Stormwater Management Report

for:

Large Scale Ground Mounted Solar Photovoltaic Installation

2394 Main Poland Road
Conway, MA 01581

Project Proponent:

Nexamp, LLC

101 Summer Street, 2nd Floor
Boston, MA 02110

December 2018

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WDA DESIGN GROUP

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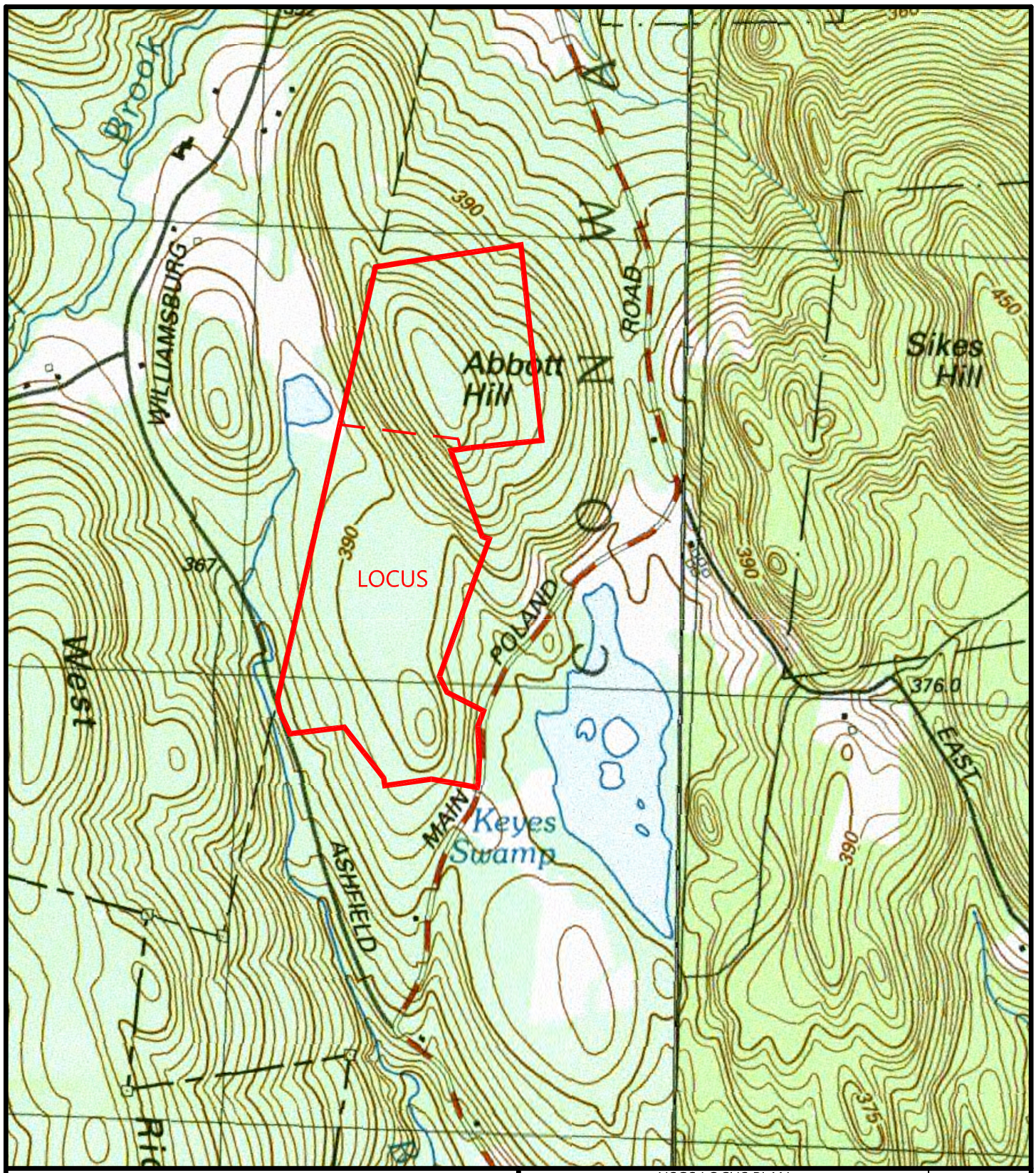

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TITLE:	USGS LOCUS PLAN 2394 Main Poland Road Conway, MA
PREPARED FOR:	NEXAMP, INC. 101 Summer Street Boston, MA
SOURCE:	USGS TOPOGRAPHIC MAP

DATE:	04/25/18	JOB NO.:	1212.00	REV. NO.:	____-__
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PURPOSE

Hydrologic calculations have been performed as part of the Site Plan Review and Notice of Intent applications for a proposed ground mounted solar array project at Main Poland Road in Conway, Massachusetts. The calculations were performed to design stormwater collection and attenuation facilities for the site and to demonstrate that the project will meet the standards of the Town of Conway and the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Regulations.

This report describes the existing project site, the proposed project, and analyses performed to develop a stormwater management system that will protect public safety and convenience and minimize environmental impacts.

PROJECT SITE

The subject property is located along the westerly side of Main Poland Road, approximately 2,000' north of the South Ashfield Road intersection. The property is located in the Rural Residential/Agricultural (RR/A) zoning district. The site has 568.71' of frontage on the west side of Main Poland Road and approximately 3,250' of the westerly property boundary is part of the Ashfield/Conway Town boundary. The entire property is 104 ± acres, although only about half is associated with this filing, and of those 51± acres approximately 2.8 acres are wetland (both jurisdictional bordering wetlands and non-jurisdictional isolated wetlands). Aside from the existing single-family home and gravel drive, the property is wooded. Adjacent property uses are single-family residential to the west and south (some in Ashfield), residential/agricultural to the east/northeast and undeveloped land to the north. Topography is variable, ranging from a high elevation of 1,484 at the top of Abbott Hill in the northern portion of the property to a low elevation of 1,200± near Main Poland Road in the southeast portion of the site (elevations refer to NAVD 1988) where the driveway enters from Main Poland Road. Several cart paths and interior stone walls traverse the property. Additionally, part of the central and eastern portion the site is subject to a limited tree harvesting. The upland areas are comprised mainly of white pine, hemlock, oak, beech, black and white birch, red maple, black cherry, mountain laurel, hazelnut and ground pine.

WDA Design Group (WDA) flagged the resource areas in April and August 2018, being Bordering Vegetated Wetlands (BVW) and Isolated Wetlands (IW) and the flags were subsequently located during an on-the-ground survey by WDA and are shown on the attached plans. The wetland boundaries as well as intermittent channels were reviewed in the field with the Conservation Commission peer reviewer, Ward Smith during the ANRAD review period. The Commission issued an ORAD on September 25, 2018 (DEP #138-0118, recorded FCRD bk. 07266, pg. 52) confirming the on-site resource areas within only that area of the site (51+/- acres) as noted on the plans. Additionally, Bradford Brook, located to the west of South Ashfield Road, is shown as a perennial stream on the USGS maps, and projects a 200' Riverfront Area onto a portion of the site along South Ashfield Road.

The two main Isolated Wetland areas, WF-1 to WF-40 and IW-500 to IW-551 were confirmed during the ANRAD process as not meeting the requirements for an isolated land subject to flooding (ILSF) under the MA WPA 310 CMR. 10.57(2)(b). These two wetland areas are not protected under the State WPA or local jurisdiction, but may fall under Section 401 or 404 of the State or Federal code.

No portion of the site contains a Special Flood Hazard Area (aka, Zone A; "100-year flood plain") as depicted on the FEMA flood map 250114 0010 B (dated June 4, 1980). No portion of the site contains an area of priority wildlife or habitat, or certified or potential vernal pools according to the current NHESP Atlas (14th Edition, dated August 1, 2017).

The soils mapped on-site by the NRCS are Pillsbury fine sandy loam (map unit 75B-hydric soil) and Millsite-Westminster Complex, rocky (Map unit 116C-F), Millsite-Westminster Complex, very rocky (map unit 120B) and Colrain-Millsite Complex, rocky (map unit 118B).

PROPOSED PROJECT

The project proponent, Nexamp, LLC proposes to install a 6.0± MW DC ground mounted solar array on an existing wooded area. The facility will include the photovoltaic panels, associated mounting racks, fittings, electrical equipment (i.e., conduit, inverters, transformers, and utility poles) with a connection to the existing pole line on Main Poland Road. Clearing of the site will occur to accommodate the solar array, and the existing gravel driveway will be expanded and improved for construction and maintenance purposes.

All stormwater runoff will flow overland through grassed areas (meadow) toward the perimeter of the site. A portion of the site is captured in a detention basin located on the south west side of the proposed array in order to mitigate the peak flow rates. Controlled outflow will be discharged to upland areas at a rate equal to or less than existing conditions for the 2, 10, and 100-year, 24-hour design storms. The project creates only minimal impervious surface area, limited to roughly 36,400 square feet of improvements to the existing gravel driveway (to prevent unraveling of the road edge) and a few small concrete pads for the electrical equipment. These areas may be considered de minimis on a 104 ± acre site.

