DESIGN ENGINEERS, INC.

Stormwater Addendum #1
For
Definitive Subdivision Plan for Colton Road Extension
Millbury, Massachusetts

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Atlantic Project No. 3085.00

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1.0 INTRODUCTION

This Addendum #1 to the original Stormwater Report dated 5/10/2020 for the proposed Colton Road Extension has been prepared to address plan revisions resulting from comments received during municipal/peer review. The extension will now include an additional 4" of pavement millings on 8" of gravel subbase per the revised plans (revision 2 dated August 27, 2020). Based on this change a modification to the curve number has now been conservatively assumed to increase to 98. Subsequently, additional improvements to the stormwater now include an infiltration area.

2.0 PROPOSED STORMWATER MANAGEMENT SYSTEM

The following is a summary of the revisions incorporated into Stormwater Addendum 1:

- Updated MASS DEP Checklist for Stormwater Report – Revision 1
- Updated Post-Development HydroCAD stormwater analysis with modeling of the Infiltration Area and Swale.
- Revised Post-Development Watershed plan
- Revised Long term Operation and Maintenance plan with Inspection Log – Revision 2
- Changes included in the Revised Definitive subdivision plans for Colton Road Extension Plans Dated August 27, 2020
- Supplemental calculations Water quality, Recharge and TSS.

3.0 COMPLIANCE WITH DEP STORMWATER MANAGEMENT STANDARDS

Standard 1: No New Untreated Discharges- Revision 1

As a conservative approach to the surface change from gravel to pavement millings, we have included TSS calculations showing treatment of the stormwater prior to discharge.

Standard 2: Peak Rate Attenuation-Revision 1

Pre- and Post-Development stormwater calculations were performed for the 2, 10, 25 and 100-year, Type III storm events for the previously reviewed and approved watershed affected by the addition of the gravel road extension/cul-de-sac. A comparison of the Pre- vs. Post-Development peak runoff rates for each storm event at Design Points is summarized in the tables below.

Design Point #1 – Northern Wetlands		
Storm Event	***Pre-Development***	***Post-Development***
2-year	9.96 cfs	9.61 cfs
10-year	26.98 cfs	25.70 cfs
25-year	39.23 cfs	37.54 cfs
100-year	59.19 cfs	56.31 cfs

As shown in the tables, the peak rates for stormwater runoff generated under Post Development condition will be equal to or less than the peak rates generated under Pre-Development conditions for the all storm events.

Complete revised runoff calculations for the 2, 10, 25 and 100-year Type III storm events including ground cover, soils types and times of concentration paths for the Pre-Development conditions and Post-Development conditions are provided in Appendix B.

Standard 3: Groundwater Recharge

Since the proposed extension will now include pavement millings, groundwater recharge calculations have been provided to conservatively estimate the surface change. Please find recharge calculations in Appendix E indicating recharge is met.

Standard 4: Water Quality

As described in the previous section, water quality calculations are being included to show that the on-site BMP will handle the required water quality volume for the surface change from gravel to pavement millings (see Appendix E).

Standard 5: Land Uses with Higher Pollutant Loads (LUHPPLs)

The proposed development is not a LUHPPL and therefore Standard 5 is not applicable.

Standard 6: Critical Areas

The site does not have any discharges within a Zone II, Interim Wellhead Protection Areas or near or to any Critical Areas as defined by the Massachusetts Stormwater Handbook. Therefore, it is our opinion that Standard 6 is not applicable.

Standard 7: Redevelopment Projects

The proposed project is not a redevelopment project and therefore Standard 7 is not applicable.

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

A Construction Period Erosion and Sedimentation Control Plan is provided on the Site plans along with notes/instructions for the contractor and details/location of all erosion control measures.

Standard 9: Long Term Operation and Maintenance Plan-Revision 2

A revised Long Term Pollution Prevention and Stormwater Operation and Maintenance Plan is provided in Appendix D.

Standard 10: Prohibition of Illicit Discharges

To our knowledge, there are no existing illicit discharges to existing stormwater systems on the Site and measures to prevent illicit discharges from the proposed development to proposed stormwater systems on the Site are included within the Long Term Pollution Prevention Plan (Rev 1). As required, an Illicit Discharge Compliance Statement will be submitted prior to the discharge of any stormwater to the post-construction stormwater Best Management Practices (BMPs).

APPENDIX A

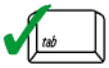
MassDEP Checklist for Stormwater Report-Revision 1

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

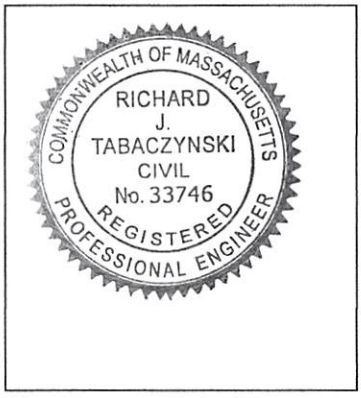
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



8/31/20

Signature and Date

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☐ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

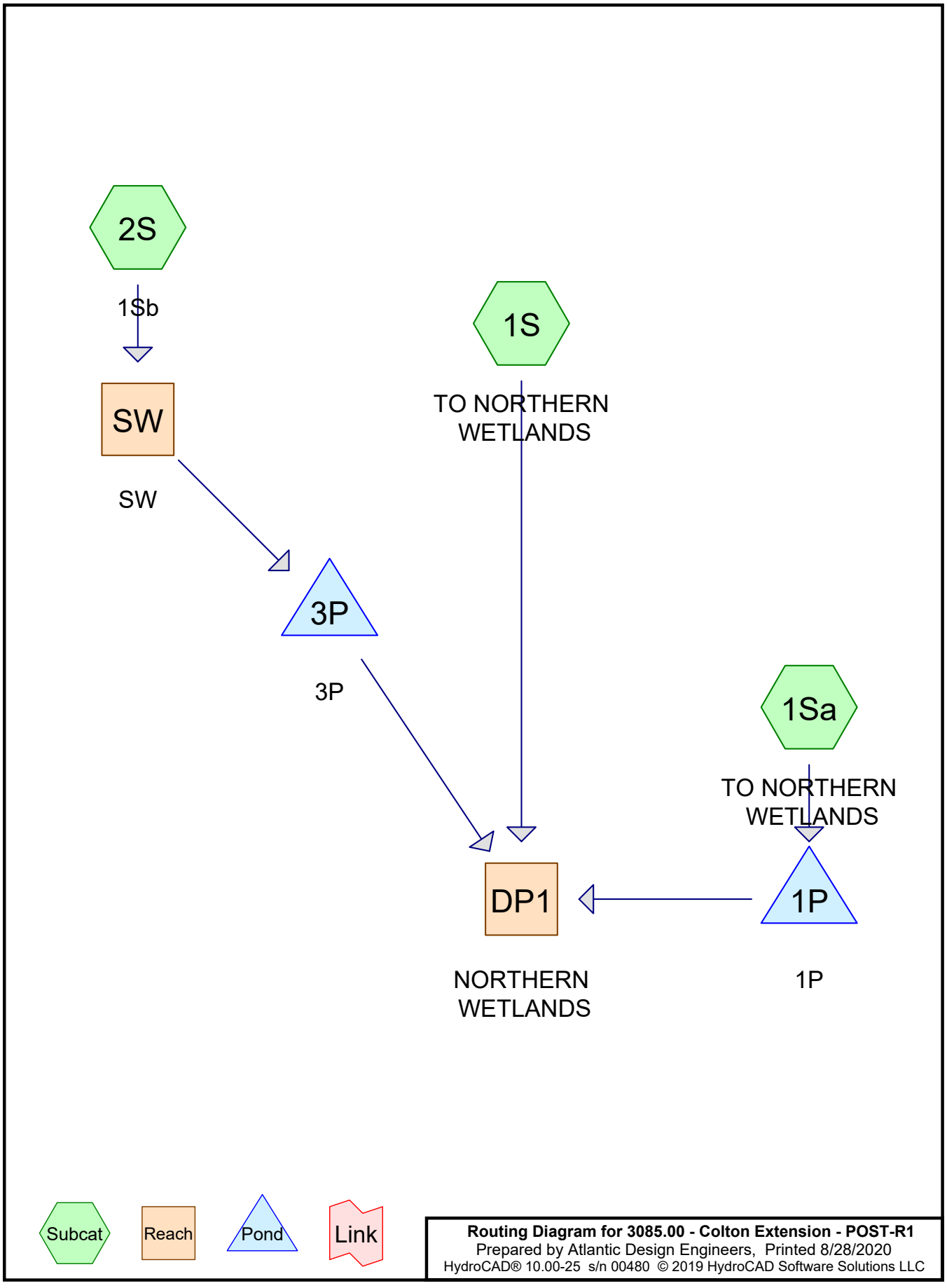
☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

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

APPENDIX B

Post-Development HydroCAD Stormwater Analysis – Revision 1



Routing Diagram for 3085.00 - Colton Extension - POST-R1
Prepared by Atlantic Design Engineers, Printed 8/28/2020

Summary for Subcatchment 1S: TO NORTHERN WETLANDS

Runoff = 8.97 cfs @ 12.40 hrs, Volume= 51,847 cf, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.24"

