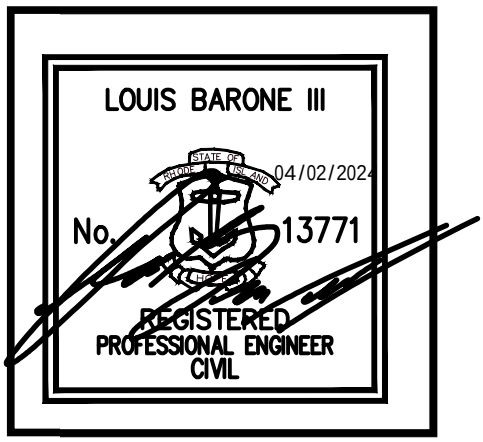
DiPrete Engineering

Stormwater Management Report



Brewed Awakenings

Located in Cranston, RI

Applicant: David Levesque

04-03-2024

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Executive Summary

On behalf of the Client, we are submitting drainage calculations for the proposed redevelopment at 1234 Oaklawn Avenue in Cranston, RI. The site is located on Assessors' Plat 15-1 Lot 1015. The site exists today as entirely pavement with a single building. The client proposes to demolish the building and construct a new two-story building with a drive-through and associated parking. The proposed building will serve as a coffee shop with office space on the second floor.

The post development stormwater will be treated for water quality using Best Management Practices (BMPs). The Site has been designed to meet the Rhode Island Stormwater Design and Installation Standards Manual (RISDISM). The site is considered a redevelopment site because the existing site is over 40% impervious, which triggers a reduced scope of reporting under Section 3.2.6 of the RISDISM. This redevelopment requires minimum stormwater management standards 2, 3, and 7-11 to be addressed. The required water quality and recharge volume must include 50% of the redevelopment area. Refer to Appendix A3.3 for a graphical representation of the impervious area calculations. The site has been designed to meet the RIDEM Stormwater Design and Installations Manual requirements for redevelopment.

At present, the project area is 100% impervious. Mitigation of post-development flows from the site is achieved through a combination of impervious reduction and infiltration through underground infiltration chambers.

This report details how the site will show no net increase in stormwater runoff from pre-development to post-development conditions, and how the proposed BMPs will provide water quality treatment for stormwater runoff.

Pre-development Conditions versus Post-development conditions Flow Rates for each watershed are summarized below:

Subwatershed (design point)	1-yr Peak Flow		10-yr Peak Flow		25-yr Peak Flow		100-yr Peak Flow	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP-1:	2.71	2.00	4.98	3.90	6.21	4.93	8.87	7.14
Totals:	2.71	2.00	4.98	3.90	6.21	4.93	8.87	7.14

All flows in cubic feet per second (cfs)

Pre development Conditions versus Post Development Volume Conditions for each watershed are summarized below:

Sub-watershed (design point)	1-yr Volume		10-yr Volume		25-yr Volume		100-yr Volume	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP-1:	0.175	0.118	0.331	0.264	0.416	0.346	0.600	0.528
Totals:	0.175	0.118	0.331	0.264	0.416	0.346	0.600	0.528

All flows in acre feet per second (af)

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

PROJECT NAME **Brewed Awakenings**	**(RIDEM USE ONLY)** **STW/WQC File #:** **Date Received:**
TOWN **Cranston**	
BRIEF PROJECT DESCRIPTION: Applicant proposes to redevelop parcel to add a two-story building with drive-through restaurant and office space with associated site improvements.	

Stormwater Management Plan (SMP) Elements – Minimum Standards

When submitting a SMP,[1] 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.**

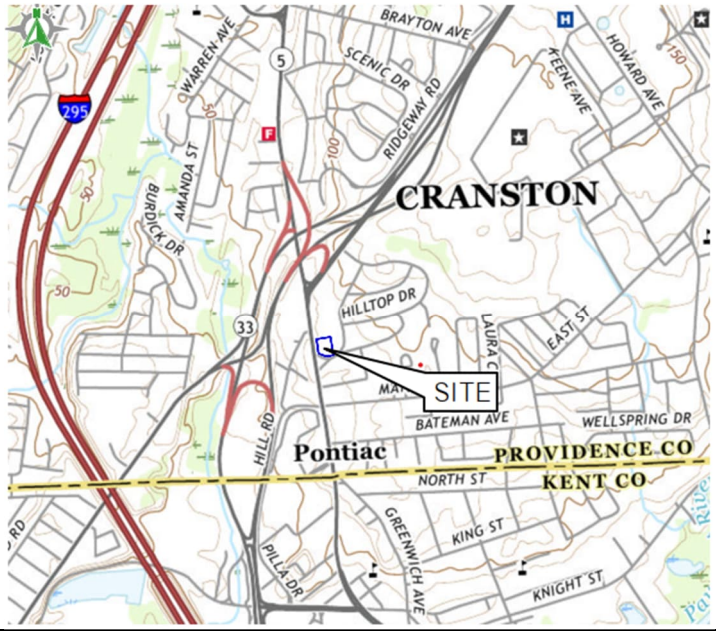
PART 1. PROJECT AND SITE INFORMATION

PROJECT TYPE (Check all that apply)

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

SITE INFORMATION

☒ Vicinity Map



[1] 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.

INITIAL DISCHARGE LOCATION(S): The WQv discharges to: (You may choose more than one answer if several discharge points are associated with the project.)		
☐ **Groundwater**	☐ **Surface Water**	☒ **MS4**
☐ GAA	☐ Isolated Wetland	☒ RIDOT
☐ GA	☐ Named Waterbody	☐ RIDOT Alteration Permit is Approved
☒ GB	☐ Unnamed Waterbody Connected to Named Waterbody	☐ Town
		☐ Other (specify):

ULTIMATE RECEIVING WATERBODY LOCATION(S): Include pertinent information that applies to both WQ_v and flow from larger storm events including overflows. Choose all that apply, and repeat table for each waterbody.			
☐ Groundwater or Disconnected Wetland	☐ SRWP		
☒ Waterbody Name: Meshanticut Brook	☐ Coldwater	☒ Warmwater	☐ Unassessed
☒ Waterbody ID: RI0006017R-02	☐ 4th order stream of pond 50 acres or more		
☒ TMDL for: Enterococcus	☒ Watershed of flood prone river (e.g., Pocasset River)		
☐ Contributes to a priority outfall listed in the TMDL	☐ Contributes stormwater to a public beach		
☐ 303(d) list – Impairment(s) for:	☐ Contributes to shellfishing grounds		

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

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

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

LUHPPL IDENTIFICATION - MINIMUM STANDARD 8:
1. OFFICE OF Land Revitalization and Sustainable Materials Management (OLRSMM)

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

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

REDEVELOPMENT STANDARD – MINIMUM STANDARD 6		
☒ Pre Construction Impervious Area		
	☒ Total Pre-Construction Impervious Area (**TIA**) 0.771 ac	
	☒ Total Site Area (**TSA**) 0.771 ac	
	☐ Jurisdictional Wetlands (**JW**) N/A	
	☐ Conservation Land (**CL**) N/A	
☒ Calculate the Site Size (defined as contiguous properties under same ownership)		
	☒ Site Size (**SS**) = (**TSA**) – (**JW**) – (**CL**) = 0.771-0-0 = 0.771	
	☒ (**TIA**) / (**SS**) = 0.771/0.771 = 1.000	☒ (**TIA**) / (**SS**) >**0.4**?
☒ YES, Redevelopment		

PART 2. LOW IMPACT DEVELOPMENT ASSESSMENT – MINIMUM STANDARD 1

(NOT REQUIRED FOR REDEVELOPMENT OR RETROFITS)

This section may be deleted if not required.

