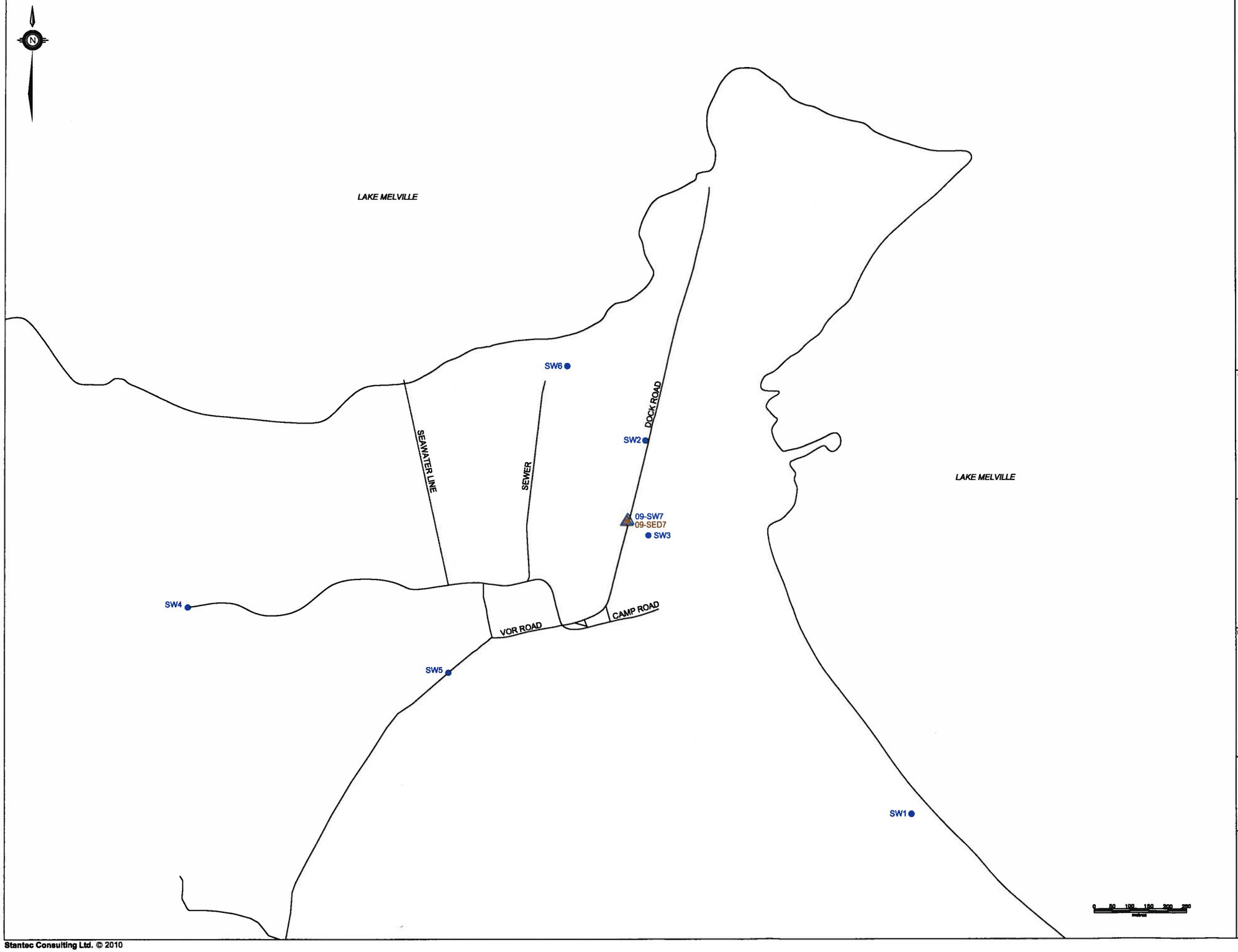
Appendix 17a

Site Drawings

– Streams



LEGEND

- SURFACE WATER SAMPLE (STANTEC 2009)
- SEDIMENT SAMPLE (STANTEC 2009)
- SURFACE WATER SAMPLE (AGRA 1999)

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

CLIENT:

NEWFOUNDLAND AND LABRADOR DEPARTMENT OF ENVIRONMENT AND CONSERVATION

PROJECT TITLE:

PHASE III ESA, HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENTS, REMEDIAL ACTION PLAN FOR THE FORMER U.S. MILITARY FACILITY OF NORTHWEST POINT, NL

DRAWING TITLE:

SITE PLAN - STREAMS

Stantec Consulting Ltd.

