STORMWATER MANAGEMENT REPORT (BASIC, GENERAL, FLOODING, AND URBAN IMPAIRED STREAM STANDARDS)

421 WARREN AVENUE COMMERCIAL COMPLEX

PREPARED FOR:

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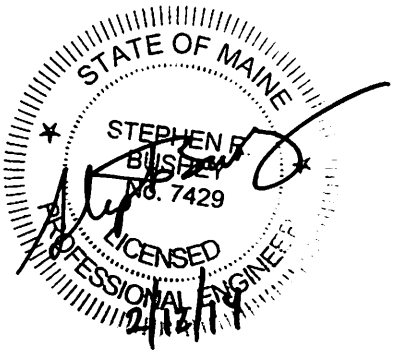

FEBRUARY 2014

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STORMWATER MANAGEMENT REPORT

1.0 INTRODUCTION

Fay, Spofford & Thorndike (FST) has been retained by Peter Holmes to assist on the preparation of site design and site permitting for a proposed 28,000 SF footprint multi-unit building in Portland, Maine. The development will include a new multi-unit building, 41 space parking lot and related infrastructure improvements.

The project's primary stormwater management measure will be the construction of two gravel wetlands. Gravel wetlands are a relatively new BMP measure that offers higher storage volumes on sites with low hydraulic head. The gravel wetland section is intended to provide sufficient capacity to meet the Chapter 500 Flooding and Water Quality treatment standards. In addition to the gravel wetlands, the project's stormwater management will include a gravel drip strip for water quality treatment of runoff from the building roof.

This proposed project will create a total of 2.53 ac of developed area of which 1.90 ac will be new structure area (building and other impervious surfaces) within the approximately 7.95 acre project watershed area analyzed. The land owner of this site also owns an approximate additional 40 acres surrounding this site. The 7.95 acre area that was analyzed was area determined to be relevant to the two project hydrologic points of interest impacted by the new developed area. This project meets the thresholds which require a MaineDEP Stormwater Permit. The stormwater management design presented herein will show that it meets the criterion of the City of Portland Stormwater Requirements and the MaineDEP Chapter 500 Regulations. The applicant is requesting the City of Portland complete the MaineDEP Stormwater review under their delegated review authority.

The development site is located on the north side of Warren Avenue between Interstate 95 and Forest Avenue in Portland. The site is owned by PH Warren Avenue, LLC. A large portion of this site currently drains to a drainage way in the northeast quadrant of the site. Part of the southerly tip of the site drains into Warren Avenue and is collected by the City's municipal drainage system. A second part of the southerly end drains across to Harbour Auto-Body and is collected in a small detention pond before being routed into the city drainage system.

The use of two gravel wetlands will allow the capture and treatment of the required water quality volume derived from a 1" rainfall as well as up to the 25 year storm event. The Stormwater Management devices on site will also meet the chapter 500 flooding requirements up to a 100-year storm.

USGS, aerial photographs, and related maps are appended to this report in Appendix A.

On behalf of the applicant, Fay, Spofford & Thorndike has prepared this report to show the proposed Stormwater Management Plan meets the MeDEP's General Stormwater Standards and City of Portland's Technical Standards.

2.0 EXISTING SITE CONDITIONS

The proposed site lies within a 7.95 acre analyzed watershed area. Area that represents analyzed represents a portion of area that lies within a larger property. FST decided to only analyze watershed area in which the proposed development would impact the chosen points of interest. The site is currently undeveloped with the following land cover:

TABLE 1 – LAND COVER	
Current Land Cover	**Area (acre)**
Woods/Meadow	5.75
Roof	0.28
Lawn	0.46
Pavement	0.67
Gravel	0.79
Total	**7.95**

The existing site is comprised of mostly undeveloped woods, meadows, lawn and gravel areas.

Topography is relatively flat within the site. A large portion of the site drains over a flat wetland area towards a tributary in the northeast quadrant of the site. About half of the area in the southern portion of the site drains towards Warren Avenue and is picked up by the City of Portland Municipal Stormwater System through a catch basin in the street. The other half flows towards an existing detention pond adjacent to Harbour Auto Body shop, which is located on property owned by the applicant. Flow is released from this detention pond and is discharged to the City of Portland Stormwater System.

The preliminary geotechnical explorations by S.W. Cole Engineering in December 2013 show that the site contains fill soils over a layer of relic topsoil underlain by glaciomarine sands, silts and clays.

The site is in the B-4 Zone and is considered by the City of Portland as a permitted use.

The site is not located in a mapped 100-year floodplain and is denoted as Zone X based upon the Portland FEMA mapping as depicted on Figure 7 containing an excerpt of the MGIS Firm Panel #2300510006B.

Figures 8, 9, and 10 appended to the report provide the USDA medium intensity soils, sand and gravel aquifers maps, and surficial geology map for the site. A copy of the geotechnical findings for the site is contained in Appendix F.

3.0 PROPOSED PROJECT

The proposed project is generally described below and is shown on the Post Development Watershed Map. The project will develop 2.53 acres including 1.90 acres of impervious area.

The proposed project includes parking areas surrounding an approximately 28,000 SF building footprint. The site access will be off the existing Warren Avenue drive serving 429 Warren Avenue and this will consist of a 60’ wide two-lane driveway positioned directly in front of the building’s southerly entrance. The parking areas include 41 spaces on the south and west sides of the building.

The proposed land use for the site after development will be as follows:

TABLE 2 – POSTDEVELOPMENT LAND USE		
Proposed Land Cover	**Area (acre)**	**Change from Current (acre)**
Woods/Meadow	4.38	-1.37
Roof	0.92	+0.64
Lawn/Landscaped Planting Areas	0.66	+0.20
Pavement	1.77	+1.17
Gravel	0.22	-0.57
Total	**7.95**	

The Erosion & Sediment Control Report contained in Appendix G of this section outlines the erosion control measures which will be required for the project (Basic Stormwater Standards).

4.0 WATERSHED DELINEATION METHOD

The following resources were used for watershed delineation:

- USGS Topographic Mapping
- Field Reconnaissance

  Justin Pellerin, Design Engineer, Fay, Spofford & Thorndike
  Reviewed by Stephen Bushey, P.E., Fay, Spofford & Thorndike

- Site Topographic Survey

  Nadeau Land Survey Dated December 2013

- Hydrologic Soil Group Information

  Medium Intensity Soils Survey by Albert Frick & Associates, Inc.

5.0 REFERENCES

- Urban Hydrology for Small Watersheds from the USDA SCC *Technical Release SS, dated 1986*
- Erosion and Sediment *Maine Erosion and Sediment Control BMPs", published by the MeDEP in 2003 http://www.maine.gov/dep/blwg/docstand/escbmps/index.htm*
- City of Portland – Code of Ordinances
- Stormwater Management for Maine Volume III – BMP Technical Design Manual
- Chapter 500 MaineDEP Rules, Revision December 2011
- City of South Portland Stormwater Manual – Gravel Wetland
- Modeling SoftwareHydroCAD Stormwater Modeling System, Version 8.5, Applied Microcomputer Systems – used for modeling underground storage facilities
- Microsoft Excel 2010, Microsoft Corporation – used for spreadsheet computations.

6.0 DESIGN STORMS

TABLE 3 – RAINFALL	
Rainfall Amount (inches)	
2-Year Storm	3.0
10-Year Storm	4.7
25-Year Storm	5.5
100-Year Storm	6.7

Hydrologic Parameters: Cumberland County SE Type III Distribution: Antecedent Moisture Condition 2, SCS 24 Hour Distribution as per MeDEP Stormwater Best Management Practices (page 25).

7.0 PRESENTATION OF ANALYSIS

The stormwater analysis has been performed for the project to determine the requirements of the City of Portland and the MeDEP Chapter 500 Stormwater Rules and to show a plan which will generally meet the requirements with any exceptions noted herein. The analysis is documented with supporting HydroCAD models appended to this narrative.

8.0 MODELING ASSUMPTIONS

- The gravel wetlands were modeled as ponds to capture and store up to the 100 year storm event rainfall volume. The gravel wetland section includes an 8" thick wetland soil layer underlain by a 3" pea stone and permanently saturated 24" layer of crushed stone. The crushed stone layer will be tied into outlet control structures that will contain weirs/orifices that will control the rate of flow passing horizontally through the crushed stone system as well as control the overall peak discharge to the two points of analysis studied for the post development conditions.
- Analysis was run with pipe lengths (modeled as culvert outlets). Pipe sizes were generated using the HydroCAD modeling flow computations.
- The Tc flow paths were assumed to be a min. of 6 minutes as recommended in the TR-55 technical manual. In instances where flow paths were computed to be less then 6 minutes a direct entry command was used.

9.0 PREDEVELOPMENT ANALYSIS

Runoff from the site flows to two points of analysis (POA). These consist of the following:

- Point of Analysis #1 is an inlet into a drainage way that abuts the northeast end of the site. Presently a majority of the site drains into this drainage way through multiple wetland fingers. The drainage way stream captures 5.72 acres relevant to the project site, although its broader watershed area is much larger.
- Point of Analysis #2 is an existing City of Portland catch basin where flows from the southerly tip of the site drain and connect into the city drainage system. Currently flow drains from the proposed development site and a portion of Harbour Auto Body into an existing detention pond that discharges into the municipal system. Currently 2.23 acres are tributary to this point of analysis from the proposed site.

The Predevelopment Peak flows at the two POI's are as follows:

TABLE 4 PREDEVELOPMENT FLOWS (PEAK DISCHARGE RATES) AT POI			
POI #	**2 Yr Storm Event (CFS)**	**10 Yr Storm Event (CFS)**	**25 Yr Storm Event (CFS)**
1	3.53	7.44	9.36
2	3.72	6.94	8.23

10.0 POSTDEVELOPMENT ANALYSIS

The postdevelopment analysis considers the two gravel wetlands and the proposed roof drain gravel drip strip treatment systems for their storage capacity and controls to detain runoff volumes up to the 100 year storm event. Runoff passing through the gravel wetland section will be captured and stored within the pond reservoir. The outflow from each gravel wetland will be controlled through a control structure that will contain an orifice control mechanism to regulate the flow rate discharging from the system. The outlet pipes from the water storage system will discharge to stabilized ground conditions and this flow will travel overland or via pipe to each Point of Interest. The following post development peak flows have been computed for each POI:

TABLE 5 POST DEVELOPMENT FLOWS (PEAK DISCHARGE RATES) AT POI			
POI #	**2 Yr Storm Event (CFS)**	**10 Yr Storm Event (CFS)**	**25 Yr Storm Event (CFS)**
1	3.04	6.98	8.91
2	2.72	5.63	6.46

11.0 STORMWATER MANAGEMENT OBJECTIVES

The goal of the Stormwater Management Plan is to design, operate, and maintain the development to avoid downstream erosion or significant water quality impairment.

This goal will be achieved by:

- Designing the project to meet the Portland Stormwater Management Standards and the MeDEP Chapter 500 Basic Standards, General Standards, and Flooding Standards (revised October 2010).
- Designing water quality measures to provide long-term removal of non-point contaminants.
- Implementing a plan to control erosion, sedimentation, or fugitive dust emissions during construction.
- Maintenance of the Stormwater Management System in accordance with the Stormwater O&M Manual (provided as a separate document).

The plan has been designed in accordance with the City of Portland Stormwater Rules.

12.0 STORMWATER MANAGEMENT QUANTITY SUMMARY

To meet the Flooding Standards of the MaineDEP Chapter 500 Stormwater Rules the project has been designed to store runoff in the two gravel wetlands and a roof drip strip system. Based on the storage volume provided by these reservoirs, there will be sufficient capacity to store greater than the 100 year storm event rainfall amount. For runoff from the building roof, the plans include the installation of a gravel drip strip system.

Flows and storage characteristics of the each gravel wetland and gravel drip strip are contained in Appendix D. A summary of the systems is as follows:

TABLE 6
SUMMARY OF GRAVEL WETLAND 1

Storm Event Interval	Peak Flows In (CFS)	Peak Flows Out (CFS)	Storage (CF)	Peak Elevation (FT)
2-Year	1.13	0.36	1,534	69.10
10-Year	2.07	1.22	2,034	69.31
25-Year	2.51	1.47	2,348	69.41
100-Year	3.18	1.80	2,714	69.53

TABLE 7
SUMMARY OF GRAVEL WETLAND 2

Storm Event Interval	Peak Flows In (CFS)	Peak Flows Out (CFS)	Storage (CF)	Peak Elevation (FT)
2-Year	2.87	1.05	3,949	69.11
10-Year	4.98	3.90	4,927	69.27
25-Year	5.97	4.88	5,198	69.31
100-Year	7.44	6.21	5,540	69.36

The following table summarizes the pre and post development comparison at each point of analysis:

TABLE 8
PRE AND POST COMPARISON (POI)

Description	2 Year		10 Year		25 Year	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**
POI #1	3.53	3.04	7.44	6.98	9.56	8.91
POI #2	3.72	2.72	6.94	5.63	8.23	6.46

TABLE 9 SUMMARY OF GRAVEL DRIP STRIP				
Storm Event Interval	**Peak Flows In (CFS)**	**Peak Flows Out (CFS)**	**Storage (CF)**	**Peak Elevation (FT)**
2-Year	2.10	1.15	438	70.27
10-Year	3.35	1.27	1,426	70.88
25-Year	3.93	1.33	2,009	71.24
100-Year	4.81	1.43	2,955	71.83

The post development flows are lower then those in predevelopment conditions at each point of analysis and therefore the Flooding Standard Goal has been met. Postdevelopment computations are contained in Appendix C.

13.0 STORMWATER MANAGEMENT QUALITY SUMMARY

Approach

To meet the General Standards, our office has reviewed the implementation of the 4 approved treatment strategies listed below. Our findings are as follows:

- **Wetpond** – Wetponds were considered for part of the project's stormwater management strategy; however, due to physical and natural resource site constraints and the required limits of proposed development, there is insufficient vertical and horizontal space to utilize this method of water quality treatment. Generally speaking, the development area would require a wet pond of approximately 0.5 to 0.75 acres in size; thus this option is not feasible.
- **Filter** – Filters cover a broad range of techniques including pre-approved proprietary stormwater treatment devices and a porous surface treatment. The development site has very flat relief and is not conducive to the use of filters which generally require at least 5' of vertical space to an outlet.
- **Infiltration** – Our office has reviewed the Geotechnical Report about the site and the USDA medium intensity soil survey. The medium intensity soil survey maps the site as predominantly Scantic Silt loam. These soils are commonly found to be poorly drained. The limiting factor to effective infiltration is the restrictive layer (i.e. bedrock, depth to groundwater, and infiltration rates of receiving soils. The presence of a restrictive layer (high groundwater table and Glacial marine soils) will make infiltration very difficult to incorporate into this site. Geotechnical explorations show that glacial marine soils are present within 3 to 5 feet below existing grade and seasonally high groundwater table approximately 5 feet below existing grade. Due to the proximity to the groundwater table and marine soils our office is not recommending the use of infiltration for the purposes of water quality treatment.
- **Buffers** – Buffers were not considered as part of the site's stormwater management due to insufficient space. As an example, a minimum forested or meadow buffer width needs to be 75 feet, 100 feet or 150 feet with a slope of 0% - 8%, none of which is attainable on the site. Additionally, buffers are required to be encumbered by a conservation easement and deed restrictions.

Implementation

Our office has laid out a plan which utilizes two gravel wetlands that will treat the entire developed parking area. We have also implemented a gravel drip strip system to treat runoff from the proposed building. Gravel wetlands are horizontal flow retention and filter systems. These systems maintain a saturated gravel bed and provide treatment by stormwater movement through the gravel bed and plant/soil processes. These systems are suited to the project site due to poorly draining subsoils and limited availability of hydraulic head (vertical space).

A water quality summary chart of the project is appended with this application in Appendix D. The basis of design of gravel wetlands and gravel drip strip are as follows:

- **Gravel Drip Strip –** The intent of a gravel drip strip is to collect and provide treatment for runoff from a building roof area. The gravel drip strip for this project was designed based on the following considerations from the MeDEP Chapter 7 Stormwater manual:

  Stone layer is assumed to have 40 % void space and be able to retain 1" of runoff over the entire building area.

  For example, a 70' deep building roof must be able to holds: (70')*(1/12)*(1') = 5.83 CF, Per Foot of Building Length

  For this project, there was 28,000 SF of building area, which requires a capacity of 2,333 CF of storage.

  Complete gravel drip strip computations can be found in Appendix B.

- **Gravel Wetlands –** The gravel wetland treatment reservoirs have been designed to treat at least 95% of the new structure area and 80 % of the developed area along with the gravel drip strip to capture building roof runoff.

  To meet Chapter 500, the Channel Protection Volume provided must be equal to or greater than the following:

  WQV= (P1)*(Rv)*(A)
  Where P1=90% rainfall event assumed to be 1"
  Where A = total tributary area within the sub-catchment
  Where Rv= .05+*0.9*(I)
  Where I = the percentage of impervious Area within the sub-catchment.

  Typically, gravel wetlands are broken into three zones:

  1. First, the forebay must hold 10% of the desired WQV. The purpose of the sediment forebay is to settle solids from storm water before it reaches the two gravel wetland cells.

  2. Two wetland cells shall hold approximately 45% of desired WQV each. These cells provide a majority of the water treatment.

3. The water quality volume provided is equal to 3,579 cubic feet in the two gravel wetland systems. Gravel wetlands water quality computations can be found in Appendix B.

Based on University of New Hampshire Design Specifications, the gravel wetlands shall be sized to treat the entire water quality volume in 24 hours with a discharge rate that is controlled by an orifice on the under drain system. The orifice drawdown computations are appended in Appendix F.

For gravel Wetland 1 located nearer to Warren Avenue, the discharge from larger storm events overflows over a broad crested weir contained in a precast concrete outlet control structure set at Elevation 69.00 (i.e. the basin stage when water quality volume has been reached). The overflow piping network is sized to handle runoff from a 25-year storm event.

For gravel Wetland 2, located at the rear of site, the discharge from larger storm events will overflow over a weir spill-way set at Elevation 69.00. The overflow will flow into the undeveloped sub-catchment and eventually drain into a drainage way in the northeast quadrant of the site.

Therefore, water quality goals for the gravel wetland system meet the General Stormwater Standards of the November 2005 Chapter 500 Rules of MeDEP (rev. December 2011). As well as City of Portland Technical Standards.

14.0 CHAPTER 500 TREATMENT PERCENT COMPLIANCE

The proposed development project creates 1.90 acres of newly constructed impervious area and .63 acres of pervious area for a total disturbed area of about 2.53 acres.

Of the 1.90 acres of impervious area the proposed Stormwater Management Plan provides treatment for all 1.90 acres or 100% percent. The disturbed area as part of this redevelopment is approximately 2.53 acres. Of the 2.53 acres the proposed Stormwater Management Plan provides treatment for 2.40 acres or 94.6% percent. Hence, the strategies proposed herein meets the minimum requirements stated in the General Standards.

TABLE 10
WATER QUALITY SUMMARY

	Impervious Area (ac)	Treated Impervious (ac)	Developed Area (ac)	Treated Developed (ac)
	1.90	1.90	2.53	2.40
PERCENTAGE		**100%**		**94.6 %**

A summary of the water quality treatment values is as follows:

- **Gravel Wetlands:** There are two gravel wetland areas proposed to treat runoff from the site's developed area. The design and treatment parameters are as follows:

TABLE 11 GRAVEL WETLAND		
Gravel Wetland Subcatchment	2*	4*
Impervious Area Treated (sf)	13,583	20,942
Pervious Area Treated (sf)	1,682	1616
Required Sediment Forebay Water Quality Volume (cf)	108	283
Required Wetland Cell Water Quality Volume (cf) Each Cell Approximately 45%	487	1273
Bottom Elevation (ft)	68.50	68.50
Elevation Where Water Quality Volume is Achieved	69.00	69.00
Depth at Water Quality Volume (in.)	0.5	0.5
Controlling Orifice Size (in.)	1.1	1.5
Controlling Orifice Elevation (ft)	68.17	68.17
100 Year Storm Stage Elevation (ft)	69.61	69.36
Major Storm Event Control Devices	WEIR	WEIR
Freeboard (ft)	.39	.64
Surface Area Provided (sf)	1,670	4,800

See HydroCAD Computations – Appendix C

- **Gravel Drip Strip**: The rooftop will sheet runoff into a gravel drip strip system. The design results are summarized below.

TABLE 12 GRAVEL DRIP STRIP	
Water Quality Volume required= (1")*(roof area) (cf)	2,333
Proposed Stone Layer Volume (sf)	2340
Bottom Elevation of Storage Layers (ft)	70.50
Top of Elevation of Stone Layer (ft)	72.00
Elevation Where Water Quality Volume is Achieved (ft)	72.00
Depth of Water Quality (ft)	1.5
Freeboard – 100-Year Storm (ft)	0.17
Maximum Volume Stone Reservoir (cf)	2,955
Proposed Surface Elevation (ft)	72.00

15.0 EROSION CONTROL

An Erosion Control Narrative, Plan, and Details have been prepared for the project and accompany this submission in Appendix G.

16.0 OPERATIONS AND MAINTENANCE

An Operations & Maintenance Manual has been prepared and accompanies this application in Appendix H.

17.0 PERMIT REQUIREMENTS

City of Portland review and permitting of the Stormwater Management Plan is required and will be completed with the review of the Site Plan Application submitted to the City of Portland Planning Department.

18.0 DRAINAGE NETWORK PIPE SIZING

The drainage network has been sized using the flows computed using HydroCad modeling software. The pipe sizes are noted on the drawings.

