STORMWATER POLLUTION PREVENTION PLAN /
STORMWATER MANAGEMENT REPORT
FOR 1258 EAST BOSTON POST ROAD

Village of Mamaroneck, New York
Date: October 7, 2021 (revised)

Prepared by: Alan L. Pilch, PE, RLA
ALP Engineering & Landscape Architecture, PLLC

INTRODUCTION:

The subject property is located on the north side of East Boston Post Road (U.S. Route 1). It is bounded by Sunnyside Avenue on the east, East Boston Post Road on the south, a vacant lot at 1220 East Boston Post Road to the west, and Beaver Swamp Brook further to the west, and a vacant lot at 1202 Sunnyside Avenue to the north.

The project consists of the following:

- Construction of a 780 square foot building in the southwest corner of the property;
- Regrading of the property for vehicular parking to be used by Toyota City.
- Construction of a stormwater management facility to manage the changes in stormwater runoff from the property.

The limits of disturbance may be referenced on drawing C-103. The drawing shows that the area of disturbance is 18,790 square feet. The proposed land disturbance involves the removal of some of the existing paved areas on the property and the construction of the building and new paved areas. Access to the project will be from the existing driveway on East Boston Post Road.

STORMWATER MANAGEMENT PLAN

Stormwater Management Plan Requirements - The project stormwater management plan has been designed in accordance with Chapter 294 of the Code of the Village of Mamaroneck and the 2015 New York State *Stormwater Management Design Manual*. Since the land disturbance activity has been calculated to be about 18,790 square feet, as per Chapter 294-8 B.2, the stormwater management plan is to provide stormwater quality and quantity controls (post-construction stormwater runoff controls). And since the land disturbance area is less than one acre, a SPDES General Permit for Stormwater Runoff from Construction Activity from the NYSDEC will not be required.

At present, the property contains 6,903 square feet of impervious pavement, 10,339 s.f. of formerly paved areas which are now lawn, weeds and stone, and 1,015 s.f. of lawn. With the construction of the building and paved parking area, and including existing walls to remain, the total amount of impervious surfaces will be 12,665 s.f., for an increase of 5,762 square feet. The remainder will be lawn and landscaped areas.

There are no stormwater management controls on the property at present. Runoff from the entire property is presently conveyed to the southwest, sheet flowing into a catch basin in East Boston Post Road, which then discharges into Beaver Swamp Brook. For purposes of analysis, the Design Point is defined as the northern edge of pavement along East Boston Post Road at the southwest corner of the property (see **Figures 3 and 4**).

To manage runoff from the property, it is proposed to install 24 Cultec 280HD chambers as four rows of 6 chambers end-to-end. This practice will provide both water quality improvement and water quantity control (i.e., peak rate attenuation) of the runoff discharged from the property to Beaver Swamp Brook as well as water quality improvement by capturing and treating the water quality volume. Runoff conveyed to the Cultec chambers will first be conveyed to a Stormceptor STC Model 900 hydrodynamic separator, which will pre-treat the runoff by removing sediment, oils and grease.

The runoff from chambers will be conveyed first to an outlet control structure (which will control the rate of flow from the chambers), and then to a manhole structure. From the manhole structure, the runoff will be conveyed in subsurface storm drainage pipes to an existing catch basin within the right of way of East Boston Post Road (see drawing C-102).

The calculations show that the runoff to the design point will be less than the existing rate of runoff from the property for all of the modeled storm events.

The text below describes the compliance of the stormwater management plan with Chapter 294 of the Code of the Village of Mamaroneck.

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 project;

The project scope includes:

- Construction of a 780 square foot building in the southwest corner of the property;
- Regrading of the property for vehicular parking to be used by Toyota City. The parking area will be paved using bituminous concrete.
- Construction of a catch basin, manholes, hydrodynamic separator, and a stormwater management facility to consist of subsurface chambers, and an outlet control structure to manage the changes in stormwater runoff from the property. Storm pipes will be installed to

convey the runoff collected on the property to an existing catch basin in East Boston Post Road – the same catch basin which presently collects all of the runoff from the property.

(b) Site map/construction drawing(s) at a scale not smaller than one inch equals 50 feet, or as otherwise approved by the SMO, for the project, including a general location map. At a minimum, the site map should 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 project drawings depict the required elements of the project, as follows: (i) the total site area is depicted on drawing C-101, (ii) all proposed site improvements may be referenced on drawing C-101 and C-102, (iii) areas of disturbance and areas that will not be disturbed may be found on drawing C-103, (iv) existing vegetation may be found on drawing C-101, (v) runoff from the project site currently and in the future will be conveyed into Beaver Swamp Brook which lies to the west of the property; (vii) existing and final slopes may be found on drawing C-102, (viii) the project does not propose to locate any material, waste, or borrow areas off the property; equipment storage areas during construction may be found on drawing C-103.

(c) Description of the soil(s) present at the site;

According to the Soils Survey of Putnam and Westchester Counties (Web Soil Survey), the soils over the portion of the property to be impacted by the proposed work consist of Urban land. To the immediate north of the property the soils are mapped as Urban land-Charlton-Chatfield complex, rolling, very rocky. Charlton soils consist of loam and sandy loam to depth of 80" or so. Chatfield soils consist of loam and flaggy silt loam; the depth to the restrictive layer is 20 to 40 inches.

A deep hole and soil percolation test were performed within the footprint of the proposed stormwater management practice. The deep hole test was conducted on May 14, 2021. The deep hole testing revealed that the soil column was comprised of earth fill to a depth of 8 feet. The fill consists of sandy loam soil, with some small rocks and boulders, and the occasional brick. No bedrock was encountered in the deep hole test; nor was there any evidence of groundwater or seepage into the test pit.

Infiltration testing was conducted on May 19, 2021 (with the presoak being performed on 05/18/2021). The testing was done in strict accordance with the methodology in Appendix D of the 2015 New York State Stormwater Management Design Manual. A 4-inch diameter casing was installed, the bottom of which was set at the bottom of the proposed stormwater infiltration system. A soil percolation rate of 11" per hour was obtained from the testing. To be

conservative, a soil percolation rate of 5.00” per hour was therefore used on the HydroCAD modeling.

(d) 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 construction phasing plan may be found on drawing C-103. As noted above, the total area of disturbance is calculated to be 18,790 square feet (0.431 acres), well below the five acre threshold, and well below 1 acre of disturbance that would trigger the need for a SPDES General Permit.

(e) Description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a pollutant source in stormwater runoff;

The Erosion and Sediment Control Plan incorporates a variety of measures designed to control litter, construction chemicals, and construction debris from becoming a source of pollution. The plan requires the staking of the clearing and grading limit line before the commencement of construction activity. Following the demarcation of the limits of disturbance, a variety of erosion and sediment control measures are to installed in accordance with the plans, including, but not limited to, silt fences and a stabilized construction entrance.

Each contractor and 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." The SMO shall provide a form for the contractor/ subcontractor certification statement which shall be signed and returned to the SMO prior to any work taking place.

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.

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.

As for construction materials, they will be stored in the locations shown on the erosion and sediment control plan, and will be protected by construction fencing as a containment.

Litter control is largely provided by having the maintenance and trash facilities placed inside a fenced-in area. This will reduce the risk of such materials from being washed by rain or blown by wind into the storm drainage system, the public street or toward neighboring properties.

In addition, the construction equipment and material storage area will be located within the portion of the site that is enclosed by the proposed erosion and sediment control measures.

(f) 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;

Construction materials expected to be stored temporarily on site include, but are not limited to, soil stockpiles, stone aggregate for the footings and foundation of the building and pavement, and sod and/or seed to establish lawn for the disturbed areas. These items are not sources of pollution in the short term.

(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;

Permanent vegetative measures to be used for soil stabilization may be referenced on the drawings. In the event that site work for the construction is completed at a time of the year that the installation of permanent plantings is not feasible (i.e. late fall, winter and early spring, essentially corresponding to December 1 through April 15), temporary measures are to be installed to prevent erosion, as detailed on drawing C-103 will be implemented.

Temporary Critical Area Plantings, in the event that permanent vegetation cannot be established due to the time of year (i.e. December 1 through April 15), then the seed mixes so noted on drawing C-103 are to be used to stabilize the ground surface until such time as permanent stabilization can be achieved.

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

Drawing C-103 depicts the location, size and length of each erosion and sediment control measure to be implemented during construction.

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

Dimensions, material specifications and installation details for all erosion and sediment control practices may be referenced on drawing C-103. Temporary sediment basins are not proposed for the site construction.

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

There are no temporary practices that will be converted to permanent control measures. A diversion swale is proposed along the northern property line to divert the runoff from properties to the north around the disturbed areas on the subject property. The diversion swale will remain in place following the redevelopment of the property.

(k) Implementation schedule for staging temporary erosion and sediment control practices, including the timing of initial placement and duration that each practice should remain in place;

The erosion control narrative on drawing C-103 provides the implementation schedule for the staging temporary erosion and sediment control practices, describes the time when practices will be placed and the duration that each practice is to remain in place. The work described in the narrative will occur in a single phase.

(l) Maintenance schedule to ensure continuous and effective operation of the erosion and sediment control practice;

The erosion control narrative on drawing C-103 provides the maintenance schedule for each erosion and sediment control practice.

(m) Name(s) of the receiving water(s);

All runoff from the subject property is conveyed to Beaver Swamp Brook.

(n) Delineation of SWPPP implementation responsibilities for each part of the site;

Implementation of the SWPPP erosion control measures will be the responsibility of the property owner.

(o) 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; and

As is noted above, the diversion of flows from exposed soils is proposed to divert the runoff from properties to the north around the disturbed areas on the subject property. The erosion and sediment control plan as implemented will be effective in limiting the discharge of pollutants from the exposed areas of the site.