	Area (sf)	CN	Description
*	208,976	55	Woods, Good, HSG B
	150,666	70	Woods, Good, HSG C
	148,992	77	Woods, Good, HSG D
*	14,916	98	Impervious
*	837	85	RipRap, HSG B
	8,587	96	Gravel surface, HSG B
	2,744	82	Dirt roads, HSG B
*	82,547	71	Honey Bee Meadow Seed Mix - (ERNMX-157), HSG C
*	117,549	78	Honey Bee Meadow Seed Mix - (ERNMX-157), HSG D
	39,753	61	>75% Grass cover, Good, HSG B
	775,567	69	Weighted Average
	760,651		98.08% Pervious Area
	14,916		1.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.2	50	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00"
3.2	624	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
25.4	674	Total			

Summary for Subcatchment 1Sa: TO NORTHERN WETLANDS

Runoff = 2.09 cfs @ 12.26 hrs, Volume= 9,347 cf, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.24"

	Area (sf)	CN	Description
*	7,668	98	Pond Surface
	3,963	96	Gravel surface, HSG B
*	62,796	78	Honey Bee Meadow Seed Mix - (ERNMX-157), HSG D
*	320	98	Concrete Pad
	74,747	81	Weighted Average
	66,759		89.31% Pervious Area
	7,988		10.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.1	50	0.0100	0.05		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 3.00"
1.1	195	0.0358	3.05		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
18.2	245	Total			

Summary for Subcatchment 2S: 1Sb

Runoff = 1.02 cfs @ 12.00 hrs, Volume= 2,607 cf, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.24"

	Area (sf)	CN	Description
*	10,511	98	Pavement Millings
	2,850	61	>75% Grass cover, Good, HSG B
*	825	85	RipRap Slopes, HSG B
	14,186	90	Weighted Average
	3,675		25.91% Pervious Area
	10,511		74.09% Impervious Area

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

Summary for Reach DP1: NORTHERN WETLANDS

Inflow Area = 864,500 sf, 3.87% Impervious, Inflow Depth = 0.86" for 2-yr event
Inflow = 9.61 cfs @ 12.40 hrs, Volume= 62,076 cf
Outflow = 9.61 cfs @ 12.40 hrs, Volume= 62,076 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs

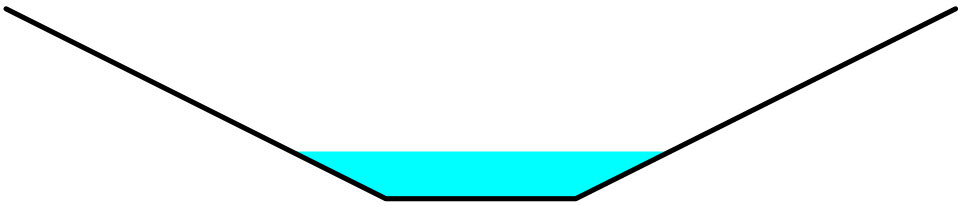
Summary for Reach SW: SW

Inflow Area = 14,186 sf, 74.09% Impervious, Inflow Depth = 2.21" for 2-yr event
Inflow = 1.02 cfs @ 12.00 hrs, Volume= 2,607 cf
Outflow = 1.00 cfs @ 12.01 hrs, Volume= 2,607 cf, Atten= 2%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.69 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 1.1 min

Peak Storage= 19 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 17.24 cfs

1.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 5.00'
Length= 50.0' Slope= 0.0300 '/'
Inlet Invert= 494.50', Outlet Invert= 493.00'



Stage-Area-Storage for Reach SW: SW

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
494.50	0.0	0
494.51	0.0	1
494.52	0.0	1
494.53	0.0	2
494.54	0.0	2
494.55	0.1	3
494.56	0.1	3
494.57	0.1	4
494.58	0.1	5
494.59	0.1	5
494.60	0.1	6
494.61	0.1	7
494.62	0.1	7
494.63	0.2	8
494.64	0.2	9
494.65	0.2	10
494.66	0.2	11
494.67	0.2	11
494.68	0.2	12
494.69	0.3	13
494.70	0.3	14
494.71	0.3	15
494.72	0.3	16
494.73	0.3	17
494.74	0.4	18
494.75	0.4	19
494.76	0.4	20
494.77	0.4	21
494.78	0.4	22
494.79	0.5	23
494.80	0.5	24
494.81	0.5	25
494.82	0.5	26
494.83	0.5	27
494.84	0.6	29
494.85	0.6	30
494.86	0.6	31
494.87	0.6	32
494.88	0.7	33
494.89	0.7	35
494.90	0.7	36
494.91	0.7	37
494.92	0.8	39
494.93	0.8	40
494.94	0.8	41
494.95	0.9	43
494.96	0.9	44
494.97	0.9	46
494.98	0.9	47
494.99	1.0	49
495.00	1.0	50
495.01	1.0	52
495.02	1.1	53
495.03	1.1	55
495.04	1.1	56
495.05	1.2	58
495.06	1.2	59
495.07	1.2	61
495.08	1.3	63
495.09	1.3	64
495.10	1.3	66
495.11	1.4	68
495.12	1.4	69
495.13	1.4	71
495.14	1.5	73
495.15	1.5	75
495.16	1.5	77
495.17	1.6	78
495.18	1.6	80
495.19	1.6	82
495.20	1.7	84
495.21	1.7	86
495.22	1.8	88
495.23	1.8	90
495.24	1.8	92
495.25	1.9	94
495.26	1.9	96
495.27	2.0	98
495.28	2.0	100
495.29	2.0	102
495.30	2.1	104
495.31	2.1	106
495.32	2.2	108
495.33	2.2	110
495.34	2.3	113
495.35	2.3	115
495.36	2.3	117
495.37	2.4	119
495.38	2.4	121
495.39	2.5	124
495.40	2.5	126
495.41	2.6	128
495.42	2.6	131
495.43	2.7	133
495.44	2.7	135
495.45	2.8	138
495.46	2.8	140
495.47	2.9	143
495.48	2.9	145
495.49	3.0	148
495.50	**3.0**	**150**

Summary for Pond 1P: 1P

Inflow Area = 74,747 sf, 10.69% Impervious, Inflow Depth = 1.50" for 2-yr event
Inflow = 2.09 cfs @ 12.26 hrs, Volume= 9,347 cf
Outflow = 0.56 cfs @ 13.01 hrs, Volume= 9,315 cf, Atten= 73%, Lag= 45.2 min
Primary = 0.56 cfs @ 13.01 hrs, Volume= 9,315 cf

Routing by Stor-Ind method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Peak Elev= 474.64' @ 12.81 hrs Surf.Area= 6,084 sf Storage= 3,670 cf

Plug-Flow detention time= 163.8 min calculated for 9,313 cf (100% of inflow)
Center-of-Mass det. time= 162.1 min (1,012.3 - 850.2)

Volume	Invert	Avail.Storage	Storage Description
#1	474.00'	21,414 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
474.00	5,382	362.0	0	0	5,382
475.00	6,497	381.0	5,931	5,931	6,565
476.00	7,669	400.0	7,075	13,006	7,809
477.00	9,169	441.0	8,408	21,414	10,585

Device	Routing	Invert	Outlet Devices
#1	Primary	474.00'	**6.0" Round Culvert** L= 28.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 474.00' / 473.72' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Primary	474.75'	**6.0" Round Culvert X 2.00** L= 20.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 474.75' / 474.55' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.20 sf
#3	Primary	475.90'	**40.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.56 cfs @ 13.01 hrs HW=474.63' (Free Discharge)
- **1=Culvert** (Barrel Controls 0.56 cfs @ 2.91 fps)
- **2=Culvert** (Controls 0.00 cfs)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Stage-Area-Storage for Pond 1P: 1P

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
474.00	5,382	0
474.05	5,435	270
474.10	5,489	544
474.15	5,543	819
474.20	5,597	1,098
474.25	5,651	1,379
474.30	5,705	1,663
474.35	5,760	1,950
474.40	5,815	2,239
474.45	5,871	2,531
474.50	5,926	2,826
474.55	5,982	3,124
474.60	6,038	3,424
474.65	6,095	3,728
474.70	6,151	4,034
474.75	6,208	4,343
474.80	6,266	4,655
474.85	6,323	4,969
474.90	6,381	5,287
474.95	6,439	5,607
475.00	6,497	5,931
475.05	6,553	6,257
475.10	6,610	6,586
475.15	6,667	6,918
475.20	6,724	7,253
475.25	6,781	7,590
475.30	6,838	7,931
475.35	6,896	8,274
475.40	6,954	8,620
475.45	7,012	8,970
475.50	7,071	9,322
475.55	7,130	9,677
475.60	7,189	10,035
475.65	7,248	10,396
475.70	7,307	10,759
475.75	7,367	11,126
475.80	7,427	11,496
475.85	7,487	11,869
475.90	7,547	12,245
475.95	7,608	12,624
476.00	7,669	13,006
476.05	7,741	13,391
476.10	7,813	13,780
476.15	7,885	14,172
476.20	7,958	14,568
476.25	8,031	14,968
476.30	8,105	15,371
476.35	8,179	15,779
476.40	8,253	16,189
476.45	8,327	16,604
476.50	8,402	17,022
476.55	8,477	17,444
476.60	8,553	17,870
476.65	8,629	18,299
476.70	8,705	18,733
476.75	8,781	19,170
476.80	8,858	19,611
476.85	8,935	20,056
476.90	9,013	20,504
476.95	9,091	20,957
477.00	**9,169**	**21,414**

