STORMWATER MANAGEMENT PLAN

Prepared for

Armstrong Plumbing
593 North State Road
Town of Ossining, NY

Prepared by:

Site Design Consultants
251F Underhill Avenue
Yorktown Heights, New York 10598
914-962-4488

Joseph C. Riina, P.E.
NYS Lic. No. 64431
CPESC No. 2670
CPSWQ No. 0073

May 2018

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593 North State Road
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Property Owner: Armstrong Plumbing
593 North State Road LLC
Ossining, NY 10510

Site Engineer: Joseph C. Riina, P.E.
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CPESC No. 2670
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Site Design Consultants
251-F Underhill Avenue
Yorktown Heights, NY 10598
914-962-4488
jriina@sitedesignconsultants.com

May 2018

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Appendices

1.0 Project Description

The subject property is located at 593 North State Road in the Town of Ossining, New York. The property is 0.697 acres in size and contains an existing residence. The property is zoned GB (General Business). The highpoint on the site is at the rear of the lot. The site slopes up from North State Road which is at the front to the west toward the back of the lot. The front half of the lot which contains the existing driveway and residence is moderately sloped and mostly lawn. Behind the house and driveway, the site slopes steeply towards the rear property line. This area is wood with exposed rock. There is an existing 24" CMP that runs through the site. This connects to the drain line in Morningside Drive to the west. This CMP daylights along North State Road, at which point it enters a 2' x 2' box culvert which crosses beneath the road and flows to the other side.

It is proposed to install a parking lot off of the existing driveway, along with a loading area and an area for refuse. A stormwater management system is proposed to capture and treat runoff from the proposed impervious surfaces. The proposed system will consist of a Downstream Defender water quality unit and a series of subsurface chambers for extended detention. Runoff from the adjacent properties to the rear will be collected by a diversion swale and discharged at the daylight point of the existing 24" CMP.

The total disturbance proposed for the site will be 8,500 SF. This disturbance will be managed during construction by implementing this stormwater management plan which will control stormwater runoff and related erosion potential. During construction, temporary erosion and sediment control measures will be kept in place and maintained. After construction surface runoff will be discharged to the stormwater management system.

The following Report and Plans describe in detail the design and implementation of the Stormwater Management Plan.

2.0 Site Hydrology

The proposed improvements will not significantly change the surface runoff patterns. Currently, the surface runoff pattern is away from the rear of the site, including some of the residences along morning side drive, and flowing towards north state road. It is along north state road that runoff reaches a swale which channels it to the 2' x 2' box culvert that runs beneath the road. The flow is a combination of sheet flow, shallow concentrated flow, and channel flow.

Under the proposed condition the general direction of the surface runoff will not be altered. All of the surface runoff from the new impervious areas will be collected and detained. The proposed improvements as shown will result in an increase in the imperviousness of the area. Therefore, there will be an increase in the volume of runoff generated by the project for a given rainfall event. This will be mitigated with the stormwater management system.

In the planning, design and construction of the development, stormwater will be managed to minimize or eliminate potential off-site impacts. The proper implementation of temporary sediment and erosion control measures are used to achieve this goal. An Erosion and Sediment

Control Plan has been established and will be implemented during all phases of construction until the completion of the project. The Erosion and Sediment Control Plan incorporates the sequence of construction and designed measures to be installed, operated and maintained during all aspects of each phase. The erosion and sediment controls are designed in accordance with the NYS Standards and Specifications for Erosion and Sediment Control.

3.0 Soils

On-site soils were classified by using the USDA Natural Resources Conservation Service (NRCS) Websoil survey for Westchester County, NY, see Figure 4.1 – Soil Map.

The predominant soil types for this project are Chatfield-Charlton complex, CsD which have a hydrologic classification of "B". The erosion hazard level for these soils are slight to moderate. The wooded rear of the site which has steep slopes is rated Hollis-Rock Outcrop, HrF. These soil properties are essential in the design and proper construction management of the site.

On-site soils were tested by digging deep test pits to a depth of 5-feet were performed in the location of the proposed detention system.

The soils were found to be a mix of sandy clays and loams. Groundwater was found at a depth of 5' which eliminated the use of infiltration chambers. The soils were important in determining the runoff coefficient in determining runoff volumes. Independent soil tests were performed and the results are located in Appendix D of this Report. These soils also have a low erodibility factor.

4.0 Stormwater Regulatory Requirements

Regulatory Obligation

Since the project disturbance is less than one acre, the filing of a Notice of Intent with the NYS DEC for compliance with General Permit 00-15-002 is not required. Therefore, the project only needs to comply with the provisions of the Town of Ossining Code Chapter 168 Stormwater Management. This project as designed complies with the Town Code Chapter 168.

A stormwater analysis has been performed and Stormwater Management Systems have been designed to provide for water quality treatment and the detention of stormwater. The basis of analysis was to capture, treat and detain the 25-year storm event with a runoff depth of 6.4". Typically the system is designed for the 90% rainfall which is approximately 1.5 inches.

5.0 Reducing Pollutant Impact

Stormwater Management During Construction

The Erosion and Sediment Control plan will be implemented during all phases of construction until the completion of the project. This will minimize or eliminate the potential

short-term adverse impacts which may occur during construction. After completion, the erosion and sediment control will become a maintenance plan to insure that permanent erosion and sediment controls continue to function and prevent the transport of sediments.

The Erosion and Sediment Control plan includes the Sequence of Construction and designed measures to be installed, operated and maintained during all aspects of construction. The appropriate measures were selected and detailed in plan for implementation by the site contractor. The main objective of the plan is to prevent erosion from occurring by stabilization of the construction site where possible. Sediment controls are to be used as a containment system to allow the removal of sediment from runoff to the greatest extent possible before leaving the work site. Control methods and standards utilized are provided in the NYS GUE&SC.

Potential sources of destabilization of the site have been determined so that proper measures will be used. The locations and methods designed for erosion and sediment control measures change as the construction sequence progresses. The priority is to stabilize disturbed areas subject to erosion and use containment and / or filtering practices where sediment may concentrate. Some of the practices and methods that will be used for this project are:

- Minimization of open disturbance by use of stabilizers such as seed, mulch, and erosion blankets, stone, etc. Areas not subject to construction traffic for extended periods will be temporarily stabilized.
- The work areas will be contained. Down grade perimeters will be lined with barriers such as silt fence, diversions, berms, etc.
- Where possible, clean stormwater will be diverted away or around the work site to reduce the amount of runoff requiring treatment.
- Sediment traps will be constructed where heavy concentrations of runoff may accumulate.
- Dust control measures will be maintained on-site such as water trucks.
- Runoff will be prevented from gaining erosive velocities on long slopes. This can be achieved with seed and mulch, erosion control blankets, curb dams and multiple rows of silt fence.
- Existing drainage structures will be protected from sediment-laden runoff.

Additional methods of practices may be employed dependent on the situation. The NYS GUE&SC consists of NYS DEC accepted and recommended practices. The design requirements of temporary and permanent erosion and sediment control practices of this Manual have been followed.

Prior to completion of the project, all permanent structural features will be cleaned, restored, and re-vegetated as necessary. The erosion and sediment control phase of the project is complete when all work is done and all areas are stabilized. The post-construction Stormwater Management Inspection and Maintenance agreement will describe the long term inspection schedule, periodic maintenance requirements, and the responsible party.

6.0 Methodology

To satisfy the requirements of the Town of Ossining standard practices have been selected. These practices meet either attenuation or water quality goals. The practices selected, and the sizing analyses are found in Chapter 6 of the NYS DEC Stormwater Management Design Manual January 2015.

7.0 Hydrologic Analysis

A hydrologic analysis was performed for the area of interest or subject to development site for existing and proposed conditions. For the purpose of this analysis the existing and proposed conditions were compared to determine the increase in runoff volume to be controlled. The method used to compute project runoff was the Soil Conservation Service TR-55. The basis for the analysis was the Type III, 24-hour storm, for the 25-year storm event. The rainfall depth for the 25-year storm is 6.4 inches. The runoff coefficient "CN" and Time of Concentration for existing and post-development conditions were computed using Standard TR-55 criteria. The summary of the input can be found in Appendix C.

There is a high point ridge line along the properties to the rear of the site. Runoff flows away from the high point to the rear of the property where the site slopes steeply to the front of the property and north state road. There is an existing swale the runs along north state road to the existing 2' x 2' box culvert. In addition, a 24" CMP pipe that carries addition runoff from Morningside Drive to the west daylights at this location. This is the point that was chosen as the design point. This area was called DA-1, and consists of the whole property, and portions of the two properties to the rear of the site. The tributary area is 1.223 acres with a runoff coefficient Cn of 72 for the existing condition and 1.095 acres and a CN of 73 for the proposed condition. The maximum discharge to the design line expected during the 25-year storm is 4.12 cfs which is significantly less than the 4.19 cfs under the existing condition.

Under the proposed condition part of the existing DA-1, which includes the proposed parking lot and other improvements were separated analyzed as DA-2. This area is 0.128 acres in size with a CN number of 98. Runoff from this area is collected in drain inlets and then conveyed to a Downstream Defender water quality unit for treatment. It will then be discharged to a subsurface STORMTECH SC-740 detention system. It is proposed that there will be a total of 15 units which will be located in the front yard. The units will be encased in gravel as detailed. They have been design to accommodate the 25 year storm. The entire 25-year storm event will be treated, detained, and discharged.

The contributing watershed is limited to the project site and portions of the adjacent properties with the design point which is the lowest point of the site where all of the current surface runoff flows to. The following table summarizes the runoff calculations shown in Appendix C.

Drainage Summary – Design Line 1

Storm Frequency	Existing, cfs	Proposed, cfs	Net Change, cfs	Storage Provided
1 year	0.80	0.74	-0.06	1,132 cf
2 year	1.20	1.10	-0.10	1,132 cf
10 year	2.77	2.51	-0.26	1,263 cf
25 year	4.19	4.12	-0.07	1,393 cf

The peak rate of discharge from the 24-hour rainfall for each rainfall event shows no increase over the existing condition. Therefore there are no downstream impacts associated with this project.

8.0 Selected Stormwater Management Practices (SMPs)

Since the only requirement is the detention of the increase in stormwater runoff during the 25-year storm event most of the runoff from the impervious areas is being collected and detained with a controlled release at the discharge with no increase in peak runoff over existing conditions.

The selected practices are as follows:

Pre-Treatment First Defense Unit: Downstream Defender Water Quality unit to provide treatment prior to the detention system. It is designed to capture and remove sediment from the surface runoff through this flow-through stormwater practice. These vaults are designed to capture 89% of suspended sediment and 40% of Phosphorus that enters the unit. Additionally, these units have been sized to capture and treat up to a 25-year, 24-hour storm event. The maintenance of these water quality vaults is included on Sheet 9 of 9 in addition to the maintenance requirements identified on the Stormwater Management Plan. This practice is installed upstream from the detention practice. After the treated runoff passes through the water quality vaults, it discharges to the detention system. The Downstream Defender is accepted by the NYS DEC as a proprietary system.

Subsurface Storage Chambers: The selected stormwater system captures runoff from drain inlets which are piped to the system. The system is comprised of a Stormtech SC-740 Chamber System. The design requires five rows of chambers with three chambers per row. The system will be encased in gravel. The chambers are interconnected to provide over 1,400 cf of storage. The 25-year storm will be detained prior to release

See Routing Calculations in Appendix C for sizing calculations.

9.0 Stormwater Management Practice Justification and Design

The selection of the management practice was based on evaluating the site to determine what would best fit the conditions providing maximum benefits. The goal was to select practices

which would meet treatment and attenuation standards and minimize the disturbance footprint. The selection of Stormwater Practices was based on the surface and subsurface conditions of the site. In addition, the site design concept is to create a natural and environmentally sensitive setting. The high groundwater made it very clear that infiltration was not a possible practice. Therefore, the water quality unit was selected for treatment, and the subsurface chambers were selected for detention.

10.0 Erosion and Sediment Control Selection

Stabilized Construction Entrance:

This has been specified for the entrance of the driveway in compliance with the NYSSESC. The installation will occur at the beginning of the project as described in the Suggested Construction Sequence. It will be maintained so as to prevent the tracking of sediment off-site. The location and detail can be found on the Construction Drawings.

Silt / Sediment Fence:

Silt fence has been specified to control and contain sediment from leaving areas under disturbance to undisturbed areas. The type, placement, and installation shall meet the requirements of the NYSGUESC. The fence shall be installed as best as possible following the contours and will be spaced in accordance with the same criteria. The fence will be inspected daily, repaired, and sediment removed. The location and details can be found on the site plan.

Soil Stockpile:

Areas are provided for temporary stockpiling of delivered soil material for the construction. These areas will be contained with sediment fence to prevent the movement of sediment. The stockpiles if not active for less than 14 days will be seeded and mulched. The stockpile areas were placed to best suit the proposed construction activity. The stockpile will be installed as described in the Construction Sequence. The location and detail can be found on the site plan.

Temporary and Permanent Vegetative Cover:

Disturbed areas that will not contain structures or other improvements must be stabilized. The stabilization may be temporary and in other cases permanent vegetative cover. The vegetative cover specifications are based on the NYS GUES&C Manual. On the Constructions Plans are notes, locations, and specifications as to the vegetative cover requirements. In the notes, there are specific situations and time constraints related to stabilization of disturbed areas. The specifications give seed and fertilizer mixes as well as placement.

11.0 Construction Sequence

A key object of the SWPPP is to reduce erosion and sedimentation potentials for the project. The construction sequence was developed to assist the site contractor. Its intent is to

coordinate the installation of E&SCs with the site disturbing activities as a means to minimize the adverse impacts of the site work.

Recommended Sequence of Construction

Use of erosion and sediment control structures and practices are important for maintaining site stability under runoff and during daily construction activities. The Construction Sequence should be staged with erosion and sediment controls, as follows, with all controls in place and implemented prior to respective infrastructure construction. As construction proceeds, the controls should be monitored, maintained and replaced as needed. Additional controls may be required as needed to address unforeseen situations.

Refer to The Construction Drawings for all plans and details which relate to the Construction Sequence. This Sequence should be followed in conjunction with all Plans, Notes, and the Stormwater Pollution Prevention Plan. Prior to the commencement of work, the Owner and General Contractor shall read and understand the Sequence for Construction. The Sequence shall be discussed at the time of the Pre-construction Meeting.

During construction of the project, the Contractor is responsible to coordinate all required inspections with various agencies and the Project Engineer.

Construction Sequence

General Sequence: The general sequence applies to the start of all Phases of the project. The requirements in such shall be applied as appropriate in that phase and shall be assumed in place prior to the start of the work outlined in the sequence for each Phase.

1. Prior to the beginning of any site work the major features of the construction must be field staked by a licensed surveyor. These include the building, limits of disturbance, utility lines, and Stormwater practices.

2. Prior to the start of the project, an on-site pre-construction meeting will be held. This will be attended by the Project Owner, the Operator responsible for complying with the approved construction drawings including the Erosion and Sediment Control (E&SC) Plan and Details, the Design Engineer, the Engineer responsible for E&SC monitoring during construction, Town representatives from the Engineering Department and Code Enforcement.