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

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

A) PRESERVATION OF UNDISTURBED AREAS, BUFFERS, AND FLOODPLAINS	**IF NOT IMPLEMENTED, EXPLAIN HERE**
☒ Sensitive resource areas and site constraints are identified (required) ☒ Local development regulations have been reviewed (required) ☐ All vegetated buffers and coastal and freshwater wetlands will be protected during and after construction **N/A** ☐ Conservation Development or another site design technique has been incorporated to protect open space and pre-development hydrology. **Note:** If Conservation Development has been used, check box and skip to Subpart C **N/A** ☒ As much natural vegetation and pre-development hydrology as possible has been maintained	No wetlands or buffers present on site. Site is 100% impervious as exists today.

B) LOCATE DEVELOPMENT IN LESS SENSITIVE AREAS AND WORK WITH THE NATURAL LANDSCAPE CONDITIONS, HYDROLOGY, AND SOILS ☐ Development sites and building envelopes have been appropriately distanced from wetlands and waterbodies **N/A** ☒ Development and stormwater systems have been located in areas with greatest infiltration capacity (e.g., soil groups A and B) ☐ Plans show measures to prevent soil compaction in areas designated as Qualified Pervious Areas (QPA's) **N/A** ☒ Development sites and building envelopes have been positioned outside of floodplains ☒ Site design positions buildings, roadways and parking areas in a manner that avoids impacts to surface water features ☐ Development sites and building envelopes have been located to minimize impacts to steep slopes (≥15%) **N/A** ☐ Other (describe):	There are no wetlands or steep slopes present on or near the site. No QPA's proposed.
C) MINIMIZE CLEARING AND GRADING ☒ Site clearing has been restricted to minimum area needed for building footprints, development activities, construction access, and safety. ☒ Site has been designed to position buildings, roadways, and parking areas in a manner that minimizes grading (cut and fill quantities) ☐ Protection for stands of trees and individual trees and their root zones to be preserved has been specified, and such protection extends at least to the tree canopy drip line(s) **N/A** ☐ Plan notes specify that public trees removed or damaged during construction shall be replaced with equivalent **N/A**	There are no existing trees on the site that require preservation. Site is 100% impervious as exists today.
D) REDUCE IMPERVIOUS COVER ☐ Reduced roadway widths (≤22 feet for ADT ≤ 400; ≤ 26 feet for ADT 400 - 2,000) ☐ Reduced driveway areas (length minimized via reduced ROW width (≤ 45 ft.) and/or reduced (or absolute minimum) front yard setback; width minimized to ≤ 9 ft. wide one lane; ≤ 18 ft. wide two lanes; shared driveways; pervious surface) ☐ Reduced building footprint: Explain approach: ☐ Reduced sidewalk area (≤ 4 ft. wide; one side of the street; unpaved path; pervious surface) ☐ Reduced cul-de-sacs (radius < 45 ft; vegetated island; alternative turn-around) ☐ Reduced parking lot area: Explain approach ☐ Use of pervious surfaces for driveways, sidewalks, parking areas/overflow parking areas, etc. ☐ Minimized impervious surfaces (project meets or is less than maximum specified by Zoning Ordinance) ☒ Other (describe):	Proposed site improvements reduce overall impervious cover within project area by approximately 14.8%.
E) DISCONNECT IMPERVIOUS AREA ☐ Impervious surfaces have been disconnected, and runoff has been diverted to QPAs to the maximum extent possible ☐ Residential street edges allow side-of-the-road drainage into vegetated open swales ☐ Parking lot landscaping breaks up impervious expanse AND accepts runoff ☐ Other (describe):	Overland flow from impervious areas has been reduced; WQ treatment provided for redevelopment WQv.
F) MITIGATE RUNOFF AT THE POINT OF GENERATION ☒ Small-scale BMPs have been designated to treat runoff as close as possible to the source	

G) PROVIDE LOW-MAINTENANCE NATIVE VEGETATION ☐ Low-maintenance landscaping has been proposed using native species and cultivars ☐ Plantings of native trees and shrubs in areas previously cleared of native vegetation are shown on site plan ☐ Lawn areas have been limited/minimized, and yards have been kept undisturbed to the maximum extent practicable on residential lots	There is no existing vegetation or landscaping areas on the site.
H) RESTORE STREAMS/WETLANDS ☐ Historic drainage patterns have been restored by removing closed drainage systems, daylighting buried streams, and/or restoring degraded stream channels and/or wetlands ☐ Removal of invasive species ☐ Other	Not applicable to project.

PART 3. SUMMARY OF REMAINING STANDARDS

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

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

Design Point	**Impervious Area Treated (sq ft)**	**Total Re_v Required (cu ft)**	**LID Stormwater Credits (see RISDISM Section 4.6.1)** **Portion of Re_v directed to a QPA (cu ft)**	**Recharge Required by Remaining BMPs (cu ft)**	**Recharge Provided by BMPs (cu ft)**
DP-1: RIDOT MS4	13,199	275	N/A	275	1,089
TOTALS:					

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

☒ Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.): Stormwater Management Report by DiPrete Engineering

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

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

Design Point and WB ID	**Impervious area treated (sq ft)**	**Total WQ_v Required (cu ft)**	**LID Stormwater Credits** (see RICR 8.18) **WQv directed to a QPA (cu ft)**	**Water Quality Treatment Remaining (cu ft)**	**Water Quality Provided by BMPs (cu ft)**
DP-1: RIDOT MS4	13,199	1,089	N/A	1,089	1,089
TOTALS:					

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

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

☒ Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.): Stormwater Management Report by DiPrete Engineering

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

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

OVERBANK FLOOD PROTECTION (RICR 8.11) AND OTHER POTENTIAL HIGH FLOWS – MINIMUM STANDARD 5			
YES	**NO**		
☐	☒	Is this standard waived? If yes, please indicate one or more of the reasons below:	
		☐	The project directs discharge to a large river (i.e., 4th-order stream or larger. See Appendix I for state-wide list and map of stream orders), bodies of water >50.0 acres in surface area (i.e., lakes, ponds, reservoirs), or tidal waters.
		☐	A Downstream Analysis (see RICR 8.11.D and E) indicates that peak discharge control would not be beneficial or would exacerbate peak flows in a downstream tributary of a particular site (e.g., through coincident peaks).
☒	☐	Does the project flow to an MS4 system or subject to other stormwater requirements? If "Yes," indicate as follows:	
		☒	RIDOT
		☐	Other (specify):
Note: The project could be approved by RIDEM but not meet RIDOT or Town standards. RIDOT's regulations indicate that post-volumes must be **less** than pre-volumes for the 10-yr storm at the design point entering the RIDOT system. If you have not already received approval for the discharge to an MS4, please explain below your strategy to comply with RIDEM and the MS4. The proposed project reduces overall impervious cover by 14.8%. Combined with infiltration from the water quality system, peak flows and volumes contributing to the RIDOT MS4 will be reduced for all design storm events up to and including the 100-year event..			
		Indicate below which model was used for your analysis. ☐ TR-55 ☐ TR-20 ☒ HydroCAD ☐ Bentley/Haestad ☐ Intellisolve ☐ Other (Specify):	
YES	**NO**		
☒	☐	Does the drainage design demonstrate that flows from the 100-year storm event through a BMP will safely manage and convey the 100-year storm? If "No," please explain briefly below and reference where in the application further documentation can be found (i.e., name of report/document, page numbers, appendices, etc.):	
☒	☐	Do off-site areas contribute to the sub-watersheds and design points? If "Yes,"	
☒	☐	Are the areas modeled as "present condition" for both pre- and post-development analysis?	
☒	☐	Are the off-site areas shown on the subwatershed maps?	
☒	☐	Does the drainage design confirm safe passage of the 100-year flow through the site for off-site runoff?	
☐	☒	Is a Downstream Analysis required (see RICR 8.11.E.1)?	
☒	☐	Calculate the following:	
		☒	Area of disturbance within the sub-watershed (areas) 0.851 acres
		☐	Impervious cover (%) 85.4%
☐	☒	Is a dam breach analysis required (earthen embankments over six (6) feet in height, or a capacity of 15 acre-feet or more, and contributes to a significant or high hazard dam)?	
☒	☐	Does this project meet the overbank flood protection standard?	