19.0 APPENDICES

A – Figures (Refer to Section 1 of the Site Plan Application)

B – Predevelopment Computations (2, 10 and 25-year Storm Event HydroCAD Computations)

C – Postdevelopment Computations (2, 10 and 25-year Storm Event HydroCAD Computations)

D – Water Quality Summary Chart and Computations

E – Orifice Drawdown Computations

F – Geotechnical Exploration Test Pit Logs

G – Erosion & Sediment Control Report

H – Inspection & Maintenance Manual for Stormwater Management and Related Stormwater Facilities

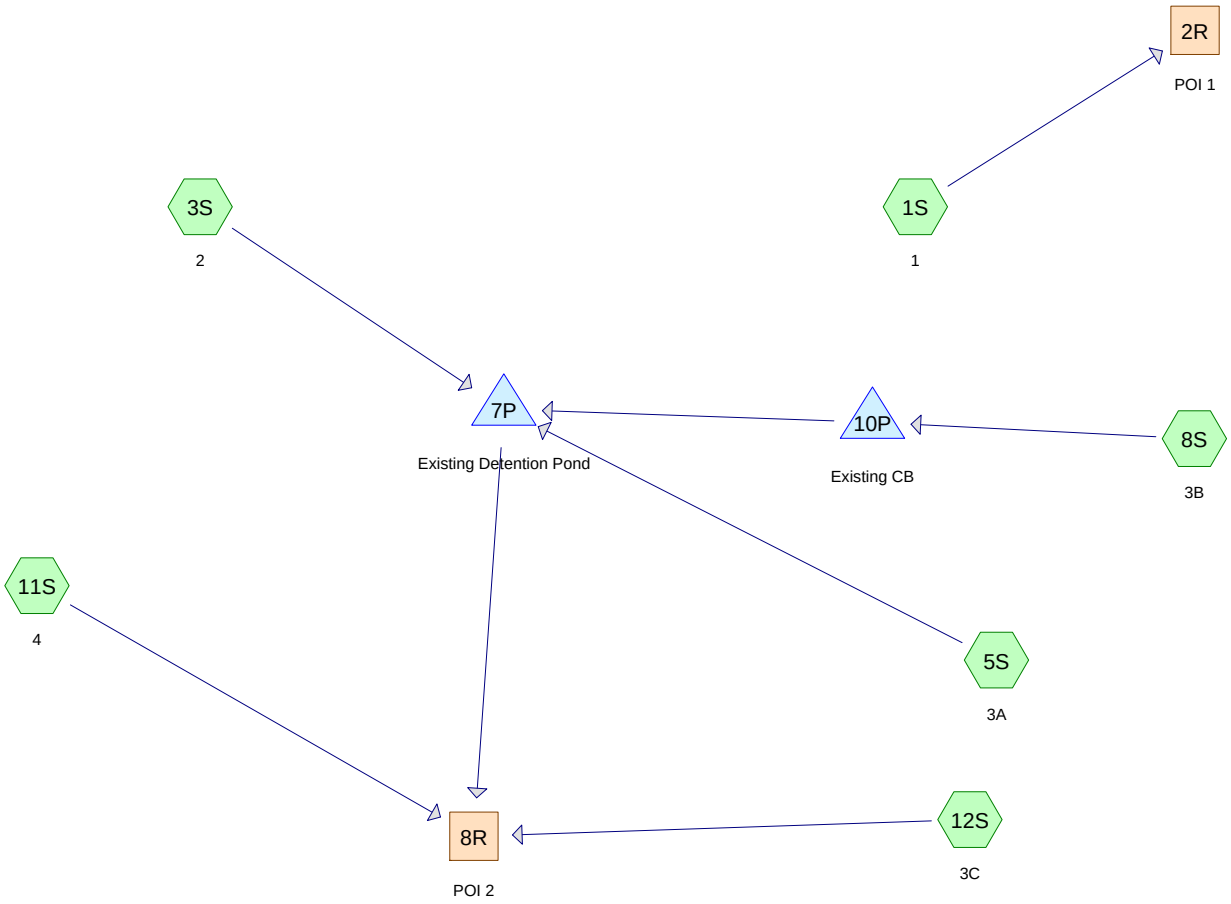
APPENDIX A

FIGURES

(Refer to Section 1 of the Site Plan Application)

APPENDIX B

PREDEVELOPMENT COMPUTATIONS
(2, 10 AND 25-YEAR STORM EVENT HYDROCAD COMPUTATIONS)



Subcat Reach Pond Link

Drainage Diagram for SP-M104 2-3-14 PRE DEVELOPMENT
Prepared by {enter your company name here}, Printed 2/11/2014

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.180	73	Woods, Fair, HSG C (3S)
0.017	74	Existing Land Scaped Area (5S)
0.078	74	Pervious Pond Area (5S)
0.363	79	50-75% Grass cover, Fair, HSG C (3S,11S)
3.924	79	Pasture/grassland/range, Fair, HSG C (1S)
1.658	84	Pasture/grassland/range, Fair, HSG D (1S)
0.791	89	Gravel Pavement (1S,3S,11S)
0.469	98	Impervious (8S,12S)
0.428	98	Impervious Pavement (3S,5S)
0.028	98	Pavement (11S)
0.017	98	Smaller Building (5S)
7.952		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
4.467	HSG C	1S, 3S, 11S
1.658	HSG D	1S
1.826	Other	1S, 3S, 5S, 8S, 11S, 12S
7.952		**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: 1 Runoff Area=248,944 sf 0.00% Impervious Runoff Depth=1.31"
Flow Length=704' Tc=56.7 min CN=81 Runoff=3.53 cfs 0.626 af

Subcatchment 3S: 2 Runoff Area=20,578 sf 8.11% Impervious Runoff Depth=1.25"
Flow Length=305' Tc=6.0 min CN=80 Runoff=0.68 cfs 0.049 af

Subcatchment 5S: 3A Runoff Area=21,816 sf 81.20% Impervious Runoff Depth=2.25"
Tc=6.0 min CN=93 Runoff=1.28 cfs 0.094 af

Subcatchment 8S: 3B Runoff Area=4,298 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.29 cfs 0.023 af

Subcatchment 11S: 4 Runoff Area=34,630 sf 3.52% Impervious Runoff Depth=1.74"
Tc=6.0 min CN=87 Runoff=1.62 cfs 0.115 af

Subcatchment 12S: 3C Runoff Area=16,117 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=1.07 cfs 0.085 af

Reach 2R: POI 1 Inflow=3.53 cfs 0.626 af
Outflow=3.53 cfs 0.626 af

Reach 8R: POI 2 Inflow=3.72 cfs 0.331 af
Outflow=3.72 cfs 0.331 af

Pond 7P: Existing Detention Pond Peak Elev=67.72' Storage=2,525 cf Inflow=2.25 cfs 0.166 af
12.0" x 190.0' Culvert Outflow=1.39 cfs 0.131 af

Pond 10P: Existing CB Inflow=0.29 cfs 0.023 af
Primary=0.29 cfs 0.023 af

Total Runoff Area = 7.952 ac Runoff Volume = 0.992 af Average Runoff Depth = 1.50"
88.16% Pervious = 7.010 ac 11.84% Impervious = 0.942 ac

Summary for Subcatchment 1S: 1

Runoff = 3.53 cfs @ 12.79 hrs, Volume= 0.626 af, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.00"

	Area (sf)	CN	Description
*	5,793	89	Gravel Pavement
	72,222	84	Pasture/grassland/range, Fair, HSG D
	170,929	79	Pasture/grassland/range, Fair, HSG C
	248,944	81	Weighted Average
	248,944		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.5	137	0.0030	0.06		**Sheet Flow, AB** Grass: Dense n= 0.240 P2= 3.00"
14.1	420	0.0050	0.49		**Shallow Concentrated Flow, BC** Short Grass Pasture Kv= 7.0 fps
2.1	147	0.0270	1.15		**Shallow Concentrated Flow, CD** Short Grass Pasture Kv= 7.0 fps
56.7	704	Total			

Summary for Subcatchment 3S: 2

Runoff = 0.68 cfs @ 12.09 hrs, Volume= 0.049 af, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.00"

	Area (sf)	CN	Description
*	4,035	89	Gravel Pavement
	7,035	79	50-75% Grass cover, Fair, HSG C
*	1,668	98	Impervious Pavement
	7,840	73	Woods, Fair, HSG C
	20,578	80	Weighted Average
	18,910		Pervious Area
	1,668		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	90	0.0167	1.21		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
2.3	215	0.0090	1.53		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
3.5	305	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: 3A

Runoff = 1.28 cfs @ 12.09 hrs, Volume= 0.094 af, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.00"

	Area (sf)	CN	Description
*	3,377	74	Pervious Pond Area
*	725	74	Existing Land Scaped Area
*	16,973	98	Impervious Pavement
*	741	98	Smaller Building
	21,816	93	Weighted Average
	4,102		Pervious Area
	17,714		Impervious Area

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

Summary for Subcatchment 8S: 3B

Runoff = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.00"

	Area (sf)	CN	Description
*	4,298	98	Impervious
	4,298		Impervious Area

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

Summary for Subcatchment 11S: 4

Runoff = 1.62 cfs @ 12.09 hrs, Volume= 0.115 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.00"

	Area (sf)	CN	Description
*	24,611	89	Gravel Pavement
	8,799	79	50-75% Grass cover, Fair, HSG C
*	1,220	98	Pavement
	34,630	87	Weighted Average
	33,410		Pervious Area
	1,220		Impervious Area

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

Summary for Subcatchment 12S: 3C

Runoff = 1.07 cfs @ 12.08 hrs, Volume= 0.085 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.00"

	Area (sf)	CN	Description
*	16,117	98	Impervious
	16,117		Impervious Area

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

Summary for Reach 2R: POI 1

Inflow Area = 5.715 ac, 0.00% Impervious, Inflow Depth = 1.31" for 2-YR event
Inflow = 3.53 cfs @ 12.79 hrs, Volume= 0.626 af
Outflow = 3.53 cfs @ 12.79 hrs, Volume= 0.626 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach 8R: POI 2

Inflow Area = 2.237 ac, 42.10% Impervious, Inflow Depth = 1.78" for 2-YR event
Inflow = 3.72 cfs @ 12.11 hrs, Volume= 0.331 af
Outflow = 3.72 cfs @ 12.11 hrs, Volume= 0.331 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond 7P: Existing Detention Pond

Inflow Area = 1.072 ac, 50.72% Impervious, Inflow Depth = 1.86" for 2-YR event
Inflow = 2.25 cfs @ 12.09 hrs, Volume= 0.166 af
Outflow = 1.39 cfs @ 12.19 hrs, Volume= 0.131 af, Atten= 38%, Lag= 6.2 min
Primary = 1.39 cfs @ 12.19 hrs, Volume= 0.131 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 67.72' @ 12.19 hrs Surf.Area= 1,549 sf Storage= 2,525 cf

Plug-Flow detention time= 156.9 min calculated for 0.131 af (79% of inflow)
Center-of-Mass det. time= 76.9 min (881.9 - 805.0)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	4,848 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	432	0	0
66.00	740	586	586
67.00	1,171	956	1,542
68.00	1,693	1,432	2,974
69.00	2,056	1,875	4,848

Device	Routing	Invert	Outlet Devices
#1	Primary	67.00'	**12.0" x 190.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 66.05' S= 0.0050 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=1.39 cfs @ 12.19 hrs HW=67.72' TW=0.00' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1.39 cfs @ 2.28 fps)

Summary for Pond 10P: Existing CB

Inflow Area = 0.099 ac,100.00% Impervious, Inflow Depth = 2.77" for 2-YR event
Inflow = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af
Primary = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: 1 Runoff Area=248,944 sf 0.00% Impervious Runoff Depth=2.72"
Flow Length=704' Tc=56.7 min CN=81 Runoff=7.44 cfs 1.296 af

Subcatchment 3S: 2 Runoff Area=20,578 sf 8.11% Impervious Runoff Depth=2.63"
Flow Length=305' Tc=6.0 min CN=80 Runoff=1.46 cfs 0.104 af

Subcatchment 5S: 3A Runoff Area=21,816 sf 81.20% Impervious Runoff Depth=3.90"
Tc=6.0 min CN=93 Runoff=2.16 cfs 0.163 af

Subcatchment 8S: 3B Runoff Area=4,298 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.45 cfs 0.037 af

Subcatchment 11S: 4 Runoff Area=34,630 sf 3.52% Impervious Runoff Depth=3.29"
Tc=6.0 min CN=87 Runoff=3.01 cfs 0.218 af

Subcatchment 12S: 3C Runoff Area=16,117 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=1.70 cfs 0.138 af

Reach 2R: POI 1 Inflow=7.44 cfs 1.296 af
Outflow=7.44 cfs 1.296 af

Reach 8R: POI 2 Inflow=6.94 cfs 0.623 af
Outflow=6.94 cfs 0.623 af

Pond 7P: Existing Detention Pond Peak Elev=68.24' Storage=3,389 cf Inflow=4.07 cfs 0.303 af
12.0" x 190.0' Culvert Outflow=2.57 cfs 0.268 af

Pond 10P: Existing CB Inflow=0.45 cfs 0.037 af
Primary=0.45 cfs 0.037 af

Total Runoff Area = 7.952 ac Runoff Volume = 1.955 af Average Runoff Depth = 2.95"
88.16% Pervious = 7.010 ac 11.84% Impervious = 0.942 ac

Summary for Subcatchment 1S: 1

Runoff = 7.44 cfs @ 12.78 hrs, Volume= 1.296 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-YR Rainfall=4.70"

	Area (sf)	CN	Description
*	5,793	89	Gravel Pavement
	72,222	84	Pasture/grassland/range, Fair, HSG D
	170,929	79	Pasture/grassland/range, Fair, HSG C
	248,944	81	Weighted Average
	248,944		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.5	137	0.0030	0.06		**Sheet Flow, AB** Grass: Dense n= 0.240 P2= 3.00"
14.1	420	0.0050	0.49		**Shallow Concentrated Flow, BC** Short Grass Pasture Kv= 7.0 fps
2.1	147	0.0270	1.15		**Shallow Concentrated Flow, CD** Short Grass Pasture Kv= 7.0 fps
56.7	704	Total			

Summary for Subcatchment 3S: 2

Runoff = 1.46 cfs @ 12.09 hrs, Volume= 0.104 af, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-YR Rainfall=4.70"

	Area (sf)	CN	Description
*	4,035	89	Gravel Pavement
	7,035	79	50-75% Grass cover, Fair, HSG C
*	1,668	98	Impervious Pavement
	7,840	73	Woods, Fair, HSG C
	20,578	80	Weighted Average
	18,910		Pervious Area
	1,668		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	90	0.0167	1.21		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
2.3	215	0.0090	1.53		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
3.5	305	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: 3A

Runoff = 2.16 cfs @ 12.08 hrs, Volume= 0.163 af, Depth= 3.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-YR Rainfall=4.70"

	Area (sf)	CN	Description
*	3,377	74	Pervious Pond Area
*	725	74	Existing Land Scaped Area
*	16,973	98	Impervious Pavement
*	741	98	Smaller Building
	21,816	93	Weighted Average
	4,102		Pervious Area
	17,714		Impervious Area

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

Summary for Subcatchment 8S: 3B

Runoff = 0.45 cfs @ 12.08 hrs, Volume= 0.037 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-YR Rainfall=4.70"

	Area (sf)	CN	Description
*	4,298	98	Impervious
	4,298		Impervious Area

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

Summary for Subcatchment 11S: 4

Runoff = 3.01 cfs @ 12.09 hrs, Volume= 0.218 af, Depth= 3.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-YR Rainfall=4.70"

	Area (sf)	CN	Description
*	24,611	89	Gravel Pavement
	8,799	79	50-75% Grass cover, Fair, HSG C
*	1,220	98	Pavement
	34,630	87	Weighted Average
	33,410		Pervious Area
	1,220		Impervious Area

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

Summary for Subcatchment 12S: 3C

Runoff = 1.70 cfs @ 12.08 hrs, Volume= 0.138 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-YR Rainfall=4.70"

	Area (sf)	CN	Description
*	16,117	98	Impervious
	16,117		Impervious Area

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

Summary for Reach 2R: POI 1

Inflow Area = 5.715 ac, 0.00% Impervious, Inflow Depth = 2.72" for 10-YR event
Inflow = 7.44 cfs @ 12.78 hrs, Volume= 1.296 af
Outflow = 7.44 cfs @ 12.78 hrs, Volume= 1.296 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach 8R: POI 2

Inflow Area = 2.237 ac, 42.10% Impervious, Inflow Depth = 3.34" for 10-YR event
Inflow = 6.94 cfs @ 12.10 hrs, Volume= 0.623 af
Outflow = 6.94 cfs @ 12.10 hrs, Volume= 0.623 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond 7P: Existing Detention Pond

Inflow Area = 1.072 ac, 50.72% Impervious, Inflow Depth = 3.40" for 10-YR event
Inflow = 4.07 cfs @ 12.09 hrs, Volume= 0.303 af
Outflow = 2.57 cfs @ 12.18 hrs, Volume= 0.268 af, Atten= 37%, Lag= 5.9 min
Primary = 2.57 cfs @ 12.18 hrs, Volume= 0.268 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 68.24' @ 12.18 hrs Surf.Area= 1,780 sf Storage= 3,389 cf

Plug-Flow detention time= 110.2 min calculated for 0.268 af (88% of inflow)
Center-of-Mass det. time= 55.3 min (846.9 - 791.5)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	4,848 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	432	0	0
66.00	740	586	586
67.00	1,171	956	1,542
68.00	1,693	1,432	2,974
69.00	2,056	1,875	4,848

Device	Routing	Invert	Outlet Devices
#1	Primary	67.00'	**12.0" x 190.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 66.05' S= 0.0050 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=2.57 cfs @ 12.18 hrs HW=68.24' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.57 cfs @ 3.27 fps)

Summary for Pond 10P: Existing CB

Inflow Area = 0.099 ac,100.00% Impervious, Inflow Depth = 4.46" for 10-YR event
Inflow = 0.45 cfs @ 12.08 hrs, Volume= 0.037 af
Primary = 0.45 cfs @ 12.08 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: 1 Runoff Area=248,944 sf 0.00% Impervious Runoff Depth=3.43"
Flow Length=704' Tc=56.7 min CN=81 Runoff=9.36 cfs 1.634 af

Subcatchment 3S: 2 Runoff Area=20,578 sf 8.11% Impervious Runoff Depth=3.33"
Flow Length=305' Tc=6.0 min CN=80 Runoff=1.84 cfs 0.131 af

Subcatchment 5S: 3A Runoff Area=21,816 sf 81.20% Impervious Runoff Depth=4.69"
Tc=6.0 min CN=93 Runoff=2.57 cfs 0.196 af

Subcatchment 8S: 3B Runoff Area=4,298 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=0.53 cfs 0.043 af

Subcatchment 11S: 4 Runoff Area=34,630 sf 3.52% Impervious Runoff Depth=4.04"
Tc=6.0 min CN=87 Runoff=3.67 cfs 0.268 af

Subcatchment 12S: 3C Runoff Area=16,117 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=1.99 cfs 0.162 af

Reach 2R: POI 1 Inflow=9.36 cfs 1.634 af
Outflow=9.36 cfs 1.634 af

Reach 8R: POI 2 Inflow=8.23 cfs 0.765 af
Outflow=8.23 cfs 0.765 af

Pond 7P: Existing Detention Pond Peak Elev=68.49' Storage=3,848 cf Inflow=4.94 cfs 0.370 af
12.0" x 190.0' Culvert Outflow=2.86 cfs 0.335 af

Pond 10P: Existing CB Inflow=0.53 cfs 0.043 af
Primary=0.53 cfs 0.043 af

Total Runoff Area = 7.952 ac Runoff Volume = 2.434 af Average Runoff Depth = 3.67"
88.16% Pervious = 7.010 ac 11.84% Impervious = 0.942 ac

Summary for Subcatchment 1S: 1

Runoff = 9.36 cfs @ 12.78 hrs, Volume= 1.634 af, Depth= 3.43"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-YR Rainfall=5.50"

	Area (sf)	CN	Description
*	5,793	89	Gravel Pavement
	72,222	84	Pasture/grassland/range, Fair, HSG D
	170,929	79	Pasture/grassland/range, Fair, HSG C
	248,944	81	Weighted Average
	248,944		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.5	137	0.0030	0.06		**Sheet Flow, AB** Grass: Dense n= 0.240 P2= 3.00"
14.1	420	0.0050	0.49		**Shallow Concentrated Flow, BC** Short Grass Pasture Kv= 7.0 fps
2.1	147	0.0270	1.15		**Shallow Concentrated Flow, CD** Short Grass Pasture Kv= 7.0 fps
56.7	704	Total			

Summary for Subcatchment 3S: 2

Runoff = 1.84 cfs @ 12.09 hrs, Volume= 0.131 af, Depth= 3.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-YR Rainfall=5.50"

	Area (sf)	CN	Description
*	4,035	89	Gravel Pavement
	7,035	79	50-75% Grass cover, Fair, HSG C
*	1,668	98	Impervious Pavement
	7,840	73	Woods, Fair, HSG C
	20,578	80	Weighted Average
	18,910		Pervious Area
	1,668		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	90	0.0167	1.21		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
2.3	215	0.0090	1.53		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
3.5	305	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: 3A

Runoff = 2.57 cfs @ 12.08 hrs, Volume= 0.196 af, Depth= 4.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-YR Rainfall=5.50"

	Area (sf)	CN	Description
*	3,377	74	Pervious Pond Area
*	725	74	Existing Land Scaped Area
*	16,973	98	Impervious Pavement
*	741	98	Smaller Building
	21,816	93	Weighted Average
	4,102		Pervious Area
	17,714		Impervious Area

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

Summary for Subcatchment 8S: 3B

Runoff = 0.53 cfs @ 12.08 hrs, Volume= 0.043 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-YR Rainfall=5.50"

	Area (sf)	CN	Description
*	4,298	98	Impervious
	4,298		Impervious Area

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

Summary for Subcatchment 11S: 4

Runoff = 3.67 cfs @ 12.09 hrs, Volume= 0.268 af, Depth= 4.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-YR Rainfall=5.50"

	Area (sf)	CN	Description
*	24,611	89	Gravel Pavement
	8,799	79	50-75% Grass cover, Fair, HSG C
*	1,220	98	Pavement
	34,630	87	Weighted Average
	33,410		Pervious Area
	1,220		Impervious Area

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

Summary for Subcatchment 12S: 3C

Runoff = 1.99 cfs @ 12.08 hrs, Volume= 0.162 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-YR Rainfall=5.50"

	Area (sf)	CN	Description
*	16,117	98	Impervious
	16,117		Impervious Area

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

Summary for Reach 2R: POI 1

Inflow Area = 5.715 ac, 0.00% Impervious, Inflow Depth = 3.43" for 25-YR event
Inflow = 9.36 cfs @ 12.78 hrs, Volume= 1.634 af
Outflow = 9.36 cfs @ 12.78 hrs, Volume= 1.634 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach 8R: POI 2

Inflow Area = 2.237 ac, 42.10% Impervious, Inflow Depth = 4.10" for 25-YR event
Inflow = 8.23 cfs @ 12.09 hrs, Volume= 0.765 af
Outflow = 8.23 cfs @ 12.09 hrs, Volume= 0.765 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond 7P: Existing Detention Pond

Inflow Area = 1.072 ac, 50.72% Impervious, Inflow Depth = 4.14" for 25-YR event
Inflow = 4.94 cfs @ 12.09 hrs, Volume= 0.370 af
Outflow = 2.86 cfs @ 12.20 hrs, Volume= 0.335 af, Atten= 42%, Lag= 6.8 min
Primary = 2.86 cfs @ 12.20 hrs, Volume= 0.335 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 68.49' @ 12.20 hrs Surf.Area= 1,871 sf Storage= 3,848 cf

Plug-Flow detention time= 97.8 min calculated for 0.335 af (90% of inflow)
Center-of-Mass det. time= 50.8 min (837.8 - 787.1)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	4,848 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	432	0	0
66.00	740	586	586
67.00	1,171	956	1,542
68.00	1,693	1,432	2,974
69.00	2,056	1,875	4,848

Device	Routing	Invert	Outlet Devices
#1	Primary	67.00'	**12.0" x 190.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 66.05' S= 0.0050 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=2.86 cfs @ 12.20 hrs HW=68.49' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 2.86 cfs @ 3.64 fps)

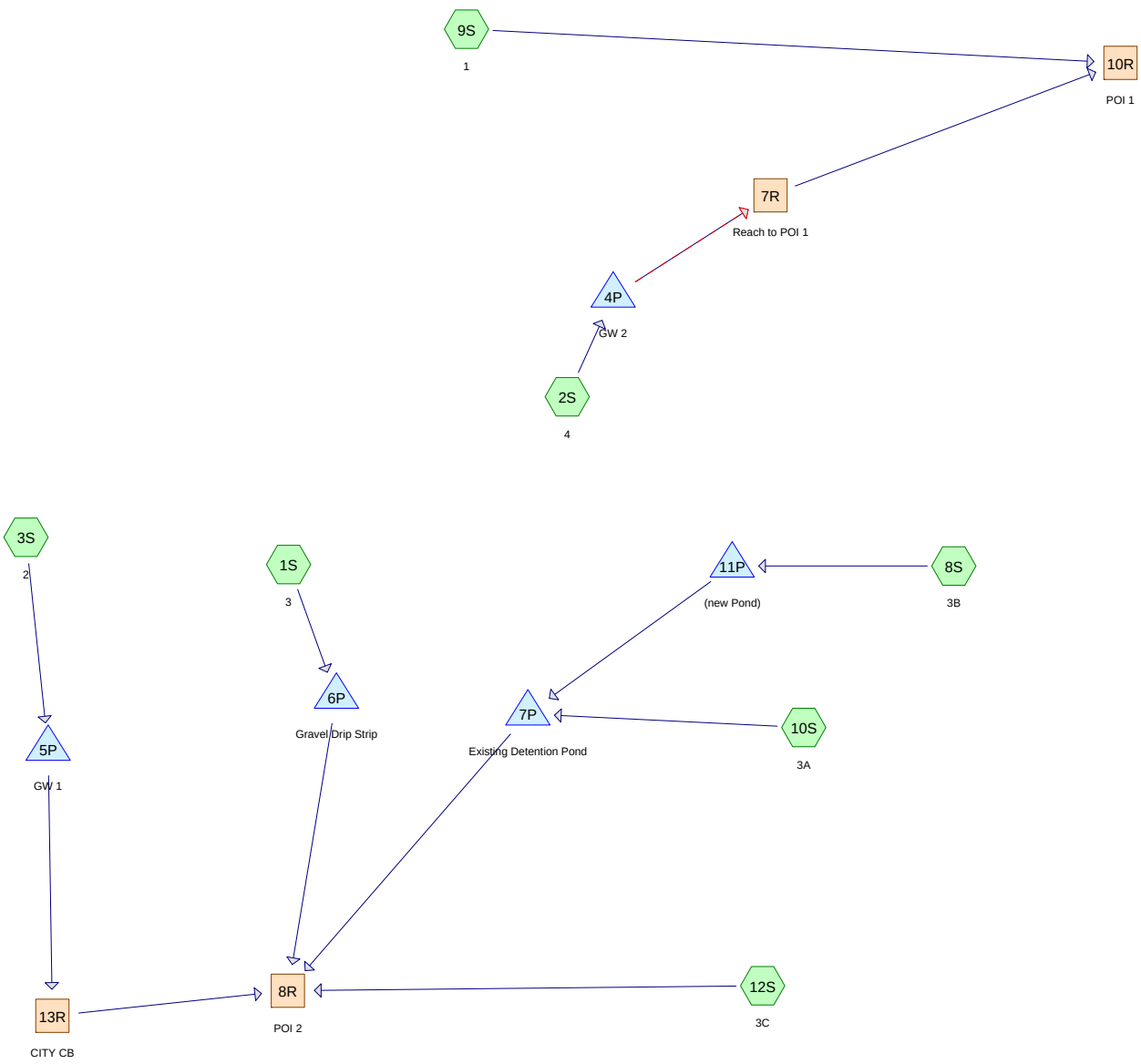
Summary for Pond 10P: Existing CB

Inflow Area = 0.099 ac,100.00% Impervious, Inflow Depth = 5.26" for 25-YR event
Inflow = 0.53 cfs @ 12.08 hrs, Volume= 0.043 af
Primary = 0.53 cfs @ 12.08 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

