.96	0.00	0.0000	(N/A)	0.00
88.50	0.6820	88.50	Free Outfall	86.14	0.00	0.0000	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
H=.25; Htw=.00; Qfree=.17;
H=.75; Htw=.00; Qfree=.68;

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice-1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
85.00	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
85.50	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.00	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.40	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.50	0.0188	86.50	Free Outfall	85.58	0.00	0.0000	(N/A)	0.00
87.00	0.2765	87.00	Free Outfall	85.79	0.00	0.0000	(N/A)	0.00
87.50	0.4058	87.50	Free Outfall	85.85	0.00	0.0000	(N/A)	0.00
87.75	0.4569	87.75	Free Outfall	85.87	0.00	0.0000	(N/A)	0.00
88.00	0.5029	88.00	Free Outfall	85.96	0.00	0.0000	(N/A)	0.00
88.50	0.5840	88.50	Free Outfall	86.14	0.00	0.0000	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
CRIT.DEPTH CONTROL Vh= .027ft Dcr= .073ft CRIT.DEPTH Hev= .00ft
H =.43
H =.93
H =1.18
H =1.43
H =1.93

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
85.00	0.0000	(N/A)	0.00
85.50	0.0000	(N/A)	0.00
86.00	0.0000	(N/A)	0.00
86.40	0.0000	(N/A)	0.00
86.50	0.0190	(N/A)	0.00
87.00	0.2764	(N/A)	0.00
87.50	0.4050	(N/A)	0.00
87.75	0.4578	(N/A)	0.00
88.00	0.6716	(N/A)	0.00
88.50	1.2660	(N/A)	0.00

Contributing Structures
(no Q: Orifice-1,Weir - 1,Culvert - 1)
(no Q: Orifice-1,Weir - 1,Culvert - 1)
(no Q: Orifice-1,Weir - 1,Culvert - 1)
(no Q: Orifice-1,Weir - 1,Culvert - 1)
Orifice-1,Culvert - 1 (no Q: Weir - 1)
Orifice-1,Culvert - 1 (no Q: Weir - 1)
Orifice-1,Culvert - 1 (no Q: Weir - 1)
Orifice-1,Culvert - 1 (no Q: Weir - 1)
Orifice-1,Weir - 1,Culvert - 1
Orifice-1,Weir - 1,Culvert - 1

Requested Pond Water Surface Elevations	
Minimum (Headwater)	85.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	88.50 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice-1	Forward	Culvert - 1	86.40	88.50
Rectangular Weir	Weir - 1	Forward	Culvert - 1	87.75	88.50
Culvert-Circular	Culvert - 1	Forward	TW	85.50	88.50
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Culvert - 1
Structure Type: Culvert-Circular

Number of Barrels	1
Diameter	15.0 in
Length	36.00 ft
Length (Computed Barrel)	36.00 ft
Slope (Computed)	0.010 ft/ft

Outlet Control Data

Manning's n	0.013
Ke	0.200
Kb	0.023
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data

Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.090
T2 ratio (HW/D)	1.192
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	86.86 ft	T1 Flow	4.8021 ft³/s
T2 Elevation	86.99 ft	T2 Flow	5.4881 ft³/s

Structure ID: Weir - 1
Structure Type: Rectangular Weir

Number of Openings	1
Elevation	87.75 ft
Weir Length	0.50 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Orifice-1
Structure Type: Orifice-Circular

Number of Openings	1
Elevation	86.40 ft
Orifice Diameter	4.0 in
Orifice Coefficient	0.600

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 6.9485 ft³/s
Upstream ID = Orifice-1, Weir - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
85.00	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
85.50	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
86.00	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
86.40	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
86.50	0.0190	85.58	Free Outfall	Free Outfall	0.00	0.0002	(N/A)	0.00
87.00	0.2764	85.79	Free Outfall	Free Outfall	0.00	0.0001	(N/A)	0.00
87.50	0.4042	85.85	Free Outfall	Free Outfall	0.00	0.0008	(N/A)	0.00
87.75	0.4578	85.87	Free Outfall	Free Outfall	0.00	0.0009	(N/A)	0.00
88.00	0.6742	85.96	Free Outfall	Free Outfall	0.00	0.0000	(N/A)	0.00
88.50	1.2748	86.14	Free Outfall	Free Outfall	0.00	0.0000	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
CRIT.DEPTH CONTROL Vh= .018ft Dcr= .054ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .070ft Dcr= .204ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .086ft Dcr= .247ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .092ft Dcr= .263ft CRIT.DEPTH Hev= .00ft
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Weir - 1 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
85.00	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
85.50	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.00	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.40	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.50	0.0000	0.00	0.00	85.58	0.00	0.0000	(N/A)	0.00
87.00	0.0000	0.00	0.00	85.79	0.00	0.0000	(N/A)	0.00
87.50	0.0000	0.00	0.00	85.85	0.00	0.0000	(N/A)	0.00
87.75	0.0000	0.00	0.00	85.87	0.00	0.0000	(N/A)	0.00
88.00	0.1688	88.00	Free Outfall	85.96	0.00	0.0000	(N/A)	0.00
88.50	0.6820	88.50	Free Outfall	86.14	0.00	0.0000	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
H=.25; Htw=.00; Qfree=.17;
H=.75; Htw=.00; Qfree=.68;

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice-1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
85.00	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
85.50	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.00	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.40	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.50	0.0188	86.50	Free Outfall	85.58	0.00	0.0000	(N/A)	0.00
87.00	0.2765	87.00	Free Outfall	85.79	0.00	0.0000	(N/A)	0.00
87.50	0.4058	87.50	Free Outfall	85.85	0.00	0.0000	(N/A)	0.00
87.75	0.4569	87.75	Free Outfall	85.87	0.00	0.0000	(N/A)	0.00
88.00	0.5029	88.00	Free Outfall	85.96	0.00	0.0000	(N/A)	0.00
88.50	0.5840	88.50	Free Outfall	86.14	0.00	0.0000	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
CRIT.DEPTH CONTROL Vh= .027ft Dcr= .073ft CRIT.DEPTH Hev= .00ft
H =.43
H =.93
H =1.18
H =1.43
H =1.93

Subsection: Composite Rating Curve | Return Event: 10 years
Label: OCS-1 | Storm Event: 10 YR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
85.00	0.0000	(N/A)	0.00
85.50	0.0000	(N/A)	0.00
86.00	0.0000	(N/A)	0.00
86.40	0.0000	(N/A)	0.00
86.50	0.0190	(N/A)	0.00
87.00	0.2764	(N/A)	0.00
87.50	0.4050	(N/A)	0.00
87.75	0.4578	(N/A)	0.00
88.00	0.6716	(N/A)	0.00
88.50	1.2660	(N/A)	0.00

Contributing Structures
(no Q: Orifice-1,Weir - 1,Culvert - 1)
(no Q: Orifice-1,Weir - 1,Culvert - 1)
(no Q: Orifice-1,Weir - 1,Culvert - 1)
(no Q: Orifice-1,Weir - 1,Culvert - 1)
Orifice-1,Culvert - 1 (no Q: Weir - 1)
Orifice-1,Culvert - 1 (no Q: Weir - 1)
Orifice-1,Culvert - 1 (no Q: Weir - 1)
Orifice-1,Culvert - 1 (no Q: Weir - 1)
Orifice-1,Weir - 1,Culvert - 1
Orifice-1,Weir - 1,Culvert - 1

Requested Pond Water Surface Elevations	
Minimum (Headwater)	85.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	88.50 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice-1	Forward	Culvert - 1	86.40	88.50
Rectangular Weir	Weir - 1	Forward	Culvert - 1	87.75	88.50
Culvert-Circular	Culvert - 1	Forward	TW	85.50	88.50
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	15.0 in
Length	36.00 ft
Length (Computed Barrel)	36.00 ft
Slope (Computed)	0.010 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.023
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.090
T2 ratio (HW/D)	1.192
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	86.86 ft	T1 Flow	4.8021 ft³/s
T2 Elevation	86.99 ft	T2 Flow	5.4881 ft³/s

Structure ID: Weir - 1 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	87.75 ft
Weir Length	0.50 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Orifice-1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	86.40 ft
Orifice Diameter	4.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 6.9485 ft³/s
Upstream ID = Orifice-1, Weir - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
85.00	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
85.50	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
86.00	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
86.40	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
86.50	0.0190	85.58	Free Outfall	Free Outfall	0.00	0.0002	(N/A)	0.00
87.00	0.2764	85.79	Free Outfall	Free Outfall	0.00	0.0001	(N/A)	0.00
87.50	0.4042	85.85	Free Outfall	Free Outfall	0.00	0.0008	(N/A)	0.00
87.75	0.4578	85.87	Free Outfall	Free Outfall	0.00	0.0009	(N/A)	0.00
88.00	0.6742	85.96	Free Outfall	Free Outfall	0.00	0.0000	(N/A)	0.00
88.50	1.2748	86.14	Free Outfall	Free Outfall	0.00	0.0000	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
CRIT.DEPTH CONTROL Vh= .018ft Dcr= .054ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .070ft Dcr= .204ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .086ft Dcr= .247ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .092ft Dcr= .263ft CRIT.DEPTH Hev= .00ft
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE

Subsection: Individual Outlet Curves | Return Event: 100 years
Label: OCS-1 | Storm Event: 100 YR

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Weir - 1 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
85.00	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
85.50	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.00	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.40	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.50	0.0000	0.00	0.00	85.58	0.00	0.0000	(N/A)	0.00
87.00	0.0000	0.00	0.00	85.79	0.00	0.0000	(N/A)	0.00
87.50	0.0000	0.00	0.00	85.85	0.00	0.0000	(N/A)	0.00
87.75	0.0000	0.00	0.00	85.87	0.00	0.0000	(N/A)	0.00
88.00	0.1688	88.00	Free Outfall	85.96	0.00	0.0000	(N/A)	0.00
88.50	0.6820	88.50	Free Outfall	86.14	0.00	0.0000	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
H=.25; Htw=.00; Qfree=.17;
H=.75; Htw=.00; Qfree=.68;

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice-1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
85.00	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
85.50	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.00	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.40	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
86.50	0.0188	86.50	Free Outfall	85.58	0.00	0.0000	(N/A)	0.00
87.00	0.2765	87.00	Free Outfall	85.79	0.00	0.0000	(N/A)	0.00
87.50	0.4058	87.50	Free Outfall	85.85	0.00	0.0000	(N/A)	0.00
87.75	0.4569	87.75	Free Outfall	85.87	0.00	0.0000	(N/A)	0.00
88.00	0.5029	88.00	Free Outfall	85.96	0.00	0.0000	(N/A)	0.00
88.50	0.5840	88.50	Free Outfall	86.14	0.00	0.0000	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
CRIT.DEPTH CONTROL Vh= .027ft Dcr= .073ft CRIT.DEPTH Hev= .00ft
H =.43
H =.93
H =1.18
H =1.43
H =1.93

Subsection: Composite Rating Curve
Label: OCS-1

Return Event: 100 years
Storm Event: 100 YR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
85.00	0.0000	(N/A)	0.00
85.50	0.0000	(N/A)	0.00
86.00	0.0000	(N/A)	0.00
86.40	0.0000	(N/A)	0.00
86.50	0.0190	(N/A)	0.00
87.00	0.2764	(N/A)	0.00
87.50	0.4050	(N/A)	0.00
87.75	0.4578	(N/A)	0.00
88.00	0.6716	(N/A)	0.00
88.50	1.2660	(N/A)	0.00

Contributing Structures
(no Q: Orifice-1,Weir - 1,Culvert - 1)
(no Q: Orifice-1,Weir - 1,Culvert - 1)
(no Q: Orifice-1,Weir - 1,Culvert - 1)
(no Q: Orifice-1,Weir - 1,Culvert - 1)
Orifice-1,Culvert - 1 (no Q: Weir - 1)
Orifice-1,Culvert - 1 (no Q: Weir - 1)
Orifice-1,Culvert - 1 (no Q: Weir - 1)
Orifice-1,Culvert - 1 (no Q: Weir - 1)
Orifice-1,Weir - 1,Culvert - 1
Orifice-1,Weir - 1,Culvert - 1

Requested Pond Water Surface Elevations	
Minimum (Headwater)	84.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	85.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Stand Pipe	Riser - 1	Forward	Culvert - 1	84.42	85.00
Culvert-Circular	Culvert - 1	Forward	TW	84.00	85.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Riser - 1 Structure Type: Stand Pipe	
Number of Openings	1
Elevation	84.42 ft
Diameter	18.0 in
Orifice Area	1.8 ft²
Orifice Coefficient	0.600
Weir Length	4.71 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	15.0 in
Length	41.00 ft
Length (Computed Barrel)	41.90 ft
Slope (Computed)	0.211 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.023
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	0.990
T2 ratio (HW/D)	1.092
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	85.24 ft	T1 Flow	4.8021 ft³/s
T2 Elevation	85.36 ft	T2 Flow	5.4881 ft³/s

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Stand Pipe)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
84.00	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
84.42	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
84.50	0.3199	84.50	Free Outfall	84.31	0.00	0.0000	(N/A)	0.00
85.00	6.2446	85.00	85.00	85.00	0.00	0.0000	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
Weir: H =0.08ft
FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 31.9157 ft³/s
Upstream ID = Riser - 1 (Stand Pipe)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
84.00	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
84.42	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
84.50	0.3187	84.31	Free Outfall	Free Outfall	0.00	0.0006	(N/A)	0.00
85.00	2.8219	85.00	Free Outfall	Free Outfall	0.00	3.4227	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
CRIT.DEPTH CONTROL Vh= .076ft Dcr= .218ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .271ft Dcr= .675ft CRIT.DEPTH Hev= .00ft

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
84.00	0.0000	(N/A)	0.00
84.42	0.0000	(N/A)	0.00
84.50	0.3193	(N/A)	0.00
85.00	2.8219	(N/A)	0.00

Contributing Structures
(no Q: Riser - 1,Culvert - 1)
(no Q: Riser - 1,Culvert - 1)
Riser - 1,Culvert - 1
Riser - 1,Culvert - 1

Requested Pond Water Surface Elevations	
Minimum (Headwater)	84.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	85.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Stand Pipe	Riser - 1	Forward	Culvert - 1	84.42	85.00
Culvert-Circular	Culvert - 1	Forward	TW	84.00	85.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Riser - 1
Structure Type: Stand Pipe

Number of Openings	1
Elevation	84.42 ft
Diameter	18.0 in
Orifice Area	1.8 ft²
Orifice Coefficient	0.600
Weir Length	4.71 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Culvert - 1
Structure Type: Culvert-Circular

Number of Barrels	1
Diameter	15.0 in
Length	41.00 ft
Length (Computed Barrel)	41.90 ft
Slope (Computed)	0.211 ft/ft

Outlet Control Data

Manning's n	0.013
Ke	0.200
Kb	0.023
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data

Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	0.990
T2 ratio (HW/D)	1.092
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	85.24 ft	T1 Flow	4.8021 ft³/s
T2 Elevation	85.36 ft	T2 Flow	5.4881 ft³/s

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Stand Pipe)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
84.00	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
84.42	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
84.50	0.3199	84.50	Free Outfall	84.31	0.00	0.0000	(N/A)	0.00
85.00	6.2446	85.00	85.00	85.00	0.00	0.0000	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
Weir: H =0.08ft
FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 31.9157 ft³/s
Upstream ID = Riser - 1 (Stand Pipe)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
84.00	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
84.42	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
84.50	0.3187	84.31	Free Outfall	Free Outfall	0.00	0.0006	(N/A)	0.00
85.00	2.8219	85.00	Free Outfall	Free Outfall	0.00	3.4227	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
CRIT.DEPTH CONTROL Vh= .076ft Dcr= .218ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .271ft Dcr= .675ft CRIT.DEPTH Hev= .00ft

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
84.00	0.0000	(N/A)	0.00
84.42	0.0000	(N/A)	0.00
84.50	0.3193	(N/A)	0.00
85.00	2.8219	(N/A)	0.00

Contributing Structures
(no Q: Riser - 1,Culvert - 1)
(no Q: Riser - 1,Culvert - 1)
Riser - 1,Culvert - 1
Riser - 1,Culvert - 1

Requested Pond Water Surface Elevations	
Minimum (Headwater)	84.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	85.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Stand Pipe	Riser - 1	Forward	Culvert - 1	84.42	85.00
Culvert-Circular	Culvert - 1	Forward	TW	84.00	85.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Riser - 1 Structure Type: Stand Pipe		
Number of Openings	1	
Elevation	84.42	ft
Diameter	18.0	in
Orifice Area	1.8	ft²
Orifice Coefficient	0.600	
Weir Length	4.71	ft
Weir Coefficient	3.00	(ft^0.5)/s
K Reverse	1.000	
Manning's n	0.000	
Kev, Charged Riser	0.000	
Weir Submergence	False	
Orifice H to crest	False	

Structure ID: Culvert - 1 Structure Type: Culvert-Circular		
Number of Barrels	1	
Diameter	15.0	in
Length	41.00	ft
Length (Computed Barrel)	41.90	ft
Slope (Computed)	0.211	ft/ft

Outlet Control Data		
Manning's n	0.013	
Ke	0.200	
Kb	0.023	
Kr	0.000	
Convergence Tolerance	0.00	ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	0.990
T2 ratio (HW/D)	1.092
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	85.24 ft	T1 Flow	4.8021 ft³/s
T2 Elevation	85.36 ft	T2 Flow	5.4881 ft³/s

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Stand Pipe)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
84.00	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
84.42	0.0000	0.00	0.00	0.00	0.00	0.0000	(N/A)	0.00
84.50	0.3199	84.50	Free Outfall	84.31	0.00	0.0000	(N/A)	0.00
85.00	6.2446	85.00	85.00	85.00	0.00	0.0000	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
Weir: H =0.08ft
FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 31.9157 ft³/s
Upstream ID = Riser - 1 (Stand Pipe)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
84.00	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
84.42	0.0000	0.00	0.00	Free Outfall	0.00	0.0000	(N/A)	0.00
84.50	0.3187	84.31	Free Outfall	Free Outfall	0.00	0.0006	(N/A)	0.00
85.00	2.8219	85.00	Free Outfall	Free Outfall	0.00	3.4227	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
CRIT.DEPTH CONTROL Vh= .076ft Dcr= .218ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .271ft Dcr= .675ft CRIT.DEPTH Hev= .00ft

Subsection: Composite Rating Curve
Label: OCS-2

Return Event: 100 years
Storm Event: 100 YR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
84.00	0.0000	(N/A)	0.00
84.42	0.0000	(N/A)	0.00
84.50	0.3193	(N/A)	0.00
85.00	2.8219	(N/A)	0.00

Contributing Structures
(no Q: Riser - 1,Culvert - 1)
(no Q: Riser - 1,Culvert - 1)
Riser - 1,Culvert - 1
Riser - 1,Culvert - 1

Infiltration	
Infiltration Method (Computed)	Average Infiltration Rate
Infiltration Rate (Average)	0.2500 in/h

Initial Conditions	
Elevation (Water Surface, Initial)	84.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0000 ft³/s
Flow (Initial Infiltration)	0.0000 ft³/s
Flow (Initial, Total)	0.0000 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
84.00	0.0000	0.000	133.000	0.0000	0.0000	0.0000
84.42	0.0000	66.141	183.301	0.0011	0.0011	0.7360
84.50	0.3193	81.223	193.795	0.0011	0.3204	1.2229
85.00	2.8219	195.697	266.000	0.0015	2.8234	4.9979

Average Infiltration Rating Table

Elevation (Water Surface) (ft)	Area (Total) (ft^2)	Flow (Infiltration) (ft^3/s)
84.00	133.0	0.0000
84.42	183.3	0.0011
84.50	193.8	0.0011
85.00	266.0	0.0015

Infiltration	
Infiltration Method (Computed)	Average Infiltration Rate
Infiltration Rate (Average)	0.2500 in/h

Initial Conditions	
Elevation (Water Surface, Initial)	84.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0000 ft³/s
Flow (Initial Infiltration)	0.0000 ft³/s
Flow (Initial, Total)	0.0000 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.0298 ft³/s	Time to Peak (Flow, In)	12.100 hours
Infiltration (Peak)	0.0011 ft³/s	Time to Peak (Infiltration)	14.950 hours
Flow (Peak Outlet)	0.0016 ft³/s	Time to Peak (Flow, Outlet)	14.950 hours

Elevation (Water Surface, Peak)	84.42 ft
Volume (Peak)	66.214 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	111.000 ft³
Volume (Total Infiltration)	43.000 ft³
Volume (Total Outlet Outflow)	6.000 ft³
Volume (Retained)	61.000 ft³
Volume (Unrouted)	-1.000 ft³
Error (Mass Balance)	0.6 %

Infiltration	
Infiltration Method (Computed)	Average Infiltration Rate
Infiltration Rate (Average)	0.2500 in/h

Initial Conditions	
Elevation (Water Surface, Initial)	84.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0000 ft³/s
Flow (Initial Infiltration)	0.0000 ft³/s
Flow (Initial, Total)	0.0000 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.1067 ft³/s	Time to Peak (Flow, In)	12.100 hours
Infiltration (Peak)	0.0011 ft³/s	Time to Peak (Infiltration)	12.050 hours
Flow (Peak Outlet)	0.1115 ft³/s	Time to Peak (Flow, Outlet)	12.050 hours

Elevation (Water Surface, Peak)	84.45 ft
Volume (Peak)	71.311 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	371.000 ft³
Volume (Total Infiltration)	48.000 ft³
Volume (Total Outlet Outflow)	257.000 ft³
Volume (Retained)	66.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.0 %

Infiltration	
Infiltration Method (Computed)	Average Infiltration Rate
Infiltration Rate (Average)	0.2500 in/h

Initial Conditions	
Elevation (Water Surface, Initial)	84.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0000 ft³/s
Flow (Initial Infiltration)	0.0000 ft³/s
Flow (Initial, Total)	0.0000 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.2430 ft³/s	Time to Peak (Flow, In)	12.100 hours
Infiltration (Peak)	0.0011 ft³/s	Time to Peak (Infiltration)	12.100 hours
Flow (Peak Outlet)	0.2389 ft³/s	Time to Peak (Flow, Outlet)	12.100 hours

Elevation (Water Surface, Peak)	84.48 ft
Volume (Peak)	77.346 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	859.000 ft³
Volume (Total Infiltration)	53.000 ft³
Volume (Total Outlet Outflow)	739.000 ft³
Volume (Retained)	66.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.0 %

Peak Discharge	0.0011 ft³/s
Time to Peak	14.950 hours
Hydrograph Volume	20.400 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
14.750	0.0010	0.0011	0.0011	0.0011	0.0011
15.000	0.0011	0.0011	0.0011	0.0011	0.0011
15.250	0.0011	0.0011	0.0011	0.0011	0.0011
15.500	0.0011	0.0011	0.0011	0.0011	0.0011
15.750	0.0011	0.0011	0.0011	0.0011	0.0011
16.000	0.0011	0.0011	0.0011	0.0011	0.0011
16.250	0.0011	0.0011	0.0011	0.0011	0.0011
16.500	0.0011	0.0011	0.0011	0.0011	0.0011
16.750	0.0011	0.0011	0.0011	0.0011	0.0011
17.000	0.0011	0.0011	0.0011	0.0011	0.0011
17.250	0.0011	0.0011	0.0011	0.0011	0.0011
17.500	0.0011	0.0011	0.0011	0.0011	0.0011
17.750	0.0011	0.0011	0.0011	0.0011	0.0011
18.000	0.0011	0.0011	0.0011	0.0011	0.0011
18.250	0.0011	0.0011	0.0011	0.0011	0.0011
18.500	0.0011	0.0011	0.0011	0.0011	0.0011
18.750	0.0011	0.0011	0.0011	0.0011	0.0011
19.000	0.0011	0.0011	0.0011	0.0011	0.0011
19.250	0.0011	0.0011	0.0011	0.0011	0.0011
19.500	0.0011	0.0011	0.0011	0.0011	0.0011
19.750	0.0011	0.0011	0.0011	0.0011	0.0011
20.000	0.0011	0.0011	0.0010	(N/A)	(N/A)

Peak Discharge	0.0011 ft³/s
Time to Peak	12.050 hours
Hydrograph Volume	46.052 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.950	0.0009	0.0011	0.0011	0.0011	0.0011
12.200	0.0011	0.0011	0.0011	0.0011	0.0011
12.450	0.0011	0.0011	0.0011	0.0011	0.0011
12.700	0.0011	0.0011	0.0011	0.0011	0.0011
12.950	0.0011	0.0011	0.0011	0.0011	0.0011
13.200	0.0011	0.0011	0.0011	0.0011	0.0011
13.450	0.0011	0.0011	0.0011	0.0011	0.0011
13.700	0.0011	0.0011	0.0011	0.0011	0.0011
13.950	0.0011	0.0011	0.0011	0.0011	0.0011
14.200	0.0011	0.0011	0.0011	0.0011	0.0011
14.450	0.0011	0.0011	0.0011	0.0011	0.0011
14.700	0.0011	0.0011	0.0011	0.0011	0.0011
14.950	0.0011	0.0011	0.0011	0.0011	0.0011
15.200	0.0011	0.0011	0.0011	0.0011	0.0011
15.450	0.0011	0.0011	0.0011	0.0011	0.0011
15.700	0.0011	0.0011	0.0011	0.0011	0.0011
15.950	0.0011	0.0011	0.0011	0.0011	0.0011
16.200	0.0011	0.0011	0.0011	0.0011	0.0011
16.450	0.0011	0.0011	0.0011	0.0011	0.0011
16.700	0.0011	0.0011	0.0011	0.0011	0.0011
16.950	0.0011	0.0011	0.0011	0.0011	0.0011
17.200	0.0011	0.0011	0.0011	0.0011	0.0011
17.450	0.0011	0.0011	0.0011	0.0011	0.0011
17.700	0.0011	0.0011	0.0011	0.0011	0.0011
17.950	0.0011	0.0011	0.0011	0.0011	0.0011
18.200	0.0011	0.0011	0.0011	0.0011	0.0011
18.450	0.0011	0.0011	0.0011	0.0011	0.0011
18.700	0.0011	0.0011	0.0011	0.0011	0.0011
18.950	0.0011	0.0011	0.0011	0.0011	0.0011
19.200	0.0011	0.0011	0.0011	0.0011	0.0011
19.450	0.0011	0.0011	0.0011	0.0011	0.0011
19.700	0.0011	0.0011	0.0011	0.0011	0.0011
19.950	0.0011	0.0011	0.0011	0.0011	0.0011
20.200	0.0011	0.0011	0.0011	0.0011	0.0011
20.450	0.0011	0.0011	0.0011	0.0011	0.0011
20.700	0.0011	0.0011	0.0011	0.0011	0.0011
20.950	0.0011	0.0011	0.0011	0.0011	0.0011
21.200	0.0011	0.0011	0.0011	0.0011	0.0011
21.450	0.0011	0.0011	0.0011	0.0011	0.0011

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
21.700	0.0011	0.0011	0.0011	0.0011	0.0011
21.950	0.0011	0.0011	0.0011	0.0011	0.0011
22.200	0.0011	0.0011	0.0011	0.0011	0.0011
22.450	0.0011	0.0011	0.0011	0.0011	0.0011
22.700	0.0011	0.0011	0.0011	0.0011	0.0011
22.950	0.0011	0.0011	0.0011	0.0011	0.0011
23.200	0.0011	0.0011	0.0011	0.0011	0.0011
23.450	0.0011	0.0011	0.0011	0.0011	0.0011
23.700	0.0011	0.0011	0.0011	0.0011	0.0011
23.950	0.0011	0.0011	(N/A)	(N/A)	(N/A)

Peak Discharge	0.0011 ft³/s
Time to Peak	12.100 hours
Hydrograph Volume	49.210 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.150	0.0010	0.0011	0.0011	0.0011	0.0011
11.400	0.0011	0.0011	0.0011	0.0011	0.0011
11.650	0.0011	0.0011	0.0011	0.0011	0.0011
11.900	0.0011	0.0011	0.0011	0.0011	0.0011
12.150	0.0011	0.0011	0.0011	0.0011	0.0011
12.400	0.0011	0.0011	0.0011	0.0011	0.0011
12.650	0.0011	0.0011	0.0011	0.0011	0.0011
12.900	0.0011	0.0011	0.0011	0.0011	0.0011
13.150	0.0011	0.0011	0.0011	0.0011	0.0011
13.400	0.0011	0.0011	0.0011	0.0011	0.0011
13.650	0.0011	0.0011	0.0011	0.0011	0.0011
13.900	0.0011	0.0011	0.0011	0.0011	0.0011
14.150	0.0011	0.0011	0.0011	0.0011	0.0011
14.400	0.0011	0.0011	0.0011	0.0011	0.0011
14.650	0.0011	0.0011	0.0011	0.0011	0.0011
14.900	0.0011	0.0011	0.0011	0.0011	0.0011
15.150	0.0011	0.0011	0.0011	0.0011	0.0011
15.400	0.0011	0.0011	0.0011	0.0011	0.0011
15.650	0.0011	0.0011	0.0011	0.0011	0.0011
15.900	0.0011	0.0011	0.0011	0.0011	0.0011
16.150	0.0011	0.0011	0.0011	0.0011	0.0011
16.400	0.0011	0.0011	0.0011	0.0011	0.0011
16.650	0.0011	0.0011	0.0011	0.0011	0.0011
16.900	0.0011	0.0011	0.0011	0.0011	0.0011
17.150	0.0011	0.0011	0.0011	0.0011	0.0011
17.400	0.0011	0.0011	0.0011	0.0011	0.0011
17.650	0.0011	0.0011	0.0011	0.0011	0.0011
17.900	0.0011	0.0011	0.0011	0.0011	0.0011
18.150	0.0011	0.0011	0.0011	0.0011	0.0011
18.400	0.0011	0.0011	0.0011	0.0011	0.0011
18.650	0.0011	0.0011	0.0011	0.0011	0.0011
18.900	0.0011	0.0011	0.0011	0.0011	0.0011
19.150	0.0011	0.0011	0.0011	0.0011	0.0011
19.400	0.0011	0.0011	0.0011	0.0011	0.0011
19.650	0.0011	0.0011	0.0011	0.0011	0.0011
19.900	0.0011	0.0011	0.0011	0.0011	0.0011
20.150	0.0011	0.0011	0.0011	0.0011	0.0011
20.400	0.0011	0.0011	0.0011	0.0011	0.0011
20.650	0.0011	0.0011	0.0011	0.0011	0.0011

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
20.900	0.0011	0.0011	0.0011	0.0011	0.0011
21.150	0.0011	0.0011	0.0011	0.0011	0.0011
21.400	0.0011	0.0011	0.0011	0.0011	0.0011
21.650	0.0011	0.0011	0.0011	0.0011	0.0011
21.900	0.0011	0.0011	0.0011	0.0011	0.0011
22.150	0.0011	0.0011	0.0011	0.0011	0.0011
22.400	0.0011	0.0011	0.0011	0.0011	0.0011
22.650	0.0011	0.0011	0.0011	0.0011	0.0011
22.900	0.0011	0.0011	0.0011	0.0011	0.0011
23.150	0.0011	0.0011	0.0011	0.0011	0.0011
23.400	0.0011	0.0011	0.0011	0.0011	0.0011
23.650	0.0011	0.0011	0.0011	0.0011	0.0011
23.900	0.0011	0.0011	0.0011	(N/A)	(N/A)

Peak Discharge	0.0016 ft³/s
Time to Peak	14.950 hours
Hydrograph Volume	2.117 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
14.900	0.0005	0.0016	0.0012	0.0013	0.0012
15.150	0.0012	0.0012	0.0011	0.0011	0.0011
15.400	0.0010	(N/A)	(N/A)	(N/A)	(N/A)

Peak Discharge	0.1115 ft³/s
Time to Peak	12.050 hours
Hydrograph Volume	248.594 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.950	0.0000	0.0303	0.1115	0.0988	0.0974
12.200	0.0720	0.0579	0.0517	0.0455	0.0396
12.450	0.0335	0.0272	0.0222	0.0185	0.0163
12.700	0.0155	0.0148	0.0141	0.0135	0.0128
12.950	0.0121	0.0114	0.0109	0.0104	0.0101
13.200	0.0100	0.0098	0.0096	0.0095	0.0093
13.450	0.0091	0.0089	0.0088	0.0086	0.0084
13.700	0.0082	0.0081	0.0079	0.0077	0.0075
13.950	0.0073	0.0072	0.0070	0.0069	0.0068
14.200	0.0067	0.0066	0.0065	0.0064	0.0063
14.450	0.0063	0.0062	0.0061	0.0060	0.0059
14.700	0.0058	0.0057	0.0056	0.0056	0.0055
14.950	0.0054	0.0053	0.0052	0.0051	0.0050
15.200	0.0049	0.0048	0.0047	0.0047	0.0046
15.450	0.0045	0.0044	0.0043	0.0042	0.0041
15.700	0.0040	0.0039	0.0038	0.0037	0.0036
15.950	0.0035	0.0035	0.0034	0.0033	0.0033
16.200	0.0032	0.0032	0.0031	0.0031	0.0030
16.450	0.0030	0.0030	0.0029	0.0029	0.0028
16.700	0.0028	0.0028	0.0027	0.0027	0.0027
16.950	0.0026	0.0026	0.0025	0.0025	0.0024
17.200	0.0024	0.0024	0.0023	0.0023	0.0022
17.450	0.0022	0.0022	0.0021	0.0021	0.0020
17.700	0.0020	0.0020	0.0019	0.0019	0.0018
17.950	0.0018	0.0017	0.0017	0.0017	0.0017
18.200	0.0016	0.0016	0.0016	0.0016	0.0016
18.450	0.0016	0.0016	0.0016	0.0016	0.0015
18.700	0.0015	0.0015	0.0015	0.0015	0.0015
18.950	0.0015	0.0015	0.0014	0.0014	0.0014
19.200	0.0014	0.0014	0.0014	0.0014	0.0014
19.450	0.0013	0.0013	0.0013	0.0013	0.0013
19.700	0.0013	0.0013	0.0013	0.0012	0.0012
19.950	0.0012	0.0012	0.0012	0.0012	0.0012
20.200	0.0012	0.0012	0.0011	0.0011	0.0011
20.450	0.0011	0.0011	0.0011	0.0011	0.0011
20.700	0.0011	0.0011	0.0011	0.0010	(N/A)

Peak Discharge	0.2389 ft³/s
Time to Peak	12.100 hours
Hydrograph Volume	739.271 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.150	0.0000	0.0086	0.0182	0.0167	0.0187
11.400	0.0196	0.0210	0.0222	0.0256	0.0312
11.650	0.0392	0.0498	0.0611	0.0732	0.0860
11.900	0.0996	0.1353	0.1940	0.2286	0.2389
12.150	0.2168	0.1613	0.1272	0.1129	0.0986
12.400	0.0855	0.0721	0.0585	0.0479	0.0400
12.650	0.0352	0.0336	0.0320	0.0306	0.0292
12.900	0.0277	0.0263	0.0248	0.0237	0.0227
13.150	0.0221	0.0217	0.0213	0.0209	0.0206
13.400	0.0202	0.0198	0.0195	0.0191	0.0187
13.650	0.0183	0.0180	0.0176	0.0172	0.0168
13.900	0.0164	0.0161	0.0157	0.0153	0.0151
14.150	0.0148	0.0146	0.0145	0.0143	0.0141
14.400	0.0139	0.0137	0.0135	0.0134	0.0132
14.650	0.0130	0.0128	0.0126	0.0125	0.0123
14.900	0.0121	0.0119	0.0117	0.0115	0.0113
15.150	0.0112	0.0110	0.0108	0.0106	0.0104
15.400	0.0102	0.0100	0.0098	0.0097	0.0095
15.650	0.0093	0.0091	0.0089	0.0087	0.0085
15.900	0.0083	0.0081	0.0080	0.0078	0.0077
16.150	0.0076	0.0075	0.0074	0.0073	0.0072
16.400	0.0071	0.0070	0.0070	0.0069	0.0068
16.650	0.0067	0.0066	0.0066	0.0065	0.0064
16.900	0.0063	0.0062	0.0061	0.0061	0.0060
17.150	0.0059	0.0058	0.0057	0.0057	0.0056
17.400	0.0055	0.0054	0.0053	0.0052	0.0051
17.650	0.0051	0.0050	0.0049	0.0048	0.0047
17.900	0.0047	0.0046	0.0045	0.0044	0.0043
18.150	0.0043	0.0043	0.0043	0.0042	0.0042
18.400	0.0042	0.0042	0.0041	0.0041	0.0041
18.650	0.0041	0.0040	0.0040	0.0040	0.0040
18.900	0.0039	0.0039	0.0039	0.0039	0.0038
19.150	0.0038	0.0038	0.0038	0.0037	0.0037
19.400	0.0037	0.0037	0.0036	0.0036	0.0036
19.650	0.0036	0.0035	0.0035	0.0035	0.0035
19.900	0.0034	0.0034	0.0034	0.0034	0.0033
20.150	0.0033	0.0033	0.0033	0.0033	0.0033
20.400	0.0032	0.0032	0.0032	0.0032	0.0032
20.650	0.0031	0.0031	0.0031	0.0031	0.0031

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
20.900	0.0030	0.0030	0.0030	0.0030	0.0030
21.150	0.0030	0.0029	0.0029	0.0029	0.0029
21.400	0.0029	0.0028	0.0028	0.0028	0.0028
21.650	0.0028	0.0027	0.0027	0.0027	0.0027
21.900	0.0027	0.0027	0.0026	0.0026	0.0026
22.150	0.0026	0.0026	0.0025	0.0025	0.0025
22.400	0.0025	0.0025	0.0024	0.0024	0.0024
22.650	0.0024	0.0024	0.0024	0.0023	0.0023
22.900	0.0023	0.0023	0.0023	0.0022	0.0022
23.150	0.0022	0.0022	0.0022	0.0021	0.0021
23.400	0.0021	0.0021	0.0021	0.0020	0.0020
23.650	0.0020	0.0020	0.0020	0.0020	0.0019
23.900	0.0019	0.0019	0.0019	(N/A)	(N/A)

Summary for Hydrograph Addition at 'BIO-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	PDA-1C

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	PDA-1C	110.708	12.100	0.0298
Flow (In)	BIO-1	110.708	12.100	0.0298

Summary for Hydrograph Addition at 'BIO-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	PDA-1C

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	PDA-1C	370.836	12.100	0.1067
Flow (In)	BIO-1	370.836	12.100	0.1067

Summary for Hydrograph Addition at 'BIO-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	PDA-1C

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	PDA-1C	858.890	12.100	0.2430
Flow (In)	BIO-1	858.890	12.100	0.2430

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.1170 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	85.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0000 ft³/s
Flow (Initial Infiltration)	0.0000 ft³/s
Flow (Initial, Total)	0.0000 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
85.00	0.0000	0.000	0.000	0.0000	0.0000	0.0000
85.50	0.0000	101.000	0.000	0.1170	0.1170	1.2392
86.00	0.0000	320.000	0.000	0.1170	0.1170	3.6726
86.40	0.0000	486.800	0.000	0.1170	0.1170	5.5259
86.50	0.0190	528.000	0.000	0.1170	0.1360	6.0027
87.00	0.2764	723.000	0.000	0.1170	0.3934	8.4268
87.50	0.4050	895.000	0.000	0.1170	0.5220	10.4664
87.75	0.4578	967.000	0.000	0.1170	0.5748	11.3192
88.00	0.6716	1,022.000	0.000	0.1170	0.7886	12.1442
88.50	1.2660	1,124.000	0.000	0.1170	1.3830	13.8719

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.1170 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	85.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0000 ft³/s
Flow (Initial Infiltration)	0.0000 ft³/s
Flow (Initial, Total)	0.0000 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.2425 ft³/s	Time to Peak (Flow, In)	12.100 hours
Infiltration (Peak)	0.1170 ft³/s	Time to Peak (Infiltration)	12.100 hours
Flow (Peak Outlet)	0.0000 ft³/s	Time to Peak (Flow, Outlet)	0.000 hours

Elevation (Water Surface, Peak)	85.62 ft
Volume (Peak)	153.204 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	867.000 ft³
Volume (Total Infiltration)	864.000 ft³
Volume (Total Outlet Outflow)	0.000 ft³
Volume (Retained)	3.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.0 %

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.1170 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	85.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0000 ft³/s
Flow (Initial Infiltration)	0.0000 ft³/s
Flow (Initial, Total)	0.0000 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.6598 ft³/s	Time to Peak (Flow, In)	12.100 hours
Infiltration (Peak)	0.1170 ft³/s	Time to Peak (Infiltration)	11.850 hours
Flow (Peak Outlet)	0.1506 ft³/s	Time to Peak (Flow, Outlet)	12.350 hours

Elevation (Water Surface, Peak)	86.76 ft
Volume (Peak)	630.151 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	2,363.000 ft³
Volume (Total Infiltration)	2,122.000 ft³
Volume (Total Outlet Outflow)	235.000 ft³
Volume (Retained)	6.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.0 %

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.1170 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	85.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0000 ft³/s
Flow (Initial Infiltration)	0.0000 ft³/s
Flow (Initial, Total)	0.0000 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	1.3329 ft³/s	Time to Peak (Flow, In)	12.100 hours
Infiltration (Peak)	0.1170 ft³/s	Time to Peak (Infiltration)	11.500 hours
Flow (Peak Outlet)	0.8729 ft³/s	Time to Peak (Flow, Outlet)	12.200 hours

Elevation (Water Surface, Peak)	88.17 ft
Volume (Peak)	1,056.545 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	4,930.000 ft³
Volume (Total Infiltration)	3,367.000 ft³
Volume (Total Outlet Outflow)	1,553.000 ft³
Volume (Retained)	11.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.0 %

Peak Discharge	0.1170 ft³/s
Time to Peak	12.350 hours
Hydrograph Volume	862.587 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.150	0.0010	0.0012	0.0014	0.0015	0.0017
10.400	0.0019	0.0021	0.0024	0.0026	0.0028
10.650	0.0031	0.0034	0.0036	0.0039	0.0042
10.900	0.0045	0.0048	0.0052	0.0055	0.0059
11.150	0.0063	0.0068	0.0074	0.0080	0.0087
11.400	0.0095	0.0103	0.0112	0.0123	0.0138
11.650	0.0161	0.0194	0.0239	0.0295	0.0364
11.900	0.0445	0.0560	0.0746	0.0989	0.1170
12.150	0.1170	0.1170	0.1170	0.1170	0.1170
12.400	0.1170	0.1170	0.1170	0.1170	0.1170
12.650	0.1170	0.1055	0.0930	0.0825	0.0737
12.900	0.0662	0.0599	0.0544	0.0497	0.0457
13.150	0.0423	0.0394	0.0369	0.0349	0.0332
13.400	0.0317	0.0304	0.0293	0.0283	0.0274
13.650	0.0266	0.0259	0.0252	0.0246	0.0240
13.900	0.0235	0.0230	0.0224	0.0219	0.0215
14.150	0.0210	0.0207	0.0203	0.0200	0.0197
14.400	0.0194	0.0191	0.0188	0.0186	0.0183
14.650	0.0181	0.0179	0.0177	0.0174	0.0172
14.900	0.0170	0.0168	0.0166	0.0163	0.0161
15.150	0.0159	0.0157	0.0155	0.0153	0.0150
15.400	0.0148	0.0146	0.0144	0.0142	0.0139
15.650	0.0137	0.0135	0.0133	0.0130	0.0128
15.900	0.0126	0.0124	0.0121	0.0119	0.0117
16.150	0.0115	0.0113	0.0112	0.0110	0.0109
16.400	0.0107	0.0106	0.0105	0.0103	0.0102
16.650	0.0101	0.0100	0.0099	0.0098	0.0097
16.900	0.0096	0.0095	0.0094	0.0093	0.0092
17.150	0.0091	0.0090	0.0089	0.0088	0.0087
17.400	0.0086	0.0085	0.0084	0.0083	0.0082
17.650	0.0081	0.0080	0.0079	0.0078	0.0077
17.900	0.0076	0.0075	0.0074	0.0073	0.0072
18.150	0.0071	0.0070	0.0069	0.0069	0.0068
18.400	0.0068	0.0067	0.0067	0.0066	0.0066
18.650	0.0066	0.0065	0.0065	0.0065	0.0064
18.900	0.0064	0.0064	0.0063	0.0063	0.0063
19.150	0.0062	0.0062	0.0062	0.0062	0.0061
19.400	0.0061	0.0061	0.0060	0.0060	0.0060
19.650	0.0059	0.0059	0.0059	0.0058	0.0058

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
19.900	0.0058	0.0058	0.0057	0.0057	0.0057
20.150	0.0056	0.0056	0.0056	0.0056	0.0055
20.400	0.0055	0.0055	0.0055	0.0054	0.0054
20.650	0.0054	0.0054	0.0053	0.0053	0.0053
20.900	0.0053	0.0053	0.0052	0.0052	0.0052
21.150	0.0052	0.0051	0.0051	0.0051	0.0051
21.400	0.0050	0.0050	0.0050	0.0050	0.0050
21.650	0.0049	0.0049	0.0049	0.0049	0.0048
21.900	0.0048	0.0048	0.0048	0.0047	0.0047
22.150	0.0047	0.0047	0.0047	0.0046	0.0046
22.400	0.0046	0.0046	0.0045	0.0045	0.0045
22.650	0.0045	0.0045	0.0044	0.0044	0.0044
22.900	0.0044	0.0043	0.0043	0.0043	0.0043
23.150	0.0042	0.0042	0.0042	0.0042	0.0041
23.400	0.0041	0.0041	0.0041	0.0041	0.0040
23.650	0.0040	0.0040	0.0040	0.0039	0.0039
23.900	0.0039	0.0039	0.0038	(N/A)	(N/A)

Peak Discharge	0.1170 ft³/s
Time to Peak	13.350 hours
Hydrograph Volume	2,120.166 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
7.650	0.0010	0.0011	0.0012	0.0013	0.0015
7.900	0.0016	0.0017	0.0019	0.0020	0.0022
8.150	0.0024	0.0025	0.0027	0.0029	0.0031
8.400	0.0033	0.0035	0.0037	0.0040	0.0042
8.650	0.0045	0.0047	0.0050	0.0053	0.0056
8.900	0.0058	0.0062	0.0065	0.0068	0.0071
9.150	0.0074	0.0078	0.0081	0.0085	0.0089
9.400	0.0092	0.0096	0.0100	0.0104	0.0108
9.650	0.0112	0.0117	0.0121	0.0125	0.0130
9.900	0.0135	0.0139	0.0144	0.0149	0.0154
10.150	0.0159	0.0165	0.0171	0.0178	0.0184
10.400	0.0192	0.0199	0.0207	0.0215	0.0223
10.650	0.0231	0.0240	0.0249	0.0258	0.0267
10.900	0.0276	0.0286	0.0296	0.0306	0.0318
11.150	0.0332	0.0348	0.0366	0.0387	0.0410
11.400	0.0435	0.0462	0.0490	0.0525	0.0578
11.650	0.0655	0.0766	0.0912	0.1090	0.1170
11.900	0.1170	0.1170	0.1170	0.1170	0.1170
12.150	0.1170	0.1170	0.1170	0.1170	0.1170
12.400	0.1170	0.1170	0.1170	0.1170	0.1170
12.650	0.1170	0.1170	0.1170	0.1170	0.1170
12.900	0.1170	0.1170	0.1170	0.1170	0.1170
13.150	0.1170	0.1170	0.1170	0.1170	0.1170
13.400	0.1170	0.1170	0.1170	0.1170	0.1170
13.650	0.1170	0.1170	0.1170	0.1170	0.1170
13.900	0.1170	0.1170	0.1170	0.1170	0.1170
14.150	0.1170	0.1170	0.1170	0.1170	0.1170
14.400	0.1170	0.1170	0.1170	0.1170	0.1170
14.650	0.1170	0.1065	0.0936	0.0831	0.0745
14.900	0.0674	0.0616	0.0567	0.0527	0.0493
15.150	0.0465	0.0441	0.0421	0.0403	0.0388
15.400	0.0375	0.0363	0.0352	0.0343	0.0334
15.650	0.0326	0.0319	0.0311	0.0305	0.0298
15.900	0.0292	0.0286	0.0280	0.0274	0.0269
16.150	0.0264	0.0259	0.0255	0.0251	0.0248
16.400	0.0244	0.0241	0.0238	0.0235	0.0233
16.650	0.0230	0.0227	0.0225	0.0222	0.0220
16.900	0.0218	0.0215	0.0213	0.0210	0.0208
17.150	0.0206	0.0203	0.0201	0.0199	0.0196

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
17.400	0.0194	0.0192	0.0189	0.0187	0.0185
17.650	0.0182	0.0180	0.0178	0.0175	0.0173
17.900	0.0171	0.0169	0.0166	0.0164	0.0162
18.150	0.0160	0.0158	0.0156	0.0155	0.0153
18.400	0.0152	0.0151	0.0150	0.0149	0.0148
18.650	0.0148	0.0147	0.0146	0.0145	0.0144
18.900	0.0144	0.0143	0.0142	0.0141	0.0141
19.150	0.0140	0.0139	0.0139	0.0138	0.0137
19.400	0.0136	0.0136	0.0135	0.0134	0.0134
19.650	0.0133	0.0132	0.0132	0.0131	0.0130
19.900	0.0129	0.0129	0.0128	0.0127	0.0127
20.150	0.0126	0.0125	0.0125	0.0124	0.0124
20.400	0.0123	0.0123	0.0122	0.0121	0.0121
20.650	0.0120	0.0120	0.0119	0.0119	0.0118
20.900	0.0118	0.0117	0.0117	0.0116	0.0116
21.150	0.0115	0.0115	0.0114	0.0113	0.0113
21.400	0.0112	0.0112	0.0111	0.0111	0.0110
21.650	0.0110	0.0109	0.0109	0.0108	0.0108
21.900	0.0107	0.0107	0.0106	0.0106	0.0105
22.150	0.0105	0.0104	0.0103	0.0103	0.0102
22.400	0.0102	0.0101	0.0101	0.0100	0.0100
22.650	0.0099	0.0099	0.0098	0.0098	0.0097
22.900	0.0097	0.0096	0.0096	0.0095	0.0094
23.150	0.0094	0.0093	0.0093	0.0092	0.0092
23.400	0.0091	0.0091	0.0090	0.0090	0.0089
23.650	0.0089	0.0088	0.0088	0.0087	0.0087
23.900	0.0086	0.0085	0.0085	(N/A)	(N/A)

Peak Discharge	0.1170 ft³/s
Time to Peak	14.450 hours
Hydrograph Volume	3,363.449 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
5.300	0.0009	0.0011	0.0012	0.0014	0.0015
5.550	0.0016	0.0018	0.0019	0.0021	0.0022
5.800	0.0024	0.0025	0.0027	0.0029	0.0030
6.050	0.0032	0.0033	0.0035	0.0037	0.0039
6.300	0.0041	0.0043	0.0045	0.0047	0.0049
6.550	0.0051	0.0054	0.0056	0.0059	0.0061
6.800	0.0064	0.0066	0.0069	0.0072	0.0075
7.050	0.0077	0.0080	0.0083	0.0086	0.0089
7.300	0.0092	0.0096	0.0099	0.0102	0.0105
7.550	0.0109	0.0112	0.0116	0.0119	0.0123
7.800	0.0127	0.0130	0.0134	0.0138	0.0142
8.050	0.0145	0.0149	0.0154	0.0159	0.0164
8.300	0.0169	0.0175	0.0180	0.0186	0.0193
8.550	0.0199	0.0206	0.0213	0.0220	0.0227
8.800	0.0234	0.0242	0.0250	0.0257	0.0265
9.050	0.0273	0.0281	0.0290	0.0298	0.0307
9.300	0.0315	0.0324	0.0333	0.0342	0.0351
9.550	0.0361	0.0370	0.0380	0.0389	0.0399
9.800	0.0409	0.0419	0.0429	0.0439	0.0449
10.050	0.0459	0.0470	0.0482	0.0495	0.0509
10.300	0.0523	0.0538	0.0554	0.0571	0.0588
10.550	0.0605	0.0623	0.0642	0.0660	0.0679
10.800	0.0699	0.0718	0.0738	0.0758	0.0779
11.050	0.0800	0.0825	0.0854	0.0889	0.0930
11.300	0.0976	0.1027	0.1081	0.1139	0.1170
11.550	0.1170	0.1170	0.1170	0.1170	0.1170
11.800	0.1170	0.1170	0.1170	0.1170	0.1170
12.050	0.1170	0.1170	0.1170	0.1170	0.1170
12.300	0.1170	0.1170	0.1170	0.1170	0.1170
12.550	0.1170	0.1170	0.1170	0.1170	0.1170
12.800	0.1170	0.1170	0.1170	0.1170	0.1170
13.050	0.1170	0.1170	0.1170	0.1170	0.1170
13.300	0.1170	0.1170	0.1170	0.1170	0.1170
13.550	0.1170	0.1170	0.1170	0.1170	0.1170
13.800	0.1170	0.1170	0.1170	0.1170	0.1170
14.050	0.1170	0.1170	0.1170	0.1170	0.1170
14.300	0.1170	0.1170	0.1170	0.1170	0.1170
14.550	0.1170	0.1170	0.1170	0.1170	0.1170
14.800	0.1170	0.1170	0.1170	0.1170	0.1170

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
15.050	0.1170	0.1170	0.1170	0.1170	0.1170
15.300	0.1170	0.1170	0.1170	0.1170	0.1170
15.550	0.1170	0.1170	0.1170	0.1170	0.1170
15.800	0.1170	0.1170	0.1170	0.1170	0.1170
16.050	0.1131	0.1003	0.0899	0.0813	0.0742
16.300	0.0684	0.0637	0.0597	0.0564	0.0536
16.550	0.0513	0.0494	0.0477	0.0463	0.0450
16.800	0.0439	0.0430	0.0421	0.0413	0.0406
17.050	0.0399	0.0393	0.0387	0.0382	0.0376
17.300	0.0371	0.0366	0.0361	0.0357	0.0352
17.550	0.0347	0.0343	0.0338	0.0334	0.0329
17.800	0.0325	0.0320	0.0316	0.0312	0.0307
18.050	0.0303	0.0299	0.0295	0.0292	0.0289
18.300	0.0286	0.0283	0.0281	0.0279	0.0277
18.550	0.0276	0.0274	0.0272	0.0271	0.0269
18.800	0.0268	0.0266	0.0265	0.0264	0.0262
19.050	0.0261	0.0260	0.0258	0.0257	0.0256
19.300	0.0254	0.0253	0.0252	0.0250	0.0249
19.550	0.0248	0.0246	0.0245	0.0244	0.0242
19.800	0.0241	0.0240	0.0239	0.0237	0.0236
20.050	0.0235	0.0233	0.0232	0.0231	0.0230
20.300	0.0229	0.0228	0.0227	0.0226	0.0224
20.550	0.0223	0.0222	0.0221	0.0220	0.0219
20.800	0.0218	0.0217	0.0216	0.0215	0.0214
21.050	0.0214	0.0213	0.0212	0.0211	0.0210
21.300	0.0209	0.0208	0.0207	0.0206	0.0205
21.550	0.0204	0.0203	0.0202	0.0201	0.0200
21.800	0.0199	0.0198	0.0197	0.0196	0.0195
22.050	0.0194	0.0193	0.0192	0.0191	0.0190
22.300	0.0189	0.0188	0.0187	0.0186	0.0185
22.550	0.0184	0.0183	0.0182	0.0181	0.0180
22.800	0.0179	0.0178	0.0177	0.0176	0.0175
23.050	0.0174	0.0173	0.0172	0.0171	0.0170
23.300	0.0169	0.0168	0.0167	0.0167	0.0166
23.550	0.0165	0.0164	0.0163	0.0162	0.0161
23.800	0.0160	0.0159	0.0158	0.0157	0.0156

Peak Discharge	0.0000 ft^3/s
Time to Peak	8.000 hours
Hydrograph Volume	0.000 ft^3

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
0.000	0.0000	0.0000	(N/A)	(N/A)	(N/A)

Peak Discharge	0.1506 ft³/s
Time to Peak	12.350 hours
Hydrograph Volume	234.537 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
12.100	0.0000	0.0096	0.0766	0.1209	0.1427
12.350	0.1506	0.1488	0.1394	0.1240	0.1049
12.600	0.0845	0.0646	0.0472	0.0324	0.0198
12.850	0.0152	0.0113	0.0073	0.0033	0.0000

Peak Discharge	0.8729 ft³/s
Time to Peak	12.200 hours
Hydrograph Volume	1,552.506 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.900	0.0000	0.0164	0.1904	0.3390	0.4453
12.150	0.7966	0.8729	0.7368	0.6229	0.5386
12.400	0.4585	0.4396	0.4145	0.3842	0.3514
12.650	0.3184	0.2875	0.2474	0.2065	0.1726
12.900	0.1442	0.1203	0.0998	0.0821	0.0671
13.150	0.0543	0.0436	0.0348	0.0274	0.0211
13.400	0.0178	0.0159	0.0140	0.0120	0.0101
13.650	0.0082	0.0062	0.0043	0.0023	0.0004

Summary for Hydrograph Addition at 'IB-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	PDA-1B

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	PDA-1B	866.685	12.100	0.2425
Flow (In)	IB-1	866.685	12.100	0.2425

Summary for Hydrograph Addition at 'IB-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	PDA-1B

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	PDA-1B	2,362.847	12.100	0.6598
Flow (In)	IB-1	2,362.847	12.100	0.6598

Summary for Hydrograph Addition at 'IB-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	PDA-1B

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	PDA-1B	4,930.137	12.100	1.3329
Flow (In)	IB-1	4,930.137	12.100	1.3329

Peak Discharge	0.0016 ft³/s
Time to Peak	14.950 hours
Hydrograph Volume	2.117 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
14.900	0.0005	0.0016	0.0012	0.0013	0.0012
15.150	0.0012	0.0012	0.0011	0.0011	0.0011
15.400	0.0010	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Diverted Hydrograph — Return Event: 10 years
Label: Outlet-10 — Storm Event: 10 YR

Peak Discharge	0.1115 ft³/s
Time to Peak	12.050 hours
Hydrograph Volume	248.594 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.950	0.0000	0.0303	0.1115	0.0988	0.0974
12.200	0.0720	0.0579	0.0517	0.0455	0.0396
12.450	0.0335	0.0272	0.0222	0.0185	0.0163
12.700	0.0155	0.0148	0.0141	0.0135	0.0128
12.950	0.0121	0.0114	0.0109	0.0104	0.0101
13.200	0.0100	0.0098	0.0096	0.0095	0.0093
13.450	0.0091	0.0089	0.0088	0.0086	0.0084
13.700	0.0082	0.0081	0.0079	0.0077	0.0075
13.950	0.0073	0.0072	0.0070	0.0069	0.0068
14.200	0.0067	0.0066	0.0065	0.0064	0.0063
14.450	0.0063	0.0062	0.0061	0.0060	0.0059
14.700	0.0058	0.0057	0.0056	0.0056	0.0055
14.950	0.0054	0.0053	0.0052	0.0051	0.0050
15.200	0.0049	0.0048	0.0047	0.0047	0.0046
15.450	0.0045	0.0044	0.0043	0.0042	0.0041
15.700	0.0040	0.0039	0.0038	0.0037	0.0036
15.950	0.0035	0.0035	0.0034	0.0033	0.0033
16.200	0.0032	0.0032	0.0031	0.0031	0.0030
16.450	0.0030	0.0030	0.0029	0.0029	0.0028
16.700	0.0028	0.0028	0.0027	0.0027	0.0027
16.950	0.0026	0.0026	0.0025	0.0025	0.0024
17.200	0.0024	0.0024	0.0023	0.0023	0.0022
17.450	0.0022	0.0022	0.0021	0.0021	0.0020
17.700	0.0020	0.0020	0.0019	0.0019	0.0018
17.950	0.0018	0.0017	0.0017	0.0017	0.0017
18.200	0.0016	0.0016	0.0016	0.0016	0.0016
18.450	0.0016	0.0016	0.0016	0.0016	0.0015
18.700	0.0015	0.0015	0.0015	0.0015	0.0015
18.950	0.0015	0.0015	0.0014	0.0014	0.0014
19.200	0.0014	0.0014	0.0014	0.0014	0.0014
19.450	0.0013	0.0013	0.0013	0.0013	0.0013
19.700	0.0013	0.0013	0.0013	0.0012	0.0012
19.950	0.0012	0.0012	0.0012	0.0012	0.0012
20.200	0.0012	0.0012	0.0011	0.0011	0.0011
20.450	0.0011	0.0011	0.0011	0.0011	0.0011
20.700	0.0011	0.0011	0.0011	0.0010	(N/A)

Peak Discharge	0.2389 ft³/s
Time to Peak	12.100 hours
Hydrograph Volume	739.271 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.150	0.0000	0.0086	0.0182	0.0167	0.0187
11.400	0.0196	0.0210	0.0222	0.0256	0.0312
11.650	0.0392	0.0498	0.0611	0.0732	0.0860
11.900	0.0996	0.1353	0.1940	0.2286	0.2389
12.150	0.2168	0.1613	0.1272	0.1129	0.0986
12.400	0.0855	0.0721	0.0585	0.0479	0.0400
12.650	0.0352	0.0336	0.0320	0.0306	0.0292
12.900	0.0277	0.0263	0.0248	0.0237	0.0227
13.150	0.0221	0.0217	0.0213	0.0209	0.0206
13.400	0.0202	0.0198	0.0195	0.0191	0.0187
13.650	0.0183	0.0180	0.0176	0.0172	0.0168
13.900	0.0164	0.0161	0.0157	0.0153	0.0151
14.150	0.0148	0.0146	0.0145	0.0143	0.0141
14.400	0.0139	0.0137	0.0135	0.0134	0.0132
14.650	0.0130	0.0128	0.0126	0.0125	0.0123
14.900	0.0121	0.0119	0.0117	0.0115	0.0113
15.150	0.0112	0.0110	0.0108	0.0106	0.0104
15.400	0.0102	0.0100	0.0098	0.0097	0.0095
15.650	0.0093	0.0091	0.0089	0.0087	0.0085
15.900	0.0083	0.0081	0.0080	0.0078	0.0077
16.150	0.0076	0.0075	0.0074	0.0073	0.0072
16.400	0.0071	0.0070	0.0070	0.0069	0.0068
16.650	0.0067	0.0066	0.0066	0.0065	0.0064
16.900	0.0063	0.0062	0.0061	0.0061	0.0060
17.150	0.0059	0.0058	0.0057	0.0057	0.0056
17.400	0.0055	0.0054	0.0053	0.0052	0.0051
17.650	0.0051	0.0050	0.0049	0.0048	0.0047
17.900	0.0047	0.0046	0.0045	0.0044	0.0043
18.150	0.0043	0.0043	0.0043	0.0042	0.0042
18.400	0.0042	0.0042	0.0041	0.0041	0.0041
18.650	0.0041	0.0040	0.0040	0.0040	0.0040
18.900	0.0039	0.0039	0.0039	0.0039	0.0038
19.150	0.0038	0.0038	0.0038	0.0037	0.0037
19.400	0.0037	0.0037	0.0036	0.0036	0.0036
19.650	0.0036	0.0035	0.0035	0.0035	0.0035
19.900	0.0034	0.0034	0.0034	0.0034	0.0033
20.150	0.0033	0.0033	0.0033	0.0033	0.0033
20.400	0.0032	0.0032	0.0032	0.0032	0.0032
20.650	0.0031	0.0031	0.0031	0.0031	0.0031

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
20.900	0.0030	0.0030	0.0030	0.0030	0.0030
21.150	0.0030	0.0029	0.0029	0.0029	0.0029
21.400	0.0029	0.0028	0.0028	0.0028	0.0028
21.650	0.0028	0.0027	0.0027	0.0027	0.0027
21.900	0.0027	0.0027	0.0026	0.0026	0.0026
22.150	0.0026	0.0026	0.0025	0.0025	0.0025
22.400	0.0025	0.0025	0.0024	0.0024	0.0024
22.650	0.0024	0.0024	0.0024	0.0023	0.0023
22.900	0.0023	0.0023	0.0023	0.0022	0.0022
23.150	0.0022	0.0022	0.0022	0.0021	0.0021
23.400	0.0021	0.0021	0.0021	0.0020	0.0020
23.650	0.0020	0.0020	0.0020	0.0020	0.0019
23.900	0.0019	0.0019	0.0019	(N/A)	(N/A)

Peak Discharge	0.0000 ft³/s
Time to Peak	8.000 hours
Hydrograph Volume	0.000 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	0.0000	0.0000	(N/A)	(N/A)	(N/A)

Peak Discharge	0.1506 ft³/s
Time to Peak	12.350 hours
Hydrograph Volume	234.537 ft³

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
12.100	0.0000	0.0096	0.0766	0.1209	0.1427
12.350	0.1506	0.1488	0.1394	0.1240	0.1049
12.600	0.0845	0.0646	0.0472	0.0324	0.0198
12.850	0.0152	0.0113	0.0073	0.0033	0.0000

Peak Discharge	0.8729 ft³/s
Time to Peak	12.200 hours
Hydrograph Volume	1,552.506 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.900	0.0000	0.0164	0.1904	0.3390	0.4453
12.150	0.7966	0.8729	0.7368	0.6229	0.5386
12.400	0.4585	0.4396	0.4145	0.3842	0.3514
12.650	0.3184	0.2875	0.2474	0.2065	0.1726
12.900	0.1442	0.1203	0.0998	0.0821	0.0671
13.150	0.0543	0.0436	0.0348	0.0274	0.0211
13.400	0.0178	0.0159	0.0140	0.0120	0.0101
13.650	0.0082	0.0062	0.0043	0.0023	0.0004

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APPENDIX C

SOIL TESTING DATA

S:\PERC TEST MATERIALS\PERC TEST STORM.xlsx

DESIGN DATA SHEET - STORMWATER INFILTRATION SYSTEM JOB NO. ____________

Owner CCI Properties Address 32-34 Washington Ave, Hastings NY 10706

Located at (Street) Warburton ave Sec. 4.75 Block 53 Lot 11
(Indicate nearest cross st.)