3. Cut and clear trees within the phase limits as necessary for the areas to be disturbed. Install tree protective measure at marked locations on E&SC Plan.

4. Install all temporary erosion control measures as shown on the Erosion and Sediment Control Plan for the project's immediate disturbance areas. This shall include, but not limited to silt fence, stabilized construction entrances, diversion swales, sediment traps, construction fence, etc. This sequence must be followed to insure proper implementation of

the Erosion and Sediment Control Plan (E&SC) and Stormwater Pollution Prevention Plan (SWPPP).

5. Timbered trees and woodchips shall be temporarily stored in the stockpile and/or staging area if necessary before being removed off-site. Woodchips may be used for mulch to stabilize disturbed areas. Woodchip mulch shall be applied at a minimum rate of 500 lbs. per 1000 SF (2" thick minimum).

6. Remove existing vegetative cover, cut and clear trees, grub, remove stumps and other surface features in the limit of construction only. Any disturbance that results from tree clearing and grubbing shall be immediately stabilized with woodchips mulch, hydro-mulch, or straw and seed. Timbered trees, wood chips, and stumps shall be removed off-site unless otherwise directed. As stated woodchips may be stockpiled for use as stabilizing ground cover. Demolish and/or remove existing features, i.e.: fence, concrete slab, asphalt etc., and dispose of or stockpile as required by the Owner. All construction debris shall be properly disposed of in accordance with all Federal, State, and Local requirements.

7. Once the tree removal operation is complete strip the topsoil within the limits of disturbance and place excavated topsoil within the identified stockpile locations. Any soils so deemed by the Design or Monitoring Engineer shall be stockpiled for future use as landscaped area topsoil. Contractor shall take every precaution feasible to reduce the amount of disturbed/exposed soils during construction.

8. Begin rough grading of driveways and adjacent areas. Slops in excess of 3H:1V shall not be left exposed and must be stabilized.

9. Cut material shall first be moved to the fill locations required to complete the access drive and parking and bring the area up to final grades. Excess material to be used toward infilling in Phase II shall be stockpiled. Blasted rock that is not suitable to remain on site shall be hauled away and properly disposed of.

10. Begin installation of subsurface detention chambers within limits of disturbance.

11. When the subsurface units are installed, the upstream drainage structure shall be blocked so as to not allow sediment laden water from reaching the subsurface chambers.

12. Backfill as installation is complete and stabilize the area. If trenches are to be left open, place excavated material on the up-slope sides of the trench and protect and stabilize if it is to remain open for an extended period of seven (7) days or more.

13. Upon completion of the subsurface chambers, begin installation of proposed Downstream Defender unit. Install storm sewer piping, catch basins and manholes, working downstream to upstream. During the installation of catch basins, install inlet protection as per E&SC Plan to assure that sediment laden water will not enter the storm system. Once the final grade above the system is achieved, put into place the final topsoil cover, seed mix, and erosion control blanket, or hydro-mulch.

14. Once the infiltrator system has been installed, grade and install the base course for the driveways and parking areas.

Final Site Stabilization and Completion of New Construction:

15. Upon completion of all Phases, the site shall be inspected by the Supervising Engineer and Town Inspector to determine completion of all work and permanent stabilization of the site.

16. Any areas deemed incomplete or not properly stabilized shall be done so to the satisfaction to the Supervising Engineer and Town Inspector.

17. Once the site is deemed adequately stable the temporary erosion and sediment control measures can be removed including the sediment traps. The area where the sediment trap was located shall be filled, top soiled, seeded and mulched in accordance with the specifications within this plan. At that time if deemed appropriate drainage structures upstream from the subsurface stormwater management systems shall be cleaned of sediment and debris. They can then be unblocked to allow for flow of collected surface runoff.

Contact information during and after construction:

593 North State Road LLC.
593 North State Road
Ossining, NY 10510
914-941-8665

12.0 Maintenance of Stormwater Management Practices During Construction

Regular site inspections will be performed by the City throughout the construction of the project. Inspections will be made weekly and after major rainfall events, i.e. ½" or greater. A report will be made of each inspection.

13.0 Maintenance of Stormwater Management Practices After Construction

This will be clearly detailed in the Stormwater Management Inspection and Maintenance Agreement. These responsibilities will reside with the Town.

The following is the proposed Inspection and Maintenance Schedule:

Control to be Inspected	Inspection Frequency	Maintenance Threshold Criteria	Maintenance Procedure
Drain Inlets	Quarterly	3"+ accumulated sediment	Remove debris and sediment annually.
Downstream Defender Unit	Quarterly	3"+ accumulated sediment	Remove debris and sediment annually.
Stormwater Chamber System	Bi-Annually	12" accumulated sediment	Flush And Vacuum out Sediment.

Drain Inlets:

Access through grate structure and remove debris and sediment with hand tools.

Pipe System:

Access chamber system through inspection ports and remove debris and sediment with hand tools or vacuum truck. Inspect the structure bi-annually.

In General:

- Controls should be inspected periodically for the first few months after construction and on a semi-annual basis thereafter. They should also be inspected after major storm events (greater than 0.5 inches).
- All stormwater controls shall be inspected and cleaned of any debris or sediment.
- Any erosion shall be repaired and stabilized with seeding and mulch or stone.

Please note that additional notes regarding maintenance activities are contained on the project Construction Drawings and should be adhered to during and after construction.

15.0 Conclusion

The Stormwater Management Plan has been established for this project in accordance with the requirements of Town of Ossining Code Chapter 168 Stormwater Management. This plan will effectively control stormwater generated by this project during and after construction. The management of the stormwater is based on controlling increases in peak runoff as well as water quality. The design of the water quality component not only will treat runoff due to the project, but also that which is currently not treated. Overall it would improve even the existing conditions.

The effectiveness of the stormwater practices selected in design will be insured by implementing a maintenance plan. The maintenance plan details specific activities, safeguards

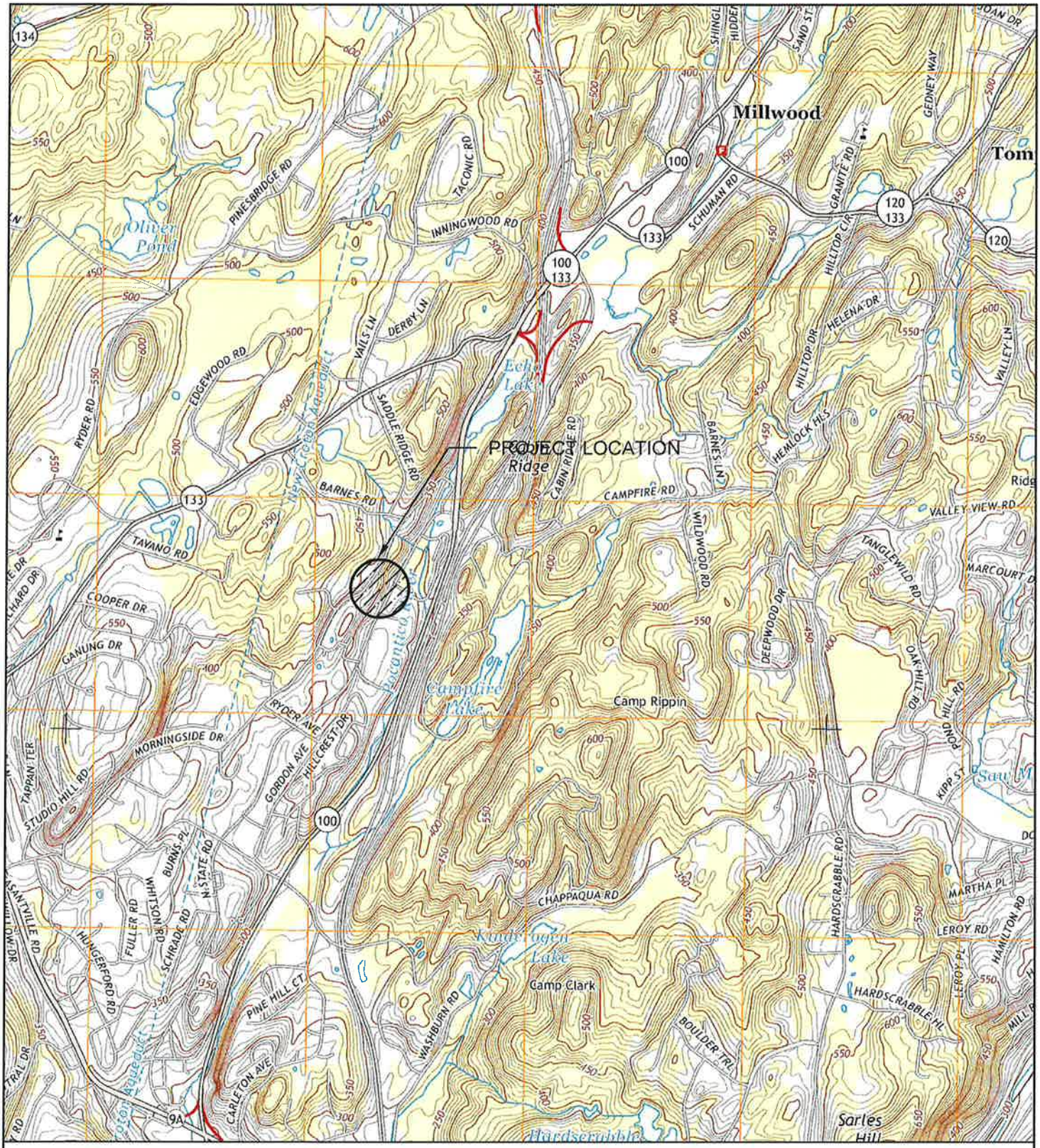
and provisions to be monitored and performed by specified frequencies. By adhering to the maintenance plan, optimum performance of the stormwater practices can be expected.

In conclusion, the Stormwater Management System will not create negative downstream impacts as a result of this project.

May 25, 2018

Joseph C. Riina, P.E.
NYS License No. 64431

Figures



NOTE:

1. Map Source: USGS 7.5 Minute Series Topographis Quadrangle Map(1:2,000 scale) for Mohegan Lake, Westchester County, New York

FIG. 1.1 LOCATION MAP

ARMSTRONG PLUMBING LLC

Town Of Ossining — Westchester County, NY

Site Design Consultants

Civil Engineers • Land Planners

251 F Underhill Avenue Yorktown Heights, NY 10598
(914) 962-4488 - Fax (914) 962-7386
www.sitedesignconsultants.com

NOT TO SCALE
DATE:3/21/18

NOTE:
1. Map Source: Google Maps Image

FIG. 1.2 VICINITY MAP

ARMSTRONG PLUMBING LLC

Town Of Ossining — Westchester County, NY

Site Design Consultants

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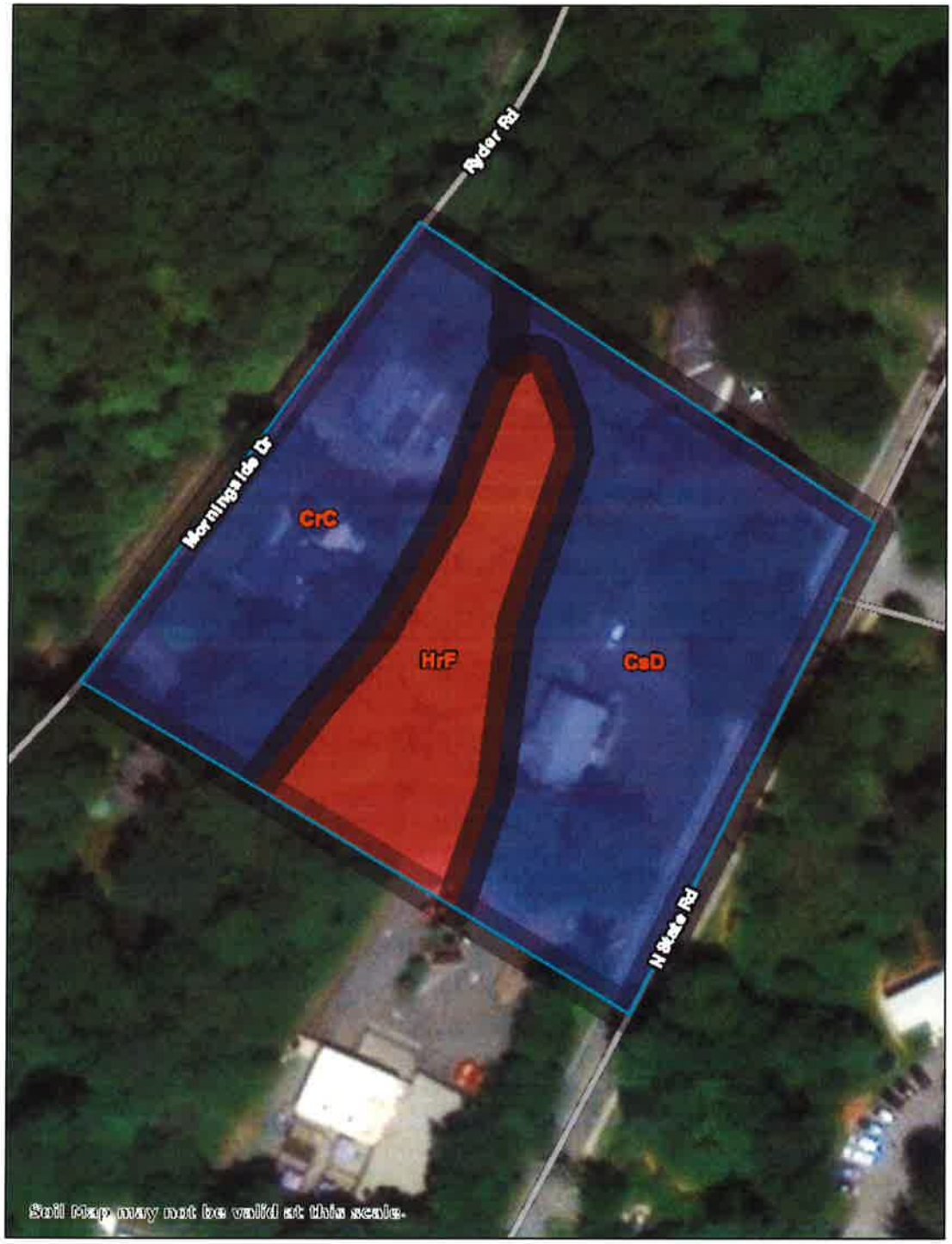

NOTE:

1. Map Source: USDA National Resources Conservation Service, National Cooperative Soil Survey, Web Soil Survey Map.

FIG. 4.1.1 SOIL MAP

ARMSTRONG PLUMBING LLC

Town Of Ossining Westchester County, NY

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MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

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

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

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

Soil Survey Area: Westchester County, New York
Survey Area Data: Version 13, Oct 8, 2017

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

Date(s) aerial images were photographed: Dec 31, 2009—Oct 5, 2016

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

NOTE:
1. Map Source: USDA National Resources Conservation Service, National Cooperative Soil Survey, Web Soil Survey Map