Low Impact Development (LID) Considerations:

> The proposed project is a low impact use of the site. The proposed development area is approximately 35± acres of the 104± acre site. The project involves a relatively small amount of proposed impervious surfaces. After construction is completed, cleared portions inside the fenced area will act as meadow and be maintained in order to keep grasses clear of the solar panels. Portions outside the fenced area will be cleared but not stumped to maintain a ground vegetative buffer for stormwater runoff.

STORMWATER MANAGEMENT STANDARDS

STANDARD #1 – NO NEW UNTREATED DISCHARGES

The nature of the low impact design of the site allows for water to run off site via overland flow similar to the current conditions. The site will continue to generate clean stormwater runoff and additional water quality treatment is not required. The outlets of proposed detention basins will discharge upland of the wetlands, and have been designed so that there will be no erosion or scour to the wetlands of the Commonwealth. Please refer to attached Stormwater Standards calculations.

STANDARD #2 – PEAK RATE ATTENUATION.

METHODOLOGY

United States Soil Conservation Service, "Urban Hydrology for Small Watersheds, Technical Release Number 55" (TR-55) methods (HydroCAD 10.00) were utilized to develop runoff hydrographs for watershed areas affected by the proposed development. Existing and proposed runoff hydrographs were developed for the 2, 10, and 100-

year, 24-hour rainfall events for the purpose of developing a stormwater management system that will limit post-development peak runoff rates to pre-development levels.

The proposed stormwater management system has been designed to meet the requirements of the Town of Amherst and the MassDEP Stormwater Management Standards. The project will limit peak rates of runoff from the site and will infiltrate runoff to approximate existing groundwater recharge.

ANALYSIS SUMMARY

In order to assess the impact of the proposed development on peak runoff rates onto down-gradient properties, hydrologic calculations were performed for each of three (3) design storms at the design point(s). The calculations refer to runoff quantities at the final design point(s), the western property line (DP-1), the eastern property line (DP-2), and the wetland system to the south of the property (DP-3).

Calculations of peak runoff rates for existing and proposed site conditions are included and summarized in Table I for comparison of peak runoff rates for the design point for the three (3) design storms. A proposed hydrology plan is provided showing the various sub-watersheds draining to the proposed stormwater management facilities. Stormwater runoff from the overland areas not tributary to the stormwater management facilities will drain by sheet flow or shallow concentrated flow along the existing flow patterns to the design point.

Table I demonstrates that the proposed stormwater management system will be effective in limiting peak rates of runoff from the subject property to approximate pre-development levels.

TABLE I: EXISTING AND PROPOSED PEAK RUNOFF

DRAINAGE AREA	DESIGN STORM EVENT / PEAK RUNOFF (cfs)		
	2-Year	10-Year	100-Year
Existing (DP-1)	0.5	8.3	35.2
Proposed (DP-1)	0.5	8.3	35.1
Existing (DP-2)	0.4	6.1	25.2
Proposed (DP-2)	0.4	6.1	25.2
Existing (DP-3)	0.6	3.6	10.5
Proposed (DP-3)	0.6	3.6	10.5

TABLE II: EXISTING AND PROPOSED RUNOFF VOLUMES

DRAINAGE AREA	DESIGN STORM EVENT / VOLUME (acre-feet)		
	2-Year	10-Year	100-Year
Existing (DP-1)	0.31	1.76	5.09
Proposed (DP-1)	0.30	1.82	5.24
Existing (DP-2)	0.18	0.87	2.37
Proposed (DP-2)	0.10	0.87	2.37
Existing (DP-3)	0.12	0.42	1.00
Proposed (DP-3)	0.12	0.42	1.00

TABLE III: MAXIMUM WATER ELEVATION

STORMWATER FACILITY	100-YEAR STORM EVENT WATER ELEVATION	TOP / BERM ELEVATION
Detention Basin (DB-100)	1239.43	1240.5

STANDARD #3 – STORMWATER RECHARGE

The project creates only minimal impervious surface area and given the size of the site, no dedicated stormwater recharge facilities are required. There is a proposed stormwater basin to mitigate peak flow rates, which also provides 1,300± cf of storage volume.

STANDARD #4 – WATER QUALITY

No dedicated TSS or Water Quality Volume measures are proposed due to the minimal impervious ground surface. The impervious areas may be considered de minimis per the Stormwater Regulations.

STANDARD #5 – LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS (LUHPPLS)

The proposed project is not considered a land use with Higher Potential Pollutant Loads therefore, Standard #5 is not applicable.

STANDARD #6 – CRITICAL AREAS

The proposed project is not discharging near or to a Critical Area therefore, Standard #6 is not applicable.

STANDARD #7 – REDEVELOPMENT PROJECT

The proposed project may be in part considered a redevelopment project, however, all standards have been met.

STANDARD #8 – CONSTRUCTION POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL

As the total area of disturbance (tree clearing areas) is over an acre, a Notice of Intent (NOI) must be filed with the US EPA and a Stormwater Pollution Prevention Plan (SWPPP) shall be retained on-site during construction.

STANDARD #9 – OPERATION AND MAINTENANCE PLAN

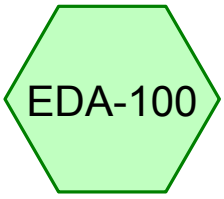
The attached Operation and Maintenance Plan describes the requisite long-term operation and maintenance of all on-site stormwater Best Management Practices (BMPs) and hydraulic drainage system. The Operation and Maintenance Plan also describes source control for the prevention of pollution to also serve as the Long Term Pollution Prevention Plan (LTPPP).

STANDARD #10 – PROHIBITION OF ILLICIT DISCHARGES

There are no known or proposed illicit discharges associated with this project.

MASSACHUSETTS STORMWATER REPORT CHECKLIST (See Appendices)

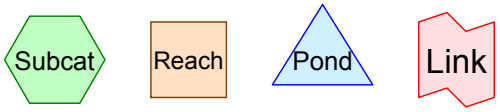
EXISTING HYDROLOGY



Subcat EDA-100

Subcat EDA-200

Subcat EDA-300



Routing Diagram for 1212 - Existing
Prepared by Microsoft

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.140	96	Gravel surface, HSG A (EDA-100)
0.585	96	Gravel surface, HSG B (EDA-100, EDA-200, EDA-300)
0.076	98	Roofs, HSG B (EDA-200, EDA-300)
17.857	30	Woods, Good, HSG A (EDA-100, EDA-200)
42.916	55	Woods, Good, HSG B (EDA-100, EDA-200, EDA-300)
2.071	77	Woods, Good, HSG D (EDA-100)
63.645	**49**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
17.997	HSG A	EDA-100, EDA-200
43.577	HSG B	EDA-100, EDA-200, EDA-300
0.000	HSG C	
2.071	HSG D	EDA-100
0.000	Other	
63.645		**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
0.140	0.585	0.000	0.000	0.000	0.725	Gravel surface	EDA-100, EDA-200, EDA-300
0.000	0.076	0.000	0.000	0.000	0.076	Roofs	EDA-200, EDA-300
17.857	42.916	0.000	2.071	0.000	62.844	Woods, Good	EDA-100, EDA-200, EDA-300
17.997	**43.577**	**0.000**	**2.071**	**0.000**	**63.645**	**TOTAL AREA**	

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 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 EDA-100: Subcat EDA-100 Runoff Area=1,782,909 sf 0.00% Impervious Runoff Depth=0.09"
Flow Length=1,052' Tc=27.4 min CN=48 Runoff=0.5 cfs 0.307 af

Subcatchment EDA-200: Subcat EDA-200 Runoff Area=742,322 sf 0.26% Impervious Runoff Depth=0.13"
Flow Length=914' Tc=9.6 min CN=50 Runoff=0.4 cfs 0.183 af

Subcatchment EDA-300: Subcat EDA-300 Runoff Area=247,165 sf 0.57% Impervious Runoff Depth=0.25"
Flow Length=627' Tc=12.5 min CN=55 Runoff=0.6 cfs 0.119 af

Total Runoff Area = 63.645 ac Runoff Volume = 0.608 af Average Runoff Depth = 0.11"
99.88% Pervious = 63.569 ac 0.12% Impervious = 0.076 ac

Summary for Subcatchment EDA-100: Subcat EDA-100

Runoff = 0.5 cfs @ 14.87 hrs, Volume= 0.307 af, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
6,085	96	Gravel surface, HSG A
4,357	96	Gravel surface, HSG B
597,044	30	Woods, Good, HSG A
1,085,204	55	Woods, Good, HSG B
90,219	77	Woods, Good, HSG D
1,782,909	48	Weighted Average
1,782,909		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
18.1	1,002	0.0340	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
27.4	1,052	Total			

Summary for Subcatchment EDA-200: Subcat EDA-200

Runoff = 0.4 cfs @ 12.54 hrs, Volume= 0.183 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
12,408	96	Gravel surface, HSG B
180,818	30	Woods, Good, HSG A
372,256	55	Woods, Good, HSG B
8,003	96	Gravel surface, HSG B
1,919	98	Roofs, HSG B
166,918	55	Woods, Good, HSG B
742,322	50	Weighted Average
740,403		99.74% Pervious Area
1,919		0.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.5600	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.3	864	0.2100	2.29		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.6	914	Total			