Municipality ____________ Watershed ____________

SOIL INFILTRATION TEST DATA

Presoak Date: 9/3/15 Run Date: #1 & #3 9-5-15 & #2 9-9-15

Hole #	CLOCK TIME					INFILTRATION		
Hole Number	Run No.	Start	Stop	Elapse Time Min.	Depth From Grd	To surface water	Water Level Drop In Inches	Soil Rate In/Hr Drop
1	1	12:30p	1:30p	60 min	10'-0"	N/A	7½"	7½"
	2							
	3							
	4							
2	1	12:30p	12:46	16 min	5'-0"	N/A	30"	112.50"
	2							
	3							
	4							
3	1	1:00p	1:23p	23 min	5'-0"	N/A	30"	78.26"
	2							
	3							
	4							
4	1							
	2							
	3							
	4							

Notes: Perc test done by: Justin

1) Tests to be repeated at same depth until approximately equal soil rates are obtained at each infiltration test hole. All data to be submitted for review.
2) Depth measurements to be made from top of hole. DO NOT REPORT INCREMENTS OF LESS THAN ONE INCH.

DESCRIPTION OF SOILS ENCOUNTERED IN TEST HOLES

DEPTH	HOLE NO. 1	HOLE NO. 2	HOLE NO. 3	HOLE NO. 4
G.L.	Grass	Grass	Grass	
6"	Topsoil ↓	Top soil ↓	Topsoil ↓	
12"				
18"	Sand ↓	Sand ↓	Sand ↓	
24"				
30"				
36"				
42"				
48"				
54"		Sand	Sand	
60"				
66"				
72"				
78"				
84"				
120"	Sand			

WAS GROUNDWATER ENCOUNTERED? No

INDICATE LEVEL AT WHICH GROUND WATER IS ENCOUNTERED N/A

INDICATE LEVEL AT WHICH WATER RISES AFTER BEING ENCOUNTERED N/A

DEEP TESTS MADE BY Justin DATE OF DEEP TESTS 9/3/15

DESIGN

Soil Rate Used: ________ Min/1" Drop:

Name ____________________ Signature ____________________

Address ____________________ SEAL

____

APPENDIX D

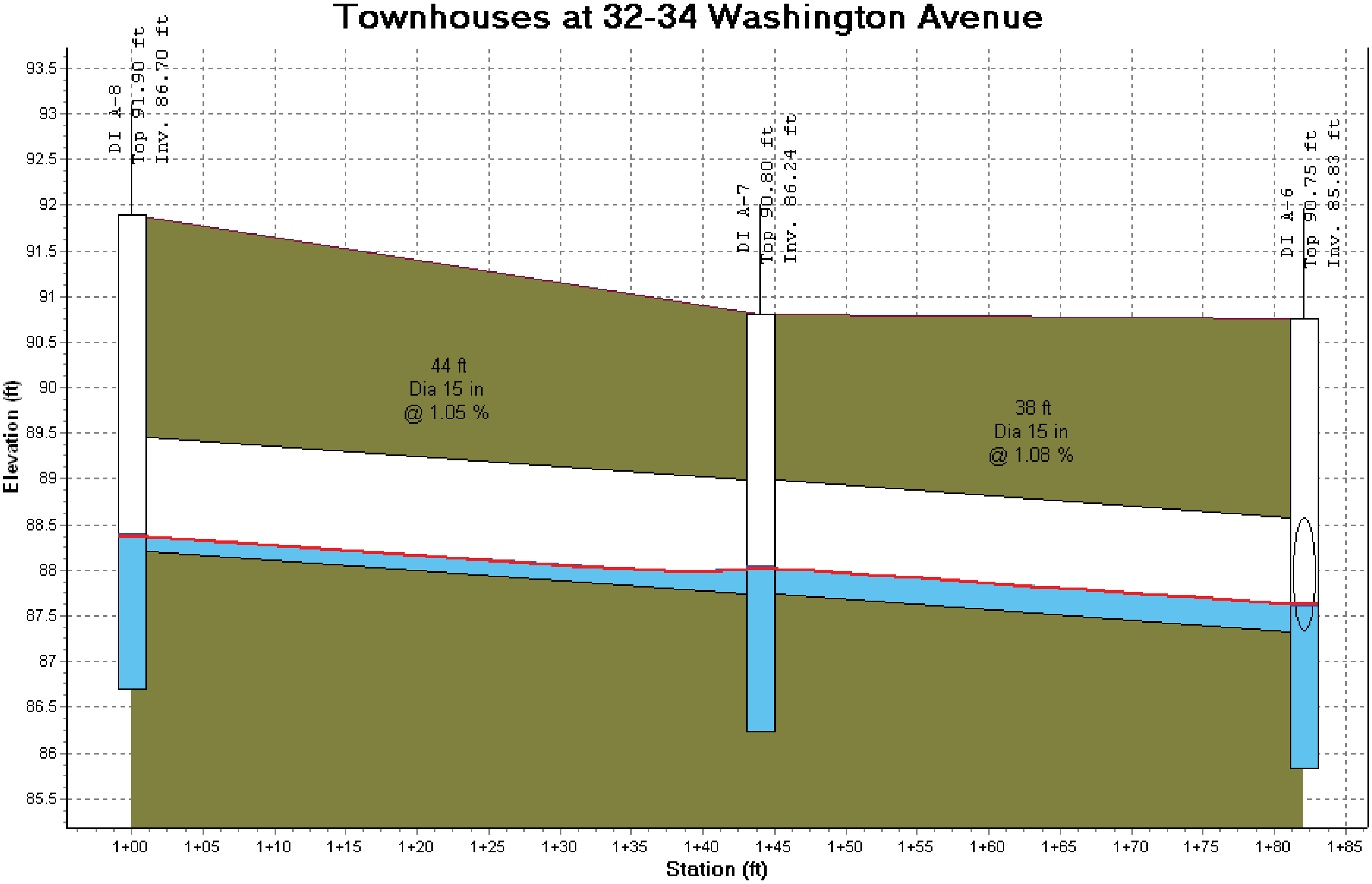
PIPE CALCULATIONS

STORM PIPE CAPACITY CALCULATIONS

25 YEAR STORM

From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Pipe Diameter (inches)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Peak Flow (cfs)	Max Flow Velocity (ft/sec)	Design Flow Capacity (cfs)	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Max Flow Depth (ft)
DI A-6	BMHA-5	13	87.33	86.92	3.15	15	0.012	0.50	0.50	0.94	4.86	12.43	0.08	0.21	0.27
BMHA-5	IB-1	3	85.50	85.50	0.00	24	0.012	0.50	0.50	0.83	2.15	10.96	0.08	0.18	0.36
Riser A-2	DMH A-1	40	79.55	75.35	10.50	15	0.012	0.50	0.50	0.45	6.79	22.68	0.02	0.11	0.14
DI A-8	DI A-7	44	88.20	87.74	1.05	15	0.012	0.50	0.50	0.30	1.92	7.16	0.04	0.18	0.23
OCS A-4	MH A-3	19	85.50	85.14	1.89	15	0.012	0.50	0.50	0.30	3.24	9.63	0.03	0.14	0.18
MH A-3	SP A-2	71	85.14	84.42	1.01	15	0.012	0.50	0.50	0.30	2.76	7.05	0.04	0.14	0.18
MH B-1	Outlet	6	85.27	85.33	1.00	15	0.012	0.50	0.50	0.07	0.86	7.00	0.01	0.11	0.14
DI A-7	DI A-6	38	87.74	87.33	1.08	15	0.012	0.50	0.50	0.67	3.02	7.27	0.09	0.24	0.30
DI C-1	Outlet	5	82.45	82.40	1.00	15	0.012	0.50	0.50	0.00	0.00	7.00	0.00	0.01	0.01
DMH A-1	EX-CB	39	75.35	73.30	5.26	15	0.012	0.50	0.50	0.45	5.44	16.04	0.03	0.12	0.15

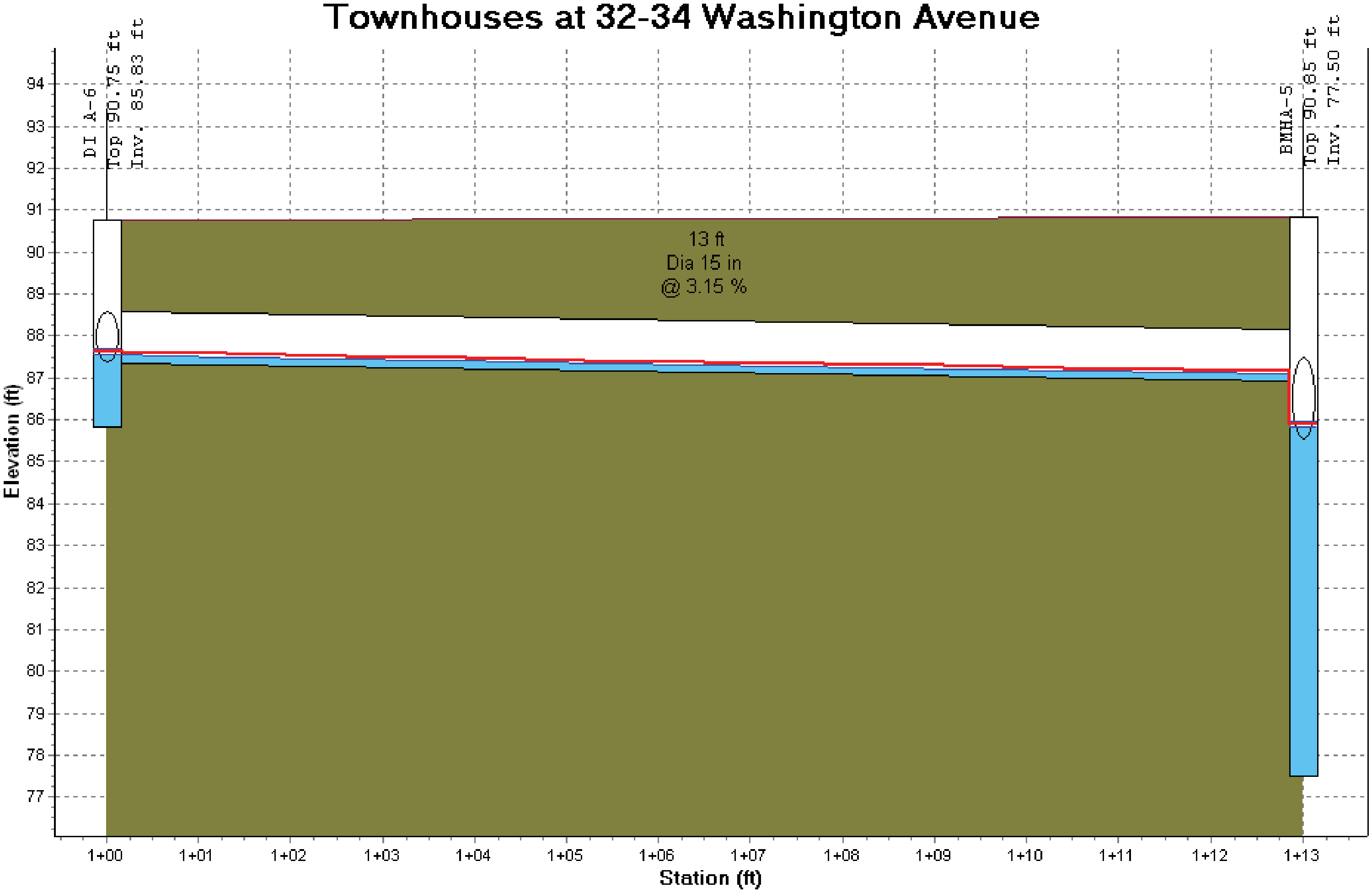
Townhouses at 32-34 Washington Avenue



:	DI A-8		DI A-7		DI A-6
Top (ft):	91.90		90.80		90.75
Inv. (ft):	86.70		86.24		85.83
Min Pipe Cover (ft):	2.45		1.81		2.17
Max HGL (ft):	88.37		88.03		87.63
Link ID:		Pipe - (149)		Pipe - (157)	
(ft):		44		38	
Dia (in):		15		15	
@ (%):		1.05		1.08	
Up Invert (ft):		88.20		87.74	
Dn Invert (ft):		87.74		87.33	
Max Q (cfs):		0.30		0.67	
Max Vel (ft/s):		1.92		3.02	
Max Depth (ft):		0.23		0.30	

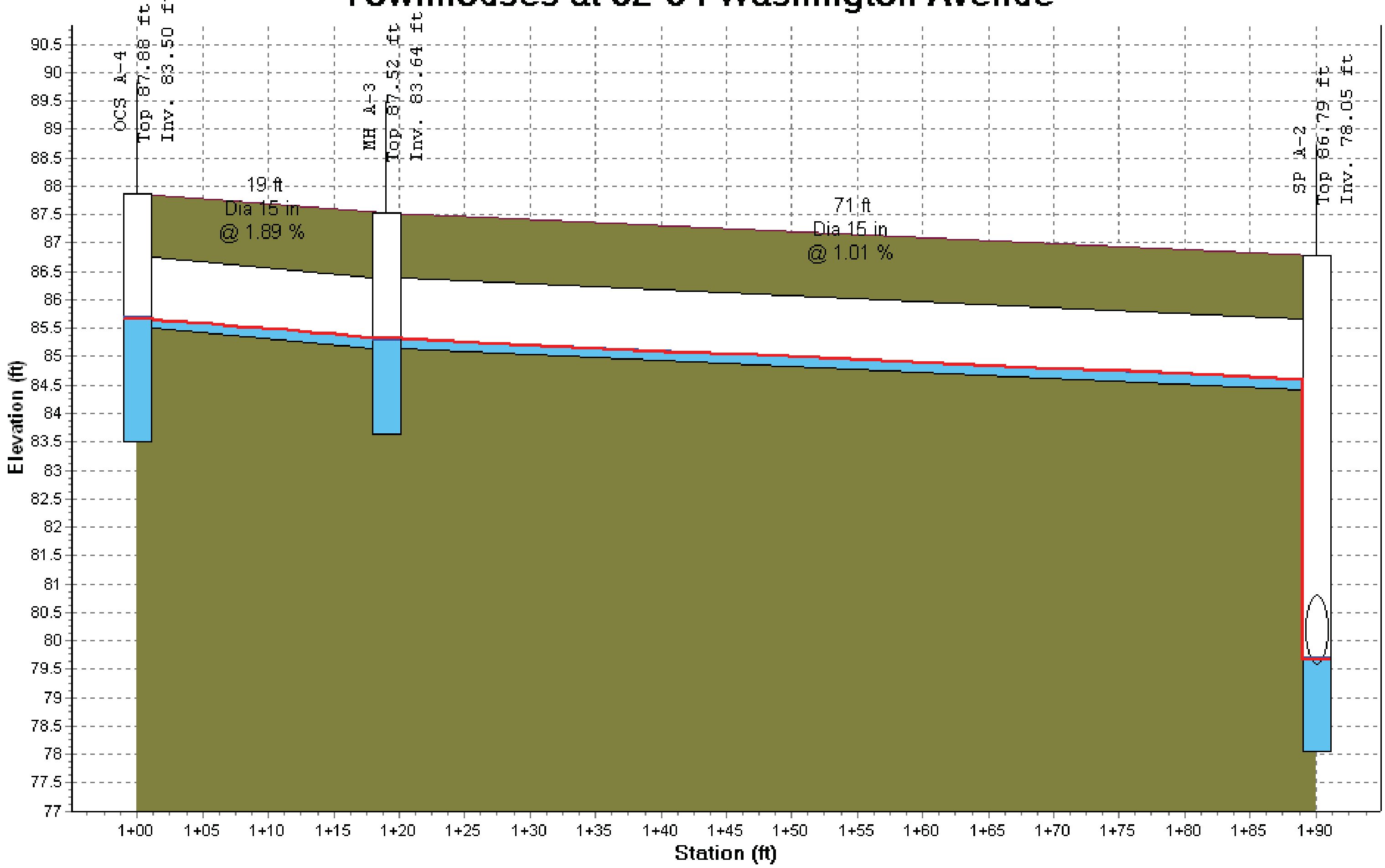
Autodesk Storm and Sanitary Analysis

Townhouses at 32-34 Washington Avenue



:	DI A-6		BMHA-5
Top (ft):	90.75		90.85
Inv. (ft):	85.83		77.50
Min Pipe Cover (ft):	2.17		2.68
Max HGL (ft):	87.63		85.91
Link ID:		12	
(ft):		13	
Dia (in):		15	
@ (%):		3.15	
Up Invert (ft):		87.33	
Dn Invert (ft):		86.92	
Max Q (cfs):		0.94	
Max Vel (ft/s):		4.86	
Max Depth (ft):		0.27	

Townhouses at 32-34 Washington Avenue

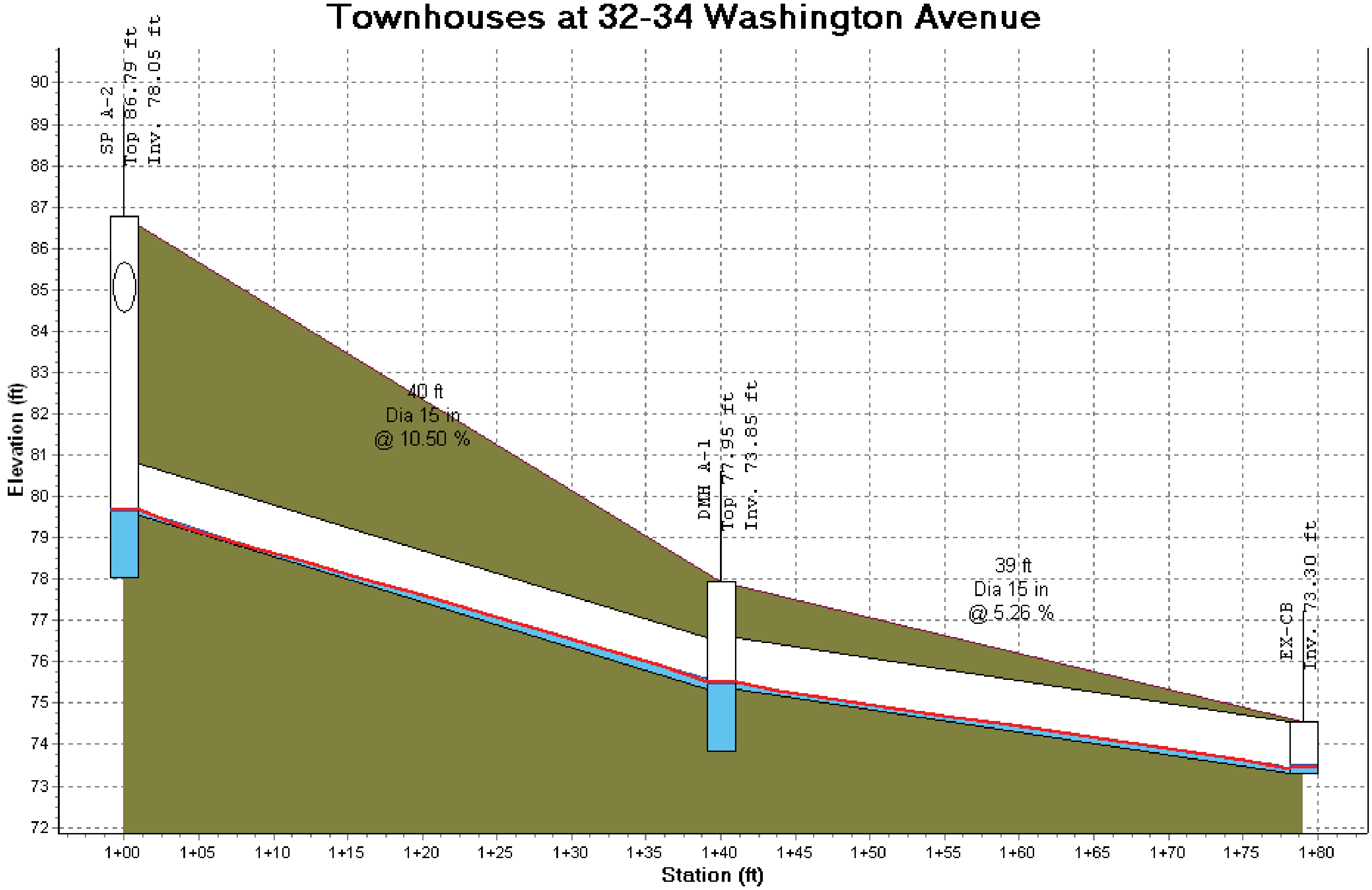


:	OCS A-4	MH A-3	SP A-2
Top (ft):	87.88	87.52	86.79
Inv. (ft):	83.50	83.64	78.05
Min Pipe Cover (ft):	1.13	1.13	1.12
Max HGL (ft):	85.67	85.32	79.67

Link ID:	Pipe - (151)	Pipe - (152)
(ft):	19	71
Dia (in):	15	15
@ (%):	1.89	1.01
Up Invert (ft):	85.50	85.14
Dn Invert (ft):	85.14	84.42
Max Q (cfs):	0.30	0.30
Max Vel (ft/s):	3.24	2.76
Max Depth (ft):	0.18	0.18

Autodesk Storm and Sanitary Analysis

Townhouses at 32-34 Washington Avenue



:	SP A-2	DMH A-1	EX-CB
Top (ft):	86.79	77.95	
Inv. (ft):	78.05	73.85	73.30
Min Pipe Cover (ft):	1.12	1.35	
Max HGL (ft):	79.67	75.50	73.44

Link ID:	Pipe - (145)	Pipe - (161)
(ft):	40	39
Dia (in):	15	15
@ (%):	10.50	5.26
Up Invert (ft):	79.55	75.35
Dn Invert (ft):	75.35	73.30
Max Q (cfs):	0.45	0.45
Max Vel (ft/s):	6.79	5.44
Max Depth (ft):	0.14	0.15

Autodesk Storm and Sanitary Analysis

APPENDIX E

WATER QUALITY VOLUME CALCULATIONS

WATER QUALITY VOLUME CALCULATIONS

Townhouses at 32-34 Washington Avenue

32-34 Washington Avenue

Hastings-on-Hudson, NY

JMC Project: **13180**

Drawing Reference: **DA-1, DA-2**

Computed by: **EH**

Checked by: **DL**

Date Printed: 10/1/2015

WATER QUALITY VOLUME WORKSHEET
FOR REDEVELOPMENT PROJECTS

JMC Project:	**13180**
Design Point:	**DP-1**

Townhouses at 32-34 Washington Avenue	Drainage Area:	**PDA-1A, 1B and 1C**

Initial Water Quality Treatment Volume

DESCRIPTION	Design Storm	Area	Existing Impervious Area	New Impervious Area	Percent Impervious	Runoff Coefficient	Total Required WQ Volume
SYMBOL	P	A	I_E	I_N	%I	R_V	WQ_V
VALUE	1.5	0.60	0.15	0.12	45.00	0.455	**1,486**
UNITS	In	Ac	Ac	Ac	%	CF	CF

Net Water Quality Treatment Volume for Standard Practices (25% I_E + 100% I_N)

DESCRIPTION	Design Storm	Area	Existing Impervious Area	New Impervious Area	Percent Impervious	Runoff Coefficient	Total Required WQ Volume
SYMBOL	P	A	I_E	I_N	%I	R_V	WQ_V
VALUE	1.5	0.60	0.04	0.12	26.25	0.28625	**935**
UNITS	In	Ac	Ac	Ac	%	CF	CF

Date Printed: 10/1/2015

INFILTRATION WORKSHEET

JMC Project:	**13180**
Design Point:	**DP-1**
Drainage Area:	**PDA-1B**

Stormtech Chambers (SC-740)

Water Quality Volume Provided			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
1-Year Storm Inflow Volume	IN	867	CF
1-Year Storm Outflow Volume	OUT	0	CF
VOLUME INFILTRATED [WQv = IN-OUT]	WQv	**867**	CF

Date Printed: 10/1/2015

BIORETENTION WORKSHEET

JMC Project:	**13180**
Design Point:	**1**
Drainage Area:	**PDA-1C**

Bioretention #1

Site Data for Drainage Area to be Treated by Practice			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Design Storm [90% Rainfall Event Number]	P	1.5	In
Impervious Area	I	0.01	Ac
Area	A	0.04	Ac
Percent Impervious	%I	29.41	%
Runoff Coefficient [0.05 + 0.009 x %I]	R_V	0.31	CF
TOTAL VOLUME Required [$WQ_V = (P \times R_V \times A) / 12$]	WQ_V	**77**	CF

Minimum Filter Bed Area			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Water Quality Volume	WQ_V	77	CF
Coefficient of permeability of filter media (hydraulic conductivity)	k	0.50	Ft / Day
Filter bed Depth (soil media)	d_f	4.00	Ft
Average Height of water above filter bed	h_f	1.80	Ft
Design filter bed drain Time	t_f	1.00	Days
Required Surface Area of Filter Bed [$A_f = (WQ_V \times d_f) / (k \times (h_f + d_f) \times t_f)$]	A_f	**105.53**	SF

Proposed Bioretention Area			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Surface Area of Filter Bed Provided	A_f	**124.00**	SF
Actual Volume Provided		**89.90**	CF

Date Printed: 10/1/2015

INFILTRATION WORKSHEET

JMC Project:	**13180**
Design Point:	**DP-1**
Drainage Area:	**PDA-1A**

Porous Paver Area #1

Site Data for Drainage Area to be Treated by Practice			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Design Storm [90% Rainfall Event Number]	P	1.5	In
Impervious Area	I	0.05	Ac
Area	A	0.05	Ac
Percent Impervious	%I	100.00	%
Runoff Coefficient [0.05 + 0.009 x %I]	R_V	0.95	CF
TOTAL VOLUME Required [WQ_V = (P x R_V x A) / 12]	WQ_V	**240**	CF

Minimum Porous Pavement Area			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Water Quality Volume	WQ_V	240	CF
Porosity	*n*	0.40	Ft / Day
Trench Depth	d_t	0.67	Ft
Surface Area Required [A_R = WQ_v/ (*n* x d_t)]	A_R	**894**	SF

Proposed Porous Pavement			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Surface Area of Porous Pavement Provided [A_p]	A_p	**2,017**	SF
Actual Volume Provided	WQ_{VP}	541	CF

INFILTRATION WORKSHEET

JMC Project:	**13180**
Design Point:	**DP-1**
Drainage Area:	**PDA-1A**

Porous Paver Area #2

Site Data for Drainage Area to be Treated by Practice			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Design Storm [90% Rainfall Event Number]	P	1.5	In
Impervious Area	I	0.01	Ac
Area	A	0.01	Ac
Percent Impervious	%I	100.00	%
Runoff Coefficient [0.05 + 0.009 x %I]	R_V	0.95	CF
TOTAL VOLUME Required [WQ_V = (P x R_V x A) / 12]	WQ_V	**45**	CF

Minimum Porous Pavement Area			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Water Quality Volume	WQ_V	45	CF
Porosity	*n*	0.40	Ft / Day
Trench Depth	d_t	0.67	Ft
Surface Area Required [A_R = WQ_v/ (*n* x d_t)]	A_R	**166**	SF

Proposed Porous Pavement			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Surface Area of Porous Pavement Provided [A_p]	A_p	**375**	SF
Actual Volume Provided	WQ_{VP}	101	CF

WATER QUALITY VOLUME WORKSHEET

JMC Project:	**13180**
Design Point:	**DP-1**

Townhouses at 32-34 Washington Avenue	Drainage Area:	**PDA-1A, 1B and 1C**

Net Total Water Quality Treatment Volume			
	SYMBOL	*VALUE*	*UNITS*
Design Storm [90% Rainfall Event Number]	WQ_V	**935**	CF

Water Quality Volume Provided			
GREEN INFRASTRUCTURE PRACTICE / SMP	*SYMBOL*	*VALUE*	*UNITS*
Stormtech Chambers (SC-740)	WQ_V	867	CF
Bioretention Area	WQ_V	90	CF
Porous Paver Area #1	WQ_V	541	CF
Porous Paver Area #2	WQ_V	101	CF
TOTAL	WQ_V	**1,598**	CF

Date Printed: 10/1/2015

APPENDIX F

STORMTECH CHAMBERS SIZING

STORM_TECH RECHARGER SC 740

THE VOLUMES ACCOUNT FOR VOID SPACE IN THE 6" STONE BASE AND SURROUNDING STONE

ADDITIONAL STONE IS CALCULATED AT 40% VOID SPACE

	HEIGHT f.t.	STAGE f.t.	STORAGE PLAIN cf/ft	STORAGE W/STONE cf/unit
STONE COVER	3.00	3.50		74.90
STONE COVER	2.75	3.25		71.52
StormTech Crown	2.50	3.00		68.14
StormTech	2.25	2.75		64.46
StormTech	2.00	2.50		59.66
StormTech	1.75	2.25		54.17
StormTech	1.50	2.00		48.19
StormTech	1.25	1.75		41.85
StormTech	1.00	1.50		35.23
StormTech	0.75	1.25		28.36
StormTech	0.50	1.00		21.31
StormTech Invert	0	0.50		6.76
BOTTOM BROKEN STONE	GRAVEL	0		0.00

		DIM. f.t.	LAY-UP f.t.
AREA/UNIT	s.f.		33.82
HEIGHT		2.50	3.50
LENGTH		7.56	7.12
WIDE		4.25	4.75

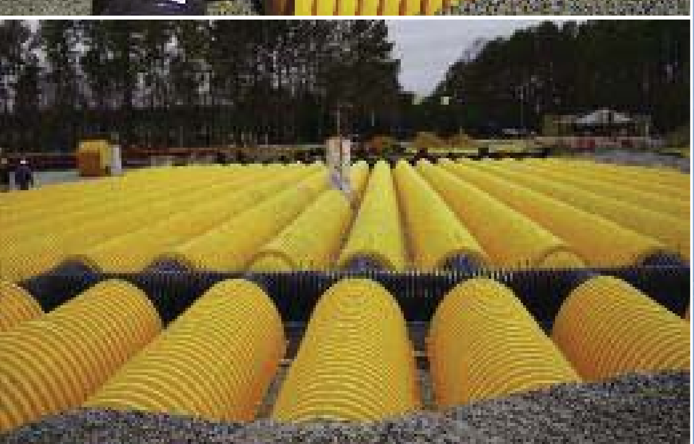
INFILTRATION	10.00 in/hr	0.0078287	cfs/unit
ELEVATION BOTTOM STONE	85.00		CUMMULATIVE

VOLUME OF STORAGE IN EACH STAGE (cf.)

1	GRAVEL		STORM-TECH RECHARGER SC 740							GUIDANCE WQ volume		GRAVEL					GUIDANCE W-quantity Volume
1	STAGE	STAGE	STAGE	STAGE	STAGE	STAGE	STAGE	STAGE	STAGE	STAGE	STAGE	STAGE	STAGE	CONSTANT		infiltrate	Storage +
inch	0	6	12	15	18	21	24	27	30	33	36	39	42				
No UNIT	0.00	0.50	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	FLOW RATE	AREA*UNIT	in 12 hrs	Infiltration
ELEV.	85.00	85.50	86.00	86.25	86.50	86.75	87.00	87.25	87.50	87.75	88.00	88.25	88.50	cfs		cf	cf
1	0.00	6.76	21.31	28.36	35.23	41.85	48.19	54.17	59.66	64.5	68.14	71.52	74.90	0.008	33.82		
2	0.00	14	43	57	70	84	96	108	119	129	136	143	150	0.016	67.64	676	826
3	0.00	20	64	85	106	126	145	163	179	193	204	215	225	0.023	101.46	1,015	1,239
4	0.00	27	85	113	141	167	193	217	239	258	273	286	300	0.031	135.28	1,353	1,652
5	0.00	34	107	142	176	209	241	271	298	322	341	358	375	0.039	169.10	1,691	2,066
6	0.00	41	128	170	211	251	289	325	358	387	409	429	449	0.047	202.92	2,029	2,479
7	0.00	47	149	199	247	293	337	379	418	451	477	501	524	0.055	236.74	2,367	2,892
8	0.00	54	170	227	282	335	386	433	477	516	545	572	599	0.063	270.56	2,706	3,305
9	0.00	61	192	255	317	377	434	488	537	580	613	644	674	0.070	304.38	3,044	3,718
10	0.00	68	213	284	352	419	482	542	597	645	681	715	749	0.078	338.20	3,382	4,131
11	0.00	74	234	312	388	460	530	596	656	709	750	787	824	0.086	372.02	3,720	4,544
12	0.00	81	256	340	423	502	578	650	716	774	818	858	899	0.094	405.84	4,058	4,957
13	0.00	88	277	369	458	544	626	704	776	838	886	930	974	0.102	439.66	4,397	5,370
14	0.00	95	298	397	493	586	675	758	835	902	954	1,001	1,049	0.110	473.48	4,735	5,783
15	0.00	101	320	425	528	628	723	813	895	967	1,022	1,073	1,124	0.117	507.30	5,073	6,197
16	0.00	108	341	454	564	670	771	867	955	1,031	1,090	1,144	1,198	0.125	541.12	5,411	6,610
17	0.00	115	362	482	599	711	819	921	1,014	1,096	1,158	1,216	1,273	0.133	574.94	5,749	7,023
18	0.00	122	384	510	634	753	867	975	1,074	1,160	1,227	1,287	1,348	0.141	608.76	6,088	7,436
19	0.00	128	405	539	669	795	916	1,029	1,134	1,225	1,295	1,359	1,423	0.149	642.58	6,426	7,849

APPENDIX G

STORMTECH DESIGN MANUAL



SC-310 / SC-740 / DC-780

StormTech®

Detention • Retention • Water Quality

Design Manual

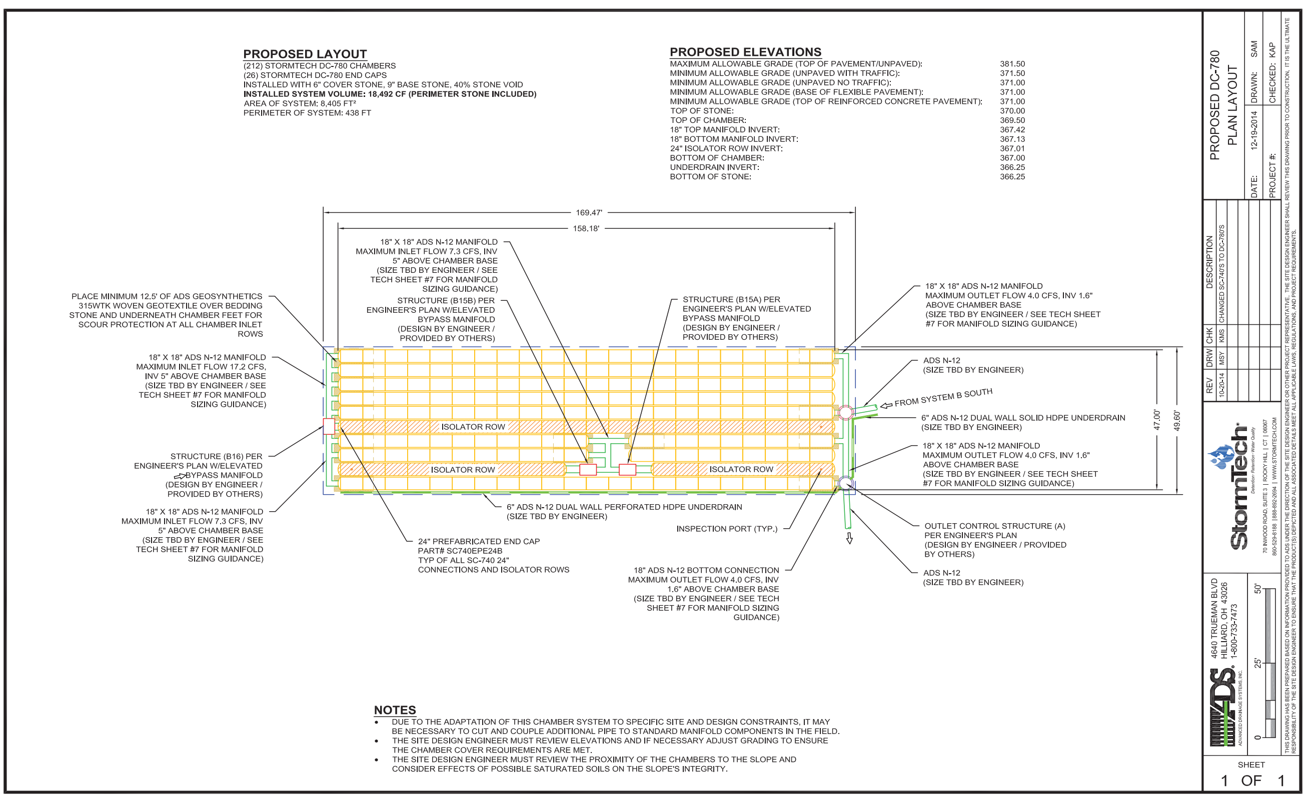
StormTech® Chamber Systems
for Stormwater Management

Table of Contents

StormTech®

* For MC-3500 and MC-4500 designs, please refer to the MC-3500/MC-4500 Design Manual

The StormTech Technical Services Department assists design professionals in specifying StormTech stormwater systems. This assistance includes the layout of chambers to meet the engineer's volume requirements and the connections to and from the chambers. The Technical Department can also assist converting and cost engineering projects currently specified with ponds, pipe, concrete and other manufactured stormwater detention/retention products. Please note that it is the responsibility of the design engineer to ensure that the chamber bed layout meets all design requirements and is in compliance with applicable laws and regulations governing this project.



This manual is exclusively intended to assist engineers in the design of subsurface stormwater systems using StormTech chambers.

1.0 Introduction

1.1 INTRODUCTION

StormTech stormwater management systems allow stormwater professionals to create more profitable, environmentally sound developments. Compared with other subsurface systems, StormTech systems offer lower overall installed cost, superior design flexibility and enhanced performance. Applications include commercial, residential, agricultural and highway drainage.

StormTech has invested over $10 million and many years in the development of StormTech chambers. These innovative products exceed the rigorous requirements of the standards governing the design of thermoplastic structures.

1.2 THE GOLD STANDARD IN STORMWATER MANAGEMENT

The advanced designs of StormTech chambers were created by implementing an aggressive research, development, design and manufacturing protocol. StormTech chamber products establish the new gold standard in stormwater management through:

- Collaborations with experts in the field of buried plastic structures and polyolefin materials
- The development and utilization of new testing methods and proprietary test methods
- The use of thermoformed prototypes to verify engineering models, perform in-ground testing and install observation sites
- The investment in custom-designed, injection molding equipment
- The utilization of polypropylene and polyethylene as manufacturing materials
- The design of molded-in features not possible with traditional thermoformed chambers

Section 3.0 of this design manual, *Structural Capabilities*, provides a detailed description of the research, development and design process.

Many of StormTech's unique chamber features can benefit a site developer, stormwater system designer, and installer. Where applicable, StormTech Product Specifications are referenced throughout this design manual. If StormTech's unique product benefits are important to a stormwater system design, consider including the applicable StormTech Product Specifications on the site plans. This can prevent substitutions with inferior products. Refer to Section 14.0, *StormTech Product Specifications.*

1.3 PRODUCT QUALITY AND DESIGN TO INTERNATIONAL STANDARDS

StormTech chambers are designed to meet the full scope of design requirements of Section 12.12 of the AASHTO LRFD Bridge Design Specifications and produced to the requirements of the American Society of Testing Materials (ASTM) International specifications F2418 (polypropylene chambers) and F2922 (polyethylene chambers).

StormTech chambers provide the full AASHTO safety factors for live loads and permanent earth loads. The two ASTM standards mentioned previously are linked to the AASHTO LRFD Bridge Design Specifications Section 12.12 design standard. Both ASTM standards require that the safety factors included in the AASHTO guidance are achieved as a prerequisite to meeting either ASTM F2418 or ASTM F2922. StormTech chambers are also designed in accordance with ASTM F2787, "Standard Practice for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers" which provides specific guidance on how to design thermoplastic chambers in accordance with AASHTO Section 12.12. These standards provide both the assurance of product quality and safe structural design.

For non-proprietary specifications for public bids that ensure high product quality and safe design, consider including the specification in Section 15.0 Chamber Specifications for Contract Documents.

1.4 TECHNICAL SUPPORT FOR PLAN REVIEWS

StormTech's in-house technical support staff is available to review proposed plans that incorporate StormTech chamber systems. They are also available to assist with plan conversions from existing products to StormTech. Not all plan sheets are necessary for StormTech's review. Required sheets include plan view sheet(s) with design contours, cross sections of the stormwater system including catch basins and drainage details.

When specifying StormTech chambers it is recommended that the following items are included in project plans: StormTech chamber system General Notes, applicable StormTech chamber illustrations and StormTech chamber system Product Specifications. These items are available in various formats and can be obtained by contacting StormTech at **1-860-529-8188** or may be downloaded at **www.stormtech.com.**

StormTech's plan review is limited to the sole purpose of determining whether plans meet StormTech chamber systems' minimum requirements. **It is the ultimate responsibility of the design engineer to assure that the stormwater system's design is in full compliance with all applicable laws and regulations.** StormTech products must be designed and installed in accordance with StormTech's minimum requirements.

SEND PLANS TO:

StormTech, Plan Review, 70 Inwood Road, Suite 3, Rocky Hill, CT 06067 E-mail: info@stormtech.com. File size should not exceed 10 MB.

2.1 PRODUCT APPLICATIONS

StormTech chamber systems may function as stormwater detention, retention, first-flush storage, or some combination of these. The StormTech chambers can be used for commercial, municipal, industrial, recreational, and residential applications especially for installations under parking lots and commercial roadways.

One of the key advantages of the StormTech chamber system is its design flexibility. Chambers may be configured into beds or trenches of various sizes or shapes. They can be centralized or decentralized, and fit on nearly all sites. Chamber lengths enhance the ability to develop on both existing and pre-developed projects. The systems can be designed easily and efficiently around utilities, natural or man-made structures and any other limiting boundaries.

2.2 CHAMBERS FOR STORMWATER DETENTION

Chamber systems have been used effectively for stormwater detention for over 15 years. A detention system temporarily holds water while it is released at a defined rate through an outlet. While some infiltration may occur in a detention system, it is often considered an environmental benefit and a storage safety factor. Over 70% of StormTech's installations are non-watertight detention systems. There are only a few uncommon situations where a detention system might need to limit infiltration: the subgrade soil's bearing capacity is significantly affected by saturation such as with expansive clays or karst soils, and; in sensitive aquifer areas where the depth to groundwater does not meet local guidelines. Adequate pretreatment could eliminate concerns for the latter case. A thermoplastic liner may be considered for both situations to limit infiltration.

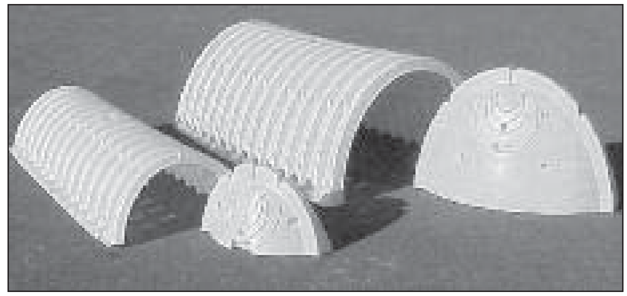
2.3 STONE POROSITY ASSUMPTION

A StormTech chamber system requires the application of clean, crushed, angular stone below, between and above the chambers. This stone serves as a structural component while allowing conveyance and storage of stormwater. Storage volume examples throughout this Design Manual are calculated with an assumption that the stone has an industry standard porosity of 40%. Actual stone porosity may vary. Contact StormTech for information on calculating stormwater volumes with varying stone porosity assumptions.

2.4 CHAMBER SELECTION

Primary considerations when selecting between the SC-310™, SC-740™ and DC-780™ chambers are the depth to restrictive layer, available area for subsurface storage, cover height and outfall restrictions.

The StormTech SC-310 chamber shown on page 4 is ideal for systems requiring low-rise and wide-span solutions. This low profile chamber allows the storage of large volumes, 1.3 ft^3/ft^2 (0.40 m^3/m^2) [minimum], at minimum depths.



The SC-310 and SC-740 chambers and end plates.

StormTech systems can be integrated into retrofit and new construction projects.

Like the Stormtech SC-310, the StormTech SC-310-3 found on page 6 allows for a design option for sites with both limited cover and limited space. With only 3" of spacing between the chambers, the SC-310-3 still provides 1.3 ft^3/ft^2 (0.40 m^3/m^2) [minimum] of storage.

The StormTech SC-740 chamber shown on page 8 optimizes storage volumes in relatively small footprints. By providing 2.2 ft^3/ft^2 (0.67 m^3/m^2) [minimum] of storage, the SC-740 chambers can minimize excavation, backfill and associated costs.

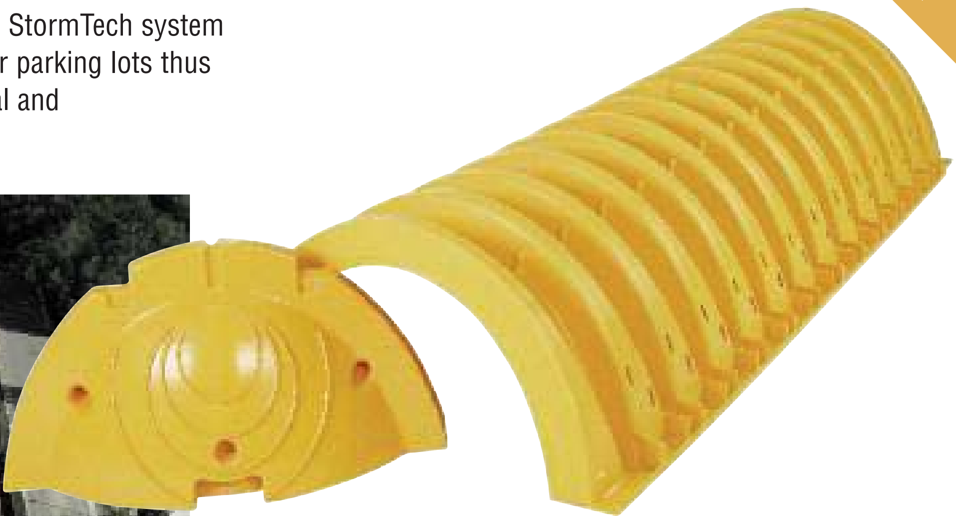
The DC-780 chamber shown on page 10 has been developed for those applications which exceed the maximum 8 ft (2.44 m) burial depth of the SC-740 and SC-310 chambers. The DC-780 is a modified version of the SC-740 allowing it to reach a maximum burial depth of 12 ft (3.66 m). The design of the DC-780 chamber, like other StormTech chambers, is designed and manufactured in accordance with the AASHTO LRFD Bridge Design Specifications as well as ASTM F 2418 and ASTM F 2787 ensuring structural adequacy for deeper systems.

The end corrugations of the DC-780 chamber have not been modified in order to allow connections to the SC-740 chamber. This will allow hybrid systems utilizing both chambers in one system design.

StormTech SC-310 Chamber

SC-310 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots thus maximizing land usage for commercial and municipal applications.

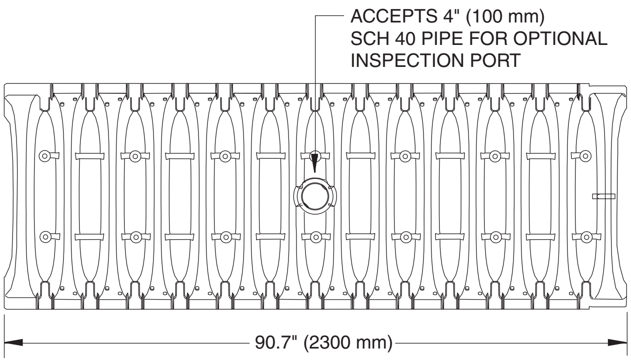


StormTech SC-310 Chamber (not to scale)

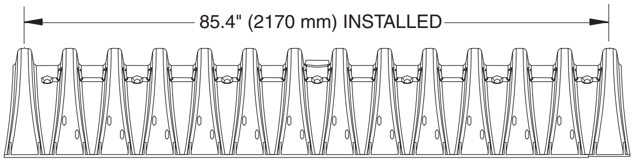
Nominal Chamber Specifications

Size (L x W x H)	85.4" x 34.0" x 16.0" (2170 x 864 x 406 mm)
Chamber Storage	14.7 ft³ (0.42 m³)
Min. Installed Storage*	31.0 ft³ (0.88 m³)
Weight	37.0 lbs (16.8 kg)

*Assumes 6" (150 mm) stone above, below and between chambers and 40% stone porosity.



SC-310 Chamber

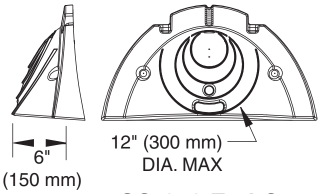


Shipping

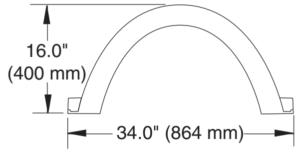
41 chambers/pallet

108 end caps/pallet

18 pallets/truck



SC-310 End Cap



StormTech SC-310 Chamber

SC-310 Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under the Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
28 (711)	↑ 14.70 (0.416)	31.00 (0.878)
27 (686)	14.70 (0.416)	30.21 (0.855)
26 (680)	Stone 14.70 (0.416)	29.42 (0.833)
25 (610)	Cover 14.70 (0.416)	28.63 (0.811)
24 (609)	14.70 (0.416)	27.84 (0.788)
23 (584)	↓ 14.70 (0.416)	27.05 (0.766)
22 (559)	14.70 (0.416)	26.26 (0.748)
21 (533)	14.64 (0.415)	25.43 (0.720)
20 (508)	14.49 (0.410)	24.54 (0.695)
19 (483)	14.22 (0.403)	23.58 (0.668)
18 (457)	13.68 (0.387)	22.47 (0.636)
17 (432)	12.99 (0.368)	21.25 (0.602)
16 (406)	12.17 (0.345)	19.97 (0.566)
15 (381)	11.25 (0.319)	18.62 (0.528)
14 (356)	10.23 (0.290)	17.22 (0.488)
13 (330)	9.15 (0.260)	15.78 (0.447)
12 (305)	7.99 (0.227)	14.29 (0.425)
11 (279)	6.78 (0.192)	12.77 (0.362)
10 (254)	5.51 (0.156)	11.22 (0.318)
9 (229)	4.19 (0.119)	9.64 (0.278)
8 (203)	2.83 (0.081)	8.03 (0.227)
7 (178)	1.43 (0.041)	6.40 (0.181)
6 (152)	↑ 0	4.74 (0.134)
5 (127)	0	3.95 (0.112)
4 (102)	0	3.16 (0.090)
3 (76)	Stone Foundation 0	2.37 (0.067)
2 (51)	0	1.58 (0.046)
1 (25)	↓ 0	0.79 (0.022)

Note: Add 0.79 cu. ft. (0.022 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber ft³ (m³)

	Bare Chamber Storage	Chamber and Stone Stone Foundation Depth in. (mm)		
	ft³ (m³)	6 (150)	12 (300)	18 (450)
StormTech SC-310	14.7 (0.4)	31.0 (0.9)	35.7 (1.0)	40.4 (1.1)

Note: Assumes 6" (150 mm) of stone above chambers, 6" (150 mm) row spacing and 40% stone porosity.

