

APPENDIX E

Environmental Sampling Results

10 January 2012

Mr. Jimmy Graham
Manager
Provincial Energy Ventures
1 Inglis Street, PO Box 1015
Sydney, NS B1P 6J7

Dear Mr. Graham:

RE: Sediment Chemistry to Support the Proposed PEV Dredging Plan

As part of the work program to assist PEV in completing the deepening of the approach to the PEV facility at the former Sysco piers CBCL Limited has completed marine sediment sampling and analysis. The sampling was carried out in accordance with the Environment Canada requirements for dredging projects.

The purpose of the marine sediment sampling and analysis was to collect data for comparison to the regulatory criteria. The objective was to provide information to support the Environmental Assessment and other regulatory processes that are required for the deepening of the approach.

The sample program was completed in November 2011. The samples were collected by BGC Engineering personnel using a barge-mounted drill rig provided by Boart-Longyear. The samples were stored in appropriate containers and maintained on ice in a cooler until delivery to Maxxam Analytics. Analysis included total metals, mercury, total organic carbon, total inorganic carbon, total carbon, Polycyclic Aromatic Hydrocarbons (PAH), Polychlorinated Biphenyls (PCBs), particle size, Benzene, Toluene, Ethylbenzene and Xylene (BTEX) and total petroleum hydrocarbons (TPH).

CBCL established a sample grid in the proposed dredge footprint consisting of eighteen (18) locations indicated as DH-7 to DH-24 on the attached Figure 1. Three (3) previous sample locations from October 2011, indicated as PEV#1, PEV#2 and PEV#3 are also shown. The results of the sampling program are reported here.

Comparison to Guidelines

The sample results were compared to three (3) federal criteria in order to help understand the nature of the sediments and the approach to disposal of the dredged material. The criteria and their relevance to the review of the data are as follows:

- CCME Canadian Sediment Quality Guidelines for the Protection of Aquatic Life – Interim Marine Sediment Quality Guidelines (2002). These guidelines are included for general reference only for the source sediment material.
- CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health – Commercial/Industrial Land Use (2007). These guidelines provide the reference for the sediment disposal, as the Confined Disposal Facility (CDF) location will be developed for future land use.
- Canadian Environmental Protection Act – Ocean Disposal (1999). These guidelines are included for general reference only as no ocean disposal will occur.

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Results

There were twenty-four (24) samples collected from twenty (20) of the twenty-one (21) locations in Figure 1. Location DH-8 near the north end of the wharf was rock/gravel and was not sampled. The samples included 20 bottom sediments and 4 underlying marine silts/clays. The complete results are included in the attached Table, with a discussion of the salient points here.

CCME Interim Marine Sediment Quality Guidelines

There are 7 metals included in these guidelines, all of which had some exceedances for the 20 sediment samples as follows:

Metal	Guideline Value (mg/kg)	No. of Samples Exceeding	Range of Results (mg/kg)
Arsenic	7.24	20	18 - 58
Cadmium	0.7	8	0.3 - 1.9
Chromium	52.3	1	22 - 56
Copper	18.7	20	28 - 140
Lead	30.2	20	59 - 340
Mercury	0.13	19	0.01 - 0.9
Zinc	124	19	120 - 1100

For other parameters the following observations apply:

- BTEX/TPH: no guidelines
- Total PCBs: 19 of the 20 sediment samples exceeded the guideline value of 0.0215 mg/kg
 - range of values ND – 26 mg/kg
 - 2 samples with Total PCBs >5 mg/kg
 - 14 samples with Total PCBs <1 mg/kg
- PAHs: 13 PAH compounds have a guideline value, all of which were exceeded in most of the sediment samples.

CCME Soil Guidelines for Commercial/Industrial Land Use

There are 18 metals included in these guidelines, 6 of which had exceedances for the 20 sediment samples as follows:

Metal	Guideline Value (mg/kg)	No. of Samples Exceeding	Range of Results (mg/kg)
Arsenic	12	20	18 - 58
Copper	91	3	28 - 140
Lead	260/600*	2	59 - 340
Selenium	2.9	2	<0.6 - 3.2
Thallium	1	1	ND- 1.1
Zinc	360	6	120 - 100
* fine/coarse; value for fine soil used for comparison			

For BTEX/TPH, 14 of the 20 sediment samples had at least 1 exceedance as follows:

Substance	Guideline Value (mg/kg)	No. of Samples Exceeding	Range of Results (mg/kg)
Benzene	0.0068 / 0.030 *	13	ND - 2.7
Toluene	0.08 / 0.37 *	11	ND - 2.0
Ethylbenzene	0.018 / 0.082 *	12	ND - 0.5
Xylenes	2.4/11*	0	ND - 1.9
* fine/coarse; ; value for fine soil used for comparison			

For other parameters the following observations apply:

- Total PCBs: No samples exceeded the guideline value of 33 mg/kg (range of values ND – 26 mg/kg)
- PAHs: 9 PAHs have guideline values, 7 of which had exceedances of 1 – 3 orders of magnitude
 - 9 samples had 1 exceedance
 - 5 samples had 2 exceedances
 - 3 samples had 3 exceedances
 - 1 samples had 5 exceedances
 - 1 sample had 6 exceedances
 - 1 sample had 7 exceedances

Canadian Environmental Protection Act – Ocean Disposal

These regulations have very few substances with limits. Cadmium (11 of 20 samples exceeding) and Mercury (1 of 20 samples exceeding) are the only metals listed. All but 2 samples exceeded the Total PCB value of 0.1mg/kg. All 20 sediment samples exceeded the Total PAH limit of 2.5 mg/kg.

