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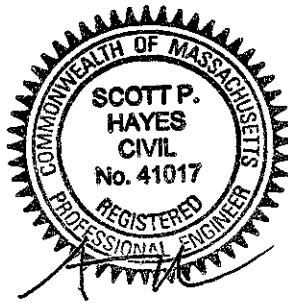
STORMWATER MANAGEMENT PLAN REPORT

FOR

Construction of a Dwelling

**LOT 2 HARVARD ROAD
Stow, Massachusetts**

Assessors Map R-09 Parcel 38



October 28, 2022

Rev. 12/30/22

Prepared for:
John Giordano
30 Heritage Lane
Stow, Massachusetts 01775

Prepared by:
FORESITE Engineering Associates, Inc.
16 Gleasondale Road, Suite 1-1
Stow, Massachusetts 01775

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I. Introduction

Lot 2 Harvard Road is an undeveloped 40,771 sq.ft. residential lot on the north side of Harvard Road between existing house numbers 137 Harvard Road and 153 Harvard Road, immediately south of Wedgewood Pines Golf Course, Hole 5 fairway. The site is wooded with areas of underbrush, surface stones and exposed rock. The development proposal consists of construction of a single-family dwelling, driveway, sewage disposal system, and drainage improvements to mitigate storm water impacts from development. Drainage is currently southerly toward Harvard Road. The site drainage area in this analysis has been separated to distinguish that portion of the site that drains off site southwesterly directly to abutting property at 153 Harvard Road from that portion of the site that drains directly to Harvard Road to evaluate drainage impacts to these areas independently. Clearing, grading, construction and landscaping activities affect off-site drainage characteristics and require evaluation and mitigation for compliance with Stow Zoning Bylaw Section 3.8.1.9.

The extents of the lot have been established as the study area. The United States Natural Resources Conservation Service (NRCS) as Charlton-Hollis Rock Outcrop series, 15-25% slopes (103D). The unit consists of well drained Charlton soils, somewhat excessively drained Hollis soils, and rock outcroppings. Soil conditions were verified in the field with test holes conducted by a Massachusetts Licensed Soil Evaluator. Field investigations were conducted to confirm soil conditions and estimated seasonal high groundwater conditions on the site.

The development proposal involves site clearing, grading, and construction of a single-family dwelling and associated site improvements (sewage disposal system, driveway, roof runoff infiltration bed, installation of water supply well and other service utilities, and associated grading and landscaping). Development of the site results in disturbance of approximately 26,000 sq.ft. of site area. These alterations, unmitigated, would increase the rate and volume of runoff from the site to abutting property and to Harvard Road. To mitigate impacts of site alteration, a roof chamber drywell system is proposed to manage roof runoff and a trap rock basin is proposed to further mitigate surface runoff from yard and driveway areas. By limiting grade and surface cover changes of the site, existing drainage patterns are not substantially altered by proposed lot development. Utilization of the chamber drywell system and trap rock basin act to effectively reduce runoff rates and manage runoff volume from development of the site.

Erosion and sediment from construction activities are mitigated by installation of staked fiber roll or straw wattle erosion control barriers along the down-gradient work limits for erosion control, and HDPE construction fencing to demark the upgradient limit of work. A stabilized crushed stone construction entrance is proposed to be installed at the site driveway access point during construction to prevent

tracking of sediments onto Harvard Road. Additionally, the proposed trap rock basin at the driveway entrance will be utilized for temporary sedimentation during construction and haybale check dams will be utilized throughout the site for control of runoff and sedimentation during construction until site stabilization is complete.

II. Methodology & References

Methodology:

SCS TR-55 & SCS TR-20 utilizing HydroCAD (v 8.0) software.

References:

A Guide to Hydrologic Analysis Using SCS Methods, Richard McCuen, copyright 1982, Prentice Hall, Inc.

Natural Resources Conservation Service (NRCS), Web Soil Survey

Soil Survey of Middlesex County, Massachusetts, published by NRCS

USGS Quadrangle Hudson, Massachusetts, 1987

Rawl (1982) Infiltration Rates

III. Results

The study area consists of the project site area. Though the entirety of the site ultimately drains to Harvard Road, the western portion drains off-site to abutting property at 153 Harvard Road (Sub 1S) prior to following the natural drainage pattern to Harvard Road, so therefore has been evaluated separately from that portion of the site that drains directly to Harvard Road (Sub 2S).

Under proposed (post-development) conditions the same study area is broken down into subcatchment areas that drain to each of the off-site areas evaluated under pre-development conditions. The proposed roof area (Sub 3S) is separated into a separate subcatchment that is directed to the modeled subsurface roof chamber system (Pond 10P) which has been sized to detain a substantial portion of the post-development runoff. The proposed yard and driveway drainage is directed to an on-site trap rock basin (Pond 11P) at the driveway entrance to further control the rate of runoff to Harvard Road. Drainage to the street following implementation of these mitigating measures is represented in the calculations as Reach 51R. The portion of the site that drains off-site to 153 Harvard Road (Sub 1S) is not proposed to be altered by development activity, there is no change to off-site rates or volumes of runoff to this area as a result of development of this lot.

Table 1 below shows the key to each off-site area analyzed as referenced in the HydroCAD calculations in Appendix H and shows which pre-development areas are compared to which post-development areas for evaluation of the effectiveness of the storm water mitigation proposed.

TABLE 1

PRE-DEVELOPMENT & POST-DEVELOPMENT COMPARISON AREAS

<u>DESCRIPTION</u>	<u>PRE</u>	<u>POST</u>
OFF SITE WEST TO 153 HARVARD RD	1S	1S
OFF SITE SOUTH TO HARVARD RD	2S	51R

The off-site areas were analyzed for rate and volume of runoff under existing conditions for the 2-yr, 10-yr and 100-yr, 24-hr design storms and the results are shown in Table 2. Under post-development conditions increases in runoff from site development are controlled through implementation of the stormwater Best Management Practices (BMP's). Comparison of the off-site rates and volumes of runoff under pre-development conditions to the off-site runoff to the same areas under post-development conditions illustrates the effectiveness of the systems. The results in Table 2 show that off-site runoff rates are effectively maintained or reduced following development of the site by the proposed drainage improvements and there will be no increase in downstream flooding impacts from development of the site for a 100-yr design storm.

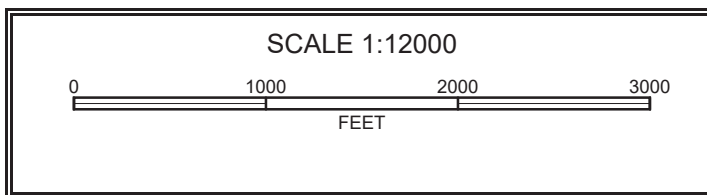
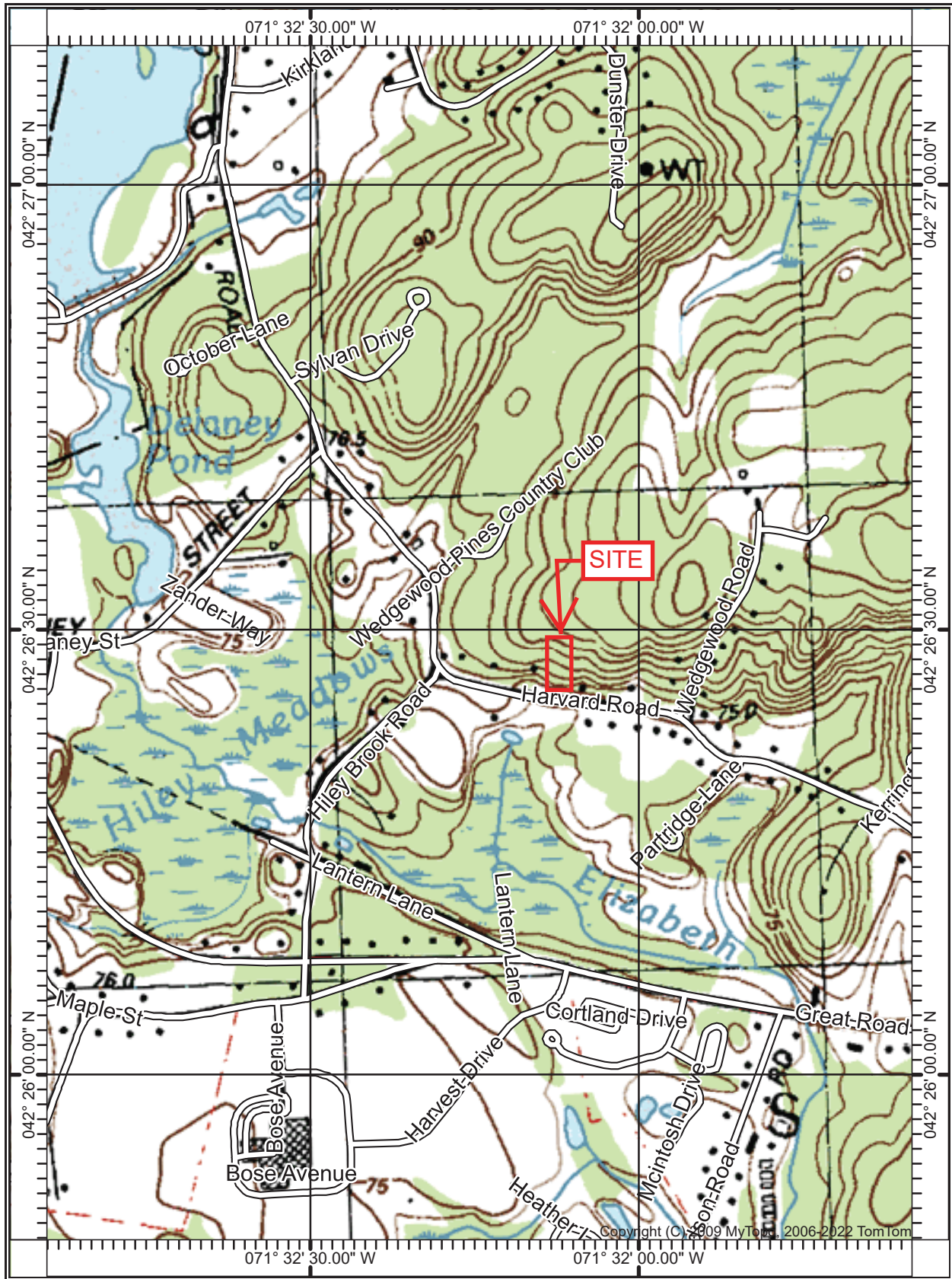
TABLE 2

PRE-DEVELOPMENT & POST-DEVELOPMENT RATES AND VOLUMES

2-YR DESIGN STORM	PRE-DEVELOPMENT		POST-DEVELOPMENT	
	Q (cfs)	V (cubic ft)	Q (cfs)	V (cubic ft)
Off-site West (1S/1S)	0.12	451	0.12	451
Off-site South (2S/51R)	0.15	946	0.04	681
10-YR DESIGN STORM	PRE-DEVELOPMENT		POST-DEVELOPMENT	
	Q (cfs)	V (cubic ft)	Q (cfs)	V (cubic ft)
Off-site West (1S/1S)	0.30	1,031	0.30	1,031
Off-site South (2S/51R)	0.79	2,951	0.52	2,902
100-YR DESIGN STORM	PRE-DEVELOPMENT		POST-DEVELOPMENT	
	Q (cfs)	V (cubic ft)	Q (cfs)	V (cubic ft)
Off-site West (1S/1S)	0.80	2,719	0.80	2,719
Off-site South (2S/51R)	2.93	9,898	2.89	10,753

Conclusions

The calculations demonstrate that the proposed drainage mitigation at Lot 2 Harvard Road adequately controls rate and volume of runoff from the site following development. The stormwater and erosion control mitigation proposed demonstrate that development of this lot meets the requirements of Zoning Bylaw Section 3.8.1.9.



