RANSOM Consulting, Inc.

Consulting Engineers and Scientists

Bayside Bowl Stormwater Management Narrative

Date:	March 23, 2015
To:	City of Portland
From:	Stephen J. Bradstreet, P.E.
Peer Review:	Maureen P. McGlone, P.E.
Location:	58 Alder Street, Portland, Maine

List of Appendices:

Appendix A: Post Construction Stormwater Management Plan
Appendix B: Stormwater BMP Inspection and Maintenance Requirements
Appendix C: Pre Development Hydro CAD Calculations
Appendix D: Post Development Hydro CAD Calculations

Existing Conditions:

The site is a 55,290 SF (1.27 acres) acre parcel that is bordered by Kennebec Street, Hanover Street, East Lancaster Street and the existing Bayside Bowl building. The site's topography is generally flat and slopes from the south to the north and drains into catch basins on Hanover Street and Alder Street. Actual site topography was difficult to ascertain due to large snow piles on much of the site. The parcel is currently being utilized for the Portland Public Services salt sheds, a paved parking area for Public Services, and a gravel parking lot for the existing Bayside Bowl. The entire parcel is impervious with either paved or gravel surfaces.

Stormwater runoff from the area of the parcel containing the two salt sheds (Sub-catchment 3) flows in two directions. A portion flows toward Hanover Street and into CB 8110. The remaining area appears to flow to an on-site catch basin located in the most northerly storage bay. It is unknown if that catch basin is tied into the City's stormdrain system on Hanover Street. The paved parking lot and possibly part of the existing gravel parking area (Sub-catchment 2) also appears to flow to CB 8110. The remaining part of the site, consisting of the majority of the gravel parking lot and the existing building flows to CB 8290 located in Alder Street. All catch basins are part of the City's combined sewer system in this area of Bayside.

Proposed Development:

The applicant, BoPo, LLC proposes to construct a 2 story (with a third floor deck area) building addition to the existing Bayside Bowl. The building will have an additional eight lanes of bowling on the first floor along with expanded restaurant sitting area, kitchen area and storage. The second floor will have Squash courts, training rooms and locker facilities. The proposed development will decrease the site's

impervious area from 52,290 SF to approximately 47,588 SF. The remaining area will be a combination of landscaped planting areas or lawn.

Stormwater Management – Basic Standards:

Erosion and sedimentation control measures are detailed within the design plans. Good housekeeping practices will be in accordance with Maine DEP Best Management Practices. A post construction stormwater management plan is provided in *Appendix A*. Stormwater BMP inspection and maintenance requirements are provided in *Appendix B*.

Stormwater Management - Quality:

The existing site is currently all gravel and basically an impervious site. The existing gravel parking lot sheet flows primarily to the catch basin in Alder Street, which at this location is a separated system. The second area of the site is a small paved parking lot. Stormwater from this area of the site flows to a catch basin located in Hanover Street which is connected to the City's combined sewer system. The third area of the site is the City's salt sheds and truck loading area that sheet flows out to the same catch basin in Hanover Street.

The site's impervious area has been reduced by 7,702 SF which is a 14% reduction. With the removal of the salt sheds and truck loading area, the stormwater quality would improve greatly. However, an underdrained vegetated swale is proposed in the grass area adjacent to Kennebec Street. This will further improve the water quality exiting the site. Furthermore, the site's stormwater will now primarily exit to Alder Street, into the separated system. This will reduce the load on the combined sewer system within Hanover Street.

Stormwater Management - Quantity:

With the reduction in impervious area and the introduction of landscaped areas with an underdrained vegetated swale, there are no detention measures proposed. The stormwater runoff has been reduced by 6% to 36% depending on the storm event. The 1" storm event is obviously the most frequent and has been reduced by 36%. Based on the proposed site conditions and the reduction in stormwater flows, we believe that detention is not required.

