ALP Engineering
& Landscape Architecture, PLLC

August 5, 2021

Hon. Christopher Carthy, Chairman and Members of the Planning Board
Town of North Castle
17 Bedford Road
Armonk, NY 10504

RE: Hidden Oak Conservation Subdivision
Hidden Oak Road
Town of North Castle (Armonk Hamlet), New York
Section 107.01, Block 1, Lot 31

Dear Chairman Carthy and Members of the Planning Board:

We are pleased to submit a pdf file of the following plans and documents in support of the application on behalf of McKenna Custom Homes of Pleasantville, N.Y. for Preliminary and Final Conservation Subdivision Approval for three single family homes:

Drawings being submitted for Preliminary and Final Subdivision Approval include the following:

Drawing No.	Drawing Title	Date
CS-1	Cover Sheet	03/20/2020
S-1	Subdivision Layout Plan	03/20/2020
S-2	Grading & Utilities Plan	03/20/2020
S-3.1	Phase 1: Erosion and Sediment Control Plan/ Tree Removal & Protection Plan	03/20/2020
S-3.2	Phase 2: Erosion and Sediment Control Plan/ Tree Removal & Protection Plan	03/20/2020
S-4	Slopes Map	03/20/2020
S-5	Landscape Plan	03/20/2020
DE-1	Construction Details	03/20/2020
DE-2	Construction Details	03/20/2020
DE-3	Subdivision Road and Driveway Profiles	03/20/2020
DE-4	Erosion Control/Restoration Notes/Trees	03/20/2020
DE-5	Construction Details / Maintenance Plan	03/20/2020

P.O. Box 843 Ridgefield, CT 06877
EAEC Office: 162 Falls Road Bethany, CT 06524
Direct: (475) 215-5343 Mobile: (203) 710-0587
EAEC Tel: (203) 393-0690 x114
Email: alan@eaec-inc.com

In addition, to the drawings noted above, appended to the set are the following three drawings for the septic system on the three lots and the water main extension that were prepared by Campbell Engineering.

Drawing No.	Drawing Title	Date
IPP-1	Integrated Plot Plan	09/06/2016
D-1	3 Lot Subdivision Site Plan Profiles and Details	06/30/2016
D-2	3 Lot Subdivision Site Plan Details	06/30/2016

We are pleased also to submit in pdf format the following application forms, calculation worksheets, and figures for Preliminary Subdivision Approval and Final Subdivision Approval:

- Application for Preliminary Subdivision Approval form, dated 08/05/2021;
- Application for Final Subdivision Approval form, dated 08/05/2021;
- Short Environmental Assessment Form, dated 05/05/2021.
- Hidden Oak Conservation Subdivision Tree Survey, dated 01/09/2015.
- Drawing entitled Preliminary Plat Hidden Oak Subdivision Proposed Lots 1, 2 & 3, prepared by William J. Welsh, L.S., dated 07/15/2020.
- Letter from Mary P. Galasso, NYCDEP dated June 6, 2016 indicating approval of the application to engage in a regulated activity (i.e. approval of the SWPPP report prepared for the project).
- Letter from Mariyam Zachariah, NYCDEP, dated June 15, 2020 which indicates a renewal of the Hidden Oak Subdivision SWPPP determination to expire on June 6, 2026.

The following documents are also included:

- Deed of Conservation Easement.
- Stormwater Control Facility Maintenance and Access Agreement.
- Declaration Of Covenants, Conditions, and Restrictions for Hidden Oak Subdivision.
- Deed of Road to Town of North Castle.

This property was the subject of a Conservation Subdivision application commencing about 7 years ago. The application was to create three single family lots on a 7.69 acre property at the south end of Hidden Oak Road. The Planning Board granted Preliminary Conservation Subdivision Plat Approval, as well as Steep Slope Permit and Tree Removal Permit approvals on February 9, 2015; Final Conservation Subdivision Plat Approval, Steep Slope Permit and Tree Removal Permit approvals were granted by the Planning Board on December 12, 2016. The applicant then applied back in March 2020 for both renewal of the Preliminary and Final Subdivision approvals, which were then granted by the Planning Board on June 8, 2020 with an expiration date of December 8, 2020. Unfortunately, these approvals have lapsed.

Therefore, on behalf of McKenna Custom Homes, Inc., our office is submitting this application for both Preliminary and Final Conservation Subdivision Approval for the same three lot subdivision.

Design of the Proposed Subdivision

The proposal is for a Conservation Subdivision which will subdivide the subject 7.69-acre property into three single family house lots. The three lots to be created are as follows: Lot 1 (1.863 acres), Lot 2 (1.920 acres), and Lot 3 (2.045 acres). The road right-of-way will encompass a total of 0.864 acres. Finally, the proposed Conservation Lands will include 0.994 acres of the property. The site plans for the property have not changed since the approvals of the project were granted back in 2016.

The project site is bounded by private residences and lands of the City of New York to the west, and lands of the City of New York to the north, south and east. The property is presently wooded with second growth trees. There are no wetlands, either Town or State regulated, on or immediately adjacent to the property. About 175 feet to the east of the property is a watercourse that eventually flows southward to the Kensico Reservoir.

Since the property contains no wetlands or watercourses, or other unique landforms, the principal lands to protect as open space are located on the project perimeter, specifically those lands within the property more directly drain to the Kensico Reservoir. These include the reservoir stem to the southeast of the site, and the lands to the south and west which are under the ownership of the New York City Department of Environmental Protection (NYCDEP). The Conservation Subdivision proposes to protect as open space virtually all of the lands within the offset from the reservoir stem, and a 50-foot wide strip along the western boundary of the site where it abuts lands of the NYCDEP. Along the southerly boundary of the property, the Conservation Lands are 10 feet in width so as to provide a physical connection between the westerly and easterly portions of the Conservation Lands.

We look forward to discussing this with the Planning Board. Should you have any comments or questions regarding the enclosed submission, please feel free to call me on my direct line at (475) 215-5343, or my cell at (203) 710-0587.

Very truly yours,

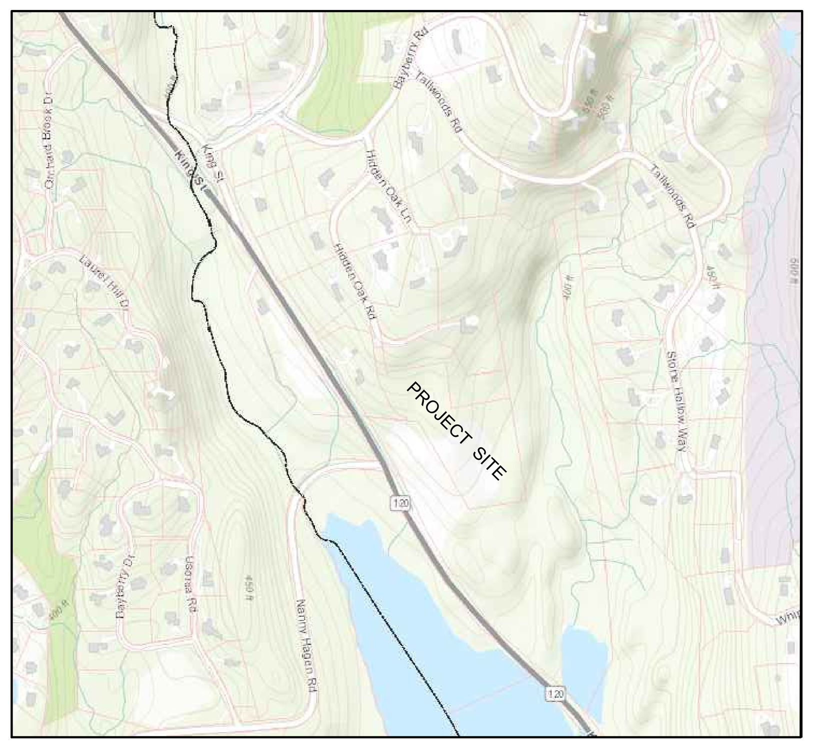
ALP ENGINEERING & LANDSCAPE ARCHITECTURE, PLLC

Alan L. Pilch, P.E., R.L.A.
Principal

cc: Kevin McKenna (w/encl.)

Hidden Oak Subdivision

Final Subdivision Approval Drawing Set



LOCATION MAP
Not to Scale

LIST OF DRAWINGS IN PLAN SET:

Drawings by ALP Engineering & Landscape Architecture, PLLC
(Evans Associates):

1. CS-1 Cover Sheet
2. S-1 Subdivision Layout Plan
3. S-2 Grading & Utilities Plan
4. S-3.1 PHASE 1: Erosion and Sediment Control Plan / Tree Removal Plan
5. S-3.2 PHASE 2: Erosion and Sediment Control Plan / Tree Removal Plan
6. S-4 Slopes Map
7. S-5 Landscape Plan
8. DE-1 Construction Details / Subdivision Road Profile
9. DE-2 Construction Details
10. DE-3 Subdivision Road and Driveway Profiles
11. DE-4 Erosion Control/Restoration Notes/Trees
12. DE-5 Construction Details/Maintenance Plan

Drawings by Campbell Engineering:

13. IPP-1 3 Lot Subdivision Site Plan (Septic System Design Parameters)
14. D-1 3 Lot Subdivision Site Plan Profiles & Details (Water Main Extension)
15. D-2 3 Lot Subdivision Site Plan Details (Water Main Extension)

TABLE OF LAND USE

ZONING DATA:	CONSERVATION SUBDIVISION			
ZONE: R-2A	TOTAL ACREAGE / SIZE OF PROPERTY TO BE SUBDIVIDED: 7.69 ACRES			
TAX MAP:	SECTION 107.01 , BLOCK 1 , LOT 32	OLD/FORMER SBL: SECTION 2 , BLOCK 1K , LOT 10		
FIRE DISTRICT:	ARMONK FIRE DISTRICT			
SCHOOL DISTRICT:	BYRAM HILLS CENTRAL			

	REQUIRED	PROVIDED		
		LOT 1	LOT 2	LOT 3
GROSS LOT AREA	1 Ac.	1.864 Ac.	1.920 Ac.	2.045 Ac.
SLOPES > 25%		0	0.102 Ac.	0.084 Ac.
50% FACTOR AS PER SEC. 213-3		0	0.051 Ac.	0.042 Ac.
NET LOT AREA	1 Ac.	1.863 Ac.	1.869 Ac.	2.003 Ac.
CONTIGUOUS BUILDING AREA	20,000 S.F.	>20,000 S.F.	>20,000 S.F.	>20,000 S.F.
FRONTAGE	125 FT.	458 FT.	73 FT.	61 FT.
DEPTH	150 FT.	168 FT.	315 FT.	276 FT.
WIDTH	125 FT.	254 FT.	243 FT.	201 FT.
MIN. YARD SETBACKS FRONT	50 FT.	57 FT.	93 FT.	175 FT.
MIN. YARD SETBACKS SIDE	30 FT. [1]	103 FT./ 164 FT.	88 FT./ 32 FT.	43 FT./ 85 FT.
MIN. YARD SETBACKS REAR	40 FT. / 50 FT. [2]	79 FT.	193 FT.	145 FT.

LOT SUMMARY

	LOT 1	LOT 2	LOT 3
DISTURBANCE AREA	58,721 S.F. [a]	52,250 S.F.	67,810 S.F. [b]
CUT/FILL	2,122 yd^3(CUT)	550 yd^3(FILL)	204 yd^3(FILL)
TOWN REGULATED TREE REMOVAL	74	59	117
TOWN REG SPECIMEN TREE REMOVAL	4	1	2
WETLAND DISTURBANCE	0	0	0
WETLAND BUFFER DISTURBANCE	0	0	0
MAX GROSS LAND COVERAGE	12,302 SF	13,009 SF	13,375 SF
MAX FLOOR AREA	10,296 SF	10,470 SF	10,296 SF
HOUSE FOOTPRINT SHOWN	4,600 SF	4,050 SF	3,600 SF
GROSS LAND COVERAGE SHOWN	9,320 SF	9,368 SF	11,044 SF

NOTES ON TABLE OF LAND USE

1. PURSUANT TO SECTION 213.25.D(4)(a) OF THE TOWN CODE, ON NORTH SIDE OF LOT 1, A 30-FOOT SIDE YARD SETBACK IS PROVIDED. LIKEWISE, ON THE NORTHERN SIDE LOT LINE OF LOT 2, A 30-FOOT SETBACK IS PROVIDED.
2. PURSUANT TO SECTION 213.25.D(4)(a) OF THE TOWN CODE, ON EASTERN REAR LOT LINE OF LOT 1, A 50-FOOT REAR YARD SETBACK IS PROVIDED. IN ADDITION, ON THE EASTERN REAR LOT LINE ON LOT 2, A 50-FOOT SETBACK IS PROVIDED.
3. SECTION, BLOCK AND LOT NUMBER FOR NEW LOTS:
   LOT 1, SECTION 107.01 BLOCK 1 LOT 32.1 (107.01-1-32.1)
   LOT 2, SECTION 107.01 BLOCK 1 LOT 32.2 (107.01-1-32.2)
   LOT 3, SECTION 107.01 BLOCK 1 LOT 32.3 (107.01-1-32.3)

NOTES ON LOT SUMMARY

a. INCLUDES DISTURBANCE FOR CONSTRUCTION OF STORMWATER MANAGEMENT FACILITIES FOR THE SUBDIVISION ROAD ON LANDS TO BE IN THE OWNERSHIP OF LOT #1 AND LOCATED ON THE WEST SIDE OF THE SUBDIVISION ROAD.

b. INCLUDES DISTURBANCE FOR CONSTRUCTION OF THE STORMWATER MANAGEMENT BASIN FOR THE SUBDIVISION AT THE SOUTH END OF LOT #3, THE STORMWATER MANAGEMENT FACILITY SWMF-1.2 AT THE SOUTH END OF THE SUBDIVISION ROAD, AND THE RAIN GARDEN ON LOT #3.

ADDITIONAL NOTES:

1. McKenna Custom Homes intends to comply with the Town construction standards and specifications as well as with the requirements of the Planning Board resolution of approval.

APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED DEC. 12, 2016.

______________________ DATE:______________
CHRISTOPHER CARTHY, CHAIRMAN
TOWN OF NORTH CASTLE PLANNING BOARD

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

______________________ DATE:_______________
JOSEPH CERMELE, PE
KELLARD SESSIONS, P.C.
CONSULTING TOWN ENGINEERS

Civil engineer:

Alan L. Pilch
ALP Engineering & Landscape Architecture, PLLC
P.O. Box 843
Ridgefield, CT 06877
P.E. #80167
C. of A. #0016331

Direct Tel: (475) 215-5343

OWNER:
McKenna Custom Homes, Inc.
433 Manville Road
Pleasantville, NY 10570
Tel: (914) 769-1869

CONSULTANTS:

CAMPBELL ENGINEERING, LLP
160 King Street
P.O. Box 255
Chappaqua, New York 10514
Tel: (914) 238-3555
Fax: (914) 238-3435

WELSH Engineering & Land Surveying, P.C.
12 Campwoods Grounds
Ossining, N.Y. 10562

Tel: (914) 773-1701

ISSUED:

Submission to Town and NYCDEP	07/24/2015
Submission to Town and NYCDEP	10/15/2015
Submission to Town and NYCDEP	12/15/2015
Submission to Town and NYCDEP	03/01/2016
Submission to Town for Final Subdivision Plan approval	06/30/2016
Submission to Town for Prelim & Final Subdivision Plan appvl	10/07/2016
Submission to Town for Prelim & Final Subdivision Plan appvl	03/20/2020

SEAL:

PROJECT NAME:
HIDDEN OAK SUBDIVISION
Hidden Oak Road
Town of North Castle, New York

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

ENVIRONMENTAL CONSULTANT:
EVANS ASSOCIATES
ENVIRONMENTAL CONSULTING, INC.
162 Falls Road Bethany, Connecticut 06524
Tel. (203) 393-0690

Drawing title:

Cover Sheet

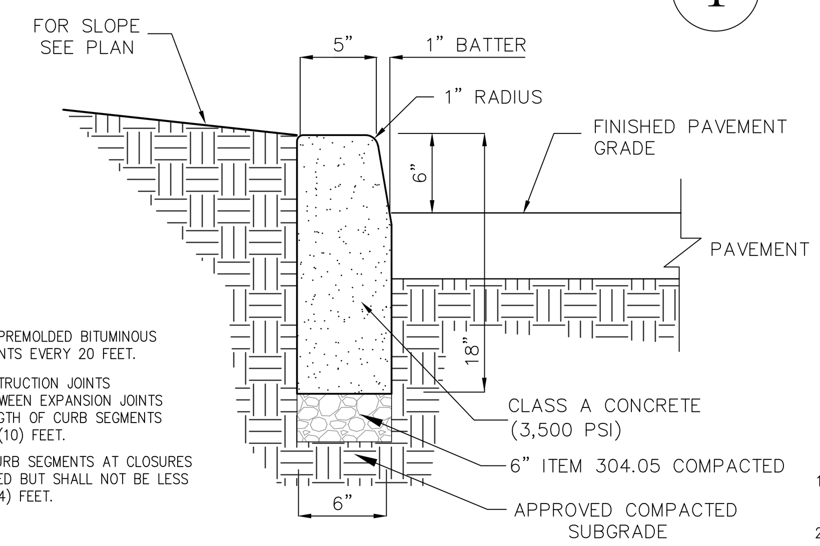
Date: July 15, 2014

Dwn. by: alp

ID: _C09-2015

CS-1

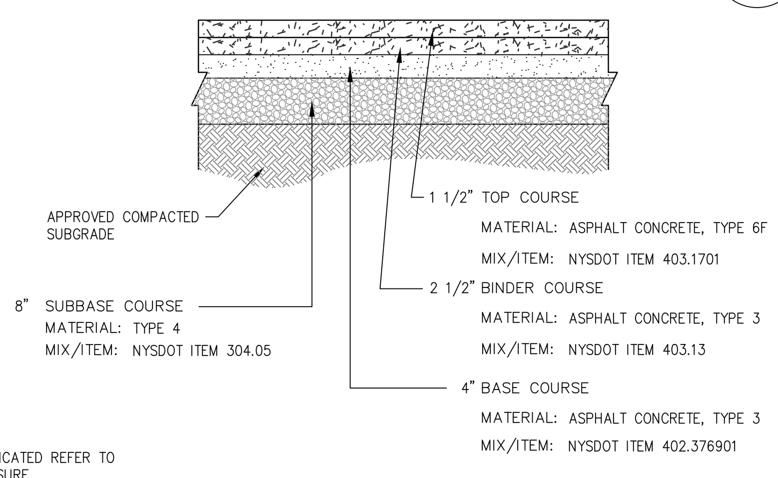
Concrete Curb (1)



NOTES:

1. INSTALL 1/2" PREMOLDED BITUMINOUS EXPANSION JOINTS EVERY 20 FEET.
2. INSTALL CONSTRUCTION JOINTS MID-WAY BETWEEN EXPANSION JOINTS SO THAT LENGTH OF CURB SEGMENTS WILL BE TEN (10) FEET.
3. LENGTH OF CURB SEGMENTS AT CLOSURES MAY BE VARIED BUT SHALL NOT BE LESS THAN FOUR (4) FEET.

Subdivision Road Pavement (2)



1 1/2" TOP COURSE
MATERIAL: ASPHALT CONCRETE, TYPE 6F
MIX/ITEM: NYSDOT ITEM 403.1701

2 1/2" BINDER COURSE
MATERIAL: ASPHALT CONCRETE, TYPE 3
MIX/ITEM: NYSDOT ITEM 403.13

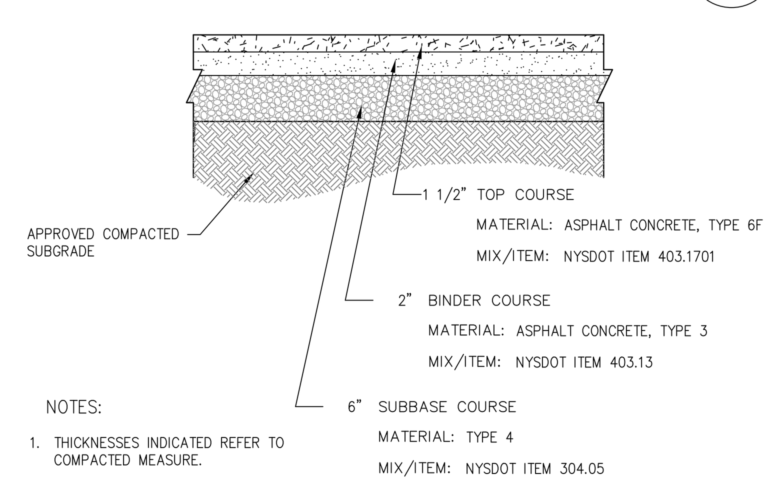
4" BASE COURSE
MATERIAL: ASPHALT CONCRETE, TYPE 3
MIX/ITEM: NYSDOT ITEM 402.376901

8" SUBBASE COURSE
MATERIAL: TYPE 4
MIX/ITEM: NYSDOT ITEM 304.05

NOTES:

1. THICKNESSES INDICATED REFER TO COMPACTED MEASURE.
2. ITEM NUMBERS REFER TO: NEW YORK STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS

Driveway Pavement (3)



1 1/2" TOP COURSE
MATERIAL: ASPHALT CONCRETE, TYPE 6F
MIX/ITEM: NYSDOT ITEM 403.1701

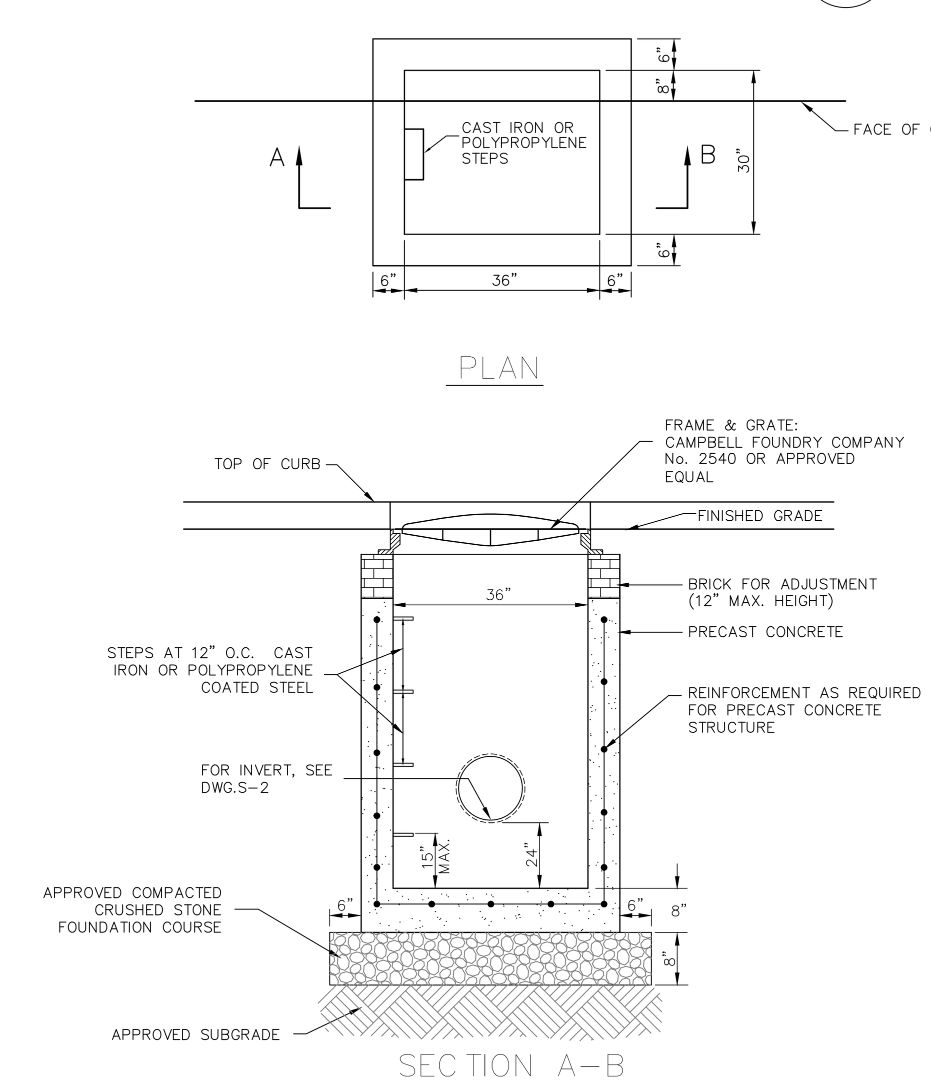
2" BINDER COURSE
MATERIAL: ASPHALT CONCRETE, TYPE 3
MIX/ITEM: NYSDOT ITEM 403.13

6" SUBBASE COURSE
MATERIAL: TYPE 4
MIX/ITEM: NYSDOT ITEM 304.05

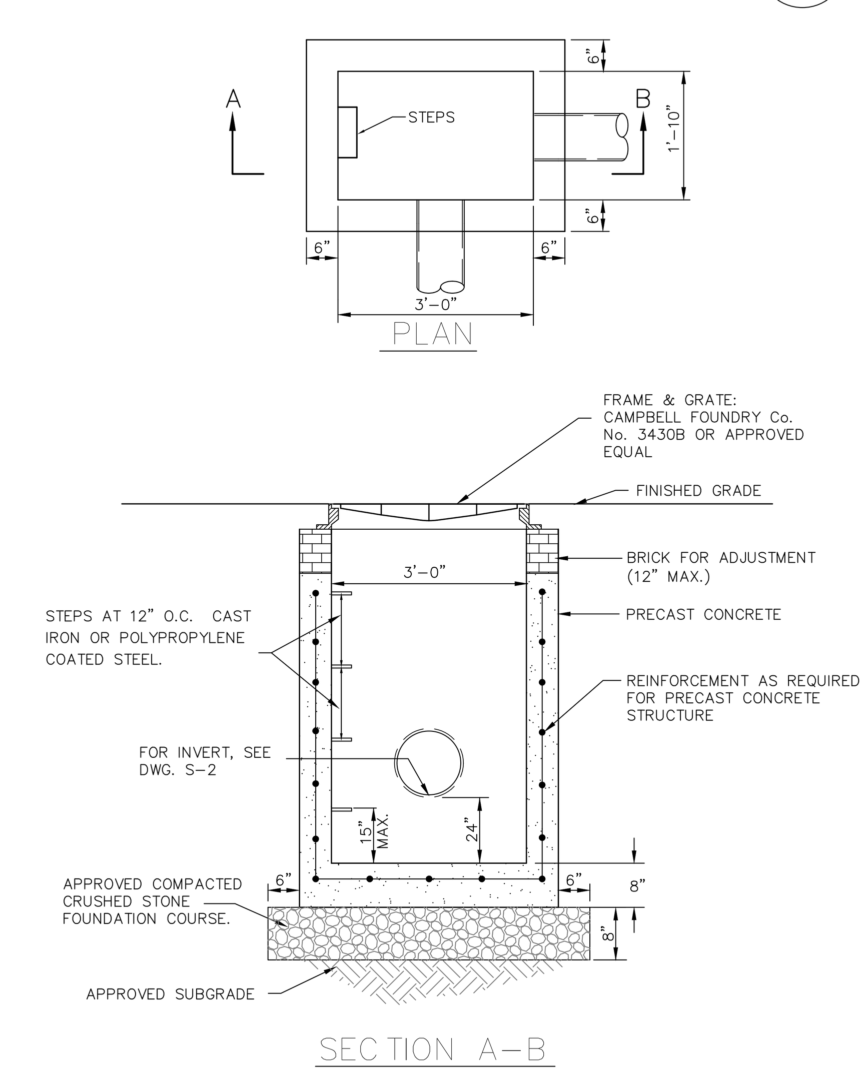
NOTES:

1. THICKNESSES INDICATED REFER TO COMPACTED MEASURE.
2. ITEM NUMBERS REFER TO: NEW YORK STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS

Catch Basin - Type: Curb Inlet (4)

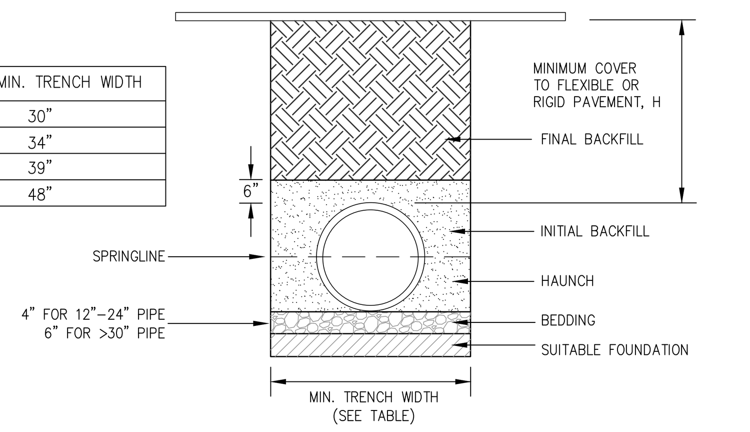


Catch Basin - Type: Drain Inlet (5)



Storm Drain Trench (6)

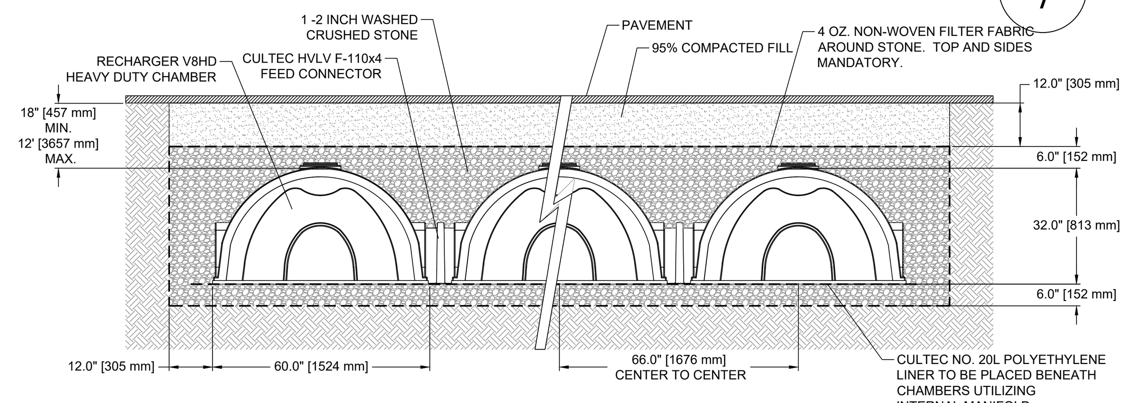
PIPE DIAM.	MIN. TRENCH WIDTH
12"	30"
15"	34"
18"	39"
24"	48"



NOTES:

1. BEDDING & HAUNCH – SHALL CONSIST OF A BED OF PROPERLY COMPACTED GRANULAR BEDDING MATERIAL (SAND OR CRUSHED STONE AS SPECIFIED) HAVING A COMPACTED THICKNESS OF AT LEAST SIX (6) INCHES BELOW THE BOTTOM OF THE PIPE OR CONDUIT AND EXTENDING AROUND THE PIPE OR CONDUIT FOR AT LEAST 30% OF ITS DIAMETER OR RISE. THE LAYER OF BEDDING MATERIAL SHALL BE SHAPED TO FIT THE PIPE OR CONDUIT FOR AT LEAST 15% OF THE OUTSIDE DIAMETER OR RISE OF THE PIPE OR CONDUIT AND SHALL HAVE RECESSES SHAPED TO RECEIVE THE BELL OF BELL AND SPIGOT PIPE. SAND BEDDING SHALL BE CLEAN, WELL–GRADED SAND CONSISTING OF HARD, DURABLE PARTICLES FREE FROM LUMPS OF CLAY, LOAM AND ALL OTHER DELETERIOUS SUBSTANCES. CRUSHED STONE BEDDING SHALL BE WELL–GRADED CRUSHED STONE CONFORMING TO ASTM DESIGNATION C–33, SIZE NO. 67.
2. INITIAL BACKFILL – SHALL CONSIST OF GRANULAR MATERIAL (SAND OR CRUSHED STONE AS SPECIFIED) AS APPROVED BY THE OWNER'S FIELD REPRESENTATIVE AND/OR SOILS ENGINEER. SAND SHALL CONSIST OF CLEAN, WELL GRADED, HARD, DURABLE PARTICLES, FREE OF LUMPS OF CLAY, LOAM AND ALL OTHER DELETERIOUS SUBSTANCES. CRUSHED STONE SHALL CONSIST OF WELL GRADED CRUSHED STONE CONFORMING TO ASTM DESIGNATION C–33, SIZE NO. 67.
3. BACKFILL FOR PIPE AND CONDUIT SHALL BE PLACED EVENLY AND CAREFULLY AROUND AND OVER THE PIPE OR CONDUIT IN SIX (6) INCH MAXIMUM LAYERS. EACH LAYER SHALL BE THOROUGHLY AND CAREFULLY COMPACTED UNTIL TWELVE (12) INCHES OF COVER EXISTS OVER THE PIPE OR CONDUIT. THE REMAINDER OF THE BACKFILL SHALL THEN BE PLACED AND COMPACTED IN MAXIMUM TWELVE (12) INCH LAYERS. EACH LAYER SHALL BE COMPACTED BY APPROVED MECHANICAL TAMPING MACHINES.

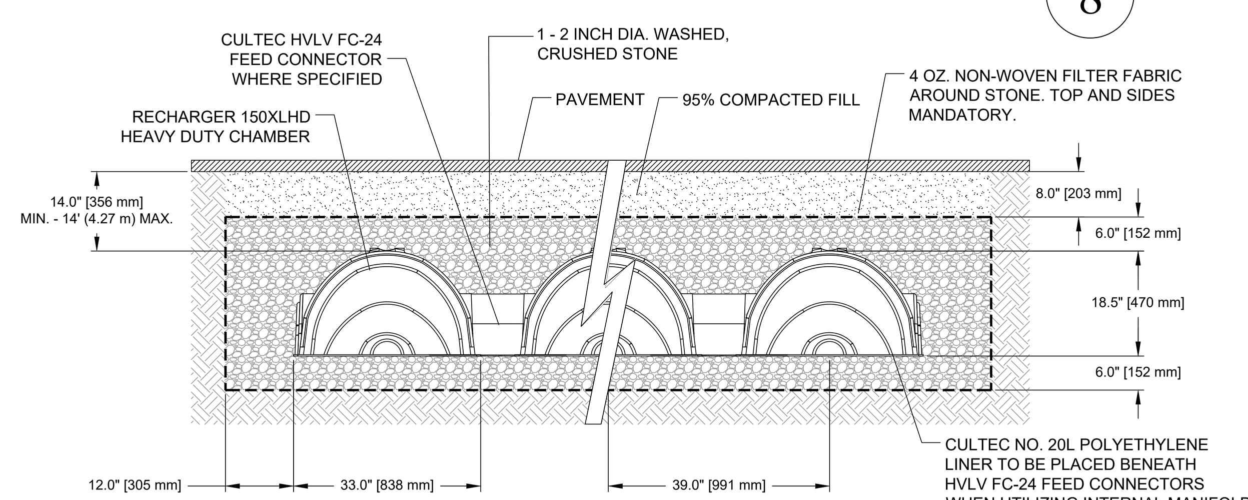
Cultec V8HD Chamber Installation (7)



GENERAL NOTES
RECHARGER V8HD BY CULTEC, INC. OF BROOKFIELD, CT.
STORAGE PROVIDED = 13.274 CF/FT PER DESIGN UNIT.
REFER TO CULTEC, INC.'S CURRENT RECOMMENDED INSTALLATION GUIDELINES.
USE RECHARGER V8HD HEAVY DUTY FOR TRAFFIC AND/OR H-25 APPLICATIONS.

ALL RECHARGER V8HD HEAVY DUTY UNITS ARE MARKED WITH A COLOR STRIPE FORMED INTO THE PART ALONG THE LENGTH OF THE CHAMBER.
ALL RECHARGER V8HD CHAMBERS MUST BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.

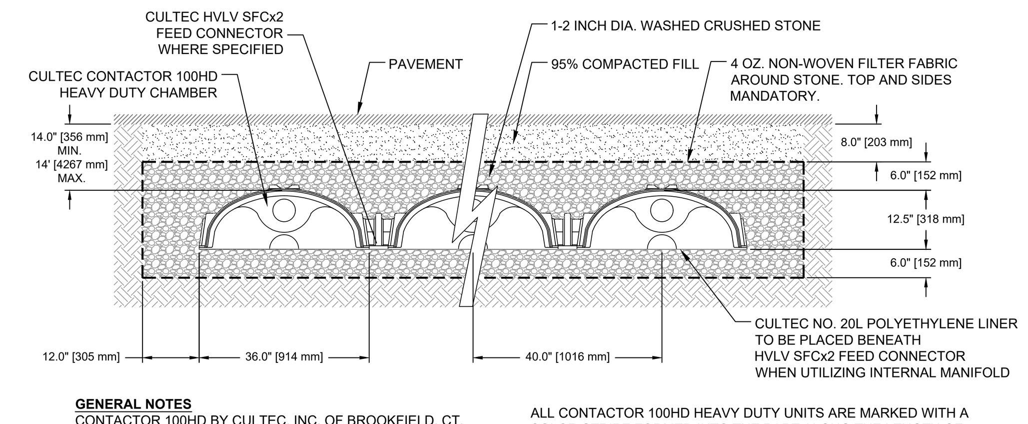
Cultec 150XLHD Chamber Installation (8)



GENERAL NOTES
RECHARGER 150XLHD BY CULTEC, INC. OF BROOKFIELD, CT.
STORAGE PROVIDED = 4.89 CF/FT (0.45 M3/M) PER DESIGN UNIT.
REFER TO CULTEC, INC.'S CURRENT RECOMMENDED INSTALLATION GUIDELINES.
USE RECHARGER 150XLHD HEAVY DUTY FOR TRAFFIC AND/OR H-25 APPLICATIONS.

ALL RECHARGER 150XLHD HEAVY-DUTY UNITS ARE MARKED WITH A COLORED STRIPE FORMED INTO THE PART ALONG THE LENGTH OF THE CHAMBER.
ALL RECHARGER 150XLHD CHAMBERS MUST BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.

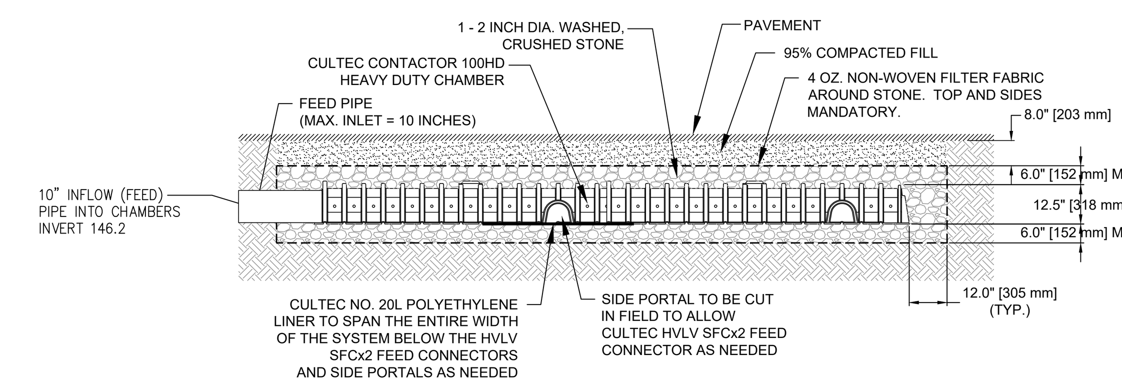
Cultec 100HD Chamber Installation (9)



GENERAL NOTES
CONTACTOR 100HD BY CULTEC, INC. OF BROOKFIELD, CT.
STORAGE PROVIDED = 3.84 CF/FT PER DESIGN UNIT.
REFER TO CULTEC, INC.'S CURRENT RECOMMENDED INSTALLATION GUIDELINES.
USE CONTACTOR 100HD HEAVY DUTY FOR TRAFFIC AND/OR H-25 APPLICATIONS.
PROPOSED INSTALLATION TO CONSIST OF 5 ROWS OF 2 CHAMBERS END TO END

ALL CONTACTOR 100HD HEAVY DUTY UNITS ARE MARKED WITH A COLOR STRIPE FORMED INTO THE PART ALONG THE LENGTH OF THE CHAMBER. ALL CONTACTOR 100 CHAMBERS MUST BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.

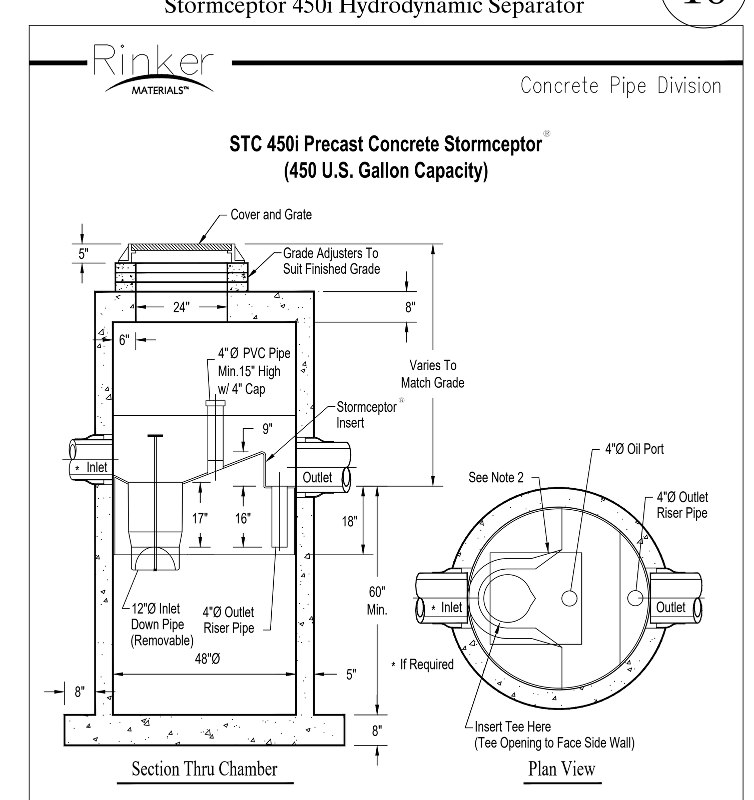
END VIEW OF CULTEC CHAMBERS



SECTION VIEW THROUGH CULTEC CHAMBERS

Pre-Treatment Facility (10)

Stormceptor 450i Hydrodynamic Separator

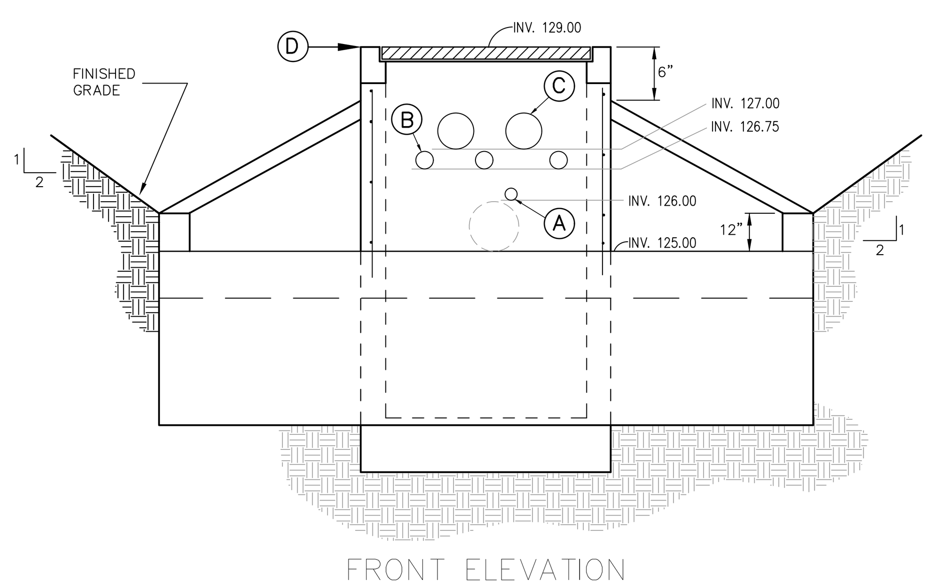


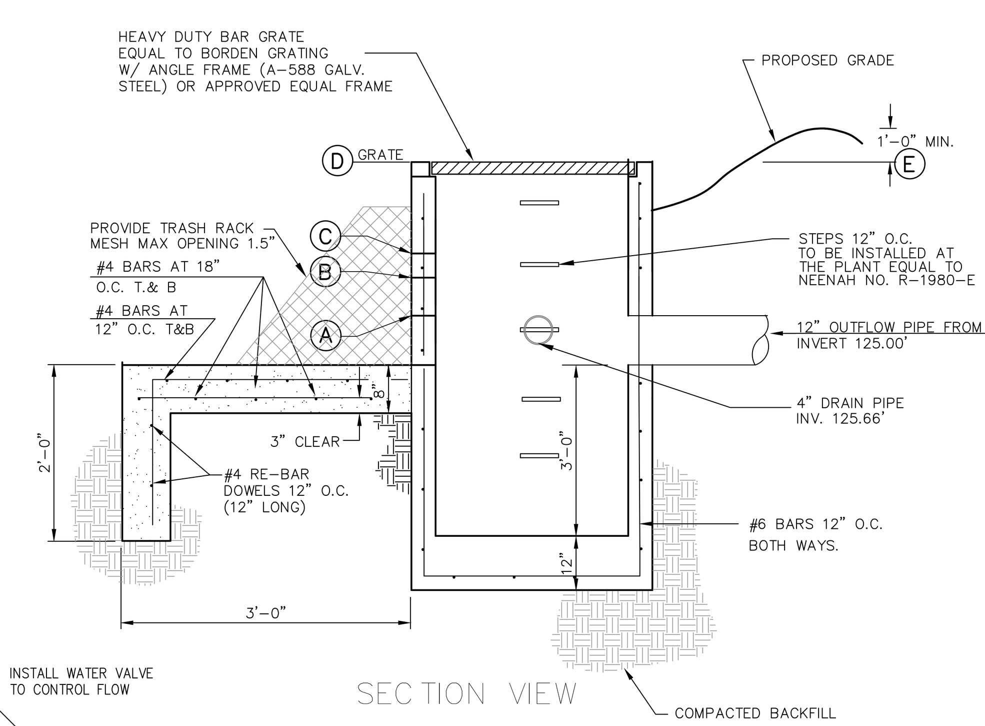
Notes:

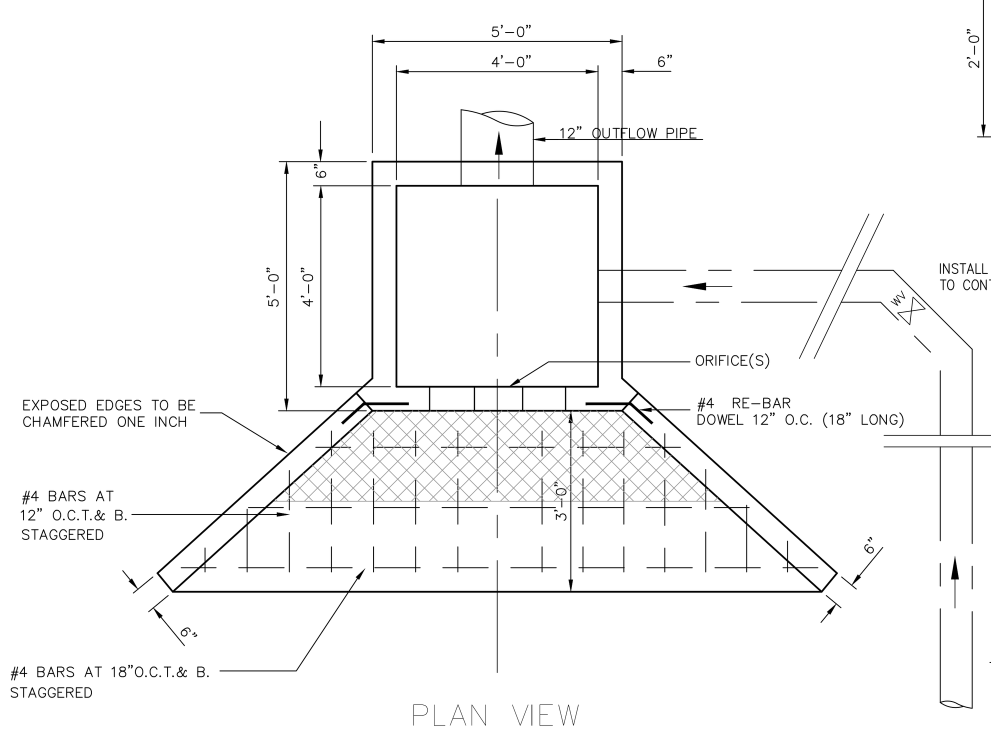
1. The Use Of Flexible Connection is Recommended at The Inlet and Outlet Where Applicable.
2. The Cover Should be Positioned Over The Inlet Drop Pipe and The Oil Port.
3. The Stormceptor System is protected by one or more of the following U.S. Patents: #4985148, #5498331, #5725760, #5753115, #5849181, #6068765, #6371690.
4. Contact a Concrete Pipe Division representative for further details not listed on this drawing.

Rinker 027

Stormwater Management Basin Outlet Control Structure Detail (12)







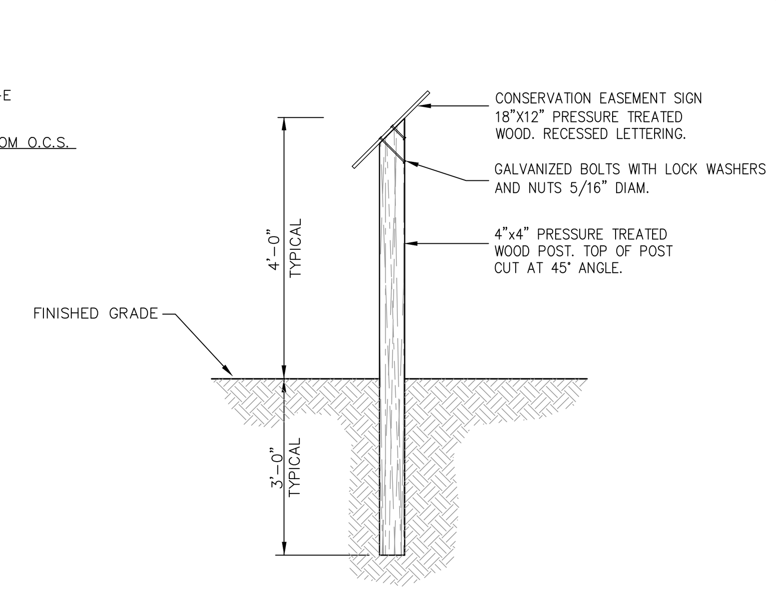
NOTES:

1. ALL JOINTS SHALL BE WATERTIGHT.
2. PROVIDE ANTI-SEEP COLLARS ON 15" DIAMETER OUTLET PIPE FROM OUTLET CONTROL STRUCTURE UNDER BERM.
3. PROVIDE SHOP DETAIL OF OUTLET CONTROL STRUCTURE FOR ENGINEER APPROVAL.

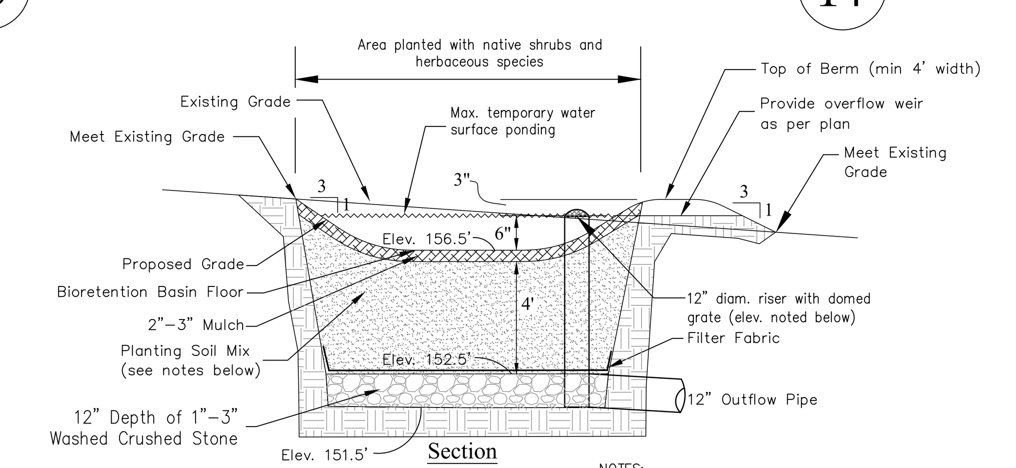
STORMWATER MANAGEMENT BASIN

ORIFICES (A) 1.3" DIAM. @ 126.00'
(B) 4" DIAM. @ 126.75' x 3
(C) 8" DIAM. @ 127.00' x 2
TOP GRATE (D) ELEV. 129.0'
PIPE FROM OCS 12" DIAM. INV. ELEV. 125.0'
6' W. EMERGENCY SPILLWAY, INV. ELEV. 129.2'

Conservation Easement Boundary Marker (13)



Bioretention Facility (14)



Section

PLANTING SOIL MIX: The soil shall be a uniform mix, free of stones, stumps, roots or other similar objects larger than two inches. No other materials or substances shall be mixed or dumped within the bioretention area that may be harmful to plant growth, or prove a hindrance to the planting or maintenance operations. The planting soil shall be free of noxious weeds.

PLANTING SOIL MIX shall consist of 50% bioretention soil (at 60% sand, 30% silt and 10% clay) and 50% sand in accordance with the NYS Stormwater Management Design Manual.

The planting soil mix shall be thoroughly mixed and shall be tested to meet the following criteria:
80 percent sands, with no more than 25% of the sands as fine or very fine sands; 15% silt and 5% clay content. The entire mix shall then be amended with 3 to 7% organics.

NOTES:

1. Length and width of bottom of bioretention facility as per plan.
2. Top of berm and overflow weir shall be stabilized with turfgrass.

BIORETENTION BASIN ELEVATIONS

Parameter	SWMF for FDA 1–1
Max. temporary water ponding elevation	157.0
Bioretention Basin Floor elevation	156.5
Base of domed riser grate	157.0
Bottom of Planting Soil Mix	152.25
Finished Grade/Top of Mulch	156.5
Top of Planting Soil Mix	
Planting Soil Mix Depth	4.0'
Bottom of Planting Soil Mix	152.25
Top of Gravel/Filter Fabric	152.25
Bottom of Gravel	151.58
12" Pipe Outlet from Bioretention Facility	151.67

RAIN GARDEN CONSTRUCTION SPECIFICATION

GENERAL
Area under the berm shall be cleared, grubbed and stripped of all existing vegetation and root mat.
Fill material for the berm embankment shall be free of roots and other woody vegetation as well as oversized stones, rocks, organic material, or other objectionable material. The berm shall be compacted by hand tamping.

ENSURE PROPER SOILS ARE PRESENT
Soils for the rain garden shall be prepared to ensure adequate filtration and percolation. The recommended soil replacement mix is 50–60% sand, 20–30% topsoil, and 20–30% compost. Be sure no clay is in the replacement soil mix.

INSTALLATION OF SOIL REPLACEMENT MIX
Remove existing soil within the area of the proposed rain garden facility to the elevations indicated on the plans. Rototill the soil in the bottom area of the rain garden to a depth of at least 12", carefully avoiding damage to existing tree roots. After rototilling the bottom area of the proposed facility, place the soil replacement mix at 8"–12" lifts, while achieving the grades shown on the plans.

Do not compact the soil lift. Rather, lightly water the soil mix to encourage natural compaction. Avoid over compaction by allowing time for natural compaction and settlement. No additional manual compaction of soil is necessary.

Rake soil material as needed to level out. It may be necessary to overfill the soil mix above the proposed surface invert elevation by a couple of inches to accommodate natural settlement to proper grade. Depending upon the soil material, up to 20% natural compaction may occur.

PLACEMENT OF SHREDDED MULCH OVER PONDING AREA
Mulch shall be placed on the surface ponding area of the facility. The mulch material should be fresh, shredded hardwood to help retain soil moisture and maximize nutrient uptake. This type of mulch material also helps resist flotation when facility is fully ponded. If aged mulch is used, select the shredded type over the chip variety to minimize floatation and wash–outs.

The layer of mulch should not exceed 3" in depth. Greater depths keep plant roots from making good contact with the soil. Mulch materials should not be mounded around the base of tree trunks or shrubs as this practice encourages pests and diseases.

MAINTENANCE OF THE RAIN GARDEN
Weeding will be needed the first couple of years. Remove by hand only those plants you are certain are weeds. Try to get out all the roots of the weedy plants. Weeds may not be a problem in the second season, depending on the variety and tenacity of weeds present. In the third year and beyond, the native grasses, sedges, rushes, and wildflowers will begin to mature and will out–compete the weeds. Weeding isolated patches might still be needed on occasion.

After each growing season, the stems and seedheads can be left for winter interest, wildlife cover and bird food. Once spring arrives and new growth is 4 to 6 inches tall, cut all tattered plants back. If the growth is really thick, hand–cut the largest plants and then use a string trimmer to mow the planting back to a height of six to eight inches.

Civil engineer:
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APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED DEC. 12, 2016.

____________________ DATE:__________
CHRISTOPHER CARTHY, CHAIRMAN
TOWN OF NORTH CASTLE PLANNING BOARD

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

____________________ DATE:__________
JOSEPH CERMELE, PE
KELLARD SESSIONS, P.C.
CONSULTING TOWN ENGINEERS

OWNER:
McKenna Custom Homes, Inc.
433 Manville Road
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CONSULTANTS:
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12 Campwoods Grounds
Ossining, N.Y. 10562
Tel: (914) 773-1701

ISSUED:

Amended sheet for Conservation Subdivision	11/17/2014
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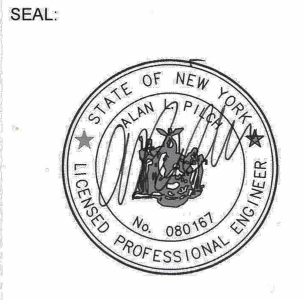
SEAL:



PROJECT NAME:
HIDDEN OAK SUBDIVISION
Hidden Oak Road
Town of North Castle, New York

ENGINEER & LANDSCAPE ARCHITECT:
ALP ENGINEERING
& LANDSCAPE ARCHITECTURE, PLLC
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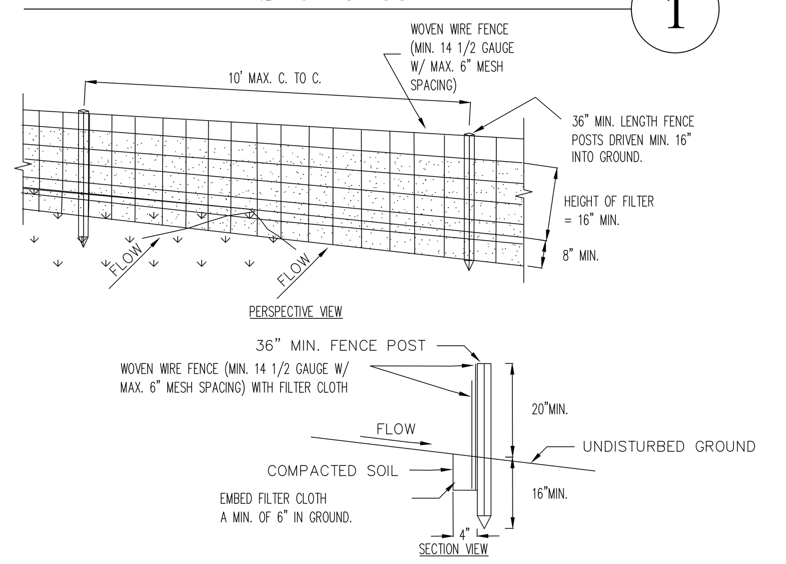
ENVIRONMENTAL CONSULTANT:
EVANS ASSOCIATES
ENVIRONMENTAL CONSULTING, INC.
162 Falls Road Bethany, Connecticut 06524
Tel. (203) 393-0690

Drawing title:
Construction Details

Date: July 15, 2014
Dwn. by: alp
ID: 2.7_C05.31.2016

DE-1

Silt Fence (1)

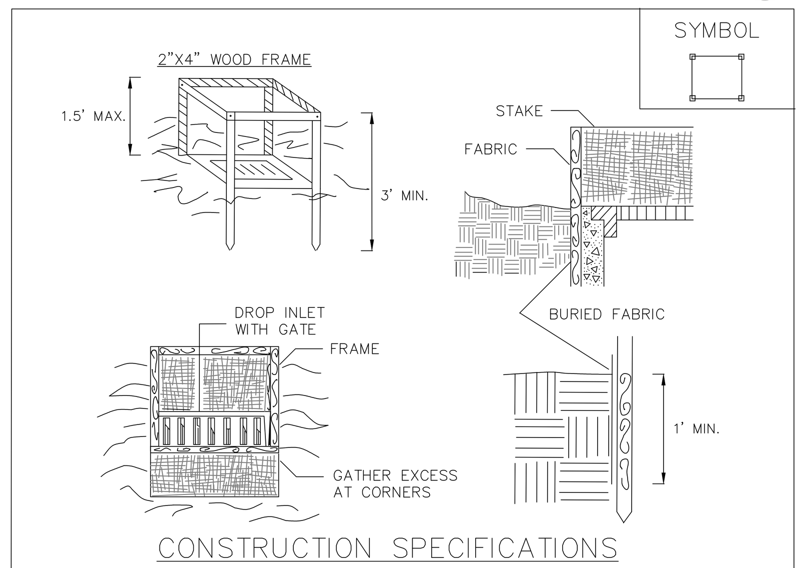


CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 12 1/2 GAUGE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	SILT FENCE

Filter Fabric Inlet Protection (2)



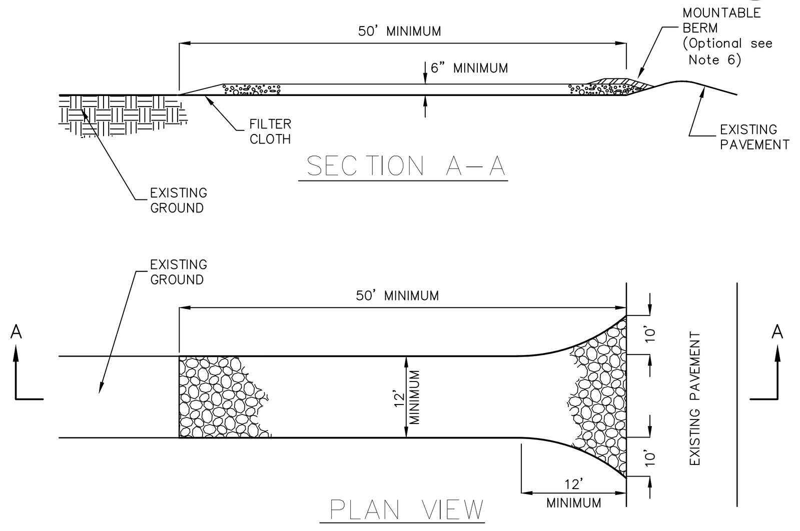
CONSTRUCTION SPECIFICATIONS

1. FILTER FABRIC SHALL HAVE AN EOS OF 40–85. BURLAP MAY BE USED FOR SHORT TERM APPLICATIONS.
2. CUT FABRIC FROM A CONTINUOUS ROLL TO ELIMINATE JOINTS. IF JOINTS ARE NEEDED THEY WILL BE OVERLAPPED TO THE NEXT STAKE.
3. STAKE MATERIALS WILL BE STANDARD 2" x 4" WOOD OR EQUIVALENT. METAL WITH A MINIMUM LENGTH OF 3 FEET.
4. SPACE STAKES EVENLY AROUND INLET 3 FEET APART AND DRIVE A MINIMUM 18 INCHES DEEP. SPANS GREATER THAN 3 FEET MAY BE BRIDGED WITH THE USE OF WIRE MESH BEHIND THE FILTER FABRIC FOR SUPPORT.
5. FABRIC SHALL BE EMBEDDED 1 FOOT MINIMUM BELOW GROUND AND BACKFILLED. IT SHALL BE SECURELY FASTENED TO THE STAKES AND FRAME.
6. A 2" x 4" WOOD FRAME SHALL BE COMPLETED AROUND THE CREST OF THE FABRIC FOR OVER FLOW STABILITY.

MAXIMUN DRAINAGE AREA 1 ACRE

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	FILTER FABRIC DROP INLET PROTECTION

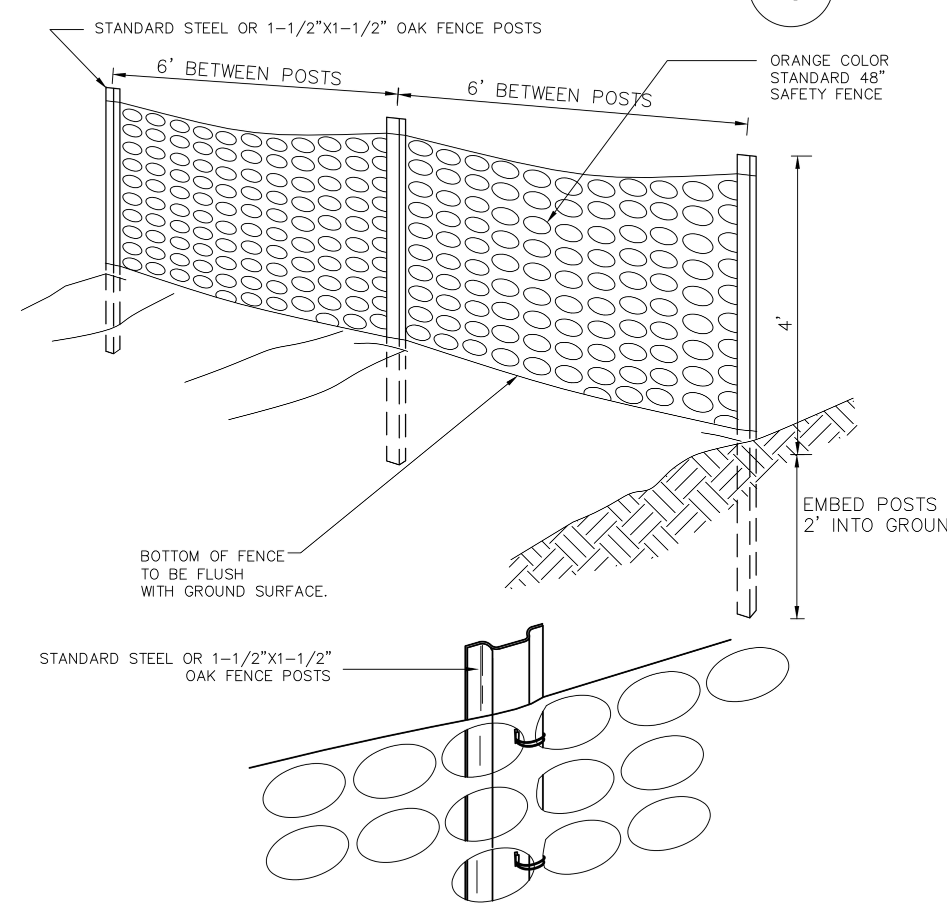
Stabilized Construction Entrance (3)



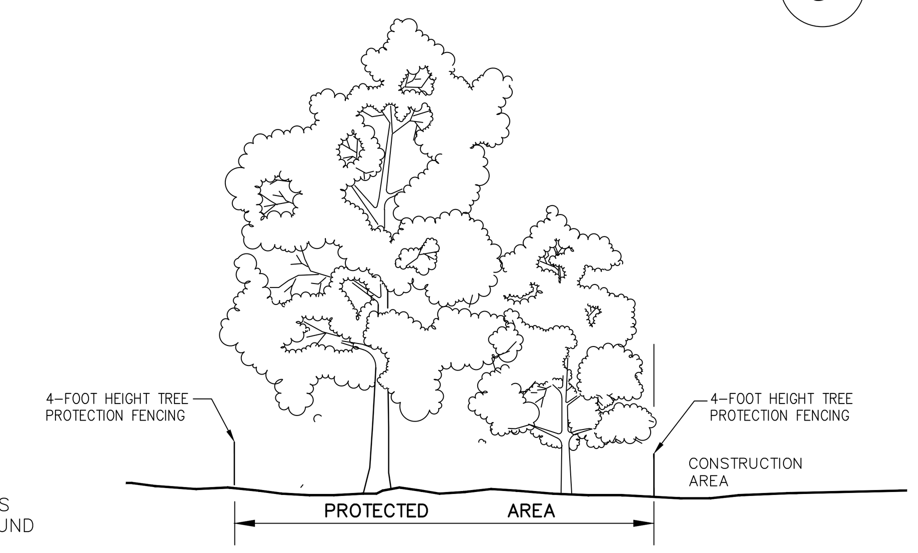
NOTES:

1. STONE SIZE – USE 1½" – 2" STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH – AS REQUIRED, BUT NOT LESS THAN 50 FEET.
3. THICKNESS – NOT LESS THAN SIX (6) INCHES.
4. WIDTH – 12 FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. 24 FOOT MINIMUM IF SINGLE ENTRANCE TO SITE.
5. FILTER CLOTH – TO BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER – ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OF FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURE USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DRIPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WASHING – WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHTS-OF-WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

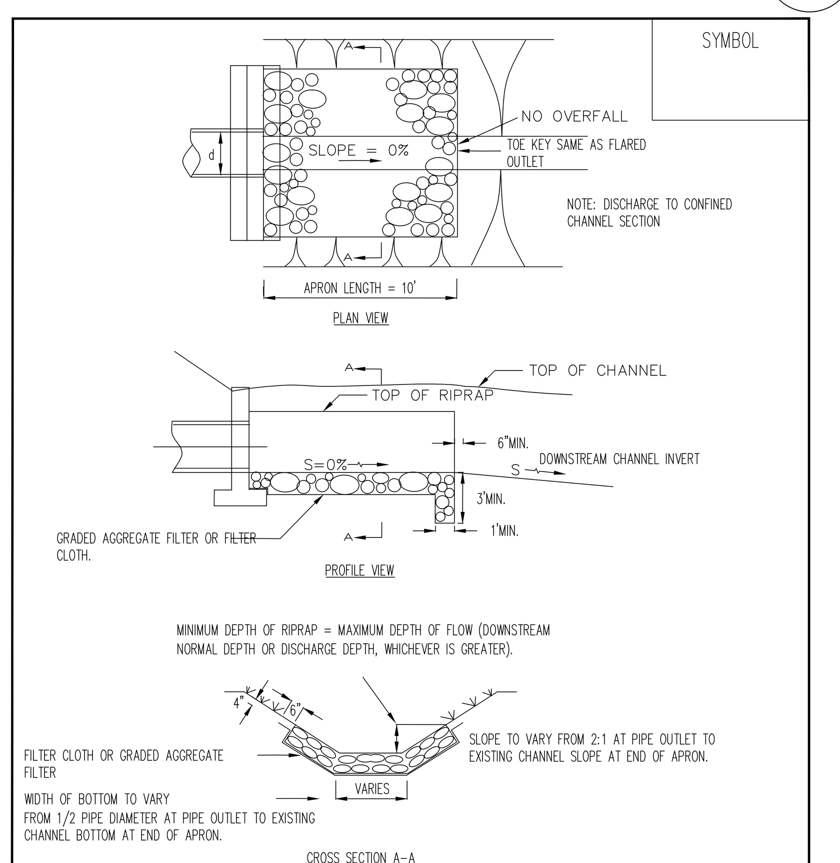
Construction Fence/Tree Protection (4)



Construction Fence/Tree Protection (5)

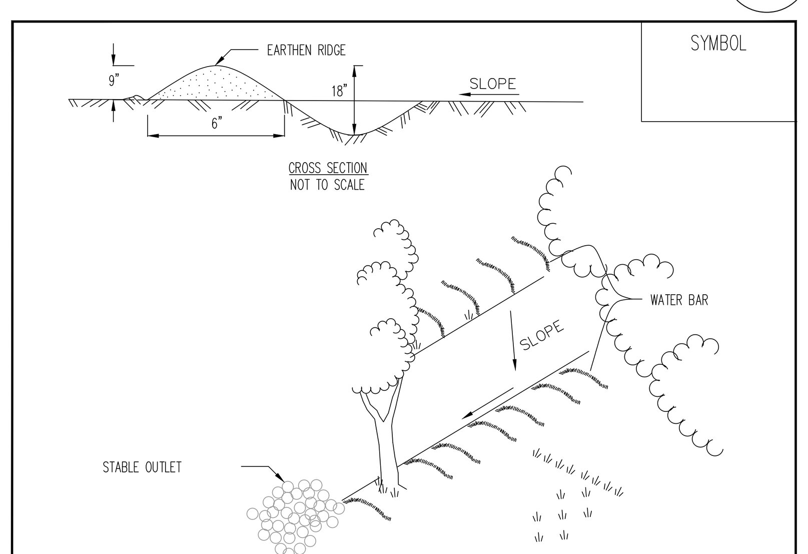


Rip Rap Apron (6)



U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	RIPRAP OUTLET PROTECTION EXAMPLE

Water Bars (7)

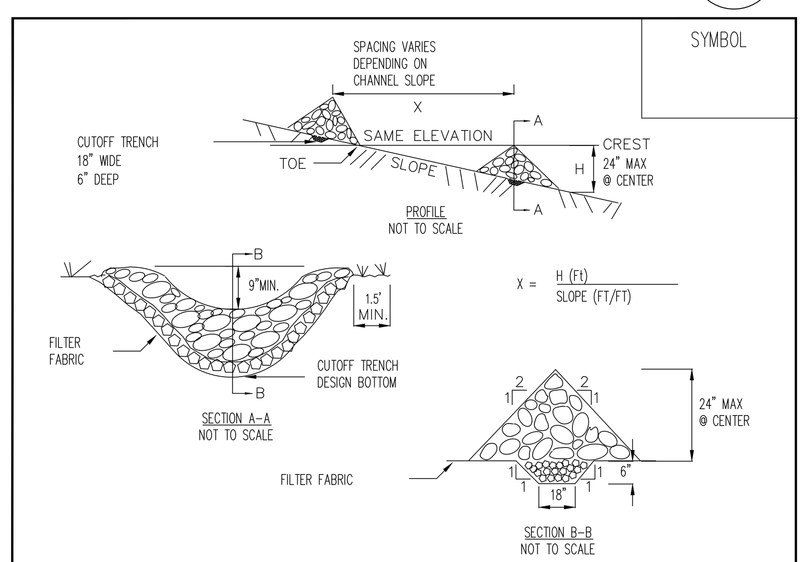


CONSTRUCTION SPECIFICATIONS

1. INSTALL THE WATER BAR AS SOON AS THE RIGHT OF WAY IS CLEARED AND GRADED.
2. DISK OR STRIP THE SOD FROM THE BASE FOR THE CONSTRUCTED RIDGE BEFORE PLACING FILL.
3. TRACK THE RIDGE TO COMPACT IT TO THE DESIGN CROSS SECTION.
4. THE OUTLET SHALL BE LOCATED ON AN UNDISTURBED AREA. FIELD SPACING WILL BE ADJUSTED TO USE THE MOST STABLE OUTLET AREAS. OUTLET PROTECTION WILL BE PROVIDED WHEN NATURAL AREAS ARE NOT ADEQUATE.
5. VEHICLE CROSSING SHALL BE STABILIZED WITH GRAVEL. EXPOSED AREAS SHALL BE IMMEDIATELY SEEDED AND MULCHED.
6. PERIODICALLY INSPECT WATER BARS FOR EROSION DAMAGE AND SEDIMENT. CHECK OUTLET AREAS AND MAKE REPAIRS AS NEEDED TO RESTORE OPERATION.

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	WATER BARS

Stone Check Dam (8)



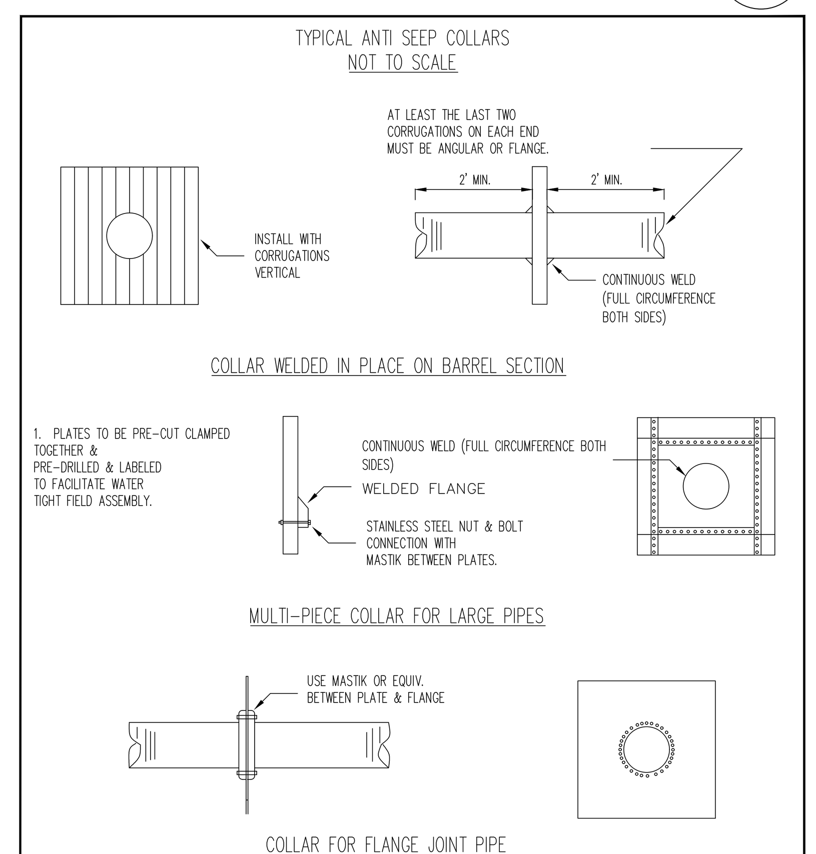
CONSTRUCTION SPECIFICATIONS

1. STONE WILL BE PLACED ON A FILTER FABRIC FOUNDATION TO THE LINES, GRADES AND LOCATIONS SHOWN IN THE PLAN.
2. SET SPACING OF CHECK DAMS TO ASSUME THAT THE ELEVATIONS OF THE CREST OF THE DOWNSTREAM DAM IS AT THE SAME ELEVATION OF THE TOE OF THE UPSTREAM DAM.
3. EXTEND THE STONE A MINIMUM OF 1.5 FEET BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
4. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS APPROPRIATE.
5. ENSURE THAT CHANNEL APPURTENANCES SUCH AS CULVERT ENTRANCES BELOW CHECK DAMS ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONE.

MAXIMUM DRAINAGE AREA 2 ACRES.

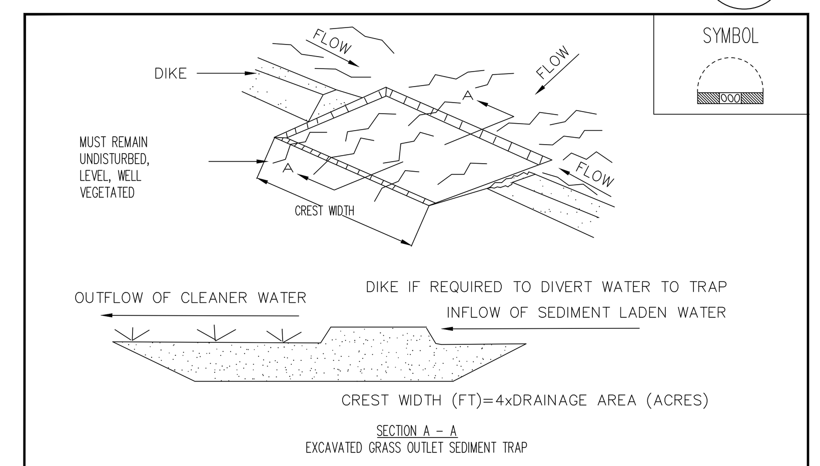
U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	CHECK DAM

Anti-Seep Collar (9)



U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	ANTI SEEP COLLAR

Grass Outlet Sediment Trap (10)



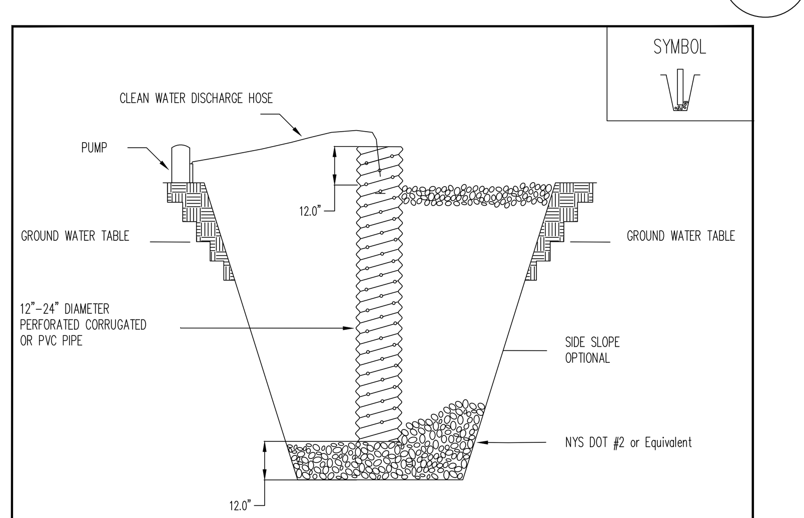
CONSTRUCTION SPECIFICATIONS

1. VOLUME OF SEDIMENT STORAGE SHALL BE 3600 CUBIC FEET PER ACRE OF CONTRIBUTORY DRAINAGE AREA, OR AT LEAST 2,684 CUBIC FEET.
2. MINIMUM CREST WIDTH SHALL BE 4 FT x DRAINAGE AREA, OR 3 FEET.
3. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.
4. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
5. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND WATER POLLUTION SHALL BE MINIMIZED.
6. THE SEDIMENT TRAP SHALL BE REMOVED AND AREA STABILIZED WHEN THE REMAINING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
7. ALL CUT SLOPES SHALL BE 1:1 OR FLATTER.

MAXIMUM DRAINAGE AREA: 5 ACRES

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	GRASS OUTLET SEDIMENT TRAP ST-II

Sump Pit (11)



CONSTRUCTION SPECIFICATIONS

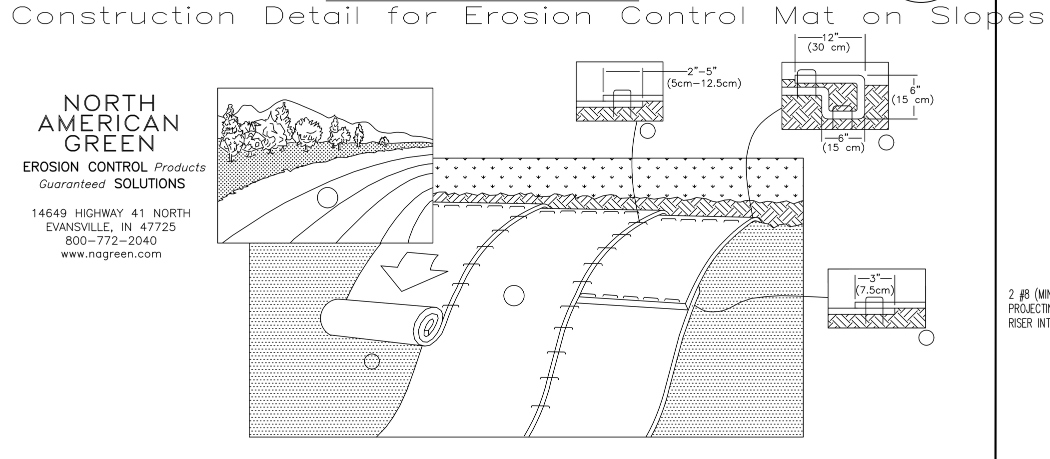
1. PIT DIMENSIONS ARE OPTIONAL.
2. THE STANDPIPE SHOULD BE CONSTRUCTED BY PERFORATING A 12–24" DIAMETER CORRUGATED OR PVC PIPE.
3. A BASE OF 2" AGGREGATE SHOULD BE PLACED IN THE PIT TO A DEPTH OF 12". AFTER INSTALLING THE STANDPIPE, THE PIT SURROUNDING THE STANDPIPE SHOULD BE BACKFILLED WITH 2" AGGREGATE.
4. THE STANDPIPE SHOULD EXTEND 12–18" ABOVE THE LIP OF THE PIT.
5. IF DISCHARGE WILL BE PUMPED DIRECTLY TO A STORM DRAINAGE SYSTEM, THE STANDPIPE SHOULD BE WRAPPED WITH FILTERCLOTH BEFORE INSTALLATION. IF DESIRED, 1/4"–1/2" HARDWARE CLOTH MAY BE PLACED AROUND THE STANDPIPE, PRIOR TO ATTACHING THE FILTERCLOTH.

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	SUMP PIT

Erosion Control Mat Detail (typ.) (15)

SLOPE INSTALLATION

Construction Detail for Erosion Control Mat on Slopes

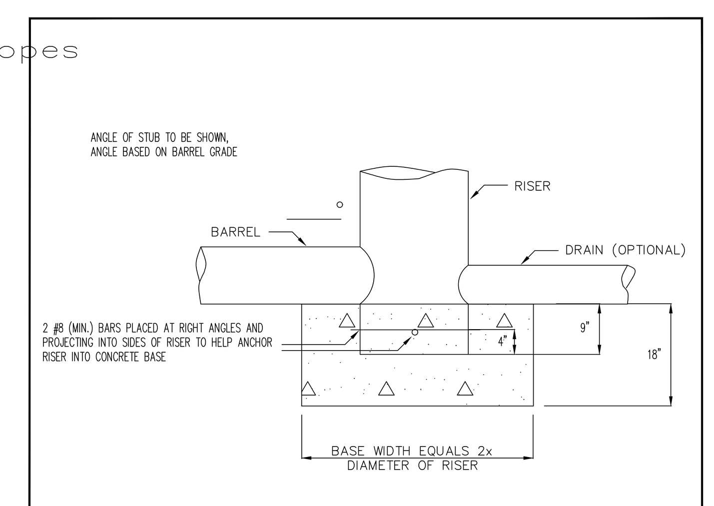


1. PREPARE SOIL BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECP's), INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
   NOTE: WHEN USING CELL-O-SEED DO NOT SEED PREPARED AREA. CELL-O-SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE RECP's IN A 6" (15 CM) DEEP X 6" (15 CM) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF RECP's EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE RECP's WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30 CM) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30 CM) PORTION OF RECP's BACK OVER SEED AND COMPACTED SOIL. SECURE RECP's OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30 CM) APART ACROSS THE WIDTH OF THE RECP's.
3. ROLL THE RECP's (A.) DOWN OR (B.) HORIZONTALLY ACROSS THE SLOPE. RECP's WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL RECP's MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING THE DOT SYSTEM™, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. THE EDGES OF PARALLEL RECP's MUST BE STAPLED WITH APPROXIMATELY 2" – 5" (5 CM – 12.5 CM) OVERLAP DEPENDING ON RECP's TYPE.
5. CONSECUTIVE RECP's SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" (7.5 CM) OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" (30 CM) APART ACROSS ENTIRE RECP's WIDTH.
   NOTE:
   *IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15 CM) MAY BE NECESSARY TO PROPERLY SECURE THE RECP's.

EROSION CONTROL MAT NOTES

1. Erosion control matting shall be installed in accordance with the manufacturer's specifications and requirements.
2. Matting to be utilized shall be manufactured by North American Green, Product C125BN, or Curlex I by American Excelsior company, or approved equal.
3. Detail shown above would be for installation of C125BN matting. If product by another manufacturer is used, then installation detail shall be as specified by that manufacturer.

Riser Base Detail (13)



CONSTRUCTION SPECIFICATIONS

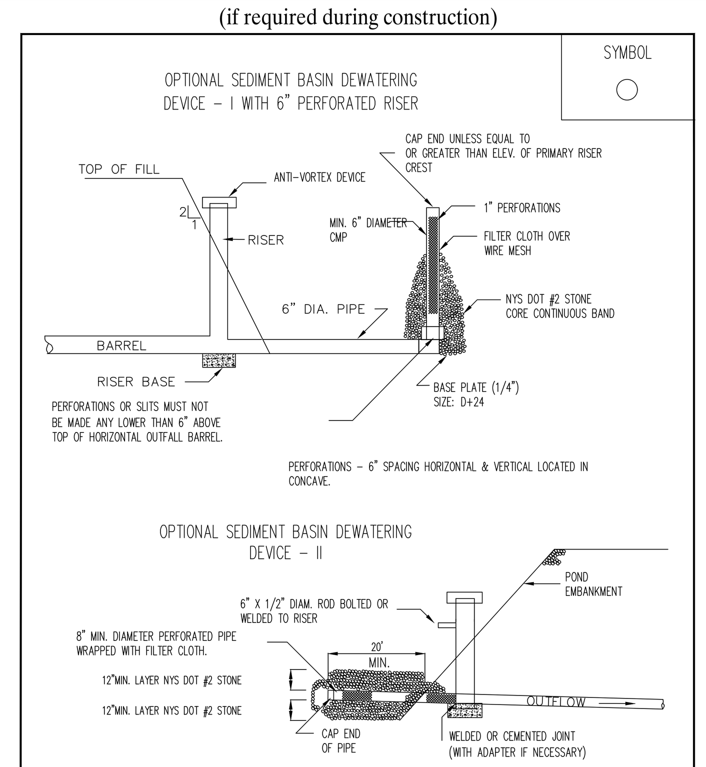
NOTES:

1. THE CONCRETE BASE SHALL BE POURED IN SUCH A MANNER TO INSURE THAT THE CONCRETE FILLS THE BOTTOM OF THE RISER TO THE INVERT OF THE OUTLET PIPE TO PREVENT THE RISER FROM BREAKING AWAY FROM THE BASE.
2. WITH ALUMINUM OR ALUMINIZED PIPE, THE EMBEDDED SECTION MUST BE PAINTED WITH CHROMATE OR EQUIVALENT.
3. RISER BASE MAY BE SIZED AS COMPUTED USING FLOATATION WITH A FACTOR OF SAFETY OF 1.2.

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	RISER BASE DETAIL SEDIMENT BASIN

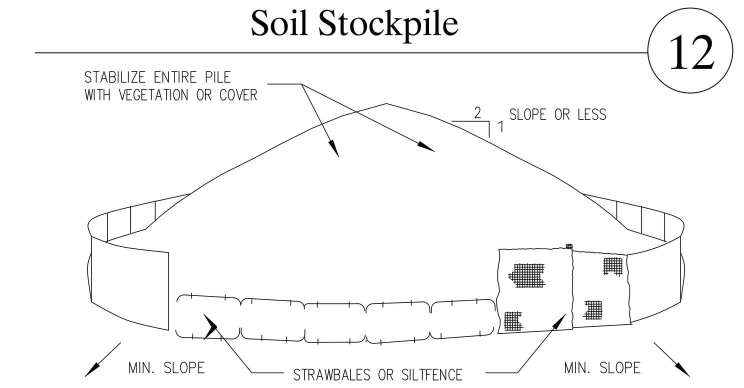
Stormwater Management Basin Dewatering (14)

(if required during construction)



U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	OPTIONAL SEDIMENT BASIN DEWATERING DEVICES

Soil Stockpile (12)



INSTALLATION NOTES

1. AREA CHOSEN FOR STOCKPILING OPERATIONS SHALL BE DRY AND STABLE.
2. MAXIMUM SLOPE OF STOCKPILE SHALL BE 1:2.
3. UPON COMPLETION OF SOIL STOCKPILING, EACH PILE SHALL BE SURROUNDED WITH EITHER SILT FENCING OR STRAWBALES, THEN STABILIZED WITH VEGETATION OR COVERED.
4. SEE SPECIFICATIONS (THIS MANUAL) FOR INSTALLATION OF SILTFENCE.

Civil engineer:

Alan L. Pilch
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P.E. #80167
C. of A. #0016331

Direct Tel: (475) 215-5343

APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED DEC. 12, 2016.

DATE: ____________

CHRISTOPHER CARTHY, CHAIRMAN
TOWN OF NORTH CASTLE PLANNING BOARD

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

DATE: ____________

JOSEPH CERMELE, PE
KELLARD SESSIONS, P.C.
CONSULTING TOWN ENGINEERS

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CONSULTANTS:

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12 Campwoods Grounds
Ossining, N.Y. 10562

Tel: (914) 773-1701

ISSUED:

Amended sheet for Conservation Subdivision	11/17/2014
General Revisions	01/09/2015
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Submission to Town for Prelim & Final Subdivision Plan appvl	10/07/2016
Submission to Town for Prelim & Final Subdivision Plan appvl	03/20/2020

SEAL:

STATE OF NEW YORK · ALAN L. PILCH · LICENSED PROFESSIONAL ENGINEER · No. 080167

PROJECT NAME:
HIDDEN OAK SUBDIVISION
Hidden Oak Road
Town of North Castle, New York

ENGINEER & LANDSCAPE ARCHITECT:
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P.O. Box 843, Ridgefield, CT 06877
Direct Tel: (475) 215-5343 Cell: (203) 710-0587

ENVIRONMENTAL CONSULTANT:
EVANS ASSOCIATES
ENVIRONMENTAL CONSULTING, INC.
162 Falls Road Bethany, Connecticut 06524
Tel. (203) 393-0690

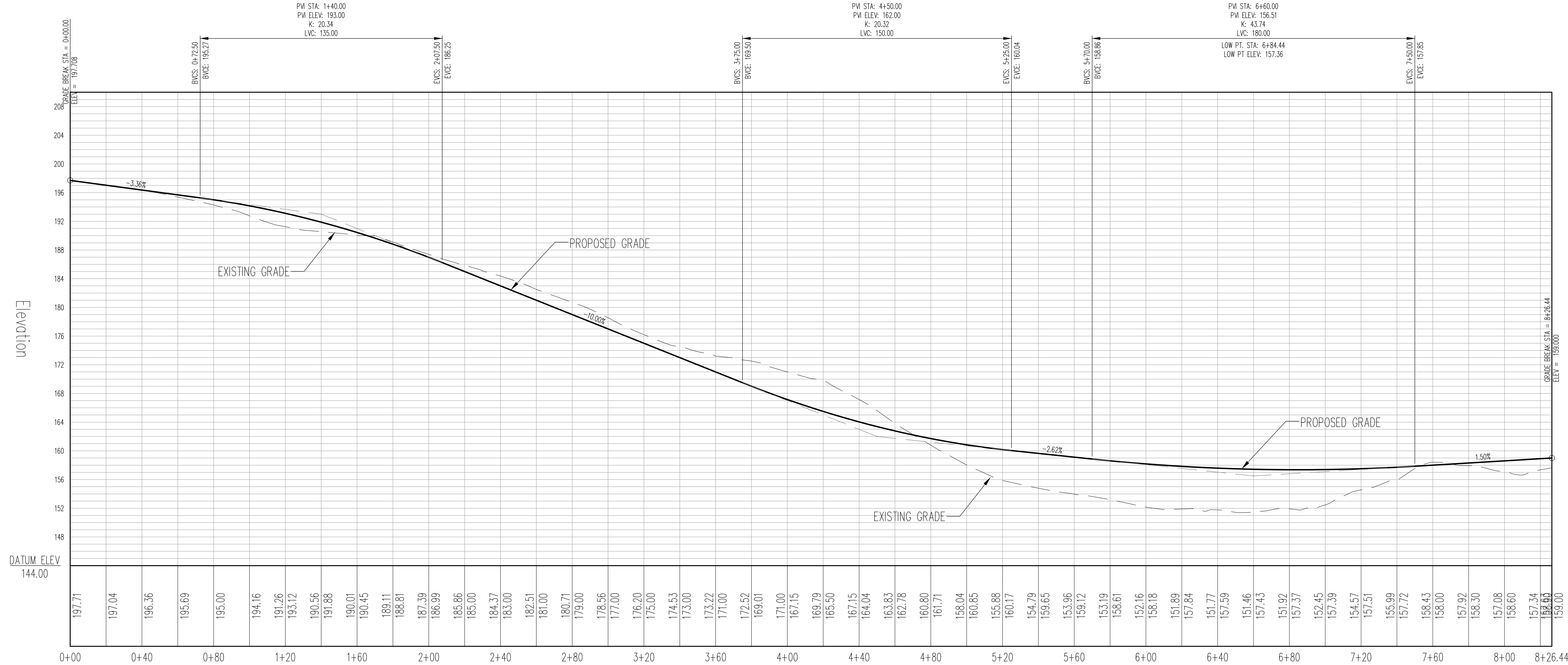
Drawing title:
Construction Details

Date:	May 30, 2014
Dwn. by:	alp
ID:	_C05.31.2016

DE-2

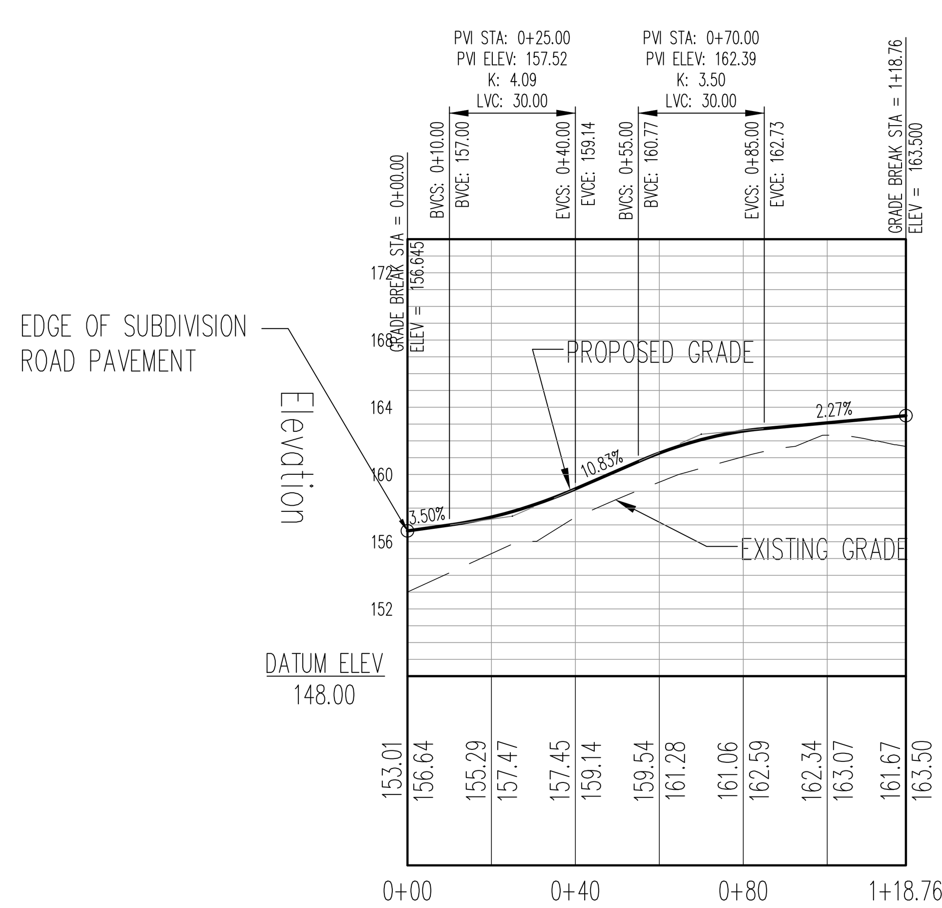
Subdivision Road Profile

1



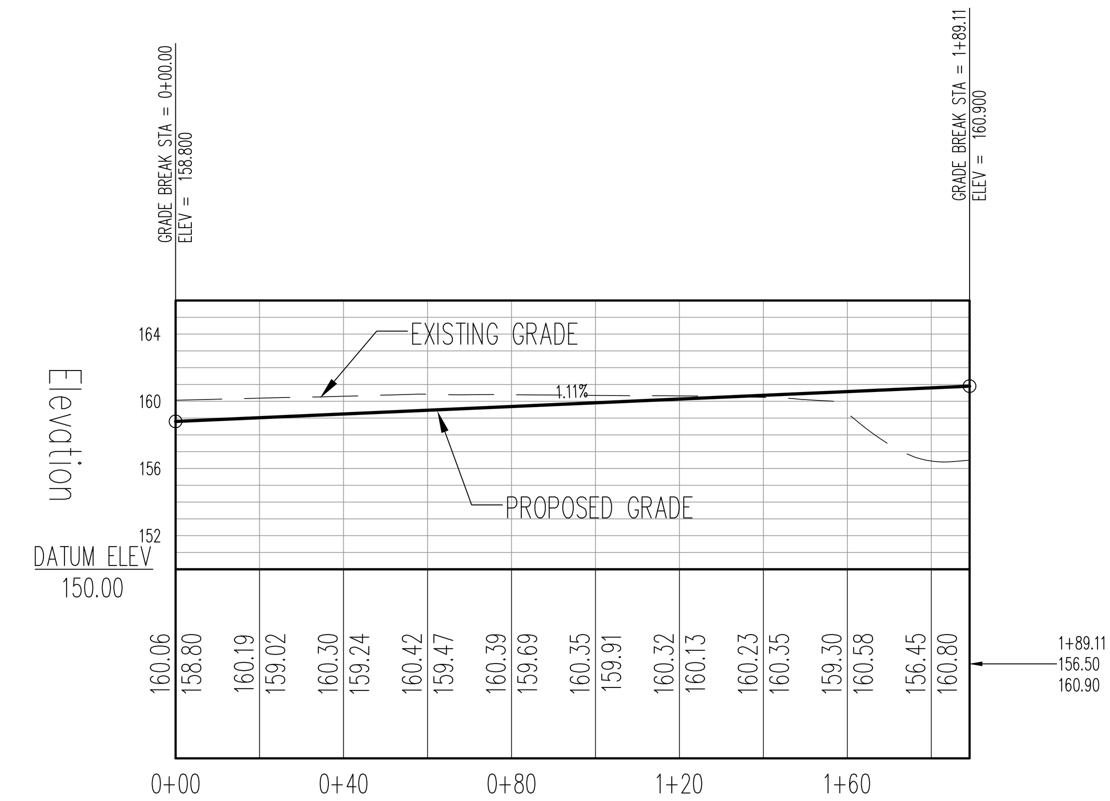
Lot 1 Driveway Profile

2



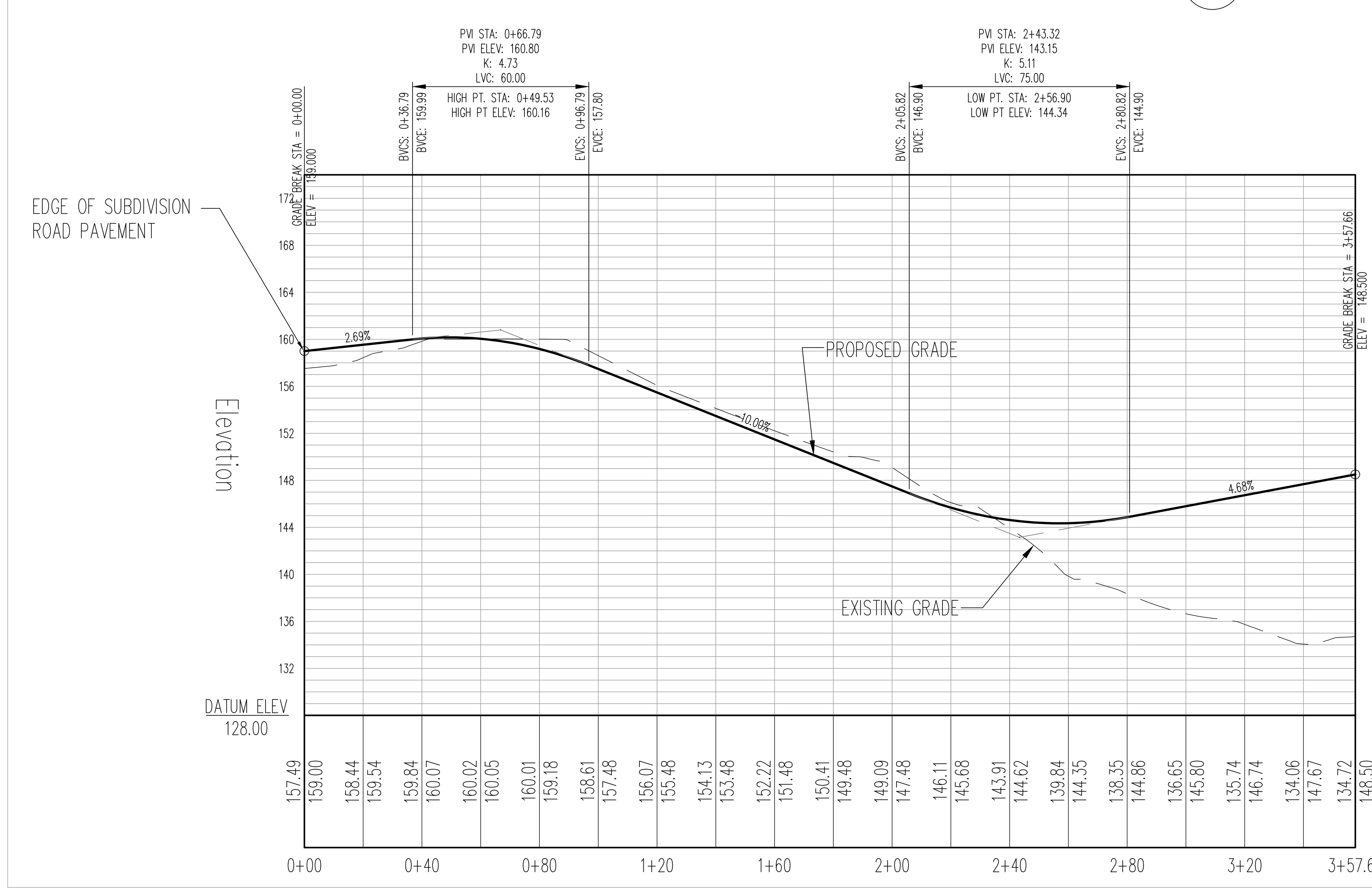
Lot 2 Driveway Profile

3



Lot 3 Driveway Profile

4



SCALE: 1" = 30' (horizontal)
1" = 7.5' (vertical)
4x vertical exaggeration

Civil engineer:
Alan L. Pilch
ALP Engineering & Landscape Architecture, PLLC
P.O. Box 843
Ridgefield, CT 06877
P.E. #80167
C. of A. #0016331
Direct Tel. (475) 215-5343

APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED DEC. 12, 2016.

DATE:

CHRISTOPHER CARTHY, CHAIRMAN
TOWN OF NORTH CASTLE PLANNING BOARD

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

DATE:

JOSEPH CERMELE, PE
KELLARD SESSIONS, P.C.
CONSULTING TOWN ENGINEERS

OWNER:
McKenna Custom Homes, Inc.
433 Manville Road
Pleasantville, NY 10570
Tel: (914) 769-1869

CONSULTANTS:

CAMPBELL ENGINEERING, LLP
160 King Street
P.O. Box 255
Chappaqua, New York 10514
Tel: (914) 238-3555
Fax: (914) 238-3435

WELSH Engineering & Land Surveying, P.C.
12 Campwoods Grounds
Ossining, N.Y. 10562

Tel: (914) 773-1701

ISSUED:

Amended Lot 1 driveway as per house location change	01/09/2015
Submission of SWPPP to NYCDEP	04/09/2015
Submission to Town and NYCDEP	07/24/2015
Submission to Town for Prelim & Final Subdivision Plan appvl	10/07/2016
Submission to Town for Prelim & Final Subdivision Plan appvl	03/20/2020

SEAL:

PROJECT NAME:
HIDDEN OAK SUBDIVISION
Hidden Oak Road
Town of North Castle, New York

ENGINEER & LANDSCAPE ARCHITECT:
ALP ENGINEERING
& LANDSCAPE ARCHITECTURE, PLLC
P.O. Box 843, Ridgefield, CT 06877
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ENVIRONMENTAL CONSULTANT:
EVANS ASSOCIATES
ENVIRONMENTAL CONSULTING, INC.
162 Falls Road Bethany, Connecticut 06524
Tel. (203) 393-0690

Drawing title:
Subdivision Road and Driveway Profiles

Date: November 17, 2014

Dwn. by: alp

ID: 2.7_C05.31.2016

DE-3

Soil Restoration/Disturbed Areas Stabilization Protocol

As is noted above, soil restoration is a required practice applied across areas of a development site where soils have been disturbed and will be vegetated in order to recover the original properties and porosity of the soil. Soil restoration is applied in the cleanup, restoration, and landscaping phase of construction followed by the permanent establishment of an appropriate, deep-rooted groundcover to help maintain the restored soil structure.

According to the protocols of the 2010 *Stormwater Management Design Manual*, during periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following Soil Restoration steps applied:

1) Apply 3 inches of compost over subsoil
2) Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor-mounted disc, or tiller, mixing, and circulating air and compost into subsoils.
3) Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site.
4) Apply topsoil to a depth of 6 inches.
5) Vegetate as required by approved plan.

At the end of the soil restoration procedure, an inspector should be able to push a 3/8" metal bar 12 inches into the soil just with body weight.

Temporary Critical Area Plantings (Temporary Seeding)

When to Apply - Temporary seeding may be necessary on construction sites to protect an area, or section, where final grading is complete, when preparing for winter work shutdown, or to provide cover when permanent seedings are likely to fail due to mid-summer heat and drought. The intent is to provide temporary protective cover during temporary shutdown of construction and/or while waiting for optimal planting time.

Water management practices must be installed as appropriate for site conditions. The area must be rough graded and slopes physically stable. Large debris and rocks are usually removed. Seedbed must be seeded within 24 hours of disturbance or scarification of the soil surface will be necessary prior to seeding. Fertilizer and lime are not typically used for temporary seedings.

If it is spring, summer or early fall, then seed the area with ryegrass (annual or perennial) at 30 lb per acre (Approximately 0.7 lb/1000 sq. ft. or use 1 lb/1000 sq. ft.).

If is late fall or early winter, then seed with Certified 'Aroostook' winter rye (cereal rye) at 100 lb per acre (2.5 lb/1000 sq. ft.).

Any seeding method may be used that will provide uniform application of seed to the area and result in relatively good soil to seed contact.

Mulch the seeded area with hay or straw at 2 tons/acre (approx. 90 lb/1000 sq. ft. or 2 bales). Quality of hay or straw mulch allowable will be determined based on long term use and visual concerns. Mulch anchoring will be required where wind or areas of concentrated water are of concern. Wood fiber hydromulch or other sprayable products approved for erosion control (nylon web or mesh) may be used if applied according to manufacturers' specification. Caution is advised when using nylon or other synthetic products. They may be difficult to remove prior to final seeding.

Permanent Lawn Areas

NOTE REGARDING USE OF FERTILIZER ON THE PROPERTY
In accordance with Article XXVI, Restrictions on the Application and Sale of Lawn Fertilizer within the County of Westchester, Section 863.1302 Regulation of the Use and Application of Lawn Fertilizer, no person shall apply any lawn fertilizer within the County that is labeled as containing more than 0% phosphorus or other compound containing phosphorus, such as phosphate, except for newly established turf or lawn areas during their first growing season. The lawn fertilizer application shall not contain an amount of phosphorus exceeding the amount and rate of application recommended in the soil test evaluation. In subsequent years, no person shall apply any lawn fertilizer within the County that is labeled as containing more than 0% phosphorus or other compound containing phosphorus, such as phosphate, nor apply lawn fertilizer between December 1st and April 1st, nor apply lawn fertilizer to any impervious surface. If such application occurs, the fertilizer must be immediately contained and either legally applied to turf or placed in an appropriate container. Finally, no person shall apply lawn fertilizer to any turf or lawn area within twenty (20) feet of any surface water, except that this restriction shall not apply where a continuous natural vegetative buffer, at least ten (10) feet wide, separates a turf or lawn area and surface water.

Time of Planting Lawns - Fall planting is preferred. Seed after August 15. In the spring, plant until May 15. If seeding is done between May 15 and August 15, irrigation may be necessary to ensure a successful seeding.

Site Preparation - Disturbed soil areas are to be restored to the procedures of the *Soil Restoration/Disturbed Areas Stabilization Protocol* above.

Lawn Planting and Installation - Use a cultipacker type seeder if possible. Seed to a depth of 1/8 to 1/4 inch. If seed is to be broadcast, cultipack or roll after seeding. If hydroseeded, lime and fertilizer may be applied through the seeder, and rolling is not practical.

Mulching - Mulch all seedings in accordance with Standard and Specifications for Mulching. Small grain straw is the best material. The following are the recommended seed mixes from Section 3, Vegetative Measures for Erosion and Sediment Control from the New York State Standards and Specifications for Erosion and Sediment Control, latest edition.

Seed Mixes For Sunny sites (well, moderately well, and somewhat poorly drained soils)
a. Athletic fields and similar areas

	lb/1000 sf	lb/acre
80% Kentucky bluegrass blend	2.4-3.2	105-138
20% perennial ryegrass	0.6-0.8	25-37
	3.0-4.0	130-175

OR
(for southern and eastern NY)

	lb/1000 sf	lb/acre
50% Kentucky bluegrass	1.5-2.0	65-88
50% perennial ryegrass	1.5-2.0	65-87
	3.0-4.0	130-175

OR

100% Tall fescue, Turf-type, fine leaf	3.4-4.6	150-200

Shady dry sites (well to somewhat poorly drained soils)

	lb/1000 sf	lb/acre
65% fine fescue	2.6-3.3	114-143
15% perennial ryegrass	0.6-0.7	26-33
20% Kentucky bluegrass blend	0.8-1.0	35-44
	4.0-5.0	174-220

OR

80% blend of shade-tolerant Kentucky bluegrass	2.4-3.2	105-138
20% perennial ryegrass	0.6-0.8	25-37
	3.0-4.0	130-175

OR

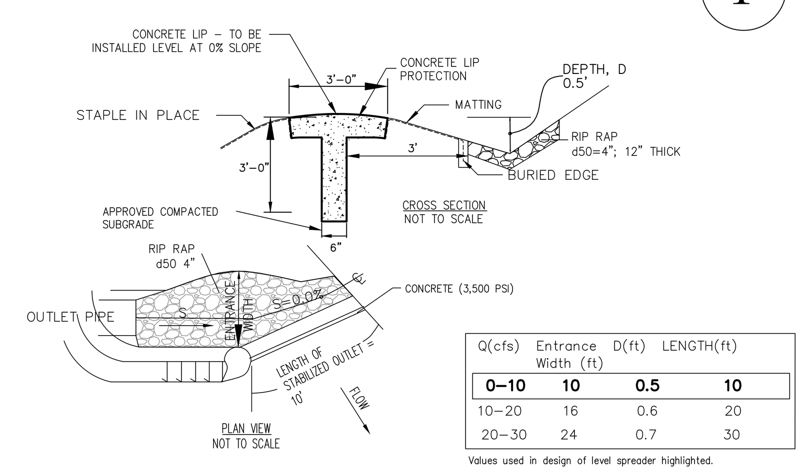
100% Tall fescue, Turf-type, fine leaf	3.4-4.6	150-200

Fertilizer Application in the First Year - Apply fertilizer as indicated by the soil test three to four weeks after germination (spring seedlings). If test results have not been obtained, apply 1 pound nitrogen/1,000 square feet using a fertilizer. Summer and early fall seedings, apply as above unless air temperatures are above 85ºF for an extended period. Wait for cooler temperatures to fertilize. Late fall/winter seedings, fertilize in spring.

Stabilization Outside of Growing Season - If grading is performed outside of the growing season, ground stabilization is still required. Apply Flexterra FGM (Flexible Growth Medium) or approved equal to the area to be stabilized in accordance with the manufacturer's specifications. The application guide for Flexterra is as follows:

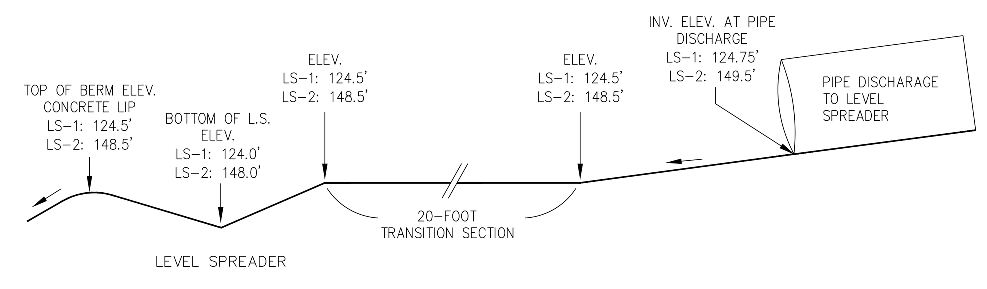
A. Strictly comply with equipment Manufacturer's installation instructions and recommendations. Use approved hydro-spraying machines with fantype nozzle (50-degree tip) whenever possible to achieve best soil coverage. Apply from opposing directions to assure 100% soil surface coverage. Slope interruption devices or water diversion techniques are recommended according to the slope interruption limits table on the back. B. To ensure proper application rates, measure and stake area. For maximum performance, apply in a two-step process*: 1. Apply specified prescriptive agronomic formulations along with 50% of seed with a small amount of SMM, BFM, FGM or ET-FGM for visual metering. 2. Mix balance of seed and apply SMM, BFM, FGM or ET-FGM at a rate of 50 pounds per 125 gallons (see mixing section on the back for details) of water over freshly seeded surfaces. See loading chart on the back and confirm loading rates with equipment manufacturer. Do not leave seeded surfaces unprotected, especially if precipitation is imminent. C. Fill 1/3 of mechanically agitated hydroseeder with water. Turn pump on for 15 seconds and purge and pre-wet lines. Turn pump off. D. Turn agitator on and load low density materials first (i.e. seed).** E. Continue slowly filling tank with water while loading fiber matrix into tank. F. Consult loading chart on the back to determine the number of bags to be added for desired area and application rate. G. SMM, BFM, FGM or ET-FGM should be completely loaded before water level reaches 75% of the top of tank. H. Top off with water and mix until all fiber is fully broken apart and hydrated (minimum of 10 minutes -- increase mixing time when applying in cold conditions). This is very important to fully activate the bonding additives and to obtain proper viscosity. I. Add fertilizer. J. Shut off recirculation valve to minimize potential for air entrainment within the slurry. K. Slow down agitator and start applying with a 50-degree fan tip nozzle. L. Spray in opposing directions for maximum soil coverage.
** Depending on site conditions, SMM, BFM, FGM or ET-FGM may be applied in a one-step process where all components may be mixed together in single tank loads. Consult with Manufacturer for further details.*
***Do not add tackifiers or polymers.*

Level Spreader with Conc. Lip at 0% Slope (1)



Q(cfs)	Entrance Width (ft)	D(ft)	LENGTH(ft)
0–10	**10**	**0.5**	**10**
10–20	16	0.6	20
20–30	24	0.7	30

Values used in design of level spreader highlighted.



SECTION THROUGH LEVEL SPREADERS
(showing proposed elevations)

CONSTRUCTION SPECIFICATIONS

1. THE MATTING SHOULD BE A MINIMUM OF 4FT. WIDE EXTENDING 6 INCHES OVER THE LIP AND BURIED 6 INCHES DEEP IN A VERTICAL TRENCH ON THE LOWER EDGE. THE UPPER EDGE SHOULD BUTT AGAINST SMOOTHLY CUT SOD AND BE SECURELY HELD IN PLACE WITH CLOSELY SPACED HEAVY DUTY WIRE STAPLES AT LEAST 12 INCHES IN LENGTH.
2. ENSURE THAT THE CONCRETE CURB LIP IS LEVEL TO UNIFORMLY SPREAD DISCHARGE.
3. THE LIP SHALL BE CONSTRUCTED ON UNDISTURBED SOIL NOT FILL.
4. A 20 FOOT TRANSITION SECTION WILL BE CONSTRUCTED FROM THE DIVERSION CHANNEL TO THE SPREADER TO SMOOTHLY BLEND THE DIFFERENT DIMENSION AND GRADES.
5. THE RUNOFF DISCHARGE WILL BE OUTLETED ONTO A STABILIZED VEGETATED SLOPE NOT EXCEEDING 10%.
6. SEED AND MULCH THE DISTURBED AREA IMMEDIATELY AFTER CONSTRUCTION.
6. CALCULATED Q VALUE FOR 100-YR STORM IS LESS THAN 10 CFS.

BASED ON A DETAIL PREPARED BY:
U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

NOTES:

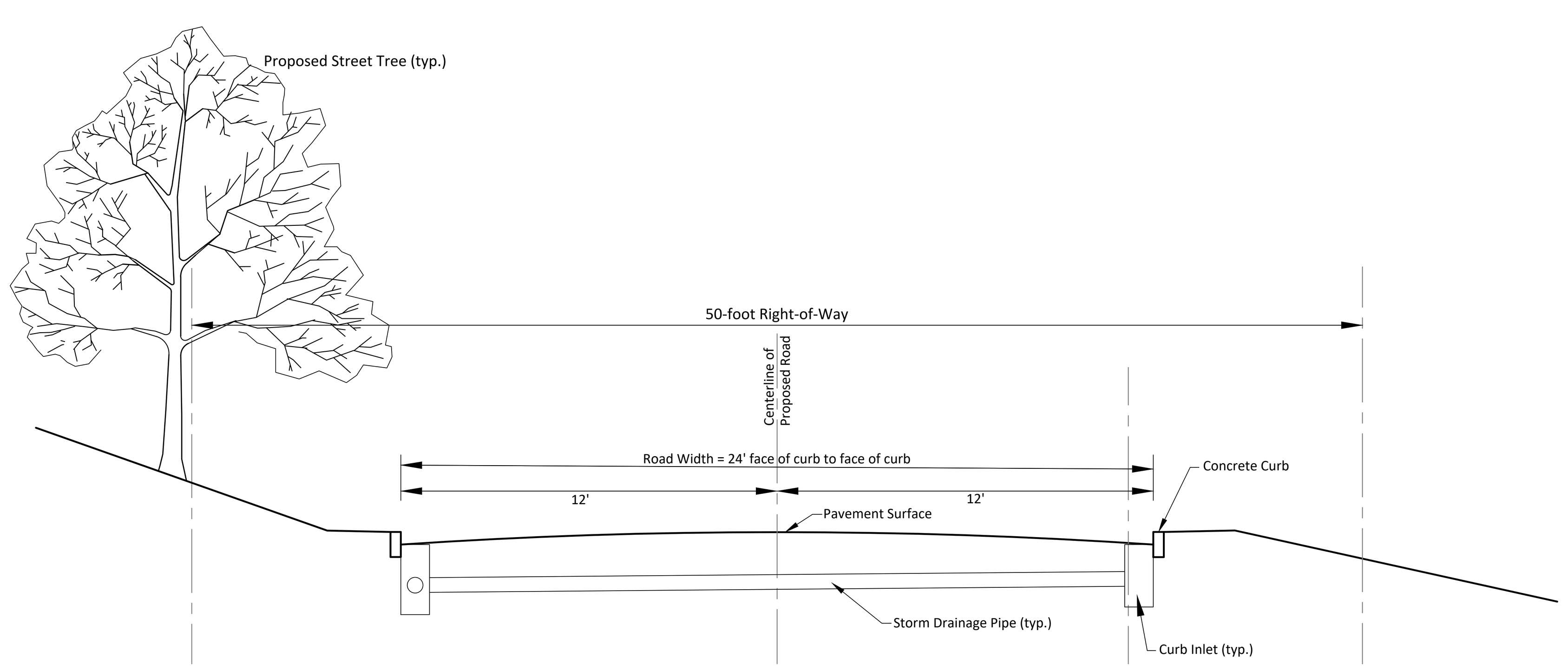
LEVEL SPREADER LS-1, DESIGNED TO THE ANTICIPATED FLOWS FROM THE 100 YEAR STORM EVENT (6.94 CFS) SHALL HAVE THE FOLLOWING DESIGN PARAMETERS:
ENTRANCE WIDTH = 10 FEET, DEPTH (D) = 6", LENGTH = 10 FEET.

LEVEL SPREADER LS-2, DESIGNED TO THE ANTICIPATED FLOWS FROM THE 100 YEAR STORM EVENT (6.53 CFS) SHALL HAVE THE FOLLOWING DESIGN PARAMETERS:
ENTRANCE WIDTH = 10 FEET, DEPTH (D) = 6", LENGTH = 10 FEET.

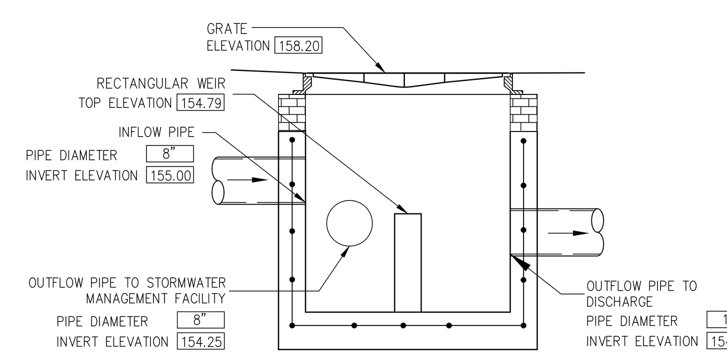
LEVEL SPREADER LS-3, DESIGNED TO THE ANTICIPATED FLOWS FROM THE 100 YEAR STORM EVENT (0.75 CFS) SHALL HAVE THE FOLLOWING DESIGN PARAMETERS:
ENTRANCE WIDTH = 10 FEET, DEPTH (D) = 6", LENGTH = 10 FEET.

GRADED AREAS WITHIN AND SURROUNDING THE LEVEL SPREADER SHALL BE STABILIZED WITH PERMANENT CRITICAL AREA PLANTINGS AS PER THE NYS STANDARDS AND SPECIFICATIONS FOR EROSION CONTROL. PENNFILE/LINN RYEGRASS (PERENNIAL) INSTALLED AT A 0.1 LB/1,000 SQUARE FEET AND MULCHED WITH STRAW MULCH IS RECOMMENDED.

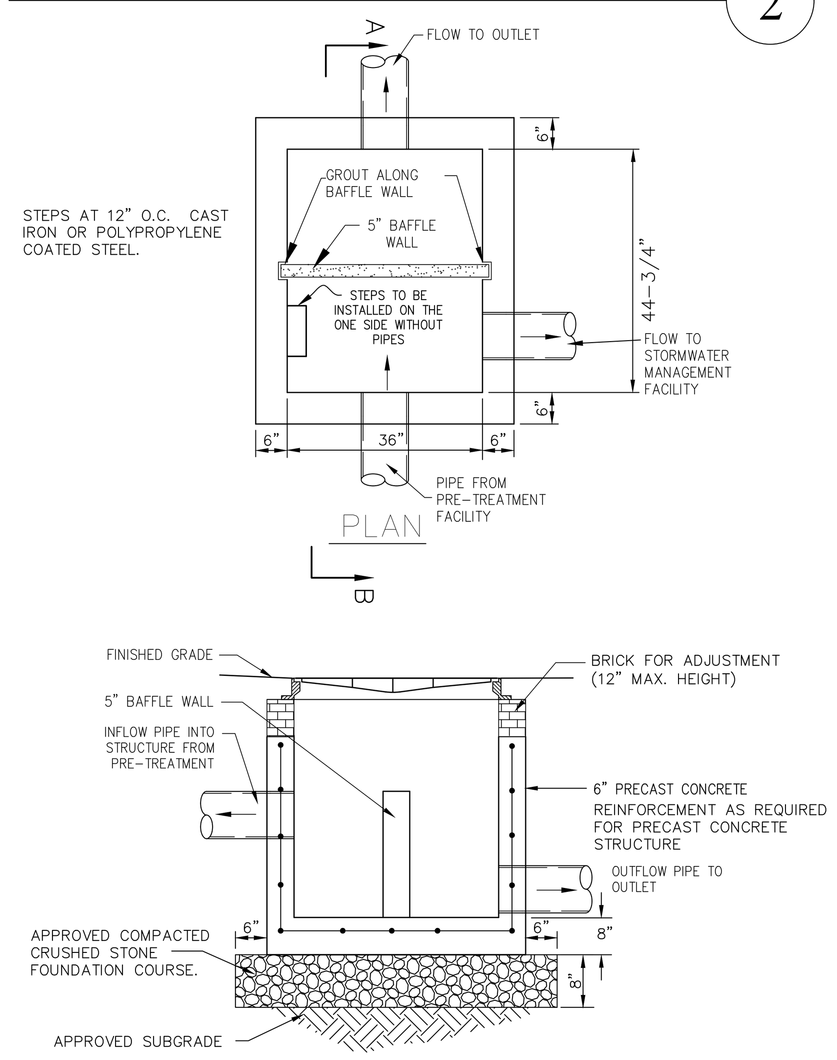
Proposed Road Cross-Section (8)



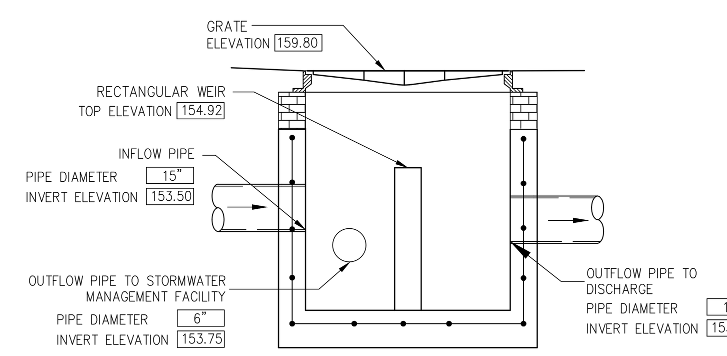
Off-Line Diversion Structure DIV-L1 (3)



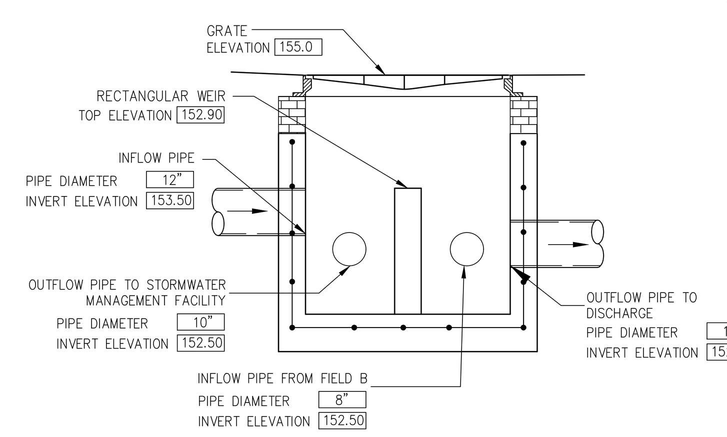
General Off-Line Diversion Structure (2)



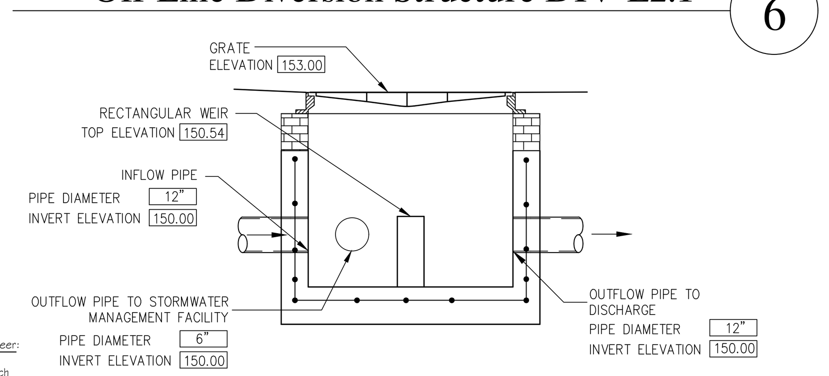
Off-Line Diversion Structure DIV-1.2 (4)



Off-Line Diversion Structure DIV-2.2 (5)

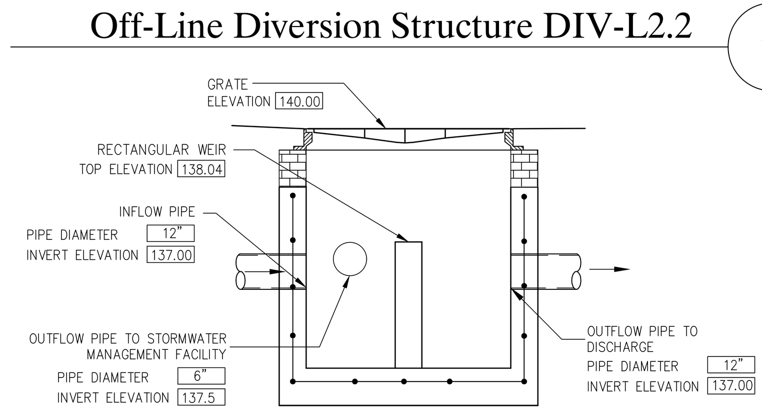


Off-Line Diversion Structure DIV-L2.1 (6)

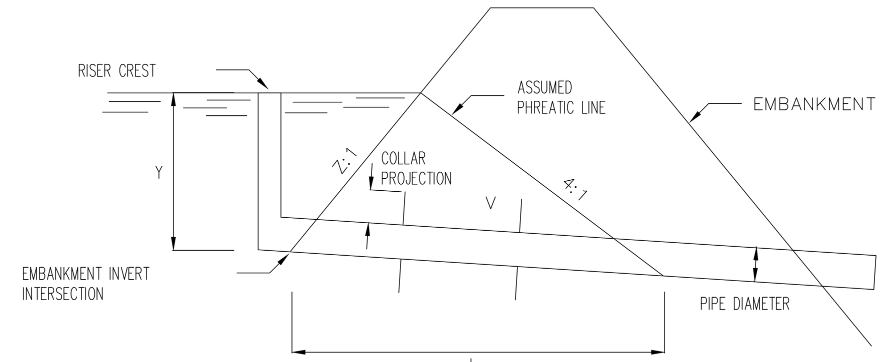


Civil engineer:
Alan L. Pilch
ALP Engineering & Landscape Architecture, PLLC
P.O. Box 843
Ridgefield, CT 06877
P.E. #80167
C. of A. #0016331
Direct Tel: (475) 215-5343

Off-Line Diversion Structure DIV-L2.2 (7)

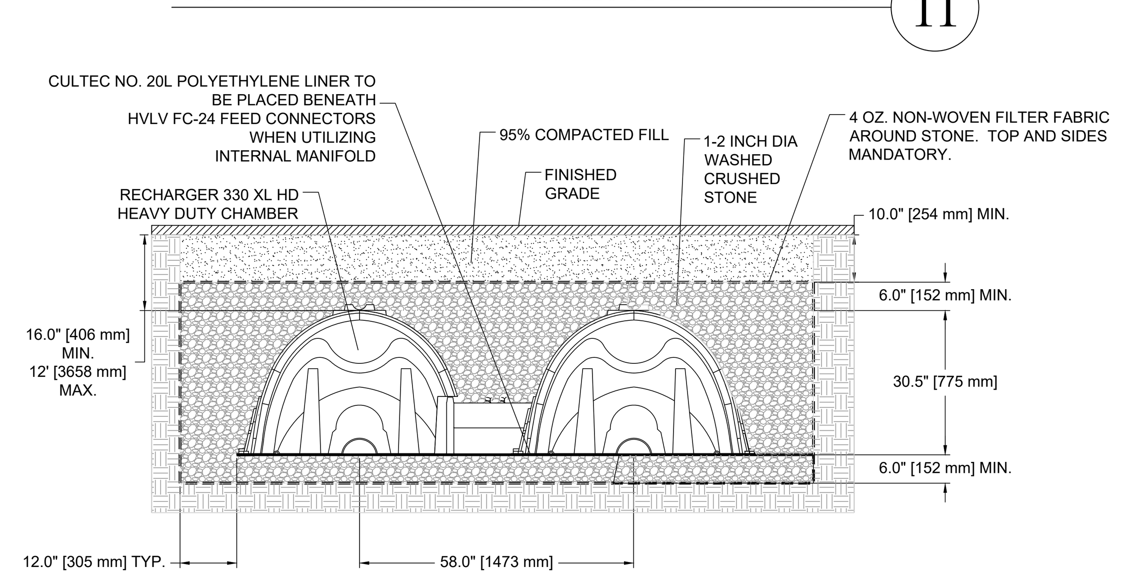


Anti-Seep Collar Design (9)



U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

Cultec 330XLHD Chamber Installation (11)

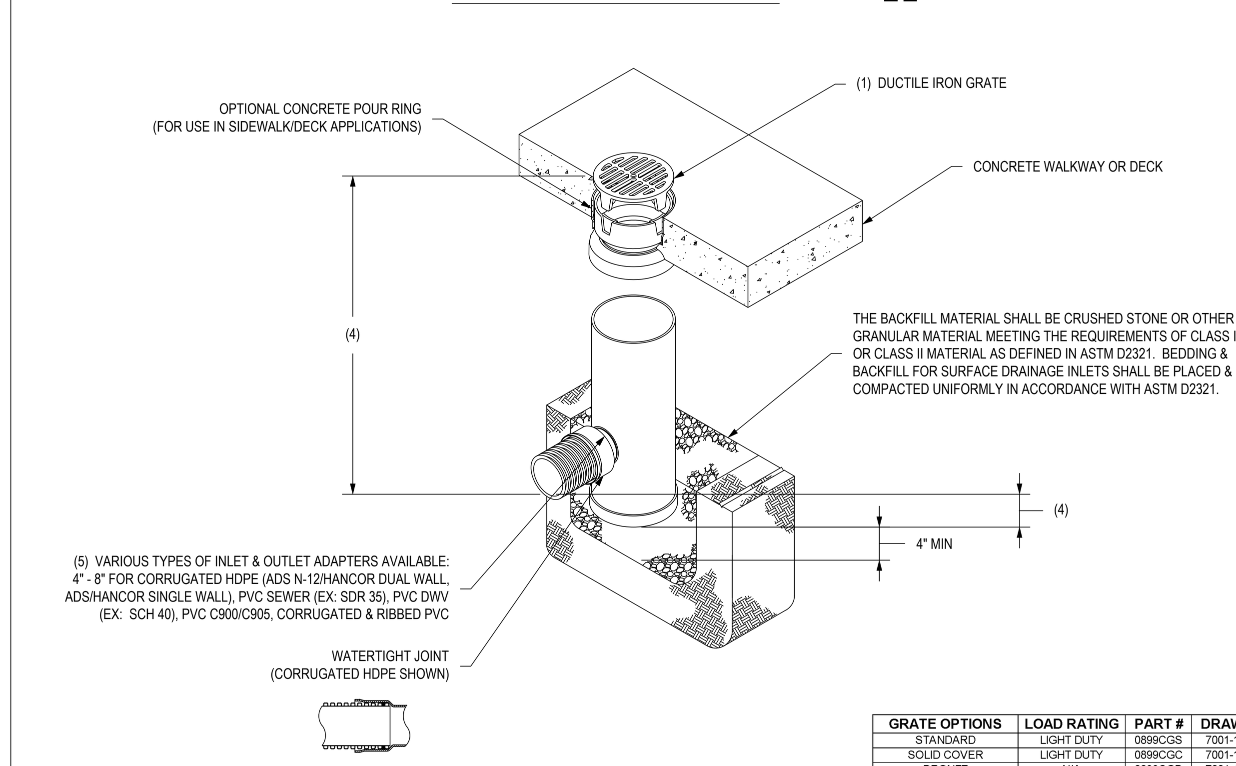


GENERAL NOTES
RECHARGER 330XL HD BY CULTEC, INC. OF BROOKFIELD, CT.
STORAGE PROVIDED = 11.32 CF/FT PER DESIGN UNIT.
REFER TO CULTEC, INC.'S CURRENT RECOMMENDED INSTALLATION GUIDELINES.
USE RECHARGER 330XL HD HEAVY DUTY FOR TRAFFIC AND/OR H-25 APPLICATIONS.

ALL RECHARGER 330XL HD HEAVY DUTY UNITS ARE MARKED WITH A COLOR STRIPE FORMED INTO THE PART ALONG THE LENGTH OF THE CHAMBER.
ALL RECHARGER 330XL HD CHAMBERS MUST BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.

Pool Area Drain (typ.) (10)

NYLOPLAST 8" DRAIN BASIN: 2808AG _ _ X



GRATE OPTIONS	LOAD RATING	PART #	DRAWING #
STANDARD	LIGHT DUTY	0899CGS	7001-110-194
SOLID COVER	LIGHT DUTY	0899CGC	7001-110-195
BRONZE	N/A	0899CGB	7001-110-196
DOME	N/A	0899CGD	7001-110-197
DROP IN GRATE	LIGHT DUTY	0801DI	7001-110-019

1 - GRATES/SOLID COVER SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05, WITH THE EXCEPTION OF THE BRONZE GRATE.
2 - CUSTOM DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS. RISERS ARE NEEDED FOR BASINS OVER 84" DUE TO SHIPPING RESTRICTIONS. SEE DRAWING NO. 7001-110-065.
3 - STANDARD DRAIN BASIN HAS FIXED ADAPTER LOCATIONS OF 0° & 180°. CUSTOM DRAIN BASIN ADAPTERS CAN BE MOUNTED ON ANY ANGLE 0° TO 360°. TO DETERMINE MINIMUM ANGLE BETWEEN ADAPTERS SEE DRAWING NO. 7001-110-012.
4 - FOR COMPLETE DESIGN DETAILS SEE DRAWING NO. 7001-110-045.
5 - DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS N-12/HANCOR DUAL WALL) & PVC SEWER (4" - 24").

DRAWN BY EBC	MATERIAL	Nyloplast, 3130 VERONA AVE, BUFORD, GA 30518, PHN (770) 932-2443, FAX (770) 932-2490, www.nyloplast-us.com	
DATE 11-14-06			
REVISED BY CCA	PROJECT NO./NAME	TITLE	8 IN DRAIN BASIN QUICK SPEC INSTALLATION DETAIL
DATE 09-04-13			
DWG SIZE A	SCALE 1:16 SHEET 1 OF 1	DWG NO. 7001-110-272	REV D

APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED DEC. 12, 2016.

______________________ DATE:______________
CHRISTOPHER CARTHY, CHAIRMAN
TOWN OF NORTH CASTLE PLANNING BOARD

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

______________________ DATE:_______________
JOSEPH CERMELE, PE
KELLARD SESSIONS, P.C.
CONSULTING TOWN ENGINEERS

OWNER:
McKenna Custom Homes, Inc.
433 Manville Road
Pleasantville, NY 10570
Tel: (914) 769-1869

CONSULTANTS:

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160 King Street
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Chappaqua, New York 10514
Tel: (914) 238-3555
Fax: (914) 238-3435

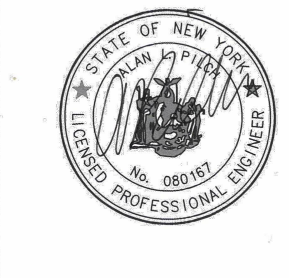
WELSH Engineering & Land Surveying, P.C.
12 Campwoods Grounds
Ossining, N.Y. 10562

Tel: (914) 773-1701

ISSUED:

Submission to Town and NYCDEP	07/24/2015
Submission to Town and NYCDEP	12/15/2015
Submission to Town and NYCDEP	03/01/2016
Submission to Town for final subdivision approval	06/30/2016
Submission to Town for Prelim & Final Subdivision Plan appvl	10/07/2016
Submission to Town for Prelim & Final Subdivision Plan appvl	03/20/2020

SEAL:



PROJECT NAME:
HIDDEN OAK SUBDIVISION
Hidden Oak Road
Town of North Castle, New York

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

ENVIRONMENTAL CONSULTANT:
EVANS ASSOCIATES
ENVIRONMENTAL CONSULTING, INC.
162 Falls Road Bethany, Connecticut 06524
Tel. (203) 393-0690

Drawing title:
Construction Details/ Erosion Control Notes

Date: April 9, 2015

Dwn. by: alp

ID: 2.7_C05.31.2016

DE-4

Maintenance Plan and Schedule for Stormwater Management Practices

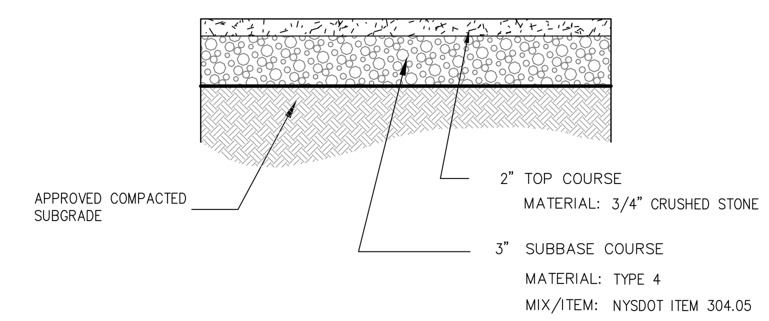
1

STORMWATER MANAGEMENT PRACTICE	MAINTENANCE ACTIVITY	FREQUENCY	RESPONSIBILITY
STORMWATER MANAGEMENT BASIN	Cleaning and removal of debris	Inspect after major storm events (>2" of rainfall); otherwise annual removal of debris	Property Owner agreement
	Inspect vegetation and harvest vegetation when a 50% reduction in the original open water surface area occurs	Inspect annually	Property Owner agreement
	Inspect and repair embankment and side slopes	Inspect annually	Property Owner agreement
	Inspect outlet control structure and repair if needed	Inspect annually	Property Owner agreement
	Removing accumulated sediment from forebay or sediment storage areas when 60% of the original volume has been lost	Every 5 years	Property Owner agreement
	Removing accumulated sediment from main cells of pond once 50% of the original volume has been lost	Every 5 years	Property Owner agreement
	Remove invasive plants	Inspect annually; remove invasive plants promptly	Property Owner agreement
INFILTRATION FACILITY	MAINTENANCE ACTIVITY	FREQUENCY	RESPONSIBILITY
	Inspect level of sediment in subsurface chambers through observation port and remove if depth > 3"	Inspect after first year in operation, then every 5 years	Property Owner (for SWMF L-1, L2.1 and L2.2); Property Owner agreement for SWMF 1.2 and 2.2
	Inspect water level in observation well	Inspect annually	Same as above
	Inspect structural integrity of inlet and outlet control structures and repair if needed	Inspect annually	Same as above

STORMWATER MANAGEMENT PRACTICE	MAINTENANCE ACTIVITY	FREQUENCY	RESPONSIBILITY
BIORETENTION FACILITY AND RAIN GARDEN	Inspect if side slopes areas of the facility are eroding	Inspect annually	Property Owner
	Apply mulching to bare or void areas	Inspect annually	Property Owner
	Removing and replacing all dead and diseased vegetation	Inspect annually	Property Owner
	Watering plant material	As may be needed in summer months	Property Owner
	Removing mulch and applying a new layer to prevent weed growth	Inspect annually	Property Owner
	Remove invasive plants	Inspect annually; remove invasive plants promptly	Property Owner
	Sediment removal	Inspect annually; observe if runoff water is present above the surface for more than 24 hr after rain event	Property Owner
CATCH BASINS AND MANHOLES	Remove sediment from sump	Inspect annually	Property Owner agreement
	Check integrity of structure	Inspect annually	Property Owner agreement
CATCH BASIN DIVERSION STRUCTURES	Check for debris that might impair the flow through the grate	Inspect after every storm event > 0.5" of precipitation	Same as above for infiltration facilities
HYDRODYNAMIC SEPARATOR	Remove floatables and sediment from facility	Inspect after first year in operation, then every 5 years	Same as above for infiltration facilities

Stormwater Basin Access Driveway

2

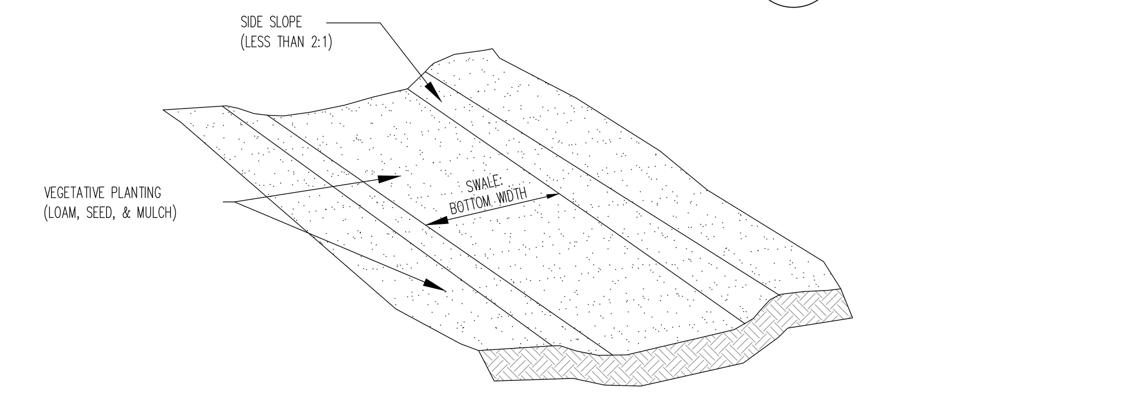


NOTES:

1. THICKNESSES INDICATED REFER TO COMPACTED MEASURE.
2. ITEM NUMBERS REFER TO: NEW YORK STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS

Vegetated Swale

3

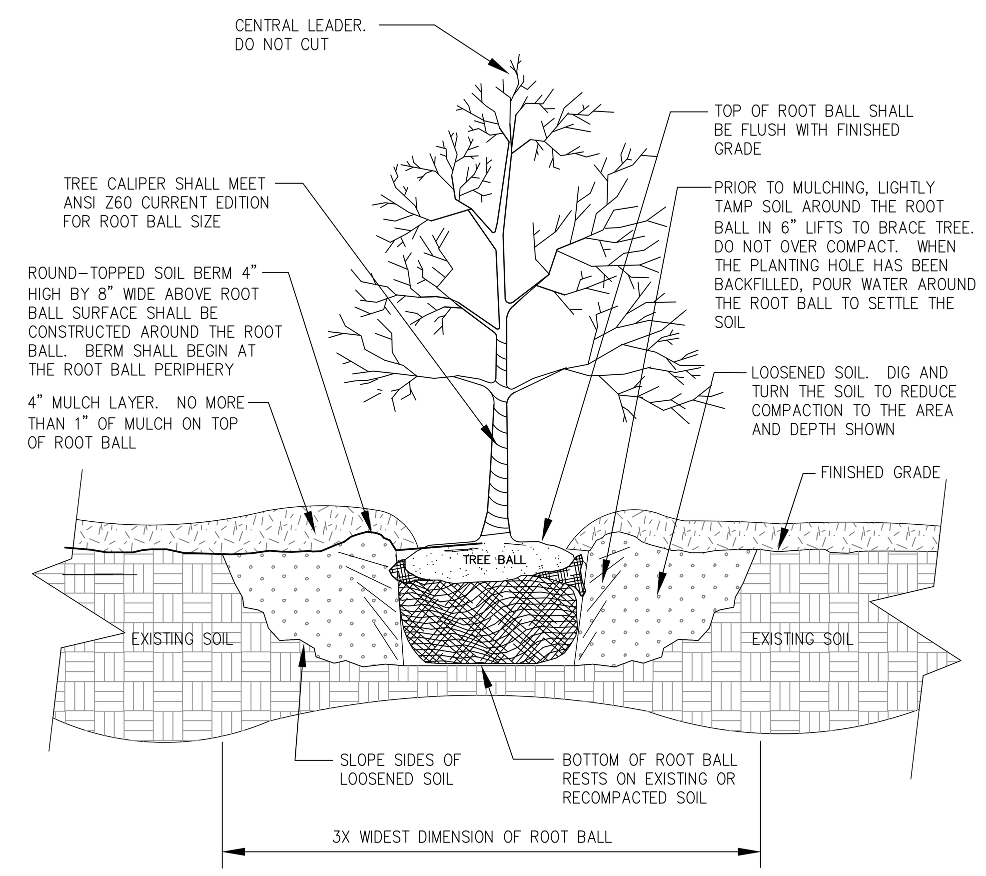


INSTALLATION NOTES:

1. THE GRASSED SWALE SHALL BE EXCAVATED TO LINE, GRADE AND CROSS-SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED HEREIN, AND SHALL BE FREE OF PROJECTIONS OR OTHER IRREGULARITIES WHICH WOULD INTERFERE OF IMPEDE THE FLOW.
2. ALL FILLS SHALL BE COMPACTED AS NEEDED TO PREVENT UNEQUAL SETTLEMENT THAT WOULD IMPACT THE COMPLETED SWALE.
3. STABILIZATION OF THE SWALE SHALL BE DONE ACCORDING TO THE APPROPRIATE STANDARD AND SPECIFICATIONS FOR CRITICAL AREA SEEDING, MULCHING AND NETTING.

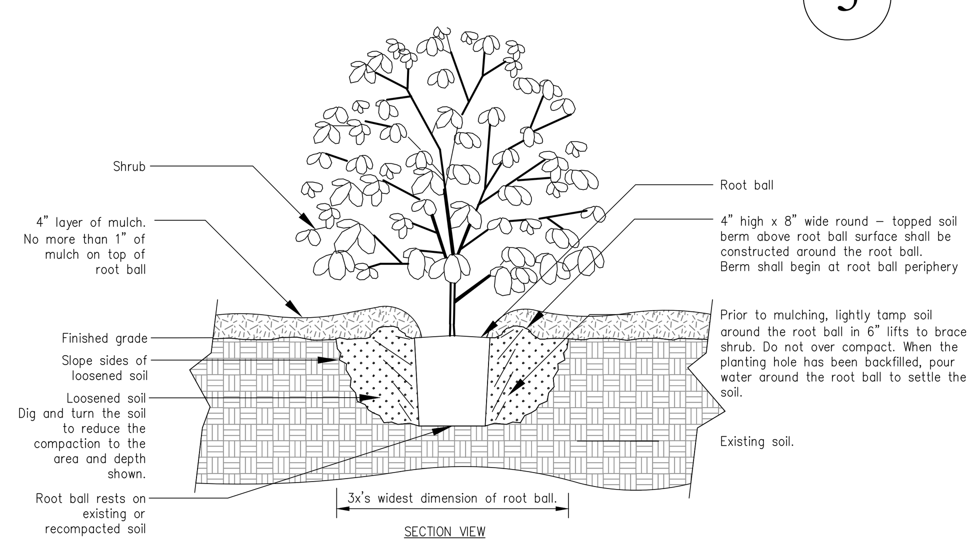
Tree Planting

4



Shrub Planting

5



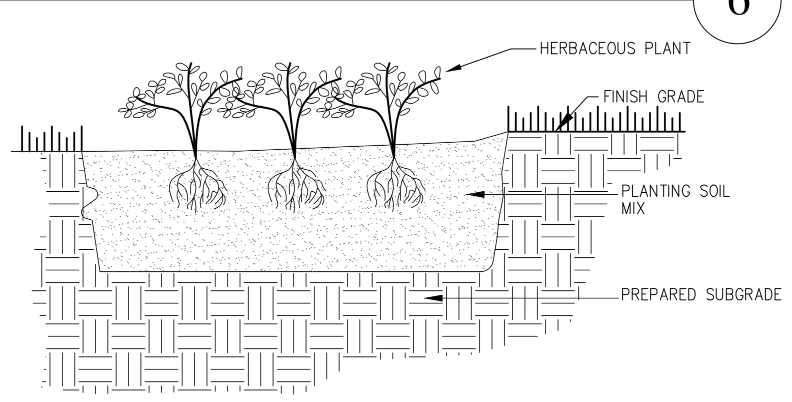
Notes:
1– Shrubs shall be of quality prescribed in the root observations detail and specifications.

2– See specifications for further requirements related to this detail.

NOTE REGARDING USE OF FERTILIZER ON THE PROPERTY
In accordance with Article XXVI, Restrictions on the Application and Sale of Lawn Fertilizer within the County of Westchester, Section 863.1302 Regulation of the Use and Application of Lawn Fertilizer, no person shall apply any lawn fertilizer within the County that is labeled as containing more than 0% phosphorus or other compound containing phosphorus, such as phosphate, except for newly established turf or lawn areas during their first growing season. The lawn fertilizer application shall not contain an amount of phosphorus exceeding the amount and rate of application recommended in the soil test evaluation. In subsequent years, no person shall apply any lawn fertilizer within the County that is labeled as containing more than 0% phosphorus or other compound containing phosphorus, such as phosphate, nor apply lawn fertilizer between December 1st and April 1st, nor apply lawn fertilizer to any impervious surface. If such application occurs, the fertilizer must be immediately contained and either legally applied to turf or placed in an appropriate container. Finally, no person shall apply lawn fertilizer to any turf or lawn area within twenty (20) feet of any surface water, except that this restriction shall not apply where a continuous natural vegetative buffer, at least ten (10) feet wide, separates a turf or lawn area and surface water.

Herbaceous Planting

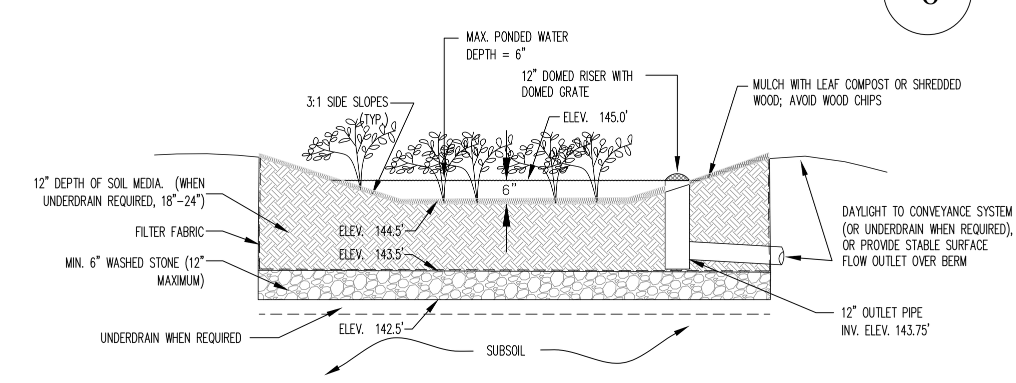
6



NOTES:
PLANTING SOIL MIX:
1 PART EXISTING SOIL
1 PART WELL ROTTED COMPOST
1 PART TOPSOIL

Rain Garden

6



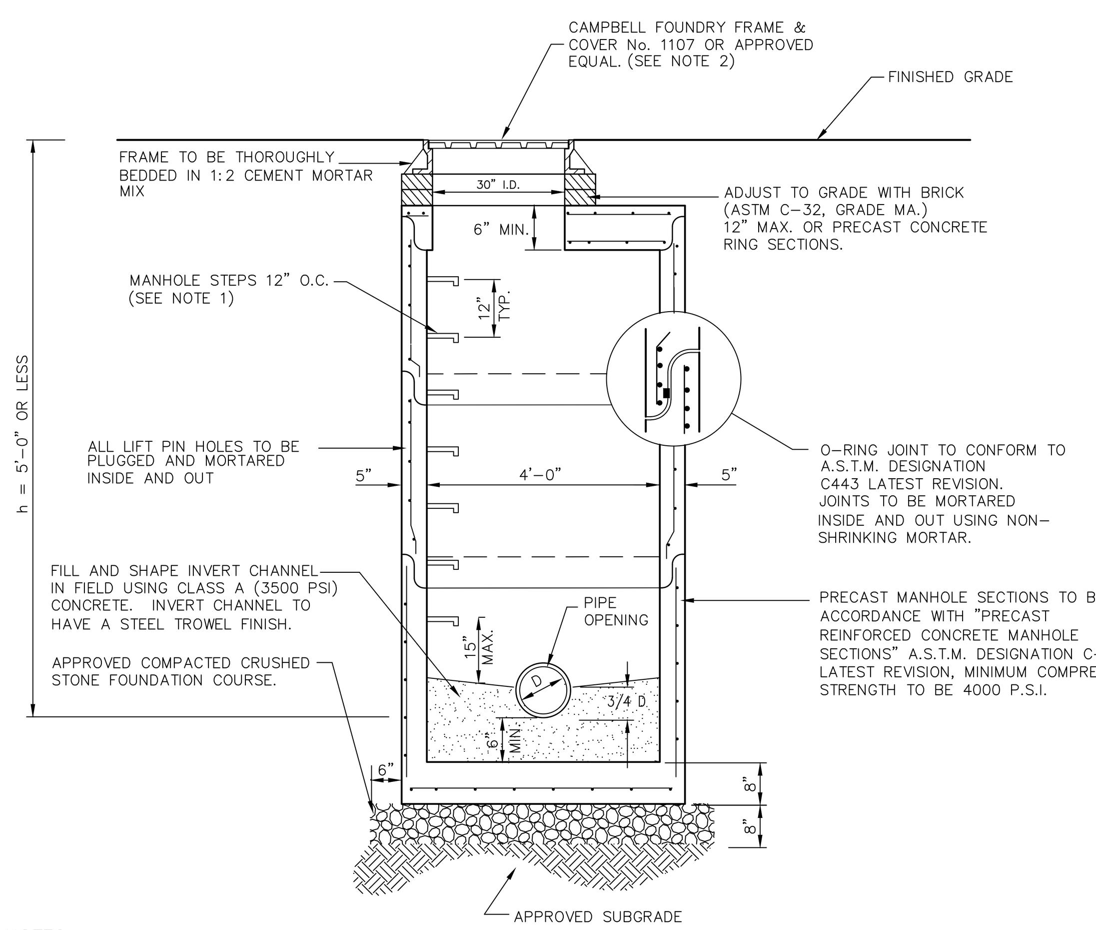
List of Trees and Removals

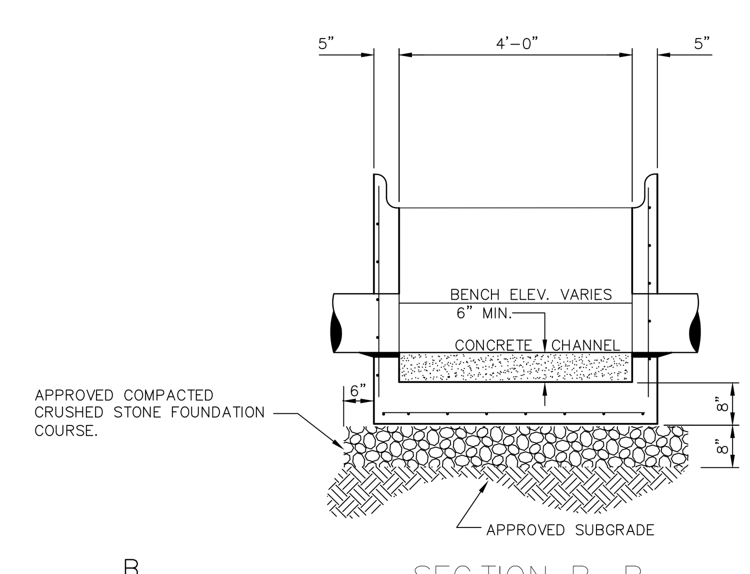
7

Road Right-of-Way					Lot 1				
			Remove?					Remove?	
Number	DBH	Species	x = yes		Number	DBH	Species	x = yes	
1	10	Locust	x		1-1	13	Maple		
2	unk	Locust	x		1-2	16	Maple	x	
3	21	Locust	x		1-3	10	Maple	x	
4	21	Locust	x		1-4	16	Locust	x	
5	18	Locust	x		1-5	15	Locust		
6	16	Locust	x	double	1-6	19	Maple		
7	17	Locust	x		1-7	18	Locust		
8	17	Locust	x		1-8	6	Black Cherry		
9	6	Maple	x		1-9	12	Maple		
10	6	Locust	x		1-10	6	Oak	x	
11	28	Locust	x		1-11	6	Maple	x	
12	19	Locust	x		1-12	10	Oak	x	
13	10	Maple	x		1-13	9	Maple		
14	10	Maple	x		1-14	12	Maple		
15	7	Maple	x		1-15	6	Maple		
16	7	Maple	x		1-16	18	Maple		
17	7	Maple	x		1-17	19	Maple		
18	13	Maple	x		1-18	9	Locust	x	
19	8	Maple	x		1-19	15	Locust	x	
20	21	Locust	x		1-20	14	Locust	x	
21	6	Maple	x		1-21	20	Locust	x	
22	21	Locust	x		1-22	10	Locust	x	
23	16	Ash	x		1-23	19	Locust	x	
24	24	Locust	x		1-24	20	Locust	x	
25	9	Oak	x		1-25	26	Ash	x	
26	6	Oak	x		1-26	16	Ash	x	triple
27	17	Black Cherry	x		1-27	6	Oak	x	
28	6	Maple	x		1-28	22	Locust	x	
29	7	Maple	x		1-29	18	Locust	x	
30	19	Locust	x		1-30	8	Oak	x	
[illegible]					[illegible]				

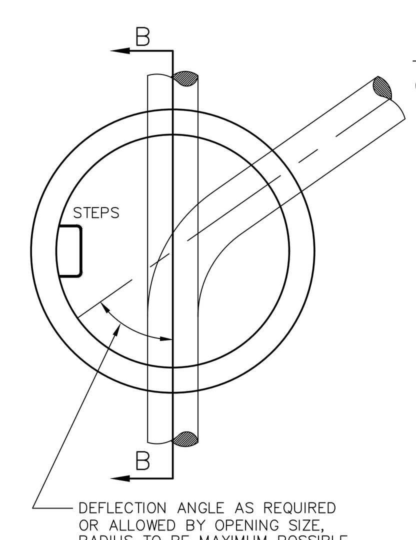
Storm Drainage Manhole

7





SECTION B–B
(Standard Manhole Base)



PLAN

NOTES:

1. MANHOLE STEPS SHALL BE CAST IRON NEENAH No. R-1981-0 OR CAMPBELL FOUNDRY No. 2588-1 OR POLYPROPYLENE COATED STEEL (SEE SPECIFICATIONS) OR APPROVED EQUAL.
2. UNLESS OTHERWISE SPECIFIED, SANITARY SEWER MANHOLES SHALL HAVE LETTERS "SEWER" AND STORM DRAIN MANHOLES SHALL HAVE LETTERS "DRAIN" CAST ON COVER. THE COVERS SHALL HAVE VENT HOLES.
3. MANHOLES SHALL MEET OR EXCEED A.S.T.M. AND O.S.H.A. REQUIREMENTS.
4. SEE "NOTES PERTAINING TO MANHOLES" ON THIS DRAWING.

NOTES PERTAINING TO DRAIN INLETS AND MANHOLES

1. ALL PRECAST CONCRETE STRUCTURES SHALL BE DESIGNED TO ACCOMMODATE AN H-20 DESIGN LOAD. ALL SUBSURFACE STORMWATER DETENTION FACILITIES SHALL ALSO MEET AN H-20 LOADING.

NOTES PERTAINING TO DRAIN INLETS

1. STEPS WILL NOT BE REQUIRED IN INLETS LESS THAN FOUR (4) FEET IN DEPTH. STEPS WILL BE REQUIRED IN INLETS FOUR (4) FEET OR GREATER IN DEPTH.
2. WHEN STEPS ARE REQUIRED, STEPS SHALL COMPLY WITH THE SAME REQUIREMENTS OF ASTM STANDARD C-478, ARTICLE 13 ENTITLED "MANHOLE STEPS & LADDERS".
3. FOR MASONRY STRUCTURES, THE FIRST COURSE OF MASONRY SHALL BE SET IN THE CONCRETE FOUNDATION BEFORE THE CONCRETE HAS SET. CONCRETE FOUNDATION SHALL BE CLASS "A" (3,500 psi) CONCRETE, TWELVE (12) INCHES THICK AND SHALL EXTEND SIX (6) INCHES BEYOND THE OUTSIDE FACE OF THE STRUCTURE.
4. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO FURNISH AND CONSTRUCT THE PROPER SIZE STRUCTURE INCLUDING THE NECESSARY OPENINGS TO ACCOMMODATE THE WORK AS SHOWN ON THE PLANS OR ORDERED BY THE ENGINEER, AT NO ADDITIONAL COST TO THE OWNER.
5. ALL NECESSARY PATCHING FOR DRAIN STRUCTURES SHALL BE ACCOMPLISHED WITH NON-SHRINKING CEMENT MORTAR GROUT, APPROVED EQUAL TO SIKA-SET AS MANUFACTURED BY THE SIKA CHEMICAL CORP.
6. FOUNDATIONS FOR PRECAST CONCRETE STRUCTURES SHALL BE SET ON A COMPACTED LAYER OF APPROVED POROUS MATERIAL HAVING A MINIMUM COMPACTED THICKNESS OF EIGHT (8) INCHES.
7. ALL PIPES SHALL BE CUT FLUSH WITH THE INSIDE WALL OF THE STRUCTURE.
8. PROVIDE REINFORCED CONCRETE TOP SLAB FOR OVERSIZED DRAIN INLETS WITH PROPER SIZE OPENING TO ACCOMMODATE INSTALLATION OF FRAME & GRATE.
9. FOR MASONRY STRUCTURES GREATER THAN TWELVE (12) FEET IN DEPTH, THICKNESS OF MASONRY WALLS SHALL BE INCREASED TO TWELVE (12) INCHES.

NOTES PERTAINING TO MANHOLES

1. PRECAST CONCRETE MANHOLES SHALL COMPLY WITH ASTM STANDARD C-478. MANHOLE JOINTS SHALL COMPLY WITH ASTM STANDARD C-443.
2. FOR PRECAST CONCRETE MANHOLES FIVE (5) FEET OR LESS IN HEIGHT, TOP CONE SECTION SHALL BE REPLACED WITH PRECAST REINFORCED CONCRETE SLAB (6" MIN. THICKNESS) WITH OPENING OF SUFFICIENT SIZE TO ACCOMMODATE MANHOLE CASTING.
3. FOR MANHOLES 12 FEET OR MORE IN DEPTH, MANHOLE DIAMETER SHALL BE FIVE (5) FEET.
4. TERMINAL MANHOLE FLOORS SHALL BE SLOPED TOWARD OUTFALL PIPE.
5. INVERT CHANNELS FOR PRECAST CONCRETE MANHOLES SHALL BE CONSTRUCTED OF CONCRETE.
6. NOTES 1, 5, 6 & 7 UNDER "NOTES PERTAINING TO DRAIN INLETS" ABOVE SHALL APPLY TO MANHOLES.

APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED DEC. 12, 2016.

DATE:

CHRISTOPHER CARTHY, CHAIRMAN
TOWN OF NORTH CASTLE PLANNING BOARD

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

DATE:

JOSEPH CERMELE, PE
KELLARD SESSIONS, P.C.
CONSULTING TOWN ENGINEERS

OWNER:
McKenna Custom Homes, Inc.
433 Manville Road
Pleasantville, NY 10570
Tel: (914) 769-1869

CONSULTANTS:

CAMPBELL ENGINEERING, LLP
160 King Street
P.O. Box 255
Chappaqua, New York 10514
Tel: (914) 238-3555
Fax: (914) 238-3435

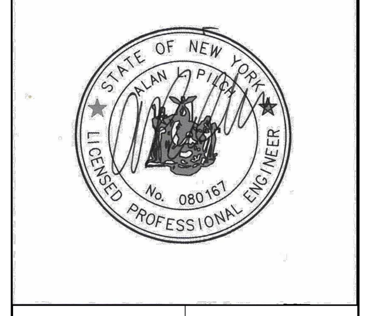
WELSH Engineering & Land Surveying, P.C.
12 Campwoods Grounds
Ossining, N.Y. 10562

Tel: (914) 773-1701

ISSUED:

Submission to Town and NYCDEP	07/24/2015
Submission to Town and NYCDEP	12/15/2015
Submission to Town and NYCDEP	03/01/2016
Submission to Town for final subdivision approval	06/30/2016
Submission to Town for Prelim & Final Subdivision Plan appvl	10/07/2016
Submission to Town for Prelim & Final Subdivision Plan appvl	03/20/2020

SEAL:



PROJECT NAME:
HIDDEN OAK SUBDIVISION
Hidden Oak Road
Town of North Castle, New York

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

ENVIRONMENTAL CONSULTANT:
EVANS ASSOCIATES
ENVIRONMENTAL CONSULTING, INC.
162 Falls Road Bethany, Connecticut 06524
Tel. (203) 393-0690

Drawing title:
Construction Details / Maintenance Plan

Date: August 25, 2015

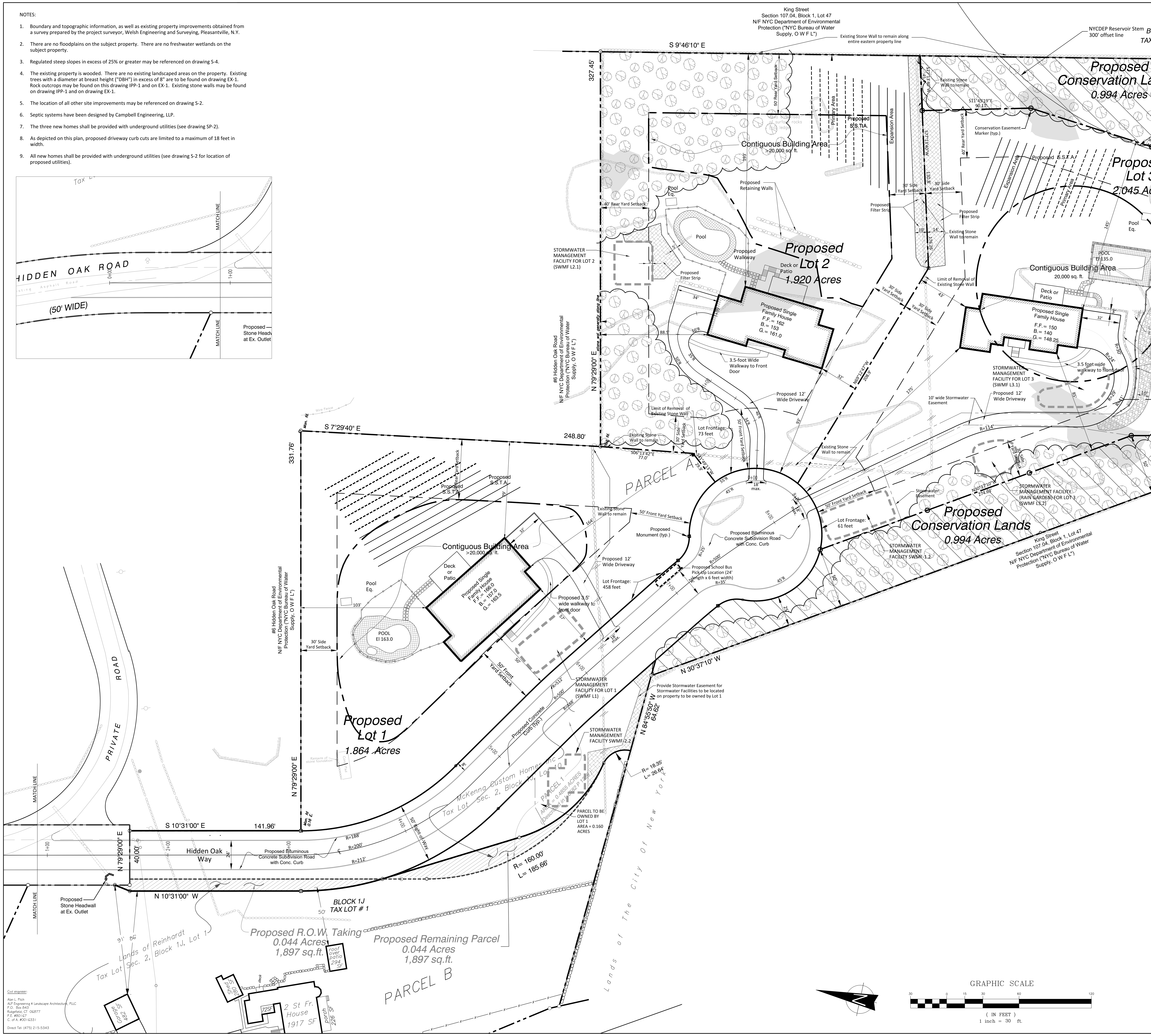
Dwn. by: alp

ID: 2.7_C05.31.2016

DE-5

NOTES:

1. Boundary and topographic information, as well as existing property improvements obtained from a survey prepared by the project surveyor, Welsh Engineering and Surveying, Pleasantville, N.Y.
2. There are no floodplains on the subject property. There are no freshwater wetlands on the subject property.
3. Regulated steep slopes in excess of 25% or greater may be referenced on drawing S-4.
4. The existing property is wooded. There are no existing landscaped areas on the property. Existing trees with a diameter at breast height ("DBH") in excess of 8" are to be found on drawing EX-1. Rock outcrops may be found on this drawing IPP-1 and on EX-1. Existing stone walls may be found on drawing IPP-1 and on drawing EX-1.
5. The location of all other site improvements may be referenced on drawing S-2.
6. Septic systems have been designed by Campbell Engineering, LLP.
7. The three new homes shall be provided with underground utilities (see drawing SP-2).
8. As depicted on this plan, proposed driveway curb cuts are limited to a maximum of 18 feet in width.
9. All new homes shall be provided with underground utilities (see drawing S-2 for location of proposed utilities).



NOTE: A TOTAL OF 3 REGULATED TREES WILL BE REMOVED WITHIN OPEN SPACE.
TOTAL REGULATED TREE REMOVAL NUMBER INCLUDES SPECIMEN TREES.

LEGEND

	PROPERTY LINE
170	EXISTING CONTOUR
+ 170.5	PROPOSED SPOT ELEVATION
	PROPOSED RESIDENCE & DRIVEWAY
	LOT LINE
	SETBACK LINE
S.S.T.A.	SEPTIC SYSTEM TREATMENT AREA
	EXISTING STONE WALL
	EXISTING STONE WALL TO BE REMOVED
	RIGHT-OF-WAY LINE
	EXISTING ROCK OUTCROP
	POOL FENCE
	STORMWATER EASEMENT
	STEEP SLOPE (>25%)
	EXISTING STONE WALL TO BE REMOVED
	PROPOSED OPEN SPACE/CONSERVATION LANDS
	CONSERVATION EASEMENT MARKER
	PROPOSED SURVEYOR MONUMENT

APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED DEC. 12, 2016.

______________________ DATE:______________

CHRISTOPHER CARTHY, CHAIRMAN
TOWN OF NORTH CASTLE PLANNING BOARD

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

______________________ DATE:_______________

JOSEPH CERMELE, PE
KELLARD SESSIONS, P.C.
CONSULTING TOWN ENGINEERS

PROPERTY OWNER:
McKenna Custom Homes, Inc.
433 Manville Road
Pleasantville, NY 10570
Tel: (914) 769-1869

CONSULTANTS:

CAMPBELL ENGINEERING, LLP
160 King Street
P.O. Box 255
Chappaqua, New York 10514
Tel: (914) 238-3555
Fax: (914) 238-3435

WELSH Engineering & Land Surveying, P.C.
12 Campwoods Grounds
Ossining, N.Y. 10562

Tel: (914) 773-1701

Submission to Town for Final Subdivision Plan appvl	03/20/2020
Submission to Town for Final Subdivision Plan appvl	01/05/2018
Submission to Town for Prelim & Final Subdivision Plan appvl	10/07/2016
Submission to Town and NYCDEP	03/01/2016
Submission to Town and NYCDEP	12/15/2015
Submission to Town and NYCDEP	10/15/2015
Submission to Town and NYCDEP	07/24/2015
Submission of SWPPP to NYCDEP	04/09/2015
Amended reservoir stem extent into property	01/14/2015
Amended Lot 1 SSDA, house location, general revisions	01/09/2015
Amended layout plan for Conservation Subdivision	11/17/2014

ISSUED:

SEAL:

STATE OF NEW YORK
ALAN L. PILCH
No. 080167
LICENSED PROFESSIONAL ENGINEER

PROJECT NAME:
HIDDEN OAK SUBDIVISION
Hidden Oak Road
Town of North Castle, New York

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

ENVIRONMENTAL CONSULTANT:
EVANS ASSOCIATES
ENVIRONMENTAL CONSULTING, INC.
162 Falls Road Bethany, Connecticut 06524
Tel. (203) 393-0690

Drawing title:
Subdivision Layout Plan

Date: July 15, 2014

Dwn. by: alp

ID: _c05.31.2016

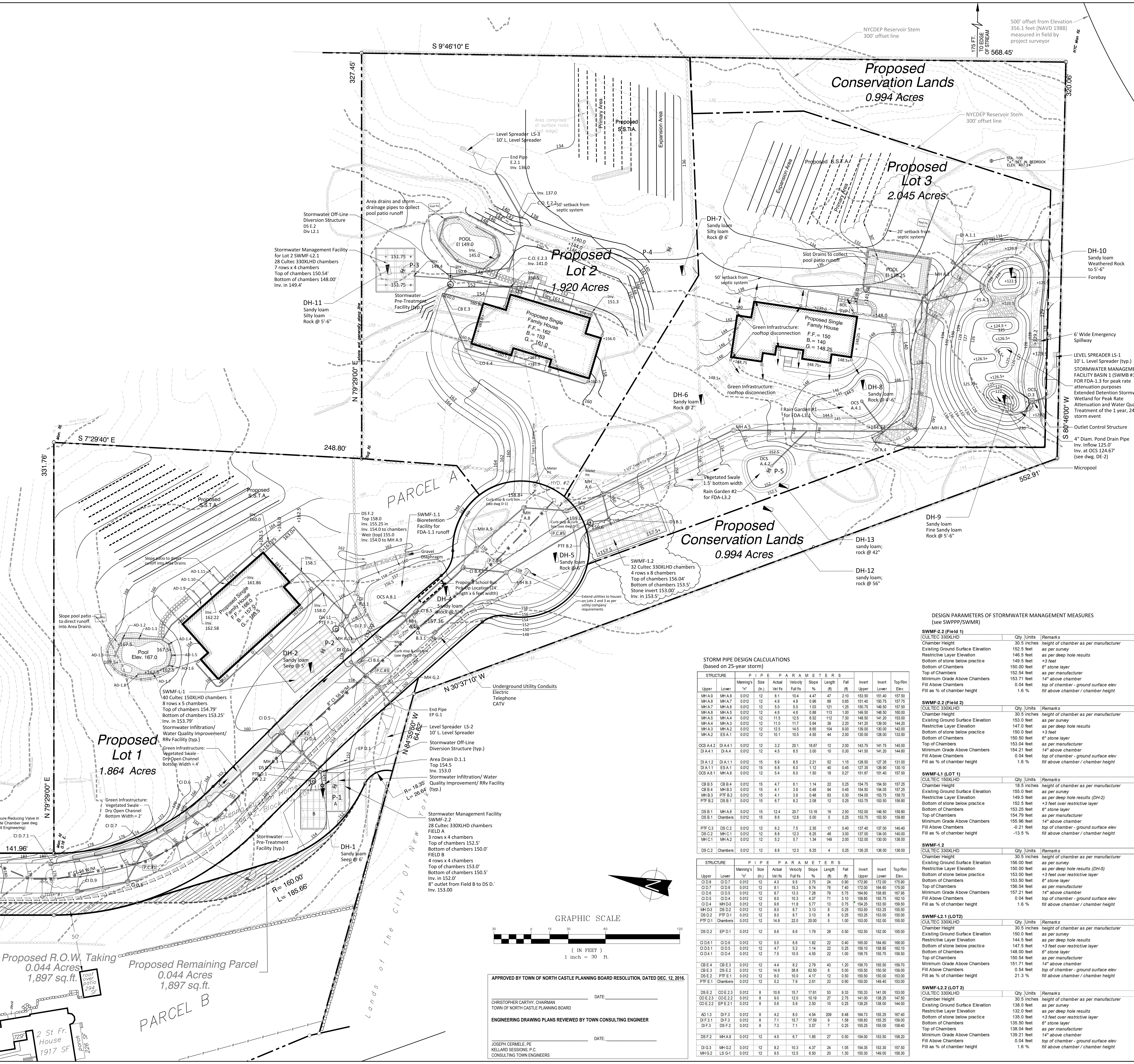
S-1

LEGEND

- PROPERTY LINE
- EXISTING CONTOUR
- PROPOSED SPOT ELEVATION
- PROPOSED CONTOUR
- SEPTIC SYSTEM TREATMENT AREA
- CATCH BASIN
- STORM DRAINAGE MANHOLE
- AREA DRAIN
- ROOF DRAIN LEADER (TYP.)
- STORM PIPE
- PROPOSED RESIDENCE & DRIVEWAY
- LOT LINE
- STORMWATER INFILTRATION FACILITY (SUBSURFACE CHAMBERS)
- VEGETATED SWALE
- STORMWATER PRETREATMENT FACILITY
- PROPOSED 8" CL. 56 DIP WATER MAIN
- PROPOSED WATER SERVICE TO HOUSE
- STORMWATER EASEMENT
- PERCOLATION TEST LOCATION
- DEEP HOLE TEST LOCATION

NOTES:

1. Boundary and topographic information, as well as existing property improvements obtained from a survey prepared by the project surveyor, Welsh Engineering and Surveying, Pleasantville, N.Y.
2. There are no floodplains on the subject property. There are no freshwater wetlands on the subject property.
3. Slopes in excess of 25% or greater may be referenced on drawing S-4.
4. The existing property is wooded. There are no existing landscaped areas on the property. Existing trees with a diameter at breast height ("DBH") in excess of 8" are to be found on drawing EX-1. Rock outcrops may be found on this drawing IPP-1 and on EX-1. Existing stone walls may be found on drawing IPP-1 and on drawing EX-1.
5. Septic systems have been designed by Campbell Engineering, LLP.
6. Water main to be 8" ductile iron pipe ("DIP"), Class 56, double cement lined.
7. Storm drainage pipe to be Advanced Drainage Systems ADS N-12 double wall corrugated polyethylene drainage pipe ("CPDP"), or approved equal.
8. For details on the design, pipe sizes and invert elevations of each of the diversion structures depicted on this plan, see sheet DE-4.
9. All new homes shall be provided with underground utilities (see this drawing for location of proposed utilities).



STORM PIPE DESIGN CALCULATIONS
(based on 25-year storm)

STRUCTURE Upper	STRUCTURE Lower	Manning's "n"	Size (In.)	Actual Vel f/s	Velocity Full f/s	Slope %	Length (ft)	Fall (ft)	Invert Upper	Invert Lower	Top/Rim Elev.
MH A.9	MH A.8	0.012	12	8.1	10.4	4.47	47	2.10	153.50	151.40	157.50
MH A.8	MH A.7	0.012	12	4.9	4.8	0.96	68	0.65	151.40	150.75	157.75
MH A.7	MH A.6	0.012	12	5.0	5.0	1.03	121	1.25	150.75	149.50	157.50
MH A.6	MH A.5	0.012	12	4.6	4.6	0.88	113	1.00	149.50	148.50	160.00
MH A.5	MH A.4	0.012	12	11.5	12.5	6.52	112	7.30	148.50	141.20	153.00
MH A.4	MH A.3	0.012	12	11.0	11.7	5.64	39	2.20	141.20	139.00	144.20
MH A.3	MH A.2	0.012	12	12.5	14.5	8.65	104	9.00	139.00	130.00	142.00
MH A.2	ES A.1	0.012	12	10.1	10.5	4.55	44	2.00	130.00	128.00	133.50
OCS A.4.2	DI A.4.1	0.012	12	3.2	20.1	16.67	12	2.00	143.75	141.75	145.50
DI A.4.1	DI A.4	0.012	12	4.5	8.5	3.00	10	0.30	141.50	141.20	144.80
DI A.1.2	DI A.1.1	0.012	15	8.9	8.5	2.21	52	1.15	128.50	127.35	131.00
DI A.1.1	ES A.1	0.012	15	6.8	6.0	1.12	40	0.45	127.35	126.90	130.10
OCS A.8.1	MH A.8	0.012	12	5.4	6.0	1.50	18	0.27	151.67	151.40	157.00
CB B.5	CB B.4	0.012	15	4.7	6.1	1.14	22	0.25	154.75	154.50	157.25
CB B.4	MH B.3	0.012	15	4.1	3.9	0.48	94	0.45	154.50	154.05	157.25
MH B.3	PTF B.2	0.012	15	4.1	3.9	0.48	63	0.30	154.05	153.75	158.70
PTF B.2	DS B.1	0.012	15	6.7	8.2	2.08	12	0.25	153.75	153.50	156.80
DS B.1	MH A.6	0.012	15	12.4	20.7	13.16	19	2.50	152.00	149.50	159.80
DS B.1	Chambers	0.012	15	8.6	12.8	5.00	5	0.25	153.75	153.50	159.80
PTF C.3	DS C.2	0.012	12	6.2	7.5	2.35	17	0.40	137.40	137.00	140.40
DS C.2	MH C.1	0.012	12	8.8	12.3	6.25	48	3.00	137.00	134.00	140.00
MH C.1	MH A.2	0.012	12	5.2	5.7	1.34	149	2.00	132.00	130.00	136.50
DS C.2	Chambers	0.012	12	8.8	12.3	6.25	4	0.25	136.25	136.00	136.50

STRUCTURE Upper	STRUCTURE Lower	Manning's "n"	Size (In.)	Actual Vel f/s	Velocity Full f/s	Slope %	Length (ft)	Fall (ft)	Invert Upper	Invert Lower	Top/Rim Elev.
CI D.8	CI D.7	0.012	12	4.3	9.5	3.75	24	0.90	172.90	172.00	175.90
CI D.7	CI D.6	0.012	12	8.1	15.3	9.74	76	7.40	172.00	164.60	175.00
CI D.6	CI D.5	0.012	12	8.7	13.3	7.28	79	5.75	164.60	158.85	167.95
CI D.5	CI D.4	0.012	12	8.0	10.3	4.37	71	3.10	158.85	155.75	162.10
CI D.4	MH D-3	0.012	12	9.6	11.8	5.77	13	0.75	154.25	153.50	159.50
MH D-3	DS D.2	0.012	12	8.0	8.7	3.13	8	0.25	153.50	153.25	155.50
DS D.2	PTF D.1	0.012	12	8.0	8.7	3.13	8	0.25	153.25	153.00	155.00
PTF D.1	Chambers	0.012	12	14.8	22.0	20.00	5	1.00	153.00	152.00	155.00
DS D.2	EP D.1	0.012	12	6.6	6.6	1.79	28	0.50	152.50	152.00	155.00
CI D.6.1	CI D.6	0.012	12	5.5	6.6	1.82	22	0.40	165.00	164.60	168.00
CI D.5.1	CI D.5	0.012	12	4.7	5.2	1.14	22	0.25	159.10	158.85	162.10
CI D.4.1	CI D.4	0.012	12	7.5	10.5	4.55	22	1.00	156.75	155.75	159.50
CB E.4	CB E.3	0.012	12	4.4	8.2	2.79	43	1.20	156.70	155.50	159.70
CB E.3	DS E.2	0.012	12	14.6	38.8	62.50	8	5.00	155.50	150.50	159.00
DS E.2	PTF E.1	0.012	12	6.0	10.0	4.17	12	0.50	150.50	150.00	153.00
PTF E.1	Chambers	0.012	12	5.2	7.9	2.61	23	0.60	150.00	149.40	153.00
DS E.2	CO E.2.3	0.012	8	10.6	15.7	17.61	53	9.33	150.33	141.00	153.00
CO E.2.3	CO E.2.2	0.012	8	9.0	12.0	10.19	27	2.75	141.00	138.25	147.50
CO E.2.2	EP E.2.1	0.012	8	5.6	5.9	2.50	10	0.25	138.25	138.00	144.00
AD 1.3	DI F.3	0.012	8	4.2	8.0	4.54	209	9.48	164.73	155.25	167.40
DI F.3.1	DI F.3	0.012	8	7.1	15.7	17.59	9	1.58	156.83	155.25	159.00
DI F.3	DS F.2	0.012	8	7.3	7.1	3.57	7	0.25	155.25	155.00	158.40
DS F.2	MH A.9	0.012	12	4.5	6.7	1.85	27	0.50	154.00	153.50	158.20
DI G.3	MH G.2	0.012	12	8.2	10.3	4.37	24	1.05	154.35	153.30	157.50
MH G.2	LS G-1	0.012	12	9.5	12.5	6.50	20	1.30	150.30	149.00	156.30

DESIGN PARAMETERS OF STORMWATER MANAGEMENT MEASURES
(see SWPPP/SWMR)

SWMF-2.2 (Field 1)

CULTEC 330XLHD	Qty.	Units	Remarks
Chamber Height	30.5	inches	*height of chamber as per manufacturer*
Existing Ground Surface Elevation	152.5	feet	*as per survey*
Restrictive Layer Elevation	146.5	feet	*as per deep hole results*
Bottom of stone below practice	149.5	feet	*+3 feet*
Bottom of Chambers	150.00	feet	*6" stone layer*
Top of Chambers	152.54	feet	*as per manufacturer*
Minimum Grade Above Chambers	153.71	feet	*14" above chamber*
Fill Above Chambers	0.04	feet	*top of chamber - ground surface elev*
Fill as % of chamber height	1.6	%	*fill above chamber / chamber height*

SWMF-2.2 (Field 2)

CULTEC 330XLHD	Qty.	Units	Remarks
Chamber Height	30.5	inches	*height of chamber as per manufacturer*
Existing Ground Surface Elevation	153.0	feet	*as per survey*
Restrictive Layer Elevation	147.0	feet	*as per deep hole results*
Bottom of stone below practice	150.0	feet	*+3 feet*
Bottom of Chambers	150.50	feet	*6" stone layer*
Top of Chambers	153.04	feet	*as per manufacturer*
Minimum Grade Above Chambers	154.21	feet	*14" above chamber*
Fill Above Chambers	0.04	feet	*top of chamber - ground surface elev*
Fill as % of chamber height	1.6	%	*fill above chamber / chamber height*

SWMF-L1 (LOT 1)

CULTEC 150XLHD	Qty.	Units	Remarks
Chamber Height	18.5	inches	*height of chamber as per manufacturer*
Existing Ground Surface Elevation	155.0	feet	*as per survey*
Restrictive Layer Elevation	149.5	feet	*as per deep hole results (DH-2)*
Bottom of stone below practice	152.5	feet	*+3 feet over restrictive layer*
Bottom of Chambers	153.25	feet	*6" stone layer*
Top of Chambers	154.79	feet	*as per manufacturer*
Minimum Grade Above Chambers	155.96	feet	*14" above chamber*
Fill Above Chambers	-0.21	feet	*top of chamber - ground surface elev*
Fill as % of chamber height	-13.5	%	*fill above chamber / chamber height*

SWMF-1.2

CULTEC 330XLHD	Qty.	Units	Remarks
Chamber Height	30.5	inches	*height of chamber as per manufacturer*
Existing Ground Surface Elevation	156.00	feet	*as per survey*
Restrictive Layer Elevation	150.00	feet	*as per deep hole results (DH-5)*
Bottom of stone below practice	153.00	feet	*+3 feet over restrictive layer*
Bottom of Chambers	153.50	feet	*6" stone layer*
Top of Chambers	156.04	feet	*as per manufacturer*
Minimum Grade Above Chambers	157.21	feet	*14" above chamber*
Fill Above Chambers	0.04	feet	*top of chamber - ground surface elev*
Fill as % of chamber height	1.6	%	*fill above chamber / chamber height*

SWMF-L2.1 (LOT2)

CULTEC 330XLHD	Qty.	Units	Remarks
Chamber Height	30.5	inches	*height of chamber as per manufacturer*
Existing Ground Surface Elevation	150.0	feet	*as per survey*
Restrictive Layer Elevation	144.5	feet	*as per deep hole results*
Bottom of stone below practice	147.5	feet	*+3 feet over restrictive layer*
Bottom of Chambers	148.00	feet	*6" stone layer*
Top of Chambers	150.54	feet	*as per manufacturer*
Minimum Grade Above Chambers	151.71	feet	*14" above chamber*
Fill Above Chambers	0.54	feet	*top of chamber - ground surface elev*
Fill as % of chamber height	21.3	%	*fill above chamber / chamber height*

SWMF-L2.2 (LOT 2)

CULTEC 330XLHD	Qty.	Units	Remarks
Chamber Height	30.5	inches	*height of chamber as per manufacturer*
Existing Ground Surface Elevation	138.0	feet	*as per survey*
Restrictive Layer Elevation	132.0	feet	*as per deep hole results*
Bottom of stone below practice	135.0	feet	*+3 feet over restrictive layer*
Bottom of Chambers	135.50	feet	*6" stone layer*
Top of Chambers	138.04	feet	*as per manufacturer*
Minimum Grade Above Chambers	139.21	feet	*14" above chamber*
Fill Above Chambers	0.04	feet	*top of chamber - ground surface elev*
Fill as % of chamber height	1.6	%	*fill above chamber / chamber height*

GRAPHIC SCALE

(IN FEET)
1 inch = 30 ft.

APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED DEC. 12, 2016.

______________________________ DATE:______________________
CHRISTOPHER CARTHY, CHAIRMAN
TOWN OF NORTH CASTLE PLANNING BOARD

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

______________________________ DATE:______________________
JOSEPH CERMELE, PE
KELLARD SESSIONS, P.C.
CONSULTING TOWN ENGINEERS

OWNER:
McKenna Custom Homes, Inc.
433 Manville Road
Pleasantville, NY 10570
Tel: (914) 769-1869

CONSULTANTS:

CAMPBELL ENGINEERING, LLP
160 King Street
P.O. Box 255
Chappaqua, New York 10514
Tel: (914) 238-3555
Fax: (914) 238-3435

WELSH Engineering & Land Surveying, P.C.
12 Campwoods Grounds
Ossining, N.Y. 10562

Tel: (914) 773-1701

ISSUED:

Amended plan for Conservation Subdivision	11/17/2014
Amended Lot 1 grading, utilities as per house & SSDA changes	01/09/2015
Submission of SWPPP to NYCDEP	04/09/2015
Submission to Town and NYCDEP	07/24/2015
Submission to Town and NYCDEP	10/15/2015
Submission to Town and NYCDEP	12/15/2015
Submission to Town and NYCDEP	03/01/2016
Water main extension modified as per Campbell Eng.	06/30/2016
Water services to each house modified as per Campbell Eng dwgs	08/15/2016
Submission to Town for Prelim & Final Subdivision Plan appvl	10/07/2016
Amended SSTS as per engineer modific.; SWMF L2.2, pool lot 3	06/16/2017
Submission to Town for Final Subdivision Plan appvl	03/20/2020
Submission to Town for Final Subdivision Plan appvl	07/30/2020

SEAL:

PROJECT NAME:
HIDDEN OAK SUBDIVISION
Hidden Oak Road
Town of North Castle, New York

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

ENVIRONMENTAL CONSULTANT:
EVANS ASSOCIATES
ENVIRONMENTAL CONSULTING, INC.
162 Falls Road Bethany, Connecticut 06524
Tel. (203) 393-0690

Drawing title:
Grading & Utilities Plan

Date: July 15, 2014

Dwn. by: alp

ID: 2.7_C05.31.2016

S-2

LEGEND

- PROPERTY LINE
- 170 — EXISTING CONTOUR
- + 170.5 — PROPOSED SPOT ELEVATION
- PROPOSED RESIDENCE & DRIVEWAY
- DISTURBANCE LIMIT
- 1-12 — EXISTING TREE AND NUMBER
- 1-12 — EXISTING TREE (TO BE REMOVED)

EROSION CONTROL LEGEND

- SF — SILT FENCE
- SS — SOIL STOCKPILE
- SCE — STABILIZED CONSTRUCTION ENTRANCE
- IP — INLET PROTECTION
- TP — TREE PROTECTION FENCE
- WB — WATER BAR
- CD — CHECK DAM
- ECM — EROSION CONTROL GEOTEXTILE MAT
- CF — CONSTRUCTION FENCE
- TR — TEMPORARY RISER & ANTI–VORTEX
- CM — CONSTRUCTION MATERIALS
- CA — CONSTRUCTION ACCESS
- SF — TEMPORARY SEDIMENT TRAP
- P — TEMPORARY CONSTRUCTION PARKING

NOTES:

1. Limits of disturbance are shown on this plan. The area of land disturbance is:

   PHASE 1: For the construction of the subdivision road and common stormwater management facilities - 2.253 acres. PHASE 2: For the construction of the three houses and other improvements on Lots 1, 2 and 3 - 3.302 acres.

   Since there is some overlap between what is included in PHASE 1 and PHASE 2, the total area of land disturbance for PHASE 1 and PHASE 2 is calculated to be 5.040 acres.

2. Trees to be removed for Phase 2 of the work (the construction of the three lots) shall be limited to the cutting of the trees but retention of the stumps until such time as the construction on the individual lot is to commence.

3. Refer to sheet DE-4 for the genus name and diameter at breast height for all numbered trees on this plan and status of the tree.

MAINTENANCE SCHEDULE

Silt Fence: Maintenance shall be performed as needed and material removed when bulges develop in the silt fence. Inspection for physical damage to the silt fence material shall be made during the weekly inspection. If filter fabric shows signs of decomposing or is damaged, it shall be repaired immediately. Typically, this entails installing a new line of silt fence adjacent to the damaged line.

Inlet Protection: The barrier should be inspected after each rain event and repairs made where needed. Remove sediment as necessary to provide for accurate storage volume for subsequent rains. Upon stabilization of contributing drainage area, remove all materials and any unstable soil and dispose of properly.

Stabilized Construction Entrance: The effective life of a stabilized construction entrance may be limited by excessive sediment deposition, unless additional aggregate is added periodically to renew the surface. Maintenance includes periodic top dressing with additional aggregate. All sediment spilled, dropped or washed into the public right-of-way must be removed immediately.

Periodic inspection of the stabilized construction entrance and nearby public rights-of-way shall be performed within 24 hours of the end of a storm event of 0.5 inches or greater and following periods of heavy use.

Tree Protection: Check on at least a weekly basis that the construction fence and/or tree protection has not been damaged by construction activities.

Soil Stockpiling: Perimeter sediment controls around each stockpile is to consist of silt fence installed in accordance with the standards delineated above. The silt fence shall be maintained as noted above. Stockpiles and fill area shall be inspected at least weekly for signs of erosion or problems with plant establishment.

ADDITIONAL NOTES AS PER SPDES GENERAL PERMIT

Owner shall fully comply with the requirements of the New York State Department of Environmental Conservation SPDES General Permit for Stormwater Discharges from Construction Activity, Permit No. GP-0-15-002. These requirements include, but is not limited to, the following:

C. General Requirements for Owners or Operators With Permit Coverage

The *owner or operator* shall ensure that the provisions of the SWPPP are implemented from the *commencement of construction activity* until all areas of disturbance have achieved *final stabilization* and the Notice of Termination ("NOT") has been submitted to the Department in accordance with Part V. of this permit. This includes any changes made to the SWPPP pursuant to Part III.A.4. of this permit.

The *owner or operator* shall maintain a copy of the General Permit (GP-0-15-002), NOI, *NOI Acknowledgment Letter*, SWPPP, MS4 SWPPP Acceptance form, inspection reports, and all documentation necessary to demonstrate eligibility with this permit at the construction site until all disturbed areas have achieved *final stabilization* and the NOT has been submitted to the Department. The documents must be maintained in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.

