

TABLE H.5.13 PETROLEUM HYDROCARBON CHEMISTRY
South Tar Pond Sludge
Jacques Whitford Project No. 1000897

Sample ID	Sample Date	BTEX Parameters (mg/kg or ppm)				Total Petroleum Hydrocarbons (mg/kg or ppm)				Resemblance
		Benzene	Toluene	Ethyl-Benzene	Xylenes	C6-C10 Gas	C10-C21 Fuel	C21-C32 Lube	Modified TPH	
SOUTH POND COMP 1	20-Jul-05	5.2	3.8	4.2	21	68	11000	8700	20000	Weathered fuel oil fraction. Lube oil fraction; interference from possible PAHs.
EQL		0.025	0.025	0.025	0.050	3	75	75	80	n/a
CCME Commercial		5	0.8	20	17	-	-	-	-	n/a
NSEL Landfill Disposal		5	30	50	50	-	-	-	-	n/a

Notes:

1. EQL = estimated quantitation limit is the minimum concentration that can be reliably reported
2. nd = parameter not detected above EQL
3. mbg = metres below grade
4. - = no guideline available
5. n/a = not applicable
6. Modified TPH = total petroleum hydrocarbons excluding total BTEX
7. CCME Commercial = Canadian Council of Ministers of the Environment Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (1999; last updated 2004); Commercial land use
8. NSEL Landfill Disposal = Nova Scotia Environment and Labour Guidelines for Disposal of Contaminated Solids in Landfills, Attachment B, March 22, 1994, Updated 2003
9. **Bolded** = Concentrations in exceedance of CCME Commercial Guidelines
10. **Bolded = Concentrations** = Concentrations in exceedance of NSEL Attachment B Landfill Guidelines, and CCME Commercial Guidelines

TABLE H.5.14 METALS CHEMISTRY
South Tar Pond Sludge
Jacques Whitford Project No. 1000897

Parameter	EQL	Units	CCME Commercial	NSEL Landfill Disposal	Sample ID
					SOUTH POND COMP 1
Sample Date					20-Jul-05
Aluminum	10	mg/kg	-	-	5300
Antimony	2	mg/kg	40	40	nd
Arsenic	2	mg/kg	12	50	80
Barium	5	mg/kg	2000	2000	88
Beryllium	2	mg/kg	8	8	nd
Boron	5	mg/kg	-	2	14
Cadmium	0.3	mg/kg	22	20	0.9
Chromium	2	mg/kg	87	800	32
Cobalt	1	mg/kg	300	300	6.6
Copper	2	mg/kg	91	500	81
Iron	50	mg/kg	-	-	39000
Lead	0.5	mg/kg	260	1000	300
Manganese	2	mg/kg	-	-	310
Molybdenum	2	mg/kg	40	40	6.3
Nickel	2	mg/kg	50	500	14
Selenium	2	mg/kg	3.9	10	3
Silver	0.5	mg/kg	40	40	nd
Strontium	5	mg/kg	-	-	45
Thallium	0.1	mg/kg	1	1	0.9
Uranium	0.1	mg/kg	-	-	1.1
Vanadium	2	mg/kg	130	200	17
Zinc	5	mg/kg	360	1500	450

Notes:

1. EQL = estimated quantitation limit is the minimum concentration that can be reliably reported
2. mbg = metres below grade
3. - = no guideline available.
4. nd = parameter not detected above laboratory detection limit.
5. CCME Commercial = Canadian Council of Ministers of the Environment Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (1999; last updated 2004); Commercial land use
6. NSEL Landfill Disposal = Nova Scotia Environment and Labour Guidelines for Disposal of Contaminated Solids in Landfills, Attachment B, March 22, 1994, Updated 2003
7. **Bolded** = Concentrations in exceedance of CCME Commercial Guidelines
8. **Bolded** = Concentrations in exceedance of NSEL Attachment B Landfill Guidelines, and CCME Commercial Guidelines

Table H.5.15

VOLATILE ORGANIC COMPOUNDS (EPA-624) CHEMISTRY
South Tar Pond Sludge
Jacques Whitford Project No. 1000897

