WALSH
ENGINEERING ASSOCIATES, INC.

Stormwater Management Report

for

Industrial Building Development
314-316 Presumpscot Street
Portland, Maine

November 29, 2017

Applicant
Jake's Development, Inc.
30 Ledgewood Drive
Falmouth, Maine 04105

Prepared By
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Westbrook, Maine 04092

Introduction

Walsh Engineering Associates, Inc. (WEA) was retained by Land Design Solutions of Cumberland, Maine to assist Jake's Development (Applicant) in the design and permitting of the Industrial Building Development project located at 314-316 Presumpscot Street in Portland, Maine. The project consists of the construction of two new industrial buildings and associated, parking, landscaping, and stormwater amenities. The proposed site improvements will result in a net increase of 6,504 square feet of new impervious area and approximately 7,267 square feet of new developed area.

This Stormwater Management Report assesses both pre-development and post-development peak runoff rates and stormwater treatment methods that will be used to manage stormwater. The analysis provided herein was completed in accordance with the City of Portland stormwater standards.

Methodology

The stormwater runoff analysis has been undertaken utilizing the HydroCAD Stormwater Modeling System software (Version 10) developed by the Applied Microcomputer Systems of Chocorua, New Hampshire. The program is based upon the TR-20 computer program and the TR-55 tabular method, both of which are based upon techniques developed by the USDA Soil Conservation Service. The analysis was undertaken for the 2, 10, and 25-year frequencies (3.1, 4.6, and 5.8 inches, respectively). Twenty-four hour storms with a Type III distribution were the basis for the analysis.

Pre-Development Conditions

The site of the proposed project is located on the west side of Presumpscot Street in Portland, Maine between Eben Hill Road and Ocean Avenue. The site consists of approximately 1.64± acres of land. The majority of the site is currently developed with two buildings, a paved and gravel parking lot, and lawn areas. There is currently 43,117 square feet of existing impervious area and 69,269 square feet of existing developed area onsite.

Stormwater runoff from the site generally flows via overland flow from west to east towards Presumpscot Street. A small upgradient area and the southern side of the site drains over the existing paved parking lot to Presumpscot Street. The northern side of the site drains over the existing gravel parking lot to the north down a steep slope to a riprap swale, which discharges at the northern property line.

As taken from the USDA NRCS Web Soil Survey, soil type consists of Hollis fine sandy loam (Hr), which is classified as hydrologic soil group (HSG) D. A Copy of the Web Soil Survey map is included in Appendix E. The soil types and hydrologic soil group boundaries are shown on drawings D1.0 - Pre-Development Drainage Plan and D2.0 - Post-Development Drainage Plan.

Runoff from the site was analyzed at four locations where stormwater discharges from the site, described as analysis points AP1 through AP3. Pre-development HydroCAD calculations can be

found in Appendix A. Pre-development peak flow rates at each of the analysis points are summarized in Table 1, for the 2, 10, and 25-year storm events.

Post-Development Conditions

The project includes the construction two industrial/commercial style buildings and associated parking, utilities, landscaping, and stormwater amenities. Stormwater runoff from the upper parking lot, the smaller building, and the lower parking lot will continue to drain via overland flow towards Presumpscot Street. Stormwater runoff from the larger building roof will be collected in in a stone dripedge filter along the north side of the building. The dripegde will provide both stormwater treatment and detention prior to discharge to the riprap swale on the north side of the property. The proposed site improvements will result in an increase of 10,600 square feet of new roof area and a reduction of 4,096 square feet of non-roof impervious area resulting in a net increase of 6,504 square feet of impervious area. The stormwater treatment calculations in Appendix C summarize the existing and proposed impervious and developed areas and associated treatment levels.

Post-development stormwater runoff from the site was analyzed by routing stormwater flows from the various developed subcatchments through proposed conveyance and treatment measures. Post-development HydroCAD calculations can be found in Appendix B and sheet D2.0 – Post Development Drainage Plan. Post-development peak flow rates at each of the analysis points are summarized in Table 1, for the 2, 10, and 25-year storm events.

Stormwater Quantity

The project is subject to the City of Portland stormwater standards which require that peak flow rates at each analysis point are not increased during the 2, 10, and 25-year storm events. In order to meet the City stormwater standards, WEA has analyzed the pre and post development flow rates at each analysis point for the respective storm events.

Stormwater detention is provided in the stone dripedge on the northerly side of the large building. The dripedge will discharge slowly through the foundation drain pipe to the riprap swale on the north side of the property.

Stormwater runoff reaches analysis points AP1, and AP3 via overland flow and do not require any additional stormwater detention to maintain pre-development peak flow rates.

The detention systems were sized and analyzed through an iterative process using HydroCAD, in order to provide attenuation of post-development peak flow rates to remain at or below pre-development peak flow rates at the analysis point.

Table 1 – Comparison of Pre and Post -Development Runoff Rates
Runoff rates in cubic feet per second (c.f.s.)

Peak Flow Rate Table			
Analysis Point	Storm		
AP1	**2 yr**	**10 yr**	**25 yr**
Pre Development	0.3	0.5	0.7
Post Development	0.3	0.5	0.7
AP2	**2 yr**	**10 yr**	**25 yr**
Pre Development	1.8	3.1	4.0
Post Development	1.8	3.0	3.9
AP3	**2 yr**	**10 yr**	**25 yr**
Pre Development	1.2	2.0	2.7
Post Development	0.6	1.1	2.4

As shown in Table 1, the peak runoff rates at all analysis points under the post-development conditions will remain at or below the peak pre-development runoff rates for the 2, 10, and 25-year storm events. Based on this analysis, we do not anticipate any adverse impact on downgradient drainage systems due to the proposed development.

Stormwater Quality

The proposed site improvements will result in an increase of 10,600 square feet of new roof area and a reduction of 4,096 square feet of parking area resulting in a net increase of 6,504 square feet of impervious area. One inch of runoff from the entire 9,000 square foot roof area of the larger building will be captured and treated in the dripedge filter on the north side of the building. The proposed stormwater management plan will achieve treatment of an area equal to 106% of the new impervious area and 134% of the new developed area. The treatment levels above 100% are due to the fact that the roof is larger than the net increase in impervious and developed areas. See Appendix C for treatment area calculations and BMP design calculations.

Erosion Control

BMPs such as silt fence and/or filter berms of erosion control mix, riprap pipe inlet and outlet protection, temporary catch basin inlet protection, mulch, and temporary seeding will be used to prevent erosion and downstream migration of sediment during construction. Permanent erosion control measures include asphalt pavement, pervious pavers, permanent seeding, turf reinforcement matting, riprap slopes, pipe inlet and outlet protection, and level spreaders. The locations of temporary and permanent erosion control measures are shown on Drawing C3.0 – Grading and Drainage Plan. Detailed Erosion and sedimentation control notes and details can be found on Drawings C4.0-C4.4.

Inspection & Maintenance

Jake's Development, Inc. will be responsible for maintaining the stormwater facilities for the project. An Inspection and Maintenance Plan is included as Appendix D.

Conclusions

The stormwater management for this project includes a roof dripline filter to control both the quantity and quality of stormwater runoff. The HydroCAD calculations show that the peak runoff rates at the analysis points under post-development conditions are estimated to be equal to or less than the peak pre-development runoff rates for the 2, 10, and 25-year storm events. The proposed stormwater management BMPs are designed to meet the City of Portland stormwater standards to provide water quality enhancement. It is our opinion that the proposed stormwater management plan meets the requirements of the City of Portland regulations.

Silas Canavan, PE
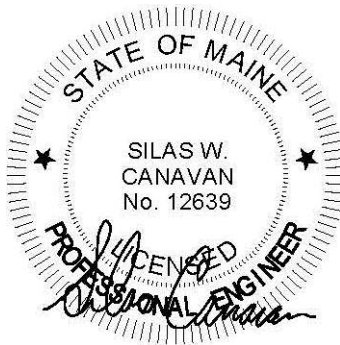
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Walsh Engineering Associates, Inc.

SUPPORTING DATA AND CALCULATIONS

The following material presents calculations and copies of source material used during the analysis for this study.