The *owner or operator* of a *construction activity* shall not disturb greater than five (5) acres of soil at any one time without prior written authorization from the Department or, in areas under the jurisdiction of a *regulated, traditional land use control MS4*, the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*). At a minimum, the *owner or operator* must comply with the following requirements in order to be authorized to disturb greater than five (5) acres of soil at any one time:

a. The *owner or operator* shall have a *qualified inspector* conduct at least two (2) site inspections in accordance with Part IV.C. of this permit every seven (7) calendar days, for as long as greater than five (5) acres of soil remain disturbed. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

b. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated August 2005.

c. The *owner or operator* shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.

d. The *owner or operator* shall install any additional site specific practices needed to protect water quality.

e. The *owner or operator* shall include the requirements above in their SWPPP.

Soil Restoration/Disturbed Areas Stabilization Protocol

As is noted above, soil restoration is a required practice applied across areas of a development site where soils have been disturbed and will be vegetated in order to recover the original properties and porosity of the soil. Soil restoration is applied in the cleanup, restoration, and landscaping phase of construction followed by the permanent establishment of an appropriate, deep-rooted groundcover to help maintain the restored soil structure.

According to the protocols of the 2010 *Stormwater Management Design Manual*, during periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following Soil Restoration steps applied:

1) Apply 3 inches of compost over subsoil
2) Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor-mounted disc, or tiller, mixing, and circulating air and compost into subsoils.
3) Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site.
4) Apply topsoil to a depth of 6 inches.
5) Vegetate as required by approved plan.

At the end of the soil restoration procedure, an inspector should be able to push a 3/8" metal bar 12 inches into the soil just with body weight.

Temporary Critical Area Plantings (Temporary Seeding)

When to Apply - Temporary seeding may be necessary on construction sites to protect an area, or section, where final grading is complete, when preparing for winter work shutdown, or to provide cover when permanent seedings are likely to fail due to mid-summer heat and drought. The intent is to provide temporary protective cover during temporary shutdown of construction and/or while waiting for optimal planting time.

Water management practices must be installed as appropriate for site conditions. The area must be rough graded and slopes physically stable. Large debris and rocks are usually removed. Seedbed must be seeded within 24 hours of disturbance or scarification of the soil surface will be necessary prior to seeding. Fertilizer and lime are not typically used for temporary seedings.

If it is spring, summer or early fall, then seed the area with ryegrass (annual or perennial) at 30 lb per acre (Approximately 0.7 lb/1000 sq. ft. or use 1 lb/1000 sq. ft.).

If is late fall or early winter, then seed with Certified 'Aroostook' winter rye (cereal rye) at 100 lb per acre (2.5 lb/1000 sq. ft.).

Any seeding method may be used that will provide uniform application of seed to the area and result in relatively good soil to seed contact.

Mulch the seeded area with hay or straw at 2 tons/acre (approx. 90 lb/1000 sq. ft. or 2 bales). Quality of hay or straw mulch allowable will be determined based on long term use and visual concerns. Mulch anchoring will be required where wind or areas of concentrated water are of concern. Wood fiber hydromulch or other sprayable products approved for erosion control (nylon web or mesh) may be used if applied according to manufacturers' specification. Caution is advised when using nylon or other synthetic products. They may be difficult to remove prior to final seeding.

Permanent Lawn Areas

NOTE REGARDING USE OF FERTILIZER ON THE PROPERTY

In accordance with Article XXVI, Restrictions on the Application and Sale of Lawn Fertilizer within the County of Westchester, Section 863.1302 Regulation of the Use and Application of Lawn Fertilizer, no person shall apply any lawn fertilizer within the County that is labeled as containing more than 0% phosphorus or other compound containing phosphorus, such as phosphate, except for newly established turf or lawn areas during their first growing season. The lawn fertilizer application shall not contain an amount of phosphorus exceeding the amount and rate of application recommended in the soil test evaluation. In subsequent years, no person shall apply any lawn fertilizer within the County that is labeled as containing more than 0% phosphorus or other compound containing phosphorus, such as phosphate, nor apply lawn fertilizer between December 1st and April 1st, nor apply lawn fertilizer to any impervious surface. If such application occurs, the fertilizer must be immediately contained and either legally applied to turf or placed in an appropriate container. Finally, no person shall apply lawn fertilizer to any turf or lawn area within twenty (20) feet of any surface water, except that this restriction shall not apply where a continuous natural vegetative buffer, at least ten (10) feet wide, separates a turf or lawn area and surface water.

Time of Planting Lawns - Fall planting is preferred. Seed after August 15. In the spring, plant until May 15. If seeding is done between May 15 and August 15, irrigation may be necessary to ensure a successful seeding.

Site Preparation - Disturbed soil areas are to be restored to the procedures of the *Soil Restoration/Disturbed Areas Stabilization Protocol* above.

Lawn Planting and Installation - Use a cultipacker type seeder if possible. Seed to a depth of 1/8 to 1/4 inch. If seed is to be broadcast, cultipack or roll after seeding. If hydroseeded, lime and fertilizer may be applied through the seeder, and rolling is not practical.

Mulching - Mulch all seedings in accordance with Standard and Specifications for Mulching. Small grain straw is the best material. The following are the recommended seed mixes from Section 3, Vegetative Measures for Erosion and Sediment Control from the New York State Standards and Specifications for Erosion and Sediment Control, latest edition.

Seed Mixes For Sunny sites (well, moderately well, and somewhat poorly drained soils)

a. Athletic fields and similar areas

	lb/1000 sf	lb/acre
80% Kentucky bluegrass blend	2.4-3.2	105-138
20% perennial ryegrass	0.6-0.8	25-37
	3.0-4.0	130-175
OR		
(for southern and eastern NY)	lb/1000 sf	lb/acre
50% Kentucky bluegrass	1.5-2.0	65-88
50% perennial ryegrass	1.5-2.0	65-87
	3.0-4.0	130-175
OR		
100% Tall fescue, Turf-type, fine leaf	3.4-4.6	150-200

Shady dry sites (well to somewhat poorly drained soils)

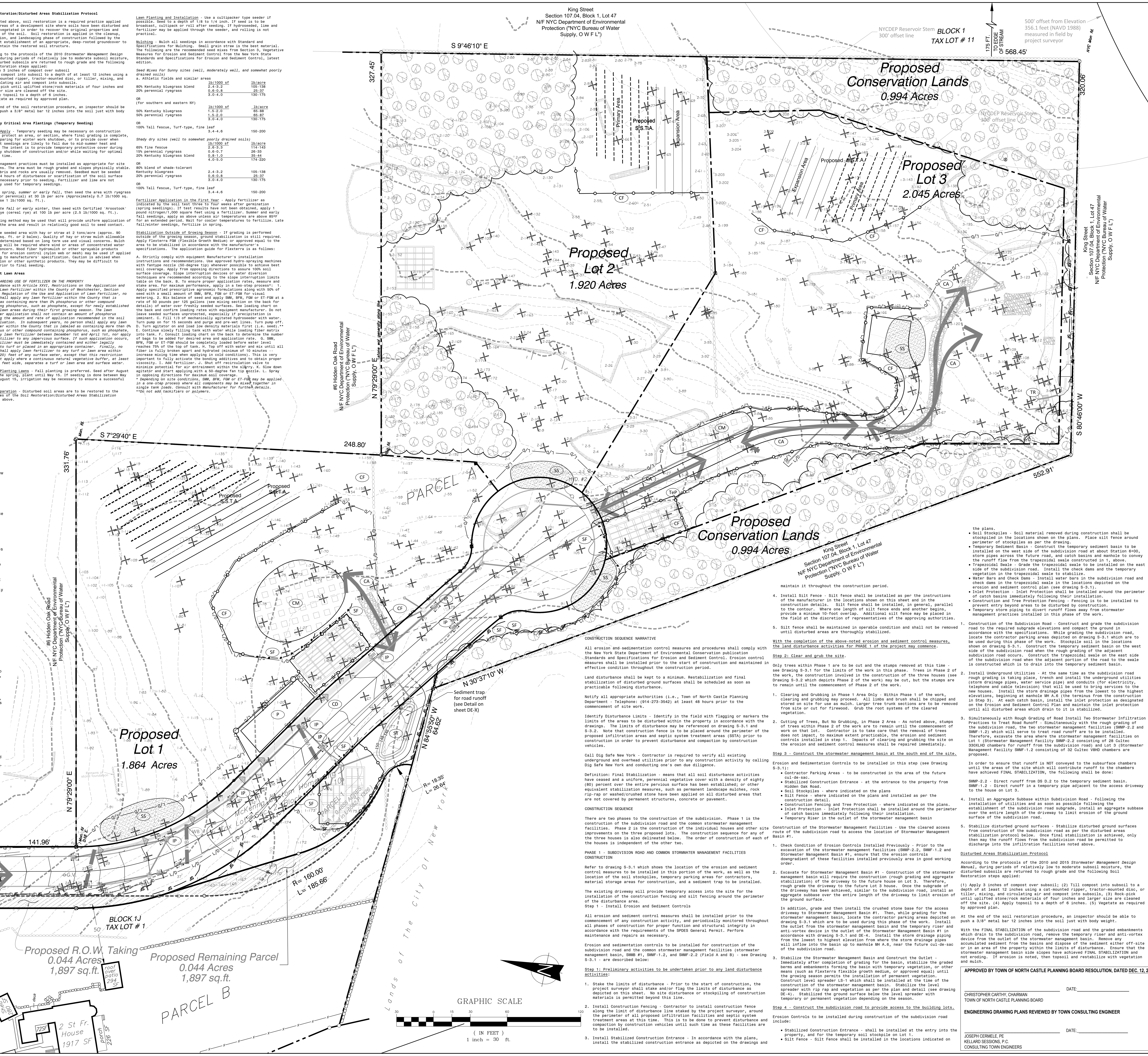
	lb/1000 sf	lb/acre
65% fine fescue	2.6-3.3	114-143
15% perennial ryegrass	0.6-0.7	26-33
20% Kentucky bluegrass blend	0.8-1.0	35-44
	4.0-5.0	174-220
OR		
80% blend of shade-tolerant Kentucky bluegrass	2.4-3.2	105-138
20% perennial ryegrass	0.6-0.8	25-37
	3.0-4.0	130-175
OR		
100% Tall fescue, Turf-type, fine leaf	3.4-4.6	150-200

Fertilizer Application in the First Year - Apply fertilizer as indicated by the soil test three to four weeks after germination (spring seedlings). If test results have not been obtained, apply 1 pound nitrogen/1,000 square feet using a fertilizer. Summer and early fall seedings, apply as above unless air temperatures are above 85ºF for an extended period. Wait for cooler temperatures to fertilize. Late fall/winter seedings, fertilize in spring.

Stabilization Outside of Growing Season - If grading is performed outside of the growing season, ground stabilization is still required. Apply Flexterra FGM (Flexible Growth Medium) or approved equal to the area to be stabilized in accordance with the manufacturer's specifications. The application guide for Flexterra is as follows:

A. Strictly comply with equipment Manufacturer's installation instructions and recommendations. Use approved hydro-spraying machines with fantype nozzle (50-degree tip) whenever possible to achieve best soil coverage. Apply from opposing directions to assure 100% soil surface coverage. Slope interruption devices or water diversion techniques are recommended according to the slope interruption limits table on the back. B. To ensure proper application rates, measure and stake area. For maximum performance, apply in a two-step process*: 1. Apply specified prescriptive agronomic formulations along with 50% of seed with a small amount of SMM, BFM, FGM or ET-FGM for visual metering. 2. Mix balance of seed and apply SMM, BFM, FGM or ET-FGM at a rate of 50 pounds per 125 gallons (see mixing section on the back for details) of water over freshly seeded surfaces. See loading chart on the back and confirm loading rates with equipment manufacturer. Do not leave seeded surfaces unprotected, especially if precipitation is imminent. C. Fill 1/3 of mechanically agitated hydroseeder with water. Turn pump on for 15 seconds and purge and pre-wet lines. Turn pump off. D. Turn agitator on and load low density materials first (i.e. seed).** E. Continue slowly filling tank with water while loading fiber matrix into tank. F. Consult loading chart on the back to determine the number of bags to be added for desired area and application rate. G. SMM, BFM, FGM or ET-FGM should be completely loaded before water level reaches 75% of the top of tank. H. Top off with water and mix until all fiber is fully broken apart and hydrated (minimum of 10 minutes -- increase mixing time when applying in cold conditions). This is very important to fully activate the bonding additives and to obtain proper viscosity. I. Add fertilizer. J. Shut off recirculation valve to minimize potential for air entrainment within the slurry. K. Slow down agitator and start applying with a 50-degree fan tip nozzle. L. Spray in opposing directions for maximum soil coverage.

** Depending on site conditions, SMM, BFM, FGM or ET-FGM may be applied in a one-step process where all components may be mixed together in single tank loads. Consult with Manufacturer for further details.*
***Do not add tackifiers or polymers.*



CONSTRUCTION SEQUENCE NARRATIVE

All erosion and sedimentation control measures and procedures shall comply with the New York State Department of Environmental Conservation publication Standards and Specifications for Erosion and Sediment Control. Erosion control measures shall be installed prior to the start of construction and maintained in effective condition throughout the construction period.

Land disturbance shall be kept to a minimum. Restabilization and final stabilization of disturbed ground surfaces shall be scheduled as soon as practicable following disturbance.

Notify all appropriate authorities (i.e., Town of North Castle Planning Department - Telephone: (914-273-3542) at least 48 hours prior to the commencement of site work.

Identify Disturbance Limits - Identify in the field with flagging or markers the limits of the areas to be disturbed within the property in accordance with the drawings. The limits of disturbance may be referenced on drawing S-3.1 and S-3.2. Note that construction fence is to be placed around the perimeter of the proposed infiltration areas and septic system treatment areas (SSTA) prior to construction in order to prevent disturbance and compaction by construction vehicles.

Call Dig Safe New York - Contractor is required to verify all existing underground and overhead utilities prior to any construction activity by calling Dig Safe New York and conducting one's own due diligence.

Definition: Final Stabilization - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

CONSTRUCTION SEQUENCE

There are two phases to the construction of the subdivision. Phase 1 is the construction of the subdivision road and the common stormwater management facilities. Phase 2 is the construction of the individual houses and other site improvements on the three proposed lots. The construction sequence for any of the three houses is also delineated below. The order of construction of each of the houses is independent of the other two.

PHASE 1 - SUBDIVISION ROAD AND COMMON STORMWATER MANAGEMENT FACILITIES CONSTRUCTION

Refer to drawing S-3.1 which shows the location of the erosion and sediment control measures to be installed in this portion of the work, as well as the location of the soil stockpiles, temporary parking areas for contractors, material storage areas for construction, and a sediment trap to be installed.

The existing driveway will provide temporary access into the site for the installation of the construction fencing and silt fencing around the perimeter of the disturbance area.
Step 1 - Install Erosion and Sediment Controls

All erosion and sediment control measures shall be installed prior to the commencement of any construction activity, and periodically monitored throughout all phases of construction for proper function and structural integrity in accordance with the requirements of the SPDES General Permit. Perform maintenance and repairs as necessary.

Erosion and sedimentation controls to be installed for construction of the subdivision road and the common stormwater management facilities (stormwater management basin, SWMB #1, SWMF-1.2, and SWMF-2.2 (Field A and B) - see Drawing S-3.1 - are described below:

Step 1: Preliminary activities to be undertaken prior to any land disturbance activities:

1. Stake the limits of disturbance - Prior to the start of construction, the project surveyor shall stake and/or flag the limits of disturbance as depicted on this sheet. No site disturbance or stockpiling of construction materials is permitted beyond this line.
2. Install Construction Fencing - Contractor to install construction fence along the limit of disturbance line staked by the project surveyor, around the perimeter of all proposed infiltration facilities and septic system treatment areas at this time. This is to be done to prevent disturbance and compaction by construction vehicles until such time as these facilities are to be installed.
3. Install Stabilized Construction Entrance - In accordance with the plans, install the stabilized construction entrance as depicted on the drawings and maintain it throughout the construction period.
4. Install Silt Fence - Silt fence shall be installed as per the instructions of the manufacturer in the locations shown on this sheet and in the construction details. Silt fence shall be installed, in general, parallel to the contour. Where one length of silt fence ends and another begins, provide a minimum 10-foot overlap. Additional silt fence may be placed in the field at the discretion of representatives of the approving authorities.
5. Silt fence shall be maintained in operable condition and shall not be removed until disturbed areas are thoroughly stabilized.

With the completion of the above-noted erosion and sediment control measures, the land disturbance activities for PHASE 1 of the project may commence.

Step 2: Clear and grub the site.

Only trees within Phase 1 are to be cut and the stumps removed at this time - see Drawing S-3.1 for the limits of the work in this phase. Trees in Phase 2 of the work, the construction involved in the construction of the three houses (see Drawing S-3.2 which depicts Phase 2 of the work) may be cut, but the stumps are to remain until the commencement of Phase 2 of the work.

1. Clearing and Grubbing in Phase 1 Area Only - Within Phase 1 of the work, clearing and grubbing may proceed. All limbs and brush shall be chipped and stored on site for use as mulch. Larger tree trunk sections are to be removed from site or cut for firewood. Grub the root systems of the cleared vegetation.
2. Cutting of Trees, But No Grubbing, in Phase 2 Area - As noted above, stumps of trees within Phase 2 of the work are to remain until the commencement of work on that lot. Contractor is to take care that the removal of trees does not impact, to maximum extent practicable, the erosion and sediment controls installed in step 1. Impacts of clearing and grubbing the site on the erosion and sediment control measures shall be repaired immediately.

Step 3 - Construct the stormwater management basin at the south end of the site.

Erosion and Sedimentation Controls to be installed in this step (see Drawing S-3.1):

- Contractor Parking Areas - to be constructed in the area of the future cul-de-sac.
- Stabilized Construction Entrance - at the entrance to the property from Hidden Oak Road.
- Soil Stockpiles - where indicated on the plans
- Silt Fence - where indicated on the plans and installed as per the construction detail.
- Construction Fencing and Tree Protection - where indicated on the plans.
- Inlet Protection - Inlet Protection shall be installed around the perimeter of catch basins immediately following their installation.
- Temporary Riser in the outlet of the stormwater management basin

Construction of the Stormwater Management Facilities - Use the cleared access route of the subdivision road to access the location of Stormwater Management Basin #1.

1. Check Condition of Erosion Controls Installed Previously - Prior to the excavation of the stormwater management facilities (SWMP-2.2, SWMF-1.2 and Stormwater Management Basin #1, ensure that the erosion controls downgradient of these facilities installed previously area in good working order.
2. Excavate for Stormwater Management Basin #1 - Construction of the stormwater management basin will require the construction (rough grading and aggregate stabilization) of the driveway to the future house on Lot 3. Therefore, rough grade the driveway to the future Lot 3 house. Once the subgrade of the driveway has been achieved, similar to the subdivision road, install an aggregate subbase over the entire length of the driveway to limit erosion of the ground surface.

   In addition, grade and then install the crushed stone base for the access driveway to Stormwater Management Basin #1. Then, while grading for the stormwater management basin, locate the contractor parking areas depicted on drawing S-3.1 which are to be used during this phase of the work. Install the outlet from the stormwater management basin and the temporary riser and anti-vortex device in the outlet of the Stormwater Management Basin #1 in accordance with drawing S-3.1 and DE-4. Install the storm drainage piping from the lowest to highest elevation from where the storm drainage pipes will inflow into the basin up to manhole MH A.6, near the future cul-de-sac of the subdivision road.
3. Stabilize the Stormwater Management Basin and Construct the Outlet - Immediately after completion of grading for the basin, stabilize the graded berms and embankments forming the basin with temporary vegetation, or other means (such as Flexterra flexible growth medium, or approved equal) until the growing season permits the installation of permanent vegetation. Construct level spreader LS-1 which shall be installed at the time of the construction of the stormwater management basin. Stabilize the level spreader with rip rap and vegetation as per the plan and detail (see drawing DE-4). Stabilized the ground surface below the level spreader with temporary or permanent vegetation depending on the season.

Step 4 - Construct the subdivision road to provide access to the building lots.

Erosion Controls to be installed during construction of the subdivision road include:

- Stabilized Construction Entrance - shall be installed at the entry into the property, and for the temporary soil stockpile on Lot 1.
- Silt Fence - Silt Fence shall be installed in the locations indicated on the plans.
- Soil Stockpiles - Soil material removed during construction shall be stockpiled in the locations shown on the plans. Place silt fence around perimeter of stockpiles as per the drawing.
- Temporary Sediment Basin - Construct the temporary sediment basin to be installed on the west side of the subdivision road at about Station 6+00, storm pipes across the future road, and catch basins and manhole to convey the runoff flow from the trapezoidal swale constructed in 1, above.
- Trapezoidal Swale - Grade the trapezoidal swale to be installed on the east side of the subdivision road. Install the check dams and the temporary vegetation in the trapezoidal swale to stabilize.
- Water Bars and Check Dams - Install water bars in the subdivision road and check dams in the trapezoidal swale in the locations depicted on the erosion and sediment control plan (see drawing S-3.1).
- Inlet Protection - Inlet Protection shall be installed around the perimeter of catch basins immediately following their installation.
- Construction and Tree Protection Fencing - Fencing is to be installed to prevent entry beyond areas to be disturbed by construction.
- Temporary storm piping to divert runoff flows away from stormwater management practices installed in this phase of the work.

1. Construction of the Subdivision Road - Construct and grade the subdivision road to the required subgrade elevations and compact the ground in accordance with the specifications. While grading the subdivision road, locate the contractor parking areas depicted on drawing S-3.1 which are to be used during this phase of the work. Stockpile soil in the locations shown on drawing S-3.1. Construct the temporary sediment basin on the west side of the subdivision road when the rough grading of the adjacent subdivision road occurs. Construct the trapezoidal swale on the east side of the subdivision road when the adjacent portion of the road to the swale is constructed which is to drain into the temporary sediment basin.
2. Install Underground Utilities - At the same time as the subdivision road rough grading is taking place, trench and install the underground utilities (storm drainage pipes, water service pipe) and conduits (for electricity, telephone and cable television) that will be used to bring services to the new houses. Install the storm drainage pipes from the lowest to the highest elevations, beginning at manhole MH A.6 (the terminus from the construction in Step 3). At each catch basin, install the inlet protection as designated on the Erosion and Sediment Control Plan and maintain the inlet protection until all disturbed areas which drain to it is stabilized.
3. Simultaneously with Rough Grading of Road Install Two Stormwater Infiltration Practices to Treat Road Runoff - Simultaneously with the rough grading of the subdivision road, the two stormwater management facilities (SWMP-2.2 and SWMF-1.2) which will serve to treat road runoff are to be installed. Therefore, excavate the area where the stormwater management facilities on Lot 1 (Stormwater Management Facility SWMP-2.2 consisting of 28 Cultec 330XLHD chambers for runoff from the subdivision road) and Lot 3 (Stormwater Management Facility SWMF-1.2 consisting of 32 Cultec V8HD chambers are proposed.

   In order to ensure that runoff is NOT conveyed to the subsurface chambers until the areas of the site which will contribute runoff to the chambers have achieved FINAL STABILIZATION, the following shall be done:

   SWMP-2.2 - Direct runoff from DS D.2 to the temporary sediment basin.
   SWMF-1.2 - Direct runoff in a temporary pipe adjacent to the access driveway to the house on Lot 3.
4. Install an Aggregate Subbase within Subdivision Road - Following the installation of utilities and as soon as possible following the establishment of the subdivision road subgrade, install an aggregate subbase over the entire length of the driveway to limit erosion of the ground surface of the subdivision road.
5. Stabilize disturbed ground surfaces - Stabilize disturbed ground surfaces from construction of the subdivision road as per the disturbed areas stabilization protocol below. Once final stabilization is achieved, only then may the runoff flows from the subdivision road be permitted to discharge into the infiltration facilities noted above.

Disturbed Areas Stabilization Protocol

According to the protocols of the 2010 and 2015 *Stormwater Management Design Manual*, during periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following Soil Restoration steps applied:

(1) Apply 3 inches of compost over subsoil; (2) Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor-mounted disc, or tiller, mixing, and circulating air and compost into subsoils, (3) Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site. (4) Apply topsoil to a depth of 6 inches. (5) Vegetate as required by approved plan.

At the end of the soil restoration procedure, an inspector should be able to push a 3/8" metal bar 12 inches into the soil just with body weight.

With the FINAL STABILIZATION of the subdivision road and the graded embankments which drain to the subdivision road, remove the temporary riser and anti-vortex device from the outlet of the stormwater management basin. Remove any accumulated sediment from the basins and dispose of the sediment either off-site or in an area of the property within the limits of disturbance. Ensure that the stormwater management basin side slopes have achieved FINAL STABILIZATION and not eroding. If erosion is noted, then topsoil and restabilize with vegetation and mulch.

APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED DEC. 12, 2016.

____________________ DATE:__________
CHRISTOPHER CARTHY, CHAIRMAN
TOWN OF NORTH CASTLE PLANNING BOARD

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

____________________ DATE:__________
JOSEPH CERMELE, PE
KELLARD SESSIONS, P.C.
CONSULTING TOWN ENGINEERS

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Pleasantville, NY 10570
Tel: (914) 769-1869

CONSULTANTS:

CAMPBELL ENGINEERING, LLP
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WELSH Engineering & Land Surveying, P.C.
12 Campwoods Grounds
Ossining, N.Y. 10562

Tel: (914) 773-1701

ISSUED:

Amended plan for Conservation Subdivision	11/17/2014
General revisions; rev as per Lot 1 layout changes	01/09/2015
Submission of SWPPP to NYCDEP	04/09/2015
Submission to Town and NYCDEP	07/24/2015
Submission to Town and NYCDEP	12/15/2015
Submission to Town and NYCDEP	03/01/2016
Added note regarding SPDES General Permit	08/15/2016
Submission to Town for Prelim & Final Subdivision Plan appvl	10/07/2016
Submission to Town for Final Subdivision Plan appvl	03/20/2020

SEAL:

STATE OF NEW YORK · ALAN PILCH · LICENSED PROFESSIONAL ENGINEER · No. 080167

PROJECT NAME:
HIDDEN OAK SUBDIVISION
Hidden Oak Road
Town of North Castle, New York

ENGINEER & LANDSCAPE ARCHITECT:
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ENVIRONMENTAL CONSULTANT:
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ENVIRONMENTAL CONSULTING, INC.
162 Falls Road Bethany, Connecticut 06524
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Drawing title:
PHASE 1: Erosion & Sediment Control Plan / Tree Removal and Protection Plan

Date: July 15, 2014

Dwn. by: alp

ID: 2.7_C05.31.2016

S-3.1

LEGEND

- PROPERTY LINE
- EXISTING CONTOUR
- PROPOSED SPOT ELEVATION
- PROPOSED RESIDENCE & DRIVEWAY
- DISTURBANCE LIMIT
- EXISTING TREE AND NUMBER
- EXISTING TREE (TO BE REMOVED)

EROSION CONTROL LEGEND

- SF SILT FENCE
- SS SOIL STOCKPILE
- SCE STABILIZED CONSTRUCTION ENTRANCE
- IP INLET PROTECTION
- TP TREE PROTECTION FENCE
- WB WATER BAR
- CD CHECK DAM
- ECM EROSION CONTROL GEOTEXTILE MAT
- CF CONSTRUCTION FENCE
- CM CONSTRUCTION MATERIALS
- CA CONSTRUCTION ACCESS
- SF TEMPORARY SEDIMENT TRAP
- P TEMPORARY CONSTRUCTION PARKING
- TeP TEMPORARY STORM PIPE

NOTES:

1. Limits of disturbance are shown on this plan. The area of land disturbance is:

   PHASE 1: For the construction of the subdivision road and common stormwater management facilities - 1.802 acres.
   PHASE 2: For the construction of the three houses and other improvements on Lots 1, 2 and 3 - 3.192 acres.

   Total area of land disturbance = 4.994 acres.

2. Trees to be removed for Phase 2 of the work (the construction of the three lots) shall be limited to the cutting of the trees but retention of the stumps until such time as the construction on the individual lot is to commence.

3. Refer to sheet DE-4 for the genus name and diameter at breast height for all numbered trees on this plan and status of the tree.

ADDITIONAL NOTES AS PER SPDES GENERAL PERMIT
Owner shall fully comply with the requirements of the New York State Department of Environmental Conservation SPDES General Permit for Stormwater Discharges from Construction Activity, Permit No. GP-0-15-002. These requirements include, but is not limited to, the following:

C. General Requirements for Owners or Operators With Permit Coverage
The *owner or operator* shall ensure that the provisions of the SWPPP are implemented from the *commencement of construction activity* until all areas of disturbance have achieved *final stabilization* and the Notice of Termination ("NOT") has been submitted to the Department in accordance with Part V. of this permit. This includes any changes made to the SWPPP pursuant to Part III.A.4. of this permit.
The *owner or operator* shall maintain a copy of the General Permit (GP-0-15-002), NOI, *NOI Acknowledgment Letter*, SWPPP, MS4 SWPPP Acceptance form, inspection reports, and all documentation necessary to demonstrate eligibility with this permit at the construction site until all disturbed areas have achieved *final stabilization* and the NOT has been submitted to the Department. The documents must be maintained in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.
The *owner or operator* of a *construction activity* shall not disturb greater than five (5) acres of soil at any one time without prior written authorization from the Department or, in areas under the jurisdiction of a *regulated, traditional land use control MS4*, the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*). At a minimum, the *owner or operator* must comply with the following requirements in order to be authorized to disturb greater than five (5) acres of soil at any one time:
a. The *owner or operator* shall have a *qualified inspector* conduct at least two (2) site inspections in accordance with Part IV.C. of this permit every seven (7) calendar days, for as long as greater than five (5) acres of soil remain disturbed. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.
b. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated August 2005.
c. The *owner or operator* shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.
d. The *owner or operator* shall install any additional site specific practices needed to protect water quality.
e. The *owner or operator* shall include the requirements above in their SWPPP.

Soil Restoration/Disturbed Areas Stabilization Protocol

As is noted above, soil restoration is a required practice applied across areas of a development site where soils have been disturbed and will be vegetated in order to recover the original properties and porosity of the soil. Soil restoration is applied in the cleanup, restoration, and landscaping phase of construction followed by the permanent establishment of an appropriate, deep-rooted groundcover to help maintain the restored soil structure.

According to the protocols of the 2010 *Stormwater Management Design Manual*, during periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following Soil Restoration steps applied:
1) Apply 3 inches of compost over subsoil
2) Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor-mounted disc, or tiller, mixing, and circulating air and compost into subsoils.
3) Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site.
4) Apply topsoil to a depth of 6 inches.
5) Vegetate as required by approved plan.

At the end of the soil restoration procedure, an inspector should be able to push a 3/8" metal bar 12 inches into the soil just with body weight.

Temporary Critical Area Plantings (Temporary Seeding)

When to Apply - Temporary seeding may be necessary on construction sites to protect an area, or section, where final grading is complete, when preparing for winter work shutdown, or to provide cover when permanent seedings are likely to fail due to mid-summer heat and drought. The intent is to provide temporary protective cover during temporary shutdown of construction and/or while waiting for optimal planting time.

Water management practices must be installed as appropriate for site conditions. The area must be rough graded and slopes physically stable. Large debris and rocks are usually removed. Seedbed must be seeded within 24 hours of disturbance or scarification of the soil surface will be necessary prior to seeding. Fertilizer and lime are not typically used for temporary seedings.

If it is spring, summer or early fall, then seed the area with ryegrass (annual or perennial) at 30 lb per acre (Approximately 0.7 lb/1000 sq. ft. or use 1 lb/1000 sq. ft.).

If is late fall or early winter, then seed with Certified 'Aroostook' winter rye (cereal rye) at 100 lb per acre (2.5 lb/1000 sq. ft.).

Any seeding method may be used that will provide uniform application of seed to the area and result in relatively good soil to seed contact.

Mulch the seeded area with hay or straw at 2 tons/acre (approx. 90 lb/1000 sq. ft. or 2 bales). Quality of hay or straw mulch allowable will be determined based on long term use and visual concerns. Mulch anchoring will be required where wind or areas of concentrated water are of concern. Wood fiber hydromulch or other sprayable products approved for erosion control (nylon web or mesh) may be used if applied according to manufacturers' specification. Caution is advised when using nylon or other synthetic products. They may be difficult to remove prior to final seeding.

Permanent Lawn Areas

NOTE REGARDING USE OF FERTILIZER ON THE PROPERTY
In accordance with Article XXVI, Restrictions on the Application and Sale of Lawn Fertilizer within the County of Westchester, Section 863.1302 Regulation of the Use and Application of Lawn Fertilizer, no person shall apply any lawn fertilizer within the County that is labeled as containing more than 0% phosphorus or other compound containing phosphorus, such as phosphate, except for newly established turf or lawn areas during their first growing season. The lawn fertilizer application shall not contain an amount of phosphorus exceeding the amount and rate of application recommended in the soil test evaluation. In subsequent years, no person shall apply any lawn fertilizer within the County that is labeled as containing more than 0% phosphorus or other compound containing phosphorus, such as phosphate, nor apply lawn fertilizer between December 1st and April 1st, nor apply lawn fertilizer to any impervious surface. If such application occurs, the fertilizer must be immediately contained and either legally applied to turf or placed in an appropriate container. Finally, no person shall apply lawn fertilizer to any turf or lawn area within twenty (20) feet of any surface water, except that this restriction shall not apply where a continuous natural vegetative buffer, at least ten (10) feet wide, separates a turf or lawn area and surface water.

Time of Planting Lawns - Fall planting is preferred. Seed after August 15. In the spring, plant until May 15. If seeding is done between May 15 and August 15, irrigation may be necessary to ensure a successful seeding.

Site Preparation - Disturbed soil areas are to be restored to the procedures of the *Soil Restoration/Disturbed Areas Stabilization Protocol* above.

Lawn Planting and Installation - Use a cultipacker type seeder if possible. Seed to a depth of 1/8 to 1/4 inch. If seed is to be broadcast, cultipack or roll after seeding. If hydroseeded, lime and fertilizer may be applied through the seeder, and rolling is not practical.

Mulching - Mulch all seedings in accordance with Standard and Specifications for Mulching. Small grain straw is the best material. The following are the recommended seed mixes from Section 3, Vegetative Measures for Erosion and Sediment Control from the New York State Standards and Specifications for Erosion and Sediment Control, latest edition.

Seed Mixes For Sunny sites (well, moderately well, and somewhat poorly drained soils)
a. Athletic fields and similar areas

	lb/1000 sf	lb/acre
80% Kentucky bluegrass blend	2.4-3.2	105-138
20% perennial ryegrass	0.6-0.8	25-37
	3.0-4.0	130-175

OR
(for southern and eastern NY)

	lb/1000 sf	lb/acre
50% Kentucky bluegrass	1.5-2.0	65-88
50% perennial ryegrass	1.5-2.0	65-87
	3.0-4.0	130-175

OR
100% Tall fescue, Turf-type, fine leaf 3.4-4.6 150-200

Shady dry sites (well to somewhat poorly drained soils)

	lb/1000 sf	lb/acre
65% fine fescue	2.6-3.3	114-143
15% perennial ryegrass	0.6-0.7	26-33
20% Kentucky bluegrass blend	0.8-1.0	35-44
	4.0-5.0	174-220

OR

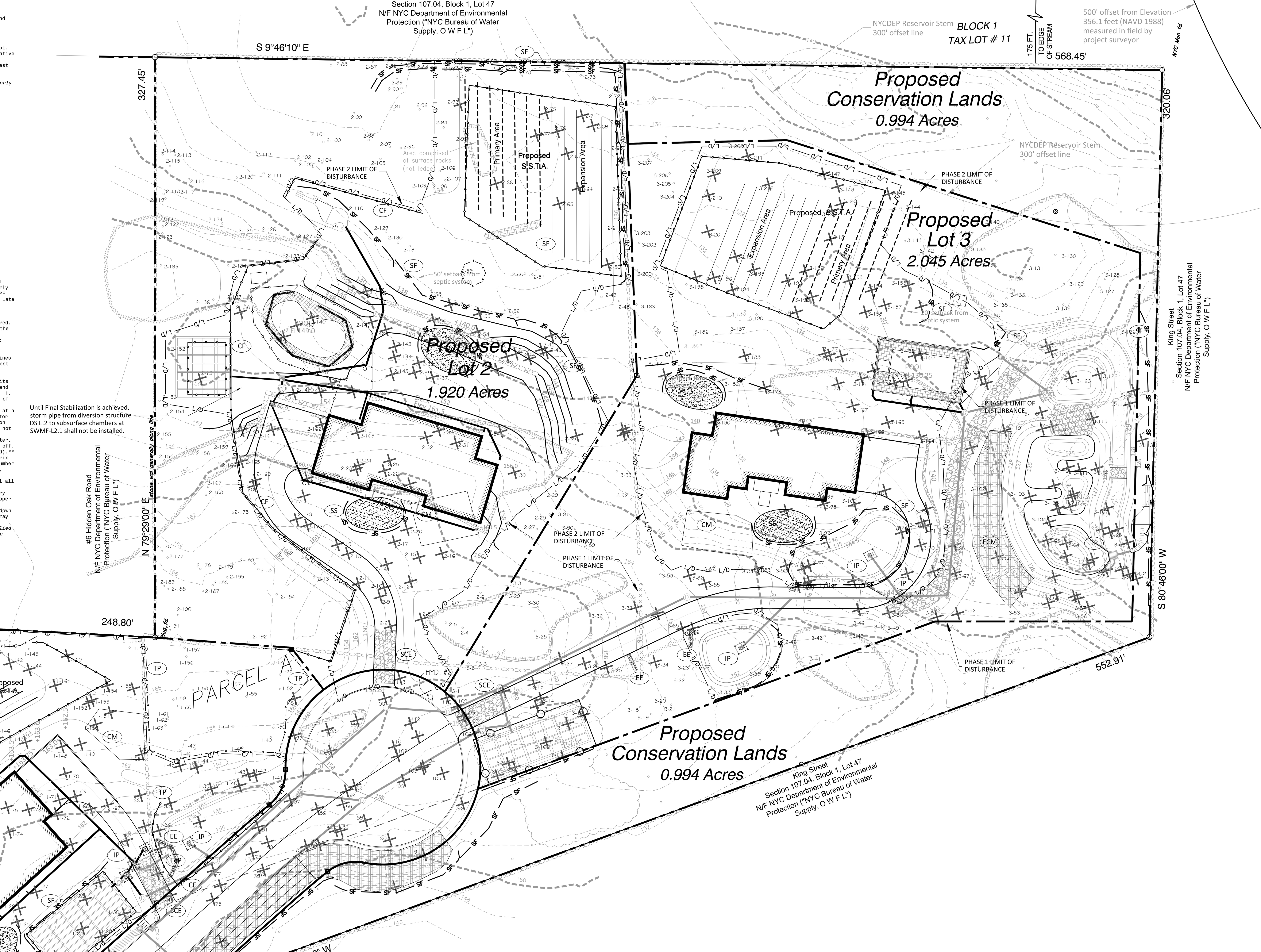
80% blend of shade-tolerant Kentucky bluegrass	2.4-3.2	105-138
20% perennial ryegrass	0.6-0.8	25-37
	3.0-4.0	130-175

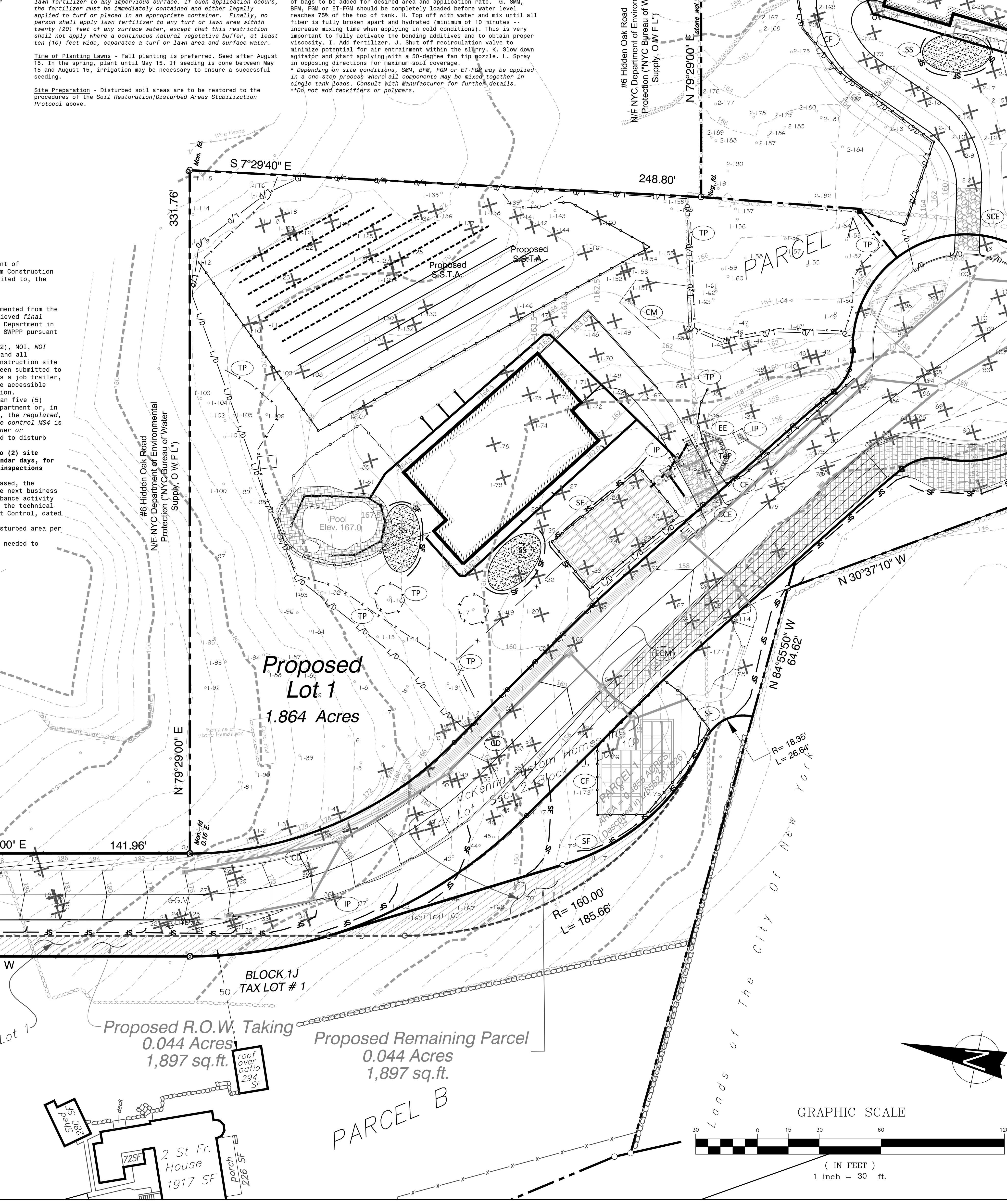
OR
100% Tall fescue, Turf-type, fine leaf 3.4-4.6 150-200

Fertilizer Application in the First Year - Apply fertilizer as indicated by the soil test three to four weeks after germination (spring seedlings). If test results have not been obtained, apply 1 pound nitrogen/1,000 square feet using a fertilizer. Summer and early fall seedings, apply as above unless air temperatures are above 85ºF for an extended period. Wait for cooler temperatures to fertilize. Late fall/winter seedings, fertilize in spring.

Stabilization Outside of Growing Season - If grading is performed outside of the growing season, ground stabilization is still required. Apply Flexterra FGM (Flexible Growth Medium) or approved equal to the area to be stabilized in accordance with the manufacturer's specifications. The application guide for Flexterra is as follows:

A. Strictly comply with equipment Manufacturer's installation instructions and recommendations. Use approved hydro-spraying machines with fantype nozzle (50-degree tip) whenever possible to achieve best soil coverage. Apply from opposing directions to assure 100% soil surface coverage. Slope interruption devices or water diversion techniques are recommended according to the slope interruption limits table on the back. B. To ensure proper application rates, measure and stake area. For maximum performance, apply in a two-step process*: 1. Apply specified prescriptive agronomic formulations along with 50% of seed with a small amount of SMM, BFM, FGM or ET-FGM for visual metering. 2. Mix balance of seed and apply SMM, BFM, FGM or ET-FGM at a rate of 50 pounds per 125 gallons (see mixing section on the back for details) of water over freshly seeded surfaces. See loading chart on the back and confirm loading rates with equipment manufacturer. Do not leave seeded surfaces unprotected, especially if precipitation is imminent. C. Fill 1/3 of mechanically agitated hydroseeder with water. Turn pump on for 15 seconds and purge and pre-wet lines. Turn pump off. D. Turn agitator on and load low density materials first (i.e. seed).** E. Continue slowly filling tank with water while loading fiber matrix into tank. F. Consult loading chart on the back to determine the number of bags to be added for desired area and application rate. G. SMM, BFM, FGM or ET-FGM should be completely loaded before water level reaches 75% of the top of tank. H. Top off with water and mix until all fiber is fully broken apart and hydrated (minimum of 10 minutes -- increase mixing time when applying in cold conditions). This is very important to fully activate the bonding additives and to obtain proper viscosity. I. Add fertilizer. J. Shut off recirculation valve to minimize potential for air entrainment within the slurry. K. Slow down agitator and start applying with a 50-degree fan tip nozzle. L. Spray in opposing directions for maximum soil coverage.
** Depending on site conditions, SMM, BFM, FGM or ET-FGM may be applied in a one-step process where all components may be mixed together in single tank loads. Consult with Manufacturer for further details.*
***Do not add tackifiers or polymers.*





CONSTRUCTION SEQUENCE NARRATIVE

All erosion and sedimentation control measures and procedures shall comply with the New York State Department of Environmental Conservation publication Standards and Specifications for Erosion and Sediment Control. Erosion control measures shall be installed prior to the start of construction and maintained in effective condition throughout the construction period.

Land disturbance shall be kept to a minimum. Restabilization and final stabilization of disturbed ground surfaces shall be scheduled as soon as practicable following disturbance.

Notify all appropriate authorities (i.e., Town of North Castle Planning Department - Telephone: (914-273-3542) at least 48 hours prior to the commencement of site work.

Identify Disturbance Limits - Identify in the field with flagging or markers the limits of the areas to be disturbed within the property in accordance with the drawings. The limits of disturbance may be referenced on drawing S-3.1 and S-3.2. Note that construction fence is to be placed around the perimeter of the proposed infiltration areas and septic system treatment areas (SSTA) prior to construction in order to prevent disturbance and compaction by construction vehicles.

Call Dig Safe New York - Contractor is required to verify all existing underground and overhead utilities prior to any construction activity by calling Dig Safe New York and conducting one's own due diligence.

Definition: Final Stabilization - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

PHASE 2 - CONSTRUCT THE INDIVIDUAL HOUSES

The typical sequence of construction of each of the houses is described below. Each of the three house lots is independent of the other one. The order of construction of the houses does not matter from an erosion control perspective.

Step 1: Preliminary activities to be undertaken prior to any land disturbance activities for the construction of the proposed houses:

Ensure that construction fencing is in place around the perimeter of the septic system treatment areas until such time as the work to grade and install the SSTA is to be performed. Ensure that construction fencing is in place around the perimeter of the infiltration facility on the lot prior to the commencement of construction. The work performed in Phase 1 must achieve FINAL STABILIZATION prior to the commencement of Phase 2.

Erosion and sedimentation controls to be installed for construction of any one of the three houses includes:

- Construction fencing and tree protection fencing.
- Stabilized construction entrance.
- Silt fence.
- Inlet Protection.
- Vegetative Stabilization.
- Construction Materials storage.

The sequence of construction of a house lot is as follows:

1. Identify Disturbance Limits - Identify the limits of the areas to be disturbed within the house lot in accordance with the drawings. The limits of disturbance may be referenced on drawing S-3.2. Verify all existing underground and overhead utilities prior to any construction activity by calling Dig Safe New York and conducting one's own due diligence. Construction parking and vehicular traffic is prohibited over all stormwater management facilities.

2. Install Erosion and Sediment Control and Tree Protection Measures - In accordance with the erosion and sediment control plans (see drawing S-3.2), install:
   - Stabilized Construction Entrance to the lot at the dimensions depicted in the construction detail.
   - Silt Fence as per the instructions of the manufacturer and as shown on the construction details. Silt fence shall be installed, in general, parallel to the contour. Where one length of silt fence ends and another begins, provide a minimum 10-foot overlap. Additional silt fence may be placed in the field at the discretion of representatives of the approving authorities. Silt fence shall be maintained in operable condition and shall not be removed until disturbed areas are thoroughly stabilized.
   - Soil Stockpile in the location(s) shown for the lot.
   - Inlet Protection to be installed around the perimeter of installed drain inlets or catch basins.
   - Construction Materials storage location which shall be circumscribed with chain link fencing.
   - Tree Protection Measures and construction fencing as delineated on the drawings to protect the existing vegetation to remain during construction and the SSTA from construction vehicle traffic.
   - Construction fencing to protect the septic system treatment system (SSTS) as depicted on the drawings, and around the perimeter of: (i) around the perimeter of SWMF L-1 (infiltration facility), (ii) on the north and west sides of SWMF-1.1, (iii) around the perimeter of SWMF-L2.1 and L2.2, and (iv) around the perimeter of SWMF-L3.1.

   All erosion control measures noted above shall be installed prior to any construction activity, and periodically monitored throughout all phases of construction for proper function and structural integrity. Perform maintenance and repairs as necessary.

3. Footing, Foundation and Building Pad Preparation - Prepare the building pad area for the house. This will involve excavation for the construction of the footings and foundation, and the temporary stockpiling of soil excavated for the house. Stockpile topsoil and soil removed during excavation and protect the stockpile in the location(s) shown on the drawings and in accordance with the detail. Rock removal, if any, shall be done in accordance with State and Town requirements. Excavation for the pool and grading for the pool patio is also to be completed at this time.

4. Excavate and Grade for the Stormwater Management Practices on the Lot - During the excavation for the house, on Lots 1 and 2, excavate the areas needed for the installation of stormwater management facilities (subsurface chambers in all three instances) SWMF-L.1 (on Lot 1), and SWMF-L2.1 and -L2.2 (on Lot 2). The subsurface chambers are also to be installed in accordance with the drawings. In addition, on Lot 1, install the bioretention facility SWMF-1.1. Install also outlet control structure OCS A.8.1 and connect the pipe from the OCS A.8.1 to MH A.8. Install inlet protection around the perimeter of OCS A.8.1 as per the plans.

   For Lot 3, grade for the two proposed rain gardens to capture and treat runoff: (1) from the house and (2) from the driveway. Construct the vegetated swale to direct the runoff into Rain Garden for FDA-L3.2. Install erosion eels across the swale as per the plans. Install silt fence around the perimeter of the rain gardens and retain it until such time as the ground surface that contributes to the rain garden achieves final stabilization. Install the storm drainage pipes from OCS A4.1 to DI A.4 and from OCS A.4.2 to connect to the storm drainage pipe from MH A.5 to DI A.4. Install the planting soil medium to the proper thickness and prepare the practice for planting. Install inlet protection around the perimeter of the outlet control structures as per the plans and retain the erosion eels and the inlet protection until the contributing area achieves full stabilization.

5. Install Storm Drainage Piping to Stormwater Management Practices - Install the subsurface storm drainage system from the lowest to highest grade on the lot, from the stormwater chambers on Lots 1 and 2 to the house and pool, and from the rain garden to the house on Lot 3. The bioretention facility on Lot 1 will receive only surface runoff from the rear and side yard.

   On Lots 1 and 2, do not permit runoff to enter the subsurface chambers until such time as the ground surface within the drainage area to the chambers has achieved FINAL STABILIZATION. For SWMF-L-1 on Lot 1, which will receive roof runoff and runoff from the pool patio, install a temporary storm drainage pipe from DI F.3 to discharge temporarily to the bioretention facility. As each catch basin in the storm drainage piping is installed, install the inlet protection as designated on the Erosion and Sediment Control Plan and maintain the inlet protection until all disturbed areas which drain to it achieves FINAL STABILIZATION.

   On Lot 2, do not install the storm drainage pipe from diversion structure DS E.2 to the SWMF-L2.1 and from diversion structure DS C.2 to SWMF-L2.2 until such time as the drainage areas that contribute runoff flows to the subsurface chambers have achieved final stabilization.

6. House Construction - Construct the new house in accordance with the architect's plans. Once the house foundation walls are backfilled, the other site work can proceed. Grade and install the septic system and septic system treatment area in accordance with the plans. Stabilize the ground surface above the SSTA with permanent (or temporary) vegetation. Complete the utility connections to the house under construction. Connect the roof drain leaders to the storm drainage piping as per the plans.

7. Complete the Fine Grading on the Lot and Prepare the Disturbed Area for Final Stabilization and Planting - Once the final fine grading work is completed, it is time for the FINAL STABILIZATION of the property. Clean up all residual site debris and litter and prepare all disturbed areas not to be hard surfaced for topsoiling and seeding and/or planting. All areas not planted as trees or shrubs are to be seeded with the permanent grass seed mix noted in the specifications prepared by the project landscape architect.

   The soil must be restored at each lot prior to FINAL STABILIZATION. The procedure is as noted above: (1) Apply 3 inches of compost over subsoil; (2) Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor-mounted disc, or tiller, mixing, and circulating air and compost into subsoils, (3) Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site. (4) Apply topsoil to a depth of 6 inches. (5) Vegetate as required by approved plan.

   Provide straw mulch cover over seeded areas. Clean out any sediment from the stormwater management basins and storm drainage pipes.

8. Remove the erosion control measures only after FINAL STABILIZATION has been achieved on the site.

APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED DEC. 12, 2016.

______________________ DATE:______________
CHRISTOPHER CARTHY, CHAIRMAN
TOWN OF NORTH CASTLE PLANNING BOARD

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

______________________ DATE:______________
JOSEPH CERMELE, PE
KELLARD SESSIONS, P.C.
CONSULTING TOWN ENGINEERS

Civil engineer:
Alan L. Pilch
ALP Engineering & Landscape Architecture, PLLC
P.O. Box 843
Ridgefield, CT 06877
P.E. #80167
C. of A. #001433
Direct Tel (475) 215-5343

OWNER:
McKenna Custom Homes, Inc.
433 Manville Road
Pleasantville, NY 10570
Tel: (914) 769-1869

CONSULTANTS:

CAMPBELL ENGINEERING, LLP
160 King Street
P.O. Box 255
Chappaqua, New York 10514
Tel: (914) 238-3555
Fax: (914) 238-3435

WELSH Engineering & Land Surveying, P.C.
12 Campwoods Grounds
Ossining, N.Y. 10562

Tel: (914) 773-1701

ISSUED:

Amended plan for Conservation Subdivision	11/17/2014
General revisions; rev as per Lot 1 layout changes	01/09/2015
Submission of SWPPP to NYCDEP	04/09/2015
Submission to Town and NYCDEP	07/24/2015
Submission to Town and NYCDEP	12/15/2015
Submission to Town and NYCDEP	03/01/2016
Added note regarding SPDES General Permit	08/15/2016
Submission to Town for Prelim & Final Subdivision Plan appvl	10/07/2016
Submission to Town for Final Subdivision Plan appvl	03/20/2020

SEAL:
STATE OF NEW YORK
ALAN L. PILCH
No. 080167
LICENSED PROFESSIONAL ENGINEER

PROJECT NAME:
HIDDEN OAK SUBDIVISION
Hidden Oak Road
Town of North Castle, New York

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

ENVIRONMENTAL CONSULTANT:
EVANS ASSOCIATES
ENVIRONMENTAL CONSULTING, INC.
162 Falls Road Bethany, Connecticut 06524
Tel. (203) 393-0690

Drawing title:
PHASE 2: Erosion & Sediment Control Plan / Tree Removal and Protection Plan

Date: July 15, 2014
Dwn. by: alp
ID: 2.7_C05.31.2016

S-3.2

LEGEND

PROPERTY LINE

EXISTING CONTOUR

PROPOSED SPOT ELEVATION

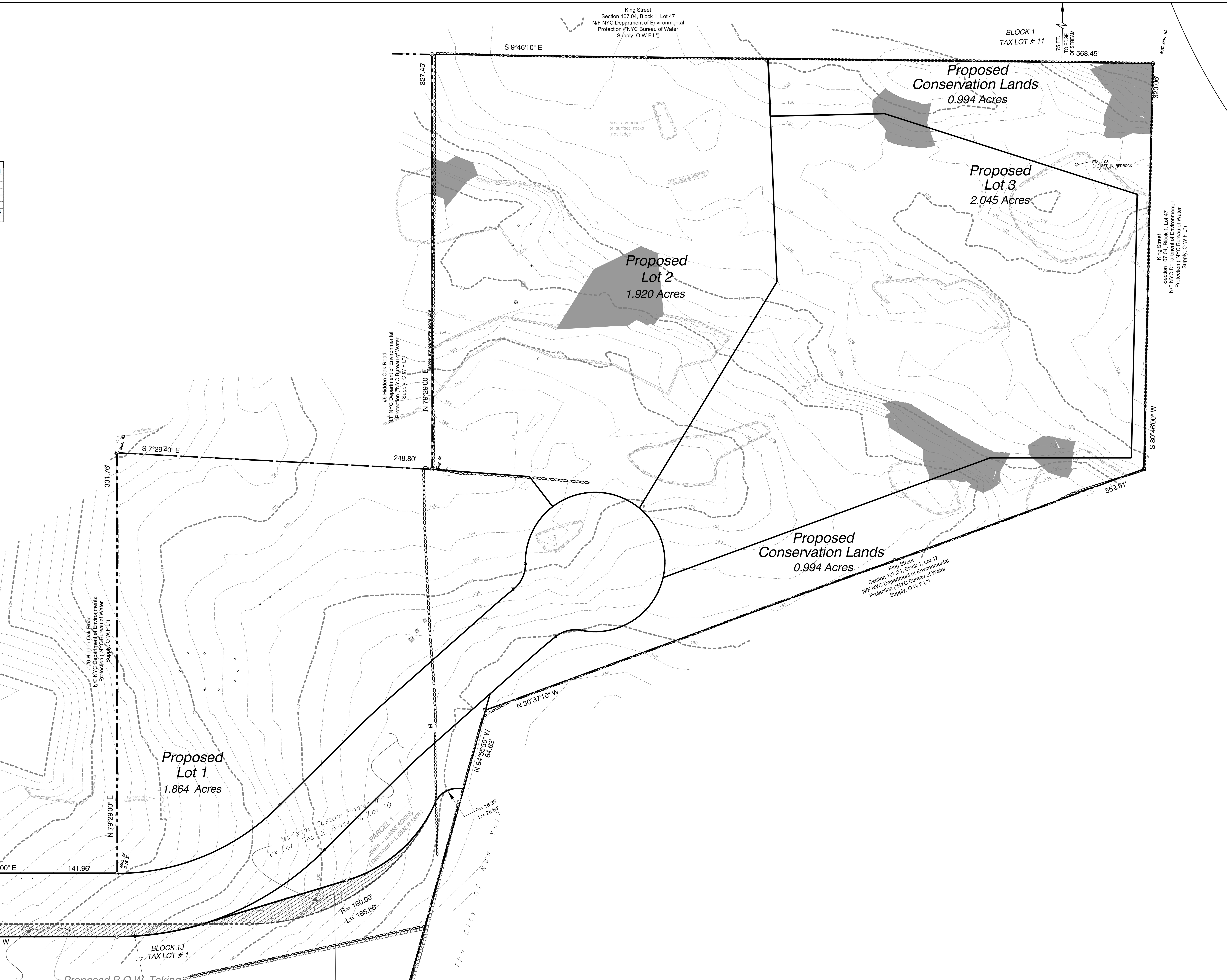
PROPOSED RESIDENCE & DRIVEWAY

REGULATED SLOPES (GREATER THAN 25%)

STEEP SLOPES AND NET LOT AREA CALCULATION

Steep Slopes Disturbance TOTAL (>25%) 6,649 sq feet

Parameter	Lot 1	Lot 2	Lot 3
Lot Area (in sq feet)	81,144.6	83,636.4	89,096.4
Gross Lot Area (in sq feet)	1.863	1.920	2.045
Total Area of Slopes > 25% (in sq feet)	0	4,449	3,644
Total Area of Slopes > 25% (in acres)	0.000	0.102	0.084
50% Factor applied to Steep Slopes (in sq feet)	0	2,225	1,822
50% Factor applied to Steep Slopes (in acres)	0.000	0.051	0.042
NET LOT AREA (in sq feet)	81,144.6	81,411.9	87,274.4
NET LOT AREA (in acres)	1.863	1.869	2.004



APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED DEC. 12, 2016.

DATE:__________
CHRISTOPHER CARTHY, CHAIRMAN
TOWN OF NORTH CASTLE PLANNING BOARD

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

DATE:__________
JOSEPH CERMELE, PE
KELLARD SESSIONS, P.C.
CONSULTING TOWN ENGINEERS

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Submission to Town for Prelim & Final Subdivision Plan appvl	10/07/2016
Submission to Town for Final Subdivision Plan appvl	03/20/2020

SEAL:

STATE OF NEW YORK
ALAN L. PILCH
No. 080167
LICENSED PROFESSIONAL ENGINEER

PROJECT NAME:
HIDDEN OAK SUBDIVISION
Hidden Oak Road
Town of North Castle, New York

ENGINEER & LANDSCAPE ARCHITECT:
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P.O. Box 843, Ridgefield, CT 06877
Direct Tel. (475) 215-5343 Cell: (203) 710-0587

ENVIRONMENTAL CONSULTANT:
EVANS ASSOCIATES
ENVIRONMENTAL CONSULTING, INC.
162 Falls Road Bethany, Connecticut 06524
Tel. (203) 393-0690

Drawing title:

Slopes Map

Date: July 15, 2014

Dwn. by: alp

ID: _C05.31.2016

S-4

LEGEND

PROPERTY LINE

EXISTING CONTOUR

PROPOSED SPOT ELEVATION

PROPOSED DECIDUOUS TREE

PROPOSED CONIFEROUS TREE

PROPOSED SHRUB

PROPOSED HERBACEOUS PLANTING

NOTES ON SEED MIXES:

New England Wetmix

As per New England Wetland Plants, Inc., if planted during the fall months, the seed mix will germinate the following spring. The wetland seeds in this mix can be sown by hand, with a hand-held spreader, or hydro-seeded on large or hard to reach sites. Lightly rake to insure good seed-to-soil contact. Seeding can take place on frozen soil, as the freezing and thawing weather of late fall and late winter will work the seed into the soil. If spring conditions are drier than usual watering may be required. If sowing during the summer months supplemental watering will likely be required until germination. A light mulch of clean, weed free straw is recommended.

New England Erosion Control/Restoration Mix for Detention Basins and Moist Sites

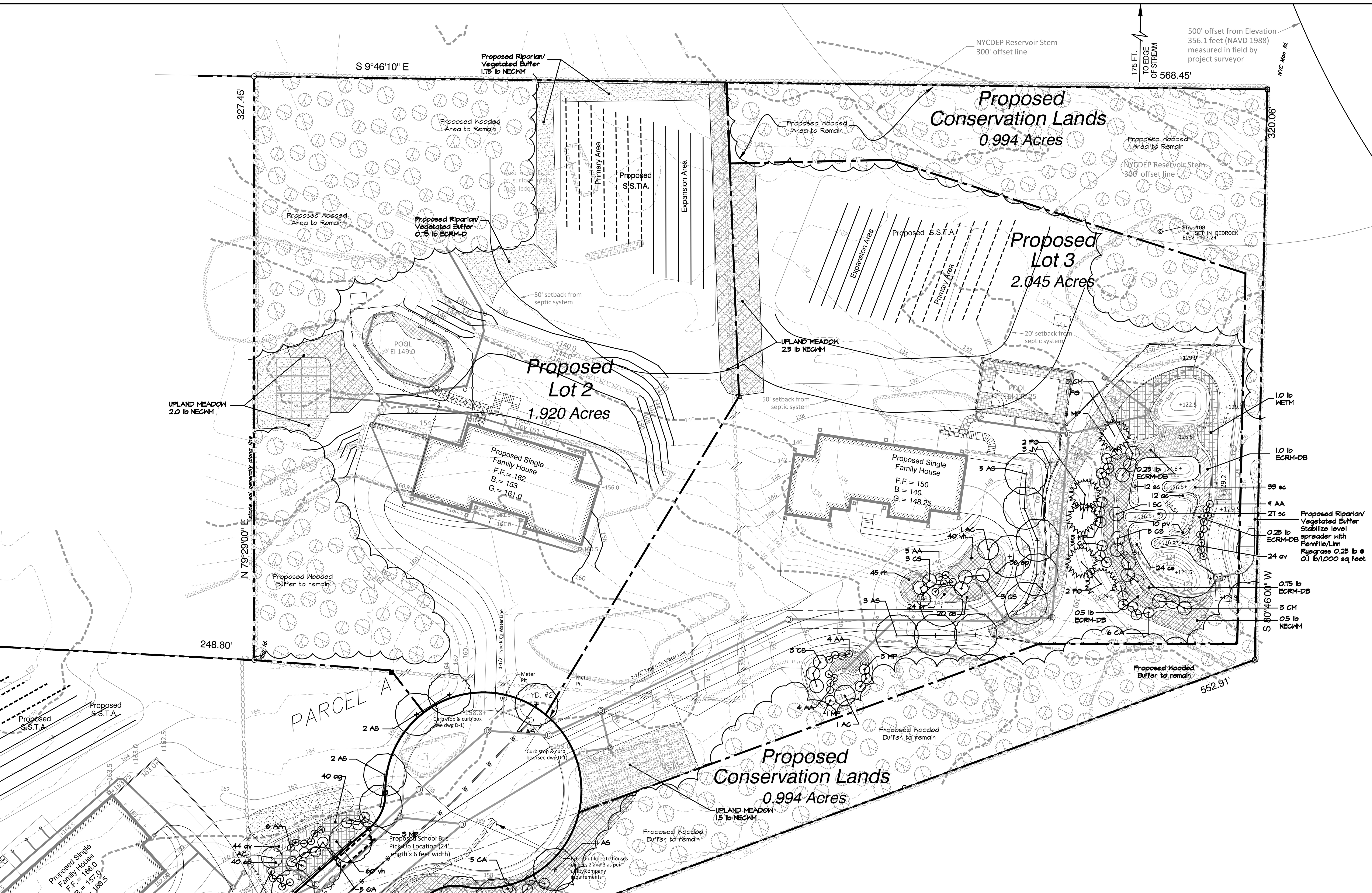
As per New England Wetland Plants, Inc., the mix may be applied by hand, by mechanical spreader, or by hydro-seeder. After sowing, lightly rake, roll or cultipack to insure good seed-to-soil contact. Best results are obtained with a Spring or late Summer seeding. Late Fall and Winter dormant seeding requires an increase in the application rate. A light mulching of clean, weed-free straw is recommended.

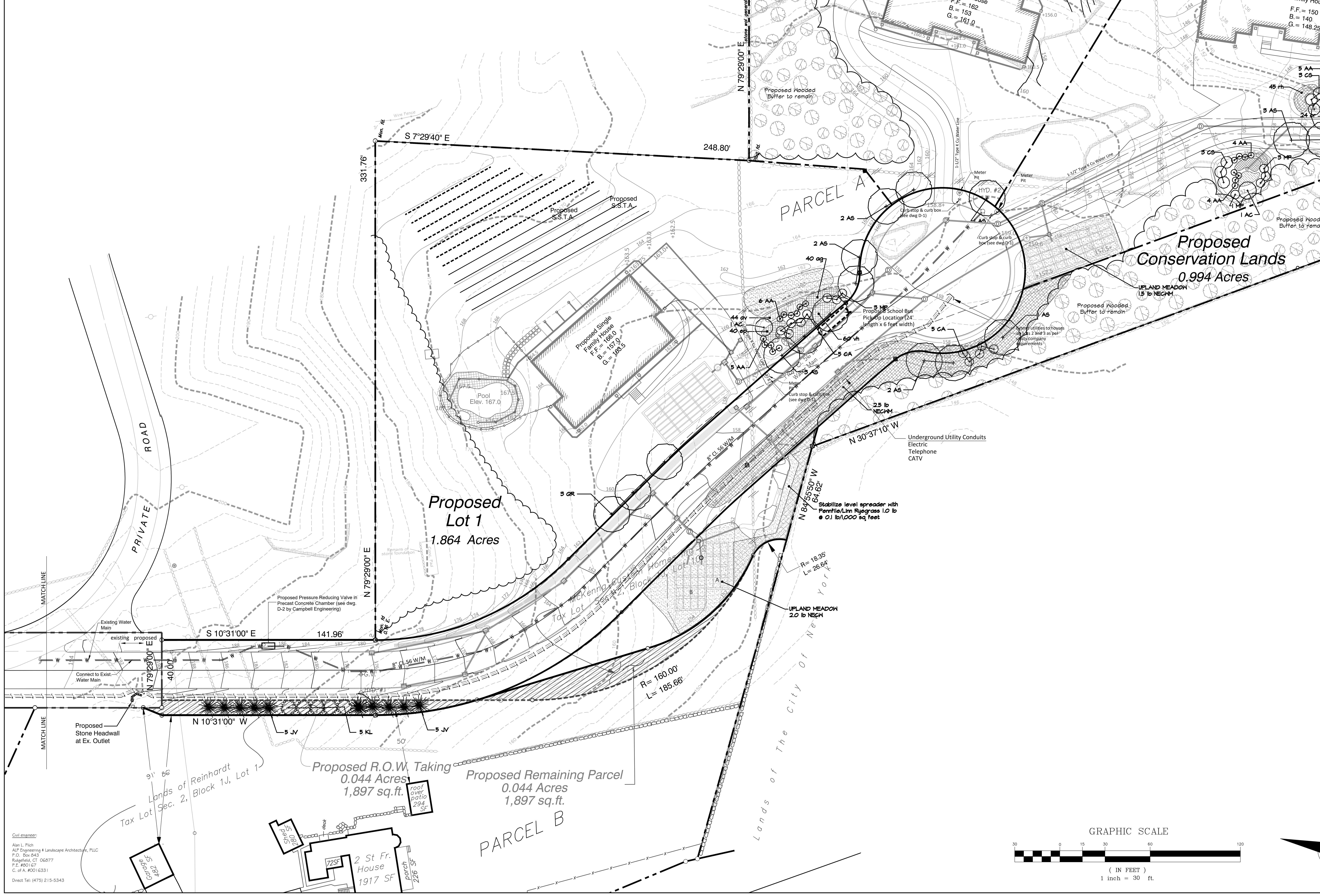
New England Conservation/Wildlife Mix

The mix may be applied by hand, by mechanical spreader, or by hydro-seeder. After sowing, lightly rake, roll or cultipack to insure good seed-to-soil contact. A light mulching of clean, weed-free straw is recommended.

GENERAL LANDSCAPE NOTES:

1. All plant material and methods of installation shall conform to the American Nursery and Landscape Association, American Standard for Nursery Stock, latest edition.
2. All disturbed areas of the site not occupied by buildings or pavement and not specified as being planted with trees, shrubs or ground cover shall be lawn.
3. All planting beds shall be mulched with three (3) inches of shredded hardwood bark chips, unless otherwise specified. See the construction detail on sheet DE-5 for planting of trees and shrubs.
4. The landscape architect or his designated representative shall inspect all plant materials before it is installed at the site. Decisions made by the landscape architect or his designated representative as to the adequacy of proposed plant material shall be final.
5. The final location of trees, shrubs and other plantings, which are referenced to this note will be determined in the field by the landscape architect, after the existing vegetation has been cleared to the limit of disturbance boundary and final regrading has been completed.
6. Plant material shall be first quality stock and conform to the code of standards set forth in the current edition of the American Standards for Nursery Stock published by the American Nursery and Landscape Association, Inc.
7. The plant materials specified on the drawings and delivered to the site shall be certified by the supplier as true to their genus, species and variety. Substitutions are not permitted without the project landscape architect's written approval.
8. The plant supplier shall facilitate inspection and identification by labeling trees, shrubs and ground covers with the genus, species and variety of plant on a durable waterproof label with weather resistant inks.
9. Plants shall be nursery grown and shall be of the varieties specified in the plant list.
10. Planting stock shall be well branched and well-formed, sound, vigorous, healthy, free from disease, sunscale, windburn, abrasion, and harmful insects or insect eggs, and shall have healthy, normal unbroken root systems. Deciduous trees and shrubs shall be symmetrically developed, of uniform habit of growth, with straight trunks or stems, and free from objectionable disfigurements. Evergreen trees and shrubs shall have well-developed symmetrical tops with typical spread of branches for each particular species or variety. Plants shall be grown under climactic conditions similar to those of the project.
11. All stock shall be balled and burlapped or container grown stock, unless otherwise specified. Bare root stock of any kind is unacceptable, unless specified.
12. All planting beds, lawns and landscaped areas shall receive a minimum 4" depth layer of topsoil, unless otherwise specified.
13. Plant material locations and bed outlines shall be staked on the project site by the contractor and approved by the construction representative before any plant pits or beds are excavated.
14. All existing trees to remain within the disturbance line shall be pruned to remove dead, d1seased, broken or crooked branches.
15. Pruning is to take place during the months of December through March unless approved by the project landscape architect. All cuts are to be painted immediately with a black asphalt-based, antiseptic tree paint.





PLANT LIST — TREES AND SHRUBS					
NATIVE TREES AND SHRUBS					
SYMBOL	QUANT.	BOTANICAL NAME / COMMON NAME	SIZE/CONT.	SPACING	REMARKS
AA	33	Aronia arbutifolia / Red Chokeberry	3 gal. cont.	4' o.c.	
AC	3	Amelanchier canadensis / Downy Serviceberry	4'–5' ht.	n.a.	shrub form
AS	19	Acer saccharum / Sugar Maple	2 1/2" – 3" cal.	as shown	B&B
CA	19	Clethra alnifolia / Summersweet Clethra	3 gal. cont.	5' o.c.	
CM	6	Cornus amomum / Silky Dogwood	3 gal. cont.	8' o.c.	
CS	14	Cornus sericea / Red Osier Dogwood	3 gal. cont.	8' o.c.	
JV	13	Juniperus virginiana / Eastern Redcedar	6'–7' ht.	10' o.c.	B&B
KL	5	Kalmia latifolia / Mountain Laurel	3'–4' ht.	5' o.c.	B&B
MP	15	Myrica pensylvanica / Northern Bayberry	3 gal. cont.	6' o.c.	
PG	5	Picea glauca / White Spruce	6'–7' ht.	n.a.	B&B
QR	5	Quercus rubra / Red Oak	2 1/2" – 3" cal.	n.a.	B&B
SC	1	Sambucus canadensis / Elderberry	3 gal. cont.	n.a.	

PLANT LIST — NATIVE HERBACEOUS PLANTS					
SYM.	QUANT.	BOTANICAL NAME / COMMON NAME	SIZE/CONT.	SPACING	REMARKS
ac	12	Acorus calamus / Sweet Flag	1 qt. pot	2.0' o.c.	
ag	40	Andropogon gerardii / Big Bluestem	1 qt. pot	2.0' o.c.	
av	68	Andropogon virginicus / Broomsedge	1 qt. pot	2.0' o.c.	
as	20	Aster novae-belgii / New York Aster	1 qt. pot	2.0' o.c.	
cs	24	Carex stricta / Tussock Sedge	1 qt. pot	2.0' o.c.	
ep	76	Eupatorium purpureum / Joe Pye Weed	1 qt. pot	2.0' o.c.	
or	24	Osmunda regalis / Royal Fern	1 qt. pot	2.0' o.c.	
pv	10	Peltandra virginica / Arrow Arum	1 qt. pot	2.0' o.c.	
rh	45	Rudbeckia hirta / Black Eyed Susan	1 qt. pot	2.0' o.c.	
sc	72	Scirpus cyperinus / Woolgrass	1 qt. pot	2.0' o.c.	
vh	100	Verbena hastata / Blue Vervain	1 qt. pot	2.0' o.c.	
sp	24	Scirpus pungens / Common Three Square	1 qt. pot	2.0' o.c.	
ss	11	Schizachyrium scoparium / Little Bluestem	1 qt. pot	2.0' o.c.	
ts	66	Carex stricta / Tussock Sedge	1 qt. pot	2.0' o.c.	

PLANT LIST — SEED MIXES			
NECWM	10.75 lb	Conservation/Wildlife Mix	1 lb per 1,750 s.f.
ECRM–DB	2.75 lb.	Erosion Control/Restoration Mix for Detention Basins	1 lb per 1,250 s.f.
ECRM–D	0.75 lb	Erosion Control/Restoration Mix for Dry Sites	1 lb per 1,250 s.f.
WETM	1.0 lb	New England Wetmix	1 lb per 2,500 s.f.

APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED DEC. 12, 2016.

______________________ DATE:______________

CHRISTOPHER CARTHY, CHAIRMAN
TOWN OF NORTH CASTLE PLANNING BOARD

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

______________________ DATE:______________

JOSEPH CERMELE, PE
KELLARD SESSIONS, P.C.
CONSULTING TOWN ENGINEERS

OWNER:
McKenna Custom Homes, Inc.
433 Manville Road
Pleasantville, NY 10570
Tel: (914) 769-1869

CONSULTANTS:

CAMPBELL ENGINEERING, LLP
160 King Street
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Chappaqua, New York 10514
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WELSH Engineering & Land Surveying, P.C.
12 Campwoods Grounds
Ossining, N.Y. 10562

Tel: (914) 773-1701

ISSUED:

Submission of SWPPP to NYCDEP	04/09/2015
Submission to Town and NYCDEP	07/24/2015
Submission to Town and NYCDEP	12/15/2015
Submission to Town and NYCDEP	03/01/2016
Submission to Town for Prelim & Final Subdivision Plan appvl	10/07/2016
Submission to Town for Prelim & Final Subdivision Plan appvl	03/20/2020

SEAL:

STATE OF NEW YORK ALAN L. PILCH No. 080167 LICENSED PROFESSIONAL ENGINEER

PROJECT NAME:
HIDDEN OAK SUBDIVISION
Hidden Oak Road
Town of North Castle, New York

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

ENVIRONMENTAL CONSULTANT:
EVANS ASSOCIATES
ENVIRONMENTAL CONSULTING, INC.
162 Falls Road Bethany, Connecticut 06524
Tel. (203) 393-0690

Drawing title:
Landscape Plan

Date: July 14, 2015
Dwn. by: alp
ID: _C05.31.2016
EAEC Proj. No.:

S-5

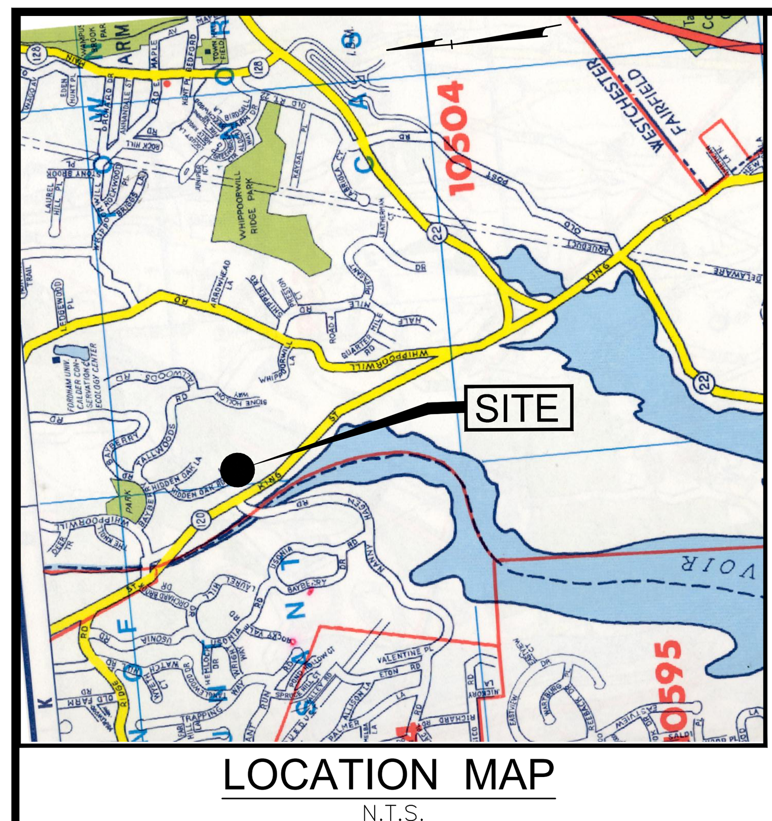


TABLE OF LAND USE

ZONING DATA:	CONSERVATION SUBDIVISION			
ZONE: R-2A	TOTAL ACREAGE / SIZE OF PROPERTY TO BE SUBDIVIDED: 7.69 ACRES			
TAX MAP:	SECTION 107.01 , BLOCK: 1 , LOT 32			
FIRE DISTRICT:	ARMONK FIRE DISTRICT			
SCHOOL DISTRICT:	BYRAM HILLS CENTRAL			

	REQUIRED	PROVIDED		
		LOT 1	LOT 2	LOT 3
GROSS LOT AREA	1 Ac.	1.864 Ac.	1.920 Ac.	2.045 Ac.
SLOPES > 25%		0	0.102 Ac.	0.084 Ac.
50% FACTOR AS PER SEC. 213-3		0	0.051 Ac.	0.042 Ac.
NET LOT AREA	1 Ac.	1.863 Ac.	1.869 Ac.	2.003 Ac.
CONTIGUOUS BUILDING AREA	20,000 S.F.	>20,000 S.F.	>20,000 S.F.	>20,000 S.F.
FRONTAGE	125'	458'	73'	61'
DEPTH	150'	168'	315'	276'
WIDTH	125'	254'	243'	201'
MIN. YARD SETBACKS — FRONT	50'	57'	141'	175'
MIN. YARD SETBACKS — SIDE	30' [2]	103'/ 164'	103'/ 31'	43'/ 85'
MIN. YARD SETBACKS — REAR	40' / 50' [3]	79'	184'	145'

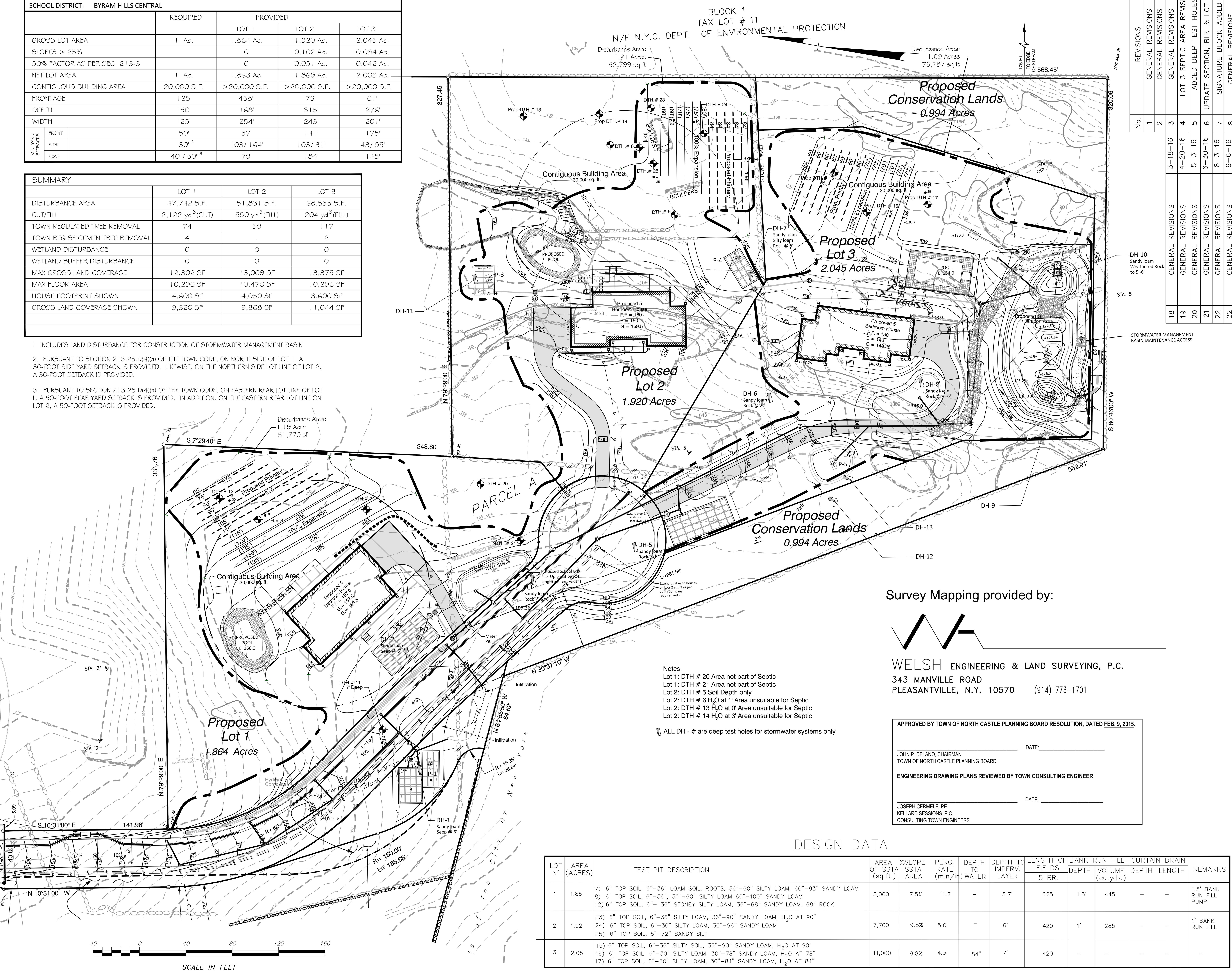
SUMMARY

	LOT 1	LOT 2	LOT 3
DISTURBANCE AREA	47,742 S.F.	51,831 S.F.	68,555 S.F. [1]
CUT/FILL	2,122 yd^3(CUT)	550 yd^3(FILL)	204 yd^3(FILL)
TOWN REGULATED TREE REMOVAL	74	59	117
TOWN REG SPICEMEN TREE REMOVAL	4	1	2
WETLAND DISTURBANCE	0	0	0
WETLAND BUFFER DISTURBANCE	0	0	0
MAX GROSS LAND COVERAGE	12,302 SF	13,009 SF	13,375 SF
MAX FLOOR AREA	10,296 SF	10,470 SF	10,296 SF
HOUSE FOOTPRINT SHOWN	4,600 SF	4,050 SF	3,600 SF
GROSS LAND COVERAGE SHOWN	9,320 SF	9,368 SF	11,044 SF

1 INCLUDES LAND DISTURBANCE FOR CONSTRUCTION OF STORMWATER MANAGEMENT BASIN

2. PURSUANT TO SECTION 213.25.D(4)(a) OF THE TOWN CODE, ON NORTH SIDE OF LOT 1, A 30-FOOT SIDE YARD SETBACK IS PROVIDED. LIKEWISE, ON THE NORTHERN SIDE LOT LINE OF LOT 2, A 30-FOOT SETBACK IS PROVIDED.

3. PURSUANT TO SECTION 213.25.D(4)(a) OF THE TOWN CODE, ON EASTERN REAR LOT LINE OF LOT 1, A 50-FOOT REAR YARD SETBACK IS PROVIDED. IN ADDITION, ON THE EASTERN REAR LOT LINE ON LOT 2, A 50-FOOT SETBACK IS PROVIDED.



Notes:
Lot 1: DTH # 20 Area not part of Septic
Lot 1: DTH # 21 Area not part of Septic
Lot 2: DTH # 5 Soil Depth only
Lot 2: DTH # 6 H_2O at 1' Area unsuitable for Septic
Lot 2: DTH # 13 H_2O at 0' Area unsuitable for Septic
Lot 2: DTH # 14 H_2O at 3' Area unsuitable for Septic

ALL DH - # are deep test holes for stormwater systems only

Survey Mapping provided by:

WELSH ENGINEERING & LAND SURVEYING, P.C.
343 MANVILLE ROAD
PLEASANTVILLE, N.Y. 10570 (914) 773-1701

APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED FEB. 9, 2015.

______________________ DATE:__________
JOHN P. DELANO, CHAIRMAN
TOWN OF NORTH CASTLE PLANNING BOARD

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

______________________ DATE:__________
JOSEPH CERMELE, PE
KELLARD SESSIONS, P.C.
CONSULTING TOWN ENGINEERS

DESIGN DATA

LOT N°	AREA (ACRES)	TEST PIT DESCRIPTION	AREA OF SSTA (sq.ft.)	%SLOPE SSTA AREA	PERC. RATE (min/in)	DEPTH TO WATER	DEPTH TO IMPERV. LAYER	LENGTH OF FIELDS 5 BR.	BANK RUN FILL DEPTH	BANK RUN FILL VOLUME (cu.yds.)	CURTAIN DRAIN DEPTH	CURTAIN DRAIN LENGTH	REMARKS
1	1.86	7) 6" TOP SOIL, 6"–36" LOAM SOIL, ROOTS, 36"–60" SILTY LOAM, 60"–93" SANDY LOAM 8) 6" TOP SOIL, 6"–36", 36"–60" SILTY LOAM 60"–100" SANDY LOAM 12) 6" TOP SOIL, 6"– 36" STONEY SILTY LOAM, 36"–68" SANDY LOAM, 68" ROCK	8,000	7.5%	11.7	–	5.7'	625	1.5'	445	–	–	1.5' BANK RUN FILL PUMP
2	1.92	23) 6" TOP SOIL, 6"–36" SILTY LOAM, 36"–90" SANDY LOAM, H_2O AT 90" 24) 6" TOP SOIL, 6"–30" SILTY LOAM, 30"–96" SANDY LOAM 25) 6" TOP SOIL, 6"–72" SANDY SILT	7,700	9.5%	5.0	–	6'	420	1'	285	–	–	1' BANK RUN FILL
3	2.05	15) 6" TOP SOIL, 6"–36" SILTY SOIL, 36"–90" SANDY LOAM, H_2O AT 90" 16) 6" TOP SOIL, 6"–30" SILTY LOAM, 30"–78" SANDY LOAM, H_2O AT 78" 17) 6" TOP SOIL, 6"–30" SILTY LOAM, 30"–84" SANDY LOAM, H_2O AT 84"	11,000	9.8%	4.3	84"	7'	420	–	–	–	–	–

No.	REVISIONS	DATE
1	GENERAL REVISIONS	3–19–13
2	GENERAL REVISIONS	4–5–13
3	GENERAL REVISIONS	5–20–13
4	LOT 3 SEPTIC AREA REVISED	12–4–13
5	ADDED DEEP TEST HOLES	12–10–13
6	UPDATE SECTION, BLK & LOT NO.	1–7–14
7	SIGNATURE BLOCK ADDED	2–4–14
8	GENERAL REVISIONS	3–12–14
9	GENERAL REVISIONS	5–20–14
10	GENERAL REVISIONS	6–10–14
11	GENERAL REVISIONS	6–26–14
12	GENERAL REVISIONS	11–14–14
13	GENERAL REVISIONS	5–27–15
14	GENERAL REVISIONS	6–15–15
15	GENERAL REVISIONS	7–28–15
16	GENERAL REVISIONS	8–17–15
17	GENERAL REVISIONS	2–22–16
18	GENERAL REVISIONS	3–18–16
19	GENERAL REVISIONS	4–20–16
20	GENERAL REVISIONS	5–3–16
21	GENERAL REVISIONS	6–30–16
22	GENERAL REVISIONS	8–3–16
22	GENERAL REVISIONS	9–6–16

INTEGRATED PLOT PLAN

Prepared for

McKenna Custom Homes Inc.
13 Hidden Oak Rd

Town of North Castle Westchester Co., N.Y.

Tax Map : Sec. 107.01 , Blk.1, Lot 32

Date: 5-15-13

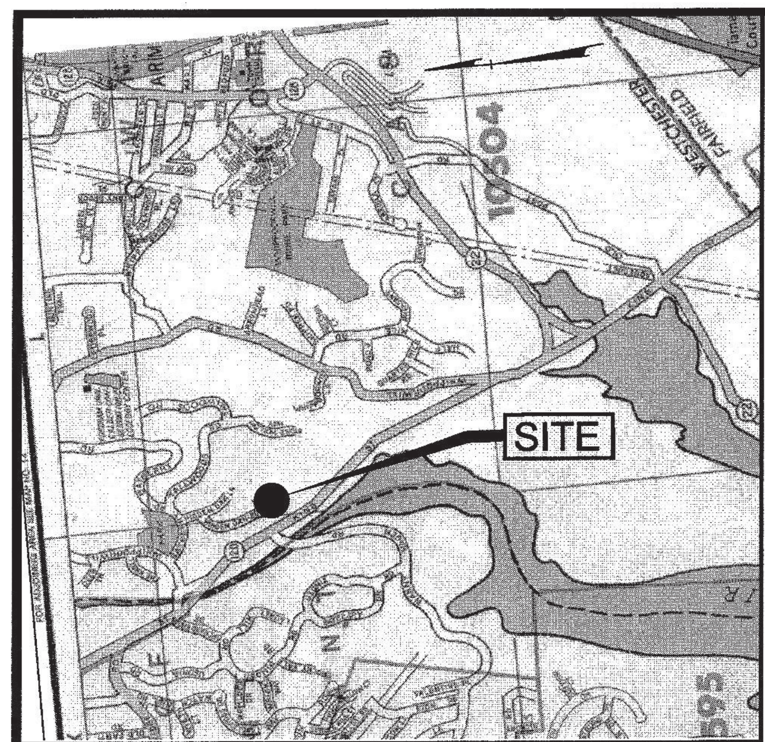
CAMPBELL ENGINEERING
Civil Engineers
Hydrology Land Planners
Sanitary and Storm Sewers
Water Supply and Sewage Disposal
Michael H.Campbell, PE
160 King Street
P.O. Box 255
Chappaqua, New York 10514
Michael@914engineer.com
(914)238-3555
Fax(914)238-3435

SCALE 1"=40'

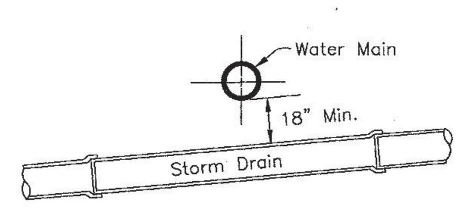
SHEET 1 OF 3

IPP-1

1759–McKenna\McKenna–Hidden Oak.dwg



LOCATION MAP
N.T.S.



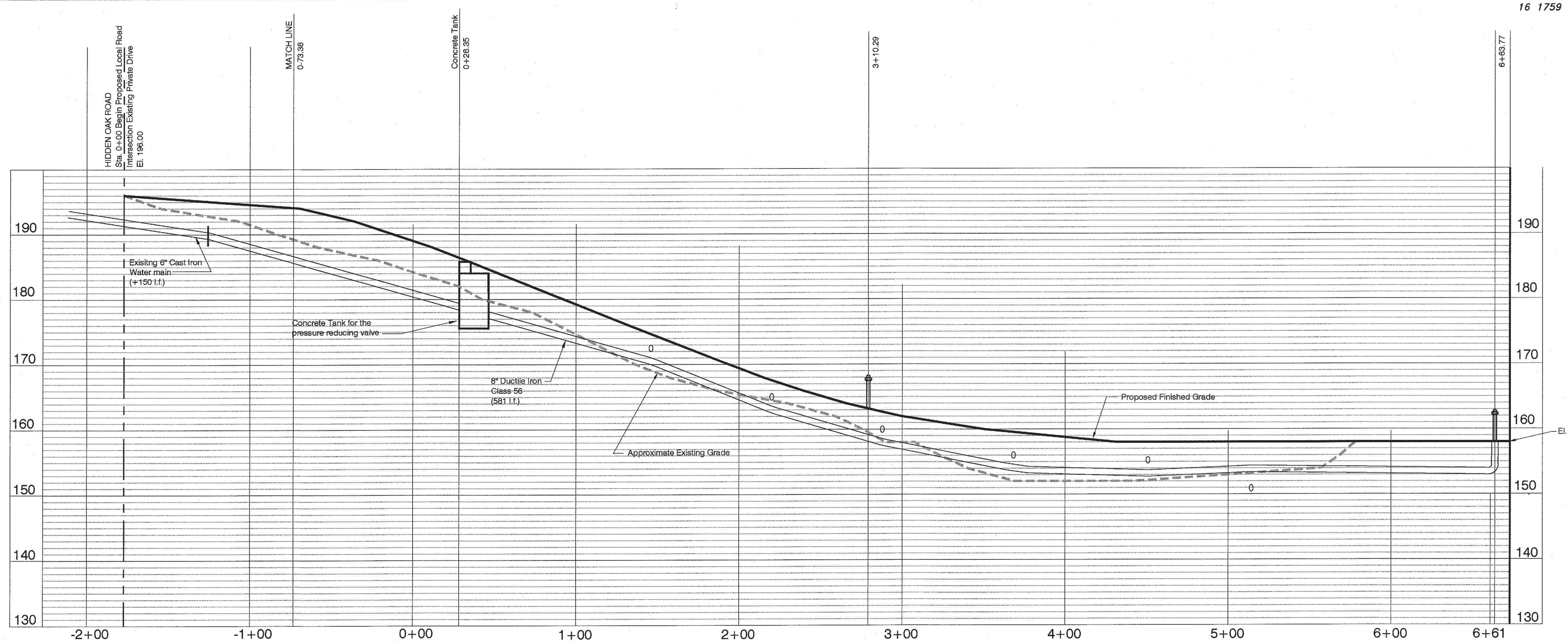
SEPARATION DETAIL
N.T.S.

APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED FEB. 9, 2015.

______________________ DATE:__________
JOHN P. DELANO, CHAIRMAN
TOWN OF NORTH CASTLE PLANNING BOARD

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

______________________ DATE:__________
JOSEPH CERMELE, PE
KELLARD SESSIONS, P.C.
CONSULTING TOWN ENGINEERS



PROPOSED HIDDEN OAK ROAD EXTENSION
CENTERLINE LOCAL ROAD PROFILE

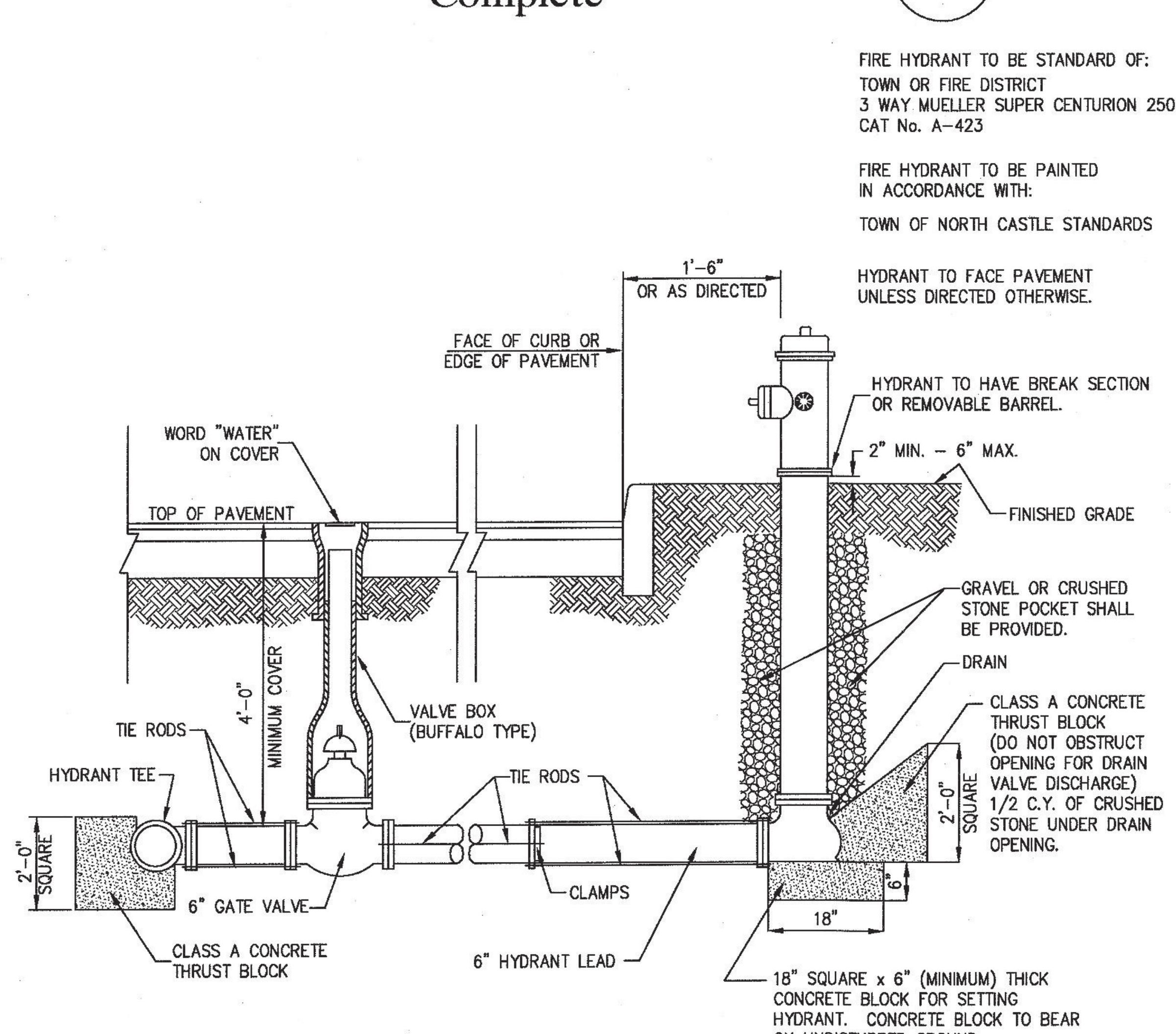
SCALE: 1" = 10' VERT.
1" = 40' HORZ.

Hydrant Installation Complete (1)

FIRE HYDRANT TO BE STANDARD OF:
TOWN OR FIRE DISTRICT
3 WAY MUELLER SUPER CENTURION 250
CAT No. A-423

FIRE HYDRANT TO BE PAINTED
IN ACCORDANCE WITH:
TOWN OF NORTH CASTLE STANDARDS

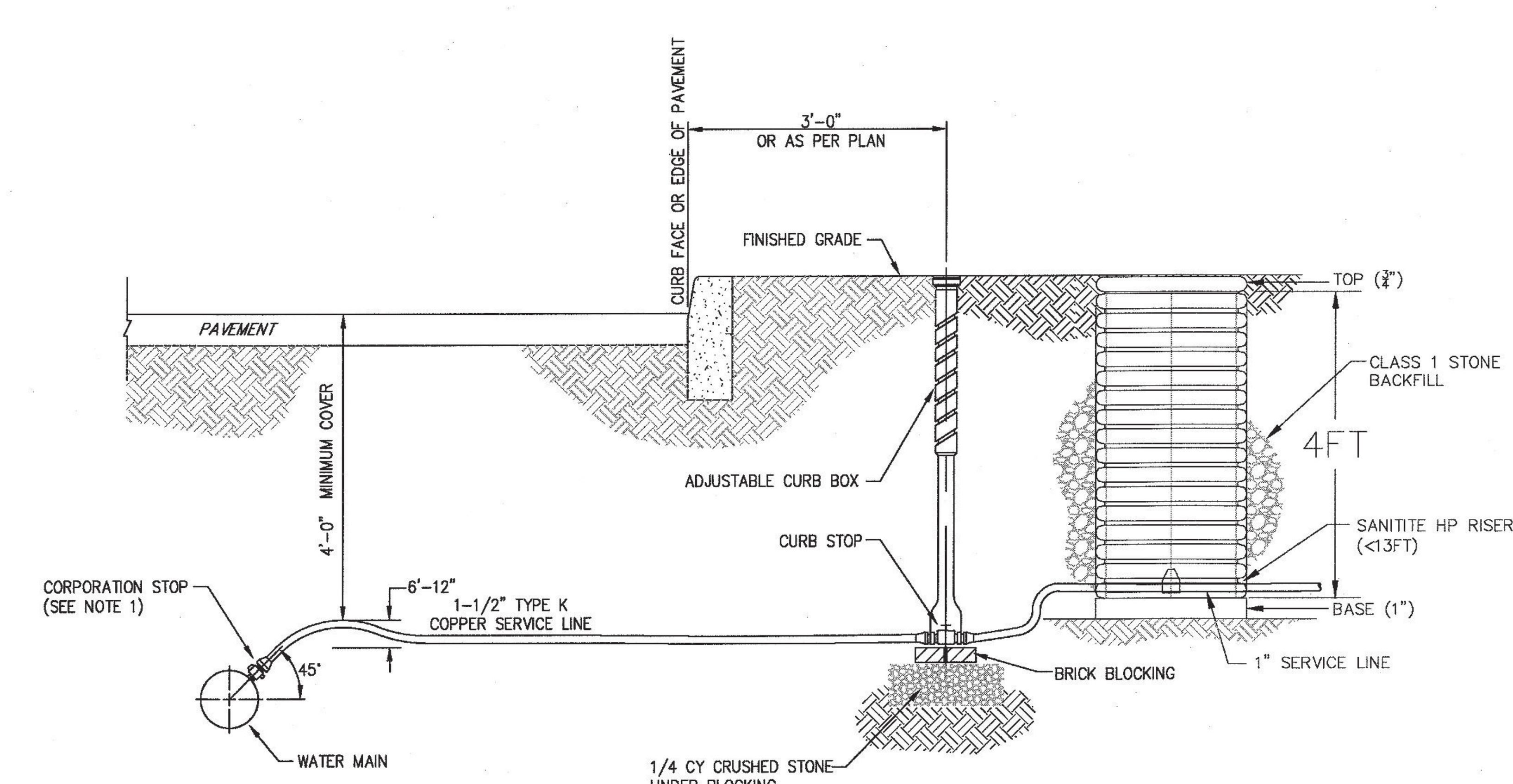
HYDRANT TO FACE PAVEMENT
UNLESS DIRECTED OTHERWISE.



NOTES:

1. ALL CONCRETE THRUST BLOCKS TO BEAR ON UNDISTURBED GROUND.
2. RODDING SHALL CONSIST OF TWO 3/4" THREADED STEEL TIE RODS WITH NUTS AND WASHERS COMPLETE WITH ALL NECESSARY AND REQUIRED CLAMPS, CAREFULLY AND THOROUGHLY COVERED WITH ASPHALT OR OTHER ACCEPTABLE CORROSIVE RETARDING MATERIAL. IN GENERAL, THE METHOD AND TYPES OF MATERIAL REQUIRED IN THE INSTALLATION OF CLAMPS AND THE RODS SHALL BE IN ACCORDANCE WITH THE LATEST NATIONAL FIRE PROTECTION STANDARDS.
3. HYDRANT DRAINS SHALL NOT BE CONNECTED TO OR WITHIN TEN (10) FEET OF SANITARY SEWERS OR STORM DRAINS.
4. IF GROUND WATER IS FOUND WITHIN SEVEN (7) FEET OF THE SURFACE, HYDRANT DRAINS ARE TO BE PLUGGED. WHEN DRAINS ARE TO BE PLUGGED, THE BARRELS MUST BE PUMPED DRY AFTER USE DURING FREEZING WEATHER. SUCH HYDRANTS SHALL BE IDENTIFIED WITH A VISIBLE MARKING AS APPROVED BY THE WATER AUTHORITY.

Water Service Connection (2)



CONSTRUCTION MATERIALS

SIZE	SERVICE LINE (Material)	CORPORATION STOP	CURB STOP	CURB BOX	ENLARGED BASE
3/4"	COPPER	H-15008	H-15214	H-10350	Not Applicable
1"	COPPER	H-15008	H-15214	H-10350	Not Applicable
1-1/2"	COPPER	H-15013	H-15214	H-10350	Not Applicable
2"	COPPER	H-15013	H-15214	H-10350	H-10349

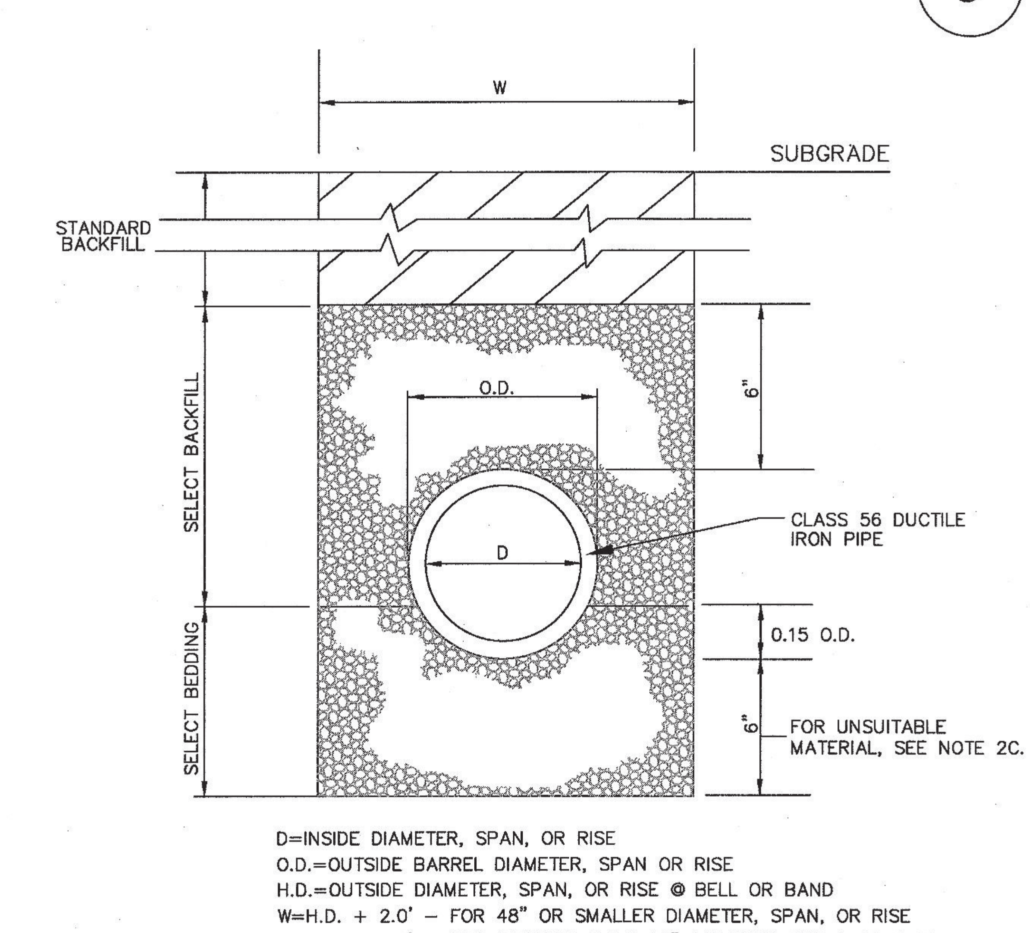
CORPORATION STOP, CURB STOP, CURB BOX AND ENLARGED BASE FOR CURB BOX SHALL BE MUELLER COMPANY OR APPROVED EQUAL. CATALOG NUMBERS SHOWN REFER TO MUELLER COMPANY.

NOTES:

1. INSTALLATION OF 1-1/2" CORPORATION STOPS SHALL BE MADE IN THE UPPER PIPE QUADRANT BUT MAY BE MADE AT ANGLES LESS THAN 45° IF APPROVED BY THE OWNER'S FIELD REPRESENTATIVE.
2. SERVICE LINE SHALL HAVE NO JOINTS BETWEEN THE WATER MAIN AND CURB STOP.

APPROVED FOR ALL PARCELS

Water Main Trench (3)



D=INSIDE DIAMETER, SPAN, OR RISE
O.D.=OUTSIDE BARREL DIAMETER, SPAN OR RISE
H.D.=OUTSIDE DIAMETER, SPAN, OR RISE @ BELL OR BAND
W=H.D. + 2.0' - FOR 48" OR SMALLER DIAMETER, SPAN, OR RISE
W=H.D. + 2.5' - FOR GREATER THAN 48" DIAMETER, SPAN, OR RISE

NOTES:

1. FOR TYPE II TRENCH, MATERIAL FOR SELECT BEDDING AND SELECT BACKFILL SHALL BE:
   A. EITHER SAND OR CRUSHED STONE IF NO WATER IS ENCOUNTERED IN TRENCH.
   B. CRUSHED STONE IF WATER IS ENCOUNTERED IN TRENCH.
2. TYPE II TRENCH SHALL BE USED IN ALL OF THE FOLLOWING CASES:
   A. FOR ALL PVC PIPE AND CONDUIT INSTALLATION.
   B. WHEN ROCK OR HARDPAN IS ENCOUNTERED IN BOTTOM OF TRENCH.
   C. WHEN UNSUITABLE MATERIAL IS ENCOUNTERED IN BOTTOM OF TRENCH. IN SUCH CASE DEPTH OF UNDERCUTTING SHALL BE AS DIRECTED BY THE ENGINEER WITH 6" MINIMUM.
3. FOR ALL TRENCH EXCAVATION IN FILL AREAS, ALL EMBANKMENTS SHALL BE CONSTRUCTED TO A MINIMUM OF 2 FEET ABOVE THE OUTSIDE TOP (AT THE BELL) OF THE PIPE PRIOR TO BEGINNING ANY TRENCH EXCAVATION.

Owner: Parcel A
McKenna Custom Home
Inc. 343 Manville Rd.
Pleasantville, NY 10570

16 1759

No.	REVISIONS	DATE
1	GENERAL REVISIONS	3-19-13
2	GENERAL REVISIONS	4-5-13
3	GENERAL REVISIONS	5-20-13
4	LOT 3 SEPTIC AREA REVISED	12-4-13
5	ADDED DEEP TEST HOLES	12-10-13
6	UPDATE SECTION, BLK & LOT NO.	1-7-14
7	SIGNATURE BLOCK ADDED	2-4-14
8	GENERAL REVISIONS	2-22-16
9	GENERAL REVISIONS	3-18-16
10	GENERAL REVISIONS	4-20-16
11	GENERAL REVISIONS	6-30-16
12	GENERAL REVISIONS	8-3-16

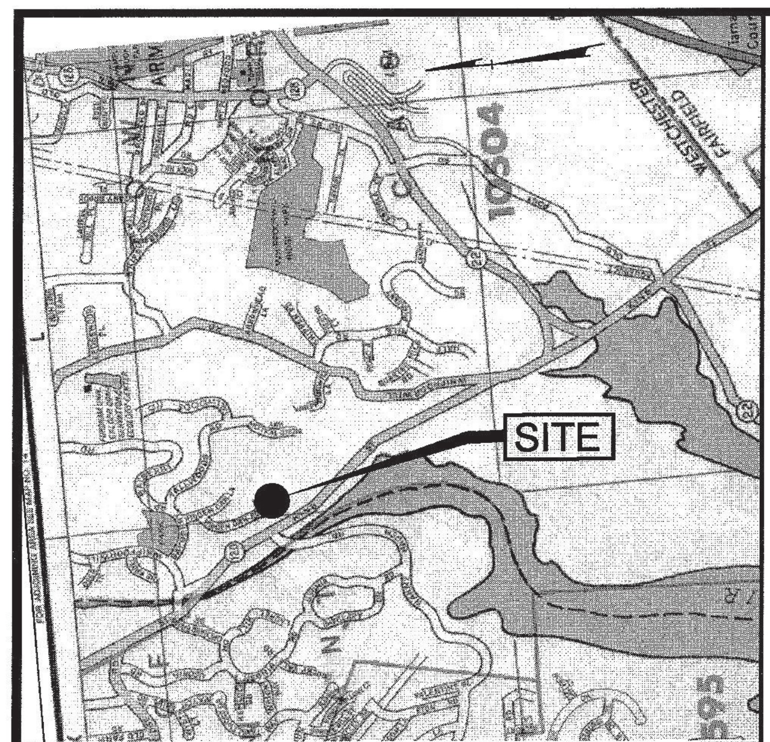
3 LOT SUBDIVSION SITE PLAN PROFILES & DETAILS
Prepared for
McKenna Custom Homes Inc.
13 Hidden Oak Rd
Town of North Castle Westchester Co., N.Y.
Tax Map : Sec. 107.01 , Blk.1, Lot 32
Date: 8-29-15

CAMPBELL ENGINEERING
Civil Engineers
Hydrology Land Planners
Sanitary and Storm Sewers
Water Supply and Sewage Disposal
Michael H.Campbell, PE
25 Memorial Drive
P.O. Box 255
Michael@914engineer.com
(914)238-3555
Fax(914)238-3435
Chappaqua, New York 10514

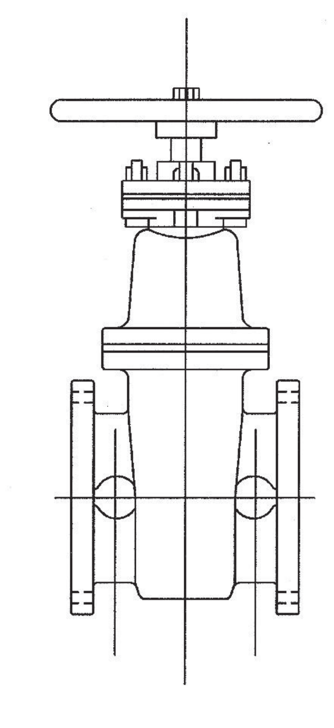
SCALE 1"=40'
SHEET 2 OF 3

D-1

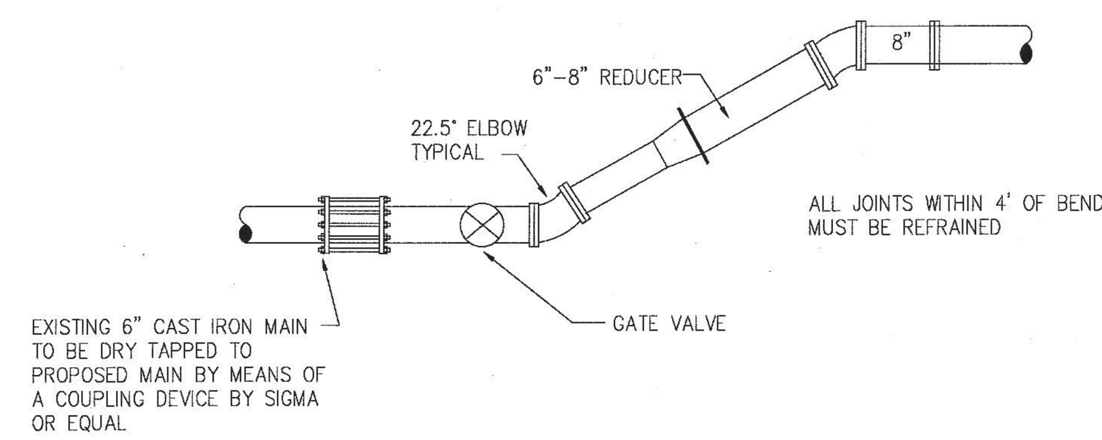
1759-McKenna\McKenna-Hidden Oak.dwg

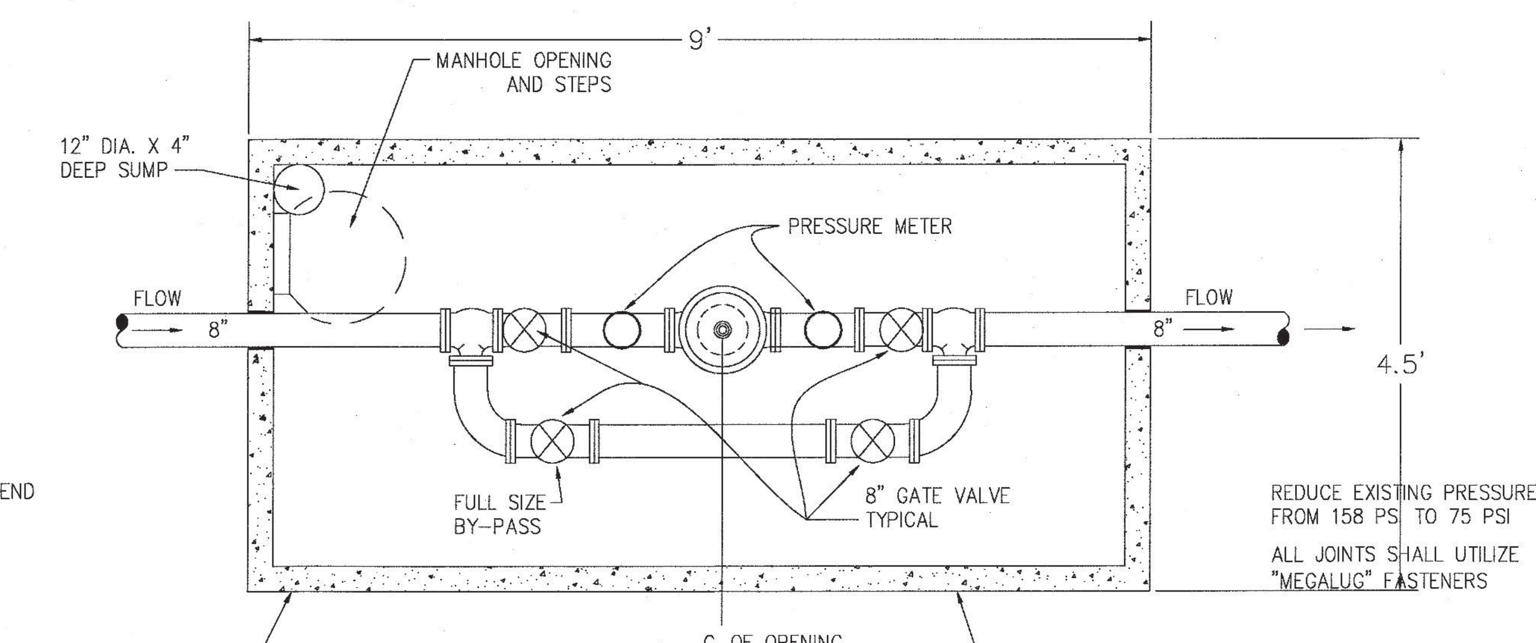


LOCATION MAP
N.T.S.

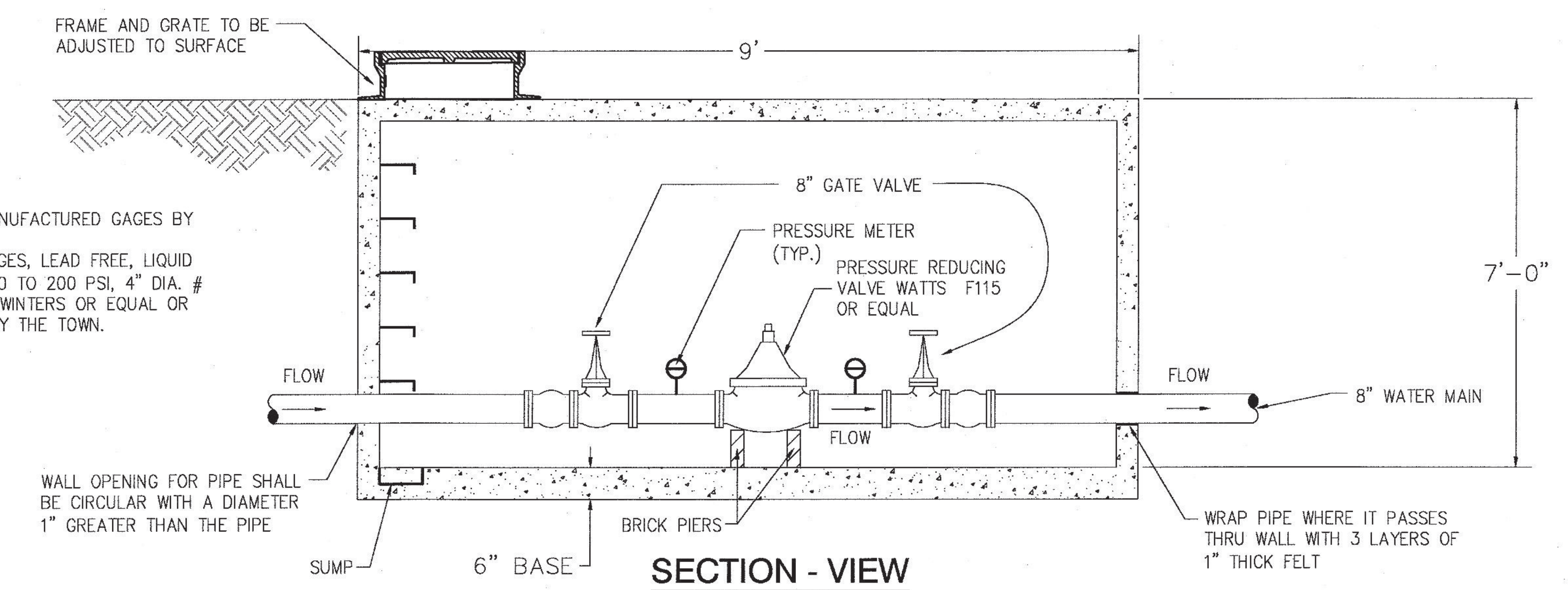


MULLER GATE VALVE
(Flanged Ends)
N.T.S.





PLAN - VIEW



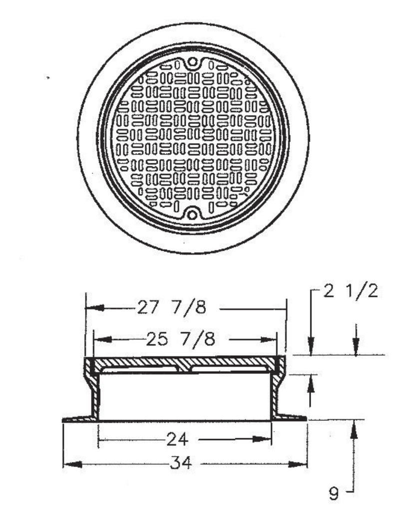
SECTION - VIEW

GAGE NOTES:
1. PRESSURE MANUFACTURED GAGES BY WINTERS.
2. PRESSURE GAGES, LEAD FREE, LIQUID FILLED TYPE, 0 TO 200 PSI, 4" DIA. # PFQ713LF BY WINTERS OR EQUAL OR AS DEFINED BY THE TOWN.

PRESSURE REDUCING SYSTEM WITH RETURN FLOW
NOT TO SCALE

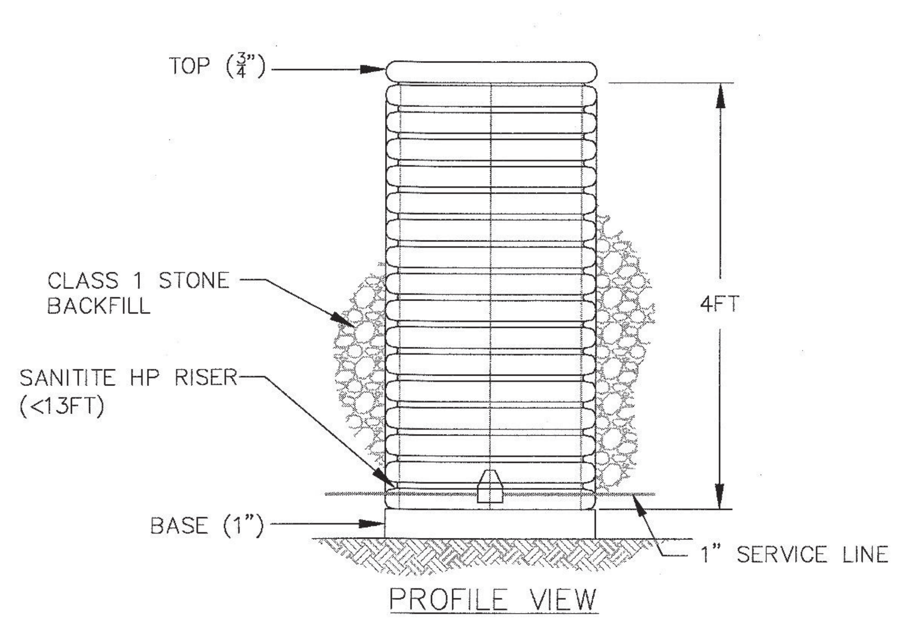
THE "PRESSURE REDUCING VALVE" SHALL BE PROVIDED WITH AN UPSTREAM AND DOWNSTREAM PRESSURE MONITOR TO ASSIST THE OPERATION SETTING TEE VALVE.
A BYPASS SYSTEM MUST BE PROVIDED FOR MAINTENANCE PURPOSES. THE VALVE STRUCTURE SHALL BE BUILT IN A CONCRETE BOX WITH ENOUGH DEPTH TO PREVENT FREEZING. TO REDUCE ANY POSSIBLE CAVITATION WITHIN THE PROPOSED REDUCING VALVE, THE PRESSURE WILL NOT BE REDUCED BELOW THE PRESSURE OF 50 PSI BASED ON THE INLET PRESSURE OF 156 PSI.

THE STATIC PRESSURE AT THE BEGINNING OF THE PROPOSED MAIN IS APPROXIMATELY 158 PSI. THE PRESSURE REDUCING VALVE SHALL BE SET TO REDUCE THE PRESSURE TO 75 PSI. THIS WILL PROVIDE A REDUCED PRESSURE OF APPROXIMATELY 100 PSI ON THE LOWER DERVICE LOCATION. EACH PARCEL SHALL UTILIZE AN INDIVIDUAL PRESSURE REDUCING VALVE TO REDUCE HOME PRESSURE TO APPROXIMATELY 50-60 PSI.



PATTERN NUMBER 1214 5232
(TAKEN FROM SYRACUSE CASTINGS-MARYLAND MUNICIPAL STD.)

MANHOLE COVER FOR PRESSURE REDUCING CHAMBER
N.T.S.

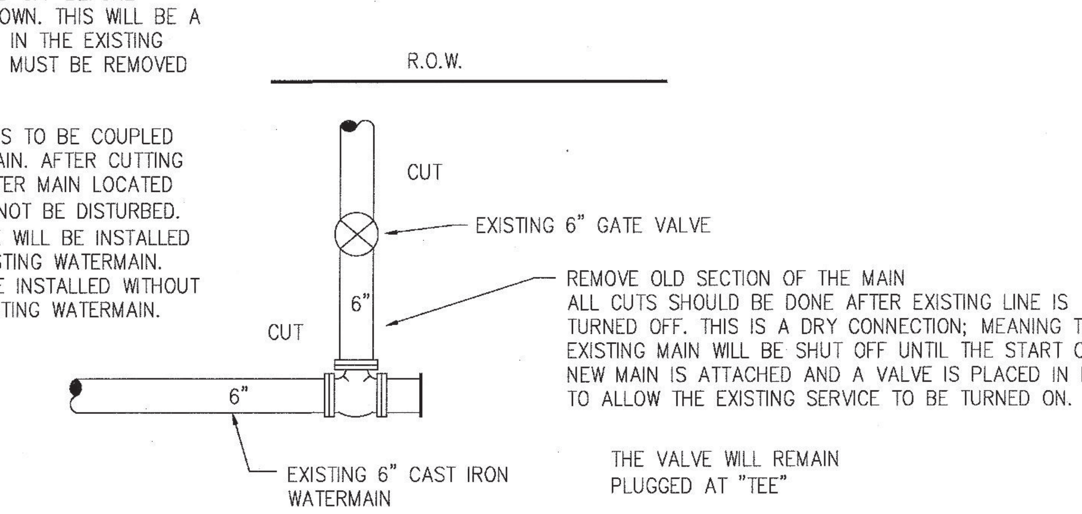


METER PIT
NOT TO SCALE

NOTES:
1. TOWN SHALL PROVIDE WATER METER
2. METER PIT IS TYPICALLY SUPPLIED BY THE SAME COMPANY THAT SUPPLIES THE SERVICE CONNECTION PIPING AND SHALL BE A 3' DIAMETER CORRUGATED PLASTIC PIPE SET ON END AT LEAST 4 FEET IN DEPTH WITH COVER (SEE DETAIL).
3. ALL METER PITS ARE LOCATED WITHIN THE "RIGHT OF WAY" (R.O.W.).
4. THERE IS NO SEPARATION REQUIREMENT FOR DRAINAGE AND DRINKING WATER MAIN. WE HAVE PROVIDED FOR A MINIMUM SEPARATION OF 18" BETWEEN THE PROPOSED WATER MAIN AND THE DRAINAGE PIPES IT CROSSES.

THE EXISTING MAIN MUST BE TURNED OFF BEFORE CUTTING THE EXISTING PIPES AS SHOWN. THIS WILL BE A DRY TAP. ALL PRESSURE REMAINING IN THE EXISTING WATER MAIN AFTER SHUTTING DOWN MUST BE REMOVED BEFORE CUTTING BEGINS.

THE PROPOSED DUCTILE IRON PIPE IS TO BE COUPLED WITH EXISTING CAST IRON WATER MAIN. AFTER CUTTING AND REMOVING AS SHOWN. THE WATER MAIN LOCATED BEYOND THE "RIGHT OF WAY" CAN NOT BE DISTURBED. AFTER THE COUPLING, A (6") VALVE WILL BE INSTALLED TO ALLOW RECHARGING OF THE EXISTING WATERMAIN. THE PROPOSED WATER MAIN CAN BE INSTALLED WITHOUT FURTHER DISTURBANCE TO THE EXISTING WATERMAIN.



THE TOWN TO SUPPLY WATER METERS AT THE TIME LOTS ARE DEVELOPED. THE METER PIT IS A 3' DIAMETER, 4' DEEP CORRUGATED PLASTIC PIPE LENGTH COVER. ALL METERS AND METER PITS ARE TO BE LOCATED WITHIN THE R.O.W.

THERE IS NO REQUIERMENT BETWEEN THE WATER AND DRAINAGE THAT THE WESTCHESTER COUNTY DEPARTMENT OF HEALTH REQUIRES FOR POSSIBLE FUTURE MAINTENANCE WE HAVE PROVIDED A MINIMUM SEPARATION OF 18".

EXISTING PIPE CONFIGURATION
NOT TO SCALE

APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED FEB. 9, 2015.

JOHN P. DELANO, CHAIRMAN
TOWN OF NORTH CASTLE PLANNING BOARD
DATE:

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

JOSEPH CERMELE, PE
KELLARD SESSIONS, P.C.
CONSULTING TOWN ENGINEERS
DATE:

Owner: Parcel A
McKenna Custom Home Inc. 343 Manville Rd. Pleasantville, NY 10570

16 1759

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3 LOT SUBDIVSION SITE PLAN DETAILS
Prepared for
McKenna Custom Homes Inc.
13 Hidden Oak Rd
Town of North Castle Westchester Co., N.Y.
Tax Map : Sec. 107.01 , Blk.1, Lot 32
Date: 1-9-2016

CAMPBELL ENGINEERING
Civil Engineers
Hydrology Land Planners
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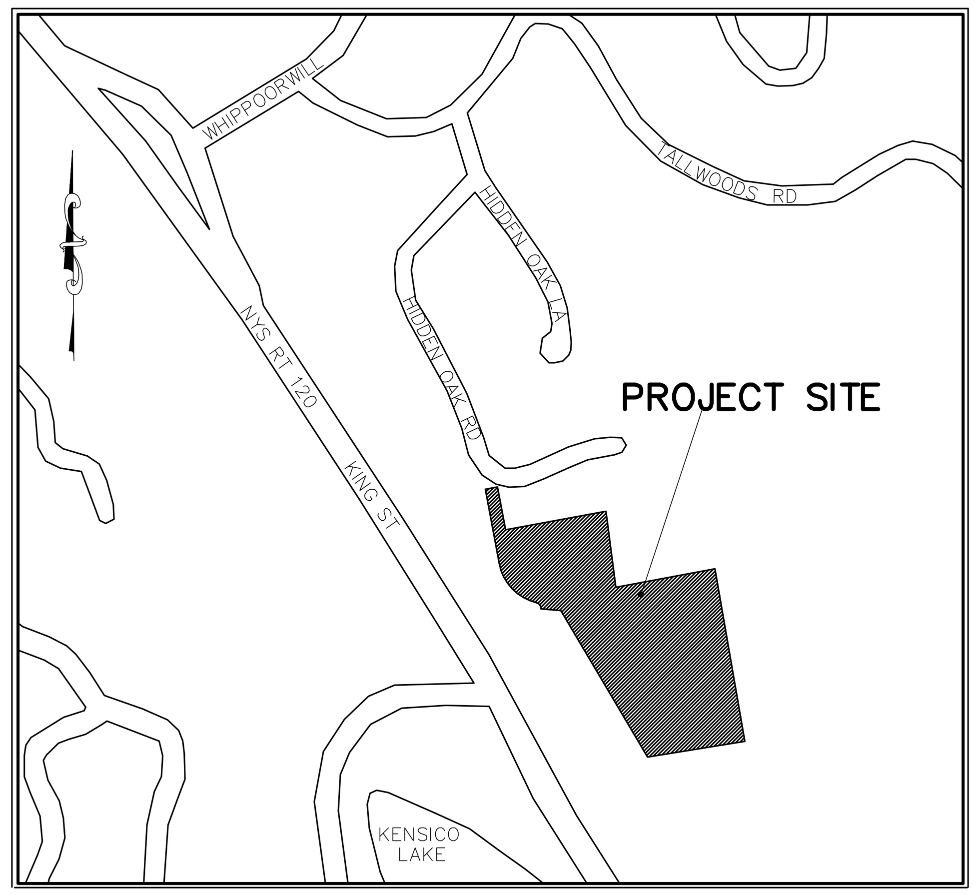
Water Supply and Sewage Disposal
Michael H.Campbell, PE
25 Memorial Drive
P.O. Box 255
Michael@914engineer.com
(914)238-3555
Fax(914)238-3435
Chappaqua, New York 10514

SCALE 1"=40'
SHEET 3 OF 3

D-2

1759-McKenna\McKenna-Hidden Oak.dwg

WELSH ENGINEERING & LAND SURVEYING, P.C.
343 MANVILLE ROAD
PLEASANTVILLE, N.Y. 10570 (914) 773-1701



LOCATION MAP

N.T.S.

NOTES PERTAINING TO FACILITY MAINTENANCE:

1. McKenna Custom Homes shall perform the Maintenance Procedures and shall pay all expenses related to the use, maintenance, repair and replacement of the Stormwater Control Facilities.
2. In the event that the property is conveyed to another party or parties, the subsequent owner or owners shall, as a result of such conveyance, assume all responsibility for performing the Maintenance Procedures and for any other costs associated with using, maintaining, repairing and replacing the Stormwater Control Facilities located on his or their lot or lots except that all property owners shall equally share in the maintenance and repair costs of all control facilities contained in Storm Water Mitigation Areas, identified on the approved subdivision map of McKenna Custom as "Easement for Common Stormwater Management Facilities Maintenance".
3. The conveyance of the property shall unconditionally release the party conveying any such property from all obligations contained herein, unless provided for otherwise in a contract of sale or other agreement between the parties to any such conveyance.

NOTES

1. FIELD SURVEY WAS CONDUCTED DECEMBER, 2004, JANUARY 2005, AUGUST 2014 & JUNE 2015 BY WELSH ENGINEERING & LAND SURVEYING, P.C.

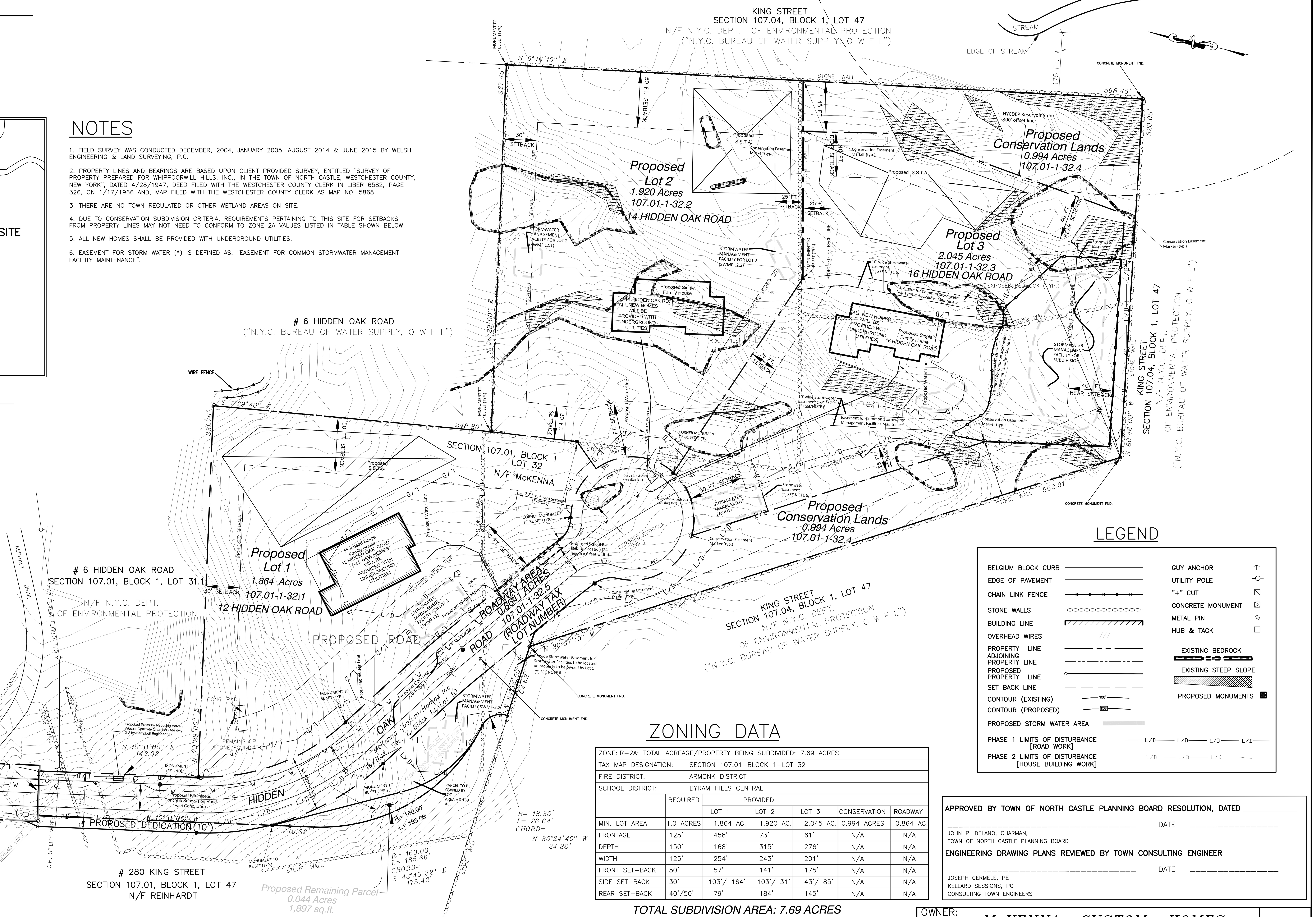
2. PROPERTY LINES AND BEARINGS ARE BASED UPON CLIENT PROVIDED SURVEY, ENTITLED "SURVEY OF PROPERTY PREPARED FOR WHIPPOORWILL HILLS, INC., IN THE TOWN OF NORTH CASTLE, WESTCHESTER COUNTY, NEW YORK", DATED 4/28/1947, DEED FILED WITH THE WESTCHESTER COUNTY CLERK IN LIBER 6582, PAGE 326, ON 1/17/1966 AND, MAP FILED WITH THE WESTCHESTER COUNTY CLERK AS MAP NO. 5868.

3. THERE ARE NO TOWN REGULATED OR OTHER WETLAND AREAS ON SITE.

4. DUE TO CONSERVATION SUBDIVISION CRITERIA, REQUIREMENTS PERTAINING TO THIS SITE FOR SETBACKS FROM PROPERTY LINES MAY NOT NEED TO CONFORM TO ZONE 2A VALUES LISTED IN TABLE SHOWN BELOW.

5. ALL NEW HOMES SHALL BE PROVIDED WITH UNDERGROUND UTILITIES.

6. EASEMENT FOR STORM WATER (*) IS DEFINED AS: "EASEMENT FOR COMMON STORMWATER MANAGEMENT FACILITY MAINTENANCE".



ZONING DATA

ZONE: R-2A; TOTAL ACREAGE/PROPERTY BEING SUBDIVIDED: 7.69 ACRES						
TAX MAP DESIGNATION:	SECTION 107.01–BLOCK 1–LOT 32					
FIRE DISTRICT:	ARMONK DISTRICT					
SCHOOL DISTRICT:	BYRAM HILLS CENTRAL					
	REQUIRED	PROVIDED				
		LOT 1	LOT 2	LOT 3	CONSERVATION	ROADWAY
MIN. LOT AREA	1.0 ACRES	1.864 AC.	1.920 AC.	2.045 AC.	0.994 ACRES	0.864 AC.
FRONTAGE	125'	458'	73'	61'	N/A	N/A
DEPTH	150'	168'	315'	276'	N/A	N/A
WIDTH	125'	254'	243'	201'	N/A	N/A
FRONT SET-BACK	50'	57'	141'	175'	N/A	N/A
SIDE SET-BACK	30'	103'/ 164'	103'/ 31'	43'/ 85'	N/A	N/A
REAR SET-BACK	40'/50'	79'	184'	145'	N/A	N/A

TOTAL SUBDIVISION AREA: 7.69 ACRES

LEGEND

- BELGIUM BLOCK CURB
- EDGE OF PAVEMENT
- CHAIN LINK FENCE
- STONE WALLS
- BUILDING LINE
- OVERHEAD WIRES
- PROPERTY LINE
- ADJOINING PROPERTY LINE
- PROPOSED PROPERTY LINE
- SET BACK LINE
- CONTOUR (EXISTING)
- CONTOUR (PROPOSED)
- PROPOSED STORM WATER AREA
- PHASE 1 LIMITS OF DISTURBANCE [ROAD WORK] — L/D
- PHASE 2 LIMITS OF DISTURBANCE [HOUSE BUILDING WORK] — L/D
- GUY ANCHOR
- UTILITY POLE
- "+" CUT
- CONCRETE MONUMENT
- METAL PIN
- HUB & TACK
- EXISTING BEDROCK
- EXISTING STEEP SLOPE
- PROPOSED MONUMENTS

APPROVED BY TOWN OF NORTH CASTLE PLANNING BOARD RESOLUTION, DATED ____________

______________________ DATE ____________
JOHN P. DELANO, CHARMAN,
TOWN OF NORTH CASTLE PLANNING BOARD

ENGINEERING DRAWING PLANS REVIEWED BY TOWN CONSULTING ENGINEER

______________________ DATE ____________
JOSEPH CERMELE, PE
KELLARD SESSIONS, PC
CONSULTING TOWN ENGINEERS

REVISION	DATES

GRAPHIC SCALE
40 0 40 80 120 160 200
SCALE: 1" = 40'

______________________ DATE: ____________
WILLIAM J. WELSH N.Y. STATE LAND SURVEYOR LIC. # 49626

OWNER:
McKENNA CUSTOM HOMES
343 MANVILLE ROAD, PLEASANTVILLE, NY 10570

DATE: OCT. 6, 2016
DRAWN BY: J.H.
CHK BY: W.J.W.
SCALE: 1" = 40'

PRELIMINARY PLAT
HIDDEN OAK SUBDIVISION
PROPOSED LOTS 1, 2, & 3
[SECTION 107.01 – BLOCK 1 – LOT 32]
IN ARMONK
TOWN OF NORTH CASTLE
WESTCHESTER COUNTY, NEW YORK

SHEET NO. 1 OF 1
PROJ. NO. 0526.00
JOB # 0526.00
CAD FILE: 052600_SUB2014.DWG

Short Environmental Assessment Form
Part 1 - Project Information

Instructions for Completing

Part 1 - Project Information. The applicant or project sponsor is responsible for the completion of Part 1. Responses become part of the application for approval or funding, are subject to public review, and may be subject to further verification. Complete Part 1 based on information currently available. If additional research or investigation would be needed to fully respond to any item, please answer as thoroughly as possible based on current information.

Complete all items in Part 1. You may also provide any additional information which you believe will be needed by or useful to the lead agency; attach additional pages as necessary to supplement any item.

Part 1 - Project and Sponsor Information

Name of Action or Project:
Hidden Oak Subdivision

Project Location (describe, and attach a location map):
13 Hidden Oak Road (at south end of Hidden Oak Road)

Brief Description of Proposed Action:
The proposed subdivision is a Conservation Subdivision which will subdivide the subject 7.69 acre property into three single family lots. Access to the three new lots will be via extension of Hidden Oak Road by a public 24-foot wide road. Each new lot will be supplied with potable water from extension of the existing Town water main. Wastewater will be treated in a septic system on each lot.

Name of Applicant or Sponsor: McKenna Custom Homes, Inc	Telephone: (914) 769-1869 E-Mail: info@mckennacustom.com

Address:
433 Manville Road

City/PO:	State:	Zip Code:
Pleasantville	NY	10570

	NO	YES
1. Does the proposed action only involve the legislative adoption of a plan, local law, ordinance, administrative rule, or regulation? If Yes, attach a narrative description of the intent of the proposed action and the environmental resources that may be affected in the municipality and proceed to Part 2. If no, continue to question 2.	☑	☐
2. Does the proposed action require a permit, approval or funding from any other governmental Agency? If Yes, list agency(s) name and permit or approval: New York City Department of Environmental Protection for Stormwater Pollution Prevention Plan Westchester County Health Department for extension of water main and for septic systems	☐	☑

3.a. Total acreage of the site of the proposed action? 7.69 acres
b. Total acreage to be physically disturbed? 5.34 acres
c. Total acreage (project site and any contiguous properties) owned or controlled by the applicant or project sponsor? 7.69 acres

4. Check all land uses that occur on, adjoining and near the proposed action.
☐ Urban ☐ Rural (non-agriculture) ☐ Industrial ☐ Commercial ☑ Residential (suburban)
☑ Forest ☐ Agriculture ☐ Aquatic ☐ Other (specify): ____________
☐ Parkland

	NO	YES	N/A
5. Is the proposed action,			
a. A permitted use under the zoning regulations?	☐	☑	☐
b. Consistent with the adopted comprehensive plan?	☐	☑	☐

	NO	YES
6. Is the proposed action consistent with the predominant character of the existing built or natural landscape?	☐	☑
7. Is the site of the proposed action located in, or does it adjoin, a state listed Critical Environmental Area? If Yes, identify: ______	☑	☐
8. a. Will the proposed action result in a substantial increase in traffic above present levels?	☑	☐
b. Are public transportation service(s) available at or near the site of the proposed action?	☑	☐
c. Are any pedestrian accommodations or bicycle routes available on or near site of the proposed action?	☑	☐
9. Does the proposed action meet or exceed the state energy code requirements? If the proposed action will exceed requirements, describe design features and technologies: ______	☐	☑
10. Will the proposed action connect to an existing public/private water supply? If No, describe method for providing potable water: ______	☐	☑
11. Will the proposed action connect to existing wastewater utilities? If No, describe method for providing wastewater treatment: Each house will have its own septic system.	☑	☐
12. a. Does the site contain a structure that is listed on either the State or National Register of Historic Places?	☑	☐
b. Is the proposed action located in an archeological sensitive area?	☑	☐
13. a. Does any portion of the site of the proposed action, or lands adjoining the proposed action, contain wetlands or other waterbodies regulated by a federal, state or local agency?	☐	☑
b. Would the proposed action physically alter, or encroach into, any existing wetland or waterbody? If Yes, identify the wetland or waterbody and extent of alterations in square feet or acres: ______	☑	☐

14. Identify the typical habitat types that occur on, or are likely to be found on the project site. Check all that apply:
☐ Shoreline ☑ Forest ☐ Agricultural/grasslands ☐ Early mid-successional
☐ Wetland ☐ Urban ☐ Suburban

	NO	YES
15. Does the site of the proposed action contain any species of animal, or associated habitats, listed by the State or Federal government as threatened or endangered?	☑	☐
16. Is the project site located in the 100 year flood plain?	☑	☐
17. Will the proposed action create storm water discharge, either from point or non-point sources? If Yes,	☐	☑
a. Will storm water discharges flow to adjacent properties? ☐ NO ☑ YES		
b. Will storm water discharges be directed to established conveyance systems (runoff and storm drains)? If Yes, briefly describe: ☐ NO ☑ YES Stormwater discharge will continue to flow to same locations as at present, albeit at reduced peak rates of flow, attenuated volumes of runoff in accordance with the approved SWPPP as a result of the implementation of the stormwater management plan for the project.		

	NO	YES
18. Does the proposed action include construction or other activities that result in the impoundment of water or other liquids (e.g. retention pond, waste lagoon, dam)? If Yes, explain purpose and size: Stormwater detention facility for peak rate attenuation and water quality improvement. Detention facility is approximately 120 feet x 60 feet in size.	☐	☑
19. Has the site of the proposed action or an adjoining property been the location of an active or closed solid waste management facility? If Yes, describe:	☑	☐
20. Has the site of the proposed action or an adjoining property been the subject of remediation (ongoing or completed) for hazardous waste? If Yes, describe:	☑	☐

I AFFIRM THAT THE INFORMATION PROVIDED ABOVE IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE

Applicant/sponsor name: Kevin McKenna (Alan L. Pilch, PE, ~~RLA,~~ agent) Date: 05/05/2021

Signature: Alan Pilch

PRINT FORM

TOWN OF NORTH CASTLE

WESTCHESTER COUNTY
17 Bedford Road
Armonk, New York 10504-1898

PLANNING DEPARTMENT
Adam R. Kaufman, AICP
Director of Planning

Telephone: (914) 273-3542
Fax: (914) 273-3554
www.northcastleny.com

Application for Preliminary Subdivision Approval

Application Name
Hidden Oak Subdivision

I. IDENTIFICATION OF PROPERTY OWNER, APPLICANT AND PROFESSIONAL REPRESENTATIVES

Name of Property Owner: McKenna Custom Homes, Inc.

Mailing Address: 433 Manville Road, Pleasantville, NY 10570

Telephone: (914) 769-1869 Fax: (914) 769-8575 e-mail info@mckennacustom.com

---

Name of Applicant (if different): not applicable

Address of Applicant: ____________________

Telephone: ____________ Fax: ____________ e-mail ____________

Interest of Applicant, if other than Property Owner:

____

Is the Applicant (if different from the property owner) a Contract Vendee?

Yes ☐ No ☐

If yes, please submit affidavit sating such. If no, application cannot be reviewed by Planning Board

---

Name of Professional Preparing Site Plan:
Alan L. Pilch, PE, RLA, ALP Engineering & Landscape Architecture, PLLC

Address: P.O. Box 843, Ridgefield, CT 06877

Telephone: (475) 215-5353 Fax: ____________ e-mail alan@eaec-inc.com

---

Name of Other Professional: Bill Welsh PE, LS, Welsh Engineering & Land Surveying, PC

Address: 12 Campwoods Grounds, Ossining, NY 10562

Telephone: (914) 497-9981 Fax: ____________ e-mail bwelsh@welshpc.com

---

Name of Attorney (if any): ____________________

Address: ____________________

Telephone: ____________ Fax: ____________ e-mail ____________

Applicant Acknowledgement

By making this application, the undersigned Applicant agrees to permit Town officials and their designated representatives to conduct on-site inspections in connection with the review of this application.

The Applicant also agrees to pay all expenses of publication and the giving of public notice as required, and further acknowledges that he/she shall be responsible for reimbursing the Town for the cost of professional review services required for this application.

It is further acknowledged by the Applicant that all bills for the expenses of publication and the giving of public notice as well as professional consultant review services shall be mailed to the Applicant, unless the Town is notified in writing by the Applicant at the time of initial submission of the application that such mailings should be sent to a designated representative instead.

Signature of Applicant: ______________________ Date: 8.5.21

Signature of Property Owner: ________________ Date: 8.5.21

Must have both signatures

II. IDENTIFICATION OF SUBJECT PROPERTY

Property Street Address: 13 Hidden Oak Road

Location (in relation to nearest intersecting street):

1,200 feet (north, south, east or west) of Bayberry Rd - Hidden Oak Road intersection

Abutting Street(s): Hidden Oak Road

Tax Map Designation (NEW): Section 107.01 Block 1 Lot 31.2

Tax Map Designation (OLD): Section 2 Block 1K Lot 10

Zoning District: R-2A Total Land Area 7.69 acres

Land Area in North Castle Only (if different) not applicable

Fire District(s) Armonk F.D. School District(s) Byram Hills

Is any portion of subject property abutting or located within five hundred (500) feet of the following:

The boundary of any city, town or village?
No X Yes (adjacent) _____ Yes (within 500 feet) ______
If yes, please identify name(s): ________________________

The boundary of any existing or proposed County or State park or any other recreation area?
No X Yes (adjacent) _____ Yes (within 500 feet) ______

The right-of-way of any existing or proposed County or State parkway, thruway, expressway, road or highway?
No ____ Yes (adjacent) _____ Yes (within 500 feet) X

The existing or proposed right-of-way of any stream or drainage channel owned by the County or for which the County has established channel lines?
No X Yes (adjacent) _____ Yes (within 500 feet) ______

The existing or proposed boundary of any county or State owned land on which a public building or institution is situated?
No X Yes (adjacent) ______ Yes (within 500 feet) ______

The boundary of a farm operation located in an agricultural district?
No X Yes (adjacent) _______ Yes (within 500 feet) ______

Does the Property Owner or Applicant have an interest in any abutting property?
No X Yes ______

If yes, please identify the tax map designation of that property:

not applicable

III. DESCRIPTION OF PROPOSED DEVELOPMENT

Type of Subdivision proposed: Conventional _______ Conservation __X__

Total Number of Lots Proposed on Preliminary Subdivision Plat: __3__

Total Number of Lots Proposed in North Castle Only (if different): ________

Are any new streets proposed? No _____ Yes __X__

Has the center line of each proposed street been staked? No ______ Yes __X__

If no, please indicate the date by which such center lines will be staked: ________

Have the corners of each proposed lot been identified with appropriate stakes? No _____ Yes __X__

If no, please indicate the date by which such lot corners will be staked: ________

Are any waivers from the provisions of Chapter 355 (Zoning) or Chapter 275 (Subdivision of Land) of the North Castle Town Code requested? No __X__ Yes ______

If yes, please specify type: ________________________________

Earthwork Balance: Cut __2,400__ C.Y. Fill __2,400__ C.Y.

Will Development on the subject property involve any of the following:

Areas of special flood hazard? No __X__ Yes ______
(If yes, application for a Development Permit pursuant to Chapter 177 of the North Castle Town Code may also be required)

Trees with a diameter at breast height (DBH) of 8" or greater?

No _____ Yes __X__
(If yes, application for a Tree Removal Prmit pursuant to Chapter 308 of the North Castle Town Code may also be required.)

Town-regulated wetlands? No __X__ Yes _____
(If yes, application for a Town Wetlands Permit pursuant to Chapter 340 of the North Castle Town Code may also be required.)

State-regulated wetlands? No __X__ Yes _____
(If yes, application for a State Wetlands Permit may also be required.)

IV. SUBMISSION REQUIREMENTS

The preliminary subdivision application package shall include all materials submitted in support of the application, including but not limited to the application form, plans, reports, letters and SEQR Environmental Assessment Form. **Submission of the following shall be required:**

- One (1) set of the preliminary subdivision application package (for distribution to the Town Planner for preliminary review purposes).
- Once a completed preliminary subdivision checklist has been received from the Planning Department, eight (8) additional sets of the site development plan application package (for distribution to Planning Board, Town Engineer, Town Attorney, Town Planner, Planning Board Secretary, police, fire department and ambulance corps).
- One (1) additional reduced sized set (11” x 17”) of the preliminary subdivision application package if any portion of the subject property abuts or is located within five hundred (500) feet of the features identified in Section II of this application form (for distribution to Westchester County Planning Board).
- A check for the required application fee and a check for the required Escrow Account, both checks made payable to "Town of North Castle" in the amount specified on the "Schedule of Application Fees."

(continued next page)

V. INFORMATION TO BE INCLUDED ON PRELIMINARY SUBDIVISION PLAT

The following checklist is provided to enable the Applicant to determine if he/she has provided enough information on the preliminary subdivision plat and preliminary construction plans for the Planning Board to review his/her proposal. Applicants are advised to review Chapter 275 of the North Castle Town Code for a complete enumeration of pertinent requirements and standards prior to making application for preliminary subdivision plat approval.

The information required to be shown on the preliminary subdivision plat and the preliminary construction plans may be combined and shown on one plan to be identified as the Integrated Plot Plan. Whether this information is presented on one or two different plans, the application for preliminary subdivision plat approval will not be accepted for Planning Board review unless all items identified below are supplied and **so indicated with a check mark in the blank line provided.** If a particular item is not relevant to the subject property or the development proposal, **the letters "NA" should be entered instead**.

The information to be included on an Integrated Plot Plan shall include:

_✓_ Name of the proposed subdivision or other identifying title and signature block.

_✓_ Name and address of the Property Owner and the Applicant (if different).

_✓_ Name, address and telephone number of the surveyor, engineer or other legally qualified professional and the seal of the professional who prepared the plan.

_✓_ Names and locations of all owners of record of properties abutting and directly across any and all adjoining streets from the subject property, including the tax map designation of the subject property and abutting and adjoining properties, as shown on the latest tax records.

_✓_ Existing zoning, fire district, school district, special district and municipal boundaries.

_✓_ Names of existing streets

_✓_ Total acreage of the property to be developed, as well as property boundaries showing dimensions and bearings as determined by a current survey; name and width of existing streets; and lines of existing rights-of-way, reservations, easements and areas dedicated to public uses.

_n.a._ Reference to the location and conditions of any covenants, easements or deed restrictions that cover all or any part of the property, as well as identification of the document where such covenants, easements or deed restrictions are legally established .

_✓_ Schedule of minimum zoning requirements, as well as the proposed lots' compliance with those requirements, including lot area, frontage, lot width, lot depth, building coverage, yards and other pertinent requirements.

_✓_ Site location map, at a scale of one (1) inch equals eight hundred (800) feet, showing the Applicant's entire property in relation to surrounding properties, streets, etc. within five hundred (500) feet of the site.

_✓_ North arrow, written and graphic scales, and the date of the original plan and all revisions, with notations identifying the revisions.

_✓_ Existing topographical contours with a vertical interval of two (2) feet or less.

_✓_ Location of existing floodplains, wetlands, slopes of 15% or greater, wooded areas, landscaped areas, single trees with a DBH of 8" or greater, rock outcrops, stone walls and any other significant existing natural or cultural features.

_✓_ Location of temporary stakes in the field to enable the Planning Board to find and appraise features of the preliminary plat.

_✓_ Location of existing use and design of buildings and other structures.

_✓_ Location of all other existing site improvements, including pavement, walks, curbing, retaining wall and fences.

_✓_ Location and sizes of existing water supply, sanitary sewage disposal, storm water drainage and other utility lines and structures within and nearby the proposed subdivision.

_✓_ Location of all existing monuments.

_✓_ Proposed arrangement of lots, including identifying numbers and approximate area and dimensions of each.

_✓_ Proposed layout of new streets, including sight distance at all proposed road intersections, widths and approximate curve radii, and any proposed rights-of-way, easements, deed restrictions, covenants and/or reservations.

_n.a._ Location, size and nature of any area proposed to be reserved for park purposes.

_✓_ Proposed system for the provision of water supply and fire protection facilities, sanitary sewage disposal facilities, storm water drainage facilities and other utility services.

_✓_ Proposed street profiles and cross-sections showing the approximate grade of proposed streets, the relationship of existing grades to proposed grades and the proposed vertical curvature along the center line of all new streets.

_✓_ Proposed names for new streets.

_✓_ Location of proposed monuments.

_n.a._ Where the preliminary plat includes only a portion of the Applicant's contiguous holding, the Applicant shall also indicate on a sketch, at a scale of not less than one (1) inch equals two hundred (200) feet, the probable future street system, lot arrangement, and location of park and other reservations for the remaining portion of the tract and topographic data with vertical contour interval of not more than ten (10) feet.

_n.a._ For all proposed subdivision plans containing land within an area of special flood hazard, the data required to ensure compliance with Chapter 177 of the North Castle Town Code.

_✓_ For all proposed subdivision plans involving clearing or removal of trees with a DBH of 8" or greater, the data required to ensure compliance with Chapter 308 of the North Castle Town Code.

_n.a._ For all proposed subdivision plans involving disturbance to Town-regulated wetlands, the data required to ensure compliance with Chapter 340 of the North Castle Town Code.

TOWN OF NORTH CASTLE
WESTCHESTER COUNTY
17 Bedford Road
Armonk, New York 10504-1898

PLANNING DEPARTMENT
Adam R. Kaufman, AICP
Director of Planning

Telephone: (914) 273-3542
Fax: (914) 273-3554
www.northcastleny.com

Application for Final Subdivision Approval

Application Name

Hidden Oak Subdivision

I. IDENTIFICATION OF PROPERTY OWNER, APPLICANT AND PROFESSIONAL REPRESENTATIVES

Name of Property Owner: McKenna Custom Homes, Inc.

Mailing Address: 433 Manville Road, Pleasantville, NY 10570

Telephone: (914) 769-1869 Fax: (914) 769-8575 e-mail info@mckennacustom.com

Name of Applicant (if different): not applicable

Address of Applicant: ______

Telephone: ______ Fax: ______ e-mail ______

Interest of Applicant, if other than Property Owner:

______

Is the Applicant (if different from the property owner) a Contract Vendee?

Yes ☐ No ☐

If yes, please submit affidavit sating such. If no, application cannot be reviewed by Planning Board

Name of Professional Preparing Site Plan:
Alan L. Pilch, PE, RLA, ALP Engineering & Landscape Architecture, PLLC

Address: P.O. Box 843, Ridgefield, CT 06877

Telephone: (475) 215-5353 Fax: ______ e-mail alan@eaec-inc.com

Name of Other Professional: Bill Welsh PE, LS, Welsh Engineering & Land Surveying, PC

Address: 12 Campwoods Grounds, Ossining, NY 10562

Telephone: (914) 497-9981 Fax: ______ e-mail bwelsh@welshpc.com

Name of Attorney (if any): ______

Address: ______

Telephone: ______ Fax: ______ e-mail ______

Applicant Acknowledgement

By making this application, the undersigned Applicant agrees to permit Town officials and their designated representatives to conduct on-site inspections in connection with the review of this application.

The Applicant also agrees to pay all expenses of publication and the giving of public notice as required, and further acknowledges that he/she shall be responsible for reimbursing the Town for the cost of professional review services required for this application.

It is further acknowledged by the Applicant that all bills for the expenses of publication and the giving of public notice as well as professional consultant review services shall be mailed to the Applicant, unless the Town is notified in writing by the Applicant at the time of initial submission of the application that such mailings should be sent to a designated representative instead.

Signature of Applicant: ____________________ Date: 8.5.21

Signature of Property Owner: ________________ Date: 8.5.21

Must have both signatures

II. IDENTIFICATION OF SUBJECT PROPERTY

Street Address: Hidden Oak Road

Location (in relation to nearest intersecting street):

1,200 feet (north, south, east or west) of Bayberry Rd - Hidden Oak Rd intersection

Abutting Street(s): Hidden Oak Road

Tax Map Designation (NEW): Section 107.01 Block 1 Lot 31.2

Tax Map Designation (OLD): Section 2 Block 1K Lot 10

Zoning District: R-2A Total Land Area 7.69 acres

Land Area in North Castle Only (if different) not applicable

Fire District(s) Armonk F.D. School District(s) Byram Hills

Is any portion of subject property abutting or located within five hundred (500) feet of the following:

The boundary of any city, town or village?
No X Yes (adjacent) _____ Yes (within 500 feet) ______
If yes, please identify name(s): ________________________

The boundary of any existing or proposed County or State park or any other recreation area?
No X Yes (adjacent) _____ Yes (within 500 feet) ______

The right-of-way of any existing or proposed County or State parkway, thruway, expressway, road or highway?
No ____ Yes (adjacent) _____ Yes (within 500 feet) X

The existing or proposed right-of-way of any stream or drainage channel owned by the County or for which the County has established channel lines?
No X Yes (adjacent) _____ Yes (within 500 feet) ______

The existing or proposed boundary of any county or State owned land on which a public building or institution is situated?
No X Yes (adjacent) ______ Yes (within 500 feet) ______

The boundary of a farm operation located in an agricultural district?
No X Yes (adjacent) _______ Yes (within 500 feet) ______

Does the Property Owner or Applicant have an interest in any abutting property?
No X Yes ______

If yes, please identify the tax map designation of that property:

not applicable

III. DESCRIPTION OF PROPOSED DEVELOPMENT

Type of Subdivision proposed: Conventional _______ Conservation __X__

Total Number of Lots Proposed on Final Subdivision Plat: ___3___

Total Number of Lots Proposed in North Castle Only (if different): __________

Is the final subdivision plat in conformance with the approved preliminary subdivision plat?

No _______ Yes __X__

If no, please identify any differences between the two plats ______________________________

____

____

____

____

Are any waivers from the provisions of Chapter 355 (Zoning) or Chapter 275 (Subdivision of Land) of the North Castle Town Code requested? No __X__ Yes ______

If yes, please specify type: ____

Earthwork Balance: Cut __2,400__ C.Y. Fill __2,400__ C.Y.

Will Development on the subject property involve any of the following:

Areas of special flood hazard? No __X__ Yes ______
(If yes, application for a Development Permit pursuant to Chapter 177 of the North Castle Town Code may also be required)

Trees with a diameter at breast height (DBH) of 8" or greater?

No _____ Yes __X__
(If yes, application for a Tree Removal Permit pursuant to Chapter 308 of the North Castle Town Code may also be required.)

Town-regulated wetlands? No __X__ Yes _____
(If yes, application for a Town Wetlands Permit pursuant to Chapter 340 of the North Castle Town Code may also be required.)

State-regulated wetlands? No __X__ Yes _____
(If yes, application for a State Wetlands Permit may also be required.)

IV. SUBMISSION REQUIREMENTS

The final subdivision plat application package shall include all materials submitted in support of the application, including but not limited to the application form, final plat, final construction plans, Coverage Calculations Worksheet for each lot, reports, letters and SEQR Environmental Assessment Form. **Submission of the following shall be required:**

- One (1) set of the final subdivision application package (for distribution to the Town Planner for preliminary review purposes).

- Once a completed final subdivision checklist has been received from the Planning Department, eight (8) additional sets of the site development plan application package (for distribution to Planning Board, Town Engineer, Town Attorney, Town Planner, Planning Board Secretary, police, fire department and ambulance corps).

- One (1) additional reduced sized set (11" x 17") of the final subdivision application package if any portion of the subject property abuts or is located within five hundred (500) feet of the features identified in Section II of this application form (for distribution to Westchester County Planning Board).

- A check for the required application fee and a check for the required Escrow Account fee, both made payable to "Town of North Castle" in the amount specified on the "Schedule of Application Fees."

During the course of review of this application, the Applicant may be requested to supply additional copies of the final subdivision plat application package for referral to other agencies as determined to be necessary by the Planning Board or its designated representatives.

(continued next page)

V. INFORMATION TO BE INCLUDED ON THE FINAL SUBDIVISION PLAT

The following checklist is provided to enable the Applicant to determine if he/she has provided enough information on the final subdivision plat and final construction plans for the Planning Board to review his/her proposal. Applicants are advised to review Chapter 275 of the North Castle Town Code for a complete enumeration of pertinent requirements and standards prior to making application for final subdivision plat approval.

The information required to be shown on the final subdivision plat and the final construction plans may be combined and shown on one plan to be identified as the Integrated Plot Plan. The application for final subdivision plat approval will not be accepted for Planning Board review unless all items identified below are supplied and **so indicated with a check mark in the blank line provided.** If a particular item is not relevant to the subject property or the development proposal, **the letters "NA" should be entered instead**.

The information to be included on the final subdivision plat shall include:

__✓__ Name of the proposed subdivision or other identifying title.

__✓__ Name and address of the Property Owner and the Applicant (if different).

__✓__ Name, address and telephone number of the surveyor, engineer or other legally qualified professional who prepared the plan as well as the seal of the professional preparing the plan

__✓__ Names and locations of all owners of record of properties abutting and directly across any and all adjoining streets from the subject property, including the tax map designation of the subject property and abutting and adjoining properties, as shown on the latest tax records.

__✓__ Location and dimensions of all boundary lines of the proposed subdivision and all existing and proposed streets, lot lines, easements and rights-of-way, with sufficient data to readily determine the location, bearing and length of all such lines and to reproduce such lines upon the ground.

__✓__ Names of all existing and proposed streets .

__✓__ Locations of all water bodies, watercourses and other wetlands.

__✓__ Location of all proposed Clearing and Grading Limit Lines.

__✓__ Location of all existing buildings, including identification of all buildings to be removed as a condition of approval.

__✓__ Total acreage included in the entire subdivision, and the identification number and acreage of all lots and land reservations within the proposed subdivision.

__✓__ Location of all existing and proposed monuments.

__✓__ Site location map, at a scale of one (1) inch equals eight hundred (800) feet, showing the Applicant's entire property in relation to surrounding properties, streets, etc. within five hundred (500) feet of the site.

__✓__ North arrow, written and graphic scales, and the date of the original plan and all revisions, with notations identifying the revisions.

__✓__ Notations explaining any drainage, sight, slope, road widening, park area or other reservations or easements, including any self-imposed restrictions or covenants.

__✓__ Endorsement of approval by the Westchester County Department of Health

__✓__ Signature block for Planning Board endorsement of approval.

The information to be included on the final construction plans shall include the following:

✓ Plans and profiles showing the location and a typical cross-section of street pavements, including curbs and gutters, sidewalks, manholes and catch basins; the location of street trees, street lighting and street signs; the location, size and invert elevations of existing and proposed sanitary sewers, storm water drains and fire hydrants; the location and size of all water, gas or other underground utilities or structures; and the location and design of any other required improvements.

✓ Profiles showing existing and proposed elevations along the center line of all streets. Where a proposed street intersects an existing street or streets, the elevation along the center line of the existing street or streets within one hundred (100) feet of the intersection shall be shown.

n.a. Where steep slopes exist and when required by the Planning Board, cross-sections showing existing and proposed elevations of all new streets every one hundred (100) feet at five (5) points on a line at right angles to the center line of the street, said elevation points to be at the center line of the street, at each property line and at points twenty-five (25) feet inside each property line.

✓ Location, size, elevation and other appropriate description of any existing facilities which will be connected to proposed facilities and utilities within the subdivision.

✓ Where the design of the subdivision requires regrading of land, the regraded contours shall be shown, along with estimates of the quantity of material to be added or removed and the proposed measures to be implemented by the Applicant to rehabilitate the disturbed area or areas.

✓ Where the design of the subdivision requires blasting, the blasting areas and proposed measures to reduce impacts shall be shown as required by the Planning Board.

✓ Where the design of the subdivision requires the regarding of land, the regarded contours shall be shown along with the estimated quantify of material to be added or removed and the proposed measures to be implemented by the subdivider to rehabilitate the disturbed area or areas

✓ Title of all sheets; the name, address, signature and seal of the licensed professional preparing the construction plans; the date prepared, including revision dates, if any; the north arrow, written and graphic scales and consecutive numbering of each street in the series of plans.

✓ Notation indicating intended compliance with the Town construction standards and specifications as well as with the requirements of the Planning Board resolution of approval.

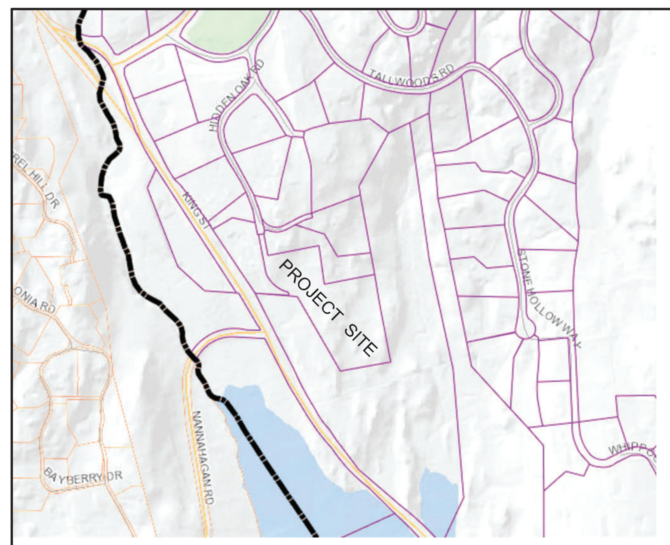
✓ Signature block for Planning Board endorsement of approval.

The application for final subdivision plat approval shall also be accompanied by the following:

✓ Proof of ownership by the Applicant of the premises affected by the application and certificate of title company covering all interests, liens and objections to title, if any.

✓ Where subdivision roads and/or other improvements are involved, a statement from the Applicant's engineer giving the estimated cost of construction, together with the quantities and unit costs used in preparing the estimate.

n.a. A list of any and all waivers of the provisions of Chapter 355 (Zoning) and Chapter 275 (Subdivision of Land) of the Town of North Castle Town Code which the Applicant requests the Planning Board to grant in this specific case, with the reasons therefor.



LOCATION MAP
Scale: 1"=800 feet

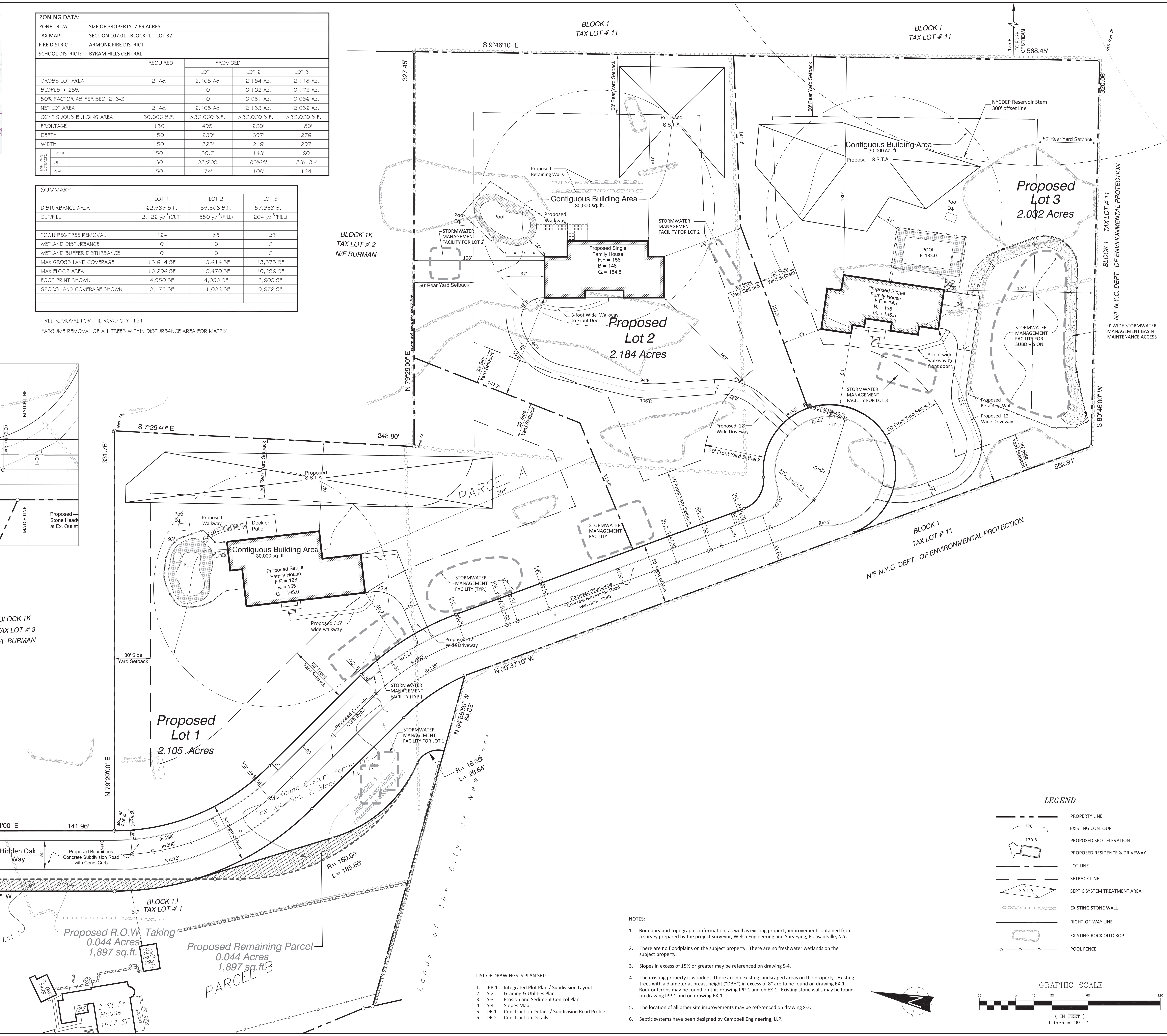
ZONING DATA:				
ZONE: R-2A	SIZE OF PROPERTY: 7.69 ACRES			
TAX MAP:	SECTION 107.01 , BLOCK: 1 , LOT 32			
FIRE DISTRICT:	ARMONK FIRE DISTRICT			
SCHOOL DISTRICT:	BYRAM HILLS CENTRAL			

	REQUIRED	PROVIDED		
		LOT 1	LOT 2	LOT 3
GROSS LOT AREA	2 Ac.	2.105 Ac.	2.184 Ac.	2.118 Ac.
SLOPES > 25%		0	0.102 Ac.	0.173 Ac.
50% FACTOR AS PER SEC. 213-3		0	0.051 Ac.	0.086 Ac.
NET LOT AREA	2 Ac.	2.105 Ac.	2.133 Ac.	2.032 Ac.
CONTIGUOUS BUILDING AREA	30,000 S.F.	>30,000 S.F.	>30,000 S.F.	>30,000 S.F.
FRONTAGE	150	495'	200'	180'
DEPTH	150	239'	397'	276'
WIDTH	150	325'	216'	297'
MIN. YARD SETBACKS — FRONT	50	50.7'	143'	60'
MIN. YARD SETBACKS — SIDE	30	93'/209'	85'/68'	33'/134'
MIN. YARD SETBACKS — REAR	50	74'	108'	124'

SUMMARY			
	LOT 1	LOT 2	LOT 3
DISTURBANCE AREA	62,939 S.F.	59,503 S.F.	57,853 S.F.
CUT/FILL	2,122 yd^3(CUT)	550 yd^3(FILL)	204 yd^3(FILL)
TOWN REG TREE REMOVAL	124	85	129
WETLAND DISTURBANCE	0	0	0
WETLAND BUFFER DISTURBANCE	0	0	0
MAX GROSS LAND COVERAGE	13,614 SF	13,614 SF	13,375 SF
MAX FLOOR AREA	10,296 SF	10,470 SF	10,296 SF
FOOT PRINT SHOWN	4,950 SF	4,050 SF	3,600 SF
GROSS LAND COVERAGE SHOWN	9,175 SF	11,096 SF	9,672 SF

TREE REMOVAL FOR THE ROAD QTY: 121

*ASSUME REMOVAL OF ALL TREES WITHIN DISTURBANCE AREA FOR MATRIX



LIST OF DRAWINGS IS PLAN SET:

1. IPP-1 Integrated Plot Plan / Subdivision Layout
2. S-2 Grading & Utilities Plan
3. S-3 Erosion and Sediment Control Plan
4. S-4 Slopes Map
5. DE-1 Construction Details / Subdivision Road Profile
6. DE-2 Construction Details

NOTES:

1. Boundary and topographic information, as well as existing property improvements obtained from a survey prepared by the project surveyor, Welsh Engineering and Surveying, Pleasantville, N.Y.
2. There are no floodplains on the subject property. There are no freshwater wetlands on the subject property.
3. Slopes in excess of 15% or greater may be referenced on drawing S-4.
4. The existing property is wooded. There are no existing landscaped areas on the property. Existing trees with a diameter at breast height ("DBH") in excess of 8" are to be found on drawing EX-1. Rock outcrops may be found on this drawing IPP-1 and on EX-1. Existing stone walls may be found on drawing IPP-1 and on drawing EX-1.
5. The location of all other site improvements may be referenced on drawing S-2.
6. Septic systems have been designed by Campbell Engineering, LLP.

OWNER:
McKenna Custom Homes, Inc.
343 Manville Road
Pleasantville, NY 10570
Tel: (914) 769-1869

CONSULTANTS:

CAMPBELL ENGINEERING, LLP
25 Memorial Drive
P.O. Box 255
Chappaqua, New York 10514
Tel: (914) 238-3555
Fax: (914) 238-3435

WELSH ENGINEERING & LAND SURVEYING, P.C.
343 MANVILLE ROAD
PLEASANTVILLE, N.Y. 10570 Tel: (914) 773-1701

ISSUED:

SEAL:

STATE OF NEW YORK
ALAN L. PILCH
LICENSED PROFESSIONAL ENGINEER

PROJECT NAME:
HIDDEN OAK SUBDIVISION
Hidden Oak Road
Town of North Castle, New York

ENGINEER AND ENVIRONMENTAL CONSULTANT:
EVANS ASSOCIATES
ENVIRONMENTAL CONSULTING, INC.
205 Amity Road
Bethany, Connecticut 06524
T. (203) 393-0690
F. (203) 393-0196
email: evans.associates@eaec-inc.com

Drawing title:
Integrated Plot Plan/ Subdivision Layout

Date:	July 15, 2014
Dwn. by:	alp
ID:	_C12-2013.E-4.5
EAEC Proj. No.:	

IPP-1

STORMWATER POLLUTION PREVENTION PLAN REPORT

Hidden Oak Subdivision

Hidden Oak Road
Town of North Castle
Westchester County, New York

Date: March 1, 2016

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Stormwater Pollution Prevention Plan Report Table of Contents

A. Narrative Report

Introduction: Six Step Design Process (pg.20)

The stormwater management measures included in the SWPPP to control the rate and volume of runoff, and to treat runoff from the site, must be detailed in a narrative report, plans, details and specifications. Primary stormwater management practices are specifically defined in the Watershed Regulations as stormwater ponds, stormwater wetlands, infiltration systems, filtering systems and open channels as listed in Section 3.3.1 of the Design Manual. Each stormwater management practice shall be designed to accommodate the quantity of runoff flowing to the practice, including runoff from off-site areas as applicable. The following information should be included as applicable to the location and design of the various stormwater management components:

a. Descriptions of the stormwater management practices including practices to treat, attenuate and convey post development stormwater runoff; (pg.27)

b. The design provisions included in the stormwater management facilities that address safety and maintenance needs; (pg.27)

c. Results of on-site soil analysis and infiltration tests, as applicable, that evaluate the suitability of the site for stormwater management facilities. An on-site determination of the elevation of bedrock and groundwater by excavation or soil borings at the proposed site of any proposed infiltration facilities; as discussed elsewhere in this Guide, on-site soil analysis should be witnessed by DEP; (pg.34)

d. A schedule for construction of the stormwater management facilities; (pg. 35)

e. Calculation of the imperviousness of tributary areas to each stormwater management practice to determine if practices in series are required; (pg.35)

f. Pre and post development drainage maps; (pg.37)

g. Hydrographs, peak discharge rates and total runoff volumes from the project area for existing conditions for the 10-year, and 100-year 24-hour storm events. The relevant variables used in this determination, including curve number and times of concentration, must be included; (pg.37)

h. The hydrographs used to evaluate post-construction volume and rate of stormwater runoff for the 1-year, 10-year, and 100-year 24-hour storm events; the relevant variables used in this determination, including curve number and times of concentration, must be included; (pg.37)

i. Calculations of the water treatment volume including a comparison of the volume of runoff generated by the 1 year - 24 hour storm event and the water quality volume generated using the 90% rule; (pg.37)

j. Calculations of the required runoff reduction volume (based on the 1-year, 24-hour storm in the EOH watershed); (pg.37)

k. Calculations supporting design of runoff reduction techniques provided; (pg.38)

l. Designs and supporting calculations for water quality treatment facilities and the compliance with the requirements and recommendations for design of these facilities in the Design Manual; (pg.38)

m. Calculations upon which the required storage volume and surface area requirements necessary to provide flood control for runoff generated by 1-year, 10-year, and 100-year, 24-hour storm events were based; (pg.38)

c. Existing impervious surfaces must be depicted, as well as locations of any vehicular entry to or exit from, the site. Existing land uses and structures, types of vegetative cover, public/permanent open space, public facilities, utility lines and easements, water supply wells, and sewage treatment systems must also be depicted. A supplemental Existing Conditions Plan is preferred when extensive details on the plan create a congested drawing that is difficult to interpret. (pg.42)
d. United States Department of Agriculture ("USDA") Soil Survey boundaries on the site, soil descriptions, and tabular information detailing, by sub-watershed, the USDA Soil Conservation Service ("SCS") Hydrologic Soil Groups; (pg.42)
e. Site constraints that may affect erosion control and stormwater management facility design and operation will be identified by field survey. These constraints include steep slopes (15% and greater), soils identified as being highly erodible by the USDA Soil Survey, depth to bedrock, depth to seasonal high water, and poorly and excessively drained soils; (pg.42)
f. The location and size of on and off-site culverts and stormwater management systems that convey runoff to, through, and away from the project site. The configuration and size of the drainage area contributing to these systems must also be shown. (pg.43)

The following should be depicted on a plan, or plans, at a scale not to exceed 1" = 50':
a. All reservoirs, reservoir stems, controlled lakes, wetlands and watercourses that affect, or may be affected by, the project, and applicable limiting distances; (pg.43)
b. Proposed lot layout and property lines, buildings, streets, and other impervious surfaces, utility lines, water supply wells, sewage treatment systems, and location and types of any easements on the project site as applicable; (pg. 43)
c. Tabular information, by sub-watershed, indicating the acres of impervious surface created by the proposed activities, and the acreage for which the imperviousness of the land will be changed from pre-construction conditions; (pg. 43)
d. The percent imperviousness of the post-construction drainage area(s) contributory to a proposed stormwater management practice(s); (pg. 43)
e. Proposed on-site topography at two (2) foot contour intervals and other areas that will be disturbed during construction; (pg. 43)
f. All proposed erosion and sediment controls and stormwater management facilities that will be implemented to control erosion and sedimentation during construction and increases in runoff and pollutants from the site after construction has been completed; (pg. 43)
g. Construction details and specifications, cross-sections, and elevations of all proposed structures; (pg. 43)
h. A soil profile to at least one foot below each stormwater management facility (three (3) feet for infiltration practices). All proposed structures and site modifications, including the final grading proposed for the site at two (2) foot contour intervals; (pg. 43)
i. Design details and specifications of proposed structural stormwater management facilities and an indication of which facilities will be used to control rates of discharge, which will be used to treat stormwater runoff from a water quality perspective, and which facilities will perform both functions; (pg. 43)

(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 a greater amount is determined necessary pursuant to an approved SWPPP (pg. 51);*
(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 (pg. 51);*
(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 (pg. 52);*
(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 (pg. 52);*
(h) *A site map/construction drawing(s) specifying the location(s), size(s) and length(s) of each erosion and sediment control practice (pg. 56);*
(i) *Dimensions, material specifications and installation details for all erosion and sediment control practices, including the siting and sizing of any temporary sediment basins (pg.56);*
(j) *Temporary practices that will be converted to permanent control measures (pg. 56);*
(k) *Implementation schedule for staging temporary erosion and sediment control practices, including the timing of initial placement and the duration that each practice should remain in place (pg. 56);*
(l) *Maintenance schedule to ensure continuous and effective operation of the erosion and sediment control practice (pg. 57);*
(m) *Name(s) of the receiving water(s) (pg. 57);*
(n) *Delineation of SWPPP implementation responsibilities for each part of the site (pg. 57);*
(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 (pg. 57); and*
(p) *Any existing data that describes the stormwater runoff at the site (pg. 54).*
(q) *Post-construction stormwater controls to the satisfaction of the Town Engineer for disturbances not meeting Condition A, B or C in § **173-5B(2)** of the Town Code (pg. 57).*

(2) *Land development activities as defined in § **173-4B** of the Town Code and meeting Condition A, B or C below shall also include water quantity and water quality controls (post-construction stormwater runoff controls) as set forth in § **173-5B(3)** below as applicable (pg. 58):*

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

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

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

(3) SWPPP requirements for Conditions A, B and C (pg. 58):

*(a) All information in § **173-5B(1)** of the Town Code.*

(b) Description of each post-construction stormwater management practice (pg. 58).

(c) Site map/construction drawing(s) showing the specific location(s) and size(s) of each post-construction stormwater management practice (pg. 58).

(d) Hydrologic and hydraulic analysis for all structural components of the stormwater management system for the applicable design storms (pg. 58);

(e) Comparison of post-development stormwater runoff conditions with predevelopment conditions (pg. 58).

(f) Dimensions, material specifications and installation details for each post-construction stormwater management practice (pg. 59).

(g) Maintenance schedule to ensure continuous and effective operation of each post-construction stormwater management practice (pg. 59).

(h) Maintenance easements to ensure access to all stormwater management practices at the site for the purpose of inspection and repair. Easements shall be recorded on the plan and shall remain in effect with transfer of title to the property (pg. 59).

*(i) Inspection and maintenance agreement binding on all subsequent landowners served by the on-site stormwater management measures in accordance with § **173-7** of the Town Code (pg. 59).*

(j) For Condition A, the SWPPP shall be prepared by a landscape architect, certified professional or professional engineer and must be signed by the professional preparing the plan, who shall certify that the design of all stormwater management practices meets the requirements in this chapter (pg. 59).

C. Other environmental permits. The applicant shall assure that all other applicable environmental permits have been or will be acquired for the land development activity prior to approval of the final stormwater design plan (pg. 59).

D. Contractor certification (pg. 60).

(1) Each contractor and subcontractor identified in the SWPPP 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."

(2) *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 (pg. 60).*

(3) *The certification statement(s) shall become part of the SWPPP for the land development activity (pg. 60).*

E. *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 (pg. 60).*

LIST OF DRAWINGS

Dwg No.	*Drawing Title*	*Date*
CS-1	*Cover Sheet*	*03/01/2016*
IPP-1	*Site Layout Plan*	*03/01/2016*
S-2	*Site Grading and Utilities Plan*	*03/01/2016*
S-3.1	*Erosion and Sediment Control Plan/ Tree Removal & Protection Plan – Phase 1*	*03/01/2016*
S-3.2	*Erosion and Sediment Control Plan/ Tree Removal & Protection Plan – Phase 2*	*03/01/2016*
S-4	*Slopes Map*	*07/24/2015*
S-5	*Landscape Plan*	*03/01/2016*
DE-1	*Construction Details*	*03/01/2016*
DE-2	*Construction Details*	*03/01/2016*
DE-3	*Subdivision Road and Driveway Profiles*	*03/01/2016*
DE-4	*Erosion Control/Restoration Notes/Trees*	*03/01/2016*
DE-5	*Construction Details / Maintenance Plan*	*03/01/2016*
DA-1	*Existing Conditions Drainage Area Map*	*04/09/2015*
DA-2	*Future Conditions Drainage Area Map*	*03/01/2016*
EX-1	*Existing Conditions Plan*	*11/17/2014*

FIGURES

TABLES

APPENDICES:

STORMWATER POLLUTION PREVENTION PLAN REPORT

A. INTRODUCTION

This Stormwater Pollution Prevention Plan (SWPPP) report has been prepared in accordance with the requirements of Chapter 173, Stormwater Management of the Town of North Castle. This report is also submitted in accordance with the technical standards set forth in the New York City Department of Environmental Protection *Guide to Stormwater Pollution Prevention Plans* and the New York State Department of Environmental Conservation's *2015 Stormwater Management Design Manual* and the 2015 General Permit for Stormwater Discharges from Construction Activity. This report describes the Stormwater Pollution Prevention Plan for the proposed subdivision of land and the development of the three lots as depicted on the Integrated Plot Plan.

The property is located within the Kensico Reservoir watershed and thus lies within the New York City water supply watershed.

1. Project Description

a. A description of the project type, including proposed facilities and structures, acreage of the entire site, the anticipated acreage of disturbance, and acreage of the site for which the imperviousness will be changed from pre-construction conditions. The acreage for which imperviousness will change should be provided in tabular form by sub-watershed to facilitate the review;

Project type: The project is a Conservation Subdivision of a property for the construction of three single family houses. The site construction will include: three single family houses, a 24-foot width road for access to the houses from Hidden Oak Road, driveways to each of the homes, and potentially swimming pools on each of the lots. Each house will obtain water from an extension of the existing public water main in Hidden Oak Road into the property; wastewater for each of the houses will be disposed of in an on-site leaching system.

Acreage of the Site: The project site is 335,016 square feet (7.691 acres) in size and is located at the south end of Hidden Oak Road, a Town road (see **Figure 1**, Site Location Map).

The property is irregular in shape, and is approximately 860 feet in a north-south direction and 460 feet in an east-west direction. At present the subject property is mostly wooded, although there are remnants of a small building foundation in the northern portion of the property.

Acreage of the Site for which Imperviousness will be changed: **Table 1**, below, summarizes the existing and future condition drainage areas analyzed, and provides the size of the drainage area and the amount of impervious surfaces in each subcatchment area.

Table 1. Drainage Areas Analyzed/Imperviousness

Drainage Areas Analyzed	*Drainage Area (in acres)*	*Impervious Surfaces (in acres)*
Drainage Areas to Design Point 1		
Existing Drainage Area, XDA-1	4.790	0.049
Future Condition Drainage Area, FDA-1.1	0.672	0
Future Condition Drainage Area, FDA-1.2	0.446	0.292
Future Condition Drainage Area, FDA-1.3	4.076	0.233
Future Condition Drainage Area, FDA-1.4	0.157	0
Future Condition Drainage Area, FDA-L1	0.212	0.194
Future Condition Drainage Area, FDA-L2.1	0.132	0.073
Future Condition Drainage Area, FDA-L2.2	0.098	0.098
Future Condition Drainage Area, FDA-L3.1	0.261	0.052
Future Condition Drainage Area, FDA-L3.2	0.098	0.023
Drainage Areas to Design Point 2		
Existing Drainage Area, XDA-2	4.866	0.050
Future Condition Drainage Area, FDA-2.1	0.890	0
Future Condition Drainage Area, FDA-2.3	0.655	0.286
Future Condition Drainage Area, FDA-2.3	1.951	0.019
Drainage Areas to Design Point 3		
Existing Drainage Area, XDA-3	0.529	0
Future Condition Drainage Area, FDA-3	0.529	0
Drainage Areas to Design Point 4		
Existing Drainage Area, XDA-4	0.242	0
Future Condition Drainage Area, FDA-4	0.242	0

b. The anticipated project start and completion dates;
It is anticipated that the work will commence in the summer of 2016 and be completed by the end of 2017.

c. A description of existing site conditions including soil types, existing land use, vegetative cover, steep slopes, wetlands, watercourses, reservoirs, and reservoir stems located on or near the site;

A summary of the soils description from the Soils Survey of Putnam and Westchester Counties may be referenced below (see **Figure 2**, Soils Map).

<u>Charlton loam</u> (ChC) soils are very dark grayish brown (10YR 3/2) loam over dark brown (10YR 3/3) loam. They are gently sloping, very deep and well-drained soils located on hilltops and parts of hills. This soil is formed in glacial till underlain by highly fractured, folded tilted granite, schist, and gneiss bedrock.

Charlton-Chatfield Complex soils (CrC) are very dark grayish brown (10YR 3/2) loam over dark brown (10YR 3/3) loam. They are very deep to moderately deep, well-drained to somewhat excessively drained soils located on the sides and tops of glaciated hills. This soil is formed in glacial till underlain by highly fractured, folded tilted granite, schist, and gneiss bedrock. Rock outcrops make up approximately 20 percent of this soil.

Chatfield-Hollis-Rock Outcrop Complex soils (CtC) are very dark grayish brown (10YR 3/2) loam over dark brown (10YR 3/3) loam. They are rolling, moderately deep, well-drained to somewhat excessively well drained soils. Rock outcrops in this soil unit are predominately granite, gneiss, and schist. This soil is located on hilltops and narrow ridges of glaciated hills.

Existing land use: The vast majority of the property is wooded. There are remnants of a small building foundation in the northern portion of the property.

Description of vegetative cover: Second growth wooded vegetation is evident from the species distribution (white ash and black locust predominate) and size of trees (most trees are smaller than 18" diameter at breast height).

Steep slopes: The steeper slopes are located in bands in the northern, central and southeastern portions of the property. About 90% of the property features slopes that are less than 25%. Over about one-third of the property, the slopes is than 8%. 55% of the property has slopes which range from 8% to 25%. **Table 2**, Hidden Oak Subdivision Slope Analysis presents the areas and percent of the site within six slope ranges.

Table 2. Hidden Oak Subdivision Slope Analysis

Slope Range	Area (in sq feet)	Percent of Site (%)
0-3%	42,660	12.8
3-8%	66,988	20.0
8-15%	114,282	34.2
15-25%	76,823	23.0
25-35%	22,743	6.8
>35%	10,773	3.2
TOTALS	334,269	100.0

Wetlands: There are no NYSDEC regulated freshwater wetlands on or adjacent to the site, and the most recent NYSDEC freshwater wetland map (see New York State Freshwater Wetlands Map, Westchester County, Map 11 of 14, Glenville Quadrangle Digital Edition, 1991) does not include any state regulated wetlands on or immediately adjacent to the subject site. Freshwater wetland G-11 is located approximately 325 feet to the southeast of the site; freshwater wetland G-12 is located 450 feet south of the site on the east side of King Street. Freshwater wetland G-10 is located 250 feet west of the property on the west side of King Street, south of Nannyhagen Road. There are no watercourses on the property, nor are there any Town regulated wetlands on or immediately adjacent to the project site (i.e. no wetland buffers from off-site wetlands or watercourses extend into the subject property).

Watercourses: There are no on-site watercourses. There is an off-site watercourse located approximately 175 feet to the east of the property. This watercourse is classified by the New York State Department of Environmental Conservation as a Class AA stream.

Reservoirs and Reservoir Stems: The Kensico Reservoir is located about 560 feet to the southwest of the subject property. The reservoir stem extends to a point to the southeast of the subject property. The 300-foot offset from the reservoir stem extends into the southeastern corner of the property (see drawings IPP-1 and S-2 for extent of reservoir stem).

d. An analysis of potential impacts that the proposed activity will have on reservoirs, reservoir stems, controlled lakes, wetlands, and watercourses;

The subdivision of the property and the construction of new impervious surfaces (road, houses, driveways and other house related impervious surfaces) has the potential to impact the reservoir and reservoir stem. No construction is proposed within the reservoir stem. The conservation subdivision being proposed will create permanent wooded open space which will cover most of the reservoir stem on the subject property. A comprehensive stormwater management plan is proposed to be implemented to reduce and minimize any potential impacts. The description of the stormwater management measures is described fully below.

e. A general description of the approaches which will be taken to control erosion and sedimentation during construction and an itemization of soil disturbance for each phase of construction;

The Erosion and Sediment Control Plan for the project has been developed to prevent erosion during construction and prevent siltation or sedimentation on off-site lands and watercourses. The plans delineating the location, construction and installation of the proposed short and long term erosion control measures are included in this report (as well as on drawing S-3). Construction details of the Erosion and Sediment Control Plan may be referenced on drawing DE-2.