Parameter	EQL	Units	CCME Commercial	NSEL Landfill Disposal	Sample ID
					SOUTH POND COMP 1
Sample Date					20-Jul-05
1,2-Dichlorobenzene	30	ug/kg	10000	10000	nd
1,3-Dichlorobenzene	30	ug/kg	10000	10000	nd
1,4-Dichlorobenzene	30	ug/kg	10000	10000	nd
Chlorobenzene	30	ug/kg	10000	10000	nd
1,1,1-Trichloroethane	30	ug/kg	50000	50000	nd
1,1,2,2-Tetrachloroethane	30	ug/kg	50000	50000	<100
1,1,2-Trichloroethane	30	ug/kg	50000	50000	nd
1,1-Dichloroethane	30	ug/kg	50000	50000	nd
1,1-Dichloroethylene	30	ug/kg	50000	50000	nd
1,2-Dichloroethane	30	ug/kg	50000	50000	nd
1,2-Dichloropropane	30	ug/kg	50000	50000	nd
Benzene	30	ug/kg	5000	5000	4700
Bromodichloromethane	30	ug/kg	-	50000	nd
Bromoform	30	ug/kg	-	-	nd
Bromomethane	200	ug/kg	-	150000	nd
Carbon Tetrachloride	30	ug/kg	50000	50000	nd
Chloroethane	200	ug/kg	-	50000	nd
Chloroform	30	ug/kg	50000	-	nd
Chloromethane	30	ug/kg	-	50000	nd
cis-1,2-Dichloroethylene	30	ug/kg	-	50000	nd
cis-1,3-Dichloropropene	30	ug/kg	-	50000	nd
Dibromochloromethane	30	ug/kg	-	50000	nd
Ethylbenzene	30	ug/kg	20000	50000	3800
Ethylene Dibromide	30	ug/kg	-	-	nd
Methylene Chloride(Dichloromethane)	30	ug/kg	50000	50000	nd
o-Xylene	30	ug/kg	17000	50000	6600
p+m-Xylene	300	ug/kg	17000	50000	11000
Styrene	30	ug/kg	50000	50000	<180
Tetrachloroethylene	30	ug/kg	500	50000	nd
Toluene	30	ug/kg	800	30000	3500
trans-1,2-Dichloroethylene	30	ug/kg	50000	-	nd
trans-1,3-Dichloropropene	30	ug/kg	50000	50000	nd
Trichloroethylene	30	ug/kg	31	50000	nd
Trichlorofluoromethane (FREON 11)	30	ug/kg	-	50000	nd
Vinyl Chloride	30	ug/kg	-	-	nd

Notes:

1. EQL = estimated quantitation limit is the minimum concentration that can be reliably reported
2. mbg = metres below grade
3. - = no guideline available
4. nd = parameter not detected above laboratory detection limit.
5. CCME Criteria = Canadian Council of Ministers of the Environment Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (1999; last updated 2004); Commercial land use
6. **Bolded** = Concentrations in exceedance of CCME Commercial Guidelines
7. NSEL Landfill Disposal = Nova Scotia Environment and Labour Guidelines for Disposal of Contaminated Solids in Landfills, Attachment B, March 22, 1994, Updated 2003

Table H.5.16

SEMI-VOLATILE ORGANIC COMPOUNDS (EPA-625) CHEMISTRY
South Tar Pond Sludge
Jacques Whitford Project No. 1000897

