

# STORMWATER MANAGEMENT REPORT

## Commercial Site Redevelopment

AP 107SE LOT 72  
160 EAST MAIN ROAD  
MIDDLETOWN, RI

**OCTOBER, 2023**

*Revised: March 2024*

**Prepared for:**

160 EAST MAIN ROAD, LLC  
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Prepared by:

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A handwritten signature in cursive script, appearing to read "Michael E. Russell", written below the professional seal.



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## **INTRODUCTION**

This report was prepared to address the Stormwater Management System (SMS) for the Commercial Site Redevelopment on AP 107SE Lot 72, 160 East Main Road in Middletown, RI. The Redevelopment will create a 1,700sf footprint for a bank facility with 2 drive-up ATM kiosk's, 13 parking spaces and associated landscaping, lighting, utilities & stormwater management system. This report will outline and summarize the current SMS as well the improvements of the proposed redevelopment. Said improvements are intended to control peak runoff & volume rates for the added impervious area(s). Additionally, the proposed SMS will provide, at minimum, the water quality & stormwater recharge volumes as required for redevelopment projects. The SMS as proposed will comply with the Town of Middletown's & State of Rhode Island's Stormwater Management Policy (2018).

## **EXISTING CONDITIONS (SUMMARY)**

The subject property is approximately 0.61 acres in area and fronts along East Main Road (Map 107SE, Lot 72). The existing ground cover consists almost entirely of a paved parking area with concrete pads and a small strip of landscaping along the rear of the lot. The site slopes generally towards the Southwest (Westerly Abutter and East Main Road). The elevation change across the site is approximately 2 feet. Currently, most of the Runoff from the site sheet flows across the site towards the Westerly abutter with about 1/3 of the site flowing towards East Main Road. The summary of the Pre-Development Analysis is located in Appendix 1 of this report.

## **PROPOSED CONDITIONS (SUMMARY)**

The Redevelopment will create a 1,700sf footprint for a bank facility with 2 drive-up ATM kiosk's, 13 parking spaces and associated landscaping, lighting, utilities & stormwater management system. Site grading will create the cuts & fills throughout the project limits to create the desired site layout and function and will maintain pre-development runoff patterns. A stormwater collection system will be incorporated into the newly designed parking area to collect runoff from impervious surfaces and landscaped areas within the limit of disturbance. This system consists of a sediment forebay and a wet swale. The forebay will provide pre-treatment for the wet swale. The system will accommodate a 100-year storm event, handle the water quality volume (WQv) and provide for total suspended solids (TSS) removal. This overall system is designed to accommodate, at minimum, the water quality volume (WQv). This system also provides recharge volume (ReV) to the maximum extent practicable for redevelopment projects. Low impact development practices (LID) will be employed to the maximum extent practicable. Summary of the Post-Development Conditions Analysis is located in Appendix 1 of this report.

## **SITE SOIL & GROUNDWATER CONDITIONS**

The underlying watershed soils within the developed area consist of the Pittstown Silt Loam series (Hydrologic Group C). A soil evaluation and groundwater determination was performed in October 20, 2023. Soil textures below the pavement & fill consisted primarily of a silt & gravel mixture with groundwater elevation approximately 12" below existing grade.



## **METHODOLOGY**

HydroCad® Stormwater Modeling System was used to quantify stormwater runoff generated by WQv, 1-year, 2-year, 10-year, 25-year, and 100-year design storms in pre and post development conditions. The calculations were performed using “Dynamic Storage-Indication” to also analyze the impact of the pipe size, material and slope selection in upstream structures. The HydroCad® program utilizes Natural Resource Conservation Service (NRCS) techniques (TR-20) to predict stormwater runoff for given design storms. The calculations performed by HydroCad® are based on the NRCS model return frequency Type III distribution and a user specified design storms. The calculation is also performed using the simple dynamic method which utilizes *Rawls Rate* for infiltration based on soil texture.

The analysis is performed by modeling the drainage area as subcatchments and ponds. A subcatchment is an area that produces runoff and drains into a pond. A pond can be a natural depression, wetland, or manmade structure that detains or retains stormwater runoff. The drainage network pipe design adequacy is evaluated by integrating it in the HydroCad® pond model for drainage structures. The pipes are modeled as the pond outlet-culvert type. Manning’s Equation and/or Hazen-Williams hydraulic equations were also utilized to determine the required pipe sizes as well as minimum and maximum pipe slopes.

## **DRAINAGE SYSTEM MODEL**

The proposed development is analyzed by creating an existing condition or pre-development model and a full build-out or post-development model. The models were created to compare the existing and post-development runoff to the abutting properties and existing SMS. The post-development analysis results are also utilized to adequately size the proposed practices. Analysis within the site was performed using WQv, 1, 2, 10, 25 and 100-year design storm projections. All excess stormwater runoff captured on site will be treated and retained/recharged on site. On site post-development runoff rates flowing overland toward abutting properties will not exceed pre-development runoff rates up to the 100-year event.

The pre-development HydroCad® model within the site consists of two subcatchments. One subcatchment encompasses the runoff that flows to the Westerly abutter. The last subcatchment are the areas that flow towards East Main Road. This was created to determine the existing stormwater runoff originating from the site.

Post-development subcatchment models were created for the site. Subcatchment models represent the drainage areas to each of the proposed reaches, drainage structures, or storage & treatment areas. Each of these areas provides elements of treatment, storage, and infiltration in order to effectively mitigate flows to the Point of Analysis in each analyzed storm event. See Post-Development output in Appendix B and summary at the end of this narrative.

The majority of the paved & landscaped areas for the developed area discharge into a forebay, before flowing into a wet swale.



## **STORMWATER TREATMENT**

Stormwater runoff will be treated through the use of Best Management Practices (BMP's). The BMP's used within the proposed development include a forebay and a wet swale. These BMP's will aid in the removal of pollutants within the stormwater runoff.

This system will provide pollutant removal and treatment to the maximum extent practicable for the proposed redevelopment.

## **ANALYSIS DATA**

The following information was used in performing the calculations for the drainage system.

<b>RUNOFF SUMMARY AT ANALYSIS POINTS</b>		
Cover Description		
Cover Type	Hydrologic condition	Curve Number (Class: A , B , C, D)
Landscaping, Lawns	Good	39 , 61 , 74 , 80
Woods	Good	30 , 55 , 70 , 77
Gravel	Good	76 , 85 , 89 , 91
Buildings	-	98
Pavement	-	98
Brick Walkways	-	98

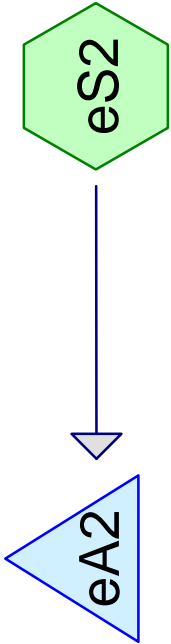
Rainfall Data (Type III - 24 Hour Storm Duration\*)

Storm Event	Rainfall
WQv	1.2 inches
1 - Year	2.8 inches
2 - Year	3.3 inches
10 - Year	4.9 inches
25 - Year	6.1 inches

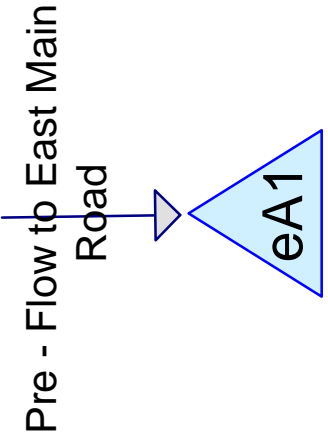




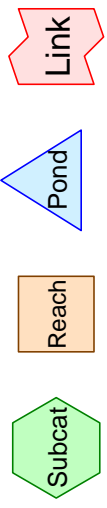




Pre - Analysis Point-2      Pre - Flow to Westerly Abutter



Pre - Analysis Point-1



**Area Listing (selected nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
1,554	74	>75% Grass cover, Good, HSG C (eS1, eS2)
322	98	Conc Pads (eS2)
169	98	Curbing (eS1, eS2)
24,370	98	Paved parking, HSG C (eS1, eS2)
<b>26,415</b>	<b>97</b>	<b>TOTAL AREA</b>

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Type III 24-hr 1-Year Rainfall=2.80"

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Time span=0.00-36.00 hrs, dt=0.04 hrs, 901 points  
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Pond eA1: Pre - Analysis Point-1**

Inflow=0.49 cfs 1,646 cf  
Primary=0.49 cfs 1,646 cf

**Pond eA2: Pre - Analysis Point-2**

Inflow=1.12 cfs 3,778 cf  
Primary=1.12 cfs 3,778 cf

**Subcatchment eS1: Pre - Flow to East Main Road**

Runoff Area=7,973 sf 94.90% Impervious Runoff Depth=2.48"  
Tc=5.0 min CN=74/98 Runoff=0.49 cfs 1,646 cf

**Subcatchment eS2: Pre - Flow to Westerly Abutter**

Runoff Area=18,442 sf 93.78% Impervious Runoff Depth=2.46"  
Tc=5.0 min CN=74/98 Runoff=1.12 cfs 3,778 cf

**Total Runoff Area = 26,415 sf Runoff Volume = 5,424 cf Average Runoff Depth = 2.46"**  
**5.88% Pervious = 1,554 sf 94.12% Impervious = 24,861 sf**

**Summary for Pond eA1: Pre - Analysis Point-1**

Inflow Area = 7,973 sf, 94.90% Impervious, Inflow Depth = 2.48" for 1-Year event  
 Inflow = 0.49 cfs @ 12.07 hrs, Volume= 1,646 cf  
 Primary = 0.49 cfs @ 12.07 hrs, Volume= 1,646 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Pond eA2: Pre - Analysis Point-2**

Inflow Area = 18,442 sf, 93.78% Impervious, Inflow Depth = 2.46" for 1-Year event  
 Inflow = 1.12 cfs @ 12.07 hrs, Volume= 3,778 cf  
 Primary = 1.12 cfs @ 12.07 hrs, Volume= 3,778 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Subcatchment eS1: Pre - Flow to East Main Road**

Runoff = 0.49 cfs @ 12.07 hrs, Volume= 1,646 cf, Depth= 2.48"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
7,502	98	Paved parking, HSG C
64	98	Curbing
407	74	>75% Grass cover, Good, HSG C
7,973	97	Weighted Average
407	74	5.10% Pervious Area
7,566	98	94.90% Impervious Area

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

**Summary for Subcatchment eS2: Pre - Flow to Westerly Abutter**

Runoff = 1.12 cfs @ 12.07 hrs, Volume= 3,778 cf, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 1-Year Rainfall=2.80"

	Area (sf)	CN	Description
*	322	98	Conc Pads
	16,868	98	Paved parking, HSG C
*	105	98	Curbing
	1,147	74	>75% Grass cover, Good, HSG C
	18,442	97	Weighted Average
	1,147	74	6.22% Pervious Area
	17,295	98	93.78% Impervious Area

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

Time span=0.00-36.00 hrs, dt=0.04 hrs, 901 points  
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Pond eA1: Pre - Analysis Point-1**

Inflow=0.87 cfs 3,018 cf  
Primary=0.87 cfs 3,018 cf

**Pond eA2: Pre - Analysis Point-2**

Inflow=2.01 cfs 6,939 cf  
Primary=2.01 cfs 6,939 cf

**Subcatchment eS1: Pre - Flow to East Main Road**

Runoff Area=7,973 sf 94.90% Impervious Runoff Depth=4.54"  
Tc=5.0 min CN=74/98 Runoff=0.87 cfs 3,018 cf

**Subcatchment eS2: Pre - Flow to Westerly Abutter**

Runoff Area=18,442 sf 93.78% Impervious Runoff Depth=4.52"  
Tc=5.0 min CN=74/98 Runoff=2.01 cfs 6,939 cf

**Total Runoff Area = 26,415 sf Runoff Volume = 9,957 cf Average Runoff Depth = 4.52"**  
**5.88% Pervious = 1,554 sf 94.12% Impervious = 24,861 sf**

**Summary for Pond eA1: Pre - Analysis Point-1**

Inflow Area = 7,973 sf, 94.90% Impervious, Inflow Depth = 4.54" for 10-Year event  
 Inflow = 0.87 cfs @ 12.07 hrs, Volume= 3,018 cf  
 Primary = 0.87 cfs @ 12.07 hrs, Volume= 3,018 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Pond eA2: Pre - Analysis Point-2**

Inflow Area = 18,442 sf, 93.78% Impervious, Inflow Depth = 4.52" for 10-Year event  
 Inflow = 2.01 cfs @ 12.07 hrs, Volume= 6,939 cf  
 Primary = 2.01 cfs @ 12.07 hrs, Volume= 6,939 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Subcatchment eS1: Pre - Flow to East Main Road**

Runoff = 0.87 cfs @ 12.07 hrs, Volume= 3,018 cf, Depth= 4.54"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
7,502	98	Paved parking, HSG C
64	98	Curbing
407	74	>75% Grass cover, Good, HSG C
7,973	97	Weighted Average
407	74	5.10% Pervious Area
7,566	98	94.90% Impervious Area

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

**Summary for Subcatchment eS2: Pre - Flow to Westerly Abutter**

Runoff = 2.01 cfs @ 12.07 hrs, Volume= 6,939 cf, Depth= 4.52"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 10-Year Rainfall=4.90"

	Area (sf)	CN	Description
*	322	98	Conc Pads
	16,868	98	Paved parking, HSG C
*	105	98	Curbing
	1,147	74	>75% Grass cover, Good, HSG C
	18,442	97	Weighted Average
	1,147	74	6.22% Pervious Area
	17,295	98	93.78% Impervious Area

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

Time span=0.00-36.00 hrs, dt=0.04 hrs, 901 points  
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Pond eA1: Pre - Analysis Point-1**

Inflow=1.10 cfs 3,807 cf  
Primary=1.10 cfs 3,807 cf

**Pond eA2: Pre - Analysis Point-2**

Inflow=2.53 cfs 8,761 cf  
Primary=2.53 cfs 8,761 cf

**Subcatchment eS1: Pre - Flow to East Main Road**

Runoff Area=7,973 sf 94.90% Impervious Runoff Depth=5.73"  
Tc=5.0 min CN=74/98 Runoff=1.10 cfs 3,807 cf

**Subcatchment eS2: Pre - Flow to Westerly Abutter**

Runoff Area=18,442 sf 93.78% Impervious Runoff Depth=5.70"  
Tc=5.0 min CN=74/98 Runoff=2.53 cfs 8,761 cf