Summary for Subcatchment EDA-300: Subcat EDA-300

Runoff = 0.6 cfs @ 12.44 hrs, Volume= 0.119 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
735	96	Gravel surface, HSG B
1,401	98	Roofs, HSG B
245,029	55	Woods, Good, HSG B
247,165	55	Weighted Average
245,764		99.43% Pervious Area
1,401		0.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
7.1	577	0.0730	1.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.5	627	Total			

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 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 EDA-100: Subcat EDA-100 Runoff Area=1,782,909 sf 0.00% Impervious Runoff Depth=0.51"
Flow Length=1,052' Tc=27.4 min CN=48 Runoff=8.3 cfs 1.756 af

Subcatchment EDA-200: Subcat EDA-200 Runoff Area=742,322 sf 0.26% Impervious Runoff Depth=0.61"
Flow Length=914' Tc=9.6 min CN=50 Runoff=6.1 cfs 0.870 af

Subcatchment EDA-300: Subcat EDA-300 Runoff Area=247,165 sf 0.57% Impervious Runoff Depth=0.88"
Flow Length=627' Tc=12.5 min CN=55 Runoff=3.6 cfs 0.417 af

Total Runoff Area = 63.645 ac Runoff Volume = 3.043 af Average Runoff Depth = 0.57"
99.88% Pervious = 63.569 ac 0.12% Impervious = 0.076 ac

Summary for Subcatchment EDA-100: Subcat EDA-100

Runoff = 8.3 cfs @ 12.58 hrs, Volume= 1.756 af, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
6,085	96	Gravel surface, HSG A
4,357	96	Gravel surface, HSG B
597,044	30	Woods, Good, HSG A
1,085,204	55	Woods, Good, HSG B
90,219	77	Woods, Good, HSG D
1,782,909	48	Weighted Average
1,782,909		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
18.1	1,002	0.0340	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
27.4	1,052	Total			

Summary for Subcatchment EDA-200: Subcat EDA-200

Runoff = 6.1 cfs @ 12.21 hrs, Volume= 0.870 af, Depth= 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
12,408	96	Gravel surface, HSG B
180,818	30	Woods, Good, HSG A
372,256	55	Woods, Good, HSG B
8,003	96	Gravel surface, HSG B
1,919	98	Roofs, HSG B
166,918	55	Woods, Good, HSG B
742,322	50	Weighted Average
740,403		99.74% Pervious Area
1,919		0.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.5600	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.3	864	0.2100	2.29		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.6	914	Total			

Summary for Subcatchment EDA-300: Subcat EDA-300

Runoff = 3.6 cfs @ 12.22 hrs, Volume= 0.417 af, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
735	96	Gravel surface, HSG B
1,401	98	Roofs, HSG B
245,029	55	Woods, Good, HSG B
247,165	55	Weighted Average
245,764		99.43% Pervious Area
1,401		0.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
7.1	577	0.0730	1.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.5	627	Total			

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 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 EDA-100: Subcat EDA-100 Runoff Area=1,782,909 sf 0.00% Impervious Runoff Depth=1.49"
Flow Length=1,052' Tc=27.4 min CN=48 Runoff=35.2 cfs 5.086 af

Subcatchment EDA-200: Subcat EDA-200 Runoff Area=742,322 sf 0.26% Impervious Runoff Depth=1.67"
Flow Length=914' Tc=9.6 min CN=50 Runoff=25.2 cfs 2.367 af

Subcatchment EDA-300: Subcat EDA-300 Runoff Area=247,165 sf 0.57% Impervious Runoff Depth=2.12"
Flow Length=627' Tc=12.5 min CN=55 Runoff=10.5 cfs 1.004 af

Total Runoff Area = 63.645 ac Runoff Volume = 8.457 af Average Runoff Depth = 1.59"
99.88% Pervious = 63.569 ac 0.12% Impervious = 0.076 ac

Summary for Subcatchment EDA-100: Subcat EDA-100

Runoff = 35.2 cfs @ 12.46 hrs, Volume= 5.086 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
6,085	96	Gravel surface, HSG A
4,357	96	Gravel surface, HSG B
597,044	30	Woods, Good, HSG A
1,085,204	55	Woods, Good, HSG B
90,219	77	Woods, Good, HSG D
1,782,909	48	Weighted Average
1,782,909		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
18.1	1,002	0.0340	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
27.4	1,052	Total			

Summary for Subcatchment EDA-200: Subcat EDA-200

Runoff = 25.2 cfs @ 12.16 hrs, Volume= 2.367 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
12,408	96	Gravel surface, HSG B
180,818	30	Woods, Good, HSG A
372,256	55	Woods, Good, HSG B
8,003	96	Gravel surface, HSG B
1,919	98	Roofs, HSG B
166,918	55	Woods, Good, HSG B
742,322	50	Weighted Average
740,403		99.74% Pervious Area
1,919		0.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.5600	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.3	864	0.2100	2.29		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.6	914	Total			

Summary for Subcatchment EDA-300: Subcat EDA-300

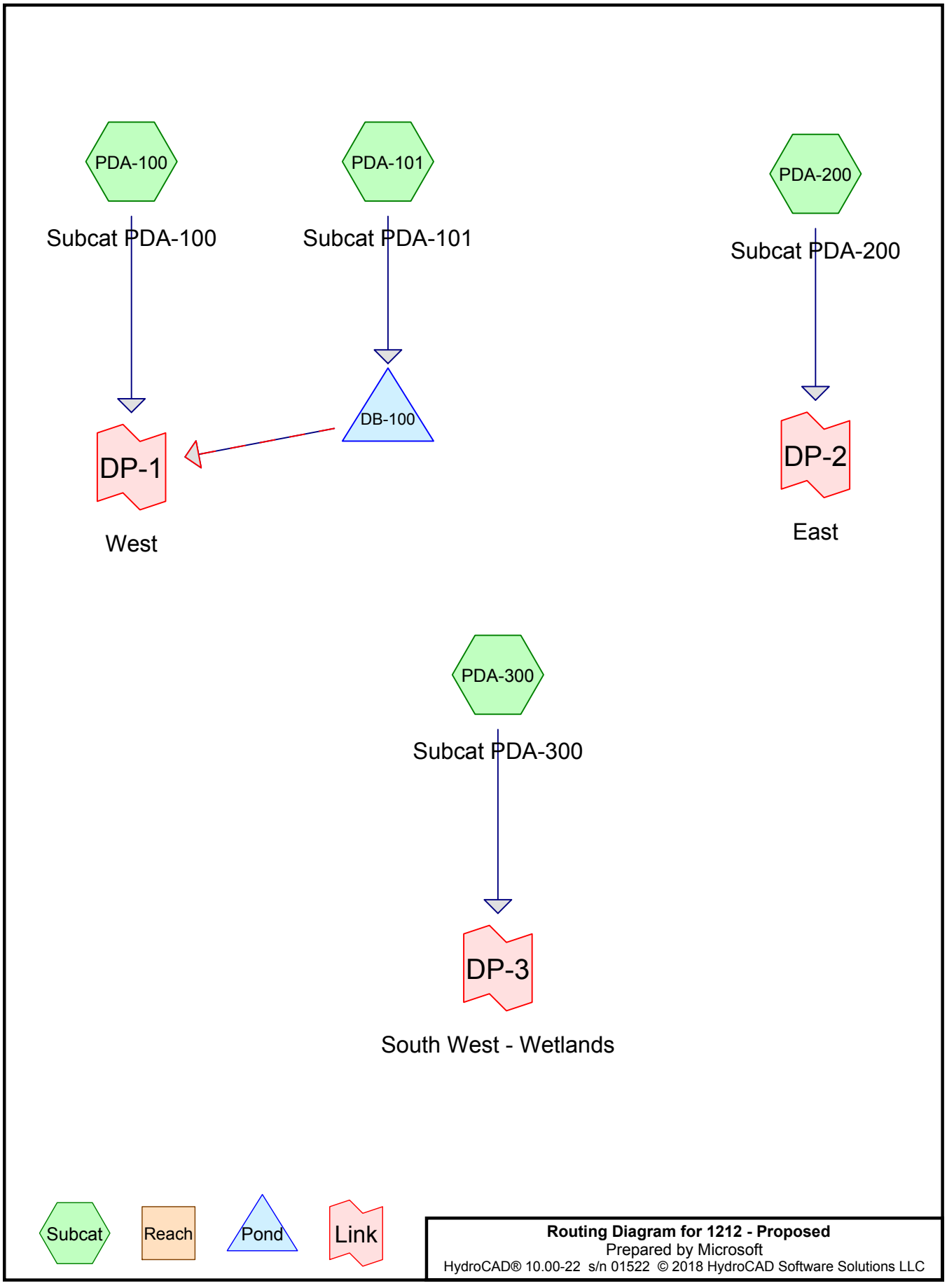
Runoff = 10.5 cfs @ 12.19 hrs, Volume= 1.004 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
735	96	Gravel surface, HSG B
1,401	98	Roofs, HSG B
245,029	55	Woods, Good, HSG B
247,165	55	Weighted Average
245,764		99.43% Pervious Area
1,401		0.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
7.1	577	0.0730	1.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.5	627	Total			

