Stormwater Management Plan

For the Proposed:
Retail Development

Located at:
1860 Kingstown Road (RI Route 108)
South Kingstown, Rhode Island

Prepared for Submission to:
Town of South Kingstown

July 17, 2020

Prepared for:
Garrett Homes, LLC
59 Field Street
Torrington, CT 06790

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BL Project Number: 18C6704

This Stormwater Management Plan is a compilation of the four key elements of a Stormwater Management Plan as described on the following Stormwater Management Plan Guide. Each of the four key documents are attached in an Appendix. Supplemental information for each document is included as an Attachment to the Appendix.

This Stormwater Management Plan includes the following:

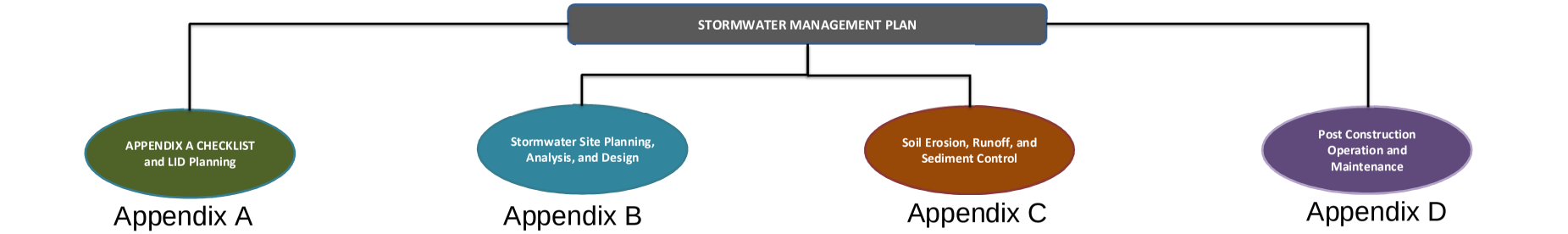
Stormwater Management Plan Guide
Appendix A – Stormwater Manual Appendix A Checklist
Appendix B – Wetlands Evaluation & Stormwater Site Planning, Analysis, and Design Report

ATTACHMENT A	LOCATION MAPS
	USGS Location Map
	FEMA Federal Insurance Rate Map
ATTACHMENT B	PRE-CONSTRUCTION HYDROLOGY
	ED-1 – Existing Drainage Plan
	Pre-Construction HydroCAD Report
ATTACHMENT C	POST-CONSTRUCTION HYDROLOGY
	PD-1 – Proposed Drainage Plan
	Post-Construction HydroCAD Report
ATTACHMENT D	STORMWATER CALCULATIONS
ATTACHMENT E	NRCS SOIL REPORT
	NRCS Soil Report with Soil Survey Map
ATTACHMENT F	INFILTRATION OBSERVATIONS
ATTACHMENT G	WETLAND REPORT BY NATURAL RESOURCE SERVICE, INC.

Appendix C – Soil Erosion and Sediment Control Plan
Appendix D – Stormwater System Operation and Maintenance Manual

STORMWATER MANAGEMENT PLAN GUIDANCE

The three (4) key elements to include in a Stormwater Management Plan for any project subject to the *RI Stormwater Design and Installation Standards Manual* (RISDISM)



Appendix A

Appendix A Checklist and LID Planning

Includes:
- · Project Description
- · LID Checklist (Attachment 1) for new development
- · LID Site Planning Considerations (TMDL's, Coldwater etc..)
- · Low Impact Development LID Water Quality Credits (QPAs)
- · Submittal Requirements
- · RIPDES CGP NOI critical information (like HNA certification)
- · Regulatiory Appicability

Addresses
1. LID Site Planning
2. Groundwater Recharge
3. Water Quality Area Treatment Requirements
6. Redevelopment and Infill Supporting Documentation
8. LUHHPL Identification
9. Illicit Discharge

Guidance
Chapter 1 of the RISDISM Manual
Atttachment 1 - LID Checklist

Appendix B

Stormwater Site Planning, Analysis, and Design Report

Includes:
- · Project Narrative
- · Hydrologic and Hydraulic Analysis
- · Best Management Practice Volumes and supporting calculations
- · Calculations

Addresses: RISDISM Minimum Standards (as Applicable):
3. Water Quality Volume and Hydraulic Calculations
8. LUHHPL specific BMP's and precautions (if necessary)
4. Conveyance and Natural Channel Protection
5. Overbank Flood Protection and Downstream Analysis

Guidance: RISDISM Appendices:
B. Vegetation Guidelines and Planting List
C. Retrofitting for Stormwater Management
F. BMP Construction Specifications
I. RI River and Stream Order
K. Hydrologic and Hydraulic Modeling Guidance

Appendix C

Soil Erosion and Sediment Control (SESC) Plan
(formerly known as a SWPPP-Stormwater Pollution Prevention Plan)

Includes:
- · Erosion, Runoff, and Sediment Control Practices
- · Construction Activity Pollution Prevention Practices
- · Control Practice Installation, Inspection, & Maint. Reqs
- · Site Plans

Addresses: RISDISM 11 Minimum Standards:
10. Construction Erosion and Sedimentation Control

Guidance: Guidance Documents:
RI Soil Erosion & Sediment Control Handbook (RISESCH)
RI Model Soil Erosion and Sediment Control (SESC) Plan

Regs: Regulatory Requirements:
RIPDES Construction General Permit (CGP) (≥ 1ac)

Appendix D

Operation and Maintenance (O&M) Plan

Includes:
- · Responsible party(s) and Maintenance Agreement
- · Long term O&M for each stormwater practice/BMP
- · Post-construction Pollution Prevention
- · 8-1/2" x 11" map (to scale) showing location of BMPs
- · Budget and Funding Source(s)

Addresses: RISDISM Minimum Standards:
7. Post Construction BMP Pollution Prevention
11. Operation and Maintenance

Guidance: RISDISM Appendices:
E. Developing Operation and Maintenance Plans
G. Pollution Prevention and Source Controls

Regs: Regulatory Requirements:
RIPDES Multi-Sector General Permit (MSGP)
(for Industrial Sites as defined in RIPDES Rule 31.b.15)

ACRONYMS AND ABBREVIATIONS:

BMP - Best Management Practice
LID - Low Impact Development
MSGP - Multi-Sector General Permit (RIPDES)
RIDEM - Rhode Island Department of Environmental Management
RISDISM - *Rhode Island Stormwater Design and Installation Standards Manual*
SESC Plan - Soil Erosion and Sediment Control Plan
CGP - Construction General Permit (RIPDES)
LUHPPLs - Land Uses with Higher Potential Pollutant Loads
O&M Plan - Operation and Maintenance Plan
RIPDES - Rhode Island Pollutant Discharge Elimination System
RISESCH - *Rhode Island Soil Erosion and Sediment Control Handbook*
SMP - Stormwater Management Plan

RI Department of Environmental Management - Office of Water Resources
235 Promenade Street, Providence, RI 02908 | Telephone: (401) 222-4700 | Fax: (401) 222-6177

October 2016

APPENDIX A

Stormwater Manual Appendix A Checklist

APPENDIX A: STORMWATER MANAGEMENT PLAN CHECKLIST AND LID PLANNING REPORT – STORMWATER DESIGN SUMMARY

PROJECT NAME Proposed Retail Development	**(RIDEM USE ONLY)** **STW/WQC File #:** **Date Received:**
TOWN South Kingstown	
BRIEF PROJECT DESCRIPTION: New construction of a 7,545 S.F. retail building and associated paved parking along with site utilities, stormwater management system, site lighting, and landscaping. Land alteration due to construction is proposed within a wetland upland review area.	

Stormwater Management Plan (SMP) Elements – Minimum Standards

Submit four separately bound documents: Appendix A Checklist; Stormwater Site Planning, Analysis and Design Report with Plan Set/Drawings; Soil Erosion and Sediment Control (SESC) Plan, and Post Construction Operations and Maintenance (O&M) Plan. Please refer to Suggestions to Promote Brevity.

Note: **All stormwater construction projects must submit a Stormwater Management Plan (SMP). However, not every element listed below is required per the RIDEM Stormwater Rules and the RIPDES Construction General Permit (CGP). This checklist will help identify the required elements to be submitted with an Application for Stormwater Construction Permit & Water Quality Certification.**

PART 1. PROJECT AND SITE INFORMATION

PROJECT TYPE (Check all that apply)

☐ Residential	☒ Commercial	☐ Federal	☐ Retrofit	☐ Restoration
☐ Road	☐ Utility	☐ Fill	☐ Dredge	☐ Mine
☐ Other (specify):				

SITE INFORMATION

☒ Vicinity Map (See Appendix B, Attachment A)

INITIAL DISCHARGE LOCATION(S): The WQv discharges to: (You may choose more than one answer if several discharge points are associated with the project.) See Guidance to identify receiving waters.

☒ **Groundwater**	☐ **Surface Water**	☐ **MS4**
☐ GAA	☐ Isolated Wetland	☐ RIDOT
☒ GA	☒ Named Waterbody (Rocky Brook)	☐ RIDOT Alteration Permit is Approved
☐ GB	☐ Unnamed Waterbody Connected to Named Waterbody	☐ Town
		☐ Other (specify):

ULTIMATE RECEIVING WATERBODY LOCATION(S): Include pertinent information that applies to both WQ_v and flow from larger storm events including overflows. Choose all that apply, and repeat table for each waterbody.

☐ Groundwater or Disconnected Wetland	☐ SRWP		
☒ Waterbody Name: Rocky Brook	☐ Coldwater	☒ Warmwater	☐ Unassessed
☒ Waterbody ID: RI0010045R-04	☐ 4th order stream of pond 50 acres or more		
☒ TMDL for: Fecal Coliform	☐ Watershed of flood prone river (e.g., Pocasset River)		
☐ Contributes to a priority outfall listed in the TMDL	☐ Contributes stormwater to a public beach		
☐ 303(d) list – Impairment(s) for:	☐ Contributes to shellfishing grounds		

PROJECT HISTORY		
☒ RIDEM Pre- Application Meeting	Meeting Date:	☐ Minutes Attached
☐ Municipal Master Plan Approval	Approval Date:	☐ Minutes Attached
☒ Subdivision Suitability Required	Approval #:	
☐ Previous Enforcement Action has been taken on the property	Enforcement #:	

FLOODPLAIN & FLOODWAY See Guidance Pertaining to Floodplain and Floodways	
☐ Riverine 100-year floodplain: **FEMA FLOODPLAIN FIRMETTE** has been reviewed and the 100-year floodplain is on site	
☐ Delineated from FEMA Maps	
NOTE: Per Rule 250-RICR-150-10-8-1.1(B)(5)(d)(3), provide volumetric floodplain compensation calculations for cut and fill/displacement calculated by qualified professional	
☐ Calculated by Professional Engineer	
☐ Calculations are provided for cut vs. fill/displacement volumes proposed within the 100-year floodplain	Amount of Fill (CY):
	Amount of Cut (CY):
☐ Restrictions or modifications are proposed to the flow path or velocities in a floodway	
☐ Floodplain storage capacity is impacted	
☐ Project area is not within 100-year floodplain as defined by RIDEM	

CRMC JURISDICTION
☐ CRMC Assent required
☐ Property subject to a Special Area Management Plan (SAMP). If so, specify which SAMP:
☐ Sea level rise mitigation has been designed into this project

LUHPPL IDENTIFICATION - MINIMUM STANDARD 8:			
1. OFFICE OF WASTE MANAGEMENT (OWM)			
	☐ Known or suspected releases of HAZARDOUS MATERIAL are present at the site (Hazardous Material is defined in Rule 1.4(A)(33) of 250-140-30-1 of the RIDEM Rules and Regulations for Investigation and Remediation of Hazardous Materials (the Remediation Regulations))		**RIDEM CONTACT:**
	☐ Known or suspected releases of PETROLEUM PRODUCT are present at the site (Petroleum Product as defined in Rule 1.5(A)(84) of 250-140-25-1 of the RIDEM Rules and Regulations for Underground Storage Facilities Used for Regulated Substances and Hazardous Materials)		
	☐ This site is identified on the RIDEM Environmental Resources Map as one of the following regulated facilities		**SITE ID#:**
		☐ CERCLIS/Superfund (NPL)	
		☐ State Hazardous Waste Site (SHWS)	
		☐ Environmental Land Usage Restriction (ELUR)	
		☐ Leaking Underground Storage Tank (LUST)	
		☐ Closed Landfill	
Note: If any boxes in 1 above are checked, the applicant must contact the RIDEM OWM Project Manager associated with the Site to determine if subsurface infiltration of stormwater is allowable for the project. Indicate if the infiltration corresponds to "Red," "Yellow" or "Green" as described in Section 3.2.8 of the RISDISM Guidance (Subsurface Contamination Guidance). Also, note and reference approval in PART 3, Minimum Standard 2: Groundwater Recharge/Infiltration.			
2. PER MINIMUM STANDARD 8 of RICR 8.14.C.1-6 "LUHPPLS," THE SITE IS/HAS:			
	☐ Industrial Site with RIPDES MSGP, except where No Exposure Certification exists. http://www.dem.ri.gov/programs/water/permits/ripdes/stormwater/status.php		
	☐ Auto Fueling Facility (e.g., gas station)		
	☐ Exterior Vehicles Service, Maintenance, or Equipment Cleaning Area		

	☐ Road Salt Storage and Loading Areas (exposed to rainwater)	
	☐ Outdoor Storage and Loading/Unloading of Hazardous Substances	
3.	**STORMWATER INDUSTRIAL PERMITTING**	
	☐ The site is associated with existing or proposed activities that are considered Land Uses with Higher Potential Pollutant Loads (LUHPPLS) (see RICR 8.14.C)	Activities: Sector:
	☐ Construction is proposed on a site that is subject to THE MULTI-SECTOR GENERAL PERMIT (MSGP) UNDER RULE 31(B)15 OF THE RIPDES REGULATIONS.	MSGP permit #
	☐ Additional stormwater treatment is required by the MSGP Explain:	

REDEVELOPMENT STANDARD – MINIMUM STANDARD 6		
☐ Pre Construction Impervious Area		
	☐ Total Pre-Construction Impervious Area (**TIA**)	
	☐ Total Site Area (**TSA**)	
	☐ Jurisdictional Wetlands (**JW**)	
	☐ Conservation Land (**CL**)	
☐ Calculate the Site Size (defined as contiguous properties under same ownership)		
	☐ Site Size (**SS**) = (**TSA**) – (**JW**) – (**CL**)	
	☐ (**TIA**) / (**SS**) =	☐ (**TIA**) / (**SS**) >**0.4**?
☐ YES, Redevelopment		

PART 2. LOW IMPACT DEVELOPMENT ASSESSMENT – MINIMUM STANDARD 1

(NOT REQUIRED FOR REDEVELOPMENT OR RETROFITS)
This section may be deleted if not required.

Note: A written description must be provided specifying why each method is not being used or is not applicable at the Site. Appropriate answers may include:

- Town requires … (state the specific local requirement)
- Meets Town's dimensional requirement of …
- Not practical for site because …
- Applying for waiver/variance to achieve this (pending/approved/denied)
- Applying for wavier/variance to seek relief from this (pending/approved/denied)

A) PRESERVATION OF UNDISTURBED AREAS, BUFFERS, AND FLOODPLAINS ☒ Sensitive resource areas and site constraints are identified (required) ☒ Local development regulations have been reviewed (required) ☒ All vegetated buffers and coastal and freshwater wetlands will be protected during and after construction ☐ Conservation Development or another site design technique has been incorporated to protect open space and pre-development hydrology. **Note:** If Conservation Development has been used, check box and skip to Subpart C ☒ As much natural vegetation and pre-development hydrology as possible has been maintained	All wetlands and wetland upland review areas have been identified on the plans. Construction disturbance in the upland review area has been minimized to preserve wetland vegetative buffer. Stormwater detention will be implemented to maintain existing hydrology patterns.

B) LOCATE DEVELOPMENT IN LESS SENSITIVE AREAS AND WORK WITH THE NATURAL LANDSCAPE CONDITIONS, HYDROLOGY, AND SOILS ☒ Development sites and building envelopes have been appropriately distanced from wetlands and waterbodies ☒ Development and stormwater systems have been located in areas with greatest infiltration capacity (e.g., soil groups A and B) ☒ Plans show measures to prevent soil compaction in areas designated as Qualified Pervious Areas (QPA's) ☒ Development sites and building envelopes have been positioned outside of floodplains ☒ Site design positions buildings, roadways and parking areas in a manner that avoids impacts to surface water features ☒ Development sites and building envelopes have been located to minimize impacts to steep slopes (≥15%) ☐ Other (describe):	
C) MINIMIZE CLEARING AND GRADING ☒ Site clearing has been restricted to minimum area needed for building footprints, development activities, construction access, and safety. ☒ Site has been designed to position buildings, roadways, and parking areas in a manner that minimizes grading (cut and fill quantities) ☐ Protection for stands of trees and individual trees and their root zones to be preserved has been specified, and such protection extends at least to the tree canopy drip line(s) ☐ Plan notes specify that public trees removed or damaged during construction shall be replaced with equivalent	Site is currently wooded, no individual trees have been identified for preservation and no trees are located in the Town right-of-way to be replaced.
D) REDUCE IMPERVIOUS COVER ☐ Reduced roadway widths (≤22 feet for ADT ≤ 400; ≤ 26 feet for ADT 400 - 2,000) ☒ Reduced driveway areas (length minimized via reduced ROW width (≤ 45 ft.) and/or reduced (or absolute minimum) front yard setback; width minimized to ≤ 9 ft. wide one lane; ≤ 18 ft. wide two lanes; shared driveways; pervious surface) ☐ Reduced building footprint: Explain approach: ☐ Reduced sidewalk area (≤ 4 ft. wide; one side of the street; unpaved path; pervious surface) ☐ Reduced cul-de-sacs (radius < 45 ft; vegetated island; alternative turn-around) ☐ Reduced parking lot area: Explain approach ☐ Use of pervious surfaces for driveways, sidewalks, parking areas/overflow parking areas, etc. ☐ Minimized impervious surfaces (project meets or is less than maximum specified by Zoning Ordinance) ☐ Other (describe):	Proposed driveway has been minimized by location of the building as close to the municipal building setback line as possible and the width is the 24' minimum required by the municipality for 2-way traffic. No roads/cul-de-sacs proposed. Building size and sidewalks meet local requirements. Parking and drive aisles only as necessary for zoning and delivery truck operations.
E) DISCONNECT IMPERVIOUS AREA ☒ Impervious surfaces have been disconnected, and runoff has been diverted to QPAs to the maximum extent possible ☐ Residential street edges allow side-of-the-road drainage into vegetated open swales ☐ Parking lot landscaping breaks up impervious expanse AND accepts runoff ☐ Other (describe):	Not a residential area or project. Parking lot landscaped areas not substantial enough to provide required stormwater flow mitigation.
F) MITIGATE RUNOFF AT THE POINT OF GENERATION ☒ Small-scale BMPs have been designated to treat runoff as close as possible to the source	

G) PROVIDE LOW-MAINTENANCE NATIVE VEGETATION ☒ Low-maintenance landscaping has been proposed using native species and cultivars ☒ Plantings of native trees and shrubs in areas previously cleared of native vegetation are shown on site plan ☒ Lawn areas have been limited/minimized, and yards have been kept undisturbed to the maximum extent practicable on residential lots	Landscaping is shown on the Landscape Plan rather than the Site Plan.
H) RESTORE STREAMS/WETLANDS ☐ Historic drainage patterns have been restored by removing closed drainage systems, daylighting buried streams, and/or restoring degraded stream channels and/or wetlands ☐ Removal of invasive species ☐ Other	N/A

PART 3. SUMMARY OF REMAINING STANDARDS

GROUNDWATER RECHARGE – MINIMUM STANDARD 2		
YES	**NO**	
☒	☐	The project has been designed to meet the groundwater recharge standard.
☐	☐	If "No," the justification for groundwater recharge criterion waiver has been explained in the Narrative (e.g., threat of groundwater contamination or physical limitation), if applicable (see RICR 8.8.D);
☐	☐	Your waiver request has been explained in the Narrative, if applicable.
☐	☒	Is this site identified as a Regulated Facility in Part 1, Minimum Standard 8: LUHPPL Identification?
☐	☐	If "Yes," has approval for infiltration by the Office of Waste Management Site Project Manager, per Part 1, Minimum Standard 8, been requested?

TABLE 2-1: Summary of Recharge (see RISDISM Section 3.3.2)
(Add or Subtract Rows as Necessary)

Design Point	Impervious Area Treated (sq ft)	Total Re_v Required (cu ft)	LID Stormwater Credits (see RISDISM Section 4.6.1)	Recharge Required by Remaining BMPs (cu ft)	Recharge Provided by BMPs (cu ft)
			Portion of Re_v directed to a QPA (cu ft)		
DP-1:	31,972	266	0	266	3,946
DP-2:					
DP-3:					
DP-4:					
TOTALS:	31,972	266	0	266	3,946

Notes:
1. Only BMPs listed in RISDISM Table 3-5 "List of BMPs Acceptable for Recharge" may be used to meet the recharge requirement.
2. Recharge requirement must be satisfied for each waterbody ID.

☒ Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.): Groundwater Recharge Volume Calculations provided in Stormwater Site Planning, Analysis, and Design Report (Appendix B)

WATER QUALITY – MINIMUM STANDARD 3		
YES	**NO**	
☒	☐	Does this project meet or exceed the required water quality volume WQv (see RICR 8.9.E-I)?
☒	☐	Is the proposed final impervious cover greater than 20% of the disturbed area (see RICR 8.9.E-I)?
☒	☐	If "Yes," either the Modified Curve Number Method or the Split Pervious/Impervious method in Hydro-CAD was used to calculate WQv; or,
☒	☐	If "Yes," either TR-55 or TR-20 was used to calculate WQv; and,
☐	☐	If "No," the project meets the minimum WQv of 0.2 watershed inches over the entire disturbed area.
☐	☐	Not Applicable
☒	☐	Does this project meet or exceed the ability to treat required water quality flow WQf (see RICR 8.9.I.1-3)?
☒	☐	Does this project propose an increase of impervious cover to a receiving water body with impairments? If "Yes," please indicate below the method that was used to address the water quality requirements of no further degradation to a low-quality water. 100% of WQv to be infiltrated.
☐	☒	RICR 8.36. A Pollutant Loading Analysis is needed and has been completed.
☒	☐	The Water Quality Guidance Document (Water Quality Goals and Pollutant Loading Analysis Guidance for Discharges to Impaired Waters) has been followed as applicable.
☐	☒	BMPs are proposed that are on the approved technology list . If "Yes," please provide all required worksheets from the manufacturer.
☐	☒	Additional pollutant-specific requirements and/or pollutant removal efficiencies are applicable to the site as the result of a TMDL, SAMP, or other watershed-specific requirements. If "Yes," please describe:

TABLE 3-1: Summary of Water Quality (see RICR 8.9)

Design Point and WB ID	**Impervious area treated (sq ft)**	**Total WQ_v Required (cu ft)**	**LID Stormwater Credits** (see RICR 8.18) **WQv directed to a QPA (cu ft)**	**Water Quality Treatment Remaining (cu ft)**	**Water Quality Provided by BMPs (cu ft)**
DP-1:	30,765	2,527	0	2,527	3,946
DP-2:					
DP-3:					
DP-4:					
TOTALS:	30,765	2,527	0	2,527	3,946

Notes:
1. Only BMPs listed in RICR 8.20 and 8.25 or the Approved Technologies List of BMPs is Acceptable for Water Quality treatment.
2. For each Design Point, the Water Quality Volume Standard must be met for each Waterbody ID.

☒ YES ☐ NO	This project has met the setback requirements for each BMP. If "No," please explain:

☒ Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.): Water Quality Volume Calculations provided in Stormwater Site Planning, Analysis, and Design Report (Appendix B)

CONVEYANCE AND NATURAL CHANNEL PROTECTION (RICR 8.10) – MINIMUM STANDARD 4		
YES	**NO**	
☒	☐	Is this standard waived? If "Yes," please indicate one or more of the reasons below:
		☐ The project directs discharge to a large river (i.e., 4th-order stream or larger. See RISDISM Appendix I for State-wide list and map of stream orders), bodies of water >50.0 acres in surface area (i.e., lakes, ponds, reservoirs), or tidal waters. ☒ The project directs is a small facility with impervious cover of less than or equal to 1 acre. ☐ The project has a post-development peak discharge rate from the facility that is less than 2 cfs for the 1-year, 24-hour Type III design storm event (prior to any attenuation). (Note: LID design strategies can greatly reduce the peak discharge rate).
☒	☐	Conveyance and natural channel protection for the site have been met. If "No,' explain why:

TABLE 4-1: Summary of Channel Protection Volumes (see RICR 8.10)					
Design Point	**Receiving Water Body Name**	**Coldwater Fishery? (Y/N)**	**Total CPv Required (cu ft)**	**Total CPv Provided (cu ft)**	**Average Release Rate Modeled in the 1-yr storm (cfs)**
DP-1:					
DP-2:					
DP-3:					
DP-4:					
TOTALS:					
Note: The Channel Protection Volume Standard must be met in each waterbody ID.					
☐ YES ☐ NO	The CPv is released at roughly a uniform rate over a 24-hour duration (see examples of sizing calculations in Appendix D of the RISDISM).				
☐ YES ☐ NO	Do additional design restrictions apply resulting from any discharge to cold-water fisheries; If "Yes," please indicate restrictions and solutions below.				
☐ Indicate below where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.).					

OVERBANK FLOOD PROTECTION (RICR 8.11) AND OTHER POTENTIAL HIGH FLOWS – MINIMUM STANDARD 5			
YES	**NO**		
☐	☒	Is this standard waived? If yes, please indicate one or more of the reasons below:	
		☐	The project directs discharge to a large river (i.e., 4th-order stream or larger. See Appendix I for state-wide list and map of stream orders), bodies of water >50.0 acres in surface area (i.e., lakes, ponds, reservoirs), or tidal waters.
		☐	A Downstream Analysis (see RICR 8.11.D and E) indicates that peak discharge control would not be beneficial or would exacerbate peak flows in a downstream tributary of a particular site (e.g., through coincident peaks).
☐	☒	Does the project flow to an MS4 system or subject to other stormwater requirements? If "Yes," indicate as follows:	
		☐	RIDOT
		☐	Other (specify):
Note: The project could be approved by RIDEM but not meet RIDOT or Town standards. RIDOT's regulations indicate that post-volumes must be **less** than pre-volumes for the 10-yr storm at the design point entering the RIDOT system. If you have not already received approval for the discharge to an MS4, please explain below your strategy to comply with RIDEM and the MS4.			
		Indicate below which model was used for your analysis. ☒ TR-55 ☐ TR-20 ☒ HydroCAD ☐ Bentley/Haestad ☐ Intellisolve ☐ Other (Specify):	
YES	**NO**		
☒	☐	Does the drainage design demonstrate that flows from the 100-year storm event through a BMP will safely manage and convey the 100-year storm? If "No," please explain briefly below and reference where in the application further documentation can be found (i.e., name of report/document, page numbers, appendices, etc.):	
☒	☐	Do off-site areas contribute to the sub-watersheds and design points? If "Yes,"	
☒	☐	Are the areas modeled as "present condition" for both pre- and post-development analysis?	
☒	☐	Are the off-site areas shown on the subwatershed maps?	
☒	☐	Does the drainage design confirm safe passage of the 100-year flow through the site for off-site runoff?	
☐	☒	Is a Downstream Analysis required (see RICR 8.11.E.1)?	
☒	☐	Calculate the following:	
		☒	Area of disturbance within the sub-watershed (areas) 1.75 acres
		☒	Impervious cover (%) 44%
☐	☒	Is a dam breach analysis required (earthen embankments over six (6) feet in height, or a capacity of 15 acre-feet or more, and contributes to a significant or high hazard dam)?	
☒	☐	Does this project meet the overbank flood protection standard?	

Table 5-1 Hydraulic Analysis Summary								
Subwatershed (Design Point)	**1.2" Peak Flow** (cfs) **		**1-yr Peak Flow** (cfs)		**10-yr Peak Flow** (cfs)		**100-yr Peak Flow** (cfs)	
	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)
DP-1:	0.38	0.33	3.91	2.18	9.93	5.67	20.88	14.93
DP-2:								
DP-3:								
DP-4:								
TOTALS:	0.38	0.33	3.91	2.18	9.93	5.67	20.88	14.93

** Utilize modified curve number method or split pervious /impervious method in HydroCAD.

Note: The hydraulic analysis must demonstrate no impact to each individual subwatershed DP unless each DP discharges to the same wetland or water resource.

Indicate as follows where the pertinent calculations and/or information for the items above are provided	**Name of report/document, page numbers, appendices, etc.**
Existing conditions analysis for each subwatershed, including curve numbers, times of concentration, runoff rates, volumes, and water surface elevations showing methodologies used and supporting calculations.	Calculations provided in Stormwater Site Planning, Analysis, and Design Report (Appendix B)
Proposed conditions analysis for each subwatershed, including curve numbers, times of concentration, runoff rates, volumes, water surface elevations, and routing showing the methodologies used and supporting calculations.	Calculations provided in Stormwater Site Planning, Analysis, and Design Report (Appendix B)
Final sizing calculations for structural stormwater BMPs, including contributing drainage area, storage, and outlet configuration.	Calculations provided in Stormwater Site Planning, Analysis, and Design Report (Appendix B)
Stage-storage, inflow and outflow hydrographs for storage facilities (e.g., detention, retention, or infiltration facilities).	Calculations provided in Stormwater Site Planning, Analysis, and Design Report (Appendix B)

Table 5-2 Summary of Best Management Practices											
BMP ID	**DP #**	**BMP Type** (e.g., bioretention, tree filter)	**BMP Functions**					**Bypass Type**	**Horizontal Setback Criteria are met per RICR 8.21.B.10, 8.22.D.11, and 8.35.B.4**		
			Pre-Treatment (Y/N/ NA)	Re_v	WQ_v	CP_v (Y/ N/ NA)	Overbank Flood Reduction (Y/N/NA)	External (E) Internal (I) or NA	Yes/ No	Technical Justification (Design Report page number)	Distance Provided
1	1	Infiltration Basin	Y	3,946 CF	3,946 CF	NA	Y	NA	Yes		65' Bldg 55' Wtlnd
2	1	Sediment Forebay 1	N/A					NA			
3	1	Sediment Forebay 2	N/A					NA			

Table 5-2 Summary of Best Management Practices											
BMP ID	**DP #**	**BMP Type** (e.g., bioretention, tree filter)	**BMP Functions**					**Bypass Type**	**Horizontal Setback Criteria are met per RICR 8.21.B.10, 8.22.D.11, and 8.35.B.4**		
			Pre-Treatment (Y/N/ NA)	Re_v	WQ_v	CP_v (Y/ N/ NA)	Overbank Flood Reduction (Y/N/NA)	External (E) Internal (I) or NA	Yes/ No	Technical Justification (Design Report page number)	Distance Provided
		TOTALS:	Y	3,946 CF	3,946 CF	NA	Y	NA	Y		65’ Bldg 55’ Wtlnd

Table 5.3 Summary of Soils to Evaluate Each BMP									
DP #	**BMP ID**	**BMP Type** (e.g., bioretention, tree filter)	**Soils Analysis for Each BMP**						
			Test Pit ID# and Ground Elevation		SHWT Elevation (ft)	Bottom of Practice Elevation* (ft)	Separation Distance Provided (ft)	Hydrologic Soil Group (A, B, C, D)	Exfiltration Rate Applied (in/hr)
			Primary	Secondary					
1	1	Infiltration Basin	3		112.00	113.50	1.50	D	0.27
		TOTALS:							

* For underground infiltration systems (UICs) bottom equals bottom of stone, for surface infiltration basins bottom equals bottom of basin, for filters bottom equals interface of storage and top of filter layer

LAND USES WITH HIGHER POTENTIAL POLLUTANTS LOADS (LUHPPLs) – MINIMUM STANDARD 8			
YES	**NO**	**N/A**	
☐	☐	☒	Describe any LUHPPLs identified in Part 1, Minimum Standard 8, Section 2. If not applicable, continue to Minimum Standard 9.
☐	☐	☒	Are these activities already covered under an MSGP? If "No," please explain if you have applied for an MSGP or intend to do so?
☐	☐	☒	List the specific BMPs that are proposed for this project that receive stormwater from LUHPPL drainage areas. These BMP types must be listed in RISDISM Table 3-3, "Acceptable BMPs for Use at LUHPPLs." Please list BMPs:
☐	☐	☒	Additional BMPs, or additional pretreatment BMP's if any, that meet RIPDES MSGP requirements; Please list BMPs:
			Indicate below where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.).

ILLICIT DISCHARGES – MINIMUM STANDARD 9			
Illicit discharges are defined as unpermitted discharges to Waters of the State that do not consist entirely of stormwater or uncontaminated groundwater, except for certain discharges identified in the RIPDES Phase II Stormwater General Permit.			
YES	**NO**	**N/A**	
☒	☐	☐	Have you checked for illicit discharges?
☐	☒	☐	Have any been found and/or corrected? If "Yes," please identify.
☒	☐	☐	Does your report explain preventative measures that keep non-stormwater discharges out of the Waters of the State (during and after construction)?

SOIL EROSION AND SEDIMENT CONTROL (SESC) – MINIMUM STANDARD 10				
YES	**NO**	**N/A**		
☒	☐	☐	Have you included a Soil Erosion and Sediment Control Plan Set and/or Complete Construction Plan Set?	
☐	☒	☐	Have you provided a **separately-bound** document based upon the SESC Template? If yes, proceed to Minimum Standard 11 (the following items can be assumed to be addressed).	
			If "No," include a document with your submittal that addresses the following elements of an SESC Plan:	
			☒	Soil Erosion and Sediment Control Plan Project Narrative, including a description of how the fifteen (15) Performance Criteria have been met:
			☒	Provide Natural Buffers and Maintain Existing Vegetation
			☒	Minimize Area of Disturbance
			☒	Minimize the Disturbance of Steep Slopes
			☒	Preserve Topsoil
			☒	Stabilize Soils
			☒	Protect Storm Drain Inlets
			☒	Protect Storm Drain Outlets
			☒	Establish Temporary Controls for the Protection of Post-Construction Stormwater Control Measures
			☒	Establish Perimeter Controls and Sediment Barriers
			☒	Divert or Manage Run-On from Up-Gradient Areas
			☒	Properly Design Constructed Stormwater Conveyance Channels
			☒	Retain Sediment On-Site
			☒	Control Temporary Increases in Stormwater Velocity, Volume, and Peak Flows
			☒	Apply Construction Activity Pollution Prevention Control Measures
			☒	Install, Inspect, and Maintain Control Measures and Take Corrective Actions
			☒	Qualified SESC Plan Preparer's Information and Certification
			☒	Operator's Information and Certification; if not known at the time of application, the Operator must certify the SESC Plan upon selection and prior to initiating site activities
			☒	Description of Control Measures, such as Temporary Sediment Trapping and Conveyance Practices, including design calculations and supporting documentation, as required

STORMWATER MANAGEMENT SYSTEM OPERATION, MAINTENANCE, AND POLLUTION PREVENTION PLAN – MINIMUM STANDARDS 7 AND 9		
Operation and Maintenance Section		
YES	**NO**	
☒	☐	Have you minimized all sources of pollutant contact with stormwater runoff, to the maximum extent practicable?
☒	☐	Have you provided a **separately-bound** Operation and Maintenance Plan for the site and for all of the BMPs, and does it address each element of RICR 8.17 and RISDISM Appendix C and E?
☒	☐	Lawn, Garden, and Landscape Management meet the requirements of RISDISM Section G.7? If "No," why not?
☒	☐	Is the property owner or homeowner's association responsible for the stormwater maintenance of all BMP's? If "No," you must provide a legally binding and enforceable maintenance agreement (see RISDISM Appendix E, page 26) that identifies the entity that will be responsible for maintenance of the stormwater. Indicate where this agreement can be found in your report (i.e., name of report/document, page numbers, appendices, etc.).
☐	☒	Do you anticipate that you will need legal agreements related to the stormwater structures? (e.g. off-site easements, deed restrictions, covenants, or ELUR per the Remediation Regulations). If "Yes," have you obtained them? Or please explain your plan to obtain them:

☐	☒	Is stormwater being directed from public areas to private property? If "Yes," note the following: Note: This is not allowed unless a funding mechanism is in place to provide the finances for the long-term maintenance of the BMP and drainage, or a funding mechanism is demonstrated that can guarantee the long-term maintenance of a stormwater BMP by an individual homeowner.
Pollution Prevention Section		
☒	☐	Designated snow stockpile locations?
☒	☐	Trash racks to prevent floatables, trash, and debris from discharging to Waters of the State?
☒	☐	Asphalt-only based sealants?
☐	☒	Pet waste stations? (Note: If a receiving water has a bacterial impairment, and the project involves housing units, then this could be an important part of your pollution prevention plan).
☒	☐	Regular sweeping? Please describe: Sweeping of paved surfaces to be performed on a quarterly basis.
☒	☐	De-icing specifications, in accordance with RISDISM Appendix G. (NOTE: If the groundwater is GAA, or this area contributes to a drinking water supply, then this could be an important part of your pollution prevention plan).
☐	☒	A prohibition of phosphate-based fertilizers? (Note: If the site discharges to a phosphorus impaired waterbody, then this could be an important part of your pollution prevention plan).

PART 4. SUBWATERSHED MAPPING AND SITE-PLAN DETAILS

Existing and Proposed Subwatershed Mapping (REQUIRED)			
YES	**NO**		
☒	☐		Existing and proposed drainage area delineations
☒	☐		Locations of all streams and drainage swales
☒	☐		Drainage flow paths, mapped according to the DEM *Guidance for Preparation of Drainage Area Maps* (included in RISDISM Appendix K)
☒	☐		Complete drainage area boundaries; include off-site areas in both mapping and analyses, as applicable
☒	☐		Logs of borings and/or test pit investigations along with supporting soils/geotechnical report
☒	☐		Mapped seasonal high-water-table test pit locations
☒	☐		Mapped locations of the site-specific borings and/or test pits and soils information from the test pits at the locations of the BMPs
☒	☐		Mapped locations of the BMPs, with the BMPs consistently identified on the Site Construction Plans
☒	☐		Mapped bedrock outcrops adjacent to any infiltration BMP
☒	☐		Soils were logged by a:
		☐	DEM-licensed Class IV soil evaluator Name:
		☒	RI-registered P.E. Name: Suzanne King – PE 10040

Subwatershed and Impervious Area Summary				
Subwatershed (area to each design point)	**First Receiving Water ID or MS4**	**Area Disturbed (Acres)**	**Existing Impervious (Acres)**	**Proposed Impervious (Acres)**
DP-1:	RI0010045R-04	1.75	0.01	0.80
DP-2:				
DP-3:				
DP-4:				
TOTALS:	Rocky Brook	1.75	0.01	0.80

Site Construction Plans (Indicate that the following applicable specifications are provided)		
YES	**NO**	
☒	☐	Existing and proposed plans (scale not greater than 1" = 40') with North arrow
☒	☐	Existing and proposed site topography (with 1 or 2-foot contours); 10-foot contours accepted for off-site areas
☒	☐	Boundaries of existing predominant vegetation and proposed limits of clearing
☒	☐	Site Location clarification
☒	☐	Location and field-verified boundaries of resource protection areas such as: ▸ freshwater and coastal wetlands, including lakes and ponds ▸ coastal shoreline features Perennial and intermittent streams, in addition to Areas Subject to Storm Flowage (ASSFs)
☒	☐	All required setbacks (e.g., buffers, water-supply wells, septic systems)
☐	☒	Representative cross-section and profile drawings, and notes and details of structural stormwater management practices and conveyances (i.e., storm drains, open channels, swales, etc.), which include: ▸ Location and size of the stormwater treatment practices (type of practice, depth, area). Stormwater treatment practices (BMPs) must have labels that correspond to RISDISM Table 5-2; ▸ Design water surface elevations (applicable storms); ▸ Structural details of outlet structures, embankments, spillways, stilling basins, grade-control structures, conveyance channels, etc.; ▸ Existing and proposed structural elevations (e.g., inverts of pipes, manholes, etc.); ▸ Location of floodplain and, if applicable, floodway limits and relationship of site to upstream and downstream properties or drainage that could be affected by work in the floodplain; ▸ Planting plans for structural stormwater BMPs, including species, size, planting methods, and maintenance requirements of proposed planting
☒	☐	Logs of borings and/or test pit investigations along with supporting soils/geotechnical report and corresponding water tables
☐	☒	Mapping of any OWM-approved remedial actions/systems (including ELURs)
☒	☐	Location of existing and proposed roads, buildings, and other structures including limits of disturbance; ▸ Existing and proposed utilities (e.g., water, sewer, gas, electric) and easements; ▸ Location of existing and proposed conveyance systems, such as grass channels, swales, and storm drains, and location(s) of final discharge point(s) (wetland, waterbody, etc.); ▸ Cross sections of roadways, with edge details such as curbs and sidewalks; ▸ Location and dimensions of channel modifications, such as bridge or culvert crossings
☐	☒	Locations, cross sections, and profiles of all stream or wetland crossings and their method of stabilization

APPENDIX B

Stormwater Site Planning, Analysis, and Design Report

Wetlands Evaluation & Stormwater Site Planning, Analysis, and Design Report

For the Proposed:
Retail Development

Located at:
1860 Kingstown Road (RI Route 108)
South Kingstown, Rhode Island

Prepared for Submission to:
Town of South Kingstown

July 17, 2020

Prepared for:
Garrett Homes, LLC
59 Field Street
Torrington, CT 06790

BL Companies
100 Constitution Plaza, 10th Floor
Hartford, CT 06103
(860) 249-2200
Fax: (860) 249-2400
BL Project Number: 18C6704

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Wetlands Evaluation 2
Existing Site Conditions and Hydrologic Conditions 4
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Stormwater Management 7
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Appendices:

ATTACHMENT A — LOCATION MAPS
USGS Location Map
FEMA Federal Insurance Rate Map

ATTACHMENT B — PRE-CONSTRUCTION HYDROLOGY
ED-1 – Existing Drainage Plan
Pre-Construction HydroCAD Report

ATTACHMENT C — POST-CONSTRUCTION HYDROLOGY
PD-1 – Proposed Drainage Plan
Post-Construction HydroCAD Report

ATTACHMENT D — STORMWATER CALCULATIONS

ATTACHMENT E — NRCS SOIL REPORT
NRCS Soil Report with Soil Survey Map

ATTACHMENT F — INFILTRATION OBSERVATIONS

ATTACHMENT G — WETLAND REPORT BY NATURAL RESOURCE SERVICE, INC.