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

A stormwater management plan has been developed for the property that quantifies the existing and future condition site runoff. No other existing data is available which quantifies the flows from the property.

(2) Post-construction runoff controls for new development and redevelopment projects.

As noted above, all runoff from the subject property is conveyed directly into Beaver Swamp Brook. The project will result in an increase of about 4,213 s.f., in the amount of impervious surfaces following the work (the former parking area consisting of lawn, weeds and stone is assumed to be pervious to be conservative).

Runoff from the impervious surfaces will be collected in catch basins and directed into the chambers via underground storm drainage pipes. A 4-inch diameter pipe from the chambers will attenuate the flows discharged from the chambers and by extension from the property. Runoff will then be conveyed to the watercourse from the manhole in a subsurface storm drainage pipe.

(a) All information in § 294-7 of this chapter;

See above for the description of the requirements of § 294-7.

(b) Description of each post-construction stormwater management practice (practices shall be as approved in Chapter 4 of the New York State DEC Stormwater Design Manual);

The post-construction stormwater management practice consists of the construction of subsurface detention system. It also includes: (i) installation of a hydrodynamic separator (Stormceptor STC Model 900) for pre-treatment of runoff to the proposed chambers, and (ii) 18-inch deep sumps in catch basins and a 2-foot sump in the two proposed trench drains.

(c) Site map/construction drawing(s) showing the specific location(s) and size(s) of each post-construction stormwater management practice;

The location of the subsurface infiltration chambers may be referenced on drawing C-102.

(d) Hydrologic and hydraulic analysis for all structural components of the stormwater management system for the applicable design storms;

The storm pipe table on sheet C-102 shows that for each segment of pipe to be installed the capacity will exceed the anticipated flows for the 25-year storm event.

Grassed Swale Design: The proposed drainage swale is to have a bottom width of 2 feet, a depth of 6" and side slopes of 3:1 (horizontal to vertical). The slope of the grassed swale, as designed is 2.59%. The drainage area to the proposed grassed swale to be installed along the northern property line has been calculated to be 9,353 square feet (0.215 acres) (see **Figure 5**).

Using the Rational Method to calculate the peak rate of runoff to the swale, with a coefficient of runoff of 0.9, rainfall intensity of 7.79 inches per hour (25-year storm at 5 minutes), and drainage area of 0.215 acres, peak rate of flow to the swale is calculated to be 1.51 cubic feet per second. The flow capacity of the proposed grassed swale is calculated to be 6.78 cubic feet per second at a velocity of 3.88 cfs at a flow depth of 6 inches and 1.82 cfs at a flow depth of 3".

(e) Comparison of post-development stormwater runoff conditions with pre-development conditions;

Appendix A provides the calculations which compare the pre-development conditions and the post-development conditions.

Table 1. Flows to Design Point

	Existing Condition	Future Condition
1-year storm	0.66	0.10
10-year storm	1.81	1.10
25-year storm	2.52	1.84
100-year storm	3.97	3.33

As can be seen in the calculations, the peak rates of runoff from the property to the Design Point will decrease over all of the modeled storm event. This will have the beneficial impact on runoff flows to the Beaver Swamp Brook.

The water quality volume calculation for the drainage area that conveys runoff to the stormwater management practice is calculated to be 1,507.9 cubic feet. The proposed 24 Cultec 280HD chambers, below the invert elevation of the lowermost orifice in the outlet control structure will contain 830.5 cubic feet of runoff. Infiltration of runoff conveyed to the chambers will also

occur. With a very conservative soil percolation rate of 5.00 inches per hour (the measured percolation rate was 11" per hour), the volume of percolation is calculated to be 0.873 cubic feet per square foot per day. The bed area of the installed chambers will be 862.5 square feet. Therefore, the volume of percolation is calculated to be (862.5 square feet x 0.873 cubic feet per square foot per day) 752.7 cubic feet. Together, the chambers will capture and treat (752.7 c.f. + 830.5 c.f.) 1,583.2 cubic feet, in excess of the 1,410.5 cubic feet calculated for the water quality volume from the drainage area to the chambers.

(f) Dimensions, material specifications and installation details for each post-construction stormwater management practice;

The proposed stormwater management practice to consist of subsurface chambers will be 45' in length x 19.2' in width, including the crushed stone installed around the perimeter of the chambers.

(g) Maintenance schedule to ensure continuous and effective operation of each post-construction stormwater management practice;

The maintenance schedule may be referenced on the drawings.

(h) Maintenance easements, if applicable, 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;

Maintenance easements are not required or proposed.

(i) Inspection and maintenance agreement binding on all subsequent landowners served by the on-site stormwater management practices in accordance with § 294-9 of this chapter;

Inspection and maintenance agreements would be made part of the approvals of the project.

(j) The SWPPP shall be prepared by a New York State licensed professional engineer, certified professional in erosion and sediment control (CPESC), or licensed landscape architect 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.
[Amended 9-22-2014 by L.L. No. 17-2014, effective 10-30-2014]

The SWPPP has been prepared by a professional engineer and landscape architect.

FIGURES

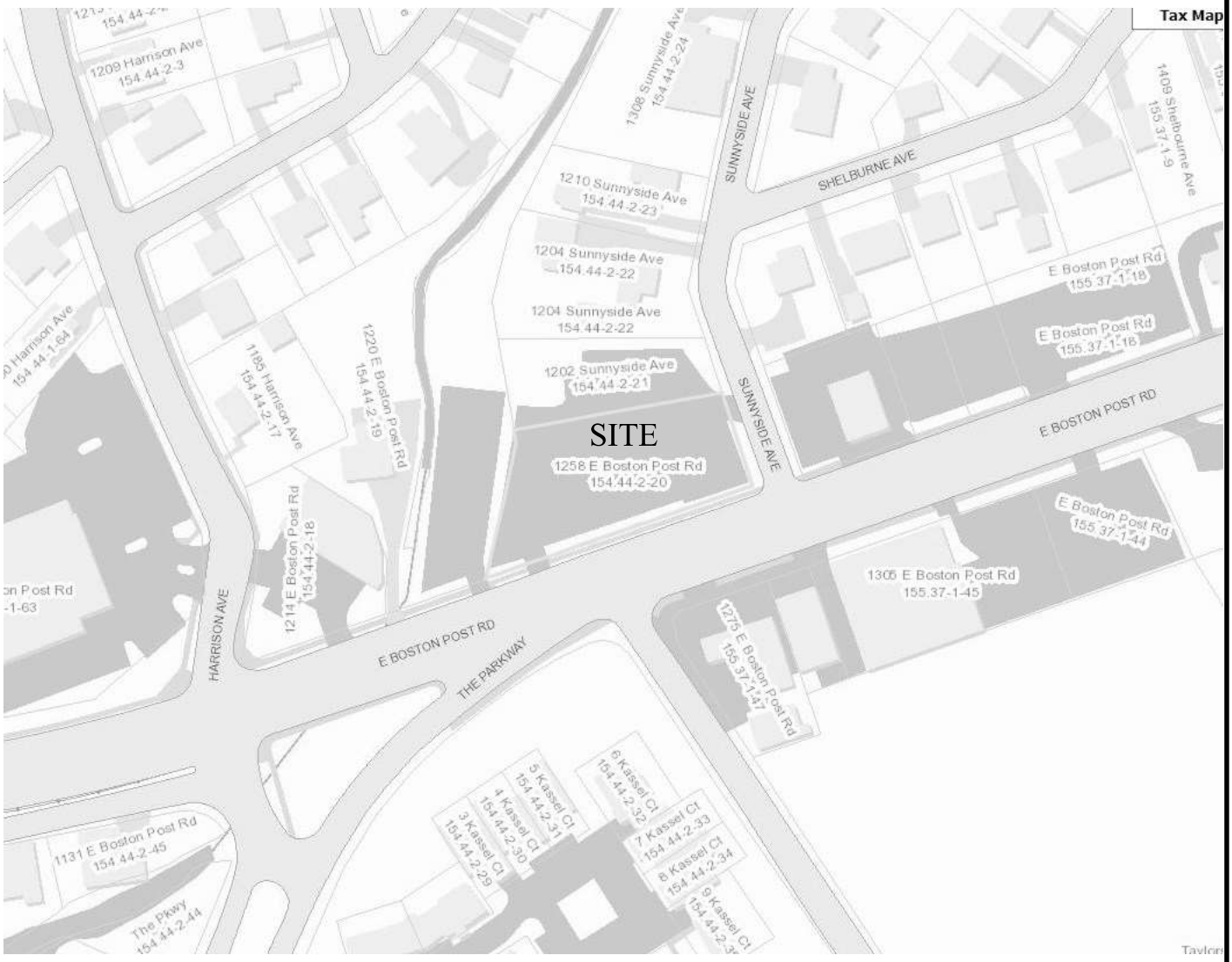
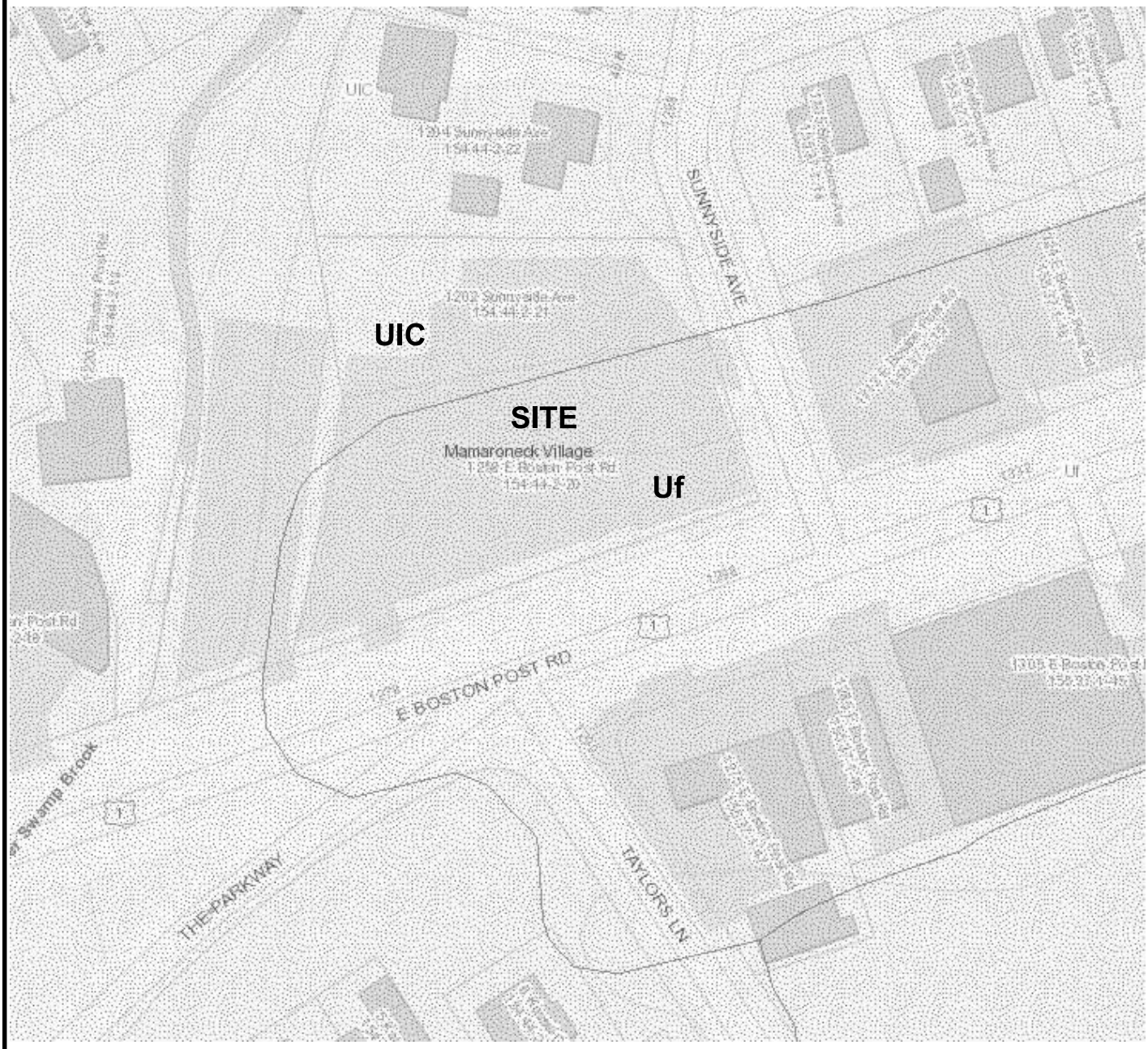