PROPOSED HYDROLOGY



Routing Diagram for 1212 - Proposed
Prepared by Microsoft

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.899	30	Brush, Good, HSG A (PDA-100, PDA-200)
5.378	48	Brush, Good, HSG B (PDA-100, PDA-101, PDA-200)
0.399	96	Gravel surface, HSG A (PDA-100, PDA-101)
1.044	96	Gravel surface, HSG B (PDA-100, PDA-101, PDA-200, PDA-300)
15.877	30	Meadow, non-grazed, HSG A (PDA-100, PDA-101, PDA-200)
11.892	58	Meadow, non-grazed, HSG B (PDA-100, PDA-101, PDA-200)
0.076	98	Roofs, HSG B (PDA-200, PDA-300)
0.821	30	Woods, Good, HSG A (PDA-100, PDA-200)
25.187	55	Woods, Good, HSG B (PDA-100, PDA-101, PDA-200, PDA-300)
2.071	77	Woods, Good, HSG D (PDA-100)
63.645	**50**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
17.997	HSG A	PDA-100, PDA-101, PDA-200
43.577	HSG B	PDA-100, PDA-101, PDA-200, PDA-300
0.000	HSG C	
2.071	HSG D	PDA-100
0.000	Other	
63.645		**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
0.899	5.378	0.000	0.000	0.000	6.277	Brush, Good	PDA-100, PDA-101, PDA-200
0.399	1.044	0.000	0.000	0.000	1.443	Gravel surface	PDA-100, PDA-101, PDA-200, PDA-300
15.877	11.892	0.000	0.000	0.000	27.770	Meadow, non-grazed	PDA-100, PDA-101, PDA-200
0.000	0.076	0.000	0.000	0.000	0.076	Roofs	PDA-200, PDA-300
0.821	25.187	0.000	2.071	0.000	28.079	Woods, Good	PDA-100, PDA-101, PDA-200, PDA-300
17.997	**43.577**	**0.000**	**2.071**	**0.000**	**63.645**	**TOTAL AREA**	

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 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 PDA-100: Subcat PDA-100 Runoff Area=1,607,983 sf 0.00% Impervious Runoff Depth=0.09"
Tc=27.4 min CN=48 Runoff=0.4 cfs 0.277 af

Subcatchment PDA-101: Subcat PDA-101 Runoff Area=174,926 sf 0.00% Impervious Runoff Depth=0.28"
Flow Length=713' Tc=15.5 min CN=56 Runoff=0.5 cfs 0.094 af

Subcatchment PDA-200: Subcat PDA-200 Runoff Area=742,323 sf 0.26% Impervious Runoff Depth=0.13"
Tc=9.6 min CN=50 Runoff=0.4 cfs 0.183 af

Subcatchment PDA-300: Subcat PDA-300 Runoff Area=247,166 sf 0.57% Impervious Runoff Depth=0.25"
Tc=12.5 min CN=55 Runoff=0.6 cfs 0.119 af

Pond DB-100: Peak Elev=1,236.95' Storage=1,571 cf Inflow=0.5 cfs 0.094 af
Discarded=0.0 cfs 0.074 af Primary=0.1 cfs 0.020 af Secondary=0.0 cfs 0.000 af Outflow=0.1 cfs 0.094 af

Link DP-1: West Inflow=0.5 cfs 0.296 af
Primary=0.5 cfs 0.296 af

Link DP-2: East Inflow=0.4 cfs 0.183 af
Primary=0.4 cfs 0.183 af

Link DP-3: South West - Wetlands Inflow=0.6 cfs 0.119 af
Primary=0.6 cfs 0.119 af

Total Runoff Area = 63.645 ac Runoff Volume = 0.672 af Average Runoff Depth = 0.13"
99.88% Pervious = 63.569 ac 0.12% Impervious = 0.076 ac

Summary for Subcatchment PDA-100: Subcat PDA-100

Runoff = 0.4 cfs @ 14.87 hrs, Volume= 0.277 af, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
26,453	30	Brush, Good, HSG A
117,175	48	Brush, Good, HSG B
16,413	96	Gravel surface, HSG A
6,152	96	Gravel surface, HSG B
536,303	30	Meadow, non-grazed, HSG A
318,202	58	Meadow, non-grazed, HSG B
8,551	30	Woods, Good, HSG A
488,514	55	Woods, Good, HSG B
90,219	77	Woods, Good, HSG D
1,607,983	48	Weighted Average
1,607,983		100.00% Pervious Area

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

Summary for Subcatchment PDA-101: Subcat PDA-101

Runoff = 0.5 cfs @ 12.46 hrs, Volume= 0.094 af, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
44,289	48	Brush, Good, HSG B
970	96	Gravel surface, HSG A
11,592	96	Gravel surface, HSG B
14,440	30	Meadow, non-grazed, HSG A
102,288	58	Meadow, non-grazed, HSG B
1,348	55	Woods, Good, HSG B
174,926	56	Weighted Average
174,926		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
6.2	451	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	212	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.5	713	Total			

Summary for Subcatchment PDA-200: Subcat PDA-200

Runoff = 0.4 cfs @ 12.54 hrs, Volume= 0.183 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
12,726	30	Brush, Good, HSG A
72,786	48	Brush, Good, HSG B
12,978	96	Gravel surface, HSG B
140,879	30	Meadow, non-grazed, HSG A
97,546	58	Meadow, non-grazed, HSG B
27,213	30	Woods, Good, HSG A
201,354	55	Woods, Good, HSG B
14,032	96	Gravel surface, HSG B
160,890	55	Woods, Good, HSG B
1,919	98	Roofs, HSG B
742,323	50	Weighted Average
740,404		99.74% Pervious Area
1,919		0.26% Impervious Area

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

Summary for Subcatchment PDA-300: Subcat PDA-300

Runoff = 0.6 cfs @ 12.44 hrs, Volume= 0.119 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
735	96	Gravel surface, HSG B
1,401	98	Roofs, HSG B
245,029	55	Woods, Good, HSG B
247,166	55	Weighted Average
245,765		99.43% Pervious Area
1,401		0.57% Impervious Area

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

Summary for Pond DB-100:

Inflow Area = 4.016 ac, 0.00% Impervious, Inflow Depth = 0.28" for 2-year event
Inflow = 0.5 cfs @ 12.46 hrs, Volume= 0.094 af
Outflow = 0.1 cfs @ 15.56 hrs, Volume= 0.094 af, Atten= 76%, Lag= 186.0 min
Discarded = 0.0 cfs @ 15.56 hrs, Volume= 0.074 af
Primary = 0.1 cfs @ 15.56 hrs, Volume= 0.020 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 1,236.95' @ 15.56 hrs Surf.Area= 1,949 sf Storage= 1,571 cf

Plug-Flow detention time= 325.0 min calculated for 0.094 af (100% of inflow)
Center-of-Mass det. time= 325.2 min (1,281.2 - 956.0)

Volume	Invert	Avail.Storage	Storage Description
#1	1,236.00'	10,608 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,236.00	1,374	0	0
1,238.00	2,591	3,965	3,965
1,240.00	4,052	6,643	10,608

Device	Routing	Invert	Outlet Devices
#1	Primary	1,236.00'	**12.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,236.00' / 1,235.00' S= 0.0222 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	1,236.80'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	1,238.40'	**10.0" Vert. Orifice/Grate** C= 0.600
#4	Secondary	1,239.50'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#5	Discarded	1,236.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.0 cfs @ 15.56 hrs HW=1,236.95' (Free Discharge)
└**5=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.1 cfs @ 15.56 hrs HW=1,236.95' (Free Discharge)
└**1=Culvert** (Passes 0.1 cfs of 2.5 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.1 cfs @ 1.30 fps)
  └**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=1,236.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Link DP-1: West

Inflow Area = 40.930 ac, 0.00% Impervious, Inflow Depth = 0.09" for 2-year event
Inflow = 0.5 cfs @ 15.14 hrs, Volume= 0.296 af
Primary = 0.5 cfs @ 15.14 hrs, Volume= 0.296 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: East

Inflow Area = 17.041 ac, 0.26% Impervious, Inflow Depth = 0.13" for 2-year event
Inflow = 0.4 cfs @ 12.54 hrs, Volume= 0.183 af
Primary = 0.4 cfs @ 12.54 hrs, Volume= 0.183 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Summary for Link DP-3: South West - Wetlands

Inflow Area = 5.674 ac, 0.57% Impervious, Inflow Depth = 0.25" for 2-year event
Inflow = 0.6 cfs @ 12.44 hrs, Volume= 0.119 af
Primary = 0.6 cfs @ 12.44 hrs, Volume= 0.119 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 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 PDA-100: Subcat PDA-100 Runoff Area=1,607,983 sf 0.00% Impervious Runoff Depth=0.51"
Tc=27.4 min CN=48 Runoff=7.5 cfs 1.584 af

