



NORTH COAL LIMITED
ATTN: Bill Arling
652 F Sparwood Drive
PO Box 576
Sparwood BC V0B 2G0

Date Received: 24-SEP-20
Report Date: 01-OCT-20 15:58 (MT)
Version: FINAL

Client Phone: 250-423-8854

Certificate of Analysis

Lab Work Order #: L2507597
Project P.O. #: NOT SUBMITTED
Job Reference: 18CANA02
C of C Numbers:
Legal Site Desc:

Patryk Wojciak, B.Sc., P.Chem.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298
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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2507597-1	L2507597-2	L2507597-3	L2507597-4
		Description	Surface Water	Surface Water	Surface Water	Surface Water
		Sampled Date	22-SEP-20	22-SEP-20	22-SEP-20	22-SEP-20
		Sampled Time	09:15	10:20	14:00	17:00
		Client ID	AND1	MICH-33.8	MICH-13	DUPLICATE
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	<5.0	<5.0	<5.0	<5.0	<5.0
	Hardness (as CaCO3) (mg/L)	135	388	255	134	
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	157 ^{DLHC}	535 ^{DLHC}	323 ^{DLHC}	142 ^{DLHC}	
	Turbidity (NTU)	0.11	<0.10	0.56	0.22	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	128	195	166	127	
	Ammonia as N (mg/L)	0.0427	0.0658	0.0658	0.0651	
	Bicarbonate (HCO3) (mg/L)	156	237	199	155	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Carbonate (CO3) (mg/L)	<5.0	<5.0	<5.0	<5.0	
	Chloride (Cl) (mg/L)	<0.50	1.05	1.23	<0.50	
	Conductivity (EC) (uS/cm)	259	760	503	260	
	Fluoride (F) (mg/L)	0.267	0.151	0.107	0.265	
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	
	Nitrate (as N) (mg/L)	0.0991	1.13	0.182	0.0964	
	Nitrite (as N) (mg/L)	<0.0010	0.0013	0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.085	0.284	0.121	0.076	
	pH (pH)	8.19	8.26	8.31	8.19	
	Orthophosphate-Dissolved (as P) (mg/L)	0.0012	<0.0010	0.0018	0.0011	
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	
	Sulfate (SO4) (mg/L)	17.4	237	110	17.5	
	Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	<0.50	0.67	0.80	<0.50
Total Organic Carbon (mg/L)		<0.50	0.56	0.75	<0.50	
Total Metals	Aluminum (Al)-Total (mg/L)	0.0038	0.0060	0.0040	0.0037	
	Antimony (Sb)-Total (mg/L)	<0.00010	0.00017	0.00012	<0.00010	
	Arsenic (As)-Total (mg/L)	0.00047	0.00025	0.00021	0.00048	
	Barium (Ba)-Total (mg/L)	0.0227	0.0958	0.173	0.0217	
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	<0.010	0.029	0.015	<0.010	
	Cadmium (Cd)-Total (mg/L)	0.0000100	0.0000225	0.0000289	0.0000136	
	Calcium (Ca)-Total (mg/L)	42.3	95.3	68.1	40.3	
	Chromium (Cr)-Total (mg/L)	0.00028	0.00020	0.00014	0.00030	
	Cobalt (Co)-Total (mg/L)	<0.00010	0.00016	<0.00010	<0.00010	
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Iron (Fe)-Total (mg/L)	<0.010	0.032	<0.010	<0.010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2507597-1 Surface Water 22-SEP-20 09:15 AND1	L2507597-2 Surface Water 22-SEP-20 10:20 MICH-33.8	L2507597-3 Surface Water 22-SEP-20 14:00 MICH-13	L2507597-4 Surface Water 22-SEP-20 17:00 DUPLICATE
Grouping	Analyte				
WATER					
Total Metals	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0022	0.0169	0.0088	0.0020
	Magnesium (Mg)-Total (mg/L)	9.00	39.7	22.3	8.89
	Manganese (Mn)-Total (mg/L)	0.00012	0.00239	0.00125	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000735	0.000950	0.000764	0.000729
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00510	0.00069	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.21	1.20	0.86	0.22
	Selenium (Se)-Total (mg/L)	0.00159	0.00533	0.00217	0.00167
	Silicon (Si)-Total (mg/L)	1.35	1.72	2.05	1.33
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.695	19.1	7.70	0.685
	Strontium (Sr)-Total (mg/L)	0.145	0.352	0.219	0.140
	Sulfur (S)-Total (mg/L)	6.50	85.4	38.9	6.44
	Thallium (Tl)-Total (mg/L)	0.000044	0.000017	<0.000010	0.000043
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.000776	0.00201	0.000865	0.000775
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0016	0.0010	0.0011	0.0017
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	0.00014	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00046	0.00021	0.00019	0.00045
	Barium (Ba)-Dissolved (mg/L)	0.0228	0.0969	0.178	0.0226
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	0.026	0.013	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000119	0.0000169	0.0000279	0.0000123
	Calcium (Ca)-Dissolved (mg/L)	39.4	91.8	65.5	39.1
	Chromium (Cr)-Dissolved (mg/L)	0.00026	0.00014	<0.00010	0.00027
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	0.00013	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	0.00022	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010