Summary for Pond 3P: 3P

Inflow Area = 14,186 sf, 74.09% Impervious, Inflow Depth = 2.21" for 2-yr event
Inflow = 1.00 cfs @ 12.01 hrs, Volume= 2,607 cf
Outflow = 0.97 cfs @ 12.02 hrs, Volume= 2,608 cf, Atten= 3%, Lag= 0.7 min
Discarded = 0.04 cfs @ 12.02 hrs, Volume= 1,693 cf
Primary = 0.92 cfs @ 12.02 hrs, Volume= 915 cf

Routing by Stor-Ind method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 492.91' @ 12.02 hrs Surf.Area= 467 sf Storage= 693 cf

Plug-Flow detention time= 183.6 min calculated for 2,607 cf (100% of inflow)
Center-of-Mass det. time= 184.1 min (985.9 - 801.9)

Volume	Invert	Avail.Storage	Storage Description
#1	490.00'	1,719 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
490.00	48	32.0	0	0	48
491.00	170	11.0	103	103	123
492.00	312	110.0	237	340	1,078
493.00	483	145.0	394	735	1,800
494.00	1,593	226.0	984	1,719	4,198

Device	Routing	Invert	Outlet Devices
#1	Primary	492.80'	**10.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	490.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 12.02 hrs HW=492.91' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.92 cfs @ 12.02 hrs HW=492.91' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.92 cfs @ 0.82 fps)

Stage-Area-Storage for Pond 3P: 3P

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
490.00	48	48	0
490.10	57	59	5
490.20	66	69	11
490.30	77	78	19
490.40	88	87	27
490.50	100	95	36
490.60	112	102	47
490.70	126	108	59
490.80	140	114	72
490.90	154	119	87
491.00	170	123	103
491.10	182	148	120
491.20	195	189	139
491.30	208	245	159
491.40	222	318	181
491.50	236	405	204
491.60	250	509	228
491.70	265	628	254
491.80	280	762	281
491.90	296	912	310
492.00	312	1,078	340
492.10	327	1,141	372
492.20	343	1,207	406
492.30	359	1,274	441
492.40	376	1,343	478
492.50	393	1,414	516
492.60	410	1,487	556
492.70	428	1,562	598
492.80	446	1,640	642
492.90	464	1,719	687
493.00	483	1,800	735
493.10	565	1,992	787
493.20	654	2,196	848
493.30	748	2,409	918
493.40	850	2,634	998
493.50	958	2,868	1,088
493.60	1,072	3,113	1,189
493.70	1,192	3,369	1,303
493.80	1,320	3,635	1,428
493.90	1,453	3,911	1,567
494.00	**1,593**	**4,198**	**1,719**

Summary for Subcatchment 1S: TO NORTHERN WETLANDS

Runoff = 24.30 cfs @ 12.38 hrs, Volume= 126,975 cf, Depth= 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.01"

	Area (sf)	CN	Description
*	208,976	55	Woods, Good, HSG B
	150,666	70	Woods, Good, HSG C
	148,992	77	Woods, Good, HSG D
*	14,916	98	Impervious
*	837	85	RipRap, HSG B
	8,587	96	Gravel surface, HSG B
	2,744	82	Dirt roads, HSG B
*	82,547	71	Honey Bee Meadow Seed Mix - (ERNMX-157), HSG C
*	117,549	78	Honey Bee Meadow Seed Mix - (ERNMX-157), HSG D
	39,753	61	>75% Grass cover, Good, HSG B
	775,567	69	Weighted Average
	760,651		98.08% Pervious Area
	14,916		1.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.2	50	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00"
3.2	624	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
25.4	674	Total			

Summary for Subcatchment 1Sa: TO NORTHERN WETLANDS

Runoff = 4.22 cfs @ 12.24 hrs, Volume= 18,650 cf, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.01"

	Area (sf)	CN	Description
*	7,668	98	Pond Surface
	3,963	96	Gravel surface, HSG B
*	62,796	78	Honey Bee Meadow Seed Mix - (ERNMX-157), HSG D
*	320	98	Concrete Pad
	74,747	81	Weighted Average
	66,759		89.31% Pervious Area
	7,988		10.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.1	50	0.0100	0.05		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 3.00"
1.1	195	0.0358	3.05		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
18.2	245	Total			

Summary for Subcatchment 2S: 1Sb

Runoff = 1.75 cfs @ 12.00 hrs, Volume= 4,594 cf, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.01"

	Area (sf)	CN	Description
*	10,511	98	Pavement Millings
	2,850	61	>75% Grass cover, Good, HSG B
*	825	85	RipRap Slopes, HSG B
	14,186	90	Weighted Average
	3,675		25.91% Pervious Area
	10,511		74.09% Impervious Area

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

Summary for Reach DP1: NORTHERN WETLANDS

Inflow Area = 864,500 sf, 3.87% Impervious, Inflow Depth = 2.06" for 10-yr event
Inflow = 25.70 cfs @ 12.39 hrs, Volume= 148,046 cf
Outflow = 25.70 cfs @ 12.39 hrs, Volume= 148,046 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs

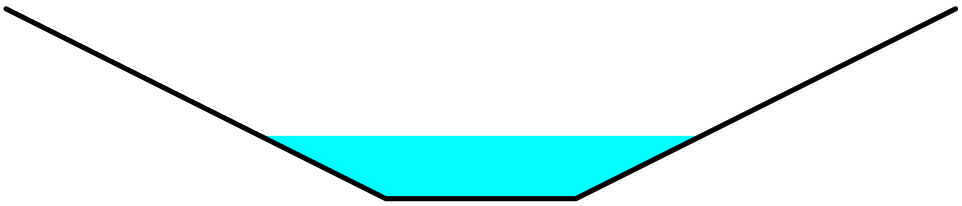
Summary for Reach SW: SW

Inflow Area = 14,186 sf, 74.09% Impervious, Inflow Depth = 3.89" for 10-yr event
Inflow = 1.75 cfs @ 12.00 hrs, Volume= 4,594 cf
Outflow = 1.72 cfs @ 12.01 hrs, Volume= 4,594 cf, Atten= 2%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.14 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 0.9 min

Peak Storage= 28 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 17.24 cfs

1.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 5.00'
Length= 50.0' Slope= 0.0300 '/'
Inlet Invert= 494.50', Outlet Invert= 493.00'



Stage-Area-Storage for Reach SW: SW

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
494.50	0.0	0
494.51	0.0	1
494.52	0.0	1
494.53	0.0	2
494.54	0.0	2
494.55	0.1	3
494.56	0.1	3
494.57	0.1	4
494.58	0.1	5
494.59	0.1	5
494.60	0.1	6
494.61	0.1	7
494.62	0.1	7
494.63	0.2	8
494.64	0.2	9
494.65	0.2	10
494.66	0.2	11
494.67	0.2	11
494.68	0.2	12
494.69	0.3	13
494.70	0.3	14
494.71	0.3	15
494.72	0.3	16
494.73	0.3	17
494.74	0.4	18
494.75	0.4	19
494.76	0.4	20
494.77	0.4	21
494.78	0.4	22
494.79	0.5	23
494.80	0.5	24
494.81	0.5	25
494.82	0.5	26
494.83	0.5	27
494.84	0.6	29
494.85	0.6	30
494.86	0.6	31
494.87	0.6	32
494.88	0.7	33
494.89	0.7	35
494.90	0.7	36
494.91	0.7	37
494.92	0.8	39
494.93	0.8	40
494.94	0.8	41
494.95	0.9	43
494.96	0.9	44
494.97	0.9	46
494.98	0.9	47
494.99	1.0	49
495.00	1.0	50
495.01	1.0	52
495.02	1.1	53
495.03	1.1	55
495.04	1.1	56
495.05	1.2	58
495.06	1.2	59
495.07	1.2	61
495.08	1.3	63
495.09	1.3	64
495.10	1.3	66
495.11	1.4	68
495.12	1.4	69
495.13	1.4	71
495.14	1.5	73
495.15	1.5	75
495.16	1.5	77
495.17	1.6	78
495.18	1.6	80
495.19	1.6	82
495.20	1.7	84
495.21	1.7	86
495.22	1.8	88
495.23	1.8	90
495.24	1.8	92
495.25	1.9	94
495.26	1.9	96
495.27	2.0	98
495.28	2.0	100
495.29	2.0	102
495.30	2.1	104
495.31	2.1	106
495.32	2.2	108
495.33	2.2	110
495.34	2.3	113
495.35	2.3	115
495.36	2.3	117
495.37	2.4	119
495.38	2.4	121
495.39	2.5	124
495.40	2.5	126
495.41	2.6	128
495.42	2.6	131
495.43	2.7	133
495.44	2.7	135
495.45	2.8	138
495.46	2.8	140
495.47	2.9	143
495.48	2.9	145
495.49	3.0	148
495.50	**3.0**	**150**