Figure 1

SITE LOCATION MAP

Scale: Not to Scale



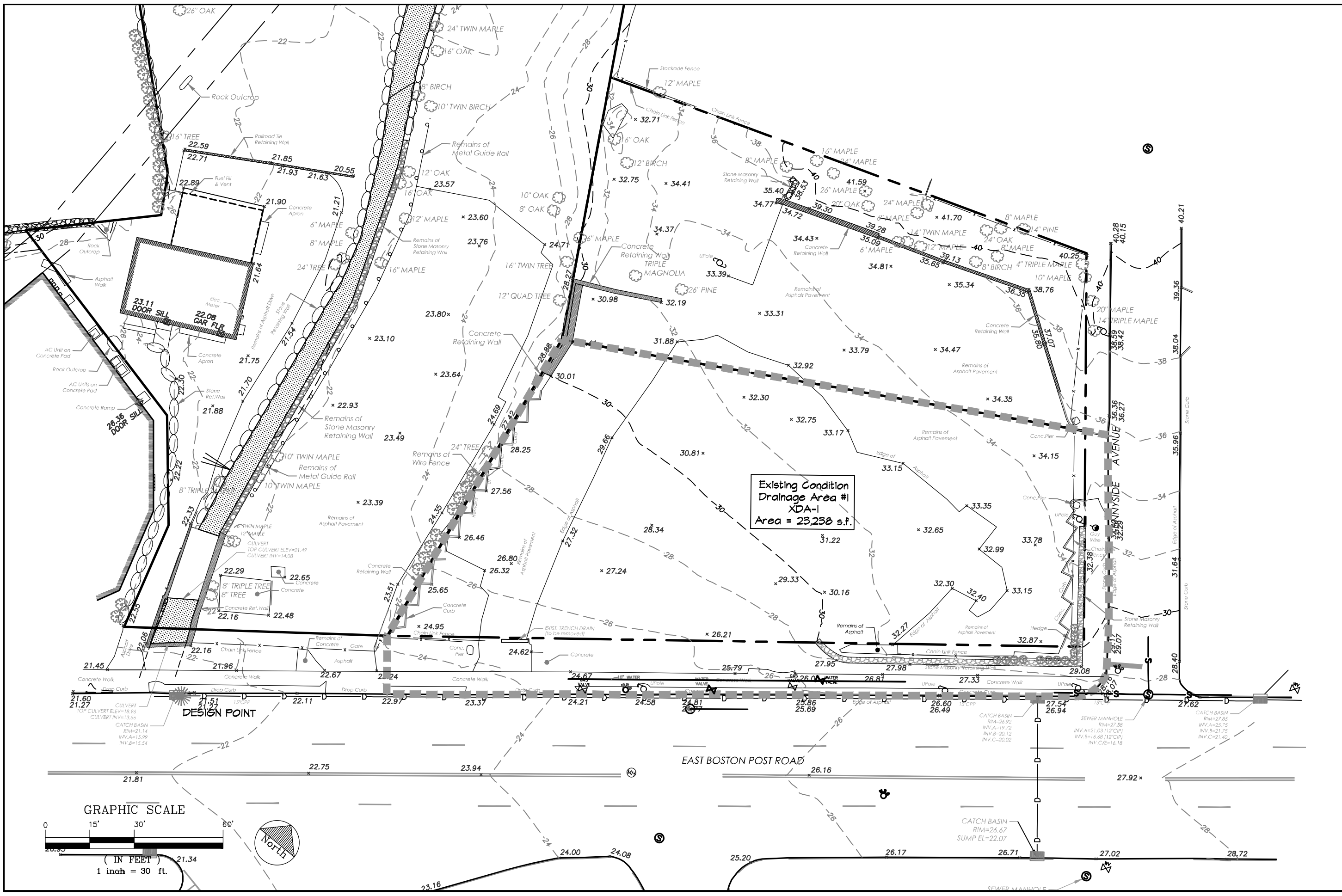
Uf—Urban land

UIC—Urban land-Charlton-Chatfield complex, rolling, very rocky

Figure 2

SOILS MAP

Scale: Not to Scale



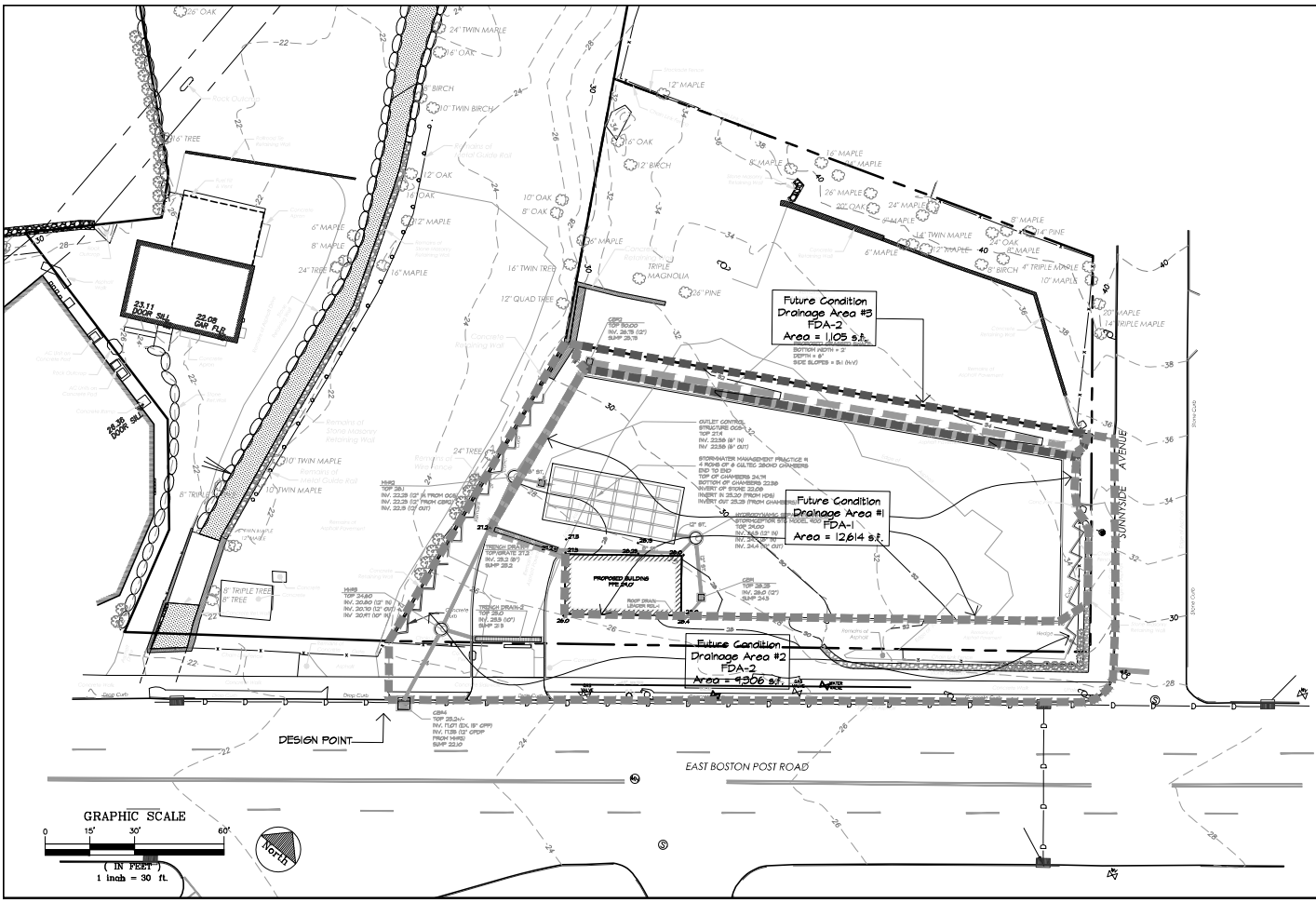
ENGINEER:
ALP ENGINEERING
AND LANDSCAPE ARCHITECTURE, PLLC
P.O. Box 843
Ridgefield, Connecticut 06877
Tel. (475) 215-5343 Cell (203) 710-0587