**Total Runoff Area = 26,415 sf Runoff Volume = 12,567 cf Average Runoff Depth = 5.71"**  
**5.88% Pervious = 1,554 sf 94.12% Impervious = 24,861 sf**

**Summary for Pond eA1: Pre - Analysis Point-1**

Inflow Area = 7,973 sf, 94.90% Impervious, Inflow Depth = 5.73" for 25-Year event  
 Inflow = 1.10 cfs @ 12.07 hrs, Volume= 3,807 cf  
 Primary = 1.10 cfs @ 12.07 hrs, Volume= 3,807 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Pond eA2: Pre - Analysis Point-2**

Inflow Area = 18,442 sf, 93.78% Impervious, Inflow Depth = 5.70" for 25-Year event  
 Inflow = 2.53 cfs @ 12.07 hrs, Volume= 8,761 cf  
 Primary = 2.53 cfs @ 12.07 hrs, Volume= 8,761 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Subcatchment eS1: Pre - Flow to East Main Road**

Runoff = 1.10 cfs @ 12.07 hrs, Volume= 3,807 cf, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 25-Year Rainfall=6.10"

Area (sf)	CN	Description
7,502	98	Paved parking, HSG C
64	98	Curbing
407	74	>75% Grass cover, Good, HSG C
7,973	97	Weighted Average
407	74	5.10% Pervious Area
7,566	98	94.90% Impervious Area

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Type III 24-hr 25-Year Rainfall=6.10"

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Tc Length Slope Velocity Capacity Description  
 (min) (feet) (ft/ft) (ft/sec) (cfs)

5.0 **Direct Entry,**

**Summary for Subcatchment eS2: Pre - Flow to Westerly Abutter**

Runoff = 2.53 cfs @ 12.07 hrs, Volume= 8,761 cf, Depth= 5.70"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 25-Year Rainfall=6.10"

	Area (sf)	CN	Description
*	322	98	Conc Pads
	16,868	98	Paved parking, HSG C
*	105	98	Curbing
	1,147	74	>75% Grass cover, Good, HSG C
	18,442	97	Weighted Average
	1,147	74	6.22% Pervious Area
	17,295	98	93.78% Impervious Area

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

Time span=0.00-36.00 hrs, dt=0.04 hrs, 901 points  
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Pond eA1: Pre - Analysis Point-1**

Inflow=1.56 cfs 5,456 cf  
Primary=1.56 cfs 5,456 cf

**Pond eA2: Pre - Analysis Point-2**

Inflow=3.59 cfs 12,571 cf  
Primary=3.59 cfs 12,571 cf

**Subcatchment eS1: Pre - Flow to East Main Road**

Runoff Area=7,973 sf 94.90% Impervious Runoff Depth=8.21"  
Tc=5.0 min CN=74/98 Runoff=1.56 cfs 5,456 cf

**Subcatchment eS2: Pre - Flow to Westerly Abutter**

Runoff Area=18,442 sf 93.78% Impervious Runoff Depth=8.18"  
Tc=5.0 min CN=74/98 Runoff=3.59 cfs 12,571 cf

**Total Runoff Area = 26,415 sf Runoff Volume = 18,027 cf Average Runoff Depth = 8.19"**  
**5.88% Pervious = 1,554 sf 94.12% Impervious = 24,861 sf**

**Summary for Pond eA1: Pre - Analysis Point-1**

Inflow Area = 7,973 sf, 94.90% Impervious, Inflow Depth = 8.21" for 100-Year event  
 Inflow = 1.56 cfs @ 12.07 hrs, Volume= 5,456 cf  
 Primary = 1.56 cfs @ 12.07 hrs, Volume= 5,456 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Pond eA2: Pre - Analysis Point-2**

Inflow Area = 18,442 sf, 93.78% Impervious, Inflow Depth = 8.18" for 100-Year event  
 Inflow = 3.59 cfs @ 12.07 hrs, Volume= 12,571 cf  
 Primary = 3.59 cfs @ 12.07 hrs, Volume= 12,571 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Subcatchment eS1: Pre - Flow to East Main Road**

Runoff = 1.56 cfs @ 12.07 hrs, Volume= 5,456 cf, Depth= 8.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
7,502	98	Paved parking, HSG C
64	98	Curbing
407	74	>75% Grass cover, Good, HSG C
7,973	97	Weighted Average
407	74	5.10% Pervious Area
7,566	98	94.90% Impervious Area

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

**Summary for Subcatchment eS2: Pre - Flow to Westerly Abutter**

Runoff = 3.59 cfs @ 12.07 hrs, Volume= 12,571 cf, Depth= 8.18"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 100-Year Rainfall=8.60"

	Area (sf)	CN	Description
*	322	98	Conc Pads
	16,868	98	Paved parking, HSG C
*	105	98	Curbing
	1,147	74	>75% Grass cover, Good, HSG C
	18,442	97	Weighted Average
	1,147	74	6.22% Pervious Area
	17,295	98	93.78% Impervious Area

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

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Type III 24-hr WQv Rainfall=1.20"

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Time span=0.00-36.00 hrs, dt=0.04 hrs, 901 points  
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Pond eA1: Pre - Analysis Point-1**

Inflow=0.19 cfs 624 cf  
Primary=0.19 cfs 624 cf

**Pond eA2: Pre - Analysis Point-2**

Inflow=0.44 cfs 1,426 cf  
Primary=0.44 cfs 1,426 cf

**Subcatchment eS1: Pre - Flow to East Main Road**

Runoff Area=7,973 sf 94.90% Impervious Runoff Depth=0.94"  
Tc=5.0 min CN=74/98 Runoff=0.19 cfs 624 cf

**Subcatchment eS2: Pre - Flow to Westerly Abutter**

Runoff Area=18,442 sf 93.78% Impervious Runoff Depth=0.93"  
Tc=5.0 min CN=74/98 Runoff=0.44 cfs 1,426 cf

**Total Runoff Area = 26,415 sf Runoff Volume = 2,050 cf Average Runoff Depth = 0.93"**  
**5.88% Pervious = 1,554 sf 94.12% Impervious = 24,861 sf**

**Summary for Pond eA1: Pre - Analysis Point-1**

Inflow Area = 7,973 sf, 94.90% Impervious, Inflow Depth = 0.94" for WQv event  
 Inflow = 0.19 cfs @ 12.07 hrs, Volume= 624 cf  
 Primary = 0.19 cfs @ 12.07 hrs, Volume= 624 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Pond eA2: Pre - Analysis Point-2**

Inflow Area = 18,442 sf, 93.78% Impervious, Inflow Depth = 0.93" for WQv event  
 Inflow = 0.44 cfs @ 12.07 hrs, Volume= 1,426 cf  
 Primary = 0.44 cfs @ 12.07 hrs, Volume= 1,426 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Subcatchment eS1: Pre - Flow to East Main Road**

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 624 cf, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
7,502	98	Paved parking, HSG C
64	98	Curbing
407	74	>75% Grass cover, Good, HSG C
7,973	97	Weighted Average
407	74	5.10% Pervious Area
7,566	98	94.90% Impervious Area

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

**Summary for Subcatchment eS2: Pre - Flow to Westerly Abutter**

Runoff = 0.44 cfs @ 12.07 hrs, Volume= 1,426 cf, Depth= 0.93"

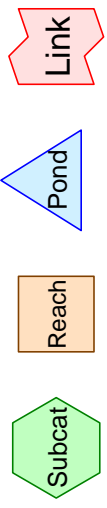
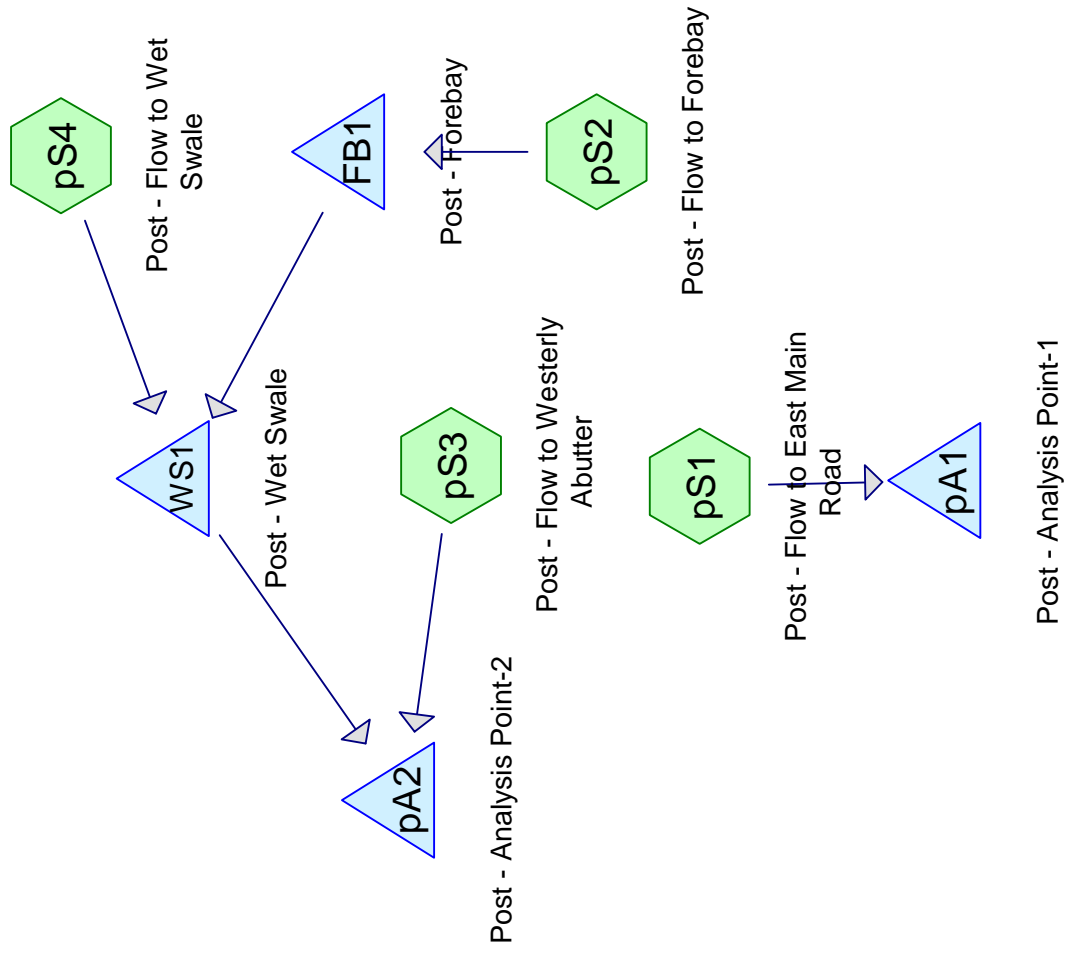
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
* 322	98	Conc Pads
16,868	98	Paved parking, HSG C
* 105	98	Curbing
1,147	74	>75% Grass cover, Good, HSG C
18,442	97	Weighted Average
1,147	74	6.22% Pervious Area
17,295	98	93.78% Impervious Area

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





**Routing Diagram for 22133 HydroCAD WVTS 3-12-2024**  
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**22133 HydroCAD WVTS 3-12-2024**

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**Area Listing (selected nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
7,763	74	>75% Grass cover, Good, HSG C (pS1, pS2, pS3, pS4)
765	98	Curbing (pS1, pS2, pS3)
156	98	Dumpster Pad (pS2)
14,702	98	Paved parking, HSG C (pS1, pS2, pS3)
1,953	98	Roofs, HSG C (pS1, pS2)
962	98	Sidewalk (pS1, pS2)
114	98	Wall (pS1, pS3)
<b>26,415</b>	<b>91</b>	<b>TOTAL AREA</b>

Time span=0.00-36.00 hrs, dt=0.04 hrs, 901 points  
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Pond FB1: Post - Forebay**

Peak Elev=47.74' Storage=171 cf Inflow=0.79 cfs 2,648 cf  
Outflow=0.77 cfs 2,530 cf

**Pond pA1: Post - Analysis Point-1**

Inflow=0.45 cfs 1,522 cf  
Primary=0.45 cfs 1,522 cf

**Pond pA2: Post - Analysis Point-2**

Inflow=0.84 cfs 2,742 cf  
Primary=0.84 cfs 2,742 cf

**Subcatchment pS1: Post - Flow to East Main Road**

Runoff Area=8,233 sf 80.34% Impervious Runoff Depth=2.22"  
Tc=5.0 min CN=74/98 Runoff=0.45 cfs 1,522 cf

**Subcatchment pS2: Post - Flow to Forebay**

Runoff Area=14,368 sf 79.97% Impervious Runoff Depth=2.21"  
Tc=5.0 min CN=74/98 Runoff=0.79 cfs 2,648 cf

**Subcatchment pS3: Post - Flow to Westerly Abutter**

Runoff Area=1,115 sf 49.15% Impervious Runoff Depth=1.66"  
Tc=5.0 min CN=74/98 Runoff=0.05 cfs 154 cf

**Subcatchment pS4: Post - Flow to Wet Swale**

Runoff Area=2,699 sf 0.00% Impervious Runoff Depth=0.78"  
Tc=5.0 min CN=74/0 Runoff=0.05 cfs 176 cf

**Pond WS1: Post - Wet Swale**

Peak Elev=47.66' Storage=863 cf Inflow=0.83 cfs 2,707 cf  
Outflow=0.80 cfs 2,588 cf

**Total Runoff Area = 26,415 sf Runoff Volume = 4,500 cf Average Runoff Depth = 2.04"**  
**29.39% Pervious = 7,763 sf 70.61% Impervious = 18,652 sf**

**Summary for Pond FB1: Post - Forebay**

Inflow Area = 14,368 sf, 79.97% Impervious, Inflow Depth = 2.21" for 1-Year event  
 Inflow = 0.79 cfs @ 12.07 hrs, Volume= 2,648 cf  
 Outflow = 0.77 cfs @ 12.09 hrs, Volume= 2,530 cf, Atten= 2%, Lag= 0.8 min  
 Primary = 0.77 cfs @ 12.09 hrs, Volume= 2,530 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Peak Elev= 47.74' @ 12.09 hrs Surf.Area= 653 sf Storage= 171 cf

Plug-Flow detention time= 48.9 min calculated for 2,530 cf (96% of inflow)  
 Center-of-Mass det. time= 22.7 min ( 789.0 - 766.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	47.25'	361 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
47.25	55	0	0
47.50	351	51	51
47.75	667	127	178
48.00	796	183	361

Device	Routing	Invert	Outlet Devices
#1	Primary	47.65'	<b>12.0' long x 3.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

**Primary OutFlow** Max=0.75 cfs @ 12.09 hrs HW=47.74' TW=47.66' (Dynamic Tailwater)  
**1=Broad-Crested Rectangular Weir** (Weir Controls 0.75 cfs @ 0.71 fps)