APPENDIX C

POSTDEVELOPMENT COMPUTATIONS
(2, 10 AND 25-YEAR STORM EVENT HYDROCAD COMPUTATIONS)



Subcat Reach Pond Link

Drainage Diagram for SP-M104-1-31-14 POST DEVELOPMENT MODEL

Prepared by {enter your company name here}, Printed 2/11/2014

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.337	74	>75% Grass cover, Good, HSG C (2S)
0.017	74	Existing Land Scaped Area (10S)
0.078	74	Pervious Pond Area (10S)
0.227	74	Proposed Land Scape (3S)
3.256	79	Pasture/grassland/range, Fair, HSG C (9S)
1.121	84	Pasture/grassland/range, Fair, HSG D WETLAND (9S)
0.093	89	Gravel Drip Strip Area (1S)
0.133	89	Gravel Pavement (9S)
0.469	98	Impervious (8S,12S)
0.407	98	Impervious Pavement (10S)
1.170	98	Pavement (2S,3S)
0.643	98	Proposed Building (1S)
7.948		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
3.593	HSG C	2S, 9S
1.121	HSG D	9S
3.234	Other	1S, 2S, 3S, 8S, 9S, 10S, 12S
7.948		**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: 3 Runoff Area=32,040 sf 87.39% Impervious Runoff Depth=2.66"
Tc=6.0 min CN=97 Runoff=2.10 cfs 0.163 af

Subcatchment 2S: 4 Runoff Area=52,272 sf 71.92% Impervious Runoff Depth=2.07"
Flow Length=455' Tc=6.0 min CN=91 Runoff=2.87 cfs 0.207 af

Subcatchment 3S: 2 Runoff Area=23,229 sf 57.51% Impervious Runoff Depth=1.82"
Flow Length=190' Tc=6.0 min CN=88 Runoff=1.13 cfs 0.081 af

Subcatchment 8S: 3B Runoff Area=4,298 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.29 cfs 0.023 af

Subcatchment 9S: 1 Runoff Area=196,458 sf 0.00% Impervious Runoff Depth=1.31"
Flow Length=704' Tc=56.7 min CN=81 Runoff=2.79 cfs 0.494 af

Subcatchment 10S: 3A Runoff Area=21,816 sf 81.20% Impervious Runoff Depth=2.25"
Tc=6.0 min CN=93 Runoff=1.28 cfs 0.094 af

Subcatchment 12S: 3C Runoff Area=16,113 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=1.07 cfs 0.085 af

Reach 7R: Reach to POI 1 Avg. Depth=0.05' Max Vel=0.06 fps Inflow=1.05 cfs 0.207 af
n=0.400 L=364.0' S=0.0140 '/' Capacity=3.26 cfs Outflow=0.28 cfs 0.205 af

Reach 8R: POI 2 Inflow=2.72 cfs 0.410 af
Outflow=2.72 cfs 0.410 af

Reach 10R: POI 1 Inflow=3.04 cfs 0.699 af
Outflow=3.04 cfs 0.699 af

Reach 13R: CITY CB Inflow=0.36 cfs 0.081 af
Outflow=0.36 cfs 0.081 af

Pond 4P: GW 2 Peak Elev=69.11' Storage=3,949 cf Inflow=2.87 cfs 0.207 af
Primary=0.99 cfs 0.078 af Secondary=0.06 cfs 0.129 af Outflow=1.05 cfs 0.207 af

Pond 5P: GW 1 Peak Elev=69.10' Storage=1,534 cf Inflow=1.13 cfs 0.081 af
Outflow=0.36 cfs 0.081 af

Pond 6P: Gravel Drip Strip Peak Elev=70.27' Storage=438 cf Inflow=2.10 cfs 0.163 af
6.0" x 51.0' Culvert Outflow=1.15 cfs 0.163 af

Pond 7P: Existing Detention Pond Peak Elev=67.52' Storage=2,223 cf Inflow=1.57 cfs 0.117 af
12.0" x 190.0' Culvert Outflow=0.80 cfs 0.081 af

Pond 11P: (new Pond) Inflow=0.29 cfs 0.023 af
Primary=0.29 cfs 0.023 af

Total Runoff Area = 7.948 ac Runoff Volume = 1.147 af Average Runoff Depth = 1.73"
66.19% Pervious = 5.261 ac 33.81% Impervious = 2.688 ac

Summary for Subcatchment 1S: 3

Runoff = 2.10 cfs @ 12.08 hrs, Volume= 0.163 af, Depth= 2.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.00"

	Area (sf)	CN	Description
*	28,000	98	Proposed Building
*	4,040	89	Gravel Drip Strip Area
	32,040	97	Weighted Average
	4,040		Pervious Area
	28,000		Impervious Area

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

Summary for Subcatchment 2S: 4

Runoff = 2.87 cfs @ 12.09 hrs, Volume= 0.207 af, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.00"

	Area (sf)	CN	Description
*	37,592	98	Pavement
	14,680	74	>75% Grass cover, Good, HSG C
	52,272	91	Weighted Average
	14,680		Pervious Area
	37,592		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	135	0.0111	1.12		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
1.2	130	0.0077	1.78		**Shallow Concentrated Flow, BC** Paved Kv= 20.3 fps
2.6	190	0.0068	1.24		**Shallow Concentrated Flow, CD** Grassed Waterway Kv= 15.0 fps
5.8	455	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: 2

Runoff = 1.13 cfs @ 12.09 hrs, Volume= 0.081 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.00"

	Area (sf)	CN	Description
*	13,358	98	Pavement
*	9,871	74	Proposed Land Scape
	23,229	88	Weighted Average
	9,871		Pervious Area
	13,358		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	85	0.0222	1.34		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
1.1	105	0.0058	1.55		**Shallow Concentrated Flow, BC** Paved Kv= 20.3 fps
2.2	190	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8S: 3B

Runoff = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.00"

	Area (sf)	CN	Description
*	4,298	98	Impervious
	4,298		Impervious Area

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

Summary for Subcatchment 9S: 1

Runoff = 2.79 cfs @ 12.79 hrs, Volume= 0.494 af, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.00"

	Area (sf)	CN	Description
*	5,796	89	Gravel Pavement
	141,841	79	Pasture/grassland/range, Fair, HSG C
*	48,821	84	Pasture/grassland/range, Fair, HSG D WETLAND
	196,458	81	Weighted Average
	196,458		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.5	137	0.0030	0.06		**Sheet Flow, AB** Grass: Dense n= 0.240 P2= 3.00"
14.1	420	0.0050	0.49		**Shallow Concentrated Flow, BC** Short Grass Pasture Kv= 7.0 fps
2.1	147	0.0272	1.15		**Shallow Concentrated Flow, CD** Short Grass Pasture Kv= 7.0 fps
56.7	704	Total			

Summary for Subcatchment 10S: 3A

Runoff = 1.28 cfs @ 12.09 hrs, Volume= 0.094 af, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.00"

	Area (sf)	CN	Description
*	3,377	74	Pervious Pond Area
*	725	74	Existing Land Scaped Area
*	17,714	98	Impervious Pavement
	21,816	93	Weighted Average
	4,102		Pervious Area
	17,714		Impervious Area

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

Summary for Subcatchment 12S: 3C

Runoff = 1.07 cfs @ 12.08 hrs, Volume= 0.085 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.00"

	Area (sf)	CN	Description
*	16,113	98	Impervious
	16,113		Impervious Area

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

Summary for Reach 7R: Reach to POI 1

Inflow Area = 1.200 ac, 71.92% Impervious, Inflow Depth > 2.07" for 2-YR event
Inflow = 1.05 cfs @ 12.35 hrs, Volume= 0.207 af
Outflow = 0.28 cfs @ 13.17 hrs, Volume= 0.205 af, Atten= 73%, Lag= 49.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.06 fps, Min. Travel Time= 108.0 min
Avg. Velocity = 0.02 fps, Avg. Travel Time= 287.2 min

Peak Storage= 1,820 cf @ 13.17 hrs, Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 0.20', Capacity at Bank-Full= 3.26 cfs

100.00' x 0.20' deep channel, n= 0.400 Sheet flow: Woods+light brush
Side Slope Z-value= 100.0 '/' Top Width= 140.00'
Length= 364.0' Slope= 0.0140 '/'
Inlet Invert= 68.10', Outlet Invert= 63.00'

‡

Summary for Reach 8R: POI 2

Inflow Area = 2.238 ac, 81.52% Impervious, Inflow Depth = 2.20" for 2-YR event
Inflow = 2.72 cfs @ 12.13 hrs, Volume= 0.410 af
Outflow = 2.72 cfs @ 12.13 hrs, Volume= 0.410 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach 10R: POI 1

Inflow Area = 5.710 ac, 15.11% Impervious, Inflow Depth > 1.47" for 2-YR event
Inflow = 3.04 cfs @ 12.80 hrs, Volume= 0.699 af
Outflow = 3.04 cfs @ 12.80 hrs, Volume= 0.699 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach 13R: CITY CB

Inflow Area = 0.533 ac, 57.51% Impervious, Inflow Depth > 1.82" for 2-YR event
Inflow = 0.36 cfs @ 12.42 hrs, Volume= 0.081 af
Outflow = 0.36 cfs @ 12.42 hrs, Volume= 0.081 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond 4P: GW 2

Inflow Area = 1.200 ac, 71.92% Impervious, Inflow Depth = 2.07" for 2-YR event
Inflow = 2.87 cfs @ 12.09 hrs, Volume= 0.207 af
Outflow = 1.05 cfs @ 12.35 hrs, Volume= 0.207 af, Atten= 64%, Lag= 16.0 min
Primary = 0.99 cfs @ 12.35 hrs, Volume= 0.078 af
Secondary = 0.06 cfs @ 12.35 hrs, Volume= 0.129 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 69.11' @ 12.35 hrs Surf.Area= 10,847 sf Storage= 3,949 cf

Plug-Flow detention time= 493.0 min calculated for 0.206 af (100% of inflow)
Center-of-Mass det. time= 492.0 min (1,296.9 - 804.9)

Volume	Invert	Avail.Storage	Storage Description
#1	68.50'	8,618 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	68.17'	634 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 1,584 cf Overall x 40.0% Voids
		9,252 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.50	4,800	0	0
69.00	5,866	2,667	2,667
69.90	7,360	5,952	8,618

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.17	4,800	0	0
68.50	4,800	1,584	1,584

Device	Routing	Invert	Outlet Devices
#1	Primary	69.00'	**10.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32
#2	Secondary	68.17'	**6.0" x 20.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 68.10' S= 0.0035 '/' Cc= 0.900 n= 0.012
#3	Device 2	68.17'	**1.5" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.99 cfs @ 12.35 hrs HW=69.11' TW=68.12' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 0.99 cfs @ 0.91 fps)

Secondary OutFlow Max=0.06 cfs @ 12.35 hrs HW=69.11' TW=68.12' (Dynamic Tailwater)
└**2=Culvert** (Passes 0.06 cfs of 0.62 cfs potential flow)
└**3=Orifice/Grate** (Orifice Controls 0.06 cfs @ 4.51 fps)

Summary for Pond 5P: GW 1

Inflow Area = 0.533 ac, 57.51% Impervious, Inflow Depth = 1.82" for 2-YR event
Inflow = 1.13 cfs @ 12.09 hrs, Volume= 0.081 af
Outflow = 0.36 cfs @ 12.42 hrs, Volume= 0.081 af, Atten= 68%, Lag= 19.6 min
Primary = 0.36 cfs @ 12.42 hrs, Volume= 0.081 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 69.10' @ 12.42 hrs Surf.Area= 4,764 sf Storage= 1,534 cf

Plug-Flow detention time= 406.5 min calculated for 0.081 af (100% of inflow)
Center-of-Mass det. time= 405.5 min (1,223.3 - 817.7)

Volume	Invert	Avail.Storage	Storage Description
#1	68.50'	3,573 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2	68.17'	307 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 767 cf Overall x 40.0% Voids
		3,880 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.50	1,670	0	0
69.00	2,325	999	999
69.90	3,396	2,574	3,573

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.17	2,325	0	0
68.50	2,325	767	767

Device	Routing	Invert	Outlet Devices
#1	Device 4	68.17'	**6.0" x 18.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 68.10' S= 0.0039 '/' Cc= 0.900 n= 0.012
#2	Device 1	68.17'	**1.1" Vert. Orifice/Grate** C= 0.600
#3	Device 5	68.50'	**12.0" x 18.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 68.50' S= 0.0000 '/' Cc= 0.900 n= 0.012
#4	Primary	67.00'	**12.0" x 140.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 66.30' S= 0.0050 '/' Cc= 0.900 n= 0.012
#5	Device 4	69.00'	**4.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Primary OutFlow Max=0.36 cfs @ 12.42 hrs HW=69.10' TW=0.00' (Dynamic Tailwater)
- **4=Culvert** (Passes 0.36 cfs of 3.55 cfs potential flow)
  - **1=Culvert** (Passes 0.03 cfs of 0.61 cfs potential flow)
    - **2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 4.52 fps)
  - **5=Broad-Crested Rectangular Weir** (Weir Controls 0.33 cfs @ 0.85 fps)
    - **3=Culvert** (Passes 0.33 cfs of 0.54 cfs potential flow)

Summary for Pond 6P: Gravel Drip Strip

Inflow Area = 0.736 ac, 87.39% Impervious, Inflow Depth = 2.66" for 2-YR event
Inflow = 2.10 cfs @ 12.08 hrs, Volume= 0.163 af
Outflow = 1.15 cfs @ 12.21 hrs, Volume= 0.163 af, Atten= 45%, Lag= 7.3 min
Primary = 1.15 cfs @ 12.21 hrs, Volume= 0.163 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 70.27' @ 12.21 hrs Surf.Area= 4,040 sf Storage= 438 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.3 min (769.0 - 767.7)

Volume	Invert	Avail.Storage	Storage Description
#1	70.50'	2,424 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 6,060 cf Overall x 40.0% Voids
#2	70.00'	808 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 2,020 cf Overall x 40.0% Voids
		3,232 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
70.50	4,040	0	0
72.00	4,040	6,060	6,060

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
70.00	4,040	0	0
70.50	4,040	2,020	2,020

Device	Routing	Invert	Outlet Devices
#1	Primary	67.17'	**6.0" x 51.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 66.92' S= 0.0049 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=1.15 cfs @ 12.21 hrs HW=70.27' TW=0.00' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 1.15 cfs @ 5.86 fps)

Summary for Pond 7P: Existing Detention Pond

Inflow Area = 0.599 ac, 84.29% Impervious, Inflow Depth = 2.34" for 2-YR event
Inflow = 1.57 cfs @ 12.09 hrs, Volume= 0.117 af
Outflow = 0.80 cfs @ 12.23 hrs, Volume= 0.081 af, Atten= 49%, Lag= 8.5 min
Primary = 0.80 cfs @ 12.23 hrs, Volume= 0.081 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 67.52' @ 12.23 hrs Surf.Area= 1,443 sf Storage= 2,223 cf

Plug-Flow detention time= 197.3 min calculated for 0.081 af (70% of inflow)
Center-of-Mass det. time= 104.1 min (891.8 - 787.7)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	4,848 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	432	0	0
66.00	740	586	586
67.00	1,171	956	1,542
68.00	1,693	1,432	2,974
69.00	2,056	1,875	4,848

Device	Routing	Invert	Outlet Devices
#1	Primary	67.00'	**12.0" x 190.0' long Culvert**

CPP, projecting, no headwall, Ke= 0.900
Outlet Invert= 66.05' S= 0.0050 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=0.80 cfs @ 12.23 hrs HW=67.52' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.80 cfs @ 1.94 fps)

Summary for Pond 11P: (new Pond)

Inflow Area = 0.099 ac,100.00% Impervious, Inflow Depth = 2.77" for 2-YR event
Inflow = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af
Primary = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: 3 Runoff Area=32,040 sf 87.39% Impervious Runoff Depth=4.35"
Tc=6.0 min CN=97 Runoff=3.35 cfs 0.267 af

Subcatchment 2S: 4 Runoff Area=52,272 sf 71.92% Impervious Runoff Depth=3.69"
Flow Length=455' Tc=6.0 min CN=91 Runoff=4.98 cfs 0.369 af

Subcatchment 3S: 2 Runoff Area=23,229 sf 57.51% Impervious Runoff Depth=3.38"
Flow Length=190' Tc=6.0 min CN=88 Runoff=2.07 cfs 0.150 af

Subcatchment 8S: 3B Runoff Area=4,298 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.45 cfs 0.037 af

Subcatchment 9S: 1 Runoff Area=196,458 sf 0.00% Impervious Runoff Depth=2.72"
Flow Length=704' Tc=56.7 min CN=81 Runoff=5.87 cfs 1.023 af

Subcatchment 10S: 3A Runoff Area=21,816 sf 81.20% Impervious Runoff Depth=3.90"
Tc=6.0 min CN=93 Runoff=2.16 cfs 0.163 af

Subcatchment 12S: 3C Runoff Area=16,113 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=1.70 cfs 0.138 af

Reach 7R: Reach to POI 1 Avg. Depth=0.11' Max Vel=0.10 fps Inflow=3.90 cfs 0.369 af
n=0.400 L=364.0' S=0.0140 '/' Capacity=3.26 cfs Outflow=1.18 cfs 0.367 af

Reach 8R: POI 2 Inflow=5.63 cfs 0.719 af
Outflow=5.63 cfs 0.719 af

Reach 10R: POI 1 Inflow=6.98 cfs 1.390 af
Outflow=6.98 cfs 1.390 af

Reach 13R: CITY CB Inflow=1.22 cfs 0.150 af
Outflow=1.22 cfs 0.150 af

Pond 4P: GW 2 Peak Elev=69.27' Storage=4,927 cf Inflow=4.98 cfs 0.369 af
Primary=3.84 cfs 0.228 af Secondary=0.06 cfs 0.141 af Outflow=3.90 cfs 0.369 af

Pond 5P: GW 1 Peak Elev=69.31' Storage=2,082 cf Inflow=2.07 cfs 0.150 af
Outflow=1.22 cfs 0.150 af

Pond 6P: Gravel Drip Strip Peak Elev=70.88' Storage=1,426 cf Inflow=3.35 cfs 0.267 af
6.0" x 51.0' Culvert Outflow=1.27 cfs 0.267 af

Pond 7P: Existing Detention Pond Peak Elev=67.87' Storage=2,761 cf Inflow=2.61 cfs 0.200 af
12.0" x 190.0' Culvert Outflow=1.82 cfs 0.164 af

Pond 11P: (new Pond) Inflow=0.45 cfs 0.037 af
Primary=0.45 cfs 0.037 af

Total Runoff Area = 7.948 ac Runoff Volume = 2.146 af Average Runoff Depth = 3.24"
66.19% Pervious = 5.261 ac 33.81% Impervious = 2.688 ac

Summary for Subcatchment 1S: 3

Runoff = 3.35 cfs @ 12.08 hrs, Volume= 0.267 af, Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-YR Rainfall=4.70"

	Area (sf)	CN	Description
*	28,000	98	Proposed Building
*	4,040	89	Gravel Drip Strip Area
	32,040	97	Weighted Average
	4,040		Pervious Area
	28,000		Impervious Area

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

Summary for Subcatchment 2S: 4

Runoff = 4.98 cfs @ 12.08 hrs, Volume= 0.369 af, Depth= 3.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-YR Rainfall=4.70"

	Area (sf)	CN	Description
*	37,592	98	Pavement
	14,680	74	>75% Grass cover, Good, HSG C
	52,272	91	Weighted Average
	14,680		Pervious Area
	37,592		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	135	0.0111	1.12		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
1.2	130	0.0077	1.78		**Shallow Concentrated Flow, BC** Paved Kv= 20.3 fps
2.6	190	0.0068	1.24		**Shallow Concentrated Flow, CD** Grassed Waterway Kv= 15.0 fps
5.8	455	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: 2

Runoff = 2.07 cfs @ 12.09 hrs, Volume= 0.150 af, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-YR Rainfall=4.70"

	Area (sf)	CN	Description
*	13,358	98	Pavement
*	9,871	74	Proposed Land Scape
	23,229	88	Weighted Average
	9,871		Pervious Area
	13,358		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	85	0.0222	1.34		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
1.1	105	0.0058	1.55		**Shallow Concentrated Flow, BC** Paved Kv= 20.3 fps
2.2	190	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8S: 3B

Runoff = 0.45 cfs @ 12.08 hrs, Volume= 0.037 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-YR Rainfall=4.70"

	Area (sf)	CN	Description
*	4,298	98	Impervious
	4,298		Impervious Area

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

Summary for Subcatchment 9S: 1

Runoff = 5.87 cfs @ 12.78 hrs, Volume= 1.023 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-YR Rainfall=4.70"

	Area (sf)	CN	Description
*	5,796	89	Gravel Pavement
	141,841	79	Pasture/grassland/range, Fair, HSG C
*	48,821	84	Pasture/grassland/range, Fair, HSG D WETLAND
	196,458	81	Weighted Average
	196,458		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.5	137	0.0030	0.06		**Sheet Flow, AB** Grass: Dense n= 0.240 P2= 3.00"
14.1	420	0.0050	0.49		**Shallow Concentrated Flow, BC** Short Grass Pasture Kv= 7.0 fps
2.1	147	0.0272	1.15		**Shallow Concentrated Flow, CD** Short Grass Pasture Kv= 7.0 fps
56.7	704	Total			

Summary for Subcatchment 10S: 3A

Runoff = 2.16 cfs @ 12.08 hrs, Volume= 0.163 af, Depth= 3.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-YR Rainfall=4.70"

	Area (sf)	CN	Description
*	3,377	74	Pervious Pond Area
*	725	74	Existing Land Scaped Area
*	17,714	98	Impervious Pavement
	21,816	93	Weighted Average
	4,102		Pervious Area
	17,714		Impervious Area

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

Summary for Subcatchment 12S: 3C

Runoff = 1.70 cfs @ 12.08 hrs, Volume= 0.138 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-YR Rainfall=4.70"

	Area (sf)	CN	Description
*	16,113	98	Impervious
	16,113		Impervious Area

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

Summary for Reach 7R: Reach to POI 1

Inflow Area = 1.200 ac, 71.92% Impervious, Inflow Depth = 3.69" for 10-YR event
Inflow = 3.90 cfs @ 12.15 hrs, Volume= 0.369 af
Outflow = 1.18 cfs @ 12.59 hrs, Volume= 0.367 af, Atten= 70%, Lag= 26.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.10 fps, Min. Travel Time= 63.6 min
Avg. Velocity = 0.02 fps, Avg. Travel Time= 257.5 min

Peak Storage= 4,497 cf @ 12.59 hrs, Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 0.20', Capacity at Bank-Full= 3.26 cfs

100.00' x 0.20' deep channel, n= 0.400 Sheet flow: Woods+light brush
Side Slope Z-value= 100.0 '/' Top Width= 140.00'
Length= 364.0' Slope= 0.0140 '/'
Inlet Invert= 68.10', Outlet Invert= 63.00'

‡

Summary for Reach 8R: POI 2

Inflow Area = 2.238 ac, 81.52% Impervious, Inflow Depth = 3.85" for 10-YR event
Inflow = 5.63 cfs @ 12.12 hrs, Volume= 0.719 af
Outflow = 5.63 cfs @ 12.12 hrs, Volume= 0.719 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach 10R: POI 1

Inflow Area = 5.710 ac, 15.11% Impervious, Inflow Depth > 2.92" for 10-YR event
Inflow = 6.98 cfs @ 12.77 hrs, Volume= 1.390 af
Outflow = 6.98 cfs @ 12.77 hrs, Volume= 1.390 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach 13R: CITY CB

Inflow Area = 0.533 ac, 57.51% Impervious, Inflow Depth = 3.38" for 10-YR event
Inflow = 1.22 cfs @ 12.20 hrs, Volume= 0.150 af
Outflow = 1.22 cfs @ 12.20 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond 4P: GW 2

Inflow Area = 1.200 ac, 71.92% Impervious, Inflow Depth = 3.69" for 10-YR event
Inflow = 4.98 cfs @ 12.08 hrs, Volume= 0.369 af
Outflow = 3.90 cfs @ 12.15 hrs, Volume= 0.369 af, Atten= 22%, Lag= 3.8 min
Primary = 3.84 cfs @ 12.15 hrs, Volume= 0.228 af
Secondary = 0.06 cfs @ 12.15 hrs, Volume= 0.141 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 69.27' @ 12.15 hrs Surf.Area= 11,110 sf Storage= 4,927 cf

Plug-Flow detention time= 308.5 min calculated for 0.368 af (100% of inflow)
Center-of-Mass det. time= 308.1 min (1,097.0 - 788.9)

Volume	Invert	Avail.Storage	Storage Description
#1	68.50'	8,618 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	68.17'	634 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 1,584 cf Overall x 40.0% Voids
		9,252 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.50	4,800	0	0
69.00	5,866	2,667	2,667
69.90	7,360	5,952	8,618