PROJECT NAME:
TOYOTA CITY
1258 East Boston Post Road
Village of Mamaroneck, New York

DRAWING TITLE:
Existing Conditions Drainage Area Map

Date: December 28, 2020
Dwn. by: alp
ID: 1258 E Boston Post Rd SITE_12-22-2020

Fig. 3



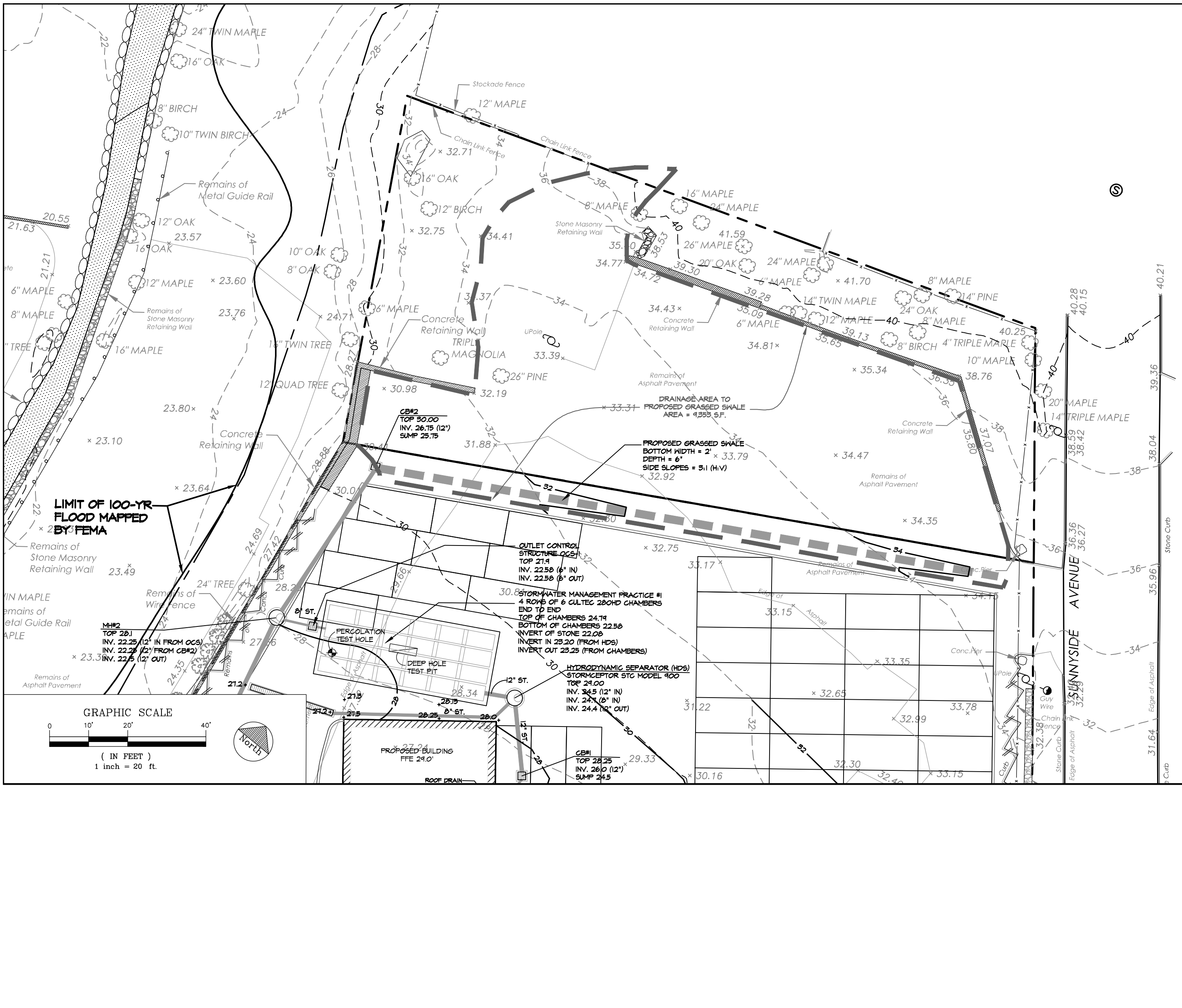
ENGINEER:
ALP ENGINEERING
ANDREW L. PRESTOPINO ARCHITECT/LDPE, PLLC
P.O. Box 843
Ridgefield, Connecticut 06877
Tel. (475) 215-5343 Cell (203) 710-0587

PROJECT NAME:
TOYOTA CITY
1258 East Boston Post Road
Village of Mamaroneck, New York

DRAWING TITLE:
Future Conditions Drainage Area Map

Date: October 7, 2021
Dwn. by: alp
ID:
1258 E Boston Post Rd SITE_09-29-2021

Fig. 4



ENGINEER:
ALP ENGINEERING
AND LANDSCAPE ARCHITECTURE, PLLC
P.O. Box 843
Ridgefield, Connecticut 06877
Tel. (475) 215-5343 Cell (203) 710-0587

PROJECT NAME:
TOYOTA CITY
1258 East Boston Post Road
Village of Mamaroneck, New York

DRAWING TITLE:
Drainage Area to Proposed Grassed Swale

Date: October 7, 2021
Dwn. by: alp
ID:
1258 E Boston Post Rd SITE_09-29-2021

Fig. 5

SUPPORTING DOCUMENTATION

Table 1
Toyota City - 1258 East Boston Post Road
Water Quality Volume Calculation

FDA-1 to SW Practice 12,614 sf total

	Area (sq feet)
Impervious Surfaces	11,057
Building Roofs	780
Lawn/Landscape, HSG B	777
TOTAL	12,614

WQv Calculator

Rainfall Depth =	1.5	inches
Drainage Area =	12,614	s.f.
Impervious Area =	11,837	s.f.
% Impervious =	93.8	%
Rv =	0.89	
WQv =	0.032	ac-feet
WQv =	1,410.5	cu feet

FDA-2 TO DESIGN POINT 9,306 sf total

	Area (sq feet)
Impervious Surfaces	1,562
Lawn/Landscape, HSG B	7,744
TOTAL	9,306

Table 2
Toyota City - 1258 East Boston Post Road
Design of Stormwater Management Facility

Stormwater Infiltration Facility

FDA-1	Consists of:	24	***Cultec 280HD chambers***
			Remarks
Vw, total volume in chambers	**1,735.9**	cubic feet	*As per calculation*
Height of Chambers, including stone =	**2.71**	feet	*Stone below chambers*
Bed Width =	**19.17**	feet	*As per design*
Bed Length =	**45.00**	feet	*As per design*
Bed Area =	**862.5**	sq feet	*As per design*
Side Surface Area =	**193.8**	sq feet	*Calculated*
Vp, Volume of percolation	**752.7**	cubic feet	*Calculated as bottom surface surface area x soil perc rate, Sr*
Plus volume captured in chambers	**830.5**	cubic feet	*Volume in chambers below invert elevation of lowest orifice*
Total volume captured and treated	**1,583.2**	cubic feet	*Sum*
Compare to WQv	**1,410.5**	cubic feet	

ALP ENGINEERING LANDSCAPE ARCHITECTURE, PLLC

P.O. Box 843, Ridgefield CT 06877

1258 EAST BOSTON POST ROAD, VILLAGE OF MAMARONECK
TEST DATA REQUIRED TO BE SUBMITTED WITH APPLICATION
DESCRIPTION OF SOILS ENCOUNTERED IN TEST HOLES

DEPTH	HOLE # 1	HOLE # _____	HOLE # _____	HOLE # _____
GROUND	SOIL (3")			
0'-6"				
1'-0"	FILL			
1'-6"	Sandy loam			
2'-0"	Some boulders			
2'-6"	Few brick			
3'-0"				
3'-6"				
4'-0"				
4'-6"				
5'-0"				
5'-6"				
6'-0"				
6'-6"				
7'-0"				
7'-6"				
8'-0"				
8'-6"				
G.W.	No groundwater			
ROCK	No bedrock			

TESTS MADE BY: Alan L. Pilch, PE, RLA DATE: May 14, 2021

NAME: ALP Engineering & Landscape Architecture, PLLC
ADDRESS: P.O. Box 843
Ridgefield, CT 06877