Short-term impacts resulting from proposed construction activities are minimized through the implementation of comprehensive sediment and erosion control measures. All sediment and erosion control measures used during construction will be consistent with the techniques identified in the New York State Department of Environmental Conservation publication *Standards and Specifications for Erosion and Sediment Control*, latest edition. Measures to be implemented include the use of silt fence, stone check dams, water bars, inlet protection, stabilized construction entrances, as well as other erosion and sediment control techniques.

The sediment and erosion control plan incorporates a variety of measures to reduce, to the maximum extent practicable, the erosion of soils from the site during and after construction. Temporary measures to be employed during construction include, but are not limited to the following: (1) inlet protection around proposed storm drainage inlets; (2) temporary stone check dams in the vegetated swales; (3) silt fences at the limit of disturbance; (4) water bars in the subdivision road, and (5) a stabilized construction entrance to the property.

f. A summary of the proposed post-development stormwater management practices proposed and the discharge rate(s) of stormwater runoff following construction; and

Runoff from the developed subdivision property will be managed in one stormwater management basin ("SWMB"), to be constructed as an extended detention shallow wetland, five subsurface infiltration facilities, one bioretention facility, and one rain garden (see **Table 3**, below).

Table 3. Summary of Proposed Stormwater Management Practices

Drainage Area	Stormwater Management Facility	Type of Facility	Contributing Area
FDA-1.1	SWMF-1.1	Bioretention Facility	Rear and side yard of Lot 1
FDA-1.2	SWMF-1.2	Infiltration (chambers)	Lower portion of subdivision road including cul-de-sac
FDA-2.2	SWMF-2.2	Infiltration (chambers)	Upper portion of subdivision road
FDA-2.3	SWMF-2.3	Vegetated swale/ Open Channel	Rear and side yard of Lot 1, on- and – off-site woods/driveway
FDA-L1	SWMF-L1	Infiltration (chambers)	House, patio and driveway of Lot 1
FDA-L2.1	SWMF-L2.1	Infiltration (chambers)	House and portion of driveway of Lot 2
FDA-L2.2	SWMF-L2.2	Infiltration (chambers)	House and portion of driveway of Lot 2
FDA-L3.1	SWMF-L3.1	Rain Garden	Portion of house roof of Lot 3
FDA-L3.2	SWMF-L3.2	Rain Garden	Portion of driveway to Lot 3
FDA-1.1, 1.2, 1.3 1.4, L1, L2.1, L2.2, L3.1, L3.2	SWMF Basin 1	Extended Detention Stormwater Wetland	Central portion of property; rear portion of house and the pool and pool deck on Lot 3

The pre- and post-development peak rates of runoff are summarized below in **Table 4**.

Table 4. Pre- and Post-Development Peak Rates of Runoff
(all flows in cubic feet per second)

DRAINAGE AREA	1 year	2 year	10 year	25 year	100 year
Design Point 1					
Pre-development	0.39	0.75	2.94	4.89	8.27
Post-development	0.12	0.26	2.26	4.02	6.18
Design Point 2					
Pre-development	0.37	0.74	3.30	5.68	9.81
Post-development	0.25	0.46	2.10	3.59	6.11
Design Point 3					
Pre-development	0.04	0.09	0.45	0.77	1.33
Post-development	0.07	0.13	0.55	0.90	1.50
Design Point 4					
Pre-development	0.11	0.16	0.41	0.60	0.91
Post-development	0.11	0.16	0.41	0.60	0.91

g. If any of the erosion and sediment control practices or post-construction stormwater management practices proposed do not conform with the requirements of the Watershed Regulations or General Permit-0-10-001, a discussion should be provided that includes the reason for the deviation and information demonstrating that the alternative design is equivalent to the technical standards.

The erosion and sediment control practices and the post-construction stormwater management practices are proposed to be in conformance with the requirements of the Watershed Regulations or General Permit-0-15-002. For the latter, the stormwater management practices are designed to capture and treat the runoff from the one-year storm event, and all proposed stormwater management facilities exceed the required thresholds described in the 2015 New York State *Stormwater Management Design Manual.*

For the stormwater management basin, the lowest outlet is to be at elevation 126.00'. Therefore, the permanent pool in the basin will be at that elevation.

Table 5. Conformance with 2015 New York State *Stormwater Management Design Manual*

Requirement Elements	**Project Proposal**
Feasibility:	
Stormwater wetlands *should* not be located within existing jurisdictional wetlands.	The stormwater management basin is located in an upland area, and not within a jurisdictional wetland.

Requirement Elements	**Project Proposal**
Conveyance:	
Flowpaths from the inflow points to the outflow points of stormwater wetlands *shall* be maximized.	Flow path from the inflow location to the outflow location has been maximized. A serpentine path for the flow through the stormwater management basin is proposed.
A minimum flowpath of 2:1 (length to relative width) *shall* be provided.	Flow path length is 185 feet. Stormwater management basin width is 60'. Ratio of length to width = 3.0 to 1, in excess of the minimum 2:1 ratio required.
Microtopography is *encouraged* to enhance wetland diversity	The design of the stormwater management basin provides a variety of elevations above and below the permanent pool to encourage wetland diversity.
Treatment:	
The surface area of the entire stormwater wetland *shall* be at least one percent of the contributing drainage area (1.5% for shallow marsh design).	Wetland will extend to an elevation of at least 1 foot above permanent pool (elev. 126') to elev. 127'. The surface area of the stormwater wetland is therefore 4,416 s.f. which is (4,416s.f. / 5.991 acres) 1.69% of the drainage area, over the 1% required.
A minimum of 35% of the total surface area [of the wetland] *can* have a depth of six inches or less, and at least 65% of the total surface area [of the wetland] *shall* be shallower than 18 inches.	Permanent pool is at elev. 126.0'. Surface area of permanent pool in main basin is 2,276 s.f. The area where the proposed water depth is 6" or less (i.e. between elevation 125.5' and 126.0') in the main basin is 1,190 s.f. Therefore, the area where the water depth is 6" or less is (1,190 s.f. / 2,351 s.f. =) 52%, over the minimum 35% of the wetland that *can* have a surface area of 6" or less. Total surface area of wetland which is shallower than 18" (i.e. between elevation 124.5' and 126.0' in the main basin) is (1,889 s.f. / 2,276 s.f.) 83%, in excess of the 65% that is required.
At least 25% of the WQv *shall* be in deepwater zones with a depth greater than four feet.	For SWMB, 25% of the WQv = 986 c.f. Deepwater zone > 4 feet deep in forebay (< elev. 123.5') Area = 210 s.f. x 4' depth = 840 cubic feet + deepwater zone in main basin (< elev. 122') = 96 s.f. x 4' depth = 384 cubic feet. TOTAL = 1,224 cubic feet, over the 986 c.f. required.

Requirement Elements	**Project Proposal**
If extended detention is used in a stormwater wetland, provide a minimum of 50% of the WQv in permanent pool; the maximum water surface elevation of WQv-ED shall not extend more than three feet above the permanent pool.	For SWMB, 1 year storm WQv = 3,944 c.f. Therefore, 50% of WQv = 1,972 c.f. Permanent pool volume in forebay = 2,734 cu. feet + Permanent Pool Volume in Main Basin = 2,414 cu feet, for a total of 5,148 cubic feet, in excess of the minimum 50% required and in excess of the WQv. Maximum water surface elevation attained is 128.96', which is 2.96 feet above the permanent pool elevation, less than the 3 foot maximum.
A forebay *shall* be located at the inlet, and a four to six foot deep micropool that stores approximately 10% of the WQv *shall* be located at the outlet to protect the low flow pipe from clogging and prevent sediment resuspension	A forebay with a depth of at least 4 feet is located at the inlet of the stormwater management basin. The micropool for the SWMB is 4.5 feet in depth, within the 4 to 6 foot depth required. Micropool for SWMB holds 1,442 cubic feet, or 36% of the net WQv, or 10.6% of the WQv, not taking into account the upgradient treatment and runoff reduction of the flows prior to it being conveyed to the SWMB, in excess of the 10% required..
The bed of stormwater wetlands *should* be graded to create maximum internal flow path and microtopography	The bed of the proposed stormwater wetland proposed is graded to maximize the flow path and provide microtopographic variations.
Landscaping:	
A landscaping plan *shall* be provided that indicates the methods used to establish and maintain wetland coverage. Minimum elements of a plan include: delineation of pondscaping zones, selection of corresponding plant species, planting plan, sequence for preparing wetland bed (including soil amendments, if needed) and sources of plant material	A landscaping plan is provided that indicates the methods used to establish and maintain wetland coverage. Minimum elements of a plan that are provided include: delineation of pondscaping zones, selection of corresponding plant species, planting plan, and sequence for preparing wetland bed.
A wetland plant buffer *must* extend 25 feet outward from the maximum water surface elevation, with an additional 15-foot setback to structures	Provided in both cases.
Donor soils for wetland mulch *shall* not be removed from natural wetlands	Noted. Included in the notes.

Compliance of Stormwater Management Practices with Design Requirements

Infiltration Facilities:

Requirement Elements	**Project Proposal**
Soil Infiltration Rate >= 0.5"/hr	Soil infiltration rates were all > 0.5"/hr
Ground Slope <= 15%	Natural ground slope at all facilities < 15%
Setting	Infiltration facilities not located in fill soils (see drawing S-2 for table showing elevation of natural ground surface and elevation of proposed chambers)
Separation of bottom of infiltration facility and restrictive layer	Infiltration facilities located at least 3' above restrictive layer (see table on drawing S-2)
Separation from wells	Project obtains water from public supply; not applicable.
De-water within 48 hours	Based on planting soil mix and infiltration rates for the proposed soil mix, expected to de-water within 48 hours.
Off-line is flow conveyed by pipe	Where flow is conveyed in pipe, diversion structures are proposed to ensure off-line
Pre-treatment	Pre-treatment is proposed using proprietary device for > 80% TSS removals from inflow.

Rain Garden:

Maximum drainage area should be < 1,000 sq. feet	Portion of roof of Lot 3 to be conveyed to rain garden is about 1,900 s.f.
Overflow to be conveyed to a formal drainage system	Overflow to be collected in catch basins (OCS A.4.1 and OCS A.4.2) which then drain into stormwater management basin
Location	Rain garden to be located in graded area of front yard which is proposed to be mainly lawn. Following grading for front yard and driveway, it will not be a treed area.
Contributing areas – no parking lot or road runoff	Contributing flow only from roof and driveway. No parking lot or road runoff is to be directed into the rain garden.

Rooftop Disconnection:

Runoff must be directed to properly graded and vegetated area	Lot 3 house roof runoff will be graded to a gently sloping lawn in the front yard and rear yard
Maximum contributing flow path < 75 feet	Length of flow path from roof drain leader to driveway in front yard and vegetated swale in rear yard is < 75 feet
Downspouts 10' from nearest impervious surface	Downspouts discharge to areas that will be pervious; no impervious surfaces intercept flow within 10 feet of discharge
Contributing area for each disconnection < 500 s.f.	Front portion of house roof area = 910 s.f. to be discharged to 3 downspouts (avg. = 303 s.f.) Rear portion of house roof area = 1,700 s.f. to be discharged to 4 downspouts (avg. = 425 s.f.)
Drain to a vegetated channel, swale or filter strip	Roof drain discharges to lawn/filter strip in rear yard and swale in front yard
Average slope < 5%	Average slope in front and rear yards < 5%

2. __Erosion and Sediment Control Plan Description__

a. A description of the temporary and permanent structural and non-structural measures that will be used to control erosion and sedimentation during each construction phase of the project;

Measures to be implemented include the use of silt fences, stone check dams, inlet protection, a stabilized construction entrance, as well as other erosion and sediment control techniques. Temporary measures to be employed during construction include: (1) inlet protection around proposed storm drainage inlets; (2) temporary stone check dams in the vegetated swales; (3) silt fences at the limit of disturbance; (4) stabilized construction entrances, and (5) rip rap aprons at the point of discharge of storm drainage pipes into stormwater management basins. Level spreaders will also be used to disperse flows discharged from stormwater management basins to the existing meadow in the wetland and wetland buffer.

Permanent measures to be employed include: (1) Stabilization of the ground surface with permanent vegetation, including trees, shrubs and ground covers following the establishment of final grades; and (2) use of stabilization fabric on steep slopes (slopes greater than 3 horizontal to 1 vertical).

b. Any measures, which will be converted to permanent stormwater management/erosion controls after construction and the techniques necessary for proper conversion;

None of the erosion and sediment control measures to be implemented during construction will be converted to permanent stormwater management facilities.

c. Calculations used in siting and sizing erosion controls, including sediment basins;

Sizing of erosion controls has been done in accordance with the publication *New York Standards and Specifications for Erosion and Sediment Control,* latest edition.

Inlet Protection is proposed around storm drainage inlets; the maximum drainage area to an inlet protection device is proposed to be less than one (1) acre. Filter fabric inlet protection is proposed (see detail 5 on drawing DE-2). Filter fabric shall be a minimum of 36" in height.

Temporary Stone Check Dams
Temporary check dams may be either stone (see detail 6 on drawing DE-2) or erosion eels (by ACF Environmental).

Specifications for Stone Check Dams:
Use a well graded stone matrix 2 to 9 inches in size (NYS – DOT Light Stone Fill meets these requirements).
Drainage Area: Maximum drainage area above the check dam shall not exceed two (2) acres.
Height: Not greater than 2 feet. Center shall be maintained 9 inches lower than abutments at natural ground elevation.
Side Slopes: Shall be 2:1 or flatter.
Spacing: The check dams shall be spaced as necessary in the channel so that the crest of the downstream dam is at the elevation of the toe of the upstream dam. This spacing is equal to the height of the check dam divided by the channel slope.

Therefore:

$S = h/s$

Where:

S = spacing interval (ft.)
h = height of check dam (ft.)
s = channel slope (ft/ft)

For erosion eels, 10' length, 20" diameter eel shall be used. Material specification is to be as per manufacturer.

Silt Fences
Silt fence fabric shall be a minimum of 36" in height (see detail 1 on drawing DE-2). All silt fences shall be placed as close to the disturbed areas as possible, but at least 10 feet from the toe of a slope to allow for maintenance and roll down. The area beyond the fence will remain undisturbed or stabilized.

The maximum allowable slope lengths contributing runoff to a silt fence placed on a slope are as follows:

Slope Maximum	Steepness Length (ft.)
2:1	25
3:1	50
4:1	75
5:1 or flatter	100

The maximum drainage area for overland flow to a silt fence shall not exceed 3 acre per 100 feet of fence, with maximum ponding depth of 1.5 feet behind the fence; and erosion would occur in the form of sheet erosion; and there is no concentration of water flowing to the barrier.

<u>Stabilized Construction Entrance</u> – will be constructed as per the detail shown on drawing DE-2. As shown on the detail, (1) the aggregate will be matrix of 1-1/2" to 2" inch stone, or reclaimed or recycled concrete equivalent, (2) the thickness will not be less than six (6) inches, (3) the width will be 12-foot minimum but not less than the full width of points where ingress or egress occurs. 24-foot minimum if there is only one access to the site, and (4) the length will not be less than 50 feet. Finally, a geotextile fabric will be placed over the entire area to be covered with aggregate. Piping of surface water under entrance shall be provided as required. If piping is impossible, a mountable berm with 5:1 slopes will be used.

<u>Grass Outlet Sediment Trap</u> – will be constructed in accordance with detail 10 on drawing DE-2. The drainage area to the grass outlet sediment trap consists of the subdivision road from its intersection with Hidden Oak Road to about Station 6+00. In addition, a roughly triangular shaped wooded area to the east of the road also contributes runoff to the subdivision road.

The drainage area to the grass outlet sediment trap has been calculated to be 0.746 acres. The minimum sediment trap volume is to be 3,600 cubic feet per acre. Thus, the sediment trap must have a minimum volume of (0.746 acres x 3600 cubic feet/acre) 2,684 cubic feet. As designed, the sediment trap (see Table 13 in Appendix A) will have a volume of 2,740 cubic feet, and thus will meet the minimum volume required.

d. The construction schedule, phasing plan, and implementation schedule for temporary and permanent erosion and sediment controls; and

A detailed erosion control plan has been developed to ensure that stormwater quality during site construction complies with all applicable state and county standards (see drawing S-3). Construction details for the erosion and sediment control measures may be referenced on drawing DE-2.

The sediment and erosion control plan incorporates a variety of measures to reduce, to the maximum extent practicable, the erosion of soils from the site during and after construction. Temporary measures to be employed during construction include: (1) inlet protection around proposed storm drainage inlets; (2) temporary stone check dams in the vegetated swales; (3) silt fences at the limit of disturbance; and (4) a stabilized construction entrance. A temporary riser and anti-vortex device is to be installed if the stormwater management basin during construction of the project.

Permanent measures to be employed include: (1) Stabilization of the ground surface with permanent vegetation, including trees, shrubs and ground covers following the establishment of final grades; and (2) use of stabilization fabric on steep slopes (slopes greater than 3 horizontal to 1 vertical).

Construction and Maintenance Schedule for Erosion and Sediment Control Measures

During construction on the site, it is essential to implement and maintain erosion and sediment control measures in accordance with the construction sequence, described below. The construction and maintenance schedule noted below may be referenced on drawing DE-2.

CONSTRUCTION SEQUENCE NARRATIVE

All erosion and sedimentation control measures and procedures shall comply with the New York State Department of Environmental Conservation publication Standards and Specifications for Erosion and Sediment Control. Erosion control measures shall be installed prior to the start of construction and maintained in effective condition throughout the construction period.

Land disturbance shall be kept to a minimum. Restabilization and final stabilization of disturbed ground surfaces shall be scheduled as soon as practicable following disturbance.

Notify all appropriate authorities (i.e., Town of North Castle Planning Department - Telephone: (914-273-3542) at least 48 hours prior to the commencement of site work.

Identify Disturbance Limits - Identify in the field with flagging or markers the limits of the areas to be disturbed within the property in accordance with the drawings. The limits of disturbance may be referenced on drawing S-3.1 and S-3.2. Note that construction fence is to be placed around the perimeter of the proposed infiltration areas and septic system treatment areas (SSTA) prior to construction in order to prevent disturbance and compaction by construction vehicles.

Call Dig Safe New York - Contractor is required to verify all existing underground and overhead utilities prior to any construction activity by calling Dig Safe New York and conducting one's own due diligence.

Definition: Final Stabilization - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

CONSTRUCTION SEQUENCE

There are two phases to the construction of the subdivision. Phase 1 is the construction of the subdivision road and the common stormwater management facilities. Phase 2 is the construction of the individual houses and other site improvements on the three proposed lots. The construction sequence for any of the three houses is also delineated below. The order of construction of each of the houses is independent of the other two.

PHASE 1 - SUBDIVISION ROAD AND COMMON STORMWATER MANAGEMENT FACILITIES CONSTRUCTION

Refer to drawing S-3.1 which shows the location of the erosion and sediment control measures to be installed in this portion of the work, as well as the location of the soil stockpiles, temporary parking areas for contractors, material storage areas for construction, and a sediment trap to be installed.

The existing driveway will provide temporary access into the site for the installation of the construction fencing and silt fencing around the perimeter of the disturbance area.
Step 1 - Install Erosion and Sediment Controls

All erosion and sediment control measures shall be installed prior to the commencement of any construction activity, and periodically monitored throughout all phases of construction for proper function and structural integrity in accordance with the requirements of the SPDES General Permit. Perform maintenance and repairs as necessary.

Erosion and sedimentation controls to be installed for construction of the subdivision road and the common stormwater management facilities (stormwater management basin, SWMB #1, SWMF-1.2, and SWMF-2.2 (Field A and B) – see Drawing S-3.1 – are described below:

<u>Step 1: Preliminary activities to be undertaken prior to any land disturbance activities</u>:

1. Stake the limits of disturbance - Prior to the start of construction, the project surveyor shall stake and/or flag the limits of disturbance as depicted on this sheet. No site disturbance or stockpiling of construction materials is permitted beyond this line.

2. Install Construction Fencing - Contractor to install construction fence along the limit of disturbance line staked by the project surveyor, around the perimeter of all proposed infiltration facilities and septic system treatment areas at this time. This is to be done to prevent disturbance and compaction by construction vehicles until such time as these facilities are to be installed.

3. Install Stabilized Construction Entrance - In accordance with the plans, install the stabilized construction entrance as depicted on the drawings and maintain it throughout the construction period.

4. Install Silt Fence - Silt fence shall be installed as per the instructions of the manufacturer in the locations shown on this sheet and in the construction details. Silt fence shall be installed, in general, parallel to the contour. Where one length of silt fence ends and another begins, provide a minimum 10-foot overlap. Additional silt fence may be placed in the field at the discretion of representatives of the approving authorities. Silt fence shall be maintained in operable condition and shall not be removed until disturbed areas are thoroughly stabilized.

<u>With the completion of the above-noted erosion and sediment control measures, the land disturbance activities for PHASE 1 of the project may commence</u>.

<u>Step 2: Clear and grub the site</u>.

Only trees within Phase 1 are to be cut and the stumps removed at this time – see Drawing S-3.1 for the limits of the work in this phase. Trees in Phase 2 of the work, the construction involved in the construction of the three houses (see Drawing S-3.2 which depicts Phase 2 of the work) are to remain until such time as the construction activity is proposed to commence on the particular lot.

1. Clearing and Grubbing in Phase 1 Area Only – Within Phase 1 of the work, clearing and grubbing may proceed. All limbs and brush shall be chipped and stored on site for use as mulch. Larger tree trunk sections are to be removed from site or cut for firewood. Grub the root systems of the cleared vegetation.

   Contractor is to take care that the removal of trees does not impact, to maximum extent practicable, the erosion and sediment controls installed in step 1. Impacts of clearing and grubbing the site on the erosion and sediment control measures shall be repaired immediately.

<u>Step 3 - Construct the stormwater management basin at the south end of the site.</u>

Erosion and Sedimentation Controls to be installed in this step (see Drawing S-3.1):

- Contractor Parking Areas – to be constructed in the area of the future cul-de-sac.
- Stabilized Construction Entrance – at the entrance to the property from Hidden Oak Road.
- Soil Stockpiles – where indicated on the plans
- Silt Fence – where indicated on the plans and installed as per the construction detail.
- Construction Fencing and Tree Protection – where indicated on the plans.

- Inlet Protection - Inlet Protection shall be installed around the perimeter of catch basins immediately following their installation.
- Temporary Riser in the outlet of the stormwater management basin

Construction of the Stormwater Management Facilities – Use the cleared access route of the subdivision road to access the location of Stormwater Management Basin #1.

1. Check Condition of Erosion Controls Installed Previously - Prior to the excavation of the stormwater management facilities (SWMP-2.2, SWMF-1.2 and Stormwater Management Basin #1, ensure that the erosion controls downgradient of these facilities installed previously area in good working order.

2. Excavate for Stormwater Management Basin #1 – Construction of the stormwater management basin will require the construction (rough grading and aggregate stabilization) of the driveway to the future house on Lot 3. Therefore, rough grade the driveway to the future Lot 3 house. Once the subgrade of the driveway has been achieved, similar to the subdivision road, install an aggregate subbase over the entire length of the driveway to limit erosion of the ground surface.

   In addition, grade and then install the crushed stone base for the access driveway to Stormwater Management Basin #1. Then, while grading for the stormwater management basin, locate the contractor parking areas depicted on drawing S-3.1 which are to be used during this phase of the work. Install the outlet from the stormwater management basin and the temporary riser and anti-vortex device in the outlet of the Stormwater Management Basin #1 in accordance with drawing S-3.1 and DE-4. Install the storm drainage piping from the lowest to highest elevation from where the storm drainage pipes will inflow into the basin up to manhole MH A.6, near the future cul-de-sac of the subdivision road.

3. Stabilize the Stormwater Management Basin and Construct the Outlet - Immediately after completion of grading for the basin, stabilize the graded berms and embankments forming the basin with temporary vegetation, or other means (such as Flexterra flexible growth medium, or approved equal) until the growing season permits the installation of permanent vegetation. Construct level spreader LS-1 which shall be installed at the time of the construction of the stormwater management basin. Stabilize the level spreader with rip rap and vegetation as per the plan and detail (see drawing DE-4). Stabilized the ground surface below the level spreader with temporary or permanent vegetation depending on the season.

Step 4 - Construct the subdivision road to provide access to the building lots.

Erosion Controls to be installed during construction of the subdivision road include:

- Stabilized Construction Entrance – shall be installed at the entry into the property, and for the temporary soil stockpile on Lot 1.

- Silt Fence – Silt Fence shall be installed in the locations indicated on the plans.
- Soil Stockpiles – Soil material removed during construction shall be stockpiled in the locations shown on the plans. Place silt fence around perimeter of stockpiles as per the drawing.
- Grass Outlet Sediment Trap – Construct the grass outlet sediment trap to be installed on the west side of the subdivision road at about Station 6+00, storm pipes across the future road, and catch basins and manhole to convey the runoff flow from the trapezoidal swale constructed in 1, above.
- Trapezoidal Swale - Grade the trapezoidal swale to be installed on the east side of the subdivision road. Install the check dams and the temporary vegetation in the trapezoidal swale to stabilize.
- Water Bars and Check Dams - Install water bars in the subdivision road and check dams in the trapezoidal swale in the locations depicted on the erosion and sediment control plan (see drawing S-3.1).
- Inlet Protection – Inlet Protection shall be installed around the perimeter of catch basins immediately following their installation.
- Construction and Tree Protection Fencing – Fencing is to be installed to prevent entry beyond areas to be disturbed by construction.
- Temporary storm piping to divert runoff flows away from stormwater management practices installed in this phase of the work.

1. <u>Construction of the Subdivision Road</u> – Construct and grade the subdivision road to the required subgrade elevations and compact the ground in accordance with the specifications. While grading the subdivision road, locate the contractor parking areas depicted on drawing S-3.1 which are to be used during this phase of the work. Stockpile soil in the locations shown on drawing S-3.1. Construct the temporary sediment basin on the west side of the subdivision road when the rough grading of the adjacent subdivision road occurs. Construct the trapezoidal swale on the east side of the subdivision road when the adjacent portion of the road to the swale is constructed which is to drain into the temporary sediment basin.

2. <u>Install Underground Utilities</u> – At the same time as the subdivision road rough grading is taking place, trench and install the underground utilities (storm drainage pipes, water service pipe) and conduits (for electricity, telephone and cable television) that will be used to bring services to the new houses. Install the storm drainage pipes from the lowest to the highest elevations, beginning at manhole MH A.6 (the terminus from the construction in Step 3). At each catch basin, install the inlet protection as designated on the Erosion and Sediment Control Plan and maintain the inlet protection until all disturbed areas which drain to it is stabilized.

3. <u>Simultaneously with Rough Grading of Road Install Two Stormwater Infiltration Practices to Treat Road Runoff</u> – Simultaneously with the rough grading of the subdivision road, the two stormwater management facilities (SWMP-2.2 and SWMF-1.2) which will serve to treat road runoff are to be installed. Therefore, excavate the area

where the stormwater management facilities on Lot 1 (Stormwater Management Facility SWMP-2.2 consisting of 28 Cultec 330XLHD chambers for runoff from the subdivision road) and Lot 3 (Stormwater Management Facility SWMF-1.2 consisting of 32 Cultec V8HD chambers are proposed.

In order to ensure that runoff is NOT conveyed to the subsurface chambers until the areas of the site which will contribute runoff to the chambers have achieved FINAL STABILIZATION, the following shall be done:

SWMP-2.2 – Direct runoff from DS D.2 to the temporary sediment basin.
SWMF-1.2 – Direct runoff in a temporary pipe adjacent to the access driveway to the house on Lot 3.

4. Install an Aggregate Subbase within Subdivision Road - Following the installation of utilities and as soon as possible following the establishment of the subdivision road subgrade, install an aggregate subbase over the entire length of the driveway to limit erosion of the ground surface of the subdivision road.

5. Stabilize Disturbed Ground Surfaces - Stabilize disturbed ground surfaces from construction of the subdivision road as per the disturbed areas stabilization protocol below. Once final stabilization is achieved, only then may the runoff flows from the subdivision road be permitted to discharge into the infiltration facilities noted above.

Disturbed Areas Stabilization Protocol

According to the protocols of the 2010 and 2015 *Stormwater Management Design Manual*, during periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following Soil Restoration steps applied:

(1) Apply 3 inches of compost over subsoil; (2) Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor-mounted disc, or tiller, mixing, and circulating air and compost into subsoils, (3) Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site. (4) Apply topsoil to a depth of 6 inches. (5) Vegetate as required by approved plan.

At the end of the soil restoration procedure, an inspector should be able to push a 3/8" metal bar 12 inches into the soil just with body weight.

With the FINAL STABILIZATION of the subdivision road and the graded embankments which drain to the subdivision road, remove the temporary riser and anti-vortex device from the outlet of the stormwater management basin. Remove any accumulated sediment from the basins and dispose of the sediment either off-site or in an area of the property within the limits of disturbance. Ensure that the stormwater management basin side slopes have achieved FINAL STABILIZATION and not eroding. If erosion is noted, then topsoil and restabilize with vegetation and mulch.

PHASE 2 - CONSTRUCT THE INDIVIDUAL HOUSES

The typical sequence of construction of each of the houses is described below. Each of the three house lots is independent of the other one. The order of construction of the houses does not matter from an erosion control perspective.

Step 1: Preliminary activities to be undertaken prior to any land disturbance activities for the construction of the proposed houses:

Ensure that construction fencing is in place around the perimeter of the septic system treatment areas until such time as the work to grade and install the SSTA is to be performed. Ensure that construction fencing is in place around the perimeter of the infiltration facility on the lot prior to the commencement of construction. The work performed in Phase 1 must achieve FINAL STABILIZATION prior to the commencement of Phase 2.

Erosion and sedimentation controls to be installed for construction of any one of the three houses includes:

- Construction fencing and tree protection fencing.
- Stabilized construction entrance.
- Silt fence.
- Inlet Protection.
- Vegetative Stabilization.
- Construction Materials storage.

The sequence of construction of a house lot is as follows:

1. Identify Disturbance Limits - Identify the limits of the areas to be disturbed within the house lot in accordance with the drawings. The limits of disturbance may be referenced on drawing S-3.2. Verify all existing underground and overhead utilities prior to any construction activity by calling Dig Safe New York and conducting one's own due diligence. Construction parking and vehicular traffic is prohibited over all stormwater management facilities.

2. Install Erosion and Sediment Control and Tree Protection Measures - In accordance with the erosion and sediment control plans (see drawing S-3.2), install:
   - Stabilized Construction Entrance to the lot at the dimensions depicted in the construction detail.
   - Silt Fence as per the instructions of the manufacturer and as shown on the construction details. Silt fence shall be installed, in general, parallel to the contour. Where one length of silt fence ends and another begins, provide a minimum 10-foot overlap. Additional silt fence may be placed in the field at the discretion of representatives of the approving authorities. Silt fence shall be

maintained in operable condition and shall not be removed until disturbed areas are thoroughly stabilized.

- Soil Stockpile in the location(s) shown for the lot.
- Inlet Protection to be installed around the perimeter of installed drain inlets or catch basins.
- Construction Materials storage location which shall be circumscribed with chain link fencing.
- Tree Protection Measures and construction fencing as delineated on the drawings to protect the existing vegetation to remain during construction and the SSTA from construction vehicle traffic.
- Construction fencing to protect the septic system treatment system (SSTS) as depicted on the drawings, and around the perimeter of: (i) around the perimeter of SWMF L-1 (infiltration facility), (ii) on the north and west sides of SWMF-1.1, (iii) around the perimeter of SWMF-L2.1 and L2.2, and (iv) around the perimeter of SWMF-L3.1.

All erosion control measures noted above shall be installed prior to any construction activity, and periodically monitored throughout all phases of construction for proper function and structural integrity. Perform maintenance and repairs as necessary.

3. <u>Clearing and Grubbing on Lot Under Construction Only</u> – Trees identified in the plans on the lot under construction to be cut shall be felled, and limbs and brush shall be chipped and stored on site for use as mulch. Larger tree trunk sections are to be removed from site or cut for firewood. Grub the root systems of the cleared vegetation.

   Contractor is to take care that the removal of trees does not impact, to maximum extent practicable, the erosion and sediment controls installed in step 1. Impacts of clearing and grubbing the site on the erosion and sediment control measures shall be repaired immediately.

4. <u>Footing, Foundation and Building Pad Preparation</u> - Prepare the building pad area for the house. This will involve excavation for the construction of the footings and foundation, and the temporary stockpiling of soil excavated for the house. Stockpile topsoil and soil removed during excavation and protect the stockpile in the location(s) shown on the drawings and in accordance with the detail. Rock removal, if any, shall be done in accordance with State and Town requirements. Excavation for the pool and grading for the pool patio is also to be completed at this time.

5. <u>Excavate and Grade for the Stormwater Management Practices on the Lot</u> – During the excavation for the house, on Lots 1 and 2, excavate the areas needed for the installation of stormwater management facilities (subsurface chambers in all three instances) SWMF-L.1 (on Lot 1), and SWMF-L2.1 and –L2.2 (on Lot 2). The subsurface chambers are also to be installed in accordance with the drawings. In addition, on Lot 1, install the bioretention facility SWMF-1.1. Install also outlet control structure OCS A.8.1 and

connect the pipe from the OCS A.8.1 to MH A.8. Install inlet protection around the perimeter of OCS A.8.1 as per the plans.

For Lot 3, grade for the two proposed rain gardens to capture and treat runoff: (1) from the house and (2) from the driveway. Construct the vegetated swale to direct the runoff into Rain Garden for FDA-L3.2. Install erosion eels across the swale as per the plans. Install silt fence around the perimeter of the rain gardens and retain it until such time as the ground surface that contributes to the rain garden achieves final stabilization. Install the storm drainage pipes from OCS A4.1 to DI A.4 and from OCS A.4.2 to connect to the storm drainage pipe from MH A.5 to DI A.4. Install the planting soil medium to the proper thickness and prepare the practice for planting. Install inlet protection around the perimeter of the outlet control structures as per the plans and retain the erosion eels and the inlet protection until the contributing area achieves full stabilization.

6. <u>Install Storm Drainage Piping to Stormwater Management Practices</u> - Install the subsurface storm drainage system from the lowest to highest grade on the lot, from the stormwater chambers on Lots 1 and 2 to the house and pool, and from the rain garden to the house on Lot 3. The bioretention facility on Lot 1 will receive only surface runoff from the rear and side yard.

   On Lots 1 and 2, do not permit runoff to enter the subsurface chambers until such time as the ground surface within the drainage area to the chambers has achieved FINAL STABILIZATION. For SWMF-L-1 on Lot 1, which will receive roof runoff and runoff from the pool patio, install a temporary storm drainage pipe from DI F.3 to discharge temporarily to the bioretention facility. As each catch basin in the storm drainage piping is installed, install the inlet protection as designated on the Erosion and Sediment Control Plan and maintain the inlet protection until all disturbed areas which drain to it achieves FINAL STABILIZATION.

   On Lot 2, do not install the storm drainage pipe from diversion structure DS E.2 to the SWMF-L2.1 and from diversion structure DS C.2 to SWMF-L2.2 until such time as the drainage areas that contribute runoff flows to the subsurface chambers have achieved final stabilization.

7. <u>House Construction</u> - Construct the new house in accordance with the architect's plans. Once the house foundation walls are backfilled, the other site work can proceed. Grade and install the septic system and septic system treatment area in accordance with the plans. Stabilize the ground surface above the SSTA with permanent (or temporary) vegetation. Complete the utility connections to the house under construction. Connect the roof drain leaders to the storm drainage piping as per the plans.

8. <u>Complete the Fine Grading on the Lot and Prepare the Disturbed Area for Final Stabilization and Planting</u> - Once the final fine grading work is completed, it is time for the FINAL STABILIZATION of the property. Clean up all residual site debris and litter and prepare all disturbed areas not to be hard surfaced for topsoiling and seeding and/or

planting. All areas not planted as trees or shrubs are to be seeded with the permanent grass seed mix noted in the specifications prepared by the project landscape architect.

The soil must be restored at each lot prior to FINAL STABILIZATION. The procedure is as noted above: (1) Apply 3 inches of compost over subsoil; (2) Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor-mounted disc, or tiller, mixing, and circulating air and compost into subsoils, (3) Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site. (4) Apply topsoil to a depth of 6 inches. (5) Vegetate as required by approved plan.

Provide straw mulch cover over seeded areas. Clean out any sediment from the stormwater management basins and storm drainage pipes.

9. <u>Remove the erosion control measures</u> – only after FINAL STABILIZATION has been achieved on the site.

EROSION AND SEDIMENT CONTROL MEASURES MAINTENANCE SCHEDULE

Silt Fence: Maintenance shall be performed as needed and material removed when bulges develop in the silt fence. Inspection for physical damage to the silt fence material shall be made during the weekly inspection. If filter fabric shows signs of decomposing or is damaged, it shall be repaired immediately. Typically, this entails installing a new line of silt fence adjacent to the damaged line.

Inlet Protection: The barrier should be inspected after each rain event and repairs made where needed. Remove sediment as necessary to provide for accurate storage volume for subsequent rains. Upon stabilization of contributing drainage area, remove all materials and any unstable soil and dispose of properly.

Stabilized Construction Entrance: The effective life of a stabilized construction entrance may be limited by excessive sediment deposition, unless additional aggregate is added periodically to renew the surface. Maintenance includes periodic top dressing with additional aggregate. All sediment spilled, dropped or washed into the public right-of-way must be removed immediately.

Periodic inspection of the stabilized construction entrance and nearby public rights-of-way shall be performed within 24 hours of the end of a storm event of 0.5 inches or greater and following periods of heavy use.

Tree Protection: Check on at least a weekly basis that the construction fence and/or tree protection has not been damaged by construction activities.

Soil Stockpiling: Perimeter sediment controls around each stockpile is to consist of silt fence installed in accordance with the standards delineated above. The silt fence shall be maintained as noted above. Stockpiles and fill area shall be inspected at least weekly for signs of erosion or problems with plant establishment.

Grass Outlet Sediment Trap – Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to one-half the design depth of the trap (which in this case is 18"). Removed sediment shall be deposited in a suitable area and stabilized. The structure shall be inspected after each rain and repairs made as needed. The sediment trap shall be removed and the area stabilized – in this case construct the proposed level spreader in accordance with the details – when the remaining drainage area has achieved final stabilization.

e. Description of the measures that will be used to control litter, construction chemicals, and construction debris from becoming a pollutant source in stormwater discharges.

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.

The contractors will be made aware that the project has a comprehensive Storm Water Pollution Prevention Plan, and that it is their responsibility to keep the site clean and to minimize the potential for litter and other potential pollutants from being conveyed into wetlands and downgradient watercourses. Construction materials will be stored in the locations shown on the erosion and sediment control plan, and will be protected by construction fencing as a containment. The locations of the fenced-in construction materials storage area may be referenced on drawing S-3.

Litter control is largely provided by having the maintenance and trash facilities placed inside this fenced-in area. This will reduce the risk of such materials from being washed by rain or blown by wind.

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.

3. Post-Construction Stormwater Management Plan Description

Introduction: Six Step Design Process – As noted in the 2015 *Stormwater Management Design Manual*, stormwater management using green infrastructure is summarized in the six step process described below. Designers are required to adhere to the six step process when developing a SWPPP. This includes providing information in the SWPPP which documents compliance with the required process.

Step 1: Site Planning
Step 2: Determine Water Quality Treatment Volume (WQv)
Step 3: Apply Runoff Reduction Techniques and Standard SMPs with RRv Capacity (e.g. infiltration practices, bioretention and open channel practices) to Reduce Total WQv

Step 4: Determine the minimum RRv required
Step 5: Apply Standard Stormwater Management Practices to Address Remaining Water Quality Volume
Step 6: Apply Volume and Peak Rate Control Practices if Still Needed to Meet Requirements

Step 1: Site Planning
The existing conditions map, drawing EX-1, identifies the applicable natural resource areas on the subject site, including reservoir stem, forest cover, topography, and bedrock. The soils map in the SWPPP identifies the soils present on the subject site.

The site design has been carefully executed to avoid, to the maximum extent practical, areas of the site with construction and development constraints. This includes avoiding construction as much as possible: (i) in areas of the property with steep slopes, and (ii) in areas where the bedrock is exposed or shallow.

In addition, the areas around the perimeter of the southeastern, southern and southwestern portions of project site will be protected as Conservation Lands in order avoid impacting the reservoir stem to the east and lands of the City of New York to the south and west. The existing trees within the majority of these areas will be retained, thus providing a natural wooded buffer between the proposed development and the surrounding properties in perpetuity. There will be no impervious surfaces within the Conservation Lands. The minimal amounts of disturbed areas within the Conservation Lands will be stabilized and planted with new native trees and shrubs.

Step 2: Determine Water Quality Treatment Volume (WQv)
The calculations of the water quality treatment volume to Design Point 1 may be referenced in **Table 9** of the SWPPP report. **Table 10** provides the calculations of the WQv to Design Point 2. As is required, the water quality volume is calculated using the precipitation depth of the 1 year, 24-hour storm event, as well as the 90% Rule. The calculations show that the WQv to Design Point 1 is 0.306 acre-feet; to Design Point 2, the WQv is 0.121 acre-feet.

Step 3: Apply Runoff Reduction Techniques and Standard SMPs with RRv Capacity (e.g. infiltration practices, bioretention and open channel practices) to Reduce Total WQv
Several runoff reduction techniques and standard stormwater management practices are proposed in order to reduce the total water quality volume. These include: (1) Conservation of 0.994 acres of natural areas of the property, (2) Tree planting along the subdivision road, (3) Rooftop disconnection of a portion of the house on Lot 3, (4) Source control RRv treatment practices, including four subsurface chamber infiltration facilities, one bioretention facility, one rain garden, and one dry swale. Standard SMP's include one extended detention stormwater wetland. The calculations of the stormwater management practices reduction of the water quality volume may be referenced in **Table 9** (for Design Point 1) and **Table 10** (for Design Point 2).

Design Point 1: The calculations show that for Design Point 1, the proposed stormwater management practices will provide a reduction of 0.164 acre-feet of runoff, which is less than the 1-year storm water quality volume of 0.306 acre-feet to the design point. The runoff reduction is, however, well above the minimum RRv of 0.090 acre-feet.

Design Point 2: The calculations show that for Design Point 2, the proposed stormwater management practices will provide a reduction of 0.053 acre-feet of runoff, which is less than the 1-year storm water quality volume of 0.121 acre-feet to the design point. The runoff reduction is well above the minimum RRv of 0.003 acre-feet.

Rationale for Not Meeting the One Year Storm Water Quality Volume:
There are many planning and design practices which have been implemented by the project to reduce the amount of impervious surfaces and overall land disturbance in order to minimize the 1 year storm water quality volume. The subdivision is designed to minimize environmental impacts and to minimize the amount of new impervious surfaces to the maximum extent. As is noted above, the subdivision is a Conservation Subdivision which permits smaller lot sizes and less lot frontage than under the Town zoning code. This permits a shorter subdivision road than would be required under Conventional zoning. Smaller lot sizes reduce disturbance when compare to a conventional lot. The shorter subdivision road significantly reduces the amount of impervious surfaces when compared to road which would be required under the conventional zoning.

The applicant's engineer is proposing to implement several measures to reduce the volume of runoff to the greatest extent that is practical. This includes: (i) infiltration on Lot 1 and 2 to convey runoff from the house roof into subsurface chambers and into the site's soils, (ii) bioretention facility on Lot 1 for runoff from the rear yard (mostly lawn area) of Lot 1, and (iii) infiltration of a portion of the runoff from the proposed subdivision road in subsurface chambers. Other measures to reduce the volume of runoff include recognized techniques as per Section 5.2 of the 2015 New York State *Stormwater Management Design Manual*. These include: (i) elimination of sidewalks, and (ii) minimizing the building footprints to the maximum extent.

Site constraints also have impacted the ability of the project to achieve the full reduction of the 1-year storm runoff volume. Specifically, these constraints include: (i) significant areas of exposed bedrock which cover 0.682 acres or about 9% of the site. There are also areas of steep slopes in excess of 25% which limits the potential for stormwater management practices to reduce the runoff volume.

Step 4: Determine the minimum RRv required
The calculation of the minimum RRv that is required may be referenced in **Table 9**. The minimum RRv for each of the subcatchment (drainage areas) to Design Point 1 and Design Point 2 may be referenced in the table in the Minimum RRv (acre-feet) column.

Step 5: Apply Standard Stormwater Management Practices to Address Remaining Water Quality Volume
Table 9 summarizes for each subcatchment the green infrastructure stormwater management practices to be used. The stormwater management basin proposed at the southerly end of the site will address the remaining water quality volume for flows destined to Design Point 1

Step 6: Apply Volume and Peak Rate Control Practices if Still Needed to Meet Requirements

The calculations of the channel protection volume, overbank flood control and extreme flood control may be referenced in **Table 11** (for Design Point 1) and **Table 12** (for Design Point 2). The hydrographs and routings show that the peak rate attenuation is provided at the design points.

Stream Channel Protection Volume Requirements (Cpv) - In accordance with the 2015 SMDM, stream channel protection volume requirements (Cpv) are designed to protect stream channels from erosion. This goal is accomplished by providing 24-hour extended detention of the 1-year, 24-hour storm event, remained from runoff reduction. Detention time may be calculated using either a center of mass method or plug flow calculation method.

As is noted above, the channel protection volume calculations may be referenced in **Table 11** and **Table 12**.

The channel protection volume at Design Point 1 is calculated to be 3,262 cubic feet (see Table 11). The average release rate is calculated to be 0.04 cubic feet per second. The hydrographs and routings for the Stormwater Management Basin show that during the 1 year storm event, the maximum storage in the basin is 5,543 cubic feet, and that this runoff volume discharges from the basin in 48 hours. Thus, the average release rate is calculated to be 0.032 cfs. The routings also show that the basin achieves a plug flow detention time of 1,460 minutes (24.3 hours)

Overbank Flood Control Requirements:

Overbank control requires storage to attenuate the post development 10-year, 24-hour peak discharge rate (Qp) to pre-development rates. As can be seen in Table 4, above, the discharge rate for the 10-year, 24-hour storm to the design points following the development of the subdivision and the implementation of the stormwater management plan is reduced to a value below the pre-development rate.

Extreme Flood Control Requirements:

The 100 Year Control requires storage to attenuate the post development 100-year, 24-hour peak discharge rate (Qf) to predevelopment rates. As can be seen in Table 4, above, the post-development discharge rate for the 100-year, 24-hour storm to the design points is less than the pre-development rate.

The stormwater management measures included in the SWPPP to control the rate and volume of runoff, and to treat runoff from the site, must be detailed in a narrative report, plans, details and specifications. Primary stormwater management practices are specifically defined in the Watershed Regulations as stormwater ponds, stormwater wetlands, infiltration systems, filtering systems and open channels as listed in Section 3.3.1 of the Design Manual. Each stormwater management practice shall be designed to accommodate the quantity of runoff flowing to the practice, including runoff from off-site areas as applicable. The following information should be included as applicable to the location and design of the various stormwater management components:

a. Descriptions of the stormwater management practices including practices to treat, attenuate and convey post development stormwater runoff;

Stormwater from the majority of new impervious surfaces, consisting of, but not limited to, the subdivision road that will provide access from Hidden Oak Road, individual driveways, houses, and swimming pools will be conveyed in grassed swales, overland flow and in subsurface storm drainage pipes to stormwater management practices which are to consist of five infiltration practices and two filtering (bioretention) practices for treatment of the 1-year storm. Runoff a portion of the developed property, plus the runoff that is in excess of the 1-year storm will, after being conveyed to the stormwater management practices noted above, be conveyed via subsurface storm pipes to a surface stormwater management facility where water quality improvement and peak rate attenuation of the runoff will be achieved.

The design of the infiltration practices has been designed to be "off-line" in accordance with the *Stormwater Management Design Manual*. In general, the off-line diversion structure is designed as follows: (i) flow enters the diversion structure and encounters a weir consisting of a 5" thick concrete baffle wall across the structure, (ii) the weir diverts the flow into the subsurface chambers, and (iii) the top of the baffle wall is set in most cases at the elevation of the top of the chambers, so that when the chambers are filled (by the runoff from the 1 year storm), the flow will overtop the baffle wall and discharge to the outlet.

b. The design provisions included in the stormwater management facilities that address safety and maintenance needs;

The proposed stormwater management practices have been designed to maximize the safety of the future residents. The proposed extended detention stormwater facility includes a safety bench above the permanent pool of water of at least 6 feet in width; similarly, the depth of the water in the permanent pool drops by only 6 inches over 6 feet or more horizontally into the basin from the side closest to Lot 3. Finally, it is proposed to construct a fence around the perimeter of the stormwater management basin for safety purposes.

As noted in Table 7.5 Community and Environmental Factors Matrix of the *Stormwater Management Design Manual*, the proposed stormwater management practices are identified as being a low safety risk.

A homeowners' association or other entity established consisting of the owners of the three lots will be responsible for the maintenance of the stormwater management practices as outlined below in **Table 6**.

Table 6 summarizes the anticipated responsibilities for maintenance of the proposed stormwater management facilities and the contributing areas to the facilities.

Table 6. Post-Construction Stormwater and Erosion Control Maintenance Responsibilities

Maintenance Item	Entity Responsible for Maintenance Following Construction and Sale of Lots
Stormwater Management Facilities	Legal agreement between the three future homeowners: SWMF-1.1 (bioretention facility), SWMF-1.2 (infiltration facility), SWMF-1.3 (stormwater management basin), and SWMF-2.2 (infiltration facility). The responsibility for the maintenance of the following stormwater management facilities are by the future individual lot owners: Lot 1, SWMF-L1 (infiltration facility); Lot 2, SWMF-L2.1 (infiltration facility) and SWMF–L2.2 (infiltration facility); and Lot 3, Rain Gardens #1 and #2.
Stormwater Collection and Conveyance System	Town of North Castle for the storm drainage facilities within the right-of-way in the subdivision road, including the vegetated swales. Storm drainage facilities (catch basin, manholes and outlet control structures outside of the right-of-way which convey runoff to SWMF-1.3 (stormwater management basin) will be the responsibility under a legal agreement between the three future homeowners. Storm drainage facilities (catch basin, manholes and outlet control structures on individual lots which convey runoff to stormwater management facilities to manage the runoff from that lot will be the responsibility of the future individual homeowner.
Erosion in Landscaped Areas of the Individual Lots	Individual homeowners
Erosion of Slopes, Sand, Grit and Debris in the Subdivision Road Right-of-Way	Town of North Castle

<u>MAINTENANCE OF STORMWATER FACILITIES</u>

Maintenance of stormwater management facilities is described below for each stormwater management practice and component of the stormwater collection and conveyance system:

STORMWATER MANAGEMENT BASIN:

1. Description: The stormwater management basin is used to control the rate of discharge from the property, and to improve the quality of the runoff.

2. Maintenance measures include:
(i) Periodically remove debris and litter from basin.
(ii) Clean trash rack when trash or debris has accumulated.
(iii) Mow side slopes, embankments, emergency spillway and access road at least once a year, preferably after August. Woody growth on the side slopes into the basin and on the berm outside of the basin should be discouraged.
(iv) Remove sediment from forebay every five to six years or when depth has reached 6" measured on the sediment stick; from main portion of the basin if depth of sediment has reached 6" or long flow path of water is hindered. Some replacement wetland planting may be necessary following removal of sediment.
(v) Stabilize eroding soils of stormwater management basin side slopes, embankment, and emergency spillway by placing topsoil as may be needed, then seeding and mulching with straw or other appropriate means.
(vi) Repair or replace structural elements such as inlet and outlet structures as necessary.
(vii) Remove larger borrowing animals, such as muskrats, from structural features. Trapping may be necessary.
(viii) Rock/riprap pads have not migrated, but are placed as per the design, and that vegetation, especially woody plants, are not growing within these areas.

3. Inspect for:
(i) Erosion, cracking, embankment subsidence, tree growth, burrowing animals.
(ii) Sediment and clogging in the outlet control facility, stormwater inlets, emergency spillway and drain (if present).
(iii) Sediment in forebay.
(iv) Adequacy of channel erosion controls at the outlet.
(v) Adequacy of plant coverage in shallow marsh (vegetated wetland) areas.
(vi) Proper functioning of structural elements.
(vii) Sources of erosion in the contributory drainage area.

4. Erosion in Stormwater Management Basin:
(i) In the event the Owner and/or the Homeowners Association observes bare soils exceeding 20 square feet within the stormwater management basin, it shall seed those areas with a quick germination rye seed mix as soon as possible, or as directed by the landscape architect or civil engineer.
(ii) In the event the Owner and/or the Homeowners Association observes gully erosion more than 3" deep within the stormwater management basin or in vegetated or grassed swales, it shall fill the same immediately and seed the area with a quick germination rye seed, or as directed by the landscape architect or civil engineer.
(iii) Any debris accumulation, litter, and/or fallen trees or brush within Drainage Easement Areas shall be removed and disposed of off-site.

5. Sediment Deposits in Stormwater Management Basin:
(i) Sediment deposits obstructing more than one-third of the inlet or outlet structures or pipes associated with the basin shall be removed therefrom by the Owner and/or the

Homeowners Association and be placed in a suitable upland area of the property or removed from the property and properly disposed of.
(ii) Sediment deposits that exceed one inch in depth within the vegetated areas of any detention basin or infiltration basin encompassing more than 20 square feet shall be removed by the Owner and/or the Homeowners Association and be placed in a suitable upland area of the property or removed from the property and properly disposed. Any plants affected by the removal process shall be dug out or replanted.
(iii) Sediment deposits in the forebay and micropool shall not exceed six (6) inches in depth. All sediment removed shall be deposited and stabilized in a location that is not likely to erode.

INFILTRATION FACILITIES:

1. Description: Infiltration facilities are used to improve the quality of the runoff, provide for a reduction in the volume of runoff, and in some cases, reduce the peak rate of runoff. Maintenance of infiltration facilities is essential to ensure their continued effectiveness. Principally, this involves preventing suspended solids from being discharged to the infiltration facilities. These may have the effect of filling the void spaces thereby clogging the soil. A log shall be maintained for each infiltration facility.

2. Maintenance Measures Include:
(i) Observation of the depth of sediment, if any, through inspection via the installed observation port on each row of the chambers during the first 2 to 3 months of operation, and thereafter on an annual basis.
(ii) Remove sediment from pre-treatment facility when the depth of sediment reaches 50% of capacity of the facility.
(iii) Remove sediment from chambers when the depth of sediment is 3" in depth.
(iv) The manufacturer of the chambers recommends cleaning of the stormwater management chambers every 9 years after installation and every 9 years thereafter.
(v) The manufacturer also recommends that 45 years after installation, the chambers be inspected using closed circuit television (CCTV) or other comparable technique to determine the condition of the interior of the chambers, and rehabilitate or replace as may be necessary.
(vi) Ensuring that the meadow vegetation to be established above the infiltration facilities, where it is proposed, achieves good growth and final stabilization of the ground surface above the chambers. Periodic mowing of the meadow, once in the spring (mid-April and once in autumn (late October) is needed to ensure that woody vegetation does not become established in the meadow.

3. Inspect for:
(i) Depth of sediment, if any, through inspection via the installed observation port on each row of the chambers during the first 2 to 3 months of operation, and thereafter on an annual basis.

(ii) The rate of dewatering of the infiltration facility following a precipitation event. The chambers should fully dewater within 48 hours of the end of the precipitation event.

CATCH BASINS, MANHOLES AND STORM DRAINAGE PIPES

Catch basins, drain inlets and manholes located within the right of way of the subdivision road will be maintained by the Town of North Castle. If these structures are located on private property, their maintenance shall be carried out by the Owner and/or the Homeowners Association.

1. Description: Catch basins have sumps to allow sediment and debris to drop out before the water exits this drainage junction. Storm pipes normally need no maintenance.

2. Maintenance Measures Include:
   (i) Clean out and dispose of sediment and debris from sump, if there is less than 12" between top of sediment and invert of pipe.
   (ii) Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.

3. Inspection:
   (i) Annual visual check for sediment accumulation is usually sufficient.
   (ii) Recommend using tool to open cover, flashlight and dipstick for inspection of deep water quality catch basins.
   (iii) Check that the grate is sitting flush on the structure, and that there are no holes or cracks in the pavement or ground adjacent to the catch basin.

LEVEL SPREADER

1. Description: Level spreader serves to dissipate the flow of water over a broad area to reduce the potential for erosion.

2. Maintenance:
   (i) Periodically remove debris and litter.
   (ii) Mow at least twice per year the meadow vegetation to be established. Mowing is to be done in spring (mid-May) and in autumn (mid-October).
   (iii) Periodically remove sediment in order to maintain original design depth.
   (iv) Stabilize eroding soils by seeding and mulching or other appropriate means.

3. Inspection:
   (i) Annual visual check for erosion, sediment accumulation and debris is usually sufficient.
   (ii) Ensure that lip over which flow is directed is level, stable and well-vegetated, and is not eroding.
   (iii) Ensuring that the vegetation to be established at the level spreader achieves good growth and final stabilization of the ground surface above the chambers.

DIVERSION STRUCTURES

1. Description: Diversion structures, also known as flow splitters, are used as required where runoff is conveyed to infiltration facilities by a storm pipe in order to divert the WQv to the filtering practice, and allow larger flows to bypass the practice.

2. Maintenance:
   (i) Clean sediment out annually or when sediment has reached a depth of 6 inches using a vactor truck or clamshell scoop. Use similar procedures to cleaning underground tanks, and catch basins.
   (ii) Remove trash and debris.

3. Inspection:
   (i) Annual visual check for sediment accumulation is usually sufficient.

BIORETENTION FACILITY AND RAIN GARDEN

1. Description: Bioretention facilities and rain gardens are similar stormwater management practices intended to manage and treat small volumes of stormwater runoff from impervious surfaces using a conditioned planting soil bed and planting materials to filter runoff stored within a shallow depression.

2. Maintenance:

   (i) Routine maintenance may include the occasional replacement of plants, mulching, weeding and thinning to maintain the desired appearance.
   (ii) Weeding and watering are essential the first year, and can be minimized with the use of a weed-free mulch layer. Re-mulch bioretention facilities annually.
   (iii) Homeowners and landscapers must be educated regarding the purpose and maintenance requirements of the bioretention facility and/or rain garden, so the desirable aspects of ponded water are recognized and maintained.
   (iv) Keep plants pruned if they start to get "leggy" and floppy. Cut off old flower heads after a plant is done blooming.
   (v) Inspect for sediment accumulations or heavy organic matter where runoff enters the bioretention facility and/or rain garden and remove as necessary. The top few inches of planting soil mix should be removed and replaced when water ponds for more than 48 hours. Re-mulch following such removal.
   (vi) If the overflow device is an earthen berm or lip, check for erosion and repair as soon as possible. If this continues, a harder armoring of stone may be necessary.
   (vii) Make sure all appropriate elevations have been maintained, no settlement has occurred and no low spots have been created.
   (viii) Mow the grass filter strip between the bioretention facility and the level spreader weekly during the growing season or as per the adjacent lawn areas. Maintenance of level spreader as per noted above.

Maintenance Schedule for Permanent Stormwater Management Practices and Stormwater Infrastructure

STORMWATER MANAGEMENT PRACTICE	MAINTENANCE ACTIVITY	FREQUENCY	RESPONSIBILITY
STORMWATER MANAGEMENT BASIN	Cleaning and removal of debris	Inspect after major storm events (>2" of rainfall); otherwise annual removal of debris	Property Owner agreement
	Inspect vegetation and harvest vegetation when a 50% reduction in the original open water surface area occurs	Inspect annually	Property Owner agreement
	Inspect and repair embankment and side slopes	Inspect annually	Property Owner agreement
	Inspect outlet control structure and repair if needed	Inspect annually	Property Owner agreement
	Removing accumulated sediment from forebay or sediment storage areas when 60% of the original volume has been lost	Every 5 years	Property Owner agreement
	Removing accumulated sediment from main cells of pond once 50% of the original volume has been lost	Every 5 years	Property Owner agreement
	Remove invasive plants	Inspect annually; remove invasive plants promptly	Property Owner agreement
INFILTRATION FACILITY	MAINTENANCE ACTIVITY	FREQUENCY	RESPONSIBILITY
	Inspect level of sediment in subsurface chambers through observation port and remove if depth > 3"	Inspect after first year in operation, then every 5 years	Property Owner (for SWMF L-1, L2.1 and L2.2); Property Owner agreement for SWMF 1.2 and 2.2
	Inspect water level in observation well	Inspect annually	Same as above
	Inspect structural integrity of inlet and outlet control structures and repair if needed	Inspect annually	Same as above

STORMWATER MANAGEMENT PRACTICE	MAINTENANCE ACTIVITY	FREQUENCY	RESPONSIBILITY
BIORETENTION FACILITY AND RAIN GARDEN	Inspect if side slopes areas of the facility are eroding	Inspect annually	Property Owner
	Apply mulching to bare or void areas	Inspect annually	Property Owner
	Removing and replacing all dead and diseased vegetation	Inspect annually	Property Owner
	Watering plant material	As may be needed in summer months	Property Owner
	Removing mulch and applying a new layer to prevent weed growth	Inspect annually	Property Owner
	Remove invasive plants	Inspect annually; remove invasive plants promptly	Property Owner
	Sediment removal	Inspect annually; observe if runoff water is present above the surface for more than 24 hr after rain event	Property Owner
CATCH BASINS AND MANHOLES	Remove sediment from sump	Inspect annually	Property Owner agreement
	Check integrity of structure	Inspect annually	Property Owner agreement
CATCH BASIN DIVERSION STRUCTURES	Check for debris that might impair the flow through the grate	Inspect after every storm event > 0.5" of precipitation	Same as above for infiltration facilities
HYDRODYNAMIC SEPARATOR	Remove floatables and sediment from facility	Inspect after first year in operation, then every 5 years	Same as above for infiltration facilities

c. Results of on-site soil analysis and infiltration tests, as applicable, that evaluate the suitability of the site for stormwater management facilities. An on-site determination of the elevation of bedrock and groundwater by excavation or soil borings at the proposed site of any proposed infiltration facilities; as discussed elsewhere in this Guide, on-site soil analysis should be witnessed by DEP;

Soil testing has been performed in the locations of the proposed stormwater management facilities. **Appendix B** provides the results of the soils testing, and **Table 7**, below, summarizes the results of the testing.

Table 7. Summary of Deep Hole and Percolation Testing

Stormwater Management Facility	Type of Facility	Results of Deep Hole Testing	Results of Percolation Testing
SWMF-1.1	Bioretention Facility	Sandy loam soils; rock at 5'-6" (DH-4)	Not required
SWMF-1.2	Infiltration (chambers)	Sandy loam soils; rock at 6 feet below grade (DH-5)	2.5 min/inch nearby (P-5)
SWMF-2.2	Infiltration (chambers)	Sandy loam soils; seep at 6' below grade	3.7 min/inch (P-1)
SWMF-L1	Infiltration (chambers)	Sandy loam soils; seep at 5 feet below grade (DH-2)	5 min/inch (P-2)
SWMF-L2.1	Infiltration (chambers)	Sandy loam, silt loam soils; rock at 5'-6" below grade (DH-1)	2.9 min/inch (P-3)
SWMF-L2.2	Infiltration (chambers)	Sandy loam, silt loam soils; rock at 6' below grade	3.2 min/inch (P-4)
SWMF-L3.1	Rain Garden for FDA-L3.1	Sandy loam soils, rock at 4'-6"	Not required
SWMF-L3.2	Rain Garden for FDA-L3.2	Sandy loam soils, rock at 4'-6" nearby	Not required
SWMF Basin 1	Extended Detention Stormwater Wetland	Sandy loam and fine sandy loam, rock at 5'- 6"; sandy loam and weathered rock to 5'-6"	Not required

In summary, the deep hole tests showed that: (1) For the soils within the footprint of the stormwater management basins (DH#9 and DH#10) the weathered rock and/or bedrock is about 5'-6" feet below grade, and (2) in other locations, rock ranged from 4'-6" to 6' below grade.

d. A schedule for construction of the stormwater management facilities;
The schedule for the construction of the proposed stormwater management facilities is detailed in Section 2 above.

e. Calculation of the imperviousness of tributary areas to each stormwater management practice to determine if practices in series are required;

In accordance with the Watershed Regulations, post-development drainage areas that will result in impervious surfaces covering twenty percent (20%) or more of the drainage area for which a stormwater management practice is designed must employ two dissimilar stormwater management practices. The calculations show that the impervious surfaces to the two stormwater management practices will cover *less* than 20% of the drainage areas and therefore would not be subject to this requirement. **Table 8,** below lists the stormwater management practices being proposed, and provides information on the drainage area to those facilities.

As can be seen **Table 8**, only future condition drainage areas FDA-1.2, FDA-2.2, FDA-L1, FDA-L2.1, FDA-L2.2 and FDA-L3 have an imperviousness greater than 20%. For all of these subcatchment areas (except FDA-L3), the runoff will be conveyed into an infiltration facility. The runoff from FDA-L3 (portion of Lot 3 house, driveway and its front yard) will be treated in a bioretention facility (a filtering practice), followed by the stormwater management basin, an extended detention stormwater wetland, two clearly dissimilar stormwater management practices. The project thus conforms to the requirements of the Watershed Regulations.

Table 8. Imperviousness of Tributary Areas

Drainage Areas	***Drainage Area (in acres)***	***Impervious Surfaces (in acres)***	***% Impervious***	***Stormwater Management Practice Proposed***
Drainage Areas to Design Point 1				
FDA-1.1	0.679	0	0%	bioretention
FDA-1.2	0.446	0.292	65.5%	infiltration
FDA-1.3	4.076	0.233	5.7%	stormwater basin
FDA-1.4	0.157	0	0%	none
FDA-L1	0.212	0.194	91.5%	infiltration
FDA-L2.1	0.132	0.073	55.5%	infiltration
FDA-L2.2	0.098	0.098	100%	infiltration
FDA-L3.1	0.261	0.052	20%	Rooftop disconnection to rain garden followed by stormwater management basin
FDA-L3.2	0.098	0.023	23.7%	Vegetated swale to rain garden followed by stormwater management basin
Overall*	6.080	0.932	15.3%	stormwater management basin
Drainage Areas to Design Point 2				
FDA-2.1	0.890	0	0	none
FDA-2.2	0.655	0.286	43.7%	infiltration
FDA-2.3	1.951	0.019	1.0%	vegetated swale
Drainage Areas to Design Point 3				
FDA-3	0.529	0	0%	none
Drainage Areas to Design Point 4				
FDA-4	0.242	0	0%	none

* *Overall drainage area to proposed stormwater management basin.*

f. Pre- and post-development drainage maps;

Pre- and post-development drainage area maps may be referenced at the end of the Project Narrative section of this SWPPP report (see Figures 3 and 4, and full-size drawings DA-1 and DA-2).

g. Hydrographs, peak discharge rates and total runoff volumes from the project area for existing conditions for the 10-year, and 100-year 24-hour storm events. The relevant variables used in this determination, including curve number and times of concentration, must be included;

Hydrographs, peak discharge rates and total runoff volumes from the project area in the existing conditions for the 10-year and 100-year storm events may be referenced in **Appendix E**.

h. The hydrographs used to evaluate post-construction volume and rate of stormwater runoff for the 1-year, 10-year, and 100-year 24-hour storm events; the relevant variables used in this determination, including curve number and times of concentration, must be included;

The hydrographs used to evaluate post-construction volume and rate of stormwater runoff for the 1-year, 10-year, and 100-year 24-hour storm events may be referenced in **Appendix E**.

i. Calculations of the water treatment volume including a comparison of the volume of runoff generated by the 1 year - 24 hour storm event and the water quality volume generated using the 90% rule;

Calculations of the water treatment volume including a comparison of the volume of runoff generated by the 1 year, 24 hour storm event (3.1 inches of precipitation) and the water quality volume generated using the 90% rule, which for this area corresponds to 1.5" of precipitation. These calculations may be referenced in Table 1 in **Appendix A**.

In **Appendix E** are found the hydrographs and routings of the proposed stormwater management facilities being proposed for the project.

j. Calculations of the required runoff reduction volume (based on the 1-year, 24-hour storm in the EOH watershed);

The calculations of the required runoff reduction volume may be referenced in Appendix A of the SWPPP report. Table 9.1 in **Appendix A** provides a summary of the following for each drainage area to the four design points: (i) drainage area in square feet, (ii) impervious surfaces within the specified drainage area, (iii) the calculated specified reduction factor based on the hydrologic soils group(s) with the drainage area, (iv) the calculated Minimum Runoff Reduction Volume, (v) the HydroCAD calculated Water Quality Volume – volume of runoff generated in the drainage area – for the 1 year storm event in cubic feet, (vi) the HydroCAD calculated WQv in acre-feet, (vii) the green infrastructure and/or stormwater management practice proposed,

(viii) the calculated Runoff Reduction Volume achieved in the stormwater management practice, and (ix) whether the RRv provided exceeds the minimum RRv required. Table 9.2 in **Appendix A** provides a summary for drainage areas FDA-1.3, FDA-L3.1 and FDA-L3.2

As can be seen in the tables, for all but one of the drainage areas the Runoff Reduction Volume that is to be provided exceeds the minimum Runoff Reduction Volume. (The one drainage area that does not achieve the minimum goal is FDA-2.3 which has minimal impervious surfaces – all of which are off-site – and drains to the trapezoidal swale along the Lot 1 frontage).

Tables 9.1 and 9.2 shows that the Runoff Reduction Volume exceeds the minimum RRv for all drainage areas (with the exception of the one identified above).

k. Calculations supporting design of runoff reduction techniques provided;

As is noted above, the supporting calculations for the runoff reduction techniques employed by the project may be referenced in **Appendix A**. The runoff reduction volumes have been calculated in accordance with the 2015 New York State *Stormwater Management Design Manual.*

l. Designs and supporting calculations for water quality treatment facilities and the compliance with the requirements and recommendations for design of these facilities in the Design Manual;

The supporting calculations for the water quality treatment facilities and the compliance with the requirements and recommendations for design of these facilities employed by the project may be referenced in **Appendix A.**

m. Calculations upon which the required storage volume and surface area requirements necessary to provide flood control for runoff generated by 1-year, 10-year, and 100-year, 24-hour storm events were based;

The required storage volume and surface area requirements that are necessary to provide flood control and to attenuate the peak rate of runoff for the 1, 10 and 100 year, 24 hour storms may be referenced in **Appendix E** of this report. The calculations show that there will be a reduction in the peak rate of runoff at all design points for all of the modeled storm events.

n. Calculation of the necessary storage volumes, detailed descriptions of all proposed stormwater management measures, and sufficient detail of the measures to determine that the relevant design criteria will be met;

Full hydrographs and routings of the modeled subcatchment areas which demonstrate that the project will accomplish the required peak rate attenuation of runoff from the developed site may be referenced in **Appendix E**.

o. Provisions for discharge control, including peak discharge, and protection for, rates, outlet design, discharge capacity for each stage, outlet channel design, and a description of the point of discharge;

The detailed information on the provisions for discharge control, including peak discharge, outlet design, and the discharge capacity for each stage of the stormwater management measures may be referenced in the hydrographs and routings presented in **Appendix E**.

The stormwater runoff from the stormwater management basin (Design Point 1) will, following its conveyance to a level spreader, will be conveyed to an upland wooded area to the south of the property. Flows to Design Point 2, also will discharge to existing upland woods following conveyance into a level spreader. Runoff to Design Point 2 will also be conveyed by overland flow to existing upland woods. Runoff to Design Points 3 and 4 in the future condition will be similar to the existing condition; there is no concentration of runoff to these design points, which will discharge to upland woods.

p. Downstream stream surveys of all watercourses that will receive stormwater discharges from the site. The surveys typically indicate channel roughness, stability, and dominant stream bank vegetation.

South and east of the project site is the only watercourse that would receive runoff from the project site. The watercourse follows essentially a north-south route; it is located approximately 175 feet to the east of the eastern property line of the project site. The watercourse is would best be described as clean, straight banks, a few deeper pools, some weeds and a generally stony bottom.

q. Pre- and post-development analyses of coliform runoff concentrations, for activities or facilities that are proposed within terminal basins;

The project site is located in the watershed of a terminal basin, the Kensico Reservoir. An analysis of pre- and post-development coliform runoff concentrations is provided in **Appendix A** of the SWPPP report. **Table 8** in Appendix A shows that there would be an overall decrease in bacteria loading from the property. Changes in the loading at the four design points are provided in the table.

r. In the EOH watershed, conformance with Chapter 10 of the Design Manual;

Conformance with Chapter 10 of the SMDM is accomplished by the following: (1) Stormwater management facilities have been designed to capture the estimated runoff resulting from the 1-year, 24-hour design storm over the post-development subcatchment areas. Thus, the 3.1" depth rainfall is used to determine the treatment volume for the stormwater management measures. (2) Green infrastructure practices have been implemented, including disconnection of rooftop runoff, use of vegetated swales, and infiltration of runoff into the ground.

s. Assumptions and coefficients used in calculating the above comparisons, and an evaluation of the post-development impact stormwater runoff will have on any identified floodplains or designated flood hazard areas in the drainage basin; and

The Federal Emergency Management Agency has mapped the area of the property (see panels 36119C0163F and 36119C0276F in **Appendix F**). In addition, the mapping from the Mapping Westchester County web site is also provided. As can be seen in the figures, the entire property is located in Zone X and is thus not subject to flood.

t. References used in developing the stormwater management plan.

1. New York State Stormwater Management Design Manual, New York State Department of Environmental Conservation, Albany, New York, January 2015.
2. Applicant's Guide to Stormwater Pollution Prevention Plans, New York City Department of Environmental Protection, September 2010.
3. Rules and Regulations for the Protection from Contamination, Degradation and Pollution of the New York City Water Supply and Its Sources, New York City Department of Environmental Protection, as amended April 4, 2010.
4. New York State Standards and Specifications for Erosion and Sediment Control, New York State Department of Environmental Conservation, Albany, New York, August 2005.
5. Urban Hydrology for Small Watersheds, TR-55, Natural Resources Conservation Service, June 1986.
6. Chapter 173, Stormwater Management of the Town of North Castle.

4. Operation & Maintenance

a. A description of the inspection program to be conducted from the construction phase through final stabilization. Inspections of disturbed areas, areas used for storage of materials, erosion control measures, and construction entry and exit areas to ensure a performance schedule in accordance with the applicable requirements of the General Permit;

The inspection program during construction will follow the protocols of the SPDES General Permit, which state that for construction sites where soil disturbance activities are on-going, the qualified inspector shall conduct a site inspection at least once every seven (7) calendar days. A report of the inspection will be forwarded to the owner, site contractor, Town of North Castle, and the New York City Department of Environmental Protection within 2 business days of the site inspection.

For construction sites where soil disturbance activities are on-going and the owner or operator has received authorization in accordance with Part II.C.3 to disturb greater than five (5) acres of soil at any one time, the qualified inspector shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the qualified inspector shall conduct a site inspection at least once every thirty (30) calendar days. The owner or operator shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F of the General Permit) or, in areas under the jurisdiction of a regulated, traditional land use control MS4, the regulated, traditional land use control MS4 (provided the regulated, traditional land use control MS4 is not the owner or operator of the construction activity) in writing prior to reducing the frequency of inspections.

For construction sites that directly discharge to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the qualified inspector shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

b. A description of post-construction stormwater facility inspection and maintenance schedules. Facility inspections should be performed at least every 30 days; and

The complete post-construction stormwater facility inspection and maintenance schedule may be referenced beginning on page 18, above.

c. Names, addresses, and phone numbers of parties responsible for implementing the maintenance program and for submitting and retaining reports detailing the scope and dates of inspections, observations relating to the implementation of the erosion and controls and stormwater management measures, incidences of non-compliance and actions taken to remedy any unsatisfactory condition.

The responsible party for the construction and maintenance of the proposed stormwater management facilities and erosion and sediment control measures to be implemented at the site shall be owner's representative, Mr. Kevin McKenna.

Mr. Kevin McKenna
McKenna Custom Homes
343 Manville Road
Pleasantville, NY 10701
Tel: 914-769-1869
Fax: 914-769-8575

B. <u>Site Plans and Construction Drawings</u>

1. Existing Conditions

The following should be depicted on a plan, or plans, at a scale not to exceed 1" = 50', unless otherwise noted:
a. Existing conditions at the site prior to the proposed development. This plan must include a north reference. The boundaries of the proposed development site, and existing topography at

two (2) feet contour intervals must be shown. Elevation data and the source of the topographic information must be provided. All existing watercourses, reservoirs, reservoir stems, controlled lakes, and wetlands on the site and within the limiting distances set forth in the Watershed Regulations must be shown;

The existing conditions drawing may be referenced in the site plan set (see drawing EX-1). The drawing shows the boundaries of the development site, with the topography depicted at a 2-foot contour interval. The topographic information was obtained from a survey by Campbell Engineering. As is noted above, there are no State regulated wetlands within or in the immediate vicinity of the subject property. The location of the reservoir stem and the restrictive distances resulting are shown on the plans.

b. The boundary of any 100-year flood plain (from the United States Flood Emergency Management Area Maps) on the site. Site boundary information must include any available 100-year flood elevations and floodway boundaries;

As is noted above and as shown in Appendix F, there are no 100-year flood plains mapped on the subject property.

c. Existing impervious surfaces must be depicted, as well as locations of any vehicular entry to or exit from, the site. Existing land uses and structures, types of vegetative cover, public/permanent open space, public facilities, utility lines and easements, water supply wells, and sewage treatment systems must also be depicted. A supplemental Existing Conditions Plan is preferred when extensive details on the plan create a congested drawing that is difficult to interpret;

Existing and future condition impervious surfaces may be referenced on drawings EX-1 and S-1, respectively. Existing land uses and structures, types of vegetative cover, public/permanent open space, public facilities, utility lines and easements, water lines and septic system locations are depicted on the plans (see drawings S-1 and S-2).

d. United States Department of Agriculture ("USDA") Soil Survey boundaries on the site, soil descriptions, and tabular information detailing, by sub-watershed, the USDA Soil Conservation Service ("SCS") Hydrologic Soil Groups;

Soils on the project site may be referenced in **Figure 2** of the Figures section of this SWPPP report.

e. Site constraints that may affect erosion control and stormwater management facility design and operation will be identified by field survey. These constraints include steep slopes (15% and greater), soils identified as being highly erodible by the USDA Soil Survey, depth to bedrock, depth to seasonal high water, and poorly and excessively drained soils.

Constraints are identified in Section A.1.c of this SWPPP report, and are summarized in Table 2 Soil Characteristics/Constraints Related to Suitability for Development and in Table 3, Period and Extent of Flooding, Saturation, or High Water Table, above.

f. The location and size of on and off-site culverts and stormwater management systems that convey runoff to, through, and away from the project site. The configuration and size of the drainage area contributing to these systems must also be shown.

This is noted in the text above.

*2. **Proposed Conditions***

The following should be depicted on a plan, or plans, at a scale not to exceed 1" = 50':
a. All reservoirs, reservoir stems, controlled lakes, wetlands and watercourses that affect, or may be affected by, the project, and applicable limiting distances; (see drawing IPP-1)
b. Proposed lot layout and property lines, buildings, streets, and other impervious surfaces, utility lines, water supply wells, sewage treatment systems, and location and types of any easements on the project site as applicable; (see drawing IPP-1 and S-2)
c. Tabular information, by sub-watershed, indicating the acres of impervious surface created by the proposed activities, and the acreage for which the imperviousness of the land will be changed from pre-construction conditions; (see drawing IPP-1)
d. The percent imperviousness of the post-construction drainage area(s) contributory to a proposed stormwater management practice(s); (see drawing IPP-1)
e. Proposed on-site topography at two (2) foot contour intervals and other areas that will be disturbed during construction; (see drawing S-2)
f. All proposed erosion and sediment controls and stormwater management facilities that will be implemented to control erosion and sedimentation during construction and increases in runoff and pollutants from the site after construction has been completed; (see drawing S-3)
g. Construction details and specifications, cross-sections, and elevations of all proposed structures; (see drawing DE-1. DE-2 and DE-3)
h. A soil profile to at least one foot below each stormwater management facility (three (3) feet for infiltration practices). All proposed structures and site modifications, including the final grading proposed for the site at two (2) foot contour intervals; (see Appendix B SWPPP report)
i. Design details and specifications of proposed structural stormwater management facilities and an indication of which facilities will be used to control rates of discharge, which will be used to treat stormwater runoff from a water quality perspective, and which facilities will perform both functions; and (see drawing DE-1. DE-2 and DE-3)
j. Plan view and cross-sectional designs of all stormwater management facilities and a description of the materials to be used for construction of each of the proposed facilities. (see drawing S-2)
k. As-built drawings of all stormwater conveyance and management facilities are to verify conformance with the approved/modified SWPPP. (to be done following construction)

The items noted above (a. through k.) may be referenced on the drawings and in **Appendix A**; soil profiles may be found in **Appendix D**.

3. __Temporary Erosion and Sediment Control Measures__

a. All proposed erosion and sediment controls that will be implemented to control erosion and sedimentation during construction;
b. Any temporary erosion and sediment control facilities which will be converted to permanent stormwater management facilities;
c. Construction details, specifications, cross sections, etc., for all temporary measures proposed;
d. The limits of disturbance, material stockpile areas, fill areas, on or off-site borrow areas, and areas where vegetation will be cleared;
e. The location of vegetation to be protected on the site;
f. Provisions to prevent erosion of open sections of the stormwater conveyance system and culvert inlets and outfalls;
g. Plans showing phasing and grading as needed to demonstrate the applicability of the proposed sequence;
h. All construction notes and sequencing to be implemented as part of the erosion control plan during construction; and
i. Inspection and maintenance intervals and criteria to be used to maintain temporary erosion control measures during construction.

The items noted above (a. through i. may be referenced on the drawings noted below:

a. All proposed erosion and sediment controls that will be implemented to control erosion and sedimentation during construction; (see **drawing S-3**)
b. Any temporary erosion and sediment control facilities which will be converted to permanent stormwater management facilities; (none proposed)
c. Construction details, specifications, cross sections, etc., for all temporary measures proposed; (see **drawing DE-1**)
d. The limits of disturbance, material stockpile areas, fill areas, on or off-site borrow areas, and areas where vegetation will be cleared; (see **drawing S-3**)
e. The location of vegetation to be protected on the site; (see **drawing S-3**)
f. Provisions to prevent erosion of open sections of the stormwater conveyance system and culvert inlets and outfalls; (see **drawing S-3**)
g. Plans showing phasing and grading as needed to demonstrate the applicability of the proposed sequence; (see **drawing S-3**)
h. All construction notes and sequencing to be implemented as part of the erosion control plan during construction; (see **drawing S-3**);
i. Inspection and maintenance intervals and criteria to be used to maintain temporary erosion control measures during construction. (see **drawing S-3**);

TOWN OF NORTH CASTLE STORMWATER POLLUTION PREVENTION PLAN REPORT

A. INTRODUCTION

This Stormwater Pollution Prevention Plan report has been prepared in accordance with the requirements of Chapter 173, Stormwater Management of the Town of North Castle.

This report describes the Stormwater Pollution Prevention Plan for the proposed subdivision of land and the development of the three lots as depicted on the Integrated Plot Plan. The project site is 335,016 square feet (7.691 acres) in size and is located at the south end of Hidden Oak Road, a Town road. The property is irregular in shape, and is approximately 860 feet in a north-south direction and 460 feet in an east-west direction. At present the subject property is mostly wooded, although there are remnants of a small building foundation in the northern portion of the property.

The site construction will include: three single family houses, a 24-foot width road for access to the houses from Hidden Oak Road. Each house will obtain water from an extension of the existing water main in Hidden Oak Road into the property; wastewater for each lot will be disposed of in an on-site leaching system.

The property is located within the Kensico Reservoir watershed and thus lies within the New York City water supply watershed. As a result, approval of the Stormwater Pollution Prevention Plan and stormwater management plan by the New York City Department of Environmental Protection will also be required.

<u>Description of the Stormwater Management Plan</u>: Stormwater from the new impervious surfaces, consisting of, but not limited to, the subdivision road that will provide access from Hidden Oak Road, individual driveways, houses, and pools will be conveyed in grassed swales, overland flow and in subsurface storm drainage pipes to infiltration facilities and filtering practices for treatment of the 1-year storm. Runoff in excess of the 1-year storm will, after being conveyed to the infiltration facilities, be conveyed via subsurface storm pipes to a stormwater management facility where the peak rate attenuation of the runoff will be achieved. Additional water quality improvement will also occur in the stormwater management facility.

In order to meet the requirements of Section 173 of the Code of the Town of North Castle, the Watershed Regulations of the City of New York and the New York State SPDES General Permit for Stormwater Discharges Associated with Construction Activities, a comprehensive stormwater management plan has been developed for the three lot subdivision which includes the construction of new stormwater management facilities.

Four design points were established in order to analyze the runoff from the property. Design Point 1 is located along the southern property line (see Drawings DA-1 and DA-2). Runoff from the central portion of the property drains to this design point. Design Point 2 is located along the western property line. Runoff from the northwestern portion of the property is conveyed to Design Point 2. Design Points 3 and 4 are located along the eastern boundary of the property.

The contributing areas to these latter two design points are very small; no changes and therefore no impacts to the drainage area to Design Point 4 are proposed; only a portion of the septic system leaching area of Lot 2 is proposed within the drainage area to Design Point 3.

In the existing condition, a total of four drainage areas were defined which drain to the four above noted design points (see **Figure 4**, Existing Conditions Drainage Area Map). In the future condition, a total of 14 drainage areas were defined (see **Figure 5**, Future Conditions Drainage Area Map). The existing and future condition drainage areas are described below:

Existing Condition Drainage Areas

Existing Condition Drainage Area #1 (XDA-1) is 4.797 acres in size and consists of the east central portion of the subject property, as well as existing lands to the north of the property. Runoff from this drainage area is conveyed to Design Point 1 at a low point along the southern property line.

Existing Condition Drainage Area #2 (XDA-2) is 4.962 acres in size and consists of the western portion of the subject property, as well as existing lands to the north of the property. Runoff from this drainage area is conveyed to Design Point 2 at a low point along the western property line.

Existing Condition Drainage Area #3 (XDA-3) is 0.529 acres in size and consists of the northeastern portion of the subject property. Runoff from this drainage area is conveyed to Design Point 3 along the eastern property line.

Existing Condition Drainage Area #4 (XDA-4) is 0.242 acres in size and consists of the southeastern portion of the subject property. Runoff from this drainage area is conveyed to Design Point 4 at the southeastern property corner.

Future Condition Drainage Areas to Design Point 1

Future Condition Drainage Area #1.1 (FDA-1.1) is 0.672 acres in size and is to consist of the rear and side yard of Lot 1. The runoff from this drainage area will be conveyed to a bioretention facility to be located on Lot 1 to the south of the driveway. Excess runoff above the 1-year storm will be conveyed from the bioretention facility to the stormwater management facility basin in the southernmost portion of the property.

Future Condition Drainage Area #1.2 (FDA-1.2) is 0.446 acres in size and is to consist of lands in the southern portion of the subdivision road and small portions of future lots 2 and 3 which will drain toward the cul-de-sac. The runoff from this drainage area will be conveyed to a subsurface storm drainage facility (SWMF-1.2) to be located on Lot 3 to the west of the driveway to Lot 3. Excess runoff above the 1-year storm will be conveyed from the subsurface storm drainage facility to the stormwater management facility basin in the southernmost portion of the property.

Future Condition Drainage Area #1.3 (FDA-1.3) is 4.076 acres in size and is to consist of lands in the central portion of the property. This drainage area includes front, side and rear yard areas of the proposed house on Lot 2 and the rear yard on Lot 3, as well as the pool and a portion of the house on Lot 3. The runoff from the roof of the house on Lot 3 will discharge to the ground surface (disconnection); runoff from this drainage area will be conveyed the stormwater management facility basin in the southernmost portion of the property.

Future Condition Drainage Area #1.4 (FDA-1.4) is 0.157 acres in size and is to consist of lands in the southern portion of the property to the south and east of the proposed stormwater management basin. The runoff from this drainage area, which will be mostly wooded, will be conveyed by sheet flow to the southern property line.

Future Condition Drainage Area L1 (FDA-L1) is 0.212 acres in size and is to consist of the house, patio/terrace and pool on Lot 1, as well as the upper portion of the driveway on Lot 1. The runoff from this drainage area will be conveyed to a subsurface storm drainage facility in the front yard of the house on Lot 1.

Future Condition Drainage Area L2.1 (FDA-L2.1) is 0.132 acres in size and is to consist of a portion of the house and driveway on Lot 2. The runoff from this drainage area will be conveyed to a subsurface storm drainage facility to the north of the house on Lot 2.

Future Condition Drainage Area L2.2 (FDA-L2.2) is 0.098 acres in size and is to consist of a portion of the house and the pool on Lot 2. The runoff from this drainage area will be conveyed to a subsurface storm drainage facility to the south of the house on Lot 2.

Future Condition Drainage Area L3.1 (FDA-L3.1) is 0.261 acres in size and is to consist of the front half of the house on Lot 3. The runoff from this drainage area will be conveyed to a rain garden to the west of the house on Lot 3 by rooftop disconnection.

Future Condition Drainage Area L3.2 (FDA-L3.2) is 0.098 acres in size and is to consist of a portion of the Lot 3 driveway. The runoff from this drainage area will be conveyed in a vegetated swale to a rain garden. Excess runoff to the rain garden will be conveyed to the stormwater management basin.

<u>Future Condition Drainage Areas to Design Point 2</u>

Future Condition Drainage Area #2.1 (FDA-2.1) is 0.890 acres in size and is to consist of lands to the west of the proposed subdivision road. The runoff from this drainage area, which will consist of portions of the proposed Conservation Lands along the western property line, will be conveyed by sheet flow to lands of the City of New York.

Future Condition Drainage Area #2.2 (FDA-2.2) is 0.655 acres in size and is to consist of the upper portion of the subdivision road and off-site lands to the east of the proposed subdivision road. The runoff from this drainage area, which discharges to Design Point 2, will be conveyed to a subsurface stormwater management facility to be located on the portion of Lot 1 to the west of the subdivision road. The runoff from this drainage area will eventually be conveyed to a level spreader for discharge to lands of the City of New York.

Future Condition Drainage Area #2.3 (FDA-2.3) is 1.951 acres in size and is to consist of lands to the lawn and wooded areas to the north of the proposed house on Lot 1. The runoff from this drainage area will be conveyed a vegetated swale on the east side of the subdivision road along the Lot 1 frontage, and eventually to a level spreader for discharge to the lands of the City of New York.

Future Condition Drainage Areas to Design Point 3

Future Condition Drainage Area #3 (FDA-3) is 0.529 acres in size and is to consist of lands in the northeastern portion of the property of Lot 2. A portion of the septic system of Lot 2 will be in this drainage area; thus, the drainage area will consist of both woods and lawn. The runoff from this drainage area will be conveyed by sheet flow to Design Point 3.

Future Condition Drainage Areas to Design Point 4

Future Condition Drainage Area #4 (FDA-4) is 0.242 acres in size and consists of the southeastern portion of the subject property. There are no proposed changes to the land cover in this drainage area. Runoff from this drainage area is conveyed to Design Point 4 at the southeastern property corner.

Stormwater Management Practices Proposed: The stormwater management practices that will treat the runoff and attenuate the peak rate of runoff from the development area include: (1) five infiltration facilities (to consist of subsurface high density polyethylene chambers), (2) one bioretention facility, (3) two rain gardens, (4) two dry vegetated swales, and (5) one stormwater management/detention facility. The infiltration facilities (subsurface chambers) have been sized to capture and treat the runoff from the 1-year storm event (3.1" of precipitation) in accordance with the Watershed Regulations, Chapter 173, Stormwater Management of the Code of the Town of North Castle, and the 2015 New York State Stormwater Management Design Manual, and reduce the peak rate of runoff via infiltration into the soils. The majority of the peak rate attenuation will be accomplished in the stormwater management/detention facility. In addition to the practices noted above, other low impact development techniques such as the use of vegetated swales and the disconnection of house roof runoff are being proposed.

To confirm that the soils on the subject property are suitable for the proposed stormwater management practices, deep hole tests in 10 locations were performed in May 2014. The testing was witnessed by the reviewing engineer from the New York City Department of Environmental Protection. The results of the testing are indicated on drawing S-2; the compliance of the stormwater management practices with the subsurface conditions are also detailed on that drawing. An additional two deep hole tests were conducted on November 12, 2014. Percolation testing was also conducted on November 12 as required. The latter tests were witnessed by the NYCDEP and the engineering consultant to the Town. Percolation testing showed rates ranging from 2 to 5 minutes per inch.

Existing and future condition drainage area maps are attached to this report. The drawings show the extent of the drainage areas used in the analysis of the pre- and post-development conditions. In addition, reference may also be made to Hidden Oak Subdivision drawings IPP-1 and S-2 for the location, sizes and details on the proposed post-construction stormwater management practices.

The post-development stormwater management practices for each of the future condition drainage areas may be referenced in **Table 3**, above.

In addition to capturing and treating the runoff from the 1-year storm, the project stormwater management plan will also provide peak rate attenuation for the 1-year through 100-year storm recurrence intervals at all design points, with the exception of Design Point 3. This is shown in **Table 4**, above. It should be noted that at Design Point 3, the very small increase in runoff flows is due to the conversion of a portion of a wooded area to a mown lawn for the purposes of creating a septic system disposal area for Lot 2. The increase in runoff flows to Design Point 3 is very small; no impact is anticipated to off-site properties as a result of this minor increase.

An important aspect of any stormwater management plan is the continued maintenance of the stormwater management practices being proposed. **Table 6,** above summarizes the anticipated responsibilities for maintenance of the proposed stormwater management facilities and the contributing areas to the facilities.

The following describes the stormwater pollution prevention plan for the property in accordance with the requirements of Chapter 173 of the Town Code.

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 is a single family residential subdivision. The site construction will include: three single family houses, a 24-foot wide public road which will terminate in a cul-de-sac for access to the houses from Hidden Oak Road. The total length of the road will be 826.44 feet. Each house will obtain water from an extension of the existing water main in Hidden Oak Road into the property; wastewater for each lot will be disposed of in an on-site leaching system.

(b) Site map/construction drawing(s) 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 site map/construction drawings for the project may be referenced on the following drawings listed below.

Dwg No.	Drawing Title	Date
CS-1	Cover Sheet	03/01/2016
IPP-1	Site Layout Plan	03/01/2016
S-2	Site Grading and Utilities Plan	03/01/2016
S-3.1	Erosion and Sediment Control Plan/ Tree Removal & Protection Plan – Phase 1	03/01/2016
S-3.2	Erosion and Sediment Control Plan/ Tree Removal & Protection Plan – Phase 2	03/01/2016
S-4	Slopes Map	07/24/2015
S-5	Landscape Plan	03/01/2016
DE-1	Construction Details	03/01/2016
DE-2	Construction Details	03/01/2016
DE-3	Subdivision Road and Driveway Profiles	03/01/2016
DE-4	Erosion Control/Restoration Notes/Trees	03/01/2016
DE-5	Construction Details / Maintenance Plan	03/01/2016
DA-1	Existing Conditions Drainage Area Map	04/09/2015
DA-2	Future Conditions Drainage Area Map	03/01/2016
EX-1	Existing Conditions Plan	11/17/2014

The location of all improvements may be referenced on drawings IPP-1 and S-2. Areas of disturbance may be found on drawing S-3. Existing vegetation (and areas that will not be disturbed) may be found on drawing S-3. Off-site surface waters are located to the east of the project site; there are no on-site wetlands or watercourses. Existing and final slopes may be referenced on drawings S-2 and S-4. No off-site material, waste, borrow or equipment storage areas are proposed. The location of the project stormwater discharges may be referenced on drawing S-2.

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

A summary of the soils description from the Soils Survey of Putnam and Westchester Counties may be referenced below (see **Figure 3**).

<u>Charlton loam</u> (ChC) soils are very dark grayish brown (10YR 3/2) loam over dark brown (10YR 3/3) loam. They are gently sloping, very deep and well-drained soils located on hilltops and parts of hills. This soil is formed in glacial till underlain by highly fractured, folded tilted granite, schist, and gneiss bedrock.

<u>Charlton-Chatfield Complex soils</u> (CrC) are very dark grayish brown (10YR 3/2) loam over dark brown (10YR 3/3) loam. They are very deep to moderately deep, well-drained to somewhat

excessively drained soils located on the sides and tops of glaciated hills. This soil is formed in glacial till underlain by highly fractured, folded tilted granite, schist, and gneiss bedrock. Rock outcrops make up approximately 20 percent of this soil.

Chatfield-Hollis-Rock Outcrop Complex soils (CtC) are very dark grayish brown (10YR 3/2) loam over dark brown (10YR 3/3) loam. They are rolling, moderately deep, well-drained to somewhat excessively well drained soils. Rock outcrops in this soil unit are predominately granite, gneiss, and schist. This soil is located on hilltops and narrow ridges of glaciated hills.

(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 a greater amount is determined necessary pursuant to an approved SWPPP;

The detailed construction phasing plan may be referenced on drawing S-3. The area of disturbance for Phase 1 of the project has been calculated to be 1.802 acres. For Phase 2, the construction of the three lots, the area of disturbance has been calculated to be 3.192 acres. The total disturbance for both Phase 1 and Phase 2 has been calculated to be 4.994 acres.

(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.

The contractors will be signatories to the SWPPP and thus they will be made quite aware that the project has a comprehensive Storm Water Pollution Prevention Plan, and that it is their responsibility to keep the site clean and to minimize the potential for litter and other potential pollutants from being conveyed off-site and into downgradient watercourses and waterbodies. Construction materials 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 or downgradient from the property.

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, aggregate, and sod and/or seed to establish lawn for the houses, wood for the house structure (walls, floors and beams), wood roof trusses, roofing materials, and paving materials, such as stone or brick for terraces and walkways. 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 drawing DE-2. In the event that site work for the construction of the house sites are 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 S-3 and DE-2. The stormwater management basin will be constructed in Phase 1 of the project, and a temporary riser and anti-vortex device will be installed at the outlet from the stormwater management basin. However, erosion controls and stabilization practices will be in place for the areas that drain to the basin. The basin will not be used as a temporary sediment trap.

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 S-3 are to be used to stabilize the ground surface until such time as permanent stabilization can be achieved.

Soil Restoration/Disturbed Areas Stabilization Protocol

As is noted above, soil restoration is a required practice applied across areas of a development site where soils have been disturbed and will be vegetated in order to recover the original properties and porosity of the soil. Soil restoration is applied in the cleanup, restoration, and landscaping phase of construction followed by the permanent establishment of an appropriate, deep-rooted groundcover to help maintain the restored soil structure.

According to the protocols of the 2010 and 2015 *Stormwater Management Design Manual*, during periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following Soil Restoration steps applied:

1) Apply 3 inches of compost over subsoil
2) Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor-mounted disc, or tiller, mixing, and circulating air and compost into subsoils.

3) Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site.
4) Apply topsoil to a depth of 6 inches.
5) Vegetate as required by approved plan.

At the end of the soil restoration procedure, an inspector should be able to push a 3/8" metal bar 12 inches into the soil just with body weight.

Temporary Critical Area Plantings (Temporary Seeding)

<u>When to Apply</u> - Temporary seeding may be necessary on construction sites to protect an area, or section, where final grading is complete, when preparing for winter work shutdown, or to provide cover when permanent seedings are likely to fail due to mid-summer heat and drought. The intent is to provide temporary protective cover during temporary shutdown of construction and/or while waiting for optimal planting time.

Water management practices must be installed as appropriate for site conditions. The area must be rough graded and slopes physically stable. Large debris and rocks are usually removed. Seedbed must be seeded within 24 hours of disturbance or scarification of the soil surface will be necessary prior to seeding. Fertilizer and lime are not typically used for temporary seedings.

If it is spring, summer or early fall, then seed the area with ryegrass (annual or perennial) at 30 lb per acre (Approximately 0.7 lb/1000 sq. ft. or use 1 lb/1000 sq. ft.).

If is late fall or early winter, then seed with Certified 'Aroostook' winter rye (cereal rye) at 100 lb per acre (2.5 lb/1000 sq. ft.).

Any seeding method may be used that will provide uniform application of seed to the area and result in relatively good soil to seed contact.

Mulch the seeded area with hay or straw at 2 tons/acre (approx. 90 lb/1000 sq. ft. or 2 bales). Quality of hay or straw mulch allowable will be determined based on long term use and visual concerns. Mulch anchoring will be required where wind or areas of concentrated water are of concern. Wood fiber hydromulch or other sprayable products approved for erosion control (nylon web or mesh) may be used if applied according to manufacturers' specification. Caution is advised when using nylon or other synthetic products. They may be difficult to remove prior to final seeding.

Permanent Lawn Areas

NOTE REGARDING USE OF FERTILIZER ON THE PROPERTY
In accordance with Article XXVI, Restrictions on the Application and Sale of Lawn Fertilizer within the County of Westchester, Section 863.1302 Regulation of the Use and Application of Lawn Fertilizer, no person shall apply any lawn fertilizer within the County that is labeled as containing more than 0% phosphorus or other compound containing phosphorus, such as

phosphate, except for newly established turf or lawn areas during their first growing season. The lawn fertilizer application shall not contain an amount of phosphorus exceeding the amount and rate of application recommended in the soil test evaluation. In subsequent years, no person shall apply any lawn fertilizer within the County that is labeled as containing more than 0% phosphorus or other compound containing phosphorus, such as phosphate, nor apply lawn fertilizer between December 1st and April 1st, nor apply lawn fertilizer to any impervious surface. If such application occurs, the fertilizer must be immediately contained and either legally applied to turf or placed in an appropriate container. Finally, no person shall apply lawn fertilizer to any turf or lawn area within twenty (20) feet of any surface water, except that this restriction shall not apply where a continuous natural vegetative buffer, at least ten (10) feet wide, separates a turf or lawn area and surface water.

Time of Planting Lawns - Fall planting is preferred. Seed after August 15. In the spring, plant until May 15. If seeding is done between May 15 and August 15, irrigation may be necessary to ensure a successful seeding.

Site Preparation – Disturbed soil areas are to be restored to the procedures of the *Soil Restoration/Disturbed Areas Stabilization Protocol* above.

Lawn Planting and Installation - Use a cultipacker type seeder if possible. Seed to a depth of 1/8 to 1/4 inch. If seed is to be broadcast, cultipack or roll after seeding. If hydroseeded, lime and fertilizer may be applied through the seeder, and rolling is not practical.

Mulching - Mulch all seedings in accordance with Standard and Specifications for Mulching. Small grain straw is the best material. The following are the recommended seed mixes from Section 3, Vegetative Measures for Erosion and Sediment Control from the New York State Standards and Specifications for Erosion and Sediment Control, latest edition.

Seed Mixes for Sunny sites (well, moderately well, and somewhat poorly drained soils)

a. Athletic fields and similar areas	lb/1000 sf	lb/acre
80% Kentucky bluegrass blend	2.4-3.2	105-138
20% perennial ryegrass	0.6-0.8	25- 37
	3.0-4.0	130-175
OR		
(for southern and eastern NY)	lb/1000 sf	lb/acre
50% Kentucky bluegrass	1.5-2.0	65-88
50% perennial ryegrass	1.5-2.0	65-87
	3.0-4.0	130-175
OR		
100% Tall fescue, Turf-type, fine leaf	3.4-4.6	150-200

Shady dry sites (well to somewhat poorly drained soils)	lb/1000 sf	lb/acre
65% fine fescue	2.6-3.3	114-143
15% perennial ryegrass	0.6-0.7	26- 33

20% Kentucky bluegrass blend	0.8-1.0	35- 44
	4.0-5.0	174-220
OR		
80% blend of shade-tolerant Kentucky bluegrass	2.4-3.2	105-138
20% perennial ryegrass	0.6-0.8	25- 37
	3.0-4.0	130-175
OR		
100% Tall fescue, Turf-type, fine leaf	3.4-4.6	150-200

Fertilizer Application in the First Year - Apply fertilizer as indicated by the soil test three to four weeks after germination (spring seedlings). If test results have not been obtained, apply 1 pound nitrogen/1,000 square feet using a fertilizer. Summer and early fall seedings, apply as above unless air temperatures are above 85°F for an extended period. Wait for cooler temperatures to fertilize. Late fall/winter seedings, fertilize in spring.

Stabilization Outside of Growing Season – If grading is performed outside of the growing season, ground stabilization is still required. Apply Flexterra FGM (Flexible Growth Medium) or approved equal to the area to be stabilized in accordance with the manufacturer's specifications. The application guide for Flexterra is as follows:

A. Strictly comply with equipment Manufacturer's installation instructions and recommendations. Use approved hydro-spraying machines with fantype nozzle (50-degree tip) whenever possible to achieve best soil coverage. Apply from opposing directions to assure 100% soil surface coverage. Slope interruption devices or water diversion techniques are recommended according to the slope interruption limits table on the back. B. To ensure proper application rates, measure and stake area. For maximum performance, apply in a two-step process*: 1. Apply specified prescriptive agronomic formulations along with 50% of seed with a small amount of SMM, BFM, FGM or ET-FGM for visual metering. 2. Mix balance of seed and apply SMM, BFM, FGM or ET-FGM at a rate of 50 pounds per 125 gallons (see mixing section on the back for details) of water over freshly seeded surfaces. See loading chart on the back and confirm loading rates with equipment manufacturer. Do not leave seeded surfaces unprotected, especially if precipitation is imminent. C. Fill 1/3 of mechanically agitated hydroseeder with water. Turn pump on for 15 seconds and purge and pre-wet lines. Turn pump off. D. Turn agitator on and load low density materials first (i.e. seed) ** E. Continue slowly filling tank with water while loading fiber matrix into tank. F. Consult loading chart on the back to determine the number of bags to be added for desired area and application rate. G. SMM, BFM, FGM or ET-FGM should be completely loaded before water level reaches 75% of the top of tank. H. Top off with water and mix until all fiber is fully broken apart and hydrated (minimum of 10 minutes — increase mixing time when applying in cold conditions). This is very important to fully activate the bonding additives and to obtain proper viscosity. I. Add fertilizer. J. Shut off recirculation valve to minimize potential for air entrainment within the slurry. K. Slow down agitator and start applying with a 50-degree fan tip nozzle. L. Spray in opposing directions for maximum soil coverage.

* *Depending on site conditions, SMM, BFM, FGM or ET-FGM may be applied in a one-step process where all components may be mixed together in single tank loads. Consult with Manufacturer for further details.*

***Do not add tackifiers or polymers.*

Seed Mixes

New England Wetmix
As per New England Wetland Plants, Inc., if planted during the fall months, the seed mix will germinate the following spring. The wetland seeds in this mix can be sown by hand, with a hand-held spreader, or hydro-seeded on large or hard to reach sites. Lightly rake to insure good seed-to-soil contact. Seeding can take place on frozen soil, as the freezing and thawing weather of late fall and late winter will work the seed into the soil. If spring conditions are drier than usual watering may be required. If sowing during the summer months supplemental watering will likely be required until germination. A light mulch of clean, weed free straw is recommended.

New England Erosion Control/Restoration Mix for Detention Basins and Moist Sites
As per New England Wetland Plants, Inc., the mix may be applied by hand, by mechanical spreader, or by hydro-seeder. After sowing, lightly rake, roll or cultipack to insure good seed-to-soil contact. Best results are obtained with a Spring or late Summer seeding. Late Fall and Winter dormant seeding requires an increase in the application rate. A light mulching of clean, weed-free straw is recommended.

New England Conservation/Wildlife Mix
The mix may be applied by hand, by mechanical spreader, or by hydro-seeder. After sowing, lightly rake, roll or cultipack to insure good seed-to-soil contact. A light mulching of clean, weed-free straw is recommended.

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

Drawing S-3 along with drawing DE-2 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 siting and sizing of any temporary sediment basins;

Drawing DE-2 depicts the dimensions, material specifications and installation details of the proposed erosion and sediment control practices.

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

There are no temporary erosion and sediment control practices which will be converted to permanent control measures. Following site stabilization, as described in the Construction Sequence narrative on drawing S-3, the erosion control practices will be removed.

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

The schedule for the implementation of the temporary erosion and sediment control practices, including the timing of the initial placement and the duration that each practice will be in place may be referenced in the Erosion and Sediment Control Plan Narrative on drawing DE-1.

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

A maintenance schedule has been prepared for the erosion and sediment control measures that are proposed. The schedule may be referenced on drawing S-3 and in the appendix to this SWPPP report.

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

Runoff from the project site is presently and will continue in the future to be conveyed toward the Kensico Reservoir.

(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

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.

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

There is no existing data that describes the stormwater runoff at the site.

According to the NYSDEC Environmental Resource Mapper, Pleasantville Cove of the Kensico Reservoir is classified as AA. The unnamed watercourse to the east of the project site and the Bronx River to the west of NY State Route 120, both of which drain to the Kensico Reservoir, are both classified A.

*(q) Post-construction stormwater controls to the satisfaction of the Town Engineer for disturbances not meeting Condition A, B or C in § **173-5B(2)** of the Town Code.*

(2) Land development activities as defined in § 173-4B of the Town Code and meeting Condition A, B or C below shall also include water quantity and water quality controls (post-construction stormwater runoff controls) as set forth in § 173-5B (3) below as applicable:

(a) Condition A: stormwater runoff from land development activities disturbing more than one acre and discharging a pollutant of concern to either an impaired water identified on the Department's 303(d) list of impaired waters or a total maximum daily load (TMDL) designated watershed for which pollutants in stormwater have been identified as a source of the impairment.
(b) Condition B: stormwater runoff from land development activities disturbing five or more acres.
(c) Condition C: stormwater runoff from land development activity disturbing between one acre and five acres of land during the course of the project, exclusive of the construction of single family residences and construction activities at agricultural properties.

The Kensico Reservoir is not listed by the NYSDEC in the Department's Section 303(d) list, nor is it listed as a TMDL designated watershed. Therefore, it appears that only Condition C would apply to the Hidden Oak Subdivision project.

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

(a) All information in § 173-5B (1) of the Town Code.
See below.

*(a) All information in § **173-5B (1)** of the Town Code.*

The information required in Section 173-5B (1) of the Town Code may be referenced above in Section B of this report.

(b) Description of each post-construction stormwater management practice.

A summary and description of each may be found in **Table 2** above.

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

Drawing S-3 shows the location and size of each post-construction stormwater management practice.

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

The hydrologic analysis for the modeled storm events (1 year, 2 year, 10 year, 25 year and 100 year recurrence interval) may be referenced in **Appendix C** of this report.

(e) Comparison of post-development stormwater runoff conditions with predevelopment conditions.

Table 2, above, provides a comparison of the pre-development and post-development peak rates of runoff to the design points. As can be seen in the table, the project stormwater management plan, once constructed, will result in a peak rate of runoff that is less than or equal to the existing peak rates of runoff for all of the modeled storm events at Design Points 1, 2 and 4. At design point 3, a small increase is predicted as a result of the conversion of a portion of the drainage area from woods to lawn for the construction of the septic system on Lot 2. The small increase in the peak rate is not significant.

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

The dimensions, material specifications and installation details for each post-construction stormwater management practice may be referenced on drawings DE-1 and DE-2.

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

A maintenance schedule for each post-construction stormwater management practice is included in this report and may be referenced in **Appendix C**.

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

Maintenance easements are proposed to ensure access to the stormwater management practices that will not be in solely private ownership. The maintenance easements may be referenced on drawing IPP-1.

(i) Inspection and maintenance agreement binding on all subsequent landowners served by the on-site stormwater management measures in accordance with § 173-7 of the Town Code.

An inspection and maintenance agreement will be prepared for review by the Town and its counsel.

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

The project SWPPP has been prepared by licensed professional engineer.

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

The applicant will commence the process to obtain approval of the SWPPP from the New York City Department of Environmental Protection (once a State Environmental Quality Review Act determination is made by the Lead Agency) and a SPDES General Permit for Stormwater

Discharges from Construction Activity from the New York State Department of Environmental Conservation (following the approval of the SWPPP).

D. Contractor certification.

(1) Each contractor and subcontractor identified in the SWPPP 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."

(2) 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.

(3) The certification statement(s) shall become part of the SWPPP for the land development activity.

So noted that each contractor to the project will need to sign a certification statement.

E. 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.

A copy of the SWPPP shall be retained at the site, as required.

FIGURES

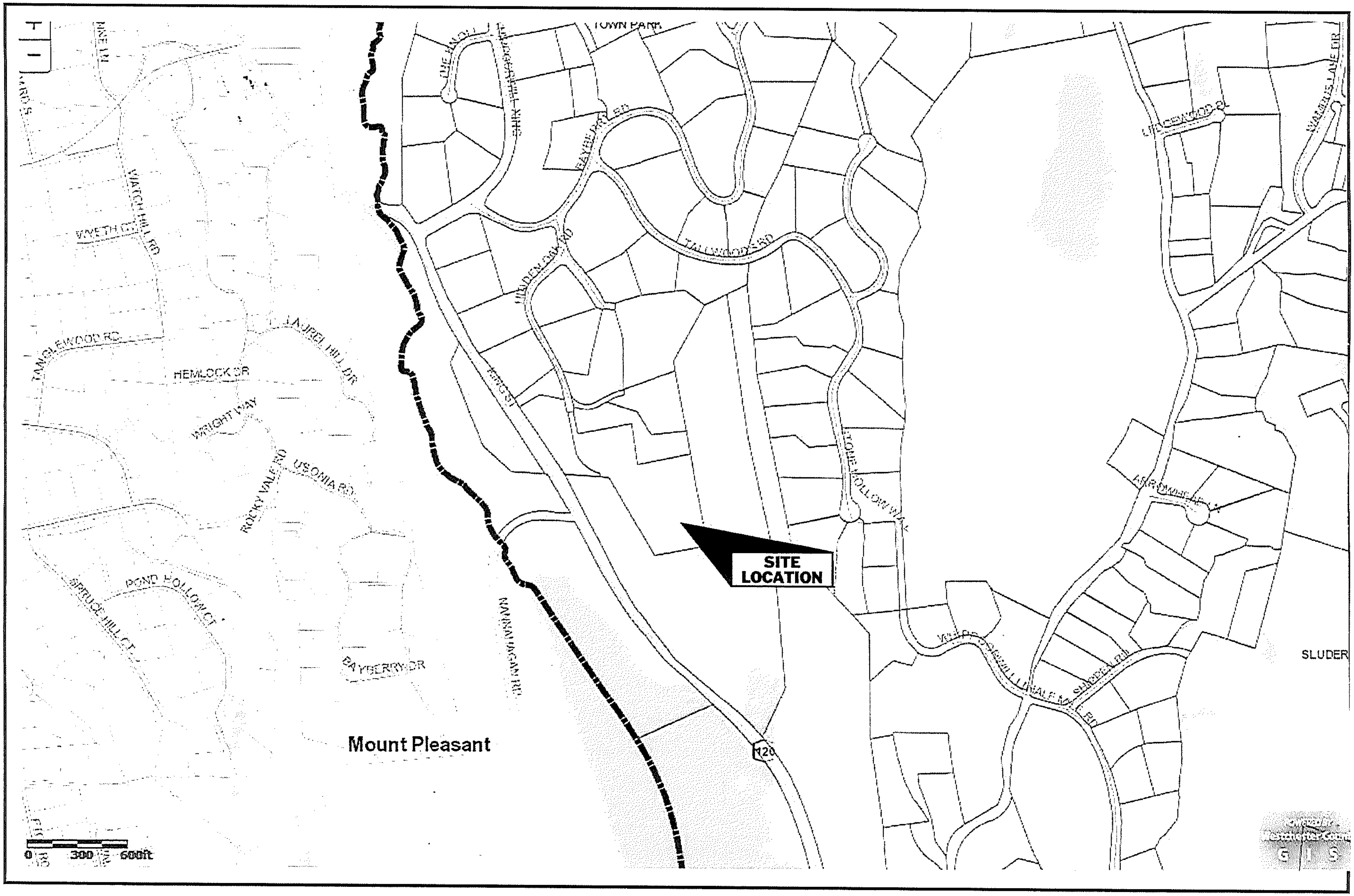
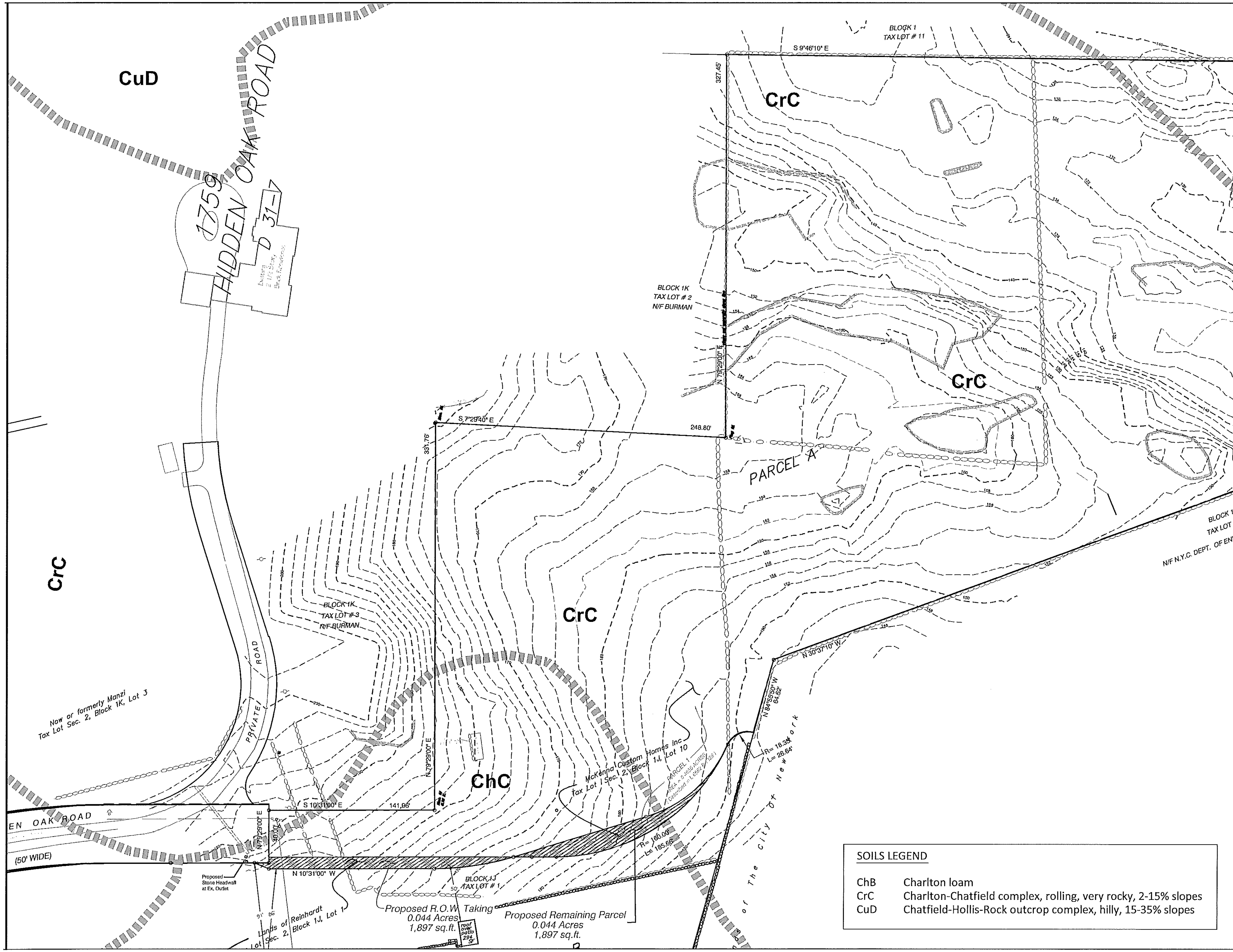


Figure 1

SITE LOCATION MAP

Scale: Not to Scale



SOILS LEGEND

ChB	Charlton loam
CrC	Charlton-Chatfield complex, rolling, very rocky, 2-15% slopes
CuD	Chatfield-Hollis-Rock outcrop complex, hilly, 15-35% slopes

SOILS MAP

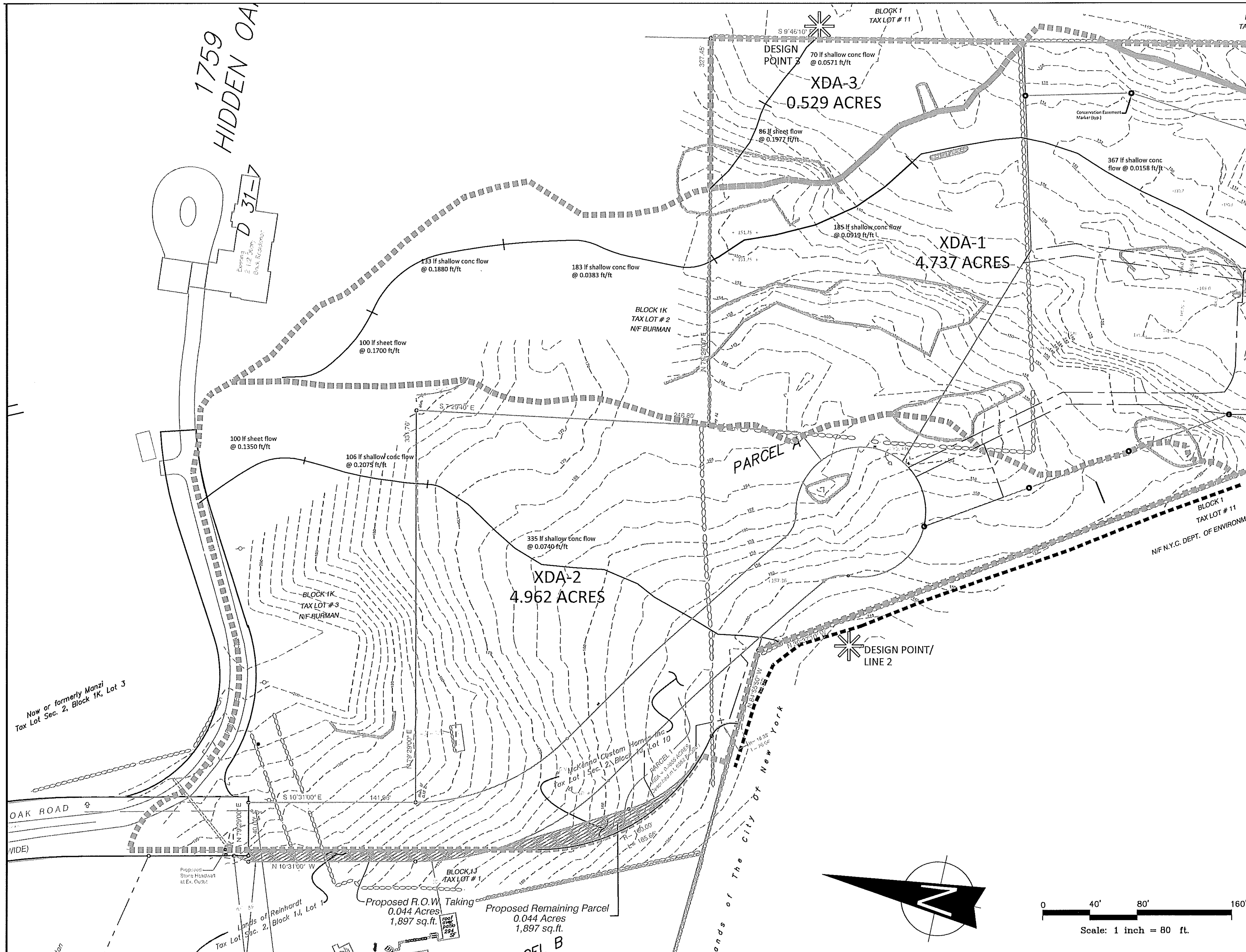
Hidden Oak Subdivision
Hidden Oak Road
Town of North Castle, New York

EVANS ASSOCIATES
ENVIRONMENTAL CONSULTING, INC.
205 Amity Road
Bethany, Connecticut 06524

April 9, 2015

Scale: 1"=80'

Figure 2



EXISTING CONDITIONS
DRAINAGE AREA MAP

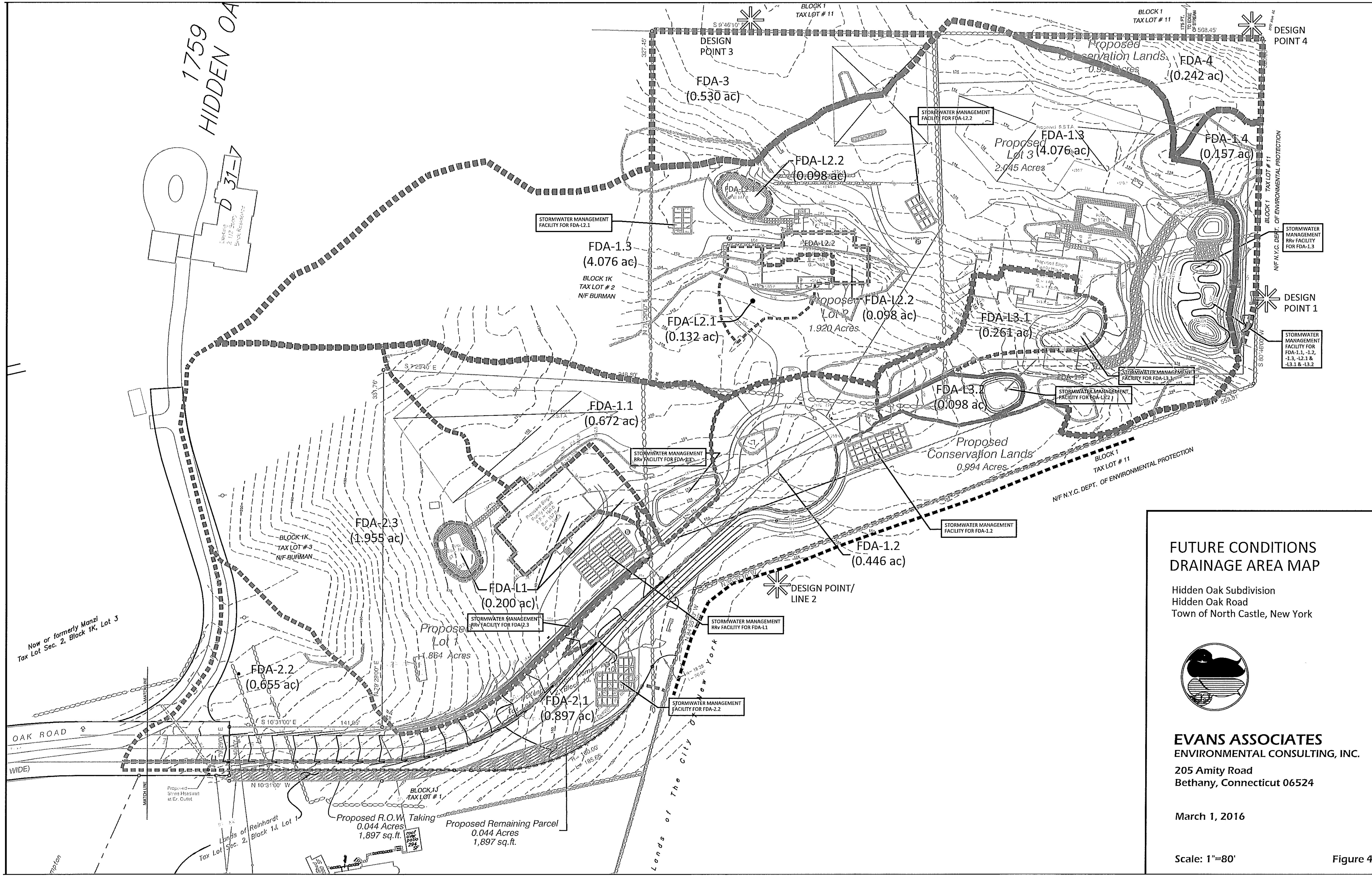
Hidden Oak Subdivision
Hidden Oak Road
Town of North Castle, New York

EVANS ASSOCIATES
ENVIRONMENTAL CONSULTING, INC.
205 Amity Road
Bethany, Connecticut 06524

April 9, 2015

Scale: 1"=80'

Figure 3



FUTURE CONDITIONS DRAINAGE AREA MAP

Hidden Oak Subdivision
Hidden Oak Road
Town of North Castle, New York

EVANS ASSOCIATES
ENVIRONMENTAL CONSULTING, INC.

205 Amity Road
Bethany, Connecticut 06524

March 1, 2016

Scale: 1"=80'

Figure 4

Appendix A

Stormwater Quality/ Runoff Reduction Volume Calculations

Table 1
Hidden Oak Subdivision
Existing Condition Drainage Areas

DRAINAGE AREA	*Area (in sq feet)*	*Area (in acres)*
XDA-1 TO DESIGN POINT 1		
Impervious Surfaces (off-site)	2,133	0.049
Woods, good condition, HSG B	195,798	4.495
Woods, good condition, HSG C	7,148	0.164
Woods, good condition, HSG D	3,574	0.082
TOTAL	208,653	4.790
XDA-2 TO DESIGN POINT 2		
Woods, good condition, HSG B	209,793	4.816
Impervious surfaces	2,190	0.050
TOTAL	211,983	4.866
XDA-3 TO DESIGN POINT 3		
Woods, good condition, HSG B	23,060	0.529
TOTAL	23,060	0.529
XDA-4 TO DESIGN POINT 4		
Woods, good condition, HSG B	4,223	0.097
Woods, good condition, HSG C	4,223	0.097
Woods, good condition, HSG D	2,111	0.048
TOTAL	10,557	0.242

Table 2
Hidden Oak Subdivision
Future Condition Drainage Areas and Water Quality Volume (WQv) Calculation

Under the Watershed Regulations, the requirement is to capture and treat the runoff from the 1-year, 24 hour storm event which is equal to 3.1 inches of precipitation, or the water quality volume, whichever is greater. The following calculates the treatment volume of runoff from the 1-year storm (using TR-55 in accordance with the New York Stormwater Management Design Manual) and the Water Quality Volume - 1.3" of precipitation (using the 90% Rule).

1-year, 24 hour precipitation =	*3.1*	*inches*
90% rule precipitation depth =	*1.3*	*inches*

Drainage Area	*Area (in sq feet)*	*Area (in acres)*	*CN Value*	*Runoff Depth (inches)*	*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*90% Rule Treatment Vol. (cu feet)*
1 - FDA-1.1 to Design Point 1: Treatment in Bioretention Facility						
Lawn/landscape, HSG B	18,513	0.425	61			
Woods, HSG B	7,020	0.161	55			
Woods, HSG B (OFF-SITE)	3,739	0.086	55			
TOTALS / WEIGHTED CN	29,272	0.672	59	0.34	824	159

Impervious Surfaces =	0	sq feet		% Impervious =	0.0
Rv =	0.05				
Water Quality Volume, WQv =	0.019	acre-feet	*1 year storm*		
Water Quality Volume, WQv =	0.004	acre-feet	*90% Rule*		

Specified Reduction Factor, S	Area (ac.)	%	S
Area in HSG B	0.672	100.0	0.4
Area in HSG C	0.000	0.0	0.3
Area in HSG D	0.000	0.0	0.2
TOTAL	0.672	100.0	
Specified Reduction Factor, S=			0.40

Drainage Area	*Area (in sq feet)*	*Area (in acres)*	*CN Value*	*Runoff Depth (inches)*	*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*90% Rule Treatment Vol. (cu feet)*
2 - FDA1.2 to Design Point 1: Treatment in Infiltration Facility						
Impervious surfaces, HSG B	12,720	0.292	98			
Lawn/landscape, HSG B	3,180	0.073	61			
Woods, HSG B	3,528	0.081	55			
TOTALS / WEIGHTED CN	19,428	0.446	84	1.60	2,589	1,345

Impervious Surfaces =	12,720	sq feet		% Impervious =	65.5
Rv =	0.64				
Water Quality Volume, WQv =	0.059	acre-feet	*1 year storm*		
Water Quality Volume, WQv =	0.031	acre-feet	*90% Rule*		

Specified Reduction Factor, S	Area (ac.)	%	S
Area in HSG B	0.446	100.0	0.4
Area in HSG C	0.000	0.0	0.3
Area in HSG D	0.000	0.0	0.2
TOTAL	0.446	100.0	
Specified Reduction Factor, S=			0.40

Table 2
Hidden Oak Subdivision
Future Condition Drainage Areas and Water Quality Volume (WQv) Calculation

Drainage Area	*Area (in sq feet)*	*Area (in acres)*	*CN Value*	*Runoff Depth (inches)*	*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*90% Rule Treatment Vol. (cu feet)*
3 - FDA1.3 to Design Point 1: Treatment in Stormwater Management Basin						
Impervious surfaces, HSG B	9,958	0.229	98			
Crushed stone maintenance path, HSG B	1,720	0.039	85			
Retaining Wall, HSG B	185	0.004	98			
Lawn/landscape, HSG B	60,200	1.382	61			
Lawn/landscape, HSG C	2,190	0.050	74			
Lawn/landscape, HSG D	523	0.012	80			
Brush/Grass Mix (BASIN), HSG B	12,069	0.277	48			
Woods, HSG B	34,260	0.787	55			
Woods, HSG B (OFF-SITE)	51,994	1.194	55			
Woods, HSG C	2,962	0.068	70			
Woods, HSG D	1,481	0.034	77			
TOTALS / WEIGHTED CN	177,542	4.076	60	0.37	5,476	1,951

Impervious Surfaces =	10,143	sq feet		% Impervious =	5.7
Rv =	0.10				
Water Quality Volume, WQv =	0.126	acre-feet	*1 year storm*		
Water Quality Volume, WQv =	0.045	acre-feet	*90% Rule*		

Specified Reduction Factor, S	Area (ac.)	%	S
Area in HSG B	3.868	95.9	0.4
Area in HSG C	0.118	2.9	0.3
Area in HSG D	0.046	1.1	0.2
TOTAL	4.032	100.0	
Specified Reduction Factor, S=			0.39

Drainage Area	*Area (in sq feet)*	*Area (in acres)*	*CN Value*	*Runoff Depth (inches)*	*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*90% Rule Treatment Vol. (cu feet)*
4 - FDA1.4 to Design Point 1: No Treatment Provided						
Lawn/landscape, HSG B	478	0.011	61			
Lawn/landscape, HSG C	124	0.003	74			
Lawn/landscape, HSG D	62	0.001	80			
Woods, HSG B	3,040	0.070	55			
Woods, HSG C	2,102	0.048	70			
Woods, HSG D	1,051	0.024	77			
TOTALS / WEIGHTED CN	6,857	0.157	64	0.51	293	37

Impervious Surfaces =	0	sq feet		% Impervious =	0.0
Rv =	0.05				
Water Quality Volume, WQv =	0.007	acre-feet	*1 year storm*		
Water Quality Volume, WQv =	0.001	acre-feet	*90% Rule*		

Specified Reduction Factor, S	Area (ac.)	%	S
Area in HSG B	0.081	51.3	0.4
Area in HSG C	0.051	32.5	0.3
Area in HSG D	0.026	16.2	0.2
TOTAL	0.157	100.0	
Specified Reduction Factor, S=			0.34

Table 2
Hidden Oak Subdivision
Future Condition Drainage Areas and Water Quality Volume (WQv) Calculation

Drainage Area	*Area (in sq feet)*	*Area (in acres)*	*CN Value*	*Runoff Depth (inches)*	*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*90% Rule Treatment Vol. (cu feet)*
5 - FDA-L1 (LOT 1) to Design Point 1: Treatment in Infiltration Facility						
Impervious surfaces, HSG B	8,454	0.194	98			
Lawn/landscape, HSG B	784	0.018	61			
TOTALS / WEIGHTED CN	9,238	0.212	95	2.55	1,961	874

Impervious Surfaces =	8,454	sq feet	% Impervious =	91.5	
Rv =	0.87				
Water Quality Volume, WQv =	0.045	acre-feet	*1 year storm*		
Water Quality Volume, WQv =	0.020	acre-feet	*90% Rule*		

Specified Reduction Factor, S	Area (ac.)	%	S
Area in HSG B	0.212	100.0	0.4
Area in HSG C	0.000	0.0	0.3
Area in HSG D	0.000	0.0	0.2
TOTAL	0.212	100.0	
Specified Reduction Factor, S=			0.40

Drainage Area	*Area (in sq feet)*	*Area (in acres)*	*CN Value*	*Runoff Depth (inches)*	*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*90% Rule Treatment Vol. (cu feet)*
6 - FDA-L2.1 (LOT 2) to Design Point 1: Treatment in Infiltration Facility						
Impervious surfaces, HSG B	3,185	0.073	98			
Lawn/landscape, HSG B	2,550	0.059	61			
TOTALS / WEIGHTED CN	5,735	0.132	82	1.46	697	342

Impervious Surfaces =	3,185	sq feet	% Impervious =	55.5	
Rv =	0.550				
Water Quality Volume, WQv =	0.016	acre-feet	*1 year storm*		
Water Quality Volume, WQv =	0.008	acre-feet	*90% Rule*		

Specified Reduction Factor, S	Area (ac.)	%	S
Area in HSG B	0.132	100.0	0.4
Area in HSG C	0.000	0.0	0.3
Area in HSG D	0.000	0.0	0.2
TOTAL	0.132	100.0	
Specified Reduction Factor, S=			0.40

Table 2
Hidden Oak Subdivision
Future Condition Drainage Areas and Water Quality Volume (WQv) Calculation

Drainage Area	*Area (in sq feet)*	*Area (in acres)*	*CN Value*	*Runoff Depth (inches)*	*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*90% Rule Treatment Vol. (cu feet)*
7 - FDA-L2.2 (LOT 2) to Design Point 1: Treatment in Infiltration Facility						
Impervious surfaces, HSG B	4,285	0.098	98			
TOTALS / WEIGHTED CN	4,285	0.098	98	2.87	1,024	441

Impervious Surfaces =	4,285 sq feet		% Impervious =	100.0
Rv =	0.95			
Water Quality Volume, WQv =	0.024 acre-feet	*1 year storm*		
Water Quality Volume, WQv =	0.010 acre-feet	*90% Rule*		

Specified Reduction Factor, S	Area (ac.)	%	S
Area in HSG B	0.098	100.0	0.4
Area in HSG C	0.000	0.0	0.3
Area in HSG D	0.000	0.0	0.2
TOTAL	0.098	100.0	
Specified Reduction Factor, S=			0.40

Drainage Area	*Area (in sq feet)*	*Area (in acres)*	*CN Value*	*Runoff Depth (inches)*	*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*90% Rule Treatment Vol. (cu feet)*
8 - FDA-L3.1 (LOT 3) to Design Point 1: Treatment in Rain Garden						
Impervious surfaces (house), HSG B	982	0.023	98			
Impervious surfaces (house), HSG B	907	0.021	98			
Impervious surfaces (walks), HSG B	387	0.009	98			
Lawn/landscape, HSG B	5,387	0.124	61			
Woods, HSG B	3,721	0.085	55			
TOTALS / WEIGHTED CN	11,384	0.261	66	0.59	563	284

Impervious Surfaces =	2,276 sq feet		% Impervious =	20.0
Rv =	0.230			
Water Quality Volume, WQv =	0.013 acre-feet	*1 year storm*		
Water Quality Volume, WQv =	0.007 acre-feet	*90% Rule*		

Specified Reduction Factor, S	Area (ac.)	%	S
Area in HSG B	0.023	100.0	0.4
Area in HSG C	0.000	0.0	0.3
Area in HSG D	0.000	0.0	0.2
TOTAL	0.023	100.0	
Specified Reduction Factor, S=			0.40

Table 2
Hidden Oak Subdivision
Future Condition Drainage Areas and Water Quality Volume (WQv) Calculation

Drainage Area	*Area (in sq feet)*	*Area (in acres)*	*CN Value*	*Runoff Depth (inches)*	*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*90% Rule Treatment Vol. (cu feet)*
9 - FDA-L3.2 (LOT 3) to Design Point 1: Treatment in RAIN GARDEN						
Impervious surfaces, HSG B	1,015	0.023	98			
Lawn/landscape, HSG B	1,875	0.043	61			
Woods, HSG B	1,396	0.032	55			
TOTALS / WEIGHTED CN	4,286	0.098	68	0.68	242	122

Impervious Surfaces =	1,015 sq feet		% Impervious =	23.7
Rv =	0.263			
Water Quality Volume, WQv =	0.006 acre-feet	*1 year storm*		
Water Quality Volume, WQv =	0.003 acre-feet	*90% Rule*		

Specified Reduction Factor, S	Area (ac.)	%	S
Area in HSG B	0.098	100.0	0.4
Area in HSG C	0.000	0.0	0.3
Area in HSG D	0.000	0.0	0.2
TOTAL	0.098	100.0	
Specified Reduction Factor, S=			0.40

OVERALL DRAINAGE AREA TO DESIGN POINT 1

LAND COVER TYPE	AREA (sq feet)	AREA (acres)	Curve Number	*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*1 yr, 24 hr storm Treatment Vol. (acre-feet)*
Impervious surfaces, HSG B	40,599	0.932	98		
Lawn/landscape, HSG B	92,967	2.134	61		
Lawn/landscape, HSG C	2,314	0.053	74		
Lawn/landscape, HSG D	585	0.013	80		
Brush/Grass Mix, HSG B	12,069	0.277	48		
Woods, HSG B	52,965	1.216	55		
Woods, HSG C	5,064	0.116	70		
Woods, HSG D	2,532	0.058	77		
TOTAL (ON-SITE)	**209,095**	**4.800**	**67**	13,668	0.314
Woods, HSG B (OFF-SITE)	55,733	1.279			
TOTAL INCLUDING OFF-SITE	264,828	6.080			

Table 2
Hidden Oak Subdivision
Future Condition Drainage Areas and Water Quality Volume (WQv) Calculation

OVERALL DRAINAGE AREA TO EXTENDED DETENTION SWMB

LAND COVER TYPE	AREA (sq feet)	AREA (acres)	CURVE NUMBER
Impervious surfaces, HSG B	40,599	0.932	98
Lawn/landscape, HSG B	92,489	2.123	61
Lawn/landscape, HSG C	2,190	0.050	74
Lawn/landscape, HSG D	523	0.012	80
Brush/Grass Mix, HSG B	12,069	0.277	48
Woods, HSG B	49,925	1.146	55
Woods, HSG C	2,962	0.068	70
Woods, HSG D	1,481	0.034	77
Woods, HSG B (OFF-SITE)	55,733	1.279	55
TOTAL (ON-SITE)	**257,971**	**5.922**	**64**

Drainage Area	*Area (in sq feet)*	*Area (in acres)*	*CN Value*	*Runoff Depth (inches)*	*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*90% Rule Treatment Vol. (cu feet)*
10 - FDA2.1 to Design Point 2: No treatment						
Lawn/landscape, HSG B	16,814	0.386	61			
Woods, HSG B	21,954	0.504	55			
TOTALS / WEIGHTED CN	38,768	0.890	58	0.31	991	210

Impervious Surfaces =	0 sq feet		% Impervious =	0.0
Rv =	0.05			
Water Quality Volume, WQv =	0.023 acre-feet	*1 year storm*		
Water Quality Volume, WQv =	0.005 acre-feet	*90% Rule*		

Specified Reduction Factor, S	Area (ac.)	%	S
Area in HSG B	0.890	100.0	0.4
Area in HSG C	0.000	0.0	0.3
Area in HSG D	0.000	0.0	0.2
TOTAL	0.890	100.0	
Specified Reduction Factor, S=			0.40

Table 2
Hidden Oak Subdivision
Future Condition Drainage Areas and Water Quality Volume (WQv) Calculation

Drainage Area	*Area (in sq feet)*	*Area (in acres)*	*CN Value*	*Runoff Depth (inches)*	*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*90% Rule Treatment Vol. (cu feet)*
11 - FDA2.2 to Design Point 2: Treatment in Infiltration Facility						
Subdivision Road, HSG B	11,021	0.253	98			
Off-site impervious road, HSG B	1,437	0.033	98			
Lawn/landscape, HSG B	1,307	0.030	61			
Woods, HSG B (OFF-SITE)	9,109	0.209	55			
Woods, HSG B	5,658	0.130	55			
TOTALS / WEIGHTED CN	28,532	0.655	74	0.97	2,312	1,369

Impervious Surfaces =	12,458 sq feet		% Impervious =	43.7
Rv =	0.44			
Water Quality Volume, WQv =	0.053 acre-feet	*1 year storm*		
Water Quality Volume, WQv =	0.031 acre-feet	*90% Rule*		

Specified Reduction Factor, S	Area (ac.)	%	S
Area in HSG B	0.655	100.0	0.4
Area in HSG C	0.000	0.0	0.3
Area in HSG D	0.000	0.0	0.2
TOTAL	0.655	100.0	
Specified Reduction Factor, S=			0.40

Drainage Area	*Area (in sq feet)*	*Area (in acres)*	*CN Value*	*Runoff Depth (inches)*	*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*90% Rule Treatment Vol. (cu feet)*
12 - FDA2.3 to Design Point 2: Treatment in Vegetated Swale						
Impervious (existing, off-site), HSG B	715	0.016	98			
Woods, HSG B (OFF-SITE)	41,149	0.945	55			
Impervious, walkway, HSG B	112	0.003	98			
Lawn/landscape, HSG B	23,284	0.535	61			
Woods, HSG B	19,715	0.453	55			
TOTALS / WEIGHTED CN	84,975	1.951	57	0.28	1,963	541

Impervious Surfaces =	827 sq feet		% Impervious =	1.0
Rv =	0.06			
Water Quality Volume, WQv =	0.045 acre-feet	*1 year storm*		
Water Quality Volume, WQv =	0.012 acre-feet	*90% Rule*		

Specified Reduction Factor, S	Area (ac.)	%	S
Area in HSG B	1.951	100.0	0.4
Area in HSG C	0.000	0.0	0.3
Area in HSG D	0.000	0.0	0.2
TOTAL	1.951	100.0	
Specified Reduction Factor, S=			0.40

Table 2
Hidden Oak Subdivision
Future Condition Drainage Areas and Water Quality Volume (WQv) Calculation

OVERALL DRAINAGE AREA TO DESIGN POINT 2

LAND COVER TYPE	AREA (sq feet)	AREA (acres)		*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*1 yr, 24 hr storm Treatment Vol. (acre-feet)*
New Impervious surfaces, HSG B	11,133	0.256	*98*		
Lawn/landscape, HSG B	41,405	0.951	*61*		
Woods, HSG B	47,327	1.086	*55*		
TOTAL	99,865	2.293		5,266	0.121
	WEIGHTED CURVE NUMBER =		*62*		
Woods, HSG B (OFF-SITE)	50,258	1.154			

Drainage Area	*Area (in sq feet)*	*Area (in acres)*	*CN Value*	*Runoff Depth (inches)*	*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*90% Rule Treatment Vol. (cu feet)*
13 - FDA-3 to Design Point 3: No Treatment Provided						
Lawn/landscape, HSG B	5,955	0.137	61			
Woods, HSG B	17,100	0.393	55			
TOTALS / WEIGHTED CN	23,055	0.529	57	0.28	533	125

Impervious Surfaces =	0 sq feet		% Impervious =	0.0
Rv =	0.05			
Water Quality Volume, WQv =	0.012 acre-feet	*1 year storm*		
Water Quality Volume, WQv =	0.003 acre-feet	*90% Rule*		

Specified Reduction Factor, S	Area (ac.)	%	S
Area in HSG B	0.529	100.0	0.4
Area in HSG C	0.000	0.0	0.3
Area in HSG D	0.000	0.0	0.2
TOTAL	0.529	100.0	
Specified Reduction Factor, S=			0.40

Table 2
Hidden Oak Subdivision
Future Condition Drainage Areas and Water Quality Volume (WQv) Calculation

Drainage Area	*Area (in sq feet)*	*Area (in acres)*	*CN Value*	*Runoff Depth (inches)*	*1 yr, 24 hr storm Treatment Vol. (cu feet)*	*90% Rule Treatment Vol. (cu feet)*
14 - FDA-4 to Design Point 4: No Treatment Provided						
Woods, HSG B	4,220	0.097	55			
Woods, HSG C	4,220	0.097	70			
Woods, HSG D	2,105	0.048	77			
TOTALS / WEIGHTED CN	10,545	0.242	65	0.55	486	57

Impervious Surfaces =	0 sq feet		% Impervious =	0.0
Rv =	0.05			
Water Quality Volume, WQv =	0.011 acre-feet	*1 year storm*		
Water Quality Volume, WQv =	0.001 acre-feet	*90% Rule*		

Specified Reduction Factor, S	Area (ac.)	%	S
Area in HSG B	0.242	100.0	0.4
Area in HSG C	0.000	0.0	0.3
Area in HSG D	0.000	0.0	0.2
TOTAL	0.242	100.0	
Specified Reduction Factor, S=			0.40

Table 3
Hidden Oak Subdivision
Percolation Test Results

Hole #/ Facility #	Run #	Start Time	Stop Time	Elapsed Time (hr:min)	Elapsed Time (min.)	Elapsed Time (hr)	Depth to water from TOC (in.) Start	Stop	Water Level drop (inches)	Soil rate min./in. drop	Soil rate (in./hr.)	Notes
P-1	1	10:15	11:05	0:50	50	0.83	12.00	36.00	24.00	2.08	28.8	Hole dry upon check
	2	11:06	11:54	0:48	48	0.80	12.00	36.00	24.00	2.00	30.0	Hole just dry
SWMF 2.2	3	11:59	12:59	1:00	60	1.00	12.00	29.00	17.00	3.53	17.0	
	4	13:00	14:02	1:02	62	1.03	12.00	29.00	17.00	3.65	16.5	
P-2	1	10:19	11:19	1:00	60	1.00	12.00	25.00	13.00	4.62	13.0	
	2	11:20	12:20	1:00	60	1.00	12.00	24.50	12.50	4.80	12.5	
SWMF L1	3	12:20	13:20	1:00	60	1.00	12.00	24.25	12.25	4.90	12.3	
	4	13:20	14:20	1:00	60	1.00	12.00	24.00	12.00	5.00	12.0	
P-3	1	10:23	11:09	0:46	46	0.77	12.00	36.00	24.00	1.92	31.3	Hole dry upon check
	2	11:11	12:11	1:00	60	1.00	12.00	35.50	23.50	2.55	23.5	
SWMF L2.1	3	12:13	13:13	1:00	60	1.00	12.00	34.00	22.00	2.73	22.0	
	4	13:14	14:14	1:00	60	1.00	12.00	33.00	21.00	2.86	21.0	
P-4	1	10:27	11:27	1:00	60	1.00	12.00	33.00	21.00	2.86	21.0	
	2	11:29	12:29	1:00	60	1.00	12.00	31.50	19.50	3.08	19.5	
SWMF L2.2	3	12:30	13:30	1:00	60	1.00	12.00	31.00	19.00	3.16	19.0	
	4	13:30	14:30	1:00	60	1.00	12.00	31.00	19.00	3.16	19.0	
P-5	1	10:30	11:22	0:52	52	0.87	12.00	36.00	24.00	2.17	27.7	Hole dry upon check
	2	11:24	12:24	1:00	60	1.00	12.00	36.00	24.00	2.50	24.0	Hole dry upon check
SWMF 1.2	3	12:24	13:06	0:42	42	0.70	12.00	35.75	23.75	1.77	33.9	
	4	13:09	13:58	0:49	49	0.82	12.00	35.75	23.75	2.06	29.1	

Note: Holes that were dry upon check have lower rates (min/in.) than shown for those runs

Pre-Soak	Date: 11/11/2014
P-1	9:30 AM
P-2	9:40 AM
P-3	9:55 AM
P-4	10:00 AM
P-5	10:08 AM

Table 4
Hidden Oak Subdivision
Soil Percolation Rate Calculations

Determine soil percolation rate for stormwater modeling purposes

Using a percolation test hole with the following parameters:		*Remarks*
Percolation hole diameter =	6 inches	*casing diameter*
Depth of percolation hole =	36 inches	*as constructed*
Bottom surface area =	0.196 square feet	*calculated (pi x radius^2)*

Percolation Rates as per testing:		
P-1	3.65 minutes per inch	*as per test*
P-2	5.00 minutes per inch	*as per test*
P-3	2.9 minutes per inch	*as per test*
P-4	3.16 minutes per inch	*as per test*
P-5	2.06 minutes per inch	*as per test*

Include a 25% safety (soil clogging) factor for percolation:		
P-1	4.6 minutes per inch	*25% safety factor applied*
P-2	6.3 minutes per inch	*25% safety factor applied*
P-3	3.6 minutes per inch	*25% safety factor applied*
P-4	3.9 minutes per inch	*25% safety factor applied*
P-5	2.6 minutes per inch	*25% safety factor applied*

Table 5
Hidden Oak Subdivision
Stormwater Infiltration Design Calculations

RECHARGERS IN DRAINAGE AREA TO DESIGN POINT 1

Stormwater Infiltration Facility for FDA-1.2

FDA-1.2	Consists of: **32**		***Recharger V8HD chambers***
Percolation Test P-5		units	*Remarks*
Vw, total volume in chambers =	**3,065.8**	cubic feet	*Vol per chamber x no. of chambers*
Height of Chambers, including stone =	**3.17**	feet	*Stone below chambers*
Bed Width =	**23.50**	feet	*As per design*
Bed Length =	**56.17**	feet	*As per design*
Bed Area =	**1,319.9**	feet	*As per design*
Side Surface Area =	**261.2**	sq feet	
Vp, Volume of percolation =	**673.5**	cubic feet	*Calculated as side surface surface area x soil perc rate, Sr*
Total 24 hr volume, Vt =	**3,739.3**	cubic feet	
Compare to 1 yr storm WQv =	**2,588.7**	cubic feet	
Capture volume in FDA-1.2 Facility =	**3,065.8**	cubic feet	

Stormwater Infiltration Facility for Lot 1

FDA-L1	Consists of: **40**		***Cultec 150XLHD chambers***
Percolation Test P-2		units	*Remarks*
Vw, total volume in chambers	**2,173.2**	cubic feet	*Vol per chamber x no. of chambers*
Height of Chambers, including stone =	**2.54**	feet	*Stone below chambers*
Bed Width =	**27.5**	feet	
Bed Length =	**54.0**	feet	*As per design*
Bed Area =	**1,485.0**	feet	*As per design*
Side Surface Area =	**247.8**	sq feet	
Vp, Volume of percolation	**1,548.7**	cubic feet	*Calculated as side surface surface area x soil perc rate, Sr*
Total 24 hr volume, Vt	**3,721.8**	cubic feet	
Compare to 1 yr storm WQv	**1,960.8**	cubic feet	
Capture volume in FDA-L1 Facility =	**2,173.2**	cubic feet	

Stormwater Infiltration Facility for Lot 2

FDA-L2.1	Consists of: **10**		***Recharger 330XLHD chambers***
Percolation Test P-3		units	*Remarks*
Vw, total volume in chambers	**984.3**	cubic feet	*Vol per chamber x no. of chambers*
Height of Chambers, including stone =	**3.04**	feet	*Stone below chambers*
Bed Width =	**20.83**	feet	
Bed Length =	**24.50**	feet	*As per design*
Bed Area =	**510.42**	feet	*As per design*
Side Surface Area =	**175.7**	sq feet	
Vp, Volume of percolation	**627.6**	cubic feet	*Calculated as side surface surface area x soil perc rate, Sr*
Total 24 hr volume, Vt	**1,611.9**	cubic feet	
Compare to 1 yr storm WQv	**696.9**	cubic feet	
Capture volume in FDA-L2.1 Facility =	**984.3**	cubic feet	

Table 5
Hidden Oak Subdivision
Stormwater Infiltration Design Calculations

FDA-L2.2	Consists of: **12**		***Recharger 330XLHD chambers***
Percolation Test P-4		units	*Remarks*
Vw, total volume in chambers	**1,363.3**	cubic feet	*Vol per chamber x no. of chambers*
Height of Chambers, including stone =	**0.50**	feet	*Stone below chambers*
Bed Width =	**20.83**	feet	
Bed Length =	**24.50**	feet	*As per design*
Bed Area =	**510.42**	feet	*As per design*
Side Surface Area =	**69.8**	sq feet	
Vp, Volume of percolation	**249.4**	cubic feet	*Calculated as side surface surface area x soil perc rate, Sr*
Total 24 hr volume, Vt	**1,612.7**	cubic feet	
Compare to 1 yr storm WQv	**1,024.1**	cubic feet	
Capture volume in FDA-L2.2 Facility =	**1,363.3**	cubic feet	

RECHARGERS IN DRAINAGE AREA TO DESIGN POINT 2

Stormwater Infiltration Facility for FDA-2.2

FDA-2.2 Field A	Consists of: **12**		***Recharger 330XLHD chambers***
Percolation Test P-1		units	*Remarks*
Vw, total volume in chambers	**1,110.6**	cubic feet	*Vol per chamber x no. of chambers*
Height of Chambers, including stone =	**2.54**	feet	*Stone below chambers*
Bed Width =	**16.0**	feet	*As per design*
Bed Length =	**31.5**	feet	*As per design*
FDA-2.2 Field B	Consists of: **16**		***Recharger 330XLHD chambers***
Percolation Test P-1		units	*Remarks*
Vw, total volume in chambers	**1,458.6**	cubic feet	*Vol per chamber x no. of chambers*
Height of Chambers, including stone =	**2.54**	feet	*Stone below chambers*
Bed Width =	**20.8**	feet	*As per design*
Bed Length =	**31.5**	feet	*As per design*
Perimeter of chamber installation	**162.6**	feet	*As per design (measured on plan)*
Side surface area	**413.3**	sq feet	*Calculated as perimeter x height*
Total Volume in Chambers	**2,569.2**	cubic feet	*Sum of Vw for Field A + Field B*
Vp, Volume of percolation	**1,884.0**	cubic feet	*Calculated as side surface surface area x soil perc rate, Sr*
Total 24 hr volume, Vt	**2,994.7**	cubic feet	
Compare to 1 yr storm WQv	**2,311.8**	cubic feet	

Table 6
Hidden Oak Subdivision
Rain Garden Design Calculations

RAIN GARDEN FOR DRAINAGE AREA FDA-L3.1

Elevation *feet*	Area *s.f.*	Incremental Volume *c.f.*	Volume Sum *cu. ft.*	Volume Sum *acre-feet*
144.50	1025	0	0	0
144.75	1135	270	270	0.0062
145.00	1245	298	568	0.0130

Parameters for Rain Garden Design as per 2015 NYS Stormwater Management Design Manual

Equations as per 2015 NYS SMDM:
WQv ≤ VSM + VDL + (DP x ARG)
VSM = ARG x DSM x nSM
VDL (optional) = ARG x DDL x nDL
where:
- VSM = volume of the soil media [cubic feet]
- VDL = volume of the gravel drainage layer [cubic feet]
- ARG = rain garden surface area [square feet]
- DSM = depth of the soil media, typically* 1.0 to 1.5 [feet]
- DDL = depth of the drainage layer, minimum 0.5 [feet]
- DP = depth of ponding above surface, maximum 0.5 feet [feet]
- nSM = porosity of the soil media (≥ 20%)
- nDL = porosity of the drainage layer (≥ 40%)
- WQv = Water Quality Volume [cubic feet], as defined in Chapter 4

			<u>*Remarks*</u>
Surface Area of Rain Garden, ARG =	1025	sq feet	*as per design*
Depth of the Soil Media, DSM =	2.5	foot	*as per design*
Porosity of the Soil Media, nSM =	30	%	*typical*
Depth of the Gravel Drainage Layer =	1	foot	*as per design*
Porosity of the Drainage Layer, nDL =	40	%	*typical*
Depth of Ponding above Surface =	0.5	feet	*as per design*
Volume of Soil Media, VSM =	769	cubic feet	*calculated*
Volume of Gravel Drainage Layer, VDL =	410	cubic feet	*calculated*
WQv for FDA L3.1A on Lot 3 =	563	cubic feet	*calculated*
WQv <= VSM + VDL + (DP x ARG) =	1691	cubic feet	*calculated*

Since the WQv for FDA-L3.1 is less than the equation above, the design is acceptable.

Table 6
Hidden Oak Subdivision
Rain Garden Design Calculations

RAIN GARDEN #2 FOR DRAINAGE AREA FDA L-3.2

Elevation *feet*	**Area** *s.f.*	**Incremental Volume** *c.f.*	**Volume Sum** *cu. ft.*	**Volume Sum** *acre-feet*
152.00	620	0	0	0
152.25	770	174	174	0.0040
152.50	920	211	385	0.0088

Parameters for Rain Garden Design as per 2015 NYS Stormwater Management Design Manual

Equations as per 2015 NYS SMDM:
WQv ≤ VSM + VDL + (DP x ARG)
VSM = ARG x DSM x nSM
VDL (optional) = ARG x DDL x nDL
where:

VSM = volume of the soil media [cubic feet]
VDL = volume of the gravel drainage layer [cubic feet]
ARG = rain garden surface area [square feet]
DSM = depth of the soil media, typically* 1.0 to 1.5 [feet]
DDL = depth of the drainage layer, minimum 0.5 [feet]
DP = depth of ponding above surface, maximum 0.5 feet [feet]
nSM = porosity of the soil media (≥ 20%)
nDL = porosity of the drainage layer (≥ 40%)
WQv = Water Quality Volume [cubic feet], as defined in Chapter 4

		<u>Remarks</u>
Surface Area of Rain Garden, ARG =	620 sq feet	*as per design*
Depth of the Soil Media, DSM =	1.5 foot	*as per design*
Porosity of the Soil Media, nSM =	30 %	*typical*
Depth of the Gravel Drainage Layer =	1 foot	*as per design*
Porosity of the Drainage Layer, nDL =	40 %	*typical*
Depth of Ponding above Surface, DP =	0.5 feet	*as per design*
Volume of Soil Media, VSM =	279 cubic feet	*calculated*
Volume of Gravel Drainage Layer, VDL =	248 cubic feet	*calculated*
WQv for FDA L3.2C on Lot 3 =	242 cubic feet	*calculated*
VSM + VDL + (DP x ARG) =	837 cubic feet	*calculated*

Since the WQv for FDA-L3.2 is less than the equation above, the design is acceptable.

Table 7.1
Hidden Oak Subdivision
Bioretention Facility Calculations for FDA-1.1

Using equations provided in the 2015 New York State Stormwater Management Design Manual chapter 6, filtering systems, page 6-50 and 6-51:

1. **WQv Calculation:**

WQv =	**824**	**cubic feet**	*as per calculation*
	0.019	**acre feet, or**	*as per calculation*

2. **Determine Size of Bioretention Area**

Using the equation, Af = (WQv)(df)/[(k)(hf+df)(tf)]

Where,

WQv = *water quality volume, in cubic feet*
Af = surface area of filter bed in sq feet
df = filter bed depth in feet
k = coefficient of permeability
hf = average height of water above filter bed in feet
tf = design filter bed drain time in days

Notes:
Use 1.67 days for filter bed drain time for sand filters; 2 days for bioretention

Factors used for k,
sand - 3.5 feet/day
peat - 2.0 feet/day
leaf compost - 8.7 feet per day
bioretention soil - 0.5 feet per day

PLANTING SOIL MIX:	In %	Coeff of Permeability
Sand	50.0	3.5
Bioretention Soil	50.0	0.5
k value =		2.0

Therefore, with the following:

			Remarks
WQv =	0.019	acre feet	*calculated*
df =	4	feet	*as per Sec. 6.4.4 of 2010 SMDM*
k =	2.0	feet/day	*as per Sec. 6.4.4 of 2010 SMDM*
hf =	0.25	feet	*as per Sec. 6.4.4 of 2010 SMDM*
tf =	2	days	*as per Sec. 6.4.4 of 2010 SMDM*
Af =	194	sq feet	*calculated as per equation*
Bioretention filter area req'd, Af =	194	sq feet	*required filter surface area*
Bioretention filter area provided =	626	sq feet	*provided surface filter area as per HydroCAD*
75% of WQv =	618	cu feet	*calculated*
Bioretention Storage =	626	cu feet	*calculated*
TOTAL =	626	cu feet	*sum > temporary storage req'd*

Table 7.1
Hidden Oak Subdivision
Bioretention Facility Calculations for FDA-1.1

Bioretention Facility Elevations Summary

Finished Grade/Top of Mulch Layer	156.50	feet	*3-inch mulch layer*
Top of Planting Soil Mix	156.25	feet	*calculated*
Planting Soil Mix Depth	4.00	feet	*as per design*
Bottom of Planting Soil Mix	152.25	feet	*calculated*
Top of Gravel/Filter Fabric	152.25	feet	*calculated*
Bottom of Gravel	151.58	feet	*calculated*
12" Pipe Invert Elevation	151.67	feet	*calculated (discharges to MH A-8)*

Table 7.2
Hidden Oak Subdivision
Bioretention Facility Stage-Storage Calculations for FDA-1.1

BIORETENTION AREA FOR FDA-1.1

Elevation *feet*	Area *s.f.*	Incremental Volume *c.f.*	Volume Sum *cu. ft.*	Volume Sum *acre-feet*
156.50	1,133	0	0	0
157.00	1,370	626	626	0.0144
157.50	1,620	748	1,373	0.0315

Table 8
Hidden Oak Subdivision
Coliform Bacteria Loading and Discharge

Calculation of Pre- and Post-Development Fecal Coliform (FC) Bacteria Discharge from Hidden Oak Subdivision Property

Loading Rate (lb/ac/yr)	FC[1]
Woods	6.07E+09
Lawn/Landscape	2.41E+10
Impervious	2.50E+08
Single Family Residential (low density)	1.43E+10

Anticipated Pollutant Reduction[2]:	
Extended Detention Wetland	78%
Infiltration Facility	90%
Bioretention (Filtering) Practice	37%
Vegetated Swale	0%

Drainage Area Number	Land Cover	Area to Design Pt (acres)	Total FC Loading at Present (lbs/yr)
DRAINAGE AREAS TO DESIGN POINT 1:			
XDA-1	Impervious Surfaces (off-site)	0.049	1.22E+07
	Woods, good condition	4.495	2.73E+10
TOTAL EXISTING LOADING TO DESIGN POINT 1			**2.73E+10**

		Area to Design Pt (acres)	Total FC Loading at Present (lbs/yr)	Reduction in Infiltration Facility (lbs/yr)	Reduction in Bioretention Facility (lbs/yr)	Reduction in Extended Det. Wetland (lbs/yr)	Residual Bacterial Load (lbs/yr)
DRAINAGE AREAS TO DESIGN POINT 1:							
FDA-1.1	Lawn/landscape, HSG B	0.425	1.06E+08		6.69E+07	1.47E+07	1.47E+07
bioret	Woods, HSG B	0.161	3.88E+09		2.45E+09	5.38E+08	5.38E+08
	Woods, HSG B (OFF-SITE)	0.086	5.21E+08		3.28E+08	7.22E+07	7.22E+07
FDA-1.2	Impervious surfaces, HSG B	0.292	7.29E+07	7.29E+06			7.29E+06
infiltra	Lawn/landscape, HSG B	0.073	1.76E+09	1.76E+08			1.76E+08
	Woods, HSG B	0.081	4.91E+08	4.91E+07			4.91E+07
FDA-1.3	Impervious surfaces, HSG B	0.229	5.71E+07			1.26E+07	1.26E+07
swmb	Lawn/landscape, HSG B	1.382	3.33E+10			7.32E+09	7.32E+09
	Lawn/landscape, HSG C	0.050	1.21E+09			2.66E+08	2.66E+08
	Lawn/landscape, HSG D	0.012	2.89E+08			6.36E+07	6.36E+07
	Brush/Grass Mix (BASIN), HSG B	0.277	6.67E+09			1.47E+09	1.47E+09
	Woods, HSG B	0.787	4.77E+09			1.05E+09	1.05E+09
	Woods, HSG B (OFF-SITE)	1.194	7.24E+09			1.59E+09	1.59E+09
	Woods, HSG C	0.068	4.12E+08			9.07E+07	9.07E+07
	Woods, HSG D	0.034	2.06E+08			4.54E+07	4.54E+07
FDA-1.4	Lawn/landscape, HSG B	0.011	2.64E+08				2.64E+08
none	Lawn/landscape, HSG C	0.003	6.86E+07				6.86E+07
	Lawn/landscape, HSG D	0.001	3.43E+07				3.43E+07
	Woods, HSG B	0.070	4.23E+08				4.23E+08
	Woods, HSG C	0.048	2.93E+08				2.93E+08
	Woods, HSG D	0.024	1.46E+08				1.46E+08

Table 8
Hidden Oak Subdivision
Coliform Bacteria Loading and Discharge

Calculation of Pre- and Post-Development Fecal Coliform (FC) Bacteria Discharge from Hidden Oak Subdivision Property

Loading Rate (lb/ac/yr)	FC[1]	Anticipated Pollutant Reduction[2]:	
Woods	6.07E+09	Extended Detention Wetland	78%
Lawn/Landscape	2.41E+10	Infiltration Facility	90%
Impervious	2.50E+08	Bioretention (Filtering) Practice	37%
Single Family Residential (low density)	1.43E+10	Vegetated Swale	0%

FDA-L1	Impervious surfaces, HSG B	0.194	4.85E+07	4.85E+06		4.85E+06
infilt	Lawn/landscape, HSG B	0.018	4.33E+08	4.33E+07		4.33E+07
FDA-L2.1	Impervious surfaces, HSG B	0.073	1.83E+07	1.83E+06		1.83E+06
infilt	Lawn/landscape, HSG B	0.059	1.41E+09	1.41E+08		1.41E+08
FDA-L2.2	Impervious surfaces, HSG B	0.098	2.46E+07	2.46E+06		2.46E+06
infilt						
FDA-L3.1	Impervious surfaces (house), HSG B	0.023	5.63E+06		3.55E+06	3.55E+06
rain garden	Impervious surfaces (house), HSG B	0.021	5.20E+06		3.28E+06	3.28E+06
	Impervious surfaces (walks), HSG B	0.009	2.22E+06		1.40E+06	1.40E+06
	Lawn/landscape, HSG B	0.124	3.09E+07		1.95E+07	1.95E+07
	Woods, HSG B	0.085	2.13E+07		1.34E+07	1.34E+07
FDA-L3.2	Impervious surfaces, HSG B	0.023	5.82E+06		3.67E+06	3.67E+06
swmb	Lawn/landscape, HSG B	0.043	1.08E+07		6.77E+06	6.77E+06
	Woods, HSG B	0.032	7.72E+08		4.86E+08	4.86E+08
TOTAL FUTURE CONDITION LOADING TO DESIGN POINT 1						**1.47E+10**
CHANGE IN BACTERIAL LOADING TO DESIGN POINT 1						**1.25E+10**
DRAINAGE AREAS TO DESIGN POINT 2:						
XDA-2	Woods, good condition	4.816	2.92E+10			
	Impervious surfaces	0.050	1.26E+07			
TOTAL EXISTING LOADING TO DESIGN POINT 2			**2.92E+10**			
DRAINAGE AREAS TO DESIGN POINT 2:						
FDA-2.1	Lawn/landscape, HSG B	0.386	9.30E+09			9.30E+09
none	Woods, HSG B	0.504	3.06E+09			3.06E+09
FDA-2.2	Subdivision Road, HSG B	0.253	6.32E+07	6.32E+06		6.32E+06
infilt	Off-site impervious road, HSG B	0.033	8.24E+06	8.24E+05		8.24E+05
	Lawn/landscape, HSG B	0.030	7.23E+08	7.23E+07		7.23E+07
	Woods, HSG B (OFF-SITE)	0.209	1.27E+09	1.27E+08		1.27E+08
	Woods, HSG B	0.130	7.88E+08	7.88E+07		7.88E+07

Table 8
Hidden Oak Subdivision
Coliform Bacteria Loading and Discharge

Calculation of Pre- and Post-Development Fecal Coliform (FC) Bacteria Discharge from Hidden Oak Subdivision Property

Loading Rate (lb/ac/yr)	FC[1]	Anticipated Pollutant Reduction[2]:	
Woods	6.07E+09	Extended Detention Wetland	78%
Lawn/Landscape	2.41E+10	Infiltration Facility	90%
Impervious	2.50E+08	Bioretention (Filtering) Practice	37%
Single Family Residential (low density)	1.43E+10	Vegetated Swale	0%

FDA-2.3	Impervious (existing, off-site), HSG B	0.016	4.10E+06	4.10E+06
veg swale	Woods, HSG B (OFF-SITE)	0.945	5.73E+09	5.73E+09
	Impervious, walkway, HSG B	0.003	6.42E+05	6.42E+05
	Lawn/landscape, HSG B	0.535	1.29E+10	1.29E+10
	Woods, HSG B	0.453	2.75E+09	2.75E+09
TOTAL FUTURE CONDITION LOADING TO DESIGN POINT 2				3.40E+10
CHANGE IN BACTERIAL LOADING TO DESIGN POINT 2				4.77E+09
DRAINAGE AREAS TO DESIGN POINT 3:				
XDA-3	Woods, good condition	0.529	3.21E+09	
TOTAL EXISTING LOADING TO DESIGN POINT 3			3.21E+09	
FDA-3	Lawn/landscape, HSG B	0.137	3.29E+09	3.29E+09
none	Woods, HSG B	0.393	2.38E+09	2.38E+09
TOTAL FUTURE CONDITION LOADING TO DESIGN POINT 3				5.67E+09
CHANGE IN BACTERIAL LOADING TO DESIGN POINT 3				2.46E+09
DRAINAGE AREAS TO DESIGN POINT 4:				
XDA-4		0.242	1.47E+09	
TOTAL EXISTING LOADING TO DESIGN POINT 4			**1.47E+09**	
FDA-4	Woods, HSG B	0.097	5.88E+08	5.88E+08
none	Woods, HSG C	0.097	5.88E+08	5.88E+08
	Woods, HSG D	0.048	2.93E+08	2.93E+08
TOTAL FUTURE CONDITION LOADING TO DESIGN POINT 4				1.47E+09
CHANGE IN BACTERIAL LOADING TO DESIGN POINT 4				-1.67E+06
OVERALL CHANGE IN BACTERIAL LOADING TO ALL DESIGN POINTS				1.98E+10

NOTES:

1. *Loading rates for fecal coliform bacteria obtained from Table 3-13 of Fundamentals of Urban Runofff Management, Technical and Institutional Issues, 2007.*
2. *Anticipated pollutant reduction percentages obtained from Table A-4 of the 2001 New York State Stormwater Management Design Manual.*

Table 9.1
Hidden Oak Subdivision
Runoff Reduction Volume (RRv) Summary

Runoff Reduction Volume (RRv) Calculation

P = 3.1 inches
Rv = 0.95

As per Chapter 4 of the 2015 NYS Stormwater Management Design Manual, the minimum runoff reduction volume, RRv min is

$$RRv\ min = \frac{P * Rv * Aic * S}{12}$$

where,
RRv min = Minimum runoff reduction volume required from impervious area (acre-feet)
Rv = 0.05+0.009(I) where I is 100% impervious
Aic = Total area of new impervious cover (in acres)
S = Hydrologic Soil Group (HSG) Specific Reduction Factor (S)

1	2	3	4	5	6	7	8	9	10	11	12
Drainage Area	Design Point	Drainage Area in sq feet	Impervious Surfaces (sq feet)	Specified Reduction Factor, S	Minimum RRv (acre-feet)	Runoff Depth (inches)	WQv (HydroCAD) (cu feet)	WQv (HydroCAD) (acre-feet)	Green/ SMP Proposed	RRv Provided (acre-feet)	RRv Provided > Min RRv?
FDA-1.1	Des. Pt. 1	29,272	0	0.40	0	0.34	824	0.019	bioretention	0.014	RRv Provided Exceeds Minimum RRv
FDA-1.2	Des. Pt. 1	19,428	12,720	0.40	0.029	1.60	2,589	0.059	infiltration	0.059	RRv Provided Exceeds Minimum RRv
FDA-1.3*	Des. Pt. 1	177,542	10,143	0.39	0.023	0.37	5,476	0.126	stormwater basin		
FDA-1.4	Des. Pt. 1	6,857	0	0.34	0	0.51	293	0.007	none	0	RRv Provided Exceeds Minimum RRv
FDA-L1	Des. Pt. 1	9,238	8,454	0.40	0.019	2.55	1,961	0.045	infiltration	0.045	RRv Provided Exceeds Minimum RRv
FDA-L2.1	Des. Pt. 1	5,735	3,185	0.40	0.007	1.46	697	0.016	infiltration	0.016	RRv Provided Exceeds Minimum RRv
FDA-L2.2	Des. Pt. 1	4,285	4,285	0.40	0.010	2.87	1,024	0.024	infiltration	0.024	RRv Provided Exceeds Minimum RRv
FDA-L3.1*	Des. Pt. 1	11,384	2,276	0.40	0.005	0.59	563	0.013	rain garden	0.013	RRv Provided Exceeds Minimum RRv
FDA-L3.2*	Des. Pt. 1	4,286	1,015	0.40	0.002	0.68	242	0.006	rain garden	0.006	RRv Provided Exceeds Minimum RRv
FDA-2.1	Des. Pt. 2	38,768	0	0.40	0	0.31	991	0.023	none	0	RRv Provided Exceeds Minimum RRv
FDA-2.2	Des. Pt. 2	28,532	12,458	0.40	0.028	0.97	2,312	0.053	infiltration	0.053	RRv Provided Exceeds Minimum RRv
FDA-2.3**	Des. Pt. 2	84,975	827	0.40	0.002	0.28	1,963	0.045	vegetated swale	0	RRv Provides Too Little
FDA-3	Des. Pt. 3	23,055	0	0.40	0	0.28	533	0.012	none	0	RRv Provided Exceeds Minimum RRv
FDA-4	Des. Pt. 4	10,545	0	0.40	0	0.55	486	0.011	none	0	RRv Provided Exceeds Minimum RRv

See Runoff Reduction Volume Summary for FDA-1.3, FDA-L3.1 and FDA-L3.2 in Table 9.2
***** Impervious surfaces for this drainage area are all off-site.***

Table 9.1
Hidden Oak Subdivision
Runoff Reduction Volume (RRv) Summary

SUMMARY:

Total Water Quality Volume to Design Point 1 =	0.314 acre-feet
Minimum Runoff Reduction Volume to Design Point 1 =	0.095 acre-feet
Total of Runoff Reduction Volume to Design Point 1 =	0.177 acre-feet

CONCLUSION: RRv Provided Exceeds Minimum RRv required.

Total Water Quality Volume to Design Point 2 =	0.121 acre-feet
Minimum Runoff Reduction Volume to Design Point 2 =	0.030 acre-feet
Total of Runoff Reduction Volume to Design Point 2 =	0.053 acre-feet

CONCLUSION: RRv Provided Exceeds Minimum RRv required.

Table 9.2
Hidden Oak Subdivision
Runoff Reduction Volume (RRv) Summary for FDA-1.3, FDA-L3.1 FDA-L3.2

Runoff Reduction Volume (RRv) Calculation

P = 3.1 inches
Rv = 0.95

As per Chapter 4 of the 2015 NYS Stormwater Management Design Manual, the minimum runoff reduction volume, RRv min is

$$\text{RRv min} = \frac{P * Rv * Aic * S}{12}$$

where,

RRv min = Minimum runoff reduction volume required from impervious area (acre-feet)
Rv = 0.05+0.009(I) where I is 100% impervious (i.e. 0.95)
Aic = Total area of new impervious cover (in acres)
S = Hydrologic Soil Group (HSG) Specific Reduction Factor (S)

COMBINED DRAINAGE AREAS FDA-1.3, FDA-L3.1 & FDA-L3.2

Drainage Area	Design Point	Drainage Area in sq feet	New Imperv Surfaces (Aic) (sq feet)	Specified Reduction Factor, S	Minimum RRv (acre-feet)	Minimum RRv (cubic feet)
FDA 1.3 FDA L3.1, L3.2	Des. Pt. 1	193,212	13,434	0.40	0.0301	1,313

Adjustments to Aic value

Aic value =	13,434 sq feet		Rooftop Disconnection Areas	
Less Rooftop Disconnect =	3,595		FDA-L3.1	1,889
New Aic value =	9,839		FDA 1.3	1,706
Less Pool Lot 3 Water Surface Area =	930		TOTAL	3,595
New Aic value =	8,909 sq feet			

Tree Planting - No. of Trees = 8
Adjustment per Tree = 100 sq feet/tree
Total Tree Planting Adjustment = 800 sq feet
New Aic value = 8,109

ADJUSTED RRv CALCULATION FOR COMBINED FDA 1.3, L-3.1 & L-3.2

Drainage Area	Design Point	On-Site Drainage Area (s.f.)	New Imperv Surfaces (Aic) (sq feet)	Specified Reduction Factor, S	Minimum RRv (acre-feet)	Minimum RRv (cubic feet)
FDA 1.3 + FDA L3.1, L3.2	Des. Pt. 1	193,212	8,109	0.40	0.0182	793

WQv for FDA-L3.1 to Rain Garden #1 = 563 cu feet
WQv for FDA-L3.2 to Rain Garden #2 = 242 cu feet
TOTAL RRv = 805 cu feet

Treatment Volume in Rain Garden #1 = 568 cu feet
Treatment Volume in Rain Garden #2 = 385 cu feet
TOTAL TREATMENT VOLUME/RRv = 953 cu feet

Table 9.2
Hidden Oak Subdivision
Runoff Reduction Volume (RRv) Summary for FDA-1.3, FDA-L3.1 FDA-L3.2

IMPERVIOUS SURFACES IN COMBINED DRAINAGE AREAS

LOCATION		
LOT 2 / FDA-1.3	Deck	450
	Walkway to Pool	290
	Pool Equipment Pad	54
	Driveway	384
	Driveway	367
LOT 3 / FDA-1.3	Pool Patio & Walkways	2,138
	Pool Equipment Pad	54
	Patio	370
	Driveway	1,966
	Driveway	1,007
	Driveway	810
	Driveway	362
	House	1,706
	Retaining Wall	185
LOT 3 / FDA-L3.1	House	907
	House	982
	Walkway to Front Door	241
	Entry to House	98
	Entry to House	48
LOT 3 / FDA-L3.2	Driveway	537
	Driveway	478
TOTAL		13,434

Table 10
Hidden Oak Subdivision
Channel Protection Volume (Cpv) Calculation for Design Point 1

Post-Development Drainage Area Summary

Land Cover Type	Area (acres)	CN	Area x CN	Remarks
Drainage Areas to Design Point 1	5.922	64	379.02	*as per calculation area to SWMB*

Precipitation (1 yr storm), P =	3.1 inches	
Runoff depth Q =	0.24 inches	*calculated*
Time of Concentration, Tc =	0.167 hr	*as per stormwater report*

Compute Stream Channel Protection Volume, (Cpv)
(see Section 4.3 and Appendix B of SMDM)

For stream channel protection, provide 24 hours of extended detention (T) for the one-year event.

Step 1:
Determine the value of the unit peak discharge (qu) using TR-55 and Type III Rainfall Distribution

Initial abstraction, Ia = (200/CN - 2)

		Remarks
Ia =	1.125	*calculated as per equation*
Ia / P =	0.363	*calculated*

Using the above data and Exhibit 4-III from TR-55 (NRCS, 1986), read the value of qu (in cu feet per second per sq mile per year)

qu =	381.2 cu feet/sec/mi^2/yr	*calculated*

Step 2:
Knowing qu and T = 24 hours, find qo/qi using Figure 8.5

qo / qi =	0.045	*read from exhibit figure*

Step 3:
Vs/Vr = 0.683 - 1.43(qo/qi) +1.64(qo/qi) 2 - 0.804(qo/qi) 3 (from Appendix B)
Where Vs equals channel protection storage (Cpv) and
Vr equals the volume of runoff in inches.

Vs / Vr =	0.621	*calculated*

Runoff Depth, Q, calculated in accordance with TR-55

Q =	0.241 inches	*as calculated above*

Solving for Vs, where Vs = Cpv = (Vs/Vr) x Q x (1/12)x (Area in acres) = Vs in acre-feet

Vs =	0.074 acre-feet	*calculated*
	3,222 cubic feet	*converted to cu feet*

Table 10
Hidden Oak Subdivision
Channel Protection Volume (Cpv) Calculation for Design Point 1

Determine the Average Release Rate
The above volume is to be released over 24 hours

Avg Release Rate =	0.04 cu feet per second	*calculated*

Actual Storage in SWMB #2 =	5,985 cubic feet	*peak storage in 1 yr storm*
(in 1 year storm event)	56.00 hr	*actual time to drain in hrs*
	201,600 sec	*converted to seconds*
	0.030 cfs avg release rate	*calculated avg release rate*

Table 11
Hidden Oak Subdivision
Channel Protection Volume (Cpv) Calculation for Design Point 2

Post-Development Drainage Area Summary

Land Cover Type	Area (acres)	CN	Area x CN	*Remarks*
Drainage Areas to Design Point 2	2.293	62	142.14	*as per calculation*

Precipitation (1 yr storm), P =	3.1 inches	
Runoff depth Q =	0.20 inches	*calculated*
Time of Concentration, Tc =	0.167 hr	*as per stormwater report*

Compute Stream Channel Protection Volume, (Cpv)
(see Section 4.3 and Appendix B of SMDM)

For stream channel protection, provide 24 hours of extended detention (T) for the one-year event.

Step 1:
Determine the value of the unit peak discharge (qu) using TR-55 and Type III Rainfall Distribution

Initial abstraction, Ia = (200/CN - 2)

		Remarks
Ia =	1.226	*calculated as per equation*
Ia / P =	0.395	*calculated*

Using the above data and Exhibit 4-III from TR-55 (NRCS, 1986), read the value of qu (in cu feet per second per sq mile per year)

qu =	371.8 cu feet/sec/mi^2/yr	*calculated*

Step 2:
Knowing qu and T = 24 hours, find qo/qi using Figure 8.5

qo / qi =	0.047	*read from exhibit figure*

Step 3:
Vs/Vr = 0.683 - 1.43(qo/qi) +1.64(qo/qi) 2 - 0.804(qo/qi) 3 (from Appendix B)
Where Vs equals channel protection storage (Cpv) and
Vr equals the volume of runoff in inches.

Vs / Vr =	0.618	*calculated*

Runoff Depth, Q, calculated in accordance with TR-55

Q =	0.200 inches	*as calculated above*

Solving for Vs, where Vs = Cpv = (Vs/Vr) x Q x (1/12)x (Area in acres) = Vs in acre-feet

Vs =	0.024 acre-feet	*calculated*
	1,027 cubic feet	*converted to cu feet*

Determine the Average Release Rate
The above volume is to be released over 24 hours

Table 11
Hidden Oak Subdivision
Channel Protection Volume (Cpv) Calculation for Design Point 2

Avg Release Rate =	0.012 cu feet per second	*calculated*

Actual Storage in SWMB #2 =	728 cubic feet	*peak storage in 1 yr storm*
(in 1 year storm event)	26.00 hr	*actual time to drain in hrs*
	93,600 sec	*converted to seconds*
	0.008 cfs avg release rate	*calculated avg release rate*

Table 12
Hidden Oak Subdivision
Vegetated Channel Design Parameters

Grass Channel Design

Drainage Area FDA-2.3			*Remarks*
Water Quality Volume, WQv =	1,963	cu feet	*1 year, 24 hour storm*
	541	cu feet	*90% Rule storm*

The Chezy-Manning Equation states that the flow Q is equal to:

Q = 1.486 / n * A * Rh^2/3 * S^1/2

where,

Q = Flow in cubic feet per second
V = Velocity of flow in feet per second
n= Manning's n factor
Area, A = Cross-sectional area in flow
Rh = Hydraulic radius
Slope, S = Slope of channel

			Remarks
Required residence time =	1,800	seconds, or 30 minutes	*as per NYS SMDM*

The grass channel is designed with the following parameters:

Enter the information to calculate the flow:

Parameter:	*Value*	*units*	*Remarks*
n =	*0.150*	unitless	*as per SMDM App. L, pg. L-2*
Bottom width =	*4.00*	feet	*as per design*
Side slope 1 =	*3.00*	to 1 horizontal to vertical	*as per design*
Side slope 2 =	*3.00*	to 1 horizontal to vertical	*as per design*
Flow Depth =	*0.19*	feet	*calculated*
Upper invert =	*162.00*	feet	*as per design*
Lower invert =	*158.00*	feet	*as per design*
Length of Open Channel Swale=	*180*	feet	*as per design*
Slope =	0.022	feet per foot	*calculated*
Af =	720	square feet	
Q =	0.40	cubic feet per second	
V =	0.45	feet per second	*calculated as per Manning's Eqn.*

Open Channel Surface Area Calculation

WQv =	1963	cubic feet
df =	2.50	feet
k =	1.50	feet per day
hf =	0.19	feet
tf =	2.00	days

Af = WQv x df / (k x (hf + df) x tf
Af = 607.4 square feet

Area of vegetated swale exceeds requirments.

Table 12
Hidden Oak Subdivision
Vegetated Channel Design Parameters

Therefore, the required length of the grass channel to treat 100% of the WQv would be:

Water Quality Volume, WQv =	1,963	cu feet	*1 year, 24 hour storm*		
Water Quality design storm flow =	0.22	cu feet per second	*1 year peak runoff as per routing*		
Flow Velocity at WQ design storm =	0.45	feet per second	*velocity at peak rate of runoff*		
Channel length, L, for 100% of WQv =	813	feet	*1,800 sec x*	0.45	ft/sec

Adjust length to account for actual volume to be provided:

Grass channel length required, L =	813	feet	*Length x WQv to treat / WQv*

Therefore, a grass channel of at least	813	feet is required	*calculated*
Grass channel length provided =	180	feet	*as per design*
Length provided sufficient?	too short		

Table 13
Hidden Oak Subdivision
Temporary Sediment Trap Design Parameters

Sediment Trap Design for Portion of Subdivision Road

Drainage Area to Trap = 32,475 sq feet
0.746 acres

As per the NYSDEC Standards and Specifications for Erosion & Sediment Control the sediment trap must have at least 3,600 cu feet of storage per acre of drainage area

Therefore, the minimum sediment trap volume is to be:
Sediment Trap Volume = 2,684 cu feet

TEMPORARY SEDIMENT TRAP

Elevation *feet*	Area *s.f.*	Incremental Volume *c.f.*	Volume Sum *cu. ft.*	Volume Sum *acre-feet*
146.00	465	0	0	0
148.00	680	1,145	1,145	0.0263
150.00	915	1,595	2,740	0.0629

Since sediment trap volume > required, therefore OK.

Stormceptor®

Stormceptor Design Summary
PCSWMM for Stormceptor

Project Information

Date	03/01/2016
Project Name	Hidden Oak Subdivision
Project Number	936
Location	North Castle, N.Y.

Designer Information

Company	Evans Associates
Contact	Alan L. Pilch, PE, RLA

Notes

FDA-1.2

Drainage Area

Total Area (ac)	0.446
Imperviousness (%)	65.5

The Stormceptor System model STC 900 achieves the water quality objective removing 87% TSS for a Fine (organics, silts and sand) particle size distribution.

Rainfall

Name	YORKTOWN HEIGHTS 1 W
State	NY
ID	9670
Years of Records	1970 to 2005
Latitude	41°15'59"N
Longitude	73°47'51"W

Water Quality Objective

TSS Removal (%)	80

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	79
STC 900	**87**
STC 1200	88
STC 1800	89
STC 2400	92
STC 3600	93
STC 4800	94
STC 6000	95
STC 7200	96
STC 11000	97
STC 13000	97
STC 16000	98

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Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)								
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in.	1 in.	3 in.
Multiple inlet pipes	3 in.	3 in.	Only one inlet pipe.

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- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
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Stormceptor Design Summary
PCSWMM for Stormceptor

Project Information

Date	03/01/2016
Project Name	Hidden Oak Subdivision
Project Number	936
Location	North Castle, N.Y.

Designer Information

Company	Evans Associates
Contact	Alan L. Pilch, PE, RLA

Notes

FDA-2.2

Drainage Area

Total Area (ac)	0.655
Imperviousness (%)	43.7

The Stormceptor System model STC 900 achieves the water quality objective removing 87% TSS for a Fine (organics, silts and sand) particle size distribution.

Rainfall

Name	YORKTOWN HEIGHTS 1 W
State	NY
ID	9670
Years of Records	1970 to 2005
Latitude	41°15'59"N
Longitude	73°47'51"W

Water Quality Objective

TSS Removal (%)	80

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	79
STC 900	**87**
STC 1200	88
STC 1800	89
STC 2400	92
STC 3600	93
STC 4800	94
STC 6000	95
STC 7200	96
STC 11000	97
STC 13000	97
STC 16000	98

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Particle Size Distribution

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Fine (organics, silts and sand)

Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

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Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in.	1 in.	3 in.
Multiple inlet pipes	3 in.	3 in.	Only one inlet pipe.

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Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	03/01/2016
Project Name	Hidden Oak Subdivision
Project Number	936
Location	North Castle, N.Y.

Designer Information

Company	Evans Associates
Contact	Alan L. Pilch, PE, RLA

Notes

FDA-L1

Drainage Area

Total Area (ac)	0.212
Imperviousness (%)	91.5

The Stormceptor System model STC 450i achieves the water quality objective removing 83% TSS for a Fine (organics, silts and sand) particle size distribution.

Rainfall

Name	YORKTOWN HEIGHTS 1 W
State	NY
ID	9670
Years of Records	1970 to 2005
Latitude	41°15'59"N
Longitude	73°47'51"W

Water Quality Objective

TSS Removal (%)	80

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	**83**
STC 900	90
STC 1200	91
STC 1800	92
STC 2400	94
STC 3600	95
STC 4800	96
STC 6000	96
STC 7200	97
STC 11000	98
STC 13000	98
STC 16000	98

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Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)

Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

Stormceptor Design Notes

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Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	03/01/2016
Project Name	Hidden Oak Subdivision
Project Number	936
Location	North Castle, N.Y.

Designer Information

Company	Evans Associates
Contact	Alan L. Pilch, PE, RLA

Notes

FDA-L2.1

Drainage Area

Total Area (ac)	0.132
Imperviousness (%)	55.5

The Stormceptor System model STC 450i achieves the water quality objective removing 91% TSS for a Fine (organics, silts and sand) particle size distribution.

Rainfall

Name	YORKTOWN HEIGHTS 1 W
State	NY
ID	9670
Years of Records	1970 to 2005
Latitude	41°15'59"N
Longitude	73°47'51"W

Water Quality Objective

TSS Removal (%)	80

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	**91**
STC 900	95
STC 1200	96
STC 1800	96
STC 2400	97
STC 3600	98
STC 4800	98
STC 6000	98
STC 7200	99
STC 11000	99
STC 13000	99
STC 16000	99

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Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)

Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

Stormceptor Design Notes

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Inlet and Outlet Pipe Invert Elevations Differences

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Single inlet pipe	3 in.	1 in.	3 in.
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Stormceptor Design Summary
PCSWMM for Stormceptor

Project Information

Date	03/01/2016
Project Name	Hidden Oak Subdivision
Project Number	936
Location	North Castle, N.Y.

Designer Information

Company	Evans Associates
Contact	Alan L. Pilch, PE, RLA

Notes

FDA-L2.2

Drainage Area

Total Area (ac)	0.098
Imperviousness (%)	100

The Stormceptor System model STC 450i achieves the water quality objective removing 89% TSS for a Fine (organics, silts and sand) particle size distribution.

Rainfall

Name	YORKTOWN HEIGHTS 1 W
State	NY
ID	9670
Years of Records	1970 to 2005
Latitude	41°15'59"N
Longitude	73°47'51"W

Water Quality Objective

TSS Removal (%)	80

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	**89**
STC 900	94
STC 1200	95
STC 1800	95
STC 2400	96
STC 3600	97
STC 4800	98
STC 6000	98
STC 7200	98
STC 11000	99
STC 13000	99
STC 16000	99

Rinker MATERIALS™

Stormceptor®

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)								
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

Stormceptor Design Notes

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- For pricing inquiries or assistance, please contact Rinker Materials 1 (800) 909-7763 www.rinkerstormceptor.com

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Appendix B

Deep Hole and Percolation Soils Testing for Stormwater Management Practices

TEST PIT DATA REQUIRED TO BE SUBMITTED WITH APPLICATION
DESCRIPTION OF SOILS ENCOUNTERED IN TEST HOLES

DEPTH	HOLE # DH-1	HOLE # DH-2	HOLE # DH-4	HOLE # DH-5
G.L.				
0'-6"	Topsoil	Topsoil	Topsoil	Topsoil
1'-0"				
1'-6"	Sandy loam	Sandy loam	Coarse sandy	Sandy loam
2'-0"			loam	
2'-6"				Moderately
3'-0"		Compact sandy		Denser Sandy
3'-6"	Moderately	loam	Roots to 4'	Loam
4'-0"	Compact			
4'-6"	Sandy Loam		Weathered rock	
5'-0"			Very friable	
5'-6"		Seep @ 5' to		
6'-0"		5'-4"	Rock @ 5'-6"	
6'-6"	Seep @ 6'			Rock @ 6'
7'-0"	Water level 6'			

INDICATE LEVEL AT WHICH GROUND WATER IS ENCOUNTERED – See each record above.
INDICATE LEVEL FOR WHICH WATER LEVEL RISES AFTER BEING ENCOUNTERED
TESTS MADE BY **Alan L. Pilch, P.E.** DATE May 14, 2014
DEEP HOLE TESTING WITNESSED BY: John Drake, P.E., New York City Dept of Environmental Protection

DESIGN

Soil Rate Used________ Min/1" Drop:________ S.D. Usable Area Provided________

No. of Bedrooms________ Septic Tank Capacity______ Gals. Masonry____ Metal______

Absorption Area Provided by ______ L.F. x 24" ________

Name: Alan L. Pilch, Evans Associates Signature: ____________

Address: 205 Amity Road SEAL:

Bethany, CT 06524

TEST PIT DATA REQUIRED TO BE SUBMITTED WITH APPLICATION

DESCRIPTION OF SOILS ENCOUNTERED IN TEST HOLES

DEPTH	HOLE # DH-6	HOLE # DH-7	HOLE # DH-8	HOLE # DH-9
G.L.				
0'-6"	Topsoil	Topsoil	Topsoil	Topsoil
1'-0"				
1'-6"	Sandy loam	Sandy loam	Mod. compact	Sandy loam
2'-0"			Sandy loam	
2'-6"	Rock @ 2'			Fine Sandy
3'-0"		Silty		Loam
3'-6"		loam	Moderately	
4'-0"			Compact sandy	
4'-6"			loam	
5'-0"		Sandy loam	Rock - refusal	Some weathered
5'-6"				Rock - friable
6'-0"				Rock
6'-6"		Rock		
7'-0"				

INDICATE LEVEL AT WHICH GROUND WATER IS ENCOUNTERED – See each record above.

INDICATE LEVEL FOR WHICH WATER LEVEL RISES AFTER BEING ENCOUNTERED

TESTS MADE BY **Alan L. Pilch, P.E.** DATE May 14, 2014

DEEP HOLE TESTING WITNESSED BY: John Drake, P.E., New York City Dept of Environmental Protection

DESIGN

Soil Rate Used______________ Min/1" Drop:_____________ S.D. Usable Area Provided_________

No. of Bedrooms____________ Septic Tank Capacity________ Gals. Masonry____ Metal_______

Absorption Area Provided by _______ L.F. x 24" _______________

Name: Alan L. Pilch, Evans Associates

Signature: ______________________________

Address: 205 Amity Road

Bethany, CT 06524

SEAL:

TEST PIT DATA REQUIRED TO BE SUBMITTED WITH APPLICATION
DESCRIPTION OF SOILS ENCOUNTERED IN TEST HOLES

DEPTH	HOLE # DH-10	HOLE # DH-11	HOLE #	HOLE #
G.L.				
0'-6"	Topsoil	Topsoil		
1'-0"				
1'-6"		Sandy loam		
2'-0"	Sandy loam			
2'-6"		Silty		
3'-0"		loam		
3'-6"				
4'-0"		Compact		
4'-6"	Weathered	Sandy loam		
5'-0"	Rock – Very			
5'-6"	Friable			
6'-0"		Rock		
6'-6"	Seep			
7'-0"				

INDICATE LEVEL AT WHICH GROUND WATER IS ENCOUNTERED – See each record above.
INDICATE LEVEL FOR WHICH WATER LEVEL RISES AFTER BEING ENCOUNTERED
TESTS MADE BY **Alan L. Pilch, P.E.** DATE May 14, 2014
DEEP HOLE TESTING WITNESSED BY: John Drake, P.E., New York City Dept of Environmental Protection

DESIGN

Soil Rate Used______________ Min/1" Drop:____________ S.D. Usable Area Provided_________

No. of Bedrooms____________ Septic Tank Capacity________ Gals. Masonry____ Metal_______

Absorption Area Provided by _______ L.F. x 24" ______________

Name: Alan L. Pilch, Evans Associates Signature: ______________________________

Address: 205 Amity Road SEAL:

Bethany, CT 06524

Table 3
Hidden Oak Subdivision
Percolation Test Results

Hole #/ Facility #	Run #	Start Time	Stop Time	Elapsed Time (hr:min)	Elapsed Time (min.)	Elapsed Time (hr)	Depth to water from TOC (in.) Start	Stop	Water Level drop (inches)	Soil rate min./in. drop	Soil rate (in./hr.)	Notes
P-1	1	10:15	11:05	0:50	50	0.83	12.00	36.00	24.00	2.08	28.8	Hole dry upon check
	2	11:06	11:54	0:48	48	0.80	12.00	36.00	24.00	2.00	30.0	Hole just dry
SWMF 2.2	3	11:59	12:59	1:00	60	1.00	12.00	29.00	17.00	3.53	17.0	
	4	13:00	14:02	1:02	62	1.03	12.00	29.00	17.00	3.65	16.5	
P-2	1	10:19	11:19	1:00	60	1.00	12.00	25.00	13.00	4.62	13.0	
	2	11:20	12:20	1:00	60	1.00	12.00	24.50	12.50	4.80	12.5	
SWMF L1	3	12:20	13:20	1:00	60	1.00	12.00	24.25	12.25	4.90	12.3	
	4	13:20	14:20	1:00	60	1.00	12.00	24.00	12.00	5.00	12.0	
P-3	1	10:23	11:09	0:46	46	0.77	12.00	36.00	24.00	1.92	31.3	Hole dry upon check
	2	11:11	12:11	1:00	60	1.00	12.00	35.50	23.50	2.55	23.5	
SWMF L2.1	3	12:13	13:13	1:00	60	1.00	12.00	34.00	22.00	2.73	22.0	
	4	13:14	14:14	1:00	60	1.00	12.00	33.00	21.00	2.86	21.0	
P-4	1	10:27	11:27	1:00	60	1.00	12.00	33.00	21.00	2.86	21.0	
	2	11:29	12:29	1:00	60	1.00	12.00	31.50	19.50	3.08	19.5	
SWMF L2.2	3	12:30	13:30	1:00	60	1.00	12.00	31.00	19.00	3.16	19.0	
	4	13:30	14:30	1:00	60	1.00	12.00	31.00	19.00	3.16	19.0	
P-5	1	10:30	11:22	0:52	52	0.87	12.00	36.00	24.00	2.17	27.7	Hole dry upon check
	2	11:24	12:24	1:00	60	1.00	12.00	36.00	24.00	2.50	24.0	Hole dry upon check
SWMF 2.1	3	12:24	13:06	0:42	42	0.70	12.00	35.75	23.75	1.77	33.9	
	4	13:09	13:58	0:49	49	0.82	12.00	35.75	23.75	2.06	29.1	

Note: Holes that were dry upon check have lower rates (min/in.) than shown for those runs

Pre-Soak	Date: 11/11/2014
P-1	9:30 AM
P-2	9:40 AM
P-3	9:55 AM
P-4	10:00 AM
P-5	10:08 AM

Table 4
Hidden Oak Subdivision
Soil Percolation Rate Calculation

Determine soil percolation rate for stormwater modeling purposes

Using a percolation test hole with the following parameters:		*Remarks*
Percolation hole diameter =	6 inches	*as measured*
Depth of percolation hole =	30 inches	*typical*
Bottom surface area =	0.196 square feet	*calculated*
Percolation Rates as per testing:		
P-1	3.65 minutes per inch	*as per test*
P-2	5.00 minutes per inch	*as per test*
P-3	2.9 minutes per inch	*as per test*
P-4	3.16 minutes per inch	*as per test*
P-5	2.06 minutes per inch	*as per test*
Include a 25% safety (soil clogging) factor for percolation:		
P-1	4.6 minutes per inch	*25% safety factor applied*
P-2	6.3 minutes per inch	*25% safety factor applied*
P-3	3.6 minutes per inch	*25% safety factor applied*
P-4	3.9 minutes per inch	*25% safety factor applied*
P-5	2.6 minutes per inch	*25% safety factor applied*

Appendix C

Maintenance Schedule for Stormwater Management Facilities

STORMWATER CONTROL FACILITY
MAINTENANCE AND ACCESS AGREEMENT

This Agreement is made as of this day of , 2016 by and between the TOWN OF NORTH CASTLE, a New York municipal corporation with offices at 15 Bedford Road, Armonk, New York 10510, hereinafter referred to as the "Town", and McKenna Custom Homes, Inc., a New York corporation with offices at 343 Manville Road, Pleasantville, New York hereinafter referred to as "McKenna Custom".