Soil Map—Middlesex County, Massachusetts



71° 32' 15" W



Map Scale: 1:3,430 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

71° 31' 42" W

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	1.1	1.9%
51A	Swansea muck, 0 to 1 percent slopes	0.0	0.0%
73B	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	0.2	0.3%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	3.8	6.8%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	7.1	12.7%
103D	Charlton-Hollis-Rock outcrop complex, 15 to 25 percent slopes	17.3	30.9%
253B	Hinckley loamy sand, 3 to 8 percent slopes	5.9	10.5%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	12.0	21.5%
256B	Deerfield loamy fine sand, 3 to 8 percent slopes	3.5	6.2%
302C	Montauk fine sandy loam, 8 to 15 percent slopes, extremely stony	3.7	6.7%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	1.3	2.4%
Totals for Area of Interest		55.8	100.0%

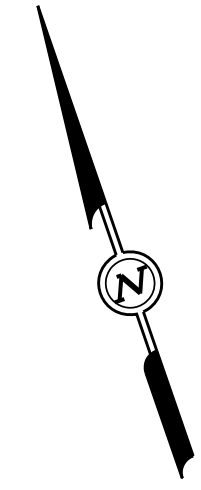
Table D.13.1 Hydrologic Soil Properties Classified by Soil Texture*

Texture Class	Effective Water Capacity (C_w) (inch per inch)	Minimum Infiltration Rate (f) (inches per hour)	Hydrologic Soil Grouping
Sand	0.35	8.27	A
Loamy Sand	0.31	2.41	A
Sandy Loam	0.25	1.02	A
Loam	0.19	0.52	B
Silt Loam	0.17	0.27	B
Sandy Clay Loam	0.14	0.17	C
Clay Loam	0.14	0.09	D
Silty Clay Loam	0.11	0.06	D
Sandy Clay	0.09	0.05	D
Silty Clay	0.09	0.04	D
Clay	0.08	0.02	D

* Source: Rawls, Brakensiek and Saxton, 1982

Based on the soil textural classes and the corresponding minimum infiltration rates, a restriction is established to eliminate unsuitable soil conditions. Soil textures with minimum infiltration rates less than 0.52 inches per hour are not suitable for usage of infiltration practices. These include soils that have a 30 percent clay content, making these soils susceptible to frost heaving and structurally unstable, in addition to having a poor capacity to percolate runoff. Soil textures that are recommended for infiltration systems include those soils with infiltration rates of 0.52 inches per hour or greater, which include loam, sandy loam, loamy sand, and sand.

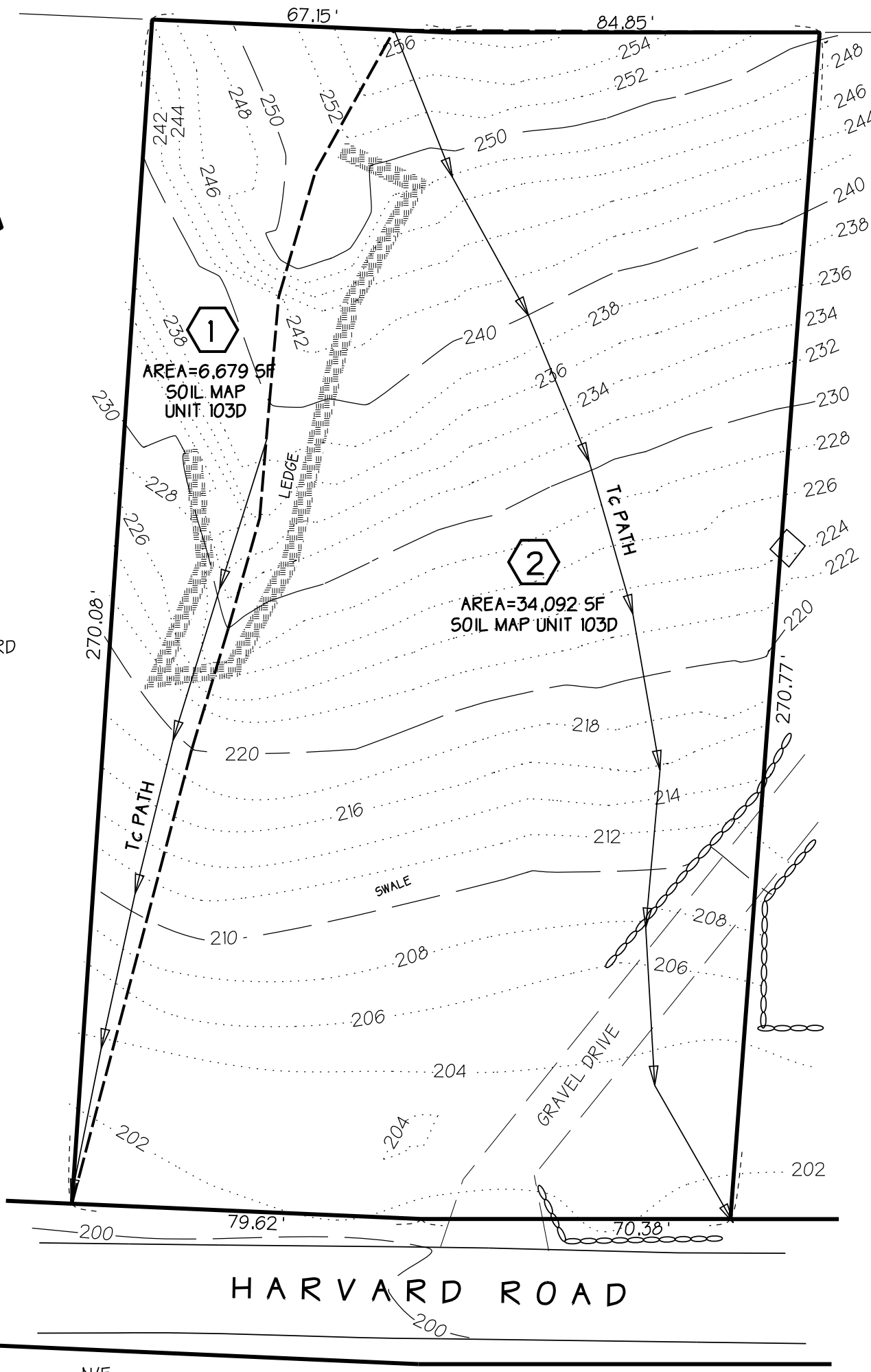
N/F
WEDGEWOOD PROPERTIES INC.
(WEDGEWOOD PINES CC - GOLF COURSE)



N/F
MASCIA
153 HARVARD RD

N/F
GIORDANO
137 HARVARD RD

#137
DWELLING






HARVARD ROAD

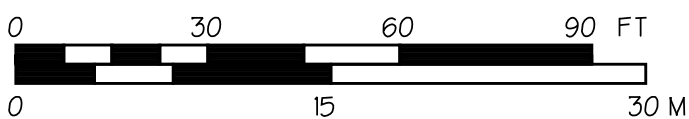
N/F
STEPHEN H. HOWARD
150 HARVARD RD

N/F
WILLIAM W. & NATALIE L. SHRADER
144 HARVARD RD

LEGEND

-  SUBCATCHMENT AREA LABEL (TYP.)
-  SUBCATCHMENT AREA BOUNDARY
-  TIME OF CONCENTRATION PATH*
- *MIN. T_c OF 6 MIN. UTILIZED FOR DESIGN CALCULATIONS

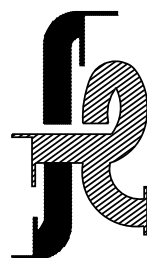
NOTE: ALL SOILS IN THE STUDY AREA ARE
CHARLTON-HOLLIS ROCK OUTCROP COMPLEX
NRCS SOIL MAP UNIT 103D



**PRE-DEVELOPMENT
DRAINAGE PLAN**

LOT 2 HARVARD ROAD
STOW, MASSACHUSETTS

DATE: OCT. 28, 2022
SCALE: 1"=30'

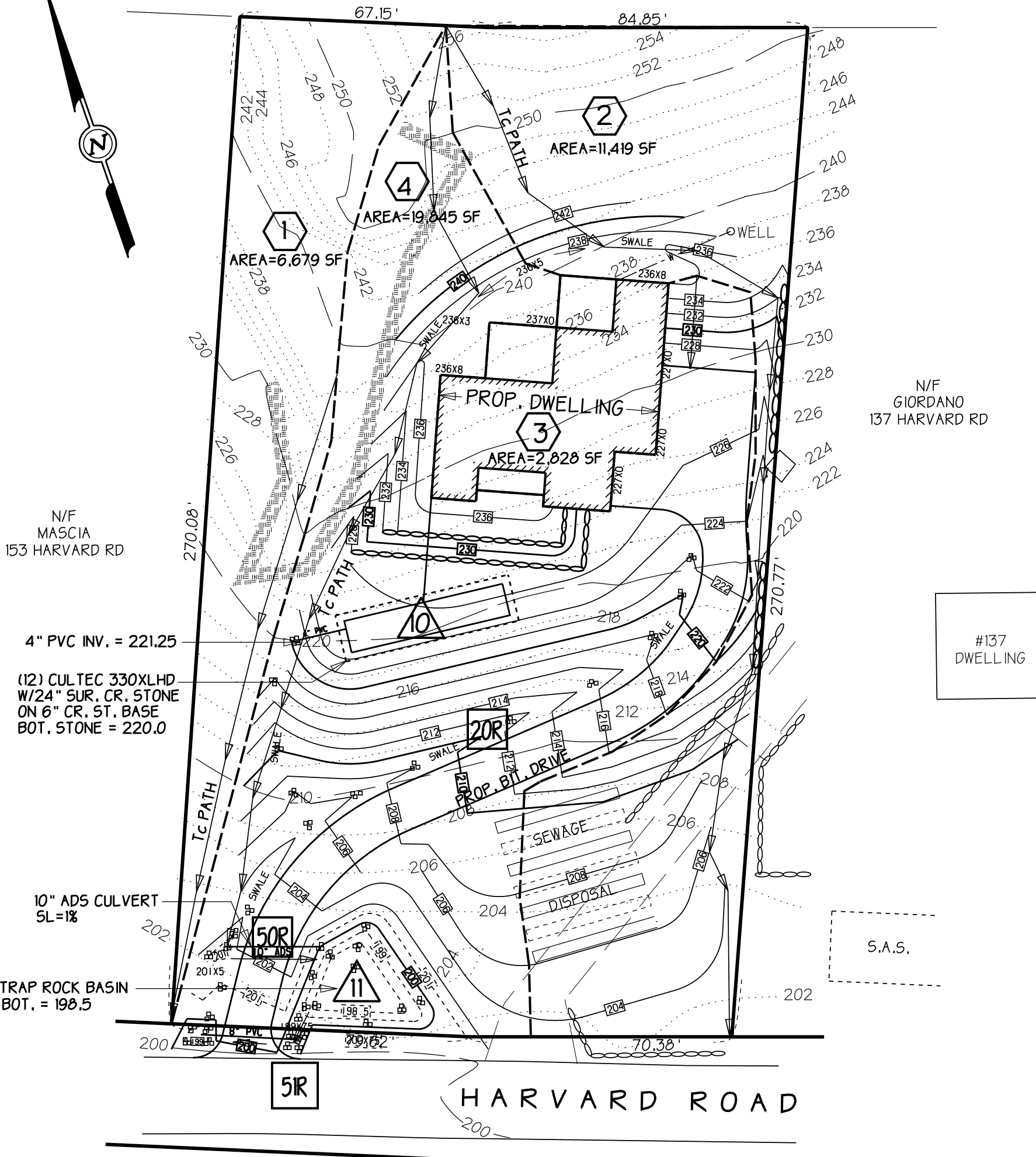
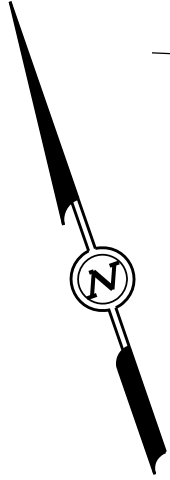


**FORESITE
ENGINEERING**

16 Gleasondale Road Suite 1-1
Stow, Massachusetts 01775

Phone: (978) 461-2350

N/F
WEDGEWOOD PROPERTIES INC.
(WEDGEWOOD PINES CC - GOLF COURSE)



N/F
MASCIA
153 HARVARD RD

N/F
GIORDANO
137 HARVARD RD

4" PVC INV. = 221.25
(12) CULTEC 330XLHD
W/24" SUR. CR. STONE
ON 6" CR. ST. BASE
BOT. STONE = 220.0

10" ADS CULVERT
SL=1%

TRAP ROCK BASIN
BOT. = 198.5

#137
DWELLING

S.A.S.