Appendix A: Pre-Development HydroCAD Calculations
Appendix B: Post-Development HydroCAD Calculations
Appendix C: Stormwater BMP Treatment Calculations
Appendix D: Inspection & Maintenance Plan
Appendix E: USDA NRCS Web Soil Survey
Appendix F: Drainage Plans
        D1.0:   Pre Development Drainage Plan
        D2.0:   Post Development Drainage Plan

Appendix A:
Pre-Development HydroCAD Calculations
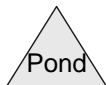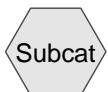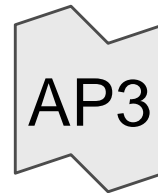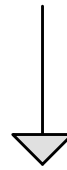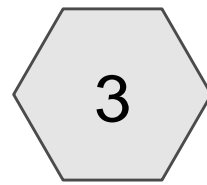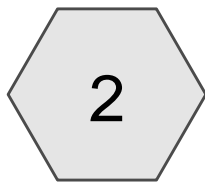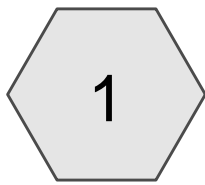
1

2

3

AP1

AP2

AP3

Subcat Reach Pond Link

Pre Development
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Type III 24-hr 2yr Rainfall=3.10"
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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Runoff Area=9,063 sf 34.21% Impervious Runoff Depth>1.59"
Flow Length=120' Tc=16.6 min CN=84 Runoff=0.28 cfs 0.028 af

Subcatchment 2: Runoff Area=63,914 sf 52.93% Impervious Runoff Depth>1.98"
Flow Length=540' Tc=33.9 min CN=89 Runoff=1.82 cfs 0.242 af

Subcatchment 3: Runoff Area=30,405 sf 43.66% Impervious Runoff Depth>1.82"
Flow Length=355' Tc=13.4 min CN=87 Runoff=1.17 cfs 0.106 af

Link AP1: Inflow=0.28 cfs 0.028 af
Primary=0.28 cfs 0.028 af

Link AP2: Inflow=1.82 cfs 0.242 af
Primary=1.82 cfs 0.242 af

Link AP3: Inflow=1.17 cfs 0.106 af
Primary=1.17 cfs 0.106 af

Total Runoff Area = 2.373 ac   Runoff Volume = 0.375 af   Average Runoff Depth = 1.90"
51.44% Pervious = 1.221 ac   48.56% Impervious = 1.153 ac

Summary for Subcatchment 1:

Runoff   =   0.28 cfs @ 12.23 hrs, Volume=   0.028 af, Depth> 1.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.10"

	Area (sf)	CN	Description
*	3,100	98	Impervious cover
	5,963	77	Woods, Good, HSG D
	9,063	84	Weighted Average
	5,963		65.79% Pervious Area
	3,100		34.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0350	1.47		**Sheet Flow, AB**
					Smooth surfaces n= 0.011 P2= 3.10"
16.0	70	0.0850	0.07		**Sheet Flow, BC**
					Woods: Dense underbrush n= 0.800 P2= 3.10"
16.6	120	Total			

Summary for Subcatchment 2:

Runoff   =   1.82 cfs @ 12.46 hrs, Volume=   0.242 af, Depth> 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.10"

	Area (sf)	CN	Description
*	33,832	98	Impervious Cover
	14,746	77	Woods, Good, HSG D
	15,336	80	>75% Grass cover, Good, HSG D
	63,914	89	Weighted Average
	30,082		47.07% Pervious Area
	33,832		52.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.4	150	0.0670	0.08		**Sheet Flow, AB**
					Woods: Dense underbrush n= 0.800 P2= 3.10"
1.1	240	0.0310	3.57		**Shallow Concentrated Flow, BC**
					Paved Kv= 20.3 fps
0.4	150	0.0970	6.32		**Shallow Concentrated Flow, CD**
					Paved Kv= 20.3 fps
33.9	540	Total			

Summary for Subcatchment 3:

Runoff   =   1.17 cfs @ 12.19 hrs, Volume=   0.106 af, Depth> 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.10"

	Area (sf)	CN	Description
	4,343	80	>75% Grass cover, Good, HSG D
	12,787	77	Woods, Good, HSG D
*	13,275	98	Impervious
	30,405	87	Weighted Average
	17,130		56.34% Pervious Area
	13,275		43.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	15	0.0160	0.10		**Sheet Flow, AB**
					Grass: Short n= 0.150 P2= 3.10"
8.8	40	0.1250	0.08		**Sheet Flow, BC**
					Woods: Dense underbrush n= 0.800 P2= 3.10"
1.3	150	0.0400	1.94		**Sheet Flow, CD**
					Smooth surfaces n= 0.011 P2= 3.10"
0.4	35	0.4000	1.58		**Shallow Concentrated Flow, DE**
					Forest w/Heavy Litter Kv= 2.5 fps
0.5	115	0.0260	4.01	12.04	**Trap/Vee/Rect Channel Flow, EF**
					Bot.W=1.00' D=1.00' Z= 2.0 '/' Top.W=5.00'
					n= 0.040 Earth, cobble bottom, clean sides
13.4	355				Total

Summary for Link AP1:

Inflow Area =   0.208 ac, 34.21% Impervious, Inflow Depth > 1.59"   for 2yr event
Inflow   =   0.28 cfs @ 12.23 hrs, Volume=   0.028 af
Primary   =   0.28 cfs @ 12.23 hrs, Volume=   0.028 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP2:

Inflow Area =   1.467 ac, 52.93% Impervious, Inflow Depth > 1.98"   for 2yr event
Inflow   =   1.82 cfs @ 12.46 hrs, Volume=   0.242 af
Primary   =   1.82 cfs @ 12.46 hrs, Volume=   0.242 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP3:

Inflow Area =   0.698 ac, 43.66% Impervious, Inflow Depth > 1.82"   for 2yr event
Inflow   =   1.17 cfs @   12.19 hrs, Volume=   0.106 af
Primary   =   1.17 cfs @   12.19 hrs, Volume=   0.106 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pre Development
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Type III 24-hr 10yr Rainfall=4.60"
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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Runoff Area=9,063 sf 34.21% Impervious Runoff Depth>2.90"
Flow Length=120' Tc=16.6 min CN=84 Runoff=0.51 cfs 0.050 af

Subcatchment 2: Runoff Area=63,914 sf 52.93% Impervious Runoff Depth>3.37"
Flow Length=540' Tc=33.9 min CN=89 Runoff=3.06 cfs 0.412 af

Subcatchment 3: Runoff Area=30,405 sf 43.66% Impervious Runoff Depth>3.19"
Flow Length=355' Tc=13.4 min CN=87 Runoff=2.02 cfs 0.185 af

Link AP1: Inflow=0.51 cfs 0.050 af
Primary=0.51 cfs 0.050 af

Link AP2: Inflow=3.06 cfs 0.412 af
Primary=3.06 cfs 0.412 af

Link AP3: Inflow=2.02 cfs 0.185 af
Primary=2.02 cfs 0.185 af

Total Runoff Area = 2.373 ac   Runoff Volume = 0.648 af   Average Runoff Depth = 3.27"
51.44% Pervious = 1.221 ac   48.56% Impervious = 1.153 ac

Summary for Subcatchment 1:

Runoff = 0.51 cfs @ 12.23 hrs, Volume= 0.050 af, Depth> 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.60"

	Area (sf)	CN	Description
*	3,100	98	Impervious cover
	5,963	77	Woods, Good, HSG D
	9,063	84	Weighted Average
	5,963		65.79% Pervious Area
	3,100		34.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0350	1.47		**Sheet Flow, AB**
					Smooth surfaces n= 0.011 P2= 3.10"
16.0	70	0.0850	0.07		**Sheet Flow, BC**
					Woods: Dense underbrush n= 0.800 P2= 3.10"
16.6	120				Total

Summary for Subcatchment 2:

Runoff = 3.06 cfs @ 12.46 hrs, Volume= 0.412 af, Depth> 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.60"

	Area (sf)	CN	Description
*	33,832	98	Impervious Cover
	14,746	77	Woods, Good, HSG D
	15,336	80	>75% Grass cover, Good, HSG D
	63,914	89	Weighted Average
	30,082		47.07% Pervious Area
	33,832		52.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.4	150	0.0670	0.08		**Sheet Flow, AB**
					Woods: Dense underbrush n= 0.800 P2= 3.10"
1.1	240	0.0310	3.57		**Shallow Concentrated Flow, BC**
					Paved Kv= 20.3 fps
0.4	150	0.0970	6.32		**Shallow Concentrated Flow, CD**
					Paved Kv= 20.3 fps
33.9	540				Total

Summary for Subcatchment 3:

Runoff   =   2.02 cfs @ 12.18 hrs, Volume=   0.185 af, Depth> 3.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.60"

	Area (sf)	CN	Description
	4,343	80	>75% Grass cover, Good, HSG D
	12,787	77	Woods, Good, HSG D
*	13,275	98	Impervious
	30,405	87	Weighted Average
	17,130		56.34% Pervious Area
	13,275		43.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	15	0.0160	0.10		**Sheet Flow, AB**
					Grass: Short n= 0.150 P2= 3.10"
8.8	40	0.1250	0.08		**Sheet Flow, BC**
					Woods: Dense underbrush n= 0.800 P2= 3.10"
1.3	150	0.0400	1.94		**Sheet Flow, CD**
					Smooth surfaces n= 0.011 P2= 3.10"
0.4	35	0.4000	1.58		**Shallow Concentrated Flow, DE**
					Forest w/Heavy Litter Kv= 2.5 fps
0.5	115	0.0260	4.01	12.04	**Trap/Vee/Rect Channel Flow, EF**
					Bot.W=1.00' D=1.00' Z= 2.0 '/' Top.W=5.00'
					n= 0.040 Earth, cobble bottom, clean sides
13.4	355				Total

Summary for Link AP1:

Inflow Area =   0.208 ac, 34.21% Impervious, Inflow Depth > 2.90"   for 10yr event
Inflow   =   0.51 cfs @ 12.23 hrs, Volume=   0.050 af
Primary   =   0.51 cfs @ 12.23 hrs, Volume=   0.050 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP2:

Inflow Area =   1.467 ac, 52.93% Impervious, Inflow Depth > 3.37"   for 10yr event
Inflow   =   3.06 cfs @ 12.46 hrs, Volume=   0.412 af
Primary   =   3.06 cfs @ 12.46 hrs, Volume=   0.412 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP3:

Inflow Area =   0.698 ac, 43.66% Impervious, Inflow Depth > 3.19"   for 10yr event
Inflow   =   2.02 cfs @   12.18 hrs, Volume=   0.185 af
Primary   =   2.02 cfs @   12.18 hrs, Volume=   0.185 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1:   Runoff Area=9,063 sf 34.21% Impervious Runoff Depth>4.00"
                    Flow Length=120' Tc=16.6 min CN=84 Runoff=0.70 cfs 0.069 af

Subcatchment 2:   Runoff Area=63,914 sf 52.93% Impervious Runoff Depth>4.52"
                    Flow Length=540' Tc=33.9 min CN=89 Runoff=4.04 cfs 0.552 af

Subcatchment 3:   Runoff Area=30,405 sf 43.66% Impervious Runoff Depth>4.32"
                    Flow Length=355' Tc=13.4 min CN=87 Runoff=2.71 cfs 0.251 af

Link AP1:   Inflow=0.70 cfs 0.069 af
                                        Primary=0.70 cfs 0.069 af

Link AP2:   Inflow=4.04 cfs 0.552 af
                                        Primary=4.04 cfs 0.552 af

Link AP3:   Inflow=2.71 cfs 0.251 af
                                        Primary=2.71 cfs 0.251 af

Total Runoff Area = 2.373 ac   Runoff Volume = 0.873 af   Average Runoff Depth = 4.41"
51.44% Pervious = 1.221 ac   48.56% Impervious = 1.153 ac

Summary for Subcatchment 1:

Runoff   =   0.70 cfs @ 12.22 hrs, Volume=   0.069 af, Depth> 4.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.80"

	Area (sf)	CN	Description
*	3,100	98	Impervious cover
	5,963	77	Woods, Good, HSG D
	9,063	84	Weighted Average
	5,963		65.79% Pervious Area
	3,100		34.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0350	1.47		**Sheet Flow, AB**
					Smooth surfaces n= 0.011 P2= 3.10"
16.0	70	0.0850	0.07		**Sheet Flow, BC**
					Woods: Dense underbrush n= 0.800 P2= 3.10"
16.6	120	Total			

Summary for Subcatchment 2:

Runoff   =   4.04 cfs @ 12.45 hrs, Volume=   0.552 af, Depth> 4.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.80"

	Area (sf)	CN	Description
*	33,832	98	Impervious Cover
	14,746	77	Woods, Good, HSG D
	15,336	80	>75% Grass cover, Good, HSG D
	63,914	89	Weighted Average
	30,082		47.07% Pervious Area
	33,832		52.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.4	150	0.0670	0.08		**Sheet Flow, AB**
					Woods: Dense underbrush n= 0.800 P2= 3.10"
1.1	240	0.0310	3.57		**Shallow Concentrated Flow, BC**
					Paved Kv= 20.3 fps
0.4	150	0.0970	6.32		**Shallow Concentrated Flow, CD**
					Paved Kv= 20.3 fps
33.9	540	Total			

Summary for Subcatchment 3:

Runoff   =   2.71 cfs @ 12.18 hrs, Volume=   0.251 af, Depth> 4.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.80"

	Area (sf)	CN	Description
	4,343	80	>75% Grass cover, Good, HSG D
	12,787	77	Woods, Good, HSG D
*	13,275	98	Impervious
	30,405	87	Weighted Average
	17,130		56.34% Pervious Area
	13,275		43.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	15	0.0160	0.10		**Sheet Flow, AB**
					Grass: Short n= 0.150 P2= 3.10"
8.8	40	0.1250	0.08		**Sheet Flow, BC**
					Woods: Dense underbrush n= 0.800 P2= 3.10"
1.3	150	0.0400	1.94		**Sheet Flow, CD**
					Smooth surfaces n= 0.011 P2= 3.10"
0.4	35	0.4000	1.58		**Shallow Concentrated Flow, DE**
					Forest w/Heavy Litter Kv= 2.5 fps
0.5	115	0.0260	4.01	12.04	**Trap/Vee/Rect Channel Flow, EF**
					Bot.W=1.00' D=1.00' Z= 2.0 '/' Top.W=5.00'
					n= 0.040 Earth, cobble bottom, clean sides
13.4	355	Total			

Summary for Link AP1:

Inflow Area =   0.208 ac, 34.21% Impervious, Inflow Depth > 4.00"   for 25yr event
Inflow   =   0.70 cfs @ 12.22 hrs, Volume=   0.069 af
Primary   =   0.70 cfs @ 12.22 hrs, Volume=   0.069 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP2:

Inflow Area =   1.467 ac, 52.93% Impervious, Inflow Depth > 4.52"   for 25yr event
Inflow   =   4.04 cfs @ 12.45 hrs, Volume=   0.552 af
Primary   =   4.04 cfs @ 12.45 hrs, Volume=   0.552 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP3:

Inflow Area =   0.698 ac, 43.66% Impervious, Inflow Depth > 4.32"   for 25yr event
Inflow   =   2.71 cfs @   12.18 hrs, Volume=   0.251 af
Primary   =   2.71 cfs @   12.18 hrs, Volume=   0.251 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Appendix B:
Post-Development HydroCAD Calculations

1.0 → AP1

2.1 ↘ AP2 ↙ 2.2

3.1 → AP3

3.2 → D1 → AP3

Dripline
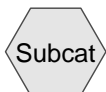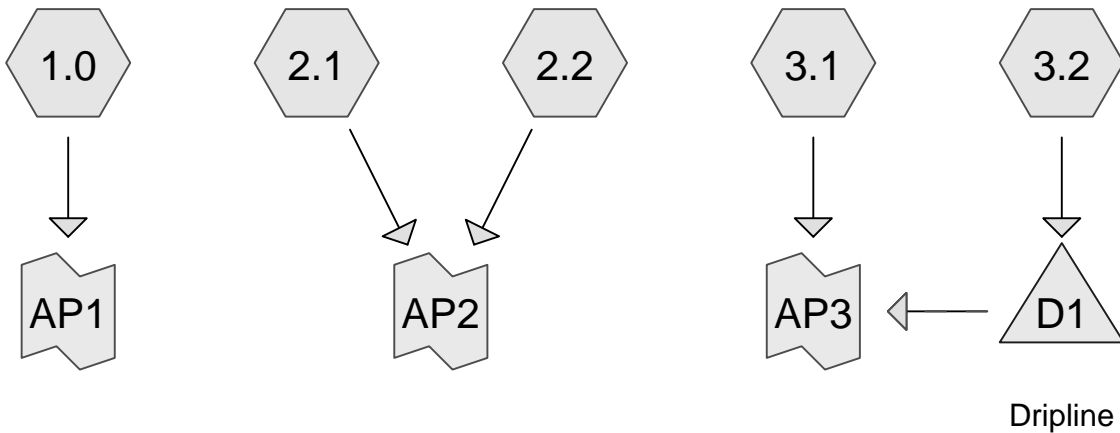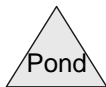
Subcat   Reach   Pond   Link

Routing Diagram for Post Development
Prepared by Walsh Engineering Associates, Inc., Printed 11/29/2017
HydroCAD® 10.00-19 s/n 01350 © 2016 HydroCAD Software Solutions LLC

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1.0:   Runoff Area=9,063 sf 34.21% Impervious Runoff Depth>1.59"
            Flow Length=120' Tc=16.6 min CN=84 Runoff=0.28 cfs 0.028 af

Subcatchment 2.1:   Runoff Area=55,583 sf 66.76% Impervious Runoff Depth>2.15"
            Flow Length=540' Tc=33.9 min CN=91 Runoff=1.71 cfs 0.229 af

Subcatchment 2.2:   Runoff Area=9,575 sf 53.27% Impervious Runoff Depth>1.99"
            Tc=5.0 min CN=89 Runoff=0.51 cfs 0.036 af

Subcatchment 3.1:   Runoff Area=19,377 sf 9.57% Impervious Runoff Depth>1.32"
            Flow Length=395' Tc=14.7 min CN=80 Runoff=0.52 cfs 0.049 af

Subcatchment 3.2:   Runoff Area=9,750 sf 100.00% Impervious Runoff Depth>2.87"
            Tc=5.0 min CN=98 Runoff=0.68 cfs 0.053 af

Pond D1: Dripline   Peak Elev=57.37' Storage=815 cf Inflow=0.68 cfs 0.053 af
   Primary=0.09 cfs 0.053 af Secondary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.053 af

Link AP1:   Inflow=0.28 cfs 0.028 af
                                     Primary=0.28 cfs 0.028 af

Link AP2:   Inflow=1.84 cfs 0.265 af
                                     Primary=1.84 cfs 0.265 af

Link AP3:   Inflow=0.60 cfs 0.102 af
                                     Primary=0.60 cfs 0.102 af

Total Runoff Area = 2.373 ac   Runoff Volume = 0.395 af   Average Runoff Depth = 2.00"
44.93% Pervious = 1.066 ac   55.07% Impervious = 1.307 ac

Summary for Subcatchment 1.0:

Runoff   =   0.28 cfs @ 12.23 hrs, Volume=   0.028 af, Depth> 1.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.10"

	Area (sf)	CN	Description
*	3,100	98	Impervious cover
	5,963	77	Woods, Good, HSG D
	9,063	84	Weighted Average
	5,963		65.79% Pervious Area
	3,100		34.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0350	1.47		**Sheet Flow, AB**
					Smooth surfaces n= 0.011 P2= 3.10"
16.0	70	0.0850	0.07		**Sheet Flow, BC**
					Woods: Dense underbrush n= 0.800 P2= 3.10"
16.6	120	Total			

Summary for Subcatchment 2.1:

Runoff   =   1.71 cfs @ 12.46 hrs, Volume=   0.229 af, Depth> 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.10"

	Area (sf)	CN	Description
*	37,107	98	Impervious Cover
	13,833	77	Woods, Good, HSG D
	4,643	80	>75% Grass cover, Good, HSG D
	55,583	91	Weighted Average
	18,476		33.24% Pervious Area
	37,107		66.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.4	150	0.0670	0.08		**Sheet Flow, AB**
					Woods: Dense underbrush n= 0.800 P2= 3.10"
1.1	240	0.0310	3.57		**Shallow Concentrated Flow, BC**
					Paved Kv= 20.3 fps
0.4	150	0.0970	6.32		**Shallow Concentrated Flow, CD**
					Paved Kv= 20.3 fps
33.9	540	Total			

Summary for Subcatchment 2.2:

Runoff   =   0.51 cfs @ 12.07 hrs, Volume=   0.036 af, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.10"

	Area (sf)	CN	Description
*	5,101	98	Impervious
	4,001	80	>75% Grass cover, Good, HSG D
	473	73	Brush, Good, HSG D
	9,575	89	Weighted Average
	4,474		46.73% Pervious Area
	5,101		53.27% Impervious Area

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

Summary for Subcatchment 3.1:

Runoff   =   0.52 cfs @ 12.21 hrs, Volume=   0.049 af, Depth> 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.10"

	Area (sf)	CN	Description
*	1,855	98	Impervious
	3,217	73	Brush, Good, HSG D
	6,848	77	Woods, Good, HSG D
	7,457	80	>75% Grass cover, Good, HSG D
	19,377	80	Weighted Average
	17,522		90.43% Pervious Area
	1,855		9.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	15	0.0160	0.10		**Sheet Flow, AB**
					Grass: Short n= 0.150 P2= 3.10"
8.8	40	0.1250	0.08		**Sheet Flow, BC**
					Woods: Dense underbrush n= 0.800 P2= 3.10"
1.6	140	0.0410	1.42		**Shallow Concentrated Flow, CD**
					Short Grass Pasture Kv= 7.0 fps
0.9	30	0.0470	0.54		**Shallow Concentrated Flow, DE**
					Forest w/Heavy Litter Kv= 2.5 fps
1.0	170	0.0130	2.84	8.51	**Trap/Vee/Rect Channel Flow, G-H**
					Bot.W=1.00' D=1.00' Z= 2.0 '/' Top.W=5.00'
					n= 0.040 Earth, cobble bottom, clean sides
14.7	395				Total

Summary for Subcatchment 3.2:

Runoff   =   0.68 cfs @ 12.07 hrs, Volume=   0.053 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.10"

	Area (sf)	CN	Description
*	9,000	98	Impervious Roof
*	750	98	Roof Dripline Filter
	9,750	98	Weighted Average
	9,750		100.00% Impervious Area

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

Summary for Pond D1: Dripline

Inflow Area =   0.224 ac,100.00% Impervious, Inflow Depth > 2.87"   for 2yr event
Inflow   =   0.68 cfs @ 12.07 hrs, Volume=   0.053 af
Outflow   =   0.09 cfs @ 12.10 hrs, Volume=   0.053 af, Atten= 87%, Lag= 1.8 min
Primary   =   0.09 cfs @ 12.10 hrs, Volume=   0.053 af
Secondary =   0.00 cfs @   0.00 hrs, Volume=   0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 57.37' @ 12.60 hrs   Surf.Area= 1,500 sf   Storage= 815 cf

Plug-Flow detention time= 86.7 min calculated for 0.053 af (100% of inflow)
Center-of-Mass det. time= 86.2 min (842.0 - 755.8)

Volume	Invert	Avail.Storage	Storage Description
#1	56.40'	810 cf	**5.00'W x 150.00'L x 2.70'H Crushed Stone**
			2,025 cf Overall x 40.0% Voids
#2	53.00'	525 cf	**5.00'W x 150.00'L x 3.50'H Drainage Layer**
			2,625 cf Overall x 20.0% Voids
		1,335 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.00'	**10.0' long x 1.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	53.00'	**2.500 in/hr Exfiltration over Horizontal area**

Primary OutFlow Max=0.09 cfs @ 12.10 hrs HW=56.42'   (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=53.00'   (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link AP1:

Inflow Area =   0.208 ac, 34.21% Impervious, Inflow Depth > 1.59"   for 2yr event
Inflow   =   0.28 cfs @   12.23 hrs, Volume=   0.028 af
Primary   =   0.28 cfs @   12.23 hrs, Volume=   0.028 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP2:

Inflow Area =   1.496 ac, 64.78% Impervious, Inflow Depth > 2.13"   for 2yr event
Inflow   =   1.84 cfs @   12.43 hrs, Volume=   0.265 af
Primary   =   1.84 cfs @   12.43 hrs, Volume=   0.265 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP3:

Inflow Area =   0.669 ac, 39.84% Impervious, Inflow Depth > 1.84"   for 2yr event
Inflow   =   0.60 cfs @   12.21 hrs, Volume=   0.102 af
Primary   =   0.60 cfs @   12.21 hrs, Volume=   0.102 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Post Development
Prepared by Walsh Engineering Associates, Inc.
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Type III 24-hr 10yr Rainfall=4.60"
Printed 11/29/2017
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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1.0:
Runoff Area=9,063 sf 34.21% Impervious Runoff Depth>2.90"
Flow Length=120' Tc=16.6 min CN=84 Runoff=0.51 cfs 0.050 af

Subcatchment 2.1:
Runoff Area=55,583 sf 66.76% Impervious Runoff Depth>3.57"
Flow Length=540' Tc=33.9 min CN=91 Runoff=2.78 cfs 0.380 af

Subcatchment 2.2:
Runoff Area=9,575 sf 53.27% Impervious Runoff Depth>3.39"
Tc=5.0 min CN=89 Runoff=0.86 cfs 0.062 af

Subcatchment 3.1:
Runoff Area=19,377 sf 9.57% Impervious Runoff Depth>2.54"
Flow Length=395' Tc=14.7 min CN=80 Runoff=1.01 cfs 0.094 af

Subcatchment 3.2:
Runoff Area=9,750 sf 100.00% Impervious Runoff Depth>4.36"
Tc=5.0 min CN=98 Runoff=1.01 cfs 0.081 af

Pond D1: Dripline
Peak Elev=59.05' Storage=1,319 cf Inflow=1.01 cfs 0.081 af
Primary=0.09 cfs 0.078 af Secondary=0.25 cfs 0.003 af Outflow=0.33 cfs 0.081 af

Link AP1:
Inflow=0.51 cfs 0.050 af
Primary=0.51 cfs 0.050 af

Link AP2:
Inflow=3.01 cfs 0.442 af
Primary=3.01 cfs 0.442 af

Link AP3:
Inflow=1.10 cfs 0.175 af
Primary=1.10 cfs 0.175 af

Total Runoff Area = 2.373 ac   Runoff Volume = 0.668 af   Average Runoff Depth = 3.38"
44.93% Pervious = 1.066 ac   55.07% Impervious = 1.307 ac

Summary for Subcatchment 1.0:

Runoff   =   0.51 cfs @ 12.23 hrs, Volume=   0.050 af, Depth> 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.60"

	Area (sf)	CN	Description
*	3,100	98	Impervious cover
	5,963	77	Woods, Good, HSG D
	9,063	84	Weighted Average
	5,963		65.79% Pervious Area
	3,100		34.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0350	1.47		**Sheet Flow, AB**
					Smooth surfaces n= 0.011 P2= 3.10"
16.0	70	0.0850	0.07		**Sheet Flow, BC**
					Woods: Dense underbrush n= 0.800 P2= 3.10"
16.6	120	Total			

Summary for Subcatchment 2.1:

Runoff   =   2.78 cfs @ 12.45 hrs, Volume=   0.380 af, Depth> 3.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.60"

	Area (sf)	CN	Description
*	37,107	98	Impervious Cover
	13,833	77	Woods, Good, HSG D
	4,643	80	>75% Grass cover, Good, HSG D
	55,583	91	Weighted Average
	18,476		33.24% Pervious Area
	37,107		66.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.4	150	0.0670	0.08		**Sheet Flow, AB**
					Woods: Dense underbrush n= 0.800 P2= 3.10"
1.1	240	0.0310	3.57		**Shallow Concentrated Flow, BC**
					Paved Kv= 20.3 fps
0.4	150	0.0970	6.32		**Shallow Concentrated Flow, CD**
					Paved Kv= 20.3 fps
33.9	540	Total			

Summary for Subcatchment 2.2:

Runoff   =   0.86 cfs @ 12.07 hrs, Volume=   0.062 af, Depth> 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.60"

	Area (sf)	CN	Description
*	5,101	98	Impervious
	4,001	80	>75% Grass cover, Good, HSG D
	473	73	Brush, Good, HSG D
	9,575	89	Weighted Average
	4,474		46.73% Pervious Area
	5,101		53.27% Impervious Area

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

Summary for Subcatchment 3.1:

Runoff   =   1.01 cfs @ 12.21 hrs, Volume=   0.094 af, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.60"

	Area (sf)	CN	Description
*	1,855	98	Impervious
	3,217	73	Brush, Good, HSG D
	6,848	77	Woods, Good, HSG D
	7,457	80	>75% Grass cover, Good, HSG D
	19,377	80	Weighted Average
	17,522		90.43% Pervious Area
	1,855		9.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	15	0.0160	0.10		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.10"
8.8	40	0.1250	0.08		**Sheet Flow, BC** Woods: Dense underbrush n= 0.800 P2= 3.10"
1.6	140	0.0410	1.42		**Shallow Concentrated Flow, CD** Short Grass Pasture Kv= 7.0 fps
0.9	30	0.0470	0.54		**Shallow Concentrated Flow, DE** Forest w/Heavy Litter Kv= 2.5 fps
1.0	170	0.0130	2.84	8.51	**Trap/Vee/Rect Channel Flow, G-H** Bot.W=1.00' D=1.00' Z= 2.0 '/' Top.W=5.00' n= 0.040 Earth, cobble bottom, clean sides
14.7	395				Total

Summary for Subcatchment 3.2:

Runoff   =   1.01 cfs @ 12.07 hrs, Volume=   0.081 af, Depth> 4.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.60"

	Area (sf)	CN	Description
*	9,000	98	Impervious Roof
*	750	98	Roof Dripline Filter
	9,750	98	Weighted Average
	9,750		100.00% Impervious Area

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

Summary for Pond D1: Dripline

Inflow Area =   0.224 ac,100.00% Impervious, Inflow Depth > 4.36"   for 10yr event
Inflow   =   1.01 cfs @ 12.07 hrs, Volume=   0.081 af
Outflow   =   0.33 cfs @ 12.41 hrs, Volume=   0.081 af, Atten= 67%, Lag= 20.5 min
Primary   =   0.09 cfs @ 12.00 hrs, Volume=   0.078 af
Secondary =   0.25 cfs @ 12.41 hrs, Volume=   0.003 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 59.05' @ 12.42 hrs Surf.Area= 1,500 sf Storage= 1,319 cf

Plug-Flow detention time= 124.2 min calculated for 0.081 af (100% of inflow)
Center-of-Mass det. time= 123.6 min (871.7 - 748.2)

Volume	Invert	Avail.Storage	Storage Description
#1	56.40'	810 cf	**5.00'W x 150.00'L x 2.70'H Crushed Stone**
			2,025 cf Overall x 40.0% Voids
#2	53.00'	525 cf	**5.00'W x 150.00'L x 3.50'H Drainage Layer**
			2,625 cf Overall x 20.0% Voids
		1,335 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.00'	**10.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	53.00'	**2.500 in/hr Exfiltration over Horizontal area**

Primary OutFlow Max=0.09 cfs @ 12.00 hrs HW=56.65' (Free Discharge)
└—**2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Secondary OutFlow Max=0.20 cfs @ 12.41 hrs HW=59.04' (Free Discharge)
└—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.20 cfs @ 0.53 fps)

Summary for Link AP1:

Inflow Area =   0.208 ac, 34.21% Impervious, Inflow Depth > 2.90"   for 10yr event
Inflow   =   0.51 cfs @   12.23 hrs, Volume=   0.050 af
Primary   =   0.51 cfs @   12.23 hrs, Volume=   0.050 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP2:

Inflow Area =   1.496 ac, 64.78% Impervious, Inflow Depth > 3.55"   for 10yr event
Inflow   =   3.01 cfs @   12.43 hrs, Volume=   0.442 af
Primary   =   3.01 cfs @   12.43 hrs, Volume=   0.442 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP3:

Inflow Area =   0.669 ac, 39.84% Impervious, Inflow Depth > 3.15"   for 10yr event
Inflow   =   1.10 cfs @   12.21 hrs, Volume=   0.175 af
Primary   =   1.10 cfs @   12.21 hrs, Volume=   0.175 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1.0:   Runoff Area=9,063 sf 34.21% Impervious Runoff Depth>4.00"
                                   Flow Length=120' Tc=16.6 min CN=84 Runoff=0.70 cfs 0.069 af

Subcatchment 2.1:   Runoff Area=55,583 sf 66.76% Impervious Runoff Depth>4.74"
                                   Flow Length=540' Tc=33.9 min CN=91 Runoff=3.64 cfs 0.504 af

Subcatchment 2.2:   Runoff Area=9,575 sf 53.27% Impervious Runoff Depth>4.54"
                                                Tc=5.0 min CN=89 Runoff=1.13 cfs 0.083 af

Subcatchment 3.1:   Runoff Area=19,377 sf 9.57% Impervious Runoff Depth>3.59"
                                   Flow Length=395' Tc=14.7 min CN=80 Runoff=1.42 cfs 0.133 af

Subcatchment 3.2:   Runoff Area=9,750 sf 100.00% Impervious Runoff Depth>5.56"
                                                Tc=5.0 min CN=98 Runoff=1.28 cfs 0.104 af

Pond D1: Dripline   Peak Elev=59.10' Storage=1,335 cf Inflow=1.28 cfs 0.104 af
              Primary=0.09 cfs 0.088 af Secondary=0.90 cfs 0.016 af Outflow=0.98 cfs 0.104 af

Link AP1:   Inflow=0.70 cfs 0.069 af
                                                     Primary=0.70 cfs 0.069 af

Link AP2:   Inflow=3.93 cfs 0.587 af
                                                     Primary=3.93 cfs 0.587 af

Link AP3:   Inflow=2.36 cfs 0.237 af
                                                     Primary=2.36 cfs 0.237 af

Total Runoff Area = 2.373 ac   Runoff Volume = 0.893 af   Average Runoff Depth = 4.52"
44.93% Pervious = 1.066 ac   55.07% Impervious = 1.307 ac

Summary for Subcatchment 1.0:

Runoff   =   0.70 cfs @ 12.22 hrs, Volume=   0.069 af, Depth> 4.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.80"

	Area (sf)	CN	Description
*	3,100	98	Impervious cover
	5,963	77	Woods, Good, HSG D
	9,063	84	Weighted Average
	5,963		65.79% Pervious Area
	3,100		34.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0350	1.47		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.10"
16.0	70	0.0850	0.07		**Sheet Flow, BC** Woods: Dense underbrush n= 0.800 P2= 3.10"
16.6	120				Total

Summary for Subcatchment 2.1:

Runoff   =   3.64 cfs @ 12.45 hrs, Volume=   0.504 af, Depth> 4.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.80"

	Area (sf)	CN	Description
*	37,107	98	Impervious Cover
	13,833	77	Woods, Good, HSG D
	4,643	80	>75% Grass cover, Good, HSG D
	55,583	91	Weighted Average
	18,476		33.24% Pervious Area
	37,107		66.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.4	150	0.0670	0.08		**Sheet Flow, AB** Woods: Dense underbrush n= 0.800 P2= 3.10"
1.1	240	0.0310	3.57		**Shallow Concentrated Flow, BC** Paved Kv= 20.3 fps
0.4	150	0.0970	6.32		**Shallow Concentrated Flow, CD** Paved Kv= 20.3 fps
33.9	540				Total

Summary for Subcatchment 2.2:

Runoff   =   1.13 cfs @ 12.07 hrs, Volume=   0.083 af, Depth> 4.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.80"

	Area (sf)	CN	Description
*	5,101	98	Impervious
	4,001	80	>75% Grass cover, Good, HSG D
	473	73	Brush, Good, HSG D
	9,575	89	Weighted Average
	4,474		46.73% Pervious Area
	5,101		53.27% Impervious Area

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

Summary for Subcatchment 3.1:

Runoff   =   1.42 cfs @ 12.20 hrs, Volume=   0.133 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.80"

	Area (sf)	CN	Description
*	1,855	98	Impervious
	3,217	73	Brush, Good, HSG D
	6,848	77	Woods, Good, HSG D
	7,457	80	>75% Grass cover, Good, HSG D
	19,377	80	Weighted Average
	17,522		90.43% Pervious Area
	1,855		9.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	15	0.0160	0.10		**Sheet Flow, AB**
					Grass: Short n= 0.150 P2= 3.10"
8.8	40	0.1250	0.08		**Sheet Flow, BC**
					Woods: Dense underbrush n= 0.800 P2= 3.10"
1.6	140	0.0410	1.42		**Shallow Concentrated Flow, CD**
					Short Grass Pasture Kv= 7.0 fps
0.9	30	0.0470	0.54		**Shallow Concentrated Flow, DE**
					Forest w/Heavy Litter Kv= 2.5 fps
1.0	170	0.0130	2.84	8.51	**Trap/Vee/Rect Channel Flow, G-H**
					Bot.W=1.00' D=1.00' Z= 2.0 '/' Top.W=5.00'
					n= 0.040 Earth, cobble bottom, clean sides
14.7	395				Total