**Summary for Pond pA1: Post - Analysis Point-1**

Inflow Area = 8,233 sf, 80.34% Impervious, Inflow Depth = 2.22" for 1-Year event  
 Inflow = 0.45 cfs @ 12.07 hrs, Volume= 1,522 cf  
 Primary = 0.45 cfs @ 12.07 hrs, Volume= 1,522 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Pond pA2: Post - Analysis Point-2**

Inflow Area = 18,182 sf, 66.21% Impervious, Inflow Depth = 1.81" for 1-Year event  
 Inflow = 0.84 cfs @ 12.11 hrs, Volume= 2,742 cf  
 Primary = 0.84 cfs @ 12.11 hrs, Volume= 2,742 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Subcatchment pS1: Post - Flow to East Main Road**

Runoff = 0.45 cfs @ 12.07 hrs, Volume= 1,522 cf, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
1,619	74	>75% Grass cover, Good, HSG C
471	98	Roofs, HSG C
616	98	Sidewalk
5,221	98	Paved parking, HSG C
48	98	Wall
258	98	Curbing
8,233	93	Weighted Average
1,619	74	19.66% Pervious Area
6,614	98	80.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
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5.0

Direct Entry,

**Summary for Subcatchment pS2: Post - Flow to Forebay**

Runoff = 0.79 cfs @ 12.07 hrs, Volume= 2,648 cf, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
9,159	98	Paved parking, HSG C
346	98	Sidewalk
2,878	74	>75% Grass cover, Good, HSG C
1,482	98	Roofs, HSG C
347	98	Curbing
156	98	Dumpster Pad
14,368	93	Weighted Average
2,878	74	20.03% Pervious Area
11,490	98	79.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
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5.0

Direct Entry,

**Summary for Subcatchment pS3: Post - Flow to Westerly Abutter**

Runoff = 0.05 cfs @ 12.08 hrs, Volume= 154 cf, Depth= 1.66"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 1-Year Rainfall=2.80"

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Type III 24-hr 1-Year Rainfall=2.80"

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Area (sf)	CN	Description
* 66	98	Wall
567	74	>75% Grass cover, Good, HSG C
322	98	Paved parking, HSG C
* 160	98	Curbing
1,115	86	Weighted Average
567	74	50.85% Pervious Area
548	98	49.15% Impervious Area

Tc Length Slope Velocity Capacity Description  
(min) (feet) (ft/ft) (ft/sec) (cfs)

5.0

Direct Entry,

**Summary for Subcatchment pS4: Post - Flow to Wet Swale**

Runoff = 0.05 cfs @ 12.09 hrs, Volume= 176 cf, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
Type III 24-hr 1-Year Rainfall=2.80"

Area (sf)	CN	Description
2,699	74	>75% Grass cover, Good, HSG C
2,699	74	100.00% Pervious Area

Tc Length Slope Velocity Capacity Description  
(min) (feet) (ft/ft) (ft/sec) (cfs)

5.0

Direct Entry,

**Summary for Pond WS1: Post - Wet Swale**

Inflow Area = 17,067 sf, 67.32% Impervious, Inflow Depth = 1.90" for 1-Year event  
Inflow = 0.83 cfs @ 12.09 hrs, Volume= 2,707 cf  
Outflow = 0.80 cfs @ 12.11 hrs, Volume= 2,588 cf, Atten= 4%, Lag= 1.4 min  
Primary = 0.80 cfs @ 12.11 hrs, Volume= 2,588 cf

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Type III 24-hr 1-Year Rainfall=2.80"

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Starting Elev= 47.50' Surf.Area= 1,139 sf Storage= 663 cf  
 Peak Elev= 47.66' @ 12.11 hrs Surf.Area= 1,294 sf Storage= 863 cf (200 cf above start)  
 Flood Elev= 48.00' Surf.Area= 1,612 sf Storage= 1,351 cf (688 cf above start)

Plug-Flow detention time= 155.6 min calculated for 1,923 cf (71% of inflow)  
 Center-of-Mass det. time= 16.8 min ( 811.0 - 794.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	1,351 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
46.50	154	0	0
47.00	680	209	209
47.50	1,139	455	663
48.00	1,612	688	1,351

Device	Routing	Invert	Outlet Devices
#1	Primary	47.60'	<b>20.0' long x 3.0' breadth Broad-Crested Rectangular Weir</b>
			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
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.72 2.81 2.92 2.97 3.07 3.32

**Primary OutFlow** Max=0.78 cfs @ 12.11 hrs HW=47.66' TW=0.00' (Dynamic Tailwater)  
**1-Broad-Crested Rectangular Weir** (Weir Controls 0.78 cfs @ 0.62 fps)

Time span=0.00-36.00 hrs, dt=0.04 hrs, 901 points  
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Pond FB1: Post - Forebay**

Peak Elev=47.79' Storage=205 cf Inflow=1.47 cfs 5,013 cf  
Outflow=1.44 cfs 4,895 cf

**Pond pA1: Post - Analysis Point-1**

Inflow=0.84 cfs 2,879 cf  
Primary=0.84 cfs 2,879 cf

**Pond pA2: Post - Analysis Point-2**

Inflow=1.65 cfs 5,612 cf  
Primary=1.65 cfs 5,612 cf

**Subcatchment pS1: Post - Flow to East Main Road**

Runoff Area=8,233 sf 80.34% Impervious Runoff Depth=4.20"  
Tc=5.0 min CN=74/98 Runoff=0.84 cfs 2,879 cf

**Subcatchment pS2: Post - Flow to Forebay**

Runoff Area=14,368 sf 79.97% Impervious Runoff Depth=4.19"  
Tc=5.0 min CN=74/98 Runoff=1.47 cfs 5,013 cf

**Subcatchment pS3: Post - Flow to Westerly Abutter**

Runoff Area=1,115 sf 49.15% Impervious Runoff Depth=3.45"  
Tc=5.0 min CN=74/98 Runoff=0.10 cfs 321 cf

**Subcatchment pS4: Post - Flow to Wet Swale**

Runoff Area=2,699 sf 0.00% Impervious Runoff Depth=2.28"  
Tc=5.0 min CN=74/0 Runoff=0.17 cfs 514 cf

**Pond WS1: Post - Wet Swale**

Peak Elev=47.70' Storage=911 cf Inflow=1.61 cfs 5,409 cf  
Outflow=1.56 cfs 5,291 cf

**Total Runoff Area = 26,415 sf Runoff Volume = 8,726 cf Average Runoff Depth = 3.96"**  
**29.39% Pervious = 7,763 sf 70.61% Impervious = 18,652 sf**

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**Summary for Pond FB1: Post - Forebay**

Inflow Area = 14,368 sf, 79.97% Impervious, Inflow Depth = 4.19" for 10-Year event  
 Inflow = 1.47 cfs @ 12.07 hrs, Volume= 5,013 cf  
 Outflow = 1.44 cfs @ 12.08 hrs, Volume= 4,895 cf, Atten= 2%, Lag= 0.7 min  
 Primary = 1.44 cfs @ 12.08 hrs, Volume= 4,895 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Peak Elev= 47.79' @ 12.09 hrs Surf.Area= 687 sf Storage= 205 cf

Plug-Flow detention time= 30.1 min calculated for 4,895 cf (98% of inflow)  
 Center-of-Mass det. time= 15.1 min ( 772.4 - 757.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	47.25'	361 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
47.25	55	0	0
47.50	351	51	51
47.75	667	127	178
48.00	796	183	361

Device	Routing	Invert	Outlet Devices
#1	Primary	47.65'	<b>12.0' long x 3.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.64 2.68 2.72 2.81 2.92 2.97 3.07 3.32

**Primary OutFlow** Max=1.37 cfs @ 12.08 hrs HW=47.79' TW=47.70' (Dynamic Tailwater)  
**1-Broad-Crested Rectangular Weir** (Weir Controls 1.37 cfs @ 0.83 fps)

**Summary for Pond pA1: Post - Analysis Point-1**

Inflow Area = 8,233 sf, 80.34% Impervious, Inflow Depth = 4.20" for 10-Year event  
 Inflow = 0.84 cfs @ 12.07 hrs, Volume= 2,879 cf  
 Primary = 0.84 cfs @ 12.07 hrs, Volume= 2,879 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Pond pA2: Post - Analysis Point-2**

Inflow Area = 18,182 sf, 66.21% Impervious, Inflow Depth = 3.70" for 10-Year event  
 Inflow = 1.65 cfs @ 12.10 hrs, Volume= 5,612 cf  
 Primary = 1.65 cfs @ 12.10 hrs, Volume= 5,612 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Subcatchment pS1: Post - Flow to East Main Road**

Runoff = 0.84 cfs @ 12.07 hrs, Volume= 2,879 cf, Depth= 4.20"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
1,619	74	>75% Grass cover, Good, HSG C
471	98	Roofs, HSG C
616	98	Sidewalk
5,221	98	Paved parking, HSG C
48	98	Wall
258	98	Curbing
8,233	93	Weighted Average
1,619	74	19.66% Pervious Area
6,614	98	80.34% Impervious Area

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Type III 24-hr 10-Year Rainfall=4.90"

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Tc Length Slope Velocity Capacity Description  
 (min) (feet) (ft/ft) (ft/sec) (cfs)

5.0

Direct Entry,

**Summary for Subcatchment pS2: Post - Flow to Forebay**

Runoff = 1.47 cfs @ 12.07 hrs, Volume= 5,013 cf, Depth= 4.19"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
9,159	98	Paved parking, HSG C
346	98	Sidewalk
2,878	74	>75% Grass cover, Good, HSG C
1,482	98	Roofs, HSG C
347	98	Curbing
156	98	Dumpster Pad
14,368	93	Weighted Average
2,878	74	20.03% Pervious Area
11,490	98	79.97% Impervious Area

Tc Length Slope Velocity Capacity Description  
 (min) (feet) (ft/ft) (ft/sec) (cfs)

5.0

Direct Entry,

**Summary for Subcatchment pS3: Post - Flow to Westerly Abutter**

Runoff = 0.10 cfs @ 12.08 hrs, Volume= 321 cf, Depth= 3.45"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 10-Year Rainfall=4.90"

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Type III 24-hr 10-Year Rainfall=4.90"

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Area (sf)	CN	Description
* 66	98	Wall
567	74	>75% Grass cover, Good, HSG C
322	98	Paved parking, HSG C
* 160	98	Curbing
1,115	86	Weighted Average
567	74	50.85% Pervious Area
548	98	49.15% Impervious Area

Tc Length Slope Velocity Capacity Description  
(min) (feet) (ft/ft) (ft/sec) (cfs)

5.0

Direct Entry,

**Summary for Subcatchment pS4: Post - Flow to Wet Swale**

Runoff = 0.17 cfs @ 12.08 hrs, Volume= 514 cf, Depth= 2.28"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
2,699	74	>75% Grass cover, Good, HSG C
2,699	74	100.00% Pervious Area

Tc Length Slope Velocity Capacity Description  
(min) (feet) (ft/ft) (ft/sec) (cfs)

5.0

Direct Entry,

**Summary for Pond WS1: Post - Wet Swale**

Inflow Area = 17,067 sf, 67.32% Impervious, Inflow Depth = 3.80" for 10-Year event  
Inflow = 1.61 cfs @ 12.08 hrs, Volume= 5,409 cf  
Outflow = 1.56 cfs @ 12.10 hrs, Volume= 5,291 cf, Atten= 3%, Lag= 1.1 min  
Primary = 1.56 cfs @ 12.10 hrs, Volume= 5,291 cf

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Type III 24-hr 10-Year Rainfall=4.90"

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Starting Elev= 47.50' Surf.Area= 1,139 sf Storage= 663 cf  
 Peak Elev= 47.70' @ 12.10 hrs Surf.Area= 1,329 sf Storage= 911 cf (248 cf above start)  
 Flood Elev= 48.00' Surf.Area= 1,612 sf Storage= 1,351 cf (688 cf above start)

Plug-Flow detention time= 108.1 min calculated for 4,622 cf (85% of inflow)  
 Center-of-Mass det. time= 12.3 min ( 790.9 - 778.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	46.50'	1,351 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
46.50	154	0	0
47.00	680	209	209
47.50	1,139	455	663
48.00	1,612	688	1,351

Device	Routing	Invert	Outlet Devices
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#1	Primary	47.60'	<b>20.0' long x 3.0' breadth Broad-Crested Rectangular Weir</b>
			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
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.72 2.81 2.92 2.97 3.07 3.32

**Primary OutFlow** Max=1.53 cfs @ 12.10 hrs HW=47.70' TW=0.00' (Dynamic Tailwater)  
**1=Broad-Crested Rectangular Weir** (Weir Controls 1.53 cfs @ 0.77 fps)

Time span=0.00-36.00 hrs, dt=0.04 hrs, 901 points  
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Pond FB1: Post - Forebay**

Peak Elev=47.82' Storage=223 cf Inflow=1.87 cfs 6,397 cf  
Outflow=1.83 cfs 6,279 cf

**Pond pA1: Post - Analysis Point-1**

Inflow=1.07 cfs 3,672 cf  
Primary=1.07 cfs 3,672 cf

**Pond pA2: Post - Analysis Point-2**

Inflow=2.15 cfs 7,318 cf  
Primary=2.15 cfs 7,318 cf

**Subcatchment pS1: Post - Flow to East Main Road**

Runoff Area=8,233 sf 80.34% Impervious Runoff Depth=5.35"  
Tc=5.0 min CN=74/98 Runoff=1.07 cfs 3,672 cf

**Subcatchment pS2: Post - Flow to Forebay**

Runoff Area=14,368 sf 79.97% Impervious Runoff Depth=5.34"  
Tc=5.0 min CN=74/98 Runoff=1.87 cfs 6,397 cf

**Subcatchment pS3: Post - Flow to Westerly Abutter**

Runoff Area=1,115 sf 49.15% Impervious Runoff Depth=4.54"  
Tc=5.0 min CN=74/98 Runoff=0.13 cfs 422 cf

**Subcatchment pS4: Post - Flow to Wet Swale**

Runoff Area=2,699 sf 0.00% Impervious Runoff Depth=3.27"  
Tc=5.0 min CN=74/0 Runoff=0.24 cfs 735 cf

**Pond WS1: Post - Wet Swale**

Peak Elev=47.72' Storage=937 cf Inflow=2.07 cfs 7,014 cf  
Outflow=2.02 cfs 6,896 cf

**Total Runoff Area = 26,415 sf Runoff Volume = 11,226 cf Average Runoff Depth = 5.10"**  
**29.39% Pervious = 7,763 sf 70.61% Impervious = 18,652 sf**