PERCOLATION TEST DATA SHEET

Test Performed by:
Alan L. Pilch, P.E., R.L.A., ALP Engineering & Landscape Architecture, PLLC
P.O. Box 843, Ridgefield, CT 06877

PROPERTY INFORMATION:

Owner: Toyota City

Address: 1258 East Boston Post Road Sec. _____
Block _____
Located at (Street): near Sunnyside Avenue Lot _____

Municipality Village of Mamaroneck
Watershed Beaver Swamp Brook Watershed

SOIL PERCOLATION TEST DATA:
Pre-soak performed on: 5/18/2021 at 12:30 pm
Percolation testing performed on: 5/19/2021

Hole #1	Clock Time				Percolation			
Hole Number	Run Number	Start Time	Stop Time	Elapsed Time (min.)	Depth of Water from Top of Casing		Drop in Inches	Soil Rate (inches per hour)
					Start In.'s	Stop In.'s		
1	1	2:05 PM	3:05 PM	60	6	19.5	13.5	13.50
	2	3:05 PM	4:05 PM	60	6	18	12	12.00
	3	4:05 PM	5:05 PM	60	6	17.5	11.5	11.50
	4	5:05 PM	6:05 PM	60	6	17	11	11.00

Hole #2	Clock Time				Percolation			
Hole Number	Run Number	Start Time	Stop Time	Elapsed Time (min.)	Depth of Water from Top of Casing		Drop in Inches	Soil Rate (inches per hour)
					Start In.'s	Stop In.'s		
2	1							
	2							
	3							
	4							

Procedure:
Pre-soak: Fill casing with clean water to a depth of 24" and allow pre-soak for 24 hrs.
Percolation Test: Refill casing with another 24" of clean water and monitor water level (measured from top of the casing) for one hour. Repeat this procedure (filling the casing each time) three additional times, for a total of four observations. Soil rate is the rate achieved at the fourth run.
The final rate shall be reported in inches per hour.
Casing size: Diameter 4", length 30"

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	No
State	New York
Location	
Longitude	73.719 degrees West
Latitude	40.954 degrees North
Elevation	0 feet
Date/Time	Fri, 13 Nov 2020 12:58:10 -0500

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.34	0.52	0.63	0.85	1.05	1.26	**1yr**	0.90	1.23	1.48	1.92	2.38	2.86	3.22	**1yr**	2.53	3.09	3.58	4.31	4.94	**1yr**
2yr	0.40	0.62	0.77	1.04	1.28	1.53	**2yr**	1.11	1.50	1.75	2.26	2.81	3.45	3.87	**2yr**	3.05	3.72	4.27	5.08	5.75	**2yr**
5yr	0.47	0.73	0.91	1.25	1.59	1.89	**5yr**	1.37	1.85	2.16	2.80	3.49	4.32	4.89	**5yr**	3.82	4.70	5.45	6.39	7.13	**5yr**
10yr	0.54	0.83	1.03	1.44	1.86	2.22	**10yr**	1.61	2.17	2.54	3.29	4.12	5.12	5.84	**10yr**	4.53	5.62	6.56	7.60	8.39	**10yr**
25yr	0.65	0.99	1.23	1.76	2.31	2.75	**25yr**	2.00	2.68	3.14	4.08	5.13	6.41	7.40	**25yr**	5.68	7.11	8.37	9.57	10.40	**25yr**
50yr	0.74	1.13	1.41	2.03	2.73	3.23	**50yr**	2.35	3.15	3.70	4.81	6.06	7.61	8.84	**50yr**	6.73	8.50	10.08	11.39	12.25	**50yr**
100yr	0.86	1.30	1.62	2.35	3.22	3.80	**100yr**	2.78	3.71	4.35	5.69	7.17	9.03	10.58	**100yr**	7.99	10.17	12.14	13.57	14.42	**100yr**
200yr	0.99	1.49	1.88	2.72	3.80	4.47	**200yr**	3.28	4.37	5.11	6.72	8.48	10.73	12.65	**200yr**	9.49	12.17	14.63	16.16	16.99	**200yr**
500yr	1.20	1.78	2.29	3.33	4.74	5.56	**500yr**	4.09	5.43	6.35	8.40	10.59	13.48	16.04	**500yr**	11.93	15.43	18.73	20.38	21.10	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.27	0.41	0.50	0.68	0.83	0.89	**1yr**	0.72	0.87	1.32	1.56	1.94	2.57	2.88	**1yr**	2.28	2.77	3.25	3.87	4.53	**1yr**
2yr	0.39	0.61	0.75	1.01	1.25	1.50	**2yr**	1.08	1.47	1.71	2.19	2.75	3.35	3.76	**2yr**	2.97	3.61	4.14	4.92	5.60	**2yr**
5yr	0.44	0.68	0.84	1.15	1.46	1.77	**5yr**	1.26	1.73	2.01	2.60	3.26	4.02	4.54	**5yr**	3.56	4.37	5.05	5.93	6.68	**5yr**
10yr	0.48	0.74	0.92	1.29	1.66	2.00	**10yr**	1.43	1.96	2.27	2.96	3.70	4.62	5.22	**10yr**	4.09	5.02	5.87	6.75	7.61	**10yr**
25yr	0.54	0.82	1.01	1.45	1.91	2.36	**25yr**	1.65	2.30	2.67	3.47	4.38	5.53	6.28	**25yr**	4.89	6.03	7.18	8.01	9.05	**25yr**
50yr	0.58	0.88	1.09	1.57	2.12	2.66	**50yr**	1.83	2.60	3.03	3.93	4.97	6.34	7.22	**50yr**	5.61	6.94	8.38	9.06	10.32	**50yr**
100yr	0.63	0.95	1.19	1.72	2.36	2.99	**100yr**	2.03	2.92	3.44	4.46	5.66	7.26	8.29	**100yr**	6.43	7.97	9.77	10.27	11.77	**100yr**
200yr	0.69	1.03	1.31	1.90	2.64	3.38	**200yr**	2.28	3.30	3.92	5.06	6.46	8.34	9.54	**200yr**	7.38	9.17	11.42	11.63	13.45	**200yr**
500yr	0.77	1.15	1.48	2.15	3.05	3.99	**500yr**	2.63	3.90	4.66	6.05	8.25	10.00	11.49	**500yr**	8.85	11.05	14.05	13.67	16.04	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.37	0.57	0.70	0.94	1.16	1.38	**1yr**	1.00	1.35	1.61	2.13	2.62	3.13	3.51	**1yr**	2.77	3.38	3.84	4.65	5.27	**1yr**
2yr	0.43	0.66	0.81	1.10	1.35	1.60	**2yr**	1.17	1.57	1.83	2.37	2.94	3.56	4.02	**2yr**	3.15	3.87	4.41	5.30	5.95	**2yr**
5yr	0.51	0.79	0.98	1.35	1.72	2.02	**5yr**	1.48	1.97	2.34	3.00	3.74	4.62	5.26	**5yr**	4.09	5.06	5.86	6.85	7.61	**5yr**
10yr	0.61	0.94	1.16	1.62	2.09	2.42	**10yr**	1.81	2.37	2.85	3.63	4.53	5.64	6.47	**10yr**	4.99	6.22	7.27	8.42	9.20	**10yr**
25yr	0.77	1.17	1.46	2.08	2.74	3.11	**25yr**	2.36	3.04	3.71	4.69	5.83	7.33	8.50	**25yr**	6.49	8.17	9.67	11.08	11.82	**25yr**
50yr	0.91	1.39	1.73	2.49	3.35	3.75	**50yr**	2.89	3.67	4.53	5.69	7.06	8.96	10.45	**50yr**	7.93	10.05	12.00	13.65	14.28	**50yr**
100yr	1.10	1.66	2.07	3.00	4.11	4.54	**100yr**	3.55	4.44	5.51	6.92	8.54	10.93	12.87	**100yr**	9.68	12.37	14.88	16.80	17.27	**100yr**
200yr	1.31	1.97	2.50	3.62	5.04	5.49	**200yr**	4.35	5.36	6.73	8.41	10.35	13.35	15.85	**200yr**	11.81	15.24	18.46	20.71	20.87	**200yr**
500yr	1.68	2.50	3.21	4.67	6.64	7.04	**500yr**	5.73	6.88	8.75	10.89	13.27	17.39	20.88	**500yr**	15.39	20.08	24.53	27.34	26.81	**500yr**