Summary for Subcatchment 3.2:

Runoff   =   1.28 cfs @ 12.07 hrs, Volume=   0.104 af, Depth> 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.80"

	Area (sf)	CN	Description
*	9,000	98	Impervious Roof
*	750	98	Roof Dripline Filter
	9,750	98	Weighted Average
	9,750		100.00% Impervious Area

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

Summary for Pond D1: Dripline

Inflow Area =   0.224 ac,100.00% Impervious, Inflow Depth > 5.56"   for 25yr event
Inflow   =   1.28 cfs @ 12.07 hrs, Volume=   0.104 af
Outflow   =   0.98 cfs @ 12.16 hrs, Volume=   0.104 af, Atten= 23%, Lag= 5.5 min
Primary   =   0.09 cfs @ 11.80 hrs, Volume=   0.088 af
Secondary =   0.90 cfs @ 12.16 hrs, Volume=   0.016 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 59.10' @ 12.15 hrs   Surf.Area= 1,500 sf   Storage= 1,335 cf

Plug-Flow detention time= 114.4 min calculated for 0.104 af (100% of inflow)
Center-of-Mass det. time= 114.1 min (858.5 - 744.4)

Volume	Invert	Avail.Storage	Storage Description
#1	56.40'	810 cf	**5.00'W x 150.00'L x 2.70'H Crushed Stone**
			2,025 cf Overall x 40.0% Voids
#2	53.00'	525 cf	**5.00'W x 150.00'L x 3.50'H Drainage Layer**
			2,625 cf Overall x 20.0% Voids
		1,335 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Secondary	59.00'	**10.0' long x 1.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	53.00'	**2.500 in/hr Exfiltration over Horizontal area**

Primary OutFlow Max=0.09 cfs @ 11.80 hrs HW=56.41'   (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Secondary OutFlow Max=0.77 cfs @ 12.16 hrs HW=59.09'   (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.77 cfs @ 0.82 fps)

Summary for Link AP1:

Inflow Area =   0.208 ac, 34.21% Impervious, Inflow Depth > 4.00"   for 25yr event
Inflow   =   0.70 cfs @   12.22 hrs, Volume=   0.069 af
Primary   =   0.70 cfs @   12.22 hrs, Volume=   0.069 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP2:

Inflow Area =   1.496 ac, 64.78% Impervious, Inflow Depth > 4.71"   for 25yr event
Inflow   =   3.93 cfs @   12.43 hrs, Volume=   0.587 af
Primary   =   3.93 cfs @   12.43 hrs, Volume=   0.587 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP3:

Inflow Area =   0.669 ac, 39.84% Impervious, Inflow Depth > 4.25"   for 25yr event
Inflow   =   2.36 cfs @   12.17 hrs, Volume=   0.237 af
Primary   =   2.36 cfs @   12.17 hrs, Volume=   0.237 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Appendix C:
Stormwater BMP Treatment Calculations

WALSH
ENGINEERING ASSOCIATES, INC.

TABLE T-1			
Impervious Area Analysis			
Industrial Building Development			
314-316 Presumpscot Street, Portland, Maine			
June 21, 2017			
Material	**Existing Conditions**	**Proposed Conditions**	**Net Change**
Roof (s.f.)	1,915	12,515	10,600
Pavement (s.f.)	41,202	37,106	-4,096
Total Impevious (s.f.)	43,117	49,621	**6,504**
Impervious Area Treated		**9,000**	138%

TABLE T-2			
Developed Area Analysis			
Industrial Building Development			
314-316 Presumpscot Street, Portland, Maine			
June 21, 2017			
Condition	**Existing Conditions**	**Proposed Conditions**	**Net Change**
Developed Area (s.f.)	69,269	76,536	**7,267**
Developed Area Treated		**9,750**	134%

Appendix D:
Inspection and Maintenance Plan

WALSH
ENGINEERING ASSOCIATES, INC.

Inspection and Maintenance Plan
For Stormwater Management Facilities

Industrial Development
314 Presumpscot Street
Portland, Maine

November 2017

Stormwater management facilities include paved surfaces, a dripedge, pipes, and ditches/swales. The maintenance of all stormwater management facilities, the establishment of any contract services required to implement the program, and the keeping of records and maintenance log book will be the responsibility of Jake's Development, Inc.

At a minimum, the following maintenance activities for each stormwater management system shall be performed by a qualified post-construction stormwater inspector on a prescribed schedule.

City of Portland Yearly Reporting Requirements

- **Inspections:** The owner or operator of a BMP shall hire a qualified post-construction stormwater inspector to at least annually, inspect the BMPs, including but not limited to any parking areas, catch basins, drainage swales, detention basins and ponds, pipes and related structures, in accordance with all municipal and state inspection, cleaning and maintenance requirements of the approved post-construction stormwater management plan

- **Maintenance and Repair:** If the BMP requires maintenance, repair or replacement to function as intended by the approved post-construction stormwater management plan, the owner or operator of the BMP shall take corrective action(s) to address the deficiency or deficiencies as soon as possible after the deficiency is discovered and shall provide a record of the deficiency and corrective action(s) to the department of public works ("DPW") in the annual report.

- **Annual Report:** The owner or operator of a BMP or a qualified post-construction stormwater inspector hired by that person, shall, on or by June 30 of each year, provide a completed and signed certification to DPW in a form provided by DPW, certifying that the person has inspected the BMP(s) and that they are adequately maintained and functioning as intended by the approved post-construction stormwater management plan, or that they require maintenance or repair, including the record of the deficiency and corrective action(s) taken.

- **Filing Fee:** Any persons required to file and annual certification under this section shall include with the annual certification a filing fee established by DPW to pay the administrative and technical costs of review of the annual certification.

- **Right of Entry:** In order to determine compliance with this article and with the post-construction stormwater management plan, DPW may enter upon property at reasonable ours with the consent of the owner, occupant or agent to inspect the BMPs.

General Inspection and Maintenance Activities

Paved Surfaces

Accumulations of winter sand along paved surfaces shall be cleared at least once a year, preferably in the spring, and periodically during the year on an as-needed basis, to minimize transportation of sediment during rainfall events. Accumulations on pavement may be removed by pavement sweeping or vacuuming. Accumulations of sand along road shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader.

Ditches and Swales

Open swales and ditches shall be inspected twice per year (in spring and fall) to assure that debris and/or sediments do not reduce the effectiveness of the system. Debris and sediments shall be removed at that time. Any sign of erosion or blockage shall be immediately repaired to assure a vigorous growth of vegetation for the stability of the ditches and slopes proper function. Maintenance shall include, but not be limited to, mowing, trimming and removal of vegetation in the ditches and slopes as required in order to prevent vegetation from blocking or diverting storm flows, replacement of riprap channel lining to prevent scour of the channel invert, removing vegetation and debris from the culverts.

Vegetated ditches should be mowed at least monthly during the growing season. Larger brush or trees must not be allowed to become established in the channel. Any areas where the vegetation fails will be subject to erosion and should be reseeded and mulched immediately.

Storm Drainage Pipes

Piped drainage systems shall be inspected on an annual basis to remove any obstructions to flow; remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit; and to repair any erosion damage at the pipe inlet and outlet. Sediment should be removed when its level exceeds 20% of the pipe diameter. This may be accomplished by hydraulic flushing or any mechanical means; however, care should be taken to contain the sediment at the pipe outlet, and not flush the sediments into the stormwater filter or wetland areas.

Riprap aprons where stone is displaced should be replaced and chinked to assure stability. With time, additional riprap may be added. Vegetation growing through riprap should be removed on an annual basis.

Stone Dripedges

Stone dripedges shall be inspected on an annual basis to remove any obstructions to flow and/or accumulated sediments and debris at the surface. If the underdrain collection pipe becomes clogged, it shall be hydraulically flushed from the cleanout at the end of the pipe. Care should be taken to contain the sediment at the pipe outlet, and not flush the sediments into the stormwater system or offsite.

Disposal

Any sediment or debris removed during maintenance of the stormwater system must be disposed of in accordance with the Maine Solid Waste Disposal Rules.

Recordkeeping

Jake's Development, Inc. will keep a written maintenance log that summarizes inspections, maintenance, and any corrective actions taken. The log shall include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean-out of any sediment or debris, the location where the sediment or debris was disposed after removal will be indicated. This log shall be made available to the City of Portland upon request.

