12. STORMWATER MANAGEMENT PLAN & CALCULATIONS

12.1 PROJECT BACKGROUND

A detailed stormwater management design was submitted as part of the original application for the Portland Technology Park. The site was anticipated to include a total of seven buildings, collectively totaling 122,000 square feet of gross floor space. Each building would have associated paved parking areas, and a paved access road and utility corridor would extend through the site. A system of gravel wetlands and underdrained soil filters were designed to provide stormwater treatment and flooding control to manage stormwater for the entire site.

A portion of the roadway and three gravel wetlands have been constructed. This permit application is addressing the development of one lot within the Technology Park, LCE 4. This lot will take advantage of stormwater treatment from one of the already completed gravel wetlands (Gravel Wetland 4) and one additional gravel wetland to be constructed (Gravel Wetland 8). In addition, with required site grading changes, a gravel wetland has been eliminated from the original design (Gravel Wetland 9).

The proposed LCE 4 layout differs from the layout as defined in the original application drawings. The building shape has changed and the footprint has been reduced from 10,000 SF (20,000 SF in two stories) to 9,500 SF (19,000 SF in two stories) Parking layouts have been modified, and 8 fewer spaces are being proposed.

Existing drainage patterns and features are shown on Figure 12-1, Pre-Development Drainage Area Map. The figure from the original application has been utilized for this new application, as the same undeveloped pre-development condition is being considered. The Technology Park site is relatively flat, with the exception being an area of significant relief in the northeast corner and along the southern edge (forested drainage channels), and contains approximately ten acres of forested wetlands. The plan delineates the site into seven distinct drainage areas, two of which (Subcatchments 1 and 2) discharge to adjacent land to the east of the site noted to be owned by Energy East Foundation, conservation land that falls within the Resource Protection Zone. Drainage from this land flows into the tidal Fore River Estuary System. The remaining five subcatchments (Subcatchments 3 through 7) discharge through forested drainage channels to a CMP power distribution Right-of-Way (ROW) south of the site, where they flow into the former Oxford-Cumberland Canal, which is now a forested stream channel along the southern edge of the CMP ROW. This stream channel/canal ultimately discharges into the tidal Fore River Estuary System.

The proposed drainage structures and features are shown on Figure 12-2, Post-Development Drainage Area Map. This figure has been updated to show the changes proposed for LCE 4. This plan identifies proposed grades, proposed surface features, and stormwater management systems, including gravel wetlands and underdrained soil filter systems, to treat and detain stormwater runoff. The total proposed impervious area for the site at full build-out is 9.31 acres. Total disturbed and developed area for the site at full build-out is 13.7 acres.

Adequate provisions have been made to collect, treat and detain the required amount of stormwater runoff generated from the developed area of the site. Eleven proposed gravel wetlands and five proposed underdrained soil filters, dispersed throughout the site, have been designed with outlet structures to store and treat stormwater volumes generated onsite from the 2-year, 10-year and 25-year, 24-hour storm events. The proposed stormwater management strategy for the site manages and discharges stormwater close to the source in an attempt to maintain the pre-development hydrology of the site. Further, rock sandwiches are proposed beneath portions of the road to reduce channelized flow where drainage crosses the roadway, and to better mimic the natural pre-development site hydrology.

The HydroCAD model has been updated to reflect the changes for LCE 4. The drainage areas for Gravel Wetlands 4 and 8 have changes, and Gravel Wetland 8 has been completely redesigned. Gravel Wetland 9 was eliminated and drainage will be re-directed to Gravel Wetland 7. In addition, the new Chapter 500 Stormwater regulations, adopted in August 2015, define new standard rainfall amounts for the 2-year, 10-year and 25-year, 24-hour storm events. Both the pre and post HydroCAD stormwater models have been updated to reflect these new rainfall amounts, and the resulting changes in flow are reported in the following section.

12.2 APPLICABLE REGULATIONS

Applicable regulations that govern stormwater management on this site include the State of Maine Department of Environmental Protection (MaineDEP) Chapter 500 Stormwater Management Law, MaineDEP Site Law Standards, Section 5 of the City of Portland Technical Standards, Chapter 32 of the City of Portland Code of Ordinances, and the Maine Stormwater Best Management Practices (BMP) Manual. The project will disturb more than one acre of area and will result in more than one acre of new impervious area. In addition, the project is being reviewed under MaineDEP Site Law regulations, which require conformance with Chapter 500 Basic Standards, General Standards, and Flooding Standards. The project will be required to meet the standards for the management of stormwater discharging to freshwater or coastal wetlands. The Fore River Estuary System is not listed as an urban impaired stream in Chapter 502 of the MaineDEP Stormwater Regulations; therefore, the project is not required to meet the urban impaired stream standard.

12.3 BASIC STANDARDS (SOIL EROSION AND SEDIMENTATION CONTROL)

According to the MaineDEP Chapter 500 Stormwater Regulations, "a project disturbing one acre or more must meet the basic standards". In addition, the project is subject to Site Law, which requires conformance with the Basic Standards. These standards address erosion and sedimentation control, inspection and maintenance, and good housekeeping practices. The application includes erosion and sediment control plans, details and notes. These notes cover good housekeeping practices. The Erosion and Sediment Control Plan for the proposed project is provided within Section 12.7 of this Report.

12.4 GENERAL STANDARDS (WATER QUALITY)

In addition to meeting the basic standards, the project must also meet the general standards. The MaineDEP Chapter 500 Stormwater Regulations require that at least 80% of the site be treated through the use of wetponds, filtration, infiltration, or buffers. Further, the 80% of the site that is treated must include at least 95% of the site's impervious area. MaineDEP regulations allow for a linear portion of a site to meet a reduced rate of treatment. Linear portions are required to treat at least 50% of the developed area and 75% of the impervious area. These requirements have been met through the use of eleven gravel wetlands and five underdrained soil filters located on the site. This stormwater management approach was approved as part of the original permit issued in 2012. Gravel wetlands are proven to provide excellent water quality treatment in similar applications, as researched and reported by the University of New Hampshire's Stormwater Center. The project site conditions lend well to the use of gravel wetland systems, considering the forested wetland hydrology, low permeability soils and high groundwater table. Table 12-1 below outlines the treated areas and calculated percentages demonstrating conformance with the MaineDEP Chapter 500 standards. Figure 12-4 gives a visual representation of treatment areas for the entire site.

Table 12-1: Portland Technology Park Water Quality Treatment Percentages

Water Quality Treatment Percentages					
		Total Area (Acres)	**Area Treated (Acres)**	**Percent Treated**	**Percent Required**
Non-Linear Portion	Impervious Area	7.95	7.72	97%	95%
	Developed Area	11.3	9.13	81%	80%
Linear Portion	Impervious Area	1.37	1.24	91%	75%
	Developed Area	2.37	1.65	69%	50%

The new LCE 4 layout has resulted in some minor modifications to the impervious, developed, and treated areas within the Technology Park. The total impervious area has been increased from 9.1 acres of impervious areas as originally permitted to 9.31 acres. This impervious area includes the surface areas of the gravel wetlands. Gravel Wetland 8 increased in size, Gravel Wetland 9 was eliminated, and the impervious surface on the site (pavement, roof, etc.) was

increased, resulting in a net increase in impervious surface. Developed area within the Technology Park has increased from 13.0 acres to 13.7 acres due to the expansion of the LCE 4 site. Required levels of treatment will continue to be exceeded for all impervious and developed areas. It is noted, that as the layout changed for LCE 4, the same will occur for each of the subsequent developed lots. Impervious areas, developed areas, and treatment levels will be reviewed at each stage of development to ensure compliance with the standards.

12.4.1 Gravel Wetland 4

A portion of the LCE 4 site will be directed to the previously constructed Gravel Wetland 4. The building's roof will drain to this wetland, as will the northern building terraces, landscaping areas, and parking areas. A shallow swale has been graded between the building and the wetland, and the area will be landscaped and will serve as a vegetated swale to direct stormwater from the parking lot and terraces back to Gravel Wetland 4. This vegetated swale area will provide some pre-treatment for the stormwater prior to it entering the gravel wetland, and this area has been incorporated into the available storage volume at the Gravel Wetland.

The sizing of this gravel wetland to meet minimum surface area, volume, and sediment forebay requirements with the new site layout has been confirmed, and is summarized in Tables 12-2, 3, and 4 below. The gravel wetland continues to meet length to width ratio requirements as summarized in Table 12-5.

The top of berm elevation within Gravel Wetland 4 is 68.8 feet. Based on the updated HydroCAD model, the peak stormwater elevation due to a 25-year storm event will be 68.01. Approximately 9.48 inches of freeboard is provided at the road. The elevation of the parking lot at the northern end of the vegetated swale is 68.2, providing only 2.28 inches of freeboard; however, drainage back into the parking lot in a significant storm event will not be an issue. The finish floor elevation of the building is 70.25, approximately 2.24 feet higher than the peak elevation in the 25-year storm event. Site flooding during a 25-year storm event due to overflow of Gravel Wetland 4 will not be a concern.

12.4.2 Gravel Wetland 8

This gravel wetland has been designed to meet minimum surface area, volume, and sediment forebay requirements, as summarized in Tables 12-2, 3, and 4 below. The gravel wetland also meets length to width ratio requirements as summarized in Table 12-5.

The top of berm elevation has been designed at 66.6 feet. The 25-year storm peak stormwater elevation is 65.83 feet, as calculated by the HydroCAD model. Approximately 9.24 inches of freeboard will be provided.

12.4.3 Gravel Wetland 7

With the elimination of Gravel Wetland 9, Gravel Wetland 7 will now receive greater flows. The surface area, volume, sediment forebay, and length to width ratio calculations have all be reconfirmed and are summarized in the tables below. The top of berm elevation remains at 68.4 feet, with a new 25-year storm peak stormwater elevation of 67.9 inches. The gravel wetland design provides for 6 inches of freeboard.

12.4.4 Gravel Wetland Summary

All gravel wetlands have been designed based on the most recent University of New Hampshire specifications. Freeboard during the 25-year storm event will provide for adequate protection for each of the three modified gravel wetlands. The following tables summarize the sizing for the three modified gravel wetlands described above.