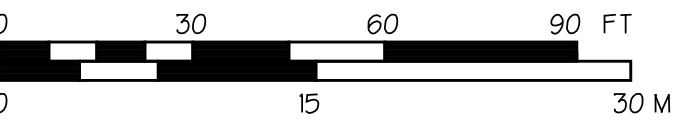
N/F
STEPHEN H. HOWARD
150 HARVARD RD

N/F
WILLIAM W. & NATALIE L. SHRADER
144 HARVARD RD

LEGEND

- SUBCATCHMENT AREA LABEL (TYP.)
- SUBCATCHMENT AREA BOUNDARY
- TIME OF CONCENTRATION PATH*
*MIN. Tc OF 6 MIN. UTILIZED FOR DESIGN CALCULATIONS

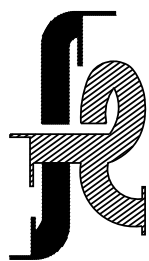
NOTE: ALL SOILS IN THE STUDY AREA ARE
CHARLTON-HOLLIS ROCK OUTCROP COMPLEX
NRCS SOIL MAP UNIT 103D



**POST-DEVELOPMENT
DRAINAGE PLAN**

LOT 2 HARVARD ROAD
STOW, MASSACHUSETTS

DATE: OCT. 28, 2022
REV. 12/30/22
SCALE: 1"=30'



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ENGINEERING**

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APPENDIX F

**EROSION & SEDIMENTATION CONTROL PLAN
REPORT**

LOT 2 HARVARD ROAD, STOW

CONTENTS

- 1 Planned Erosion & Sedimentation Controls
During Construction
- 2 Long Term Inspection & Maintenance Measures
After Construction
- 3 Illicit Discharge Compliance Statement

1. Planned Erosion and Sedimentation Control Measures During Construction

12" Staked Straw Wattle Erosion Control Barrier

A 12" staked straw wattle erosion control barrier is proposed to be installed along the down-gradient limit of work. Additionally, 4-ft HDPE construction fencing is proposed around the up-gradient limit of work to limit site disturbance to establish a clear limit of work. The siltation barrier and construction fencing will be installed prior to the commencement of work. An additional supply of wattles or straw bales shall be stored on-site to replace and/or repair barriers damaged by and during construction activities and to reinforce problem areas. The erosion control barrier shall be inspected and maintained on a weekly basis during construction and repaired or replaced as necessary until final site stabilization has occurred.

Stabilized Crushed Stone Construction Entrance

A stabilized 2-3" washed crushed stone construction entrance shall be installed at the construction entrance from Harvard Road at the start of construction and maintained until all construction is complete and disturbed surfaces have been stabilized with vegetation or other final stabilizing cover. Crushed stone shall be removed if/when voids become filled with sediment and/or when tracking of silt or soil onto the public way is observed.

Surface Stabilization

The surface of all disturbed areas shall be stabilized during and after construction. Temporary measures shall be taken during construction to prevent erosion and siltation. All disturbed slopes will be stabilized with a permanent vegetative cover. Some or all of the following measures may be utilized on this project as conditions may warrant.

- a. Temporary Seeding
- b. Temporary Mulching
- c. Permanent Seeding
- d. Placement of Sod
- e. Hydroseeding
- f. Placement of Hay
- g. Placement of Jute Netting

2. Long-Term Inspection and Maintenance Measures After Construction

Stormwater Management System Owners & Party Responsible for Maintenance:

John Giordano
30 Heritage Lane
Stow, MA 01775
Phone (978) 375-3336

Erosion Control

Eroded sediments can adversely affect the performance of the stormwater management system. Eroding or barren areas should be re-vegetated immediately with permanent stabilizing cover or temporary measures (wood chips, bark mulch, etc.) if not to be permanently stabilized immediately.

Debris and Litter Removal

Trash may collect in the BMP's, potentially causing clogging of the facilities. All debris and litter shall be collected and stored in designated refuse receptacles until it can be removed from the site for proper disposal. The site shall be inspected for debris and litter weekly during construction, and after each substantial storm event that occurs during construction.

3. Illicit Discharge Compliance Statement

(1) Prohibition of Illicit Discharges.

(a) Prohibition. No person shall throw, drain, discharge, cause to be discharged, or allow others under their control to discharge into the storm sewer system or watercourse any materials other than stormwater, including but not limited to pollutants or waters containing pollutants.

(b) Exemptions. The following non-stormwater discharges are excluded from (a) above:

(1) waterline flushing or other potable water sources;

(2) landscape irrigation or lawn watering;

- (3) diverted, natural riparian habitat and/or wetland flows;
- (4) rising ground water, ground water infiltration to storm drains, and/or uncontaminated pumped groundwater;
- (5) foundation or footing drains (not including active ground water dewatering systems) and crawl space pumps;
- (6) air conditioning condensation;
- (7) springs;
- (8) other water sources determined by the Massachusetts Department of Environmental Protection, in writing, as not containing pollutants that cause or contribute to waterway degradation, including but not limited to a violation of applicable water quality standards and/or degradation of the biotic integrity of surface water bodies and their floodplains.

Drywell Operation & Maintenance Plan

The property owner of record shall be responsible for the design, performance, operation, and maintenance of the drywell system proposed for this site. Drywells that cease to drain in a 48-hour period due to clogging shall be replaced by the owner.

Drywell Inspection

Drywell inspections are to be performed annually by the owner or whenever ponding is still evident 48 hours after a storm. The inspection procedure should include visual inspection of roof gutter for accumulation of debris and removal of the inspection port cover and inspection of the interior of the system. Inspections shall be documented with a written report and kept on file by the drywell facility owner. Annual inspection reports should also be sent to the Weston Stormwater Engineer.

Should inspection reveal that the system is no longer effective and cannot be returned to effective use, a new system should be installed. Drywell maintenance should occur when inspection shows:

- Drainage time has increased beyond 48 hours
- A non-stormwater discharge has entered the system
- Upon change of ownership of the system

Drywell Maintenance

Drywell maintenance may include, but is not limited to;

- Removal of sediment, trash, and debris from the system
- Purging of accumulated silt out of the aggregate fill by jetting, surging, or pumping
- Clearing gutters of accumulated debris



CULTEC Recharger® 330XLHD Stormwater Chamber

The Recharger® 330XLHD is a 30.5" (775 mm) tall, high capacity chamber. Typically when using this model, fewer chambers are required resulting in less labor and a smaller installation area. The Recharger® 330XLHD has the side portal internal manifold feature. HVLV® FC-24 Feed Connectors are inserted into the side portals to create the internal manifold.



Size (L x W x H)	8.5' x 52" x 30.5" 2.59 m x 1321 mm x 775 mm
Installed Length	7' 2.13 m
Length Adjustment per Run	1.50' 0.46 m
Chamber Storage	7.46 ft ³ /ft 0.69 m ³ /m 52.21 ft ³ /unit 1.48 m ³ /unit
Min. Installed Storage	11.32 ft ³ /ft 1.05 m ³ /m 79.26 ft ³ /unit 2.24 m ³ /unit
Min. Area Required	33.83 ft ² 3.14 m ²
Chamber Weight	73.0 lbs 33.11 kg
Shipping	30 chambers/skid 2,335 lbs/skid 10 skids/48' flatbed
Min. Center-to-Center Spacing	4.83' 1.47 m
Max. Allowable Cover	12' 3.66 m
Max. Inlet Opening in End Wall	24" HDPE, PVC 600 mm HDPE, PVC
Max. Allowable O.D. in Side Portal	10" HDPE, 12" PVC 250 mm HDPE, 300 mm PVC
Compatible Feed Connector	HVLV FC-24 Feed Connector

Calculations are based on installed chamber length.
All above values are nominal.
Min. installed storage includes 6" (152 mm) stone base, 6" (152 mm) stone above crown of chamber and typical stone surround at 58" (1473 mm) center-to-center spacing.

	Stone Foundation Depth		
	6" 152 mm	12" 305 mm	18" 457 mm
Chamber and Stone Storage Per Chamber	79.26 ft ³ 2.24 m ³	86.03 ft ³ 2.44 m ³	92.79 ft ³ 2.63 m ³
Min. Effective Depth	3.54' 1.08 m	4.04' 1.23 m	4.54' 1.38 m
Stone Required Per Chamber	2.50 yd ³ 1.91 m ³	3.13 yd ³ 2.39 m ³	3.76 yd ³ 2.87 m ³

Calculations are based on installed chamber length.
Includes 6" (305 mm) stone above crown of chamber and typical stone surround at 58" (1473 mm) center-to-center spacing and stone foundation as listed in table.
Stone void calculated at 40%.

Recharger® 330XLHD Bare Chamber Storage Volumes

Elevation		Incremental Storage Volume				Cumulative Storage	
in.	mm	ft ³ /ft	m ³ /m	ft ³	m ³	ft ³	m ³
30.5	775	0.000	0.000	0.000	0.000	52.213	1.479
30	762	0.019	0.002	0.133	0.004	52.213	1.479
29	737	0.051	0.005	0.357	0.010	52.080	1.475
28	711	0.084	0.008	0.588	0.017	51.723	1.465
27	686	0.124	0.012	0.868	0.025	51.135	1.448
26	660	0.150	0.014	1.05	0.030	50.267	1.424
25	635	0.173	0.016	1.211	0.034	49.217	1.394
24	609	0.191	0.018	1.337	0.038	48.006	1.360
23	584	0.207	0.019	1.449	0.041	46.669	1.322
22	559	0.221	0.021	1.547	0.044	45.220	1.281
21	533	0.233	0.022	1.631	0.046	43.673	1.237
20	508	0.244	0.023	1.708	0.048	42.042	1.191
19	483	0.254	0.024	1.778	0.050	40.334	1.142
18	457	0.264	0.025	1.848	0.052	38.556	1.092
17	432	0.271	0.025	1.897	0.054	36.708	1.040
16	406	0.283	0.026	1.981	0.056	34.811	0.986
15	381	0.294	0.027	2.058	0.058	32.830	0.930
14	356	0.296	0.027	2.072	0.059	30.772	0.871
13	330	0.299	0.028	2.093	0.059	28.700	0.813
12	305	0.301	0.028	2.107	0.060	26.607	0.754
11	279	0.303	0.028	2.121	0.060	24.500	0.694
10	254	0.304	0.028	2.128	0.060	22.379	0.634
9	229	0.306	0.028	2.142	0.061	20.251	0.574
8	203	0.313	0.029	2.191	0.062	18.109	0.513
7	178	0.321	0.030	2.247	0.064	15.918	0.451
6	152	0.322	0.030	2.254	0.064	13.671	0.387
5	127	0.323	0.030	2.261	0.064	11.417	0.323
4	102	0.324	0.030	2.268	0.064	9.156	0.259
3	76	0.325	0.030	2.275	0.064	6.888	0.195
2	51	0.327	0.030	2.289	0.065	4.613	0.131
1	25	0.332	0.031	2.324	0.066	2.324	0.066
Total		7.459	0.693	52.213	1.479	52.213	1.479

Calculations are based on installed chamber length.