Subcatchment PDA-101: Subcat PDA-101 Runoff Area=174,926 sf 0.00% Impervious Runoff Depth=0.94"
Flow Length=713' Tc=15.5 min CN=56 Runoff=2.6 cfs 0.315 af

Subcatchment PDA-200: Subcat PDA-200 Runoff Area=742,323 sf 0.26% Impervious Runoff Depth=0.61"
Tc=9.6 min CN=50 Runoff=6.1 cfs 0.870 af

Subcatchment PDA-300: Subcat PDA-300 Runoff Area=247,166 sf 0.57% Impervious Runoff Depth=0.88"
Tc=12.5 min CN=55 Runoff=3.6 cfs 0.417 af

Pond DB-100: Peak Elev=1,237.84' Storage=3,548 cf Inflow=2.6 cfs 0.315 af
Discarded=0.1 cfs 0.083 af Primary=0.8 cfs 0.232 af Secondary=0.0 cfs 0.000 af Outflow=0.9 cfs 0.315 af

Link DP-1: West Inflow=8.3 cfs 1.816 af
Primary=8.3 cfs 1.816 af

Link DP-2: East Inflow=6.1 cfs 0.870 af
Primary=6.1 cfs 0.870 af

Link DP-3: South West - Wetlands Inflow=3.6 cfs 0.417 af
Primary=3.6 cfs 0.417 af

Total Runoff Area = 63.645 ac Runoff Volume = 3.186 af Average Runoff Depth = 0.60"
99.88% Pervious = 63.569 ac 0.12% Impervious = 0.076 ac

Summary for Subcatchment PDA-100: Subcat PDA-100

Runoff = 7.5 cfs @ 12.58 hrs, Volume= 1.584 af, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
26,453	30	Brush, Good, HSG A
117,175	48	Brush, Good, HSG B
16,413	96	Gravel surface, HSG A
6,152	96	Gravel surface, HSG B
536,303	30	Meadow, non-grazed, HSG A
318,202	58	Meadow, non-grazed, HSG B
8,551	30	Woods, Good, HSG A
488,514	55	Woods, Good, HSG B
90,219	77	Woods, Good, HSG D
1,607,983	48	Weighted Average
1,607,983		100.00% Pervious Area

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

Summary for Subcatchment PDA-101: Subcat PDA-101

Runoff = 2.6 cfs @ 12.26 hrs, Volume= 0.315 af, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
44,289	48	Brush, Good, HSG B
970	96	Gravel surface, HSG A
11,592	96	Gravel surface, HSG B
14,440	30	Meadow, non-grazed, HSG A
102,288	58	Meadow, non-grazed, HSG B
1,348	55	Woods, Good, HSG B
174,926	56	Weighted Average
174,926		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
6.2	451	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	212	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.5	713	Total			

Summary for Subcatchment PDA-200: Subcat PDA-200

Runoff = 6.1 cfs @ 12.21 hrs, Volume= 0.870 af, Depth= 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
12,726	30	Brush, Good, HSG A
72,786	48	Brush, Good, HSG B
12,978	96	Gravel surface, HSG B
140,879	30	Meadow, non-grazed, HSG A
97,546	58	Meadow, non-grazed, HSG B
27,213	30	Woods, Good, HSG A
201,354	55	Woods, Good, HSG B
14,032	96	Gravel surface, HSG B
160,890	55	Woods, Good, HSG B
1,919	98	Roofs, HSG B
742,323	50	Weighted Average
740,404		99.74% Pervious Area
1,919		0.26% Impervious Area

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

Summary for Subcatchment PDA-300: Subcat PDA-300

Runoff = 3.6 cfs @ 12.22 hrs, Volume= 0.417 af, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
735	96	Gravel surface, HSG B
1,401	98	Roofs, HSG B
245,029	55	Woods, Good, HSG B
247,166	55	Weighted Average
245,765		99.43% Pervious Area
1,401		0.57% Impervious Area

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

Summary for Pond DB-100:

Inflow Area = 4.016 ac, 0.00% Impervious, Inflow Depth = 0.94" for 10-year event
Inflow = 2.6 cfs @ 12.26 hrs, Volume= 0.315 af
Outflow = 0.9 cfs @ 12.78 hrs, Volume= 0.315 af, Atten= 66%, Lag= 31.3 min
Discarded = 0.1 cfs @ 12.78 hrs, Volume= 0.083 af
Primary = 0.8 cfs @ 12.78 hrs, Volume= 0.232 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 1,237.84' @ 12.78 hrs Surf.Area= 2,491 sf Storage= 3,548 cf

Plug-Flow detention time= 133.8 min calculated for 0.314 af (100% of inflow)
Center-of-Mass det. time= 134.0 min (1,035.5 - 901.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,236.00'	10,608 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,236.00	1,374	0	0
1,238.00	2,591	3,965	3,965
1,240.00	4,052	6,643	10,608

Device	Routing	Invert	Outlet Devices
#1	Primary	1,236.00'	**12.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,236.00' / 1,235.00' S= 0.0222 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	1,236.80'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	1,238.40'	**10.0" Vert. Orifice/Grate** C= 0.600
#4	Secondary	1,239.50'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#5	Discarded	1,236.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.1 cfs @ 12.78 hrs HW=1,237.84' (Free Discharge)
└**5=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.8 cfs @ 12.78 hrs HW=1,237.84' (Free Discharge)
└**1=Culvert** (Passes 0.8 cfs of 4.4 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.8 cfs @ 4.27 fps)
  └**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=1,236.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Link DP-1: West

Inflow Area = 40.930 ac, 0.00% Impervious, Inflow Depth = 0.53" for 10-year event
Inflow = 8.3 cfs @ 12.59 hrs, Volume= 1.816 af
Primary = 8.3 cfs @ 12.59 hrs, Volume= 1.816 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: East

Inflow Area = 17.041 ac, 0.26% Impervious, Inflow Depth = 0.61" for 10-year event
Inflow = 6.1 cfs @ 12.21 hrs, Volume= 0.870 af
Primary = 6.1 cfs @ 12.21 hrs, Volume= 0.870 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Summary for Link DP-3: South West - Wetlands

Inflow Area = 5.674 ac, 0.57% Impervious, Inflow Depth = 0.88" for 10-year event
Inflow = 3.6 cfs @ 12.22 hrs, Volume= 0.417 af
Primary = 3.6 cfs @ 12.22 hrs, Volume= 0.417 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 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 PDA-100: Subcat PDA-100 Runoff Area=1,607,983 sf 0.00% Impervious Runoff Depth=1.49"
Tc=27.4 min CN=48 Runoff=31.8 cfs 4.587 af

Subcatchment PDA-101: Subcat PDA-101 Runoff Area=174,926 sf 0.00% Impervious Runoff Depth=2.22"
Flow Length=713' Tc=15.5 min CN=56 Runoff=7.2 cfs 0.742 af

Subcatchment PDA-200: Subcat PDA-200 Runoff Area=742,323 sf 0.26% Impervious Runoff Depth=1.67"
Tc=9.6 min CN=50 Runoff=25.2 cfs 2.367 af

Subcatchment PDA-300: Subcat PDA-300 Runoff Area=247,166 sf 0.57% Impervious Runoff Depth=2.12"
Tc=12.5 min CN=55 Runoff=10.5 cfs 1.004 af

Pond DB-100: Peak Elev=1,239.43' Storage=8,418 cf Inflow=7.2 cfs 0.742 af
Discarded=0.1 cfs 0.093 af Primary=3.5 cfs 0.649 af Secondary=0.0 cfs 0.000 af Outflow=3.6 cfs 0.742 af

Link DP-1: West Inflow=35.1 cfs 5.236 af
Primary=35.1 cfs 5.236 af

Link DP-2: East Inflow=25.2 cfs 2.367 af
Primary=25.2 cfs 2.367 af

Link DP-3: South West - Wetlands Inflow=10.5 cfs 1.004 af
Primary=10.5 cfs 1.004 af

Total Runoff Area = 63.645 ac Runoff Volume = 8.700 af Average Runoff Depth = 1.64"
99.88% Pervious = 63.569 ac 0.12% Impervious = 0.076 ac

Summary for Subcatchment PDA-100: Subcat PDA-100

Runoff = 31.8 cfs @ 12.46 hrs, Volume= 4.587 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
26,453	30	Brush, Good, HSG A
117,175	48	Brush, Good, HSG B
16,413	96	Gravel surface, HSG A
6,152	96	Gravel surface, HSG B
536,303	30	Meadow, non-grazed, HSG A
318,202	58	Meadow, non-grazed, HSG B
8,551	30	Woods, Good, HSG A
488,514	55	Woods, Good, HSG B
90,219	77	Woods, Good, HSG D
1,607,983	48	Weighted Average
1,607,983		100.00% Pervious Area