Table 12-2: Gravel Wetland Surface Area Calculations

Gravel Wetland	Total Drainage Area (acre)	% Impervious	Impervious Area (acre)	Pervious Area (acre)	Surface Area Required** (acre)	Surface Area Required (SF)	Surface Area Provided (SF)
4	1.30	0.64	0.84	0.46	0.05	2225	4633
7	0.60	0.65	0.39	0.21	0.02	1029	4339
8	1.40	0.76	1.07	0.33	0.06	2619	3229

***Required Surface Area includes 5% Impervious area plus 2% Pervious area.*

Table 12-3: Gravel Wetland Volume Calculations

Gravel Wetland	Total Drainage Area (acre)	% Impervious	Impervious Area (acre)	Pervious Area (acre)	Volume Required** (acre-feet)	Volume Required (CF)	Actual Volume (CF)
4	1.30	0.64	0.84	0.46	0.09	3708	11053
7	0.60	0.65	0.39	0.21	0.04	1715	7129
8	1.40	0.76	1.07	0.33	0.10	4365	4916

***Required Volume includes 1" over Impervious area plus 0.4" over Pervious area.*

Table 12-4: Gravel Wetland Forebay Calculations

Gravel Wetland	Forebay Required** (CF)	Actual Forebay (CF)
4	371	723
7	171	691
8	437	525

***Required Forebay is 10% of Total Volume Required.*

Table 12-5: Gravel Wetland Length-to-Width Ratio

Gravel Wetland	Cell #	Length (ft) (min 15)	Width (ft)	Ratio (min 0.5)
4	1	40	45	0.89
4	2	60	30	2.00
7	1	90	20	4.50
7	2	90	20	4.50
8	1	55	15	3.67
8	2	50	30	1.67
8	3	65	15	4.33

12.5 FLOODING STANDARD

In addition to meeting the basic and general standards, the project is required to meet the flooding standard. The MaineDEP Chapter 500 Stormwater Regulations indicate that the stormwater management system must detain, retain, or result in the infiltration of the stormwater flows from the 24-hour storm of the 2-, 10- and 25-year frequencies such that peak flows from the post-development design of the site do not exceed those from the pre-development design.

Stormwater modeling was performed using HydroCAD Stormwater Modeling System software by Applied Microcomputer Systems. HydroCAD uses TR-20 runoff calculation methodology. The HydroCAD output from both the pre- and post-development models is attached for your reference.

The runoff curve numbers (CN) for the subcatchments (drainage areas) have been computed using the TR-55 methodology. The subcatchments were divided based on land use, and these acreage measurements were used to compute a weighted (composite) CN.

The time of concentration (Tc) paths for the subcatchments were selected to represent the most hydrologically remote point of the watershed. The Tc paths are shown on the attached Pre-Development and Post-Development Stormwater Plans, Figures 12-1 and 12-2 respectively. Note that the Tc computations contain time calculations using TR-55 sheet flow, shallow concentrated flow, and channel (pipe) flow equations.

Subcatchment areas and flowpath determinations were based on the survey and proposed contours. The property boundary was used as the most downstream point of the stormwater analysis in both the pre and post development calculations.

Post-Development subcatchment areas and Tc paths for a portion of the site have changed due to changes to LCE 4. In addition, the rainfall data used for modeling has been updated by the MaineDEP. The HydroCAD model has been updated to reflect these changes. All other conditions, including soil types and curve numbers, have remained the same as originally modeled and approved.

12.5.1 Pre-Development Conditions

Although a portion of the roadway has been constructed, the Pre-Developed condition considering no development, as previously submitted, will continue to be used. The rainfall events have been updated, and the HydroCAD model re-run, and the output of the model is attached. Results of the model are summarized later in this report.

12.5.2 Post-Development Conditions

The Post-Development condition remains primarily as previously defined, with some minor modifications to subcatchments to account for the proposed LCE 4 development which differs from the original submission.

The proposed overall Technology Park development includes construction of a new road and building sites with associated stormwater infrastructure and utilities. At full build out, the site will contain seven office buildings. The total impervious area for the site is 9.31 acres. Total developed area for the site is 13.7 acres. The post-development drainage system will operate as thirty-six distinct drainage areas (subcatchments). Table 6 describes how the post development subcatchments relate to the pre development subcatchment study points (SPs) and drainage areas. Table 12-7 describes the individual subcatchments for the post development model. Subcatchments that have changed in area since the previous submission are highlighted in gray. Figure 12-3 shows the locations of the post-development subcatchment areas.

Table 12-6: Post Development Subcatchment Routing

Study Point/Drainage Area	Subcatchments
1	0S, 1S, 2S, 3S, 4Sa, 4Sb, 4Sc, 5S, 6S, 8S
2	7S, 9S, 11S
3	17S
4	18S
5	10S, 12S, 13S, 14S, 15S, 16S, 19S, 20S, 21S, 23S, 29S
6	22S, 24S, 25S, 26S, 27S, 28S, 30S, 32S, 34S
7	31S, 33S, 35S, 36S

Table 12-7: Post Development Subcatchment Descriptions

Subcatchment	Discharge Point	Includes
0	Swale to SP1	Access road, grassed area
1	Swale to SP1	Access road, grassed area, undisturbed area
2	Culvert under main entrance to SP1	Undisturbed area
3	Soil Filter 3 to SP1	Parking lot
4a	SP1	Undisturbed area, grassed area
4b	Soil Filter 1 to SP1	Undisturbed area, grassed area
4c	Soil Filter 2 to SP1	Undisturbed area, grassed area
5	Soil Filter 4 to SP1	Building 1
6	Soil Filter 4 to SP1	Parking lot, grassed area
7	Soil Filter 5 to SP2	Parking lot, sidewalk
8	Soil Filter 4 to SP1	Parking lot
9	Soil Filter 5 to SP2	Parking lot, driveway, sidewalk, grassed area
10	Gravel Wetland 1 to SP5	Access road, sidewalk
11	SP2	Undisturbed area, grassed area
12	Gravel Wetland 2 to SP5	Parking lot, sidewalk
13	Gravel Wetland 3 to SP5	Building 2
14	Gravel Wetland 3 to SP5	Access Road, parking lot, sidewalk, grassed area
15	SP5	Undisturbed area, grassed area
16	SP5	Undisturbed area, grassed area
17	SP3	Undisturbed area
18	SP4	Undisturbed area, pervious paver area

Subcatchment	Discharge Point	Includes
19	SP5	Undisturbed area, sidewalk, grassed area, pervious paver area
20	Gravel Wetland 4 to SP5	Building 4
21	Gravel Wetland 5 to SP5	Building 3
22	Gravel Wetland 8 to SP6	Parking lot, sidewalk, access road
23	Gravel Wetland 4 to SP5	Access road, parking lot, grassed area, sidewalk
24	SP6	Undisturbed area, grassed area
25	Gravel Wetland 8 to SP6	Access road, sidewalk
26	Gravel Wetland 7 to SP6	Building 5
27	Gravel Wetland 7 to SP6	Parking lot, sidewalk, grassed area
28	Gravel Wetland 6 to SP6	Parking lot, driveway, grassed area
29	SP5	Undisturbed area, grassed area, pervious paver area
30	SP6	Undisturbed area, grassed area
31	Gravel Wetland 12 to SP7	Building 6
32	Gravel Wetland 10 to SP6	Building 7
33	Gravel Wetland 12 to SP7	Parking lot, sidewalk, grassed area
34	Gravel Wetland 10 to SP6	Driveway, parking lot, grassed area, sidewalk
35	Gravel Wetland 11 to SP7	Parking lot, grassed area
36	SP7	Undisturbed area, grassed area

Note: Subcatchments that have changed from the previous submission are highlighted above in gray

Adequate provisions have been made to collect and discharge all stormwater generated from the developed area of the site. Eleven gravel wetlands and five underdrained soil filters have been designed to store and treat stormwater volumes generated onsite from the 2-year, 10-year, and 25-year, 24-hour storm event. These rainfall amounts have increased from the previous submittal to reflect the newly approved Chapter 500 stormwater management rules.

The detention time of the water quality volume for each of the gravel wetlands and underdrained soil filters was evaluated for compliance with the MaineDEP required 24-48 hour detention time, as shown in Table 12-8 below. Where necessary, an orifice was added to the outlet to slow down flow to achieve the required detention time. The table lists the detention times calculated based on the HydroCAD outputs for the 1-inch 24-hour storm event.

Table 12-8: Treatment Detention Times

Treatment System	Start Detention Hour	Stop Detention Hour	Detention Time (Hours)
Gravel Wetland #1	6	32	26
Gravel Wetland #2	8	38	30
Gravel Wetland #3	6	42	36
Gravel Wetland #4	6	56	50*
Gravel Wetland #5	6	32	26
Gravel Wetland #6	6	34	28
Gravel Wetland #7	6	40	34
Gravel Wetland #8	8	34	26
Gravel Wetland #9	Eliminated		
Gravel Wetland #10	6	40	34
Gravel Wetland #11	8	36	28
Gravel Wetland #12	6	32	26
Underdrained Soil Filter #1	12	24	12*
Underdrained Soil Filter #2	12	20	8*
Underdrained Soil Filter #3	10	40	30
Underdrained Soil Filter #4	6	34	28
Underdrained Soil Filter #5	8	38	30

Stormwater systems listed above with an asterisk next to their detention time value do not meet the required 24-48 hour timing requirement. Underdrained Soil Filter's 1 and 2 as modeled did not meet the required time limit when previously approved, and continue to have shorter detention times. Both filters have been designed to just exceed the minimum surface area required and as such even with a very small orifice; the filters do not detain the water quality volumes for at least 24 hours. This is due to the very small contributing area, which is all pervious. A waiver from this requirement for these specific soil filters was requested as part of the original application. We request that this waiver be maintained.

Gravel Wetland 4 exceeds the maximum 48 hour detention time by two hours. This gravel wetland is already constructed. It will be receiving a larger drainage area, and will have greater flow, requiring longer detention time. The gravel wetland is larger and has been designed to assist with flood control. The original design for Gravel Wetland 4 had a detention time of 46 hours, and has increased to 50 hours. We request a waiver from this requirement for this Gravel Wetland.

Gravel Wetland 9 has been eliminated. Drainage that would have been directed to Gravel Wetland 9 will be directed to Gravel Wetland 7.