Parameter	Units	EQL	CCME Commercial	NSEL Landfill Guidelines	Sample ID
					SOUTH POND COMP 1
Sample Date					20-Jul-05
1,2,4-Trichlorobenzene	ug/Kg	2000	10000	10000	nd
1,2-Dichlorobenzene	ug/Kg	2000	10000	10000	nd
1,3-Dichlorobenzene	ug/Kg	2000	10000	10000	nd
1,4-Dichlorobenzene	ug/Kg	2000	10000	10000	nd
2,4,6-Trichlorophenol	ug/Kg	2000	5000	10000	nd
2,4-Dichlorophenol	ug/Kg	2000	5000	10000	nd
2,4-Dimethylphenol	ug/Kg	2000	-	10000	nd
2,4-Dinitrophenol	ug/Kg	5000	-	10000	nd
2,4-Dinitrotoluene	ug/Kg	2000	-	30000	nd
2,6-Dinitrotoluene	ug/Kg	2000	-	30000	nd
2-Chloronaphthalene	ug/Kg	2000	-	10000	nd
2-Chlorophenol	ug/Kg	2000	-	10000	nd
2-Nitrophenol	ug/Kg	2000	-	10000	nd
3,3'-Dichlorobenzidine	ug/Kg	20000	-	-	nd
4-Chloro-3-Methylphenol	ug/Kg	5000	-	10000	nd
4,6-Dinitro-2-methylphenol	ug/Kg	5000	-	10000	nd
4-Bromophenyl phenyl ether	ug/Kg	2000	-	-	nd
4-Chlorophenyl phenyl ether	ug/Kg	2000	-	-	nd
4-Nitrophenol	ug/Kg	5000	-	10000	nd
Acenaphthene	ug/Kg	500	-	10000	93000
Acenaphthylene	ug/Kg	500	-	10000	9700
Anthracene	ug/Kg	500	-	10000	95000
Benzidine	ug/Kg	20000	-	-	nd
Benzo(a)anthracene	ug/Kg	500	10000	10000	46000
Benzo(a)pyrene	ug/Kg	500	700	10000	27000
Benzo(b)fluoranthene	ug/Kg	500	10000	10000	34000
Benzo(k)fluoranthene	ug/Kg	500	10000	10000	14000
Benzo(ghi)perylene	ug/Kg	1000	-	10000	11000
Bis(2-chloroethoxy)methane	ug/Kg	2000	-	50000	nd
Bis(2-chloroethyl)ether	ug/Kg	2000	-	50000	nd
Bis(2-chloroisopropyl)ether	ug/Kg	2000	-	50000	nd
Bis(2-ethylhexyl)phthalate	ug/Kg	2000	-	-	2400
Benzyl butyl phthalate	ug/Kg	2000	-	-	nd
Chrysene	ug/Kg	500	-	10000	46000
Di-N-butyl phthalate	ug/Kg	2000	-	-	nd
Di-N-octyl phthalate	ug/Kg	2000	-	-	nd
Dibenzo(a,h)anthracene	ug/Kg	1000	10000	10000	4500
Diethyl phthalate	ug/Kg	2000	-	-	nd
Dimethyl phthalate	ug/Kg	2000	-	-	nd
Fluoranthene	ug/Kg	500	-	10000	130000
Fluorene	ug/Kg	500	-	10000	88000
Hexachlorobenzene	ug/Kg	2000	10000	10000	nd
Hexachlorobutadiene	ug/Kg	2000	-	10000	nd
Hexachlorocyclopentadiene	ug/Kg	2000	-	-	nd
Hexachloroethane	ug/Kg	2000	-	10000	nd
Indeno(1,2,3-cd)pyrene	ug/Kg	1000	10000	10000	12000
Isophorone	ug/Kg	2000	-	-	nd
N-Nitroso-di-n-propylamine	ug/Kg	5000	-	-	nd
N-Nitrosodimethylamine	ug/Kg	10000	-	-	nd
Naphthalene	ug/Kg	500	22000	10000	170000
Nitrobenzene	ug/Kg	2000	-	5000	nd
Nitrosodiphenylamine/Diphenylamine	ug/Kg	5000	-	-	nd
Pentachlorophenol	ug/Kg	2000	7600	10000	nd
Phenanthrene	ug/Kg	500	50000	10000	200000
Phenol	ug/Kg	2000	3800	10000	nd
Pyrene	ug/Kg	500	100000	10000	99000
Total PAHs	-	-	-	50000	1079200

Notes:

1. EQL = estimated quantitation limit is the minimum concentration that can be reliably reported
2. mbg = metres below grade
3. nd = parameter not detected above EQL
4. - = no guideline available
5. CCME Commercial = Canadian Council of Ministers of the Environment *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (1999; last updated 2004); Commercial land use
6. NSEL Landfill Disposal = Nova Scotia Environment and Labour Guidelines for Disposal of Contaminated Solids in Landfills, Attachment B, March 22, 1994, Updated 2003
7. **Bolded** = Concentrations in exceedance of CCME Commercial Guidelines
8. **Bolded** = Concentrations in exceedance of NSEL Attachment B Landfill Guidelines, and CCME Commercial Guidelines

**TABLE H.5.17 PCB, DIOXIN TEQ, PH, TOC CHEMISTRY
South Tar Pond Sludge
Jacques Whitford Project No. 1000897**

Parameter	EQL	Units	CCME Commercial	NSEL Landfill Disposal	Sample ID
					SOUTH POND COMP 1
			Sample Date		
pH	n/a	pH	6-8	-	7.79
PCBs	1	ug/g	33	50	nd
Dioxin/Furan	-	ng/kg	4	-	43.3
TOC	0.2	g/kg	-	-	400

Notes:

1. EQL = estimated quantitation limit is the minimum concentration that can be reliably reported
 2. mbg = metres below grade
 3. - = no guideline available
 4. nd = parameter not detected above laboratory detection limit.
- the Protection of Environmental and Human Health (1999; last updated 2004); Commercial land use*
6. **Bolded** = concentrations in exceedance of the CCME Commercial Guidelines
 7. NSEL Landfill Disposal = Nova Scotia Environment and Labour Guidelines for Disposal of Contaminated Solids in Landfills, Attachment B, March 22, 1994, Updated 2003