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.17	4,800	0	0
68.50	4,800	1,584	1,584

Device	Routing	Invert	Outlet Devices
#1	Primary	69.00'	**10.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32
#2	Secondary	68.17'	**6.0" x 20.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 68.10' S= 0.0035 '/' Cc= 0.900 n= 0.012
#3	Device 2	68.17'	**1.5" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=3.82 cfs @ 12.15 hrs HW=69.27' TW=68.16' (Dynamic Tailwater)
↑└**1=Broad-Crested Rectangular Weir** (Weir Controls 3.82 cfs @ 1.44 fps)

Secondary OutFlow Max=0.06 cfs @ 12.15 hrs HW=69.27' TW=68.16' (Dynamic Tailwater)
↑└**2=Culvert** (Passes 0.06 cfs of 0.69 cfs potential flow)
↑└**3=Orifice/Grate** (Orifice Controls 0.06 cfs @ 4.90 fps)

Summary for Pond 5P: GW 1

Inflow Area = 0.533 ac, 57.51% Impervious, Inflow Depth = 3.38" for 10-YR event
Inflow = 2.07 cfs @ 12.09 hrs, Volume= 0.150 af
Outflow = 1.22 cfs @ 12.20 hrs, Volume= 0.150 af, Atten= 41%, Lag= 6.7 min
Primary = 1.22 cfs @ 12.20 hrs, Volume= 0.150 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 69.31' @ 12.20 hrs Surf.Area= 5,018 sf Storage= 2,082 cf

Plug-Flow detention time= 258.4 min calculated for 0.150 af (100% of inflow)
Center-of-Mass det. time= 257.8 min (1,057.9 - 800.1)

Volume	Invert	Avail.Storage	Storage Description
#1	68.50'	3,573 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	68.17'	307 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 767 cf Overall x 40.0% Voids
		3,880 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.50	1,670	0	0
69.00	2,325	999	999
69.90	3,396	2,574	3,573

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.17	2,325	0	0
68.50	2,325	767	767

Device	Routing	Invert	Outlet Devices
#1	Device 4	68.17'	**6.0" x 18.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 68.10' S= 0.0039 '/' Cc= 0.900 n= 0.012
#2	Device 1	68.17'	**1.1" Vert. Orifice/Grate** C= 0.600
#3	Device 5	68.50'	**12.0" x 18.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 68.50' S= 0.0000 '/' Cc= 0.900 n= 0.012
#4	Primary	67.00'	**12.0" x 140.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 66.30' S= 0.0050 '/' Cc= 0.900 n= 0.012
#5	Device 4	69.00'	**4.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Primary OutFlow Max=1.22 cfs @ 12.20 hrs HW=69.31' TW=0.00' (Dynamic Tailwater)
- **4=Culvert** (Passes 1.22 cfs of 3.76 cfs potential flow)
  - **1=Culvert** (Passes 0.03 cfs of 0.70 cfs potential flow)
    - **2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.03 fps)
  - **5=Broad-Crested Rectangular Weir** (Passes 1.18 cfs of 1.92 cfs potential flow)
    - **3=Culvert** (Barrel Controls 1.18 cfs @ 2.37 fps)

Summary for Pond 6P: Gravel Drip Strip

Inflow Area = 0.736 ac, 87.39% Impervious, Inflow Depth = 4.35" for 10-YR event
Inflow = 3.35 cfs @ 12.08 hrs, Volume= 0.267 af
Outflow = 1.27 cfs @ 12.32 hrs, Volume= 0.267 af, Atten= 62%, Lag= 13.9 min
Primary = 1.27 cfs @ 12.32 hrs, Volume= 0.267 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 70.88' @ 12.32 hrs Surf.Area= 8,080 sf Storage= 1,426 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.7 min (761.7 - 757.1)

Volume	Invert	Avail.Storage	Storage Description
#1	70.50'	2,424 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 6,060 cf Overall x 40.0% Voids
#2	70.00'	808 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 2,020 cf Overall x 40.0% Voids
		3,232 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
70.50	4,040	0	0
72.00	4,040	6,060	6,060

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
70.00	4,040	0	0
70.50	4,040	2,020	2,020

Device	Routing	Invert	Outlet Devices
#1	Primary	67.17'	**6.0" x 51.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 66.92' S= 0.0049 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=1.27 cfs @ 12.32 hrs HW=70.88' TW=0.00' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 1.27 cfs @ 6.46 fps)

Summary for Pond 7P: Existing Detention Pond

Inflow Area = 0.599 ac, 84.29% Impervious, Inflow Depth = 4.00" for 10-YR event
Inflow = 2.61 cfs @ 12.08 hrs, Volume= 0.200 af
Outflow = 1.82 cfs @ 12.17 hrs, Volume= 0.164 af, Atten= 30%, Lag= 4.8 min
Primary = 1.82 cfs @ 12.17 hrs, Volume= 0.164 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 67.87' @ 12.17 hrs Surf.Area= 1,626 sf Storage= 2,761 cf

Plug-Flow detention time= 146.3 min calculated for 0.164 af (82% of inflow)
Center-of-Mass det. time= 75.5 min (849.9 - 774.4)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	4,848 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	432	0	0
66.00	740	586	586
67.00	1,171	956	1,542
68.00	1,693	1,432	2,974
69.00	2,056	1,875	4,848

Device	Routing	Invert	Outlet Devices
#1	Primary	67.00'	**12.0" x 190.0' long Culvert**

CPP, projecting, no headwall, Ke= 0.900
Outlet Invert= 66.05' S= 0.0050 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=1.82 cfs @ 12.17 hrs HW=67.87' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 1.82 cfs @ 2.51 fps)

Summary for Pond 11P: (new Pond)

Inflow Area = 0.099 ac,100.00% Impervious, Inflow Depth = 4.46" for 10-YR event
Inflow = 0.45 cfs @ 12.08 hrs, Volume= 0.037 af
Primary = 0.45 cfs @ 12.08 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: 3 Runoff Area=32,040 sf 87.39% Impervious Runoff Depth=5.15"
Tc=6.0 min CN=97 Runoff=3.93 cfs 0.315 af

Subcatchment 2S: 4 Runoff Area=52,272 sf 71.92% Impervious Runoff Depth=4.47"
Flow Length=455' Tc=6.0 min CN=91 Runoff=5.97 cfs 0.447 af

Subcatchment 3S: 2 Runoff Area=23,229 sf 57.51% Impervious Runoff Depth=4.15"
Flow Length=190' Tc=6.0 min CN=88 Runoff=2.51 cfs 0.184 af

Subcatchment 8S: 3B Runoff Area=4,298 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=0.53 cfs 0.043 af

Subcatchment 9S: 1 Runoff Area=196,458 sf 0.00% Impervious Runoff Depth=3.43"
Flow Length=704' Tc=56.7 min CN=81 Runoff=7.39 cfs 1.290 af

Subcatchment 10S: 3A Runoff Area=21,816 sf 81.20% Impervious Runoff Depth=4.69"
Tc=6.0 min CN=93 Runoff=2.57 cfs 0.196 af

Subcatchment 12S: 3C Runoff Area=16,113 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=1.99 cfs 0.162 af

Reach 7R: Reach to POI 1 Avg. Depth=0.14' Max Vel=0.11 fps Inflow=4.88 cfs 0.446 af
n=0.400 L=364.0' S=0.0140 '/' Capacity=3.26 cfs Outflow=1.69 cfs 0.445 af

Reach 8R: POI 2 Inflow=6.46 cfs 0.866 af
Outflow=6.46 cfs 0.866 af

Reach 10R: POI 1 Inflow=8.91 cfs 1.734 af
Outflow=8.91 cfs 1.734 af

Reach 13R: CITY CB Inflow=1.47 cfs 0.184 af
Outflow=1.47 cfs 0.184 af

Pond 4P: GW 2 Peak Elev=69.31' Storage=5,198 cf Inflow=5.97 cfs 0.447 af
Primary=4.82 cfs 0.302 af Secondary=0.06 cfs 0.144 af Outflow=4.88 cfs 0.446 af

Pond 5P: GW 1 Peak Elev=69.41' Storage=2,348 cf Inflow=2.51 cfs 0.184 af
Outflow=1.47 cfs 0.184 af

Pond 6P: Gravel Drip Strip Peak Elev=71.24' Storage=2,009 cf Inflow=3.93 cfs 0.315 af
6.0" x 51.0' Culvert Outflow=1.33 cfs 0.316 af

Pond 7P: Existing Detention Pond Peak Elev=67.99' Storage=2,962 cf Inflow=3.10 cfs 0.239 af
12.0" x 190.0' Culvert Outflow=2.10 cfs 0.204 af

Pond 11P: (new Pond) Inflow=0.53 cfs 0.043 af
Primary=0.53 cfs 0.043 af

Total Runoff Area = 7.948 ac Runoff Volume = 2.637 af Average Runoff Depth = 3.98"
66.19% Pervious = 5.261 ac 33.81% Impervious = 2.688 ac

Summary for Subcatchment 1S: 3

Runoff = 3.93 cfs @ 12.08 hrs, Volume= 0.315 af, Depth= 5.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-YR Rainfall=5.50"

	Area (sf)	CN	Description
*	28,000	98	Proposed Building
*	4,040	89	Gravel Drip Strip Area
	32,040	97	Weighted Average
	4,040		Pervious Area
	28,000		Impervious Area

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

Summary for Subcatchment 2S: 4

Runoff = 5.97 cfs @ 12.08 hrs, Volume= 0.447 af, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-YR Rainfall=5.50"

	Area (sf)	CN	Description
*	37,592	98	Pavement
	14,680	74	>75% Grass cover, Good, HSG C
	52,272	91	Weighted Average
	14,680		Pervious Area
	37,592		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	135	0.0111	1.12		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
1.2	130	0.0077	1.78		**Shallow Concentrated Flow, BC** Paved Kv= 20.3 fps
2.6	190	0.0068	1.24		**Shallow Concentrated Flow, CD** Grassed Waterway Kv= 15.0 fps
5.8	455	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: 2

Runoff = 2.51 cfs @ 12.09 hrs, Volume= 0.184 af, Depth= 4.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-YR Rainfall=5.50"

	Area (sf)	CN	Description
*	13,358	98	Pavement
*	9,871	74	Proposed Land Scape
	23,229	88	Weighted Average
	9,871		Pervious Area
	13,358		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	85	0.0222	1.34		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
1.1	105	0.0058	1.55		**Shallow Concentrated Flow, BC** Paved Kv= 20.3 fps
2.2	190	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8S: 3B

Runoff = 0.53 cfs @ 12.08 hrs, Volume= 0.043 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-YR Rainfall=5.50"

	Area (sf)	CN	Description
*	4,298	98	Impervious
	4,298		Impervious Area

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

Summary for Subcatchment 9S: 1

Runoff = 7.39 cfs @ 12.78 hrs, Volume= 1.290 af, Depth= 3.43"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-YR Rainfall=5.50"

	Area (sf)	CN	Description
*	5,796	89	Gravel Pavement
	141,841	79	Pasture/grassland/range, Fair, HSG C
*	48,821	84	Pasture/grassland/range, Fair, HSG D WETLAND
	196,458	81	Weighted Average
	196,458		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.5	137	0.0030	0.06		**Sheet Flow, AB** Grass: Dense n= 0.240 P2= 3.00"
14.1	420	0.0050	0.49		**Shallow Concentrated Flow, BC** Short Grass Pasture Kv= 7.0 fps
2.1	147	0.0272	1.15		**Shallow Concentrated Flow, CD** Short Grass Pasture Kv= 7.0 fps
56.7	704	Total			

Summary for Subcatchment 10S: 3A

Runoff = 2.57 cfs @ 12.08 hrs, Volume= 0.196 af, Depth= 4.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-YR Rainfall=5.50"

	Area (sf)	CN	Description
*	3,377	74	Pervious Pond Area
*	725	74	Existing Land Scaped Area
*	17,714	98	Impervious Pavement
	21,816	93	Weighted Average
	4,102		Pervious Area
	17,714		Impervious Area

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

Summary for Subcatchment 12S: 3C

Runoff = 1.99 cfs @ 12.08 hrs, Volume= 0.162 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-YR Rainfall=5.50"

	Area (sf)	CN	Description
*	16,113	98	Impervious
	16,113		Impervious Area

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

Summary for Reach 7R: Reach to POI 1

Inflow Area = 1.200 ac, 71.92% Impervious, Inflow Depth = 4.46" for 25-YR event
Inflow = 4.88 cfs @ 12.14 hrs, Volume= 0.446 af
Outflow = 1.69 cfs @ 12.53 hrs, Volume= 0.445 af, Atten= 65%, Lag= 23.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.11 fps, Min. Travel Time= 56.0 min
Avg. Velocity = 0.02 fps, Avg. Travel Time= 248.8 min

Peak Storage= 5,675 cf @ 12.53 hrs, Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 0.20', Capacity at Bank-Full= 3.26 cfs

100.00' x 0.20' deep channel, n= 0.400 Sheet flow: Woods+light brush
Side Slope Z-value= 100.0 '/' Top Width= 140.00'
Length= 364.0' Slope= 0.0140 '/'
Inlet Invert= 68.10', Outlet Invert= 63.00'

‡

Summary for Reach 8R: POI 2

Inflow Area = 2.238 ac, 81.52% Impervious, Inflow Depth = 4.64" for 25-YR event
Inflow = 6.46 cfs @ 12.12 hrs, Volume= 0.866 af
Outflow = 6.46 cfs @ 12.12 hrs, Volume= 0.866 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach 10R: POI 1

Inflow Area = 5.710 ac, 15.11% Impervious, Inflow Depth > 3.65" for 25-YR event
Inflow = 8.91 cfs @ 12.74 hrs, Volume= 1.734 af
Outflow = 8.91 cfs @ 12.74 hrs, Volume= 1.734 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach 13R: CITY CB

Inflow Area = 0.533 ac, 57.51% Impervious, Inflow Depth = 4.14" for 25-YR event
Inflow = 1.47 cfs @ 12.20 hrs, Volume= 0.184 af
Outflow = 1.47 cfs @ 12.20 hrs, Volume= 0.184 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond 4P: GW 2

Inflow Area = 1.200 ac, 71.92% Impervious, Inflow Depth = 4.47" for 25-YR event
Inflow = 5.97 cfs @ 12.08 hrs, Volume= 0.447 af
Outflow = 4.88 cfs @ 12.14 hrs, Volume= 0.446 af, Atten= 18%, Lag= 3.4 min
Primary = 4.82 cfs @ 12.14 hrs, Volume= 0.302 af
Secondary = 0.06 cfs @ 12.14 hrs, Volume= 0.144 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 69.31' @ 12.14 hrs Surf.Area= 11,180 sf Storage= 5,198 cf

Plug-Flow detention time= 263.0 min calculated for 0.446 af (100% of inflow)
Center-of-Mass det. time= 262.2 min (1,045.9 - 783.8)

Volume	Invert	Avail.Storage	Storage Description
#1	68.50'	8,618 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	68.17'	634 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 1,584 cf Overall x 40.0% Voids
		9,252 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.50	4,800	0	0
69.00	5,866	2,667	2,667
69.90	7,360	5,952	8,618

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.17	4,800	0	0
68.50	4,800	1,584	1,584

Device	Routing	Invert	Outlet Devices
#1	Primary	69.00'	**10.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32
#2	Secondary	68.17'	**6.0" x 20.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 68.10' S= 0.0035 '/' Cc= 0.900 n= 0.012
#3	Device 2	68.17'	**1.5" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=4.81 cfs @ 12.14 hrs HW=69.31' TW=68.18' (Dynamic Tailwater)
↑└**1=Broad-Crested Rectangular Weir** (Weir Controls 4.81 cfs @ 1.55 fps)

Secondary OutFlow Max=0.06 cfs @ 12.14 hrs HW=69.31' TW=68.18' (Dynamic Tailwater)
↑└**2=Culvert** (Passes 0.06 cfs of 0.70 cfs potential flow)
↑└**3=Orifice/Grate** (Orifice Controls 0.06 cfs @ 5.00 fps)

Summary for Pond 5P: GW 1

Inflow Area = 0.533 ac, 57.51% Impervious, Inflow Depth = 4.15" for 25-YR event
Inflow = 2.51 cfs @ 12.09 hrs, Volume= 0.184 af
Outflow = 1.47 cfs @ 12.20 hrs, Volume= 0.184 af, Atten= 42%, Lag= 6.7 min
Primary = 1.47 cfs @ 12.20 hrs, Volume= 0.184 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 69.41' @ 12.20 hrs Surf.Area= 5,133 sf Storage= 2,348 cf

Plug-Flow detention time= 220.7 min calculated for 0.184 af (100% of inflow)
Center-of-Mass det. time= 220.3 min (1,014.8 - 794.5)

Volume	Invert	Avail.Storage	Storage Description
#1	68.50'	3,573 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2	68.17'	307 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 767 cf Overall x 40.0% Voids
		3,880 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.50	1,670	0	0
69.00	2,325	999	999
69.90	3,396	2,574	3,573

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.17	2,325	0	0
68.50	2,325	767	767

Device	Routing	Invert	Outlet Devices
#1	Device 4	68.17'	**6.0" x 18.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 68.10' S= 0.0039 '/' Cc= 0.900 n= 0.012
#2	Device 1	68.17'	**1.1" Vert. Orifice/Grate** C= 0.600
#3	Device 5	68.50'	**12.0" x 18.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 68.50' S= 0.0000 '/' Cc= 0.900 n= 0.012
#4	Primary	67.00'	**12.0" x 140.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 66.30' S= 0.0050 '/' Cc= 0.900 n= 0.012
#5	Device 4	69.00'	**4.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Primary OutFlow Max=1.47 cfs @ 12.20 hrs HW=69.41' TW=0.00' (Dynamic Tailwater)
- **4=Culvert** (Passes 1.47 cfs of 3.85 cfs potential flow)
  - **1=Culvert** (Passes 0.03 cfs of 0.74 cfs potential flow)
    - **2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.25 fps)
  - **5=Broad-Crested Rectangular Weir** (Passes 1.43 cfs of 2.92 cfs potential flow)
    - **3=Culvert** (Barrel Controls 1.43 cfs @ 2.52 fps)

Summary for Pond 6P: Gravel Drip Strip

Inflow Area = 0.736 ac, 87.39% Impervious, Inflow Depth = 5.15" for 25-YR event
Inflow = 3.93 cfs @ 12.08 hrs, Volume= 0.315 af
Outflow = 1.33 cfs @ 12.36 hrs, Volume= 0.316 af, Atten= 66%, Lag= 16.3 min
Primary = 1.33 cfs @ 12.36 hrs, Volume= 0.316 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 71.24' @ 12.36 hrs Surf.Area= 8,080 sf Storage= 2,009 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 6.7 min (760.5 - 753.8)

Volume	Invert	Avail.Storage	Storage Description
#1	70.50'	2,424 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 6,060 cf Overall x 40.0% Voids
#2	70.00'	808 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 2,020 cf Overall x 40.0% Voids
		3,232 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
70.50	4,040	0	0
72.00	4,040	6,060	6,060

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
70.00	4,040	0	0
70.50	4,040	2,020	2,020

Device	Routing	Invert	Outlet Devices
#1	Primary	67.17'	**6.0" x 51.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 66.92' S= 0.0049 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=1.33 cfs @ 12.36 hrs HW=71.24' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.33 cfs @ 6.79 fps)

Summary for Pond 7P: Existing Detention Pond

Inflow Area = 0.599 ac, 84.29% Impervious, Inflow Depth = 4.78" for 25-YR event
Inflow = 3.10 cfs @ 12.08 hrs, Volume= 0.239 af
Outflow = 2.10 cfs @ 12.17 hrs, Volume= 0.204 af, Atten= 32%, Lag= 5.1 min
Primary = 2.10 cfs @ 12.17 hrs, Volume= 0.204 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 67.99' @ 12.17 hrs Surf.Area= 1,689 sf Storage= 2,962 cf

Plug-Flow detention time= 132.5 min calculated for 0.203 af (85% of inflow)
Center-of-Mass det. time= 69.5 min (839.8 - 770.2)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	4,848 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	432	0	0
66.00	740	586	586
67.00	1,171	956	1,542
68.00	1,693	1,432	2,974
69.00	2,056	1,875	4,848

Device	Routing	Invert	Outlet Devices
#1	Primary	67.00'	**12.0" x 190.0' long Culvert**

CPP, projecting, no headwall, Ke= 0.900
Outlet Invert= 66.05' S= 0.0050 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=2.10 cfs @ 12.17 hrs HW=67.99' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 2.10 cfs @ 2.68 fps)

Summary for Pond 11P: (new Pond)

Inflow Area = 0.099 ac,100.00% Impervious, Inflow Depth = 5.26" for 25-YR event
Inflow = 0.53 cfs @ 12.08 hrs, Volume= 0.043 af
Primary = 0.53 cfs @ 12.08 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

APPENDIX D

WATER QUALITY SUMMARY CHART AND COMPUTATIONS

Water Quality Calculations

	Treatment Approach	Total Developed Area	Total Treated Area	Total Impervious Area	Total Treated Impervious Area
SUB CATCHMENT 1	NONE	3470	0	0	0
SUB CATCHMENT 2	Gravel Wetland 1	32040	32040	32040	32040
SUB CATCHMENT 3	Drip Strip	20229	20229	13358	13358
SUB CATCHMENT 4	Gravel Wetland 2	52236	52236	37577	37577
Area outside Property subcatchments	NONE	2603	0	0	0

Percentage of developed Area Treated	94.51%
Percentage of Impervious Area Treated	100.00%

SUBSURFACE GRAVEL WETLAND #1
DESIGN COMPUTATIONS

	GRAVEL WETLAND 1						
	TRIBUTARY AREA:						
		16,568	SF				
	TRIBUTARY IMPERVIOUS AREA:			13,583	SF	0.31	AC
	TRIBUTARY LANDSCAPED AREA:			1,682	SF	0.04	AC
	TOTAL TRIBUTARY AREA:			15,265	SF	0.35	AC
	GRAVEL WETLAND SIZING						
	WQV = (P1)(Rv)(A)			1,082	CF		
	P1 = 90% RAINFALL EVENT			1	IN		
	Rv = 0.05 + 0.90 (I)			0.850831969			
	I = % IMPERVIOUS AREA			89%			
	FOREBAY VOLUME (10% WQV)			108	CF		
	WETLAND CELL VOLUME (45% WQV)			487	CF		
	STAGE - STORAGE (EACH WETLAND CELL)						
	STAGE, FT	SURFACE AREA (SF)	INCREMENTAL VOLUME (CF)	CUMULATIVE VOLUME (CF)	NOTES		
Cell 3	68.5	835	0	0	BOTTOM		
	69	1,111	487	487			
Cell4	68.5	853	0	0			
	69	1126	495	495			
Total Storage Both cells				981	CF		
Total Storage Required				974.10	CF		
	STAGE-STORAGE (SEDIMENT FOREBAY)						
	STAGE, FT	SURFACE AREA (SF)	INCREMENTAL VOLUME (CF)	CUMULATIVE VOLUME (CF)	NOTES		
	69	100	0	0			
	69.9	383	217	217			
				Design Check			
				Required volume:	**108 CF**		
				Volume Design	**217**		

SUBSURFACE GRAVEL WETLAND #2
DESIGN COMPUTATIONS

	GRAVEL WETLAND 2						
	TRIBUTARY AREA:						
		39,891	SF				
	TRIBUTARY IMPERVIOUS AREA:			35,489	SF	0.81	AC
	TRIBUTARY LANDSCAPED AREA:			4,402	SF	0.10	AC
	TOTAL TRIBUTARY AREA:			39,891	SF	0.92	AC
	GRAVEL WETLAND SIZING						
	WQV = (P1)(Rv)(A)			2,828	CF		
	P1 = 90% RAINFALL EVENT			1	IN		
	Rv = 0.05 + 0.90 (I)			0.850684365			
	I = % IMPERVIOUS AREA			89%			
	FOREBAY VOLUME (10% WQV)			283	CF		
	WETLAND CELL VOLUME (45% WQV)			1,273	CF		
	STAGE - STORAGE (EACH WETLAND CELL)						
	STAGE, FT	SURFACE AREA (SF)	INCREMENTAL VOLUME (CF)	CUMULATIVE VOLUME (CF)	NOTES		
Cell 1	68.5	2,400	0	0	BOTTOM		
	69	2,795	1,299	1,299			
Cell 2	68.5	2400	0	0			
	69	2795	1,299	1,299			
Total Storage Both cells				2,598	CF		
Total Storage Required				2545.10	CF		
	STAGE-STORAGE (SEDIMENT FOREBAY)						
	STAGE, FT	SURFACE AREA (SF)	INCREMENTAL VOLUME (CF)	CUMULATIVE VOLUME (CF)	NOTES		
	69	276	0	0			
	69.9	487	343	343			
				Design Check			
				Required volume:	**283**		
				Volume Design	**343**		

APPENDIX E

ORIFICE DRAWDOWN COMPUTATIONS

ORIFICE DIAMETER FOR GRAVEL WET LAND 1

Elevation	Surface Area (sq.ft)	Area End (sq.ft)	Area End Depth (ft)	Volume (c.f)	Head (ft)	Orifice Flow (cfs)	Drawdown Time (secs)	Drawdown Time (hours)
69.00	3,396.00	2860.50	0.50	1430.25	0.83	0.0289	49424.40	13.729
68.50	2,325.00	2325.00	0.33	767.25	0.33	0.0182	42048.30	11.680
68.17	2,325.00	0.00	0.00	0.00	0.00	0.0000	0.00	0.000
							TOTAL	***25.409***

$CA\ (2gh)^{1/2}$

Orifice Diameter	1.1	inch
Area	0.0066	sq.ft
Head	2.53	feet
g	32.174	ft/s^2
C	0.6	Orifice/Grate

ORIFICE DIAMETER FOR GRAVEL WETLAND 2

Depth (ft)	Surface Area (sq.ft)	Area End (sq.ft)	Area End Depth (ft)	Volume (c.f)	Head (ft)	Orifice Flow (cfs)	Drawdown Time (secs)	Drawdown Time (hours)
69.00	5,866.00	5333.00	0.50	2666.50	0.83	0.0538	49553.45	13.765
68.50	4,800.00	4800.00	0.33	1584.00	0.33	0.0339	46684.16	12.968
68.17	4,800.00	0.00	0.00	0.00	0.00	0.0000	0.00	0.000
							TOTAL	***26.733***

$CA\ (2gh)^{1/2}$

Orifice Diameter	1.5	inch
Area	0.0123	sq.ft
Head	2.53	feet
g	32.174	ft/s^2
C	0.6	Orifice/Grate

APPENDIX F

GEOTECHNICAL EXPLORATION TEST PIT LOGS

REPORT

December 27, 2013
13-1392 S

Geotechnical Engineering Services

Proposed Pre-Engineered Building
424 Warren Avenue
Portland, Maine

PREPARED FOR:
Peter F. Holmes
c/o Harbour Auto Body
401 Warren Avenue
Portland, Maine 04103

PREPARED BY:
S. W. Cole Engineering, Inc.
286 Portland Road
Gray, Maine 04039
207-657-2866

S.W.COLE ENGINEERING, INC.

