



November 24, 2015

File: PR-105809

Cassandra Caunce
Director, Compliance Section
Environmental Protection Regional Operations
Ministry of Environment

RE: Soil Quality at Cobble Hill Holdings Collected November 12, 2015

Soil samples were collected at Cobble Hill Holdings quarry and landfill site (PR-105809) from recently deposited materials originating from Pacific Coast Terminals in Port Moody. Ministry staff were on site to sample and observe conditions on November 12, 2015. The purpose of sampling was to determine whether the landfilled soil meets permit limits.

PR-105809 states that landfilled materials must not exceed Hazardous Waste Regulation Leachate Quality Standards¹ (PR-105809 section 1.3.2) and the type of soil landfilled must meet the Contaminated Sites Regulation² Industrial Land use standards for all parameters except the following: metals, Dioxins, Furans, BTEX, MTBE, VPHs, LEPHs/HEPHs, PAHs, Styrene, Chlorinated Hydrocarbons, Phenolic Substances, Chloride, Sodium and Glycols (PR-105809 section 1.3.3). Leachable quality standards are prescribed concentrations of extract that must be met for waste when subject to the toxicity characteristic leaching procedure (TCLP) in US EPA Method 1311.

Three soil samples were collected on November 12, 2015 by Ministry staff. These samples were collected directly into sample jars, packed on ice and shipped to the analytical laboratory overnight. The soil parameters analyzed were pH, metals, chloride, sulphate and polycyclic aromatic hydrocarbons as well as soil leachate metals and PAHs were analyzed for the TCLP. Three samples provide a very limited snapshot of the total material landfilled. Results are summarized in the table below.

The Ministry results for the TCLP leachable quality standards for all three soils samples showed no exceedances for metals and PAHs. Direct chemical analyses on these soil sample results also showed no exceedances of permitted soil contaminant levels. Soil chloride levels measured ranged between 216-631 mg/kg which exceeded CSR industrial land use standard of 90 mg/kg. Soil zinc slightly exceeded the CSR IL of 150 mg/kg CSR IL standard for one sample.

Soil analytical data was also supplied by the proponent's qualified professional. A cursory review of the soil characterization data provided showed no exceedances of hazardous waste leachate quality standards (TCLP). Soil lead, zinc and some PAHs were elevated in many samples but below CSR Industrial Land standards. Soil chloride concentrations were above CSR Industrial Land use standards.

Based on very limited Ministry sampling and a cursory review of data supplied by the proponent, the soils appear to meet permit requirements.