Hydraulic Analysis:

Stormwater runoff calculations for quantity were made using the HydroCAD 10.0 computer program, which is based on the Soil Conservation Service's TR-20 methodology. Runoff hydrographs are generated based on a standard Type III 24 hour storm.

Five storm events were modeled as follows:

1. 1" storm: The 1" storm event was analyzed to simulate a heavy weather event that would typically happen multiple times over a given year and may impact the CSO frequency and volume.

2. 2-year frequency flood event: 3" rainfall

3. 10-year frequency flood event: 4.7" rainfall

4. 25-year frequency flood event: 5.5" rainfall

5. 100-year frequency flood event: 6.7" rainfall

Runoff Curve numbers were determined based on land coverage and soil type based on geotechnical investigations conducted on March 12, 2015. Soils were typically 8-10 feet of urban fill underlain by soft clays. Times of concentration were developed based on runoff flow paths for each subarea and shown on the Pre and Post-Development plans. A minimum Tc of 6 minutes was set in the HydroCAD model.

Peak runoff flow rates and runoff volumes are provided for the following two analysis points, which are identified on the Pre and Post-Development plans.

1. Analysis Point A (CB at Alder Street)-This catch basin currently receives stormwater runoff from the existing gravel parking lot. In this area the catch basin is in a separated stormwater system.

2. Analysis Point B (CB at Hanover Street)-This catch basin currently receives stormwater runoff from the salt shed and paved parking lot areas. In this area the catch basin is in a combined sewer system.

Analysis Point A shows an increase in runoff rates and volume; however reduction in flows going to Analysis Point B and the overall reduction in flows and volumes off-site benefits the combined sewer system downstream of the site.

Analysis Point B) shows a reduction in runoff rates and volumes.

Peak runoff rates and runoff volumes for the above analysis points and storm events are tabulated in the following tables. HydroCAD calculations can be found in ***Appendices C & D***. Pre- and Post-Development plans (SW-1 and SW-2) can be found in the plan set.

Storm Event	PRE-Development Peak Runoff RATES cubic feet per second (CFS)			
	Analysis Point A CB in Alder St	Analysis Point B CB in Hanover St		Total A + B
	Sub Area 1	Sub Area 2	Sub Area 3	
1" Storm	.55	.2	.32	1.07
2 Year Frequency Storm	1.93	.69	1.03	3.65
10 Year Frequency Storm	3.07	1.1	1.63	5.80
25 Year Frequency Storm	3.61	1.29	1.91	6.81
100 Year Frequency Storm	4.41	1.57	2.33	8.31

Storm Event	POST-Development Peak Runoff RATES cubic feet per second (CFS)		
	Analysis Point A CB in Alder St	Analysis Point B CB in Hanover St	Total A + B
1" Storm	.66	.00	.66
2 Year Frequency Storm	2.99	.10	3.09
10 Year Frequency Storm	4.96	.25	5.21
25 Year Frequency Storm	5.87	.33	6.2
100 Year Frequency Storm	7.24	.44	7.69

Storm Event	PRE-Development Runoff VOLUMES acre feet (AF) volume of water 1' deep over one acre			
	Analysis Point A CB in Alder St	Analysis Point B CB in Hanover St		Total A + B
	Sub Area 1	Sub Area 2	Sub Area 3	
1" Storm	.037	.013	.022	.072
2 Year Frequency Storm	.142	.051	.078	.270
10 Year Frequency Storm	.233	.083	.125	.441
25 Year Frequency Storm	.275	.098	.148	.521
100 Year Frequency Storm	.339	.121	.181	.641

Storm Event	POST-Development Runoff VOLUMES acre feet (AF) volume of water 1' deep over one acre		
	Analysis Point A CB in Alder St	Analysis Point B CB in Hanover St	Total A+B
1" Storm	.046	.000	.046
2 Year Frequency Storm	.217	.007	.224
10 Year Frequency Storm	.372	.017	.388
25 Year Frequency Storm	.445	.022	.467
100 Year Frequency Storm	.556	.029	.586