Amount of Stone Per Chamber

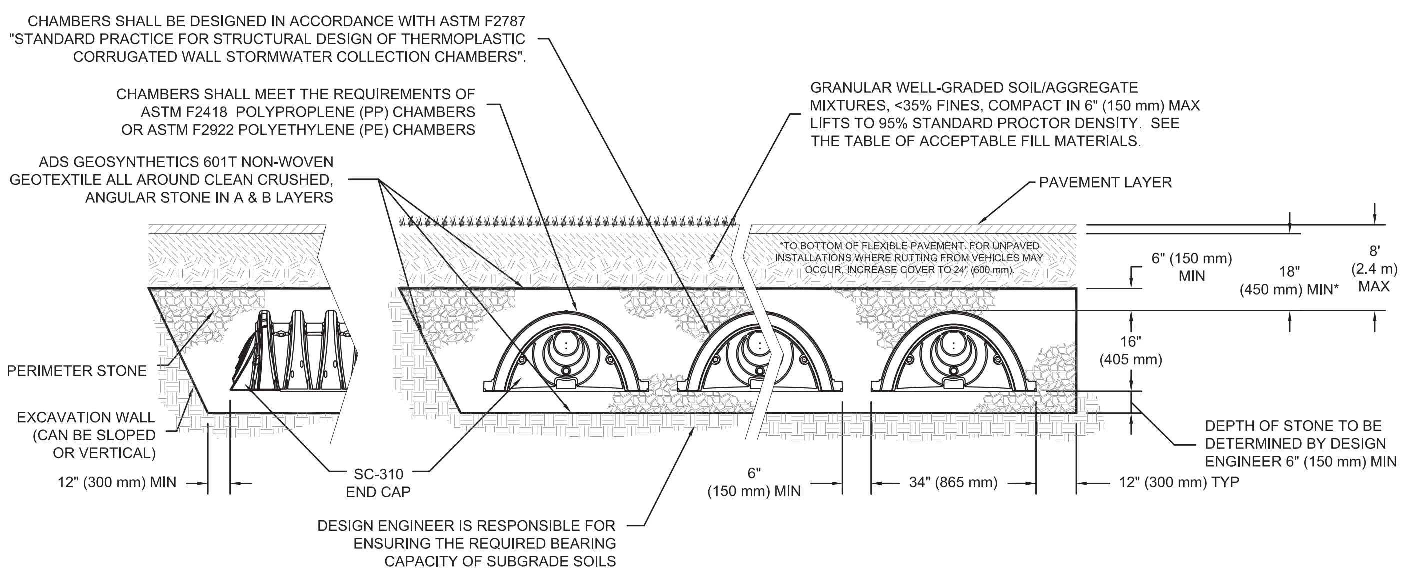
	Stone Foundation Depth		
ENGLISH TONS (yds³)	**6"**	**12"**	**18"**
StormTech SC-310	2.1 (1.5 yd³)	2.7 (1.9 yd³)	3.4 (2.4 yd³)
METRIC KILOGRAMS (m³)	**150 mm**	**300 mm**	**450 mm**
StormTech SC-310	1830 (1.1 m³)	2490 (1.5 m³)	2990 (1.8 m³)

Note: Assumes 6" (150 mm) of stone above, and between chambers.

Volume of Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	6" (150 mm)	**12" (300 mm)**	**18" (450 mm)**
StormTech SC-310	2.9 (2.2)	3.4 (2.6)	3.8 (2.9)

Note: Assumes 6" (150 mm) of row separation and 18" (450 mm) of cover. The volume of excavation will vary as the depth of the cover increases.



THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS, WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.

StormTech SC-310-3 Chamber

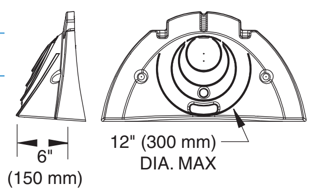
The proven strength and durability of the SC-310-3 Chamber allows for a design option for sites where limited cover, limited space, high water table and escalated aggregate cost are a factor. The SC-310-3 has a minimum cover requirement of 16" (400 mm) to bottom of pavement and reduces the spacing requirement between chambers by 50% to 3" (76 mm). This provides a reduced footprint overall and allows the designer to offer a traffic bearing application yet comply with water table separation regulations.

StormTech SC-310-3 Chamber (not to scale)

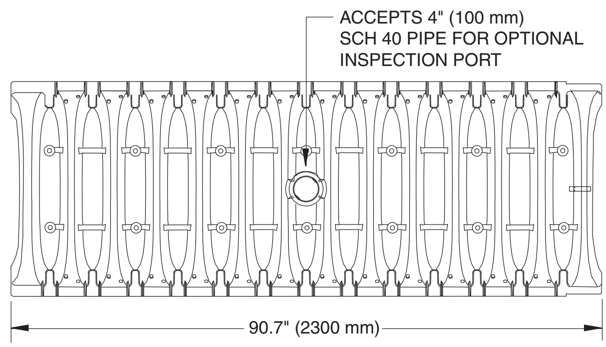
Nominal Chamber Specifications

Size (L x W x H)	85.4" x 34.0" x 16.0" (2170 x 864 x 406 mm)
Chamber Storage	14.7 ft³ (0.42 m³)
Min. Installed Storage*	29.3 ft³ (0.83 m³)
Weight	37.0 lbs (16.8 kg)

*Assumes 6" (150 mm) stone above and below chambers, 3" (76 mm) row spacing and 40% stone porosity.



SC-310 End Cap



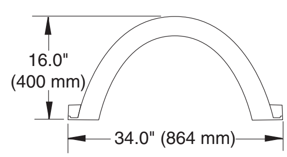
SC-310 Chamber

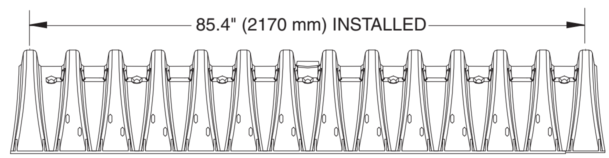
Shipping

41 chambers/pallet

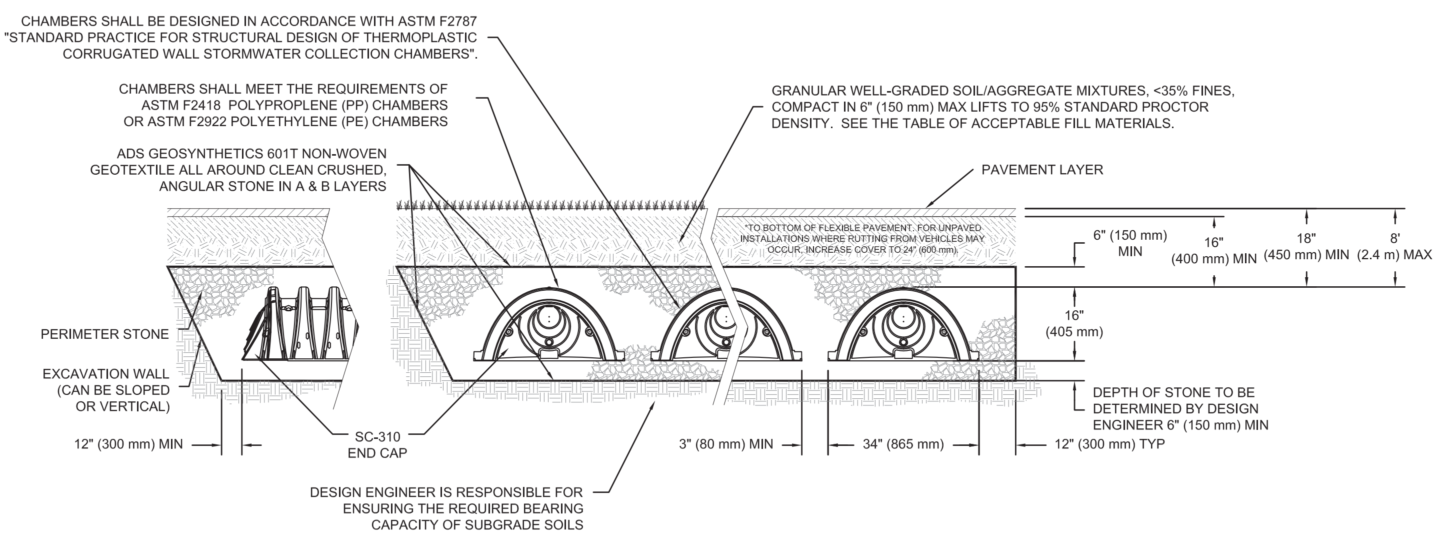
108 end caps/pallet

18 pallets/truck





Typical Cross Section Detail



THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS, WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.

StormTech SC-310-3 Chamber

SC-310-3 Cumulative Storage Volume Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under the Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
28 (711)	14.7 (0.416)	29.34 (0.831)
27 (686)	14.7 (0.416)	28.60 (0.810)
26 (660)	Stone 14.7 (0.416)	27.87 (0.789)
25 (635)	Cover 14.7 (0.416)	27.14 (0.769)
24 (610)	14.7 (0.416)	26.41 (0.748)
23 (584)	14.7 (0.416)	25.68 (0.727)
22 (559)	14.7 (0.416)	24.95 (0.707)
21 (533)	14.64 (0.415)	24.18 (0.685)
20 (508)	14.49 (0.410)	23.36 (0.661)
19 (483)	14.22 (0.403)	22.47 (0.636)
18 (457)	13.68 (0.387)	21.41 (0.606)
17 (432)	12.99 (0.368)	20.25 (0.573)
16 (406)	12.17 (0.345)	19.03 (0.539)
15 (381)	11.25 (0.319)	17.74 (0.502)
14 (356)	10.23 (0.290)	16.40 (0.464)
13 (330)	9.15 (0.260)	15.01 (0.425)
12 (305)	7.99 (0.226)	13.59 (0.385)
11 (279)	6.78 (0.192)	12.13 (0.343)
10 (254)	5.51 (0.156)	10.63 (0.301)
9 (229)	4.19 (0.119)	9.11 (0.258)
8 (203)	2.83 (0.080)	7.56 (0.214)
7 (178)	1.43 (0.040)	5.98 (0.169)
6 (152)	0	4.39 (0.124)
5 (127)	0	3.66 (0.104)
4 (102)	Stone Foundation 0	2.93 (0.083)
3 (76)	0	2.19 (0.062)
2 (51)	0	1.46 (0.041)
1 (25)	0	0.73 (0.021)

Note: Add 0.73 ft³ (0.021 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume per Chamber ft³ (m³)

	Bare Chamber Storage	Chamber and Stone Volume Stone Foundation Depth in. (mm)		
	ft³ (m³)	6 (150)	12 (300)	18 (450)
SC-310-3	14.7 (0.42)	29.3 (0.83)	33.7 (0.95)	38.1 (1.08)

Note: Assumes 6" (150 mm) of stone above chambers, 3" (76 mm) row spacing and 40% stone porosity.

Volume of Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	6" (150)	12" (300)	18" (450)
SC-310-3	2.6 (2.0)	3.0 (2.3)	3.4 (2.6)

Note: Assumes 3" (76 mm) of row separation, 6" (150 mm) of stone above the chambers and 16" (400 mm) of cover. The volume of excavation will vary as depth of cover increases.

Amount of Stone Per Chamber

	Stone Foundation Depth		
ENGLISH TONS (yd³)	**6"**	**12"**	**18"**
SC-310-3	1.9 (1.4)	2.5 (1.8)	3.1 (2.2)
METRIC KILOGRAMS (m³)	**150 mm**	**300 mm**	**450 mm**
SC-310-3	1724 (1.0)	2268 (1.3)	2812 (1.7)

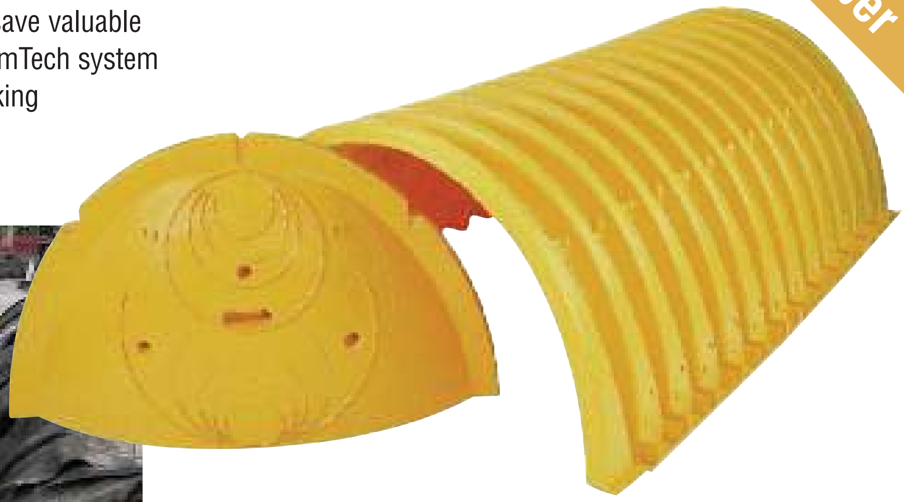
Note: Assumes 6" (150 mm) of stone above chambers and 3" (76 mm) row spacing.

Cover ft (m)	Minimum Required Bearing Resistance for Service Loads ksf (kPa) 3.0 (144)	2.9 (139)	2.8 (134)	2.7 (129)	2.6 (124)	2.5 (120)	2.4 (115)	2.3 (110)	2.2 (105)	2.1 (101)	2.0 (96)
1.5 (0.46)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)
2 (0.61)	6 152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)
2.5 (0.76)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)
3 (0.91)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)
3.5 (1.07)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	12 (305)
4 (1.22)	6 152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)
4.5 (1.37)	6 152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)
5 (1.52)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)
5.5 (1.68)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	12 (305)
6 (1.83)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)
6.5 (1.98)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)
7 (2.13)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)
7.5 (2.29)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)
8 (2.44)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	15 (381)

NOTE: The design engineer is solely responsible for assessing the bearing resistance (allowable bearing capacity) of the sub-grade soils and determining the depth of foundation stone. Subgrade bearing resistance should be assessed with consid-eration for the range of soil moisture conditions expected under a stormwater system.

StormTech SC-740 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots thus maximizing land usage for commercial and municipal applications.



StormTech SC-740 Chamber (not to scale)

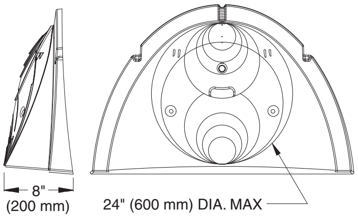
Nominal Chamber Specifications

Size (L x W x H)	85.4" x 51.0" x 30.0" (2170 x 1295 x 762 mm)
Chamber Storage	45.9 ft³ (1.30 m³)
Min. Installed Storage*	74.9 ft³ (2.12 m³)
Weight	74.0 lbs (33.6 kg)

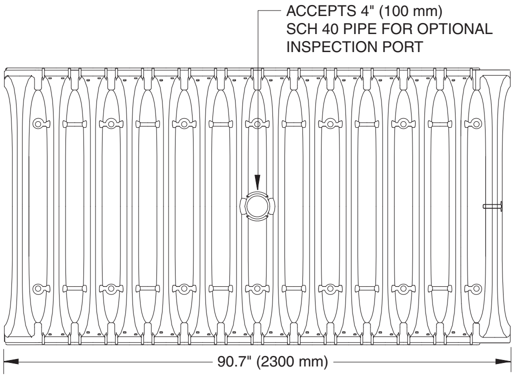
*Assumes 6" (150 mm) stone above, below and between chambers and 40% stone porosity.

Shipping

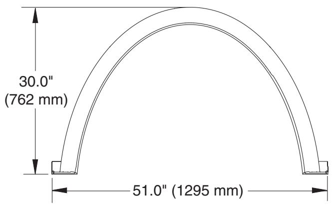
- 30 chambers/pallet
- 60 end caps/pallet
- 12 pallets/truck

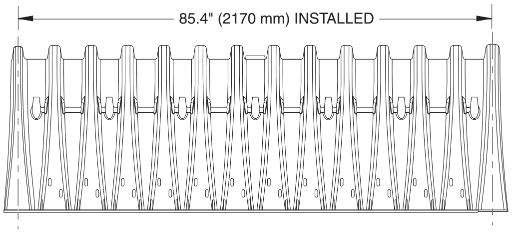


SC-740 End Cap



SC-740 Chamber





StormTech SC-740 Chamber

SC-740 Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under the Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage Ft³ (m³)	Total System Cumulative Storage Ft³ (m³)
42 (1067)	↑ 45.90 (1.300)	74.90 (2.121)
41 (1041)	45.90 (1.300)	73.77 (2.089)
40 (1016)	Stone 45.90 (1.300)	72.64 (2.057)
39 (991)	Cover 45.90 (1.300)	71.52 (2.025)
38 (965)	45.90 (1.300)	70.39 (1.993)
37 (948)	↓ 45.90 (1.300)	69.26 (1.961)
36 (914)	45.90 (1.300)	68.14 (1.929)
35 (889)	45.85 (1.298)	66.98 (1.897)
34 (864)	45.69 (1.294)	65.75 (1.862)
33 (838)	45.41 (1.286)	64.46 (1.825)
32 (813)	44.81 (1.269)	62.97 (1.783)
31 (787)	44.01 (1.246)	61.36 (1.737)
30 (762)	43.06 (1.219)	59.66 (1.689)
29 (737)	41.98 (1.189)	57.89 (1.639)
28 (711)	40.80 (1.155)	56.05 (1.587)
27 (686)	39.54 (1.120)	54.17 (1.534)
26 (660)	38.18 (1.081)	52.23 (1.479)
25 (635)	36.74 (1.040)	50.23 (1.422)
24 (610)	35.22 (0.977)	48.19 (1.365)
23 (584)	33.64 (0.953)	46.11 (1.306)
22 (559)	31.99 (0.906)	44.00 (1.246)
21 (533)	30.29 (0.858)	41.85 (1.185)
20 (508)	28.54 (0.808)	39.67 (1.123)
19 (483)	26.74 (0.757)	37.47 (1.061)
18 (457)	24.89 (0.705)	35.23 (0.997)
17 (432)	23.00 (0.651)	32.96 (0.939)
16 (406)	21.06 (0.596)	30.68 (0.869)
15 (381)	19.09 (0.541)	28.36 (0.803)
14 (356)	17.08 (0.484)	26.03 (0.737)
13 (330)	15.04 (0.426)	23.68 (0.670)
12 (305)	12.97 (0.367)	21.31 (0.608)
11 (279)	10.87 (0.309)	18.92 (0.535)
10 (254)	8.74 (0.247)	16.51 (0.468)
9 (229)	6.58 (0.186)	14.09 (0.399)

SC-740 Cumulative Storage Volumes Per Chamber (cont.)

Depth of Water in System Inches (mm)	Cumulative Chamber Storage Ft³ (m³)	Total System Cumulative Storage Ft³ (m³)
8 (203)	4.41 (0.125)	11.66 (0.330)
7 (178)	2.21 (0.063)	9.21 (0.264)
6 (152)	↑ 0	6.76 (0.191)
5 (127)	0	5.63 (0.160)
4 (102)	Stone Foundation 0	4.51 (0.125)
3 (76)	0	3.38 (0.095)
2 (51)	0	2.25 (0.064)
1 (25)	↓ 0	1.13 (0.032)

Note: Add 1.13 cu. ft. (0.032 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber ft³ (m³)

	Bare Chamber Storage	Chamber and Stone Stone Foundation Depth in. (mm)		
	ft³ (m³)	6 (150)	12 (300)	18 (450)
StormTech SC-740	45.9 (1.3)	74.9 (2.1)	81.7 (2.3)	88.4 (2.5)

Note: Assumes 6" (150 mm) of stone above chambers, 6" (150 mm) row spacing and 40% porosity.

Amount of Stone Per Chamber

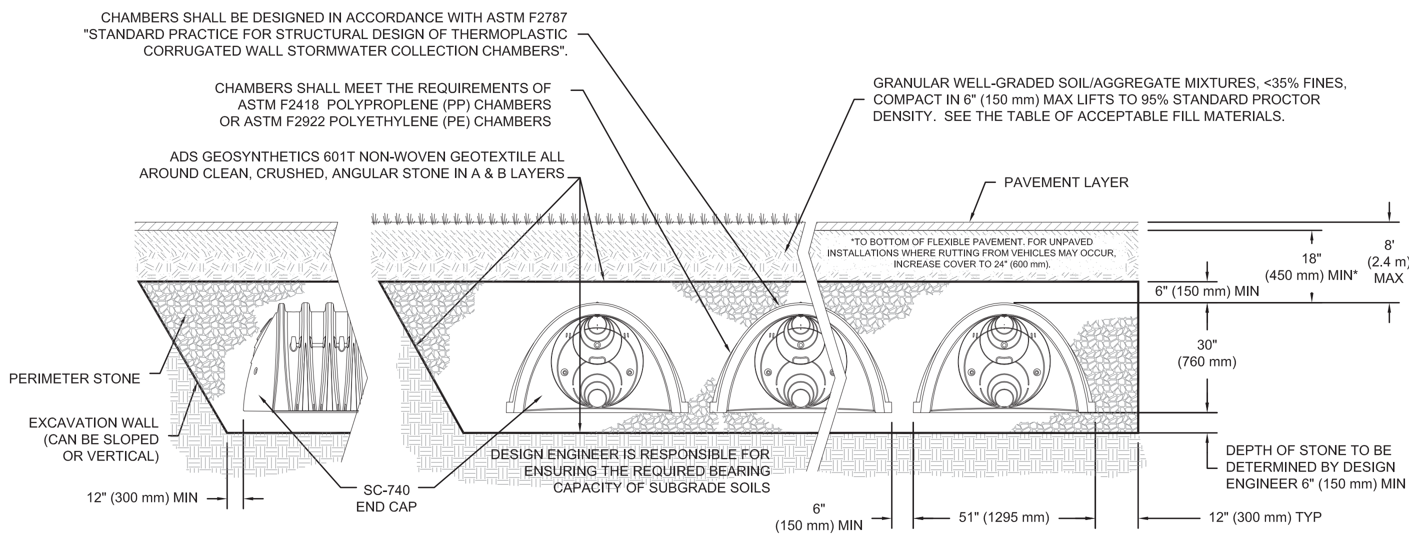
	Stone Foundation Depth		
ENGLISH TONS (yd³)	**6"**	**12"**	**18"**
StormTech SC-740	3.8 (2.8 yd³)	4.6 (3.3 yd³)	5.5 (3.9 yd³)
METRIC KILOGRAMS (m³)	**150 mm**	**300 mm**	**450 mm**
StormTech SC-740	3450 (2.1 m³)	4170 (2.5 m³)	4490 (3.0 m³)

Note: Assumes 6" (150 mm) of stone above, and between chambers.

Volume of Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	6" (150 mm)	**12" (300 mm)**	**18" (450 mm)**
StormTech SC-740	5.5 (4.2)	6.2 (4.7)	6.8 (5.2)

Note: Assumes 6" (150 mm) of row separation and 18" (450 mm) of cover. Volume of excavation will vary as depth of cover increases.

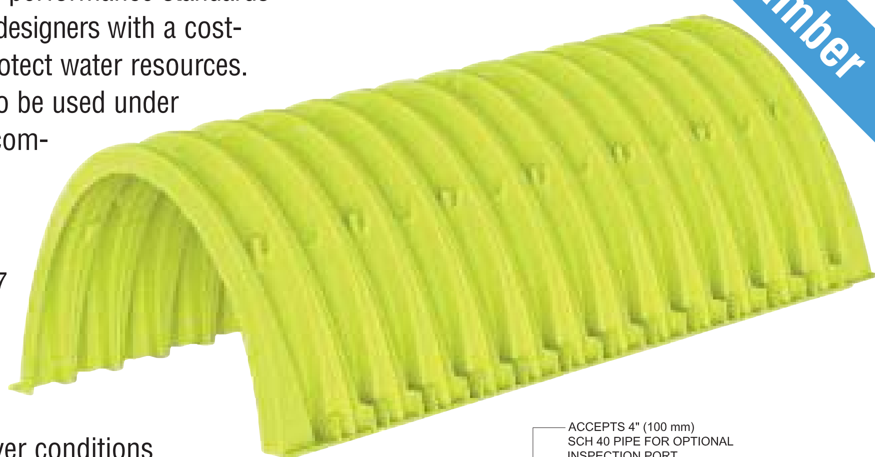


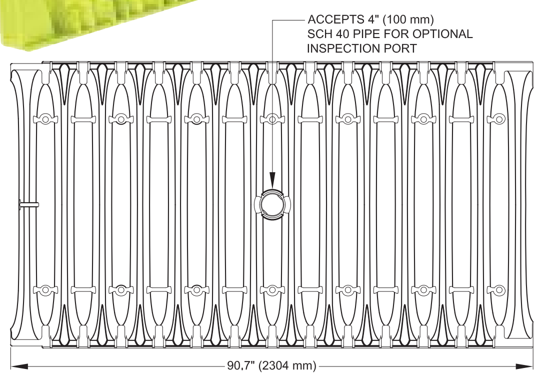
THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS, WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.

StormTech DC-780 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots thus maximizing land usage for commercial and municipal applications.

- 12' Deep Cover applications.
- Designed in accordance with ASTM F 2787 and produced to meet the ASTM F 2418 product standard.
- AASHTO safety factors provided for AASHTO Design Truck (H20) and deep cover conditions





StormTech DC-780 Chamber (not to scale)

Nominal Chamber Specifications

Size (L x W x H)	85.4" x 51.0" x 30.0" (2169 x 1295 x 762 mm)
Chamber Storage	46.2 ft³ (1.3 m³)
Min. Installed Storage*	78.4 ft³ (2.2 m³)

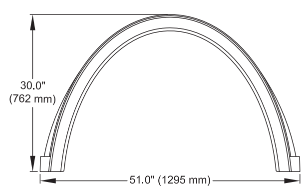
* Assumes 9" (230 mm) stone below, 6" (150 mm) stone above, 6" (150 mm) row spacing and 40% stone porosity.

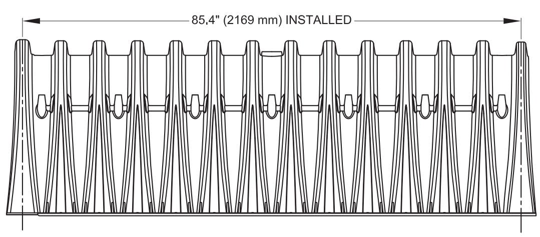
Shipping

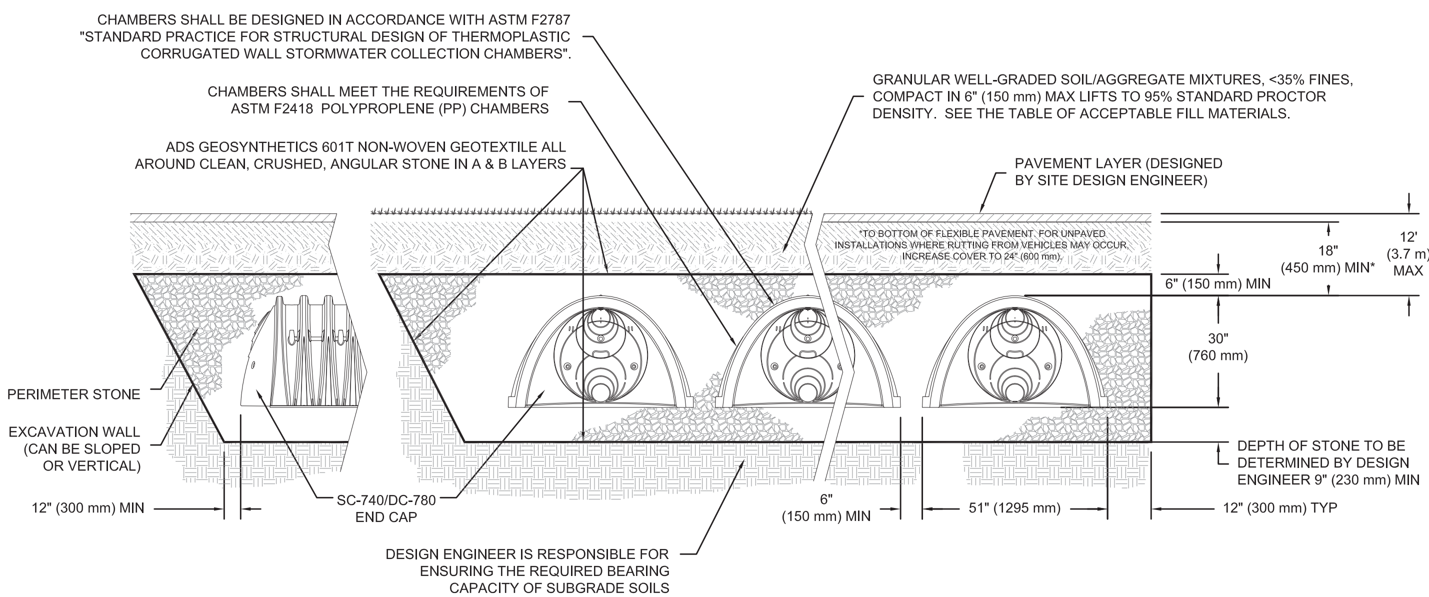
24 chambers/pallet

60 end caps/pallet

12 pallets/truck







THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS, WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.

StormTech DC-780 Chamber

DC-780 Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 9" (230 mm) Stone Base Under the Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
45 (1143)	↑ 46.27 (1.310)	78.47 (2.222)
44 (1118)	46.27 (1.310)	77.34 (2.190)
43 (1092)	Stone 46.27 (1.310)	76.21 (2.158)
42 (1067)	Cover 46.27 (1.310)	75.09 (2.126)
41 (1041)	46.27 (1.310)	73.96 (2.094)
40 (1016)	↓ 46.27 (1.310)	72.83 (2.062)
39 (991)	46.27 (1.310)	71.71 (2.030)
38 (965)	46.21 (1.309)	70.54 (1.998)
37 (940)	46.04 (1.304)	69.32 (1.963)
36 (914)	45.76 (1.296)	68.02 (1.926)
35 (889)	45.15 (1.278)	66.53 (1.884)
34 (864)	44.34 (1.255)	64.91 (1.838)
33 (838)	43.38 (1.228)	63.21 (1.790)
32 (813)	42.29 (1.198)	61.43 (1.740)
31 (787)	41.11 (1.164)	59.59 (1.688)
30 (762)	39.83 (1.128)	57.70 (1.634)
29 (737)	38.47 (1.089)	55.76 (1.579)
28 (711)	37.01 (1.048)	53.76 (1.522)
27 (686)	35.49 (1.005)	51.72 (1.464)
26 (660)	33.90 (0.960)	49.63 (1.405)
25 (635)	32.24 (0.913)	47.52 (1.346)
24 (610)	30.54 (0.865)	45.36 (1.285)
23 (584)	28.77 (0.815)	43.18 (1.223)
22 (559)	26.96 (0.763)	40.97 (1.160)
21 (533)	25.10 (0.711)	38.72 (1.096)
20 (508)	23.19 (0.657)	36.45 (1.032)
19 (483)	21.25 (0.602)	34.16 (0.967)
18 (457)	19.26 (0.545)	31.84 (0.902)
17 (432)	17.24 (0.488)	29.50 (0.835)
16 (406)	15.19 (0.430)	27.14 (0.769)
15 (381)	13.10 (0.371)	24.76 (0.701)
14 (356)	10.98 (0.311)	22.36 (0.633)
13 (330)	8.83 (0.250)	19.95 (0.565)
12 (305)	6.66 (0.189)	17.52 (0.496)
11 (279)	4.46 (0.126)	15.07 (0.427)

DC-780 Cumulative Storage Volumes Per Chamber (cont.)

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
10 (254)	2.24 (0.064)	12.61 (0.357)
9 (229)	↑ 0	10.14 (0.287)
8 (203)	0	9.01 (0.255)
7 (178)	0	7.89 (0.223)
6 (152)	Stone 0	6.76 (0.191)
5 (127)	Foundation 0	5.63 (0.160)
4 (102)	0	4.51 (0.128)
3 (76)	0	3.38 (0.096)
2 (51)	0	2.25 (0.064)
1 (25)	↓ 0	1.13 (0.032)

Note: Add 1.13 cu. ft. (0.032 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber ft³ (m³)

	Bare Chamber Storage	Chamber and Stone Volume- Stone Foundation Depth inches (millimeters)		
	ft³ (m³)	9 (230)	12 (300)	18 (450)
StormTech DC-780	46.2 (1.3)	78.4 (2.2)	81.8 (2.3)	88.6 (2.5)

Note: Assumes 40% porosity for the stone, the bare chamber volume, 6" (150 mm) stone above, and 6" (150 mm) row spacing.

Amount of Stone Per Chamber

	Stone Foundation Depth		
ENGLISH TONS (YD³)	9"	12"	18"
StormTech DC-780	4.2 (3.0 yd³)	4.7 (3.3 yd³)	5.6 (3.9 yd³)
METRIC KILOGRAMS (M³)	**230 mm**	**300 mm**	**450 mm**
StormTech DC-780	3810 (2.3 m³)	4264 (2.5 m³)	5080 (3.0 m³)

Note: Assumes 6" (150 mm) of stone above, and between chambers.

Volume of Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	9" (230 mm)	12" (300 mm)	18" (450 mm)
StormTech DC-780	5.9 (4.5)	6.3 (4.8)	6.9 (5.3)

Note: Assumes 6" (150 mm) of separation between chamber rows and 18" (450 mm) of cover. The volume of excavation will vary as the depth of the cover increases.

2.5 STORMTECH CHAMBERS

StormTech chamber systems have unique features to improve site optimization and reduce product waste. The SC-740, SC-310 and DC-780 chambers can be cut at the job site in approximately 6.5" (165 mm) increments to shorten a chamber's length. Designing and constructing chamber rows around site obstacles is easily accomplished by including specific cutting instructions or a well placed "cut to fit" note on the design plans. The last chamber of a row can be cut in any of its corrugation's valleys. An end cap placed into the trimmed corrugation's crest completes the row. The trimmed-off piece of a StormTech chamber may then be used to start the next row. See **Figure 4**.

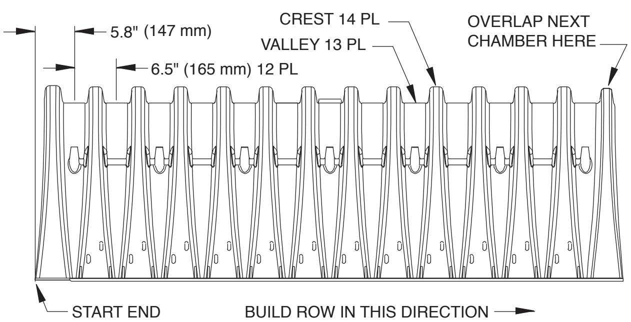
To assist the contractor, StormTech chambers are molded with simple assembly instructions and arrows that indicate the direction in which to build rows. Rows are formed by overlapping the next chamber's "Start End" corrugation with the previously laid chamber's end corrugation. Two people can safely and efficiently form rows of chambers without complicated connectors, special tools or heavy equipment.
Product Specifications: 2.2, 2.4, 2.5, 2.9 and 3.2

2.6 STORMTECH END CAPS

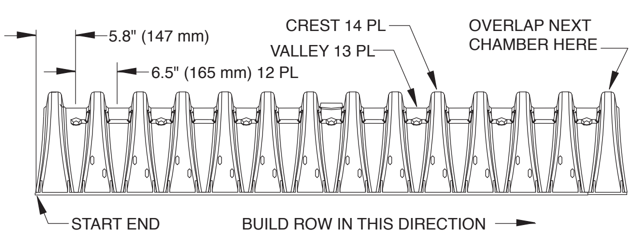
The StormTech end cap has features which make the chamber system simple to design, easy to build and more versatile than other products. StormTech end caps can be easily secured within any corrugation's crest. A molded-in handle makes attaching the end cap a one-person operation. Tools or fasteners are not required.

StormTech end caps are required at each end of a chamber row to prevent stone intrusion (two per row). The SC-740 and DC-780 end caps will accept up to a 24" (600 mm) HDPE inlet pipe. The SC-310 end cap will accept up to a 12" (300 mm) HDPE inlet pipe. See **Figure 5**.
Product Specifications: 3.1, 3.2, 3.3 and 3.4

Figure 4 – Distance Between Corrugations (not to scale)

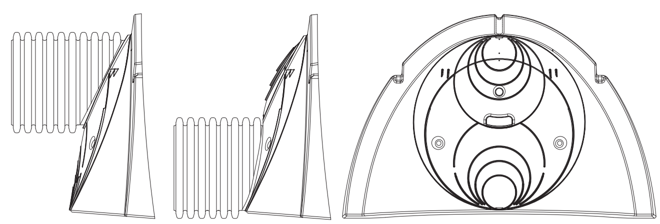


SC-740 chamber



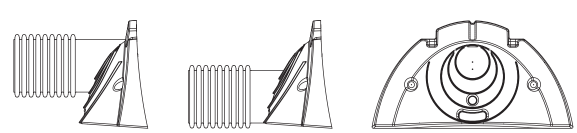
SC-310 chamber

Figure 5 – Chamber End Caps (not to scale)



SC-740/DC-780 CHAMBER FABRICATED END CAP (TOP AND BOTTOM FEED)
PIPES SIZES RANGE FROM 6" (150 mm) TO 24" (600 mm)
(INVERTS VARY WITH PIPE SIZE)

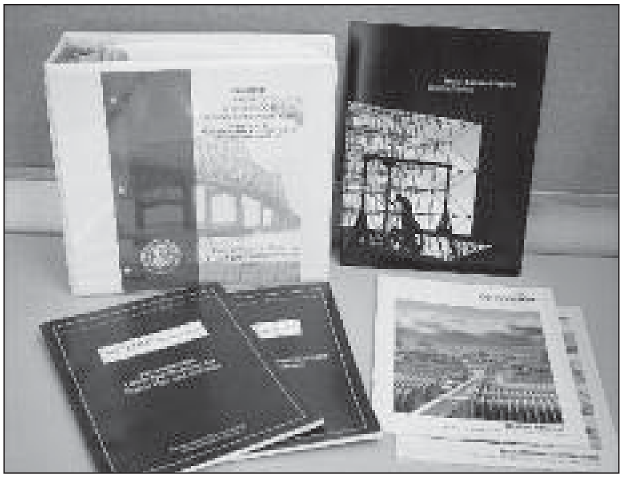
SC-740 / DC-780 end cap



SC-310 CHAMBER FABRICATED END CAP (TOP AND BOTTOM FEED)
PIPES SIZES RANGE FROM 6" (150 mm) TO 12" (300 mm)
(INVERTS VARY WITH PIPE SIZE)

SC-310 end cap

3.0 Structural Capabilities



3.1 STRUCTURAL DESIGN APPROACH

When installed per StormTech's minimum requirements, StormTech products are designed to exceed American Association of State Highway and Transportation Officials (AASHTO) LRFD recommended design factors for Earth loads and Vehicular live loads. AASHTO Vehicular live loads (previously HS-20) consist of two heavy axle configurations, that of a single 32 (142 kN) kip axle and that of tandem 25 (111 kN) kip axles. Factors for impact and multiple presences of vehicles ensure a conservative design where structural adequacy is assumed for a wide range of street legal vehicle weights and axle configurations.

Computer models of the chambers under shallow and deep conditions were developed. Utilizing design forces from computer models, chamber sections were evaluated using AASHTO procedures that consider thrust and moment, and check for local buckling capacity. The procedures also considered the time-dependent strength and stiffness properties of polypropylene and polyethylene. These procedures were developed in a research study conducted by the National Cooperative Highway Research Program (NCHRP) for AASHTO, and published as NCHRP Report 438 Recommended LRFD Specifications for Plastic Pipe and Culverts. *Product Specifications: 2.12.*

StormTech does not recommend installing StormTech products underneath buildings or parking garages. When specifying the StormTech products in close proximity to buildings, it is important to ensure that the StormTech products are not receiving any loads from these structures that may jeopardize the long term performance of the chambers.

3.2 FULL SCALE TESTING

After developing the StormTech chamber designs, the chambers were subjected to rigorous full-scale testing. The test programs verified the predicted safety factors of the designs by subjecting the chambers to more severe load conditions than anticipated during service life. Capacity under live loads and deep fill was investigated by conducting tests with a range of cover depths. Monitoring of long term deep fill installations has been done to validate the long term performance of the StormTech products.

3.3 INDEPENDENT EXPERT ANALYSIS

StormTech worked closely with the consulting firm Simpson Gumpertz & Heger Inc. (SGH) to develop and evaluate the SC-740, SC-310 and DC-780 chamber designs. SGH has world-renowned expertise in the design of buried drainage structures. The firm was the principal investigator for the NCHRP research program that developed the structural analysis and design methods adopted by AASHTO for thermoplastic culverts. SGH conducted design calculations and computer simulations of chamber performance under various installation and live load conditions. They worked with StormTech to design the full-scale test programs to verify the structural capacity of the chambers. SGH also observed all full-scale tests and inspected the chambers after completion of the tests. SGH continues to be StormTech's structural consultant.

3.4 INJECTION MOLDING

To comply with both the structural and design requirements of AASHTO's LRFD specifications and ASTM F 2787 as well as the product requirements of ASTM F 2418 or ASTM F2922, StormTech uses proprietary injection molding equipment to manufacture the chambers and end caps.

In addition to meeting structural goals, injection molding allows StormTech to design added features and advantages into StormTech's parts including:

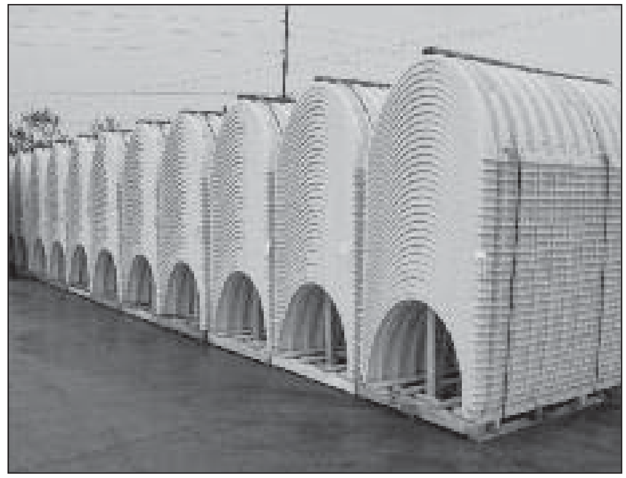
- Precise control of wall thickness throughout parts
- Precise fit of joints and end caps
- Molded-in inspection port fitting
- Molded-in handles on end caps
- Molded-in pipe guides with blade starter slots
- Repeatability for Quality Control (See Section 3.6)

Product Specifications: 2.1, 3.1 and 3.3

3.5 POLYPROPYLENE AND POLYETHYLENE RESIN

StormTech chambers are injection molded from polypropylene and polyethylene. Polypropylene and polyethylene chambers are inherently resistant to chemicals typically found in stormwater run-off. StormTech chambers maintain a greater portion of their structural stiffness through higher installation and service temperatures.

StormTech polypropylene and polyethylene are virgin materials specially designed to achieve a high 75-year creep modulus that is necessary to provide a sound long-term structural design. Since the modulus remains high well beyond the 75-year value, StormTech chambers can exhibit a service life in excess of 75 years.



3.6 QUALITY CONTROL

StormTech chambers are manufactured under tight quality control programs. Materials are routinely tested in an environmentally controlled lab that is verified every six months via the external ASTM Proficiency Testing Program. The chamber material properties are measured and controlled with procedures following ISO 9001:2000 requirements.

Statistical Process Control (SPC) techniques are applied during manufacturing. Established upper and lower control limits are maintained on key manufacturing parameters to maintain consistent product.
Product Specifications: 2.13 and 3.6

4.0 Foundation for Chambers

4.1 FOUNDATION REQUIREMENTS

StormTech chamber systems and embedment stone may be installed in various native soil types. The subgrade bearing capacity and chamber cover height determine the required depth of clean, crushed, angular stone for the chamber foundation. The chamber foundation is the clean, crushed, angular stone placed between the subgrade soils and the feet of the chamber.

As cover height increases (top of chamber to top of finished grade) the chambers foundation requirements increase. Foundation strength is the product of the subgrade soils bearing capacity and the depth of clean, crushed, angular stone below the chamber foot. **Table 1** for the SC-740 and SC-310 and **Table 2** for the DC-780 specify the required minimum foundation depth for varying cover heights and subgrade bearing capacities.

4.2 WEAKER SOILS

For sub-grade soils with allowable bearing capacity less than 2000 pounds per square foot [(2.0 ksf) (96 kPa)], a geotechnical engineer should evaluate the specific conditions. These soils are often highly variable, may contain organic materials and could be more sensitive to moisture. A geotechnical engineer's recommendations may include increasing the stone foundation, improving the bearing capacity of the sub-grade soils through compaction, replacement, or other remedial measures including the use of geogrids. The use of a thermoplastic liner may also be considered for systems installed in subgrade soils that are highly affected by moisture. The project engineer is responsible for ensuring overall site settlement is within acceptable limits. A geotechnical engineer should always review installation of StormTech chambers on organic soils.

4.3 CHAMBER SPACING OPTION

StormTech always requires a minimum of 6" (150 mm) clear spacing between the feet of chambers rows for the SC-310, SC-740 and DC-780 chambers. However, increasing the spacing between chamber rows may allow the application of StormTech chambers with either less foundation stone or with weaker subgrade soils. This may be a good option where a vertical restriction on site prevents the use of a deeper foundation. Contact StormTech's Technical Service Department for more information on this option. In all cases, StormTech recommends consulting a geotechnical engineer for subgrade soils with a bearing capacity less than 2.0 ksf (96 kPa).

Table 1 – SC-310 and SC-740 Minimum Required Foundation Depth in inches (millimeters)

Cover	Minimum Required Bearing Resistance for Service Loads ksf (kPa)																					
Ht. ft. (m)	4.1 (196)	4.0 (192)	3.9 (187)	3.8 (182)	3.7 (177)	3.6 (172)	3.5 (168)	3.4 (163)	3.3 (158)	3.2 (153)	3.1 (148)	3.0 (144)	2.9 (139)	2.8 (134)	2.7 (129)	2.6 (124)	2.5 (120)	2.4 (115)	2.3 (110)	2.2 (105)	2.1 (101)	2.0 (96)
1.5 (0.46)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)
2 (0.61)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)
2.5 (0.76)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	18 (457)
3 (0.91)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)
3.5 (1.07)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	18 (457)	18 (457)	21 (533)
4 (1.22)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	18 (457)	18 (457)	21 (533)
4.5 (1.37)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	18 (457)	18 (457)	21 (533)
5 (1.52)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)	21 (533)
5.5 (1.68)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)	21 (533)
6 (1.83)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)	21 (533)	21 (533)
6.5 (1.98)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)	18 (457)	21 (533)	24 (610)
7 (2.13)	6 (152)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)	21 (533)	21 (533)	24 (610)
7.5 (2.29)	6 (152)	6 (152)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)	21 (533)	21 (533)	24 (610)	27 (686)
8 (2.44)	6 (152)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)	21 (533)	21 (533)	24 (610)	24 (610)	27 (686)

NOTE: The design engineer is solely responsible for assessing the bearing resistance (allowable bearing capacity) of the subgrade soils and determining the depth of foundation stone. Subgrade bearing resistance should be assessed with consideration for the range of soil moisture conditions expected under a stormwater system.

4.0 Foundation for Chambers/5.0 Cumulative Storage Volumes

Table 2 – DC-780 Minimum Required Foundation Depth in inches (millimeters)

Cover Ht. ft. (m)	Minimum Required Bearing Resistance for Service Loads ksf (kPa)																					
	4.1 (196)	4.0 (192)	3.9 (187)	3.8 (182)	3.7 (177)	3.6 (172)	3.5 (168)	3.4 (163)	3.3 (158)	3.2 (153)	3.1 (148)	3.0 (144)	2.9 (139)	2.8 (134)	2.7 (129)	2.6 (124)	2.5 (120)	2.4 (115)	2.3 (110)	2.2 (105)	2.1 (101)	2.0 (96)
8.5 (2.59)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)	18 (457)	21 (533)	24 (610)	24 (610)	27 (686)	30 (762)
9.0 (2.74)	9 (229)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)	18 (457)	21 (533)	21 (533)	24 (610)	24 (610)	27 (686)	30 (762)
9.5 (2.90)	9 (229)	9 (229)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)	18 (457)	21 (533)	21 (533)	24 (610)	24 (610)	27 (686)	30 (762)	33 (838)
10.0 (3.05)	9 (229)	9 (229)	12 (305)	12 (305)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)	18 (457)	21 (533)	21 (533)	24 (610)	24 (610)	27 (686)	30 (762)	33 (838)	36 (915)
10.5 (3.20)	9 (229)	12 (305)	12 (305)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)	18 (457)	21 (533)	21 (533)	24 (610)	24 (610)	27 (686)	30 (762)	30 (762)	33 (838)	36 (915)
11.0 (3.35)	12 (305)	12 (305)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)	18 (457)	21 (533)	21 (533)	24 (610)	24 (610)	27 (686)	27 (686)	30 (762)	33 (838)	36 (915)	39 (991)
11.5 (3.50)	12 (305)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)	18 (457)	21 (533)	21 (533)	24 (610)	24 (610)	27 (686)	27 (686)	30 (762)	33 (838)	36 (915)	39 (991)	42 (1067)
12.0 (3.66)	12 (305)	12 (305)	12 (305)	15 (381)	15 (381)	15 (381)	15 (381)	18 (457)	18 (457)	18 (457)	21 (533)	21 (533)	21 (533)	24 (610)	24 (610)	27 (686)	30 (762)	30 (762)	33 (838)	36 (915)	39 (991)	42 (1067)

NOTE: The design engineer is solely responsible for assessing the bearing resistance (allowable bearing capacity) of the subgrade soils and determining the depth of foundation stone. Subgrade bearing resistance should be assessed with consideration for the range of soil moisture conditions expected under a stormwater system.

Tables 3, 4 and **5** provide cumulative storage volumes for the SC-310, SC-740 and DC-780 chamber systems. This information may be used to calculate a detention/retention system's stage storage volume. A spreadsheet is available at www.stormtech.com in which the number of chambers can be input for quick cumulative storage calculations. *Product Specifications: 1.1, 2.2, 2.3, 2.4, and 2.6*

Table 3 - SC-310 Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under the Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
28 (711)	↑ 14.70 (0.416)	31.00 (0.878)
27 (686)	14.70 (0.416)	30.21 (0.855)
26 (680)	Stone 14.70 (0.416)	29.42 (0.833)
25 (610)	Cover 14.70 (0.416)	28.63 (0.811)
24 (609)	14.70 (0.416)	27.84 (0.788)
23 (584)	↓ 14.70 (0.416)	27.05 (0.766)
22 (559)	14.70 (0.416)	26.26 (0.748)
21 (533)	14.64 (0.415)	25.43 (0.720)
20 (508)	14.49 (0.410)	24.54 (0.695)
19 (483)	14.22 (0.403)	23.58 (0.668)
18 (457)	13.68 (0.387)	22.47 (0.636)
17 (432)	12.99 (0.368)	21.25 (0.602)

Table 3 - SC-310 Cumulative Storage Volumes (cont.)

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
16 (406)	12.17 (0.345)	19.97 (0.566)
15 (381)	11.25 (0.319)	18.62 (0.528)
14 (356)	10.23 (0.290)	17.22 (0.488)
13 (330)	9.15 (0.260)	15.78 (0.447)
12 (305)	7.99 (0.227)	14.29 (0.425)
11 (279)	6.78 (0.192)	12.77 (0.362)
10 (254)	5.51 (0.156)	11.22 (0.318)
9 (229)	4.19 (0.119)	9.64 (0.278)
8 (203)	2.83 (0.081)	8.03 (0.227)
7 (178)	1.43 (0.041)	6.40 (0.181)
6 (152)	↑ 0	4.74 (0.134)
5 (127)	0	3.95 (0.112)
4 (102)	Stone 0	3.16 (0.090)
3 (76)	Foundation 0	2.37 (0.067)
2 (51)	0	1.58 (0.046)
1 (25)	↓ 0	0.79 (0.022)

Note: Add 0.79 ft³ (0.022 m³) of storage for each additional inch (25 mm) of stone foundation.

5.0 Cumulative Storage Volumes

TABLE 4 – SC-740 Cumulative Storage Volumes Per Chamber
Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under the Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage Ft^3 (m^3)	Total System Cumulative Storage Ft^3 (m^3)
42 (1067)	↑ 45.90 (1.300)	74.90 (2.121)
41 (1041)	45.90 (1.300)	73.77 (2.089)
40 (1016)	Stone 45.90 (1.300)	72.64 (2.057)
39 (991)	Cover 45.90 (1.300)	71.52 (2.025)
38 (965)	45.90 (1.300)	70.39 (1.993)
37 (948)	↓ 45.90 (1.300)	69.26 (1.961)
36 (914)	45.90 (1.300)	68.14 (1.929)
35 (889)	45.85 (1.298)	66.98 (1.897)
34 (864)	45.69 (1.294)	65.75 (1.862)
33 (838)	45.41 (1.286)	64.46 (1.825)
32 (813)	44.81 (1.269)	62.97 (1.783)
31 (787)	44.01 (1.246)	61.36 (1.737)
30 (762)	43.06 (1.219)	59.66 (1.689)
29 (737)	41.98 (1.189)	57.89 (1.639)
28 (711)	40.80 (1.155)	56.05 (1.587)
27 (686)	39.54 (1.120)	54.17 (1.534)
26 (660)	38.18 (1.081)	52.23 (1.479)
25 (635)	36.74 (1.040)	50.23 (1.422)
24 (610)	35.22 (0.977)	48.19 (1.365)
23 (584)	33.64 (0.953)	46.11 (1.306)
22 (559)	31.99 (0.906)	44.00 (1.246)
21 (533)	30.29 (0.858)	41.85 (1.185)
20 (508)	28.54 (0.808)	39.67 (1.123)
19 (483)	26.74 (0.757)	37.47 (1.061)
18 (457)	24.89 (0.705)	35.23 (0.997)
17 (432)	23.00 (0.651)	32.96 (0.939)
16 (406)	21.06 (0.596)	30.68 (0.869)
15 (381)	19.09 (0.541)	28.36 (0.803)
14 (356)	17.08 (0.484)	26.03 (0.737)
13 (330)	15.04 (0.426)	23.68 (0.670)
12 (305)	12.97 (0.367)	21.31 (0.608)
11 (279)	10.87 (0.309)	18.92 (0.535)
10 (254)	8.74 (0.247)	16.51 (0.468)
9 (229)	6.58 (0.186)	14.09 (0.399)
8 (203)	4.41 (0.125)	11.66 (0.330)
7 (178)	2.21 (0.063)	9.21 (0.264)
6 (152)	↑ 0	6.76 (0.191)
5 (127)	0	5.63 (0.160)
4 (102)	Stone 0	4.51 (0.125)
3 (76)	Foundation 0	3.38 (0.095)
2 (51)	0	2.25 (0.064)
1 (25)	↓ 0	1.13 (0.032)

Note: Add 1.13 ft^3 (0.032 m^3) of storage for each additional inch (25 mm) of stone foundation.

Table 5 - DC-780 Cumulative Storage Volumes Per Chamber
Assumes 40% Stone Porosity. Calculations are Based Upon a 9" (230 mm) Stone Base Under the Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage Ft^3 (m^3)	Total System Cumulative Storage Ft^3 (m^3)
45 (1143)	↑ 46.27 (1.310)	78.47 (2.222)
44 (1118)	46.27 (1.310)	77.34 (2.190)
43 (1092)	Stone 46.27 (1.310)	76.21 (2.158)
42 (1067)	Cover 46.27 (1.310)	75.09 (2.126)
41 (1041)	46.27 (1.310)	73.96 (2.094)
40 (1016)	↓ 46.27 (1.310)	72.83 (2.062)
39 (991)	46.27 (1.310)	71.71 (2.030)
38 (965)	46.21 (1.309)	70.54 (1.998)
37 (940)	46.04 (1.304)	69.32 (1.963)
36 (914)	45.76 (1.296)	68.02 (1.926)
35 (889)	45.15 (1.278)	66.53 (1.884)
34 (864)	44.34 (1.255)	64.91 (1.838)
33 (838)	43.38 (1.228)	63.21 (1.790)
32 (813)	42.29 (1.198)	61.43 (1.740)
31 (787)	41.11 (1.164)	59.59 (1.688)
30 (762)	39.83 (1.128)	57.70 (1.634)
29 (737)	38.47 (1.089)	55.76 (1.579)
28 (711)	37.01 (1.048)	53.76 (1.522)
27 (686)	35.49 (1.005)	51.72 (1.464)
26 (660)	33.90 (0.960)	49.63 (1.405)
25 (635)	32.24 (0.913)	47.52 (1.346)
24 (610)	30.54 (0.865)	45.36 (1.285)
23 (584)	28.77 (0.815)	43.18 (1.223)
22 (559)	26.96 (0.763)	40.97 (1.160)
21 (533)	25.10 (0.711)	38.72 (1.096)
20 (508)	23.19 (0.657)	36.45 (1.032)
19 (483)	21.25 (0.602)	34.16 (0.967)
18 (457)	19.26 (0.545)	31.84 (0.902)
17 (432)	17.24 (0.488)	29.50 (0.835)
16 (406)	15.19 (0.430)	27.14 (0.769)
15 (381)	13.10 (0.371)	24.76 (0.701)
14 (356)	10.98 (0.311)	22.36 (0.633)
13 (330)	8.83 (0.250)	19.95 (0.565)
12 (305)	6.66 (0.189)	17.52 (0.496)
11 (279)	4.46 (0.126)	15.07 (0.427)
10 (254)	2.24 (0.064)	12.61 (0.357)
9 (229)	↑ 0	10.14 (0.287)
8 (203)	0	9.01 (0.255)
7 (178)	Stone 0	7.89 (0.223)
6 (152)	Foundation 0	6.76 (0.191)
5 (127)	0	5.63 (0.160)
4 (102)	0	4.51 (0.128)
3 (76)	0	3.38 (0.096)
2 (51)	0	2.25 (0.064)
1 (25)	↓ 0	1.13 (0.032)

Note: Add 1.13 cu. ft. (0.032 m^3) of storage for each additional inch (25 mm) of stone foundation.