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

Summary for Subcatchment PDA-101: Subcat PDA-101

Runoff = 7.2 cfs @ 12.23 hrs, Volume= 0.742 af, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
44,289	48	Brush, Good, HSG B
970	96	Gravel surface, HSG A
11,592	96	Gravel surface, HSG B
14,440	30	Meadow, non-grazed, HSG A
102,288	58	Meadow, non-grazed, HSG B
1,348	55	Woods, Good, HSG B
174,926	56	Weighted Average
174,926		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
6.2	451	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	212	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.5	713	Total			

Summary for Subcatchment PDA-200: Subcat PDA-200

Runoff = 25.2 cfs @ 12.16 hrs, Volume= 2.367 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
12,726	30	Brush, Good, HSG A
72,786	48	Brush, Good, HSG B
12,978	96	Gravel surface, HSG B
140,879	30	Meadow, non-grazed, HSG A
97,546	58	Meadow, non-grazed, HSG B
27,213	30	Woods, Good, HSG A
201,354	55	Woods, Good, HSG B
14,032	96	Gravel surface, HSG B
160,890	55	Woods, Good, HSG B
1,919	98	Roofs, HSG B
742,323	50	Weighted Average
740,404		99.74% Pervious Area
1,919		0.26% Impervious Area

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

Summary for Subcatchment PDA-300: Subcat PDA-300

Runoff = 10.5 cfs @ 12.19 hrs, Volume= 1.004 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
735	96	Gravel surface, HSG B
1,401	98	Roofs, HSG B
245,029	55	Woods, Good, HSG B
247,166	55	Weighted Average
245,765		99.43% Pervious Area
1,401		0.57% Impervious Area

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

Summary for Pond DB-100:

Inflow Area = 4.016 ac, 0.00% Impervious, Inflow Depth = 2.22" for 100-year event
Inflow = 7.2 cfs @ 12.23 hrs, Volume= 0.742 af
Outflow = 3.6 cfs @ 12.58 hrs, Volume= 0.742 af, Atten= 50%, Lag= 20.7 min
Discarded = 0.1 cfs @ 12.58 hrs, Volume= 0.093 af
Primary = 3.5 cfs @ 12.58 hrs, Volume= 0.649 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 1,239.43' @ 12.58 hrs Surf.Area= 3,636 sf Storage= 8,418 cf

Plug-Flow detention time= 82.3 min calculated for 0.742 af (100% of inflow)
Center-of-Mass det. time= 82.6 min (954.9 - 872.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,236.00'	10,608 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,236.00	1,374	0	0
1,238.00	2,591	3,965	3,965
1,240.00	4,052	6,643	10,608

Device	Routing	Invert	Outlet Devices
#1	Primary	1,236.00'	**12.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,236.00' / 1,235.00' S= 0.0222 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	1,236.80'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	1,238.40'	**10.0" Vert. Orifice/Grate** C= 0.600
#4	Secondary	1,239.50'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#5	Discarded	1,236.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.1 cfs @ 12.58 hrs HW=1,239.43' (Free Discharge)
└**5=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=3.5 cfs @ 12.58 hrs HW=1,239.43' (Free Discharge)
└**1=Culvert** (Passes 3.5 cfs of 6.5 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.5 cfs @ 7.42 fps)
  └**3=Orifice/Grate** (Orifice Controls 2.1 cfs @ 3.76 fps)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=1,236.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Link DP-1: West

Inflow Area = 40.930 ac, 0.00% Impervious, Inflow Depth = 1.54" for 100-year event
Inflow = 35.1 cfs @ 12.46 hrs, Volume= 5.236 af
Primary = 35.1 cfs @ 12.46 hrs, Volume= 5.236 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: East

Inflow Area = 17.041 ac, 0.26% Impervious, Inflow Depth = 1.67" for 100-year event
Inflow = 25.2 cfs @ 12.16 hrs, Volume= 2.367 af
Primary = 25.2 cfs @ 12.16 hrs, Volume= 2.367 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Summary for Link DP-3: South West - Wetlands

Inflow Area = 5.674 ac, 0.57% Impervious, Inflow Depth = 2.12" for 100-year event
Inflow = 10.5 cfs @ 12.19 hrs, Volume= 1.004 af
Primary = 10.5 cfs @ 12.19 hrs, Volume= 1.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

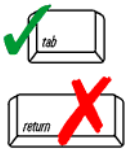
APPENDICES

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

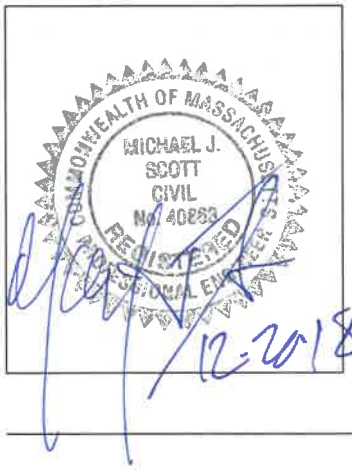
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☒ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☐ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☒ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☒ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☐ Name of the stormwater management system owners;
- ☐ Party responsible for operation and maintenance;
- ☐ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☐ Operation and Maintenance Log Form.

☒ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Stormwater Management System
O&M and Long Term Pollution Prevention Plan
2394 Main Poland Road
Conway, Massachusetts

December 2018

PREPARED FOR:

Conway Solar, LLC.
101 Summer Street, 2nd Floor
Boston, Massachusetts

RESPONSIBILITY:

The Owner, or assigns, will be responsible for implementation of the Operation and Maintenance Plan for the stormwater management system and Long Term Pollution Prevention Plan for the ground mounted solar photovoltaic installation and for any corrective action required.

SITE CONDITIONS:

The stormwater management system for the site includes a detention basin.

DETENTION BASIN(S):

1. The basin(s) shall be inspected for accumulated sediment at least twice per year and sediment shall be removed when depth is 12 inches or at least once every 10 years.

2. Basins shall be inspected at least twice per year and immediately following large storm events to determine if the basin is functioning as intended. Inspections should be conducted during wet weather to determine if the basin is meeting the targeted detention times (24-hour average detention time; 72-hour drawdown). The basins shall be checked for slope integrity, soil moisture, vegetative health, soil stability, soil compaction, soil erosion, ponding, and sedimentation. Any necessary repairs shall be made immediately.

3. During the first few months following construction, the basin shall be inspected to ensure that the proposed vegetation becomes adequately established.

4. At least twice during the growing season, the basin, side slopes, and embankments shall be mowed and accumulated trash and debris removed.

5. To maintain the dense growth of vegetation, periodic reseeding shall be performed.

6. Basins shall not be used for snow removal and yard waste disposal.

7. Outlet control structures, headwalls, and riprap aprons or riprap stilling basins shall be checked a minimum of once per year for evidence of clogging or flow restrictions and cleared as necessary. Any debris or accumulated sediments that could hinder flows shall be removed and disposed.

SPILL CONTAINMENT:

1. In the event of a reportable spill, the Owner or its representative shall be responsible for notifying the appropriate authorities of the spill. In the event that spill materials discharges from a containment

structure (e.g., catch-basin or Stormwater Treatment Unit) the Owner shall be responsible for spill removal and restoration of the stormwater management system to its original condition in accordance with all applicable local and state regulations.

LAWN/LANDSCAPE MAINTENANCE:

1. Apply pesticides and fertilizers properly; at the proper time of year and at proper application rates to ensure absorption.

2. Limit lawn watering: choose drought-tolerant landscaping and grasses, and use mulch and compost to retain moisture.

3. Under no circumstance shall the stormwater management system be used for yard waste and landscape debris.

VEGETATED FILTER STRIP MAINTENANCE

1. Conduct semi-annual inspections during the first year (and annually thereafter).

2. Inspect the vegetated border for sediment buildup. Check vegetation for signs of erosion and overall health to ensure stability.