- *Geotechnical Engineering*
- *Construction Materials Testing*
- *GeoEnvironmental Services*
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December 27, 2013

Peter F. Holmes
c/o Harbour Auto Body
401 Warren Avenue
Portland, Maine 04103

Subject: Geotechnical Engineering Services
Proposed Pre-Engineered Building
424 Warren Avenue
Portland, Maine

Dear Peter:

In accordance with our Proposal dated December 12, 2013, we have performed subsurface explorations for the subject project in Portland, Maine. This report presents our findings and geotechnical recommendations and its contents are subject to the limitations set forth in Attachment A.

1.0 INTRODUCTION

1.1 Scope and Purpose

The purpose of our work was to obtain subsurface information at the site in order to develop geotechnical recommendations relative to foundations and earthwork associated with the proposed construction. Our scope of work included the making of thirteen test pit explorations, a geotechnical analysis of the subsurface findings and preparation of this report.

1.2 Proposed Construction

Based on the information provided by FST, Inc. (project civil engineer), we understand development plans call for construction of a new L-Shaped, pre-engineered steel building with associated paved and stormwater management areas. We understand the building will occupy a plan area of about 38,500 SF and is proposed at a finished floor

elevation of 72.0 feet, requiring about 1 to 3 feet of tapered fill over the building pad. Proposed and existing site features are shown on the "Exploration Location Plan" attached as Sheet 1.

2.0 EXPLORATION AND TESTING

2.1 Explorations

Thirteen test pits (TP-101 through TP-109 and TP-ST-1 through TP-ST-4) were made at the site on December 20, 2013, by Eastern Excavation, Inc. of Westbrook, Maine working under subcontract to S. W. Cole Engineering, Inc. (S.W.COLE). The exploration locations were selected and established by S.W.COLE using taped measurements from existing site features.

The approximate exploration locations are shown on the "Exploration Location Plan" attached as Sheet 1. Logs of the explorations are attached as Sheets 2 through 8. A key to the notes and symbols used on the log is attached as Sheet 9. The ground surface elevations shown on the logs were estimated based on topographic information shown on Sheet 1.

2.2 Testing

The soils were visually classified as they were encountered at the explorations. Pocket Penetrometer Tests (PPT) were performed on some cohesive soils encountered at the test pits. PPT results are shown on the test pit logs.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Surficial Conditions

The site is located at 424 Warren Avenue in Portland, Maine. The site consists of an open gravel lot adjacent to Warren Avenue transitioning to a lightly wooded area and open grassed field area to the north and to the rear of the existing Harbour Auto Body Facility. The site is relatively flat and level with existing grades varying from about elevation 68 to 70 feet within the proposed building footprint.

Existing site features are shown on the "Exploration Location Plan" attached as Sheet 1.

3.2 Subsurface Conditions

Underlying a surficial layer of topsoil, the test pits encountered a soils profile generally consisting of fill and/or reworked soils overlying a layer of relic topsoil overlying glaciomarine sands, silts, and clays. The principal strata encountered are summarized below. Refer to the attached logs for more detailed descriptions of the subsurface findings.

Fill and Reworked Soils: Each test pit encountered a layer of fill and/or reworked soils extending to depths varying from 0.8 to 3.2 feet below ground surface. The fill generally consisted of sand or clay with varying portions of silt, gravel, cobbles, organics and miscellaneous debris such as bricks and plastic. The reworked soils generally consisted of disturbed silt and clay with varying portions of sand and organics.

Relic Topsoil: Underlying the fill and/or reworked soils, test pits TP-105 through TP-109 encountered a layer of relic topsoil up to about 1 foot in thickness. The relic topsoil generally consisted of dark brown silty sand with organics. A layer of reworked, disturbed silty sandy clay was encountered below the relic topsoil at test pit TP-105 to a depth of about 3.5 feet.

Glaciomarine Soils: Underlying the fill, reworked soils, and/or relic topsoil, the test pits encountered glaciomarine soils generally consisted of brown to gray-brown sands, silts, and relatively stiff silty clays. The test pits were terminated in the glaciomarine soils at depths varying from 4.0 to 6.2 feet below the ground surface.

3.3 Groundwater Conditions

The soils encountered at the explorations were generally moist to wet. Groundwater seepage was encountered at some of the explorations at depths varying from 3.1 to 5.5 feet. Groundwater likely becomes perched on the relatively impervious glaciomarine silts and clays encountered beneath the site. It should be anticipated that seasonal groundwater levels will fluctuate, especially during periods of snowmelt and precipitation.

3.4 Seismic and Frost Conditions

The 25-year Air Freezing Index for the Portland, Maine area is about 1,250-Fahrenheit degree-days, which corresponds to a frost penetration depth on the order of 4.5 feet.

Based on the findings at the explorations and our experience on adjacent sites, we interpret the site soils to correspond to Seismic Soil Site Class E according to 2009 IBC.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 General Findings

Based on the subsurface findings, the proposed construction appears feasible from a geotechnical standpoint. The principle geotechnical considerations are:

- The existing fill, relic topsoil, and reworked/disturbed soils must be completely removed beneath the proposed building footprint and replaced with compacted Granular Borrow.

- Spread footing foundations and on-grade floor slabs bearing on properly prepared subgrades appear appropriate for the proposed construction.

- A 6-inch thick layer of crushed stone wrapped in geotextile fabric is recommended beneath the perimeter building foundations. Interior footings may bear on compacted Granular Borrow or stable, native non-organic soils.

- Perimeter foundation underdrains should be provided for the proposed building.

- Imported Granular Borrow, Structural Fill and Crushed Stone will be needed for construction. The existing fills and native soils are unsuitable for reuse below the proposed building or as backfill for foundations.

4.2 Site and Subgrade Preparation

We recommend that site preparation begin with the construction of an erosion control system to protect adjacent drainage ways and areas outside the construction limits. As much vegetation as possible should remain outside the construction areas to lessen the potential for erosion and site disturbance.

All organics, existing fills, relic topsoil, and reworked/disturbed soils must be completely removed from beneath the proposed building and entrance slabs until undisturbed native non-organic soils are encountered. Overexcavation of existing unsuitable materials should

extend 1-foot horizontally outward from outer edge of perimeter footings for each foot of excavation depth (1H:1V bearing splay). Overexcavations should be backfilled to grade with properly compacted Structural Fill (over wet subgrades and during wet/cold weather conditions) or with properly compacted Granular Borrow (over dry subgrades and during non-freezing, dry conditions).

At least 6-inches of Crushed Stone wrapped in non-woven geotextile, such as Mirafi 160N or equivalent, should be provided below perimeter foundations. The crushed stone and geotextile should overlay undisturbed native glaciomarine soils and/or properly compacted Structural Fill or Granular Borrow overlying undisturbed native glaciomarine soils.

We recommend that excavations be completed with a smooth-edged bucket to help lessen disturbance of native soils and foundation bearing surfaces. S.W.COLE should observe exposed subgrades prior to placement of compacted fills and geotextile wrapped crushed stone mats below the footings.

4.3 Excavation and Dewatering

Excavation work will generally encounter existing fills, relic topsoil, reworked native soils and native glaciomarine sands, silts, and clays. Care must be exercised during construction to minimize disturbance of the bearing soils. Final cuts to subgrade elevation should be performed with a smooth-edged bucket to help minimize soil disturbance.

Sumping and pumping dewatering techniques should be adequate to control groundwater in excavations. The layer of geotextile wrapped Crushed Stone recommended below foundations will provide a media from which to sump and pump, as needed. Controlling the water levels to below planned excavation depths will help stabilize subgrades during construction.

Excavations must be properly shored and/or sloped in accordance with OSHA Regulations to prevent sloughing and caving of the sidewalls during construction. The contractor is ultimately responsible for dewatering and stability of excavations.

4.4 Foundations

We recommend the proposed building be supported on spread footings bearing on properly prepared subgrades. We recommend the following geotechnical parameters for design consideration:

- Design Frost Depth = 4.5 feet
- Allowable Soil Bearing Pressure = 1.5 ksf or less
- Seismic Site Soil Class = E (IBC 2009)
- Base Friction Factor = 0.40
- Lateral Earth Pressure = 65 pcf (equivalent fluid pressure)
- Unit Weight of Backfill = 130 pcf (compacted Structural Fill)
- At-Rest Lateral Earth Pressure Coefficient = 0.5 (compacted Structural Fill)
- Internal Friction Angle of Backfill = 30° (compacted Structural Fill)

Footings should be at least 18-inches in width regardless of bearing pressure.

4.5 Foundation Drainage

We recommend an underdrain system be installed along the exterior side of the perimeter foundations. The underdrain system should consist of a 4-inch diameter, perforated SDR-35 foundation drain pipe surrounded by at least 6-inches of Crushed Stone, fully enveloped in non-woven geotextile, such as Mirafi 160N or equivalent. The underdrain pipe must be connected to a positive gravity outlet protected from freezing, clogging and backflow. Surface grades should be sloped away from the building for positive drainage. General underdrain details are illustrated on Sheet 10.

If a drip strip is used, S.W.COLE should be consulted to provide recommendations for frost protection.

4.6 Slab-On-Grade

On-grade floor slabs in heated areas may be designed using a subgrade reaction modulus of 120 pci (pounds per cubic inch) provided the slab is underlain by at least 12-inches of compacted Structural Fill overlying properly prepared subgrades. The structural engineer or concrete consultant must design steel reinforcing and joint spacing appropriate to slab thickness and function.

We recommend a sub-slab vapor retarder particularly in areas of the building where the concrete slab will be covered with an impermeable surface treatment or floor covering that may be sensitive to moisture vapors. The vapor retarder must have a permeance that is less than the floor cover or surface treatment that is applied to the slab. The vapor retarder must have sufficient durability to withstand direct contact with the sub-slab base material and construction activity. The vapor retarder material shall be placed according to the manufacturer's recommended method, including the taping and lapping of all joints and wall connections. The architect and/or flooring consultant should select the vapor retarder products compatible with flooring and adhesive materials.

The floor slab should be appropriately cured using moisture retention methods after casting. Typical floor slab curing methods should be used for at least 7 days. The architect or flooring consultant should assign curing methods consistent with current applicable American Concrete Institute (ACI) procedures with consideration of curing method compatibility to proposed surface treatments, flooring and adhesive materials.

4.7 Entrance Slabs

Entrance slabs adjacent to buildings must be designed to reduce the effects of differential frost action between adjacent pavement, doorways, and sidewalks. We recommend that clean, non-frost susceptible sand and gravel meeting the requirements of Structural Fill be provided to a depth of at least 4.5 feet below the top of entrance slabs. This thickness of Structural Fill should extend the full width of the entrance slabs and outward at least 4.5 feet, thereafter transitioning up to the bottom of the adjacent sidewalk or pavement subbase gravel at a 3H:1V or flatter slope. General details of this frost transition zone are illustrated on Sheet 10.

4.8 Backfill and Compaction

We recommend the following fill and backfill materials for use during construction:

Granular Borrow: Sand or silty sand meeting the requirements of MDOT Standard Specification 703.19 Granular Borrow. Granular Borrow is recommended for use as:

- Fill to raise site grades and backfill overexcavations (dry and non-freezing conditions and over dry subgrades)

Structural Fill: Clean, non-frost susceptible sand and gravel meeting the gradation requirements for Structural Fill as given below.

Structural Fill	
Sieve Size	**Percent Finer by Weight**
4 inch	100
3 inch	90 to 100
¼ inch	25 to 90
#40	0 to 30
#200	0 to 5

Structural Fill is recommended for use as:

- Fill to raise site grades and backfill overexcavations (wet and cold weather conditions and over wet subgrades)
- Backfill for building foundations and below entrance slabs
- Slab-on-grade base material

Crushed Stone: Crushed Stone used below footings and around underdrains should consist of crushed rock meeting the gradation requirements of MDOT Standard Specifications 703.22 “Underdrain Backfill Type C”.

Placement and Compaction: Fill should be placed in horizontal lifts and compacted such that the desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Loose lift thicknesses for grading, fill and backfill activities should not exceed 12 inches. We recommend that fill and backfill in building areas be compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557. Crushed Stone should be compacted in loose lifts not exceeding 12-inches with 2 to 3 passes of a vibratory plate compactor with a static weight of at least 600 lbs.

4.9 Weather Considerations

Construction activity should be limited during wet weather and the site soils may require drying before construction activities may continue. The contractor should anticipate the need for water to temper fills in order to facilitate compaction during dry weather. If construction takes place during cold weather, subgrades, foundations and floor slabs must be protected during freezing conditions. Concrete and fill must not be placed on frozen

soil; and once placed, the concrete and soil beneath the structure must be protected from freezing.

4.10 Design Review and Construction Testing

S.W.COLE should be retained to review the foundation and earthwork construction documents to determine that our geotechnical recommendations have been properly interpreted and implemented.

A soils and concrete testing program should also be implemented during construction to observe compliance with the design concepts, plans, and specifications. S.W.COLE is available to provide earthwork observations as well as testing services for soils, concrete, asphalt, steel and spray-applied fireproofing construction materials.

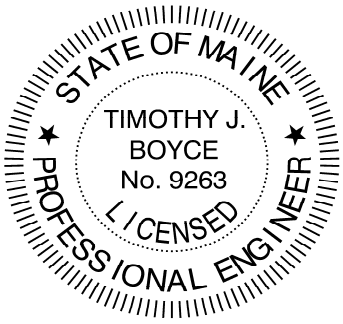
5.0 CLOSURE

It has been a pleasure to be of assistance to you with this phase of your project. We look forward to working with you during the construction phase of the project.

Sincerely,

S. W. Cole Engineering, Inc.

Evan M. Walker, P.E.
Geotechnical Engineer



Timothy J. Boyce, P.E.
Senior Geotechnical Engineer

EMW:tjb

Attachment A
Limitations

This report has been prepared for the exclusive use of Peter F. Holmes for specific application to the proposed Pre-Engineered Building at 424 Warren Avenue in Portland, Maine. S. W. Cole Engineering, Inc. (S.W.COLE) has endeavored to conduct the work in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

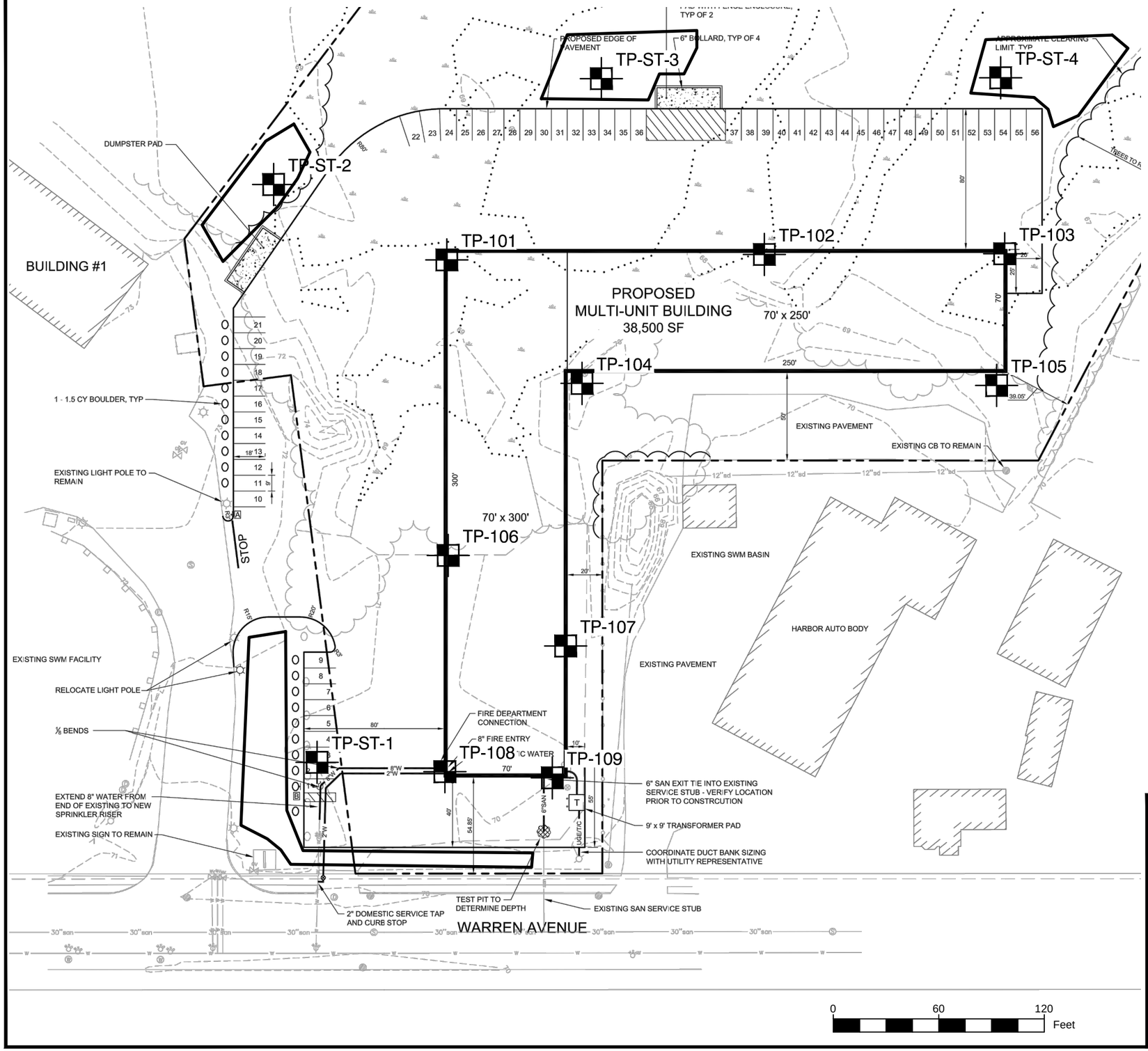
The soil profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.

The analyses performed during this investigation and recommendations presented in this report are based in part upon the data obtained from subsurface explorations made at the site. Variations in subsurface conditions may occur between explorations and may not become evident until construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and to review the recommendations of this report.

Observations have been made during exploration work to assess site groundwater levels. Fluctuations in water levels will occur due to variations in rainfall, temperature, and other factors.

S.W.COLE's scope of work has not included the investigation, detection, or prevention of any Biological Pollutants at the project site or in any existing or proposed structure at the site. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and the byproducts of any such biological organisms.

Recommendations contained in this report are based substantially upon information provided by others regarding the proposed project. In the event that any changes are made in the design, nature, or location of the proposed project, S.W.COLE should review such changes as they relate to analyses associated with this report. Recommendations contained in this report shall not be considered valid unless the changes are reviewed by S.W.COLE.



LEGEND:

APPROXIMATE TEST PIT LOCATION

NOTES:

1. EXPLORATION LOCATION PLAN WAS PREPARED FROM A 1"=30' SCALE PLAN OF THE SITE ENTITLED "SITE LAYOUT AND UTILITY PLAN," PREPARED BY FAY, SPOFFORD & THORNDIKE, INC., DATED NOVEMBER 2013.
2. THE TEST PITS WERE LOCATED IN THE FIELD BY TAPED MEASUREMENTS FROM EXISTING SITE FEATURES.
3. THIS PLAN SHOULD BE USED IN CONJUNCTION WITH THE ASSOCIATED S.W. COLE ENGINEERING, INC. GEOTECHNICAL REPORT.
4. THE PURPOSE OF THIS PLAN IS ONLY TO DEPICT THE LOCATION OF THE EXPLORATIONS IN RELATION TO THE EXISTING CONDITIONS AND PROPOSED CONSTRUCTION AND IS NOT TO BE USED FOR CONSTRUCTION.

S.W.COLE ENGINEERING, INC.

PETER F. HOLMES

EXPLORATION LOCATION PLAN

PROPOSED PRE-ENGINEERED BUILDING
424 WARREN AVENUE
PORTLAND, MAINE

Job No.:	13-1392	Scale:	1" =60'
Date :	12/24/2013	Sheet:	1

S.W.COLE ENGINEERING, INC.

TEST PIT LOGS

PROJECT / CLIENT: PROPOSED PRE-ENGINEERED BUILDING / PETER F. HOLMES
LOCATION: 424 WARREN AVENUE, PORTLAND, MAINE
EXCAVATOR: EASTERN EXCAVATION, INC. / KOMATSU PC 50 MR

SWC REP.: EMW
PROJECT NO. 13-0912

TEST PIT TP-101

DATE: 12/20/13 SURFACE ELEVATION: 69' +/- LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.5	VEGETATION / BROWN CLAYEY SILTY SAND WITH ORGANICS (TOPSOIL)	
		1.5	REWORKED DARK GRAY AND BROWN SILTY SAND CLAYEY WITH ORGANICS (FILL / DISTURBED SOILS)	
		5.5	BROWN SILTY FINE SAND WITH SILT SEAMS	

COMPLETION DEPTH: 5.5' DEPTH TO WATER: SEEPAGE/CAVING @ 4.6'

TEST PIT TP-102

DATE: 12/20/13 SURFACE ELEVATION: 68' +/- LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.2	VEGETATION / DARK BROWN CLAYEY SILTY SAND WITH ORGANICS (TOPSOIL)	
		0.8	DARK GRAY-BROWN AND BLACK SANDY SILTY CLAY WITH BRICK, ORGANICS (FILL)	
		3.6	GRAY-BROWN WITH RUST-BROWN STAINING SILTY FINE SAND WITH SILT LAYERS	
		5.3	BROWN SILTY CLAY WITH SAND SEAMS ~ VERY STIFF ~	@ 4' : q_p = 7 KSF

COMPLETION DEPTH: 5.3' DEPTH TO WATER: SEEPAGE @ 3.9', SOILS MOIST ABOVE 3.9'

S.W.COLE ENGINEERING, INC.

TEST PIT LOGS

PROJECT / CLIENT: PROPOSED PRE-ENGINEERED BUILDING / PETER F. HOLMES
LOCATION: 424 WARREN AVENUE, PORTLAND, MAINE
EXCAVATOR: EASTERN EXCAVATION, INC. / KOMATSU PC 50 MR

SWC REP.: EMW
PROJECT NO. 13-0912

TEST PIT TP-103

DATE: 12/20/13 SURFACE ELEVATION: 68' +/- LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.3	VEGETATION / BROWN CLAYEY SILTY SAND WITH ORGANICS (TOPSOIL)	
		2.0	REWORKED BROWN SILTY CLAY WITH SAND SEAMS WITH ORGANICS (FILL / DISTURBED SOILS)	
		4.8'	LAYERED BROWN SILTY FINE SAND, CLAYEY SILT AND SILTY CLAY	

COMPLETION DEPTH: 4.8' DEPTH TO WATER: SEEPAGE @ 3.1'

TEST PIT TP-104

DATE: 12/20/13 SURFACE ELEVATION: 70' +/- LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		2.0	DARK BROWN SILTY SAND WITH COBBLES, ORGANICS, BRICKS, PLASTIC DEBRIS (FILL)	
		2.5	ORANGE-BROWN SILTY FINE SAND	
		6.0	LAYERED GRAY-BROWN SILTY CLAY WITH SILTY FINE SAND LAYERS	

COMPLETION DEPTH: 6.0' DEPTH TO WATER: SEEPAGE @ 5.5'. SOILS MOIST ABOVE 5.5'

S.W.COLE ENGINEERING, INC.