6.1 CHAMBER ROW SEPARATION

StormTech SC-740, SC-310 and DC-780 chambers must be specified with a minimum 6" (150 mm) space between the feet of adjacent parallel chamber rows. Increasing the space between rows is acceptable. This will increase the storage volume due to additional stone voids.

6.2 STONE SURROUNDING CHAMBERS

Refer to **Table 6** for acceptable stone materials. StormTech requires clean, crushed, angular stone below, between and above chambers as shown in **Figure 6**. Acceptable gradations are listed in **Table 6.** Subrounded and rounded stone are not acceptable.

6.3 GEOTEXTILE SEPARATION REQUIREMENT

A non-woven geotextile that meets AASHTO M288 Class 2 Separation requirements must be applied as a separation layer to prevent soil intrusion into the clean, crushed, angular stone as shown in **Figure 6**. The geotextile is required between the clean, crushed, angular stone and the subgrade soils, the excavation's sidewalls and the fill materials. The geotextile should completely envelope the clean, crushed, angular stone. Overlap adjacent geotextile rolls per AASHTO M288 separation guidelines. Contact StormTech for a list of acceptable geotextiles.

6.4 FILL ABOVE CHAMBERS

Refer to **Table 6** and **Figure 6** for acceptable fill material above the 6" (150 mm) of clean, crushed, angular stone. Minimum and maximum fill requirements for the SC-740, SC-310 and DC-780 chambers are shown in **Figure 6** below. StormTech requires a minimum of 24" (600 mm) of fill in non-paved installations where rutting from vehicles may occur. **Table 6** provides details on soil class and compaction requirements for suitable fill materials.

Table 6 – Acceptable Fill Materials

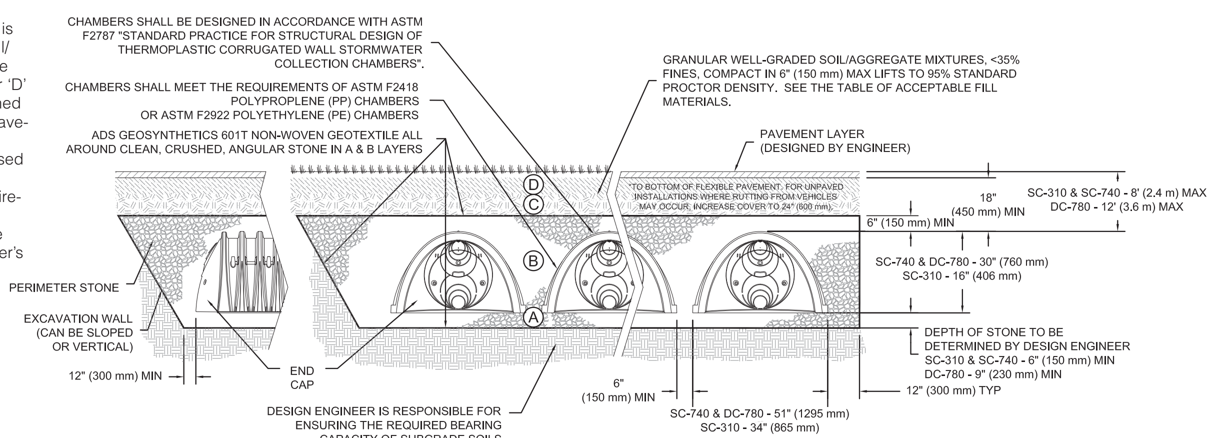
MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2,3]

PLEASE NOTE:

1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.

Figure 6 – Fill Material Locations

Once layer 'C' is placed any soil/material can be placed in layer 'D' up to the finished grade. Most pavement subbase soils can be used to replace the materials requirements of layer 'C' or 'D' at the design engineer's discretion.



7.0 Inletting the Chambers

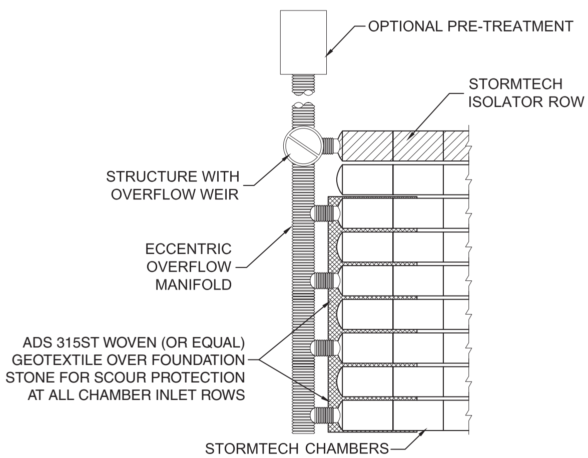
The design flexibility of a StormTech chamber system includes many inletting possibilities. Contact StormTech's Technical Service Department for guidance on designing an inlet system to meet specific site goals.

7.1 TREATMENT TRAIN

A properly designed inlet system can ensure good water quality, easy inspection and maintenance, and a long system service life. StormTech recommends a treatment train approach for inletting an underground stormwater management system under a typical commercial parking area. *Treatment train* is an industry term for a multi-tiered water quality network. As shown in **Figure 7**, a StormTech recommended inlet system can inexpensively have tiers of treatment upstream of the StormTech chambers:

Tier 1 – Pre-treatment (BMP)
Tier 2 - StormTech Isolator® Row
Tier 3 - Enhanced Treatment (BMP)

Figure 7 – Typical StormTech Treatment Train Inlet System



7.2 PRE-TREATMENT (BMP) – TREATMENT TIER 1

In some areas pre-treatment of the stormwater is required prior to entry into a stormwater system. By treating the stormwater prior to entry into the system, the service life of the system can be extended, pollutants such as hydrocarbons may be captured, and local regulations met. Pre-treatment options are often described as a Best Management Practice or simply a BMP.

Pre-treatment devices differ greatly in complexity, design and effectiveness. Depending on a site's characteristics and treatment goals, the simple, least expensive pre-treatment solutions can sometimes be just as effective as the complex systems. Options include a simple deep sumped manhole with a 90° bend on its outlet, baffle boxes, swirl concentrators, and devices that combine these processes. Some of the most effective pre-treatment options combine engineered site grading with vegetation such as bio-swales or grassy strips.

The type of pretreatment device specified as the first level of treatment up-stream of a StormTech chamber system can vary greatly throughout the country and from site-to-site. It is the responsibility of the design engineer to understand the water quality requirements and design a stormwater treatment system that will satisfy local regulators and follow applicable laws. A design engineer should apply their understanding of local weather conditions, site topography, local maintenance requirements, expected service life, etc…to select an appropriate stormwater pre-treatment system.

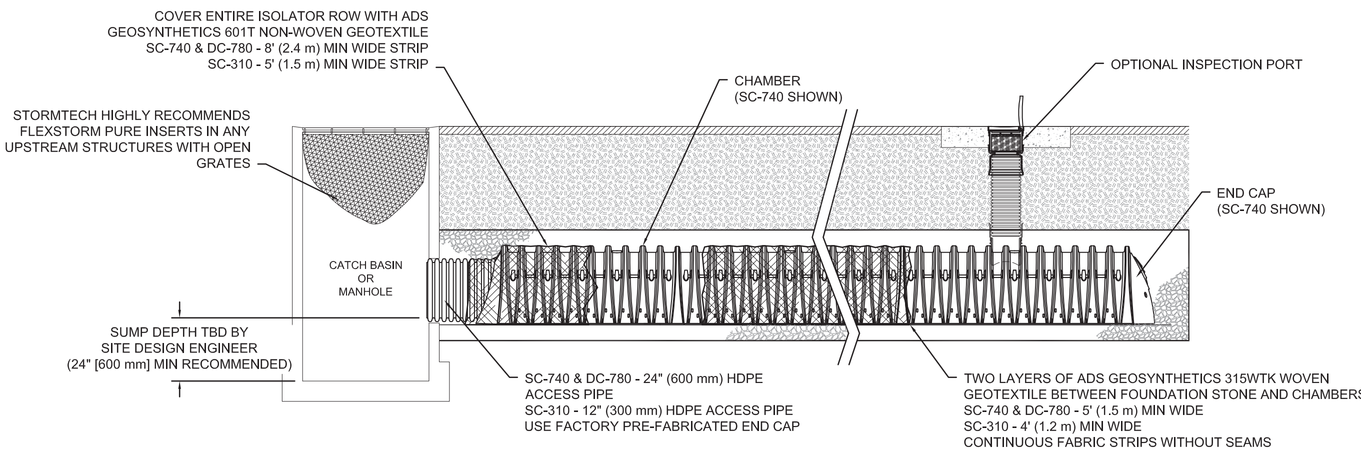
7.3 STORMTECH ISOLATOR ROW – TREATMENT TIER 2

StormTech has a patented technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance. The StormTech Isolator Row is a row of standard StormTech chambers surrounded with appropriate filter fabrics and connected to a manhole for easy access. This application basically creates a filter/detention basin that allows water to egress through the surrounding filter fabric while sediment is trapped within. It may be best to think of the Isolator Row as a first-flush treatment device. *First-Flush* is a term typically used to describe the first ½" to 1" (13-25 mm) of rainfall or runoff on a site. The majority of stormwater pollutants are carried in the sediments of the first-flush, therefore the Isolator Row is an effective component of a treatment train.

The StormTech Isolator Row should be designed with a manhole with an overflow weir at its upstream end. The diversion manhole is multi-purposed. It can provide access to the Isolator Row for both inspection and maintenance and acts as a diversion structure. The manhole is connected to the Isolator Row with a short length of 12" (300 mm) pipe for the SC-310 chamber and 24" (600 mm) pipe for the SC-740 and DC-780 chambers. These pipes are connected to the Isolator Row with a 12" (300 mm) fabricated end cap for the SC-310 chamber and a 24" (600 mm) fabricated end cap for the SC-740 and DC-780 chambers. The overflow weir typically has its crest set between the top of the chamber and its midpoint. This allows stormwater in excess of the Isolator Row's storage/conveyance capacity to bypass into the chamber system through the downstream manifold system.

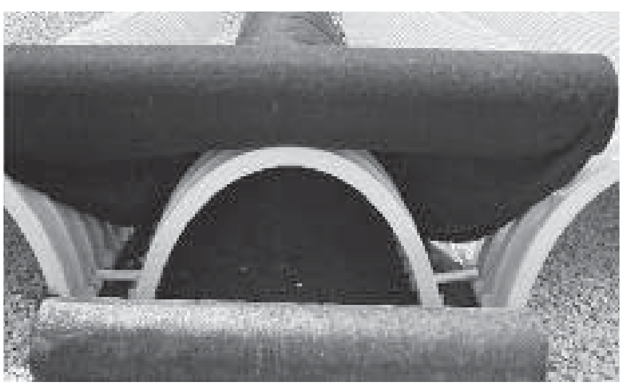
Specifying and installing proper geotextiles is essential for efficient operation and to prevent damage to the system during the JetVac maintenance process. In a typical configuration, two strips of woven geotextile that meet AASHTO M288 Class 1 requirements are required between the chambers and the stone foundation. This strong filter fabric traps sediments and protects the stone base during maintenance. A strip of non-woven

Figure 8 – StormTech Isolator Row Detail



Note: Non-woven geotextile over DC-780 Isolator Row chambers is not required.

AASHTO M288 Class 2 geotextile is draped over the Isolator chamber row. This 6-8 oz. (217-278 g/m^2) non-woven filter fabric prevents sediments from migrating out of the chamber perforations while allowing modest amounts of water to flow out of the Isolator Row. **Figure 8** is a detail of the Isolator Row that shows proper application of the geotextiles. Contact StormTech for a table of acceptable geotextiles.



Inspection is easily accomplished through the upstream manhole or optional inspection ports. Maintenance of an Isolator Row is fast and easy using the JetVac process through the upstream manhole. Section 12.0 explains the inspection and maintenance process in more detail.

Isolator Rows can be sized to accommodate either a water quality volume or a water quality flow rate requirement. The use of filter fabric around the Isolator Row chambers allows stormwater to egress out of the row during and between storm events. The rate of egression for design is dependent upon the chamber model and sediment accumulation on the geotextile. Contact StormTech's Technical Services Department for more information on Isolator Row sizing.

7.4 ENHANCED TREATMENT (BMP) – TREATMENT TIER 3

As regulations have become more stringent, requiring higher levels of containment removal, water quality systems may be required to treat higher flow rates, greater volumes or to provide a higher level of filtration or other more sophisticated treatment process. StormTech systems can easily be configured with enhanced treatment techniques located either upstream or down stream of the retention or detention chamber system. Located upstream of an infiltration bed, between the pretreatment device and the Isolator Row, enhanced treatment provides a high level of contaminant removal which protects groundwater or better preserves the infiltration surface. Located downstream of detention, enhanced treatment provides a higher level of contaminant removal prior to discharge to a receiving body.

Enhanced treatment BMPs are normally applied where specific regulations and specific water quality product approvals are in place. StormTech works closely with providers of enhanced treatment technologies to meet local requirements.

7.5 TREATMENT TRAIN CONCLUSION

The treatment train is a highly effective water-quality approach that may not add significant cost to a StormTech system being installed under commercial parking areas. The StormTech Isolator Row adds a significant level of treatment, easy inspection and maintenance, while maintaining storage volume credit for the cost of a modest amount of geotextile. Finally where higher levels of treatment are required, StormTech can integrate other technologies into the treatment train to provide the most cost effective treatment approach. This treatment train concept provides three levels of treatment, inspection and maintenance upstream and downsstream of the StormTech detention/retention bed.

7.0 Inletting the Chambers

7.6 OTHER INLET OPTIONS

While the three-tiered treatment train approach is the recommended method of inletting StormTech chambers for typical under-commercial parking applications, there are other effective inlet methods that may be considered. For instance, Isolator Rows, while adding an inexpensive level of confidence, are not always necessary. A header system with fewer inlets can be designed to further minimize the cost of a StormTech system. There may be applications where stormwater pre-treatment may not be necessary at all and the system can be inlet directly from the source. Contact StormTech's Technical Service Department to discuss inlet options.

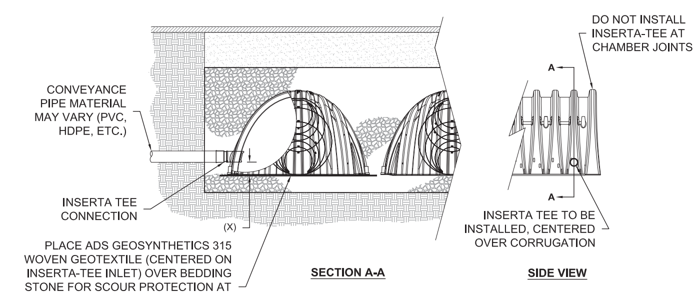
7.7 LATERAL FLOW RATES

The embedment stone surrounding the StormTech chambers allows the rapid conveyance of stormwater between chamber rows. Stormwater will rise and fall evenly within a bed of chambers. A single StormTech SC-740 chamber is able to release or accept stormwater at a rate of at least 0.5 cfs (14.2 l/s) through the surrounding stone.

7.8 INLETTING PERPENDICULAR TO A ROW OF CHAMBERS WITH INSERTA TEE

There is an easy, inexpensive method to perpendicularly inlet a row of chambers. Simply connect the inlet directly to the chamber with an Inserta Tee. **Figure 9** shows a typical detail along with the standard sizes offered for each chamber model.

Figure 9 – Inserta Tee Detail



CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

7.9 MAXIMUM INLET PIPE VELOCITIES TO PREVENT SCOURING OF THE STONE FOUNDATION

The primary function of the inlet manifold is to convey and distribute flows to a sufficient number of rows in the chamber bed such that there is ample conveyance capacity to pass the peak flows without creating an unacceptable backwater condition in upstream piping or scour the foundation stone under the chambers.

Manifolds are connected to the end caps either at the top or bottom of the end cap. High inlet flow rates from either connection location produce a shear scour potential of the foundation stone. Inlet flows from top inlets also produce impingement scour potential. Scour potential is reduced when standing water is present over the foundation stone. However, for safe design across the wide range of applications, StormTech assumes minimal standing water at the time the design flow occurs.

To minimize scour potential, StormTech recommends the installation of woven scour protection fabric at each inlet row. This enables a protected transition zone from the concentrated flow coming out of the inlet pipe to a uniform flow across the entire width of the chamber for both top and bottom connections. Allowable flow rates for design are dependent upon: the elevation of inlet pipe, foundation stone size and scour protection. An appropriate scour protection geotextile is installed from the end cap to at least 10.5' (3.2 m) for the SC-310, SC-740 and DC 780 chambers for both top and bottom feeding inlet pipes.

See StormTech's Tech Sheet #7 for guidance on manifold sizing. ADS's Technical Services department can also assist with sizing inlet manifolds for the StormTech chamber systems.

Table 7A – Standard distances from base of chamber to invert of inlet and outlet manifolds on StormTech end caps.

SC-310 ENDCAPS				
	PIPE DIA.	INV. (IN)	INV. (FT)	INV. (MM)
TOP	6" (150 mm)	5.8"	0.48	146
	8" (200 mm)	3.5"	0.29	88
	10" (250 mm)	1.4"	0.12	37
BOTTOM	6" (150 mm)	0.5"	0.04	12
	8" (200 mm)	0.6"	0.05	15
	10" (250 mm)	0.7"	0.06	18
	12" (300 mm)	0.9"	0.08	24

SC-740 / DC-780 ENDCAPS				
	PIPE DIA.	INV. (IN)	INV. (FT)	INV. (MM)
TOP	6" (150 mm)	18.5"	1.54	469
	8" (200 mm)	16.5"	1.38	421
	10" (250 mm)	14.5"	1.21	369
	12" (300 mm)	12.5"	1.04	317
	15" (375 mm)	9"	0.75	229
	18" (450 mm)	5"	0.42	128
BOTTOM	6" (150 mm)	0.5"	0.04	12
	8" (200 mm)	0.6"	0.05	15
	10" (250 mm)	0.7"	0.06	18
	12" (300 mm)	1.2"	0.10	30
	15" (375 mm)	1.3"	0.11	34
	18" (450 mm)	1.6"	0.13	40
	24" (600 mm)	0.1"	0.01	3

See StormTech's Tech Sheet #7 for manifold sizing guidance

StormTech®

8.0 OUTLETS FOR STORMTECH CHAMBER SYSTEMS

The majority of StormTech installations are detention systems and have some type of outlet structure. An outlet manifold is generally designed to ensure that peak flows can be conveyed to the outlet structure.

To drain the system completely, an underdrain system is located at or below the bottom of the foundation stone. Some beds may be designed with a pitched base to ensure complete drainage of the system. A grade of ½% is usually satisfactory.

An outlet pipe may be located at a higher invert within a bed. This allows a designed volume of water to infiltrate while excess volumes are outlet as necessary. This is an excellent method of recharging groundwater, replicating a site's pre-construction hydraulics.

Depending on the bed layout and inverts, outlet pipes should be placed in the embedment stone along the bed's perimeter as shown in **Figures 10** and **11**. Solid outlet pipes should also be used to penetrate the StormTech end caps at the designed outlet invert as shown in **Figure 12**. An Isolator Row should not be directly penetrated with an outlet pipe. For systems requiring higher outlet flow rates, a combination of connections may be utilized as shown in **Figure 13**.

In detention and retention applications the discharge of water from the stormwater management system is determined based on the hydrology of the area and the hydraulic design of the system. It is the design engineer's responsibility to design an outlet system that meets their hydraulic objectives while following local laws and regulations.

Table 7B – Maximum outlet flow rate capacities from StormTech manifolds.

OUTLET FLOW		
PIPE DIA.	**FLOW (CFS)**	**FLOW (L/S)**
6" (150 mm)	0.4	11.3
8" (200 mm)	0.7	19.8
10" (250 mm)	1.0	28.3
12" (300 mm)	2.0	56.6
15" (375 mm)	2.7	76.5
18" (450 mm)	4.0	113.3
24" (600 mm)	7.0	198.2
30" (750 mm)	11.0	311.5
36" (900 mm)	16.0	453.1
42" (1050 mm)	22.0	623.0
48" (1200 mm)	28.0	792.9

Figure 10 – Underdrain Parallel

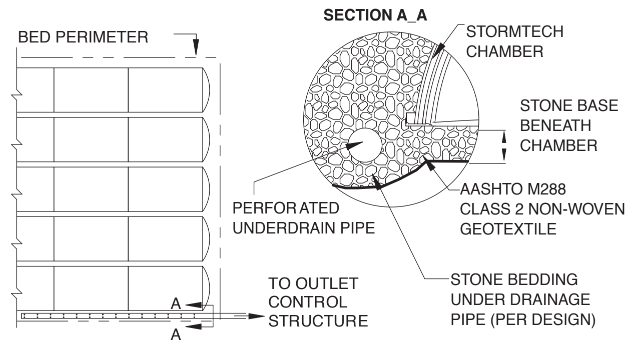


Figure 11 – Underdrain Perpendicular

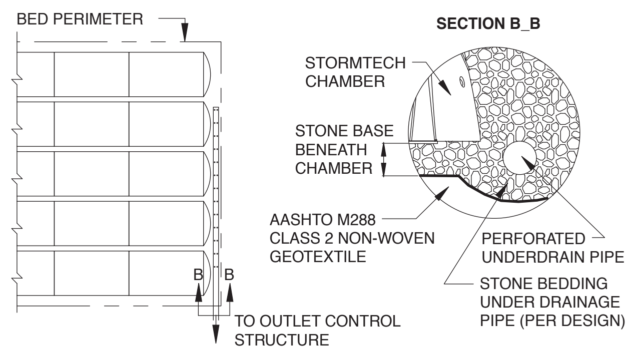


Figure 12 – Outlet Manifold

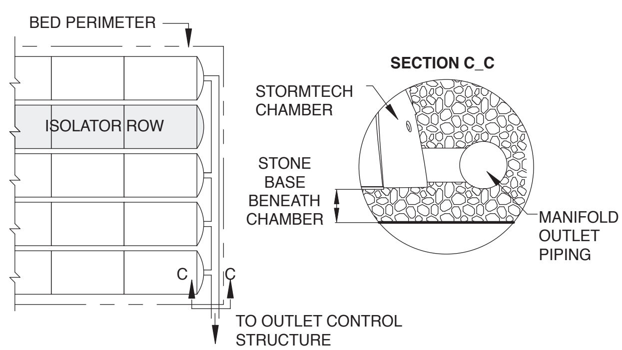
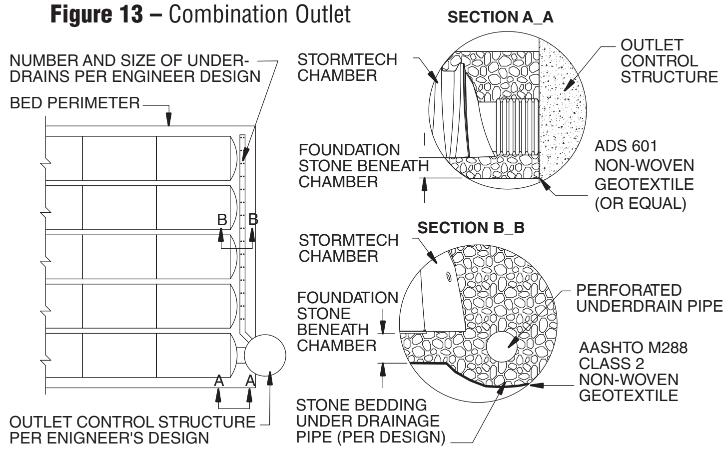


Figure 13 – Combination Outlet



9.1 EROSION CONTROL

Erosion and sediment control measures must be integrated into the plan to protect the stormwater system both during and after construction. These practices may have a direct impact on the system's infiltration performance and longevity. Vegetation, temporary sediment barriers (silt fences, hay bales, fabric-wrapped catch basin grates), and strategic stormwater runoff management may be used to control erosion and sedimentation. StormTech recommends the use of pipe plugs on the inlet pipe until the system is in service.

9.2 SITE IMPROVEMENT TECHNIQUES

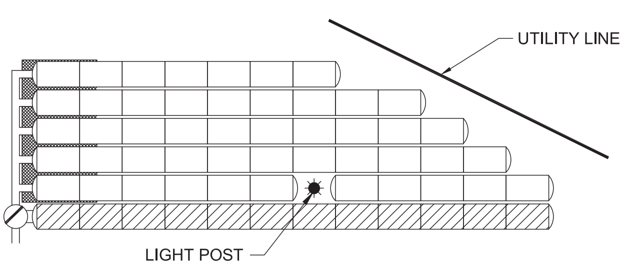
When site conditions are less than optimal, StormTech recognizes many methods for improving a site for construction. Some techniques include the removal and replacement of poor materials, the use of engineered subgrade materials, aggregates, chemical treatment, and mechanical treatments including the use of geosynthetics. StormTech recommends referring to AASHTO M 288 guidelines for the appropriate use of geotextiles.

StormTech also recognizes geogrid as a potential component of an engineered solution to improve site conditions or as a construction tool for the experienced contractor. StormTech chamber systems are compatible with the use of geosynthetics. The use of geosynthetics or any other site improvement method does not eliminate or modify any of StormTech's requirements. **It is the ultimate responsibility of the design engineer to ensure that site conditions are suitable for a StormTech chamber system.**

9.3 CONFORMING TO SITE CONSTRAINTS

StormTech chambers have the unique ability to conform to site constraints such as utility lines, light posts, large trees, etc. Rows of chambers can be ended short or interrupted by placing an end cap at the desired location, leaving the required number of chambers out of the row to get by the obstruction, then starting the row of chambers again with another end cap. See **Figure 14** for an example.

Figure 14 – Ability to Conform to Site Constraints



9.4 LINERS

StormTech chambers offer the distinct advantage and versatility that allow them to be designed as an open bottom detention or retention system. In fact, the vast majority of StormTech installations and designs are open bottom detention systems. Using an open bottom system enables treatment of the storm water through the underlying soils and provides a volume safety factor based on the infiltrative capacity of the underlying soils.

In some applications, however, open bottom detention systems may not be allowed. StormTech's Tech Sheet #2 provides guidance for the design and installation of thermoplastic liners for detention systems using StormTech chambers. The major points of the memo are:

- Infiltration of stormwater is generally a desirable stormwater management practice, often required by regulations. Lined systems should only be specified where unique site conditions preclude significant infiltration.
- Thermoplastic liners provide cost effective and viable means to contain stormwater in StormTech subsurface systems where infiltration is undesirable.
- PVC and LLDPE are the most cost effective, installed membrane materials.
- Enhanced puncture resistance from angular aggregate on the water side and from protrusions on the soil side can be achieved by placing a non-woven geotextile reinforcement on each side of the geomembrane. A sand underlayment in lieu of the geotextile reinforcement on the soil side may be considered when cost effective.
- StormTech does not design, fabricate, sell or install thermoplastic liners. StormTech recommends consulting with liner professionals for final design and installation advice.

Figure 15 – Chamber bed placed around light post.

For quick calculations, refer to the Site Calculator on StormTech's website at ***www.stormtech.com****.*

10.1 SYSTEM SIZING

The following steps provide the calculations necessary to size a system. If you need assistance determining the number of chambers per row or customizing the bed configuration to fit a specific site, call StormTech's Technical Services Department at **1-888-892-2694.**

1) Determine the amount of storage volume (V_S) required.

It is the design engineer's sole responsibility to determine the storage volume required by local codes.

TABLE 8 – Storage Volume Per Chamber ft³ (m³)

	Bare Chamber Storage	Chamber and Stone Foundation Depth in. (mm)		
	ft³ (m³)	6 (150)	12 (300)	18 (450)
StormTech SC-740	45.9 (1.3)	74.9 (2.1)	81.7 (2.3)	88.4 (2.5)
StormTech SC-310	14.7 (0.4)	31.0 (0.9)	35.7 (1.0)	40.4 (1.1)
	ft³ (m³)	9 (230)	12 (300)	18 (450)
StormTech DC-780	46.2 (1.3)	78.4 (2.2)	81.8 (2.3)	88.6 (2.5)

Note: Assumes 40% porosity for the stone plus the chamber volume.

2) Determine the number of chambers (C) required.

To calculate the number of chambers needed for adequate storage, divide the storage volume (Vs) by the volume of the selected chamber, as follows:
C = Vs / Volume per Chamber

3) Determine the required bed size (S).

To find the size of the bed, multiply the number of chambers needed (C) by either:

StormTech SC-740 / DC-780
bed area per chamber = 33.8 ft² (3.1 m³)

StormTech SC-310
bed area per chamber = 23.7 ft² (2.2 m³)

S = (C x bed area per chamber) +
[1 foot (0.3 m) x bed perimeter in feet (meters)]

NOTE: It is necessary to add one foot (0.3 m) around the perimeter of the bed for end caps and working space.

4) Determine the amount of clean, crushed, angular stone (Vst) required.

TABLE 9 – Amount of Stone Per Chamber

	Stone Foundation Depth		
ENGLISH tons (yd³)	6"	12"	18"
StormTech SC-740	3.8 (2.8)	4.6 (3.3)	5.5 (3.9)
StormTech SC-310	2.1 (1.5)	2.7 (1.9)	3.4 (2.4)
METRIC kg (m³)	150 mm	300 mm	450 mm
StormTech SC-740	3450 (2.1)	4170 (2.5)	4490 (3.0)
StormTech SC-310	1830 (1.1)	2490 (1.5)	2990 (1.8)
ENGLISH tons (yd³)	9"	12"	18"
StormTech DC-780	4.2 (3.0)	4.7 (3.3)	5.6 (3.9)
METRIC kg (m³)	230 mm	300 mm	450 mm
StormTech DC-780	3810 (2.3)	4264 (2.5)	5080 (3.0)

Note: Assumes 6" (150 mm) of stone above, and between chambers.

To calculate the total amount of clean, crushed, angular stone required, multiply the number of chambers (C) by the selected weight of stone from **Table 9.**
NOTE: Clean, crushed, angular stone is also required around the perimeter of the system.

5) Determine the volume of excavation (Ex) required.
6) Determine the area of filter fabric (F) required.

TABLE 10 – Volume of Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	6" (150 mm)	12" (300 mm)	18" (450 mm)
StormTech SC-740	5.5 (4.2)	6.2 (4.7)	6.8 (5.2)
StormTech SC-310	2.9 (2.2)	3.4 (2.6)	3.8 (2.9)
	9" (230 mm)	12" (300 mm)	18" (457 mm)
StormTech DC-780	5.9 (4.5)	6.3 (4.8)	6.9 (5.3)

Note: Assumes 6" (150 mm) of separation between chamber rows and 18" (450 mm) of cover. The volume of excavation will vary as the depth of the cover increases.

Each additional foot of cover will add a volume of excavation of 1.3 yds³ (1.0 m³) per SC-740 / DC-780 and 0.9 yds³ (0.7 m³) per SC-310 chamber.

The bottom and sides of the bed and the top of the embedment stone must be covered with ADS 601 (or equal) a non-woven geotextile (filter fabric). The area of the sidewalls must be calculated and a 2 foot (0.6 m) overlap must be included where two pieces of filter fabric are placed side-by-side or end-to-end. Geotextiles typically come in 15 foot (4.6 m) wide rolls.

7) Determine the number of end caps (E_C) required.

Each row of chambers requires two end caps.
E_C = number of rows x 2

11.0 Detail Drawings

Figure 16 – Inspection Port Detail

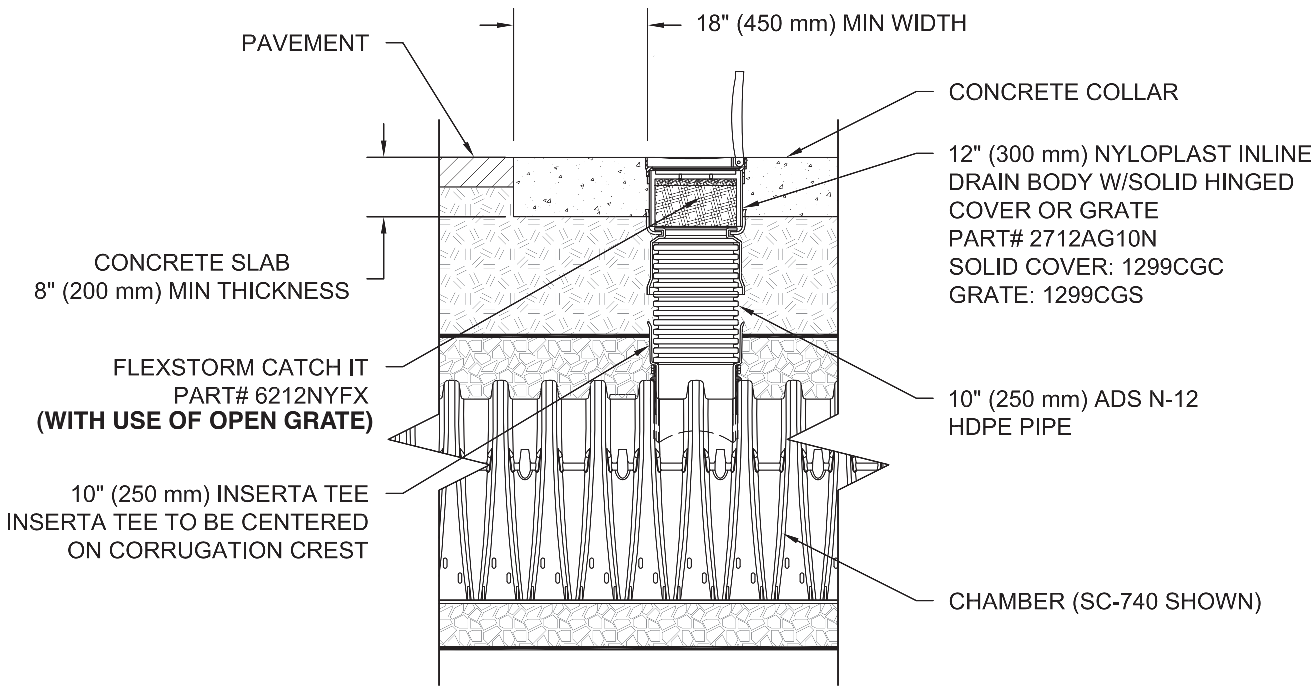
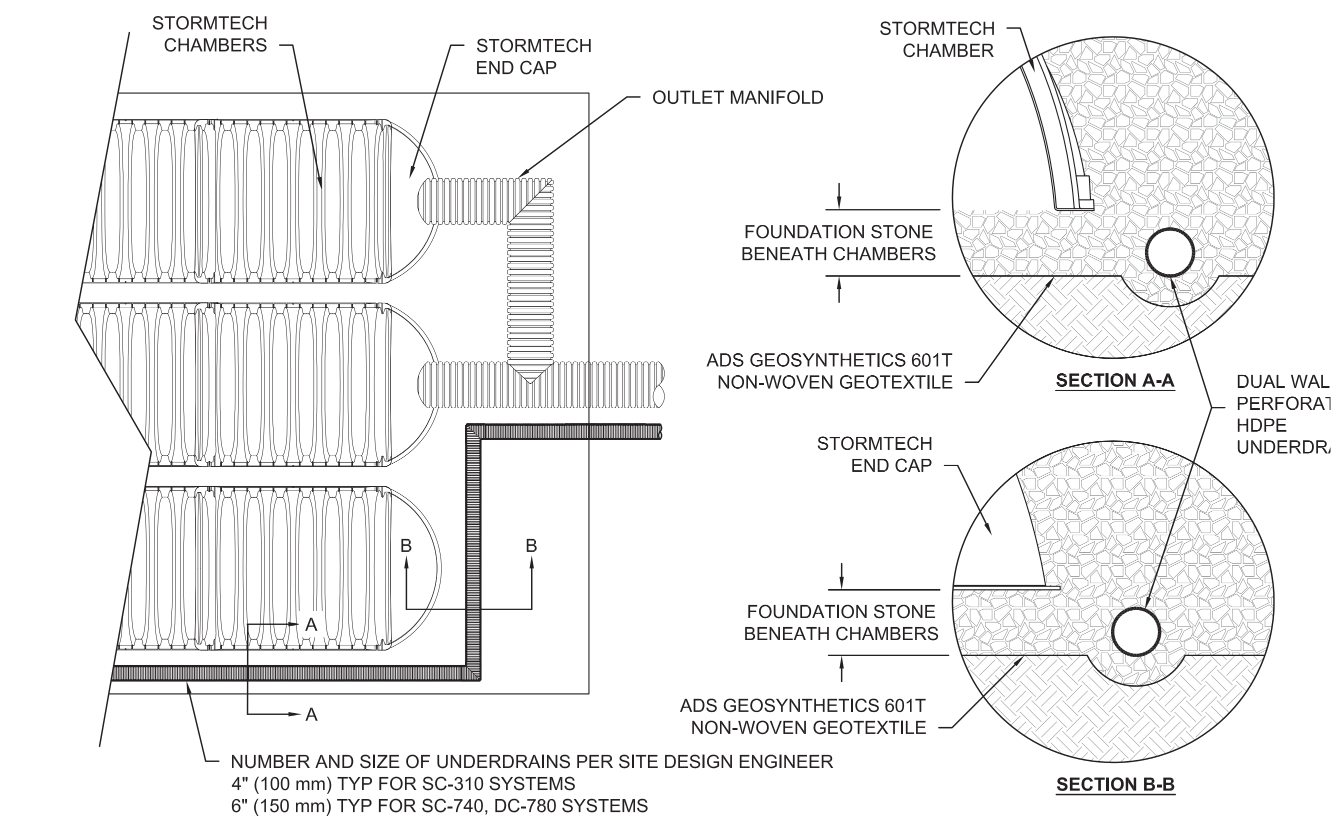


Figure 17 – Under Drain Detail



12.0 Inspection and Maintenance

12.1 ISOLATOR ROW INSPECTION

Regular inspection and maintenance are essential to assure a properly functioning stormwater system. Inspection is easily accomplished through the manhole or optional inspection ports of an Isolator Row. Please follow local and OSHA rules for a confined space entry.

Inspection ports can allow inspection to be accomplished completely from the surface without the need for a confined space entry. Inspection ports provide visual access to the system with the use of a flashlight. A stadia rod may be inserted to determine the depth of sediment. If upon visual inspection it is found that sediment has accumulated to an average depth exceeding 3" (76 mm), cleanout is required.

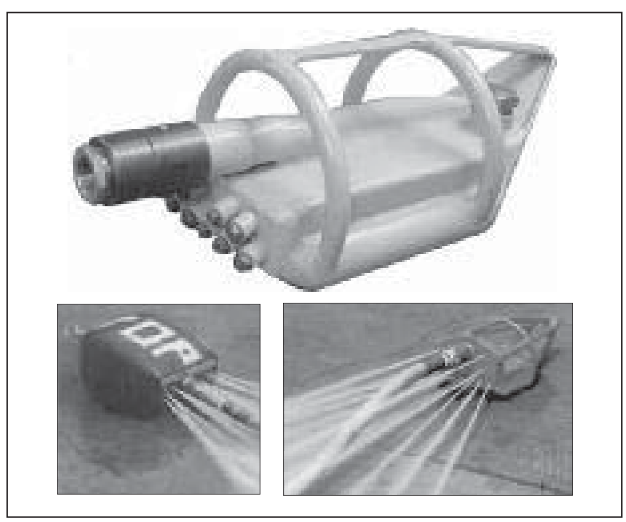
A StormTech Isolator Row should initially be inspected immediately after completion of the site's construction. While every effort should be made to prevent sediment from entering the system during construction, it is during this time that excess amounts of sediments are most likely to enter any stormwater system. Inspection and maintenance, if necessary, should be performed prior to passing responsibility over to the site's owner. Once in normal service, a StormTech Isolator Row should be inspected bi-annually until an understanding of the sites characteristics is developed. The site's maintenance manager can then revise the inspection schedule based on experience or local requirements.

12.2 ISOLATOR ROW MAINTENANCE

JetVac maintenance is recommended if sediment has been collected to an average depth of 3" (76 mm) inside the Isolator Row. More frequent maintenance may be required to maintain minimum flow rates through the Isolator Row. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, a wave of suspended sediments is flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/ JetVac combination vehicles. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" (1143 mm) are best. The JetVac process shall only be performed on StormTech Rows that have AASHTO class 1 woven geotextile over the foundation stone (ADS 315ST or equal).

Looking down the Isolator Row.

A typical JetVac truck. (This is not a StormTech product.)



Examples of culvert cleaning nozzles appropriate for Isolator Row maintenance. (These are not StormTech products.)

12.0 Inspection & Maintenance

STORMTECH ISOLATOR™ ROW - STEP-BY-STEP MAINTENANCE PROCEDURES

Step 1) Inspect Isolator Row for sediment

A) Inspection ports (if present)

i. Remove lid from floor box frame

ii. Remove cap from inspection riser

iii. Using a flashlight and stadia rod, measure depth of sediment

iv. If sediment is at, or above, 3" (76 mm) depth proceed to Step 2. If not proceed to Step 3.

B) All Isolator Rows

i. Remove cover from manhole at upstream end of Isolator Row

ii. Using a flashlight, inspect down Isolator Row through outlet pipe

1. Follow OSHA regulations for confined space entry if entering manhole

2. Mirrors on poles or cameras may be used to avoid a confined space entry

iii. If sediment is at or above the lower row of sidewall holes [approximately 3" (76 mm)] proceed to Step 2. If not proceed to Step 3.

Step 2) Clean out Isolator Row using the JetVac process

A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45" (1143 mm) or more is preferable

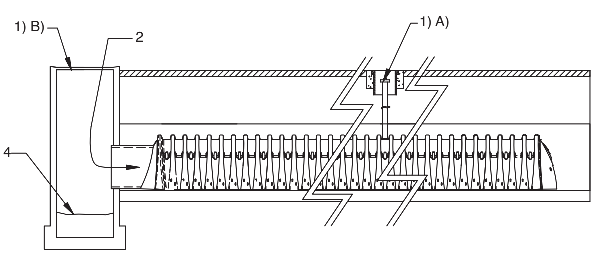
B) Apply multiple passes of JetVac until backflush water is clean

C) Vacuum manhole sump as required during jetting

Step 3) Replace all caps, lids and covers

Step 4) Inspect and clean catch basins and manholes upstream of the StormTech system following local guidelines.

Figure 20 – StormTech Isolator Row (not to scale)



12.3 ECCENTRIC PIPE HEADER INSPECTION

Theses guidelines do not supercede a pipe manufacturer's recommended I&M procedures. Consult with the manufacturer of the pipe header system for specific I&M procedures. Inspection of the header system should be carried out quarterly. On sites which generate higher levels of sediment more frequent inspections may be necessary. Headers may be accessed through risers, access ports or manholes. Measurement of sediment may be taken with a stadia rod or similar device. Cleanout of sediment should occur when the sediment volume has reduced the storage area by 25% or the depth of sediment has reached approximately 25% of the diameter of the structure.

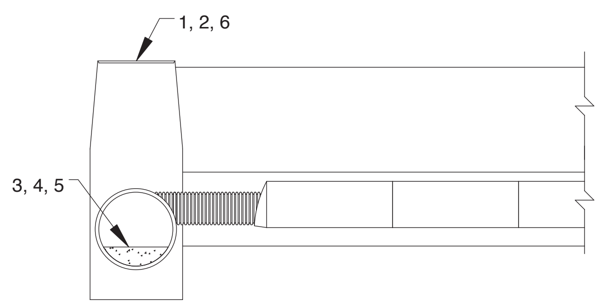
12.4 ECCENTRIC PIPE MANIFOLD MAINTENANCE

Cleanout of accumulated material should be accomplished by vacuum pumping the material from the header. Cleanout should be accomplished during dry weather. Care should be taken to avoid flushing sediments out through the outlet pipes and into the chamber rows.

Eccentric Header Step-by-Step Maintenance Procedures

1. Locate manholes connected to the manifold system
2. Remove grates or covers
3. Using a stadia rod, measure the depth of sediment
4. If sediment is at a depth of about 25% pipe volume or 25% pipe diameter proceed to step 5. If not proceed to step 6.
5. Vacuum pump the sediment. Do not flush sediment out inlet pipes.
6. Replace grates and covers
7. Record depth and date and schedule next inspection

Figure 21 – Eccentric Manifold Maintenance



Please contact StormTech's Technical Services Department at 888-892-2894 for a spreadsheet to estimate cleaning intervals.

13.0 General Notes

1. StormTech ("StormTech") requires installing contractors to use and understand StormTech's latest Installation Instructions prior to beginning system installation.
2. Our Technical Services Department offers installation consultations to installing contractors. Contact our Technical Service Representatives at least 30 days prior to system installation to arrange a pre-installation consultation. Our representatives can then answer questions or address comments on the StormTech chamber system and inform the Installing contractor of the minimum installation requirements before beginning the system's construction. Call **860-529-8188** to speak to a Technical Service Representative or visit **www.stormtech.com** to receive a copy of our Installation Instructions.
3. StormTech's requirements for systems with pavement design (asphalt, concrete pavers, etc.): Minimum cover for the SC-740, DC-780 and SC-310 chambers is 18" (457 mm) not including pavement; Maximum cover for the SC-740 and SC-310 chambers is 96" (2.4 m) including pavement design; Maximum cover for the DC-780 chamber is 12' (3.6 m) including pavement design. For installations that do not include pavement, where rutting from vehicles may occur, minimum required cover is 24" (610 mm), maximum cover is as stated above.
4. The contractor must report any discrepancies with the bearing capacity of the chamber foundation materials to the design engineer.
5. AASHTO M288 Class 2 non-woven geotextile (filter fabric) must be used as indicated in the project plans.
6. Stone placement between chamber rows and around perimeter must follow instructions as indicated in the most current version of StormTech's Installation Instructions.
7. Backfilling over the chambers must follow requirements as indicated in the most current version of StormTech's Installation Instructions.
8. The contractor must refer to StormTech's Installation Instructions for a Table of Acceptable Vehicle Loads at various depths of cover. This information is also available at StormTech's website: **www.stormtech.com.** The contractor is responsible for preventing vehicles that exceed StormTech's requirements from traveling across or parking over the stormwater system. Temporary fencing, warning tape and appropriately located signs are commonly used to prevent unauthorized vehicles from entering sensitive construction areas.
9. The contractor must apply erosion and sediment control measures to protect the stormwater system during all phases of site construction per local codes and design engineer's specifications.
10. STORMTECH PRODUCT WARRANTY IS LIMITED. Contact StormTech for warranty information.

14.0 StormTech Product Specifications

1.0 GENERAL

1.1 StormTech chambers are designed to control stormwater runoff. As a subsurface retention system, StormTech chambers retain and allow effective infiltration of water into the soil. As a subsurface detention system, StormTech chambers detain and allow for the metered flow of water to an outfall.

2.0 CHAMBER PARAMETERS

2.1 The Chamber shall be injection molded of an impact modified polypropylene or polyethylene copolymer to maintain adequate stiffness through higher temperatures experienced during installation and service.

2.2 The nominal chamber dimensions of the StormTech SC-740 and DC-780 shall be 30.0" (762 mm) tall, 51.0" (1295 mm) wide and 90.7" (2304 mm) long. The nominal chamber dimensions of the StormTech SC-310 shall be 16.0" (406 mm) tall, 34.0" (864 mm) wide and 90.7" (2304 mm) long. The installed length of a joined chamber shall be 85.4" (2169 mm).

2.3 The chamber shall have a continuously curved section profile.

2.4 The chamber shall be open-bottomed.

2.5 The chamber shall incorporate an overlapping corrugation joint system to allow chamber rows of almost any length to be created. The overlapping corrugation joint system shall be effective while allowing a chamber to be trimmed to shorten its overall length.

2.6 The nominal storage volume of all StormTech chambers includes the volume of the clean, crushed, angular stone with an assumed 40% porosity. The nominal storage volume of a joined StormTech SC-740 chamber shall be 74.9 ft^3 (2.1 m^3) per chamber when installed per StormTech's typical details. This equates to a storage volume per unit area of bed of 2.2 ft^3/ft^2 (0.67 m^3/m^2). The nominal storage volume of a joined StormTech DC-780 chamber shall be 78.4 ft^3 (2.2 m^3) per chamber when installed per StormTech's typical details. This equates to a storage volume per unit area of bed of 2.3 ft^3/ft^2 (0.70 m^3/m^2). The nominal storage volume of a joined StormTech SC-310 chamber shall be 31.0 ft^3 (0.88 m^3) per chamber when installed per StormTech's typical details. This equates to a storage volume per unit area of bed of 1.3 ft^3/ft^2 (0.40 m^3/m^2).

2.7 The SC-740 and SC-310 chambers shall have forty-eight orifices penetrating the sidewalls to allow for lateral conveyance of water.

2.8 The chamber shall have two orifices near its top to allow for equalization of air pressure between its interior and exterior.

2.9 The chamber shall have both of its ends open to allow for unimpeded hydraulic flows and visual inspections down a row's entire length.

2.10 The chamber shall have 14 corrugations.

2.11 The chamber shall have a circular, indented, flat surface on the top of the chamber for an optional 4" (100 mm) diameter (maximum) inspection port.

2.12 The chamber shall be analyzed and designed using AASHTO methods for thermoplastic culverts contained in the LRFD Bridge Design Specifications, 2nd Edition, including Interim Specifications through 2001. Design live load shall be the AASHTO design truck. Design shall consider earth and live loads as appropriate for the minimum to maximum specified depth of fill.

2.13 The chamber shall be manufactured in an ISO 9001:2000 certified facility.

3.0 END CAP PARAMETERS

3.1 The end cap shall be designed to fit into any corrugation of a chamber, which allows: capping a chamber that has its length trimmed; segmenting rows into storage basins of various lengths.

3.2 The end cap shall have saw guides to allow easy cutting for various diameters of pipe that may be used to inlet the system.

3.3 The end cap shall have excess structural adequacies to allow cutting an orifice of any size at any invert elevation.

3.4 The primary face of an end cap shall be curved outward to resist horizontal loads generated near the edges of beds.

3.5 The end cap shall be manufactured in an ISO 9001:2000 certified facility.

15.0 Chamber Specifications for Contract Documents

STORMWATER CHAMBER SPECIFICATIONS:

1. Chambers shall be StormTech SC-740, SC-310 or approved equal.
2. Chambers shall conform to the requirements of ASTM F 2922, "Standard Specification for Polyethylene (PE) Corrugated Wall Stormwater Collection Chambers."
3. Chamber rows shall provide continuous, unobstructed internal space with no internal support panels.
4. The structural design of the chambers, the structural backfill and the installation requirements shall ensure that the load factors specified in the AASHTO LRFD Bridge Design Specifications, Section 12.12 are met for: 1) long-duration dead loads and 2) short-duration live loads, based on the AASHTO Design Truck with consideration for impact and multiple vehicle presences.
5. Chambers shall conform to the requirements of ASTM F2787, "Standard Practice for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers."
6. Only chambers that are approved by the engineer will be allowed. The contractor shall submit (3 sets) of the following to the engineer for approval before delivering chambers to the project site:
   - A structural evaluation by a registered structural engineer that demonstrates that the load factors specified in the AASHTO LRFD Bridge Design Specifications, Section 12.12 are met. The 50-year creep modulus data specified in ASTM F2922 must be used as part of the AASHTO structural evaluation to verify long-term performance.
7. Chambers shall be produced at an ISO 9001 certified manufacturing facility.
8. All design specifications for chambers shall be in accordance with the manufacturer's latest design manual.
9. The installation of chambers shall be in accordance with the manufacturer's latest installation instructions.

STORMWATER CHAMBER SPECIFICATIONS:

1. Chambers shall be StormTech DC-780 or approved equal.
2. Chambers shall conform to the requirements of ASTM F 2418, "Standard Specification for Polypropylene (PP) Corrugated Wall Stormwater Collection Chambers."
3. Chamber rows shall provide continuous, unobstructed internal space with no internal support panels.
4. The structural design of the chambers, the structural backfill and the installation requirements shall ensure that the load factors specified in the AASHTO LRFD Bridge Design Specifications, Section 12.12 are met for: 1) long-duration dead loads and 2) short-duration live loads, based on the AASHTO Design Truck with consideration for impact and multiple vehicle presences.
5. Chambers shall conform to the requirements of ASTM F2787, "Standard Practice for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers."
6. Only chambers that are approved by the engineer will be allowed. The contractor shall submit (3 sets) of the following to the engineer for approval before delivering chambers to the project site:
   - A structural evaluation by a registered structural engineer that demonstrates that the load factors specified in the AASHTO LRFD Bridge Design Specifications, Section 12.12 are met. The 50-year creep modulus data specified in ASTM F2418 must be used as part of the AASHTO structural evaluation to verify long-term performance.
7. Chambers shall be produced at an ISO 9001 certified manufacturing facility.
8. All design specifications for chambers shall be in accordance with the manufacturer's latest design manual.
9. The installation of chambers shall be in accordance with the manufacturer's latest installation instructions.

A Family of Products and Services for the Stormwater Industry:

- MC-3500 and MC-4500 Chambers and End Caps
- SC-310 and SC-740 Chambers and End Caps
- DC-780 Chambers and End Caps
- Fabricated End Caps
- Fabricated Manifold Fittings
- Patented Isolator Row for Maintenance and Water Quality
- Chamber Separation Spacers
- In-House System Layout Assistance
- On-Site Educational Seminars
- Worldwide Technical Sales Group
- Centralized Product Applications Department
- Research and Development Team
- Technical Literature, O&M Manuals and Detailed CAD drawings all downloadable via our Web Site

StormTech provides state of the art products and services that meet or exceed industry performance standards and expectations. We offer designers, regulators, owners and contractors the highest quality products and services for stormwater management that "Saves Valuable Land and Protects Water Resources."

Please contact one of our inside project application professionals or Engineered Product Managers (EPMs) to discuss your particular application. A wide variety of technical support material is available in print, electronic media or from our website at www.stormtech.com. For any questions, please call StormTech at 888-892-2694.

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860.529.8188 | 888.892.2694 | fax 866.328.8401 | fax 860.529.8040 | www.stormtech.com

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APPENDIX H

TEMPORARY EROSION AND SEDIMENT CONTROL INSPECTION & MAINTENANCE CHECKLIST/PERMANENT STORMWATER MANAGEMENT PRACTICE INSPECTION & MAINTENANCE CHECKLIST

JMC Project 13180
Townhouses at 32-34 Washington Avenue
32-34 Washington Avenue
Hasting-on-Hudson, NY

Temporary Erosion and Sediment Control Inspection and Maintenance Checklist

Erosion and Sediment Control Measure	Inspection/Maintenance Intervals	Inspection/Maintenance Requirements
Stabilized Construction Entrance	Daily	• Periodic top dressing with additional aggregate as required • Clean sediment in public right-of-ways immediately
Silt Fence	Weekly + After Each Rain	• Remove & redistribute sediment when bulges develop in the silt fence.
Inlet Protection	Weekly + After Each Rain	• Refer to Figures A5.11, A5.12, A5.13 & A5.14 within the NYSDEC New York State Standard and Specifications for Erosion and Sediment Control

<u>Permanent Stormwater Management Practice Inspection and Maintenance Checklist</u>

Stormwater Management Practice	Inspection/Maintenance Intervals	Inspection/Maintenance Requirements
Drain Inlets	Monthly	• Check for blockage and/or erosion at top of each inlet. Repair/remove as necessary. • Check for sediment and debris collected within sumps and clean out as necessary.
Porous Pavement and Permeable Pavers	Monthly and As Needed	• Ensure that paving area is clean of debris • Ensure that paving dewaters between storms • Ensure that the area is clean of sediments • Mow upland and adjacent areas, and seed bare areas
	Quarterly	• Vacuum sweep frequently to keep surface free of sediments
	Annually	• Inspect the surface for deterioration or spalling
StormTech Subsurface Retention Facility	Semi-Annually + After Major Storms	• Check level of sediment accumulated within the isolator row through the access manhole. If 3 inches of sediment or greater, clean out utilizing a high pressure water nozzle to scour and suspend sediments. • Flush all sediment to access manhole and remove using a vacuum truck.

<u>Permanent Stormwater Management Practice Inspection and Maintenance Checklist (Cont'd)</u>

Stormwater Management Practice	Inspection/Maintenance Intervals	Inspection/Maintenance Requirements
Biroretention	Routine and As Needed	• Mowing-Frequency depends upon location and desired aesthetic appeal. • Watering-If droughty, watering after the initial year may be required. • Miscellaneous Upkeep-Tasks include trash collection, spot weeding, and removing mulch from overflow device.
	Semi-Annually	• Pruning -Nutrients in runoff often cause biortention vegetation to flourish. • Mulching -Remulch bare areas with fresh mulch
	Annually	• Mulch Removal-Mulch accumulation reduces available water storage volume. Removal of mulch also increases surface infiltration rate of fill soil. • Remove and Replace Dead Plants-Within the first year, 10 percent of plants may die. Survival rates increase with time.