3. Regular mowing of the grass is required.

4. Remove sediment that accumulates to prevent the formation of a berm.

DEICING:

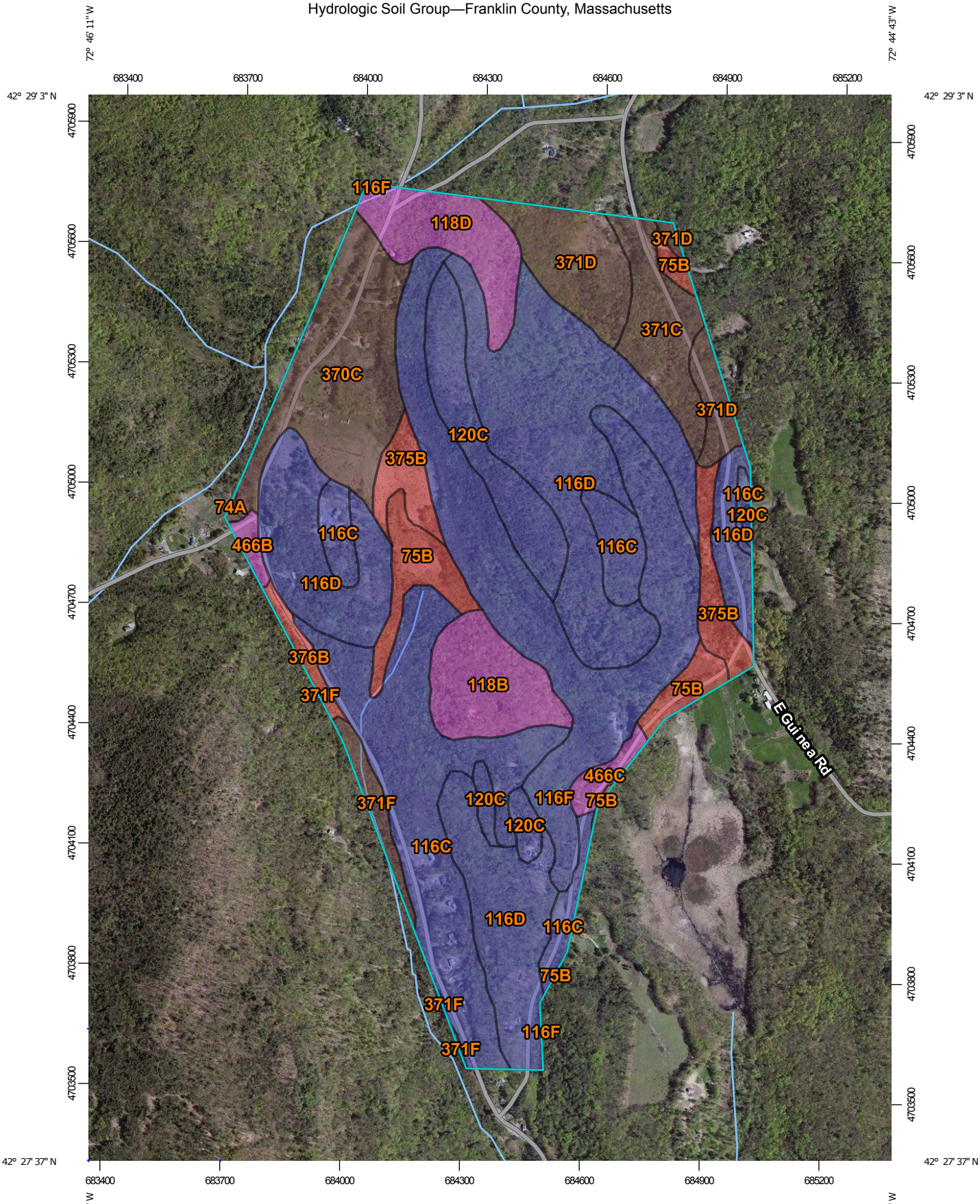
1. The use and loading rates for application of deicing salts should be limited to the minimum required to maintain safe vehicular and pedestrian travel.

2. Alternative materials such as sand or gravel, calcium chloride, and calcium magnesium acetate should be considered in areas adjacent stormwater management facilities and resource areas.

3. Deicing materials shall not be stored on site.

SNOW MANAGEMENT:

1. Snow shall be stockpiled in pervious areas as indicated on the plans where it can slowly infiltrate. Under no circumstance shall the stormwater management system be used for snow storage.
2. Avoid dumping/piling snow over catch basins or in drainage channels to prevent blockages and localized flooding of the drainage system.
3. The Owner shall be responsible to manage snow storage on-site and to ensure that snow is not stockpiled in such a manner as to be a nuisance or hazard. If necessary, snow shall be removed from the site and disposed of in accordance with local, state and federal regulations.
4. Sediments deposited from the snow storage areas shall be removed every spring.


72° 46' 11" W
72° 44' 43" W
42° 29' 3" N
42° 27' 37" N
683400
683700
684000
684300
684600
684900
685200
4705900
4705600
4705300
4705000
4704700
4704400
4704100
4703800
4703500
116F
118D
371D
75B
371C
370C
120C
375B
116D
116C
74A
466B
376B
371F
118B
E Guinea Rd
120C
116F
466C
Map Scale: 1:13,000 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 150 300 600 900
Feet
0 500 1000 2000 3000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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: Franklin County, Massachusetts
Survey Area Data: Version 13, Sep 7, 2018

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

Date(s) aerial images were photographed: Apr 9, 2011—May 12, 2011

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
74A	Peacham mucky peat, 0 to 8 percent slopes, very stony	D	0.1	0.0%
75B	Pillsbury fine sandy loam, 0 to 8 percent slopes, very stony	D	16.6	3.7%
116C	Millsite-Westminster complex, 8 to 15 percent slopes, rocky	B	73.1	16.2%
116D	Millsite-Westminster complex, 15 to 25 percent slopes, rocky	B	121.7	27.0%
116F	Millsite-Westminster complex, 25 to 50 percent slopes, rocky	B	69.0	15.3%
118B	Colrain-Millsite complex, 3 to 8 percent slopes, rocky	A	19.0	4.2%
118D	Colrain-Millsite complex, 15 to 25 percent slopes, rocky	A	18.1	4.0%
120C	Millsite-Westminster complex, 8 to 15 percent slopes, very rocky	B	24.8	5.5%
370C	Shelburne fine sandy loam, 8 to 15 percent slopes	B/D	38.3	8.5%
371C	Shelburne fine sandy loam, 8 to 15 percent slopes, very stony	B/D	17.3	3.8%
371D	Shelburne fine sandy loam, 15 to 25 percent slopes, very stony	B/D	24.0	5.3%
371F	Shelburne fine sandy loam, 25 to 45 percent slopes, very stony	B/D	4.8	1.1%
375B	Ashfield fine sandy loam, 1 to 8 percent slopes	D	14.4	3.2%
376B	Ashfield fine sandy loam, 3 to 8 percent slopes, very stony	D	3.1	0.7%
466B	Colrain fine sandy loam, 3 to 8 percent slopes, very stony	A	2.1	0.5%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
466C	Colrain fine sandy loam, 8 to 15 percent slopes, very stony	A	3.6	0.8%
Totals for Area of Interest			**449.9**	**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.

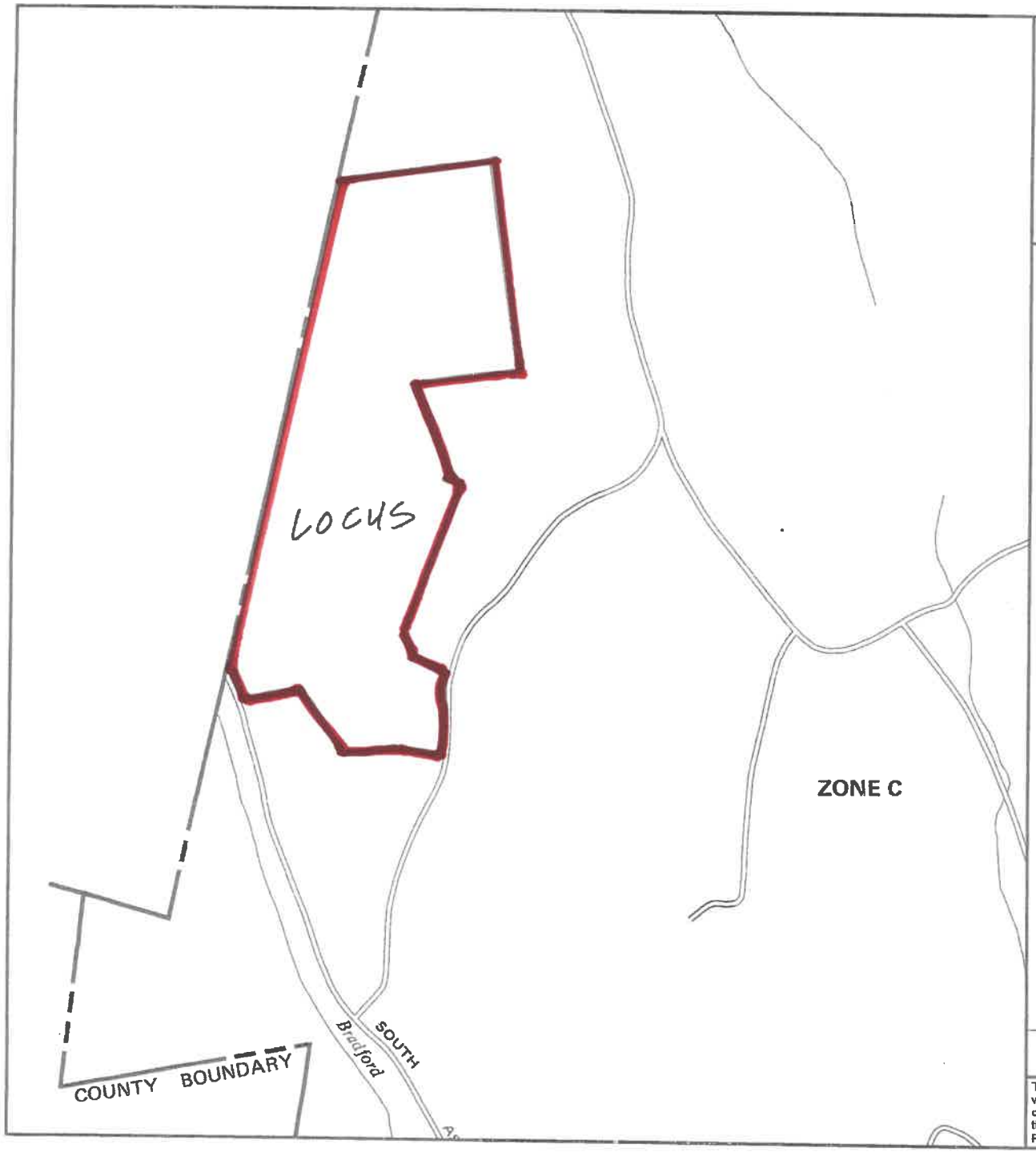
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