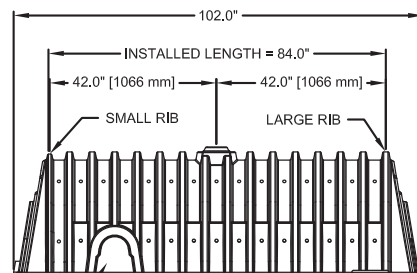
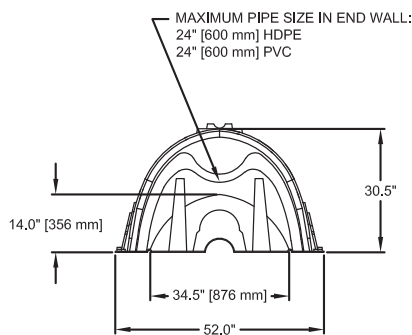
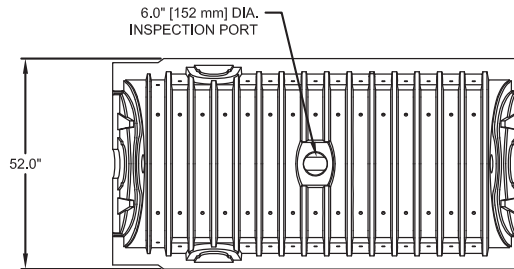
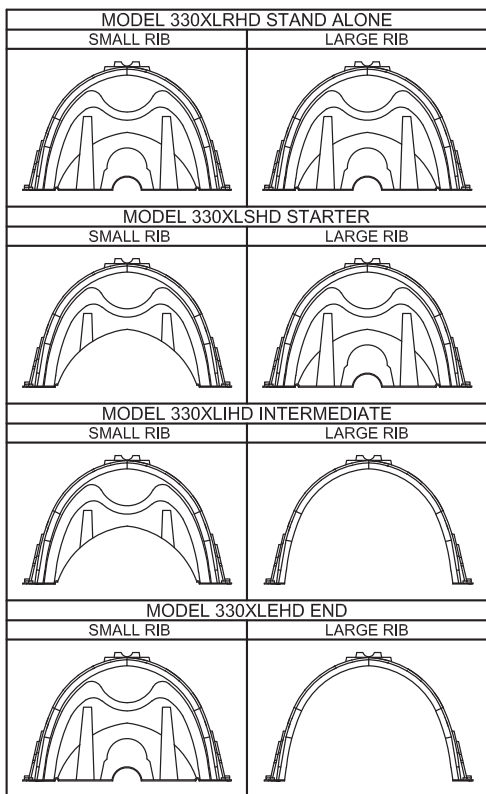
Visit <http://cultec.com/downloads/> for Product Downloads and CAD details.

For more information, contact CULTEC at (203) 775-4416 or visit www.cultec.com.



CULTEC Recharger® 330XLHD Stormwater Chamber

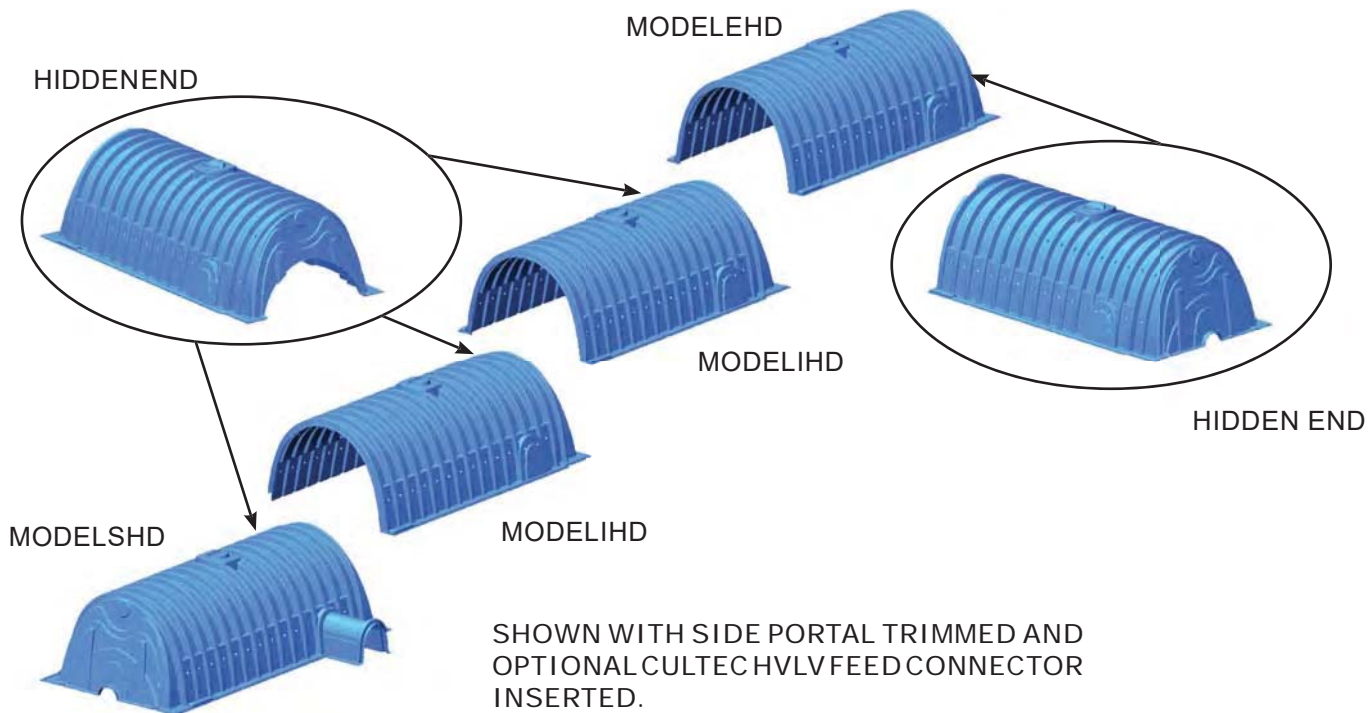
Three View Drawing



SIDE PORTAL FOR OPTIONAL INTERNAL MANIFOLD (ACCOMMODATES CULTEC HVLV FC-24 FEED CONNECTOR OR STORM PIPE)
MAX. PIPE:
10" [250 mm] HDPE
12" [300 mm] PVC

CULTEC RECHARGER 330XLHD CHAMBER STORAGE = 7.459 CF/FT [0.693 m³/m]
INSTALLED LENGTH ADJUSTMENT = 1.5" [0.46 m]
SIDE PORTAL ACCEPTS CULTEC HVLV FC-24 FEED CONNECTOR

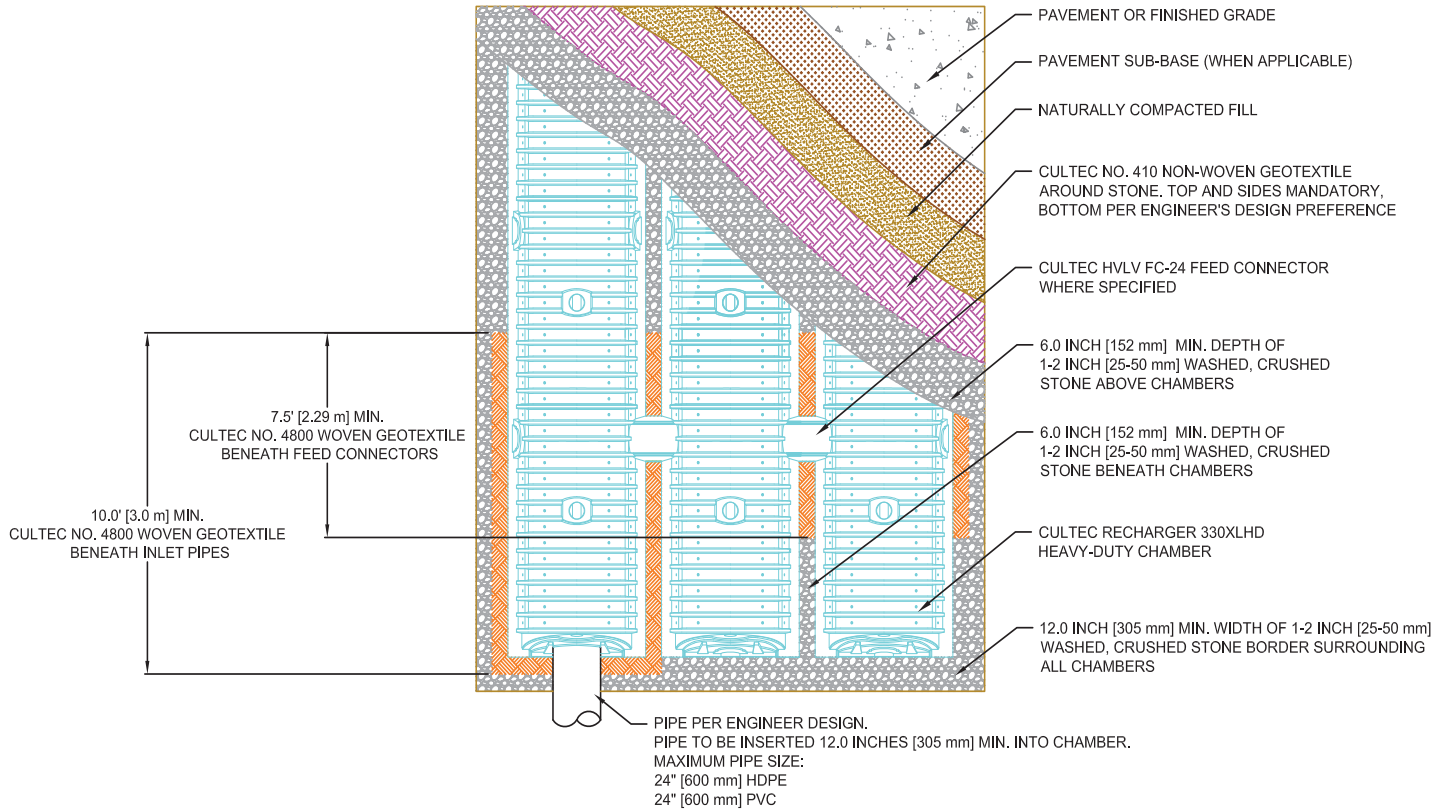
Typical Interlock Installation



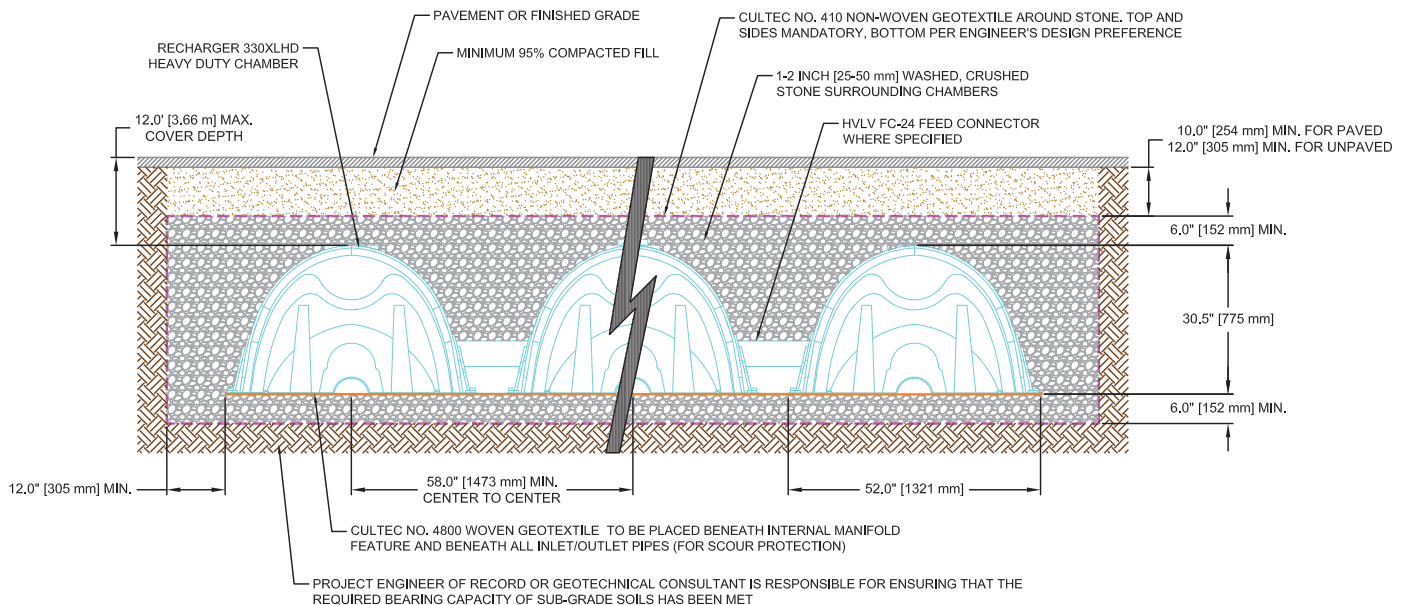
For more information, contact CULTEC at (203) 775-4416 or visit www.cultec.com.