The owner/operator responsible for inspection and maintenance as outlined above:

CCI Properties, LLC
Andrew Cortese
52 Cedar Street
Dobbs Ferry, NY 10522
Phone: 914-478-4250
Email: Andrew@CorteseConstruction.com

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APPENDIX I

REDEVELOPMENT FIGURES

IMPERVIOUS/PERVIOUS COVER

	TYPE	AREA (SF/AC)
	IMPERVIOUS (SIDEWALK/ROOF/WALLS)	6,412 / 0.147
	GRASS	17,020 / 0.391
	WOODED	2,694 / 0.062
	TOTAL	26,126 / 0.600

TOWNHOUSES AT 32-34 WASHINGTON AVENUE

32-34 WASHINGTON AVENUE HASTINGS-ON-HUDSON

EXISTING IMPERVIOUS AREA

DATE: 10/01/2015 JMC PROJECT: 13180

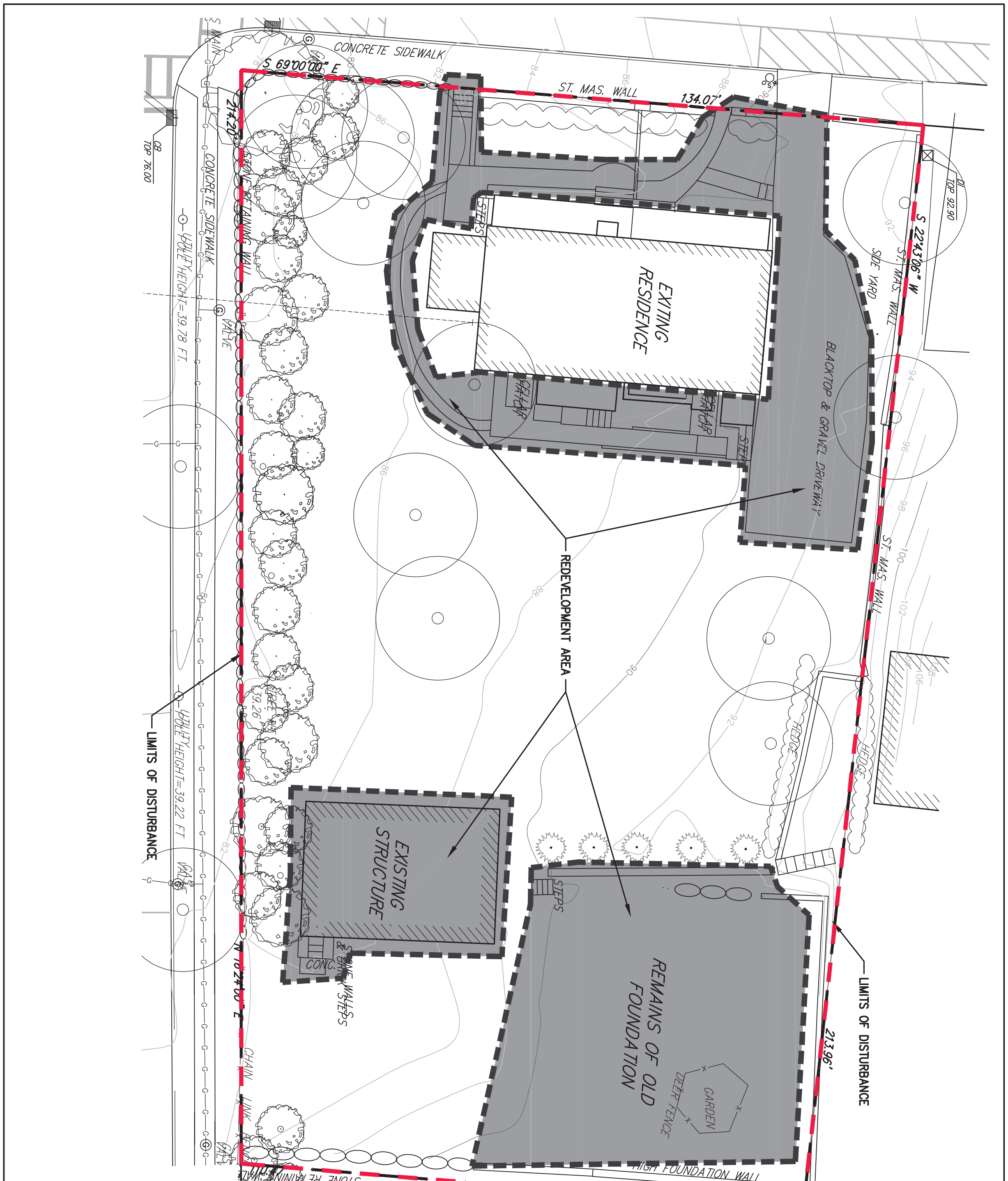
FIGURE: 1 SCALE: 1"=20'

120 BEDFORD RD
ARMONK
NY 10504

(914) 273-5225
fax 273-2102

JMCPLLC.COM

JMC



AREAS

	TYPE	AREA (SF/AC)
(red dashed line)	DISTURBANCE AREA	26,126 / 0.600
(grey shaded area)	REDEVELOPMENT AREA	8,282 / 0.0190

TOWNHOUSES AT 32-34 WASHINGTON AVENUE

32-34 WASHINGTON AVENUE HASTINGS-ON-HUDSON

LIMIT OF DISTURBANCE / REDEVELOPMENT AREA

DATE: 10/01/2015 JMC PROJECT: 13180

FIGURE: 2 SCALE: 1"=20'

120 BEDFORD RD
ARMONK
NY 10504
(914) 273-5225
fax 273-2102
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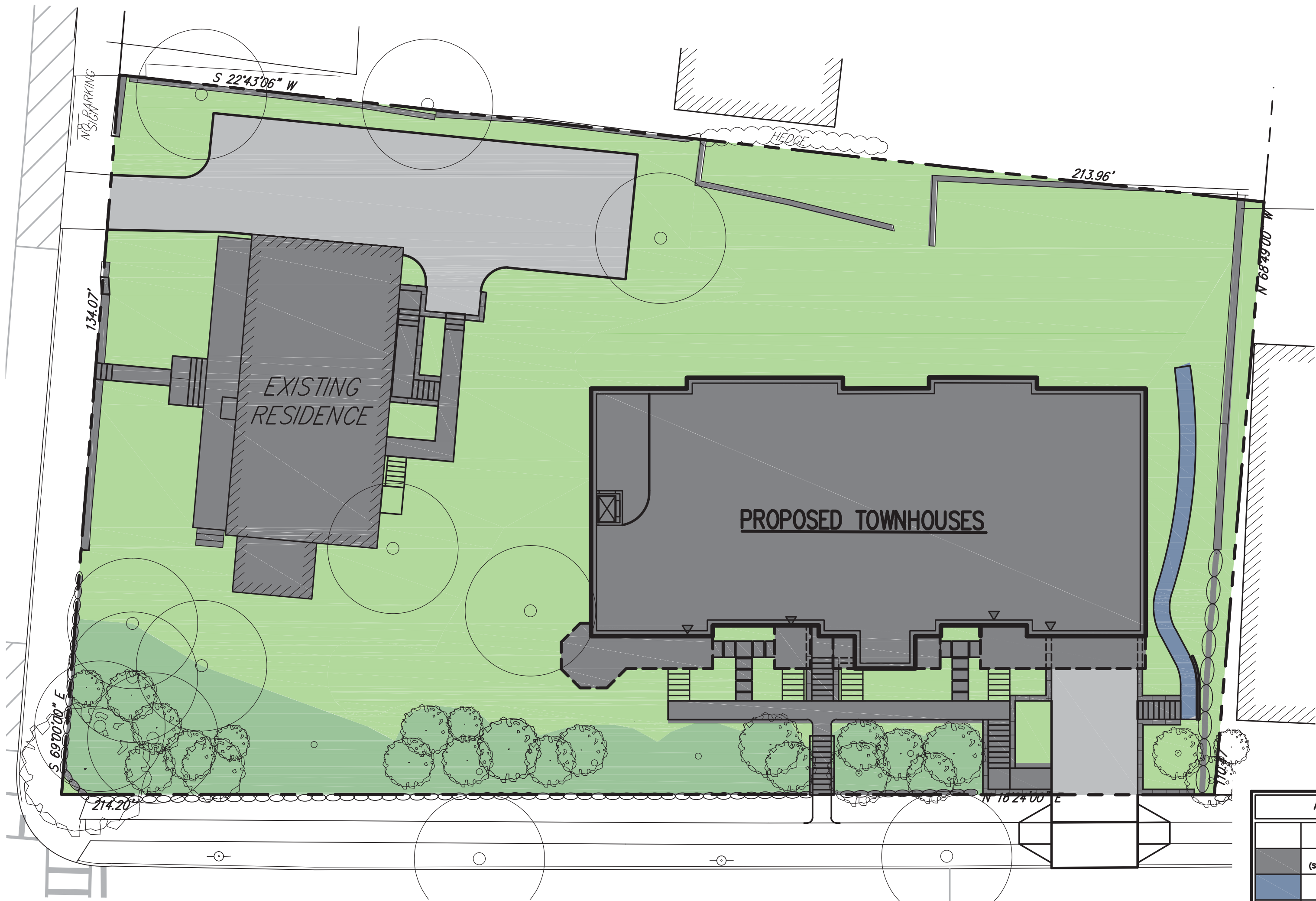

EXISTING IMPERVIOUS AREA = 6,412 SF / 0.147 AC

PROPOSED IMPERVIOUS AREA = 11,616 SF / 0.267 AC

INCREASED IMPERVIOUS AREA = 5,204 SF / 0.119 AC

IMPERVIOUS/PERVIOUS COVER

	TYPE	AREA (SF/AC)
	IMPERVIOUS (SIDEWALK/ROOF/WALLS)	8,973 / 0.206
	IMPERVIOUS (GRAVEL)	201 / .005
	IMPERVIOUS (POROUS PAVERS)	2,442 / 0.056
	TOTAL IMPERVIOUS	11,616/ 0.267
	GRASS	11,850/ 0.272
	WOODED	2,660 / 0.061
	TOTAL	26,126 / 0.600

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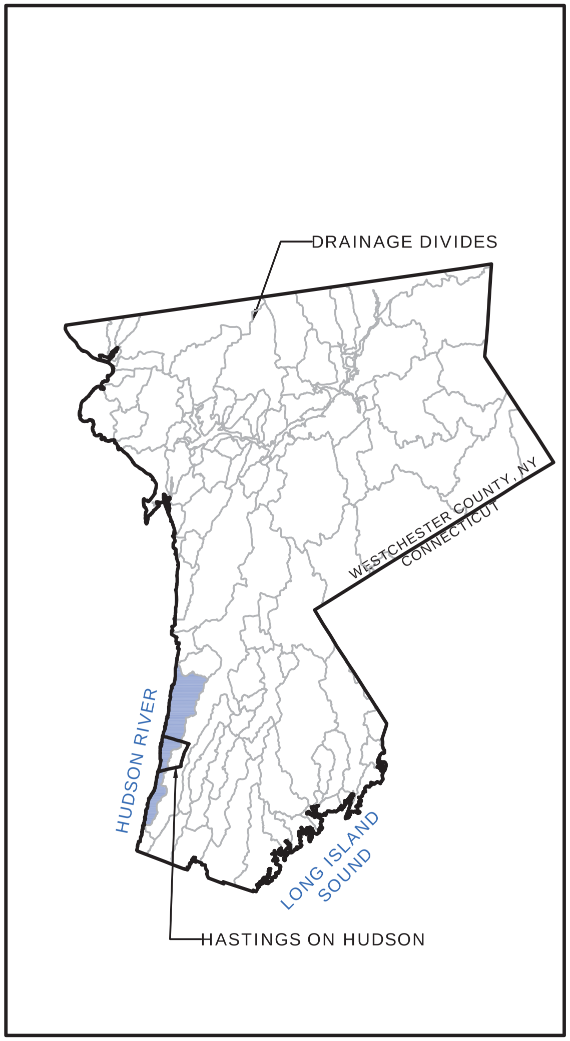
TOWNHOUSES AT 32-34 WASHINGTON AVENUE

32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON

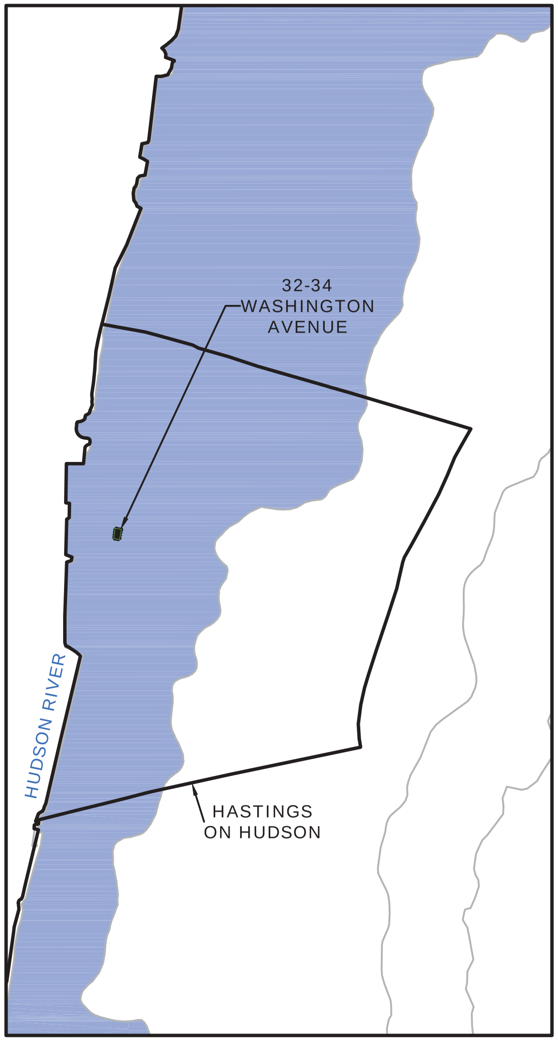
PROPOSED IMPERVIOUS AREAS

DATE: 10/01/2015
JMC PROJECT: 13180

FIGURE: 3
SCALE: 1"=20'



DRAINAGE DIVIDES IN WESTCHESTER COUNTY



32–34 WASHINGTON AVENUE WITHIN DRAINAGE DIVIDE

DRAINAGE AROUND 32–34 WASHINGTON AVENUE

NOTE: EXISTING CONDITIONS DEPICTED ON THIS PLAN HAVE BEEN OBTAINED FROM WESTCHESTER COUNTY GEOGRAPHIC INFORMATION SYSTEMS AND SHOULD BE CONSIDERED APPROXIMATE AND USED FOR PLANNING PURPOSES ONLY.

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TOWNHOUSES AT 32-34 WASHINGTON AVENUE

32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON

DRAINAGE IN CONTEXT

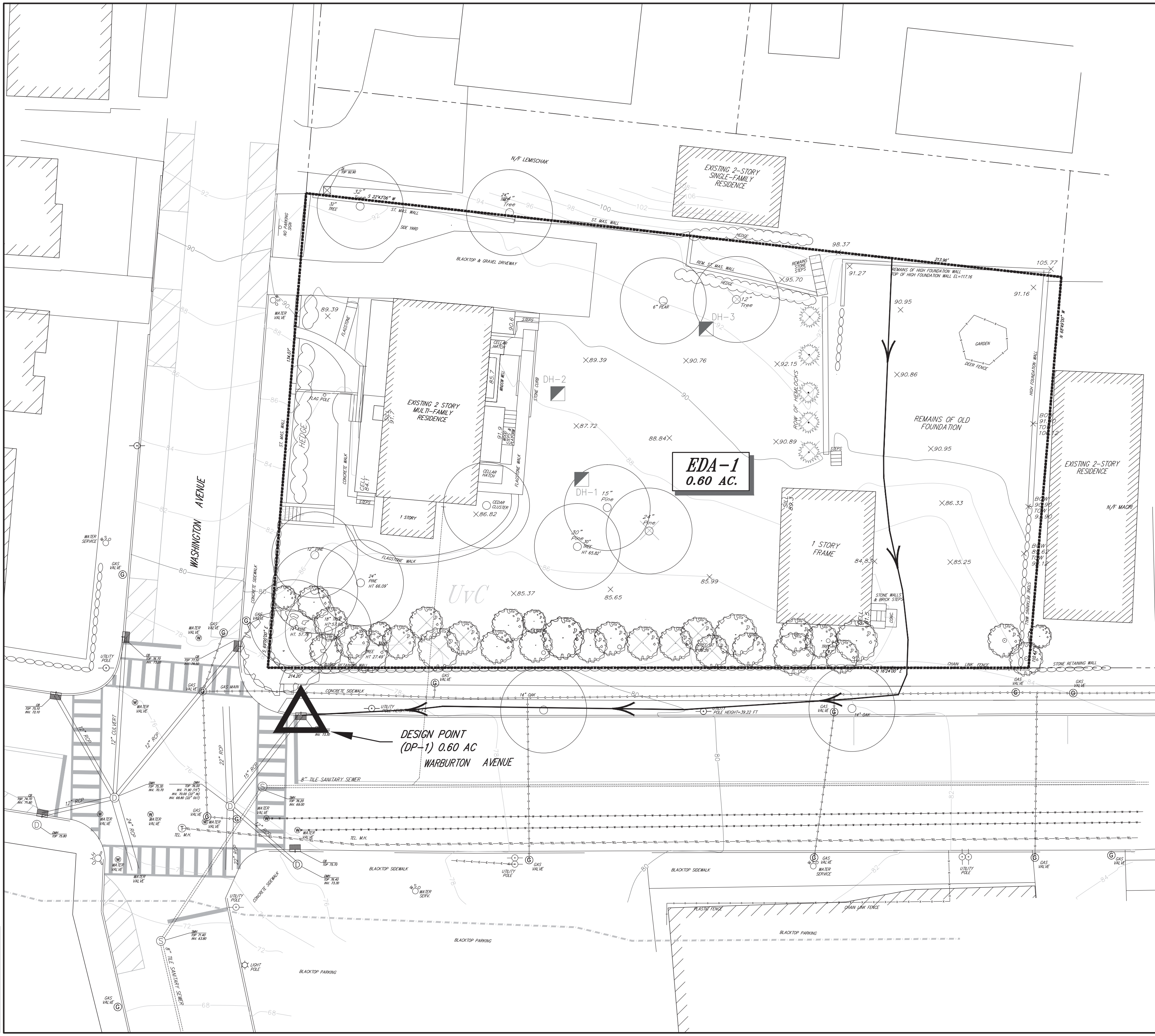
DATE: 10/01/2015
JMC PROJECT: 13180

FIGURE: 4
SCALE: N.T.S.

13180–GISdrainage2.dwg; A–1.tab

APPENDIX J

DRAWINGS



EXISTING DRAINAGE LEGEND

	EXISTING GRADE
	FLAGGED WETLANDS WITH FLAG NUMBERS
	EXISTING STONE WALL
	WATERSHED BOUNDARY LINE
	BOUNDARY OF COVER TYPE LINE
	LIMIT OF SOIL GROUPS LINE
	FLOW PATH LINE
	HYDROLOGIC SOIL GROUP "B"
DH-3A	PERCOLATION TEST LOCATION

SOIL TYPE TABLE

DESIGNATION	HYDROLOGIC GROUP	DESCRIPTION
UvC	B	URBAN LAND-RIVERHEAD COMPLEX, 8 TO 15 PERCENT SLOPES

NOTES:

1. EXISTING CONDITIONS DEPICTED ON THIS PLAN HAVE BEEN TAKEN FROM SURVEY TITLED, "TOPOGRAPHIC SURVEY" PREPARED BY WARD CARPENTER ENGINEERS, INC. DATED APRIL 23, 2015
2. EXISTING CONDITIONS OFF SITE DEPICTED ON THIS PLAN HAVE BEEN OBTAINED FROM WESTCHESTER COUNTY GEOGRAPHIC INFORMATION SYSTEMS AND SHOULD BE CONSIDERED APPROXIMATE AND USED FOR PLANNING PURPOSES ONLY.
3. GEOTECHNICAL BORING/TEST PIT LOCATIONS DEPICTED ON THIS PLAN WERE TAKEN FROM THE GEOTECHNICAL REPORT ENTITLED, "SOIL INFILTRATION TEST DATA", DATED 09/09/2015, PREPARED BY CCI PROPERTIES.

No.	Revision	Date	By
1.	PLANNING BOARD SUBMISSION	10/01/2015	EH

Previous Editions Obsolete

APPLICANT/OWNER:
CCI PROPERTIES, LLC
52 CEDAR STREET
DOBBS FERRY, NY 10522

ARCHITECT:
CHRISTINA GRIFFIN ARCHITECT, PC
10 SPRING STREET
HASTINGS-ON-HUDSON, NY 10706

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JMC Planning Engineering Landscape Architecture & Land Surveying, PLLC
JMC Site Development Consultants, LLC
John Meyer Consulting, Inc.
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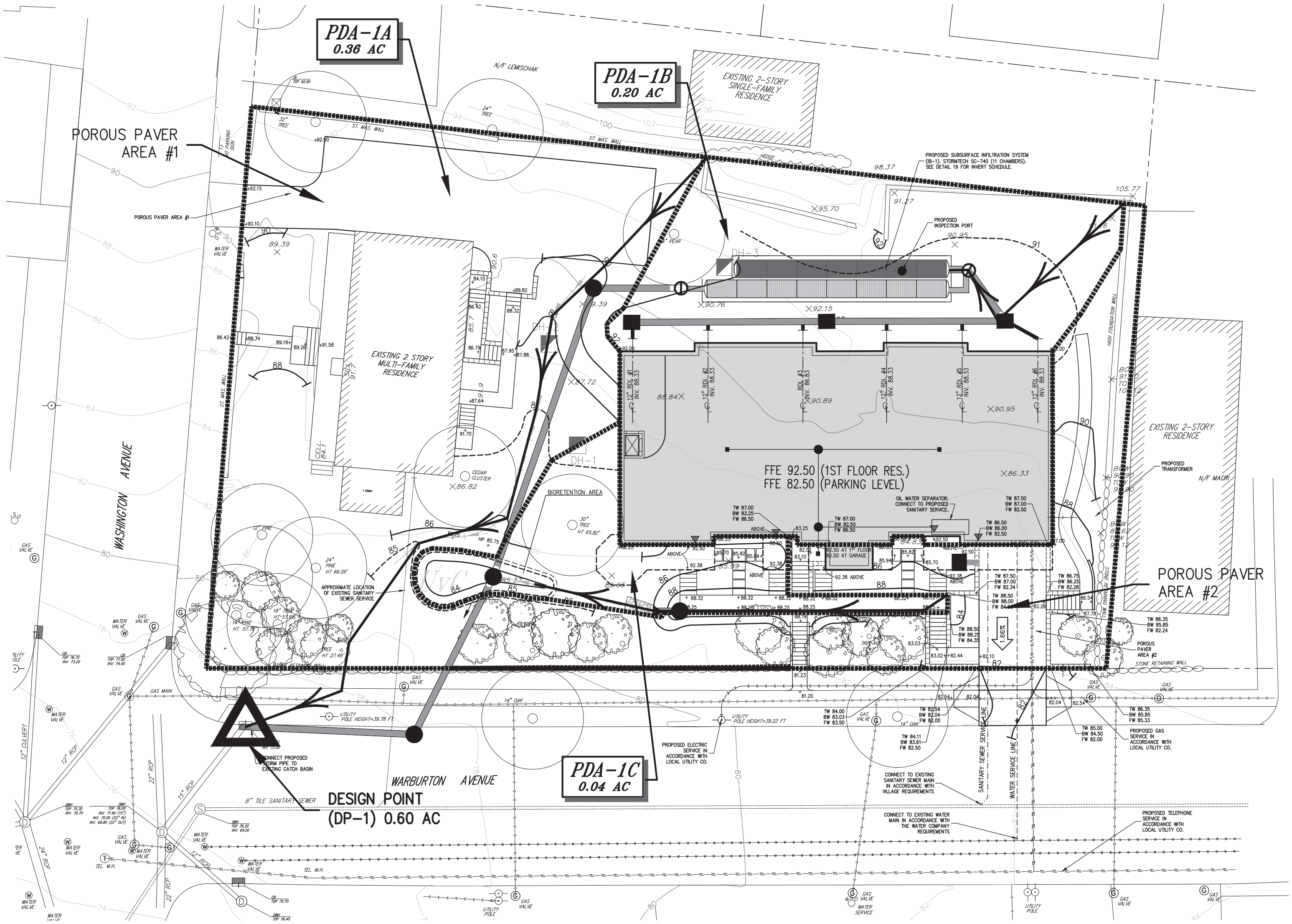
EXISTING DRAINAGE AREA MAP
TOWNHOUSES AT 32-34 WASHINGTON AVENUE
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON

ANY ALTERATION OF PLANS, SPECIFICATIONS, PLATS AND REPORTS BEARING THE SEAL OF A LICENSED PROFESSIONAL ENGINEER OR LICENSED LAND SURVEYOR IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW, EXCEPT AS PROVIDED FOR BY SECTION 7209, SUBSECTION 2.

Drawn:	EH	Approved:	RR
Scale:	1" = 10'		
Date:	08/11/2015		
Project No:	13180		
13180-DRAINAGE	EDA	EDALS	

DA-1



PROPOSED DRAINAGE LEGEND

- EXISTING GRADE
- PROPOSED FINISHED GRADE
- PROPOSED DITCH OR SWALE
- EXISTING WALL
- EXISTING STONE WALL
- PROPOSED WALL
- PERVIOUS PAVERS
- WATERSHED BOUNDARY LINE
- FLOW PATH LINE
- PROPOSED BUILDING LINE
- PROPOSED CONCRETE CURB
- PROPOSED MANHOLE (MH)
- EXISTING DRAIN INLET
- PROPOSED DRAIN INLET (DI)
- PROPOSED LAWN INLET (LI)
- PERCOLATION TEST LOCATION
- PROPOSED WATER QUALITY STRUCTURE
- PROPOSED BYPASS MANHOLE
- PROPOSED OUTLET CONTROL STRUCTURE

SOIL TYPE TABLE

DESIGNATION	HYDROLOGIC GROUP	DESCRIPTION
UvC	B	URBAN LAND-RIVERHEAD COMPLEX, 8 TO 15 PERCENT SLOPES

NOTES:

1. EXISTING CONDITIONS DEPICTED ON THIS PLAN HAVE BEEN TAKEN FROM SURVEY TITLED, "TOPOGRAPHIC SURVEY" PREPARED BY WARD CARPENTER ENGINEERS, INC. DATED APRIL 23, 2015
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No.	Revision	Date	By
1	PLANNING BOARD SUBMISSION	10/01/2015	EH

Previous Editions Obsolete

APPLICANT/OWNER:
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DOBBS FERRY, NY 10522

ARCHITECT:
CHRISTINA GRIFFIN ARCHITECT, PC
10 SPRING STREET
HASTINGS-ON-HUDSON, NY 10706

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John Meyer Consulting, Inc.
120 BEDFORD ROAD • ARMONK, NY 10504
office 914.273.5225 • fax 914.273.2102
www.jmcpllc.com

PROPOSED DRAINAGE AREA MAP

TOWNHOUSES AT 32-34 WASHINGTON AVENUE
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON

ANY ALTERATION OF PLANS, SPECIFICATIONS, PLATS AND REPORTS BEARING THE SEAL OF A LICENSED PROFESSIONAL ENGINEER OR LICENSED LAND SURVEYOR IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW, EXCEPT AS PROVIDED FOR BY SECTION 7209, SUBSECTION 2.

Drawn: EH		Approved: RR	
Scale: 1" = 10'			
Date: 08/11/2015			
Project No: 13180			
13180-DRAINAGE	PDA	PDALS	

Drawing No:
DA-2

NOT FOR CONSTRUCTION

Full Environmental Assessment Form
Part 1 - Project and Setting

Instructions for Completing Part 1

Part 1 is to be completed by the applicant or project sponsor. Responses become part of the application for approval or funding, are subject to public review, and may be subject to further verification.

Complete Part 1 based on information currently available. If additional research or investigation would be needed to fully respond to any item, please answer as thoroughly as possible based on current information; indicate whether missing information does not exist, or is not reasonably available to the sponsor; and, when possible, generally describe work or studies which would be necessary to update or fully develop that information.

Applicants/sponsors must complete all items in Sections A & B. In Sections C, D & E, most items contain an initial question that must be answered either "Yes" or "No". If the answer to the initial question is "Yes", complete the sub-questions that follow. If the answer to the initial question is "No", proceed to the next question. Section F allows the project sponsor to identify and attach any additional information. Section G requires the name and signature of the project sponsor to verify that the information contained in Part 1is accurate and complete.

A. Project and Sponsor Information.

Name of Action or Project: Townhouses at 32-34 Washington Avenue		
Project Location (describe, and attach a general location map): 32-34 Washington Avenue		
Brief Description of Proposed Action (include purpose or need): Site Plan approval for the renovation of an existing 2 1/2 story, 2 family apartment building with a new area for 4 parking spaces and a reconstructed curb cut onto Washington Avenue in the northern portion of the property and Site Plan approval for the construction of a new 4,762 sf. footprint 5 unit Townhouse (9,529 sf. total building floor area) with 3 floors (partially buried lower level for parking), 10 parking spaces, new utility services and a new curb cut onto Warburton Avenue.		
Name of Applicant/Sponsor: CCI Properties, LLC (Mr. Andrew Cortese)	Telephone: (914) 447-3965 E-Mail: andrew@corteseconstruction.com	
Address: 52 Cedar Street		
City/PO: Dobbs Ferry	State: NY	Zip Code: 10522
Project Contact (if not same as sponsor; give name and title/role): -same as sponsor-	Telephone: E-Mail:	
Address:		
City/PO:	State:	Zip Code:
Property Owner (if not same as sponsor): -same as sponsor-	Telephone: E-Mail:	
Address:		
City/PO:	State:	Zip Code:

B. Government Approvals

B. Government Approvals Funding, or Sponsorship. ("Funding" includes grants, loans, tax relief, and any other forms of financial assistance.)

Government Entity	If Yes: Identify Agency and Approval(s) Required	Application Date (Actual or projected)
a. City Council, Town Board, or Village Board of Trustees ☐ Yes ☒ No		
b. City, Town or Village Planning Board or Commission ☐ Yes ☐ No	Planning Board; Site Plan Approval	August 13, 2015
c. City Council, Town or Village Zoning Board of Appeals ☒ Yes ☐ No	ZBA; 1. §295-72E(2), variance for max. development coverage 2. §295-18D, variance to allow two permitted uses on one lot 3. §295-41B, variance to exceed the max. allowed curbcut width of 24'	August 13, 2015
d. Other local agencies ☒ Yes ☐ No	Architectural Review Board (interested agency): ARB review & View Preservation	August 13, 2015
e. County agencies ☒ Yes ☐ No	WCDPW; curb cut, utility trenching, sewer service connection	August 13, 2015
f. Regional agencies ☐ Yes ☒ No		
g. State agencies ☒ Yes ☐ No	NYSDEC (interested agency)	August 13, 2015
h. Federal agencies ☐ Yes ☐ No		

i. Coastal Resources.
i. Is the project site within a Coastal Area, or the waterfront area of a Designated Inland Waterway? ☒ Yes ☐ No
If Yes,
ii. Is the project site located in a community with an approved Local Waterfront Revitalization Program? ☐ Yes ☒ No
iii. Is the project site within a Coastal Erosion Hazard Area? ☐ Yes ☒ No

C. Planning and Zoning

C.1. Planning and zoning actions.

Will administrative or legislative adoption, or amendment of a plan, local law, ordinance, rule or regulation be the only approval(s) which must be granted to enable the proposed action to proceed? ☐ Yes ☒ No

- **If Yes,** complete sections C, F and G.
- **If No,** proceed to question C.2 and complete all remaining sections and questions in Part 1

C.2. Adopted land use plans.

a. Do any municipally- adopted (city, town, village or county) comprehensive land use plan(s) include the site where the proposed action would be located? ☒ Yes ☐ No
If Yes, does the comprehensive plan include specific recommendations for the site where the proposed action would be located? ☒ Yes ☐ No

b. Is the site of the proposed action within any local or regional special planning district (for example: Greenway Brownfield Opportunity Area (BOA); designated State or Federal heritage area; watershed management plan; or other?) ☐ Yes ☒ No
If Yes, identify the plan(s):

____

c. Is the proposed action located wholly or partially within an area listed in an adopted municipal open space plan, or an adopted municipal farmland protection plan? ☐ Yes ☒ No
If Yes, identify the plan(s):

____

C.3. Zoning

a. Is the site of the proposed action located in a municipality with an adopted zoning law or ordinance. ☒ Yes ☐ No
If Yes, what is the zoning classification(s) including any applicable overlay district?
Multi-Family Residence District (MR-1.5). View Preservation Overlay District

b. Is the use permitted or allowed by a special or conditional use permit? ☒ Yes ☐ No

c. Is a zoning change requested as part of the proposed action? ☐ Yes ☒ No
If Yes,
i. What is the proposed new zoning for the site? ____________

C.4. Existing community services.

a. In what school district is the project site located? Hastings-on-Hudson

b. What police or other public protection forces serve the project site?
Hastings-on-Hudson Police Department

c. Which fire protection and emergency medical services serve the project site?
Hastings-on-Hudson, Hastings EMS

d. What parks serve the project site?
Old Croton Trailways State Park, Draper Park

D. Project Details

D.1. Proposed and Potential Development

a. What is the general nature of the proposed action (e.g., residential, industrial, commercial, recreational; if mixed, include all components)?
Residential

b. a. Total acreage of the site of the proposed action? 0.60 acres
b. Total acreage to be physically disturbed? 0.40 acres
c. Total acreage (project site and any contiguous properties) owned or controlled by the applicant or project sponsor? 0.60 acres

c. Is the proposed action an expansion of an existing project or use? ☐ Yes ☒ No
i. If Yes, what is the approximate percentage of the proposed expansion and identify the units (e.g., acres, miles, housing units, square feet)? % ____________ Units: ____________

d. Is the proposed action a subdivision, or does it include a subdivision? ☐ Yes ☒ No
If Yes,
i. Purpose or type of subdivision? (e.g., residential, industrial, commercial; if mixed, specify types)
____
ii. Is a cluster/conservation layout proposed? ☐ Yes ☐ No
iii. Number of lots proposed? ________
iv. Minimum and maximum proposed lot sizes? Minimum __________ Maximum __________

e. Will proposed action be constructed in multiple phases? ☐ Yes ☒ No
i. If No, anticipated period of construction: 8 months
ii. If Yes:
- Total number of phases anticipated _____
- Anticipated commencement date of phase 1 (including demolition) _____ month _____ year
- Anticipated completion date of final phase _____ month _____year
- Generally describe connections or relationships among phases, including any contingencies where progress of one phase may determine timing or duration of future phases: ____________

f. Does the project include new residential uses? ☒ Yes ☐ No
If Yes, show numbers of units proposed.

	One Family	Two Family	Three Family	Multiple Family (four or more)
Initial Phase				
At completion of all phases				5 3-bedroom units

g. Does the proposed action include new non-residential construction (including expansions)? ☐ Yes ☒ No
If Yes,
i. Total number of structures ___________
ii. Dimensions (in feet) of largest proposed structure: ________height; ________width; and _______ length
iii. Approximate extent of building space to be heated or cooled: ______________________ square feet

h. Does the proposed action include construction or other activities that will result in the impoundment of any liquids, such as creation of a water supply, reservoir, pond, lake, waste lagoon or other storage? ☐ Yes ☒ No
If Yes,
i. Purpose of the impoundment: ________________________________
ii. If a water impoundment, the principal source of the water: ☐ Ground water ☐ Surface water streams ☐ Other specify: ________________________________
iii. If other than water, identify the type of impounded/contained liquids and their source. ________________________________
iv. Approximate size of the proposed impoundment. Volume: ____________ million gallons; surface area: ____________ acres
v. Dimensions of the proposed dam or impounding structure: ________ height; _______ length
vi. Construction method/materials for the proposed dam or impounding structure (e.g., earth fill, rock, wood, concrete): ________________________________

D.2. Project Operations

a. Does the proposed action include any excavation, mining, or dredging, during construction, operations, or both? ☒ Yes ☐ No
(Not including general site preparation, grading or installation of utilities or foundations where all excavated materials will remain onsite)
If Yes:
i .What is the purpose of the excavation or dredging? to construct a new multi-family building
ii. How much material (including rock, earth, sediments, etc.) is proposed to be removed from the site?
- Volume (specify tons or cubic yards): approx. 1,300 cy
- Over what duration of time? approx. 4 months

iii. Describe nature and characteristics of materials to be excavated or dredged, and plans to use, manage or dispose of them.
material excavated is needed to provide the projects parking garage beneath the building at the garage level. Portion of the excavated area includes the existing garage to be demolished. Excavated material is located in an area that contains fills from previous developments. No unsuitable, or contaminated material is expected.
iv. Will there be onsite dewatering or processing of excavated materials? ☐ Yes ☒ No
If yes, describe. ________________________________
v. What is the total area to be dredged or excavated? approx. 0.1 acres
vi. What is the maximum area to be worked at any one time? approx. 0.1 acres
vii. What would be the maximum depth of excavation or dredging? approx. 10 feet
viii. Will the excavation require blasting? ☐ Yes ☒ No
ix. Summarize site reclamation goals and plan: Within all areas of disturbance, topsoil will be striped and stockpiled for reuse in all newly disturbed areas. Excess material not needed to meet proposed grades will be disposed of off-site in accordance with all applicable laws and rules.

b. Would the proposed action cause or result in alteration of, increase or decrease in size of, or encroachment into any existing wetland, waterbody, shoreline, beach or adjacent area? ☐ Yes ☒ No
If Yes:
i. Identify the wetland or waterbody which would be affected (by name, water index number, wetland map number or geographic description): ________________________________

ii. Describe how the proposed action would affect that waterbody or wetland, e.g. excavation, fill, placement of structures, or alteration of channels, banks and shorelines. Indicate extent of activities, alterations and additions in square feet or acres: ____________________

iii. Will proposed action cause or result in disturbance to bottom sediments? ☐ Yes ☐ No
If Yes, describe: ____________________

iv. Will proposed action cause or result in the destruction or removal of aquatic vegetation? ☐ Yes ☐ No
If Yes:
- acres of aquatic vegetation proposed to be removed: __________
- expected acreage of aquatic vegetation remaining after project completion: __________
- purpose of proposed removal (e.g. beach clearing, invasive species control, boat access): __________
- proposed method of plant removal: __________
- if chemical/herbicide treatment will be used, specify product(s): __________

v. Describe any proposed reclamation/mitigation following disturbance: __________

c. Will the proposed action use, or create a new demand for water? ☒ Yes ☐ No
If Yes:
i. Total anticipated water usage/demand per day: 750 gallons/day
ii. Will the proposed action obtain water from an existing public water supply? ☒ Yes ☐ No
If Yes:
- Name of district or service area: United Water New Rochelle-West
- Does the existing public water supply have capacity to serve the proposal? ☒ Yes ☐ No
- Is the project site in the existing district? ☒ Yes ☐ No
- Is expansion of the district needed? ☐ Yes ☒ No
- Do existing lines serve the project site? ☒ Yes ☐ No

iii. Will line extension within an existing district be necessary to supply the project? (Service line only, not an extension of a supply main) ☐ Yes ☒ No
If Yes:
- Describe extensions or capacity expansions proposed to serve this project: __________
- Source(s) of supply for the district: __________

iv. Is a new water supply district or service area proposed to be formed to serve the project site? ☐ Yes ☒ No
If, Yes:
- Applicant/sponsor for new district: __________
- Date application submitted or anticipated: __________
- Proposed source(s) of supply for new district: __________

v. If a public water supply will not be used, describe plans to provide water supply for the project: __________

vi. If water supply will be from wells (public or private), maximum pumping capacity: _______ gallons/minute.

d. Will the proposed action generate liquid wastes? ☒ Yes ☐ No
If Yes:
i. Total anticipated liquid waste generation per day: 750 gallons/day
ii. Nature of liquid wastes to be generated (e.g., sanitary wastewater, industrial; if combination, describe all components and approximate volumes or proportions of each): Sanitary wastewater; anticipated usage volume is 750 gpd

iii. Will the proposed action use any existing public wastewater treatment facilities? ☒ Yes ☐ No
If Yes:
- Name of wastewater treatment plant to be used: Yonkers Wastewater Treatment Facility
- Name of district: North Yonkers Sewer District
- Does the existing wastewater treatment plant have capacity to serve the project? ☒ Yes ☐ No
- Is the project site in the existing district? ☒ Yes ☐ No
- Is expansion of the district needed? ☐ Yes ☒ No

- Do existing sewer lines serve the project site? ☒ Yes ☐ No
- Will line extension within an existing district be necessary to serve the project? ☐ Yes ☒ No

  If Yes:
  - Describe extensions or capacity expansions proposed to serve this project: ____________________

iv. Will a new wastewater (sewage) treatment district be formed to serve the project site? ☐ Yes ☒ No

If Yes:
- Applicant/sponsor for new district: ____________________
- Date application submitted or anticipated: ____________________
- What is the receiving water for the wastewater discharge? ____________________

v. If public facilities will not be used, describe plans to provide wastewater treatment for the project, including specifying proposed receiving water (name and classification if surface discharge, or describe subsurface disposal plans):

____

vi. Describe any plans or designs to capture, recycle or reuse liquid waste: ____________________

e. Will the proposed action disturb more than one acre and create stormwater runoff, either from new point sources (i.e. ditches, pipes, swales, curbs, gutters or other concentrated flows of stormwater) or non-point source (i.e. sheet flow) during construction or post construction? ☐ Yes ☒ No

If Yes:

i. How much impervious surface will the project create in relation to total size of project parcel?

_____ Square feet or _____ acres (impervious surface)

_____ Square feet or _____ acres (parcel size)

ii. Describe types of new point sources. ____________________

iii. Where will the stormwater runoff be directed (i.e. on-site stormwater management facility/structures, adjacent properties, groundwater, on-site surface water or off-site surface waters)?

____

- If to surface waters, identify receiving water bodies or wetlands: ____________________
- Will stormwater runoff flow to adjacent properties? ☐ Yes ☐ No

iv. Does proposed plan minimize impervious surfaces, use pervious materials or collect and re-use stormwater? ☐ Yes ☐ No

f. Does the proposed action include, or will it use on-site, one or more sources of air emissions, including fuel combustion, waste incineration, or other processes or operations? ☒ Yes ☐ No

If Yes, identify:

i. Mobile sources during project operations (e.g., heavy equipment, fleet or delivery vehicles)

Heavy equipment, occasional delivery vehicles

ii. Stationary sources during construction (e.g., power generation, structural heating, batch plant, crushers)

power generators

iii. Stationary sources during operations (e.g., process emissions, large boilers, electric generation)

heating fuel and effluence from that fuel

g. Will any air emission sources named in D.2.f (above), require a NY State Air Registration, Air Facility Permit, or Federal Clean Air Act Title IV or Title V Permit? ☐ Yes ☒ No

If Yes:

i. Is the project site located in an Air quality non-attainment area? (Area routinely or periodically fails to meet ambient air quality standards for all or some parts of the year) ☐ Yes ☒ No

ii. In addition to emissions as calculated in the application, the project will generate:
- ___________Tons/year (short tons) of Carbon Dioxide (CO_2)
- ___________Tons/year (short tons) of Nitrous Oxide (N_2O)
- ___________Tons/year (short tons) of Perfluorocarbons (PFCs)
- ___________Tons/year (short tons) of Sulfur Hexafluoride (SF_6)
- ___________Tons/year (short tons) of Carbon Dioxide equivalent of Hydroflourocarbons (HFCs)
- ___________Tons/year (short tons) of Hazardous Air Pollutants (HAPs)

h. Will the proposed action generate or emit methane (including, but not limited to, sewage treatment plants, landfills, composting facilities)? ☐ Yes ☒ No

If Yes:

i. Estimate methane generation in tons/year (metric): ______

ii. Describe any methane capture, control or elimination measures included in project design (e.g., combustion to generate heat or electricity, flaring): ______

i. Will the proposed action result in the release of air pollutants from open-air operations or processes, such as quarry or landfill operations? ☐ Yes ☒ No

If Yes: Describe operations and nature of emissions (e.g., diesel exhaust, rock particulates/dust): ______

j. Will the proposed action result in a substantial increase in traffic above present levels or generate substantial new demand for transportation facilities or services? ☐ Yes ☒ No

If Yes:

i. When is the peak traffic expected (Check all that apply): ☐ Morning ☐ Evening ☐ Weekend
☐ Randomly between hours of ______ to ______.

ii. For commercial activities only, projected number of semi-trailer truck trips/day: ______

iii. Parking spaces: Existing ______ Proposed ______ Net increase/decrease ______

iv. Does the proposed action include any shared use parking? ☐ Yes ☐ No

v. If the proposed action includes any modification of existing roads, creation of new roads or change in existing access, describe:

The project proposes a new residential driveway curb cut onto Warburton Ave., a Westchester County Roadway. This driveway will eliminate one existing parking space along Warburton. Also, the project proposes to modify an existing driveway curb cut on Washington Ave. Both curb cuts occur were their is only one lane in each direction in Washington & Warburton Avenues.

vi. Are public/private transportation service(s) or facilities available within ½ mile of the proposed site? ☐ Yes ☐ No

vii Will the proposed action include access to public transportation or accommodations for use of hybrid, electric or other alternative fueled vehicles? ☐ Yes ☐ No

viii. Will the proposed action include plans for pedestrian or bicycle accommodations for connections to existing pedestrian or bicycle routes? ☐ Yes ☐ No

k. Will the proposed action (for commercial or industrial projects only) generate new or additional demand for energy? ☐ Yes ☒ No

If Yes:

i. Estimate annual electricity demand during operation of the proposed action: ______

ii. Anticipated sources/suppliers of electricity for the project (e.g., on-site combustion, on-site renewable, via grid/local utility, or other): ______

iii. Will the proposed action require a new, or an upgrade to, an existing substation? ☐ Yes ☐ No

l. Hours of operation. Answer all items which apply.

i. During Construction:

- Monday - Friday: 7:30 am to 8:00 pm
- Saturday: 7:30 am to 8:00 pm
- Sunday: no work anticipated on Sundays
- Holidays: no work anticipated on Holidays

ii. During Operations:

- Monday - Friday: Residential Development
- Saturday: ______
- Sunday: ______
- Holidays: ______

m. Will the proposed action produce noise that will exceed existing ambient noise levels during construction, operation, or both? ☐ Yes ☒ No

If yes:

i. Provide details including sources, time of day and duration:

ii. Will proposed action remove existing natural barriers that could act as a noise barrier or screen? ☐ Yes ☐ No

Describe:

n.. Will the proposed action have outdoor lighting? ☒ Yes ☐ No

If yes:

i. Describe source(s), location(s), height of fixture(s), direction/aim, and proximity to nearest occupied structures:

Porch lights & building light above garage door

ii. Will proposed action remove existing natural barriers that could act as a light barrier or screen? ☐ Yes ☒ No

Describe:

o. Does the proposed action have the potential to produce odors for more than one hour per day? ☐ Yes ☒ No

If Yes, describe possible sources, potential frequency and duration of odor emissions, and proximity to nearest occupied structures:

p. Will the proposed action include any bulk storage of petroleum (combined capacity of over 1,100 gallons) or chemical products (185 gallons in above ground storage or any amount in underground storage)? ☐ Yes ☒ No

If Yes:

i. Product(s) to be stored

ii. Volume(s) ______ per unit time ___________ (e.g., month, year)

iii. Generally describe proposed storage facilities:

q. Will the proposed action (commercial, industrial and recreational projects only) use pesticides (i.e., herbicides, insecticides) during construction or operation? ☐ Yes ☒ No

If Yes:

i. Describe proposed treatment(s):

ii. Will the proposed action use Integrated Pest Management Practices? ☐ Yes ☐ No

r. Will the proposed action (commercial or industrial projects only) involve or require the management or disposal of solid waste (excluding hazardous materials)? (Project is a Residential Development) ☒ Yes ☐ No

If Yes:

i. Describe any solid waste(s) to be generated during construction or operation of the facility:

- Construction: TBD tons per ________ (unit of time)
- Operation : 0.56 tons per month (unit of time)

ii. Describe any proposals for on-site minimization, recycling or reuse of materials to avoid disposal as solid waste:

- Construction: TBD
- Operation: Recycling pick-up service in Village available and is taken to a recycling/garbage transfer station.

iii. Proposed disposal methods/facilities for solid waste generated on-site:

- Construction: TBD
- Operation: Garbage pick-up service in Village available and is taken to a recycling/garbage transfer station.

s. Does the proposed action include construction or modification of a solid waste management facility? ☐ Yes ☒ No

If Yes:

i. Type of management or handling of waste proposed for the site (e.g., recycling or transfer station, composting, landfill, or other disposal activities): ______

ii. Anticipated rate of disposal/processing:

- ________ Tons/month, if transfer or other non-combustion/thermal treatment, or
- ________ Tons/hour, if combustion or thermal treatment

iii. If landfill, anticipated site life: ______ years

t. Will proposed action at the site involve the commercial generation, treatment, storage, or disposal of hazardous waste? ☐ Yes ☒ No

If Yes:

i. Name(s) of all hazardous wastes or constituents to be generated, handled or managed at facility: ______

ii. Generally describe processes or activities involving hazardous wastes or constituents: ______

iii. Specify amount to be handled or generated _____ tons/month

iv. Describe any proposals for on-site minimization, recycling or reuse of hazardous constituents: ______

v. Will any hazardous wastes be disposed at an existing offsite hazardous waste facility? ☐ Yes ☐ No

If Yes: provide name and location of facility: ______

If No: describe proposed management of any hazardous wastes which will not be sent to a hazardous waste facility:

None to be generated.

E. Site and Setting of Proposed Action

E.1. Land uses on and surrounding the project site

a. Existing land uses.

i. Check all uses that occur on, adjoining and near the project site.

☐ Urban ☐ Industrial ☒ Commercial ☒ Residential (suburban) ☐ Rural (non-farm)
☐ Forest ☐ Agriculture ☐ Aquatic ☐ Other (specify): ______

ii. If mix of uses, generally describe:

Along Warburton Ave.; tavern, multi-family residences, one family residences, auto body repair shop. Along Washington Ave.; multi-family residences, one family residences, small shops and Jasper Cropsey House.

b. Land uses and covertypes on the project site.

Land use or Covertype	Current Acreage	Acreage After Project Completion	Change (Acres +/-)
• Roads, buildings, and other paved or impervious surfaces	0.07	0.22	+0.15
• Forested	0	0	
• Meadows, grasslands or brushlands (non-agricultural, including abandoned agricultural)	0.53	0.38	-0.15
• Agricultural (includes active orchards, field, greenhouse etc.)	0	0	N/A
• Surface water features (lakes, ponds, streams, rivers, etc.)	0	0	N/A
• Wetlands (freshwater or tidal)	0	0	N/A
• Non-vegetated (bare rock, earth or fill)			
• Other Describe: ______			

c. Is the project site presently used by members of the community for public recreation? ☐ Yes ☒ No

i. If Yes: explain: ____________________

d. Are there any facilities serving children, the elderly, people with disabilities (e.g., schools, hospitals, licensed day care centers, or group homes) within 1500 feet of the project site? ☒ Yes ☐ No

If Yes,

i. Identify Facilities:

Hastings Youth Advocate Program, Hastings Busy Bees Junior Club, Hastings-on-Hudson Public Library

e. Does the project site contain an existing dam? ☐ Yes ☒ No

If Yes:

i. Dimensions of the dam and impoundment:

- Dam height: ____________________ feet
- Dam length: ____________________ feet
- Surface area: ____________________ acres
- Volume impounded: ____________________ gallons OR acre-feet

ii. Dam's existing hazard classification: ____________________

iii. Provide date and summarize results of last inspection:

____

f. Has the project site ever been used as a municipal, commercial or industrial solid waste management facility, or does the project site adjoin property which is now, or was at one time, used as a solid waste management facility? ☐ Yes ☒ No

If Yes:

i. Has the facility been formally closed? ☐ Yes ☐ No

- If yes, cite sources/documentation: ____________________

ii. Describe the location of the project site relative to the boundaries of the solid waste management facility:

____

iii. Describe any development constraints due to the prior solid waste activities: ____________________

g. Have hazardous wastes been generated, treated and/or disposed of at the site, or does the project site adjoin property which is now or was at one time used to commercially treat, store and/or dispose of hazardous waste? ☐ Yes ☒ No

If Yes:

i. Describe waste(s) handled and waste management activities, including approximate time when activities occurred:

____

h. Potential contamination history. Has there been a reported spill at the proposed project site, or have any remedial actions been conducted at or adjacent to the proposed site? ☐ Yes ☒ No

If Yes:

i. Is any portion of the site listed on the NYSDEC Spills Incidents database or Environmental Site Remediation database? Check all that apply: ☐ Yes ☐ No

☐ Yes – Spills Incidents database — Provide DEC ID number(s): ____________________

☐ Yes – Environmental Site Remediation database — Provide DEC ID number(s): ____________________

☐ Neither database

ii. If site has been subject of RCRA corrective activities, describe control measures: ____________________

iii. Is the project within 2000 feet of any site in the NYSDEC Environmental Site Remediation database? ☒ Yes ☐ No

If yes, provide DEC ID number(s): 360022, V00728, 360015

iv. If yes to (i), (ii) or (iii) above, describe current status of site(s):

360022: Harbor at Hastings, River St. Hastings-on-Hudson, State Superfund Program, still a threat to environment
V00728: CE-Hastings Gas Works, 8-12 Washington Ave., Hastings-on-Hudson, Voluntary Clean-up Program
360015: Tappan Terminal (Eastern Portion), Railroad Ave., Hastings-on-Hudson, State Superfund Program

v. Is the project site subject to an institutional control limiting property uses? ☐ Yes ☒ No

- If yes, DEC site ID number: ____
- Describe the type of institutional control (e.g., deed restriction or easement): ____
- Describe any use limitations: ____
- Describe any engineering controls: ____
- Will the project affect the institutional or engineering controls in place? ☐ Yes ☐ No
- Explain: ____

E.2. Natural Resources On or Near Project Site

a. What is the average depth to bedrock on the project site? >7.0 feet

b. Are there bedrock outcroppings on the project site? ☐ Yes ☒ No
If Yes, what proportion of the site is comprised of bedrock outcroppings? ____%

c. Predominant soil type(s) present on project site: UvC-Urban Land Riverhead Complex 100 %
____ ____%
____ ____%

d. What is the average depth to the water table on the project site? Average: >6.56 feet

e. Drainage status of project site soils: ☒ Well Drained:* 100 % of site
☐ Moderately Well Drained: ____% of site
☐ Poorly Drained ____% of site

* There is no rating for UvC, however this has been updated per on-site percolation testing.

f. Approximate proportion of proposed action site with slopes: ☒ 0-10%: 95 % of site
☒ 10-15%: 5 % of site
☐ 15% or greater: ____% of site

g. Are there any unique geologic features on the project site? ☐ Yes ☒ No
If Yes, describe: ____

h. Surface water features.
i. Does any portion of the project site contain wetlands or other waterbodies (including streams, rivers, ponds or lakes)? ☐ Yes ☒ No
ii. Do any wetlands or other waterbodies adjoin the project site? ☐ Yes ☒ No
If Yes to either *i* or *ii*, continue. If No, skip to E.2.i.
iii. Are any of the wetlands or waterbodies within or adjoining the project site regulated by any federal, state or local agency? ☐ Yes ☒ No
iv. For each identified regulated wetland and waterbody on the project site, provide the following information:

- Streams: Name ____ Classification ____
- Lakes or Ponds: Name ____ Classification ____
- Wetlands: Name ____ Approximate Size ____
- Wetland No. (if regulated by DEC) ____

v. Are any of the above water bodies listed in the most recent compilation of NYS water quality-impaired waterbodies? ☐ Yes ☒ No
If yes, name of impaired water body/bodies and basis for listing as impaired: ____

i. Is the project site in a designated Floodway? ☐ Yes ☒ No

j. Is the project site in the 100 year Floodplain? ☐ Yes ☒ No

k. Is the project site in the 500 year Floodplain? ☐ Yes ☒ No

l. Is the project site located over, or immediately adjoining, a primary, principal or sole source aquifer? ☐ Yes ☒ No
If Yes:
i. Name of aquifer: ____

m. Identify the predominant wildlife species that occupy or use the project site: Site is located in a built landscape habitat and has wildlife species commonly associated with such an environment including, small mammals, birds, and amphibians.

n. Does the project site contain a designated significant natural community? ☐ Yes ☒ No
If Yes:
i. Describe the habitat/community (composition, function, and basis for designation): ______

ii. Source(s) of description or evaluation: ______
iii. Extent of community/habitat:
- Currently: ______ acres
- Following completion of project as proposed: ______ acres
- Gain or loss (indicate + or -): ______ acres

o. Does project site contain any species of plant or animal that is listed by the federal government or NYS as endangered or threatened, or does it contain any areas identified as habitat for an endangered or threatened species? ☒ Yes ☐ No

Project site is located within a rare plant and rare animal area.

p. Does the project site contain any species of plant or animal that is listed by NYS as rare, or as a species of special concern? ☒ Yes ☐ No

Project site is located within a rare plant and rare animal area.

q. Is the project site or adjoining area currently used for hunting, trapping, fishing or shell fishing? ☐ Yes ☒ No
If yes, give a brief description of how the proposed action may affect that use: ______

E.3. Designated Public Resources On or Near Project Site

a. Is the project site, or any portion of it, located in a designated agricultural district certified pursuant to Agriculture and Markets Law, Article 25-AA, Section 303 and 304? ☐ Yes ☒ No
If Yes, provide county plus district name/number: ______

b. Are agricultural lands consisting of highly productive soils present? ☐ Yes ☒ No
i. If Yes: acreage(s) on project site? ______
ii. Source(s) of soil rating(s): ______

c. Does the project site contain all or part of, or is it substantially contiguous to, a registered National Natural Landmark? ☐ Yes ☒ No
If Yes:
i. Nature of the natural landmark: ☐ Biological Community ☐ Geological Feature
ii. Provide brief description of landmark, including values behind designation and approximate size/extent: ______

d. Is the project site located in or does it adjoin a state listed Critical Environmental Area? ☒ Yes ☐ No
If Yes:
i. CEA name: County & State Park Lands, Hudson River
ii. Basis for designation: Exceptional or unique character
iii. Designating agency and date: Westchester County, 01/31/1990

e. Does the project site contain, or is it substantially contiguous to, a building, archaeological site, or district which is listed on, or has been nominated by the NYS Board of Historic Preservation for inclusion on, the State or National Register of Historic Places? If Yes: *i.* Nature of historic/archaeological resource: ☐ Archaeological Site ☒ Historic Building or District *ii.* Name: Old Croton Aqueduct, Crapsey, Jasper F., House and Studio *iii.* Brief description of attributes on which listing is based: Historic architecture and infrastructure	☒ Yes ☐ No
f. Is the project site, or any portion of it, located in or adjacent to an area designated as sensitive for archaeological sites on the NY State Historic Preservation Office (SHPO) archaeological site inventory?	☐ Yes ☒ No
g. Have additional archaeological or historic site(s) or resources been identified on the project site? If Yes: *i.* Describe possible resource(s): ____ *ii.* Basis for identification: ____	☐ Yes ☒ No
h. Is the project site within 5 miles of any officially designated and publicly accessible federal, state, or local scenic or aesthetic resource? If Yes: *i.* Identify resource: Saw Mill River Parkway *ii.* Nature of, or basis for, designation (e.g., established highway overlook, state or local park, state historic trail or scenic byway, etc.): NYS Scenic Byway *iii.* Distance between project and resource: 0.97 miles.	☒ Yes ☐ No
i. Is the project site located within a designated river corridor under the Wild, Scenic and Recreational Rivers Program 6 NYCRR 666? If Yes: *i.* Identify the name of the river and its designation: ____ *ii.* Is the activity consistent with development restrictions contained in 6NYCRR Part 666?	☐ Yes ☒ No ☐ Yes ☐ No

F. Additional Information

Attach any additional information which may be needed to clarify your project.