Stantec

SCALE: 1:10,000	DATE: JUNE 18, 2010
DRAWN BY: N.M.	CHECKED BY: A.R.
EDITED BY: -	REV. No. 0
DRAWING No: 121410105-EE-17A	
CAD FILE: 1044857-EE-20.DWG	

18JUN10 2:00PM

Appendix 17b

Sample Coordinates

– Streams

Sample Coordinates - Streams
Phase III ESA, HHERA and RAP
Former U.S Military Facility, Northwest Point, NL
Stantec Consulting Ltd. Project No. 121410105

Sample ID	Coordinates (NAD27)	
	Easting	Northing
SURFACE WATER		
09-SW7	694609	5931606
SEDIMENT		
09-SED7	694609	5931606

Appendix 17c

Laboratory Analytical Results Summary Tables

– Streams

Table 17.1 Results of Laboratory Analysis of TPH/BTEX in Surface Water - Streams
Phase III ESA, HHERA and RAP
Former U.S Military Facility, Northwest Point, NL
Stantec Consulting Ltd. Project No. 121410105

Sample Location	Benzene	Toluene	Ethylbenzene	Xylenes	$<C_{10}$	C_{10}-C_{30}	C_6-C_{12}	C_{13}-C_{23}	C_{24}-C_{32}	C_6-C_{10} (Gas Range)	C_{11}-C_{20} (Fuel Range)	C_{21}-C_{32} (Lube Range)	Modified TPH - Tier I[3]	Resemblance
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	-
Criteria[1]	0.37	0.002	0.09	-	-	-	-	-	-	-	-	-	-	-
Criteria[2]	0.005	0.024	0.0024	0.3	-	-	-	-	-	-	-	-	-	-
1999 Sampling (AGRA)														
SW1	<0.0002	<0.0002	<0.00022	<0.00045	<0.005	<0.05	-	-	-	-	-	-	<0.055	-
SW2	<0.0002	<0.0002	<0.00022	<0.00045	<0.005	<0.05	-	-	-	-	-	-	<0.055	-
SW3	<0.0002	<0.0002	<0.00022	<0.00045	<0.005	1.1	-	-	-	-	-	-	1.1	NRG/D
SW6	<0.0002	<0.0002	<0.00022	<0.00045	<0.005	<0.05	-	-	-	-	-	-	<0.055	-
RDL	0.0002	0.0002	0.00022	0.00045	0.005	0.05	0.005	0.05	0.05	-	-	-	0.55	-
2001 Sampling (AMEC)														
SW-1	<0.0002	<0.0002	<0.00022	<0.00045	-	-	<0.05	0.64	0.46	-	-	-	1.1	HO
SW-2	<0.0002	<0.0002	<0.00022	<0.00045	-	-	<0.05	<0.05	<0.05	-	-	-	<0.105	-
SW-3	<0.0002	<0.0002	<0.00022	<0.00045	-	-	<0.05	<0.05	<0.05	-	-	-	<0.105	-
SW-6	<0.0002	<0.0002	<0.00022	<0.00045	-	-	<0.05	<0.05	<0.05	-	-	-	<0.105	-
SW-C1	<0.0002	<0.0002	<0.00022	<0.00045	-	-	<0.05	<0.05	<0.05	-	-	-	<0.105	-
SW-C2	<0.0002	<0.0002	<0.00022	<0.00045	-	-	<0.05	<0.05	<0.05	-	-	-	<0.105	-
SW-C3	<0.0002	<0.0002	<0.00022	<0.00045	-	-	<0.05	<0.05	<0.05	-	-	-	<0.105	-
RDL	0.0002	0.0002	0.00022	0.00045	0.005	0.05	0.005	0.05	0.05	-	-	-	0.105	-
2009 Sampling (Stantec)														
09-SW7	<0.001	<0.001	<0.001	<0.002	-	-	-	-	-	<0.01	<0.05	<0.1	<0.1	-
RDL	0.001	0.001	0.001	0.002	-	-	-	-	-	0.01	0.05	0.1	0.1	-

Notes:

1 = CCME Water Quality Guidelines for the protection of freshwater aquatic life (2007)