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Sample ID Description Sampled Date Sampled Time Client ID	L2507597-1 Surface Water 22-SEP-20 09:15 AND1	L2507597-2 Surface Water 22-SEP-20 10:20 MICH-33.8	L2507597-3 Surface Water 22-SEP-20 14:00 MICH-13	L2507597-4 Surface Water 22-SEP-20 17:00 DUPLICATE	
Grouping	Analyte				
WATER					
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0018	0.0176	0.0078	0.0017
	Magnesium (Mg)-Dissolved (mg/L)	8.92	38.6	22.3	8.77
	Manganese (Mn)-Dissolved (mg/L)	<0.00010	0.00185	0.00075	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000744	0.000961	0.000776	0.000747
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00477	0.00061	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.21	1.19	0.85	0.21
	Selenium (Se)-Dissolved (mg/L)	0.00156	0.00515	0.00208	0.00166
	Silicon (Si)-Dissolved (mg/L)	1.29	1.66	1.94	1.29
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.631	17.1	7.03	0.617
	Strontium (Sr)-Dissolved (mg/L)	0.141	0.357	0.217	0.141
	Sulfur (S)-Dissolved (mg/L)	6.05	84.7	38.7	6.34
	Thallium (Tl)-Dissolved (mg/L)	0.000040	0.000017	<0.000010	0.000041
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000746	0.00192	0.000828	0.000733
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0019	<0.0010	<0.0010	0.0019
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
Aggregate Organics	Chemical Oxygen Demand (mg/L)	<10	<10	<10	<10
Volatile Organic Compounds	Acetone (mg/L)	<0.050	<0.050	<0.050	<0.050
	Acrolein (mg/L)	<0.050	<0.050	<0.050	<0.050
	Acrylonitrile (mg/L)	<0.020	<0.020	<0.020	<0.020
	Benzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Bromobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Bromochloromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Bromodichloromethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Bromoform (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Bromomethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	2-Butanone (MEK) (mg/L)	<0.020	<0.020	<0.020	<0.020
	n-Butylbenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	sec-Butylbenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	tert-Butylbenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010

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Sample ID Description Sampled Date Sampled Time Client ID		L2507597-1 Surface Water 22-SEP-20 09:15 AND1	L2507597-2 Surface Water 22-SEP-20 10:20 MICH-33.8	L2507597-3 Surface Water 22-SEP-20 14:00 MICH-13	L2507597-4 Surface Water 22-SEP-20 17:00 DUPLICATE
Grouping	Analyte				
WATER					
Volatile Organic Compounds	Carbon disulfide (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Carbon tetrachloride (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Chlorobenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Dibromochloromethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Chloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Chloroform (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Chloromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	2-Chlorotoluene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	4-Chlorotoluene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	1,2-Dibromo-3-chloropropane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Ethylene dibromide (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Dibromomethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	cis-1,4-Dichloro-2-butene (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050
	trans-1,4-Dichloro-2-butene (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050
	1,2-Dichlorobenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	1,3-Dichlorobenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	1,4-Dichlorobenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Dichlorodifluoromethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	1,1-Dichloroethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	1,2-Dichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	1,1-Dichloroethene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	cis-1,2-Dichloroethene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	trans-1,2-Dichloroethene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Methylene chloride (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	1,2-Dichloropropane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	1,3-Dichloropropane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	2,2-Dichloropropane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	1,1-Dichloropropene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	cis-1,3-Dichloropropene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	trans-1,3-Dichloropropene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Ethanol (mg/L)	<0.20	<0.20	<0.20	<0.20
	Ethyl methacrylate (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050
	Ethylbenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Hexachlorobutadiene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	2-Hexanone (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050
	Iodomethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Isopropylbenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010