Summary for Pond 1P: 1P

Inflow Area = 74,747 sf, 10.69% Impervious, Inflow Depth = 2.99" for 10-yr event
Inflow = 4.22 cfs @ 12.24 hrs, Volume= 18,650 cf
Outflow = 1.53 cfs @ 12.68 hrs, Volume= 18,617 cf, Atten= 64%, Lag= 26.1 min
Primary = 1.53 cfs @ 12.68 hrs, Volume= 18,617 cf

Routing by Stor-Ind method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Peak Elev= 475.19' @ 12.68 hrs Surf.Area= 6,708 sf Storage= 7,161 cf

Plug-Flow detention time= 131.6 min calculated for 18,617 cf (100% of inflow)
Center-of-Mass det. time= 130.4 min (960.7 - 830.3)

Volume	Invert	Avail.Storage	Storage Description
#1	474.00'	21,414 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
474.00	5,382	362.0	0	0	5,382
475.00	6,497	381.0	5,931	5,931	6,565
476.00	7,669	400.0	7,075	13,006	7,809
477.00	9,169	441.0	8,408	21,414	10,585

Device	Routing	Invert	Outlet Devices
#1	Primary	474.00'	**6.0" Round Culvert** L= 28.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 474.00' / 473.72' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Primary	474.75'	**6.0" Round Culvert X 2.00** L= 20.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 474.75' / 474.55' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.20 sf
#3	Primary	475.90'	**40.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=1.53 cfs @ 12.68 hrs HW=475.19' (Free Discharge)
- **1=Culvert** (Barrel Controls 0.80 cfs @ 4.09 fps)
- **2=Culvert** (Barrel Controls 0.73 cfs @ 2.66 fps)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Stage-Area-Storage for Pond 1P: 1P

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
474.00	5,382	0
474.05	5,435	270
474.10	5,489	544
474.15	5,543	819
474.20	5,597	1,098
474.25	5,651	1,379
474.30	5,705	1,663
474.35	5,760	1,950
474.40	5,815	2,239
474.45	5,871	2,531
474.50	5,926	2,826
474.55	5,982	3,124
474.60	6,038	3,424
474.65	6,095	3,728
474.70	6,151	4,034
474.75	6,208	4,343
474.80	6,266	4,655
474.85	6,323	4,969
474.90	6,381	5,287
474.95	6,439	5,607
475.00	6,497	5,931
475.05	6,553	6,257
475.10	6,610	6,586
475.15	6,667	6,918
475.20	6,724	7,253
475.25	6,781	7,590
475.30	6,838	7,931
475.35	6,896	8,274
475.40	6,954	8,620
475.45	7,012	8,970
475.50	7,071	9,322
475.55	7,130	9,677
475.60	7,189	10,035
475.65	7,248	10,396
475.70	7,307	10,759
475.75	7,367	11,126
475.80	7,427	11,496
475.85	7,487	11,869
475.90	7,547	12,245
475.95	7,608	12,624
476.00	7,669	13,006
476.05	7,741	13,391
476.10	7,813	13,780
476.15	7,885	14,172
476.20	7,958	14,568
476.25	8,031	14,968
476.30	8,105	15,371
476.35	8,179	15,779
476.40	8,253	16,189
476.45	8,327	16,604
476.50	8,402	17,022
476.55	8,477	17,444
476.60	8,553	17,870
476.65	8,629	18,299
476.70	8,705	18,733
476.75	8,781	19,170
476.80	8,858	19,611
476.85	8,935	20,056
476.90	9,013	20,504
476.95	9,091	20,957
477.00	**9,169**	**21,414**

Summary for Pond 3P: 3P

Inflow Area = 14,186 sf, 74.09% Impervious, Inflow Depth = 3.89" for 10-yr event
Inflow = 1.72 cfs @ 12.01 hrs, Volume= 4,594 cf
Outflow = 1.68 cfs @ 12.02 hrs, Volume= 4,594 cf, Atten= 2%, Lag= 0.5 min
Discarded = 0.04 cfs @ 12.02 hrs, Volume= 2,139 cf
Primary = 1.63 cfs @ 12.02 hrs, Volume= 2,455 cf

Routing by Stor-Ind method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 492.96' @ 12.02 hrs Surf.Area= 476 sf Storage= 718 cf

Plug-Flow detention time= 130.4 min calculated for 4,593 cf (100% of inflow)
Center-of-Mass det. time= 130.6 min (916.5 - 786.0)

Volume	Invert	Avail.Storage	Storage Description
#1	490.00'	1,719 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
490.00	48	32.0	0	0	48
491.00	170	11.0	103	103	123
492.00	312	110.0	237	340	1,078
493.00	483	145.0	394	735	1,800
494.00	1,593	226.0	984	1,719	4,198

Device	Routing	Invert	Outlet Devices
#1	Primary	492.80'	**10.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	490.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 12.02 hrs HW=492.96' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=1.62 cfs @ 12.02 hrs HW=492.96' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.62 cfs @ 0.99 fps)

Stage-Area-Storage for Pond 3P: 3P

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
490.00	48	48	0
490.10	57	59	5
490.20	66	69	11
490.30	77	78	19
490.40	88	87	27
490.50	100	95	36
490.60	112	102	47
490.70	126	108	59
490.80	140	114	72
490.90	154	119	87
491.00	170	123	103
491.10	182	148	120
491.20	195	189	139
491.30	208	245	159
491.40	222	318	181
491.50	236	405	204
491.60	250	509	228
491.70	265	628	254
491.80	280	762	281
491.90	296	912	310
492.00	312	1,078	340
492.10	327	1,141	372
492.20	343	1,207	406
492.30	359	1,274	441
492.40	376	1,343	478
492.50	393	1,414	516
492.60	410	1,487	556
492.70	428	1,562	598
492.80	446	1,640	642
492.90	464	1,719	687
493.00	483	1,800	735
493.10	565	1,992	787
493.20	654	2,196	848
493.30	748	2,409	918
493.40	850	2,634	998
493.50	958	2,868	1,088
493.60	1,072	3,113	1,189
493.70	1,192	3,369	1,303
493.80	1,320	3,635	1,428
493.90	1,453	3,911	1,567
494.00	**1,593**	**4,198**	**1,719**

Summary for Subcatchment 1S: TO NORTHERN WETLANDS

Runoff = 35.32 cfs @ 12.36 hrs, Volume= 181,390 cf, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=6.12"

	Area (sf)	CN	Description
*	208,976	55	Woods, Good, HSG B
	150,666	70	Woods, Good, HSG C
	148,992	77	Woods, Good, HSG D
*	14,916	98	Impervious
*	837	85	RipRap, HSG B
	8,587	96	Gravel surface, HSG B
	2,744	82	Dirt roads, HSG B
*	82,547	71	Honey Bee Meadow Seed Mix - (ERNMX-157), HSG C
*	117,549	78	Honey Bee Meadow Seed Mix - (ERNMX-157), HSG D
	39,753	61	>75% Grass cover, Good, HSG B
	775,567	69	Weighted Average
	760,651		98.08% Pervious Area
	14,916		1.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.2	50	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00"
3.2	624	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
25.4	674	Total			

Summary for Subcatchment 1Sa: TO NORTHERN WETLANDS

Runoff = 5.61 cfs @ 12.24 hrs, Volume= 24,874 cf, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=6.12"

	Area (sf)	CN	Description
*	7,668	98	Pond Surface
	3,963	96	Gravel surface, HSG B
*	62,796	78	Honey Bee Meadow Seed Mix - (ERNMX-157), HSG D
*	320	98	Concrete Pad
	74,747	81	Weighted Average
	66,759		89.31% Pervious Area
	7,988		10.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.1	50	0.0100	0.05		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 3.00"
1.1	195	0.0358	3.05		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
18.2	245	Total			

Summary for Subcatchment 2S: 1Sb

Runoff = 2.20 cfs @ 12.00 hrs, Volume= 5,867 cf, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=6.12"

	Area (sf)	CN	Description
*	10,511	98	Pavement Millings
	2,850	61	>75% Grass cover, Good, HSG B
*	825	85	RipRap Slopes, HSG B
	14,186	90	Weighted Average
	3,675		25.91% Pervious Area
	10,511		74.09% Impervious Area

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

Summary for Reach DP1: NORTHERN WETLANDS

Inflow Area = 864,500 sf, 3.87% Impervious, Inflow Depth = 2.91" for 25-yr event
Inflow = 37.54 cfs @ 12.36 hrs, Volume= 209,726 cf
Outflow = 37.54 cfs @ 12.36 hrs, Volume= 209,726 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs

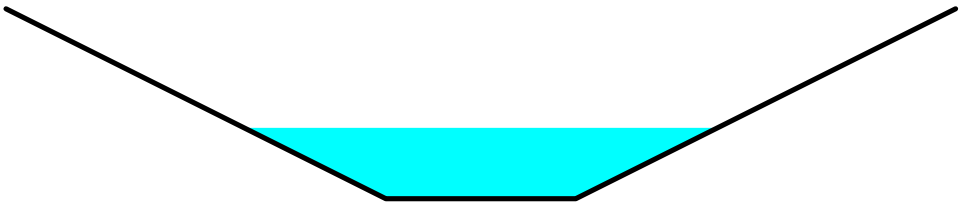
Summary for Reach SW: SW

Inflow Area = 14,186 sf, 74.09% Impervious, Inflow Depth = 4.96" for 25-yr event
Inflow = 2.20 cfs @ 12.00 hrs, Volume= 5,867 cf
Outflow = 2.16 cfs @ 12.01 hrs, Volume= 5,867 cf, Atten= 2%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.35 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 0.9 min

Peak Storage= 33 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 17.24 cfs

1.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 5.00'
Length= 50.0' Slope= 0.0300 '/'
Inlet Invert= 494.50', Outlet Invert= 493.00'



Stage-Area-Storage for Reach SW: SW

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
494.50	0.0	0
494.51	0.0	1
494.52	0.0	1
494.53	0.0	2
494.54	0.0	2
494.55	0.1	3
494.56	0.1	3
494.57	0.1	4
494.58	0.1	5
494.59	0.1	5
494.60	0.1	6
494.61	0.1	7
494.62	0.1	7
494.63	0.2	8
494.64	0.2	9
494.65	0.2	10
494.66	0.2	11
494.67	0.2	11
494.68	0.2	12
494.69	0.3	13
494.70	0.3	14
494.71	0.3	15
494.72	0.3	16
494.73	0.3	17
494.74	0.4	18
494.75	0.4	19
494.76	0.4	20
494.77	0.4	21
494.78	0.4	22
494.79	0.5	23
494.80	0.5	24
494.81	0.5	25
494.82	0.5	26
494.83	0.5	27
494.84	0.6	29
494.85	0.6	30
494.86	0.6	31
494.87	0.6	32
494.88	0.7	33
494.89	0.7	35
494.90	0.7	36
494.91	0.7	37
494.92	0.8	39
494.93	0.8	40
494.94	0.8	41
494.95	0.9	43
494.96	0.9	44
494.97	0.9	46
494.98	0.9	47
494.99	1.0	49
495.00	1.0	50
495.01	1.0	52
495.02	1.1	53
495.03	1.1	55
495.04	1.1	56
495.05	1.2	58
495.06	1.2	59
495.07	1.2	61
495.08	1.3	63
495.09	1.3	64
495.10	1.3	66
495.11	1.4	68
495.12	1.4	69
495.13	1.4	71
495.14	1.5	73
495.15	1.5	75
495.16	1.5	77
495.17	1.6	78
495.18	1.6	80
495.19	1.6	82
495.20	1.7	84
495.21	1.7	86
495.22	1.8	88
495.23	1.8	90
495.24	1.8	92
495.25	1.9	94
495.26	1.9	96
495.27	2.0	98
495.28	2.0	100
495.29	2.0	102
495.30	2.1	104
495.31	2.1	106
495.32	2.2	108
495.33	2.2	110
495.34	2.3	113
495.35	2.3	115
495.36	2.3	117
495.37	2.4	119
495.38	2.4	121
495.39	2.5	124
495.40	2.5	126
495.41	2.6	128
495.42	2.6	131
495.43	2.7	133
495.44	2.7	135
495.45	2.8	138
495.46	2.8	140
495.47	2.9	143
495.48	2.9	145
495.49	3.0	148
495.50	**3.0**	**150**

Summary for Pond 1P: 1P

Inflow Area = 74,747 sf, 10.69% Impervious, Inflow Depth = 3.99" for 25-yr event
Inflow = 5.61 cfs @ 12.24 hrs, Volume= 24,874 cf
Outflow = 2.10 cfs @ 12.66 hrs, Volume= 24,839 cf, Atten= 63%, Lag= 25.1 min
Primary = 2.10 cfs @ 12.66 hrs, Volume= 24,839 cf

Routing by Stor-Ind method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Peak Elev= 475.48' @ 12.66 hrs Surf.Area= 7,048 sf Storage= 9,186 cf

Plug-Flow detention time= 117.4 min calculated for 24,836 cf (100% of inflow)
Center-of-Mass det. time= 116.9 min (939.0 - 822.1)

Volume	Invert	Avail.Storage	Storage Description
#1	474.00'	21,414 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
474.00	5,382	362.0	0	0	5,382
475.00	6,497	381.0	5,931	5,931	6,565
476.00	7,669	400.0	7,075	13,006	7,809
477.00	9,169	441.0	8,408	21,414	10,585

Device	Routing	Invert	Outlet Devices
#1	Primary	474.00'	**6.0" Round Culvert** L= 28.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 474.00' / 473.72' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Primary	474.75'	**6.0" Round Culvert X 2.00** L= 20.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 474.75' / 474.55' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.20 sf
#3	Primary	475.90'	**40.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=2.10 cfs @ 12.66 hrs HW=475.48' (Free Discharge)
- **1=Culvert** (Barrel Controls 0.92 cfs @ 4.68 fps)
- **2=Culvert** (Barrel Controls 1.18 cfs @ 3.00 fps)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Stage-Area-Storage for Pond 1P: 1P

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
474.00	5,382	0
474.05	5,435	270
474.10	5,489	544
474.15	5,543	819
474.20	5,597	1,098
474.25	5,651	1,379
474.30	5,705	1,663
474.35	5,760	1,950
474.40	5,815	2,239
474.45	5,871	2,531
474.50	5,926	2,826
474.55	5,982	3,124
474.60	6,038	3,424
474.65	6,095	3,728
474.70	6,151	4,034
474.75	6,208	4,343
474.80	6,266	4,655
474.85	6,323	4,969
474.90	6,381	5,287
474.95	6,439	5,607
475.00	6,497	5,931
475.05	6,553	6,257
475.10	6,610	6,586
475.15	6,667	6,918
475.20	6,724	7,253
475.25	6,781	7,590
475.30	6,838	7,931
475.35	6,896	8,274
475.40	6,954	8,620
475.45	7,012	8,970
475.50	7,071	9,322
475.55	7,130	9,677
475.60	7,189	10,035
475.65	7,248	10,396
475.70	7,307	10,759
475.75	7,367	11,126
475.80	7,427	11,496
475.85	7,487	11,869
475.90	7,547	12,245
475.95	7,608	12,624
476.00	7,669	13,006
476.05	7,741	13,391
476.10	7,813	13,780
476.15	7,885	14,172
476.20	7,958	14,568
476.25	8,031	14,968
476.30	8,105	15,371
476.35	8,179	15,779
476.40	8,253	16,189
476.45	8,327	16,604
476.50	8,402	17,022
476.55	8,477	17,444
476.60	8,553	17,870
476.65	8,629	18,299
476.70	8,705	18,733
476.75	8,781	19,170
476.80	8,858	19,611
476.85	8,935	20,056
476.90	9,013	20,504
476.95	9,091	20,957
477.00	**9,169**	**21,414**

Summary for Pond 3P: 3P

Inflow Area = 14,186 sf, 74.09% Impervious, Inflow Depth = 4.96" for 25-yr event
Inflow = 2.16 cfs @ 12.01 hrs, Volume= 5,867 cf
Outflow = 2.12 cfs @ 12.02 hrs, Volume= 5,867 cf, Atten= 2%, Lag= 0.5 min
Discarded = 0.04 cfs @ 12.02 hrs, Volume= 2,370 cf
Primary = 2.07 cfs @ 12.02 hrs, Volume= 3,497 cf

Routing by Stor-Ind method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 492.99' @ 12.02 hrs Surf.Area= 482 sf Storage= 731 cf

Plug-Flow detention time= 113.4 min calculated for 5,866 cf (100% of inflow)
Center-of-Mass det. time= 113.6 min (892.9 - 779.3)

Volume	Invert	Avail.Storage	Storage Description
#1	490.00'	1,719 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
490.00	48	32.0	0	0	48
491.00	170	11.0	103	103	123
492.00	312	110.0	237	340	1,078
493.00	483	145.0	394	735	1,800
494.00	1,593	226.0	984	1,719	4,198

Device	Routing	Invert	Outlet Devices
#1	Primary	492.80'	**10.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	490.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 12.02 hrs HW=492.99' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=2.06 cfs @ 12.02 hrs HW=492.99' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 2.06 cfs @ 1.07 fps)

Stage-Area-Storage for Pond 3P: 3P

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
490.00	48	48	0
490.10	57	59	5
490.20	66	69	11
490.30	77	78	19
490.40	88	87	27
490.50	100	95	36
490.60	112	102	47
490.70	126	108	59
490.80	140	114	72
490.90	154	119	87
491.00	170	123	103
491.10	182	148	120
491.20	195	189	139
491.30	208	245	159
491.40	222	318	181
491.50	236	405	204
491.60	250	509	228
491.70	265	628	254
491.80	280	762	281
491.90	296	912	310
492.00	312	1,078	340
492.10	327	1,141	372
492.20	343	1,207	406
492.30	359	1,274	441
492.40	376	1,343	478
492.50	393	1,414	516
492.60	410	1,487	556
492.70	428	1,562	598
492.80	446	1,640	642
492.90	464	1,719	687
493.00	483	1,800	735
493.10	565	1,992	787
493.20	654	2,196	848
493.30	748	2,409	918
493.40	850	2,634	998
493.50	958	2,868	1,088
493.60	1,072	3,113	1,189
493.70	1,192	3,369	1,303
493.80	1,320	3,635	1,428
493.90	1,453	3,911	1,567
494.00	**1,593**	**4,198**	**1,719**