Liz Freyman R.P.Bio.
Head, Compliance Section

Attachment: Table of Results

¹ http://www.bclaws.ca/Recon/document/ID/freeside/63_88_00

² http://www.bclaws.ca/Recon/document/ID/freeside/375_96_00

November 12, 2015 Landfilled Soil Results Summary						
Date Sampled			12-Nov-2015	12-Nov-2015	12-Nov-2015	
TCLP Extractables (Soil)	Lowest Detection Limit	Units	REG 1	REG 2	REG 3	Hazardous Waste Leachable Quality
<i>The characteristics of the discharge (soil) must be better than haz waste leachable quality standards as defined in EMA and the HWR as per PR-105809 section 1.3.2.</i>						
TCLP Metals (Soil)						
Antimony (Sb)-Leachable	1.0	mg/L	<1.0	<1.0	<1.0	
Arsenic (As)-Leachable	1.0	mg/L	<1.0	<1.0	<1.0	2.5
Barium (Ba)-Leachable	2.5	mg/L	<2.5	<2.5	<2.5	100.0
Beryllium (Be)-Leachable	0.025	mg/L	<0.025	<0.025	<0.025	
Boron (B)-Leachable	0.50	mg/L	<0.50	<0.50	<0.50	500.0
Cadmium (Cd)-Leachable	0.050	mg/L	<0.050	<0.050	<0.050	0.5
Calcium (Ca)-Leachable	2.0	mg/L	333	236	298	
Chromium (Cr)-Leachable	0.25	mg/L	<0.25	<0.25	<0.25	5.0
Cobalt (Co)-Leachable	0.050	mg/L	<0.050	<0.050	<0.050	
Copper (Cu)-Leachable	0.050	mg/L	<0.050	<0.050	<0.050	100.0
Iron (Fe)-Leachable	0.15	mg/L	1.16	0.73	0.99	
Lead (Pb)-Leachable	0.25	mg/L	<0.25	<0.25	<0.25	5.0
Magnesium (Mg)-Leachable	0.50	mg/L	15.7	13.6	13.4	
Mercury (Hg)-Leachable	0.0010	mg/L	<0.0010	<0.0010	<0.0010	0.1
Nickel (Ni)-Leachable	0.25	mg/L	<0.25	<0.25	<0.25	
Selenium (Se)-Leachable	1.0	mg/L	<1.0	<1.0	<1.0	1.0
Silver (Ag)-Leachable	0.050	mg/L	<0.050	<0.050	<0.050	5.0
Thallium (Tl)-Leachable	1.0	mg/L	<1.0	<1.0	<1.0	
Vanadium (V)-Leachable	0.15	mg/L	<0.15	<0.15	<0.15	
Zinc (Zn)-Leachable	0.50	mg/L	0.89	3.95	0.80	500.0
1st Preliminary pH	0.10	pH	7.91	7.65	8.19	
2nd Preliminary pH	0.10	pH	1.71	1.71	1.73	
Final pH	0.10	pH	5.08	5.09	5.11	
Extraction Solution Initial pH	0.10	pH	4.96	4.96	4.96	
TCLP PAHs (Soil)						
Acenaphthene	0.000050	mg/L	0.000134	0.000943	0.000217	
Acenaphthylene	0.000050	mg/L	<0.000050	<0.000050	<0.000050	
Acridine	0.000050	mg/L	<0.000050	<0.000050	<0.000050	
Anthracene	0.000050	mg/L	<0.000050	<0.000050	<0.000050	
Benzo(a)anthracene	0.000050	mg/L	<0.000050	<0.000050	<0.000050	
Benzo(a)pyrene	0.000050	mg/L	<0.000050	<0.000050	<0.000050	0.001
Benzo(b)fluoranthene	0.000050	mg/L	<0.000050	<0.000050	<0.000050	
Benzo(g,h,i)perylene	0.000050	mg/L	<0.000050	<0.000050	<0.000050	
Benzo(k)fluoranthene	0.000050	mg/L	<0.000050	<0.000050	<0.000050	
Chrysene	0.000050	mg/L	<0.000050	<0.000050	<0.000050	
Dibenz(a,h)anthracene	0.000050	mg/L	<0.000050	<0.000050	<0.000050	
Fluoranthene	0.000050	mg/L	<0.000050	0.000078	<0.000050	
Fluorene	0.000050	mg/L	0.000065	0.000485	0.000133	
Indeno(1,2,3-c,d)pyrene	0.000050	mg/L	<0.000050	<0.000050	<0.000050	
Naphthalene	0.000050	mg/L	0.000132	0.002244	0.000276	
1st Preliminary pH	0.10	pH	7.91	7.65	8.19	
2nd Preliminary pH	0.10	pH	1.71	1.71	1.73	
Extraction Solution Initial pH	0.10	pH	4.96	4.96	4.96	
Final pH	0.10	pH	5.05	5.05	5.08	
Phenanthrene	0.000050	mg/L	0.000105	0.000680	0.000159	
Pyrene	0.000050	mg/L	<0.000050	<0.000050	<0.000050	