TEST PIT LOGS

PROJECT / CLIENT: PROPOSED PRE-ENGINEERED BUILDING / PETER F. HOLMES
LOCATION: 424 WARREN AVENUE, PORTLAND, MAINE
EXCAVATOR: EASTERN EXCAVATION, INC. / KOMATSU PC 50 MR

SWC REP.: EMW
PROJECT NO. 13-0912

TEST PIT TP-105

DATE: 12/20/13 SURFACE ELEVATION: 69' +/- LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.3	VEGETATION / BROWN SILTY SAND WITH ORGANICS (TOPSOIL)	@ 4' : q_p = 6 KSF
		1.1	YELLOW-BROWN SILTY SAND TRACE ORGANICS (FILL)	
		2.1	DARK BROWN SILTY SAND WITH ORGANICS (RELIC TOPSOIL)	
		3.5	REWORKED GRAY-BROWN WITH RUST-BROWN STAINING SILTY SANDY CLAY (DISTURBED SOILS)	
		6.2'	LAYERED BROWN SILTY FINE SAND, SILTY CLAY, AND CLAYEY SILT	

COMPLETION DEPTH: 6.2' DEPTH TO WATER: SEEPAGE @ 5.5', SOILS MOIST ABOVE 5.5'

TEST PIT TP-106

DATE: 12/20/13 SURFACE ELEVATION: 70' +/- LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		2.0	DARK GRAY-BROWN SILTY SAND SOME GRAVEL WITH COBBLES, ORGANICS, BRICK (FILL)	
		3.2	BROWN SAND SOME SILT, SOME GRAVEL (FILL)	
		3.6	DARK BROWN AND BLACK SILTY SAND WITH ORGANICS (RELIC TOPSOIL)	
		5.6	GRAY WITH BROWN MOTTLING CLAYEY SILT AND FINE SAND WITH SAND LAYERS	

COMPLETION DEPTH: 5.6' DEPTH TO WATER: ALL SOILS MOIST

S.W.COLE ENGINEERING, INC.

TEST PIT LOGS

PROJECT / CLIENT: PROPOSED PRE-ENGINEERED BUILDING / PETER F. HOLMES
LOCATION: 424 WARREN AVENUE, PORTLAND, MAINE
EXCAVATOR: EASTERN EXCAVATION, INC. / KOMATSU PC 50 MR

SWC REP.: EMW
PROJECT NO. 13-0912

TEST PIT TP-107

DATE: 12/20/13 SURFACE ELEVATION: 69' +/- LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
			BROWN GRAVELLY SAND SOME SILT WITH COBBLES ORGANICS IN UPPER 6" +/-	
		1.5	(FILL)	
		2.0	DARK BROWN SILTY SAND WITH ORGANICS (RELIC TOPSOIL)	
		5.0	LAYERED GRAY-BROWN SILTY SAND AND SILTY CLAY	

COMPLETION DEPTH: 5 DEPTH TO WATER: ALL SOILS MOIST TO WET

TEST PIT TP-108

DATE: 12/20/13 SURFACE ELEVATION: 70' +/- LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
			BROWN GRAVELLY SAND SOME SILT WITH COBBLES (FILL)	
		0.6		
		1.4	DARK BROWN AND BLACK SILTY SAND WITH ORGANICS (RELIC TOPSOIL)	
		1.7	ORANGE-BROWN SILTY SAND	
		3.5	LIGHT GRAY-BROWN SILTY SAND	
		6.0	GRAY-BROWN CLAYEY SANDY SILT WITH SAND LAYERS	@ 4.5' : q_p = 7 KSF

COMPLETION DEPTH: 6.0' DEPTH TO WATER: ALL SOILS MOIST

S.W.COLE ENGINEERING, INC.

TEST PIT LOGS

PROJECT / CLIENT: PROPOSED PRE-ENGINEERED BUILDING / PETER F. HOLMES
LOCATION: 424 WARREN AVENUE, PORTLAND, MAINE
EXCAVATOR: EASTERN EXCAVATION, INC. / KOMATSU PC 50 MR

SWC REP.: EMW
PROJECT NO. 13-0912

TEST PIT TP-109

DATE: 12/20/13 SURFACE ELEVATION: 70' +/- LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
			BROWN SILTY GRAVELLY SAND WITH COBBLES (FILL)	
		1.9		
		2.1	DARK BROWN SILTY SAND WITH ORGANICS (TOPSOIL)	
			GRAY SILTY FINE SAND WITH SILT AND SILTY CLAY SEAMS TRACE ROOTLETS	
		4.0		
			GRAY-BROWN WITH RUST-BROWN MOTTLING SILTY SANDY CLAY	
		6.2		

COMPLETION DEPTH: 6.2' DEPTH TO WATER: ALL SOILS MOIST

S.W.COLE ENGINEERING, INC.

TEST PIT LOGS

PROJECT / CLIENT: PROPOSED PRE-ENGINEERED BUILDING / PETER F. HOLMES
LOCATION: 424 WARREN AVENUE, PORTLAND, MAINE
EXCAVATOR: EASTERN EXCAVATION, INC. / KOMATSU PC 50 MR

SWC REP.: EMW
PROJECT NO. 13-0912

TEST PIT TP-ST-1

DATE: 12/20/13 SURFACE ELEVATION: 71' +/- LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
			DARK BROWN SILTY SAND SOME GRAVEL WITH ORGANICS (FILL)	
		0.9		
			BROWN SILTY FINE TO MEDIUM SAND WITH SILT SEAMS	
		4.0		
		4.3	BROWN CLAYEY SILT AND SAND	
			NOTE: TEST PIT ALSO LOGGED BY ALBERT FRICK ASSOCIATES	

COMPLETION DEPTH: 4.3' DEPTH TO WATER: ALL SOILS MOIST

TEST PIT TP-ST-2

DATE: 12/20/13 SURFACE ELEVATION: 69' +/- LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.5	VEGETATION / DARK BROWN CLAYEY SILTY SAND WITH ORGANICS (TOPSOIL)	
			REWORKED GRAY-BROWN CLAYEY SANDY SILT (FILL / DISTURBED SOILS)	
		2.0		
			GRAY-BROWN CLAYEY SILT AND SAND WITH FINE SAND LAYERS	
		3.5		
			BROWN SILTY FINE SAND	
		4.2		
			NOTE: TEST PIT ALSO LOGGED BY ALBERT FRICK ASSOCIATES	

COMPLETION DEPTH: 4.2' DEPTH TO WATER: HEAVY SEEPAGE @ 4'

S.W.COLE ENGINEERING, INC.

TEST PIT LOGS

PROJECT / CLIENT: PROPOSED PRE-ENGINEERED BUILDING / PETER F. HOLMES
LOCATION: 424 WARREN AVENUE, PORTLAND, MAINE
EXCAVATOR: EASTERN EXCAVATION, INC. / KOMATSU PC 50 MR

SWC REP.: EMW
PROJECT NO. 13-0912

TEST PIT TP-ST-3

DATE: 12/20/13 SURFACE ELEVATION: 69' +/- LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.3	VEGETATION / BROWN SILTY SAND WITH ORGANICS (TOPSOIL)	
		1.8	REWORKED GRAY-BROWN CLAYEY SANDY SILT WITH ORGANICS (FILL / DISTURBED SOILS)	
		4.5	GRAY-BROWN CLAYEY SILT, SOME SAND	
			NOTE: TEST PIT ALSO LOGGED BY ALBERT FRICK ASSOCIATES	

COMPLETION DEPTH: 4.5' DEPTH TO WATER: HEAVY SEEPAGE @ 4'

TEST PIT TP-ST-4

DATE: 12/20/13 SURFACE ELEVATION: 68' +/- LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.5	VEGETATION / BROWN CLAYEY SILT SAND WITH ORGANICS (TOPSOIL)	
		2.5	REWORKED CLAYEY SILT AND SAND WITH ORGANICS (FILL / DISTURBED SOILS)	
		4.0'	GRAY-BROWN WITH BROWN MOTTLING CLAYEY SILT AND SAND WITH SAND SEAMS	
			NOTE: TEST PIT ALSO LOGGED BY ALBERT FRICK ASSOCIATES	

COMPLETION DEPTH: 4.0' DEPTH TO WATER: ALL SOILS MOIST

KEY TO THE NOTES & SYMBOLS
Test Boring and Test Pit Explorations

All stratification lines represent the approximate boundary between soil types and the transition may be gradual.

Key to Symbols Used:

w	-	water content, percent (dry weight basis)
q_u	-	unconfined compressive strength, kips/sq. ft. - based on laboratory unconfined compressive test
S_v	-	field vane shear strength, kips/sq. ft.
L_v	-	lab vane shear strength, kips/sq. ft.
q_p	-	unconfined compressive strength, kips/sq. ft. based on pocket penetrometer test
O	-	organic content, percent (dry weight basis)
W_L	-	liquid limit - Atterberg test
W_P	-	plastic limit - Atterberg test
WOH	-	advance by weight of hammer
WOM	-	advance by weight of man
WOR	-	advance by weight of rods
HYD	-	advance by force of hydraulic piston on drill
RQD	-	Rock Quality Designator - an index of the quality of a rock mass. RQD is computed from recovered core samples.
γ_T	-	total soil weight
γ_B	-	buoyant soil weight

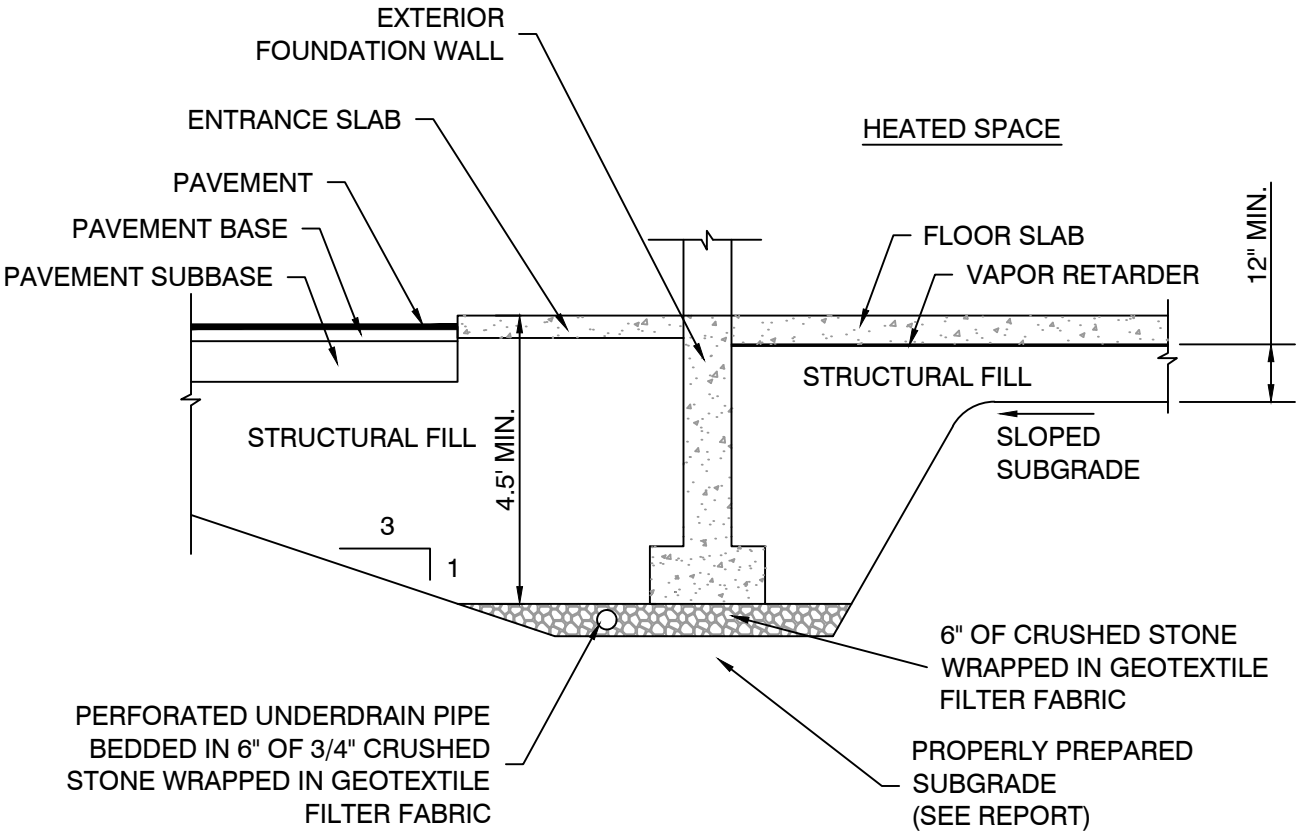
Description of Proportions:

0 to 5% TRACE
5 to 12% SOME
12 to 35% "Y"
35+% AND

REFUSAL: **Test Boring Explorations** - Refusal depth indicates that depth at which, in the drill foreman's opinion, sufficient resistance to the advance of the casing, auger, probe rod or sampler was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

REFUSAL: **Test Pit Explorations** - Refusal depth indicates that depth at which sufficient resistance to the advance of the backhoe bucket was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

Although refusal may indicate the encountering of the bedrock surface, it may indicate the striking of large cobbles, boulders, very dense or cemented soil, or other buried natural or man-made objects or it may indicate the encountering of a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock.



NOTE:

1. UNDERDRAIN INSTALLATION AND MATERIAL GRADATION RECOMMENDATIONS ARE CONTAINED WITHIN THIS REPORT.

2. DETAIL IS PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY, NOT FOR CONSTRUCTION.

S.W.COLE ENGINEERING, INC.

PETER F. HOLMES

UNDERDRAIN DETAIL

PROPOSED PRE-ENGINEERED BUILDING
424 WARREN AVENUE
PORTLAND, MAINE

Job No.:	13-1392	Scale:	Not to Scale
Date :	12/24/2013	Sheet:	10

Town, City, Plantation	Street, Road Subdivision	Owner's Name
PORTLAND	WARREN AVENUE	PETER HOLMES

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP ST-1 ■ Test Pit ☐ Boring

_____" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

	Texture	Consistency	Color	Mottling
0–10	GRAVELLY LOAMY SAND (FILL)	FROZEN	VARIABLE BROWN	
10–20	SANDY LOAM		DARK BROWN 10YR3/3	
20–30	LOAMY SAND	FRIABLE	YELLOWISH BROWN 10YR5/6	
30–40	FINE SAND W/ SILT LENSES	SOMEWHAT FIRM TO FIRM	MIXED OLIVE BROWN / LIGHT OLIVE BROWN	FEW FAINT
40–50	SILTY CLAY LOAM	FIRM (NO SATURATION)	OLIVE GRAY	COMMON DISTINCT

(LIMIT OF EXCAVATION @ 52")

Soil Classification (Profile / Condition)	Slope	Limiting Factor	Ground Water / Restrictive Layer / Bedrock / Pit Depth
	____ %	23 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR WASTEWATER DISPOSAL →

FOR SOILS MAPPING →

Soil Series Name:	Drainage Class:	Hydrologic Group:
FILL OVER ELDRIDGE (ELMWOOD)		

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP ST-2 ■ Test Pit ☐ Boring

_____" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

	Texture	Consistency	Color	Mottling
0–10	SILT LOAM	FRIABLE	DARK BROWN	
10–20	SILTY CLAY LOAM	SOMEWHAT FIRM	OLIVE GRAY	COMMON DISTINCT
20–30				
30–40	LOAMY FINE SAND	FRIABLE	LIGHT OLIVE BROWN	
40–50	SILTY CLAY LOAM	FIRM	OLIVE	△△△ FREE WATER

(LIMIT OF EXCAVATION @ 56")

Soil Classification (Profile / Condition)	Slope	Limiting Factor	Ground Water / Restrictive Layer / Bedrock / Pit Depth
	____ %	7 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name:	Drainage Class:	Hydrologic Group:
STRIPPED LAMOINE		

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP ST-3 ■ Test Pit ☐ Boring

_____" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

	Texture	Consistency	Color	Mottling
0–10	SILT LOAM	FRIABLE	DARK BROWN 10YR3/3	
10–20	SILTY CLAY (FILL/ OVERBURDEN)	FIRM	OLIVE	RELIC
20–30	SILTY CLAY LOAM W/ SILT & LOAMY FINE SAND IN LENSES		OLIVE BROWN	
40–50				△△△ FREE WATER

STATE OF MAINE — JAMES LOGAN #213 — SOIL SCIENTIST

Soil Classification (Profile / Condition)	Slope	Limiting Factor	Ground Water / Restrictive Layer / Bedrock / Pit Depth
	____ %	46 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR WASTEWATER DISPOSAL →

FOR SOILS MAPPING →

Soil Series Name:	Drainage Class:	Hydrologic Group:
STRIPPED/REGRADED LAMOINE		

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP ST-4 ■ Test Pit ☐ Boring

_____" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

	Texture	Consistency	Color	Mottling
0–10	SILTY CLAY (REGRADED & OVERBURDEN)	FROZEN	VARIABLE OLIVE BROWN & OLIVE GRAY	
10–20		SOMEWHAT FIRM		MANY PROMINENT (RELIC)
20–30	SILTY CLAY LOAM W/LOAMY FINE SAND AND SILT LENSES	FIRM	VARIABLE OLIVE BROWN AND DARK YELLOWISH BROWN	COMMON DISTINCT
40–50				NOTE: NO FREE WATER IN TEST PIT

(LIMIT OF EXCAVATION @ 55")

Soil Classification (Profile / Condition)	Slope	Limiting Factor	Ground Water / Restrictive Layer / Bedrock / Pit Depth
	____ %	9 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name:	Drainage Class:	Hydrologic Group:
STRIPPED/REGRADED LAMOINE		

James Logan (for ASF-S) — Site Evaluator / Soil Scientist Signature

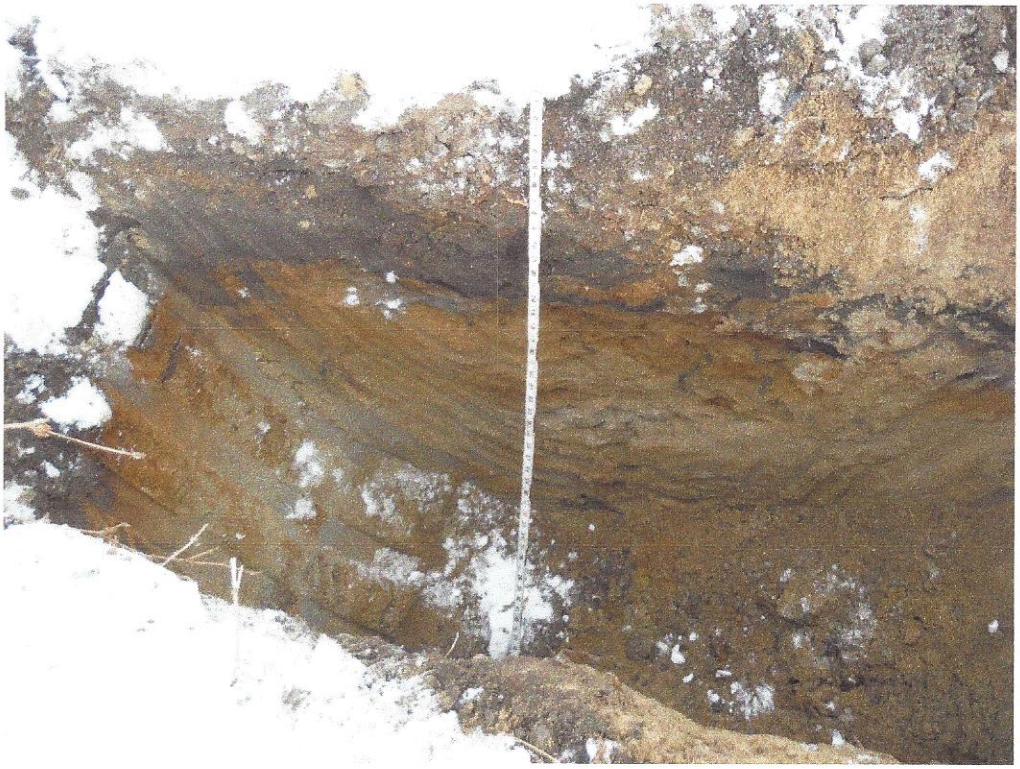
237/213 — SE/CSS #

12-20-13 — Date

ALBERT FRICK ASSOCIATES – 95A COUNTY ROAD GORHAM, MAINE 04038 – (207) 839-5563

Peter Holmes Site
off Warren Avenue
Portland, Maine

View of excavator near edge of upland



View of typical non-hydric, regraded soils on site (TP ST-4)

APPENDIX G

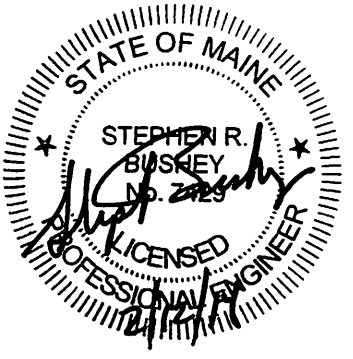
EROSION CONTROL PLAN

BASIC STANDARDS
EROSION AND SEDIMENTATION CONTROL REPORT

421 WARREN AVENUE
COMMERCIAL COMPLEX

PREPARED FOR:

PH WARREN AVENUE, LLC
421 WARREN AVENUE
PORTLAND, MAINE 04101



PREPARED BY:

FAY, SPOFFORD & THORNDIKE, INC.
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SOUTH PORTLAND, MAINE 04106
(207) 775-1121

FEBRUARY 2014

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Figures and Photographs

Please refer to Section 1 of the Site Plan Application for Figures and Photographs

Appendices

1.0 INTRODUCTION

Fay, Spofford & Thorndike (FST) has been retained by Peter Holmes to assist on the preparation of site design and site permitting for a proposed 28,000 SF footprint multi-unit building in Portland, Maine. The development will include a new multi-unit building, 41 space parking lot and related infrastructure improvements. This proposed project will create a total of 2.53 ac of developed area of which 1.90 ac will be new structure area (building and other impervious surfaces) within the approximately 7.95 acre project watershed area analyzed. The landowner of this site also owns an approximate additional 40 acres surrounding this site.

The development site is located on the north side of Warren Avenue between Interstate 95 and Forest Avenue in Portland. The site is owned by PH Warren Avenue, LLC. A large portion of this site currently drains to a drainage way in the northeast quadrant of the site. Part of the southerly tip of the site drains into Warren Avenue and is collected by the City's municipal drainage system. A second part of the southerly end drains across to Harbour Auto-Body and is collected in a small detention pond before being routed into the city drainage system.

A USGS Map, Zoning, Aerial Photographs, Flood, Soils, figures are included in Section 1 of the Site Plan Application. The accompanying plan set includes erosion control details and overall erosion control plan.

This section of the permit application presents the Erosion Sediment Control Plan designed for the project. The erosion control plans will be contained in the contract documents for implementation by the Contractor who is awarded the bid for the project. This project is coordinated with the MeDEP erosion control requirements. The Contract documents will require that turbid discharges from the site do not occur. Fugitive dust emissions will be controlled and the requirements of this erosion control plan, and all permit requirements will be fulfilled. Winter construction may be required. Specific erosion controls stipulated by the plan and this report are minimum requirements.

2.0 EXISTING SITE CONDITIONS

The current site cover conditions are summarized in the table below:

SUMMARY OF LAND USE COVER	
Current Land Cover	**Area (acre)**
Woods/Meadow	5.75
Roof	0.28
Lawn	0.46
Pavement	0.67
Gravel	0.79
Total	**7.95**

3.0 EXISTING DRAINAGE FEATURES

The existing site is comprised of undeveloped woods, meadow and lawn area associated and gravel areas.

Topography is relatively flat within the site. A large portion of the site drains over a flat wetland area towards a tributary in the northeast quadrant of the site. About half of the area in the southern portion of the site drains towards Warren Avenue and is picked up by the City of Portland Municipal Stormwater System through a catch basin in the street. The other half flows towards an existing detention pond adjacent to Harbour Auto Body shop, which is located on property owned

by the applicant. Flow is released from this detention pond and is discharged to the City of Portland Stormwater System.

The preliminary geotechnical explorations by S.W. Cole Engineering in December 2013 show that the site contains fill soils over a layer of relic topsoil underlain by glaciomarine sands, silts and clays.