FIG. 4.1.2 SOIL MAP

ARMSTRONG PLUMBING LLC

Town Of Ossining
Westchester County, NY

Site Design Consultants
Civil Engineers • Land Planners
251 F Underhill Avenue Yorktown Heights, NY 10598
(914) 962-4488 - Fax (914) 962-7386
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Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CrC	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	B	0.8	31.9%
CsD	Chatfield-Charlton complex, 15 to 35 percent slopes, very rocky	B	1.1	46.4%
HrF	Hollis-Rock outcrop complex, 35 to 60 percent slopes	D	0.5	21.7%
Totals for Area of Interest			2.4	100.0%

NOTE:

1. Map Source: USDA National Resources Conservation Service, National Cooperative Soil Survey, Web Soil Survey Map

FIG. 4.1.3 SOIL MAP

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Town Of Ossining — Westchester County, NY

Site Design Consultants

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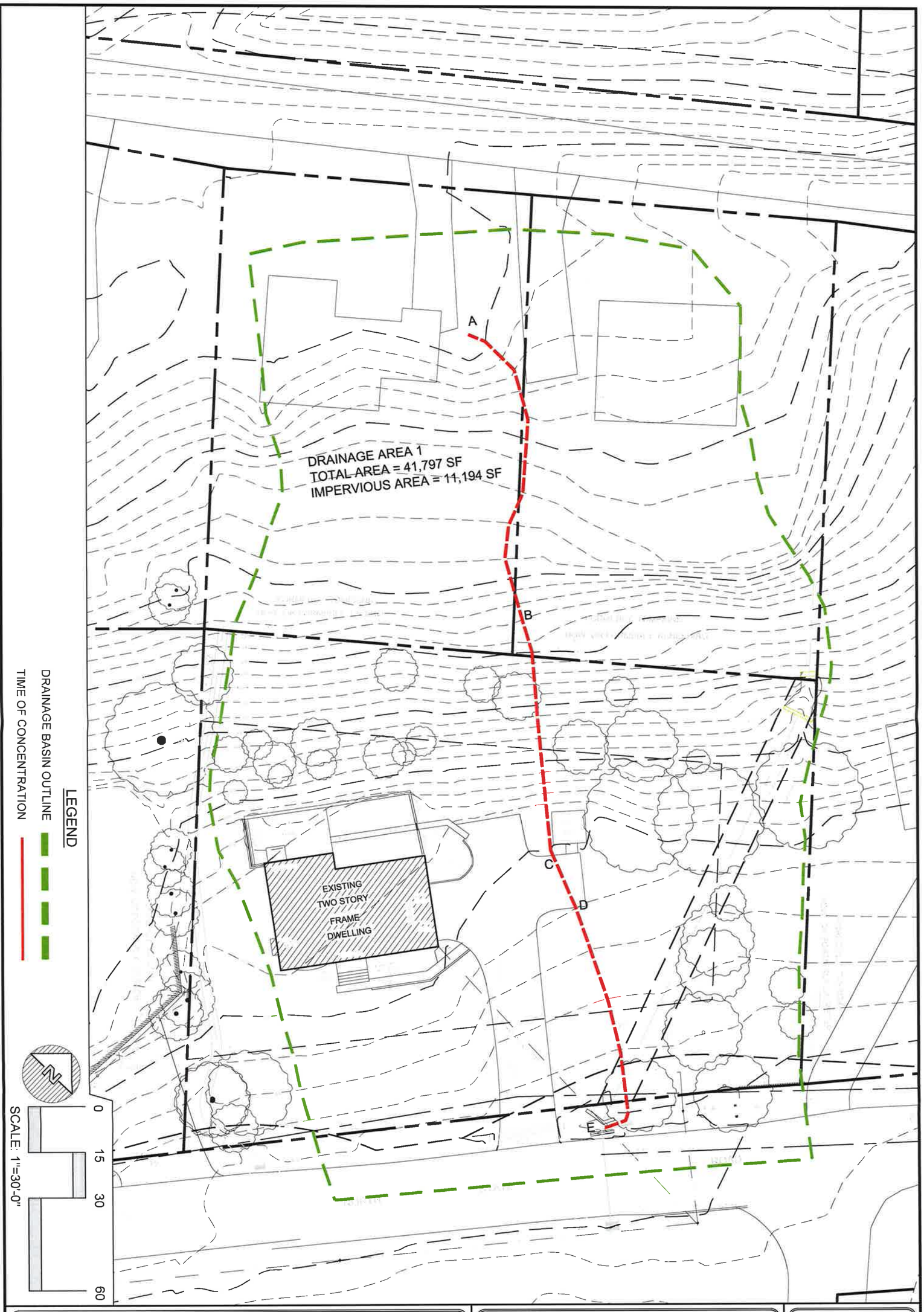

NOTE: UNAUTHORIZED ALTERATIONS OR ADDITIONS TO THIS DRAWING IS A VIOLATION OF SECTION 7209 (2) OF THE NEW YORK STATE EDUCATION LAW.

FIG. 5.1 PRE DEVELOPED WATERSHED

PREPARED FOR

ARMSTRONG PLUMBING LLC

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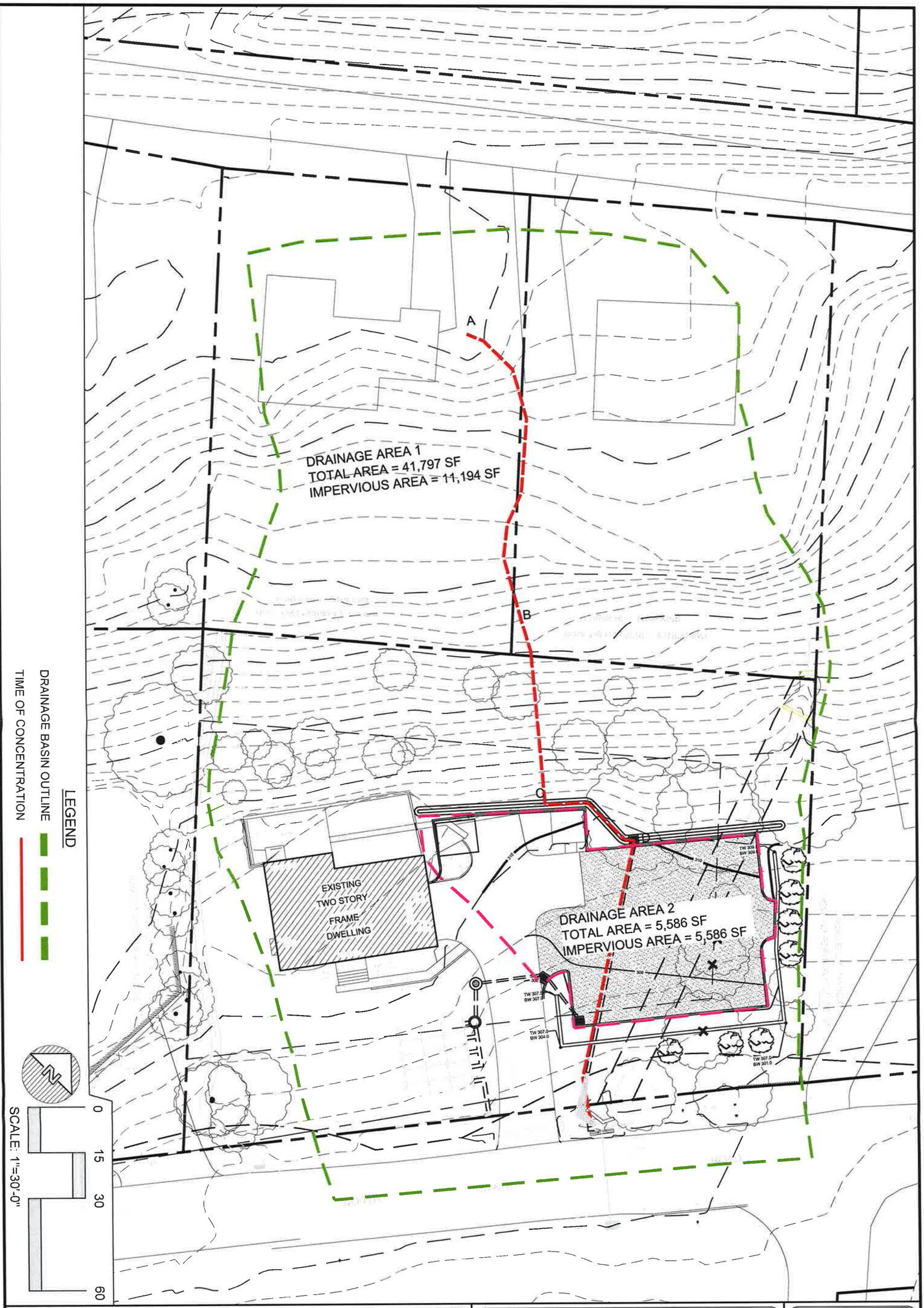

FIG. 5.2 POST DEVELOPED WATERSHED

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251 F Underhill Avenue Yorktown Heights, NY 10598
(914) 962-4488 - Fax (914) 962-7386
www.sitedesignconsultants.com

DATE: 2/13/15

Table 5.3 Soil Restoration Requirements			
Type of Soil Disturbance	**Soil Restoration Requirement**		**Comments/Examples**
No soil disturbance	Restoration not permitted		Preservation of Natural Features
Minimal soil disturbance	Restoration not required		Clearing and grubbing
Areas where topsoil is stripped only - no change in grade	HSG A &B	HSG C&D	Protect area from any ongoing construction activities.
	apply 6 inches of topsoil	Aerate* and apply 6 inches of topsoil	
Areas of cut or fill	HSG A &B	HSG C & D	
	Aerate and apply 6 inches of topsoil	Apply full Soil Restoration **	
Heavy traffic areas on site (especially in a zone 5-25 feet around buildings but not within a 5 foot perimeter around foundation walls)	Apply full Soil Restoration (de-compaction and compost enhancement)		
Areas where Runoff Reduction and/or Infiltration practices are applied	Restoration not required, but may be applied to enhance the reduction specified for appropriate practices.		Keep construction equipment from crossing these areas. To protect newly installed practice from any ongoing construction activities construct a single phase operation fence area
Redevelopment projects	Soil Restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area.		

*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".

FIG. 8.1 SOIL RESTORATION REQUIREMENTS

ARMSTRONG PLUMBING LLC

Town Of Ossining Westchester County, NY

Site Design Consultants
Civil Engineers • Land Planners
251 F Underhill Avenue Yorktown Heights, NY 10598
(914) 962-4488 - Fax (914) 962-7386
www.sitedesignconsultants.com

NOT TO SCALE
DATE:3/21/18

Appendix A

List of Approvals and Applications:

Town of Ossining Building Permit – approvals pending

Town of Ossining Planning Board – approval pending

Appendix B

Town of Ossining Code Chapter 168 Stormwater Management

Chapter 168. Stormwater Management and Erosion and Sediment Control

[HISTORY: Adopted by the Town Board of the Town of Ossining 7-11-2006 by L.L. No. 5-2006. Amendments noted where applicable.]

GENERAL REFERENCES

Building construction — See Ch. **63**.
Environmental quality review — See Ch. **85**.
Excavations — See Ch. **87**.
Filling and grading — See Ch. **92**.
Flood damage prevention — See Ch. **102**.
Freshwater wetlands, watercourses and water body protection — See Ch. **105**.
Sewers — See Ch. **160**.
Steep slope protection — See Ch. **167**.
Streams and watercourses — See Ch. **169**.
Subdivision of land — See Ch. **176**.
Zoning — See Ch. **200**.

Article I. General Provisions

§ 168-1. Title.

This chapter shall be known and cited as the "Stormwater Management and Erosion and Sediment Control Law of the Town of Ossining."

§ 168-2. Definitions.

A. Unless specifically defined below, words and phrases used in this chapter shall be interpreted to have common English usage, to give effect to the purpose set forth in § **168-3** and to provide reasonable application of this chapter.

B. As used in this chapter, the following terms shall have the meanings indicated:

AGRICULTURAL ACTIVITY
The activity of an active farm, including grazing and watering livestock, irrigating crops, harvesting crops, using land for growing agricultural products, and cutting timber for sale, but shall not include the operation of a dude ranch or similar operation or the construction of new structures associated with agricultural activities.

APPLICANT
A property owner or agent of a property owner who has filed an application for a land development activity.

BUILDING
Any structure, either temporary or permanent, having walls and a roof, designed for the shelter of any person, animal, or property, and occupying more than 100 square feet of area.

CHANNEL
A natural or artificial watercourse with a definite bed and banks that conducts continuously or periodically flowing water.

CLEARING
Any activity that removes the vegetative surface cover.

DEDICATION
The deliberate appropriation of property by its owner for general public use.

DEPARTMENT

The New York State Department of Environmental Conservation.

DESIGN MANUAL

The New York State Stormwater Management Design Manual, most recent version, including applicable updates, that serves as the official guide for stormwater management principles, methods and practices.

DEVELOPER

A person who undertakes land development activities.

EROSION CONTROL MANUAL

The most recent version of the New York Standards and Specifications for Erosion and Sediment Control manual, commonly known as the "Blue Book."

FACILITY OWNER

A person who owns stormwater control facilities as defined herein.

GRADING

Excavation or fill of material, including the resulting conditions thereof.

IMPERVIOUS COVER

Those surfaces, improvements and structures that cannot effectively infiltrate rainfall, snowmelt and water (e.g., building rooftops, pavement, sidewalks, driveways, etc.).

INDUSTRIAL STORMWATER PERMIT

A State Pollutant Discharge Elimination System permit issued to a commercial industry or group of industries which regulates the pollutant levels associated with industrial stormwater discharges or specifies on-site pollution control strategies.

INFILTRATION

The process of percolating stormwater into the subsoil.

LAND DEVELOPMENT ACTIVITY

Construction activity, including clearing, grading, excavating, soil disturbance or placement of fill, that results in land disturbance of equal to or greater than one acre, or activities disturbing less than one acre of total land area that is part of a larger common plan of development or sale, even though multiple separate and distinct land development activities may take place at different times on different schedules.

LANDOWNER

The legal or beneficial owner of land, including those holding the right to purchase or lease the land, or any other person holding proprietary rights in the land.

MAINTENANCE AGREEMENT

A legally recorded document which acts as a property deed restriction and which provides for long-term maintenance of stormwater management practices.

NONPOINT SOURCE POLLUTION

Pollution from any source other than from any discernible, confined, and discrete conveyances and shall include, but not be limited to, pollutants from agricultural, silvicultural, mining, construction, subsurface disposal and urban runoff sources.

PERSON

Any person, firm, partnership, association, corporation, company, organization or other legal entity of any kind, including public agencies and municipal corporations.

PHASING

Clearing a parcel of land in distinct pieces or parts, with the stabilization of each piece completed before the clearing of the next.

POLLUTANT OF CONCERN

Sediment or a water quality measurement that addresses sediment (such as total suspended solids, turbidity or siltation) and any other pollutant that has been identified as a cause of impairment of any water body that will receive a discharge from the land development activity.

PROJECT

Land development activity.

RECHARGE

The replenishment of underground water reserves.

SEDIMENT CONTROL

Measures that prevent eroded sediment from leaving the site.