The stormwater outlet control structures are sized to attenuate the flow and therefore provide flood control so that the rate of runoff after construction of the proposed project is no greater than the pre-development rate of runoff in the design storm conditions.

HydroCAD was used to model stormwater flows from the site based on the modeling assumptions described above. Table 12-9 below provides a summary of the peak flow rates for the 24-hour, 2-, 10- and 25-year Type-III storm events. As shown below, there is a net decrease in the post-development rate of runoff during all storms at the modeled point of interest.

Table 12-9: Stormwater Summary of Results

Study Points	Return Period (24-hr Storm) 2-Year Storm Event		Return Period (24-hr Storm) 10-Year Storm Event		Return Period (24-hr Storm) 25-Year Storm Event	
	Peak Runoff Rate (cfs)	Runoff Volume (acre-feet)	Peak Runoff Rate (cfs)	Runoff Volume (acre-feet)	Peak Runoff Rate (cfs)	Runoff Volume (acre-feet)
Pre-Development SP1	2.30	0.32	4.93	0.65	7.28	0.95
Pre-Development SP2	4.15	0.65	8.62	1.32	12.49	1.91
Energy East Subtotal	**5.69**	**0.97**	**12.11**	**1.97**	**17.68**	**2.86**
Pre-Development SP3	0.60	0.07	1.28	0.14	1.87	0.20
Pre-Development SP4	1.58	0.235	3.20	0.47	4.59	0.68
Pre-Development SP5	5.89	1.31	11.19	2.49	15.62	3.49
Pre-Development SP6	8.29	1.23	15.63	2.32	21.74	3.26
Pre-Development SP7	3.92	0.54	7.38	1.03	10.27	1.44
Canal Subtotal	**17.52**	**3.39**	**33.54**	**6.44**	**47.00**	**9.07**
Pre Total	**23.17**	**4.35**	**45.54**	**8.41**	**64.50**	**11.93**
Post-Development SP1	2.14	0.60	4.67	1.03	6.79	1.38
Post-Development SP2	3.71	0.65	8.40	1.27	12.65	1.82
Energy East Subtotal	**5.32**	**1.25**	**11.53**	**2.30**	**17.74**	**3.20**
Post-Development SP3	0.60	0.07	1.28	0.15	1.87	0.21
Post-Development SP4	1.51	0.25	3.13	0.51	4.54	0.73
Post-Development SP5	5.40	1.76	10.94	3.11	15.94	4.25
Post-Development SP6	5.79	1.62	12.12	2.81	18.52	3.82
Post-Development SP7	2.77	0.67	5.42	1.18	7.84	1.64
Canal Subtotal	**15.59**	**4.38**	**32.22**	**7.76**	**47.68**	**10.65**
Post Total	**20.18**	**5.57**	**42.62**	**9.92**	**63.65**	**13.70**

The post-development peak runoff rates for study points 2 and 5 for the 25-year storm exceed pre-development rates, as they did when previously approved. These values are highlighted in gray in the table above. Prior to previous approval, both the Energy East and CMP property owners were contacted and waivers authorizing the increase at these study points were granted. However, the total post-development rates for the overall areas and project are all either at or below their respective pre-development rates.

The watershed routing diagrams and model outputs from HydroCAD for both the Pre-and Post-Development conditions are attached. Upon completion of the project, the condominium association will assume responsibility for overseeing the property, including inspection and maintenance of the sites, stormwater drainage system, and treatment measures. The proposed stormwater management systems have been designed to maintain predevelopment runoff conditions to the maximum extent possible, to decrease peak flow rates, and to improve water quality and thermal impacts to the Fore River Estuary System. The flow from the seven study points ultimately discharges into the Fore River Estuary System by way of existing drainage across Energy East Foundation conservation land and the CMP ROW. Finally, as the site's total discharge rate has been reduced, there will be no adverse effects, including flooding and erosion, to abutting properties or the Fore River Estuary System as a result of the project.

12.5.3 Discharge to Freshwater Wetlands Standard

We propose maintaining many of the hydrologic features that exist on the site in the pre-development condition, including large areas of forested freshwater wetlands. The project will result in stormwater discharges to these forested freshwater wetland systems. Per MaineDEP stormwater regulations, discharge of runoff to the wetlands due to a 2-year storm may not increase the mean storage depth within a wetland more than two inches above pre-development levels for more than 24-hours from the end of the storm event. Each of the discharge locations from the site are modeled by a study point. In order to evaluate the change in depth to a wetland due to stormwater discharge, the pre-development runoff volume was compared to the post-development runoff volume for a 2-year 24-hour storm. As shown in Table 9, the post-development runoff volumes increased by approximately 1.22 Acre-Foot (AF). The total non-disturbed wetland area is approximately 8.39 acres. Therefore, the total increase in volume across the on-site wetland areas is approximately 0.15 feet, or approximately 1.74 inches, which is less than the 2-inch threshold.

12.6 INSPECTION AND MAINTENANCE OF STORMWATER SYSTEMS

Schedule D of the Condominium Documents includes the language addressing inspection and maintenance of stormwater systems, as it was approved as part of the original application. A copy of Schedule D is attached. In addition, checklists for stormwater inspections and a recommended list of maintenance tasks and a schedule follow this section.

12.7 EROSION AND SEDIMENTATION CONTROL PLAN

The overall goal of the Soil Erosion and Sedimentation Plan is to restrict the potential for erosion and sedimentation at the site and down-gradient of the site, particularly adjacent to protected natural resources such as wetlands, as shown on the drawings attached to Section 19 of this Report. A variety of erosion control techniques will be implemented to achieve this goal. During construction, these include:

- Positive grades throughout the construction site to direct flow to sediment control barriers;
- Diversion barriers to keep upslope runoff from flowing through the construction site;
- Preserving and maintaining vegetated areas to the maximum extent possible;
- Installation and maintenance of sedimentation barriers adjacent to the project;
- Installation and maintenance of construction entrances at the travelled interface between stabilized and non-stabilized portions of the project site;
- Permanent seeding and mulching applied as soon as areas are at final grades; and
- Inspection of all in-place measures after every significant rainfall until permanent measures are in place.

Structural measures will be installed where shown on the Soil Erosion and Sedimentation Control Plan, which is included in the drawings attached to Section 19 of this Report; details for the proposed measures are also included in the drawings. All measures will be implemented in accordance with the "Maine Erosion and Sedimentation Handbook

for Construction: Best Management Practices"; they will be installed prior to any earth disturbing activities. All temporary measures will be removed after the areas are permanently stabilized.

Permanent erosion control measures for the business park will include vegetation and pavement. Areas of concentrated flow will be protected from erosion by establishing vegetation and riprap. All measures will be maintained in effective operating condition. The Contractor will be responsible for implementing and maintaining all erosion and sediment control measures and will use the attached maintenance inspection form or equivalent.

12.8 **ATTACHMENTS**

- Stormwater Erosion & Sedimentation Control Inspection Report Form
- Stormwater Inspection Checklist
- Stormwater Management Maintenance Tasks and Recommended Schedule
- Figure 12.1 Pre-Development Drainage Area Plan
- Figure 12.2 Post-Development Drainage Area Plan
- Figure 12.3 Post-Development Subcatchment Plan
- Pre-Development HydroCAD output (bound separately)
- Post-Development HydroCAD output (bound separately)
- Figure 12.4 Treatment Area Plan
- Condominium Document Schedule D Inspection and Maintenance

STORMWATER EROSION & SEDIMENTATION CONTROL
INSPECTION REPORT FORM

Inspectors: Date: ___ / ___ / _____

_____ of _____ (Project Owner)

_____ of _____ (Contractor)

_____ of _____

_____ of _____

Storm Event? ☐ Yes ☐ No Rainfall Amount _____ Storm Duration _____ hours

Visual Observations of Activity and Site Conditions:

Disturbed Soil Areas:

Storage Of Soils:

Sediment & Erosion Control Measures:

Construction Site Entrance:

Surface Stabilization:

Corrective Actions Taken

Attachments (if any):

Signature:

_____

Representing:

_____

Representing:

STORMWATER INSPECTION CHECKLIST

Inspection by: _____ Date: _____

Stormwater Management Feature	Condition						Comments
Vegetative cover on slopes	no bare spots, no evidence of rill erosion		some bare spots, some rill erosion		large bare areas, extensive erosion		
Drainage channels/Ditches	no erosion, channels clear		some erosion and siltation		major erosion, channels clogged		
Gravel Wetlands	no siltation		some siltation		heavily silted in		
Gravel Wetlands	sideslopes free of erosion		some erosion on sideslopes		sideslopes heavily eroded		
Gravel Wetlands	inlet free of erosion		some erosion at inlet		inlet heavily eroded		
Gravel Wetlands	inlet / outlet clear		some debris		completely blocked		
Gravel Wetlands	no erosion on outlet weir		some rutting or erosion		deeply rutted and washed out		

Recommended Actions: _____

_____

Actions Completed: _____ Date: _____ Mgr. Approval: _____

STORMWATER MANAGEMENT MAINTENANCE TASKS AND RECOMMENDED SCHEDULE

TASKS	OUTLET CONTROL STRUCTURES	GRAVEL WETLANDS	CULVERTS	SCHEDULE
Inspect for sediment accumulation	X	X	X	Annually
Remove sediment accumulation	X	X	X	As needed
Clean debris	X	X	X	Early spring, fall and after major storm
Inspect for Erosion	X	X		As needed
Reestablish vegetation in erosion areas	X	X		Early spring
Rake out dead vegetation		X		Early spring, fall
Replace stone rip-rap	X	X	X	Every 3 – 5 years as needed
Inspect structural elements during wet weather and compare to as-built plans	X	X		Annually
Make adjustments or replacements as determined by wet weather observations		X		As needed
Keep records of all inspections and maintenance activities	X	X	X	Annually
Have a professional engineer perform emergency inspections upon identification of severe problems	X	X	X	As needed

SOURCES:

1. SITE AND TOPOGRAPHIC DATA WERE PROVIDED BY NUMEROUS SOURCES AS IDENTIFIED HEREIN AND COMPILED BY WOODARD & CURRAN INC BETWEEN JANUARY 2007 AND AUGUST 2010. FEATURES DEPICTED ON THE EXISTING SITE PLAN WERE NOT FIELD VERIFIED FOR ACCURACY OR OMISSIONS UPON PLAN COMPILATION. HORIZONTAL DATUM IS REFERENCED TO STATE PLANE NAD 1983 (FEET), MAINE WEST ZONE.
2. BOUNDARY, SITE, AND TOPOGRAPHIC FEATURES FOR CITY OWNED PARCELS THAT COMPOSE THE PROJECT AREA ORIGINATE FROM A PLAN BY LAND SERVICES, INC. "STANDARD BOUNDARY SURVEY, PROPERTY OF THE CITY OF PORTLAND, WESTBROOK STREET, PORTLAND, MAINE" PROJECT 99148 SHEET 1 OF 1 DATED OCT., 1997 WITH A FINAL REVISION DATE OF OCT. 23, 2002. VERTICAL DATUM IS REFERENCED TO NGVD29 WITH ONE FOOT CONTOUR INTERVALS
3. SITE AND TOPOGRAPHIC FEATURES FOR ADJACENT ROADWAY AND ABUTTING PARCELS ORIGINATE FROM CITY OF PORTLAND, ME AERIAL SURVEY COMPILED USING 2000 AERIAL IMAGES BY BRADSTREET CONSULTANTS OF MANCHESTER, MAINE. VERTICAL DATUM IS REFERENCED TO NGVD29 WITH TWO FOOT CONTOUR INTERVALS.
4. WETLAND DELINEATION FOR WETLAND AREAS LABELED #1–22 CONDUCTED BY DAMES & MOORE APRIL – MAY, 1998, AS DESCRIBED IN "WETLAND DELINEATION AND WETLAND FUNCTIONAL ASSESSMENT FOR SNYDER TRACT, WESTBROOK ST., PORTLAND, ME" REPORT DATED MAY 1998. WETLAND DELINEATION FIELD VERIFIED BY U.S. ARMY CORPS OF ENGINEERS ON MAY 8, 1998. FLAGS LOCATED BY SURVEY WORKS, INC. USING GPS, MAY 1998.
5. FIELD RECONNAISSANCE AND VISUAL VERIFICATION OF THE WETLANDS PREVIOUSLY DELINEATED BY DAMES & MOORE IN APRIL AND MAY OF 1998 WAS PERFORMED BY SW COLE ENGINEERING INC. IN NOVEMBER AND DECEMBER OF 2006, AND SUMMARIZED IN A LETTER REPORT DATED DECEMBER 15, 2006. ADDITIONAL WETLAND DELINEATION CONDUCTED BY S.W. COLE ON DECEMBER 15, 2006 IDENTIFIED AND DELINEATED THE LOCATION OF A FRESHWATER WETLAND AT THE NORTHEAST CORNER OF THE PROPERTY, JUST WEST OF A PORTLAND WATER DISTRICT EASEMENT, LABELED "WETLAND A, PF01/4", AND FURTHER DESCRIBED IN A LETTER REPORT DATED DECEMBER 21, 2006. WETLAND LOCATED BY MEANS OF GPS, DECEMBER 2006.
6. TREE ASSESSMENT CONDUCTED BY WOODLOT ALTERNATIVES, INC. APRIL 2007, AND SUMMARIZED WITHIN A LETTER REPORT DATED APRIL 13, 2007. LOCATIONS DETERMINED WITH HAND-HELD GPS UNIT, APRIL 2007.
7. VERNAL POOL ASSESSMENT CONDUCTED BY URS ON APRIL 16 AND MAY 19, 2006 AND SUMMARIZED IN LETTER REPORT DATED MAY 31, 2006.
8. EXISTING SEWER MAIN LOCATION FROM PLAN BY HNTB "WESTBROOK INTERCHANGE TOLL PLAZA LATERAL PLAN AND PROFILE 50+00 TO 63+70" DATED AUGUST, 2001
9. EXISTING WATER MAIN LOCATION FROM PLAN BY HNTB "WESTBROOK INTERCHANGE 42" WATERMAIN RELOCATION" DATED APRIL, 2001
10. UNITED STATES DEPARTMENT OF AGRICULTURE, NATURAL RESOURCES CONSERVATION SERVICE, SOIL MAP OF CUMBERLAND COUNTY AND PART OF OXFORD COUNTY, MAINE WEB SOIL SURVEY NATIONAL COOPERATIVE SOIL SURVEY

SOIL LEGEND

BuB	Buxton silt loam, 3 to 8 percent slopes
BuC2	Buxton silt loam, 8 to 15 percent slopes, eroded
EmB	Elmwood fine sandy loam, 0 to 8 percent slopes
Sn	Scantic silt loam
Sue2	Suffield loam, 25 to 45 percent slopes, eroded
Sz	Swanton fine sandy loam
WmD	Windsor loamy sand, 15 to 30 percent slopes

LEGEND:

- 100' — SUBCATCHMENT FLOWPATH
- DRAINAGE AREA BOUNDARY
- (2) — SUBCATCHMENT NUMBER
- 150 — 5 FT. CONTOUR
- INTERMEDIATE CONTOUR
- WETLAND
- PROPERTY LINE
- SOILS BOUNDARY
- STUDY POINTS
- POTENTIAL VERNAL POOL LOCATION (APPROX.)

100' 0 100' 200'
BAR SCALE 1" = 100'
CHECK GRAPHIC SCALE BEFORE USING

NOT FOR CONSTRUCTION

41 Hutchins Drive
Portland, Maine 04102
800.426.4262 | www.woodardcurran.com

DAVID A. SPEARS 10758 STATE OF MAINE REGISTERED PROFESSIONAL ENGINEER 12/30/2011

REV	DESCRIPTION	DATE
DRAWN BY:	JDE	
DESIGNED BY:	MKC	
CHECKED BY:	DAS	
203848\3-U12_1\12_12-3.dwg		

PRE-DEVELOPMENT DRAINAGE AREA MAP

CITY OF PORTLAND
ECONOMIC DEVELOPMENT OFFICE
PORTLAND, MAINE

PORTLAND TECHNOLOGY PARK

JOB NO.:	203848.63
DATE:	DECEMBER, 2011
SCALE:	1"=100'
SHEET:	OF

FIG 12-1

\\BANGOR\Projects\213452 Madawaska - Sewer System Improvements\wip\203848.63 City of Portland\Rand Road\CAD In Progress\203848\3-U12_1\12_12-3.dwg, Dec 30, 2011 - 8:50pm

24x36 SHEET
1:1

SOURCES:

1. SITE AND TOPOGRAPHIC DATA WERE PROVIDED BY NUMEROUS SOURCES AS IDENTIFIED HEREIN AND COMPILED BY WOODARD & CURRAN INC BETWEEN JANUARY 2007 AND AUGUST 2010. FEATURES DEPICTED ON THE EXISTING SITE PLAN WERE NOT FIELD VERIFIED FOR ACCURACY OR OMISSIONS UPON PLAN COMPILATION. HORIZONTAL DATUM IS REFERENCED TO STATE PLANE NAD 1983 (FEET), MAINE WEST ZONE.
2. BOUNDARY, SITE, AND TOPOGRAPHIC FEATURES FOR CITY OWNED PARCELS THAT COMPOSE THE PROJECT AREA ORIGINATE FROM A PLAN BY LAND SERVICES, INC. "STANDARD BOUNDARY SURVEY, PROPERTY OF THE CITY OF PORTLAND, WESTBROOK STREET, PORTLAND, MAINE" PROJECT 99148 SHEET 1 OF 1 DATED OCT., 1997 WITH A FINAL REVISION DATE OF OCT. 23, 2002. VERTICAL DATUM IS REFERENCED TO NGVD29 WITH ONE FOOT CONTOUR INTERVALS
3. SITE AND TOPOGRAPHIC FEATURES FOR ADJACENT ROADWAY AND ABUTTING PARCELS ORIGINATE FROM CITY OF PORTLAND, ME AERIAL SURVEY COMPILED USING 2000 AERIAL IMAGES BY BRADSTREET CONSULTANTS OF MANCHESTER, MAINE. VERTICAL DATUM IS REFERENCED TO NGVD29 WITH TWO FOOT CONTOUR INTERVALS.
4. WETLAND DELINEATION FOR WETLAND AREAS LABELED #1–22 CONDUCTED BY DAMES & MOORE APRIL – MAY, 1998, AS DESCRIBED IN "WETLAND DELINEATION AND WETLAND FUNCTIONAL ASSESSMENT FOR SNYDER TRACT, WESTBROOK ST., PORTLAND, ME" REPORT DATED MAY 1998. WETLAND DELINEATION FIELD VERIFIED BY U.S. ARMY CORPS OF ENGINEERS ON MAY 8, 1998. FLAGS LOCATED BY SURVEY WORKS, INC. USING GPS, MAY 1998.
5. FIELD RECONNAISSANCE AND VISUAL VERIFICATION OF THE WETLANDS PREVIOUSLY DELINEATED BY DAMES & MOORE IN APRIL AND MAY OF 1998 WAS PERFORMED BY SW COLE ENGINEERING INC. IN NOVEMBER AND DECEMBER OF 2006, AND SUMMARIZED IN A LETTER REPORT DATED DECEMBER 15, 2006. ADDITIONAL WETLAND DELINEATION CONDUCTED BY S.W. COLE ON DECEMBER 15, 2006 IDENTIFIED AND DELINEATED THE LOCATION OF A FRESHWATER WETLAND AT THE NORTHEAST CORNER OF THE PROPERTY, JUST WEST OF A PORTLAND WATER DISTRICT EASEMENT, LABELED "WETLAND A, PF01/4", AND FURTHER DESCRIBED IN A LETTER REPORT DATED DECEMBER 21, 2006. WETLAND LOCATED BY MEANS OF GPS, DECEMBER 2006.
6. TREE ASSESSMENT CONDUCTED BY WOODLOT ALTERNATIVES, INC. APRIL 2007, AND SUMMARIZED WITHIN A LETTER REPORT DATED APRIL 13, 2007. LOCATIONS DETERMINED WITH HAND–HELD GPS UNIT, APRIL 2007.
7. VERNAL POOL ASSESSMENT CONDUCTED BY URS ON APRIL 16 AND MAY 19, 2006 AND SUMMARIZED IN LETTER REPORT DATED MAY 31, 2006.
8. EXISTING SEWER MAIN LOCATION FROM PLAN BY HNTB "WESTBROOK INTERCHANGE TOOL PLAZA LATERAL PLAN AND PROFILE 50+00 TO 63+70" DATED 08/01
9. EXISTING WATER MAIN LOCATION FROM PLAN BY HNTB "WESTBROOK INTERCHANGE 42" WATERMAIN RELOCATION" DATED 04/2001
10. LOCATION OF GEOTECHNICAL BORING, SEE REPORT "WETLAND DELINEATION AND WETLAND FUNCTIONAL ASSESSMENT FOR SNYDER TRACT, WESTBROOK ST., PORTLAND, ME" DATED MAY 1998 BY DAMES & MOORE
11. ADDITIONAL BORINGS BY HALEY & ALDRICH DATED AUUGUST 17, 2010
12. UNITED STATES DEPARTMENT OF AGRICULTURE, NATURAL RESOURCES CONSERVATION SERVICE, SOIL MAP OF CUMBERLAND COUNTY AND PART OF OXFORD COUNTY, MAINE WEB SOIL SURVEY NATIONAL COOPERATIVE SOIL SURVEY