4.0 OVERVIEW OF SOIL EROSION AND SEDIMENTATION CONCERNS

The susceptibility of soils to erosion is indicated on a relative "K" scale of values over a range of 0.02 to 0.69. The "K" value is frequently used with the universal soil loss equation. The higher values are indicative of the more erodible soils. The relative K values of the underlying material at the site would be as follows:

Soil Symbol	Soil Description	"K" Value
Scantic	Silt Loam	0.49-0.64

The primary emphasis of the Erosion and Sedimentation Control Plan to be implemented for this project is as follows:

- **Temporary Measures:** Planning the project to have erosion resistant measures in place by implementing measures intended to prevent erosion from occurring.

- **Phasing Sequencing:** The plan includes measures to intercept and convey runoff to temporary sediment sumps and control devices as the construction of the project occurs. The use of small collection sumps with a clean sand filter above an underdrained discharge is recommended to supplement the principal sumps to help reduce turbidity.

- **Use of Type 1 Settling:** Installing sediment sumps and swales early in the construction sequence to provide secondary relief for erosion control measures within the site until late in the project when the sedimentation areas need to be removed for final restoration.

- **Restabilization:** Stabilization of areas denuded to underlying parent material must occur within stipulated time frame to minimize the period of soil exposure and stabilization of drainage paths to avoid rill and gully erosion.

- **Interim Entrapment:** The use of on-site measures to capture sediment (hay bales/silt fence, etc.) before it is conveyed to sediment sumps.

- **Long Term Site Protection:** The implementation of long-term measures for erosion/sediment and pollutant treatment through the construction of permanent water quality measures including gravel wetlands.

- **Special Winter Construction Measures:** These will be required for work between September 15 and April 15.

5.0 DESCRIPTION AND LOCATION OF LIMITS OF ALL PROPOSED EARTH MOVEMENTS

The construction of the project will disturb about 4 acres of land. The limit of disturbance is generally coincident with the limit of grading.

The earth moving will include trenching for underground utilities, excavation for the water quality measures, earthwork to reshape the perimeter of the site, earthwork to prepare and shape the parking lot, excavation attendant with the building, and excavation and borrow for the project improvements.

6.0 PROPOSED DRAINAGE FEATURES

The postdevelopment plan includes consideration and design for water quality treatment of stormwater runoff. These measures will also constitute the stormwater management provisions for the development.

Certain manholes on the project provide flow management by directing stormwater to different areas and by regulating the discharge rates for various points of analysis.

The proposed cover conditions for the site upon completion of the project will be as follows:

TABLE 2 – POSTDEVELOPMENT LAND USE

Proposed Land Cover	Area (acre)	Change from Current (acre)
Woods/Meadow	4.38	-1.37
Roof	0.92	+0.64
Lawn/Landscaped Planting Areas	0.66	+0.20
Pavement	1.77	+1.17
Gravel	0.22	-0.57
Total	**7.95**	

7.0 CRITICAL AREAS

Critical resource areas include nearby wetlands to the north of the site. No special species habitats have been identified on the interior areas of the site. It is noted that the stormwater systems shall not be activated until the tributary areas have been stabilized and at least three weeks has passed subsequent to placement of bituminous concrete paving materials.

8.0 EROSION/SEDIMENTATION CONTROL DEVICES

As part of the site development, the Contractor will be obligated to implement the following erosion and sediment control devices. These devices shall be installed as indicated on the plans or as described within this report. For further reference on these devices, see the *Maine Department of Environmental Protection Erosion and Sediment Control BMPS Manual (March, 2003).*

1. Siltation fence or an erosion control mix berm shall be installed down slope of any disturbed areas to trap runoff borne sediments until the site is revegetated. The silt fence shall be installed per the detail provided in the plan set and inspected immediately after each rainfall and at least daily during prolonged rainfall. The Contractor shall make repairs immediately if there are any signs of erosion or sedimentation below the fence line. If such erosion is observed, the Contractor shall take proactive action to identify the cause of the erosion and take action to avoid its reoccurrence. Typically, this requires that stabilization measures be undertaken. Proper placement of stakes and keying the bottom of the fabric into the ground is critical to the fence's effectiveness. If there are signs of undercutting at the center or the edges, or impounding of large volumes of water behind the fence, the barrier shall be replaced with a stone check dam and measures taken to avoid the concentration of flows not directed to the silt fence.

2. Straw or hay mulch including hydroseeding is intended to provide cover for denuded or seeded areas until revegetation is established. Mulching should be occurring several times per week when the site construction activity is high and at sufficient intervals to reduce the period of exposure of bare soils to the time limits set forth in this plan. Mulch placed on slopes of less than 10 percent shall be anchored by applying water; mulch placed on slopes steeper than 10 percent shall be covered with fabric netting as immediately after mulching as practicable and anchored with staples in accordance with the manufacturer's recommendations. Proposed drainage channels, which are to be revegetated, shall receive Curlex® blankets by American Excelsior Company selected for the slope, velocity, and whether the measure is temporary or intended to be in place for a sustained period. Mulch application rates are provided in Appendix A of this section. Hay mulch shall be available on site at all times in order to provide immediate temporary stabilization when necessary. Where necessary, a windrow of crushed stone and/or gravel shall be placed at the top of the slope and directed to a temporary stone channel or pipe sluice to convey runoff down slopes. A dissipation device such as stone or a plunge pool should be installed at the base of the slope and sluice outlet to dissipate the energy of the water from the sluice or channel.

3. Temporary sediment sumps will provide sedimentation control for stormwater runoff from disturbed areas during construction until stabilization has been achieved. The sediment sumps need to include a sand filter above an underdrain or a chemical coagulant to remove fine-grained sediment. Appropriate measures to reduce sediment suspended in discharges to less than 280 NTU's will be required.

4. Riprap slopes, ditch linings, stone check dams, hay bale barriers, and culvert outlet aprons are intended to stabilize and protect denuded soil surfaces or dissipate the energy and erosive forces from concentrated flows. Installation details and stone sizes are provided in the construction plan set on the erosion control detail sheets.

5. A construction entrance will be constructed at all access points onto the site to prevent tracking of soil onto adjacent local roads and streets and the existing driveway for 429 Warren Avenue.

6. Stone sediment traps or a premanufactured SiltSack™ and a sediment bag will be installed at catch basin inlets to prevent silt from entering the municipal storm drain system. Installation details are provided in the plan set on the erosion control detail sheets.

7. Dirtbags™ will be required to be on site and available for construction dewatering. The Contractor will be required to provide two Dirtbags™ with one prepared for operation prior to commencing any trenching operations. Dirtbags™ will need to be installed above filter sand and crushed stone in accordance with the details shown on the plan set will need to be installed.

8. Loam and seed is intended to serve as the primary permanent revegetative measure for all denuded areas not provided with other erosion control measures, such as riprap. Specific areas as shown on the landscape plan may receive sod. Application rates are provided in Appendix A of this section for temporary and permanent seeding.

9. Stone check dams will be installed in areas noted on the plan or as warranted, based upon observations during construction of the site.

10. Silt logs are an option for stone check dams and may be substituted provided the devices are well anchored.

11. DirtGlue™ is an acceptable means of temporary stabilization and is intended to form a "crust" on the surface that is resistant to erosion. However, applications where DirtGlue™ is used must be protected from traffic that would crack the "crust" and the DirtGlue™ has temperature

limitations that restrict the periods of use. Use of this material shall conform to the requirements of Appendix D.

12. Wattles (constructed of rice straw) are to be used for small areas where the surface is irregular and where an immediate measure is needed to protect downstream measures.

9.0 TEMPORARY EROSION/SEDIMENTATION CONTROL MEASURES

The following are planned as temporary erosion/sedimentation control measures during construction:

1. Crushed stone-stabilized construction entrances shall be placed at any construction access points from adjacent streets or the existing 429 Warren Avenue driveway. The location of the construction entrance shown on the drawings should be considered illustrative and will need to be adjusted as appropriate and located at any area where there is the potential for tracking of mud and debris onto existing roads or streets. Stone stabilized construction entrances will require the stone to be removed and replaced, as it becomes covered or filled with mud and material tracked by vehicles exiting the site.

2. Dirtbags™ shall be installed in accordance with the details in the plan set. The purpose of the Dirtbags™ is to receive any water pumped from excavations during construction. A Dirtbag™ shall be installed and prepared for operation prior to any trenching or foundation construction on site. When Dirtbags™ are observed to be at 50% capacity, they shall be cleaned or replaced. Stone and filter sand under the Dirtbag™ shall be removed and replaced concurrently with the replacement of the Dirtbag™.

3. Temporary stockpiles of common excavation will be protected as follows:

   a) Temporary stockpiles shall not be located at least 50 feet upgradient of the perimeter silt barrier.

   b) Inactive stockpiles shall be stabilized within 5 days by either temporarily seeding the stockpile with a hydroseed method containing an emulsified mulch tackifier or by covering the stockpile with mulch. If necessary, mesh shall be installed to prevent wind from removing the mulch.

4. All denuded areas except gravel areas shall receive mulch, erosion control mesh fabric, or other approved temporary erosion sediment measure within 7 days of initial disturbance of soil or before a predicted rain event of >1/2" unless permanent measures are installed.

5. All soils disturbed between September 15 and April 15 will be covered with mulch within 5 days of disturbance, prior to any predicted storm event of the equivalent of ½" of rainfall in a 24-hour period, or prior to any work shutdown lasting more than 35 hours (including weekends and holidays). The mulch rate shall be double the normal rate.

   For work that is conducted between September 15 and April 15 of any calendar year, all denuded areas will be covered with hay mulch, applied at twice the normal application rate, and (in areas over 10% grade) anchored with a fabric netting. The time period for applying mulch shall be limited to 5 days for all areas, or immediately in advance of a predicted rainfall event.

6. Stone check dams, silt logs, or hay bale barriers will be installed at any evident concentrated flow discharge points during construction and earthwork operations.

7. Silt fencing with a maximum stake spacing of 6 feet should be used, unless the fence is supported by wire fence reinforcement of minimum 14 gauge and with a maximum mesh spacing of 6 inches, in which case stakes may be spaced a maximum of 10 feet apart. The

bottom of the fence should be properly anchored a minimum of 6" per the plan detail and backfilled. Any silt fence identified by the owner or reviewing agencies as not being properly installed during construction shall be immediately repaired in accordance with the installation details.

8. Storm drain catch basin inlet protection shall be provided through the use of stone sediment barriers or a premanufactured SiltSack™. Stone sediment barrier installation details are provided in the plan set. The barriers or SiltSacks™ shall be inspected after each rainfall and repairs made as necessary, including the removal of sediment. Sediment shall be removed and the barrier or SiltSack™ restored to its original dimensions when the sediment has accumulated to one-half the design depth of the barrier. Sediment shall be removed from SiltSacks™ as necessary. Inlet protection shall be removed when the tributary drainage area has been stabilized.
9. All slopes steeper than 4:1 shall receive erosion control mesh.
10. Slopes steeper than 3:1 shall receive erosion control blanket.
11. Areas of visible erosion and the temporary sediment sumps shall be stabilized with crushed stone. The size of the stone shall be determined by the contractor's designated representative in consultation with the Owner.
12. Any flow from the site that is concentrated must be directed to a sump with sand filter and underdrained discharge.
13. Underground utilities must be installed in compliance with the following standards and other requirements of this erosion control plan:

    - No more than 500 linear feet of trench may be opened at one time;
    - Excavated materials shall be placed on the uphill side of trenches;
    - Dewatering of the trench shall be pumped through a Dirtbag™ and appropriate sediment control facilities to avoid a turbid discharge; and
    - Stabilization shall occur as soon as practicable.

14. Rice straw wattles shall be used to control localized erosion.
15. Maintenance of the erosion control, sedimentation facilities, and control of fugitive dust must occur until the site is stabilized with permanent erosion control measures. For turf areas, stabilization shall be defined to be the establishment of a 90 percent "catch of grass" with no areas larger than 2 square feet, and no spots that cumulatively add up to more than 5 square feet per 100 square feet.

10.0 STANDARDS FOR STABILIZING SITES FOR THE WINTER

The construction of the project will require winter construction. The project is anticipated to require about 11-12 months to construct. For permitted winter construction, the erosion control measures are substantially more stringent due to the cold temperatures and lack of weather conditions which aid in drying the subgrade soils through evaporation.

If construction activities involving earth disturbance continue past September 15 or begin before April 15, the following must be incorporated with the erosion control plan and implementation:

1. Enlarged access points must be stabilized to provide for snow stockpiling.

2. Limits of disturbance shall be reduced to the extent practicable.

3. A snow management plan including adequate storage and control of snowmelt, requiring cleared snow to be stored downgradient of all areas of disturbance shall be prepared by the contractor and submitted to the Owner for review and approval.

4. Snow shall not be stored in sediment basins or to preclude drainage structures from operating as intended.

5. A minimum 25-foot buffer maintained from perimeter controls such as silt fence shall be maintained on the "work area side" to allow for snow clearing and maintenance.

6. Drainage systems intended to operate during the winter shall be catalogued, shown on a plan, and inspected after each snow removal period to make sure the drainage structures are open and free of snow and ice dams.

7. To ensure cover of disturbed soil in advance of a melt event, areas of disturbed soil must be stabilized at the end of each work day, with the following exceptions:

   - If no precipitation within 24 hours is forecast and work will resume in the same disturbed area within 24 hours, daily stabilization is not necessary.
   - Disturbed areas that collect and retain runoff, such as house foundations or open utility trenches.

8. Standard for the timely stabilization of ditches and channels: The Contractor shall construct and stabilize all stone-lined ditches and channels on the site by September 15. The contractor shall construct and stabilize all grass-lined ditches and channels on the site by September 1. If the Contractor fails to stabilize a ditch or channel to be grass-lined by September 1, then the Contractor shall take one of the following actions to stabilize the ditch for late fall and winter.

   i. Install a sod lining in the ditch. The contractor shall line the ditch with properly installed sod by September 15. Proper installation includes the applicant pinning the sod onto the soil with wire pins, rolling the sod to guarantee contact between the sod and underlying soil, watering the sod to promote root growth into the disturbed soil, and anchoring the sod with jute or plastic mesh to prevent the sod strips from sloughing during flow conditions.

   ii. Install a stone lining in the ditch. The contractor shall line the ditch with stone riprap by September 15. The contractor shall hire a registered professional engineer to determine the stone size and lining thickness needed to withstand the anticipated flow velocities and flow depths within the ditch. If necessary, the Contractor shall regrade the ditch prior to placing the stone lining so as to prevent the stone lining from reducing the ditch's cross-sectional area.

9. Standard for the timely stabilization of disturbed slopes: The Contractor shall construct and stabilize stone-covered slopes by September 15. The Contractor shall seed and mulch all slopes to be vegetated by September 1. The Department will consider any area having a grade greater than 15% (10H:1V) to be a slope. If the Contractor fails to stabilize any slope to be vegetated by September 1, then the Contractor shall take one of the following actions to stabilize the slope for late fall and winter.

   i. Stabilize the soil with temporary vegetation and erosion control mesh. By September 15, the Contractor shall seed the disturbed slope with winter rye at a seeding rate of 3 pounds per 1,000 square feet and apply erosion control mats over the mulched slope. The contractor shall monitor growth of the rye over the next 30 days. If the rye fails to grow at least three inches or fails to cover at least 75% of the disturbed slope by September 15,

then the Contractor shall cover the slope with a layer of wood waste compost as described in item iii of this standard or with stone rip rap as described in item iv of this standard.

ii. Stabilize the slope with sod. The Contractor shall stabilize the disturbed slope with properly installed sod by September 15. Proper installation includes the Contractor pinning the sod onto the slope with wire pins, rolling the sod to guarantee contact between the sod and underlying soil, and watering the sod to promote root growth into the disturbed soil. The Contractor shall not use late-season sod installation to stabilize slopes having a grade greater than 33% (3H:1V) or having groundwater seeps on the slope face.

iii. Stabilize the slope with wood waste compost. The Contractor shall place a six-inch layer of wood waste compost on the slope by September 15. Prior to placing the wood waste compost, the Contractor shall remove any snow accumulation on the disturbed slope. The contractor shall not use wood waste compost to stabilize slopes having grades greater than 50% (2H:1V) or having groundwater seeps on the slope face.

iv. Stabilize the slope with stone rip rap. The Contractor shall place a layer of stone riprap on the slope by September 15. The Contractor shall hire a registered professional engineer to determine the stone size needed for stability and to design a filter layer for underneath the riprap.

10. Standard for the timely stabilization of disturbed soil: By September 1, the Contractor shall seed and mulch all disturbed soils on areas having a slope less than 15%. If the Contractor fails to stabilize these soils by this date, then the Contractor shall take one of the following actions to stabilize the soil for late fall and winter.

    i. Stabilize the soil with temporary vegetation. By September 15, the Contractor shall seed the disturbed soil with winter rye at a seeding rate of 3 pounds per 1,000 square feet, lightly mulch the seeded soil with hay or straw at 75 pounds per 1,000 square feet, and anchor the mulch with plastic netting. The Contractor shall monitor the growth of the rye over the next 30 days. If the rye fails to grow at least three inches or fails to cover at least 75% of the disturbed soil before September 15, then the Contractor shall mulch the area for over-winter protection as described in item iii of this standard.

    ii. Stabilize the soil with sod. The Contractor shall stabilize the disturbed soil with properly installed sod by September 15. Proper installation includes the Contractor pinning the sod onto the soil with wire pins, rolling the sod to guarantee contact between the sod and underlying soil, and watering the sod to promote root growth into the disturbed soil.

    iii. Stabilize the soil with mulch. By September 15, the Contractor shall mulch the disturbed soil by spreading hay or straw at a rate of at least 150 pounds per 1,000 square feet on the area so that no soil is visible through the mulch. Prior to applying the mulch, the Contractor shall remove any snow accumulation on the disturbed area. Immediately after applying the mulch, the Contractor shall anchor the mulch with plastic netting to prevent wind from moving the mulch off the disturbed soil.

    iv. Stabilize all stockpiles with mulch within 24 hours.

11.0 SPECIAL MEASURES FOR SUMMER CONSTRUCTION

The summer period is generally optimum for construction in Maine, but it is also the period when intense short duration storms are most common, making denuded areas very susceptible to erosion,

when dust control needs to be the most stringent, and when the potential to establish vegetation is often restricted by moisture deficit. During these periods, the Contractor must:

1. Implement a program to apply dust control measures on a daily basis except those days where the precipitation exceeds 0.25 inch. This program shall extend to and include adjacent streets used by construction vehicles.

2. Spray any mulches with water after anchoring to dampen the soil and encourage early growth. Spraying may be required several times. Temporary seed may be required until the late summer seeding season.

3. Mulch, cover, and moisten stockpiles of fine-grained materials, which are susceptible to erosion. In the summer months, the potential for wind erosion is of concern, as well as erosion from the intense, short-duration storms, which are more prevalent in the summer months.

4. Take additional steps needed to control fugitive dust emissions to minimize reductions in visibility and the airborne disbursement of fine-grained soils. This is particularly important along the adjacent streets.

These measures may also be required in the spring and fall during the drier periods of these seasons.

12.0 SEDIMENTATION SUMPS

The sediment sumps shall be sized in accordance with the plan and specifications. The bottom of the sumps is intended to be used for temporary infiltration.

Discharge must be through a sand filter over an underdrained outlet to aid in the control of turbidity levels in the discharge. An emergency bypass shall be included and shall be constructed of 6" of stone overlaying filter fabric and discharge to undisturbed turf.

13.0 PERMANENT EROSION CONTROL MEASURES

The following permanent erosion control measures have been designed as part of the Erosion/Sedimentation Control Plan:

1. The drainage conveyance systems have been designed to intercept and convey the 25-year storm. In the case of open channels or swales, this includes the design of measures to resist scour of the channel.

2. All storm drainpipes shall have stabilization at their outlet to protect the outlet and receiving channel of the culverts from scour and deterioration. Installation details are provided in the plan set. The aprons shall be installed and stabilized prior to directing runoff to the tributary pipe or culvert. Orifices in hydraulic control structures will be protected with a wire mesh screen with an opening of no more than 25 percent of the orifice size and a surface are of at least 25 times the area of the orifice.

3. All areas disturbed during construction, but not subject to other restoration (paving, riprap, etc.), will be loamed, limed, fertilized, mulched, and seeded. Fabric netting, anchored with staples, shall be placed over the mulch in areas where the finish grade slope is greater than 10 percent. Native topsoil and wetland soils shall be stockpiled and temporarily stabilized with seed and mulch and reused for final restoration when it is of sufficient quality.

4. Permanent seeding shall be conducted only in April through May and in late summer until September 15.

5. A riprap plunge pool will be installed at the stormwater management discharges at the wetland edge to disperse the flows.

14.0 TIMING AND SEQUENCE OF EROSION/SEDIMENTATION CONTROL MEASURES

The Contractor must control fugitive dust emissions respect and not impede the neighboring land uses while controlling sediment laden runoff to 280 NTU or less. For all grading activities, the Contractor shall exercise extreme caution not to overexpose the site by limiting the disturbed area and shall stabilize any steep slopes within 24 hours if final slope grading and stabilization will not be completed within 7 days. Any final slopes shall have the specified erosion control measures installed within 7 days of final stabilization.

The following construction sequence shall be required, (unless otherwise authorized in writing by the Owner's project manager or authorized permit agent).

The description of the work is:

- Mark the Phase 1 work limits.
- Install safety fence and security signs around the perimeter of the site.
- Establish and install construction entrances with gates.
- Install silt fence or equivalent sediment barrier along the perimeter and other designated areas requiring silt fence or equivalent sediment barrier.
- Establish Dirtbag® area and pump system for dewatering activities.
- Construct sedimentation facilities with riprap discharge locations.
- Construct a diversion swale(s) to direct as much of the site to the sedimentation basins as possible.
- Install temporary seed and mulch around the perimeter of the temporary sedimentation facilities.

There is more flexibility for the contractor to schedule the work provided once the erosion control measures are in place. The measures shown on the erosion control drawing of the plan set are the measures that need to be installed as soon as practicable during construction in subsequent phases.

The underground facilities and treatment units shall not be activated until authorized by the design engineer or a certified erosion control professional who has signed an affidavit indicating they have reviewed the plans, Stormwater Management, Erosion Sediment Control Plan, Stormwater O&M Manual, and any State and Local site permits issued for the project.

15.0 CONTRACTING PROCEDURE

The onsite components of the project will be constructed by a General Contractor under contract to the Developer. Offsite improvements may be constructed by a General Contractor under contract to the owner. The Contractor shall submit a schedule for the completion of the work, which will satisfy the following criteria:

1. The construction sequence of Section M should generally be completed in the specified order; however, several separate items may be constructed simultaneously. Work must also be scheduled or phased to prevent the duration of areas exposed or susceptible to erosion as specified below. The intent of this sequence is to provide for erosion control and to have structural measures such as sediment barriers and construction entrances in place before large areas of land are denuded.
2. The work shall be conducted in sections which will:
   a) Limit the amount of exposed area to those areas in which work is expected to be undertaken during the preceding 30 days.
   b) Revegetate disturbed areas as rapidly as possible. All areas shall be permanently stabilized within 7 days of final grading and temporarily stabilized within 7 days of initial disturbance or before a predicted storm event of over ½" of rain.
   c) Incorporate planned inlets and drainage system as early as possible into the construction phase. The ditches shall be immediately lined or revegetated as soon as their installation is complete.
   d) Achieve the parking space numbers indicated in the construction phasing.
3. Once final grade has been established, the Contractor may choose to dormant seed the disturbed areas prior to placement of mulch and placement of fabric netting anchored with staples.
   a) If dormant seeding is used for the site, all disturbed areas shall receive 6" of loam and seed at an application rate of 5#/1,000 s.f.

      All areas seeded during the winter months will be inspected in the spring for adequate catch. All areas insufficiently vegetated (less than 75 percent catch) shall be revegetated by replacing loam, seed, and mulch.
   b) If dormant seeding is not used for the site, all disturbed areas shall be revegetated in the spring.
4. The area of denuded, non-stabilized construction shall be limited to the minimum area practicable. An area shall be considered to be denuded until the subbase gravel is installed in parking areas, or the areas of future loam and seed have been loamed, seeded, and mulched. The mulch rate shall be twice the rate specified in the seeding plan. [For example, 115#/1,000 s.f. x 2 = 230#/s.f.]
5. Within the exposed work area, temporary sedimentation sumps shall be provided any concentrated flow area with sand filter or chemical coagulation. Additional information is provided in prior sections of this narrative and on the Erosion Control Details of the plan set. Along the sedimentation sumps, barriers shall be provided at sufficient intervals to permit runoff to be accumulated to a maximum depth of 12" before overflowing.
6. The schedule shall be subject to the approval of the Owner.

7. The Contractor must maintain an accurate set of record drawings indicating the date when an area is first denuded, the date of temporary stabilization, and the date of final stabilization. On September 15 of any calendar year, the Contractor shall submit a detailed plan for stabilizing the site for the winter and a description of what activities are planned during the winter.