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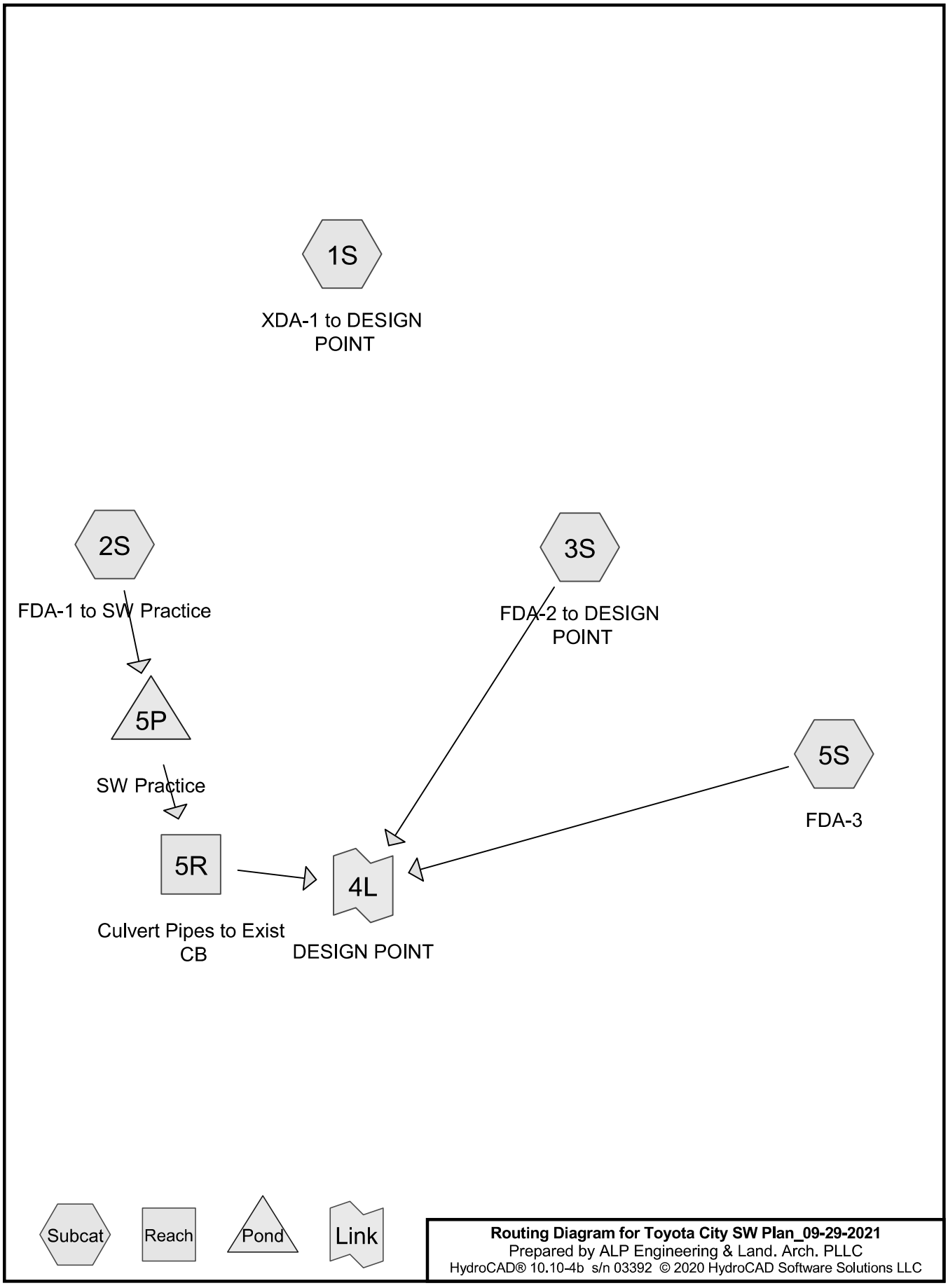
Appendix A

Stormwater Management Report
Hydrographs and Routings


1S
XDA-1 to DESIGN POINT
2S
FDA-1 to SW Practice
3S
FDA-2 to DESIGN POINT
5P
SW Practice
5S
FDA-3
5R
Culvert Pipes to Exist CB
4L
DESIGN POINT
Subcat
Reach
Pond
Link
Routing Diagram for Toyota City SW Plan_09-29-2021
Prepared by ALP Engineering & Land. Arch. PLLC
HydroCAD® 10.10-4b s/n 03392 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-year	Type III 24-hr		Default	24.00	1	2.86	2
2	10-year	Type III 24-hr		Default	24.00	1	5.12	2
3	25-year	Type III 24-hr		Default	24.00	1	6.41	2
4	100-year	Type III 24-hr		Default	24.00	1	9.03	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.237	69	50-75% Grass cover, Fair, HSG B (1S)
0.314	61	>75% Grass cover, Good, HSG B (1S, 2S, 3S, 5S)
0.492	98	Paved parking, HSG B (1S, 2S, 3S)
0.018	98	Roofs, HSG B (2S)
1.062	**81**	**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.237	0.000	0.000	0.000	0.237	50-75% Grass cover, Fair	1S
0.000	0.314	0.000	0.000	0.000	0.314	>75% Grass cover, Good	1S, 2S, 3S, 5S
0.000	0.492	0.000	0.000	0.000	0.492	Paved parking	1S, 2S, 3S
0.000	0.018	0.000	0.000	0.000	0.018	Roofs	2S
0.000	**1.062**	**0.000**	**0.000**	**0.000**	**1.062**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: XDA-1 to DESIGN Runoff Area=23,238 sf 38.01% Impervious Runoff Depth=1.09"
Tc=6.0 min CN=79 Runoff=0.66 cfs 0.048 af

Subcatchment 2S: FDA-1 to SW Practice Runoff Area=12,614 sf 93.84% Impervious Runoff Depth=2.41"
Tc=6.0 min CN=96 Runoff=0.77 cfs 0.058 af

Subcatchment 3S: FDA-2 to DESIGN POINT Runoff Area=9,306 sf 16.78% Impervious Runoff Depth=0.52"
Tc=6.0 min CN=67 Runoff=0.10 cfs 0.009 af

Subcatchment 5S: FDA-3 Runoff Area=1,105 sf 0.00% Impervious Runoff Depth=0.31"
Tc=6.0 min CN=61 Runoff=0.00 cfs 0.001 af

Reach 5R: Culvert Pipes to Exist CB Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
12.0" Round Pipe n=0.012 L=141.0' S=0.0305 '/' Capacity=6.74 cfs Outflow=0.00 cfs 0.000 af

Pond 5P: SW Practice Peak Elev=23.44' Storage=787 cf Inflow=0.77 cfs 0.058 af
Discarded=0.10 cfs 0.058 af Primary=0.00 cfs 0.000 af Outflow=0.10 cfs 0.058 af

Link 4L: DESIGN POINT Inflow=0.10 cfs 0.010 af
Primary=0.10 cfs 0.010 af

Total Runoff Area = 1.062 ac Runoff Volume = 0.116 af Average Runoff Depth = 1.32"
51.94% Pervious = 0.552 ac 48.06% Impervious = 0.510 ac

Summary for Subcatchment 1S: XDA-1 to DESIGN POINT

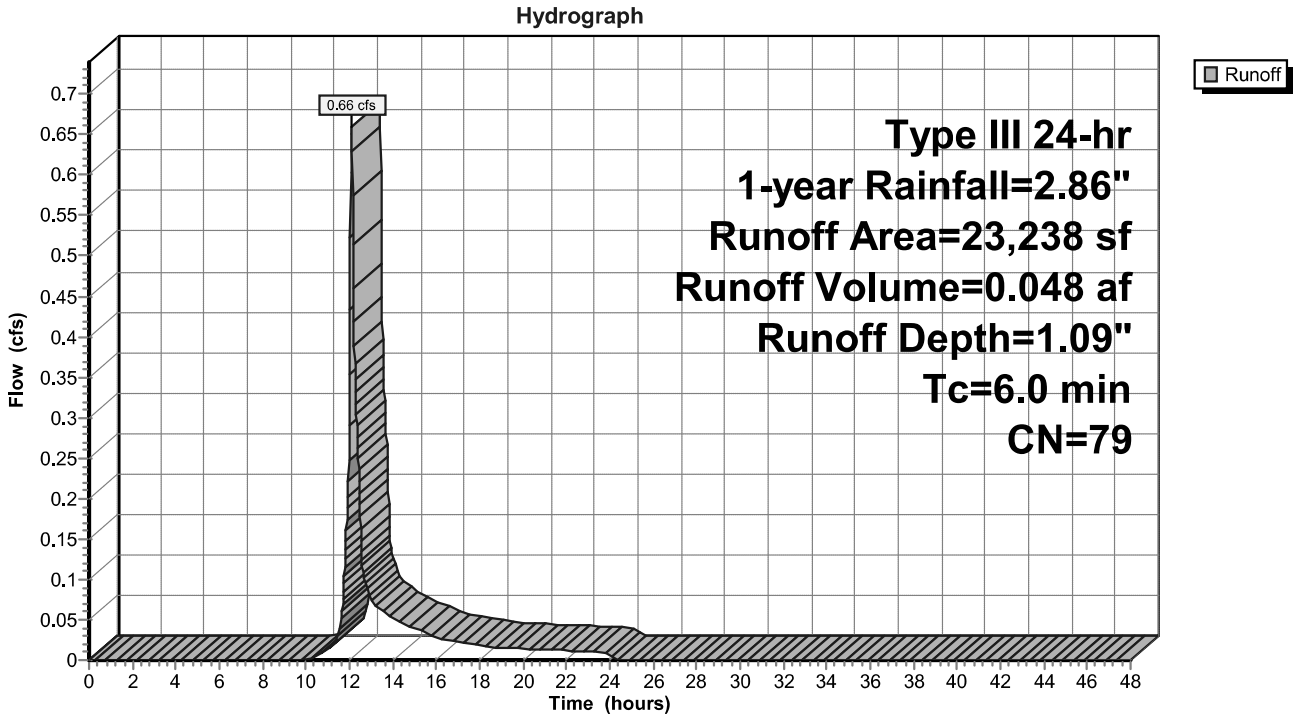
Runoff = 0.66 cfs @ 12.09 hrs, Volume= 0.048 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-year Rainfall=2.86"

Area (sf)	CN	Description
8,833	98	Paved parking, HSG B
10,339	69	50-75% Grass cover, Fair, HSG B
4,066	61	>75% Grass cover, Good, HSG B
23,238	79	Weighted Average
14,405		61.99% Pervious Area
8,833		38.01% Impervious Area