Plan View Drawing



Typical Cross Section for Traffic Application





CULTEC Recharger® 330XLHD Specifications

GENERAL

CULTEC Recharger® 330XLHD chambers are designed for underground stormwater management. The chambers may be used for retention, recharging, detention or controlling the flow of on-site stormwater runoff.

CHAMBER PARAMETERS

1. The chambers shall be manufactured in the U.S.A. by CULTEC, Inc. of Brookfield, CT (cultec.com, 203-775-4416).
2. The chamber shall be vacuum thermoformed of polyethylene with a black interior and blue exterior.
3. The chamber shall be arched in shape.
4. The chamber shall be open-bottomed.
5. The chamber shall be joined using an interlocking overlapping rib method. Connections must be fully shouldered overlapping ribs, having no separate couplings or separate end walls.
6. The nominal chamber dimensions of the CULTEC Recharger® 330XLHD shall be 30.5 inches (775 mm) tall, 52 inches (1321 mm) wide and 8.5 feet (2.59 m) long. The installed length of a joined Recharger® 330XLHD shall be 7 feet (2.13 m).
7. Maximum inlet opening on the chamber end wall is 24 inches (600 mm) HDPE, PVC.
8. The chamber shall have two side portals to accept CULTEC HVLV® FC-24 Feed Connectors to create an internal manifold. Maximum allowable O.D. in the side portal is 10 inches (250 mm) HDPE and 12 inches (300 mm) PVC.
9. The nominal chamber dimensions of the CULTEC HVLV® FC-24 Feed Connector shall be 12 inches (305 mm) tall, 16 inches (406 mm) wide and 24.2 inches (614 mm) long.
10. The nominal storage volume of the Recharger® 330XLHD chamber shall be 7.459 ft³ / ft (0.693 m³ / m) - without stone. The nominal storage volume of a single Recharger® 330XLHD Stand Alone unit shall be 63.40 ft³ (1.80 m³) - without stone. The nominal storage volume of a joined Recharger® 330XLHD Intermediate unit shall be 52.213 ft³ (1.478 m³) - without stone. The nominal storage volume of the length adjustment amount per run shall be 11.19 ft³ (1.04 m³) - without stone.
11. The nominal storage volume of the HVLV® FC-24 Feed Connector shall be 0.913 ft³ / ft (0.026 m³ / m) - without stone.
12. The Recharger® 330XLHD chamber shall have fifty-six discharge holes bored into the sidewalls of the unit's core to promote lateral conveyance of water.
13. The Recharger® 330XLHD chamber shall have 16 corrugations.
14. The end wall of the chamber, when present, shall be an integral part of the continuously formed unit. Separate end plates cannot be used with this unit.
15. The Recharger® 330XLHD Stand Alone unit must be formed as a whole chamber having two fully formed integral end walls and having no separate end plates or separate end walls.
16. The Recharger® 330XLHD Starter unit must be formed as a whole chamber having one fully formed integral end wall and one partially formed integral end wall with a lower transfer opening of 14 inches (356 mm) high x 34.5 inches (876 mm) wide.
17. The Recharger® 330XLHD Intermediate unit must be formed as a whole chamber having one fully open end wall and one partially formed integral end wall with a lower transfer opening of 14 inches (356 mm) high x 34.5 inches (876 mm) wide.
18. The Recharger® 330XLHD End unit must be formed as a whole chamber having one fully formed integral end wall and one fully open end wall and having no separate end plates or end walls.
19. The HVLV® FC-24 Feed Connector must be formed as a whole chamber having two open end walls and having no separate end plates or separate end walls. The unit shall fit into the side portals of the Recharger® 330XLHD and act as cross feed connections.
20. Chambers must have horizontal stiffening flex reduction steps between the ribs.
21. The chamber shall have a raised integral cap at the top of the arch in the center of each unit to be used as an optional inspection port or clean-out.
22. The units may be trimmed to custom lengths by cutting back to any corrugation on the large rib end.
23. The chamber shall be manufactured in an ISO 9001:2015 certified facility.
24. The chamber shall be designed and manufactured to meet the material and structural requirements of IAPMO PS 63-2019, including resistance to AASHTO H-10 and H-20 highway live loads, when installed in accordance with CULTEC's installation instructions.
25. The chamber shall be designed and manufactured in accordance with the specifications of NSAI Irish Agreement Board Certificate for Cultec Attenuation and Infiltration.
26. Maximum allowable cover over the top of the chamber shall be 12' (3.66 m).
27. The chamber shall be designed to withstand traffic loads when installed according to CULTEC's recommended installation instructions.

RETENTION BASIN INSPECTION & MAINTENANCE PLAN

RETENTION POND INFORMATION

Retention ponds are designed to settle out sediment and associated pollutants to improve water quality. Retention ponds also provide rate and flood control prior to discharging into the storm drain system of a receiving waterway.

RETENTION POND INSPECTION/MAINTENANCE

The CURRENT OWNER or their designee is responsible for completing inspections and conducting maintenance.

WHEN WILL THE RETENTION POND BE INSPECTED AND MAINTAINED?

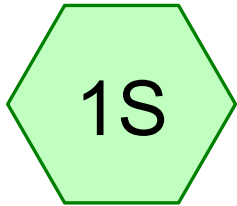
At a minimum, Retention ponds must be inspected once per year. Additional inspections are recommended during or after rain events. Personnel should be aware of the maintenance plan. It is recommended to consult with the designer and builder to understand the inspection and maintenance needs.

INSPECTION & MAINTENANCE CHECKLIST (to be completed once/year):

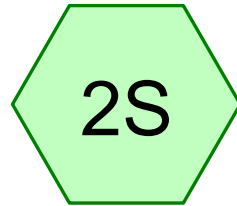
	Visually inspect for sediment and debris accumulation within the pond and pre-treatment (e.g. sumps, forebay) areas annually.
	Clean pond if sediment/debris accumulates taking up 50% of the storage capacity or the pond is negatively affecting downstream waterways or properties.
	Detailed inspection of sediment accumulation (sediment survey) every 5-7 years.
	Inspect drainage area for erosion and possible illicit discharges.
	Repair clogging or erosion at the inlets, outlets, and overflow.
	Perform any mowing or weed control needed. Identify pond bank erosion and repair as needed.

Appendix H

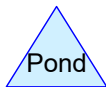
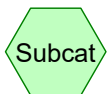
HydroCAD Output



OFF SITE WEST



SOUTH TO HARVARD
RD



Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-YR	NRCC 24-hr	D	Default	24.00	1	3.09	2
2	10-YR	NRCC 24-hr	D	Default	24.00	1	4.65	2
3	100-YR	NRCC 24-hr	D	Default	24.00	1	8.36	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
19,729	56	Brush, Fair, HSG B (2S)
1,000	98	Paved parking, HSG B (2S)
2,551	98	Unconnected pavement, HSG B (1S)
13,363	60	Woods, Fair, HSG B (2S)
4,128	55	Woods, Good, HSG B (1S)
40,771	61	TOTAL AREA

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
40,771	HSG B	1S, 2S
0	HSG C	
0	HSG D	
0	Other	
40,771		TOTAL AREA

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	19,729	0	0	0	19,729	Brush, Fair
0	1,000	0	0	0	1,000	Paved parking
0	2,551	0	0	0	2,551	Unconnected pavement
0	13,363	0	0	0	13,363	Woods, Fair
0	4,128	0	0	0	4,128	Woods, Good
0	40,771	0	0	0	40,771	TOTAL AREA

Subca
Numb

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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: OFF SITE WEST

Runoff Area=6,679 sf 38.19% Impervious Runoff Depth>0.81"
Flow Length=125' Tc=6.3 min CN=71 Runoff=0.12 cfs 451 cf

Subcatchment 2S: SOUTH TO HARVARD RD

Runoff Area=34,092 sf 2.93% Impervious Runoff Depth>0.33"
Flow Length=200' Slope=0.2000 '/' Tc=6.0 min CN=59 Runoff=0.15 cfs 946 cf

Total Runoff Area = 40,771 sf Runoff Volume = 1,398 cf Average Runoff Depth = 0.41"
91.29% Pervious = 37,220 sf 8.71% Impervious = 3,551 sf

Summary for Subcatchment 1S: OFF SITE WEST

Runoff = 0.12 cfs @ 12.14 hrs, Volume= 451 cf, Depth> 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-YR Rainfall=3.09"

Area (sf)	CN	Description
2,551	98	Unconnected pavement, HSG B
4,128	55	Woods, Good, HSG B
6,679	71	Weighted Average
4,128		61.81% Pervious Area
2,551		38.19% Impervious Area
2,551		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	25	0.1500	0.07		Sheet Flow, Overland Woods: Dense underbrush n= 0.800 P2= 3.09"
0.7	100	0.2000	2.24		Shallow Concentrated Flow, Overland Woodland Kv= 5.0 fps
6.3	125	Total			

Summary for Subcatchment 2S: SOUTH TO HARVARD RD

Runoff = 0.15 cfs @ 12.16 hrs, Volume= 946 cf, Depth> 0.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-YR Rainfall=3.09"

Area (sf)	CN	Description
1,000	98	Paved parking, HSG B
13,363	60	Woods, Fair, HSG B
19,729	56	Brush, Fair, HSG B
34,092	59	Weighted Average
33,092		97.07% Pervious Area
1,000		2.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	25	0.2000	0.36		Sheet Flow, SHEET FLOW Range n= 0.130 P2= 3.09"
1.3	175	0.2000	2.24		Shallow Concentrated Flow, SH CONC. FLOW Woodland Kv= 5.0 fps
2.5	200	Total, Increased to minimum Tc = 6.0 min			

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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: OFF SITE WEST

Runoff Area=6,679 sf 38.19% Impervious Runoff Depth>1.85"
Flow Length=125' Tc=6.3 min CN=71 Runoff=0.30 cfs 1,031 cf

Subcatchment 2S: SOUTH TO HARVARD RD

Runoff Area=34,092 sf 2.93% Impervious Runoff Depth>1.04"
Flow Length=200' Slope=0.2000 '/' Tc=6.0 min CN=59 Runoff=0.79 cfs 2,951 cf

Total Runoff Area = 40,771 sf Runoff Volume = 3,982 cf Average Runoff Depth = 1.17"
91.29% Pervious = 37,220 sf 8.71% Impervious = 3,551 sf

Summary for Subcatchment 1S: OFF SITE WEST

Runoff = 0.30 cfs @ 12.14 hrs, Volume= 1,031 cf, Depth> 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-YR Rainfall=4.65"

Area (sf)	CN	Description
2,551	98	Unconnected pavement, HSG B
4,128	55	Woods, Good, HSG B
6,679	71	Weighted Average
4,128		61.81% Pervious Area
2,551		38.19% Impervious Area
2,551		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	25	0.1500	0.07		Sheet Flow, Overland Woods: Dense underbrush n= 0.800 P2= 3.09"
0.7	100	0.2000	2.24		Shallow Concentrated Flow, Overland Woodland Kv= 5.0 fps
6.3	125	Total			

Summary for Subcatchment 2S: SOUTH TO HARVARD RD

Runoff = 0.79 cfs @ 12.14 hrs, Volume= 2,951 cf, Depth> 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-YR Rainfall=4.65"

Area (sf)	CN	Description
1,000	98	Paved parking, HSG B
13,363	60	Woods, Fair, HSG B
19,729	56	Brush, Fair, HSG B
34,092	59	Weighted Average
33,092		97.07% Pervious Area
1,000		2.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	25	0.2000	0.36		Sheet Flow, SHEET FLOW Range n= 0.130 P2= 3.09"
1.3	175	0.2000	2.24		Shallow Concentrated Flow, SH CONC. FLOW Woodland Kv= 5.0 fps
2.5	200	Total, Increased to minimum Tc = 6.0 min			

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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: OFF SITE WEST

Runoff Area=6,679 sf 38.19% Impervious Runoff Depth>4.89"
Flow Length=125' Tc=6.3 min CN=71 Runoff=0.80 cfs 2,719 cf