Summary for Subcatchment 1S: TO NORTHERN WETLANDS

Runoff = 53.29 cfs @ 12.36 hrs, Volume= 271,261 cf, Depth= 4.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.82"

	Area (sf)	CN	Description
*	208,976	55	Woods, Good, HSG B
	150,666	70	Woods, Good, HSG C
	148,992	77	Woods, Good, HSG D
*	14,916	98	Impervious
*	837	85	RipRap, HSG B
	8,587	96	Gravel surface, HSG B
	2,744	82	Dirt roads, HSG B
*	82,547	71	Honey Bee Meadow Seed Mix - (ERNMX-157), HSG C
*	117,549	78	Honey Bee Meadow Seed Mix - (ERNMX-157), HSG D
	39,753	61	>75% Grass cover, Good, HSG B
	775,567	69	Weighted Average
	760,651		98.08% Pervious Area
	14,916		1.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.2	50	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00"
3.2	624	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
25.4	674	Total			

Summary for Subcatchment 1Sa: TO NORTHERN WETLANDS

Runoff = 7.76 cfs @ 12.24 hrs, Volume= 34,711 cf, Depth= 5.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.82"

	Area (sf)	CN	Description
*	7,668	98	Pond Surface
	3,963	96	Gravel surface, HSG B
*	62,796	78	Honey Bee Meadow Seed Mix - (ERNMX-157), HSG D
*	320	98	Concrete Pad
	74,747	81	Weighted Average
	66,759		89.31% Pervious Area
	7,988		10.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.1	50	0.0100	0.05		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 3.00"
1.1	195	0.0358	3.05		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
18.2	245	Total			

Summary for Subcatchment 2S: 1Sb

Runoff = 2.89 cfs @ 12.00 hrs, Volume= 7,836 cf, Depth= 6.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.82"

	Area (sf)	CN	Description
*	10,511	98	Pavement Millings
	2,850	61	>75% Grass cover, Good, HSG B
*	825	85	RipRap Slopes, HSG B
	14,186	90	Weighted Average
	3,675		25.91% Pervious Area
	10,511		74.09% Impervious Area

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

Summary for Reach DP1: NORTHERN WETLANDS

Inflow Area = 864,500 sf, 3.87% Impervious, Inflow Depth = 4.32" for 100-yr event
Inflow = 56.31 cfs @ 12.36 hrs, Volume= 311,111 cf
Outflow = 56.31 cfs @ 12.36 hrs, Volume= 311,111 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs

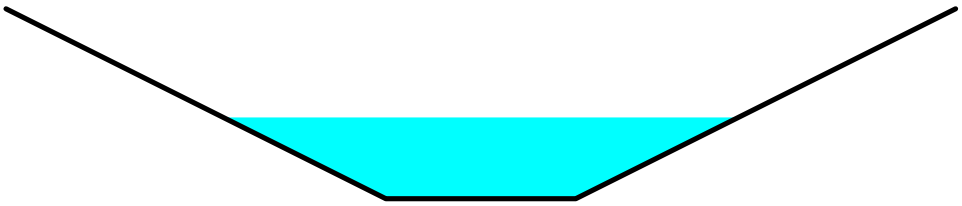
Summary for Reach SW: SW

Inflow Area = 14,186 sf, 74.09% Impervious, Inflow Depth = 6.63" for 100-yr event
Inflow = 2.89 cfs @ 12.00 hrs, Volume= 7,836 cf
Outflow = 2.84 cfs @ 12.01 hrs, Volume= 7,836 cf, Atten= 2%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.60 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.06 fps, Avg. Travel Time= 0.8 min

Peak Storage= 40 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 17.24 cfs

1.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 5.00'
Length= 50.0' Slope= 0.0300 '/'
Inlet Invert= 494.50', Outlet Invert= 493.00'



Stage-Area-Storage for Reach SW: SW

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
494.50	0.0	0
494.51	0.0	1
494.52	0.0	1
494.53	0.0	2
494.54	0.0	2
494.55	0.1	3
494.56	0.1	3
494.57	0.1	4
494.58	0.1	5
494.59	0.1	5
494.60	0.1	6
494.61	0.1	7
494.62	0.1	7
494.63	0.2	8
494.64	0.2	9
494.65	0.2	10
494.66	0.2	11
494.67	0.2	11
494.68	0.2	12
494.69	0.3	13
494.70	0.3	14
494.71	0.3	15
494.72	0.3	16
494.73	0.3	17
494.74	0.4	18
494.75	0.4	19
494.76	0.4	20
494.77	0.4	21
494.78	0.4	22
494.79	0.5	23
494.80	0.5	24
494.81	0.5	25
494.82	0.5	26
494.83	0.5	27
494.84	0.6	29
494.85	0.6	30
494.86	0.6	31
494.87	0.6	32
494.88	0.7	33
494.89	0.7	35
494.90	0.7	36
494.91	0.7	37
494.92	0.8	39
494.93	0.8	40
494.94	0.8	41
494.95	0.9	43
494.96	0.9	44
494.97	0.9	46
494.98	0.9	47
494.99	1.0	49
495.00	1.0	50
495.01	1.0	52
495.02	1.1	53
495.03	1.1	55
495.04	1.1	56
495.05	1.2	58
495.06	1.2	59
495.07	1.2	61
495.08	1.3	63
495.09	1.3	64
495.10	1.3	66
495.11	1.4	68
495.12	1.4	69
495.13	1.4	71
495.14	1.5	73
495.15	1.5	75
495.16	1.5	77
495.17	1.6	78
495.18	1.6	80
495.19	1.6	82
495.20	1.7	84
495.21	1.7	86
495.22	1.8	88
495.23	1.8	90
495.24	1.8	92
495.25	1.9	94
495.26	1.9	96
495.27	2.0	98
495.28	2.0	100
495.29	2.0	102
495.30	2.1	104
495.31	2.1	106
495.32	2.2	108
495.33	2.2	110
495.34	2.3	113
495.35	2.3	115
495.36	2.3	117
495.37	2.4	119
495.38	2.4	121
495.39	2.5	124
495.40	2.5	126
495.41	2.6	128
495.42	2.6	131
495.43	2.7	133
495.44	2.7	135
495.45	2.8	138
495.46	2.8	140
495.47	2.9	143
495.48	2.9	145
495.49	3.0	148
495.50	**3.0**	**150**

Summary for Pond 1P: 1P

Inflow Area = 74,747 sf, 10.69% Impervious, Inflow Depth = 5.57" for 100-yr event
Inflow = 7.76 cfs @ 12.24 hrs, Volume= 34,711 cf
Outflow = 3.36 cfs @ 12.61 hrs, Volume= 34,676 cf, Atten= 57%, Lag= 22.1 min
Primary = 3.36 cfs @ 12.61 hrs, Volume= 34,676 cf

Routing by Stor-Ind method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs
Peak Elev= 475.93' @ 12.61 hrs Surf.Area= 7,587 sf Storage= 12,489 cf

Plug-Flow detention time= 106.2 min calculated for 34,676 cf (100% of inflow)
Center-of-Mass det. time= 105.6 min (918.3 - 812.7)

Volume	Invert	Avail.Storage	Storage Description
#1	474.00'	21,414 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
474.00	5,382	362.0	0	0	5,382
475.00	6,497	381.0	5,931	5,931	6,565
476.00	7,669	400.0	7,075	13,006	7,809
477.00	9,169	441.0	8,408	21,414	10,585

Device	Routing	Invert	Outlet Devices
#1	Primary	474.00'	**6.0" Round Culvert** L= 28.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 474.00' / 473.72' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Primary	474.75'	**6.0" Round Culvert X 2.00** L= 20.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 474.75' / 474.55' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.20 sf
#3	Primary	475.90'	**40.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=3.32 cfs @ 12.61 hrs HW=475.93' (Free Discharge)
- **1=Culvert** (Barrel Controls 1.07 cfs @ 5.45 fps)
- **2=Culvert** (Barrel Controls 1.69 cfs @ 4.29 fps)
- **3=Broad-Crested Rectangular Weir** (Weir Controls 0.56 cfs @ 0.44 fps)