Project Narrative

This report is included as Appendix B of the Stormwater Management Plan. To avoid confusion, supplemental information for this report are included as "Attachments".

This report has been prepared in support of the proposed retail development at 1860 Kingstown Road (Site) by Garrett Homes, LLC. The project parcel consists of two lots to be consolidated into one. The total Site area is approximately 2.18 acres and is currently undeveloped, consisting of wooded area and lawn area.

The Site is bordered to the north by an existing commercial development, including a car dealership, Kingston Auto Sales & Services, and a two-story single-family home. The property is bordered to the east by Kingstown Road, and to the south by an affordable housing apartment complex. The property is bordered to the west by a residential neighborhood. The Site is located within the Town of South Kingstown's Mixed Use (MU) Zone. The south abutting property to the development parcel is also zoned MU. North of the parcel, the car dealership is located within the Commercial Highway (CH) Zone. The two-story single-family homes are located within the Medium High Density Residential (R10) Zone. The property along the western property line is zoned as Medium High Density Residential (R20) Zone.

The proposed stormwater management system has been designed in accordance with the 2002 Rhode Island Guidelines for Soil Erosion and Sediment Control and the 2015 Rhode Island Stormwater Design and Installation Standards Manual (Stormwater Manual).

A HydroCAD model, using TR-20 methodology, was developed to evaluate the existing and proposed drainage conditions of the property. The stormwater regulations require the stormwater runoff from the proposed development for the 10-year and 100-year storm, 24-hour Type III design storm events not exceed that of the existing conditions. Additionally, HydroCAD was used to calculate the runoff volume for 1.2 inches of precipitation for the Water Quality storm event and rate of runoff for the 1-year, 24-hour (Type III) design storm for channel protection. The precipitation amounts are taken from Table 3-1 of the Stormwater Manual.

Table 1: Design Rainfall Amounts for Washington County

Return Period	**24-hour (Type III) Rainfall Amount**
Water Quality (WQ)	1.2 inches
1-year	2.8 inches
10-year	4.9 inches
100-year	8.5 inches

Wetlands Evaluation

General Wetland Information

The project site in its existing condition consists of a wooded, undeveloped parcel. The topography of the parcel slopes southwest to a freshwater wetland area located at the western side of the project site that was delineated by Caroline Decker, wetland biologist (CD) from Natural Resource Services, Inc. (NRS) on July 31, 2018. In a report of their findings (attached hereto as Attachment G), NRS indicates that the wetland classifies as a wooded swamp with vegetation typical of wetlands in Rhode Island. The total wetland area located on the project site is approximately 14,600 s.f. of which approximately 1,640 s.f. is swamp area and 12,960 s.f. is perimeter wetland area (defined as area of land within 50 feet of the edge of any freshwater wetland consisting in part, or in whole, of a bog, marsh, swamp, or pond). The swamp, a tributary to Rocky Brook, extends off-site to the southwest. As proposed, the project would result in the alteration of approximately 460 square feet of perimeter wetland area.

Wildlife Habitat/Support

On July 19, 2018, representatives from BL Companies performed site observations, during which no significant indicators of wildlife activity were found. As such, it does not appear that the site is a noteworthy wildlife resource or habitat. Also, as noted above, CD performed wetland delineation and a site assessment of rare species on July 31, 2018. Although the site is mapped in a Natural Heritage Area (Reference ID #129), no rare species were observed.

Recreation and Aesthetics

The site is wooded with heavy scrub brush and is predominately occupied by invasive species such as autumn olive (Elaeagnus umbellate) and Japanese knotweed (Fallopia japonica) as noted in Appendix G. There are also multiple earthen mounds that appear to be former soil stockpiles. As can be seen from Kingstown Road (see Figure1 below), the site is not easily accessible due to the heavy brush and does not present an aesthetically pleasing appearance or significant recreational opportunity.

Figure 1. View of Project Site from Kingstown Road (Photo taken by BL Companies on 07/19/2018)

Flood Protection, Groundwater and Surface Water Supplies, Water Quality, Soil Erosion and Sediment Control

The following sections of this report describe the pre- and post-development characteristics and design methodology of the project site pertaining to flood protection, groundwater and surface water supplies, water quality, soil erosion and sediment control. Attachments B through F contain detailed calculations and reports to support the methodology.

Avoidance and Minimization of Project-related Wetland Impacts

As noted above, the proposed project will alter approximately 460 square feet of perimeter wetland area. Factors considered in the design process for this project in attempting to **avoid** impacts to the wetland were:

- The proposed use of the site is small-box commercial/retail and is not water-dependent nor does it require access to freshwater wetlands as a central element of its primary purpose.
- No additional areas within the site property or other properties owned or controlled by the applicant could be used to achieve the project purpose without altering the perimeter wetland area.

- Alternative designs and layouts were considered but it was determined that the design and layout as proposed best minimizes wetland alterations based on the requirements for the proposed use (building size, parking, delivery vehicle access, etc.).
- The applicant has not attempted to overcome zoning restrictions because site is located within the Kingston Road Overlay District which requires a minimum 25' front setback.
- Given the flat topography of the developable portion of the site, the perimeter wetland disturbance proposed is only to facilitate a drainage outfall installation at an elevation low enough to effectively drain the site in a safe and sustainable manner. The majority of this disturbance is temporary and necessary for construction access, it is anticipated the area will return to natural vegetation (with the exception of the riprap outlet protection) in the years following completion of construction.

Factors considered in the design process for this project in attempting to minimize impacts to the wetland were:

- Proposed project scale: The proposed use of the site is small-box commercial/retail and the site layout and design has been developed to require no direct wetland impacts by utilizing all available non-wetland areas while also meeting the requirements necessary for this use.
- Project location: The proposed project use is ideally suitable for the surrounding area which hosts various uses such as commercial, retail, residential, and institutional.
- Alternative designs: The proposed design currently incorporates features such as surface infiltration basin best management practices (BMPs) formed to the shape of natural slopes and wetland buffer areas to best minimize wetland buffer alterations. The applicant has determined that no feasible alternative designs could further minimize wetland impacts.
- The area to be disturbed will be restored with native wetland vegetation as shown on the landscape plan.

Existing Site Conditions and Hydrologic Conditions

General Site Information

Existing elevations along the roadway frontage range from 115 feet to 117 feet. The site gently slopes to the southwest at approximately 1% to elevation 114 and then the slope increases to roughly 20% to the wetland at approximate elevation 111.

The site soil identified by the United States Department of Agriculture (USDA) Natural Resources Conservation Services (NRCS) is Udorthents-Urban land complex soil (UD). The NRCS Hydrologic Soil Group the soil rating is not available; therefore, the soil group is estimated to be to be Group

D based on soil observation test pits that revealed the site soils to be Fills with underlying silt loams (See Attachment F). A copy of the USDA NRCS Hydrologic Soil Group Map is included in Attachment E for reference.

Per the FEMA Flood Insurance Rate Map Number 44009C0184J for Washington County, Rhode Island, map revised date: October 16, 2013, the site resides in FEMA Flood Hazard Zone X. This is defined as areas determined to be outside the 0.2% annual chance floodplain. A copy of the FEMA Flood insurance rate map is included in Attachment A for reference.

Existing Hydrologic Conditions

The existing drainage area that was analyzed totals 3.3 acres and is approximately 20% impervious. There are no existing stormwater facilities on Site. The stormwater runoff flows overland from Kingstown Road on the eastern side of the Site to the wetland on the western side of the Site. The ground was observed to be dry, generally, during the Site visit on July 19, 2018.

The wetland area is the existing design point and the Site and associated off-site drainage area is modeled as one subcatchment area as shown on the enclosed Existing Drainage Plan (ED-1) located in Attachment B.

Developed Site Conditions and Hydrologic Conditions

General Site Information

The proposed site development consists of a proposed 7,545 square feet (SF) (7,020 SF Gross Leasable Floor Area) commercial retail building, associated impervious parking and drives, above-ground stormwater detention facilities, site utilities and lighting, and lawns with various plantings.

Proposed Hydrologic Conditions

The proposed retail development has been analyzed as four sub-catchment areas that discharge to one design point located at the wetland as shown on the enclosed Proposed Drainage Plan (PD-1) located in Attachment C. The proposed analysis includes 3.3 acres and is approximately 44% impervious. The intent of the proposed site drainage design is to follow existing drainage patterns to the maximum extent practical, while providing the required water quality treatment and peak flow attenuation.

The proposed drainage improvements include a surface stormwater management basin (SWMB) with two sediment forebays which collect and treat runoff from the proposed parking lot and roof areas. Pre-treatment for the SWMB is provided by sediment forebays 1 and 2. The basin is

intended to provide peak flow rate attenuation for the site as well as water quality volume and groundwater recharge.

The six sub-catchments areas are described below:

- *Perimeter Site and Off-Site Area: Subcatchment PDA-10*

  Ruoff from Kingstown Road, portions of the northern and southern adjacent parcels, and the portion of the site area outside of the parking area will flow overland to the wetland. A swale is proposed starting in front of the proposed building and ending at the western extent of the development for conveyance of runoff from Kingstown Road to the existing wetland system, as it currently drains.

- *Parking Area 1: Subcatchment PDA-11*

  The northern portion of the parking area will be directed to Sediment Forebay 1 for pre-treatment before overflowing into the stormwater management basin (SWMB).

- *Parking Area 2: Subcatchment PDA-12*

  The southern portion of the parking area will be directed to Sediment Forebay 2 for pre-treatment before overflowing into the stormwater management basin (SWMB).

- *Roof Runoff: Subcatchment PDA-13*

  The roof runoff will be directed into the SWMB for peak flow attenuation through an underground roof leader pipe system.

Soil observation test pits were performed in the anticipated locations of stormwater BMPs. These observations revealed that the site consists of 3-5 feet of fill soils overlaying natural silt loams. Estimated seasonal high groundwater tables based on redoximorphic features were observed at depths between 18” and 36”, all within the fill soil layers. Due to these soil conditions, groundwater recharge will be extremely limited.

Infiltration testing was not completed due to the soil conditions/limitations of the site. Therefore, the recharge requirement can only be implemented to the maximum extent practicable. As such, the stormwater management basin has been designed assuming minimal flow through to the water table.

Stormwater Management

Hydrologic Modeling of the Entire Site

The hydrologic analysis to determine peak stormwater discharge rates was performed using the HydroCAD stormwater modeling system computer program, version 10.00 developed by HydroCAD Software Solutions, LLC. Hydrographs for each watershed were developed using the SCS Synthetic Unit Hydrograph Method. Rainfall depths and distribution per the depths shown in Table 1 above. The drainage areas, or subcatchments as labeled by the program, are depicted by hexagons on the attached drainage diagrams. The pre-construction HydroCAD report is located in Attachment B and the post-construction HydroCAD report is located in Attachment C.

The existing and proposed rates of runoffs for key design storm events are summarized in Table 2 below. The proposed rates of runoff at the design point for the design storm events are less than or equal to the existing rates of runoff at the design point.

Table 2 – Existing vs Proposed Peak Rates of Runoff (cfs)

Site Condition	1.2-in (WQf)	1-Year	10-Year	100-Year
Pre-Construction	0.38	3.91	9.93	20.88
Post-Construction	*0.33*	*2.18*	*5.67*	*14.93*
Net Decrease	*0.05*	*1.73*	*4.26*	*5.95*

The existing and proposed runoff volumes for key design storm events are summarized in Table 3 below. The runoff volumes for the proposed condition at the design point for the design storm events are less than or equal to the existing runoff volumes at the design point.

Table 3 – Existing vs Proposed Runoff Volume (acre-feet)

Site Condition	*1.2-in (WQf)*	*1-Year*	*10-Year*	*100-Year*
Pre-Construction	*0.048*	*0.320*	*0.798*	*1.711*
Post-Construction	*0.045*	*0.262*	*0.756*	*1.685*
Net Decrease	*0.003*	*0.058*	*0.042*	*0.026*

Minimum Stormwater Standards

A summary for each of the Minimum Standards are below. Calculations are provided in Attachment D.

Minimum Standard 1: LID Site Planning and Design Strategies

This Stormwater Management Plan and the Stormwater Management Plan checklist provided in Appendix A of the overall Stormwater Management Plan have been prepared in accordance with Minimum Standard 1.

Minimum Standard 2: Groundwater Recharge

Due to the soil conditions described above, groundwater recharge will be limited and therefore accounted for only to the maximum extent practicable. Runoff directed to the stormwater management basin will be allowed to discharge to the groundwater as the soils below allow.

Minimum Standard 3: Water Quality

Sediment Forebays 1 and 2 provide pretreatment for runoff prior to entering the stormwater management basin. The water quality volume is stored below the overflow pipe and is greater than the required water quality volume of 0.091 acre-feet (3,946 CF).

No flow is conveyed through diversion structures that would require the water quality flow to be calculated. Peak runoff from the site does not increase for the Water Quality precipitation event of 1.2".

Minimum Standard 4: Conveyance and Natural Channel Protection

Criterion waived due to proposed impervious area being less than 1 acre. Proposed impervious area is 0.73 acres. The proposed disturbance area is 1.75 acres.

Minimum Standard 5: Overbank Flood Protection

The infiltration system has been sized to attenuate peak flows for the 10- and 100-year, 24-hour (Type III) design storm events.

Minimum Standard 6: Redevelopment and Infill Projects

The proposed project is not a redevelopment.

Minimum Standard 7: Pollution Prevention

The Soil Erosion and Sediment Control (SESC) Plan is included in Appendix C of the overall Stormwater Management Plan. The SESC Plan is part of the permitting set of plans that accompany the Stormwater Management Plan.

Minimum Standard 8: Land Uses with Higher Potential Pollutant Loads

The proposed project is not a land uses with higher potential pollutant loads (LUHPPLs).

Minimum Standard 9: Illicit Discharges

The proposed stormwater design does not include illicit discharges.

Minimum Standard 10: Construction Activity Soil Erosion, Runoff, Sedimentation, and Pollution Prevention Control Measure Requirements

The SESC Plan is included in Appendix C of the overall Stormwater Management Plan.

Minimum Standard 11: Stormwater Management System Operation and Maintenance

The Operations and Maintenance Plan is included in Appendix D of the overall Stormwater Management Plan.

Summary

The post-construction peak discharge rates *and runoff volumes* for the developed site have been *maintained or* decreased for all design storm events. Post development stormwater discharges will mimic existing drainage patterns. The proposed surface stormwater detention systems have been designed to attenuate peak flows for up to the 100-year, 24-hour (Type III) design storm event.

ATTACHMENT A

LOCATION MAPS

USGS Location Map
FEMA Federal Insurance Rate Map

USGS
science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

KINGSTON QUADRANGLE
RHODE ISLAND - WASHINGTON COUNTY
7.5-MINUTE SERIES

Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 19T
This map is not a legal document. Boundaries may be
generalized for this map scale. Private lands within government
reservations may not be shown. Obtain permission before
entering private lands.

Imagery		NAIP, July 2016 - September 2016	
Roads	U.S. Census Bureau,		2016
Names		GNIS, 1976 -	2018
Hydrography	National Hydrography Dataset,	2005 -	2017
Contours	National Elevation Dataset,		2012
Boundaries	Multiple sources; see metadata file	2016 -	2017
Wetlands	FWS National Wetlands Inventory		2010

MN
GN
14°54'
253 MILS
4°51'
30 MILS
UTM GRID AND 2017 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
18T
Grid Zone Designation
18T

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 MILES 1
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES

1 Hope Valley
2 Slocum
3 Wickford
4 Carolina
5 Narragansett Pier
6 Quonochontaug
7 Kingston OE S
8 Narragansett Pier OE S

ROAD CLASSIFICATION

Expressway
Secondary Hwy
Ramp
Interstate Route
US Route
Local Connector
Local Road
4WD
State Route

KINGSTON, RI
2018

76430163920 76
USGS X2 K7 87 4
NGA REF NO.

Figure 3: FEMA Federal Insurance Rate Map

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0 North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

The AE Zone category has been divided by a **Limit of Moderate Wave Action (LIMWA)**. The LIMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LIMWA (or between the shoreline and the LIMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Rhode Island State Plane Zone (FIPS zone 3800). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on the FIRM panels produced for this coastal study revision was derived from USGS High Resolution orthophotography dated spring of 2011, produced at six inch resolution. The horizontal datum used was North American Datum of 1983 (NAD 83).

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

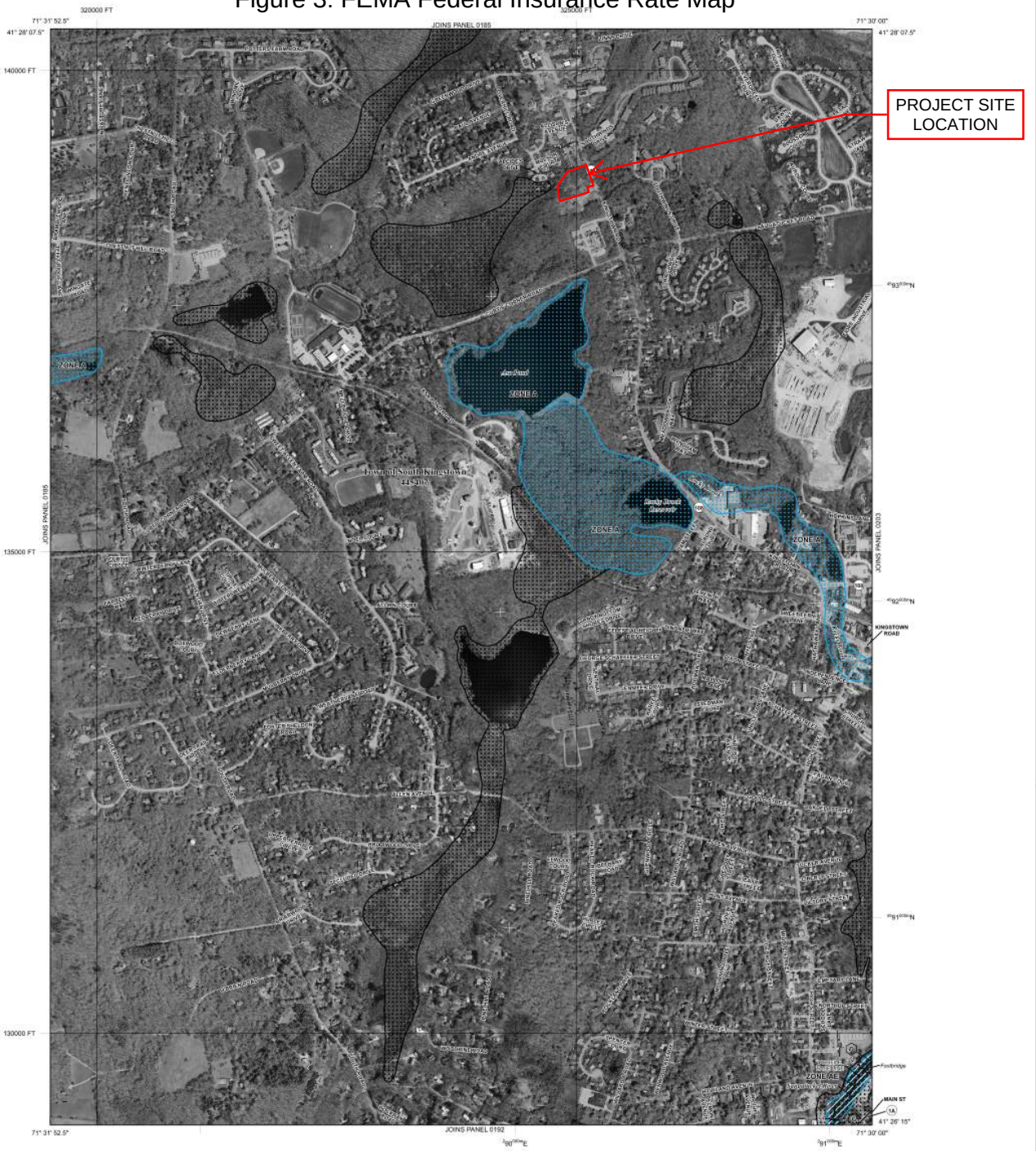
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

Only coastal structures that are certified to provide protection from the 1-percent-annual chance flood are shown on this panel. However, all structures taken into consideration for the purpose of coastal flood hazard analysis and mapping are present in the DFIRM database in S_Gen_Struct.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A — No Base Flood Elevations determined.
- ZONE AE — Base Flood Elevations determined.
- ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR — Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Floodplain Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- Limit of Moderate Wave Action
- Limit of Moderate Wave Action coincident with Zone Break
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- Culvert
- Bridge
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 3120000 FT — 5000-foot ticks: Rhode Island State Plane Zone (FIPS Zone 3800), Transverse Mercator projection
- 4992000m N — 1000-meter Universal Transverse Mercator grid values, zone 19N
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
October 16, 2013

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
October 16, 2013 - to change Base Flood Elevations and Special Flood Hazard Areas, to change zone designations, to update the effects of wave action, to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision and to modify Coastal Barrier Resources System units.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0184J

FIRM

FLOOD INSURANCE RATE MAP

WASHINGTON COUNTY, RHODE ISLAND (ALL JURISDICTIONS)

PANEL 184 OF 368
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINING:

COMMUNITY	NUMBER	PANEL	SUFFIX
SOUTH KINGSTOWN, TOWN OF	440407	0184	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
44009C0184J
MAP REVISED
OCTOBER 16, 2013

Federal Emergency Management Agency

ATTACHMENT B

PRE-CONSTRUCTION HYDROLOGY

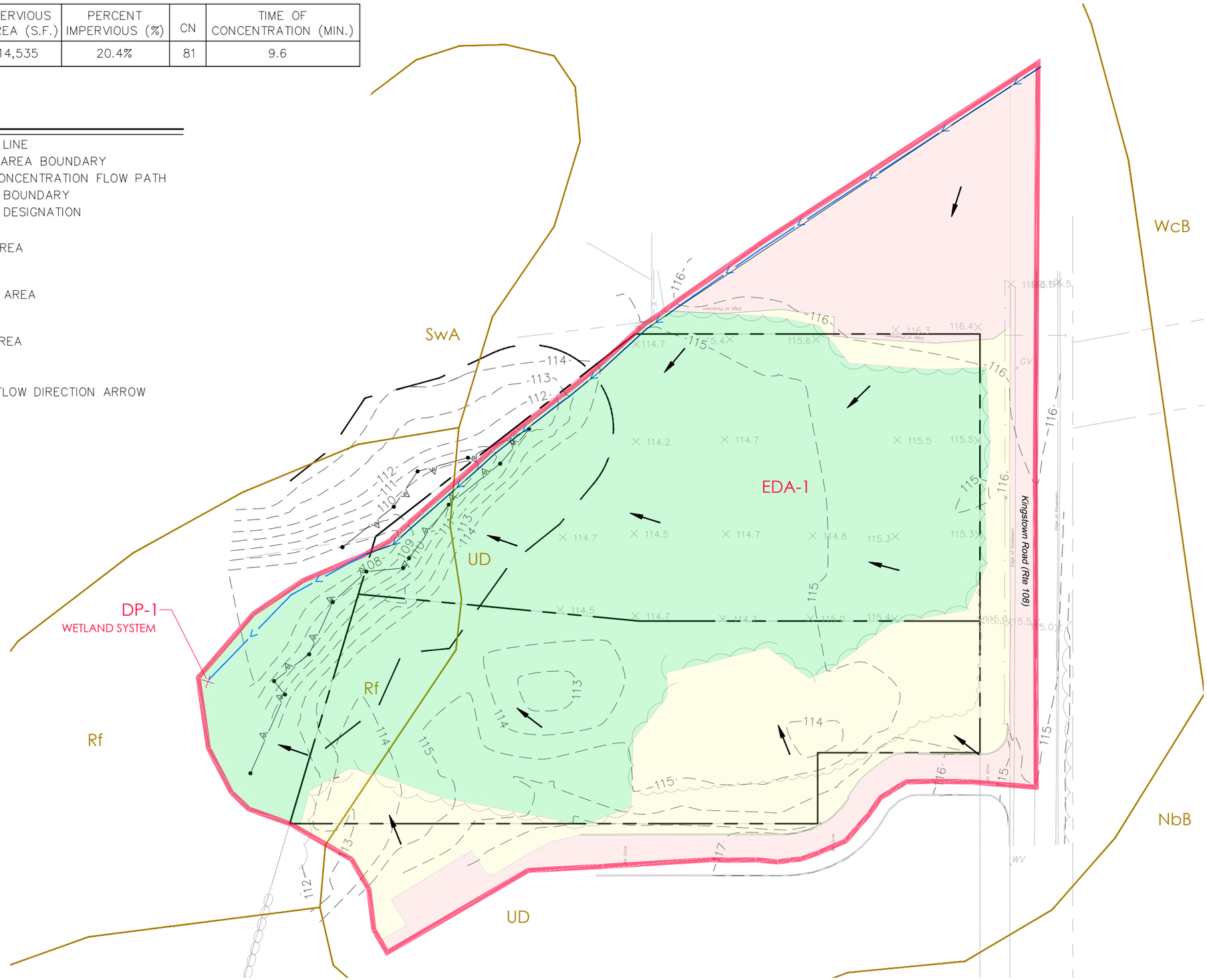
ED-1 – Existing Drainage Plan
Pre-Construction HydroCAD Report

EXISTING HYDROLOGY INFORMATION

DRAINAGE AREA	TOTAL AREA (S.F.)	IMPERVIOUS AREA (S.F.)	PERVIOUS AREA (S.F.)	PERCENT IMPERVIOUS (%)	CN	TIME OF CONCENTRATION (MIN.)
EDA-1	143,930	29,395	114,535	20.4%	81	9.6

HYDROLOGY LEGEND

- PROPERTY LINE
- DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION FLOW PATH
- SOIL TYPE BOUNDARY
- UD — SOIL TYPE DESIGNATION
- MEADOW AREA
- PAVEMENT AREA
- WOODED AREA
- SURFACE FLOW DIRECTION ARROW



GRAPHIC SCALE
60 30 0 60
SCALE IN FEET

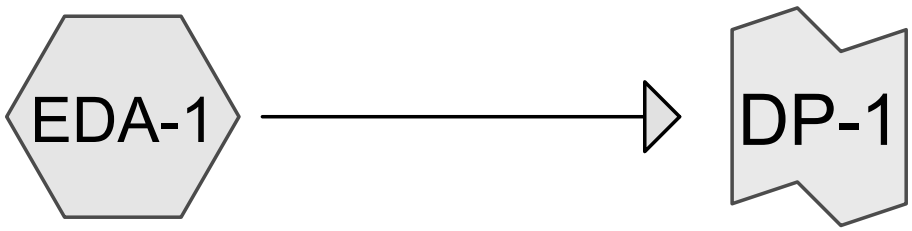
BL Companies

PROPOSED RETAIL DEVELOPMENT
1860 KINGSTOWN ROAD (RI ROUTE 108)
SOUTH KINGSTOWN, RHODE ISLAND

Designed	C.J.L.
Drawn	C.J.L.
Reviewed	M.J.B.
Scale	1"=60'
Project	18C6704
Date	06/25/2020

EXISTING DRAINAGE PLAN

ED-1



Area Draining to Wetland System

Wetland System

Subcat Reach Pond Link

Routing Diagram for C-DAT-18C6704-Pre-Construction-Drainage_20200625

Prepared by {enter your company name here}, Printed 7/10/2020

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.720	78	Meadow, non-grazed, HSG D (EDA-1)
0.524	98	Paved parking, HSG D (EDA-1)
0.150	93	Paved roads w/open ditches, 50% imp, HSG D (EDA-1)
1.910	77	Woods, Good, HSG D (EDA-1)
3.304	**81**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
3.304	HSG D	EDA-1
0.000	Other	
3.304		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatch Numbers
0.000	0.000	0.000	0.720	0.000	0.720	Meadow, non-grazed	
0.000	0.000	0.000	0.524	0.000	0.524	Paved parking	
0.000	0.000	0.000	0.150	0.000	0.150	Paved roads w/open ditches, 50% imp	
0.000	0.000	0.000	1.910	0.000	1.910	Woods, Good	
0.000	**0.000**	**0.000**	**3.304**	**0.000**	**3.304**	**TOTAL AREA**	

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 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-1: Area Draining to Runoff Area=143,930 sf 18.15% Impervious Runoff Depth=1.16"
Flow Length=615' Tc=9.6 min CN=81 Runoff=3.91 cfs 0.320 af

Link DP-1: Wetland System Inflow=3.91 cfs 0.320 af
Primary=3.91 cfs 0.320 af

Total Runoff Area = 3.304 ac Runoff Volume = 0.320 af Average Runoff Depth = 1.16"
81.85% Pervious = 2.705 ac 18.15% Impervious = 0.600 ac

Summary for Subcatchment EDA-1: Area Draining to Wetland System

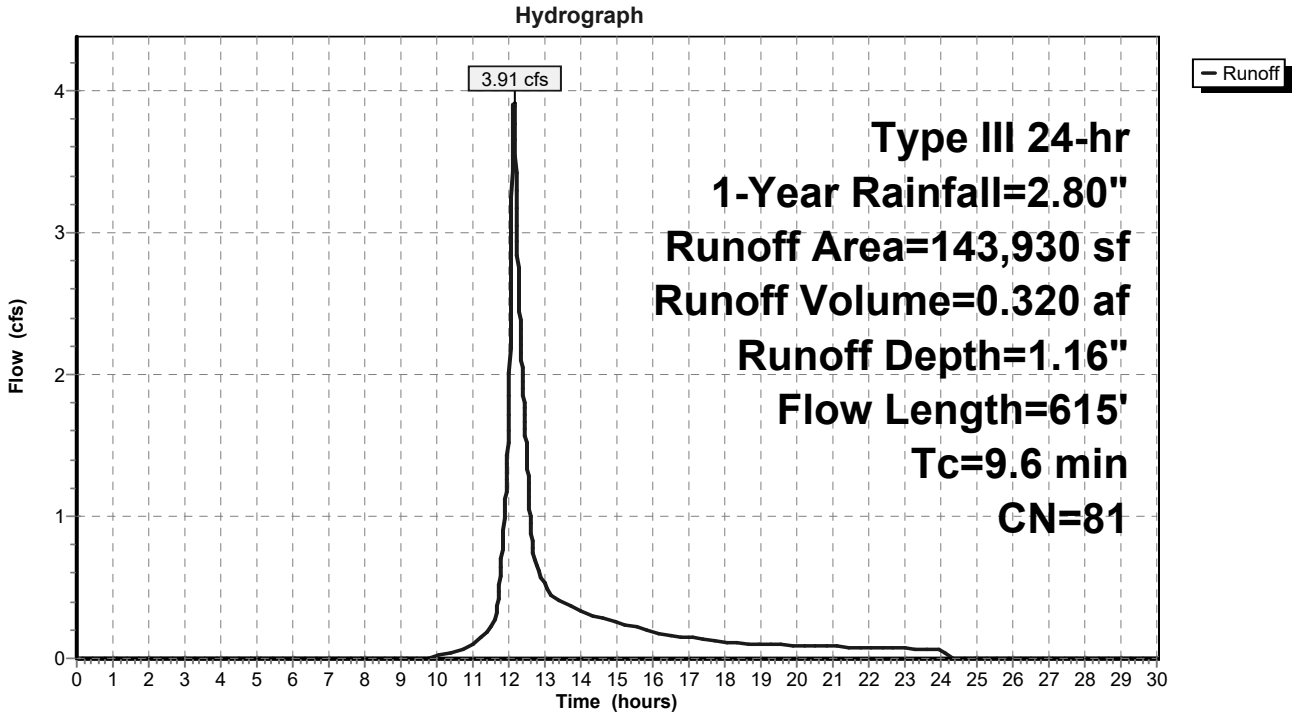
Runoff = 3.91 cfs @ 12.14 hrs, Volume= 0.320 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
22,845	98	Paved parking, HSG D
83,185	77	Woods, Good, HSG D
31,350	78	Meadow, non-grazed, HSG D
6,550	93	Paved roads w/open ditches, 50% imp, HSG D
143,930	81	Weighted Average
117,810		81.85% Pervious Area
26,120		18.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.22		**Sheet Flow, Paved - Sheet** Smooth surfaces n= 0.011 P2= 3.30"
2.2	212	0.0200	1.62		**Sheet Flow, Paved - Concentrated** Smooth surfaces n= 0.011 P2= 3.30"
1.0	54	0.0300	0.87		**Shallow Concentrated Flow, Wood - 1** Woodland Kv= 5.0 fps
1.5	92	0.0430	1.04		**Shallow Concentrated Flow, Wood - 2** Woodland Kv= 5.0 fps
1.4	87	0.0460	1.07		**Shallow Concentrated Flow, Wetland - 1** Woodland Kv= 5.0 fps
2.8	120	0.0200	0.71		**Shallow Concentrated Flow, Wetland - 2** Woodland Kv= 5.0 fps
9.6	615	Total			

Subcatchment EDA-1: Area Draining to Wetland System

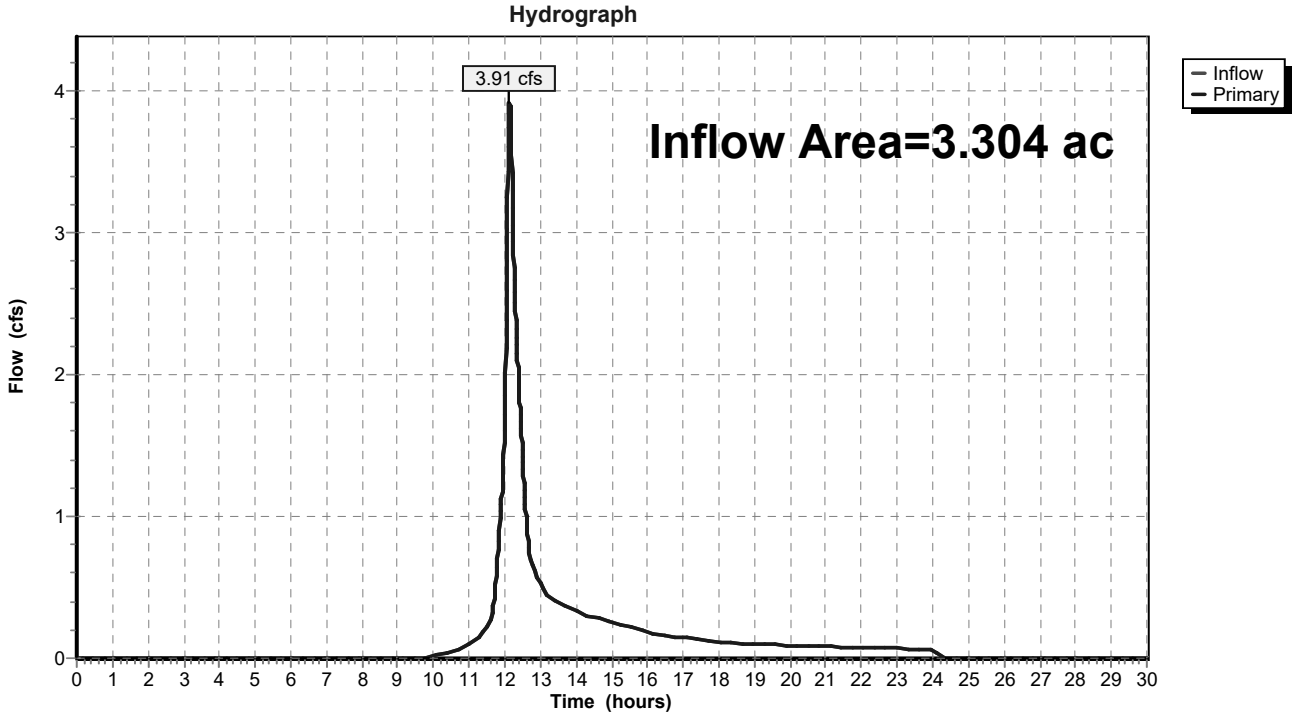


Summary for Link DP-1: Wetland System

Inflow Area = 3.304 ac, 18.15% Impervious, Inflow Depth = 1.16" for 1-Year event
Inflow = 3.91 cfs @ 12.14 hrs, Volume= 0.320 af
Primary = 3.91 cfs @ 12.14 hrs, Volume= 0.320 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: Wetland System



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 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-1: Area Draining to Runoff Area=143,930 sf 18.15% Impervious Runoff Depth=0.17"
Flow Length=615' Tc=9.6 min CN=81 Runoff=0.38 cfs 0.048 af

Link DP-1: Wetland System Inflow=0.38 cfs 0.048 af
Primary=0.38 cfs 0.048 af

Total Runoff Area = 3.304 ac Runoff Volume = 0.048 af Average Runoff Depth = 0.17"
81.85% Pervious = 2.705 ac 18.15% Impervious = 0.600 ac

Summary for Subcatchment EDA-1: Area Draining to Wetland System

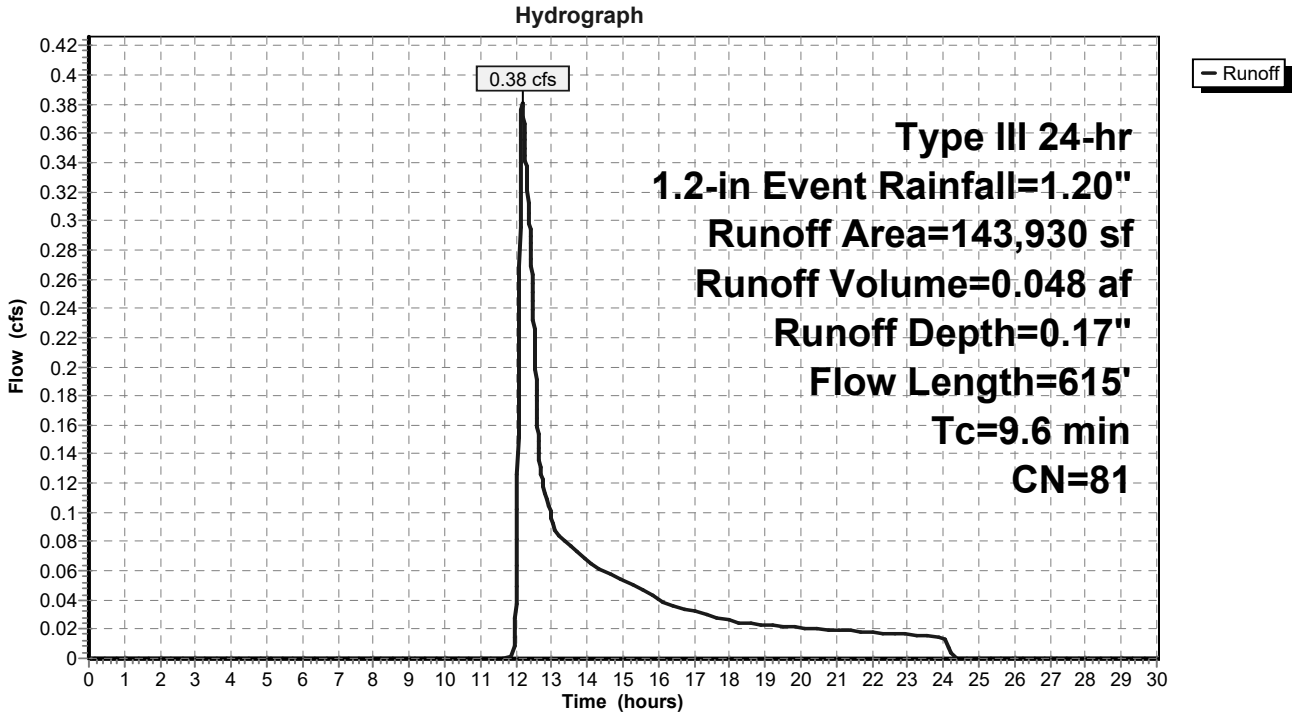
Runoff = 0.38 cfs @ 12.18 hrs, Volume= 0.048 af, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1.2-in Event Rainfall=1.20"

Area (sf)	CN	Description
22,845	98	Paved parking, HSG D
83,185	77	Woods, Good, HSG D
31,350	78	Meadow, non-grazed, HSG D
6,550	93	Paved roads w/open ditches, 50% imp, HSG D
143,930	81	Weighted Average
117,810		81.85% Pervious Area
26,120		18.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.22		**Sheet Flow, Paved - Sheet** Smooth surfaces n= 0.011 P2= 3.30"
2.2	212	0.0200	1.62		**Sheet Flow, Paved - Concentrated** Smooth surfaces n= 0.011 P2= 3.30"
1.0	54	0.0300	0.87		**Shallow Concentrated Flow, Wood - 1** Woodland Kv= 5.0 fps
1.5	92	0.0430	1.04		**Shallow Concentrated Flow, Wood - 2** Woodland Kv= 5.0 fps
1.4	87	0.0460	1.07		**Shallow Concentrated Flow, Wetland - 1** Woodland Kv= 5.0 fps
2.8	120	0.0200	0.71		**Shallow Concentrated Flow, Wetland - 2** Woodland Kv= 5.0 fps
9.6	615	Total			

