Treatment of Stormwater Runoff from Snow Melt at the Portland Snow Dump

Stormwater Management in Cold Climates
November 3-5, 2003
Portland, Maine

Presented By
Pamela Deahl
Vice-President
CITY OF PORTLAND, MAINE
OPEN SPACE

Area: 21.2 sq. miles
Population: 64,250
City streets: 340 miles
Dumping Snow the old-fashioned way
Non-Point Source Pollution
Non-Point Source Pollution
Fall 2000: City changes Snow Dumping Practices, Establishing Snow Dump Site
Design Considerations

- 88.26-acre site.
- 6.05 acres of impervious surface (6.85%).
- 40% TSS removal required.
- 2-year pre-development = 12.98 cfs.
- 2-year post-development = 19.83 cfs.
- 25-year pre-development = 45.77 cfs.
- 25-year post-development = 57.7 cfs.
MEDEP TSS Removal Requirement
Water Quality with Retention Facility
34 Species of Waterfowl in Maine
Airplane taking off from PWM
Airplane landing at PWM
FAA’s “Hazardous Wildlife Attractants Near Airports”
Water Quality with Hydrodynamic Vortex Separation
Maine DEP’s Requirements for Manufactured systems
October 1, 2000

- Calculate required *treatment flow rate* as: peak runoff from a one year 24-hour storm

- Size water quality units to provide

  - 80% U.S. Silica F-95 foundry sand for 50% TSS rating
  - 80% U.S. Silica OK-110 sand for 60% TSS rating

  at the *treatment flow rate*
Treatment Flow Rates

W.Q. Unit #1 = 8 cfs

W.Q. Unit #2 = 4 cfs
Isolated Storage Zones

- Oils and Floatables
- Sediments

Inlet

Outlet

Dip Plate

Cone
Maine DEP Testing

.. 4 ft Downstream Defender Unit ..

![Graph showing Total Suspended Solids (mg/l) for Paired Sample No 0 to 10, with red line for Influent TSS and green line for Effluent TSS.](image)
Particle Size Distributions
..Sediment Samples..

- OK-110 Sand
- F-95 Foundry Sand
- Coventry Test Sand
- ME DOT Road Sediment
Maine DEP Approved Flows

\[ Q_{1ypf} = 628 \left(\frac{D}{4}\right)^{2.5} \]

50% rating

Where:

\( Q_{1ypf} = \) the projected one year peak flow from the device's drainage area and

\( D = \) the diameter in feet of the device's treatment chamber

<table>
<thead>
<tr>
<th>Chamber Diameter (ft)</th>
<th>Max 1 yr Peak Flow (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.7</td>
</tr>
<tr>
<td>4</td>
<td>1.4</td>
</tr>
<tr>
<td>6</td>
<td>4.0</td>
</tr>
<tr>
<td>8</td>
<td>8.0</td>
</tr>
<tr>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>12</td>
<td>15</td>
</tr>
</tbody>
</table>
8-ft diameter
Downstream Defender
18-inch Inlet to 
8-ft 
Downstream 
Defender

© 2003 Hydro International
24-inch Outlet Pipe from 8-ft Downstream Defender
Looking upstream from 8-ft diameter Downstream Defender
12-inch Inlet to 6-ft Downstream Defender
18-inch Outlet Pipe from 6-ft Downstream Defender
Looking upstream from 6-ft diameter Downstream Defender
Trash and oil captured in 8-ft Downstream Defender
Sediment captured in 8-ft Downstream Defender
Oil and sediment captured in 6-ft Downstream Defender
Sediment Sampling
Snow Dump Particle Size Distribution

Percent Finer

Particle Size (microns)

WQU #1: 8-ft Downstream Defender

© 2003 Hydro International
# Sediment Analysis
## WQU #1: 8-ft Downstream Defender

## Report of Analytical Results

**Client:** Mark Johnston  
Hydro International  
94 Hutchins Drive  
Portland, ME 04102

**Lab Sample ID:** WT2577-2  
**Report Date:** 24-OCT-03  
**Client PO:** 2032  
**Project:** SNOW DUMP  
**SDG:** WT2577

<table>
<thead>
<tr>
<th>Sample Description</th>
<th>Matrix</th>
<th>Date Sampled</th>
<th>Date Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD#8</td>
<td>SL</td>
<td>17-OCT-03</td>
<td>21-OCT-03</td>
</tr>
</tbody>
</table>

### Parameter Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Units</th>
<th>Adj PQL</th>
<th>Adjusted PQL</th>
<th>Dilution Factor</th>
<th>PQL</th>
<th>Analytical Method</th>
<th>Analytical Date</th>
<th>By</th>
<th>Prep. Method</th>
<th>Prepped Date</th>
<th>By</th>
<th>QC</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphorus, Total As P</td>
<td>620 mg/Kg</td>
<td>37</td>
<td>EPA 365.4</td>
<td>WGH61</td>
<td>22-OCT-03</td>
<td>PAG</td>
<td>EPA 365.4</td>
<td>21-OCT-03</td>
<td>PAG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Solids</td>
<td>61 %</td>
<td>.1</td>
<td>CLP SOW 788</td>
<td>WGH3999</td>
<td>23-OCT-03</td>
<td>PAG</td>
<td>CLP SOW 788</td>
<td>22-OCT-03</td>
<td>PAG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Snow Dump Particle Size Distribution

Percent Finer

Particle Size (microns)