SILVICULTURAL

Of or relating to the management and care of forests.

SPDES GENERAL PERMIT FOR CONSTRUCTION ACTIVITIES GP-02-01

A permit under the New York State Pollutant Discharge Elimination System (SPDES) issued to developers of construction activities to regulate disturbance of one or more acres of land.

SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES FROM MUNICIPAL SEPARATE STORMWATER SEWER SYSTEMS GP-02-02

A permit under the New York State Pollutant Discharge Elimination System (SPDES) issued to municipalities to regulate discharges from municipal separate storm sewers for compliance with EPA-established water quality standards and/or to specify stormwater control standards.

STABILIZATION

The use of practices that prevent exposed soil from eroding.

STOP-WORK ORDER

An order issued by the duly authorized municipal authority which requires that all land development activity and other construction activity on a site be stopped.

STORMWATER

Rainwater, surface runoff, snowmelt and drainage.

STORMWATER HOTSPOT

A land use or activity that generates higher concentrations of hydrocarbons, trace metals or toxicants than are found in typical stormwater runoff, based on monitoring studies.

STORMWATER MANAGEMENT

The use of structural or nonstructural practices that are designed to reduce stormwater runoff and mitigate its adverse impacts on property, natural resources and the environment.

STORMWATER MANAGEMENT FACILITY

One or a series of stormwater management practices installed, stabilized and operating for the purpose of controlling stormwater runoff.

STORMWATER MANAGEMENT OFFICER

An employee, officer or duly authorized representative designated by the municipality to accept and review stormwater pollution prevention plans, forward the plans to the applicable municipal board and inspect stormwater management practices upon implementation.

STORMWATER MANAGEMENT PRACTICES (SMPs)

Measures, either structural or nonstructural, that are determined to be the most effective, practical means of preventing flood damage and preventing or reducing point source or nonpoint source pollution inputs to stormwater runoff and water bodies.

STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A plan for controlling stormwater runoff and pollutants from a site during and after construction activities.

STORMWATER RUNOFF

Flow on the surface of the ground, resulting from precipitation.

SURFACE WATERS OF THE STATE OF NEW YORK

Lakes, bays, sounds, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic Ocean within the territorial seas of the State of New York and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface or underground waters), which are wholly or partially within or bordering the state or within its jurisdiction. Storm sewers and waste treatment systems, including treatment ponds or lagoons that also meet the criteria of this definition, are not waters of the state. This exclusion applies only to man-made bodies of water that neither were originally created in waters of the state (such as a disposal area in wetlands) nor resulted from impoundment of waters of the state.

WATERCOURSE

A permanent or intermittent stream or other body of water, either natural or man-made, which gathers or carries surface water.

WATERWAY

A channel that directs surface runoff to a watercourse or to the public storm drain.

WETLAND

An area as defined in § **105-2B** of this Code.

§ 168-3. Findings of fact.

It is hereby determined that:

A. Land development activities and associated increases in site impervious cover often alter the hydrologic response of local watersheds and increase stormwater runoff rates and volumes, flooding, stream channel erosion, or sediment transport and deposition.

B. This stormwater runoff contributes to increased quantities of water-borne pollutants, including siltation of aquatic habitat for fish and other desirable species.

C. Clearing, grading, excavating, soil disturbance or placement of fill during construction tends to increase soil erosion and add to the loss of native vegetation necessary for terrestrial and aquatic habitat.

D. Improper design, maintenance and construction of stormwater management practices can increase the velocity of stormwater runoff, thereby increasing streambank erosion and sedimentation.

E. Impervious surfaces allow less water to percolate into the soil, thereby decreasing groundwater recharge and stream baseflow.

F. Substantial economic losses can result from these adverse impacts on the waters of the municipality.

G. Stormwater runoff, soil erosion and nonpoint source pollution can be controlled and minimized through the regulation of stormwater runoff from land development activities.

H. The regulation of stormwater runoff discharges from land development activities in order to control and minimize increases in stormwater runoff rates and volumes, soil erosion, stream channel erosion, and nonpoint source pollution associated with stormwater runoff is in the public interest and will minimize threats to public health and safety.

I. Regulation of land development activities by means of performance standards governing stormwater management and site design will produce development compatible with the natural functions of a particular site or an entire watershed and thereby mitigate the adverse effects of erosion and sedimentation from development.

§ 168-4. Purpose.

The purpose of this chapter is to establish minimum stormwater management requirements and controls to protect and safeguard the general health, safety, and welfare of the public residing within this jurisdiction and to address the findings of fact in § **168-3** hereof. This chapter seeks to meet this purpose by achieving the following objectives:

A. Meet the requirements of minimum measures 4 and 5 of the SPDES general permit for stormwater discharges from municipal separate stormwater sewer systems (MS4 SPDES No. NYR20A370), Permit No. GP-02-02, or as amended or revised.

B. Require land development activities to conform to the substantive requirements of the NYS Department of Environmental Conservation State Pollutant Discharge Elimination System (SPDES) general permit for construction activities GP-02-01, or as amended or revised.

C. Minimize increases in the rate of stormwater runoff from land development activities in order to reduce flooding, siltation, increases in stream temperature, and streambank erosion and maintain the integrity of stream channels.

D. Minimize increases in pollution caused by stormwater runoff from land development activities which would otherwise degrade local water quality.

E. Minimize the total annual volume of stormwater runoff that flows from any specific site during and following development to the maximum extent practicable.

F. Reduce stormwater runoff rates and volumes, soil erosion and nonpoint source pollution, wherever possible, through stormwater management practices, and ensure that these management practices are properly maintained and eliminate threats to public safety.

§ 168-5. Statutory authority.

In accordance with Article 10 of the Municipal Home Rule Law of the State of New York, the Town Board has the authority to enact local laws and amend local laws for the purpose of promoting the health, safety or general welfare of the Town and for the protection and enhancement of its physical environment. The Town Board may include in any such local law provisions for the appointment of any municipal officer, employees, or independent contractor to effectuate, administer and enforce such chapter.

§ 168-6. Applicability; Stormwater Management Officer; review of land development activities.

A. This chapter shall be applicable to all land development activities as defined in § **168-2** of this chapter.

B. The municipality shall designate a Stormwater Management Officer, who shall accept and review all stormwater pollution prevention plans and forward such plans to the applicable municipal board. The Stormwater Management Officer may:

   (1) Review the plans;

   (2) Upon approval by the Town Board, engage the services of a registered professional engineer to review the plans, specifications and related documents at a cost not to exceed a fee schedule established by said governing board; or

   (3) Accept the certification of a licensed professional that the plans conform to the requirements of this chapter.

C. All land development activities subject to review and approval by the Planning Board shall be reviewed subject to the standards contained in this chapter.

D. All land development activities not subject to review as stated in § **168-6C** shall be required to submit a stormwater pollution prevention plan (SWPPP) to the Stormwater Management Officer, who shall approve the SWPPP if it complies with the requirements of this chapter.

§ 168-7. Exemptions.

The following activities may be exempt from review under this chapter:

A. Agricultural activity as defined in this chapter.

B. Silvicultural activity, except that landing areas and log haul roads are subject to this chapter.

C. Routine maintenance activities that disturb less than five acres and are performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility.

D. Repairs to any stormwater management practice or facility deemed necessary by the Stormwater Management Officer.

E. Any part of a subdivision if a plat for the subdivision has been approved by the Town on or before the effective date of this chapter.

F. Land development activities for which a building permit has been approved on or before the effective date of this chapter.

G. Cemetery graves.

H. Installation of fence, sign, telephone, and electric poles and other kinds of posts or poles.

I. Emergency activity immediately necessary to protect life, property or natural resources.

J. Activities of an individual engaging in home gardening by growing flowers, vegetables and other plants primarily for use by that person and his or her family.

K. Landscaping and horticultural activities in connection with an existing noncommercial structure.

Article II. Principles and General Requirements

§ 168-8. Stormwater pollution prevention plans.

A. Stormwater pollution prevention plan requirement. No application for approval of a land development activity shall be reviewed until the appropriate board has received a stormwater pollution prevention plan (SWPPP) prepared in accordance with the specifications in this chapter.

B. Contents of stormwater pollution prevention plans.

(1) All SWPPPs shall provide the following background information and erosion and sediment controls:

(a) Background information about the scope of the project, including location, type and size of the project.

(b) A site map/construction drawing(s) for the project, including a general location map. At a minimum, the site map shall show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s); wetlands and drainage patterns that could be affected by the construction activity; existing and final slopes; locations of off-site material, waste, borrow or equipment storage areas; and location(s) of the stormwater discharges(s). The site map shall be at a scale no smaller than one inch equals 50 feet (e.g., one inch equals 500 feet is smaller than one inch equals 100 feet).

(c) A description of the soil(s) present at the site.

(d) A construction phasing plan describing the intended sequence of construction activities, including clearing and grubbing, excavation and grading, utility and infrastructure installation and any other activity at the site that results in soil disturbance. Consistent with the New York Standards and Specifications for Erosion and Sediment Control (Erosion Control Manual), not more than five acres shall be disturbed at any one time unless pursuant to an approved SWPPP. The Town may opt to reduce the amount of land that may be exposed at any one time.

(e) A description of the pollution prevention measures that will be used to control construction materials, chemicals and debris from becoming a pollutant source in stormwater runoff.

(f) A description of construction and waste materials expected to be stored on site, with updates as appropriate, and a description of controls to reduce pollutants from these materials, including storage practices to minimize exposure of the materials, to stormwater, and spill prevention and response.

(g) Temporary and permanent structural and vegetative measures to be used for soil stabilization, runoff control and sediment control for each stage of the project, from initial land clearing and grubbing to project closeout.

(h) A site map/construction drawing(s) specifying the location(s), size(s) and length(s) of each erosion and sediment control practice.

(i) Dimensions, material specifications and installation details for all erosion and sediment control practices, including the siting and sizing of any temporary sediment basins.

(j) Temporary practices that will be converted to permanent control measures.

(k) An implementation schedule for staging temporary erosion and sediment control practices, including the timing of initial placement and duration that each practice will remain in place until the site is stabilized.

(l) A maintenance schedule to ensure continuous and effective operation of the erosion and sediment control practice.

(m) The name(s) of the receiving water(s) and NYSDEC classification(s), if applicable.

(n) A delineation of SWPPP implementation responsibilities for each part of the site.

(o) A description of structural practices designed to divert flows from exposed soils, store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site to the degree attainable.

(p) Any existing data that describes the stormwater runoff at the site.

(2) Land development activities as defined in § **168-2** of this chapter and meeting Conditions A, B or C below shall also include water quantity and water quality controls (postconstruction stormwater runoff controls) as set forth in § **168-8B(3)** below as applicable:

(a) Condition A: Stormwater runoff from land development activities discharging a pollutant of concern to either an impaired water identified on the Department's 303(d) list of impaired waters or a total-maximum-daily-load (TMDL)-designated watershed for which pollutants in stormwater have been identified as a source of the impairment.

(b) Condition B: Stormwater runoff from land development activities disturbing five or more acres.

(c) Condition C: Stormwater runoff from land development activity disturbing between one and five acres of land during the course of the project, exclusive of the construction of one single-family residence and construction activities at agricultural properties.

(3) SWPPP requirements for Conditions A, B and C:

(a) All information in § **168-8B(1)** of this chapter.

(b) A description of each postconstruction stormwater management practice.

(c) A site map/construction drawing(s) showing the specific location(s) and size(s) of each postconstruction stormwater management practice.

(d) A hydrologic and hydraulic analysis for all structural components of the stormwater management system for the applicable design storms.

(e) A comparison of postdevelopment stormwater runoff conditions with predevelopment conditions.

(f) Dimensions, material specifications and installation details for each postconstruction stormwater management practice.

(g) A maintenance schedule to ensure continuous and effective operation of each postconstruction stormwater management practice.

(h) Maintenance easements to ensure access to all stormwater management practices at the site for the purpose of inspection and repair. Easements shall be recorded on the plan and shall remain in effect with transfer of title to the property.

(i) An inspection and maintenance agreement binding on all subsequent landowners served by the on-site stormwater management measures in accordance with § **168-10** of this chapter.

(4) Plan certification. The SWPPP shall be prepared by a landscape architect, certified professional or professional engineer and must be signed by the professional preparing the plan, who shall certify that the design of all stormwater management practices meets the requirements in this chapter.

(5) Other environmental permits. The applicant shall assure that all other applicable environmental permits have been or will be acquired for the land development activity prior to approval of the final stormwater design plan.

(6) Contractor certification.

(a) Each contractor and subcontractor identified in the SWPPP and/or any successor or substitute contractor or subcontractor who will be involved in soil disturbance and/or stormwater management practice installation shall sign and date a copy of the following certification statement before undertaking any land development activity: "I certify under penalty of law that I understand and agree to comply with the terms and conditions of the stormwater pollution prevention plan. I also understand that it is unlawful for any person to cause or contribute to a violation of water quality standards." Copies of these statements shall be delivered to the duly authorized municipal authority.

(b) The certification must include the name and title of the person providing the signature, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification is made. The certification statement(s) shall become part of the SWPPP for the land development activity.

(7) A copy of the SWPPP shall be retained at the site of the land development activity during construction from the date of initiation of construction activities to the date of final stabilization.

§ 168-9. Performance and design criteria.

All land development activities shall be subject to the following performance and design criteria:

A. Official guides. For the purpose of this chapter, the following documents shall serve as the official guides and specifications for stormwater management; stormwater management practices that are designed and constructed in accordance with these technical documents shall be presumed to meet the standards imposed by this chapter:

(1) The New York State Stormwater Management Design Manual (New York State Department of Environmental Conservation, most current version or its successor, hereafter referred to as the Design Manual). See Schedule A of this chapter for stormwater management practices acceptable for water quality.[1]

[1] *Editor's Note: A copy of Schedule A is available in the Supervisor's office.*

(2) New York Standards and Specifications for Erosion and Sediment Control (Empire State Chapter of the Soil and Water Conservation Society, 2004, most current version or its successor, hereafter referred to as the Erosion Control Manual). A copy of the manual is on file in the office of the Stormwater Management Officer.

B. Technical standards. All development proposals disturbing less than one acre of land are subject to the same requirements specified in the manuals in Subsections **A(1)** and **(2)** above for land development activities disturbing between one and five acres of land. Such requirements shall include but not be limited to the following:

(1) Grading, erosion control practices, sediment control practices, and waterway crossings shall meet the design criteria set forth in the most recent version of the Erosion Control Manual.

(2) Clearing, except that necessary to establish sediment control devices, shall not begin until all erosion and sediment control devices have been installed and have been stabilized.

(3) Erosion control requirements shall include stabilization measures applied as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased. This requirement does not apply in the following instances:

(a) Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently ceased is precluded by snow cover or frozen ground conditions, stabilization measures shall be initiated as soon as practicable.

(b) Where construction activity on a portion of the site is temporarily ceased and earth-disturbing activities will be resumed within 21 days, temporary stabilization measures need not be initiated on that portion of the site.

(4) If seeding or other vegetative erosion control method does not germinate within two weeks, the Stormwater Management Officer may require the site to be reseeded or a nonvegetative option employed.