Table 5-1 Hydraulic Analysis Summary								
Subwatershed (Design Point)	**1.2" Peak Flow** (cfs) **		**1-yr Peak Flow** (cfs)		**10-yr Peak Flow** (cfs)		**100-yr Peak Flow** (cfs)	
	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)
DP-1: RIDOT MS4	1.14	0.46	2.71	2.00	4.98	3.90	8.87	7.14
TOTALS:	1.14	0.46	2.71	2.00	4.98	3.90	8.87	7.14

** 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.	Stormwater Management Report by DiPrete Engineering
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.	Stormwater Management Report by DiPrete Engineering
Final sizing calculations for structural stormwater BMPs, including contributing drainage area, storage, and outlet configuration.	Stormwater Management Report by DiPrete Engineering
Stage-storage, inflow and outflow hydrographs for storage facilities (e.g., detention, retention, or infiltration facilities).	Stormwater Management Report by DiPrete Engineering

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

Table 5.3 Summary of Soils to Evaluate Each BMP									
DP #	**BMP ID**	**BMP Type** (e.g., bioretention, tree filter)	**Soils Analysis for Each BMP**						
			Test Pit ID# and Ground Elevation		SHWT Elevation (ft)	Bottom of Practice Elevation* (ft)	Separation Distance Provided (ft)	Hydrologic Soil Group (A, B, C, D)	Exfiltration Rate Applied (in/hr)
			Primary	Secondary					
1	2	Underground Infiltration System	DTH 24-3	N/A	75.13	78.13	3'	B	1.02
		TOTALS:							

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

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

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

SOIL EROSION AND SEDIMENT CONTROL (SESC) – MINIMUM STANDARD 10			
YES	**NO**	**N/A**	
☒	☐	☐	Have you included a Soil Erosion and Sediment Control Plan Set and/or Complete Construction Plan Set?

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

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

Pollution Prevention Section		
☐	☒	Designated snow stockpile locations?
☐	☒	Trash racks to prevent floatables, trash, and debris from discharging to Waters of the State?
☒	☐	Asphalt-only based sealants?
☐	☒	Pet waste stations? (Note: If a receiving water has a bacterial impairment, and the project involves housing units, then this could be an important part of your pollution prevention plan).
☐	☒	Regular sweeping? Please describe:
☐	☒	De-icing specifications, in accordance with RISDISM Appendix G. (NOTE: If the groundwater is GAA, or this area contributes to a drinking water supply, then this could be an important part of your pollution prevention plan).
☐	☒	A prohibition of phosphate-based fertilizers? (Note: If the site discharges to a phosphorus impaired waterbody, then this could be an important part of your pollution prevention plan).

PART 4. SUBWATERSHED MAPPING AND SITE-PLAN DETAILS

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

Subwatershed and Impervious Area Summary				
Subwatershed (area to each design point)	**First Receiving Water ID or MS4**	**Area Disturbed (units)**	**Existing Impervious (units)**	**Proposed Impervious (units)**
DP-1:	RIDOT MS4 – Oaklawn Avenue	0.851 acres	0.851 acres	0.727 acres
TOTALS:	---	0.851 acres	0.851 acres	0.727 acres

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

1.0 Project Description

The 0.851-acre project area consists of the 0.771-acre parcel located at 1234 Oaklawn Avenue in Cranston, RI, and approximately 0.080 acres of offsite improvements directly adjacent to the parcel. The project is located at Assessors' Plat 15-1 Lot 1015, at the intersection of Oak Hill Drive and Oaklawn Avenue. The proposed development will include a new 4,000 sf building with associated parking and a drive-through. The site will be serviced by public water and sewer. Water is provided by Providence Water and Sewer is provided by Veolia.

Under the RISDISM, the site is considered a redevelopment site because the existing site is over 40% impervious. This triggers a reduced scope of reporting under Section 3.2.6 of the RISDISM. This redevelopment requires at a minimum that stormwater management Standards 2, 3, and 7-11 be met. The required water quality and recharge volume must include 50% of the redevelopment area. Refer to Appendix A3.3 for a graphical representation of the impervious calculations.

The stormwater quality will be improved by utilizing Best Management Practices (BMPs) as established by the RISDISM for the treatment of stormwater runoff from the proposed development. BMPs will consist of a Cascade Separator and underground infiltration chambers. The system has been designed to meet the RIDEM Stormwater Design and Installations Standards Manual.

2.0 Site Conditions

2.1 SOILS

These are the following soil types within the analyzed area of the Site as mapped by the NRCS USDA Soil Conservation service:

Soil Symbol	Description	Hydrologic Group
Ur	Urban land	None

The onsite soils are Urban Land which does not have a Hydrologic Group. Soils adjacent to the site are classified as PD – Paxton-Urban land complex which has Hydrologic Group C. Onsite test holes generally indicated the presence of sandy loam at the C-Horizon. Hydrologic Group C has been used for modeling the site.

Site specific soil evaluations can be found in Appendix A2.1.

2.2 EXISTING SITE CONDITIONS

Currently the site is entirely impervious. There is one building surrounded by asphalt. All stormwater from the site flows overland to the RIDOT-owned MS4 in Oaklawn Avenue, which ultimately discharges to Meshanticut Brook. A TMDL for enterococcus has been established for this brook. None of the stormwater from the site is treated or detained before being discharged to the RIDOT-owned MS4.

2.3 POST SITE CONDITIONS

Following redevelopment, the project area will provide a decrease in impervious cover from existing conditions. This will naturally result in a decrease in stormwater runoff from pre- to post-development conditions for all design storm events, reducing the impact to the existing drainage system on Oaklawn Avenue. The water quality and stormwater recharge volume as established by the RISDISM for the treatment of stormwater runoff will be provided by utilizing BMPs. The proposed drainage analysis uses stormwater management systems to control and treat runoff from the proposed redevelopment. The following BMPs are used on site:

- Cascade Separator
    - Provides pretreatment for runoff
- Underground Infiltration System

The above elements will used to meet the design standards of the Rhode Island Stormwater Design and Installation Standard.

3.0 Minimum Standards

The site has been designed to meet the minimum standards as outlined in the Rhode Island Stormwater Design and Installation Standards Manual (RISDISM). The following sections outline how the site meets and exceeds the minimum required standards.

3.1 Minimum Standard 1: LID Site Planning and Design Strategies

Not applicable for redevelopment, per RISDISM Section 3.

3.2 Minimum Standard 2: Groundwater Recharge

Groundwater is to be recharged per watershed based on impervious area coverage in accordance with section 3.2.2 of the RISDISM.

Groundwater recharge is determined from the following equation:

Re_v=1”*F*I/12

Where:

Re_v=Groundwater Recharge Volume (cf)

F=Recharge Factor based on Hydrologic Soil Groups (HSG) (see table below)

I=Impervious Area (sf)

HSG	Recharge Factor (F)
A	0.60
B	0.35
C	0.25
D	0.10

	HSG	F	I (acres)	Re_v (af)	Re_v Provided (af)
Redevelopment Area	C	0.25	0.300	0.006	0.025

See Table 2-1 of the Appendix A checklist for a summary of recharge values. The required recharge volume is based on all impervious area, not just areas which are captured in the proposed BMPs.

See Appendix A3.2 for the water quality storm HydroCAD analysis. The water quality storm is calculated in HydroCAD using the 'calculate separate Pervious/Impervious runoff' option.