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**Summary for Pond FB1: Post - Forebay**

Inflow Area = 14,368 sf, 79.97% Impervious, Inflow Depth = 5.34" for 25-Year event  
 Inflow = 1.87 cfs @ 12.07 hrs, Volume= 6,397 cf  
 Outflow = 1.83 cfs @ 12.08 hrs, Volume= 6,279 cf, Atten= 2%, Lag= 0.6 min  
 Primary = 1.83 cfs @ 12.08 hrs, Volume= 6,279 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Peak Elev= 47.82' @ 12.09 hrs Surf.Area= 701 sf Storage= 223 cf

Plug-Flow detention time= 24.4 min calculated for 6,272 cf (98% of inflow)  
 Center-of-Mass det. time= 12.7 min ( 766.9 - 754.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	47.25'	361 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
47.25	55	0	0
47.50	351	51	51
47.75	667	127	178
48.00	796	183	361

Device	Routing	Invert	Outlet Devices
#1	Primary	47.65'	<b>12.0' long x 3.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

**Primary OutFlow** Max=1.74 cfs @ 12.08 hrs HW=47.81' TW=47.72' (Dynamic Tailwater)  
**1-Broad-Crested Rectangular Weir** (Weir Controls 1.74 cfs @ 0.88 fps)

**Summary for Pond pA1: Post - Analysis Point-1**

Inflow Area = 8,233 sf, 80.34% Impervious, Inflow Depth = 5.35" for 25-Year event  
 Inflow = 1.07 cfs @ 12.07 hrs, Volume= 3,672 cf  
 Primary = 1.07 cfs @ 12.07 hrs, Volume= 3,672 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Pond pA2: Post - Analysis Point-2**

Inflow Area = 18,182 sf, 66.21% Impervious, Inflow Depth = 4.83" for 25-Year event  
 Inflow = 2.15 cfs @ 12.10 hrs, Volume= 7,318 cf  
 Primary = 2.15 cfs @ 12.10 hrs, Volume= 7,318 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Subcatchment pS1: Post - Flow to East Main Road**

Runoff = 1.07 cfs @ 12.07 hrs, Volume= 3,672 cf, Depth= 5.35"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 25-Year Rainfall=6.10"

Area (sf)	CN	Description
1,619	74	>75% Grass cover, Good, HSG C
471	98	Roofs, HSG C
616	98	Sidewalk
5,221	98	Paved parking, HSG C
48	98	Wall
258	98	Curbing
8,233	93	Weighted Average
1,619	74	19.66% Pervious Area
6,614	98	80.34% Impervious Area

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Type III 24-hr 25-Year Rainfall=6.10"

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Tc Length Slope Velocity Capacity Description  
(min) (feet) (ft/ft) (ft/sec) (cfs)

5.0

Direct Entry,

**Summary for Subcatchment pS2: Post - Flow to Forebay**

Runoff = 1.87 cfs @ 12.07 hrs, Volume= 6,397 cf, Depth= 5.34"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
Type III 24-hr 25-Year Rainfall=6.10"

Area (sf)	CN	Description
9,159	98	Paved parking, HSG C
346	98	Sidewalk
2,878	74	>75% Grass cover, Good, HSG C
1,482	98	Roofs, HSG C
347	98	Curbing
156	98	Dumpster Pad
14,368	93	Weighted Average
2,878	74	20.03% Pervious Area
11,490	98	79.97% Impervious Area

Tc Length Slope Velocity Capacity Description  
(min) (feet) (ft/ft) (ft/sec) (cfs)

5.0

Direct Entry,

**Summary for Subcatchment pS3: Post - Flow to Westerly Abutter**

Runoff = 0.13 cfs @ 12.07 hrs, Volume= 422 cf, Depth= 4.54"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
Type III 24-hr 25-Year Rainfall=6.10"

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Type III 24-hr 25-Year Rainfall=6.10"

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Area (sf)	CN	Description
* 66	98	Wall
567	74	>75% Grass cover, Good, HSG C
322	98	Paved parking, HSG C
* 160	98	Curbing
1,115	86	Weighted Average
567	74	50.85% Pervious Area
548	98	49.15% Impervious Area

Tc Length Slope Velocity Capacity Description  
(min) (feet) (ft/ft) (ft/sec) (cfs)

5.0

Direct Entry,

**Summary for Subcatchment pS4: Post - Flow to Wet Swale**

Runoff = 0.24 cfs @ 12.08 hrs, Volume= 735 cf, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
Type III 24-hr 25-Year Rainfall=6.10"

Area (sf)	CN	Description
2,699	74	>75% Grass cover, Good, HSG C
2,699	74	100.00% Pervious Area

Tc Length Slope Velocity Capacity Description  
(min) (feet) (ft/ft) (ft/sec) (cfs)

5.0

Direct Entry,

**Summary for Pond WS1: Post - Wet Swale**

Inflow Area = 17,067 sf, 67.32% Impervious, Inflow Depth = 4.93" for 25-Year event  
Inflow = 2.07 cfs @ 12.08 hrs, Volume= 7,014 cf  
Outflow = 2.02 cfs @ 12.10 hrs, Volume= 6,896 cf, Atten= 2%, Lag= 1.0 min  
Primary = 2.02 cfs @ 12.10 hrs, Volume= 6,896 cf

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Type III 24-hr 25-Year Rainfall=6.10"

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Starting Elev= 47.50' Surf.Area= 1,139 sf Storage= 663 cf  
 Peak Elev= 47.72' @ 12.10 hrs Surf.Area= 1,347 sf Storage= 937 cf (273 cf above start)  
 Flood Elev= 48.00' Surf.Area= 1,612 sf Storage= 1,351 cf (688 cf above start)

Plug-Flow detention time= 93.8 min calculated for 6,232 cf (89% of inflow)  
 Center-of-Mass det. time= 10.8 min ( 784.0 - 773.2 )

Volume	Invert	Avail. Storage	Storage Description
#1	46.50'	1,351 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
46.50	154	0	0
47.00	680	209	209
47.50	1,139	455	663
48.00	1,612	688	1,351

Device	Routing	Invert	Outlet Devices
#1	Primary	47.60'	<b>20.0' long x 3.0' breadth Broad-Crested Rectangular Weir</b>
			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
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.72 2.81 2.92 2.97 3.07 3.32

**Primary OutFlow** Max=1.97 cfs @ 12.10 hrs HW=47.72' TW=0.00' (Dynamic Tailwater)  
**1-Broad-Crested Rectangular Weir** (Weir Controls 1.97 cfs @ 0.84 fps)

Time span=0.00-36.00 hrs, dt=0.04 hrs, 901 points  
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Pond FB1: Post - Forebay**

Peak Elev=47.87' Storage=260 cf Inflow=2.70 cfs 9,315 cf  
Outflow=2.65 cfs 9,198 cf

**Pond pA1: Post - Analysis Point-1**

Inflow=1.55 cfs 5,345 cf  
Primary=1.55 cfs 5,345 cf

**Pond pA2: Post - Analysis Point-2**

Inflow=3.19 cfs 10,948 cf  
Primary=3.19 cfs 10,948 cf

**Subcatchment pS1: Post - Flow to East Main Road**

Runoff Area=8,233 sf 80.34% Impervious Runoff Depth=7.79"  
Tc=5.0 min CN=74/98 Runoff=1.55 cfs 5,345 cf

**Subcatchment pS2: Post - Flow to Forebay**

Runoff Area=14,368 sf 79.97% Impervious Runoff Depth=7.78"  
Tc=5.0 min CN=74/98 Runoff=2.70 cfs 9,315 cf

**Subcatchment pS3: Post - Flow to Westerly Abutter**

Runoff Area=1,115 sf 49.15% Impervious Runoff Depth=6.89"  
Tc=5.0 min CN=74/98 Runoff=0.19 cfs 640 cf

**Subcatchment pS4: Post - Flow to Wet Swale**

Runoff Area=2,699 sf 0.00% Impervious Runoff Depth=5.47"  
Tc=5.0 min CN=74/0 Runoff=0.40 cfs 1,229 cf

**Pond WS1: Post - Wet Swale**

Peak Elev=47.76' Storage=986 cf Inflow=3.06 cfs 10,427 cf  
Outflow=3.00 cfs 10,308 cf

**Total Runoff Area = 26,415 sf Runoff Volume = 16,530 cf Average Runoff Depth = 7.51"**  
**29.39% Pervious = 7,763 sf 70.61% Impervious = 18,652 sf**

**Summary for Pond FB1: Post - Forebay**

Inflow Area = 14,368 sf, 79.97% Impervious, Inflow Depth = 7.78" for 100-Year event  
 Inflow = 2.70 cfs @ 12.07 hrs, Volume= 9,315 cf  
 Outflow = 2.65 cfs @ 12.08 hrs, Volume= 9,198 cf, Atten= 2%, Lag= 0.6 min  
 Primary = 2.65 cfs @ 12.08 hrs, Volume= 9,198 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Peak Elev= 47.87' @ 12.09 hrs Surf.Area= 727 sf Storage= 260 cf

Plug-Flow detention time= 17.9 min calculated for 9,188 cf (99% of inflow)  
 Center-of-Mass det. time= 9.6 min ( 759.3 - 749.7 )

Volume	Invert	Avail.Storage	Storage	Description
#1	47.25'	361 cf	<b>Custom Stage Data (Prismatic)</b>	Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
47.25	55	0	0
47.50	351	51	51
47.75	667	127	178
48.00	796	183	361

Device	Routing	Invert	Outlet Devices
#1	Primary	47.65'	<b>12.0' long x 3.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

**Primary OutFlow** Max=2.51 cfs @ 12.08 hrs HW=47.87' TW=47.75' (Dynamic Tailwater)  
**1-Broad-Crested Rectangular Weir** (Weir Controls 2.51 cfs @ 0.97 fps)

**Summary for Pond pA1: Post - Analysis Point-1**

Inflow Area = 8,233 sf, 80.34% Impervious, Inflow Depth = 7.79" for 100-Year event  
 Inflow = 1.55 cfs @ 12.07 hrs, Volume= 5,345 cf  
 Primary = 1.55 cfs @ 12.07 hrs, Volume= 5,345 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Pond pA2: Post - Analysis Point-2**

Inflow Area = 18,182 sf, 66.21% Impervious, Inflow Depth = 7.23" for 100-Year event  
 Inflow = 3.19 cfs @ 12.09 hrs, Volume= 10,948 cf  
 Primary = 3.19 cfs @ 12.09 hrs, Volume= 10,948 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Subcatchment pS1: Post - Flow to East Main Road**

Runoff = 1.55 cfs @ 12.07 hrs, Volume= 5,345 cf, Depth= 7.79"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
1,619	74	>75% Grass cover, Good, HSG C
471	98	Roofs, HSG C
616	98	Sidewalk
5,221	98	Paved parking, HSG C
48	98	Wall
258	98	Curbing
8,233	93	Weighted Average
1,619	74	19.66% Pervious Area
6,614	98	80.34% Impervious Area

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Type III 24-hr 100-Year Rainfall=8.60"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
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5.0

Direct Entry,

**Summary for Subcatchment pS2: Post - Flow to Forebay**

Runoff = 2.70 cfs @ 12.07 hrs, Volume= 9,315 cf, Depth= 7.78"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
9,159	98	Paved parking, HSG C
346	98	Sidewalk
2,878	74	>75% Grass cover, Good, HSG C
1,482	98	Roofs, HSG C
347	98	Curbing
156	98	Dumpster Pad
14,368	93	Weighted Average
2,878	74	20.03% Pervious Area
11,490	98	79.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
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5.0

Direct Entry,

**Summary for Subcatchment pS3: Post - Flow to Westerly Abutter**

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 640 cf, Depth= 6.89"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr 100-Year Rainfall=8.60"

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Type III 24-hr 100-Year Rainfall=8.60"

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Area (sf)	CN	Description
* 66	98	Wall
567	74	>75% Grass cover, Good, HSG C
322	98	Paved parking, HSG C
* 160	98	Curbing
1,115	86	Weighted Average
567	74	50.85% Pervious Area
548	98	49.15% Impervious Area

Tc Length Slope Velocity Capacity Description  
(min) (feet) (ft/ft) (ft/sec) (cfs)

5.0

Direct Entry,

**Summary for Subcatchment pS4: Post - Flow to Wet Swale**

Runoff = 0.40 cfs @ 12.08 hrs, Volume= 1,229 cf, Depth= 5.47"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
2,699	74	>75% Grass cover, Good, HSG C
2,699	74	100.00% Pervious Area

Tc Length Slope Velocity Capacity Description  
(min) (feet) (ft/ft) (ft/sec) (cfs)

5.0

Direct Entry,

**Summary for Pond WS1: Post - Wet Swale**

Inflow Area = 17,067 sf, 67.32% Impervious, Inflow Depth = 7.33" for 100-Year event  
Inflow = 3.06 cfs @ 12.08 hrs, Volume= 10,427 cf  
Outflow = 3.00 cfs @ 12.10 hrs, Volume= 10,308 cf, Atten= 2%, Lag= 0.8 min  
Primary = 3.00 cfs @ 12.10 hrs, Volume= 10,308 cf

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Type III 24-hr 100-Year Rainfall=8.60"

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Starting Elev= 47.50' Surf.Area= 1,139 sf Storage= 663 cf  
 Peak Elev= 47.76' @ 12.10 hrs Surf.Area= 1,381 sf Storage= 986 cf (322 cf above start)  
 Flood Elev= 48.00' Surf.Area= 1,612 sf Storage= 1,351 cf (688 cf above start)

Plug-Flow detention time= 72.7 min calculated for 9,635 cf (92% of inflow)  
 Center-of-Mass det. time= 8.6 min ( 774.2 - 765.6 )

Volume	Invert	Avail. Storage	Storage Description
#1	46.50'	1,351 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
46.50	154	0	0
47.00	680	209	209
47.50	1,139	455	663
48.00	1,612	688	1,351

Device	Routing	Invert	Outlet Devices
#1	Primary	47.60'	<b>20.0' long x 3.0' breadth Broad-Crested Rectangular Weir</b>
			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
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.72 2.81 2.92 2.97 3.07 3.32

**Primary OutFlow** Max=2.92 cfs @ 12.10 hrs HW=47.75' TW=0.00' (Dynamic Tailwater)  
**1=Broad-Crested Rectangular Weir** (Weir Controls 2.92 cfs @ 0.95 fps)

Time span=0.00-36.00 hrs, dt=0.04 hrs, 901 points  
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Pond FB1: Post - Forebay**