WITNESSETH

WHEREAS, McKenna Custom is the owner of that certain plot, piece and parcel of land, with the buildings and improvements thereon, situated at 13 Hidden Oak Road in the Town of North Castle, comprising 7.69 acres, and shown and designated on the Tax Map for the Town of North Castle Section 107.01, Block 1, Lot 32 (the "Land") and title to said lands being subject to the conditions imposed by the Town of North Castle as shown and designated on a certain Map entitled "Hidden Oak Subdivision Proposed Lots 1, 2 & 3, in Armonk, Town of North Castle, Westchester County, New York" , made by William J. Welsh, Land Surveyor, dated ________ and filed in the Westchester County Clerk's Office, Division of Land Records, on as Map No. ; and

WHEREAS, Declarant plans to undertake or is undertaking plans for the development or sale of land that will result in Plans for development or sale of land that will result in the disturbance of five (5) or more acres of total land area as described in the Section 18-39 (b) (3) (i) in the Rules and Regulations for the Protection from Contamination, Degradation and Pollution of the New York City Water Supply and Its Sources ("Watershed Regulations"); and

WHEREAS, the Watershed Regulations require Declarant to prepare a Stormwater Pollution Prevention Plan ("SWPPP") and submit the SWPPP to the New York City Department of Environmental Protection ("DEP") for its review and approval so that stormwater generated by precipitation during and after soil disturbing activities and runoff from newly created impervious surfaces is captured and treated, thus reducing or eliminating a pollution discharge; and

WHEREAS, Declarant has submitted a SWPPP application to DEP for the Property described above, Hidden Oak Subdivision, DEP Log # 2014-KE-01088-SP.1, and received an approval from DEP for such SWPPP, dated _______________, such SWPPP approval and the maintenance obligations being attached hereto as Exhibits 1 and 2; and

WHEREAS, McKenna Custom has submitted a Stormwater Pollution Prevention Plan ("SWPPP") to the Town dated March 1, 2016 prepared by Evans Associates which sets forth, among other things, the proposed improvements to be constructed and/or installed for the purpose of controlling and mitigating stormwater runoff from the Subdivision ("Storm Water Control Facilities") consisting of subsurface infiltration facilities, an extended detention stormwater management basin, a bioretention facility, two rain gardens and tree planting, as well as filter strips; and

WHEREAS, the SWPPP has been approved by the Town; and

WHEREAS, as required by the Town of North Castle, a maintenance and access agreement is to be recorded in the Office of the Westchester County Clerk (Division of Land Records) in order to provide for the long-term maintenance and continuation of the various stormwater control measures shown on the approved subdivision plans (the "Plan") and

WHEREAS, copies of the approved plans of the Subdivision are on file with the Building Department of the Town of North Castle at the Town Hall, 17 Bedford Road, Armonk, New York 10504; and

WHEREAS, the Town and McKenna Custom desire that Stormwater Control Facilities be constructed and installed in accordance with the approved plans and that they thereafter be inspected, used, maintained, repaired and replaced in perpetuity in order to insure that they continue to function in the manner for which they are intended.

NOW, THEREFORE, in consideration of the approval and the mutual agreements and understandings set forth herein, and consistent with all applicable provisions of the Town Code, the Town and McKenna Custom hereby agree as follows:

1. McKenna Custom and/or any subsequent owner(s) of property shall use, maintain, repair and replace the Stormwater Control Facilities located on the portions of the premises owned by them in accordance with the maintenance plan contained in the SWPPP, a copy of which

maintenance plan is set forth on Schedule "A" which is annexed hereto and hereby made a part hereof (the "Maintenance Procedures").

2. McKenna Custom shall perform the Maintenance Procedures and shall pay all expenses related to the use, maintenance, repair and replacement of the Stormwater Control Facilities. In the event that the property is conveyed to another party or parties, the subsequent owner or owners shall, as a result of such conveyance, assume all responsibility for performing the Maintenance Procedures and for any other costs associated with using, maintaining, repairing and replacing the Stormwater Control Facilities located on his or their lot or lots except that all property owners shall equally share in the maintenance and repair costs of all control facilities contained in Storm Water Mitigation Areas, identified on the approved subdivision map of McKenna Custom as "Easement for Maintenance of Common Stormwater Control Facilities". The conveyance of the property shall unconditionally release the party conveying any such property from all obligations contained herein, unless provided for otherwise in a contract of sale or other agreement between the parties to any such conveyance.

3. McKenna Custom, or any subsequent owner or owners of the property, shall inspect the Storm Water Control Facilities at the frequency set forth in the SWPPP. The inspector shall prepare and submit a written report to the appropriate lot owner and to the Town's Stormwater Management Officer ("SMO") within 30 days following the completion of the inspection. Any such report of the findings shall include, if appropriate, recommendations for future use, maintenance, repair and/or replacement of the Stormwater Control Facilities in order to ensure the continuing effectiveness of the Facilities.

4. No lot owner shall authorize, undertake or permit alteration, abandonment, modification or discontinuation of the use of the Stormwater Control Facilities except in accordance with written approval of the Town and the North Castle Planning Board, which approval shall not be unreasonably withheld.

5. Any lot owner shall undertake on his lot any necessary repairs and replacement of the

Stormwater Control Facilities at the reasonable direction of the Town or in accordance with the recommendations of the inspector. In the event that the SMO determines that a lot owner or all lot owners as the case may be have failed to construct or maintain the Stormwater Control Facilities located on their lot in accordance with the SWPPP or has failed to undertake corrective action specified by the Town or by the engineer pursuant to this Paragraph, the SMO shall notify such lot owner or all lot owners, as the case may be, to perform or cause to be performed any such maintenance or corrective action. Any such notice shall be sent to such lot owner or owners, as the case may be, by certified mail, return receipt requested, to the address for such lot owner(s) maintained by the Tax Assessor's Office for the Town. Any such lot owner(s) shall have thirty-five (35) days from the mailing of such notice to (a) complete or timely commence such corrective action; or (b) appeal any such determination of the SMO to the Town Board. The decision of the Town Board may be appealed pursuant to the provisions of Article 78 of the New York State Civil Practice Law and Rules.

6. In the event that a lot owner(s) is (a) duly notified by the Town to undertake maintenance or corrective action pursuant to Paragraph 4, above; and (b) either (1) such lot owner(s) does not appeal said notification; or (2) the order of the Town is upheld by either the Town Board or a court of competent jurisdiction and the lot owner does not, following the outcome of such appeal, carry out said maintenance or corrective action if required to do so, the Town is hereby granted an easement to enter the lots for the purpose of undertaking said maintenance or corrective action to the Facilities. Reasonable notice shall be given prior to such entry. The Town may affix the expenses thereof as a lien against the property.

7. In order to give effect to the provisions of this Agreement, the Town is permitted, at reasonable times, to have access to the property for inspection of the Stormwater Control Facilities. Access to the lots pursuant to Paragraph 6 above or this Paragraph 7 shall be limited to the areas known and designated on a certain Map entitled "Final Subdivision Plat for Hidden Oak Subdivision prepared by William J. Welsh, Welsh Engineering & Land Surveying, P.C. and filed in the office of Westchester County Clerk, Division of Land Records on

as filed Map No. as Storm Water Mitigation Areas.

8. The approval of the Town and the North Castle Planning Board, by resolution or otherwise shall be required prior to any amendment to this Agreement or the SWPPP.

9. This Agreement shall run with the land and shall be binding on the successors and assigns of McKenna Custom. This Agreement is to be recorded in the Office of the County Clerk of Westchester (Division of Land Records) upon the approval of the subdivision and shall be effective as of the date of recording.

10. The singular number as used herein shall be read as the plural number, and *vice versa,* and the masculine gender shall be read as the feminine or neuter gender, whenever necessary to give full effect to the terms and provisions hereof.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the date first written above.

McKENNA CUSTOM HOMES, INC.

BY:______________________

TOWN OF NORTH CASTLE

BY:________________________
Supervisor

STATE OF NEW YORK
COUNTY

On the day of 2016. before me, a notary public of New York State, personally appeared , personally known to me or proved to me by satisfactory evidence to be the individual whose name is subscribed to the within instrument and (s) he duly acknowledged to me that (s) he executed the same in his/her capacity and that by his/her signature on the instrument, the individual or person upon behalf of which the individual acted, executed the instrument. Notary Public:

STATE OF
NEW YORK

On the day of 2016. before me, a notary public of New York State, personally appeared , personally known to me or proved to me by satisfactory evidence to be the individual whose name is subscribed to the within instrument and (s)he duly acknowledged to me that (s)he executed the same in his/her capacity as the Supervisor of the Town of North CASTLE and that by his/her signature on the instrument, the individual or person upon behalf of which the individual acted, executed the instrument.

Record and Return:

____

____

SCHEDULE "A"
TO STORMWATER CONTROL FACILITY
MAINTENANCE AND ACCESS AGREEMENT
BY AND BETWEEN MCKENNA CUSTOM, LTD.
AND THE TOWN OF NORTH CASTLE

As used herein, "Short Term Maintenance Requirements" are those stormwater control measures to be undertaken by a lot owner during such time as a residence is under construction upon said lot. "Long Term Maintenance Requirements" are those stormwater control measures to be undertaken following the completion of construction of a residence on any such lot.

Maintenance and Inspection Requirements:

In accordance with New York State Department of Environmental Conservation SPDES General Permit for Stormwater Discharges from Construction Activity, Permit No. GP-0-15-002, the qualified inspector shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

At a minimum, the qualified inspector shall inspect all erosion and sediment control practices and pollution prevention measures to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved final stabilization, all points of discharge to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site, and all points of discharge from the construction site.

The qualified inspector shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

a. Date and time of inspection;

b. Name and title of person(s) performing inspection;

c. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;

d. A description of the condition of the runoff at all points of discharge from the construction site. This shall include identification of any discharges of sediment from the construction site. Include discharges from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

e. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site which receive runoff from disturbed areas. This shall include identification of any discharges of sediment to the surface waterbody;

f. Identification of all erosion and sediment control practices and pollution prevention measures that need repair or maintenance;

g. Identification of all erosion and sediment control practices and pollution prevention measures that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

h. Description and sketch of areas with active soil disturbance activity, areas that have been disturbed but are inactive at the time of the inspection, and areas that have been stabilized (temporary and/or final) since the last inspection;

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices and pollution prevention measures; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s);

k. Identification and status of all corrective actions that were required by previous inspection; and

l. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The qualified inspector shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The qualified inspector shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The qualified inspector shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

Within one business day of the completion of an inspection, the qualified inspector shall notify the owner or operator and appropriate contractor or subcontractor identified in Part III.A.6. of this permit of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

All inspection reports shall be signed by the qualified inspector. Pursuant to Part II.C.2. of this permit, the inspection reports shall be maintained on site with the SWPPP.

Short Term Maintenance and Inspection Requirements:

Inspections performed during construction shall verify all practices are functioning properly, correctly maintained, and accumulated sediment is removed from all control structures. The inspector must also examine the site for any evidence of soil erosion, the potential for pollutants to enter the storm drain system, turbid discharge at all outfalls, and the potential for soil and mud to be transported on the public roadway at the site entrance. In addition to these general guidelines, the project plans will provide more specific erosion control guidelines, as well as a construction sequence to guide the contractor through the construction process. Discussed below are specific maintenance and inspection requirements for the temporary practices to be employed at the site. The short-term maintenance requirements may be referenced in the Stormwater Pollution Prevention Plan report in the section entitled "Erosion and Sediment Control Measures Maintenance Schedule" beginning on page 22 of said report.

The contractor shall notify the Town of North Castle Stormwater Management Officer at least 48 hours prior to the commencement of any of the following construction stages: start of construction, installation of erosion and sediment control measures, completion of site clearing, completion of rough grading, installation of stormwater management practices, completion of final grading and stabilization of disturbed areas, closure of construction, and completion of final landscaping.

Once construction is completed and the site has been stabilized, a Notice of Termination shall be filed.

Long Term Maintenance and Inspection Requirements:

Once final stabilization is achieved, and construction is complete, maintenance and inspections will be performed by the parties identified in Exhibit 1, attached. The Maintenance and Inspection Checklists from Appendix "G" of the New York State Stormwater Management Design Manual shall serve as a guide for maintaining and inspecting the infiltration and bioretention facilities. Appendix "G" can be found as part of the Hidden Oak SWPPP report on file with the Town of North Castle as well as using the following link http://www.dec.ny.gov/docs/water_pdf/swdmappendixg.pdf. The entire New York State Stormwater Management Design Manual may be found at the following web page http://www.dec.ny.gov/docs/water_pdf/swdm2015entire.pdf.

Inspections of the stormwater management practices and the collection and conveyance facilities shall be performed in accordance with **Exhibit 1** which is excerpted from the approved Stormwater Pollution Prevention Plan.

EXHIBIT 1: Post-Construction Stormwater and Erosion Control Maintenance Responsibilities

Maintenance Item	Entity Responsible for Maintenance Following Construction and Sale of Lots
Stormwater Management Facilities	**The three future homeowners collectively and under the legal agreement between them** will be responsible for the maintenance of the following stormwater management practices: o SWMF-1.1 (bioretention facility) o SWMF-1.2 (infiltration facility) o SWMF-1.3 (stormwater management basin) o SWMF-2.2 (infiltration facility). **Individual homeowner has responsibility** for the maintenance of the following stormwater management facilities located on the lot to which he/she has acquired title: o On Lot 1, SWMF-L1 (infiltration facility); o On Lot 2, SWMF-L2.1 (infiltration facility) and SWMF–L2.2 (infiltration facility); o On Lot 3, Rain Gardens #1 and #2, and Green Infrastructure Tree Planting.
Stormwater Collection and Conveyance System	**Town of North Castle** responsibility includes: o Storm drainage facilities within the right-of-way in the subdivision road which is to be dedicated to the Town. o Maintaining the vegetated swales within the Town roadway right-of-way. **The three future homeowners collectively and under the legal agreement between them** will be responsible for: o Storm drainage facilities (catch basin, manholes and outlet control structures **outside of the subdivision road right-of-way** which convey runoff to SWMF-1.3 (stormwater management basin). **Individual homeowner has responsibility for:** Storm drainage facilities (catch basin, manholes and outlet control structures on the individual lot to which he/she has obtained title and which convey runoff to stormwater management facilities to manage the runoff from that lot. This includes the collection and conveyance storm drainage system which conveys runoff to: o On Lot 1, SWMF-L1 (infiltration facility) o On Lot 2, SWMF-L2.1 (infiltration facility) and SWMF–L2.2 (infiltration facility) o On Lot 3, Rain Gardens #1 and #2.
Erosion in Landscaped Areas of the Individual Lots	**Each individual homeowner** for the lot to which he/she has obtained title

Maintenance Item	Entity Responsible for Maintenance Following Construction and Sale of Lots
Erosion of Slopes, Sand, Grit and Debris in the Subdivision Road Right-of-Way	**Town of North Castle**

EXHIBIT 2: MAINTENANCE OF STORMWATER FACILITIES

Maintenance of stormwater management facilities is described below for each stormwater management practice and component of the stormwater collection and conveyance system.

Definitions:
Owner - Refers to the present owner and applicant for the three lot subdivision of the property, McKenna Custom Homes, or its successors and assigns.

Homeowner – Refers to an individual owner of one of the three lots that has acquired the title to one of the lots.

Legal Agreement between the Three Homeowners ("three future homeowners collectively") – Refers to the legal agreement between the three future homeowners of the individual lots. Under the legal agreement, the three future homeowners collectively have maintenance and financial responsibility with regard to the stormwater practices and facilities noted in Exhibit 1.

STORMWATER MANAGEMENT BASIN
(SWMF-1.3):

1. Description: The stormwater management basin is used to control the rate of discharge from the property, and to improve the quality of the runoff.

2. Maintenance measures include:
   (i) Periodically remove debris and litter from basin.
   (ii) Clean trash rack when trash or debris has accumulated.
   (iii) Mow side slopes, embankments, emergency spillway and access road at least once a year, preferably after August. Woody growth on the side slopes into the basin and on the berm outside of the basin should be discouraged.
   (iv) Remove sediment from forebay every five to six years or when depth has reached 6" measured on the sediment stick; from main portion of the basin if depth of sediment has reached 6" or long flow path of water is hindered. Some replacement wetland planting may be necessary following removal of sediment.
   (v) Stabilize eroding soils of stormwater management basin side slopes, embankment, and emergency spillway by placing topsoil as may be needed, then seeding and mulching with straw or other appropriate means.
   (vi) Repair or replace structural elements such as inlet and outlet structures as necessary.
   (vii) Remove larger borrowing animals, such as muskrats, from structural features. Trapping may be necessary.
   (viii) Rock/riprap pads have not migrated, but are placed as per the design, and that vegetation, especially woody plants, are not growing within these areas.

3. Inspect for:
   (i) Erosion, cracking, embankment subsidence, tree growth, burrowing animals.
   (ii) Sediment and clogging in the outlet control facility, stormwater inlets, emergency spillway and drain (if present).
   (iii) Sediment in forebay.
   (iv) Adequacy of channel erosion controls at the outlet.
   (v) Adequacy of plant coverage in shallow marsh (vegetated wetland) areas.

(vi) Proper functioning of structural elements.
(vii) Sources of erosion in the contributory drainage area.

4. Erosion in Stormwater Management Basin:
(i) In the event the Owner and/or the three future homeowners collectively under the legal agreement observe bare soils exceeding 20 square feet within the stormwater management basin, it shall seed those areas with a quick germination rye seed mix as soon as possible, or as directed by the landscape architect or civil engineer.
(ii) In the event the Owner and/or the three future homeowners collectively observe gully erosion more than 3" deep within the stormwater management basin or in vegetated or grassed swales, it shall fill the same immediately and seed the area with a quick germination rye seed, or as directed by the landscape architect or civil engineer.
(iii) Any debris accumulation, litter, and/or fallen trees or brush within Drainage Easement Areas shall be removed and disposed of off-site.

5. Sediment Deposits in Stormwater Management Basin:
(i) Sediment deposits obstructing more than one-third of the inlet or outlet structures or pipes associated with the basin shall be removed therefrom by the Owner and/or the three future homeowners collectively and be placed in a suitable upland area of the property or removed from the property and properly disposed of.
(ii) Sediment deposits that exceed one inch in depth within the vegetated areas of any detention basin or infiltration basin encompassing more than 20 square feet shall be removed by the Owner and/or the three future homeowners collectively and be placed in a suitable upland area of the property or removed from the property and properly disposed. Any plants affected by the removal process shall be dug out or replanted.
(iii) Sediment deposits in the forebay and micropool shall not exceed six (6) inches in depth. All sediment removed shall be deposited and stabilized in a location that is not likely to erode.

INFILTRATION FACILITIES
(SWMF-1.2, SWMF-L1, SWMF-L2.1 and SWMF–L2.2, and SWMF-2.2):

1. Description: Infiltration facilities are used to improve the quality of the runoff, provide for a reduction in the volume of runoff, and in some cases, reduce the peak rate of runoff. Maintenance of infiltration facilities is essential to ensure their continued effectiveness. Principally, this involves preventing suspended solids from being discharged to the infiltration facilities. These may have the effect of filling the void spaces thereby clogging the soil. A log shall be maintained for each infiltration facility.

2. Maintenance Measures Include:
(i) Observation of the depth of sediment, if any, through inspection via the installed observation port on each row of the chambers during the first 2 to 3 months of operation, and thereafter on an annual basis.
(ii) Remove sediment from pre-treatment facility when the depth of sediment reaches 50% of capacity of the facility.
(iii) Remove sediment from chambers when the depth of sediment is 3" in depth.
(iv) The manufacturer of the chambers recommends cleaning of the stormwater management chambers every 9 years after installation and every 9 years thereafter.
(v) The manufacturer also recommends that 45 years after installation, the chambers be inspected using closed circuit television (CCTV) or other comparable technique to determine the condition of the interior of the chambers, and rehabilitate or replace as may be necessary.

(vi) Ensuring that the meadow vegetation to be established above the infiltration facilities, where it is proposed, achieves good growth and final stabilization of the ground surface above the chambers. Periodic mowing of the meadow, once in the spring (mid-April and once in autumn (late October) is needed to ensure that woody vegetation does not become established in the meadow.

3. Inspect for:
(i) Depth of sediment, if any, through inspection via the installed observation port on each row of the chambers during the first 2 to 3 months of operation, and thereafter on an annual basis.
(ii) The rate of dewatering of the infiltration facility following a precipitation event. The chambers should fully dewater within 48 hours of the end of the precipitation event.

CATCH BASINS, MANHOLES AND STORM DRAINAGE PIPES

Catch basins, drain inlets and manholes located within the right of way of the subdivision road will be maintained by the Town of North Castle. If these structures are located on private property, their maintenance shall be carried out by the Owner and/or by the three future homeowners collectively under their legal agreement.

1. Description: Catch basins have sumps to allow sediment and debris to drop out before the water exits this drainage junction. Storm pipes normally need no maintenance.

2. Maintenance Measures Include:
(i) Clean out and dispose of sediment and debris from sump, if there is less than 12" between top of sediment and invert of pipe.
(ii) Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.

3. Inspection:
(i) Annual visual check for sediment accumulation is usually sufficient.
(ii) Recommend using tool to open cover, flashlight and dipstick for inspection of deep water quality catch basins.
(iii) Check that the grate is sitting flush on the structure, and that there are no holes or cracks in the pavement or ground adjacent to the catch basin.

LEVEL SPREADER

1. Description: Level spreader serves to dissipate the flow of water over a broad area to reduce the potential for erosion. Maintenance of the level spreader is to be performed under by the legal agreement between the three homeowners.

2. Maintenance:
(i) Periodically remove debris and litter.
(ii) Mow at least twice per year the meadow vegetation to be established. Mowing is to be done in spring (mid-May) and in autumn (mid-October).
(iii) Periodically remove sediment in order to maintain original design depth.
(iv) Stabilize eroding soils by seeding and mulching or other appropriate means.

3. Inspection:
(i) Annual visual check for erosion, sediment accumulation and debris is usually sufficient.

(ii) Ensure that lip over which flow is directed is level, stable and well-vegetated, and is not eroding.
(iii) Ensuring that the vegetation to be established at the level spreader achieves good growth and final stabilization of the ground surface above the chambers.

DIVERSION STRUCTURES

1. Description: Diversion structures, also known as flow splitters, are used as required where runoff is conveyed to infiltration facilities by a storm pipe in order to divert the WQv to the filtering practice, and allow larger flows to bypass the practice. Maintenance of diversion structures is to be performed for each stormwater practice as per Exhibit 1, above.

2. Maintenance:
(i) Clean sediment out annually or when sediment has reached a depth of 6 inches using a vactor truck or clamshell scoop. Use similar procedures to cleaning underground tanks, and catch basins.
(ii) Remove trash and debris.

3. Inspection:
(i) Annual visual check for sediment accumulation is usually sufficient.

BIORETENTION FACILITY AND RAIN GARDENS

1. Description: Bioretention facilities and rain gardens are similar stormwater management practices intended to manage and treat small volumes of stormwater runoff from impervious surfaces using a conditioned planting soil bed and planting materials to filter runoff stored within a shallow depression. SWMF-1.1 (bioretention facility) is to be maintained under by the legal agreement between the three homeowners. The two rain gardens on Lot 3 shall be maintained by the future homeowner of Lot 3.

2. Maintenance:

(i) Routine maintenance may include the occasional replacement of plants, mulching, weeding and thinning to maintain the desired appearance.
(ii) Weeding and watering are essential the first year, and can be minimized with the use of a weed-free mulch layer. Re-mulch bioretention facilities annually.
(iii) Homeowners and landscapers must be educated regarding the purpose and maintenance requirements of the bioretention facility and/or rain garden, so the desirable aspects of ponded water are recognized and maintained.
(iv) Keep plants pruned if they start to get "leggy" and floppy. Cut off old flower heads after a plant is done blooming.
(v) Inspect for sediment accumulations or heavy organic matter where runoff enters the bioretention facility and/or rain garden and remove as necessary. The top few inches of planting soil mix should be removed and replaced when water ponds for more than 48 hours. Re-mulch following such removal.
(vi) If the overflow device is an earthen berm or lip, check for erosion and repair as soon as possible. If this continues, a harder armoring of stone may be necessary.
(vii) Make sure all appropriate elevations have been maintained, no settlement has occurred and no low spots have been created.
(viii) Mow the grass filter strip between the bioretention facility and the level spreader weekly during the growing season or as per the adjacent lawn areas. Maintenance of level spreader as per noted above.

EXHIBIT 2: Summary of Maintenance Schedule for Permanent Stormwater Management Practices and Stormwater Infrastructure

STORMWATER MANAGEMENT PRACTICE	MAINTENANCE ACTIVITY	FREQUENCY
STORMWATER MANAGEMENT BASIN	Cleaning and removal of debris	Inspect after major storm events (>2" of rainfall); otherwise annual removal of debris
	Inspect vegetation and harvest vegetation when a 50% reduction in the original open water surface area occurs	Inspect annually
	Inspect and repair embankment and side slopes	Inspect annually
	Inspect outlet control structure and repair if needed	Inspect annually
	Removing accumulated sediment from forebay or sediment storage areas when 60% of the original volume has been lost	Every 5 years
	Removing accumulated sediment from main cells of pond once 50% of the original volume has been lost	Every 5 years
	Remove invasive plants	Inspect annually; remove invasive plants promptly

INFILTRATION FACILITY	MAINTENANCE ACTIVITY	FREQUENCY
	Inspect level of sediment in subsurface chambers through observation port and remove if depth > 3"	Inspect after first year in operation, then every 5 years
	Inspect water level in observation well	Inspect annually
	Inspect structural integrity of inlet and outlet control structures and repair if needed	Inspect annually
BIORETENTION FACILITY AND RAIN GARDENS	Inspect if side slopes areas of the facility are eroding	Inspect annually
	Apply mulching to bare or void areas	Inspect annually
	Removing and replacing all dead and diseased vegetation	Inspect annually
	Watering plant material	As may be needed in summer months
	Removing mulch and applying a new layer to prevent weed growth	Inspect annually
	Remove invasive plants	Inspect annually; remove invasive plants promptly
	Sediment removal	Inspect annually; observe if runoff water is present above the surface for more than 24 hr after rain event

	MAINTENANCE ACTIVITY	FREQUENCY
TREE PLANTING	Place mulch (shredded hardwood bark) around trunk of tree to a diameter of at least 3 feet. Mulch shall be placed to a depth of between 3" and 4", and mulch shall not be placed against the trunk (i.e. no "mulch volcanoes")	Inspect annually and add mulch as needed
	Watering of the newly planted tree	Watering of newly planted trees is needed for the first two growing seasons after planting.
	Observe condition of tree. Call expert (arborist or cooperative extension service) for questions about pest or disease problems.	Inspect annually.
CATCH BASINS AND MANHOLES	Remove sediment from sump	Inspect annually
	Check integrity of structure	Inspect annually
CATCH BASIN DIVERSION STRUCTURES	Check for debris that might impair the flow through the grate	Inspect after every storm event > 0.5" of precipitation
HYDRODYNAMIC SEPARATOR	Remove floatables and sediment from facility in accordance with manufacturer's specifications	Inspect after first year in operation, then every 5 years

Appendix D

Contractor Certification

Contractor Certification

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

The owner or operator shall have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before they commence any construction activity:

“I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations”.

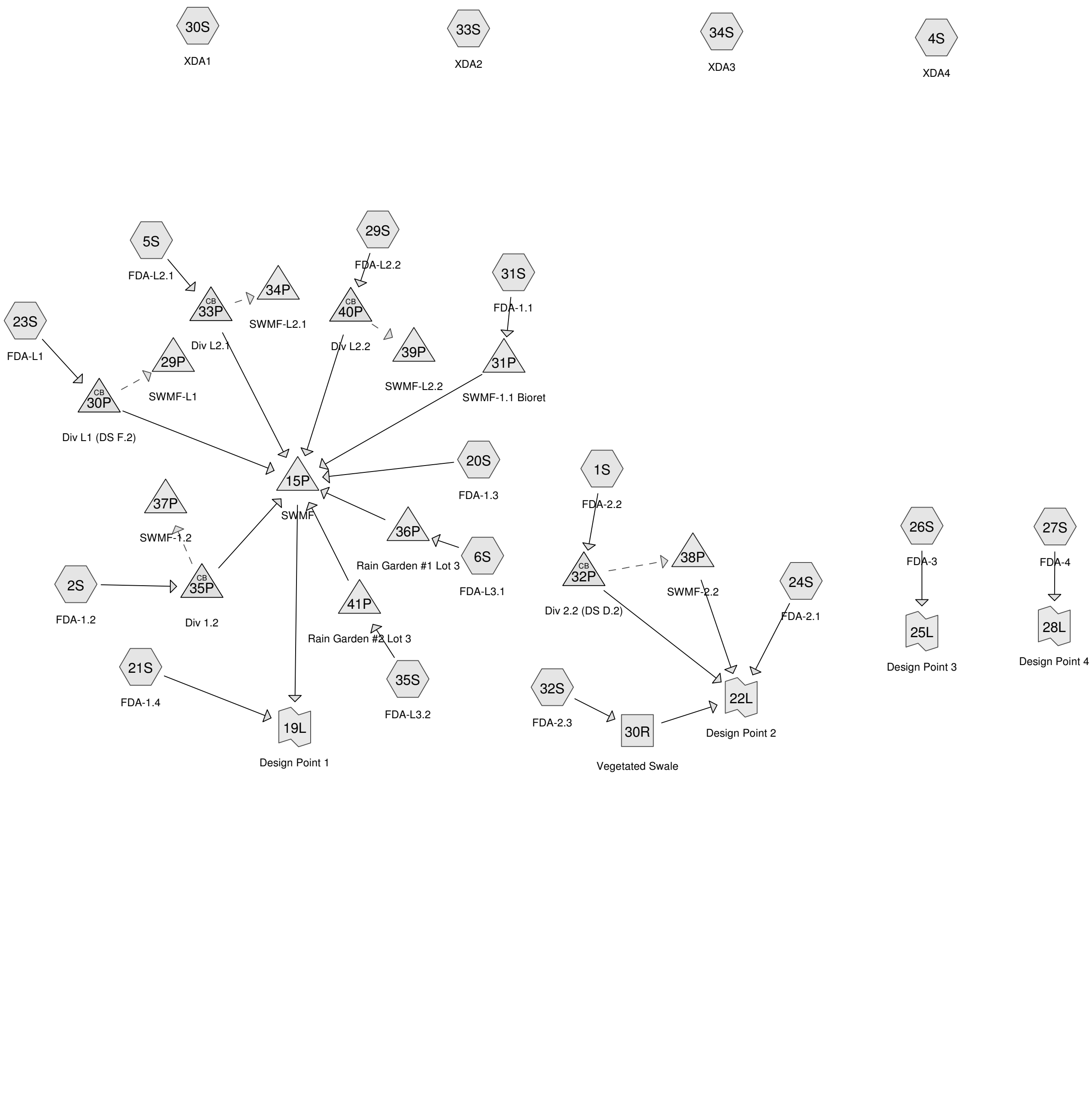
In addition to providing the certification statement above, the certification page must also identify the specific elements of the SWPPP that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the trained contractor responsible for SWPPP implementation; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification statement is signed. The owner or operator shall attach the certification statement(s) to the copy of the SWPPP that is maintained at the construction site. If new or additional contractors are hired to implement measures identified in the SWPPP after construction has commenced, they must also sign the certification statement and provide the information listed above.

____

Signature of Contractor

Appendix E

Stormwater Management Report Hydrographs and Routings



Routing Diagram for Hidden Oak_2.7 01-26-2016
Prepared by EAEC
HydroCAD® 10.00-15 s/n 03392 © 2015 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.216	61	>75% Grass cover, Good, HSG B (1S, 2S, 5S, 6S, 20S, 21S, 23S, 24S, 26S, 31S, 32S, 35S)
0.053	74	>75% Grass cover, Good, HSG C (20S, 21S)
0.013	80	>75% Grass cover, Good, HSG D (20S, 21S)
0.277	48	Brush, Good, HSG B (20S)
0.073	98	Driveway and roofs, HSG B (5S)
0.023	98	Driveway, HSG B (35S)
0.229	98	Impervious Surfaces, HSG B (20S)
0.043	98	Lot 3 Roof, HSG B (6S)
0.039	85	Maintenance Path, HSG B (20S)
0.016	98	Off-Site Road, HSG B (32S)
0.033	98	Off-site impervious road, HSG B (1S)
0.524	98	Paved parking, HSG B (2S, 23S, 33S)
0.004	98	Retaining Wall, HSG B (20S)
0.098	98	Roofs, HSG B (29S)
0.253	98	Subdivision Road, HSG B (1S)
0.063	98	Unconnected pavement, HSG B (30S, 32S)
0.009	98	Walks, Entry Steps, HSG B (6S)
1.279	55	Woods (off-site), Good, HSG B (20S, 31S)
0.787	55	Woods (on-site), Good, HSG B (20S)
13.096	55	Woods, Good, HSG B (1S, 2S, 4S, 6S, 21S, 24S, 26S, 27S, 30S, 31S, 32S, 33S, 34S, 35S)
0.474	70	Woods, Good, HSG C (4S, 20S, 21S, 27S, 30S)
0.236	77	Woods, Good, HSG D (4S, 20S, 21S, 27S, 30S)
20.841	**59**	**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	3.216	0.053	0.013	0.000	3.283	>75% Grass cover, Good	1S, 2S, 5S, 6S, 20S, 21S, 23S, 24S, 26S, 31S, 32S, 35S
0.000	0.277	0.000	0.000	0.000	0.277	Brush, Good	20S
0.000	0.023	0.000	0.000	0.000	0.023	Driveway	35S
0.000	0.073	0.000	0.000	0.000	0.073	Driveway and roofs	5S
0.000	0.229	0.000	0.000	0.000	0.229	Impervious Surfaces	20S
0.000	0.043	0.000	0.000	0.000	0.043	Lot 3 Roof	6S
0.000	0.039	0.000	0.000	0.000	0.039	Maintenance Path	20S
0.000	0.016	0.000	0.000	0.000	0.016	Off-Site Road	32S
0.000	0.033	0.000	0.000	0.000	0.033	Off-site impervious road	1S
0.000	0.524	0.000	0.000	0.000	0.524	Paved parking	2S, 23S, 33S
0.000	0.004	0.000	0.000	0.000	0.004	Retaining Wall	20S
0.000	0.098	0.000	0.000	0.000	0.098	Roofs	29S
0.000	0.253	0.000	0.000	0.000	0.253	Subdivision Road	1S
0.000	0.063	0.000	0.000	0.000	0.063	Unconnected pavement	30S, 32S
0.000	0.009	0.000	0.000	0.000	0.009	Walks, Entry Steps	6S
0.000	1.279	0.000	0.000	0.000	1.279	Woods (off-site), Good	20S, 31S
0.000	0.787	0.000	0.000	0.000	0.787	Woods (on-site), Good	20S
0.000	13.096	0.474	0.236	0.000	13.807	Woods, Good	1S, 2S, 4S, 6S, 20S, 21S, 24S, 26S, 27S, 30S, 31S, 32S, 33S, 34S, 35S
0.000	**20.064**	**0.527**	**0.250**	**0.000**	**20.841**	**TOTAL AREA**	

Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 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: FDA-2.2 Runoff Area=28,532 sf 43.66% Impervious Runoff Depth=0.97"
Flow Length=483' Tc=13.2 min CN=74 Runoff=0.55 cfs 0.053 af

Subcatchment 2S: FDA-1.2 Runoff Area=19,428 sf 65.47% Impervious Runoff Depth=1.60"
Tc=10.0 min CN=84 Runoff=0.73 cfs 0.059 af

Subcatchment 4S: XDA4 Runoff Area=10,541 sf 0.00% Impervious Runoff Depth=0.55"
Flow Length=100' Slope=0.1900 '/' Tc=8.3 min CN=65 Runoff=0.11 cfs 0.011 af

Subcatchment 5S: FDA-L2.1 Runoff Area=5,735 sf 55.54% Impervious Runoff Depth=1.46"
Tc=5.0 min CN=82 Runoff=0.23 cfs 0.016 af

Subcatchment 6S: FDA-L3.1 Runoff Area=11,384 sf 19.99% Impervious Runoff Depth=0.59"
Tc=10.0 min CN=66 Runoff=0.12 cfs 0.013 af

Subcatchment 20S: FDA-1.3 Runoff Area=177,542 sf 5.71% Impervious Runoff Depth=0.37"
Flow Length=974' Tc=17.9 min CN=60 Runoff=0.73 cfs 0.126 af

Subcatchment 21S: FDA-1.4 Runoff Area=6,857 sf 0.00% Impervious Runoff Depth=0.51"
Flow Length=87' Tc=5.5 min CN=64 Runoff=0.07 cfs 0.007 af

Subcatchment 23S: FDA-L1 Runoff Area=8,712 sf 91.00% Impervious Runoff Depth=2.55"
Tc=5.0 min CN=95 Runoff=0.59 cfs 0.042 af

Subcatchment 24S: FDA-2.1 Runoff Area=38,768 sf 0.00% Impervious Runoff Depth=0.31"
Flow Length=141' Tc=6.3 min CN=58 Runoff=0.13 cfs 0.023 af

Subcatchment 26S: FDA-3 Runoff Area=23,055 sf 0.00% Impervious Runoff Depth=0.28"
Flow Length=156' Tc=7.6 min CN=57 Runoff=0.07 cfs 0.012 af

Subcatchment 27S: FDA-4 Runoff Area=10,545 sf 0.00% Impervious Runoff Depth=0.55"
Flow Length=100' Slope=0.1900 '/' Tc=8.3 min CN=65 Runoff=0.11 cfs 0.011 af

Subcatchment 29S: FDA-L2.2 Runoff Area=4,285 sf 100.00% Impervious Runoff Depth=2.87"
Tc=5.0 min CN=98 Runoff=0.31 cfs 0.024 af

Subcatchment 30S: XDA1 Runoff Area=208,652 sf 1.02% Impervious Runoff Depth=0.25"
Flow Length=1,046' Tc=25.6 min CN=56 Runoff=0.39 cfs 0.099 af

Subcatchment 31S: FDA-1.1 Runoff Area=29,272 sf 0.00% Impervious Runoff Depth=0.34"
Tc=15.0 min CN=59 Runoff=0.11 cfs 0.019 af

Subcatchment 32S: FDA-2.3 Runoff Area=85,225 sf 1.54% Impervious Runoff Depth=0.28"
Flow Length=401' Tc=14.7 min CN=57 Runoff=0.22 cfs 0.045 af

Subcatchment 33S: XDA2 Runoff Area=211,963 sf 1.03% Impervious Runoff Depth=0.22"
Flow Length=544' Tc=15.5 min CN=55 Runoff=0.37 cfs 0.090 af

Subcatchment 34S: XDA3 Runoff Area=23,043 sf 0.00% Impervious Runoff Depth=0.22"
Flow Length=156' Tc=8.3 min CN=55 Runoff=0.04 cfs 0.010 af

Subcatchment 35S: FDA-L3.2 Runoff Area=4,286 sf 23.68% Impervious Runoff Depth=0.68"
Tc=10.0 min CN=68 Runoff=0.06 cfs 0.006 af

Reach 30R: Vegetated Swale Avg. Flow Depth=0.19' Max Vel=0.43 fps Inflow=0.22 cfs 0.045 af
n=0.240 L=285.0' S=0.0561 '/' Capacity=6.76 cfs Outflow=0.19 cfs 0.045 af

Pond 15P: SWMF Peak Elev=126.85' Storage=5,951 cf Inflow=0.73 cfs 0.126 af
Outflow=0.11 cfs 0.126 af

Pond 29P: SWMF-L1 Peak Elev=153.16' Storage=245 cf Inflow=0.59 cfs 0.042 af
Outflow=0.21 cfs 0.042 af

Pond 30P: Div L1 (DS F.2) Peak Elev=154.71' Inflow=0.59 cfs 0.042 af
Primary=0.00 cfs 0.000 af Secondary=0.59 cfs 0.042 af Outflow=0.59 cfs 0.042 af

Pond 31P: SWMF-1.1 Bioret Peak Elev=156.65' Storage=175 cf Inflow=0.11 cfs 0.019 af
Discarded=0.03 cfs 0.019 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.019 af

Pond 32P: Div 2.2 (DS D.2) Peak Elev=152.90' Inflow=0.55 cfs 0.053 af
Primary=0.00 cfs 0.000 af Secondary=0.55 cfs 0.053 af Outflow=0.55 cfs 0.053 af

Pond 33P: Div L2.1 Peak Elev=150.30' Inflow=0.23 cfs 0.016 af
Primary=0.00 cfs 0.000 af Secondary=0.23 cfs 0.016 af Outflow=0.23 cfs 0.016 af

Pond 34P: SWMF-L2.1 Peak Elev=148.13' Storage=136 cf Inflow=0.23 cfs 0.016 af
Outflow=0.06 cfs 0.016 af

Pond 35P: Div 1.2 Peak Elev=154.60' Inflow=0.73 cfs 0.059 af
Primary=0.00 cfs 0.000 af Secondary=0.73 cfs 0.059 af Outflow=0.73 cfs 0.059 af

Pond 36P: Rain Garden #1 Lot 3 Peak Elev=144.63' Storage=142 cf Inflow=0.12 cfs 0.013 af
Discarded=0.03 cfs 0.013 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.013 af

Pond 37P: SWMF-1.2 Peak Elev=153.81' Storage=610 cf Inflow=0.73 cfs 0.059 af
Outflow=0.18 cfs 0.059 af

Pond 38P: SWMF-2.2 Peak Elev=150.62' Storage=551 cf Inflow=0.55 cfs 0.053 af
Discarded=0.16 cfs 0.053 af Primary=0.00 cfs 0.000 af Outflow=0.16 cfs 0.053 af

Pond 39P: SWMF-L2.2 Peak Elev=135.76' Storage=209 cf Inflow=0.31 cfs 0.024 af
Outflow=0.07 cfs 0.024 af

Pond 40P: Div L2.2 Peak Elev=137.86' Inflow=0.31 cfs 0.024 af
Primary=0.00 cfs 0.000 af Secondary=0.31 cfs 0.024 af Outflow=0.31 cfs 0.024 af

Pond 41P: Rain Garden #2 Lot 3 Peak Elev=152.08' Storage=53 cf Inflow=0.06 cfs 0.006 af
Discarded=0.02 cfs 0.006 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.006 af

Link 19L: Design Point 1 Inflow=0.12 cfs 0.132 af
Primary=0.12 cfs 0.132 af

Link 22L: Design Point 2 Inflow=0.25 cfs 0.068 af
Primary=0.25 cfs 0.068 af

Link 25L: Design Point 3 Inflow=0.07 cfs 0.012 af
Primary=0.07 cfs 0.012 af

Link 28L: Design Point 4 Inflow=0.11 cfs 0.011 af
Primary=0.11 cfs 0.011 af

Total Runoff Area = 20.841 ac Runoff Volume = 0.666 af Average Runoff Depth = 0.38"
93.43% Pervious = 19.472 ac 6.57% Impervious = 1.369 ac

Summary for Subcatchment 1S: FDA-2.2

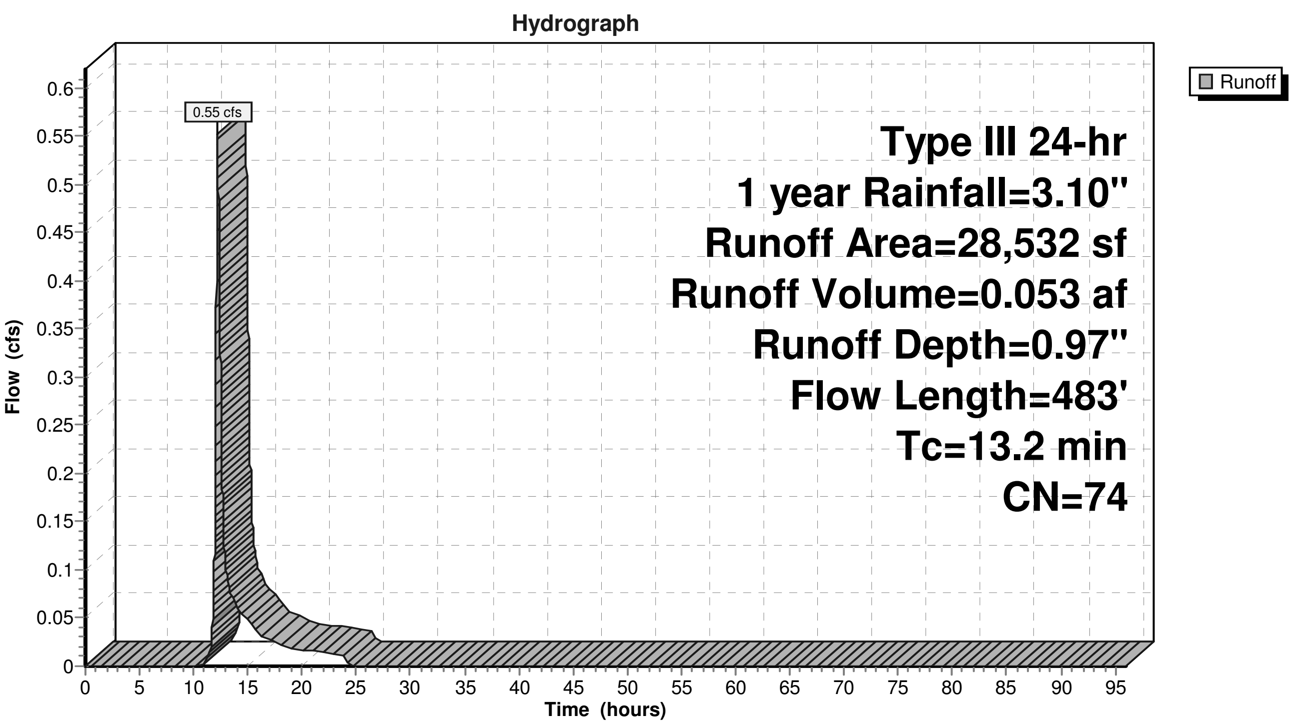
Runoff = 0.55 cfs @ 12.19 hrs, Volume= 0.053 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

	Area (sf)	CN	Description
*	11,021	98	Subdivision Road, HSG B
*	1,437	98	Off-site impervious road, HSG B
	1,307	61	>75% Grass cover, Good, HSG B
	14,767	55	Woods, Good, HSG B
	28,532	74	Weighted Average
	16,074		56.34% Pervious Area
	12,458		43.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	100	0.0750	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.6	68	0.1250	1.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	65	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	250	0.0750	13.46	10.57	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
13.2	483	Total			

Subcatchment 1S: FDA-2.2



Summary for Subcatchment 2S: FDA-1.2

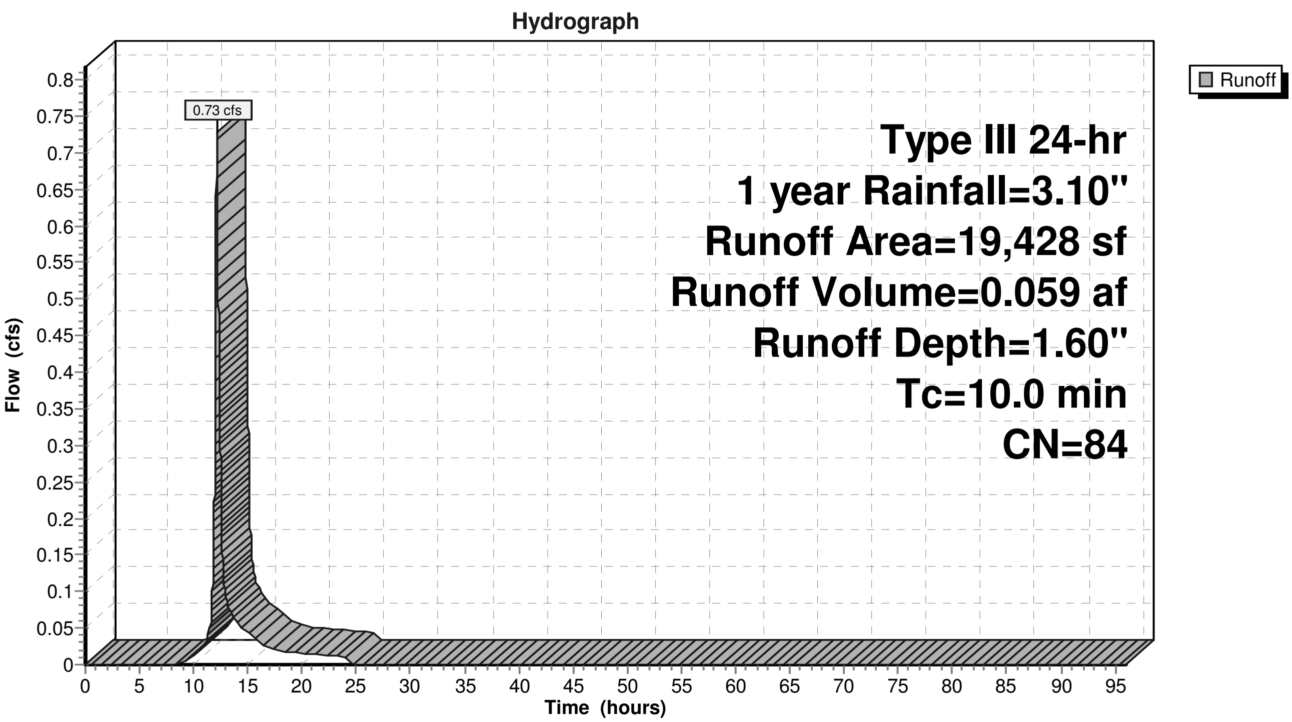
Runoff = 0.73 cfs @ 12.14 hrs, Volume= 0.059 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

Area (sf)	CN	Description
12,720	98	Paved parking, HSG B
3,180	61	>75% Grass cover, Good, HSG B
3,528	55	Woods, Good, HSG B
19,428	84	Weighted Average
6,708		34.53% Pervious Area
12,720		65.47% Impervious Area

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

Subcatchment 2S: FDA-1.2



Summary for Subcatchment 4S: XDA4

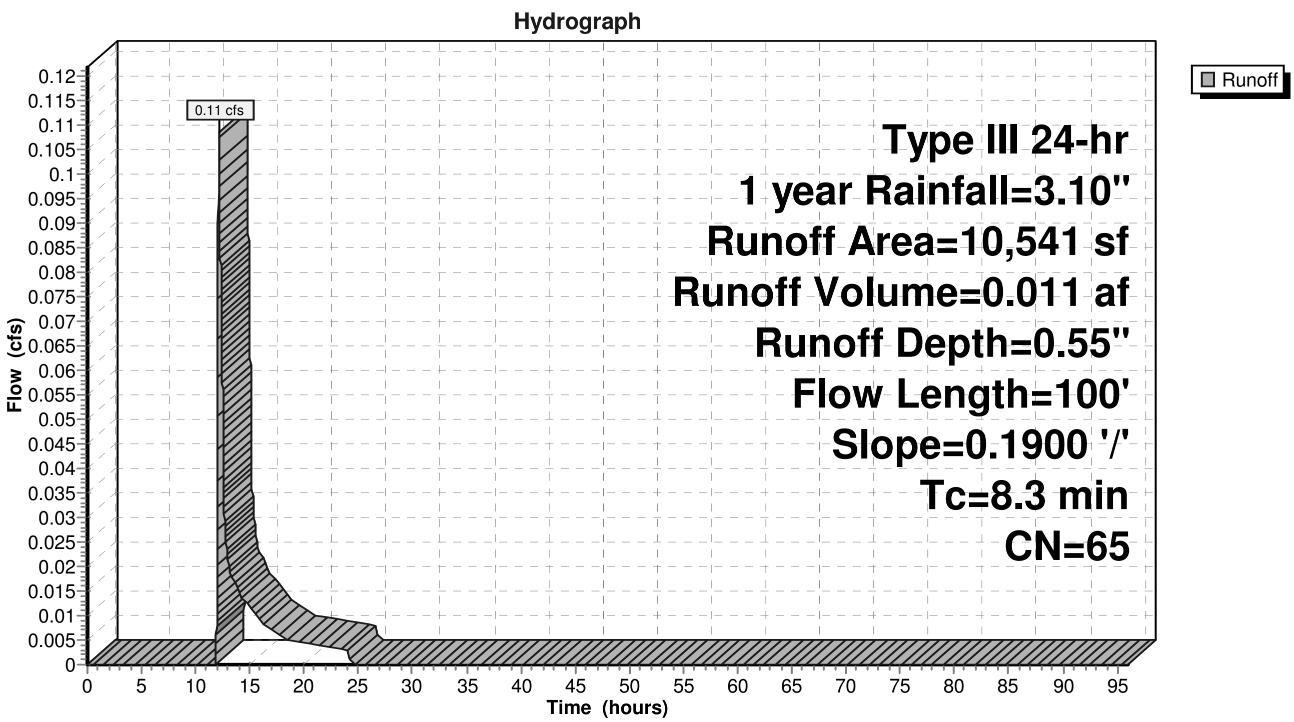
Runoff = 0.11 cfs @ 12.14 hrs, Volume= 0.011 af, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

Area (sf)	CN	Description
4,225	55	Woods, Good, HSG B
4,225	70	Woods, Good, HSG C
2,091	77	Woods, Good, HSG D
10,541	65	Weighted Average
10,541		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.1900	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"

Subcatchment 4S: XDA4



Summary for Subcatchment 5S: FDA-L2.1

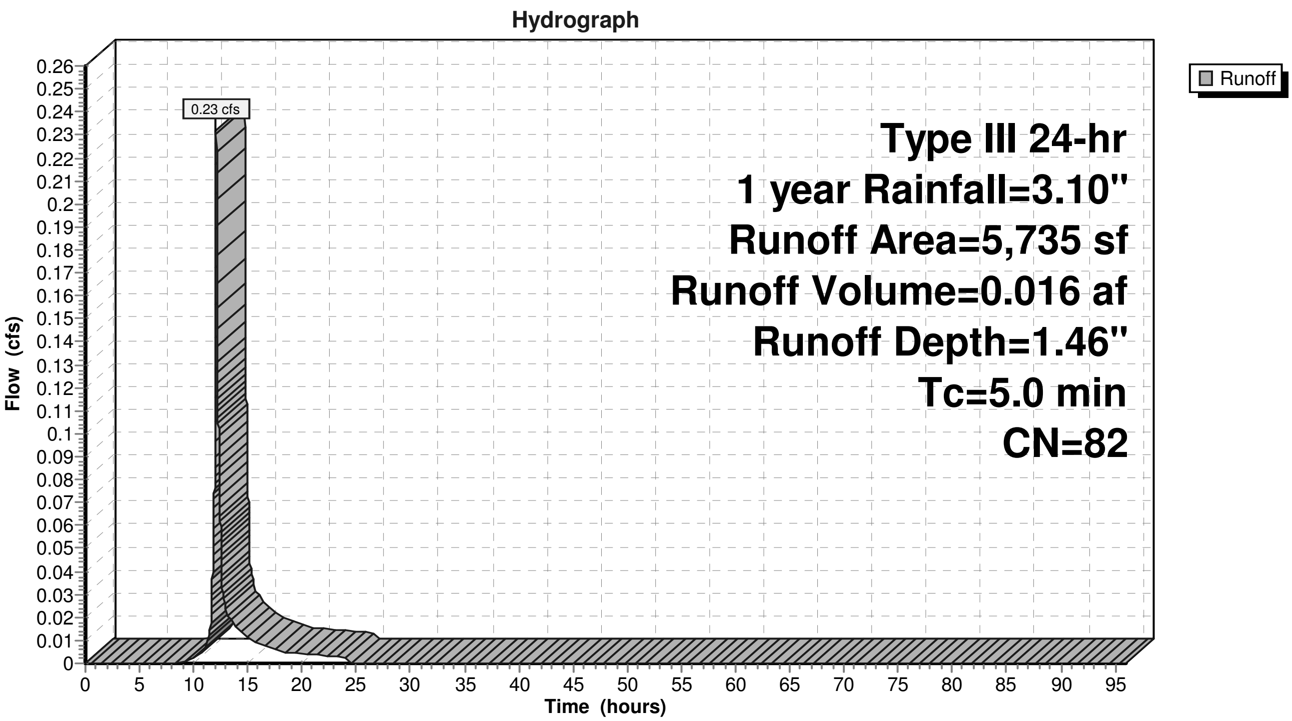
Runoff = 0.23 cfs @ 12.08 hrs, Volume= 0.016 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

	Area (sf)	CN	Description
*	3,185	98	Driveway and roofs, HSG B
	2,550	61	>75% Grass cover, Good, HSG B
	5,735	82	Weighted Average
	2,550		44.46% Pervious Area
	3,185		55.54% Impervious Area

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

Subcatchment 5S: FDA-L2.1



Summary for Subcatchment 6S: FDA-L3.1

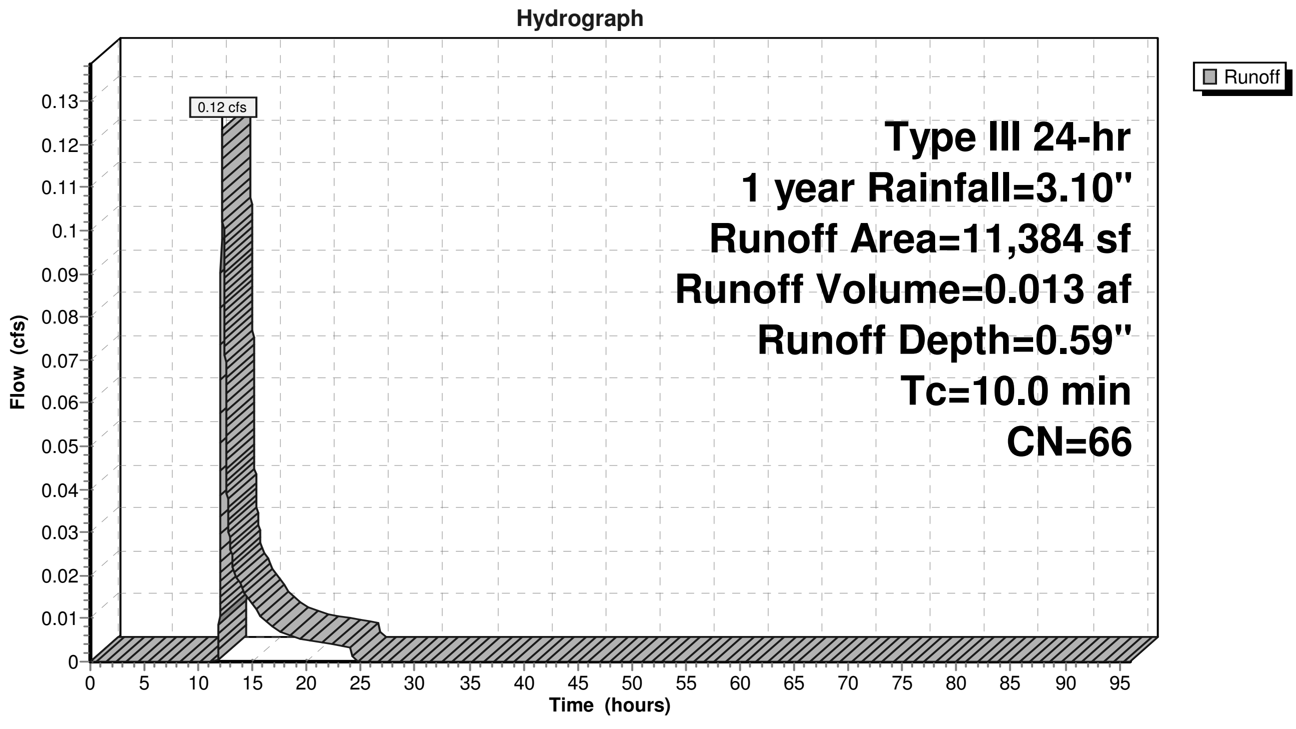
Runoff = 0.12 cfs @ 12.17 hrs, Volume= 0.013 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

	Area (sf)	CN	Description
*	982	98	Lot 3 Roof, HSG B
*	907	98	Lot 3 Roof, HSG B
*	387	98	Walks, Entry Steps, HSG B
	5,387	61	>75% Grass cover, Good, HSG B
	3,721	55	Woods, Good, HSG B
	11,384	66	Weighted Average
	9,108		80.01% Pervious Area
	2,276		19.99% Impervious Area

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

Subcatchment 6S: FDA-L3.1



Summary for Subcatchment 20S: FDA-1.3

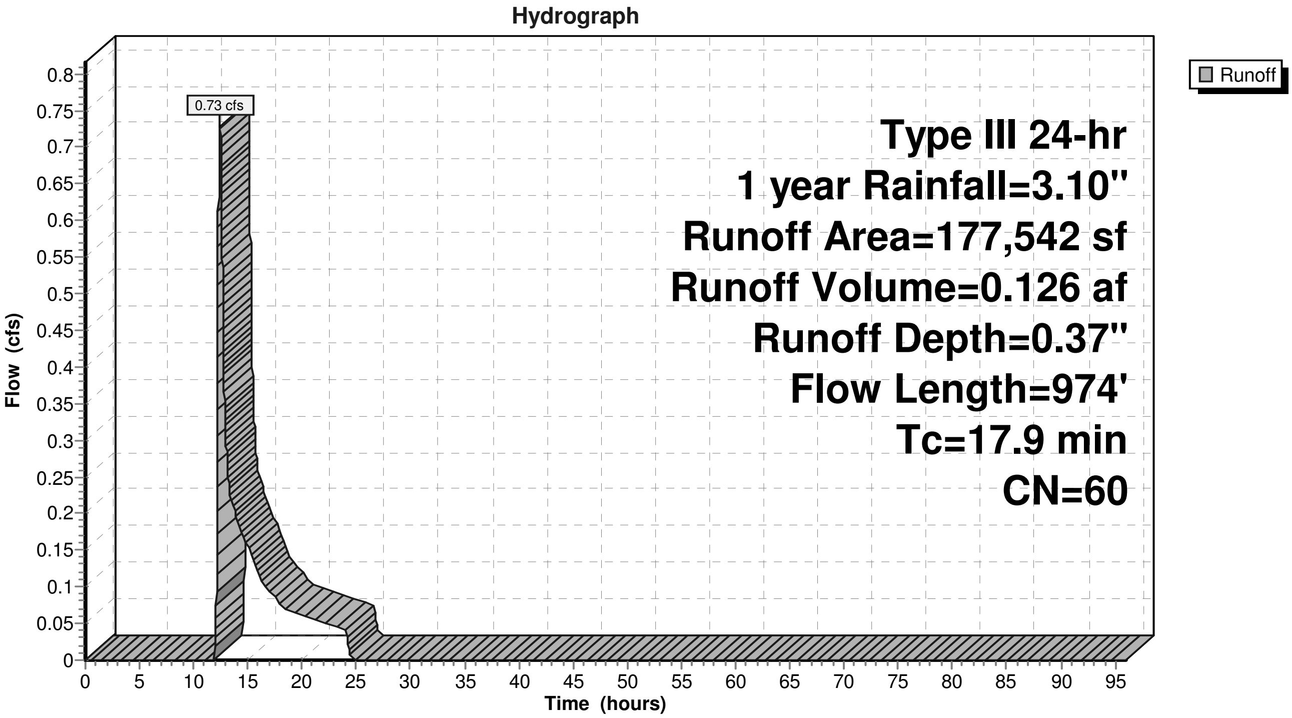
Runoff = 0.73 cfs @ 12.40 hrs, Volume= 0.126 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

	Area (sf)	CN	Description
*	9,958	98	Impervious Surfaces, HSG B
*	1,720	85	Maintenance Path, HSG B
*	185	98	Retaining Wall, HSG B
	60,200	61	>75% Grass cover, Good, HSG B
	2,190	74	>75% Grass cover, Good, HSG C
	523	80	>75% Grass cover, Good, HSG D
	12,069	48	Brush, Good, HSG B
*	34,260	55	Woods (on-site), Good, HSG B
*	51,994	55	Woods (off-site), Good, HSG B
	2,962	70	Woods, Good, HSG C
	1,481	77	Woods, Good, HSG D
	177,542	60	Weighted Average
	167,399		94.29% Pervious Area
	10,143		5.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.1700	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	133	0.1880	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.1	183	0.0383	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	57	0.0219	2.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.1	91	0.1000	15.54	12.21	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
1.6	274	0.0299	2.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.0	136	0.0022	0.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
17.9	974	Total			

Subcatchment 20S: FDA-1.3



Summary for Subcatchment 21S: FDA-1.4

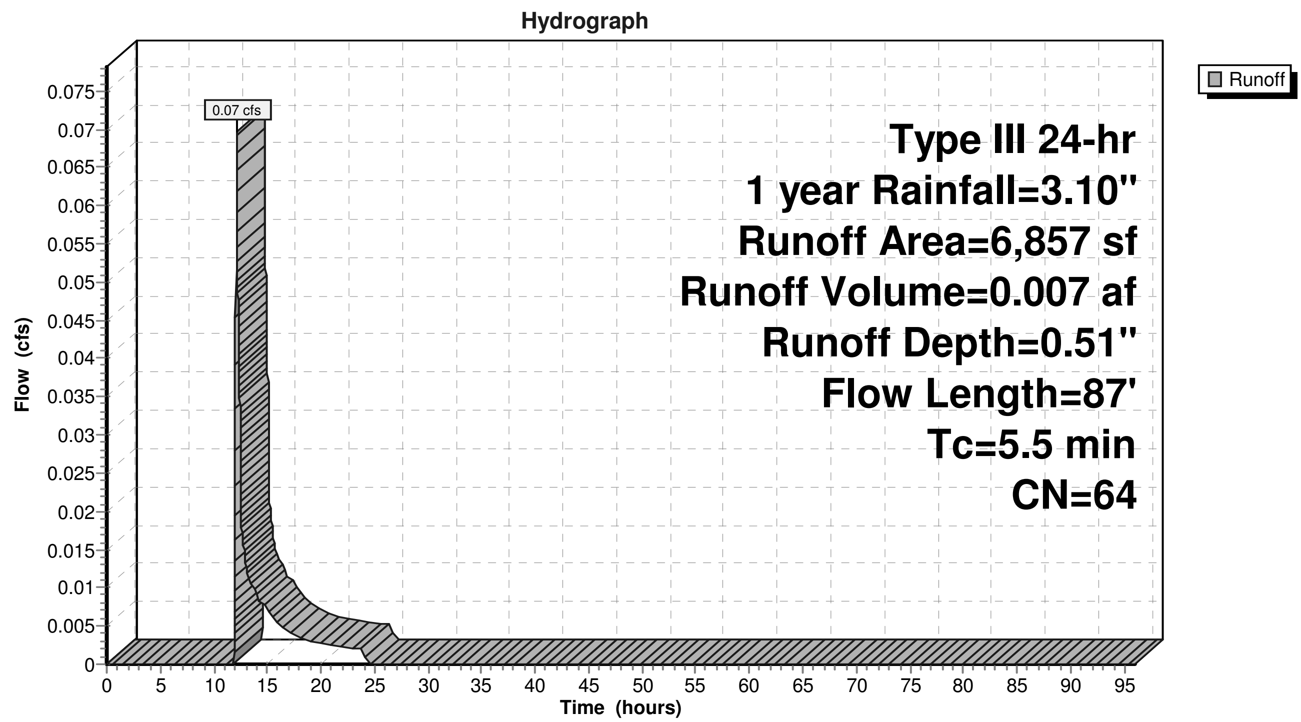
Runoff = 0.07 cfs @ 12.11 hrs, Volume= 0.007 af, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

Area (sf)	CN	Description
478	61	>75% Grass cover, Good, HSG B
124	74	>75% Grass cover, Good, HSG C
62	80	>75% Grass cover, Good, HSG D
3,040	55	Woods, Good, HSG B
2,102	70	Woods, Good, HSG C
1,051	77	Woods, Good, HSG D
6,857	64	Weighted Average
6,857		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	40	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	47	0.2300	2.40		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.5	87	Total			

Subcatchment 21S: FDA-1.4



Summary for Subcatchment 23S: FDA-L1

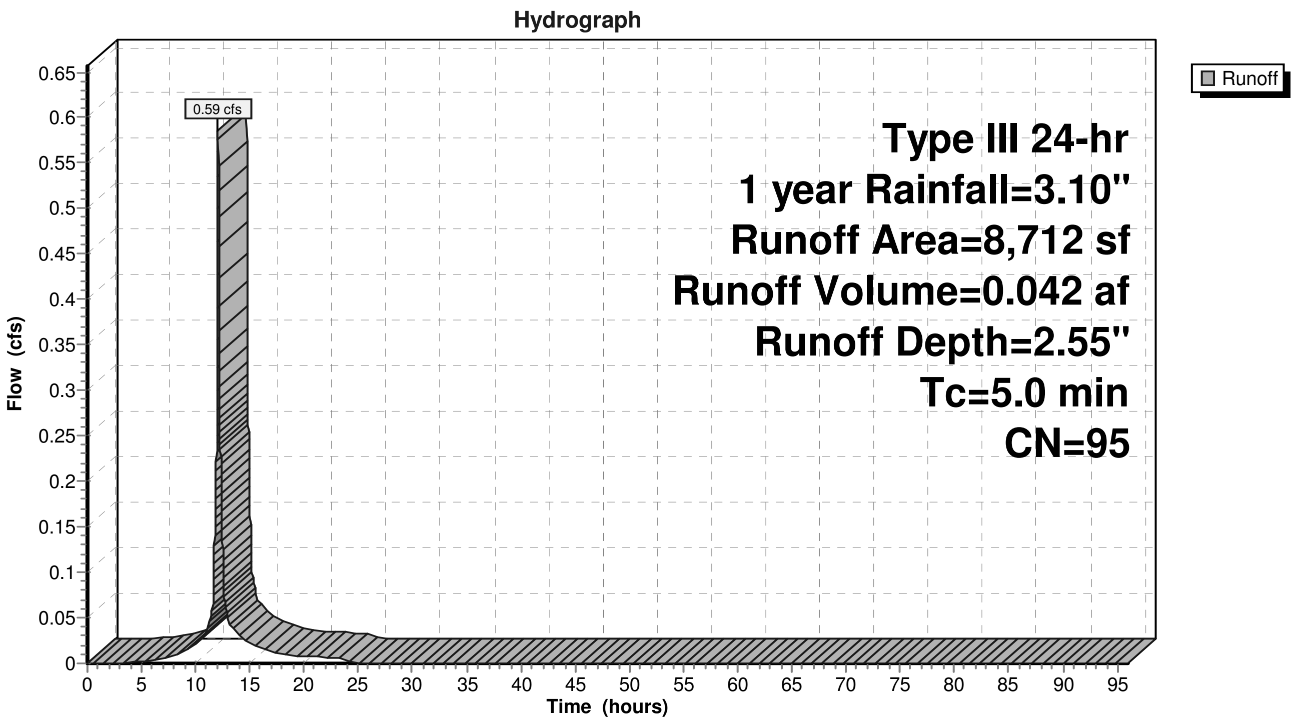
Runoff = 0.59 cfs @ 12.07 hrs, Volume= 0.042 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

Area (sf)	CN	Description
7,928	98	Paved parking, HSG B
784	61	>75% Grass cover, Good, HSG B
8,712	95	Weighted Average
784		9.00% Pervious Area
7,928		91.00% Impervious Area

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

Subcatchment 23S: FDA-L1



Summary for Subcatchment 24S: FDA-2.1

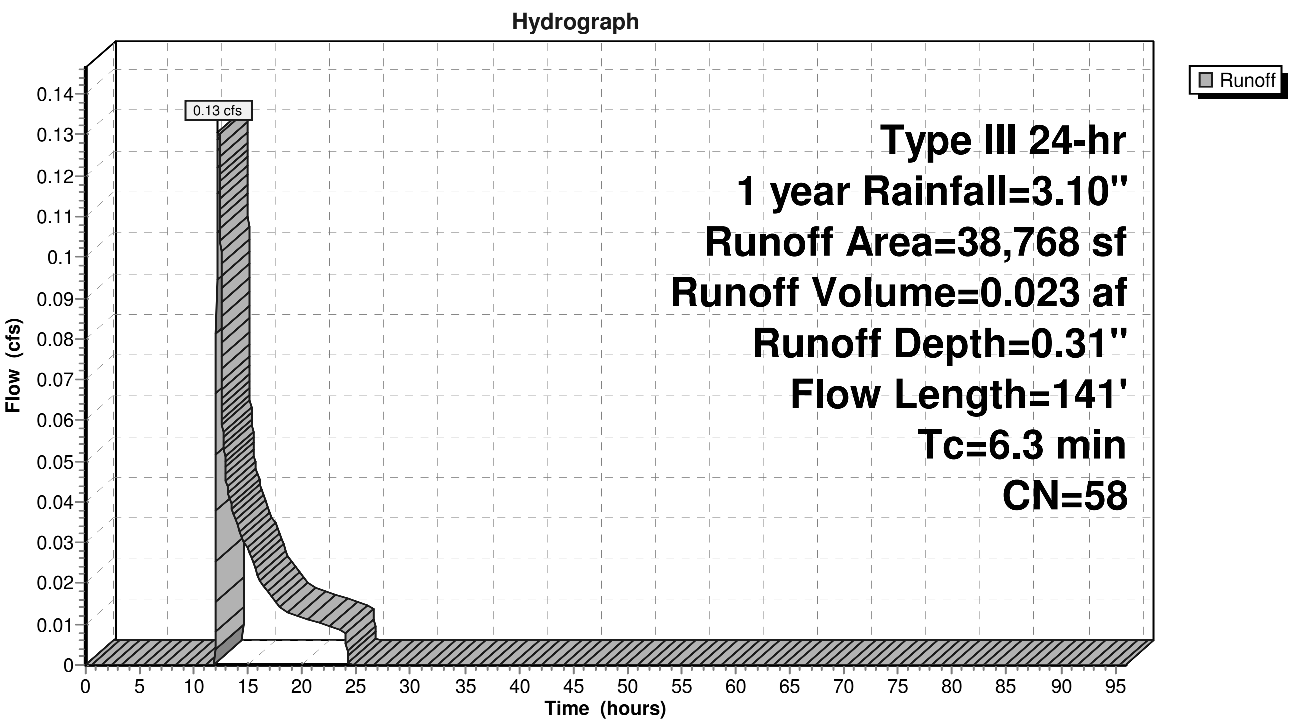
Runoff = 0.13 cfs @ 12.27 hrs, Volume= 0.023 af, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

Area (sf)	CN	Description
16,814	61	>75% Grass cover, Good, HSG B
21,954	55	Woods, Good, HSG B
38,768	58	Weighted Average
38,768		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	63	0.1698	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	78	0.0744	4.09		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
6.3	141	Total			

Subcatchment 24S: FDA-2.1



Summary for Subcatchment 26S: FDA-3

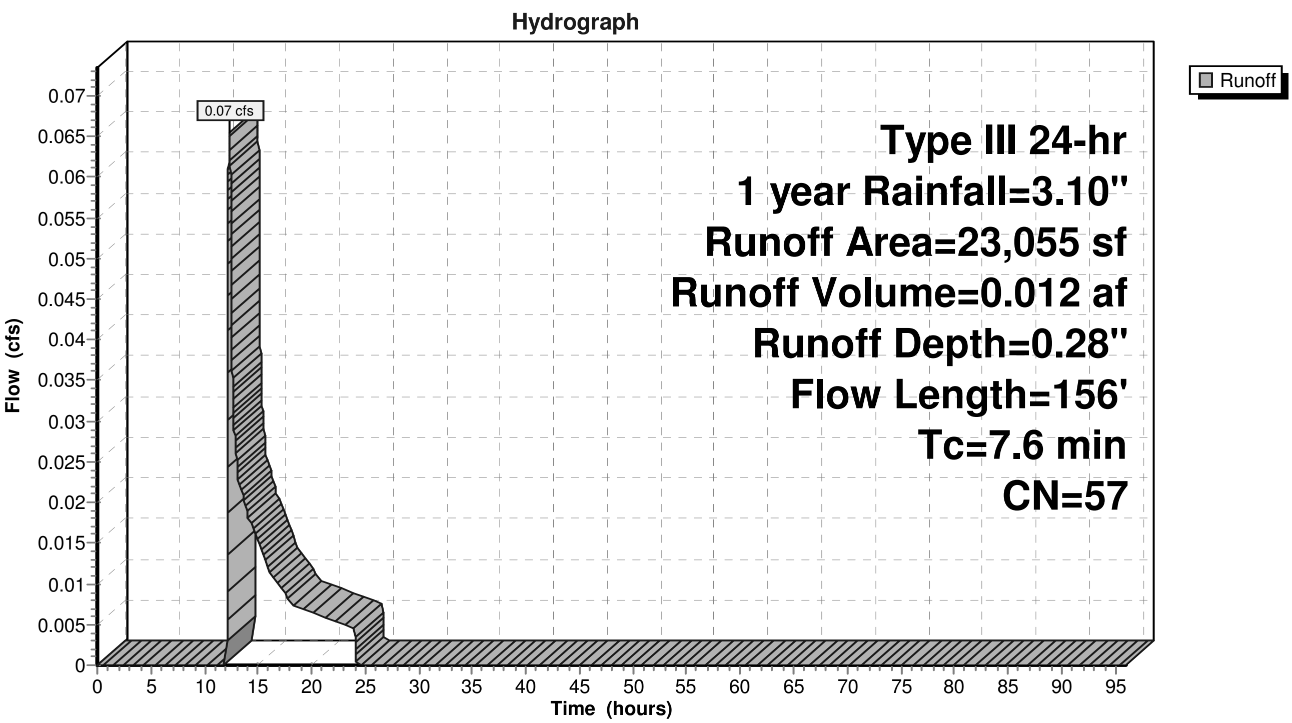
Runoff = 0.07 cfs @ 12.32 hrs, Volume= 0.012 af, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

Area (sf)	CN	Description
5,955	61	>75% Grass cover, Good, HSG B
17,100	55	Woods, Good, HSG B
23,055	57	Weighted Average
23,055		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	86	0.1977	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	70	0.0571	3.58		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.6	156	Total			

Subcatchment 26S: FDA-3



Summary for Subcatchment 27S: FDA-4

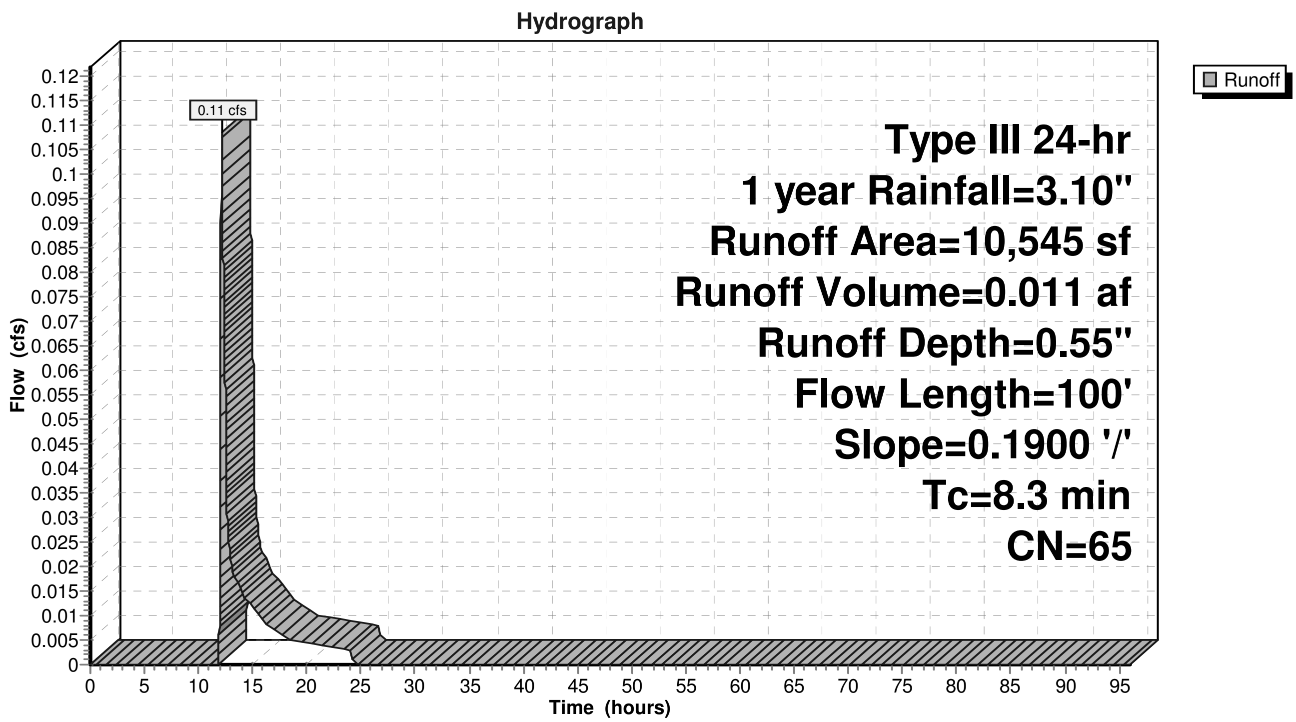
Runoff = 0.11 cfs @ 12.14 hrs, Volume= 0.011 af, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

Area (sf)	CN	Description
4,220	55	Woods, Good, HSG B
4,220	70	Woods, Good, HSG C
2,105	77	Woods, Good, HSG D
10,545	65	Weighted Average
10,545		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.1900	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"

Subcatchment 27S: FDA-4



Summary for Subcatchment 29S: FDA-L2.2

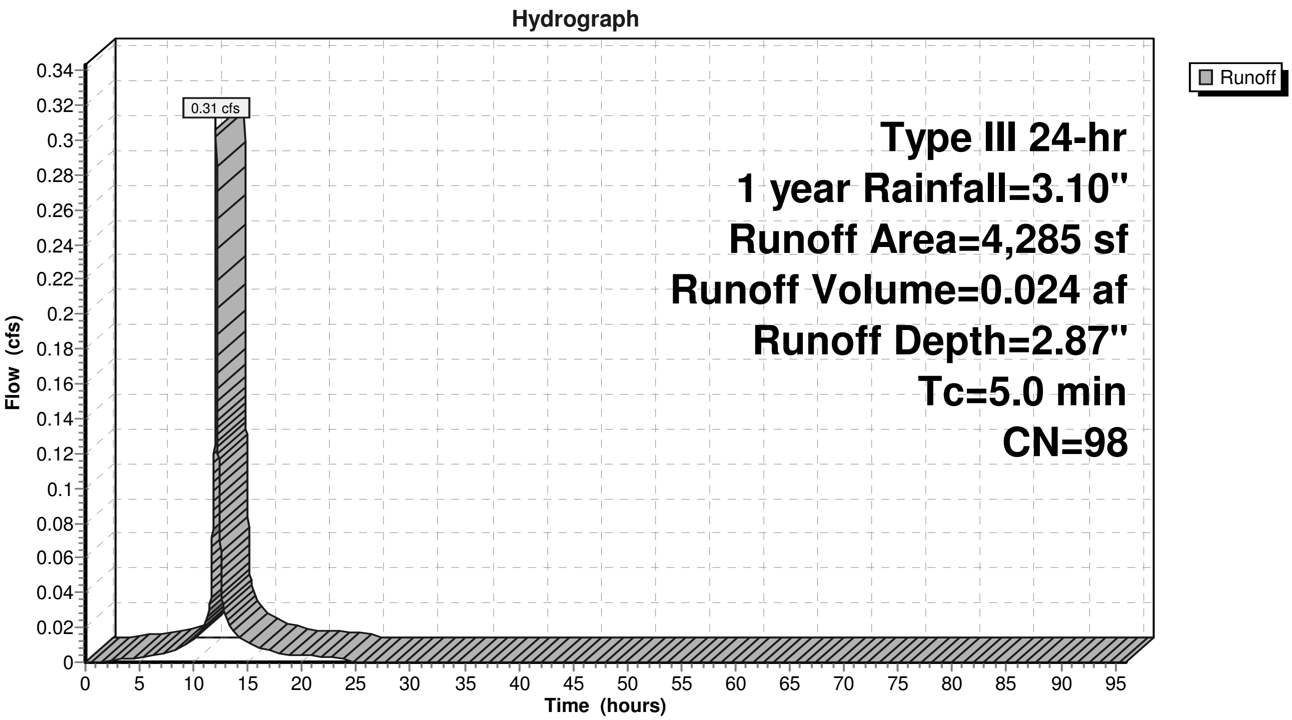
Runoff = 0.31 cfs @ 12.07 hrs, Volume= 0.024 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

Area (sf)	CN	Description
4,285	98	Roofs, HSG B
4,285		100.00% Impervious Area

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

Subcatchment 29S: FDA-L2.2



Summary for Subcatchment 30S: XDA1

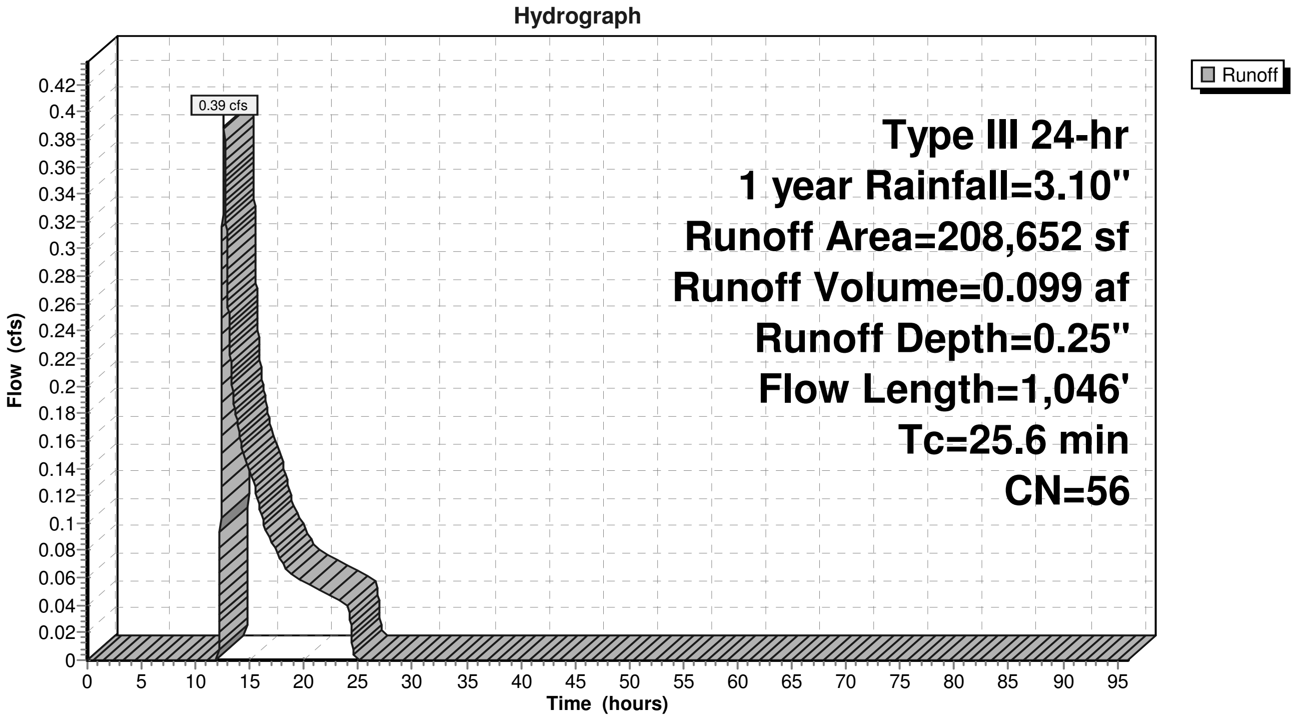
Runoff = 0.39 cfs @ 12.61 hrs, Volume= 0.099 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

Area (sf)	CN	Description
2,134	98	Unconnected pavement, HSG B
195,802	55	Woods, Good, HSG B
7,144	70	Woods, Good, HSG C
3,572	77	Woods, Good, HSG D
208,652	56	Weighted Average
206,518		98.98% Pervious Area
2,134		1.02% Impervious Area
2,134		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.1700	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	133	0.1880	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.1	183	0.0383	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	185	0.0919	1.52		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	367	0.0158	0.63		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	78	0.0538	1.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.6	1,046	Total			

Subcatchment 30S: XDA1



Summary for Subcatchment 31S: FDA-1.1

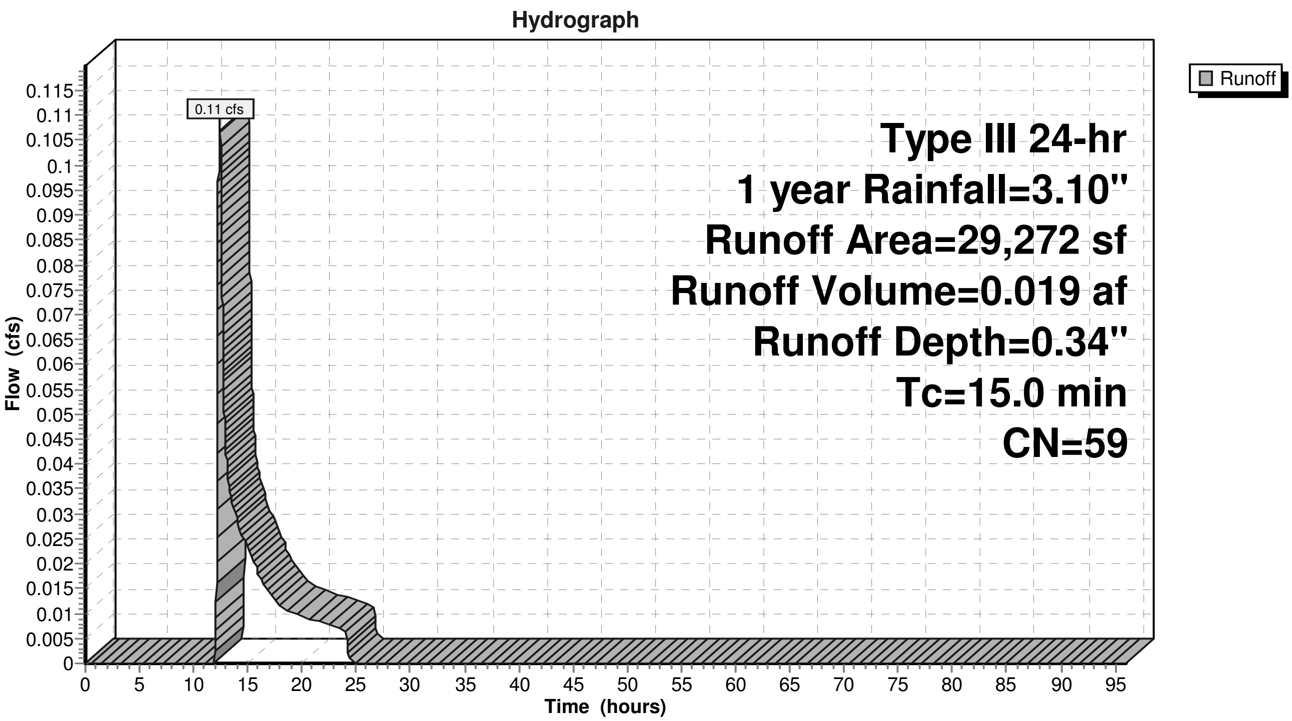
Runoff = 0.11 cfs @ 12.39 hrs, Volume= 0.019 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

	Area (sf)	CN	Description
	18,513	61	>75% Grass cover, Good, HSG B
	7,020	55	Woods, Good, HSG B
*	3,739	55	Woods (off-site), Good, HSG B
	29,272	59	Weighted Average
	29,272		100.00% Pervious Area

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

Subcatchment 31S: FDA-1.1



Summary for Subcatchment 32S: FDA-2.3

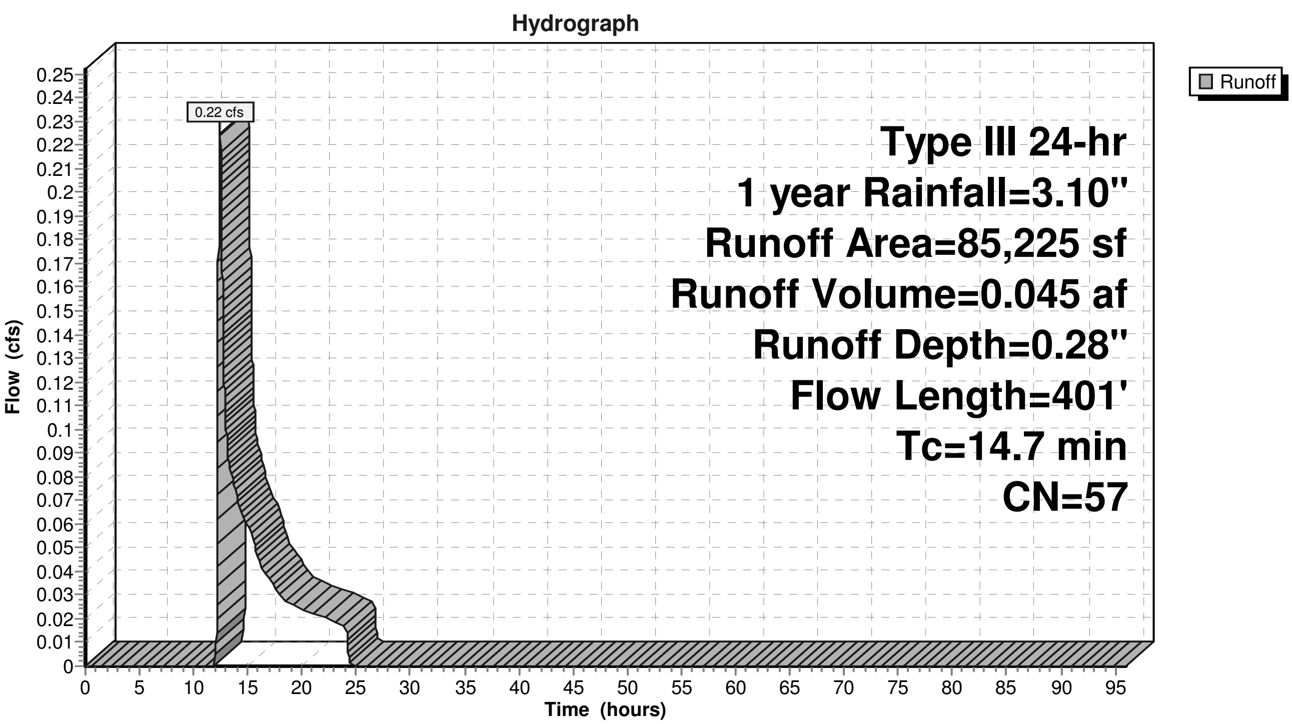
Runoff = 0.22 cfs @ 12.43 hrs, Volume= 0.045 af, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

	Area (sf)	CN	Description
*	715	98	Off-Site Road, HSG B
	315	98	Unconnected pavement, HSG B
	280	98	Unconnected pavement, HSG B
	23,051	61	>75% Grass cover, Good, HSG B
	60,864	55	Woods, Good, HSG B
	85,225	57	Weighted Average
	83,915		98.46% Pervious Area
	1,310		1.54% Impervious Area
	595		45.42% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	100	0.2050	0.21		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.4	148	0.1284	1.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.2	153	0.0163	0.49	1.29	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.75' Z= 2.0 '/' Top.W=5.00' n= 0.240 Sheet flow over Dense Grass
14.7	401	Total			

Subcatchment 32S: FDA-2.3



Summary for Subcatchment 33S: XDA2

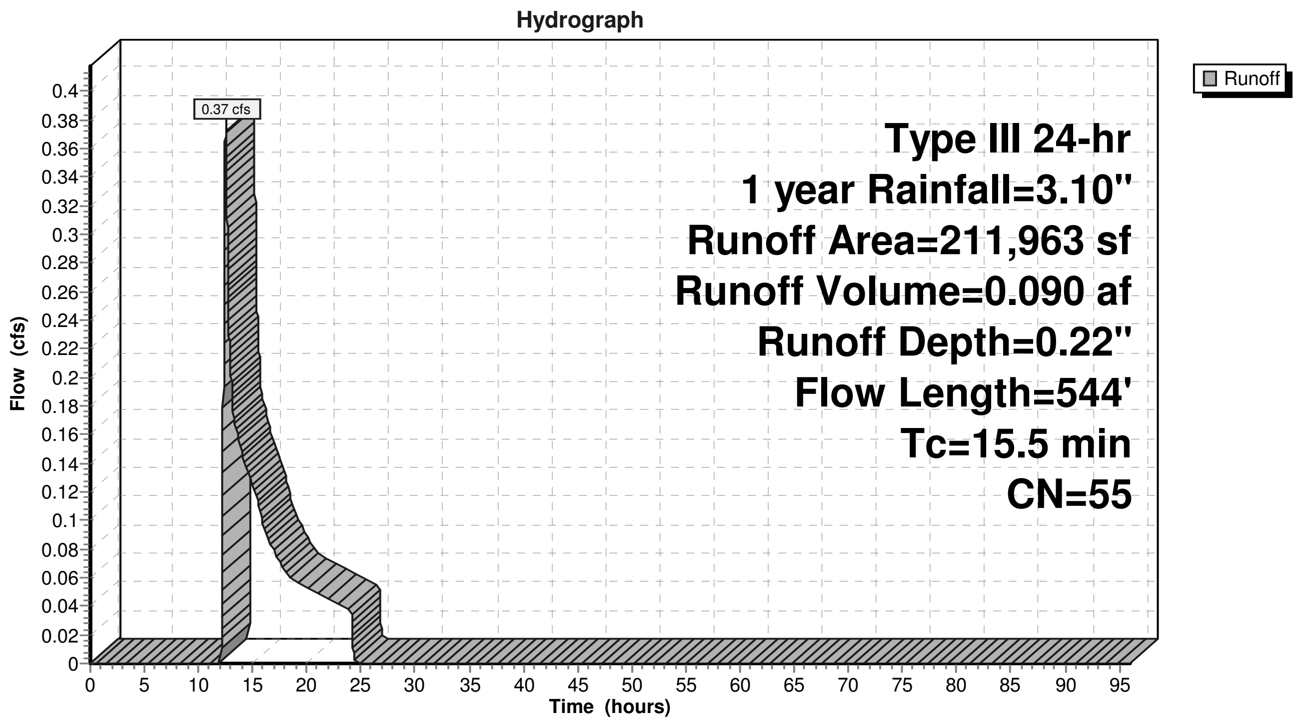
Runoff = 0.37 cfs @ 12.49 hrs, Volume= 0.090 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

Area (sf)	CN	Description
209,785	55	Woods, Good, HSG B
2,178	98	Paved parking, HSG B
211,963	55	Weighted Average
209,785		98.97% Pervious Area
2,178		1.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.1050	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.8	106	0.2075	2.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.1	338	0.0740	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.5	544	Total			

Subcatchment 33S: XDA2



Summary for Subcatchment 34S: XDA3

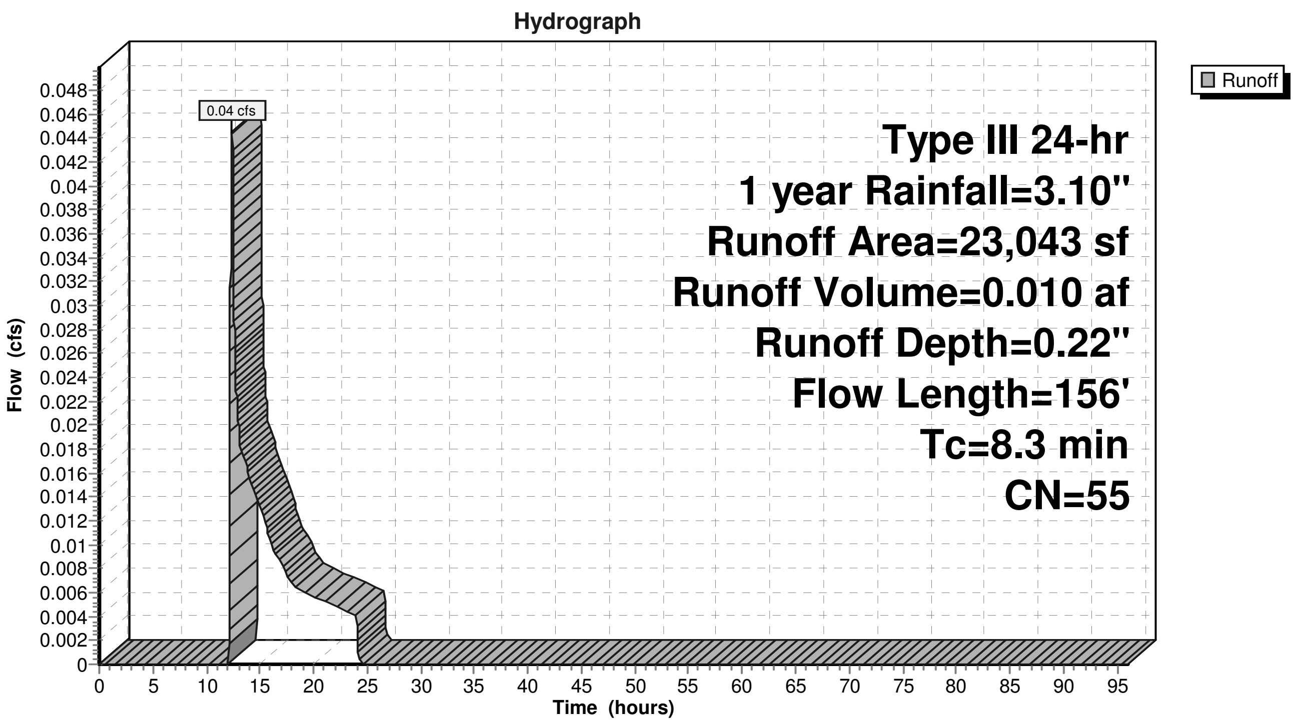
Runoff = 0.04 cfs @ 12.39 hrs, Volume= 0.010 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

Area (sf)	CN	Description
23,043	55	Woods, Good, HSG B
23,043		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	86	0.1977	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	70	0.0571	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.3	156	Total			

Subcatchment 34S: XDA3



Summary for Subcatchment 35S: FDA-L3.2

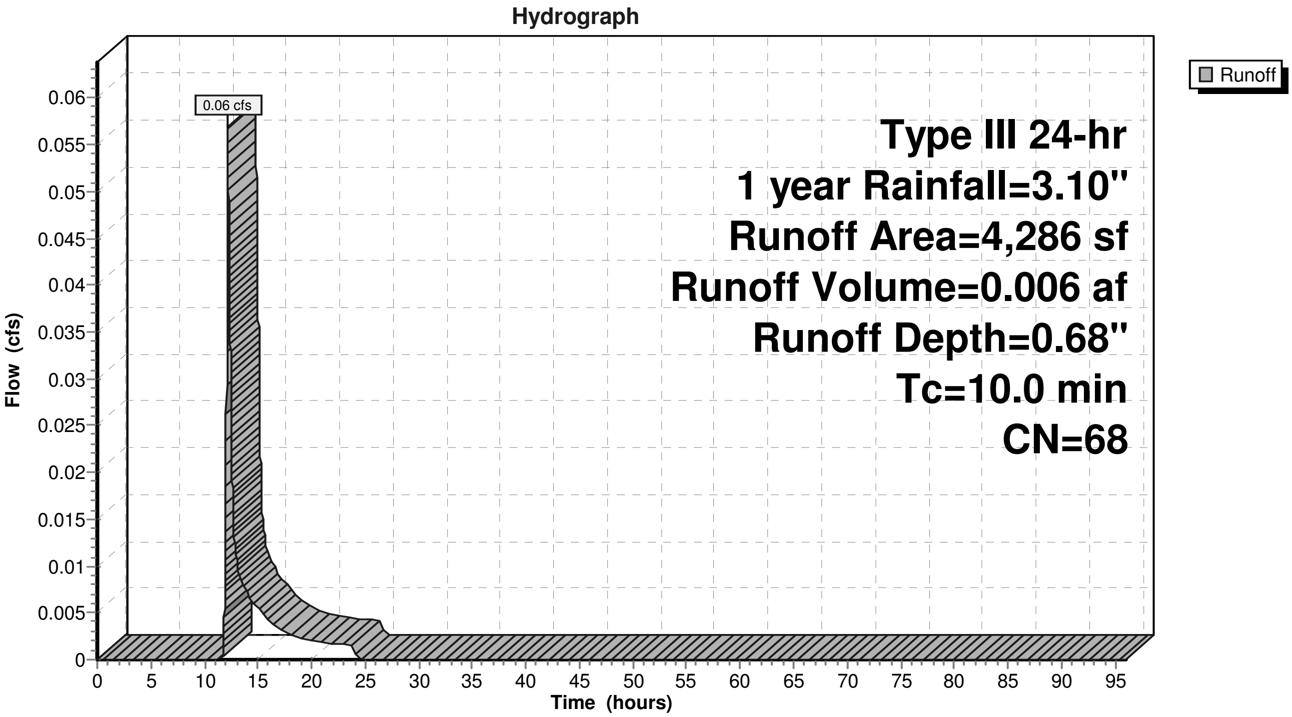
Runoff = 0.06 cfs @ 12.16 hrs, Volume= 0.006 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 year Rainfall=3.10"

	Area (sf)	CN	Description
*	1,015	98	Driveway, HSG B
	1,875	61	>75% Grass cover, Good, HSG B
	1,396	55	Woods, Good, HSG B
	4,286	68	Weighted Average
	3,271		76.32% Pervious Area
	1,015		23.68% Impervious Area

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

Subcatchment 35S: FDA-L3.2



Summary for Reach 30R: Vegetated Swale

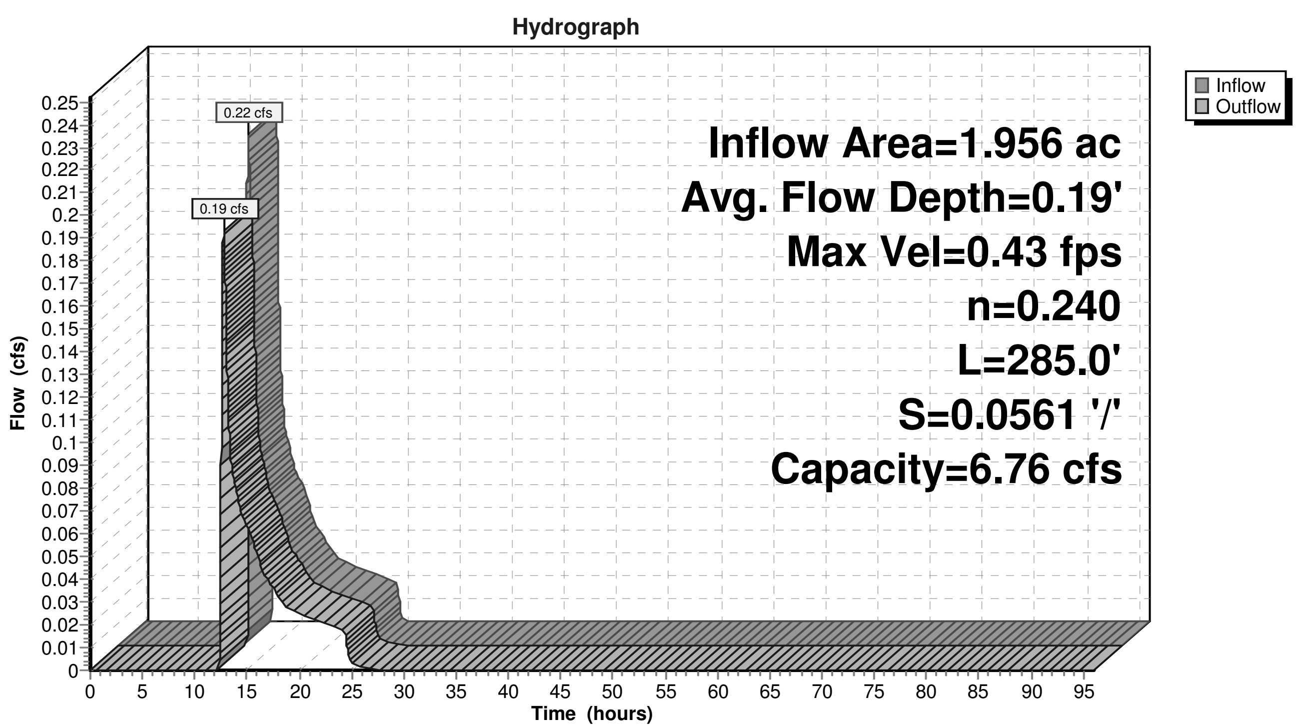
Inflow Area = 1.956 ac, 1.54% Impervious, Inflow Depth = 0.28" for 1 year event
Inflow = 0.22 cfs @ 12.43 hrs, Volume= 0.045 af
Outflow = 0.19 cfs @ 12.76 hrs, Volume= 0.045 af, Atten= 14%, Lag= 19.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.43 fps, Min. Travel Time= 11.1 min
Avg. Velocity = 0.19 fps, Avg. Travel Time= 25.4 min

Peak Storage= 128 cf @ 12.58 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 1.25' Flow Area= 5.6 sf, Capacity= 6.76 cfs

2.00' x 1.25' deep channel, n= 0.240 Sheet flow over Dense Grass
Side Slope Z-value= 2.0 '/' Top Width= 7.00'
Length= 285.0' Slope= 0.0561 '/'
Inlet Invert= 174.00', Outlet Invert= 158.00'

Reach 30R: Vegetated Swale



Summary for Pond 15P: SWMF

Inflow Area = 5.984 ac, 15.94% Impervious, Inflow Depth = 0.25" for 1 year event
Inflow = 0.73 cfs @ 12.40 hrs, Volume= 0.126 af
Outflow = 0.11 cfs @ 16.09 hrs, Volume= 0.126 af, Atten= 84%, Lag= 221.3 min
Primary = 0.11 cfs @ 16.09 hrs, Volume= 0.126 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 126.00' Surf.Area= 2,806 sf Storage= 3,133 cf
Peak Elev= 126.85' @ 16.09 hrs Surf.Area= 3,835 sf Storage= 5,951 cf (2,818 cf above start)

Plug-Flow detention time= 1,554.2 min calculated for 0.054 af (43% of inflow)
Center-of-Mass det. time= 700.8 min (1,636.7 - 936.0)

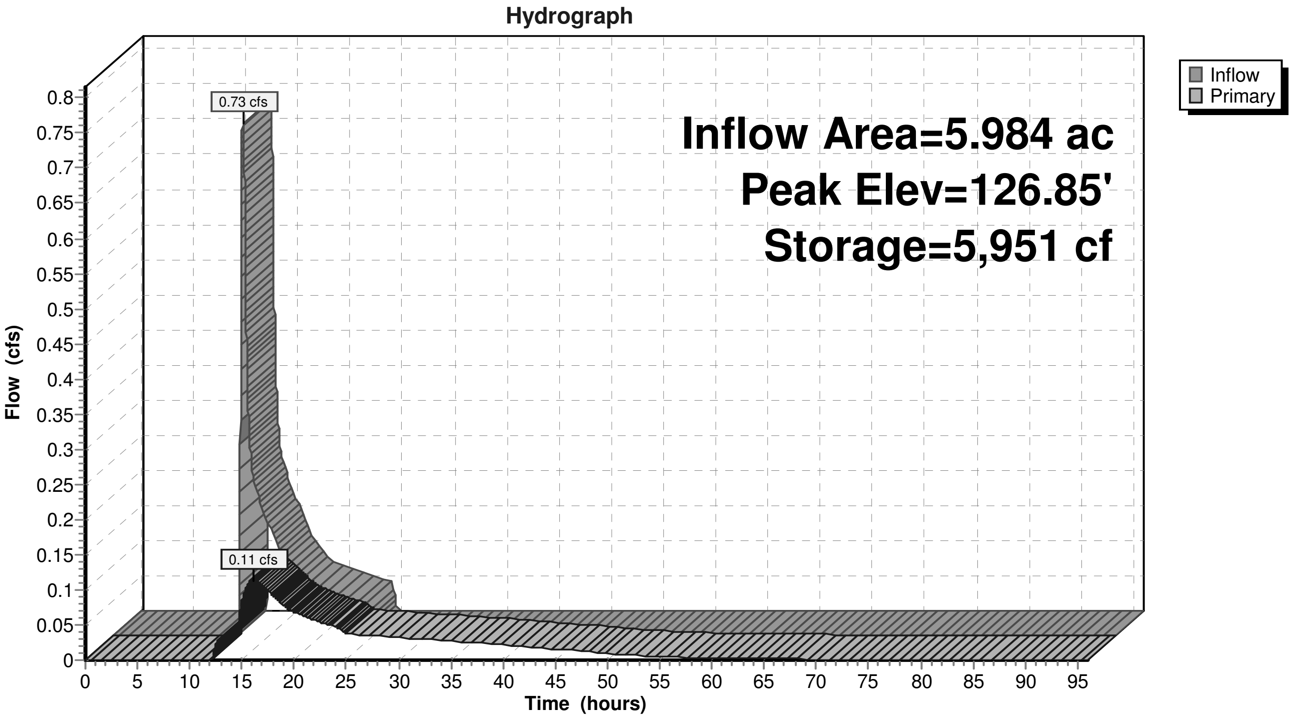
Volume	Invert	Avail.Storage	Storage Description
#1	121.50'	21,119 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
121.50	0	0	0
122.00	96	24	24
123.00	318	207	231
124.00	513	416	647
125.00	827	670	1,317
126.00	2,806	1,817	3,133
127.00	4,018	3,412	6,545
128.00	6,230	5,124	11,669
129.00	6,090	6,160	17,829
129.50	7,070	3,290	21,119

Device	Routing	Invert	Outlet Devices
#1	Primary	125.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Device 1	126.00'	**1.3" Vert. Orifice/Grate** C= 0.600
#3	Device 1	126.75'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#4	Device 1	127.00'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600
#5	Primary	129.20'	**6.0' long (Profile 7) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 Coef. (English) 2.99 3.41 3.62

Primary OutFlow Max=0.11 cfs @ 16.09 hrs HW=126.85' (Free Discharge)
└─**1=Orifice/Grate** (Passes 0.11 cfs of 4.39 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.04 cfs @ 4.29 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.07 cfs @ 1.07 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 15P: SWMF



Summary for Pond 29P: SWMF-L1

Inflow	=	0.59 cfs @	12.07 hrs, Volume=	0.042 af
Outflow	=	0.21 cfs @	11.89 hrs, Volume=	0.042 af, Atten= 65%, Lag= 0.0 min
Discarded	=	0.21 cfs @	11.89 hrs, Volume=	0.042 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 153.16' @ 12.32 hrs Surf.Area= 1,485 sf Storage= 245 cf

Plug-Flow detention time= 5.6 min calculated for 0.042 af (100% of inflow)
Center-of-Mass det. time= 5.6 min (786.7 - 781.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	152.75'	1,069 cf	**27.50'W x 54.00'L x 2.54'H Field A**
			3,774 cf Overall - 1,102 cf Embedded = 2,672 cf x 40.0% Voids
#2A	153.25'	1,102 cf	**Cultec R-150XLHD** x 40 Inside #1
			Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
			Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
			Row Length Adjustment= +0.75' x 2.65 sf x 8 rows
		2,171 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	152.75'	**6.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.21 cfs @ 11.89 hrs HW=152.78' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Pond 29P: SWMF-L1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 8 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

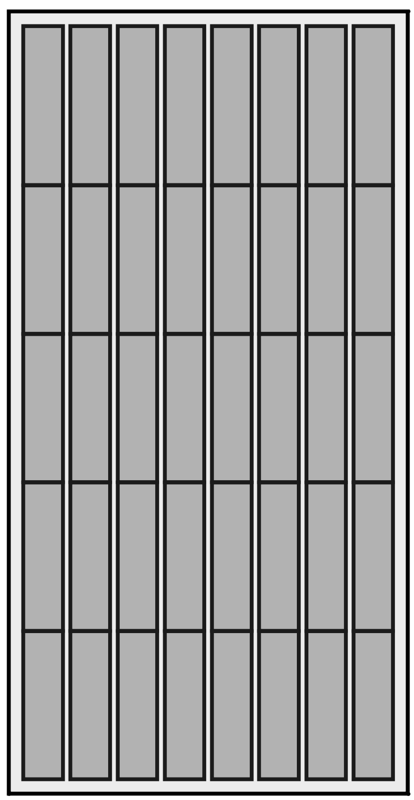
5 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 52.00' Row Length +12.0" End Stone x 2 = 54.00' Base Length
8 Rows x 33.0" Wide + 6.0" Spacing x 7 + 12.0" Side Stone x 2 = 27.50' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

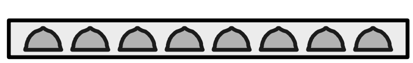
40 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 8 Rows = 1,102.0 cf Chamber Storage

3,774.4 cf Field - 1,102.0 cf Chambers = 2,672.4 cf Stone x 40.0% Voids = 1,069.0 cf Stone Storage

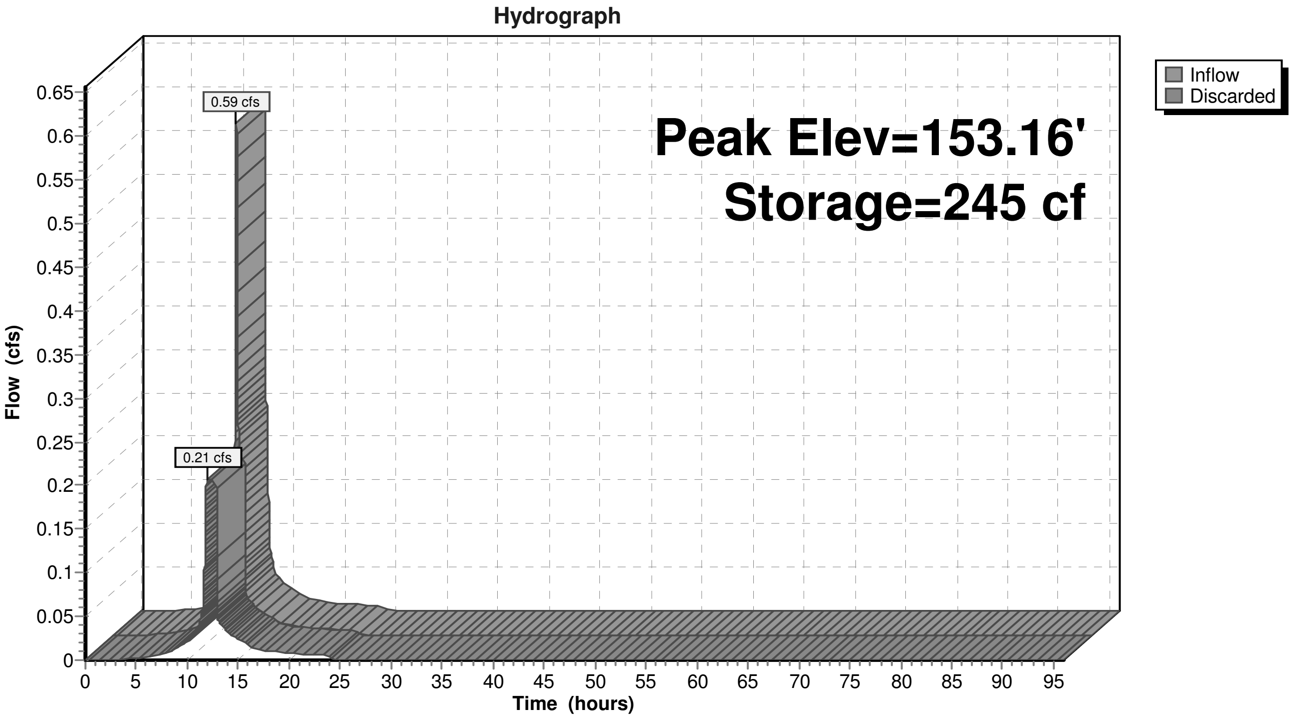
Chamber Storage + Stone Storage = 2,170.9 cf = 0.050 af
Overall Storage Efficiency = 57.5%

40 Chambers
139.8 cy Field
99.0 cy Stone





Pond 29P: SWMF-L1



Summary for Pond 30P: Div L1 (DS F.2)

[57] Hint: Peaked at 154.71' (Flood elevation advised)

Inflow Area =	0.200 ac, 91.00% Impervious, Inflow Depth = 2.55" for 1 year event			
Inflow =	0.59 cfs @	12.07 hrs, Volume=	0.042 af	
Outflow =	0.59 cfs @	12.07 hrs, Volume=	0.042 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Secondary =	0.59 cfs @	12.07 hrs, Volume=	0.042 af	

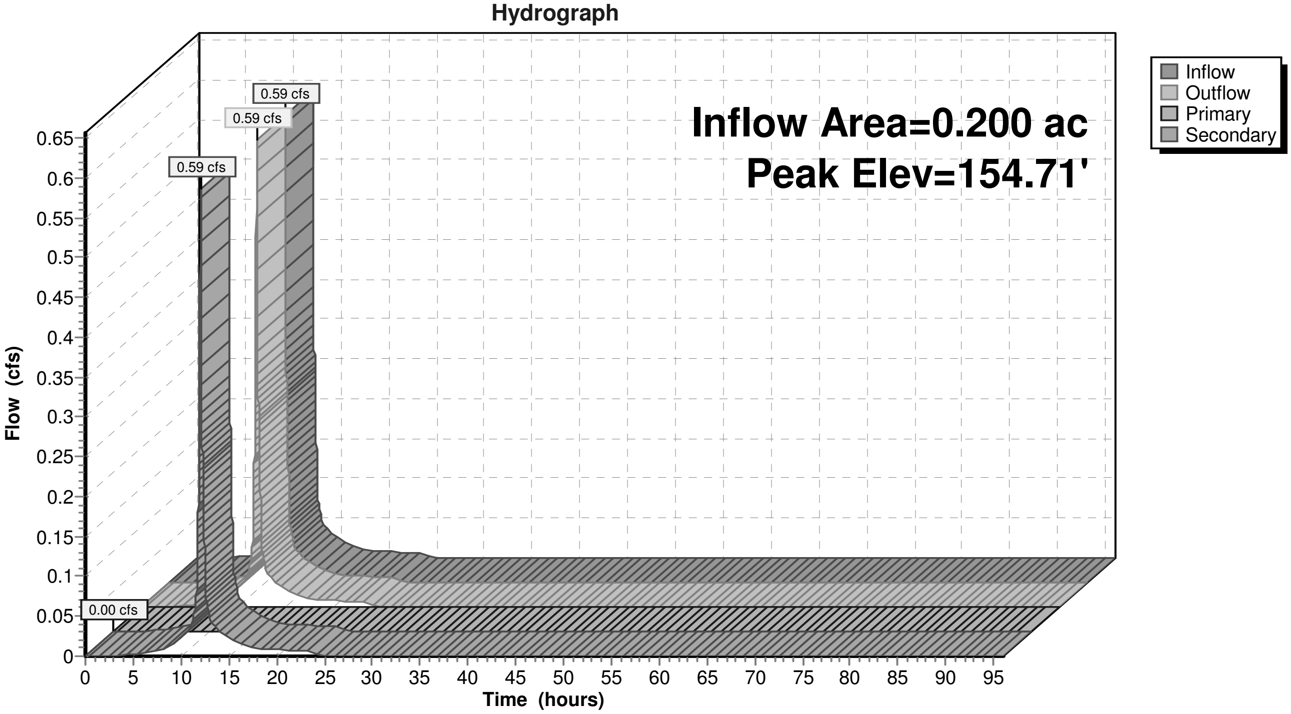
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 154.71' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	154.00'	**12.0" Round Culvert to MH A.9** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 154.00' / 153.50' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	154.25'	**8.0" Round Culvert to SWMF L1** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 154.25' / 154.00' S= 0.0313 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#3	Device 1	154.79'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=154.00' (Free Discharge)
└─**1=Culvert to MH A.9** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.59 cfs @ 12.07 hrs HW=154.71' (Free Discharge)
└─**2=Culvert to SWMF L1** (Inlet Controls 0.59 cfs @ 2.30 fps)

Pond 30P: Div L1 (DS F.2)



Summary for Pond 31P: SWMF-1.1 Bioret

Inflow Area = 0.672 ac, 0.00% Impervious, Inflow Depth = 0.34" for 1 year event
Inflow = 0.11 cfs @ 12.39 hrs, Volume= 0.019 af
Outflow = 0.03 cfs @ 14.11 hrs, Volume= 0.019 af, Atten= 74%, Lag= 103.2 min
Discarded = 0.03 cfs @ 14.11 hrs, Volume= 0.019 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 156.65' @ 14.11 hrs Surf.Area= 1,204 sf Storage= 175 cf

Plug-Flow detention time= 59.8 min calculated for 0.019 af (100% of inflow)
Center-of-Mass det. time= 59.8 min (999.5 - 939.6)

Volume	Invert	Avail.Storage	Storage Description
#1	156.50'	1,373 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

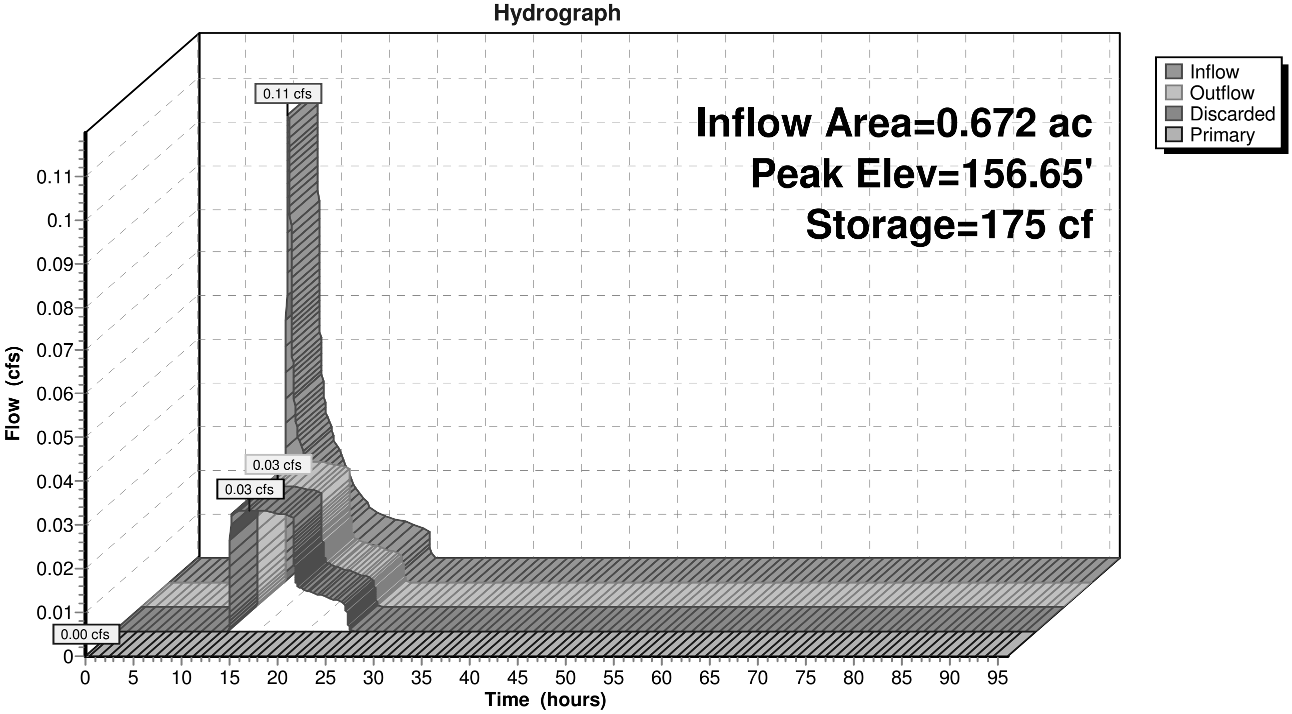
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
156.50	1,133	0	0
157.00	1,370	626	626
157.50	1,620	748	1,373

Device	Routing	Invert	Outlet Devices
#1	Primary	151.67'	**12.0" Round Culvert** L= 18.4' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 151.67' / 151.40' S= 0.0147 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	157.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	156.50'	**1.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.03 cfs @ 14.11 hrs HW=156.65' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=156.50' (Free Discharge)
└─**1=Culvert** (Passes 0.00 cfs of 7.87 cfs potential flow)
  └─**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 31P: SWMF-1.1 Bioret



Summary for Pond 32P: Div 2.2 (DS D.2)

[57] Hint: Peaked at 152.90' (Flood elevation advised)

Inflow Area = 0.655 ac, 43.66% Impervious, Inflow Depth = 0.97" for 1 year event
Inflow = 0.55 cfs @ 12.19 hrs, Volume= 0.053 af
Outflow = 0.55 cfs @ 12.19 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.55 cfs @ 12.19 hrs, Volume= 0.053 af

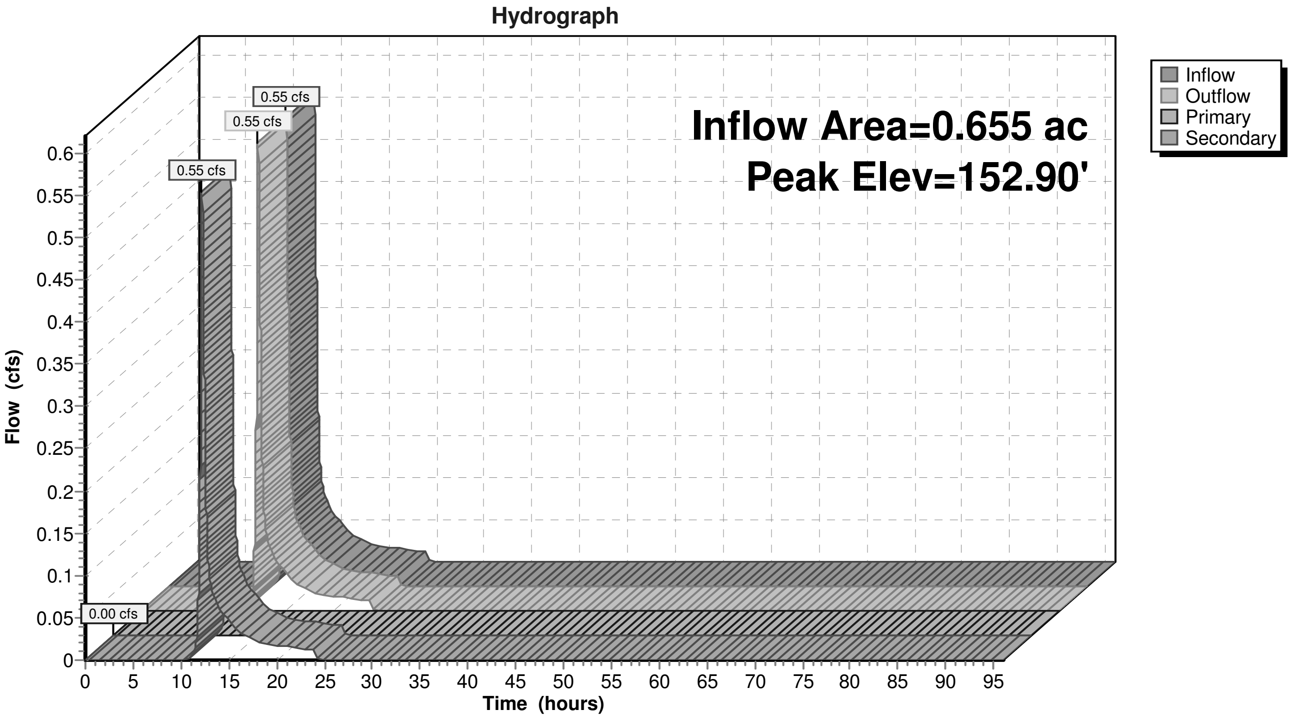
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 152.90' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.75'	**15.0" Round Culvert to Level Spreader** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.75' / 151.50' S= 0.0417 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Secondary	152.50'	**10.0" Round Culvert to SWMF-2.2** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.50' / 152.00' S= 0.0333 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#3	Device 1	152.90'	**3.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=152.50' (Free Discharge)
└─**1=Culvert to Level Spreader** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.55 cfs @ 12.19 hrs HW=152.90' (Free Discharge)
└─**2=Culvert to SWMF-2.2** (Inlet Controls 0.55 cfs @ 2.15 fps)

Pond 32P: Div 2.2 (DS D.2)



Summary for Pond 33P: Div L2.1

[57] Hint: Peaked at 150.30' (Flood elevation advised)

Inflow Area = 0.132 ac, 55.54% Impervious, Inflow Depth = 1.46" for 1 year event
Inflow = 0.23 cfs @ 12.08 hrs, Volume= 0.016 af
Outflow = 0.23 cfs @ 12.08 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.23 cfs @ 12.08 hrs, Volume= 0.016 af

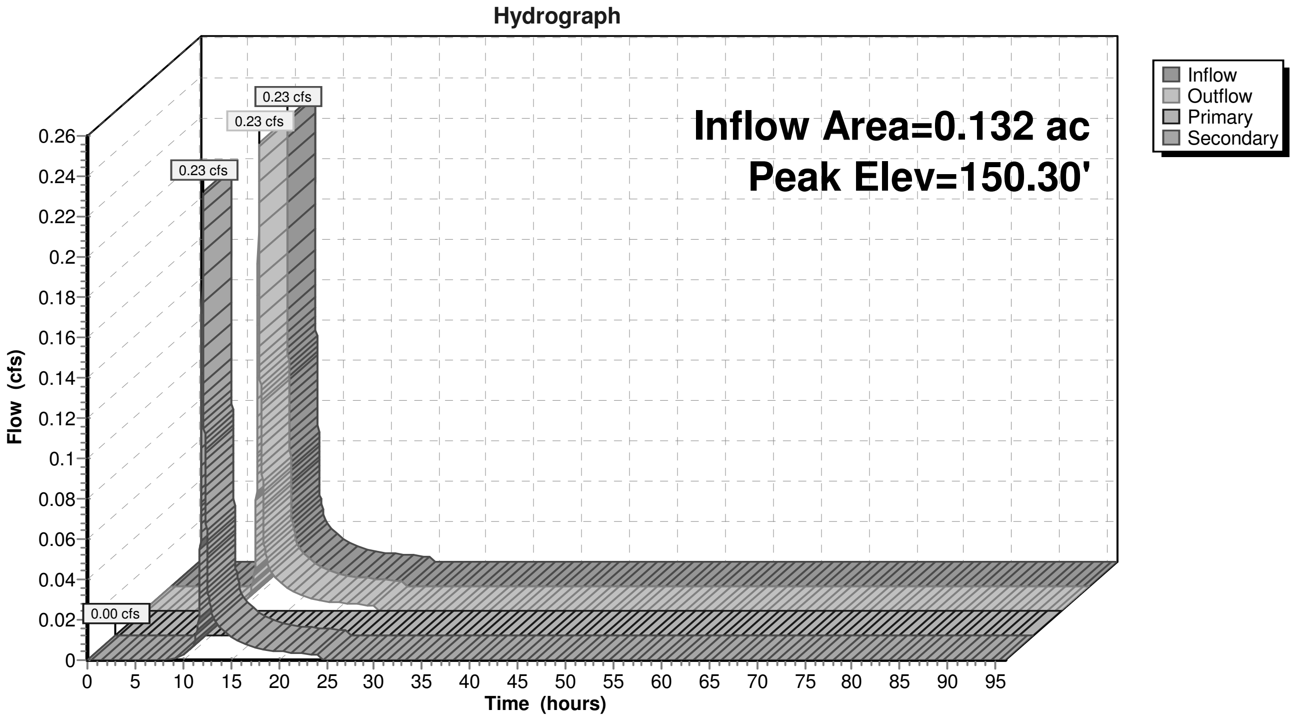
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 150.30' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	150.00'	**8.0" Round Culvert to Node EP E.1** L= 96.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.00' / 146.00' S= 0.0417 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#2	Secondary	150.00'	**6.0" Round Culvert to PTF E.1 & SWMF L2.1** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.00' / 149.70' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 1	150.54'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=150.00' (Free Discharge)
└—**1=Culvert to Node EP E.1** (Controls 0.00 cfs)
  └—**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.23 cfs @ 12.08 hrs HW=150.30' (Free Discharge)
└—**2=Culvert to PTF E.1 & SWMF L2.1** (Inlet Controls 0.23 cfs @ 1.87 fps)

Pond 33P: Div L2.1



Summary for Pond 34P: SWMF-L2.1

Inflow = 0.23 cfs @ 12.08 hrs, Volume= 0.016 af
Outflow = 0.06 cfs @ 11.88 hrs, Volume= 0.016 af, Atten= 73%, Lag= 0.0 min
Discarded = 0.06 cfs @ 11.88 hrs, Volume= 0.016 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 148.13' @ 12.46 hrs Surf.Area= 449 sf Storage= 136 cf

Plug-Flow detention time= 12.0 min calculated for 0.016 af (100% of inflow)
Center-of-Mass det. time= 12.0 min (848.8 - 836.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	147.50'	405 cf	**25.67'W x 17.50'L x 3.54'H Field A**
			1,591 cf Overall - 577 cf Embedded = 1,013 cf x 40.0% Voids
#2A	148.00'	577 cf	**Cultec R-330XLHD** x 10 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 5 rows
		983 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	147.50'	**6.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.06 cfs @ 11.88 hrs HW=147.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Pond 34P: SWMF-L2.1 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

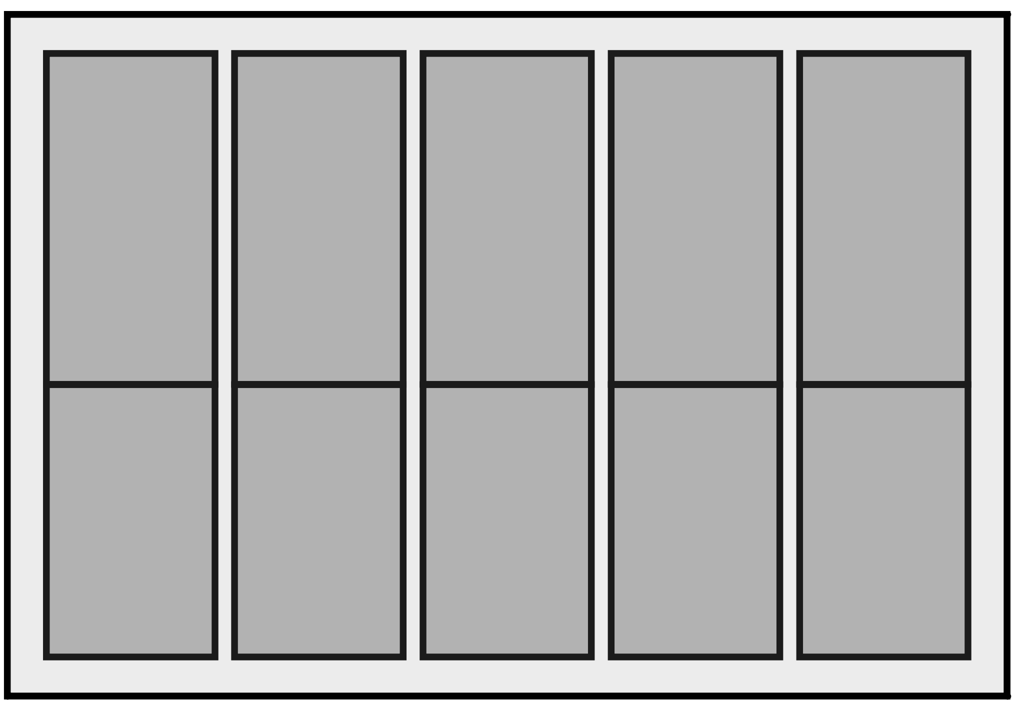
2 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 15.50' Row Length +12.0" End Stone x 2 = 17.50' Base Length
5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

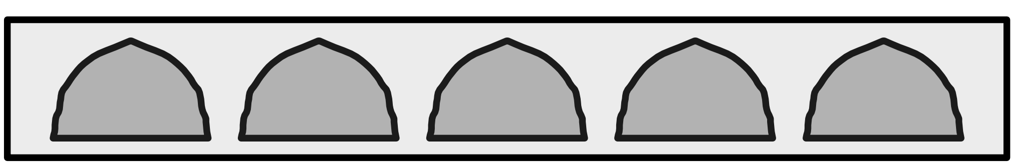
10 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 577.5 cf Chamber Storage

1,590.8 cf Field - 577.5 cf Chambers = 1,013.3 cf Stone x 40.0% Voids = 405.3 cf Stone Storage

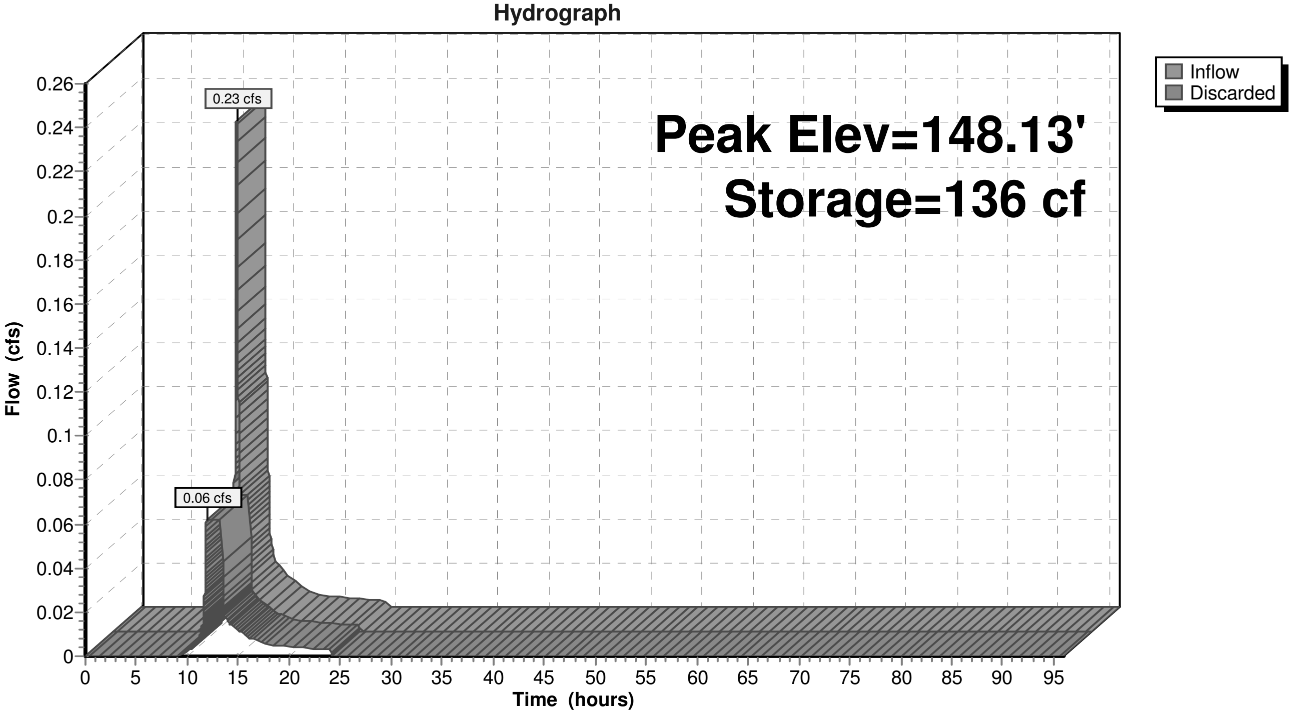
Chamber Storage + Stone Storage = 982.8 cf = 0.023 af
Overall Storage Efficiency = 61.8%

10 Chambers
58.9 cy Field
37.5 cy Stone





Pond 34P: SWMF-L2.1



Summary for Pond 35P: Div 1.2

[57] Hint: Peaked at 154.60' (Flood elevation advised)

Inflow Area = 0.446 ac, 65.47% Impervious, Inflow Depth = 1.60" for 1 year event
Inflow = 0.73 cfs @ 12.14 hrs, Volume= 0.059 af
Outflow = 0.73 cfs @ 12.14 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.73 cfs @ 12.14 hrs, Volume= 0.059 af

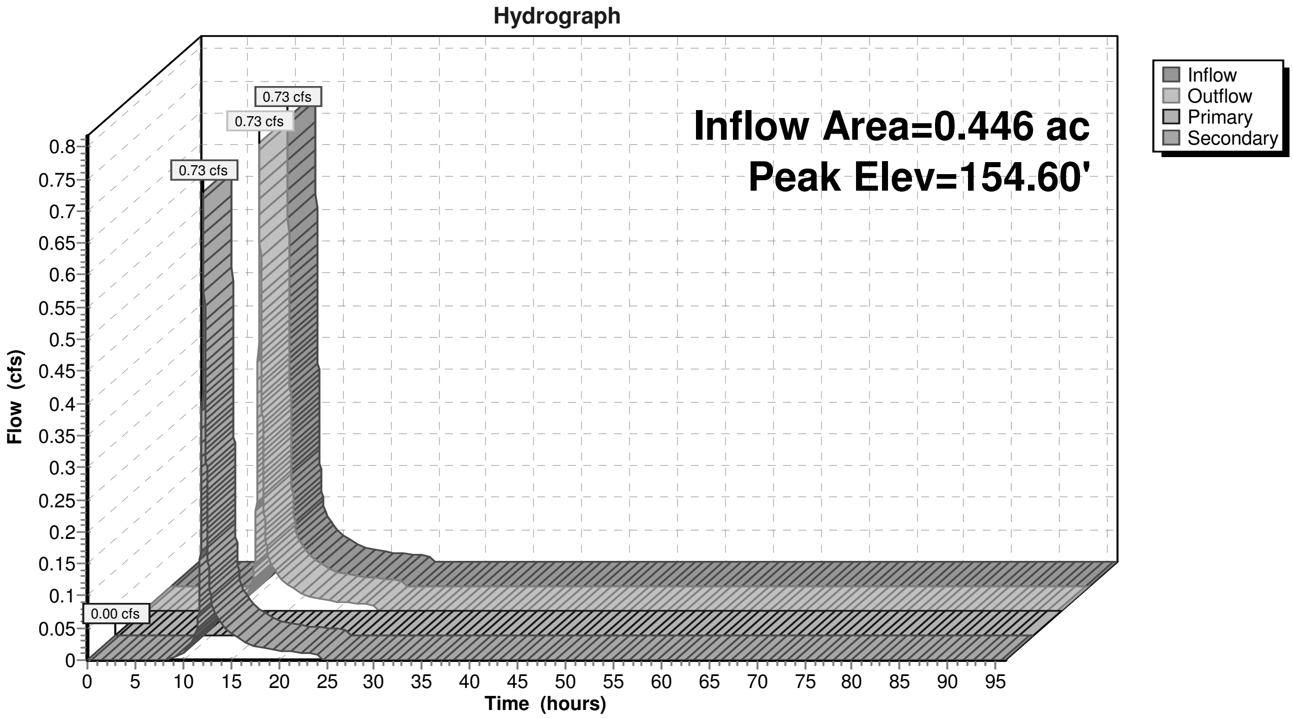
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 154.60' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	153.92'	**12.0" Round Culvert to MH A.6** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 153.92' / 151.00' S= 0.1622 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	153.75'	**6.0" Round Culvert to SWMF-1.2** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 153.75' / 153.50' S= 0.0417 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 1	154.92'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=153.75' (Free Discharge)
└─**1=Culvert to MH A.6** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.73 cfs @ 12.14 hrs HW=154.59' (Free Discharge)
└─**2=Culvert to SWMF-1.2** (Inlet Controls 0.73 cfs @ 3.71 fps)

Pond 35P: Div 1.2



Summary for Pond 36P: Rain Garden #1 Lot 3

Inflow Area =	0.261 ac, 19.99% Impervious,	Inflow Depth = 0.59"	for 1 year event	
Inflow =	0.12 cfs @	12.17 hrs, Volume=	0.013 af	
Outflow =	0.03 cfs @	13.00 hrs, Volume=	0.013 af,	Atten= 80%, Lag= 50.2 min
Discarded =	0.03 cfs @	13.00 hrs, Volume=	0.013 af	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 144.63' @ 13.00 hrs Surf.Area= 1,084 sf Storage= 142 cf

Plug-Flow detention time= 46.8 min calculated for 0.013 af (100% of inflow)
Center-of-Mass det. time= 46.8 min (944.7 - 897.8)

Volume	Invert	Avail.Storage	Storage Description
#1	144.50'	904 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

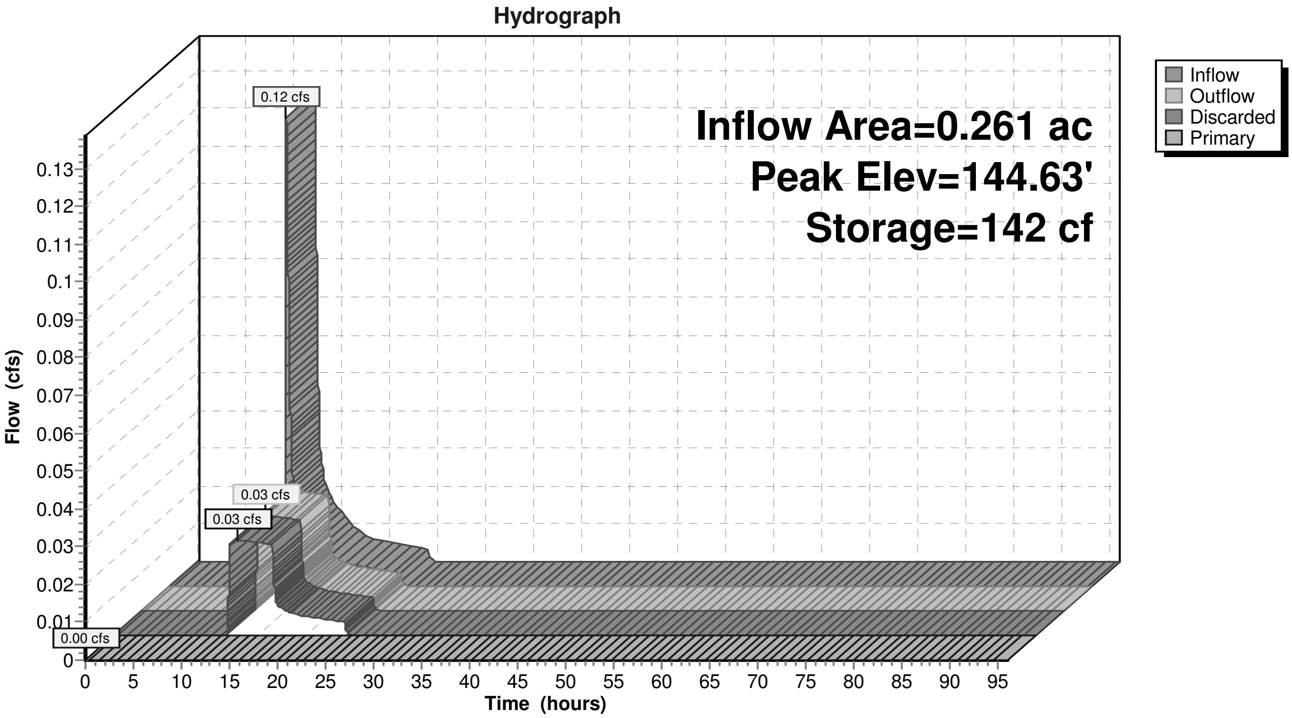
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
144.50	1,025	0	0
144.75	1,135	270	270
145.00	1,245	298	568
145.25	1,450	337	904

Device	Routing	Invert	Outlet Devices
#1	Primary	145.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	144.50'	**1.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 13.00 hrs HW=144.63' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=144.50' (Free Discharge)
└─**1=Orifice/Grate** (Controls 0.00 cfs)

Pond 36P: Rain Garden #1 Lot 3



Summary for Pond 37P: SWMF-1.2

[79] Warning: Submerged Pond 35P Secondary device # 2 INLET by 0.06'

Inflow	=	0.73 cfs @	12.14 hrs,	Volume=	0.059 af
Outflow	=	0.18 cfs @	11.88 hrs,	Volume=	0.059 af, Atten= 75%, Lag= 0.0 min
Discarded	=	0.18 cfs @	11.88 hrs,	Volume=	0.059 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 153.81' @ 12.59 hrs Surf.Area= 1,320 sf Storage= 610 cf

Plug-Flow detention time= 19.5 min calculated for 0.059 af (100% of inflow)
Center-of-Mass det. time= 19.5 min (854.3 - 834.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	153.00'	1,184 cf	**23.50'W x 56.17'L x 3.67'H Field A** 4,840 cf Overall - 1,880 cf Embedded = 2,960 cf x 40.0% Voids
#2A	153.50'	1,880 cf	**Cultec R-V8HD** x 32 Inside #1 Effective Size= 55.2"W x 32.0"H => 8.68 sf x 7.50'L = 65.1 cf Overall Size= 60.0"W x 32.0"H x 8.00'L with 0.50' Overlap Row Length Adjustment= -5.83' x 8.68 sf x 4 rows
		3,064 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	153.00'	**6.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.18 cfs @ 11.88 hrs HW=153.04' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.18 cfs)

Pond 37P: SWMF-1.2 - Chamber Wizard Field A

Chamber Model = Cultec R-V8HD (Cultec Recharger® V8HD)
Effective Size= 55.2"W x 32.0"H => 8.68 sf x 7.50'L = 65.1 cf
Overall Size= 60.0"W x 32.0"H x 8.00'L with 0.50' Overlap
Row Length Adjustment= -5.83' x 8.68 sf x 4 rows

60.0" Wide + 6.0" Spacing = 66.0" C-C Row Spacing

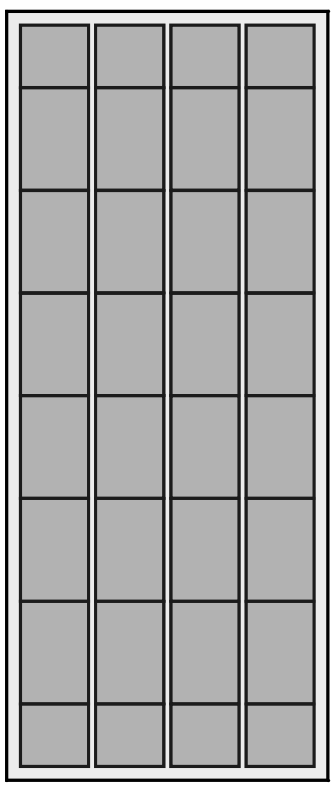
8 Chambers/Row x 7.50' Long -5.83' Row Adjustment = 54.17' Row Length +12.0" End Stone x 2 = 56.17' Base Length
4 Rows x 60.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 23.50' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

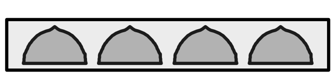
32 Chambers x 65.1 cf -5.83' Row Adjustment x 8.68 sf x 4 Rows = 1,879.9 cf Chamber Storage

4,840.0 cf Field - 1,879.9 cf Chambers = 2,960.1 cf Stone x 40.0% Voids = 1,184.0 cf Stone Storage

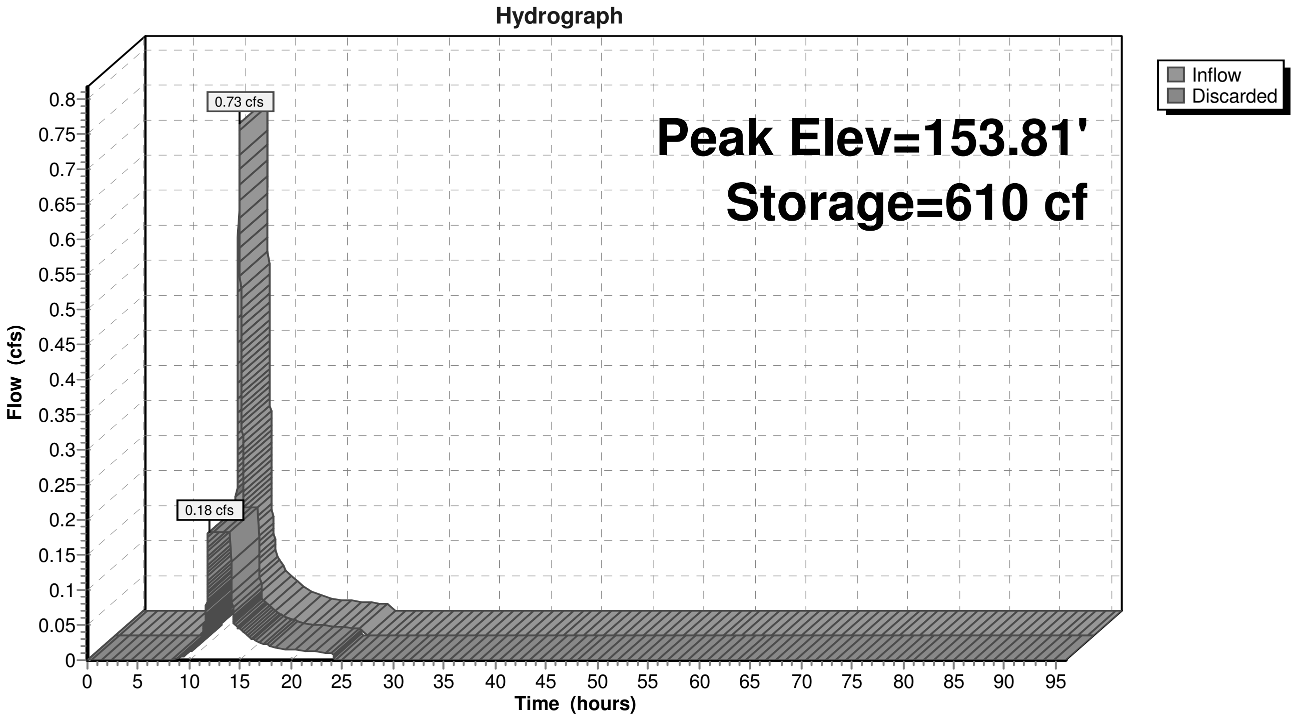
Chamber Storage + Stone Storage = 3,063.9 cf = 0.070 af
Overall Storage Efficiency = 63.3%

32 Chambers
179.3 cy Field
109.6 cy Stone





Pond 37P: SWMF-1.2



Summary for Pond 38P: SWMF-2.2

Inflow	=	0.55 cfs @ 12.19 hrs,	Volume=	0.053 af
Outflow	=	0.16 cfs @ 12.09 hrs,	Volume=	0.053 af, Atten= 71%, Lag= 0.0 min
Discarded	=	0.16 cfs @ 12.09 hrs,	Volume=	0.053 af
Primary	=	0.00 cfs @ 0.00 hrs,	Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 150.62' @ 12.68 hrs Surf.Area= 1,160 sf Storage= 551 cf

Plug-Flow detention time= 23.4 min calculated for 0.053 af (100% of inflow)
Center-of-Mass det. time= 23.4 min (894.2 - 870.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	149.50'	450 cf	**16.00'W x 31.50'L x 3.54'H Field A** 1,785 cf Overall - 659 cf Embedded = 1,126 cf x 40.0% Voids
#2A	150.00'	659 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 3 rows
#3B	150.00'	578 cf	**20.83'W x 31.50'L x 3.54'H Field B** 2,324 cf Overall - 879 cf Embedded = 1,445 cf x 40.0% Voids
#4B	150.50'	879 cf	**Cultec R-330XLHD** x 16 Inside #3 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 4 rows
		2,567 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	149.50'	**6.000 in/hr Exfiltration over Horizontal area**
#2	Primary	153.00'	**8.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 153.00' / 151.50' S= 0.1000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf

Discarded OutFlow Max=0.16 cfs @ 12.09 hrs HW=150.00' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=149.50' (Free Discharge)
↑—**2=Culvert** (Controls 0.00 cfs)

Pond 38P: SWMF-2.2 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

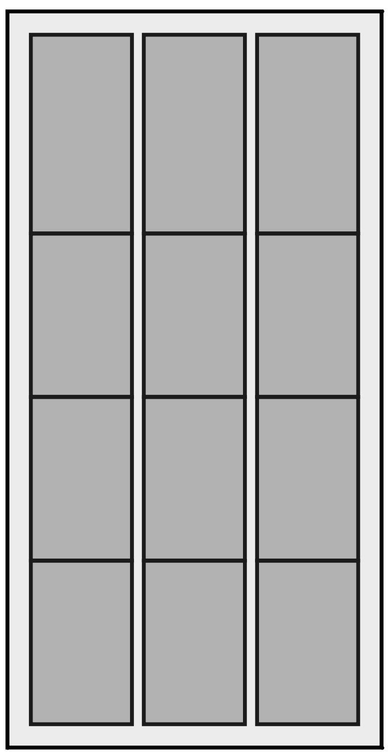
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

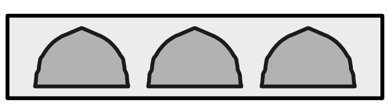
12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 659.4 cf Chamber Storage

1,785.0 cf Field - 659.4 cf Chambers = 1,125.6 cf Stone x 40.0% Voids = 450.2 cf Stone Storage

Chamber Storage + Stone Storage = 1,109.6 cf = 0.025 af
Overall Storage Efficiency = 62.2%

12 Chambers
66.1 cy Field
41.7 cy Stone





Pond 38P: SWMF-2.2 - Chamber Wizard Field B

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

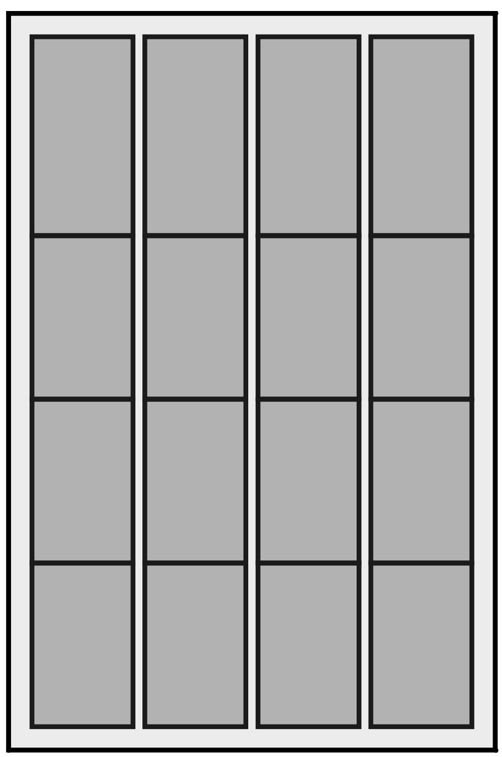
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

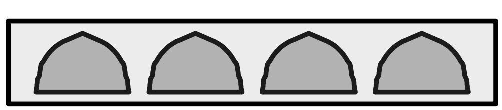
16 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 879.2 cf Chamber Storage

2,324.2 cf Field - 879.2 cf Chambers = 1,445.0 cf Stone x 40.0% Voids = 578.0 cf Stone Storage

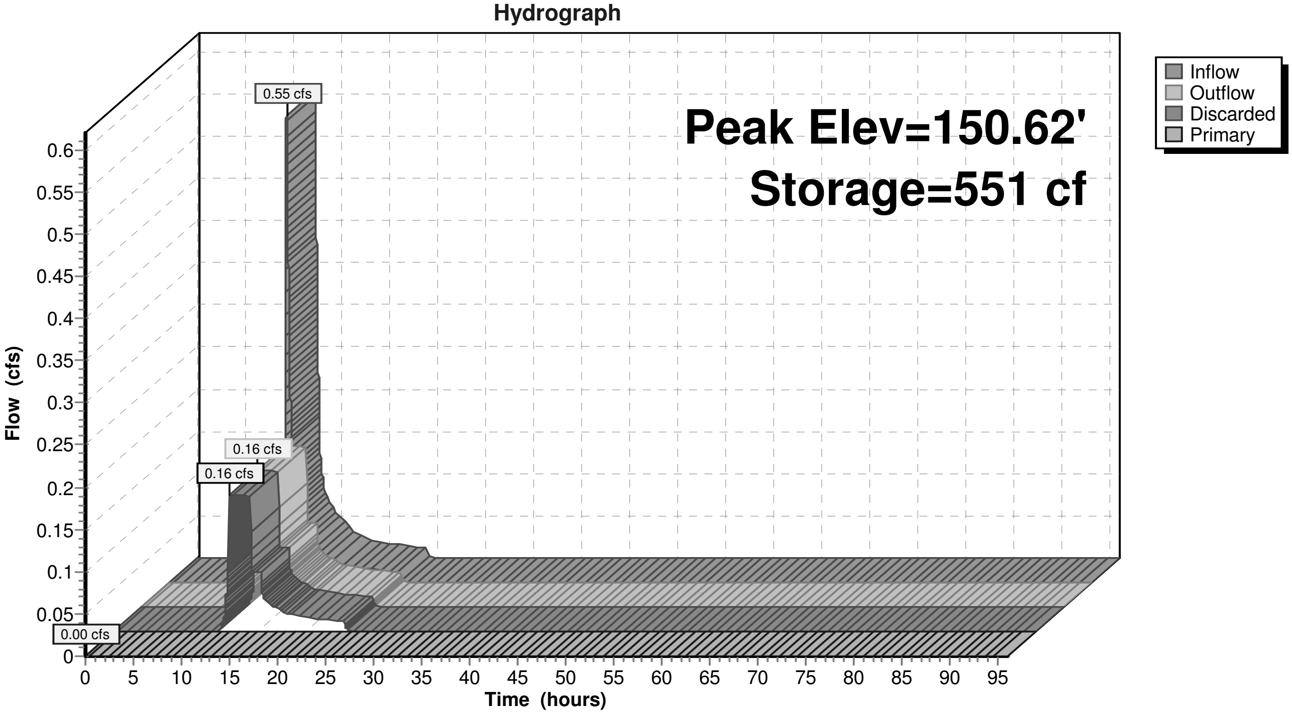
Chamber Storage + Stone Storage = 1,457.2 cf = 0.033 af
Overall Storage Efficiency = 62.7%

16 Chambers
86.1 cy Field
53.5 cy Stone





Pond 38P: SWMF-2.2



Summary for Pond 39P: SWMF-L2.2

Inflow	=	0.31 cfs @	12.07 hrs,	Volume=	0.024 af
Outflow	=	0.07 cfs @	11.74 hrs,	Volume=	0.024 af, Atten= 77%, Lag= 0.0 min
Discarded	=	0.07 cfs @	11.74 hrs,	Volume=	0.024 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 135.76' @ 12.45 hrs Surf.Area= 504 sf Storage= 209 cf

Plug-Flow detention time= 14.7 min calculated for 0.024 af (100% of inflow)
Center-of-Mass det. time= 14.7 min (770.9 - 756.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	135.00'	450 cf	**16.00'W x 31.50'L x 3.54'H Field A** 1,785 cf Overall - 659 cf Embedded = 1,126 cf x 40.0% Voids
#2A	135.50'	659 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 3 rows
		1,110 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	135.00'	**6.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.07 cfs @ 11.74 hrs HW=135.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Pond 39P: SWMF-L2.2 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

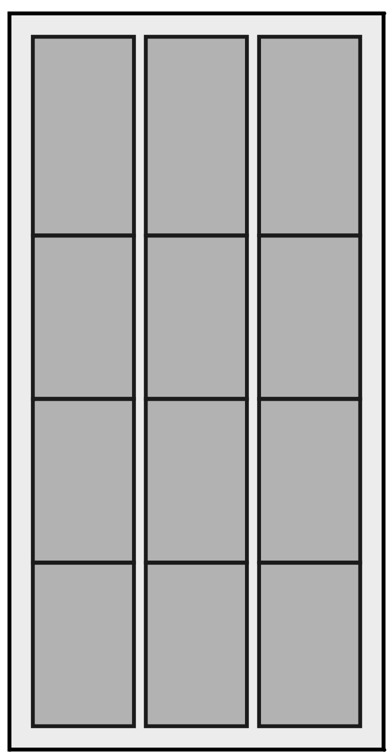
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

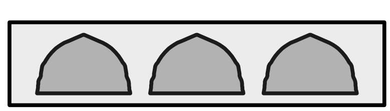
12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 659.4 cf Chamber Storage

1,785.0 cf Field - 659.4 cf Chambers = 1,125.6 cf Stone x 40.0% Voids = 450.2 cf Stone Storage

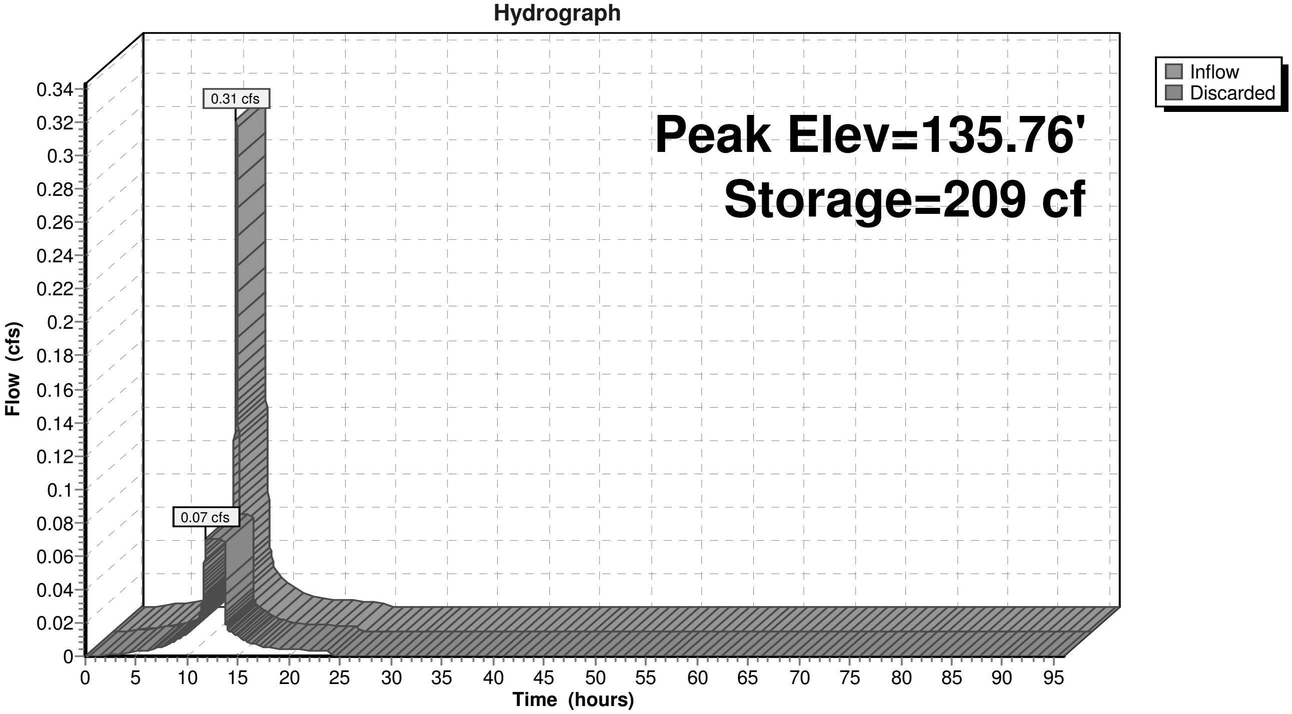
Chamber Storage + Stone Storage = 1,109.6 cf = 0.025 af
Overall Storage Efficiency = 62.2%

12 Chambers
66.1 cy Field
41.7 cy Stone





Pond 39P: SWMF-L2.2



Summary for Pond 40P: Div L2.2

[57] Hint: Peaked at 137.86' (Flood elevation advised)

Inflow Area =	0.098 ac,100.00% Impervious,	Inflow Depth = 2.87"	for 1 year event
Inflow =	0.31 cfs @ 12.07 hrs,	Volume=	0.024 af
Outflow =	0.31 cfs @ 12.07 hrs,	Volume=	0.024 af, Atten= 0%, Lag= 0.0 min
Primary =	0.00 cfs @ 0.00 hrs,	Volume=	0.000 af
Secondary =	0.31 cfs @ 12.07 hrs,	Volume=	0.024 af

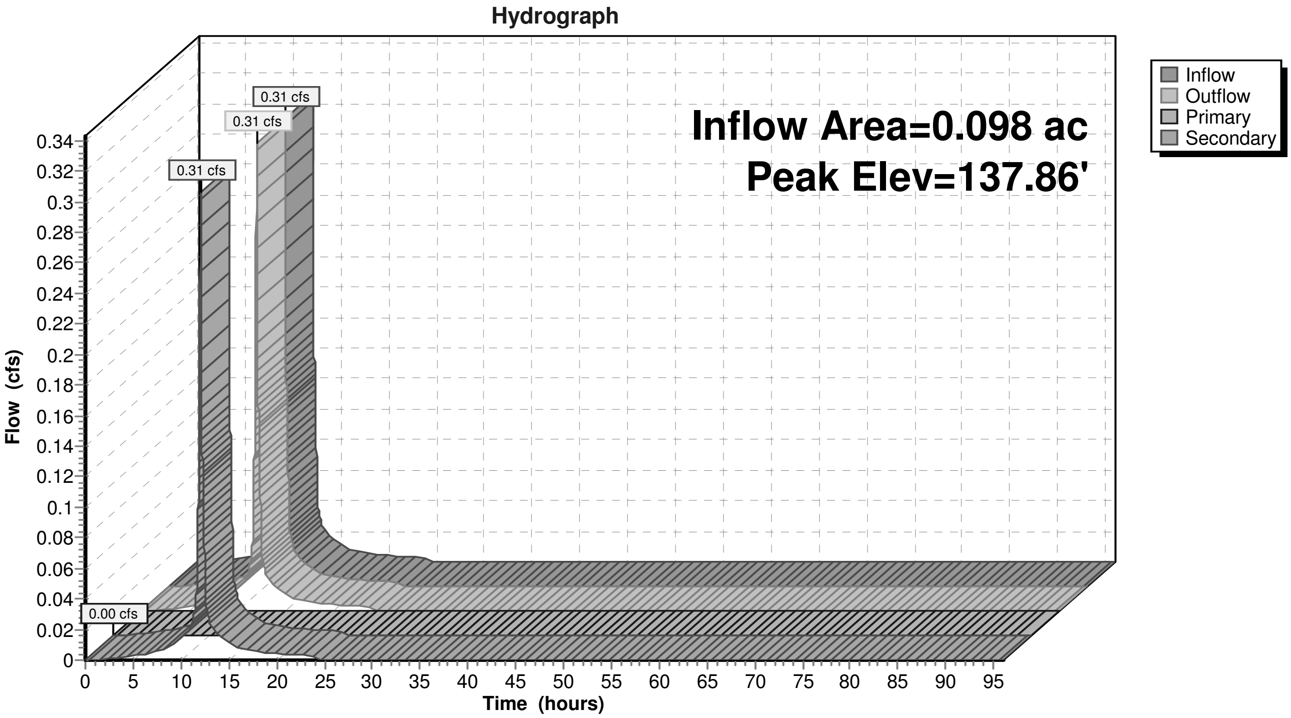
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 137.86' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	138.00'	**12.0" Round Culvert to MH C.1** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 138.00' / 134.00' S= 0.0800 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	137.50'	**6.0" Round Culvert to SWMF L2.2** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 137.50' / 136.00' S= 0.3000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 1	138.04'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=137.50' (Free Discharge)
└─**1=Culvert to MH C.1** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.31 cfs @ 12.07 hrs HW=137.86' (Free Discharge)
└─**2=Culvert to SWMF L2.2** (Inlet Controls 0.31 cfs @ 2.04 fps)

Pond 40P: Div L2.2



Summary for Pond 41P: Rain Garden #2 Lot 3

Inflow Area = 0.098 ac, 23.68% Impervious, Inflow Depth = 0.68" for 1 year event
Inflow = 0.06 cfs @ 12.16 hrs, Volume= 0.006 af
Outflow = 0.02 cfs @ 12.67 hrs, Volume= 0.006 af, Atten= 73%, Lag= 30.3 min
Discarded = 0.02 cfs @ 12.67 hrs, Volume= 0.006 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 152.08' @ 12.67 hrs Surf.Area= 670 sf Storage= 53 cf

Plug-Flow detention time= 24.9 min calculated for 0.006 af (100% of inflow)
Center-of-Mass det. time= 24.9 min (914.5 - 889.5)

Volume	Invert	Avail.Storage	Storage Description
#1	152.00'	875 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

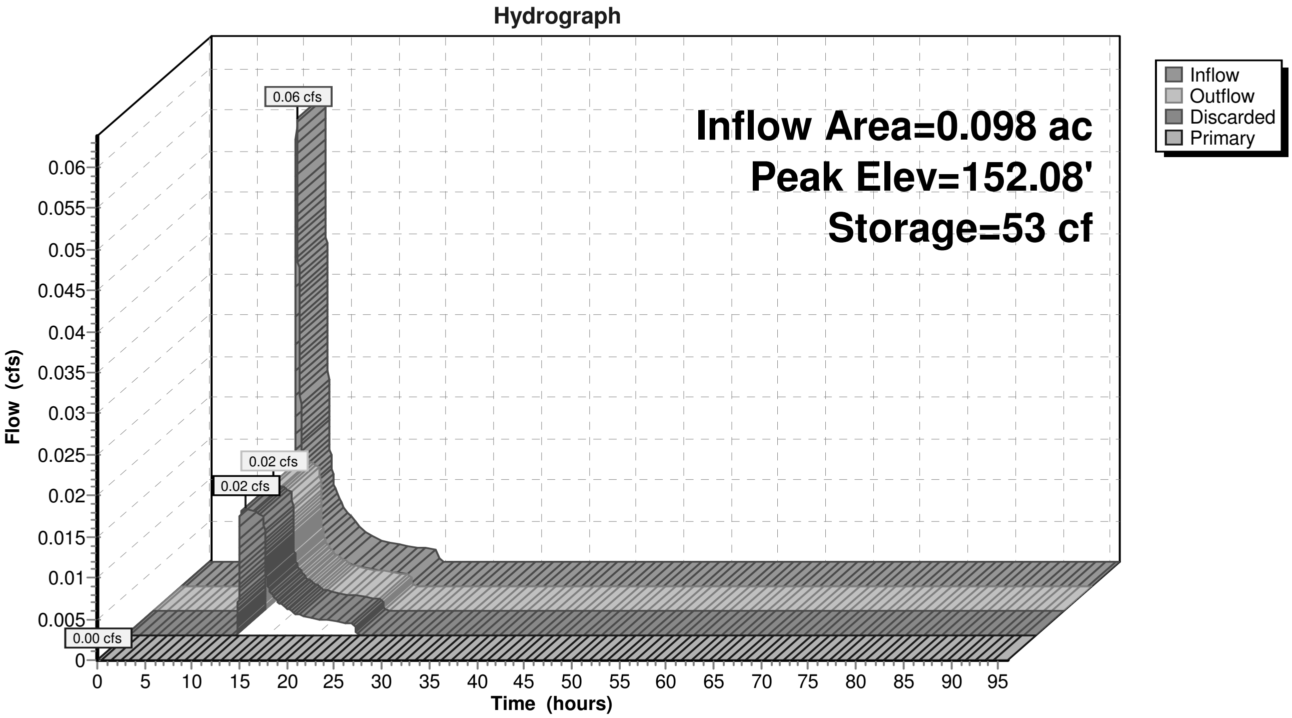
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
152.00	620	0	0
152.25	770	174	174
152.50	920	211	385
153.00	1,038	490	875

Device	Routing	Invert	Outlet Devices
#1	Primary	152.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	152.00'	**1.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.67 hrs HW=152.08' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=152.00' (Free Discharge)
↑—**1=Orifice/Grate** (Controls 0.00 cfs)

Pond 41P: Rain Garden #2 Lot 3

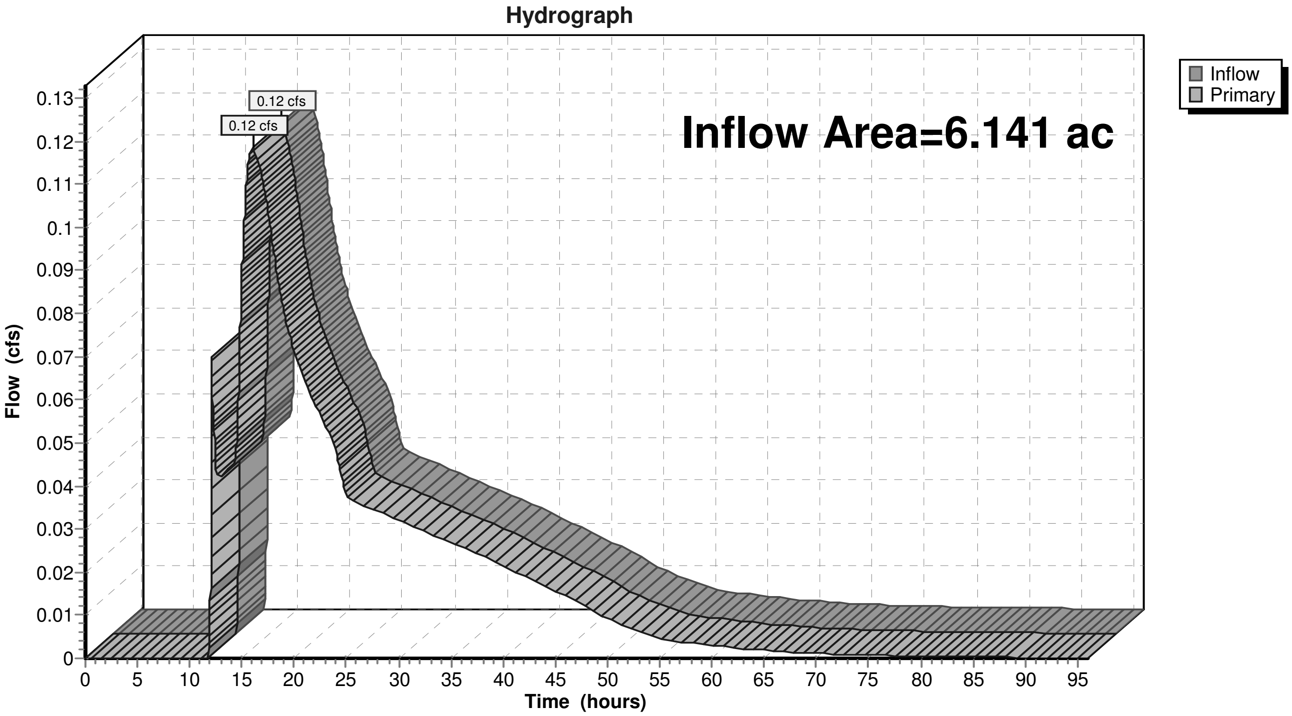


Summary for Link 19L: Design Point 1

Inflow Area = 6.141 ac, 15.53% Impervious, Inflow Depth > 0.26" for 1 year event
Inflow = 0.12 cfs @ 16.04 hrs, Volume= 0.132 af
Primary = 0.12 cfs @ 16.04 hrs, Volume= 0.132 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 19L: Design Point 1

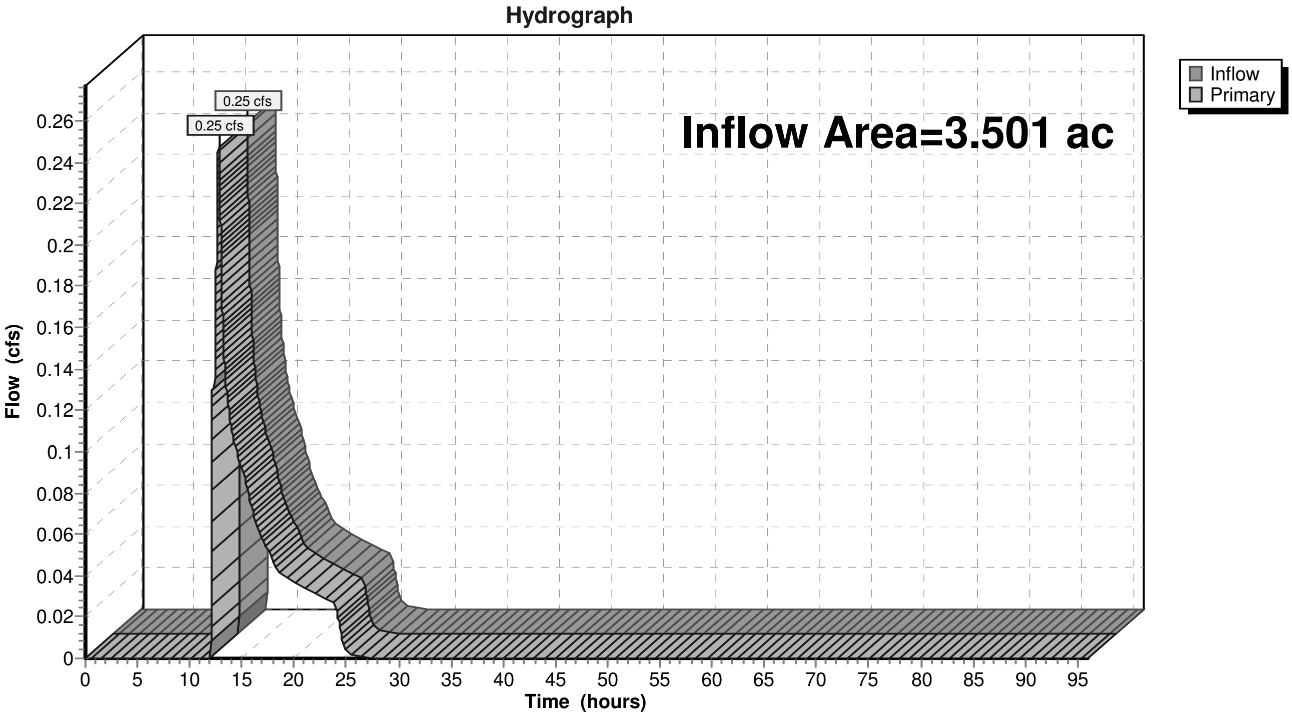


Summary for Link 22L: Design Point 2

Inflow Area = 3.501 ac, 9.03% Impervious, Inflow Depth = 0.23" for 1 year event
Inflow = 0.25 cfs @ 12.75 hrs, Volume= 0.068 af
Primary = 0.25 cfs @ 12.75 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 22L: Design Point 2

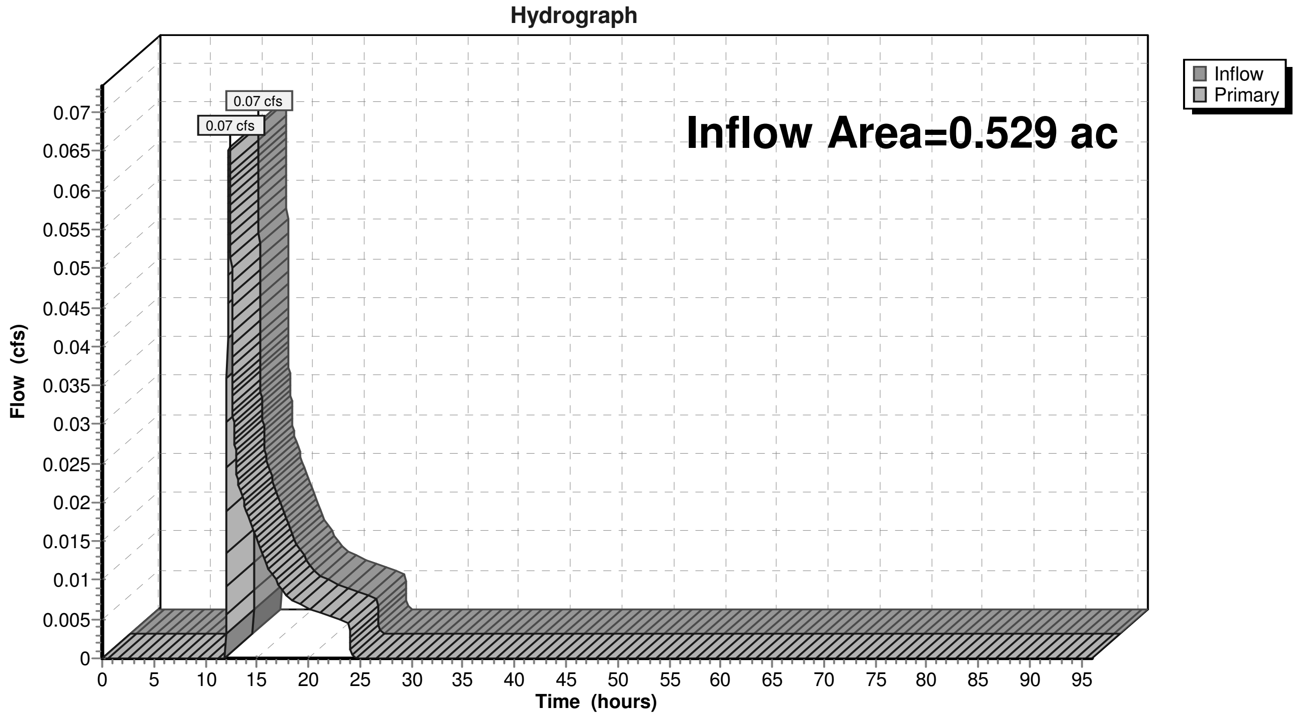


Summary for Link 25L: Design Point 3

Inflow Area = 0.529 ac, 0.00% Impervious, Inflow Depth = 0.28" for 1 year event
Inflow = 0.07 cfs @ 12.32 hrs, Volume= 0.012 af
Primary = 0.07 cfs @ 12.32 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 25L: Design Point 3

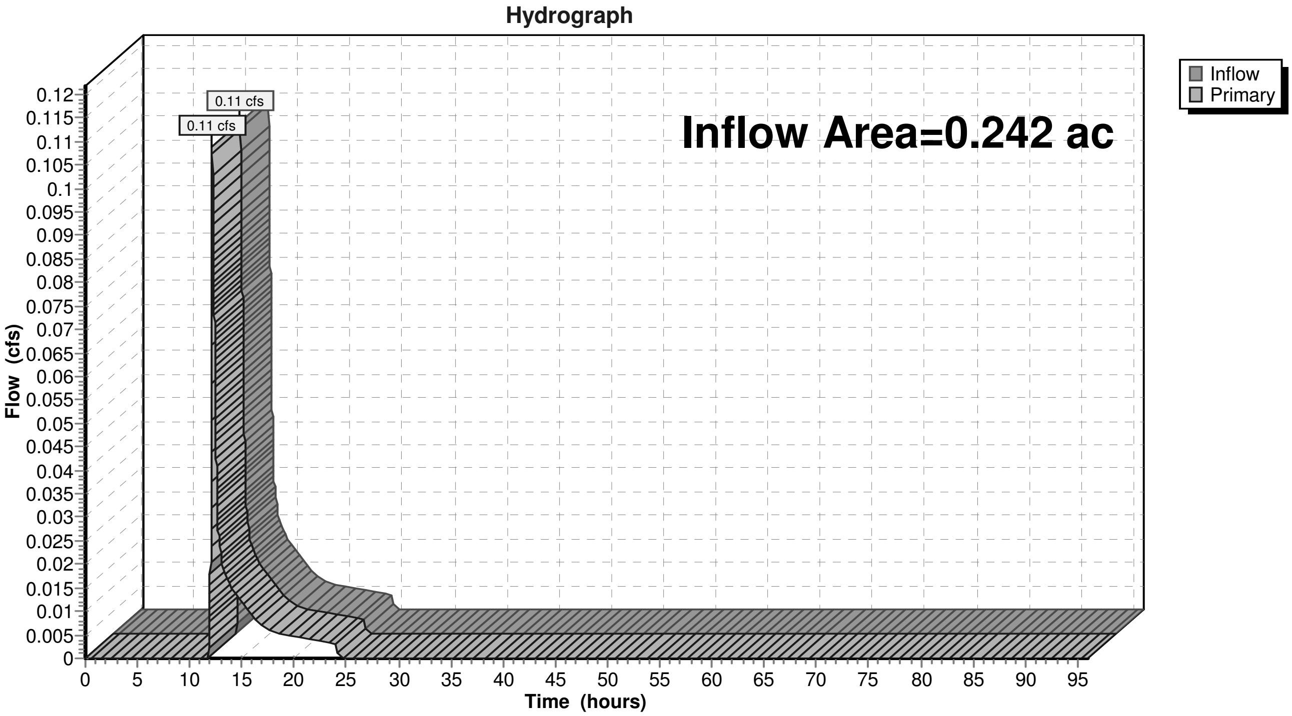


Summary for Link 28L: Design Point 4

Inflow Area = 0.242 ac, 0.00% Impervious, Inflow Depth = 0.55" for 1 year event
Inflow = 0.11 cfs @ 12.14 hrs, Volume= 0.011 af
Primary = 0.11 cfs @ 12.14 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 28L: Design Point 4



Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 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: FDA-2.2 Runoff Area=28,532 sf 43.66% Impervious Runoff Depth=1.24"
Flow Length=483' Tc=13.2 min CN=74 Runoff=0.72 cfs 0.068 af

Subcatchment 2S: FDA-1.2 Runoff Area=19,428 sf 65.47% Impervious Runoff Depth=1.94"
Tc=10.0 min CN=84 Runoff=0.88 cfs 0.072 af

Subcatchment 4S: XDA4 Runoff Area=10,541 sf 0.00% Impervious Runoff Depth=0.75"
Flow Length=100' Slope=0.1900 '/' Tc=8.3 min CN=65 Runoff=0.16 cfs 0.015 af

Subcatchment 5S: FDA-L2.1 Runoff Area=5,735 sf 55.54% Impervious Runoff Depth=1.78"
Tc=5.0 min CN=82 Runoff=0.28 cfs 0.020 af

Subcatchment 6S: FDA-L3.1 Runoff Area=11,384 sf 19.99% Impervious Runoff Depth=0.80"
Tc=10.0 min CN=66 Runoff=0.18 cfs 0.017 af

Subcatchment 20S: FDA-1.3 Runoff Area=177,542 sf 5.71% Impervious Runoff Depth=0.53"
Flow Length=974' Tc=17.9 min CN=60 Runoff=1.23 cfs 0.181 af

Subcatchment 21S: FDA-1.4 Runoff Area=6,857 sf 0.00% Impervious Runoff Depth=0.71"
Flow Length=87' Tc=5.5 min CN=64 Runoff=0.11 cfs 0.009 af

Subcatchment 23S: FDA-L1 Runoff Area=8,712 sf 91.00% Impervious Runoff Depth=2.94"
Tc=5.0 min CN=95 Runoff=0.67 cfs 0.049 af

Subcatchment 24S: FDA-2.1 Runoff Area=38,768 sf 0.00% Impervious Runoff Depth=0.45"
Flow Length=141' Tc=6.3 min CN=58 Runoff=0.27 cfs 0.034 af

Subcatchment 26S: FDA-3 Runoff Area=23,055 sf 0.00% Impervious Runoff Depth=0.42"
Flow Length=156' Tc=7.6 min CN=57 Runoff=0.13 cfs 0.018 af

Subcatchment 27S: FDA-4 Runoff Area=10,545 sf 0.00% Impervious Runoff Depth=0.75"
Flow Length=100' Slope=0.1900 '/' Tc=8.3 min CN=65 Runoff=0.16 cfs 0.015 af

Subcatchment 29S: FDA-L2.2 Runoff Area=4,285 sf 100.00% Impervious Runoff Depth=3.27"
Tc=5.0 min CN=98 Runoff=0.35 cfs 0.027 af

Subcatchment 30S: XDA1 Runoff Area=208,652 sf 1.02% Impervious Runoff Depth=0.38"
Flow Length=1,046' Tc=25.6 min CN=56 Runoff=0.75 cfs 0.152 af

Subcatchment 31S: FDA-1.1 Runoff Area=29,272 sf 0.00% Impervious Runoff Depth=0.49"
Tc=15.0 min CN=59 Runoff=0.19 cfs 0.028 af

Subcatchment 32S: FDA-2.3 Runoff Area=85,225 sf 1.54% Impervious Runoff Depth=0.42"
Flow Length=401' Tc=14.7 min CN=57 Runoff=0.41 cfs 0.068 af

Subcatchment 33S: XDA2 Runoff Area=211,963 sf 1.03% Impervious Runoff Depth=0.35"
Flow Length=544' Tc=15.5 min CN=55 Runoff=0.74 cfs 0.140 af

Subcatchment 34S: XDA3 Runoff Area=23,043 sf 0.00% Impervious Runoff Depth=0.35"
Flow Length=156' Tc=8.3 min CN=55 Runoff=0.09 cfs 0.015 af

Subcatchment 35S: FDA-L3.2 Runoff Area=4,286 sf 23.68% Impervious Runoff Depth=0.90"
Tc=10.0 min CN=68 Runoff=0.08 cfs 0.007 af

Reach 30R: Vegetated Swale Avg. Flow Depth=0.27' Max Vel=0.53 fps Inflow=0.41 cfs 0.068 af
n=0.240 L=285.0' S=0.0561 '/' Capacity=6.76 cfs Outflow=0.37 cfs 0.068 af

Pond 15P: SWMF Peak Elev=126.93' Storage=6,251 cf Inflow=1.23 cfs 0.181 af
Outflow=0.25 cfs 0.180 af

Pond 29P: SWMF-L1 Peak Elev=153.28' Storage=332 cf Inflow=0.67 cfs 0.049 af
Outflow=0.21 cfs 0.049 af

Pond 30P: Div L1 (DS F.2) Peak Elev=154.75' Inflow=0.67 cfs 0.049 af
Primary=0.00 cfs 0.000 af Secondary=0.67 cfs 0.049 af Outflow=0.67 cfs 0.049 af

Pond 31P: SWMF-1.1 Bioret Peak Elev=156.83' Storage=400 cf Inflow=0.19 cfs 0.028 af
Discarded=0.03 cfs 0.028 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.028 af

Pond 32P: Div 2.2 (DS D.2) Peak Elev=152.94' Inflow=0.72 cfs 0.068 af
Primary=0.07 cfs 0.001 af Secondary=0.65 cfs 0.067 af Outflow=0.72 cfs 0.068 af

Pond 33P: Div L2.1 Peak Elev=150.34' Inflow=0.28 cfs 0.020 af
Primary=0.00 cfs 0.000 af Secondary=0.28 cfs 0.020 af Outflow=0.28 cfs 0.020 af

Pond 34P: SWMF-L2.1 Peak Elev=148.30' Storage=199 cf Inflow=0.28 cfs 0.020 af
Outflow=0.06 cfs 0.020 af

Pond 35P: Div 1.2 Peak Elev=154.88' Inflow=0.88 cfs 0.072 af
Primary=0.00 cfs 0.000 af Secondary=0.88 cfs 0.072 af Outflow=0.88 cfs 0.072 af

Pond 36P: Rain Garden #1 Lot 3 Peak Elev=144.72' Storage=241 cf Inflow=0.18 cfs 0.017 af
Discarded=0.03 cfs 0.017 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.017 af

Pond 37P: SWMF-1.2 Peak Elev=154.02' Storage=846 cf Inflow=0.88 cfs 0.072 af
Outflow=0.18 cfs 0.072 af

Pond 38P: SWMF-2.2 Peak Elev=150.89' Storage=805 cf Inflow=0.65 cfs 0.067 af
Discarded=0.16 cfs 0.067 af Primary=0.00 cfs 0.000 af Outflow=0.16 cfs 0.067 af

Pond 39P: SWMF-L2.2 Peak Elev=135.89' Storage=262 cf Inflow=0.35 cfs 0.027 af
Outflow=0.07 cfs 0.027 af

Pond 40P: Div L2.2 Peak Elev=137.89' Inflow=0.35 cfs 0.027 af
Primary=0.00 cfs 0.000 af Secondary=0.35 cfs 0.027 af Outflow=0.35 cfs 0.027 af

Pond 41P: Rain Garden #2 Lot 3 Peak Elev=152.13' Storage=88 cf Inflow=0.08 cfs 0.007 af
Discarded=0.02 cfs 0.007 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.007 af

Link 19L: Design Point 1 Inflow=0.26 cfs 0.190 af
Primary=0.26 cfs 0.190 af

Link 22L: Design Point 2 Inflow=0.46 cfs 0.102 af
Primary=0.46 cfs 0.102 af

Link 25L: Design Point 3 Inflow=0.13 cfs 0.018 af
Primary=0.13 cfs 0.018 af

Link 28L: Design Point 4 Inflow=0.16 cfs 0.015 af
Primary=0.16 cfs 0.015 af

Total Runoff Area = 20.841 ac Runoff Volume = 0.934 af Average Runoff Depth = 0.54"
93.43% Pervious = 19.472 ac 6.57% Impervious = 1.369 ac