Sample Inspection Report:

Industrial Building Development
314 Presumpscot Street, Portland, Maine

STORMWATER FACILITIES INSPECTION REPORT

NAME: _____   SIGNATURE: _____

TITLE: _____   COMPANY: _____

DATE: _____   WEATHER: _____

OBSERVATIONS:

BMP	Defects	Location(s)	Repair/Action Needed	Date/Action taken
Ditches/ Swales	Yes/no			
Paved Areas	Yes/no			
Stormdrain Pipes	Yes/no			
Riprap Aprons	Yes/no			
Drip Edges	Yes/no			

DRAFT
STORMWATER DRAINAGE SYSTEM
MAINTENANCE AGREEMENT AND
RELEASE FROM LIABILITY

IN CONSIDERATION OF <u>Level II Site Plan</u> approval granted by the Planning Board of the City of Portland to a plan entitled Proposed Industrial Development, 314-316 Presumpscot Street, prepared for Jake's Development, Inc., 30 Ledgewood Drive, Falmouth, ME 04105, by Land Design Solutions dated _____ recorded in the Cumberland County Registry of Deeds in Plan Book _____, Page _____ (the "Plan") and pursuant to a condition thereof, Jake's Development, Inc. having a mailing address of 30 Ledgewood Drive, Falmouth, ME 04105, the owner of the subject premises, does hereby agree, for itself, its successors and assigns (the "Owner"), as follows:

<u>Maintenance Agreement</u>

That it will, at its own cost and expense and at all times in perpetuity, maintain in good repair and in proper working order the stormwater drainage system, as shown on said plan, including but not limited to the stormwater dripedge in strict compliance with the Maintenance of Facilities as described in Inspection and Maintenance Plan for Stormwater Management Facilities for 314-316 Presumpscot Street, Portland, Maine dated _____ and Chapter 32 of the Portland City Code. Owner of the subject premises further agrees to keep a Stormwater Maintenance Log that will be made available for inspection by the City of Portland upon reasonable notice and request.

This Agreement is for the benefit of the said City of Portland and all persons in lawful possession of the property; further, that the said City of Portland may enforce this Agreement by an action at law or in equity in any court of competent jurisdiction; further, that after giving the Owner written notice as described in this Agreement, and a stated time to perform, that the said City of Portland, by its authorized agents or representatives, may, but is not obligated to (and in fact any and all maintenance shall be performed by the applicant and/or owner), enter upon the property in question to maintain, repair, or replace said stormwater drainage system, including but not limited to the dripedge thereon in the event of any failure or neglect thereof, the cost and expense thereof to be reimbursed in full to the said City of Portland by the Owner upon written demand. Any funds owed to the City under this paragraph shall be secured by a lien on the property.

This Agreement shall bind the undersigned only so long as it retains any interest in said premises, and shall run with the land and be binding upon the Owner's successors and assigns as their interests may from time to time appear. The Owner agrees to provide a copy of this Agreement to any successor or assign and to forward to the City an Addendum signed by any successor or assign in which the successor or assign states that the successor or assign has read the Agreement, agrees to all its terms and conditions.

For the purpose of this Agreement the real estate shown by chart, block and lot number in the records on file in the City Assessor's office shall constitute "the property" that may be entered by the City and liened if the City is not paid all of its costs and charges following the mailing of a written demand for payment to the Owner pursuant to the process and with the same force and effect as that established by 36 M.R.S.A. §§ 942 and 943 for real estate tax liens.

Any written notices or demands required by this Agreement shall be complete on the date the notice is mailed to the owner of record as shown on the tax roles on file in the City Assessor's Office. If the property has more than one owner on said tax rolls, service shall be complete by mailing it to only the first listed owner. The failure to receive any written notice required by this Agreement shall not prevent the City from entering the property and performing maintenance or repairs on the stormwater system, or any component thereof, or liening it or create a cause of action against the City.

Dated at Portland, Maine this _____ day of _____, 20___.

_____

By: _____

Its: _____

STATE OF MAINE
CUMBERLAND, ss.   Date: _____

Personally appeared the above-named _____, and acknowledged the foregoing instrument to be his/his free act and deed in his/her said capacity, and the free act and deed of said _____.

Before me,

_____

Notary Public/Attorney at Law

Print name: _____

Appendix E:
USDA NRCS Web Soil Survey Map

Soil Map—Cumberland County and Part of Oxford County, Maine

Web Soil Survey
National Cooperative Soil Survey

Map Scale: 1:4,240 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator   Corner coordinates: WGS84   Edge tics: UTM Zone 19N WGS84

N

0   50   100   200   300   Meters
0   200   400   800   1200 Feet

MAP LEGEND

MAP INFORMATION

Area of Interest (AOI)
☐ Area of Interest (AOI)

Soils
☐ Soil Map Unit Polygons
〜 Soil Map Unit Lines
■ Soil Map Unit Points

Special Point Features
ⓒ Blowout
⊠ Borrow Pit
✖ Clay Spot
◇ Closed Depression
✖ Gravel Pit
∴ Gravelly Spot
⊛ Landfill
⋏ Lava Flow
⊥ Marsh or swamp
⊕ Mine or Quarry
◉ Miscellaneous Water
◉ Perennial Water
< Rock Outcrop
+ Saline Spot
∴ Sandy Spot
⬭ Severely Eroded Spot
⬙ Sinkhole
◇ Slide or Slip
⬗ Sodic Spot

Water Features
〜 Streams and Canals

Transportation
╫ Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background
Aerial Photography

Spoil Area
Stony Spot
Very Stony Spot
Wet Spot
Other
Special Line Features

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Cumberland County and Part of Oxford County, Maine
Survey Area Data: Version 12, Sep 15, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

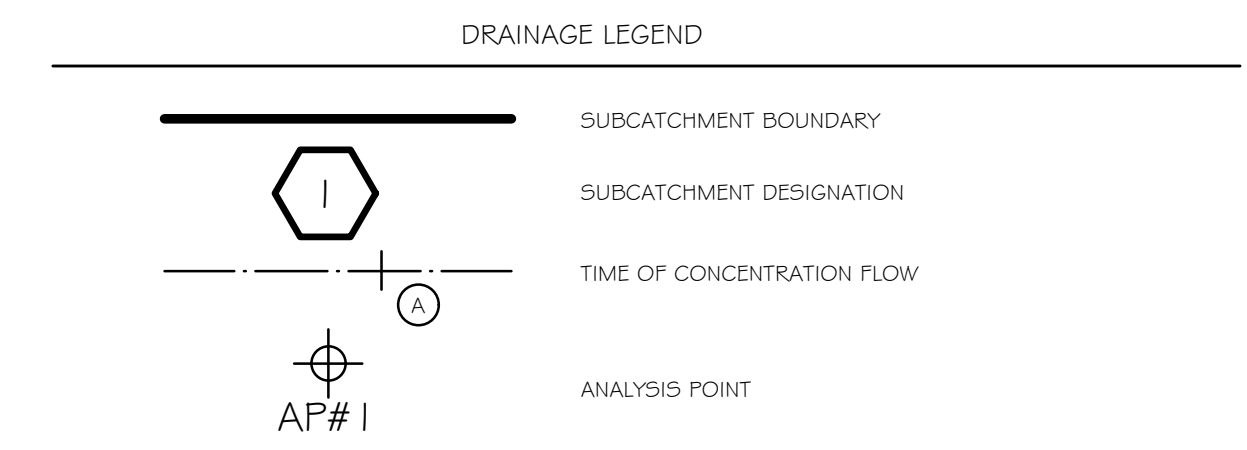Date(s) aerial images were photographed: Jun 20, 2010—Aug 11, 2013

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Cumberland County and Part of Oxford County, Maine (ME005)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
BuB	Lamoine silt loam, 3 to 8 percent slopes	5.6	6.8%
BuC2	Buxton silt loam, 8 to 15 percent slopes	4.1	5.1%
Cu	Cut and fill land	13.5	16.5%
HrB	Hollis fine sandy loam, 3 to 8 percent slopes	18.4	22.5%
HrC	Hollis fine sandy loam, 8 to 15 percent slopes	23.6	28.9%
HrD	Hollis fine sandy loam, 15 to 25 percent slopes	2.8	3.5%
HsC	Hollis very rocky fine sandy loam, 8 to 20 percent slopes	10.8	13.2%
Sn	Scantic silt loam, 0 to 3 percent slopes	0.8	1.0%
W	Water	2.0	2.5%
Totals for Area of Interest		**81.7**	**100.0%**

Appendix F:
Drainage Plans

D1.0: Pre Development Drainage Plan
D2.0: Post Development Drainage Plan

DRAINAGE LEGEND

SUBCATCHMENT BOUNDARY

1 — SUBCATCHMENT DESIGNATION

A — TIME OF CONCENTRATION FLOW

AP#1 — ANALYSIS POINT

Tc FLOW LINE DATA:

SUBCATCHMENT 1.0

SEGMENT	LENGTH	SLOPE	FLOW TYPE
A-B	50'	0.035	SHEET FLOW
B-C	50'	0.100	SHEET FLOW
C-D	20'	0.050	SHEET FLOW

SUBCATCHMENT 2.0

SEGMENT	LENGTH	SLOPE	FLOW TYPE
A-B	150'	0.067	SHEET FLOW
B-C	15'	0.133	SHALLOW CONCENTRATED FLOW
C-D	240'	0.031	SHALLOW CONCENTRATED FLOW
D-E	150'	0.100	SHALLOW CONCENTRATED FLOW

SUBCATCHMENT 3.0

SEGMENT	LENGTH	SLOPE	FLOW TYPE
A-B	15'	0.016	SHEET FLOW
B-C	30'	0.133	SHEET FLOW
C-D	55'	0.027	SHALLOW CONCENTRATED FLOW
D-E	105'	0.038	SHALLOW CONCENTRATED FLOW
E-F	35'	0.400	SHALLOW CONCENTRATED FLOW
F-G	115'	0.026	TRAPEZOIDAL CHANNEL FLOW

NOTES

1. SOIL INFORMATION OBTAINED FROM THE FOLLOWING SOURCE:
    1.1. SOIL SURVEY STAFF, NATURAL RESOURCES CONSERVATION SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE. WEB SOIL SURVEY. AVAILABLE ONLINE AT HTTP://WEBSOILSURVEY.NRCS.USDA.GOV/, ACCESSED JULY 22, 2016.