Subcatchment 2S: SOUTH TO HARVARD RD

Runoff Area=34,092 sf 2.93% Impervious Runoff Depth>3.48"
Flow Length=200' Slope=0.2000 '/' Tc=6.0 min CN=59 Runoff=2.93 cfs 9,898 cf

Total Runoff Area = 40,771 sf Runoff Volume = 12,618 cf Average Runoff Depth = 3.71"
91.29% Pervious = 37,220 sf 8.71% Impervious = 3,551 sf

Summary for Subcatchment 1S: OFF SITE WEST

Runoff = 0.80 cfs @ 12.13 hrs, Volume= 2,719 cf, Depth> 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-YR Rainfall=8.36"

Area (sf)	CN	Description
2,551	98	Unconnected pavement, HSG B
4,128	55	Woods, Good, HSG B
6,679	71	Weighted Average
4,128		61.81% Pervious Area
2,551		38.19% Impervious Area
2,551		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	25	0.1500	0.07		Sheet Flow, Overland Woods: Dense underbrush n= 0.800 P2= 3.09"
0.7	100	0.2000	2.24		Shallow Concentrated Flow, Overland Woodland Kv= 5.0 fps
6.3	125	Total			

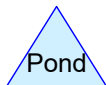
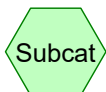
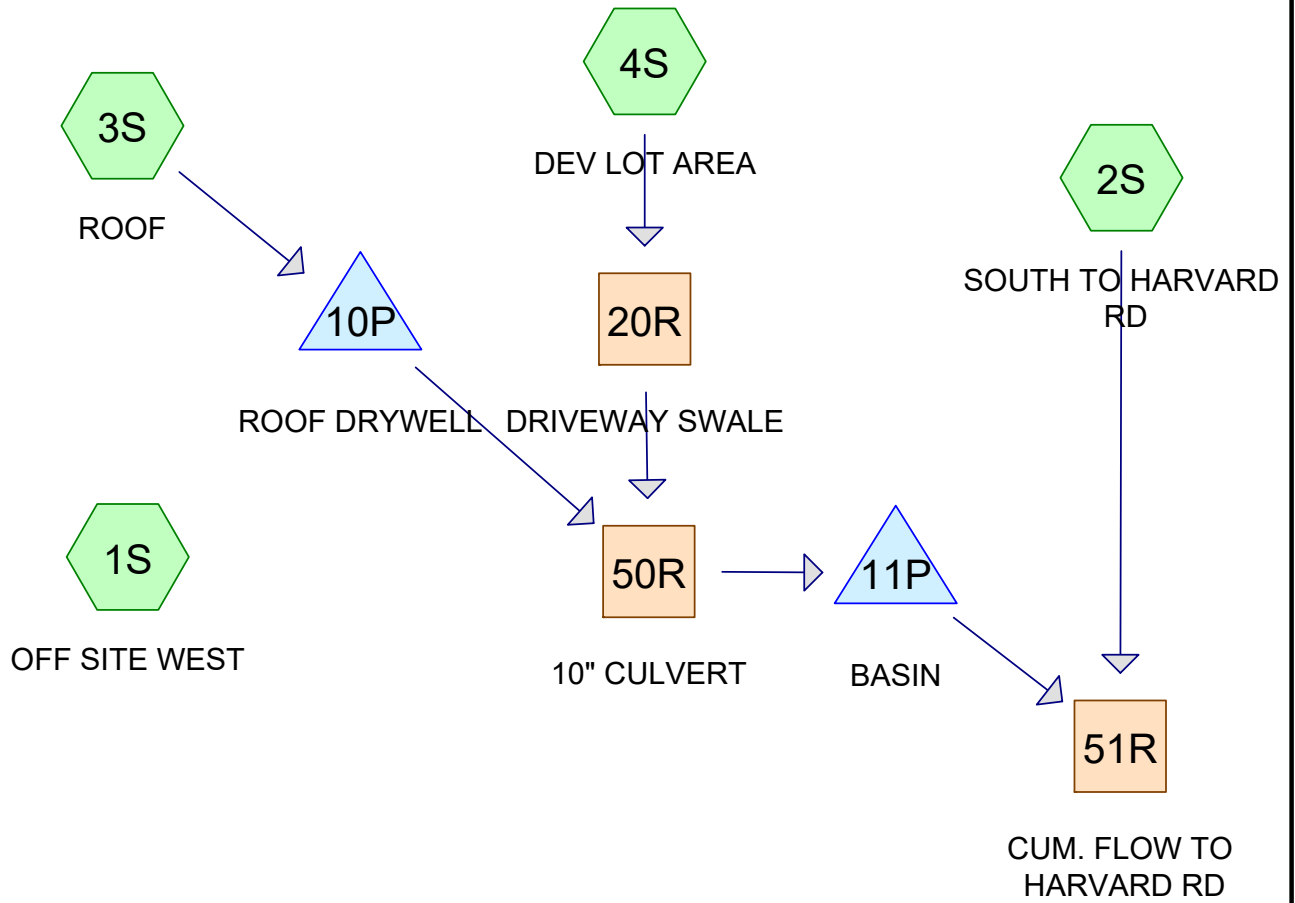
Summary for Subcatchment 2S: SOUTH TO HARVARD RD

Runoff = 2.93 cfs @ 12.13 hrs, Volume= 9,898 cf, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-YR Rainfall=8.36"

Area (sf)	CN	Description
1,000	98	Paved parking, HSG B
13,363	60	Woods, Fair, HSG B
19,729	56	Brush, Fair, HSG B
34,092	59	Weighted Average
33,092		97.07% Pervious Area
1,000		2.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	25	0.2000	0.36		Sheet Flow, SHEET FLOW Range n= 0.130 P2= 3.09"
1.3	175	0.2000	2.24		Shallow Concentrated Flow, SH CONC. FLOW Woodland Kv= 5.0 fps
2.5	200	Total, Increased to minimum Tc = 6.0 min			



Routing Diagram for 2152_POST_12-30-22
 Prepared by FORESITE ENGINEERING, Printed 1/6/2023
 HydroCAD® 10.10-5a s/n 01697 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-YR	NRCC 24-hr	D	Default	24.00	1	3.09	2
2	10-YR	NRCC 24-hr	D	Default	24.00	1	4.65	2
3	100-YR	NRCC 24-hr	D	Default	24.00	1	8.36	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
19,502	61	>75% Grass cover, Good, HSG B (2S, 4S)
3,580	98	Paved parking, HSG B (4S)
2,828	98	Roofs, HSG B (3S)
2,551	98	Unconnected pavement, HSG B (1S)
9,023	55	Woods, Good, HSG B (1S, 2S)
3,287	58	Woods/grass comb., Good, HSG B (4S)
40,771	68	TOTAL AREA

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
40,771	HSG B	1S, 2S, 3S, 4S
0	HSG C	
0	HSG D	
0	Other	
40,771		TOTAL AREA

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	19,502	0	0	0	19,502	>75% Grass cover, Good
0	3,580	0	0	0	3,580	Paved parking
0	2,828	0	0	0	2,828	Roofs
0	2,551	0	0	0	2,551	Unconnected pavement
0	9,023	0	0	0	9,023	Woods, Good
0	3,287	0	0	0	3,287	Woods/grass comb., Good
0	40,771	0	0	0	40,771	TOTAL AREA

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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: OFF SITE WEST Runoff Area=6,679 sf 38.19% Impervious Runoff Depth>0.81"
Flow Length=125' Tc=6.3 min CN=71 Runoff=0.12 cfs 451 cf

Subcatchment 2S: SOUTH TO HARVARD RD Runoff Area=11,419 sf 0.00% Impervious Runoff Depth>0.30"
Flow Length=200' Tc=6.0 min CN=58 Runoff=0.04 cfs 288 cf

Subcatchment 3S: ROOF Runoff Area=2,828 sf 100.00% Impervious Runoff Depth>2.85"
Flow Length=25' Slope=0.5000 '/' Tc=6.0 min CN=98 Runoff=0.17 cfs 673 cf

Subcatchment 4S: DEV LOT AREA Runoff Area=19,845 sf 18.04% Impervious Runoff Depth>0.63"
Flow Length=275' Tc=6.0 min CN=67 Runoff=0.27 cfs 1,040 cf

Reach 20R: DRIVEWAY SWALE Avg. Flow Depth=0.14' Max Vel=1.67 fps Inflow=0.27 cfs 1,040 cf
n=0.069 L=175.0' S=0.1071 '/' Capacity=6.33 cfs Outflow=0.24 cfs 1,035 cf

Reach 50R: 10" CULVERT Avg. Flow Depth=0.16' Max Vel=3.19 fps Inflow=0.24 cfs 1,035 cf
10.0" Round Pipe n=0.010 L=25.0' S=0.0100 '/' Capacity=2.85 cfs Outflow=0.24 cfs 1,035 cf

Reach 51R: CUM. FLOW TO HARVARD RD Inflow=0.04 cfs 681 cf
Outflow=0.04 cfs 681 cf

Pond 10P: ROOF DRYWELL Peak Elev=221.73' Storage=673 cf Inflow=0.17 cfs 673 cf
4.0" Round Culvert n=0.010 L=25.0' S=0.0500 '/' Outflow=0.00 cfs 0 cf

Pond 11P: BASIN Peak Elev=199.76' Storage=643 cf Inflow=0.24 cfs 1,035 cf
Outflow=0.02 cfs 393 cf

Total Runoff Area = 40,771 sf Runoff Volume = 2,452 cf Average Runoff Depth = 0.72"
78.03% Pervious = 31,812 sf 21.97% Impervious = 8,959 sf

Summary for Subcatchment 1S: OFF SITE WEST

Runoff = 0.12 cfs @ 12.14 hrs, Volume= 451 cf, Depth> 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-YR Rainfall=3.09"

Area (sf)	CN	Description
2,551	98	Unconnected pavement, HSG B
4,128	55	Woods, Good, HSG B
6,679	71	Weighted Average
4,128		61.81% Pervious Area
2,551		38.19% Impervious Area
2,551		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	25	0.1500	0.07		Sheet Flow, Overland Woods: Dense underbrush n= 0.800 P2= 3.09"
0.7	100	0.2000	2.24		Shallow Concentrated Flow, Overland Woodland Kv= 5.0 fps
6.3	125	Total			

Summary for Subcatchment 2S: SOUTH TO HARVARD RD

Runoff = 0.04 cfs @ 12.17 hrs, Volume= 288 cf, Depth> 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-YR Rainfall=3.09"

Area (sf)	CN	Description
4,895	55	Woods, Good, HSG B
6,524	61	>75% Grass cover, Good, HSG B
11,419	58	Weighted Average
11,419		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	25	0.2000	0.36		Sheet Flow, SHEET FLOW Range n= 0.130 P2= 3.09"
1.2	175	0.2500	2.50		Shallow Concentrated Flow, SH CONC. FLOW Woodland Kv= 5.0 fps
2.4	200	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: ROOF

Runoff = 0.17 cfs @ 12.13 hrs, Volume= 673 cf, Depth> 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-YR Rainfall=3.09"

Area (sf)	CN	Description
2,828	98	Roofs, HSG B
2,828		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	25	0.5000	3.71		Sheet Flow, SHEET FLOW Smooth surfaces n= 0.011 P2= 3.09"
0.1	25	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4S: DEV LOT AREA

Runoff = 0.27 cfs @ 12.14 hrs, Volume= 1,040 cf, Depth > 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-YR Rainfall=3.09"

Area (sf)	CN	Description
3,287	58	Woods/grass comb., Good, HSG B
3,580	98	Paved parking, HSG B
12,978	61	>75% Grass cover, Good, HSG B
19,845	67	Weighted Average
16,265		81.96% Pervious Area
3,580		18.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	25	0.1500	0.13		Sheet Flow, SHEET FLOW Woods: Light underbrush n= 0.400 P2= 3.09"
0.4	50	0.2000	2.24		Shallow Concentrated Flow, SH CONC WOODS Woodland Kv= 5.0 fps
1.1	200	0.2000	3.13		Shallow Concentrated Flow, SH CONC LAWN Short Grass Pasture Kv= 7.0 fps
4.7	275	Total, Increased to minimum Tc = 6.0 min			