Summary for Subcatchment 1S: FDA-2.2

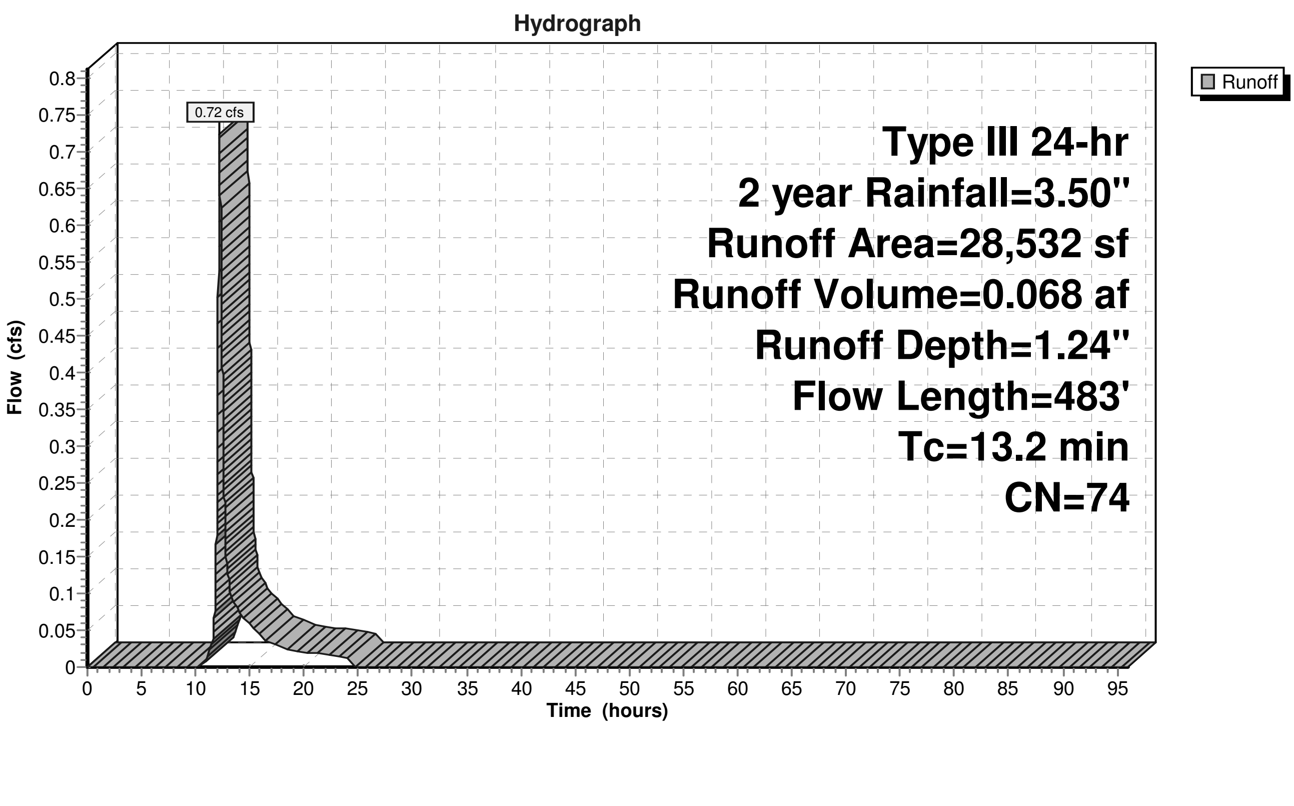
Runoff = 0.72 cfs @ 12.19 hrs, Volume= 0.068 af, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

	Area (sf)	CN	Description
*	11,021	98	Subdivision Road, HSG B
*	1,437	98	Off-site impervious road, HSG B
	1,307	61	>75% Grass cover, Good, HSG B
	14,767	55	Woods, Good, HSG B
	28,532	74	Weighted Average
	16,074		56.34% Pervious Area
	12,458		43.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	100	0.0750	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.6	68	0.1250	1.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	65	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	250	0.0750	13.46	10.57	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
13.2	483	Total			

Subcatchment 1S: FDA-2.2



Summary for Subcatchment 2S: FDA-1.2

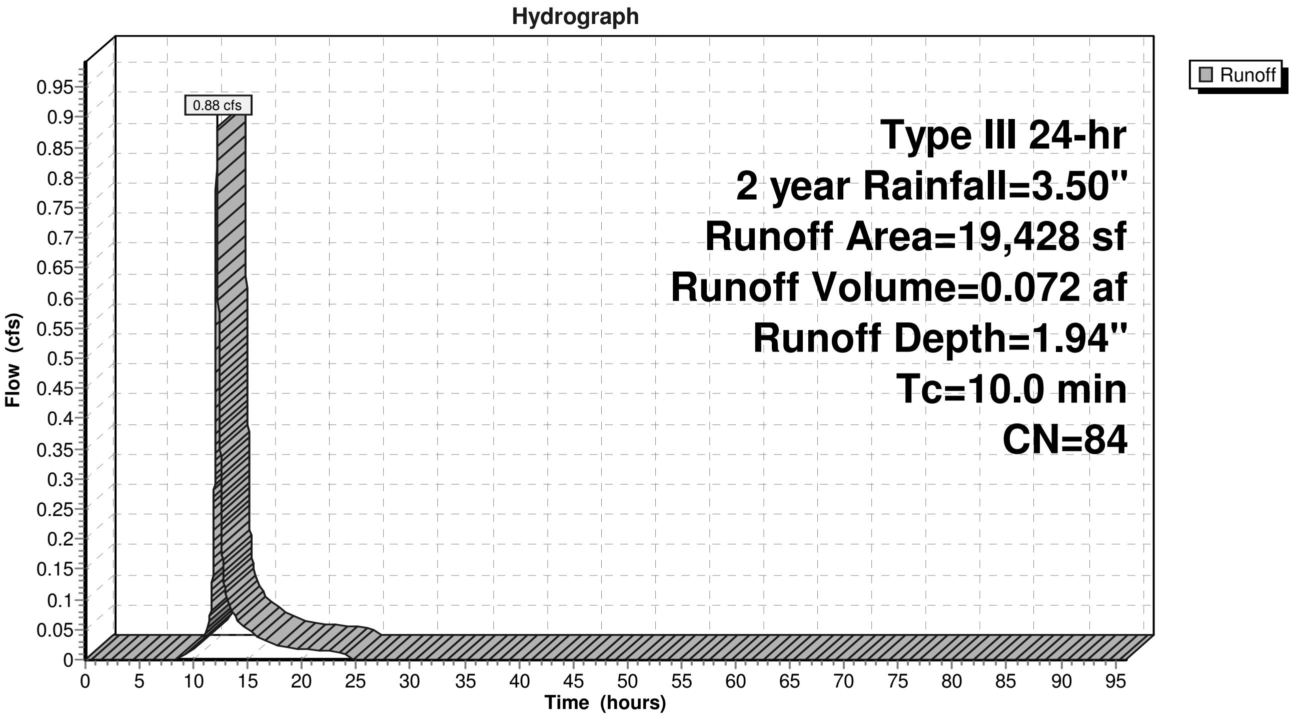
Runoff = 0.88 cfs @ 12.14 hrs, Volume= 0.072 af, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

Area (sf)	CN	Description
12,720	98	Paved parking, HSG B
3,180	61	>75% Grass cover, Good, HSG B
3,528	55	Woods, Good, HSG B
19,428	84	Weighted Average
6,708		34.53% Pervious Area
12,720		65.47% Impervious Area

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

Subcatchment 2S: FDA-1.2



Summary for Subcatchment 4S: XDA4

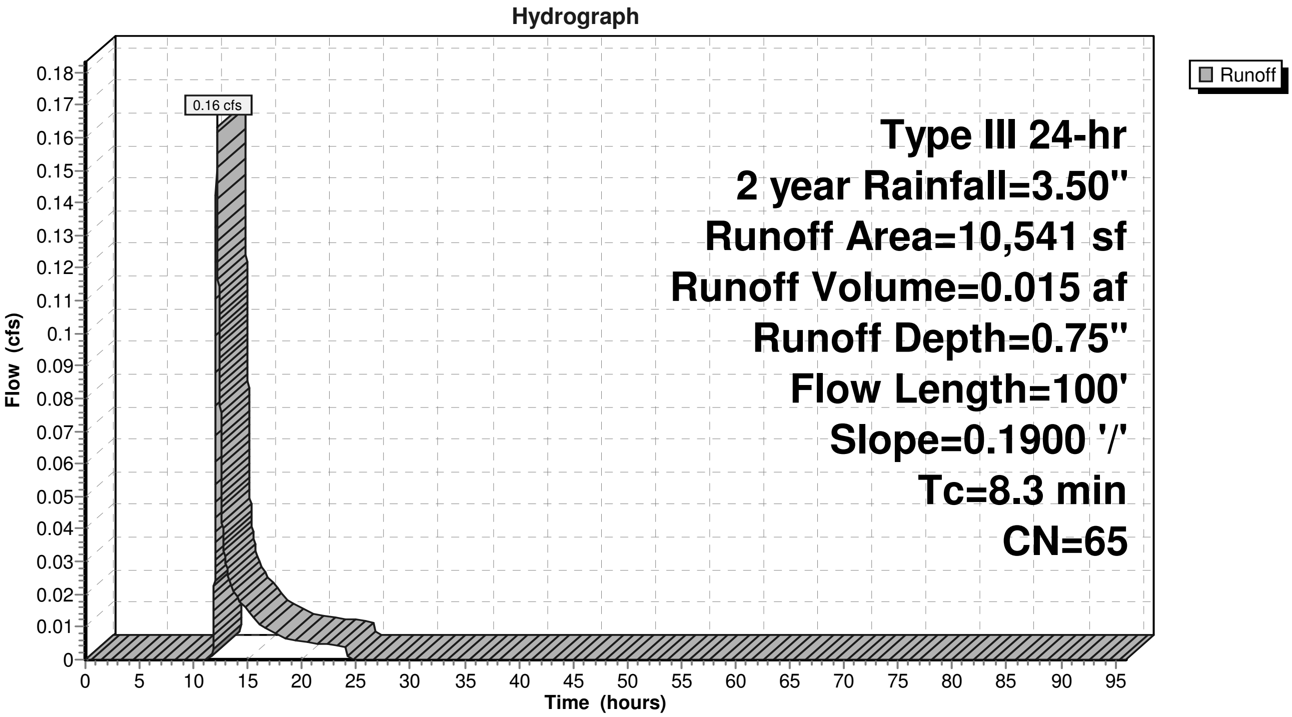
Runoff = 0.16 cfs @ 12.14 hrs, Volume= 0.015 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

Area (sf)	CN	Description
4,225	55	Woods, Good, HSG B
4,225	70	Woods, Good, HSG C
2,091	77	Woods, Good, HSG D
10,541	65	Weighted Average
10,541		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.1900	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"

Subcatchment 4S: XDA4



Summary for Subcatchment 5S: FDA-L2.1

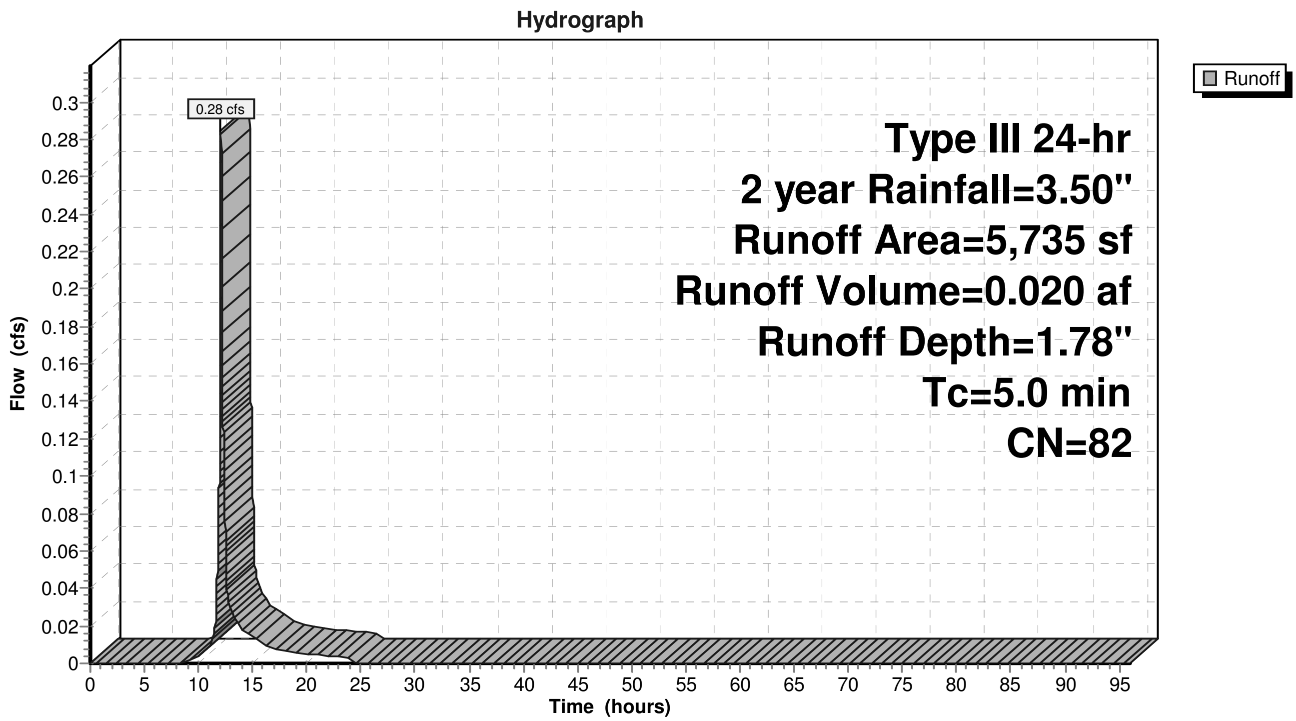
Runoff = 0.28 cfs @ 12.08 hrs, Volume= 0.020 af, Depth= 1.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

	Area (sf)	CN	Description
*	3,185	98	Driveway and roofs, HSG B
	2,550	61	>75% Grass cover, Good, HSG B
	5,735	82	Weighted Average
	2,550		44.46% Pervious Area
	3,185		55.54% Impervious Area

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

Subcatchment 5S: FDA-L2.1



Summary for Subcatchment 6S: FDA-L3.1

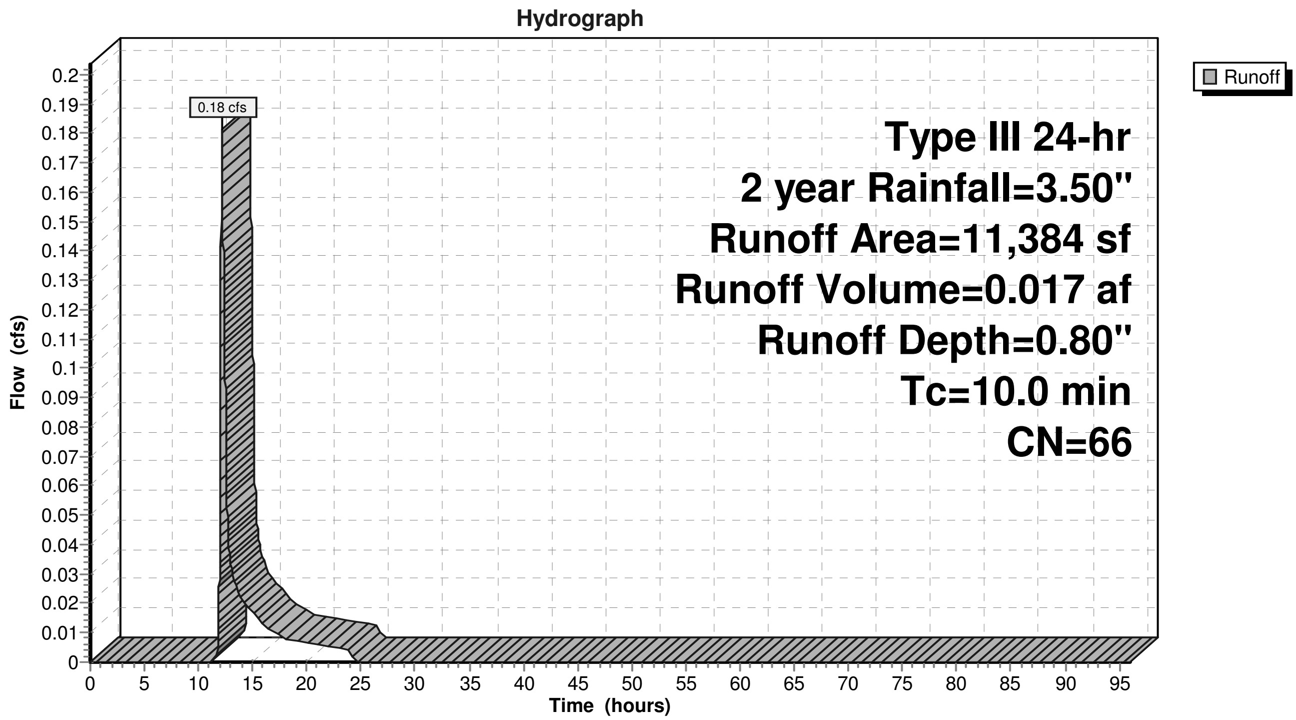
Runoff = 0.18 cfs @ 12.16 hrs, Volume= 0.017 af, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

	Area (sf)	CN	Description
*	982	98	Lot 3 Roof, HSG B
*	907	98	Lot 3 Roof, HSG B
*	387	98	Walks, Entry Steps, HSG B
	5,387	61	>75% Grass cover, Good, HSG B
	3,721	55	Woods, Good, HSG B
	11,384	66	Weighted Average
	9,108		80.01% Pervious Area
	2,276		19.99% Impervious Area

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

Subcatchment 6S: FDA-L3.1



Summary for Subcatchment 20S: FDA-1.3

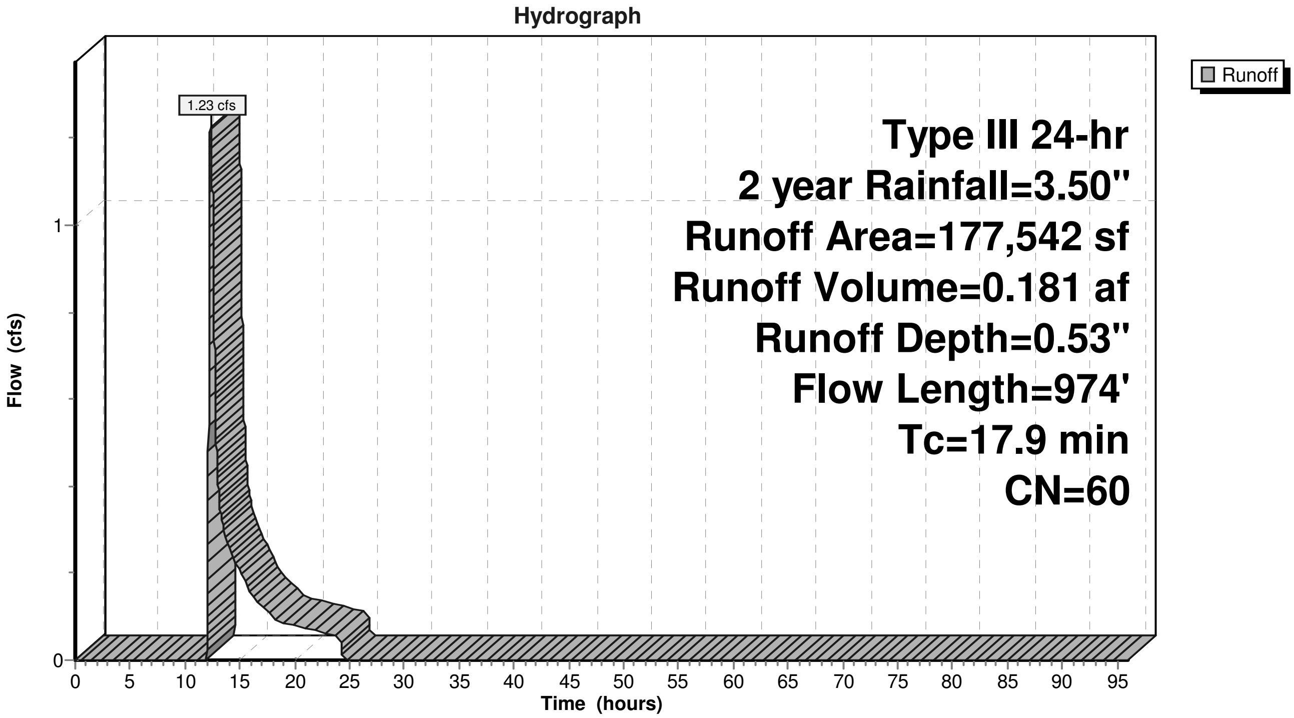
Runoff = 1.23 cfs @ 12.34 hrs, Volume= 0.181 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

	Area (sf)	CN	Description
*	9,958	98	Impervious Surfaces, HSG B
*	1,720	85	Maintenance Path, HSG B
*	185	98	Retaining Wall, HSG B
	60,200	61	>75% Grass cover, Good, HSG B
	2,190	74	>75% Grass cover, Good, HSG C
	523	80	>75% Grass cover, Good, HSG D
	12,069	48	Brush, Good, HSG B
*	34,260	55	Woods (on-site), Good, HSG B
*	51,994	55	Woods (off-site), Good, HSG B
	2,962	70	Woods, Good, HSG C
	1,481	77	Woods, Good, HSG D
	177,542	60	Weighted Average
	167,399		94.29% Pervious Area
	10,143		5.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.1700	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	133	0.1880	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.1	183	0.0383	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	57	0.0219	2.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.1	91	0.1000	15.54	12.21	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
1.6	274	0.0299	2.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.0	136	0.0022	0.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
17.9	974	Total			

Subcatchment 20S: FDA-1.3



Summary for Subcatchment 21S: FDA-1.4

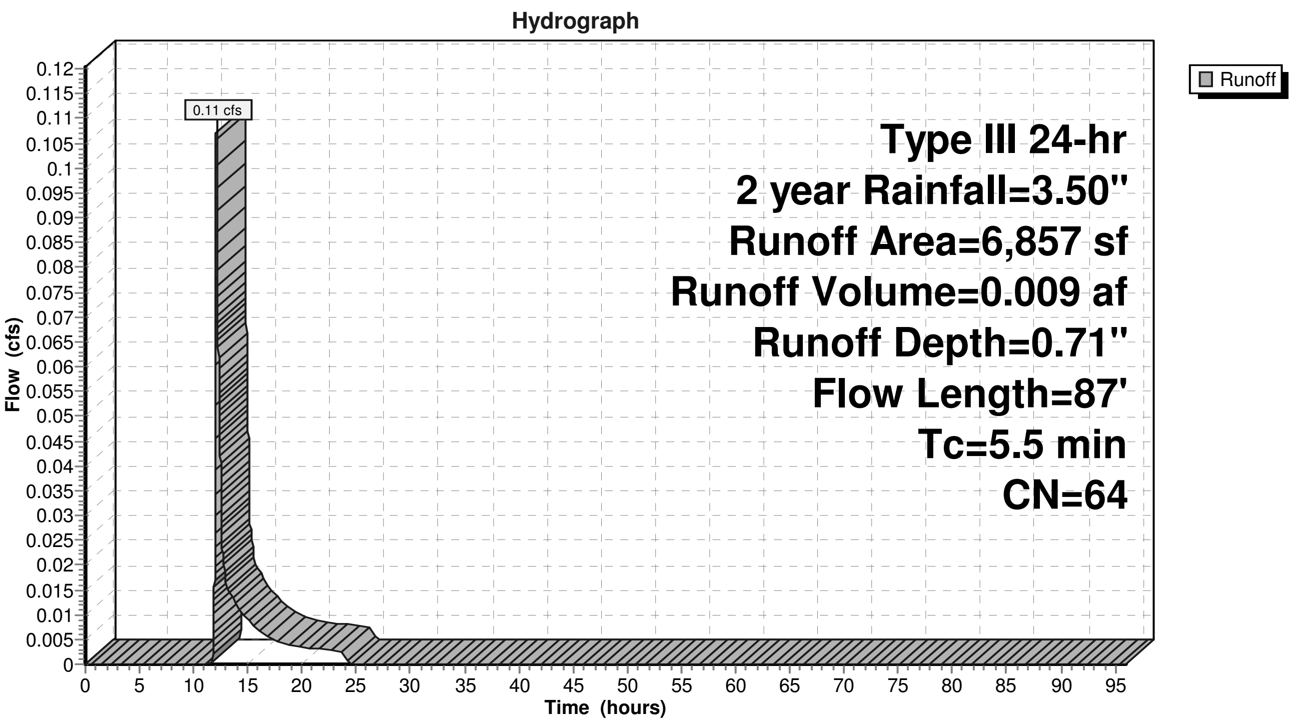
Runoff = 0.11 cfs @ 12.10 hrs, Volume= 0.009 af, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

Area (sf)	CN	Description
478	61	>75% Grass cover, Good, HSG B
124	74	>75% Grass cover, Good, HSG C
62	80	>75% Grass cover, Good, HSG D
3,040	55	Woods, Good, HSG B
2,102	70	Woods, Good, HSG C
1,051	77	Woods, Good, HSG D
6,857	64	Weighted Average
6,857		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	40	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	47	0.2300	2.40		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.5	87	Total			

Subcatchment 21S: FDA-1.4



Summary for Subcatchment 23S: FDA-L1

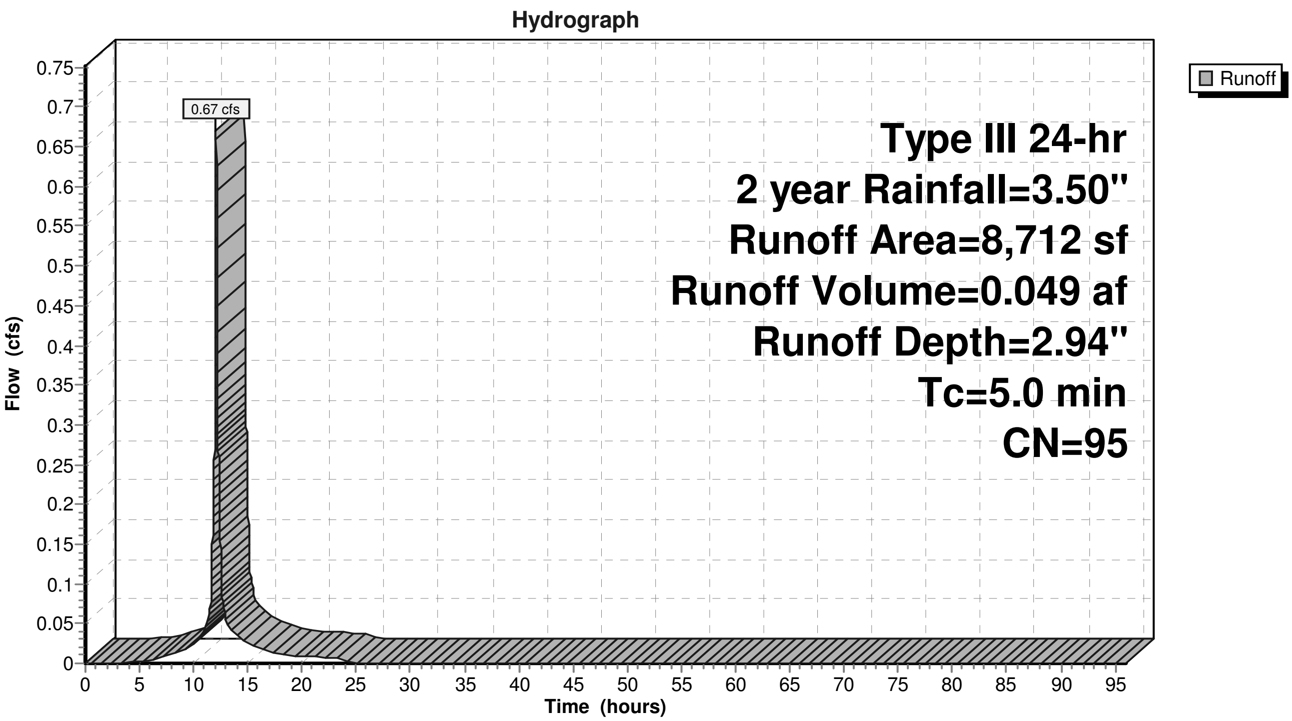
Runoff = 0.67 cfs @ 12.07 hrs, Volume= 0.049 af, Depth= 2.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

Area (sf)	CN	Description
7,928	98	Paved parking, HSG B
784	61	>75% Grass cover, Good, HSG B
8,712	95	Weighted Average
784		9.00% Pervious Area
7,928		91.00% Impervious Area

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

Subcatchment 23S: FDA-L1



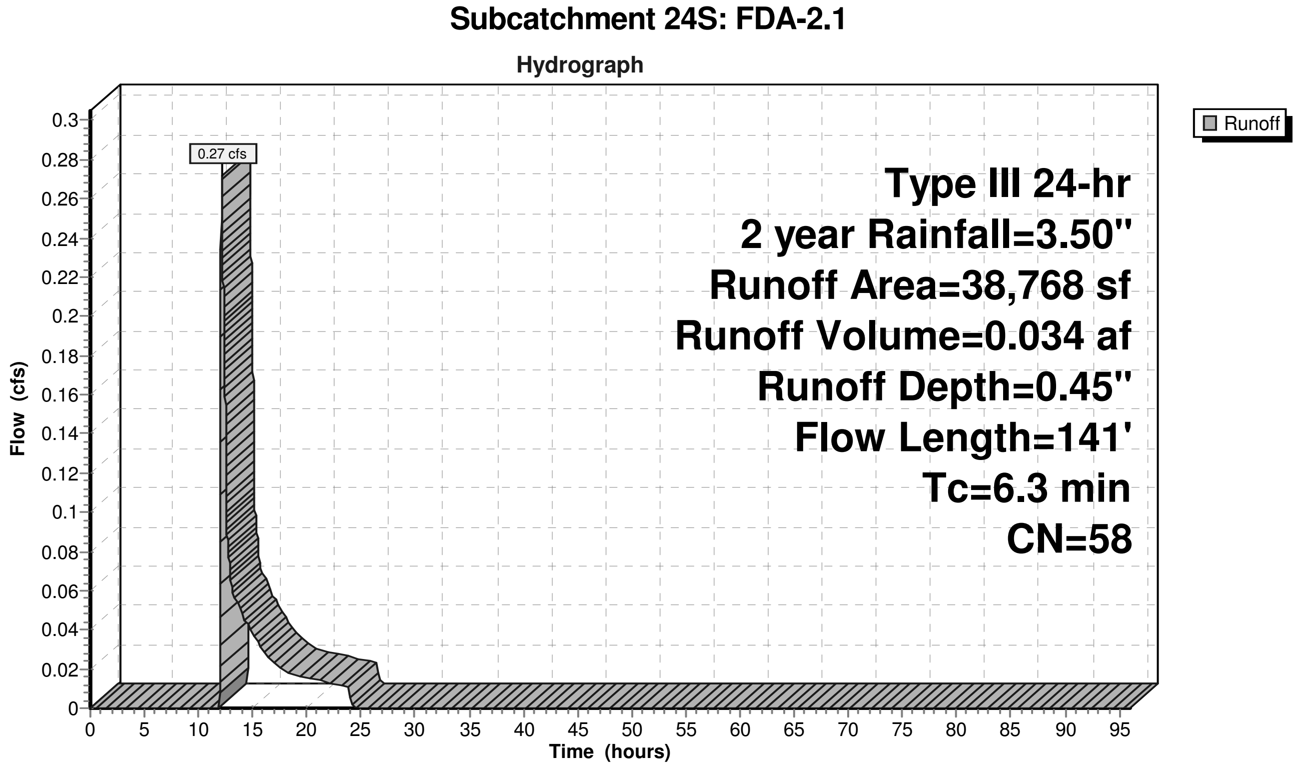
Summary for Subcatchment 24S: FDA-2.1

Runoff = 0.27 cfs @ 12.13 hrs, Volume= 0.034 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

Area (sf)	CN	Description
16,814	61	>75% Grass cover, Good, HSG B
21,954	55	Woods, Good, HSG B
38,768	58	Weighted Average
38,768		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	63	0.1698	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	78	0.0744	4.09		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
6.3	141	Total			



Summary for Subcatchment 26S: FDA-3

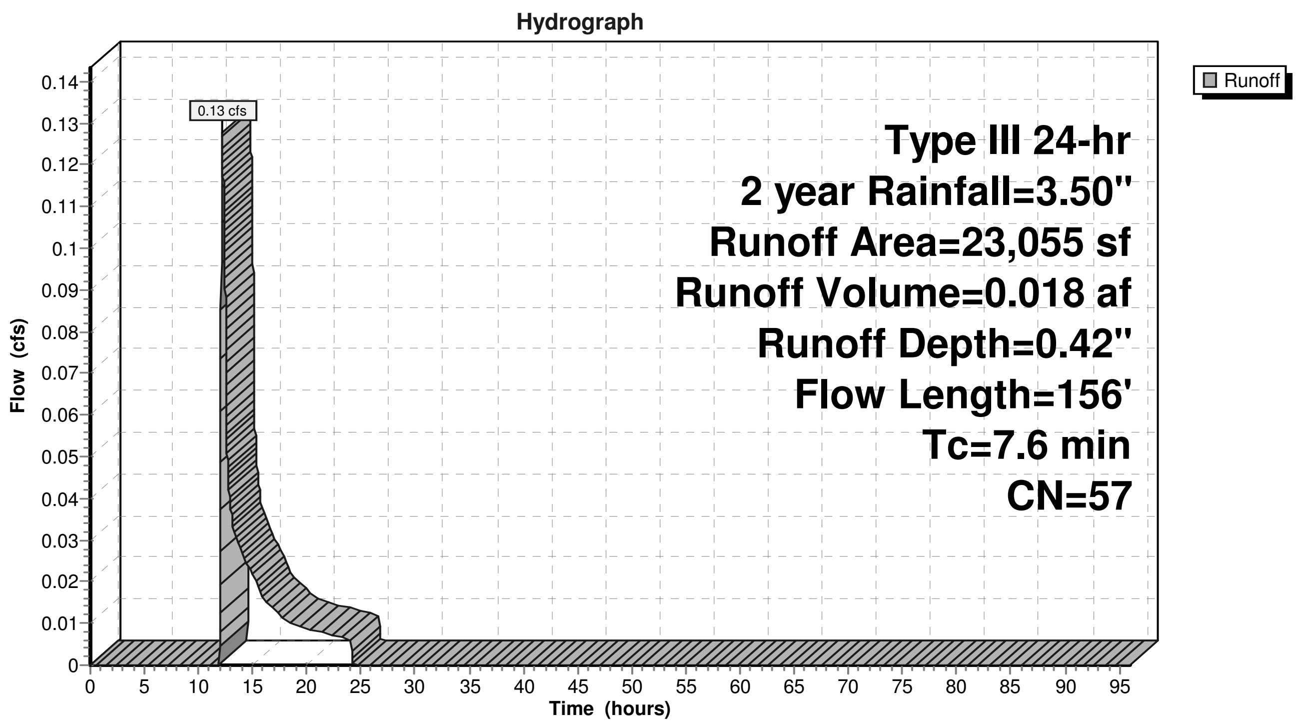
Runoff = 0.13 cfs @ 12.16 hrs, Volume= 0.018 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

Area (sf)	CN	Description
5,955	61	>75% Grass cover, Good, HSG B
17,100	55	Woods, Good, HSG B
23,055	57	Weighted Average
23,055		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	86	0.1977	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	70	0.0571	3.58		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.6	156	Total			

Subcatchment 26S: FDA-3



Summary for Subcatchment 27S: FDA-4

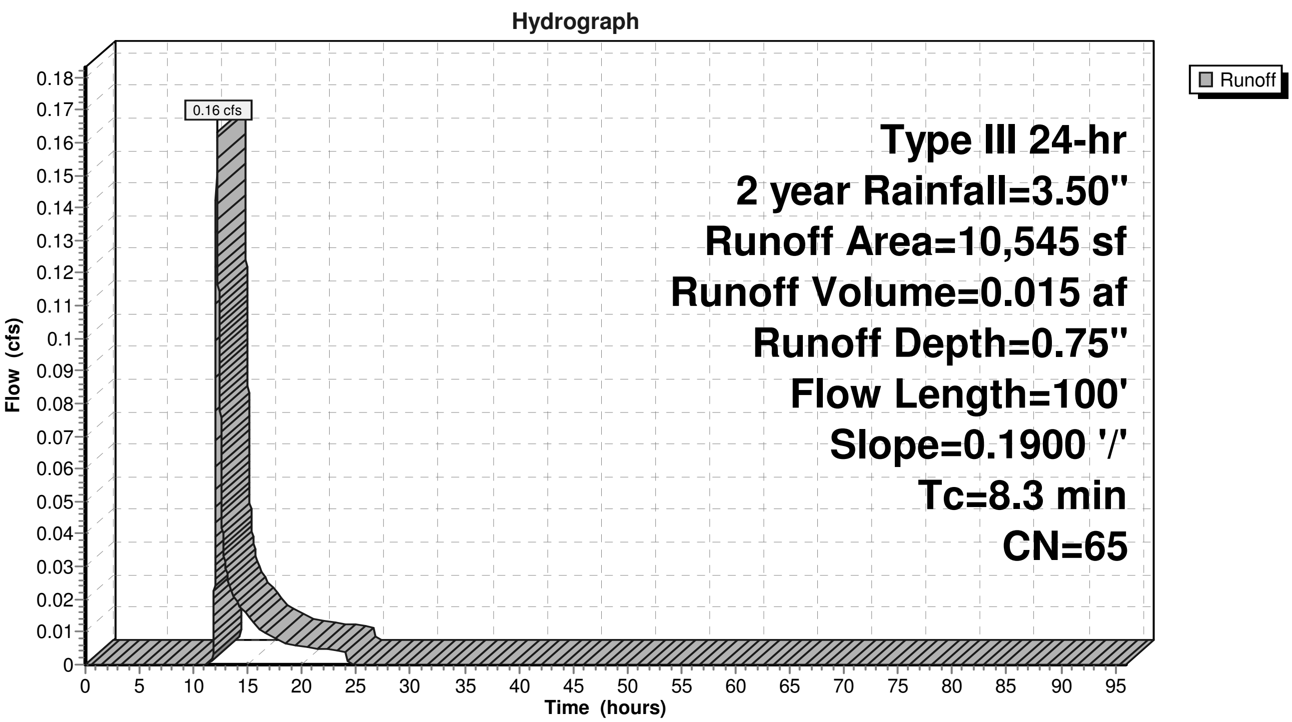
Runoff = 0.16 cfs @ 12.14 hrs, Volume= 0.015 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

Area (sf)	CN	Description
4,220	55	Woods, Good, HSG B
4,220	70	Woods, Good, HSG C
2,105	77	Woods, Good, HSG D
10,545	65	Weighted Average
10,545		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.1900	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"

Subcatchment 27S: FDA-4



Summary for Subcatchment 29S: FDA-L2.2

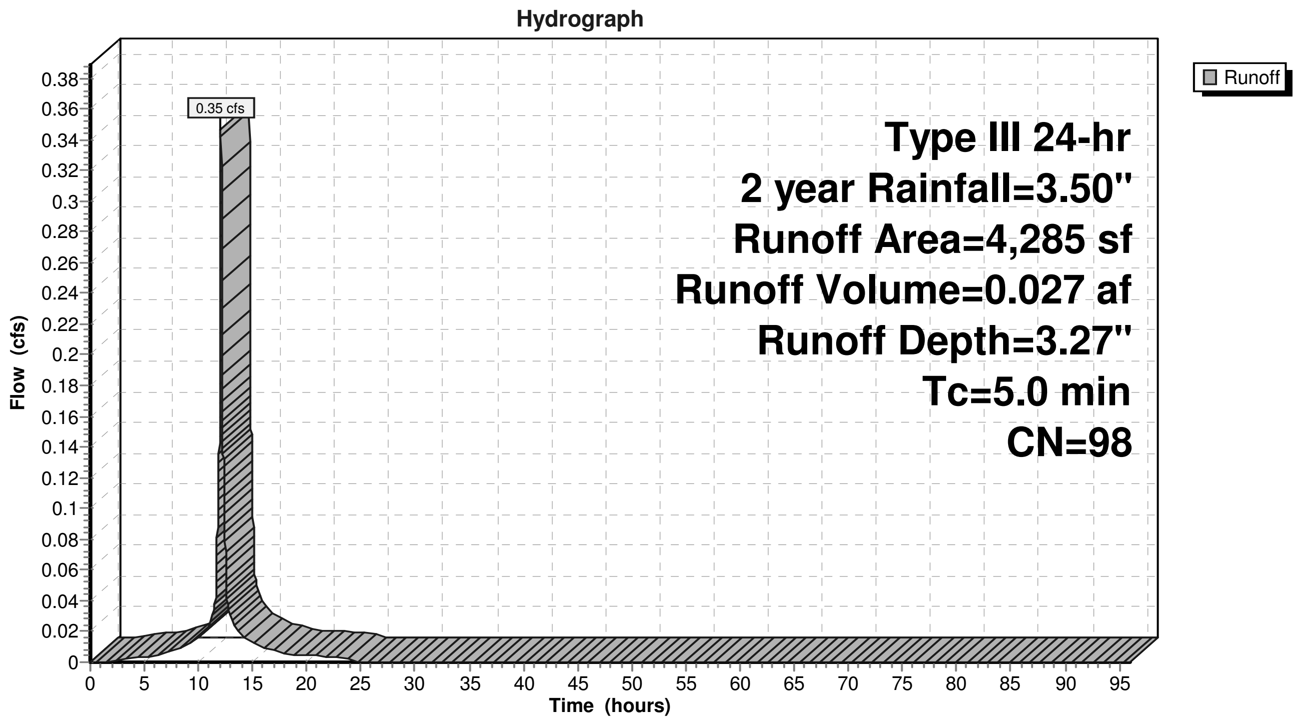
Runoff = 0.35 cfs @ 12.07 hrs, Volume= 0.027 af, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

Area (sf)	CN	Description
4,285	98	Roofs, HSG B
4,285		100.00% Impervious Area

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

Subcatchment 29S: FDA-L2.2



Summary for Subcatchment 30S: XDA1

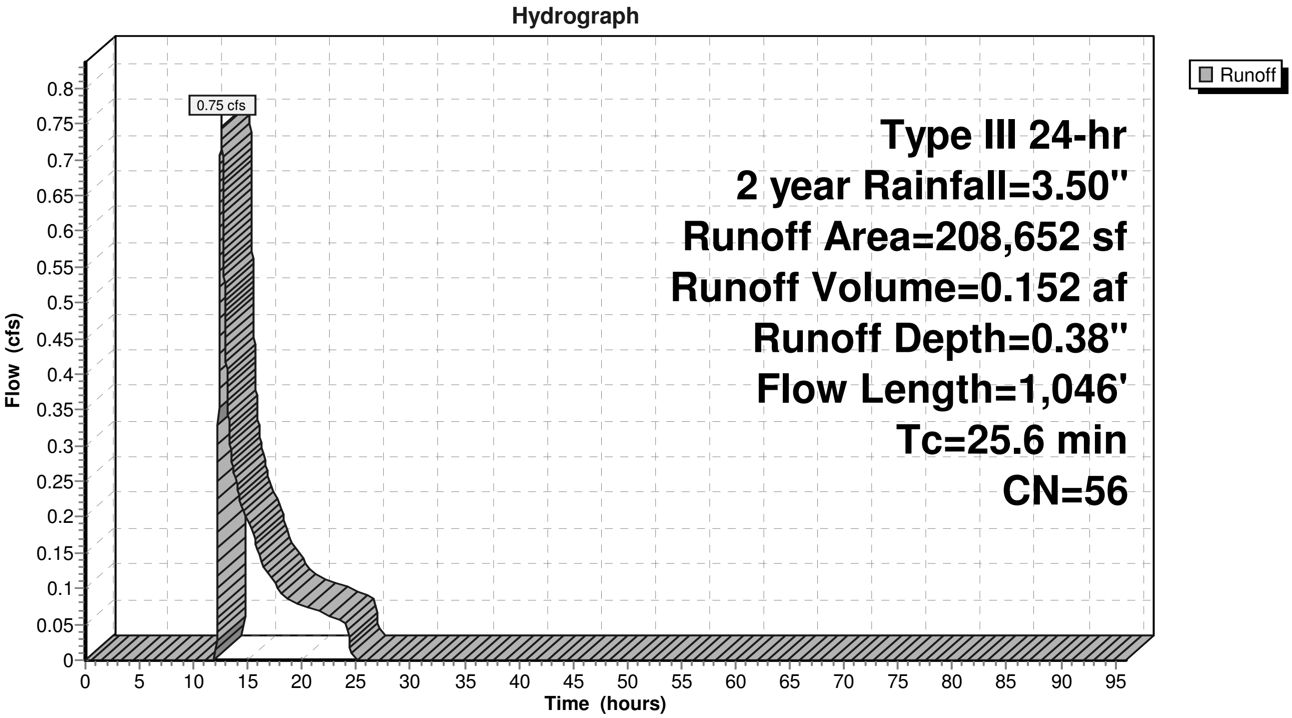
Runoff = 0.75 cfs @ 12.55 hrs, Volume= 0.152 af, Depth= 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

Area (sf)	CN	Description
2,134	98	Unconnected pavement, HSG B
195,802	55	Woods, Good, HSG B
7,144	70	Woods, Good, HSG C
3,572	77	Woods, Good, HSG D
208,652	56	Weighted Average
206,518		98.98% Pervious Area
2,134		1.02% Impervious Area
2,134		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.1700	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	133	0.1880	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.1	183	0.0383	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	185	0.0919	1.52		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	367	0.0158	0.63		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	78	0.0538	1.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.6	1,046	Total			

Subcatchment 30S: XDA1



Summary for Subcatchment 31S: FDA-1.1

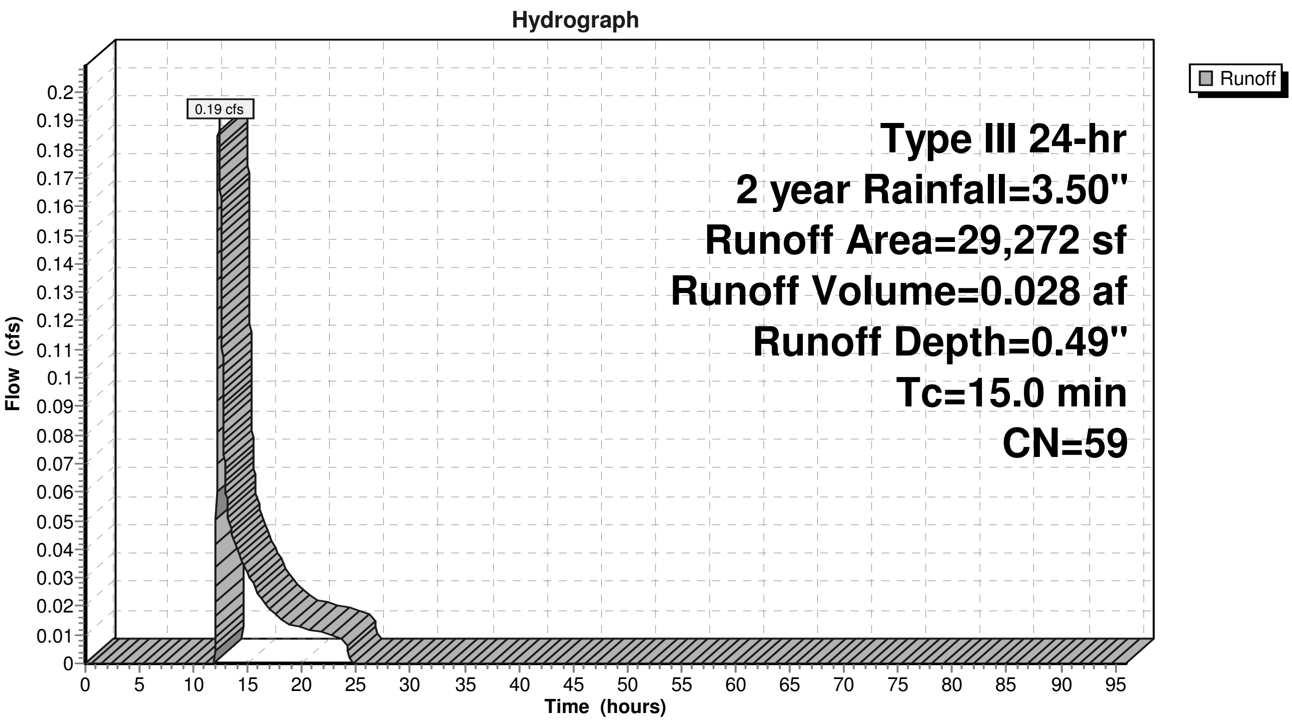
Runoff = 0.19 cfs @ 12.29 hrs, Volume= 0.028 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

	Area (sf)	CN	Description
	18,513	61	>75% Grass cover, Good, HSG B
	7,020	55	Woods, Good, HSG B
*	3,739	55	Woods (off-site), Good, HSG B
	29,272	59	Weighted Average
	29,272		100.00% Pervious Area

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

Subcatchment 31S: FDA-1.1



Summary for Subcatchment 32S: FDA-2.3

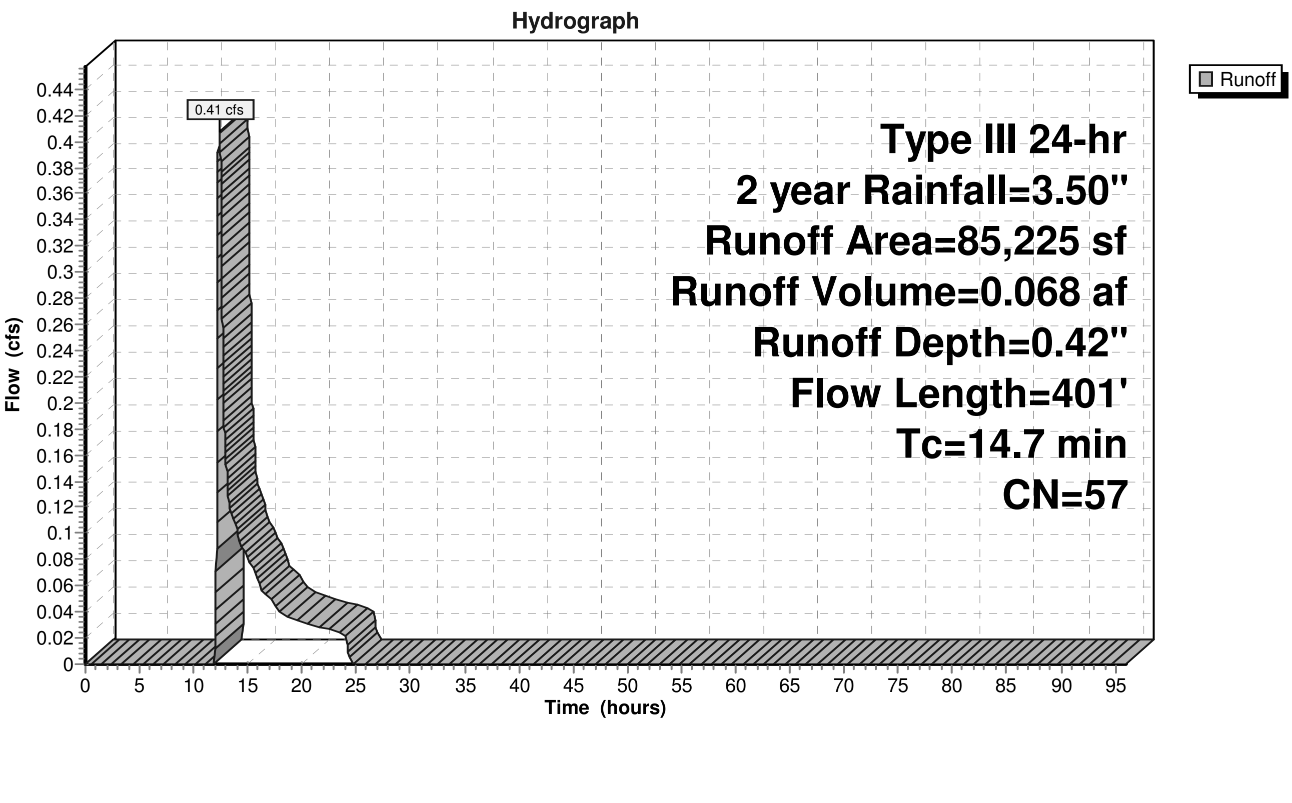
Runoff = 0.41 cfs @ 12.36 hrs, Volume= 0.068 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

	Area (sf)	CN	Description
*	715	98	Off-Site Road, HSG B
	315	98	Unconnected pavement, HSG B
	280	98	Unconnected pavement, HSG B
	23,051	61	>75% Grass cover, Good, HSG B
	60,864	55	Woods, Good, HSG B
	85,225	57	Weighted Average
	83,915		98.46% Pervious Area
	1,310		1.54% Impervious Area
	595		45.42% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	100	0.2050	0.21		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.4	148	0.1284	1.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.2	153	0.0163	0.49	1.29	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.75' Z= 2.0 '/' Top.W=5.00' n= 0.240 Sheet flow over Dense Grass
14.7	401	Total			

Subcatchment 32S: FDA-2.3



Summary for Subcatchment 33S: XDA2

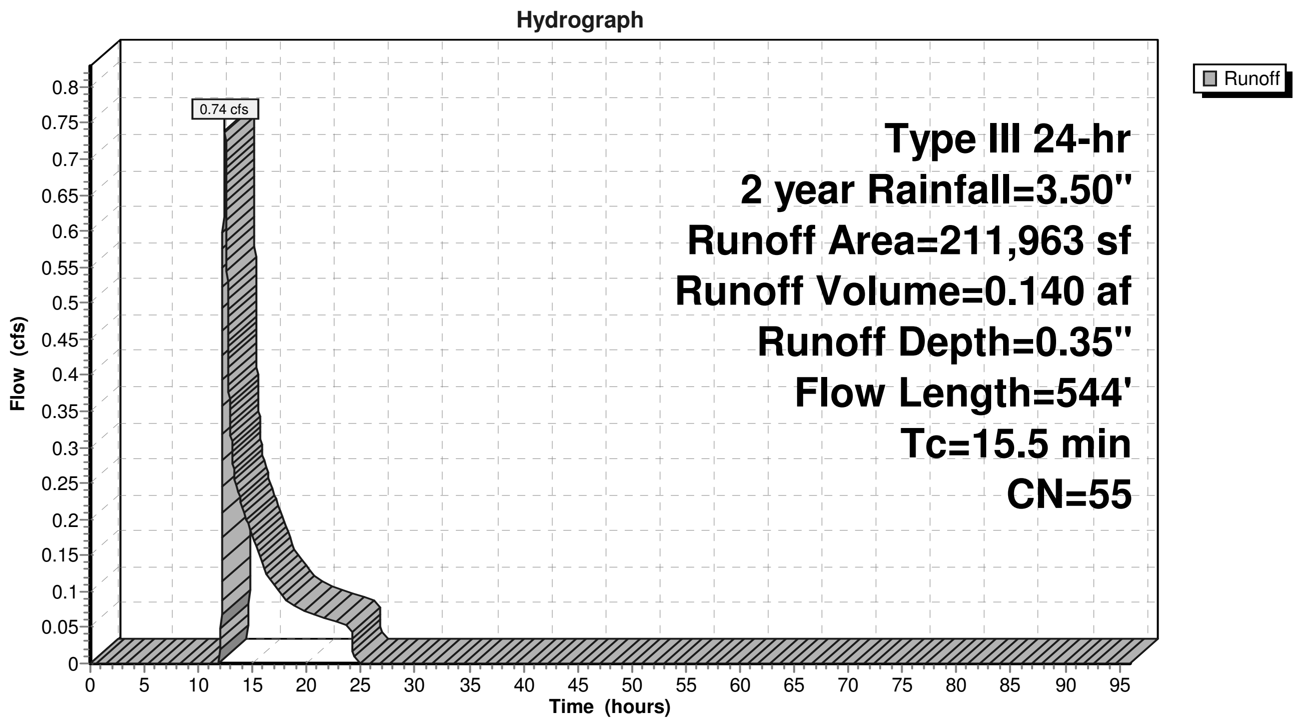
Runoff = 0.74 cfs @ 12.42 hrs, Volume= 0.140 af, Depth= 0.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

Area (sf)	CN	Description
209,785	55	Woods, Good, HSG B
2,178	98	Paved parking, HSG B
211,963	55	Weighted Average
209,785		98.97% Pervious Area
2,178		1.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.1050	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.8	106	0.2075	2.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.1	338	0.0740	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.5	544	Total			

Subcatchment 33S: XDA2



Summary for Subcatchment 34S: XDA3

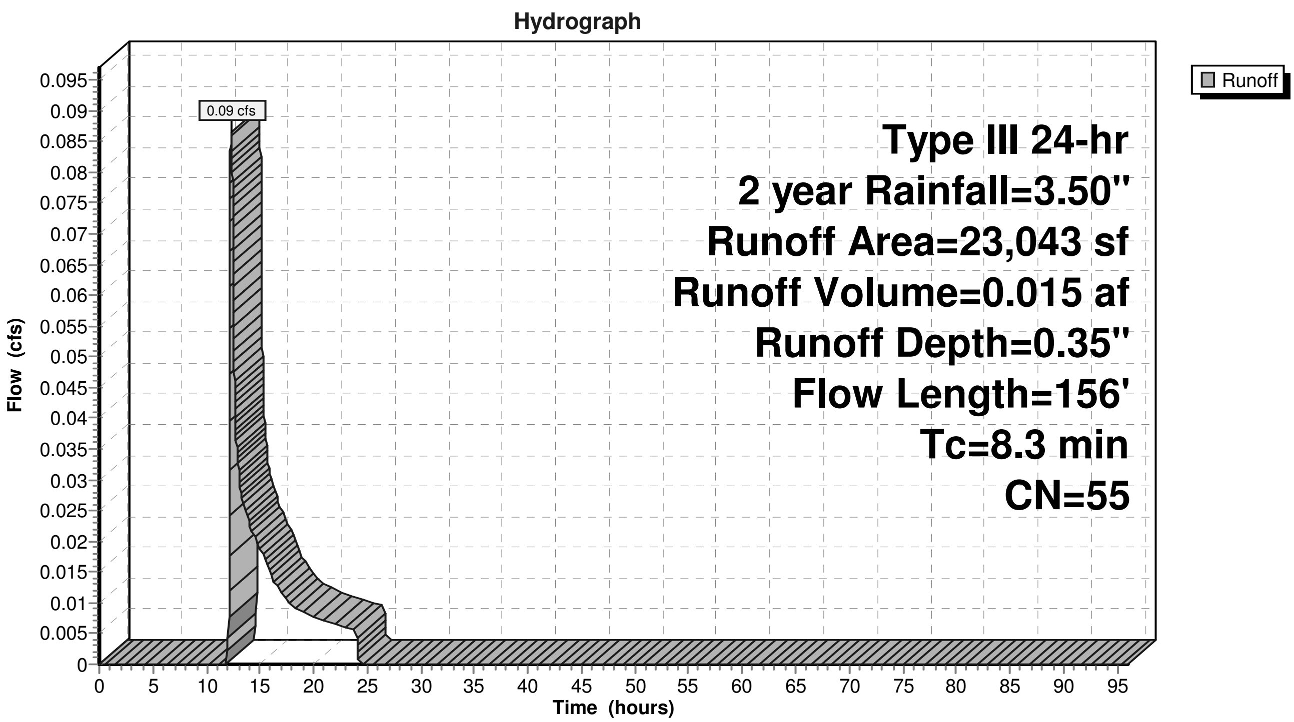
Runoff = 0.09 cfs @ 12.31 hrs, Volume= 0.015 af, Depth= 0.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

Area (sf)	CN	Description
23,043	55	Woods, Good, HSG B
23,043		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	86	0.1977	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	70	0.0571	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.3	156	Total			

Subcatchment 34S: XDA3



Summary for Subcatchment 35S: FDA-L3.2

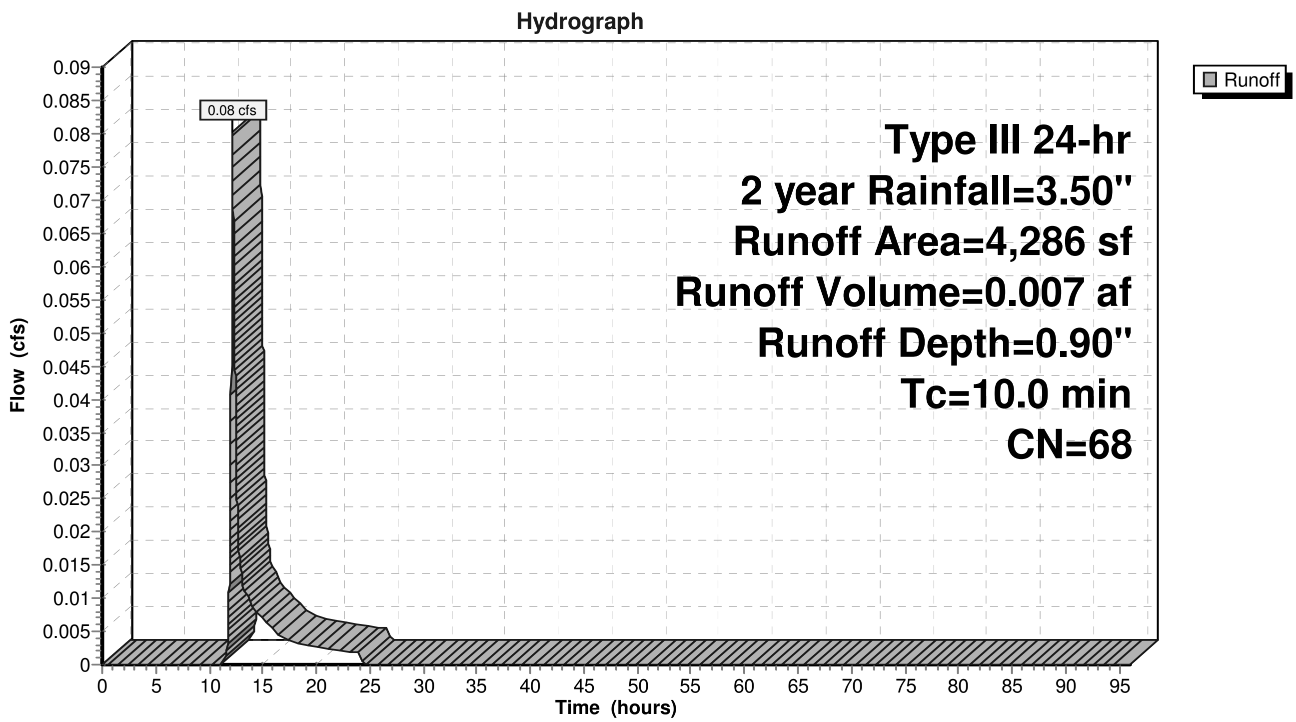
Runoff = 0.08 cfs @ 12.16 hrs, Volume= 0.007 af, Depth= 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.50"

	Area (sf)	CN	Description
*	1,015	98	Driveway, HSG B
	1,875	61	>75% Grass cover, Good, HSG B
	1,396	55	Woods, Good, HSG B
	4,286	68	Weighted Average
	3,271		76.32% Pervious Area
	1,015		23.68% Impervious Area

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

Subcatchment 35S: FDA-L3.2



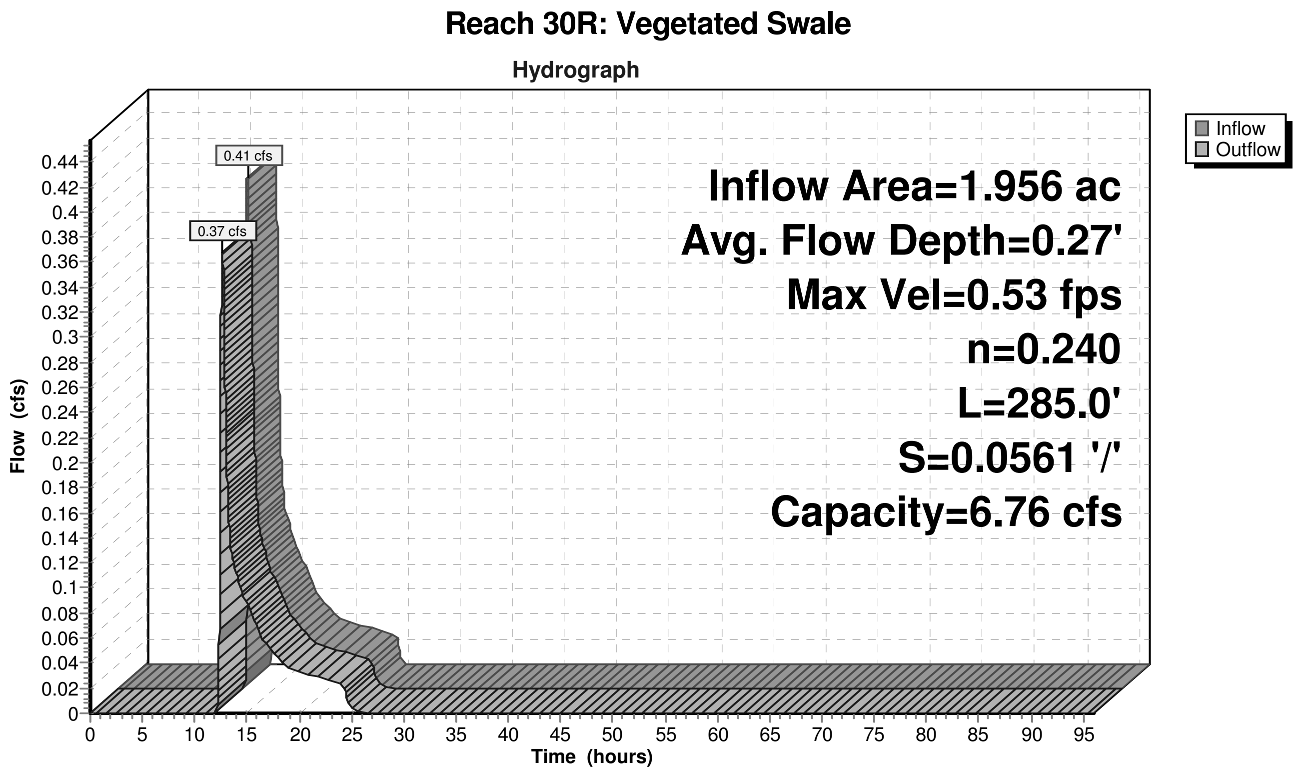
Summary for Reach 30R: Vegetated Swale

Inflow Area = 1.956 ac, 1.54% Impervious, Inflow Depth = 0.42" for 2 year event
Inflow = 0.41 cfs @ 12.36 hrs, Volume= 0.068 af
Outflow = 0.37 cfs @ 12.65 hrs, Volume= 0.068 af, Atten= 10%, Lag= 17.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.53 fps, Min. Travel Time= 9.0 min
Avg. Velocity = 0.21 fps, Avg. Travel Time= 22.8 min

Peak Storage= 199 cf @ 12.50 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 1.25' Flow Area= 5.6 sf, Capacity= 6.76 cfs

2.00' x 1.25' deep channel, n= 0.240 Sheet flow over Dense Grass
Side Slope Z-value= 2.0 '/' Top Width= 7.00'
Length= 285.0' Slope= 0.0561 '/'
Inlet Invert= 174.00', Outlet Invert= 158.00'



Summary for Pond 15P: SWMF

Inflow Area = 5.984 ac, 15.94% Impervious, Inflow Depth = 0.36" for 2 year event
Inflow = 1.23 cfs @ 12.34 hrs, Volume= 0.181 af
Outflow = 0.25 cfs @ 14.18 hrs, Volume= 0.180 af, Atten= 80%, Lag= 110.5 min
Primary = 0.25 cfs @ 14.18 hrs, Volume= 0.180 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 126.00' Surf.Area= 2,806 sf Storage= 3,133 cf
Peak Elev= 126.93' @ 14.18 hrs Surf.Area= 3,928 sf Storage= 6,251 cf (3,118 cf above start)

Plug-Flow detention time= 1,006.6 min calculated for 0.108 af (60% of inflow)
Center-of-Mass det. time= 517.6 min (1,437.4 - 919.9)

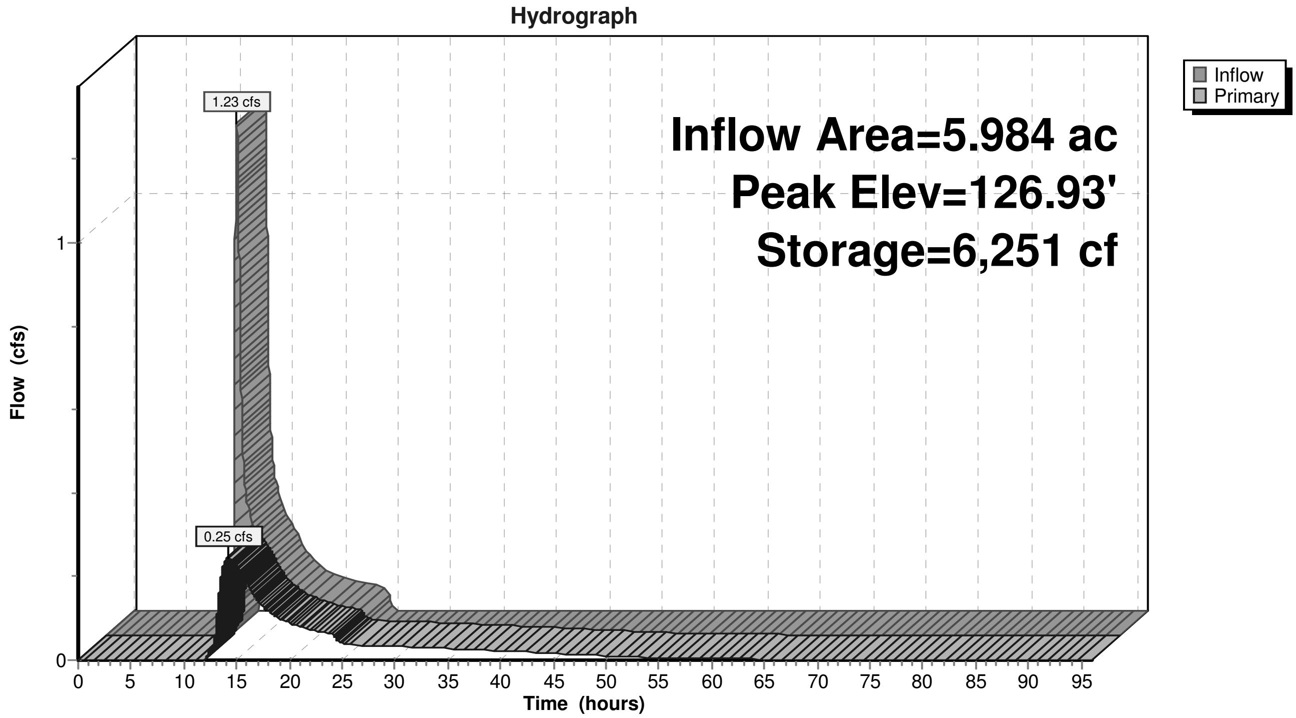
Volume	Invert	Avail.Storage	Storage Description
#1	121.50'	21,119 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
121.50	0	0	0
122.00	96	24	24
123.00	318	207	231
124.00	513	416	647
125.00	827	670	1,317
126.00	2,806	1,817	3,133
127.00	4,018	3,412	6,545
128.00	6,230	5,124	11,669
129.00	6,090	6,160	17,829
129.50	7,070	3,290	21,119

Device	Routing	Invert	Outlet Devices
#1	Primary	125.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Device 1	126.00'	**1.3" Vert. Orifice/Grate** C= 0.600
#3	Device 1	126.75'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#4	Device 1	127.00'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600
#5	Primary	129.20'	**6.0' long (Profile 7) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 Coef. (English) 2.99 3.41 3.62

Primary OutFlow Max=0.24 cfs @ 14.18 hrs HW=126.93' (Free Discharge)
1=Orifice/Grate (Passes 0.24 cfs of 4.52 cfs potential flow)
2=Orifice/Grate (Orifice Controls 0.04 cfs @ 4.50 fps)
3=Orifice/Grate (Orifice Controls 0.20 cfs @ 1.43 fps)
4=Orifice/Grate (Controls 0.00 cfs)
5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 15P: SWMF



Summary for Pond 29P: SWMF-L1

Inflow	=	0.67 cfs @	12.07 hrs,	Volume=	0.049 af
Outflow	=	0.21 cfs @	11.84 hrs,	Volume=	0.049 af, Atten= 69%, Lag= 0.0 min
Discarded	=	0.21 cfs @	11.84 hrs,	Volume=	0.049 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 153.28' @ 12.37 hrs Surf.Area= 1,485 sf Storage= 332 cf

Plug-Flow detention time= 7.6 min calculated for 0.049 af (100% of inflow)
Center-of-Mass det. time= 7.6 min (785.0 - 777.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	152.75'	1,069 cf	**27.50'W x 54.00'L x 2.54'H Field A**
			3,774 cf Overall - 1,102 cf Embedded = 2,672 cf x 40.0% Voids
#2A	153.25'	1,102 cf	**Cultec R-150XLHD** x 40 Inside #1
			Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
			Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
			Row Length Adjustment= +0.75' x 2.65 sf x 8 rows
		2,171 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	152.75'	**6.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.21 cfs @ 11.84 hrs HW=152.78' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Pond 29P: SWMF-L1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 8 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

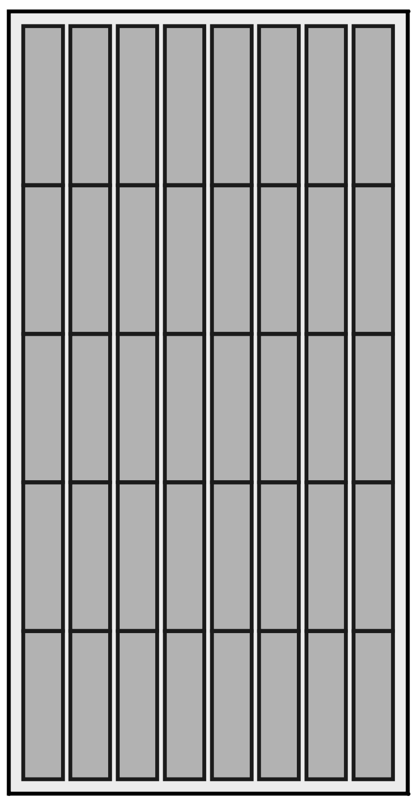
5 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 52.00' Row Length +12.0" End Stone x 2 = 54.00' Base Length
8 Rows x 33.0" Wide + 6.0" Spacing x 7 + 12.0" Side Stone x 2 = 27.50' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

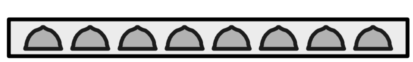
40 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 8 Rows = 1,102.0 cf Chamber Storage

3,774.4 cf Field - 1,102.0 cf Chambers = 2,672.4 cf Stone x 40.0% Voids = 1,069.0 cf Stone Storage

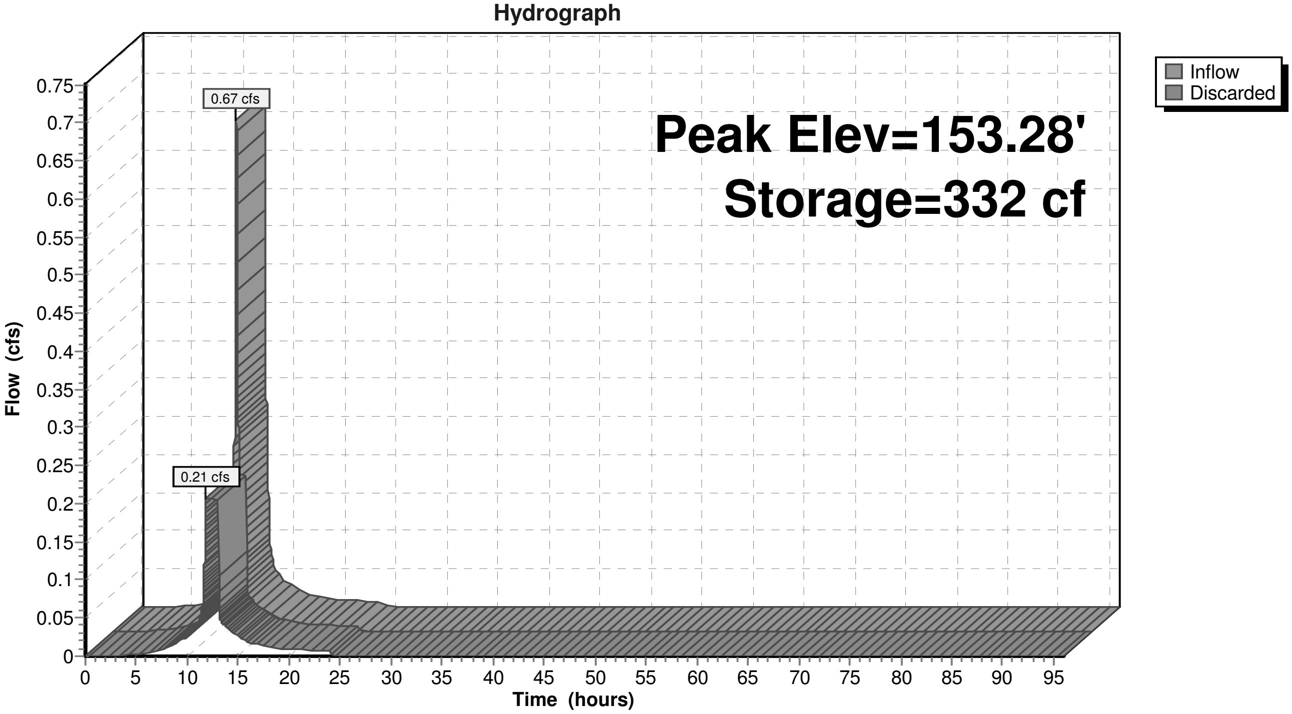
Chamber Storage + Stone Storage = 2,170.9 cf = 0.050 af
Overall Storage Efficiency = 57.5%

40 Chambers
139.8 cy Field
99.0 cy Stone





Pond 29P: SWMF-L1



Summary for Pond 30P: Div L1 (DS F.2)

[57] Hint: Peaked at 154.75' (Flood elevation advised)

Inflow Area = 0.200 ac, 91.00% Impervious, Inflow Depth = 2.94" for 2 year event
Inflow = 0.67 cfs @ 12.07 hrs, Volume= 0.049 af
Outflow = 0.67 cfs @ 12.07 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.67 cfs @ 12.07 hrs, Volume= 0.049 af

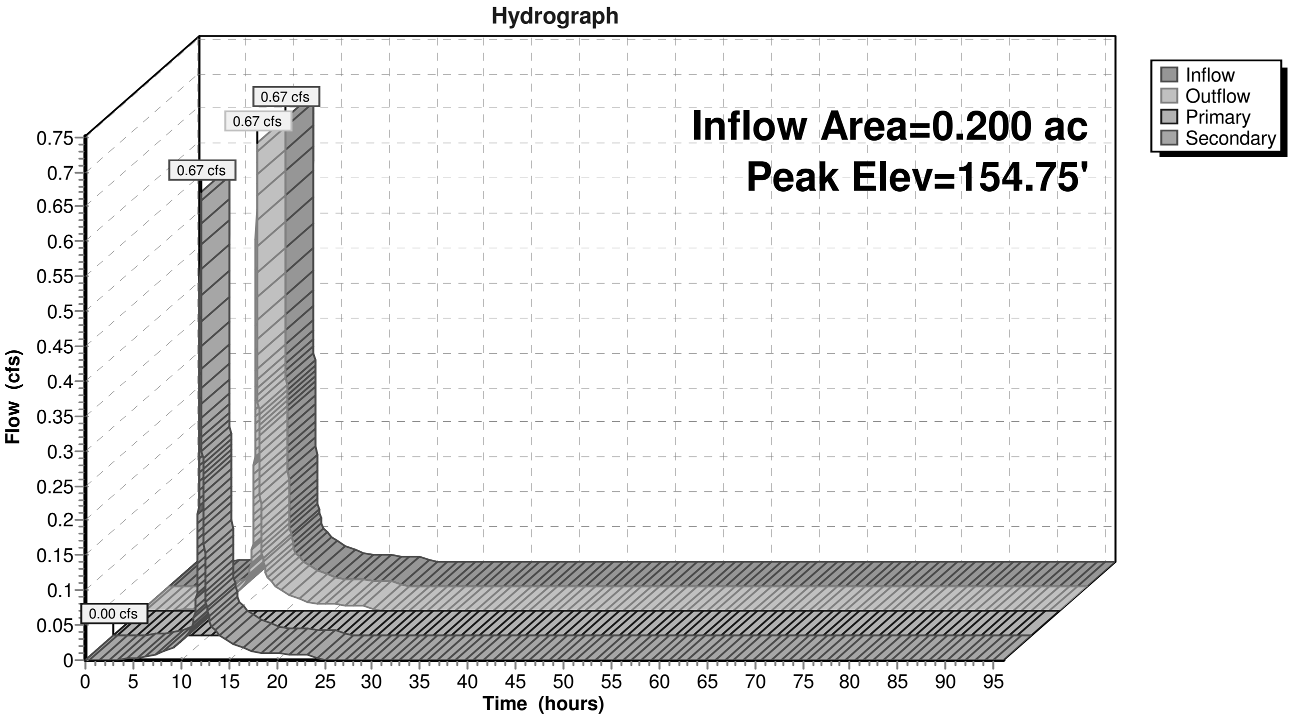
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 154.75' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	154.00'	**12.0" Round Culvert to MH A.9** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 154.00' / 153.50' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	154.25'	**8.0" Round Culvert to SWMF L1** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 154.25' / 154.00' S= 0.0313 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#3	Device 1	154.79'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=154.00' (Free Discharge)
└─**1=Culvert to MH A.9** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.67 cfs @ 12.07 hrs HW=154.75' (Free Discharge)
└─**2=Culvert to SWMF L1** (Inlet Controls 0.67 cfs @ 2.40 fps)

Pond 30P: Div L1 (DS F.2)



Summary for Pond 31P: SWMF-1.1 Bioret

Inflow Area =	0.672 ac,	0.00% Impervious,	Inflow Depth = 0.49"	for 2 year event	
Inflow =	0.19 cfs @	12.29 hrs,	Volume=	0.028 af	
Outflow =	0.03 cfs @	15.27 hrs,	Volume=	0.028 af,	Atten= 84%, Lag= 179.0 min
Discarded =	0.03 cfs @	15.27 hrs,	Volume=	0.028 af	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 156.83' @ 15.27 hrs Surf.Area= 1,289 sf Storage= 400 cf

Plug-Flow detention time= 147.1 min calculated for 0.028 af (100% of inflow)
Center-of-Mass det. time= 147.1 min (1,069.4 - 922.3)

Volume	Invert	Avail.Storage	Storage Description
#1	156.50'	1,373 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

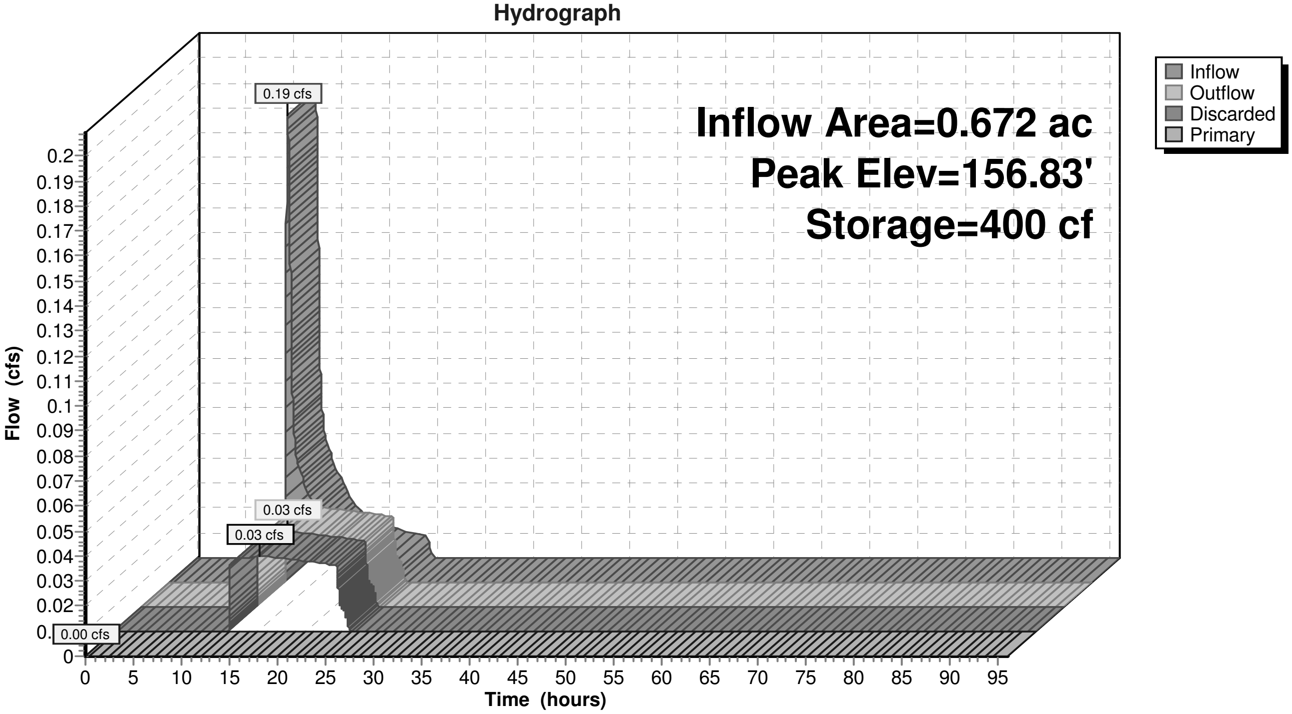
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
156.50	1,133	0	0
157.00	1,370	626	626
157.50	1,620	748	1,373

Device	Routing	Invert	Outlet Devices
#1	Primary	151.67'	**12.0" Round Culvert** L= 18.4' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 151.67' / 151.40' S= 0.0147 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	157.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	156.50'	**1.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.03 cfs @ 15.27 hrs HW=156.83' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=156.50' (Free Discharge)
└─**1=Culvert** (Passes 0.00 cfs of 7.87 cfs potential flow)
  └─**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 31P: SWMF-1.1 Bioret



Summary for Pond 32P: Div 2.2 (DS D.2)

[57] Hint: Peaked at 152.94' (Flood elevation advised)

Inflow Area = 0.655 ac, 43.66% Impervious, Inflow Depth = 1.24" for 2 year event
Inflow = 0.72 cfs @ 12.19 hrs, Volume= 0.068 af
Outflow = 0.72 cfs @ 12.19 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min
Primary = 0.07 cfs @ 12.19 hrs, Volume= 0.001 af
Secondary = 0.65 cfs @ 12.19 hrs, Volume= 0.067 af

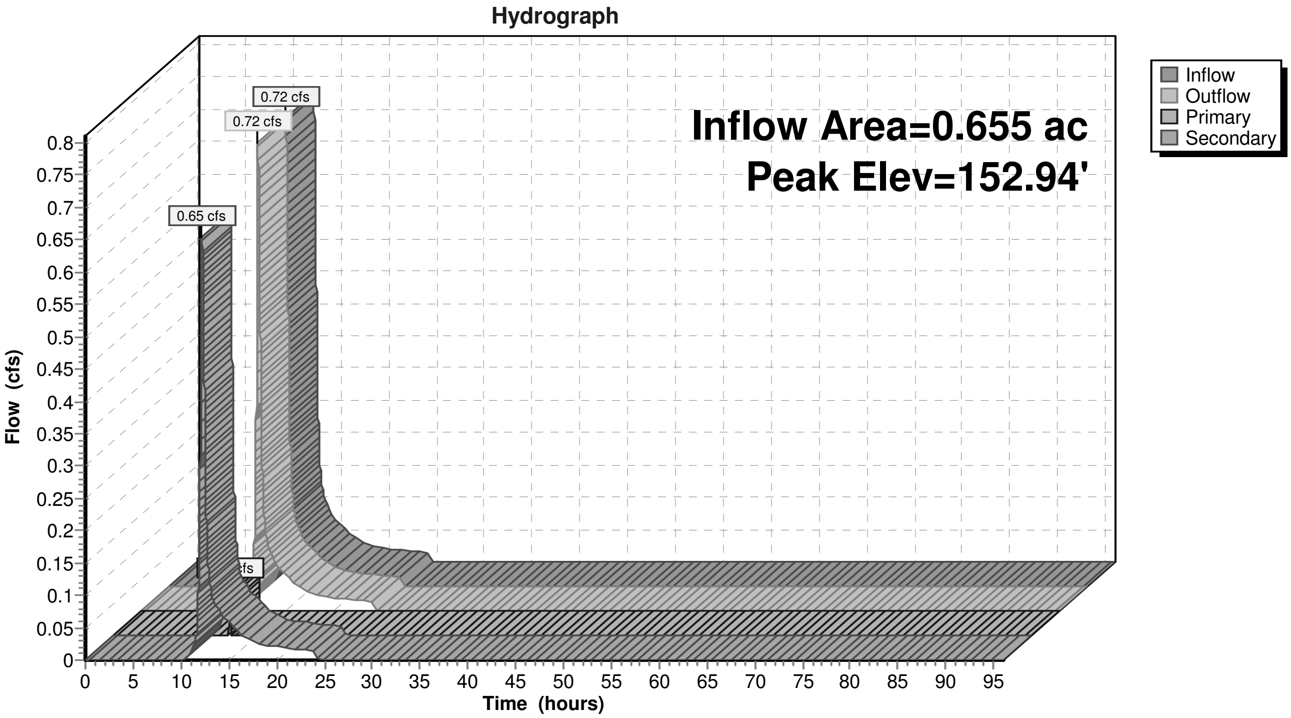
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 152.94' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.75'	**15.0" Round Culvert to Level Spreader** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.75' / 151.50' S= 0.0417 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Secondary	152.50'	**10.0" Round Culvert to SWMF-2.2** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.50' / 152.00' S= 0.0333 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#3	Device 1	152.90'	**3.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.07 cfs @ 12.19 hrs HW=152.94' (Free Discharge)
└─**1=Culvert to Level Spreader** (Passes 0.07 cfs of 0.17 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.07 cfs @ 0.63 fps)

Secondary OutFlow Max=0.65 cfs @ 12.19 hrs HW=152.94' (Free Discharge)
└─**2=Culvert to SWMF-2.2** (Inlet Controls 0.65 cfs @ 2.25 fps)

Pond 32P: Div 2.2 (DS D.2)



Summary for Pond 33P: Div L2.1

[57] Hint: Peaked at 150.34' (Flood elevation advised)

Inflow Area =	0.132 ac, 55.54% Impervious,	Inflow Depth = 1.78"	for 2 year event
Inflow =	0.28 cfs @ 12.08 hrs,	Volume=	0.020 af
Outflow =	0.28 cfs @ 12.08 hrs,	Volume=	0.020 af, Atten= 0%, Lag= 0.0 min
Primary =	0.00 cfs @ 0.00 hrs,	Volume=	0.000 af
Secondary =	0.28 cfs @ 12.08 hrs,	Volume=	0.020 af

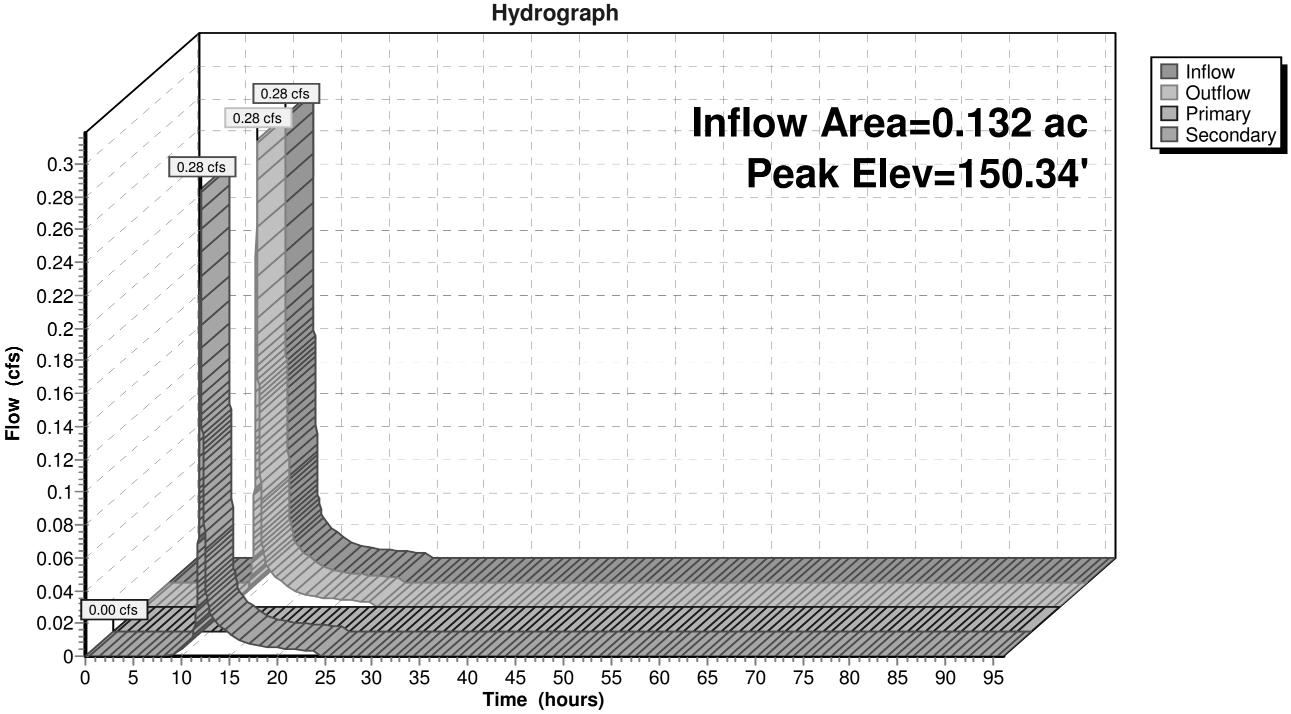
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 150.34' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	150.00'	**8.0" Round Culvert to Node EP E.1** L= 96.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.00' / 146.00' S= 0.0417 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#2	Secondary	150.00'	**6.0" Round Culvert to PTF E.1 & SWMF L2.1** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.00' / 149.70' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 1	150.54'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=150.00' (Free Discharge)
└─**1=Culvert to Node EP E.1** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.28 cfs @ 12.08 hrs HW=150.34' (Free Discharge)
└─**2=Culvert to PTF E.1 & SWMF L2.1** (Inlet Controls 0.28 cfs @ 1.99 fps)

Pond 33P: Div L2.1



Summary for Pond 34P: SWMF-L2.1

Inflow	=	0.28 cfs @	12.08 hrs,	Volume=	0.020 af
Outflow	=	0.06 cfs @	11.82 hrs,	Volume=	0.020 af, Atten= 78%, Lag= 0.0 min
Discarded	=	0.06 cfs @	11.82 hrs,	Volume=	0.020 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 148.30' @ 12.50 hrs Surf.Area= 449 sf Storage= 199 cf

Plug-Flow detention time= 18.4 min calculated for 0.020 af (100% of inflow)
Center-of-Mass det. time= 18.4 min (849.5 - 831.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	147.50'	405 cf	**25.67'W x 17.50'L x 3.54'H Field A** 1,591 cf Overall - 577 cf Embedded = 1,013 cf x 40.0% Voids
#2A	148.00'	577 cf	**Cultec R-330XLHD** x 10 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 5 rows
		983 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	147.50'	**6.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.06 cfs @ 11.82 hrs HW=147.54' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Pond 34P: SWMF-L2.1 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

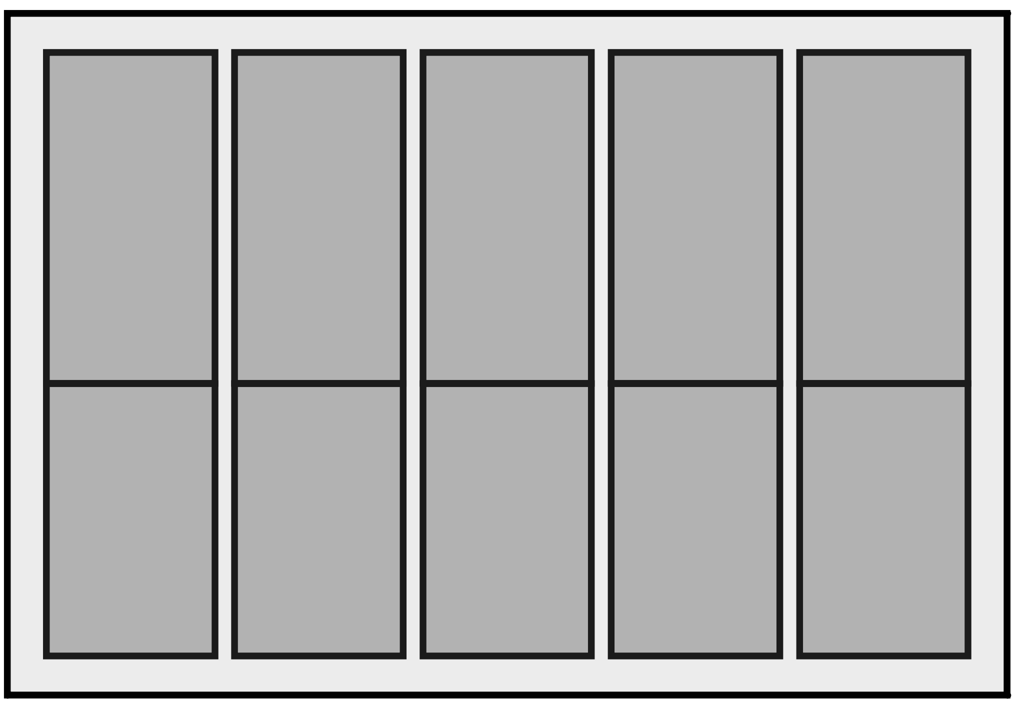
2 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 15.50' Row Length +12.0" End Stone x 2 = 17.50' Base Length
5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

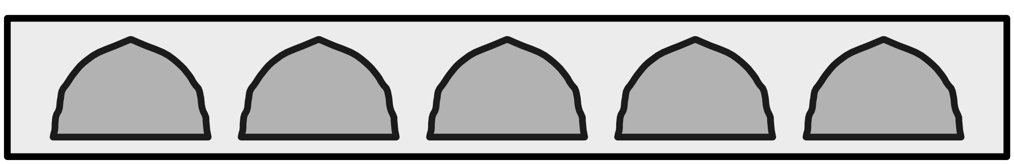
10 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 577.5 cf Chamber Storage

1,590.8 cf Field - 577.5 cf Chambers = 1,013.3 cf Stone x 40.0% Voids = 405.3 cf Stone Storage

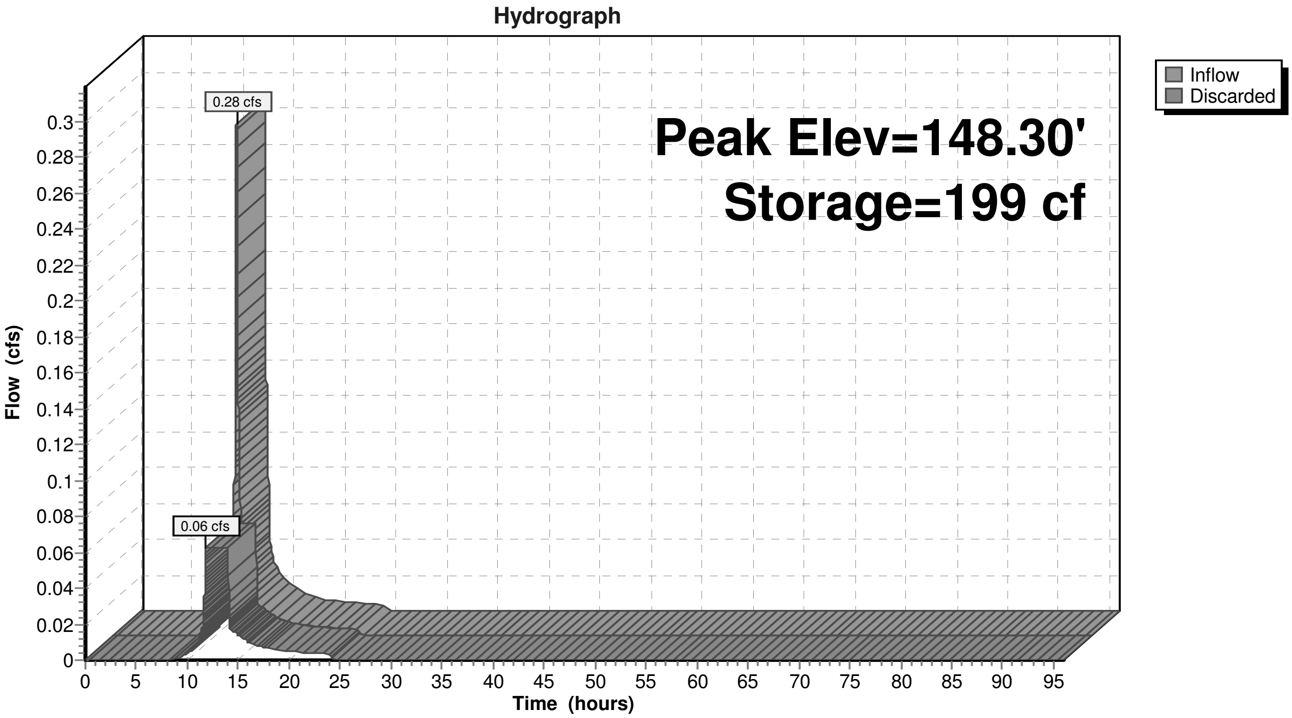
Chamber Storage + Stone Storage = 982.8 cf = 0.023 af
Overall Storage Efficiency = 61.8%

10 Chambers
58.9 cy Field
37.5 cy Stone





Pond 34P: SWMF-L2.1



Summary for Pond 35P: Div 1.2

[57] Hint: Peaked at 154.88' (Flood elevation advised)

Inflow Area =	0.446 ac, 65.47% Impervious, Inflow Depth = 1.94"	for 2 year event	
Inflow =	0.88 cfs @ 12.14 hrs, Volume=	0.072 af	
Outflow =	0.88 cfs @ 12.14 hrs, Volume=	0.072 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.00 cfs @ 0.00 hrs, Volume=	0.000 af	
Secondary =	0.88 cfs @ 12.14 hrs, Volume=	0.072 af	

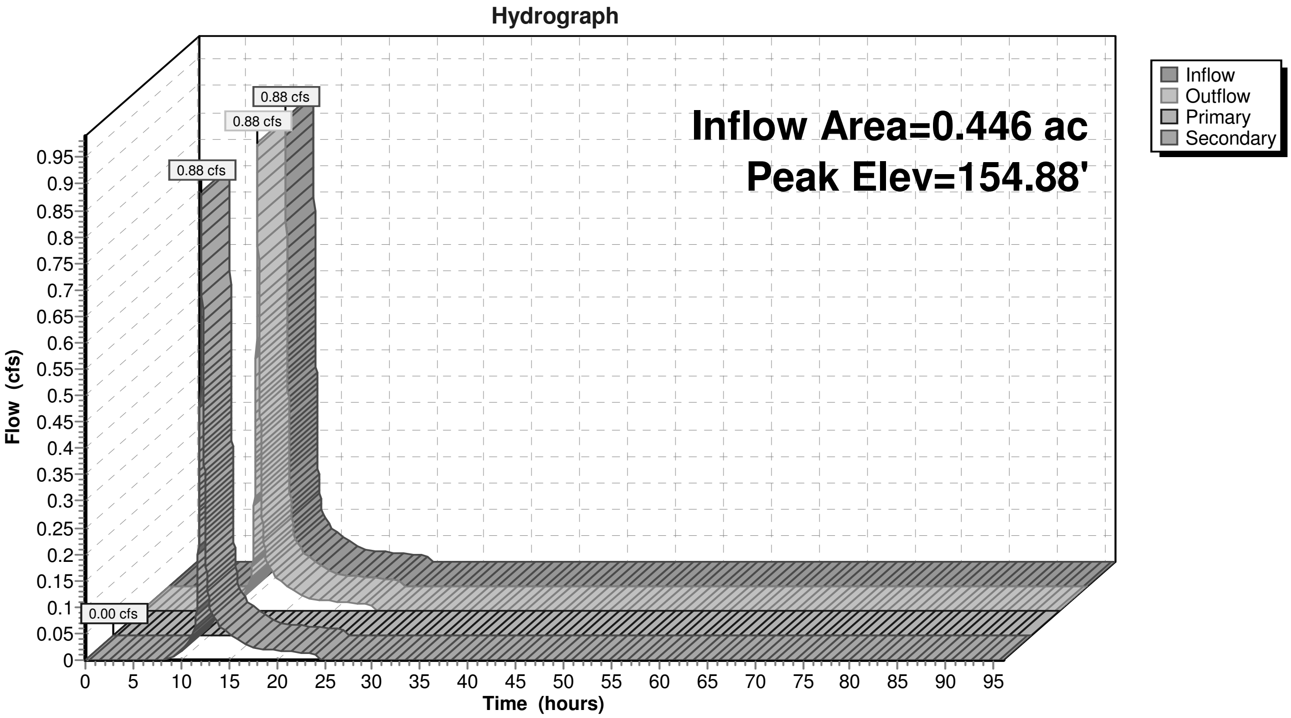
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 154.88' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	153.92'	**12.0" Round Culvert to MH A.6** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 153.92' / 151.00' S= 0.1622 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	153.75'	**6.0" Round Culvert to SWMF-1.2** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 153.75' / 153.50' S= 0.0417 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 1	154.92'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=153.75' (Free Discharge)
└─**1=Culvert to MH A.6** (Controls 0.00 cfs)
 └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.88 cfs @ 12.14 hrs HW=154.88' (Free Discharge)
└─**2=Culvert to SWMF-1.2** (Inlet Controls 0.88 cfs @ 4.51 fps)

Pond 35P: Div 1.2



Summary for Pond 36P: Rain Garden #1 Lot 3

Inflow Area = 0.261 ac, 19.99% Impervious, Inflow Depth = 0.80" for 2 year event
Inflow = 0.18 cfs @ 12.16 hrs, Volume= 0.017 af
Outflow = 0.03 cfs @ 13.46 hrs, Volume= 0.017 af, Atten= 86%, Lag= 78.0 min
Discarded = 0.03 cfs @ 13.46 hrs, Volume= 0.017 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 144.72' @ 13.46 hrs Surf.Area= 1,124 sf Storage= 241 cf

Plug-Flow detention time= 88.6 min calculated for 0.017 af (100% of inflow)
Center-of-Mass det. time= 88.6 min (975.6 - 886.9)

Volume	Invert	Avail.Storage	Storage Description
#1	144.50'	904 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

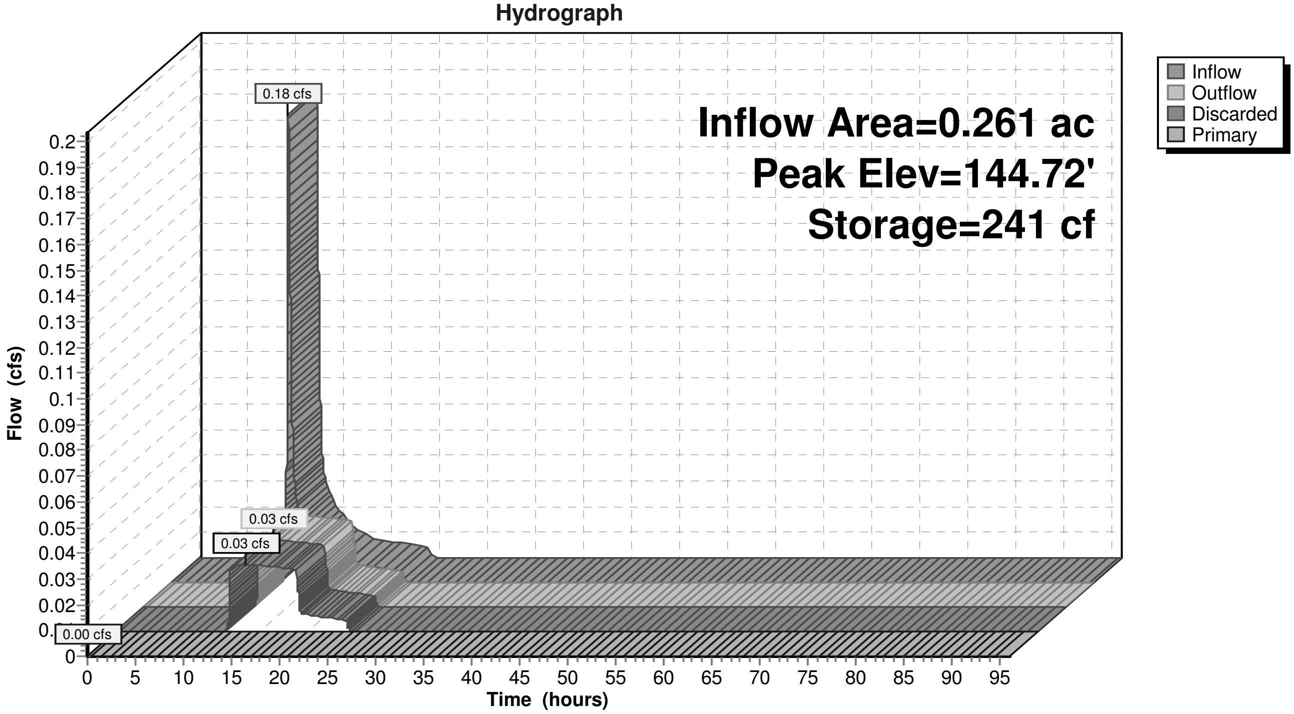
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
144.50	1,025	0	0
144.75	1,135	270	270
145.00	1,245	298	568
145.25	1,450	337	904

Device	Routing	Invert	Outlet Devices
#1	Primary	145.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	144.50'	**1.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 13.46 hrs HW=144.72' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=144.50' (Free Discharge)
└─**1=Orifice/Grate** (Controls 0.00 cfs)

Pond 36P: Rain Garden #1 Lot 3



Summary for Pond 37P: SWMF-1.2

[81] Warning: Exceeded Pond 35P by 0.04' @ 12.78 hrs

Inflow	=	0.88 cfs @	12.14 hrs, Volume=	0.072 af
Outflow	=	0.18 cfs @	11.82 hrs, Volume=	0.072 af, Atten= 79%, Lag= 0.0 min
Discarded	=	0.18 cfs @	11.82 hrs, Volume=	0.072 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 154.02' @ 12.63 hrs Surf.Area= 1,320 sf Storage= 846 cf

Plug-Flow detention time= 29.1 min calculated for 0.072 af (100% of inflow)
Center-of-Mass det. time= 29.1 min (858.3 - 829.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	153.00'	1,184 cf	**23.50'W x 56.17'L x 3.67'H Field A** 4,840 cf Overall - 1,880 cf Embedded = 2,960 cf x 40.0% Voids
#2A	153.50'	1,880 cf	**Cultec R-V8HD** x 32 Inside #1 Effective Size= 55.2"W x 32.0"H => 8.68 sf x 7.50'L = 65.1 cf Overall Size= 60.0"W x 32.0"H x 8.00'L with 0.50' Overlap Row Length Adjustment= -5.83' x 8.68 sf x 4 rows
		3,064 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	153.00'	**6.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.18 cfs @ 11.82 hrs HW=153.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.18 cfs)

Pond 37P: SWMF-1.2 - Chamber Wizard Field A

Chamber Model = Cultec R-V8HD (Cultec Recharger® V8HD)
Effective Size= 55.2"W x 32.0"H => 8.68 sf x 7.50'L = 65.1 cf
Overall Size= 60.0"W x 32.0"H x 8.00'L with 0.50' Overlap
Row Length Adjustment= -5.83' x 8.68 sf x 4 rows

60.0" Wide + 6.0" Spacing = 66.0" C-C Row Spacing

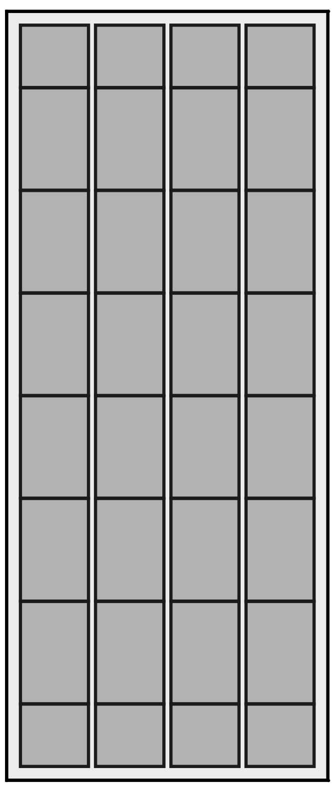
8 Chambers/Row x 7.50' Long -5.83' Row Adjustment = 54.17' Row Length +12.0" End Stone x 2 = 56.17' Base Length
4 Rows x 60.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 23.50' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

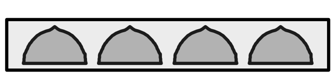
32 Chambers x 65.1 cf -5.83' Row Adjustment x 8.68 sf x 4 Rows = 1,879.9 cf Chamber Storage

4,840.0 cf Field - 1,879.9 cf Chambers = 2,960.1 cf Stone x 40.0% Voids = 1,184.0 cf Stone Storage

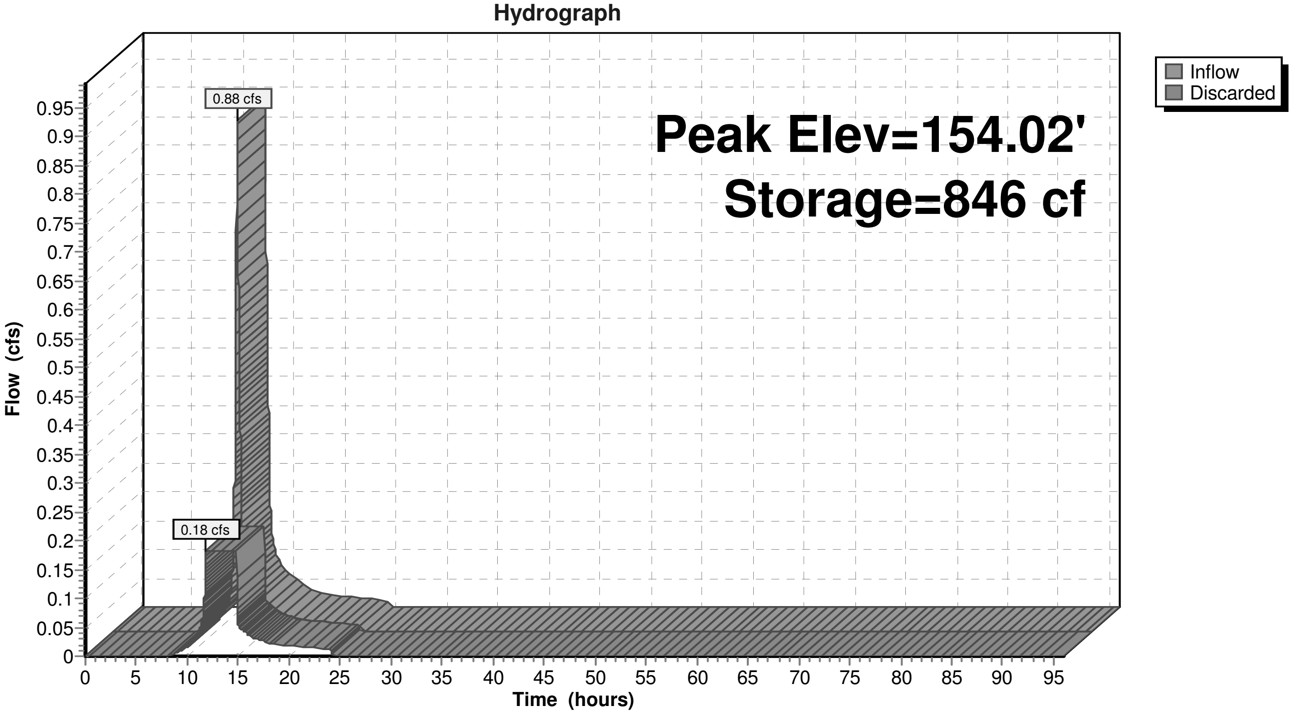
Chamber Storage + Stone Storage = 3,063.9 cf = 0.070 af
Overall Storage Efficiency = 63.3%

32 Chambers
179.3 cy Field
109.6 cy Stone





Pond 37P: SWMF-1.2



Summary for Pond 38P: SWMF-2.2

Inflow	=	0.65 cfs @	12.19 hrs,	Volume=	0.067 af
Outflow	=	0.16 cfs @	12.03 hrs,	Volume=	0.067 af, Atten= 75%, Lag= 0.0 min
Discarded	=	0.16 cfs @	12.03 hrs,	Volume=	0.067 af
Primary	=	0.00 cfs @	0.00 hrs,	Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 150.89' @ 12.78 hrs Surf.Area= 1,160 sf Storage= 805 cf

Plug-Flow detention time= 36.4 min calculated for 0.067 af (100% of inflow)
Center-of-Mass det. time= 36.4 min (901.1 - 864.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	149.50'	450 cf	**16.00'W x 31.50'L x 3.54'H Field A** 1,785 cf Overall - 659 cf Embedded = 1,126 cf x 40.0% Voids
#2A	150.00'	659 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 3 rows
#3B	150.00'	578 cf	**20.83'W x 31.50'L x 3.54'H Field B** 2,324 cf Overall - 879 cf Embedded = 1,445 cf x 40.0% Voids
#4B	150.50'	879 cf	**Cultec R-330XLHD** x 16 Inside #3 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 4 rows
		2,567 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	149.50'	**6.000 in/hr Exfiltration over Horizontal area**
#2	Primary	153.00'	**8.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 153.00' / 151.50' S= 0.1000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf

Discarded OutFlow Max=0.16 cfs @ 12.03 hrs HW=150.00' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=149.50' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)

Pond 38P: SWMF-2.2 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

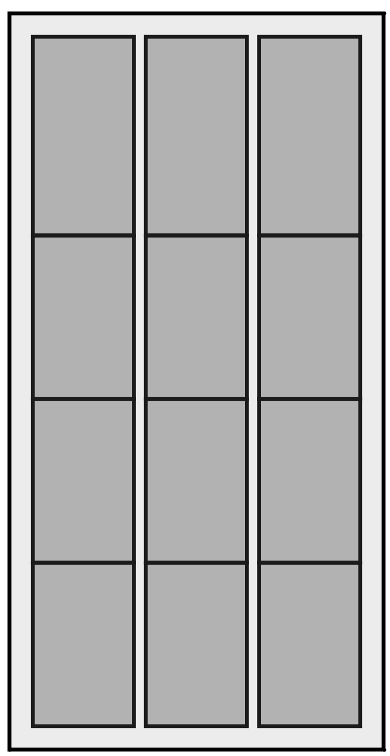
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

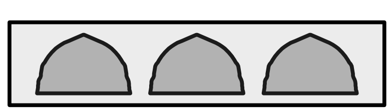
12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 659.4 cf Chamber Storage

1,785.0 cf Field - 659.4 cf Chambers = 1,125.6 cf Stone x 40.0% Voids = 450.2 cf Stone Storage

Chamber Storage + Stone Storage = 1,109.6 cf = 0.025 af
Overall Storage Efficiency = 62.2%

12 Chambers
66.1 cy Field
41.7 cy Stone





Pond 38P: SWMF-2.2 - Chamber Wizard Field B

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

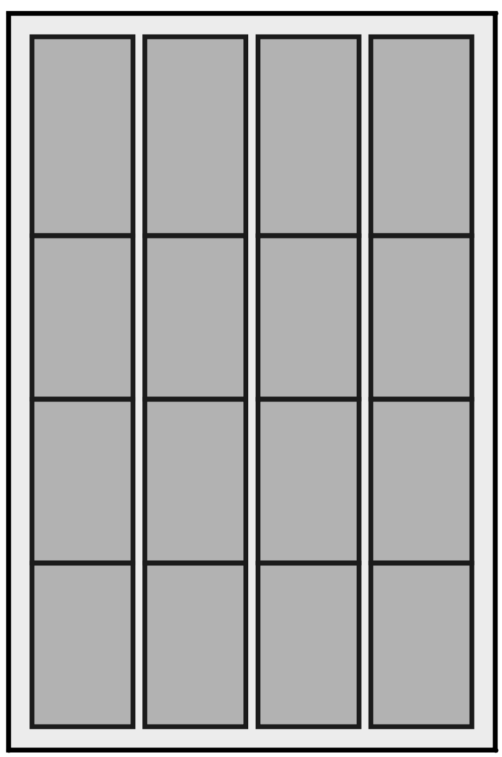
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

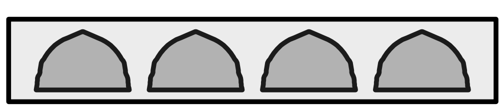
16 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 879.2 cf Chamber Storage

2,324.2 cf Field - 879.2 cf Chambers = 1,445.0 cf Stone x 40.0% Voids = 578.0 cf Stone Storage

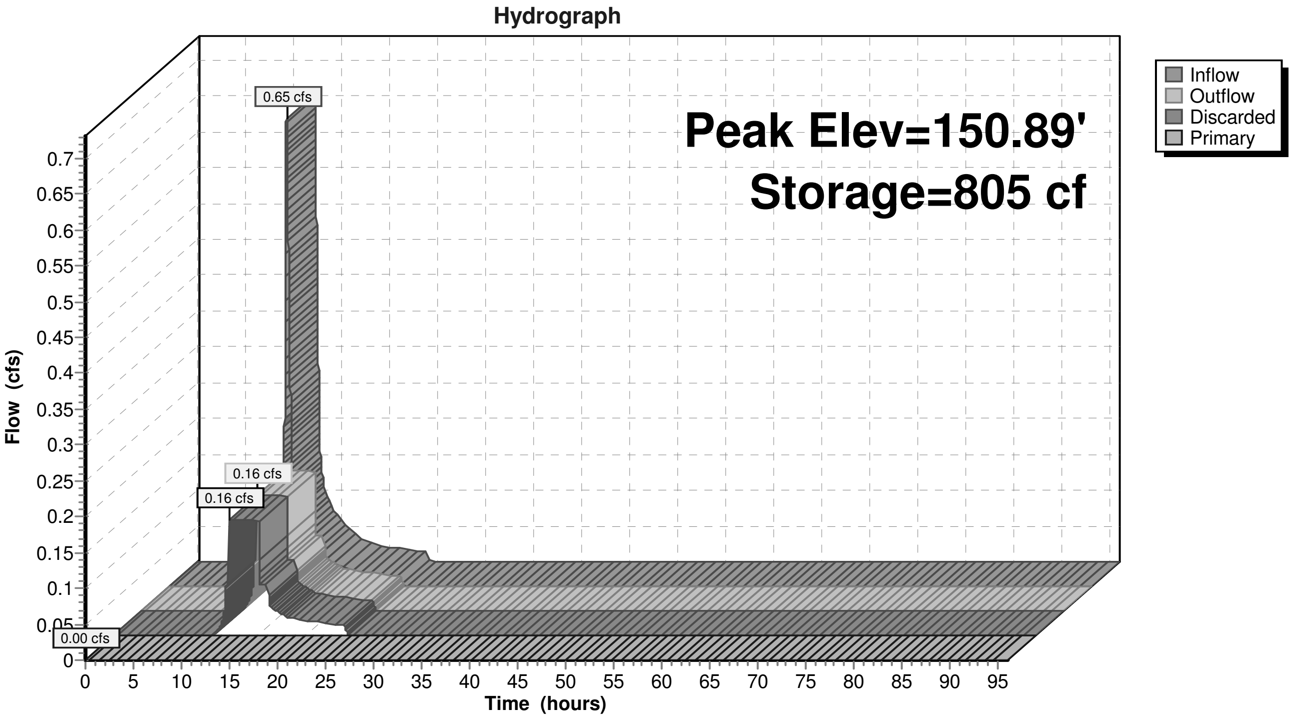
Chamber Storage + Stone Storage = 1,457.2 cf = 0.033 af
Overall Storage Efficiency = 62.7%

16 Chambers
86.1 cy Field
53.5 cy Stone





Pond 38P: SWMF-2.2



Summary for Pond 39P: SWMF-L2.2

Inflow	=	0.35 cfs @	12.07 hrs,	Volume=	0.027 af
Outflow	=	0.07 cfs @	11.71 hrs,	Volume=	0.027 af, Atten= 80%, Lag= 0.0 min
Discarded	=	0.07 cfs @	11.71 hrs,	Volume=	0.027 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 135.89' @ 12.48 hrs Surf.Area= 504 sf Storage= 262 cf

Plug-Flow detention time= 18.9 min calculated for 0.027 af (100% of inflow)
Center-of-Mass det. time= 18.9 min (772.6 - 753.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	135.00'	450 cf	**16.00'W x 31.50'L x 3.54'H Field A** 1,785 cf Overall - 659 cf Embedded = 1,126 cf x 40.0% Voids
#2A	135.50'	659 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 3 rows
		1,110 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	135.00'	**6.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.07 cfs @ 11.71 hrs HW=135.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Pond 39P: SWMF-L2.2 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

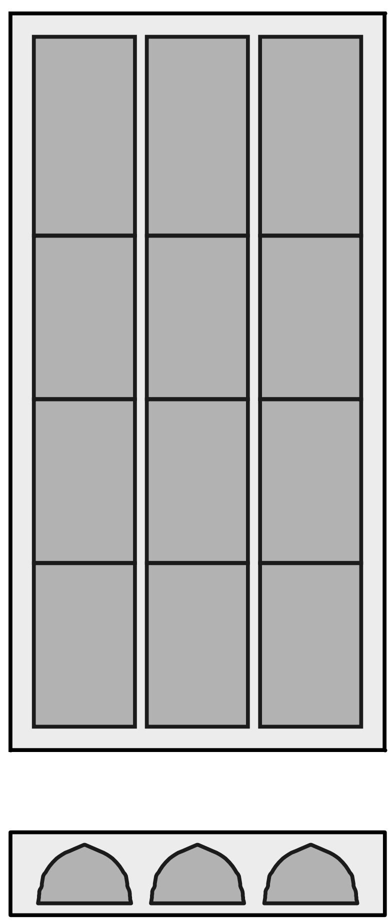
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 659.4 cf Chamber Storage

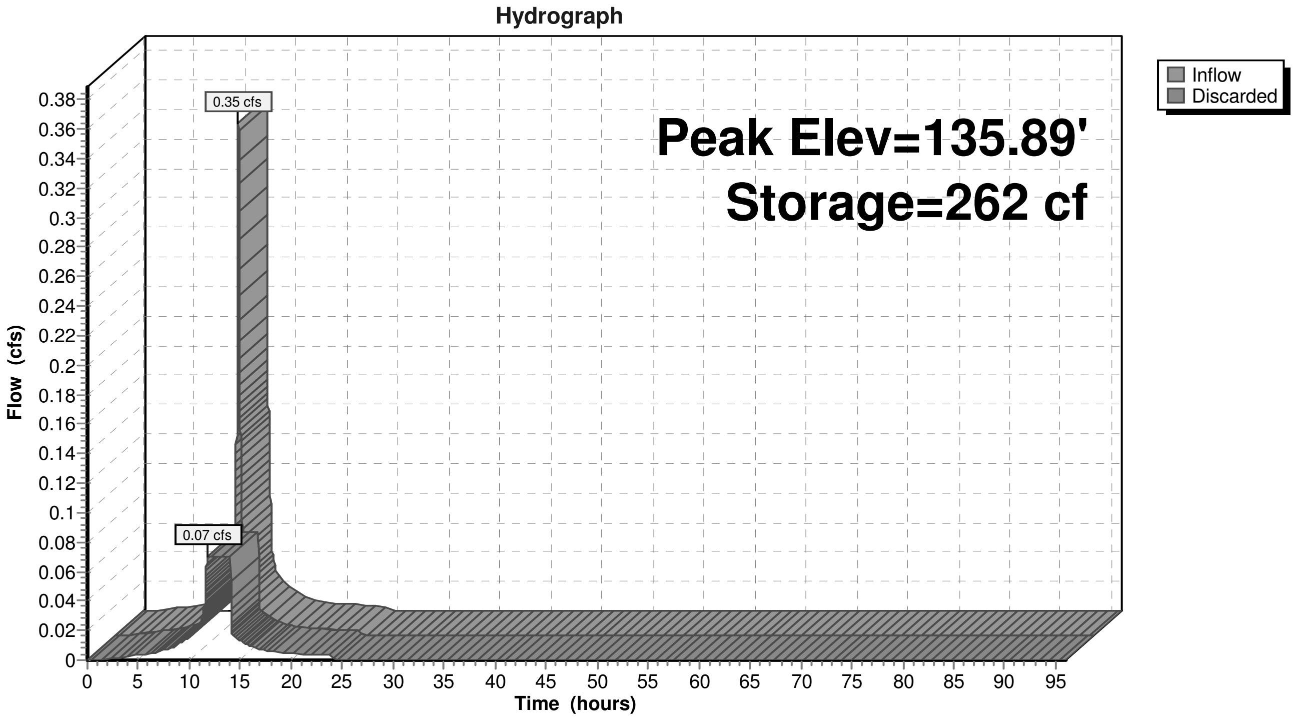
1,785.0 cf Field - 659.4 cf Chambers = 1,125.6 cf Stone x 40.0% Voids = 450.2 cf Stone Storage

Chamber Storage + Stone Storage = 1,109.6 cf = 0.025 af
Overall Storage Efficiency = 62.2%

12 Chambers
66.1 cy Field
41.7 cy Stone



Pond 39P: SWMF-L2.2



Summary for Pond 40P: Div L2.2

[57] Hint: Peaked at 137.89' (Flood elevation advised)

Inflow Area = 0.098 ac,100.00% Impervious, Inflow Depth = 3.27" for 2 year event
Inflow = 0.35 cfs @ 12.07 hrs, Volume= 0.027 af
Outflow = 0.35 cfs @ 12.07 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.35 cfs @ 12.07 hrs, Volume= 0.027 af

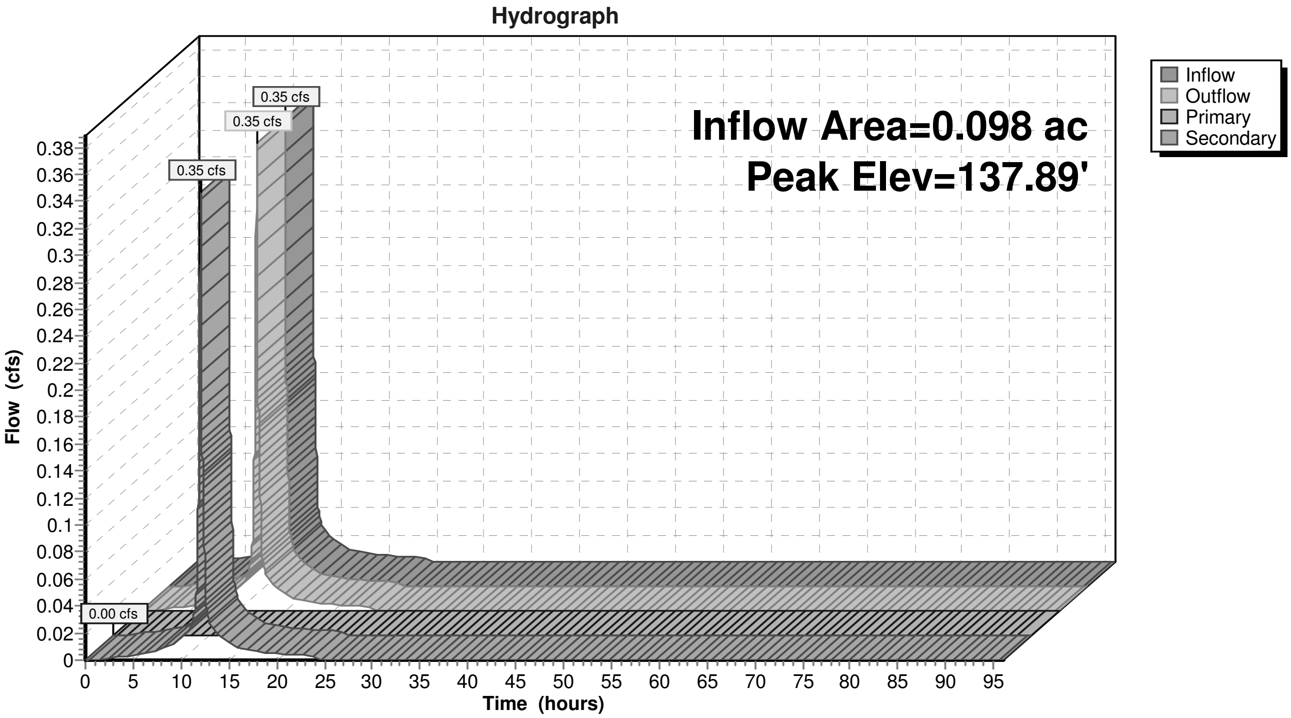
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 137.89' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	138.00'	**12.0" Round Culvert to MH C.1** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 138.00' / 134.00' S= 0.0800 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	137.50'	**6.0" Round Culvert to SWMF L2.2** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 137.50' / 136.00' S= 0.3000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 1	138.04'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=137.50' (Free Discharge)
└—**1=Culvert to MH C.1** (Controls 0.00 cfs)
  └—**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.35 cfs @ 12.07 hrs HW=137.89' (Free Discharge)
└—**2=Culvert to SWMF L2.2** (Inlet Controls 0.35 cfs @ 2.12 fps)

Pond 40P: Div L2.2



Summary for Pond 41P: Rain Garden #2 Lot 3

Inflow Area =	0.098 ac,	23.68% Impervious,	Inflow Depth = 0.90"	for 2 year event	
Inflow =	0.08 cfs @	12.16 hrs,	Volume=	0.007 af	
Outflow =	0.02 cfs @	12.81 hrs,	Volume=	0.007 af,	Atten= 80%, Lag= 39.4 min
Discarded =	0.02 cfs @	12.81 hrs,	Volume=	0.007 af	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 152.13' @ 12.81 hrs Surf.Area= 700 sf Storage= 88 cf

Plug-Flow detention time= 44.0 min calculated for 0.007 af (100% of inflow)
Center-of-Mass det. time= 43.9 min (923.7 - 879.7)

Volume	Invert	Avail.Storage	Storage Description
#1	152.00'	875 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

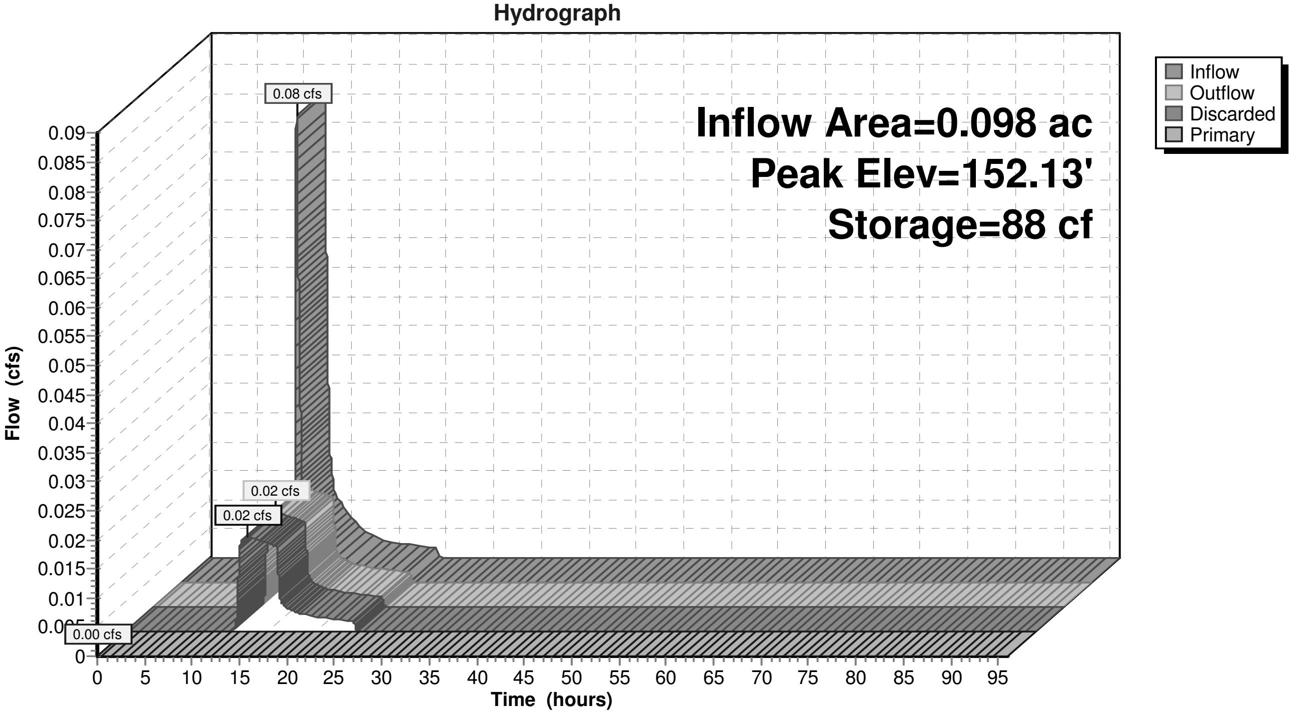
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
152.00	620	0	0
152.25	770	174	174
152.50	920	211	385
153.00	1,038	490	875

Device	Routing	Invert	Outlet Devices
#1	Primary	152.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	152.00'	**1.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.81 hrs HW=152.13' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=152.00' (Free Discharge)
└─**1=Orifice/Grate** (Controls 0.00 cfs)

Pond 41P: Rain Garden #2 Lot 3

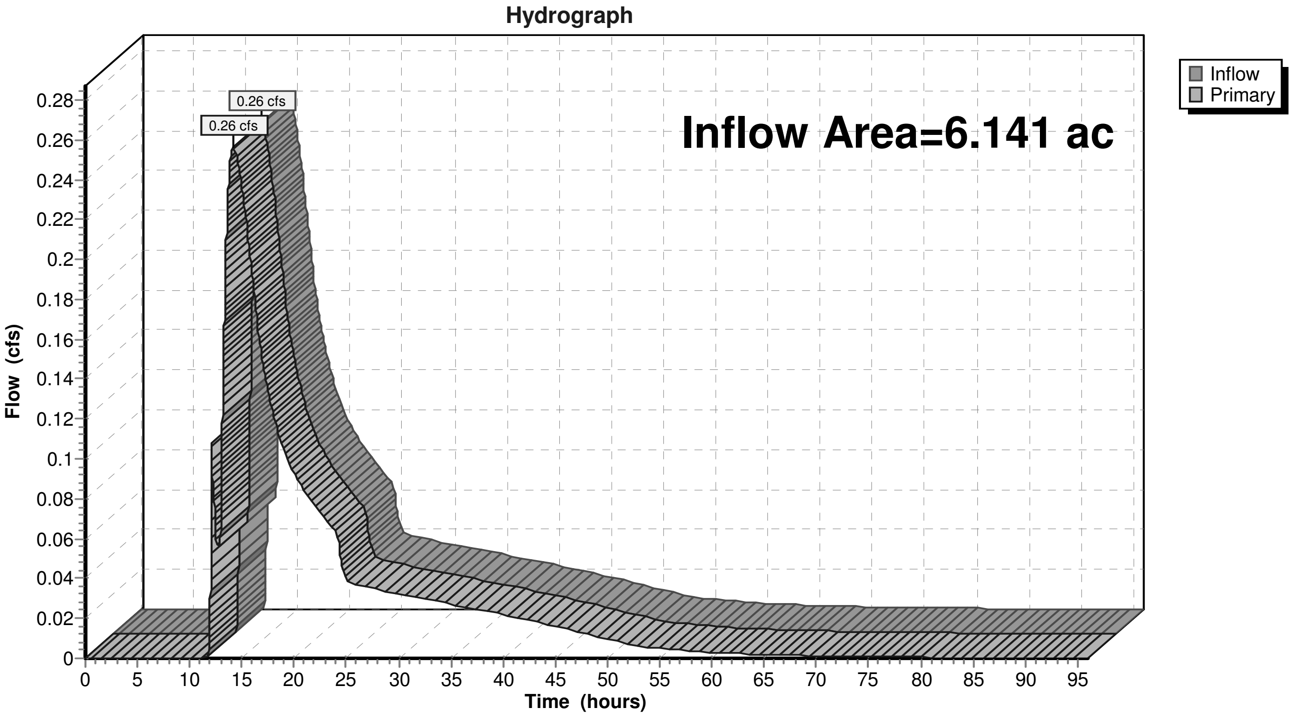


Summary for Link 19L: Design Point 1

Inflow Area =	6.141 ac, 15.53% Impervious, Inflow Depth > 0.37" for 2 year event			
Inflow =	0.26 cfs @	14.16 hrs, Volume=	0.190 af	
Primary =	0.26 cfs @	14.16 hrs, Volume=	0.190 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 19L: Design Point 1

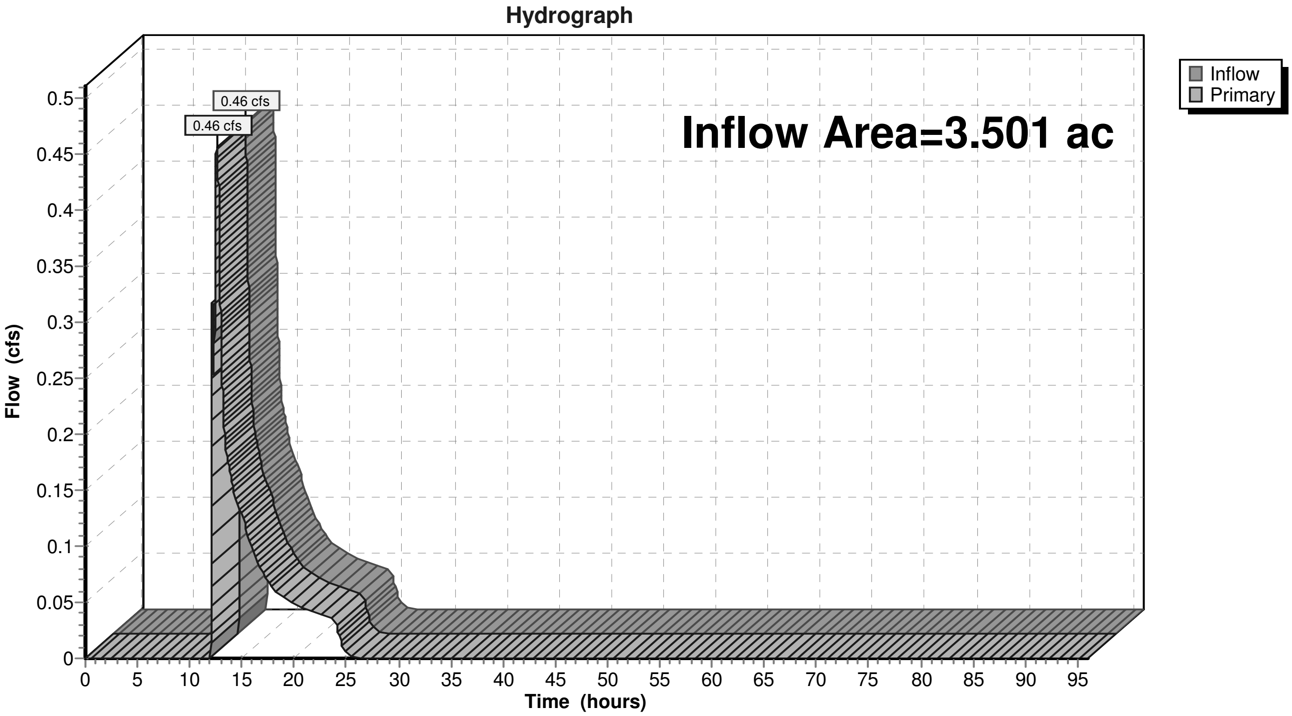


Summary for Link 22L: Design Point 2

Inflow Area = 3.501 ac, 9.03% Impervious, Inflow Depth = 0.35" for 2 year event
Inflow = 0.46 cfs @ 12.62 hrs, Volume= 0.102 af
Primary = 0.46 cfs @ 12.62 hrs, Volume= 0.102 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 22L: Design Point 2

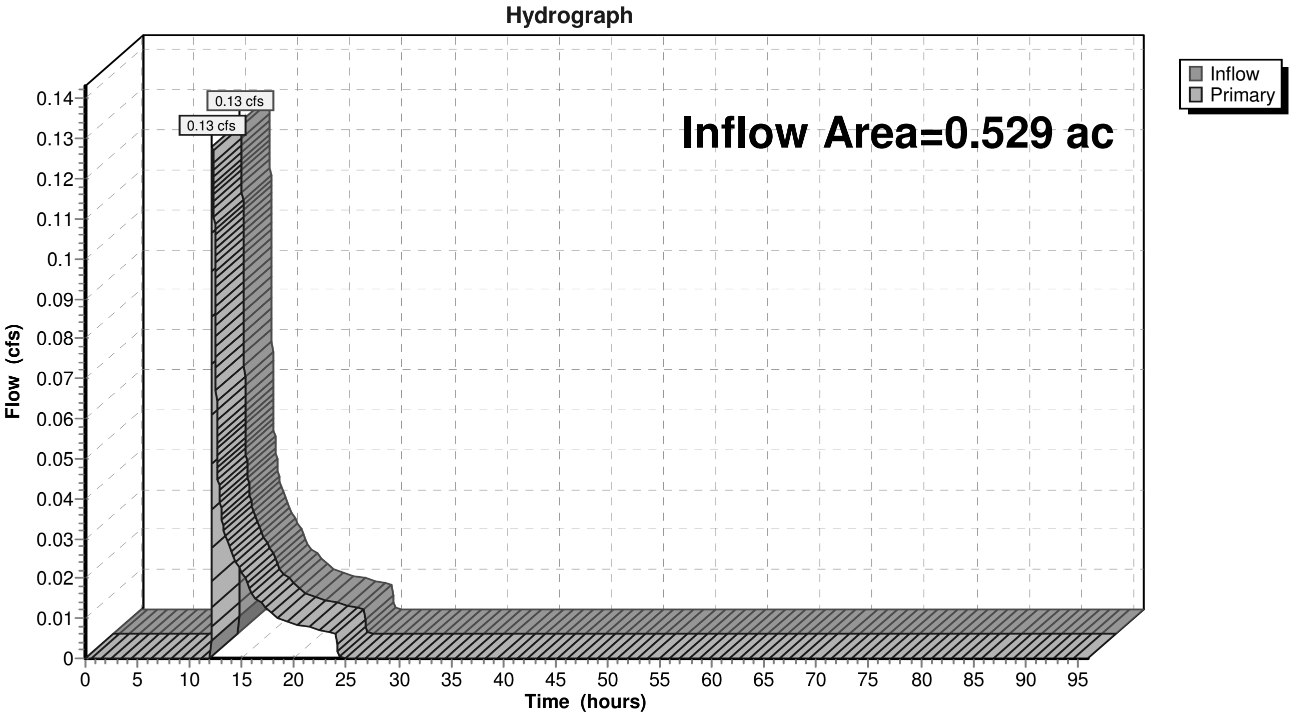


Summary for Link 25L: Design Point 3

Inflow Area = 0.529 ac, 0.00% Impervious, Inflow Depth = 0.42" for 2 year event
Inflow = 0.13 cfs @ 12.16 hrs, Volume= 0.018 af
Primary = 0.13 cfs @ 12.16 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 25L: Design Point 3

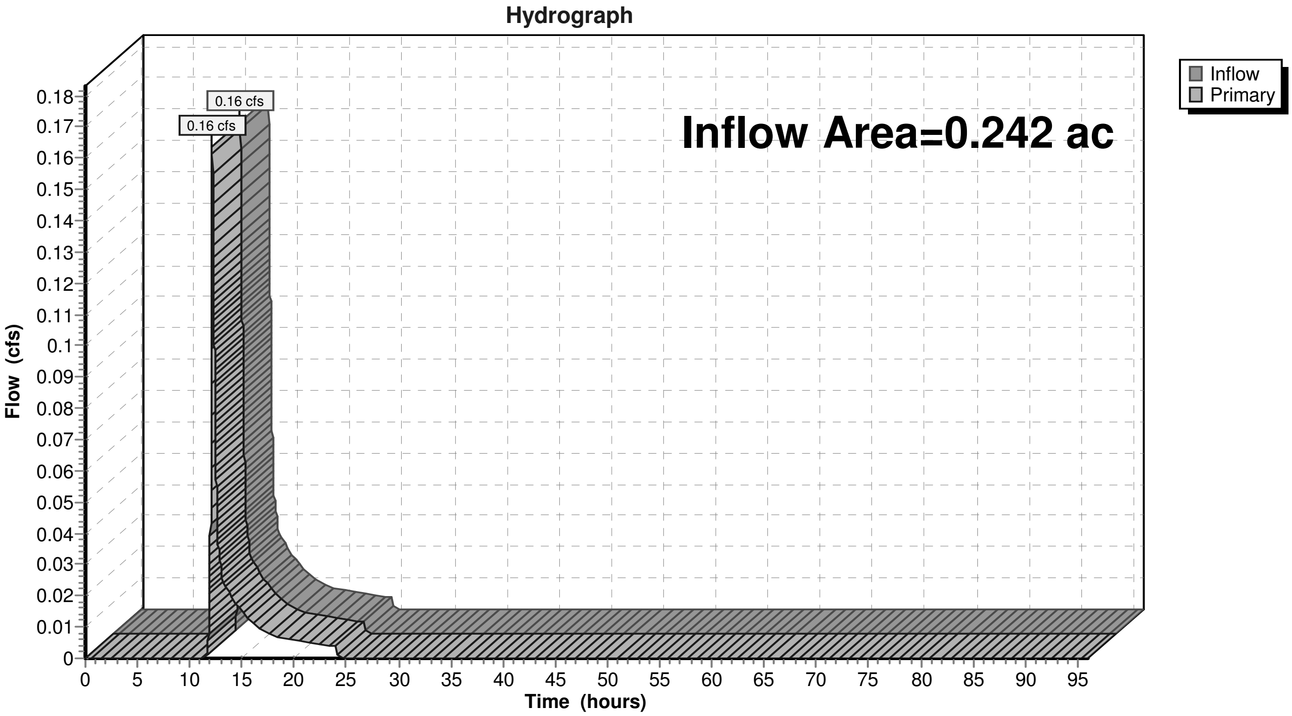


Summary for Link 28L: Design Point 4

Inflow Area = 0.242 ac, 0.00% Impervious, Inflow Depth = 0.75" for 2 year event
Inflow = 0.16 cfs @ 12.14 hrs, Volume= 0.015 af
Primary = 0.16 cfs @ 12.14 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 28L: Design Point 4



Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 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: FDA-2.2 Runoff Area=28,532 sf 43.66% Impervious Runoff Depth=2.36"
Flow Length=483' Tc=13.2 min CN=74 Runoff=1.43 cfs 0.129 af

Subcatchment 2S: FDA-1.2 Runoff Area=19,428 sf 65.47% Impervious Runoff Depth=3.27"
Tc=10.0 min CN=84 Runoff=1.49 cfs 0.122 af

Subcatchment 4S: XDA4 Runoff Area=10,541 sf 0.00% Impervious Runoff Depth=1.65"
Flow Length=100' Slope=0.1900 '/' Tc=8.3 min CN=65 Runoff=0.41 cfs 0.033 af

Subcatchment 5S: FDA-L2.1 Runoff Area=5,735 sf 55.54% Impervious Runoff Depth=3.08"
Tc=5.0 min CN=82 Runoff=0.49 cfs 0.034 af

Subcatchment 6S: FDA-L3.1 Runoff Area=11,384 sf 19.99% Impervious Runoff Depth=1.73"
Tc=10.0 min CN=66 Runoff=0.44 cfs 0.038 af

Subcatchment 20S: FDA-1.3 Runoff Area=177,542 sf 5.71% Impervious Runoff Depth=1.30"
Flow Length=974' Tc=17.9 min CN=60 Runoff=3.89 cfs 0.442 af

Subcatchment 21S: FDA-1.4 Runoff Area=6,857 sf 0.00% Impervious Runoff Depth=1.58"
Flow Length=87' Tc=5.5 min CN=64 Runoff=0.28 cfs 0.021 af

Subcatchment 23S: FDA-L1 Runoff Area=8,712 sf 91.00% Impervious Runoff Depth=4.42"
Tc=5.0 min CN=95 Runoff=0.99 cfs 0.074 af

Subcatchment 24S: FDA-2.1 Runoff Area=38,768 sf 0.00% Impervious Runoff Depth=1.17"
Flow Length=141' Tc=6.3 min CN=58 Runoff=1.04 cfs 0.087 af

Subcatchment 26S: FDA-3 Runoff Area=23,055 sf 0.00% Impervious Runoff Depth=1.10"
Flow Length=156' Tc=7.6 min CN=57 Runoff=0.55 cfs 0.049 af

Subcatchment 27S: FDA-4 Runoff Area=10,545 sf 0.00% Impervious Runoff Depth=1.65"
Flow Length=100' Slope=0.1900 '/' Tc=8.3 min CN=65 Runoff=0.41 cfs 0.033 af

Subcatchment 29S: FDA-L2.2 Runoff Area=4,285 sf 100.00% Impervious Runoff Depth=4.76"
Tc=5.0 min CN=98 Runoff=0.50 cfs 0.039 af

Subcatchment 30S: XDA1 Runoff Area=208,652 sf 1.02% Impervious Runoff Depth=1.04"
Flow Length=1,046' Tc=25.6 min CN=56 Runoff=2.94 cfs 0.416 af

Subcatchment 31S: FDA-1.1 Runoff Area=29,272 sf 0.00% Impervious Runoff Depth=1.23"
Tc=15.0 min CN=59 Runoff=0.64 cfs 0.069 af

Subcatchment 32S: FDA-2.3 Runoff Area=85,225 sf 1.54% Impervious Runoff Depth=1.10"
Flow Length=401' Tc=14.7 min CN=57 Runoff=1.61 cfs 0.180 af

Subcatchment 33S: XDA2 Runoff Area=211,963 sf 1.03% Impervious Runoff Depth=0.98"
Flow Length=544' Tc=15.5 min CN=55 Runoff=3.30 cfs 0.397 af

Subcatchment 34S: XDA3 Runoff Area=23,043 sf 0.00% Impervious Runoff Depth=0.98"
Flow Length=156' Tc=8.3 min CN=55 Runoff=0.45 cfs 0.043 af

Subcatchment 35S: FDA-L3.2 Runoff Area=4,286 sf 23.68% Impervious Runoff Depth=1.88"
Tc=10.0 min CN=68 Runoff=0.18 cfs 0.015 af

Reach 30R: Vegetated Swale Avg. Flow Depth=0.58' Max Vel=0.79 fps Inflow=1.61 cfs 0.180 af
n=0.240 L=285.0' S=0.0561 '/' Capacity=6.76 cfs Outflow=1.45 cfs 0.180 af

Pond 15P: SWMF Peak Elev=127.47' Storage=8,677 cf Inflow=3.96 cfs 0.481 af
Outflow=2.22 cfs 0.481 af

Pond 29P: SWMF-L1 Peak Elev=153.58' Storage=686 cf Inflow=0.86 cfs 0.073 af
Outflow=0.21 cfs 0.073 af

Pond 30P: Div L1 (DS F.2) Peak Elev=154.84' Inflow=0.99 cfs 0.074 af
Primary=0.12 cfs 0.001 af Secondary=0.86 cfs 0.073 af Outflow=0.99 cfs 0.074 af

Pond 31P: SWMF-1.1 Bioret Peak Elev=157.10' Storage=768 cf Inflow=0.64 cfs 0.069 af
Discarded=0.03 cfs 0.042 af Primary=0.34 cfs 0.027 af Outflow=0.37 cfs 0.069 af

Pond 32P: Div 2.2 (DS D.2) Peak Elev=153.06' Inflow=1.43 cfs 0.129 af
Primary=0.44 cfs 0.010 af Secondary=0.99 cfs 0.119 af Outflow=1.43 cfs 0.129 af

Pond 33P: Div L2.1 Peak Elev=150.52' Inflow=0.49 cfs 0.034 af
Primary=0.00 cfs 0.000 af Secondary=0.49 cfs 0.034 af Outflow=0.49 cfs 0.034 af

Pond 34P: SWMF-L2.1 Peak Elev=149.09' Storage=476 cf Inflow=0.49 cfs 0.034 af
Outflow=0.06 cfs 0.034 af

Pond 35P: Div 1.2 Peak Elev=155.06' Inflow=1.49 cfs 0.122 af
Primary=0.51 cfs 0.006 af Secondary=0.97 cfs 0.116 af Outflow=1.49 cfs 0.122 af

Pond 36P: Rain Garden #1 Lot 3 Peak Elev=145.03' Storage=611 cf Inflow=0.44 cfs 0.038 af
Discarded=0.03 cfs 0.032 af Primary=0.07 cfs 0.005 af Outflow=0.10 cfs 0.038 af

Pond 37P: SWMF-1.2 Peak Elev=154.73' Storage=1,599 cf Inflow=0.97 cfs 0.116 af
Outflow=0.18 cfs 0.116 af

Pond 38P: SWMF-2.2 Peak Elev=152.01' Storage=1,789 cf Inflow=0.99 cfs 0.119 af
Discarded=0.16 cfs 0.119 af Primary=0.00 cfs 0.000 af Outflow=0.16 cfs 0.119 af

Pond 39P: SWMF-L2.2 Peak Elev=136.41' Storage=470 cf Inflow=0.50 cfs 0.039 af
Outflow=0.07 cfs 0.039 af

Pond 40P: Div L2.2 Peak Elev=138.03' Inflow=0.50 cfs 0.039 af
Primary=0.00 cfs 0.000 af Secondary=0.50 cfs 0.039 af Outflow=0.50 cfs 0.039 af

Pond 41P: Rain Garden #2 Lot 3 Peak Elev=152.37' Storage=267 cf Inflow=0.18 cfs 0.015 af
Discarded=0.02 cfs 0.015 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.015 af

Link 19L: Design Point 1 Inflow=2.26 cfs 0.501 af
Primary=2.26 cfs 0.501 af

Link 22L: Design Point 2 Inflow=2.10 cfs 0.277 af
Primary=2.10 cfs 0.277 af

Link 25L: Design Point 3 Inflow=0.55 cfs 0.049 af
Primary=0.55 cfs 0.049 af

Link 28L: Design Point 4 Inflow=0.41 cfs 0.033 af
Primary=0.41 cfs 0.033 af

Total Runoff Area = 20.841 ac Runoff Volume = 2.220 af Average Runoff Depth = 1.28"
93.43% Pervious = 19.472 ac 6.57% Impervious = 1.369 ac

Summary for Subcatchment 1S: FDA-2.2

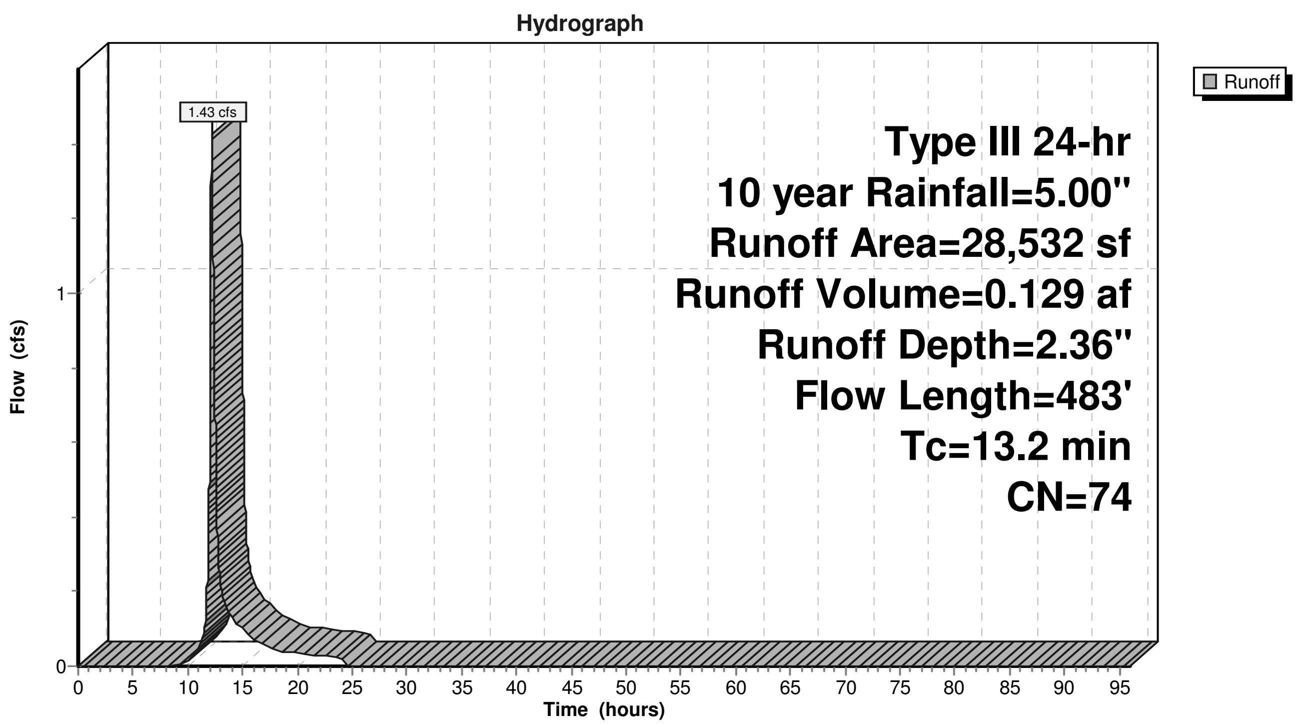
Runoff = 1.43 cfs @ 12.19 hrs, Volume= 0.129 af, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

	Area (sf)	CN	Description
*	11,021	98	Subdivision Road, HSG B
*	1,437	98	Off-site impervious road, HSG B
	1,307	61	>75% Grass cover, Good, HSG B
	14,767	55	Woods, Good, HSG B
	28,532	74	Weighted Average
	16,074		56.34% Pervious Area
	12,458		43.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	100	0.0750	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.6	68	0.1250	1.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	65	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	250	0.0750	13.46	10.57	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
13.2	483	Total			

Subcatchment 1S: FDA-2.2



Summary for Subcatchment 2S: FDA-1.2

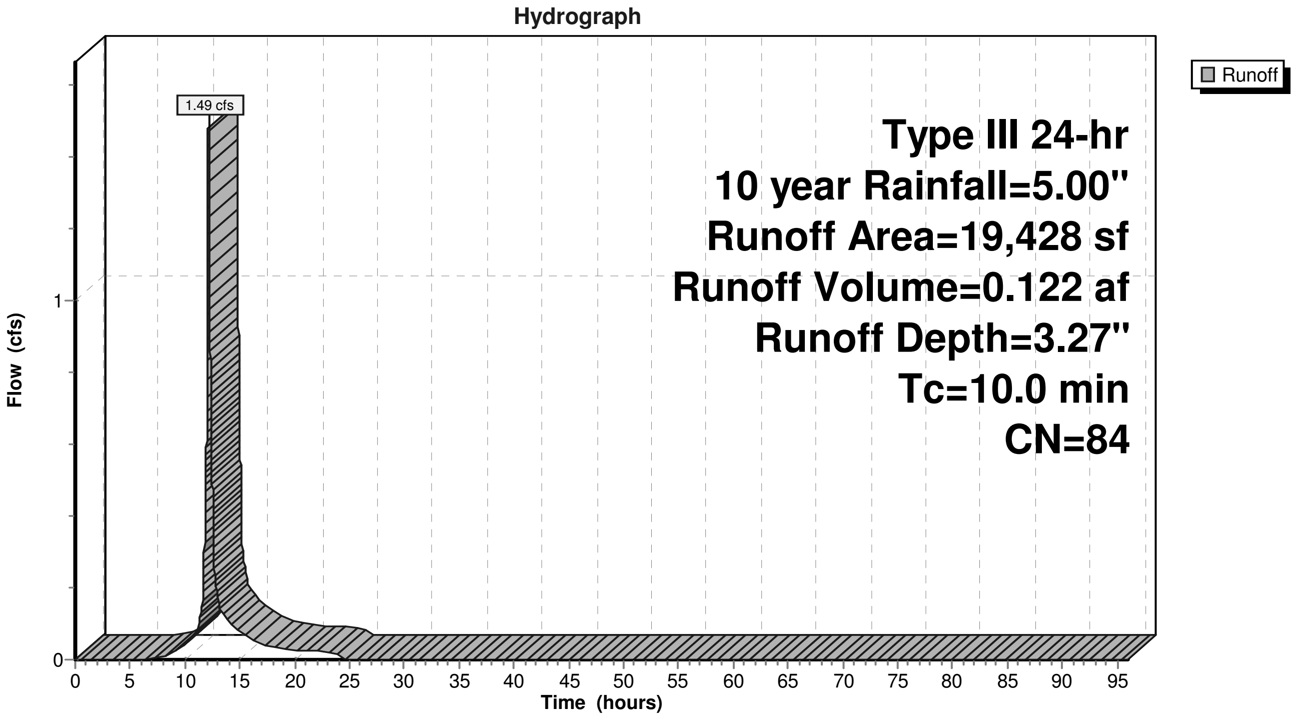
Runoff = 1.49 cfs @ 12.14 hrs, Volume= 0.122 af, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

Area (sf)	CN	Description
12,720	98	Paved parking, HSG B
3,180	61	>75% Grass cover, Good, HSG B
3,528	55	Woods, Good, HSG B
19,428	84	Weighted Average
6,708		34.53% Pervious Area
12,720		65.47% Impervious Area

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

Subcatchment 2S: FDA-1.2



Summary for Subcatchment 4S: XDA4

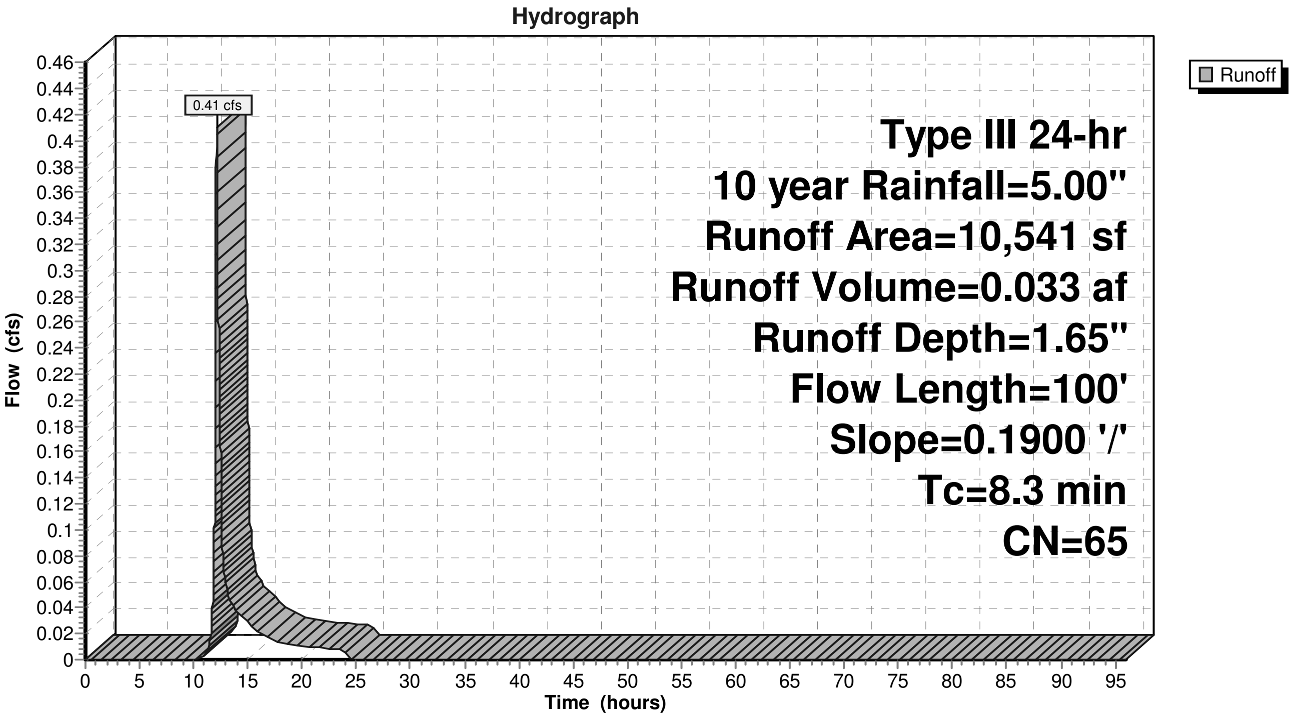
Runoff = 0.41 cfs @ 12.13 hrs, Volume= 0.033 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

Area (sf)	CN	Description
4,225	55	Woods, Good, HSG B
4,225	70	Woods, Good, HSG C
2,091	77	Woods, Good, HSG D
10,541	65	Weighted Average
10,541		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.1900	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"

Subcatchment 4S: XDA4



Summary for Subcatchment 5S: FDA-L2.1

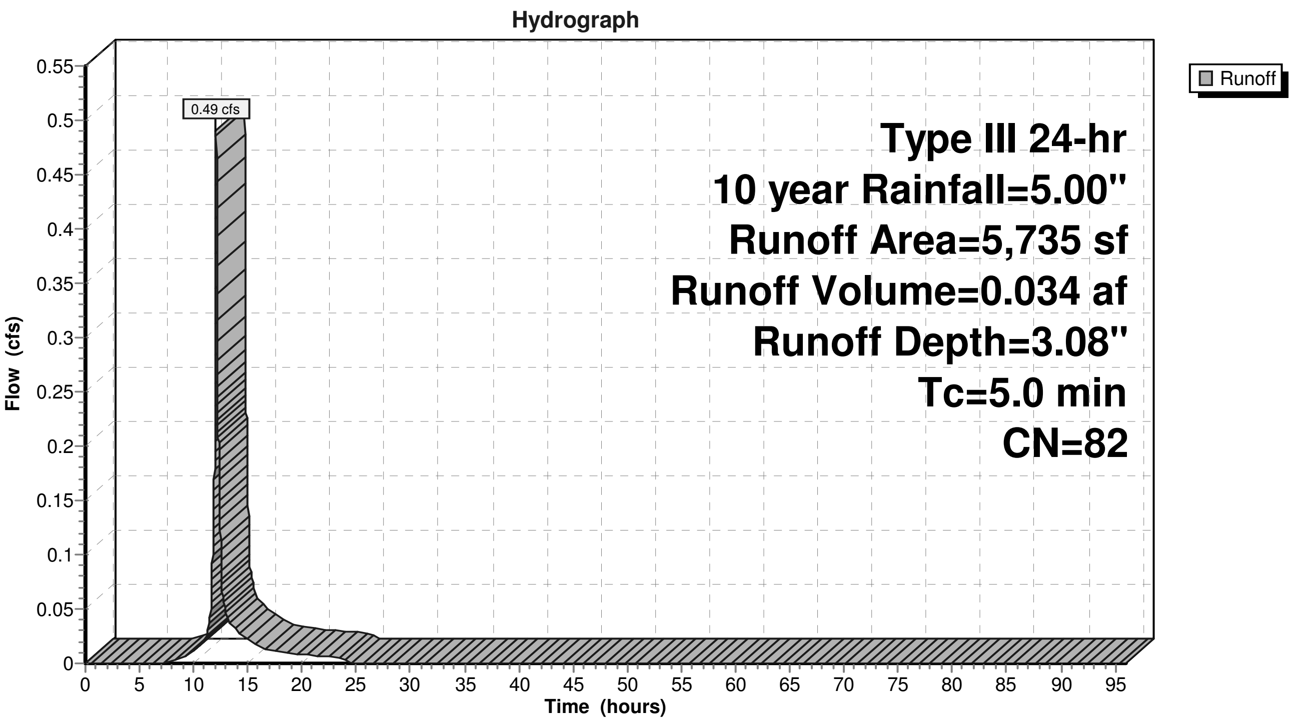
Runoff = 0.49 cfs @ 12.07 hrs, Volume= 0.034 af, Depth= 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

	Area (sf)	CN	Description
*	3,185	98	Driveway and roofs, HSG B
	2,550	61	>75% Grass cover, Good, HSG B
	5,735	82	Weighted Average
	2,550		44.46% Pervious Area
	3,185		55.54% Impervious Area

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

Subcatchment 5S: FDA-L2.1



Summary for Subcatchment 6S: FDA-L3.1

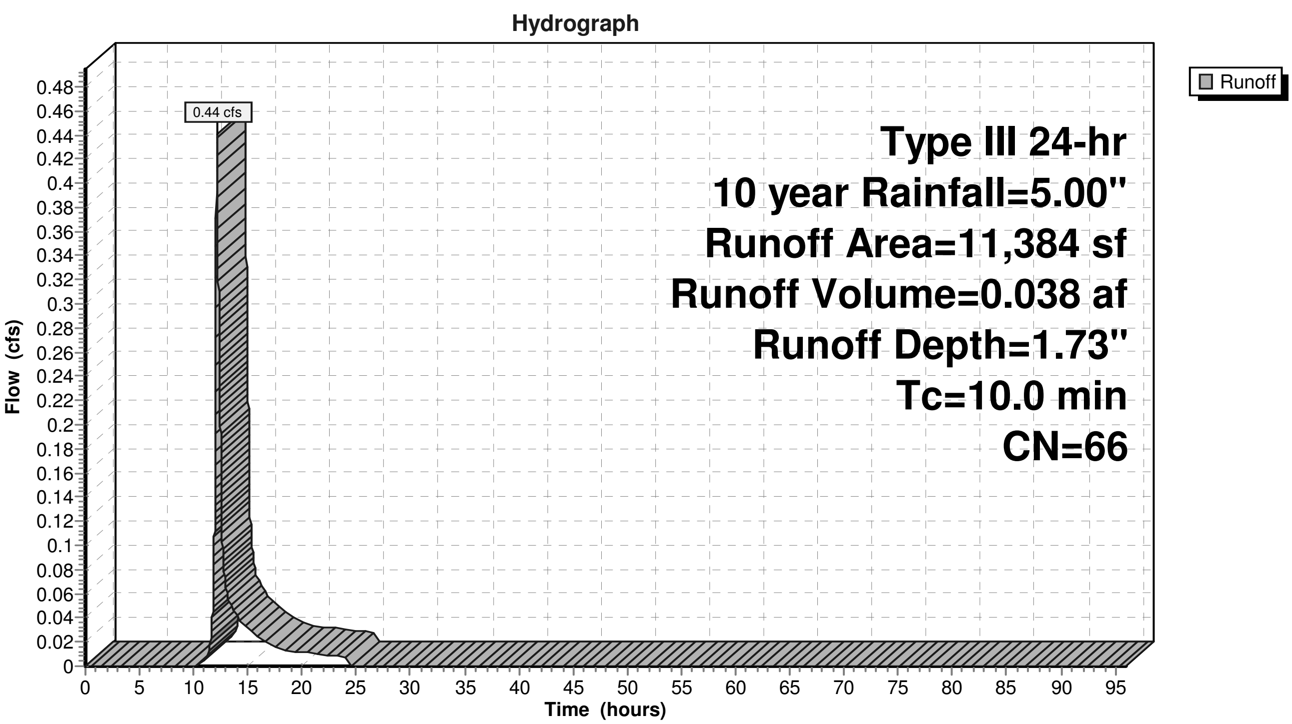
Runoff = 0.44 cfs @ 12.15 hrs, Volume= 0.038 af, Depth= 1.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

	Area (sf)	CN	Description
*	982	98	Lot 3 Roof, HSG B
*	907	98	Lot 3 Roof, HSG B
*	387	98	Walks, Entry Steps, HSG B
	5,387	61	>75% Grass cover, Good, HSG B
	3,721	55	Woods, Good, HSG B
	11,384	66	Weighted Average
	9,108		80.01% Pervious Area
	2,276		19.99% Impervious Area

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

Subcatchment 6S: FDA-L3.1



Summary for Subcatchment 20S: FDA-1.3

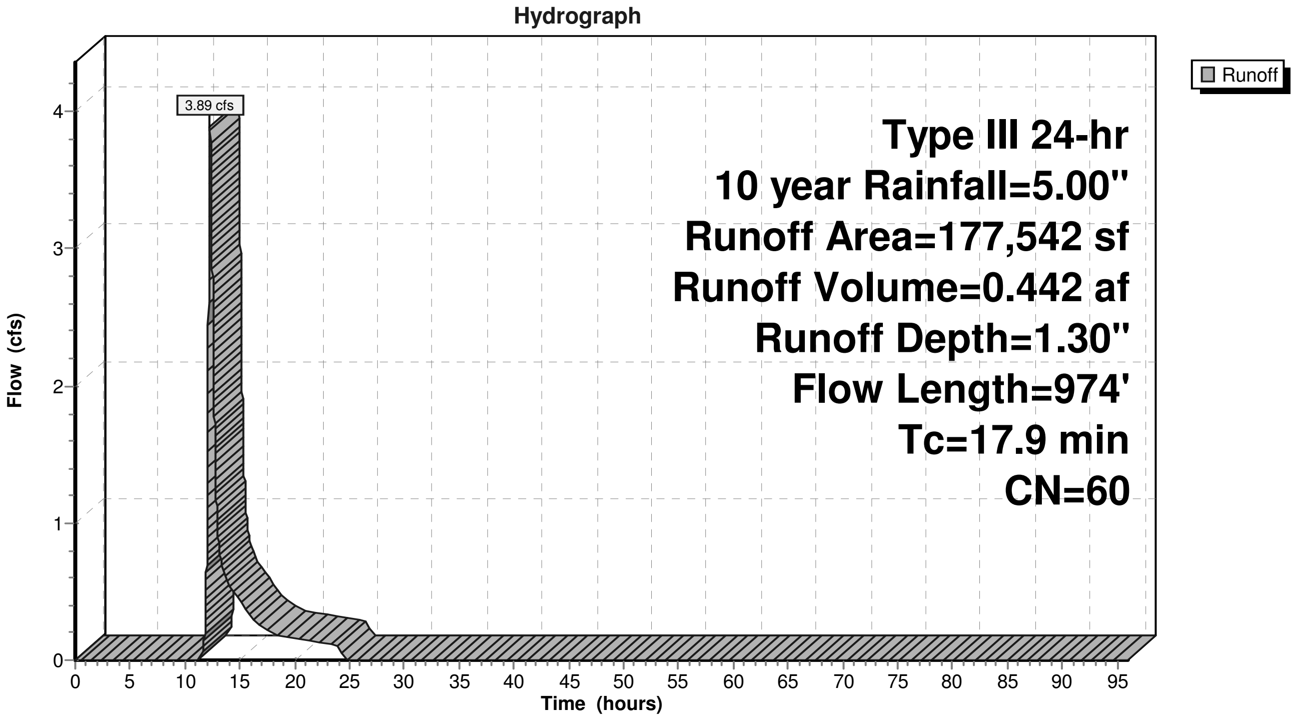
Runoff = 3.89 cfs @ 12.27 hrs, Volume= 0.442 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

	Area (sf)	CN	Description
*	9,958	98	Impervious Surfaces, HSG B
*	1,720	85	Maintenance Path, HSG B
*	185	98	Retaining Wall, HSG B
	60,200	61	>75% Grass cover, Good, HSG B
	2,190	74	>75% Grass cover, Good, HSG C
	523	80	>75% Grass cover, Good, HSG D
	12,069	48	Brush, Good, HSG B
*	34,260	55	Woods (on-site), Good, HSG B
*	51,994	55	Woods (off-site), Good, HSG B
	2,962	70	Woods, Good, HSG C
	1,481	77	Woods, Good, HSG D
	177,542	60	Weighted Average
	167,399		94.29% Pervious Area
	10,143		5.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.1700	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	133	0.1880	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.1	183	0.0383	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	57	0.0219	2.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.1	91	0.1000	15.54	12.21	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
1.6	274	0.0299	2.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.0	136	0.0022	0.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
17.9	974	Total			

Subcatchment 20S: FDA-1.3



Summary for Subcatchment 21S: FDA-1.4

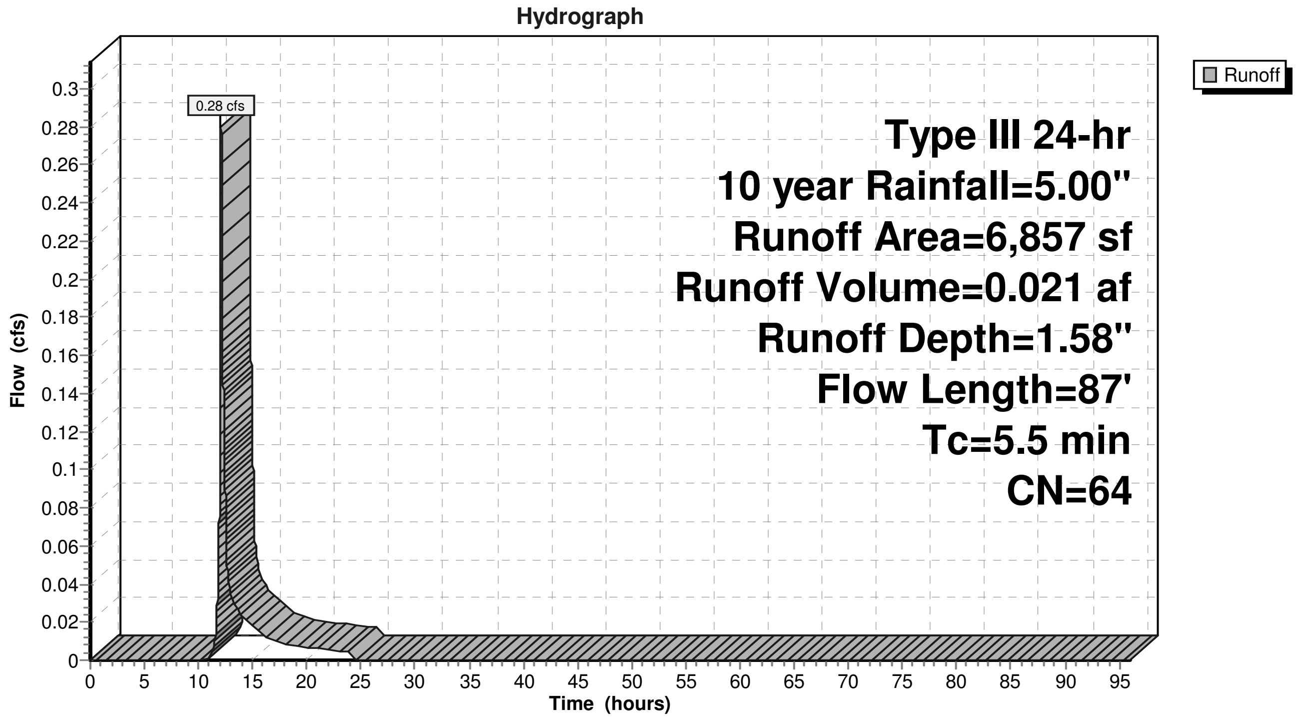
Runoff = 0.28 cfs @ 12.09 hrs, Volume= 0.021 af, Depth= 1.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

Area (sf)	CN	Description
478	61	>75% Grass cover, Good, HSG B
124	74	>75% Grass cover, Good, HSG C
62	80	>75% Grass cover, Good, HSG D
3,040	55	Woods, Good, HSG B
2,102	70	Woods, Good, HSG C
1,051	77	Woods, Good, HSG D
6,857	64	Weighted Average
6,857		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	40	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	47	0.2300	2.40		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.5	87	Total			

Subcatchment 21S: FDA-1.4



Summary for Subcatchment 23S: FDA-L1

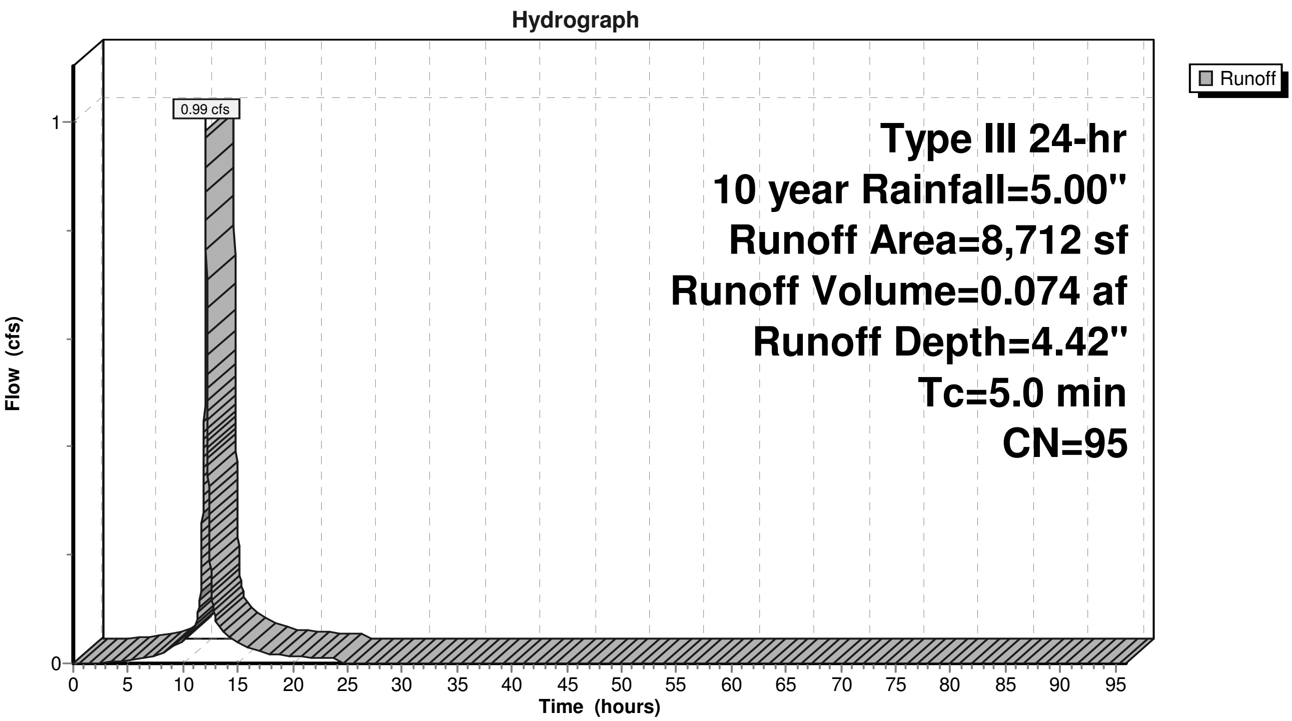
Runoff = 0.99 cfs @ 12.07 hrs, Volume= 0.074 af, Depth= 4.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

Area (sf)	CN	Description
7,928	98	Paved parking, HSG B
784	61	>75% Grass cover, Good, HSG B
8,712	95	Weighted Average
784		9.00% Pervious Area
7,928		91.00% Impervious Area

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

Subcatchment 23S: FDA-L1



Summary for Subcatchment 24S: FDA-2.1

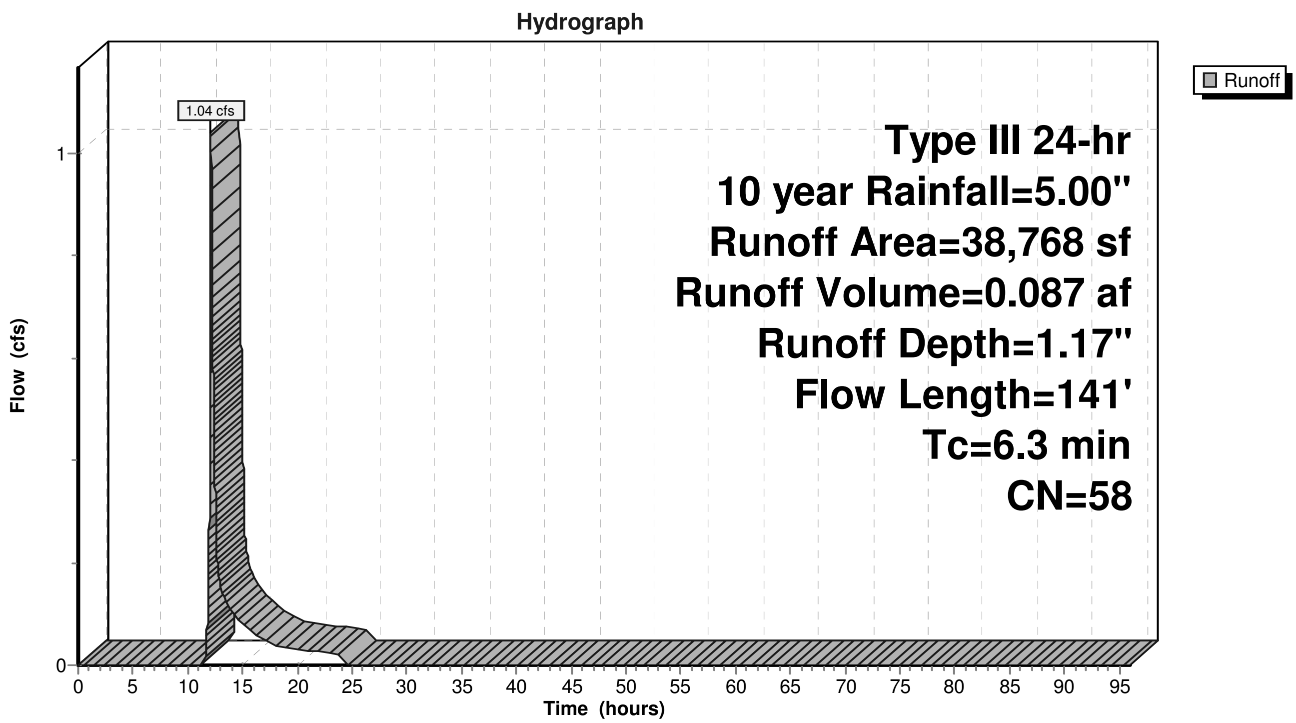
Runoff = 1.04 cfs @ 12.11 hrs, Volume= 0.087 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

Area (sf)	CN	Description
16,814	61	>75% Grass cover, Good, HSG B
21,954	55	Woods, Good, HSG B
38,768	58	Weighted Average
38,768		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	63	0.1698	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	78	0.0744	4.09		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
6.3	141	Total			

Subcatchment 24S: FDA-2.1



Summary for Subcatchment 26S: FDA-3

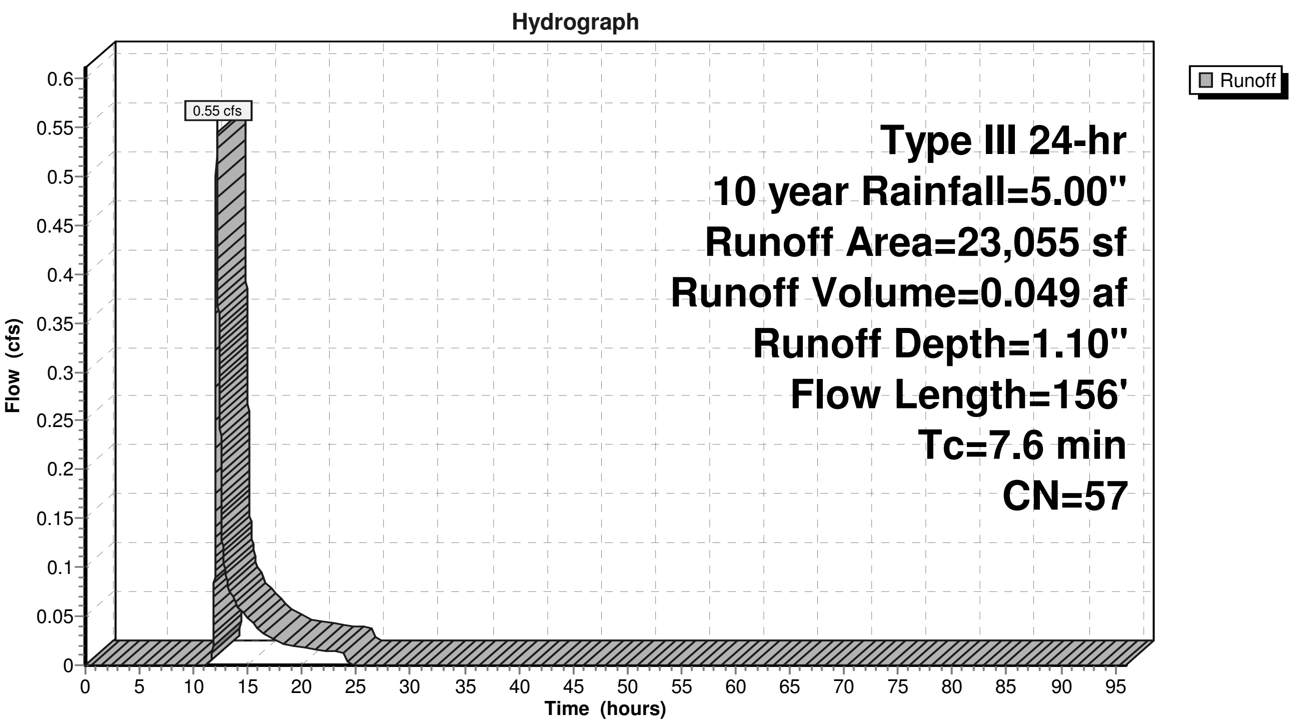
Runoff = 0.55 cfs @ 12.13 hrs, Volume= 0.049 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

Area (sf)	CN	Description
5,955	61	>75% Grass cover, Good, HSG B
17,100	55	Woods, Good, HSG B
23,055	57	Weighted Average
23,055		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	86	0.1977	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	70	0.0571	3.58		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.6	156	Total			

Subcatchment 26S: FDA-3



Summary for Subcatchment 27S: FDA-4

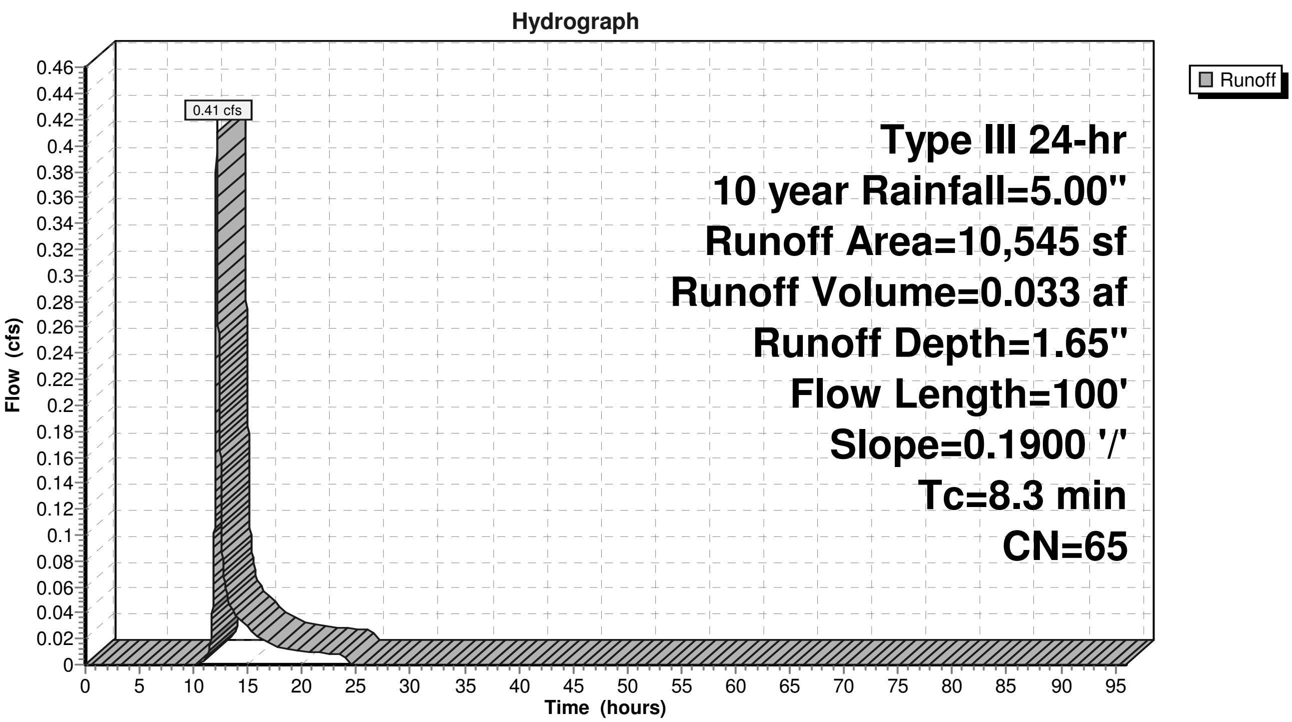
Runoff = 0.41 cfs @ 12.13 hrs, Volume= 0.033 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

Area (sf)	CN	Description
4,220	55	Woods, Good, HSG B
4,220	70	Woods, Good, HSG C
2,105	77	Woods, Good, HSG D
10,545	65	Weighted Average
10,545		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.1900	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"

Subcatchment 27S: FDA-4



Summary for Subcatchment 29S: FDA-L2.2

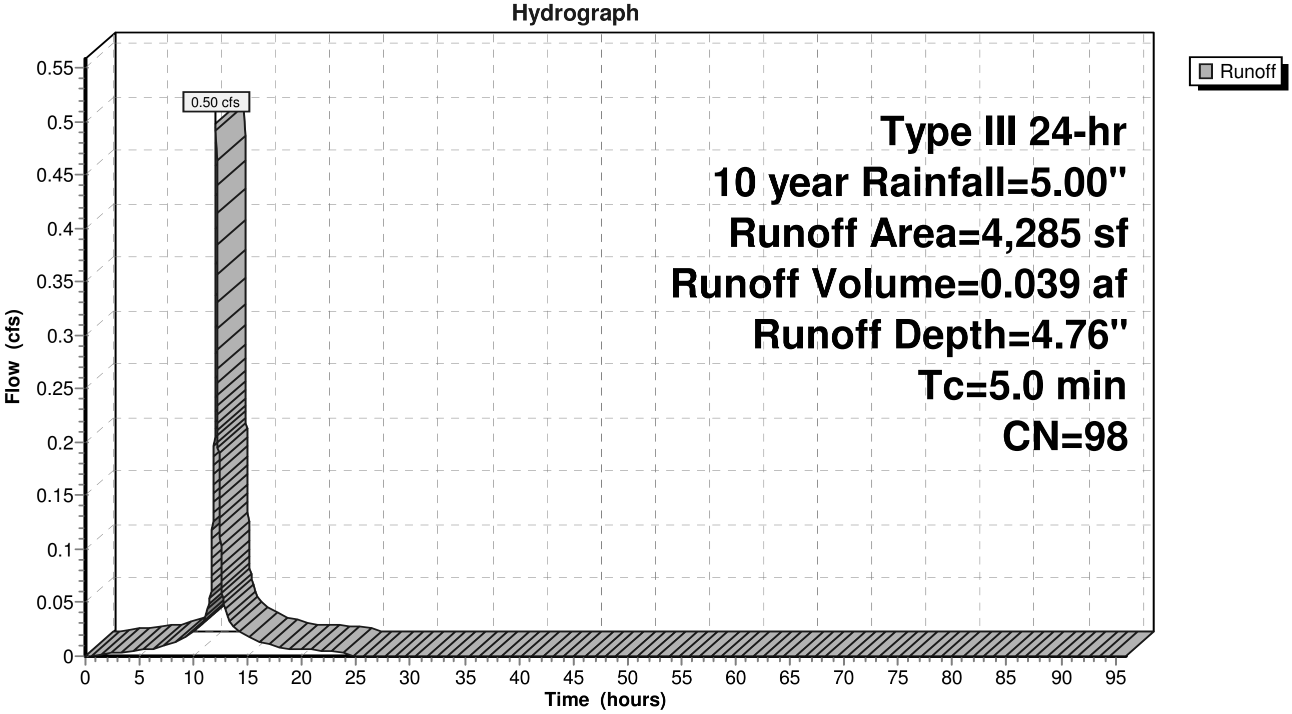
Runoff = 0.50 cfs @ 12.07 hrs, Volume= 0.039 af, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

Area (sf)	CN	Description
4,285	98	Roofs, HSG B
4,285		100.00% Impervious Area

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

Subcatchment 29S: FDA-L2.2



Summary for Subcatchment 30S: XDA1

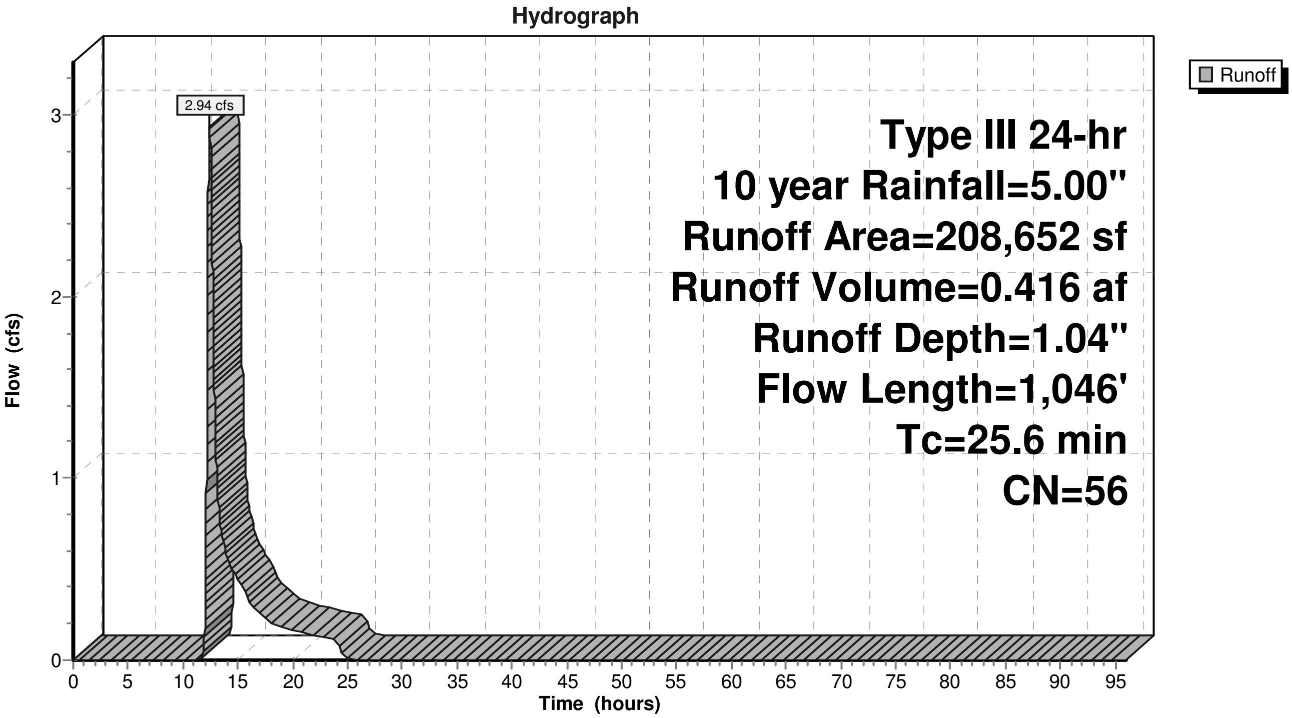
Runoff = 2.94 cfs @ 12.43 hrs, Volume= 0.416 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