Subcatchment EDA-1: Area Draining to Wetland System

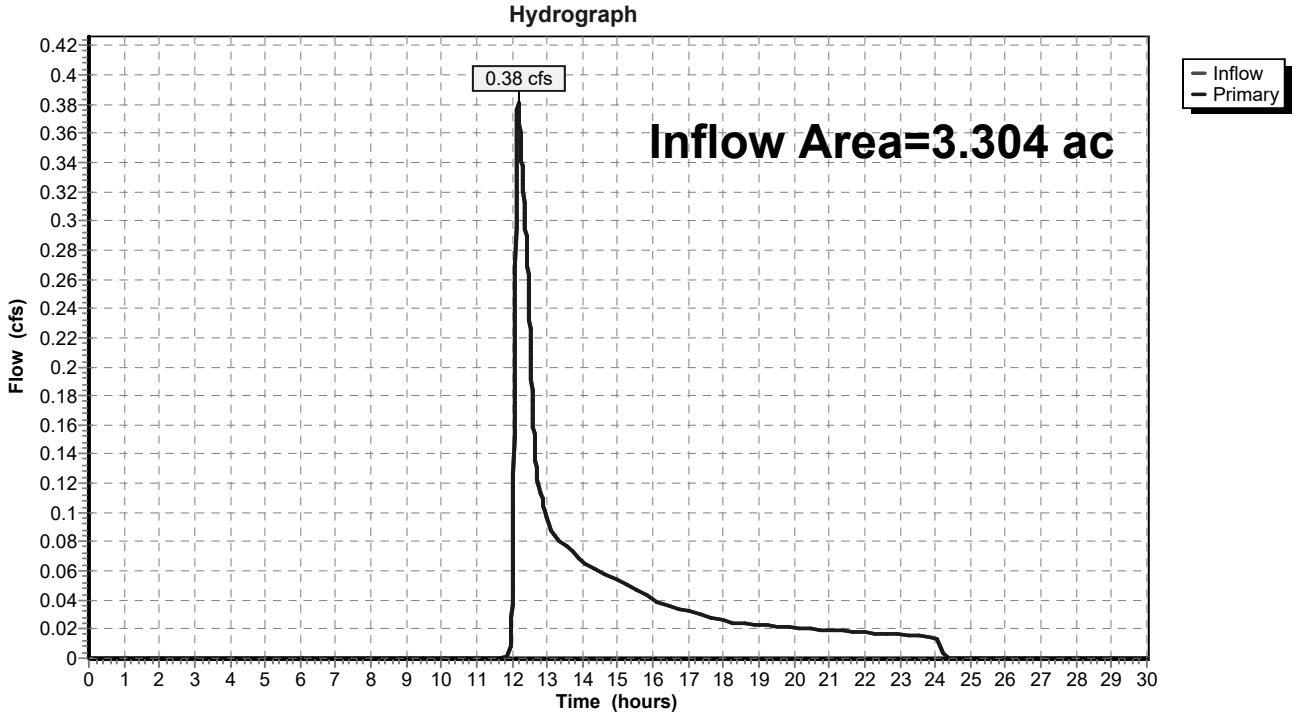


Summary for Link DP-1: Wetland System

Inflow Area = 3.304 ac, 18.15% Impervious, Inflow Depth = 0.17" for 1.2-in Event event
Inflow = 0.38 cfs @ 12.18 hrs, Volume= 0.048 af
Primary = 0.38 cfs @ 12.18 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: Wetland System



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 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-1: Area Draining to Runoff Area=143,930 sf 18.15% Impervious Runoff Depth=2.90"
Flow Length=615' Tc=9.6 min CN=81 Runoff=9.93 cfs 0.798 af

Link DP-1: Wetland System Inflow=9.93 cfs 0.798 af
Primary=9.93 cfs 0.798 af

Total Runoff Area = 3.304 ac Runoff Volume = 0.798 af Average Runoff Depth = 2.90"
81.85% Pervious = 2.705 ac 18.15% Impervious = 0.600 ac

Summary for Subcatchment EDA-1: Area Draining to Wetland System

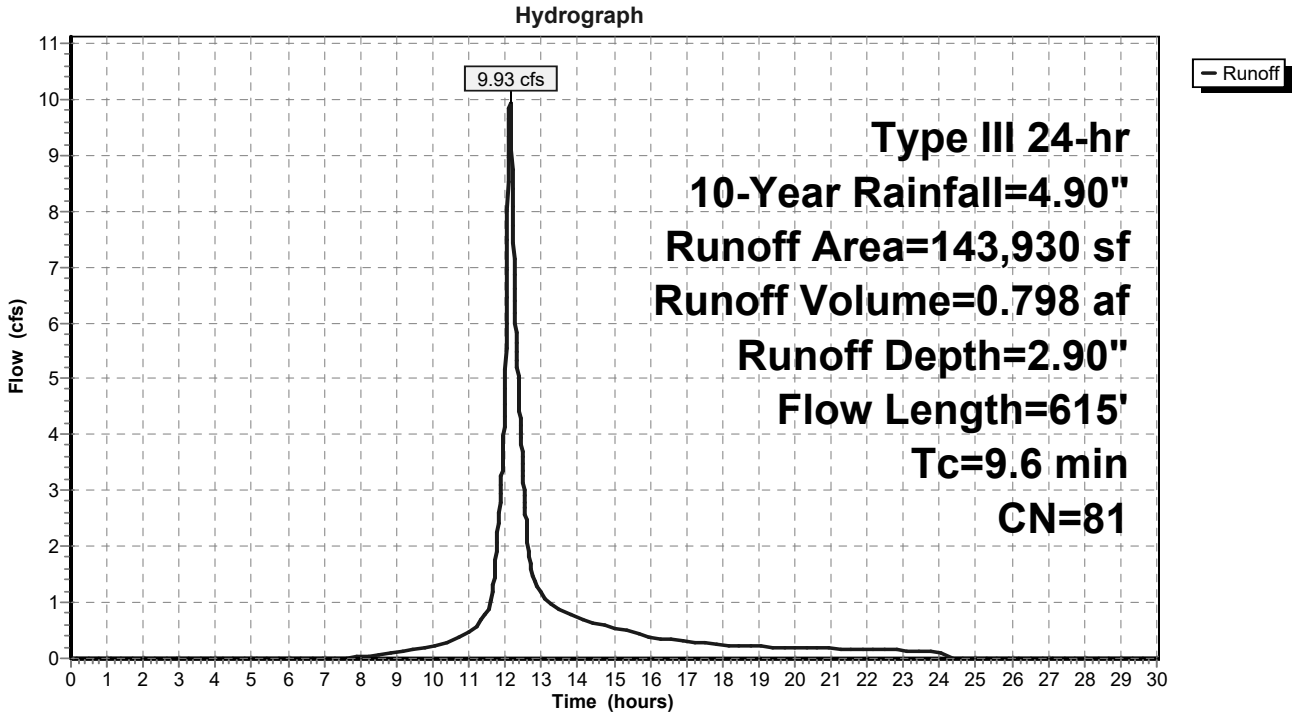
Runoff = 9.93 cfs @ 12.13 hrs, Volume= 0.798 af, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
22,845	98	Paved parking, HSG D
83,185	77	Woods, Good, HSG D
31,350	78	Meadow, non-grazed, HSG D
6,550	93	Paved roads w/open ditches, 50% imp, HSG D
143,930	81	Weighted Average
117,810		81.85% Pervious Area
26,120		18.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.22		**Sheet Flow, Paved - Sheet** Smooth surfaces n= 0.011 P2= 3.30"
2.2	212	0.0200	1.62		**Sheet Flow, Paved - Concentrated** Smooth surfaces n= 0.011 P2= 3.30"
1.0	54	0.0300	0.87		**Shallow Concentrated Flow, Wood - 1** Woodland Kv= 5.0 fps
1.5	92	0.0430	1.04		**Shallow Concentrated Flow, Wood - 2** Woodland Kv= 5.0 fps
1.4	87	0.0460	1.07		**Shallow Concentrated Flow, Wetland - 1** Woodland Kv= 5.0 fps
2.8	120	0.0200	0.71		**Shallow Concentrated Flow, Wetland - 2** Woodland Kv= 5.0 fps
9.6	615	Total			

Subcatchment EDA-1: Area Draining to Wetland System

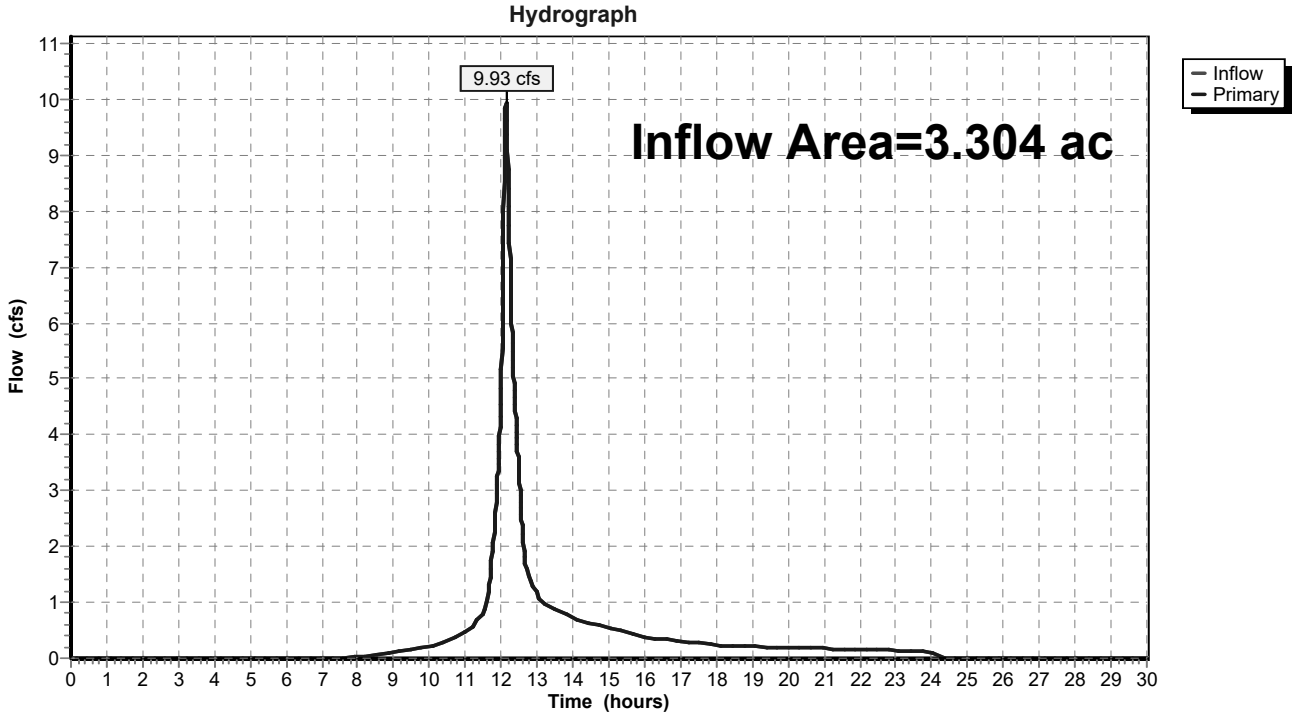


Summary for Link DP-1: Wetland System

Inflow Area = 3.304 ac, 18.15% Impervious, Inflow Depth = 2.90" for 10-Year event
Inflow = 9.93 cfs @ 12.13 hrs, Volume= 0.798 af
Primary = 9.93 cfs @ 12.13 hrs, Volume= 0.798 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: Wetland System



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 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-1: Area Draining to Runoff Area=143,930 sf 18.15% Impervious Runoff Depth=6.22"
Flow Length=615' Tc=9.6 min CN=81 Runoff=20.88 cfs 1.711 af

Link DP-1: Wetland System Inflow=20.88 cfs 1.711 af
Primary=20.88 cfs 1.711 af

Total Runoff Area = 3.304 ac Runoff Volume = 1.711 af Average Runoff Depth = 6.22"
81.85% Pervious = 2.705 ac 18.15% Impervious = 0.600 ac

Summary for Subcatchment EDA-1: Area Draining to Wetland System

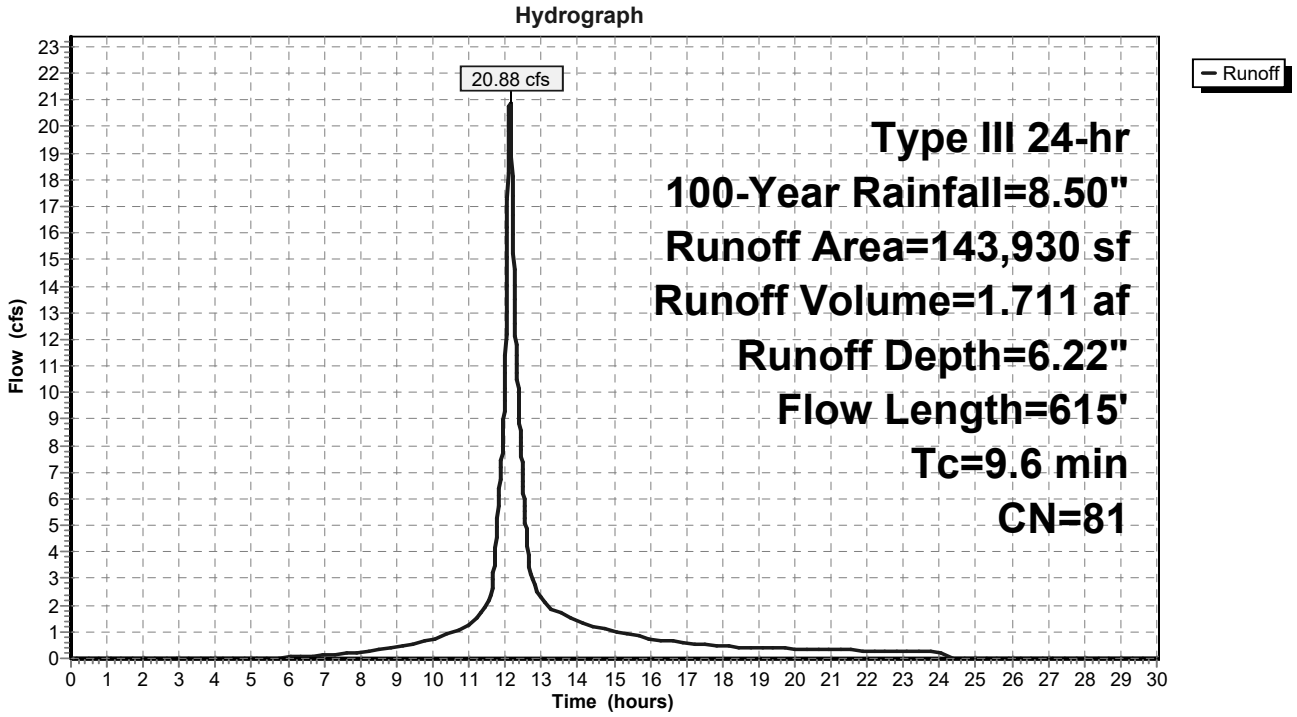
Runoff = 20.88 cfs @ 12.13 hrs, Volume= 1.711 af, Depth= 6.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (sf)	CN	Description
22,845	98	Paved parking, HSG D
83,185	77	Woods, Good, HSG D
31,350	78	Meadow, non-grazed, HSG D
6,550	93	Paved roads w/open ditches, 50% imp, HSG D
143,930	81	Weighted Average
117,810		81.85% Pervious Area
26,120		18.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.22		**Sheet Flow, Paved - Sheet** Smooth surfaces n= 0.011 P2= 3.30"
2.2	212	0.0200	1.62		**Sheet Flow, Paved - Concentrated** Smooth surfaces n= 0.011 P2= 3.30"
1.0	54	0.0300	0.87		**Shallow Concentrated Flow, Wood - 1** Woodland Kv= 5.0 fps
1.5	92	0.0430	1.04		**Shallow Concentrated Flow, Wood - 2** Woodland Kv= 5.0 fps
1.4	87	0.0460	1.07		**Shallow Concentrated Flow, Wetland - 1** Woodland Kv= 5.0 fps
2.8	120	0.0200	0.71		**Shallow Concentrated Flow, Wetland - 2** Woodland Kv= 5.0 fps
9.6	615	Total			

Subcatchment EDA-1: Area Draining to Wetland System

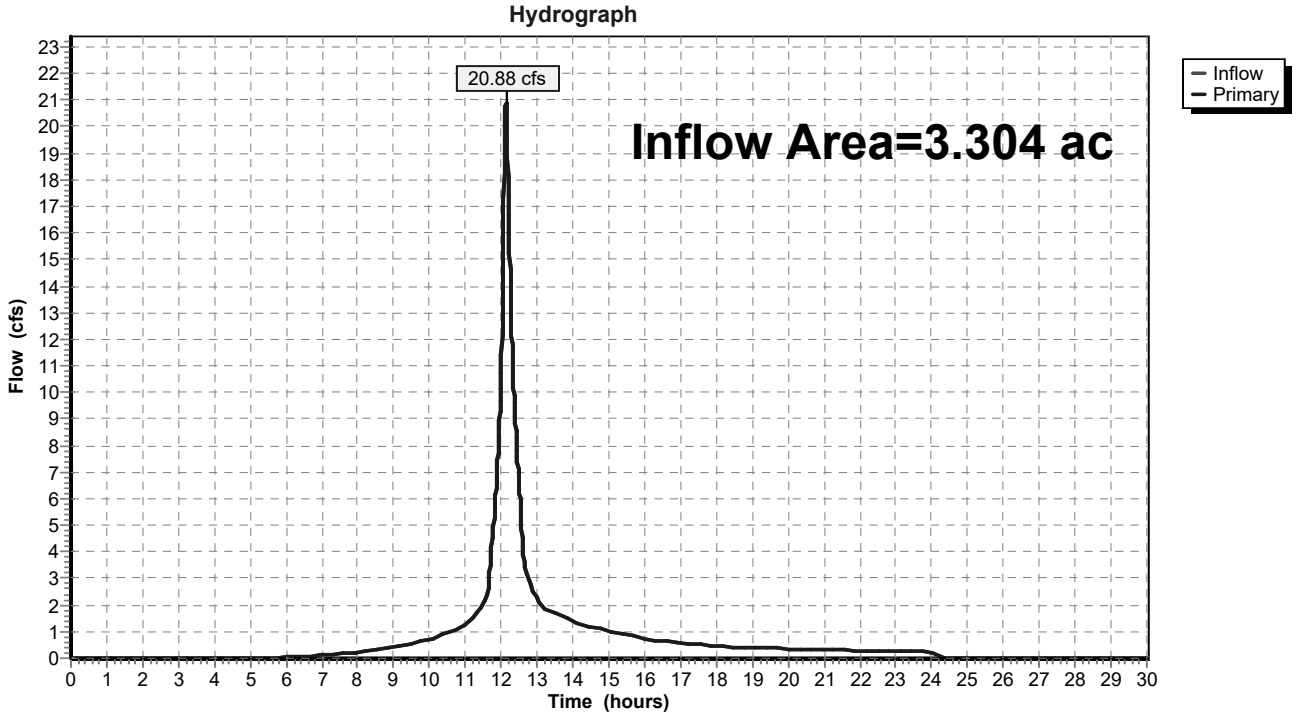


Summary for Link DP-1: Wetland System

Inflow Area = 3.304 ac, 18.15% Impervious, Inflow Depth = 6.22" for 100-Year event
Inflow = 20.88 cfs @ 12.13 hrs, Volume= 1.711 af
Primary = 20.88 cfs @ 12.13 hrs, Volume= 1.711 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: Wetland System



ATTACHMENT C

POST-CONSTRUCTION HYDROLOGY

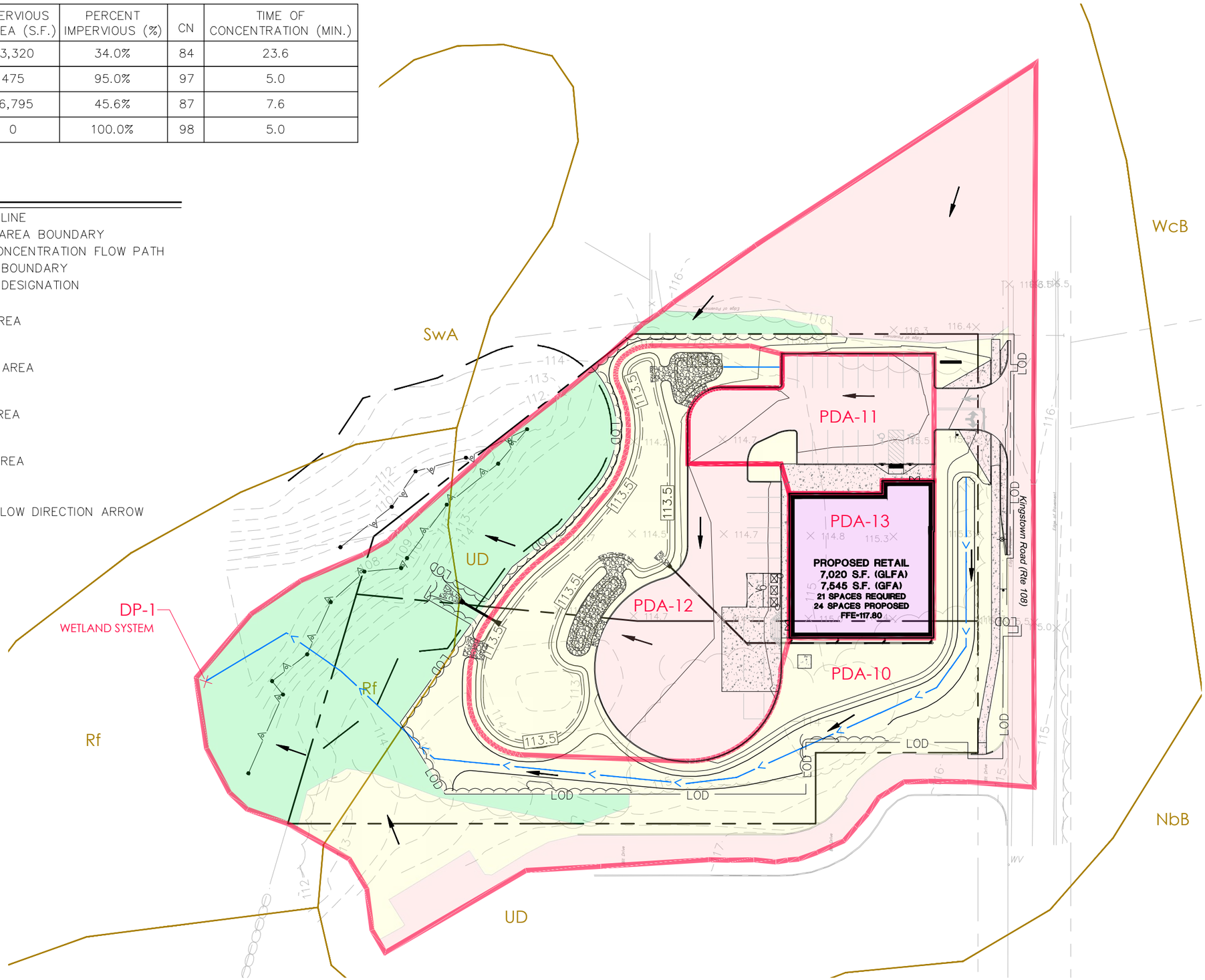
PD-1 – Proposed Drainage Plan
Post-Construction HydroCAD Report

PROPOSED HYDROLOGY INFORMATION

DRAINAGE AREA	TOTAL AREA (S.F.)	IMPERVIOUS AREA (S.F.)	PERVIOUS AREA (S.F.)	PERCENT IMPERVIOUS (%)	CN	TIME OF CONCENTRATION (MIN.)
PDA–10	95,895	32,575	63,320	34.0%	84	23.6
PDA–11	9,595	9,120	475	95.0%	97	5.0
PDA–12	30,890	14,095	16,795	45.6%	87	7.6
PDA–13	7,550	7,550	0	100.0%	98	5.0

HYDROLOGY LEGEND

- PROPERTY LINE
- DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION FLOW PATH
- SOIL TYPE BOUNDARY
- UD — SOIL TYPE DESIGNATION
- MEADOW AREA
- PAVEMENT AREA
- WOODED AREA
- BUILDING AREA
- SURFACE FLOW DIRECTION ARROW



GRAPHIC SCALE
60 30 0 60
SCALE IN FEET

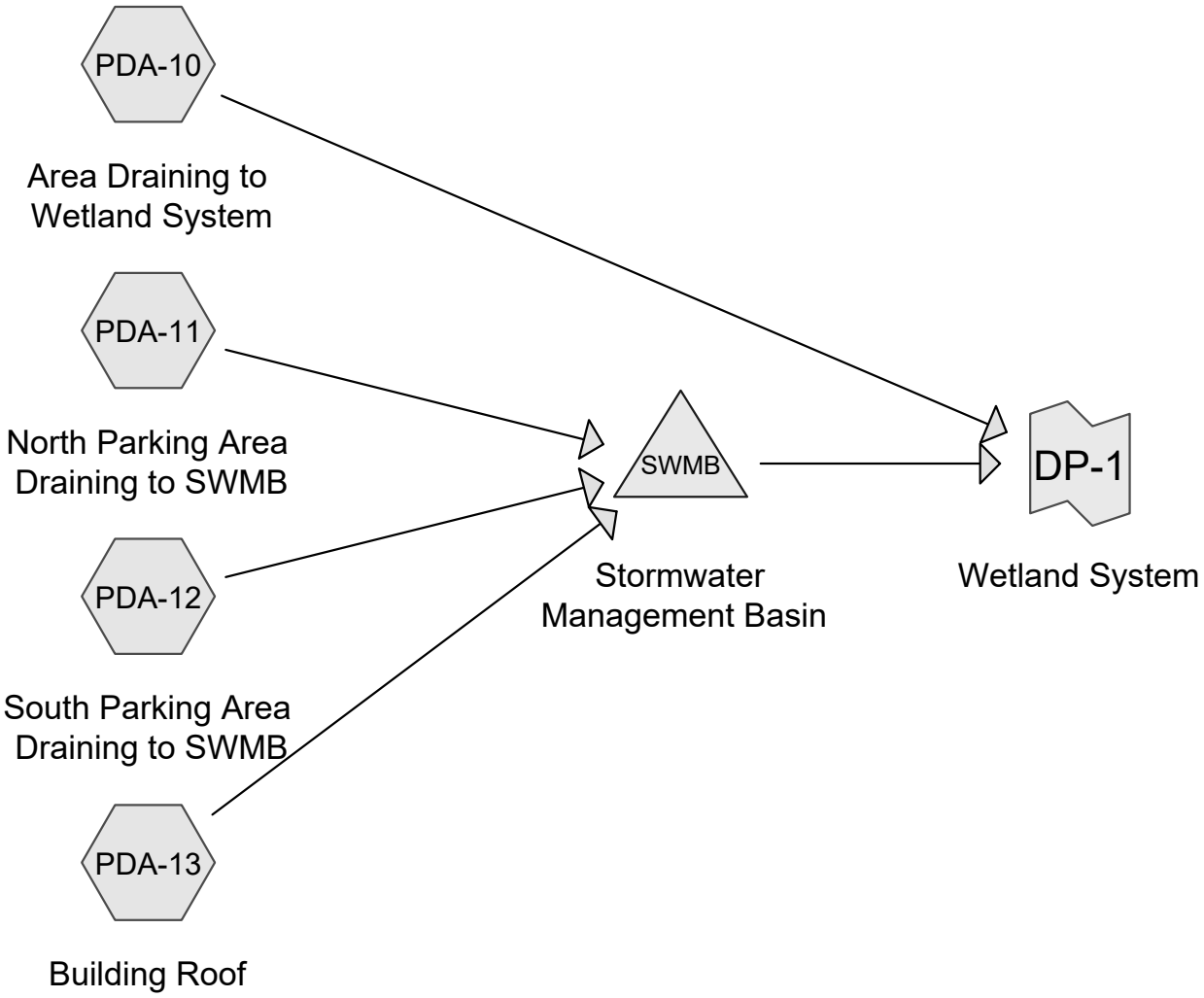
BL Companies

PROPOSED RETAIL DEVELOPMENT
1860 KINGSTOWN ROAD (RI ROUTE 108)
SOUTH KINGSTOWN, RHODE ISLAND

Designed	C.J.L.
Drawn	C.J.L.
Reviewed	M.J.B.
Scale	1"=60'
Project	18C6704
Date	06/25/2020

PROPOSED DRAINAGE PLAN

PD-1



Subcat Reach Pond Link

Routing Diagram for C-DAT-18C6704-Post-Construction-Drainage_20200625
Prepared by {enter your company name here}, Printed 7/10/2020

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.214	78	Meadow, non-grazed, HSG D (PDA-10, PDA-11, PDA-12)
1.130	98	Paved parking, HSG D (PDA-10, PDA-11, PDA-12)
0.150	93	Paved roads w/open ditches, 50% imp, HSG D (PDA-10)
0.173	98	Roofs, HSG D (PDA-13)
0.636	77	Woods, Good, HSG D (PDA-10)
3.304	**86**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
3.304	HSG D	PDA-10, PDA-11, PDA-12, PDA-13
0.000	Other	
3.304		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatch Numbers
0.000	0.000	0.000	1.214	0.000	1.214	Meadow, non-grazed	
0.000	0.000	0.000	1.130	0.000	1.130	Paved parking	
0.000	0.000	0.000	0.150	0.000	0.150	Paved roads w/open ditches, 50% imp	
0.000	0.000	0.000	0.173	0.000	0.173	Roofs	
0.000	0.000	0.000	0.636	0.000	0.636	Woods, Good	
0.000	**0.000**	**0.000**	**3.304**	**0.000**	**3.304**	**TOTAL AREA**	

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 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-10: Area Draining to Runoff Area=95,895 sf 30.55% Impervious Runoff Depth=1.35"
Flow Length=610' Tc=23.6 min CN=84 Runoff=2.18 cfs 0.248 af

Subcatchment PDA-11: North Parking Area Runoff Area=9,595 sf 95.05% Impervious Runoff Depth=2.46"
Tc=5.0 min CN=97 Runoff=0.61 cfs 0.045 af

Subcatchment PDA-12: South Parking Runoff Area=30,890 sf 45.63% Impervious Runoff Depth=1.57"
Flow Length=33' Slope=0.0100 '/' Tc=7.6 min CN=87 Runoff=1.23 cfs 0.093 af

Subcatchment PDA-13: Building Roof Runoff Area=7,550 sf 100.00% Impervious Runoff Depth=2.57"
Tc=5.0 min CN=98 Runoff=0.49 cfs 0.037 af

Pond SWMB: Stormwater Management Peak Elev=114.09' Storage=4,736 cf Inflow=2.26 cfs 0.175 af
Discarded=0.05 cfs 0.095 af Primary=0.03 cfs 0.014 af Outflow=0.09 cfs 0.109 af

Link DP-1: Wetland System Inflow=2.18 cfs 0.262 af
Primary=2.18 cfs 0.262 af

Total Runoff Area = 3.304 ac Runoff Volume = 0.423 af Average Runoff Depth = 1.54"
58.27% Pervious = 1.925 ac 41.73% Impervious = 1.379 ac

Summary for Subcatchment PDA-10: Area Draining to Wetland System

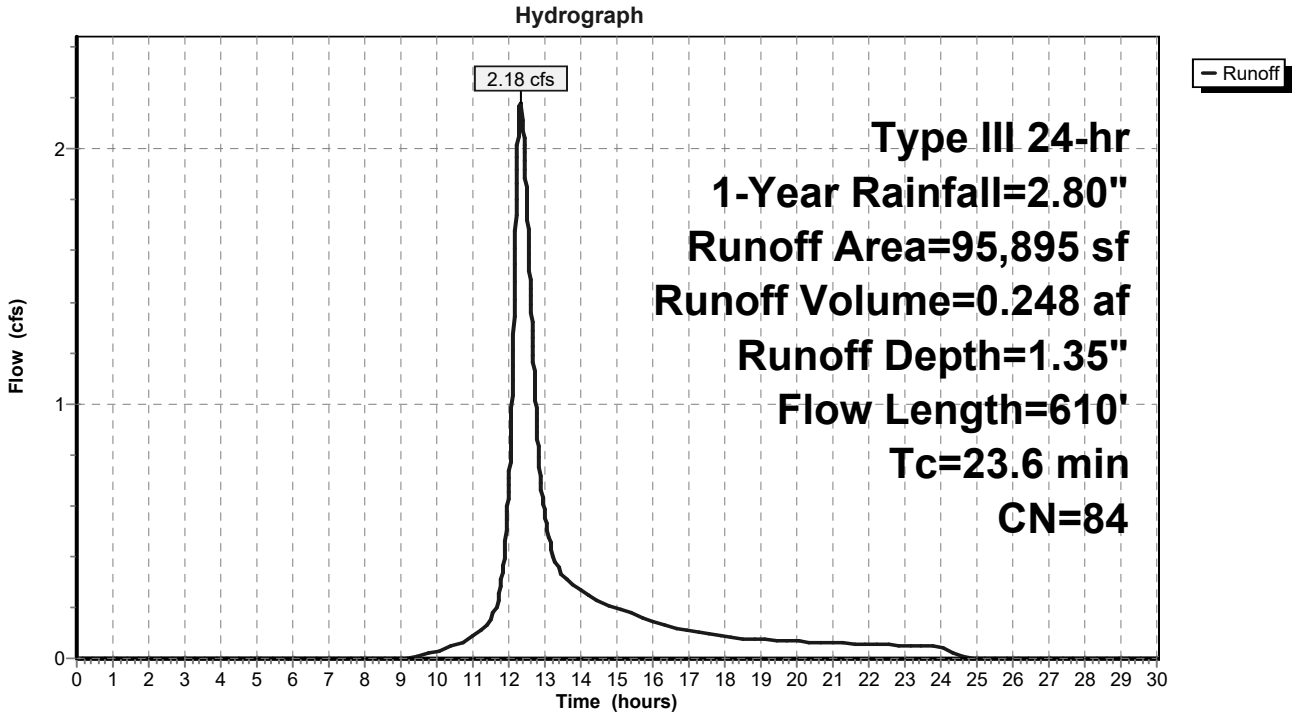
Runoff = 2.18 cfs @ 12.34 hrs, Volume= 0.248 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
26,025	98	Paved parking, HSG D
27,690	77	Woods, Good, HSG D
35,630	78	Meadow, non-grazed, HSG D
6,550	93	Paved roads w/open ditches, 50% imp, HSG D
95,895	84	Weighted Average
66,595		69.45% Pervious Area
29,300		30.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	50	0.0050	0.06		**Sheet Flow, Lawn - Sheet** Grass: Dense n= 0.240 P2= 3.30"
6.4	410	0.0050	1.06		**Shallow Concentrated Flow, Lawn - Concentrated** Grassed Waterway Kv= 15.0 fps
1.5	55	0.0150	0.61		**Shallow Concentrated Flow, Wood - 1** Woodland Kv= 5.0 fps
0.3	40	0.1500	1.94		**Shallow Concentrated Flow, Wood - 2** Woodland Kv= 5.0 fps
1.3	55	0.0200	0.71		**Shallow Concentrated Flow, Wetland - 1** Woodland Kv= 5.0 fps
23.6	610	Total			

Subcatchment PDA-10: Area Draining to Wetland System



Summary for Subcatchment PDA-11: North Parking Area Draining to SWMB

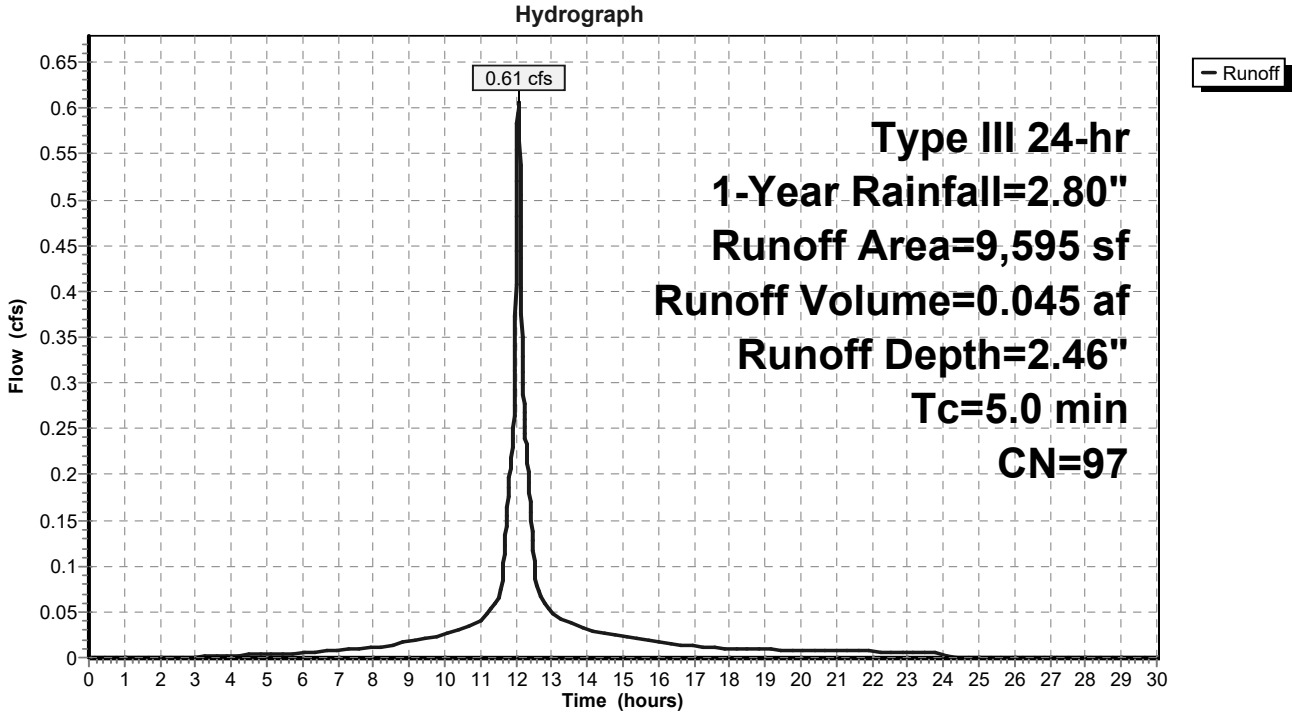
Runoff = 0.61 cfs @ 12.07 hrs, Volume= 0.045 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
9,120	98	Paved parking, HSG D
0	77	Woods, Good, HSG D
475	78	Meadow, non-grazed, HSG D
0	93	Paved roads w/open ditches, 50% imp, HSG D
9,595	97	Weighted Average
475		4.95% Pervious Area
9,120		95.05% Impervious Area

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

Subcatchment PDA-11: North Parking Area Draining to SWMB



Summary for Subcatchment PDA-12: South Parking Area Draining to SWMB

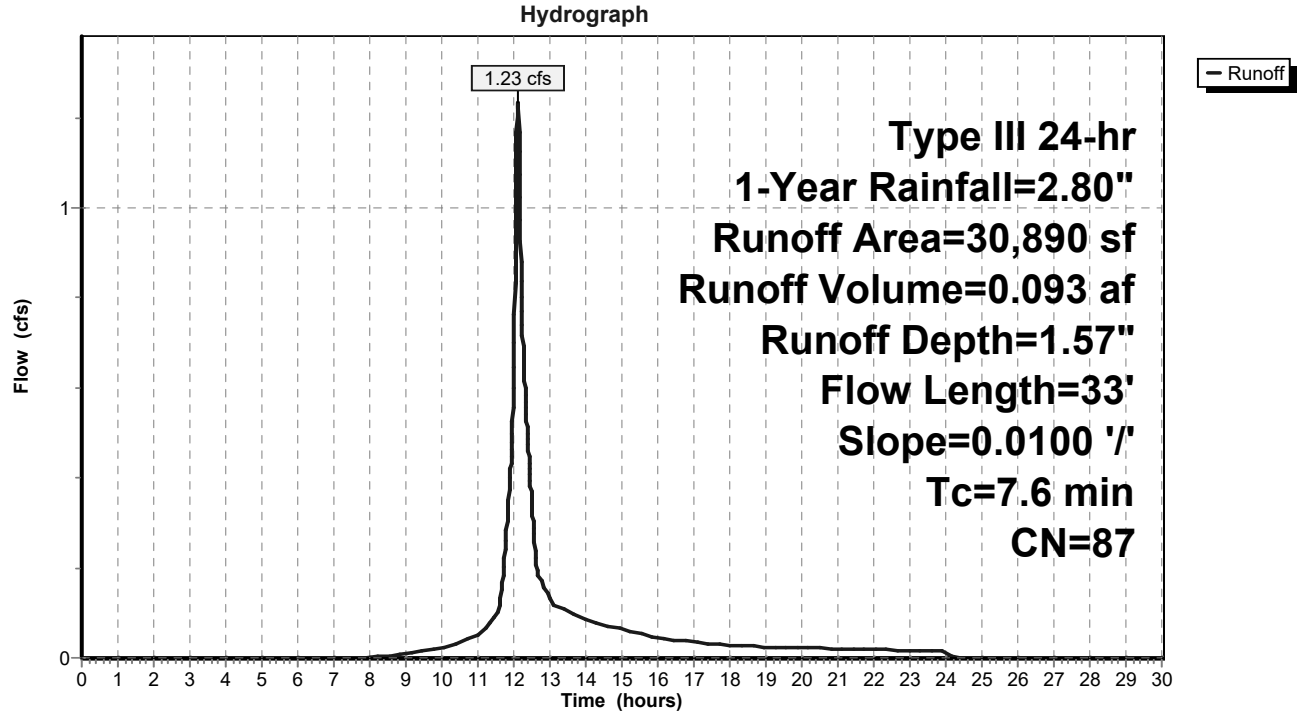
Runoff = 1.23 cfs @ 12.11 hrs, Volume= 0.093 af, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
14,095	98	Paved parking, HSG D
0	77	Woods, Good, HSG D
16,795	78	Meadow, non-grazed, HSG D
0	93	Paved roads w/open ditches, 50% imp, HSG D
30,890	87	Weighted Average
16,795		54.37% Pervious Area
14,095		45.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	33	0.0100	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"