Peak Elev=47.70' Storage=144 cf Inflow=0.30 cfs 959 cf  
Outflow=0.29 cfs 841 cf

**Pond pA1: Post - Analysis Point-1**

Inflow=0.17 cfs 552 cf  
Primary=0.17 cfs 552 cf

**Pond pA2: Post - Analysis Point-2**

Inflow=0.29 cfs 784 cf  
Primary=0.29 cfs 784 cf

**Subcatchment pS1: Post - Flow to East Main Road**

Runoff Area=8,233 sf 80.34% Impervious Runoff Depth=0.80"  
Tc=5.0 min CN=74/98 Runoff=0.17 cfs 552 cf

**Subcatchment pS2: Post - Flow to Forebay**

Runoff Area=14,368 sf 79.97% Impervious Runoff Depth=0.80"  
Tc=5.0 min CN=74/98 Runoff=0.30 cfs 959 cf

**Subcatchment pS3: Post - Flow to Westerly Abutter**

Runoff Area=1,115 sf 49.15% Impervious Runoff Depth=0.52"  
Tc=5.0 min CN=74/98 Runoff=0.01 cfs 48 cf

**Subcatchment pS4: Post - Flow to Wet Swale**

Runoff Area=2,699 sf 0.00% Impervious Runoff Depth=0.06"  
Tc=5.0 min CN=74/0 Runoff=0.00 cfs 14 cf

**Pond WS1: Post - Wet Swale**

Peak Elev=47.63' Storage=821 cf Inflow=0.29 cfs 855 cf  
Outflow=0.27 cfs 736 cf

**Total Runoff Area = 26,415 sf Runoff Volume = 1,572 cf Average Runoff Depth = 0.71"**  
**29.39% Pervious = 7,763 sf 70.61% Impervious = 18,652 sf**

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Type III 24-hr WQv Rainfall=1.20"

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**Summary for Pond FB1: Post - Forebay**

Inflow Area = 14,368 sf, 79.97% Impervious, Inflow Depth = 0.80" for WQv event  
 Inflow = 0.30 cfs @ 12.07 hrs, Volume= 959 cf  
 Outflow = 0.29 cfs @ 12.09 hrs, Volume= 841 cf, Atten= 3%, Lag= 1.1 min  
 Primary = 0.29 cfs @ 12.09 hrs, Volume= 841 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Peak Elev= 47.70' @ 12.09 hrs Surf.Area= 599 sf Storage= 144 cf

Plug-Flow detention time= 94.6 min calculated for 841 cf (88% of inflow)  
 Center-of-Mass det. time= 37.9 min ( 822.2 - 784.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	47.25'	361 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
47.25	55	0	0
47.50	351	51	51
47.75	667	127	178
48.00	796	183	361

Device	Routing	Invert	Outlet Devices
#1	Primary	47.65'	<b>12.0' long x 3.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

**Primary OutFlow** Max=0.28 cfs @ 12.09 hrs HW=47.70' TW=47.63' (Dynamic Tailwater)  
**1-Broad-Crested Rectangular Weir** (Weir Controls 0.28 cfs @ 0.52 fps)

**Summary for Pond pA1: Post - Analysis Point-1**

Inflow Area = 8,233 sf, 80.34% Impervious, Inflow Depth = 0.80" for WQv event  
 Inflow = 0.17 cfs @ 12.07 hrs, Volume= 552 cf  
 Primary = 0.17 cfs @ 12.07 hrs, Volume= 552 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Pond pA2: Post - Analysis Point-2**

Inflow Area = 18,182 sf, 66.21% Impervious, Inflow Depth = 0.52" for WQv event  
 Inflow = 0.29 cfs @ 12.12 hrs, Volume= 784 cf  
 Primary = 0.29 cfs @ 12.12 hrs, Volume= 784 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs

**Summary for Subcatchment pS1: Post - Flow to East Main Road**

Runoff = 0.17 cfs @ 12.07 hrs, Volume= 552 cf, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
1,619	74	>75% Grass cover, Good, HSG C
471	98	Roofs, HSG C
616	98	Sidewalk
5,221	98	Paved parking, HSG C
48	98	Wall
258	98	Curbing
8,233	93	Weighted Average
1,619	74	19.66% Pervious Area
6,614	98	80.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
----------	---------------	---------------	-------------------	----------------	-------------

5.0

Direct Entry,

**Summary for Subcatchment pS2: Post - Flow to Forebay**

Runoff = 0.30 cfs @ 12.07 hrs, Volume= 959 cf, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
9,159	98	Paved parking, HSG C
346	98	Sidewalk
2,878	74	>75% Grass cover, Good, HSG C
1,482	98	Roofs, HSG C
347	98	Curbing
156	98	Dumpster Pad
14,368	93	Weighted Average
2,878	74	20.03% Pervious Area
11,490	98	79.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
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5.0

Direct Entry,

**Summary for Subcatchment pS3: Post - Flow to Westerly Abutter**

Runoff = 0.01 cfs @ 12.07 hrs, Volume= 48 cf, Depth= 0.52"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr WQv Rainfall=1.20"

**22133 HydroCAD WVTS 3-12-2024**

Prepared by {enter your company name here}  
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Type III 24-hr WQv Rainfall=1.20"

Printed 3/21/2024

Page 31

Area (sf)	CN	Description
* 66	98	Wall
567	74	>75% Grass cover, Good, HSG C
322	98	Paved parking, HSG C
* 160	98	Curbing
1,115	86	Weighted Average
567	74	50.85% Pervious Area
548	98	49.15% Impervious Area

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

**Summary for Subcatchment pS4: Post - Flow to Wet Swale**

Runoff = 0.00 cfs @ 12.40 hrs, Volume= 14 cf, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
2,699	74	>75% Grass cover, Good, HSG C
2,699	74	100.00% Pervious Area

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

**Summary for Pond WS1: Post - Wet Swale**

Inflow Area = 17,067 sf, 67.32% Impervious, Inflow Depth = 0.60" for WQv event  
 Inflow = 0.29 cfs @ 12.09 hrs, Volume= 855 cf  
 Outflow = 0.27 cfs @ 12.12 hrs, Volume= 736 cf, Atten= 5%, Lag= 1.8 min  
 Primary = 0.27 cfs @ 12.12 hrs, Volume= 736 cf

**22133 HydroCAD WVTS 3-12-2024**

Prepared by {enter your company name here}

HydroCAD® 10.00 s/n 05085 © 2013 HydroCAD Software Solutions LLC

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.04 hrs  
 Starting Elev= 47.50' Surf.Area= 1,139 sf Storage= 663 cf  
 Peak Elev= 47.63' @ 12.12 hrs Surf.Area= 1,263 sf Storage= 821 cf (158 cf above start)  
 Flood Elev= 48.00' Surf.Area= 1,612 sf Storage= 1,351 cf (688 cf above start)

Plug-Flow detention time= 616.7 min calculated for 73 cf (9% of inflow)  
 Center-of-Mass det. time= 27.0 min ( 851.9 - 824.9 )

Volume #1 Invert 46.50' Avail. Storage 1,351 cf Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
46.50	154	0	0
47.00	680	209	209
47.50	1,139	455	663
48.00	1,612	688	1,351

Device #1 Routing Primary Invert 47.60' Outlet Devices

Device #1	Routing	Invert	Outlet Devices
#1	Primary	47.60'	<b>20.0' long x 3.0' breadth Broad-Crested Rectangular Weir</b>
			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
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.27 cfs @ 12.12 hrs HW=47.63' TW=0.00' (Dynamic Tailwater)  
 ←1=Broad-Crested Rectangular Weir (Weir Controls 0.27 cfs @ 0.43 fps)





**Centreville Bank Commercial Redevelopment**

160 East Main Road - Middletown, RI

STORMWATER MANAGEMENT

**STORMWATER RUNOFF RATES SUMMARY**

SDE Job No.: 22133  
Prepared by: SJE

Date: 10/23/2023  
Revised: 3/21/2024  
Checked by: MER

**PRE-DEVELOPMENT**

Analysis Points (Subcatchment/Pond)	Storm Event											
	1.2 inch Storm		1-yr		2-yr		10-yr		25-yr		100-yr	
	Rate (cfs)	Vol. (cf)	Rate (cfs)	Vol. (cf)	Rate (cfs)	Vol. (cf)	Rate (cfs)	Vol. (cf)	Rate (cfs)	Vol. (cf)	Rate (cfs)	Vol. (cf)
eA1	0.19	624	0.49	1,646	0.58	1,971	0.87	3,018	1.10	3,807	1.56	5,456
eA2	0.44	1,426	1.12	3,778	1.33	4,526	2.01	6,939	2.53	8,761	3.59	12,571
<b>Totals</b>	<b>0.63</b>	<b>2050</b>	<b>1.61</b>	<b>5424</b>	<b>1.91</b>	<b>6497</b>	<b>2.88</b>	<b>9957</b>	<b>3.63</b>	<b>12568</b>	<b>5.15</b>	<b>18027</b>

**POST-DEVELOPMENT**

Analysis Points (Subcatchment/Pond)	Storm Event											
	1.2 inch Storm		1-yr		2-yr		10-yr		25-yr		100-yr	
	Rate (cfs)	Vol. (cf)	Rate (cfs)	Vol. (cf)	Rate (cfs)	Vol. (cf)	Rate (cfs)	Vol. (cf)	Rate (cfs)	Vol. (cf)	Rate (cfs)	Vol. (cf)
pA1	0.17	552	0.45	1,522	0.54	1,839	0.84	2,879	1.07	3,672	1.55	5,345
pA2	0.29	784	0.84	2,742	1.03	3,406	1.65	5,612	2.15	7,318	3.19	10,948
<b>Totals</b>	<b>0.46</b>	<b>1,336</b>	<b>1.29</b>	<b>4,264</b>	<b>1.57</b>	<b>5,245</b>	<b>2.49</b>	<b>8,491</b>	<b>3.22</b>	<b>10,990</b>	<b>4.74</b>	<b>16,293</b>

Notes:

**Totals** are the summations of the Analysis points values ( Overall combine values leaving the site ).  
Analysis points **eA1** & **pA1** are pre-development and post-development comparisons. (Site's runoff flow to the East Main Road)  
Analysis points **eA2** & **pA2** are pre-development and post-development comparisons. (Site's runoff flow to Midas)

Refer to Hydrocad® calculations for additional information.

**Centreville Bank Commercial Redevelopment**  
 160 East Main Road - Middletown, RI  
 STORMWATER MANAGEMENT  
**WATER QUALITY TREATMENT VOLUME CALCULATION WORKSHEET**

SDE Job No.: 22133  
 Prepared by: SJE

Date: 10/23/2023  
 Checked by: MER

Revised: 3/21/2024

Impervious Area	Area sf		X in. of runoff 1.0 cf		
Total Impervious Area Excluding Roof	16,699		1,392		
Building Roof Area	1,953		163		
<b>1.2 inch rainfall total runoff</b>					
<b>Total Water Quality Volume , (cf) =</b>			100% WQv <b>1,554</b>	50% WQv <b>777</b>	
<b><u>System Water Quality Volume</u></b> <b>(volumes below lowest outlet device)</b>	<i>Impervious Area to BMP</i>	1 WQv	Treatment Required (cf)	Pretreatment Provided (cf)	Extended Treatment (cf)
(FB1) Forebay =	11490	958	10% = 96	118	
(WVTS) Wet Vegetated Treatment System =	11490	958	90% = 862		782
Total =	11490	958		118	782
<b>Total Water Quality Volume Available , (cf) =</b>			<b>900</b>		

**Note:**

1. Total water quality volume (WQV) in the 1.2 inch rainfall event is the inflow volume flowing toward the drainage system.
2. Recharged volume are calculated utilizing Simple Dynamic Method : Automated
3. Refer to HydroCAD report for additional information.

# Centreville Bank Commercial Redevelopment

160 East Main Road - Middletown, RI

STORMWATER MANAGEMENT

## TSS REMOVAL CALCULATION WORKSHEET

SDE Job No.: 22133

Date: 10/23/2023

Revised: 3/21/2024

Prepared by: SJE

Checked by: MER

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Design Point pA1

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (BxC)	E Remaining Load (C-D)
Forebay	25.0%	1.000	0.250	0.750
Wet Swale	85.0%	0.750	0.638	0.113
		0.113	0.000	0.113
<b>Total TSS Removal =</b>			<b>88.8%</b>	





STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources  
 Onsite Wastewater Treatment System Program



Site Evaluation Form

Part A - Soil Profile Description

Application Number

N/A

Property Owner:

160 EAST MAIN ROAD LLC

Property Location:

MIDDLETOWN, 160 EAST MAIN ROAD, PLOTSE L72

Date of Test Hole:

20 OCTOBER 2023

Soil Evaluator:

N. LETENDRE

License Number:

D4019

Weather:

HAZY SUN, 65°F, 3-5 MPH

Shaded: Yes  No

Time:

0900

TH Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Contr.				
ASPH.	-12 to -9											
FILL	-9 to 0	C	S									
Cd	24	C	S									
		C	W	2.5Y 6/3	@ 0 10Y R 5/8	C	ld	gs	L omm		vf	9
2C	51	C	W	2.5Y 7/2	7.5Y R 4	C	ld	vg	L omm		fr	7

TH 1 Soil Class A/B Total Depth 5' Impervious/Limiting Layer Depth N/A (og) GW Seepage Depth 5" (og) SHWT 0 (og)

TH \_\_\_\_\_ Soil Class \_\_\_\_\_ Total Depth \_\_\_\_\_ Impervious/Limiting Layer Depth \_\_\_\_\_ (og) GW Seepage Depth \_\_\_\_\_ (og) SHWT \_\_\_\_\_ (og)

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Revised 1/31/14







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

<b>PROJECT NAME</b> SITE REDEVELOPMENT PLANS CENTREVILLE BANK REDEVELOPMENT	(RIDEM USE ONLY)  STW/WQC File #:
<b>TOWN</b> Middletown	Date Received:
<b>BRIEF PROJECT DESCRIPTION:</b> The project proposed to demolish an existing parking lot and create a bank with 13 parking spaces.	