(5) Special techniques that meet the design criteria outlined in the Erosion Control Manual for steep slopes and/or drainageways shall be used. Soil stockpiles must be stabilized. At the close of the construction season, the entire site must

be stabilized using a heavy mulch layer or another method that does not require seed germination to control erosion (if seed germination will not occur due to climate limitations).

(6) Techniques shall be employed to prevent the blowing of dust or sediment from the site.

(7) Techniques that divert upland runoff past disturbed slopes shall be employed. Sediment control requirements shall include settling basins, sediment traps or tanks, and perimeter controls.

(8) Settling basins that are designed for adaptation to long-term stormwater management require approval by the Stormwater Management Officer.

(9) If a wet watercourse will be crossed regularly during construction, a temporary stream crossing practice approved by the Stormwater Management Officer will be installed. Stabilization of the watercourse channel and banks before, during and after any in-channel work will be completed.

(10) Stabilization adequate to prevent erosion located at the outlets of all pipes, paved channels and on-site stormwater conveyance channels shall be designed according to the criteria outlined in the Erosion Control Manual.

(11) Construction site access requirements shall include a temporary access road provided at all access points to ensure that sediment is not tracked onto public streets by construction vehicles or washed into storm drains or watercourses.

C. Water quality standards. Any land development activity shall not cause an increase in turbidity that will result in substantial visible contrast to natural conditions in surface waters of the State of New York.

§ 168-10. Maintenance and repair of stormwater facilities.

A. Maintenance during construction.

(1) The applicant or developer of the land development activity shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the applicant or developer to achieve compliance with the conditions of this chapter. Sediment shall be removed from sediment traps or sediment ponds whenever their design capacity has been reduced by 50%.

(2) The applicant or developer or his or her representative shall be on site at all times when construction or grading activity takes place and shall inspect and document the effectiveness of all erosion and sediment control practices. Inspection reports shall be completed every seven days and within 24 hours of any storm event producing 0.5 inches of precipitation or more. The reports shall be delivered to the Stormwater Management Officer and also copied to the site log book.

B. Maintenance easement(s). Prior to the issuance of any approval that has a stormwater management facility as one of the requirements, the applicant or developer must execute a maintenance easement agreement that shall be binding on all subsequent landowners served by the stormwater management facility. The easement shall provide for access to the facility at reasonable times for periodic inspection by the Town to ensure that the facility is maintained in proper working condition to meet design standards and any other provisions established by this chapter. The easement shall be recorded by the grantor in the office of the County Clerk after approval by the Counsel for the Town.

C. Maintenance after construction. The owner or operator of permanent stormwater management practices installed in accordance with this chapter shall operate and maintain the stormwater management practices to achieve the goals of this chapter. Proper operation and maintenance also includes, as a minimum, the following:

(1) A preventive/corrective maintenance program for all critical facilities and systems of treatment and control (or related appurtenances) that are installed or used by the owner or operator to achieve the goals of this chapter.

(2) Written procedures for operation and maintenance and training new maintenance personnel.

(3) Discharges from the SMPs shall not exceed design criteria or cause or contribute to water quality standard violations in accordance with **§ 168-9C**.

D. Maintenance agreements. The Town shall approve a formal maintenance agreement for stormwater management facilities binding on all subsequent landowners and recorded in the office of the County Clerk as a deed restriction on the property prior to final plan approval. The maintenance agreement shall be consistent with the terms and conditions of Schedule B of this chapter entitled "Sample Stormwater Control Facility Maintenance Agreement."[1] The Town, in lieu of a maintenance

agreement, at its sole discretion, may accept dedication of any existing or future stormwater management facility, provided that such facility meets all the requirements of this chapter and includes adequate and perpetual access and sufficient area, by easement or otherwise, for inspection and regular maintenance.

[1] *Editor's Note: A copy of Schedule B is available in the Supervisor's office.*

Article III. Administration and Enforcement

§ 168-11. Construction inspection.

A. Stormwater management practice inspections. The Town Stormwater Management Officer is responsible for conducting inspections of stormwater management practices (SMPs). All applicants are required to submit as built plans for any stormwater management practices located on site after final construction is completed. The plan must show the final design specifications for all stormwater management facilities and must be certified by a professional engineer.

B. Inspection of stormwater facilities after project completion. Inspection programs shall be established on any reasonable basis, including but not limited to routine inspections; random inspections; inspections based upon complaints or other notice of possible violations; inspection of drainage basins or areas identified as higher-than-typical sources of sediment or other contaminants or pollutants; inspections of businesses or industries of a type associated with higher-than-usual discharges of contaminants or pollutants or with discharges of a type that are more likely than the typical discharge to cause violations of state or federal water or sediment quality standards or the SPDES stormwater permit; and joint inspections with other agencies inspecting under environmental or safety laws. Inspections may include, but are not limited to, reviewing maintenance and repair records; sampling discharges, surface water, groundwater, and material or water in drainage control facilities; and evaluating the condition of drainage control facilities and other stormwater management practices.

C. Submission of reports. The Town of Ossining Stormwater Management Officer may require monitoring and reporting from entities subject to this chapter as are necessary to determine compliance with this chapter.

D. Right of entry for inspection. When any new stormwater management facility is installed on private property or when any new connection is made between private property and the public stormwater system, the landowner shall grant to the Town the right to enter the property at reasonable times and in a reasonable manner for the purpose of inspection as specified in **§ 168-11B**.

§ 168-12. Performance guarantee.

A. Construction completion guarantee. In order to ensure the full and faithful completion of all land development activities related to compliance with all conditions set forth by the Town in its approval of the stormwater pollution prevention plan, the Town may require the applicant or developer to provide, prior to construction, a performance bond, cash escrow, or irrevocable letter of credit from an appropriate financial or surety institution which guarantees satisfactory completion of the project and names the Town as the beneficiary. The security shall be in an amount to be determined by the Town based on submission of final design plans, with reference to actual construction and landscaping costs. The performance guarantee shall remain in force until the surety is released from liability by the Town, provided that such period shall not be less than one year from the date of final acceptance or such other certification that the facility(ies) have been constructed in accordance with the approved plans and specifications and that a one-year inspection has been conducted and the facilities have been found to be acceptable to the Town. Per annum interest on cash escrow deposits shall be reinvested in the account until the surety is released from liability.

B. Maintenance guarantee. Where stormwater management and erosion and sediment control facilities are to be operated and maintained by the developer or by a corporation that owns or manages a commercial or industrial facility, the developer, prior to construction, may be required to provide the Town with an irrevocable letter of credit from an approved financial institution or surety to ensure proper operation and maintenance of all stormwater management and erosion control facilities both during and after construction and until the facilities are removed from operation. If the developer or landowner fails to properly operate and maintain stormwater management and erosion and sediment control facilities, the Town may draw upon the account to cover the costs of proper operation and maintenance, including engineering and inspection costs.

C. Recordkeeping. Entities subject to this chapter shall maintain records demonstrating compliance with this chapter.

§ 168-13. Enforcement; penalties for offenses.

A. Notice of violation. When the Town determines that a land development activity is not being carried out in accordance with the requirements of this chapter, it may issue a written notice of violation to the landowner. The notice of violation shall contain:

(1) The name and address of the landowner, developer or applicant;

(2) The address, when available, or a description of the building, structure or land upon which the violation is occurring;

(3) A statement specifying the nature of the violation;

(4) A description of the remedial measures necessary to bring the land development activity into compliance with this chapter and a time schedule for the completion of such remedial action;

(5) A statement of the penalty or penalties that shall or may be assessed against the person to whom the notice of violation is directed;

(6) A statement that the determination of violation may be appealed to the municipality by filing a written notice of appeal within 15 days of service of notice of violation.

B. Stop-work orders. The Town may issue a stop-work order for violations of this law. Persons receiving a stop-work order shall be required to halt all land development activities and other construction activities on the site, except those activities that address the violations leading to the stop-work order. The stop-work order shall be in effect until the Town confirms that the land development activity is in compliance and the violation has been satisfactorily addressed. Failure to address a stop-work order in a timely manner may result in civil, criminal, or monetary penalties in accordance with the enforcement measures authorized in this chapter.

C. Injunction. Any land development activity that is commenced or is conducted contrary to this chapter may be restrained by injunction or otherwise abated in a manner provided by this chapter.

D. Penalties for offenses. Any person who violates the provisions of this chapter shall be guilty of a violation punishable by a fine not less than $500 nor more than $1,000 or imprisonment for a period not to exceed six months, or both, for conviction of a first offense; for conviction of a second offense, both of which were committed within a period of five years, punishable by a fine not less than $1,000 nor more than $1,500 or imprisonment for a period not to exceed six months, or both; and upon conviction for a third or subsequent offense, all of which were committed within a period of five years, punishable by a fine not less than $1,500 nor more than $2,000 or imprisonment for a period not to exceed six months, or both. However, for the purposes of conferring jurisdiction upon courts and judicial officers generally, violations of this chapter shall be deemed misdemeanors, and for such purpose only, all provisions of law relating to misdemeanors shall apply to such violations. Each week's continued violation shall constitute a separate additional violation.

E. Restoration of lands and mitigation of damage. In addition to any penalty provided herein or by law, any person in violation of this chapter may be required to restore land to its undisturbed condition and/or mitigate on-site and off-site damage from stormwater runoff, sediment or pollutants resulting from the violator's activities. In the event that restoration is not undertaken within a reasonable time after notice, the Town may take necessary corrective action, the cost of which shall become a lien upon the property until paid.

F. Withholding of certificate of occupancy. If any building or land development activity is installed or conducted in violation of this chapter, the Stormwater Management Officer may prevent the occupancy of said building or land.

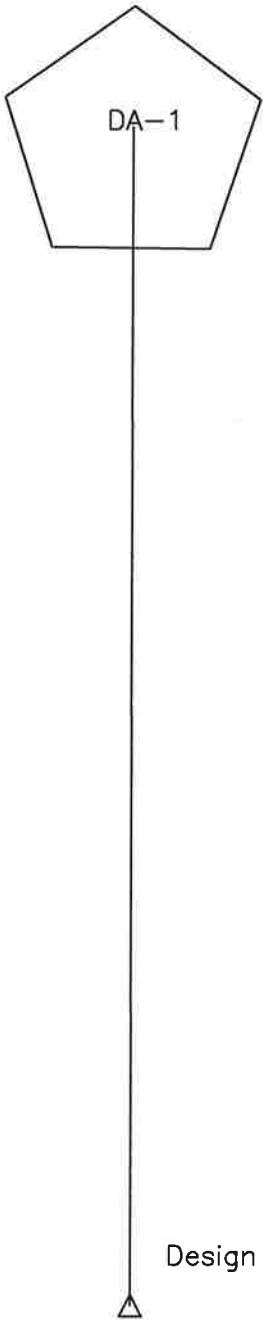
§ 168-14. Fees for services.

Any person undertaking land development activities regulated by this chapter shall pay the cost of services incurred by the Town for the review of SWPPPs, inspections, or SMP maintenance performed by the Town or performed by a third party for the Town. The Town may establish escrow accounts for this purpose prior to authorizing the performance of said services.

Appendix C

Stormwater Runoff Calculations and Stormwater Runoff Management Practices Sizing Calculations

Hydrologic Analysis



NOTE:

1. Source: NYS DEC Stormwater Design Manual - August 2010

PRE DEVELOPED SCHEMATIC

ARMSTRONG PLUMBING LLC

Town Of Ossining Westchester County, NY

Site Design Consultants

Civil Engineers • Land Planners

251 F Underhill Avenue Yorktown Heights, NY 10598
(914) 962-4488 - Fax (914) 962-7386
www.sitedesignconsultants.com

NOT TO SCALE
DATE:3/21/18

Pre Developed

Project Summary	
Title	18-13 Armstrong Plumbing
Engineer	Joseph Riina
Company	Site Design Consultants
Date	5/25/2018

Notes

Table of Contents

Pre Developed

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
DA-1	Pre-Development 1 year	1	0.070	12.100	0.80
DA-1	Pre-Development 2 year	2	0.101	12.100	1.20
DA-1	Pre-Development 10 year	10	0.224	12.100	2.77
DA-1	Pre-Development 25 year	25	0.338	12.100	4.19

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Design Point	Pre-Development 1 year	1	0.070	12.100	0.80
Design Point	Pre-Development 2 year	2	0.101	12.100	1.20
Design Point	Pre-Development 10 year	10	0.224	12.100	2.77
Design Point	Pre-Development 25 year	25	0.338	12.100	4.19

Pre Developed

Subsection: Time-Depth Curve
Label: Westchester County 1-100 2015

Return Event: 1 years
Storm Event: 1 Year

Time-Depth Curve: 1 Year	
Label	1 Year
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	0.7	0.8	0.8
11.500	0.8	0.9	1.0	1.0	1.2
12.000	1.4	1.6	1.8	1.8	1.9
12.500	2.0	2.0	2.0	2.1	2.1
13.000	2.1	2.1	2.1	2.2	2.2
13.500	2.2	2.2	2.2	2.2	2.3
14.000	2.3	2.3	2.3	2.3	2.3
14.500	2.3	2.3	2.4	2.4	2.4
15.000	2.4	2.4	2.4	2.4	2.4
15.500	2.4	2.4	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	2.5	2.5

Pre Developed

Subsection: Time-Depth Curve
Label: Westchester County 1-100 2015

Return Event: 1 years
Storm Event: 1 Year

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)
17.000	2.5	2.6	2.6	2.6	2.6
17.500	2.6	2.6	2.6	2.6	2.6
18.000	2.6	2.6	2.6	2.6	2.6
18.500	2.6	2.6	2.6	2.6	2.6
19.000	2.6	2.6	2.6	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	2.7	2.7	2.7	2.7	2.7
22.000	2.7	2.7	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)

Pre Developed

Subsection: Time-Depth Curve
Label: Westchester County 1-100 2015

Return Event: 10 years
Storm Event: 10 Year

Time-Depth Curve: 10 Year	
Label	10 Year
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	0.0	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	0.2	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	0.5	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	0.7	0.8	0.8	0.8
9.500	0.8	0.9	0.9	0.9	0.9
10.000	0.9	1.0	1.0	1.0	1.1
10.500	1.1	1.1	1.1	1.2	1.2
11.000	1.2	1.3	1.3	1.4	1.4
11.500	1.5	1.6	1.7	1.9	2.1
12.000	2.5	2.9	3.1	3.3	3.4
12.500	3.5	3.6	3.6	3.7	3.7
13.000	3.7	3.8	3.8	3.9	3.9
13.500	3.9	3.9	4.0	4.0	4.0
14.000	4.1	4.1	4.1	4.1	4.1
14.500	4.2	4.2	4.2	4.2	4.3
15.000	4.3	4.3	4.3	4.3	4.3
15.500	4.4	4.4	4.4	4.4	4.4
16.000	4.4	4.4	4.5	4.5	4.5
16.500	4.5	4.5	4.5	4.5	4.5