3.3 Minimum Standard 3: Water Quality

The required water quality from the redevelopment area is to be fully infiltrated through the proposed underground infiltration chambers. The site has been designed to capture the required impervious area needed to be treated for water quality, provide pretreatment through a hydrodynamic separator, and infiltrate the water quality volume through the proposed underground infiltration chambers.

Per Section 3.2.6 of the RISDISM, the water quality requirement may be met by a combination of impervious area reduction and BMPs for at least 50% of the redevelopment area.

Refer to Appendix A.3.3 for a graphical representation of the impervious calculations.

Existing Impervious Area: 0.851 acres

Proposed Impervious Area: 0.725 acres

Impervious Reduction: 0.851 - 0.725 = 0.126 acres

WQ Required (Redevelopment): 0.851 x 50% = 0.426 acres

Total WQ Required: 0.426 – 0.126 = 0.300 acres
Redevelopment – Impervious Reduction

In conclusion, the required net impervious area calculated for water quality treatment by BMPs is 0.300 acres.

The site has been designed to meet the water quality requirements for redevelopment projects using a hydrodynamic separator and underground infiltration chambers located in the southwestern portion of the site. The UIC consists of 42 Stormtech SC-160 chambers that have been sized to fully infiltrate the required water quality volume. An outlet control structure with a weir on the outlet end of the system allows larger storms to flow through the system and discharge to the RIDOT MS4. This system results in water quality improvements to Meshanticut Brook, including the known enterococcus impairment. Refer to Appendix A3.2 for the water quality storm HydroCAD results.

Water Quality Underground Infiltration System

The Underground Infiltration System has been designed as a water quality system. The system has been sized using HydroCAD and an infiltration rate based on a parent material within the footprint of the BMP. The project site largely consists of sandy loam in the C-horizon where the infiltration system will be located and an infiltration rate was used from table 5-3 in section 5.3.4 of the RISDISM. See Appendix A3.2 for HydroCAD analysis for the water quality event. The underground infiltration system has been designed to fully infiltrate the water quality event.

Pretreatment for the underground infiltration system has been provided using a proprietary hydrodynamic separator.

3.4 Minimum Standard 4: Conveyance and Natural Channel Protection

Under RISDISM Section 3, the project is considered a redevelopment site; therefore, this minimum standard is not required to be addressed. Due to the reduction in impervious area, the stormwater contribution to the RIDOT-owned MS4 on Oaklawn Avenue has been reduced for all storm events, improving the conveyance and natural channel protection for areas downstream from the site.

3.5 Minimum Standard 5: Overbank Flood Protection & Downstream Analysis

Under RISDISM Section 3, the project is considered a redevelopment site; therefore, this minimum standard is not required to be addressed. Due to the reduction in impervious area, the stormwater contribution to the RIDOT-owned MS4 on Oaklawn Avenue has been reduced for all storm events, improving the conveyance and natural channel protection for areas downstream from the site.

3.5.1 Outlet Protection

The site is proposed to capture stormwater in a new closed drainage network and convey it to the existing RIDOT-owned MS4 on Oaklawn Avenue. Overland flow from the site reaches the same MS4. Impervious cover areas have been reduced and replaced with vegetated landscape areas, which will prevent scour and minimize the potential for downstream erosion by reducing the velocities of any concentrated stormwater flows.

3.5.2 Design Storm

Analysis of 1-year, 10-year, 25-year, and 100-year frequency storms are included. The following 24-hour rainfall intensities are obtained from the Rhode Island Stormwater Design and Installation Standards Manual,

3.5.5 Downstream Analysis

A downstream analysis is required under the following conditions:

Area of Disturbance (Acres)	Impervious Cover (%)
>5 to 10	>75
>10 to 25	>50
>25 to 50	>25
>50	All Projects

The proposed project disturbs less than an acre and reduces impervious cover. A downstream analysis is not required.

3.5.6 Overbank Flood Protection Conclusion

The tables below present a summary of the pre development flows vs. the mitigated post development flows. The table shows a decrease in the rate of runoff for all storms included in the analysis.

Pre Development Flows vs. Post Development Flows Mitigated
Watershed #1: (DL-1)Watershed #1: (DP-1)

Pre-development Conditions versus Post-development conditions Flow Rates for each watershed are summarized below:

Subwatershed (design point)	**1-yr Peak Flow**		**10-yr Peak Flow**		**25-yr Peak Flow**		**100-yr Peak Flow**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
DP-1:	2.71	2.00	4.98	3.90	6.21	4.93	8.87	7.14
Totals:	2.71	2.00	4.98	3.90	6.21	4.93	8.87	7.14

All flows in cubic feet per second (cfs)

Pre-development Conditions versus Post-development Volume Conditions for each watershed are summarized below:

Sub-watershed (design point)	**1-yr Volume**		**10-yr Volume**		**25-yr Volume**		**100-yr Volume**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
DP-1:	0.175	0.118	0.331	0.264	0.416	0.346	0.600	0.528
Totals:	0.175	0.118	0.331	0.264	0.416	0.346	0.600	0.528

All flows in acre feet per second (af)

As shown in the tables above, no increase in stormwater runoff flow will occur following the proposed construction during the 1 through 100-year storm events.

3.6 Minimum Standard 6: Redevelopment and Infill Projects.

This is a redevelopment site in accordance with the Rhode Island Stormwater Design and Installations Standards Manual (RISDISM) Section 3.2.6.

3.7 Minimum Standard 7: Pollution Prevention

A Soil Erosion and Sediment Control Plan (SESC) for this development can be found under a separate document. See the Soil Erosion and Sediment Control Plan for the development prepared by DiPrete Engineering. The SESC contains information for construction pollution prevention. For post construction pollution prevention see the Operations and Maintenance (O&M) document prepared for this development by DiPrete Engineering.

3.8 Minimum Standard 8: Land Uses with High Potential Pollutant Loads (LUHPPLs)

The site is not considered LUHPPL.

3.9 Minimum Standard 9: Illicit Discharges

There are no proposed Illicit Discharges on site. The site will be serviced by public water and sewer.

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

See the SESC for this development prepared by DiPrete Engineering.

3.11 Minimum Standard 11: Stormwater Management System Operation and Maintenance

See the O&M for this development prepared by DiPrete Engineering.

Appendix A

A2.1 Soil Evaluations

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

Site Evaluation Form
Part A – Soil Profile Description **Application Number** _____

Property Owner: Chaychen, LLC
Property Location: 1234- 1242 Oaklawn Ave (AP 15, Lot 1015), Cranston
Date of Test Hole: February 15, 2024
Soil Evaluator: Allison Drake License Number: D-4105
Weather: Sunny, 30's Shaded: Yes ☐ No ☑ Time: 8:00AM

TH DTH 24-1 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
M	0-4"									Asphalt
HTM	4-26"									Fill
Cd	26-96"	-	-	5Y 4/2	7.5YR 5/6	C M P	gsl	0m	firm	8

TH DTH 24-2 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
M	0-4"									Asphalt
HTM	4-37"									Fill
C	37-67"	-	-	2.5Y 4/2	-	-	gcbls	0m	fri	6
R	67"									

TH DTH 24-1 Soil Class Dense Till Total Depth 96" Impervious/Limiting Layer Depth N/A (og) GW Seepage Depth N/A SHWT 45" (og)
TH DTH 24-2 Soil Class Ablation Till Total Depth 67" Impervious/Limiting Layer Depth 67" (og) GW Seepage Depth N/A SHWT 60" (og)

Comments: _____

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

Site Evaluation Form
Part A – Soil Profile Description **Application Number** _____

Property Owner: Chaychen, LLC
Property Location: 1234- 1242 Oaklawn Ave (AP 15, Lot 1015), Cranston
Date of Test Hole: February 15, 2024
Soil Evaluator: Allison Drake License Number: D-4105
Weather: Sunny, 30's Shaded: Yes ☐ No ☑ Time: 8:00AM