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

Subcatchment 1S: XDA-1 to DESIGN POINT



Summary for Subcatchment 2S: FDA-1 to SW Practice

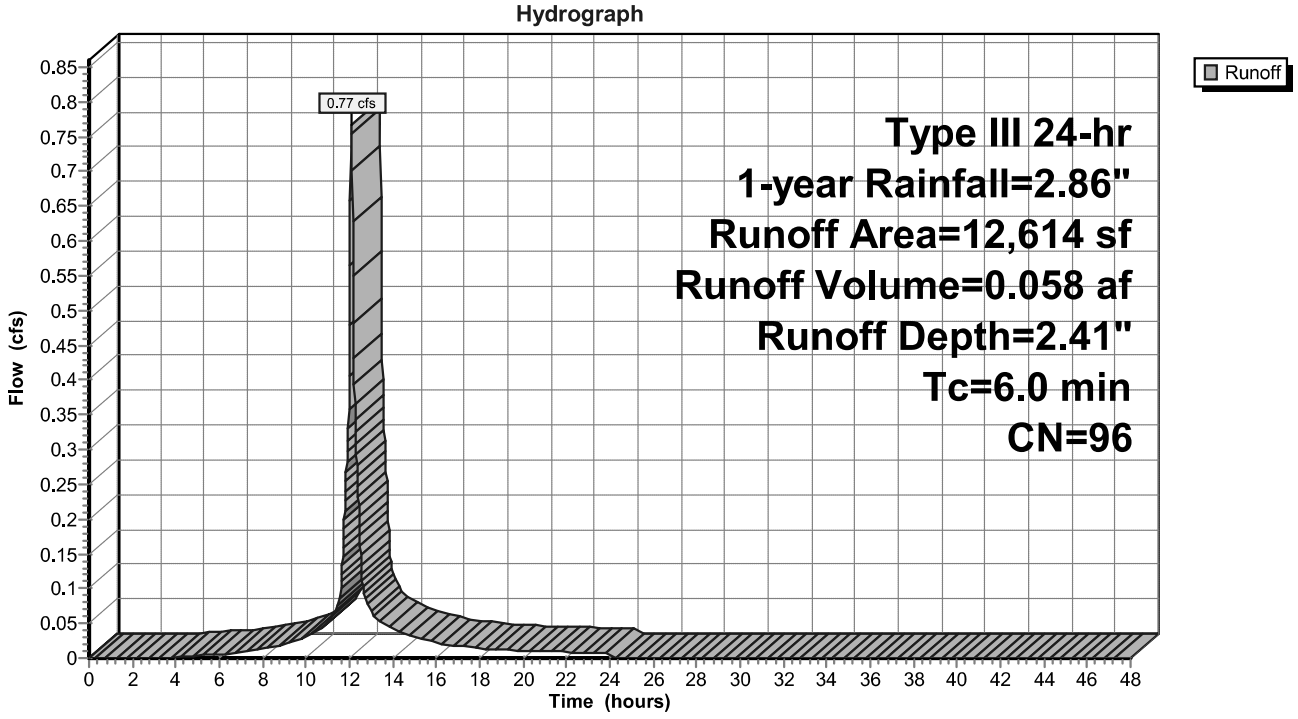
Runoff = 0.77 cfs @ 12.08 hrs, Volume= 0.058 af, Depth= 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-year Rainfall=2.86"

Area (sf)	CN	Description
11,057	98	Paved parking, HSG B
780	98	Roofs, HSG B
777	61	>75% Grass cover, Good, HSG B
12,614	96	Weighted Average
777		6.16% Pervious Area
11,837		93.84% Impervious Area

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

Subcatchment 2S: FDA-1 to SW Practice



Summary for Subcatchment 3S: FDA-2 to DESIGN POINT

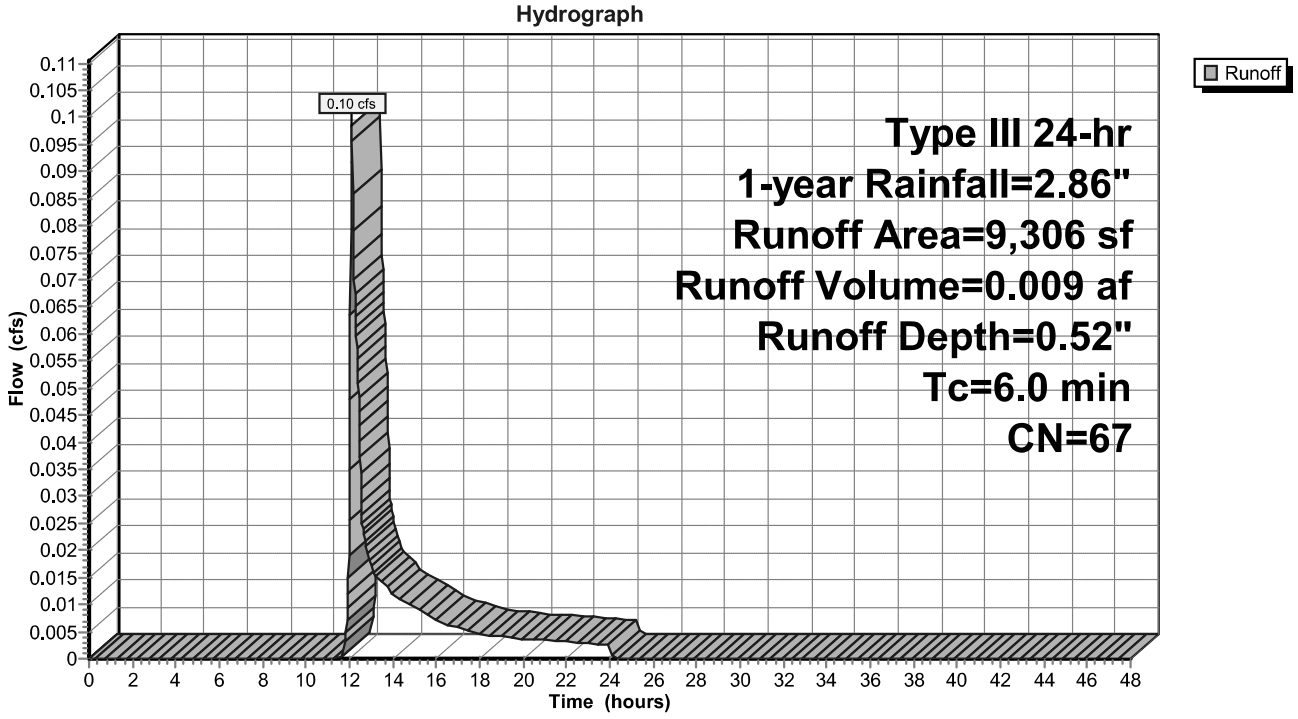
Runoff = 0.10 cfs @ 12.11 hrs, Volume= 0.009 af, Depth= 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-year Rainfall=2.86"

Area (sf)	CN	Description
1,562	98	Paved parking, HSG B
7,744	61	>75% Grass cover, Good, HSG B
9,306	67	Weighted Average
7,744		83.22% Pervious Area
1,562		16.78% Impervious Area

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

Subcatchment 3S: FDA-2 to DESIGN POINT



Summary for Subcatchment 5S: FDA-3

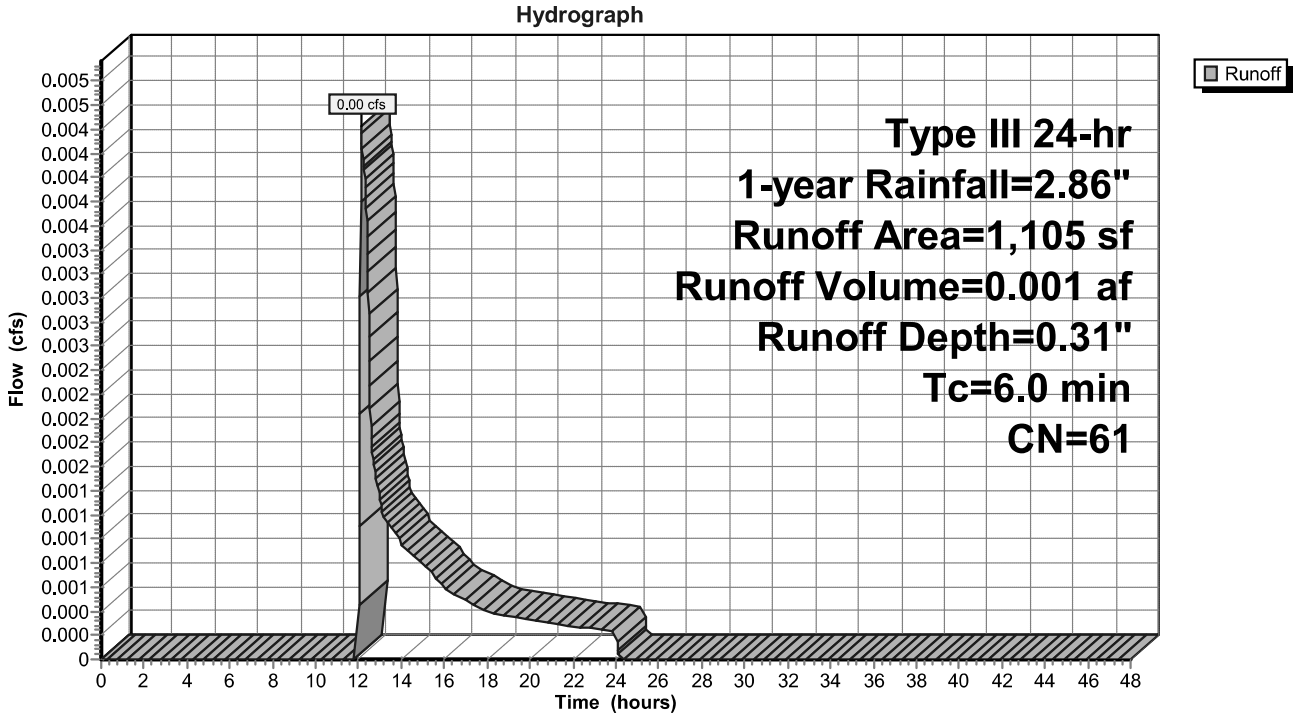
Runoff = 0.00 cfs @ 12.14 hrs, Volume= 0.001 af, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 1-year Rainfall=2.86"