SOIL LEGEND

BuB	Buxton silt loam, 3 to 8 percent slopes
BuC2	Buxton silt loam, 8 to 15 percent slopes, eroded
EmB	Elmwood fine sandy loam, 0 to 8 percent slopes
Sn	Scantic silt loam
Sue2	Suffield loam, 25 to 45 percent slopes, eroded
Sz	Swanton fine sandy loam
WmD	Windsor loamy sand, 15 to 30 percent slopes

LEGEND:

- SUBCATCHMENT FLOWPATH
- DRAINAGE AREA BOUNDARY
- DRAINAGE NUMBER
- 5 FT. CONTOUR
- INTERMEDIATE CONTOUR
- WETLAND
- PROPERTY LINE
- SOILS BOUNDARY
- STUDY POINTS
- POTENTIAL VERNAL POOL LOCATION (APPROX.)

BAR SCALE
1" = 100'
CHECK GRAPHIC SCALE BEFORE USING

PERMITTING SET - NOT FOR CONSTRUCTION

41 Hutchins Drive
Portland, Maine 04102
800.426.4262 | www.woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

DAVID A. SENUS — STATE OF MAINE — REGISTERED PROFESSIONAL ENGINEER

10/2/2015

REV	DESCRIPTION	CHECKED BY: DAS	22900-U12-1_12_2_12-3.dwg
DRAWN BY: JBC	DESIGNED BY: MKC/AEA	DATE:	

CITY OF PORTLAND
ECONOMIC DEVELOPMENT OFFICE
PORTLAND, MAINE
& PATRONS OXFORD INSURANCE CO.

PORTLAND TECHNOLOGY PARK UPDATE
& LCE 4 DEVELOPMENT

POST-DEVELOPMENT DRAINAGE AREA MAP

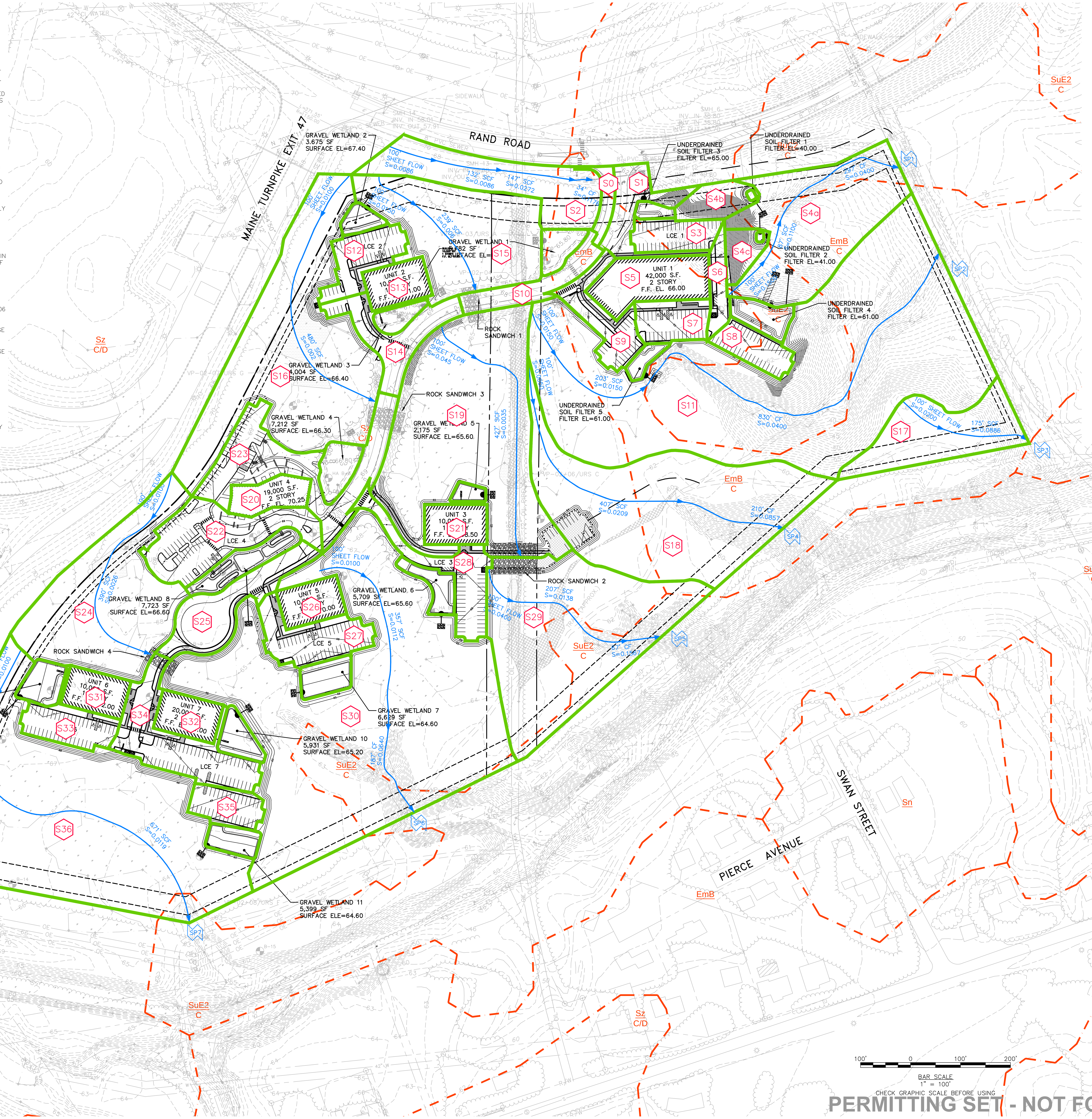
JOB NO.: 229001
DATE: OCTOBER 2015
SCALE: 1" = 100'
SHEET: OF

FIG 12-2

24x36 SHEET
1:1

SOURCES:

1. SITE AND TOPOGRAPHIC DATA WERE PROVIDED BY NUMEROUS SOURCES AS IDENTIFIED HEREIN AND COMPILED BY WOODARD & CURRAN INC BETWEEN JANUARY 2007 AND AUGUST 2010. FEATURES DEPICTED ON THE EXISTING SITE PLAN WERE NOT FIELD VERIFIED FOR ACCURACY OR OMISSIONS UPON PLAN COMPILATION. HORIZONTAL DATUM IS REFERENCED TO STATE PLANE NAD 1983 (FEET), MAINE WEST ZONE.
2. BOUNDARY, SITE, AND TOPOGRAPHIC FEATURES FOR CITY OWNED PARCELS THAT COMPOSE THE PROJECT AREA ORIGINATE FROM A PLAN BY LAND SERVICES, INC. "STANDARD BOUNDARY SURVEY, PROPERTY OF THE CITY OF PORTLAND, WESTBROOK STREET, PORTLAND, MAINE" PROJECT 99148 SHEET 1 OF 1 DATED OCT., 1997 WITH A FINAL REVISION DATE OF OCT. 23, 2002. VERTICAL DATUM IS REFERENCED TO NGVD29 WITH ONE FOOT CONTOUR INTERVALS
3. SITE AND TOPOGRAPHIC FEATURES FOR ADJACENT ROADWAY AND ABUTTING PARCELS ORIGINATE FROM CITY OF PORTLAND, ME AERIAL SURVEY COMPILED USING 2000 AERIAL IMAGES BY BRADSTREET CONSULTANTS OF MANCHESTER, MAINE. VERTICAL DATUM IS REFERENCED TO NGVD29 WITH TWO FOOT CONTOUR INTERVALS.
4. WETLAND DELINEATION FOR WETLAND AREAS LABELED #1–22 CONDUCTED BY DAMES & MOORE APRIL – MAY, 1998, AS DESCRIBED IN "WETLAND DELINEATION AND WETLAND FUNCTIONAL ASSESSMENT FOR SNYDER TRACT, WESTBROOK ST., PORTLAND, ME" REPORT DATED MAY 1998. WETLAND DELINEATION FIELD VERIFIED BY U.S. ARMY CORPS OF ENGINEERS ON MAY 8, 1998. FLAGS LOCATED BY SURVEY WORKS, INC. USING GPS, MAY 1998.
5. FIELD RECONNAISSANCE AND VISUAL VERIFICATION OF THE WETLANDS PREVIOUSLY DELINEATED BY DAMES & MOORE IN APRIL AND MAY OF 1998 WAS PERFORMED BY SW COLE ENGINEERING INC. IN NOVEMBER AND DECEMBER OF 2006, AND SUMMARIZED IN A LETTER REPORT DATED DECEMBER 15, 2006. ADDITIONAL WETLAND DELINEATION CONDUCTED BY S.W. COLE ON DECEMBER 15, 2006 IDENTIFIED AND DELINEATED THE LOCATION OF A FRESHWATER WETLAND AT THE NORTHEAST CORNER OF THE PROPERTY, JUST WEST OF A PORTLAND WATER DISTRICT EASEMENT, LABELED "WETLAND A, PF01/4", AND FURTHER DESCRIBED IN A LETTER REPORT DATED DECEMBER 21, 2006. WETLAND LOCATED BY MEANS OF GPS, DECEMBER 2006.
6. TREE ASSESSMENT CONDUCTED BY WOODLOT ALTERNATIVES, INC. APRIL 2007, AND SUMMARIZED WITHIN A LETTER REPORT DATED APRIL 13, 2007. LOCATIONS DETERMINED WITH HAND–HELD GPS UNIT, APRIL 2007.
7. VERNAL POOL ASSESSMENT CONDUCTED BY URS ON APRIL 16 AND MAY 19, 2006 AND SUMMARIZED IN LETTER REPORT DATED MAY 31, 2006.
8. EXISTING SEWER MAIN LOCATION FROM PLAN BY HNTB "WESTBROOK INTERCHANGE TOOL PLAZA LATERAL PLAN AND PROFILE 50+00 TO 63+70" DATED 08/01
9. EXISTING WATER MAIN LOCATION FROM PLAN BY HNTB "WESTBROOK INTERCHANGE 42" WATERMAIN RELOCATION" DATED 04/2001
10. LOCATION OF GEOTECHNICAL BORING, SEE REPORT "WETLAND DELINEATION AND WETLAND FUNCTIONAL ASSESSMENT FOR SNYDER TRACT, WESTBROOK ST., PORTLAND, ME" DATED MAY 1998 BY DAMES & MOORE
11. ADDITIONAL BORINGS BY HALEY & ALDRICH DATED AUUGUST 17, 2010
12. UNITED STATES DEPARTMENT OF AGRICULTURE, NATURAL RESOURCES CONSERVATION SERVICE, SOIL MAP OF CUMBERLAND COUNTY AND PART OF OXFORD COUNTY, MAINE WEB SOIL SURVEY NATIONAL COOPERATIVE SOIL SURVEY