WQU #2: 6ft Downstream Defender

© 2003 Hydro International
Sediment Analysis
WQU #2: 6-ft Downstream Defender

Report of Analytical Results

Client: Mark Johnston  
Hydro International  
94 Hutchins Drive  
Portland, ME 04102

Lab Sample ID: WT2577-1  
Report Date: 24-OCT-03  
Client PO: 2032  
Project: SNOW DUMP  
SDG: WT2577

Sample Description
SD#6

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphorus, Total As P</td>
<td>650 mg/Kg</td>
<td>44</td>
<td>EPA 365.4</td>
<td>WG3961</td>
<td>22-OCT-03</td>
<td>PAG</td>
<td>EPA 365.4</td>
<td>21-OCT-03</td>
<td>PAG</td>
<td></td>
</tr>
<tr>
<td>Total Solids</td>
<td>56 %</td>
<td>.1</td>
<td>CLP SOW 788</td>
<td>WG3999</td>
<td>23-OCT-03</td>
<td>PAG</td>
<td>CLP SOW 788</td>
<td>22-OCT-03</td>
<td>PAG</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Units</th>
<th>Adjusted PQL</th>
<th>Dilution Factor</th>
<th>PQL</th>
<th>Analytical Method</th>
<th>Analysis Date</th>
<th>By</th>
<th>Prep. Method</th>
<th>Prepped Date</th>
<th>By</th>
<th>QC</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARSENIC</td>
<td>12.</td>
<td>mg/Kg</td>
<td>1.</td>
<td>1</td>
<td>0.8</td>
<td>SW846 6010</td>
<td>10/21/03</td>
<td>MUF</td>
<td>SW846 3050</td>
<td>10/21/03</td>
<td>JWM TJ21CS0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>BARIUM</td>
<td>182.</td>
<td>mg/Kg</td>
<td>0.64</td>
<td>1</td>
<td>0.5</td>
<td>SW846 6010</td>
<td>10/21/03</td>
<td>MUF</td>
<td>SW846 3050</td>
<td>10/21/03</td>
<td>JWM TJ21CS0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CADMIUM</td>
<td>1.28</td>
<td>mg/Kg</td>
<td>1.28</td>
<td>1</td>
<td>1</td>
<td>SW846 6010</td>
<td>10/21/03</td>
<td>MUF</td>
<td>SW846 3050</td>
<td>10/21/03</td>
<td>JWM TJ21CS0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHROMIUM</td>
<td>53.4</td>
<td>mg/Kg</td>
<td>1.93</td>
<td>1</td>
<td>1.5</td>
<td>SW846 6010</td>
<td>10/21/03</td>
<td>MUF</td>
<td>SW846 3050</td>
<td>10/21/03</td>
<td>JWM TJ21CS0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COPPER</td>
<td>26.4</td>
<td>mg/Kg</td>
<td>3.2</td>
<td>1</td>
<td>2.5</td>
<td>SW846 6010</td>
<td>10/21/03</td>
<td>MUF</td>
<td>SW846 3050</td>
<td>10/21/03</td>
<td>JWM TJ21CS0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEAD</td>
<td>22.2</td>
<td>mg/Kg</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>SW846 6010</td>
<td>10/21/03</td>
<td>MUF</td>
<td>SW846 3050</td>
<td>10/21/03</td>
<td>JWM TJ21CS0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MERCURY</td>
<td>0.057</td>
<td>ugl/g</td>
<td>0.057</td>
<td>1</td>
<td>0.04</td>
<td>SW846 7471</td>
<td>10/23/03</td>
<td>MUF</td>
<td>7471</td>
<td>10/22/03</td>
<td>MUF TJ22HS0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>NICKEL</td>
<td>42.5</td>
<td>mg/Kg</td>
<td>5.14</td>
<td>1</td>
<td>4</td>
<td>SW846 6010</td>
<td>10/21/03</td>
<td>MUF</td>
<td>7471</td>
<td>10/22/03</td>
<td>MUF TJ22HS0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SELENIUM</td>
<td>1.3</td>
<td>mg/Kg</td>
<td>1.10</td>
<td>1</td>
<td>1</td>
<td>SW846 6010</td>
<td>10/21/03</td>
<td>MUF</td>
<td>SW846 3050</td>
<td>10/21/03</td>
<td>JWM TJ21CS0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>SILVER</td>
<td>1.9</td>
<td>mg/Kg</td>
<td>1.9</td>
<td>1</td>
<td>1.5</td>
<td>SW846 6010</td>
<td>10/21/03</td>
<td>MUF</td>
<td>SW846 3050</td>
<td>10/21/03</td>
<td>JWM TJ21CS0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ZINC</td>
<td>102.</td>
<td>mg/Kg</td>
<td>3.21</td>
<td>1</td>
<td>2.5</td>
<td>SW846 6010</td>
<td>10/21/03</td>
<td>MUF</td>
<td>SW846 3050</td>
<td>10/21/03</td>
<td>JWM TJ21CS0</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

1 The laboratory’s Practical Quantitation Level could not be achieved for this parameter due to sample composition, matrix effects, sample volume, or quantity used for analysis.
Portland, ME Snow Dump

Benefits

• Avoidance of large retention pond
  – eliminated FAA safety hazard
  – no unsightly trash and debris
• Protection of Clark Pond and Fore River
• Elimination of pollutants into Back Bay
Thank You!

Dump trucks drop off snow at the Portland Snow Dump