Subcatchment PDA-12: South Parking Area Draining to SWMB



Summary for Subcatchment PDA-13: Building Roof

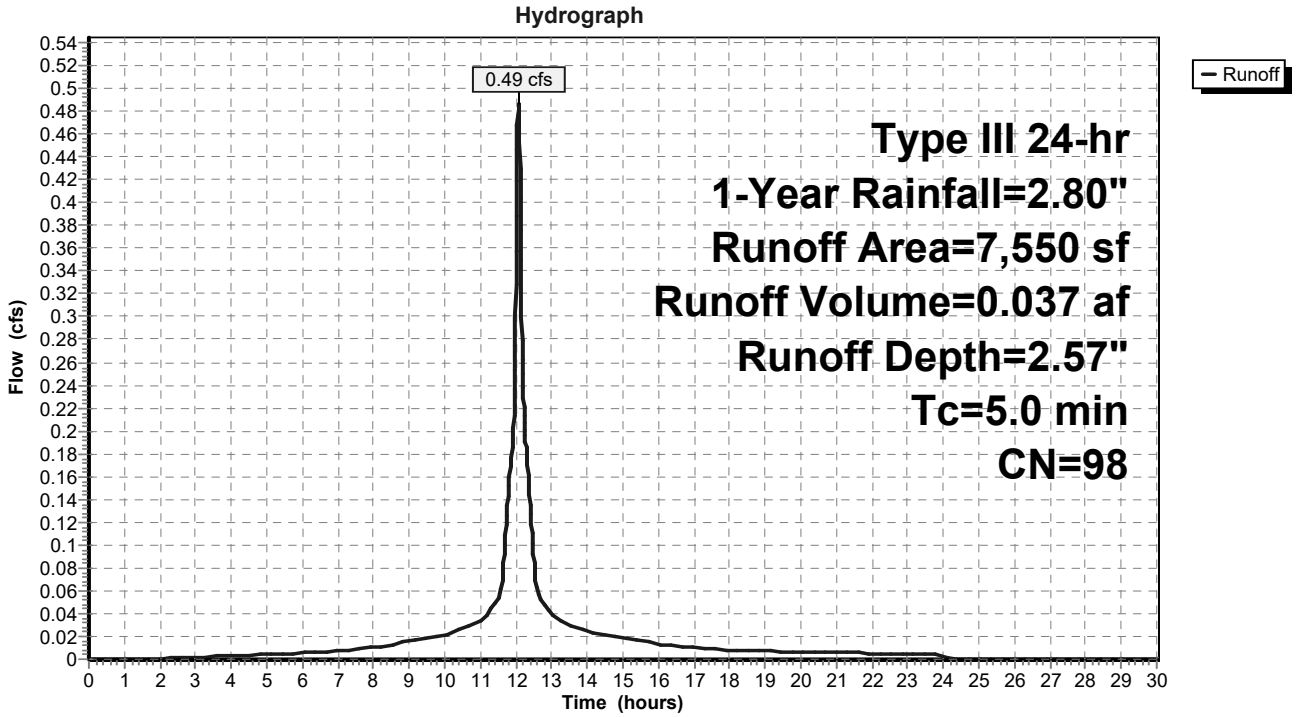
Runoff = 0.49 cfs @ 12.07 hrs, Volume= 0.037 af, Depth= 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
7,550	98	Roofs, HSG D
7,550		100.00% Impervious Area

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

Subcatchment PDA-13: Building Roof



Summary for Pond SWMB: Stormwater Management Basin

Inflow Area = 1.103 ac, 64.05% Impervious, Inflow Depth = 1.90" for 1-Year event
Inflow = 2.26 cfs @ 12.09 hrs, Volume= 0.175 af
Outflow = 0.09 cfs @ 15.60 hrs, Volume= 0.109 af, Atten= 96%, Lag= 210.4 min
Discarded = 0.05 cfs @ 15.60 hrs, Volume= 0.095 af
Primary = 0.03 cfs @ 15.60 hrs, Volume= 0.014 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 114.09' @ 15.60 hrs Surf.Area= 8,730 sf Storage= 4,736 cf

Plug-Flow detention time= 433.6 min calculated for 0.109 af (62% of inflow)
Center-of-Mass det. time= 328.2 min (1,125.0 - 796.9)

Volume	Invert	Avail.Storage	Storage Description
#1	113.50'	19,309 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

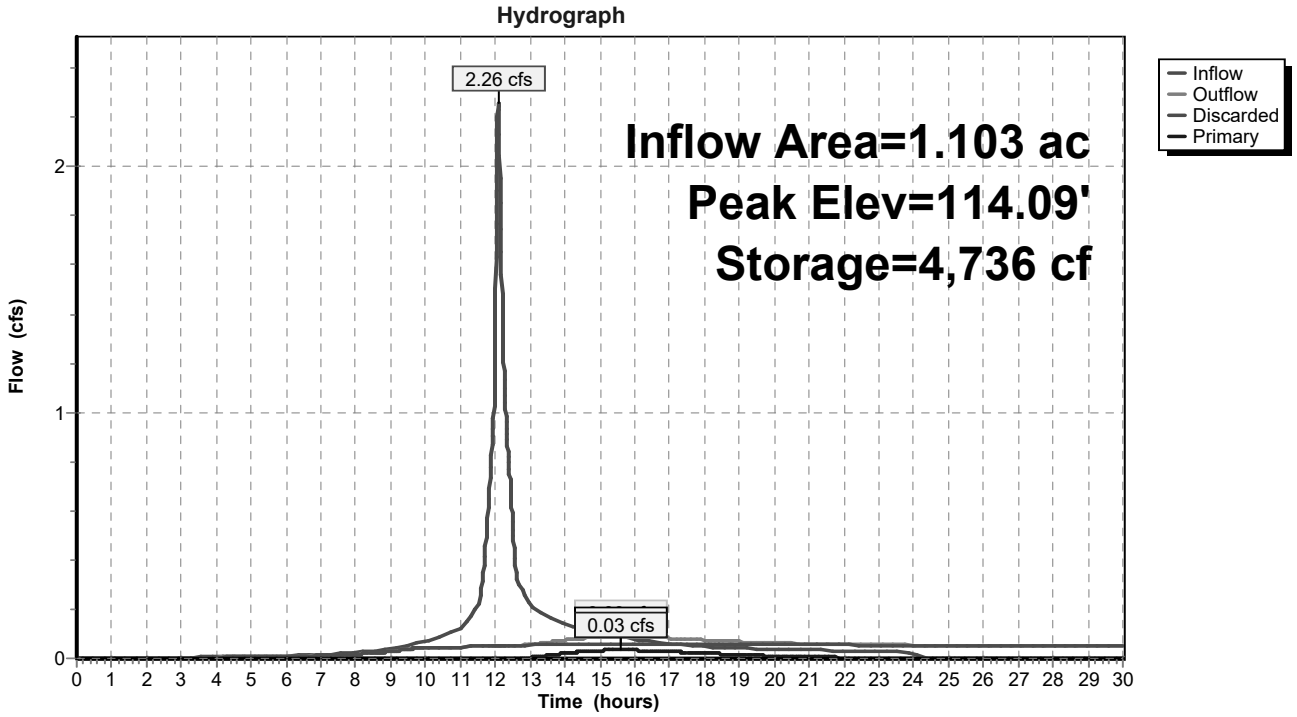
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
113.50	7,305	0	0
114.00	8,480	3,946	3,946
114.50	9,841	4,580	8,527
115.00	11,096	5,234	13,761
115.50	11,096	5,548	19,309

Device	Routing	Invert	Outlet Devices
#1	Primary	114.00'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 114.00' / 113.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Primary	114.50'	**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
#3	Discarded	113.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 15.60 hrs HW=114.09' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.03 cfs @ 15.60 hrs HW=114.09' (Free Discharge)
├**1=Culvert** (Barrel Controls 0.03 cfs @ 1.40 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond SWMB: Stormwater Management Basin

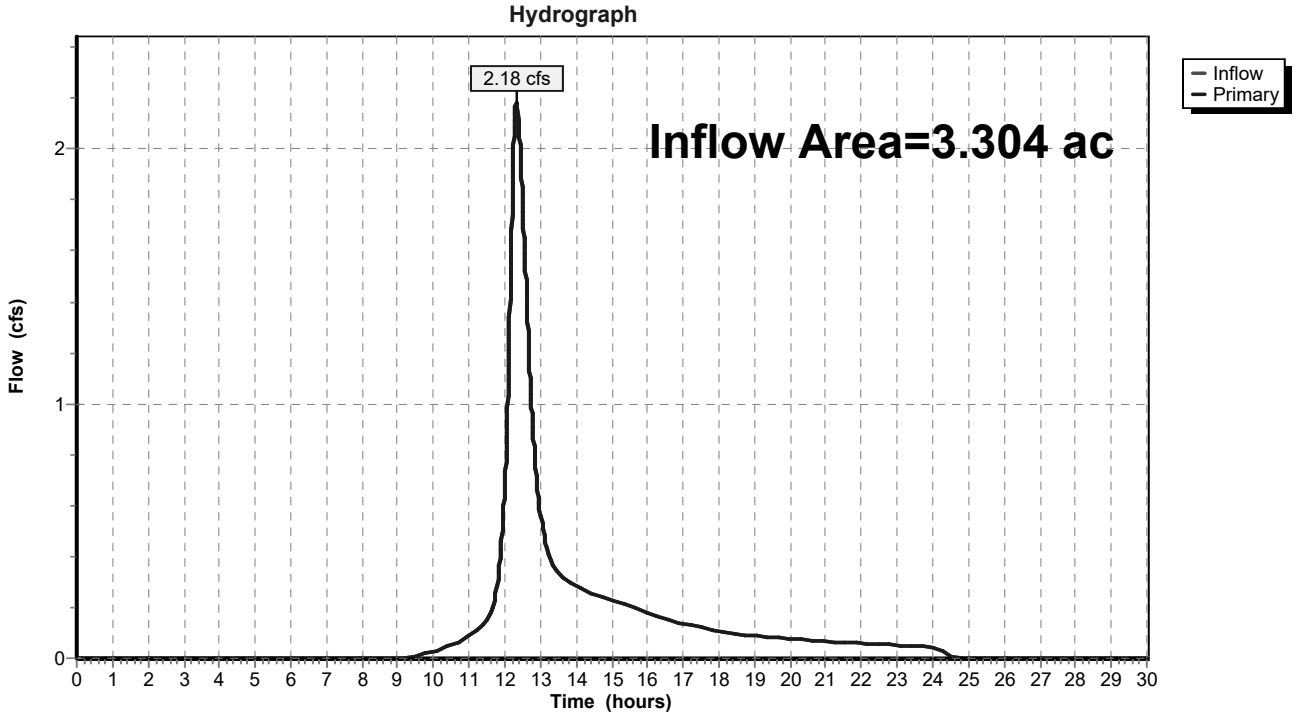


Summary for Link DP-1: Wetland System

Inflow Area = 3.304 ac, 41.73% Impervious, Inflow Depth = 0.95" for 1-Year event
Inflow = 2.18 cfs @ 12.34 hrs, Volume= 0.262 af
Primary = 2.18 cfs @ 12.34 hrs, Volume= 0.262 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: Wetland System



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 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-10: Area Draining to Runoff Area=95,895 sf 30.55% Impervious Runoff Depth=0.25"
Flow Length=610' Tc=23.6 min CN=84 Runoff=0.33 cfs 0.045 af

Subcatchment PDA-11: North Parking Area Runoff Area=9,595 sf 95.05% Impervious Runoff Depth=0.89"
Tc=5.0 min CN=97 Runoff=0.23 cfs 0.016 af

Subcatchment PDA-12: South Parking Runoff Area=30,890 sf 45.63% Impervious Runoff Depth=0.34"
Flow Length=33' Slope=0.0100 '/' Tc=7.6 min CN=87 Runoff=0.24 cfs 0.020 af

Subcatchment PDA-13: Building Roof Runoff Area=7,550 sf 100.00% Impervious Runoff Depth=0.99"
Tc=5.0 min CN=98 Runoff=0.20 cfs 0.014 af

Pond SWMB: Stormwater Management Basin Peak Elev=113.63' Storage=992 cf Inflow=0.65 cfs 0.051 af
Discarded=0.05 cfs 0.051 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.051 af

Link DP-1: Wetland System Inflow=0.33 cfs 0.045 af
Primary=0.33 cfs 0.045 af

Total Runoff Area = 3.304 ac Runoff Volume = 0.096 af Average Runoff Depth = 0.35"
58.27% Pervious = 1.925 ac 41.73% Impervious = 1.379 ac

Summary for Subcatchment PDA-10: Area Draining to Wetland System

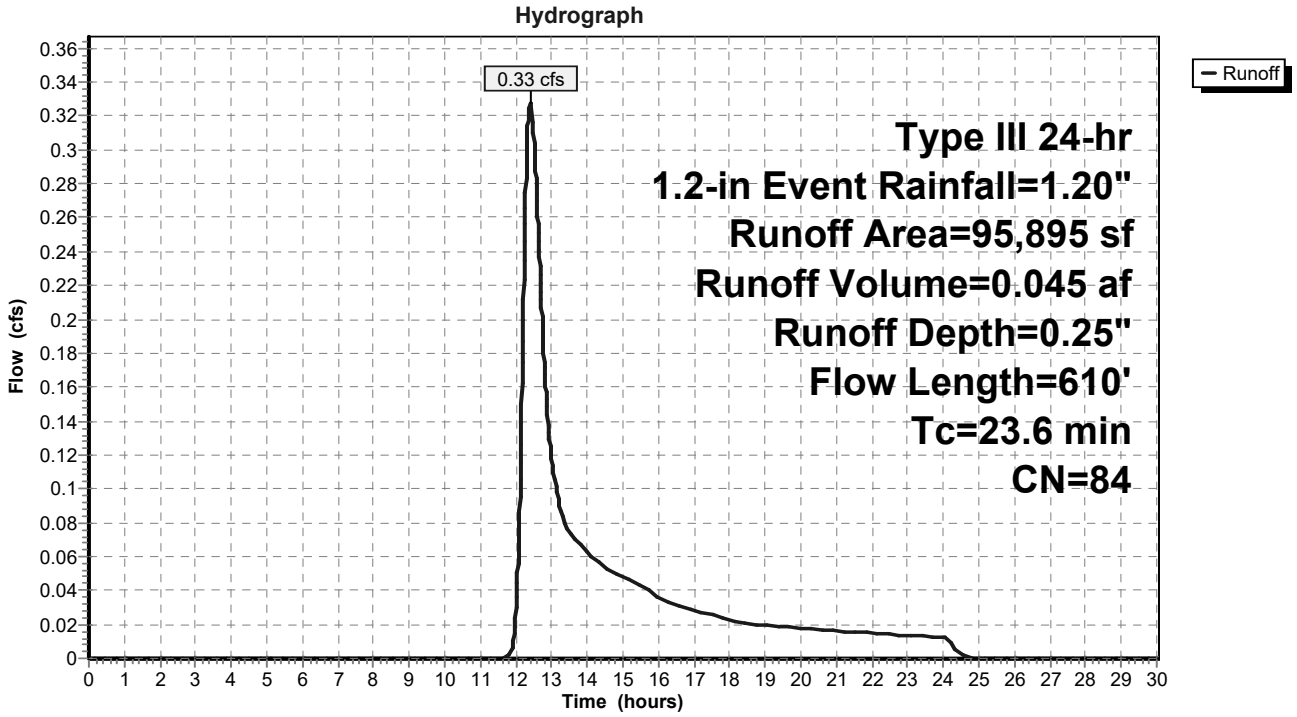
Runoff = 0.33 cfs @ 12.40 hrs, Volume= 0.045 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1.2-in Event Rainfall=1.20"

Area (sf)	CN	Description
26,025	98	Paved parking, HSG D
27,690	77	Woods, Good, HSG D
35,630	78	Meadow, non-grazed, HSG D
6,550	93	Paved roads w/open ditches, 50% imp, HSG D
95,895	84	Weighted Average
66,595		69.45% Pervious Area
29,300		30.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	50	0.0050	0.06		**Sheet Flow, Lawn - Sheet** Grass: Dense n= 0.240 P2= 3.30"
6.4	410	0.0050	1.06		**Shallow Concentrated Flow, Lawn - Concentrated** Grassed Waterway Kv= 15.0 fps
1.5	55	0.0150	0.61		**Shallow Concentrated Flow, Wood - 1** Woodland Kv= 5.0 fps
0.3	40	0.1500	1.94		**Shallow Concentrated Flow, Wood - 2** Woodland Kv= 5.0 fps
1.3	55	0.0200	0.71		**Shallow Concentrated Flow, Wetland - 1** Woodland Kv= 5.0 fps
23.6	610	Total			

Subcatchment PDA-10: Area Draining to Wetland System



Summary for Subcatchment PDA-11: North Parking Area Draining to SWMB

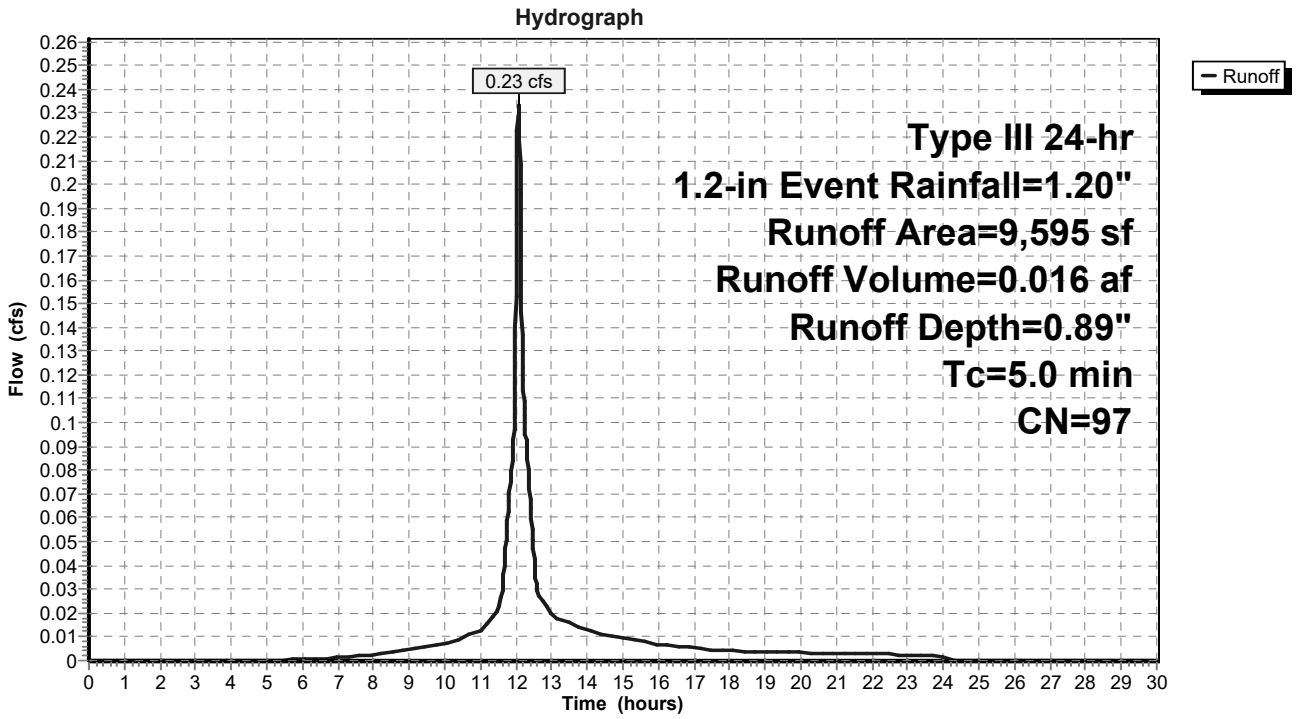
Runoff = 0.23 cfs @ 12.07 hrs, Volume= 0.016 af, Depth= 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1.2-in Event Rainfall=1.20"

Area (sf)	CN	Description
9,120	98	Paved parking, HSG D
0	77	Woods, Good, HSG D
475	78	Meadow, non-grazed, HSG D
0	93	Paved roads w/open ditches, 50% imp, HSG D
9,595	97	Weighted Average
475		4.95% Pervious Area
9,120		95.05% Impervious Area

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

Subcatchment PDA-11: North Parking Area Draining to SWMB



Summary for Subcatchment PDA-12: South Parking Area Draining to SWMB

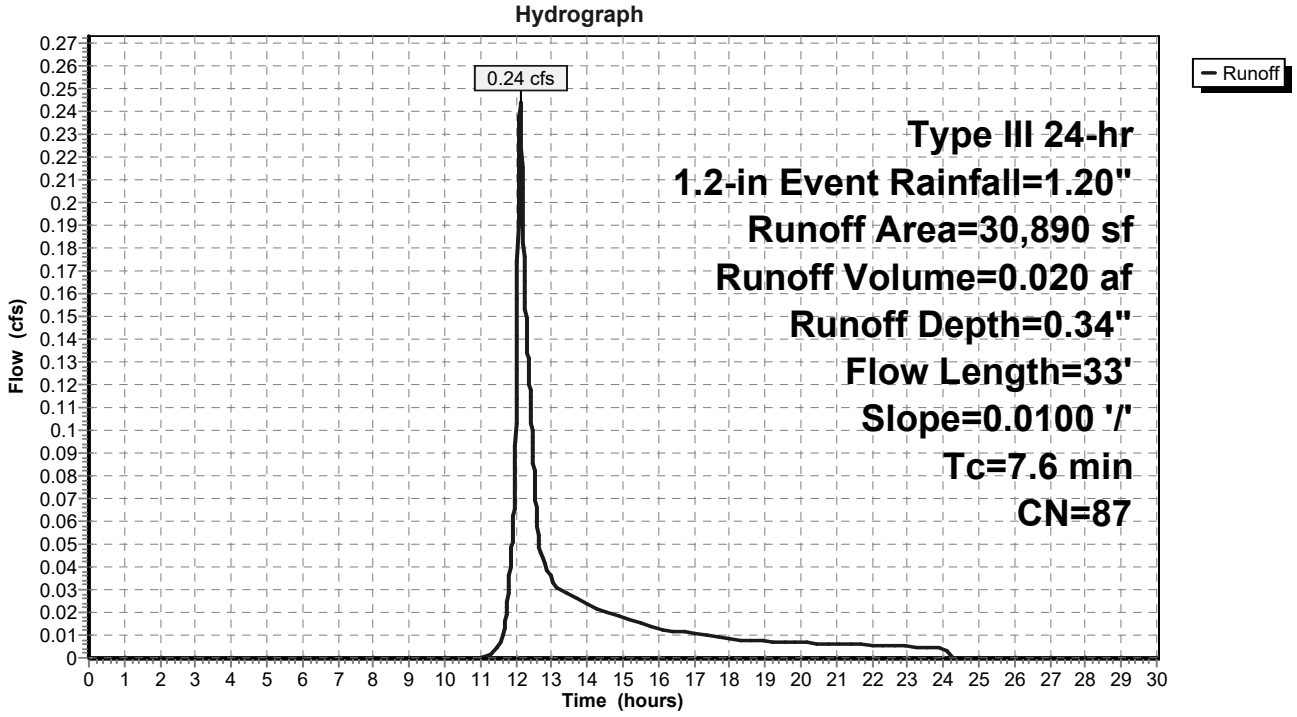
Runoff = 0.24 cfs @ 12.12 hrs, Volume= 0.020 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1.2-in Event Rainfall=1.20"

Area (sf)	CN	Description
14,095	98	Paved parking, HSG D
0	77	Woods, Good, HSG D
16,795	78	Meadow, non-grazed, HSG D
0	93	Paved roads w/open ditches, 50% imp, HSG D
30,890	87	Weighted Average
16,795		54.37% Pervious Area
14,095		45.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	33	0.0100	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"

Subcatchment PDA-12: South Parking Area Draining to SWMB



Summary for Subcatchment PDA-13: Building Roof

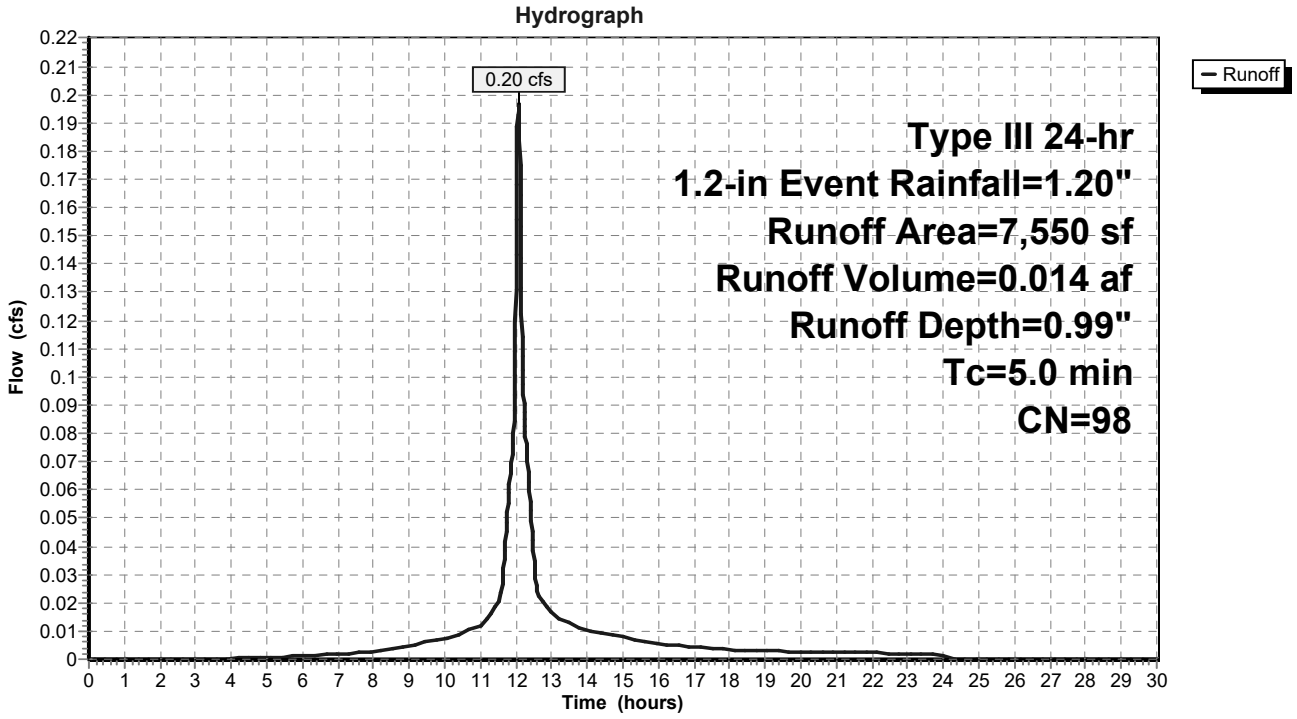
Runoff = 0.20 cfs @ 12.07 hrs, Volume= 0.014 af, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1.2-in Event Rainfall=1.20"

Area (sf)	CN	Description
7,550	98	Roofs, HSG D
7,550		100.00% Impervious Area

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

Subcatchment PDA-13: Building Roof



Summary for Pond SWMB: Stormwater Management Basin

Inflow Area = 1.103 ac, 64.05% Impervious, Inflow Depth = 0.55" for 1.2-in Event event
Inflow = 0.65 cfs @ 12.09 hrs, Volume= 0.051 af
Outflow = 0.05 cfs @ 13.93 hrs, Volume= 0.051 af, Atten= 93%, Lag= 110.7 min
Discarded = 0.05 cfs @ 13.93 hrs, Volume= 0.051 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 113.63' @ 13.93 hrs Surf.Area= 7,617 sf Storage= 992 cf

Plug-Flow detention time= 209.1 min calculated for 0.051 af (100% of inflow)
Center-of-Mass det. time= 209.1 min (1,030.5 - 821.5)

Volume	Invert	Avail.Storage	Storage Description
#1	113.50'	19,309 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

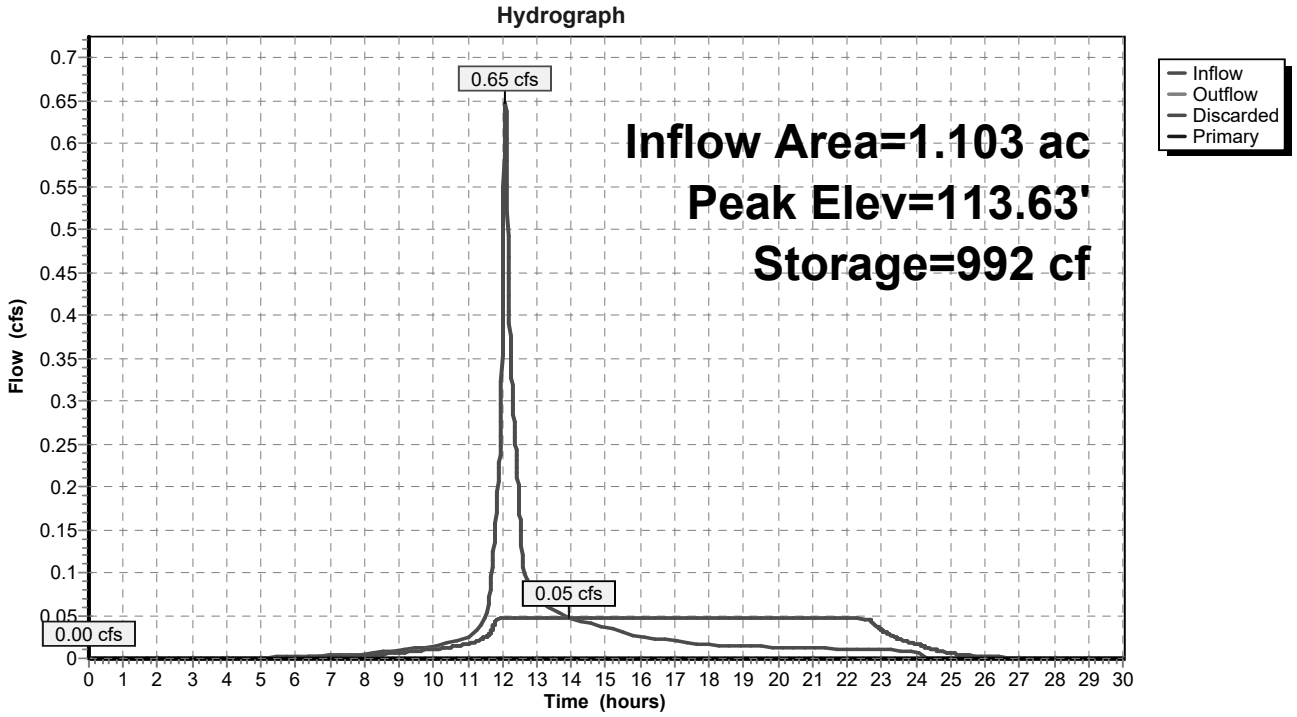
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
113.50	7,305	0	0
114.00	8,480	3,946	3,946
114.50	9,841	4,580	8,527
115.00	11,096	5,234	13,761
115.50	11,096	5,548	19,309

Device	Routing	Invert	Outlet Devices
#1	Primary	114.00'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 114.00' / 113.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Primary	114.50'	**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
#3	Discarded	113.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 13.93 hrs HW=113.63' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=113.50' (Free Discharge)
├**1=Culvert** (Controls 0.00 cfs)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond SWMB: Stormwater Management Basin

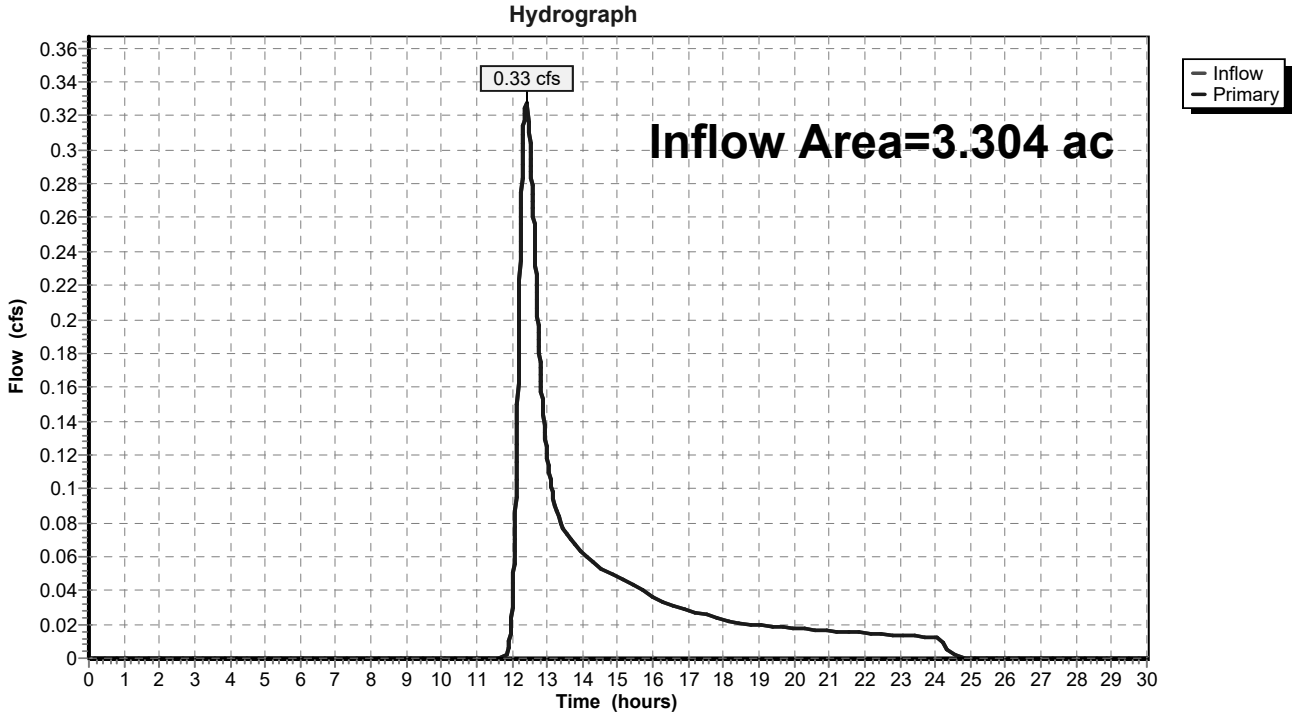


Summary for Link DP-1: Wetland System

Inflow Area = 3.304 ac, 41.73% Impervious, Inflow Depth = 0.16" for 1.2-in Event event
Inflow = 0.33 cfs @ 12.40 hrs, Volume= 0.045 af
Primary = 0.33 cfs @ 12.40 hrs, Volume= 0.045 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: Wetland System



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 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-10: Area Draining to Runoff Area=95,895 sf 30.55% Impervious Runoff Depth=3.18"
Flow Length=610' Tc=23.6 min CN=84 Runoff=5.13 cfs 0.583 af

Subcatchment PDA-11: North Parking Area Runoff Area=9,595 sf 95.05% Impervious Runoff Depth=4.55"
Tc=5.0 min CN=97 Runoff=1.09 cfs 0.083 af

Subcatchment PDA-12: South Parking Runoff Area=30,890 sf 45.63% Impervious Runoff Depth=3.47"
Flow Length=33' Slope=0.0100 '/' Tc=7.6 min CN=87 Runoff=2.69 cfs 0.205 af

Subcatchment PDA-13: Building Roof Runoff Area=7,550 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=0.86 cfs 0.067 af

Pond SWMB: Stormwater Management Peak Elev=114.43' Storage=7,824 cf Inflow=4.52 cfs 0.356 af
Discarded=0.06 cfs 0.107 af Primary=0.69 cfs 0.173 af Outflow=0.75 cfs 0.280 af

Link DP-1: Wetland System Inflow=5.67 cfs 0.756 af
Primary=5.67 cfs 0.756 af

Total Runoff Area = 3.304 ac Runoff Volume = 0.939 af Average Runoff Depth = 3.41"
58.27% Pervious = 1.925 ac 41.73% Impervious = 1.379 ac

Summary for Subcatchment PDA-10: Area Draining to Wetland System

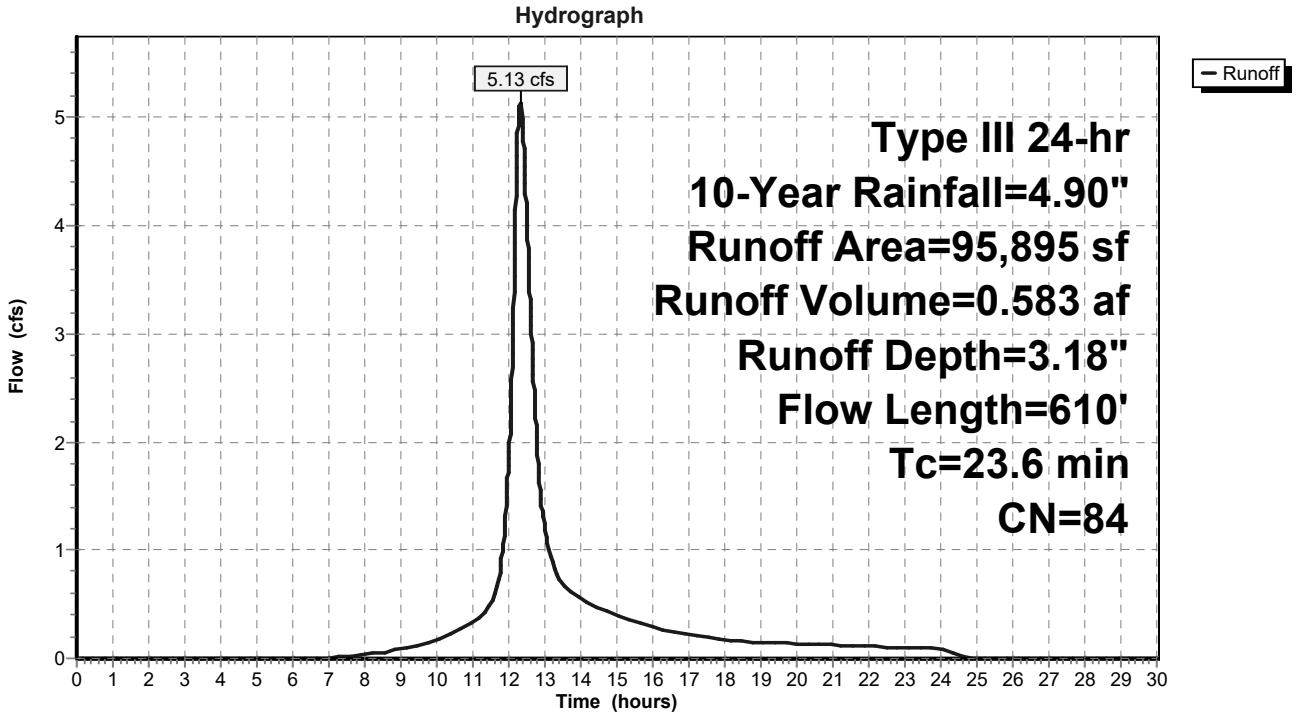
Runoff = 5.13 cfs @ 12.32 hrs, Volume= 0.583 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
26,025	98	Paved parking, HSG D
27,690	77	Woods, Good, HSG D
35,630	78	Meadow, non-grazed, HSG D
6,550	93	Paved roads w/open ditches, 50% imp, HSG D
95,895	84	Weighted Average
66,595		69.45% Pervious Area
29,300		30.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	50	0.0050	0.06		**Sheet Flow, Lawn - Sheet** Grass: Dense n= 0.240 P2= 3.30"
6.4	410	0.0050	1.06		**Shallow Concentrated Flow, Lawn - Concentrated** Grassed Waterway Kv= 15.0 fps
1.5	55	0.0150	0.61		**Shallow Concentrated Flow, Wood - 1** Woodland Kv= 5.0 fps
0.3	40	0.1500	1.94		**Shallow Concentrated Flow, Wood - 2** Woodland Kv= 5.0 fps
1.3	55	0.0200	0.71		**Shallow Concentrated Flow, Wetland - 1** Woodland Kv= 5.0 fps
23.6	610	Total			

Subcatchment PDA-10: Area Draining to Wetland System



Summary for Subcatchment PDA-11: North Parking Area Draining to SWMB

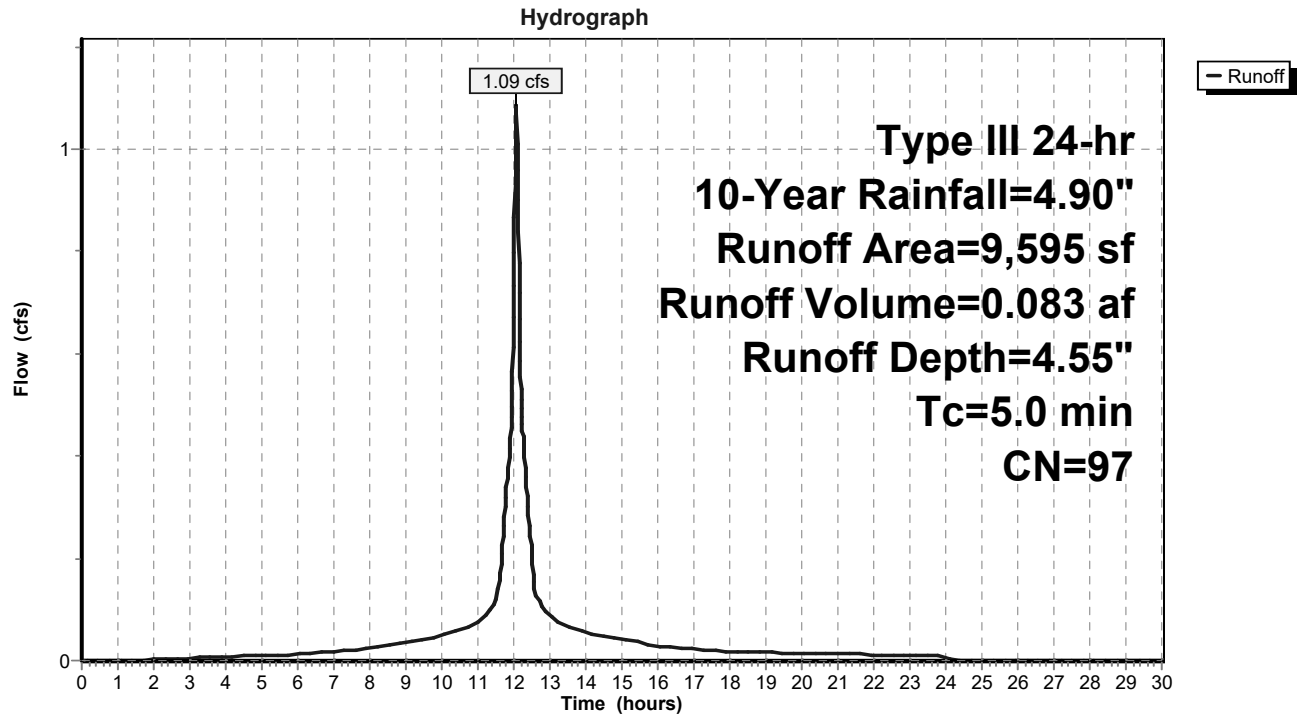
Runoff = 1.09 cfs @ 12.07 hrs, Volume= 0.083 af, Depth= 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
9,120	98	Paved parking, HSG D
0	77	Woods, Good, HSG D
475	78	Meadow, non-grazed, HSG D
0	93	Paved roads w/open ditches, 50% imp, HSG D
9,595	97	Weighted Average
475		4.95% Pervious Area
9,120		95.05% Impervious Area