SOIL LEGEND

BuB	Buxton silt loam, 3 to 8 percent slopes
BuC2	Buxton silt loam, 8 to 15 percent slopes, eroded
EmB	Elmwood fine sandy loam, 0 to 8 percent slopes
Sn	Scantic silt loam
Sue2	Suffield loam, 25 to 45 percent slopes, eroded
Sz	Swanton fine sandy loam
WmD	Windsor loamy sand, 15 to 30 percent slopes

LEGEND:

- 100' SUBCATCHMENT FLOWPATH
- DRAINAGE AREA BOUNDARY
- 2 SUBCATCHMENT NUMBER
- 150 5 FT. CONTOUR
- INTERMEDIATE CONTOUR
- WETLAND
- PROPERTY LINE
- SOILS BOUNDARY
- STUDY POINTS
- POTENTIAL VERNAL POOL LOCATION (APPROX.)

100' 0 100' 200'
BAR SCALE
1" = 100'
CHECK GRAPHIC SCALE BEFORE USING

PERMITTING SET - NOT FOR CONSTRUCTION

WOODARD & CURRAN
41 Hutchins Drive
Portland, Maine 04102
800.426.4262 | www.woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

STATE OF MAINE DAVID A. SENUS 10791 PROFESSIONAL ENGINEER
10/2/2015

REV	DESCRIPTION	DATE

DESIGNED BY: MKC/AEA CHECKED BY: DAS
DRAWN BY: JBC 229001-U12-1_12_2_12-3.dwg

POST-DEVELOPMENT SUB-CATCHMENT AREA MAP

CITY OF PORTLAND ECONOMIC DEVELOPMENT OFFICE PORTLAND, MAINE & PATRONS OXFORD INSURANCE CO.

PORTLAND TECHNOLOGY PARK UPDATE & LCE 4 DEVELOPMENT

JOB NO.: 229001
DATE: OCTOBER 2015
SCALE: 1" = 100'
SHEET: OF

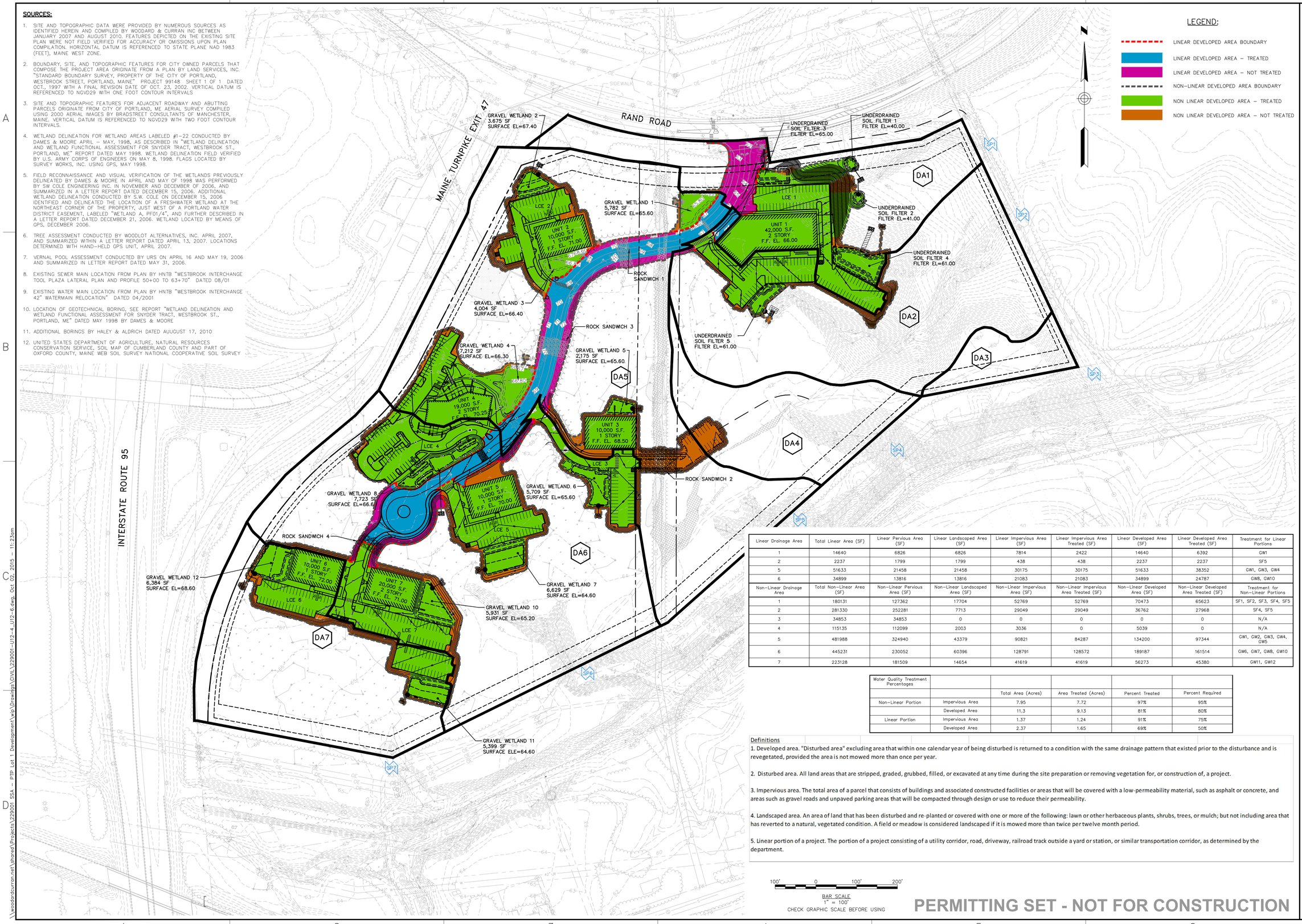
FIG 12-3

\\Woodardcurran.net\shared\Projects\229001 SSA - PTP Lot 1 Development\wip\Drawings\CIVIL\229001-U12-1_12_2_12-3.dwg, Oct 02, 2015 - 11:21am

HydroCAD Output Filed in Separate Volume

SOURCES:

1. SITE AND TOPOGRAPHIC DATA WERE PROVIDED BY NUMEROUS SOURCES AS IDENTIFIED HEREIN AND COMPILED BY WOODARD & CURRAN INC BETWEEN JANUARY 2007 AND AUGUST 2010. FEATURES DEPICTED ON THE EXISTING SITE PLAN WERE NOT FIELD VERIFIED FOR ACCURACY OR OMISSIONS UPON PLAN COMPILATION. HORIZONTAL DATUM IS REFERENCED TO STATE PLANE NAD 1983 (FEET), MAINE WEST ZONE.
2. BOUNDARY, SITE, AND TOPOGRAPHIC FEATURES FOR CITY OWNED PARCELS THAT COMPOSE THE PROJECT AREA ORIGINATE FROM A PLAN BY LAND SERVICES, INC. "STANDARD BOUNDARY SURVEY, PROPERTY OF THE CITY OF PORTLAND, WESTBROOK STREET, PORTLAND, MAINE" PROJECT 99148 SHEET 1 OF 1 DATED OCT., 1997 WITH A FINAL REVISION DATE OF OCT. 23, 2002. VERTICAL DATUM IS REFERENCED TO NGVD29 WITH ONE FOOT CONTOUR INTERVALS
3. SITE AND TOPOGRAPHIC FEATURES FOR ADJACENT ROADWAY AND ABUTTING PARCELS ORIGINATE FROM CITY OF PORTLAND, ME AERIAL SURVEY COMPILED USING 2000 AERIAL IMAGES BY BRADSTREET CONSULTANTS OF MANCHESTER, MAINE. VERTICAL DATUM IS REFERENCED TO NGVD29 WITH TWO FOOT CONTOUR INTERVALS.
4. WETLAND DELINEATION FOR WETLAND AREAS LABELED #1–22 CONDUCTED BY DAMES & MOORE APRIL – MAY, 1998, AS DESCRIBED IN "WETLAND DELINEATION AND WETLAND FUNCTIONAL ASSESSMENT FOR SNYDER TRACT, WESTBROOK ST., PORTLAND, ME" REPORT DATED MAY 1998. WETLAND DELINEATION FIELD VERIFIED BY U.S. ARMY CORPS OF ENGINEERS ON MAY 8, 1998. FLAGS LOCATED BY SURVEY WORKS, INC. USING GPS, MAY 1998.
5. FIELD RECONNAISSANCE AND VISUAL VERIFICATION OF THE WETLANDS PREVIOUSLY DELINEATED BY DAMES & MOORE IN APRIL AND MAY OF 1998 WAS PERFORMED BY SW COLE ENGINEERING INC. IN NOVEMBER AND DECEMBER OF 2006, AND SUMMARIZED IN A LETTER REPORT DATED DECEMBER 15, 2006. ADDITIONAL WETLAND DELINEATION CONDUCTED BY S.W. COLE ON DECEMBER 15, 2006 IDENTIFIED AND DELINEATED THE LOCATION OF A FRESHWATER WETLAND AT THE NORTHEAST CORNER OF THE PROPERTY, JUST WEST OF A PORTLAND WATER DISTRICT EASEMENT, LABELED "WETLAND A, PF01/4", AND FURTHER DESCRIBED IN A LETTER REPORT DATED DECEMBER 21, 2006. WETLAND LOCATED BY MEANS OF GPS, DECEMBER 2006.
6. TREE ASSESSMENT CONDUCTED BY WOODLOT ALTERNATIVES, INC. APRIL 2007, AND SUMMARIZED WITHIN A LETTER REPORT DATED APRIL 13, 2007. LOCATIONS DETERMINED WITH HAND–HELD GPS UNIT, APRIL 2007.
7. VERNAL POOL ASSESSMENT CONDUCTED BY URS ON APRIL 16 AND MAY 19, 2006 AND SUMMARIZED IN LETTER REPORT DATED MAY 31, 2006.
8. EXISTING SEWER MAIN LOCATION FROM PLAN BY HNTB "WESTBROOK INTERCHANGE TOOL PLAZA LATERAL PLAN AND PROFILE 50+00 TO 63+70" DATED 08/01
9. EXISTING WATER MAIN LOCATION FROM PLAN BY HNTB "WESTBROOK INTERCHANGE 42" WATERMAIN RELOCATION" DATED 04/2001
10. LOCATION OF GEOTECHNICAL BORING, SEE REPORT "WETLAND DELINEATION AND WETLAND FUNCTIONAL ASSESSMENT FOR SNYDER TRACT, WESTBROOK ST., PORTLAND, ME" DATED MAY 1998 BY DAMES & MOORE
11. ADDITIONAL BORINGS BY HALEY & ALDRICH DATED AUUGUST 17, 2010
12. UNITED STATES DEPARTMENT OF AGRICULTURE, NATURAL RESOURCES CONSERVATION SERVICE, SOIL MAP OF CUMBERLAND COUNTY AND PART OF OXFORD COUNTY, MAINE WEB SOIL SURVEY NATIONAL COOPERATIVE SOIL SURVEY



LEGEND:

- LINEAR DEVELOPED AREA BOUNDARY
- LINEAR DEVELOPED AREA – TREATED
- LINEAR DEVELOPED AREA – NOT TREATED
- NON–LINEAR DEVELOPED AREA BOUNDARY
- NON LINEAR DEVELOPED AREA – TREATED
- NON LINEAR DEVELOPED AREA – NOT TREATED

Linear Drainage Area	Total Linear Area (SF)	Linear Pervious Area (SF)	Linear Landscaped Area (SF)	Linear Impervious Area (SF)	Linear Impervious Area Treated (SF)	Linear Developed Area (SF)	Linear Developed Area Treated (SF)	Treatment for Linear Portions
1	14640	6826	6826	7814	2422	14640	6392	GW1
2	2237	1799	1799	438	438	2237	2237	SF5
5	51633	21458	21458	30175	30175	51633	38352	GW1, GW3, GW4
6	34899	13816	13816	21083	21083	34899	24787	GW8, GW10
Non–Linear Drainage Area	**Total Non–Linear Area (SF)**	**Non–Linear Pervious Area (SF)**	**Non–Linear Landscaped Area (SF)**	**Non–Linear Impervious Area (SF)**	**Non–Linear Impervious Area Treated (SF)**	**Non–Linear Developed Area (SF)**	**Non–Linear Developed Area Treated (SF)**	**Treatment for Non–Linear Portions**
1	180131	127362	17704	52769	52769	70473	65623	SF1, SF2, SF3, SF4, SF5
2	281330	252281	7713	29049	29049	36762	27968	SF4, SF5
3	34853	34853	0	0	0	0	0	N/A
4	115135	112099	2003	3036	0	5039	0	N/A
5	481988	324940	43379	90821	84287	134200	97344	GW1, GW2, GW3, GW4, GW5
6	445231	230052	60396	128791	128572	189187	161514	GW6, GW7, GW8, GW10
7	223128	181509	14654	41619	41619	56273	45380	GW11, GW12

Water Quality Treatment Percentages					
		Total Area (Acres)	Area Treated (Acres)	Percent Treated	Percent Required
Non–Linear Portion	Impervious Area	7.95	7.72	97%	95%
	Developed Area	11.3	9.13	81%	80%
Linear Portion	Impervious Area	1.37	1.24	91%	75%
	Developed Area	2.37	1.65	69%	50%

Definitions

1. Developed area. "Disturbed area" excluding area that within one calendar year of being disturbed is returned to a condition with the same drainage pattern that existed prior to the disturbance and is revegetated, provided the area is not mowed more than once per year.

2. Disturbed area. All land areas that are stripped, graded, grubbed, filled, or excavated at any time during the site preparation or removing vegetation for, or construction of, a project.

3. Impervious area. The total area of a parcel that consists of buildings and associated constructed facilities or areas that will be covered with a low–permeability material, such as asphalt or concrete, and areas such as gravel roads and unpaved parking areas that will be compacted through design or use to reduce their permeability.

4. Landscaped area. An area of land that has been disturbed and re–planted or covered with one or more of the following: lawn or other herbaceous plants, shrubs, trees, or mulch; but not including area that has reverted to a natural, vegetated condition. A field or meadow is considered landscaped if it is mowed more than twice per twelve month period.

5. Linear portion of a project. The portion of a project consisting of a utility corridor, road, driveway, railroad track outside a yard or station, or similar transportation corridor, as determined by the department.

100' 0 100' 200'

BAR SCALE
1" = 100'
CHECK GRAPHIC SCALE BEFORE USING

PERMITTING SET - NOT FOR CONSTRUCTION

WOODARD & CURRAN
41 Hutchins Drive
Portland, Maine 04102
800.426.4262 | www.woodardcurran.com

DAVID A. SENUS 10791 STATE OF MAINE REGISTERED PROFESSIONAL ENGINEER
10/2/2015

REV	DESCRIPTION	DATE

DESIGNED BY: MKG/AEA
DRAWN BY: JBC
CHECKED BY: DAS
229001-U12-4_U12-6.dwg

POST DEVELOPMENT
STORM WATER TREATMENT
OVERAL PLAN

CITY OF PORTLAND
ECONOMIC DEVELOPMENT OFFICE
PORTLAND, MAINE
& PATRONS OXFORD INSURANCE CO.

PORTLAND TECHNOLOGY PARK UPDATE
& LCE 4 DEVELOPMENT

JOB NO.:229001
DATE: OCTOBER 2015
SCALE: 1" = 100'
SHEET: OF

FIG 12-4

Declaration of Condominium
Portland Technology Park Condominium

SCHEDULE D

Inspection and Maintenance Requirements

General inspection and maintenance during and after construction must take place in accordance with the requirements outlined in Chapter 500, Stormwater Management, Appendix B, Inspection and Maintenance, and Stormwater Management, Maine Department of Environmental Protection publication No. DEPLW0738. The condominium association will be responsible for implementing maintenance and inspection requirements for the stormwater management systems associated with the development. During the period that the City of Portland is the only member or one among other members of the condominium association, the contact person under responsible charge for this, until such time as this responsibility is transferred (as noted below), is:

John Emerson
Wastewater Facilities Coordinator
55 Portland Street
Portland, Maine 04101
Phone: (207) 874-8468

Upon development of the building sites, additional members will join the condominium association. These documents outline the maintenance and inspection responsibilities of the individual building tenants and the condominium association.

The responsible party will ensure that stormwater management facilities are properly maintained and inspected. Specifically, the underdrained soil filters, stormwater gravel wetlands, outlet structures, outlet pipes, culverts, roadways and parking lots will be inspected and maintained per the guidance outlined herein.

Inspection and Maintenance of Stormwater Systems

Upon completion of the project, the condominium association (association) will assume responsibility for overseeing the property, including the inspection and maintenance of the site's stormwater drainage system and treatment measures. The inspection and maintenance outlined in Chapter 500 Stormwater Regulations, and in the Maine Department of Environmental Protection's Stormwater BMP Manual, will be followed. Inspection and maintenance activities subject to the Post-Construction Stormwater Management Plan will be carried out in conformance with Chapter 32 of the City of Portland Code of Ordinances as follows.

A person with knowledge of stormwater management and erosion and sediment control, including municipal and state regulations and the standards and conditions in the permit, shall conduct the inspections and perform maintenance of the facilities at least annually. The association is responsible for maintaining records of all inspection and maintenance activities, to be submitted in the annual report to the City Department of Public Services (DPS) on or by June 30th of each year, certifying the successful inspection of all BMPs and that noted deficiencies in the stormwater management facilities have been

repaired. The association shall include the DPS filing fee with the annual report.

Specifically, the condominium association will assume inspection and maintenance responsibility for the underdrained soil filters and gravel wetlands.

The condominium association will also be required to submit a certification of the following to the Maine Department of Environmental Protection within three months of the expiration of each five-year interval from the date of issuance of the permit.

a) Identification and repair of erosion problems. All areas of the project site have been inspected for areas of erosion, and appropriate steps have been taken to permanently stabilize these areas.

b) Inspection and repair of stormwater control system. All aspects of the stormwater control system have been inspected for damage, wear, and malfunction, and appropriate steps have been taken to repair or replace the system, or portions of the system.

c) Maintenance. The erosion and stormwater maintenance plan for the site is being implemented as written, or modifications to the plan have been submitted to and approved by the department, and the maintenance log is being maintained.