If you have identified any adverse impacts which could be associated with your proposal, please describe those impacts plus any measures which you propose to avoid or minimize them.

G. Verification

I certify that the information provided is true to the best of my knowledge.

Applicant/Sponsor Name James A. Ryan, RLA Date 10/01/2015

Signature [signature] Title JMC Principal (owner agent)

f:/2013/13180/EAF 8-13-2015b.pdf

TOWNHOUSES AT 32-34 WASHINGTON AVE

WASHINGTON AVE HASTINGS-ON-HUDSON

SITE LOCATION MAP

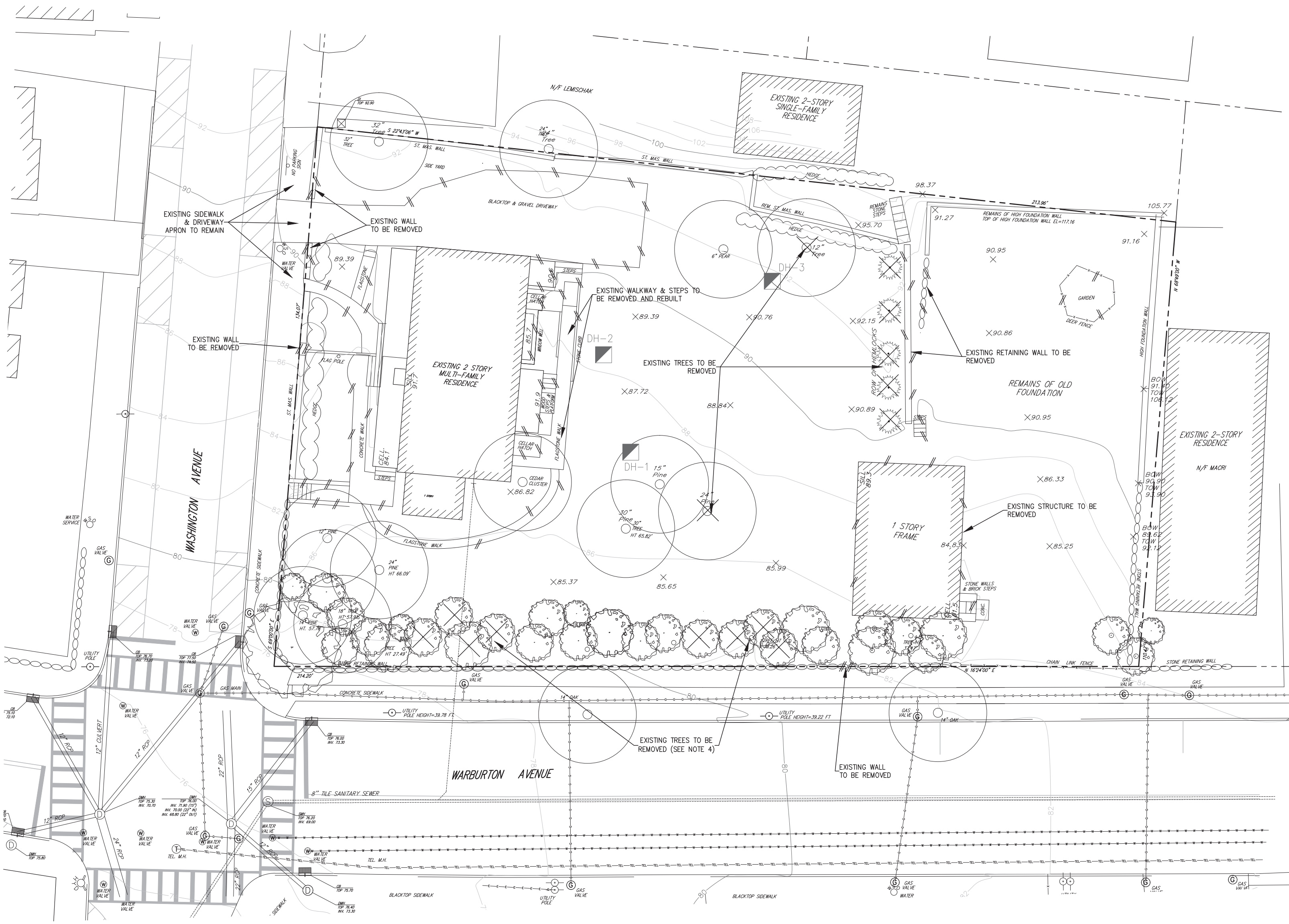
DATE: 03/19/2015 JMC PROJECT: 13180

FIGURE: SLM-1 SCALE: 1" = 1,000'

JMC
SITE DEVELOPMENT CONSULTANTS

120 BEDFORD ROAD • ARMONK, NY 10504
voice 914.273.5225 • fax 914.273.2102
www.jmcpllc.com

13180–SLM.dwg; SLM.tab



LEGEND

- EXISTING PROPERTY LINE
- ADJACENT PROPERTY LINE
- EXISTING BUILDING LINE
- EXISTING PAVEMENT EDGE
- EXISTING CURB LINE
- EXISTING CONTOUR
- EXISTING INDEX CONTOUR
- EXISTING STONE WALL
- EXISTING RETAINING WALL
- EXISTING FENCE
- 14" Oak — EXISTING TREE AND DESIGNATION
- 36" RCP — EXISTING STORM DRAIN LINE AND SIZE
- 8" SAN — EXISTING SANITARY LINE AND SIZE
- EXISTING WATER LINE
- EXISTING GAS LINE
- EXISTING TELEPHONE LINE
- EXISTING DRAIN INLET
- EXISTING MANHOLE
- EXISTING FIRE HYDRANT
- EXISTING GAS VALVE
- EXISTING WATER VALVE
- EXISTING UTILITY POLE
- EXISTING LIGHT POLE
- EXISTING SIGN
- EXISTING FEATURE TO BE REMOVED
- DH-1 — PERCOLATION TEST LOCATION
- PERCOLATION TEST LOCATION

NOTES:

1. EXISTING CONDITIONS DEPICTED ON THIS PLAN HAVE BEEN TAKEN FROM SURVEY TITLED, "TOPOGRAPHIC SURVEY" PREPARED BY WARD CARPENTER ENGINEERS, INC. DATED APRIL 23, 2015
2. EXISTING CONDITIONS OFF SITE DEPICTED ON THIS PLAN HAVE BEEN OBTAINED FROM WESTCHESTER COUNTY GEOGRAPHIC INFORMATION SYSTEMS AND SHOULD BE CONSIDERED APPROXIMATE AND USED FOR PLANNING PURPOSES ONLY.
3. GEOTECHNICAL BORING/TEST PIT LOCATIONS DEPICTED ON THIS PLAN WERE TAKEN FROM THE GEOTECHNICAL REPORT ENTITLED, "SOIL INFILTRATION TEST DATA", DATED 09/09/2015, PREPARED BY CCI PROPERTIES.

GRAPHIC SCALE

(IN FEET)
1 inch = 10 ft.

ANY ALTERATION OF PLANS, SPECIFICATIONS, PLATS AND REPORTS BEARING THE SEAL OF A LICENSED PROFESSIONAL ENGINEER OR LICENSED LAND SURVEYOR IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW, EXCEPT AS PROVIDED FOR BY SECTION 7209, SUBSECTION 2.

NOT FOR CONSTRUCTION

NO.	REVISION	DATE	BY

APPLICANT/OWNER:
CCI PROPERTIES, LLC
52 CEDAR STREET
DOBBS FERRY, NY 10522

ARCHITECT:
CHRISTINA GRIFFIN ARCHITECT, PC
10 SPRING STREET
HASTINGS-ON-HUDSON, NY 10706

JMC
JOHN MEYER CONSULTING, PC
120 Bedford Road
Armonk, NY 10504
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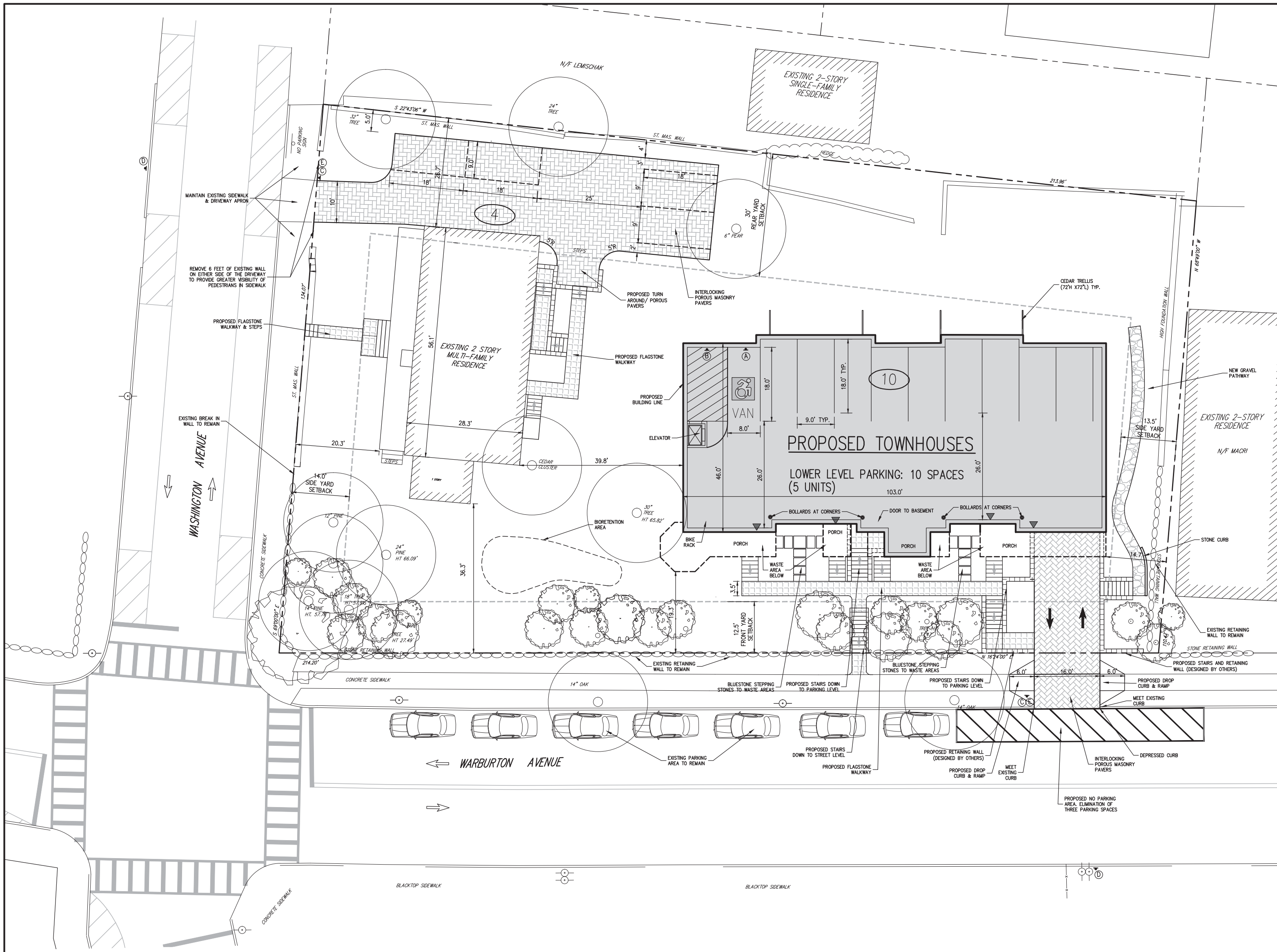
www.johnmeyerconsulting.com

EXISTING CONDITIONS & DEMOLITION PLAN

TOWNHOUSES AT 32-34 WASHINGTON AVENUE
32-34 WASHINGTON AVENUE
HASTING-ON-HUDSON, NY

DRAWN	EH
APPROVED	RR
SCALE	1"=10'
DATE	10/01/2015
PROJECT No	13180
DRAWING No	E-1



GRAPHIC SCALE

(IN FEET)
1 inch = 10 ft.

LEGEND

- EXISTING PROPERTY LINE
- ADJACENT PROPERTY LINE
- PROPOSED PROPERTY LINE
- SETBACK LINE
- EXISTING BUILDING LINE
- EXISTING PAVEMENT EDGE
- EXISTING CURB LINE
- EXISTING STONE WALL
- EXISTING RETAINING WALL
- EXISTING FENCE
- EXISTING TREE AND DESIGNATION
- EXISTING UTILITY POLE
- EXISTING LIGHT POLE
- EXISTING SIGN
- PROPOSED BUILDING LINE
- PROPOSED CONCRETE CURB
- PROPOSED PARKING SPACES WITH NUMBER OF SPACES INDICATED
- PROPOSED HANDICAPPED PARKING SPACES WITH NUMBER OF SPACES INDICATED
- PROPOSED FLAGSTONE WALK
- PROPOSED POROUS PAVERS
- PROPOSED DROP CURB AND RAMP
- PROPOSED RETAINING WALL (DESIGN BY OTHERS)
- TRAFFIC SIGN LOCATION & DESIGNATION

NOTES:

1. EXISTING CONDITIONS DEPICTED ON THIS PLAN HAVE BEEN TAKEN FROM SURVEY TITLED, "TOPOGRAPHIC SURVEY", PREPARED BY WARD CARPENTER ENGINEERS, INC, DATED APRIL 23, 2015.
2. PLEASE REFER TO L-1 "LANDSCAPE PLAN" PREPARED BY CHRISTINA GRIFFIN ARCHITECT PC. FOR PROPOSED LANDSCAPING INFORMATION.
3. THE BUILDING INSPECTOR OR VILLAGE ENGINEER MAY REQUIRE ADDITIONAL EROSION CONTROL MEASURES IF DEEMED APPROPRIATE TO MITIGATE UNFORESEEN SILTATION AND EROSION OF DISTURBED SOILS.
4. "AS-BUILT" DRAWINGS OF THE SITE IMPROVEMENTS SHALL BE SUBMITTED TO THE VILLAGE ENGINEER FOR REVIEW PRIOR TO OBTAINING CERTIFICATE OF OCCUPANCY.
5. THE RESTORATION WORK FOR THE ROADWAY AND SHOULDER CONSTRUCTION WITHIN THE VILLAGE RIGHT-OF-WAY SHALL BE PERFORMED TO THE SATISFACTION OF THE HIGHWAY DEPARTMENT.

SIGN TABLE

DESIGNATION NUMBER	SIGN	SIZE	DESCRIPTION	MOUNTING TYPE	MOUNTING HEIGHT	REGULATORY	REFLECTORIZED
A		12"X18" 12"X6"	GREEN & BLUE ON WHITE	WALL MOUNTED	7'-0"	R7-8	X
B	NO PARKING ANY TIME	12"X18"	RED ON WHITE	STEEL CHANNEL	7'-0"	NYP1-2	X
C	RIGHT TURN ONLY	24"X30"	BLACK ON WHITE	STEEL CHANNEL	BELOW "STOP" SIGN (6'-0" MIN. HEIGHT)	NYR3-20	X
D		24"X24"	BLACK ON RED AND WHITE	STEEL CHANNEL	7'-0"	R3-2	X
E	STOP	30"X30"	WHITE ON RED	STEEL CHANNEL	7'-0"	R1-1	X

NO.	REVISION	DATE	BY
1.	GENERAL REVISIONS	04/02/2015	EH
2.	GENERAL REVISIONS	05/07/2015	EH
3.	GENERAL REVISIONS	05/21/2015	EH
4.	GENERAL REVISIONS	06/30/2015	PD
5.	GENERAL REVISIONS	07/27/2015	EH
6.	PLANNING BOARD SUBMISSION	08/11/2015	EH
7.	PLANNING BOARD SUBMISSION	10/01/2015	EH

Previous Editions Obsolete

APPLICANT/OWNER:
CCI PROPERTIES, LLC
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ARCHITECT:
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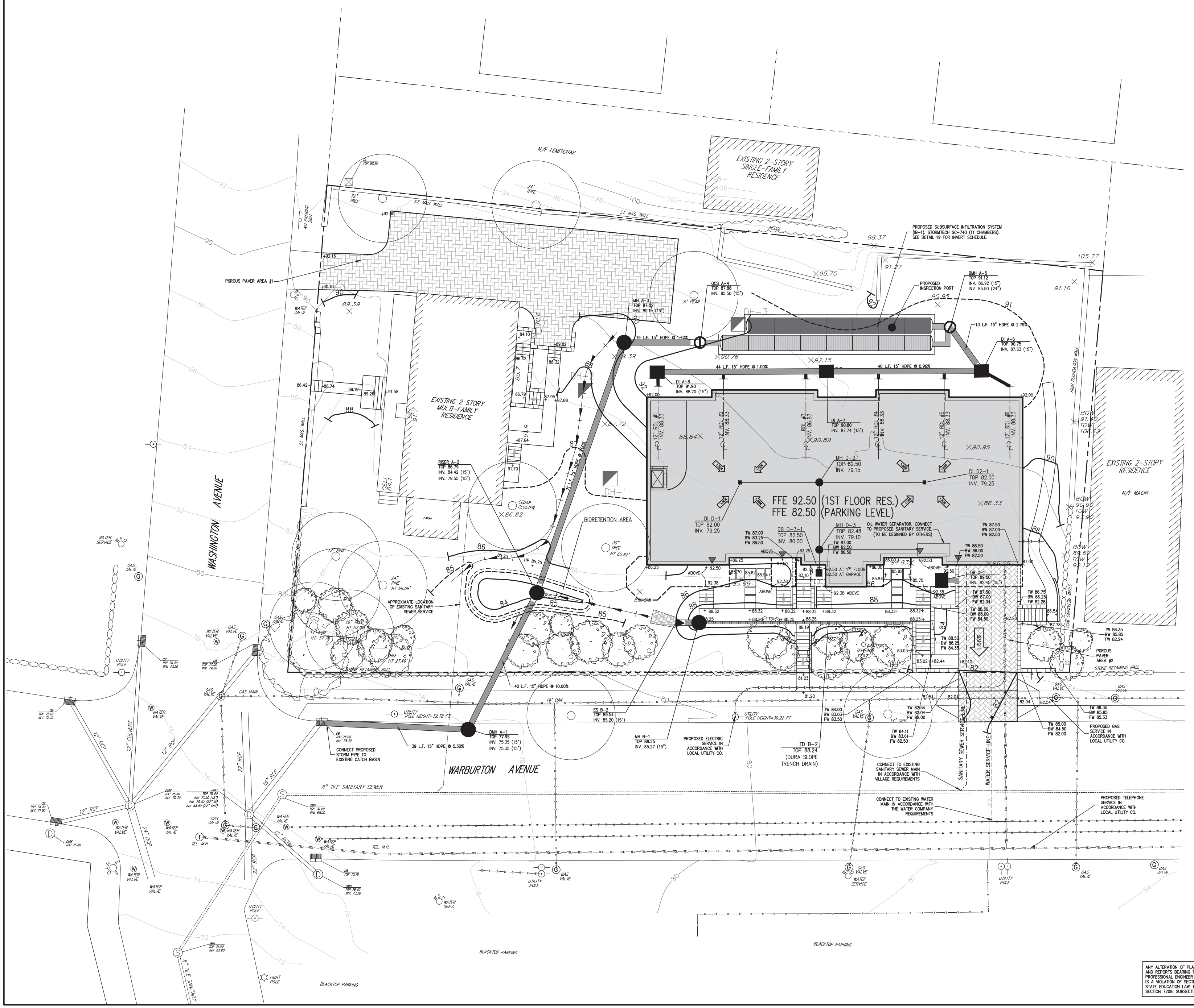
LAYOUT PLAN

TOWNHOUSES AT 32-34 WASHINGTON AVENUE
32-34 WASHINGTON AVENUE
HASTING-ON-HUDSON, NY

ANY ALTERATION OF PLANS, SPECIFICATIONS, PLATS AND REPORTS BEARING THE SEAL OF A LICENSED PROFESSIONAL ENGINEER OR LICENSED LAND SURVEYOR IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW, EXCEPT AS PROVIDED FOR BY SECTION 7209, SUBSECTION 2.

NOT FOR CONSTRUCTION

DRAWN: ED	APPROVED: RR
SCALE: 1" = 10'	
DATE: 03/19/2015	
PROJECT No: 13180	
DWG: 13180-SITE	TAB: LAYOUT / SCR: LAYOUT
DRAWING No: C-1	



LEGEND

	EXISTING PROPERTY LINE
	ADJACENT PROPERTY LINE
	PROPOSED PROPERTY LINE
	EXISTING BUILDING LINE
	EXISTING PAVEMENT EDGE
	EXISTING CURB LINE
	EXISTING CONTOUR
	EXISTING INDEX CONTOUR
	EXISTING STONE WALL
	EXISTING RETAINING WALL
	EXISTING FENCE
	EXISTING DRAIN INLET
	EXISTING MANHOLE
	EXISTING UTILITY POLE
	EXISTING LIGHT POLE
	EXISTING SIGN
	PROPOSED BUILDING LINE
	PROPOSED CONCRETE CURB
	PROPOSED CONCRETE SIDEWALK
	PROPOSED POROUS PAVERS
	PROPOSED FINISHED GRADE
191.00	PROPOSED SPOT GRADE
SMH	PROPOSED SANITARY SEWER MANHOLE
MH	PROPOSED STORM DRAIN MANHOLE
CI	PROPOSED TYPE CI DRAIN INLET
U	PROPOSED TYPE U DRAIN INLET
15" HDPE	PROPOSED STORM DRAIN LINE & SIZE
6" PVC	PROPOSED SANITARY SEWER LINE & SIZE
2" WATER	PROPOSED WATER LINE & SIZE
	PROPOSED GAS LINE
	PROPOSED ELECTRIC/TELEPHONE/CABLE
	PROPOSED WATER VALVE
	PROPOSED GAS VALVE
	PROPOSED RETAINING WALL (DESIGN BY OTHERS)
	TRENCH DRAIN
DH-1	PERCOLATION TEST LOCATION
	OUTLET CONTROL STRUCTURE
	SWALE CENTERLINE
	ROOF DRAIN LEADER

NOTES:

1. EXISTING CONDITIONS DEPICTED ON THIS PLAN HAVE BEEN TAKEN FROM SURVEY TITLED, "TOPOGRAPHIC SURVEY", PREPARED BY WARD CARPENTER ENGINEERS, INC, DATED APRIL 23, 2015.
2. UNLESS OTHERWISE SPECIFIED, PIPE FOR STORM DRAINS SHALL BE HIGH DENSITY POLYETHYLENE PIPE (HDPE) WITH A SMOOTH INTERIOR AND ANNULAR EXTERIOR CORRUGATIONS IN ACCORDANCE WITH ASTM F-2648. JOINTS SHALL BE WATERTIGHT IN ACCORDANCE WITH ASTM D-3212.
3. UNLESS OTHERWISE SPECIFIED, PIPE FOR SANITARY SEWER GRAVITY LINES SHALL BE POLYVINYL CHLORIDE PIPE (PVCP), SDR-35, WITH PUSH-ON JOINTS IN ACCORDANCE WITH ASTM D-3034 AND D-3212.
4. UNLESS OTHERWISE SPECIFIED, PIPE FOR WATER LINES SHALL BE DOUBLE CEMENT-LINED DUCTILE IRON PIPE (DIP), CLASS 52, WITH PUSH ON JOINTS IN ACCORDANCE WITH AWWA C-150, C-151, C-104 AND C-111.
5. ELECTRIC, TELEPHONE, FIRE ALARM AND CABLE TELEVISION LINES SHALL BE INSTALLED UNDERGROUND IN CONDUIT IN ACCORDANCE WITH THE REQUIREMENTS OF THE UTILITY COMPANY HAVING JURISDICTION.
6. THE BUILDING INSPECTOR OR VILLAGE ENGINEER MAY REQUIRE ADDITIONAL EROSION CONTROL MEASURES IF DEEMED APPROPRIATE TO MITIGATE UNFORESEEN SILTATION AND EROSION OF DISTURBED SOILS.
7. "AS-BUILT" DRAWINGS OF THE SITE IMPROVEMENTS SHALL BE SUBMITTED TO THE VILLAGE ENGINEER FOR REVIEW PRIOR TO OBTAINING CERTIFICATE OF OCCUPANCY.
8. THE RESTORATION WORK FOR THE ROADWAY AND SHOULDER CONSTRUCTION WITHIN THE VILLAGE RIGHT-OF-WAY SHALL BE PERFORMED TO THE SATISFACTION OF THE HIGHWAY DEPARTMENT.
9. GEOTECHNICAL BORING/TEST PIT LOCATIONS DEPICTED ON THIS PLAN WERE TAKEN FROM THE GEOTECHNICAL REPORT ENTITLED, "SOIL INFILTRATION TEST DATA", DATED 09/09/2015, PREPARED BY CCI PROPERTIES.
10. APPROXIMATELY 1,300 CUBIC YARDS OF MATERIAL IS TO BE REMOVED FROM THE SITE.

(PROPOSED GRADE) BW TW FW (PROPOSED GRADE)

RETAINING WALL SPOT GRADE LEGEND

GRAPHIC SCALE

10 0 5 10 20 40

(IN FEET)
1 inch = 10 ft.

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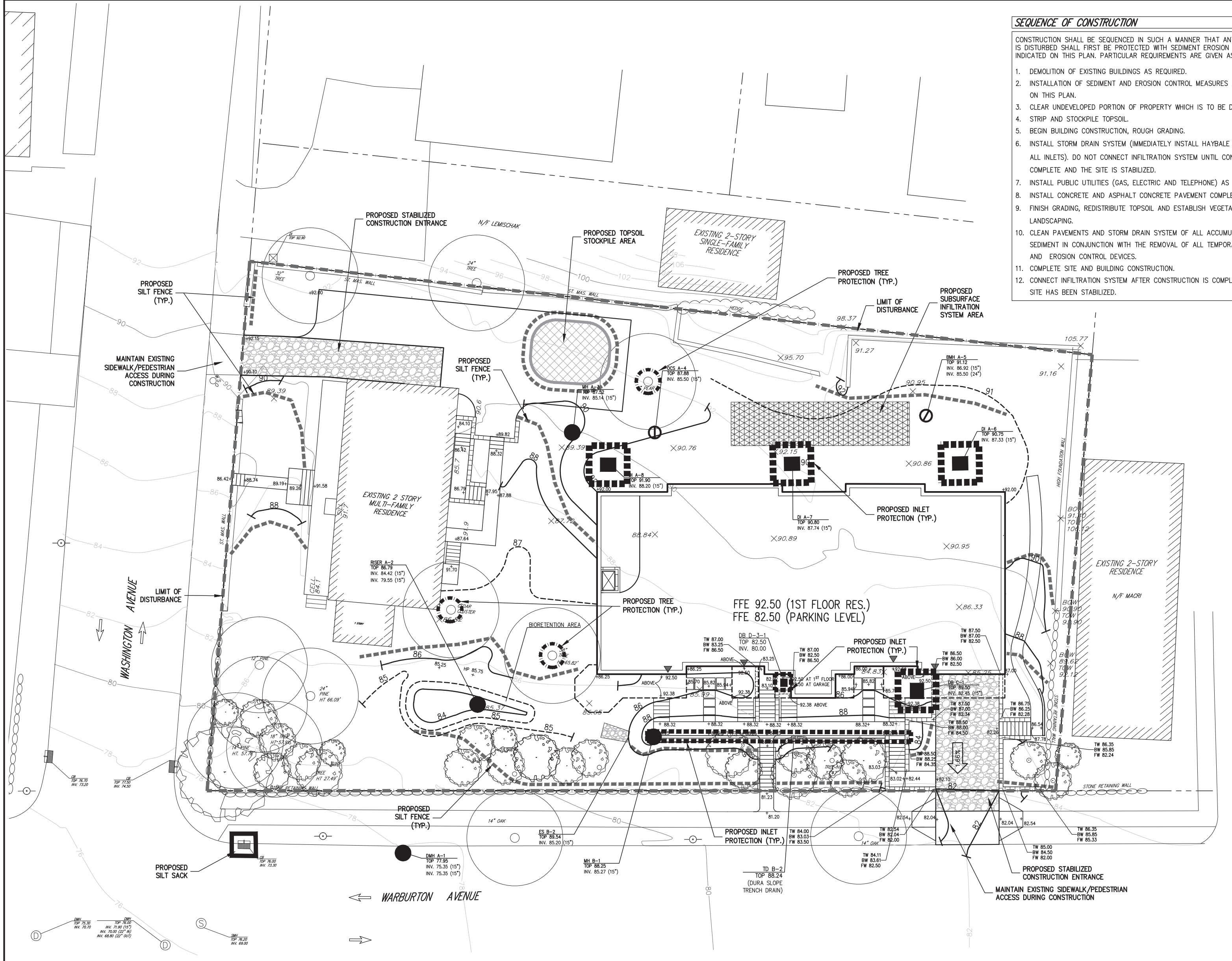
GRADING & UTILITIES PLAN

TOWNHOUSES AT 32-34
WASHINGTON AVENUE
32-34 WASHINGTON AVENUE
HASTING-ON-HUDSON, NY

DRAWN: ED	APPROVED: RR
SCALE:	1" = 10'
DATE:	03/19/2015
PROJECT No:	13180
DWG: 1318-SITE	FAB: GRAD & UTIL / SCHE: GRADING
DRAWING No:	C-2



SEQUENCE OF CONSTRUCTION

CONSTRUCTION SHALL BE SEQUENCED IN SUCH A MANNER THAT ANY AREA WHICH IS DISTURBED SHALL FIRST BE PROTECTED WITH SEDIMENT EROSION CONTROLS AS INDICATED ON THIS PLAN. PARTICULAR REQUIREMENTS ARE GIVEN AS FOLLOWS:

1. DEMOLITION OF EXISTING BUILDINGS AS REQUIRED.
2. INSTALLATION OF SEDIMENT AND EROSION CONTROL MEASURES AS INDICATED ON THIS PLAN.
3. CLEAR UNDEVELOPED PORTION OF PROPERTY WHICH IS TO BE DEVELOPED.
4. STRIP AND STOCKPILE TOPSOIL.
5. BEGIN BUILDING CONSTRUCTION, ROUGH GRADING.
6. INSTALL STORM DRAIN SYSTEM (IMMEDIATELY INSTALL HAYBALE FILTERS ON ALL INLETS). DO NOT CONNECT INFILTRATION SYSTEM UNTIL CONSTRUCTION IS COMPLETE AND THE SITE IS STABILIZED.
7. INSTALL PUBLIC UTILITIES (GAS, ELECTRIC AND TELEPHONE) AS REQUIRED.
8. INSTALL CONCRETE AND ASPHALT CONCRETE PAVEMENT COMPLETE.
9. FINISH GRADING, REDISTRIBUTE TOPSOIL AND ESTABLISH VEGETATION AND/OR LANDSCAPING.
10. CLEAN PAVEMENTS AND STORM DRAIN SYSTEM OF ALL ACCUMULATED SEDIMENT IN CONJUNCTION WITH THE REMOVAL OF ALL TEMPORARY SEDIMENT AND EROSION CONTROL DEVICES.
11. COMPLETE SITE AND BUILDING CONSTRUCTION.
12. CONNECT INFILTRATION SYSTEM AFTER CONSTRUCTION IS COMPLETE AND THE SITE HAS BEEN STABILIZED.

LEGEND

- PROPOSED INLET PROTECTION
- PROPOSED SILT FENCE
- PROPOSED STABILIZED CONSTRUCTION ENTRANCE
- PROPOSED SILT SACK
- PROPOSED TREE PROTECTION
- PROPOSED LIMIT OF DISTURBANCE
- PROPOSED STOCKPILE AREA
- PROPOSED SUBSURFACE INFILTRATION SYSTEM

NOTES:

1. EXISTING CONDITIONS DEPICTED ON THIS PLAN HAVE BEEN TAKEN FROM SURVEY TITLED, "TOPOGRAPHIC SURVEY", PREPARED BY WARD CARPENTER ENGINEERS, INC, DATED APRIL 23, 2015.
2. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH ALL THE PLANS, PRIOR TO BEGINNING ANY CLEARING, GRUBBING OR EXCAVATION.
3. EXPOSED SLOPES AND ALL GRADED AREAS SHALL BE SEEDED WITH THE FOLLOWING GRASS MIX IMMEDIATELY UPON COMPLETION OF ITS CONSTRUCTION AT A RATE OF 6 POUNDS PER 1000 S.F. IN THE FOLLOWING PROPORTIONS:
   CREEPING RED FESCUE 30 %
   PERENNIAL RYE GRASS 70 %
4. GRASS SEED MIX FOR EROSION AND SEDIMENT CONTROL MAY BE APPLIED BY EITHER MECHANICAL OR HYDROSEEDING METHODS. HYDROSEEDING SHALL BE PERFORMED IN ACCORDANCE WITH THE AMERICAN ASSOCIATION OF NURSERYMEN, AMERICAN STANDARD FOR NURSERY STOCK, LATEST EDITION.
5. SEEDED AREAS SHALL BE MULCHED WITH STRAW AT A RATE OF 2 TONS PER ACRE (90 LBS. PER 1,000 S.F.)SUCH THAT THE MULCH FORMS A CONTINUOUS BLANKET.
6. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED AND MAINTAINED ON A DAILY BASIS BY THE CONTRACTOR. ALL COLLECTED SEDIMENT WITHIN SEDIMENT BARRIERS SHALL BE REMOVED PERIODICALLY TO MAINTAIN THE FUNCTION OF THE SEDIMENT BARRIER. ALL SEDIMENT COLLECTED SHALL BE RESPREAD ON-SITE WITHIN STABILIZED AREAS AS DIRECTED BY THE OWNERS FIELD REPRESENTATIVE.
7. DUST SHALL BE CONTROLLED BY SPRINKLING OR OTHER APPROVED METHODS AS NECESSARY, OR AS DIRECTED BY THE TOWN ENGINEER.
8. CUT AND FILLS SHALL NOT ENDANGER ADJOINING PROPERTIES, NOR DIVERT WATER ONTO THE PROPERTY OF OTHERS.
9. ALL FILLS SHALL BE COMPACTED TO PROVIDE STABILITY OF MATERIAL AND TO PREVENT SETTLEMENT.
10. THE CONTRACTOR SHALL INSPECT DOWNSTREAM CONDITIONS FOR EVIDENCE OF SEDIMENTATION ON A WEEKLY BASIS AND AFTER RAINSTORMS.
11. AS WARRANTED BY FIELD CONDITIONS, SPECIAL ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED BY THE CONTRACTOR AS REQUIRED.
12. STOCKPILING OF CONSTRUCTION MATERIAL SHALL BE PLACED ON-SITE IN THE AREA DESIGNATED. STOCKPILED EXCAVATED MATERIAL SHALL HAVE SILT FENCE LOCATED AROUND PERIMETER. ALL STOCKPILED MATERIAL SHALL BE MAINTAINED IN AN ORDERLY MANNER SO AS NOT TO IMPEDE ON EXISTING TRAFFIC CIRCULATION ROUTES.
13. THE INFILTRATION SYSTEM MUST NOT BE CONNECTED UNTIL CONSTRUCTION IS COMPLETE AND THE SITE IS STABILIZED.
14. THE BUILDING INSPECTOR OR VILLAGE ENGINEER MAY REQUIRE ADDITIONAL EROSION CONTROL MEASURES IF DEEMED APPROPRIATE TO MITIGATE UNFORESEEN SILTATION AND EROSION OF DISTURBED SOILS.
15. "AS-BUILT" DRAWINGS OF THE SITE IMPROVEMENTS SHALL BE SUBMITTED TO THE VILLAGE ENGINEER FOR REVIEW PRIOR TO OBTAINING CERTIFICATE OF OCCUPANCY.
16. THE RESTORATION WORK FOR THE ROADWAY AND SHOULDER CONSTRUCTION WITHIN THE VILLAGE RIGHT-OF-WAY SHALL BE PERFORMED TO THE SATISFACTION OF THE HIGHWAY DEPARTMENT.

Permanent Stormwater Management Practice Inspection and Maintenance Checklist

Stormwater Management Practice	Inspection/Maintenance Intervals	Inspection/Maintenance Requirements
Drain Inlets	Monthly	• Check for blockage and/or erosion at top of each inlet. Repair/remove as necessary. • Check for sediment and debris collected within sumps and clean out as necessary.
Porous Pavement and Permeable Pavers	Monthly and As Needed	• Ensure that paving area is clean of debris • Ensure that paving dewaters between storms • Ensure that the area is clean of sediments • Mow upland and adjacent areas, and seed bare areas
	Quarterly	• Vacuum sweep frequently to keep surface free of sediments
	Annually	• Inspect the surface for deterioration or spalling
StormTech Subsurface Retention Facility	Semi-Annually + After Major Storms	• Check level of sediment accumulated within the isolator row through the access manhole. If 3 inches of sediment or greater, clean out utilizing a high pressure water nozzle to scour and suspend sediments. • Flush all sediment to access manhole and remove using a vacuum truck.

Stormwater Management Practice	Inspection/Maintenance Intervals	Inspection/Maintenance Requirements
Bioretention	Routine and As Needed	• Mowing-Frequency depends upon location and desired aesthetic appeal. • Watering-If droughty, watering after the initial year may be required. • Miscellaneous Upkeep-Tasks include trash collection, spot weeding, and removing mulch from overflow device.
	Semi-Annually	• Pruning -Nutrients in runoff often cause bioretention vegetation to flourish. • Mulching -Remulch bare areas with fresh mulch.
	Annually	• Mulch Removal-Mulch accumulation reduces available water storage volume. Removal of mulch also increases surface infiltration rate of fill soil. • Remove and Replace Dead Plants-Within the first year, 10 percent of plants may die. Survival rates increase with time.

Temporary Erosion and Sediment Control Inspection and Maintenance Checklist

Erosion and Sediment Control Measure	Inspection/Maintenance Intervals	Inspection/Maintenance Requirements
Stabilized Construction Entrance	Daily	• Periodic top dressing with additional aggregate as required • Clean sediment in public right-of-ways immediately
Silt Fence	Weekly + After Each Rain	• Remove & redistribute sediment when bulges develop in the silt fence.
Inlet Protection	Weekly + After Each Rain	• Refer to Figures A5.11, A5.12, A5.13 & A5.14 within the NYSDEC New York State Standard and Specifications for Erosion and Sediment Control

GRAPHIC SCALE

(IN FEET)
1 inch = 10 ft.

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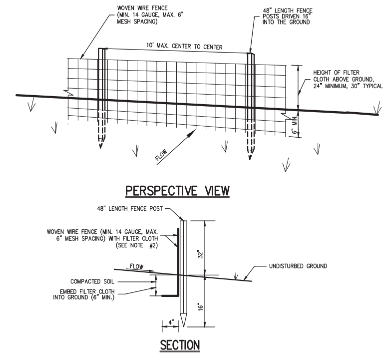
SEDIMENT & EROSION CONTROL PLAN

TOWNHOUSES AT 32-34 WASHINGTON AVENUE
32-34 WASHINGTON AVENUE
HASTING-ON-HUDSON, NY

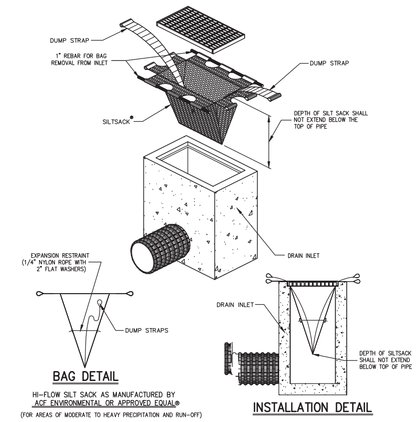
DRAWN: ED APPROVED: RR
SCALE: 1" = 10'
DATE: 03/19/2015
PROJECT No: 13180
DWG: 1318-SITE TAB: S&E SCHE: SE
DRAWING No: C-3



NOTES:

1. WOVEN WIRE FENCE SHALL BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL, EITHER T OR U TYPE OR HARDWOOD.
2. FILTER CLOTH SHALL BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABLINKA T140N, OR APPROVED EQUAL.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUAL.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED AND REPLACED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

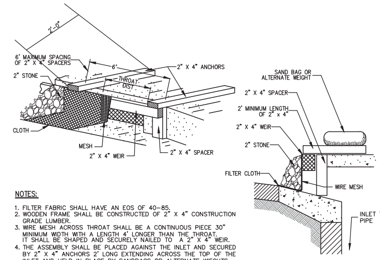
SILT FENCE 1



HI-FLOW SILT SACK AS MANUFACTURED BY ACF ENVIRONMENTAL OR APPROVED EQUAL®
(FOR AREAS OF MODERATE TO HEAVY PRECIPITATION AND RUN-OFF)

PROPERTIES	TEST METHOD	UNITS
GRAB TENSILE STRENGTH	ASTM D-4632	265 LBS
GRAB TENSILE ELONGATION	ASTM D-4632	20 %
PUNCTURE	ASTM D-4833	135 LBS
MULLEN BURST	ASTM D-3786	420 PSI
TRAPEZOID TEAR	ASTM D-4533	45 LBS
UV RESISTANCE	ASTM D-4355	90 %
APPARENT OPENING SIZE	ASTM D-4751	20 US SIEVE
FLOW RATE	ASTM D-4491	200 GAL/MIN/SQ FT
PERMITTIVITY	ASTM D-4491	1.5 SEC -1

SILT SACK 2

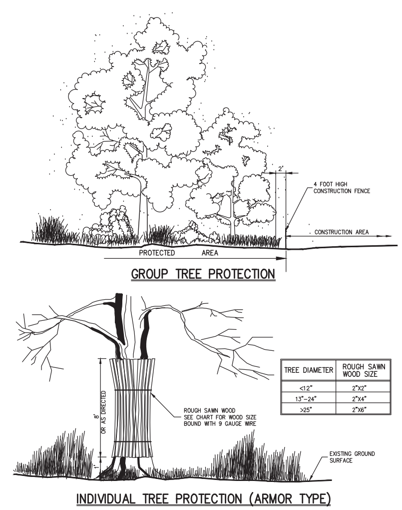


NOTES:

1. FILTER FABRIC SHALL HAVE AN EOS OF 40-85.
2. WOODEN FRAME SHALL BE CONSTRUCTED OF 2" X 4" CONSTRUCTION GRADE LUMBER.
3. WIRE MESH ACROSS THROAT SHALL BE A CONTINUOUS PIECE 30" MINIMUM WIDTH WITH A LENGTH 4' LONGER THAN THE THROAT. IT SHALL BE SHAPED AND SECURELY NAILED TO A 2" X 4" WEIR.
4. THE ASSEMBLY SHALL BE PLACED AGAINST THE INLET AND SECURED BY 2" X 4" ANCHORS 2' LONG EXTENDING ACROSS THE TOP OF THE INLET AND HELD IN PLACE BY SANDBAGS OR ALTERNATE WIEGHTS.
5. INLET PROTECTION SHALL BE INSPECTED FREQUENTLY, MAINTAINED, REPAIRED OR REPLACED TO MAINTAIN EFFECTIVENESS OF INSTALLATION.
6. INLET PROTECTION SHALL BE REMOVED WHEN DIRECTED BY THE OWNER'S FIELD REPRESENTATIVE.
7. IF A SIDEWALK EXISTS, THE CONTRACTOR SHALL PROVIDE PROTECTIVE FENCING (SEE DETAIL) TO PROTECT THE PUBLIC.
8. THE WEIR SHALL BE SECURELY NAILED TO 2" X 4" SPACERS 9 INCHES LONG SPACED NO MORE THAN 6 FEET APART.

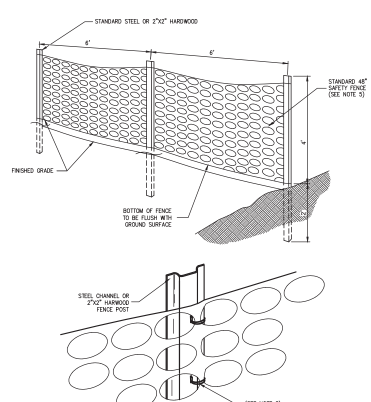
MAXIMUM DRAINAGE AREA 1 ACRE

CURB DROP INLET PROTECTION STRUCTURE 3



TREE DIAMETER	ROUGH SAWN WOOD SIZE
<12"	2"x2"
13"-24"	2"x4"
>25"	2"x6"

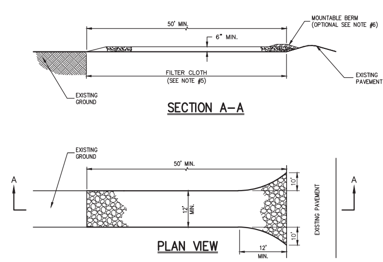
TREE PROTECTION 4



NOTES:

1. SPACE SUPPORT FENCE POSTS AT 6 FOOT INTERVALS.
2. DRIVE SUPPORT POSTS 2 FEET INTO GROUND.
3. FIRMLY FASTEN FENCE MATERIAL IN PLACE BY WIRING TO FENCE POST WHILE MAINTAINING TENSION ACROSS FULL HEIGHT OF FENCE. WIRING SHALL BE DONE IN A MANNER THAT WILL PREVENT SAGGING OF FENCE MATERIAL.
4. PROVIDE PERIODIC INSPECTION AND MAINTENANCE OF FENCE INCLUDING REPAIRS AS NECESSARY AND REQUIRED.
5. PLASTIC FENCE SHALL BE INTERNATIONAL ORANGE COLOR, AS MANUFACTURED BY ADPI ENTERPRISES, INC. OR APPROVED EQUAL.
6. REMOVE CONSTRUCTION FENCE AS DIRECTED BY THE OWNER'S FIELD REPRESENTATIVE.

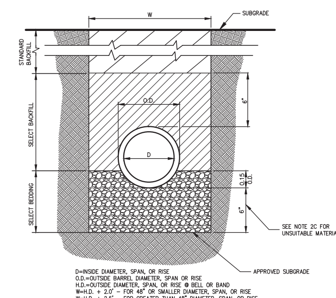
CONSTRUCTION FENCE 5



NOTES

1. STONE SIZE - USE 1" TO 4" STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - AS REQUIRED, BUT NOT LESS THAN 50 FEET.
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - 12 FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. 24 FOOT MINIMUM IF SINGLE ENTRANCE TO SITE.
5. FILTER CLOTH TO BE PLACED OVER THE ENTIRE WIDTH AND LENGTH OF AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURE USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WASHING - WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHTS-OF-WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

STABILIZED CONSTRUCTION ENTRANCE 6

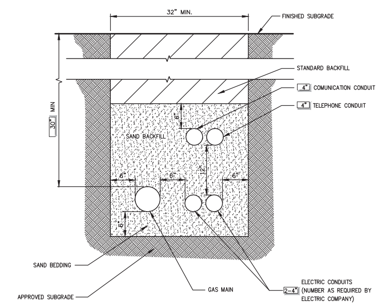


D=INSIDE DIAMETER, SPAN, OR RISE
O.D.=OUTSIDE BARREL DIAMETER, SPAN OR RISE
H.D.=OUTSIDE DIAMETER, SPAN, OR RISE @ BELL OR BAND
W=H.D. + 2.0' - FOR 48" OR SMALLER DIAMETER, SPAN, OR RISE
W=H.D. + 2.5' - FOR GREATER THAN 48" DIAMETER, SPAN, OR RISE

NOTES:

1. FOR TYPE II TRENCH, MATERIAL FOR SELECT BEDDING AND SELECT BACKFILL SHALL BE:
   A. EITHER SAND OR CRUSHED STONE IF NO WATER IS ENCOUNTERED IN TRENCH.
   B. 3/4"CRUSHED STONE IF WATER IS ENCOUNTERED IN TRENCH.
2. TYPE II TRENCH SHALL BE USED IN ALL OF THE FOLLOWING CASES:
   A. FOR ALL CORRUGATED POLYETHYLENE DRAIN PIPE (CPDP) AND PVC PIPE AND CONDUIT INSTALLATION.
   B. WHEN ROCK OR HARDPAN IS ENCOUNTERED IN BOTTOM OF TRENCH.
   C. WHEN UNSUITABLE MATERIAL IS ENCOUNTERED IN BOTTOM OF TRENCH. IN SUCH CASE DEPTH OF UNDERCUTTING SHALL BE AS DIRECTED BY THE ENGINEER WITH 6" MINIMUM.
3. FOR ALL TRENCH EXCAVATION IN FILL AREAS, ALL EMBANKMENTS SHALL BE CONSTRUCTED TO A MINIMUM OF 2 FEET ABOVE THE OUTSIDE TOP (AT THE BELL) OF THE PIPE PRIOR TO BEGINNING ANY TRENCH EXCAVATION.
4. BACKFILL FOR PIPE AND CONDUIT SHALL BE PLACED EVENLY AND CAREFULLY AROUND AND OVER THE PIPE OR CONDUIT IN SIX (6) INCH MAXIMUM LAYERS. EACH LAYER SHALL BE THOROUGHLY AND CAREFULLY COMPACTED UNTIL TWELVE (12) INCHES OF COVER EXISTS OVER THE PIPE OR CONDUIT. THE REMAINDER OF THE BACKFILL MAY THEN BE PLACED AND COMPACTED IN A MAXIMUM OF TWELVE (12) INCH LAYERS. EACH LAYER SHALL BE COMPACTED BY APPROVED MECHANICAL TAMPING MACHINES. UNLESS OTHERWISE SPECIFIED BACKFILL SHALL BE COMPACTED TO NOT LESS THAN 92% MAXIMUM MODIFIED DENSITY IN ACCORDANCE WITH ASTM DESIGNATION D-1557 IN THE MANNER HEREIN DESCRIBED. BACKFILL SHALL PROCEED UP TO THE LINES AND GRADES AS SHOWN ON THE DRAWINGS.

TYPE II TRENCH 7



NOTES:

1. UTILITIES TO BE INSTALLED IN ACCORDANCE WITH THE REGULATIONS AND REQUIREMENTS OF THE UTILITY COMPANY HAVING JURISDICTION.
2. BACKFILL FOR PIPE AND CONDUIT SHALL BE PLACED EVENLY AND CAREFULLY AROUND AND OVER THE PIPE OR CONDUIT IN SIX (6) INCH MAXIMUM LAYERS. EACH LAYER SHALL BE THOROUGHLY AND CAREFULLY COMPACTED UNTIL TWELVE (12) INCHES OF COVER EXISTS OVER THE PIPE OR CONDUIT. THE REMAINDER OF THE BACKFILL MAY THEN BE PLACED AND COMPACTED IN A MAXIMUM OF TWELVE (12) INCH LAYERS. EACH LAYER SHALL BE COMPACTED BY APPROVED MECHANICAL TAMPING MACHINES. UNLESS OTHERWISE SPESIFIED BACKFILL SHALL BE COMPACTED TO NOT LESS THAN 92% MAXIMUM MODIFIED DENSITY IN ACCORDANCE WITH ASTM DESIGNATION D-1557 IN THE MANNER HEREIN DESCRIBED. BACKFILL SHALL PROCEED UP TO THE LINES AND GRADES AS SHOWN ON THE DRAWINGS.

UTILITY TRENCH DETAIL 8

NOT FOR CONSTRUCTION

NO.	REVISION	DATE	BY
1	GENERAL REVISIONS	5/7/2015	EH

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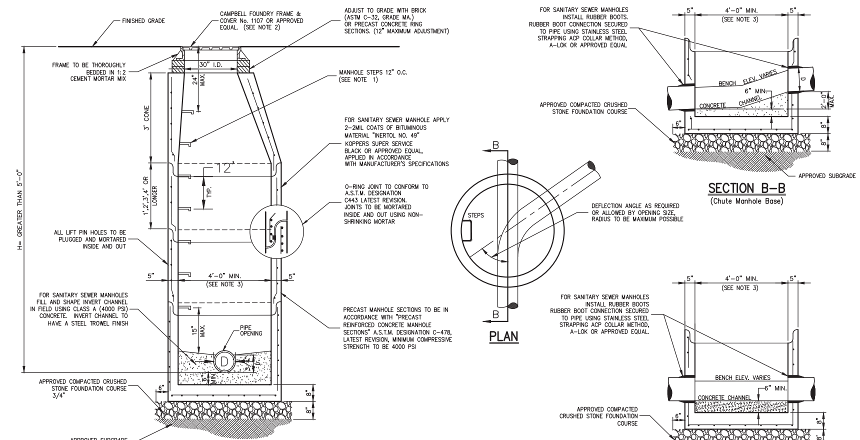
CONSTRUCTION DETAILS

TOWNHOUSES AT 32-34 WASHINGTON AVENUE
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY

DRAWN: ED APPROVED: RR
SCALE: NTS
DATE: 03/19/2015
PROJ. NO: 13180
13180-DETAILS.dwg SP-7.tab -
DRAWING NO: C-4

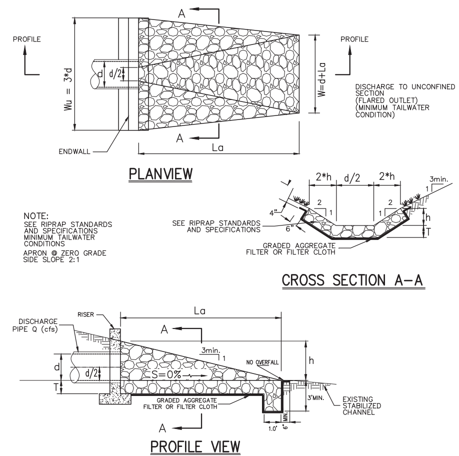


NOTES:

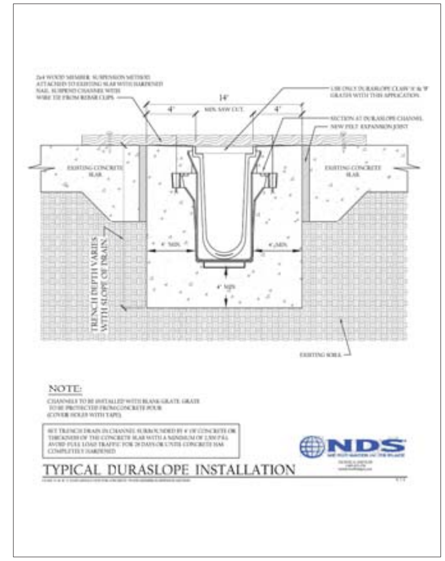
1. MANHOLE STEPS SHALL BE CAST IRON NEENAH No. R-1981-0 OR CAMPBELL FOUNDRY No. 2588-1 OR POLYPROPYLENE COATED STEEL (SEE SPECIFICATIONS) OR APPROVED EQUAL.
2. UNLESS OTHERWISE SPECIFIED, SANITARY SEWER MANHOLES SHALL HAVE LETTERS "SEWER" AND STORM DRAIN MANHOLES SHALL HAVE LETTERS "DRAIN" CAST ON COVER. THE COVERS SHALL HAVE VENT HOLES.
3. MANHOLES WITH DEPTH (h) 10' OR GREATER SHALL BE FIVE (5) FEET IN DIAMETER.
4. MANHOLES SHALL MEET OR EXCEED A.S.T.M. AND O.S.H.A. REQUIREMENTS.
5. SEE "NOTES PERTAINING TO MANHOLES" UNDER "UTILITY NOTES" ON DRAWING SP-8

MANHOLE (TYPE B) — 9

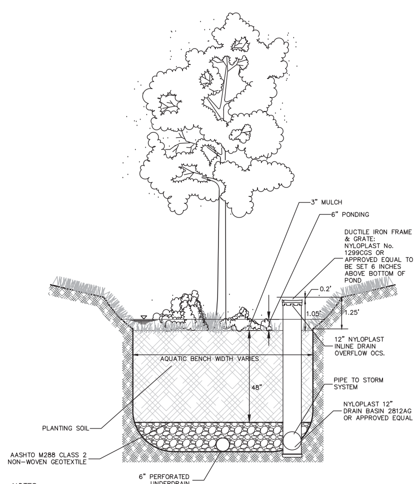
(H > 5'-0"<10'-0")



RIP-RAP APRON/ ENERGY DISSIPATOR — 10



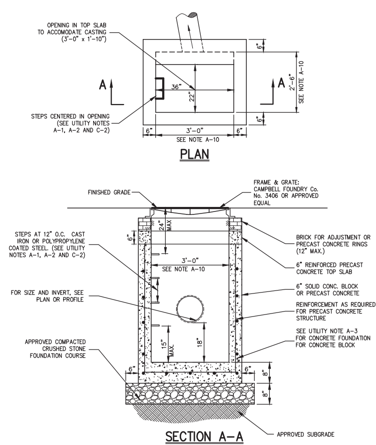
DURA SLOPE TRENCH DRAIN — 11



NOTES:

1. NATIVE PLANT SPECIES BASED ON THE ZONE OF HYDRIC TOLERANCE SHALL BE USED FOR VEGETATION.
2. TREES WITH AN UNDERSTORY OF SHRUBS AND HERBACEOUS MATERIAL SHALL BE PROVIDED.
3. TREES SHALL BE PLANTED PRIMARILY ALONG THE PERIMETER OF THE FACILITY.
4. A TREE DENSITY OF 1 TREE PER 100 SQUARE FEET AND SHRUBS & HERBACEOUS VEGETATION DENSITY OF 5 FEET ON-CENTER SHALL BE PROVIDED.

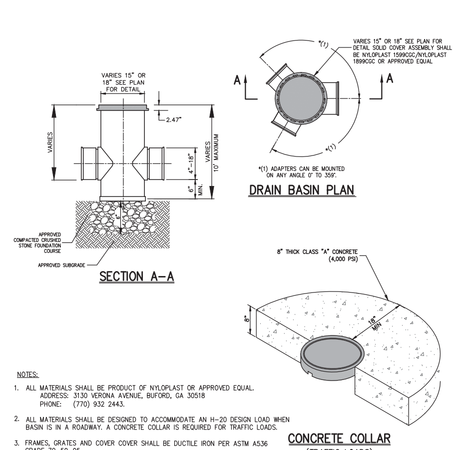
BIORETENTION AREA — 12



NOTE

1. REINFORCE PRECAST CONCRETE TOP SLAB AND REINFORCE PRECAST CONCRETE STRUCTURE SHALL BE DESIGNED TO ACCOMMODATE AN H-20 DESIGN LOAD.
2. SEE NOTES PERTAINING TO DRAIN INLETS UNDER UTILITY NOTES ON DRAWING C-5

DRAIN INLET (TYPE DI) — 13



NOTES:

1. ALL MATERIALS SHALL BE PRODUCT OF NYLOPLAST OR APPROVED EQUAL. ADDRESS: 3130 VERONA AVENUE, BUFORD, GA 30518 PHONE: (770) 932 2443.
2. ALL MATERIALS SHALL BE DESIGNED TO ACCOMMODATE AN H-20 DESIGN LOAD WHEN BASIN IS IN A ROADWAY. A CONCRETE COLLAR IS REQUIRED FOR TRAFFIC LOADS.
3. FRAMES, GRATES AND COVER COVER SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05.
4. DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE.