Table H.5.18

METALS LEACHATE CHEMISTRY
South Tar Pond Sludge
Jacques Whitford Project No. 1000897

Parameter	Units	DL	NSEL Landfill Guidelines	Sample ID
				SOUTH POND COMP 1
Sample Depth (mbg)				
Sample Date				30-Jun-05
Aluminum (Al)	ug/L	1000	500000	1000
Antimony (Sb)	ug/L	200	-	nd
Arsenic (As)	ug/L	200	5000	nd
Barium (Ba)	ug/L	500	100000	1100
Beryllium (Be)	ug/L	200	10000	nd
Boron (B)	ug/L	5000	500000	nd
Cadmium (Cd)	ug/L	30	500	nd
Chromium (Cr)	ug/L	200	5000	nd
Cobalt (Co)	ug/L	100	5000	nd
Copper (Cu)	ug/L	200	100000	nd
Iron (Fe)	ug/L	5000	-	430000
Lead (Pb)	ug/L	50	5000	93
Manganese (Mn)	ug/L	200	-	3100
Total Mercury (Hg)	ug/L	200	100	n/a
Molybdenum (Mo)	ug/L	200	5000	nd
Nickel (Ni)	ug/L	200	20000	nd
Selenium (Se)	ug/L	50	1000	nd
Silver (Ag)	ug/L	500	5000	nd
Strontium (Sr)	ug/L	10	-	680
Thallium (Tl)	ug/L	200	-	nd
Tin (Sn)	ug/L	10	-	nd
Uranium (U)	ug/L	200	2000	nd
Vanadium (V)	ug/L	500	10000	nd
Zinc (Zn)	ug/L	200	500000	1400
Lithium (Li)	ug/L	20	250000	nd

Notes:

- DL = Detection limit for routine analysis
- <(0)= parameter not detected above EQL
- "-" = no guideline available
- n/a = not applicable
- NSEL Landfill Guidelines = Nova Scotia Department of Environment and Labour Guidelines for disposal of contaminated solids and landfills, Attachment C, March 1994, Updated 2003

TABLE H.5.19

SEMI-VOLATILE LEACHATE CHEMISTRY
South Tar Pond Sludge
Jacques Whitford Project No. 1000897

Parameter	Units	EQL	NSEL Landfill Guidelines	Sample ID
				COMP 1
Sample Date				20-Jul-05
1,2,4-Trichlorobenzene	ug/L	5	500	n/a
1,2-Dichlorobenzene	ug/L	5	500	n/a
1,3-Dichlorobenzene	ug/L	5	500	nd
1,4-Dichlorobenzene	ug/L	5	500	nd
2,4,6-Trichlorophenol	ug/L	5	200	nd
2,4-Dichlorophenol	ug/L	5	200	nd
2,4-Dimethylphenol	ug/L	5	100	nd
2,4-Dinitrophenol	ug/L	13	100	nd
2,4-Dinitrotoluene	ug/L	5	2400	nd
2,6-Dinitrotoluene	ug/L	5	2400	nd
2-Chloronaphthalene	ug/L	5	500	nd
2-Chlorophenol	ug/L	5	200	nd
2-Nitrophenol	ug/L	5	100	nd
3,3'-Dichlorobenzidine	ug/L	50	-	nd
4-Chloro-3-Methylphenol	ug/L	13	100	nd
4,6-Dinitro-2-methylphenol	ug/L	13	100	nd
4-Bromophenyl phenyl ether	ug/L	5	-	nd
4-Chlorophenyl phenyl ether	ug/L	5	-	nd
4-Nitrophenol	ug/L	13	100	nd
Acenaphthene	ug/L	3	10	78
Acenaphthylene	ug/L	3	10	nd
Anthracene	ug/L	3	10	16
Benzidine	ug/L	50	10	nd
Benzo(a)anthracene	ug/L	3	10	nd
Benzo(a)pyrene	ug/L	3	10	nd
Benzo(k)fluoranthene	ug/L	3	10	nd
Benzo(ghi)perylene	ug/L	5	10	nd
Bis(2-chloroethoxy)methane	ug/L	5	500	nd
Bis(2-chloroethyl)ether	ug/L	5	500	nd
Bis(2-chloroisopropyl)ether	ug/L	5	500	nd
Bis(2-ethylhexyl)phthalate	ug/L	5	-	nd
Benzyl butyl phthalate	ug/L	5	-	nd
Chrysene	ug/L	3	10	nd
Di-N-butyl phthalate	ug/L	5	-	nd
Di-N-octyl phthalate	ug/L	5	-	nd
Dibenzo(a,h)anthracene	ug/L	5	10	nd
Diethyl phthalate	ug/L	5	-	nd
Dimethyl phthalate	ug/L	5	-	nd
Fluoranthene	ug/L	3	10	9
Fluorene	ug/L	3	10	66
Hexachlorobenzene	ug/L	5	500	nd
Hexachlorobutadiene	ug/L	5	-	nd
Hexachlorocyclopentadiene	ug/L	5	-	nd
Hexachloroethane	ug/L	5	500	nd
Indeno(1,2,3-cd)pyrene	ug/L	5	10	nd
Isophorone	ug/L	5	-	nd
N-Nitroso-di-n-propylamine	ug/L	13	-	nd
N-Nitrosodimethylamine	ug/L	25	-	nd
Naphthalene	ug/L	3	10	120
Nitrobenzene	ug/L	5	500	nd
Nitrosodiphenylamine/Diphenylam	ug/L	13	-	nd
Pentachlorophenol	ug/L	5	10000	nd
Phenanthrene	ug/L	3	10	72
Phenol	ug/L	5	100	nd
Pyrene	ug/Kg	3	10	6
Total PAHs	ug/Kg	-	10	367