TH DTH 24-3 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
M	0-4"									Asphalt
HTM	4-27"									Fill
C	27-81"	-	-	2.5Y 4/2	-	-	gcbls	0m	fri	6
R	81"									

TH DTH 24-4 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
M	0-4"									Asphalt
HTM	4-34"									Fill
Cd1	34-53"	C	S	5Y 4/3	10YR 4/6	C M P	gsl	0m	firm	8
Cd2	53-108"	-	-	5Y 4/2	-	-	gcbsl	0m	firm	8

TH DTH 24-3 Soil Class Ablation Till Total Depth 81" Impervious/Limiting Layer Depth 81" (og) GW Seepage Depth N/A SHWT 80" (og)
TH DTH 24-4 Soil Class Dense Till Total Depth 108" Impervious/Limiting Layer Depth N/A (og) GW Seepage Depth N/A SHWT 40" (og)

Comments: _____

A3.2 Water Quality HydroCAD Storm Analysis

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10: WPre-1: Entire Project Area Runoff Area=0.851 ac 100.00% Impervious Runoff Depth=0.99"
Tc=0.0 min CN=0/98 Runoff=1.14 cfs 0.070 af

Link 11: DP-1: RIDOT MS4 Inflow=1.14 cfs 0.070 af
Primary=1.14 cfs 0.070 af

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100: WPost-1: Building Roof Runoff Area=0.092 ac 100.00% Impervious Runoff Depth=0.99"
Tc=6.0 min CN=0/98 Runoff=0.10 cfs 0.008 af

Subcatchment 101: WPost-2: Direct to RIDOT Runoff Area=0.258 ac 86.85% Impervious Runoff Depth=0.86"
Tc=6.0 min CN=74/98 Runoff=0.25 cfs 0.019 af

Subcatchment 102: WPost-3: Captured On Site Runoff Area=0.338 ac 89.64% Impervious Runoff Depth=0.89"
Tc=6.0 min CN=74/98 Runoff=0.33 cfs 0.025 af

Subcatchment 105: WPost-4: Indirect to RIDOT Runoff Area=0.164 ac 64.79% Impervious Runoff Depth=0.66"
Tc=6.0 min CN=74/98 Runoff=0.12 cfs 0.009 af

Pond 103: SC-160 Peak Elev=79.45' Storage=0.012 af Inflow=0.33 cfs 0.025 af
Discarded=0.02 cfs 0.025 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.025 af

Pond 104: DMH-7 Peak Elev=76.87' Inflow=0.35 cfs 0.026 af
15.00" Round Culvert n=0.012 L=28.9' S=0.0138 '/' Outflow=0.35 cfs 0.026 af

Link 106: DP-1: RIDOT MS4 Inflow=0.46 cfs 0.035 af
Primary=0.46 cfs 0.035 af

A3.4.2 Drainage Network Hydraulic Calculations

DiPrete Engineering
Engineers • Planners • Surveyors

Project Name: Brewed Awakenings
Project Number: 2233-001

25-Year Storm
Date: 12/25/2020

Pipe Analysis

Pipe ID	Pipe Length	Pipe Size	Pipe Slope	Flow Rate	Capacity Full	Velocity	Invert Down	Invert Up
	(ft)	(in)	(%)	(cfs)	(cfs)	(ft/s)	(Ft)	(ft)
2 - CS-3	15.43	10	2.14%	1.1	3.48	5.6	78.70	79.03
1 - CS-3	99.53	10	0.50%	1.3	1.68	3.4	78.70	79.20
4 - 20657	28.94	15	0.69%	2.2	5.82	4.4	76.20	76.40

DiPrete Engineering
Engineers • Planners • Surveyors

Project Name: Brewed Awakenings
Project Number: 2233-001

100-Year Storm
Date: 12/25/2020

Pipe Analysis

Pipe ID	Pipe Length	Pipe Size	Pipe Slope	Flow Rate	Capacity Full	Velocity	Invert Down	Invert Up
	(ft)	(in)	(%)	(cfs)	(cfs)	(ft/s)	(Ft)	(ft)
2 - CS-3	15.43	10	2.14%	1.4	3.48	6.0	78.70	79.03
1 - CS-3	99.53	10	0.50%	1.7	1.68	3.5	78.70	79.20
4 - 20657	28.94	15	0.69%	2.8	5.38	4.4	76.20	76.40

DiPrete Engineering
Engineers • Planners • Surveyors

Project Name: Brewed Awakenings 100-Year Storm
Project Number: 2233-001 Date: 12/25/2020

HGL at Structure

Structure	Rim Elevation	HGL Elevation	Rim-HGL
	(ft)	(ft)	(ft)
CS-3	81.74	0.00	N/A
2	81.53	79.94	1.58
1	81.62	80.38	1.24
20657	80.25	0.00	N/A
4	79.91	78.25	1.66

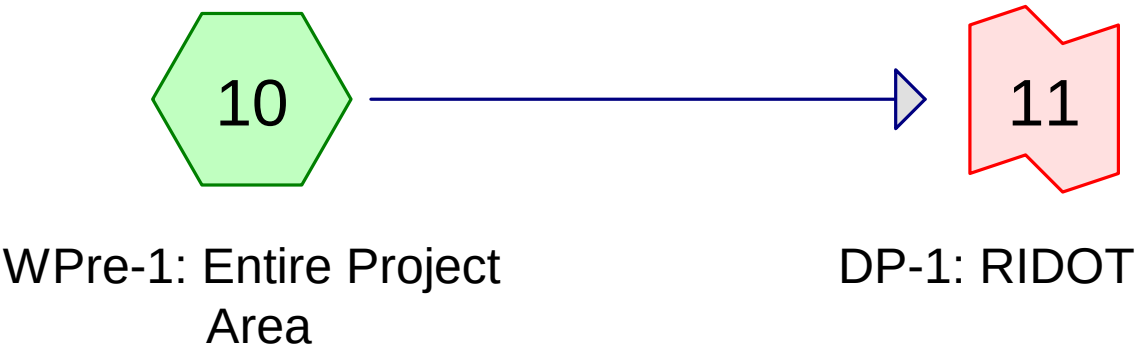
DiPrete Engineering
Engineers • Planners • Surveyors

Project Name: Brewed Awakenings
Project Number: 2233-001

10-Year Storm
Date: 12/25/2020

Structure	Area	Inlet Time	Intensity	Runoff C	Q=Cia	Q Carry over	Q Captured	Q Bypassed	Bypass Structure	Inlet Type	Curb Opening	Curb Opening	Grate Length	Grate Width	Depth	Spread
	(sf)	(min)	(in/hr)	(C)	(cfs)	(cfs)	(cfs)	(cfs)			(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
1	8,268	6	6.94	0.8	1.06	0	1.06	0.00	---	Grate inlet	---	---	2	2	0.162	16.158
2	6,202	6	6.938	0.87	0.87	0	0.87	0.00	---	Grate inlet	---	---	2	2	0.146	17.792
4	12,648	6	6.938	0.88	1.79	0	1.79	0.00	---	Grate inlet	---	---	2	2	0.234	11.722