8. The Contractor must install any added measures which may be necessary to control erosion/sedimentation and fugitive dust emissions from the site, with adjustments made dependent upon forecasted and actual site and weather conditions.

9. The Contractor shall note that no area within 50 feet of a slope with a vertical drop of more than 3' in 50 feet shall remain denuded for a period of over 5 days before it is temporarily stabilized. Temporary stabilization shall be the installation of mulching. All other areas shall be stabilized within 7 days or before a predicted rain event. For construction between September 15 and April 15 of any calendar year, all areas shall be temporarily stabilized at the earlier time frames specified above.

10. Certain erosion control products (such as DirtGlue™) come in a form that a release could occur on the site or into the environs. The Contractor shall include MSDS information for all products that have the potential for release to the environment and shall be responsible for implementing a safety control program for proper handling of these materials on the site.

11. A notice and point of contact with cell phone number shall be posted at the trailer to permit access to the erosion records during normal work hours and in case of emergency at other times. All additions and construction records shall be copied via e-mail to the Owner.

    The Owner reserves the right to add additional personnel to this list at the pre-construction conference or at reasonable intervals during the project.

12. The Owner will provide a copy of the Maine Construction General Permit Notice of Intent acceptance letter to the Contractor. This letter shall be maintained at the site with the Erosion Control Plan.

13. Any revisions to the Erosion Control Plan must be authorized in writing by the Preparer of the Plan (Fay, Spofford & Thorndike) The Preparer of the Plan shall be permitted reasonable time to review and notify the city and other agencies of said changes. Revisions to the Erosion Control Plan will be required:

    a. Whenever the current provisions prove to be ineffective in minimizing pollutants in stormwater *discharges* from the site;

    b. Whenever there is a change in design, construction, or operation at the construction site that has or could have an effect on the discharge of pollutants; and

    c. To address issues or deficiencies identified during an inspection by the *qualified inspector*, the MaineDEP, City of Portland, or other regulatory authority.

14. Should the Owner notify the contractor that the activity on the site is in violation of the Erosion Control Plan, the Contractor shall at its sole cost correct the deficiencies and file a photographic log with a list of corrective actions with the Owner within 7 days of notification by the Owner.

15. The Contractor shall engage a qualified inspector to monitor the work. This inspector shall be approved by the Owner prior to the individual being engaged on the project. This inspection

shall be a part of the Contractor's Quality Control Plan for the project by the Contractor. The inspector's qualifications and duties that he shall perform are as follows:

a. Licensed Professional Engineer or Certified Professional in Erosion Control

b. Covered by Workman's Compensation Insurance

c. Experienced in this type of work, the specific erosion controls applicable to this project with a resume approved by the engineer

d. Compensated on a unit rate basis with no incentives for reduced costs or subject to any type of compensation for passing inspections

e. Approved by the Owner and the preparer of this plan

The *qualified inspector*s shall conduct site inspections in accordance with the following timetable:

a. Where soil disturbance activities are on-going, the *qualified inspector* shall conduct a site inspection at least once every seven (7) calendar days.

b. Where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the *qualified inspector* shall conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* shall notify the City's stormwater contact person or, in areas under the jurisdiction of a *regulated traditional land use control MS4*, the MS4 (provided the MS4 is not the *owner or operator* of the construction activity) in writing prior to reducing the frequency of inspections.

c. Where soil disturbance activities have been shut down with partial project completion, the *qualified inspector* can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the Erosion Control requirements and are operational. The *owner or operator* shall notify the City's stormwater contact person in writing prior to the shutdown. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the Contractor shall have the *qualified inspector* perform a final inspection and certify that all disturbed areas have achieved *final stabilization*, and all temporary, structural erosion and sediment control measures have been removed, and that all post-construction stormwater management practices have been constructed in conformance with the Erosion Control Plan by signing the "Final Stabilization" and "Post-Construction Stormwater Management Practice" certification statements on the Notice of Termination. The *owner or operator* shall then submit the completed Notice of Termination form to the City of Portland and MaineDEP.

At a minimum, the *qualified inspector* shall inspect all erosion and sediment control practices to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the Contract documents and Permit conditions, all areas of disturbance that have not achieved *final stabilization*, all points of discharge to natural surface water bodies located within, or immediately adjacent to, the property boundaries of the construction site, and all points of discharge from the construction site.

The *qualified inspector* shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

a. Date and time of inspection;

b. Name and title of person(s) performing inspection;

c. A description of the weather which shall be consistent with the National Weather Service Forecast Office, Portland-Gray, ME and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;

d. A description of the condition of the runoff at all points of discharge from the construction site and sampling to determine the turbidity in NTU's. This shall include identification of any *discharges* of sediment from the construction site. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

e. A description of the condition of all natural surface water bodies located within, or immediately adjacent to, the property boundaries of the construction site which received runoff from disturbed areas. This shall include identification of any *discharge* of sediment to the surface water body;

f. Identification of all erosion and sediment control practices that need repair or maintenance;

g. Identification of all erosion and sediment control practices that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

h. Description and sketch of areas that are disturbed at the time of the inspection and areas that have been stabilized (temporary and/or final) since the last inspection;

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s); and

k. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

Within one business day of the completion of an inspection, the *qualified inspector* shall notify the owner the appropriate contractor or subcontractor of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame, at its sole cost.

All inspection reports shall be signed by the *qualified inspector*. The inspection reports shall be maintained on site.

16. The Owner reserves the right to have quality assurance monitoring of the work. The Contractor shall, at its sole cost, cooperate with the Owner and their quality assurance monitoring of the work including maintaining an accurate schedule for performing the work. The Owner will notify the contractor if any particular elements of the work should be uncovered or available for observation by the Quality Assurance Monitor selected by the Owner. The Owner reserves the right to conduct the quality assurance monitoring during working hours at any time during the project.

16.0 PROVISIONS FOR MAINTENANCE OF THE EROSION/SEDIMENTATION CONTROL FEATURES

The project will be contracted to a General Contractor. The project is subject to the requirements of the local permits, and a state regulated Construction General Permit and City of Portland Site Plan Approval.

This project requires the Contractor to prepare a list and designate by name, address and telephone number all individuals who will be responsible for implementation, inspection, and maintenance of all erosion control measures identified within this section and as contained in the Erosion and Sedimentation Control Plan of the contract drawings. Specific responsibilities of the inspector(s) will include:

1. Execution of the Contractor/Subcontractor Certification contained in Appendix B by any and all parties responsible for erosion control measures on the site as required by the permit authorities.

2. Assuring and certifying the Owner's construction sequence is in conformance with the specified schedule of this section. A weekly certification stating compliance, any deviations, and corrective measures necessary to comply with the erosion control requirements of this section shall be prepared and signed by the inspector(s).

3. In addition to the weekly certifications, the inspector(s) shall maintain written reports recording construction activities on site which include:

    - Dates when major grading activities occur in a particular areas.
    - Dates when major construction activities cease in a particular area, either temporarily or permanently.
    - Dates when an area is stabilized.

4. Inspection of this project work site on a weekly basis and after each significant rainfall event (0.5 inch or more within any consecutive 24-hour period) during construction until permanent erosion control measures have been properly installed and the site has been stabilized. Inspection of the project work site shall include:

    - Identification of proper erosion control measure installation in accordance with the erosion control detail sheet or as specified in this section.
    - Determine whether each erosion control measure is properly operating. If not, identify damage to the control device and determine remedial measures.
    - Identify areas which appear vulnerable to erosion and determine additional erosion control measures which should be used to improve conditions.

- Inspect areas of recent seeding to determine percent catch of grass. A minimum catch of 90 percent is required prior to removal of erosion control measures.
- All erosion controls shall be removed within 30 days of permanent stabilization except for mulch and netting not detrimental to the project. Removals shall include but not be limited to all silt fence, hay bales, inlet protection, and stone check dams.
- Accumulated silt/sediment should be removed when the depth of sediment reaches 50 percent of the barrier height. Accumulated silt/sediment should be removed from behind silt fencing when the depth of the sediment reaches 6 inches.
- Silt sacks should be removed and replaced at least every three months and at any time where the weekly inspection reveals that siltation has significantly retarded the rate of flow through the silt sack.
- Discharges should be measured during storm events to document the turbidity of stormwater discharge is <280 NTU.

5. If inspection of the site indicates a change should be made to the erosion control plan, to either improve effectiveness or correct a site-specific deficiency, the inspector shall immediately implement the corrective measure and notify the Owner of the change.
6. Arranging for an on-site meeting prior to commencing winter construction to assure that all special winter construction measures will be implemented and to review the specific requirements of this plan for winter construction.

All certifications, inspection forms, and written reports prepared by the inspector(s) shall be filed with the Owner, and the Permit File contained on the project site. All written certifications, inspection forms, and written reports must be filed within one (1) week of the inspection date.

The Contractor has sole responsibility for complying with the erosion/sediment control report, including control of fugitive dust, and shall be responsible for any monetary penalties resulting from failure to comply with these standards.

Once construction has been completed, long-term maintenance of the stormwater management system will be the responsibility of the applicant. Inspection and Maintenance items with a list of maintenance requirements and frequency are described in a separate document. In the event of defective workmanship or any failure by the contractor and its subcontractors to adhere to the Standards set forth in these documents, the Contractor shall be responsible to correct, at its sole cost, any latent defects together with reimbursement of Owner for any expenses borne by the Owner up to the time of said correction. This provision shall remain in effect beyond any stated or implied warranty period.

17.0 PRECONSTRUCTION CONFERENCE

Prior to any construction at the site, representatives of the Contractor, the Owner, and the site design engineer and any personnel identified in the permit conditions shall meet to discuss the scheduling of the site construction and the designation of the responsible parties for implementing the plan. The Contractor shall be responsible for scheduling the meeting. Prior to the meeting, the Contractor will prepare a detailed schedule and a marked-up site plan indicating areas and components of the work and key dates showing date of disturbance and completion of the work. The Contractor shall conduct a meeting with employees and sub-contractors to review the erosion control plan, the construction techniques which will be employed to implement the plan, and provide a list of attendees and items

discussed at the meeting to the Owner. Three copies of the schedule, the Contractor's meeting minutes, and marked-up site plan shall be provided to the Owner.

18.0 APPENDICES

Appendix A – Seeding Plan

Appendix B –Sample Erosion Control Compliance Certification and Inspection Forms

Appendix C –DirtGlue™ Application and Use Requirements

19.0 PLAN REFERENCES

Drawings C-5.0 & C-6.0 to C-6.2 Erosion/Sediment Control Plan and Details

APPENDIX A

Seeding Plan

PERMANENT SEEDING PLAN (TURF AROUND PERIMETER)

Project: 421 Warren Avenue Commercial Complex

Site Location: Portland, Maine

X Permanent Seeding _____ Temporary Seeding

1. **Area to be Seeded:** Approximately 1.0 acre(s) or 40 /M. Sq. Ft.

2. **Instructions on Preparation of Soil:** Prepare a good seed bed for planting method use (do not overcompact).

3. **Apply Lime as Follows:** _____ #/acres or 138# /M Sq. Ft. or per soil test

4. **Fertilize:** __ pounds of _____ - _____N-P-K/ac.

   20 pounds of 3-27-5 N-P-K/M Sq. Ft. or per soil test

5. **Method of Applying Lime and Fertilizer:** Spread and work into the soil before seeding.

6. **Seed with the following mixture:**

   30% Perennial Rye
   35% Kentucky Bluegrass
   35% Penn Lawn Tall Fescue

7. **Mulching Instructions**: Apply at the rate of ___ tons per acre or 115 pounds per M. Sq. Ft.

8. **Application:**

Type	Unit#	Tons, Etc.
Total Lime	138	#/1,000 s.f.
Total Fertilizer	20	#/1,000 s.f.
Total Seed	8.0	#/1,000 s.f.
Total Mulch	115	#/1,000 s.f.
Total Other	0	0

9. **Remarks:**

Seeding dates April 15 to May 31 and August 1 until September 1. Permanent seeding should be made prior to September 1 or as a dormant seeding after the first killing frost and before the first snowfall. If seeding cannot be done within these seeding dates, temporary seeding and mulching shall be used to protect the site. Permanent seeding shall be delayed until the next recommended seeding period.

Fertilizer requirements shall be subject to actual test results of the topsoil used for the project. The Contractor shall be responsible for providing topsoil test results for pH and recommended fertilizer application rates to the Owner.

Seed mixture shall be fresh, clean, new crop seed. Seed may be mixed by an appropriate method on the site or may be mixed by the dealer. If the seed is mixed on the site, each variety shall be delivered in the original containers bearing the dealer's guaranteed analysis.

Deep tine aerate if soil is compacted.

If seed is mixed by the dealer, the Seeding Contractor shall furnish to the Owner the dealer's guaranteed statement of the composition of the mixture and the percentage of purity and germination of each variety.

Seed shall be purchased from a recognized distributor and shall test to a minimum percentage of 95% for purity and 85% for germination.

All loam shall have compost or peat admixtures to raise the organic content to 6%.

TEMPORARY SEEDING PLAN (EROSION CONTROL MIX)

Project: 421 Warren Avenue Commercial Complex

Site Location: Portland, Maine

__X__ Permanent Seeding __X__ Temporary Seeding

1. **Area to be Seeded:** Approximately 0.5 acre(s) or _____/M. Sq. Ft.

2. **Instructions on Preparation of Soil:** Prepare a good seed bed for planting method used.

3. **Apply Lime as Follows:** ____ #/acres or 138# /M Sq. Ft. or per soil test

4. **Fertilize:** __ pounds of _____ - _____N-P-K/ac.

   20 pounds of 10-10-10 N-P-K/M Sq. Ft. or per soil test

5. **Method of Applying Lime and Fertilizer:** Spread and work into the soil before seeding.

6. **Seed with the following mixture:**

Annual Rye-grass	50%
Timothy	25%
Winter Rye	25%

7. **Mulching Instructions:** Apply at the rate of tons per acre or 230 pounds per M. Sq. Ft.

8. **Application:**

Type	Unit#	Tons, Etc.
Total Lime	138	#/1,000 s.f.
Total Fertilizer	20	#/1,000 s.f.
Total Seed	1	#/1,000 s.f.
Total Mulch	230	#/1,000 s.f.
Total Other		

9. **Remarks:**

   For areas with slopes >10% and fall and winter erosion control areas, mulch netting shall be used per manufacturer's specifications.

   Permanent seeding should be made prior to September 1 or as a dormant seeding after the first killing frost and before the first snowfall. If seeding cannot be done within these seeding dates, temporary seeding and mulching shall be used to protect the site. Permanent seeding shall be delayed until the next recommended seeding period.

   Fertilizer requirements shall be subject to actual test results of the topsoil used for the project. The Contractor shall be responsible for providing topsoil test results for pH and recommended fertilizer application rates to the Owner.

   Seed mixture shall be fresh, clean, new crop seed. Seed may be mixed by an appropriate method on the site or may be mixed by the dealer. If the seed is mixed on the site, each variety shall be delivered in the original containers bearing the dealer's guaranteed analysis. If seed is mixed by the dealer, the Seeding Contractor shall furnish to the Owner the dealer's guaranteed statement of the composition of the mixture and the percentage of purity and germination of each variety.

   Seed shall be purchased from a recognized distributor and shall test to a minimum percentage of 95% for purity and 85% for germination.

   All loam shall have compost or peat admixtures to raise the organic content to 6%.

APPENDIX B

Sample Erosion Control Compliance Certification and Inspection Forms

MAINE CONSTRUCTION GENERAL PERMIT
CONTRACTOR/SUBCONTRACTOR CERTIFICATION

PROJECT INFORMATION

Project Name: 421 Warren Avenue Commercial Complex

Address: Portland, Maine

CONTRACTOR/SUBCONTRACTOR INFORMATION

Firm Name:

Address:

Telephone:

Type of Firm:

CERTIFICATION STATEMENT

"I certify under penalty of law that I understand the terms and conditions of the Maine Construction General Permit (MCGP) permit that authorizes the stormwater discharges associated with construction activity from the project site identified as part of this certification."

_____
Signature

_____
Typed Name

_____
Title

_____
Date

MAINE CONSTRUCTION GENERAL PERMIT

INSPECTION REPORT

PROJECT INFORMATION

Project Name: 421 Warren Avenue Commercial Complex

Address: Portland, Maine

INSPECTOR INFORMATION

Inspector Name: _____

Firm: _____

Title: _____

Qualifications: _____

Weather and Soil Conditions: _____

INSPECTION SUMMARY

Date of Inspection: _____

Major Observations: _____

_____

_____

_____

1. Attach the following to the Report:

   a. A description of the condition of the runoff at all points of discharge from the construction site and sampling to determine the NTU. This shall include identification of any *discharges* of sediment from the construction site. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

   b. A description of the condition of all natural surface water bodies located within, or immediately adjacent to, the property boundaries of the construction site which received runoff from disturbed areas. This shall include identification of any discharge of sediment to the surface water body;

   c. Identification of all erosion and sediment control practices that need repair or maintenance.

   d. Identification of all erosion and sediment control practices that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

   e. Description and sketch of areas that are disturbed at the time of the inspection and areas that have been stabilized (temporary and/or final) since the last inspection;

f. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPP and technical standards;

g. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s); and

h. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

2. Within one business day of the completion of an inspection, the *qualified inspector* shall notify the owner the appropriate contractor or subcontractor of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

3. All inspection reports shall be signed by the *qualified inspector*. The inspection reports shall be maintained on site and distributed via email at the time of filing.

THE FACILITY IS IN COMPLIANCE WITH THE STORMWATER POLLUTION PREVENTION PLAN WITH THE FOLLOWING EXCEPTIONS:

_____

_____

_____

_____

ACTIONS NECESSARY TO BRING FACILITY INTO COMPLIANCE:

_____

_____

REQUIRED MODIFICATIONS TO STORMWATER POLLUTION PREVENTION PLAN (MUST BE SUBMITTED WITHIN 2 DAYS OF INSPECTION TO OWNER FOR APPROVAL):

_____

_____

_____

_____

CERTIFICATION STATEMENT:

"I certify under penalty of law that this document and all Appendices were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the systems, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of find and imprisonment for knowing violations."

_____
Signature

_____
Typed Name

_____
Title

_____
Date

APPENDIX C

DirtGlue™ Application and Use Requirements

DIRTGLUE™
APPLICATION INSTRUCTIONS FOR DUST CONTROL

METHODOLOGY

A. Heavy Duty Driving Surface

Application Rates (per surface acre)

DirtGlue™ Polymer Emulsion:	2,400 gallons/acre
Water:	3,600 -14,400 gallons/acre

Application Process

1. Loosen the existing soil using a scarifying attachment mounted on a grader (or similar piece of equipment) or a tractor with an agriculture disk attachment. If additional soil is required, it should be applied and mixed into the existing soil at this time. It is important to loosen the soil to ensure penetration of the DirtGlue™/water mixture into the soil.
2. Apply DirtGlue™/water mixture to soil using a water truck equipped with a gravity feed drip bar, spray bar, or automated distributor truck. Multiple passes will be necessary to get the desired amount of DirtGlue™ polymer emulsion for the specific application. Multiple passes will also ensure gradual, thorough saturation of the soil.
3. Thoroughly blend the DirtGlue™/water mixture into the soil with a rototiller, "S" harrow, or similar attachment. The soil must be evenly mixed and saturated with the DirtGlue™/water mixture to a depth of four (4") inches.
4. Grade the soil to finish grade with a grader, a small dozer or other suitable equipment.
5. Compact the soil with a vibratory roller. The final compaction should be greater than asphalt (Strive for 100% compaction, but always in excess of 95%).
6. Immediately after compacting, apply a topcoat of DirtGlue™ polymer emulsion to seal the road surface. In order to ensure a longer life and superior performance of the application, an additional coat should be applied between twenty four to forty eight hours after completion and then annually as an ongoing maintenance procedure. This topcoat should be applied at a rate of 250 gallons per surface acre.

B. Temporary Light Duty Driving Surface

This type of application will provide acceptable performance when used by cars and light trucks. It is not intended for constant use by heavy-duty trucks and/or tracked construction equipment. Areas that will be used by this type of equipment should be treated as a heavy-duty application as noted above.

Application Rates (per surface acre)

DirtGlue™ Polymer Emulsion:	1,200 gallons/acre
Water:	3,600-6000 gallons/acre

Application Process:

1. Loosen the existing soil for a depth of two (2") inches using a scarifying attachment mounted on a grader (or similar piece of equipment) or a tractor with a rototiller or agriculture disk attachment. If additional soil is required, it should be applied and mixed into the existing soil

at this time. It is important to loosen the soil to ensure penetration of the **DirtGlue™/**water mixture into the soil.

2. Apply **DirtGlue™/**water mixture to soil using a water truck equipped with gravity feed drip bar, spray bar, or automated distributor truck. Multiple passes will be necessary to get the desired amount of DirtGlue™ polymer emulsion for the specific application. Multiple passes will also ensure gradual, thorough saturation of the soil. Do not apply the **DirtGlue™/**water mixture so heavy as to create run-off.
3. Grade the soil to finish grade with a grader, a small dozer or other suitable equipment.
4. Compact with a vibratory roller. The final compaction should be greater than asphalt (Strive for 100% compaction, but always in excess of 95%).
5. Immediately after compacting, apply a topcoat of **DirtGlue™** polymer emulsion to seal the road surface. In order to ensure a longer life and superior performance of the application, an additional coat should be applied between twenty four to forty eight hours after completion and then again annually as an ongoing maintenance procedure.

C. Dust & Erosion Control (Non-driving Areas)

This type of application is intended for pedestrian use only. Vehicular use will break through the skin and adversely affect the performance of the application. Areas that will require any vehicular use should be treated as a light-duty application as noted above or retreated as traffic damage occurs.

Application Rates (per surface acre)

DirtGlue™ Polymer Emulsion:	300 gallons (windblown dust control) 600 gallons (bank stabilization, erosion/silt, run-off control)
Water:	2,000-6,000 gallons

Application Process

1. Apply *DirtGlue*™/water mixture to existing soil using a water truck equipped with a gravity feed spray bar or tank and pump (i.e. hydro seeder).
2. Add *DirtGlue*™ to water rather than water to *DirtGlue*™ or place a fill hose at bottom of tank, underneath surface of liquid to prevent foaming.
3. When applying *DirtGlue*™/water mixture, dispense large droplets. Avoid any fine mist. <u>The intent is to apply a sheet of liquid onto the soil</u>.
4. It is important to determine the moisture content of the soil prior to starting an application. The moisture content will have an effect on the dilution ratio of the *DirtGlue*™/water mixture. Your *DirtGlue*™ representative will assist you in determining the correct dilution ratio for the conditions on your site.
5. Temperature and, to a lesser extent, humidity have a significant effect on curing/drying time. Testing has shown that applications should be done only when the air temperature will be above 50° F for at least 72 hours following the application. Soil temperature must be above 40° F for several days.
6. The *DirtGlue*™ application must be protected from the rain until the curing process has formed a skin on the surface. Uncured *DirtGlue*™ is water soluble. If the application is exposed to rain before it has the opportunity to cure, the rainwater will dilute the polymer and wash it out of the soil. If this happens, the application will not be as strong.

CONDITIONS FOR USE OF DIRTGLUE™ (REGISTERED TRADEMARK OF DIRTGLUE™ ENTERPRISES)
APPROVED MATERIALS LIST

Applicant: DirtGlue™ Enterprises

General Conditions

1. DirtGlue™ Enterprises shall ensure that every applicator of DirtGlue™ is provided a copy of these conditions.

2. These Conditions do not override the need for any applicator to obtain permits (including DEP permits) or approvals that may be required (e.g., use associated with activities in or near regulated wetlands, surface waters, or other regulated natural resources).

3. DirtGlue™ shall only be used as stated in these conditions and shall not be mixed with any other chemicals, including petroleum products.

4. No application shall be conducted when the National Weather Service forecasts greater than 25% probability of precipitation in the application area to occur within 24 hours, or the temperature will drop below 35° F anytime within 24 hours after the application.

5. Applications shall not be conducted when the ground is saturated (due to precipitation or wetting) as defined by visible pools of water at or in the vicinity of the application, in order to prevent movement of DirtGlue™ beyond the shoulder of the road.

6. DirtGlue™ must not be applied or handled in a manner that could result in spillage or application within 100 feet of a wetland regulated by New York State, or 50 feet of all other water bodies and bridges.

7. Any spill which could enter the waters of the state shall be reported to the DEC Spills Hotline within two hours (1-800-457-7362). Any required response (including any needed cleanup) in addition to that being conducted shall then be determined by the DEC regional office.

8. The time of application shall be chosen to take meteorological conditions into account, to avoid significant potential airborne or odor impacts.

9. Prior to application, DirtGlue™ Material Safety Data Sheet shall be provided to applicators and others who would come in proximity or contact with the material.

APPENDIX H

INSPECTION & MAINTENANCE MANUAL FOR STORMWATER MANAGEMENT AND RELATED STORMWATER FACILITIES

(NOT INCLUDED WITH THIS SUBMISSION)