2. CONTOURS SHOWN OUTSIDE OF THE GROUND SURVEY AREA ARE BASED ON LIDAR TOPOGRAPHIC INFORMATION OBTAINED FROM THE MAINE OFFICE OF GIS.
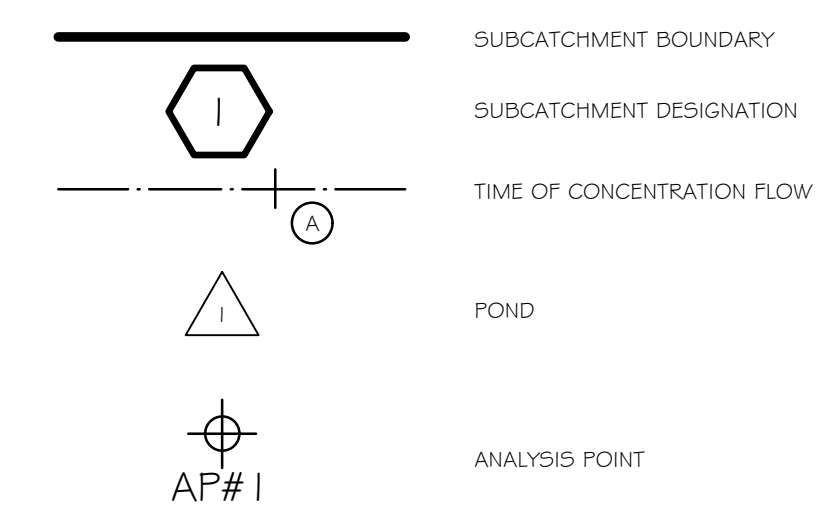
HrB (HSG D)

HrC (HSG D)

HrB (HSG D)

BuC2 (HSG D)

AP#1

AP#3

AP#2

BUILDING A ±,341 S.F.

BUILDING ±573 S.F.

BUILDING

BUILDING

BUILDING

GATE

GRAVEL

APPROXIMATE LOCATION PLASTIC PIPE WATER SERVICE

APPROXIMATE LOCAT LIMIT OF 2" PL GROUND SURVEY WATER SERVICE

APPROXIMATE LOCATION 2" PLASTIC WATER SERVICE

40' REAR SETBACK

25' SIDE SETBACK

25' FRONT SETBACK

PRESUMPSCOT STREET

1-1/2" COPPER WATER SERVICE

3/4" COPPER WATER SERVICE

ASSUMED LOCATION OF EX. 10 CL. WATER MAIN

GRAPHIC SCALE

30   0   15   30   60   120

1 inch = 30 ft.

WALSH
ENGINEERING ASSOCIATES, INC.

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ph: 207.553.9898 | www.walsh-eng.com
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STATE OF MAINE
SILAS W. CANAVAN
No. 12639

DESIGN:	PBB
DRAWN:	DEPT.
CHKD:	PBB
DATE:	Jun 2017
SCALE:	1"=30'

PROPOSED INDUSTRIAL DEVELOPMENT
314-316 PRESUMPSCOT STREET, PORTLAND, MAINE

PRE DEVELOPMENT
DRAINAGE PLAN

| PROJ. NO. | 16-115 | REV. A |
| DWG. NO. | D-101 | A |

REV.	DATE	STATUS	BY	CHKD.	APPD.	REV.	DATE	STATUS	BY	CHKD.	APPD.
A	11/21/17	SUBMITTED TO THE CITY OF PORTLAND FOR LEVEL 2 SITE PLAN REVIEW	DEPT.	SWC	SWC						

DRAINAGE LEGEND

- SUBCATCHMENT BOUNDARY
- ⬡ I SUBCATCHMENT DESIGNATION
- A TIME OF CONCENTRATION FLOW
- △ POND
- ⊕ AP#I ANALYSIS POINT

NOTES

1.
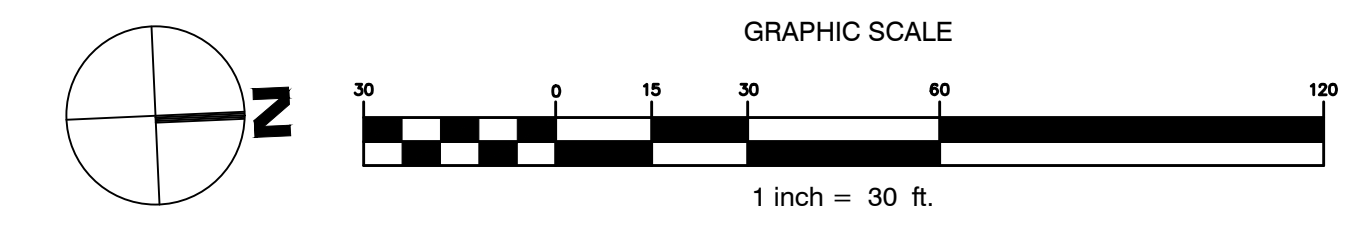   1.1. SOIL INFORMATION OBTAINED FROM THE FOLLOWING SOURCE:
   SOIL SURVEY STAFF, NATURAL RESOURCES CONSERVATION SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE. WEB SOIL SURVEY. AVAILABLE ONLINE AT HTTP://WEBSOILSURVEY.NRCS.USDA.GOV/. ACCESSED JULY 22, 2016.

2. CONTOURS SHOWN OUTSIDE OF THE GROUND SURVEY AREA ARE BASED ON LIDAR TOPOGRAPHIC INFORMATION OBTAINED FROM THE MAINE OFFICE OF GIS.

Tc FLOW LINE DATA:

SUBCATCHMENT 1.0

SEGMENT	LENGTH	SLOPE	FLOW TYPE
A-B	50'	0.035	SHEET FLOW
B-C	50	0.100	SHEET FLOW
C-D	20'	0.050	SHEET FLOW

SUBCATCHMENT 2.1

SEGMENT	LENGTH	SLOPE	FLOW TYPE
A-B	150'	0.067	SHEET FLOW
B-C	15'	0.133	SHALLOW CONCENTRATED FLOW
C-D	240'	0.031	SHALLOW CONCENTRATED FLOW
D-E	110'	0.110	SHALLOW CONCENTRATED FLOW
E-F	20'	0.025	SHALLOW CONCENTRATED FLOW
F-G	20'	0.050	SHALLOW CONCENTRATED FLOW

SUBCATCHMENT 2.2

SEGMENT	LENGTH	SLOPE	FLOW TYPE
DIRECT ENTRY, 5 MINUTE MINIMUM			

SUBCATCHMENT 3.1

SEGMENT	LENGTH	SLOPE	FLOW TYPE
A-B	15'	0.016	SHEET FLOW
B-C	30'	0.133	SHEET FLOW
C-D	55'	0.027	SHEET FLOW
D-E	45'	0.039	SHEET FLOW
E-F	50'	0.030	SHALLOW CONCENTRATED FLOW
F-G	35'	0.457	SHALLOW CONCENTRATED FLOW
G-H	155'	0.013	TRAPEZOIDAL CHANNEL FLOW

SUBCATCHMENT 3.2

SEGMENT	LENGTH	SLOPE	FLOW TYPE
DIRECT ENTRY, 5 MINUTE MINIMUM			

HrB (HSG D)
HrC (HSG D)
HrB (HSG D)
BuC2 (HSG D)

BUILDING A ±1,341 S.F.
BUILDING ±573 S.F.
LIMIT OF GROUND SURVEY
BUILDING
BUILDING

AP#1
AP#2
AP#3

PRESUMPSCOT STREET

GRAPHIC SCALE
30 0 15 30 60 120
1 inch = 30 ft.

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No. 12639
11/30/17

LAND DESIGN SOLUTIONS
LAND PLANNING, SITE PLANNING & LANDSCAPE ARCHITECTURE
P.O. Box 316, 160 Longwoods Road, Cumberland, ME 04021 tel.(207) 934-1717
APPLICANT & OWNER:
JAKE'S DEVELOPMENT, INC.
30 LEDGEWOOD DRIVE, FALMOUTH, MAINE 04105

DESIGN: PBB
DRAWN: DEPT.
CHKD: PBB
DATE: Nov 2017
SCALE: 1"=30'

PROPOSED INDUSTRIAL DEVELOPMENT
314-316 PRESUMPSCOT STREET, PORTLAND, MAINE

POST DEVELOPMENT DRAINAGE PLAN

PROJ. NO. 16-115 REV. A
DWG. NO. D-102 A

REV.	DATE	STATUS	BY	CHKD.	APPD.	REV.	DATE	STATUS	BY	CHKD.	APPD.
A	11/21/17	SUBMITTED TO THE CITY OF PORTLAND FOR LEVEL 2 SITE PLAN REVIEW	DEPT.	SWC	SWC						

Drawing Name: P:\138 — 314 Presumpscot St, Portland\S_CAD\138 — Drainage | Plot Date / Time: Nov. 28, '17 / 4:54 PM