A3.5.4.1 HydroCAD Node Diagram

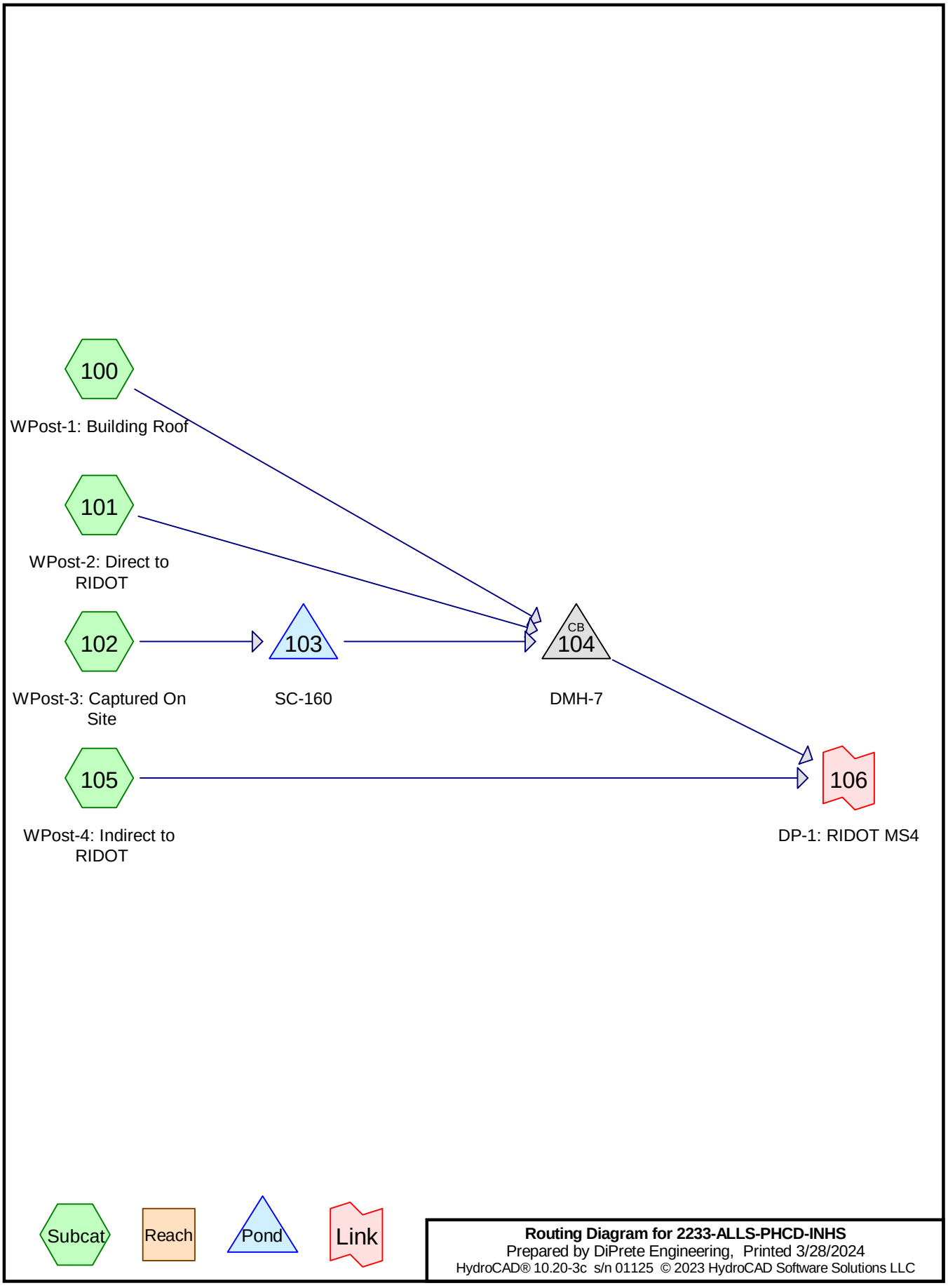


Subcat Reach Pond Link

Routing Diagram for 2233-ALLS-EHCD-INHS
Prepared by DiPrete Engineering, Printed 3/28/2024

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.457	98	Impervious, HSG C (10)
0.081	98	Offsite Impervious, HSG C (10)
0.313	98	Roofs, HSG C (10)
0.851	**98**	**TOTAL AREA**


100
WPost-1: Building Roof
101
WPost-2: Direct to RIDOT
102
WPost-3: Captured On Site
103
SC-160
CB
104
DMH-7
105
WPost-4: Indirect to RIDOT
106
DP-1: RIDOT MS4
Subcat
Reach
Pond
Link
Routing Diagram for 2233-ALLS-PHCD-INHS
Prepared by DiPrete Engineering, Printed 3/28/2024
HydroCAD® 10.20-3c s/n 01125 © 2023 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.126	74	>75% Grass cover, Good, HSG C (101, 102, 105)
0.602	98	Impervious, HSG C (100, 101, 102, 105)
0.032	98	Offsite Impervious, HSG C (101, 105)
0.091	98	Roofs, HSG C (100, 102)
0.851	**94**	**TOTAL AREA**

A3.5.4.2 HydroCAD 1-Year Storm Analysis

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

Subcatchment 10: WPre-1: Entire Project Area Runoff Area=0.851 ac 100.00% Impervious Runoff Depth=2.47"
Tc=0.0 min CN=98 Runoff=2.71 cfs 0.175 af

Link 11: DP-1: RIDOT MS4 Inflow=2.71 cfs 0.175 af
Primary=2.71 cfs 0.175 af

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

Subcatchment 100: WPost-1: Building Roof Runoff Area=0.092 ac 100.00% Impervious Runoff Depth=2.47"
Tc=6.0 min CN=98 Runoff=0.24 cfs 0.019 af

Subcatchment 101: WPost-2: Direct to RIDOT Runoff Area=0.258 ac 86.85% Impervious Runoff Depth=2.16"
Tc=6.0 min CN=95 Runoff=0.62 cfs 0.046 af

Subcatchment 102: WPost-3: Captured On Site Runoff Area=0.338 ac 89.64% Impervious Runoff Depth=2.26"
Tc=6.0 min CN=96 Runoff=0.84 cfs 0.064 af

Subcatchment 105: WPost-4: Indirect to RIDOT Runoff Area=0.164 ac 64.79% Impervious Runoff Depth=1.71"
Tc=6.0 min CN=90 Runoff=0.33 cfs 0.023 af

Pond 103: SC-160 Peak Elev=79.67' Storage=0.013 af Inflow=0.84 cfs 0.064 af
Discarded=0.02 cfs 0.034 af Primary=0.82 cfs 0.030 af Outflow=0.84 cfs 0.064 af

Pond 104: DMH-7 Peak Elev=77.23' Inflow=1.68 cfs 0.095 af
15.00" Round Culvert n=0.012 L=28.9' S=0.0138 '/' Outflow=1.68 cfs 0.095 af

Link 106: DP-1: RIDOT MS4 Inflow=2.00 cfs 0.118 af
Primary=2.00 cfs 0.118 af

A3.5.4.3 HydroCAD 10-Year Storm Analysis

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

Subcatchment 10: WPre-1: Entire Project Area Runoff Area=0.851 ac 100.00% Impervious Runoff Depth=4.66"
Tc=0.0 min CN=98 Runoff=4.98 cfs 0.331 af

Link 11: DP-1: RIDOT MS4 Inflow=4.98 cfs 0.331 af
Primary=4.98 cfs 0.331 af

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

Subcatchment 100: WPost-1: Building Roof Runoff Area=0.092 ac 100.00% Impervious Runoff Depth=4.66"
Tc=6.0 min CN=98 Runoff=0.44 cfs 0.036 af

Subcatchment 101: WPost-2: Direct to RIDOT Runoff Area=0.258 ac 86.85% Impervious Runoff Depth=4.32"
Tc=6.0 min CN=95 Runoff=1.20 cfs 0.093 af

Subcatchment 102: WPost-3: Captured On Site Runoff Area=0.338 ac 89.64% Impervious Runoff Depth=4.43"
Tc=6.0 min CN=96 Runoff=1.59 cfs 0.125 af

Subcatchment 105: WPost-4: Indirect to RIDOT Runoff Area=0.164 ac 64.79% Impervious Runoff Depth=3.78"
Tc=6.0 min CN=90 Runoff=0.70 cfs 0.052 af

Pond 103: SC-160 Peak Elev=79.77' Storage=0.014 af Inflow=1.59 cfs 0.125 af
Discarded=0.02 cfs 0.041 af Primary=1.57 cfs 0.084 af Outflow=1.59 cfs 0.125 af

Pond 104: DMH-7 Peak Elev=77.54' Inflow=3.20 cfs 0.212 af
15.00" Round Culvert n=0.012 L=28.9' S=0.0138 '/' Outflow=3.20 cfs 0.212 af

Link 106: DP-1: RIDOT MS4 Inflow=3.90 cfs 0.264 af
Primary=3.90 cfs 0.264 af

A3.5.4.4 HydroCAD 25-Year Storm Analysis

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

Subcatchment 10: WPre-1: Entire Project Area Runoff Area=0.851 ac 100.00% Impervious Runoff Depth=5.86"
Tc=0.0 min CN=98 Runoff=6.21 cfs 0.416 af

Link 11: DP-1: RIDOT MS4 Inflow=6.21 cfs 0.416 af
Primary=6.21 cfs 0.416 af

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

Subcatchment 100: WPost-1: Building Roof Runoff Area=0.092 ac 100.00% Impervious Runoff Depth=5.86"
Tc=6.0 min CN=98 Runoff=0.55 cfs 0.045 af

Subcatchment 101: WPost-2: Direct to RIDOT Runoff Area=0.258 ac 86.85% Impervious Runoff Depth=5.51"
Tc=6.0 min CN=95 Runoff=1.51 cfs 0.118 af

Subcatchment 102: WPost-3: Captured On Site Runoff Area=0.338 ac 89.64% Impervious Runoff Depth=5.63"
Tc=6.0 min CN=96 Runoff=2.00 cfs 0.158 af

Subcatchment 105: WPost-4: Indirect to RIDOT Runoff Area=0.164 ac 64.79% Impervious Runoff Depth=4.94"
Tc=6.0 min CN=90 Runoff=0.90 cfs 0.067 af

Pond 103: SC-160 Peak Elev=79.81' Storage=0.014 af Inflow=2.00 cfs 0.158 af
Discarded=0.02 cfs 0.043 af Primary=1.97 cfs 0.116 af Outflow=1.99 cfs 0.158 af

Pond 104: DMH-7 Peak Elev=77.70' Inflow=4.03 cfs 0.279 af
15.00" Round Culvert n=0.012 L=28.9' S=0.0138 '/' Outflow=4.03 cfs 0.279 af

Link 106: DP-1: RIDOT MS4 Inflow=4.93 cfs 0.346 af
Primary=4.93 cfs 0.346 af

A3.5.4.5 HydroCAD 100-Year Storm Analysis

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

Subcatchment 10: WPre-1: Entire Project Area Runoff Area=0.851 ac 100.00% Impervious Runoff Depth=8.46"
Tc=0.0 min CN=98 Runoff=8.87 cfs 0.600 af

Link 11: DP-1: RIDOT MS4 Inflow=8.87 cfs 0.600 af
Primary=8.87 cfs 0.600 af

Summary for Subcatchment 10: WPre-1: Entire Project Area

Runoff = 8.87 cfs @ 12.00 hrs, Volume= 0.600 af, Depth= 8.46"
Routed to Link 11 : DP-1: RIDOT MS4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.457	98	Impervious, HSG C
0.081	98	Offsite Impervious, HSG C
0.313	98	Roofs, HSG C
0.851	98	Weighted Average
0.851	98	100.00% Impervious Area

Summary for Link 11: DP-1: RIDOT MS4

Inflow Area = 0.851 ac,100.00% Impervious, Inflow Depth = 8.46" for 100-Year event
Inflow = 8.87 cfs @ 12.00 hrs, Volume= 0.600 af
Primary = 8.87 cfs @ 12.00 hrs, Volume= 0.600 af, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment 100: WPost-1: Building Roof Runoff Area=0.092 ac 100.00% Impervious Runoff Depth=8.46"
Tc=6.0 min CN=98 Runoff=0.79 cfs 0.065 af

Subcatchment 101: WPost-2: Direct to RIDOT Runoff Area=0.258 ac 86.85% Impervious Runoff Depth=8.10"
Tc=6.0 min CN=95 Runoff=2.18 cfs 0.174 af

Subcatchment 102: WPost-3: Captured On Site Runoff Area=0.338 ac 89.64% Impervious Runoff Depth=8.22"
Tc=6.0 min CN=96 Runoff=2.87 cfs 0.231 af

Subcatchment 105: WPost-4: Indirect to RIDOT Runoff Area=0.164 ac 64.79% Impervious Runoff Depth=7.50"
Tc=6.0 min CN=90 Runoff=1.34 cfs 0.102 af

Pond 103: SC-160 Peak Elev=79.89' Storage=0.015 af Inflow=2.87 cfs 0.231 af
Discarded=0.02 cfs 0.044 af Primary=2.84 cfs 0.187 af Outflow=2.86 cfs 0.231 af

Pond 104: DMH-7 Peak Elev=78.19' Inflow=5.80 cfs 0.426 af
15.00" Round Culvert n=0.012 L=28.9' S=0.0138 '/' Outflow=5.80 cfs 0.426 af

Link 106: DP-1: RIDOT MS4 Inflow=7.14 cfs 0.528 af
Primary=7.14 cfs 0.528 af

Summary for Subcatchment 100: WPost-1: Building Roof

Runoff = 0.79 cfs @ 12.08 hrs, Volume= 0.065 af, Depth= 8.46"
Routed to Pond 104 : DMH-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.001	98	Impervious, HSG C
0.090	98	Roofs, HSG C
0.092	98	Weighted Average
0.092	98	100.00% Impervious Area

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

Summary for Subcatchment 101: WPost-2: Direct to RIDOT

Runoff = 2.18 cfs @ 12.08 hrs, Volume= 0.174 af, Depth= 8.10"
Routed to Pond 104 : DMH-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.034	74	>75% Grass cover, Good, HSG C
0.216	98	Impervious, HSG C
0.008	98	Offsite Impervious, HSG C
0.258	95	Weighted Average
0.034	74	13.15% Pervious Area
0.224	98	86.85% Impervious Area

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

Summary for Subcatchment 102: WPost-3: Captured On Site

Runoff = 2.87 cfs @ 12.08 hrs, Volume= 0.231 af, Depth= 8.22"
Routed to Pond 103 : SC-160

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.035	74	>75% Grass cover, Good, HSG C
0.303	98	Impervious, HSG C
0.000	98	Roofs, HSG C
0.338	96	Weighted Average
0.035	74	10.36% Pervious Area
0.303	98	89.64% Impervious Area

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

Summary for Subcatchment 105: WPost-4: Indirect to RIDOT

Runoff = 1.34 cfs @ 12.08 hrs, Volume= 0.102 af, Depth= 7.50"
Routed to Link 106 : DP-1: RIDOT MS4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.058	74	>75% Grass cover, Good, HSG C
0.082	98	Impervious, HSG C
0.024	98	Offsite Impervious, HSG C
0.164	90	Weighted Average
0.058	74	35.21% Pervious Area
0.106	98	64.79% Impervious Area

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

Summary for Pond 103: SC-160

Inflow Area = 0.338 ac, 89.64% Impervious, Inflow Depth = 8.22" for 100-Year event
Inflow = 2.87 cfs @ 12.08 hrs, Volume= 0.231 af
Outflow = 2.86 cfs @ 12.09 hrs, Volume= 0.231 af, Atten= 0%, Lag= 0.4 min
Discarded = 0.02 cfs @ 3.85 hrs, Volume= 0.044 af
Primary = 2.84 cfs @ 12.09 hrs, Volume= 0.187 af
Routed to Pond 104 : DMH-7

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 79.89' @ 12.09 hrs Surf.Area= 0.017 ac Storage= 0.015 af