Pre Developed

Subsection: Time-Depth Curve
Label: Westchester County 1-100 2015

Return Event: 10 years
Storm Event: 10 Year

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)
17.000	4.5	4.6	4.6	4.6	4.6
17.500	4.6	4.6	4.6	4.6	4.6
18.000	4.6	4.6	4.7	4.7	4.7
18.500	4.7	4.7	4.7	4.7	4.7
19.000	4.7	4.7	4.7	4.7	4.7
19.500	4.8	4.8	4.8	4.8	4.8
20.000	4.8	4.8	4.8	4.8	4.8
20.500	4.8	4.8	4.8	4.8	4.8
21.000	4.8	4.9	4.9	4.9	4.9
21.500	4.9	4.9	4.9	4.9	4.9
22.000	4.9	4.9	4.9	4.9	4.9
22.500	4.9	4.9	4.9	4.9	4.9
23.000	5.0	5.0	5.0	5.0	5.0
23.500	5.0	5.0	5.0	5.0	5.0
24.000	5.0	(N/A)	(N/A)	(N/A)	(N/A)

Pre Developed

Subsection: Time-Depth Curve
Label: Westchester County 1-100 2015

Return Event: 2 years
Storm Event: 2 Year

Time-Depth Curve: 2 Year	
Label	2 Year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	2 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	0.1	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	0.1	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	0.2	0.2	0.2
4.500	0.2	0.2	0.2	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	0.3	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.3	0.3	0.4	0.4	0.4
8.000	0.4	0.4	0.4	0.4	0.4
8.500	0.4	0.4	0.4	0.5	0.5
9.000	0.5	0.5	0.5	0.5	0.5
9.500	0.5	0.6	0.6	0.6	0.6
10.000	0.6	0.6	0.7	0.7	0.7
10.500	0.7	0.7	0.8	0.8	0.8
11.000	0.8	0.9	0.9	0.9	0.9
11.500	1.0	1.0	1.1	1.2	1.4
12.000	1.6	1.9	2.1	2.2	2.3
12.500	2.3	2.4	2.4	2.4	2.4
13.000	2.5	2.5	2.5	2.5	2.6
13.500	2.6	2.6	2.6	2.6	2.7
14.000	2.7	2.7	2.7	2.7	2.7
14.500	2.8	2.8	2.8	2.8	2.8
15.000	2.8	2.8	2.8	2.9	2.9
15.500	2.9	2.9	2.9	2.9	2.9
16.000	2.9	2.9	2.9	2.9	3.0
16.500	3.0	3.0	3.0	3.0	3.0

Pre Developed

Subsection: Time-Depth Curve
Label: Westchester County 1-100 2015

Return Event: 2 years
Storm Event: 2 Year

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)
17.000	3.0	3.0	3.0	3.0	3.0
17.500	3.0	3.0	3.0	3.1	3.1
18.000	3.1	3.1	3.1	3.1	3.1
18.500	3.1	3.1	3.1	3.1	3.1
19.000	3.1	3.1	3.1	3.1	3.1
19.500	3.1	3.1	3.1	3.1	3.2
20.000	3.2	3.2	3.2	3.2	3.2
20.500	3.2	3.2	3.2	3.2	3.2
21.000	3.2	3.2	3.2	3.2	3.2
21.500	3.2	3.2	3.2	3.2	3.2
22.000	3.2	3.2	3.2	3.2	3.3
22.500	3.3	3.3	3.3	3.3	3.3
23.000	3.3	3.3	3.3	3.3	3.3
23.500	3.3	3.3	3.3	3.3	3.3
24.000	3.3	(N/A)	(N/A)	(N/A)	(N/A)

Pre Developed

Subsection: Time-Depth Curve
Label: Westchester County 1-100 2015

Return Event: 25 years
Storm Event: 25 Year

Time-Depth Curve: 25 Year	
Label	25 Year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	25 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	0.1	0.1
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	0.2
2.500	0.2	0.2	0.2	0.2	0.2
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.3	0.3	0.3
4.000	0.3	0.3	0.3	0.3	0.3
4.500	0.3	0.3	0.3	0.3	0.4
5.000	0.4	0.4	0.4	0.4	0.4
5.500	0.4	0.4	0.4	0.4	0.5
6.000	0.5	0.5	0.5	0.5	0.5
6.500	0.5	0.5	0.5	0.6	0.6
7.000	0.6	0.6	0.6	0.6	0.6
7.500	0.7	0.7	0.7	0.7	0.7
8.000	0.7	0.7	0.8	0.8	0.8
8.500	0.8	0.8	0.9	0.9	0.9
9.000	0.9	1.0	1.0	1.0	1.0
9.500	1.1	1.1	1.1	1.1	1.2
10.000	1.2	1.2	1.3	1.3	1.3
10.500	1.4	1.4	1.5	1.5	1.6
11.000	1.6	1.6	1.7	1.8	1.8
11.500	1.9	2.0	2.2	2.4	2.7
12.000	3.2	3.7	4.0	4.2	4.4
12.500	4.5	4.6	4.6	4.7	4.8
13.000	4.8	4.8	4.9	4.9	5.0
13.500	5.0	5.1	5.1	5.1	5.2
14.000	5.2	5.2	5.3	5.3	5.3
14.500	5.3	5.4	5.4	5.4	5.4
15.000	5.5	5.5	5.5	5.5	5.6
15.500	5.6	5.6	5.6	5.6	5.7
16.000	5.7	5.7	5.7	5.7	5.7
16.500	5.7	5.8	5.8	5.8	5.8

Pre Developed

Subsection: Time-Depth Curve
Label: Westchester County 1-100 2015

Return Event: 25 years
Storm Event: 25 Year

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)
17.000	5.8	5.8	5.8	5.9	5.9
17.500	5.9	5.9	5.9	5.9	5.9
18.000	5.9	5.9	6.0	6.0	6.0
18.500	6.0	6.0	6.0	6.0	6.0
19.000	6.0	6.0	6.1	6.1	6.1
19.500	6.1	6.1	6.1	6.1	6.1
20.000	6.1	6.1	6.1	6.1	6.2
20.500	6.2	6.2	6.2	6.2	6.2
21.000	6.2	6.2	6.2	6.2	6.2
21.500	6.2	6.2	6.3	6.3	6.3
22.000	6.3	6.3	6.3	6.3	6.3
22.500	6.3	6.3	6.3	6.3	6.3
23.000	6.3	6.3	6.4	6.4	6.4
23.500	6.4	6.4	6.4	6.4	6.4
24.000	6.4	(N/A)	(N/A)	(N/A)	(N/A)

Pre Developed

Subsection: Time of Concentration Calculations
Label: DA-1

Return Event: 1 years
Storm Event: 1 Year

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.240
Slope	0.260 ft/ft
2 Year 24 Hour Depth	3.3 in
Average Velocity	0.33 ft/s
Segment Time of Concentration	0.084 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	78.00 ft
Is Paved?	False
Slope	0.440 ft/ft
Average Velocity	10.70 ft/s
Segment Time of Concentration	0.002 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	20.00 ft
Is Paved?	True
Slope	2.000 ft/ft
Average Velocity	28.75 ft/s
Segment Time of Concentration	0.000 hours

Segment #4: TR-55 Shallow Concentrated Flow	
Hydraulic Length	80.00 ft
Is Paved?	False
Slope	0.125 ft/ft
Average Velocity	5.70 ft/s
Segment Time of Concentration	0.004 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.090 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

Pre Developed

Subsection: Runoff CN-Area
Label: DA-1

Return Event: 1 years
Storm Event: 1 Year

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Woods - good - Soil D	77.000	0.228	0.0	0.0	77.000
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil B	61.000	0.709	0.0	0.0	61.000
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil B	98.000	0.257	0.0	0.0	98.000
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil D	80.000	0.029	0.0	0.0	80.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	1.223	(N/A)	(N/A)	72.206

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

Pre Developed

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).

Pre Developed

Subsection: Unit Hydrograph Summary
Label: DA-1

Return Event: 1 years
Storm Event: 1 Year

Storm Event	1 Year
Return Event	1 years
Duration	24.000 hours
Depth	2.8 in
Time of Concentration (Composite)	0.090 hours
Area (User Defined)	1.223 acres
Computational Time Increment	0.012 hours
Time to Peak (Computed)	12.117 hours
Flow (Peak, Computed)	0.82 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	0.80 ft³/s

Drainage Area	
SCS CN (Composite)	72.000
Area (User Defined)	1.223 acres
Maximum Retention (Pervious)	3.9 in
Maximum Retention (Pervious, 20 percent)	0.8 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.7 in
Runoff Volume (Pervious)	0.071 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.070 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.090 hours
Computational Time Increment	0.012 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Pre Developed

Subsection: Unit Hydrograph Summary
Label: DA-1

Return Event: 1 years
Storm Event: 1 Year

SCS Unit Hydrograph Parameters	
Unit peak, qp	15.38 ft³/s
Unit peak time, Tp	0.060 hours
Unit receding limb, Tr	0.240 hours
Total unit time, Tb	0.300 hours

Pre Developed

Subsection: Unit Hydrograph Summary
Label: DA-1

Return Event: 2 years
Storm Event: 2 Year

Storm Event	2 Year
Return Event	2 years
Duration	24.000 hours
Depth	3.3 in
Time of Concentration (Composite)	0.090 hours
Area (User Defined)	1.223 acres
Computational Time Increment	0.012 hours
Time to Peak (Computed)	12.117 hours
Flow (Peak, Computed)	1.22 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	1.20 ft³/s

Drainage Area	
SCS CN (Composite)	72.000
Area (User Defined)	1.223 acres
Maximum Retention (Pervious)	3.9 in
Maximum Retention (Pervious, 20 percent)	0.8 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	0.101 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.101 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.090 hours
Computational Time Increment	0.012 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Pre Developed

Subsection: Unit Hydrograph Summary
Label: DA-1

Return Event: 2 years
Storm Event: 2 Year

SCS Unit Hydrograph Parameters	
Unit peak, qp	15.38 ft³/s
Unit peak time, Tp	0.060 hours
Unit receding limb, Tr	0.240 hours
Total unit time, Tb	0.300 hours

Pre Developed

Subsection: Unit Hydrograph Summary
Label: DA-1

Return Event: 10 years
Storm Event: 10 Year

Storm Event	10 Year
Return Event	10 years
Duration	24.000 hours
Depth	5.0 in
Time of Concentration (Composite)	0.090 hours
Area (User Defined)	1.223 acres

Computational Time Increment	0.012 hours
Time to Peak (Computed)	12.117 hours
Flow (Peak, Computed)	2.79 ft^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	2.77 ft^3/s

Drainage Area	
SCS CN (Composite)	72.000
Area (User Defined)	1.223 acres
Maximum Retention (Pervious)	3.9 in
Maximum Retention (Pervious, 20 percent)	0.8 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.2 in
Runoff Volume (Pervious)	0.224 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.224 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.090 hours
Computational Time Increment	0.012 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Pre Developed

Subsection: Unit Hydrograph Summary
Label: DA-1

Return Event: 10 years
Storm Event: 10 Year

SCS Unit Hydrograph Parameters	
Unit peak, qp	15.38 ft³/s
Unit peak time, Tp	0.060 hours
Unit receding limb, Tr	0.240 hours
Total unit time, Tb	0.300 hours

Pre Developed

Subsection: Unit Hydrograph Summary
Label: DA-1

Return Event: 25 years
Storm Event: 25 Year

Storm Event	25 Year
Return Event	25 years
Duration	24.000 hours
Depth	6.4 in
Time of Concentration (Composite)	0.090 hours
Area (User Defined)	1.223 acres
Computational Time Increment	0.012 hours
Time to Peak (Computed)	12.105 hours
Flow (Peak, Computed)	4.21 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	4.19 ft³/s

Drainage Area	
SCS CN (Composite)	72.000
Area (User Defined)	1.223 acres
Maximum Retention (Pervious)	3.9 in
Maximum Retention (Pervious, 20 percent)	0.8 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.3 in
Runoff Volume (Pervious)	0.339 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.338 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.090 hours
Computational Time Increment	0.012 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Pre Developed

Subsection: Unit Hydrograph Summary
Label: DA-1

Return Event: 25 years
Storm Event: 25 Year

SCS Unit Hydrograph Parameters	
Unit peak, qp	15.38 ft³/s
Unit peak time, Tp	0.060 hours
Unit receding limb, Tr	0.240 hours
Total unit time, Tb	0.300 hours

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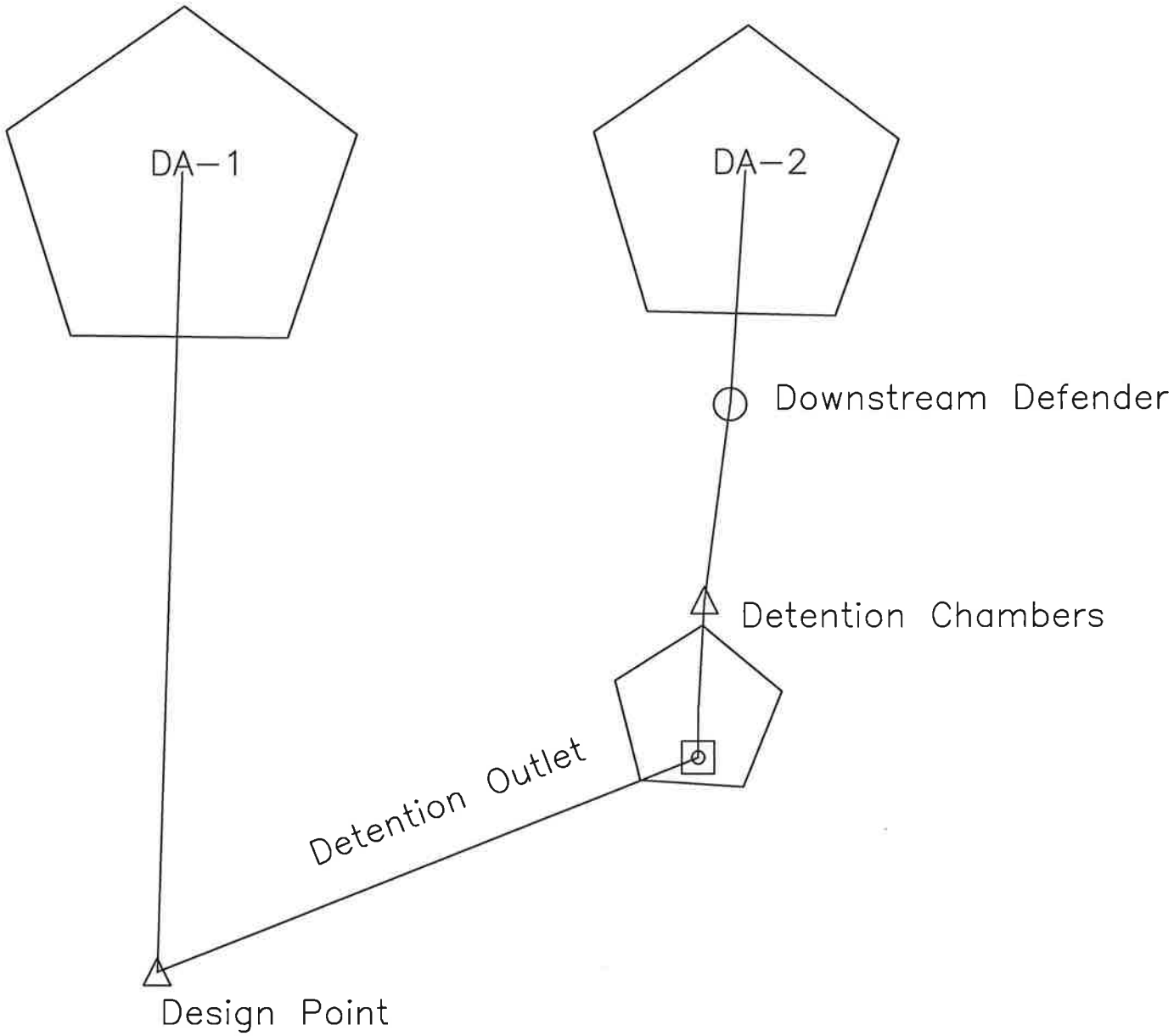