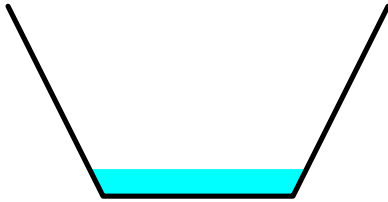
Summary for Reach 20R: DRIVEWAY SWALE

Inflow Area = 19,845 sf, 18.04% Impervious, Inflow Depth > 0.63" for 2-YR event
 Inflow = 0.27 cfs @ 12.14 hrs, Volume= 1,040 cf
 Outflow = 0.24 cfs @ 12.19 hrs, Volume= 1,035 cf, Atten= 9%, Lag= 3.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Max. Velocity= 1.67 fps, Min. Travel Time= 1.7 min
 Avg. Velocity = 0.64 fps, Avg. Travel Time= 4.5 min

Peak Storage= 27 cf @ 12.16 hrs
 Average Depth at Peak Storage= 0.14', Surface Width= 1.14'
 Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 6.33 cfs

1.00' x 1.00' deep channel, n= 0.069 Riprap, 6-inch
Side Slope Z-value= 0.5 '/' Top Width= 2.00'
Length= 175.0' Slope= 0.1071 '/'
Inlet Invert= 220.00', Outlet Invert= 201.25'



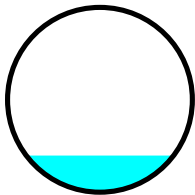
Summary for Reach 50R: 10" CULVERT

Inflow Area = 22,673 sf, 28.26% Impervious, Inflow Depth > 0.55" for 2-YR event
Inflow = 0.24 cfs @ 12.19 hrs, Volume= 1,035 cf
Outflow = 0.24 cfs @ 12.20 hrs, Volume= 1,035 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.19 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.47 fps, Avg. Travel Time= 0.3 min

Peak Storage= 2 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 0.66'
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe
n= 0.010
Length= 25.0' Slope= 0.0100 '/'
Inlet Invert= 200.25', Outlet Invert= 200.00'



Summary for Reach 51R: CUM. FLOW TO HARVARD RD

Inflow Area = 34,092 sf, 18.80% Impervious, Inflow Depth > 0.24" for 2-YR event
Inflow = 0.04 cfs @ 12.17 hrs, Volume= 681 cf
Outflow = 0.04 cfs @ 12.17 hrs, Volume= 681 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 10P: ROOF DRYWELL

Inflow Area = 2,828 sf, 100.00% Impervious, Inflow Depth > 2.85" for 2-YR event
 Inflow = 0.17 cfs @ 12.13 hrs, Volume= 673 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 221.73' @ 24.00 hrs Surf.Area= 625 sf Storage= 673 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	220.00'	627 cf	13.17'W x 47.50'L x 3.54'H Field A 2,215 cf Overall - 648 cf Embedded = 1,567 cf x 40.0% Voids
#2A	220.50'	648 cf	Cultec R-330XLHD x 12 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,275 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	222.50'	4.0" Round Culvert L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 222.50' / 221.25' S= 0.0500 ' S= 0.0500 ' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=220.00' (Free Discharge)
 ↑1=Culvert (Controls 0.00 cfs)

Summary for Pond 11P: BASIN

Inflow Area = 22,673 sf, 28.26% Impervious, Inflow Depth > 0.55" for 2-YR event
 Inflow = 0.24 cfs @ 12.20 hrs, Volume= 1,035 cf
 Outflow = 0.02 cfs @ 16.00 hrs, Volume= 393 cf, Atten= 92%, Lag= 227.9 min
 Primary = 0.02 cfs @ 16.00 hrs, Volume= 393 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 199.76' @ 16.00 hrs Surf.Area= 677 sf Storage= 643 cf

Plug-Flow detention time= 426.2 min calculated for 393 cf (38% of inflow)
 Center-of-Mass det. time= 238.0 min (1,169.8 - 931.8)

Volume	Invert	Avail.Storage	Storage Description
#1	198.50'	1,724 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

2152_POST_12-30-22

NRCC 24-hr D 2-YR Rainfall=3.09"

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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
198.50	295	0	0
199.00	499	199	199
200.00	735	617	816
201.00	1,082	909	1,724

Device	Routing	Invert	Outlet Devices
#1	Primary	199.75'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.01 cfs @ 16.00 hrs HW=199.76' (Free Discharge)
 ↑1=Sharp-Crested Rectangular Weir (Weir Controls 0.01 cfs @ 0.25 fps)

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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: OFF SITE WEST Runoff Area=6,679 sf 38.19% Impervious Runoff Depth>1.85"
Flow Length=125' Tc=6.3 min CN=71 Runoff=0.30 cfs 1,031 cf

Subcatchment 2S: SOUTH TO HARVARD RD Runoff Area=11,419 sf 0.00% Impervious Runoff Depth>0.98"
Flow Length=200' Tc=6.0 min CN=58 Runoff=0.24 cfs 932 cf

Subcatchment 3S: ROOF Runoff Area=2,828 sf 100.00% Impervious Runoff Depth>4.41"
Flow Length=25' Slope=0.5000 '/' Tc=6.0 min CN=98 Runoff=0.26 cfs 1,039 cf

Subcatchment 4S: DEV LOT AREA Runoff Area=19,845 sf 18.04% Impervious Runoff Depth>1.56"
Flow Length=275' Tc=6.0 min CN=67 Runoff=0.75 cfs 2,581 cf

Reach 20R: DRIVEWAY SWALE Avg. Flow Depth=0.27' Max Vel=2.36 fps Inflow=0.75 cfs 2,581 cf
n=0.069 L=175.0' S=0.1071 '/' Capacity=6.33 cfs Outflow=0.69 cfs 2,574 cf

Reach 50R: 10" CULVERT Avg. Flow Depth=0.28' Max Vel=4.28 fps Inflow=0.69 cfs 2,616 cf
10.0" Round Pipe n=0.010 L=25.0' S=0.0100 '/' Capacity=2.85 cfs Outflow=0.69 cfs 2,615 cf

Reach 51R: CUM. FLOW TO HARVARD RD Inflow=0.52 cfs 2,902 cf
Outflow=0.52 cfs 2,902 cf

Pond 10P: ROOF DRYWELL Peak Elev=222.54' Storage=997 cf Inflow=0.26 cfs 1,039 cf
4.0" Round Culvert n=0.010 L=25.0' S=0.0500 '/' Outflow=0.00 cfs 42 cf

Pond 11P: BASIN Peak Elev=199.83' Storage=692 cf Inflow=0.69 cfs 2,615 cf
Outflow=0.42 cfs 1,971 cf

Total Runoff Area = 40,771 sf Runoff Volume = 5,582 cf Average Runoff Depth = 1.64"
78.03% Pervious = 31,812 sf 21.97% Impervious = 8,959 sf

Summary for Subcatchment 1S: OFF SITE WEST

Runoff = 0.30 cfs @ 12.14 hrs, Volume= 1,031 cf, Depth> 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-YR Rainfall=4.65"

Area (sf)	CN	Description
2,551	98	Unconnected pavement, HSG B
4,128	55	Woods, Good, HSG B
6,679	71	Weighted Average
4,128		61.81% Pervious Area
2,551		38.19% Impervious Area
2,551		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	25	0.1500	0.07		Sheet Flow, Overland Woods: Dense underbrush n= 0.800 P2= 3.09"
0.7	100	0.2000	2.24		Shallow Concentrated Flow, Overland Woodland Kv= 5.0 fps
6.3	125	Total			

Summary for Subcatchment 2S: SOUTH TO HARVARD RD

Runoff = 0.24 cfs @ 12.14 hrs, Volume= 932 cf, Depth> 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-YR Rainfall=4.65"

Area (sf)	CN	Description
4,895	55	Woods, Good, HSG B
6,524	61	>75% Grass cover, Good, HSG B
11,419	58	Weighted Average
11,419		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	25	0.2000	0.36		Sheet Flow, SHEET FLOW Range n= 0.130 P2= 3.09"
1.2	175	0.2500	2.50		Shallow Concentrated Flow, SH CONC. FLOW Woodland Kv= 5.0 fps
2.4	200	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: ROOF

Runoff = 0.26 cfs @ 12.13 hrs, Volume= 1,039 cf, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-YR Rainfall=4.65"

Area (sf)	CN	Description
2,828	98	Roofs, HSG B
2,828		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	25	0.5000	3.71		Sheet Flow, SHEET FLOW Smooth surfaces n= 0.011 P2= 3.09"
0.1	25	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4S: DEV LOT AREA

Runoff = 0.75 cfs @ 12.14 hrs, Volume= 2,581 cf, Depth> 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-YR Rainfall=4.65"

Area (sf)	CN	Description
3,287	58	Woods/grass comb., Good, HSG B
3,580	98	Paved parking, HSG B
12,978	61	>75% Grass cover, Good, HSG B
19,845	67	Weighted Average
16,265		81.96% Pervious Area
3,580		18.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	25	0.1500	0.13		Sheet Flow, SHEET FLOW Woods: Light underbrush n= 0.400 P2= 3.09"
0.4	50	0.2000	2.24		Shallow Concentrated Flow, SH CONC WOODS Woodland Kv= 5.0 fps
1.1	200	0.2000	3.13		Shallow Concentrated Flow, SH CONC LAWN Short Grass Pasture Kv= 7.0 fps
4.7	275	Total, Increased to minimum Tc = 6.0 min			

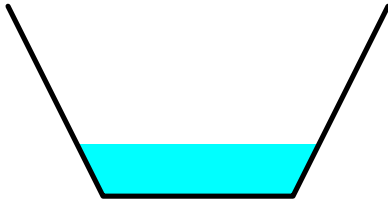
Summary for Reach 20R: DRIVEWAY SWALE

Inflow Area = 19,845 sf, 18.04% Impervious, Inflow Depth > 1.56" for 10-YR event
 Inflow = 0.75 cfs @ 12.14 hrs, Volume= 2,581 cf
 Outflow = 0.69 cfs @ 12.17 hrs, Volume= 2,574 cf, Atten= 8%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.36 fps, Min. Travel Time= 1.2 min
 Avg. Velocity = 0.83 fps, Avg. Travel Time= 3.5 min

Peak Storage= 55 cf @ 12.15 hrs
 Average Depth at Peak Storage= 0.27' , Surface Width= 1.27'
 Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 6.33 cfs

1.00' x 1.00' deep channel, n= 0.069 Riprap, 6-inch
Side Slope Z-value= 0.5 '/' Top Width= 2.00'
Length= 175.0' Slope= 0.1071 '/'
Inlet Invert= 220.00', Outlet Invert= 201.25'



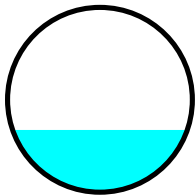
Summary for Reach 50R: 10" CULVERT

Inflow Area = 22,673 sf, 28.26% Impervious, Inflow Depth > 1.38" for 10-YR event
Inflow = 0.69 cfs @ 12.17 hrs, Volume= 2,616 cf
Outflow = 0.69 cfs @ 12.17 hrs, Volume= 2,615 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.28 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.82 fps, Avg. Travel Time= 0.2 min

Peak Storage= 4 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.28' , Surface Width= 0.79'
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe
n= 0.010
Length= 25.0' Slope= 0.0100 '/'
Inlet Invert= 200.25', Outlet Invert= 200.00'



Summary for Reach 51R: CUM. FLOW TO HARVARD RD

Inflow Area = 34,092 sf, 18.80% Impervious, Inflow Depth > 1.02" for 10-YR event
Inflow = 0.52 cfs @ 12.30 hrs, Volume= 2,902 cf
Outflow = 0.52 cfs @ 12.30 hrs, Volume= 2,902 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 10P: ROOF DRYWELL

Inflow Area = 2,828 sf, 100.00% Impervious, Inflow Depth > 4.41" for 10-YR event
 Inflow = 0.26 cfs @ 12.13 hrs, Volume= 1,039 cf
 Outflow = 0.00 cfs @ 23.07 hrs, Volume= 42 cf, Atten= 98%, Lag= 656.4 min
 Primary = 0.00 cfs @ 23.07 hrs, Volume= 42 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 222.54' @ 23.07 hrs Surf.Area= 625 sf Storage= 997 cf