NYOPLAST DRAIN BASIN (DB) — 14

NOTES PERTAINING TO DRAIN INLETS

A-1 STEPS WILL NOT BE REQUIRED IN INLETS LESS THAN FOUR (4) FEET IN DEPTH. STEPS WILL BE REQUIRED IN INLETS FOUR (4) FEET OR GREATER IN DEPTH. DEPTHS FOR DRAIN INLETS SHALL BE MEASURED FROM FINISHED GRADE TO INSIDE BOTTOM OF STRUCTURE (INCLUDING SUMP AS APPLICABLE).

A-2 WHEN STEPS ARE REQUIRED, STEPS SHALL COMPLY WITH THE SAME REQUIREMENTS OF ASTM STANDARD C-478, ARTICLE 13 ENTITLED "MANHOLE STEPS & LADDERS".

A-3 FOR MASONRY STRUCTURES, THE FIRST COURSE OF MASONRY SHALL BE SET IN THE CONCRETE FOUNDATION BEFORE THE CONCRETE HAS SET. CONCRETE FOUNDATION SHALL BE CLASS "A"(4000 psi) CONCRETE, TWELVE (12) INCHES THICK AND SHALL EXTEND SIX (6) INCHES BEYOND THE OUTSIDE FACE THE STRUCTURE.

A-4 IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO FURNISH AND CONSTRUCT THE PROPER SIZE STRUCTURE INCLUDING THE NECESSARY OPENINGS TO ACCOMMODATE THE WORK AS SHOWN ON THE PLANS OR ORDERED BY THE ENGINEER, AT NO ADDITIONAL COST TO THE OWNER.

A-5 ALL NECESSARY PATCHING FOR DRAIN STRUCTURES SHALL BE ACCOMPLISHED WITH NON-SHRINKING CEMENT MORTAR GROUT, APPROVED EQUAL TO SIKA-SET AS MANUFACTURED BY THE SIKA CHEMICAL CORP.

A-6 FOUNDATIONS FOR PRECAST CONCRETE STRUCTURES SHALL BE SET ON A COMPACTED LAYER OF APPROVED CRUSHED STONE HAVING A MINIMUM COMPACTED THICKNESS OF EIGHT (8) INCHES.

A-7 ALL PIPES SHALL BE CUT FLUSH WITH THE INSIDE WALL OF THE STRUCTURE.

A-8 PROVIDE REINFORCED CONCRETE TOP SLAB FOR OVERSIZED DRAIN INLETS WITH PROPER SIZE OPENING TO ACCOMMODATE INSTALLATION OF FRAME & GRATE.

A-9 FOR MASONRY STRUCTURES GREATER THAN TEN (10) FEET IN DEPTH, THICKNESS OF MASONRY WALLS SHALL BE INCREASED TO TWELVE (12) INCHES.

A-10 FOR ALL STRUCTURES GREATER THAN 10 FEET IN DEPTH, STRUCTURES SHALL PROVIDE MINIMUM INSIDE DIMENSIONS OF 4 FEET X 4 FEET.

NOTES PERTAINING TO MANHOLES

B-1 PRECAST CONCRETE MANHOLES SHALL COMPLY WITH ASTM STANDARD C-478. MANHOLE JOINTS SHALL COMPLY WITH ASTM STANDARD C-443.

B-2 FOR PRECAST CONCRETE MANHOLES FIVE (5) FEET OR LESS IN HEIGHT, TOP CONE SECTION SHALL BE REPLACED WITH PRECAST REINFORCED CONCRETE SLAB (6" MIN. THICKNESS) WITH OPENING OF SUFFICIENT SIZE TO ACCOMMODATE MANHOLE CASTING.

B-3 FOR MANHOLES 10 FEET OR MORE IN DEPTH, MANHOLE DIAMETER SHALL BE FIVE (5) FEET.

B-4 TERMINAL MANHOLE FLOORS SHALL BE SLOPED TOWARD OUTFALL PIPE.

B-5 INVERT CHANNELS FOR PRECAST CONCRETE MANHOLES SHALL BE CONSTRUCTED OF CONCRETE.

B-6 NOTES A-1, A-2, A-4, A-5, A-6 & A-7 UNDER "NOTES PERTAINING TO DRAIN INLETS" ABOVE SHALL APPLY TO MANHOLES.

NOTES PERTAINING TO PRECAST CONCRETE STRUCTURES FOR STORM DRAINS, SANITARY SEWERS AND WATER LINES

C-1 ALL PRECAST CONCRETE STRUCTURES SHALL BE DESIGNED TO ACCOMMODATE AN H-20 DESIGN LOAD.

C-2 STEPS SHALL BE LOCATED WITHIN STRUCTURE TO AVOID PLACEMENT OVER PIPES WHEN PRACTICABLE.

UTILITY NOTES — 15

NO.	REVISION	DATE	BY
1	GENERAL REVISIONS	5/7/2015	EH
2	PLANNING BOARD SUBMISSION	08/11/2015	EH
3	PLANNING BOARD SUBMISSION	10/01/2015	EH

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SP-8.tab
DRAWING NO: C-5

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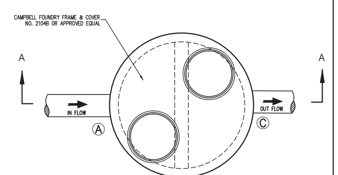
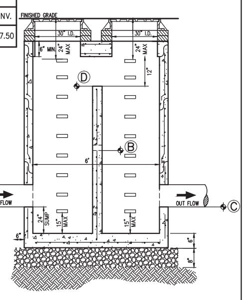


PLAN VIEW
N.T.S.

NOTES:
1. STEPS SHALL BE CAST IRON NEENAH No. R-1981-0 OR CAMPBELL FOUNDRY No. 2588-1 OR POLYPROPYLENE COATED STEEL (SEE SPECIFICATIONS) OR APPROVED EQUAL.
2. STRUCTURES SHALL MEET OR EXCEED A.S.T.M. AND O.S.H.A. REQUIREMENTS.
3. STRUCTURES SHALL BE DESIGNED TO ACCOMMODATE H-20 LOADING.
3. SEE UTILITY NOTES ON DRAWING CD 7 AND CD 8.

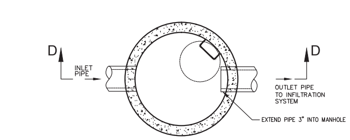
SCHEDULE OF INVERTS

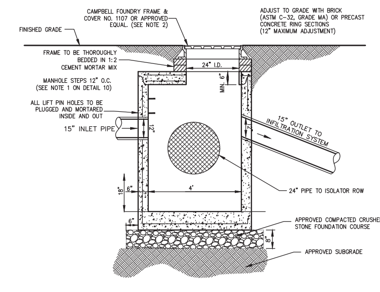
DESIGNATION	(A) INLET		(B) ORIFICE		(C) OUTLET		(D) WEIR	
	SIZE	INV.	SIZE	INV.	SIZE	INV.	SIZE	INV.
OCS 1A-2	15" HDPE	85.50	4"	86.40	15" HDPE	85.50	0.5'	87.50



SECTION A-A
N.T.S.

OULET CONTROL STRUCTURE 16

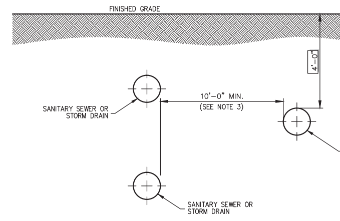




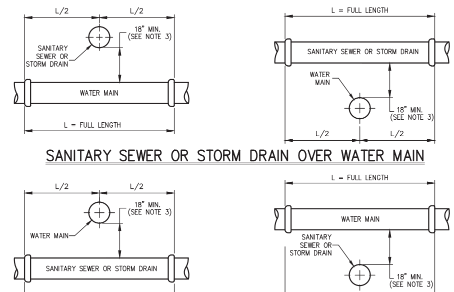
SECTION D-D

NOTES:
1. CONCRETE TO TEST 4000 PSI AT 28 DAYS. WELDED WIRE MESH TO COMPLY WITH ASTM A185.
2. UNLESS OTHERWISE SPECIFIED, SANITARY SEWER MANHOLES SHALL HAVE LETTERS "SEWER" AND STORM DRAIN MANHOLES SHALL HAVE LETTERS "DRAIN" CAST ON COVER. THE COVERS SHALL HAVE VENT HOLES.
3. PROVIDE 0.063" DIA. STAINLESS STEEL WELDED WIRE MESH WITH ¼" OPENINGS ANCHORED INTO PIPE TO PREVENT LEAVES AND DEBRIS FROM ENTERING ISOLATOR ROW. PROJECT 24" PIPE 3" INTO MANHOLE.

PRETREATMENT MANHOLE (BMH A-5) 17



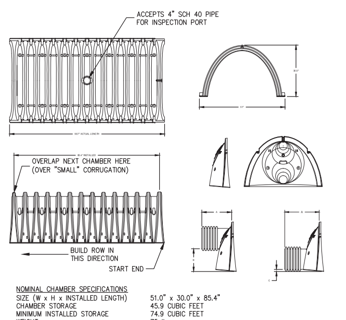
HORIZONTAL SEPARATION



SANITARY SEWER OR STORM DRAIN OVER WATER MAIN
WATER MAIN OVER SANITARY SEWER OR STORM DRAIN
VERTICAL SEPARATION

NOTES:
1. NORMAL CONDITIONS:
   A. WHENEVER A WATER MAIN MUST CROSS OVER OR UNDER A SANITARY SEWER OR STORM DRAIN, THE PIPES SHALL BE LAID TO PROVIDE A VERTICAL SEPARATION BETWEEN THEM OF AT LEAST 18 INCHES, AS MEASURED FROM THE BOTTOM OF THE HIGHER PIPE TO THE CROWN OF THE LOWER PIPE.
   B. FULL LENGTH OF WATER PIPE MUST BE CENTERED AT THE POINT OF CROSSING; NO JOINTS WILL BE PERMITTED AT THE POINT OF CROSSING.
2. WATER MAIN CROSSING UNDER SANITARY SEWERS:
   A. VERTICAL SEPARATION OF 18 INCHES MUST BE PROVIDED.
   B. ADEQUATE STRUCTURAL SUPPORT MUST BE PROVIDED FOR THE SANITARY SEWER TO PREVENT EXCESSIVE DEFLECTION OF JOINTS AND SETTLING.
   C. FULL LENGTH OF WATER PIPE MUST BE CENTERED AT THE POINT OF CROSSING; NO JOINTS WILL BE PERMITTED AT THE POINT OF CROSSING.
3. IF DURING CONSTRUCTION IT IS FOUND THAT THE REQUIRED SEPARATION OF WATER MAINS, SANITARY SEWERS, STORM SEWERS AND BUILDING SANITARY SEWERS CANNOT BE MET, THE CONTRACTOR OR HIS AUTHORIZED REPRESENTATIVE SHALL IN WRITING ADVISE JOHN MEYER CONSULTING OF THE SPECIFIC CONDITIONS ENCOUNTERED. APPROVAL OF ALTERNATIVE SEPARATION CRITERIA SHALL BE OBTAINED FROM THE WESTCHESTER COUNTY HEALTH DEPARTMENT PRIOR TO INSTALLATION.

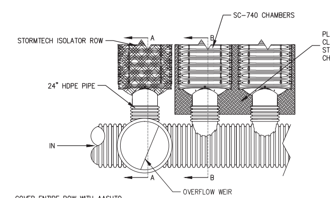
SEPARATION OF WATER AND SANITARY SEWER/STORM DRAIN LINES 18



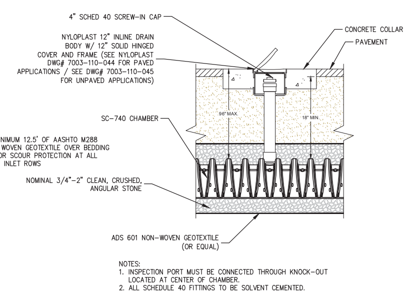
NOMINAL CHAMBER SPECIFICATIONS
SIZE (W x H x INSTALLED LENGTH) 51.0" x 30.0" x 85.4"
CHAMBER STORAGE 45.9 CUBIC FEET
MINIMUM INSTALLED STORAGE 74.9 CUBIC FEET
WEIGHT 75 lbs.

SCHEDULE OF INVERTS

DESIGNATION	(A) FOUNDATION BOTTOM	(B) CHAMBER BOTTOM	(C) MANIFOLD & INLET STUB INVERT	(D) ISOLATOR ROW PIPE INVERT	(E) OVERFLOW WEIR INVERT
IB-1	85.00	85.50	85.50	85.50	87.50



PLAN VIEW

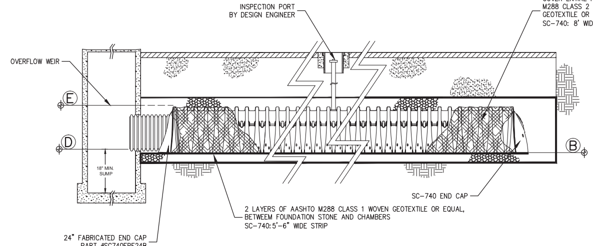


NOTES:
1. INSPECTION PORT MUST BE CONNECTED THROUGH KNOCK-OUT LOCATED AT CENTER OF CHAMBER.
2. ALL SCHEDULE 40 FITTINGS TO BE SOLVENT CEMENTED.

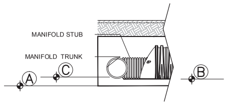
INSPECTION PORT DETAIL

MATERIAL LOCATION	DESCRIPTION	AASHTO M43 DESIGNATION[1]	COMPACTION/DENSITY REQUIREMENT
(d) FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISH GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THIS LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
(c) FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THIS LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, < 35% FINES. MOST PAVEMENT SUB-BASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTION AFTER 12" OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" LIFTS TO A MIN. 95% STANDARD PROCTOR DENSITY. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs. DYNAMIC FORCE NOT TO EXCEED 20,000 lbs.
(b) EMBEDMENT STONE SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4 - 2 INCH	3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
(a) FOUNDATION STONE BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4 - 2 INCH	3, 35, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A 95% STANDARD PROCTOR DENSITY[2].

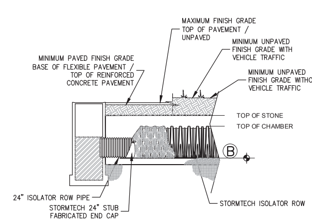
PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. AS AN ALTERNATE TO PROCTOR TESTING AND FIELD DENSITY MEASUREMENTS ON OPEN GRADED STONE, STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9"[229 mm] (MAX) LIFTS USING TWO FULL COVERAGES WITH AN APPROPRIATE COMPACTOR.



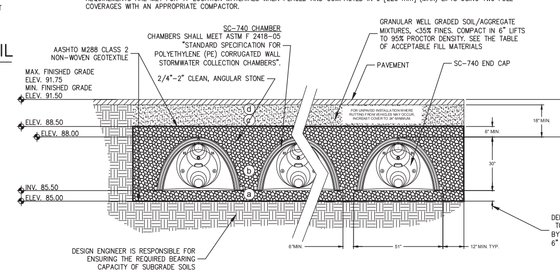
SECTION AT ISOLATOR ROW



SECTION B-B



SECTION A-A



THIS CROSS SECTION DETAILS THE REQUIREMENTS NECESSARY TO SATISFY THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS USING STORMTECH CHAMBERS, WITH CONSIDERATION FOR IMPACT AND MUTIPLE VEHICLE PRESENCES.

SECTION AT DETENTION AND WATER QUALITY CONTROL

STORMTECH CHAMBERS SC-740 (IB-1) 19

NO.	REVISION	DATE	BY
1	GENERAL REVISIONS	5/7/2015	EH
2	PLANNING BOARD SUBMISSION	08/11/2015	EH
3	PLANNING BOARD SUBMISSION	10/01/2015	EH

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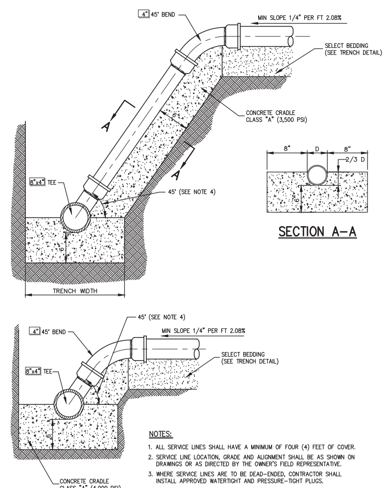
SCALE: NTS
DATE: 03/19/2015
PROJ. NO: 13180
13180-DETAILS.dwg SP-9.tab
DRAWING NO: C-6

NOT FOR CONSTRUCTION

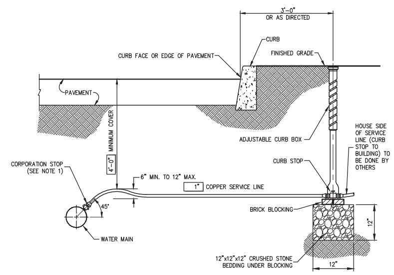
SANITARY SEWER SERVICE CONNECTION — 20



NOTES:

1. ALL SERVICE LINES SHALL HAVE A MINIMUM OF FOUR (4) FEET OF COVER.
2. SERVICE LINE LOCATION, GRADE AND ALIGNMENT SHALL BE AS SHOWN ON DRAWINGS OR AS DIRECTED BY THE OWNER'S FIELD REPRESENTATIVE.
3. WHERE SERVICE LINES ARE TO BE DEAD–ENDED, CONTRACTOR SHALL INSTALL APPROVED WATERTIGHT AND PRESSURE–TIGHT PLUGS.
4. IF MINIMUM COVER CANNOT BE ATTAINED WHILE MAINTAINING MINIMUM SLOPE, THE ANGLE OF CONNECTION MAY BE REDUCED TO 22.5°, IF APPROVED BY THE OWNER'S FIELD REPRESENTATIVE AND GOVERNING BODY WITH JURISDICTION.
5. SANITARY SEWER SERVICE LINE INCLUDING FITTINGS SHALL BE PVC, SDR 35.

WATER SERVICE CONNECTION — 21
(2" OR LESS)



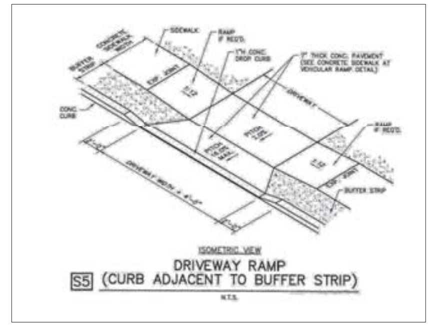
SERVICE LINE REQUIREMENTS

SIZE	SERVICE LINE(MATERIALS)	CORPORATION STOP	CURB STOP	CURB BOX	ENLARGED BASE
3/4"	COPPER, TYPE K	H–15008	H–15214	H–10308	Not Applicable
1"	COPPER, TYPE K	H–15008	H–15214	H–10308	Not Applicable
1–1/2"	COPPER, TYPE K	H–15013	H–15214	H–10310	Not Applicable
2"	COPPER, TYPE K	H–15013	H–15214	H–10310	H–10349

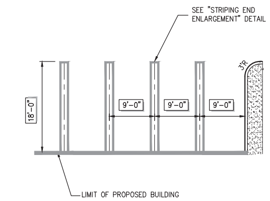
NOTES:

1. INSTALLATION OF 1–1/2" AND 2" CORPORATION STOPS SHALL BE MADE IN THE UPPER PIPE QUADRANT, BUT MAY BE MADE AT ANGLES LESS THAN 45° IF APPROVED BY THE OWNER'S FIELD REPRESENTATIVE.
2. SERVICE LINE SHALL HAVE NO JOINTS BETWEEN THE WATER MAIN AND CURB STOP.
3. CORPORATION STOP, CURB STOP, CURB BOX AND ENLARGED BASE FOR CURB BOX SHALL BE MUELLER COMPANY OR APPROVED EQUAL. CATALOG NUMBERS SHOWN REFER TO MUELLER COMPANY.

DRIVEWAY RAMP — 22



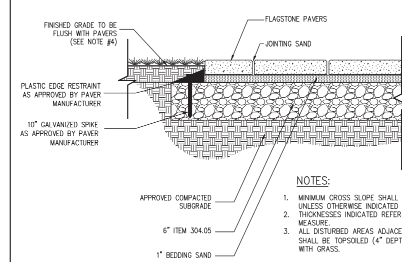
90° PARKING — 23
(DOUBLE STRIPING – CURBED END)



NOTES

1. COLOR OF PAINT SHALL BE WHITE
2. OUTSIDE RADIUS MAY VARY DEPENDING ON SHAPE OF ISLAND. RADIUS SHALL BE AS SHOWN ON LAYOUT PLAN.

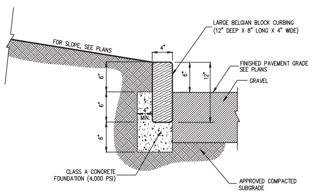
FLAGSTONE PAVER WALKWAY — 24



NOTES:

1. MINIMUM CROSS SLOPE SHALL BE 1/4" PER FOOT UNLESS OTHERWISE INDICATED ON DRAWINGS.
2. THICKNESSES INDICATED REFER TO COMPACTED MEASURE.
3. ALL DISTURBED AREAS ADJACENT TO SIDEWALKS SHALL BE TOPSOILED (4" DEPTH) AND SEEDED WITH GRASS.

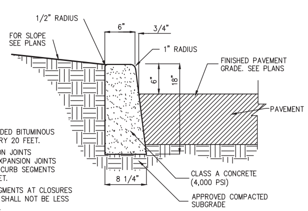
STONE CURB — 25A
(BELGIAN BLOCK)



NOTES

1. JOINTS SHALL BE NO WIDER THAN 3/4" AND SHALL BE MORTARED. JOINTS SHALL BE FULLY FILLED WITH 1:2 CEMENT MORTAR, NEATLY POINTED AND CLEANED OF EXCESS MORTAR.

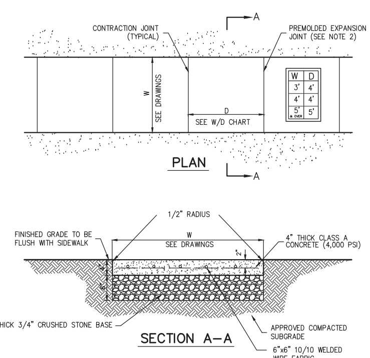
CAST–IN–PLACE CONCRETE CURB — 25B



NOTES:

1. INSTALL 1/2" PREMOLDED BITUMINOUS EXPANSION JOINT EVERY 20 FEET.
2. INSTALL CONSTRUCTION JOINTS MID–WAY BETWEEN EXPANSION JOINTS SO THAT LENGTH OF CURB SEGMENTS WILL BE TEN (10) FEET.
3. LENGTH OF CURB SEGMENTS AT CLOSURES MAY BE VARIED BUT SHALL NOT BE LESS THAN FOUR (4) FEET.
4. WHEN INSTALLED ADJACENT TO SIDEWALK OR CONCRETE PAVEMENT, MATCH EXPANSION JOINTS.

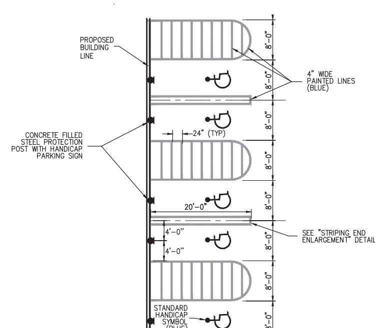
CONCRETE SIDEWALK — 26



NOTES:

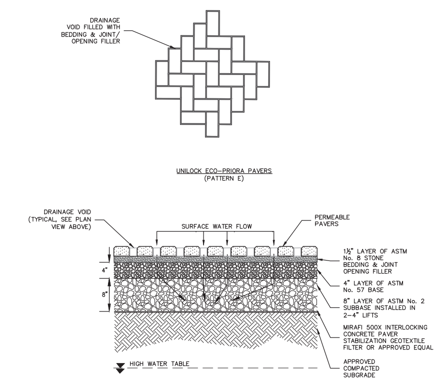
1. SIDEWALK CROSS SLOPE SHALL BE 1% MIN. TO 2% MAX.
2. PROVIDE 1/2" PREMOLDED EXPANSION JOINTS AT 20' INTERVALS UNLESS OTHERWISE DIRECTED.
3. REINFORCING SHALL NOT EXTEND THROUGH EXPANSION JOINTS.
4. SIDEWALK SHALL HAVE LIGHT BROOM FINISH

HANDICAP PARKING — 27
(DOUBLE STRIPING – CURBLINE ALIGNMENT – W/O SIDEWALK) (NEW YORK)



NOTE: SLOPES IN HANDICAP PARKING AREAS SHALL NOT EXCEED 2%.

POROUS PAVERS — 28



CRUSHED STONE FILLER, BEDDING, BASE & SUBBASE

A. CRUSHED STONE WITH 90% FRACTURED FACES, LA ABRASION <40 PER ASTM C 131, MINIMUM CBR OF 80% PER ASTM D 1883.

B. DO NOT USE ROUNDED RIVER GRAVEL.

C. ALL STONE MATERIALS SHALL BE WASHED WITH LESS THAN 1% PASSING THE No. 200 SIEVE.
D. JOINT/OPENING FILLER, BEDDING, BASE AND SUBBASE: CONFORMING TO ASTM D 448 GRADATION AS SHOWN IN TABLES 1, 2 AND 3 BELOW:

NOTE: No. 89 OR FINER GRADATION MAY BE USED TO FILL PERMEABLE PAVERS WITH NARROW JOINTS.

TABLE 1 — ASTM No. 8 GRADING REQUIREMENTS BEDDING & JOINT/OPENING FILLER

SIEVE SIZE	PERCENT PASSING
12.5 mm (1/2")	100
9.5 mm (3/8")	85 TO 100
4.75 mm (No.4)	10 TO 30
2.36 mm (No.8)	0 TO 10
1.16 mm (No.16)	0 TO 5

TABLE 2 — ASTM No. 57 BASE GRADING REQUIREMENTS

SIEVE SIZE	PERCENT PASSING
37.5 mm (1–1/2")	100
25 mm (1")	95 TO 100
12.5 mm (1/2")	25 TO 60
4.75 mm (No.4)	0 TO 10
2.36 mm (No.8)	0 TO 5

TABLE 3 — GRADING REQUIREMENTS FOR ASTM No.2 SUBBASE

SIEVE SIZE	PERCENT PASSING
75 mm (3")	100
63 mm (2–1/2")	90 TO 100
50 mm (2")	35 TO 70
37.5 mm (1–1/2")	0 TO 15
19 mm (3/4")	0 TO 5

NO.	REVISION	DATE	BY
1	PLANNING BOARD SUBMISSION	10/01/2015	EH

Previous Editions Obsolete

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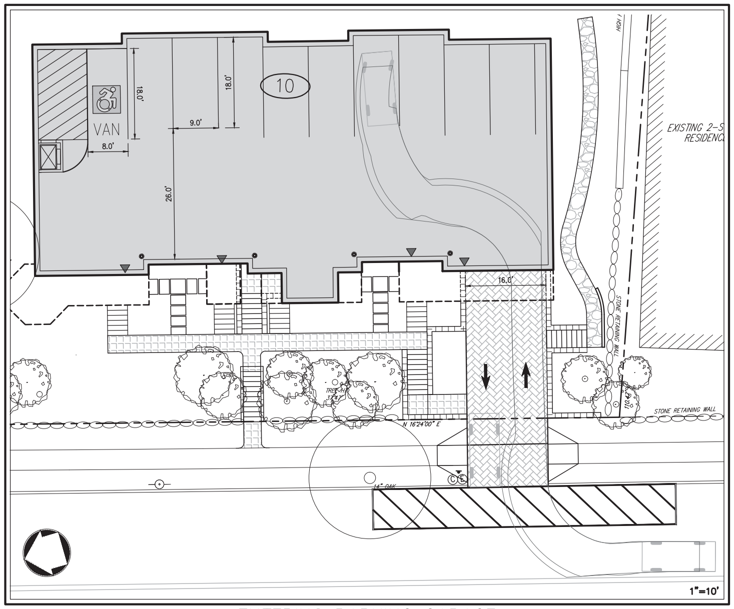
www.johnmeyerconsulting.com

CONSTRUCTION DETAILS

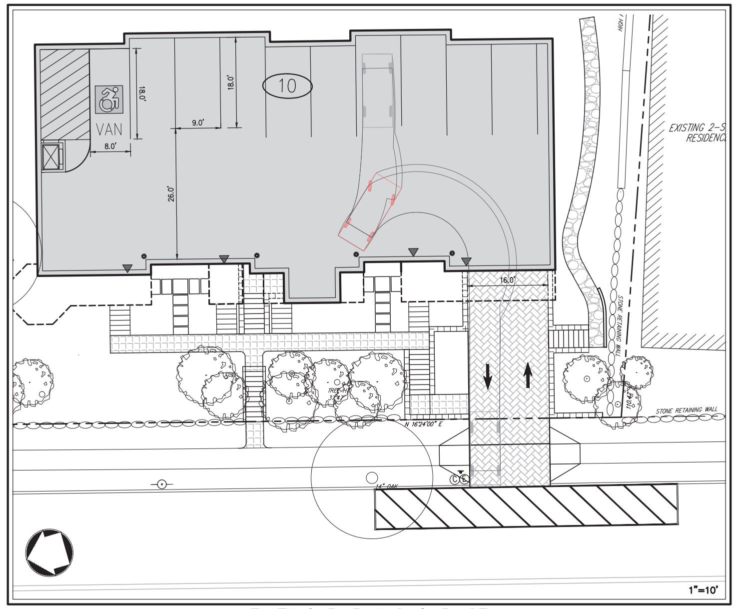
TOWNHOUSES AT 32–34 WASHINGTON AVENUE
32–34 WASHINGTON AVENUE
HASTINGS–ON–HUDSON, NY

DRAWN: EH — APPROVED: RR
SCALE: NTS
DATE: 08/11/2015
PROJ. NO: 13180
13180–DETAILS.dwg — SP–9.tab
DRAWING NO: C–6A

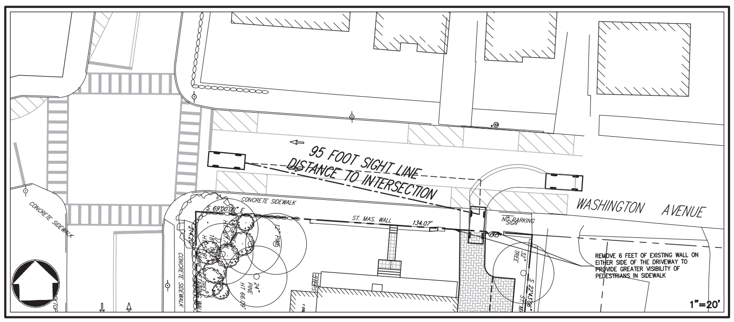
NOT FOR CONSTRUCTION



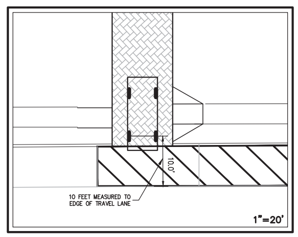
ENTERING PARKING GARAGE



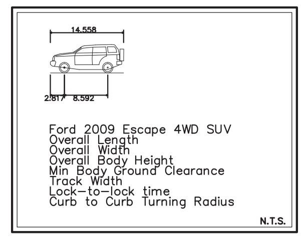
EXITING PARKING GARAGE



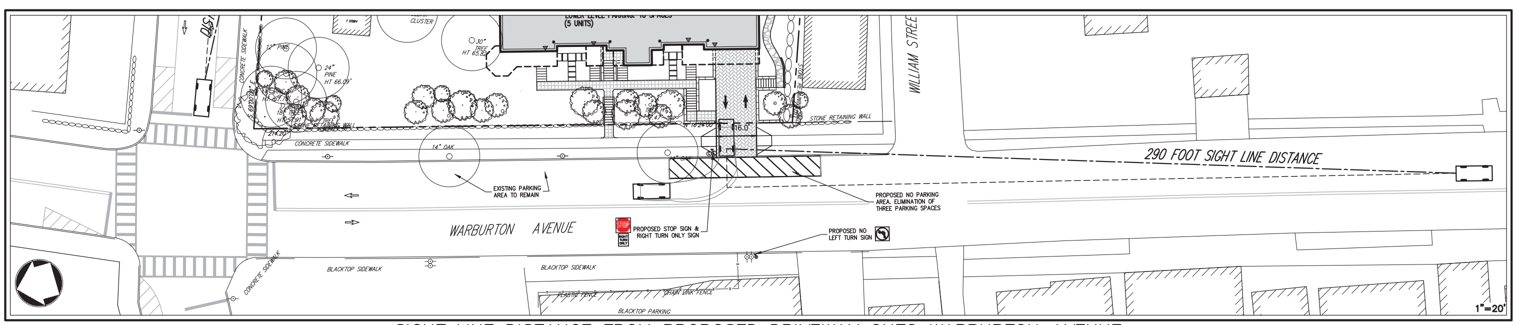
SIGHT LINE DISTANCE FROM EXISTING DRIVEWAY ONTO WASHINGTON AVENUE



EXITING VEHICLE DECISION LOCATION



VEHICLE PROFILE



SIGHT LINE DISTANCE FROM PROPOSED DRIVEWAY ONTO WARBURTON AVENUE

LEGEND

- EXISTING PROPERTY LINE
- ADJACENT PROPERTY LINE
- PROPOSED PROPERTY LINE
- SETBACK LINE
- EXISTING BUILDING LINE
- EXISTING PAVEMENT EDGE
- EXISTING CURB LINE
- EXISTING STONE WALL
- EXISTING RETAINING WALL
- EXISTING FENCE
- EXISTING TREE AND DESIGNATION
- EXISTING UTILITY POLE
- EXISTING LIGHT POLE
- EXISTING SIGN
- PROPOSED BUILDING LINE
- PROPOSED CONCRETE CURB
- PROPOSED PARKING SPACES WITH NUMBER OF SPACES INDICATED
- PROPOSED HANDICAPPED PARKING SPACES WITH NUMBER OF SPACES INDICATED
- PROPOSED FLAGSTONE WALK
- PROPOSED PERMEABLE PAVERS
- PROPOSED DROP CURB AND RAMP
- PROPOSED RETAINING WALL (DESIGN BY OTHERS)
- TRAFFIC SIGN LOCATION & DESIGNATION

NOTES:

1. EXISTING CONDITIONS DEPICTED ON THIS PLAN HAVE BEEN TAKEN FROM SURVEY TITLED, "TOPOGRAPHIC SURVEY", PREPARED BY WARD CARPENTER ENGINEERS, INC, DATED APRIL 23, 2015.
2. EXISTING CONDITIONS OFF SITE DEPICTED ON THIS PLAN HAVE BEEN OBTAINED FROM WESTCHESTER COUNTY GEOGRAPHIC INFORMATION SYSTEMS AND SHOULD BE CONSIDERED APPROXIMATE AND USED FOR PLANNING PURPOSES ONLY.
3. FOR SITE STRUCTURE DETAILS, SEE DRAWINGS C-1 THROUGH C-6A.

NO.	REVISION	DATE	BY
1.	GENERAL REVISIONS	07/27/2015	EH
2.	PLANNING BOARD SUBMISSION	10/01/2015	EH

Previous Editions Obsolete

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SIGHT LINE DISTANCE & PARKING MANEUVER PLAN
TOWNHOUSES AT 32-34 WASHINGTON AVENUE
32-34 WASHINGTON AVENUE
HASTING-ON-HUDSON, NY

ANY ALTERATION OF PLANS, SPECIFICATIONS, PLATS AND REPORTS BEARING THE SEAL OF A LICENSED PROFESSIONAL ENGINEER OR LICENSED LAND SURVEYOR IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW, EXCEPT AS PROVIDED FOR BY SECTION 7209, SUBSECTION 2.

NOT FOR CONSTRUCTION

DRAWN	EH
APPROVED	RR
SCALE	AS SHOWN
DATE	5/21/2015
PROJECT No	13180
DWG	13180-SITE
TAB	SIGHT DIST
LS	SIGHTLS
DRAWING No	C-7

TOWNHOUSES at 32-34 WASHINGTON AVENUE

HASTINGS-ON-HUDSON, NY 10706

CHRISTINA GRIFFIN ARCHITECT

10 Spring Street, Hastings-on-Hudson, NY 10706

PLANNING BOARD SUBMISSION 10-01-15

OWNER	ARCHITECT	CIVIL ENGINEER
CCI Properties Andrew Cortese, President 52 Cedar Street Dobbs Ferry, NY 10522 914.447.3965 andrew@corteseconstruction.com	Christina Griffin Architect, PC Christina Griffin AIA LEED AP CPHC 10 Spring Street Hastings-on-Hudson, NY 10706 914.478.0799 cg@cgastudio.com	JMC John Meyer Consulting, PC 120 Bedford Road Armonk, NY, 10504 914.273.5225

As-Built drawings of the site improvements shall be submitted to the Village Engineer for review prior to obtaining Certificate of Occupancy.

LIST OF DRAWINGS

TITLE SHEET	RENDERING OF PROPOSED BUILDING
S-1	SITE PLAN
S-1a	OPEN SPACE PLAN
S-2	SECTIONS THROUGH SITE
L-1	LANDSCAPING PLAN
A-1	BASEMENT PLAN
A-2	FIRST FLOOR PLAN
A-3	SECOND FLOOR PLAN
A-4	ATTIC PLAN
A-5	WEST ELEVATION
A-6	NORTH & SOUTH ELEVATIONS
A-7	EAST ELEVATION
A-8-16	VIEWS OF NEIGHBORHOOD
E-1	EXISTING CONDITIONS & DEMOLITION PLAN
C-1	LAYOUT PLAN
C-2	GRADING & UTILITIES PLAN
C-3	SEDIMENT & EROSION CONTROL PLAN
C-4	CONSTRUCTION DETAILS
C-5	CONSTRUCTION DETAILS
C-6	CONSTRUCTION DETAILS
C-6A	CONSTRUCTION DETAILS
C-7	SIGHT LINE DISTANCE & PARKING MANEUVER PLAN

DATES

PRELIMINARY PLANNING BOARD SUBMISSION	2-19-15
PLANNING BOARD SUBMISSION	3-19-15
PLANNING BOARD SUBMISSION	4-15-15
PLANNING BOARD SUBMISSION	5-07-15
PLANNING BOARD SUBMISSION	6-30-15
WESTCHESTER COUNTY PLANNING SUBMISSION	7-28-15
PLANNING BOARD SUBMISSION	8-11-15
PLANNING BOARD SUBMISSION	10-01-15

COVERAGE CALCULATIONS

LOT AREA	26,126 SF / 0.60 AC
WALLS	686 SF (2.6%)
SIDEWALKS & STEPS	1,010 SF (3.8%)
EXTERIOR PARKING	741 SF (2.8%)
DRIVEWAY (OVER 960 SF)	765 SF (2.9%)
BUILDING (NOT INCL. PORCHES)	6,500 SF (25%) (1,738 SF EXIST. + 4,762 SF NEW)
PORCHES	934 SF (3.6%) (339 SF EXIST. + 595 SF NEW)
TOTAL DEVELOPMENT COVERAGE	10,636 SF (40.7%)
TOTAL BUILDING COVERAGE (BUILDING AND PORCHES ONLY)	7,434 SF (28.5%)

TABLE of ZONING DATA

ZONING DISTRICT: MR 1.5 TAX DESIGNATION: SECTION 4.75, BLOCK 53, LOT 11

	REQUIRED	EXISTING	PROPOSED
LOT AREA	1,500 SF / .034 AC	26,126.47 SF / 0.6 AC	26,126.47 SF / 0.6 AC
NUMBER OF DWELLING UNITS	TO BE DETERMINED	2	7
MINIMUM LOT AREA PER DWELLING UNIT (DENSITY)	1,500 SF PER UNIT	13,063 SF PER UNIT	3,732 SF PER UNIT
MAXIMUM DEVELOPMENT COVERAGE	15% / 1,491 SF	12% / 3,018 SF	40.7% / 10,636 SF **VARIANCE REQUIRED**
TOTAL BUILDING COVERAGE (bldg. & porches only)	-	-	28.6% / 7,434 SF
OPEN SPACE	1,600 SF FOR EXISTING 2-FAMILY HOUSE 2,800 SF FOR NEW TOWNHOUSES	20,613 SF -	2,135 SF AT EXISTING 2- FAMILY HOUSE, 5,628 SF AT TOWNHOUSES, 7,800 SF COMMON SPACE
MINIMUM LOT WIDTH FRONTAGE	25	134	134
MAXIMUM BUILDING HEIGHT	3 STORIES / 40 FT	2 1/2 STORIES / 34.75 FT	2 1/2 STORIES / 32.6 FT at NEW BUILDING
MAXIMUM DRIVEWAY SLOPE	3%	--	3%
MAXIMUM CURB CUT	24.0 FT	10.0 FT	22.0 FT
FRONT YARD SETBACK	12.5 FT	36.33 FT	19.33 SF
REAR YARD SETBACK	30.0 FT	26.66 FT	26.66 FT at OLD HOUSE, 37.83 FT at NEW BUILDING
SIDE ONE	13.5 FT	159.00 FT	14.70 FT
SIDE TWO	15.0 FT	20.33 FT	20.33 FT
TOTAL OF TWO SIDES	27.5 FT	179.33 FT	35.03 FT
FRONT PARKING SETBACK	10 FT	--	--
REAR PARKING SETBACK	5 FT	+/- 2 FT	5 FT
SIDE PARKING SETBACK	5 FT	0 FT	0 FT
PARKING SUMMARY - TOTAL SPACES PROVIDED	4 SPACES	+/- 2 SPACES	14 SPACES

ZONING NOTES

1. PER ZONING CODE (295-71A), OPEN SPACE IS CALCULATED 200 SQUARE FEET FOR EACH BEDROOM: NEW TOWNHOUSES: (4) 3-BEDROOM UNITS AND (1) 2-BEDROOM UNIT = 14 BEDROOMS X 200 = 2800 SF EXISTING 2-FAMILY HOUSE: 8 BEDROOMS X 200 = 1,600 SF

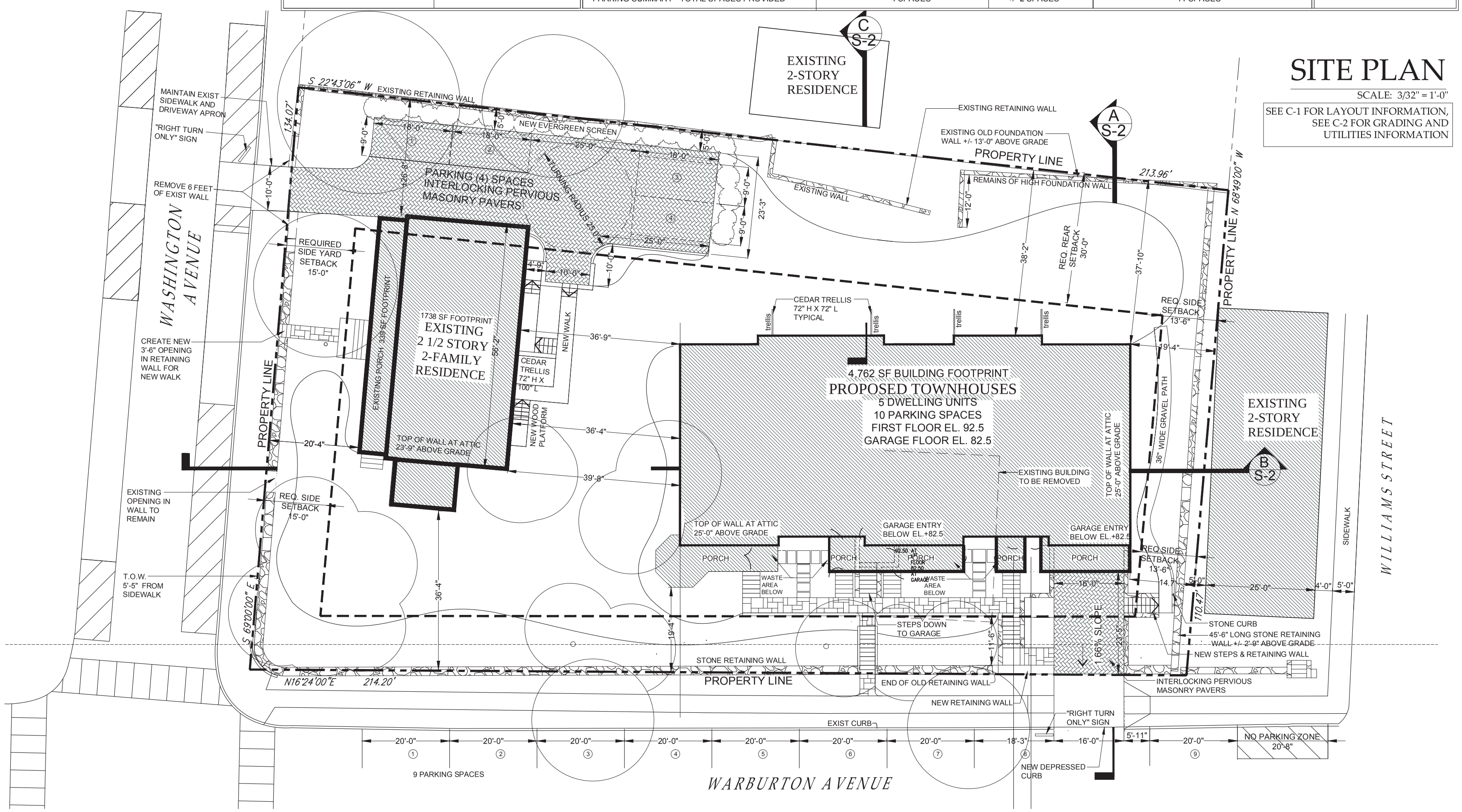
2. PER ZONING CODE (295-72E), FRONT AND SIDE YARD IS AT LEAST 12 FEET OR 1/2 OF THE HEIGHT OF THE BUILDING WALL NEAREST THE SIDE LOT LINE, WHICHEVER IS GREATER, PLUS 1 FOOT FOR EACH 10 FEET LENGTH IN EXCESS OF 50 FEET.

3. A BUILDING WALL HEIGHT OF 25 FEET WAS USED TO CALCULATE THE FRONT AND SIDE YARD SETBACK. BASED ON INTERPRETATION PROVIDED BY HASTINGS BUILDING DEPARTMENT, BUILDING WALL HEIGHT IS FROM GRADE TO TOP OF ATTIC FLOOR.

SITE PLAN

SCALE: 3/32" = 1'-0"

SEE C-1 FOR LAYOUT INFORMATION, SEE C-2 FOR GRADING AND UTILITIES INFORMATION



TOWNHOUSES at 32-34 WASHINGTON AVENUE

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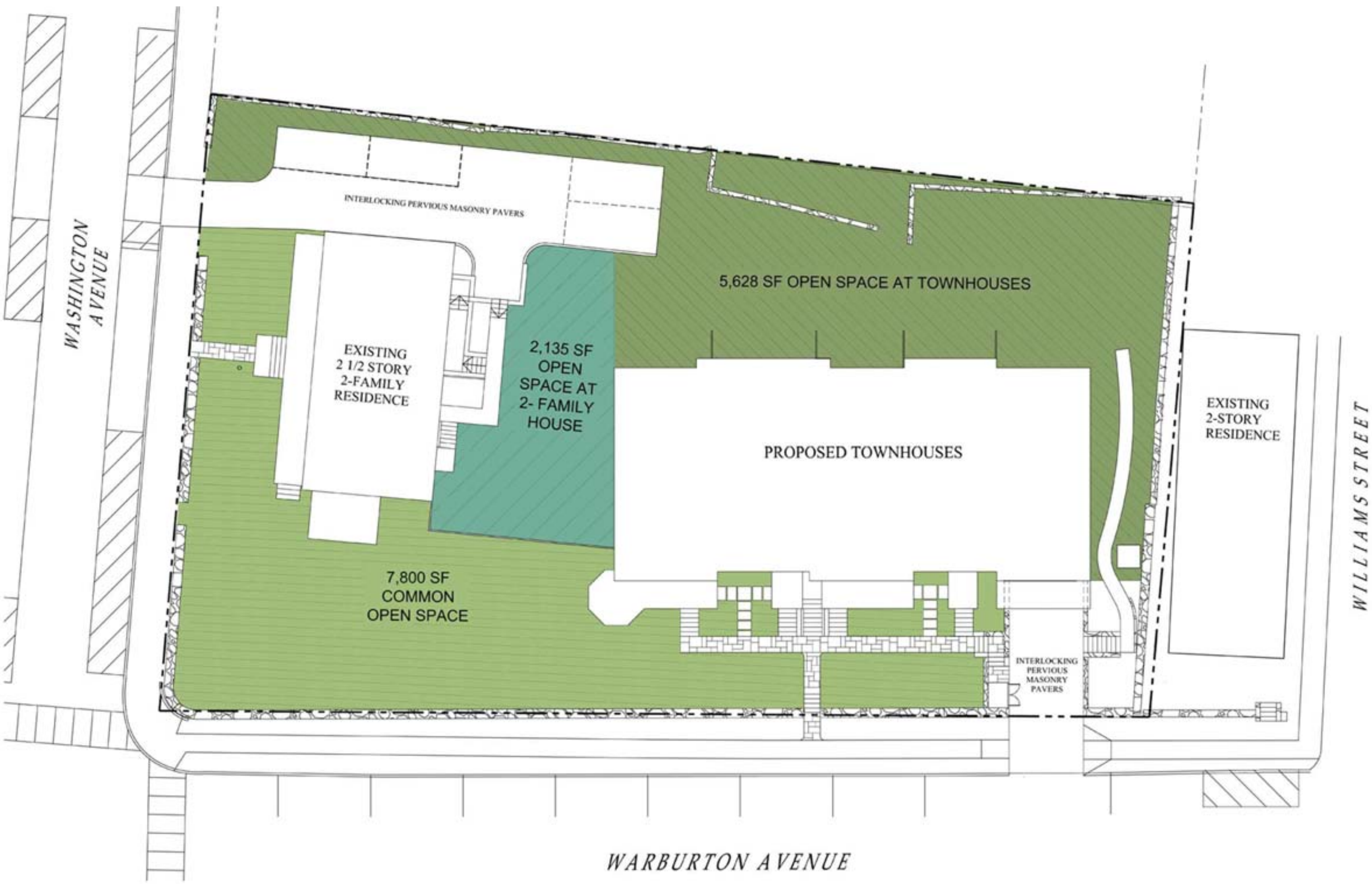
Date	
PLANNING BD PRE-SUBMISSION	2-1-15
PLANNING BOARD SUBMISSION	3-19-15
PLANNING BOARD SUBMISSION	4-15-15
PLANNING BOARD SUBMISSION	5-07-15
PLANNING BOARD SUBMISSION	6-30-15
PLANNING BOARD SUBMISSION	7-14-15
WESTCHESTER COUNTY PLANNING SUBMISSION	7-28-15/7-14-15
PLANNING BOARD SUBMISSION	8-11-15
PLANNING BOARD SUB	10-01-15

Drawing Title: SITE PLAN

Scale: AS SHOWN

S-1



OPEN SPACE PLAN

SCALE: 3/32" = 1'-0"

TOTAL OPEN SPACE	15,563 SF
REQUIRED OPEN SPACE	4,400 SF

PER ZONING CODE (295-71A),
OPEN SPACE IS CALCULATED 200 SQUARE FEET FOR EACH BEDROOM:
NEW TOWNHOUSES: (4) 3-BEDROOM UNITS & (1) 2-BEDROOM UNIT = 14 BEDROOMS X 200 = 2800 SF
EXISTING 2-FAMILY HOUSE: 8 BEDROOMS X 200 = 1,600 SF

TOWNHOUSES at
32-34 WASHINGTON AVENUE
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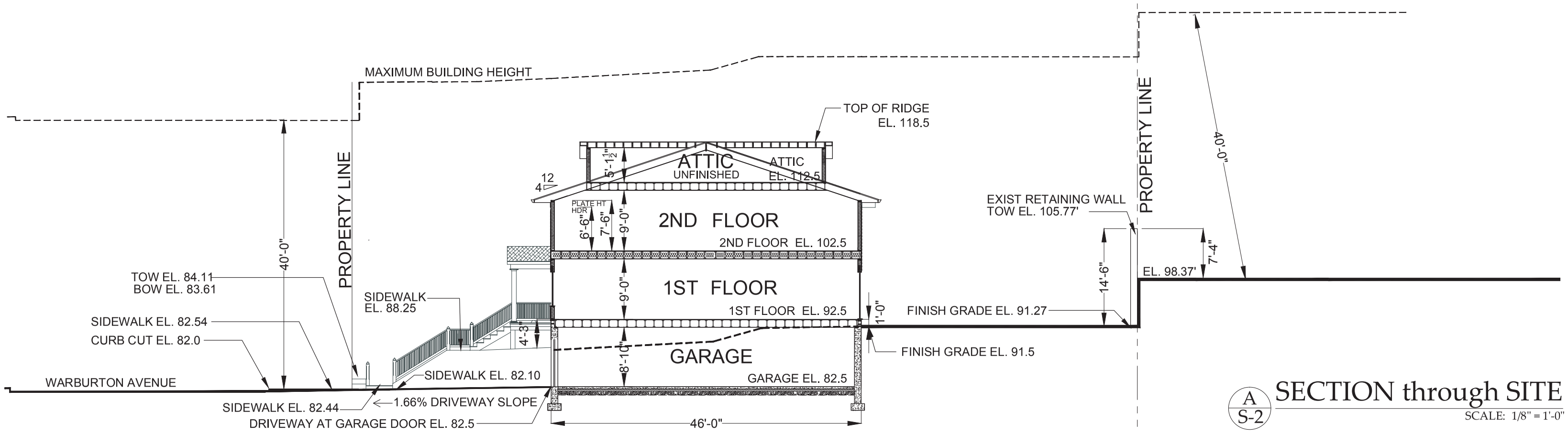
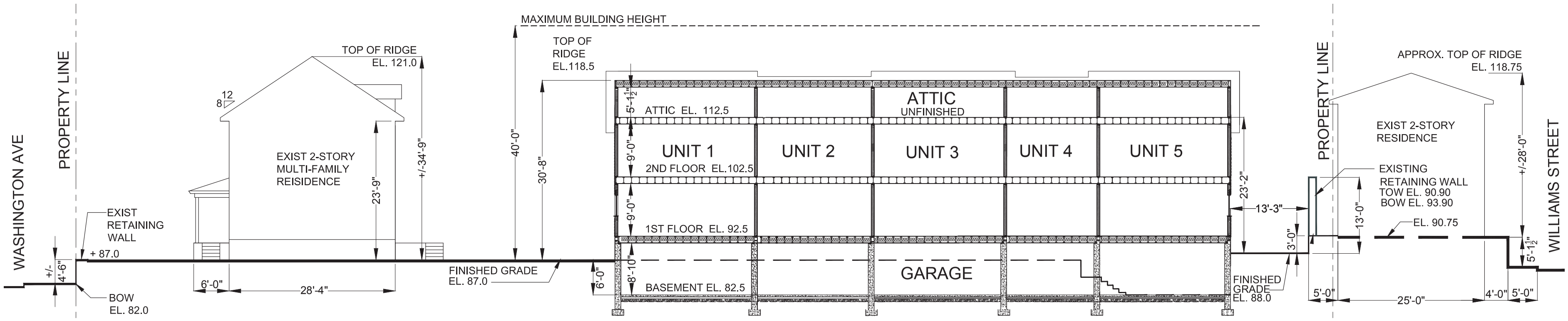
Drawing Title: LANDSCAPE PLAN
Scale: AS SHOWN

Date	
PLANNING BD PRE-SUBMISSION	2-1-15
PLANNING BOARD SUBMISSION	3-19-15
PLANNING BOARD SUBMISSION	4-15-15
ZONING BOARD SUBMISSION	4-23-15
PLANNING BOARD SUBMISSION	5-07-15
PLANNING BOARD SUBMISSION	6-30-15
PLANNING BOARD SUBMISSION	7-14-15
WESTCHESTER COUNTY PLANNING SUBMISSION 7-28-15	7-14-15
PLANNING BOARD SUB 10-01-15	

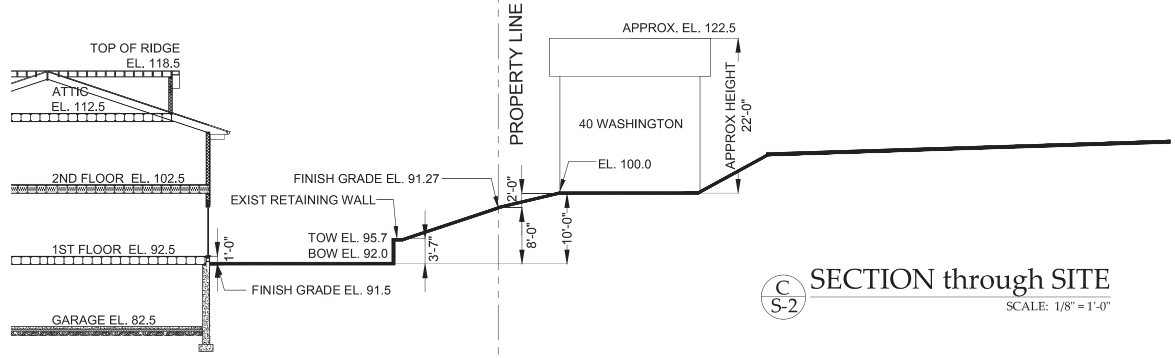
S-1a



(A/S-2) SECTION through SITE
SCALE: 1/8" = 1'-0"



(B/S-2) SECTION through SITE
SCALE: 1/8" = 1'-0"