Stage-Area-Storage for Pond 1P: 1P

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
474.00	5,382	0
474.05	5,435	270
474.10	5,489	544
474.15	5,543	819
474.20	5,597	1,098
474.25	5,651	1,379
474.30	5,705	1,663
474.35	5,760	1,950
474.40	5,815	2,239
474.45	5,871	2,531
474.50	5,926	2,826
474.55	5,982	3,124
474.60	6,038	3,424
474.65	6,095	3,728
474.70	6,151	4,034
474.75	6,208	4,343
474.80	6,266	4,655
474.85	6,323	4,969
474.90	6,381	5,287
474.95	6,439	5,607
475.00	6,497	5,931
475.05	6,553	6,257
475.10	6,610	6,586
475.15	6,667	6,918
475.20	6,724	7,253
475.25	6,781	7,590
475.30	6,838	7,931
475.35	6,896	8,274
475.40	6,954	8,620
475.45	7,012	8,970
475.50	7,071	9,322
475.55	7,130	9,677
475.60	7,189	10,035
475.65	7,248	10,396
475.70	7,307	10,759
475.75	7,367	11,126
475.80	7,427	11,496
475.85	7,487	11,869
475.90	7,547	12,245
475.95	7,608	12,624
476.00	7,669	13,006
476.05	7,741	13,391
476.10	7,813	13,780
476.15	7,885	14,172
476.20	7,958	14,568
476.25	8,031	14,968
476.30	8,105	15,371
476.35	8,179	15,779
476.40	8,253	16,189
476.45	8,327	16,604
476.50	8,402	17,022
476.55	8,477	17,444
476.60	8,553	17,870
476.65	8,629	18,299
476.70	8,705	18,733
476.75	8,781	19,170
476.80	8,858	19,611
476.85	8,935	20,056
476.90	9,013	20,504
476.95	9,091	20,957
477.00	**9,169**	**21,414**

Summary for Pond 3P: 3P

Inflow Area = 14,186 sf, 74.09% Impervious, Inflow Depth = 6.63" for 100-yr event
Inflow = 2.84 cfs @ 12.01 hrs, Volume= 7,836 cf
Outflow = 2.79 cfs @ 12.01 hrs, Volume= 7,836 cf, Atten= 2%, Lag= 0.4 min
Discarded = 0.04 cfs @ 12.01 hrs, Volume= 2,662 cf
Primary = 2.74 cfs @ 12.01 hrs, Volume= 5,174 cf

Routing by Stor-Ind method, Time Span= 1.00-73.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 493.03' @ 12.01 hrs Surf.Area= 508 sf Storage= 750 cf

Plug-Flow detention time= 95.8 min calculated for 7,835 cf (100% of inflow)
Center-of-Mass det. time= 96.0 min (867.8 - 771.8)

Volume	Invert	Avail.Storage	Storage Description
#1	490.00'	1,719 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
490.00	48	32.0	0	0	48
491.00	170	11.0	103	103	123
492.00	312	110.0	237	340	1,078
493.00	483	145.0	394	735	1,800
494.00	1,593	226.0	984	1,719	4,198

Device	Routing	Invert	Outlet Devices
#1	Primary	492.80'	**10.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	490.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 12.01 hrs HW=493.03' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=2.72 cfs @ 12.01 hrs HW=493.03' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 2.72 cfs @ 1.18 fps)

Stage-Area-Storage for Pond 3P: 3P

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
490.00	48	48	0
490.10	57	59	5
490.20	66	69	11
490.30	77	78	19
490.40	88	87	27
490.50	100	95	36
490.60	112	102	47
490.70	126	108	59
490.80	140	114	72
490.90	154	119	87
491.00	170	123	103
491.10	182	148	120
491.20	195	189	139
491.30	208	245	159
491.40	222	318	181
491.50	236	405	204
491.60	250	509	228
491.70	265	628	254
491.80	280	762	281
491.90	296	912	310
492.00	312	1,078	340
492.10	327	1,141	372
492.20	343	1,207	406
492.30	359	1,274	441
492.40	376	1,343	478
492.50	393	1,414	516
492.60	410	1,487	556
492.70	428	1,562	598
492.80	446	1,640	642
492.90	464	1,719	687
493.00	483	1,800	735
493.10	565	1,992	787
493.20	654	2,196	848
493.30	748	2,409	918
493.40	850	2,634	998
493.50	958	2,868	1,088
493.60	1,072	3,113	1,189
493.70	1,192	3,369	1,303
493.80	1,320	3,635	1,428
493.90	1,453	3,911	1,567
494.00	**1,593**	**4,198**	**1,719**

APPENDIX C

Post-Development Watershed Plans – Revision 1

MASS STATE PLANE

422B "B"

102E "B"

1S

1Sa

DP1

307B "C"

1P

71B "D"

SW

3P

102C "B"

1Sb

1B "

PROPOSED COLTON ROAD EXTENSION

310B "C/D"

307B "C"

71B "D"

312B "C/D"

BASIN

LEGEND

1P	STORMWATER BASIN
1S	SUBCATCHMENT AREA
DP1	DESIGN POINT
	Tc PATH
	SUBCATCHMENT AND UNDISTURBED AREA BOUNDARY
32A "D"	HYDROLOGIC SOIL GROUP AND BOUNDARY

FILE:3085.00-WSHD-DEF-R1

Atlantic® DESIGN ENGINEERS, INC.
P.O. Box 1051, Sandwich, MA 02563 (508) 888 – 9282

Designed by :
Drawn by :
Checked by :
Survey chk. by :
Approved by :

SCALE
SCALE 1" = 80'
0 20 40 80 160

DATE

NO.	BY	DATE	REVISION
1	PMJ	8-27-20	REVISED PER TOWN COMMENTS

APPLICANT:
NEXT GRID COLTON, LLC
P.O. BOX 7775 #73069
SAN FRANCISCO, CA 94120-775

POST-DEVELOPMENT WATERSHED PLAN
FOR
DEFINITIVE SUBDIVISION PLAN FOR COLTON ROAD EXT.
MILLBURY, MASSACHUSETTS 01527
JUNE 10, 2020

Sheet 1 of 1

JOB NUMBER 3085.00

APPENDIX D

Long Term Stormwater Operation and Maintenance Plan and Inspection form– Revision 2

Definitive Subdivision Plan for Colton Road Extension

Post-Construction

Long Term Stormwater Operation & Maintenance Plan-Revision 2

August 27, 2020

A. GENERAL NOTES

1. Upon completion of construction, the operation and maintenance of all components of the stormwater management system will be the responsibility (financially and otherwise) of the system owner (responsible party):

Next Grid Colton, LLC
P.O. Box 7775 #73069
San Francisco, CA 94120-7775
(559) 731-4645
daniel@nextgridpartners.com

Daniel Serber _____ 8/27/2020____

Signature **Date**

2. The responsible party shall file an inspection report with the Town of Millbury Planning Board and Conservation Commission following each site inspection as recommended in the Operation & Maintenance (O&M) Schedule. The inspection report shall identify the date of inspection, name, and contact number of responsible party, specific structures inspected, specific maintenance and/or repairs required and general observations. Any deficiencies noted in the inspection report shall be corrected to the Town of Millbury Planning Board and Conservation Commission's satisfaction.

3. Disposal of accumulated sediment and hydrocarbons to be in accordance with the applicable local, state, and federal guidelines and regulations.

4. There shall be no illicit discharge of any waste or waste water into the stormwater management system. The maintenance of the facility shall be undertaken in such a manner as to prevent any discharge of waste or waste water into the stormwater management system. Any waste oil or other waste products generated during the maintenance shall be properly disposed of offsite.

Daniel Serber _____ 8/27/2020____

Signature **Date**

5. The Town will be notified of changes in project ownership or assignment of operation and maintenance financial responsibility.

6. The maintenance schedule in this operation and maintenance (O&M) Plan will only be amended by mutual agreement of the Town and the responsible party. Amendments will be made in writing and signed by the responsible party.

B. STORMWATER SYSTEM/BMPs

Erosion Control Barriers:

Erosion control barriers (sediment log, straw wattles, silt fence, etc.) should be inspected immediately after each run-off producing rainfall event and at least daily during prolonged rainfall. Sediment deposits must be removed when the level of deposition reaches approximately one-half the height of the barrier. Sediment shall be disposed of in a suitable area and protected from erosion by either structural or vegetative means.

Grassed Swale with Check-Dams:

During construction grassed lined swales shall be inspected immediately after each run-off producing rainfall event and at least daily during prolonged rainfall. After construction, inspect at a minimum of four times a year (quarterly), for the first two years and twice a year thereafter or after major storm events (2" or greater). Repair eroded spots immediately after inspection. additional inspections should be scheduled during the first few months to ensure that the vegetation in the channels is established adequately. Accumulated sediment shall be removed at least once a year or before it exceeds 0.5' in depth, whichever occurs first.

Outlet Pipes and Flared End Sections:
Inspect after every major storm event (2" or greater) for the first few months after construction to ensure proper stabilization and function, thereafter inspect twice a year for erosion, clogging, settling, and excessive accumulation of leaves, trash, debris or sediment and channelization of stormwater discharge.

Rock Lined Swales, Rip-rap aprons:
During construction rock lined swales shall be inspected immediately after each run-off producing rainfall event and at least daily during prolonged rainfall. After construction, inspect at a minimum of twice a year or after major storm events (2" or greater), repair eroded spots immediately after inspection. additional inspections should be scheduled during the first few months to ensure that the channels is established adequately. accumulated sediment shall be removed at least once a year or before it exceeds 0.25' in depth, whichever occurs first.