### Stormwater Management Plan (SMP) Elements – Minimum Standards

When submitting a SMP,<sup>1</sup> 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 create** 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**

<b>PROJECT TYPE</b> (Check all that apply)				
<input type="checkbox"/> Residential	<input checked="" type="checkbox"/> Commercial	<input type="checkbox"/> Federal	<input type="checkbox"/> Retrofit	<input type="checkbox"/> Restoration
<input type="checkbox"/> Road	<input type="checkbox"/> Utility	<input type="checkbox"/> Fill	<input type="checkbox"/> Dredge	<input type="checkbox"/> Mine
<input type="checkbox"/> Other (specify):				

#### **SITE INFORMATION**

Vicinity Map

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

<input checked="" type="checkbox"/> <b>Groundwater</b>	<input type="checkbox"/> <b>Surface Water</b>	<input type="checkbox"/> <b>MS4</b>
<input type="checkbox"/> GAA	<input type="checkbox"/> Isolated Wetland	<input type="checkbox"/> RIDOT
<input checked="" type="checkbox"/> GA	<input type="checkbox"/> Named Waterbody	<input type="checkbox"/> RIDOT Alteration Permit is Approved
<input type="checkbox"/> GB	<input type="checkbox"/> Unnamed Waterbody Connected to Named Waterbody	<input type="checkbox"/> Town
<input type="checkbox"/> Other (specify):		

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

<input type="checkbox"/> Groundwater or Disconnected Wetland	<input checked="" type="checkbox"/> SRWP
<input checked="" type="checkbox"/> Waterbody Name: Bailey’s Brook	<input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater <input type="checkbox"/> Unassessed
<input checked="" type="checkbox"/> Waterbody ID: RI0007035R-01	<input type="checkbox"/> 4 <sup>th</sup> order stream of pond 50 acres or more
<input checked="" type="checkbox"/> TMDL for: Enterococcus	<input type="checkbox"/> Watershed of flood prone river (e.g., Pocasset River)
<input type="checkbox"/> Contributes to a priority outfall listed in the TMDL	<input type="checkbox"/> Contributes stormwater to a public beach
<input checked="" type="checkbox"/> 303(d) list – Impairment(s) for: Enterococcus	<input type="checkbox"/> Contributes to shellfishing grounds

<sup>1</sup> Applications for a Construction General Permit that do not require any other permits from RIDEM and will disturb less than 5 acres over the entire course of the project do not need to submit a SMP. The Appendix A checklist must still be submitted.

<b>PROJECT HISTORY</b>		
<input type="checkbox"/> RIDEM Pre- Application Meeting	Meeting Date:	<input type="checkbox"/> Minutes Attached
<input type="checkbox"/> Municipal Master Plan Approval	Approval Date:	<input type="checkbox"/> Minutes Attached
<input type="checkbox"/> Subdivision Suitability Required	Approval #:	
<input type="checkbox"/> Previous Enforcement Action has been taken on the property	Enforcement #:	
<b>FLOODPLAIN &amp; FLOODWAY</b> See <a href="#">Guidance Pertaining to Floodplain and Floodways</a>		
<input type="checkbox"/> Riverine 100-year floodplain: <a href="#">FEMA FLOODPLAIN FIRMETTE</a> has been reviewed and the 100-year floodplain is on site		
<input type="checkbox"/> Delineated from FEMA Maps		
<b>NOTE:</b> 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		
<input type="checkbox"/> Calculated by Professional Engineer		
<input type="checkbox"/> Calculations are provided for cut vs. fill/displacement volumes proposed within the 100-year floodplain	Amount of Fill (CY):	
	Amount of Cut (CY):	
<input type="checkbox"/> Restrictions or modifications are proposed to the flow path or velocities in a floodway		
<input type="checkbox"/> Floodplain storage capacity is impacted		
<input type="checkbox"/> Project area is not within 100-year floodplain as defined by RIDEM		

<b>CRMC JURISDICTION</b>
<input type="checkbox"/> CRMC Assent required
<input type="checkbox"/> Property subject to a Special Area Management Plan (SAMP). If so, specify which SAMP:
<input type="checkbox"/> Sea level rise mitigation has been designed into this project

<b>LUHPPL IDENTIFICATION - MINIMUM STANDARD 8:</b>		
<b>1. OFFICE OF Land Revitalization and Sustainable Materials Management (OLRSMM)</b>		
<input type="checkbox"/> 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))		<b>RIDEM CONTACT:</b>
<input type="checkbox"/> 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)		
<input type="checkbox"/> This site is identified on the <a href="#">RIDEM Environmental Resources Map</a> as one of the following regulated facilities		<b>SITE ID#:</b>
<input type="checkbox"/> CERCLIS/Superfund (NPL)		
<input type="checkbox"/> State Hazardous Waste Site (SHWS)		
<input type="checkbox"/> Environmental Land Usage Restriction (ELUR)		
<input type="checkbox"/> Leaking Underground Storage Tank (LUST)		
<input type="checkbox"/> Closed Landfill		
<b>Note:</b> If any boxes in 1 above are checked, the applicant must contact the RIDEM OLRSM 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.		
<b>2. PER MINIMUM STANDARD 8 of RICR 8.14.C.1-6 "LUHPPLS," THE SITE IS/HAS:</b>		
<input type="checkbox"/> Industrial Site with RIPDES MSGP, except where No Exposure Certification exists. <a href="http://www.dem.ri.gov/programs/water/permits/ripdes/stormwater/status.php">http://www.dem.ri.gov/programs/water/permits/ripdes/stormwater/status.php</a>		
<input type="checkbox"/> Auto Fueling Facility (e.g., gas station)		
<input type="checkbox"/> Exterior Vehicles Service, Maintenance, or Equipment Cleaning Area		

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

<input type="checkbox"/>	Road Salt Storage and Loading Areas (exposed to rainwater)	
<input type="checkbox"/>	Outdoor Storage and Loading/Unloading of Hazardous Substances	
<b>3. STORMWATER INDUSTRIAL PERMITTING</b>		
<input type="checkbox"/>	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:
<input type="checkbox"/>	Construction is proposed on a site that is subject to <a href="#">THE MULTI-SECTOR GENERAL PERMIT (MSGP) UNDER RULE 31(B)15 OF THE RIPDES REGULATIONS.</a>	MSGP permit #
<input type="checkbox"/>	Additional stormwater treatment is required by the MSGP Explain:	

<b>REDEVELOPMENT STANDARD – MINIMUM STANDARD 6</b>		
<input checked="" type="checkbox"/> Pre Construction Impervious Area		
<input checked="" type="checkbox"/>	Total Pre-Construction Impervious Area ( <b>TIA</b> ): 24,861 sf	
<input checked="" type="checkbox"/>	Total Site Area ( <b>TSA</b> ): 26,415 sf	
<input checked="" type="checkbox"/>	Jurisdictional Wetlands ( <b>JW</b> )	
<input checked="" type="checkbox"/>	Conservation Land ( <b>CL</b> )	
<input checked="" type="checkbox"/> Calculate the Site Size (defined as contiguous properties under same ownership)		
<input checked="" type="checkbox"/>	Site Size ( <b>SS</b> ) = ( <b>TSA</b> ) – ( <b>JW</b> ) – ( <b>CL</b> )	
<input checked="" type="checkbox"/>	$(\mathbf{TIA}) / (\mathbf{SS}) = 24,861 / 26,415 = 0.94$	<input checked="" type="checkbox"/> ( <b>TIA</b> ) / ( <b>SS</b> ) >0.4?
<input checked="" type="checkbox"/> 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.

<p><b>Note:</b> 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:</p> <ul style="list-style-type: none"> <li>• Town requires ... (state the specific local requirement)</li> <li>• Meets Town’s dimensional requirement of ...</li> <li>• Not practical for site because ...</li> <li>• Applying for waiver/variance to achieve this (pending/approved/denied)</li> <li>• Applying for wavier/variance to seek relief from this (pending/approved/denied)</li> </ul>	
<p><b>A) PRESERVATION OF UNDISTURBED AREAS, BUFFERS, AND FLOODPLAINS</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Sensitive resource areas and site constraints are identified (required)</li> <li><input type="checkbox"/> Local development regulations have been reviewed (required)</li> <li><input type="checkbox"/> All vegetated buffers and coastal and freshwater wetlands will be protected during and after construction</li> <li><input type="checkbox"/> Conservation Development or another site design technique has been incorporated to protect open space and pre-development hydrology. <b>Note:</b> If Conservation Development has been used, check box and skip to Subpart C</li> <li><input type="checkbox"/> As much natural vegetation and pre-development hydrology as possible has been maintained</li> </ul>	<p><b>IF NOT IMPLEMENTED, EXPLAIN HERE</b></p>

<p><b>B) LOCATE DEVELOPMENT IN LESS SENSITIVE AREAS AND WORK WITH THE NATURAL LANDSCAPE CONDITIONS, HYDROLOGY, AND SOILS</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Development sites and building envelopes have been appropriately distanced from wetlands and waterbodies</li> <li><input type="checkbox"/> Development and stormwater systems have been located in areas with greatest infiltration capacity (e.g., soil groups A and B)</li> <li><input type="checkbox"/> Plans show measures to prevent soil compaction in areas designated as Qualified Pervious Areas (QPA's)</li> <li><input type="checkbox"/> Development sites and building envelopes have been positioned outside of floodplains</li> <li><input type="checkbox"/> Site design positions buildings, roadways and parking areas in a manner that avoids impacts to surface water features</li> <li><input type="checkbox"/> Development sites and building envelopes have been located to minimize impacts to steep slopes (<math>\geq 15\%</math>)</li> <li><input type="checkbox"/> Other (describe):</li> </ul>	
<p><b>C) MINIMIZE CLEARING AND GRADING</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Site clearing has been restricted to <u>minimum area needed</u> for building footprints, development activities, construction access, and safety.</li> <li><input type="checkbox"/> Site has been designed to position buildings, roadways, and parking areas in a manner that minimizes grading (cut and fill quantities)</li> <li><input type="checkbox"/> 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)</li> <li><input type="checkbox"/> Plan notes specify that public trees removed or damaged during construction shall be replaced with equivalent</li> </ul>	
<p><b>D) REDUCE IMPERVIOUS COVER</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Reduced roadway widths (<math>\leq 22</math> feet for ADT <math>\leq 400</math>; <math>\leq 26</math> feet for ADT 400 - 2,000)</li> <li><input type="checkbox"/> Reduced driveway areas (length minimized via reduced ROW width (<math>\leq 45</math> ft.) and/or reduced (or absolute minimum) front yard setback; width minimized to <math>\leq 9</math> ft. wide one lane; <math>\leq 18</math> ft. wide two lanes; shared driveways; pervious surface)</li> <li><input type="checkbox"/> Reduced building footprint: Explain approach:</li>   <li><input type="checkbox"/> Reduced sidewalk area (<math>\leq 4</math> ft. wide; one side of the street; unpaved path; pervious surface)</li> <li><input type="checkbox"/> Reduced cul-de-sacs (radius <math>&lt; 45</math> ft; vegetated island; alternative turn-around)</li> <li><input type="checkbox"/> Reduced parking lot area: Explain approach</li> <li><input type="checkbox"/> Use of pervious surfaces for driveways, sidewalks, parking areas/overflow parking areas, etc.</li> <li><input type="checkbox"/> Minimized impervious surfaces (project meets or is less than maximum specified by Zoning Ordinance)</li> <li><input type="checkbox"/> Other (describe):</li> </ul>	
<p><b>E) DISCONNECT IMPERVIOUS AREA</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Impervious surfaces have been disconnected, and runoff has been diverted to QPAs to the maximum extent possible</li> <li><input type="checkbox"/> Residential street edges allow side-of-the-road drainage into vegetated open swales</li> <li><input type="checkbox"/> Parking lot landscaping breaks up impervious expanse AND accepts runoff</li> <li><input type="checkbox"/> Other (describe):</li> </ul>	
<p><b>F) MITIGATE RUNOFF AT THE POINT OF GENERATION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Small-scale BMPs have been designated to treat runoff as close as possible to the source</li> </ul>	

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<p><b>G) PROVIDE LOW-MAINTENANCE NATIVE VEGETATION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Low-maintenance landscaping has been proposed using native species and cultivars</li> <li><input type="checkbox"/> Plantings of native trees and shrubs in areas previously cleared of native vegetation are shown on site plan</li> <li><input type="checkbox"/> Lawn areas have been limited/minimized, and yards have been kept undisturbed to the maximum extent practicable on residential lots</li> </ul>	
<p><b>H) RESTORE STREAMS/WETLANDS</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Historic drainage patterns have been restored by removing closed drainage systems, daylighting buried streams, and/or restoring degraded stream channels and/or wetlands</li> <li><input type="checkbox"/> Removal of invasive species</li> <li><input type="checkbox"/> Other</li> </ul>	

**PART 3. SUMMARY OF REMAINING STANDARDS**

<b>GROUNDWATER RECHARGE – MINIMUM STANDARD 2</b>		
YES	NO	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	The project has been designed to meet the groundwater recharge standard.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	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);
<input type="checkbox"/>	<input type="checkbox"/>	Your waiver request has been explained in the Narrative, if applicable.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Is this site identified as a Regulated Facility in Part 1, Minimum Standard 8: LUHPPL Identification?
<input type="checkbox"/>	<input type="checkbox"/>	If “Yes,” has approval for infiltration by the OLRSM Site Project Manager, per Part 1, Minimum Standard 8, been requested?