(C/S-2) SECTION through SITE
SCALE: 1/8" = 1'-0"

TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

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Date
PLANNING BD PRE-SUBMISSION 2-1-15
PLANNING BOARD SUBMISSION 3-19-15
PLANNING BOARD SUBMISSION 4-15-15
ZONING BOARD SUBMISSION 4-23-15
PLANNING BOARD SUBMISSION 5-07-15
WESTCHESTER COUNTY PLANNING SUBMISSION 7-28-157-14-15
PLANNING BOARD SUBMISSION 8-11-15
PLANNING BOARD SUB 10-01-15

Drawing Title: SECTION THROUGH SITE
Scale: AS SHOWN

S-2

SCHEDULE of LIGHT FIXTURES

SYMBOL	TYPE/DESIGN	DIRECTION	POWER	TIMER
⌖	LAMPPOST	MULTI-DIRECTIONAL	100 WATT	NO
○	LED PATH LIGHTS	GRADE LEVEL	4 WATT	NO

LANDSCAPE PLAN

SCALE: 3/32" = 1'-0"

SEE C-1 FOR LAYOUT INFORMATION
SEE C-2 FOR GRADING AND UTILITIES INFORMATION

TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

CHRISTINA GRIFFIN ARCHITECT pc
10 Spring Street
Hastings-on-Hudson, New York 10706
914.478.0799 tel 914.478.0806 fax
www.christinagriffinarchitect.com

Date
PLANNING BD PRE-SUBMISSION 2-1-15
PLANNING BOARD SUBMISSION 3-19-15
PLANNING BOARD SUBMISSION 4-15-15
ZONING BOARD SUBMISSION 4-23-15
PLANNING BOARD SUBMISSION 5-07-15
PLANNING BOARD SUBMISSION 6-30-15
PLANNING BOARD SUBMISSION 7-14-15
WESTCHESTER COUNTY PLANNING SUBMISSION 7-28-157-14-15
PLANNING BOARD SUB 10-01-15

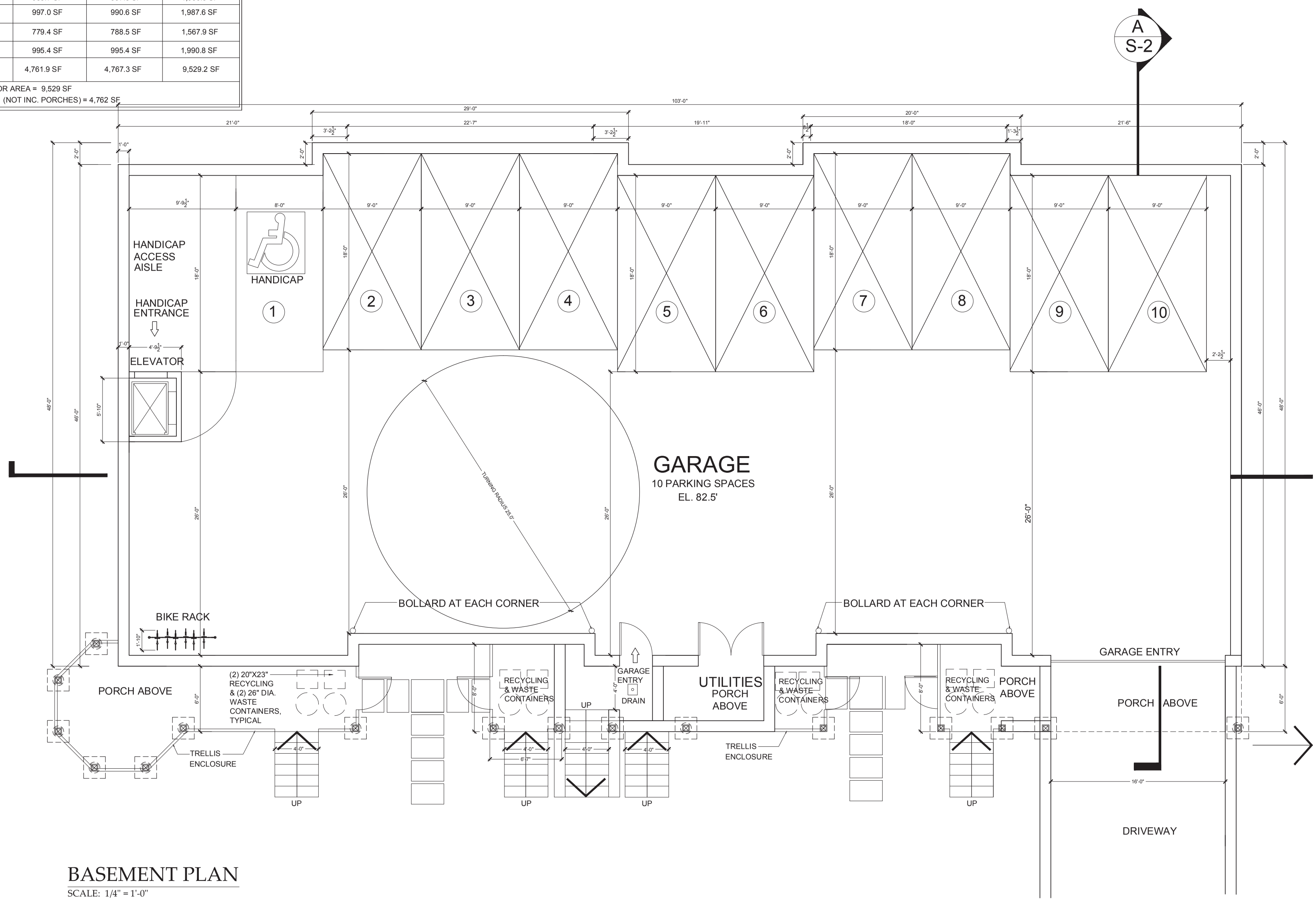
Drawing Title: LANDSCAPE PLAN
Scale: AS SHOWN

L-1

FLOOR AREA CALCULATIONS

	1ST FLOOR	2ND FLOOR	TOTAL 1ST & 2ND
UNIT 1	1,001.4 SF	995 SF	1,996.4 SF
UNIT 2	988.7 SF	997.8 SF	1,986.5 SF
UNIT 3	997.0 SF	990.6 SF	1,987.6 SF
UNIT 4	779.4 SF	788.5 SF	1,567.9 SF
UNIT 5	995.4 SF	995.4 SF	1,990.8 SF
TOTAL FLOOR AREA	4,761.9 SF	4,767.3 SF	9,529.2 SF

TOTAL BUILDING FLOOR AREA = 9,529 SF
BUILDING FOOTPRINT (NOT INC. PORCHES) = 4,762 SF



BASEMENT PLAN

SCALE: 1/4" = 1'-0"

TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

CHRISTINA GRIFFIN ARCHITECT PC
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Drawing Title: BASEMENT PLAN
Scale: AS SHOWN

Date	
PLANNING BD PRE-SUBMISSION	2-1-15
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PLANNING BOARD SUBMISSION	4-15-15
ZONING BOARD SUBMISSION	4-23-15
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PLANNING BOARD SUBMISSION	5-21-15
WESTCHESTER COUNTY PLANNING SUBMISSION	7-28-157-14-15
PLANNING BOARD SUBMISSION	9-4-15
PLANNING BOARD SUB	10-01-15

A-1

FLOOR AREA CALCULATIONS

	1ST FLOOR	2ND FLOOR	TOTAL 1ST & 2ND
UNIT 1	1,001.4 SF	995 SF	1,996.4 SF
UNIT 2	988.7 SF	997.8 SF	1,986.5 SF
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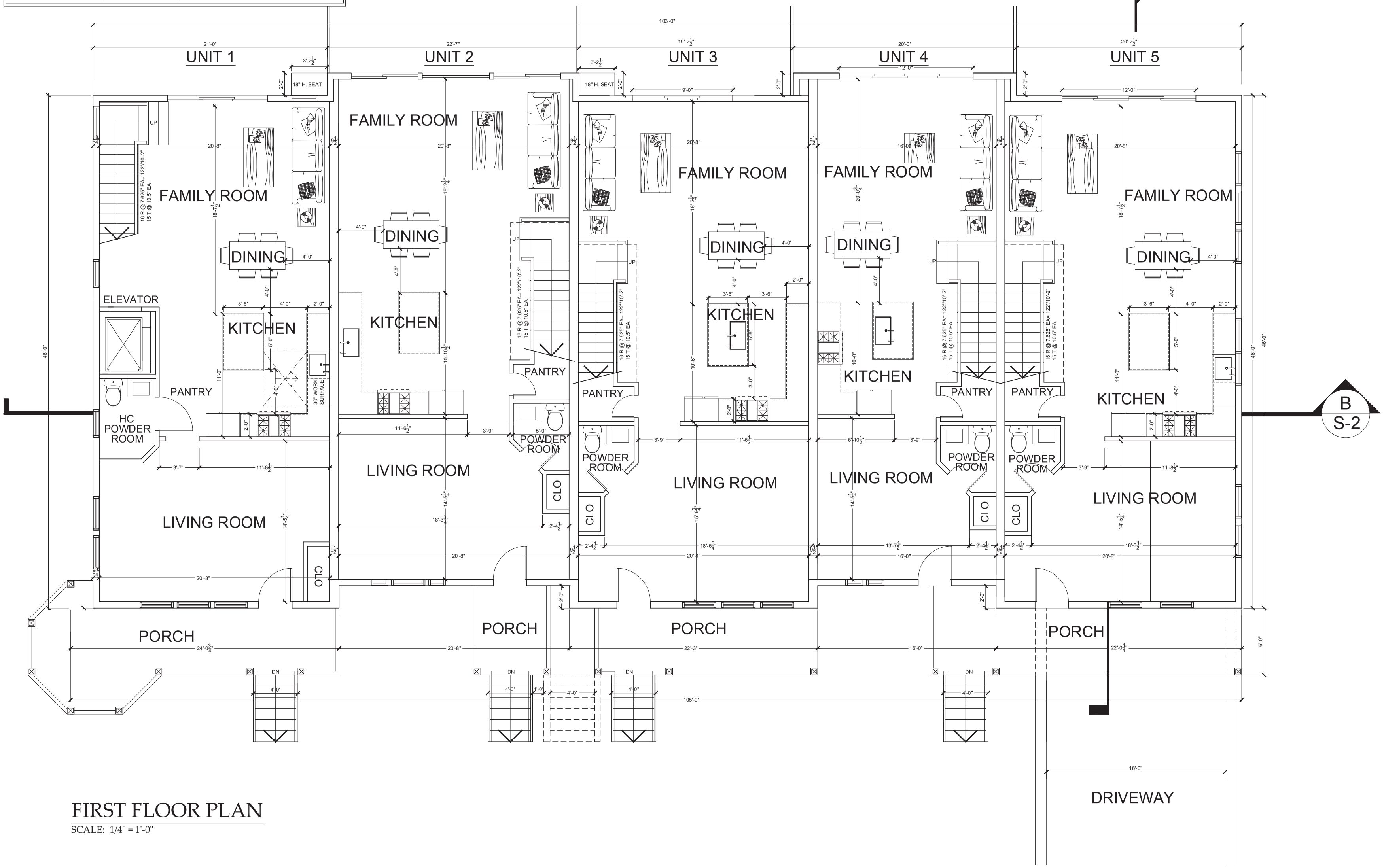

FIRST FLOOR PLAN
SCALE: 1/4" = 1'-0"

TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

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Drawing Title
FIRST FLOOR PLAN

Scale:
AS SHOWN

Date
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PLANNING BOARD SUBMISSION 3-19-15
PLANNING BOARD SUBMISSION 4-15-15
ZONING BOARD SUBMISSION 4-23-15
PLANNING BOARD SUBMISSION 5-07-15
PLANNING BOARD SUBMISSION 5-21-15
WESTCHESTER COUNTY PLANNING SUBMISSION 7-28-15 7-14-15
PLANNING BOARD SUBMISSION 9-4-15
PLANNING BOARD SUB 10-01-15

A-2

FLOOR AREA CALCULATIONS

	1ST FLOOR	2ND FLOOR	TOTAL 1ST & 2ND
UNIT 1	1,001.4 SF	995 SF	1,996.4 SF
UNIT 2	988.7 SF	997.8 SF	1,986.5 SF
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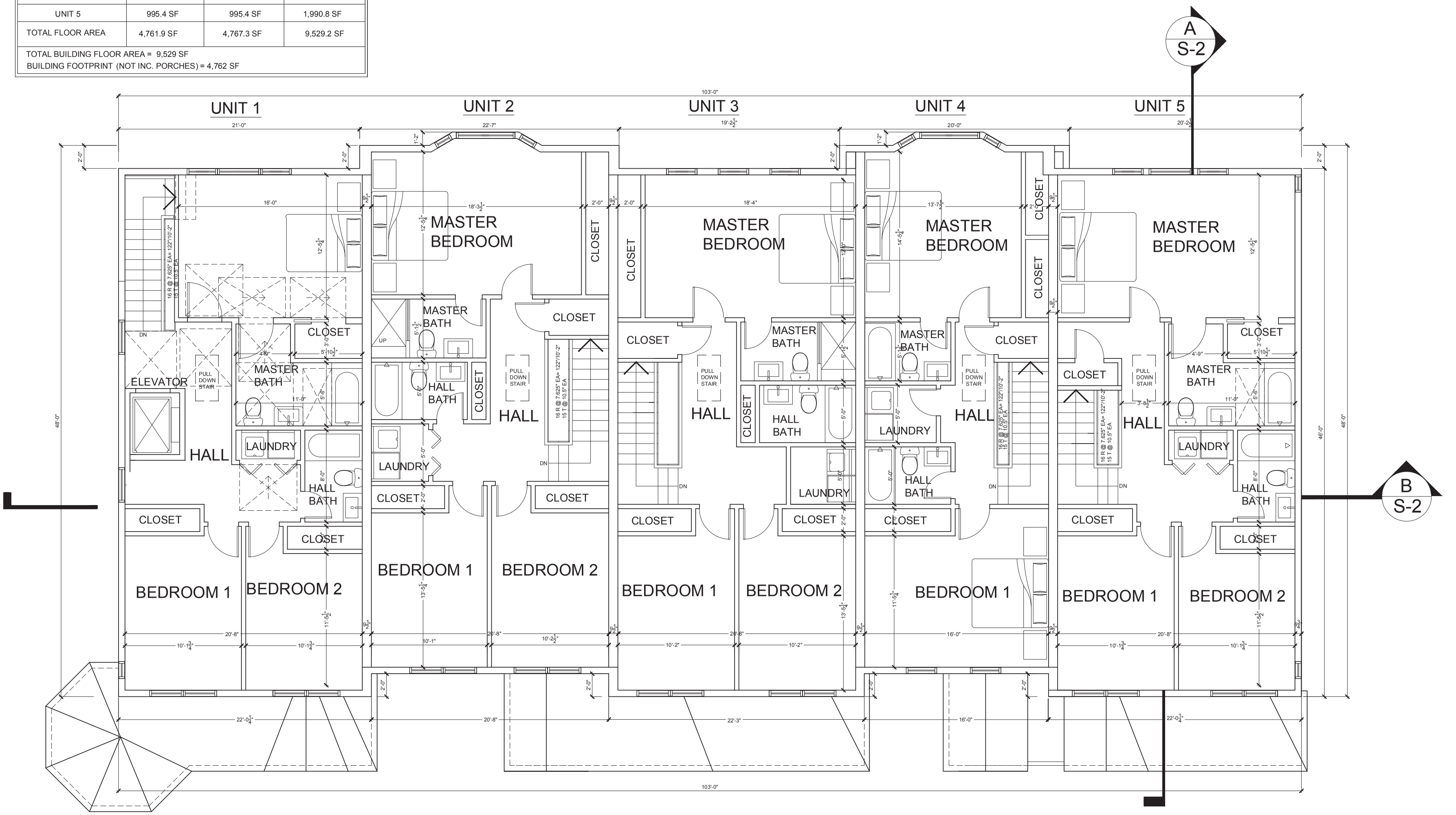

SECOND FLOOR PLAN
SCALE: 1/4" = 1'-0"

TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

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Drawing Title
SECOND FLOOR PLAN

Scale:
AS SHOWN

Date
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PLANNING BOARD SUBMISSION 3-19-15
PLANNING BOARD SUBMISSION 4-15-15
ZONING BOARD SUBMISSION 4-23-15
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PLANNING BOARD SUBMISSION 5-21-15
WESTCHESTER COUNTY PLANNING SUBMISSION 7-28-157-14-15
PLANNING BOARD SUBMISSION 9-4-15
PLANNING BOARD SUB 10-01-15

A-3

FLOOR AREA CALCULATIONS

	1ST FLOOR	2ND FLOOR	TOTAL 1ST & 2ND
UNIT 1	1,001.4 SF	995 SF	1,996.4 SF
UNIT 2	988.7 SF	997.8 SF	1,986.5 SF
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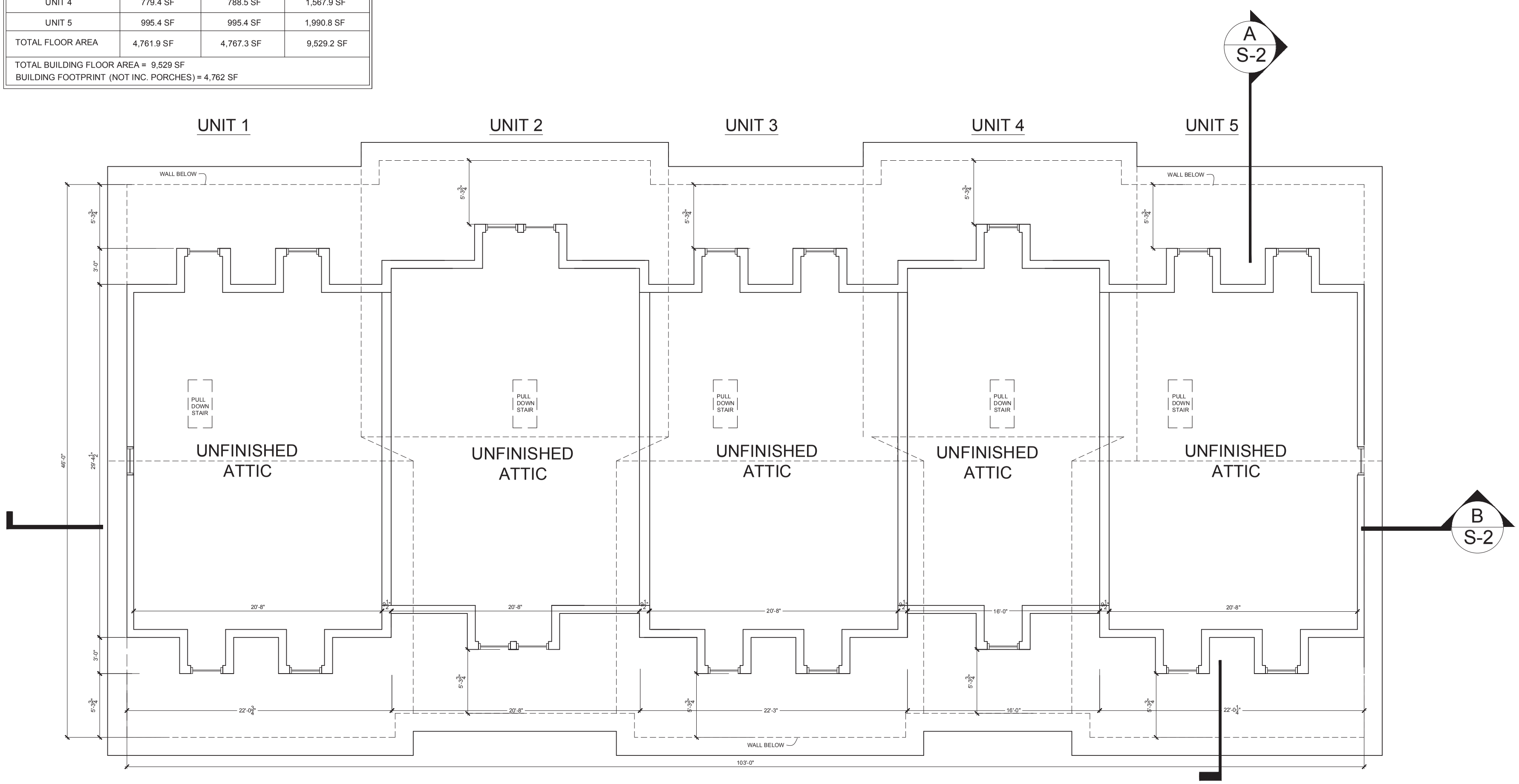

ATTIC PLAN

SCALE: 1/4" = 1'-0"

TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

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WESTCHESTER COUNTY PLANNING SUBMISSION 7-28-15 7-14-15
PLANNING BOARD SUBMISSION 8-11-15
PLANNING BOARD SUB 10-01-15

Drawing Title: ATTIC PLAN

Scale: AS SHOWN

A-4

WEST ELEVATION

SCALE: 1/4" = 1'-0"

TOWNHOUSES at
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HASTINGS-ON-HUDSON, NY 10706

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Date:
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WESTCHESTER COUNTY PLANNING SUBMISSION 7-28-15 7-14-15
PLANNING BOARD SUBMISSION 8-11-15
PLANNING BOARD SUB 10-01-15

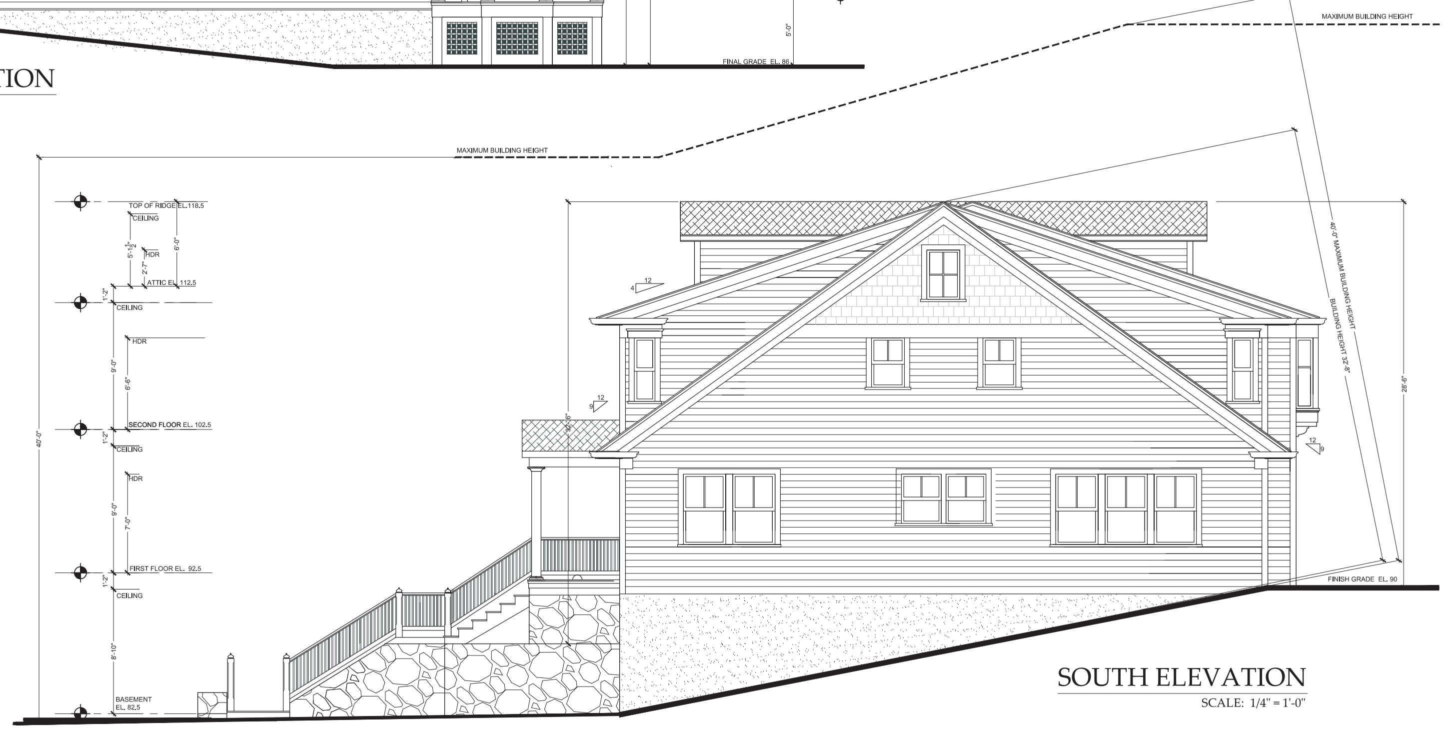
Drawing Title: WEST ELEVATION

Scale: AS SHOWN

A-5

NORTH ELEVATION

SCALE: 1/4" = 1'-0"



SOUTH ELEVATION

SCALE: 1/4" = 1'-0"

TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

CHRISTINA GRIFFIN ARCHITECT pc
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Drawing Title: NORTH & SOUTH ELEVATIONS

Scale: AS SHOWN

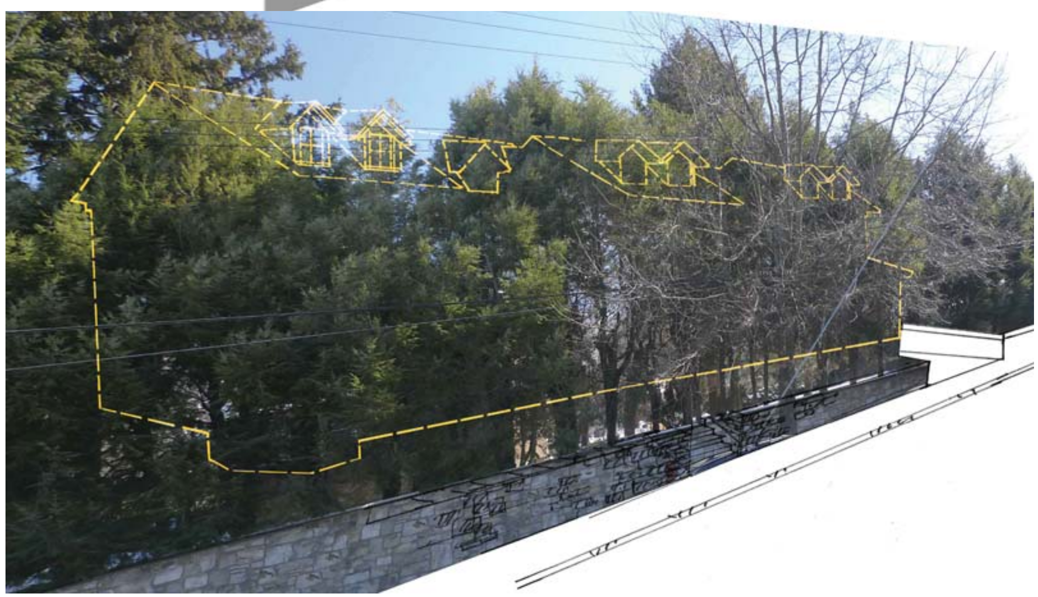
Date	
PLANNING BD PRE-SUBMISSION	2-1-15
PLANNING BOARD SUBMISSION	3-19-15
PLANNING BOARD SUBMISSION	4-15-15
ZONING BOARD SUBMISSION	4-23-15
PLANNING BOARD SUBMISSION	5-07-15
PLANNING BOARD SUBMISSION	5-21-15
WESTCHESTER COUNTY PLANNING SUBMISSION	7-28-15 7-14-15
PLANNING BOARD SUBMISSION	8-11-15
PLANNING BOARD SUB	10-01-15

A-6

VIEWS of SITE

PERSPECTIVE VIEW from
WARBURTON AVENUE
SHOWN WITHOUT
EXISTING TREES

PERSPECTIVE VIEW from
WARBURTON AVENUE
SHOWN WITH
EXISTING TREES



TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

CHRISTINA GRIFFIN ARCHITECT pc
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Hastings-on-Hudson, New York 10706
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Drawing Title
PERSPECTIVE VIEW
FROM
WARBURTON AVE

Date	
PLANNING BD PRE-SUBMISSION	2-1-15
PLANNING BOARD SUBMISSION	3-19-15
PLANNING BOARD SUBMISSION	4-15-15
ZONING BOARD SUBMISSION	4-23-15
PLANNING BOARD SUBMISSION	5-07-15
PLANNING BOARD SUBMISSION	6-30-15

Scale:
AS SHOWN

A-8

KEY PLAN

BEFORE
VIEW from
NEIGHBORING PROPERTY
on WILLIAM STREET
1

AFTER
VIEW from
NEIGHBORING PROPERTY
on WILLIAM STREET
1

TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

CHRISTINA GRIFFIN ARCHITECT pc
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Date
PLANNING BD PRE-SUBMISSION 2-1-15
PLANNING BOARD SUBMISSION 3-19-15
ZONING BOARD SUBMISSION 4-23-15
PLANNING BOARD SUBMISSION 6-30-15

Drawing Title
VIEWS from
WILLIAM STREET

Scale:
AS SHOWN

A-9

KEY PLAN

BEFORE VIEW ② from FIRST FLOOR at 15 WILLIAM STREET

AFTER VIEW from ② the FIRST FLOOR at 15 WILLIAM STREET

TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

CHRISTINA GRIFFIN ARCHITECT pc
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Date
PLANNING BD PRE-SUBMISSION 2-1-15
PLANNING BOARD SUBMISSION 3-19-15
ZONING BOARD SUBMISSION 4-23-15
PLANNING BOARD SUBMISSION 6-30-15

Drawing Title
VIEWS from 15 WILLIAM STREET

Scale:
AS SHOWN

A-10

KEY PLAN

N

BEFORE VIEW
from SECOND FLOOR
at 15 WILLIAM STREET

2A

AFTER VIEW
from SECOND FLOOR
at 15 WILLIAM STREET

2A

TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

CHRISTINA GRIFFIN ARCHITECT pc
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Date
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PLANNING BOARD SUBMISSION 3-19-15
ZONING BOARD SUBMISSION 4-23-15
PLANNING BOARD SUBMISSION 6-30-15

Drawing Title
VIEWS from
15 WILLIAM STREET

Scale
AS SHOWN

A-11

EAST ELEVATION

SCALE: 1/4" = 1'-0"

TOWNHOUSES at

32-34 WASHINGTON AVENUE

HASTINGS-ON-HUDSON, NY 10706

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Date:
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WESTCHESTER COUNTY PLANNING SUBMISSION 7-28-15
7-14-15
PLANNING BOARD SUBMISSION 8-11-15
PLANNING BOARD SUB 10-01-15

Drawing Title:
EAST ELEVATION

Scale:
AS SHOWN

A-7

KEY PLAN

BEFORE VIEW from (3)
NEIGHBORING PROPERTY
on WILLIAM STREET

AFTERVIEW from (3)
NEIGHBORING PROPERTY
on WILLIAM STREET

TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

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Date
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PLANNING BOARD SUBMISSION 3-19-15
ZONING BOARD SUBMISSION 4-23-15
PLANNING BOARD SUBMISSION 6-30-15

Drawing Title
VIEWS from
WILLIAM STREET

Scale:
AS SHOWN

A-12

KEY PLAN

BEFORE VIEW from (4)
NEIGHBORING PROPERTY
on WASHINGTON AVENUE

AFTERVIEW from (4)
NEIGHBORING PROPERTY
on WASHINGTON AVENUE

TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

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Date
PLANNING BD PRE-SUBMISSION 2-1-15
PLANNING BOARD SUBMISSION 3-19-15
ZONING BOARD SUBMISSION 4-23-15
PLANNING BOARD SUBMISSION 6-30-15

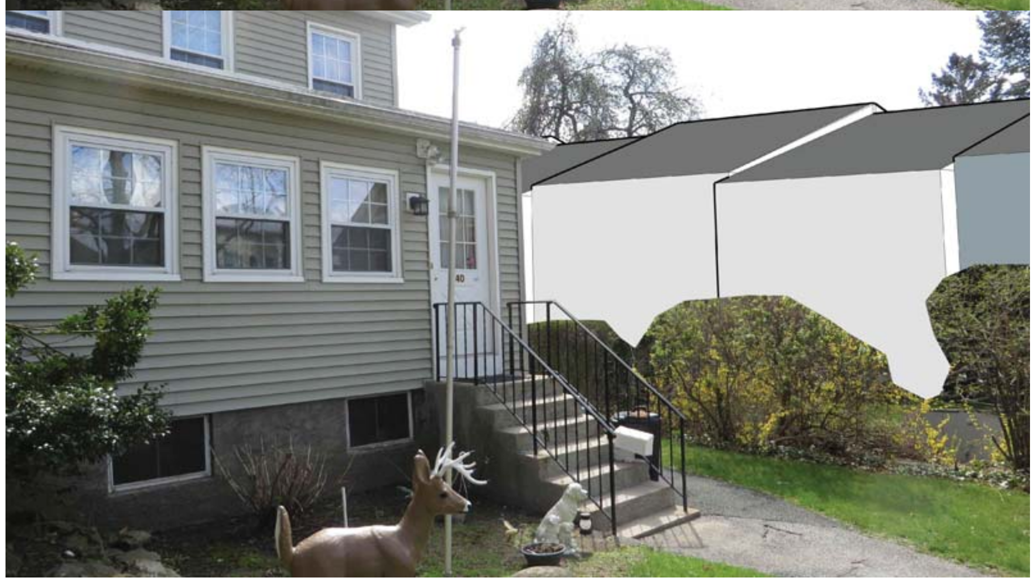
Drawing Title
VIEWS from
WILLIAMS STREET

Scale
AS SHOWN

A-13

KEY PLAN

BEFORE VIEW from (5)
NEIGHBORING PROPERTY
on WASHINGTON AVENUE



AFTERVIEW from (5)
NEIGHBORING PROPERTY
on WASHINGTON AVENUE

TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

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ZONING BOARD SUBMISSION 4-23-15
PLANNING BOARD SUBMISSION 6-30-15

Drawing Title
VIEWS from
WILLIAMS STREET

Scale:
AS SHOWN

A-14

VIEWS of SITE

TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

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ZONING BOARD SUBMISSION 4-23-15
PLANNING BOARD SUBMISSION 5-07-15
PLANNING BOARD SUBMISSION 6-30-15

Drawing Title
VIEWS of SITE

Scale:
AS SHOWN

A-15

VIEWS of NEIGHBORHOOD

TOWNHOUSES at
32-34 WASHINGTON AVENUE
HASTINGS-ON-HUDSON, NY 10706

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Date	
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ZONING BOARD SUBMISSION	4-23-15
PLANNING BOARD SUBMISSION	5-07-15
PLANNING BOARD SUBMISSION	6-30-15

Drawing Title
VIEWS of SITE

Scale
AS SHOWN

A-16

CHRISTINAGRIFFINARCHITECT PC
10 Spring Street, Hastings-on-Hudson, New York 10706

October 1, 2015
Chairman and Members of the Hastings Planning Board
Village of Hastings-on-Hudson
7 Maple Avenue
Hastings-on-Hudson, NY 10706

Re: Townhouses at 32-34 Washington Avenue
Revised Documents for review by the Planning Board

Dear Chairman and Members of the Planning Board:

As the Architect for the proposed townhouses at 32-34 Washington Avenue, I am submitting the following revised documents for review at the October 15, 2015 Planning Board meeting:

Summary of Response to Planning Board Comments, dated 5-21-15, 7-1-15, 8-13-15, & 10-1-15
Letter to Hahn Engineering in Response to Comments, dated 10-1-15
Environmental Assessment Form, dated 10-1-15
Stormwater Pollution Prevention Plan, dated 10-1-15
Letter to Andrew Cortese regarding traffic, dated 8-11--15
Letter from Stephen Lopez, Landscape Architect regarding trees, dated 8-11-15
S-1 Site Plan, dated 10-1-15
S-2 Sections through the Site, dated 10-1-15
L-1 Landscape Plan, dated 10-1-15
A-1- 4 Basement, First Floor, Second Floor and Attic Floor Plans, dated 10-1-15
A-5 West Elevation, dated 10-1-15
A-6 North & South Elevation, dated 10-1-15
A-7 East Elevation, dated 10-1-15
A-8 -16 View Preservation Studies, dated 10-1-15
C-1 Layout Plan, dated 10-1-15
C-2 Grading & Utilities Plan, dated 10-1-15
C-3 Sediment & Erosion Control Plan, dated 10-1-15
C-4 - 6A Construction Details, dated 10-1-15
C-7 Sight Line Distance & Parking Maneuver Plan, dated 10-1-15

In addition, please find attached an electronic version of the full set of documents, including the revised documents listed above, and the latest version of all other documents previously submitted.

I look forward to presenting the revised documents to the Planning Board meeting on October 15th.

Thank you again for your time and consideration in your review of our proposal.

Sincerely,

Christina Griffin AIA LEED AP CPHC

cc: CCI Properties
JMC Engineering

Summary of Response to Planning Board Comments 5-21-15

1. Survey, site plan, and layout plans updated and corrected.
2. Footprint of New Building reduced from 4,813 to 4,762 SF
3. Reduced length of building by 2 ft.
4. Height of Building reduced from 34,6 ft. to 32.6 ft.
5. Central garage entry and steps added to improve pedestrian access to garage
6. Waste areas shown, central location for pick-up added
7. Dormers are reduced in size to reduce bulk
8. Front setback changed from 15.75 to 19.33 ft. to provide more space between building and trees, corner porch reduced in size
9. Driveway at two-family house enlarged, turn-around moved to rear of house
10. Details of Driveway showing site lines, distance from traffic lights, etc., provided
11. Garage layout changed to show parking spaces and turn around to meet zoning code
12. View analysis prepared based on photos taken from inside 15 William Street & 42 Washington Street (properties most affected)
13. Usage of back yards - to be kept open without fences
14. Civil engineering details, such as drainage details, do not coordinate with the plans - reviewed and confirmed by JMC, tree protection details added
15. Comparison of size of units with other townhouses in the area:

32-34 Washington	1,570 - 1,996 SF
Ridge Street	1,680 - 2,400 SF
400 Warburton	2,100 SF
River Town House	2,100 SF
Warburton Avenue Townhouses	+/-3,500 SF

16. Method for collecting data for density studies - example of information obtained from property card presented at 5-21-15 Planning Board Meeting

Summary of Response to Planning Board Comments 7-1-15

1. Poles and string were mounted on site to show top of ridge of proposed townhouses
2. EAF Statement by JMC Site Development Consultants, dated 7-1-15, corrected Traffic Study by JMC Site Development Consultants, dated 7-1-15, provided
3. Letter from landscape architect, Stephen Lopez, dated 7-1-15, about impact on trees by construction provided. Note that the recommended safe distance of 15 feet from the trees to the building has been provided, see Site Plan drawing S-1, dated 6-30-15
4. Central exterior stair to provide pedestrian access from Warburton Avenue has been added back to the plans, see drawings S-1, C-1. C-2, C-3, dated 6-30-15. As a result, the development coverage changed from 39% to 40%, see revised zoning data, drawing S-1, and revised density studies, drawings S-3 and S-4, dated 6-30-15.
5. Changes were made to clarify (same data, better graphics) the Density Study of Neighboring Properties, drawing A-4, dated 6-30-15. Note that the proposed development has 3,752 SF lot area per unit, which is the he highest ratio of lot area to unit (lowest density) when compared to the lot area per unit of groups of properties with similar lot areas. Also note that

the proposed lot area per unit is 2.5 times greater than the minimum 1,500 SF lot area per unit required in the MR 1.5 zone.

6. Additional view analysis, drawing A-11, dated 6-30-15, provided to show views from second floor of 15 William Street, as requested by neighbor

Summary of Changes and Response to Planning Board Comments 8-13-15

1. A fully developed SWPPP has been submitted, showing necessary drainage plans and details
2. The Landscape Plan, Drawing L-1, has been updated and completed.
3. Fences between units have been eliminated to provide more open space. For privacy, six foot long trellises will be attached to the rear wall between the units.
4. Path to south of building was added to improve pedestrian circulation through the property.
5. The driveway along Warburton Avenue has been widened to 16 feet, as requested by Westchester County Engineering Department. A zoning variance will be needed for a total driveway width of 26 feet, exceeding the 24 foot maximum.
6. Development coverage was recalculated and is now 40.7%, to account for new path and wider driveway.
7. The south side of the building has been regraded to include the gravel walkway and to preserve the existing retaining walls.
8. Additional information has been added to Drawings C-2 to show spot grades throughout the site, including grades on the expanded driveway, renovated walkway/steps to existing building (both sides), and throughout the front of the proposed building.
9. A trench drain has been added along the new walkway in front of the new building, see Drawing C-2, to collect storm water. We are still in the process of determining the specifications/details but you can see the general location on the plan.
10. The 12” tree to the east of the building to allow for the drywells and without exceeding a 3:1 slope, the 92-foot contour cannot be moved closer to the existing building - it is likely that such regrading would have impacted the root system and overall health of the tree.
11. The EAF has been corrected to indicate no waterbodies located on site.

Summary of Changes and Response to Planning Board Comments 10-1-15

1. The number and sizes of recycling bins have been added to the Basement Plan, see Drawing A-1.
2. The corner lot setback of 15 feet has been shown on the site plan and zoning data chart.
3. Evergreen screening along the property line next to parking areas for two-family house has been added on the site plan and landscaping plan.
4. The parking layout at the two-family house has been changed to indicate 9’ x 18’ parking spaces, and a 25 ft. diameter turn-a-round space.
5. Clarifications have been made to the wall and steps on north side of driveway, see Section A, Drawing S-2, and Grading & Utilities Plan, Drawing C-2.
6. The Site Plan has been coordinated with the civil engineering drawings. A note was added to the Site Plan to refer to the Grading & Utilities Plan, Drawing C-2, for all grading and topographic information.
7. Type and location of exterior lighting has been added to the Landscape Plan, Drawings L-1.

8. A note indicating a right turn only sign has been added at the driveway to the two-family house and at new driveway, see Drawings C-1 and C-7
9. The transformer has been removed, service will be underground.
10. Structural supports were added to the basement floor plan and the elevation of the porch above the garage. The headroom below the structural beam at garage door has been added to the West Elevation, Drawing A-5.
11. The 25 ft. diameter turnaround space has been indicated on the Basement Floor Plan, Drawing A-1.
12. Bollards were added at the garage to protect the corners of the building, see Basement Plan, Drawing A-1.
13. The elevator layout was changed to eliminate obstruction of the HC aisle, see Basement Plan, Drawing A-1.
14. The powder room at the HC accessible unit has been changed to meet ADA regulations, see Drawing A-2.
15. The number of public parking spaces to be removed on Warburton Avenue has been indicated on Drawings C-1 & C-7.

16. JMC will be providing additional information about the traffic study to address questions/comments from the Planning Board, including:
    a. Explanation of why the traffic standard does not take into count number of bedrooms
    b. Clarification of traffic generated by the new units
    c. Comparison of traffic generation at similar properties, such as 491-493 Warburton & 45 Main
    d. Review of the traffic after project is built and occupied to compare proposed vs. actual

    JMC will present this information at the next Planning Board meeting.

17. The EAS has been revised as follows:
    a. Page 6, D.2.f third item - revised to show heating fuel and effluence from that fuel
    b. Page 10, E.h.part 4 environmentally sensitive sites - reviewed to check accuracy of address for Gasworks on Washington Avenue
    c. Page 11, E.2.e drainage of site soils - updated and completed based on the SWPP
    d. Page 19 hydrology- updated and completed based on the SWPP

18. Comments from Hahn Engineering have been addressed by JMC engineering. Revised civil engineering drawings were sent directly to Hahn Engineering by JMC on October 1, 2015.

Stephen Lopez

Town Planner & Landscape Architect

RLA, New York AICP, Member

May 5, 2015

Mr. Andrew Cortese
Cortese Construction
52 Cedar Street
Dobbs Ferry, NY 10522

RE: 32-34 Washington Avenue
Hastings, NY

Dear Mr. Cortese,

This letter report has been prepared based on a field visit with you to the above referenced property, to examine an existing hedgerow of Hemlock (Tsuga canadensis) trees along Warburton Avenue. The planting appears to be about 20 years old.

The original spacing of the trees has left the more mature stand very crowded. Several trees that have broken trunks or poor crowns should be removed. Most of the others should be selectively pruned to remove dead branches. This will have a positive effect on the remaining trees allowing more space for them to grow.

In addition to the above the trees should be fertilized by a tree care company and treated for Woolly Adelgid, an insect that attacks Hemlocks and is present on these plants. This treatment should be repeated by the tree care company on a regular schedule that they will recommend.

Please call or email with and questions or comments.

Sincerely

Stephen Lopez

254 Bedford Road, Pleasantville, NY 10570
Phone/Fax 914-769-7606, email stephenlopez@optonline.net

Site Planning
Civil Engineering
Landscape Architecture
Land Surveying
Transportation Engineering
Environmental Studies
Entitlements
Construction Services
3D Visualization
Laser Scanning

August 11, 2015

Mr. Andrew Cortese
CCI Properties, LLC
52 Cedar Street
Dobbs Ferry, NY 10522

RE: JMC Project 13180
Washington Avenue Residences
32-34 Washington Avenue
Village of Hasting-On-Hudson, NY

<u>Trip Generation Analysis</u>

Dear Mr. Cortese:

This letter has been prepared to assess traffic generation and associated impacts of the proposed 5 additional townhouses located at 32-34 Washington Avenue.

We have projected traffic volumes associated with the additional townhouses of the Washington Avenue Residences redevelopment based on information contained in "Trip Generation Manual, 9th Edition" published by the Institute of Transportation Engineers (ITE). The ITE publication is an industry standard to project traffic volumes generated by specific land uses. For our analysis, we utilized the Residential Condominium/Townhouse (ITE Code 230) land use to calculate the projected traffic volumes. The proposed 5 additional townhouses which will be accessed via Warburton Avenue are anticipated to generate 1 entering trip and 4 exiting trips, for a total of 5 trips during the peak weekday morning hour, which is based on data from 59 studies. During the peak weekday afternoon hour, the additional townhouses are anticipated to generate 3 entering trips and 2 exiting trips, for a total of 5 trips based on data from 62 studies.

The 5 total trips generated by the additional townhouses average 1 trip every 12 minutes during the peak hours. Since the site is located near the downtown central business district and the train station, the additional trips will likely be less than projected since future residents will have the opportunity to walk rather than drive. It is the professional opinion of JMC that the low volume of additional traffic related to the 5 or fewer additional townhouses will not have a perceptible impact on the operations of the Warburton Avenue and Washington Avenue intersection.

Sincerely,

JMC Planning Engineering Landscape Architecture & Land Surveying, PLLC

Marc Petroro, PE
Project Manager

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October 1, 2015

Mr. James J. Hahn
James J. Hahn Engineering P.C.
1689 Route 22
Brewster, NY 10509

RE: JMC Project 13180
Townhouses at 32-34 Washington Avenue
32-34 Washington Avenue
Village of Hasting-On-Hudson, NY

Response to Comments

Dear Mr. Hahn:

Pursuant to the comments received in James J. Hahn Engineering, PC memorandum, dated August 27 2015, we are pleased to provide 1 copy of the following drawings and report for your review.

1. JMC Drawings:

Dwg. No.	Title	Rev. #	Date
E-1	"Existing Conditions & Demolition Plan"	0	10/01/2015
C-1	"Layout Plan"	7	10/01/2015
C-2	"Grading & Utilities Plan"	7	10/01/2015
C-3	"Sediment & Erosion Control Plan"	6	10/01/2015
C-4	"Construction Details"	1	10/01/2015
C-5	"Construction Details"	3	10/01/2015
C-6	"Construction Details"	3	10/01/2015
C-6A	"Construction Details"	1	10/01/2015
C-7	"Sight Distance & Parking Maneuver Plan"	2	10/01/2015

2. JMC Stormwater Pollution Control Plan & Stormwater Management Report revised 10/01/2015.

3. Christina Griffin Architect, PC Drawings:

Dwg. No.	Title	Rev. #/Date
SP-1	"Site Plan"	10/01/2015
A-1	"Basement Plan"	10/01/2015
L-1	"Landscape Plan"	10/01/2015

For ease of review, we have repeated the enumerated comments in italic print, followed by our responses:

Comment No. 1

A plan should be provided showing the existing conditions and labeled as "Existing Conditions". Items to be demolished or removed should also be shown.

Response No. 1

E-1 "Existing Conditions & Demolition Plan" has been developed and is included with the 10/01/2015 Planning Board submission.

Comment No. 2

The landscaping plan should be reviewed by a Landscape Architect.

Response No. 2

The Landscaping Plan will be reviewed by Andrew Cortese's landscape architect, Steven Lopez.

Comment No. 3

All structures must be able to withstand H-20 loading.

Response No. 3

All structures are able to withstand H-20 loading.

Comment No. 4

Deep test pits and percolation tests should be provided. Using the referenced soil survey is not acceptable for a final design.

Response No. 4

Soil testing was performed by CCI Properties during the week of September 5, 2015. Soil testing data sheets can be found in the revised SWPPP in Appendix 'C' "Soil Testing Data."

Comment No. 5

The proposed infiltration practices do not appear to comply with the sizing requirements provided in the NYSDEC Stormwater Management Design Manual. Compliance should be shown and described in the SWPPP.

Response No. 5

This project is a redevelopment. Currently the site contains an existing residential building with an associated driveway and building. This site also contains remnants of a foundation and foundation walls of a previously demolished building. The proposed stormwater management for this project has been designed in accordance with Chapter 9: Redevelopment Projects of the NYSDEC Stormwater Design Manual. Infiltration practices have been sized to treat the water quality volume calculated for 100% of the new impervious area and 25% of the existing impervious area.

Comment No. 6

A diagram(s) should be included in the SWPPP that clearly shows the existing impervious area, redevelopment area, and proposed new impervious areas. The calculated areas should be individually shown on each diagram.

Response No. 6

Figures 1 "Existing Impervious Area", Figure 2 "Limit of Disturbance/Redevelopment Area" and Figure 3 "Proposed Impervious Areas" are found in the revised SWPPP as Appendix 'I' "Redevelopment Figures."

Comment No. 7

Additional detail of the proposed drywell inlet pipes should be provided. It is not clear what the pipes are connected to.

Response No. 7

Drywells are no longer proposed as a stormwater management practice. All references to proposed drywells have been removed from civil drawings and the SWPPP.

Comment No. 8

It appears that the present design isolates the property based on the property lines. Additional topography of the adjacent areas should be provided to demonstrate whether or not this is the case. All Stormwater Management Practices must be designed based on the area which is tributary to them. In addition, it appears that more area is tributary to the drywells, which should be shown.

Response No. 8

The present design includes all stormwater runoff that enters the site. The property is bounded by retaining walls along the eastern and southern property lines. Please refer to Figure 4 in the revised SWPPP to see how the site fits within the greater context of drainage throughout Westchester County. Although the site has minimal impact on the greater system as seen in Figure 4, the stormwater management system has been designed to over-detain water onsite and does not increase stormwater runoff volumes.

Comment No. 9

The 100 year storm should be relabeled in Table 6 of the SWPPP.

Response No. 9

Table 6, 100 year storm label has been updated in the revised SWPPP.

Comment No. 10

Pretreatment for the proposed drywells should comply with the NYSDEC Stormwater Management Design Manual.

Response No. 10

As stated in Response 7, drywells are no longer proposed.

Comment No. 11

All drainage analysis items (i.e., areas, outlets, etc.) provided on the Pond Pack schematic layout in the SWPPP should be at a legible size.

Response No. 11

PondPack schematics for both existing and proposed hydrologic calculations have been updated to be more legible.

Comment No. 12

The volumes of each infiltration practice should be added to the narrative in the SWPPP.

Response No. 12

Volumes of each infiltration practice have been added to the narrative of the revised SWPPP. The volume of proposed subsurface infiltration system is also located in Appendix 'F' of the revised SWPPP. Sizing of the bioretention area and infiltration provided during the 1 Year storm for the subsurface infiltration system have been provided in Appendix 'E' of the revised SWPPP.

Comment No. 13

The SWPPP and stormwater calculations should be revised to use the values in the NYSDEC Stormwater Management Design Manual Figures 4.3 and 4.4 for the 10 and 100 year storm events (i.e., 5.25 inches for the 10 year and 9 inches for the 100 year).

Response No. 13

Stormwater calculations and SWPPP text have been updated to reflect 5.25 inches of precipitation for the 10 year storm and 9 inches for the 100 year storm.

Comment No. 14

The SWPPP should include a narrative as to why Runoff Reduction Volume (RRV) is not required for this project (Sections II and V).

Response No. 14

A narrative has been added to Sections II and V under Step 3 within the revised SWPPP. RRv is not required for this project because this is a redevelopment project. Also, this project does not exceed NYSDEC requirements for developing a SWPPP and has been developed due to disturbance thresholds and stormwater pollution prevention specifications within the Hastings-on-Hudson code. This code does not reference RRv requirements.

Comment No. 15

A narrative should be included that describes the WQv calculations, how the project will comply with the requirements, and reference the calculations, in the SWPPP, Section V, Step 2: WQv.

Response No. 15

A description of the water quality treatment volume calculation has been added to the SWPPP under Section V-Step 2.

Comment No. 16

A hydraulic profile should be provided of the proposed stormwater system.

Response No. 16

Hydraulic pipe calculations and profiles have been added to the SWPPP under Appendix 'D' "Pipe Calculations.

Comment No. 17

The proposed hydrodynamic separator (HDS) and stormtech units appear to be proposed to treat area PDA-IE. Therefore, the proposed drywells should not be directed to this system. If additional treatment is required, a larger system should be provided.

Response No. 17

As stated in Response 7, drywells are no longer proposed.
Comment No. 18

A note should be added to the plans that states the infiltration system must not be connected until construction is complete and the site is stabilized.

Response No. 18

A note has been added to C-3, "Sediment & Erosion Control Plan" (Note 13).

Comment No. 19

Inspection ports should be shown for the infiltration units and a detail should be provided. They should be located as recommended by the manufacturer.

Response No. 19

Inspection ports have been shown for the infiltration units (C-2 "Grading & Utilities Plan) and a detail can be found on C-6, "Construction Details," detail number 19.

Comment No. 20

Maintenance notes should be provided for the post-stormwater management practices.

Response No. 20

Maintenance notes are provided on C-3 "Sediment & Erosion Control Plan" as well as in Appendix 'H' in the SWPPP.

Comment No. 21
Parking maneuvers should be shown on plans. The garage entrance only appears to allow access for one vehicle at a time which may be an issue with a 2 way driveway.

Response 21
The driveway has been designed to be 16 feet wide, the minimum allowable for a multi-family residence as advised by the Westchester County Department of Public Works. Parking maneuvers are shown on C-7, "Sight Line Distance & Parking Maneuver Plan". A vehicle can safely turn into the driveway with a car waiting to exit and then continue on to park inside the garage. Also shown is a vehicle backing out of a parking space and driving out of the garage.

Comment No. 22

The access aisle for ADA parking space should be free of obstructions. Alternate locations for the elevator should be considered.

Response No. 22

Drawings have been revised to show the access aisle for the ADA parking space free of obstructions.

Comment No. 23

Top and bottom wall elevations should be shown at all changes in elevation of the retaining wall.

Response No. 23

Top and bottom wall elevations have been added at all changes in elevation of retaining walls.

Comment No. 24

The location, height and details of all proposed fences, if any, should be provided.

Response No. 24

Trellis fencing behind the proposed building is shown on C-1 "Layout Plan" as well as S-1 "Site Plan" prepared by Christina Griffin Architect PC.

Comment No. 25

Drawings must be signed and sealed by a Registered Architect or Professional Engineer, licensed in New York State. At least one (1) original seal should be submitted and the remaining plans should include an electrical or copied seal.

Response No. 25

Plans will be signed and sealed by a Registered Architect or Professional Engineer.

Comment No. 26

The drawings submitted are not to scale and should be provided. Please be aware that the half-scale drawings are acceptable for our review, however the drawings provided were not to half-scale.

Response No. 26

Drawings will be submitted to scale. A set of the engineering drawings and SWPPP will be submitted directly to Hahn Engineering for review.

Comment No. 27

Single trees with a diameter of eight inches or more measured three feet above the base of the trunk should be shown on the plans. It appears existing trees to be removed are not shown.

Response No. 27

Trees to be removed have been shown on E-1 "Existing Conditions & Demolition Plan" and are also noted on the Landscaping Plan.

Comment No. 28

All trees to be removed should be shown.

Response No. 28

Trees to be removed have been shown on E-1 "Existing Conditions & Demolition Plan" and are also noted on the Landscaping Plan.

Comment No. 29

The location of all existing utilities should be shown (i.e. water, gas, electric, storm, sewer, cable, etc.).

Response No. 29

Location of all existing utilities are shown on E-1 "Existing Conditions & Demolition Plan" as well as C-2 "Grading & Utilities Plan".

Comment No. 30

The minimum clearance between the water main and sewer main should be ten (10') feet horizontal and eighteen (18") inches vertical. A crossing detail should be provided.

Response No. 30

A detail is provided. Please refer to C-6 "Construction Details" detail number 18.

Comment No. 31

Details of "waste areas" should be provided.

Response No. 31

Individual waste storage areas are to be located under the porches, as shown on C-1 "Layout Plan" as well as A-1 "Basement Plan" prepared by Christina Griffin Architect PC.

Comment No. 32

The quantity of cut/fill material to be exported/imported should be stated on the plans.

Response No. 32

Approximately 1,300 cubic yards of material is to be removed from the site. This is noted on C-2 "Grading & Utilities Plan" (Note 10).

Comment No. 33

The following notes should be shown on the plan.

> *"The Building Inspector or Village Engineer may require additional erosion control measures if deemed appropriate to mitigate unforeseen siltation and erosion of disturbed soils."*
>
> *""As-Built" drawings of the site improvements shall be submitted to the Village Engineer for review prior to obtaining Certificate of Occupancy."*
>
> *"The restoration work for the roadway and shoulder construction within the Village Right-of-Way shall be performed to the satisfaction of the Highway Department."*

Response No. 32

These notes have been added to drawings C-1, C-2, and C-3. The second note has also been added to the Cover Page, provided by Christina Griffin Architect.

We hope that you find the above responses and the enclosed plans and report sufficient in your review.

Sincerely,

JMC Planning Engineering Landscape Architecture & Land Surveying, PLLC

Anthony P. Nester, RLA
Associate

Cc: Chairman James Cameron, Planning Board Chairman & Members of the Planning Board
Mr. Charles Minozzi
Mr. Andrew Cortese
Mr. Neil Alexander
Mr. Christina Griffin

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