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

Subcatchment PDA-11: North Parking Area Draining to SWMB



Summary for Subcatchment PDA-12: South Parking Area Draining to SWMB

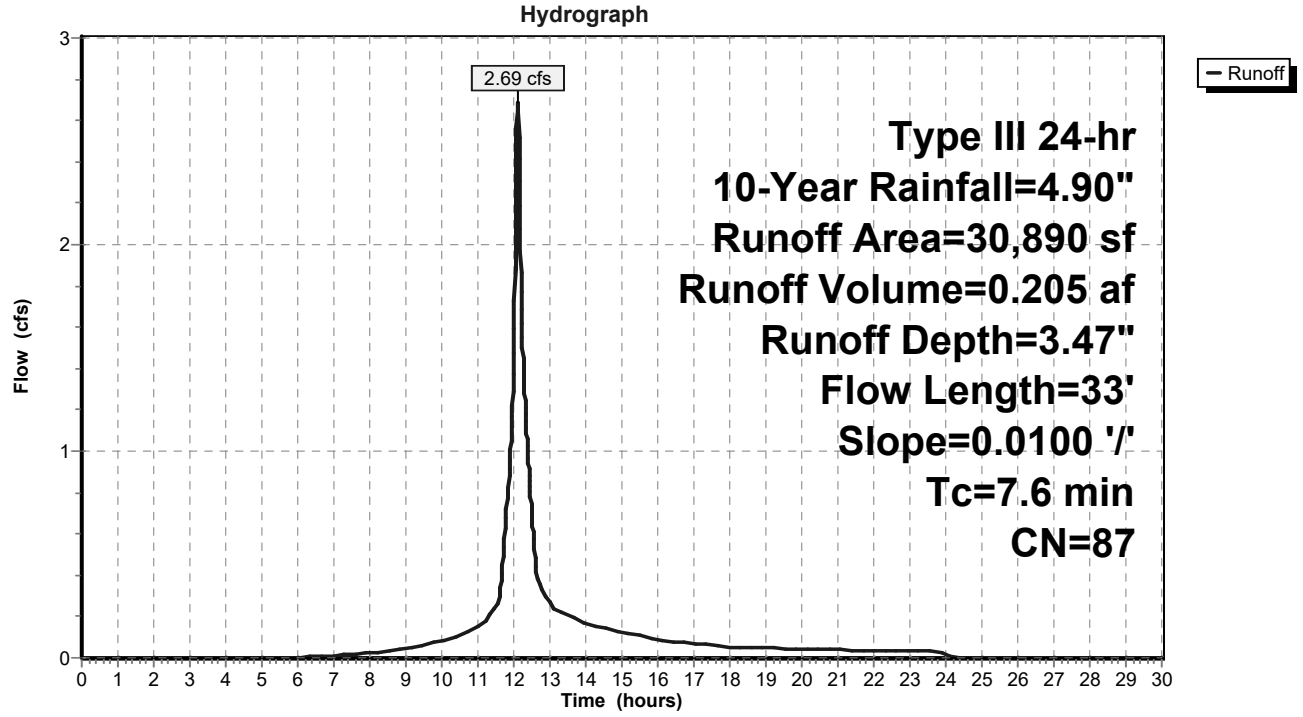
Runoff = 2.69 cfs @ 12.11 hrs, Volume= 0.205 af, Depth= 3.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
14,095	98	Paved parking, HSG D
0	77	Woods, Good, HSG D
16,795	78	Meadow, non-grazed, HSG D
0	93	Paved roads w/open ditches, 50% imp, HSG D
30,890	87	Weighted Average
16,795		54.37% Pervious Area
14,095		45.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	33	0.0100	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"

Subcatchment PDA-12: South Parking Area Draining to SWMB



Summary for Subcatchment PDA-13: Building Roof

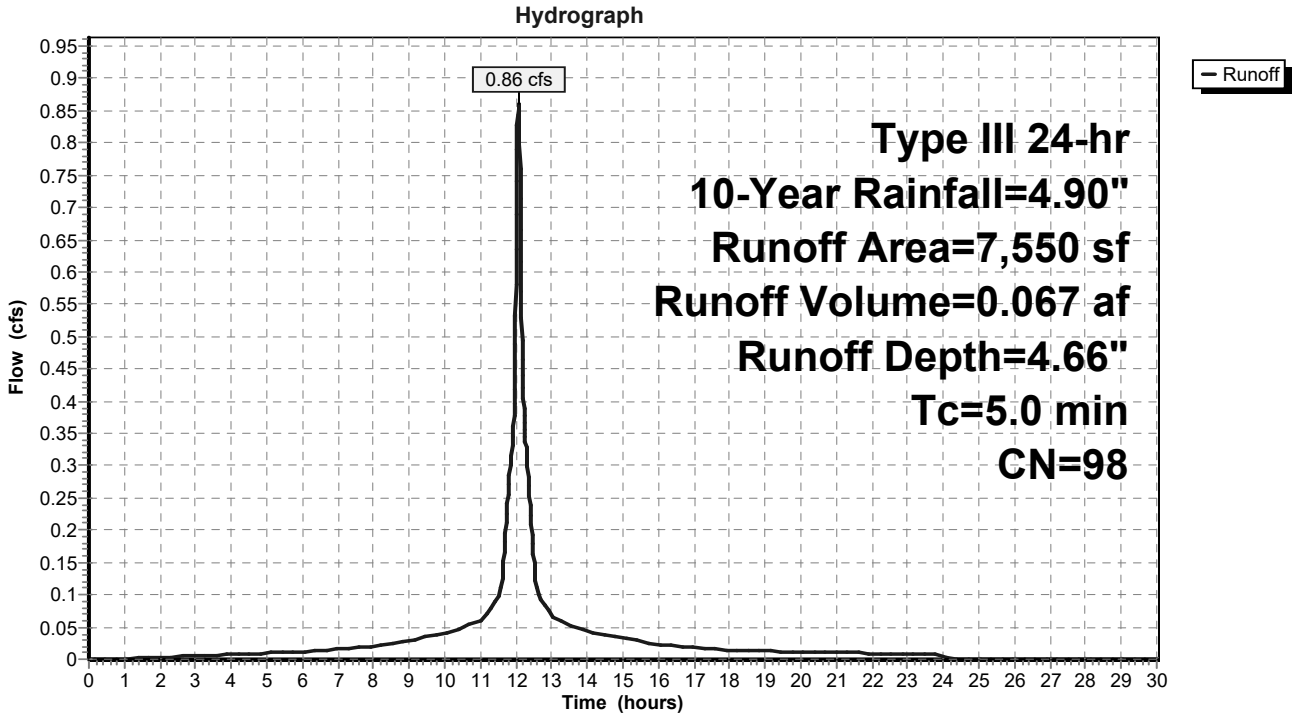
Runoff = 0.86 cfs @ 12.07 hrs, Volume= 0.067 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
7,550	98	Roofs, HSG D
7,550		100.00% Impervious Area

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

Subcatchment PDA-13: Building Roof



Summary for Pond SWMB: Stormwater Management Basin

Inflow Area = 1.103 ac, 64.05% Impervious, Inflow Depth = 3.87" for 10-Year event
Inflow = 4.52 cfs @ 12.09 hrs, Volume= 0.356 af
Outflow = 0.75 cfs @ 12.58 hrs, Volume= 0.280 af, Atten= 83%, Lag= 29.3 min
Discarded = 0.06 cfs @ 12.58 hrs, Volume= 0.107 af
Primary = 0.69 cfs @ 12.58 hrs, Volume= 0.173 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 114.43' @ 12.58 hrs Surf.Area= 9,645 sf Storage= 7,824 cf

Plug-Flow detention time= 264.9 min calculated for 0.280 af (79% of inflow)
Center-of-Mass det. time= 185.5 min (967.0 - 781.6)

Volume	Invert	Avail.Storage	Storage Description
#1	113.50'	19,309 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

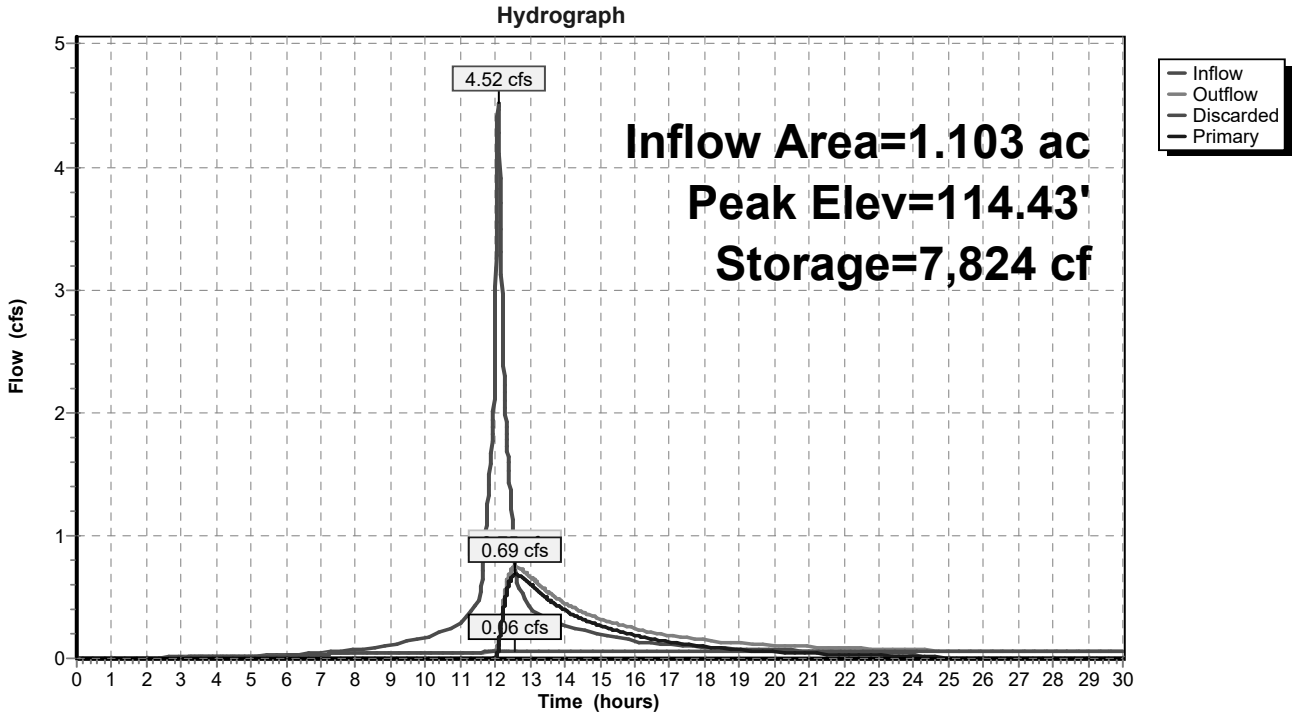
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
113.50	7,305	0	0
114.00	8,480	3,946	3,946
114.50	9,841	4,580	8,527
115.00	11,096	5,234	13,761
115.50	11,096	5,548	19,309

Device	Routing	Invert	Outlet Devices
#1	Primary	114.00'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 114.00' / 113.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Primary	114.50'	**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
#3	Discarded	113.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.06 cfs @ 12.58 hrs HW=114.43' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.69 cfs @ 12.58 hrs HW=114.43' (Free Discharge)
├**1=Culvert** (Barrel Controls 0.69 cfs @ 3.16 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond SWMB: Stormwater Management Basin

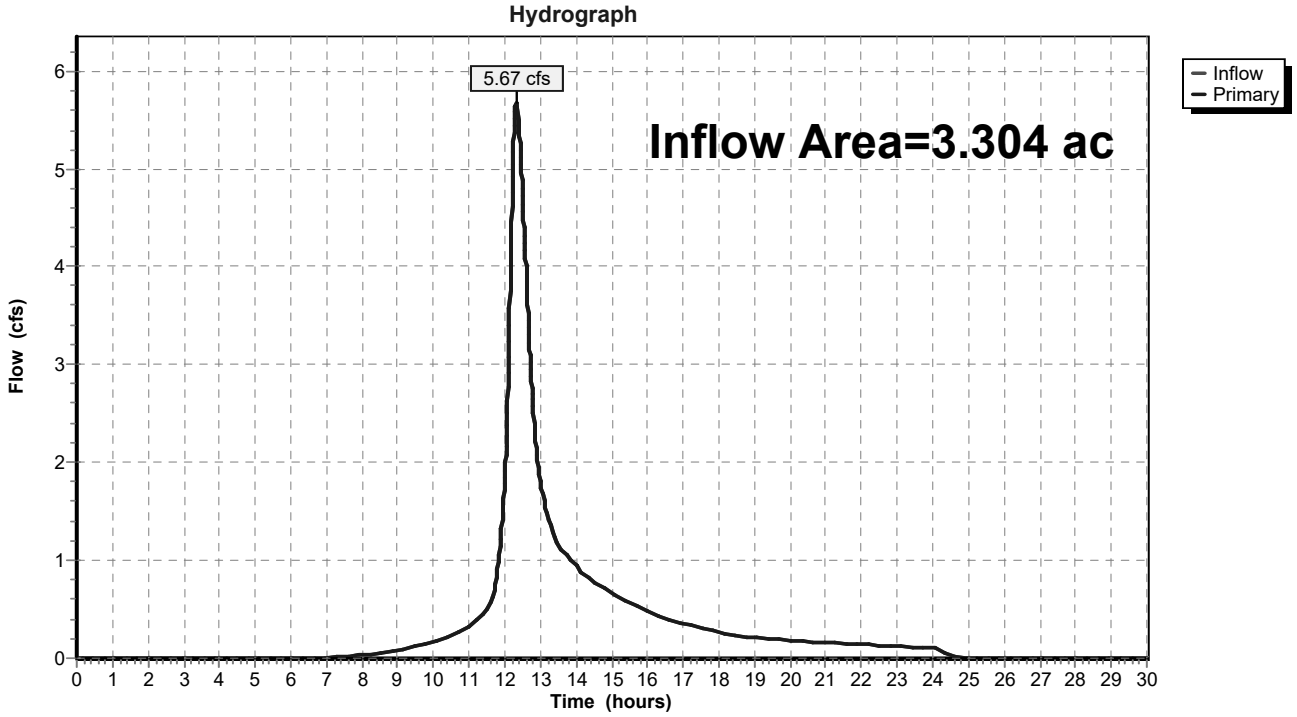


Summary for Link DP-1: Wetland System

Inflow Area = 3.304 ac, 41.73% Impervious, Inflow Depth = 2.75" for 10-Year event
Inflow = 5.67 cfs @ 12.33 hrs, Volume= 0.756 af
Primary = 5.67 cfs @ 12.33 hrs, Volume= 0.756 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: Wetland System



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 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-10: Area Draining to Runoff Area=95,895 sf 30.55% Impervious Runoff Depth=6.58"
Flow Length=610' Tc=23.6 min CN=84 Runoff=10.38 cfs 1.206 af

Subcatchment PDA-11: North Parking Area Runoff Area=9,595 sf 95.05% Impervious Runoff Depth=8.14"
Tc=5.0 min CN=97 Runoff=1.90 cfs 0.149 af

Subcatchment PDA-12: South Parking Runoff Area=30,890 sf 45.63% Impervious Runoff Depth=6.94"
Flow Length=33' Slope=0.0100 '/' Tc=7.6 min CN=87 Runoff=5.19 cfs 0.410 af

Subcatchment PDA-13: Building Roof Runoff Area=7,550 sf 100.00% Impervious Runoff Depth=8.26"
Tc=5.0 min CN=98 Runoff=1.50 cfs 0.119 af

Pond SWMB: Stormwater Management Peak Elev=114.76' Storage=11,151 cf Inflow=8.40 cfs 0.679 af
Discarded=0.07 cfs 0.118 af Primary=5.03 cfs 0.478 af Outflow=5.10 cfs 0.596 af

Link DP-1: Wetland System Inflow=14.93 cfs 1.685 af
Primary=14.93 cfs 1.685 af

Total Runoff Area = 3.304 ac Runoff Volume = 1.885 af Average Runoff Depth = 6.85"
58.27% Pervious = 1.925 ac 41.73% Impervious = 1.379 ac

Summary for Subcatchment PDA-10: Area Draining to Wetland System

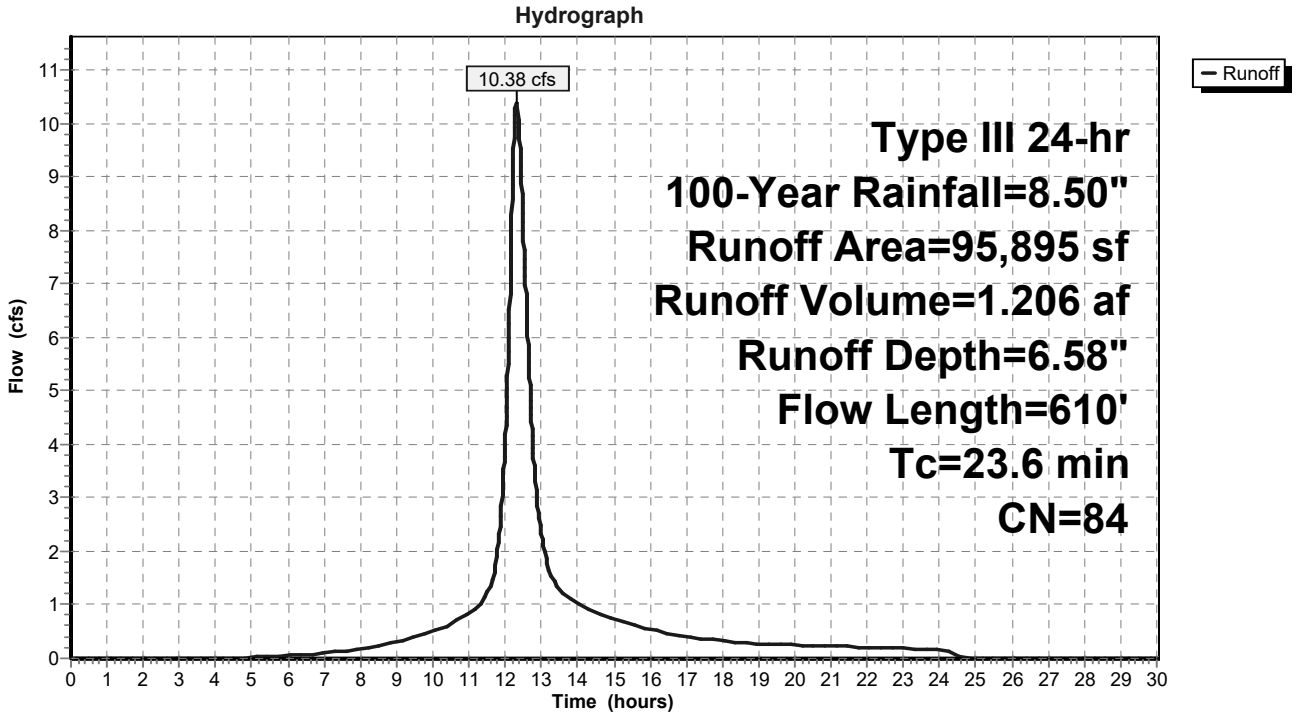
Runoff = 10.38 cfs @ 12.30 hrs, Volume= 1.206 af, Depth= 6.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (sf)	CN	Description
26,025	98	Paved parking, HSG D
27,690	77	Woods, Good, HSG D
35,630	78	Meadow, non-grazed, HSG D
6,550	93	Paved roads w/open ditches, 50% imp, HSG D
95,895	84	Weighted Average
66,595		69.45% Pervious Area
29,300		30.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	50	0.0050	0.06		**Sheet Flow, Lawn - Sheet** Grass: Dense n= 0.240 P2= 3.30"
6.4	410	0.0050	1.06		**Shallow Concentrated Flow, Lawn - Concentrated** Grassed Waterway Kv= 15.0 fps
1.5	55	0.0150	0.61		**Shallow Concentrated Flow, Wood - 1** Woodland Kv= 5.0 fps
0.3	40	0.1500	1.94		**Shallow Concentrated Flow, Wood - 2** Woodland Kv= 5.0 fps
1.3	55	0.0200	0.71		**Shallow Concentrated Flow, Wetland - 1** Woodland Kv= 5.0 fps
23.6	610	Total			

Subcatchment PDA-10: Area Draining to Wetland System



Summary for Subcatchment PDA-11: North Parking Area Draining to SWMB

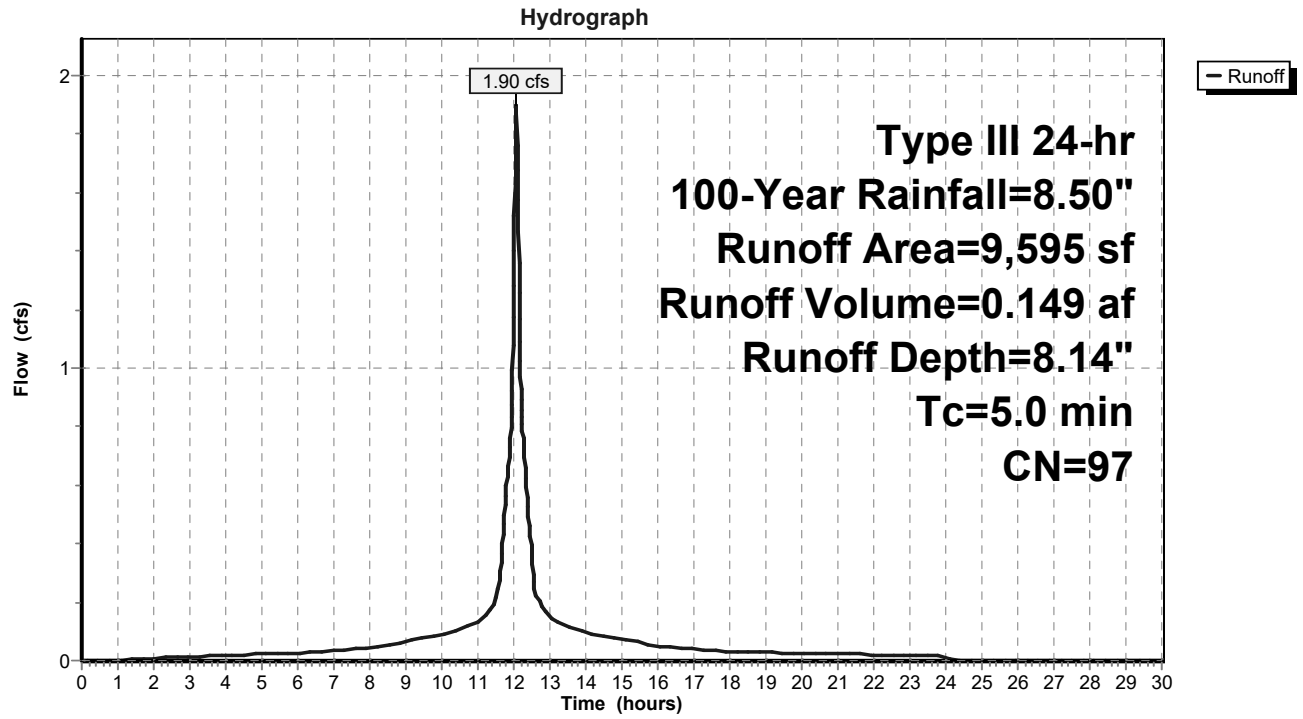
Runoff = 1.90 cfs @ 12.07 hrs, Volume= 0.149 af, Depth= 8.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (sf)	CN	Description
9,120	98	Paved parking, HSG D
0	77	Woods, Good, HSG D
475	78	Meadow, non-grazed, HSG D
0	93	Paved roads w/open ditches, 50% imp, HSG D
9,595	97	Weighted Average
475		4.95% Pervious Area
9,120		95.05% Impervious Area

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

Subcatchment PDA-11: North Parking Area Draining to SWMB



Summary for Subcatchment PDA-12: South Parking Area Draining to SWMB

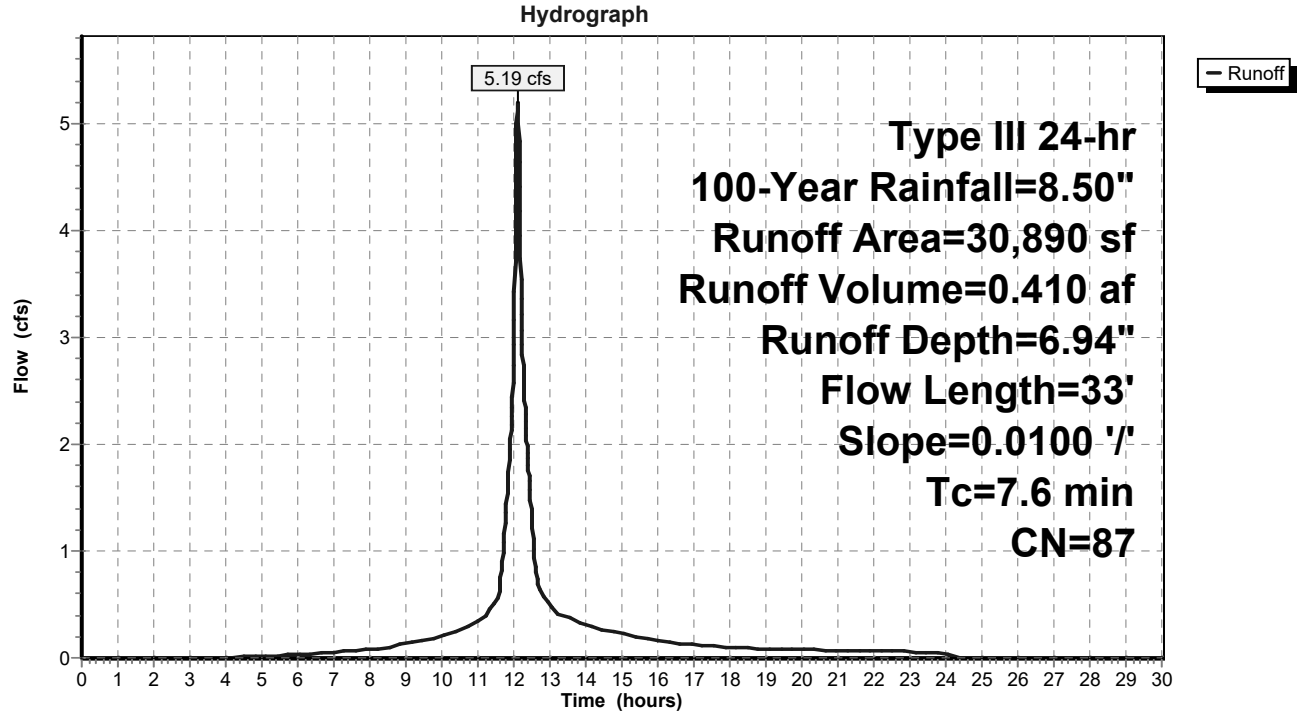
Runoff = 5.19 cfs @ 12.10 hrs, Volume= 0.410 af, Depth= 6.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (sf)	CN	Description
14,095	98	Paved parking, HSG D
0	77	Woods, Good, HSG D
16,795	78	Meadow, non-grazed, HSG D
0	93	Paved roads w/open ditches, 50% imp, HSG D
30,890	87	Weighted Average
16,795		54.37% Pervious Area
14,095		45.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	33	0.0100	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"

Subcatchment PDA-12: South Parking Area Draining to SWMB



Summary for Subcatchment PDA-13: Building Roof

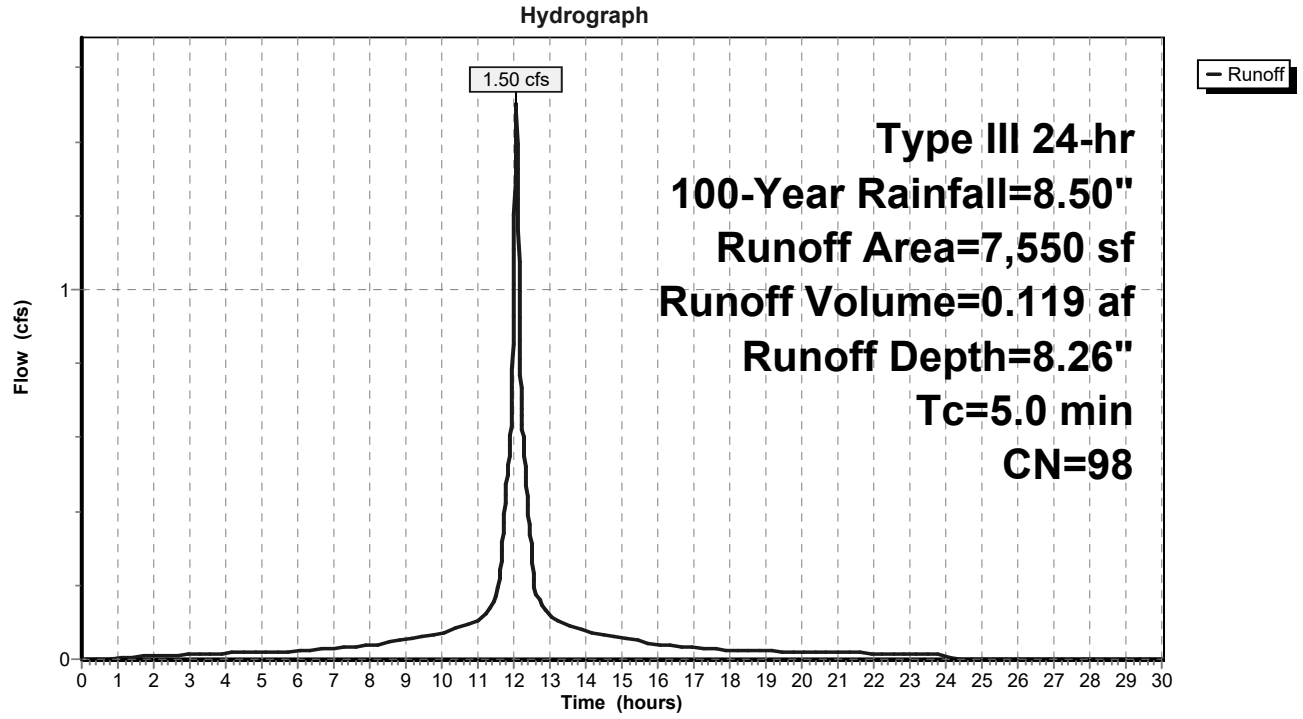
Runoff = 1.50 cfs @ 12.07 hrs, Volume= 0.119 af, Depth= 8.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (sf)	CN	Description
7,550	98	Roofs, HSG D
7,550		100.00% Impervious Area

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

Subcatchment PDA-13: Building Roof



Summary for Pond SWMB: Stormwater Management Basin

Inflow Area = 1.103 ac, 64.05% Impervious, Inflow Depth = 7.39" for 100-Year event
Inflow = 8.40 cfs @ 12.09 hrs, Volume= 0.679 af
Outflow = 5.10 cfs @ 12.20 hrs, Volume= 0.596 af, Atten= 39%, Lag= 6.9 min
Discarded = 0.07 cfs @ 12.20 hrs, Volume= 0.118 af
Primary = 5.03 cfs @ 12.20 hrs, Volume= 0.478 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 114.76' @ 12.20 hrs Surf.Area= 10,489 sf Storage= 11,151 cf

Plug-Flow detention time= 175.5 min calculated for 0.596 af (88% of inflow)
Center-of-Mass det. time= 119.1 min (887.1 - 768.0)

Volume	Invert	Avail.Storage	Storage Description
#1	113.50'	19,309 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

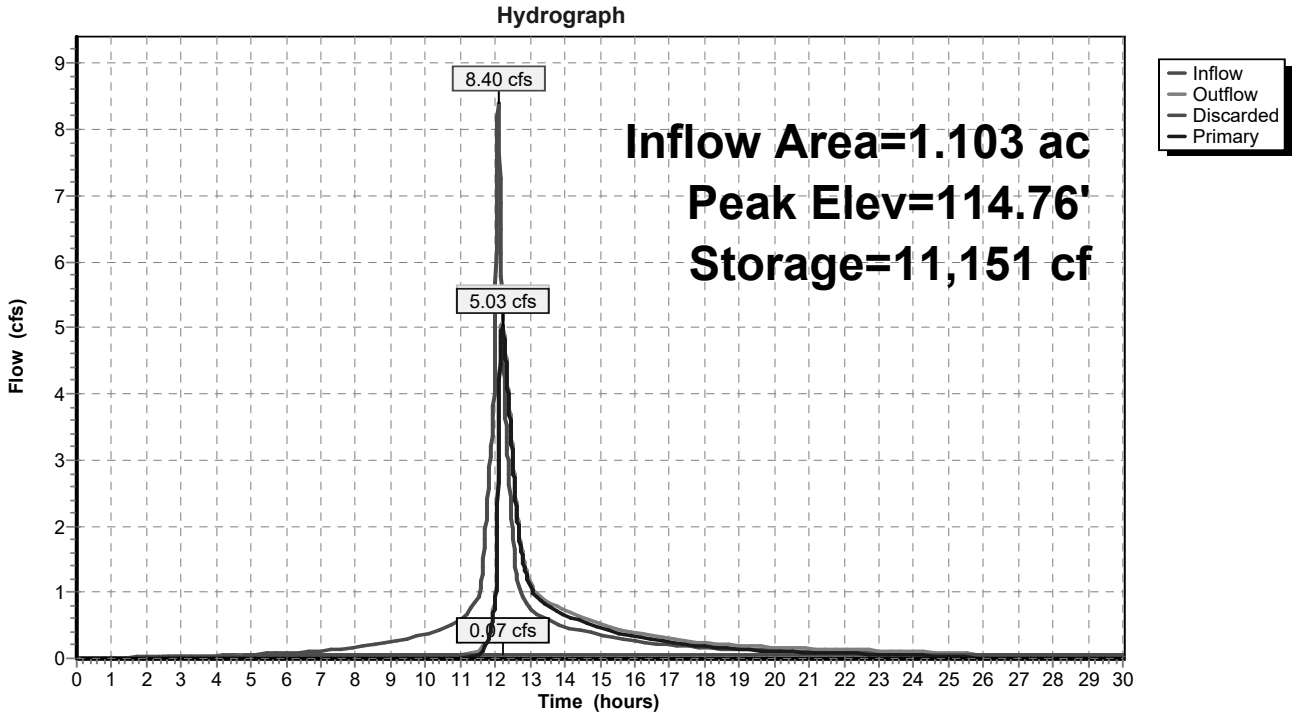
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
113.50	7,305	0	0
114.00	8,480	3,946	3,946
114.50	9,841	4,580	8,527
115.00	11,096	5,234	13,761
115.50	11,096	5,548	19,309

Device	Routing	Invert	Outlet Devices
#1	Primary	114.00'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 114.00' / 113.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Primary	114.50'	**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
#3	Discarded	113.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.07 cfs @ 12.20 hrs HW=114.76' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=5.03 cfs @ 12.20 hrs HW=114.76' (Free Discharge)
└**1=Culvert** (Barrel Controls 1.80 cfs @ 3.90 fps)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 3.23 cfs @ 1.25 fps)

Pond SWMB: Stormwater Management Basin

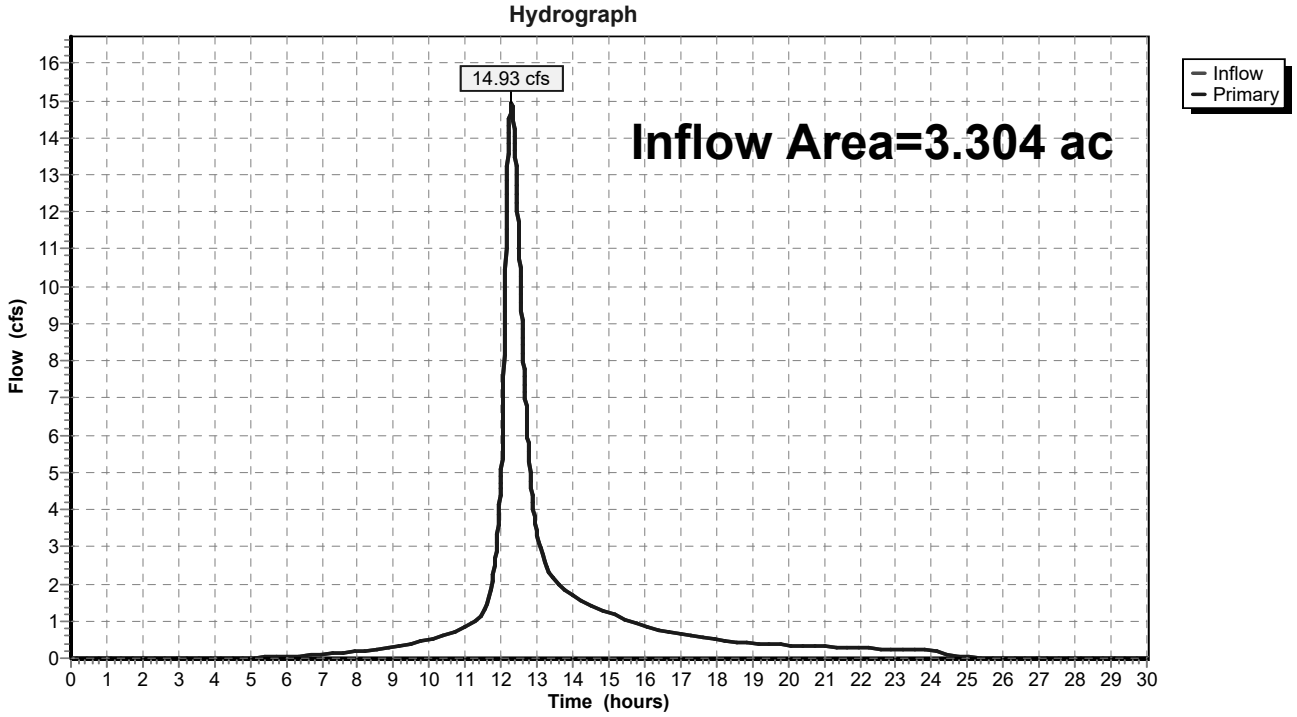


Summary for Link DP-1: Wetland System

Inflow Area = 3.304 ac, 41.73% Impervious, Inflow Depth = 6.12" for 100-Year event
Inflow = 14.93 cfs @ 12.29 hrs, Volume= 1.685 af
Primary = 14.93 cfs @ 12.29 hrs, Volume= 1.685 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP-1: Wetland System



ATTACHMENT D

STORMWATER CALCULATIONS

Water Quality Calculations

Determine Water Quality Volume (WQv)

From the Rhode Island Department of Environmental Management Stormwater Management, Design, and Installation Rules Section 8.9(E):

$$WQv = \frac{(1")(I)}{12}$$

WQv = water quality volume (ac-ft)
I = site impervious area (ac)
1" = WQv Runoff Depth[1]

Area		Total Area		Impervious Area		Impervious Cover	Water Quality Volume (WQV)		Water Quality Volume Provided[2]
ID		ac	ft^2	ac	ft^2	%	acre-feet	ft^3	ft^3
Area to Stormwater Management Basin - North	PDA-11	0.220	9,595	0.209	9,120	95.00	0.017	741	3,946
Area to Stormwater Management Basin - South	PDA-12	0.709	30,890	0.324	14,095	45.70	0.027	1,176	
Roof to Stormwater Management Basin	PDA-13	0.173	7,550	0.173	7,550	100.00	0.014	610	

Notes:

1. The WQV runoff depth was determined to be 1" for the project parcel.
2. The provided Water Quality Volume for the Underground detention System was derived from the Stage Volume tables in HydroCAD as the volume below the outlet elevation.

Pre-Treatment Calculations

Determine Water Quality Pre-Treatment device volume and sizing

From the Rhode Island Department of Environmental Management Stormwater Management, Design, and Installation Standards Manual Section 6.4.1

$As = 5750*Q$

$Q = WQV/86{,}400\ sec$

As = Sedimentation Surface Area (ft^2)
Q = discharge from drainage area
WQv = water quality volume (ft^3)

Area	Pre-Treatment Device		Water Quality Volume (WQV)		Pre-Treatment Volume Required[1]	Pre-Treatment Volume Provided	Sediment Forebay Required Sedimentation Surface Area (As)	Sediment Forebay As Provided	Sediment Forebay Top Area	Sediment Forebay Depth
ID			acre-feet	ft^3	ft^3	ft^3	ft^2	ft^2	ft^2	ft
Area to Stormwater Management Basin - North	Sediment Forebay 1	PDA-11	0.017	741	185	369	49	250	487	1
Area to Stormwater Management Basin - South	Sediment Forebay 2	PDA-12	0.027	1,176	294	396	78	231	560	1

Notes:

1. The required pre-treatment volume has been calcated as 25% of the required WQV.

Groundwater Recharge Volume Calculations

Groundwater Recharge Volume

From the Rhode Island Department of Environmental Management Stormwater Management, Design, and Installation Rules Section 8.8(D):

$$Rev = \frac{(1")(F)(I)}{12}$$

Rev Groundwater recharge volume (ac-ft)
F = Recahrge factor
I = Impervious area (ac)

	A	I															
	Total Site Area (AC)	Site Area by NRCS Hydrologic Soil Group				Impervious Cover by NRCS Hydrologic Soil Group				Site Imperviousness (Decimel) by NRCS Hydrologic Soil Group				GRV Required		Potential Recharge Pond Volumes Proposed	
		A	B	C	D	A	B	C	D	A	B	C	D	(ac-ft)	(cu ft)	(ac-ft)	(cu ft)
Proposed	2.18	0.000	0.000	0.000	2.179	0.000	0.000	0.000	0.734	0.00	0.00	0.00	0.00	0.006	266	0.091	3,946

Table from the Rhode Island Department of Environmental Management Stormwater Management, Design, and Installation Rules Section 8.8(F):

NRCS Hydrologic Soil Group	Groundwater Recharge
A	0.60
B	0.35
C	0.25
D	0.10

Best Management Practice (BMP) Treatment Train Efficiency Worksheet

Prepared for:
Proposed Retail Development
1850 Kingstown Road
South Kingstown, Rhode Island

Prepared by:
BL Companies
100 Constitution Plaza, 10th Floor
Hartford, CT

Date prepared:
June 25, 2020

Overall Site Treatment Train Efficiency to Stormwater Management Basin

Et=[1-(1-E1)(1-E2)(1-E3)(1-E4)(1-E?)]*100

BMP	BMP Description	Type pf Treatment	Efficiency Rate %
E1	Sediment Forebay	Pre-Treatment	25
E2	Infiltration Basin	Primary	90

Overall Treatment Train Efficiency (Et)= **93 % Total Suspended Solids (TSS) Remova**

BMP	*Type pf Treatment*	*TSS Removal Rate*	*Starting TSS Load*	*Amount Removed*	*Remaining Load*
Sediment Forebay	secondary (conventional)	0.25	1	0.25	0.75
Infiltration Basin	secondary (conventional)	0.9	0.75	0.68	0.08

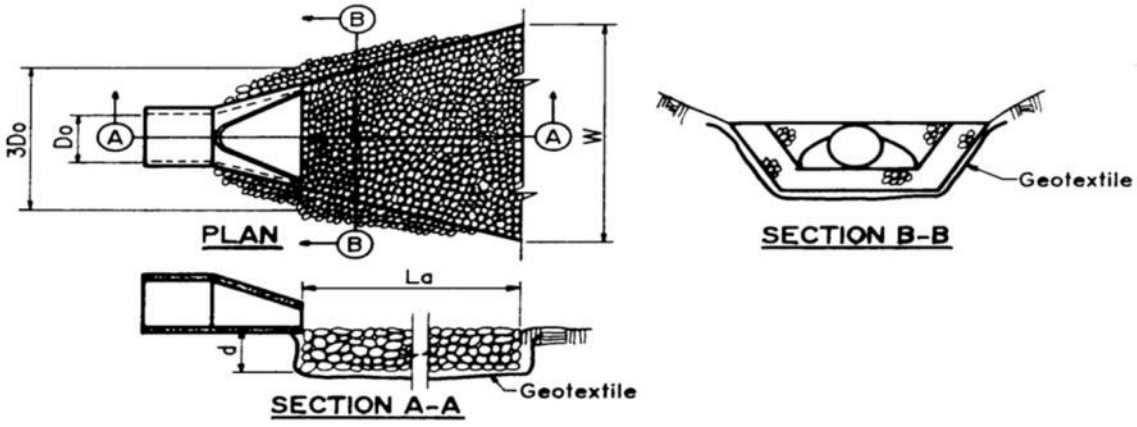
Overall Treatment Train Efficiency (% **93**

TSS Removal Rates (adapted from the Rhode Island Department of Environmental Management Stormwater Management, Design, and Installation Standards Manual Table H-3)

BMP List	Design Rate
Infiltration Basin	90%
Infiltration Trench	90%
Subsurface Chambers	90%
Dry Well	90%
Sand Filter	86%
Bioretention	90%
Tree Filter	90%
Grass Channel	70%
Sediment Forebay	25%
Filter Strip	25%
Deep Sump Catch Basin	25%
Hydrodynamic Device	25%
Wet Extended Detention Basin	80%

Riprap Apron Outlet Protection

PROJECT NAME: Proposed Retail Development
LOCATION: 1860 Kingstown Road - South Kingstown RI
PREPARED BY: C.J.L. DATE: 7/2/2020
LAST REVISED BY: DATE:



OUTLET	Sp (Diam., in.)	Q (CFS)	V (FPS)	TW (ft.)	Apron Type	La (ft.)	3Do (ft.)	W (ft.)	d_{50} (ft.)	Riprap Specification
FES-2	12	1.77	2.68	0.78	Type B	12	3	8	0.06	R-4
FES-3	8	1.07	3.33	0.58	Type B	9	2	6	0.07	R-4

Note: Riprap apron design calculations based off of standards provided by the Rhode Island State Conservation Committee in the Rhode Island Soil Erosion and Sediment Control Hanbook.