Pavement and Drainage Structures

All proposed drainage structures located on site, such as culverts, basins and piping, shall be inspected annually to ensure they are being well maintained and are adequate in carrying stormwater flows throughout the site. Parking and paved areas, such as the access road, will be inspected annually each spring. Visual inspections will enable site roads and parking areas to be kept clean and clear through periodic sweeping (at minimum annually) and winter plowing as required. The inspections will also ensure pavement markings are repainted as needed to maintain proper traffic circulation and parking space delineation. Paved areas will be plowed and sanded as often as necessary to maintain safety. Periodic sweeping of pavement (at minimum annually) will keep the parking areas clean and will reduce the amount of sediment available to enter the stormwater management systems, in turn reducing the need to clean these systems.

Gravel Wetland Systems

Gravel Wetlands maintain a saturated gravel bed and provide treatment of stormwater through physical chemical and biological processes within the plants and gravels/soils of the system. Gravel Wetlands are well suited for poorly draining sub-soils due to the limited hydraulic head requirement (difference in elevation between what flows in and what flows out) and lack of required separation from the groundwater table. Because infiltration is not designed to occur, separation from groundwater is not required and the systems are sited much like stormwater ponds.

Monitoring and maintenance is critical for the proper operation of gravel wetland systems. First year post-construction monitoring differs primarily by its increased frequency to assure proper vegetative establishment and system functioning. Post-construction routine monitoring is based on USEPA requirements for good housekeeping practices.

Unlike other filtration systems, a subsurface gravel wetland is a subsurface, horizontal filtration system and does not rely upon the surface soils for treatment. As such, surface infiltration rates are

expected to be low and are not used for the criteria for cleaning/maintenance. Rather, stormwater conveyance into the subsurface gravel layer is the critical hydraulic performance measure.

1st Year Post-Construction: Inspection frequency should be after every major storm in the first year following construction.

- ❑ Ensure system drains within 24-72 hrs (within the design period, but also not so quickly as to minimize stormwater treatment).
- ❑ Water plants as necessary during the first growing season
- ❑ Re-vegetate poorly established areas as necessary
- ❑ Treat diseased vegetation as necessary
- ❑ Quarterly inspection of side slopes, earthen embankments, forebays and inlets; repair eroded areas, especially on slopes
- ❑ Check inlets, outlets, and overflow spillway for blockage, structural integrity, and evidence of erosion.

Post-Construction: Inspection frequency should be at least every 6 months thereafter. Inspection frequency can be reduced to annually following 2 years of monitoring that indicates the rate of sediment accumulation is less than the cleaning criteria listed herein. Inspections should focus on:

- ❑ Check the filter surface for dense, complete, root mat establishment across the wetland surface. Thorough vegetation with grasses, forbs, and shrubs is necessary.
- ❑ Check the gravel wetland surface for standing water or other evidence of riser clogging, such as discolored or accumulated sediments. More detail in section below.
- ❑ Check the sedimentation forebay for sediment accumulation, trash, and debris.
- ❑ Ensure system drains within 24 to 72 hrs.
- ❑ Check inlets, outlets, valves, weir walls, orifice structures, and overflow spillway for blockage, structural integrity, and evidence of erosion.
- ❑ Check side slopes and earthen embankments; repair eroded areas, especially on slopes.
- ❑ Remove decaying vegetation, litter, and debris.

Gravel Wetland Maintenance

Cleaning Criteria for Sedimentation Forebay: Sediment should be removed from the sedimentation chamber (forebay) on an annual basis. Sediment can be removed with hand tools or hand operated power equipment (power brooms, vac equipment, etc.). If larger equipment is necessary, this equipment should not track on the wetland surface. Disturbed areas should be revegetated as necessary. Removed sediments should be dewatered (if necessary) and disposed of in accordance with state solid waste guidance.

Cleaning Criteria for Gravel Wetland Treatment Area: Sediment should be removed from the gravel wetland surface when it accumulates to a depth of several inches across the wetland surface. Sediment should be removed with hand tools or hand operated power equipment (power brooms, vac

equipment, etc) rather than heavy construction equipment to avoid compaction of the gravel wetland surface. If larger equipment is necessary, this equipment should work adjacent to the gravel wetland and should not track on the wetland surface. Removed sediments should be dewatered (if necessary) and disposed of in accordance with state solid waste guidance.

Draining and Flushing Gravel Wetland Treatment Area: For maintenance it may be necessary to drain or flush the treatment cells. Flushing of the risers and horizontal subdrains is most effective with the entire system drained. Flushed water and sediment should be collected and properly disposed.

Inlets: Inlets to each stormwater treatment area should be kept open and in good working condition. This is particularly important around curb breaks and/or sidewalk culverts. These locations should be marked on the roadway at the completion of construction to allow for winter snow removal. All eroded areas should be repaired.

Initial Turf Maintenance (when applicable): Sod or seeded areas at inlets or along gravel wetland embankments should ideally be mowed no lower than 3" for optimum grass health and to minimize erosion.

Large Debris: Large debris within the ponding area should be removed.

Weeds in the Gravel Wetland Area: Periodic weeding of the gravel wetland areas and forebays may be necessary, particularly in the landscaped portions of the stormwater management system. Hand weeding is required as the use of herbicides is not recommended.

Surface Mulch Layer (when applicable): Areas devoid of mulch should be remulched by hand. Every year, in the spring, a fresh layer of mulch should be added to the soil filter area as needed.

Sedimentation (or Apparent Clogging) of Wetland Surface Area: To correct a standing water problem, the following remedial actions are recommended:

1. Check adjacent groundwater levels. High seasonal groundwater may influence system drain-down. Inspect system outlet for inundation or debris blockages.
2. Evaluate the drainage area to the treatment area to identify any potential sources of sediment, such as an erosive condition, that may be contributing to the clogging of the device. If a source is identified, it is recommended that that source be eliminated to the fullest extent practicable before proceeding with the remaining recommendations provided below.
3. Flush the subdrains. Use cleanouts to flush the subdrains. Sediment in the drains may be preventing the system from draining. Make sure to provide a way to capture any flushed sediment before it enters the stream environment or storm drain system downstream of the device. If, after flushing the subdrains, the device continues to hold water, the wetland soil may be contaminated. As such, following the guidelines provided below is recommended.
4. Gage the extent of soil contamination. To do this, it is recommended that one or more test pits be dug with a shovel and that the soil layer be evaluated for contamination. Once the levels of contamination have been determined (for example, the top 4" of soil appears to be contaminated), it is recommended that you proceed with the remaining remedial actions.
5. Harvest the plants (when applicable). Care should be taken in the removal and temporary storage of the plants so that as many as possible can be harvested for replanting in the wetland area once the functioning of the device has been restored sufficiently.
6. Remove the top few inches of contaminated soil plus an additional 2-inch of soil, and replace the removed soil with a clean soil mix in accordance with the soil mix specification.
7. Monitor the function of the system during the next two to three rain events. If the device appears to be draining as intended (e.g., there is no standing water 72 hours following a rain event), proceed with the remaining remedial actions. If the area continues to hold

standing water, then the entire soil mix and the subdrains may need to be removed and replaced. Reuse of any undamaged subdrains may be possible once they have been cleaned thoroughly.

8. Replant the harvested plants, and replace any plants that were rendered unusable during or following their removal from the soil filter area.
9. Water the plants in the soil filter for the next two or more weeks unless there is sufficient rainfall. This will help the plants to reestablish.

In addition to the inspection and maintenance of stormwater systems, parking and paved areas, such as the access road, will be inspected annually each spring. Visual inspections will enable site roads and parking areas to be kept clean and clear through contracting periodic sweeping and winter plowing as required. The inspections will also ensure pavement markings are repainted as needed to maintain proper traffic circulation and parking space delineation. Paved areas will be plowed and sanded as often as necessary to maintain public safety. Periodic sweeping of pavement will keep the parking areas clean and will reduce the amount of sediment available to enter the gravel wetlands, in turn reducing the need to clean these devices.

Stormwater inspection and maintenance requirements are summarized in more detail in the following Stormwater Inspection Checklist and Stormwater Management Maintenance Tasks and Recommended Schedule.

Underdrained Soil Filter Systems

The underdrained soil filters will be inspected semi-annually in spring and fall. Additionally, for the first six months, each filter will be inspected following major storm events. These inspections will ensure that there is no erosion in the soil filter, the filter remains capable of filtering runoff within two days, and sediment does not build up. Should the soil filter to drain within 72 hours, the top several inches of the filter media will be removed and replaced with fresh material. Attachment 12.8 includes an inspection form to be used during all soil filter inspections.

Maine DEP recommends mowing at least twice each year to allow visual inspection and to prevent the growth of woody plants. Sediment will be removed annually. Any eroding areas will be repaired immediately. Should a basin or swale fail to filter the runoff from a storm within two days, the soil filter layer may need to be retilled. No basin or swale will be used for snow storage or for any activities that involve heavy foot traffic. Vehicle traffic within the filter basin will not be allowed.

GRAVEL WETLAND/UNDERDRAIN SOIL FILTER
VISUAL INSPECTION RECORD

____INITIAL STORM INSPECTION: For the first six months perform inspections after each major storm.
____SEMIANNUAL INSPECTION: Following the first six months, inspect twice annually, in the spring and the fall.

Date: _____ Time: _____
Location: _____
Last Date and Approximate rainfall amount (in): _____
Estimated depth of undrained water in soil filter (in): _____

Characteristics of Soil Filter:

Vegetation Condition: _____
_____
Sedimentation Present (Y/N): _____ Amount (depth over filter): _____
Filter Media / Wetland Soil Condition (i.e. erosion, rilling, etc.): _____
_____
_____
Outlet Control Structure Condition: _____
Oil Sheen (Y/N): ____ Trash (Y/N): _____ Amount: _____
Other observances: _____
_____

Maintenance:

Task	Completed Since Last Inspection (Y/N)*	Needs to be Completed (Y/N)
Annual sediment removal		
Semiannual mowing		
Debris clean-out at beehive grate		
Woody vegetation control mowing/cutting		

** If yes, list date (month, year) when maintenance activity was performed.*

Observations of drainage area during visual monitoring: _____
_____
_____

Follow-up actions required following inspection (i.e. removal and replacement of top layer of material):

_____
_____

Signature of person conducting visual monitoring:

_____ _____
Name Date
_____