Notes:

1. EQL = estimated quantitation limit for routine analysis
2. <(0)= parameter not detected above EQL
3. "-" = no guideline available
4. **Bolded** = exceeds applicable criteria
5. NSEL Landfill Guidelines = Nova Scotia Department of Environment and Labour Guidelines for disposal of contaminated solids and landfills, Attachment C, March 1994, Updated 2003

Table H.5.20

VOLATILE LEACHATE CHEMISTRY
South Tar Pond Sludge
Jacques Whitford Project No. 1000897

Parameter	EQL	Units	NSEL Landfill Disposal	Sample ID
			Sample Date	SOUTH POND COMP 1
				20-Jul-05
Acetone	1000	ug/L	-	nd
Benzene	10	ug/L	5000	27
Bromodichloromethane	10	ug/L	500	nd
Bromoform	20	ug/L	-	nd
Bromomethane	50	ug/L	1500	nd
Carbon Tetrachloride	10	ug/L	-	nd
Chlorobenzene	10	ug/L	500	nd
Chloroform	10	ug/L	-	nd
Dibromochloromethane	20	ug/L	500	nd
1,2-Dichlorobenzene	10	ug/L	500	nd
1,3-Dichlorobenzene	10	ug/L	500	nd
1,4-Dichlorobenzene	10	ug/L	500	nd
1,1-Dichloroethane	10	ug/L	500	nd
1,2-Dichloroethane	10	ug/L	500	nd
1,1-Dichloroethylene	10	ug/L	500	nd
cis-1,2-Dichloroethylene	10	ug/L	500	nd
trans-1,2-Dichloroethylene	10	ug/L	500	nd
1,2-Dichloropropane	10	ug/L	500	nd
cis-1,3-Dichloropropene	20	ug/L	500	nd
trans-1,3-Dichloropropene	20	ug/L	500	nd
Ethylbenzene	10	ug/L	240	26
Ethylene Dibromide	20	ug/L	-	nd
Methylene Chloride(Dichloromethane)	50	ug/L	500	nd
Methyl Isobutyl Ketone	500	ug/L	-	nd
Methyl Ethyl Ketone	500	ug/L	-	nd
Methyl t-butyl ether (MTBE)	20	ug/L	-	nd
Styrene	10	ug/L	2400	nd
1,1,1,2-Tetrachloroethane	10	ug/L	500	nd
1,1,2,2-Tetrachloroethane	10	ug/L	500	nd
Tetrachloroethylene	10	ug/L	500	nd
Toluene	20	ug/L	2400	21
1,1,1-Trichloroethane	10	ug/L	500	nd
1,1,2-Trichloroethane	20	ug/L	500	nd
Trichloroethylene	10	ug/L	500	nd
Vinyl Chloride	20	ug/L	-	nd
p+m-Xylene	10	ug/L	-	88
o-Xylene	10	ug/L	-	53
Xylene (Total)	10	ug/L	30000	142

Notes:

1. EQL = estimated quantitation limit is the minimum concentration that can be reliably reported
2. mbg = metres below grade
3. - = no guideline available
4. nd = parameter not detected above laboratory detection limit.
5. NSEL Landfill Disposal = Nova Scotia Environment and Labour Guidelines for Disposal of Contaminated Solids in Landfills, Attachment C, March 22, 1994, Updated 2003.