Area (sf)	CN	Description
2,134	98	Unconnected pavement, HSG B
195,802	55	Woods, Good, HSG B
7,144	70	Woods, Good, HSG C
3,572	77	Woods, Good, HSG D
208,652	56	Weighted Average
206,518		98.98% Pervious Area
2,134		1.02% Impervious Area
2,134		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.1700	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	133	0.1880	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.1	183	0.0383	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	185	0.0919	1.52		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	367	0.0158	0.63		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	78	0.0538	1.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.6	1,046	Total			

Subcatchment 30S: XDA1



Summary for Subcatchment 31S: FDA-1.1

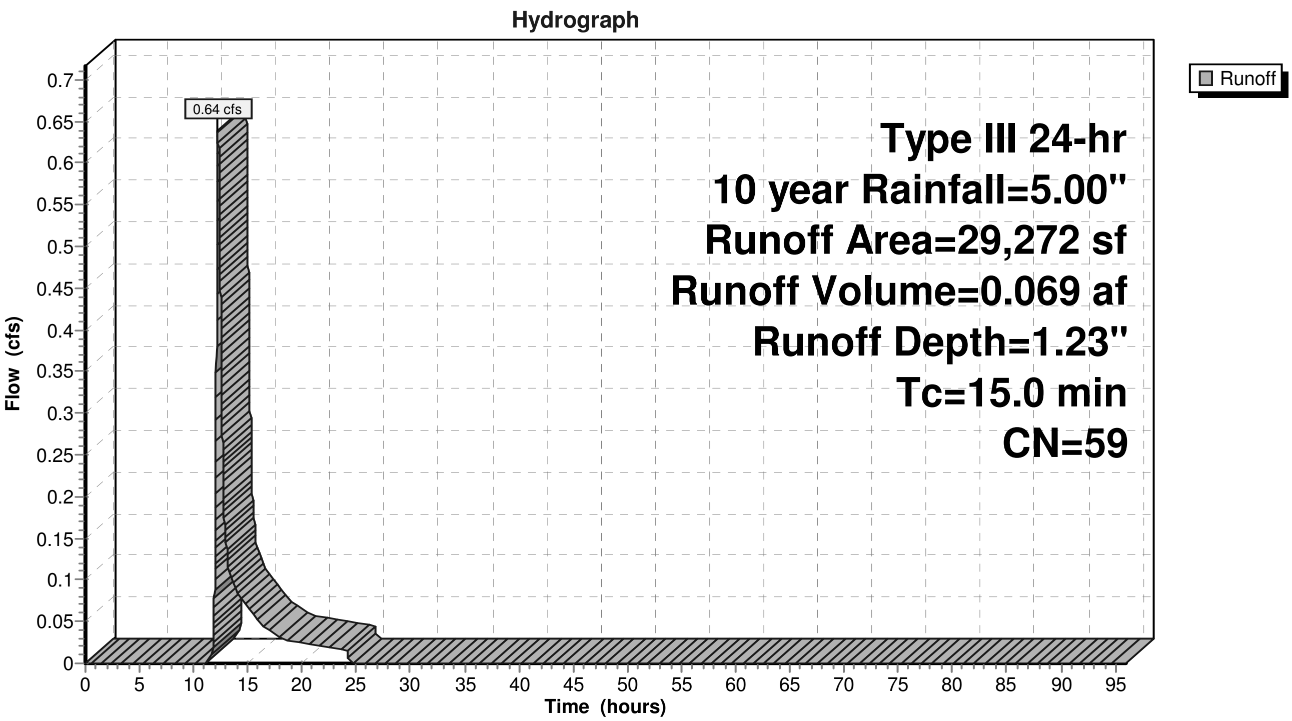
Runoff = 0.64 cfs @ 12.23 hrs, Volume= 0.069 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

	Area (sf)	CN	Description
	18,513	61	>75% Grass cover, Good, HSG B
	7,020	55	Woods, Good, HSG B
*	3,739	55	Woods (off-site), Good, HSG B
	29,272	59	Weighted Average
	29,272		100.00% Pervious Area

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

Subcatchment 31S: FDA-1.1



Summary for Subcatchment 32S: FDA-2.3

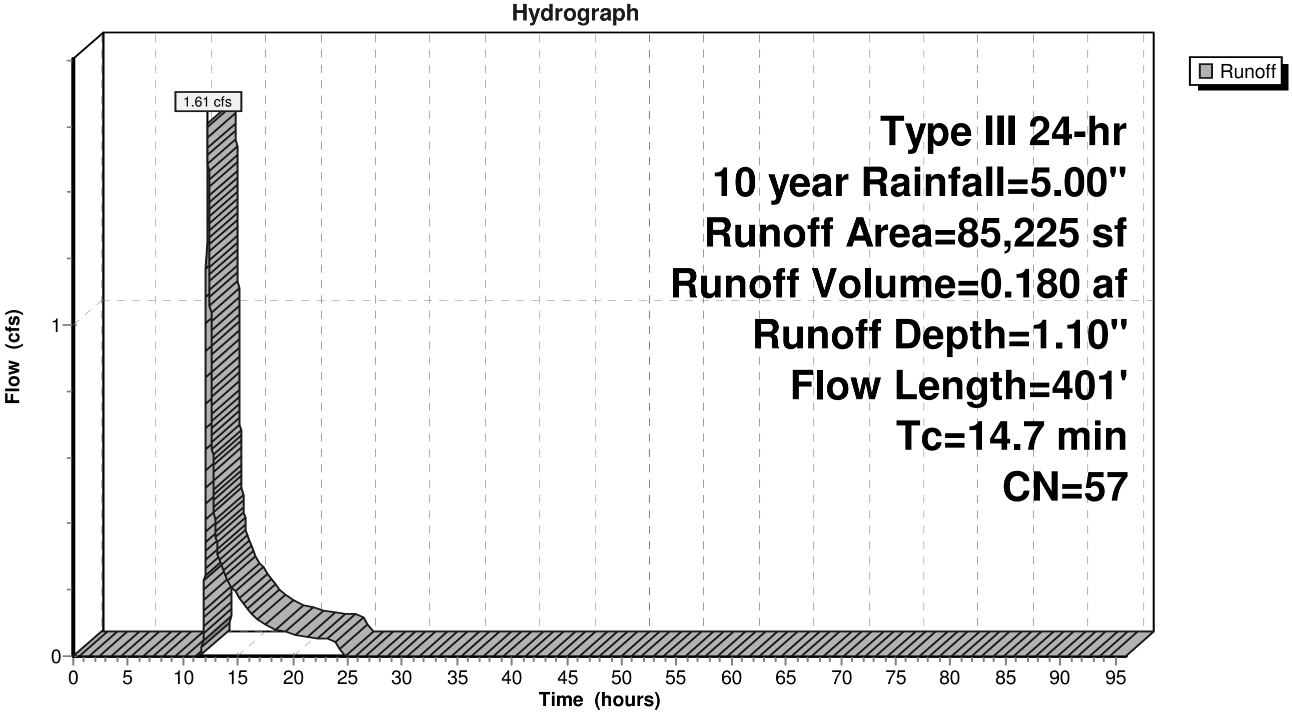
Runoff = 1.61 cfs @ 12.23 hrs, Volume= 0.180 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

	Area (sf)	CN	Description
*	715	98	Off-Site Road, HSG B
	315	98	Unconnected pavement, HSG B
	280	98	Unconnected pavement, HSG B
	23,051	61	>75% Grass cover, Good, HSG B
	60,864	55	Woods, Good, HSG B
	85,225	57	Weighted Average
	83,915		98.46% Pervious Area
	1,310		1.54% Impervious Area
	595		45.42% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	100	0.2050	0.21		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.4	148	0.1284	1.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.2	153	0.0163	0.49	1.29	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.75' Z= 2.0 '/' Top.W=5.00' n= 0.240 Sheet flow over Dense Grass
14.7	401	Total			

Subcatchment 32S: FDA-2.3



Summary for Subcatchment 33S: XDA2

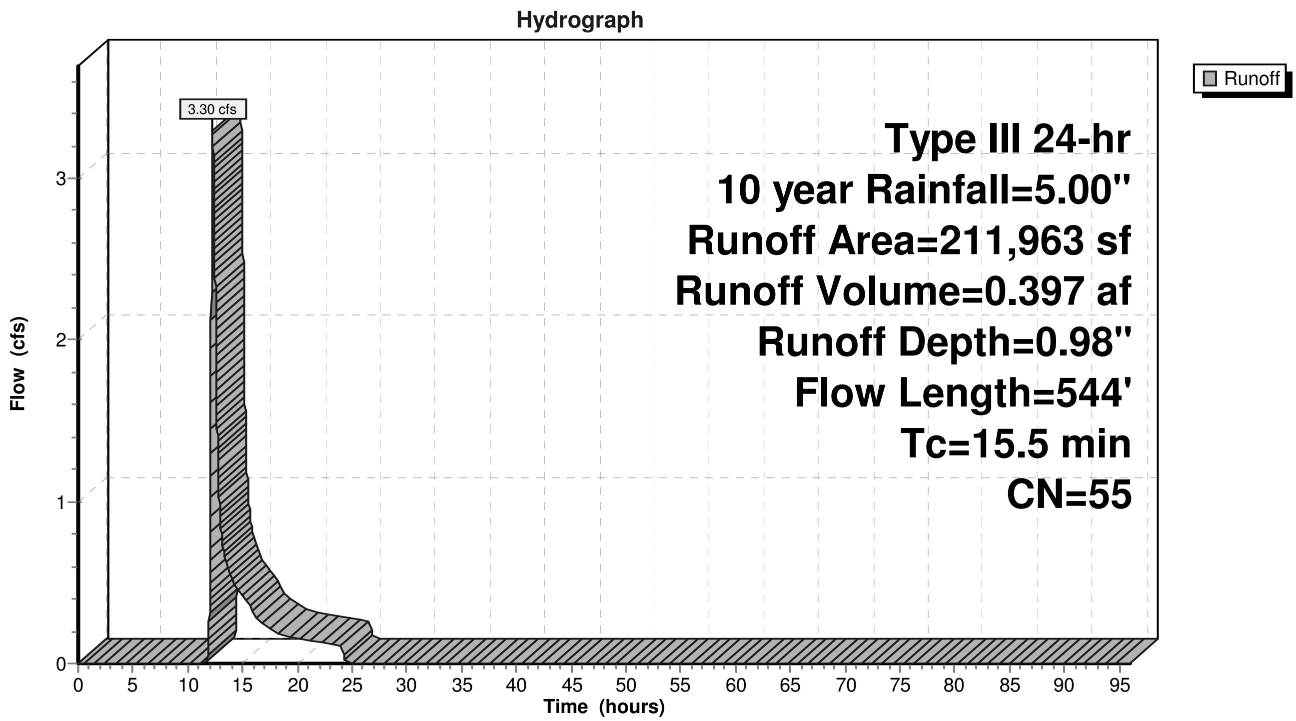
Runoff = 3.30 cfs @ 12.25 hrs, Volume= 0.397 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

Area (sf)	CN	Description
209,785	55	Woods, Good, HSG B
2,178	98	Paved parking, HSG B
211,963	55	Weighted Average
209,785		98.97% Pervious Area
2,178		1.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.1050	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.8	106	0.2075	2.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.1	338	0.0740	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.5	544	Total			

Subcatchment 33S: XDA2



Summary for Subcatchment 34S: XDA3

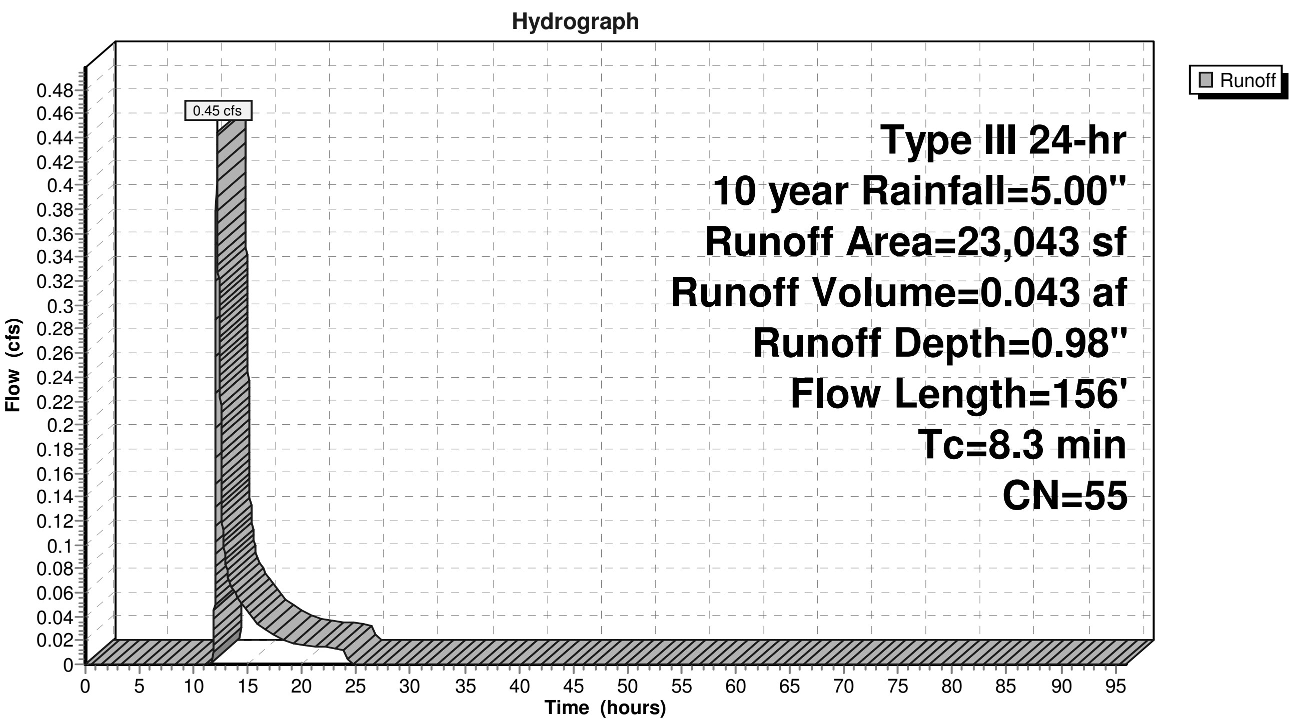
Runoff = 0.45 cfs @ 12.14 hrs, Volume= 0.043 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

Area (sf)	CN	Description
23,043	55	Woods, Good, HSG B
23,043		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	86	0.1977	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	70	0.0571	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.3	156	Total			

Subcatchment 34S: XDA3



Summary for Subcatchment 35S: FDA-L3.2

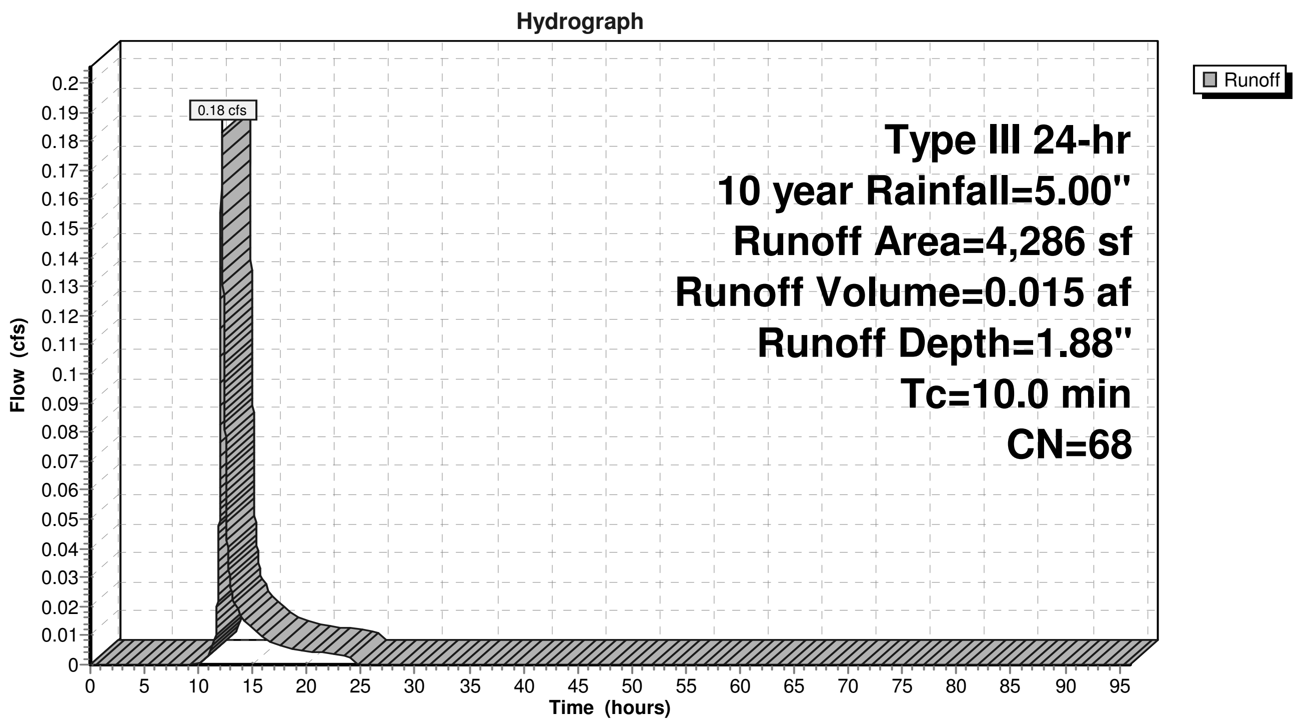
Runoff = 0.18 cfs @ 12.15 hrs, Volume= 0.015 af, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.00"

	Area (sf)	CN	Description
*	1,015	98	Driveway, HSG B
	1,875	61	>75% Grass cover, Good, HSG B
	1,396	55	Woods, Good, HSG B
	4,286	68	Weighted Average
	3,271		76.32% Pervious Area
	1,015		23.68% Impervious Area

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

Subcatchment 35S: FDA-L3.2



Summary for Reach 30R: Vegetated Swale

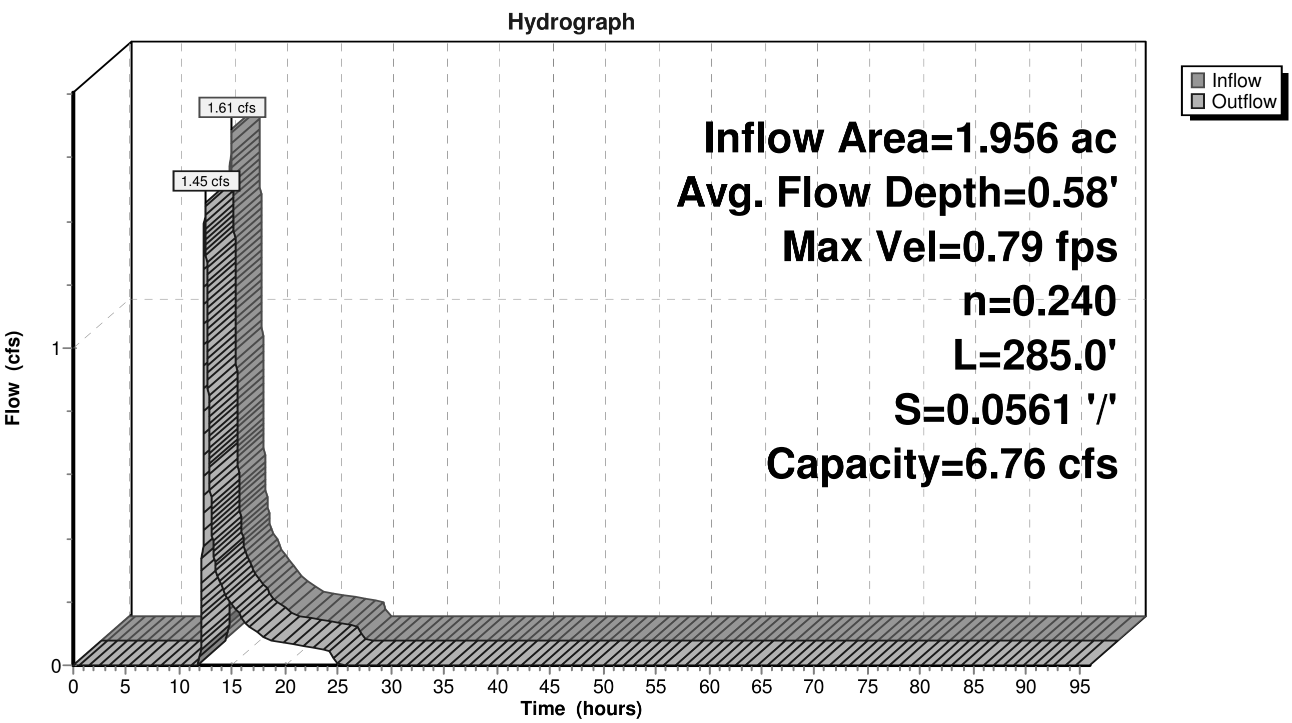
Inflow Area = 1.956 ac, 1.54% Impervious, Inflow Depth = 1.10" for 10 year event
Inflow = 1.61 cfs @ 12.23 hrs, Volume= 0.180 af
Outflow = 1.45 cfs @ 12.42 hrs, Volume= 0.180 af, Atten= 10%, Lag= 11.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.79 fps, Min. Travel Time= 6.0 min
Avg. Velocity = 0.27 fps, Avg. Travel Time= 17.7 min

Peak Storage= 522 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 1.25' Flow Area= 5.6 sf, Capacity= 6.76 cfs

2.00' x 1.25' deep channel, n= 0.240 Sheet flow over Dense Grass
Side Slope Z-value= 2.0 '/' Top Width= 7.00'
Length= 285.0' Slope= 0.0561 '/'
Inlet Invert= 174.00', Outlet Invert= 158.00'

Reach 30R: Vegetated Swale



Summary for Pond 15P: SWMF

Inflow Area = 5.984 ac, 15.94% Impervious, Inflow Depth = 0.96" for 10 year event
Inflow = 3.96 cfs @ 12.25 hrs, Volume= 0.481 af
Outflow = 2.22 cfs @ 12.66 hrs, Volume= 0.481 af, Atten= 44%, Lag= 24.9 min
Primary = 2.22 cfs @ 12.66 hrs, Volume= 0.481 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 126.00' Surf.Area= 2,806 sf Storage= 3,133 cf
Peak Elev= 127.47' @ 12.66 hrs Surf.Area= 5,058 sf Storage= 8,677 cf (5,544 cf above start)

Plug-Flow detention time= 347.6 min calculated for 0.409 af (85% of inflow)
Center-of-Mass det. time= 220.6 min (1,100.1 - 879.5)

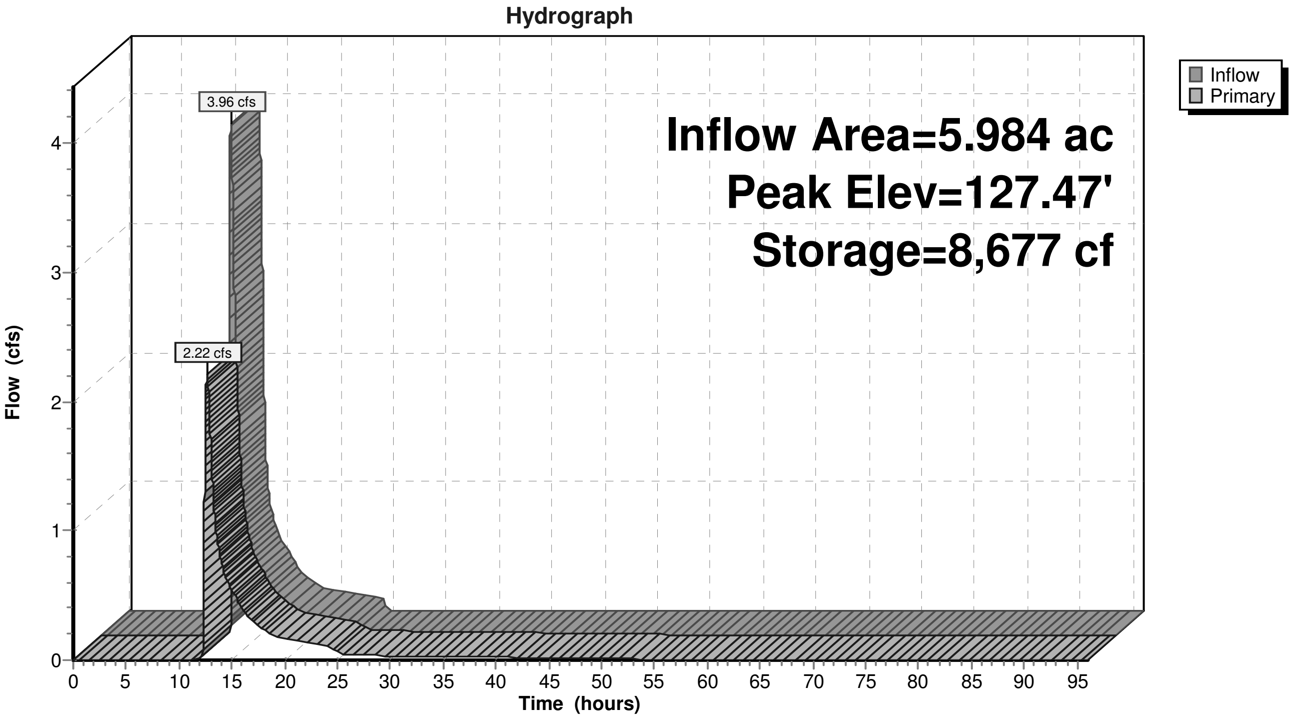
Volume	Invert	Avail.Storage	Storage Description
#1	121.50'	21,119 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
121.50	0	0	0
122.00	96	24	24
123.00	318	207	231
124.00	513	416	647
125.00	827	670	1,317
126.00	2,806	1,817	3,133
127.00	4,018	3,412	6,545
128.00	6,230	5,124	11,669
129.00	6,090	6,160	17,829
129.50	7,070	3,290	21,119

Device	Routing	Invert	Outlet Devices
#1	Primary	125.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Device 1	126.00'	**1.3" Vert. Orifice/Grate** C= 0.600
#3	Device 1	126.75'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#4	Device 1	127.00'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600
#5	Primary	129.20'	**6.0' long (Profile 7) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 Coef. (English) 2.99 3.41 3.62

Primary OutFlow Max=2.22 cfs @ 12.66 hrs HW=127.47' (Free Discharge)
└─**1=Orifice/Grate** (Passes 2.22 cfs of 5.31 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 5.73 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.94 cfs @ 3.58 fps)
  └─**4=Orifice/Grate** (Orifice Controls 1.23 cfs @ 2.33 fps)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 15P: SWMF



Summary for Pond 29P: SWMF-L1

Inflow	=	0.86 cfs @	12.07 hrs, Volume=	0.073 af
Outflow	=	0.21 cfs @	11.72 hrs, Volume=	0.073 af, Atten= 76%, Lag= 0.0 min
Discarded	=	0.21 cfs @	11.72 hrs, Volume=	0.073 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 153.58' @ 12.48 hrs Surf.Area= 1,485 sf Storage= 686 cf

Plug-Flow detention time= 16.7 min calculated for 0.073 af (100% of inflow)
Center-of-Mass det. time= 16.7 min (784.4 - 767.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	152.75'	1,069 cf	**27.50'W x 54.00'L x 2.54'H Field A** 3,774 cf Overall - 1,102 cf Embedded = 2,672 cf x 40.0% Voids
#2A	153.25'	1,102 cf	**Cultec R-150XLHD** x 40 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 8 rows
		2,171 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	152.75'	**6.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.21 cfs @ 11.72 hrs HW=152.78' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Pond 29P: SWMF-L1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 8 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

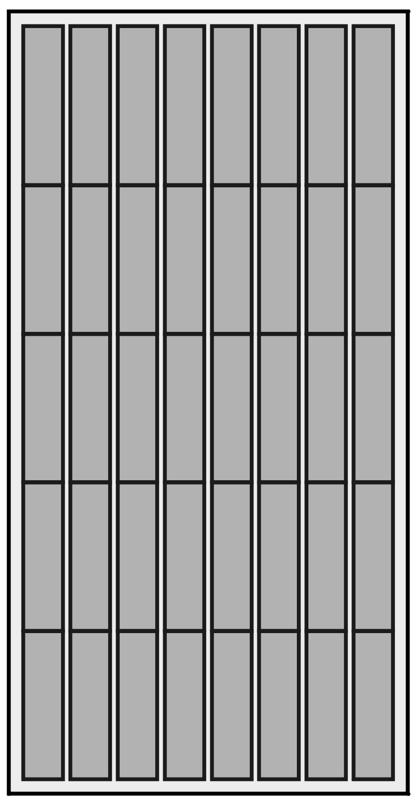
5 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 52.00' Row Length +12.0" End Stone x 2 = 54.00' Base Length
8 Rows x 33.0" Wide + 6.0" Spacing x 7 + 12.0" Side Stone x 2 = 27.50' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

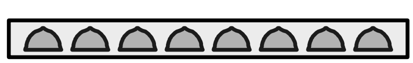
40 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 8 Rows = 1,102.0 cf Chamber Storage

3,774.4 cf Field - 1,102.0 cf Chambers = 2,672.4 cf Stone x 40.0% Voids = 1,069.0 cf Stone Storage

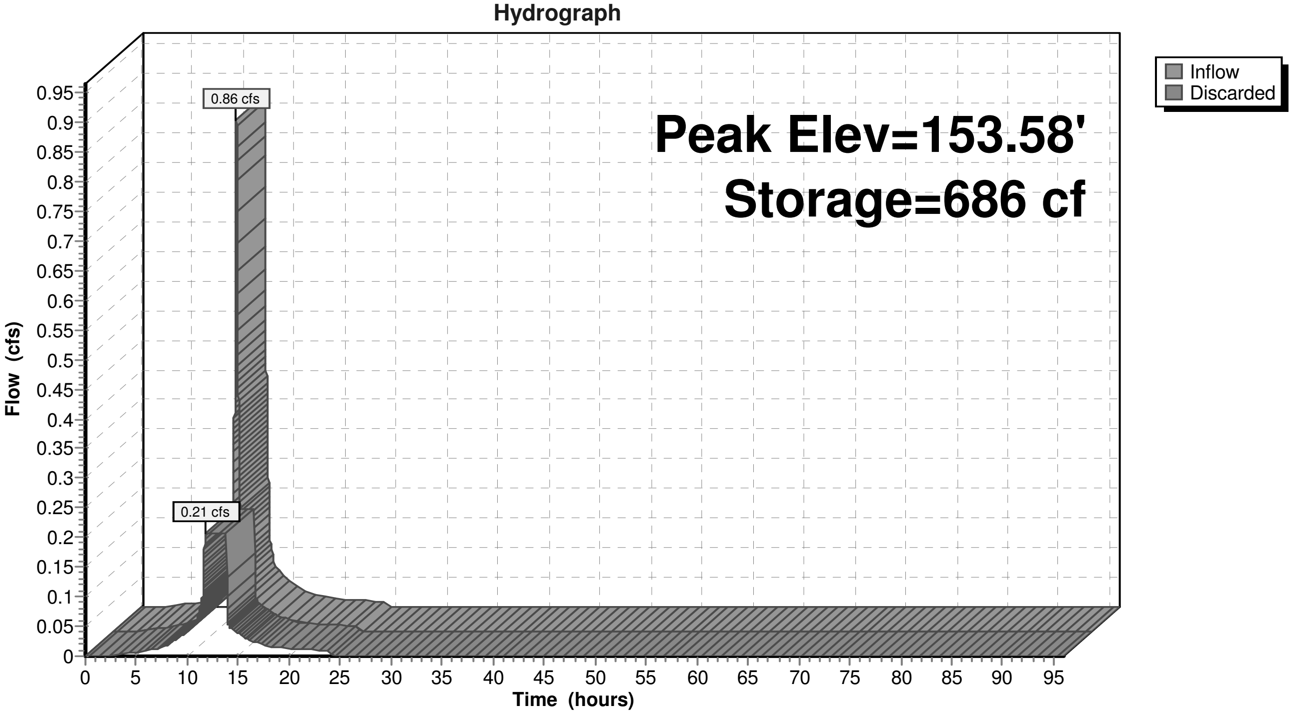
Chamber Storage + Stone Storage = 2,170.9 cf = 0.050 af
Overall Storage Efficiency = 57.5%

40 Chambers
139.8 cy Field
99.0 cy Stone





Pond 29P: SWMF-L1



Summary for Pond 30P: Div L1 (DS F.2)

[57] Hint: Peaked at 154.84' (Flood elevation advised)

Inflow Area = 0.200 ac, 91.00% Impervious, Inflow Depth = 4.42" for 10 year event
Inflow = 0.99 cfs @ 12.07 hrs, Volume= 0.074 af
Outflow = 0.99 cfs @ 12.07 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min
Primary = 0.12 cfs @ 12.07 hrs, Volume= 0.001 af
Secondary = 0.86 cfs @ 12.07 hrs, Volume= 0.073 af

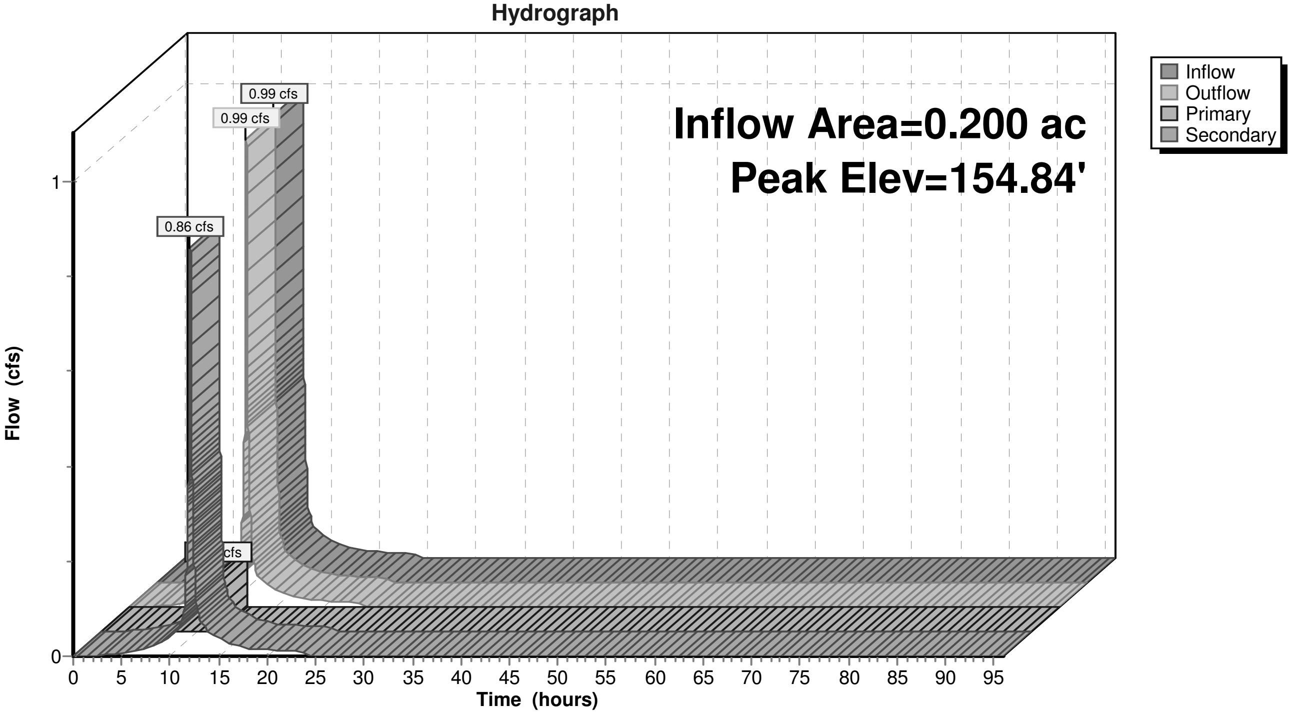
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 154.84' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	154.00'	**12.0" Round Culvert to MH A.9** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 154.00' / 153.50' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	154.25'	**8.0" Round Culvert to SWMF L1** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 154.25' / 154.00' S= 0.0313 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#3	Device 1	154.79'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.12 cfs @ 12.07 hrs HW=154.84' (Free Discharge)
└─**1=Culvert to MH A.9** (Passes 0.12 cfs of 2.21 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.12 cfs @ 0.76 fps)

Secondary OutFlow Max=0.86 cfs @ 12.07 hrs HW=154.84' (Free Discharge)
└─**2=Culvert to SWMF L1** (Inlet Controls 0.86 cfs @ 2.62 fps)

Pond 30P: Div L1 (DS F.2)



Summary for Pond 31P: SWMF-1.1 Bioret

Inflow Area = 0.672 ac, 0.00% Impervious, Inflow Depth = 1.23" for 10 year event
Inflow = 0.64 cfs @ 12.23 hrs, Volume= 0.069 af
Outflow = 0.37 cfs @ 12.54 hrs, Volume= 0.069 af, Atten= 42%, Lag= 18.7 min
Discarded = 0.03 cfs @ 12.54 hrs, Volume= 0.042 af
Primary = 0.34 cfs @ 12.54 hrs, Volume= 0.027 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 157.10' @ 12.54 hrs Surf.Area= 1,421 sf Storage= 768 cf

Plug-Flow detention time= 164.2 min calculated for 0.069 af (100% of inflow)
Center-of-Mass det. time= 164.2 min (1,051.1 - 886.9)

Volume	Invert	Avail.Storage	Storage Description
#1	156.50'	1,373 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

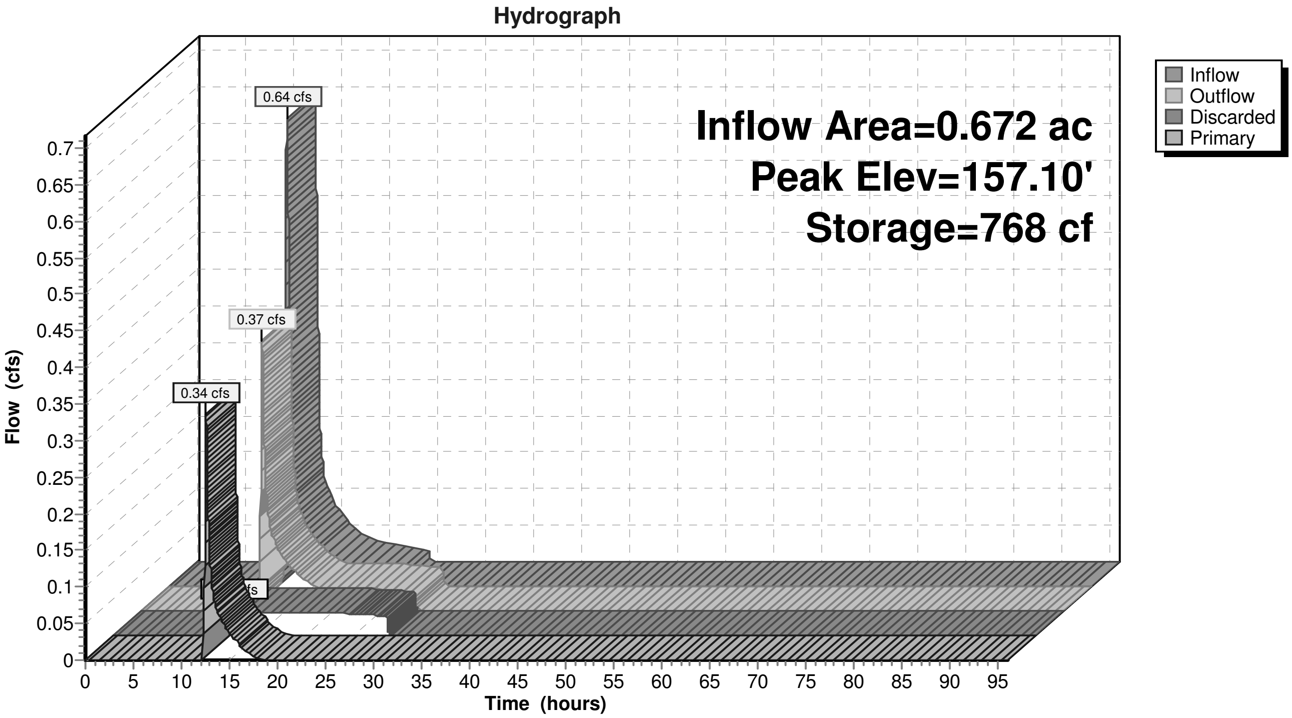
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
156.50	1,133	0	0
157.00	1,370	626	626
157.50	1,620	748	1,373

Device	Routing	Invert	Outlet Devices
#1	Primary	151.67'	**12.0" Round Culvert** L= 18.4' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 151.67' / 151.40' S= 0.0147 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	157.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	156.50'	**1.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.03 cfs @ 12.54 hrs HW=157.10' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.34 cfs @ 12.54 hrs HW=157.10' (Free Discharge)
└─**1=Culvert** (Passes 0.34 cfs of 8.40 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 0.34 cfs @ 1.05 fps)

Pond 31P: SWMF-1.1 Bioret



Summary for Pond 32P: Div 2.2 (DS D.2)

[57] Hint: Peaked at 153.06' (Flood elevation advised)

Inflow Area =	0.655 ac,	43.66% Impervious,	Inflow Depth = 2.36"	for 10 year event
Inflow =	1.43 cfs @	12.19 hrs, Volume=	0.129 af	
Outflow =	1.43 cfs @	12.19 hrs, Volume=	0.129 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.44 cfs @	12.19 hrs, Volume=	0.010 af	
Secondary =	0.99 cfs @	12.19 hrs, Volume=	0.119 af	

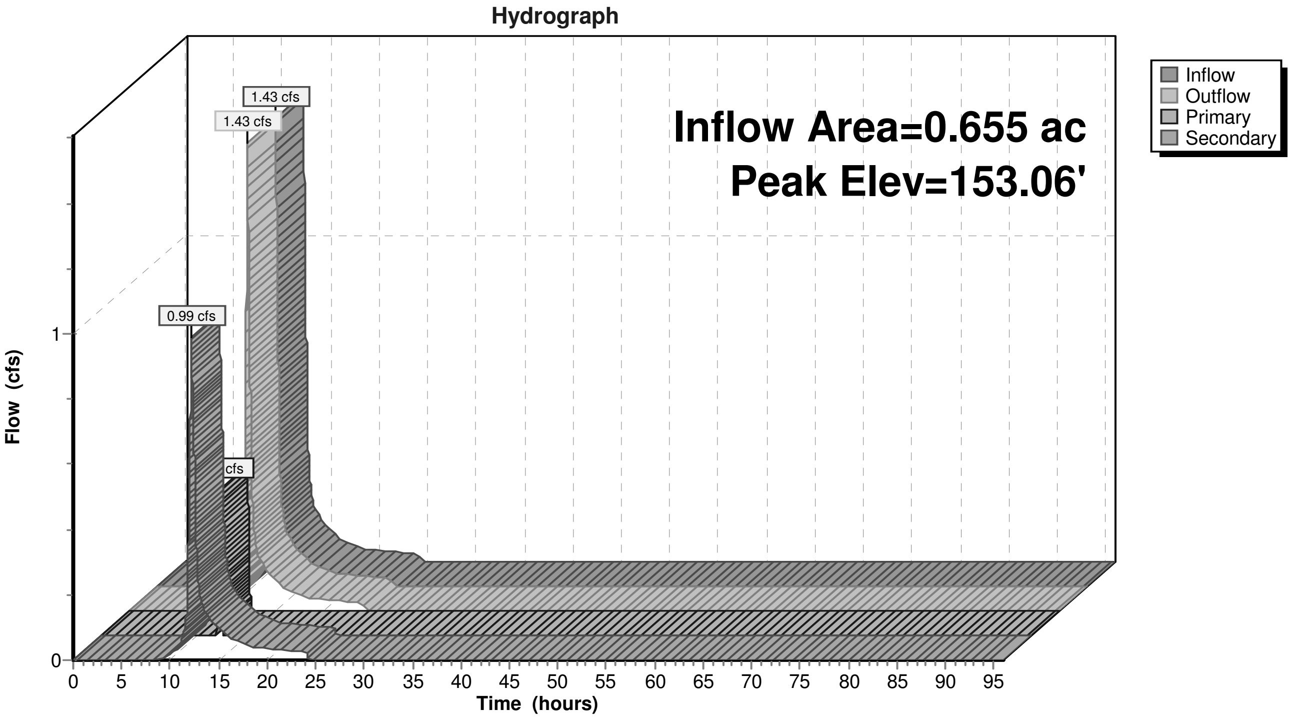
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 153.06' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.75'	**15.0" Round Culvert to Level Spreader** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.75' / 151.50' S= 0.0417 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Secondary	152.50'	**10.0" Round Culvert to SWMF-2.2** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.50' / 152.00' S= 0.0333 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#3	Device 1	152.90'	**3.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.44 cfs @ 12.19 hrs HW=153.06' (Free Discharge)
└─**1=Culvert to Level Spreader** (Inlet Controls 0.44 cfs @ 1.89 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Passes 0.44 cfs of 0.61 cfs potential flow)

Secondary OutFlow Max=0.99 cfs @ 12.19 hrs HW=153.06' (Free Discharge)
└─**2=Culvert to SWMF-2.2** (Inlet Controls 0.99 cfs @ 2.54 fps)

Pond 32P: Div 2.2 (DS D.2)



Summary for Pond 33P: Div L2.1

[57] Hint: Peaked at 150.52' (Flood elevation advised)

Inflow Area =	0.132 ac,	55.54% Impervious,	Inflow Depth = 3.08"	for 10 year event
Inflow =	0.49 cfs @	12.07 hrs, Volume=	0.034 af	
Outflow =	0.49 cfs @	12.07 hrs, Volume=	0.034 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Secondary =	0.49 cfs @	12.07 hrs, Volume=	0.034 af	

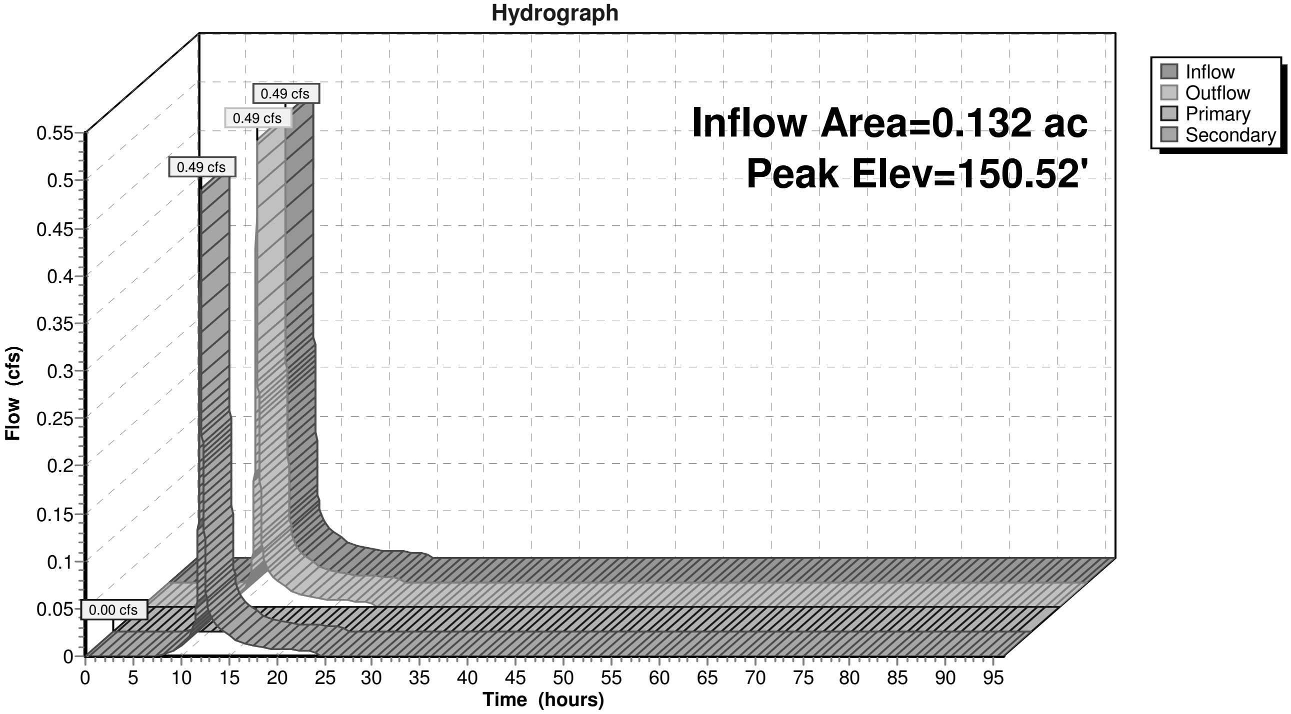
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 150.52' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	150.00'	**8.0" Round Culvert to Node EP E.1** L= 96.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.00' / 146.00' S= 0.0417 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#2	Secondary	150.00'	**6.0" Round Culvert to PTF E.1 & SWMF L2.1** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.00' / 149.70' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 1	150.54'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=150.00' (Free Discharge)
└─**1=Culvert to Node EP E.1** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.49 cfs @ 12.07 hrs HW=150.52' (Free Discharge)
└─**2=Culvert to PTF E.1 & SWMF L2.1** (Inlet Controls 0.49 cfs @ 2.50 fps)

Pond 33P: Div L2.1



Summary for Pond 34P: SWMF-L2.1

Inflow	=	0.49 cfs @	12.07 hrs,	Volume=	0.034 af
Outflow	=	0.06 cfs @	11.66 hrs,	Volume=	0.034 af, Atten= 87%, Lag= 0.0 min
Discarded	=	0.06 cfs @	11.66 hrs,	Volume=	0.034 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 149.09' @ 12.65 hrs Surf.Area= 449 sf Storage= 476 cf

Plug-Flow detention time= 54.4 min calculated for 0.034 af (100% of inflow)
Center-of-Mass det. time= 54.4 min (869.8 - 815.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	147.50'	405 cf	**25.67'W x 17.50'L x 3.54'H Field A**
			1,591 cf Overall - 577 cf Embedded = 1,013 cf x 40.0% Voids
#2A	148.00'	577 cf	**Cultec R-330XLHD** x 10 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 5 rows
		983 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	147.50'	**6.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.06 cfs @ 11.66 hrs HW=147.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Pond 34P: SWMF-L2.1 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

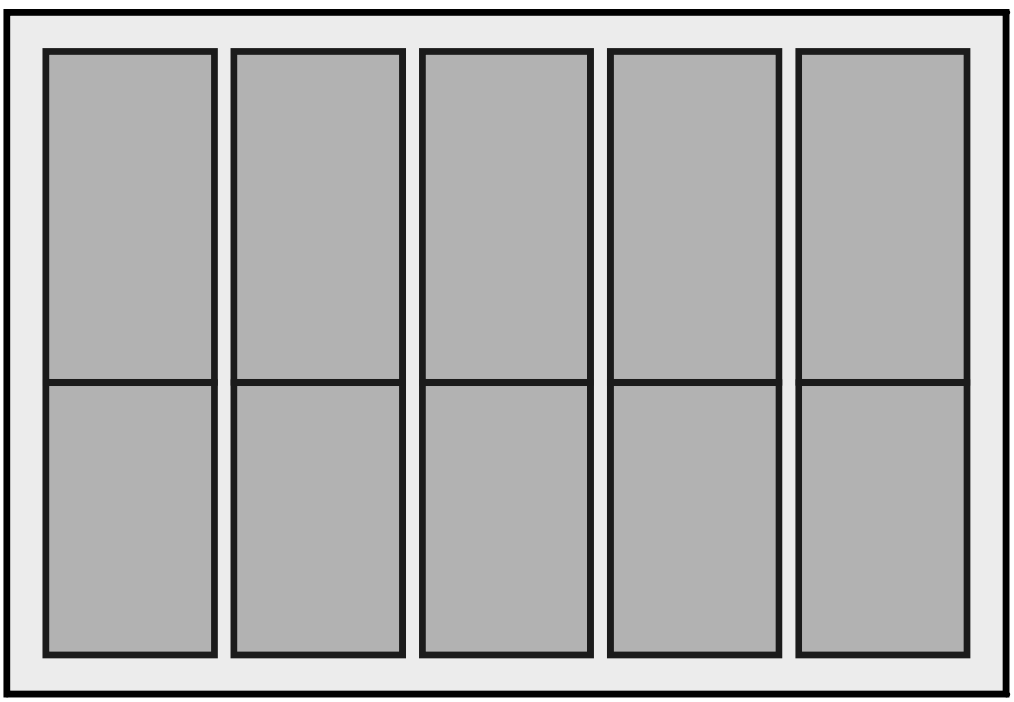
2 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 15.50' Row Length +12.0" End Stone x 2 = 17.50' Base Length
5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

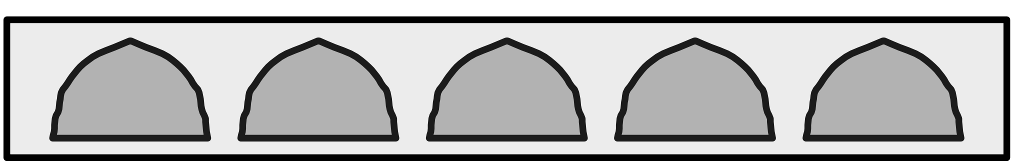
10 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 577.5 cf Chamber Storage

1,590.8 cf Field - 577.5 cf Chambers = 1,013.3 cf Stone x 40.0% Voids = 405.3 cf Stone Storage

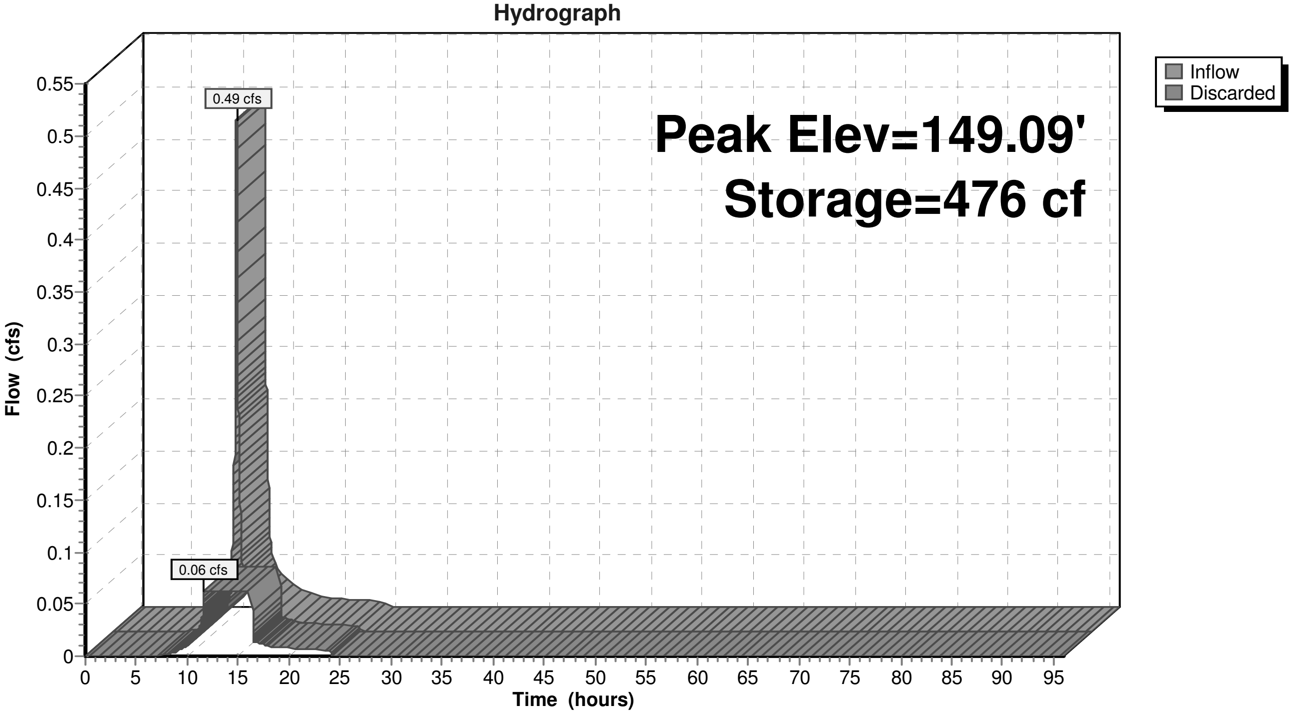
Chamber Storage + Stone Storage = 982.8 cf = 0.023 af
Overall Storage Efficiency = 61.8%

10 Chambers
58.9 cy Field
37.5 cy Stone





Pond 34P: SWMF-L2.1



Summary for Pond 35P: Div 1.2

[57] Hint: Peaked at 155.06' (Flood elevation advised)

Inflow Area =	0.446 ac, 65.47% Impervious,	Inflow Depth = 3.27"	for 10 year event
Inflow =	1.49 cfs @ 12.14 hrs,	Volume=	0.122 af
Outflow =	1.49 cfs @ 12.14 hrs,	Volume=	0.122 af, Atten= 0%, Lag= 0.0 min
Primary =	0.51 cfs @ 12.14 hrs,	Volume=	0.006 af
Secondary =	0.97 cfs @ 12.14 hrs,	Volume=	0.116 af

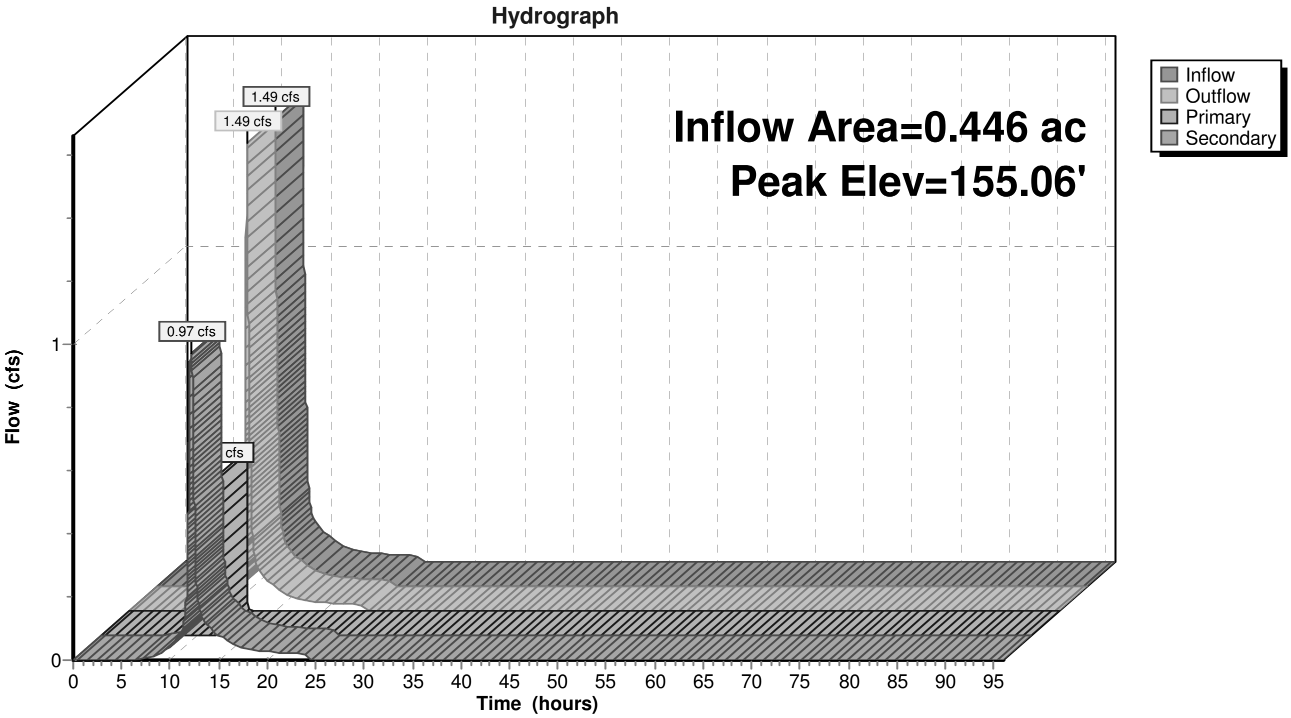
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 155.06' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	153.92'	**12.0" Round Culvert to MH A.6** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 153.92' / 151.00' S= 0.1622 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	153.75'	**6.0" Round Culvert to SWMF-1.2** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 153.75' / 153.50' S= 0.0417 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 1	154.92'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.51 cfs @ 12.14 hrs HW=155.06' (Free Discharge)
└─**1=Culvert to MH A.6** (Passes 0.51 cfs of 3.03 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.51 cfs @ 1.22 fps)

Secondary OutFlow Max=0.97 cfs @ 12.14 hrs HW=155.06' (Free Discharge)
└─**2=Culvert to SWMF-1.2** (Inlet Controls 0.97 cfs @ 4.96 fps)

Pond 35P: Div 1.2



Summary for Pond 36P: Rain Garden #1 Lot 3

Inflow Area = 0.261 ac, 19.99% Impervious, Inflow Depth = 1.73" for 10 year event
Inflow = 0.44 cfs @ 12.15 hrs, Volume= 0.038 af
Outflow = 0.10 cfs @ 12.67 hrs, Volume= 0.038 af, Atten= 78%, Lag= 31.6 min
Discarded = 0.03 cfs @ 12.67 hrs, Volume= 0.032 af
Primary = 0.07 cfs @ 12.67 hrs, Volume= 0.005 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 145.03' @ 12.67 hrs Surf.Area= 1,273 sf Storage= 611 cf

Plug-Flow detention time= 196.6 min calculated for 0.038 af (100% of inflow)
Center-of-Mass det. time= 196.6 min (1,058.5 - 861.9)

Volume	Invert	Avail.Storage	Storage Description
#1	144.50'	904 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

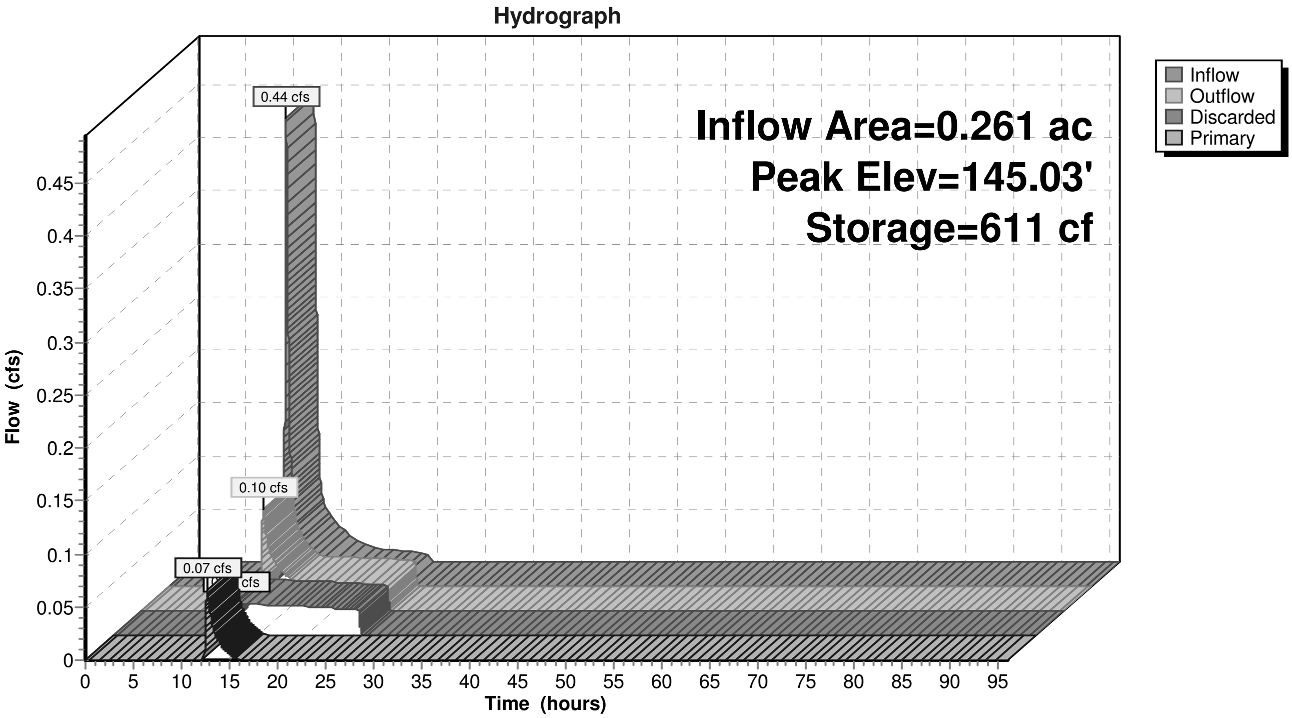
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
144.50	1,025	0	0
144.75	1,135	270	270
145.00	1,245	298	568
145.25	1,450	337	904

Device	Routing	Invert	Outlet Devices
#1	Primary	145.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	144.50'	**1.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 12.67 hrs HW=145.03' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.07 cfs @ 12.67 hrs HW=145.03' (Free Discharge)
└─**1=Orifice/Grate** (Weir Controls 0.07 cfs @ 0.61 fps)

Pond 36P: Rain Garden #1 Lot 3



Summary for Pond 37P: SWMF-1.2

[81] Warning: Exceeded Pond 35P by 0.73' @ 13.11 hrs

Inflow	=	0.97 cfs @	12.14 hrs, Volume=	0.116 af
Outflow	=	0.18 cfs @	11.67 hrs, Volume=	0.116 af, Atten= 81%, Lag= 0.0 min
Discarded	=	0.18 cfs @	11.67 hrs, Volume=	0.116 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 154.73' @ 12.93 hrs Surf.Area= 1,320 sf Storage= 1,599 cf

Plug-Flow detention time= 64.3 min calculated for 0.115 af (100% of inflow)
Center-of-Mass det. time= 64.3 min (883.0 - 818.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	153.00'	1,184 cf	**23.50'W x 56.17'L x 3.67'H Field A** 4,840 cf Overall - 1,880 cf Embedded = 2,960 cf x 40.0% Voids
#2A	153.50'	1,880 cf	**Cultec R-V8HD** x 32 Inside #1 Effective Size= 55.2"W x 32.0"H => 8.68 sf x 7.50'L = 65.1 cf Overall Size= 60.0"W x 32.0"H x 8.00'L with 0.50' Overlap Row Length Adjustment= -5.83' x 8.68 sf x 4 rows
		3,064 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	153.00'	**6.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.18 cfs @ 11.67 hrs HW=153.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.18 cfs)

Pond 37P: SWMF-1.2 - Chamber Wizard Field A

Chamber Model = Cultec R-V8HD (Cultec Recharger® V8HD)
Effective Size= 55.2"W x 32.0"H => 8.68 sf x 7.50'L = 65.1 cf
Overall Size= 60.0"W x 32.0"H x 8.00'L with 0.50' Overlap
Row Length Adjustment= -5.83' x 8.68 sf x 4 rows

60.0" Wide + 6.0" Spacing = 66.0" C-C Row Spacing

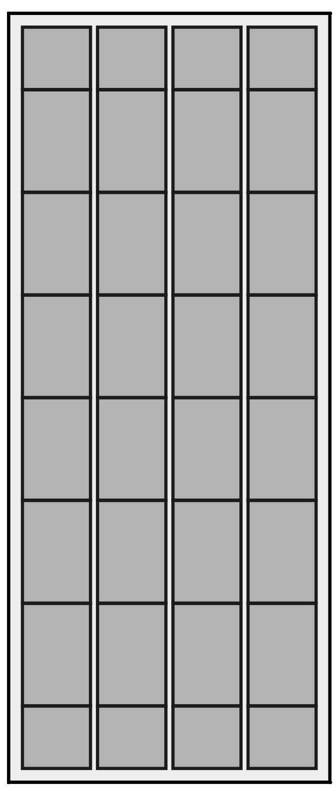
8 Chambers/Row x 7.50' Long -5.83' Row Adjustment = 54.17' Row Length +12.0" End Stone x 2 = 56.17' Base Length
4 Rows x 60.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 23.50' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

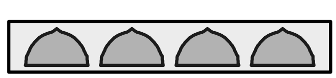
32 Chambers x 65.1 cf -5.83' Row Adjustment x 8.68 sf x 4 Rows = 1,879.9 cf Chamber Storage

4,840.0 cf Field - 1,879.9 cf Chambers = 2,960.1 cf Stone x 40.0% Voids = 1,184.0 cf Stone Storage

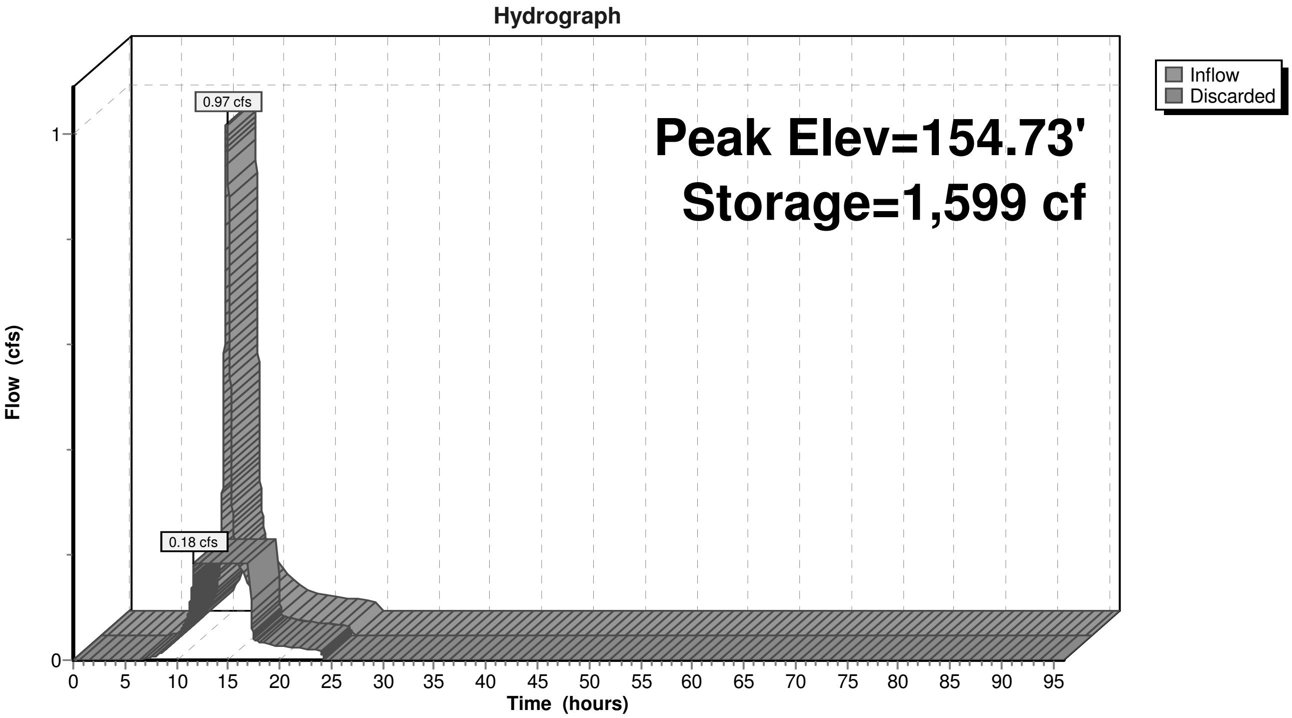
Chamber Storage + Stone Storage = 3,063.9 cf = 0.070 af
Overall Storage Efficiency = 63.3%

32 Chambers
179.3 cy Field
109.6 cy Stone





Pond 37P: SWMF-1.2



Summary for Pond 38P: SWMF-2.2

[79] Warning: Submerged Pond 32P Secondary device # 2 OUTLET by 0.01'

Inflow	=	0.99 cfs @ 12.19 hrs,	Volume=	0.119 af
Outflow	=	0.16 cfs @ 11.80 hrs,	Volume=	0.119 af, Atten= 84%, Lag= 0.0 min
Discarded	=	0.16 cfs @ 11.80 hrs,	Volume=	0.119 af
Primary	=	0.00 cfs @ 0.00 hrs,	Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 152.01' @ 13.43 hrs Surf.Area= 1,160 sf Storage= 1,789 cf

Plug-Flow detention time= 98.7 min calculated for 0.119 af (100% of inflow)
Center-of-Mass det. time= 98.7 min (952.2 - 853.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	149.50'	450 cf	**16.00'W x 31.50'L x 3.54'H Field A**
			1,785 cf Overall - 659 cf Embedded = 1,126 cf x 40.0% Voids
#2A	150.00'	659 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 3 rows
#3B	150.00'	578 cf	**20.83'W x 31.50'L x 3.54'H Field B**
			2,324 cf Overall - 879 cf Embedded = 1,445 cf x 40.0% Voids
#4B	150.50'	879 cf	**Cultec R-330XLHD** x 16 Inside #3
			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 4 rows
		2,567 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	149.50'	**6.000 in/hr Exfiltration over Horizontal area**
#2	Primary	153.00'	**8.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 153.00' / 151.50' S= 0.1000 '/' Cc= 0.900
			n= 0.012, Flow Area= 0.35 sf

Discarded OutFlow Max=0.16 cfs @ 11.80 hrs HW=150.00' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=149.50' (Free Discharge)
2=Culvert (Controls 0.00 cfs)

Pond 38P: SWMF-2.2 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

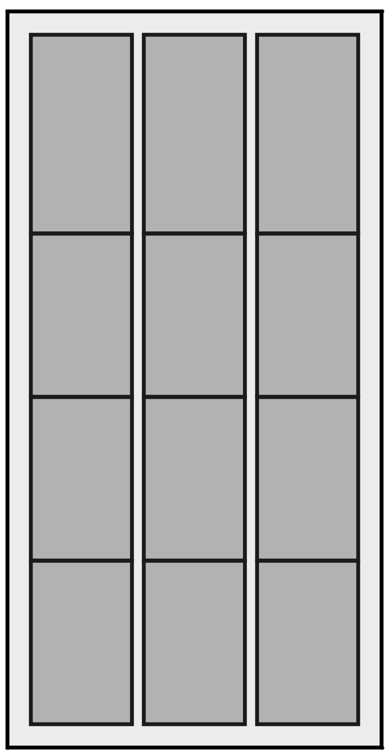
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

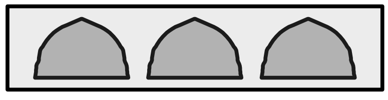
12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 659.4 cf Chamber Storage

1,785.0 cf Field - 659.4 cf Chambers = 1,125.6 cf Stone x 40.0% Voids = 450.2 cf Stone Storage

Chamber Storage + Stone Storage = 1,109.6 cf = 0.025 af
Overall Storage Efficiency = 62.2%

12 Chambers
66.1 cy Field
41.7 cy Stone





Pond 38P: SWMF-2.2 - Chamber Wizard Field B

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

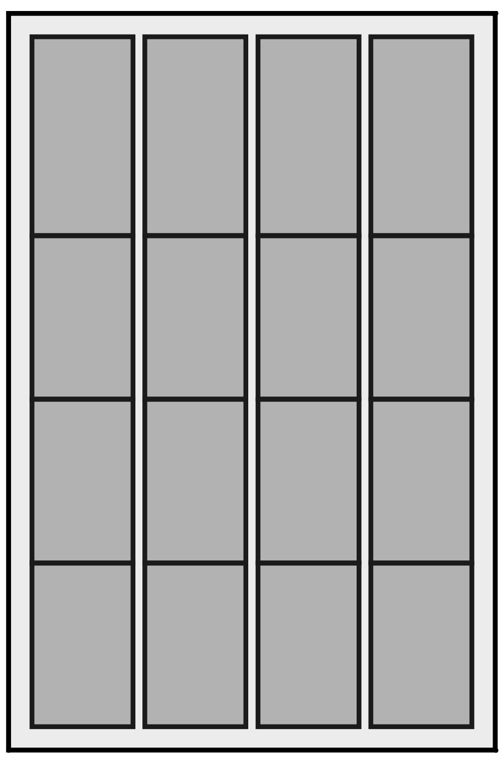
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

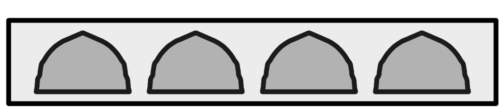
16 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 879.2 cf Chamber Storage

2,324.2 cf Field - 879.2 cf Chambers = 1,445.0 cf Stone x 40.0% Voids = 578.0 cf Stone Storage

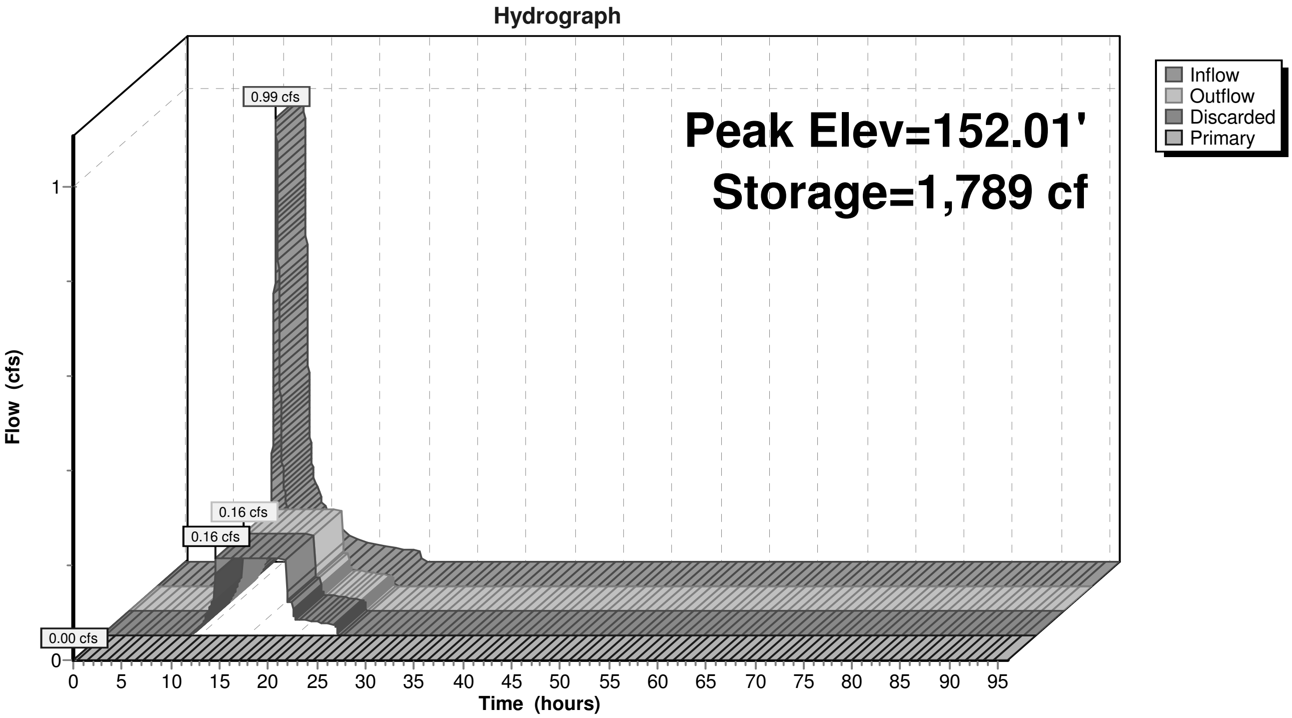
Chamber Storage + Stone Storage = 1,457.2 cf = 0.033 af
Overall Storage Efficiency = 62.7%

16 Chambers
86.1 cy Field
53.5 cy Stone





Pond 38P: SWMF-2.2



Summary for Pond 39P: SWMF-L2.2

[79] Warning: Submerged Pond 40P Secondary device # 2 OUTLET by 0.41'

Inflow	=	0.50 cfs @	12.07 hrs,	Volume=	0.039 af
Outflow	=	0.07 cfs @	11.63 hrs,	Volume=	0.039 af, Atten= 86%, Lag= 0.0 min
Discarded	=	0.07 cfs @	11.63 hrs,	Volume=	0.039 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 136.41' @ 12.56 hrs Surf.Area= 504 sf Storage= 470 cf

Plug-Flow detention time= 38.1 min calculated for 0.039 af (100% of inflow)
Center-of-Mass det. time= 38.1 min (785.2 - 747.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	135.00'	450 cf	**16.00'W x 31.50'L x 3.54'H Field A**
			1,785 cf Overall - 659 cf Embedded = 1,126 cf x 40.0% Voids
#2A	135.50'	659 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 3 rows
		1,110 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	135.00'	**6.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.07 cfs @ 11.63 hrs HW=135.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Pond 39P: SWMF-L2.2 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

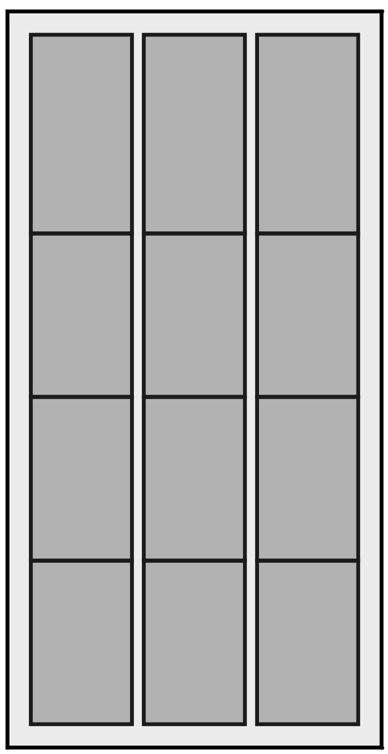
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

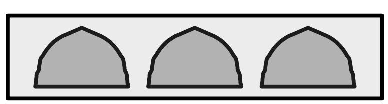
12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 659.4 cf Chamber Storage

1,785.0 cf Field - 659.4 cf Chambers = 1,125.6 cf Stone x 40.0% Voids = 450.2 cf Stone Storage

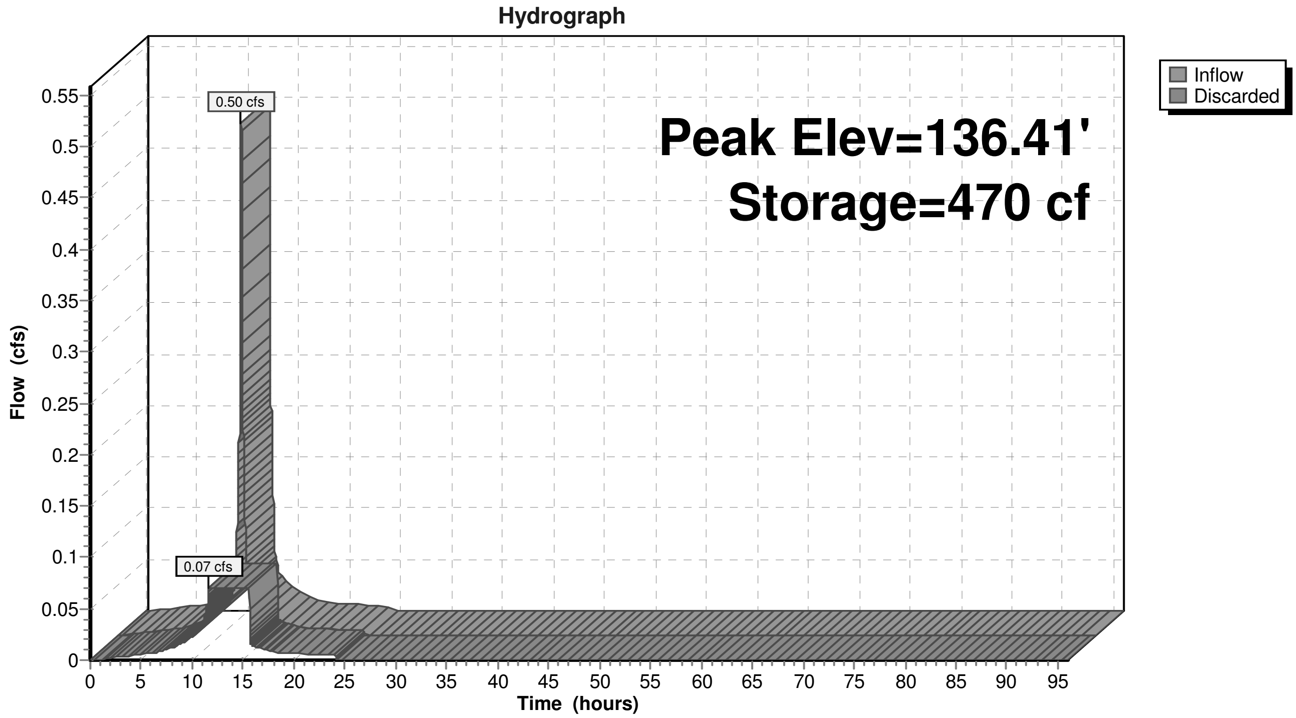
Chamber Storage + Stone Storage = 1,109.6 cf = 0.025 af
Overall Storage Efficiency = 62.2%

12 Chambers
66.1 cy Field
41.7 cy Stone





Pond 39P: SWMF-L2.2



Summary for Pond 40P: Div L2.2

[57] Hint: Peaked at 138.03' (Flood elevation advised)

Inflow Area = 0.098 ac,100.00% Impervious, Inflow Depth = 4.76" for 10 year event
Inflow = 0.50 cfs @ 12.07 hrs, Volume= 0.039 af
Outflow = 0.50 cfs @ 12.07 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.50 cfs @ 12.07 hrs, Volume= 0.039 af

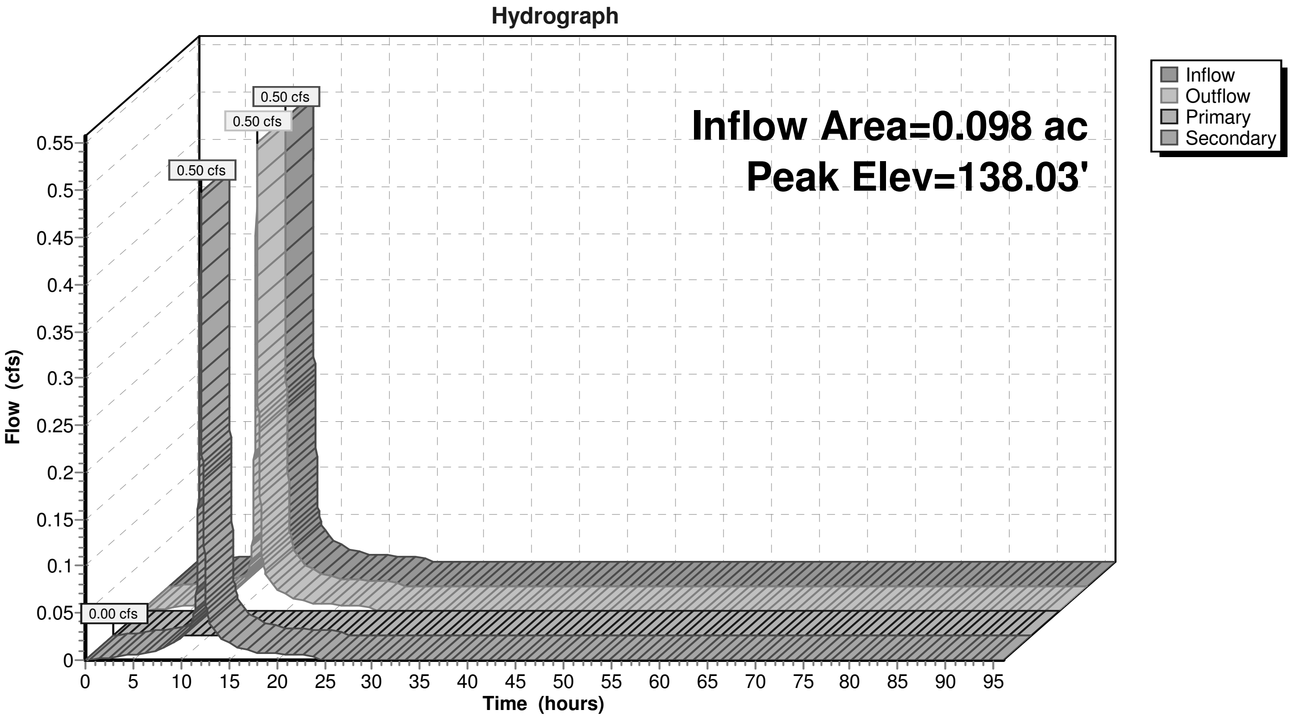
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 138.03' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	138.00'	**12.0" Round Culvert to MH C.1** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 138.00' / 134.00' S= 0.0800 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	137.50'	**6.0" Round Culvert to SWMF L2.2** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 137.50' / 136.00' S= 0.3000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 1	138.04'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=137.50' (Free Discharge)
└─**1=Culvert to MH C.1** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.50 cfs @ 12.07 hrs HW=138.03' (Free Discharge)
└─**2=Culvert to SWMF L2.2** (Inlet Controls 0.50 cfs @ 2.54 fps)

Pond 40P: Div L2.2



Summary for Pond 41P: Rain Garden #2 Lot 3

Inflow Area = 0.098 ac, 23.68% Impervious, Inflow Depth = 1.88" for 10 year event
Inflow = 0.18 cfs @ 12.15 hrs, Volume= 0.015 af
Outflow = 0.02 cfs @ 13.57 hrs, Volume= 0.015 af, Atten= 89%, Lag= 85.6 min
Discarded = 0.02 cfs @ 13.57 hrs, Volume= 0.015 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 152.37' @ 13.57 hrs Surf.Area= 839 sf Storage= 267 cf

Plug-Flow detention time= 140.8 min calculated for 0.015 af (100% of inflow)
Center-of-Mass det. time= 140.8 min (997.3 - 856.6)

Volume	Invert	Avail.Storage	Storage Description
#1	152.00'	875 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

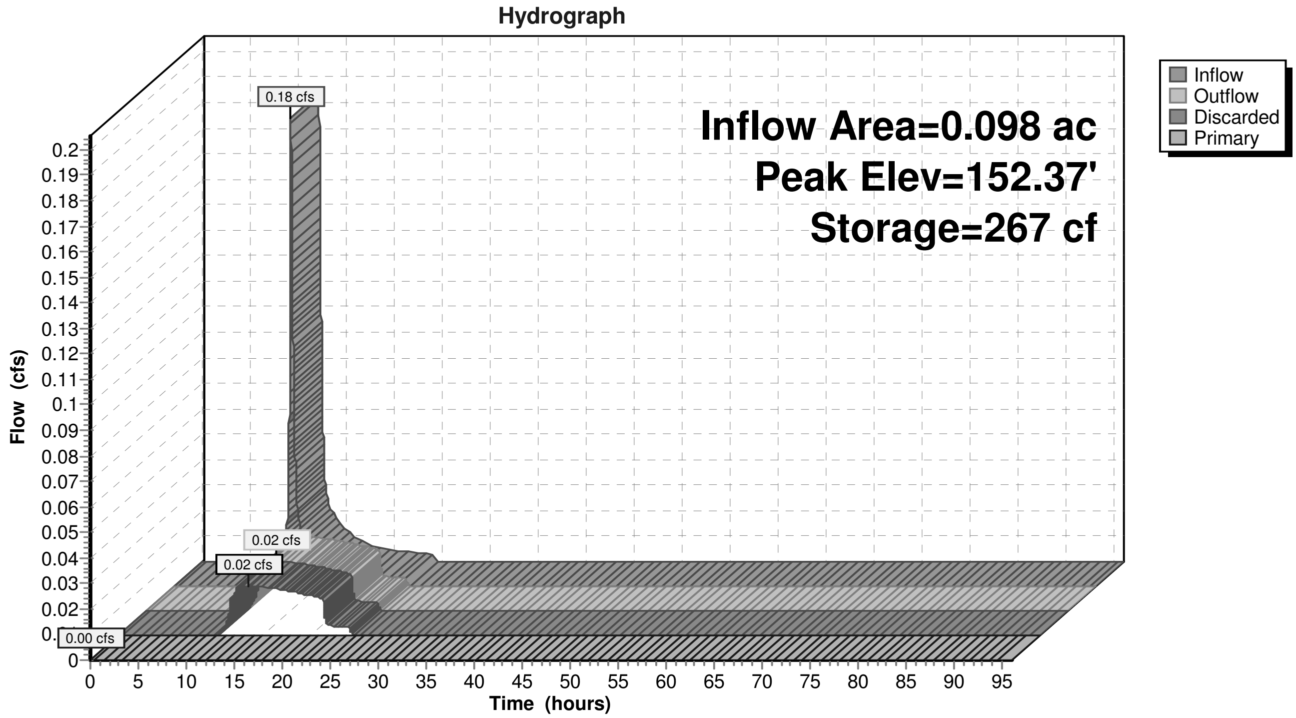
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
152.00	620	0	0
152.25	770	174	174
152.50	920	211	385
153.00	1,038	490	875

Device	Routing	Invert	Outlet Devices
#1	Primary	152.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	152.00'	**1.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 13.57 hrs HW=152.37' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=152.00' (Free Discharge)
└─**1=Orifice/Grate** (Controls 0.00 cfs)

Pond 41P: Rain Garden #2 Lot 3

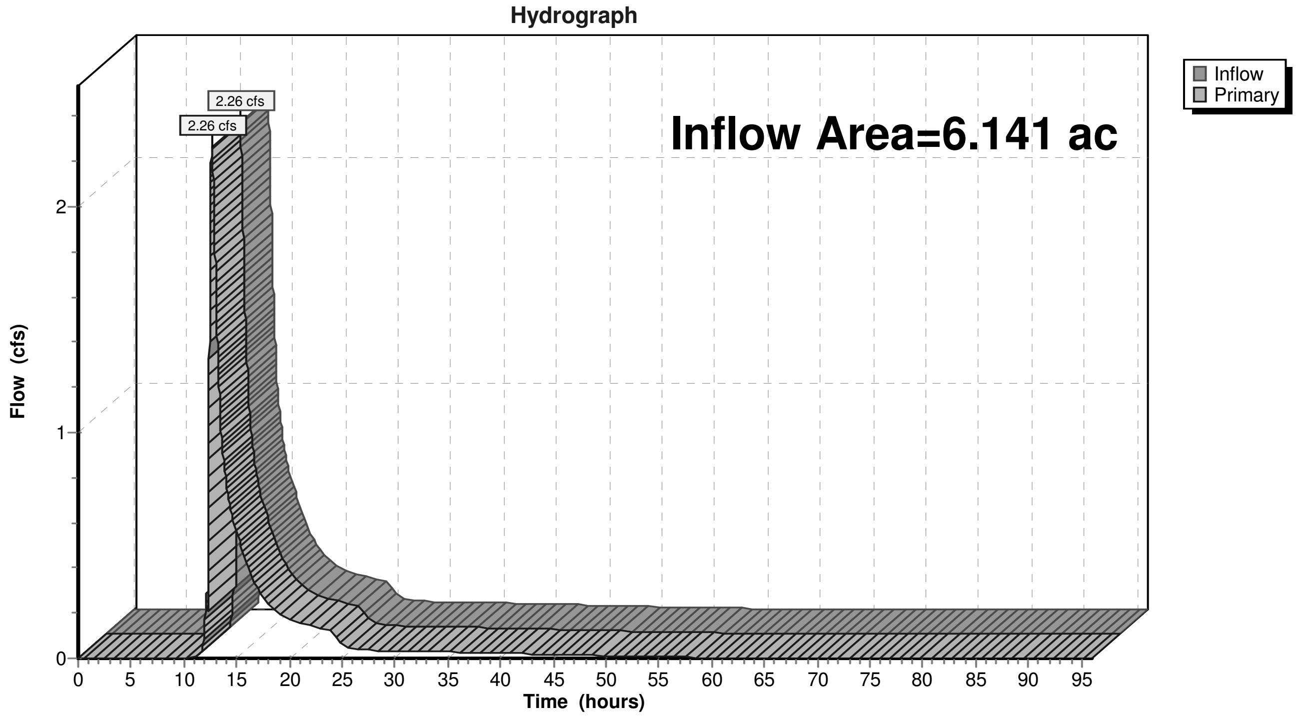


Summary for Link 19L: Design Point 1

Inflow Area = 6.141 ac, 15.53% Impervious, Inflow Depth = 0.98" for 10 year event
Inflow = 2.26 cfs @ 12.66 hrs, Volume= 0.501 af
Primary = 2.26 cfs @ 12.66 hrs, Volume= 0.501 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 19L: Design Point 1

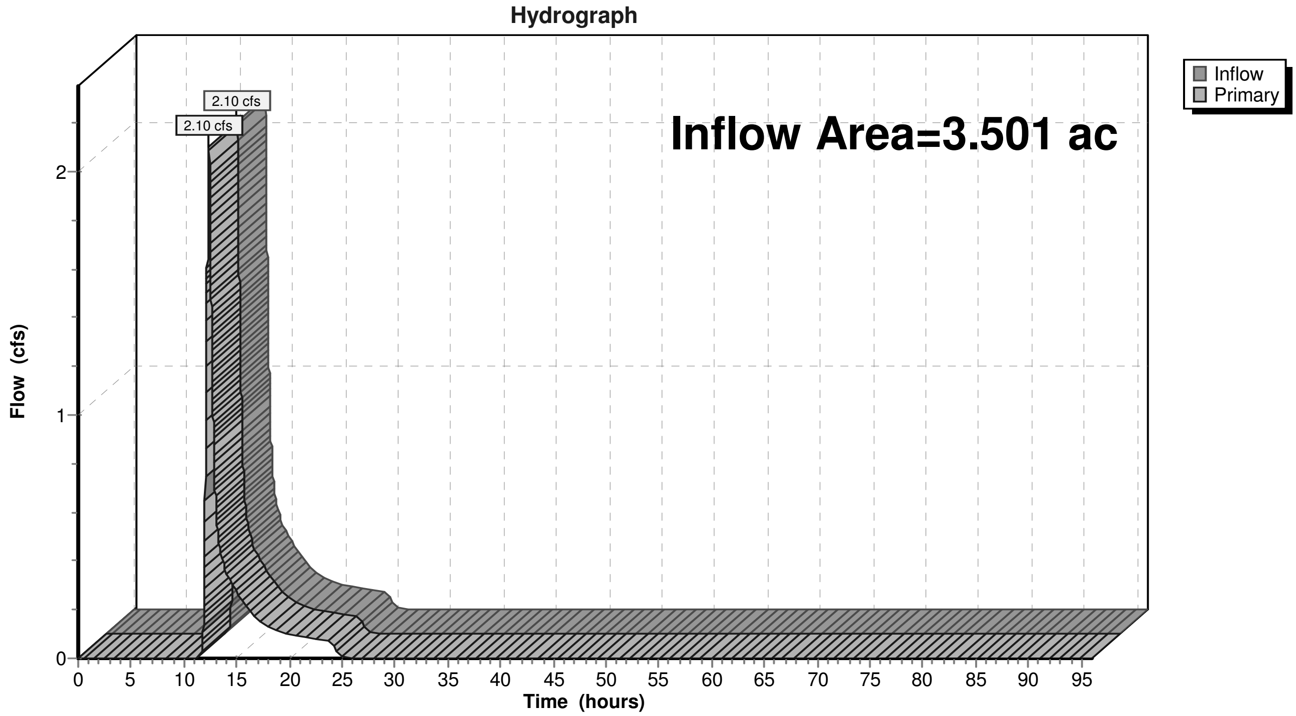


Summary for Link 22L: Design Point 2

Inflow Area = 3.501 ac, 9.03% Impervious, Inflow Depth = 0.95" for 10 year event
Inflow = 2.10 cfs @ 12.37 hrs, Volume= 0.277 af
Primary = 2.10 cfs @ 12.37 hrs, Volume= 0.277 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 22L: Design Point 2

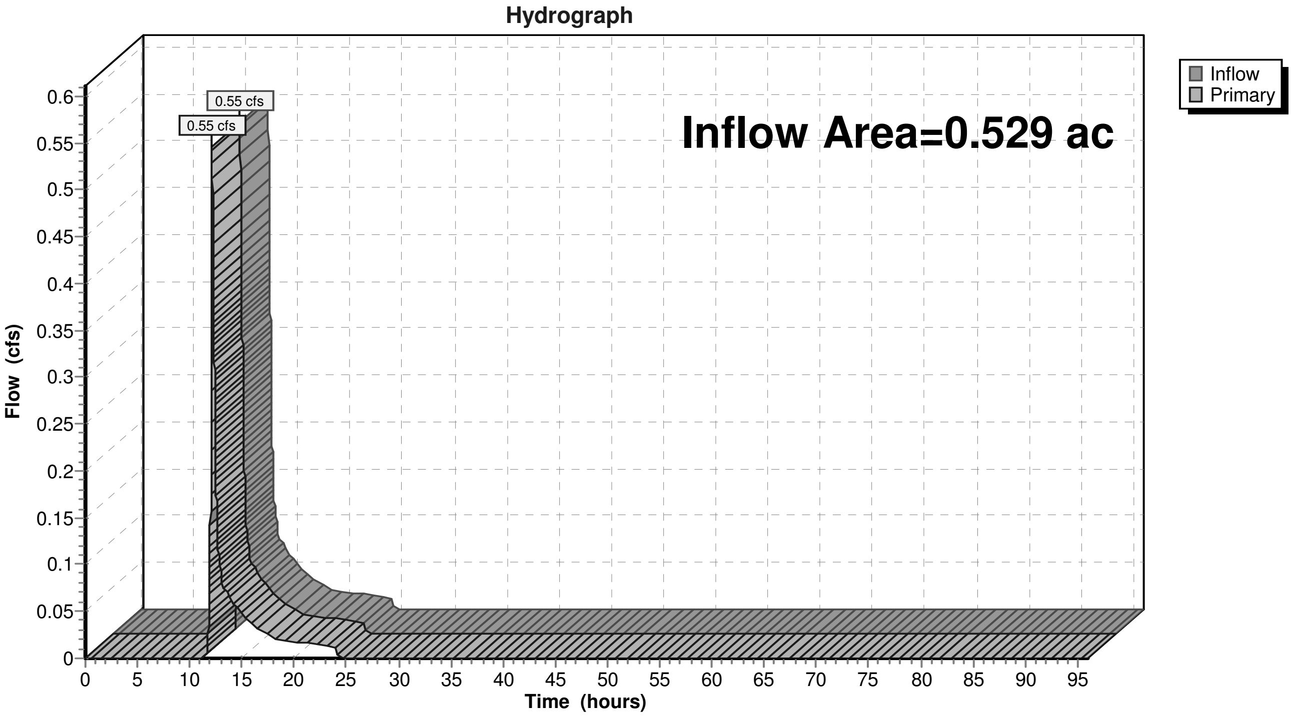


Summary for Link 25L: Design Point 3

Inflow Area = 0.529 ac, 0.00% Impervious, Inflow Depth = 1.10" for 10 year event
Inflow = 0.55 cfs @ 12.13 hrs, Volume= 0.049 af
Primary = 0.55 cfs @ 12.13 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 25L: Design Point 3

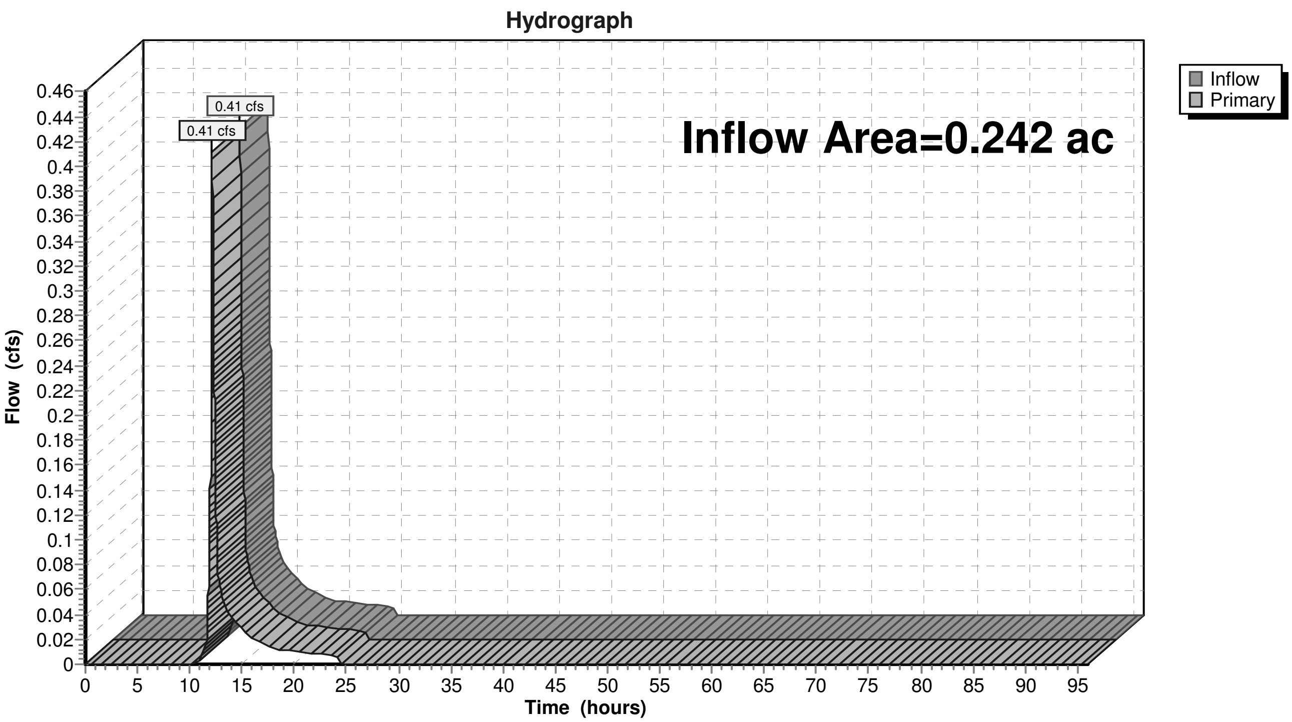


Summary for Link 28L: Design Point 4

Inflow Area = 0.242 ac, 0.00% Impervious, Inflow Depth = 1.65" for 10 year event
Inflow = 0.41 cfs @ 12.13 hrs, Volume= 0.033 af
Primary = 0.41 cfs @ 12.13 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 28L: Design Point 4



Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 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: FDA-2.2 Runoff Area=28,532 sf 43.66% Impervious Runoff Depth=3.18"
Flow Length=483' Tc=13.2 min CN=74 Runoff=1.94 cfs 0.174 af

Subcatchment 2S: FDA-1.2 Runoff Area=19,428 sf 65.47% Impervious Runoff Depth=4.20"
Tc=10.0 min CN=84 Runoff=1.89 cfs 0.156 af

Subcatchment 4S: XDA4 Runoff Area=10,541 sf 0.00% Impervious Runoff Depth=2.35"
Flow Length=100' Slope=0.1900 '/' Tc=8.3 min CN=65 Runoff=0.60 cfs 0.047 af

Subcatchment 5S: FDA-L2.1 Runoff Area=5,735 sf 55.54% Impervious Runoff Depth=3.99"
Tc=5.0 min CN=82 Runoff=0.63 cfs 0.044 af

Subcatchment 6S: FDA-L3.1 Runoff Area=11,384 sf 19.99% Impervious Runoff Depth=2.44"
Tc=10.0 min CN=66 Runoff=0.64 cfs 0.053 af

Subcatchment 20S: FDA-1.3 Runoff Area=177,542 sf 5.71% Impervious Runoff Depth=1.92"
Flow Length=974' Tc=17.9 min CN=60 Runoff=6.08 cfs 0.653 af

Subcatchment 21S: FDA-1.4 Runoff Area=6,857 sf 0.00% Impervious Runoff Depth=2.26"
Flow Length=87' Tc=5.5 min CN=64 Runoff=0.41 cfs 0.030 af

Subcatchment 23S: FDA-L1 Runoff Area=8,712 sf 91.00% Impervious Runoff Depth=5.41"
Tc=5.0 min CN=95 Runoff=1.19 cfs 0.090 af

Subcatchment 24S: FDA-2.1 Runoff Area=38,768 sf 0.00% Impervious Runoff Depth=1.76"
Flow Length=141' Tc=6.3 min CN=58 Runoff=1.68 cfs 0.130 af

Subcatchment 26S: FDA-3 Runoff Area=23,055 sf 0.00% Impervious Runoff Depth=1.68"
Flow Length=156' Tc=7.6 min CN=57 Runoff=0.90 cfs 0.074 af

Subcatchment 27S: FDA-4 Runoff Area=10,545 sf 0.00% Impervious Runoff Depth=2.35"
Flow Length=100' Slope=0.1900 '/' Tc=8.3 min CN=65 Runoff=0.60 cfs 0.047 af

Subcatchment 29S: FDA-L2.2 Runoff Area=4,285 sf 100.00% Impervious Runoff Depth=5.76"
Tc=5.0 min CN=98 Runoff=0.60 cfs 0.047 af

Subcatchment 30S: XDA1 Runoff Area=208,652 sf 1.02% Impervious Runoff Depth=1.60"
Flow Length=1,046' Tc=25.6 min CN=56 Runoff=4.89 cfs 0.637 af

Subcatchment 31S: FDA-1.1 Runoff Area=29,272 sf 0.00% Impervious Runoff Depth=1.84"
Tc=15.0 min CN=59 Runoff=1.02 cfs 0.103 af

Subcatchment 32S: FDA-2.3 Runoff Area=85,225 sf 1.54% Impervious Runoff Depth=1.68"
Flow Length=401' Tc=14.7 min CN=57 Runoff=2.65 cfs 0.273 af

Subcatchment 33S: XDA2 Runoff Area=211,963 sf 1.03% Impervious Runoff Depth=1.52"
Flow Length=544' Tc=15.5 min CN=55 Runoff=5.68 cfs 0.615 af

Subcatchment 34S: XDA3 Runoff Area=23,043 sf 0.00% Impervious Runoff Depth=1.52"
Flow Length=156' Tc=8.3 min CN=55 Runoff=0.77 cfs 0.067 af

Subcatchment 35S: FDA-L3.2 Runoff Area=4,286 sf 23.68% Impervious Runoff Depth=2.62"
Tc=10.0 min CN=68 Runoff=0.26 cfs 0.021 af

Reach 30R: Vegetated Swale Avg. Flow Depth=0.76' Max Vel=0.92 fps Inflow=2.65 cfs 0.273 af
n=0.240 L=285.0' S=0.0561 '/' Capacity=6.76 cfs Outflow=2.44 cfs 0.273 af

Pond 15P: SWMF Peak Elev=127.94' Storage=11,291 cf Inflow=6.97 cfs 0.743 af
Outflow=3.95 cfs 0.743 af

Pond 29P: SWMF-L1 Peak Elev=153.77' Storage=907 cf Inflow=0.92 cfs 0.088 af
Outflow=0.21 cfs 0.088 af

Pond 30P: Div L1 (DS F.2) Peak Elev=154.88' Inflow=1.19 cfs 0.090 af
Primary=0.27 cfs 0.002 af Secondary=0.92 cfs 0.088 af Outflow=1.19 cfs 0.090 af

Pond 31P: SWMF-1.1 Bioret Peak Elev=157.18' Storage=874 cf Inflow=1.02 cfs 0.103 af
Discarded=0.03 cfs 0.047 af Primary=0.75 cfs 0.056 af Outflow=0.79 cfs 0.103 af

Pond 32P: Div 2.2 (DS D.2) Peak Elev=153.14' Inflow=1.94 cfs 0.174 af
Primary=0.71 cfs 0.019 af Secondary=1.23 cfs 0.155 af Outflow=1.94 cfs 0.174 af

Pond 33P: Div L2.1 Peak Elev=150.58' Inflow=0.63 cfs 0.044 af
Primary=0.09 cfs 0.000 af Secondary=0.55 cfs 0.043 af Outflow=0.63 cfs 0.044 af

Pond 34P: SWMF-L2.1 Peak Elev=149.66' Storage=667 cf Inflow=0.55 cfs 0.043 af
Outflow=0.06 cfs 0.043 af

Pond 35P: Div 1.2 Peak Elev=155.12' Inflow=1.89 cfs 0.156 af
Primary=0.89 cfs 0.014 af Secondary=1.00 cfs 0.142 af Outflow=1.89 cfs 0.156 af

Pond 36P: Rain Garden #1 Lot 3 Peak Elev=145.09' Storage=685 cf Inflow=0.64 cfs 0.053 af
Discarded=0.03 cfs 0.036 af Primary=0.28 cfs 0.017 af Outflow=0.32 cfs 0.053 af

Pond 37P: SWMF-1.2 Peak Elev=155.17' Storage=2,037 cf Inflow=1.00 cfs 0.142 af
Outflow=0.18 cfs 0.142 af

Pond 38P: SWMF-2.2 Peak Elev=153.13' Storage=2,460 cf Inflow=1.23 cfs 0.155 af
Discarded=0.16 cfs 0.151 af Primary=0.06 cfs 0.004 af Outflow=0.22 cfs 0.155 af

Pond 39P: SWMF-L2.2 Peak Elev=136.76' Storage=607 cf Inflow=0.56 cfs 0.047 af
Outflow=0.07 cfs 0.047 af

Pond 40P: Div L2.2 Peak Elev=138.10' Inflow=0.60 cfs 0.047 af
Primary=0.04 cfs 0.000 af Secondary=0.56 cfs 0.047 af Outflow=0.60 cfs 0.047 af

Pond 41P: Rain Garden #2 Lot 3 Peak Elev=152.51' Storage=395 cf Inflow=0.26 cfs 0.021 af
Discarded=0.02 cfs 0.021 af Primary=0.01 cfs 0.001 af Outflow=0.03 cfs 0.021 af

Link 19L: Design Point 1 Inflow=4.02 cfs 0.772 af
Primary=4.02 cfs 0.772 af

Link 22L: Design Point 2 Inflow=3.59 cfs 0.426 af
Primary=3.59 cfs 0.426 af

Link 25L: Design Point 3 Inflow=0.90 cfs 0.074 af
Primary=0.90 cfs 0.074 af

Link 28L: Design Point 4 Inflow=0.60 cfs 0.047 af
Primary=0.60 cfs 0.047 af

Total Runoff Area = 20.841 ac Runoff Volume = 3.263 af Average Runoff Depth = 1.88"
93.43% Pervious = 19.472 ac 6.57% Impervious = 1.369 ac

Summary for Subcatchment 1S: FDA-2.2

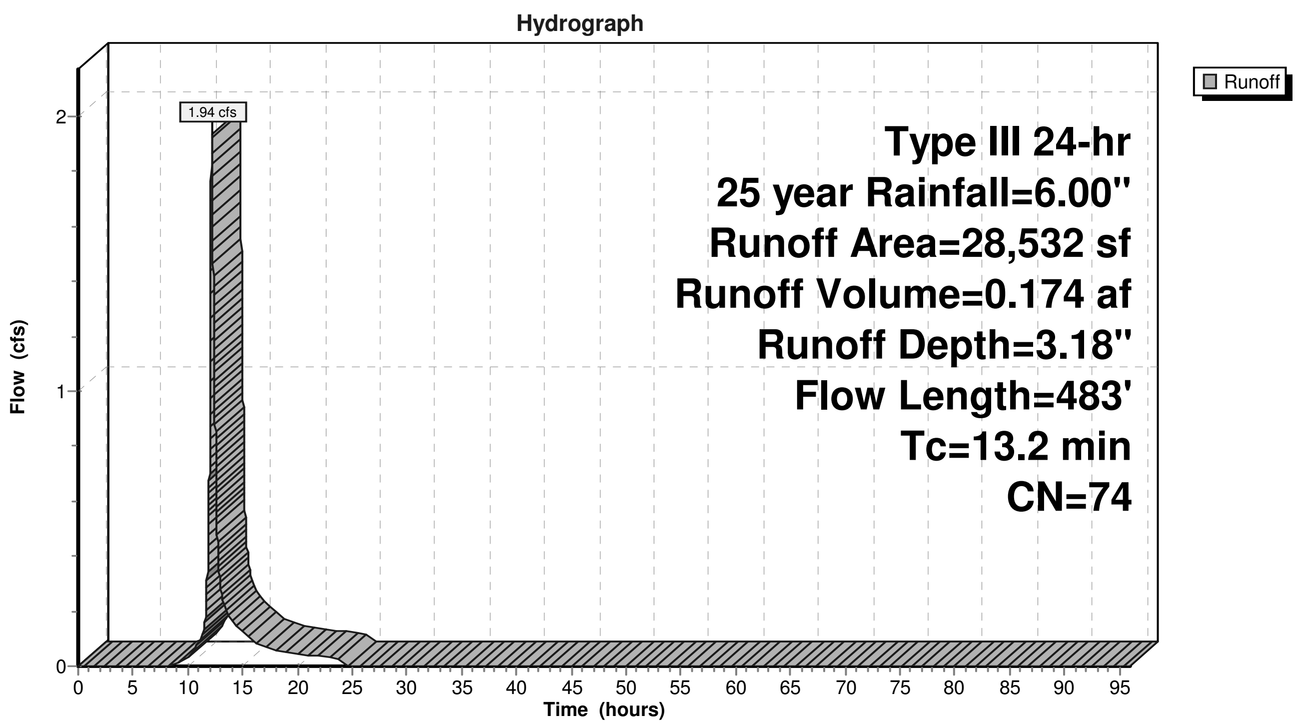
Runoff = 1.94 cfs @ 12.19 hrs, Volume= 0.174 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

	Area (sf)	CN	Description
*	11,021	98	Subdivision Road, HSG B
*	1,437	98	Off-site impervious road, HSG B
	1,307	61	>75% Grass cover, Good, HSG B
	14,767	55	Woods, Good, HSG B
	28,532	74	Weighted Average
	16,074		56.34% Pervious Area
	12,458		43.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	100	0.0750	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.6	68	0.1250	1.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	65	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	250	0.0750	13.46	10.57	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
13.2	483	Total			

Subcatchment 1S: FDA-2.2



Summary for Subcatchment 2S: FDA-1.2

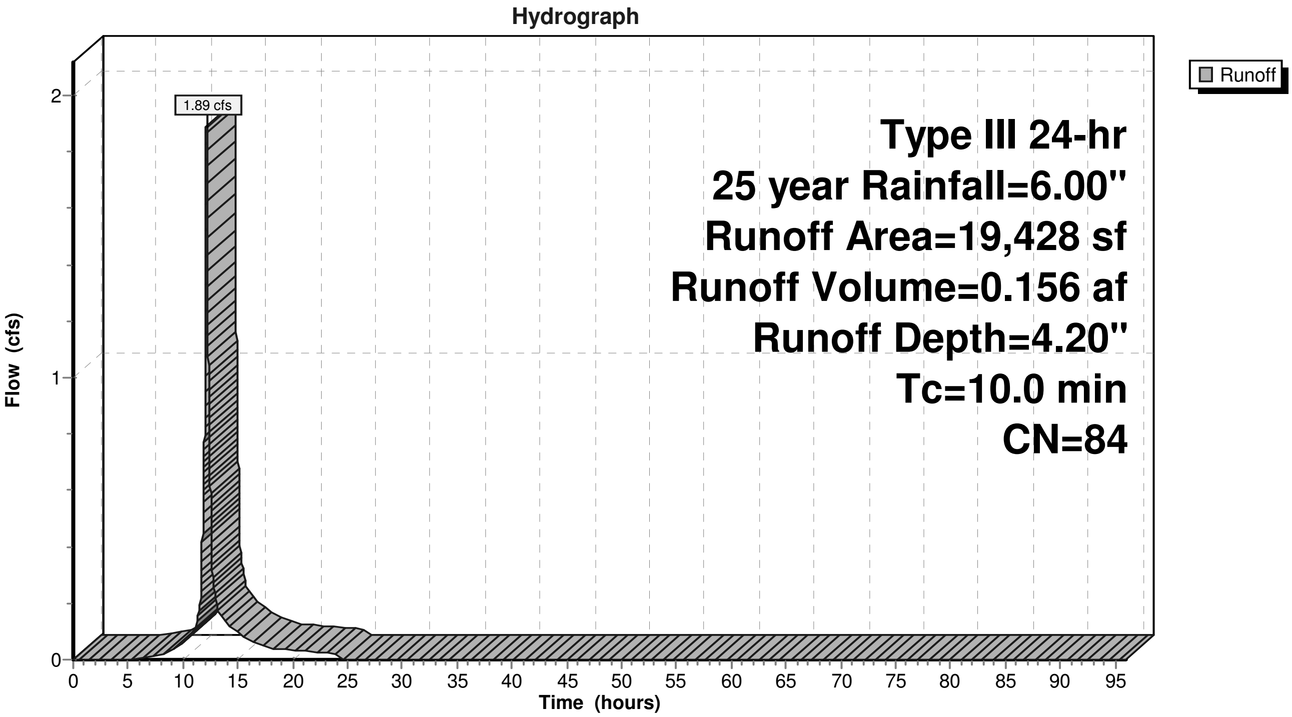
Runoff = 1.89 cfs @ 12.14 hrs, Volume= 0.156 af, Depth= 4.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

Area (sf)	CN	Description
12,720	98	Paved parking, HSG B
3,180	61	>75% Grass cover, Good, HSG B
3,528	55	Woods, Good, HSG B
19,428	84	Weighted Average
6,708		34.53% Pervious Area
12,720		65.47% Impervious Area

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

Subcatchment 2S: FDA-1.2



Summary for Subcatchment 4S: XDA4

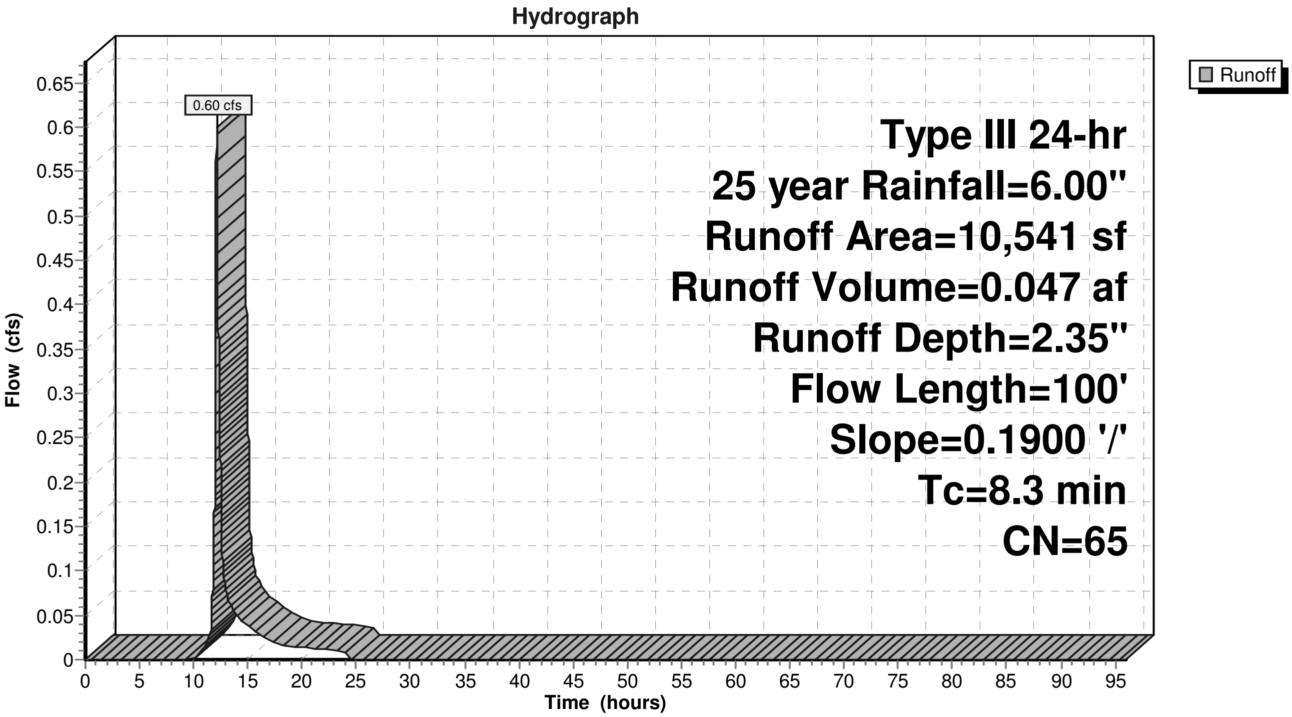
Runoff = 0.60 cfs @ 12.12 hrs, Volume= 0.047 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

Area (sf)	CN	Description
4,225	55	Woods, Good, HSG B
4,225	70	Woods, Good, HSG C
2,091	77	Woods, Good, HSG D
10,541	65	Weighted Average
10,541		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.1900	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"

Subcatchment 4S: XDA4



Summary for Subcatchment 5S: FDA-L2.1

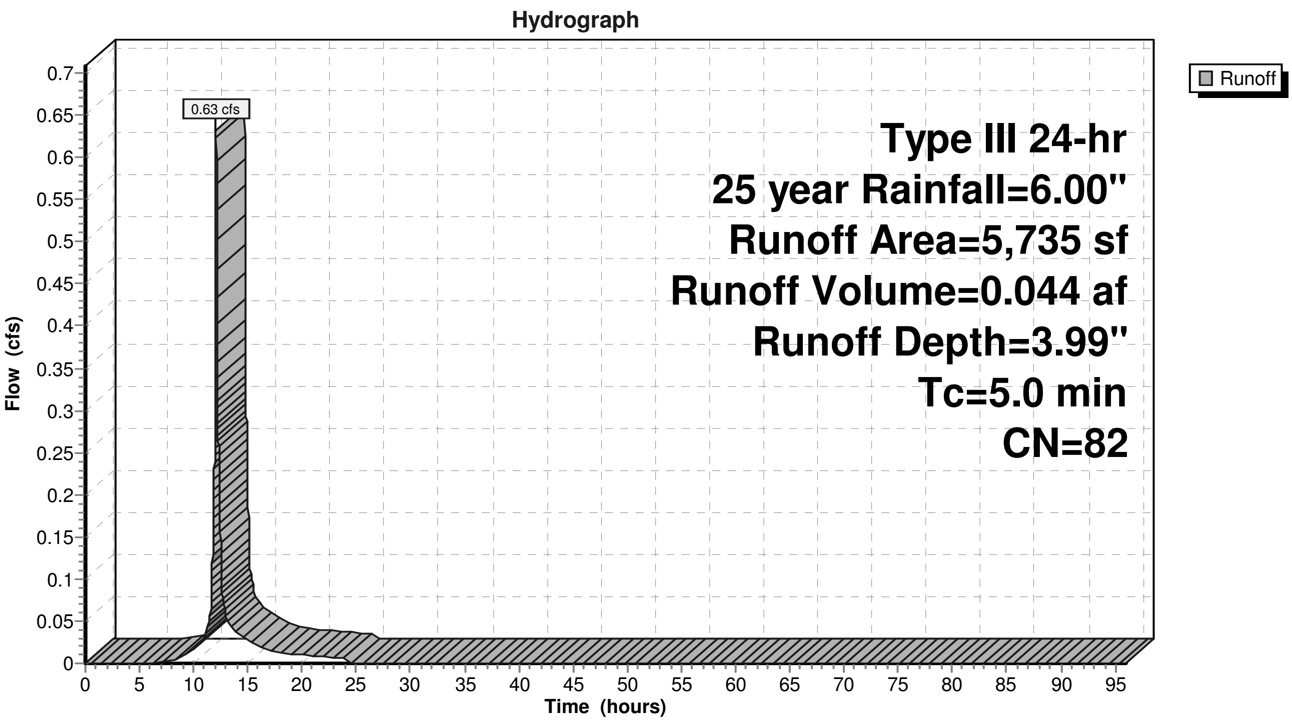
Runoff = 0.63 cfs @ 12.07 hrs, Volume= 0.044 af, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

	Area (sf)	CN	Description
*	3,185	98	Driveway and roofs, HSG B
	2,550	61	>75% Grass cover, Good, HSG B
	5,735	82	Weighted Average
	2,550		44.46% Pervious Area
	3,185		55.54% Impervious Area

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

Subcatchment 5S: FDA-L2.1



Summary for Subcatchment 6S: FDA-L3.1

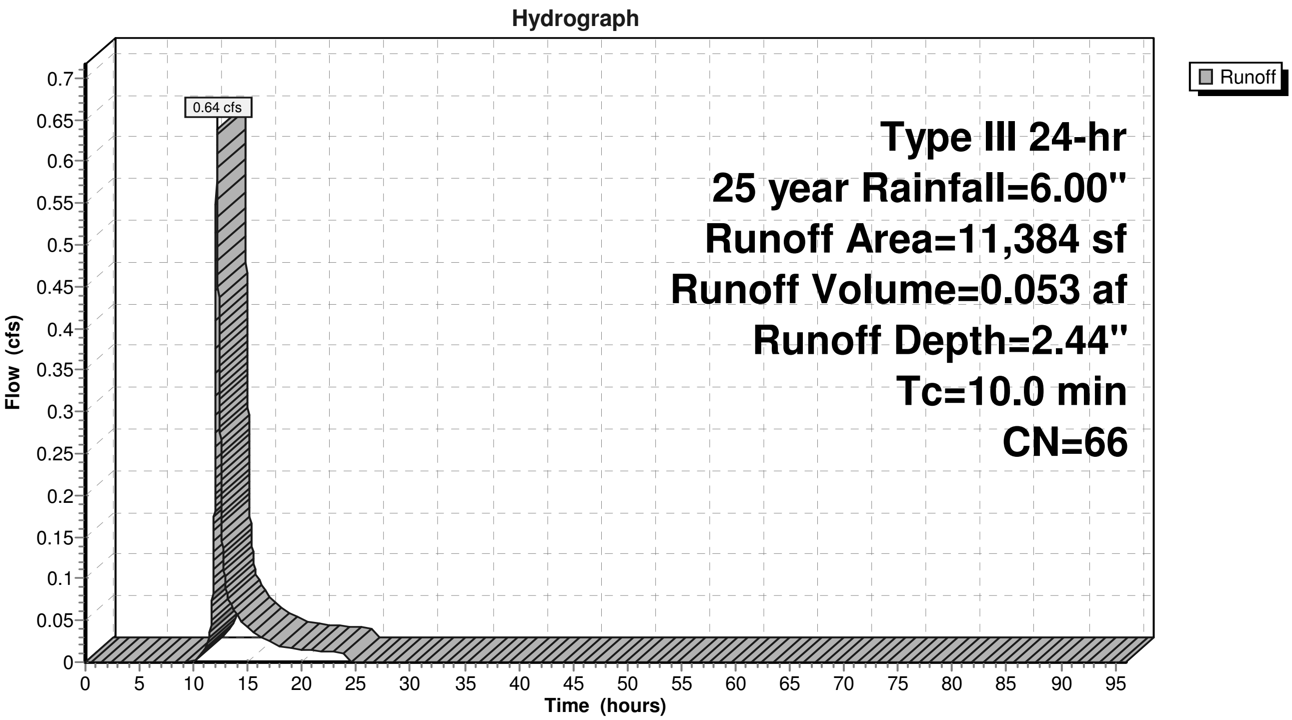
Runoff = 0.64 cfs @ 12.15 hrs, Volume= 0.053 af, Depth= 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

	Area (sf)	CN	Description
*	982	98	Lot 3 Roof, HSG B
*	907	98	Lot 3 Roof, HSG B
*	387	98	Walks, Entry Steps, HSG B
	5,387	61	>75% Grass cover, Good, HSG B
	3,721	55	Woods, Good, HSG B
	11,384	66	Weighted Average
	9,108		80.01% Pervious Area
	2,276		19.99% Impervious Area

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

Subcatchment 6S: FDA-L3.1



Summary for Subcatchment 20S: FDA-1.3

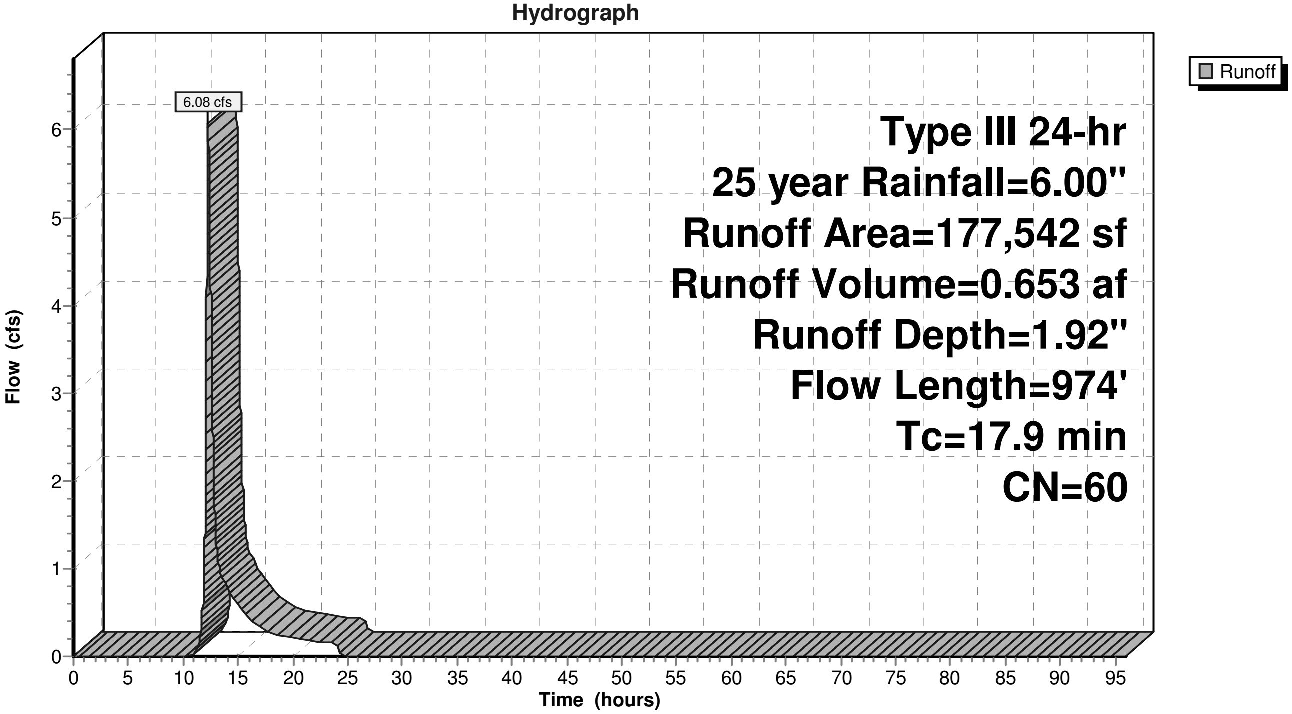
Runoff = 6.08 cfs @ 12.27 hrs, Volume= 0.653 af, Depth= 1.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

	Area (sf)	CN	Description
*	9,958	98	Impervious Surfaces, HSG B
*	1,720	85	Maintenance Path, HSG B
*	185	98	Retaining Wall, HSG B
	60,200	61	>75% Grass cover, Good, HSG B
	2,190	74	>75% Grass cover, Good, HSG C
	523	80	>75% Grass cover, Good, HSG D
	12,069	48	Brush, Good, HSG B
*	34,260	55	Woods (on-site), Good, HSG B
*	51,994	55	Woods (off-site), Good, HSG B
	2,962	70	Woods, Good, HSG C
	1,481	77	Woods, Good, HSG D
	177,542	60	Weighted Average
	167,399		94.29% Pervious Area
	10,143		5.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.1700	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	133	0.1880	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.1	183	0.0383	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	57	0.0219	2.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.1	91	0.1000	15.54	12.21	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
1.6	274	0.0299	2.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.0	136	0.0022	0.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
17.9	974	Total			

Subcatchment 20S: FDA-1.3



Summary for Subcatchment 21S: FDA-1.4

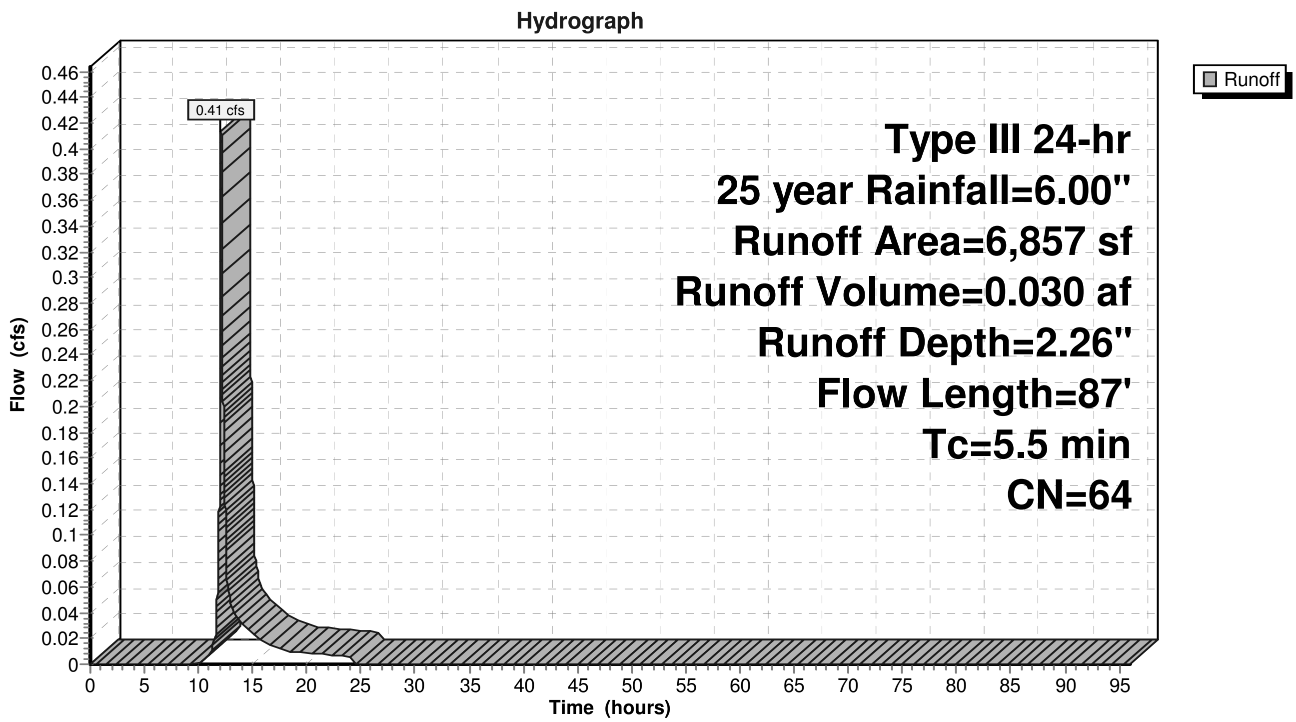
Runoff = 0.41 cfs @ 12.09 hrs, Volume= 0.030 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

Area (sf)	CN	Description
478	61	>75% Grass cover, Good, HSG B
124	74	>75% Grass cover, Good, HSG C
62	80	>75% Grass cover, Good, HSG D
3,040	55	Woods, Good, HSG B
2,102	70	Woods, Good, HSG C
1,051	77	Woods, Good, HSG D
6,857	64	Weighted Average
6,857		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	40	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	47	0.2300	2.40		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.5	87	Total			

Subcatchment 21S: FDA-1.4



Summary for Subcatchment 23S: FDA-L1

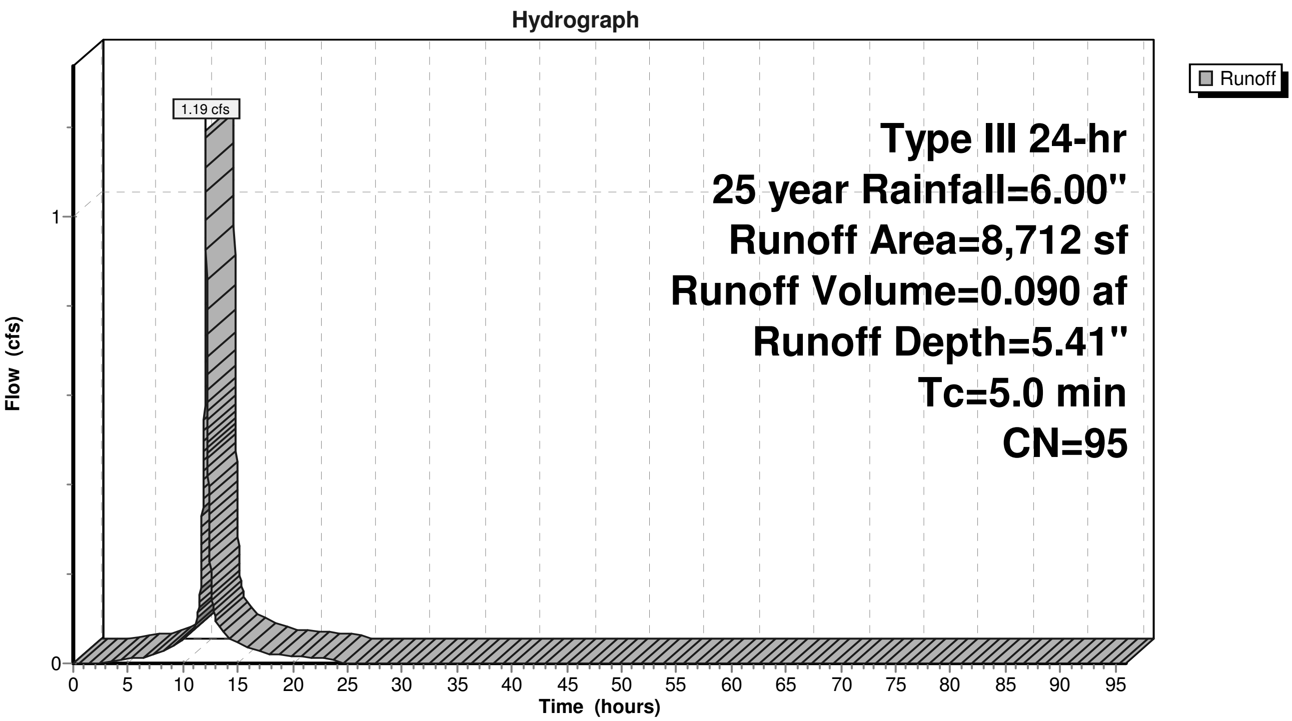
Runoff = 1.19 cfs @ 12.07 hrs, Volume= 0.090 af, Depth= 5.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

Area (sf)	CN	Description
7,928	98	Paved parking, HSG B
784	61	>75% Grass cover, Good, HSG B
8,712	95	Weighted Average
784		9.00% Pervious Area
7,928		91.00% Impervious Area

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

Subcatchment 23S: FDA-L1



Summary for Subcatchment 24S: FDA-2.1

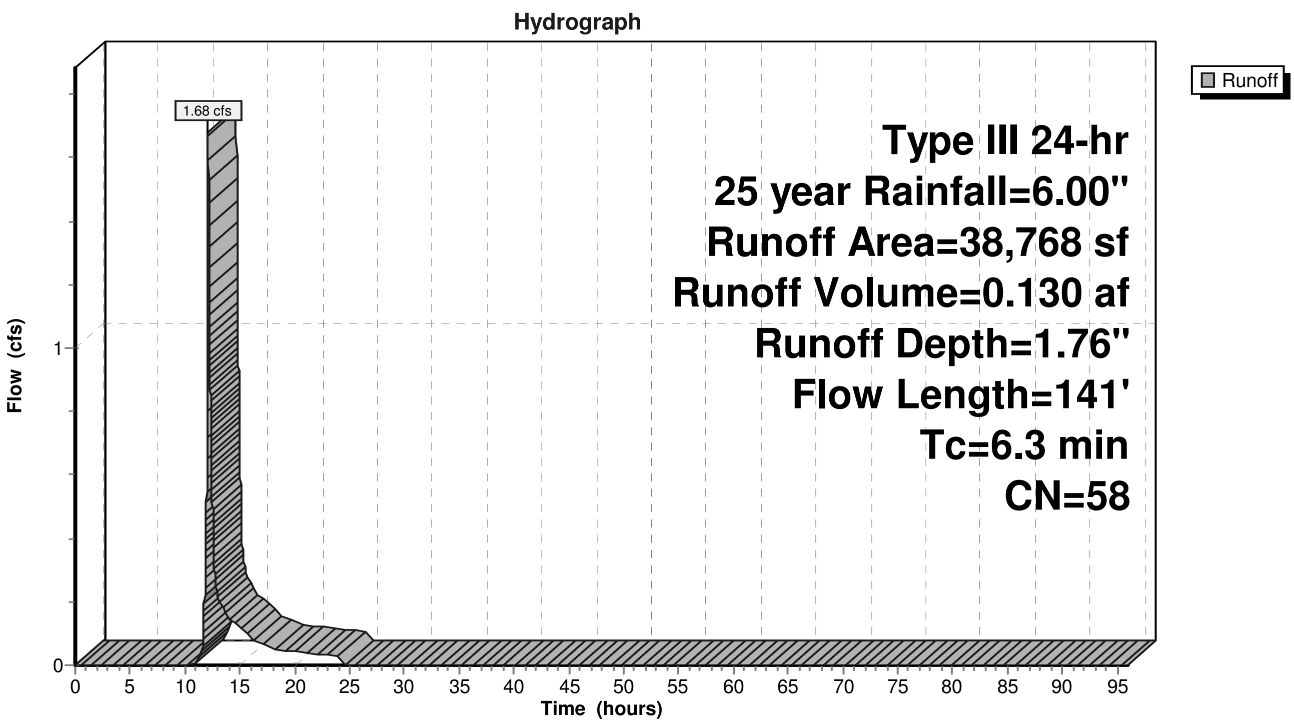
Runoff = 1.68 cfs @ 12.10 hrs, Volume= 0.130 af, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

Area (sf)	CN	Description
16,814	61	>75% Grass cover, Good, HSG B
21,954	55	Woods, Good, HSG B
38,768	58	Weighted Average
38,768		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	63	0.1698	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	78	0.0744	4.09		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
6.3	141	Total			

Subcatchment 24S: FDA-2.1



Summary for Subcatchment 26S: FDA-3

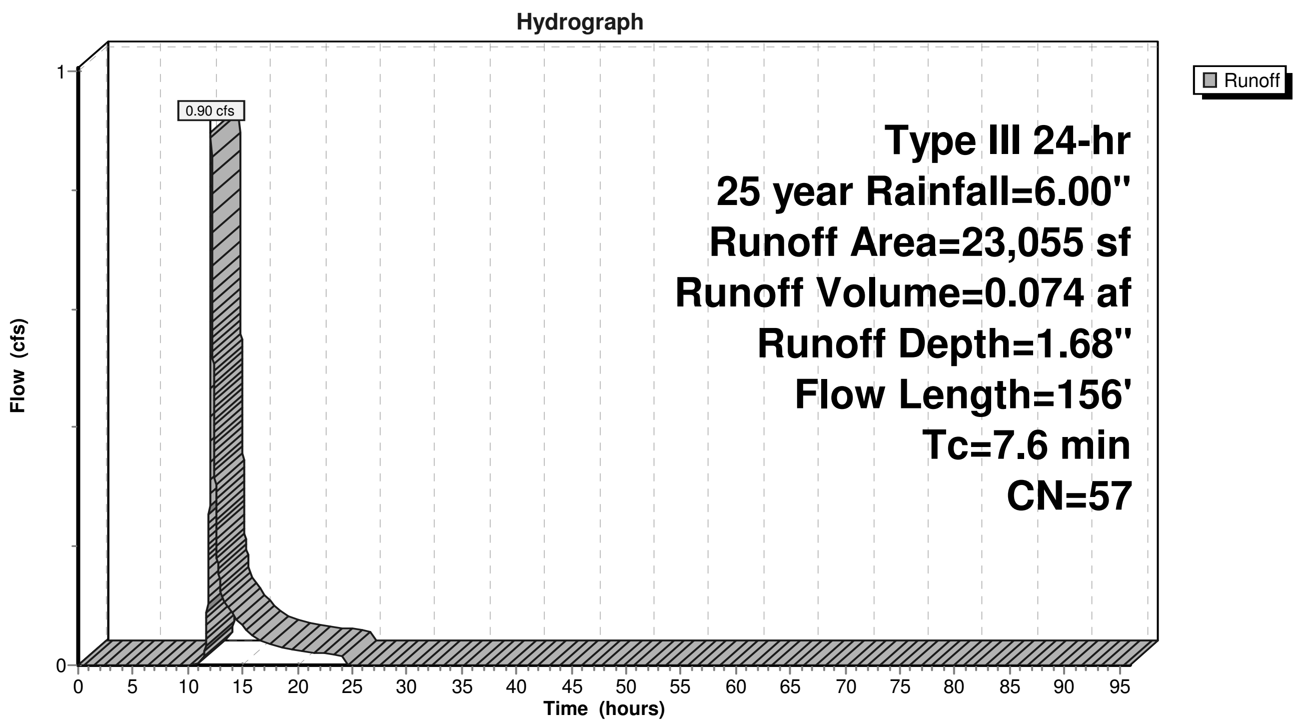
Runoff = 0.90 cfs @ 12.12 hrs, Volume= 0.074 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

Area (sf)	CN	Description
5,955	61	>75% Grass cover, Good, HSG B
17,100	55	Woods, Good, HSG B
23,055	57	Weighted Average
23,055		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	86	0.1977	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	70	0.0571	3.58		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.6	156	Total			

Subcatchment 26S: FDA-3



Summary for Subcatchment 27S: FDA-4

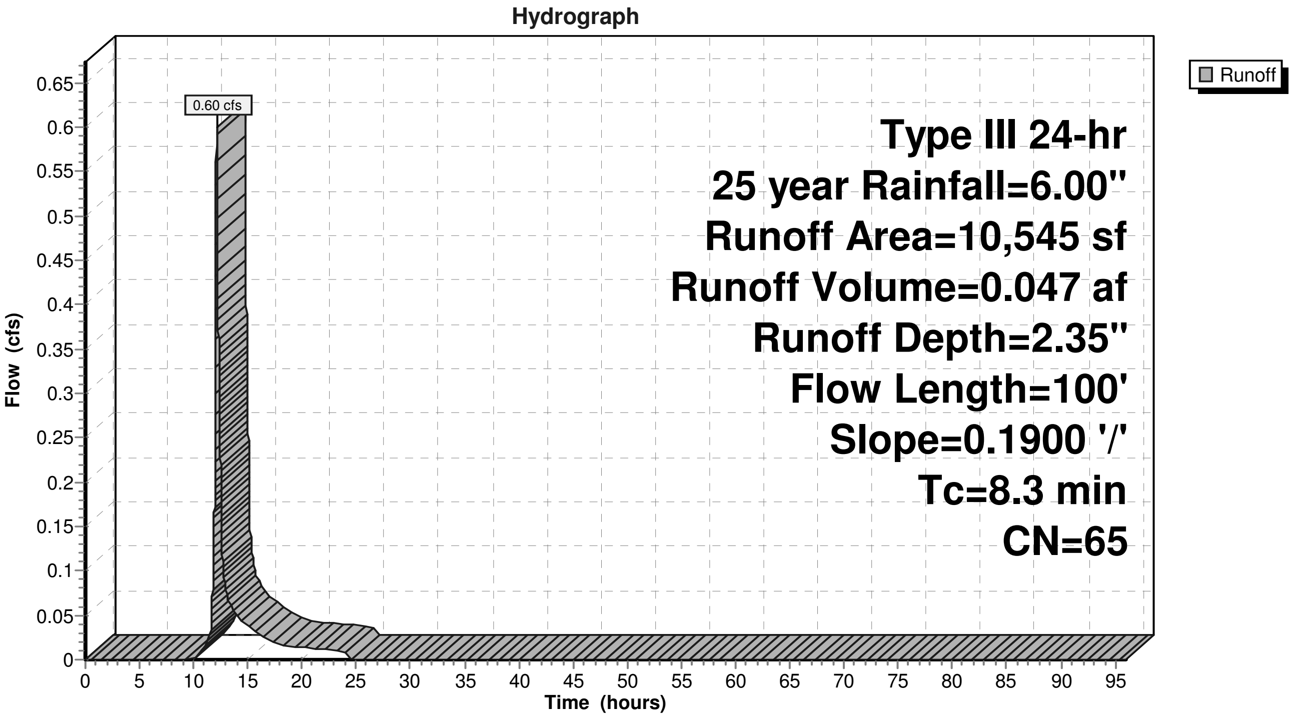
Runoff = 0.60 cfs @ 12.12 hrs, Volume= 0.047 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

Area (sf)	CN	Description
4,220	55	Woods, Good, HSG B
4,220	70	Woods, Good, HSG C
2,105	77	Woods, Good, HSG D
10,545	65	Weighted Average
10,545		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.1900	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"

Subcatchment 27S: FDA-4



Summary for Subcatchment 29S: FDA-L2.2

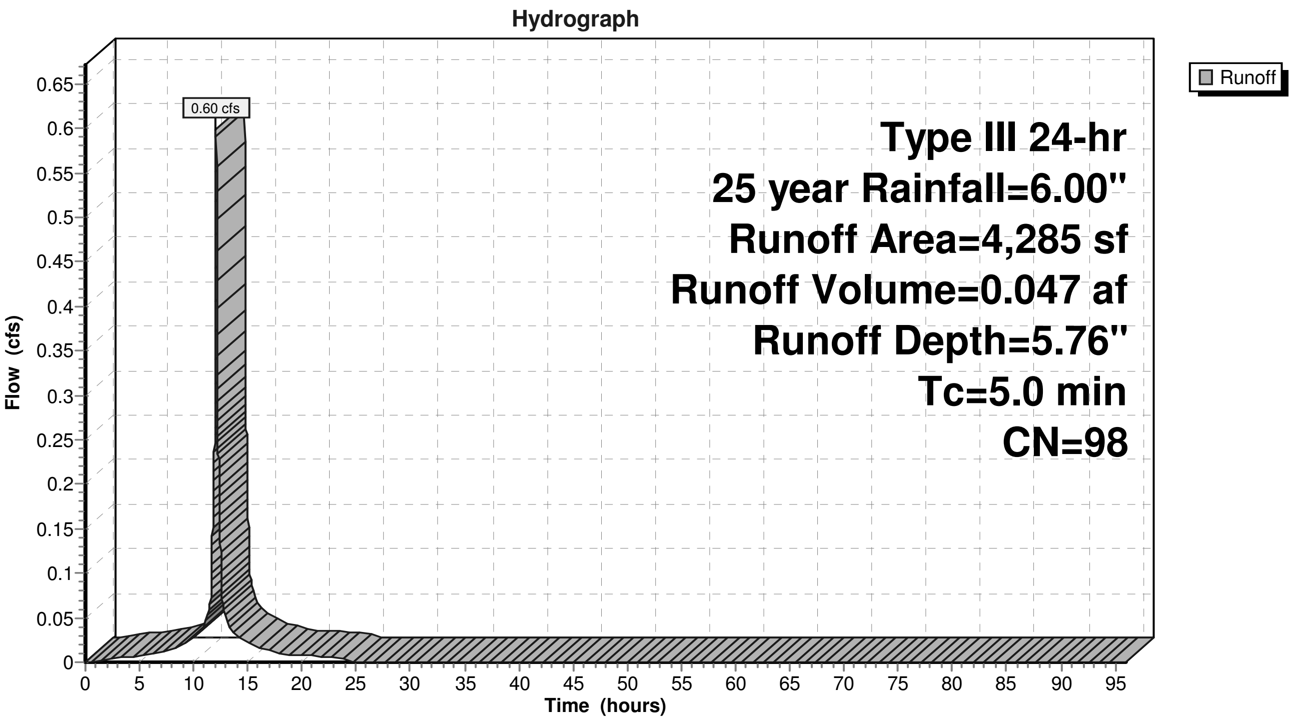
Runoff = 0.60 cfs @ 12.07 hrs, Volume= 0.047 af, Depth= 5.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

Area (sf)	CN	Description
4,285	98	Roofs, HSG B
4,285		100.00% Impervious Area

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

Subcatchment 29S: FDA-L2.2



Summary for Subcatchment 30S: XDA1

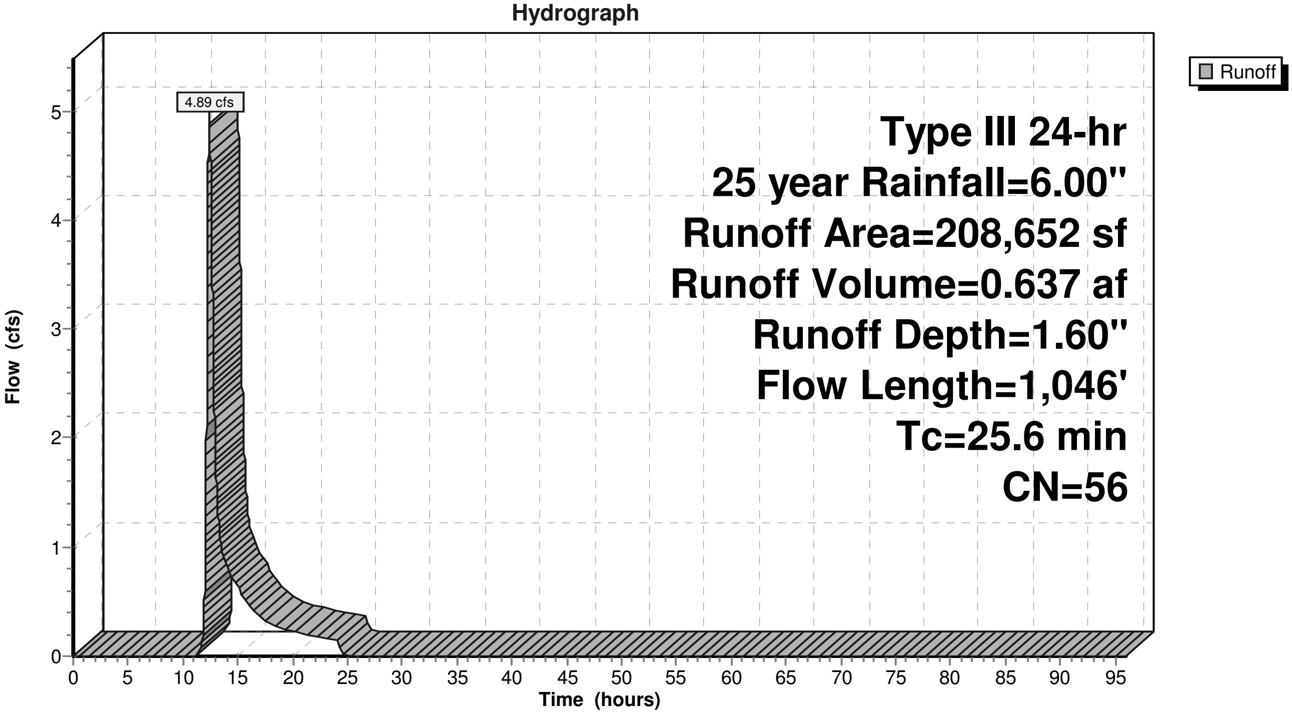
Runoff = 4.89 cfs @ 12.40 hrs, Volume= 0.637 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

Area (sf)	CN	Description
2,134	98	Unconnected pavement, HSG B
195,802	55	Woods, Good, HSG B
7,144	70	Woods, Good, HSG C
3,572	77	Woods, Good, HSG D
208,652	56	Weighted Average
206,518		98.98% Pervious Area
2,134		1.02% Impervious Area
2,134		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.1700	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	133	0.1880	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.1	183	0.0383	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	185	0.0919	1.52		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	367	0.0158	0.63		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	78	0.0538	1.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.6	1,046	Total			

Subcatchment 30S: XDA1



Summary for Subcatchment 31S: FDA-1.1

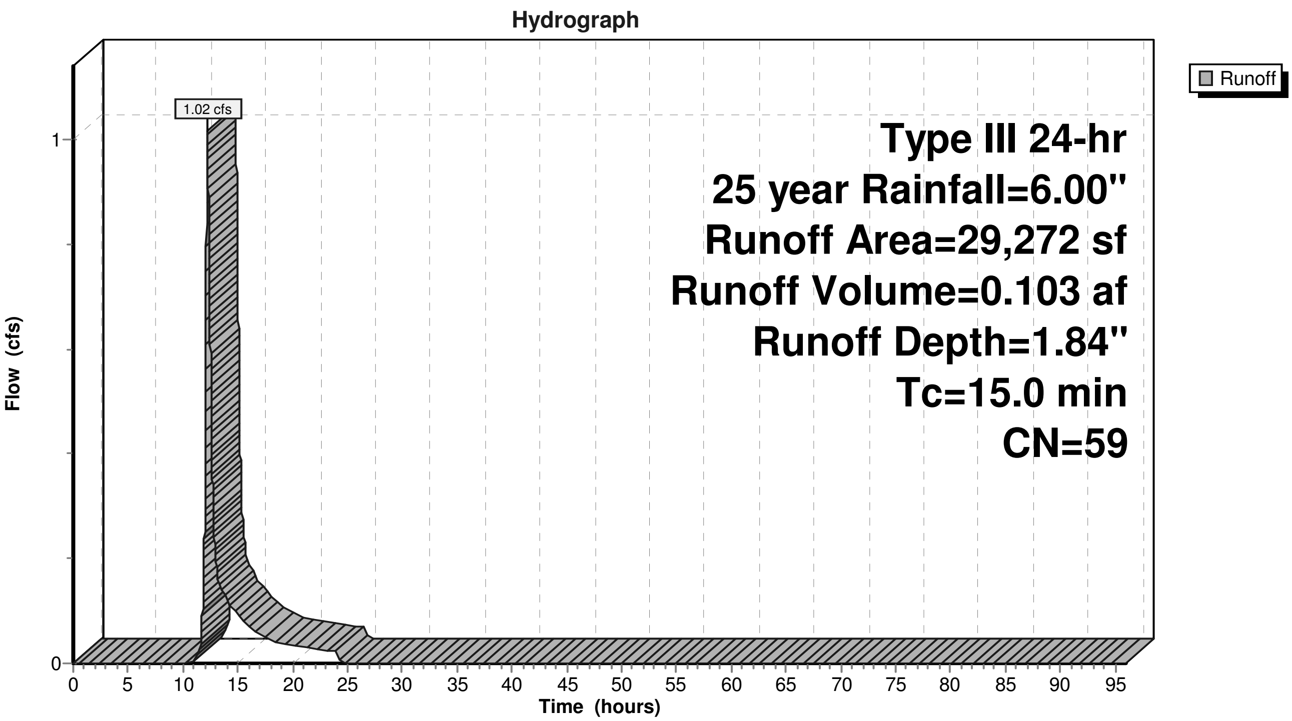
Runoff = 1.02 cfs @ 12.22 hrs, Volume= 0.103 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

	Area (sf)	CN	Description
	18,513	61	>75% Grass cover, Good, HSG B
	7,020	55	Woods, Good, HSG B
*	3,739	55	Woods (off-site), Good, HSG B
	29,272	59	Weighted Average
	29,272		100.00% Pervious Area

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

Subcatchment 31S: FDA-1.1



Summary for Subcatchment 32S: FDA-2.3

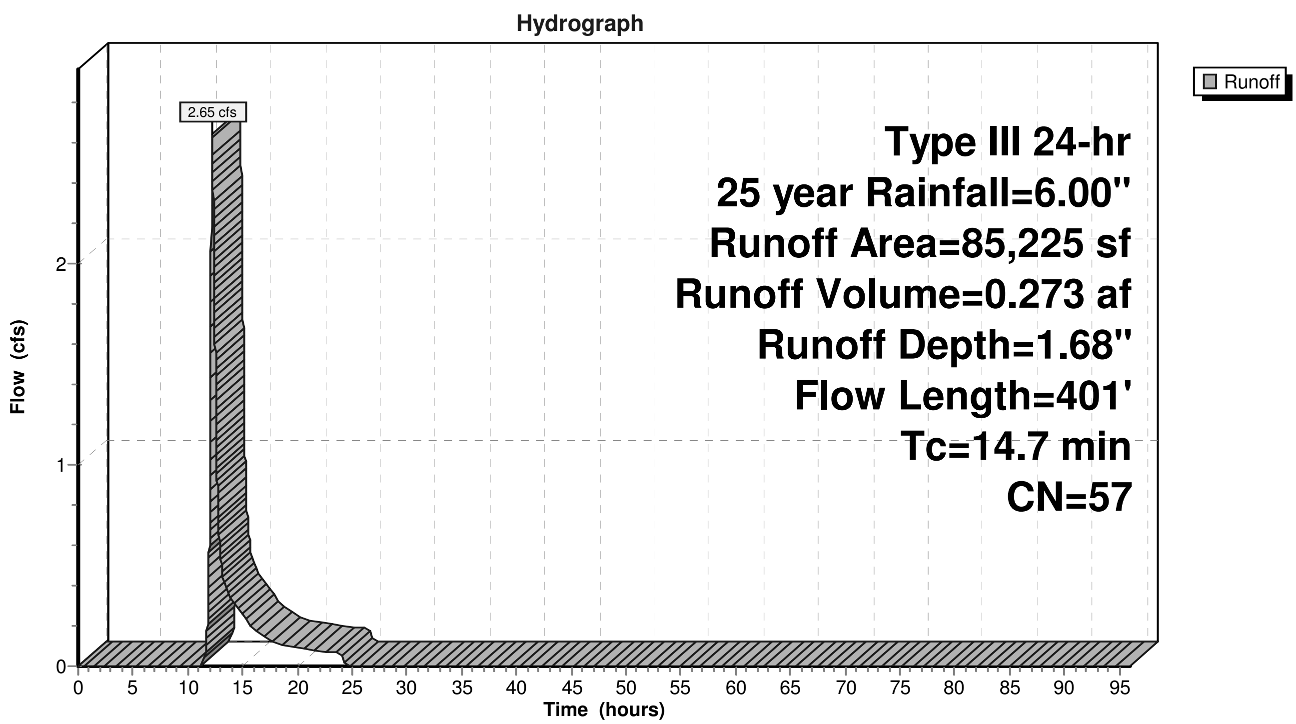
Runoff = 2.65 cfs @ 12.22 hrs, Volume= 0.273 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

	Area (sf)	CN	Description
*	715	98	Off-Site Road, HSG B
	315	98	Unconnected pavement, HSG B
	280	98	Unconnected pavement, HSG B
	23,051	61	>75% Grass cover, Good, HSG B
	60,864	55	Woods, Good, HSG B
	85,225	57	Weighted Average
	83,915		98.46% Pervious Area
	1,310		1.54% Impervious Area
	595		45.42% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	100	0.2050	0.21		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.4	148	0.1284	1.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.2	153	0.0163	0.49	1.29	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.75' Z= 2.0 '/' Top.W=5.00' n= 0.240 Sheet flow over Dense Grass
14.7	401	Total			

Subcatchment 32S: FDA-2.3



Summary for Subcatchment 33S: XDA2

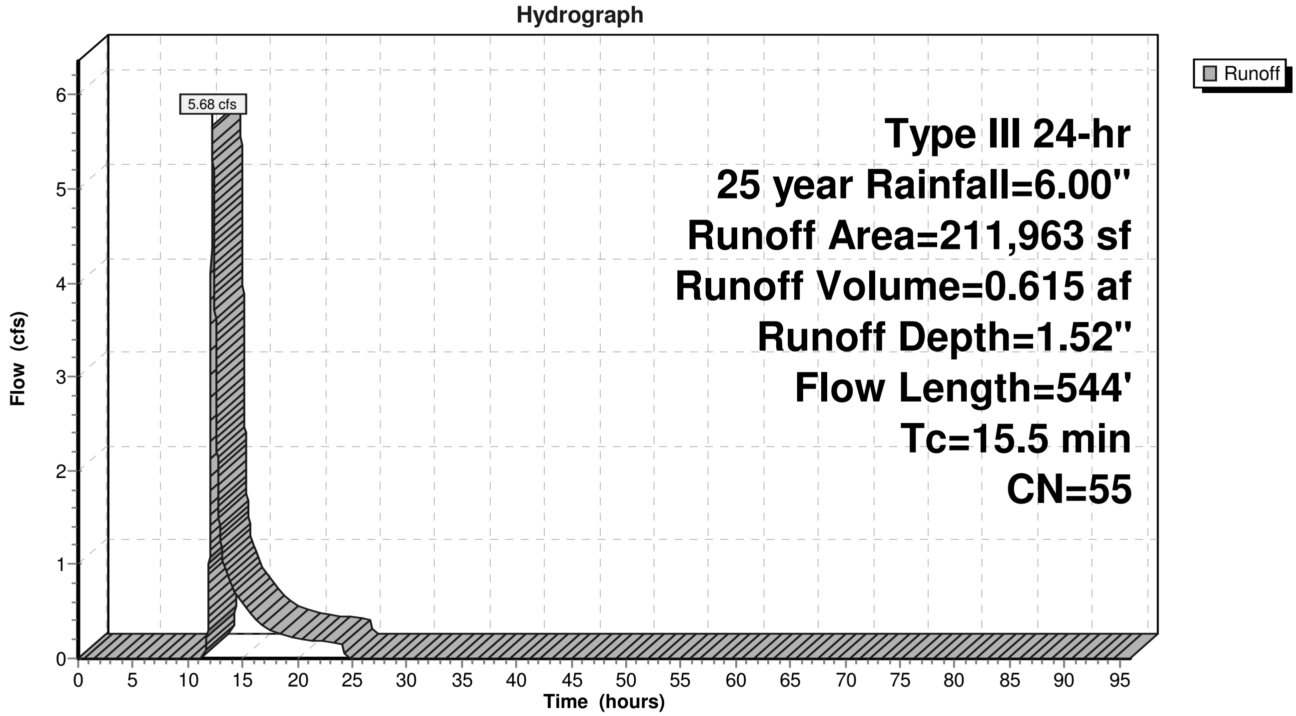
Runoff = 5.68 cfs @ 12.24 hrs, Volume= 0.615 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

Area (sf)	CN	Description
209,785	55	Woods, Good, HSG B
2,178	98	Paved parking, HSG B
211,963	55	Weighted Average
209,785		98.97% Pervious Area
2,178		1.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.1050	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.8	106	0.2075	2.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.1	338	0.0740	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.5	544	Total			

Subcatchment 33S: XDA2



Summary for Subcatchment 34S: XDA3

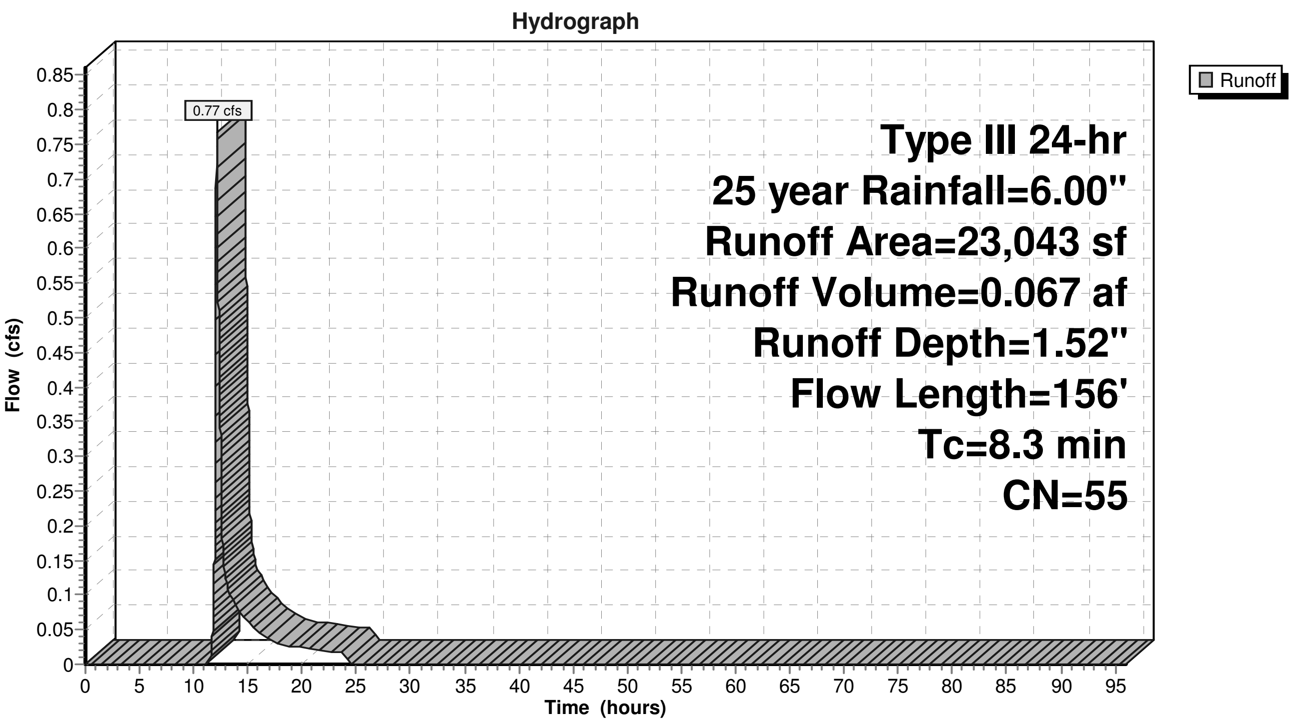
Runoff = 0.77 cfs @ 12.13 hrs, Volume= 0.067 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

Area (sf)	CN	Description
23,043	55	Woods, Good, HSG B
23,043		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	86	0.1977	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	70	0.0571	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.3	156	Total			

Subcatchment 34S: XDA3



Summary for Subcatchment 35S: FDA-L3.2

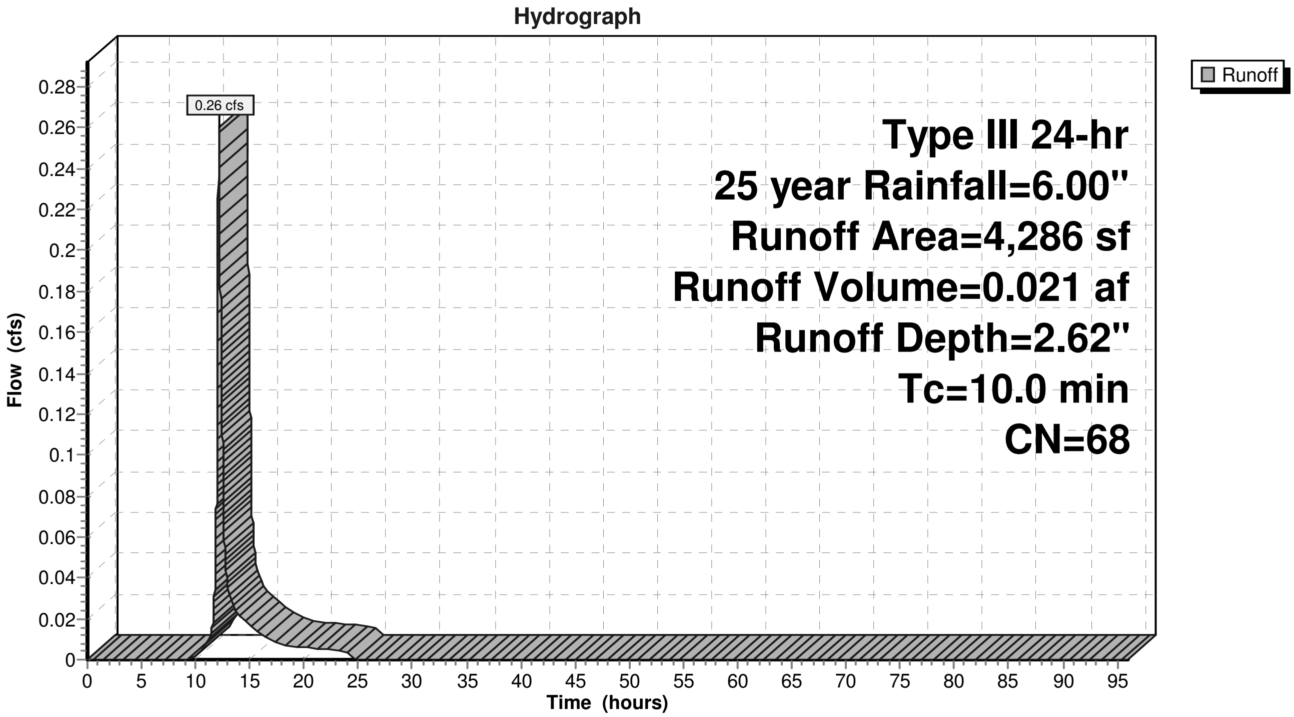
Runoff = 0.26 cfs @ 12.14 hrs, Volume= 0.021 af, Depth= 2.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=6.00"

	Area (sf)	CN	Description
*	1,015	98	Driveway, HSG B
	1,875	61	>75% Grass cover, Good, HSG B
	1,396	55	Woods, Good, HSG B
	4,286	68	Weighted Average
	3,271		76.32% Pervious Area
	1,015		23.68% Impervious Area

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

Subcatchment 35S: FDA-L3.2



Summary for Reach 30R: Vegetated Swale

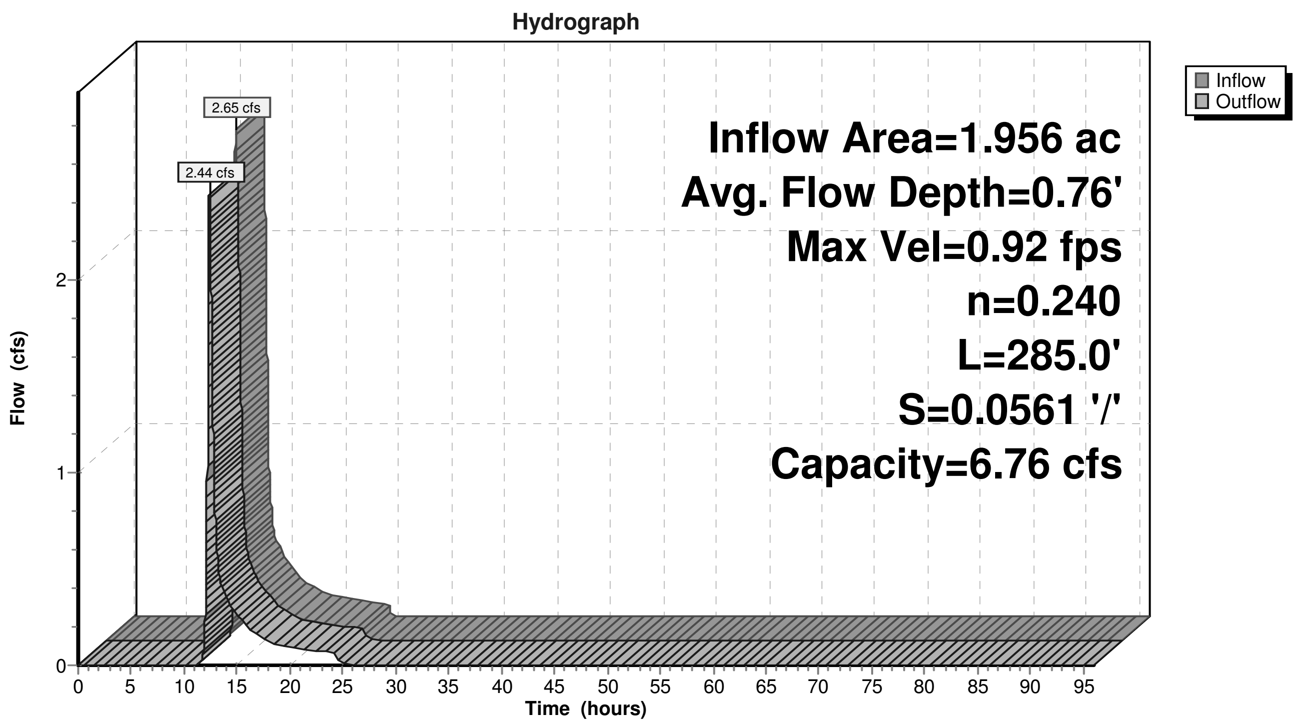
Inflow Area = 1.956 ac, 1.54% Impervious, Inflow Depth = 1.68" for 25 year event
Inflow = 2.65 cfs @ 12.22 hrs, Volume= 0.273 af
Outflow = 2.44 cfs @ 12.38 hrs, Volume= 0.273 af, Atten= 8%, Lag= 9.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.92 fps, Min. Travel Time= 5.2 min
Avg. Velocity = 0.30 fps, Avg. Travel Time= 16.0 min

Peak Storage= 759 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.76'
Bank-Full Depth= 1.25' Flow Area= 5.6 sf, Capacity= 6.76 cfs

2.00' x 1.25' deep channel, n= 0.240 Sheet flow over Dense Grass
Side Slope Z-value= 2.0 '/' Top Width= 7.00'
Length= 285.0' Slope= 0.0561 '/'
Inlet Invert= 174.00', Outlet Invert= 158.00'

Reach 30R: Vegetated Swale



Summary for Pond 15P: SWMF

Inflow Area = 5.984 ac, 15.94% Impervious, Inflow Depth = 1.49" for 25 year event
Inflow = 6.97 cfs @ 12.29 hrs, Volume= 0.743 af
Outflow = 3.95 cfs @ 12.60 hrs, Volume= 0.743 af, Atten= 43%, Lag= 18.9 min
Primary = 3.95 cfs @ 12.60 hrs, Volume= 0.743 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 126.00' Surf.Area= 2,806 sf Storage= 3,133 cf
Peak Elev= 127.94' @ 12.60 hrs Surf.Area= 6,094 sf Storage= 11,291 cf (8,158 cf above start)

Plug-Flow detention time= 229.3 min calculated for 0.671 af (90% of inflow)
Center-of-Mass det. time= 153.0 min (1,017.3 - 864.3)

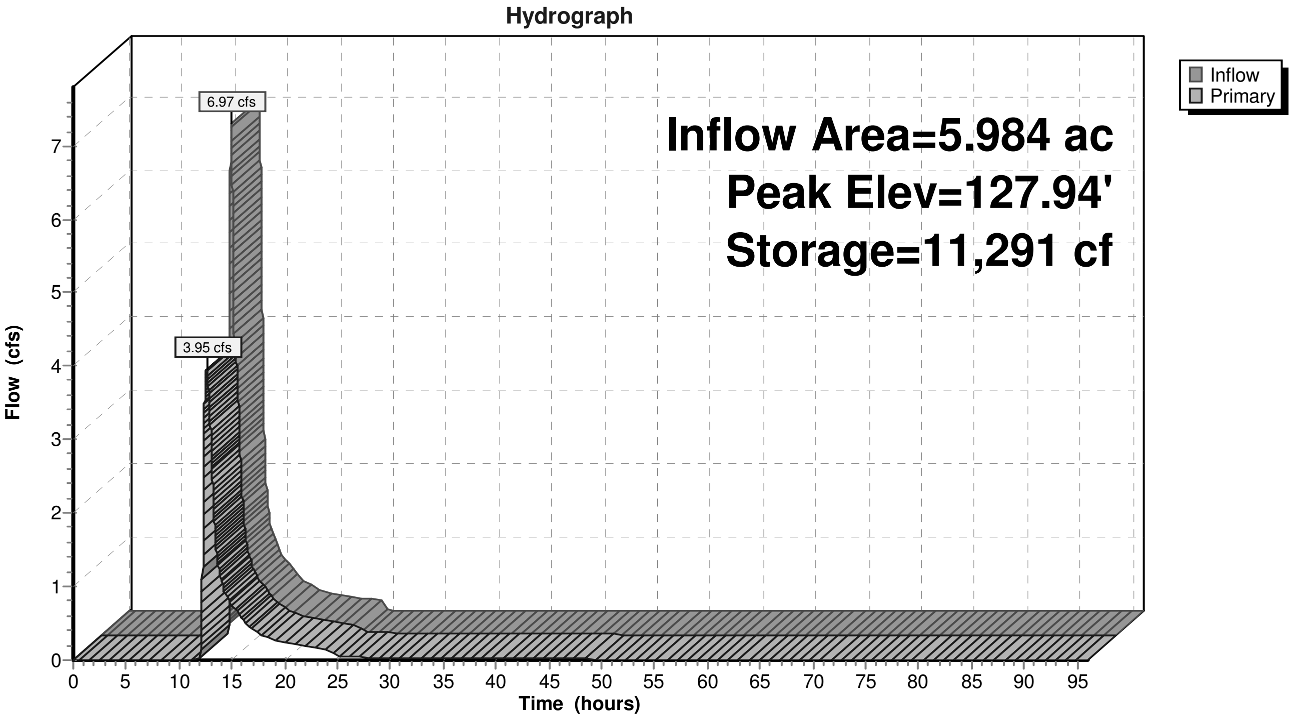
Volume	Invert	Avail.Storage	Storage Description
#1	121.50'	21,119 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
121.50	0	0	0
122.00	96	24	24
123.00	318	207	231
124.00	513	416	647
125.00	827	670	1,317
126.00	2,806	1,817	3,133
127.00	4,018	3,412	6,545
128.00	6,230	5,124	11,669
129.00	6,090	6,160	17,829
129.50	7,070	3,290	21,119

Device	Routing	Invert	Outlet Devices
#1	Primary	125.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Device 1	126.00'	**1.3" Vert. Orifice/Grate** C= 0.600
#3	Device 1	126.75'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#4	Device 1	127.00'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600
#5	Primary	129.20'	**6.0' long (Profile 7) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 Coef. (English) 2.99 3.41 3.62

Primary OutFlow Max=3.95 cfs @ 12.60 hrs HW=127.94' (Free Discharge)
1=**Orifice/Grate** (Passes 3.95 cfs of 5.91 cfs potential flow)
2=**Orifice/Grate** (Orifice Controls 0.06 cfs @ 6.61 fps)
3=**Orifice/Grate** (Orifice Controls 1.27 cfs @ 4.87 fps)
4=**Orifice/Grate** (Orifice Controls 2.62 cfs @ 3.75 fps)
5=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 15P: SWMF



Summary for Pond 29P: SWMF-L1

Inflow	=	0.92 cfs @	12.07 hrs,	Volume=	0.088 af
Outflow	=	0.21 cfs @	11.67 hrs,	Volume=	0.088 af, Atten= 78%, Lag= 0.0 min
Discarded	=	0.21 cfs @	11.67 hrs,	Volume=	0.088 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 153.77' @ 12.52 hrs Surf.Area= 1,485 sf Storage= 907 cf

Plug-Flow detention time= 23.0 min calculated for 0.088 af (100% of inflow)
Center-of-Mass det. time= 23.0 min (786.6 - 763.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	152.75'	1,069 cf	**27.50'W x 54.00'L x 2.54'H Field A**
			3,774 cf Overall - 1,102 cf Embedded = 2,672 cf x 40.0% Voids
#2A	153.25'	1,102 cf	**Cultec R-150XLHD** x 40 Inside #1
			Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
			Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
			Row Length Adjustment= +0.75' x 2.65 sf x 8 rows
		2,171 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	152.75'	**6.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.21 cfs @ 11.67 hrs HW=152.78' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Pond 29P: SWMF-L1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 8 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

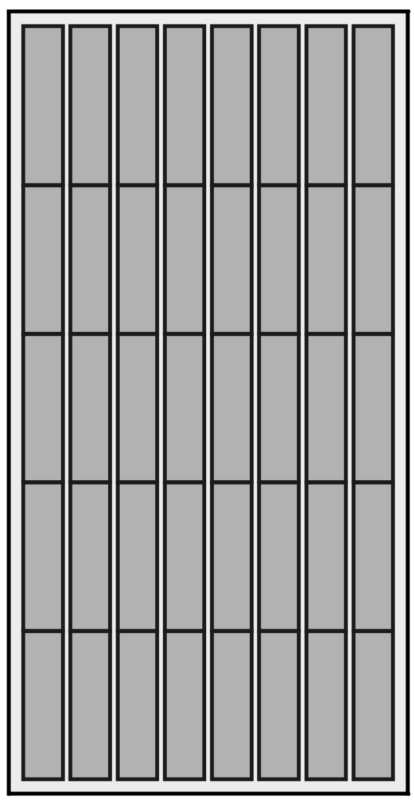
5 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 52.00' Row Length +12.0" End Stone x 2 = 54.00' Base Length
8 Rows x 33.0" Wide + 6.0" Spacing x 7 + 12.0" Side Stone x 2 = 27.50' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

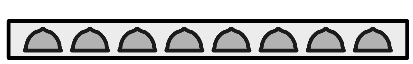
40 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 8 Rows = 1,102.0 cf Chamber Storage

3,774.4 cf Field - 1,102.0 cf Chambers = 2,672.4 cf Stone x 40.0% Voids = 1,069.0 cf Stone Storage

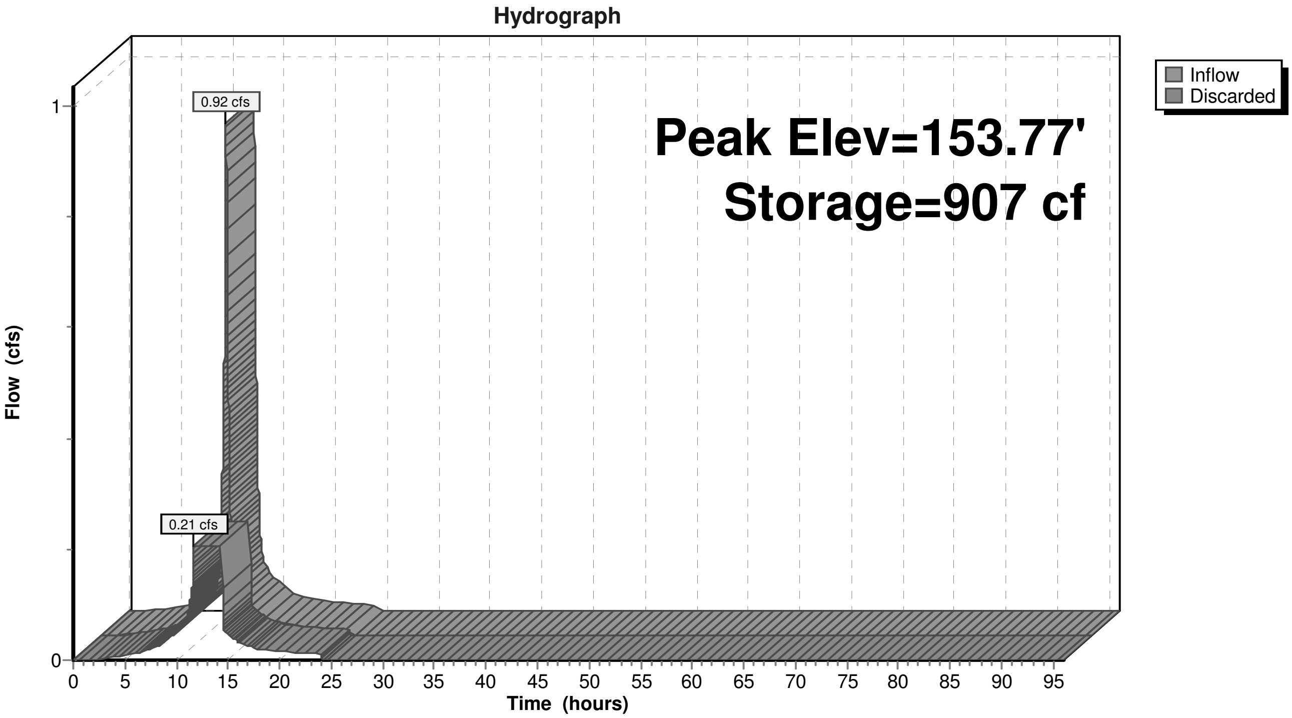
Chamber Storage + Stone Storage = 2,170.9 cf = 0.050 af
Overall Storage Efficiency = 57.5%

40 Chambers
139.8 cy Field
99.0 cy Stone





Pond 29P: SWMF-L1



Summary for Pond 30P: Div L1 (DS F.2)

[57] Hint: Peaked at 154.88' (Flood elevation advised)

Inflow Area = 0.200 ac, 91.00% Impervious, Inflow Depth = 5.41" for 25 year event
Inflow = 1.19 cfs @ 12.07 hrs, Volume= 0.090 af
Outflow = 1.19 cfs @ 12.07 hrs, Volume= 0.090 af, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.07 hrs, Volume= 0.002 af
Secondary = 0.92 cfs @ 12.07 hrs, Volume= 0.088 af

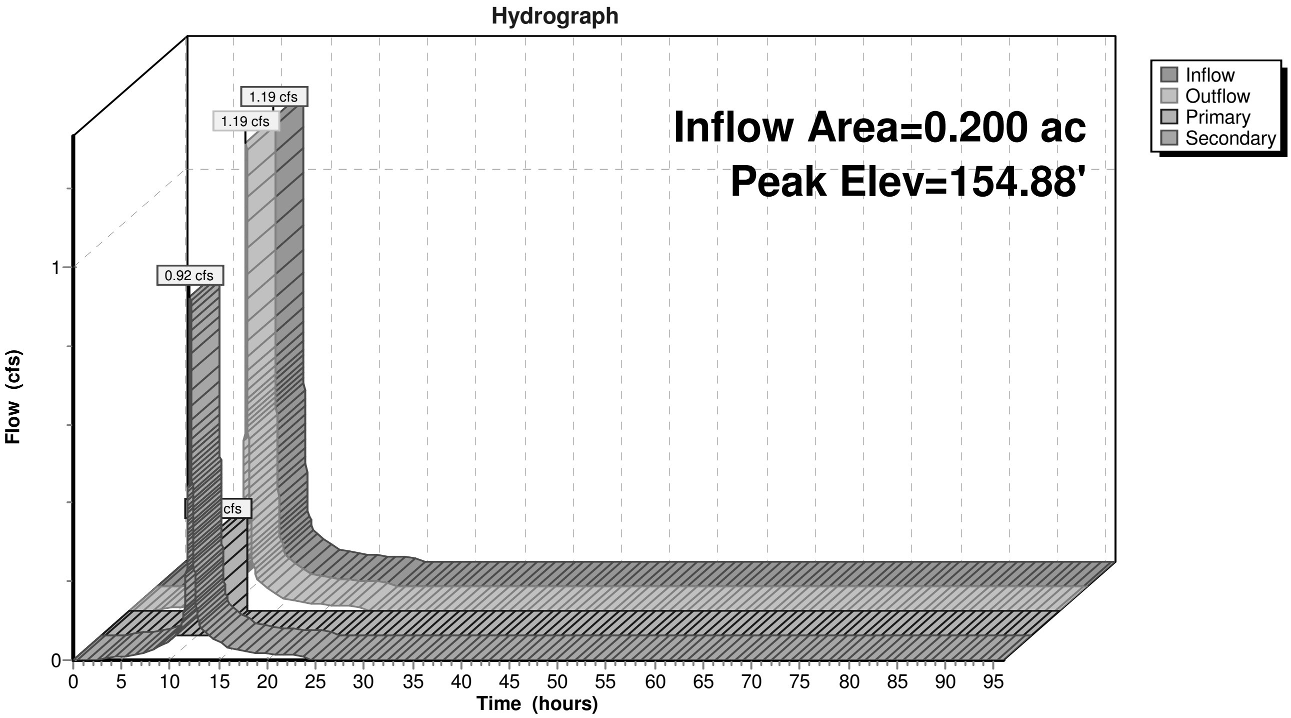
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 154.88' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	154.00'	**12.0" Round Culvert to MH A.9** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 154.00' / 153.50' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	154.25'	**8.0" Round Culvert to SWMF L1** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 154.25' / 154.00' S= 0.0313 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#3	Device 1	154.79'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.27 cfs @ 12.07 hrs HW=154.88' (Free Discharge)
└─**1=Culvert to MH A.9** (Passes 0.27 cfs of 2.34 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.27 cfs @ 0.99 fps)

Secondary OutFlow Max=0.92 cfs @ 12.07 hrs HW=154.88' (Free Discharge)
└─**2=Culvert to SWMF L1** (Inlet Controls 0.92 cfs @ 2.71 fps)

Pond 30P: Div L1 (DS F.2)



Summary for Pond 31P: SWMF-1.1 Bioret

Inflow Area = 0.672 ac, 0.00% Impervious, Inflow Depth = 1.84" for 25 year event
Inflow = 1.02 cfs @ 12.22 hrs, Volume= 0.103 af
Outflow = 0.79 cfs @ 12.38 hrs, Volume= 0.103 af, Atten= 23%, Lag= 9.5 min
Discarded = 0.03 cfs @ 12.38 hrs, Volume= 0.047 af
Primary = 0.75 cfs @ 12.38 hrs, Volume= 0.056 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 157.18' @ 12.38 hrs Surf.Area= 1,458 sf Storage= 874 cf

Plug-Flow detention time= 126.2 min calculated for 0.103 af (100% of inflow)
Center-of-Mass det. time= 126.2 min (1,000.1 - 873.9)

Volume	Invert	Avail.Storage	Storage Description
#1	156.50'	1,373 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

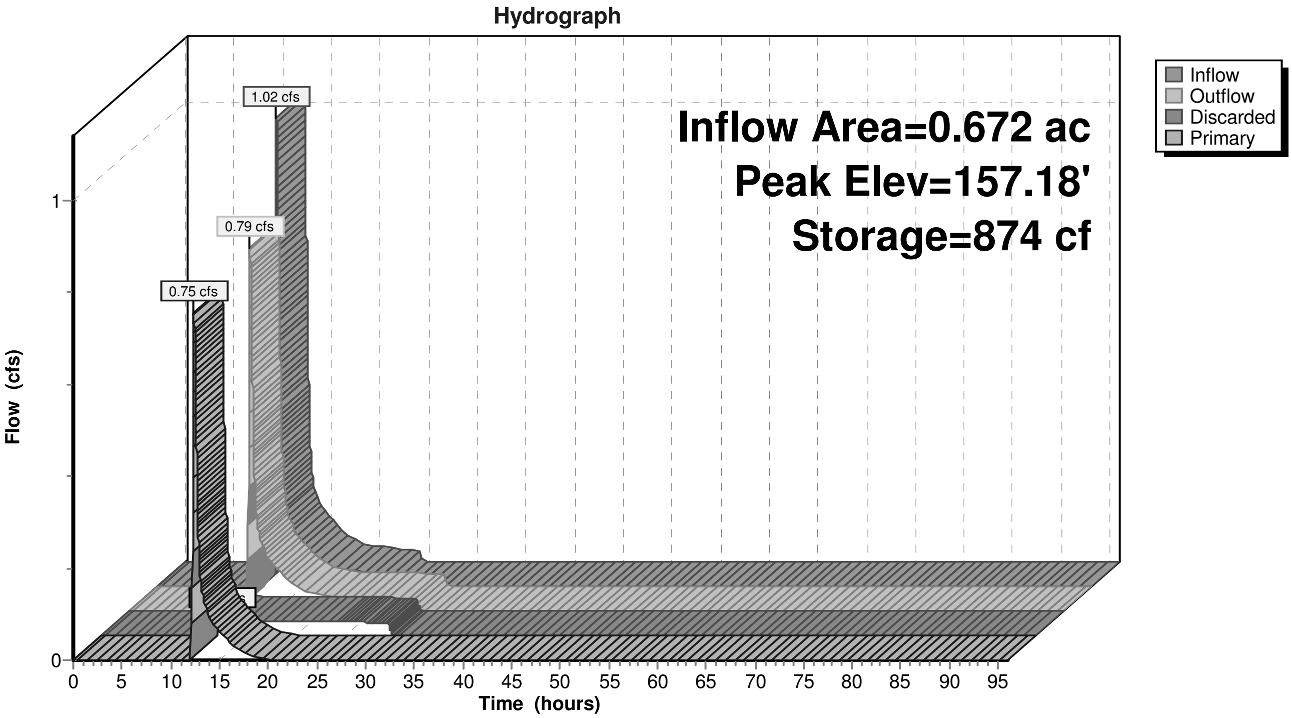
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
156.50	1,133	0	0
157.00	1,370	626	626
157.50	1,620	748	1,373

Device	Routing	Invert	Outlet Devices
#1	Primary	151.67'	**12.0" Round Culvert** L= 18.4' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 151.67' / 151.40' S= 0.0147 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	157.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	156.50'	**1.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.03 cfs @ 12.38 hrs HW=157.18' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.75 cfs @ 12.38 hrs HW=157.18' (Free Discharge)
└─**1=Culvert** (Passes 0.75 cfs of 8.46 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 0.75 cfs @ 1.37 fps)

Pond 31P: SWMF-1.1 Bioret



Summary for Pond 32P: Div 2.2 (DS D.2)

[57] Hint: Peaked at 153.14' (Flood elevation advised)

Inflow Area =	0.655 ac,	43.66% Impervious,	Inflow Depth = 3.18"	for 25 year event
Inflow =	1.94 cfs @	12.19 hrs, Volume=	0.174 af	
Outflow =	1.94 cfs @	12.19 hrs, Volume=	0.174 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.71 cfs @	12.19 hrs, Volume=	0.019 af	
Secondary =	1.23 cfs @	12.19 hrs, Volume=	0.155 af	