Design:
$La = (1.7Q)/(Do^{3/2})+8Do$
$W = 3Do+0.4La$
$d_{50} = (0.02/TW)(Q/Do)^{4/3}$

Where:
La= Required length of riprap apron (ft)
Q= Discharge flow rate from outlet pipe in 25-year storm (cfs)
Q= Discharge flow velocity from outlet pipe in 25-year storm (fps)
Do= Outlet pipe diameter (ft)

ATTACHMENT E

NRCS SOIL REPORT

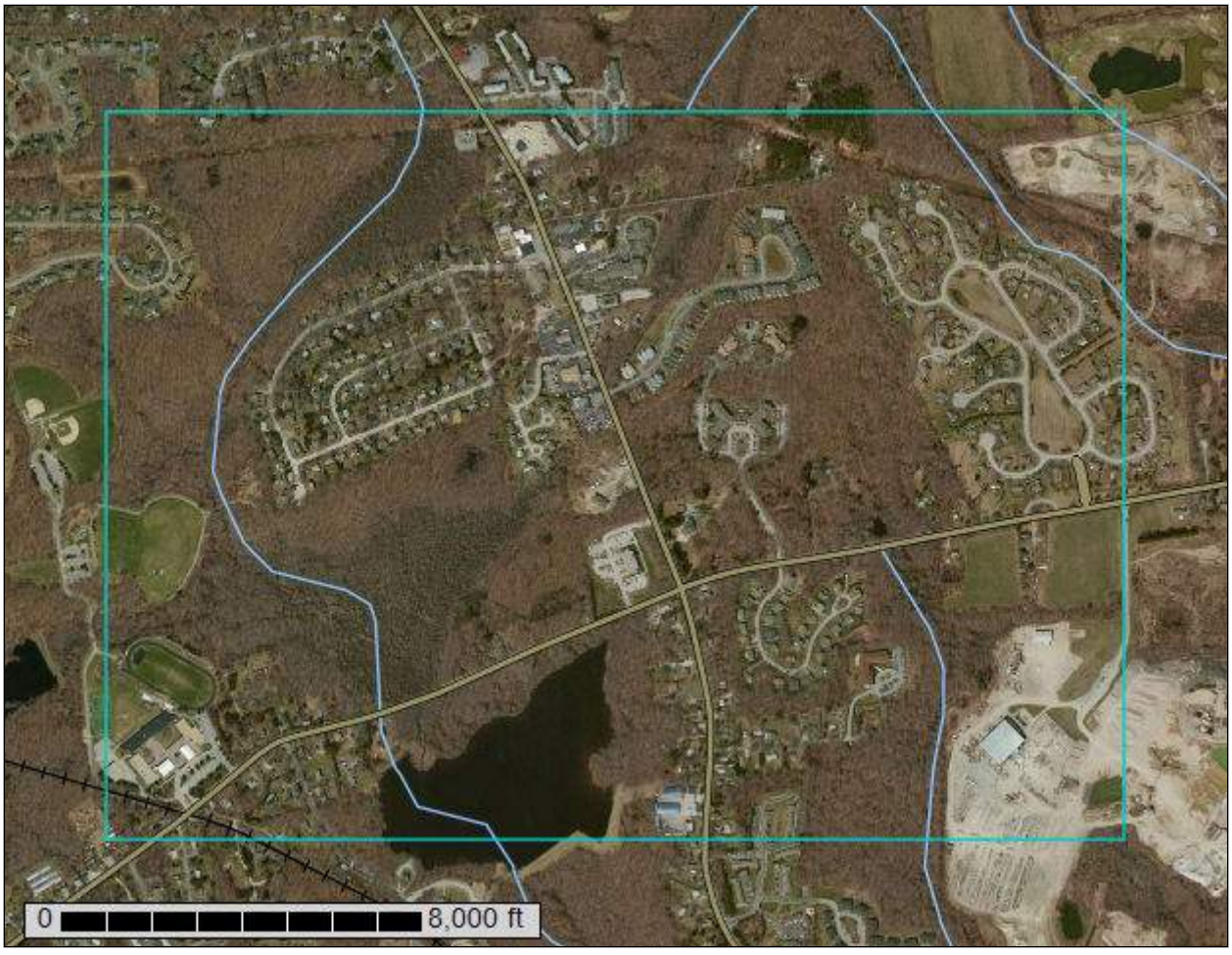
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties



July 30, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Note: Only the highlighted Map Unit Descriptions are included to decrease paper.

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

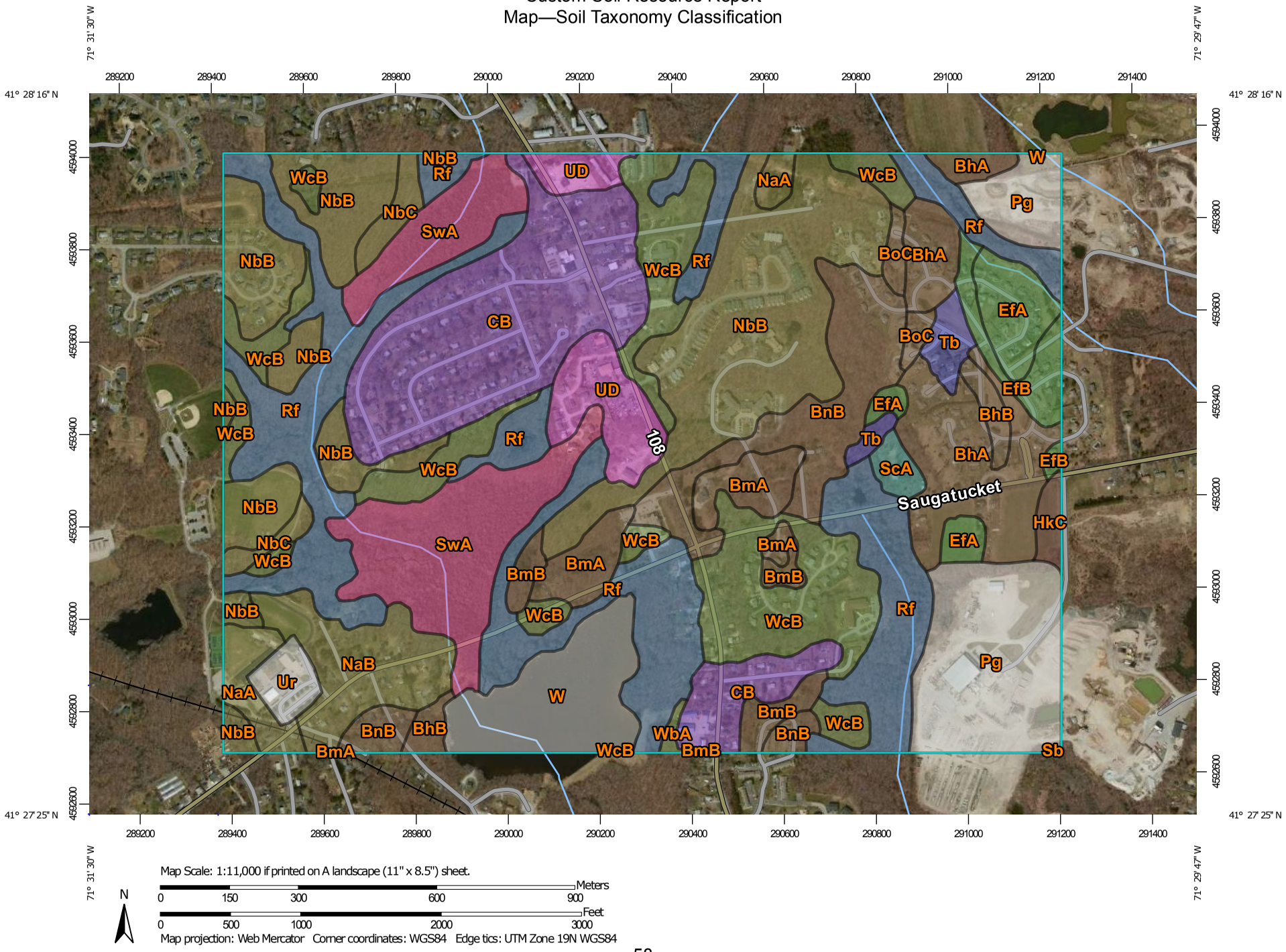
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Map—Soil Taxonomy Classification



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- Coarse-loamy over sandy or sandy-skeletal, mixed, active, acid, mesic Aeric Endoaquepts
- Coarse-loamy over sandy or sandy-skeletal, mixed, active, mesic Typic Dystrudepts
- Coarse-loamy over sandy or sandy-skeletal, mixed, semiactive, mesic Typic Dystrudepts
- Coarse-loamy, mixed, active, mesic Aquic Dystrudepts
- Coarse-silty over sandy or sandy-skeletal, mixed, active, mesic Aquic Dystrudepts
- Coarse-silty over sandy or sandy-skeletal, mixed, active, mesic Typic Dystrudepts
- Coarse-silty, mixed, active, mesic Aquic Dystrudepts
- Coarse-silty, mixed, active, mesic Typic Dystrudepts
- Loamy, mixed, superactive, acid, mesic, shallow Aeric Endoaquepts
- Sandy or sandy-skeletal, mixed, dysic, mesic Terric Haplosaprists
- Sandy, mixed, mesic Typic Humaquepts
- Sandy-skeletal, mixed, mesic Typic Udorthents
- Udorthents
- Not rated or not available

Soil Rating Lines

- Coarse-loamy over sandy or sandy-skeletal, mixed, active, acid, mesic Aeric Endoaquepts
- Coarse-loamy over sandy or sandy-skeletal, mixed, active, mesic Typic Dystrudepts
- Coarse-loamy over sandy or sandy-skeletal, mixed, semiactive, mesic Typic Dystrudepts
- Coarse-loamy, mixed, active, mesic Aquic Dystrudepts
- Coarse-silty over sandy or sandy-skeletal, mixed, active, mesic Aquic Dystrudepts
- Coarse-silty over sandy or sandy-skeletal, mixed, active, mesic Typic Dystrudepts
- Coarse-silty, mixed, active, mesic Aquic Dystrudepts
- Coarse-silty, mixed, active, mesic Typic Dystrudepts
- Loamy, mixed, superactive, acid, mesic, shallow Aeric Endoaquepts
- Sandy or sandy-skeletal, mixed, dysic, mesic Terric Haplosaprists
- Sandy, mixed, mesic Typic Humaquepts
- Sandy-skeletal, mixed, mesic Typic Udorthents
- Udorthents
- Not rated or not available

Soil Rating Points

- Coarse-loamy over sandy or sandy-skeletal, mixed, active, acid, mesic Aeric Endoaquepts
- Coarse-loamy over sandy or sandy-skeletal, mixed, active, mesic Typic Dystrudepts
- Coarse-loamy over sandy or sandy-skeletal, mixed, semiactive, mesic Typic Dystrudepts
- Coarse-loamy, mixed, active, mesic Aquic Dystrudepts
- Coarse-silty over sandy or sandy-skeletal, mixed, active, mesic Aquic Dystrudepts
- Coarse-silty over sandy or sandy-skeletal, mixed, active, mesic Typic Dystrudepts
- Coarse-silty, mixed, active, mesic Aquic Dystrudepts
- Coarse-silty, mixed, active, mesic Typic Dystrudepts
- Loamy, mixed, superactive, acid, mesic, shallow Aeric Endoaquepts

MAP INFORMATION

- Sandy or sandy-skeletal, mixed, dysic, mesic Terric Haplosaprists
- Sandy, mixed, mesic Typic Humaquepts
- Sandy-skeletal, mixed, mesic Typic Udorthents
- Udorthents
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

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: State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties
Survey Area Data: Version 16, Sep 14, 2017

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

Date(s) aerial images were photographed: Apr 8, 2011—Apr 9, 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.

Table—Soil Taxonomy Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BhA	Bridgehampton silt loam, 0 to 3 percent slopes	Coarse-silty, mixed, active, mesic Typic Dystrudepts	32.5	5.5%
BhB	Bridgehampton silt loam, 3 to 8 percent slopes	Coarse-silty, mixed, active, mesic Typic Dystrudepts	4.8	0.8%
BmA	Bridgehampton silt loam, till substratum, 0 to 3 percent slopes	Coarse-silty, mixed, active, mesic Typic Dystrudepts	13.6	2.3%
BmB	Bridgehampton silt loam, till substratum, 3 to 8 percent slopes	Coarse-silty, mixed, active, mesic Typic Dystrudepts	6.9	1.2%
BnB	Bridgehampton-Charlton complex, very stony, 0 to 8 percent slopes	Coarse-silty, mixed, active, mesic Typic Dystrudepts	30.3	5.2%
BoC	Bridgehampton-Charlton complex, extremely stony, 3 to 15 percent slopes	Coarse-silty, mixed, active, mesic Typic Dystrudepts	3.2	0.5%
CB	Canton-Urban land complex	Coarse-loamy over sandy or sandy-skeletal, mixed, semiactive, mesic Typic Dystrudepts	63.8	10.9%
EfA	Enfield silt loam, 0 to 3 percent slopes	Coarse-silty over sandy or sandy-skeletal, mixed, active, mesic Typic Dystrudepts	11.7	2.0%
EfB	Enfield silt loam, 3 to 8 percent slopes	Coarse-silty over sandy or sandy-skeletal, mixed, active, mesic Typic Dystrudepts	7.1	1.2%
HkC	Hinckley loamy sand, 8 to 15 percent slopes	Sandy-skeletal, mixed, mesic Typic Udorthents	2.4	0.4%
NaA	Narragansett silt loam, 0 to 3 percent slopes	Coarse-loamy over sandy or sandy-skeletal, mixed, active, mesic Typic Dystrudepts	8.1	1.4%
NaB	Narragansett silt loam, 3 to 8 percent slopes	Coarse-loamy over sandy or sandy-skeletal, mixed, active, mesic Typic Dystrudepts	18.9	3.2%
NbB	Narragansett very stony silt loam, 0 to 8 percent slopes	Coarse-loamy over sandy or sandy-skeletal, mixed, active, mesic Typic Dystrudepts	91.3	15.6%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
NbC	Narragansett very stony silt loam, 8 to 15 percent slopes	Coarse-loamy over sandy or sandy-skeletal, mixed, active, mesic Typic Dystrudepts	5.8	1.0%
Pg	Pits, gravel		38.9	6.6%
Rc	Raypol silt loam	Coarse-loamy over sandy or sandy-skeletal, mixed, active, acid, mesic Aeric Endoaquepts	0.0	0.0%
Rf	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	Loamy, mixed, superactive, acid, mesic, shallow Aeric Endoaquepts	94.4	16.1%
Sb	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	Sandy, mixed, mesic Typic Humaquepts	0.1	0.0%
ScA	Scio silt loam, 0 to 3 percent slopes	Coarse-silty, mixed, active, mesic Aquic Dystrudepts	2.7	0.5%
SwA	Swansea muck, 0 to 1 percent slopes	Sandy or sandy-skeletal, mixed, dysic, mesic Terric Haplosaprists	43.6	7.4%
Tb	Tisbury silt loam	Coarse-silty over sandy or sandy-skeletal, mixed, active, mesic Aquic Dystrudepts	5.0	0.8%
UD	Udorthents-Urban land complex	Udorthents	15.7	2.7%
Ur	Urban land		4.5	0.8%
W	Water		21.8	3.7%
WbA	Wapping silt loam, 0 to 3 percent slopes	Coarse-loamy, mixed, active, mesic Aquic Dystrudepts	0.8	0.1%
WcB	Wapping very stony silt loam, 0 to 8 percent slopes	Coarse-loamy, mixed, active, mesic Aquic Dystrudepts	59.0	10.1%
Totals for Area of Interest			**586.8**	**100.0%**

Rating Options—Soil Taxonomy Classification

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Rf—Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2t2qt
Elevation: 0 to 1,480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Ridgebury, extremely stony, and similar soils: 40 percent
Leicester, extremely stony, and similar soils: 35 percent
Whitman, extremely stony, and similar soils: 17 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ridgebury, Extremely Stony

Setting

Landform: Hills, depressions, drumlins, ground moraines, drainageways
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 6 inches: fine sandy loam
Bw - 6 to 10 inches: sandy loam
Bg - 10 to 19 inches: gravelly sandy loam
Cd - 19 to 66 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 15 to 35 inches to densic material
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: Yes

Description of Leicester, Extremely Stony

Setting

Landform: Depressions, ground moraines, drainageways, hills
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave
Parent material: Coarse-loamy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 7 inches: fine sandy loam
Bg - 7 to 18 inches: fine sandy loam
BC - 18 to 24 inches: fine sandy loam
C1 - 24 to 39 inches: gravelly fine sandy loam
C2 - 39 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Description of Whitman, Extremely Stony

Setting

Landform: Ground moraines, drainageways, hills, depressions, drumlins
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 1 inches: peat
A - 1 to 10 inches: fine sandy loam
Bg - 10 to 17 inches: gravelly fine sandy loam
Cdg - 17 to 61 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 7 to 38 inches to densic material
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: Yes

Minor Components

Woodbridge, extremely stony

Percent of map unit: 6 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Footslope, summit, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Swansea

Percent of map unit: 2 percent
Landform: Swamps, bogs
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

SwA—Swansea muck, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2trl2
Elevation: 0 to 1,140 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Swansea and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Swansea

Setting

Landform: Bogs, swamps
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material over loose sandy and gravelly glaciofluvial deposits

Typical profile

Oa1 - 0 to 24 inches: muck
Oa2 - 24 to 34 inches: muck
Cg - 34 to 79 inches: coarse sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 16.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Freetown

Percent of map unit: 10 percent
Landform: Bogs, swamps
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

UD—Udorthents-Urban land complex

Map Unit Setting

National map unit symbol: 9lxj
Mean annual precipitation: 44 to 50 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 120 to 211 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 70 percent
Urban land: 20 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Human transported material

Typical profile

A - 0 to 12 inches: sandy loam
C1 - 12 to 25 inches: sandy loam
C2 - 25 to 60 inches: stratified sand to very gravelly coarse sand

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 42 to 54 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.5 inches)

Description of Urban Land

Setting

Parent material: Human transported material

Typical profile

R - 0 to 6 inches: variable

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent
Landform: Kames, outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Quonset

Percent of map unit: 5 percent
Landform: Eskers, outwash plains, outwash terraces, terraces
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Soil Taxonomy Classification

This rating presents the taxonomic classification based on Soil Taxonomy.

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999 and 2003). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. This table shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in sol. An example is Alfisols.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the

name of a suborder indicates the order. An example is Udalfs (Ud, meaning humid, plus alfs, from Alfisols).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (Hapl, meaning minimal horizonation, plus udalfs, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective Typic identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, active, mesic Typic Hapludalfs.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

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ATTACHMENT F

INFILTRATION OBSERVATIONS

Field Observation Report

Project Number:	18C6704
Project Name:	South Kingstown Retail Development
Date of Field Visit:	April 18, 2019
Weather Conditions:	Overcast
Temperature:	Approx. 47-50°F
Prepared By:	Audrey Turcotte, EIT

Copies of Report Have Been Sent To: ☐ Client ☐ Contractor ☐ Other

Client:
Garrett Homes, LLC
6 William Way
Harwinton, CT 06791

Contractor:
BL Companies
220 Norwood Park South, Suite 201
Norwood, MA 02062

Three soil pits were excavated by a mini excavator and described to varying depths under the supervision of Suzanne King, registered Rhode Island Professional Engieer. According to the Web Soil Survey, soils within the area of the pits are described by the USDA-NRCS as Udorthents-Urban land complex, 0 to 15 percent slopes.

Due to conditions of fill material revealed upon excavation, as well as the saturation of stones, cobbles, boulders and roots, infiltration tests using the double ring infiltrometer method were not conducted at each pit location. The elevations of the proposed improvements and the existing ground are provided on the infiltration testing location map.

See Attachment E for the NRCS Soil Report.

Field Observation Report

Pit Number	Pit Location (Decimal Degrees)	Observed Limiting Layer	Infiltration Test Depth (inches below the surface)	Infiltration Rate (inches/hour)
Test Pit #1	41.46462, -71.51079	36 inches, Redoximorphic Features	Not Conducted	N/A
Test Pit #2	41.46452, -71.51131	23 inches, Redoximorphic Features	Not Conducted	N/A
Test Pit #3	41.46463, -71.51154	18 inches, Redoximorphic Features	Not Conducted	N/A

A test pit location map, soil profile logs, photographs, and USDA-NRCS Soil Survey information are attached.

NOTES

TEST PIT 1:
- LOCATED 25 FT FROM EXISTING UTILITY POLE.
- EXISTING GRADE AT APPROXIMATE ELEVATION 115.0
- BOTTOM OF PROPOSED INFILTRATION SYSTEM AT ELEVATION 113.0 (DIG DOWN 2.0 FT FOR INFILTRATION TESTING).
- DIG DOWN TO ELEVATION 109.0 FOR SOIL OBSERVATIONS (4 FT BELOW PROPOSED BOTTOM OF INFILTRATION SYSTEM).

TEST PIT 2:
- LOCATED 175 FT FROM EXISTING ROADSIDE SIGN.
- EXISTING GRADE AT APPROXIMATE ELEVATION 114.7
- BOTTOM OF PROPOSED INFILTRATION SYSTEM AT ELEVATION 115.0 (INFILTRATION TEST DONE AT SURFACE).
- DIG DOWN TO ELEVATION 111.0 FOR SOIL OBSERVATIONS (4 FT BELOW PROPOSED BOTTOM OF INFILTRATION SYSTEM).

TEST PIT 3:
- LOCATED 36 FT FROM EXISTING FENCE CORNER.
- EXISTING GRADE AT APPROXIMATE ELEVATION 114.5
- BOTTOM OF PROPOSED INFILTRATION SYSTEM AT ELEVATION 114.0 (DIG DOWN 0.5 FT FOR INFILTRATION TESTING).
- DIG DOWN TO ELEVATION 110.0 FOR SOIL OBSERVATIONS (4 FT BELOW PROPOSED BOTTOM OF INFILTRATION SYSTEM).

GRAPHIC SCALE
20 10 0 20
SCALE IN FEET

REFER TO SHEET GN-1 FOR SITEWORK GENERAL NOTES

4/18/2019, ATURCOTTE, G:\JOBS\18C\18C6704\DWG\SK18C670403_INFILTRATION.DWG,SK-3 24X36 2056C.

Xref (ρ): - BB18C670401 - XYT18C670401

BL Companies
ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING

100 River Ridge Drive, Suite 105
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(781) 619-9500

SUZANNE M. KING
No. 10040
REGISTERED PROFESSIONAL ENGINEER
CIVIL

OWNER:
South Shore Mental Health
765 Allens Ave, Suite 100
Providence, RI 02905

APPLICANT:
Garrett Home, LLC
6 William Way
Harwinton, CT 06791

PROPOSED RETAIL
1860 KINGSTOWN ROAD
SOUTH KINGSTOWN, RHODE ISLAND

REVISIONS
No. Date Desc.

Designed	A.J.T.
Drawn	A.J.T.
Reviewed	S.M.K.
Scale	1"=20'
Project No.	18C6704
Date	03/12/19

CAD File: SK18C670403_INFILTRATION

Title
INFILTRATION EXHIBIT

Sheet No.
SK-3

Soil Profile Log

Project Proposed Development
Test Pit # 1
Name Audrey Turcotte, EIT
Date April 18, 2019
Weather Overcast, 47°-50° F
Equipment Mini Excavator

Elevation 115.0
Soil Type UD - Udorthents-Urban land complex
Geology Human transported material
Landscape Position/Slope Summit, 0-8%
Land Use Vacant Lot
Additional Notes

Horizon	Depth (inches)	Texture	Coarse Fragments	Matrix Color	Color Patterns	Redoximorphic Features	Structure	Consistency	Boundary Strike/Dip	Roots/ Pores	Depth to Bedrock	Depth to Water
Fill	0-50	-	-	-	-	10% 7.5YR 7/8	-	-	-	-	-	-
O/Ab	50-52	Loam	-	10YR 2/1	-	-	Massive	Friable	-	5% roots	-	-
B	52-54+	Silt Loam	-	2.5Y 5/4	-	-	Massive	Friable	-	-	-	-

Comments: Limiting layer observed at 36 inches below surface due to the presence of redoximorphic features.
Excavator operatored noted a change in digging conditions comparing the fill material to the underlying layers.
The fill material was littered with stones, cobbles, boulders, asphalt, and roots. The underlying layers were extremely soft, and tightly packed.

Soil Profile Log

Project Proposed Development
Test Pit # 2
Name Audrey Turcotte, EIT
Date April 18, 2019
Weather Overcast, 47°-50° F
Equipment Mini Excavator

Elevation 114.7
Soil Type UD - Udorthents-Urban land complex
Geology Human transported material
Landscape Position/Slope Summit, 0-8%
Land Use Vacant Lot
Additional Notes

Horizon	Depth (inches)	Texture	Coarse Fragments	Matrix Color	Color Patterns	Redoximorphic Features	Structure	Consistency	Boundary Strike/Dip	Roots/ Pores	Depth to Bedrock	Depth to Water
Fill	0-36	-	-	-	-	10% 7.5YR 7/8	-	-	-	-	-	-
Ab	36-40	Loam	-	7.5YR 3/2	-	-	Massive	Friable	-	5% roots	-	-
B	40-48+	Silt Loam	-	10YR 5/6	-	-	Massive	Friable	-	-	-	-

Comments: Limiting layer observed at 23 inches below surface due to the presence of redoximorphic features.
Excavtor kept digging below test pit, and groundwater was encountered 80" below the surface.
Excavator operatored noted a change in digging conditions comparing the fill material to the underlying layers.
The fill material was littered with stones, cobbles, boulders, asphalt, and roots. The underlying layers were extremely soft, and tightly packed.

Soil Profile Log

Project Proposed Development
Test Pit # 3
Name Audrey Turcotte, EIT
Date April 18, 2019
Weather Overcast, 47°-50° F
Equipment Mini Excavator

Elevation 115.0
Soil Type UD - Udorthents-Urban land complex
Geology Human transported material
Landscape Position/Slope Summit, 0-8%
Land Use Vacant Lot
Additional Notes

Horizon	Depth (inches)	Texture	Coarse Fragments	Matrix Color	Color Patterns	Redoximorphic Features	Structure	Consistency	Boundary Strike/Dip	Roots/ Pores	Depth to Bedrock	Depth to Water
Fill	0-48	-	-	-	-	2% 7.5YR 7/8	-	-	-	-	-	-
O/Ab	48-51	Loam	-	10YR 2/1	-	-	Massive	Friable	-	2% roots	-	-
B	51-54+	Silt Loam	-	10YR 4/4	-	-	Massive	Friable	-	-	-	-

Comments: Limiting layer observed at 18 inches below surface due to the presence of redoximorphic features.
Excavator operatored noted a change in digging conditions comparing the fill material to the underlying layers.
The fill material was littered with stones, cobbles, boulders, asphalt, and roots. The underlying layers were extremely soft, and tightly packed.

View of Test Pit #1.

View of Test Pit #2.

View of Test Pit #3.

ATTACHMENT G

WETLAND REPORT

By: Natural Resource Services, Inc.
Dated: July 31, 2018

Natural Resource Services, Inc.

July 31, 2018

Michelle Carlson, PE
BL Companies
355 Research Parkway
Meriden, CT 06450

RE: Freshwater Wetland Delineation
Kingstown Road; A.P. 40-1, Lot 125
South Kingstown, Rhode Island

Dear Ms. Carlson:

Natural Resource Services, Inc. (NRS) has completed its freshwater wetland delineation of the above-referenced parcel. This field work was performed in accordance with the delineation standards outlined in Appendix 2 of the Rules and Regulations Governing the Administration and Enforcement of the Freshwater Wetlands Act (effective July 16, 2014). Rule 8.03(D) of the wetland regulations states that all delineations performed by wetland consultants, including NRS, are not considered valid for regulatory purposes until the work is reviewed and approved by the RI Department of Environmental Management, Office of Water Resources (DEM, OWR). NRS wetland biologist Carolyn Decker performed the delineation July 31, 2018.

The tax assessor's database for the Town of South Kingstown lists the parcel at 1.16 acres. The property lies west of Kingstown Road approximately 200 feet south of its intersection with Southwinds Drive. The property is vacant land. The site is predominately occupied by invasive species such as autumn olive *(Elaeagnus umbellata)* and Japanese knotweed *(Fallopia japonica)*. The site is within a Natural Heritage Area (Reference ID#129) as mapped by the DEM. However, no rare species were observed during the wetland delineation.

The Rhode Island Soil Survey (2015) depicts the property with non-hydric and hydric soils. The majority of the lot is mapped as the non-hydric soil series Udorthents-urban land complex (UD). UD soils are generally well-drained or excessively drained soils that have been disturbed by human activity such as filling or other forms of construction. The hydric soil series Ridgebury, Whitman, and Leicester extremely stony fine sandy loams (Rf) is mapped in the rear of the property. Rf soils are typical of wetlands. Given the configuration of these soil designations relative to the delineated wetland edge, the NRS findings were generally consistent with that of the soil series.

P.O. Box 311 Harrisville, RI 02830 401-568-7390 FAX 401-568-7490

The property contains wetland resource areas within the jurisdiction of the DEM. The NRS delineation marked the limit of a swamp with flagging labeled A1 – A15. The swamp is in the rear of the property with a narrow portion of swamp extending along the western property line toward the neighboring parking lot. The swamp extends off-site to the southwest.

The regulations define a swamp as "a place greater than three (3) acres in extent wholly or partly within the state of Rhode Island where groundwater shall be near or at the surface of the ground for a significant part of the growing season, or where runoff water from surface drainage shall collect frequently, and/or where a vegetational community shall be made up of a significant portion…predominantly hydrophytic vegetation." Swamps receive a regulatory setback known as a 50 foot perimeter wetland.

The dominant woody plant species in the swamp include red maple *(Acer rubrum*), black tupelo *(Nyssa sylvatica)*, sweet pepperbush *(Clethra alnifolia)*, and spicebush *(Lindera benzoin)*. Skunk cabbage *(Symplocarpus foetidus*), cinnamon fern (*Osmundastrum cinnamomeum*) and greenbrier *(Smilax rotundifolia)* are dominant herbaceous and vine species. These are all plant species typical of wetlands in Rhode Island.

I used a hand-held GPS unit (Trimble Geo7X) to approximately locate the wetland delineation on the subject property. While this work does not represent a professional survey, the information obtained is valuable for preliminary planning purposes. I have enclosed a geographic information systems (GIS) graphic with this letter. The graphic is a 2014 aerial image of the subject property. The GPS data obtained during our field work of the wetland edge is provided as an overlay on the image. I have also approximated the limit of the 50 foot perimeter wetland on the graphic.

The wetland delineation flagging series are listed in the table below:

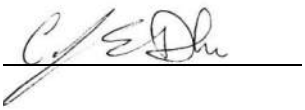
Flagging Series	Resource Classification	Regulatory Setback
A1 – A15	Swamp	50 ft. Perimeter Wetland

It is important to recognize that the 50 foot perimeter wetland is regulated as part of the actual wetland and not a simple buffer zone. Any development proposal which would alter the swamp or 50 foot perimeter wetland requires a permit from the Department of Environmental Management, Office of Water Resources (DEM, OWR).

It is important to note that a new state freshwater wetlands law was enacted in July of 2015. This law made changes to the jurisdictional limits currently utilized in the regulations. The Department of Environmental Management (DEM) is writing new regulations which will require buffer zones for all freshwater wetlands. While a comprehensive timeline has not been established for the enactment of these rules, it is anticipated that they will be in effect at some point in 2018. If you submit an application prior to the promulgation of these rules, your project would then be grandfathered under the current setback standards.

I hope that the information provided is of assistance to you. Please do not hesitate to contact my office if you have any questions or require additional information.

Very truly yours,



Carolyn Decker
Wetland Biologist

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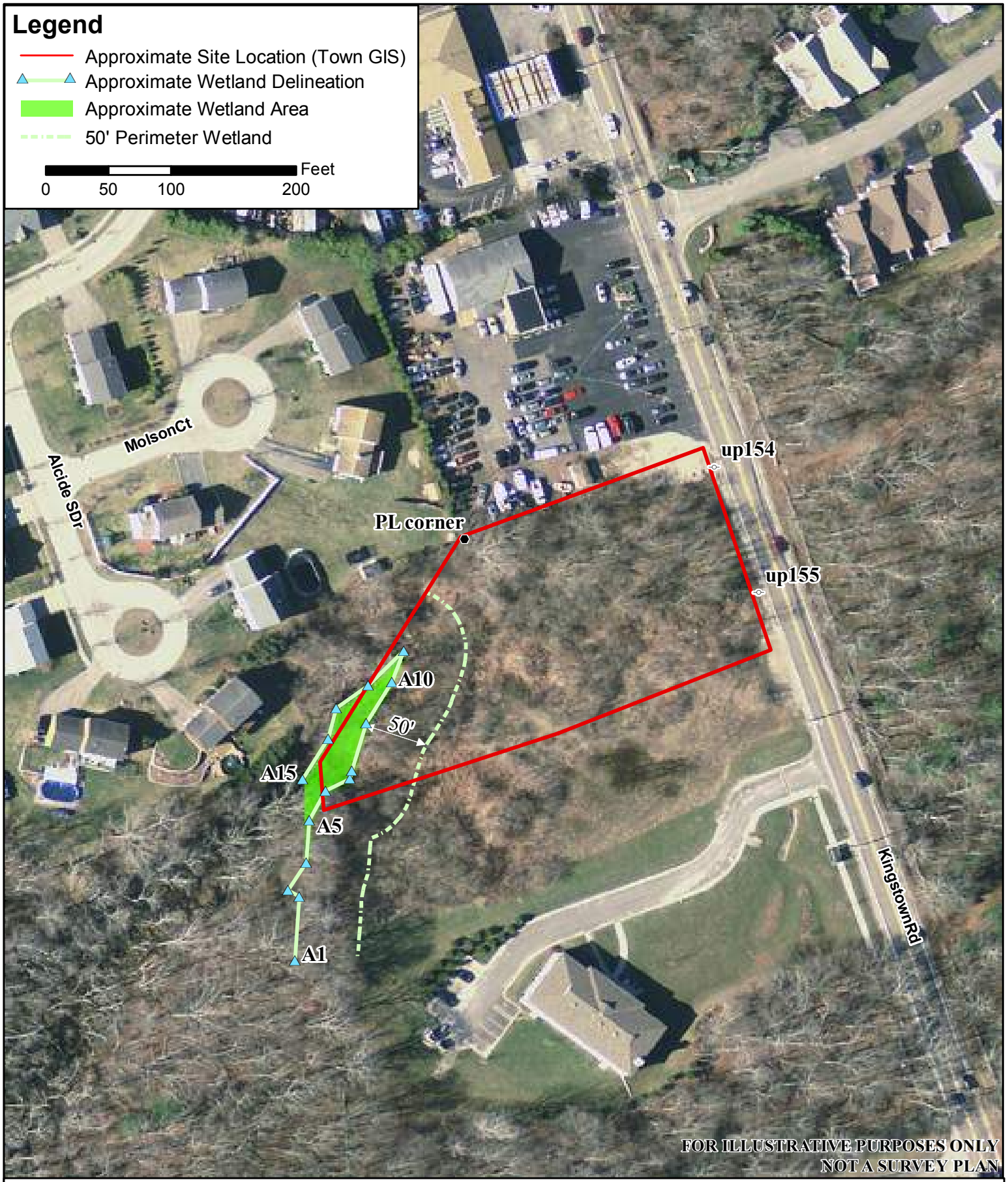

Site Sketch for Approximate Wetland Delineation
Kingstown Road
A.P. 40-1, Lot 125

South Kingstown, RI

Performed by
Carolyn Decker 7/31/18
Located using hand-held Trimble Geo7x

N
W E
S

2014 USGS Digital True Color Orthophotography

Natural Resource Services, Inc.
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180 Tinkham Lane
Harrisville, RI 02830
p: (401) 568-7390
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USDA Soil Survey Map
Kingstown Road
A.P. 40-1, Lot 125

South Kingstown, RI

Approximate Site Location

2014 USGS Digital True Color Orthophotography

0 100 200 400 Feet

N W E S

RIGIS

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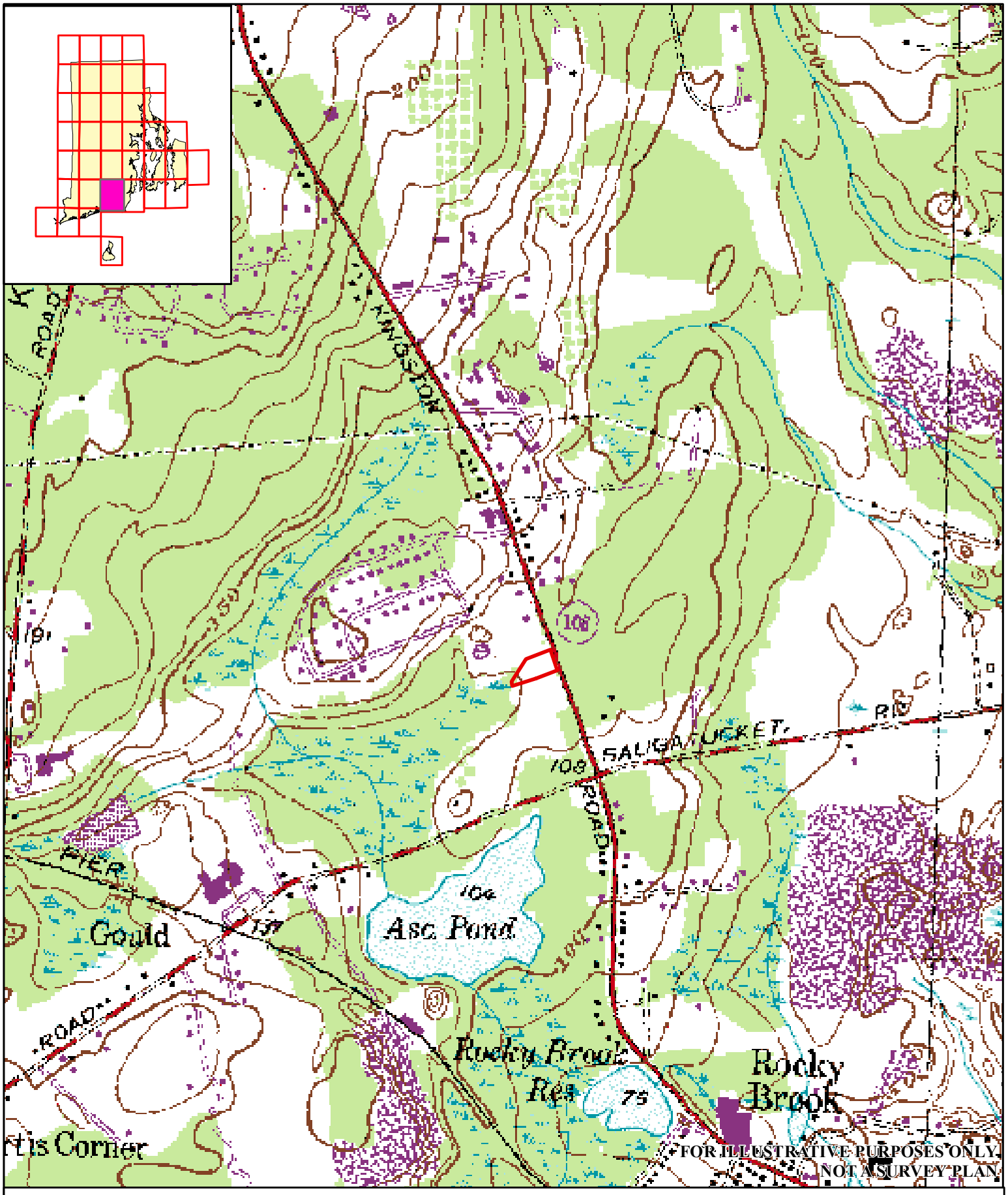

USGS Topographic Map
Kingstown Road
A.P. 40-1, Lot 125

South Kingstown, RI

Kingston Quad Map

Approximate Site Location

USGS Topographic Series
Contour Interval 10 Feet
National Geodetic Vertical Datum of 1929

0 500 1,000 2,000 Feet

RIGIS

Natural Resource Services, Inc.
PO Box 311
180 Tinkham Lane
Harrisville, RI 02830
p: (401) 568-7390
f: (401) 568-7490

Wetland Edge Delineation Data Form (Wetland)

Applicant:
Project: Kingstown Road
City/Town: North Kingstown, RI

Wetland No.: 1
Flag No. Sequence: A1 – A15
Date: July 31, 2018

Vegetation: List the three dominant species in each vegetative strata along with their NWI status.