2 = Health Canada Drinking Water Quality Guidelines (2008)

3 = Modified TPH - Tier I does not include BTEX

"-" = Value is not available or does not apply

"*" = Aesthetic objective only

RDL = Reportable Detection Limit for routine analysis

< # = Not detected above RDL noted

NRG/D = No resemblance to gasoline or diesel; HO = Heavy oil

Shaded = Value exceeds the CCME freshwater aquatic life guideline

Table 17.2 Results of Lab Analysis of Dissolved Metals in Surface Water - Streams
Phase III ESA, HHERA and RAP
Former U.S Military Facility, Northwest Point, NL
Stantec Consulting Ltd. Project No. 121410105

Parameters	Units	Criteria[1]	Criteria[2]	1999 Sampling (AGRA)			2001 Sampling (AMEC)								2009 Sampling (Stantec)	
				SW1	SW3	RDL	SW1	SW2	SW3	SW6	SW-C1	SW-C2	SW-C3	RDL	09-SW7	RDL
Aluminum	ug/L	5-100[3]	100	49	<5	5	**234**	**358**	**106**	**386**	98	**442**	**110**	5	**529**	5.0
Antimony	ug/L	-	6	-	-	-	-	-	-	-	-	-	-	-	<2.0	2.0
Arsenic	ug/L	5	10	-	-	-	-	-	-	-	-	-	-	-	<2.0	2.0
Barium	ug/L	-	1000	5	11	5	<5	7	6	7	13	6	<5	5	9.7	5.0
Beryllium	ug/L	-	-	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	1	<2.0	2.0
Bismuth	ug/L	-	-	<2	<2	2	<1	<1	<1	<1	<1	<1	<1	1	<2.0	2.0
Boron	ug/L	-	5000	-	-	-	-	-	-	-	-	-	-	-	<5.0	5.0
Cadmium	ug/L	0.017[4]	5	<0.015	<0.015	0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.015	<0.017	0.017
Chromium	ug/L	8.9	50	1	2	1	<1	<1	<1	<1	<1	<1	3	1	1.4	1.0
Cobalt	ug/L	-	-	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	1	0.90	0.40
Copper	ug/L	2 to 4[5]	1000*	2	<1	1	5	<1	<1	2	<1	<1	5	1	<2.0	2.0
Iron	ug/L	300	300*	**3,040**	**1,930**	1	**1,450**	**1,940**	**1,060**	**331**	**621**	**1,080**	281	1	**1,120**	50
Lead	ug/L	1-7[6]	10	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	1	<0.50	0.50
Magnesium	ug/L	-	-	690	580	50	610	700	630	690	350	480	180	50	-	-
Manganese	ug/L	-	50*	32	9	1	21	38	22	6	9	13	19	1	48.4	2.0
Mercury	ug/L	0.026	1	-	-	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.013	0.0
Molybdenum	ug/L	73	-	<5	<5	5	<5	<5	<5	<5	<5	<5	<5	5	<2.0	2.0
Nickel	ug/L	25-150[7]	-	<1	<1	1 / 5	<5	<5	<5	<5	<5	<5	<5	1 / 5	<2.0	2.0
Phosphorous	ug/L	<0.004 to >0.1[8]	-	<5	<5	5	53	6	<5	<5	<5	18	8	5	-	-
Potassium	ug/L	-	-	220	600	50	170	510	820	660	200	220	310	50	-	-
Selenium	ug/L	1	10	-	-	-	-	-	-	-	-	-	-	-	<1.0	1.0
Silver	ug/L	0.1	-	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.10	0.10
Strontium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	21.4	5.0
Thallium	ug/L	0.8	-	-	-	-	-	-	-	-	-	-	-	-	<0.10	0.10
Tin	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	<2.0	2.0
Titanium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	5.3	2.0
Uranium	ug/L	-	20	-	-	-	-	-	-	-	-	-	-	-	<0.10	0.10
Vanadium	ug/L	-	-	<2	<2	5	<5	<5	<5	<5	<5	<5	<5	5	<2.0	2.0
Zinc	ug/L	30	5000*	5	3	1	1	4	<1	<1	1	8	10	1	<5.0	5.0
General Chemistry																
pH	-	6.5 - 9	6.5-8.5[AO]	-	-	-	-	-	-	-	-	-	-	-	8	-
Hardness ($CaCO_3$)	mg/L	-	500	-	-	-	-	-	-	-	-	-	-	-	6.0	1