<b>TABLE 2-1: Summary of Recharge (see RISDISM Section 3.3.2)</b>					
(Add or Subtract Rows as Necessary)					
Design Point	Impervious Area Treated (sq ft)	Total Re <sub>v</sub> 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 <sub>v</sub> directed to a QPA (cu ft)		
DP-1:					
DP-2:					
DP-3:					
DP-4:					
<b>TOTALS:</b>					
<p><u>Notes:</u></p> <ol style="list-style-type: none"> <li>1. Only BMPs listed in RISDISM Table 3-5 “List of BMPs Acceptable for Recharge” may be used to meet the recharge requirement.</li> <li>2. Recharge requirement must be satisfied for each waterbody ID.</li> </ol>					
<input type="checkbox"/> Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.):					

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<b>WATER QUALITY – MINIMUM STANDARD 3</b>		
<b>YES</b>	<b>NO</b>	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Does this project meet or exceed the required water quality volume WQv (see RICR 8.9.E-I)?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Is the proposed final impervious cover greater than 20% of the disturbed area (see RICR 8.9.E-I)?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	If “Yes,” either the Modified Curve Number Method or the Split Pervious/Impervious method in Hydro-CAD was used to calculate WQv; or,
<input type="checkbox"/>	<input type="checkbox"/>	If “Yes,” either TR-55 or TR-20 was used to calculate WQv; and,
<input type="checkbox"/>	<input type="checkbox"/>	If “No,” the project meets the minimum WQv of 0.2 watershed inches over the entire disturbed area.
<input type="checkbox"/>	<input type="checkbox"/>	Not Applicable
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Does this project meet or exceed the ability to treat required water quality flow WQf (see RICR 8.9.I.1-3)?
<input type="checkbox"/>	<input checked="" type="checkbox"/>	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.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	RICR 8.36. A Pollutant Loading Analysis is needed and has been completed.
<input type="checkbox"/>	<input type="checkbox"/>	The Water Quality Guidance Document ( <a href="#">Water Quality Goals and Pollutant Loading Analysis Guidance for Discharges to Impaired Waters</a> ) has been followed as applicable.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	BMPs are proposed that are on the <a href="#">approved technology list</a> . If “Yes,” please provide all required worksheets from the manufacturer.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	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:

<b>TABLE 3-1: Summary of Water Quality (see RICR 8.9)</b>					
<b>Design Point and WB ID</b>	<b>Impervious area treated (sq ft)</b>	<b>Total WQv Required (cu ft)</b>	<b>LID Stormwater Credits (see RICR 8.18)</b>	<b>Water Quality Treatment Remaining (cu ft)</b>	<b>Water Quality Provided by BMPs (cu ft)</b>
			<b>WQv directed to a QPA (cu ft)</b>		
pA1:	11,490 sf	958	0	958	900
DP-2:					
DP-3:					
DP-4:					
<b>TOTALS:</b>					
<b>Notes:</b>					
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.					
<input checked="" type="checkbox"/> YES	This project has met the setback requirements for each BMP.				
<input type="checkbox"/> NO	If “No,” please explain:				
<input checked="" type="checkbox"/>	Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.): Appendix 2 of the stormwater management report				

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<b>CONVEYANCE AND NATURAL CHANNEL PROTECTION (RICR 8.10) – MINIMUM STANDARD 4</b>		
<b>YES</b>	<b>NO</b>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Is this standard waived? If “Yes,” please indicate one or more of the reasons below:
		<input type="checkbox"/> 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. <input checked="" type="checkbox"/> The project is a small facility with impervious cover of less than or equal to 1 acre. <input type="checkbox"/> 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). ( <u>Note</u> : LID design strategies can greatly reduce the peak discharge rate).
<input type="checkbox"/>	<input type="checkbox"/>	Conveyance and natural channel protection for the site have been met. If “No,” explain why:

<b>TABLE 4-1: Summary of Channel Protection Volumes (see RICR 8.10)</b>					
<b>Design Point</b>	<b>Receiving Water Body Name</b>	<b>Coldwater Fishery? (Y/N)</b>	<b>Total CPv Required (cu ft)</b>	<b>Total CPv Provided (cu ft)</b>	<b>Average Release Rate Modeled in the 1-yr storm (cfs)</b>
DP-1:					
DP-2:					
DP-3:					
DP-4:					
<b>TOTALS:</b>					
<u>Note</u> : The Channel Protection Volume Standard must be met in each waterbody ID.					
<input type="checkbox"/> YES <input type="checkbox"/> 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).				
<input type="checkbox"/> YES <input type="checkbox"/> NO	Do additional design restrictions apply resulting from any discharge to cold-water fisheries; If “Yes,” please indicate restrictions and solutions below.				
<input type="checkbox"/>	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.).				

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<b>OVERBANK FLOOD PROTECTION (RICR 8.11) AND OTHER POTENTIAL HIGH FLOWS – MINIMUM STANDARD 5</b>		
<b>YES</b>	<b>NO</b>	
<input type="checkbox"/>	<input type="checkbox"/>	Is this standard waived? If yes, please indicate one or more of the reasons below:
	<input type="checkbox"/>	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.
	<input type="checkbox"/>	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).
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Does the project flow to an MS4 system or subject to other stormwater requirements? If “Yes,” indicate as follows:
	<input type="checkbox"/>	RIDOT
	<input type="checkbox"/>	Other (specify):
<p><u>Note:</u> The project could be approved by RIDEM but not meet RIDOT or Town standards. RIDOT’s regulations indicate that post-volumes must be <b>less</b> 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.</p>		
		Indicate below which model was used for your analysis. <input type="checkbox"/> TR-55 <input type="checkbox"/> TR-20 <input type="checkbox"/> HydroCAD <input type="checkbox"/> Bentley/Haestad <input type="checkbox"/> Intellisolve <input type="checkbox"/> Other (Specify):
<b>YES</b>	<b>NO</b>	
<input type="checkbox"/>	<input type="checkbox"/>	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.):
<input type="checkbox"/>	<input type="checkbox"/>	Do off-site areas contribute to the sub-watersheds and design points? If “Yes,”
<input type="checkbox"/>	<input type="checkbox"/>	Are the areas modeled as “present condition” for both pre- and post-development analysis?
<input type="checkbox"/>	<input type="checkbox"/>	Are the off-site areas shown on the subwatershed maps?
<input type="checkbox"/>	<input type="checkbox"/>	Does the drainage design confirm safe passage of the 100-year flow through the site for off-site runoff?
<input type="checkbox"/>	<input type="checkbox"/>	Is a Downstream Analysis required (see RICR 8.11.E.1)?
<input type="checkbox"/>	<input type="checkbox"/>	Calculate the following:
	<input type="checkbox"/>	Area of disturbance within the sub-watershed (areas)
	<input type="checkbox"/>	Impervious cover (%)
<input type="checkbox"/>	<input type="checkbox"/>	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)?
<input type="checkbox"/>	<input type="checkbox"/>	Does this project meet the overbank flood protection standard?

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**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)
pA1:	0.19	0.17	0.49	0.45	0.87	0.84	1.56	1.55
pA2:	0.44	0.29	1.12	0.84	2.01	1.65	3.59	3.19
DP-3:								
DP-4:								
<b>TOTALS:</b>	0.63	0.46	1.61	1.29	2.88	2.49	5.15	4.74

\*\* 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.	See Appendix 1 of the stormwater management report
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.	See Appendix 1 of the stormwater management report
Final sizing calculations for structural stormwater BMPs, including contributing drainage area, storage, and outlet configuration.	See Appendix 1 of the stormwater management report
Stage-storage, inflow and outflow hydrographs for storage facilities (e.g., detention, retention, or infiltration facilities).	See Appendix 1 of the stormwater management report

**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 <sub>v</sub>	WQ <sub>v</sub>	CP <sub>v</sub> (Y/N/NA)	Overbank Flood Reduction (Y/N/NA)		External (E) Internal (I) or NA	Yes/No	Technical Justification (Design Report page number)
FB1	pA2	Forebay	Y		118				Y		
WS1	pA2	Wet Swale	N	N	782				Y		
		<b>TOTALS:</b>									

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<b>Table 5.3 Summary of Soils to Evaluate Each BMP</b>									
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					
FB1	pA2	Forebay	TP-1		12"	47.0	0	C	N/A
WS1	pA2	Wet Swale	TP-1		12" (47+/-)	46.5	Wet System	C	N/A
		<b>TOTALS:</b>							

\* 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

<b>LAND USES WITH HIGHER POTENTIAL POLLUTANTS LOADS (LUHPPLs) – MINIMUM STANDARD 8</b>			
YES	NO	N/A	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Describe any LUHPPLs identified in Part 1, Minimum Standard 8, Section 2. If not applicable, continue to Minimum Standard 9.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Are these activities already covered under an MSGP? If “No,” please explain if you have applied for an MSGP or intend to do so?
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	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:
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	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.).

<b>ILLICIT DISCHARGES – MINIMUM STANDARD 9</b>			
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	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have you checked for illicit discharges?
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Have any been found and/or corrected? If “Yes,” please identify.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Does your report explain preventative measures that keep non-stormwater discharges out of the Waters of the State (during and after construction)?

<b>SOIL EROSION AND SEDIMENT CONTROL (SESC) – MINIMUM STANDARD 10</b>
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YES	NO	N/A	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have you included a Soil Erosion and Sediment Control Plan Set and/or Complete Construction Plan Set?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have you provided a <b>separately-bound</b> document based upon the <a href="#">SESC Template</a> ? 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:
		<input type="checkbox"/>	Soil Erosion and Sediment Control Plan Project Narrative, including a description of how the fifteen (15) Performance Criteria have been met:
		<input type="checkbox"/>	Provide Natural Buffers and Maintain Existing Vegetation
		<input type="checkbox"/>	Minimize Area of Disturbance
		<input type="checkbox"/>	Minimize the Disturbance of Steep Slopes
		<input type="checkbox"/>	Preserve Topsoil
		<input type="checkbox"/>	Stabilize Soils
		<input type="checkbox"/>	Protect Storm Drain Inlets
		<input type="checkbox"/>	Protect Storm Drain Outlets
		<input type="checkbox"/>	Establish Temporary Controls for the Protection of Post-Construction Stormwater Control Measures
		<input type="checkbox"/>	Establish Perimeter Controls and Sediment Barriers
		<input type="checkbox"/>	Divert or Manage Run-On from Up-Gradient Areas
		<input type="checkbox"/>	Properly Design Constructed Stormwater Conveyance Channels
		<input type="checkbox"/>	Retain Sediment On-Site
		<input type="checkbox"/>	Control Temporary Increases in Stormwater Velocity, Volume, and Peak Flows
		<input type="checkbox"/>	Apply Construction Activity Pollution Prevention Control Measures
		<input type="checkbox"/>	Install, Inspect, and Maintain Control Measures and Take Corrective Actions
		<input type="checkbox"/>	Qualified SESC Plan Preparer's Information and Certification
		<input type="checkbox"/>	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
		<input type="checkbox"/>	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	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Have you minimized all sources of pollutant contact with stormwater runoff, to the maximum extent practicable?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Have you provided a <b>separately-bound</b> 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?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Lawn, Garden, and Landscape Management meet the requirements of RISDISM Section G.7? If "No," why not?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	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.).
<input type="checkbox"/>	<input checked="" type="checkbox"/>	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:
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Is stormwater being directed from public areas to private property? If "Yes," note the following: <u>Note:</u> This is not allowed unless a funding mechanism is in place to provide the finances for the long-term

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		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.
<b>Pollution Prevention Section</b>		
<input type="checkbox"/>	<input type="checkbox"/>	Designated snow stockpile locations?
<input type="checkbox"/>	<input type="checkbox"/>	Trash racks to prevent floatables, trash, and debris from discharging to Waters of the State?
<input type="checkbox"/>	<input type="checkbox"/>	Asphalt-only based sealants?
<input type="checkbox"/>	<input type="checkbox"/>	Pet waste stations? ( <u>Note:</u> 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).
<input type="checkbox"/>	<input type="checkbox"/>	Regular sweeping? Please describe:
<input type="checkbox"/>	<input type="checkbox"/>	De-icing specifications, in accordance with RISDISM Appendix G. ( <u>NOTE:</u> 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).
<input type="checkbox"/>	<input type="checkbox"/>	A prohibition of phosphate-based fertilizers? ( <u>Note:</u> 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**

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

<b>Subwatershed and Impervious Area Summary</b>				
<b>Subwatershed (area to each design point)</b>	<b>First Receiving Water ID or MS4</b>	<b>Area Disturbed (units)</b>	<b>Existing Impervious (units)</b>	<b>Proposed Impervious (units)</b>
<b>DP-1:</b>	RI0007035R-01	26,415 sf	24,591 sf	18,382 sf
<b>DP-2:</b>				
<b>DP-3:</b>				
<b>DP-4:</b>				
<b>TOTALS:</b>				

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<b>Site Construction Plans (Indicate that the following applicable specifications are provided)</b>		
<b>YES</b>	<b>NO</b>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Existing and proposed plans (scale not greater than 1" = 40') with North arrow
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Existing and proposed site topography (with 1 or 2-foot contours); 10-foot contours accepted for off-site areas
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Boundaries of existing predominant vegetation and proposed limits of clearing
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Site Location clarification
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Location and field-verified boundaries of resource protection areas such as: <ul style="list-style-type: none"> <li>▶ freshwater and coastal wetlands, including lakes and ponds</li> <li>▶ coastal shoreline features</li> </ul> Perennial and intermittent streams, in addition to Areas Subject to Storm Flowage (ASSFs)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	All required setbacks (e.g., buffers, water-supply wells, septic systems)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	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: <ul style="list-style-type: none"> <li>▶ 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;</li> <li>▶ Design water surface elevations (applicable storms);</li> <li>▶ Structural details of outlet structures, embankments, spillways, stilling basins, grade-control structures, conveyance channels, etc.;</li> <li>▶ Existing and proposed structural elevations (e.g., inverts of pipes, manholes, etc.);</li> <li>▶ 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;</li> <li>▶ Planting plans for structural stormwater BMPs, including species, size, planting methods, and maintenance requirements of proposed planting</li> </ul>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Logs of borings and/or test pit investigations along with supporting soils/geotechnical report and corresponding water tables
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mapping of any OLRSM-approv ed remedial actions/systems (including ELURs)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Location of existing and proposed roads, buildings, and other structures including limits of disturbance; <ul style="list-style-type: none"> <li>▶ Existing and proposed utilities (e.g., water, sewer, gas, electric) and easements;</li> <li>▶ 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.);</li> <li>▶ Cross sections of roadways, with edge details such as curbs and sidewalks;</li> <li>▶ Location and dimensions of channel modifications, such as bridge or culvert crossings</li> </ul>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Locations, cross sections, and profiles of all stream or wetland crossings and their method of stabilization



**Commercial Redevelopment**  
 160 East Main Road - Middletown, RI  
**STORMWATER MANAGEMENT**  
**TOTAL BACTERIA REMOVAL**

SDE Job No.: 22133  
 Prepared by: SJE

Date: 1/10/2024

Revised: 3/21/2024  
 Checked by: MER

<b>Bacteria Loading</b>
<b><math>L=1.03(10^{-3})[(P)(P_j)(R_v)](C')(A)</math></b>
P = Rainfall Depth (in.) P <sub>j</sub> = Rainfall Correction Factor R <sub>v</sub> = Runoff Coefficient C' = Flow-weighted mean bacteria concentration A = Contributing drainage area (acres)

<b>Pre-Development</b>			
Area	0.61	(Acres)	

<b>Post-Development</b>			
Area	0.61	(Acres)	

R <sub>v</sub> = 0.05+0.009(%I)	R <sub>v</sub> =	0.8969	
%I = % Impervious	%I =	94.1	

R <sub>v</sub> = 0.05+0.009(%I)	R <sub>v</sub> =	0.6854	
%I = % Impervious	%I =	70.6	

P =	47	C' =	4600
P <sub>j</sub> =	0.9	R <sub>v</sub> =	0.8969
A =	0.61		

P =	47	C' =	4600
P <sub>j</sub> =	0.9	R <sub>v</sub> =	0.6854
A =	0.61		

<b>Bacteria Loading Pre-Dev</b>			
$L=1.03(10^{-3})[(P)(P_j)(R_v)](C')(A)$			
L =	109.65	Billion colonies/year	