Tree	Indicator Status	Herbs	Indicator Status
1. *Nyssa sylvatica*	FAC	1. *Osmundastrum cinnamomeum*	FACW
2. *Acer rubrum*	FAC	2. *Symplocarpus foetidus*	OBL
3.		3. *Thelypteris noveboracensis*	FAC
Saplings/Shrubs		**Woody Vines**	
1. *Clethra alnifolia*	FAC	1. *Smilax rotundifolia*	FAC
2. *Lindera benzoin*	FACW	2.	
3. *Rosa multiflora*	FACU	3.	

List other vegetative species noted which may have affected determination of the wetland edge: *Fallopia japonica* (FACU)

Soil: SCS Soil Survey Mapping Unit: Rf
On Hydric Soils List (Y / N) Y

Soil Profile: (Note wetland flag no. nearest soil test pit): A3

Horizon	Depth	Matrix Color	Mottling Description	Depth to Saturation	Depth to Free Water
A	0-10”	10YR 2/1	-	-	-
B	10-18”	10YR 5/2	10YR 3/2 streaks	-	-
-	-	-	-	-	-

Other indicators of wetland hydrology (eg. water marks, drainage patterns, root Rhizospheres, etc: Buttressed roots, leaf staining
Landscape Position: Toeslope
Altered / atypical situation? (describe)
Comments:

Wetland Edge Delineation Data Form (Upland)

Applicant:
Project: Kingstown Road
City/Town: North Kingstown, RI

Wetland No.: 1
Flag No. Sequence: A1 – A15
Date: July 31, 2018

Vegetation: List the three dominant species in each vegetative strata along with their NWI status.

Tree	Indicator Status	Herbs	Indicator Status
1. *Acer rubrum*	FAC	1. *Fallopia japonica*	FACU
2.		2.	
3.		3.	
Saplings/Shrubs		**Woody Vines**	
1. *Berberis thunbergii*	FACU	1. *Celastrus orbiculatus*	UPL
2. *Rosa multiflora*	FACU	2.	
3. *Elaeagnus umbellata*	FACU	3.	

List other vegetative species noted which may have affected determination of the wetland Edge:_____

Soil: SCS Soil Survey Mapping Unit: UD
On Hydric Soils List (Y / N) N

Soil Profile: (Note wetland flag no. nearest soil test pit): A3

Horizon	Depth	Matrix Color	Mottling Description	Depth to Saturation	Depth to Free Water
HTM	0-18”	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

Other indicators of wetland hydrology (eg. water marks, drainage patterns, root Rhizospheres, etc.): _____
Landscape Position: Footslope
Altered / atypical situation? (describe)_____
Comments: Previously disturbed area

APPENDIX C

Soil Erosion and Sediment Control Plan

Soil Erosion and Sediment Control Plan

For the Proposed:
Retail Development

Located at:
1860 Kingstown Road (RI Route 108)
South Kingstown, Rhode Island

Prepared for Submission to:
Town of South Kingstown

July 17, 2020

Prepared for:
Garrett Homes, LLC
59 Field Street
Torrington, CT 06790

BL Companies
100 Constitution Plaza, 10th Floor
Hartford, CT 06103
(860) 249-2200
Fax: (860) 249-2400
BL Project Number: 18C6704

Soil Erosion and Sediment Control Plan

For:

Proposed Retail Development

1860 Kingstown Road

South Kingstown, RI 02879

Plat 40-1 / Lot 125 & 40-1 / Lot 126

Owner:	South Shore Mental Health Daniel Wall All Correspondence should go through mbruton@blcompanies.com until Contractor is named.
Operator: *TO BE DETERMINED UPON CONTRACT AWARD*	Company Name Name Address City, State, Zip Code Telephone Number Email Address
Estimated Project Dates:	Start Date: TBD Completion Date: TBD
SESC Plan Prepared By:	BL Companies Matthew Bruton 100 Constitution Plaza, 10th Floor Hartford, CT 06103 (860) 760-1933 mbruton@blcompanies.com
SESC Plan Preparation Date:	07/17/2020
SESC Plan Revision Date:	

OPERATOR CERTIFICATION

Upon contract award, the OPERATOR must sign this certification statement before construction may begin.

I certify under penalty of law that this document and all attachments were prepared under the direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that it is the responsibility of the owner/operator to implement and amend the Soil Erosion and Sediment Control Plan as appropriate in accordance with the requirements of the RIPDES Construction General Permit.

_____

Operator Signature: Date

Contractor Representative: Name

Contractor Title: Title

Contractor Company Name: Company Name (if applicable)

Address: Mailing Address

Phone Number: Phone Number

Email Address: Email

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INTRODUCTION

The purpose of erosion, runoff, and sedimentation control measures is to prevent pollutants from leaving the construction site and entering waterways or environmentally sensitive areas during and after construction. This SESC Plan has been prepared prior to the initiation of construction activities to address anticipated worksite conditions. The control measures depicted on the site plan and described in this narrative should be considered the minimum measures required to control erosion, sedimentation, and stormwater runoff at the site. Since construction is a dynamic process with changing site conditions, it is the operator's responsibility to manage the site during each construction phase so as to prevent pollutants from leaving the site. This may require the operator to revise and amend the SESC Plan during construction to address varying site and/or weather conditions, such as by adding or realigning erosion or sediment controls to ensure the SESC Plan remains compliant with the RIPDES Construction General Permit. Records of these changes must be added to the amendment log attached to the SESC Plan, and to the site plans as "red-lined" drawings. Please Note: **Even if practices are correctly installed on a site according to the approved plan, the site is only in compliance when erosion, runoff, and sedimentation are effectively controlled throughout the entire site.**

It is the responsibility of the site owner and the site operator to maintain the SESC Plan at the site, including all attachments, amendments and inspection records, and to make all records available for inspection by RIDEM during and after construction. (RIPDES CGP - Part III.G)

The site owner, the site operator, and the designated site inspector are required to review the SESC Plan and sign the Party Certification pages (Section 8). The primary contractor (if different) and all subcontractors (if applicable) involved in earthwork or exterior construction activities are also required to review the SESC Plan and sign the certification pages before construction begins.

Any questions regarding the SESC Plan, control measures, inspection requirements, or any other facet of this document may be addressed to the RIDEM Office of Water Resources, at 401-222-4700 or via email: water@dem.ri.gov.

SOIL EROSION AND SEDIMENT CONTROL PLAN GUIDENCE

SECTION 1: SITE DESCRIPTION

1.1 Project/Site Information

Project/Site Name:

- Proposed Retail Development
- This report has been prepared in support of the proposed retail development at 1860 Kingstown Road (Site) by Garrett Homes, LLC. The project parcel consists of two lots to be consolidated into one. The total Site area is approximately 2.18 acres and is currently undeveloped, consisting of wooded area and lawn area.

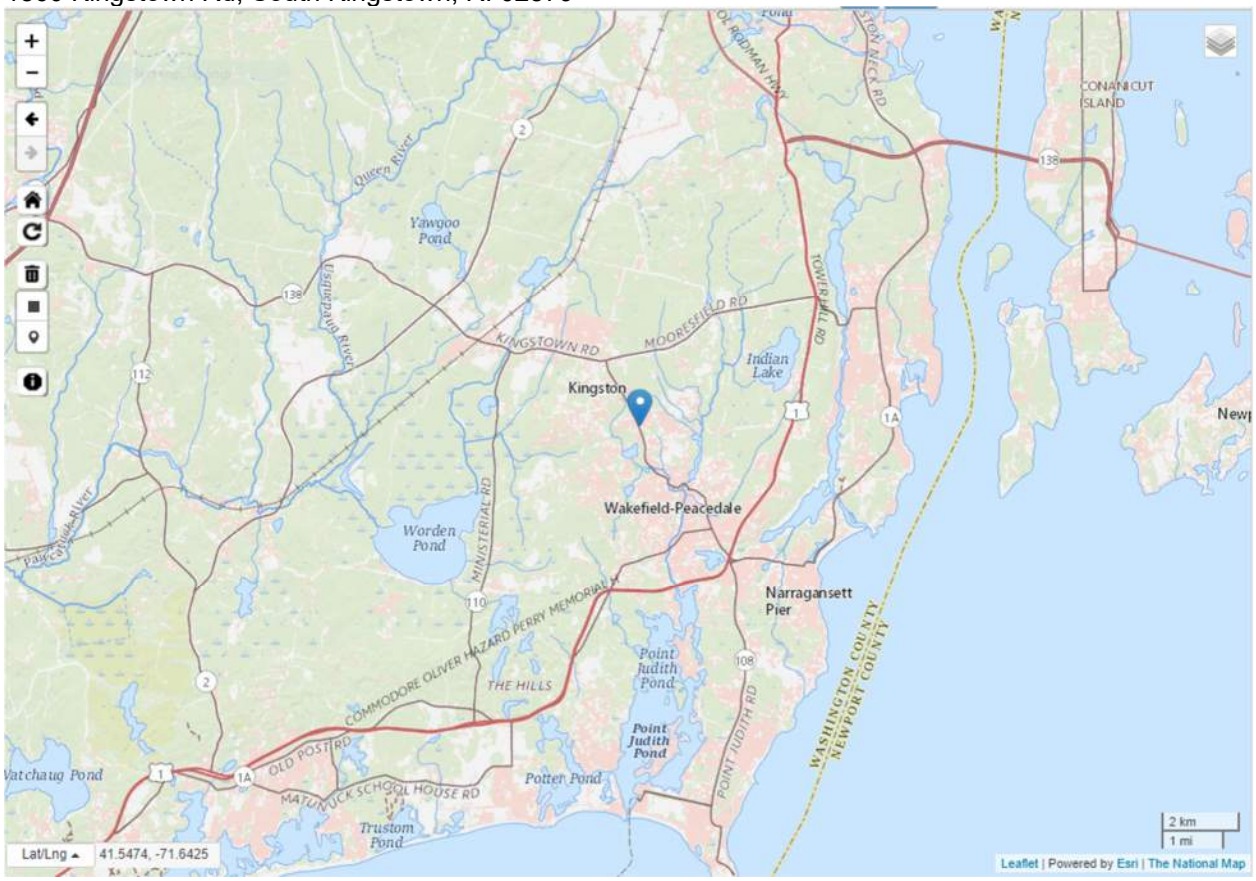
  The Site is bordered to the north by an existing commercial development, including a car dealership, Kingston Auto Sales & Services, and a two-story single-family home. The property is bordered to the east by Kingstown Road, and to the south by an affordable housing apartment complex. The property is bordered to the west by a residential neighborhood. The Site is located within the Town of South Kingstown's Mixed Use (MU) Zone. The south abutting property to the development parcel is also zoned MU. North of the parcel, the car dealership is located within the Commercial Highway (CH) Zone. The two-story single-family homes are located within the

Medium High Density Residential (R10) Zone. The property along the western property line is zoned as Medium High Density Residential (R20) Zone.

Generally, the topography slopes to a regional low point located at the southwestern corner of the site. This low point accepts stormwater runoff from the car dealership located north of the property, the ranch to the west, and properties to the south including an undeveloped parcel and apartments owned by Bayberry Courts. The majority of the stormwater runoff is directed to the low point via sheet flow and shallow concentrated flow, until eventually ponding on-site and infiltrating into the ground. Elevations of the existing roadway frontage range from 115 feet to 117 feet.

Project Street/Location:

- 1860 Kingstown Rd, South Kingstown, RI 02879



Provide construction site estimates of the total area of the site and the total area of the site that is expected to undergo soil disturbance.

The following are estimates of the construction site area:

- Total Project Area 2.18 acres
- Total Project Area to be Disturbed 1.75 acres

☒ Yes ☐ No The Limits of Disturbance have been marked in the field

1.3 Natural Heritage Area Information

RIPDES CGP - Part III.H
Each project authorized under the RIPDES Construction General Permit must determine if the site is within or directly discharges to a Natural Heritage Area (NHA). DEM Natural Heritage Areas include known occurrences of state and federal rare, threatened and endangered species. Review RIDEM NHA maps to determine if there are natural heritage areas on or near the construction site that may be impacted during construction. For more information you may contact the RIDEM Rhode Island Natural Heritage Program mailto:plan@dem.ri.gov

Are there any Natural Heritage Areas being disturbed by the construction activity or will discharges be directed to the Natural Heritage Area as a result of the construction activity?

☐ Yes ☒ No

If yes, describe or refer to documentation which determines the likelihood of an impact on this area and the steps that will be taken to address any impacts.

1.4 Historic Preservation/Cultural Resources

The National Historic Preservation Act, and any state, local, and tribal historic preservation laws apply to construction activities. As with endangered species, some permits may specifically require you to assess the potential impact of your stormwater discharges on historic properties. However, whether or not this is stated as a condition for permit coverage, the National Historic Preservation Act and any applicable state or tribal laws apply to you. Contact the Rhode Island Historic Preservation Officer (http://www.preservation.ri.gov/) or your Tribal Historic Preservation Officer (http://grants.cr.nps.gov/THPO_Review/index.cfm) for more information.

Are there any historic properties, historic cemeteries or cultural resources on or near the construction site?

☐ Yes ☒ No

Describe how this determination was made and summarize state or tribal review comments:

- Site is not listed on National Register of Historical Places and no historical resources were found during land title research.

If yes, describe or refer to documentation which determines the likelihood of an impact on this historic property, historic cemetery or cultural resource and the steps taken to address that impact including any conditions or mitigation measures that were approved by other parties.

- INSERT TEXT HERE

SECTION 2: EROSION, RUNOFF, AND SEDIMENT CONTROL

RIPDES Construction General Permit – Part III.J.1 – Erosion, Runoff, and Sediment Controls

The purpose of erosion controls is to prevent sediment from being detached and moved by wind or the action of raindrop, sheet, rill, gully, and channel erosion. Properly installed and maintained erosion controls are the primary defense against sediment pollution.

Runoff controls are used to slow the velocity of concentrated water flows. By intercepting and diverting stormwater runoff to a stabilized outlet or treatment practice or by converting concentrated flows to sheet flow erosion and sedimentation are reduced.

Sediment controls are the last line of defense against moving sediment. The purpose is to prevent sediment from leaving the construction site and entering environmentally sensitive areas.

This section describes the set of control measures that will be installed before and during the construction project to avoid, mitigate, and reduce impacts associated with construction activity. Specific control measures and their applicability are contained in Section Four: Erosion Control Measures, Section Five: Runoff Control Measures, and Section Six: Sediment Control Measures of the *RI SESC Handbook*. The *RI SESC Handbook* can be found at the following address:

http://www.dem.ri.gov/soilerosion2014final.pdf

2.1 Avoid and Protect Sensitive Areas and Natural Features

Per RI Stormwater Design and Installation Standards Manual 3.3.7.1:

Areas of existing and remaining vegetation and areas that are to be protected as identified in the Section 1.6 of the SESC Plan must be clearly identified on the SESC Site Plans for each Phase of Construction. Prior to any land disturbance activities commencing on the site, the Contractor shall physically mark limits of disturbance (LOD) on the site and any areas to be protected within the site, so that workers can clearly identify the areas to be protected.

Constraints are identified to ensure a comprehensive understanding of the project and surrounding areas. The first goal in the low impact development (LID) site planning and design process is to avoid disturbance of natural features. This includes identification and preservation of natural areas that can be used in the protection of water resources. It is important to understand that minimizing the hydrologic alteration of a site is just as important as stormwater treatment for resource protection. Therefore, describe all site features and sensitive resources that exist at the site such as, view barriers,, steep slopes (>15%)that if disturbed will require additional erosion controls, areas with the potential to receive run-on from off-site areas, wetlands, surface waters, and their riparian buffers, specimen trees, natural vegetation, forest areas, stream crossings, historic properties, historic cemeteries or cultural resources that are to be preserved. ***This includes those site features that should be avoided within the designated limits of disturbance.*** *These areas are often identified on a constraints map or in a separate constraints report. For additional discussion on this topic refer to Appendix F. Site Constraint Map of the RI SESC Handbook.*

Describe and illustrate on SESC Site Plans Sensitive Areas and Natural Features and how each will be protected during construction activity. Examples of areas to be protected include vegetated buffers, forests, stands of trees on the perimeter and within the site, large diameter trees, areas designated for infiltration (QPAs), bioretention, rain gardens, and OWTS leachfields. Protection for stands of trees and individual trees to be preserved must be specified and such protection must comply with the RI SESC Handbook and extend to the drip line.

Describe and illustrate on SESC Site Plans based on Constraints Map, the areas that will be disturbed with each phase of construction and the control measures (signs, fences, etc.) that will be used to protect those areas that should not be disturbed. ***This includes marking for limits of disturbance at the perimeter and areas within the limits of disturbance.*** *Acceptable measures include but are not limited to*

construction fencing (plastic mesh, snow fence, chain link fence etc.) appropriate for the site, boundary markers using construction tape, flagged stakes, etc. for low density use, sediment barriers such as silt fence, compost socks with flagging where also required for sediment control, and signage. The narrative portion of the plan and SESC Site Plans must highlight measures to prevent soil compaction in areas designated as Qualified Pervious Areas (QPAs) and infiltration practices to protect infiltration capacity.

Feature Requiring Protection	Construction Phase #	Method of Protection	Sheet #
Insert Text	Insert Text	Insert Text	Insert Text
Insert Text	Insert Text	Insert Text	Insert Text
Insert Text	Insert Text	Insert Text	Insert Text

2.2 Minimize Area of Disturbance

Per RI Stormwater Design and Installation Standards Manual 3.3.7.2:

Will >5 acres be disturbed in order to complete this project?

☐ Yes ☒ No

If yes, phasing must be utilized at this site.

Will <5 acres be disturbed or will disturbance activities be completed within a six (6) month window?

☒ Yes ☐ No

If yes, phasing is not required as long as all other performance criteria will be met and phasing is not necessary to protect sensitive or highly vulnerable areas.

Based on the answers to the above questions will phasing be required for this project?

☐ Yes ☒ No

If yes, and phasing is required, describe phasing plan as prompted below.

If No, provide substantive reasons why this was determined to be infeasible.
Less than 5 acres will be disturbed for this project. The need to phase construction activity is not applicable.

PHASING PLAN
For each phase of the construction project, provide site estimates of the total area of the project phase, and the total area of the project phase that is expected to undergo soil disturbance.

The following are estimates of each phase of the construction project:

(Copy and paste this section for projects with multiple phases)

Phase No. or Identifier
Total Area of Phase acres
Area to be Disturbed 1.75 acres

Description of Construction Sequencing for Phase -

General Construction Sequence Included on Sheet EC-2.

Proper sequencing of construction activities is essential to maximize the effectiveness of erosion, runoff, and sediment control measures. Construction sequencing of construction activities for each phase must address the following elements:

1. *Installation of control measures identifying limits of disturbance and areas internal to the site that require protection before start of land disturbance.*
2. *Installation of all erosion, runoff, and sediment controls and temporary pollution prevention measures that are required to be in place and functional before any earthwork begins. This shall be done in accordance with the RI SESC Handbook and/or the RI Department of Transportation Standard Specifications for Road and Bridge Construction (as amended). Upon acceptable completion of site preparation and installation of erosion, runoff, and sediment controls and temporary pollution prevention measures, site construction activities may commence.*
3. *The phasing plan shall address the use of phasing to manage and limit increases in runoff rates and volumes during construction. Designated phases and timing of construction should also address the impacts to important or sensitive habitats.*
4. *Upon commencement of site construction activities, the operator shall initiate appropriate stabilization practices on all disturbed areas as soon as possible, but not more than fourteen (14) days after the construction activity in that area has temporarily or permanently ceased. Such temporary or permanent soil stabilization measures must be installed prior to initiating land disturbance in subsequent phases.*
5. *Routine inspection and maintenance and/or modification of erosion, runoff, and sediment controls and temporary pollution prevention measures while earthwork is ongoing is required.*
6. *Final site stabilization of any disturbed areas after earthwork has been completed and removal of temporary erosion, runoff, and sediment controls and temporary pollution prevention measures.*
7. *Activation of post-construction stormwater treatment conveyances and practices.*

2.3 Minimize the Disturbance of Steep Slopes

Per RI Stormwater Design and Installation Standards Manual 3.3.7.3:

Are steep slopes (>15%) present within the proposed project area?

☒ Yes ☐ No

If yes, steep slopes must be identified on SESC Site Plans.

If yes, also list the specific control measures that will be used to control surface runoff and reduce erosion potential on steep slopes during construction including references to SESC Site Plans where the locations of such control measures are shown. Examples include limiting the number of steep slopes that are disturbed at one time, implementing land grading techniques such as reverse slope benches, diversions, stair steps, and terraced landforms, installation of retaining walls for stabilization of challenging slopes, prevention of soil movement, and slope protection, applying materials for temporary and permanent protection of slopes to prevent erosion such as stone aggregates, rip-rap, erosion control blankets, appropriate spacing of sediment barriers as a function of barrier size, slope, and slope length, geotextile, cellular confinement systems, mattresses (gabions and others), and articulating blocks.

Steep slopes present on site are to be stabilized with erosion control blanket until vegetation is established.

2.4 Preserve Topsoil

Per RI Stormwater Design and Installation Standards Manual 3.3.7.4:

Site owners and operators must preserve existing topsoil on the construction site to the maximum extent feasible and as necessary to support healthy vegetation, promote soil stabilization, and increase stormwater infiltration rates in the post-construction phase of the project.

Will existing topsoil be preserved at the site?

☒ Yes ☐ No

If Yes, describe how topsoil will be preserved at the site by describing the techniques that will be implemented to achieve appropriate depths of topsoil (4 inch minimum) and identify the locations where topsoil will be restored on SESC Site Plans.

Topsoil will be removed and stockpiled after the site is cleared per the erosion control notes on Sheet EC-2. The topsoil will be used to fine grade the landscape areas to the final grades shown on GD-1.

If No, provide substantive reasons why this was determined to be infeasible.

Insert Text Here

Identify the methods that will be used to restore and amend topsoil at the site. Include references to plan notes and SESC Site Plan sheet numbers where this information is made available for the site operator.

Topsoil will be removed and stockpiled after the site is cleared per the erosion control notes on Sheet EC-2. The topsoil will be used to fine grade the landscape areas to the final grades shown on GD-1.

2.5 Stabilize Soils

Per RI Stormwater Design and Installation Standards Manual 3.3.7.5:

Upon completion and acceptance of site preparation and initial installation of erosion, runoff, and sediment controls and temporary pollution prevention measures, the operator shall initiate appropriate temporary or permanent stabilization practices during all phases of construction on all disturbed areas as soon as possible, but not more than fourteen (14) days after the construction activity in that area has temporarily or permanently ceased.

Any disturbed areas that will not have active construction activity occurring within 14 days must be stabilized using the control measures depicted in the SESC Site Plans, in accordance with the *RI SESC Handbook*, and per manufacturer product specifications.

Only areas that can be reasonably expected to have active construction work being performed within 14 days of disturbance will be cleared/grubbed at any one time. It is NOT acceptable to clear and grub the entire construction site if portions will not be active within the 14-day time frame. Proper phasing of clearing and grubbing activities shall include temporary stabilization techniques for areas cleared and grubbed that will not be active within the 14-day time frame.

All disturbed soils exposed prior to October 15 of any calendar year shall be seeded by that date if vegetative measures are the intended soil stabilization method. Any such areas that do not have adequate vegetative stabilization, as determined by the site operator or designated inspector, by November 15, must be stabilized through the use of non-vegetative erosion control measures. If work continues within any of these areas during the period from October 15 through April 15, care must be taken to ensure that only the area required for that day's work is exposed, and all erodible soil must be restabilized within 5 working days. In limited circumstances, stabilization may not be required if the intended function of a specific area of the site necessitates that it remain disturbed (i.e. construction of a motocross track).

Describe controls (i.e., temporary seeding with native vegetation, hydroseeding, mulching, application of rolled erosion control products, etc.) including design specifications and details that will be implemented to stabilize exposed soils where construction activities have temporarily or permanently ceased.

Temporary Vegetative Control Measures

Seed and mulch disturbed areas with temporary mix as soon as practicable using perennial ryegrass at 40 lbs/acre. Mulch all cut and fill slopes and swales with loose straw.

Temporary Non-Vegetative Control Measures

If necessary, replace loose straw on slopes with erosion control blankets or jute cloth. Moderately graded areas, islands, and temporary construction staging areas may be hydroseeded with tackifier.

Permanent Vegetative Control Measures

All slopes shall be seeded, and any road or driveway shoulder and banks shall be stabilized immediately upon completion of final grading until turf is established.

Permanent Non-Vegetative Control Measures

Use erosion control blankets as required or ordered for slopes greater than 3:1.

2.6 Protect Storm Drain Outlets

Per RI Stormwater Design and Installation Standards Manual 3.3.7.7:

Temporary or permanent outlet protection must be used to prevent scour and erosion at discharge points through the protection of the soil surface, reduction in discharge velocities, and through the promotion of infiltration. Outlets often have high velocity, high volume flows, and require strong materials that will withstand the forces of stormwater. Storm drain outlet control measures also offer a last line of protection against sediment entering environmentally sensitive areas.

All stormwater outlets that may discharge sediment-laden stormwater flow from the construction site must be protected using the control practices depicted on the approved plan set and in accordance with the *RI SESC Handbook*.

Describe controls, including design specifications and details, which will be implemented to protect outlets discharging stormwater from the project.

Will temporary or permanent point source discharges be generated at the site as the result of construction of sediment traps or basins, diversions, and conveyance channels?

☐ Yes ☒ No

If Yes, describe the method(s) of outlet protection specified for each instance where a point source discharge will be generated. In addition, specifically reference SESC Site Plan Sheet Numbers which identify where the outlets will be constructed at the site and the corresponding control measures that will be utilized for their protection including any associated specifications required for their installation and maintenance.

If No, discuss rationale for not including these elements in the SESC Plan.

No point source discharges will be generated at the site as a result of construction. The discharges will be via riprap overflow spillways and a level spreader.

2.7 Establish Temporary Controls for the Protection of Post-Construction Stormwater Treatment Practices

Per RI Stormwater Design and Installation Standards Manual 3.3.7.8:

Temporary measures shall be installed to protect permanent or long-term stormwater control and treatment measures as they are installed and throughout the construction phase of the project so that they will function properly when they are brought online.

Examples of temporary control measures that can be used to protect permanent stormwater control measures include: establishing temporary sediment barriers around infiltrating practices, ensuring proper material staging areas and equipment routing (i.e. do not allow construction equipment to compact areas where infiltrating practices will be installed), and by conducting final cleaning of structural long term practices after construction is completed.

List and describe all post-construction stormwater treatment practices that will be installed during the construction process. Next, outline how these measures will be protected during the construction phase of the project to ensure that they will function appropriately once they are brought online.

Will long-term stormwater treatment practices be installed at the site?

☒ Yes ☐ No

If Yes, describe the specific long-term stormwater treatment practices that will require protection from sedimentation and compaction. In addition, specifically reference SESC Site Plan Sheet Numbers which identify the location of these practices and the corresponding control measures that will be utilized for their protection including any associated specifications required for their installation and maintenance.

Swales, sediment forebays, and a stormwater management basin will detain and treat stormwater runoff. Pre-treatment areas are designed to collect the majority of sediment before the water flows into the stormwater management basin. See GD-1 for locations.

If No, discuss rationale for not including these elements in the SESC Plan.

2.8 Divert or Manage Run-on from Up-gradient Areas

Per RI Stormwater Design and Installation Standards Manual 3.3.7.10:

Is stormwater from off-site areas anticipated to flow onto the project area or onto areas where soils will be disturbed?

☒ Yes ☐ No

If Yes, describe the specific runoff control measures (i.e., check dams, water bars, diversions, perimeter dikes, lined waterways, vegetated waterways, temporary line channels, sediment barriers, pipe slope drains, etc.) that will be utilized at the site including references to the SESC Site Plan Sheet Numbers, design specifications and details. See the RI SESC Handbook,Section Five: Runoff Control Measures for additional guidance.

Swales are proposed to be installed along the southern property line to intercept off-site runoff. Silt fence will be installed along the top of the bank uphill of the wetland to protect the wetland from sediment during construction.

Control measures shall be installed as depicted on the approved plan set and in accordance with the *RI SESC Handbook* or the *RI Department of Transportation Standard Specifications for Road and Bridge Construction*. **Run-on and Run-off Management**				
Construction Phase #	On-site or Off-site Run-on?	Control measure	Identified on Sheet #	Detail(s) is/are on Sheet #
1	Off - Site	Swale	GD-1	DN-1

If No, discuss rationale for not including these elements in the SESC Plan.

2.9 Retain Sediment Onsite through Structural and Non-Structural Practices

Per RI Stormwater Design and Installation Standards Manual 3.3.7.12:

Once the erosion control measures and the run-on diversions are identified and located on the plans, the next step to site planning is sediment control and sediment management. Sediment barriers, inlet protection, construction entrances, stockpile containment, temporary sediment traps, and temporary sediment basins must be integrated into the SESC Plan if applicable. Refer to the RI SESC Handbook Section Six: Sediment Control Measures for additional guidance.

Per RI Stormwater Design and Installation Standards Manual 3.3.7.9:

SEDIMENT BARRIERS must be installed along the perimeter areas of the site that will receive stormwater from disturbed areas. This also may include the use of sediment barriers along the contour of disturbed slopes to maintain sheet flow and minimize rill and gully erosion during construction. Installation and maintenance of sediment barriers must be completed in accordance with the maintenance requirements specified by the product manufacturer or the *RI SESC Handbook*.

Will sediment barriers be utilized at the toe of slopes and other downgradient areas subject to stormwater impacts and erosion during construction?

☒ Yes ☐ No

If Yes, Describe the rationale for selecting control measures to serve as sediment barriers at the toe of slopes and other down gradient areas subject to stormwater impacts during construction. Describe the specific sediment barriers that will be used at the site in the table provided.

Silt fence will be installed along the top of the bank uphill of the wetland to protect the wetland from sediment during construction.

If No, discuss rationale for not including these elements in the SESC Plan.

Describe rationale for whether or sediment barriers are required at regular intervals along slopes in order to minimize the creation of concentrated flow paths (i.e. rilling, gully erosion) and to encourage sheet flow. Keep in mind that sediment barriers can be placed at the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow. The description of the selected control measures must focus on sediment barrier spacing as a function of slope length and steepness.

Refer to the RI SESC Handbook, Section Six: Sediment Control Measure, Straw Wattles, Compost Tubes, and Fiber Rolls Control Measure for additional information on acceptable spacing distances.

Will sediment barriers be utilized along the contour of slopes to maintain sheet flow and minimize rill and gully erosion during construction?

☒ Yes ☐ No

If Yes, list the specific sediment barriers that will be used at the site in the table provided. Describe the rationale for the locations and spacing frequency selected by the designer based on slope length and steepness. For additional guidance refer to the RI SESC Handbook or sediment barrier manufacturer's specifications.

SEDIMENT BARRIERS			
Construction Phase #	Sediment Barrier Type	Sediment Barrier is Labeled on Sheet #	Detail is on Sheet #
1	Silt fence	EC-1	DN-1

If No, discuss rationale for not including these elements in the SESC Plan.

Per RI Stormwater Design and Installation Standards Manual 3.3.7.6:

INLET PROTECTION will be utilized to prevent soil and debris from entering storm drain inlets. These measures are usually temporary and are implemented before a site is disturbed. ALL stormwater inlets &/or catch basins that are operational during construction and have the potential to receive sediment-laden stormwater flow from the construction site must be protected using control measures outlined in the *RI SESC Handbook*.

For more information on inlet protection refer to the *RI SESC Handbook*, Inlet Protection control measure.

Maintenance

The operator must clean, or remove and replace the inlet protection measures as sediment accumulates, the filter becomes clogged, and/or as performance is compromised. Accumulated sediment adjacent to the inlet protection measures should be removed by the end of the same work day in which it is found or by the end of the following work day if removal by the same work day is not feasible.

Describe controls, including design specifications and details, which will be implemented to protect all inlets receiving stormwater from the project during the entire duration of the project. For more information on inlet protection refer to the RI SESC Handbook Inlet Protection control measure.

Do inlets exist adjacent to or within the project area that require temporary protection?

☐ Yes ☒ No

If Yes, describe the method(s) of inlet protection, including maintenance requirements and complete the table provided.

The following lists the proposed storm drain inlet types selected from Section Six of the *RI SESC Handbook*. Each row is unique for each phase and inlet protection type.

INLET PROTECTION			
Construction Phase #	Inlet Protection Type	Inlet Protection is labeled on Sheet #	Detail(s) is/are on Sheet #

If No, discuss rationale for not including these elements in the SESC Plan.

CONSTRUCTION ENTRANCES will be used in conjunction with the stabilization of construction roads to reduce the amount of sediment tracking off the project. This project has avoided placing construction entrances on poorly drained soils where possible. Where poorly drained soils could not be eliminated, the detail includes subsurface drainage.

Any construction site access point must employ the control measures on the approved SESC site plans and in accordance with the *RI SESC Handbook*. Construction entrances shall be used in conjunction with the stabilization of construction roads to reduce the amount of mud picked up by construction vehicles. All construction access roads shall be constructed prior to any roadway accepting construction traffic.

The site owner and operator must:

1. Restrict vehicle use to properly designated exit points.

2. Use properly designed and constructed construction entrances at all points that exit onto paved roads so that sediment removal occurs prior to vehicle exit.

3. When and where necessary, use additional controls to remove sediment from vehicle tires prior to exit (i.e. wheel washing racks, rumble strips, and rattle plates).

4. Where sediment has been tracked out from the construction site onto the surface of off-site streets, other paved areas, and sidewalks, the deposited sediment must be removed by the end of the same work day in which the track out occurs. Track-out must be removed by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal.

Will construction entrances be utilized at the proposed construction site?

☒ Yes ☐ No

If Yes, indicate location(s) of vehicle entrance(s) and exit(s), and stabilization practices used to prevent sediment from being tracked off-site in the table provided. See also RI SESC Handbook, Section Six, Construction Entrances Measure.

CONSTRUCTION ENTRANCE			
Construction Phase #	Soil Type at the Entrance	Entrance is located on Sheet #	Detail is on Sheet #
1	Crushed Stone	EC-1	DN-1

If No, discuss rationale.

STOCKPILE CONTAINMENT will be used onsite to minimize or eliminate the discharge of soil, topsoil, base material or rubble, from entering drainage systems or surface waters. All stockpiles must be located within the limit of disturbance, protected from run-on with the use of temporary sediment barriers and provided with cover or stabilization to avoid contact with precipitation and wind where and when practical.

Stock pile management consists of procedures and practices designed to minimize or eliminate the discharge of stockpiled material (soil, topsoil, base material, rubble) from entering drainage systems or surface waters.

For any stockpiles or land clearing debris composed, in whole or in part, of sediment or soil, you must comply with the following requirements:

1. Locate piles within the designated limits of disturbance.

2. Protect from contact with stormwater (including run-on) using a temporary perimeter sediment barrier.

3. Where practicable, provide cover or appropriate temporary vegetative or structural stabilization to avoid direct contact with precipitation or to minimize sediment discharge.

4. NEVER hose down or sweep soil or sediment accumulated on pavement or other impervious surfaces into any stormwater conveyance, storm drain inlet, or surface water.

5. To the maximum extent practicable, contain and securely protect from wind.

Describe materials expected to be stockpiled or stored on-site and procedures for storage of materials to minimize exposure of the materials to stormwater and to eliminate the discharge of stockpiled material from entering drainage systems and surface waters. Refer to the RI SESC Handbook, Stockpile and Staging Area Management Control Measure for additional guidance. Complete the table provided.

Materials to be stockpiled on site are anticipated to be topsoil, fill materials for swales and sand filter detention ponds, and crushed stone for pavement subbase.

STOCKPILE CONTAINMENT				
Construction Phase #	Run-on measures necessary? (yes/no)	Stabilization or Cover Type	Stockpile Containment Measure	Sheet #
1	no	Silt Fence	Siltfence/Strawbales	DN-1

2.11 Erosion, Runoff, and Sediment Control Measure List

Complete the following table for each Phase of construction where Erosion, Runoff, and Sediment Control Measures are located. This table is to be used as part of the SESC Plan Inspection Report – please fill out accordingly.

It is expected that this table and corresponding Inspection Reports will be amended as needed throughout the construction project as control measures are added or modified.

Phase No. #		
Location/Station	**Control Measure Description/Reference**	**Maintenance Requirement**
Silt Fence – Shown on EC-1	Silt Fence. Section Six, Sediment Control Measures, Straw Wattles, Compost Tubes and Fiber Rolls – *RI SESC Handbook*.	Inspection should be made after each storm event or 1 week and repair or replacement should be made promptly as needed. Cleanout of accumulated sediment behind the wattle if sediment accumulates to at least six inches.
Construction Entrance – Shown on EC-1	Stone Stabilized Pad. Section Six: Sediment Control Measures – Construction Entrances – *RI SESC Handbook*.	The entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto pave surfaces. Provide periodic top dressing with additional stone or additional length as conditions demand. Roads adjacent to entrance shall be clean at the end of each day. If maintenance alone is not enough to prevent excessive track out, increase length of entrance, modify construction access road surface, or install washrack or mudrack.
Erosion Control Blankets – Shown on EC-1	Slope Protection. Section Four: Erosion Control Measures – Slope Protection – *RI SESC Handbook*.	Inspect temporary erosion control blankets at least once a week and within 24 hours of the end of a storm with a rainfall amount of 0.5 inch or greater for failures during the period of time that they are required until the slope is permanently stabilized. Blanket failure has occurred when (1) soils and/or seed have washed away from beneath the blanket and the soil surface can be expected to continue to erode at an accelerated rate, and/or (2) the blanket has become dislodged from the soil surface or is torn. If washouts or breakouts occur, reinstall the blanket after regrading and reseeding, ensuring that blanket installation still meets design specifications. When repetitive failures occur at the same location, review conditions and limitations for use and determine if diversions, stone check dams or other measures are needed to reduce failure rate. Repair any dislodged or failed blankets immediately.

SECTION 3: CONSTRUCTION ACTIVITY POLLUTION PREVENTION

Per RI Stormwater Design and Installation Standards Manual 3.3.7.14:

The purpose of construction activity pollution prevention is to prevent day to day construction activities from causing pollution.

This section describes the key pollution prevention measures that must be implemented to avoid and reduce the discharge of pollutants in stormwater. Example control measures include the proper management of waste, material handling and storage, and equipment/vehicle fueling/washing/maintenance operations.

Where applicable, include *RI SESC Handbook* or the *RI Department of Transportation Standard Specifications for Road and Bridge Construction* (as amended) specifications.

3.1 Existing Data of Known Discharges from Site

Per RIPDES Construction General Permit – Part III.I:

List and provide existing data (if available) on the quality of any known discharges from the site. Examples include discharges from existing stormwater collection systems, discharges from industrial areas of the site, etc.

Are there known discharges from the project area?

☐ Yes ☒ No

Describe how this determination was made:

- The Site is undeveloped. There are no existing buildings or known underground pipes on Site.

If yes, list discharges and locations:

- INSERT TEXT HERE

Is there existing data on the quality of the known discharges?

☐ Yes ☒ No

If yes, provide data:

- INSERT TEXT HERE

3.2 Prohibited Discharges

Per RI SESC Handbook – Part D

The following discharges are prohibited at the construction site:

- Contaminated groundwater, unless specifically authorized by the DEM. These types of discharges may only be authorized under a separate DEM RIPDES permit.
- Wastewater from washout of concrete, unless the discharge is contained and managed by appropriate control measures.
- Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials.
- Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance. Proper storage and spill prevention practices must be utilized at all construction sites.
- Soaps or solvents used in vehicle and equipment washing.

- Toxic or hazardous substances from a spill or other release.

All types of waste generated at the site shall be disposed of in a manner consistent with State Law and/or regulations.

Will any of the above listed prohibited discharges be generated at the site?

☐ Yes ☒ No

Proper spill prevention practices will be utilized at the site and a concrete washout on site shown on EC-1.

3.3 Proper Waste Disposal

Per RI SESC Handbook – Part D

Building materials and other construction site wastes must be properly managed and disposed of in a manner consistent with State Law and/or regulations.

- A waste collection area shall be designated on the site that does not receive a substantial amount of runoff from upland areas and does not drain directly to a waterbody or storm drain.
- All waste containers shall be covered to avoid contact with wind and precipitation.
- Waste collection shall be scheduled frequently enough to prevent containers from overfilling.
- All construction site wastes shall be collected, removed, and disposed of in accordance with applicable regulatory requirements and only at authorized disposal sites.
- Equipment and containers shall be checked for leaks, corrosion, support or foundation failure, or other signs of deterioration. Those that are found to be defective shall be immediately repaired or replaced.

Is waste disposal a significant element of the proposed project?

☐ Yes ☒ No

If Yes, identify potential building materials and other construction wastes and document how these wastes will be properly managed and disposed of at the construction site (i.e., trash disposal, sanitary wastes, recycling, and proper material handling). Include references to the specific SESC Site Plans where such control measures are specified.

If No, discuss rationale.

Typical construction site waste will be properly collected and disposed of in accordance with local and state regulations.

3.4 Spill Prevention and Control

Per RI SESC Handbook – Part D

All chemicals and/or hazardous waste material must be stored properly and legally in covered areas, with containment systems constructed in or around the storage areas. Areas must be designated for materials

delivery and storage. All areas where potential spills can occur and their accompanying drainage points must be described. The owner and operator must establish spill prevention and control measures to reduce the chance of spills, stop the source of spills, contain and clean-up spills, and dispose of materials contaminated by spills. The operator must establish and make highly visible location(s) for the storage of spill prevention and control equipment and provide training for personnel responsible for spill prevention and control on the construction site.