NOTE:
1. Source: NYS DEC Stormwater Design Manual - August 2010

POST DEVELOPED SCHEMATIC

ARMSTRONG PLUMBING LLC

Town Of Ossining Westchester County, NY

Site Design Consultants
Civil Engineers • Land Planners
251 F Underhill Avenue Yorktown Heights, NY 10598
(914) 962-4488 - Fax (914) 962-7386
www.sitedesignconsultants.com

NOT TO SCALE
DATE:3/21/18

Post Developed

Project Summary	
Title	18-13 Armstrong Plumbing
Engineer	Joseph Riina
Company	Site Design Consultants
Date	5/25/2018

Notes

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Post Developed

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
DA-1	Post-Development 1 year	1	0.067	12.100	0.74
DA-1	Post-Development 2 year	2	0.095	12.100	1.10
DA-1	Post-Development 10 year	10	0.208	12.100	2.51
DA-1	Post-Development 25 year	25	0.312	12.100	3.78
DA-2	Post-Development 1 year	1	0.027	12.100	0.30
DA-2	Post-Development 2 year	2	0.033	12.100	0.35
DA-2	Post-Development 10 year	10	0.051	12.100	0.54
DA-2	Post-Development 25 year	25	0.066	12.100	0.69

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
Design Point	Post-Development 1 year	1	0.069	12.100	0.74
Design Point	Post-Development 2 year	2	0.103	12.100	1.10
Design Point	Post-Development 10 year	10	0.233	12.100	2.51
Design Point	Post-Development 25 year	25	0.352	12.100	4.12
Downstream Defender	Post-Development 1 year	1	0.027	12.100	0.30
Downstream Defender	Post-Development 2 year	2	0.033	12.100	0.35
Downstream Defender	Post-Development 10 year	10	0.051	12.100	0.54
Downstream Defender	Post-Development 25 year	25	0.066	12.100	0.69

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)

Post Developed

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Detention Chambers (IN)	Post-Development 1 year	1	0.027	12.100	0.30	(N/A)	(N/A)
Detention Chambers (OUT)	Post-Development 1 year	1	0.002	19.150	0.01	302.01	0.026
Detention Chambers (IN)	Post-Development 2 year	2	0.033	12.100	0.35	(N/A)	(N/A)
Detention Chambers (OUT)	Post-Development 2 year	2	0.007	14.250	0.02	302.03	0.026
Detention Chambers (IN)	Post-Development 10 year	10	0.051	12.100	0.53	(N/A)	(N/A)
Detention Chambers (OUT)	Post-Development 10 year	10	0.025	12.350	0.23	302.34	0.029
Detention Chambers (IN)	Post-Development 25 year	25	0.066	12.100	0.68	(N/A)	(N/A)
Detention Chambers (OUT)	Post-Development 25 year	25	0.040	12.200	0.47	302.68	0.032

Time-Depth Curve: 1 Year	
Label	1 Year
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	0.7	0.8	0.8
11.500	0.8	0.9	1.0	1.0	1.2
12.000	1.4	1.6	1.8	1.8	1.9
12.500	2.0	2.0	2.0	2.1	2.1
13.000	2.1	2.1	2.1	2.2	2.2
13.500	2.2	2.2	2.2	2.2	2.3
14.000	2.3	2.3	2.3	2.3	2.3
14.500	2.3	2.3	2.4	2.4	2.4
15.000	2.4	2.4	2.4	2.4	2.4
15.500	2.4	2.4	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	2.5	2.5

Post Developed

Subsection: Time-Depth Curve
Label: Westchester County 1-100 2015

Return Event: 1 years
Storm Event: 1 Year

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)
17.000	2.5	2.6	2.6	2.6	2.6
17.500	2.6	2.6	2.6	2.6	2.6
18.000	2.6	2.6	2.6	2.6	2.6
18.500	2.6	2.6	2.6	2.6	2.6
19.000	2.6	2.6	2.6	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	2.7	2.7	2.7	2.7	2.7
22.000	2.7	2.7	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 Year	
Label	10 Year
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	0.0	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	0.2	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	0.5	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	0.7	0.8	0.8	0.8
9.500	0.8	0.9	0.9	0.9	0.9
10.000	0.9	1.0	1.0	1.0	1.1
10.500	1.1	1.1	1.1	1.2	1.2
11.000	1.2	1.3	1.3	1.4	1.4
11.500	1.5	1.6	1.7	1.9	2.1
12.000	2.5	2.9	3.1	3.3	3.4
12.500	3.5	3.6	3.6	3.7	3.7
13.000	3.7	3.8	3.8	3.9	3.9
13.500	3.9	3.9	4.0	4.0	4.0
14.000	4.1	4.1	4.1	4.1	4.1
14.500	4.2	4.2	4.2	4.2	4.3
15.000	4.3	4.3	4.3	4.3	4.3
15.500	4.4	4.4	4.4	4.4	4.4
16.000	4.4	4.4	4.5	4.5	4.5
16.500	4.5	4.5	4.5	4.5	4.5

Post Developed

Subsection: Time-Depth Curve
Label: Westchester County 1-100 2015

Return Event: 10 years
Storm Event: 10 Year

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)
17.000	4.5	4.6	4.6	4.6	4.6
17.500	4.6	4.6	4.6	4.6	4.6
18.000	4.6	4.6	4.7	4.7	4.7
18.500	4.7	4.7	4.7	4.7	4.7
19.000	4.7	4.7	4.7	4.7	4.7
19.500	4.8	4.8	4.8	4.8	4.8
20.000	4.8	4.8	4.8	4.8	4.8
20.500	4.8	4.8	4.8	4.8	4.8
21.000	4.8	4.9	4.9	4.9	4.9
21.500	4.9	4.9	4.9	4.9	4.9
22.000	4.9	4.9	4.9	4.9	4.9
22.500	4.9	4.9	4.9	4.9	4.9
23.000	5.0	5.0	5.0	5.0	5.0
23.500	5.0	5.0	5.0	5.0	5.0
24.000	5.0	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: 2 Year	
Label	2 Year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	2 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	0.1	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	0.1	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	0.2	0.2	0.2
4.500	0.2	0.2	0.2	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	0.3	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.3	0.3	0.4	0.4	0.4
8.000	0.4	0.4	0.4	0.4	0.4
8.500	0.4	0.4	0.4	0.5	0.5
9.000	0.5	0.5	0.5	0.5	0.5
9.500	0.5	0.6	0.6	0.6	0.6
10.000	0.6	0.6	0.7	0.7	0.7
10.500	0.7	0.7	0.8	0.8	0.8
11.000	0.8	0.9	0.9	0.9	0.9
11.500	1.0	1.0	1.1	1.2	1.4
12.000	1.6	1.9	2.1	2.2	2.3
12.500	2.3	2.4	2.4	2.4	2.4
13.000	2.5	2.5	2.5	2.5	2.6
13.500	2.6	2.6	2.6	2.6	2.7
14.000	2.7	2.7	2.7	2.7	2.7
14.500	2.8	2.8	2.8	2.8	2.8
15.000	2.8	2.8	2.8	2.9	2.9
15.500	2.9	2.9	2.9	2.9	2.9
16.000	2.9	2.9	2.9	2.9	3.0
16.500	3.0	3.0	3.0	3.0	3.0

Post Developed

Subsection: Time-Depth Curve
Label: Westchester County 1-100 2015

Return Event: 2 years
Storm Event: 2 Year

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)
17.000	3.0	3.0	3.0	3.0	3.0
17.500	3.0	3.0	3.0	3.1	3.1
18.000	3.1	3.1	3.1	3.1	3.1
18.500	3.1	3.1	3.1	3.1	3.1
19.000	3.1	3.1	3.1	3.1	3.1
19.500	3.1	3.1	3.1	3.1	3.2
20.000	3.2	3.2	3.2	3.2	3.2
20.500	3.2	3.2	3.2	3.2	3.2
21.000	3.2	3.2	3.2	3.2	3.2
21.500	3.2	3.2	3.2	3.2	3.2
22.000	3.2	3.2	3.2	3.2	3.3
22.500	3.3	3.3	3.3	3.3	3.3
23.000	3.3	3.3	3.3	3.3	3.3
23.500	3.3	3.3	3.3	3.3	3.3
24.000	3.3	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: 25 Year	
Label	25 Year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	25 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	0.1	0.1
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	0.2
2.500	0.2	0.2	0.2	0.2	0.2
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.3	0.3	0.3
4.000	0.3	0.3	0.3	0.3	0.3
4.500	0.3	0.3	0.3	0.3	0.4
5.000	0.4	0.4	0.4	0.4	0.4
5.500	0.4	0.4	0.4	0.4	0.5
6.000	0.5	0.5	0.5	0.5	0.5
6.500	0.5	0.5	0.5	0.6	0.6
7.000	0.6	0.6	0.6	0.6	0.6
7.500	0.7	0.7	0.7	0.7	0.7
8.000	0.7	0.7	0.8	0.8	0.8
8.500	0.8	0.8	0.9	0.9	0.9
9.000	0.9	1.0	1.0	1.0	1.0
9.500	1.1	1.1	1.1	1.1	1.2
10.000	1.2	1.2	1.3	1.3	1.3
10.500	1.4	1.4	1.5	1.5	1.6
11.000	1.6	1.6	1.7	1.8	1.8
11.500	1.9	2.0	2.2	2.4	2.7
12.000	3.2	3.7	4.0	4.2	4.4
12.500	4.5	4.6	4.6	4.7	4.8
13.000	4.8	4.8	4.9	4.9	5.0
13.500	5.0	5.1	5.1	5.1	5.2
14.000	5.2	5.2	5.3	5.3	5.3
14.500	5.3	5.4	5.4	5.4	5.4
15.000	5.5	5.5	5.5	5.5	5.6
15.500	5.6	5.6	5.6	5.6	5.7
16.000	5.7	5.7	5.7	5.7	5.7
16.500	5.7	5.8	5.8	5.8	5.8

Post Developed

Subsection: Time-Depth Curve
Label: Westchester County 1-100 2015

Return Event: 25 years
Storm Event: 25 Year

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)
17.000	5.8	5.8	5.8	5.9	5.9
17.500	5.9	5.9	5.9	5.9	5.9
18.000	5.9	5.9	6.0	6.0	6.0
18.500	6.0	6.0	6.0	6.0	6.0
19.000	6.0	6.0	6.1	6.1	6.1
19.500	6.1	6.1	6.1	6.1	6.1
20.000	6.1	6.1	6.1	6.1	6.2
20.500	6.2	6.2	6.2	6.2	6.2
21.000	6.2	6.2	6.2	6.2	6.2
21.500	6.2	6.2	6.3	6.3	6.3
22.000	6.3	6.3	6.3	6.3	6.3
22.500	6.3	6.3	6.3	6.3	6.3
23.000	6.3	6.3	6.4	6.4	6.4
23.500	6.4	6.4	6.4	6.4	6.4
24.000	6.4	(N/A)	(N/A)	(N/A)	(N/A)

Post Developed

Subsection: Time of Concentration Calculations
Label: DA-1

Return Event: 1 years
Storm Event: 1 Year

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.240
Slope	0.260 ft/ft
2 Year 24 Hour Depth	3.3 in
Average Velocity	0.33 ft/s
Segment Time of Concentration	0.084 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	50.00 ft
Is Paved?	False
Slope	0.440 ft/ft
Average Velocity	10.70 ft/s
Segment Time of Concentration	0.001 hours

Segment #3: TR-55 Channel Flow	
Flow Area	1.3 ft²
Hydraulic Length	34.00 ft
Manning's n	0.150
Slope	0.010 ft/ft
Wetted Perimeter	4.16 ft
Average Velocity	0.45 ft/s
Segment Time of Concentration	0.021 hours

Segment #4: TR-55 Channel Flow	
Flow Area	0.4 ft²
Hydraulic Length	76.00 ft
Manning's n	0.012
Slope	0.050 ft/ft
Wetted Perimeter	1.57 ft
Average Velocity	11.07 ft/s
Segment Time of Concentration	0.002 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.108 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, %

Post Developed

Subsection: Runoff CN-Area
Label: DA-1

Return Event: 1 years
Storm Event: 1 Year

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Woods - good - Soil D	77.000	0.228	0.0	0.0	77.000
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil B	61.000	0.591	0.0	0.0	61.000
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil B	98.000	0.247	0.0	0.0	98.000
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil D	80.000	0.029	0.0	0.0	80.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	1.095	(N/A)	(N/A)	73.181

Post Developed

Subsection: Runoff CN-Area
Label: DA-2

Return Event: 1 years
Storm Event: 1 Year

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil B	98.000	0.128	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.128	(N/A)	(N/A)	98.000

Post Developed

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

Post Developed

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 Year
Return Event	1 years
Duration	24.000 hours
Depth	2.8 in
Time of Concentration (Composite)	0.108 hours
Area (User Defined)	1.095 acres

Computational Time Increment	0.014 hours
Time to Peak (Computed)	12.121 hours
Flow (Peak, Computed)	0.77 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	0.74 ft³/s

Drainage Area	
SCS CN (Composite)	73.000
Area (User Defined)	1.095 acres
Maximum Retention (Pervious)	3.7 in
Maximum Retention (Pervious, 20 percent)	0.7 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.7 in
Runoff Volume (Pervious)	0.067 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.067 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.108 hours
Computational Time Increment	0.014 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Developed

Subsection: Unit Hydrograph Summary
Label: DA-1

Return Event: 1 years
Storm Event: 1 Year

SCS Unit Hydrograph Parameters	
Unit peak, qp	11.45 ft^3/s
Unit peak time, Tp	0.072 hours
Unit receding limb, Tr	0.289 hours
Total unit time, Tb	0.361 hours

Post Developed

Subsection: Unit Hydrograph Summary
Label: DA-1

Return Event: 2 years
Storm Event: 2 Year

Storm Event	2 Year
Return Event	2 years
Duration	24.000 hours
Depth	3.3 in
Time of Concentration (Composite)	0.108 hours
Area (User Defined)	1.095 acres

Computational Time Increment	0.014 hours
Time to Peak (Computed)	12.121 hours
Flow (Peak, Computed)	1.14 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	1.10 ft³/s