Area (sf)	CN	Description
1,105	61	>75% Grass cover, Good, HSG B
1,105		100.00% Pervious Area

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

Subcatchment 5S: FDA-3



Summary for Reach 5R: Culvert Pipes to Exist CB

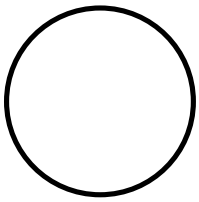
[52] Hint: Inlet/Outlet conditions not evaluated

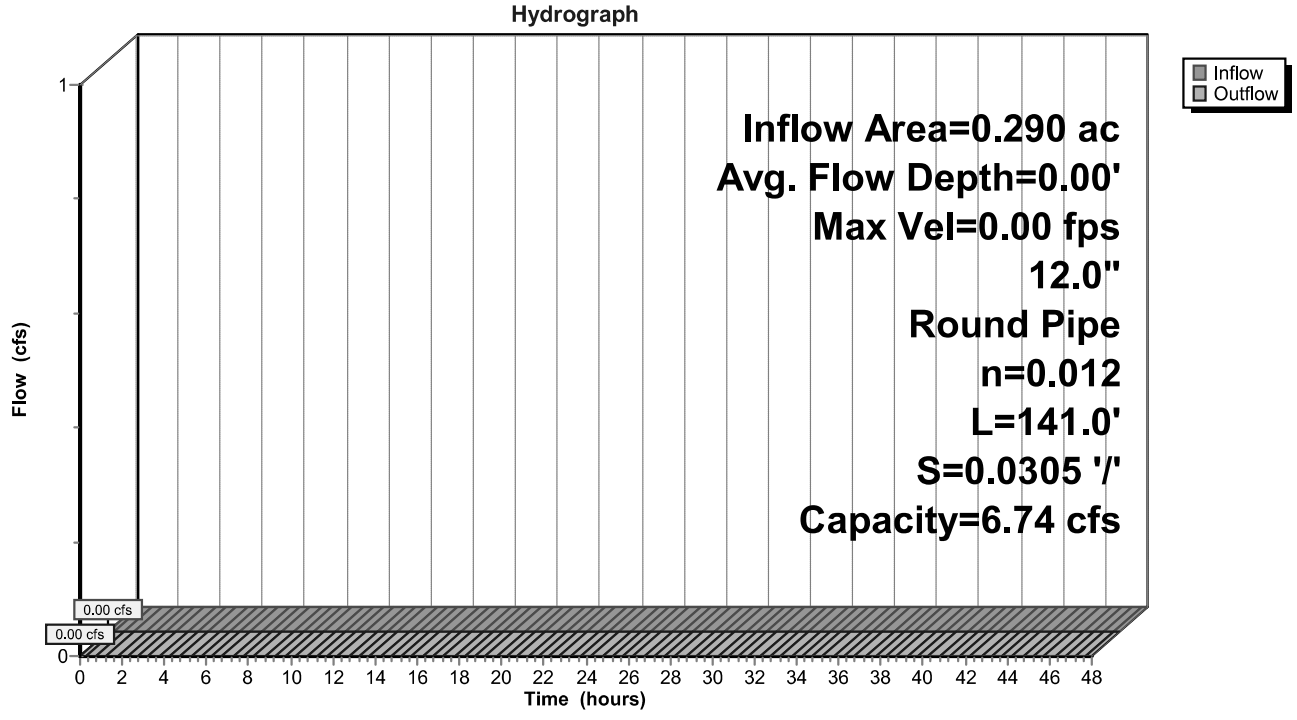
Inflow Area = 0.290 ac, 93.84% Impervious, Inflow Depth = 0.00" for 1-year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

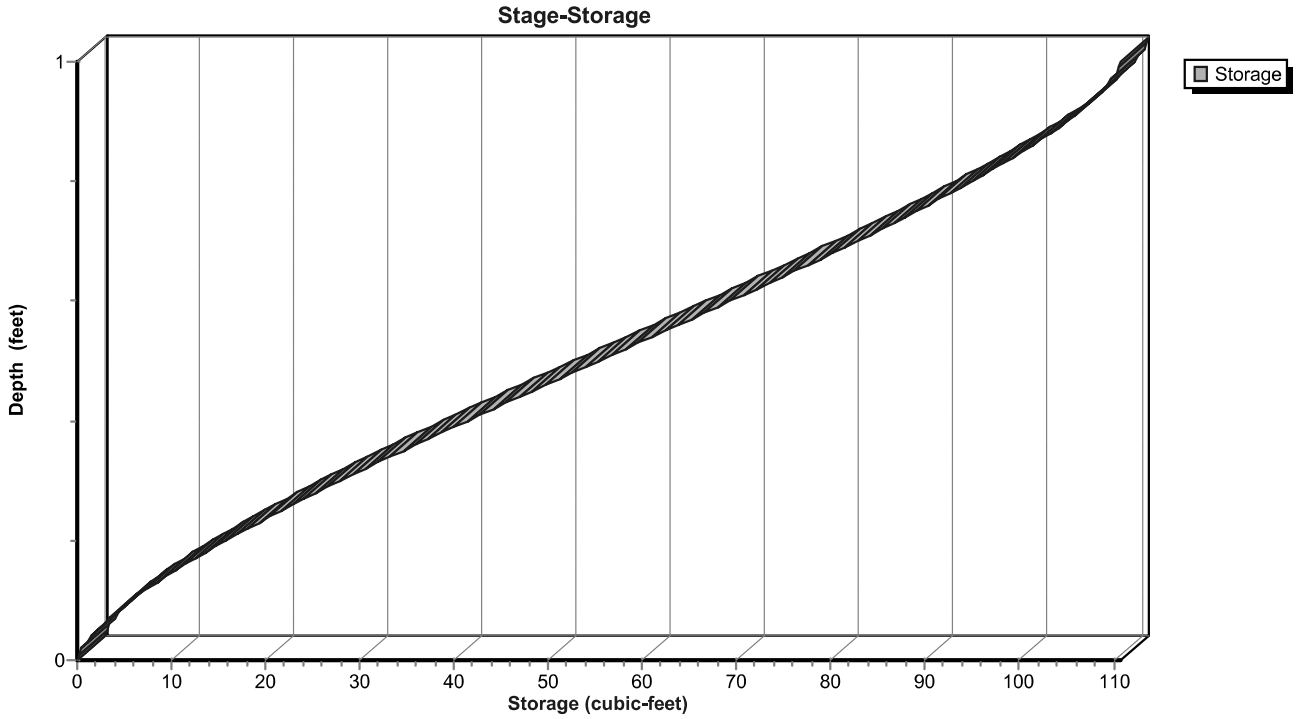
Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.74 cfs

12.0" Round Pipe
n= 0.012
Length= 141.0' Slope= 0.0305 '/'
Inlet Invert= 21.80', Outlet Invert= 17.50'





Reach 5R: Culvert Pipes to Exist CB



Summary for Pond 5P: SW Practice

Inflow Area = 0.290 ac, 93.84% Impervious, Inflow Depth = 2.41" for 1-year event
Inflow = 0.77 cfs @ 12.08 hrs, Volume= 0.058 af
Outflow = 0.10 cfs @ 11.64 hrs, Volume= 0.058 af, Atten= 87%, Lag= 0.0 min
Discarded = 0.10 cfs @ 11.64 hrs, Volume= 0.058 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Peak Elev= 23.44' @ 12.62 hrs Surf.Area= 863 sf Storage= 787 cf

Plug-Flow detention time= 50.6 min calculated for 0.058 af (100% of inflow)
Center-of-Mass det. time= 50.6 min (827.9 - 777.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.08'	689 cf	**19.17'W x 45.00'L x 3.21'H Field A** 2,767 cf Overall - 1,044 cf Embedded = 1,723 cf x 40.0% Voids
#2A	22.58'	1,044 cf	**Cultec R-280HD** x 24 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 4 rows
		1,733 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	22.58'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.58' / 22.25' S= 0.1100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	23.50'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	24.25'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	25.00'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#5	Discarded	22.08'	**5.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.10 cfs @ 11.64 hrs HW=22.11' (Free Discharge)
└**5=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.08' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)
  ├**2=Orifice/Grate** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: SW Practice - Chamber Wizard Field A

Chamber Model = Cultec R-280HD (Cultec Recharger® 280HD)
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
Row Length Adjustment= +1.00' x 6.07 sf x 4 rows

47.0" Wide + 6.0" Spacing = 53.0" C-C Row Spacing

6 Chambers/Row x 7.00' Long +1.00' Row Adjustment = 43.00' Row Length +12.0" End Stone x 2 = 45.00' Base Length
4 Rows x 47.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 19.17' Base Width
6.0" Stone Base + 26.5" Chamber Height + 6.0" Stone Cover = 3.21' Field Height

24 Chambers x 42.5 cf +1.00' Row Adjustment x 6.07 sf x 4 Rows = 1,044.3 cf Chamber Storage

2,767.2 cf Field - 1,044.3 cf Chambers = 1,722.8 cf Stone x 40.0% Voids = 689.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,733.5 cf = 0.040 af
Overall Storage Efficiency = 62.6%
Overall System Size = 45.00' x 19.17' x 3.21'

24 Chambers
102.5 cy Field
63.8 cy Stone