Plug-Flow detention time= 69.0 min calculated for 0.231 af (100% of inflow)
Center-of-Mass det. time= 68.9 min (819.7 - 750.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	78.13'	0.009 af	**14.50'W x 52.31'L x 2.00'H Field A** 0.035 af Overall - 0.007 af Embedded = 0.028 af x 33.0% Voids
#2A	78.63'	0.007 af	**ADS_StormTech SC-160LP +Cap** x 42 Inside #1 Effective Size= 18.0"W x 12.0"H => 0.96 sf x 7.12'L = 6.8 cf Overall Size= 25.0"W x 12.0"H x 7.56'L with 0.44' Overlap 42 Chambers in 6 Rows
		0.016 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	78.13'	**1.020 in/hr Exfiltration over Surface area** Phase-In= 0.10'
#2	Device 3	79.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	78.70'	**12.00" Round 12" OUTLET** L= 73.4' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 78.70' / 76.60' S= 0.0286 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Discarded OutFlow Max=0.02 cfs @ 3.85 hrs HW=78.25' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=2.84 cfs @ 12.09 hrs HW=79.89' TW=78.19' (Dynamic Tailwater)
3=12" OUTLET (Passes 2.84 cfs of 3.14 cfs potential flow)
2=Broad-Crested Rectangular Weir (Weir Controls 2.84 cfs @ 1.82 fps)

Summary for Pond 104: DMH-7

Inflow Area = 0.688 ac, 89.98% Impervious, Inflow Depth = 7.43" for 100-Year event
Inflow = 5.80 cfs @ 12.09 hrs, Volume= 0.426 af
Outflow = 5.80 cfs @ 12.09 hrs, Volume= 0.426 af, Atten= 0%, Lag= 0.0 min
Primary = 5.80 cfs @ 12.09 hrs, Volume= 0.426 af
Routed to Link 106 : DP-1: RIDOT MS4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 78.19' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	76.60'	**15.00" Round 15" OUTLET** L= 28.9' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 76.60' / 76.20' S= 0.0138 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

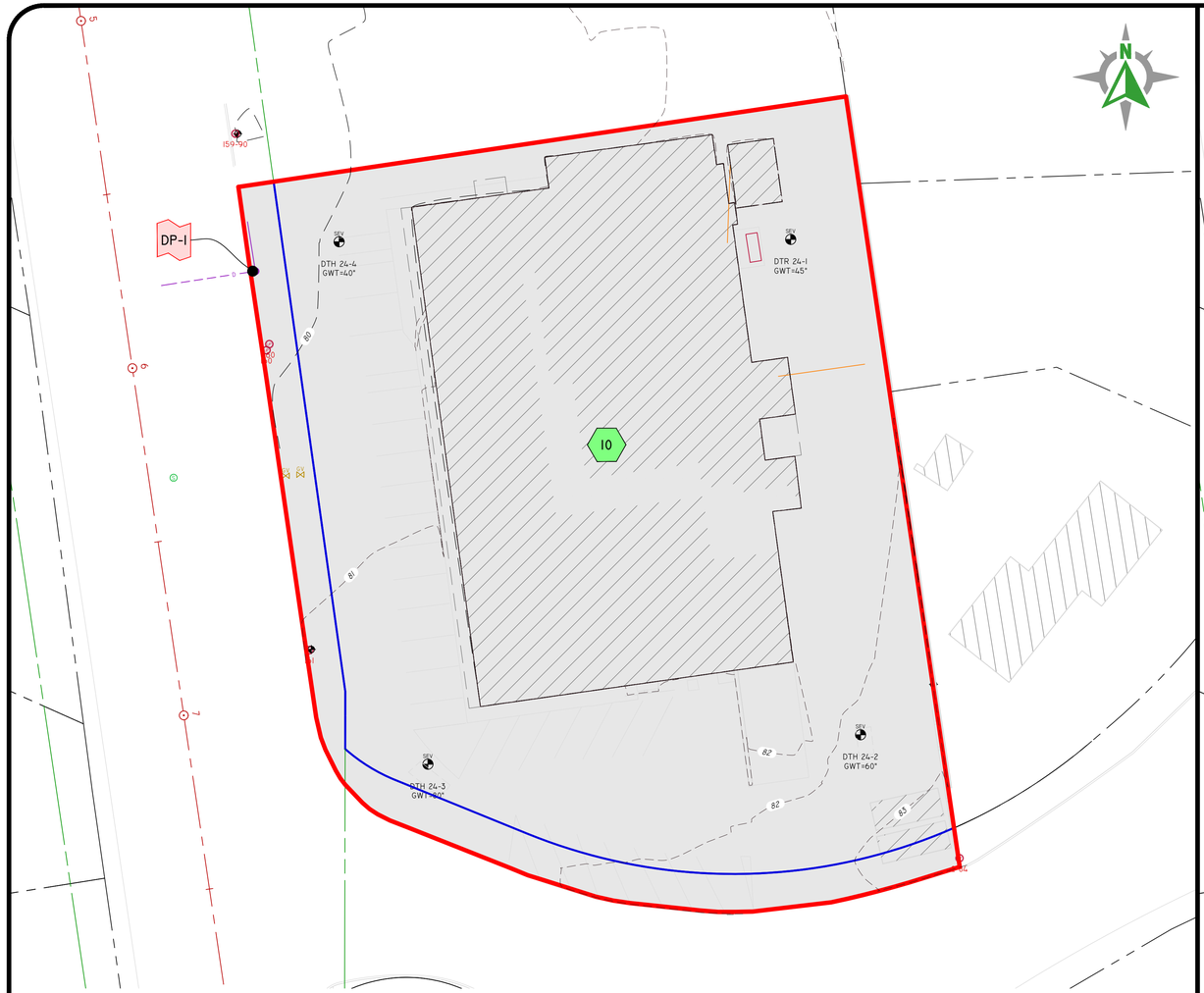
Primary OutFlow Max=5.79 cfs @ 12.09 hrs HW=78.19' TW=0.00' (Dynamic Tailwater)
1=15" OUTLET (Inlet Controls 5.79 cfs @ 4.72 fps)

Summary for Link 106: DP-1: RIDOT MS4

Inflow Area = 0.851 ac, 85.14% Impervious, Inflow Depth = 7.44" for 100-Year event
Inflow = 7.14 cfs @ 12.09 hrs, Volume= 0.528 af
Primary = 7.14 cfs @ 12.09 hrs, Volume= 0.528 af, Atten= 0%, Lag= 0.0 min

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

Watershed Maps



PRE-WATERSHED	
TOTAL REDEVELOPMENT AREA	0.851 AC
TOTAL IMPERVIOUS AREA	0.851 AC
PERCENT IMPERVIOUS AREA	100.00%

PRE-DEVELOPMENT

SCALE: 1"=20'
0 10' 20' 40'

POST-WATERSHED	
TOTAL REDEVELOPMENT AREA	0.851 AC
TOTAL IMPERVIOUS AREA	0.725 AC
PERCENT IMPERVIOUS AREA	85.2%

POST-DEVELOPMENT

SCALE: 1"=20'
0 10' 20' 40'

WATER QUALITY CALCULATIONS

IMPERVIOUS DATA:
EXISTING IMPERVIOUS 0.851 AC
PROPOSED IMPERVIOUS 0.727 AC

IMPERVIOUS REDUCTION:
EXISTING - PROPOSED 0.851 - 0.725 = 0.126 AC

WQ REQUIRED (REDEVELOPMENT):
50% EXISTING IMPERVIOUS 0.851 * 50% = 0.426 AC

TOTAL WQ REQUIRED:
REDEVELOPMENT 0.426 AC
IMPERVIOUS REDUCTION -0.126 AC
0.300 AC

IMPERVIOUS CALCULATION MAP
BREWED AWAKENINGS

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