Notes:

1 = CCME Water Quality Guidelines for the protection of freshwater aquatic life (2007)
2 = Health Canada Drinking Water Quality Guidelines (2008)
3 = Aluminum guideline = 5 µg/L at pH<6.5
= 100 µg/L at pH>=6.5
4 = Cadmium guideline = 10^{0.86[log(hardness)]-3.2}
= 0.017 mg/L at a water hardness of 45 mg/L as $CaCO_3$
5 = Copper guideline = 2 µg/L at water hardness of 0-120 mg/L as $CaCO_3$
= 3 µg/L at water hardness of 120-180 mg/L as $CaCO_3$
= 4 µg/L at water hardness >180 mg/L as $CaCO_3$
6 =Lead guideline = 1 µg/L at water hardness of 0-60 mg/L as $CaCO_3$
= 2 µg/L at water hardness of 60-120 mg/L as $CaCO_3$
= 4 µg/L at water hardness of 120-180 mg/L as $CaCO_3$
= 7 µg/L at water hardness >180 mg/L as $CaCO_3$
7 = Nickel guideline = 25 µg/L at water hardness of 0-60 mg/L as $CaCO_3$
= 65 µg/L at water hardness of 60-120 mg/L as $CaCO_3$
= 110 µg/L at water hardness of 120-180 mg/L as $CaCO_3$
= 150 µg/L at water hardness >180 mg/L as $CaCO_3$
8 = Phosphorous guideline is dependant on trophic status of the freshwater environment
* = Aesthetic guideline only
"-" = Not analysed or no applicable guideline
< # = Not detected above RDL noted
Shaded = Value exceeds CCME freshwater aquatic life guideline
Bold = Value exceeds drinking water guideline

Table 17.3 Results of Laboratory Analysis of General Chemistry in Surface Water - Streams
Phase III ESA, HHERA and RAP
Former U.S Military Facility, Northwest Point, NL
Stantec Consulting Ltd. Project No. 121410105

Parameter	RDL	Units	Criteria[1]	Criteria[2]	2009 Sampling (Stantec)
					09-SW7
Metals					
Dissolved Calcium	0.1	mg/L	-	-	2.1
Dissolved Magnesium	0.1	mg/L	-	-	0.6
Dissolved Phosphorus	0.1	mg/L	<0.004 to >0.1[3]	-	<0.1
Dissolved Potassium	0.1	mg/L	-	-	0.4
Dissolved Sodium	0.1	mg/L	-	200[AO]	2.2
Dissolved Sulphur	-	mg/L	-	-	NA
Calculated Parameters					
Anion Sum	N/A	me/L	-	-	0.0800
Bicarb. Alkalinity (calc. as $CaCO_3$)	1	mg/L	-	-	<1
Calculated TDS	1	mg/L	-	500[AO]	23
Carb.Alkalinity (calc. as $CaCO_3$)	1	mg/L	-	-	<1
Cation Sum	N/A	me/L	-	-	0.300
Hardness ($CaCO_3$)	1	mg/L	-	500	8
Ion Balance (% Difference)	N/A	%	-	-	57.9
Langelier Index (@ 20C)	-	N/A	-	-	NC
Langelier Index (@ 4C)	-	N/A	-	-	NC
Nitrate (N)	0.05	ug/L	3	10	<0.05
Saturation pH (@20C)	-	N/A	-	-	NC
Saturation pH (@4C)	-	N/A	-	-	NC
Inorganics					
Total Alkalinity (Total as $CaCO_3$)	5	mg/L	-	-	<5
Dissolved Chloride (Cl)	1	mg/L	-	250[AO]	3
Colour	80	TCU	Narrative	15[AO]	100
Nitrate + Nitrite	0.05	mg/L	-	45	<0.05
Nitrite (N)	0.01	ug/L	0.06	3.2	<0.01
Nitrogen (Ammonia Nitrogen)	0.05	mg/L	-	-	<0.05
Total Organic Compound	1 - 50	mg/L	-	-	14 (1)
Orthophosphate (P)	0.01	mg/L	-	-	<0.01
pH	N/A	pH	6.5 - 9	6.5-8.5[AO]	**6.03**
Reactive Silica (SiO_2)	0.5	mg/L	-	-	14
Dissolved Sulphate (SO_4)	2	mg/L	-	500[AO]	<2
Turbidity	1	NTU	Narrative[4]	1.0	**2.3**
Conductivity	1	uS/cm	-	-	27