Drainage Area	
SCS CN (Composite)	73.000
Area (User Defined)	1.095 acres
Maximum Retention (Pervious)	3.7 in
Maximum Retention (Pervious, 20 percent)	0.7 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	0.096 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.095 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.108 hours
Computational Time Increment	0.014 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Developed

Subsection: Unit Hydrograph Summary
Label: DA-1

Return Event: 2 years
Storm Event: 2 Year

SCS Unit Hydrograph Parameters	
Unit peak, qp	11.45 ft³/s
Unit peak time, Tp	0.072 hours
Unit receding limb, Tr	0.289 hours
Total unit time, Tb	0.361 hours

Post Developed

Subsection: Unit Hydrograph Summary
Label: DA-1

Return Event: 10 years
Storm Event: 10 Year

Storm Event	10 Year
Return Event	10 years
Duration	24.000 hours
Depth	5.0 in
Time of Concentration (Composite)	0.108 hours
Area (User Defined)	1.095 acres

Computational Time Increment	0.014 hours
Time to Peak (Computed)	12.121 hours
Flow (Peak, Computed)	2.54 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	2.51 ft³/s

Drainage Area	
SCS CN (Composite)	73.000
Area (User Defined)	1.095 acres
Maximum Retention (Pervious)	3.7 in
Maximum Retention (Pervious, 20 percent)	0.7 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.3 in
Runoff Volume (Pervious)	0.208 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.208 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.108 hours
Computational Time Increment	0.014 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Developed

Subsection: Unit Hydrograph Summary
Label: DA-1

Return Event: 10 years
Storm Event: 10 Year

SCS Unit Hydrograph Parameters	
Unit peak, qp	11.45 ft^3/s
Unit peak time, Tp	0.072 hours
Unit receding limb, Tr	0.289 hours
Total unit time, Tb	0.361 hours

Post Developed

Subsection: Unit Hydrograph Summary
Label: DA-1

Return Event: 25 years
Storm Event: 25 Year

Storm Event	25 Year
Return Event	25 years
Duration	24.000 hours
Depth	6.4 in
Time of Concentration (Composite)	0.108 hours
Area (User Defined)	1.095 acres

Computational Time Increment	0.014 hours
Time to Peak (Computed)	12.121 hours
Flow (Peak, Computed)	3.81 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	3.78 ft³/s

Drainage Area	
SCS CN (Composite)	73.000
Area (User Defined)	1.095 acres
Maximum Retention (Pervious)	3.7 in
Maximum Retention (Pervious, 20 percent)	0.7 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.4 in
Runoff Volume (Pervious)	0.312 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.312 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.108 hours
Computational Time Increment	0.014 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Developed

Subsection: Unit Hydrograph Summary
Label: DA-1

Return Event: 25 years
Storm Event: 25 Year

SCS Unit Hydrograph Parameters	
Unit peak, qp	11.45 ft^3/s
Unit peak time, Tp	0.072 hours
Unit receding limb, Tr	0.289 hours
Total unit time, Tb	0.361 hours

Post Developed

Subsection: Unit Hydrograph Summary
Label: DA-2

Return Event: 1 years
Storm Event: 1 Year

Storm Event	1 Year
Return Event	1 years
Duration	24.000 hours
Depth	2.8 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	0.128 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.100 hours
Flow (Peak, Computed)	0.30 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	0.30 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.128 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.6 in
Runoff Volume (Pervious)	0.027 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.027 ac-ft

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

Post Developed

Subsection: Unit Hydrograph Summary
Label: DA-2

Return Event: 1 years
Storm Event: 1 Year

SCS Unit Hydrograph Parameters	
Unit peak, qp	1.74 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Subsection: Unit Hydrograph Summary
Label: DA-2

Return Event: 2 years
Storm Event: 2 Year

Storm Event	2 Year
Return Event	2 years
Duration	24.000 hours
Depth	3.3 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	0.128 acres
Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.100 hours
Flow (Peak, Computed)	0.35 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	0.35 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.128 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.1 in
Runoff Volume (Pervious)	0.033 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.033 ac-ft

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

Post Developed

Subsection: Unit Hydrograph Summary
Label: DA-2

Return Event: 2 years
Storm Event: 2 Year

SCS Unit Hydrograph Parameters	
Unit peak, qp	1.74 ft^3/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Subsection: Unit Hydrograph Summary
Label: DA-2

Return Event: 10 years
Storm Event: 10 Year

Storm Event	10 Year
Return Event	10 years
Duration	24.000 hours
Depth	5.0 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	0.128 acres
Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.100 hours
Flow (Peak, Computed)	0.54 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	0.54 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.128 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.8 in
Runoff Volume (Pervious)	0.051 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.051 ac-ft

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

Post Developed

Subsection: Unit Hydrograph Summary
Label: DA-2

Return Event: 10 years
Storm Event: 10 Year

SCS Unit Hydrograph Parameters	
Unit peak, qp	1.74 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Post Developed

Subsection: Unit Hydrograph Summary
Label: DA-2

Return Event: 25 years
Storm Event: 25 Year

Storm Event	25 Year
Return Event	25 years
Duration	24.000 hours
Depth	6.4 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	0.128 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.100 hours
Flow (Peak, Computed)	0.69 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	0.69 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.128 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.2 in
Runoff Volume (Pervious)	0.066 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.066 ac-ft

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

Post Developed

Subsection: Unit Hydrograph Summary
Label: DA-2

Return Event: 25 years
Storm Event: 25 Year

SCS Unit Hydrograph Parameters	
Unit peak, qp	1.74 ft^3/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Post Developed

Subsection: Channel Routing Summary
Label: Downstream Defender Outlet

Return Event: 1 years
Storm Event: 1 Year

Modified Puls Results Summary	
Length (Channel)	8.50 ft
Travel Time (Channel)	0.000 hours
Number of Sections	1
Length (Section)	8.50 ft
Flow (Weighted)	0.09 ft³/s
Overflow Channel	No Overflow Data
Elevation (Overflow)	304.93 ft

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Starting Water Surface)	304.31 ft
Volume (Starting, per section)	0.000 ac-ft
Flow (Out Starting)	0.00 ft³/s
Infiltration (Starting, per section)	0.00 ft³/s
Flow (Total Out Starting)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.30 ft³/s	Time to Peak (In)	12.100 hours
Flow (Peak Out)	0.30 ft³/s	Time to Peak (Out)	12.100 hours

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.027 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.027 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Subsection: Channel Routing Summary
Label: Downstream Defender Outlet

Return Event: 2 years
Storm Event: 2 Year

Modified Puls Results Summary	
Length (Channel)	8.50 ft
Travel Time (Channel)	0.000 hours
Number of Sections	1
Length (Section)	8.50 ft
Flow (Weighted)	0.10 ft³/s
Overflow Channel	No Overflow Data
Elevation (Overflow)	304.93 ft

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Starting Water Surface)	304.31 ft
Volume (Starting, per section)	0.000 ac-ft
Flow (Out Starting)	0.00 ft³/s
Infiltration (Starting, per section)	0.00 ft³/s
Flow (Total Out Starting)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.35 ft³/s	Time to Peak (In)	12.100 hours
Flow (Peak Out)	0.35 ft³/s	Time to Peak (Out)	12.100 hours

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.033 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.033 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Subsection: Channel Routing Summary
Label: Downstream Defender Outlet

Return Event: 10 years
Storm Event: 10 Year

Modified Puls Results Summary	
Length (Channel)	8.50 ft
Travel Time (Channel)	0.000 hours
Number of Sections	1
Length (Section)	8.50 ft
Flow (Weighted)	0.16 ft³/s
Overflow Channel	No Overflow Data
Elevation (Overflow)	304.93 ft

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Starting Water Surface)	304.31 ft
Volume (Starting, per section)	0.000 ac-ft
Flow (Out Starting)	0.00 ft³/s
Infiltration (Starting, per section)	0.00 ft³/s
Flow (Total Out Starting)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.54 ft³/s	Time to Peak (In)	12.100 hours
Flow (Peak Out)	0.53 ft³/s	Time to Peak (Out)	12.100 hours

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.051 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.051 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Post Developed

Subsection: Channel Routing Summary
Label: Downstream Defender Outlet

Return Event: 25 years
Storm Event: 25 Year

Modified Puls Results Summary	
Length (Channel)	8.50 ft
Travel Time (Channel)	0.000 hours
Number of Sections	1
Length (Section)	8.50 ft
Flow (Weighted)	0.20 ft³/s
Overflow Channel	No Overflow Data
Elevation (Overflow)	304.93 ft

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Starting Water Surface)	304.31 ft
Volume (Starting, per section)	0.000 ac-ft
Flow (Out Starting)	0.00 ft³/s
Infiltration (Starting, per section)	0.00 ft³/s
Flow (Total Out Starting)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.69 ft³/s	Time to Peak (In)	12.100 hours
Flow (Peak Out)	0.68 ft³/s	Time to Peak (Out)	12.100 hours

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.066 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.066 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Storage Chamber			
ID	47	Notes	Created on 02/10/2010. Please check with the manufacturer for the latest data.
Label	SC-740 Chamber		

Storage Chamber			
Effective Length	7.12 ft	Manufacturer	StormTech
Section Length Varies?	False	Default Spacing	0.50 ft

Depth-Incremental Volume Per Unit Length Curve

Depth (ft)	Incremental Volume Per Unit Length (ft^3/ft)
0.08	0.31
0.17	0.31
0.25	0.31
0.33	0.30
0.42	0.30
0.50	0.30
0.58	0.29
0.67	0.29
0.75	0.28
0.83	0.28
0.92	0.27
1.00	0.27
1.08	0.26
1.17	0.25
1.25	0.25
1.33	0.24
1.42	0.23
1.50	0.22
1.58	0.21
1.67	0.20
1.75	0.19
1.83	0.18
1.92	0.17
2.00	0.15
2.08	0.13
2.17	0.11
2.25	0.09

Subsection: Storage Chamber System
Label: Detention Chambers

Return Event: 1 years
Storm Event: 1 Year

Depth-Incremental Volume Per Unit Length Curve

Depth (ft)	Incremental Volume Per Unit Length (ft^3/ft)
2.33	0.04
2.42	0.02
2.50	0.01

Storage Chamber			
Storage Chamber Type	Incremental Volume Per Unit Length	Maximum Width	4.25 ft

Storage Chamber (Pond)	
Chamber System Invert	299.50 ft
Chamber System Rows	5
Chamber System Chambers per Row	3
Chamber System Fill Void Space	40.0 %
Chamber System Row Spacing	6.0 in
Chamber System Side Fill	12.0 in
Chamber System Fill Cover Depth	6.0 in
Chamber System Fill Base Depth	6.0 in
Chamber System Fill Side Slope	1.000 H:V
Chamber System End Fill	12.0 in
Chamber System Includes Header?	False

Subsection: Outlet Input Data
Label: Detention Outlet

Return Event: 1 years
Storm Event: 1 Year

Requested Pond Water Surface Elevations	
Minimum (Headwater)	299.50 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	303.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)

Post Developed

Subsection: Outlet Input Data
Label: Detention Outlet

Return Event: 1 years
Storm Event: 1 Year

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Culvert-Circular	Culvert - 1	Forward	TW	302.00	303.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	6.0 in
Length	10.00 ft
Length (Computed Barrel)	10.00 ft
Slope (Computed)	0.010 ft/ft

Outlet Control Data	
Manning's n	0.012
Ke	0.700
Kb	0.067
Kr	0.700
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0210
M	1.3300
C	0.0463
Y	0.7500
T1 ratio (HW/D)	1.158
T2 ratio (HW/D)	1.498
Slope Correction Factor	0.700

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	302.58 ft	T1 Flow	0.49 ft³/s
T2 Elevation	302.75 ft	T2 Flow	0.56 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

Post Developed

Subsection: Level Pool Pond Routing Summary
Label: Detention Chambers (IN)

Return Event: 1 years
Storm Event: 1 Year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	299.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.30 ft³/s	Time to Peak (Flow, In)	12.100 hours
Flow (Peak Outlet)	0.01 ft³/s	Time to Peak (Flow, Outlet)	19.150 hours

Elevation (Water Surface, Peak)	302.01 ft
Volume (Peak)	0.026 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.027 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.002 ac-ft
Volume (Retained)	0.025 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Subsection: Level Pool Pond Routing Summary
Label: Detention Chambers (IN)

Return Event: 2 years
Storm Event: 2 Year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	299.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.35 ft³/s	Time to Peak (Flow, In)	12.100 hours
Flow (Peak Outlet)	0.02 ft³/s	Time to Peak (Flow, Outlet)	14.250 hours

Elevation (Water Surface, Peak)	302.03 ft
Volume (Peak)	0.026 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.033 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.007 ac-ft
Volume (Retained)	0.025 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Post Developed

Subsection: Level Pool Pond Routing Summary
Label: Detention Chambers (IN)

Return Event: 10 years
Storm Event: 10 Year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	299.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.53 ft³/s	Time to Peak (Flow, In)	12.100 hours
Flow (Peak Outlet)	0.23 ft³/s	Time to Peak (Flow, Outlet)	12.350 hours

Elevation (Water Surface, Peak)	302.34 ft
Volume (Peak)	0.029 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.051 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.025 ac-ft
Volume (Retained)	0.025 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Subsection: Level Pool Pond Routing Summary
Label: Detention Chambers (IN)

Return Event: 25 years
Storm Event: 25 Year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	299.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.68 ft³/s	Time to Peak (Flow, In)	12.100 hours
Flow (Peak Outlet)	0.47 ft³/s	Time to Peak (Flow, Outlet)	12.200 hours

Elevation (Water Surface, Peak)	302.68 ft
Volume (Peak)	0.032 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.066 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.040 ac-ft
Volume (Retained)	0.026 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

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Appendix D

Soil Testing Data

TEST PIT DATA REQUIRED TO BE SUBMITTED WITH APPLICATION

DESCRIPTION OF SOILS ENCOUNTERED IN TEST HOLES

DEPTH	HOLE NO. 1	DEPTH		DEPTH		DEPTH	
G.L.	Topsoil	G.L.	Topsoil	G.L.		G.L.	
6"		4"		6"		6"	
12"		12"		12"		12"	
18"	Light brown Sandy loam	18"	Light brown Sandy loam	18"		18"	
24"		24"		20"		24"	
28"	Abandoned Septic Field	28"	Abandoned Septic Field	30"		28"	
32"		34"		36"		36"	
42"		42"		42"		42"	
48"		48"	Grey sandy Clay, Water @ 5'	48"		48"	
54"	Dark Brown Sandy Loam	54"		54"		54"	
60"		60"		60"		60"	
66"		66"		66"		66"	
72"		72"		72"		72"	
78"		78"		78"		78"	
84"		84"		84"		84"	
90"		90"		90"		90"	
96"	Total Depth = 6.0'	96"	Total Depth = 5.0'	96"	Total Depth = 5.0'	96"	Total Depth = 6'

INDICATE LEVEL AT WHICH GROUND WATER IS ENCOUNTERED varies

INDICATE LEVEL FOR WHICH WATER LEVEL RISES AFTER BEING ENCOUNTERED varies

TESTS MADE BY Thomas Kerrigan, witnessed by Dan Ciarcia Town of Ossining DATE 4/30/2018

Sketch: