



Stormwater Analysis and Design Report

Pomham Solar

AP 16, Lot 19
Off Iron Mine Hill Road,
North Smithfield, RI 02896

PREPARED FOR:

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AP16, LOT 19

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ESS Project No. P322-001

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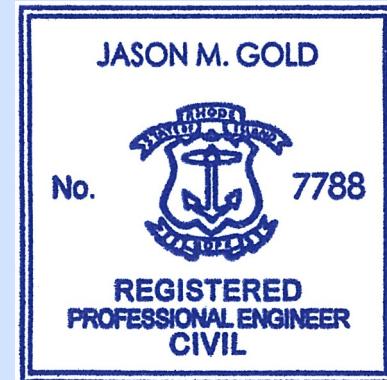


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EXECUTIVE SUMMARY

The goal of this analysis is to evaluate pre- and post-development stormwater conditions and develop a site design consistent with the Rhode Island Stormwater Management, Design and Installation Rules (250-RICR-150-10-8).

The Site is located south of Iron Mine Hill Road in North Smithfield, Rhode Island. The $22.24\pm$ acre wooded parcel is identified as Assessor's Plat 16, Lot 19. Two forested wetlands have been identified in the southwestern portion of the Site. The project will be accessed by a gravel road to be constructed from Iron Mine Hill Road, through an abutting property (lot 18).

The design of the road and associated water quality treatment has been previously reviewed and authorized under the RIPDES Construction General Permit (WQC/STW file no. 21-201; RIPDES File No. RIR102282). This Stormwater Analysis and Design Report addresses proposed work not previously approved. However, previously approved work is included in the post-development analysis where applicable.

The Applicant proposes to construct a $2.8\pm$ MW direct current (DC) ground mounted photovoltaic solar array and corresponding electrical equipment, equipment pad, utility poles, fence, and three stormwater basins. Several trails that traverse the proposed array area will be restored by scarifying, loaming, and seeding. The proposed array occupies approximately 5.5 acres of the parcel and will be surrounded by a seven-foot-tall chain-link security fence, enclosing a total area of approximately 6 acres. A 6-inch clearance will be provided beneath the security fence to wildlife passage. The total Limits of Disturbance, including shade tree cutting, is $12.5\pm$ acres.

The results of the stormwater analysis indicate that the post-development conditions peak runoff rates generated by the 1, 2, 10, 25, and 100-year design storms will not exceed pre-development conditions. Stormwater attenuation, groundwater recharge, and water quality treatment will be provided by a dry swale (previously approved) and three stormwater basins providing infiltration and filtration. The 11 Minimum Stormwater Management Standards required by the Rhode Island Stormwater Management, Design and Installation Rules have been met.

1.0 PROJECT SCOPE AND DESCRIPTION

The goal of this analysis is to evaluate pre- and post-development stormwater conditions and develop a site design consistent with the Rhode Island Stormwater Management, Design and Installation Rules (250-RICR-150-10-8).

The project will be accessed by a gravel road to be constructed from Iron Mine Hill Road, through an abutting property (lot 18). The design of the road and associated water quality treatment has been previously reviewed and authorized under the RIPDES Construction General Permit (WQC/STW file no. 21-201; RIPDES File No. RIR102282). This Stormwater Analysis and Design Report addresses proposed work not previously approved. However, previously approved work is included in the post-development analysis where applicable.

2.0 EXISTING CONDITIONS

2.1 Existing Site Use

The Site is located in North Smithfield, Rhode Island south of Iron Mine Hill Road. The 22.24± acre wooded parcel is identified as Assessor's Plat 16, Lot 19. The Site contains several meandering trails and many boulders and ledge outcrops, ranging from average to very large. The southern portion of the Site contains large areas densely covered with boulders.

2.2 Hydrology

The Site is located within the Crookfall Brook watershed (Waterbody ID RI0001004R-01) and drains to Woonsocket Reservoir Number Three (RI0001004L-01). This waterbody is listed as a coldwater fishery in 250-RICR-150-05-1 (Water Quality Regulations), section 1.25 E.4. Crookfall Brook has an approved TMDL according to the 2016 Impaired Waters Report, dated March 2018. The listed cause of impairment is enterococcus.

2.3 Wetland Delineation

Wetlands were delineated by Tetra Tech in November 2018 and ESS in September 2019. The field survey resulted in the identification and delineation of two wetland features, in the southwestern portion of Lot 19.

Wetland A (by Tetra Tech) is delineated by the DS-flag series (DS-1 – DS-18) and is located in the southwestern portion of Lot 19. This wetland is classified as a forested wetland under the Freshwater Wetlands Act and meets the classification as a seasonally flooded/saturated palustrine broad-leaved deciduous forest (PFO1) per National Wetland Inventory.

Wetland B (by ESS) is delineated by the W-flag series (W1-W18) and is located in the south-western portion of Lot 19. This wetland is classified as a forested wetland under the Freshwater Wetlands Act and meets the classification as a seasonally flooded/saturated palustrine broad-leaved deciduous forest (PFO1) per National Wetland Inventory.

2.4 Test Borings

Three test borings, IB-1, IB-2, and IB-3, were completed on the Site in November 2020, as documented in a "Geotechnical Engineering Report" prepared by Terracon, dated January 21, 2021. The boring logs are included in Appendix D and summarized in the following table.

Table 1: Boring Observations

ID	SHGW Depth	Restrictive Layer Depth
IB-1	*	6.9'
IB-2	*	6.5'
IB-3	*	2.5,

* Groundwater was not observed

Sandy silt (ML) and silty sand (SM) subsoil was generally observed to a depth of 2 ft, underlain by silty sand (SM) glacial till.

2.5 Test Pits

Six test pits, identified TP-1 through TP-6, were observed by ESS on November 17, 2021. The test pit logs are included in Appendix D and summarized in the following table.

Table 2: Test Pit Observations

ID	Estimated SHGW Depth (ft)	Restrictive Layer Depth (ft)	Design Soil Texture Class	Design Rawls Rate (in/hr)
TP-1	~4	-	Sandy Loam	1.02
TP-2	~3	6	Sandy Loam	1.02
TP-3	>9	9	Sandy Loam	1.02
TP-4	>8	8	Sandy Loam	1.02
TP-5	~3	8	Sandy Loam	1.02
TP-6	>6	6	Sandy Loam	1.02

3.0 PROPOSED DEVELOPMENT

The Applicant proposes to construct a $2.8\pm$ MW direct current (DC) ground mounted photovoltaic solar array and corresponding electrical equipment, equipment pad, utility poles, fence, and three stormwater basins. Several trails that traverse the proposed array area will be restored by scarifying, loaming, and seeding. The proposed array occupies approximately 5.5 acres of the parcel and will be surrounded by a seven-foot-tall chain-link security fence, enclosing a total area of approximately 6 acres. A 6-inch clearance will be provided beneath the security fence to wildlife passage. The total Limits of Disturbance, including shade tree cutting, is $12.5\pm$ acres.

The ground within the fenced area will be grubbed and seeded with a low maintenance grass seed mix. Shade trees between the proposed fence and limits of disturbance where no grading is proposed will be cut but not grubbed, leaving the existing ground cover intact. Disturbed ground outside the fence will be seeded with a restoration mix.

A previously permitted gravel driveway will provide access from Iron Mine Hill Road, through Lot 18, to the Site.

4.0 HYDROLOGIC AND HYDRAULIC ANALYSIS

4.1 Methodology

HydroCAD® software (developed by Applied Microcomputer Systems) was used to create a hydraulic and hydrologic model utilizing the methods prescribed in Soil Conservation Service (SCS) Technical Release No. 20 and SCS Technical Release No. 55. The HydroCAD® program calculates runoff based on rainfall and watershed characteristics and produces a runoff hydrograph (a runoff rate versus time curve). The stage-storage-discharge curves for a specific detention area are used to compute an outflow hydrograph by hydraulically routing an inflow hydrograph through a basin. This procedure calculates the relationship of the inflow hydrograph with the characteristics of the detention area to determine the outflow, stage, and storage capacity of the detention area for a given time during the specified storm event. All drainage analyses utilized Type III, 24-hour rainfall data from the Rhode Island Stormwater Management, Design and Installation Rules (250-RICR-150-10-8.6E) for Providence County. The rainfall frequency values used in this drainage analysis are listed in the table below.

Table 3: Rainfall Frequency Values

Frequency	1-Yr	2-Yr	10-Yr	25-Yr	100-Yr
Inches of Rainfall	2.7	3.3	4.90	6.1	8.70

Hydrographs were generated based on drainage area, hydrologic soil group, curve number (CN) values, times of concentration (Tc), and rainfall amount. The CN values for each drainage area were estimated by determining the composite value of the CN for the soil groups and ground cover mixture. Stormwater model simulations were performed for the 24-hour rainfall for the 1, 2, 10, 25, and 100-year storm events using a Type III storm distribution.

The watershed characteristics for existing conditions, including flow patterns, were estimated based on topographic information determined by field survey and aerial photography. Refer to the HydroCAD calculations included in Appendix A.

4.2 Design Points

Drainage areas contributing to Design Points 1, 2, and 3 are located entirely off-site and are included in the previous RIPDES approval for the project. While Design Point 4 was also included in the previous proposal, it was re-evaluated to incorporate additional construction proposed within the contributing drainage area (204).

Three design points were evaluated based on existing drainage patterns and site characteristics. Each design point is summarized below and illustrated on the drainage area maps included in Appendix E.

- Design Point 4 (DP-4) represents potential off-site wetlands located southeast of the Site.
- Design Point 5 (DP-5) represents a swamp which crosses onto the southwestern portion of the Site.

- Design Point 6 (DP-6) represents the western abutter, lot 31.

4.3 Pre-Development Drainage Areas

Design Points 4 through 6 receive stormwater runoff from drainage areas 104 through 106, respectively. The drainage areas are summarized below and illustrated on drawing DA-1, included in Appendix E. Table 4 lists key characteristics of the hydrologic model for each drainage area.

All three drainage areas are primarily wooded and include existing trails. Drainage Area 104 also contains some grass, gravel and roof surfaces associated with off-site residential development. Drainage Areas 104 and 105 contain large areas densely covered with large boulders. Two of these areas were modeled with a curve number representing 50% good condition woods and 50% impervious surfaces.

All drainage areas contain Charlton fine sandy loams. These soils are classified as Hydrologic Soil Group (HSG) B soils.

Table 4: Pre-Development Drainage Area Characteristics

Drainage Area ID	Design Point	Area (acres)	Curve Number	Time of Conc. (minutes)
104	4	9.39	58	21.1
105	5	10.93	60	15.3
106	6	5.30	56	22.5

4.4 Post-Development Drainage Areas

The post-development conditions stormwater runoff has been modeled as six drainage areas that flow to the three design points described above. The drainage areas are summarized below and illustrated on drawing DA-2, included in Appendix E. Table 5 lists key characteristics of the hydrologic model for each drainage area.

- Drainage Area 204 drains to Basin 1. It includes the previously permitted proposed road and a portion of the proposed solar array. Drainage Area 204U includes primarily wooded areas draining to Design Point 4 unattenuated.
- Drainage Area 205 drains to Basin 2 and consists primarily of the proposed solar array. Drainage Area 205U is primarily wooded and drains to Design Point 5 unattenuated.
- Drainage Area 206 drains to Basin 3 and consists of portions of the proposed solar array as well as wooded area. Drainage Area 206U is primarily wooded and drains to Design Point 6 unattenuated.

Table 5: Post-Development Drainage Area Characteristics

Drainage Area ID	Design Point	Area (acres)	Curve Number	Time of Conc. (minutes)
204	4	5.69	64	21.5
204U	4	3.69	57	15.7
205	5	2.31	62	7.1
205U	5	8.61	61	15.3
206	6	2.57	60	10.5
206U	6	2.79	56	16.7

4.5 Proposed Stormwater Design

A grass channel and dry swale proposed along the side of the proposed road is included in the previous RIPDES permit. Additional stormwater elements proposed include:

- Level stone trenches – Level stone trenches are proposed to encourage sheet flow beneath the panel drip edges. The trenches are proposed beneath the panels where slopes exceed 8% and are not generally parallel with the array drip edge. They are 10 feet long by 2.5 feet wide with a reverse slope. The trenches will be installed parallel with the contours and spaced at intervals no longer than 100 feet.
- Basin 1 – A 4.25 foot deep, 16,669 cubic foot basin will attenuate stormwater runoff from Drainage Area 204 prior to discharging through an outlet control structure onto a level spreader. A 6 foot wide spillway has been provided to accommodate the 100-yr design storm while providing 1 foot of freeboard. A 10 foot by 10 foot sand filter within the basin will provide treatment for the small, additional WQv not provided by the previously permitted dry swale. The sand filter will be surrounded by permanent filter sock.
- Basin 2 – A 4 foot deep, 9,890 cubic foot infiltration basin will attenuate and infiltrate stormwater runoff from Drainage Area 205. The basin will infiltrate runoff from the 1, 2, and 10-yr design storms. Larger storms will discharge over a 15 foot wide spillway. The basin is preceded by a 2 foot deep, 6,776 cubic foot forebay to provide pre-treatment prior to entering the infiltration basin via a 10 foot wide spillway.
- Basin 3 – A 4 foot deep, 12,916 cubic foot sand filter will filter and attenuate stormwater runoff from Drainage Area 206. The basin will infiltrate runoff from the 1-yr design storm and most of the 2-yr design storm. Larger storms will discharge through an outlet control structure onto a level spreader. A 6 foot wide emergency spillway has been provided above the peak 100-yr design storm water surface elevation. The basin is preceded by a 2 foot deep, 3,832 cubic foot forebay to provide pre-treatment prior to entering the infiltration basin via a gabion basket weir.

All basins have been designed to drain within 48 hours after the design storm ends.

4.6 Results

The results of the stormwater analysis indicate that the post-development conditions peak runoff rates generated by the design storms will not exceed pre-development conditions. The results are summarized in the tables below. Refer to the HydroCAD calculations provided in Appendix A for detailed results.

Table 6: Detention Basin Elevations (ft)

	Basin 1	Basin 2	Basin 3
Bottom	426.00	436.00	415.00
Orifice Invert	426.50	--	416.00
Spillway Crest	428.80	438.70	418.00
Top of Berm	430.25	440.00	419.00
1-yr Design Storm	426.86	436.46	415.52
10-yr Design Strom	428.12	438.46	416.43
100-yr Design Storm	429.17	438.97	417.97

Table 7: Design Point 4 Peak Runoff Rate, cfs

Design Storm	Pre-Dev	Post-Dev
1-yr	0.52	0.47
2-yr	1.6	1.5
10-yr	6.9	6.9
25-yr	12.2	12.2
100-yr	25.9	25.9

Table 8: Design Point 5 Peak Runoff Rate, cfs

Design Storm	Pre-Dev	Post-Dev
1-yr	1.0	0.96
2-yr	2.7	2.4
10-yr	10.5	8.9
25-yr	18.0	14.9
100-yr	36.7	36.8

Table 9: Design Point 6 Peak Runoff Rate, cfs

Design Storm	Pre-Dev	Post-Dev
1-yr	0.16	0.09
2-yr	0.64	0.36
10-yr	3.2	2.0
25-yr	6.0	4.9
100-yr	13.2	12.0

5.0 STORMWATER MANAGEMENT STANDARDS

5.1 Minimum Standard 1: LID Site Planning and Design Strategies

LID site planning and design strategies must be used to the maximum extent practicable in order to reduce the generation of the water runoff volume for both new and redevelopment projects.

The following LID site planning and design strategies are proposed to the maximum extent practicable in order to reduce the volume of stormwater runoff generated:

1. The proposed array area has been sited to avoid steep slopes to the maximum extent practicable.
2. Site disturbance will be minimized by only grubbing areas required for construction. Stumps and existing groundcover will remain in areas of shade tree clearing.
3. Grading has been minimized and is generally limited to construction of BMPs and restoration of trails located within the proposed array.

5.2 Minimum Standard 2: Groundwater Recharge

Stormwater must be recharged within the same subwatershed to maintain baseflow at pre-development recharge levels to the maximum extent practicable in accordance with the requirements described in §§ 8.8(D) through (H) of this Part. Applicants may be required to provide a water budget analysis for proposed groundwater dewatering. Recharge volume is determined as a function of annual pre-development recharge for site-specific soils or surficial materials, average annual rainfall volume, and amount of impervious cover on a site. Recharge must occur in a manner that protects groundwater quality.

The groundwater recharge criterion (Re_v) is minimal as the only impervious surface proposed is a 270 square foot equipment pad and 1,905 square feet of additional gravel road, not previously permitted. Both are located within Drainage Area 204. The total recharge volume is only 63 cubic feet.

The recharge value was calculated using the formula given in 250-RICR-150-10-8.8D:

$$Re_v = 1" * F * I / 12$$

Where:

$F = 0.35$ (Hydrologic Soils Group B)

$I = 2,175$ sf (Proposed Impervious Area)

Re_v = recharge volume (cubic feet)

The recharge volume is provided by the previously approved dry swale as follows:

Previously approved Re_v , required = 507 cf

Additional Re_v , required = 63 cf

Total Re_v , required = 570 cf

Previously approved Re_v , provided = 1,533 cf

All proposed impervious areas are located within Drainage Area 204.

5.3 Minimum Standard 3: Water Quality

Stormwater runoff must be treated before discharge. The amount that must be treated from each rainfall event is known as the required water quality volume (WQ_v). The required WQ_v is calculated as described in §§ 8.9(E) through (J) of this Part and excludes LID credits allowed under §8.18 of this Part.

The WQ_v was calculated using the formula provided by 250-RICR-150-10-8.9(F):

$$WQ_v = 0.2" * I / 12$$

Where:

I = Disturbed area within the proposed solar array

WQ_v = Water Quality Volume (cubic feet)

The minimum WQ_v required is provided by the previously approved dry swale as well as an infiltration basin (Basin 2) and two sand filters (Basin 1 and Basin 3) as summarized in the following table. Refer to the detailed calculations provided in Appendix B.

Table 10: Water Quality Volume

Drainage Area	Required (cf)	Provided (cf)
204*	1,587	1,633
205	1,761	10,064
206	1,233	5,305

* Drainage area 204 includes the previously approved road and dry swale.

5.4 Minimum Standard 4: Conveyance and Natural Channel Protection

Open drainage and pipe conveyance systems must be designed to provide adequate passage for flows leading to, from, and through stormwater management facilities for at least the peak flow from the 10-year, 24-hour Type III design storm event. Protection for natural channels downstream must be supplied by providing 24-hour extended detention of the 1-year, 24-hour Type III design storm event runoff volume.

The CPv criterion can be waived since “post-development peak discharge from the facility [to each design point] without attenuation is less than 2 cubic feet per second for the 1-year, 24-hour Type III design storm event.” (Rule 8.10 D.3).

5.5 Minimum Standard 5: Overbank Flood Protection

Downstream overbank flood protection must be provided by attenuating the post development peak discharge rate to the pre-development levels for the 10-year and 100-year, 24-hour Type III design storm events. In addition, designers must demonstrate that runoff from the site for storms up to the 100-year, 24-hour Type III design storm events actually reach proposed structural practices designed to meet this criterion.

Overbank flood protection will be provided by the proposed basins. The post-development peak discharge rates for the 10-year and 100-year design storms will be attenuated to pre-development levels. Runoff flows overland to the structural practices and are not restricted by conveyance systems. Refer to Section 4.6 .

5.6 Minimum Standard 6: Redevelopment and Infill Projects

Not Applicable - The proposed project is not a Redevelopment and Infill Project.

5.7 Minimum Standard 7: Pollution Prevention

All development sites require the use of source control and pollution prevention measures to minimize the impact that the land use may have on stormwater runoff quality. These measures shall be outlined in a stormwater pollution prevention plan.

The proposed project work will include low impact use of the project Site. No paving activities, solid waste generation, significant snow removal, or hazardous waste use is proposed. Low maintenance grasses that require little to no fertilization will be used.

5.8 Minimum Standard 8: Land Uses with Higher Potential Pollutant Loads

Stormwater discharges from land uses with higher potential pollutant loads (LUHPPLs) require the use of specific source control and pollution prevention measures and the specific stormwater BMPs approved for such use. Allowable BMPs for LUHPPLs are included in the Table in § 8.14(D) of this Part. Many LUHPPLs require additional special permits such as a RIPDES Multi-Sector General Permit, and sector-specific required BMPs are included in Section VI of the Multi-Sector General Permit.

Not Applicable -The proposed project is not a Land Use with Higher Potential Pollutant Loads.

5.9 Minimum Standard 9: Illicit Discharges

All illicit discharges to stormwater management systems are prohibited, including discharges from OWTS, and sub-drains and French drains near OWTS that do not meet the State’s Rules Establishing Minimum

Standards Relating to Location, Design, Construction and Maintenance of Onsite Wastewater Treatment Systems.

No illicit discharges have been identified or are proposed.

5.10 Minimum Standard 10: Construction Activity SESC and Pollution Prevention Control Measure

Soil Erosion and sedimentation control measures must be utilized during the construction phase as well as during any land disturbing activities.

A Soil Erosion and Sediment Control (SESC) Plan has been prepared.

5.11 Minimum Standard 11: Stormwater Management System Operation and Maintenance

The stormwater management system, including all structural stormwater controls and conveyances, must have an Operation and Maintenance Plan to ensure that it continues to function as designed. The Operation and Maintenance Plan shall identify measures for implementing maintenance activities in a manner that minimizes stormwater runoff impacts.

A long term Operation and Maintenance Plan has been prepared.

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Photographs

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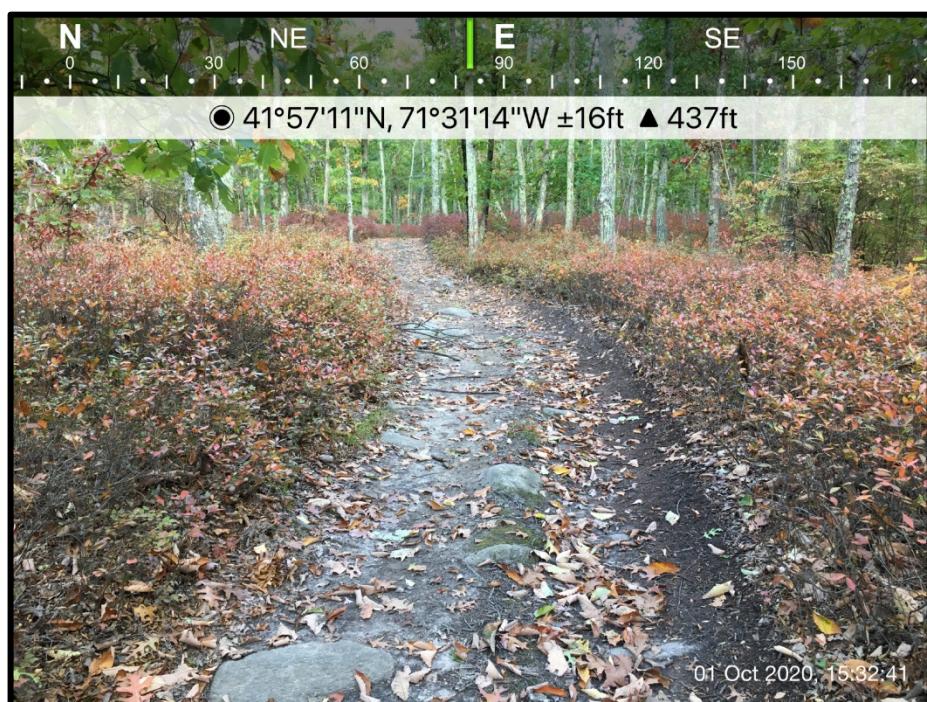
Photograph No.: 1
Boulder covered slope



Photograph No.: 2
Boulder covered slope



Photograph No.: 3
Boulders in southwestern portion of site



Photograph No.: 4
Trail



Photograph No.: 5
Trail



environmental consulting
& engineering services

Pomham Solar
North Smithfield, RI

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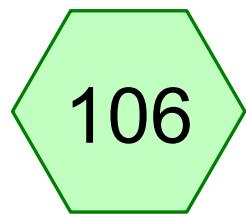
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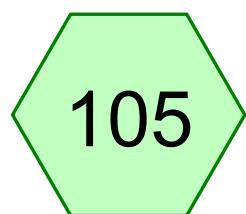
Appendix A

HydroCAD Summary Report

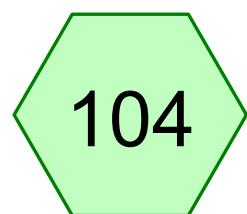
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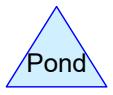
DP 6



DP 5



DP 4



Routing Diagram for P322-001 Pomham Solar Pre-Dev

Prepared by ESS Group, Inc., Printed 12/20/2021
HydroCAD® 10.00-26 s/n 01446 © 2020 HydroCAD Software Solutions LLC

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

Subcatchment 104: DP 4

Runoff Area=9.393 ac 0.28% Impervious Runoff Depth=0.00"
Flow Length=535' Tc=21.1 min CN=57/98 Runoff=0.02 cfs 0.002 af

Subcatchment 105: DP 5

Runoff Area=10.927 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=244' Tc=15.3 min CN=60/0 Runoff=0.00 cfs 0.000 af

Subcatchment 106: DP 6

Runoff Area=5.298 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=732' Tc=22.5 min CN=56/0 Runoff=0.00 cfs 0.000 af

**Total Runoff Area = 25.618 ac Runoff Volume = 0.002 af Average Runoff Depth = 0.00"
99.90% Pervious = 25.591 ac 0.10% Impervious = 0.027 ac**

Summary for Subcatchment 104: DP 4

Runoff = 0.02 cfs @ 12.27 hrs, Volume= 0.002 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 1.2 in Rainfall=1.20"

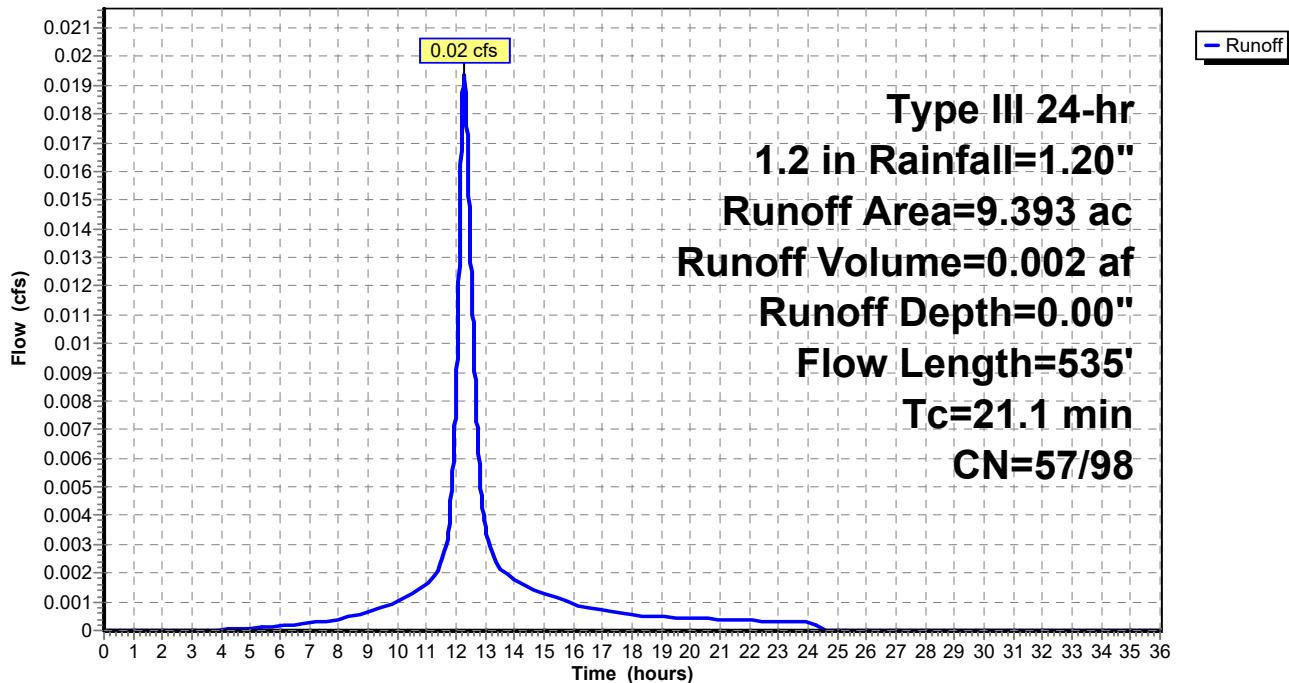
Area (ac)	CN	Description
0.417	61	>75% Grass cover, Good, HSG B
0.176	96	Gravel surface, HSG B
0.027	98	Roofs, HSG B
8.155	55	Woods, Good, HSG B
0.618	77	Woods/Boulders, Good, HSG B
9.393	58	Weighted Average
9.366	57	99.72% Pervious Area
0.027	98	0.28% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
18.7	95	0.0244	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.30"
2.4	440	0.0374	3.11		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps

21.1 535 Total

Subcatchment 104: DP 4

Hydrograph



Summary for Subcatchment 105: DP 5

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

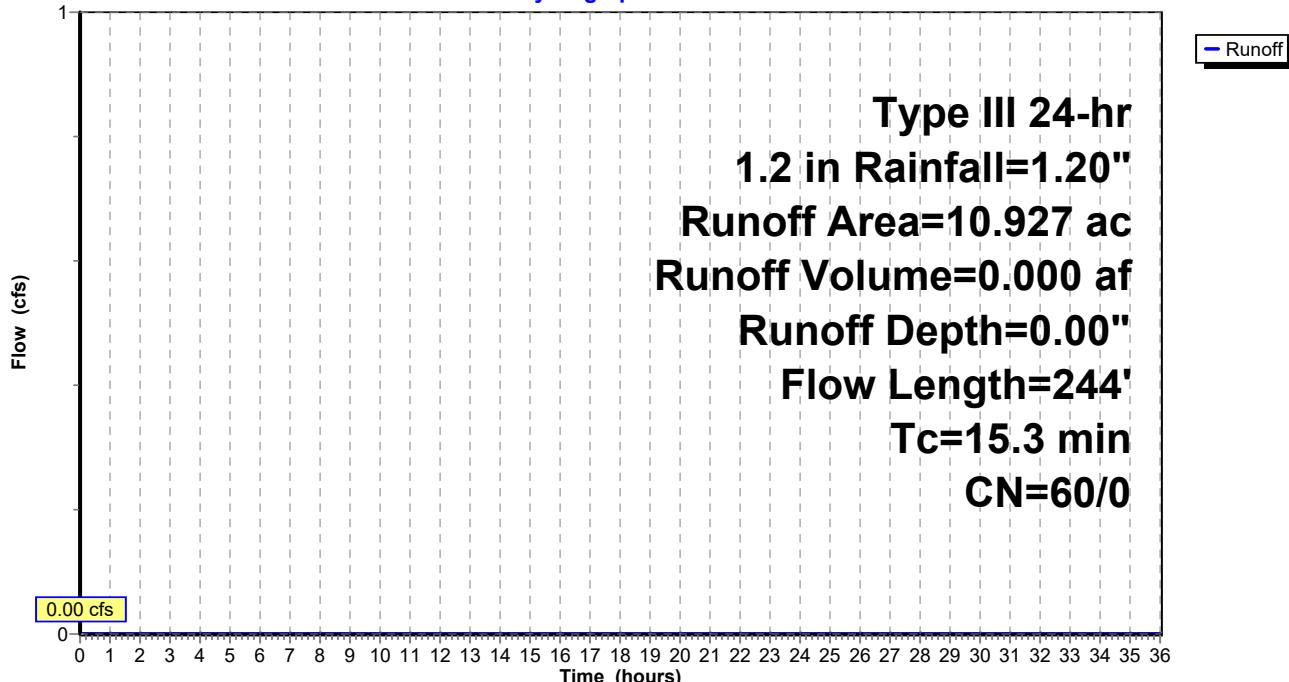
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 1.2 in Rainfall=1.20"

Area (ac)	CN	Description
0.141	96	Gravel surface, HSG B
8.661	55	Woods, Good, HSG B
2.124	77	Woods/Boulders, Good, HSG B
10.927	60	Weighted Average
10.927	60	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	37	0.0160	0.06		Sheet Flow, Point A Woods: Light underbrush n= 0.400 P2= 3.30"
4.4	31	0.0970	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.30"
0.5	176	0.1250	5.69		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
15.3	244	Total			

Subcatchment 105: DP 5

Hydrograph



Summary for Subcatchment 106: DP 6

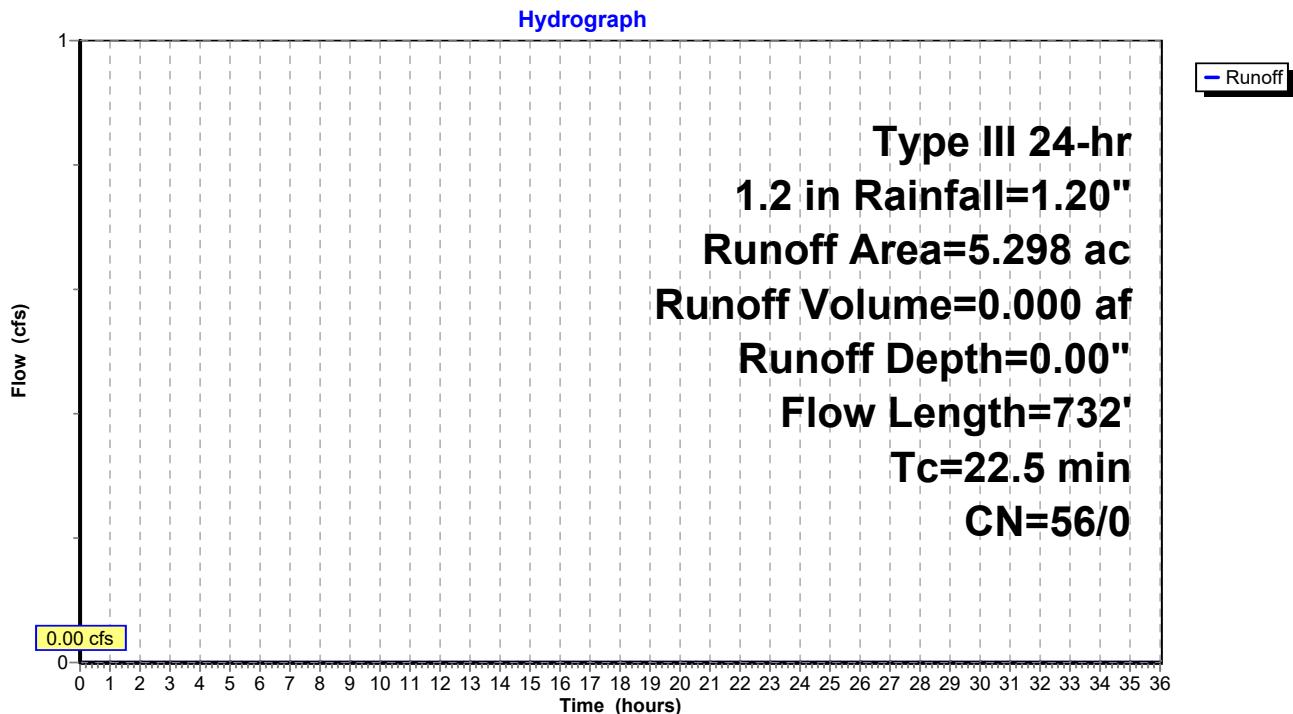
[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Type III 24-hr 1.2 in Rainfall=1.20"

Area (ac)	CN	Description
0.123	61	>75% Grass cover, Good, HSG B
0.100	96	Gravel surface, HSG B
5.074	55	Woods, Good, HSG B
5.298	56	Weighted Average
5.298	56	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.4	100	0.0220	0.08		Sheet Flow, Point A Woods: Light underbrush n= 0.400 P2= 3.30"
0.3	68	0.0780	4.50		Shallow Concentrated Flow, Point B Unpaved Kv= 16.1 fps
1.2	374	0.0800	5.36	4.71	Trap/Vee/Rect Channel Flow, Point C Bot.W=4.00' D=0.20' Z= 2.0 ' Top.W=4.80' n= 0.025 Earth, clean & winding
0.6	190	0.0950	4.96		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
22.5	732	Total			

Subcatchment 106: DP 6

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

Subcatchment104: DP 4

Runoff Area=9.393 ac 0.28% Impervious Runoff Depth=0.18"
Flow Length=535' Tc=21.1 min CN=58 Runoff=0.52 cfs 0.144 af

Subcatchment105: DP 5

Runoff Area=10.927 ac 0.00% Impervious Runoff Depth=0.23"
Flow Length=244' Tc=15.3 min CN=60 Runoff=1.02 cfs 0.212 af

Subcatchment106: DP 6

Runoff Area=5.298 ac 0.00% Impervious Runoff Depth=0.14"
Flow Length=732' Tc=22.5 min CN=56 Runoff=0.16 cfs 0.063 af

**Total Runoff Area = 25.618 ac Runoff Volume = 0.419 af Average Runoff Depth = 0.20"
99.90% Pervious = 25.591 ac 0.10% Impervious = 0.027 ac**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

Subcatchment 104: DP 4Runoff Area=9.393 ac 0.28% Impervious Runoff Depth=0.38"
Flow Length=535' Tc=21.1 min CN=58 Runoff=1.59 cfs 0.295 af**Subcatchment 105: DP 5**Runoff Area=10.927 ac 0.00% Impervious Runoff Depth=0.45"
Flow Length=244' Tc=15.3 min CN=60 Runoff=2.68 cfs 0.408 af**Subcatchment 106: DP 6**Runoff Area=5.298 ac 0.00% Impervious Runoff Depth=0.31"
Flow Length=732' Tc=22.5 min CN=56 Runoff=0.64 cfs 0.138 af**Total Runoff Area = 25.618 ac Runoff Volume = 0.841 af Average Runoff Depth = 0.39"**
99.90% Pervious = 25.591 ac 0.10% Impervious = 0.027 ac

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

Subcatchment 104: DP 4

Runoff Area=9.393 ac 0.28% Impervious Runoff Depth=1.11"
Flow Length=535' Tc=21.1 min CN=58 Runoff=6.87 cfs 0.872 af

Subcatchment 105: DP 5

Runoff Area=10.927 ac 0.00% Impervious Runoff Depth=1.24"
Flow Length=244' Tc=15.3 min CN=60 Runoff=10.50 cfs 1.132 af

Subcatchment 106: DP 6

Runoff Area=5.298 ac 0.00% Impervious Runoff Depth=0.99"
Flow Length=732' Tc=22.5 min CN=56 Runoff=3.21 cfs 0.437 af

Total Runoff Area = 25.618 ac Runoff Volume = 2.441 af Average Runoff Depth = 1.14"
99.90% Pervious = 25.591 ac 0.10% Impervious = 0.027 ac

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

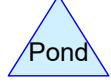
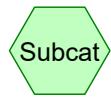
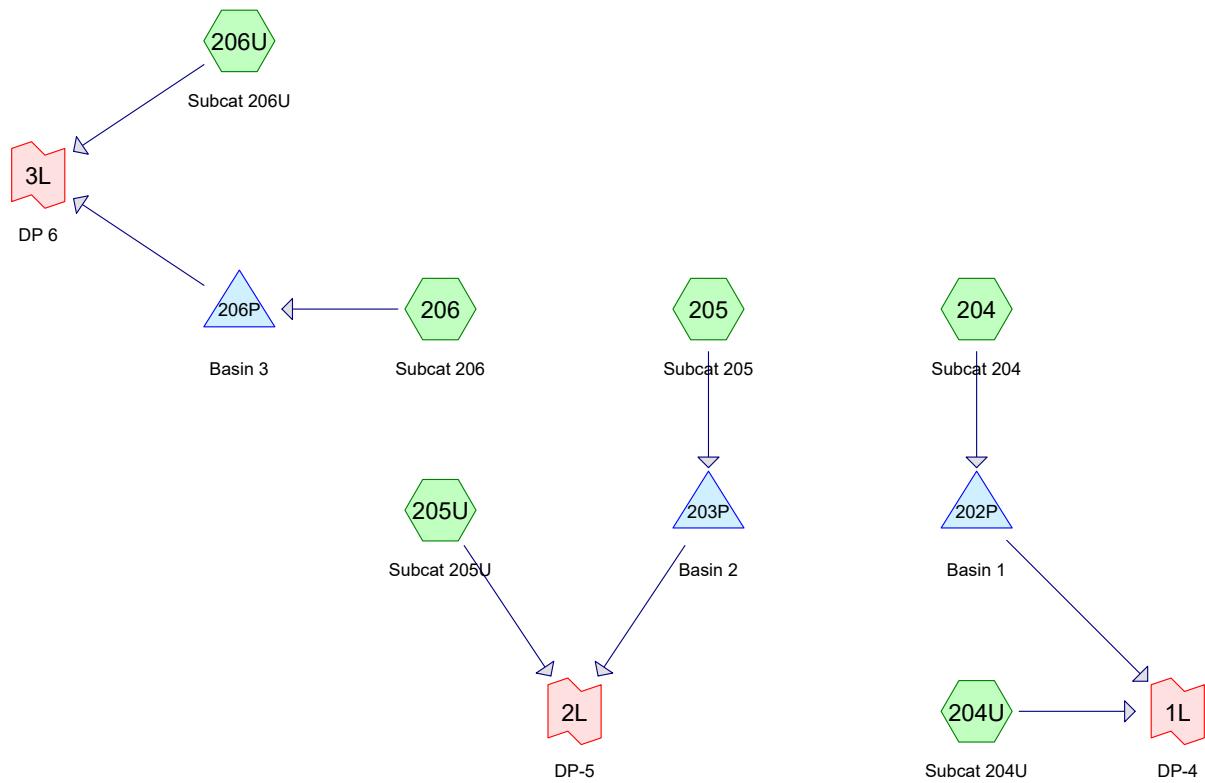
Subcatchment 104: DP 4Runoff Area=9.393 ac 0.28% Impervious Runoff Depth=1.82"
Flow Length=535' Tc=21.1 min CN=58 Runoff=12.21 cfs 1.424 af**Subcatchment 105: DP 5**Runoff Area=10.927 ac 0.00% Impervious Runoff Depth=1.99"
Flow Length=244' Tc=15.3 min CN=60 Runoff=17.99 cfs 1.809 af**Subcatchment 106: DP 6**Runoff Area=5.298 ac 0.00% Impervious Runoff Depth=1.66"
Flow Length=732' Tc=22.5 min CN=56 Runoff=5.95 cfs 0.731 af**Total Runoff Area = 25.618 ac Runoff Volume = 3.965 af Average Runoff Depth = 1.86"
99.90% Pervious = 25.591 ac 0.10% Impervious = 0.027 ac**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

Subcatchment 104: DP 4Runoff Area=9.393 ac 0.28% Impervious Runoff Depth=3.63"
Flow Length=535' Tc=21.1 min CN=58 Runoff=25.86 cfs 2.840 af**Subcatchment 105: DP 5**Runoff Area=10.927 ac 0.00% Impervious Runoff Depth=3.87"
Flow Length=244' Tc=15.3 min CN=60 Runoff=36.74 cfs 3.521 af**Subcatchment 106: DP 6**Runoff Area=5.298 ac 0.00% Impervious Runoff Depth=3.39"
Flow Length=732' Tc=22.5 min CN=56 Runoff=13.15 cfs 1.497 af**Total Runoff Area = 25.618 ac Runoff Volume = 7.859 af Average Runoff Depth = 3.68"**
99.90% Pervious = 25.591 ac 0.10% Impervious = 0.027 ac



Routing Diagram for P322-001 Pomham Solar Post-Dev
 Prepared by ESS Group, Inc., Printed 12/20/2021
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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

Subcatchment204: Subcat 204Runoff Area=5.694 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=932' Tc=21.5 min CN=64/0 Runoff=0.00 cfs 0.000 af**Subcatchment204U: Subcat 204U**Runoff Area=3.694 ac 0.72% Impervious Runoff Depth=0.01"
Flow Length=100' Slope=0.0420 '/' Tc=15.7 min CN=56/98 Runoff=0.02 cfs 0.002 af**Subcatchment205: Subcat 205**Runoff Area=2.312 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=361' Tc=7.1 min CN=62/0 Runoff=0.00 cfs 0.000 af**Subcatchment205U: Subcat 205U**Runoff Area=8.614 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=244' Tc=15.3 min CN=61/0 Runoff=0.00 cfs 0.000 af**Subcatchment206: Subcat 206**Runoff Area=2.569 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=469' Tc=10.5 min CN=60/0 Runoff=0.00 cfs 0.000 af**Subcatchment206U: Subcat 206U**Runoff Area=2.729 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=194' Tc=16.7 min CN=56/0 Runoff=0.00 cfs 0.000 af**Pond 202P: Basin 1**Peak Elev=426.00' Storage=2 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af**Pond 203P: Basin 2**Peak Elev=435.99' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af**Pond 206P: Basin 3**Peak Elev=415.00' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af**Link 1L: DP-4**Inflow=0.02 cfs 0.002 af
Primary=0.02 cfs 0.002 af**Link 2L: DP-5**Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af**Link 3L: DP 6**Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af**Total Runoff Area = 25.613 ac Runoff Volume = 0.003 af Average Runoff Depth = 0.00"**
99.90% Pervious = 25.586 ac 0.10% Impervious = 0.027 ac

Summary for Subcatchment 204: Subcat 204

Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1.2 in Rainfall=1.20"

Area (ac)	CN	Description
2.626	61	>75% Grass cover, Good, HSG B
0.468	96	Gravel surface, HSG B
0.034	98	Water Surface, 0% imp, HSG B
2.007	55	Woods, Good, HSG B
0.560	77	Woods/Boulders, Good, HSG B
5.694	64	Weighted Average
5.694	64	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	65	0.0150	0.06		Sheet Flow, Point A Woods: Light underbrush n= 0.400 P2= 3.30"
2.0	461	0.0550	3.78		Shallow Concentrated Flow, Point B Unpaved Kv= 16.1 fps
1.8	199	0.0100	1.86	1.71	Trap/Vee/Rect Channel Flow, Point C Bot.W=4.00' D=0.20' Z= 3.0 ' Top.W=5.20' n= 0.025 Earth, clean & straight
0.9	207	0.0580	3.88		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
21.5	932	Total			

Summary for Subcatchment 204U: Subcat 204U

Runoff = 0.02 cfs @ 12.21 hrs, Volume= 0.002 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1.2 in Rainfall=1.20"

Area (ac)	CN	Description
0.197	61	>75% Grass cover, Good, HSG B
0.064	96	Gravel surface, HSG B
0.027	98	Roofs, HSG B
3.376	55	Woods, Good, HSG B
0.030	77	Woods/Boulders, Good, HSG B
3.694	57	Weighted Average
3.667	56	99.28% Pervious Area
0.027	98	0.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0420	0.11		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.30"

Summary for Subcatchment 205: Subcat 205

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1.2 in Rainfall=1.20"

Area (ac)	CN	Description
2.123	61	>75% Grass cover, Good, HSG B
0.010	96	Gravel surface, HSG B
0.044	98	Water Surface, 0% imp, HSG B
0.135	55	Woods, Good, HSG B
2.312	62	Weighted Average
2.312	62	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	100	0.0710	0.29		Sheet Flow, Point A Grass: Short n= 0.150 P2= 3.30"
1.3	261	0.0420	3.30		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
7.1	361	Total			

Summary for Subcatchment 205U: Subcat 205U

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1.2 in Rainfall=1.20"

Area (ac)	CN	Description
0.459	61	>75% Grass cover, Good, HSG B
0.090	96	Gravel surface, HSG B
5.968	55	Woods, Good, HSG B
2.098	77	Woods/Boulders, Good, HSG B
8.614	61	Weighted Average
8.614	61	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	37	0.0160	0.06		Sheet Flow, Point A Woods: Light underbrush n= 0.400 P2= 3.30"
4.4	31	0.0970	0.12		Sheet Flow, Point B Woods: Light underbrush n= 0.400 P2= 3.30"
0.5	176	0.1250	5.69		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
15.3	244	Total			

Summary for Subcatchment 206: Subcat 206

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1.2 in Rainfall=1.20"

Area (ac)	CN	Description
1.531	61	>75% Grass cover, Good, HSG B
0.042	96	Gravel surface, HSG B
0.045	98	Water Surface, 0% imp, HSG B
0.952	55	Woods, Good, HSG B
2.569	60	Weighted Average
2.569	60	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	100	0.0220	0.18		Sheet Flow, Point A Grass: Short n= 0.150 P2= 3.30"
1.2	369	0.1050	5.22		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
10.5	469	Total			

Summary for Subcatchment 206U: Subcat 206U

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1.2 in Rainfall=1.20"

Area (ac)	CN	Description
0.485	61	>75% Grass cover, Good, HSG B
0.014	96	Gravel surface, HSG B
2.230	55	Woods, Good, HSG B
2.729	56	Weighted Average
2.729	56	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0410	0.11		Sheet Flow, Point A Woods: Light underbrush n= 0.400 P2= 3.30"
0.8	94	0.0140	1.90		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
16.7	194	Total			

Summary for Pond 202P: Basin 1

Inflow Area = 5.694 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1.2 in event
 Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 24.10 hrs, Volume= 0.000 af, Atten= 2%, Lag= 5.2 min
 Discarded = 0.00 cfs @ 24.10 hrs, Volume= 0.000 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 426.00' @ 24.10 hrs Surf.Area= 1,473 sf Storage= 2 cf

Plug-Flow detention time= 28.0 min calculated for 0.000 af (100% of inflow)
 Center-of-Mass det. time= 28.0 min (1,364.3 - 1,336.3)

Volume	Invert	Avail.Storage	Storage Description
#1	426.00'	16,669 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
426.00	1,472	0	0	1,472
427.00	2,248	1,846	1,846	2,263
428.00	3,080	2,653	4,499	3,115
429.00	5,744	4,343	8,843	5,789
430.00	10,112	7,826	16,669	10,168

Device	Routing	Invert	Outlet Devices
#1	Discarded	426.00'	1.020 in/hr Exfiltration over Horizontal area
#2	Primary	424.47'	18.0" Round Culvert L= 40.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 424.47' / 424.07' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Device 2	426.50'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Elev. (feet) 426.50 427.20 427.20 428.10 428.10 428.60 428.60
#4	Primary	428.80'	Width (feet) 0.50 0.50 1.00 1.00 2.00 2.00 0.00 143.0 deg x 6.0' long Sharp-Crested Vee/Trap Weir Cv= 2.47 (C= 3.09)

Discarded OutFlow Max=0.03 cfs @ 24.10 hrs HW=426.00' (Free Discharge)
 ↗1=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=426.00' (Free Discharge)
 ↗2=Culvert (Passes 0.00 cfs of 7.16 cfs potential flow)
 ↗3=Custom Weir/Orifice (Controls 0.00 cfs)
 ↗4=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

Summary for Pond 203P: Basin 2

Inflow Area = 2.312 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1.2 in event
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 435.99' @ 0.00 hrs Surf.Area= 545 sf Storage= 0 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	435.99'	6,776 cf	Forebay (Conic) Listed below (Recalc)
#2	436.00'	9,890 cf	Basin (Conic) Listed below (Recalc)
16,666 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
435.99	545	0	0	545
440.00	3,203	6,776	6,776	3,263
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
436.00	1,384	0	0	1,384
440.00	3,754	9,890	9,890	3,855

Device	Routing	Invert	Outlet Devices
#1	Discarded	435.99'	1.020 in/hr Exfiltration over Surface area above 435.99' Excluded Surface area = 545 sf
#2	Primary	438.70'	143.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir Cv= 2.47 (C= 3.09)

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=435.99' (Free Discharge)
 ↗1=Exfiltration (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=435.99' (Free Discharge)
 ↗2=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

Summary for Pond 206P: Basin 3

Inflow Area = 2.569 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1.2 in event
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Peak Elev= 415.00' @ 0.00 hrs Surf.Area= 862 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	415.00'	3,832 cf	Forebay (Conic) Listed below (Recalc) -Impervious
#2	415.00'	12,916 cf	Pond (Conic) Listed below (Recalc)
16,748 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
415.00	1,094	0	0	1,094
416.00	1,919	1,487	1,487	1,930
417.00	2,797	2,344	3,832	2,825

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
415.00	862	0	0	862
416.00	1,242	1,046	1,046	1,259
417.00	1,641	1,437	2,483	1,680
418.00	6,071	3,623	6,106	6,115
419.00	7,577	6,810	12,916	7,649

Device	Routing	Invert	Outlet Devices
#1	Discarded	415.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	413.01'	12.0" Round Culvert L= 39.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 413.01' / 412.62' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 2	416.00'	12.0" Vert. Orifice/Grate C= 0.600
#4	Primary	418.00'	143.0 deg x 6.0' long Sharp-Crested Vee/Trap Weir Cv= 2.47 (C= 3.09)

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=415.00' (Free Discharge)

↑ 1=Exfiltration (Passes 0.00 cfs of 0.02 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=415.00' (Free Discharge)

↑ 2=Culvert (Passes 0.00 cfs of 4.49 cfs potential flow)

↑ 3=Orifice/Grate (Controls 0.00 cfs)

4=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

Summary for Link 1L: DP-4

Inflow Area = 9.388 ac, 0.28% Impervious, Inflow Depth = 0.00" for 1.2 in event

Inflow = 0.02 cfs @ 12.21 hrs, Volume= 0.002 af

Primary = 0.02 cfs @ 12.21 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link 2L: DP-5

Inflow Area = 10.927 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1.2 in event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link 3L: DP 6

Inflow Area = 5.298 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1.2 in event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

Subcatchment204: Subcat 204

Runoff Area=5.694 ac 0.00% Impervious Runoff Depth=0.34"
Flow Length=932' Tc=21.5 min CN=64 Runoff=0.94 cfs 0.163 af

Subcatchment204U: Subcat 204U

Runoff Area=3.694 ac 0.72% Impervious Runoff Depth=0.16"
Flow Length=100' Slope=0.0420 '/' Tc=15.7 min CN=57 Runoff=0.17 cfs 0.050 af

Subcatchment205: Subcat 205

Runoff Area=2.312 ac 0.00% Impervious Runoff Depth=0.29"
Flow Length=361' Tc=7.1 min CN=62 Runoff=0.34 cfs 0.055 af

Subcatchment205U: Subcat 205U

Runoff Area=8.614 ac 0.00% Impervious Runoff Depth=0.26"
Flow Length=244' Tc=15.3 min CN=61 Runoff=0.96 cfs 0.186 af

Subcatchment206: Subcat 206

Runoff Area=2.569 ac 0.00% Impervious Runoff Depth=0.23"
Flow Length=469' Tc=10.5 min CN=60 Runoff=0.25 cfs 0.050 af

Subcatchment206U: Subcat 206U

Runoff Area=2.729 ac 0.00% Impervious Runoff Depth=0.14"
Flow Length=194' Tc=16.7 min CN=56 Runoff=0.09 cfs 0.032 af

Pond 202P: Basin 1

Peak Elev=426.86' Storage=1,545 cf Inflow=0.94 cfs 0.163 af
Discarded=0.05 cfs 0.067 af Primary=0.36 cfs 0.097 af Outflow=0.41 cfs 0.163 af

Pond 203P: Basin 2

Peak Elev=436.46' Storage=988 cf Inflow=0.34 cfs 0.055 af
Discarded=0.04 cfs 0.055 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.055 af

Pond 206P: Basin 3

Peak Elev=415.52' Storage=1,160 cf Inflow=0.25 cfs 0.050 af
Discarded=0.02 cfs 0.050 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.050 af

Link 1L: DP-4

Inflow=0.47 cfs 0.147 af
Primary=0.47 cfs 0.147 af

Link 2L: DP-5

Inflow=0.96 cfs 0.186 af
Primary=0.96 cfs 0.186 af

Link 3L: DP 6

Inflow=0.09 cfs 0.032 af
Primary=0.09 cfs 0.032 af

Total Runoff Area = 25.613 ac Runoff Volume = 0.536 af Average Runoff Depth = 0.25"
99.90% Pervious = 25.586 ac 0.10% Impervious = 0.027 ac

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

Subcatchment204: Subcat 204

Runoff Area=5.694 ac 0.00% Impervious Runoff Depth=0.61"
Flow Length=932' Tc=21.5 min CN=64 Runoff=2.05 cfs 0.288 af

Subcatchment204U: Subcat 204U

Runoff Area=3.694 ac 0.72% Impervious Runoff Depth=0.34"
Flow Length=100' Slope=0.0420 '/' Tc=15.7 min CN=57 Runoff=0.58 cfs 0.106 af

Subcatchment205: Subcat 205

Runoff Area=2.312 ac 0.00% Impervious Runoff Depth=0.52"
Flow Length=361' Tc=7.1 min CN=62 Runoff=0.95 cfs 0.101 af

Subcatchment205U: Subcat 205U

Runoff Area=8.614 ac 0.00% Impervious Runoff Depth=0.49"
Flow Length=244' Tc=15.3 min CN=61 Runoff=2.44 cfs 0.349 af

Subcatchment206: Subcat 206

Runoff Area=2.569 ac 0.00% Impervious Runoff Depth=0.45"
Flow Length=469' Tc=10.5 min CN=60 Runoff=0.70 cfs 0.096 af

Subcatchment206U: Subcat 206U

Runoff Area=2.729 ac 0.00% Impervious Runoff Depth=0.31"
Flow Length=194' Tc=16.7 min CN=56 Runoff=0.36 cfs 0.071 af

Pond 202P: Basin 1

Peak Elev=427.27' Storage=2,493 cf Inflow=2.05 cfs 0.288 af
Discarded=0.06 cfs 0.070 af Primary=1.15 cfs 0.218 af Outflow=1.21 cfs 0.288 af

Pond 203P: Basin 2

Peak Elev=437.01' Storage=2,416 cf Inflow=0.95 cfs 0.101 af
Discarded=0.06 cfs 0.101 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.101 af

Pond 206P: Basin 3

Peak Elev=416.05' Storage=2,707 cf Inflow=0.70 cfs 0.096 af
Discarded=0.03 cfs 0.089 af Primary=0.01 cfs 0.007 af Outflow=0.04 cfs 0.096 af

Link 1L: DP-4

Inflow=1.52 cfs 0.323 af
Primary=1.52 cfs 0.323 af

Link 2L: DP-5

Inflow=2.44 cfs 0.349 af
Primary=2.44 cfs 0.349 af

Link 3L: DP 6

Inflow=0.36 cfs 0.078 af
Primary=0.36 cfs 0.078 af

Total Runoff Area = 25.613 ac Runoff Volume = 1.010 af Average Runoff Depth = 0.47"
99.90% Pervious = 25.586 ac 0.10% Impervious = 0.027 ac

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

Subcatchment204: Subcat 204

Runoff Area=5.694 ac 0.00% Impervious Runoff Depth=1.52"
Flow Length=932' Tc=21.5 min CN=64 Runoff=6.16 cfs 0.719 af

Subcatchment204U: Subcat 204U

Runoff Area=3.694 ac 0.72% Impervious Runoff Depth=1.05"
Flow Length=100' Slope=0.0420 '/' Tc=15.7 min CN=57 Runoff=2.79 cfs 0.324 af

Subcatchment205: Subcat 205

Runoff Area=2.312 ac 0.00% Impervious Runoff Depth=1.38"
Flow Length=361' Tc=7.1 min CN=62 Runoff=3.29 cfs 0.265 af

Subcatchment205U: Subcat 205U

Runoff Area=8.614 ac 0.00% Impervious Runoff Depth=1.31"
Flow Length=244' Tc=15.3 min CN=61 Runoff=8.87 cfs 0.940 af

Subcatchment206: Subcat 206

Runoff Area=2.569 ac 0.00% Impervious Runoff Depth=1.24"
Flow Length=469' Tc=10.5 min CN=60 Runoff=2.84 cfs 0.266 af

Subcatchment206U: Subcat 206U

Runoff Area=2.729 ac 0.00% Impervious Runoff Depth=0.99"
Flow Length=194' Tc=16.7 min CN=56 Runoff=1.85 cfs 0.225 af

Pond 202P: Basin 1

Peak Elev=428.12' Storage=4,894 cf Inflow=6.16 cfs 0.719 af
Discarded=0.08 cfs 0.078 af Primary=4.85 cfs 0.641 af Outflow=4.93 cfs 0.719 af

Pond 203P: Basin 2

Peak Elev=438.46' Storage=7,811 cf Inflow=3.29 cfs 0.265 af
Discarded=0.10 cfs 0.265 af Primary=0.00 cfs 0.000 af Outflow=0.10 cfs 0.265 af

Pond 206P: Basin 3

Peak Elev=416.43' Storage=3,988 cf Inflow=2.84 cfs 0.266 af
Discarded=0.03 cfs 0.095 af Primary=0.71 cfs 0.171 af Outflow=0.74 cfs 0.266 af

Link 1L: DP-4

Inflow=6.89 cfs 0.965 af
Primary=6.89 cfs 0.965 af

Link 2L: DP-5

Inflow=8.87 cfs 0.940 af
Primary=8.87 cfs 0.940 af

Link 3L: DP 6

Inflow=1.96 cfs 0.397 af
Primary=1.96 cfs 0.397 af

Total Runoff Area = 25.613 ac Runoff Volume = 2.740 af Average Runoff Depth = 1.28"
99.90% Pervious = 25.586 ac 0.10% Impervious = 0.027 ac

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

Subcatchment204: Subcat 204

Runoff Area=5.694 ac 0.00% Impervious Runoff Depth=2.33"
Flow Length=932' Tc=21.5 min CN=64 Runoff=9.89 cfs 1.108 af

Subcatchment204U: Subcat 204U

Runoff Area=3.694 ac 0.72% Impervious Runoff Depth=1.74"
Flow Length=100' Slope=0.0420 '/' Tc=15.7 min CN=57 Runoff=5.09 cfs 0.535 af

Subcatchment205: Subcat 205

Runoff Area=2.312 ac 0.00% Impervious Runoff Depth=2.16"
Flow Length=361' Tc=7.1 min CN=62 Runoff=5.42 cfs 0.416 af

Subcatchment205U: Subcat 205U

Runoff Area=8.614 ac 0.00% Impervious Runoff Depth=2.07"
Flow Length=244' Tc=15.3 min CN=61 Runoff=14.92 cfs 1.488 af

Subcatchment206: Subcat 206

Runoff Area=2.569 ac 0.00% Impervious Runoff Depth=1.99"
Flow Length=469' Tc=10.5 min CN=60 Runoff=4.85 cfs 0.426 af

Subcatchment206U: Subcat 206U

Runoff Area=2.729 ac 0.00% Impervious Runoff Depth=1.66"
Flow Length=194' Tc=16.7 min CN=56 Runoff=3.45 cfs 0.377 af

Pond 202P: Basin 1

Peak Elev=428.55' Storage=6,567 cf Inflow=9.89 cfs 1.108 af
Discarded=0.11 cfs 0.085 af Primary=8.39 cfs 1.023 af Outflow=8.49 cfs 1.108 af

Pond 203P: Basin 2

Peak Elev=438.75' Storage=9,186 cf Inflow=5.42 cfs 0.416 af
Discarded=0.11 cfs 0.312 af Primary=0.48 cfs 0.104 af Outflow=0.58 cfs 0.416 af

Pond 206P: Basin 3

Peak Elev=416.80' Storage=5,468 cf Inflow=4.85 cfs 0.426 af
Discarded=0.04 cfs 0.097 af Primary=2.06 cfs 0.328 af Outflow=2.10 cfs 0.426 af

Link 1L: DP-4

Inflow=12.21 cfs 1.558 af
Primary=12.21 cfs 1.558 af

Link 2L: DP-5

Inflow=14.92 cfs 1.592 af
Primary=14.92 cfs 1.592 af

Link 3L: DP 6

Inflow=4.93 cfs 0.705 af
Primary=4.93 cfs 0.705 af

Total Runoff Area = 25.613 ac Runoff Volume = 4.349 af Average Runoff Depth = 2.04"
99.90% Pervious = 25.586 ac 0.10% Impervious = 0.027 ac

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

Subcatchment204: Subcat 204

Runoff Area=5.694 ac 0.00% Impervious Runoff Depth=4.35"
Flow Length=932' Tc=21.5 min CN=64 Runoff=18.94 cfs 2.063 af

Subcatchment204U: Subcat 204U

Runoff Area=3.694 ac 0.72% Impervious Runoff Depth=3.51"
Flow Length=100' Slope=0.0420 '/' Tc=15.7 min CN=57 Runoff=11.03 cfs 1.080 af

Subcatchment205: Subcat 205

Runoff Area=2.312 ac 0.00% Impervious Runoff Depth=4.11"
Flow Length=361' Tc=7.1 min CN=62 Runoff=10.66 cfs 0.791 af

Subcatchment205U: Subcat 205U

Runoff Area=8.614 ac 0.00% Impervious Runoff Depth=3.99"
Flow Length=244' Tc=15.3 min CN=61 Runoff=29.94 cfs 2.862 af

Subcatchment206: Subcat 206

Runoff Area=2.569 ac 0.00% Impervious Runoff Depth=3.87"
Flow Length=469' Tc=10.5 min CN=60 Runoff=9.90 cfs 0.828 af

Subcatchment206U: Subcat 206U

Runoff Area=2.729 ac 0.00% Impervious Runoff Depth=3.39"
Flow Length=194' Tc=16.7 min CN=56 Runoff=7.65 cfs 0.771 af

Pond 202P: Basin 1

Peak Elev=429.17' Storage=9,886 cf Inflow=18.94 cfs 2.063 af
Discarded=0.15 cfs 0.098 af Primary=17.31 cfs 1.965 af Outflow=17.46 cfs 2.063 af

Pond 203P: Basin 2

Peak Elev=438.97' Storage=10,355 cf Inflow=10.66 cfs 0.791 af
Discarded=0.11 cfs 0.321 af Primary=6.82 cfs 0.470 af Outflow=6.93 cfs 0.791 af

Pond 206P: Basin 3

Peak Elev=417.97' Storage=9,733 cf Inflow=9.90 cfs 0.828 af
Discarded=0.14 cfs 0.107 af Primary=4.58 cfs 0.721 af Outflow=4.72 cfs 0.828 af

Link 1L: DP-4

Inflow=25.91 cfs 3.045 af
Primary=25.91 cfs 3.045 af

Link 2L: DP-5

Inflow=36.75 cfs 3.332 af
Primary=36.75 cfs 3.332 af

Link 3L: DP 6

Inflow=11.95 cfs 1.493 af
Primary=11.95 cfs 1.493 af

Total Runoff Area = 25.613 ac Runoff Volume = 8.395 af Average Runoff Depth = 3.93"
99.90% Pervious = 25.586 ac 0.10% Impervious = 0.027 ac

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Appendix B

Water Quality Calculations

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Pomham Solar
North Smithfield, RI
DA 204
12/17/2021

Water Quality Volume (WQV)		
Disturbed Area, DA, (ac)	2.19	
Impervious Area, IA, (ac)	0.35	Gravel Road
WQV, (cf)	1,273	IA * 1/12 * 43560
Min WQV, (cf)	1,587	DA*0.2/12*43560
Design WQV, (cf)	1,587	Max WQV

Dry Swale Volume Provided		
Length (L), ft	233	
Width (W), ft	4	
Surface Area, A_f (sf)	932	Design (Bot. Width x Length)
Filter Depth, d_f (ft)	2.33	Design (28")
Porosity of media (n)	0.33	Default
Media volume, cf	718	$A_f * d_f * n$
Ponding Depth, h_f (ft)	1	Max depth behind Check Dam
Side Slopes, (SS) x:1	3	
End Area (EA), sf	7	$W * H_f + H_f * H_f / SS$
Ponding Volume, cf	816	$EA / 2 * L$
Total Filter Volume, F_v (cf)	1,533	

Check Minimum Surface Area		
Coeff. Of Permeability, k (ft/day)	1	Bioretention soil
Drain Time, t_f (days)	2	
Min. Surface Area, A_{fmin} (SF)	556	$WQV * d_f / [k(h_f + d_f)t_f]$

Remaining WQV, cf	54	WQV-Fv
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BASIN 1 SAND FILTER		
Length (L), ft	10	
Width (W), ft	10	
Surface Area, A_f (sf)	100	Design (Bot. Width x Length)
Filter Depth, d_f (ft)	1.50	Design
Porosity of media (n)	0.33	Default
Media volume, cf	50	$A_f * d_f * n$
Ponding Depth	0.5	
Ponding Volume, cf	50	
Total Filter Volume, F_{v2} (cf)	100	

Check Minimum Surface Area		
Coeff. Of Permeability, k (ft/day)	3.5	Sand
Drain Time, t_f (days)	2	
Min. Surface Area, A_{fmin} (SF)	6	$WQV * d_f / [k(h_f + d_f)t_f]$

Total WQV Provided (Cf)	1,633
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Pomham Solar
North Smithfield, RI
DA 205
12/17/2021

Water Quality Volume (WQV)		
Disturbed Area, DA, (ac)	2.43	
Impervious Area, IA, (ac)	-	
WQV, (cf)	-	IA * 1/12 * 43560
Min WQV, (cf)	1,761	DA*0.2/12*43560
Design WQV, (cf)	1,761	Max WQV

Basin 2 -Infiltration Basin		
Min Forbay Area Required (sf)	29.30	5,750 * 0.25WQV/86400
Forbay Area Provided (sf)	545	HydroCAD
Forebay Vol Rqd (cf)	440.30	0.25 * WQV
Forebay Vol Provided (cf)	3,388	Interpolated From HydroCAD
Infiltration Vol Provided (cf)	6,676	Interpolated From HydroCAD

Total WQV provided (cf)	10,064	
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Pomham Solar
North Smithfield, RI
DA 206
12/17/2021

Water Quality Volume (WQV)		
Disturbed Area, DA, (ac)	1.70	
Impervious Area, IA, (ac)	-	
WQV, (cf)	-	IA * 1/12 * 43560
Min WQV, (cf)	1,233	DA*0.2/12*43560
Design WQV, (cf)	1,233	Max WQV

Basin 3 Forebay		
Min Forbay Area Required (sf)	20.51	5,750 * 0.25WQV/86400
Forbay Area Provided (sf)	1,094	HydroCAD
Forebay Vol Rqd (cf)	308	0.25 * WQV
Forebay Vol Provided (cf)	3,832	HydroCAD

BASIN 3 SAND FILTER		
Surface Area, A_f (sf)	862	HydroCAD
Filter Depth, d_f (ft)	1.50	Design
Porosity of media (n)	0.33	Default
Media volume, cf	427	$A_f * d_f * n$
Ponding Depth, h_f (ft)	0.5	
Ponding Volume, (cf)	1,046	HydroCAD
Total Filter Volume, F_{V2} (cf)	1,473	

Check Minimum Surface Area		
Coeff. Of Permeability, k (ft/day)	3.5	Sand
Drain Time, t_f (days)	2	
Min. Surface Area, A_{fmin} (SF)	132	$WQV * d_f / [k(h_f + d_f)t_f]$

Total WQV Provided (Cf)	5,305	
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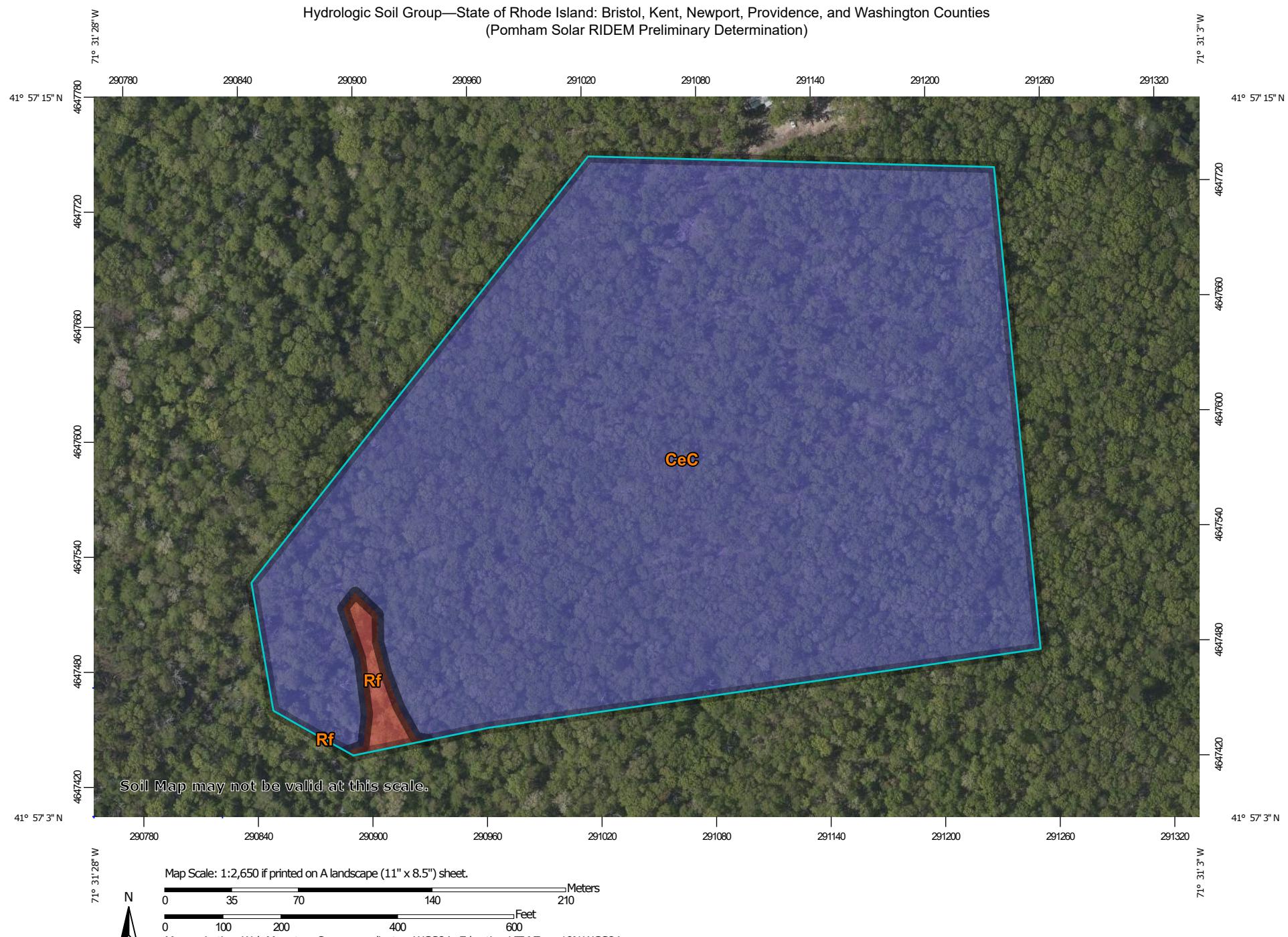
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Appendix C

NRCS Soils Map

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Hydrologic Soil Group—State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties (Pomham Solar RIDEM Preliminary Determination)



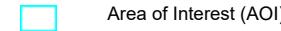
Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

12/21/2021
Page 1 of 4

MAP LEGEND

Area of Interest (AOI)



Soils

Soil Rating Polygons

	A
	A/D
	B
	B/D
	C
	C/D
	D
	Not rated or not available

Soil Rating Lines

	A
	A/D
	B
	B/D
	C
	C/D
	D
	Not rated or not available

Soil Rating Points

	A
	A/D
	B
	B/D

C

C/D

D

Not rated or not available

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties

Survey Area Data: Version 21, Sep 3, 2021

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

Date(s) aerial images were photographed: May 24, 2020—Jul 18, 2020

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



Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CeC	Canton and Charlton fine sandy loams, 3 to 15 percent slopes, very rocky	B	23.0	98.6%
Rf	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	D	0.3	1.4%
Totals for Area of Interest			23.3	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix D

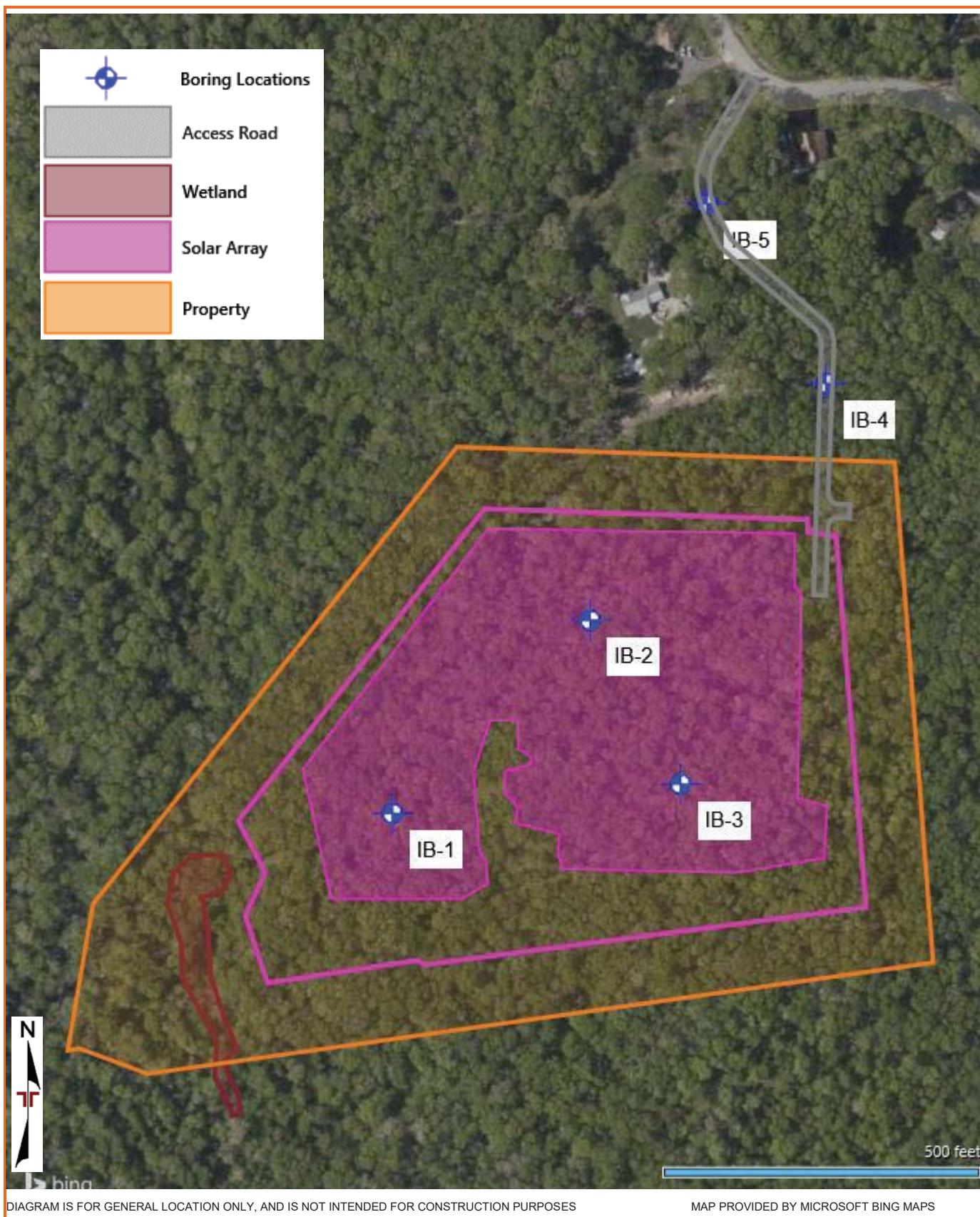
Boring and Test Pit Logs

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EXPLORATION PLAN

Islander Solar ■ North Smithfield, Rhode Island
January 21, 2021 ■ Terracon Project No. J2205052

Terracon
GeoReport



BORING LOG NO. IB-1

Page 1 of 1

PROJECT: Islander Solar		CLIENT: Islander Solar LLC Summit, New Jersey	
SITE: 850 Iron Mine Hill Road North Smithfield, Rhode Island			
MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 41.9527° Longitude: -71.5217° Approximate Surface Elev.: 425 (Ft.) +/- DEPTH ELEVATION (Ft.)	
1		SILTY SAND WITH GRAVEL (SM) , light brown, medium dense, (SUBSOIL) Note: Collect one bucket sample between 1 to 3 ft.	
2	2.0	SILTY SAND (SM) , with gravel and pieces of rock, light brown to gray, very dense, (GLACIAL TILL)	
2	6.9	<i>Auger Refusal on Probable Bedrock at 6.9 Feet</i>	
Stratification lines are approximate. In-situ, the transition may be gradual. Samples obtained using a 2-in. O.D. split spoon sampler		Hammer Type: Automatic	
Advancement Method: 0-6.9 ft: Continuous flight augers		See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).	
Abandonment Method: Boring backfilled with soil cuttings upon completion.		See Supporting Information for explanation of symbols and abbreviations. Elevations taken from Google Earth	
WATER LEVEL OBSERVATIONS No free water observed		Terracon 201 Hammer Mill Rd Rocky Hill, CT	
		Boring Started: 11-18-2020 Drill Rig: CME-75 Project No.: J2205052	
		Boring Completed: 11-18-2020 Driller: P. Michaud	

BORING LOG NO. IB-2

Page 1 of 1

PROJECT: Islander Solar		CLIENT: Islander Solar LLC Summit, New Jersey	
SITE: 850 Iron Mine Hill Road North Smithfield, Rhode Island			
MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 41.9531° Longitude: -71.5205°	DEPTH (Ft.)
		Approximate Surface Elev.: 458 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)
1		SANDY SILT (ML) , light brown, loose, (SUBSOIL) Note: Collect two bucket samples between 1 to 3 ft.	8
2		SILTY SAND (SM) , trace gravel, gray, medium dense, (GLACIAL TILL) 456+/-	15
2		WELL GRADED SAND (SW) , trace gravel, gray, very dense, (GLACIAL TILL) 454+/-	10
		6.5 <i>Auger Refusal on Probable Bedrock at 6.5 Feet</i>	451.5+/-
Stratification lines are approximate. In-situ, the transition may be gradual. Samples obtained using a 2-in. O.D. split spoon sampler			
Advancement Method: 0-6.5 ft: Continuous flight augers		See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any). See Supporting Information for explanation of symbols and abbreviations. Elevations taken from Google Earth	
Abandonment Method: Boring backfilled with soil cuttings upon completion.		Notes:	
WATER LEVEL OBSERVATIONS		Boring Started: 11-18-2020	Boring Completed: 11-18-2020
No free water observed		Drill Rig: CME-75	Driller: P. Michaud
		Project No.: J2205052	

BORING LOG NO. IB-3

Page 1 of 1

PROJECT: Islander Solar		CLIENT: Islander Solar LLC Summit, New Jersey	
SITE: 850 Iron Mine Hill Road North Smithfield, Rhode Island			
MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 41.9526° Longitude: -71.5201° Approximate Surface Elev.: 449 (Ft.) +/- ELEVATION (Ft.) DEPTH 1  SANDY SILT (ML) , light brown, loose, (SUBSOIL) Note: Collect 1 bucket sample between 1 to 2 ft. 2.0 3  BEDROCK 2.5 <i>Auger Refusal on Probable Bedrock at 2.5 Feet</i>	
		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS
			SAMPLE TYPE
			RECOVERY (In.)
			FIELD TEST RESULTS
			WATER CONTENT (%)
Stratification lines are approximate. In-situ, the transition may be gradual. Samples obtained using a 2-in. O.D. split spoon sampler			
Hammer Type: Automatic			
Advancement Method: 0-2.5 ft: Continuous flight augers	See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).	Notes:	
Abandonment Method: Boring backfilled with soil cuttings upon completion.	See Supporting Information for explanation of symbols and abbreviations. Elevations taken from Google Earth		
WATER LEVEL OBSERVATIONS		Boring Started: 11-18-2020	Boring Completed: 11-18-2020
No free water observed		Drill Rig: CME-75	Driller: P. Michaud
		Project No.: J2205052	

TEST PIT LOG 		SITE: Ponham Solar		TEST PIT NO: TP1	
		CLIENT: Nautilus Solar Energy LLC		DATE: 11/17/2021	
		EXCAV. CONTRACTOR: B. Brown Construction		ESS INSPECTOR: Craig Paradis	
		EXCAVATION METHOD: Backhoe		SURFACE ELEV: NM	
		WEATHER: Clear & Sunny 28 - 45 °F		DEPTH TO WATER: 6.5 feet	
Depth (feet)	Soil Texture Class	NRCS Hydrologic Soil Group/ Rawls Rate	Depth (feet)	Materials Description Moisture, Color, density, size, major and minor constituents	
0.5	Silt Loam	C/0.27	0.5	Damp, dark brown SILT and organics	
	Sandy Loam	B/1.02	0.5	Moist, brown FINE SAND and silt, little fine and coarse gravel, cobbles, and boulders, trace medium and coarse sand and clay	
1.0			1.0	;	
1.5			1.5	;	
2.0			2.0	;	
2.5			2.5	;	
3.0	Sandy Loam	B/1.02	3.0	Moist to saturated, light brown FINE SAND and medium sand, some fine and coarse gravel, little silt, medium and coarse sand, cobbles and boulders	
3.5			3.5	;	
4.0			4.0	;	
4.5			4.5	;	
5.0			5.0	;	
5.5			5.5	;	
6.0			6.0	;	
6.5			6.5	;	
7.0			7.0	;	
			7.0	Excavation terminated at 7'	
7.5			7.5	;	
8.0			8.0	;	
8.5			8.5	;	
9.0			9.0	;	
9.5			9.5	;	
10.0			10.0	;	
				Water entering excavation (6.5')	
PROPORTIONS USED		MOISTURE		LEGEND:	COMMENTS:
Trace	<10%	Dry		NM = Not Measured	No high water level indicators observed.
Little	10-20%	Damp			
Some	20-35%	Moist			
And	35-50%	Wet			

TEST PIT LOG		SITE: Pomham Solar		TEST PIT NO: TP2	
		CLIENT: Nautilus Solar Energy LLC		DATE: 11/17/2021	
EXCAV. CONTRACTOR: B. Brown Construction		ESS INSPECTOR: Craig Paradis			
EXCAVATION METHOD: Backhoe		SURFACE ELEV: NM			
WEATHER: Clear & Sunny 28 - 45 °F		DEPTH TO WATER: 5.5 f			
Depth (feet)	Soil Texture Class	NRCS Hydrologic Soil Group/ Rawls Rate	Depth (feet)	Materials Description Moisture, Color, density, size, major and minor constituents	
0.5	Silt Loam	C/0.27	0.5	Damp, dark brown SILT and organic materials Damp, orange brown FINE SAND and silt, some fine and coarse gravel, little cobbles and boulders, trace coarse sand and clay	
1.0			1.0	:	
1.5	Sandy Loam	B/1.02	1.5	:	
2.0			2.0	:	
2.5			2.5	:	
3.0			3.0	:	
3.5			3.5	:	
4.0	Loamy Sand	A/2.41	4.0	:	
4.5			4.5	:	
5.0			5.0	:	
5.5	Loamy Sand	A/2.41	5.5	Damp to wet, olive brown MEDIUM SAND, some fine sand, coarse sand, cobbles, boulders, little silt	
6.0			6.0	Water entering at 5.5'	
6.5			6.5		
7.0			7.0		
7.5			7.5		
8.0			8.0		
8.5			8.5		
9.0			9.0		
9.5			9.5		
10.0			10.0		
PROPORTIONS USED		MOISTURE	LEGEND:	COMMENTS:	
Trace	<10%	Dry	NM = Not Measured		
Little	10-20%	Damp			
Some	20-35%	Moist			
And	35-50%	Wet			

TEST PIT LOG 		SITE: Pomham Solar		TEST PIT NO: TP3	
		CLIENT: Nautilus Solar Energy LLC		DATE: 11/17/2021	
		EXCAV. CONTRACTOR: B. Brown Construction		ESS INSPECTOR: Craig Paradis	
		EXCAVATION METHOD: Backhoe		SURFACE ELEV: NM	
		WEATHER: Clear & Sunny 28 - 45 °F		DEPTH TO WATER: NM	
Depth (feet)	Soil Texture Class	NRCS Hydrologic Soil Group/ Rawls Rate	Depth (feet)	Materials Description Moisture, Color, density, size, major and minor constituents	
0.5	Silt Loam	C/0.27	0.5	Damp, dark brown SILT and organic material	
1.0			1.0	Dry, orange brown FINE SAND, some silt, cobbles and boulders, trace medium and coarse sand	
1.5	Loamy Sand	A/2.41	1.5		
2.0			2.0		
2.5			2.5		
3.0			3.0	Dry, olive brown FINE SAND, some silt, little medium and coarse sand, fine and coarse gravel	
3.5			3.5		
4.0	Loamy Sand	A/2.41	4.0		
4.5			4.5		
5.0			5.0		
5.5			5.5		
6.0			6.0	Dry, orange brown, FINE SAND and medium sand, some silt, little fine and coarse gravel, coarse sand, cobbles, and boulders	
6.5			6.5		
7.0			7.0		
7.5	Sandy Loam	B/1.02	7.5		
8.0			8.0		
8.5			8.5		
9.0			9.0		
9.5			9.5	REFUSAL at 9.0'	
10.0			10.0		
PROPORTIONS USED		MOISTURE	LEGEND:	COMMENTS:	
Trace	<10%	Dry	NM = Not Measured	No water observed entering test pit. In addition, no high water table indicators observed.	
Little	10-20%	Damp			
Some	20-35%	Moist			
And	35-50%	Wet			

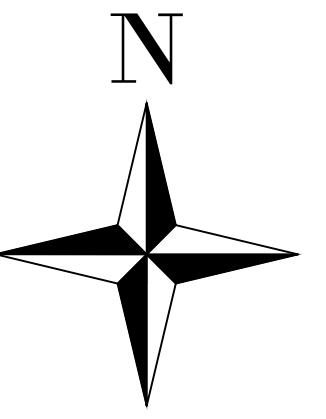
TEST PIT LOG 		SITE: Pomham Solar		TEST PIT NO: TP4	
		CLIENT: Nautilus Solar Energy LLC		DATE: 11/17/2021	
		EXCAV. CONTRACTOR: B. Brown Construction		ESS INSPECTOR: Craig Paradis	
		EXCAVATION METHOD: Backhoe		SURFACE ELEV: NM	
		WEATHER: Clear & Sunny 28 - 45 °F		DEPTH TO WATER: NM	
		Depth (feet)	Soil Texture Class	NRCS Hydrologic Soil Group/ Rawls Rate	Depth (feet)
0.5	Silt Loam	C/0.27	0.5	Damp, dark brown SILT AND ORGANIC MATERIAL	
1.0	Sandy Loam	B/1.02	0.5	Dry, orange brown FINE SAND and silt, little medium and coarse sand, cobbles, boulders, and organics (roots), trace clay	
1.5			1.0	:	
2.0			1.5		
2.5	Sandy Loam	B/1.02	2.0	Dry, brown FINE SAND and silt, little medium and coarse sand, cobbles, and boulders	
3.0			2.5	:	
3.5			3.0		
3.5			3.5	Dry, light olive brown FINE SAND and medium sand, some coarse sand, fine and coarse gravel, little silt, cobbles and boulders	
4.0			4.0	:	
4.5			4.5		
5.0			5.0		
5.5	Loamy Sand	A/2.41	5.5		
6.0			6.0		
6.5			6.5		
7.0			7.0		
7.5			7.5		
8.0			8.0	REFUSAL at 8.0'	
8.5			8.5		
9.0			9.0	:	
9.5			9.5		
10.0			10.0		
PROPORTIONS USED		MOISTURE	LEGEND:	COMMENTS:	
Trace	<10%	Dry	NM = Not Measured	No water observed entering test pit. In addition, no high water table indicators observed.	
Little	10-20%	Damp			
Some	20-35%	Moist			
And	35-50%	Wet			

TEST PIT LOG		SITE: Pomham Solar		TEST PIT NO: TP5	
		CLIENT: Nautilus Solar Energy LLC		DATE: 11/17/2021	
EXCAV. CONTRACTOR: B. Brown Construction		ESS INSPECTOR: Craig Paradis			
EXCAVATION METHOD: Backhoe		SURFACE ELEV: NM			
WEATHER: Clear & Sunny 28 - 45 °F		DEPTH TO WATER: 7.5'			
Depth (feet)	Soil Texture Class	NRCS Hydrologic Soil Group/ Rawls Rate	Depth (feet)	Materials Description Moisture, Color, density, size, major and minor constituents	
0.5	Silt Loam	C/0.27	0.5	Damp, dark brown SILT and organic material	
1.0	Loam	B/0.52	1.0	Moist, light brown FINE SAND and silt, little fine and coarse gravel, cobbles, and boulders, trace clay and medium and coarse sand	
1.5	Sandy Loam	B/1.02	1.5	Moist, light brown FINE SAND and silt, little fine and coarse gravel, cobbles, AND boulders, trace medium and coarse sand	
2.0			2.0	:	
2.5			2.5	Wet, gray FINE SAND, some silt	
3.0			3.0	:	
3.5			3.5	:	
4.0			4.0	:	
4.5			4.5	:	
5.0	Sandy Loam	B/1.02	5.0	:	
5.5			5.5	:	
6.0			6.0	:	
6.5			6.5	:	
7.0			7.0	:	
7.5			7.5	:	
8.0			8.0	Water entering (high water)	
8.5			8.5	:	
9.0			9.0	:	
9.5			9.5	:	
10.0			10.0	Water entering (significant)	
PROPORTIONS USED		MOISTURE	LEGEND:	COMMENTS:	
Trace	<10%	Dry	NM = Not Measured		
Little	10-20%	Damp			
Some	20-35%	Moist			
And	35-50%	Wet			

TEST PIT LOG 		SITE: Pomham Solar		TEST PIT NO: TP6		
		CLIENT: Nautilus Solar Energy LLC		DATE: 11/17/2021		
		EXCAV. CONTRACTOR: B. Brown Construction		ESS INSPECTOR: Craig Paradis		
		EXCAVATION METHOD: Backhoe		SURFACE ELEV: NM		
		WEATHER: Clear & Sunny 28 - 45 °F		DEPTH TO WATER:		
Depth (feet)	Soil Texture Class	NRCS Hydrologic Soil Group/ Rawls Rate	Depth (feet)	Materials Description Moisture, Color, density, size, major and minor constituents	Depth (feet)	Notes
0.5	Silt Loam	C/0.27	0.5	Damp, dark brown SILT and organic materials	0.5	
1.0			1.0	Damp, brown SILT and fine sand, some cobbles and boulders, trace clay, medium and coarse sand and fine and coarse gravel	1.0	
1.5			1.5		1.5	
2.0	Sandy Loam	B/1.02	2.0		2.0	
2.5			2.5		2.5	
3.0			3.0		3.0	
3.5	Sandy Loam	B/1.02	3.5	Damp, brown FINE SAND, some silt, trace medium and coarse sand, fine and coarse gravel	3.5	
4.0			4.0	Damp, brown FINE SAND, some medium and coarse sand, fine and coarse gravel, cobbles, and boulders, little silt	4.0	
4.5			4.5		4.5	
5.0	Loamy Sand	A/2.41	5.0		5.0	
5.5			5.5		5.5	
6.0			6.0	REFUSAL at 6.0'	6.0	
6.5			6.5		6.5	
7.0			7.0		7.0	
7.5			7.5		7.5	
8.0			8.0		8.0	
8.5			8.5		8.5	
9.0			9.0		9.0	
9.5			9.5		9.5	
10.0			10.0		10.0	
PROPORTIONS USED		MOISTURE	LEGEND:	COMMENTS:		
Trace	<10%	Dry	NM = Not Measured	No water observed entering test pit. In addition, no high water table indicators observed.		
Little	10-20%	Damp				
Some	20-35%	Moist				
And	35-50%	Wet				

Appendix E

Drainage Area Maps

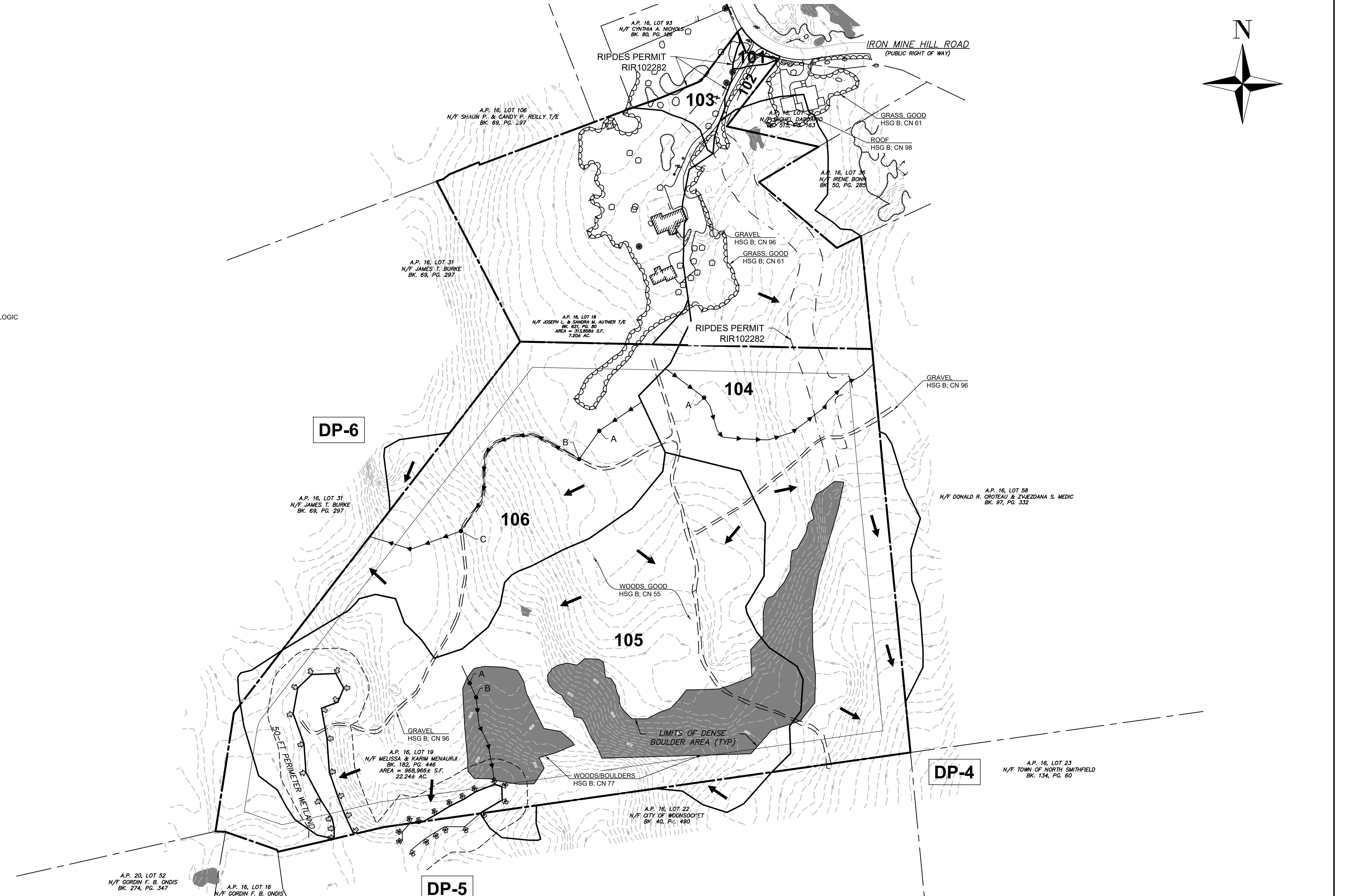


LEGEND

	DRAINAGE AREA BOUNDARY
	PROPERTY LINE
	MAJOR CONTOUR
	MINOR CONTOUR
	TIME OF CONC. FLOW PATH
	FLOW ARROW
	DESIGN POINT ID
104	DRAINAGE AREA ID

NOTES:

1. BASE PLAN: "ALTA/NSPS LAND TITLE SURVEY", DATED SEPTEMBER 16, 2021, NORTHEAST ENGINEERS & CONSULTANTS
2. SOIL IS CLASSIFIED CANTON AND CHARLTON FINE SANDY LOAMS (CEC), HYDROLOGIC SOIL GROUP B, BY THE NATURAL RESOURCES CONSERVATION SERVICE.



LEGEND

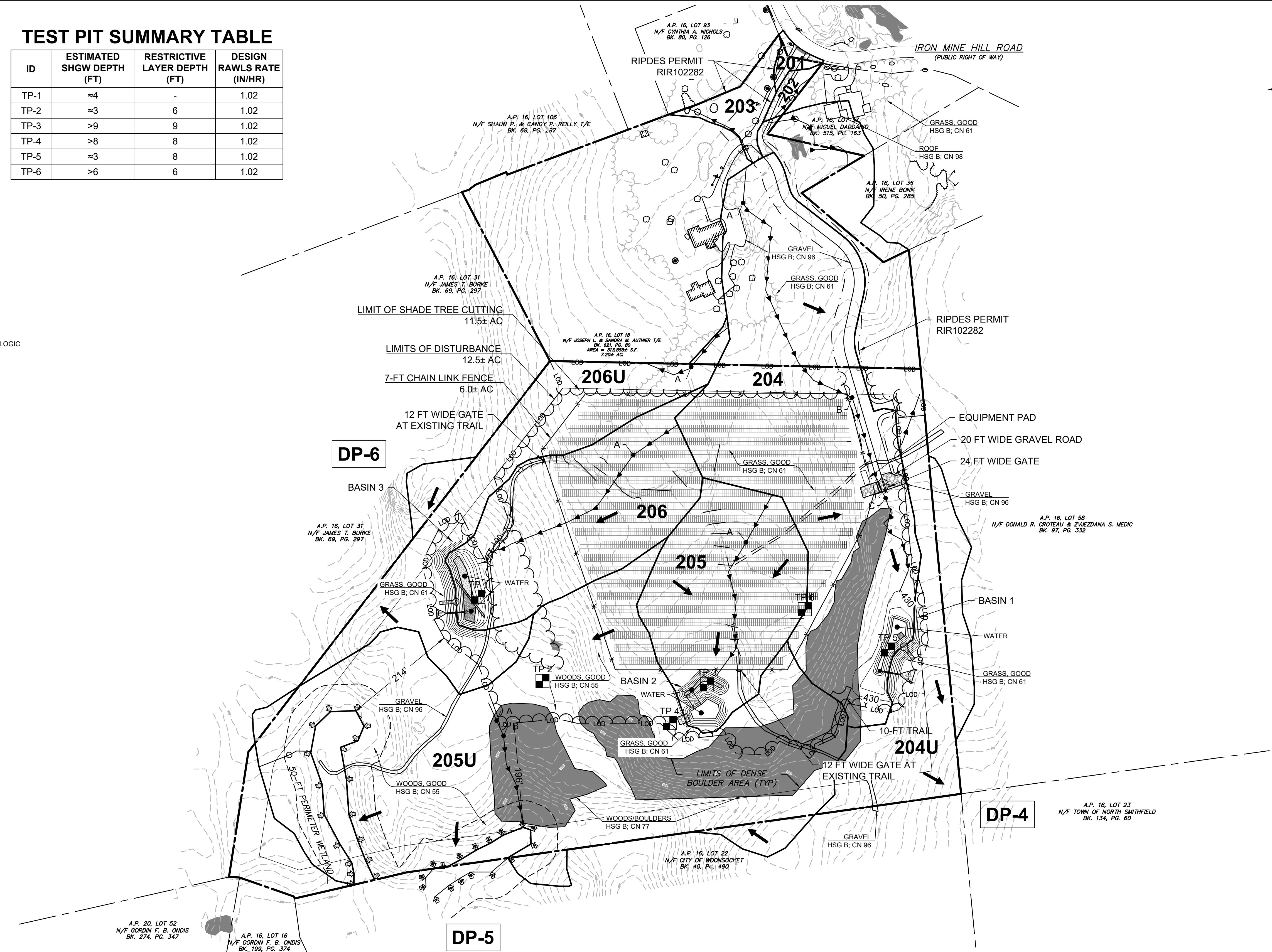
- DRAINAGE AREA BOUNDARY
- PROPERTY LINE
- 115 MAJOR CONTOUR
- MINOR CONTOUR
- TIME OF CONC. FLOW PATH
- FLOW ARROW
- DP-4 DESIGN POINT ID
- 204 DRAINAGE AREA ID

TEST PIT SUMMARY TABLE

ID	ESTIMATED SHGW DEPTH (FT)	RESTRICTIVE LAYER DEPTH (FT)	DESIGN RAWLS RATE (IN/HR)
TP-1	≈4	-	1.02
TP-2	≈3	6	1.02
TP-3	>9	9	1.02
TP-4	>8	8	1.02
TP-5	≈3	8	1.02
TP-6	>6	6	1.02

NOTES:

1. BASE PLAN: "ALTA/NSPS LAND TITLE SURVEY", DATED SEPTEMBER 16, 2021, NORTHEAST ENGINEERS & CONSULTANTS
2. SOIL IS CLASSIFIED CANTON AND CHARLTON FINE SANDY LOAMS (CEC), HYDROLOGIC SOIL GROUP B, BY THE NATURAL RESOURCES CONSERVATION SERVICE.



No.	REVISION	DATE	DRAWN	DESIGN	CHK
DRAWN BY: GJR	DESIGNED BY: JMG	CHECKED BY:			