Are spill prevention and control measures required for this particular project?

☐ Yes ☒ No

If Yes, describe all areas where potential spills can occur, and their accompanying drainage points, and describe the spill prevention and control plan to reduce the chance of spills, stop the source of spills, contain and clean up spills, dispose of materials contaminated by spills, and train personnel responsible for spill prevention and control. Provide the method of establishing and making highly visible the location(s) for the storage of spill prevention equipment. Refer to the RI SESC Handbook, Spill Prevention and Control Plan for guidance.

If No, discuss rationale.

Typical construction with non-hazardous materials.

3.5 Control of Allowable Non-Stormwater Discharges

Per RIPDES Construction General Permit – Part III.J.2.e:

Discharges not comprised of stormwater are allowed under the RIPDES Construction General Permit but are limited to the following: discharges which result from the washdown of vehicles where no detergents are used; external building wash-down where no detergents are used; the use of water to control dust; firefighting activities; fire hydrant flushing; natural springs; uncontaminated groundwater; lawn watering; potable water sources including waterline flushing; irrigation drainage; pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled materials have been removed) and where detergents are not used; and foundation or footing drains where flows are not contaminated with process materials such as solvents, or contaminated by contact with soils where spills or leaks of toxic or hazardous materials has occurred. If any of these discharges may reasonably be expected to be present and to be mixed with stormwater discharges, they must be specifically listed here.

Are there allowable non-Stormwater discharges present on or near the project area?

☐ Yes ☒ No

If yes, list the sources of allowable non-Stormwater discharge(s) associated with construction activity. For each of the allowable non-stormwater discharge(s) identified, describe the controls and measures that will be implemented at those locations to minimize pollutant contamination of these discharges and to separate them from temporary discharges of stormwater during construction.

List of allowable non-stormwater discharge(s) and the associated control measure(s):

If any existing or proposed discharges consist of contaminated groundwater, such discharges are not authorized under the RIPDES Construction General Permit. These discharges must be permitted separately by seeking coverage to treat and discharge under a separate RIPDES individual permit or under the RIPDES Remediation General Permit. Contact the RIDEM Office of Water Resources RIPDES Permitting Program at 401-222-4700 for application requirements and additional information.

Are there any known or proposed contaminated discharges, including anticipated contaminated dewatering operations, planned on or near the project area?

☐ Yes ☒ No

If yes, list the discharge types and the RIPDES individual permit number(s) or RIPDES Remediation General Permit Authorization number(s) associated with these discharges.

- Discharge Type and RIPDES Individual Permit number : INSERT TEXT HERE
- Discharge Type and RIPDES Remediation General Permit Authorization number: INSERT TEXT HERE

3.6 Control Dewatering Practices

Per RI SESC Handbook – Part D

Site owners and operators are prohibited from discharging groundwater or accumulated stormwater that is removed from excavations, trenches, foundations, vaults, or other similar points of accumulation, unless such waters are first effectively managed by appropriate control measures.

Examples of appropriate control measures include, but are not limited to, temporary sediment basins or sediment traps, sediment socks, dewatering tanks and bags, or filtration systems (e.g. bag or sand filters) that are designed to remove sediment. Uncontaminated, non-turbid dewatering water can be discharged without being routed to a control.

At a minimum the following discharge requirements must be met for dewatering activities:

1. Do not discharge visible floating solids or foam.
2. To the extent feasible, utilize vegetated, upland areas of the site to infiltrate dewatering water before discharge. In no case will surface waters be considered part of the treatment area.
3. At all points where dewatering water is discharged, utilize velocity dissipation devices.
4. With filter backwash water, either haul it away for disposal or return it to the beginning of the treatment process.
5. Replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer's specifications.
6. Dewatering practices must involve the implementation of appropriate control measures as applicable (i.e. containment areas for dewatering earth materials, portable sediment tanks and bags, pumping settling basins, and pump intake protection.)

Is it at all likely that the site operator will need to implement construction dewatering in order to complete the proposed project?

☒ Yes ☐ No

If Yes, describe all areas where construction dewatering may be required and the proposed control measures that will be used to treat and manage dewatering fluids including all proposed discharge points. Proposed control measures must comply with the RI SESC Handbook. Include references to all relevant SESC Site Plans.

- Dewatering is not anticipated, but if dewatering activities are required, the Operator will follow the above requirements at a minimum.
    - Potential locations to discharge water is in the landscape area at the front of the Site or in the southern sand filter detention pond outside of the wetland setback.

If No, discuss rationale.

3.7 Establish Proper Building Material Staging Areas

Per RI SESC Handbook – Part D

All construction materials that have the potential to contaminate stormwater must be stored properly and legally in covered areas, with containment systems constructed in or around the storage areas. Areas must be designated for materials delivery and storage. Designated areas shall be approved by the site owner/engineer. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in the discharge of pollutants, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use).

Describe construction materials expected to be stored on-site and procedures for storage of materials to minimize exposure of the materials to stormwater. Include references to all relevant SESC Site Plans.

Materials to be stockpiled on site are anticipated to be topsoil, fill materials for swales and sand filter detention ponds, and crushed stone for pavement subbase. The construction staging area is shown on EC-1 and shall not to encroach wetland setback.

3.8 Minimize Dust

Per RI SESC Handbook – Part D

Dust control procedures and practices shall be used to suppress dust on a construction site during the construction process, as applicable. Precipitation, temperature, humidity, wind velocity and direction will determine amount and frequency of applications. However, the best method of controlling dust is to prevent dust production. This can best be accomplished by limiting the amount of bare soil exposed at one time. Dust Control measures outlined in the *RI SESC Handbook* shall be followed. Other dust control methods include watering, chemical application, surface roughening, wind barriers, walls, and covers.

Describe dust control practices that will be used to suppress dust and limit its generation (i.e. applying water, limiting the amount of bare soil exposed at one time etc.).

Typical street sweeping practices to minimize dust. Parking lots and sidewalks shall be swept as necessary by the property owner to clean trash and other debris. The property owner will sweep parking lots on the property in the spring to remove winter accumulations of road sand. Loads shall be covered on dump trucks.

3.9 Designate Washout Areas

Per RI SESC Handbook – Part D

At no time shall any material (concrete, paint, chemicals) be washed into storm drains, open ditches, streets, streams, wetlands, or any environmentally sensitive area. The site operator must ensure that construction waste is properly disposed of, to avoid exposure to precipitation, at the end of each working day.

Will washout areas be required for the proposed project?

☒ Yes ☐ No

If Yes, describe location(s) and control measures that will be used to minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, washout areas for concrete mixers, paint, stucco, etc. The recommended location(s) of washout areas should be identified, or at a minimum the locations where these washout areas should not be sited should be called out.

Concrete washout area shown on EC-1 and detail on DN-1.

If No, discuss rationale.

3.10 Establish Proper Equipment/Vehicle Fueling and Maintenance Practices

Per RI SESC Handbook – Part D

Vehicle fueling shall not take place within regulated wetlands or buffer zone areas, or within 50-feet of the storm drain system. Designated areas shall be depicted on the SESC Site Plans, or shall be approved by the site owner.

Vehicle maintenance and washing shall occur off-site, or in designated areas depicted on the SESC Site Plans or approved of by the site owner. Maintenance or washing areas shall not be within regulated wetlands or buffer zone areas, or within 50-feet of the storm drain system. Maintenance areas shall be clearly designated, and barriers shall be used around the perimeter of the maintenance area to prevent stormwater contamination.

Construction vehicles shall be inspected frequently for leaks. Repairs shall take place immediately. Disposal of all used oil, antifreeze, solvents and other automotive-related chemicals shall be according to applicable regulations; at no time shall any material be washed down the storm drain or in to any environmentally sensitive area.

Describe equipment/vehicle fueling and maintenance practices that will be implemented to prevent pollutants from mixing with stormwater (e.g., secondary containment, drip pans, spill kits, etc.) Provide recommended location(s) of fueling/maintenance areas, or, at minimum, locations where fueling/maintenance should be avoided.

Typical small site construction, occasional vehicle fueling via small gas storage containers. Drip pans will be utilized.

3.11 Chemical Treatment for Erosion and Sediment Control

Per RI SESC Handbook – Appendix J

Chemical stabilizers, polymers, and flocculants are readily available on the market and can be easily applied to construction sites for the purposes of enhancing the control of erosion, runoff, and sedimentation. The following guidelines should be adhered to for construction sites that plan to use treatment chemicals as part of their overall erosion, runoff, and sedimentation control strategy.

The U.S. Environmental Protection Agency has conducted research into the relative toxicity of chemicals commonly used for the treatment of construction stormwater discharges. The research conducted by the EPA focused on different formulations of chitosan, a cationic compound, and both cationic and anionic polyacrylamide (PAM). In summary, the studies found significant toxicity resulting from the use of chitosan and cationic PAM in laboratory conditions, and significantly less toxicity associated with using anionic PAM. EPA's research has led to the conclusion that the use of treatment chemicals for erosion, runoff, and sedimentation control requires proper operator training and appropriate usage to avoid risk to aquatic species. In the case of cationic treatment chemicals additional safeguards may be necessary.

Application/Installation Minimum Requirements

If a site operator plans to use polymers, flocculants, or other treatment chemicals during construction the SESC plan must address the following:

1. Treatment chemicals shall not be applied directly to or within 100 feet of any surface water body, wetland, or storm drain inlet.

2. Use conventional erosion, runoff, and sedimentation controls prior to and after the application of treatment chemicals. Use conventional erosion, runoff, and sedimentation controls prior to chemical addition to ensure effective treatment. Chemicals may only be applied where treated stormwater is directed to a sediment control (e.g. temporary sediment basin, temporary sediment trap or sediment barrier) prior to discharge.

3. Sites shall be stabilized as soon as possible using conventional measures to minimize the need to use chemical treatment.

4. Select appropriate treatment chemicals. Chemicals must be selected that are appropriately suited to the types of soils likely to be exposed during construction and to the expected turbidity, pH, and flow rate of stormwater flowing into the chemical treatment system or treatment area. **Soil testing is essential. Using the wrong form of chemical treatment will result in some form of performance failure and unnecessary environmental risk.**

5. Minimize discharge risk from stored chemicals. Store all treatment chemicals in leak-proof containers that are kept under storm-resistant cover and surrounded by secondary containment structures (e.g., spill berms, decks, spill containment pallets), or provide equivalent measures, designed and maintained to minimize the potential discharge of treatment chemicals in stormwater or by any other means (e.g., storing chemicals in covered areas or having a spill kit available on site).

6. Use chemicals in accordance with good engineering practices and specifications of the chemical provider/supplier. You must also use treatment chemicals and chemical treatment systems in accordance with good engineering practices, and with dosing specifications and sediment removal design specifications provided by the supplier of the applicable chemicals, or document specific departures from these practices or specifications and how they reflect good engineering practice.

Will chemical stabilizers, polymers, flocculants or other treatment chemicals be utilized on the proposed construction project?

☐ Yes ☒ No

If Yes, create a Treatment Chemical Application Plan and describe how the owner or SESC Plan preparer/designer intends to educate the designated operator prior to the application of such treatment chemicals.

Treatment Chemical Application Plan Required Elements

Insert information listed below:

1. *List Manufacturer's name and product name for each treatment chemical proposed for use at the site.*
2. *Attach a copy of applicable Material Safety Data Sheets (MSDSs) or Safety Data Sheets (SDS) for each proposed treatment chemical.*
3. *Provide the results of third party toxicity testing of the materials proposed for use at the site.*
4. *Provide a certification from the site owner and operator that all proposed treatment chemicals are the same as those used in the toxicity tests and will not be altered in any way.*
5. *Provide an explanation as to why conventional erosion, runoff, and sediment control measures, alone or in combination, will not be sufficient to prevent turbidity impacts and sedimentation in downstream receptors.*
6. *Provide a plan prepared in consultation with the chemical treatment manufacturer(s) or authorized manufacturer's representative which includes the following:*
    a. *Identification of the areas of the site where treatment chemicals will be applied and the name, location, and distance to all downstream receptors that have the potential to be impacted from the discharges from the treatment areas.*
    b. *List the expected start and end dates or specific phases of the project during which each treatment chemical will be applied.*
    c. *Provide test results for representative soils from the site, and any recommendations from the manufacturer based on the soil tests, indicating the type of treatment chemical and the recommended application rate.*

d. List the frequency, method, and rates of application which are designed to ensure that treatment chemical concentrations will not exceed 50% of the IC25 or NOEC toxicity values, whichever is less, for each treatment chemical proposed.
e. Provide the frequency of inspection and maintenance of the treatment chemical application system.
f. List the method proposed for the collection, removal, and disposal or stabilization of settled particles to prevent re-suspension.
g. Describe the training that will be provided to all persons who will handle and use treatment chemicals at the construction site. Training must include appropriate, product-specific training and proper dosing requirements for each product.

Treatment Chemical SESC Plan Weekly Inspection Report Documentation Requirements

1. Document the type and quantity of treatment chemicals applied.

2. List the date, duration of discharge, and estimated discharge rate.

3. Provide an estimate of the volume of water treated.

4. Provide an estimate of the concentration of treatment chemicals in the discharge, with supporting calculations.

3.12 Construction Activity Pollution Prevention Control Measure List

Complete the following table for each Phase of construction where Pollution Prevention Control Measures will be implemented. This table is to be used as part of the SESC Plan Inspection Report – please fill out accordingly.

It is expected that this table will be amended as needed throughout the construction project.

Phase No. #1 (Only One Phase)		
Location/Station	**Control Measure Description/Reference**	**Maintenance Requirement**
Wetland located at eastern end of site	Maintain silt fence at top of bank	Check stability and effectiveness of silt fence at least once every seven (7) calendar days and within twenty-four (24) hours after any storm event, which generates at least 0.25 inches of rainfall per twenty-four (24) hour period and/or after a significant amount of runoff or snowmelt. Remove sediment when sediment is one-foot or less.
Site Entrance	Construction Entrance	Maintain rock at construction entrance to be 5 inches minimum. Inspect Kingstown Road daily for sediment being tracked onto the road and sweep entrance area as necessary to mitigate tracking of sediment onto the public road.

Insert a new table for each additional construction phase.

SECTION 4: CONTROL MEASURE INSTALLATION, INSPECTION, and MAINTENANCE

4.1 Installation

Per RI SESC Handbook – Part D:

Complete the installation of temporary erosion, runoff, sediment, and pollution prevention control measures by the time each phase of earth-disturbance has begun. All stormwater control measures must be installed in accordance with good judgment, including applicable design and manufacturer specifications. Installation techniques and maintenance requirements may be found in manufacturer specifications and/or the *RI SESC Handbook*.

Include references to SESC Site Plans where installation requirements are located.

EC-1, EC-2, and DN-1

4.2 Monitoring Weather Conditions

Per RI SESC Handbook – Part D:

Anticipating Weather Events - Care will be taken to the best of the operator's ability to avoid disturbing large areas prior to anticipated precipitation events. Weather forecasts must be routinely checked, and in the case of an expected precipitation event of over 0.25-inches over a 24-hour period, it is highly recommended that all control measures should be evaluated and maintained as necessary, prior to the weather event. In the case of an extreme weather forecast (greater than one-inch of rain over a 24-hour period), additional erosion/sediment controls may need to be installed.

Storm Event Monitoring For Inspections - At a minimum, storm events must be monitored and tracked in order to determine when post-storm event inspections must be conducted. Inspections must be conducted and documented at least once every seven (7) calendar days and within twenty-four (24) hours after any storm event, which generates at least 0.25 inches of rainfall per twenty-four (24) hour period and/or after a significant amount of runoff or snowmelt.

In order for an operator to successfully satisfy this requirement list the weather gauge station that will be utilized to monitor weather conditions on the construction site. See www.wunderground.com or www.weather.gov for available stations.

The weather gauge station and website that will be utilized to monitor weather conditions on the construction site is as follows: www.weather.gov

4.3 Inspections

Per RI SESC Handbook – Part D:

Minimum Frequency - Each of the following areas must be inspected by or under the supervision of the owner and operator at least once every seven (7) calendar days and within twenty-four (24) hours after any storm event, which generates at least 0.25 inches of rainfall per twenty-four (24) hour period and/or after a significant amount of runoff or snowmelt:

a. All areas that have been cleared, graded, or excavated and where permanent stabilization has not been achieved;

b. All stormwater erosion, runoff, and sediment control measures (including pollution prevention control measures) installed at the site;

c. Construction material, unstabilized soil stockpiles, waste, borrow, or equipment storage, and maintenance areas that are covered by this permit and are exposed to precipitation;

d. All areas where stormwater typically flows within the site, including temporary drainage ways designed to divert, convey, and/or treat stormwater;

e. All points of discharge from the site;

f. All locations where temporary soil stabilization measures have been implemented;

g. All locations where vehicles enter or exit the site.

Reductions in Inspection Frequency - If earth disturbing activities are suspended due to frozen conditions, inspections may be reduced to a frequency of once per month. The owner and operator must document the beginning and ending dates of these periods in an inspection report.

Qualified Personnel – The site owner and operator are responsible for designating personnel to conduct inspections and for ensuring that the personnel who are responsible for conducting the inspections are "qualified" to do so. A "qualified person" is a person knowledgeable in the principles and practices of erosion, runoff, sediment, and pollution prevention controls, who possesses the skills to assess conditions at the construction site that could impact stormwater quality, and the skills to assess the effectiveness of any stormwater controls selected and installed to meet the requirements of the permit.

Recordkeeping Requirements - All records of inspections, including records of maintenance and corrective actions must be maintained with the SESC Plan. Inspection records must include the date and time of the inspection, and the inspector's name, signature, and contact information.

General Notes

- A separate inspection report will be prepared for each inspection.
- The Inspection Reference Number shall be a combination of the RIPDES Construction General Permit No - consecutively numbered inspections. Example: Inspection reference number for the **4**th inspection of a project would be:RIR10####-**4**
- Each report will be signed and dated by the Inspector and must be kept onsite.
- Each report will be signed and dated by the Site Operator.
- The corrective action log contained in each inspection report must be completed, signed, and dated by the site operator once all necessary repairs have been completed.
- It is the responsibility of the site operator to maintain a copy of the SESC Plan, copies of all completed inspection reports, and amendments as part of the SESC Plan documentation at the site during construction.

Failure to make and provide documentation of inspections and corrective actions under this part constitutes a violation of your permit and enforcement actions under 46-12 of R.I. General Laws may result.

4.4 Maintenance

Per RI SESC Handbook – Part D:

Maintenance procedures for erosion and sedimentation controls and stormwater management structures/facilities are described on the SESC Site Plans and in the *RI SESC Handbook*.

Site owners and operators must ensure that all erosion, runoff, sediment, and pollution prevention controls remain in effective operating condition and are protected from activities that would reduce their effectiveness. Erosion, runoff, sedimentation, and pollution prevention control measures must be maintained throughout the course of the project.

Note: It is recommended that the site operator designates a full-time, on-site contact person responsible for working with the site owner to resolve SESC Plan-related issues.

4.5 Corrective Actions

Per RI SESC Handbook – Part D:

If, in the opinion of the designated site inspector, corrective action is required, the inspector shall note it on the inspection report and shall inform the site operator that corrective action is necessary. The site operator must make all necessary repairs whenever maintenance of any of the control measures instituted at the site is required.

In accordance with the *RI SESC Handbook*, the site operator shall initiate work to fix the problem immediately after its discovery, and complete such work by the close of the next work day, if the problem does not require significant repair or replacement, or if the problem can be corrected through routine maintenance.

When installation of a new control or a significant repair is needed, site owners and operators must ensure that the new or modified control measure is installed and made operational by no later than seven (7) calendar days from the time of discovery where feasible. If it is infeasible to complete the installation or repair within seven (7) calendar days, the reasons why it is infeasible must be documented in the SESC Plan along with the schedule for installing the control measures and making it operational as soon as practicable after the 7-day timeframe. Such documentation of these maintenance procedures and timeframes should be described in the inspection report in which the issue was first documented. If these actions result in changes to any of the control measures outlined in the SESC Plan, site owners and operators must also modify the SESC Plan accordingly within seven (7) calendar days of completing this work.

SECTION 5: AMENDMENTS

Per RIPDES Construction General Permit – Part III.F:

This SESC Plan is intended to be a working document. It is expected that amendments will be required throughout the active construction phase of the project. **Even if practices are installed on a site according to the approved plan, the site is only in compliance when erosion, runoff, and sedimentation are effectively controlled throughout the entire site for the entire duration of the project.**

The SESC Plan shall be amended within seven (7) days whenever there is a change in design, construction, operation, maintenance or other procedure which has a significant effect on the potential for the discharge of pollutants, or if the SESC Plan proves to be ineffective in achieving its objectives (i.e. the selected control measures are not effective in controlling erosion or sedimentation).

In addition, the SESC Plan shall be amended to identify any new operator that will implement a component of the SESC Plan.

All revisions must be recorded in the Record of Amendments Log Sheet, which is contained in Attachment G of this SESC Plan, and dated red-lined drawings and/or a detailed written description must be appended to the SESC Plan. Inspection Forms must be revised to reflect all amendments. Update the Revision Date and the Version # in the footer of the Report to reflect amendments made.

All SESC Plan Amendments, except minor non-technical revisions, must be approved by the site owner and operator. Any amendments to control measures that involve the practice of engineering must be reviewed, signed, and stamped by a Professional Engineer registered in the State of RI.

The amended SESC plan must be kept on file at the site while construction is ongoing and any modifications must be documented.

Attach a copy of the Amendment Log.

Reference RI Model SESC Plan ATTACHMENT G

SECTION 6: RECORDKEEPING

RIPDES Construction General Permit – Parts III.D, III.G, III.J.3.b.iii, & V.O

It is the site owner and site operator's responsibility to have the following documents available at the construction site and immediately available for RIDEM review upon request:

- A copy of the fully signed and dated SESC Plan, which includes:
  - A copy of the General Location Map
    INCLUDED AS ATTACHMENT A
  - A copy of all SESC Site Plans
    INCLUDED AS ATTACHMENT B
  - A copy of the RIPDES Construction General Permit *(To save paper and file space, do not include in DEM/CRMC submittal, for operator copy only)*
    INCLUDED AS ATTACHMENT C
  - A copy of any regulatory permits (RIDEM Freshwater Wetlands Permit, CRMC Assent, RIDEM Water Quality Certification, RIDEM Groundwater Discharge Permit, RIDEM RIPDES Construction General Permit authorization letter, etc.)
    INCLUDED AS ATTACHMENT D
  - The signed and certified NOI form or permit application form *(if required as part of the application, see RIPDES Construction General Permit for applicability)*
    INCLUDED AS ATTACHMENT E
  - Completed Inspection Reports w/Completed Corrective Action Logs
    INCLUDED AS ATTACHMENT F
  - SESC Plan Amendment Log
    INCLUDED AS ATTACHMENT G

Attachments to be added upon approval of General Permit and prior to construction.

SECTION 7: PARTY CERTIFICATIONS

RIPDES Construction General Permit – Part V.G

All parties working at the project site are required to comply with the Soil Erosion and Sediment Control Plan (SESC Plan including SESC Site Plans) for any work that is performed on-site. The site owner, site operator, contractors and sub-contractors are encouraged to advise all employees working on this project of the requirements of the SESC Plan. A copy of the SESC Plan is available for your review at the following location: Insert Onsite Location Here, or may be obtained by contacting the site owner or site operator.

The site owner and site operator and each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement.

I acknowledge that I have read and understand the terms and conditions of the Soil Erosion and Sediment Control (SESC) Plan for the above designated project and agree to follow the control measures described in the SESC Plan and SESC Site Plans.

Site Owner:
Insert Company or Organization Name
Insert Name & Title
Insert Address _____
Insert City, State, Zip Code signature/date
Insert Telephone Number, Insert Fax/Email

Site Operator:
Insert Company or Organization Name
Insert Name & Title
Insert Address _____
Insert City, State, Zip Code signature/date
Insert Telephone Number, Insert Fax/Email

Designated Site Inspector:
Insert Company or Organization Name
Insert Name & Title
Insert Address _____
Insert City, State, Zip Code signature/date
Insert Telephone Number, Insert Fax/Email

SubContractor SESC Plan Contact:
Insert Company or Organization Name
Insert Name & Title
Insert Address _____
Insert City, State, Zip Code signature/date
Insert Telephone Number, Insert Fax/Email
Insert more contact/signature lines as necessary

LIST OF ATTACHMENTS

Attachments to be added upon approval of General Permit and prior to construction.

Attachment A - General Location Map

Attachment B - SESC Site Plans

Attachment C - Copy of RIPDES Construction General Permit and Authorization to Discharge *(To save paper and file space, do not include in DEM/CRMC submittal, for operator copy only)*

Attachment D - Copy of Other Regulatory Permits

Attachment E - Copy of RIPDES NOI *(if required as part of application, see RIPDES Construction General Permit for applicability)*

Attachment F - Inspection Reports w/ Corrective Action Log

Attachment G - SESC Plan Amendment Log

APPENDIX D

Operation and Maintenance Manual

BMP ID	BMP TYPE	INSPECTION/MAINTENANCE SCHEDULE
SF-1 SF-2	SEDIMENT FOREBAY	SEDIMENT FOREBAYS SHALL BE INSPECTED QUARTERLY IN THE MONTHS OF APRIL, JULY, OCTOBER, AND DECEMBER FOR THE FIRST YEAR OF OPERATION. INSPECTIONS SHALL BE CONDUCTED BIANNUALLY IN THE MONTHS OF APRIL AND OCTOBER AFTER THE FIRST YEAR OF OPERATION. FOREBAYS SHALL BE CLEANED ONCE PER YEAR IN THE MONTH OF APRIL OR WHEN SEDIMENT BUILDUP REACHES A LEVEL GREATER THAN EQUAL TO 50% OF THE FOREBAY DEPTH.
D-1	DETENTION BASIN	THE DETENTION BASIN AND OUTLET PIPE SHALL BE INSPECTED QUARTERLY IN THE MONTHS OF APRIL, JULY, OCTOBER, AND DECEMBER. SEDIMENT SHALL BE REMOVED FROM THE DETENTION BASIN WHEN THE SEDIMENT BUILDUP REACHES A LEVEL GREATER THAN OR EQUAL TO 10% OF THE BASIN DEPTH. REMOVE TRASH AND DEBRIS FROM OUTLET PIPE TRASH RACK AND DISPOSE IN PROPER RECEPTACLES TO ENSURE CORRECT BASIN FUNCTIONALITY ON A MINIMUM QUARTERLY BASIS, OR AS NECESSARY. REPAIR RIPRAP APRON OUTLET PROTECTION AS NECESSARY IF LOOSE OR WASHED OUT STONES AND/OR BARE SOIL ARE OBSERVED.

GRAPHIC SCALE

50 25 0 50

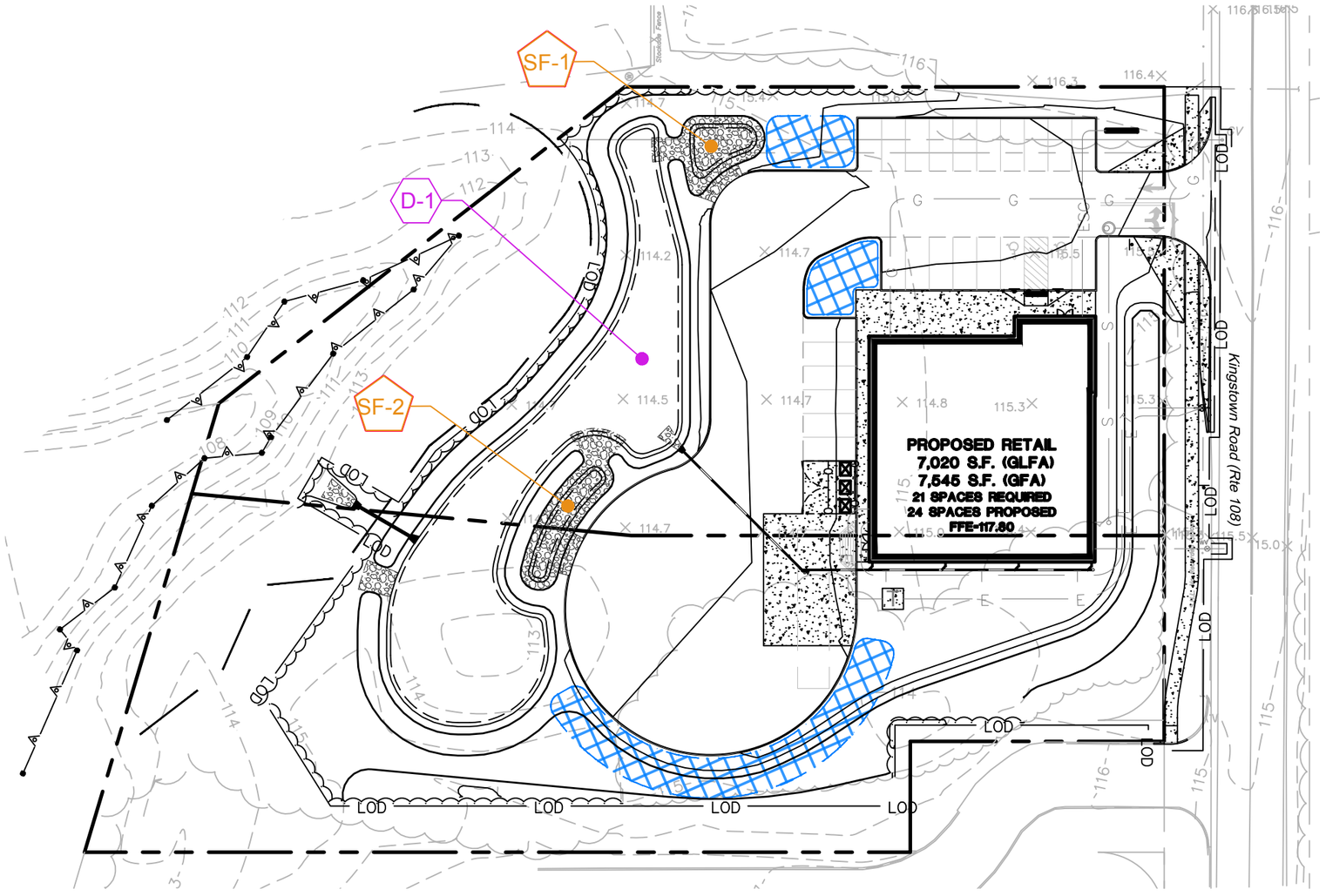
SCALE IN FEET

LEGEND

SF-1 — SEDIMENT FOREBAY

D-1 — DETENTION BASIN

SNOW STORAGE AREA



BL Companies

STORMWATER OPERATION AND MAINTENANCE PLAN

PROPOSED RETAIL DEVELOPMENT
1860 KINGSTOWN ROAD (RI ROUTE 108)
SOUTH KINGSTOWN, RHODE ISLAND

PREPARED FOR: GARRETT HOMES, LLC, 59 FIELD STREET, TORRINGTON, CT

Designed	C.J.L.
Drawn	C.J.L.
Reviewed	M.J.B.
Scale	1"=50'
Project	18C6704
Date	07/17/20
Rev	

OM-1

GENERAL OPERATION AND MAINTENANCE NOTES:

PURPOSE & GOALS

THE PURPOSE OF THIS MANUAL IS TO ENSURE THAT THE STORMWATER MANAGEMENT COMPONENTS ARE OPERATED IN ACCORDANCE WITH ALL APPROVALS AND PERMITS. THE PRIMARY GOAL IS TO INFORM ALL THE PROPERTY MANAGERS ABOUT HOW THE SYSTEM OPERATES AND WHAT MAINTENANCE ITEMS ARE NECESSARY TO PROTECT DOWNSTREAM WETLANDS AND WATERCOURSES. THE SECONDARY GOAL IS TO PROVIDE A PRACTICAL, EFFICIENT MEANS OF MAINTENANCE PLANNING AND RECORD KEEPING VERIFYING PERMIT COMPLIANCE.

AN ESSENTIAL COMPONENT OF A SUCCESSFUL STORMWATER SYSTEM IS THE ONGOING OPERATION AND MAINTENANCE OF THE VARIOUS COMPONENTS OF THE STORMWATER DRAINAGE, CONTROL, AND CONVEYANCE SYSTEMS. FAILURE TO PROVIDE EFFECTIVE MAINTENANCE CAN REDUCE THE HYDRAULIC CAPACITY AND THE POLLUTANT REMOVAL EFFICIENCY OF STORMWATER PRACTICES.

MANY PEOPLE EXPECT THAT STORMWATER FACILITIES WILL CONTINUE TO FUNCTION CORRECTLY AS DESIGNED FOREVER. HOWEVER, IT IS INEVITABLE THAT DETERIORATION OF THE STORMWATER INFRASTRUCTURE WILL OCCUR ONCE IT BECOMES OPERATIONAL. THE QUESTION IS NOT WHETHER STORMWATER MANAGEMENT SYSTEM MAINTENANCE IS NECESSARY BUT HOW OFTEN. IDEALLY, A PROGRAM SHOULD ADDRESS OPERATION AND MAINTENANCE CONCERNS PROACTIVELY INSTEAD OF REACTING TO PROBLEMS THAT OCCUR SUCH AS FLOODING, OR WATER QUALITY DEGRADATION ASSOCIATED WITH EROSION, CLOGGING, OR OUTRIGHT FAILURE OF ONE OR MORE PRACTICES. THUS, ON-GOING MAINTENANCE IS A VITAL PART OF ENSURING THE OPERATIONAL SUCCESS OF STORMWATER MANAGEMENT FACILITIES AND IS CRITICAL TO ACHIEVING AN EXTENDED SERVICE LIFE OF CONTINUOUS OPERATION AS DESIGNED.

THERE ARE TWO KEY COMPONENTS TO ADEQUATELY MAINTAINING A STORMWATER MANAGEMENT INFRASTRUCTURE:

- PERIODIC AND SCHEDULED INSPECTIONS, AND
- MAINTENANCE SCHEDULING AND PERFORMANCE.

RESPONSIBLE PARTIES

THE PROPERTY OWNER WILL BE RESPONSIBLE FOR IMPLEMENTING THE PLAN ON THE PROPERTY. IT IS NOT MANDATORY THAT ALL INSPECTORS BE TRAINED ENGINEERS, BUT THEY SHOULD HAVE SOME KNOWLEDGE OR EXPERIENCE WITH STORMWATER SYSTEMS. IN GENERAL, TRAINED STORMWATER ENGINEERS SHOULD, HOWEVER, DIRECT THEM. INSPECTIONS BY REGISTERED ENGINEERS SHOULD BE PERFORMED WHERE ROUTINE INSPECTION HAS REVEALED A QUESTION OF STRUCTURAL OR HYDRAULIC INTEGRITY AFFECTING PUBLIC SAFETY.

LIST OF PERMITS & SPECIAL CONDITIONS

THE PROJECT WILL RECEIVE SEVERAL PERMITS, WHICH MAY CONTAIN SPECIAL CONDITIONS THAT REQUIRE COMPLIANCE BY THE PROPERTY OWNER AND MAINTENANCE CONTRACTORS. THIS PERMIT MAY INCLUDE THE FOLLOWING:

- TOWN OF SOUTH KINGSTOWN PERMITS – SPECIAL USE PERMIT, DEVELOPMENT PLAN AND BUILDING PERMIT
- STATE OF RHODE ISLAND – DETERMINATION AND PERMIT OF INSIGNIFICANT WETLAND ALTERATION

MAINTENANCE LOGS

THE PROPERTY OWNER WILL KEEP A RECORD OF ALL MAINTENANCE PROCEDURES PERFORMED, DATE OF INSPECTION/ CLEANINGS, ETC. COPIES OF INSPECTION REPORTS AND MAINTENANCE RECORDS SHALL BE KEPT ON-SITE.

EMPLOYEE TRAINING

THE PROPERTY OWNER WILL HAVE AN EMPLOYEE-TRAINING PROGRAM, WITH ANNUAL UP-DATES, TO ENSURE THAT THE QUALIFIED EMPLOYEES CHARGED WITH MAINTAINING THE BUILDINGS AND GROUNDS DO SO IN ACCORDANCE WITH THE APPROVED PERMIT CONDITIONS. ALL EMPLOYEES THAT HAVE MAINTENANCE DUTIES WILL BE ADEQUATELY INFORMED OF THEIR RESPONSIBILITIES.

SITE MAINTENANCE NOTES:

PARKING LOTS

PARKING LOTS AND SIDEWALKS SHALL BE SWEPT AS NECESSARY BY THE PROPERTY OWNER TO CLEAN TRASH AND OTHER DEBRIS. THE PROPERTY OWNER WILL SWEEP PARKING LOTS ON THE PROPERTY IN THE SPRING TO REMOVE WINTER ACCUMULATIONS OF ROAD SAND.

LANDSCAPING

THE MANAGEMENT COMPANY RETAINED BY THE PROPERTY OWNER WILL MAINTAIN LANDSCAPED AREAS. NORMALLY THE LANDSCAPING MAINTENANCE WILL CONSIST OF PRUNING, MULCHING, PLANTING, MOWING LAWNS, RAKING LEAVES, ETC. USE OF FERTILIZERS AND PESTICIDES WILL BE CONTROLLED AND LIMITED TO MINIMAL AMOUNTS NECESSARY FOR HEALTHY LANDSCAPE MAINTENANCE.

THE LAWN AREAS, ONCE ESTABLISHED, WILL BE MAINTAINED AT A TYPICAL HEIGHT OF 3 ½". THIS WILL ALLOW THE GRASS TO BE MAINTAINED WITH MINIMAL IMPACT FROM WEEDS AND/OR PESTS. THE LOW-MAINTENANCE AREAS WILL BE MAINTAINED AS A MEADOW OR ALLOWED TO REVERT TO NATURAL CONDITIONS. TOPSOIL, BRUSH, LEAVES, CLIPPINGS, WOODCHIPS, MULCH, EQUIPMENT, AND OTHER MATERIAL SHALL BE STORED OFF SITE.

OUTDOOR STORAGE

THERE WILL BE NO OUTDOOR STORAGE OF HAZARDOUS CHEMICALS, DE-ICING AGENTS, FERTILIZER, PESTICIDES, OR HERBICIDES ANYWHERE AROUND THE BUILDINGS.

DEICING AND SNOW REMOVAL & STORAGE

THE USE OF CLEAN SAND MAY BE USED TO AID TRACTION IN CONJUNCTION WITH SALT AND/OR CHEMICALS FOR DEICING, SNOW MELTING AND OTHER RELATED WINTER WEATHER MANAGEMENT. SNOW SHALL BE SHOVELED AND PLOWED FROM SIDEWALK AND PARKING AREAS AS SOON AS PRACTICAL DURING AND AFTER WINTER STORMS. SAND ACCUMULATION SHALL BE REMOVED FROM THE SITE AT THE END OF THE WINTER SEASON OR APPROPRIATE TIME WHEN SEASONAL SNOW HAS MELTED. ALTERNATIVE DEICING METHODS MUST BE SUBMITTED PRIOR TO USE ONSITE FOR REVIEW TO THE TOWN OF SOUTH KINGSTOWN FOR APPROVAL.

SPILL CONTROL

THE FOLLOWING PRACTICES WILL BE FOLLOWED FOR SPILL PREVENTION AND CLEAN-UP:

- MANUFACTURER'S RECOMMENDED METHODS FOR SPILL CLEAN-UP WILL BE CLEARLY POSTED AND SITE PERSONNEL WILL BE MADE AWARE OF THE PROCEDURES AND THE LOCATION OF THE INFORMATION AND CLEAN-UP SUPPLIES.
- MATERIALS AND EQUIPMENT NECESSARY FOR SPILL CLEAN-UP WILL BE KEPT IN THE MATERIAL STORAGE AREA ON-SITE. EQUIPMENT AND MATERIALS WILL INCLUDE BUT NOT BE LIMITED TO: ABSORBENT BOOMS OR MATS, BROOMS, DUST PANS, MOPS, RAGS, GLOVES, GOGGLES, SAND, AND PLASTIC AND METAL TRASH CONTAINERS SPECIFICALLY FOR THIS PURPOSE.
- ALL SPILLS WILL BE CLEANED IMMEDIATELY AFTER DISCOVERY.
- THE SPILL AREA WILL BE KEPT WELL-VENTILATED AND PERSONNEL WILL WEAR APPROPRIATE PROTECTIVE CLOTHING TO PREVENT INJURY FROM CONTACT WITH HAZARDOUS SUBSTANCE.
- SPILLS OF TOXIC OR HAZARDOUS MATERIAL, REGARDLESS OF SIZE, WILL BE REPORTED TO THE APPROPRIATE STATE OR LOCAL GOVERNMENT AGENCY.
- IF A SPILL OCCURS, THIS PLAN WILL BE ADJUSTED TO INCLUDE MEASURES TO PREVENT THIS TYPE OF SPILL FROM REOCCURRING AND HOW TO CLEAN THE SPILL IF THERE IS ANOTHER ONE. A DESCRIPTION OF THE SPILL, THE CAUSE, AND THE REMEDIATION MEASURES WILL ALSO BE INCLUDED.

A SPILL REPORT SHALL BE PREPARED BY THE PROPERTY OWNER FOLLOWING EACH OCCURRENCE. THE SPILL REPORT SHALL PRESENT A DESCRIPTION OF THE RELEASE, INCLUDING QUANTITY AND TYPE OF MATERIAL, DATE OF SPILL, CIRCUMSTANCES LEADING TO THE RELEASE, LOCATION OF SPILL, RESPONSE ACTIONS AND PERSONNEL, DOCUMENTATION OF NOTIFICATIONS AND CORRECTIVE MEASURES IMPLEMENTED TO PREVENT REOCCURRENCE.

THE PROPERTY OWNER SHALL IDENTIFY AN APPROPRIATELY QUALIFIED AND TRAINED SITE EMPLOYEE INVOLVED WITH DAY-TO-DAY SITE OPERATIONS TO BE THE SPILL PREVENTION AND CLEAN-UP COORDINATOR. THE NAME(S) OF RESPONSIBLE SPILL PERSONNEL SHALL BE POSTED ON-SITE. EACH EMPLOYEE SHALL BE INSTRUCTED THAT ALL SPILLS ARE TO BE REPORTED TO THE SPILL PREVENTION AND CLEAN-UP COORDINATOR.

BL Companies

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PROPOSED RETAIL DEVELOPMENT
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