Summary

Representative sediment samples were collected from the proposed dredge footprint and compared to several guidelines. The CCME Soil Guidelines for Commercial/Industrial Land Use are of primary interest as the dredged sediments will be disposed in a CDF which will be infilled and reclaimed for future land use. The results of the sediment sampling compared to the CCME Soil Guidelines for Commercial/Industrial Land Use guidelines are summarized here:

- The 20 sediment samples all have some metal, BTEX and PAH exceedances of the CCME Soil Guidelines for Commercial/Industrial Land Use.
- No samples exceeded the CCME Soil Guidelines for Commercial/Industrial Land Use for Total PCBs.

If you have any questions or follow-up, please feel free to contact myself or Richard Morykot at your convenience.

Yours very truly,

CBCL Limited



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Donald Humphrey, Fisheries & Oceans Canada
Carl Ripley, Transport Canada
Jeff Corkum, Environment Canada
Adrian MacDonald, Environment Canada
Robert Federico, Stantec
Jim Wooder, Sydney Marine Group

DRILLHOLE TABLE FROM BGC

Drillhole (new)	Drillhole (original)	Easting	Northing
DH-7	DH-4	715696	5115009
DH-8	DH-1	715815	5115298
DH-9	DH-10	715734	5115381
DH-10	DH-13	715679	5115516
DH-11	DH-18	715562	5115538
DH-12	DH-17	715531	5115438
DH-13	DH-15	715584	5115319
DH-14	DH-8	715643	5115183
DH-15	DH-12	715690	5115593
DH-16	DH-11	715751	5115458
DH-17	DH-14	715630	5115406
DH-18	DH-16	715569	5115212
DH-19	DH-6	715592	5114991
DH-20	DH-3	715749	5115086
DH-21	DH-9	715692	5115272
DH-22	DH-7	715627	5115086
DH-23	DH-5	715666	5114910
DH-24	DH-2	715759	5115185

DRILLHOLE TABLE FROM PEV

POINT	EASTING	NORTHING
PEV#1	715710.64	5115228.00
PEV#2	715601.00	5115215.00
PEV#3	715665.40	5114970.00



BGC GRID

BGC DRILLHOLE

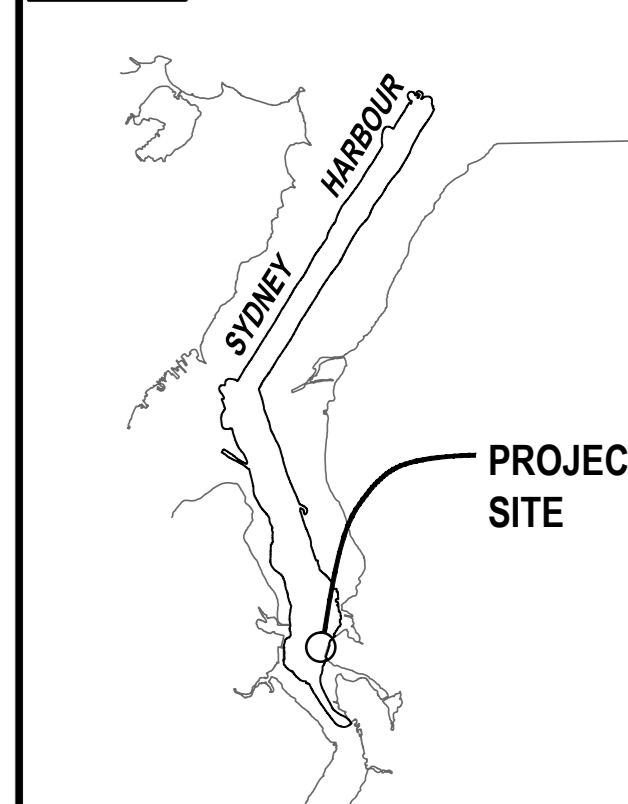
SYDNEY HARBOUR

LIGHT SHADED AREA BELOW -16.5m

DARKER SHADED AREA ABOVE -16.5m

ATLANTIC CANADA BULK TERMINAL

LEGEND



REVIEW
NOT FOR CONSTRUCTION

No.	Description	Date	By
A	ISSUED FOR REVIEW	NOV. 30/11	PGL

PEV PROVINCIAL ENERGY VENTURES LTD.
ATLANTIC CANADA BULK TERMINAL
SYDNEY, NOVA SCOTIA

ATLANTIC CANADA BULK TERMINAL
SYDNEY, NOVA SCOTIA

PROPOSED DREDGING
BULK TERMINAL PIER

PROPOSED DREDGING
SAMPLING COLLECTION

CBCL CBCL LIMITED
Consulting Engineers
ISO 9001 CERTIFIED

Scale	Date	Drawn
1:1000	OCT. 21/11	E.B.

Contract No.	Revision
112400.00	A

FIG. 1