Forebay and Riprap/Stone Settling Trench and Areas:

Inspect after every major storm event (2" or greater) during construction and for the first few months after construction to ensure proper stabilization and function, thereafter inspect at least four times per year (quarterly) for the first two years and twice a year thereafter during wet weather to ensure the system is working properly. Check for accumulation of sediment, debris and leaflitter. Remove sediment as necessary during construction, and at least twice a year after construction is completed.

Infiltration Trench/Area:

Inspect after every major storm event (2" or greater) during construction and for the first few months after construction to ensure proper stabilization and function. Thereafter, inspect at least once per year during wet weather to ensure the system is draining properly. Check for accumulation of sediment and ponding water. If ponding water is visible inside the system for several days after a storm event, notify the engineer for possible remedial measures. Remove sediment as necessary during construction, while the system is dry, and at least every five years after construction.

At least two times during the growing season, mow upper-stage, side slopes and embankment. The grass should not be cut lower than 4", remove trash, grass clippings, organic matter and debris.

Drainage Easement:

There is a drainage easement of 2,193 sq. ft. located on the property at Map 31, Lot 31 (Town of Millbury) and is on the north side of the Colton Road Right-of-way at STA 14+00 (see sheet 4 of the Definitive Subdivision plan for Colton Road Extension - revised August 27, 2020 by Atlantic Design Engineers) . The easement is for drainage structures associated with the stormwater runoff from Colton road. The stone infiltration trench will require maintenance per the schedule outlined herein.

Owner: Deborah A Maturi, Town of Millbury Map 31, Lot 31.

Owner Signature: _____

Date:_____

SAMPLE INSPECTION LOG

COLTON ROAD EXTENSIN PROJECT
MILLBURY, MASSACHUSETTS

LONG TERM STORMWATER OPERATIONS & MAINTENANCE PLAN

INSPECTION CHECKLIST/REPORT

Date: _____ **Personnel Present:** _____

_____

Inspectors Name: _____

Inspectors Contact Information: _____

Signatures: _____

_____

_____

Type of Inspection: Scheduled Pre-Storm During Storm Post Storm
(circle one) Other: _____

Areas to be Inspected: • *Drainage structures:* o *Riprap/Stone Settling Areas* o *Rock Lined swales* o *Outlet Pipes & Flared End Sections* o *Rirrap aprons /slopes* o *Erosion Control Barriers* o *Grassed Swales* o *Sediment Forebay*	

General Evaluation Checklist:

1. *Has there been a storm event since the last inspection?*

2. *Weather at time of inspection?*

3. *Is there any evidence of pollution or sediment entering the storm water drainage system or surrounding wetlands/receiving waters?*

4. *Is any cleanup of spills, leaks, or refuse needed?*

5. *Are the engineering controls working effectively to prevent storm water pollution?*

6. *What, if any, changes to the plans are necessary?*

7. *Are all sediment traps, barriers, and basins clean and functioning properly?*

8. *Are all discharge points free of noticeable pollutant discharges?*

9. *Are all natural resource areas (e.g. streams, wetlands, mature trees, etc.) protected with proper BMP's?*

Items to be Cleaned/Replaced:

- *During construction rock lined swales and Riprap aprons shall be inspected immediately after each run-off producing rainfall event and at least daily during prolonged rainfall. After construction, inspect at a minimum of twice a year or after major storm events (2" or greater), repair eroded spots immediately after inspection. additional inspections should be scheduled during the first few months to ensure that the channels is established adequately. accumulated sediment shall be removed at least once a year or before it exceeds 0.25' in depth, whichever occurs first.*

- *Infiltration trenches/ Areas shall be inspected after every major storm event (2" or greater) during construction and for the first few months after construction to ensure proper stabilization and function, thereafter inspect at least four times per year (quarterly) for the first two years and twice a year thereafter during wet weather to ensure the system is working properly. Observation wells provided for inspection purposes. If clogging is observed, notify the engineer for remedial measures. (Possible remedial measures include but are not limited to improved maintenance or removal and replacement of trench material). Check for accumulation of sediment, debris and leaf litter twice a year. Remove sediment as necessary during construction, and at least twice a year after construction is completed.*

- *Outlet pipes and flared end sections shall be inspected after every major storm event (2" or greater) for the first few months after construction to ensure proper stabilization and function, thereafter inspect twice a year for erosion, clogging, settling, and excessive accumulation of leaves, trash, debris or sediment and channelization of stormwater discharge. Inspect rip-rap aprons for signs of failure. Repair eroded spots immediately after inspection.*

- *During construction grassed lined swales with Check Dams shall be inspected immediately after each run-off producing rainfall event and at least daily during prolonged rainfall. After construction, inspect at a minimum of four times a year (quarterly), for the first two years and twice a year thereafter or after major storm events (2" or greater). Repair eroded spots immediately after inspection. additional inspections should be scheduled during the first few months to ensure that the vegetation in the channels is established adequately. Accumulated sediment shall be removed at least once a year or before it exceeds 0.5' in depth, whichever occurs first.*

- *Erosion control barriers (sediment log, straw wattles, silt fence, etc.) should be inspected immediately after each run-off producing rainfall event and at least daily during prolonged rainfall. Sediment deposits must be removed when the level of deposition reaches approximately one-half the height of the barrier. Sediment shall be disposed of in a suitable area and protected from erosion by either structural or vegetative means.*

- *Inspect Forebay and RipRap stone Settling area fter every major storm event (2" or greater) during construction and for the first few months after construction to ensure proper stabilization and function, thereafter inspect at least four times per year (quarterly) for the first two years and twice a year thereafter during wet weather to ensure the system is working properly. Check for accumulation of sediment, debris and leaflitter. Remove sediment as necessary during construction, and at least twice a year after construction is completed.*

NOTES:

1. *The developer (responsible party) shall be responsible for the proper inspection and maintenance of all stormwater facilities once construction is completed.*

2. *The developer/contractor shall file an inspection report with the design engineer and, if necessary, the Town of Norton Conservation Commission following each site inspection as recommended in the O & M schedule. Copies of the inspection reports are to be made available to the Norton Building Inspector or Conservation Agent upon request. The inspection report shall identify the date of inspection, name and contact number of responsible party, specific structures inspected, specific maintenance and/or repairs required and general observations. Any deficiencies noted in the inspection report shall be corrected to the design engineer and/or the Town of Norton Conservation Commission satisfaction.*
3. *Disposal of accumulated sediment and hydrocarbons to be in accordance with applicable local, state and federal guidelines and regulations.*
4. *There shall be no illicit discharge of any waste or waste water into the stormwater management system. The maintenance of the facility shall be undertaken in such a manner as to prevent any discharge of waste or waste water into stormwater management system. Any waste products generated during maintenance shall be properly disposed of off-site.*

ITEMS INSPECTED	LOCATION	COMMENTS, CORRECTIVE ACTION NEEDED, AND NOTES

APPENDIX E

Miscellaneous Calculations

Required Recharge Volume

Design Engineer:	Atlantic Design Engineers, Inc.	Job No.:	3085.00
Project Name:	Colton Road Extension	Calc'd By:	PMJ
Location:	Millbury, MA	Date:	8/27/2020

Rv = (F) (Aimp)
Rv = Required Recharge Volume
Aimp= Impervious Area on site
F = Target Depth Factor: 0.35 inch for B soils (conservative)

Infiltration Area = 439 CF (See Hydrocad volume report

Total proposed impervious area =	10,511	sf	
Required Recharge Volume (Rv) =	10,511 * 0.35" * (1/12)=	307	cf

Recharge Volume Provided		
Infiltration Area	439	cf
Total Volume Provided	439	cf

Total Required Recharge Volume on Site=	**307**	**cf**	
Total Recharge Volume Provided on the Site=	**687**	**cf**	**REQUIREMENT MET**

Water Quality Calulation Sheet

Design Engineer:	Atlantic Design Engineers, Inc	Job No.:	3085.00
Project Name:	Colton Road Extension	Calc'd By:	PMJ
Location:	Millbury, MA	Date:	8/27/2020

The required water quality treatment volume is calculated as follows:

Vwq = (Dwq)*(Aimp)
Vwq =Required Water Quality Volume
Dwq =Water Quality Depth = 0.5” (Per Local Requirements)
Aimp=Area of New Impervious not including new roof area

Subcatchment Areas: 1S - (Pavement)

Pavement Millings=	10,511	sf			
Water Quality Volume Required (Vwq)=	10,511	* 0.5" * (1/12)=	438	cf	
Water Quality Volume Provided=			687	cf	Infiltration Area

Total Volume Quality Required=	438	cf	
Total Volume Provided=	**687**	**cf**	**Standard is Met**

TSS REMOVAL CALCULATION SHEET

Design Engineer:	Atlantic Design Engineers, Inc.	Job No.:	3085.00
Project Name:	Colton Road Extension	Calc'd By:	PMJ
Location:	Millbury, Massachusetts	Date:	8/24/2020

1S

BMP	Removal Rate	Starting TSS Load	TSS Removed	Remaining Load
Grassed Swale/Channel	50%	100%	50.0%	50.0%
Infiltration Area	80%	50.0%	40.0%	10.0%
Total Removed			**90.0%**	