Soil Chemistry Results	Lowest Detection Limit	Units	REG 1	REG 2	REG 3	CSR Schedule 4 & 5 IL soil standards*
Physical Tests (Soil)						
Moisture	0.25	%	28.1	20.8	29.0	
pH (1:2 soil:water)	0.10	pH	7.23	7.70	7.50	
Inorganic Parameters (Soil)						
Acid Volatile Sulphides	0.20	umol/g	4.53	0.95	3.38	
Organic / Inorganic Carbon (Soil)						
CaCO3 Equivalent	0.80	%	0.97	1.66	<0.80	
Inorganic Carbon	0.10	%	0.12	0.20	<0.10	
Total Carbon by Combustion	0.1	%	2.2	1.4	1.7	
Total Organic Carbon	0.10	%	2.11	1.21	1.73	
Saturated Paste Extractables (Soil)						
Chloride (Cl)	40	mg/kg	300	216	631	90
% Saturation	1.0	%	40.7	35.3	35.6	
Sodium (Na)	1.0	mg/kg	210	142	303	15000
Metals (Soil)						
Aluminum (Al)	50	mg/kg	11800	20600	12600	
Antimony (Sb)	0.10	mg/kg	0.97	1.61	0.96	40
Arsenic (As)	0.10	mg/kg	5.89	5.69	6.06	15
Barium (Ba)	0.10	mg/kg	57.4	101	57.9	400
Beryllium (Be)	0.10	mg/kg	0.21	0.37	0.22	8
Boron (B)	5.0	mg/kg	9.8	7.5	9.5	
Cadmium (Cd)	0.020	mg/kg	0.648	0.257	0.633	1.5
Calcium (Ca)	50	mg/kg	12300	11400	12100	
Chromium (Cr)	0.50	mg/kg	22.9	41.6	24.0	60
Cobalt (Co)	0.10	mg/kg	6.63	14.2	7.22	300
Copper (Cu)	0.50	mg/kg	29.5	78.3	40.2	250
Iron (Fe)	50	mg/kg	20200	32400	22000	
Lead (Pb)	0.10	mg/kg	92.3	79.8	86.0	100
Magnesium (Mg)	20	mg/kg	5490	9650	6030	
Manganese (Mn)	0.30	mg/kg	264	525	301	
Molybdenum (Mo)	0.10	mg/kg	2.49	0.71	2.34	40
Nickel (Ni)	0.50	mg/kg	17.8	32.6	19.5	500
Phosphorus (P)	50	mg/kg	503	810	530	
Potassium (K)	40	mg/kg	1320	1420	1320	
Selenium (Se)	0.20	mg/kg	0.38	<0.20	0.39	10
Silver (Ag)	0.050	mg/kg	0.120	0.155	0.202	40
Sodium (Na)	50	mg/kg	1110	715	1510	
Strontium (Sr)	0.10	mg/kg	60.3	62.1	59.8	
Sulphur (S)	500	mg/kg	19700	19900	31500	
Tin (Sn)	0.10	mg/kg	1.88	8.86	1.66	300
Titanium (Ti)	1.0	mg/kg	738	1160	735	
Vanadium (V)	2.0	mg/kg	45.8	77.0	48.8	
Zinc (Zn)	0.50	mg/kg	144	132	158	150

Soil Chemistry Results	Lowest Detection Limit	Units	REG 1	REG 2	REG 3	CSR Schedule 4 & 5 IL soil standards*
Hydrocarbons (Soil)						
EPH10-19	200	mg/kg	<200	<200	<200	
EPH19-32	200	mg/kg	<200	<200	<200	
LEPH	200	mg/kg	<200	<200	<200	2000
HEPH	200	mg/kg	<200	<200	<200	5000
Polycyclic Aromatic Hydrocarbons (Soil)						
Acenaphthene	0.050	mg/kg	0.242	<0.050	0.064	
Acenaphthylene	0.050	mg/kg	<0.050	<0.050	<0.050	
Anthracene	0.050	mg/kg	0.406	<0.050	0.078	
Benz(a)anthracene	0.050	mg/kg	0.901	<0.050	0.140	10
Benzo(a)pyrene	0.050	mg/kg	0.920	<0.050	0.097	10
Benzo(b)fluoranthene	0.050	mg/kg	1.44	<0.050	0.195	10
Benzo(g,h,i)perylene	0.050	mg/kg	0.814	<0.050	0.071	
Benzo(k)fluoranthene	0.050	mg/kg	0.606	<0.050	0.070	10
Chrysene	0.050	mg/kg	1.10	<0.050	0.194	
Dibenz(a,h)anthracene	0.050	mg/kg	0.092	<0.050	<0.050	10
Fluoranthene	0.050	mg/kg	2.14	0.129	0.290	
Fluorene	0.050	mg/kg	0.278	<0.050	0.081	
Indeno(1,2,3-c,d)pyrene	0.050	mg/kg	0.645	<0.050	0.059	10
2-Methylnaphthalene	0.050	mg/kg	0.260	<0.050	0.157	
Naphthalene	0.050	mg/kg	0.330	0.089	0.157	
Phenanthrene	0.050	mg/kg	2.35	0.167	0.420	50
Pyrene	0.050	mg/kg	2.53	0.110	0.330	100
Acenaphthene d10		%	106.4	86.3	106.4	
Chrysene d12		%	108.8	122.1	119.2	
Naphthalene d8		%	107.9	79.8	100.5	
Phenanthrene d10		%	102.4	86.4	98.4	
* For CSR Matrix Numerical Soil Standards groundwater used for drinking water was used						
Exceedance of CSR Sch 4&5 numerical standards						