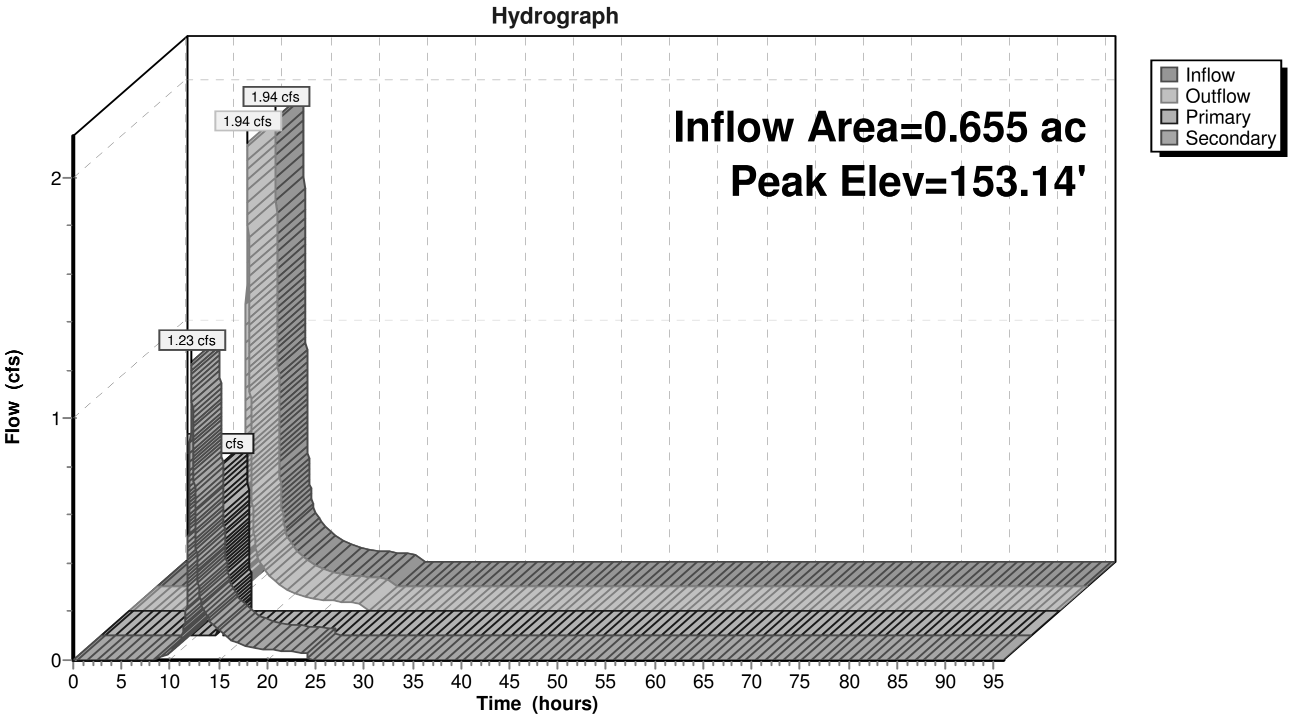
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 153.14' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.75'	**15.0" Round Culvert to Level Spreader** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.75' / 151.50' S= 0.0417 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Secondary	152.50'	**10.0" Round Culvert to SWMF-2.2** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.50' / 152.00' S= 0.0333 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#3	Device 1	152.90'	**3.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.71 cfs @ 12.19 hrs HW=153.14' (Free Discharge)
└─**1=Culvert to Level Spreader** (Inlet Controls 0.71 cfs @ 2.13 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Passes 0.71 cfs of 1.16 cfs potential flow)

Secondary OutFlow Max=1.23 cfs @ 12.19 hrs HW=153.14' (Free Discharge)
└─**2=Culvert to SWMF-2.2** (Inlet Controls 1.23 cfs @ 2.73 fps)

Pond 32P: Div 2.2 (DS D.2)



Summary for Pond 33P: Div L2.1

[57] Hint: Peaked at 150.58' (Flood elevation advised)

Inflow Area =	0.132 ac, 55.54% Impervious, Inflow Depth = 3.99" for 25 year event		
Inflow =	0.63 cfs @ 12.07 hrs, Volume=	0.044 af	
Outflow =	0.63 cfs @ 12.07 hrs, Volume=	0.044 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.09 cfs @ 12.07 hrs, Volume=	0.000 af	
Secondary =	0.55 cfs @ 12.07 hrs, Volume=	0.043 af	

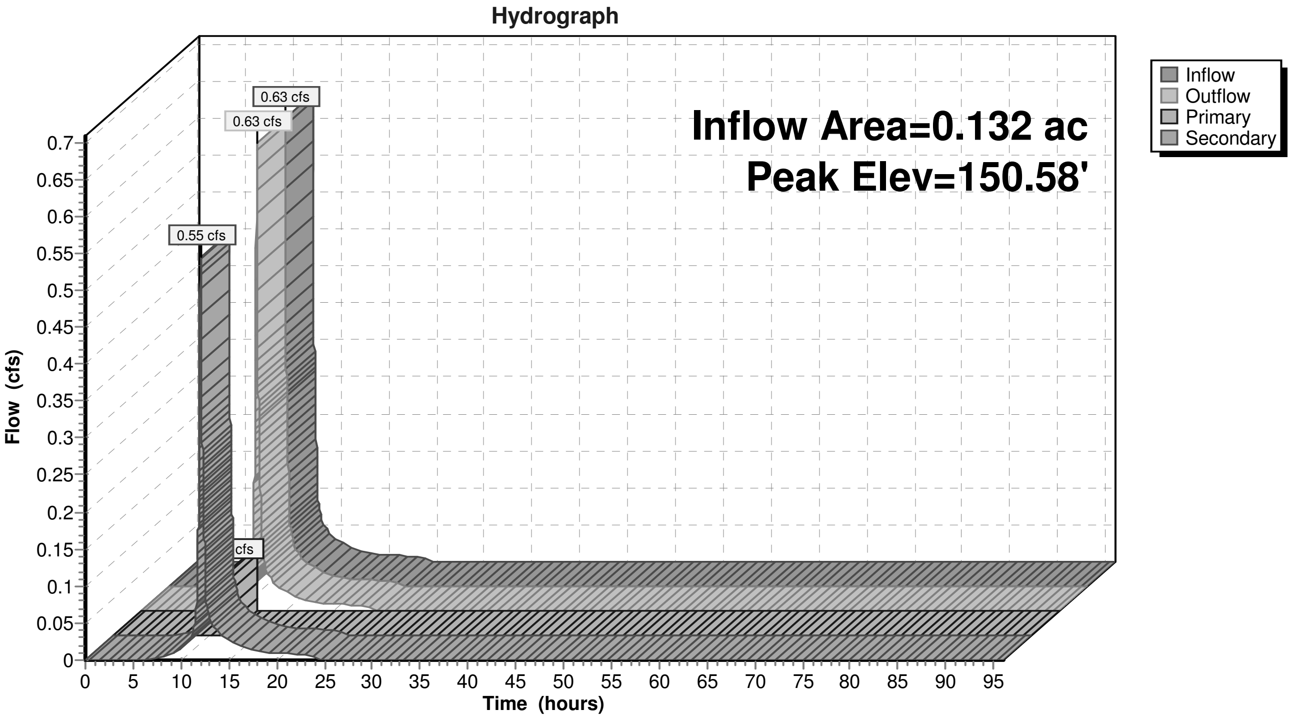
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 150.58' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	150.00'	**8.0" Round Culvert to Node EP E.1** L= 96.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.00' / 146.00' S= 0.0417 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#2	Secondary	150.00'	**6.0" Round Culvert to PTF E.1 & SWMF L2.1** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.00' / 149.70' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 1	150.54'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.09 cfs @ 12.07 hrs HW=150.58' (Free Discharge)
└─**1=Culvert to Node EP E.1** (Passes 0.09 cfs of 0.84 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.09 cfs @ 0.67 fps)

Secondary OutFlow Max=0.55 cfs @ 12.07 hrs HW=150.58' (Free Discharge)
└─**2=Culvert to PTF E.1 & SWMF L2.1** (Inlet Controls 0.55 cfs @ 2.78 fps)

Pond 33P: Div L2.1



Summary for Pond 34P: SWMF-L2.1

Inflow	=	0.55 cfs @	12.07 hrs,	Volume=	0.043 af
Outflow	=	0.06 cfs @	11.60 hrs,	Volume=	0.043 af, Atten= 89%, Lag= 0.0 min
Discarded	=	0.06 cfs @	11.60 hrs,	Volume=	0.043 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 149.66' @ 12.90 hrs Surf.Area= 449 sf Storage= 667 cf

Plug-Flow detention time= 82.2 min calculated for 0.043 af (100% of inflow)
Center-of-Mass det. time= 82.2 min (891.1 - 808.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	147.50'	405 cf	**25.67'W x 17.50'L x 3.54'H Field A** 1,591 cf Overall - 577 cf Embedded = 1,013 cf x 40.0% Voids
#2A	148.00'	577 cf	**Cultec R-330XLHD** x 10 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 5 rows
		983 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	147.50'	**6.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.06 cfs @ 11.60 hrs HW=147.54' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Pond 34P: SWMF-L2.1 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

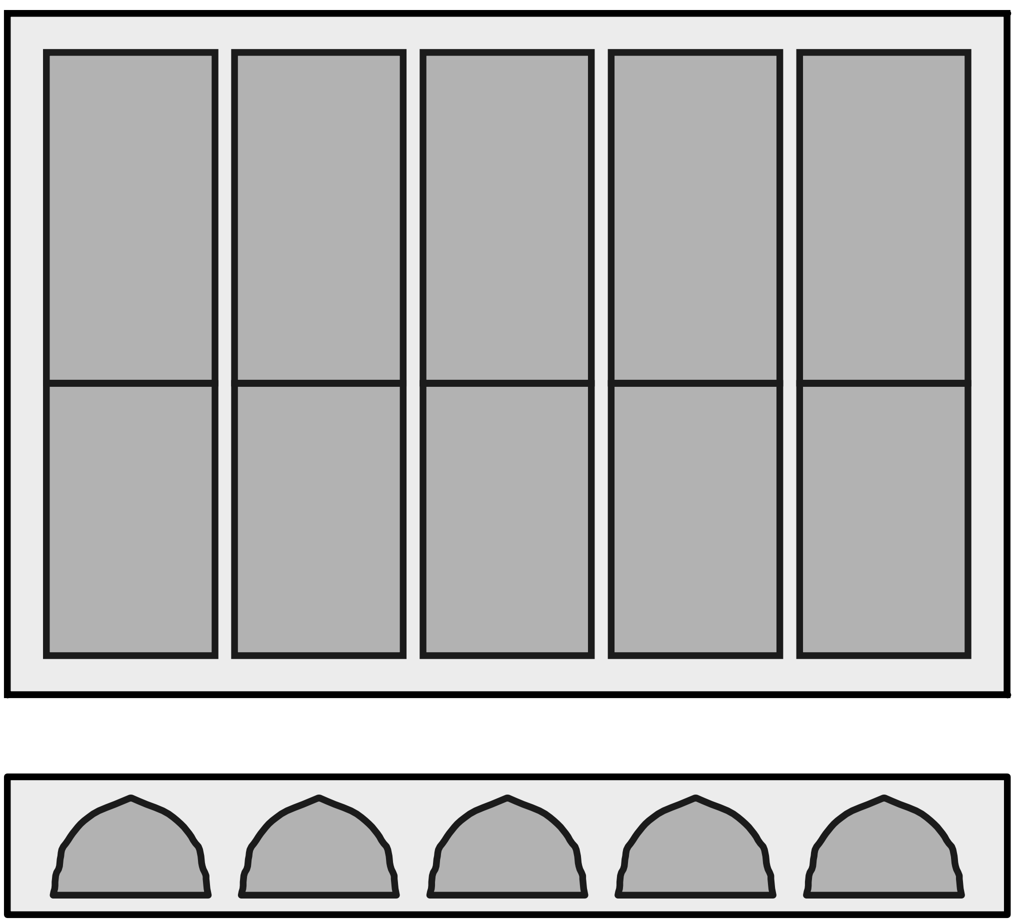
2 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 15.50' Row Length +12.0" End Stone x 2 = 17.50' Base Length
5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

10 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 577.5 cf Chamber Storage

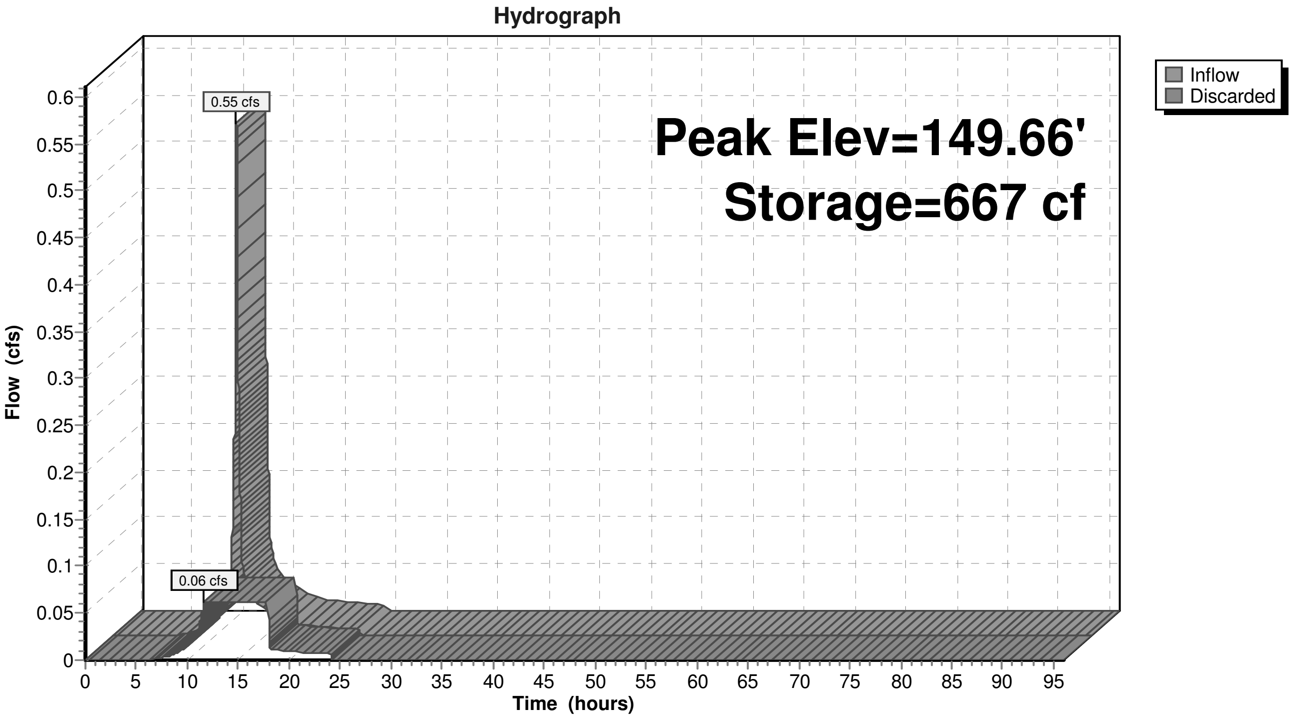
1,590.8 cf Field - 577.5 cf Chambers = 1,013.3 cf Stone x 40.0% Voids = 405.3 cf Stone Storage

Chamber Storage + Stone Storage = 982.8 cf = 0.023 af
Overall Storage Efficiency = 61.8%

10 Chambers
58.9 cy Field
37.5 cy Stone



Pond 34P: SWMF-L2.1



Summary for Pond 35P: Div 1.2

[57] Hint: Peaked at 155.12' (Flood elevation advised)

Inflow Area =	0.446 ac, 65.47% Impervious,	Inflow Depth = 4.20"	for 25 year event
Inflow =	1.89 cfs @ 12.14 hrs,	Volume=	0.156 af
Outflow =	1.89 cfs @ 12.14 hrs,	Volume=	0.156 af, Atten= 0%, Lag= 0.0 min
Primary =	0.89 cfs @ 12.14 hrs,	Volume=	0.014 af
Secondary =	1.00 cfs @ 12.14 hrs,	Volume=	0.142 af

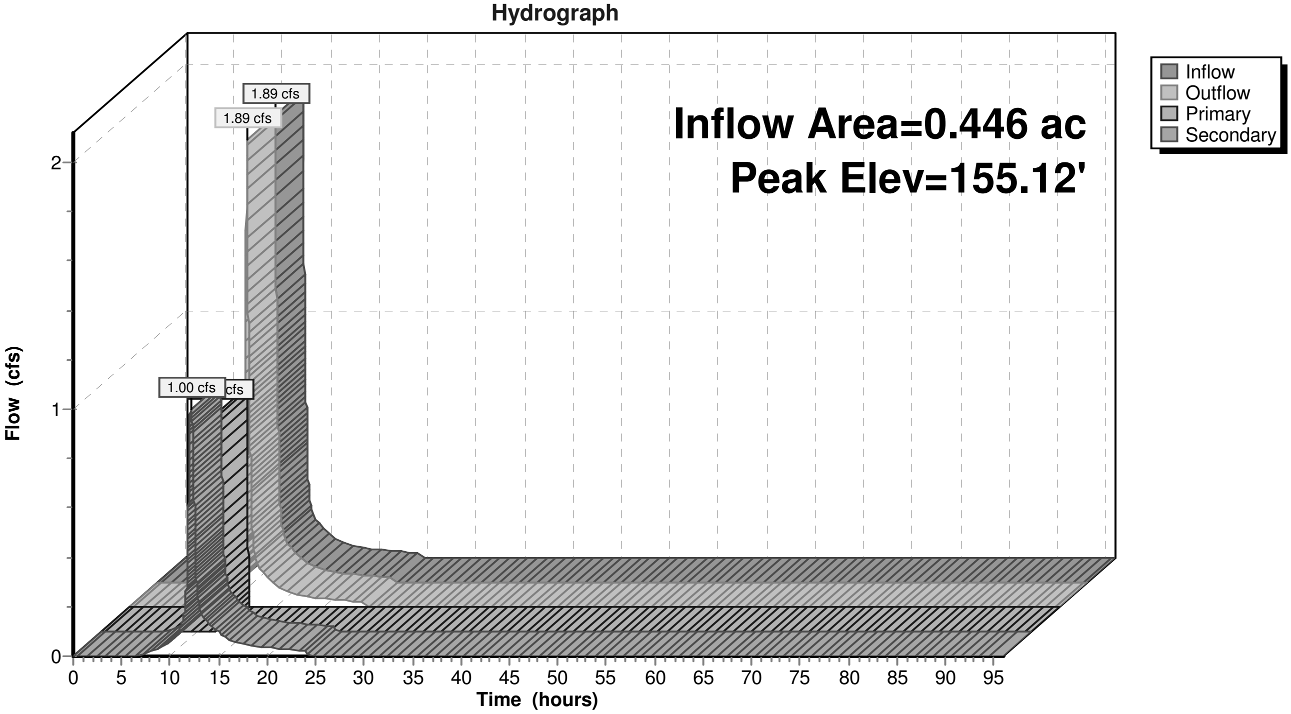
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 155.12' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	153.92'	**12.0" Round Culvert to MH A.6** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 153.92' / 151.00' S= 0.1622 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	153.75'	**6.0" Round Culvert to SWMF-1.2** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 153.75' / 153.50' S= 0.0417 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 1	154.92'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.89 cfs @ 12.14 hrs HW=155.12' (Free Discharge)
└─**1=Culvert to MH A.6** (Passes 0.89 cfs of 3.17 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.89 cfs @ 1.47 fps)

Secondary OutFlow Max=1.00 cfs @ 12.14 hrs HW=155.12' (Free Discharge)
└─**2=Culvert to SWMF-1.2** (Inlet Controls 1.00 cfs @ 5.10 fps)

Pond 35P: Div 1.2



Summary for Pond 36P: Rain Garden #1 Lot 3

Inflow Area = 0.261 ac, 19.99% Impervious, Inflow Depth = 2.44" for 25 year event
Inflow = 0.64 cfs @ 12.15 hrs, Volume= 0.053 af
Outflow = 0.32 cfs @ 12.41 hrs, Volume= 0.053 af, Atten= 51%, Lag= 15.8 min
Discarded = 0.03 cfs @ 12.41 hrs, Volume= 0.036 af
Primary = 0.28 cfs @ 12.41 hrs, Volume= 0.017 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 145.09' @ 12.41 hrs Surf.Area= 1,320 sf Storage= 685 cf

Plug-Flow detention time= 162.8 min calculated for 0.053 af (100% of inflow)
Center-of-Mass det. time= 162.8 min (1,014.3 - 851.5)

Volume	Invert	Avail.Storage	Storage Description
#1	144.50'	904 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

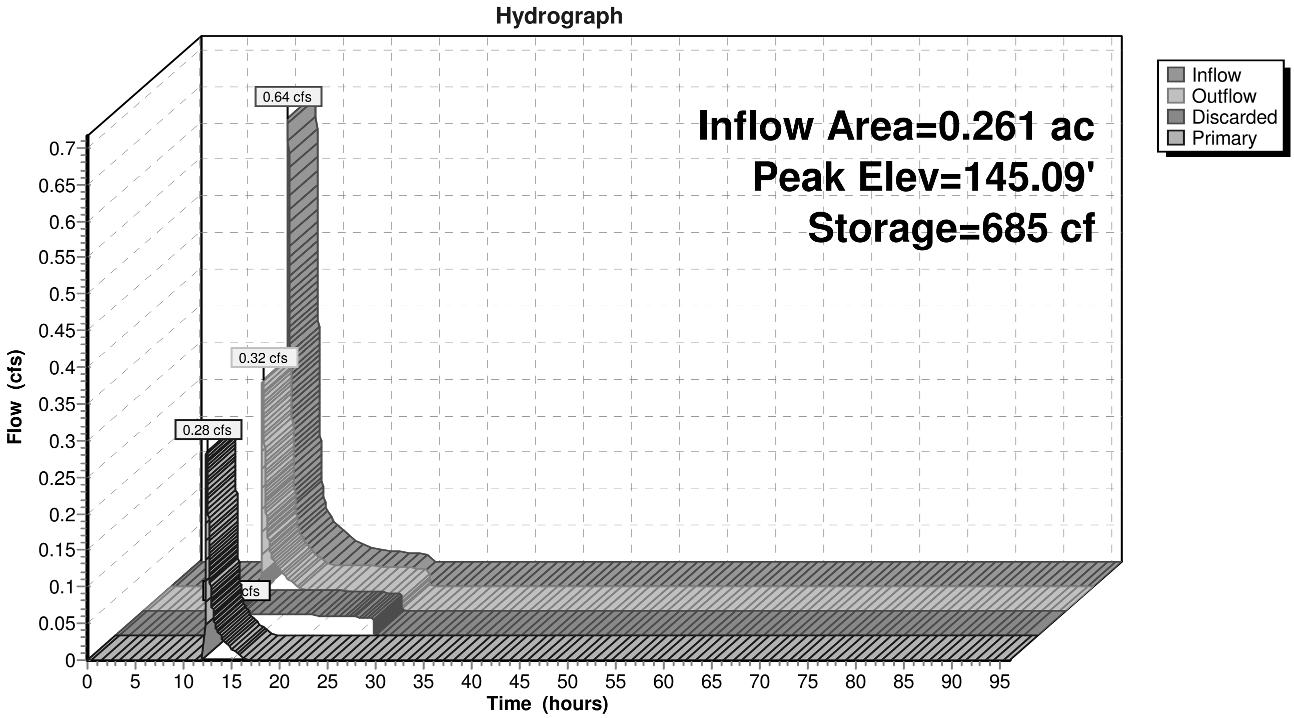
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
144.50	1,025	0	0
144.75	1,135	270	270
145.00	1,245	298	568
145.25	1,450	337	904

Device	Routing	Invert	Outlet Devices
#1	Primary	145.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	144.50'	**1.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 12.41 hrs HW=145.09' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.28 cfs @ 12.41 hrs HW=145.09' (Free Discharge)
└─**1=Orifice/Grate** (Weir Controls 0.28 cfs @ 0.99 fps)

Pond 36P: Rain Garden #1 Lot 3



Summary for Pond 37P: SWMF-1.2

[81] Warning: Exceeded Pond 35P by 1.16' @ 13.31 hrs

Inflow	=	1.00 cfs @	12.14 hrs,	Volume=	0.142 af
Outflow	=	0.18 cfs @	11.53 hrs,	Volume=	0.142 af, Atten= 82%, Lag= 0.0 min
Discarded	=	0.18 cfs @	11.53 hrs,	Volume=	0.142 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 155.17' @ 13.14 hrs Surf.Area= 1,320 sf Storage= 2,037 cf

Plug-Flow detention time= 86.4 min calculated for 0.142 af (100% of inflow)
Center-of-Mass det. time= 86.4 min (901.0 - 814.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	153.00'	1,184 cf	**23.50'W x 56.17'L x 3.67'H Field A**
			4,840 cf Overall - 1,880 cf Embedded = 2,960 cf x 40.0% Voids
#2A	153.50'	1,880 cf	**Cultec R-V8HD** x 32 Inside #1
			Effective Size= 55.2"W x 32.0"H => 8.68 sf x 7.50'L = 65.1 cf
			Overall Size= 60.0"W x 32.0"H x 8.00'L with 0.50' Overlap
			Row Length Adjustment= -5.83' x 8.68 sf x 4 rows
		3,064 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	153.00'	**6.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.18 cfs @ 11.53 hrs HW=153.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.18 cfs)

Pond 37P: SWMF-1.2 - Chamber Wizard Field A

Chamber Model = Cultec R-V8HD (Cultec Recharger® V8HD)
Effective Size= 55.2"W x 32.0"H => 8.68 sf x 7.50'L = 65.1 cf
Overall Size= 60.0"W x 32.0"H x 8.00'L with 0.50' Overlap
Row Length Adjustment= -5.83' x 8.68 sf x 4 rows

60.0" Wide + 6.0" Spacing = 66.0" C-C Row Spacing

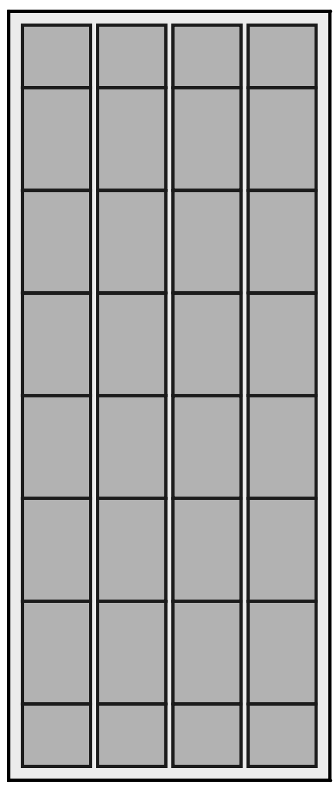
8 Chambers/Row x 7.50' Long -5.83' Row Adjustment = 54.17' Row Length +12.0" End Stone x 2 = 56.17' Base Length
4 Rows x 60.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 23.50' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

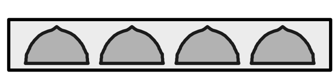
32 Chambers x 65.1 cf -5.83' Row Adjustment x 8.68 sf x 4 Rows = 1,879.9 cf Chamber Storage

4,840.0 cf Field - 1,879.9 cf Chambers = 2,960.1 cf Stone x 40.0% Voids = 1,184.0 cf Stone Storage

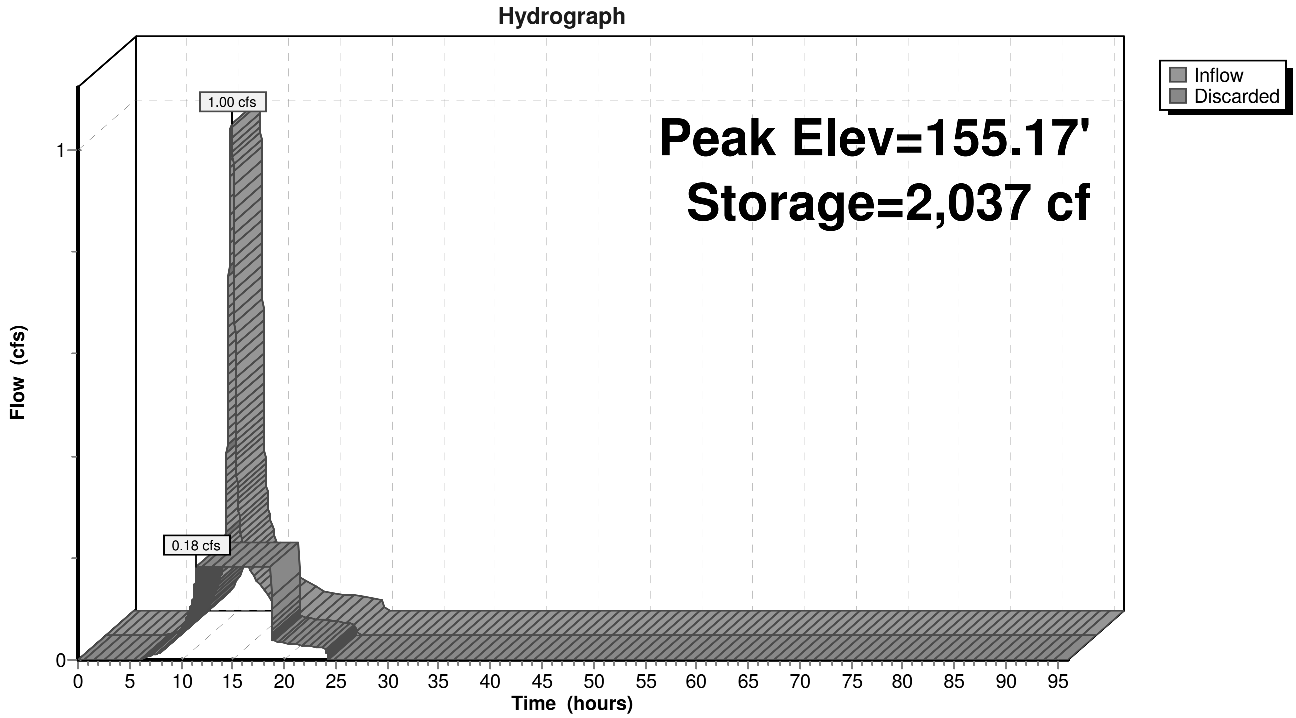
Chamber Storage + Stone Storage = 3,063.9 cf = 0.070 af
Overall Storage Efficiency = 63.3%

32 Chambers
179.3 cy Field
109.6 cy Stone





Pond 37P: SWMF-1.2



Summary for Pond 38P: SWMF-2.2

[81] Warning: Exceeded Pond 32P by 0.39' @ 13.29 hrs

Inflow	=	1.23 cfs @	12.19 hrs,	Volume=	0.155 af
Outflow	=	0.22 cfs @	13.24 hrs,	Volume=	0.155 af, Atten= 82%, Lag= 63.6 min
Discarded	=	0.16 cfs @	11.59 hrs,	Volume=	0.151 af
Primary	=	0.06 cfs @	13.24 hrs,	Volume=	0.004 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 153.13' @ 13.24 hrs Surf.Area= 1,160 sf Storage= 2,460 cf

Plug-Flow detention time= 139.6 min calculated for 0.155 af (100% of inflow)
Center-of-Mass det. time= 139.6 min (987.5 - 848.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	149.50'	450 cf	**16.00'W x 31.50'L x 3.54'H Field A** 1,785 cf Overall - 659 cf Embedded = 1,126 cf x 40.0% Voids
#2A	150.00'	659 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 3 rows
#3B	150.00'	578 cf	**20.83'W x 31.50'L x 3.54'H Field B** 2,324 cf Overall - 879 cf Embedded = 1,445 cf x 40.0% Voids
#4B	150.50'	879 cf	**Cultec R-330XLHD** x 16 Inside #3 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 4 rows
		2,567 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	149.50'	**6.000 in/hr Exfiltration over Horizontal area**
#2	Primary	153.00'	**8.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 153.00' / 151.50' S= 0.1000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf

Discarded OutFlow Max=0.16 cfs @ 11.59 hrs HW=150.00' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=0.06 cfs @ 13.24 hrs HW=153.13' (Free Discharge)
└─**2=Culvert** (Inlet Controls 0.06 cfs @ 1.25 fps)

Pond 38P: SWMF-2.2 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

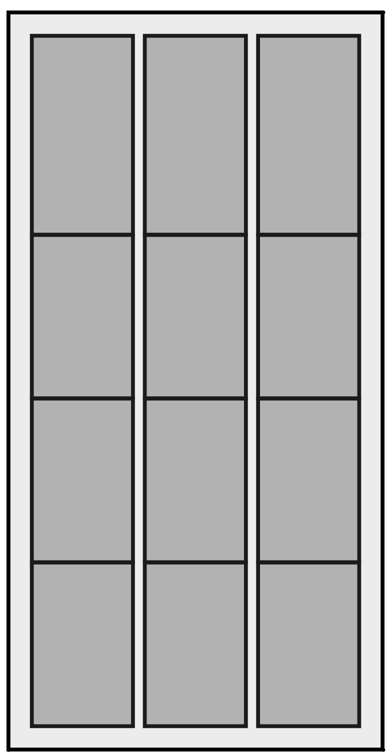
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

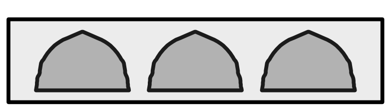
12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 659.4 cf Chamber Storage

1,785.0 cf Field - 659.4 cf Chambers = 1,125.6 cf Stone x 40.0% Voids = 450.2 cf Stone Storage

Chamber Storage + Stone Storage = 1,109.6 cf = 0.025 af
Overall Storage Efficiency = 62.2%

12 Chambers
66.1 cy Field
41.7 cy Stone





Pond 38P: SWMF-2.2 - Chamber Wizard Field B

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

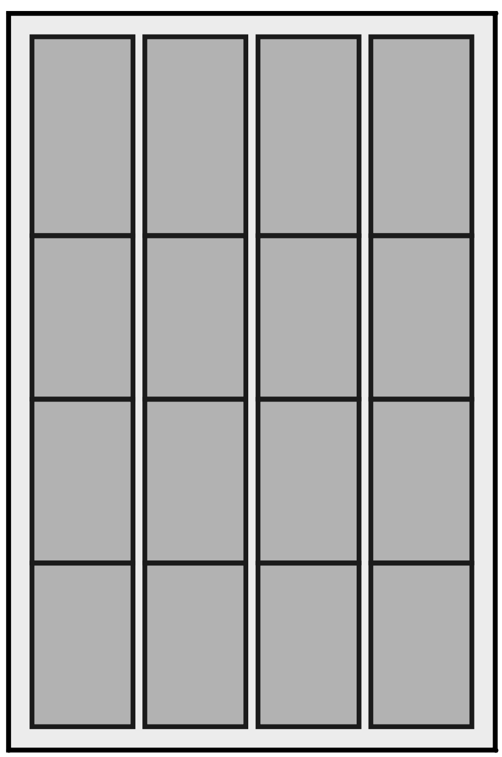
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

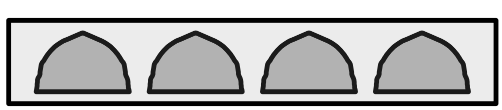
16 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 879.2 cf Chamber Storage

2,324.2 cf Field - 879.2 cf Chambers = 1,445.0 cf Stone x 40.0% Voids = 578.0 cf Stone Storage

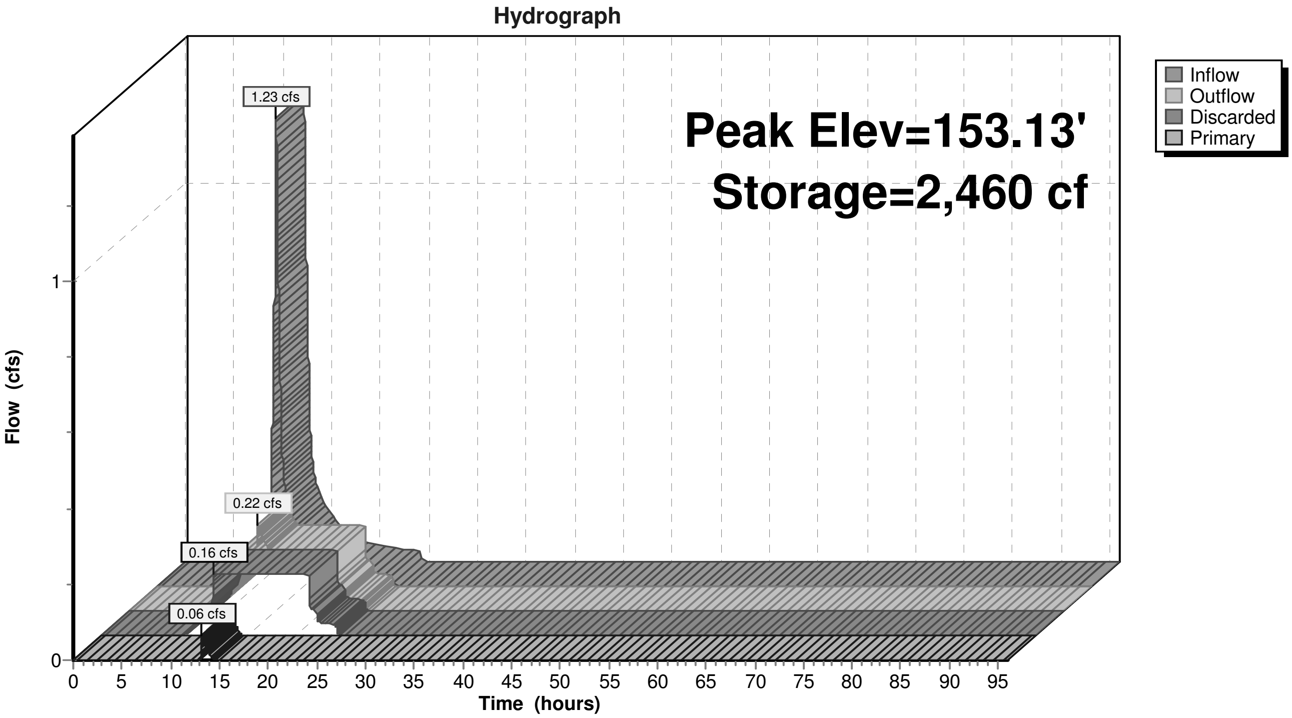
Chamber Storage + Stone Storage = 1,457.2 cf = 0.033 af
Overall Storage Efficiency = 62.7%

16 Chambers
86.1 cy Field
53.5 cy Stone





Pond 38P: SWMF-2.2



Summary for Pond 39P: SWMF-L2.2

[79] Warning: Submerged Pond 40P Secondary device # 2 OUTLET by 0.76'

Inflow	=	0.56 cfs @	12.07 hrs,	Volume=	0.047 af
Outflow	=	0.07 cfs @	11.58 hrs,	Volume=	0.047 af, Atten= 87%, Lag= 0.0 min
Discarded	=	0.07 cfs @	11.58 hrs,	Volume=	0.047 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 136.76' @ 12.62 hrs Surf.Area= 504 sf Storage= 607 cf

Plug-Flow detention time= 52.4 min calculated for 0.047 af (100% of inflow)
Center-of-Mass det. time= 52.4 min (796.7 - 744.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	135.00'	450 cf	**16.00'W x 31.50'L x 3.54'H Field A**
			1,785 cf Overall - 659 cf Embedded = 1,126 cf x 40.0% Voids
#2A	135.50'	659 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 3 rows
		1,110 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	135.00'	**6.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.07 cfs @ 11.58 hrs HW=135.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Pond 39P: SWMF-L2.2 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

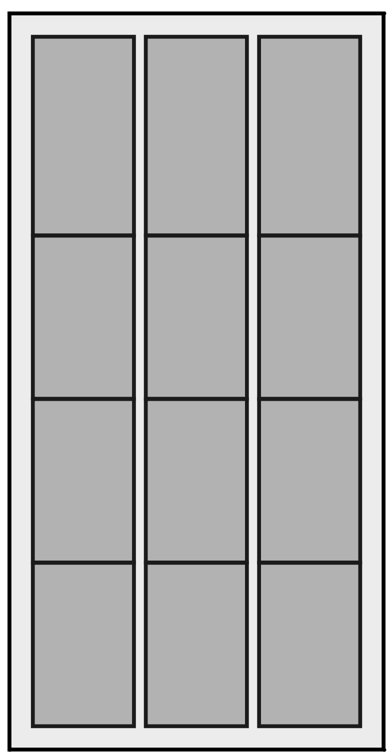
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

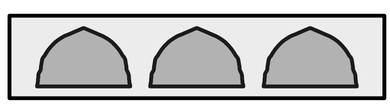
12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 659.4 cf Chamber Storage

1,785.0 cf Field - 659.4 cf Chambers = 1,125.6 cf Stone x 40.0% Voids = 450.2 cf Stone Storage

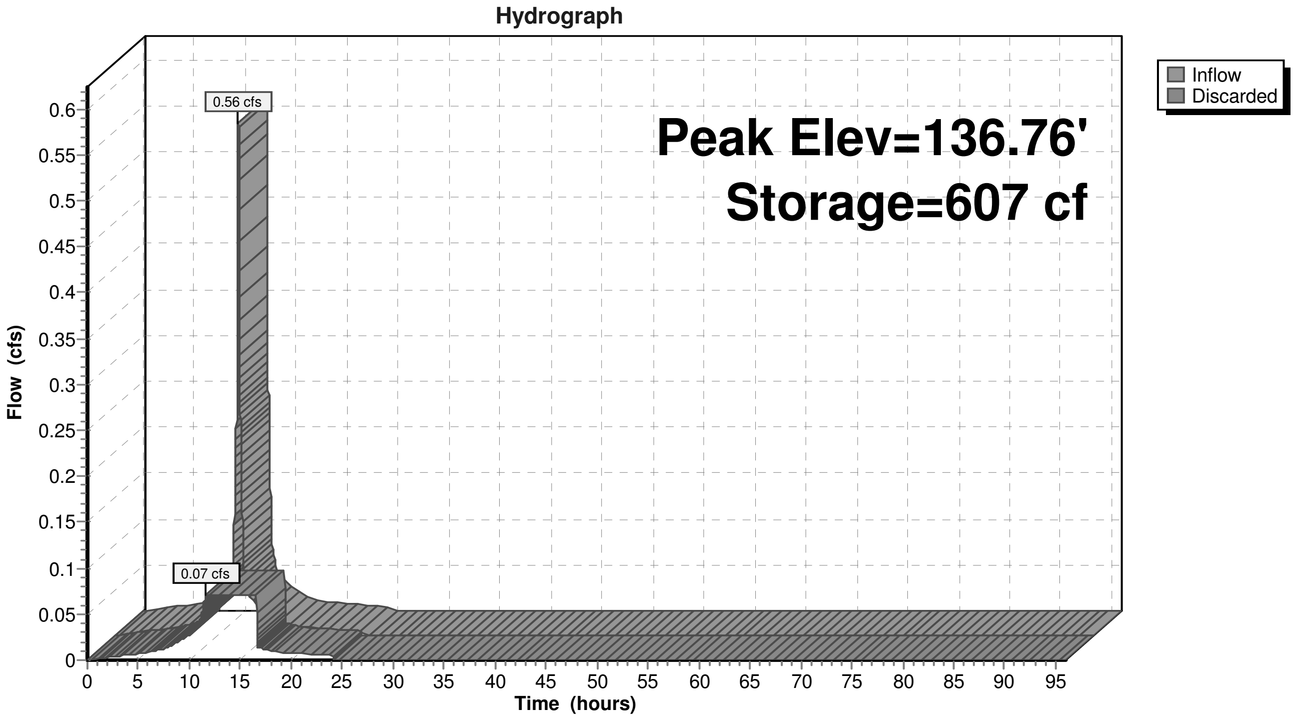
Chamber Storage + Stone Storage = 1,109.6 cf = 0.025 af
Overall Storage Efficiency = 62.2%

12 Chambers
66.1 cy Field
41.7 cy Stone





Pond 39P: SWMF-L2.2



Summary for Pond 40P: Div L2.2

[57] Hint: Peaked at 138.10' (Flood elevation advised)

Inflow Area =	0.098 ac,100.00% Impervious,	Inflow Depth = 5.76"	for 25 year event
Inflow =	0.60 cfs @ 12.07 hrs,	Volume=	0.047 af
Outflow =	0.60 cfs @ 12.07 hrs,	Volume=	0.047 af, Atten= 0%, Lag= 0.0 min
Primary =	0.04 cfs @ 12.07 hrs,	Volume=	0.000 af
Secondary =	0.56 cfs @ 12.07 hrs,	Volume=	0.047 af

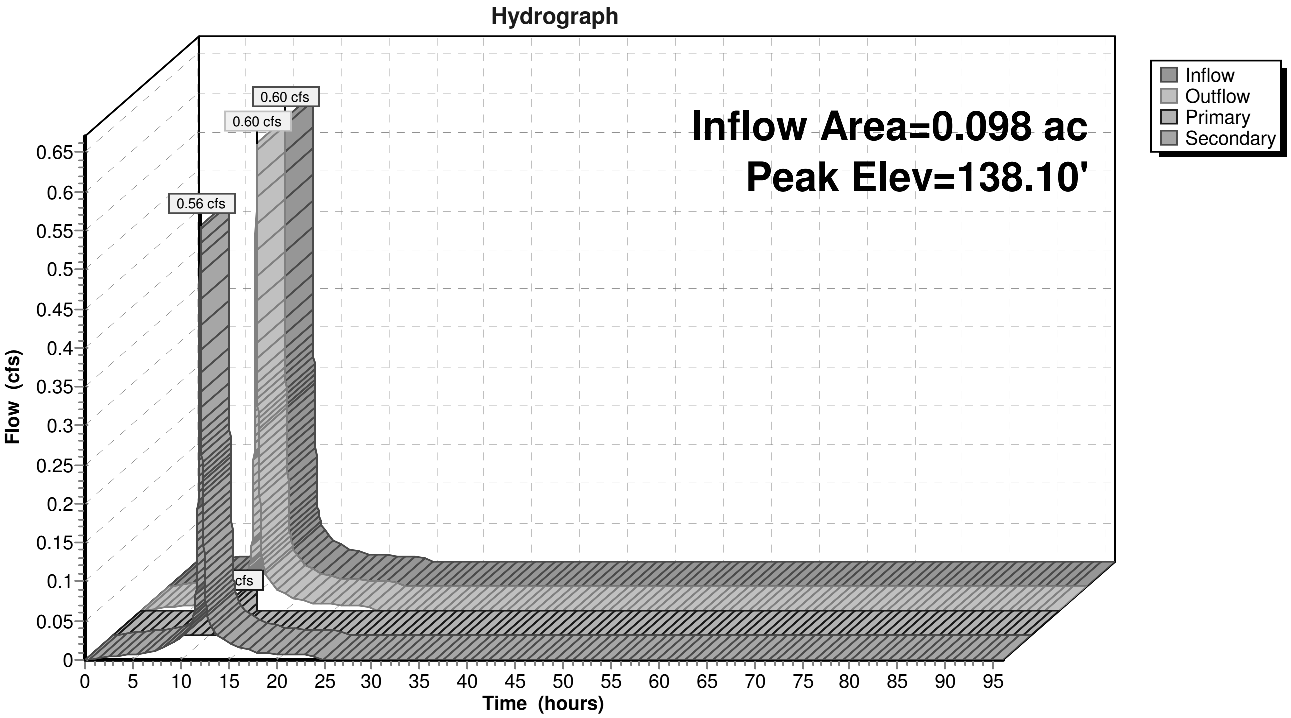
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 138.10' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	138.00'	**12.0" Round Culvert to MH C.1** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 138.00' / 134.00' S= 0.0800 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	137.50'	**6.0" Round Culvert to SWMF L2.2** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 137.50' / 136.00' S= 0.3000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 1	138.04'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.04 cfs @ 12.07 hrs HW=138.10' (Free Discharge)
└─**1=Culvert to MH C.1** (Inlet Controls 0.04 cfs @ 1.06 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Passes 0.04 cfs of 0.13 cfs potential flow)

Secondary OutFlow Max=0.56 cfs @ 12.07 hrs HW=138.10' (Free Discharge)
└─**2=Culvert to SWMF L2.2** (Inlet Controls 0.56 cfs @ 2.84 fps)

Pond 40P: Div L2.2



Summary for Pond 41P: Rain Garden #2 Lot 3

Inflow Area = 0.098 ac, 23.68% Impervious, Inflow Depth = 2.62" for 25 year event
Inflow = 0.26 cfs @ 12.14 hrs, Volume= 0.021 af
Outflow = 0.03 cfs @ 13.06 hrs, Volume= 0.021 af, Atten= 87%, Lag= 55.0 min
Discarded = 0.02 cfs @ 13.06 hrs, Volume= 0.021 af
Primary = 0.01 cfs @ 13.06 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 152.51' @ 13.06 hrs Surf.Area= 922 sf Storage= 395 cf

Plug-Flow detention time= 191.1 min calculated for 0.021 af (100% of inflow)
Center-of-Mass det. time= 191.1 min (1,037.8 - 846.7)

Volume	Invert	Avail.Storage	Storage Description
#1	152.00'	875 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

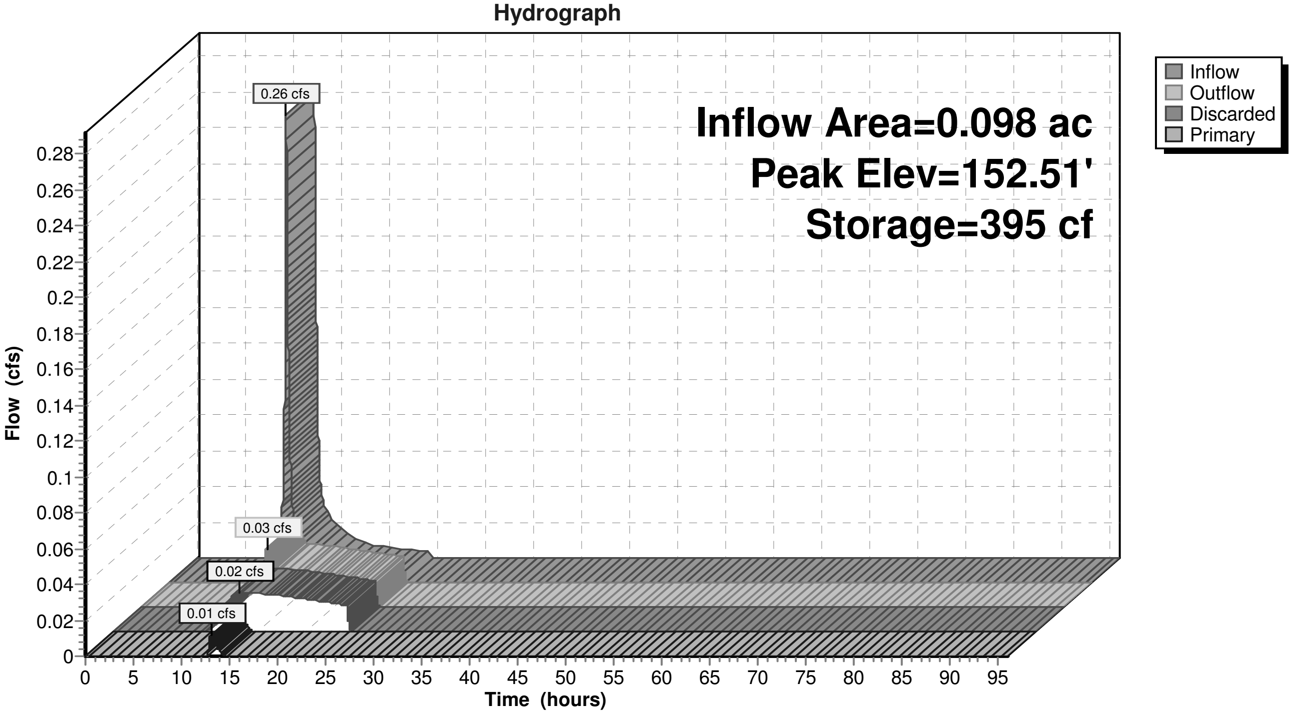
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
152.00	620	0	0
152.25	770	174	174
152.50	920	211	385
153.00	1,038	490	875

Device	Routing	Invert	Outlet Devices
#1	Primary	152.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	152.00'	**1.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 13.06 hrs HW=152.51' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.01 cfs @ 13.06 hrs HW=152.51' (Free Discharge)
└─**1=Orifice/Grate** (Weir Controls 0.01 cfs @ 0.34 fps)

Pond 41P: Rain Garden #2 Lot 3

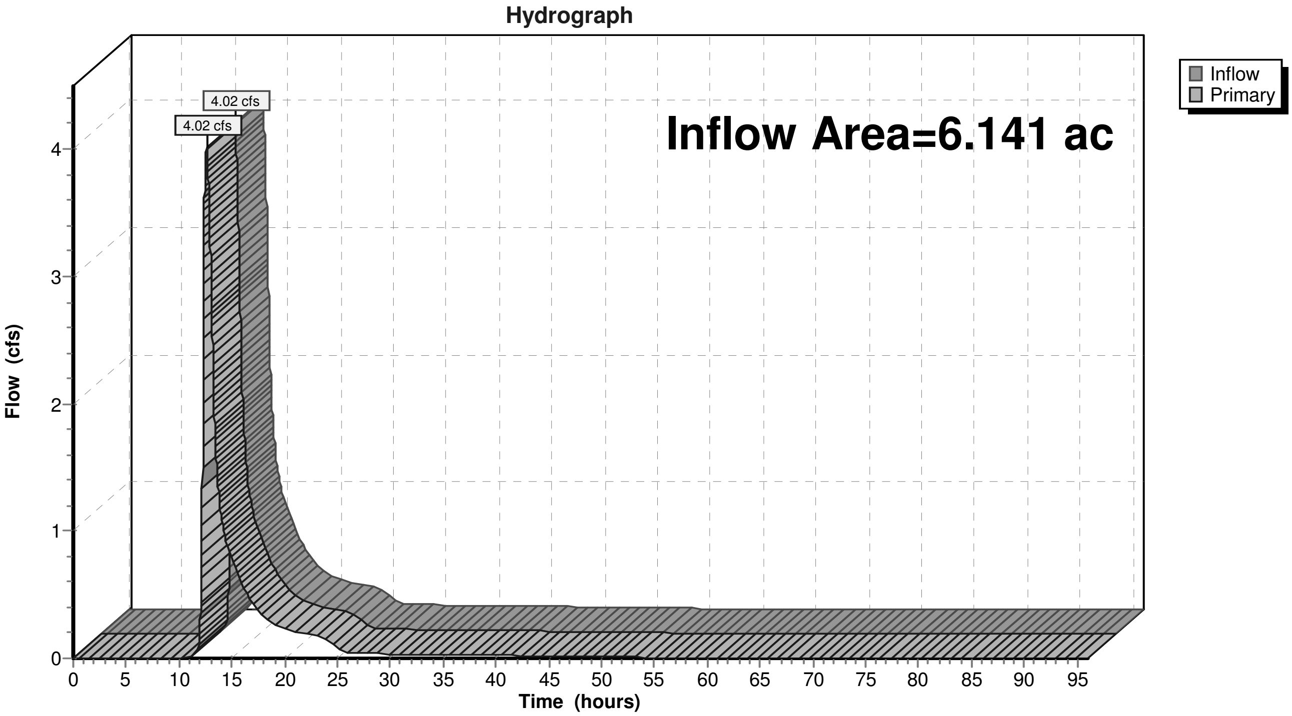


Summary for Link 19L: Design Point 1

Inflow Area = 6.141 ac, 15.53% Impervious, Inflow Depth = 1.51" for 25 year event
Inflow = 4.02 cfs @ 12.59 hrs, Volume= 0.772 af
Primary = 4.02 cfs @ 12.59 hrs, Volume= 0.772 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 19L: Design Point 1

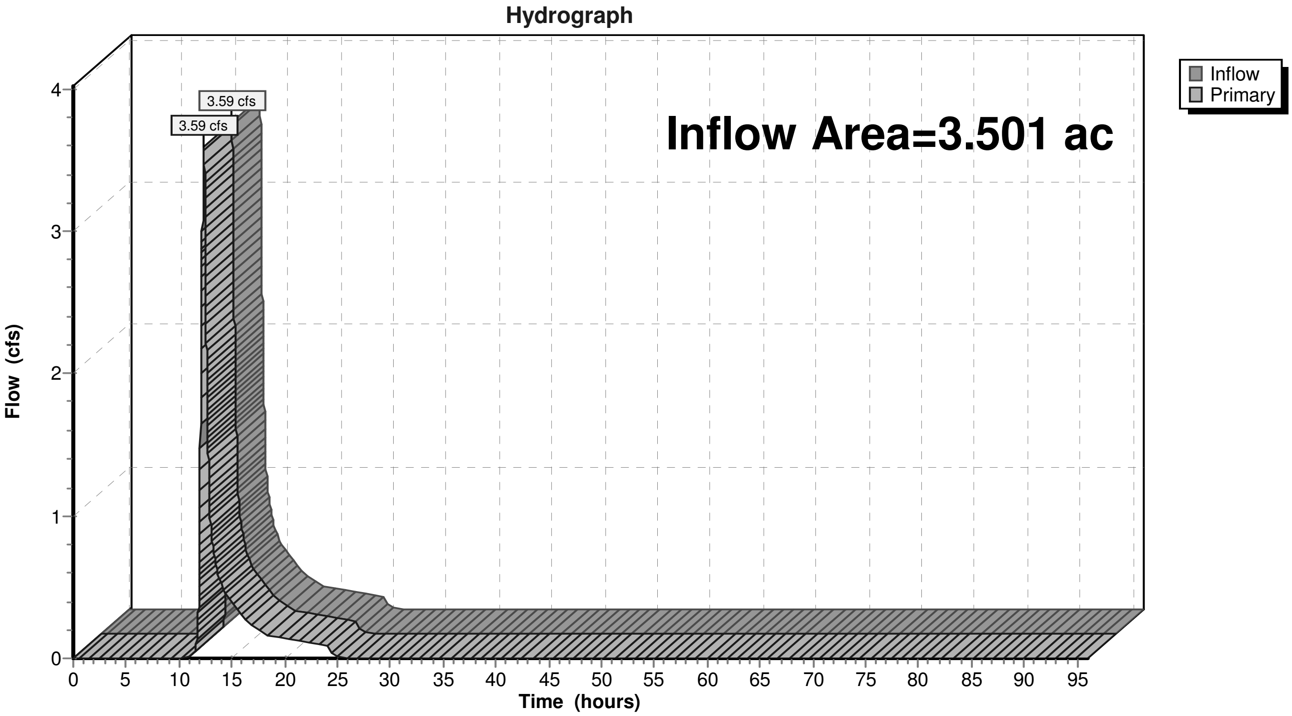


Summary for Link 22L: Design Point 2

Inflow Area =	3.501 ac,	9.03% Impervious, Inflow Depth = 1.46"	for 25 year event	
Inflow =	3.59 cfs @	12.34 hrs, Volume=	0.426 af	
Primary =	3.59 cfs @	12.34 hrs, Volume=	0.426 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 22L: Design Point 2

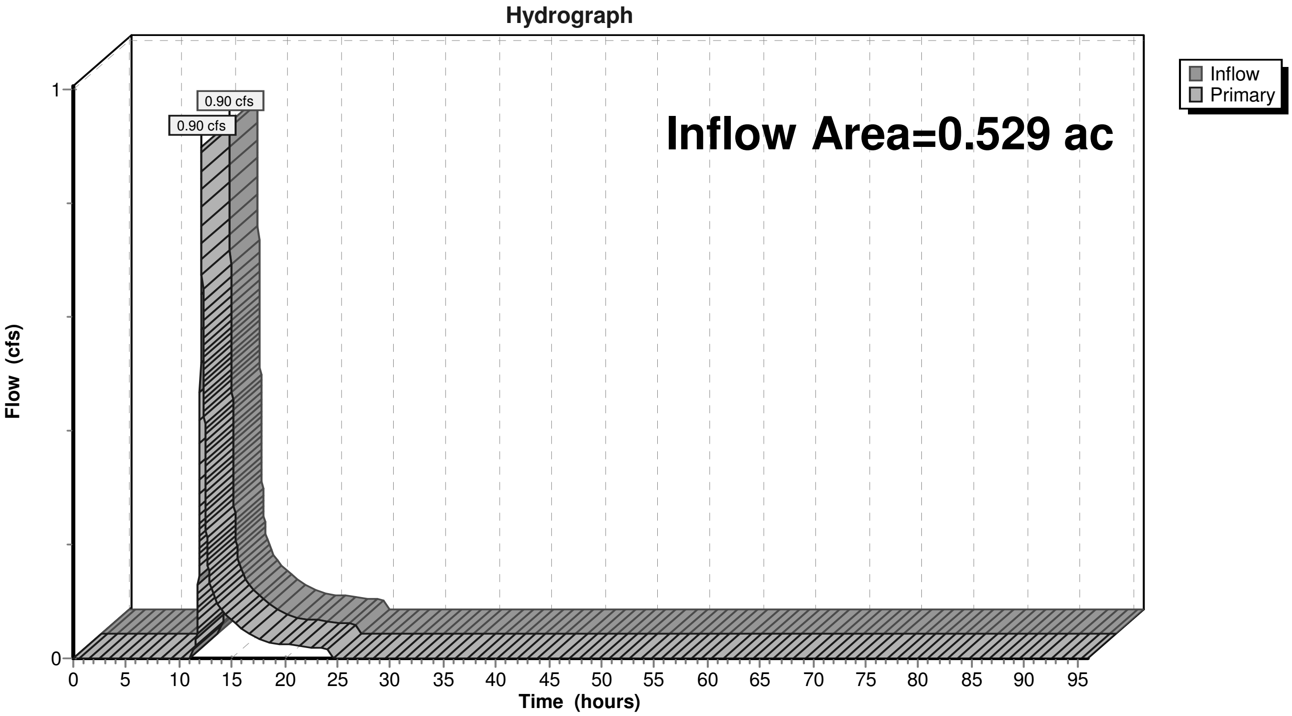


Summary for Link 25L: Design Point 3

Inflow Area =	0.529 ac,	0.00% Impervious, Inflow Depth = 1.68"	for 25 year event
Inflow =	0.90 cfs @	12.12 hrs, Volume=	0.074 af
Primary =	0.90 cfs @	12.12 hrs, Volume=	0.074 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 25L: Design Point 3

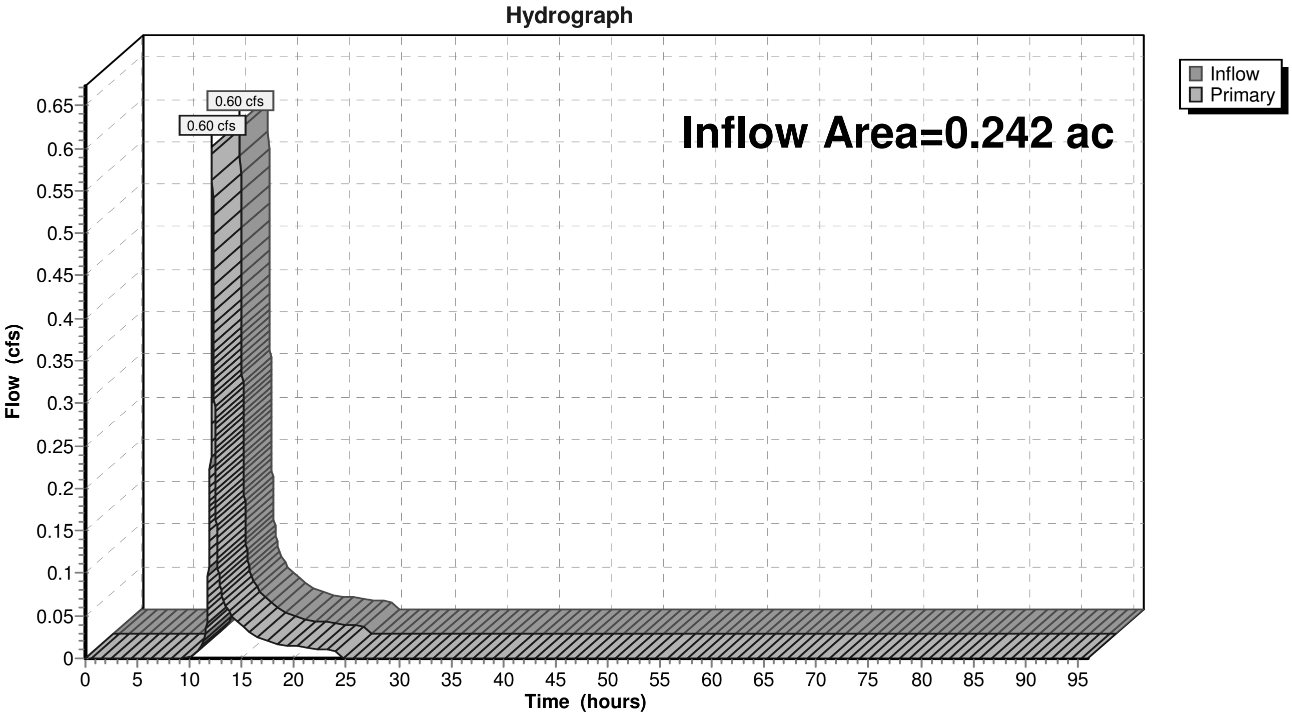


Summary for Link 28L: Design Point 4

Inflow Area = 0.242 ac, 0.00% Impervious, Inflow Depth = 2.35" for 25 year event
Inflow = 0.60 cfs @ 12.12 hrs, Volume= 0.047 af
Primary = 0.60 cfs @ 12.12 hrs, Volume= 0.047 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 28L: Design Point 4



Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 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: FDA-2.2 Runoff Area=28,532 sf 43.66% Impervious Runoff Depth=4.48"
Flow Length=483' Tc=13.2 min CN=74 Runoff=2.73 cfs 0.245 af

Subcatchment 2S: FDA-1.2 Runoff Area=19,428 sf 65.47% Impervious Runoff Depth=5.62"
Tc=10.0 min CN=84 Runoff=2.50 cfs 0.209 af

Subcatchment 4S: XDA4 Runoff Area=10,541 sf 0.00% Impervious Runoff Depth=3.49"
Flow Length=100' Slope=0.1900 '/' Tc=8.3 min CN=65 Runoff=0.91 cfs 0.070 af

Subcatchment 5S: FDA-L2.1 Runoff Area=5,735 sf 55.54% Impervious Runoff Depth=5.39"
Tc=5.0 min CN=82 Runoff=0.85 cfs 0.059 af

Subcatchment 6S: FDA-L3.1 Runoff Area=11,384 sf 19.99% Impervious Runoff Depth=3.60"
Tc=10.0 min CN=66 Runoff=0.96 cfs 0.078 af

Subcatchment 20S: FDA-1.3 Runoff Area=177,542 sf 5.71% Impervious Runoff Depth=2.96"
Flow Length=974' Tc=17.9 min CN=60 Runoff=9.71 cfs 1.006 af

Subcatchment 21S: FDA-1.4 Runoff Area=6,857 sf 0.00% Impervious Runoff Depth=3.39"
Flow Length=87' Tc=5.5 min CN=64 Runoff=0.63 cfs 0.044 af

Subcatchment 23S: FDA-L1 Runoff Area=8,712 sf 91.00% Impervious Runoff Depth=6.90"
Tc=5.0 min CN=95 Runoff=1.50 cfs 0.115 af

Subcatchment 24S: FDA-2.1 Runoff Area=38,768 sf 0.00% Impervious Runoff Depth=2.76"
Flow Length=141' Tc=6.3 min CN=58 Runoff=2.76 cfs 0.204 af

Subcatchment 26S: FDA-3 Runoff Area=23,055 sf 0.00% Impervious Runoff Depth=2.65"
Flow Length=156' Tc=7.6 min CN=57 Runoff=1.50 cfs 0.117 af

Subcatchment 27S: FDA-4 Runoff Area=10,545 sf 0.00% Impervious Runoff Depth=3.49"
Flow Length=100' Slope=0.1900 '/' Tc=8.3 min CN=65 Runoff=0.91 cfs 0.070 af

Subcatchment 29S: FDA-L2.2 Runoff Area=4,285 sf 100.00% Impervious Runoff Depth=7.26"
Tc=5.0 min CN=98 Runoff=0.75 cfs 0.060 af

Subcatchment 30S: XDA1 Runoff Area=208,652 sf 1.02% Impervious Runoff Depth=2.55"
Flow Length=1,046' Tc=25.6 min CN=56 Runoff=8.27 cfs 1.018 af

Subcatchment 31S: FDA-1.1 Runoff Area=29,272 sf 0.00% Impervious Runoff Depth=2.86"
Tc=15.0 min CN=59 Runoff=1.65 cfs 0.160 af

Subcatchment 32S: FDA-2.3 Runoff Area=85,225 sf 1.54% Impervious Runoff Depth=2.65"
Flow Length=401' Tc=14.7 min CN=57 Runoff=4.43 cfs 0.432 af

Subcatchment 33S: XDA2 Runoff Area=211,963 sf 1.03% Impervious Runoff Depth=2.45"
Flow Length=544' Tc=15.5 min CN=55 Runoff=9.81 cfs 0.993 af

Subcatchment 34S: XDA3 Runoff Area=23,043 sf 0.00% Impervious Runoff Depth=2.45"
Flow Length=156' Tc=8.3 min CN=55 Runoff=1.33 cfs 0.108 af

Subcatchment 35S: FDA-L3.2 Runoff Area=4,286 sf 23.68% Impervious Runoff Depth=3.82"
Tc=10.0 min CN=68 Runoff=0.38 cfs 0.031 af

Reach 30R: Vegetated Swale Avg. Flow Depth=0.99' Max Vel=1.06 fps Inflow=4.43 cfs 0.432 af
n=0.240 L=285.0' S=0.0561 '/' Capacity=6.76 cfs Outflow=4.14 cfs 0.432 af

Pond 15P: SWMF Peak Elev=128.91' Storage=17,299 cf Inflow=12.58 cfs 1.197 af
Outflow=6.08 cfs 1.197 af

Pond 29P: SWMF-L1 Peak Elev=154.05' Storage=1,219 cf Inflow=0.99 cfs 0.110 af
Outflow=0.21 cfs 0.110 af

Pond 30P: Div L1 (DS F.2) Peak Elev=154.93' Inflow=1.50 cfs 0.115 af
Primary=0.51 cfs 0.005 af Secondary=0.99 cfs 0.110 af Outflow=1.50 cfs 0.115 af

Pond 31P: SWMF-1.1 Bioret Peak Elev=157.27' Storage=1,021 cf Inflow=1.65 cfs 0.160 af
Discarded=0.03 cfs 0.050 af Primary=1.48 cfs 0.110 af Outflow=1.52 cfs 0.160 af

Pond 32P: Div 2.2 (DS D.2) Peak Elev=153.27' Inflow=2.73 cfs 0.245 af
Primary=1.17 cfs 0.035 af Secondary=1.56 cfs 0.209 af Outflow=2.73 cfs 0.245 af

Pond 33P: Div L2.1 Peak Elev=150.63' Inflow=0.85 cfs 0.059 af
Primary=0.26 cfs 0.002 af Secondary=0.58 cfs 0.057 af Outflow=0.85 cfs 0.059 af

Pond 34P: SWMF-L2.1 Peak Elev=150.81' Storage=941 cf Inflow=0.58 cfs 0.057 af
Outflow=0.06 cfs 0.057 af

Pond 35P: Div 1.2 Peak Elev=155.20' Inflow=2.50 cfs 0.209 af
Primary=1.46 cfs 0.028 af Secondary=1.04 cfs 0.181 af Outflow=2.50 cfs 0.209 af

Pond 36P: Rain Garden #1 Lot 3 Peak Elev=145.16' Storage=782 cf Inflow=0.96 cfs 0.078 af
Discarded=0.03 cfs 0.041 af Primary=0.68 cfs 0.037 af Outflow=0.71 cfs 0.078 af

Pond 37P: SWMF-1.2 Peak Elev=155.97' Storage=2,688 cf Inflow=1.04 cfs 0.181 af
Outflow=0.18 cfs 0.181 af

Pond 38P: SWMF-2.2 Peak Elev=153.49' Storage=2,554 cf Inflow=1.56 cfs 0.209 af
Discarded=0.16 cfs 0.175 af Primary=0.66 cfs 0.034 af Outflow=0.83 cfs 0.209 af

Pond 39P: SWMF-L2.2 Peak Elev=137.32' Storage=810 cf Inflow=0.62 cfs 0.059 af
Outflow=0.07 cfs 0.059 af

Pond 40P: Div L2.2 Peak Elev=138.18' Inflow=0.75 cfs 0.060 af
Primary=0.13 cfs 0.001 af Secondary=0.62 cfs 0.059 af Outflow=0.75 cfs 0.060 af

Pond 41P: Rain Garden #2 Lot 3 Peak Elev=152.56' Storage=442 cf Inflow=0.38 cfs 0.031 af
Discarded=0.02 cfs 0.024 af Primary=0.16 cfs 0.008 af Outflow=0.18 cfs 0.031 af

Link 19L: Design Point 1 Inflow=6.18 cfs 1.242 af
Primary=6.18 cfs 1.242 af

Link 22L: Design Point 2 Inflow=6.11 cfs 0.707 af
Primary=6.11 cfs 0.707 af

Link 25L: Design Point 3 Inflow=1.50 cfs 0.117 af
Primary=1.50 cfs 0.117 af

Link 28L: Design Point 4 Inflow=0.91 cfs 0.070 af
Primary=0.91 cfs 0.070 af

Total Runoff Area = 20.841 ac Runoff Volume = 5.021 af Average Runoff Depth = 2.89"
93.43% Pervious = 19.472 ac 6.57% Impervious = 1.369 ac

Summary for Subcatchment 1S: FDA-2.2

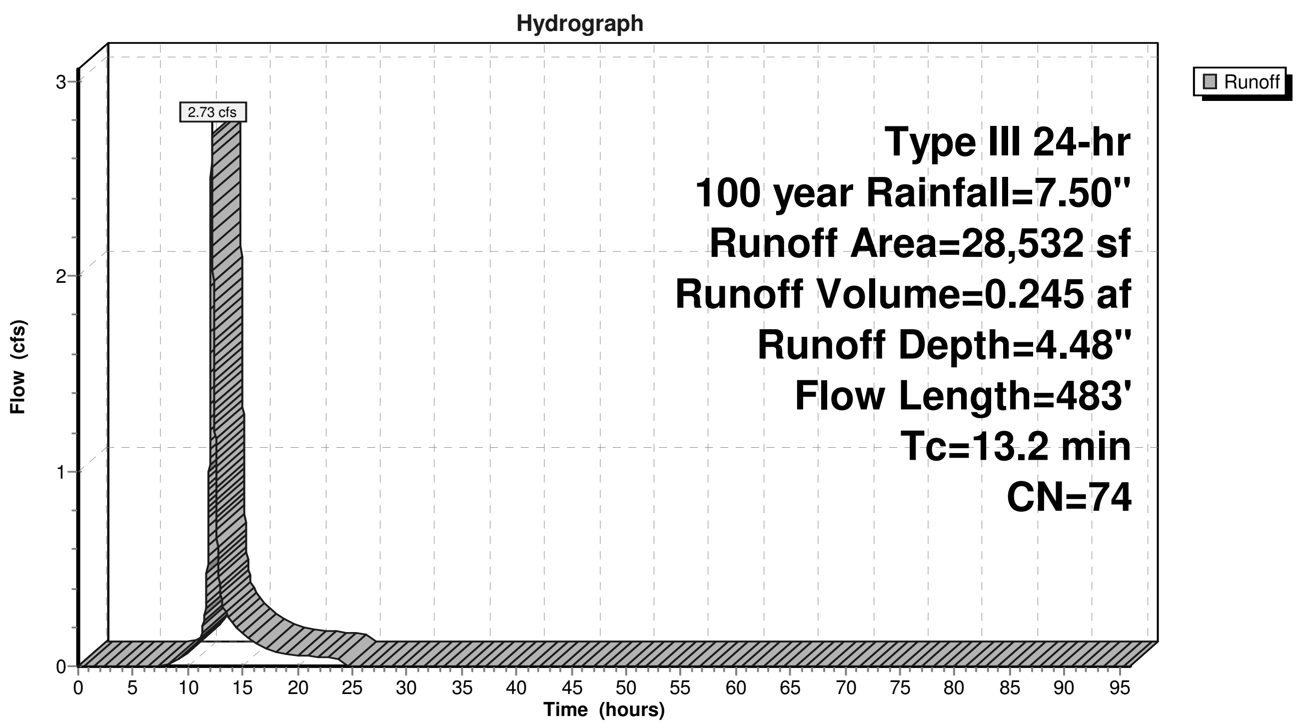
Runoff = 2.73 cfs @ 12.18 hrs, Volume= 0.245 af, Depth= 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

	Area (sf)	CN	Description
*	11,021	98	Subdivision Road, HSG B
*	1,437	98	Off-site impervious road, HSG B
	1,307	61	>75% Grass cover, Good, HSG B
	14,767	55	Woods, Good, HSG B
	28,532	74	Weighted Average
	16,074		56.34% Pervious Area
	12,458		43.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	100	0.0750	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.6	68	0.1250	1.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	65	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	250	0.0750	13.46	10.57	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
13.2	483	Total			

Subcatchment 1S: FDA-2.2



Summary for Subcatchment 2S: FDA-1.2

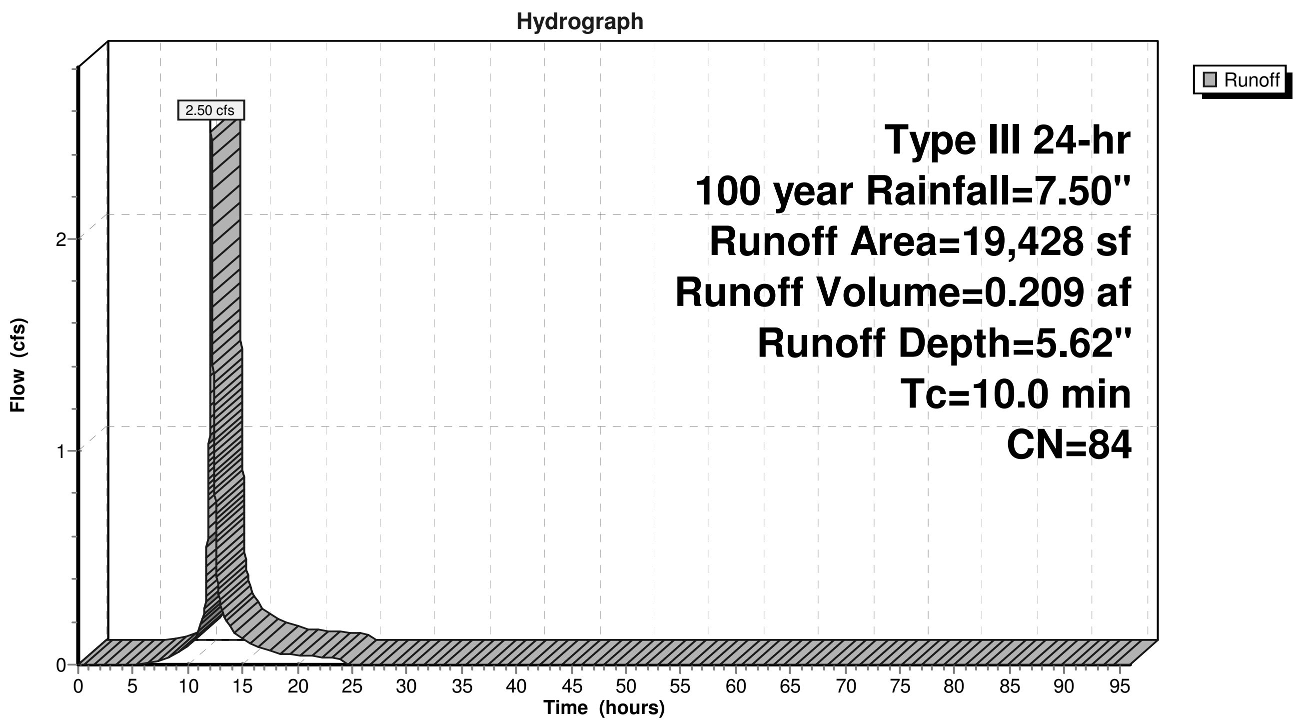
Runoff = 2.50 cfs @ 12.14 hrs, Volume= 0.209 af, Depth= 5.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

Area (sf)	CN	Description
12,720	98	Paved parking, HSG B
3,180	61	>75% Grass cover, Good, HSG B
3,528	55	Woods, Good, HSG B
19,428	84	Weighted Average
6,708		34.53% Pervious Area
12,720		65.47% Impervious Area

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

Subcatchment 2S: FDA-1.2



Summary for Subcatchment 4S: XDA4

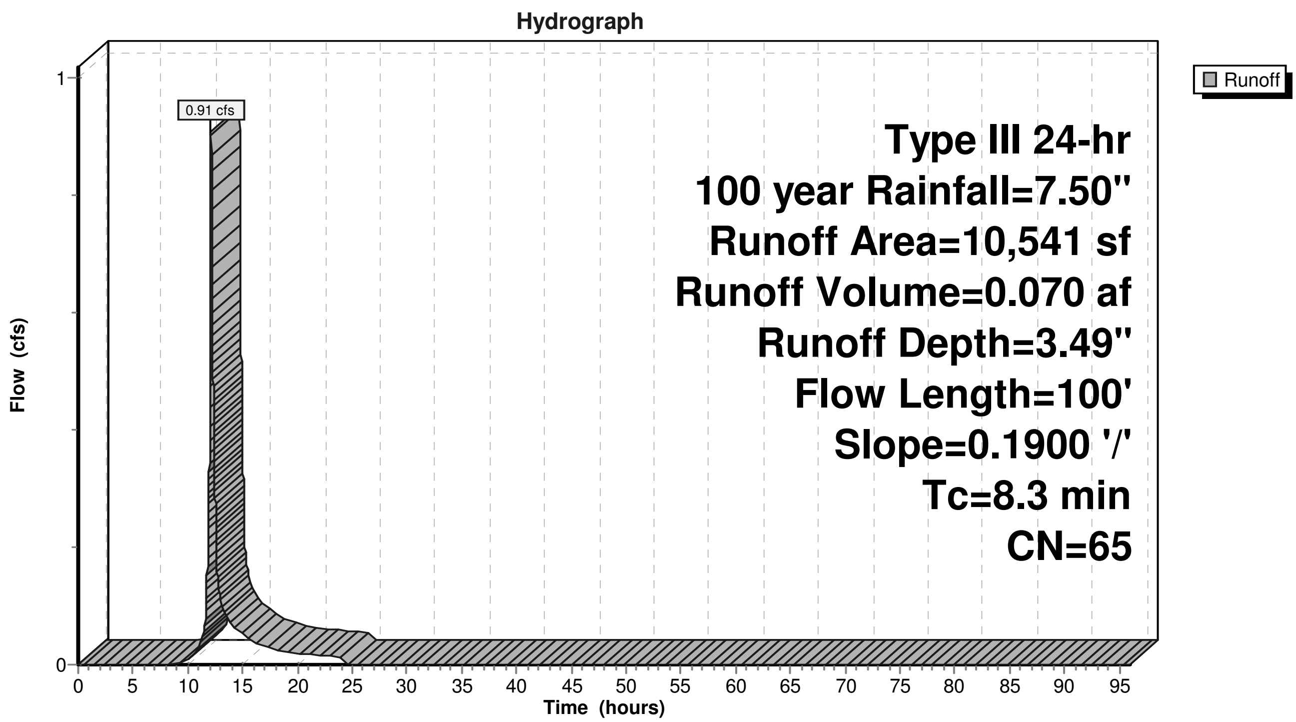
Runoff = 0.91 cfs @ 12.12 hrs, Volume= 0.070 af, Depth= 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

Area (sf)	CN	Description
4,225	55	Woods, Good, HSG B
4,225	70	Woods, Good, HSG C
2,091	77	Woods, Good, HSG D
10,541	65	Weighted Average
10,541		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.1900	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"

Subcatchment 4S: XDA4



Summary for Subcatchment 5S: FDA-L2.1

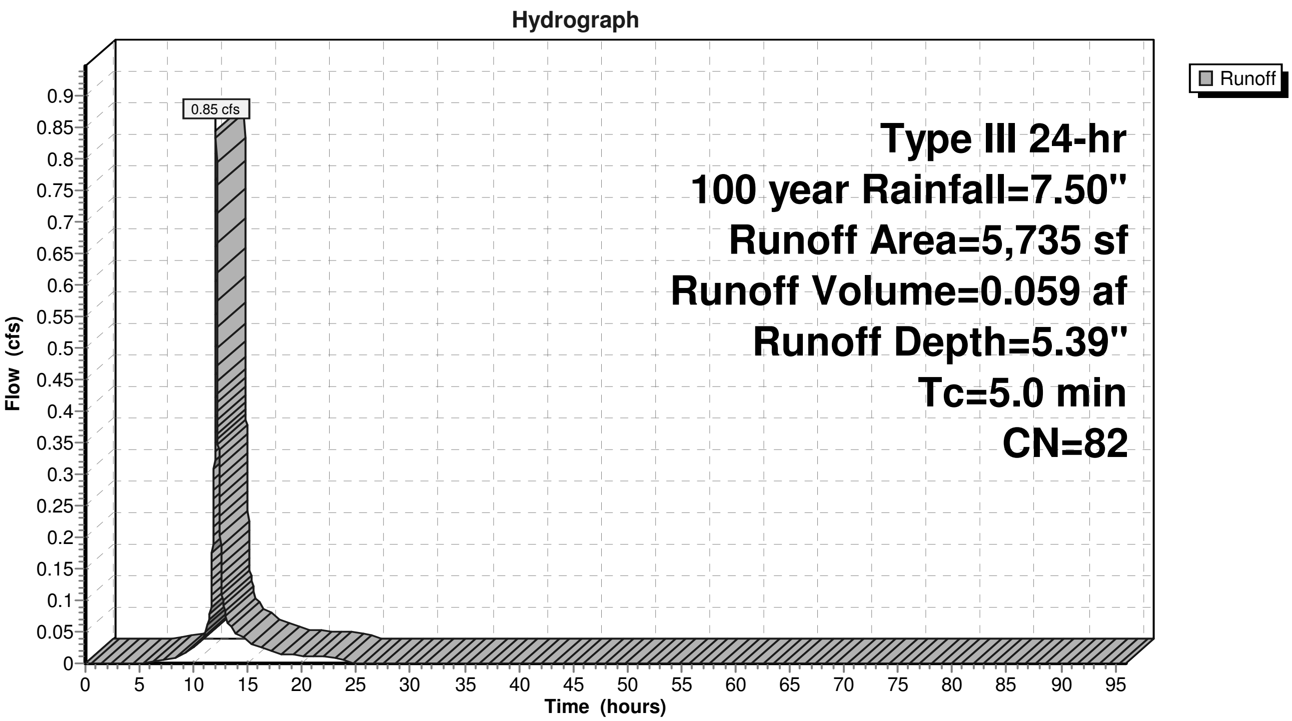
Runoff = 0.85 cfs @ 12.07 hrs, Volume= 0.059 af, Depth= 5.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

	Area (sf)	CN	Description
*	3,185	98	Driveway and roofs, HSG B
	2,550	61	>75% Grass cover, Good, HSG B
	5,735	82	Weighted Average
	2,550		44.46% Pervious Area
	3,185		55.54% Impervious Area

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

Subcatchment 5S: FDA-L2.1



Summary for Subcatchment 6S: FDA-L3.1

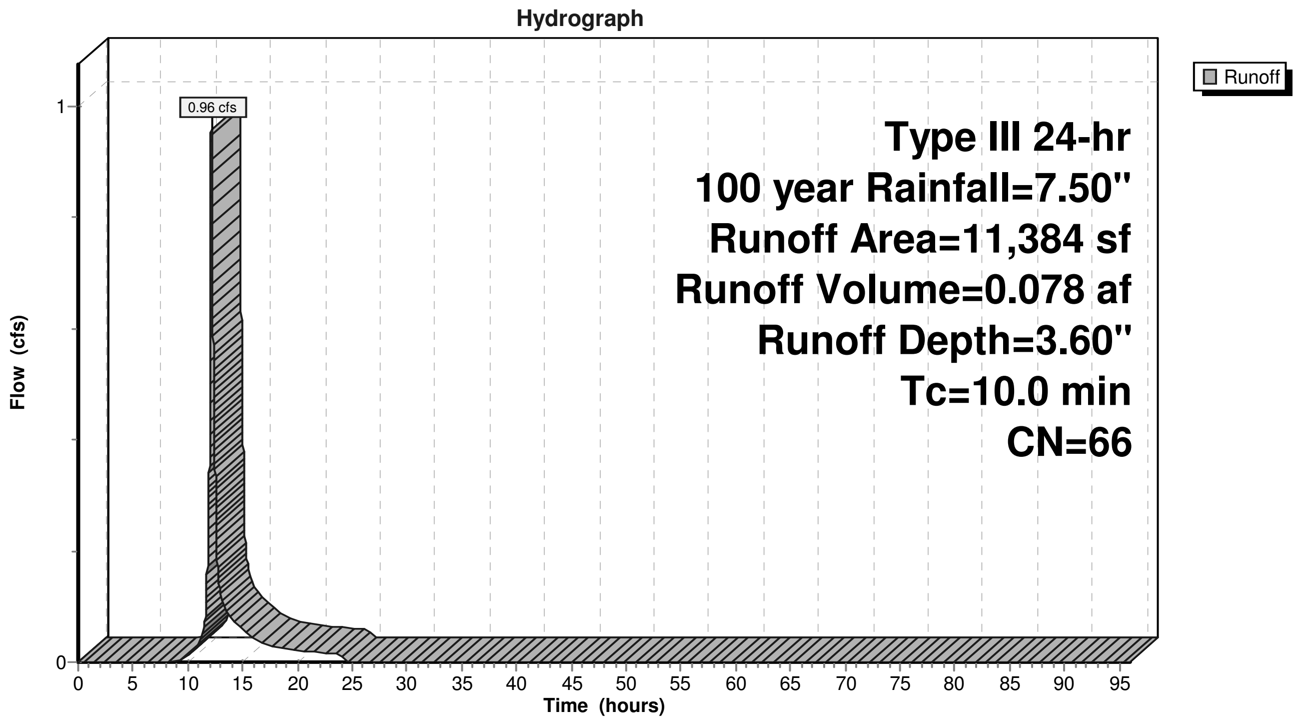
Runoff = 0.96 cfs @ 12.14 hrs, Volume= 0.078 af, Depth= 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

	Area (sf)	CN	Description
*	982	98	Lot 3 Roof, HSG B
*	907	98	Lot 3 Roof, HSG B
*	387	98	Walks, Entry Steps, HSG B
	5,387	61	>75% Grass cover, Good, HSG B
	3,721	55	Woods, Good, HSG B
	11,384	66	Weighted Average
	9,108		80.01% Pervious Area
	2,276		19.99% Impervious Area

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

Subcatchment 6S: FDA-L3.1



Summary for Subcatchment 20S: FDA-1.3

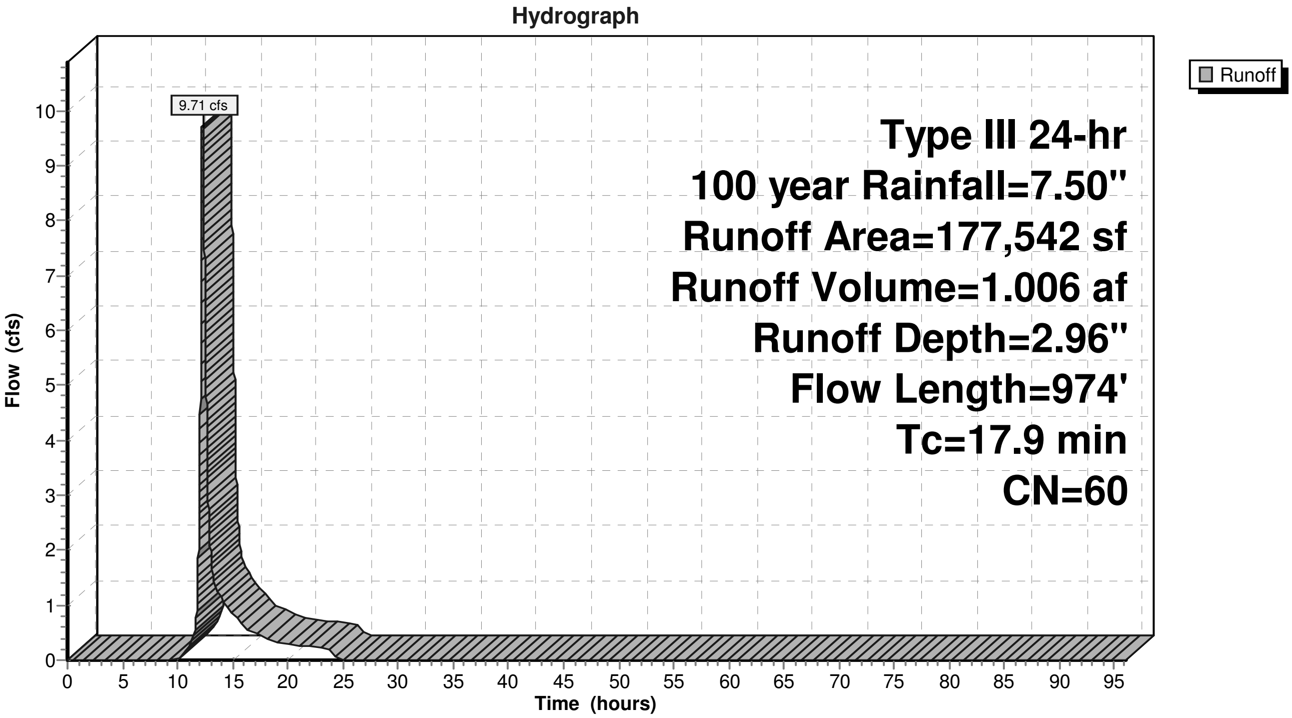
Runoff = 9.71 cfs @ 12.26 hrs, Volume= 1.006 af, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

	Area (sf)	CN	Description
*	9,958	98	Impervious Surfaces, HSG B
*	1,720	85	Maintenance Path, HSG B
*	185	98	Retaining Wall, HSG B
	60,200	61	>75% Grass cover, Good, HSG B
	2,190	74	>75% Grass cover, Good, HSG C
	523	80	>75% Grass cover, Good, HSG D
	12,069	48	Brush, Good, HSG B
*	34,260	55	Woods (on-site), Good, HSG B
*	51,994	55	Woods (off-site), Good, HSG B
	2,962	70	Woods, Good, HSG C
	1,481	77	Woods, Good, HSG D
	177,542	60	Weighted Average
	167,399		94.29% Pervious Area
	10,143		5.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.1700	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	133	0.1880	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.1	183	0.0383	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	57	0.0219	2.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.1	91	0.1000	15.54	12.21	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
1.6	274	0.0299	2.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.0	136	0.0022	0.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
17.9	974	Total			

Subcatchment 20S: FDA-1.3



Summary for Subcatchment 21S: FDA-1.4

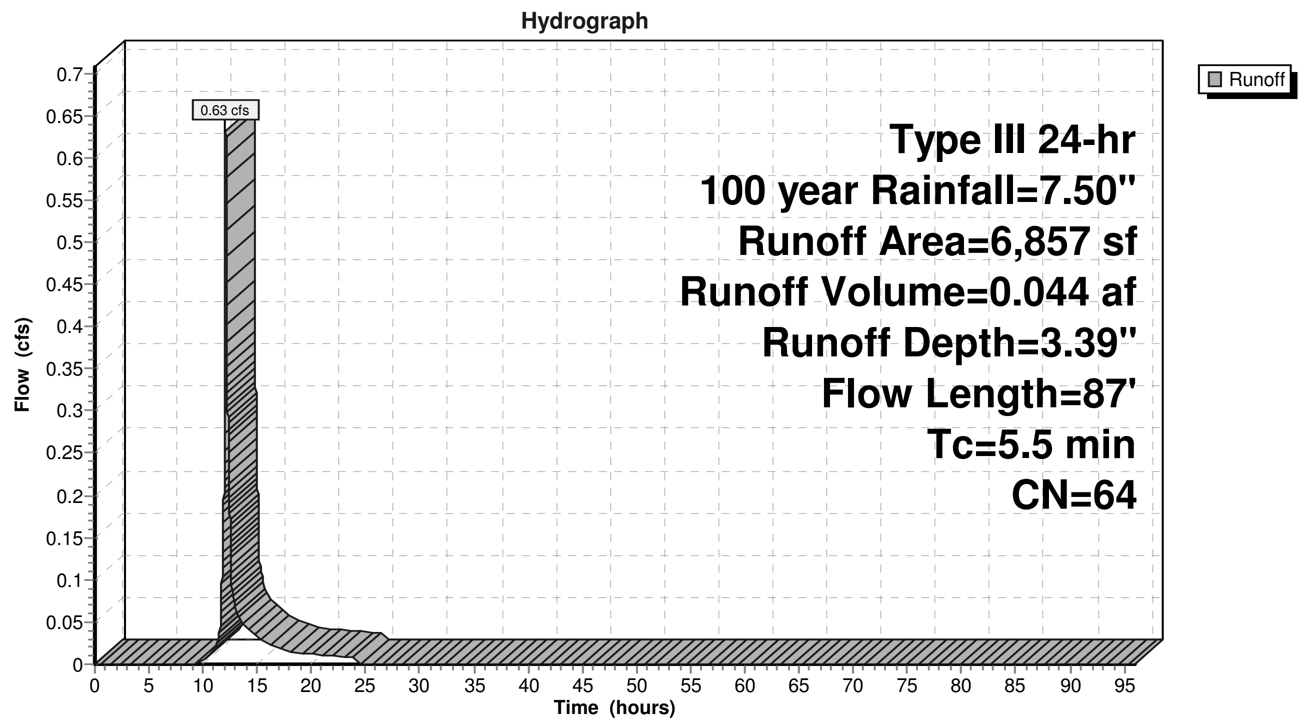
Runoff = 0.63 cfs @ 12.08 hrs, Volume= 0.044 af, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

Area (sf)	CN	Description
478	61	>75% Grass cover, Good, HSG B
124	74	>75% Grass cover, Good, HSG C
62	80	>75% Grass cover, Good, HSG D
3,040	55	Woods, Good, HSG B
2,102	70	Woods, Good, HSG C
1,051	77	Woods, Good, HSG D
6,857	64	Weighted Average
6,857		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	40	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	47	0.2300	2.40		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.5	87	Total			

Subcatchment 21S: FDA-1.4



Summary for Subcatchment 23S: FDA-L1

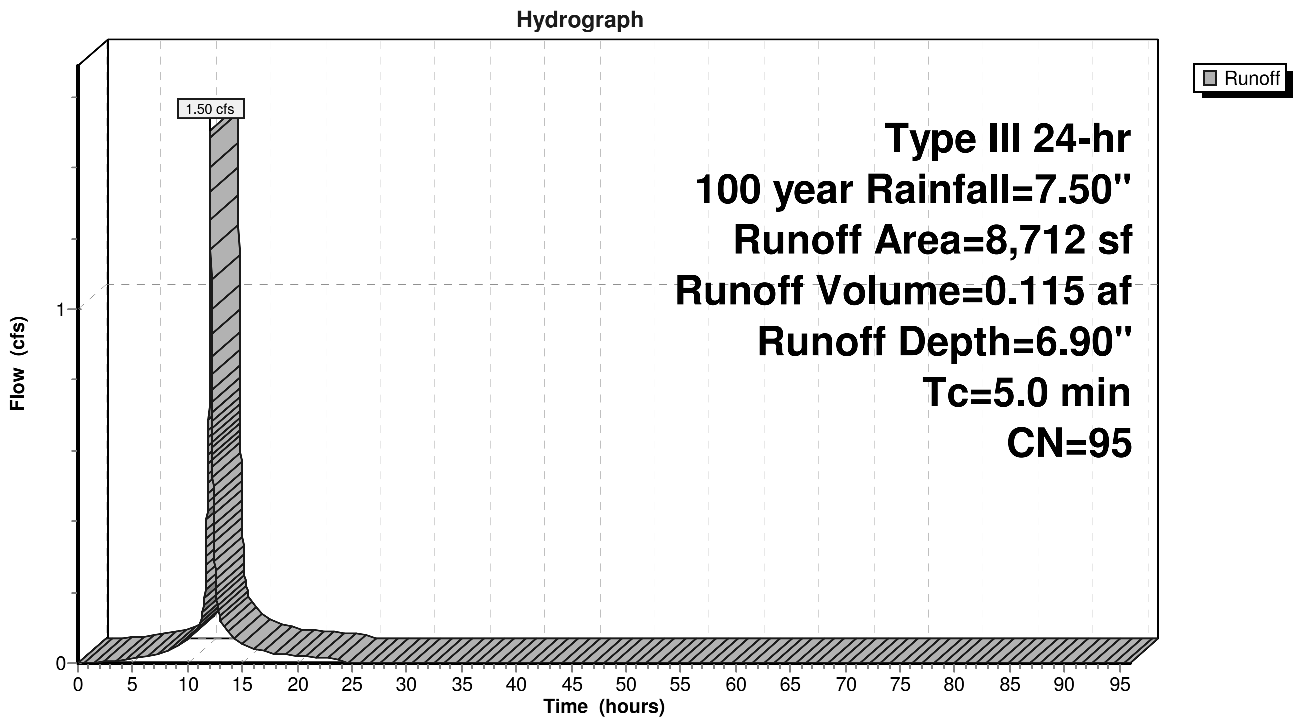
Runoff = 1.50 cfs @ 12.07 hrs, Volume= 0.115 af, Depth= 6.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

Area (sf)	CN	Description
7,928	98	Paved parking, HSG B
784	61	>75% Grass cover, Good, HSG B
8,712	95	Weighted Average
784		9.00% Pervious Area
7,928		91.00% Impervious Area

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

Subcatchment 23S: FDA-L1



Summary for Subcatchment 24S: FDA-2.1

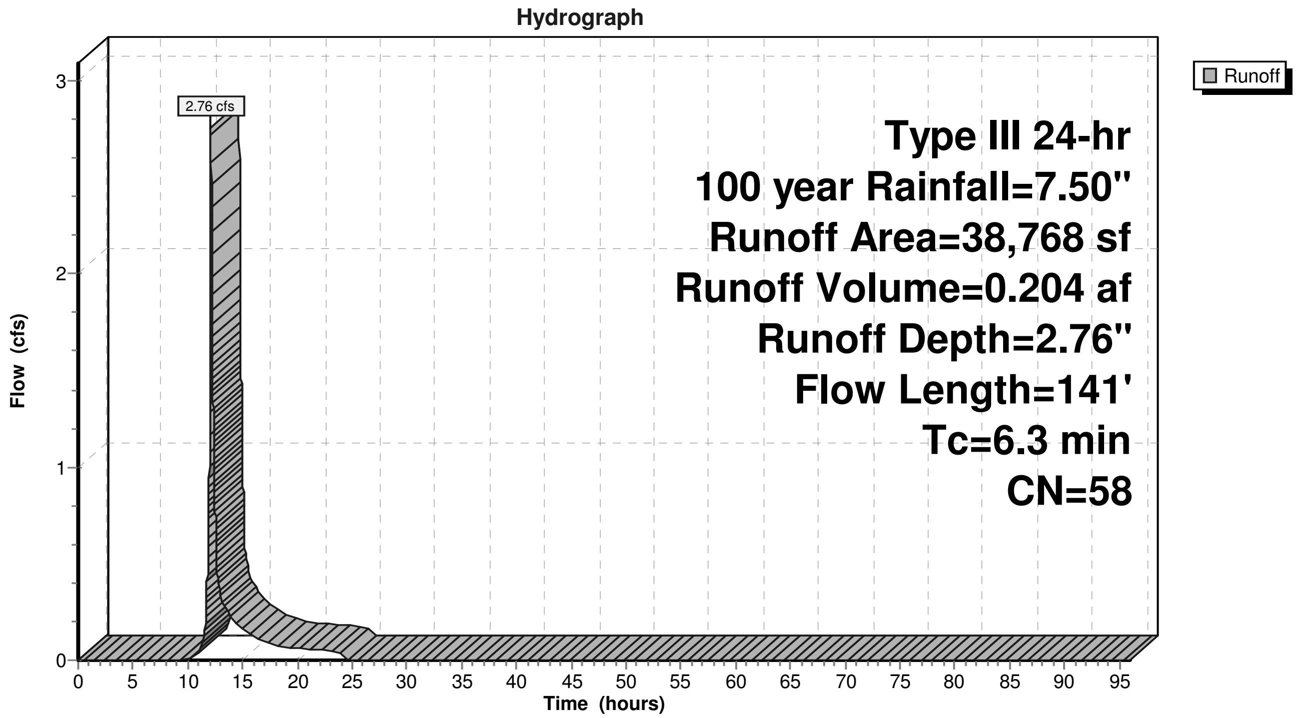
Runoff = 2.76 cfs @ 12.10 hrs, Volume= 0.204 af, Depth= 2.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

Area (sf)	CN	Description
16,814	61	>75% Grass cover, Good, HSG B
21,954	55	Woods, Good, HSG B
38,768	58	Weighted Average
38,768		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	63	0.1698	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	78	0.0744	4.09		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
6.3	141	Total			

Subcatchment 24S: FDA-2.1



Summary for Subcatchment 26S: FDA-3

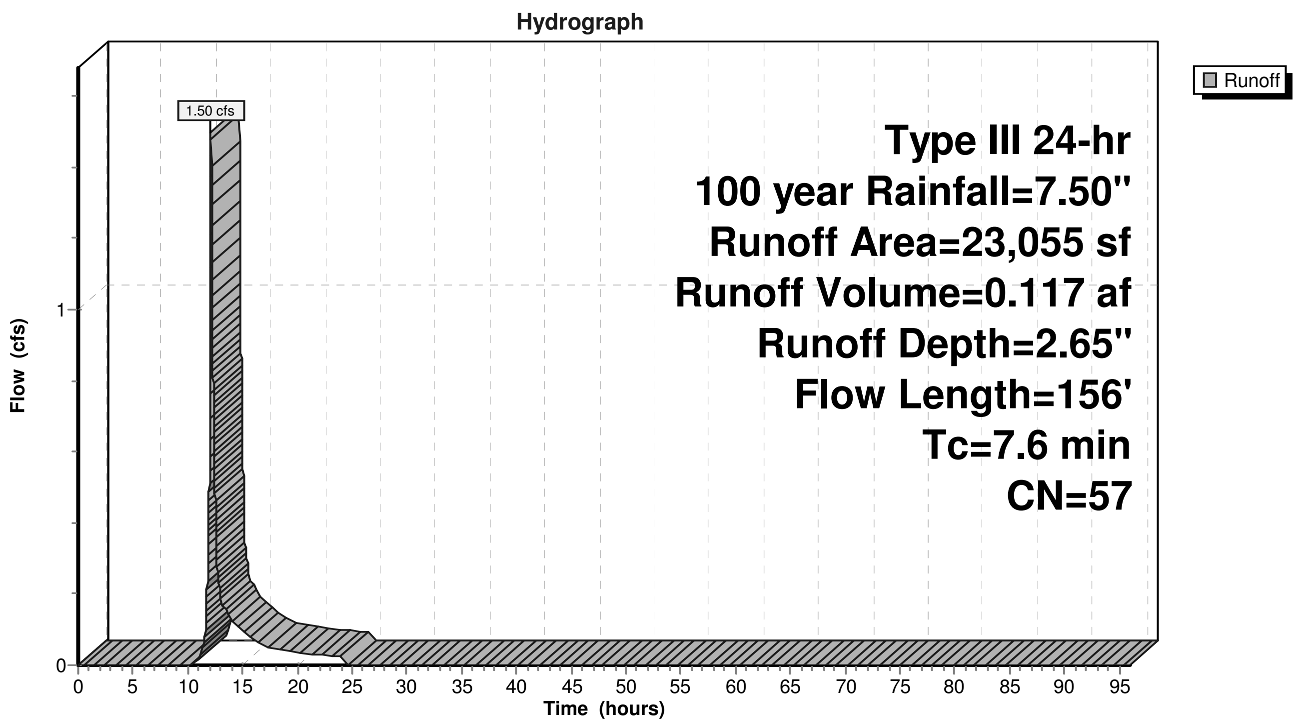
Runoff = 1.50 cfs @ 12.12 hrs, Volume= 0.117 af, Depth= 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

Area (sf)	CN	Description
5,955	61	>75% Grass cover, Good, HSG B
17,100	55	Woods, Good, HSG B
23,055	57	Weighted Average
23,055		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	86	0.1977	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	70	0.0571	3.58		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.6	156	Total			

Subcatchment 26S: FDA-3



Summary for Subcatchment 27S: FDA-4

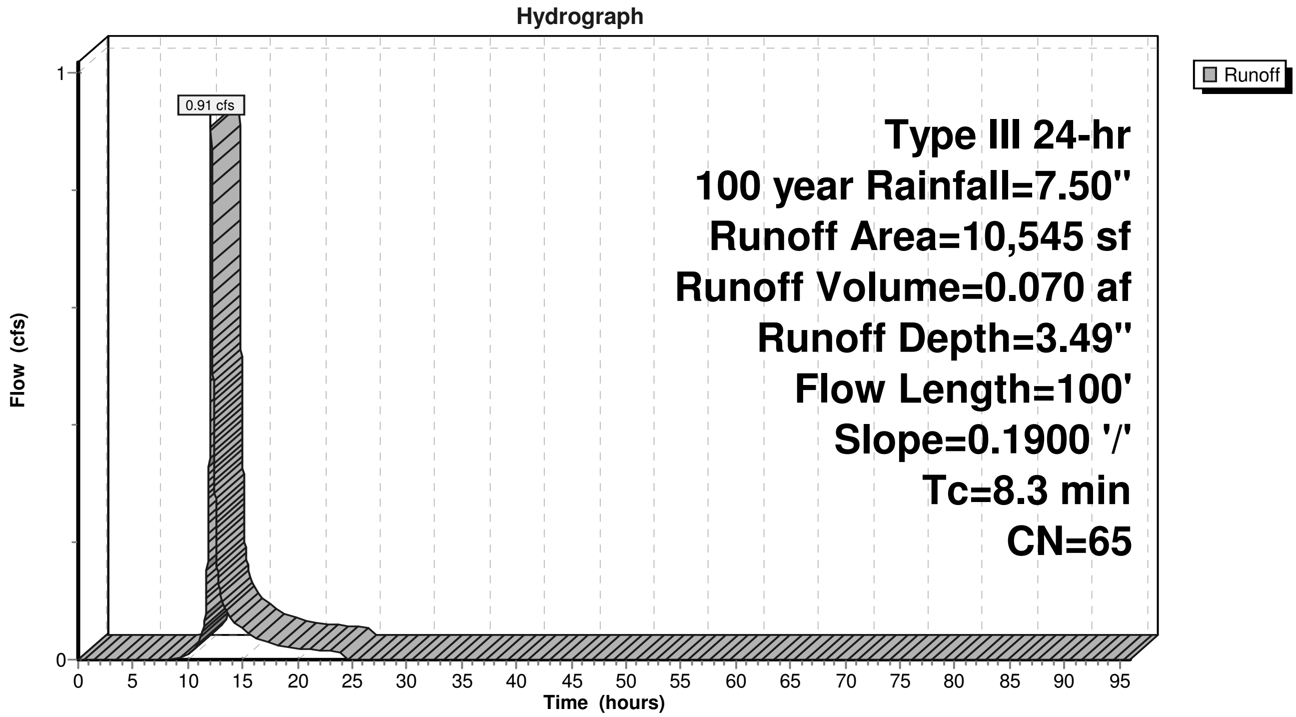
Runoff = 0.91 cfs @ 12.12 hrs, Volume= 0.070 af, Depth= 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

Area (sf)	CN	Description
4,220	55	Woods, Good, HSG B
4,220	70	Woods, Good, HSG C
2,105	77	Woods, Good, HSG D
10,545	65	Weighted Average
10,545		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.1900	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"

Subcatchment 27S: FDA-4



Summary for Subcatchment 29S: FDA-L2.2

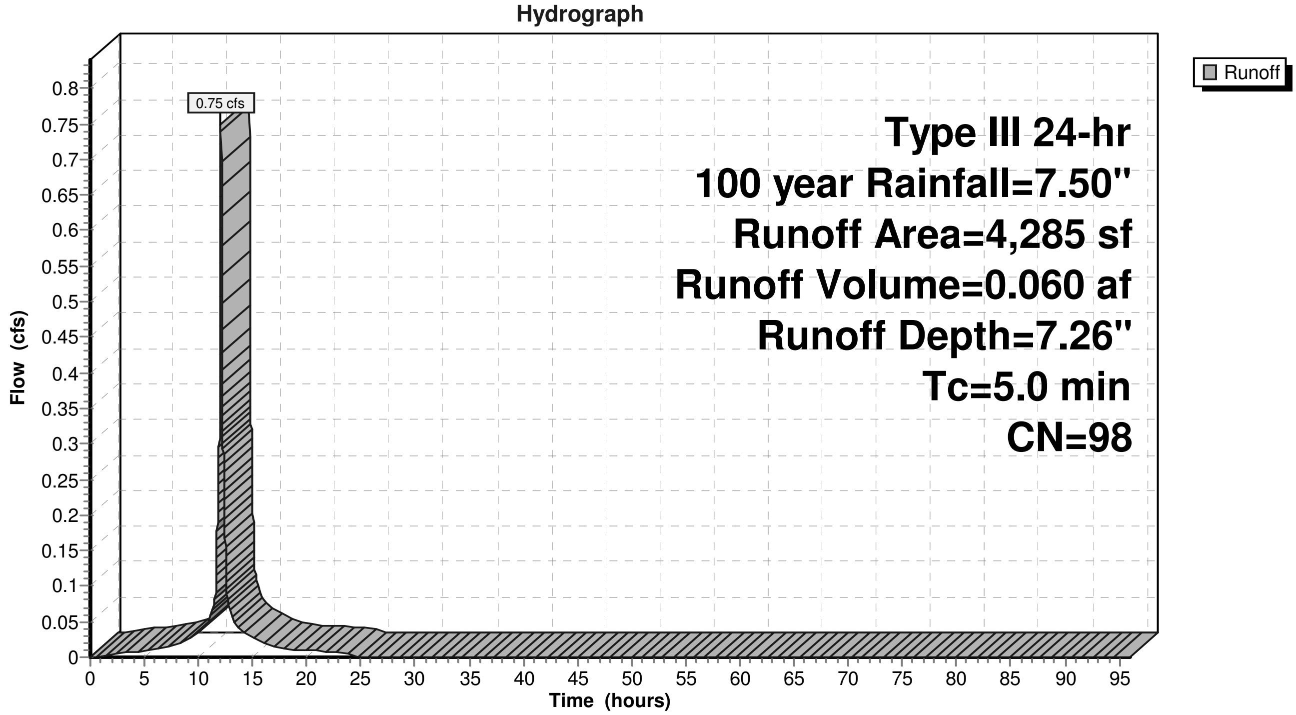
Runoff = 0.75 cfs @ 12.07 hrs, Volume= 0.060 af, Depth= 7.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

Area (sf)	CN	Description
4,285	98	Roofs, HSG B
4,285		100.00% Impervious Area

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

Subcatchment 29S: FDA-L2.2



Summary for Subcatchment 30S: XDA1

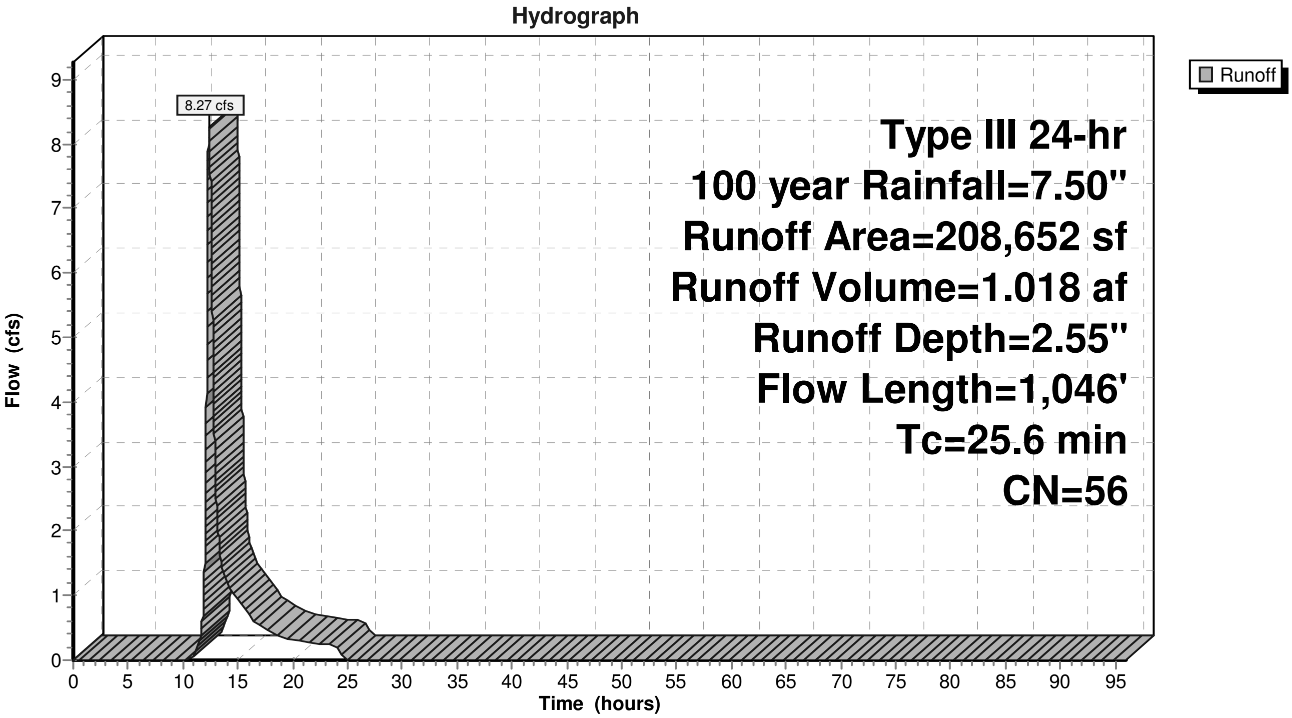
Runoff = 8.27 cfs @ 12.38 hrs, Volume= 1.018 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

Area (sf)	CN	Description
2,134	98	Unconnected pavement, HSG B
195,802	55	Woods, Good, HSG B
7,144	70	Woods, Good, HSG C
3,572	77	Woods, Good, HSG D
208,652	56	Weighted Average
206,518		98.98% Pervious Area
2,134		1.02% Impervious Area
2,134		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.1700	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	133	0.1880	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.1	183	0.0383	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	185	0.0919	1.52		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	367	0.0158	0.63		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	78	0.0538	1.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.6	1,046	Total			

Subcatchment 30S: XDA1



Summary for Subcatchment 31S: FDA-1.1

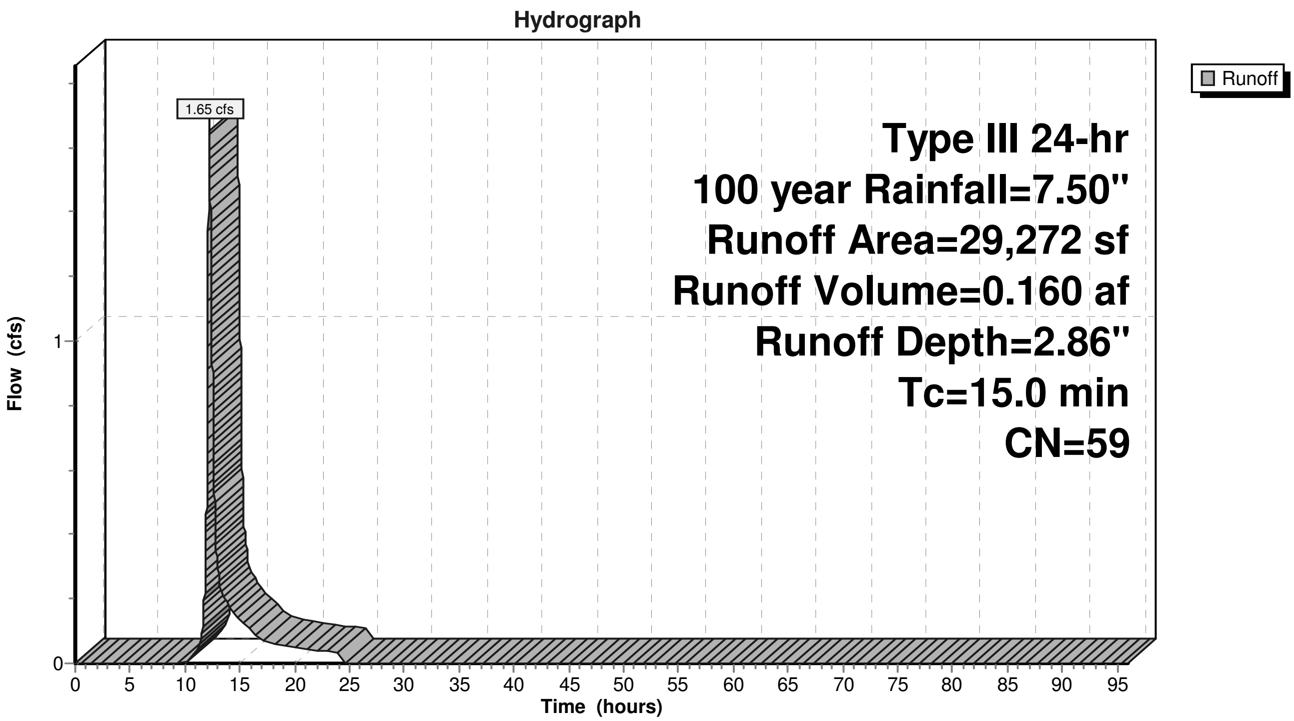
Runoff = 1.65 cfs @ 12.22 hrs, Volume= 0.160 af, Depth= 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

	Area (sf)	CN	Description
	18,513	61	>75% Grass cover, Good, HSG B
	7,020	55	Woods, Good, HSG B
*	3,739	55	Woods (off-site), Good, HSG B
	29,272	59	Weighted Average
	29,272		100.00% Pervious Area

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

Subcatchment 31S: FDA-1.1



Summary for Subcatchment 32S: FDA-2.3

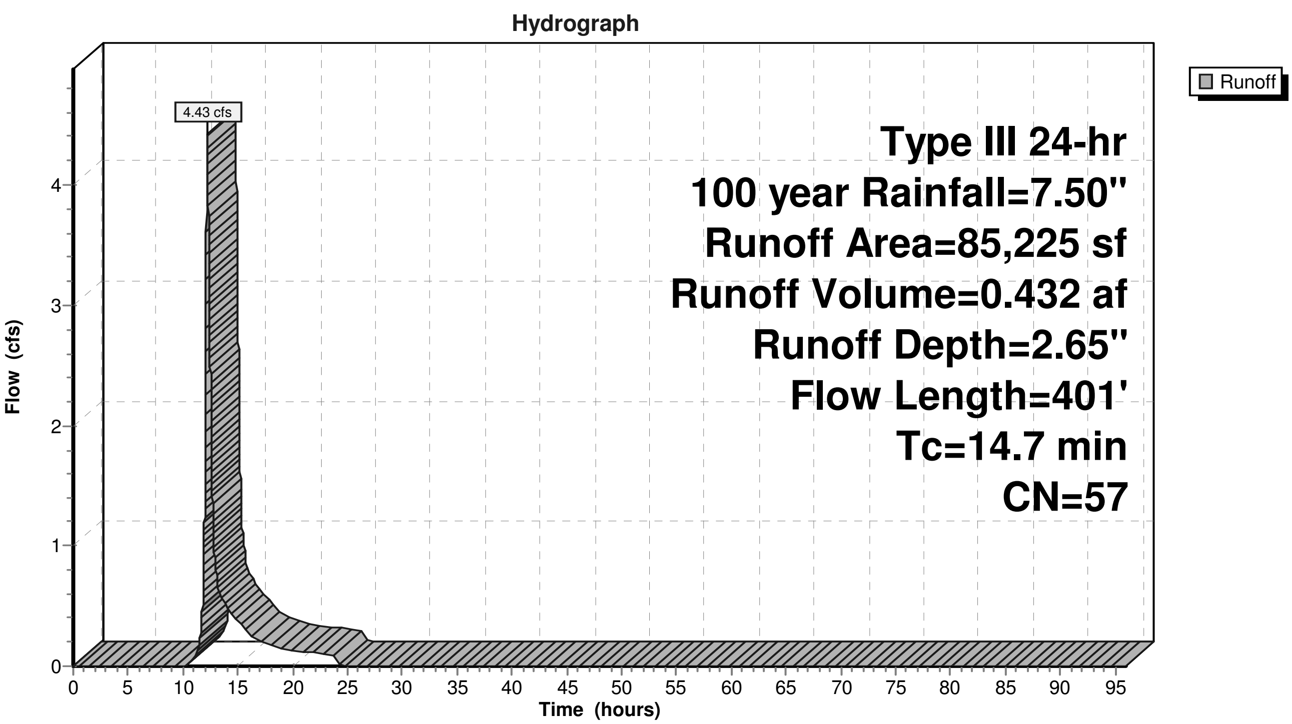
Runoff = 4.43 cfs @ 12.21 hrs, Volume= 0.432 af, Depth= 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

	Area (sf)	CN	Description
*	715	98	Off-Site Road, HSG B
	315	98	Unconnected pavement, HSG B
	280	98	Unconnected pavement, HSG B
	23,051	61	>75% Grass cover, Good, HSG B
	60,864	55	Woods, Good, HSG B
	85,225	57	Weighted Average
	83,915		98.46% Pervious Area
	1,310		1.54% Impervious Area
	595		45.42% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	100	0.2050	0.21		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.4	148	0.1284	1.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.2	153	0.0163	0.49	1.29	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.75' Z= 2.0 '/' Top.W=5.00' n= 0.240 Sheet flow over Dense Grass
14.7	401	Total			

Subcatchment 32S: FDA-2.3



Summary for Subcatchment 33S: XDA2

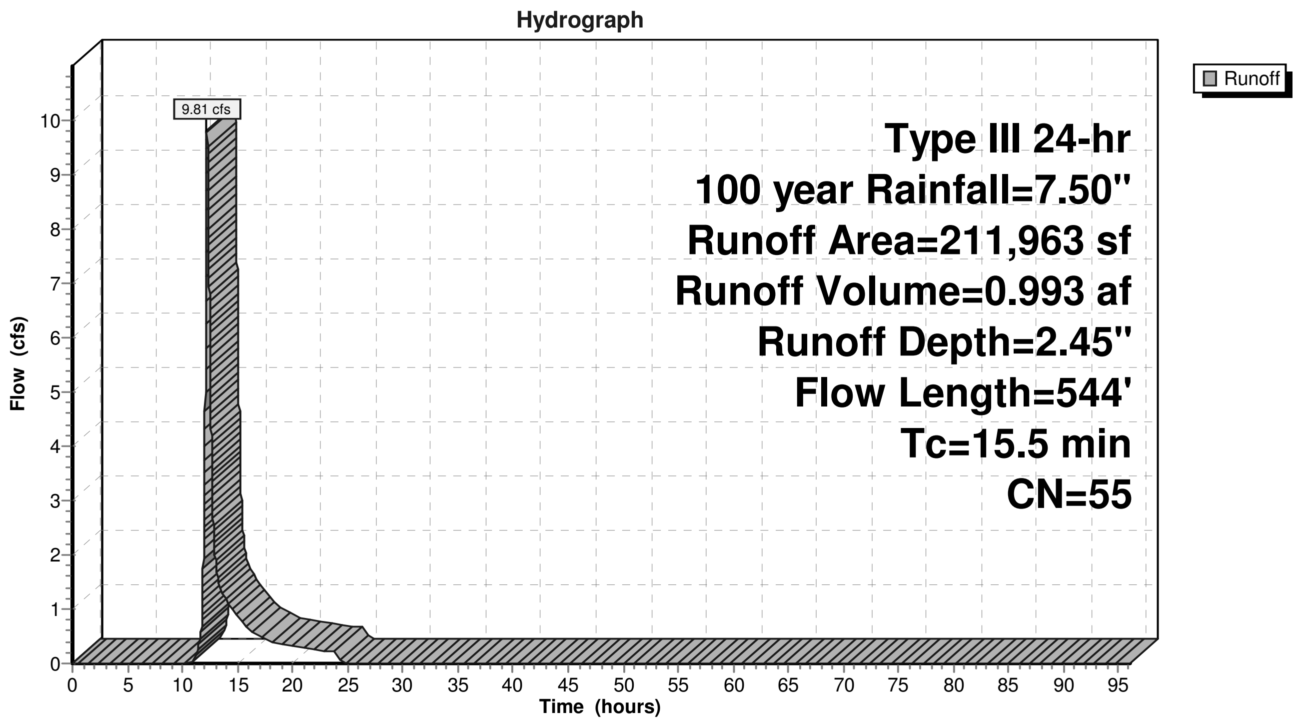
Runoff = 9.81 cfs @ 12.23 hrs, Volume= 0.993 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

Area (sf)	CN	Description
209,785	55	Woods, Good, HSG B
2,178	98	Paved parking, HSG B
211,963	55	Weighted Average
209,785		98.97% Pervious Area
2,178		1.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.1050	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.8	106	0.2075	2.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.1	338	0.0740	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.5	544	Total			

Subcatchment 33S: XDA2



Summary for Subcatchment 34S: XDA3

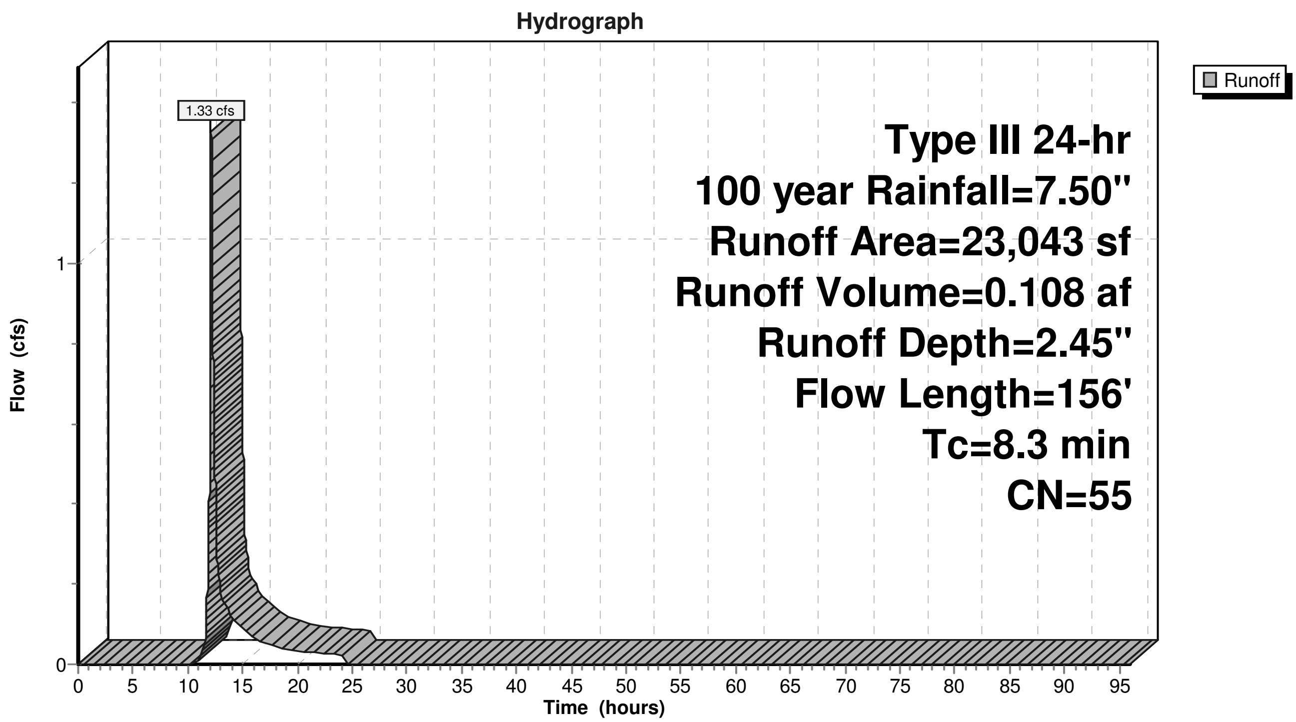
Runoff = 1.33 cfs @ 12.13 hrs, Volume= 0.108 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

Area (sf)	CN	Description
23,043	55	Woods, Good, HSG B
23,043		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	86	0.1977	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	70	0.0571	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.3	156	Total			

Subcatchment 34S: XDA3



Summary for Subcatchment 35S: FDA-L3.2

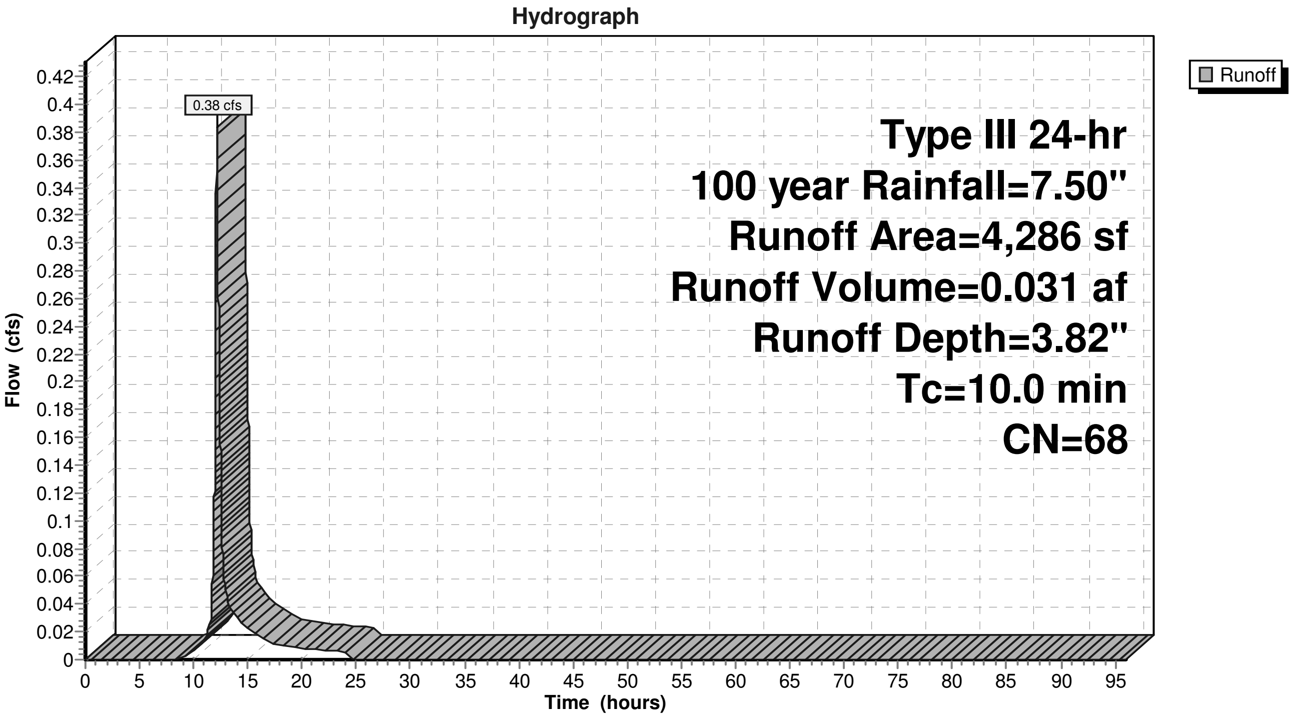
Runoff = 0.38 cfs @ 12.14 hrs, Volume= 0.031 af, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.50"

	Area (sf)	CN	Description
*	1,015	98	Driveway, HSG B
	1,875	61	>75% Grass cover, Good, HSG B
	1,396	55	Woods, Good, HSG B
	4,286	68	Weighted Average
	3,271		76.32% Pervious Area
	1,015		23.68% Impervious Area

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

Subcatchment 35S: FDA-L3.2



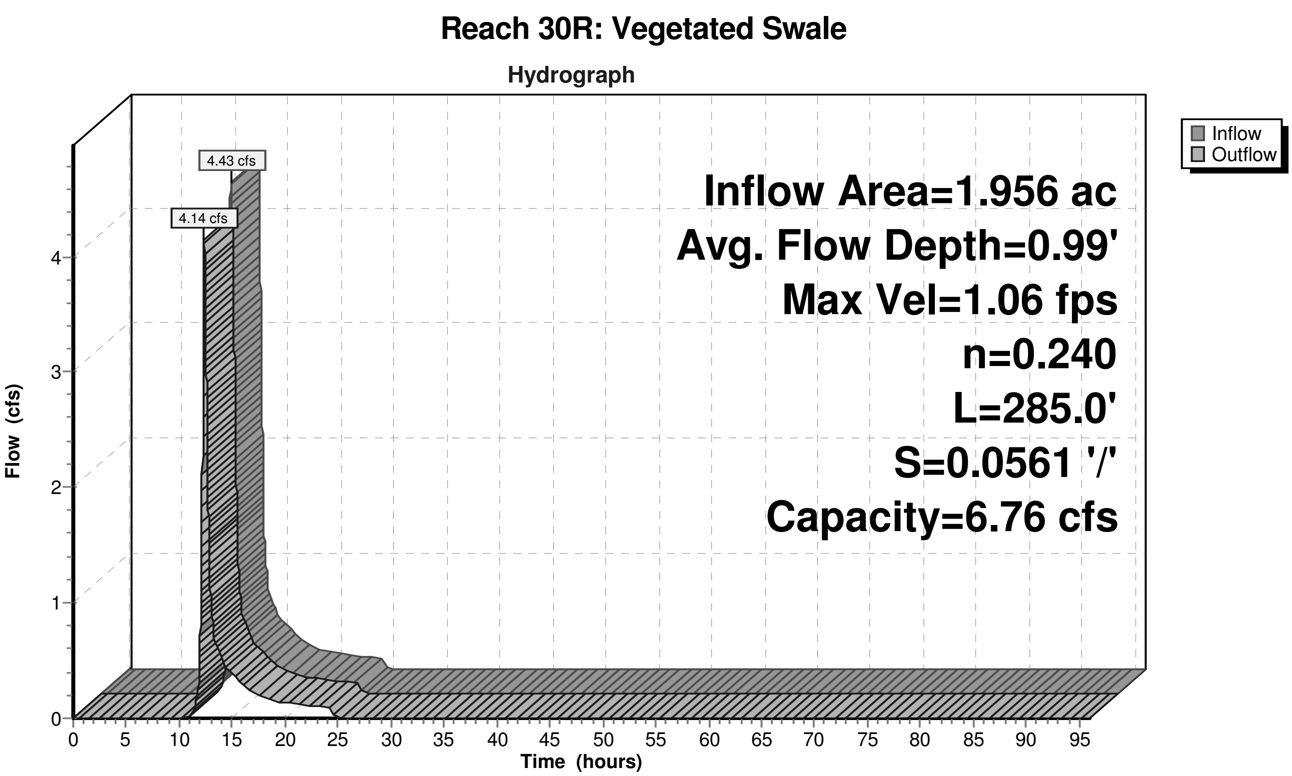
Summary for Reach 30R: Vegetated Swale

Inflow Area = 1.956 ac, 1.54% Impervious, Inflow Depth = 2.65" for 100 year event
Inflow = 4.43 cfs @ 12.21 hrs, Volume= 0.432 af
Outflow = 4.14 cfs @ 12.35 hrs, Volume= 0.432 af, Atten= 6%, Lag= 8.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.06 fps, Min. Travel Time= 4.5 min
Avg. Velocity = 0.33 fps, Avg. Travel Time= 14.3 min

Peak Storage= 1,118 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.99'
Bank-Full Depth= 1.25' Flow Area= 5.6 sf, Capacity= 6.76 cfs

2.00' x 1.25' deep channel, n= 0.240 Sheet flow over Dense Grass
Side Slope Z-value= 2.0 '/' Top Width= 7.00'
Length= 285.0' Slope= 0.0561 '/'
Inlet Invert= 174.00', Outlet Invert= 158.00'



Summary for Pond 15P: SWMF

Inflow Area = 5.984 ac, 15.94% Impervious, Inflow Depth = 2.40" for 100 year event
Inflow = 12.58 cfs @ 12.25 hrs, Volume= 1.197 af
Outflow = 6.08 cfs @ 12.60 hrs, Volume= 1.197 af, Atten= 52%, Lag= 21.3 min
Primary = 6.08 cfs @ 12.60 hrs, Volume= 1.197 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 126.00' Surf.Area= 2,806 sf Storage= 3,133 cf
Peak Elev= 128.91' @ 12.60 hrs Surf.Area= 6,102 sf Storage= 17,299 cf (14,166 cf above start)

Plug-Flow detention time= 153.6 min calculated for 1.125 af (94% of inflow)
Center-of-Mass det. time= 108.0 min (958.7 - 850.6)

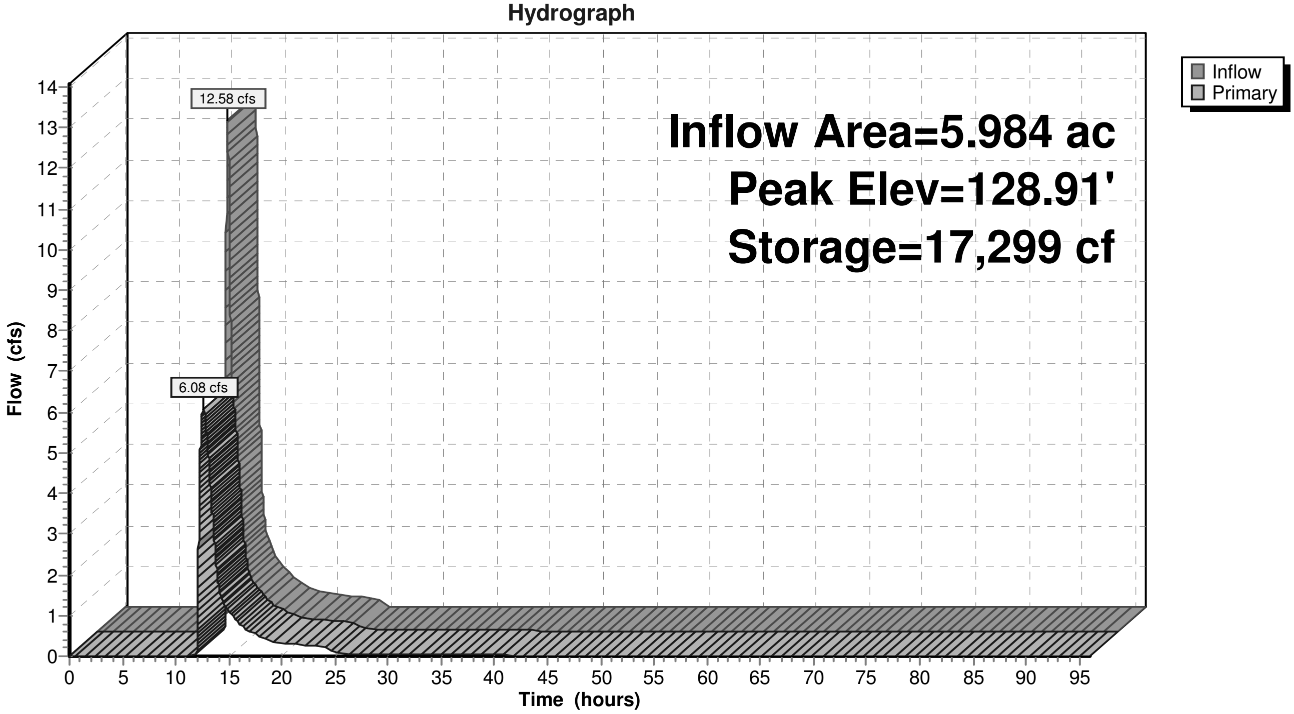
Volume	Invert	Avail.Storage	Storage Description
#1	121.50'	21,119 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
121.50	0	0	0
122.00	96	24	24
123.00	318	207	231
124.00	513	416	647
125.00	827	670	1,317
126.00	2,806	1,817	3,133
127.00	4,018	3,412	6,545
128.00	6,230	5,124	11,669
129.00	6,090	6,160	17,829
129.50	7,070	3,290	21,119

Device	Routing	Invert	Outlet Devices
#1	Primary	125.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Device 1	126.00'	**1.3" Vert. Orifice/Grate** C= 0.600
#3	Device 1	126.75'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#4	Device 1	127.00'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600
#5	Primary	129.20'	**6.0' long (Profile 7) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 Coef. (English) 2.99 3.41 3.62

Primary OutFlow Max=6.08 cfs @ 12.60 hrs HW=128.91' (Free Discharge)
└─**1=Orifice/Grate** (Passes 6.08 cfs of 6.99 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.08 cfs @ 8.14 fps)
  └─**3=Orifice/Grate** (Orifice Controls 1.78 cfs @ 6.80 fps)
  └─**4=Orifice/Grate** (Orifice Controls 4.22 cfs @ 6.05 fps)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 15P: SWMF



Summary for Pond 29P: SWMF-L1

[79] Warning: Submerged Pond 30P Secondary device # 2 OUTLET by 0.05'

Inflow	=	0.99 cfs @	12.07 hrs,	Volume=	0.110 af
Outflow	=	0.21 cfs @	11.62 hrs,	Volume=	0.110 af, Atten= 79%, Lag= 0.0 min
Discarded	=	0.21 cfs @	11.62 hrs,	Volume=	0.110 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 154.05' @ 12.56 hrs Surf.Area= 1,485 sf Storage= 1,219 cf

Plug-Flow detention time= 32.9 min calculated for 0.110 af (100% of inflow)
Center-of-Mass det. time= 32.9 min (791.9 - 759.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	152.75'	1,069 cf	**27.50'W x 54.00'L x 2.54'H Field A** 3,774 cf Overall - 1,102 cf Embedded = 2,672 cf x 40.0% Voids
#2A	153.25'	1,102 cf	**Cultec R-150XLHD** x 40 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 8 rows
		2,171 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	152.75'	**6.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.21 cfs @ 11.62 hrs HW=152.78' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Pond 29P: SWMF-L1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 8 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

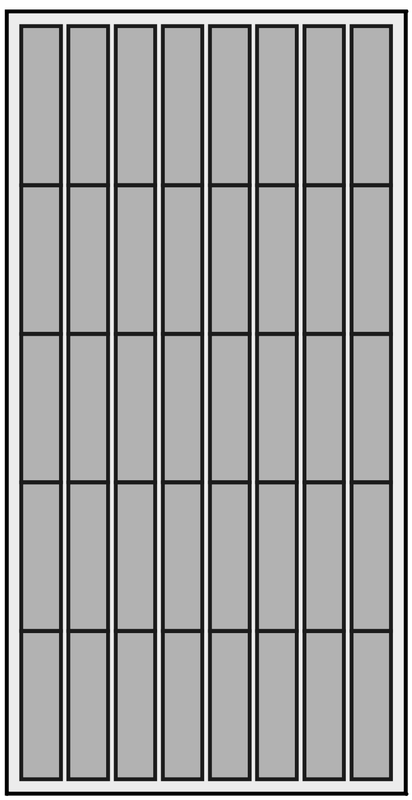
5 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 52.00' Row Length +12.0" End Stone x 2 = 54.00' Base Length
8 Rows x 33.0" Wide + 6.0" Spacing x 7 + 12.0" Side Stone x 2 = 27.50' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

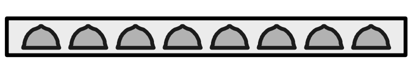
40 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 8 Rows = 1,102.0 cf Chamber Storage

3,774.4 cf Field - 1,102.0 cf Chambers = 2,672.4 cf Stone x 40.0% Voids = 1,069.0 cf Stone Storage

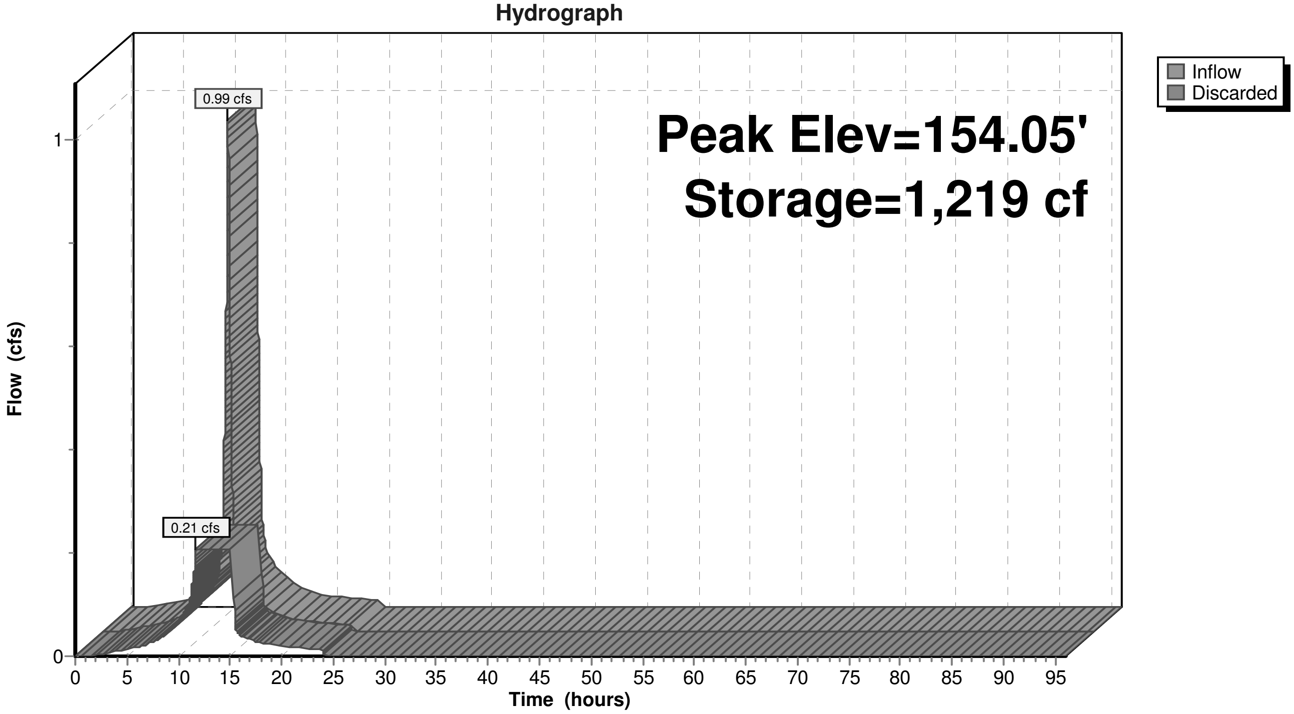
Chamber Storage + Stone Storage = 2,170.9 cf = 0.050 af
Overall Storage Efficiency = 57.5%

40 Chambers
139.8 cy Field
99.0 cy Stone





Pond 29P: SWMF-L1



Summary for Pond 30P: Div L1 (DS F.2)

[57] Hint: Peaked at 154.93' (Flood elevation advised)

Inflow Area = 0.200 ac, 91.00% Impervious, Inflow Depth = 6.90" for 100 year event
Inflow = 1.50 cfs @ 12.07 hrs, Volume= 0.115 af
Outflow = 1.50 cfs @ 12.07 hrs, Volume= 0.115 af, Atten= 0%, Lag= 0.0 min
Primary = 0.51 cfs @ 12.07 hrs, Volume= 0.005 af
Secondary = 0.99 cfs @ 12.07 hrs, Volume= 0.110 af

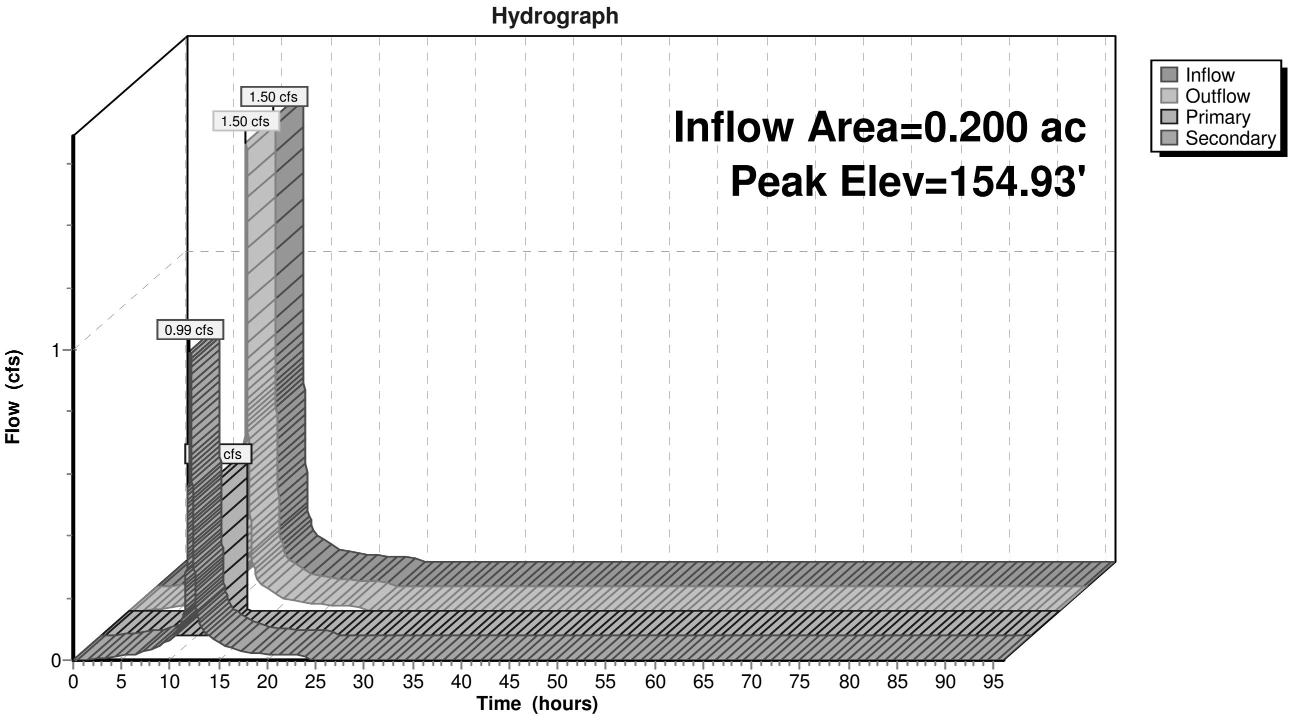
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 154.93' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	154.00'	**12.0" Round Culvert to MH A.9** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 154.00' / 153.50' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	154.25'	**8.0" Round Culvert to SWMF L1** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 154.25' / 154.00' S= 0.0313 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#3	Device 1	154.79'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.51 cfs @ 12.07 hrs HW=154.93' (Free Discharge)
└─**1=Culvert to MH A.9** (Passes 0.51 cfs of 2.50 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.51 cfs @ 1.23 fps)

Secondary OutFlow Max=0.99 cfs @ 12.07 hrs HW=154.93' (Free Discharge)
└─**2=Culvert to SWMF L1** (Inlet Controls 0.99 cfs @ 2.84 fps)

Pond 30P: Div L1 (DS F.2)



Summary for Pond 31P: SWMF-1.1 Bioret

Inflow Area = 0.672 ac, 0.00% Impervious, Inflow Depth = 2.86" for 100 year event
Inflow = 1.65 cfs @ 12.22 hrs, Volume= 0.160 af
Outflow = 1.52 cfs @ 12.29 hrs, Volume= 0.160 af, Atten= 8%, Lag= 4.1 min
Discarded = 0.03 cfs @ 12.29 hrs, Volume= 0.050 af
Primary = 1.48 cfs @ 12.29 hrs, Volume= 0.110 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 157.27' @ 12.29 hrs Surf.Area= 1,507 sf Storage= 1,021 cf

Plug-Flow detention time= 87.8 min calculated for 0.160 af (100% of inflow)
Center-of-Mass det. time= 87.8 min (948.1 - 860.3)

Volume	Invert	Avail.Storage	Storage Description
#1	156.50'	1,373 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

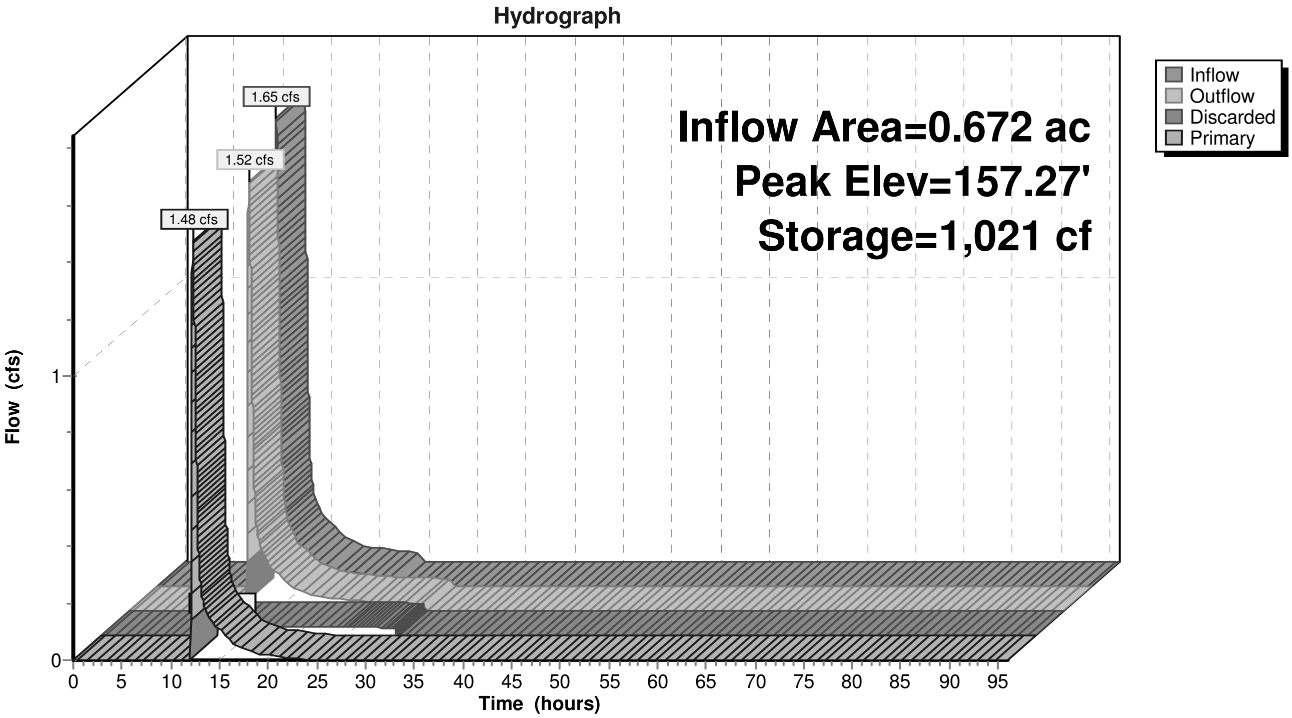
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
156.50	1,133	0	0
157.00	1,370	626	626
157.50	1,620	748	1,373

Device	Routing	Invert	Outlet Devices
#1	Primary	151.67'	**12.0" Round Culvert** L= 18.4' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 151.67' / 151.40' S= 0.0147 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	157.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	156.50'	**1.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.03 cfs @ 12.29 hrs HW=157.27' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.48 cfs @ 12.29 hrs HW=157.27' (Free Discharge)
└─**1=Culvert** (Passes 1.48 cfs of 8.54 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 1.48 cfs @ 1.71 fps)

Pond 31P: SWMF-1.1 Bioret



Summary for Pond 32P: Div 2.2 (DS D.2)

[57] Hint: Peaked at 153.27' (Flood elevation advised)

Inflow Area =	0.655 ac, 43.66% Impervious, Inflow Depth = 4.48"	for 100 year event	
Inflow =	2.73 cfs @ 12.18 hrs, Volume=	0.245 af	
Outflow =	2.73 cfs @ 12.18 hrs, Volume=	0.245 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.17 cfs @ 12.18 hrs, Volume=	0.035 af	
Secondary =	1.56 cfs @ 12.18 hrs, Volume=	0.209 af	

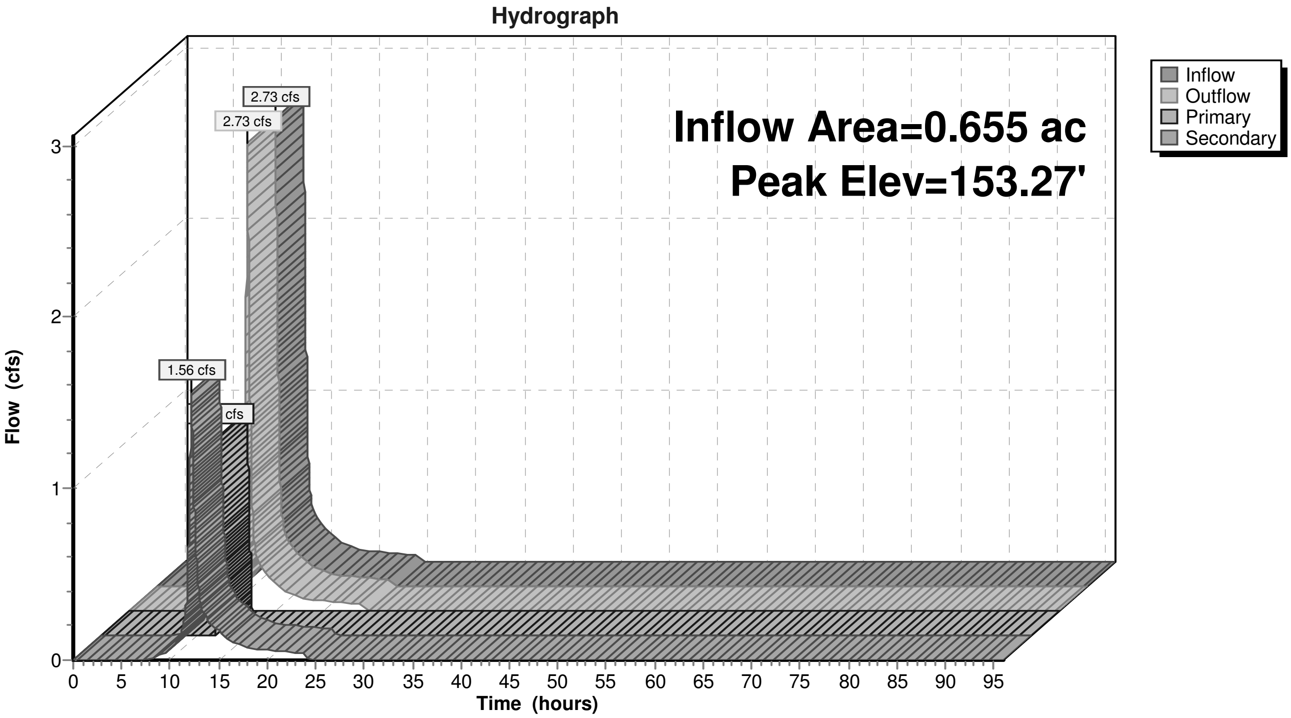
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 153.27' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.75'	**15.0" Round Culvert to Level Spreader** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.75' / 151.50' S= 0.0417 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Secondary	152.50'	**10.0" Round Culvert to SWMF-2.2** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.50' / 152.00' S= 0.0333 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#3	Device 1	152.90'	**3.0' long x 1.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.17 cfs @ 12.18 hrs HW=153.27' (Free Discharge)
└─**1=Culvert to Level Spreader** (Inlet Controls 1.17 cfs @ 2.44 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Passes 1.17 cfs of 2.12 cfs potential flow)

Secondary OutFlow Max=1.56 cfs @ 12.18 hrs HW=153.27' (Free Discharge)
└─**2=Culvert to SWMF-2.2** (Inlet Controls 1.56 cfs @ 2.98 fps)

Pond 32P: Div 2.2 (DS D.2)



Summary for Pond 33P: Div L2.1

[57] Hint: Peaked at 150.63' (Flood elevation advised)

Inflow Area = 0.132 ac, 55.54% Impervious, Inflow Depth = 5.39" for 100 year event
Inflow = 0.85 cfs @ 12.07 hrs, Volume= 0.059 af
Outflow = 0.85 cfs @ 12.07 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min
Primary = 0.26 cfs @ 12.07 hrs, Volume= 0.002 af
Secondary = 0.58 cfs @ 12.07 hrs, Volume= 0.057 af

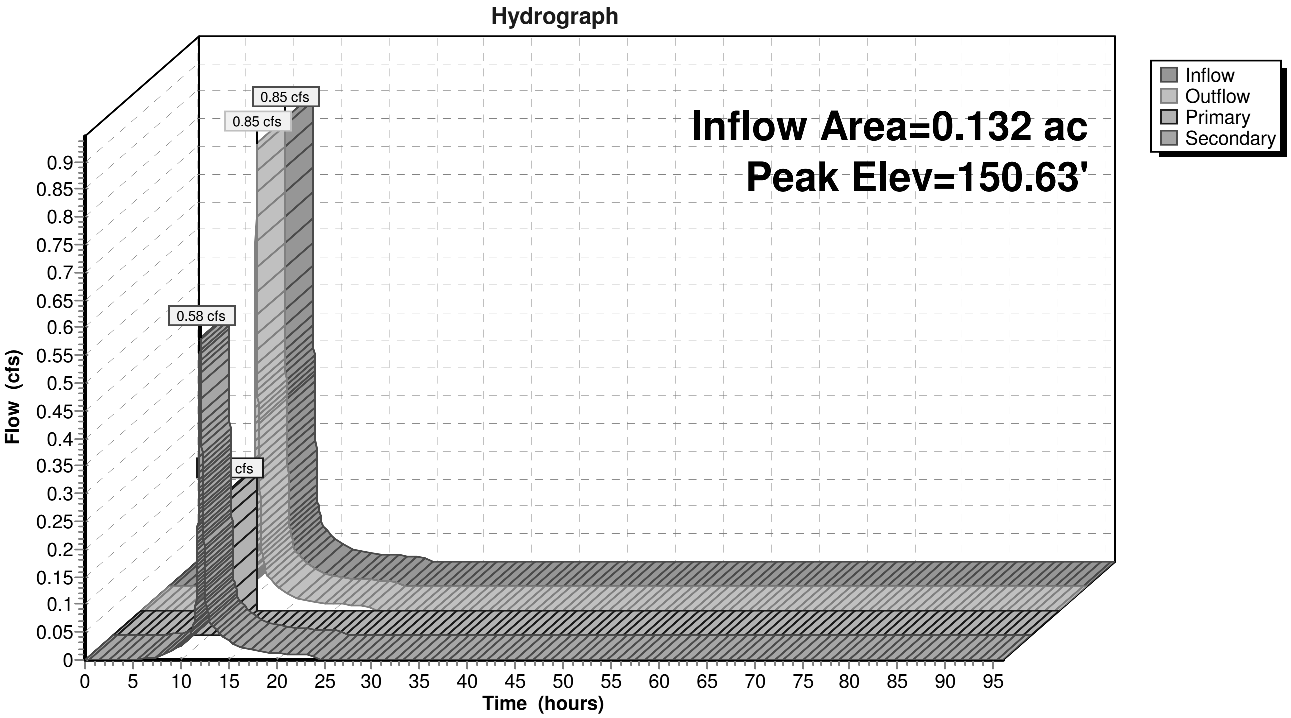
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 150.63' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	150.00'	**8.0" Round Culvert to Node EP E.1** L= 96.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.00' / 146.00' S= 0.0417 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#2	Secondary	150.00'	**6.0" Round Culvert to PTF E.1 & SWMF L2.1** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.00' / 149.70' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 1	150.54'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.26 cfs @ 12.07 hrs HW=150.63' (Free Discharge)
└─**1=Culvert to Node EP E.1** (Passes 0.26 cfs of 0.92 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.26 cfs @ 0.98 fps)

Secondary OutFlow Max=0.58 cfs @ 12.07 hrs HW=150.63' (Free Discharge)
└─**2=Culvert to PTF E.1 & SWMF L2.1** (Inlet Controls 0.58 cfs @ 2.97 fps)

Pond 33P: Div L2.1



Summary for Pond 34P: SWMF-L2.1

[81] Warning: Exceeded Pond 33P by 0.67' @ 13.32 hrs

Inflow	=	0.58 cfs @	12.07 hrs,	Volume=	0.057 af
Outflow	=	0.06 cfs @	11.34 hrs,	Volume=	0.057 af, Atten= 89%, Lag= 0.0 min
Discarded	=	0.06 cfs @	11.34 hrs,	Volume=	0.057 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 150.81' @ 13.26 hrs Surf.Area= 449 sf Storage= 941 cf

Plug-Flow detention time= 123.8 min calculated for 0.057 af (100% of inflow)
Center-of-Mass det. time= 123.8 min (926.1 - 802.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	147.50'	405 cf	**25.67'W x 17.50'L x 3.54'H Field A**
			1,591 cf Overall - 577 cf Embedded = 1,013 cf x 40.0% Voids
#2A	148.00'	577 cf	**Cultec R-330XLHD** x 10 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 5 rows
		983 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	147.50'	**6.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.06 cfs @ 11.34 hrs HW=147.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Pond 34P: SWMF-L2.1 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

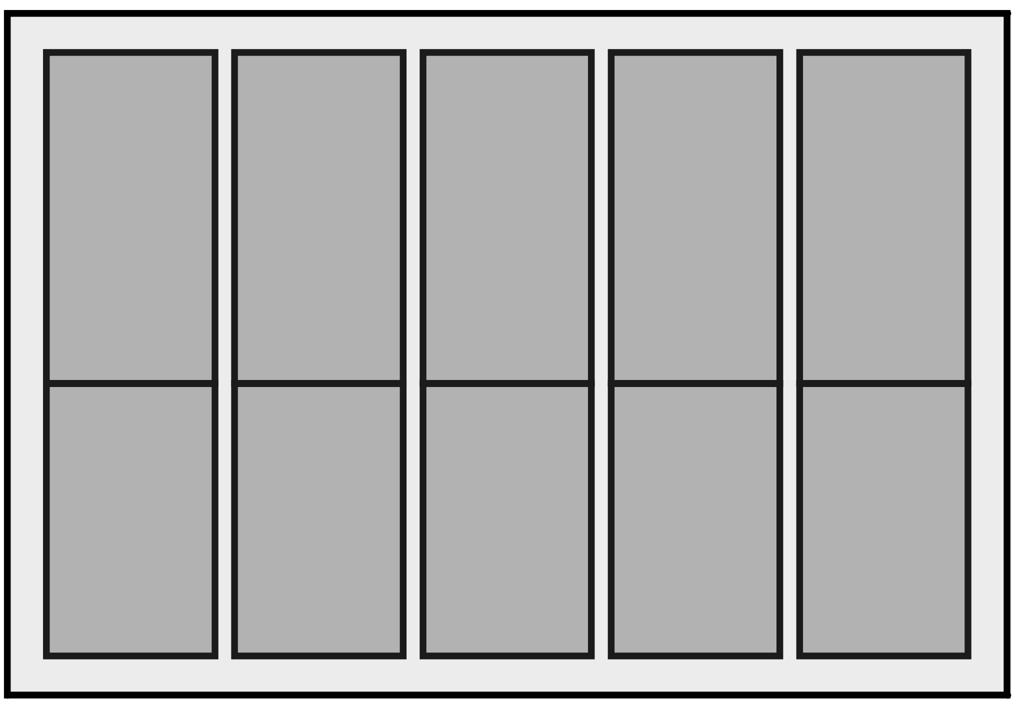
2 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 15.50' Row Length +12.0" End Stone x 2 = 17.50' Base Length
5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

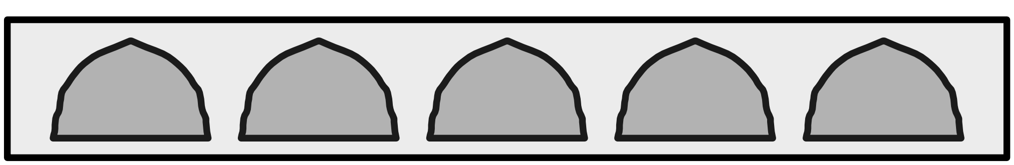
10 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 577.5 cf Chamber Storage

1,590.8 cf Field - 577.5 cf Chambers = 1,013.3 cf Stone x 40.0% Voids = 405.3 cf Stone Storage

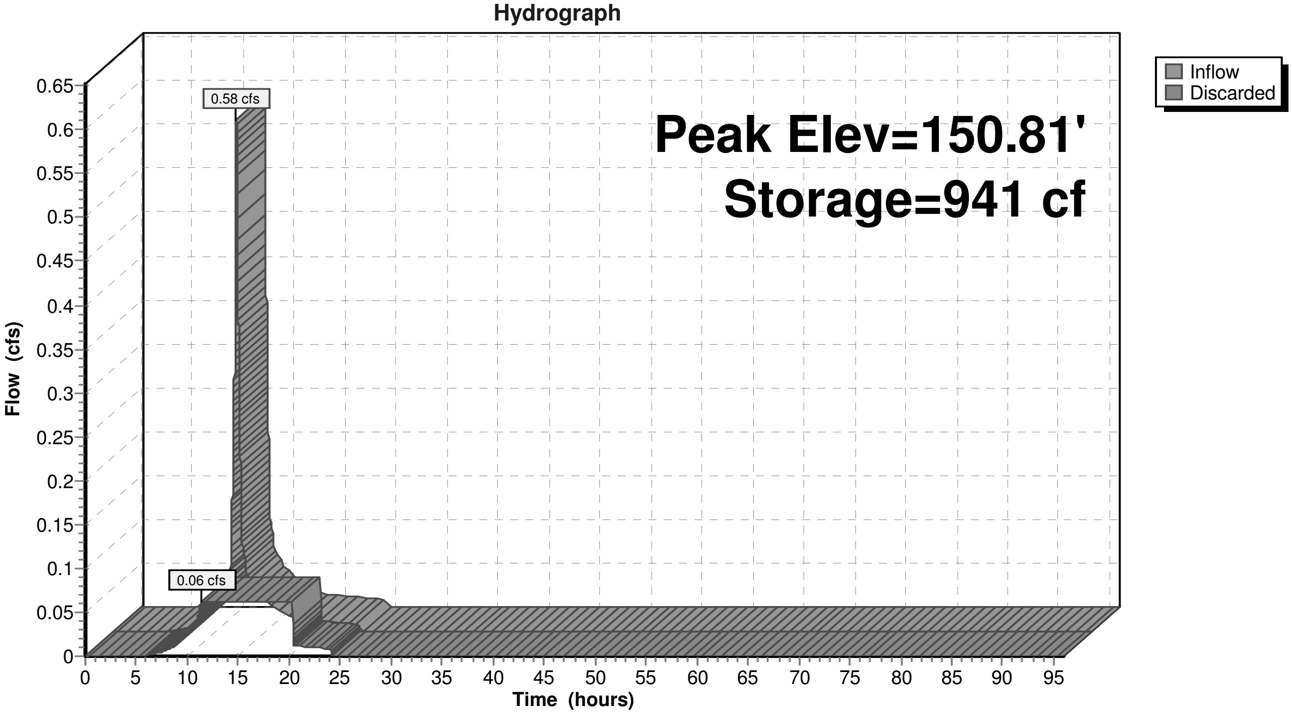
Chamber Storage + Stone Storage = 982.8 cf = 0.023 af
Overall Storage Efficiency = 61.8%

10 Chambers
58.9 cy Field
37.5 cy Stone





Pond 34P: SWMF-L2.1



Summary for Pond 35P: Div 1.2

[57] Hint: Peaked at 155.20' (Flood elevation advised)

Inflow Area =	0.446 ac, 65.47% Impervious, Inflow Depth = 5.62"	for 100 year event	
Inflow =	2.50 cfs @ 12.14 hrs, Volume=	0.209 af	
Outflow =	2.50 cfs @ 12.14 hrs, Volume=	0.209 af, Atten= 0%, Lag= 0.0 min	
Primary =	1.46 cfs @ 12.14 hrs, Volume=	0.028 af	
Secondary =	1.04 cfs @ 12.14 hrs, Volume=	0.181 af	

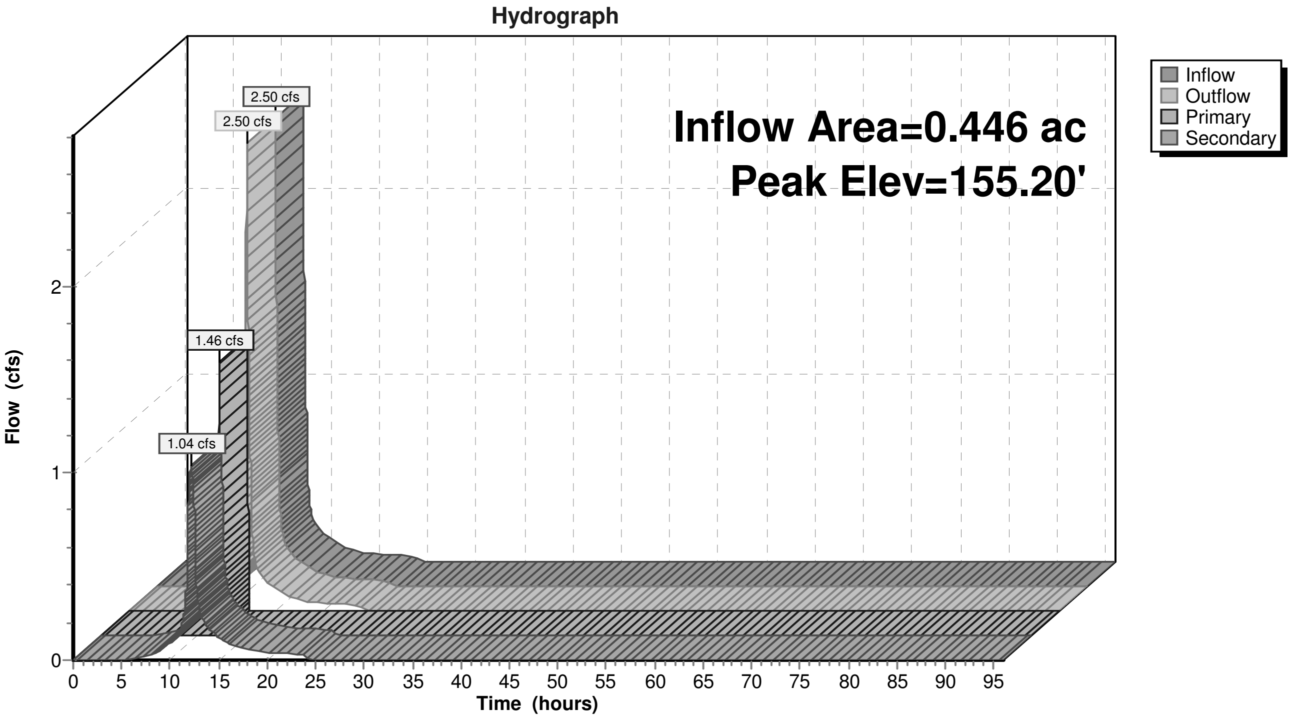
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 155.20' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	153.92'	**12.0" Round Culvert to MH A.6** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 153.92' / 151.00' S= 0.1622 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	153.75'	**6.0" Round Culvert to SWMF-1.2** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 153.75' / 153.50' S= 0.0417 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 1	154.92'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.46 cfs @ 12.14 hrs HW=155.20' (Free Discharge)
└─**1=Culvert to MH A.6** (Passes 1.46 cfs of 3.35 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 1.46 cfs @ 1.74 fps)

Secondary OutFlow Max=1.04 cfs @ 12.14 hrs HW=155.20' (Free Discharge)
└─**2=Culvert to SWMF-1.2** (Inlet Controls 1.04 cfs @ 5.28 fps)

Pond 35P: Div 1.2



Summary for Pond 36P: Rain Garden #1 Lot 3

Inflow Area = 0.261 ac, 19.99% Impervious, Inflow Depth = 3.60" for 100 year event
Inflow = 0.96 cfs @ 12.14 hrs, Volume= 0.078 af
Outflow = 0.71 cfs @ 12.25 hrs, Volume= 0.078 af, Atten= 26%, Lag= 6.4 min
Discarded = 0.03 cfs @ 12.25 hrs, Volume= 0.041 af
Primary = 0.68 cfs @ 12.25 hrs, Volume= 0.037 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 145.16' @ 12.25 hrs Surf.Area= 1,379 sf Storage= 782 cf

Plug-Flow detention time= 130.1 min calculated for 0.078 af (100% of inflow)
Center-of-Mass det. time= 130.2 min (970.2 - 840.0)

Volume	Invert	Avail.Storage	Storage Description
#1	144.50'	904 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

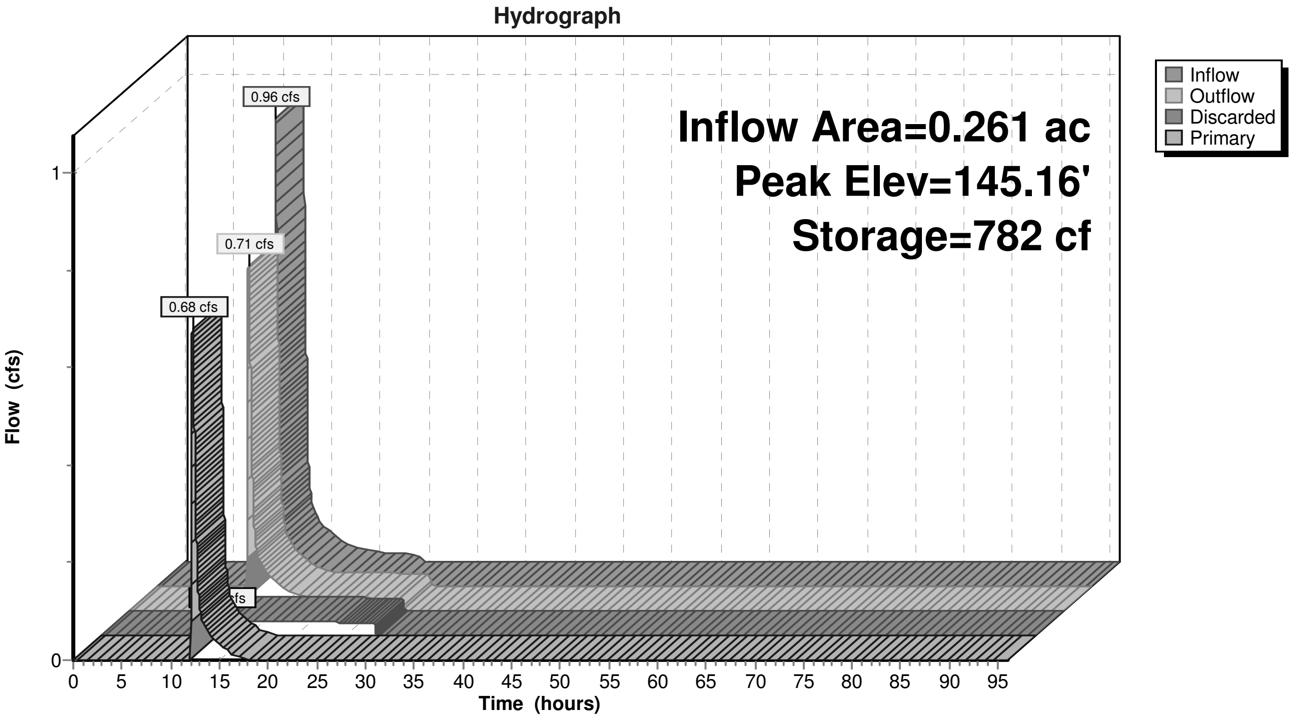
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
144.50	1,025	0	0
144.75	1,135	270	270
145.00	1,245	298	568
145.25	1,450	337	904

Device	Routing	Invert	Outlet Devices
#1	Primary	145.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	144.50'	**1.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 12.25 hrs HW=145.16' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.68 cfs @ 12.25 hrs HW=145.16' (Free Discharge)
└**1=Orifice/Grate** (Weir Controls 0.68 cfs @ 1.32 fps)

Pond 36P: Rain Garden #1 Lot 3



Summary for Pond 37P: SWMF-1.2

[81] Warning: Exceeded Pond 35P by 1.96' @ 13.91 hrs

Inflow	=	1.04 cfs @	12.14 hrs, Volume=	0.181 af
Outflow	=	0.18 cfs @	11.24 hrs, Volume=	0.181 af, Atten= 82%, Lag= 0.0 min
Discarded	=	0.18 cfs @	11.24 hrs, Volume=	0.181 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 155.97' @ 13.77 hrs Surf.Area= 1,320 sf Storage= 2,688 cf

Plug-Flow detention time= 120.0 min calculated for 0.181 af (100% of inflow)
Center-of-Mass det. time= 120.0 min (929.8 - 809.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	153.00'	1,184 cf	**23.50'W x 56.17'L x 3.67'H Field A**
			4,840 cf Overall - 1,880 cf Embedded = 2,960 cf x 40.0% Voids
#2A	153.50'	1,880 cf	**Cultec R-V8HD** x 32 Inside #1
			Effective Size= 55.2"W x 32.0"H => 8.68 sf x 7.50'L = 65.1 cf
			Overall Size= 60.0"W x 32.0"H x 8.00'L with 0.50' Overlap
			Row Length Adjustment= -5.83' x 8.68 sf x 4 rows
		3,064 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	153.00'	**6.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.18 cfs @ 11.24 hrs HW=153.04' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.18 cfs)

Pond 37P: SWMF-1.2 - Chamber Wizard Field A

Chamber Model = Cultec R-V8HD (Cultec Recharger® V8HD)
Effective Size= 55.2"W x 32.0"H => 8.68 sf x 7.50'L = 65.1 cf
Overall Size= 60.0"W x 32.0"H x 8.00'L with 0.50' Overlap
Row Length Adjustment= -5.83' x 8.68 sf x 4 rows

60.0" Wide + 6.0" Spacing = 66.0" C-C Row Spacing

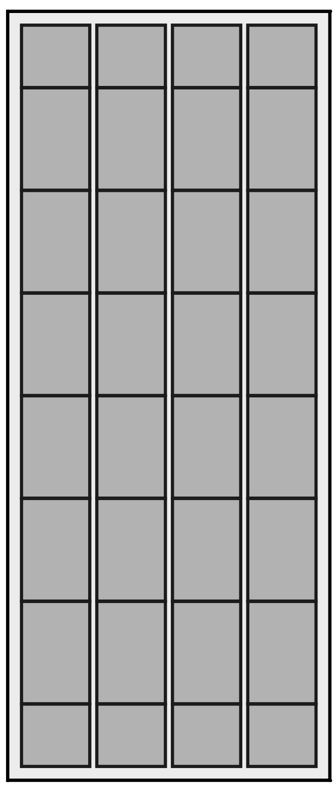
8 Chambers/Row x 7.50' Long -5.83' Row Adjustment = 54.17' Row Length +12.0" End Stone x 2 = 56.17' Base Length
4 Rows x 60.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 23.50' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

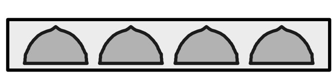
32 Chambers x 65.1 cf -5.83' Row Adjustment x 8.68 sf x 4 Rows = 1,879.9 cf Chamber Storage

4,840.0 cf Field - 1,879.9 cf Chambers = 2,960.1 cf Stone x 40.0% Voids = 1,184.0 cf Stone Storage

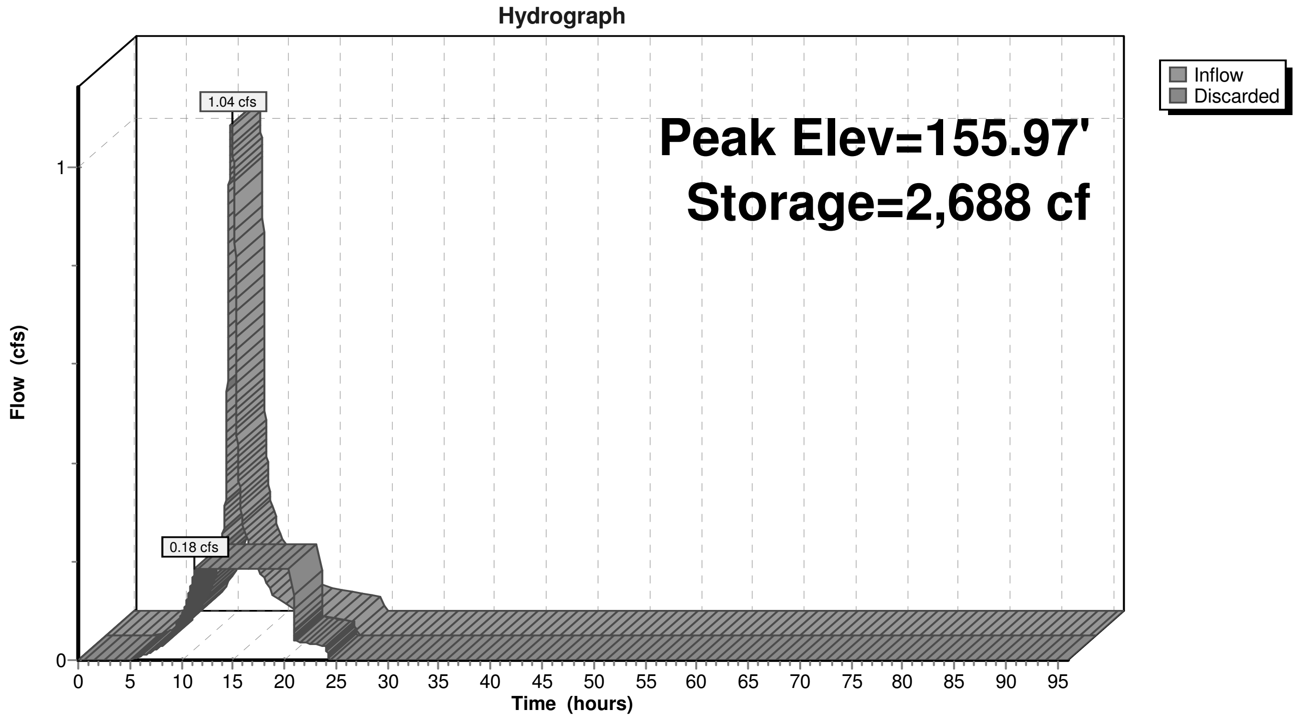
Chamber Storage + Stone Storage = 3,063.9 cf = 0.070 af
Overall Storage Efficiency = 63.3%

32 Chambers
179.3 cy Field
109.6 cy Stone





Pond 37P: SWMF-1.2



Summary for Pond 38P: SWMF-2.2

[81] Warning: Exceeded Pond 32P by 0.50' @ 12.56 hrs

Inflow	=	1.56 cfs @	12.18 hrs, Volume=	0.209 af
Outflow	=	0.83 cfs @	12.52 hrs, Volume=	0.209 af, Atten= 47%, Lag= 20.4 min
Discarded	=	0.16 cfs @	11.22 hrs, Volume=	0.175 af
Primary	=	0.66 cfs @	12.52 hrs, Volume=	0.034 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 153.49' @ 12.52 hrs Surf.Area= 1,160 sf Storage= 2,554 cf

Plug-Flow detention time= 125.2 min calculated for 0.209 af (100% of inflow)
Center-of-Mass det. time= 125.2 min (966.4 - 841.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	149.50'	450 cf	**16.00'W x 31.50'L x 3.54'H Field A** 1,785 cf Overall - 659 cf Embedded = 1,126 cf x 40.0% Voids
#2A	150.00'	659 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 3 rows
#3B	150.00'	578 cf	**20.83'W x 31.50'L x 3.54'H Field B** 2,324 cf Overall - 879 cf Embedded = 1,445 cf x 40.0% Voids
#4B	150.50'	879 cf	**Cultec R-330XLHD** x 16 Inside #3 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 4 rows
		2,567 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	149.50'	**6.000 in/hr Exfiltration over Horizontal area**
#2	Primary	153.00'	**8.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 153.00' / 151.50' S= 0.1000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf

Discarded OutFlow Max=0.16 cfs @ 11.22 hrs HW=150.00' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=0.66 cfs @ 12.52 hrs HW=153.49' (Free Discharge)
└─**2=Culvert** (Inlet Controls 0.66 cfs @ 2.39 fps)

Pond 38P: SWMF-2.2 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

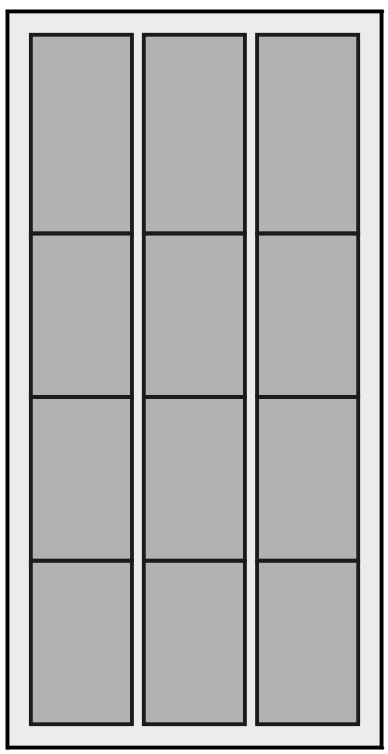
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

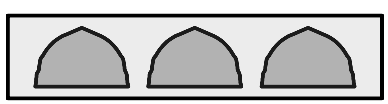
12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 659.4 cf Chamber Storage

1,785.0 cf Field - 659.4 cf Chambers = 1,125.6 cf Stone x 40.0% Voids = 450.2 cf Stone Storage

Chamber Storage + Stone Storage = 1,109.6 cf = 0.025 af
Overall Storage Efficiency = 62.2%

12 Chambers
66.1 cy Field
41.7 cy Stone





Pond 38P: SWMF-2.2 - Chamber Wizard Field B

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

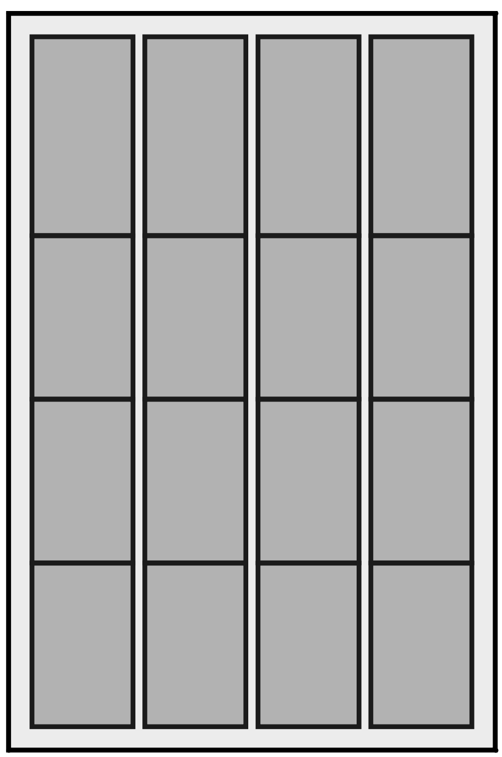
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

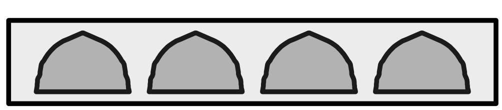
16 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 879.2 cf Chamber Storage

2,324.2 cf Field - 879.2 cf Chambers = 1,445.0 cf Stone x 40.0% Voids = 578.0 cf Stone Storage

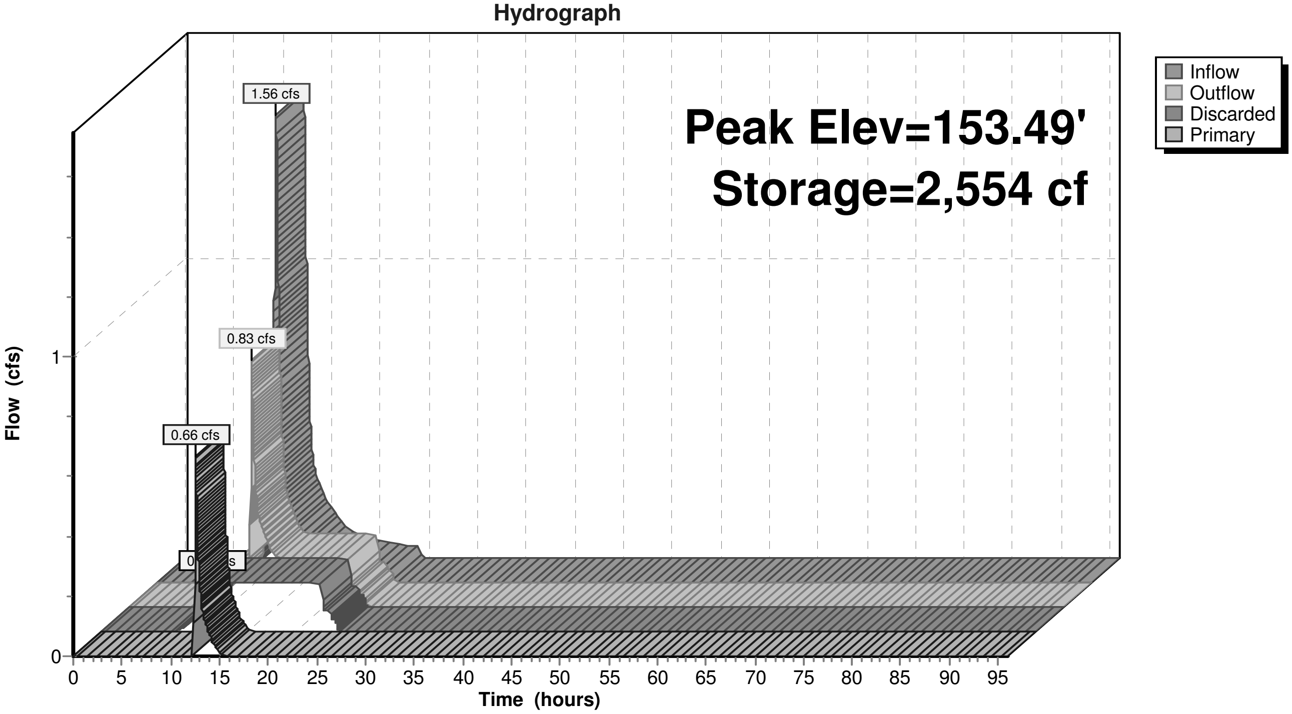
Chamber Storage + Stone Storage = 1,457.2 cf = 0.033 af
Overall Storage Efficiency = 62.7%

16 Chambers
86.1 cy Field
53.5 cy Stone





Pond 38P: SWMF-2.2



Summary for Pond 39P: SWMF-L2.2

[79] Warning: Submerged Pond 40P Secondary device # 2 OUTLET by 1.32'

Inflow	=	0.62 cfs @	12.07 hrs, Volume=	0.059 af
Outflow	=	0.07 cfs @	11.35 hrs, Volume=	0.059 af, Atten= 89%, Lag= 0.0 min
Discarded	=	0.07 cfs @	11.35 hrs, Volume=	0.059 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 137.32' @ 12.85 hrs Surf.Area= 504 sf Storage= 810 cf

Plug-Flow detention time= 75.0 min calculated for 0.059 af (100% of inflow)
Center-of-Mass det. time= 75.0 min (816.4 - 741.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	135.00'	450 cf	**16.00'W x 31.50'L x 3.54'H Field A**
			1,785 cf Overall - 659 cf Embedded = 1,126 cf x 40.0% Voids
#2A	135.50'	659 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 3 rows
		1,110 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	135.00'	**6.000 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.07 cfs @ 11.35 hrs HW=135.04' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Pond 39P: SWMF-L2.2 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
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 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

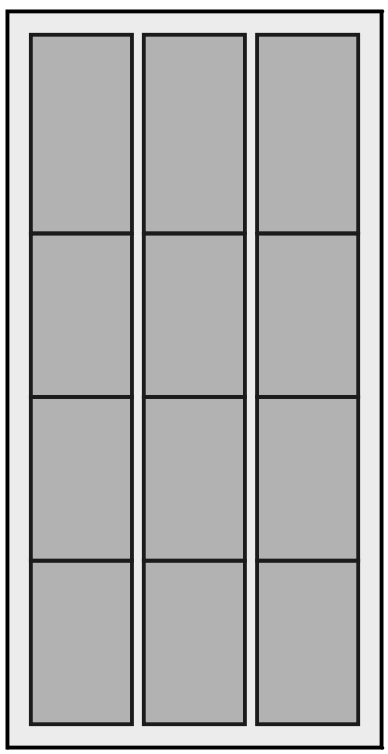
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

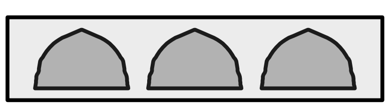
12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 659.4 cf Chamber Storage

1,785.0 cf Field - 659.4 cf Chambers = 1,125.6 cf Stone x 40.0% Voids = 450.2 cf Stone Storage

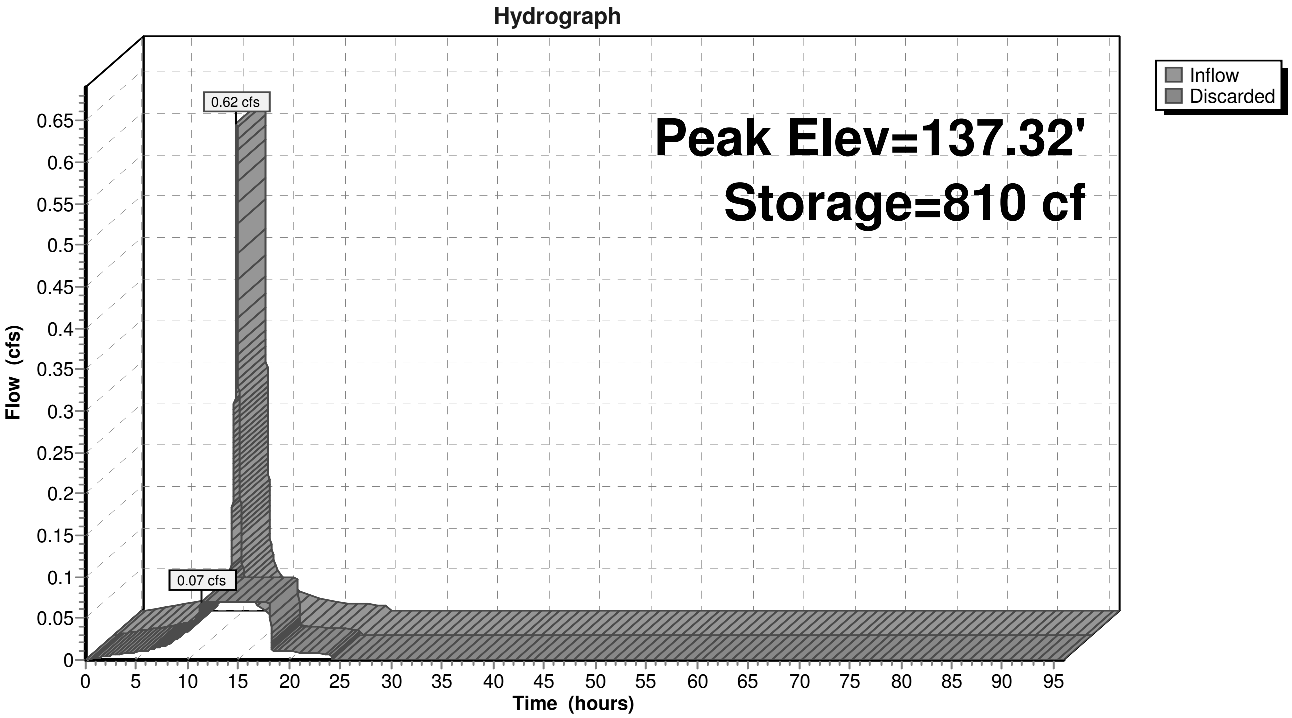
Chamber Storage + Stone Storage = 1,109.6 cf = 0.025 af
Overall Storage Efficiency = 62.2%

12 Chambers
66.1 cy Field
41.7 cy Stone





Pond 39P: SWMF-L2.2



Summary for Pond 40P: Div L2.2

[57] Hint: Peaked at 138.18' (Flood elevation advised)

Inflow Area = 0.098 ac,100.00% Impervious, Inflow Depth = 7.26" for 100 year event
Inflow = 0.75 cfs @ 12.07 hrs, Volume= 0.060 af
Outflow = 0.75 cfs @ 12.07 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min
Primary = 0.13 cfs @ 12.07 hrs, Volume= 0.001 af
Secondary = 0.62 cfs @ 12.07 hrs, Volume= 0.059 af

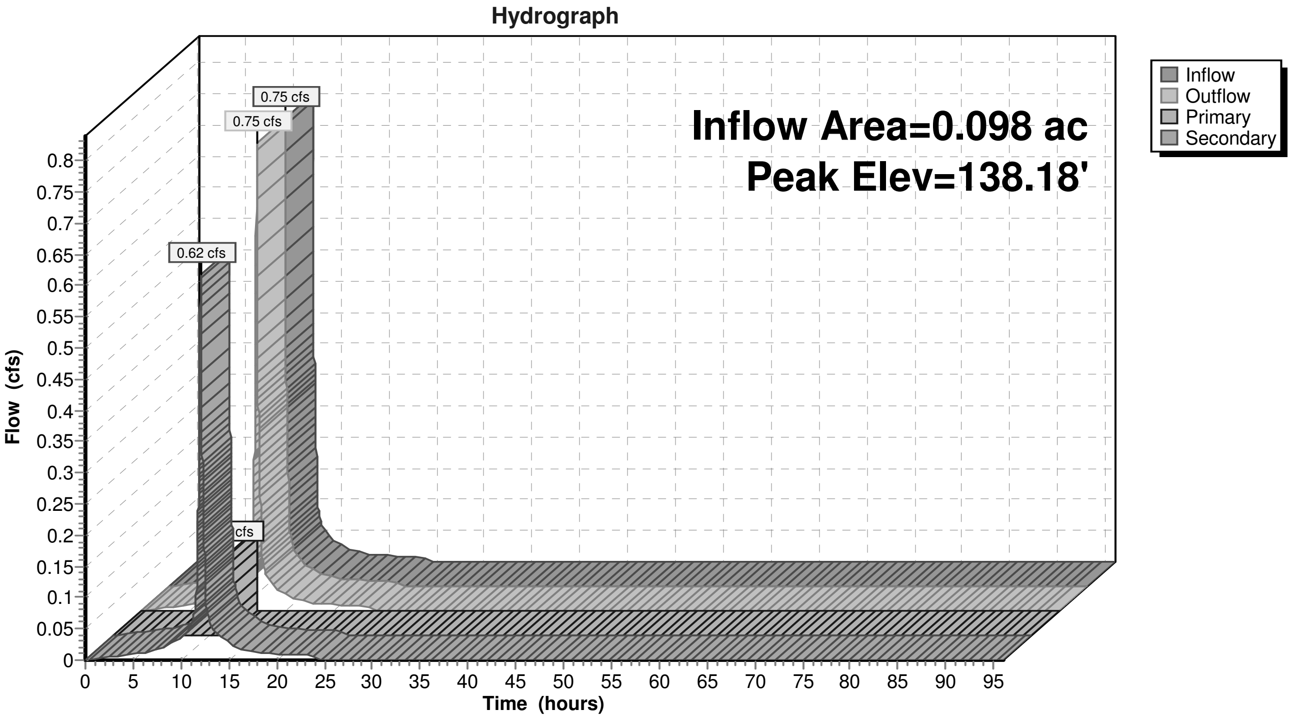
Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 138.18' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	138.00'	**12.0" Round Culvert to MH C.1** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 138.00' / 134.00' S= 0.0800 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	137.50'	**6.0" Round Culvert to SWMF L2.2** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 137.50' / 136.00' S= 0.3000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 1	138.04'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.13 cfs @ 12.07 hrs HW=138.18' (Free Discharge)
└─**1=Culvert to MH C.1** (Inlet Controls 0.13 cfs @ 1.43 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Passes 0.13 cfs of 0.49 cfs potential flow)

Secondary OutFlow Max=0.62 cfs @ 12.07 hrs HW=138.18' (Free Discharge)
└─**2=Culvert to SWMF L2.2** (Inlet Controls 0.62 cfs @ 3.14 fps)

Pond 40P: Div L2.2



Summary for Pond 41P: Rain Garden #2 Lot 3

Inflow Area = 0.098 ac, 23.68% Impervious, Inflow Depth = 3.82" for 100 year event
Inflow = 0.38 cfs @ 12.14 hrs, Volume= 0.031 af
Outflow = 0.18 cfs @ 12.41 hrs, Volume= 0.031 af, Atten= 53%, Lag= 16.0 min
Discarded = 0.02 cfs @ 12.41 hrs, Volume= 0.024 af
Primary = 0.16 cfs @ 12.41 hrs, Volume= 0.008 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 152.56' @ 12.41 hrs Surf.Area= 935 sf Storage= 442 cf

Plug-Flow detention time= 158.2 min calculated for 0.031 af (100% of inflow)
Center-of-Mass det. time= 158.2 min (993.9 - 835.7)

Volume	Invert	Avail.Storage	Storage Description
#1	152.00'	875 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

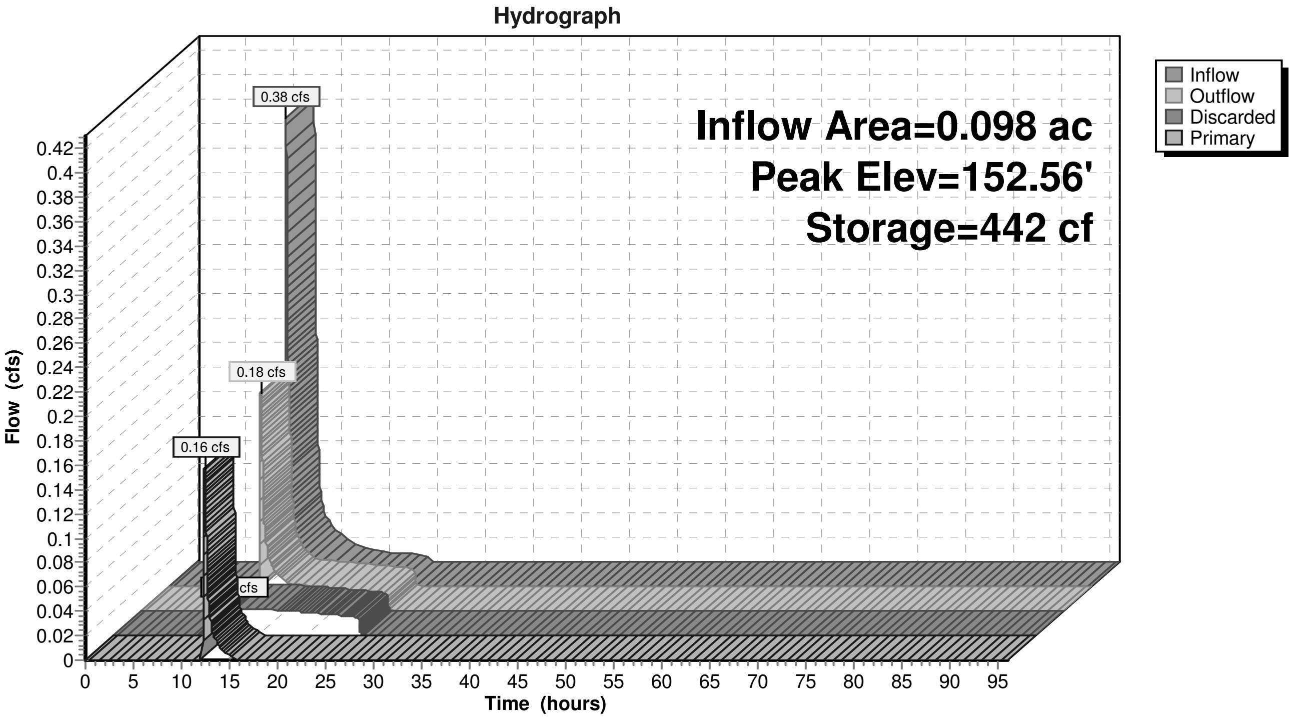
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
152.00	620	0	0
152.25	770	174	174
152.50	920	211	385
153.00	1,038	490	875

Device	Routing	Invert	Outlet Devices
#1	Primary	152.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	152.00'	**1.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.41 hrs HW=152.56' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.16 cfs @ 12.41 hrs HW=152.56' (Free Discharge)
1=Orifice/Grate (Weir Controls 0.16 cfs @ 0.81 fps)

Pond 41P: Rain Garden #2 Lot 3

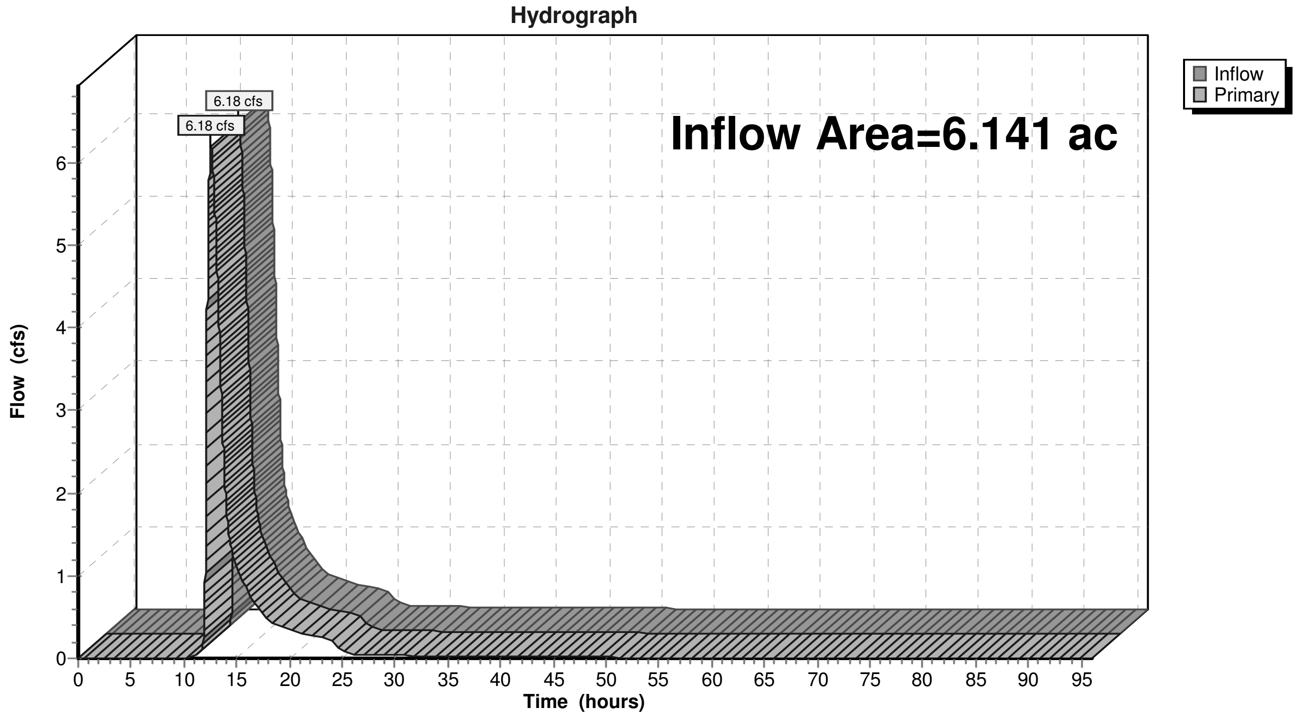


Summary for Link 19L: Design Point 1

Inflow Area = 6.141 ac, 15.53% Impervious, Inflow Depth = 2.43" for 100 year event
Inflow = 6.18 cfs @ 12.59 hrs, Volume= 1.242 af
Primary = 6.18 cfs @ 12.59 hrs, Volume= 1.242 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 19L: Design Point 1

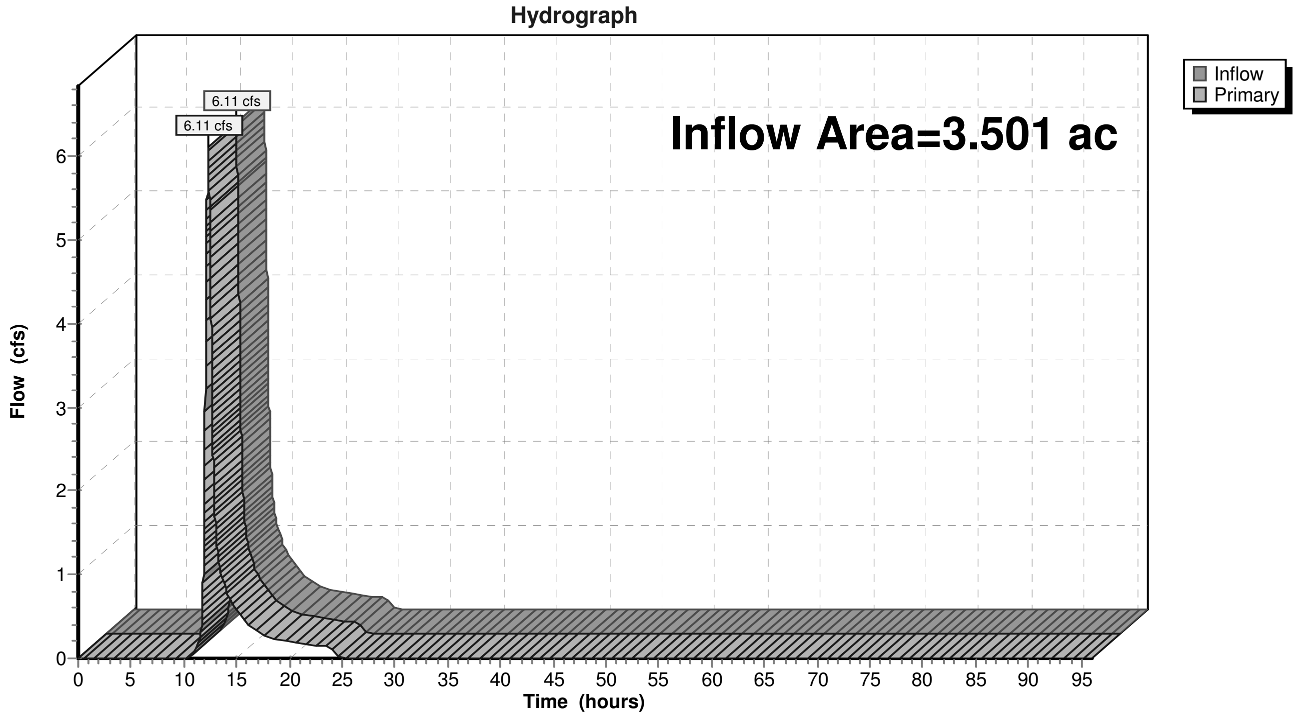


Summary for Link 22L: Design Point 2

Inflow Area =	3.501 ac,	9.03% Impervious, Inflow Depth = 2.42"	for 100 year event	
Inflow =	6.11 cfs @	12.31 hrs, Volume=	0.707 af	
Primary =	6.11 cfs @	12.31 hrs, Volume=	0.707 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 22L: Design Point 2

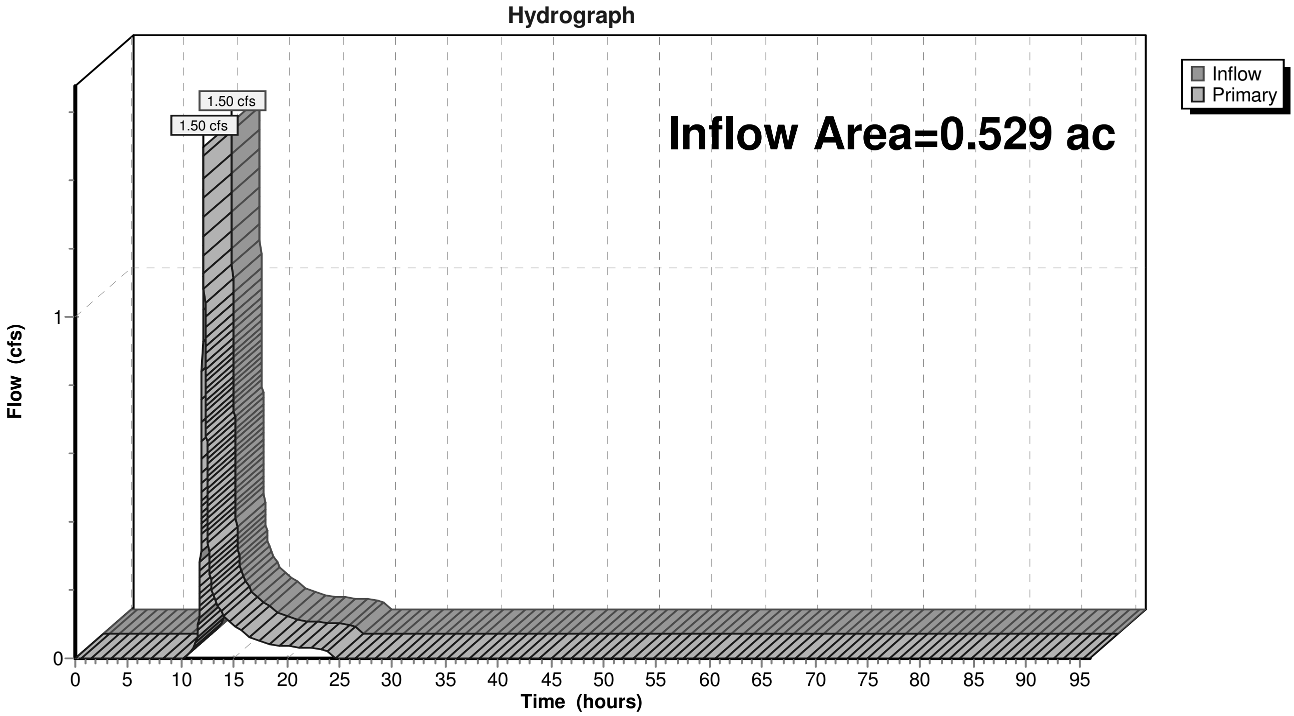


Summary for Link 25L: Design Point 3

Inflow Area =	0.529 ac, 0.00% Impervious, Inflow Depth = 2.65" for 100 year event		
Inflow =	1.50 cfs @ 12.12 hrs, Volume=	0.117 af	
Primary =	1.50 cfs @ 12.12 hrs, Volume=	0.117 af, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 25L: Design Point 3

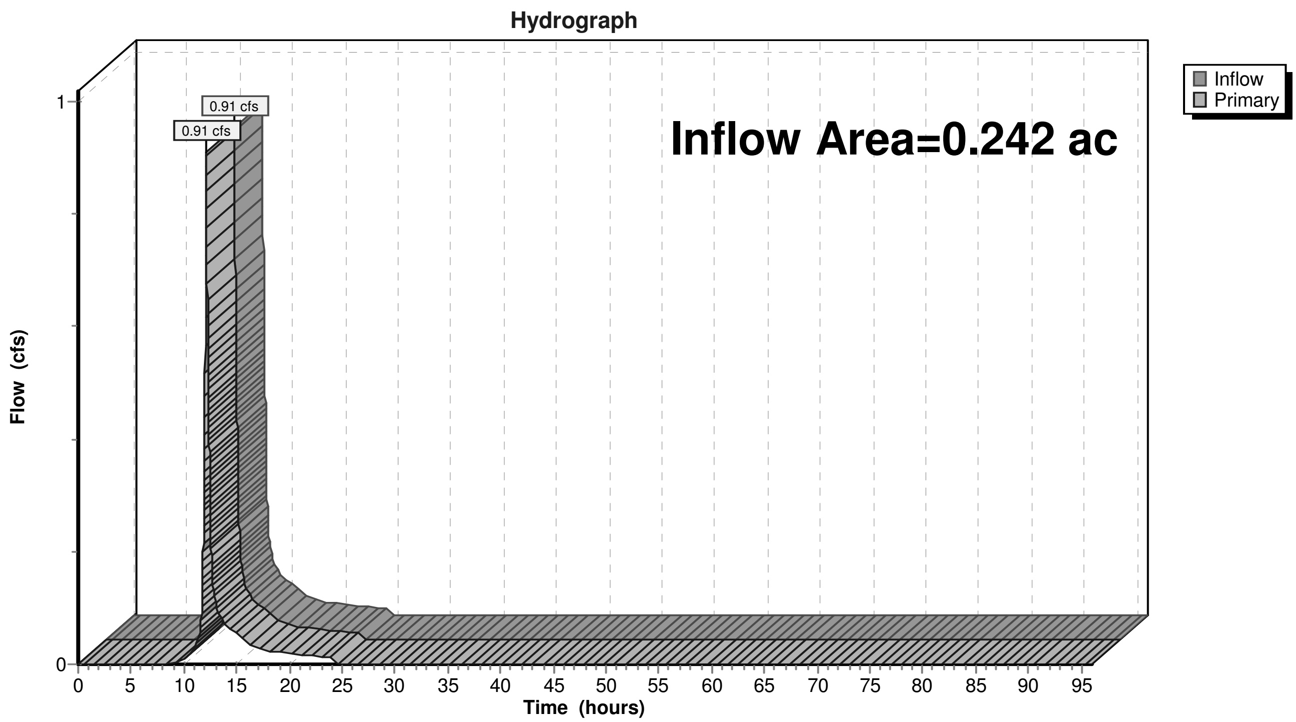


Summary for Link 28L: Design Point 4

Inflow Area =	0.242 ac,	0.00% Impervious, Inflow Depth = 3.49"	for 100 year event	
Inflow =	0.91 cfs @	12.12 hrs, Volume=	0.070 af	
Primary =	0.91 cfs @	12.12 hrs, Volume=	0.070 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link 28L: Design Point 4



Appendix F

FEMA Flood Maps

$^{6}06^{000m}E$

JOINS PANEL 0276

MAP SCALE 1" = 500'

250 0 500 1000 FEET

METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0163F

FIRM

FLOOD INSURANCE RATE MAP

for WESTCHESTER COUNTY, NEW YORK
(ALL JURISDICTIONS)

CONTAINS:

COMMUNITY	NUMBER
MOUNT PLEASANT, TOWN OF	360919
NEW CASTLE, TOWN OF	360921
NORTH CASTLE, TOWN OF	360923

PANEL 163 OF 426
MAP SUFFIX: F
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

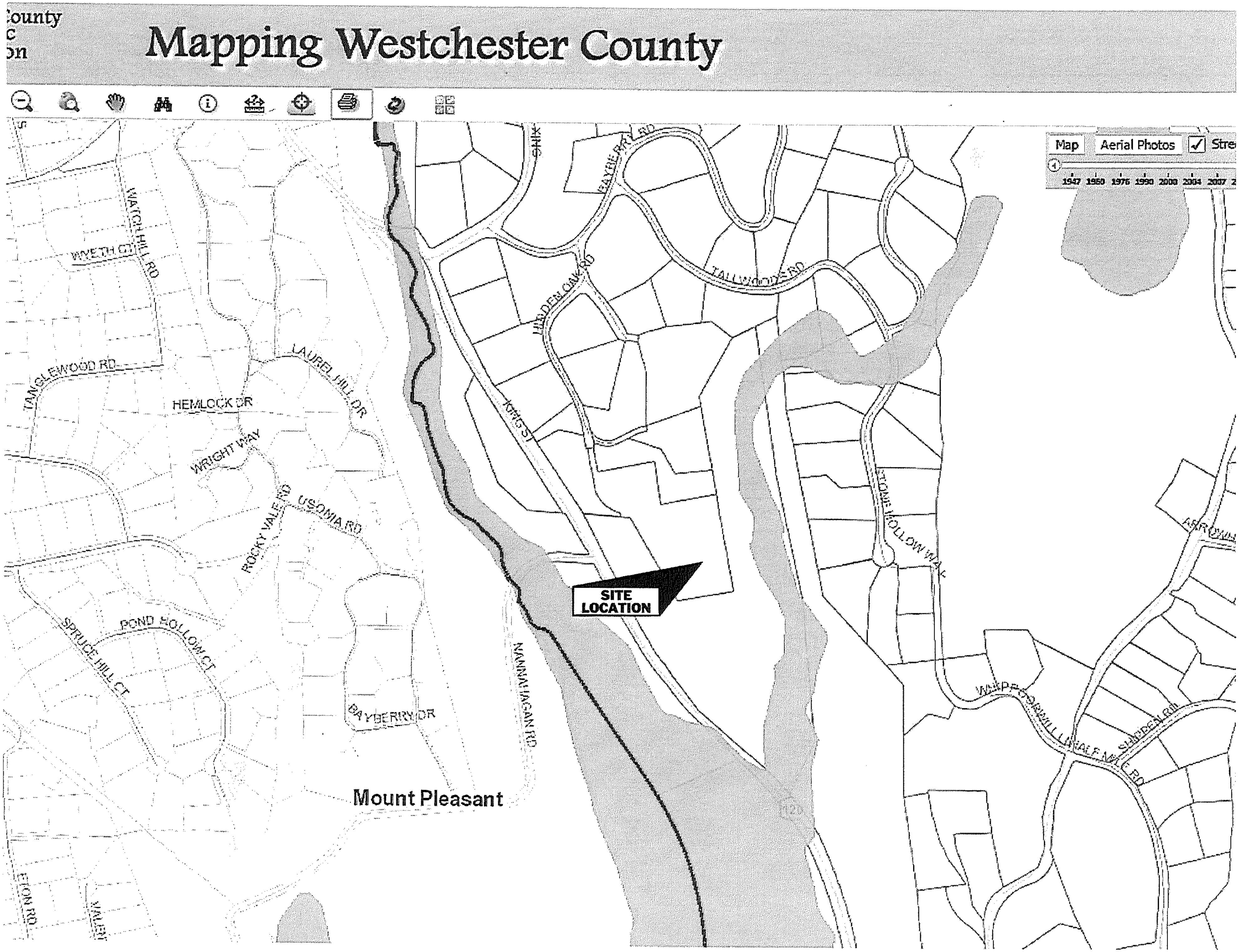
Notice to User: The **Map Number** shown below should be used when placing map orders: the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
36119C0163F

EFFECTIVE DATE
SEPTEMBER 28, 2007

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov


ounty
c
on
Mapping Westchester County
Map
Aerial Photos
1947 1960 1976 1990 2000 2004 2007
SITE LOCATION
KING ST
HIDDEN OAK RD
TALLWOODS RD
BAYBERRY RD
STONE HOLLOW WAY
WATCH HILL RD
WYETH CT
TANGLEWOOD RD
HEMLOCK DR
LAUREL HILL DR
WRIGHT WAY
ROCKY VALE RD
USONIA RD
POND HOLLOW CT
SPRUCE HILL CT
BAYBERRY DR
NANNAHAGAN RD
Mount Pleasant
ETON RD

Appendix G

NYCDEP Application for Review and Approval of Stormwater Pollution Prevention Plans

APPENDIX B
NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
APPLICATION FOR REVIEW AND APPROVAL OF STORMWATER POLLUTION PREVENTION PLANS AND CROSSING, PIPING OR DIVERSION PERMITS

You are encouraged to participate in an optional pre-application consultation to discuss your proposal and any specific requirements for Department review and approval. Please contact the appropriate Department office listed on page 2 of the accompanying Applicant's Guide to arrange a pre-application meeting.

Applicant/Designated representative:
Name: McKenna Custom Homes, Inc.
Address: 343 Manville Road
Pleasantville, NY 10570
Phone: (914) 769-1869

Design Professional:
Name: Alan L. Pilch, PE, RLA, Evans Associates
Address: 205 Amity Road
Bethany, CT 06524
Phone: (203) 393-0690 x114

Project Location: Address: 13 Hidden Oak Road
Town: North Castle
Subdivision Name: Hidden Oak Subd.
Reservoir Basin: Kensico

Tax Map Parcel: Sec. 107.01, Block 1
County: Westchester
Lot number: Lot 32

Type of Approval Sought: ☒ Stormwater Pollution Prevention Plan
☐ Crossing, Piping or Diversion Permit

Submissions must include four copies of all plans and supporting documents.

All applications must include narratives, plans, details, and specifications providing the following information:

- Project Description
- Description of Existing Conditions
- Description of Proposed Conditions
- Operations and Maintenance Plans

General Requirements for submissions are set forth in Section 3.1 of the accompanying Guide. Supplemental required information for each type of approval is described in Sections 3.2 and 3.3 (Stormwater Pollution Prevention Plans and Crossing, Piping or Diversion Permits, respectively). Also see Appendix A for a checklist of items to be included in the submission.

Notice of Cost-Sharing Funds

Certain costs incurred in the design, implementation, and maintenance of Stormwater Pollution Prevention Plans may be eligible for Department funding. Refer to Section 3.4 and Appendix F of the accompanying Guide.

I believe this application to be complete and in compliance with the Regulations.

Alan Pilch
(Signature)

(Filing Date)

Alan L. Pilch
(Print Name)

Appendix H

Notice of Intent

0644089821

NOTICE OF INTENT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NYR (for DEC use only)

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-0-15-002

All sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required.

-IMPORTANT-

RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)
McKenna Custom Homes

Owner/Operator Contact Person Last Name (NOT CONSULTANT)
McKenna

Owner/Operator Contact Person First Name
Kevin

Owner/Operator Mailing Address
343 Manville Road

City
Pleasantville

State
NY

Zip
10570 -

Phone (Owner/Operator)
914 - 769 - 1869

Fax (Owner/Operator)
- -

Email (Owner/Operator)
mckennacustom@optonline.net

FED TAX ID
16 - 1663300 (not required for individuals)

Project Site Information

Project/Site Name
HIDDEN OAK SUBDIVISION

Street Address (NOT P.O. BOX)
HIDDEN OAK ROAD

Side of Street
○ North ● South ○ East ○ West

City/Town/Village (THAT ISSUES BUILDING PERMIT)
NORTH CASTLE

State: NY
Zip: 10570 -
County: WESTCHESTER
DEC Region: 3

Name of Nearest Cross Street
BAYBERRY ROAD

Distance to Nearest Cross Street (Feet)
1250

Project In Relation to Cross Street
○ North ● South ○ East ○ West

Tax Map Numbers
Section-Block-Parcel
107.01 1 32

Tax Map Numbers

1. Provide the Geographic Coordinates for the project site in NYTM Units. To do this you **must** go to the NYSDEC Stormwater Interactive Map on the DEC website at:

www.dec.ny.gov/imsmaps/stormwater/viewer.htm

Zoom into your Project Location such that you can accurately click on the centroid of your site. Once you have located your project site, go to the tool boxes on the top and choose "i"(identify). Then click on the center of your site and a new window containing the X, Y coordinates in UTM will pop up. Transcribe these coordinates into the boxes below. For problems with the interactive map use the help function.

X Coordinates (Easting)	Y Coordinates (Northing)
605670	4553561

2. What is the nature of this construction project?

● **New Construction**

○ **Redevelopment with increase in impervious area**

○ **Redevelopment with no increase in impervious area**

4107089829

3. Select the predominant land use for both pre and post development conditions.
SELECT ONLY ONE CHOICE FOR EACH

Pre-Development Existing Land Use

- ● FOREST
- ○ PASTURE/OPEN LAND
- ○ CULTIVATED LAND
- ○ SINGLE FAMILY HOME
- ○ SINGLE FAMILY SUBDIVISION
- ○ TOWN HOME RESIDENTIAL
- ○ MULTIFAMILY RESIDENTIAL
- ○ INSTITUTIONAL/SCHOOL
- ○ INDUSTRIAL
- ○ COMMERCIAL
- ○ ROAD/HIGHWAY
- ○ RECREATIONAL/SPORTS FIELD
- ○ BIKE PATH/TRAIL
- ○ LINEAR UTILITY
- ○ PARKING LOT
- ○ OTHER

Post-Development Future Land Use

- ○ SINGLE FAMILY HOME
- ● SINGLE FAMILY SUBDIVISION — Number of Lots: 3
- ○ TOWN HOME RESIDENTIAL
- ○ MULTIFAMILY RESIDENTIAL
- ○ INSTITUTIONAL/SCHOOL
- ○ INDUSTRIAL
- ○ COMMERCIAL
- ○ MUNICIPAL
- ○ ROAD/HIGHWAY
- ○ RECREATIONAL/SPORTS FIELD
- ○ BIKE PATH/TRAIL
- ○ LINEAR UTILITY (water, sewer, gas, etc.)
- ○ PARKING LOT
- ○ CLEARING/GRADING ONLY
- ○ DEMOLITION, NO REDEVELOPMENT
- ○ WELL DRILLING ACTIVITY *(Oil, Gas, etc.)
- ○ OTHER

***Note:** for gas well drilling, non-high volume hydraulic fractured wells only

4. In accordance with the larger common plan of development or sale, enter the total project site area; the total area to be disturbed; existing impervious area to be disturbed (for redevelopment activities); and the future impervious area constructed within the disturbed area. (Round to the nearest tenth of an acre.)

Total Site Area	**Total Area To Be Disturbed**	**Existing Impervious Area To Be Disturbed**	**Future Impervious Area Within Disturbed Area**
7.7	5.2	0.	1.2

5. Do you plan to disturb more than 5 acres of soil at any one time? ○ **Yes** ● **No**

6. Indicate the percentage of each Hydrologic Soil Group(HSG) at the site.

A	**B**	**C**	**D**
0 %	95 %	3 %	2 %

7. Is this a phased project? ○ **Yes** ○ **No**

8. Enter the planned start and end dates of the disturbance activities.

Start Date 10/01/2016 - **End Date** 11/30/2018

9. Identify the nearest surface waterbody(ies) to which construction site runoff will discharge.

Name

UNNAMED WATERCOURSE

9a. Type of waterbody identified in Question 9?

- ○ Wetland / State Jurisdiction On Site (Answer 9b)
- ○ Wetland / State Jurisdiction Off Site
- ○ Wetland / Federal Jurisdiction On Site (Answer 9b)
- ○ Wetland / Federal Jurisdiction Off Site
- ○ Stream / Creek On Site
- ● Stream / Creek Off Site
- ○ River On Site
- ○ River Off Site
- ○ Lake On Site
- ○ Lake Off Site
- ○ Other Type On Site
- ○ Other Type Off Site

9b. How was the wetland identified?

- ○ Regulatory Map
- ○ Delineated by Consultant
- ○ Delineated by Army Corps of Engineers
- ○ Other (identify)

10. Has the surface waterbody(ies) in question 9 been identified as a 303(d) segment in Appendix E of GP-0-15-002? ○ Yes ● No

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-15-002? ● Yes ○ No

12. Is the project located in one of the watershed areas associated with AA and AA-S classified waters? ● Yes ○ No
If no, skip question 13.

13. Does this construction activity disturb land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey? ○ Yes ● No
If Yes, what is the acreage to be disturbed?

14. Will the project disturb soils within a State regulated wetland or the protected 100 foot adjacent area? ○ Yes ● No

15. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)? ○ Yes ● No ○ Unknown

16. What is the name of the municipality/entity that owns the separate storm sewer system?

NOT APPLICABLE

17. Does any runoff from the site enter a sewer classified as a Combined Sewer? ○ Yes ● No ○ Unknown

18. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law? ○ Yes ● No

19. Is this property owned by a state authority, state agency, federal government or local government? ○ Yes ● No

20. Is this a remediation project being done under a Department approved work plan? (i.e. CERCLA, RCRA, Voluntary Cleanup Agreement, etc.) ○ Yes ● No

21. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book)? ● Yes ○ No

22. Does this construction activity require the development of a SWPPP that includes the post-construction stormwater management practice component (i.e. Runoff Reduction, Water Quality and Quantity Control practices/techniques)? ● Yes ○ No
If No, skip questions 23 and 27-39.

23. Has the post-construction stormwater management practice component of the SWPPP been developed in conformance with the current NYS Stormwater Management Design Manual? ● Yes ○ No

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

● **Professional Engineer (P.E.)**

○ **Soil and Water Conservation District (SWCD)**

○ **Registered Landscape Architect (R.L.A)**

○ **Certified Professional in Erosion and Sediment Control (CPESC)**

○ **Owner/Operator**

○ **Other**

SWPPP Preparer
EVANS ASSOCIATES

Contact Name (Last, Space, First)
PILCH ALAN

Mailing Address
205 AMITY ROAD

City
BETHANY

State: CT
Zip: 06524-

Phone: 203-393-0690
Fax: 203-393-0196

Email
alan@eaec-inc.com

SWPPP Preparer Certification

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-15-002. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First Name: ALAN
MI: L

Last Name: PILCH

Signature: Alan Pilch

Date: 05/31/2016

25. Has a construction sequence schedule for the planned management practices been prepared? ● Yes ○ No

26. Select **all** of the erosion and sediment control practices that will be employed on the project site:

Temporary Structural

- [x] Check Dams
- [ ] Construction Road Stabilization
- [ ] Dust Control
- [ ] Earth Dike
- [x] Level Spreader
- [ ] Perimeter Dike/Swale
- [ ] Pipe Slope Drain
- [ ] Portable Sediment Tank
- [ ] Rock Dam
- [ ] Sediment Basin
- [ ] Sediment Traps
- [x] Silt Fence
- [x] Stabilized Construction Entrance
- [x] Storm Drain Inlet Protection
- [ ] Straw/Hay Bale Dike
- [ ] Temporary Access Waterway Crossing
- [ ] Temporary Stormdrain Diversion
- [ ] Temporary Swale
- [ ] Turbidity Curtain
- [x] Water bars

Biotechnical

- [ ] Brush Matting
- [ ] Wattling

Vegetative Measures

- [ ] Brush Matting
- [ ] Dune Stabilization
- [ ] Grassed Waterway
- [ ] Mulching
- [x] Protecting Vegetation
- [ ] Recreation Area Improvement
- [x] Seeding
- [ ] Sodding
- [ ] Straw/Hay Bale Dike
- [ ] Streambank Protection
- [ ] Temporary Swale
- [ ] Topsoiling
- [ ] Vegetating Waterways

Permanent Structural

- [ ] Debris Basin
- [ ] Diversion
- [ ] Grade Stabilization Structure
- [ ] Land Grading
- [ ] Lined Waterway (Rock)
- [ ] Paved Channel (Concrete)
- [ ] Paved Flume
- [ ] Retaining Wall
- [ ] Riprap Slope Protection
- [x] Rock Outlet Protection
- [ ] Streambank Protection

Other

GEOTEXTILE MAT

Post-construction Stormwater Management Practice (SMP) Requirements

Important: Completion of Questions 27-39 is not required if response to Question 22 is No.

27. Identify all site planning practices that were used to prepare the final site plan/layout for the project.

- ● **Preservation of Undisturbed Areas**
- ○ **Preservation of Buffers**
- ● **Reduction of Clearing and Grading**
- ○ **Locating Development in Less Sensitive Areas**
- ○ **Roadway Reduction**
- ○ **Sidewalk Reduction**
- ○ **Driveway Reduction**
- ○ **Cul-de-sac Reduction**
- ○ **Building Footprint Reduction**
- ○ **Parking Reduction**

27a. Indicate which of the following soil restoration criteria was used to address the requirements in Section 5.1.6("Soil Restoration") of the Design Manual (2010 version).

- ● All disturbed areas will be restored in accordance with the Soil Restoration requirements in Table 5.3 of the Design Manual (see page 5-22).
- ○ Compacted areas were considered as impervious cover when calculating the **WQv Required,** and the compacted areas were assigned a post-construction Hydrologic Soil Group (HSG) designation that is one level less permeable than existing conditions for the hydrology analysis.

28. Provide the total Water Quality Volume (WQv) required for this project (based on final site plan/layout).

Total WQv Required

0.435 **acre-feet**

29. Identify the RR techniques (Area Reduction), RR techniques(Volume Reduction) and Standard SMPs with RRv Capacity in Table 1 (See Page 9) that were used to reduce the Total WQv Required(#28).

Also, provide in Table 1 the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

Note: Redevelopment projects shall use Tables 1 and 2 to identify the SMPs used to treat and/or reduce the WQv required. If runoff reduction techniques will not be used to reduce the required WQv, skip to question 33a after identifying the SMPs.

Table 1 - Runoff Reduction (RR) Techniques and Standard Stormwater Management Practices (SMPs)

RR Techniques (Area Reduction)	Total Contributing Area (acres)		Total Contributing Impervious Area (acres)
○ Conservation of Natural Areas (RR-1)	.	and/or	.
○ Sheetflow to Riparian Buffers/Filters Strips (RR-2)	.	and/or	.
● Tree Planting/Tree Pit (RR-3)	.	and/or	0.090
● Disconnection of Rooftop Runoff (RR-4)	.	and/or	0.083

RR Techniques (Volume Reduction)	
● Vegetated Swale (RR-5)	0.019
● Rain Garden (RR-6)	0.076
○ Stormwater Planter (RR-7)	.
○ Rain Barrel/Cistern (RR-8)	.
○ Porous Pavement (RR-9)	.
○ Green Roof (RR-10)	.

Standard SMPs with RRv Capacity	
○ Infiltration Trench (I-1)	.
○ Infiltration Basin (I-2)	.
○ Dry Well (I-3)	.
● Underground Infiltration System (I-4)	0.944
● Bioretention (F-5)	0.000
○ Dry Swale (O-1)	.

Standard SMPs	
○ Micropool Extended Detention (P-1)	.
○ Wet Pond (P-2)	.
○ Wet Extended Detention (P-3)	.
○ Multiple Pond System (P-4)	.
○ Pocket Pond (P-5)	.
○ Surface Sand Filter (F-1)	.
○ Underground Sand Filter (F-2)	.
○ Perimeter Sand Filter (F-3)	.
○ Organic Filter (F-4)	.
○ Shallow Wetland (W-1)	.
● Extended Detention Wetland (W-2)	0.233
○ Pond/Wetland System (W-3)	.
○ Pocket Wetland (W-4)	.
○ Wet Swale (O-2)	.

Table 2 - Alternative SMPs (DO NOT INCLUDE PRACTICES BEING USED FOR PRETREATMENT ONLY)

Alternative SMP	Total Contributing Impervious Area (acres)
○ Hydrodynamic	.
○ Wet Vault	.
○ Media Filter	.
○ Other	.

Provide the name and manufacturer of the Alternative SMPs (i.e. proprietary practice(s)) being used for WQv treatment.

Name

Manufacturer

Note: Redevelopment projects which do not use RR techniques, shall use questions 28, 29, 33 and 33a to provide SMPs used, total WQv required and total WQv provided for the project.

30. Indicate the Total RRv provided by the RR techniques (Area/Volume Reduction) and Standard SMPs with RRv capacity identified in question 29.

Total RRv provided

0.230 **acre-feet**

31. Is the Total RRv provided (#30) greater than or equal to the total WQv required (#28).

○ Yes ● No

If Yes, go to question 36.
If No, go to question 32.

32. Provide the Minimum RRv required based on HSG.
[Minimum RRv Required = (P)(0.95)(Ai)/12, Ai=(S)(Aic)]

Minimum RRv Required

0.124 **acre-feet**

32a. Is the Total RRv provided (#30) greater than or equal to the Minimum RRv Required (#32)?

● Yes ○ No

If Yes, go to question 33.
Note: Use the space provided in question #39 to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). A detailed evaluation of the specific site limitations and justification for not reducing 100% of the WQv required (#28) must also be included in the SWPPP.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

33. Identify the Standard SMPs in Table 1 and, if applicable, the Alternative SMPs in Table 2 that were used to treat the remaining total WQv(=Total WQv Required in 28 - Total RRv Provided in 30).

Also, provide in Table 1 and 2 the total impervious area that contributes runoff to each practice selected.

Note: Use Tables 1 and 2 to identify the SMPs used on Redevelopment projects.

33a. Indicate the Total WQv provided (i.e. WQv treated) by the SMPs identified in question #33 and Standard SMPs with RRv Capacity identified in question 29.

WQv Provided

0.219 **acre-feet**

Note: For the standard SMPs with RRv capacity, the WQv provided by each practice = the WQv calculated using the contributing drainage area to the practice - RRv provided by the practice. (See Table 3.5 in Design Manual)

34. Provide the sum of the Total RRv provided (#30) and the WQv provided (#33a). 0.449

35. Is the sum of the RRv provided (#30) and the WQv provided (#33a) greater than or equal to the total WQv required (#28)? ● **Yes** ○ **No**

If Yes, go to question 36.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

36. Provide the total Channel Protection Storage Volume (CPv) required and provided or select waiver (36a), if applicable.

CPv Required	**CPv Provided**
0.098 **acre-feet**	0.149 **acre-feet**

36a. The need to provide channel protection has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.

○ Reduction of the total CPv is achieved on site through runoff reduction techniques or infiltration systems.

37. Provide the Overbank Flood (Qp) and Extreme Flood (Qf) control criteria or select waiver (37a), if applicable.

Total Overbank Flood Control Criteria (Qp)

Pre-Development	**Post-development**
7.10 CFS	5.32 CFS

Total Extreme Flood Control Criteria (Qf)

Pre-Development	**Post-development**
20.32 CFS	14.70 CFS

37a. The need to meet the Qp and Qf criteria has been waived because:

- ○ Site discharges directly to tidal waters or a fifth order or larger stream.
- ○ Downstream analysis reveals that the Qp and Qf controls are not required

38. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed?

● Yes ○ No

If Yes, Identify the entity responsible for the long term Operation and Maintenance

legal agreement between the three
homeowners

39. Use this space to summarize the specific site limitations and justification for not reducing 100% of WQv required(#28). (See question 32a)
This space can also be used for other pertinent project information.

There are many planning and design practices which have been implemented by the project to reduce the amount of impervious surfaces and overall land disturbance in order to minimize the 1 year storm water quality volume. The subdivision is designed to minimize environmental impacts and to minimize the amount of new impervious surfaces to the maximum extent. As is noted above, the subdivision is a Conservation Subdivision which permits smaller lot sizes and less lot frontage than under the Town zoning code. This permits a shorter subdivision road than would be required under Conventional zoning. Smaller lot sizes reduce disturbance when compare to a conventional lot. The shorter subdivision road significantly reduces the amount of impervious surfaces when compared to road which would be required under the conventional zoning.

The applicant's engineer is proposing to implement several measures to reduce the volume of runoff to the greatest extent that is practical. This includes: (i) infiltration on Lot 1 and 2 to convey runoff from the house roof into subsurface chambers and into the site's soils, (ii) bioretention facility on Lot 1 for runoff from the rear yard (mostly lawn area) of Lot 1, and (iii) infiltration of a portion of the runoff from the proposed subdivision road in subsurface chambers. Other measures to reduce the volume of runoff include recognized techniques as per Section 5.2 of the 2015 New York State Stormwater Management Design Manual. These include: (i) elimination of sidewalks, and (ii) minimizing the building footprints to the maximum extent.

Site constraints also have impacted the ability of the project to achieve the full reduction of the 1-year storm runoff volume. Specifically, these constraints include: (i) significant areas of exposed bedrock which cover 0.682 acres or about 9% of the site. There are also areas of steep slopes in excess of 25% which limits the potential for stormwater management practices to reduce the runoff volume.

40. Identify other DEC permits, existing and new, that are required for this project/facility.

- ○ Air Pollution Control
- ○ Coastal Erosion
- ○ Hazardous Waste
- ○ Long Island Wells
- ○ Mined Land Reclamation
- ○ Solid Waste
- ○ Navigable Waters Protection / Article 15
- ○ Water Quality Certificate
- ○ Dam Safety
- ○ Water Supply
- ○ Freshwater Wetlands/Article 24
- ○ Tidal Wetlands
- ○ Wild, Scenic and Recreational Rivers
- ○ Stream Bed or Bank Protection / Article 15
- ○ Endangered or Threatened Species(Incidental Take Permit)
- ○ Individual SPDES
- ○ SPDES Multi-Sector GP NYR
- ○ Other
- ● None

41. Does this project require a US Army Corps of Engineers Wetland Permit? ○ **Yes** ● **No**
If Yes, Indicate Size of Impact. .

42. Is this project subject to the requirements of a regulated, traditional land use control MS4? ● **Yes** ○ **No**
(If No, skip question 43)

43. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI? ○ **Yes** ○ **No**

44. If this NOI is being submitted for the purpose of continuing or transferring coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned. NYR

Owner/Operator Certification

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Print First Name: KEVIN

MI:

Print Last Name: McKENNA

Owner/Operator Signature:

Date: / /

Hidden Oak Subdivision

Phase 1A Literature Review & Sensitivity Analysis & Phase 1B Archaeological Field Reconnaissance Survey

Hidden Oak Road
Town of North Castle
Westchester County, New York

Prepared for:

McKenna Custom Homes, Inc.
343 Manville Road
Pleasantville, NY 10510

By:

CITY/SCAPE: Cultural Resource Consultants
166 Hillair Circle
White Plains NY 10605

December 2014

Hidden Oak Subdivision

Hidden Oak Road
Town of North Castle
Westchester County, New York

TABLE OF CONTENTS

Management Summary

SHPO Project Review Number (if available):

Involved State and Federal Agencies:

Phase of Survey: **Phase 1A Literature Review & Sensitivity Analysis & Phase 1B Archaeological Field Reconnaissance Survey**

Location Information:

Location: **Hidden Oak Road**
Minor Civil Division: **Town of North Castle**
County**: Westchester County, New York**

Survey Area (Metric & English)

Length: **1150' (350)**

Width: **650' (198 m)**

Depth (when appropriate):

Number of Acres Surveyed: **±6.5 acres (2.63 hectares).**

] Number of Square Meters & Feet Excavated (Phase II, Phase III only): **N/A**

Percentage of the Site Excavated (Phase II, Phase III only):

USGS 7.5 Minute Quadrangle Map: **Glenville CT & Mt Kisco**

Archaeological Survey Overview

Number & Interval of Shovel Tests: **93 at 50' (15 m)**

Number & Size of Units: N/A

Width of Plowed Strips: N/A

Surface Survey Transect Interval: N/A

Results of Archaeological Survey

Number & name of prehistoric sites identified: 0

Number & name of historic sites identified: 0

Number & name of sites recommended for Phase II/Avoidance: N/A

Results of Architectural Survey

Number of buildings/structures/cemeteries within project area: 0

Number of buildings/structures/cemeteries adjacent to project area: 0

Number of previously determined NR listed or eligible buildings/structures/cemeteries/districts: 0

Number of identified eligible buildings/structures/cemeteries/districts: N/A

Report Author (s): **Stephanie Roberg-Lopez M.A., R.P.A. Gail T. Guillet and Beth Selig, M.A.,R.P.A.**

Date of Report: **December 2014**

MAP & FIGURE LIST

Maps

Figures

.

HIDDEN OAK SUBDIVISION

Hidden Oak Road

Town of North Castle. Westchester County, New York

Introduction

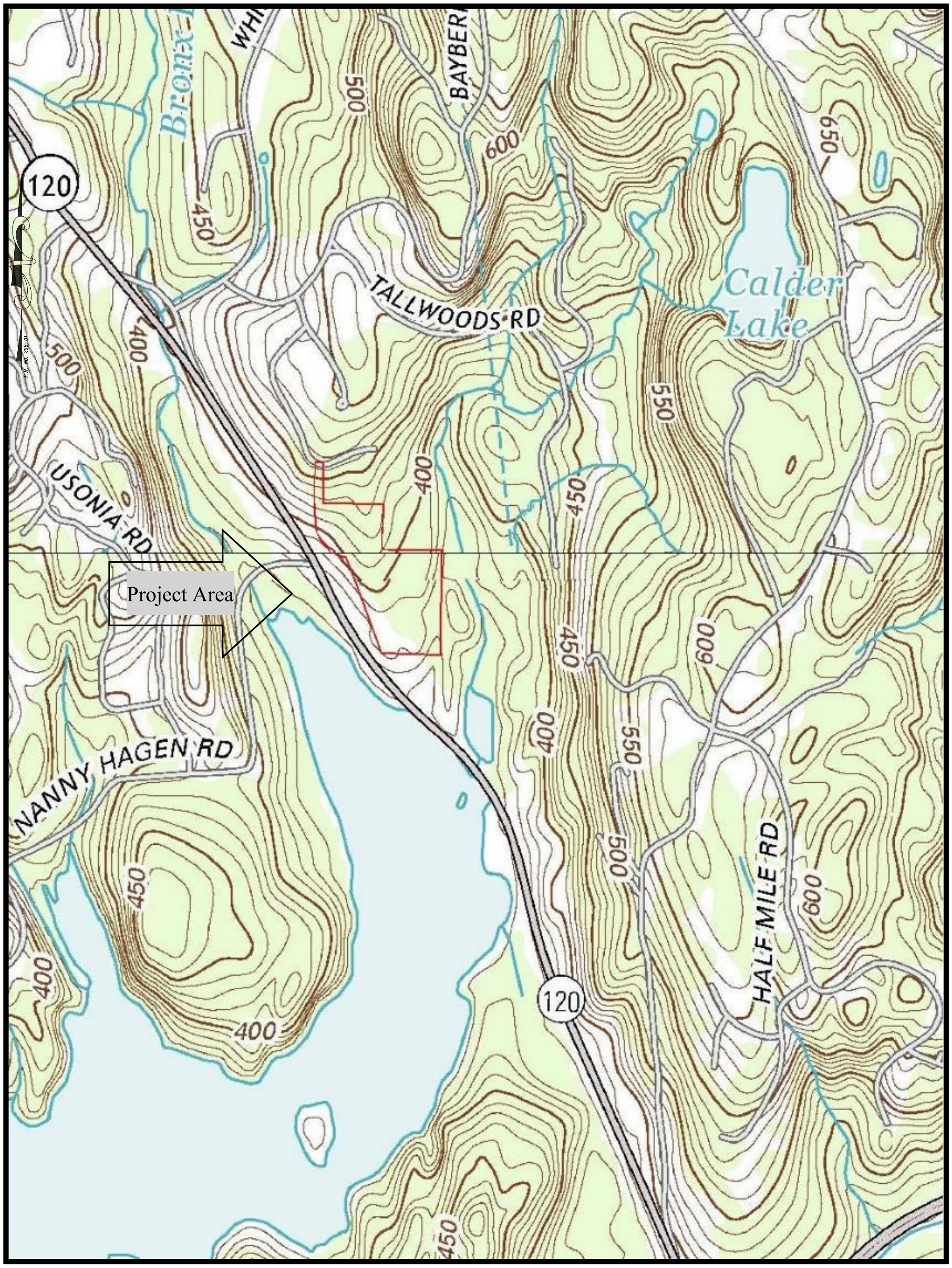
In October 2014, CITY/SCAPE: Cultural Resource Consultants undertook a Phase 1A Literature Review and Sensitivity Analysis of Hidden Oak Subdivision site located in the Town of North Castle, Westchester County, New York. (Maps 1 & 2) For the purposes of this report, the area of potential effect (APE) is considered the entirety of the property, which contains ± 8.2158 acres (3.325 hectares). It is proposed to subdivide the property into three house lots, each of which will include a residential structure, driveways, septic systems and storm water management systems.

The Phase 1A work was performed in accordance with the guidelines established by the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) and the *Standards for Cultural Resource Investigations and the Curation of Archeological Collections* published by the New York State Archeological Council (2005 & 2000). The field investigation and technical report meet the specifications of the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (*Federal Register* 48:190:44716-44742) (United States Department of the Interior 1983). All work performed meets the requirements of the relevant federal standards (36 CFR 61) and of the State Environmental Quality Review Act (SEQRA) 6NYCRR, part 617 of the New York State Environmental Conservation Law. In addition, the qualifications of the Principal Investigator, who will supervise the project, meet or exceed the qualifications described in the Secretary of the Interior's Professional Qualifications Standards (*Federal Register* 48:190:44738-44739) (United States Department of the Interior 1983).

Project Area Description

The project area is located on the east side of King Street (Route 120) in the Town of North Castle New York, and northeast of the Kensico Reservoir. The project area is bounded to the north by Hidden Oak Road, and to the east and south by forested land. (Photos 5 & 6) On the southern boundary is a small stream that empties into the Kensico Reservoir, which, along with the land to the south of the project area, is part of the City of New York watershed. The project area contains open forest with extensive rock outcrops and steep slopes descending to the drainage noted above. (Photo 7) Map research indicates that the project area was open farm land throughout the 19th and early 20th centuries. The project area, which is marked by stone walls, is vacant, except for construction materials that have been stored on the site.

To the west of the project area, fronting King Street (Route 120), is a house that dates to the early 19th century. With the exception of this house, the area in which the Hidden Oak Subdivision is located consists of houses built in the later part of the 20th and the early part of the 21st century.



Map 1: 2013 USGS Topographical Map including Project Area. Mt. Kisco NY & Glenville CT Quadrangle. Scale: 1"=700'.

Map 2: Locator Map including Project Area. (Source: *Google Maps*). Scale: 1”= 365’.

Fig. 1: Aerial Photograph showing Project Area. (Source: *Google Earth*) Scale: 1"=370'.

Environmental Conditions

The elevation of the Village of Armonk, located to the west of the project area, is ±387 feet (117.95 meters) above mean sea level (AMSL). The Hidden Oak Subdivision is located at a lower elevation with the elevation in the northern portion of the site reaching 160' (48.7 m) AMSL. The land then drops to 123' (37.5 m) in the southern portion of the project area.

The Hudson Valley region, of which Westchester County is a part, is a northern extension of the Great Appalachian Valley. The site itself is considered to be within the northern extension of the Manhattan Prong, which is part of the larger New England Physiographic Province. The underlying bedrock consists of Cambrian and Ordovician duotones, quartzites, schist's and gneiss. Bedrock outcrops occur in a number of places on the site, but the surficial deposits, to the extent that they exist, consist of undifferentiated glacial till. Most recently, during the Wisconsin glacial event of the Pleistocene Epoch approximately 10,000 to 13,000 years ago, a sheet of ice several thousand feet thick covered the area. As it retreated, contouring the land and smoothing off mountain tops, it left behind a mantle of sediment. This unconsolidated sediment provided the source material for the undifferentiated glacial till that covers most of the bedrock in the region.

The characteristics of the soils within the project area have an impact on the potential for the site to contain prehistoric cultural material. The Natural Resources Conservation Service indicates that the project area contains well drained soils, including Charlton loam (Chic), Charlton-Chatfield complex (Croc) and Chatfield-Hollis-Rock outcrop (Cud). (Appendix B: Soil Descriptions, Fig. 2)

As noted above, there is a small stream located on the eastern and southern boundaries of the project area that flows into the Kensico Reservoir, which is on the west side of King Street (Route 120). The Kensico Reservoir is part of the New York City watershed.

Stone walls define the boundaries of former agricultural fields or pasture. Access to the project area is a temporary road. No structures are located on the site, but the central area contains construction materials that have been stored on site.

Potential for the Site to Contain Prehistoric and Historic Cultural Resources

As part of the initial research for the Phase 1A report, CITY/SCAPE: Cultural Resource Consultants examined the available information regarding prehistoric sites in the general vicinity. Due to the ongoing scanning and digitizing process at the Office of Parks, Recreation and Historic Preservation (OPRHP), the site files were not available for review and CITY/SCAPE's staff, therefore, relied on information obtained from several cultural resource surveys completed for projects in the vicinity of the Hidden Oaks Subdivision site.

Three prehistoric archaeological sites were identified, two of which are located along the Byram River, which is located east of the project area. In historical texts, the Stockade Site (A119.10.0009/NYSM 5178) and Camp Site II (A119.10.0008/NYSM 5171) were identified as Late Woodland sites; however, no professional excavations were undertaken at these locations. To the northeast of the project area, NYSM 8853 identifies a site containing prehistoric finds located on a terrace along an unnamed road. No additional information was available regarding this site.

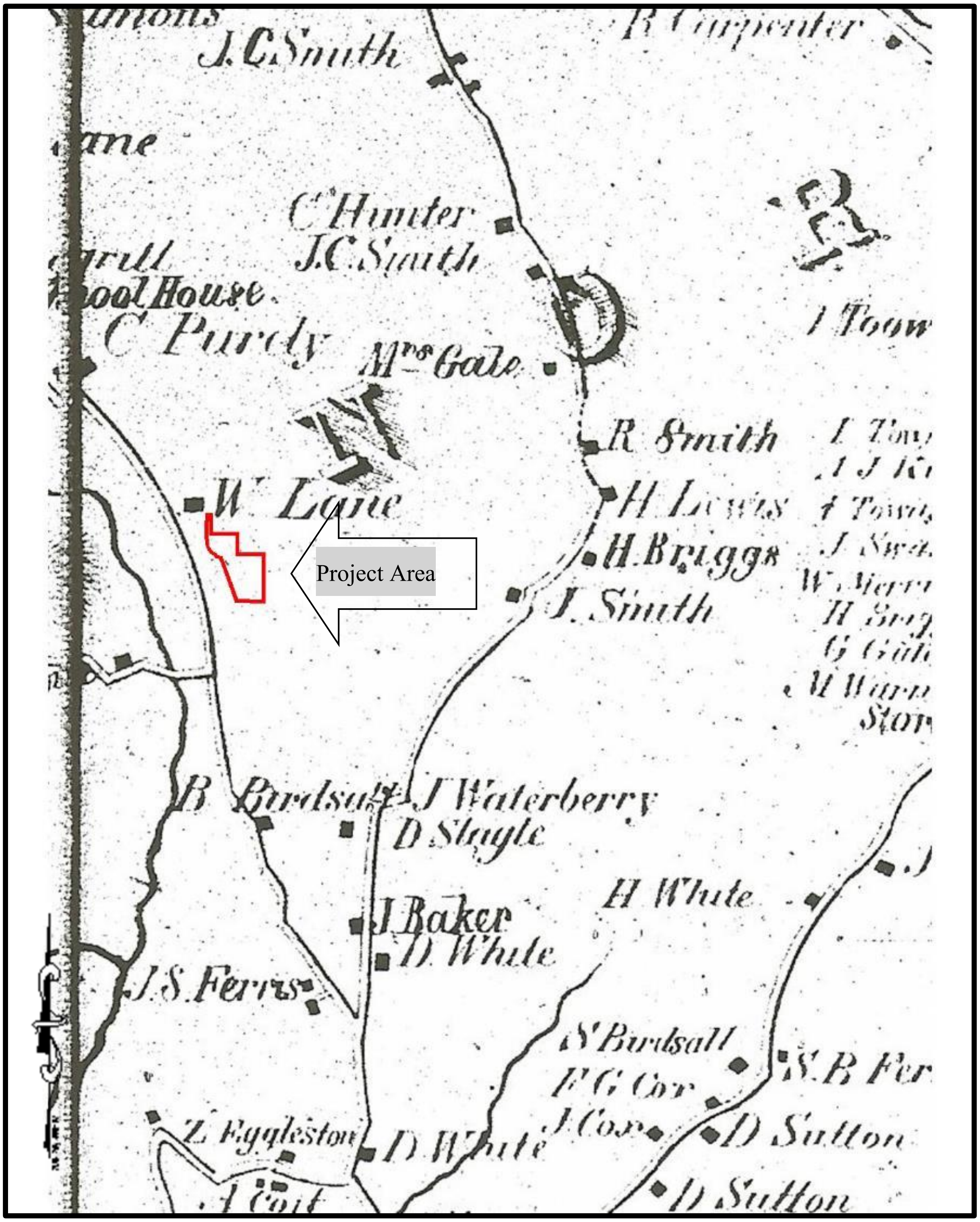
The Townsend Site is located northwest of the hamlet of Armonk. While this site is located more than a mile (1.6 km) from the project area, it is included, because it provides information on the types of sites and material recovered in the general area. Two loci were discussed, the first was identified as a cave or rock shelter, and the second as a camp site. According to the author of the report, a total of fifty-one (51) prehistoric artifacts were recovered, including several diagnostic projectile points, among them one or more Orient Fishtails, a Wading River, a Squibnocket Triangle, two Beekman Triangles, and several untyped stemmed points. In addition to the diagnostics, there were also Stage 2, Stage 3 and Stage 4 bifaces, projectile point tips, a cobble hammerstone and a utilized flake (Wiegand 1997). In addition to the projectile points and non-diagnostic material, the Townsend Site produced a total of 5,783 pieces of lithic debitage, including quartz, quartzite, grey chert, dark gray/black chert and yellow jasper.

While there are few professionally excavated prehistoric sites identified within a mile of the project area, the project area itself is located in an area with elevated level terraces overlooking wetland and freshwater resources that would have been attractive to prehistoric peoples. For this reason, the prehistoric potential within the project area must be considered moderate to high.

The eastern portion of the Bedford Road Historic District, which is described as historically and architecturally significant, falls within a two mile radius of the project area. The Bedford Road Historic District is described ". . . as the last intact grouping of distinctive nineteenth-century buildings that reflect the architectural character of Armonk during the period 1842-1880" (NR Form 1985, Section 8). Due to its distance from the project area, the historic district will not be impacted either physically or visually by the proposed development.

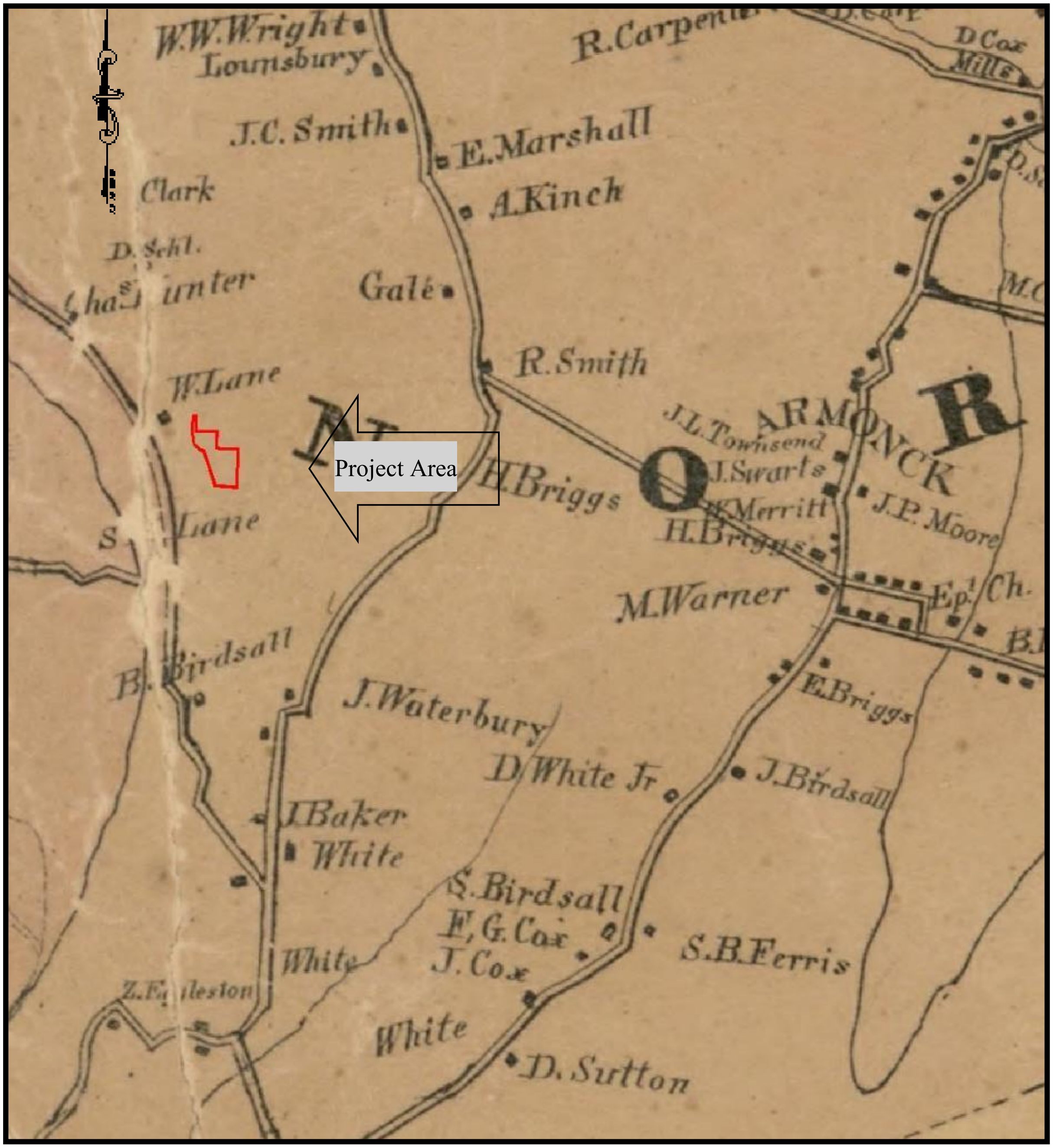
History of the Site

As part of the Phase 1A Literature Review and Sensitivity Analysis, historic maps of the area were examined to determine whether the project area had the potential to contain Map Documented Structures (MDS) or historic cultural resources. The earliest map examined for this report dates to 1851. The *Map of Westchester County*, published by Sidney & Neff, includes the project area. On this map, King Street is shown extending through the Town of North Castle. The project area is located on property owned by W. Lane, whose residence was located adjacent to the northwestern boundary of the project area. The house is an example of a vernacular farm house and exhibits elements of the Greek Revival style. Based on its architectural details, the house dates to the early 19th century. On the Armonk-Bedford Road between Bedford Street and School Street were several houses owned by the Townsend family. There were also two stores, a school and an Episcopal Church located in the area. Along Whippoorwill Road, east of the project area, there were numerous residences located on both sides of the highway. To the southwest of the project area, Nanny Hagen Road (then Nannahagen Road) crossed the Bronx River, which drained to the south. On this map, the project area is interior land that would have been used as pasture or woodlot. No structures were shown within the project area boundaries.



Map 3: Sidney & Neff's 1851 *Atlas of Westchester County* Scale: 1"=1650'.

The 1858 *Map of Westchester County* (Map 4), which was surveyed and published by F. C. Merry, indicates that the Village of Armonk (then spelled "ARMONCK") had been established at the intersection of two major roads, one running northeast-southwest (Main Street/Armonk-Bedford Road), and the other northwest (East Whippoorwill Road) and east (Bedford Road). The Wampus River flows to the east of the village center. A portion of Armonk is identified on the 1858 map as an early subdivision, which was laid out by St. Stephen's Episcopal Church; remnants of that development are reflected in the block defined by Bedford Road. The area surrounding Armonk contained a scattering of farms located along Whippoorwill Road to the east and the Armonk- Bedford Road (NYS Route 22) to the south. The land on which the project area is located was still owned by W. Lane. S. Lane owned the land to the south. Southwest of the project area, the Bronx River was shown as a small stream. The Bronx River would later be impounded to create the Kensico Reservoir.



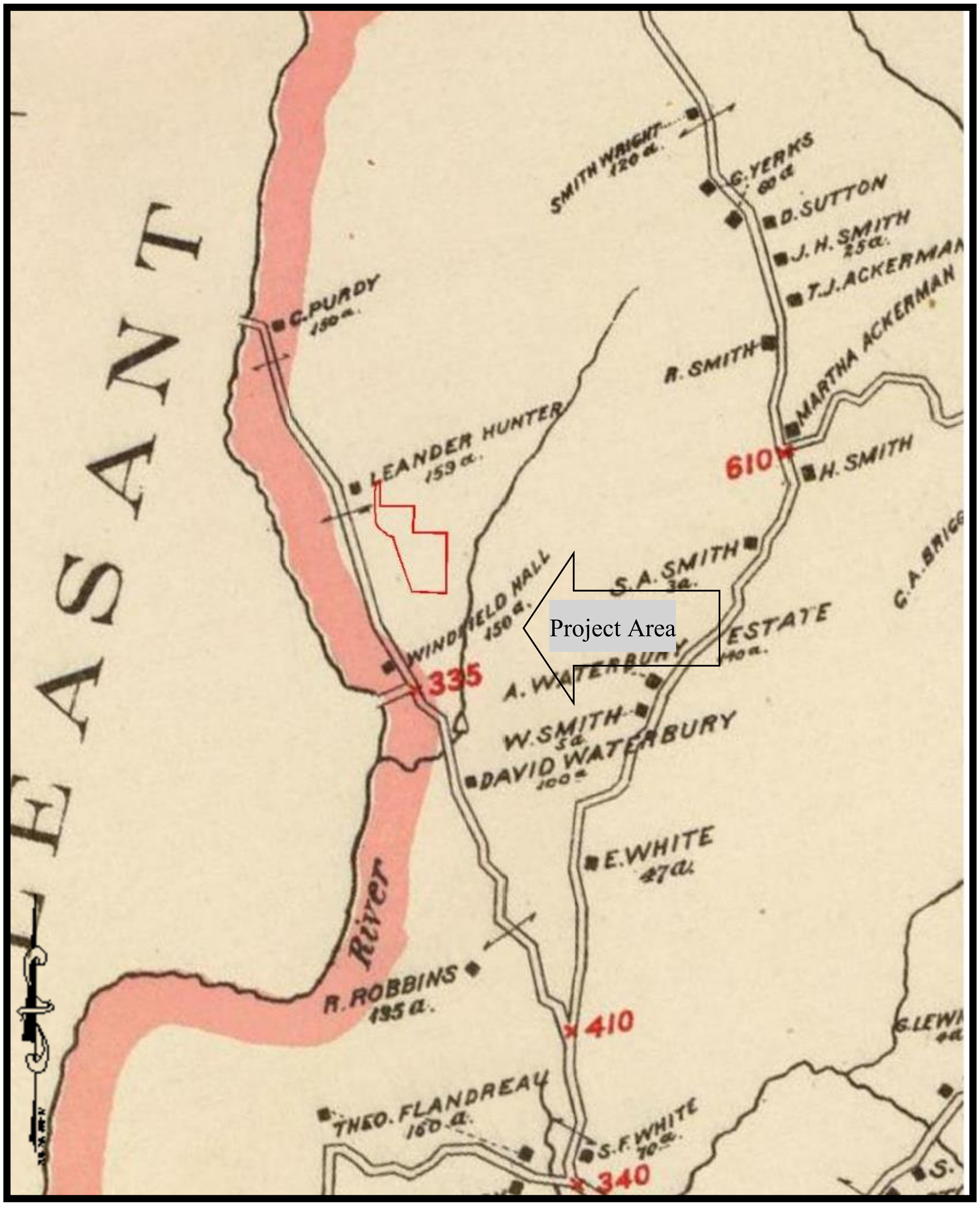
Map 4: 1858 F.C Merry *Map of Westchester County*. Scale: 1"=2200'.

On the 1868 F. W. Beers' *Atlas of New York and Vicinity*, the hamlet of Armonk is well established east of the project area. (Map 5) The project area remained vacant interior farm land. This map indicates that the S. J. Lane residence, which was shown on the 1858 map, was now owned by W. J. Lane, who also owned the house northwest of the project area at the intersection of King Street and Nanny Hagen Road. This house, identified as Locust Grove, is

280 King Street. This map shows the Bronx River as a substantial waterway west of the project area which defines the boundary with the Town of Mount Pleasant.

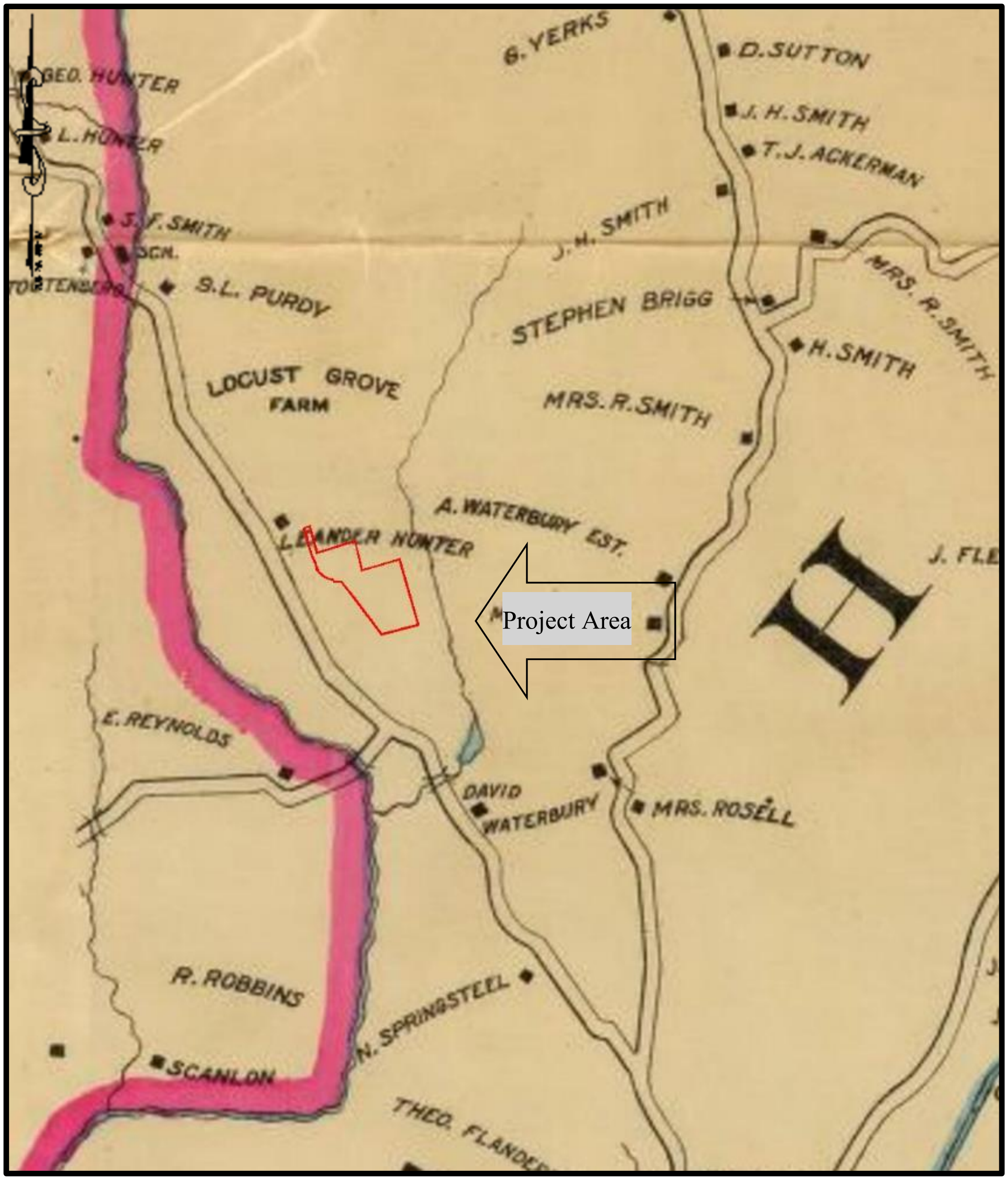
Map 5: F.W. Beers' 1868 *Atlas of New York and Vicinity*. Scale: 1"=825'.

By 1893, when J. R. Bien published the *Atlas of Westchester* County, New York, the W. Lane residence was owned by Leander Hunter. Hunter then owned 159 acres, which included the project area. (Map 6) South of the project area was Windfield Hall, an estate owned by W. Lane that included 450 acres. Also to the south of the project area was a farm owned by David Waterbury that contained 100 acres. East of the project area along Whippoorwill Road, the Waterbury Estate encompassed 440 acres. The Bronx River is shown as flowing to the west of the project area, while a small stream flowed into the river from the upland area east of the project area.



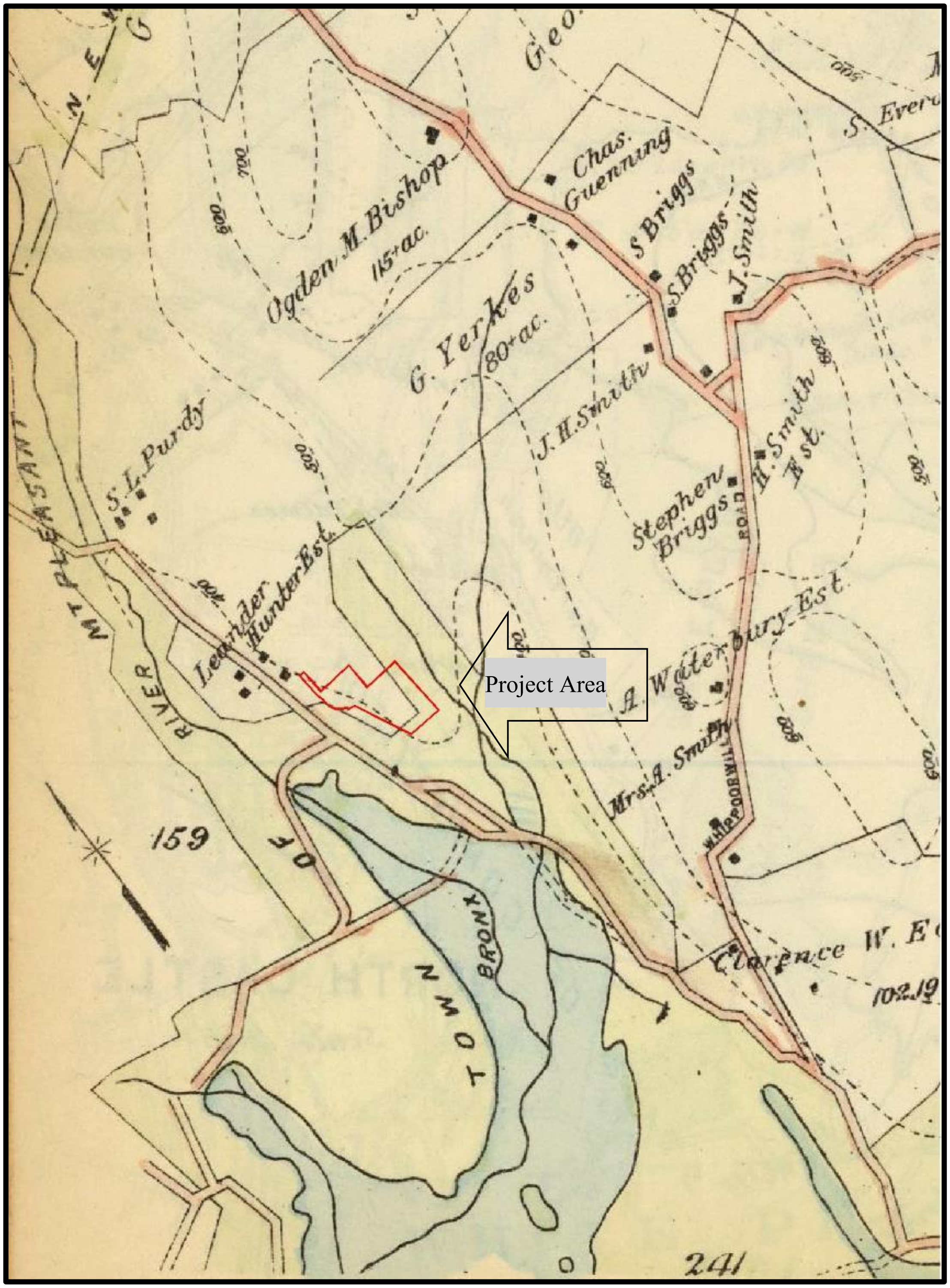
Map 6: 1893 J.R. Bien *Atlas of Westchester County*, New York. Scale: 1"=1650'

Fifteen years later, when Hyde & Company published the *Map of North Castle* in the *Atlas of Westchester County, New York*, there had been few changes in the general vicinity of the project area. (Map 7) To the west of the project area, the former Windfield Hall estate was now owned by E. Reynolds. The ownership of the lands to the north and south of the project area had remained unchanged. Leander Hunter owned the house on the northwestern boundary of the project area.



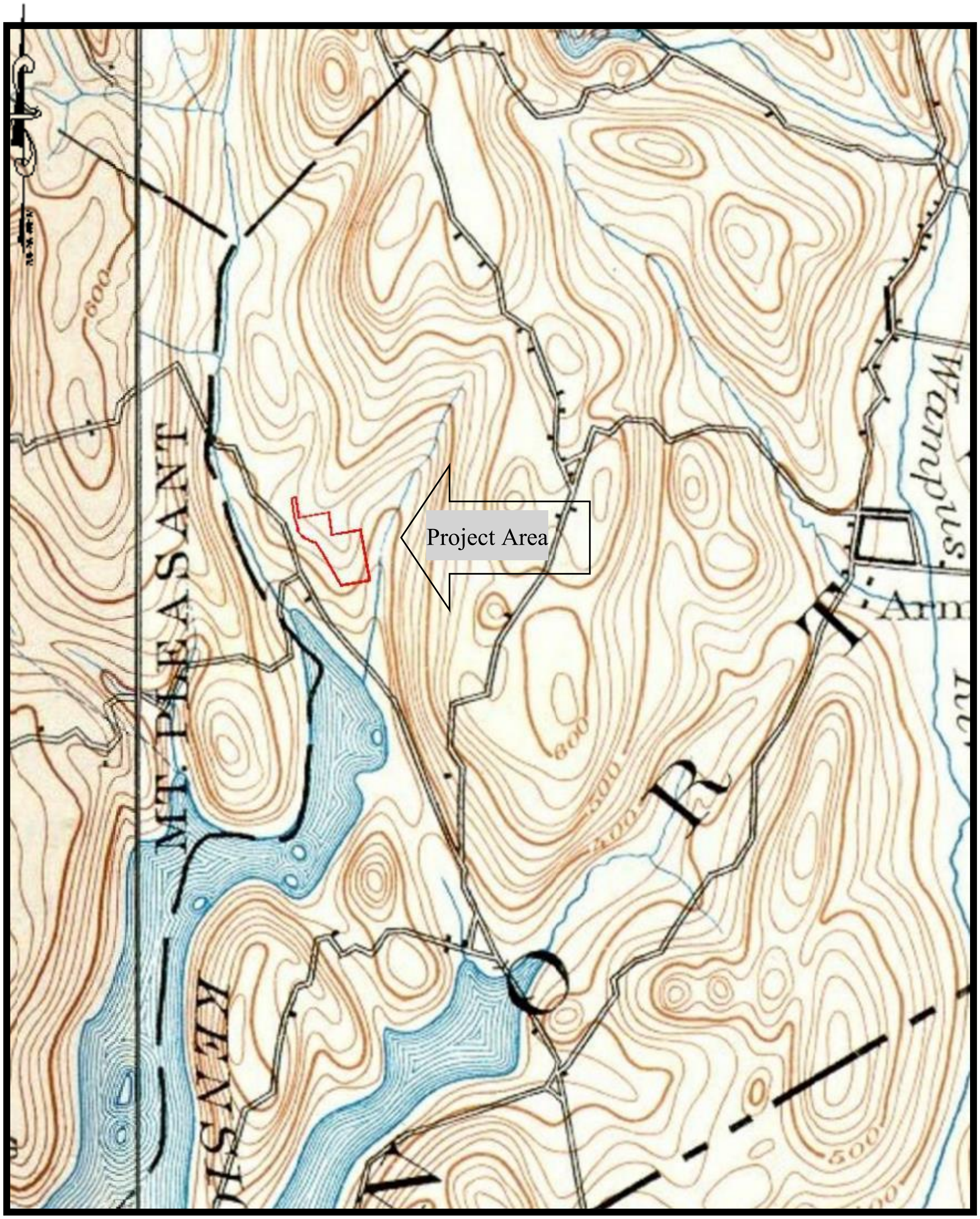
Map 7: Hyde & Company's 1908 *Map of North Castle and part of New Castle*. Scale: 1"=1470'.

In 1914, G. W. Bromley published the *Automobile Atlas of Westchester County, New York.* (Map 8) At that time, the project area was owned by the Leander Hunter Estate. This map shows the Bronx River flowing into the Kensico Reservoir. Along Whipoorwill Road, the Waterbury Estate was still shown, along with residential structures owned by Mrs. A. Smith and Stephen Briggs.

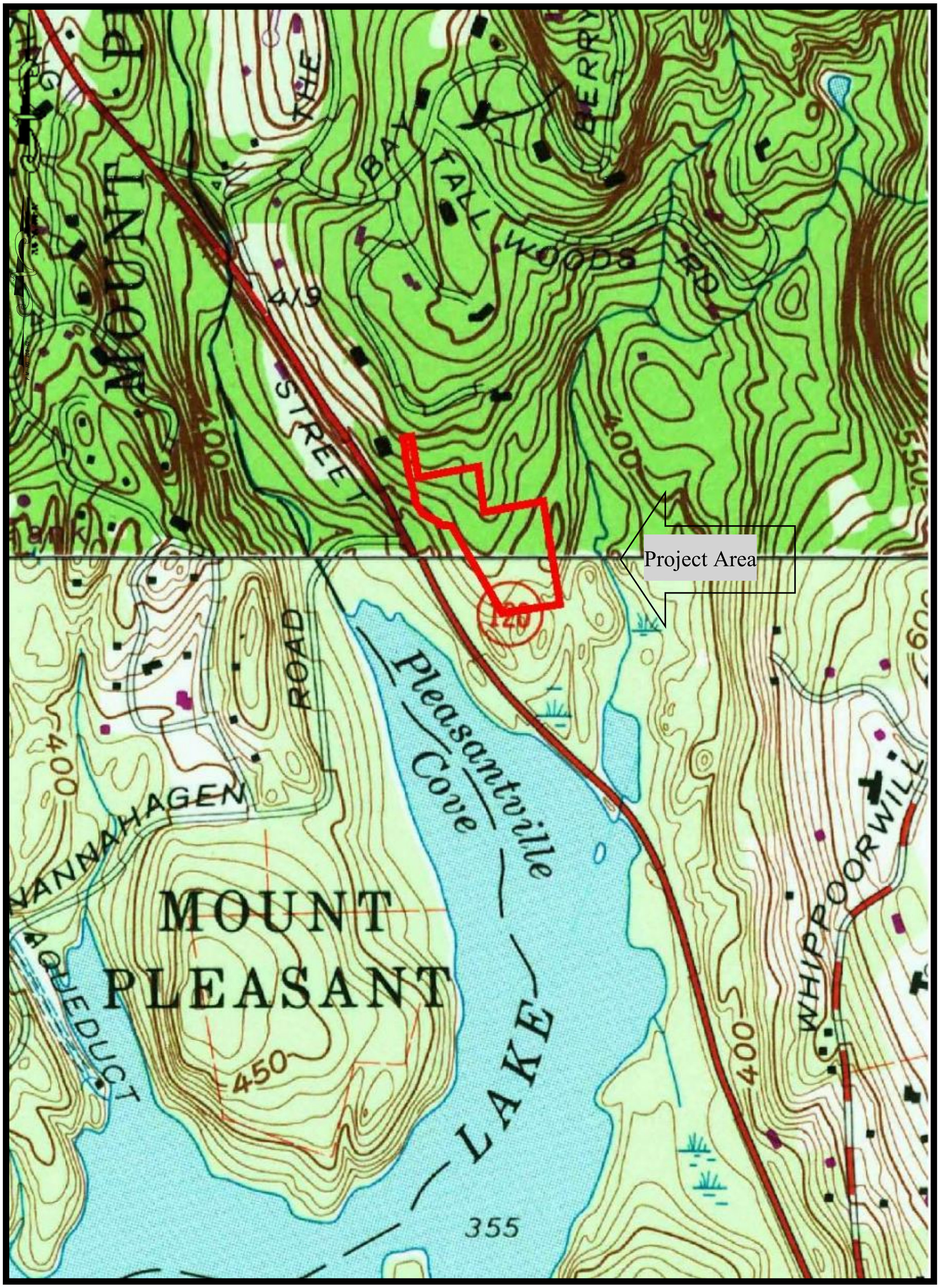


Map 8: G.W. Bromley's 1914 *Atlas of Westchester County, New York*. Scale: 1"=1470'.

Two historic topographical maps were examined for this report. These maps indicate the location of roads and structures, but do not include the names of landowners. The 1899, the USGS Stamford Quadrangle and 1902 Tarrytown topographical map for the area of North Castle include the project area. The street pattern had remained the same, with the reservoir located on the west side of King Street. (Map 9) On this map, there were no structures shown within the boundaries of the project area or in the immediate vicinity of it. Several structures were shown along Whippoorwill Road.



Map 9: 1899 Stamford Quadrangle & 1902 Tarrytown Quadrangle USGS Topographical Map. 15 Minute Series. Scale: 1”=1650’.



Map 10: 1951 Mt. Kisco and 1960 Glenville CT. Quadrangles. 7.5 Minute Series. Scale: 1"=775'

By 1951/1960, the roads in the vicinity of the site had change significantly. King Street was now identified as Route 120 and Hidden Oak Road had been opened. The reservoir is identified as Kensico Lake, with the area near the project area identified as Pleasantville Cove. Adjacent to the northwest boundary of the project area is the house located at 280 King Street. The wetland area and the small stream that drains into the Kensico Reservoir are located outside the southern boundary of the project area.

National Register Eligible and Listed Properties

There is one National Register property, the Witthoeff Residence, within a one mile radius of the project area. The Witthoeff Residence, located on Tallwoods Road, was listed in 2010. The structure, built by Arthur Witthoeft in 1957, is an example of the International style. The house is considered one of the great remaining residential examples of the International Modernist style in this region (NRNF 2010: section 8 page 1). The Witthoeft property is located 1530’ from the proposed project area. Topography and distance make it unlikely that the proposed Hidden Oak Subdivision will have any visual impacts to the Witthoeft property.

Additional Research Undertaken

As part of the research for the Phase 1A Literature Review and Sensitivity Analysis, surveys completed for projects in the general area were consulted. As previously stated, the hard copies of these reports were not accessible at the OPRHP office, and cultural resource reports completed in the area were, therefore, used to develop this regional context.

Directly to the west of the project area, Louis Berger completed a Phase 1 Cultural Resources Survey of the Nichols Project site, located south of the Village of Armonk near the confluence of the Wampus and Byram Rivers. The Nichols Project site, located two miles southeast project area, is situated in proximity to a stream on well drained ground. Despite the environmental conditions on the site, which suggested that the project area contained the potential to contain cultural resources, the Nichols Project site contained no significant historic or prehistoric cultural resources.

Eugene J. Boesch, Ph.D., completed a Stage I Archaeological Investigation of the Proposed Water Pipeline Crossing of the Wampus River - IBM Headquarters Building Study Area in 1996. Located west of the project area and I-684, the project area yielded scant prehistoric materials. The site was interpreted as a short-term prehistoric campsite, but the finds were not judged significant and no further work was recommended (Boesch 1996).

In 1987, improvements were proposed to the Route 22/I-684 interchange, which is located 2 miles east of the project area. The State Education Department undertook a survey of the areas to be impacted by the proposed improvement. No evidence of either prehistoric or historical archaeological sites was identified within the proposed improvement area (Vaillancourt 1987:18).

In 1994, the Leisure Farm Subdivision Property, located 2½ miles east project area, was investigated at the level of a Phase 1A and Phase 1B by Sheffield Associates. No prehistoric material was recovered from the site. The property contained several historic structures, but, as these were not judged to be eligible for National Register listing, no further investigation was recommended.

In 1986, Ernest A. Wiegand II completed a Phase 1A and Phase 1B report for the Kent Development site, located immediately west of Main Street in the Village of Armonk. The site is approximately 1½ miles east of the proposed project area. The survey of the property yielded prehistoric materials, including a Levanna projectile point and several pieces of debitage. The site, referred to as the Whippoorwill Site, was interpreted as a briefly occupied camp site. With the exception of the Levanna point, scant evidence of prehistoric occupation was recovered and no further archaeological work was recommended (Wiegand 1986:11).

In 2009, CITY/SCAPE completed a Phase 1A Literature Review and Sensitivity Analysis and Phase 1B Archaeological Field Reconnaissance Survey of the Turet Subdivision. The Phase 1B survey investigated five acres along the Town's southern boundary. No cultural material of any kind was recovered in the Phase 1B survey.

Sensitivity Assessment and Site Prediction

Drawing on previous surveys of prehistoric sites in the vicinity of the project area in the Town of North Castle, Westchester County, New York, there is evidence that Native Americans utilized the area. The types of sites identified include rockshelters and small camp sites. There is a report of a stockaded village near the confluence of the Wampus and Byram Rivers, but the site is anecdotal and it was never subjected to a professional archaeological survey. There is also anecdotal evidence of sites along the Bronx River, which is now impounded by the Kensico Reservoir, but historically flowed a short distance to the west of the project area. Based on the presence of sites in the vicinity, the prehistoric potential for the Hidden Oak Subdivision is considered to be moderate to high. This assessment is based on the presence of prehistoric sites in similar topography within a one mile radius of the project area, the relationship of the site to the Bronx, Wampus and Byram Rivers, which would have provided access to the area from Long Island Sound, and environmental factors on the southern boundary of the site, including the presence of a small stream corridor and wetlands. The potential of the site to contain prehistoric cultural resources is reduced by the fact that significant portions of the project area contain steep slopes in excess of 12 percent.

The potential for the project to contain historic cultural resources is considered low to moderate. Research indicates that in 19th and early 20th century the project area was interior farmland. No structures were located within the project area, but there is a house that dates to the early 19th century located adjacent to the northwestern boundary of the property, and there is the possibility that dump sites or sheet middens could be present in the northwestern portion of the project area.

Conclusions and Recommendations

Based on the sensitivity model developed by the New York Archaeological Council (NYAC), which has been accepted by OPRHP, as well as reported resources within a one mile radius of the Hidden Oak Subdivision site, it has been determined that the project area has a moderate to high potential to contain prehistoric cultural resources. With respect to historic cultural resources, it is considered possible that dump sites or shaft features associated with the historic occupation of the house at 280 King Street may exist within the northwestern portion of the project area. It is, therefore, recommended that a Phase 1B Archaeological Field Reconnaissance Survey be undertaken on the Hidden Oak Subdivision site to rule out or rule in the presence of both prehistoric and historic cultural resources. The Phase 1B survey will be limited to the Area of Potential Effect (APE), eliminating from testing those area with slopes that are 12 percent or greater.

PHASE 1B FIELD RECONNAISSANCE SURVEY

Phase 1B Introduction

On December 12, 2014, CITY/SCAPE: Cultural Resource Consultants completed a field reconnaissance level archaeological survey of the Hidden Oaks Subdivision Site in the Town of North Castle, Westchester County, New York. (Maps 1 & 2)

Archaeological fieldwork was directed by Stephanie Roberg-Lopez, M.A., R.P.A., Principal Investigator. Beth Selig, M.A., R.P.A., CITY/SCAPE's staff archaeologist, supervised the excavations. Field technicians include Franco Zani Jr. and Frank Spada. A light flurry covered the ground surface, and the soils were soft with no evidence of frozen ground. The final report was completed by Beth Selig. Site photography was completed by Gail T. Guillet and Beth Selig. The preparation of the Field Reconnaissance Map and final production of the report was completed by Beth Selig.

Phase 1A Information

The proposed project description, environmental information, and archaeological sensitivity assessment are included in the Phase 1A report that is bound with this report.

Methodology

Results of the Phase 1A confirmed that the site is located in an area of prehistoric activity. In addition, the landscape closely conforms to an ecological model that indicates that the more level, undisturbed portions of the project area could be highly sensitive for prehistoric cultural materials. The testing strategy for the site was, therefore, structured around the knowledge that portions of the property possessed the potential to yield prehistoric cultural remains. The potential for the site to yield historic cultural material was considered moderate to low.

The areas selected for shovel testing were subjected to tests at intervals of 15 m (50') along transects conforming to the land surface. Determinations concerning the sensitivity of the various areas were based on environmental factors, topography, and known activity patterns of the prehistoric population. The locations of the tests and disturbed areas were recorded on a large-scale map that shows surveyed borders and the locations of the various structures identified on the site. (See Field Reconnaissance Map)

Field Methodology

Field methodology employed at the Hidden Oaks Subdivision site consisted of several stages of investigation. These included:

1. A walkover and visual inspection of the site to assess areas of potential sensitivity for prehistoric cultural remains.

2. The excavation of a control shovel test to establish the stratigraphy of the site and to identify the depth and composition of the sterile glacially deposited sub soils.
3. Systematic visual inspection of the land surface to rule out the presence of rock faces and overhangs.
4. Shovel testing in the areas identified as having a potential sensitivity for prehistoric remains.
5. Photographic documentation of the overall site.

The methodology for shovel testing in the sensitive areas involved excavating 40 cm (16") diameter shovel tests at 15m (50') intervals. Soils were passed through a ¼ inch steel mesh screen, and the material remaining in the screens was carefully examined for historic and prehistoric artifacts. The stratigraphy of each test was recorded including the depth and the soil description of each layer. (See Appendix C) No cultural material was recovered from the Hidden Oaks Subdivision site.

Field Results

Once a testing strategy had been established and areas unsuitable for testing (standing water, percolation tests and associated spoil piles) were eliminated from the survey, the potentially sensitive areas were systematically shovel tested. The areas subjected to shovel testing represent the flat and well drained areas within the project area. To maintain spatial control the site was divided into three areas. The division of these areas was based on existing stone walls that mark small pasture areas within the project area.

For the purposes of the Phase 1B investigation, testing was limited to the Area of Potential Effect (APE). The proposed development plan, provided by the project sponsor, indicates two conservation easement areas located adjacent to the southeastern, and western boundaries of the project area. No testing was undertaken within the conservation easements.

Area 1

The first area to be tested is located in the central portion of the project area. As stated, stone walls defined the boundaries of this rectangular area. (Photos 9 & 20) Transects began along the northern stone wall, and progressed south to a second stone wall. Six transects containing 36 shovel test comprehensively tested this area. Of the 36 shovel tests, seven shovel tests were not excavated due to steep slopes or exposed surficial bedrock. (Photos 19 & 26) The southern portion of TR 6 encountered areas of standing water, and three open percolation tests with large back dirt piles on the surface. (Photos 23-25) The soils in this area consisted of a dark brown to dark yellowish brown silty sandy loam overlying a reddish brown or brownish yellow silty clay. No cultural material of any kind was recovered from this portion of the project area.

Area 2

The second area to be tested is located in the southern portion of the site. As with the previous area, stone walls provided identifiable boundaries. Transects 7 through 13 were aligned north to south in this area. (Photo 26) Much like Area 1, the landscape consists of steep slopes with areas of exposed surficial bedrock. (Photos 23-26) A total of 34 shovel tests were planned in this area. Of the 34 planned shovel tests, 13 were not excavated due to steep slopes and areas of exposed surficial bedrock. Like Area 1, the soils varied with a dark brown to brown silty sandy loam A horizon, overlying a reddish brown sand with gravel, or a brownish yellow sandy clay. No cultural material of any kind was recovered from Area 2.

Area 3

The final area to be tested is the northern portion of the project area. This area is also characterized by areas of steep slope and exposed surficial bedrock. Portions of the sloped area, adjacent to the northern boundary, are currently being used to store construction equipment. (Photo 5) In addition, other areas of the landscape are overgrown with forsythia and honeysuckle bushes. (Photo 17) Transects 14 through 18 were aligned south to north in Area 3. Here a total of 23 shovel tests were planned. Of the planned shovel tests, five were eliminated due to steep slope, exposed bedrock, surface water and percolation test pits. (Photo 22) The soils identified in this location are consistent with those previously discussed. No cultural material of any kind was recovered.

Rockshelters and Mines

As discussed above, there are numerous areas of exposed bedrock, composed primarily of dolostone and gneiss, located throughout the project area. None of the outcrops had the height to have been utilized as rockshelters. Several small veins of quartz were identified within the bedrock, none of which appear to have been quarried. There were also large cobbles throughout the property. As with the quartz veins, none of the cobbles exhibited evidence of being culturally modified.

Summary and Conclusions

In December of 2014, CITY/SCAPE: Cultural Resource Consultants completed a Phase 1B archaeological field reconnaissance survey of the Hidden Oak Subdivision site in the Town of North Castle Westchester County, New York. A thorough review of the existing body of archaeological data relevant to the project area was undertaken and conclusions were drawn concerning the probability of encountering prehistoric and/or historic cultural remains on the site. Areas of slope in excess of 15% grade, exposed surficial bedrock, standing water and areas of prior disturbance were eliminated from testing. Once this process was completed, areas possessing the potential to yield cultural remains were subjected to systematic subsurface archaeological testing.

A total of 93 shovel tests were placed in areas considered to have the potential to yield prehistoric or historic cultural material. Of the 93 shovel tests none yielded prehistoric or historic cultural material. Based on the results of the archaeological field survey completed on the Hidden Oak Subdivision site, it is the conclusion of CITY/SCAPE: Cultural Resource Consultants that the project may proceed without further archaeological investigation of the Hidden Oak Subdivision site.

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FIELD RECONNAISSANCE MAP

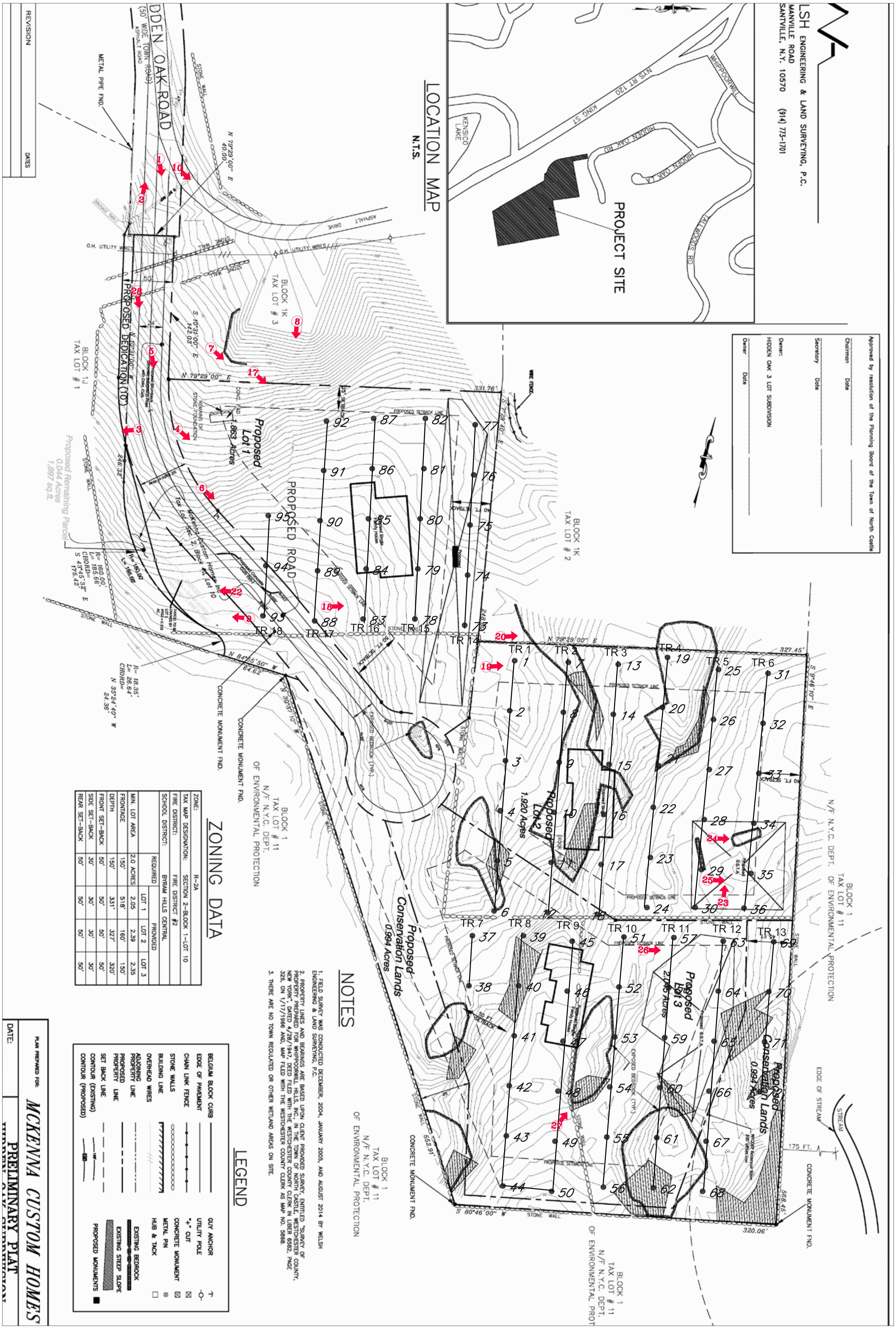

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Fig. 3: Hidden Oak Subdivision
Phase 1B Archaeological Reconnaissance Map
Scale 1"=100'

Legend

ST Sterile Shovel Test Location

Photographic View

GRAPHIC SCALE

0 50 100 200

(IN FEET)
1 inch = 100 ft.

APPENDICES

LIST OF APPENDICES

APPENDIX A

PHOTOGRAPHS

Photo 1: Entrance to Hidden Oak Subdivision from Hidden Oak Road. Driveway to 6 Hidden Oak Road is to left. View to southeast.

Photo 2: Looking northeast along entrance drive to Hidden Oak Subdivision. Stone wall located on property marks old farm field boundaries. Building in background is outbuilding on 280 King Street property.

Photo 3: 280 King Street**.** Hidden Oak Subdivision is adjacent to front and side yard of 280 King Street. View to northeast.

Photo 4: Much of land surface on Hidden Oak Subdivision is characterized by bedrock outcrops. View to southeast.

Photo 5: Proposed entrance drive for Hidden Oak Subdivision. Some building materials are currently stored on site. View to southeast.

Photo 6:. Portions of project area are relatively level, but underlain by bedrock that is near surface. View to southeast.

Photo 7: Project area falls steeply on southern boundary into area that is part of New York City watershed. View to southeast.

Photo 8: Another view to southeast from edge of southern part of Hidden Oak Subdivision site.

Photo 9: Looking southeast across project area to King Street and Kensico Reservoir.

Photo 10: Looking into project area from drive to 6 Hidden Oak Road. View to southeast.

Photo 11: 6 Hidden Oak Road. House is currently under renovation. View to northeast.

Photo 12: House located on north side of drive to 6 Hidden Oak Road is modern structure. View to northeast.

Photo 13: 5 Hidden Oak Road. House dates to 20th century. View to southeast.

Photo 14: House located north of 5 Hidden Oak Road dates to 20th century. View to east.

Photo 15: 10 Hidden Oak Road. House is recent construction. View to northwest.

Photo 16: 294 King Street. House located on King Street north of 280 King Street, which backs up to Hidden Oak Subdivision site. View to southeast.

Photo 17: Looking southeast across project area. Photo taken from highest elevation at northern boundary. View to southeast.

Photo 18: Dirt roadway provides access to interior of site. View to east.

Photo 19: Steep slopes and exposed bedrock located in Area 2. View to east.

Photo 20: Stone wall served as baseline for TR 1-TR 6. View to east.

Photo 21: Quartz cobbles were noted within stone wall and at surface.   None exhibit evidence of cultural modification. View to north.

Photo 22: Area of surface water noted in Area 3 adjacent to TR 20. A percolation test is located to right of roadway (not visible in photo). View to west.

Photo 23: Southeastern corner of Area 1 contained wet soils and surface water. View to north.

Photo 24: Landscape along TR 6 was visibly churned, likely due to deep percolation tests. See Photo 25. View to west.

Photo 25: One of many deep percolation test pits located throughout project area. View to east.

Photo 26: Field technician excavated TR 11. View to east.

Photo 27: Surface bedrock and downed trees were located across the site. View to northeast.

Photo 28: Northwestern portion of APE contains existing road that exhibits evidence of surface grading. View to south.

APPENDIX B

SOIL DESCRIPTION AND MAP

Name	Soil Horizon Depth	Texture/ Inclusions	Slope (Percent)	Drainage	Landform
Charlton Loam (ChC)	Surface: 0-8” (0-20 cm) Subsoil: 8-24” (20-60 cm) Subsoil: 24-60”(60-152 cm)	Loam Sandy Loam Sandy Loam	8 to 15%	Well Drained	Hill, Ridges, Till Plains
Chatfield-Charlton complex, (CrC) Chatfield Charlton:	Surface: 0-2" (0-5.08 cm) Subsoil: 2-7" (5.08-17.78 cm) Substratum: 7-24" (17.79-60.96 cm) Surface: 0-2 (0-5 cm) Subsoil: 2-8" (5-20 cm) Substratum:: 8-24" (20-60.96 cm)	Loam Loam Sandy Loam Loam Loam Sandy Loam	2 to 15%	Well drained to somewhat excessively drained	Hills, ridges and till plains
Chatfield Hollis Complex (CuD) Chatfield Hollis	Surface: 0-19” (0-18 cm) Subsoil: 19-32” (49-82 cm) Substratum: 32--72” (82-205 cm) Surface: 0-6” (0-15 cm) Subsoil: 6-13” (15-33 cm) Substratum: 13-72” (33-205 cm)	Gravelly Fine Sandy Loam Fine Sandy Loam Unweathered Bedrock Loam Gravelly Fine Sandy Loam Unweathered bedrock	15 to 35%	Well Drained	Hills, ridges

Figure 2: Soil Map for the Hidden Oak Subdivision. (Natural Resources Conservation Service).

APPENDIX C

SHOVEL TEST RECORDS

Transect	STP	Level	Depth (in)	Depth (cm)	Munsell	Soil Description	Cultural Material
TR 1	1	1	0-14	0-35	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	14-19	35-47	10YR4/6	Dark yellowish brown sandy clay	NCM
	2	1	0-45	0-18	10YR4/4	Dark yellowish brown silty sandy loam	NCM
		2	45-17	18-42	10YR4/6	Dark yellowish brown sandy clay	NCM
	3	2	0-10	0-24	10YR4/4	Dark yellowish brown silty sandy loam	NCM
		1	10-14	24-35	10YR4/6	Dark yellowish brown sandy clay	NCM
	4	1	0-7	0-17	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
	5	1	-	-	-	Not Excavated: Exposed Bedrock	
	6	1	0-4	0-10	10YR4/6	Dark yellowish brown sandy clay	NCM
		2	4-12	10-30	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
TR 2	7	1	-	-	-	Not Excavated: Slope >15%	
	8	1	0-12	0-30	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
	9	1	0-6	0-15	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
	10	1	-	-	-	Not Excavated: Slope >15%	
	11	1	-	-	-	Not Excavated: Slope >15%	
	12	1	0-12	0-30	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
TR 3	13	1	0-7	03	10YR3/4	Dark brown sandy loam, terminated at bedrock.	NCM
	14	1	0-18	0-33	10YR3/4	Dark brown sandy loam	NCM
		2	18-24	33-43	10YR4/6	Dark yellowish brown sandy clay	NCM
	15	1	-	-	-	Not Excavated: Slope >15%	
	16	1	0-4	0-10	10YR3/4	Dark brown sandy loam, terminated at bedrock.	NCM

Transect	STP	Level	Depth (in)	Depth (cm)	Munsell	Soil Description	Cultural Material
	17	1	0-20	0-25	10YR3/4	Dark brown sandy loam	NCM
		2	20-25	25-36	10YR4/6	Dark yellowish brown sandy clay	NCM
	18	1	0-14	0-25	10YR3/4	Dark brown sandy loam, terminated at bedrock.	NCM
TR 4	19	1	0-18	0-48	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	18-20	48-50	7.5YR5/4	Brown sandy clay	NCM
	20	1	0-10	0-25	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	10-14	25-35	10YR5/4	Yellowish brown sandy clay	NCM
	21	1	0-14	0-35	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	14-18	35-45	10YR5/4	Yellowish brown sandy clay	NCM
	22	1	0-9	0-23	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	9-10	23-25	10YR5/8	Brownish yellow sandy clay	NCM
	23	1	0-14	0-35	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	14-18	35-45	10YR5/6	Yellowish brown sandy clay	NCM
	24	1	0-12	0-30	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	12-14	30-35	10YR5/4	Yellowish brown sandy clay	NCM
TR 5	25	1	-	-	-	Not Excavated: Slope >15%	
	26	1	0-22	0-55	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
	27	1	0-6	0-14	10YR4/4	Dark yellowish brown silty sandy loam	NCM
		2	6-21	14-52	10YR4/6	Dark yellowish brown sandy clay	NCM
	28	1	0-24	0-60	10YR4/4	Dark yellowish brown silty sandy loam	NCM
		2	24-26	60-65	10YR4/6	Dark yellowish brown sandy clay	NCM
	29	1	0-11	0-28	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
	30	1	0-8	0-20	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM

Transect	STP	Level	Depth (in)	Depth (cm)	Munsell	Soil Description	Cultural Material
TR 6	31	1	0-14	0-35	10YR4/6	Dark yellowish brown sandy clay	NCM
		2	14-18	35-45	10YR4/4	Dark yellowish brown silty sandy loam	NCM
	32	1	-	-	-	Not Excavated: Surface Water	
	33	1	-	-	-	Not Excavated: Surface Water	
	34	1	-	-	-	Not Excavated: Surface Water	
	35	1	-	-	-	Not Excavated: Percolation Test Pit	
	36	1	-	-	-	Not Excavated: Percolation Test Pit	
TR 7	37	1	0-14	0-35	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	14-18	35-45	10YR5/6	Yellowish brown sandy clay	NCM
	38	1	0-12	0-30	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
TR 8	39	1	-	-	-	Not Excavated: Slope >15%	
	40	1	-	-	-	Not Excavated: Slope >15%	
	41	1	0-10	0-25	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	10-12	25-30	10YR5/6	Yellowish brown sandy clay	NCM
	42	1	0-12	0-30	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	12-16	30-40	10YR5/6	Yellowish brown sandy clay	NCM
	43	1	-	-	-	Not Excavated: Slope >15%	
	44	1	-	-	-	Not Excavated: Slope >15%	
TR 9	45	1	-	-	-	Not Excavated: Slope >15%	
	46	1	0-14	0-35	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	14-18	35-45	7.5YR5/4	Brown sandy clay	NCM
	47	1	0-10	0-25	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	10-16	25-40	10YR5/4	Yellowish brown sandy clay	NCM

Transect	STP	Level	Depth (in)	Depth (cm)	Munsell	Soil Description	Cultural Material
	48	1	0-9	0-23	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	9-12	23-30	10YR5/4	Yellowish brown sandy clay	NCM
	49	1	0-10	0-25	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	10-13	25-33	10YR5/4	Yellowish brown sandy clay	NCM
	50	1	0-6	0-15	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
TR 10	51	1	0-3	0-8	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
	52		-	-	-	Not Excavated: Slope >15%	
	53		-	-	-	Not Excavated: Exposed Bedrock	
	54		-	-	-	Not Excavated: Exposed Bedrock	
	55		-	-	-	Not Excavated: Exposed Bedrock	
	56		-	-	-	Not Excavated: Exposed Bedrock	
TR 11	57	1	0	0-27	10YR4/4	Dark yellowish brown silty sandy loam	NCM
		2	8-20	20-50	10YR4/6	Dark yellowish brown sandy clay	NCM
	58	1	-	-	-	Not Excavated: Exposed Bedrock	
	59	1	0-8	0-19	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
	60	1	0-8	0-17	10YR4/4	Dark yellowish brown silty sandy loam	NCM
		2	8-34	17-34	10YR4/6	Dark yellowish brown sandy clay	NCM
	61	1	-	-	-	Not Excavated: Exposed Bedrock	
	62	1	-	-	-	Not Excavated: Exposed Bedrock	
TR 12	63	1	0-14	0-35	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
	64	1	0-8	0-20	10YR4/4	Dark yellowish brown silty sandy loam	NCM
		2	8-14	20-35	10YR4/6	Dark yellowish brown sandy clay	NCM
	65	1	0-9	0-23	10YR4/4	Dark yellowish brown silty sandy loam	NCM

Transect	STP	Level	Depth (in)	Depth (cm)	Munsell	Soil Description	Cultural Material
		2	9-16	23-40	10YR4/6	Dark yellowish brown sandy clay	NCM
	66	1	0-6	0-15	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
	67	1	0-12	0-30	10YR4/4	Dark yellowish brown silty sandy loam	NCM
		2	12-18	30-45	10YR4/6	Dark yellowish brown sandy clay	NCM
	68	1	-	-	-	Not Excavated: Exposed Bedrock	
TR 13	69	1	0-10	0-25	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	10-12	25-30	10YR5/8	Brownish yellow sandy clay	NCM
	70	1	0-8	0-20	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
	71	1	-	-	-	Not Excavated: Slope >15%	
	72	1	-	-	-	Not Excavated: Slope >15%	
TR 14	73	1	0-10	0-25	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	10-13	25-33	7.5YR5/4	Brown sandy clay	NCM
	74	1	-	-	-	Not Excavated: Exposed Bedrock	
	75	1	0-7	0-18	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
	76	1	0-9	0-23	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	9-12	23-30	10YR5/8	Brownish yellow sandy clay	NCM
	77	1	0-9	0-23	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
TR 15	78		0-13	0-33	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
	79		-	-	-	Not Excavated: Percolation Test Pit	
	80		0-3	0-8	10YR4/4	Dark yellowish brown sandy loam, terminated at bedrock	NCM
	81		-	-	-	Not Excavated: Percolation Test Pit	
	82		-	-	-	Not Excavated: Percolation Test Pit	
TR 16	83	1	0-10	0-25	10YR4/4	Dark yellowish brown sandy loam	NCM

Transect	STP	Level	Depth (in)	Depth (cm)	Munsell	Soil Description	Cultural Material
		2	10-13	25-33	10YR5/8	Brownish yellow sandy clay	NCM

Transect	STP	Level	Depth (in)	Depth (cm)	Munsell	Soil Description	Cultural Material
	84	1	0-14	0-35	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	14-17	35-43	10YR5/8	Brownish yellow sandy clay	NCM
	85	1	0-9	0-23	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	9-13	23-33	10YR5/8	Brownish yellow sandy clay	NCM
	86	1	0-13	0-33	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	13-16	33-40	10YR5/8	Brownish yellow sandy clay	NCM
	87	1	0-12	0-30	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	12-15	30-38	10YR5/8	Brownish yellow sandy clay	NCM
TR 17	88	1	0-12	0-30	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	12-18	30-45	10YR5/8	Brownish yellow sandy clay	NCM
	89	1	0-14	0-35	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	14-20	35-50	10YR5/8	Brownish yellow sandy clay	NCM
	90	1	0-12	0-30	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	12-18	30-45	10YR5/8	Brownish yellow sandy clay	NCM
	91	1	0-36	0-90	10YR3/3 & 10YR5/6	Mottled brown and yellow coarse sand and gravel	NCM
	92	1	-	-	-	Not Excavated: Slope >15%	
TR 18	93	1	0-12	0-30	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	12-50	30-51	10YR5/8	Brownish yellow sandy clay	NCM
	94	1	0-7	0-16	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	7-14	16-34	10YR5/8	Brownish yellow sandy clay	NCM
	95	1	0-18	0-45	10YR4/4	Dark yellowish brown sandy loam	NCM
		2	18-22	45-55	10YR5/8	Brownish yellow sandy clay	NCM

Hidden Oak Conservation Subdivision
Tree Survey

Road Right-of-Way				
			Remove?	
Number	DBH	Species	x = yes	
1	10	Locust	x	
2	unk	Locust	x	
3	21	Locust	x	
4	21	Locust	x	
5	18	Locust	x	
6	16	Locust	x	double
7	17	Locust	x	
8	17	Locust	x	
9	6	Maple	x	
10	6	Locust	x	
11	28	Locust	x	
12	19	Locust	x	
13	10	Maple	x	
14	10	Maple	x	
15	7	Maple	x	
16	7	Maple	x	
17	7	Maple	x	
18	13	Maple	x	
19	8	Maple	x	
20	21	Locust	x	
21	6	Maple	x	
22	21	Locust	x	
23	16	Ash	x	
24	24	Locust	x	
25	9	Oak	x	
26	6	Oak	x	
27	17	Black Cherry	x	
28	6	Maple	x	
29	7	Maple	x	
30	19	Locust	x	
31	15	Locust	x	
32	14	Maple	x	
33	19	Locust	x	
34	22	Locust	x	
35	8	Oak	x	
36	8	Maple	x	
37	10	Maple		
38	6	Maple	x	
39	22	Maple	x	
40	23	Ash		
41	6	Maple	x	
42	6	Maple	x	
43	6	Maple	x	
44	7	Ash		
45	19	Ash		
46	6	Maple	x	
47	6	Maple	x	
48	6	Maple	x	
49	8	Maple	x	
50	8	Maple	x	
51	8	Maple	x	
52	6	Oak	x	
53	6	Oak	x	
54	25	Ash	x	
55	8	Maple	x	
56	8	Ash	x	
57	24	Ash	x	

Lot 1				
			Remove?	
Number	DBH	Species	x = yes	
1-1	13	Maple		
1-2	16	Maple	x	
1-3	10	Maple	x	
1-4	16	Locust	x	
1-5	15	Locust		
1-6	19	Maple		
1-7	18	Locust		
1-8	6	Black Cherry		
1-9	12	Maple		
1-10	6	Oak	x	
1-11	6	Maple	x	
1-12	10	Oak	x	
1-13	9	Maple		
1-14	12	Maple		
1-15	6	Maple		
1-16	18	Maple		
1-17	19	Maple		
1-18	9	Locust	x	
1-19	15	Locust	x	
1-20	14	Locust	x	
1-21	20	Locust	x	
1-22	10	Locust	x	
1-23	19	Locust	x	
1-24	20	Locust	x	
1-25	26	Ash	x	
1-26	16	Ash	x	triple
1-27	6	Oak	x	
1-28	22	Locust	x	
1-29	18	Locust	x	
1-30	8	Oak	x	
1-31	9	Oak	x	
1-32	26	Ash	x	
1-33	6	Oak	x	
1-34	8	Oak	x	
1-35	17	Ash	x	
1-36	7	Maple	x	
1-37	12	Oak	x	
1-38	6	Oak	x	
1-39	11	Locust	x	
1-40	11	Oak	x	
1-41	12	Oak		
1-42	11	Oak	x	
1-43	12	Locust	x	
1-44	10	Locust	x	
1-45	8	Ash	x	
1-46	10	Oak		
1-47	12	Locust		
1-48	11	Oak		
1-49	9	Locust		
1-50	8	Oak		
1-51	8	Locust		
1-52	11	Oak		
1-53	13	Locust		
1-54	12	Maple		
1-55	13	Locust		
1-56	unk	Locust		
1-57	11	Oak		

Lot 2				
			Remove?	
Number	DBH	Species	x = yes	
2-1	10	Maple		
2-2	14	Locust	x	
2-3	13	Locust		
2-4	10	Oak		
2-5	11	Locust		
2-6	11	Locust		
2-7	9	Maple		
2-8	13	Locust	x	
2-9	12	Locust	x	
2-10	6	Oak	x	
2-11	11	Locust	x	
2-12	10	Oak	x	
2-13	12	Black Cherry		
2-14	11	Oak	x	
2-15	7	Oak	x	
2-16	11	Locust	x	
2-17	9	Locust	x	
2-18	9	Locust	x	
2-19	11	Oak	x	
2-20	10	Oak	x	
2-21	7	Locust	x	
2-22	11	Locust	x	
2-23	10	Locust	x	
2-24	11	Oak	x	
2-25	13	Locust	x	
2-26	14	Oak		
2-27	14	Ash		
2-28	9	Ash		
2-29	7	Oak		
2-30	15	Oak	x	double
2-31	8	Oak	x	
2-32	14	Ash	x	
2-33	15	Ash	x	
2-34	12	Oak	x	
2-35	15	Ash	x	
2-36	13	Oak	x	
2-37	7	Maple	x	
2-38	7	Maple	x	
2-39	22	Ash	x	
2-40	6	Maple	x	
2-41	9	Ash	x	
2-42	7	Maple	x	
2-43	13	Ash	x	
2-44	6	Maple	x	
2-45	11	Ash	x	
2-46	7	Maple	x	
2-47	14	Ash	x	
2-48	17	Ash		
2-49	7	Oak		
2-50	17	Ash		double
2-51	11	Ash	x	
2-52	8	Ash	x	
2-53	6	Maple	x	
2-54	6	Maple	x	
2-55	6	Maple	x	
2-56	13	Ash	x	
2-57	9	Ash	x	

Lot 3				
			Remove?	
Number	DBH	Species	x = yes	
3-1	8	Maple		
3-2	14	Locust		
3-3	unk			
3-4	12	Ash		double
3-5	13	Locust		
3-6	15	Locust	x	
3-7	10	Oak	x	
3-8	16	Locust	x	
3-9	10	Ash	x	
3-10	8	Oak	x	
3-11	10	Locust	x	
3-12	16	Locust	x	
3-13	8	Oak	x	
3-14	17	Ash	x	
3-15	17	Ash	x	
3-16	6	Oak	x	
3-17	8	Locust		
3-18	8	Locust		
3-19	14	Locust		
3-20	14	Locust		
3-21	13	Locust		
3-22	7	Maple		
3-23	10	Maple		
3-24	10	Maple	x	
3-25	6	Oak	x	
3-26	8	Oak	x	
3-27	8	Oak	x	
3-28	13	Ash		
3-29	10	Locust		
3-30	16	Ash		
3-31	9	Oak		
3-32	10	Locust		
3-33	10	Ash	x	double
3-34	8	Maple	x	
3-35	18	Ash	x	
3-36	8	Locust	x	
3-37	20	Ash		
3-38	9	Maple		
3-39	9	Maple	x	
3-40	8	Maple		
3-41	8	Maple		
3-42	22	Ash		
3-43	12	Oak		
3-44	12	Ash		
3-45	18	Ash		
3-46	15	Oak		
3-47	9	Maple	x	
3-48	13	Ash		
3-49	8	Oak		
3-50	18	Oak	x	
3-51	11	Ash		
3-52	13	Ash		
3-53	18	Oak		
3-54	9	Oak	x	
3-55	unk	unk	x	
3-56	14	Oak	x	
3-57	8	Maple	x	

Open Space			
			Remove?
Number	DBH	Species	x = yes
4-1	13	Oak	x
4-2	6	Maple	x
4-3	10	Maple	x

Note: within open space, only trees to be removed were numbered

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Tree Survey

Road Right-of-Way				
			Remove?	
Number	DBH	Species	x = yes	
58	22	Ash	x	
59	8	Oak	x	
60	12	Maple	x	
61	7	Maple	x	
62	23	Locust	x	
63	24	Locust	x	
64	17	Oak	x	
65	20	Locust	x	
66	8	Maple	x	
67	20	Locust	x	
68	9	Black Cherry	x	
69	10	Oak	x	
70	10	Ash	x	
71	18	Locust	x	
72	19	Locust	x	
73	10	Oak	x	
74	12	Oak	x	
75	18	Ash	x	
76	10	Ash	x	
77	10	Ash	x	
78	14	Ash	x	
79	11	Ash	x	
80	12	Oak	x	
81	16	Locust	x	
82	8	Oak	x	
83	12	Ash	x	
84	6	Maple	x	
85	13	Ash	x	
86	15	Oak	x	
87	8	Oak	x	
88	7	Maple	x	
89	13	Ash	x	
90	13	Ash	x	
91	13	Oak	x	
92	10	Maple	x	
93	13	Locust	x	
94	15	Locust	x	
95	8	Maple	x	
96	12	Locust	x	
97	14	Oak	x	
98	13	Locust	x	
99	12	Locust	x	
100	11	Locust	x	double
101	14	Locust	x	
102	7	Maple	x	
103	7	Maple	x	
104	6	Maple	x	
105	15	Locust	x	
106	14	Locust	x	
107	8	Maple	x	
108	9	Maple	x	
109	12	Locust	x	
110	11	Locust	x	
111	6	Maple	x	
112	8	Maple	x	
113	6	Maple	x	
114	20	Ash	x	

Lot 1				
			Remove?	
Number	DBH	Species	x = yes	
1-58	12	Black Cherry		
1-59	7	Maple		
1-60	8	Oak		
1-61	8	Locust		
1-62	7	Locust		
1-63	10	Maple		
1-64	16	Ash		
1-65	12	Ash	x	
1-66	20	Ash	x	
1-67	22	Ash	x	
1-68	11	Oak	x	
1-69	7	Locust	x	
1-70	11	Locust	x	
1-71	8	Oak	x	
1-72	8	Locust	x	
1-73	16	Ash	x	triple
1-74	11	Ash	x	
1-75	12	Locust	x	
1-76	14	Ash	x	
1-77	13	Locust	x	
1-78	6	Maple	x	
1-79	7	Maple	x	
1-80	8	Locust	x	
1-81	21	Locust	x	
1-82	8	Maple		
1-83	7	Maple		
1-84	9	Maple		
1-85	24	Locust		
1-86	22	Black Cherry		
1-87	8	Maple		
1-88	13	Maple		
1-89	11	Locust		
1-90	9	Maple		
1-91	21	Maple		double
1-92	9	Maple		
1-93	6	Maple		
1-94	9	Maple		
1-95	16	Maple		
1-96	8	Maple		
1-97	24	Maple		
1-98	15	Ash		
1-99	20	Ash		
1-100	14	Maple		
1-101	13	Locust		
1-102	6	Maple		
1-103	8	Maple		
1-104	9	Maple		
1-105	6	Maple		
1-106	30	Ash		
1-107	26	Ash	x	
1-108	38	Ash	x	
1-109	20	Ash	x	
1-110	14	Ash	x	
1-111	15	Maple	x	
1-112	20	Locust		
1-113	14	Locust		
1-114	8	Locust		
1-115	15	Hickory		
1-116	6	Ash		

Lot 2				
			Remove?	
Number	DBH	Species	x = yes	
2-58	17	Maple		
2-59	12	Maple		
2-60	12	Ash	x	double
2-61	18	Ash		double
2-62	13	Oak		
2-63	12	Ash		
2-64	7	Oak	x	
2-65	7	Hickory	x	
2-66	12	Ash	x	double
2-67	15	Ash	x	
2-68	7	Oak		
2-69	11	Oak	x	
2-70	11	Oak		
2-71	7	Hickory	x	
2-72	14	Black Cherry		triple
2-73	20	Oak	x	
2-74	12	Black Cherry		
2-75	13	Ash	x	
2-76	10	Ash	x	
2-77	10	Ash	x	
2-78	6	Fagus	x	
2-79	9	Ash		
2-80	9	Ash		
2-81	14	Ash		
2-82	9	Fagus	x	
2-83	10	Ash		
2-84	6	Oak		
2-85	12	Ash		
2-86	14	Ash		
2-87	18	Ash		
2-88	12	Ash		
2-89	11	Ash		
2-90	11	Ash		
2-91	16	Ash		
2-92	12	Ash		
2-93	13	Ash	x	
2-94	11	Ash	x	
2-95	12	Ash		
2-96	6	Oak		
2-97	7	Oak		
2-98	14	Ash		
2-99	14	Ash		double
2-100	8	Maple		
2-101	12	Ash		
2-102	13	Ash		
2-103	9	Ash		
2-104	14	Ash		double
2-105	10	Ash		double
2-106	13	Ash		
2-107	13	Ash		
2-108	11	Ash		
2-109	10	Oak		
2-110	17	Ash		
2-111	13	Ash		
2-112	6	Maple		
2-113	24	Ash		
2-114	14	Ash		
2-115	6	Maple		
2-116	11	Ash		

Lot 3				
			Remove?	
Number	DBH	Species	x = yes	
3-58	8	Oak		
3-59	6	Oak	x	
3-60	14	Oak	x	
3-61	11	Ash	x	
3-62	9	Oak	x	
3-63	10	Ash	x	
3-64	14	Ash	x	
3-65	14	Ash	x	
3-66	16	Oak	x	
3-67	9	Oak	x	
3-68	15	Oak	x	
3-69	9	Oak	x	
3-70	9	Oak	x	
3-71	15	Oak	x	
3-72	13	Ash	x	
3-73	15	Ash	x	
3-74	12	Oak	x	
3-75	12	Oak	x	
3-76	7	Oak	x	
3-77	8	Maple	x	
3-78	8	Maple	x	
3-79	11	Ash	x	
3-80	8	Maple	x	
3-81	8	Ash	x	
3-82	7	Maple	x	
3-83	13	Locust	x	
3-84	14	Locust		
3-85	13	Locust	x	
3-86	13	Locust	x	
3-87	7	Cedar		
3-88	12	Maple		
3-89	11	Maple		
3-90	12	Locust		
3-91	13	Locust		
3-92	16	Oak		
3-93	10	Oak		
3-94	8	Oak	x	
3-95	11	Oak	x	
3-96	12	Ash	x	
3-97	15	Ash	x	
3-98	12	Ash	x	
3-99	8	Oak	x	
3-100	13	Ash	x	
3-101	12	Ash	x	
3-102	16	Ash	x	
3-103	unk		x	
3-104	unk		x	
3-105	14	Ash	x	
3-106	15	Ash	x	
3-107	16	Ash	x	
3-108	12	Ash	x	
3-109	15	Ash	x	
3-110	unk		x	
3-111	11	Ash	x	
3-112	9	Ash	x	
3-113	10	Maple	x	
3-114	6	Fagus	x	
3-115	13	Oak	x	
3-116	25	Oak	x	

Open Space			
			Remove?
Number	DBH	Species	x = yes

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Tree Survey

Road Right-of-Way				
			Remove?	
Number	DBH	Species	x = yes	

Lot 1				
			Remove?	
Number	DBH	Species	x = yes	
1-117	16	Locust		
1-118	18	Locust	x	
1-119	13	Locust	x	
1-120	13	Maple	x	
1-121	11	Locust	x	
1-122	18	Locust	x	
1-123	14	Locust	x	
1-124	17	Locust	x	
1-125	10	Maple	x	
1-126	9	Locust	x	
1-127	8	Locust	x	
1-128	17	Locust	x	
1-129	9	Black Cherry	x	
1-130	12	Black Cherry	x	
1-131	11	Locust	x	
1-132	12	Locust	x	
1-133	15	Maple	x	
1-134	7	Locust	x	
1-135	10	Locust		
1-136	20	Locust	x	
1-137	9	Oak	x	
1-138	7	TOH	x	
1-139	7	Black Cherry		
1-140	5	Black Cherry		
1-141	6	Black Cherry	x	
1-142	6	Black Cherry	x	
1-143	5	Black Cherry	x	
1-144	5	Black Cherry	x	
1-145	10	Locust	x	
1-146	15	Maple	x	
1-147	13	Locust	x	
1-148	11	Locust	x	
1-149	16	Maple	x	
1-150	11	Locust	x	
1-151	16	Black Cherry	x	
1-152	12	Locust	x	
1-153	13	Maple	x	
1-154	11	Locust	x	
1-155	7	Maple	x	
1-156	7	Oak		
1-157	11	Oak		
1-158	9	Ash	x	double
1-159	7	Hickory		
1-160	6	Black Cherry	x	
1-161	16	Maple	x	
1-162	18	Maple		
1-163	26	Maple		
1-164	25	Locust		
1-165	11	Maple		
1-166	6	Maple		
1-167	13	Black Cherry		
1-168	18	Locust		
1-169	8	Maple		
1-170	6	Maple		
1-171	9	Maple		
1-172	15	Maple		
1-173	9	Maple		
1-174	16	Ash		
1-175	23	Ash		

Lot 2				
			Remove?	
Number	DBH	Species	x = yes	
2-117	6	Maple		
2-118	15	Ash		
2-119	6	Maple		
2-120	6	Maple		
2-121	15	Ash		
2-122	7	Maple		
2-123	7	Maple		
2-124	6	Fagus		
2-125	16	Oak		double
2-126	8	Fagus		
2-127	10	Ash		
2-128	6	Maple		
2-129	6	Maple		
2-130	13	Ash		
2-131	6	Oak		
2-132	6	Fagus	x	
2-133	14	Maple		
2-134	7	Fagus		
2-135	12	Hickory		
2-136	6	Oak		
2-137	7	Maple		
2-138	16	Ash	x	
2-139	7	Maple	x	
2-140	7	Maple	x	
2-141	8	Fagus	x	
2-142	24	Oak	x	
2-143	6	Oak	x	
2-144	10	Ash	x	
2-145	12	Ash	x	
2-146	7	Oak	x	
2-147	8	Oak	x	
2-148	15	Ash	x	
2-149	12	Maple	x	
2-150	14	Ash	x	
2-151	12	Hickory		
2-152	7	Fagus		
2-153	9	Maple		
2-154	20	Ash		
2-155	7	Oak		
2-156	11	Oak		
2-157	7	Maple		
2-158	14	Ash		
2-159	8	Oak		
2-160	7	Fagus	x	
2-161	13	Oak	x	
2-162	10	Locust	x	
2-163	14	Ash	x	
2-164	11	Oak	x	
2-165	15	Locust	x	
2-166	8	Maple		
2-167	13	Oak		
2-168	11	Oak		
2-169	7	Oak	x	
2-170	14	Oak	x	
2-171	6	Maple	x	
2-172	10	Locust	x	
2-173	12	Oak	x	
2-174	9	Locust		
2-175	15	Oak		

Lot 3				
			Remove?	
Number	DBH	Species	x = yes	
3-117	12	Black Cherry	x	double
3-118	9	Hickory	x	
3-119	9	Oak	x	
3-120	10	Oak	x	
3-121	16	Maple	x	double
3-122	9	Black Cherry	x	
3-123	9	Black Cherry	x	
3-124	16	Ash	x	
3-125	11	Black Cherry	x	
3-126	16	Maple		double
3-127	9	Oak		
3-128	6	Oak		
3-129	9	Cedar		
3-130	7	Cedar		
3-131	12	Oak		
3-132	11	Oak		
3-133	15	Black Cherry		double
3-134	11	Oak		
3-135	15	Oak		
3-136	9	Black Cherry		
3-137	14	Maple		
3-138	16	Maple		
3-139	6	Black Cherry	x	
3-140	10	Hickory	x	
3-141	15	Ash	x	
3-142	7	Fagus	x	
3-143	10	Black Cherry	x	
3-144	12	Black Cherry	x	
3-145	7	Black Cherry	x	
3-146	8	Oak		
3-147	14	Maple	x	double
3-148	11	Oak	x	
3-149	7	Oak	x	
3-150	14	Oak	x	
3-151	15	Oak	x	
3-152	15	Tulip	x	
3-153	12	Fagus	x	
3-154	14	Oak		
3-155	6	Maple	x	
3-156	16	Oak		
3-157	12	Maple		double
3-158	11	Oak		
3-159	6	Oak	x	
3-160	6	Oak	x	
3-161	10	Ash	x	
3-162	18	Ash	x	
3-163	8	Oak	x	
3-164	11	Hickory	x	
3-165	11	Hickory	x	
3-166	11	Oak	x	
3-167	7	Oak	x	
3-168	18	Ash	x	
3-169	12	Hickory	x	
3-170	7	Hickory	x	
3-171	10	Hickory	x	
3-172	14	Ash	x	
3-173	8	Oak	x	
3-174	10	Hickory	x	
3-175	11	Oak	x	double

Open Space			
			Remove?
Number	DBH	Species	x = yes

Date: 10/14/2016

Hidden Oak Conservation Subdivision
Tree Survey

Road Right-of-Way				
			Remove?	
Number	**DBH**	**Species**	x = yes	

Lot 1				
			Remove?	
Number	**DBH**	**Species**	x = yes	
1-176	11	Maple	x	
1-177	9	Oak	x	
1-178	9	Maple	x	
1-179	16	Locust	x	

Lot 2				
			Remove?	
Number	**DBH**	**Species**	x = yes	
2-176	14	Black Cherry		
2-177	8	Maple		
2-178	10	Oak		
2-179	7	Oak		
2-180	11	Oak		
2-181	7	Locust		
2-182	11	Locust		
2-183	10	Oak		
2-184	9	Locust		
2-185	9	Locust		
2-186	8	Oak		
2-187	13	Locust		
2-188	9	Locust		
2-189	6	Hickory		
2-190	8	Oak		
2-191	15	Ash		
2-192	9	Oak		

Lot 3				
			Remove?	
Number	**DBH**	**Species**	x = yes	
3-176	14	Hickory	x	
3-177	11	Fagus	x	
3-178	8	Maple	x	
3-179	10	Fagus	x	
3-180	8	Ash	x	
3-181	8	Oak		
3-182	10	Maple		
3-183	14	Oak	x	
3-184	18	Ash		
3-185	13	Ash		
3-186	13	Black Cherry		
3-187	13	Oak		
3-188	12	Ash		
3-189	10	Oak		
3-190	7	Hickory		double
3-191	25	Tulip	x	
3-192	7	Tulip	x	
3-193	7	Oak	x	
3-194	9	Oak		
3-195	7	Oak	x	
3-196	18	Oak	x	
3-197	11	Oak	x	
3-198	6	Oak		
3-199	18	Ash		
3-200	8	Ash		
3-201	12	Ash	x	double
3-202	14	Ash		
3-203	12	Oak		
3-204	7	Fagus	x	
3-205	14	Oak	x	
3-206	12	Oak	x	
3-207	12	Oak		double
3-208	7	Oak		double
3-209	14	Fagus	x	
3-210	15	Oak	x	
3-211	11	Oak	x	
3-212	14	Maple	x	double
3-213	6	Fagus	x	

Open Space			
			Remove?
Number	**DBH**	**Species**	x = yes

Tree Removal Summary

	R.O.W.	**Lot 1**	**Lot 2**	**Lot 3**	**Open Space**
All regulated trees (≥ 8" DBH)	84	74	59	117	3
Specimen trees (≥ 24" DBH)	6	4	1	2	0

Note: all regulated trees includes specimen trees

Date: 10/14/2016

Environmental Protection

Emily Lloyd
Commissioner

Paul V. Rush, P.E.
Deputy Commissioner
Bureau of Water Supply
prush@dep.nyc.gov

465 Columbus Avenue
Valhalla, NY 10595
T: (914) 742-2001
F: (914) 742-2027

June 6, 2016

Alan L. Pilch, P.E., R.L.A.
Evans Associates Environmental Consulting, Inc.
205 Amity Road
Bethany, CT 06524

Re: Hidden Oak Subdivision – SWPPP
Hidden Oak Road, (T) North Castle
TM # 107.01-1-32
Kensico Reservoir Basin
DEP Log # 2014-KE-0108-SP.1

Dear Mr. Pilch:

This letter is to inform you that your application to engage in the above referenced regulated activity pursuant to the "Rules and Regulations for the Protection from Contamination, Degradation and Pollution of the New York City Water Supply and Its Sources" (Regulations) was approved on June 6, 2016.

The Department reserves the right to modify, suspend or revoke this approval based on the grounds set forth in Section 18-26 of the Regulations. The activity proposed in your application only applies to the terms of this approval and is subject to the Regulations cited above. Failure to comply with the conditions of the approval may be the cause for suspension of this approval and initiation of an enforcement action. Should modification, suspension or revocation of an approval be necessary, the Department will notify the regulated party, via certified mail or personal service prior to modifying, suspending or revoking the approval. The notice will state the alleged facts or conduct which appear to warrant the intended action and explain the procedures to be followed.

The Regulations provide that an applicant may appeal the imposition of a substantial condition in an approval by filing a petition, in writing, with NYCDEP and with the New York City Office of Administrative Trials and Hearings (OATH) within thirty days of the date this determination was mailed.

NYCDEP may inspect and monitor the erosion control practices at the project site during construction. Therefore, a pre-construction meeting must be held at least two days prior to the start of any work. The owner, design professional, contractor and NYCDEP personnel must attend.

Please contact Mary Galasso at (914) 773 – 4440 to schedule this pre-construction meeting.

Sincerely,

Mary P. Galasso
Supervisor
Stormwater Programs EOH

c: McKenna Custom Homes, Owner, mckennacustom@optonline.net
A. Kaufman, (T) North Castle Planning (w/enc.) - planning@northcastleny.com
Armand DeAngelis, NYSDEC - armand.deangelis@dec.ny.gov

New York City
Department of Environmental Protection

STORMWATER POLLUTION PREVENTION PLAN DETERMINATION

Pursuant to the authority granted under:

Article 11 of the New York State Public Health Law;

Rules and Regulations For The Protection From Contamination, Degradation and Pollution Of The New York City Water Supply and Its Sources, 15 RCNY Chapter 18, 10 NYCRR Part 128.

New York City Department of Environmental Protection makes the following determinations with respect to the stormwater pollution prevention plan described below:

Name of Project: Hidden Oak Subdivision

Location: Hidden Oak Road
(T) North Castle, Westchester County, New York
Tax Map # 107.01-1-32

Owner: Kevin McKenna
McKenna Custom Homes

Address: 343 Manville Road
Pleasantville, NY 10570

Drainage Basin: Kensico Reservoir

General Description:

The proposed project is a three lot residential subdivision on approximately 7.7 aces. The lots will be served by individual subsurface sewage treatment systems and wells. Stormwater management practices include underground infiltration systems, a bioretention practice, a vegetated swale, and an extended detention stormwater wetland. Proprietary devices units will provide pretreatment for infiltration and bioretention practices. Runoff reduction will be achieved using infiltration, rain gardens, and tree planting.

Date(s) of site inspection:

May 14, 2014 and November 11, 2014

(XX) Approved ( ) Denied

Conditions of Approval:

This approval is granted with the following conditions:

- The regulated activity must be conducted in compliance with the plans as approved, listed in Appendix A, all applicable accepted standards, and all applicable laws, rules and regulations.
- Any alteration or modification of the SWPPP must be approved by DEP prior to implementation; DEP may opt to issue an amended SWPPP Determination.
- The applicant must schedule a pre-construction conference prior to the start of construction. Present at the meeting should be the applicant, the design engineer, the general contractor, and DEP staff.
- The applicant must notify DEP at least forty-eight (48) hours prior to the commencement of construction activity so that compliance inspections may be scheduled by DEP.
- All erosion and sediment controls must be properly installed and maintained until the site has been stabilized and the risk of erosion eliminated. Final stabilization is defined in the General Permit as all soil disturbing activities at the site have been completed, and that a uniform perennial vegetative cover with a density of 80% cover for the area has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed.
- The applicant is required to submit as-built drawings for all stormwater management and water quality facilities.
- The stormwater management and water quality facilities must be maintained in accordance with the maintenance schedule included in the SWPPP as approved by DEP.
- This approval shall expire and thereafter be null and void unless construction is completed within Five (5) years of the date of issuance or within any extended period of time approved by DEP upon good cause shown.
- In the event that the material submitted is inaccurate or misleading, this approval is not valid and construction of this project is in violation of DEP regulations
- Failure to comply with any of the conditions of this approval is a violation of this approval and the *Rules and Regulations For The Protection From Contamination, Degradation and Pollution Of The New York City Water Supply and Its Sources.*

- This approval and all conditions of the approval are binding on the owner of the property where the facility is to be located. Any references to the "applicant" in this approval or in any conditions of this approval shall be deemed to refer to the owner of such property.

- If the applicant sells or otherwise transfers title of Hidden Oak Subdivision before all construction planned for the property is completed and the site is stabilized, the applicant shall require the new owner ("Buyer") to comply with the SWPPP approved by the New York City Department of Environmental Protection on June 6, 2016 including, but not limited to, conservation easements, negative covenants, all provisions relating to erosion and sediment control during construction and to all maintenance of the stormwater management facilities once construction is complete. In particular, the applicant shall provide the Buyer with a copy of the SWPPP and shall cause the following real covenants and restrictions to be recorded with the deed for Hidden Oak Subdivision with the following provisions:

  (1) Buyer hereby acknowledges, covenants, warrants, and represents that he/she shall install and maintain any and all erosion controls and stormwater management facilities on the premises in accordance with the SWPPP, such SWPPP being attached hereto as Exhibit __.

  (2) Buyer's installation and maintenance of the erosion control and stormwater management facilities shall be for the benefit of the City of New York as well as for the owners of Hidden Oak Subdivision.

  (3) Buyer's obligation to install and maintain any and all erosion controls and stormwater management facilities on the premises in accordance with the attached SWPPP shall be perpetual, shall run with the land, and shall be binding on Buyer's heirs, successors, and assigns.

  (4) Buyer hereby covenants, warrants and represents that any lease, mortgage, subdivision, or other transfer of Hidden Oak Subdivision SWPPP, or any interest therein, shall be subject to the restrictive covenants contained herein pertaining to the installation and maintenance of erosion control and stormwater management facilities, and any deed, mortgage, or other instrument of conveyance shall specifically refer to the attached SWPPP and shall specifically state that the interest thereby conveyed is subject to covenants and restrictions contained herein.

- Prior to conveying title to Hidden Oak Subdivision, the applicant shall submit to the New York City Department of Environmental Protection a proposed deed containing the aforementioned real covenants and restrictions.

This approval and all conditions of the approval are binding on the owner of the property where the stormwater management facilities are to be located. Any references to the "applicant" in this approval or in any conditions of this approval shall be deemed to refer to the owner of such property.

Date: June 6, 2016

Determination made by:

Mary P. Galasso
Supervisor
Stormwater programs, EOH
DEP Regulatory and Engineering Programs

This determination letter must be maintained by the applicant and be readily available for inspection at the construction site.

APPENDIX A

The following documents were prepared by Evans Associates Environmental Consulting, Inc., for Hidden Oak Subdivision:

1. Stormwater Pollution Prevention Plan report dated March 1, 2016.

2. Drawing CS-1 entitled "Cover Sheet" dated July 15, 2014, last revised March 1, 2016.

3. Drawing IPP-1 entitled "Integrated Plot Plan/Subdivision Layout" dated July 15, 2014, last revised March 1, 2016.

4. Drawing S-2 entitled "Grading & Utilities Plan" dated July 15, 2014, last revised March 1, 2016.

5. Drawing SP-3.1 entitled "Phase 1: Erosion & Sediment Control Plan/Tree Removal and Protection Plan" dated July 15, 2014, last revised March 1, 2016.

6. Drawing SP-3.2 entitled "Phase 2: Erosion & Sediment Control Plan/Tree Removal and Protection Plan" dated July 15, 2014, last revised March 1, 2016.

7. Drawing SP-4 entitled "Slopes Map" dated July 15, 2014, last revised July 24, 2015.

8. Drawing SP-5 entitled "Landscape Plan" dated July 14, 2014, last revised March 1, 2016

9. Drawing DE-1 entitled "Construction Details" dated July 15, 2014, last revised March 1, 2016.

10. Drawing DE-2 entitled "Construction Details" dated May 30, 2014, last revised March 1, 2016.

11. Drawing DE-3 entitled "Construction Details" dated November 17, 2014, last revised July 24, 2015.

12. Drawing DE-4 entitled "Construction Details/Erosion Control Notes" dated April 9, 2015, last revised March 1, 2016.

13. Drawing DE-5 entitled "Construction Details/Maintenance Plan" dated August 25, 2015, last revised March 1, 2016.

DEED
OF CONSERVATION EASEMENT

This Indenture, made the day of 2021 between

MCKENNA CUSTOM HOMES, INC., 433 Manville Road, Pleasantville, New York 10570 party of the first part, and

TOWN OF NORTH CASTLE, a municipal corporation of the State of New York, 15 Bedford Road, Armonk, New York 10510 party of the second part,

WITNESSETH, that the said party of the First Part in consideration of the sum of ONE DOLLAR and other good and valuable consideration, paid by the party of the Second Part, does hereby grant and release unto the party of the Second Part, its successors and assigns forever, a conservation easement extending in and through a certain property of the party of the First Part, situate, lying and being in the Town of North Castle, County of Westchester and State of New York which easement is more particularly bound and described in SCHEDULE "A" annexed hereto and made a part hereof.

WHEREAS, the party of the First Part hereby desires to grant to the party of the Second Part the right to preserve and protect the conservation values described herein by encumbering the Property with a conservation easement pursuant to the provision of New York Conservation Law, Article, 49, Title 3; and

WHEREAS, the Grantee agrees to accept this conservation easement and honor the intentions of the Grantee as stated herein and to preserve and protect the Property in perpetuity according to the terms of this easement for the benefit of this and future generations.

NOW THEREFORE, in consideration of the foregoing and the mutual covenants terms, conditions and restrictions contained herein, the Grantor hereby voluntarily grants and conveys to Grantee a conservation easement in perpetuity over the Property of the nature and character and to the extent set forth herein.

1. Purpose. It is the purpose of this easement to ensure the open natural character and to protect it from development. This easement shall prevent any use of the property that will impair or interfere with the conservation values of the property by restricting use of the property as provided herein.

2. Prohibited Uses and Restrictions. Any activity on or use of the property, beyond what is depicted on the approved subdivision plans, is inconsistent with the purpose of this conservation easement and is prohibited. Without limiting the generality of the foregoing provision, the following restrictions specifically apply to the property:

a. No quarry, gravel pit, surface or subsurface mining or drilling, or other mining or drilling activities prohibited under applicable provisions of Section 170(h) of the Internal Revenue Code shall be permitted on or under the Property.

b. No dumping or storage of ashes, non-composted organic waste, sewage, garbage, or any toxic or offensive materials shall be allowed in the Property.

c. No more than *de minimus* recreational activities may be conducted on the Property.

d. Notwithstanding any other restriction contained herein, the owner of the Property (or any relevant part thereof) or the Grantee may take such actions with respect to the Property as are necessary to protect the health and safety of the public and the persons using the Property; provided that if any such action is contrary to a restriction contained herein, the action shall be limited to the minimum variation necessary to afford the required protection.

3. Rights Conveyed to Grantee. To accomplish the purposes of this easement, the following rights are conveyed to the Grantee by this easement.

a. The right to preserve and protect the conservation values of the Property.

b. The right to enter upon the Property at reasonable times in order to monitor compliance and otherwise enforce the terms of this easement. Grantee shall provide Grantor or Grantor's successors, reasonable notice of such entry unless Grantee determines that immediate entry is required to prevent, terminate or migrate violation of this easement.

Commented [pb1]: terms

c. The right to prevent any activity on, incursion into, or use of the property that is inconsistent with the purpose of this easement, and to require the restoration of such areas or features of the property that are damaged by any inconsistent activity or use pursuant to the remedies set forth herein.

d. The right, but not the obligation to cut, remove and plant trees and to maintain and/or improve the wetlands and other natural habitat on the Property.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives and successors in interest with respect to the Property, all rights accruing from its ownership of the Property, including, without limitation, the right to sell or transfer the Property, as owner, subject to the restrictions and covenants set forth herein this easement; and the right to engage in, or permit others to engage in, all uses of the property that are not expressly prohibited herein and are not inconsistent with in addition, any other provisions of this easement to the contrary notwithstanding, Grantor specifically reserves for itself and its successors in interest with respect to the Property, and they shall enjoy, the following rights with respect to the Property:

a. Grantor specifically reserves the right to control access to the property except that specifically granted to Grantee for purpose of monitoring compliance with this easement, and no right of access to the general public to any portion of the Property is conveyed by this easement.

b. Grantor reserves for itself, its assigns, representatives and successors the right to maintain the discharge swale from Stormwater Management Facility Basin 1 (SWMB #1) for FDA-1.3, and Level Spreader LS-1.

5. Enforcement.

a. Notice. If Grantee determines that a violation of this easement has occurred or is threatened, Grantee shall give written notice to Grantor of such violation and demand that corrective action sufficient to cure the violation be taken. Where the violation involves injury to the property resulting from any use inconsistent with the terms or the purpose of this conservation easement, Grantee shall demand that Grantor restore the Property to its prior condition in accordance with a plan approved by the Grantee.

b. Injunctive Relief. If, Grantor fails to cure the violation within 30 days after receipt of notice of a violation from Grantee, or, where the violation cannot reasonably be cured within a 30 day period, Grantor fails to begin curing such violation within a 30 day period, or Grantor fails to diligently continue to cure such violation until it is cured, Grantee may bring action-at law or inequity in a court of competent jurisdiction to enforce the terms of this easement, to enjoin the violation by temporary or permanent injunction, and to require the restoration of the property to the condition that existed prior to any such injury.

c. Damages. Grantee shall be entitled to recover damages for a violation of the terms of this easement or for injury to any of the conservation values protected by this easement, including, without limitation, damages for loss of scenic, aesthetic, or environmental values. Without limiting Grantor's liability therefore, Grantee may, in its sole discretion, apply any damages recovered to the costs of undertaking any corrective action on the Property.

e. Costs of Enforcement. All reasonable costs of enforcing the terms of this easement against Grantor, including but not limited to the costs and expenses of legal action, reasonable attorney's fees, and any costs involved in the restoration of the Property resulting from Grantor's violation of the terms of this easement, shall be borne by Grantor unless Grantor ultimately prevails in judicial enforcement, in which case each party shall bear its own costs.

f. Forbearance. Forbearance or delay by Grantee in the exercise of any of its rights to the terms of this easement shall not be deemed a waiver of such rights or of any of the terms of the easement. Grantors hereby waive any defense of laches, estoppel or prescription.

g. Acts Beyond Grantor's Control. Grantee shall have no cause of action under this easement against Grantor for injury or damage to the property which is beyond Grantor's control, including, without limitation, flood, fire, wind, storms, or earth movement, or from any prudent action taken by Grantor, under emergency conditions, to prevent, abate or mitigate significant injury to the Property or adjacent properties from such causes.

6. **Notices and Approvals.** Grantor agrees to give Grantee written notice before exercising any reserved right, the exercise of which may have an adverse impact on the conservation interests of this conservation easement. Grantor further agrees to notify Grantee of any conveyance, lease or transfer of the Property, such notice to be given in writing at least twenty (20) days in advance of such conveyance, lease or transfer. The failure to give such notice shall not, however, invalidate the conveyance, lease or transfer. When Grantee's or Grantor's approval is required for any action or activity allowed by this easement to be taken only with approval such approval shall be in writing and signed by both parties to this easement agreement or their successors. Any notice required by this easement shall be deemed given when received or three days after being mailed by certified or registered mail, return receipt requested, postage prepaid, properly addressed as follows: (a) if to Grantee, at address set forth above; (b) if to Grantor, at the address set forth above; (c) if to any subsequent owner, at the address provided by notice to Grantee of transfer of the property as required by this paragraph. Any party may change the address to which notices are to be sent to him, her or it by duly giving notice pursuant to this paragraph.

7. Costs and Liabilities. Grantors shall retain all responsibilities and shall bear all costs and liabilities of any kind related to the ownership, operation, upkeep and maintenance of the Property. Grantor shall remain solely responsible for obtaining any applicable governmental permits and approvals for any construction or other activity or use permitted by this easement, and all such construction and other such activity or use shall be undertaken in accordance with all applicable federal, state and local laws, regulations and requirements. Grantor shall keep the Property free of all liens arising out of any work performed for materials furnished to, or obligations incurred by Grantor.

8. Taxes. Grantor shall pay before delinquency all taxes, assessments, fees and charges of whatever including any taxes imposed upon or incurred as result of this easement and shall furnish Grantee with evidence of such payment upon request.

9. Amendment. This conservation easement may be amended upon written consent of Grantee and alter the restrictions on use or permitted structure of this conservation easement. Any such amendment, variance or waiver shall be consistent with the basic purpose of this conservation easement.

10. Recordation. Grantee shall record this instrument in a timely fashion in the official records of the office of the Clerk of the County of Westchester Division of Land Records.

11. Assignment. Grantee's rights and obligations under this conservation easement may be assigned only to an organization that is a qualified organization under Section 170(11) of the Internal Revenue Code (or any successor provision then applicable) and is not-for-profit conservation corporation or other entity authorized to take title to a conservation easement under New York Environmental Law, Article 49, Title 3, and which agrees to continue to carry out the conservation progress of this conservation easement. Any assignee other than a governmental unit in the County of Westchester, must be an entity able to enforce this conservation easement, having purposes similar to those of Grantee and which encompass those of this conservation easement. Grantee agrees to provide Grantor notice of any assignment 20 days prior to any assignment Failure to provide such notice prior to assignment shall not affect the validity of the assignment, nor shall it impair the validity of this easement or limit its enforceability in any way.

12. Subsequent Transfers. Any subsequent conveyance of any interest in the Property, including without limitation, transfer, lease or mortgage, shall be subject to this conservation easement, and any deed, lease, mortgage or other instrument evidencing or effecting such conveyance shall contain language substantially as follows: "This [conveyance, lease, mortgage, easement, etc.] is subject to a Conservation Easement which runs with the land and which was granted to the Town of North Castle by instrument dated and recorded in the office of the Clerk of Westchester County, Control Number: . The failure to include such language in any deed or instrument shall not affect the validity or enforceability of this conservation easement.

13. Binding Effect. The provisions of this conservation easement shall run with the Property in perpetuity and shall bind and be enforceable against the Grantor and all future owners and any party entitled to possession or use of the Property or any portion thereof while such party is the owner or entitled to possession or use thereof. As used in this conservation easement, the term "owner" included the owner of any beneficial equitable interest in the Property or any portion thereof; the term "Grantor" includes the original Grantor, his, her or their heirs, successors and assigns, all future owners of all or any portion of the Property, and any party entitled to possession or use thereof; and the term "Grantee" includes the original Grantee and its successors and assigns. Notwithstanding the foregoing, upon any transfer of title, the transferor shall cease being a Grantor or owner for purpose of this conservation easement and shall have no further responsibility or liability hereunder for acts done or conditions arising thereafter, but the transferor shall remain liable for earlier acts and conditions. The obligations imposed on Grantor by this agreement shall be joint and several.

14. Extinguishment. If circumstances arise in the future that make the purpose of this easement impossible to accomplish, and if this Easement of any of its restrictions are extinguished by judicial proceeding, then, upon any subsequent sale, exchange or involuntary conversion by the Grantor, the Grantee shall be entitled to that portion of the proceeds equal to the proportionate value of the conservation restrictions as provided immediately below. For such purposes only, grantor agrees that the donation/conveyance of this Conservation Easement to Grantee gives rise to a property right, immediately vested in Grantee, with a fair market value that is equal to the proportionate value that the conservation restrictions hereby created at the date hereof bears to the value of the Property as a whole at the date hereof (subject to reasonable adjustment to the extent permissible under Section 170(h) of the Internal Revenue Code for any improvements which may hereafter be made on the Property). Grantee agrees to use it share of such proceeds in a manner consistent with the conservation purposes of this conservation easement.

15. Condemnation. If all or any part of the property is taken by the exercise of the power of eminent domain, or acquired by purchase in lieu of condemnation, whether by public, corporate or other authority, so as to terminate this easement, in whole or in part, Grantor and Grantee shall act jointly to recover the full value of the interests in the Property subject to the taking or in lieu purchase and all direct or incidental damages resulting therefrom. All expenses reasonably incurred by Grantors or Grantees in connection with the taking or in lieu purchase shall be paid out of the amount recovered. Grantee's share of the balance of the amount recovered shall be determined by multiplying that balance by the ration set forth in paragraph 14.

16. Further Acts. Each party shall perform any further acts and execute and deliver any documents, including amendments to this conservation easement, which may be reasonably necessary to carry out its provisions or which are necessary to qualify this instrument as a conservation easement under Article 49, Title 3, of the Conservation Law or any regulations promulgated pursuant thereto.

17. Severability. Invalidation of any provision of this conservation easement by Court Judgment, Order, Statute or otherwise shall not affect any other provisions, which shall be and remain in force and effect.

18. Interpretation. This instrument in intended to create a "qualified real property interest" for "conservation purposes" as defined in Section 170(h) of the Internal Revenue Code, and shall be interpreted consistently with such intention. In the event that any provision has been omitted from this instrument which is necessary to qualify the interest hereby granted as such a "qualified real property interest" for "conservation purposes", such provision shall be deemed incorporated herein to the extent necessary to cause the interest hereby granted to be so qualified.

IN WITNESS WHEREOF, the parties have executed this instrument as of the day and year written above.

MCKENNA CUSTOM HOMES, INC.

BY:____________________________
GREGORY MCKENNA, PRES.

____
TOWN OF NORTH CASTLE
BY:

STATE OF NEW YORK]
]SS.:

COUNTY OF WESTCHESTER]

On the day of , 2016 before me, the undersigned personally appeared: GREGORY MCKENNA personally known to me or proven on the basis of satisfactory evidence to be the individual(s) whose name(s) is [are] subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity[ies] and that by his/her/their signature[s] on the instrument, the individual[s] or the person upon behalf of which the individual[s] acted executed this instrument.

____

STATE OF NEW YORK]
]SS.:
COUNTY OF WESTCHESTER]

On the day of , 2016 before me, the undersigned personally appeared: personally known to me or proven on the basis of satisfactory evidence to be the individual(s) whose name(s) is [are] subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity[ies] and that by his/her/their signature[s] on the instrument, the individual[s] or the person upon behalf of which the individual[s] acted executed this instrument.

____

Section:
Block:
Lot:

RECORD AND RETURN TO:

PATRICK J. BLISS, ESQ.
399 KNOLLWOOD RD, 204
WHITE PLAINS, NEW YORK 10603

DEED OF ROAD TO TOWN OF NORTH CASTLE

This Indenture, made the day of 2021 between

MCKENNA CUSTOM HOMES, INC., 433 Manville Road, Pleasantville, New York 10570 party of the first part, and

TOWN OF NORTH CASTLE, a municipal corporation of the State of New York, 15 Bedford Road, Armonk, New York 10510 party of the second part,

WITNESSETH, that the party of the first part, in consideration of ten dollars and other valuable consideration paid by the party of the second part, does hereby grant and release unto the party of the second part, the heirs or successors and assigns of the party of the second part forever,

ALL THAT CERTAIN plot, piece or parcel of land, with the improvements thereon situate and lying in the Town of North Castle County of Westchester being more particularly described on SCHEDULE A annexed hereto and incorporated herein by reference.

BEING AND INTENDED to be only a part of the premises conveyed to the party of the first part by deed from the dated and duly recorded in the Westchester County Clerk's Office, Division of Land Records under Control No.

This conveyance is made upon unanimous Resolution of the Board of Trustees and Shareholders of McKenna Custom Homes, Inc., of this date in accordance with BCL §909.

TOGETHER with all right title and interest, if any, of the party of the first part in and to any streets and roads abutting the above described premises to the center lines thereof; TOGETHER with appurtenances and all the estate and rights of the party of the first part in and to said premises; TO HAVE AND TO HOLD the premises herein granted unto the party of the second part, the heirs or successors and assigns of the party of the second part forever.

AND the party of the first part covenants that the party of the first part has done nothing or suffered anything whereby the said premises have been encumbered in any way whatever, except as aforesaid.

AND the party of the first part, in compliance with Section 13 of the Lien Law, covenants that the party of the first will receive the consideration for this conveyance and will hold the right to receive such consideration as a trust fund to be applied first for the purpose of paying the cost of the improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purpose. The "party" shall be construed as if it read "parties" whenever the sense of this indenture requires.

IN WITNESS WHEREOF, the party of the first part has duly executed this deed the date and year above first written.

MCKENNA CUSTOM HOMES, INC.

BY: ____________________________
GREGORY MCKENNA

DECLARATION OF COVENANTS, CONDITIONS, AND RESTRICTIONS FOR
<u>HIDDEN OAK SUBDIVISION</u>

DECLARATION made as of the ___ day of _____, 20__, by ________________ with an address at _________________ (hereinafter referred to as the "Declarant").

W I T N E S S E T H:

WHEREAS, Declarant is the owner of all that certain lot, piece or parcel of land situate, lying and being in the Town of [_______], County of [_______] and State of New York, being designated as Section, Block and Lot [indicate all lots of subdivision] as shown on that certain map entitled "[filed map name]" which was filed in the Office of the County Clerk of [________] County on [________] as Filed Map No. [_________] and which is more accurately bounded and described in the deed attached hereto as Exhibit 1 (the "Property"); and

WHEREAS, Declarant plans to undertake or is undertaking plans for the development or sale of land that will result in [________] as described in the definition of "[______]" referenced in the *Rules and Regulations for the Protection from Contamination, Degradation and Pollution of the New York City Water Supply and Its Sources*, Title 10 New York Codes, Rules and Regulations Part 128-3.9(b)(___)(___); Title 15 Rules of the City of New York Chapter 18-39(b)(___)(___) ("Watershed Regulations"); and

WHEREAS, the Watershed Regulations require Declarant to prepare a Stormwater Pollution Prevention Plan ("SWPPP") and submit the SWPPP to the New York City Department of Environmental Protection ("DEP") for its review and approval so that stormwater generated by precipitation during and after soil disturbing activities and runoff from newly created impervious surfaces is captured and treated, thus reducing or eliminating a pollution discharge; and

WHEREAS, Declarant has submitted a SWPPP application to DEP for the Property described above, <u>Project name and number</u>, and received an approval from DEP for such SWPPP, dated ________, such SWPPP approval and the maintenance obligations being attached hereto as Exhibit 2; and

WHEREAS, Declarant desires to declare the following covenants, conditions and restrictions to govern the future development, use and maintenance of any lots that are part of the Property that may be conveyed to future owners, including the Declarant's respective heirs, successors, and assigns, and to subject any deed of conveyance of any such lots to this Declaration, by reference thereto, to the covenants, conditions and restrictions described herein,

NOW, THEREFORE, Declarant hereby declares that the Property shall be held, sold, conveyed, transferred and occupied subject to the following covenants, conditions, and restrictions which are for the benefit of the City of New York as well as for the owners of the Property and which shall be perpetual so long as the provisions of the SWPPP continue to be required by the Watershed Regulations, shall run with the Property and be binding on the Declarant, its heirs, successors and assigns and be binding upon each successive owner of any Property parcel or lot described in the subdivision plan and the heirs, successors and assigns of each subsequent party having or acquiring any right, title or interest in the Property or any part thereof.

1. Declarant hereby acknowledges, covenants, warrants, and represents that it shall install and maintain any and all erosion and sediment controls and stormwater management practices on the Property in accordance with the SWPPP approved by DEP, dated _______, and any and all amendments to the SWPPP that may be required and that DEP may approve.

2. Declarant's installation and maintenance of the erosion and sediment controls and stormwater management practices shall be for the benefit of the City of New York as well as for the owners of the Property.

3. Declarant's obligation to install and maintain any and all erosion and sediment controls and stormwater management practices on the Property in accordance with the DEP-approved SWPPP and any and all amendments to the SWPPP that DEP may approve shall be perpetual so long as the provisions of the SWPPP continue to be required by the Watershed Regulations.

4. Declarant hereby acknowledges, covenants and warrants that this Property shall be subject to the maintenance obligations set forth and described in the SWPPP, with respect to any stormwater management practices or treatment of runoff located on areas commonly owned by multiple property owners or a homeowners' association in the subdivision.

5. Declarant hereby covenants, warrants, and represents that any lease, mortgage, subdivision, or other transfer of the Property, or any interest therein, shall be subject to the restrictive covenants contained herein pertaining to the installation and maintenance of erosion and sediment control and stormwater management practices, and any deed, mortgage, or other instrument of conveyance shall be subject to and, specifically refer to, the attached SWPPP approval and shall specifically state that the interest thereby conveyed is subject to the covenants and restrictions contained herein and therein.

6. These covenants, conditions and restrictions shall be recorded at the Office of the County Clerk, shall run with the land and shall apply to, inure to the benefit of, and bind the Declarant and all subsequent heirs, executors, administrators, successors and assigns.

IN WITNESS WHEREOF, Declarant has executed this document on the date first above written.

______Signature__________

STATE OF NEW YORK)

)

COUNTY OF ____________)

On _______________, 20__, before me, the undersigned, a Notary Public in and for said State, personally appeared _________________, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his/her capacity, and that by his/her capacity, and that by his/her signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

____

Notary Public

Exhibit 1

Exhibit 2

STORMWATER CONTROL FACILITY
MAINTENANCE AND ACCESS AGREEMENT

This Agreement is made as of this day of , 2021 by and between the TOWN OF NORTH CASTLE, a New York municipal corporation with offices at 15 Bedford Road, Armonk, New York 10510, hereinafter referred to as the "Town", and McKenna Custom Homes, Inc., a New York corporation with offices at 343 Manville Road, Pleasantville, New York hereinafter referred to as "McKenna Custom".

W I T N E S S E T H

WHEREAS, McKenna Custom is the owner of that certain plot, piece and parcel of land, with the buildings and improvements thereon, situated at 13 Hidden Oak Road in the Town of North Castle, comprising 7.69 acres, and shown and designated on the Tax Map for the Town of North Castle Section 107.01, Block 1, Lot 32 (the "Land") and title to said lands being subject to the conditions imposed by the Town of North Castle as shown and designated on a certain Map entitled "Hidden Oak Subdivision Proposed Lots 1, 2 & 3, in Armonk, Town of North Castle, Westchester County, New York" , made by William J. Welsh, Land Surveyor, dated ________ and filed in the Westchester County Clerk's Office, Division of Land Records, on
as Map No. ; and

WHEREAS, Declarant plans to undertake or is undertaking plans for the development or sale of land that will result in Plans for development or sale of land that will result in the disturbance of five (5) or more acres of total land area as described in the Section 18-39 (b) (3) (i) in the Rules and Regulations for the Protection from Contamination, Degradation and Pollution of the New York City Water Supply and Its Sources ("Watershed Regulations"); and

WHEREAS, the Watershed Regulations require Declarant to prepare a Stormwater Pollution Prevention Plan ("SWPPP") and submit the SWPPP to the New York City Department of Environmental Protection ("DEP") for its review and approval so that stormwater generated by precipitation during and after soil disturbing activities and runoff from newly created impervious surfaces is captured and treated, thus reducing or eliminating a pollution discharge; and

WHEREAS, Declarant has submitted a SWPPP application to DEP for the Property described above, Hidden Oak Subdivision, DEP Log # 2014-KE-01088-SP.1, and received an approval from DEP for such SWPPP, dated _______________, such SWPPP approval and the maintenance obligations being attached hereto as Exhibits 1 and 2; and

WHEREAS, McKenna Custom has submitted a Stormwater Pollution Prevention Plan ("SWPPP") to the Town dated March 1, 2016 prepared by Evans Associates which sets forth, among other things, the proposed improvements to be constructed and/or installed for the purpose of controlling and mitigating stormwater runoff from the Subdivision ("Storm Water Control Facilities") consisting of subsurface infiltration facilities, an extended detention stormwater management basin, a bioretention facility, two rain gardens and tree planting, as well as filter strips; and

WHEREAS, the SWPPP has been approved by the Town; and

WHEREAS, as required by the Town of North Castle, a maintenance and access agreement is to be recorded in the Office of the Westchester County Clerk (Division of Land Records) in order to provide for the long-term maintenance and continuation of the various stormwater control measures shown on the approved subdivision plans (the "Plan") and

WHEREAS, copies of the approved plans of the Subdivision are on file with the Building Department of the Town of North Castle at the Town Hall, 17 Bedford Road, Armonk, New York 10504; and

WHEREAS, the Town and McKenna Custom desire that Stormwater Control Facilities be constructed and installed in accordance with the approved plans and that they thereafter be inspected, used, maintained, repaired and replaced in perpetuity in order to insure that they continue to function in the manner for which they are intended.

NOW, THEREFORE, in consideration of the approval and the mutual agreements and understandings set forth herein, and consistent with all applicable provisions of the Town Code, the Town and McKenna Custom hereby agree as follows:

1. McKenna Custom and/or any subsequent owner(s) of property shall use, maintain, repair and replace the Stormwater Control Facilities located on the portions of the premises owned by them in accordance with the maintenance plan contained in the SWPPP, a copy of which

maintenance plan is set forth on Schedule "A" which is annexed hereto and hereby made a part hereof (the "Maintenance Procedures").

2. McKenna Custom shall perform the Maintenance Procedures and shall pay all expenses related to the use, maintenance, repair and replacement of the Stormwater Control Facilities. In the event that the property is conveyed to another party or parties, the subsequent owner or owners shall, as a result of such conveyance, assume all responsibility for performing the Maintenance Procedures and for any other costs associated with using, maintaining, repairing and replacing the Stormwater Control Facilities located on his or their lot or lots except that all property owners shall equally share in the maintenance and repair costs of all control facilities contained in Storm Water Mitigation Areas, identified on the approved subdivision map of McKenna Custom as “Easement for Maintenance of Common Stormwater Control Facilities”. The conveyance of the property shall unconditionally release the party conveying any such property from all obligations contained herein, unless provided for otherwise in a contract of sale or other agreement between the parties to any such conveyance.

3. McKenna Custom, or any subsequent owner or owners of the property, shall inspect the Storm Water Control Facilities at the frequency set forth in the SWPPP. The inspector shall prepare and submit a written report to the appropriate lot owner and to the Town's Stormwater Management Officer ("SMO") within 30 days following the completion of the inspection. Any such report of the findings shall include, if appropriate, recommendations for future use, maintenance, repair and/or replacement of the Stormwater Control Facilities in order to ensure the continuing effectiveness of the Facilities.

4. No lot owner shall authorize, undertake or permit alteration, abandonment, modification or discontinuation of the use of the Stormwater Control Facilities except in accordance with written approval of the Town and the North Castle Planning Board, which approval shall not be unreasonably withheld.

5. Any lot owner shall undertake on his lot any necessary repairs and replacement of the

Stormwater Control Facilities at the reasonable direction of the Town or in accordance with the recommendations of the inspector. In the event that the SMO determines that a lot owner or all lot owners as the case may be have failed to construct or maintain the Stormwater Control Facilities located on their lot in accordance with the SWPPP or has failed to undertake corrective action specified by the Town or by the engineer pursuant to this Paragraph, the SMO shall notify such lot owner or all lot owners, as the case may be, to perform or cause to be performed any such maintenance or corrective action. Any such notice shall be sent to such lot owner or owners, as the case may be, by certified mail, return receipt requested, to the address for such lot owner(s) maintained by the Tax Assessor's Office for the Town. Any such lot owner(s) shall have thirty-five (35) days from the mailing of such notice to (a) complete or timely commence such corrective action; or (b) appeal any such determination of the SMO to the Town Board. The decision of the Town Board may be appealed pursuant to the provisions of Article 78 of the New York State Civil Practice Law and Rules.

6. In the event that a lot owner(s) is (a) duly notified by the Town to undertake maintenance or corrective action pursuant to Paragraph 4, above; and (b) either (1) such lot owner(s) does not appeal said notification; or (2) the order of the Town is upheld by either the Town Board or a court of competent jurisdiction and the lot owner does not, following the outcome of such appeal, carry out said maintenance or corrective action if required to do so, the Town is hereby granted an easement to enter the lots for the purpose of undertaking said maintenance or corrective action to the Facilities. Reasonable notice shall be given prior to such entry. The Town may affix the expenses thereof as a lien against the property.

7. In order to give effect to the provisions of this Agreement, the Town is permitted, at reasonable times, to have access to the property for inspection of the Stormwater Control Facilities. Access to the lots pursuant to Paragraph 6 above or this Paragraph 7 shall be limited to the areas known and designated on a certain Map entitled "Final Subdivision Plat for Hidden Oak Subdivision prepared by William J. Welsh, Welsh Engineering & Land Surveying, P.C. and filed in the office of Westchester County Clerk, Division of Land Records on

as filed Map No. as Storm Water Mitigation Areas.

8. The approval of the Town and the North Castle Planning Board, by resolution or otherwise shall be required prior to any amendment to this Agreement or the SWPPP.

9. This Agreement shall run with the land and shall be binding on the successors and assigns of McKenna Custom. This Agreement is to be recorded in the Office of the County Clerk of Westchester (Division of Land Records) upon the approval of the subdivision and shall be effective as of the date of recording.

10. The singular number as used herein shall be read as the plural number, and *vice versa,* and the masculine gender shall be read as the feminine or neuter gender, whenever necessary to give full effect to the terms and provisions hereof.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the date first written above.

McKENNA CUSTOM HOMES, INC.

BY:________________________

TOWN OF NORTH CASTLE

BY:__________________________

Supervisor

STATE OF NEW YORK
COUNTY

On the day of 2016. before me, a notary public of New York State, personally appeared , personally known to me or proved to me by satisfactory evidence to be the individual whose name is subscribed to the within instrument and (s) he duly acknowledged to me that (s) he executed the same in his/her capacity and that by his/her signature on the instrument, the individual or person upon behalf of which the individual acted, executed the instrument. Notary Public:

STATE OF
NEW YORK

On the day of 2016. before me, a notary public of New York State, personally appeared , personally known to me or proved to me by satisfactory evidence to be the individual whose name is subscribed to the within instrument and (s)he duly acknowledged to me that (s)he executed the same in his/her capacity as the Supervisor of the Town of North CASTLE and that by his/her signature on the instrument, the individual or person upon behalf of which the individual acted, executed the instrument.

Record and Return:

____

____

SCHEDULE "A"
TO STORMWATER CONTROL FACILITY
MAINTENANCE AND ACCESS AGREEMENT
BY AND BETWEEN MCKENNA CUSTOM, LTD.
AND THE TOWN OF NORTH CASTLE

As used herein, "Short Term Maintenance Requirements" are those stormwater control measures to be undertaken by a lot owner during such time as a residence is under construction upon said lot. "Long Term Maintenance Requirements" are those stormwater control measures to be undertaken following the completion of construction of a residence on any such lot.

Maintenance and Inspection Requirements:

In accordance with New York State Department of Environmental Conservation SPDES General Permit for Stormwater Discharges from Construction Activity, Permit No. GP-0-15-002, the qualified inspector shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

At a minimum, the qualified inspector shall inspect all erosion and sediment control practices and pollution prevention measures to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved final stabilization, all points of discharge to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site, and all points of discharge from the construction site.

The qualified inspector shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

a. Date and time of inspection;

b. Name and title of person(s) performing inspection;

c. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;

d. A description of the condition of the runoff at all points of discharge from the construction site. This shall include identification of any discharges of sediment from the construction site. Include discharges from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

e. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site which receive runoff from disturbed areas. This shall include identification of any discharges of sediment to the surface waterbody;

f. Identification of all erosion and sediment control practices and pollution prevention measures that need repair or maintenance;

g. Identification of all erosion and sediment control practices and pollution prevention measures that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

h. Description and sketch of areas with active soil disturbance activity, areas that have been disturbed but are inactive at the time of the inspection, and areas that have been stabilized (temporary and/or final) since the last inspection;

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices and pollution prevention measures; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s);

k. Identification and status of all corrective actions that were required by previous inspection; and

l. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The qualified inspector shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The qualified inspector shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The qualified inspector shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

Within one business day of the completion of an inspection, the qualified inspector shall notify the owner or operator and appropriate contractor or subcontractor identified in Part III.A.6. of this permit of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

All inspection reports shall be signed by the qualified inspector. Pursuant to Part II.C.2. of this permit, the inspection reports shall be maintained on site with the SWPPP.

Short Term Maintenance and Inspection Requirements:

Inspections performed during construction shall verify all practices are functioning properly, correctly maintained, and accumulated sediment is removed from all control structures. The inspector must also examine the site for any evidence of soil erosion, the potential for pollutants to enter the storm drain system, turbid discharge at all outfalls, and the potential for soil and mud to be transported on the public roadway at the site entrance. In addition to these general guidelines, the project plans will provide more specific erosion control guidelines, as well as a construction sequence to guide the contractor through the construction process. Discussed below are specific maintenance and inspection requirements for the temporary practices to be employed at the site. The short-term maintenance requirements may be referenced in the Stormwater Pollution Prevention Plan report in the section entitled “Erosion and Sediment Control Measures Maintenance Schedule” beginning on page 22 of said report.

The contractor shall notify the Town of North Castle Stormwater Management Officer at least 48 hours prior to the commencement of any of the following construction stages: start of construction, installation of erosion and sediment control measures, completion of site clearing, completion of rough grading, installation of stormwater management practices, completion of final grading and stabilization of disturbed areas, closure of construction, and completion of final landscaping.

Once construction is completed and the site has been stabilized, a Notice of Termination shall be filed.

Long Term Maintenance and Inspection Requirements:

Once final stabilization is achieved, and construction is complete, maintenance and inspections will be performed by the parties identified in Exhibit 1, attached. The Maintenance and Inspection Checklists from Appendix "G" of the New York State Stormwater Management Design Manual shall serve as a guide for maintaining and inspecting the infiltration and bioretention facilities. Appendix "G" can be found as part of the Hidden Oak SWPPP report on file with the Town of North Castle as well as using the following link http://www.dec.ny.gov/docs/water_pdf/swdmappendixg.pdf. The entire New York State Stormwater Management Design Manual may be found at the following web page http://www.dec.ny.gov/docs/water_pdf/swdm2015entire.pdf.

Inspections of the stormwater management practices and the collection and conveyance facilities shall be performed in accordance with **Exhibit 1** which is excerpted from the approved Stormwater Pollution Prevention Plan.

EXHIBIT 1: Post-Construction Stormwater and Erosion Control Maintenance Responsibilities

Maintenance Item	Entity Responsible for Maintenance Following Construction and Sale of Lots
Stormwater Management Facilities	**The three future homeowners collectively and under the legal agreement between them** will be responsible for the maintenance of the following stormwater management practices: o SWMF-1.1 (bioretention facility) o SWMF-1.2 (infiltration facility) o SWMF-1.3 (stormwater management basin) o SWMF-2.2 (infiltration facility). **Individual homeowner has responsibility** for the maintenance of the following stormwater management facilities located on the lot to which he/she has acquired title: o On Lot 1, SWMF-L1 (infiltration facility); o On Lot 2, SWMF-L2.1 (infiltration facility) and SWMF–L2.2 (infiltration facility); o On Lot 3, Rain Gardens #1 and #2, and Green Infrastructure Tree Planting.
Stormwater Collection and Conveyance System	**Town of North Castle** responsibility includes: o Storm drainage facilities within the right-of-way in the subdivision road which is to be dedicated to the Town. o Maintaining the vegetated swales within the Town roadway right-of-way. **The three future homeowners collectively and under the legal agreement between them** will be responsible for: o Storm drainage facilities (catch basin, manholes and outlet control structures **outside of the subdivision road right-of-way** which convey runoff to SWMF-1.3 (stormwater management basin). **Individual homeowner has responsibility for:** Storm drainage facilities (catch basin, manholes and outlet control structures on the individual lot to which he/she has obtained title and which convey runoff to stormwater management facilities to manage the runoff from that lot. This includes the collection and conveyance storm drainage system which conveys runoff to: o On Lot 1, SWMF-L1 (infiltration facility) o On Lot 2, SWMF-L2.1 (infiltration facility) and SWMF–L2.2 (infiltration facility) o On Lot 3, Rain Gardens #1 and #2.
Erosion in Landscaped Areas of the Individual Lots	**Each individual homeowner** for the lot to which he/she has obtained title

Maintenance Item	Entity Responsible for Maintenance Following Construction and Sale of Lots
Erosion of Slopes, Sand, Grit and Debris in the Subdivision Road Right-of-Way	**Town of North Castle**

EXHIBIT 2: MAINTENANCE OF STORMWATER FACILITIES

Maintenance of stormwater management facilities is described below for each stormwater management practice and component of the stormwater collection and conveyance system.

Definitions:
Owner - Refers to the present owner and applicant for the three lot subdivision of the property, McKenna Custom Homes, or its successors and assigns.

Homeowner – Refers to an individual owner of one of the three lots that has acquired the title to one of the lots.

Legal Agreement between the Three Homeowners ("three future homeowners collectively") – Refers to the legal agreement between the three future homeowners of the individual lots. Under the legal agreement, the three future homeowners collectively have maintenance and financial responsibility with regard to the stormwater practices and facilities noted in Exhibit 1.

STORMWATER MANAGEMENT BASIN
(SWMF-1.3):

1. Description: The stormwater management basin is used to control the rate of discharge from the property, and to improve the quality of the runoff.

2. Maintenance measures include:
   - (i) Periodically remove debris and litter from basin.
   - (ii) Clean trash rack when trash or debris has accumulated.
   - (iii) Mow side slopes, embankments, emergency spillway and access road at least once a year, preferably after August. Woody growth on the side slopes into the basin and on the berm outside of the basin should be discouraged.
   - (iv) Remove sediment from forebay every five to six years or when depth has reached 6" measured on the sediment stick; from main portion of the basin if depth of sediment has reached 6" or long flow path of water is hindered. Some replacement wetland planting may be necessary following removal of sediment.
   - (v) Stabilize eroding soils of stormwater management basin side slopes, embankment, and emergency spillway by placing topsoil as may be needed, then seeding and mulching with straw or other appropriate means.
   - (vi) Repair or replace structural elements such as inlet and outlet structures as necessary.
   - (vii) Remove larger borrowing animals, such as muskrats, from structural features. Trapping may be necessary.
   - (viii) Rock/riprap pads have not migrated, but are placed as per the design, and that vegetation, especially woody plants, are not growing within these areas.

3. Inspect for:
   - (i) Erosion, cracking, embankment subsidence, tree growth, burrowing animals.
   - (ii) Sediment and clogging in the outlet control facility, stormwater inlets, emergency spillway and drain (if present).
   - (iii) Sediment in forebay.
   - (iv) Adequacy of channel erosion controls at the outlet.
   - (v) Adequacy of plant coverage in shallow marsh (vegetated wetland) areas.

(vi) Proper functioning of structural elements.
(vii) Sources of erosion in the contributory drainage area.

4. Erosion in Stormwater Management Basin:
(i) In the event the Owner and/or the three future homeowners collectively under the legal agreement observe bare soils exceeding 20 square feet within the stormwater management basin, it shall seed those areas with a quick germination rye seed mix as soon as possible, or as directed by the landscape architect or civil engineer.
(ii) In the event the Owner and/or the three future homeowners collectively observe gully erosion more than 3” deep within the stormwater management basin or in vegetated or grassed swales, it shall fill the same immediately and seed the area with a quick germination rye seed, or as directed by the landscape architect or civil engineer.
(iii) Any debris accumulation, litter, and/or fallen trees or brush within Drainage Easement Areas shall be removed and disposed of off-site.

5. Sediment Deposits in Stormwater Management Basin:
(i) Sediment deposits obstructing more than one-third of the inlet or outlet structures or pipes associated with the basin shall be removed therefrom by the Owner and/or the three future homeowners collectively and be placed in a suitable upland area of the property or removed from the property and properly disposed of.
(ii) Sediment deposits that exceed one inch in depth within the vegetated areas of any detention basin or infiltration basin encompassing more than 20 square feet shall be removed by the Owner and/or the three future homeowners collectively and be placed in a suitable upland area of the property or removed from the property and properly disposed. Any plants affected by the removal process shall be dug out or replanted.
(iii) Sediment deposits in the forebay and micropool shall not exceed six (6) inches in depth. All sediment removed shall be deposited and stabilized in a location that is not likely to erode.

INFILTRATION FACILITIES
(SWMF-1.2, SWMF-L1, SWMF-L2.1 and SWMF–L2.2, and SWMF-2.2):

1. Description: Infiltration facilities are used to improve the quality of the runoff, provide for a reduction in the volume of runoff, and in some cases, reduce the peak rate of runoff. Maintenance of infiltration facilities is essential to ensure their continued effectiveness. Principally, this involves preventing suspended solids from being discharged to the infiltration facilities. These may have the effect of filling the void spaces thereby clogging the soil. A log shall be maintained for each infiltration facility.

2. Maintenance Measures Include:
(i) Observation of the depth of sediment, if any, through inspection via the installed observation port on each row of the chambers during the first 2 to 3 months of operation, and thereafter on an annual basis.
(ii) Remove sediment from pre-treatment facility when the depth of sediment reaches 50% of capacity of the facility.
(iii) Remove sediment from chambers when the depth of sediment is 3” in depth.
(iv) The manufacturer of the chambers recommends cleaning of the stormwater management chambers every 9 years after installation and every 9 years thereafter.
(v) The manufacturer also recommends that 45 years after installation, the chambers be inspected using closed circuit television (CCTV) or other comparable technique to determine the condition of the interior of the chambers, and rehabilitate or replace as may be necessary.

(vi) Ensuring that the meadow vegetation to be established above the infiltration facilities, where it is proposed, achieves good growth and final stabilization of the ground surface above the chambers. Periodic mowing of the meadow, once in the spring (mid-April and once in autumn (late October) is needed to ensure that woody vegetation does not become established in the meadow.

3. Inspect for:
(i) Depth of sediment, if any, through inspection via the installed observation port on each row of the chambers during the first 2 to 3 months of operation, and thereafter on an annual basis.
(ii) The rate of dewatering of the infiltration facility following a precipitation event. The chambers should fully dewater within 48 hours of the end of the precipitation event.

CATCH BASINS, MANHOLES AND STORM DRAINAGE PIPES

Catch basins, drain inlets and manholes located within the right of way of the subdivision road will be maintained by the Town of North Castle. If these structures are located on private property, their maintenance shall be carried out by the Owner and/or by the three future homeowners collectively under their legal agreement.

1. Description: Catch basins have sumps to allow sediment and debris to drop out before the water exits this drainage junction. Storm pipes normally need no maintenance.

2. Maintenance Measures Include:
(i) Clean out and dispose of sediment and debris from sump, if there is less than 12" between top of sediment and invert of pipe.
(ii) Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.

3. Inspection:
(i) Annual visual check for sediment accumulation is usually sufficient.
(ii) Recommend using tool to open cover, flashlight and dipstick for inspection of deep water quality catch basins.
(iii) Check that the grate is sitting flush on the structure, and that there are no holes or cracks in the pavement or ground adjacent to the catch basin.

LEVEL SPREADER

1. Description: Level spreader serves to dissipate the flow of water over a broad area to reduce the potential for erosion. Maintenance of the level spreader is to be performed under by the legal agreement between the three homeowners.

2. Maintenance:
(i) Periodically remove debris and litter.
(ii) Mow at least twice per year the meadow vegetation to be established. Mowing is to be done in spring (mid-May) and in autumn (mid-October).
(iii) Periodically remove sediment in order to maintain original design depth.
(iv) Stabilize eroding soils by seeding and mulching or other appropriate means.

3. Inspection:
(i) Annual visual check for erosion, sediment accumulation and debris is usually sufficient.

(ii) Ensure that lip over which flow is directed is level, stable and well-vegetated, and is not eroding.
(iii) Ensuring that the vegetation to be established at the level spreader achieves good growth and final stabilization of the ground surface above the chambers.

DIVERSION STRUCTURES

1. Description: Diversion structures, also known as flow splitters, are used as required where runoff is conveyed to infiltration facilities by a storm pipe in order to divert the WQv to the filtering practice, and allow larger flows to bypass the practice. Maintenance of diversion structures is to be performed for each stormwater practice as per Exhibit 1, above.

2. Maintenance:
(i) Clean sediment out annually or when sediment has reached a depth of 6 inches using a vactor truck or clamshell scoop. Use similar procedures to cleaning underground tanks, and catch basins.
(ii) Remove trash and debris.

3. Inspection:
(i) Annual visual check for sediment accumulation is usually sufficient.

BIORETENTION FACILITY AND RAIN GARDENS

1. Description: Bioretention facilities and rain gardens are similar stormwater management practices intended to manage and treat small volumes of stormwater runoff from impervious surfaces using a conditioned planting soil bed and planting materials to filter runoff stored within a shallow depression. SWMF-1.1 (bioretention facility) is to be maintained under by the legal agreement between the three homeowners. The two rain gardens on Lot 3 shall be maintained by the future homeowner of Lot 3.

2. Maintenance:

(i) Routine maintenance may include the occasional replacement of plants, mulching, weeding and thinning to maintain the desired appearance.
(ii) Weeding and watering are essential the first year, and can be minimized with the use of a weed-free mulch layer. Re-mulch bioretention facilities annually.
(iii) Homeowners and landscapers must be educated regarding the purpose and maintenance requirements of the bioretention facility and/or rain garden, so the desirable aspects of ponded water are recognized and maintained.
(iv) Keep plants pruned if they start to get “leggy” and floppy. Cut off old flower heads after a plant is done blooming.
(v) Inspect for sediment accumulations or heavy organic matter where runoff enters the bioretention facility and/or rain garden and remove as necessary. The top few inches of planting soil mix should be removed and replaced when water ponds for more than 48 hours. Re-mulch following such removal.
(vi) If the overflow device is an earthen berm or lip, check for erosion and repair as soon as possible. If this continues, a harder armoring of stone may be necessary.
(vii) Make sure all appropriate elevations have been maintained, no settlement has occurred and no low spots have been created.
(viii) Mow the grass filter strip between the bioretention facility and the level spreader weekly during the growing season or as per the adjacent lawn areas. Maintenance of level spreader as per noted above.

EXHIBIT 2: Summary of Maintenance Schedule for Permanent Stormwater Management Practices and Stormwater Infrastructure

STORMWATER MANAGEMENT PRACTICE	MAINTENANCE ACTIVITY	FREQUENCY
STORMWATER MANAGEMENT BASIN	Cleaning and removal of debris	Inspect after major storm events (>2" of rainfall); otherwise annual removal of debris
	Inspect vegetation and harvest vegetation when a 50% reduction in the original open water surface area occurs	Inspect annually
	Inspect and repair embankment and side slopes	Inspect annually
	Inspect outlet control structure and repair if needed	Inspect annually
	Removing accumulated sediment from forebay or sediment storage areas when 60% of the original volume has been lost	Every 5 years
	Removing accumulated sediment from main cells of pond once 50% of the original volume has been lost	Every 5 years
	Remove invasive plants	Inspect annually; remove invasive plants promptly

INFILTRATION FACILITY	MAINTENANCE ACTIVITY	FREQUENCY
	Inspect level of sediment in subsurface chambers through observation port and remove if depth > 3”	Inspect after first year in operation, then every 5 years
	Inspect water level in observation well	Inspect annually
	Inspect structural integrity of inlet and outlet control structures and repair if needed	Inspect annually
BIORETENTION FACILITY AND RAIN GARDENS	Inspect if side slopes areas of the facility are eroding	Inspect annually
	Apply mulching to bare or void areas	Inspect annually
	Removing and replacing all dead and diseased vegetation	Inspect annually
	Watering plant material	As may be needed in summer months
	Removing mulch and applying a new layer to prevent weed growth	Inspect annually
	Remove invasive plants	Inspect annually; remove invasive plants promptly
	Sediment removal	Inspect annually; observe if runoff water is present above the surface for more than 24 hr after rain event

	MAINTENANCE ACTIVITY	FREQUENCY
TREE PLANTING	Place mulch (shredded hardwood bark) around trunk of tree to a diameter of at least 3 feet. Mulch shall be placed to a depth of between 3” and 4”, and mulch shall not be placed against the trunk (i.e. no “mulch volcanoes”)	Inspect annually and add mulch as needed
	Watering of the newly planted tree	Watering of newly planted trees is needed for the first two growing seasons after planting.
	Observe condition of tree. Call expert (arborist or cooperative extension service) for questions about pest or disease problems.	Inspect annually.
CATCH BASINS AND MANHOLES	Remove sediment from sump	Inspect annually
	Check integrity of structure	Inspect annually
CATCH BASIN DIVERSION STRUCTURES	Check for debris that might impair the flow through the grate	Inspect after every storm event > 0.5” of precipitation
HYDRODYNAMIC SEPARATOR	Remove floatables and sediment from facility in accordance with manufacturer’s specifications	Inspect after first year in operation, then every 5 years