Notes:

1 = CCME Water Quality Guidelines for the protection of freshwater aquatic life (2007)
2 = Health Canada Drinking Water Quality Guidelines (2008)
3 = Phosphorous guideline is dependant on trophic status of the freswater environment
4 = Maximum increase of 8 NTUs from background levels when background levels are between 8 and 80 NTUs
RDL = Reportable Detection Limit; () = RDL for TOC shown in brackets

AO = guideline based on aesthetic criteria
"-" = indicates value is not available or does not apply
< # = Not detected above RDL noted
Shaded = Value exceeds CCME freshwater aquatic life guideline
Bold = Value exceeds drinking water guideline

Table 17.4 Results of Laboratory Analysis of TPH/BTEX in Freshwater Sediment - Streams
Phase III ESA, HHERA and RAP
Former U.S Military Facility, Northwest Point, NL
Stantec Consulting Ltd. Project No. 121410105

Sample Location	Benzene	Toluene	Ethyl-Benzene	Xylenes	C_6-C_{10} (Gas Range)	C_{10}-C_{21} (Fuel Range)	C_{21}-C_{32} (Lube Range)	Modified TPH[2]	Resemblance
RDL	0.03	0.03	0.03	0.05	3	15	15	20	-
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-
Criteria[1]	-	-	-	-	-	-	-	1,500	-
2009 Sampling (Stantec) - Streams									
09-SED7	<0.03	<0.03	<0.03	<0.05	<3	410	190	610	WFO/NRL

Notes:
1 = Ontario Ministry of Environment Guideline for sediments to be used as lake fill material (1993). There are no federal or provincial guidelines for TPH or BTEX in freshwater sediment
2 = Modified TPH - Tier I does not include BTEX
RDL = Reportable Detection Limit for routine analysis
< # = Not detected above RDL noted
"-" = Indicates value is not available or does not apply
WFO = Weathered fuel oil; LO = Lube Oil; NRL= No resemblance to petroleum products in lube oil range

Table 17.5 Results of Laboratory Analysis of Metals in Freshwater Sediment - Streams
Phase III ESA, HHERA and RAP
Former U.S Military Facility, Northwest Point, NL
Stantec Consulting Ltd. Project No. 121410105

Parameters	RDL	Units	Criteria[1]	Criteria[2]	2009 Sampling (Stantec)
					09-SED7
Aluminum	10	mg/kg	-	-	4,800
Antimony	2	mg/kg	-	-	<2
Arsenic	2	mg/kg	5.9	17	<2
Barium	5	mg/kg	-	-	51
Beryllium	2	mg/kg	-	-	<2
Bismuth	2	mg/kg	-	-	<2
Boron	5	mg/kg	-	-	<5
Cadmium	0.3	mg/kg	0.6	3.5	<0.3
Chromium	2	mg/kg	37.3	90	9
Cobalt	1	mg/kg	-	-	3
Copper	2	mg/kg	35.7	197	8
Iron	50	mg/kg	-	-	13,000
Lead	0.5	mg/kg	35	91.3	5.7
Lithium	2	mg/kg	-	-	2
Manganese	2	mg/kg	-	-	94
Mercury	0.1	mg/kg	-	-	<0.1
Molybdenum	2	mg/kg	-	-	<2
Nickel	2	mg/kg	-	-	6
Rubidium	2	mg/kg	-	-	5
Selenium	1 / 2	mg/kg	-	-	<1
Silver	0.5	mg/kg	-	-	<0.5
Strontium	5	mg/kg	-	-	22
Thallium	0.1	mg/kg	-	-	<0.1
Tin	2	mg/kg	-	-	<2
Uranium	0.1	mg/kg	-	-	0.2
Vanadium	2	mg/kg	-	-	24
Zinc	5	mg/kg	123	315	16

Notes:
1 = CCME Interim Sediment Quality Guidelines (ISQGs) for freshwater sediment (2002)
2 = CCME Probable Effects Levels (PELs) for freshwater sediment (2002)
RDL = Reportable Detection Limit
< = Not detected above RDL noted
"-" = indicates value is not available or does not apply
Shaded = Value exceeds CCME ISQG
Bold = Value exceeds CCME PEL