APPROXIMATE SCALE
1000 0

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

TOWN OF
CONWAY,
MASSACHUSETTS
FRANKLIN COUNTY

PANEL 10 OF 15

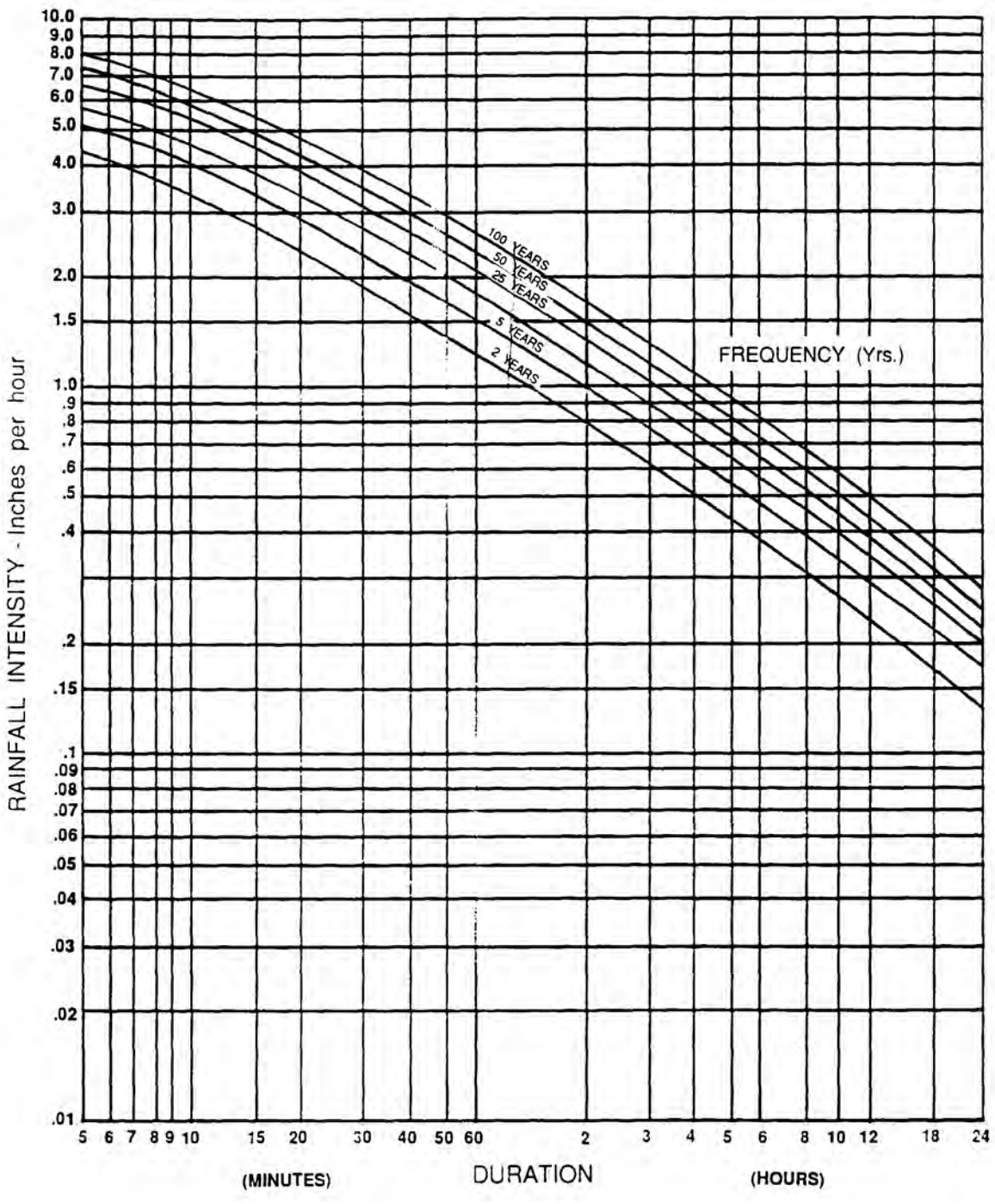
COMMUNITY-PANEL NUMBER
250114 0010 B

EFFECTIVE DATE:
JUNE 4, 1980

U.S. DEPARTMENT OF HOUSING
AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

Exhibit 8-14

Intensity – Duration – Frequency Curve for Worcester, MA



Source: TR55 - Urban Hydrology for Small Wetlands, NRCS

Hydrograph for Pond DB-100: North East

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.0	0	1,236.00	0.0	0.0	0.0
2.50	0.0	0	1,236.00	0.0	0.0	0.0
5.00	0.0	0	1,236.00	0.0	0.0	0.0
7.50	0.0	0	1,236.00	0.0	0.0	0.0
10.00	**0.0**	0	1,236.00	0.0	0.0	0.0
12.50	**4.4**	**8,294**	**1,239.40**	**3.5**	**0.1**	**3.4**
15.00	0.7	**3,945**	**1,237.99**	**1.0**	**0.1**	**0.9**
17.50	0.3	2,087	1,237.20	0.4	0.0	0.4
20.00	0.2	1,837	1,237.08	0.3	0.0	0.2
22.50	0.2	1,753	1,237.04	0.2	0.0	0.2
25.00	0.0	1,428	1,236.87	0.1	0.0	0.0
27.50	0.0	1,023	1,236.65	0.0	0.0	0.0
30.00	0.0	661	1,236.44	0.0	0.0	0.0
32.50	0.0	326	1,236.23	0.0	0.0	0.0
35.00	0.0	28	1,236.02	0.0	0.0	0.0
37.50	0.0	0	1,236.00	0.0	0.0	0.0
40.00	0.0	0	1,236.00	0.0	0.0	0.0
42.50	0.0	0	1,236.00	0.0	0.0	0.0
45.00	0.0	0	1,236.00	0.0	0.0	0.0
47.50	0.0	0	1,236.00	0.0	0.0	0.0
50.00	0.0	0	1,236.00	0.0	0.0	0.0
52.50	0.0	0	1,236.00	0.0	0.0	0.0
55.00	0.0	0	1,236.00	0.0	0.0	0.0
57.50	0.0	0	1,236.00	0.0	0.0	0.0
60.00	0.0	0	1,236.00	0.0	0.0	0.0
62.50	0.0	0	1,236.00	0.0	0.0	0.0
65.00	0.0	0	1,236.00	0.0	0.0	0.0
67.50	0.0	0	1,236.00	0.0	0.0	0.0
70.00	0.0	0	1,236.00	0.0	0.0	0.0
72.50	0.0	0	1,236.00	0.0	0.0	0.0
75.00	0.0	0	1,236.00	0.0	0.0	0.0
77.50	0.0	0	1,236.00	0.0	0.0	0.0
80.00	0.0	0	1,236.00	0.0	0.0	0.0
82.50	0.0	0	1,236.00	0.0	0.0	0.0
85.00	0.0	0	1,236.00	0.0	0.0	0.0
87.50	0.0	0	1,236.00	0.0	0.0	0.0
90.00	0.0	0	1,236.00	0.0	0.0	0.0
92.50	0.0	0	1,236.00	0.0	0.0	0.0
95.00	0.0	0	1,236.00	0.0	0.0	0.0

REMAINDER OF PROPERTY NOT STUDIED

DP-2
EAST

MAIN POLAND ROAD

EDA-200

EDA-300

EDA-100

DP-3
WETLANDS

DP-1
WEST

SOUTH ASHFIELD ROAD

N

TITLE: EXISTING HYDROLOGY PLAN
2394 Main Poland Road
Conway, MA

OWNER: ROBERT & SARAH MEWMAN
2394 Main Poland Road
Conway, MA

APPLICANT: Nexamp, LLC
101 Summer Street, 2nd Floor
Boston, MA

DATE: December 2018
DRAWN BY: TBS
JOB NO.: 1212
FILE NO.: 1212350
REV. NO.:
REV. DATE:

0 250 500 750

PREPARED BY:

WDA DESIGN GROUP
31 EAST MAIN STREET WESTBOROUGH, MA | 508.366.6552
7 CENTRAL STREET PROVIDENCE, RI | 401.274.1360
WDA-DG.COM

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REMAINDER OF PROPERTY NOT STUDIED

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