Plug-Flow detention time= 1,175.1 min calculated for 42 cf (4% of inflow)
 Center-of-Mass det. time= 611.2 min (1,362.4 - 751.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	220.00'	627 cf	13.17'W x 47.50'L x 3.54'H Field A
			2,215 cf Overall - 648 cf Embedded = 1,567 cf x 40.0% Voids
#2A	220.50'	648 cf	Cultec R-330XLHD x 12 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,275 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	222.50'	4.0" Round Culvert L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 222.50' / 221.25' S= 0.0500 ' /' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf

Primary OutFlow Max=0.00 cfs @ 23.07 hrs HW=222.54' (Free Discharge)
 ↑1=Culvert (Inlet Controls 0.00 cfs @ 0.68 fps)

Summary for Pond 11P: BASIN

Inflow Area = 22,673 sf, 28.26% Impervious, Inflow Depth > 1.38" for 10-YR event
 Inflow = 0.69 cfs @ 12.17 hrs, Volume= 2,615 cf
 Outflow = 0.42 cfs @ 12.31 hrs, Volume= 1,971 cf, Atten= 38%, Lag= 8.1 min
 Primary = 0.42 cfs @ 12.31 hrs, Volume= 1,971 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 199.83' @ 12.31 hrs Surf.Area= 694 sf Storage= 692 cf

Plug-Flow detention time= 170.8 min calculated for 1,971 cf (75% of inflow)
 Center-of-Mass det. time= 61.9 min (963.2 - 901.2)

Volume	Invert	Avail.Storage	Storage Description
#1	198.50'	1,724 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

2152_POST_12-30-22

NRCC 24-hr D 10-YR Rainfall=4.65"

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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
198.50	295	0	0
199.00	499	199	199
200.00	735	617	816
201.00	1,082	909	1,724

Device	Routing	Invert	Outlet Devices
#1	Primary	199.75'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.41 cfs @ 12.31 hrs HW=199.83' (Free Discharge)
 ↑1=Sharp-Crested Rectangular Weir (Weir Controls 0.41 cfs @ 0.91 fps)

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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: OFF SITE WEST Runoff Area=6,679 sf 38.19% Impervious Runoff Depth>4.89"
Flow Length=125' Tc=6.3 min CN=71 Runoff=0.80 cfs 2,719 cf

Subcatchment 2S: SOUTH TO HARVARD RD Runoff Area=11,419 sf 0.00% Impervious Runoff Depth>3.37"
Flow Length=200' Tc=6.0 min CN=58 Runoff=0.95 cfs 3,206 cf

Subcatchment 3S: ROOF Runoff Area=2,828 sf 100.00% Impervious Runoff Depth>8.11"
Flow Length=25' Slope=0.5000 '/' Tc=6.0 min CN=98 Runoff=0.48 cfs 1,912 cf

Subcatchment 4S: DEV LOT AREA Runoff Area=19,845 sf 18.04% Impervious Runoff Depth>4.41"
Flow Length=275' Tc=6.0 min CN=67 Runoff=2.17 cfs 7,301 cf

Reach 20R: DRIVEWAY SWALE Avg. Flow Depth=0.53' Max Vel=3.21 fps Inflow=2.17 cfs 7,301 cf
n=0.069 L=175.0' S=0.1071 '/' Capacity=6.33 cfs Outflow=2.06 cfs 7,290 cf

Reach 50R: 10" CULVERT Avg. Flow Depth=0.53' Max Vel=5.69 fps Inflow=2.07 cfs 8,198 cf
10.0" Round Pipe n=0.010 L=25.0' S=0.0100 '/' Capacity=2.85 cfs Outflow=2.06 cfs 8,197 cf

Reach 51R: CUM. FLOW TO HARVARD RD Inflow=2.89 cfs 10,753 cf
Outflow=2.89 cfs 10,753 cf

Pond 10P: ROOF DRYWELL Peak Elev=222.81' Storage=1,087 cf Inflow=0.48 cfs 1,912 cf
4.0" Round Culvert n=0.010 L=25.0' S=0.0500 '/' Outflow=0.16 cfs 909 cf

Pond 11P: BASIN Peak Elev=199.97' Storage=791 cf Inflow=2.06 cfs 8,197 cf
Outflow=2.02 cfs 7,547 cf

Total Runoff Area = 40,771 sf Runoff Volume = 15,138 cf Average Runoff Depth = 4.46"
78.03% Pervious = 31,812 sf 21.97% Impervious = 8,959 sf

Summary for Subcatchment 1S: OFF SITE WEST

Runoff = 0.80 cfs @ 12.13 hrs, Volume= 2,719 cf, Depth> 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-YR Rainfall=8.36"

Area (sf)	CN	Description
2,551	98	Unconnected pavement, HSG B
4,128	55	Woods, Good, HSG B
6,679	71	Weighted Average
4,128		61.81% Pervious Area
2,551		38.19% Impervious Area
2,551		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	25	0.1500	0.07		Sheet Flow, Overland Woods: Dense underbrush n= 0.800 P2= 3.09"
0.7	100	0.2000	2.24		Shallow Concentrated Flow, Overland Woodland Kv= 5.0 fps
6.3	125	Total			

Summary for Subcatchment 2S: SOUTH TO HARVARD RD

Runoff = 0.95 cfs @ 12.13 hrs, Volume= 3,206 cf, Depth> 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-YR Rainfall=8.36"

Area (sf)	CN	Description
4,895	55	Woods, Good, HSG B
6,524	61	>75% Grass cover, Good, HSG B
11,419	58	Weighted Average
11,419		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	25	0.2000	0.36		Sheet Flow, SHEET FLOW Range n= 0.130 P2= 3.09"
1.2	175	0.2500	2.50		Shallow Concentrated Flow, SH CONC. FLOW Woodland Kv= 5.0 fps
2.4	200	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: ROOF

Runoff = 0.48 cfs @ 12.13 hrs, Volume= 1,912 cf, Depth> 8.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-YR Rainfall=8.36"

Area (sf)	CN	Description
2,828	98	Roofs, HSG B
2,828		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	25	0.5000	3.71		Sheet Flow, SHEET FLOW Smooth surfaces n= 0.011 P2= 3.09"
0.1	25	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4S: DEV LOT AREA

Runoff = 2.17 cfs @ 12.13 hrs, Volume= 7,301 cf, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-YR Rainfall=8.36"

Area (sf)	CN	Description
3,287	58	Woods/grass comb., Good, HSG B
3,580	98	Paved parking, HSG B
12,978	61	>75% Grass cover, Good, HSG B
19,845	67	Weighted Average
16,265		81.96% Pervious Area
3,580		18.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	25	0.1500	0.13		Sheet Flow, SHEET FLOW Woods: Light underbrush n= 0.400 P2= 3.09"
0.4	50	0.2000	2.24		Shallow Concentrated Flow, SH CONC WOODS Woodland Kv= 5.0 fps
1.1	200	0.2000	3.13		Shallow Concentrated Flow, SH CONC LAWN Short Grass Pasture Kv= 7.0 fps
4.7	275	Total, Increased to minimum Tc = 6.0 min			

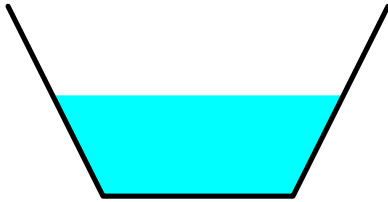
Summary for Reach 20R: DRIVEWAY SWALE

Inflow Area = 19,845 sf, 18.04% Impervious, Inflow Depth > 4.41" for 100-YR event
 Inflow = 2.17 cfs @ 12.13 hrs, Volume= 7,301 cf
 Outflow = 2.06 cfs @ 12.15 hrs, Volume= 7,290 cf, Atten= 5%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Max. Velocity= 3.21 fps, Min. Travel Time= 0.9 min
 Avg. Velocity = 1.09 fps, Avg. Travel Time= 2.7 min

Peak Storage= 117 cf @ 12.14 hrs
 Average Depth at Peak Storage= 0.53', Surface Width= 1.53'
 Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 6.33 cfs

1.00' x 1.00' deep channel, n= 0.069 Riprap, 6-inch
Side Slope Z-value= 0.5 '/' Top Width= 2.00'
Length= 175.0' Slope= 0.1071 '/'
Inlet Invert= 220.00', Outlet Invert= 201.25'



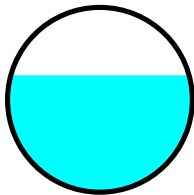
Summary for Reach 50R: 10" CULVERT

Inflow Area = 22,673 sf, 28.26% Impervious, Inflow Depth > 4.34" for 100-YR event
Inflow = 2.07 cfs @ 12.16 hrs, Volume= 8,198 cf
Outflow = 2.06 cfs @ 12.16 hrs, Volume= 8,197 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.69 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.33 fps, Avg. Travel Time= 0.2 min

Peak Storage= 9 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.53' , Surface Width= 0.80'
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe
n= 0.010
Length= 25.0' Slope= 0.0100 '/'
Inlet Invert= 200.25', Outlet Invert= 200.00'



Summary for Reach 51R: CUM. FLOW TO HARVARD RD

Inflow Area = 34,092 sf, 18.80% Impervious, Inflow Depth > 3.78" for 100-YR event
Inflow = 2.89 cfs @ 12.16 hrs, Volume= 10,753 cf
Outflow = 2.89 cfs @ 12.16 hrs, Volume= 10,753 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 10P: ROOF DRYWELL

Inflow Area = 2,828 sf, 100.00% Impervious, Inflow Depth > 8.11" for 100-YR event
 Inflow = 0.48 cfs @ 12.13 hrs, Volume= 1,912 cf
 Outflow = 0.16 cfs @ 12.31 hrs, Volume= 909 cf, Atten= 67%, Lag= 10.8 min
 Primary = 0.16 cfs @ 12.31 hrs, Volume= 909 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 222.81' @ 12.31 hrs Surf.Area= 625 sf Storage= 1,087 cf

Plug-Flow detention time= 365.0 min calculated for 909 cf (48% of inflow)
 Center-of-Mass det. time= 187.8 min (929.2 - 741.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	220.00'	627 cf	13.17'W x 47.50'L x 3.54'H Field A 2,215 cf Overall - 648 cf Embedded = 1,567 cf x 40.0% Voids
#2A	220.50'	648 cf	Cultec R-330XLHD x 12 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,275 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	222.50'	4.0" Round Culvert L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 222.50' / 221.25' S= 0.0500 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf

Primary OutFlow Max=0.16 cfs @ 12.31 hrs HW=222.81' (Free Discharge)
 ↑1=Culvert (Inlet Controls 0.16 cfs @ 1.89 fps)

Summary for Pond 11P: BASIN

Inflow Area = 22,673 sf, 28.26% Impervious, Inflow Depth > 4.34" for 100-YR event
 Inflow = 2.06 cfs @ 12.16 hrs, Volume= 8,197 cf
 Outflow = 2.02 cfs @ 12.18 hrs, Volume= 7,547 cf, Atten= 2%, Lag= 1.1 min
 Primary = 2.02 cfs @ 12.18 hrs, Volume= 7,547 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 199.97' @ 12.18 hrs Surf.Area= 727 sf Storage= 791 cf

Plug-Flow detention time= 63.7 min calculated for 7,547 cf (92% of inflow)
 Center-of-Mass det. time= 22.2 min (884.7 - 862.5)

Volume	Invert	Avail.Storage	Storage Description
#1	198.50'	1,724 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

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NRCC 24-hr D 100-YR Rainfall=8.36"

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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
198.50	295	0	0
199.00	499	199	199
200.00	735	617	816
201.00	1,082	909	1,724

Device	Routing	Invert	Outlet Devices
#1	Primary	199.75'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=1.97 cfs @ 12.18 hrs HW=199.96' (Free Discharge)
 ↑1=Sharp-Crested Rectangular Weir (Weir Controls 1.97 cfs @ 1.55 fps)