<b>Bacteria Loading Post-Dev</b>			
$L=1.03(10^{-3})[(P)(P_j)(R_v)](C')(A)$			
L =	83.79	Billion colonies/year	

<b>Bacteria Removed</b>		
Sediment Forebay	6.093	Billion colonies/year
Wet Swale	30.830	Billion colonies/year
<b>Total Removed</b>	<b>36.922</b>	<b>Billion colonies/year</b>

**Post-Development Total Bacteria Remaining**

83.79 - 24.103 = **46.87 Billion colonies/year**

**Reduction Compared to Pre-Dev**

1-(59.69 / 109.65) = **57%**

**Reduction Compared to Un-Mitigated Post-Dev**

1-(59.69 / 83.79) = **44%**

Notes:

Pollutant Loading Analysis Method taken from RIDEM Rhode Island Stormwater Design and Installation Standards Manual, Appendix H.3

**Commercial Redevelopment**  
 160 East Main Road - Middletown, RI  
 STORMWATER MANAGEMENT  
**SEDIOMENT FOREBAY BACTERIA LOADING**

SDE Job No.: 22133  
 Prepared by: SJE

Date: 1/10/2024

Revised: 3/21/2024  
 Checked by: MER

**Sediment Forebay**

Bacteria Loading
<b><math>L=1.03(10^{-3})[(P)(P_j)(R_v)](C')(A)</math></b>
P = Rainfall Depth (in.) P <sub>j</sub> = Rainfall Correction Factor R <sub>v</sub> = Runoff Coefficient C' = Flow-weighted mean bacteria concentration A = Contributing drainage area (acres)

R <sub>v</sub> = 0.05+0.009(%I)	%I =	80	P =	47	C' =	4600
%I = % Impervious	A =	0.329	P <sub>j</sub> =	0.9	R <sub>v</sub> =	0.770

Bacteria Loading
<b><math>L=1.03(10^{-3})[(P)(P_j)(R_v)](C')(A)</math></b>
<b>L = 50.77 Billion colonies/year</b>

A BMP	B Bacteria Removal Rate	C Starting Bacteria Load	D Amount Removed (BxC)	E Remaining Load (C-D)
Sediment Forebay	12%	50.77	6.093	44.679
	0%	44.679	0.000	44.679
		44.679	0.000	44.679
<b>Total Bacteria Removal =</b>			<b>6.093 Billion colonies/year</b>	<b>12.00%</b>
<b>Total Bacteria Remaining =</b>			<b>44.679 Billion colonies/year</b>	<b>88.00%</b>

**Notes:**

Pollutant Loading Analysis Method taken from RIDEM Rhode Island Stormwater Design and Installation Standards Manual, Appendix H.3

**Commercial Redevelopment**  
 160 East Main Road - Middletown, RI  
**STORMWATER MANAGEMENT**  
**WET SWALE BACTERIA LOADING**

SDE Job No.: 22133  
 Prepared by: SJE

Date: 1/10/2024

Revised: 3/21/2024  
 Checked by: MER

**Wet Swale**

Bacteria Loading
<b><math>L=1.03(10^{-3})[(P)(P_j)(R_v)](C')(A)</math></b>
P = Rainfall Depth (in.) P <sub>j</sub> = Rainfall Correction Factor R <sub>v</sub> = Runoff Coefficient C' = Flow-weighted mean bacteria concentration A = Contributing drainage area (acres)

R <sub>v</sub> = 0.05+0.009(%I)	%I =	67.3	P =	47	C' =	4600
%I = % Impervious	A =	0.391	P <sub>j</sub> =	0.9	R <sub>v</sub> =	0.656

Bacteria Loading
<b><math>L=1.03(10^{-3})[(P)(P_j)(R_v)](C')(A)</math></b>
<b>L = 51.38 Billion colonies/year</b>

A BMP	B Bacteria Removal Rate	C Starting Bacteria Load	D Amount Removed (BxC)	E Remaining Load (C-D)
Wet Swale	60%	51.38	30.830	20.553
	0%	20.553	0.000	20.553
		20.553	0.000	20.553
<b>Total Bacteria Removal =</b> <b>Total Bacteria Remaining =</b>			<b>30.830 Billion colonies/year</b> <b>20.553 Billion colonies/year</b>	<b>60.00%</b> <b>40.00%</b>

**Notes:**

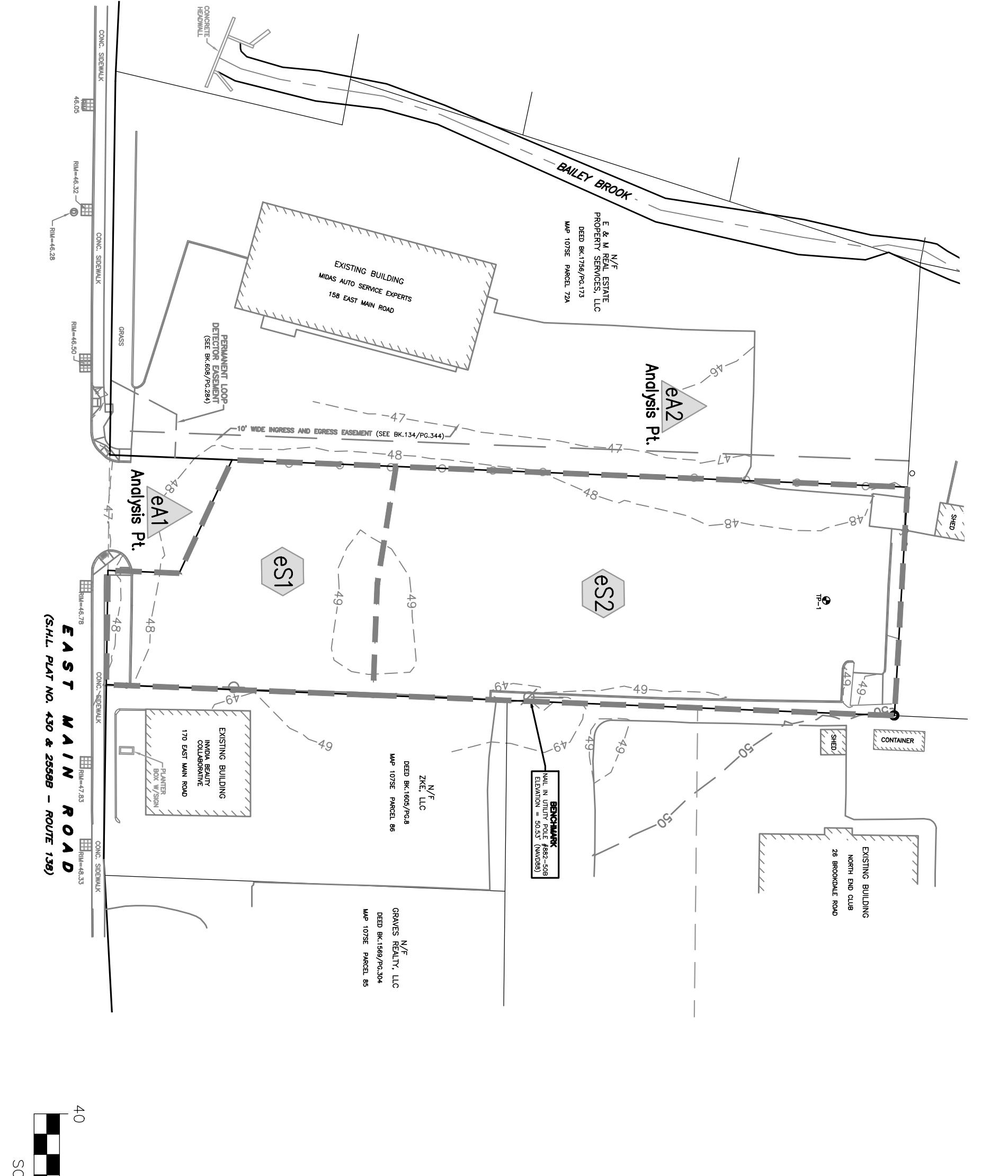
Pollutant Loading Analysis Method taken from RIDEM Rhode Island Stormwater Design and Installation Standards Manual, Appendix H.3





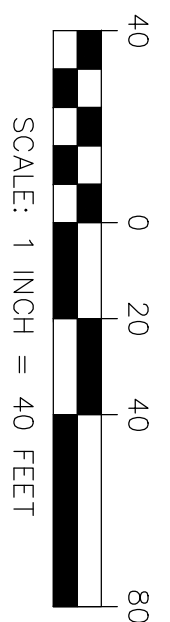






**EAST MAIN ROAD**  
(S.H.L. PLAT NO. 430 & 2558B - ROUTE 138)

- WATERSHED LEGEND**
- SUBCATCHMENT AREA
  - POND / STRUCTURE
  - REACH / CHANNEL
  - Tc-FLOWPATH  
START END PRE-DEVELOPMENT
  - PRE-DEVELOPMENT  
SUBCATCHMENT  
BOUNDARY



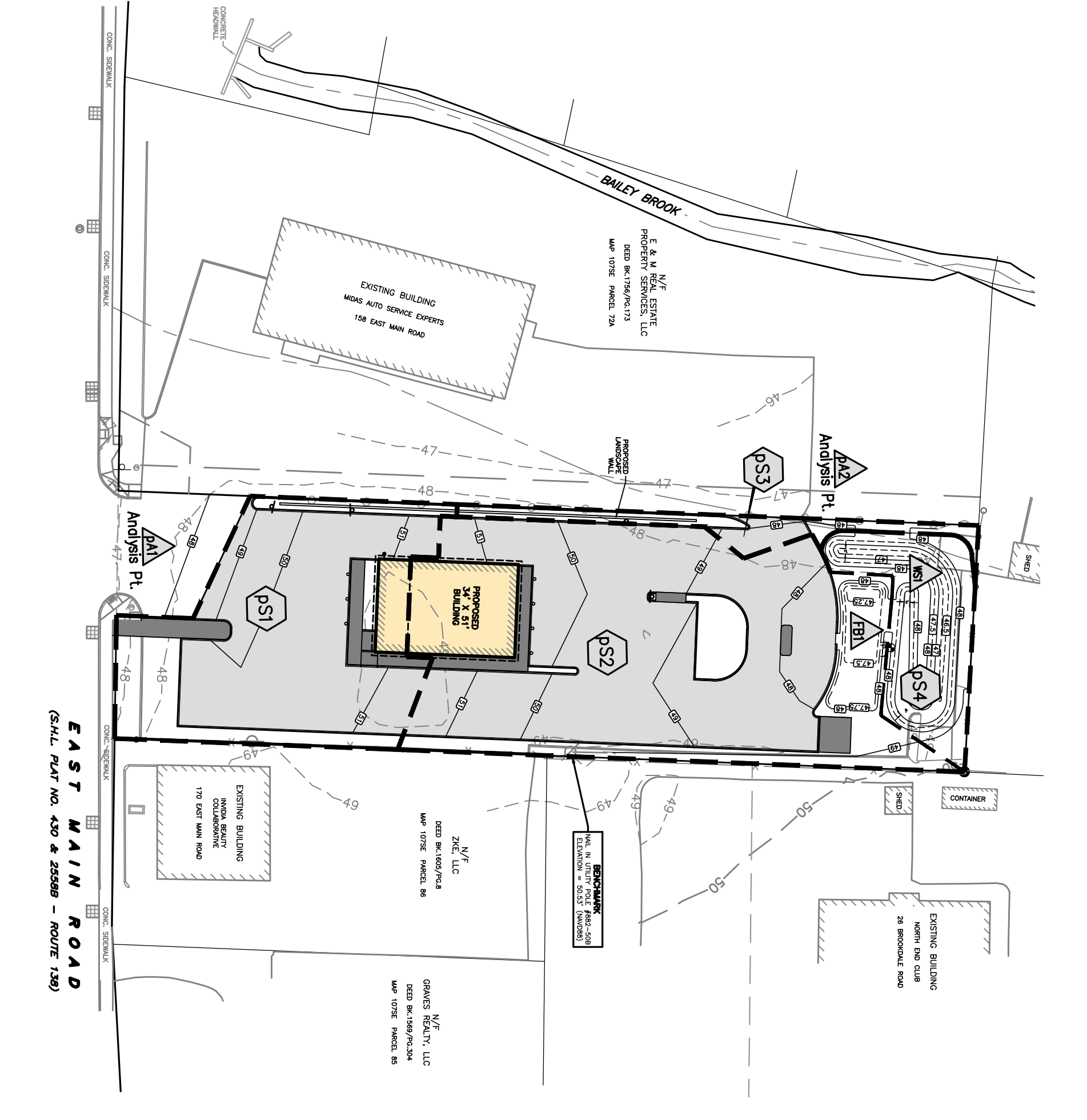
DATE: OCTOBER 10, 2023		REV. DATE:	
PROJ.#: 22133	SCALE : 1" = 40'	DRAWN BY: SJE	CHECK BY: MER
ISSUED FOR : PERMITTING			
PREPARED FOR: 160 EAST MAIN ROAD, LLC			

**PRE DEVELOPMENT  
WATERSHED PLAN**  
160 EAST MAIN ROAD  
MIDDLETOWN, RHODE ISLAND  
ASSESSORS MAP 107SE, PARCEL 72

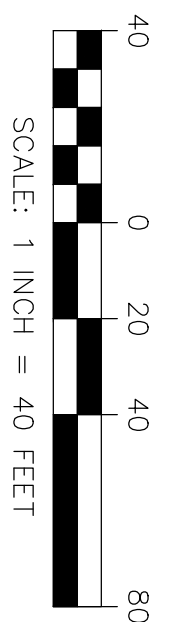
207 HIGH POINT AVE.  
UNIT 6  
Portsmouth, RI 02871  
T: 401-354-2050  
F: 401-369-9775  
WWW.SDE-LDEC.COM







- WATERSHED LEGEND**
- 1 SUBCATCHMENT AREA
  - 1 POND / STRUCTURE
  - 1 REACH / CHANNEL
  - A-B Tc-FLOW PATH
  - START END POST-DEVELOPMENT
  - POSTE-DEVELOPMENT SUBCATCHMENT BOUNDARY



**POST DEVELOPMENT  
WATERSHED PLAN**

160 EAST MAIN ROAD  
MIDDELTOWN, RHODE ISLAND  
ASSESSORS MAP 107SE, PARCEL 72

DATE: MARCH 21, 2024		REV. DATE:	
PROJ.#: 22133	SCALE : 1" = 40'	DRAWN BY: SJE	CHECK BY: MER
ISSUED FOR : PERMITTING			
PREPARED FOR: 160 EAST MAIN ROAD, LLC			

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