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Grouping	Analyte				
WATER					
Volatile Organic Compounds	p-Isopropyltoluene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	4-Methyl-2-pentanone (MIBK) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050
	Methyl-t-butyl ether (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	n-Propylbenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Styrene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	1,1,1,2-Tetrachloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	1,1,2,2-Tetrachloroethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Tetrachloroethylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Toluene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	1,2,3-Trichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	1,2,4-Trichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	1,3,5-Trichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	1,1,1-Trichloroethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	1,1,2-Trichloroethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Trichloroethene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Trichlorofluoromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	1,2,3-Trichloropropane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	1,2,4-Trimethylbenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	1,3,5-Trimethylbenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Vinyl chloride (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	o-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	m+p-Xylenes (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Xylenes (mg/L)	<0.00071	<0.00071	<0.00071	<0.00071
Surrogate: 4-Bromofluorobenzene (%)	104.2	106.2	100.6	100.5	
Surrogate: 3,4-Dichlorotoluene (%)	105.3	127.4	93.7	120.9	
Surrogate: 1,4-Difluorobenzene (%)	103.1	103.4	104.0	102.4	
Hydrocarbons	EPH10-19 (ug/L)	<100	<100	<100	<100
	EPH19-32 (ug/L)	<100	<100	<100	<100
	Surrogate: 2-Bromobenzotrifluoride (%)	87.8	83.6	83.6	87.2

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2507597-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2507597-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2507597-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L2507597-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L2507597-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2507597-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2507597-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Total	MS-B	L2507597-1, -2, -3, -4
Matrix Spike	Trichloroethene	MSDH	L2507597-1, -2, -3, -4
Matrix Spike	1,1,2,2-Tetrachloroethane	MSDL	L2507597-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
MSDH	TCE recovery in MS was high. Spiked 1122-TCA converted to TCE due to sample matrix (dehydrohalogenation).
MSDL	1122-TCA recovery in MS was low. Analyte is unstable in this sample matrix due to dehydrohalogenation.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BE-D-L-CCMS-CL	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
BE-T-L-CCMS-CL	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.			
TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.			
TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
COD-T-COL-CL	Water	Chemical Oxygen Demand (COD)	APHA 5220 D Colorimetry

Reference Information

Samples are analyzed using the closed reflux colourimetric method

COLOUR-TRUE-CL	Water	Colour (True) by Spectrometer	APHA 2120 Color
True Colour is measured spectrophotometrically by comparison to platinum-cobalt standards using the single wavelength method (450 - 465 nm) after filtration of sample through a 0.45 um filter. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.			
EPH-L-ME-FID-CL	Water	EPH (C10-C19) & EPH (C19-C32)	BC Lab manual
EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-CL	Water	Hardness	APHA 2340 B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-CL	Water	Dissolved Mercury in Water by CVAAS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.			
HG-T-CVAA-CL	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.			
MET-D-CCMS-CL	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-CL	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MTBE-ADD-CL	Water	MTBE - additional to BTEX	EPA 8260C/5021A
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. MTBE Target compound concentration is measured using mass spectrometry detection.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH/EC/ALK-CL	Water	pH, Conductivity and Total Alkalinity	APHA 4500H,2510,2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed) pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode. Alkalinity measurement is based on the sample's capacity to neutralize acid Conductivity measurement is based on the sample's capacity to convey an electric current			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C

Reference Information

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VOC-HS-MS-CL Water VOCs in Water EPA 8260C/5021A

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. VOC Target compound concentrations are measured using mass spectrometry detection.

XYLENES-CALC-CL Water Sum of Xylene Isomer Concentrations CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

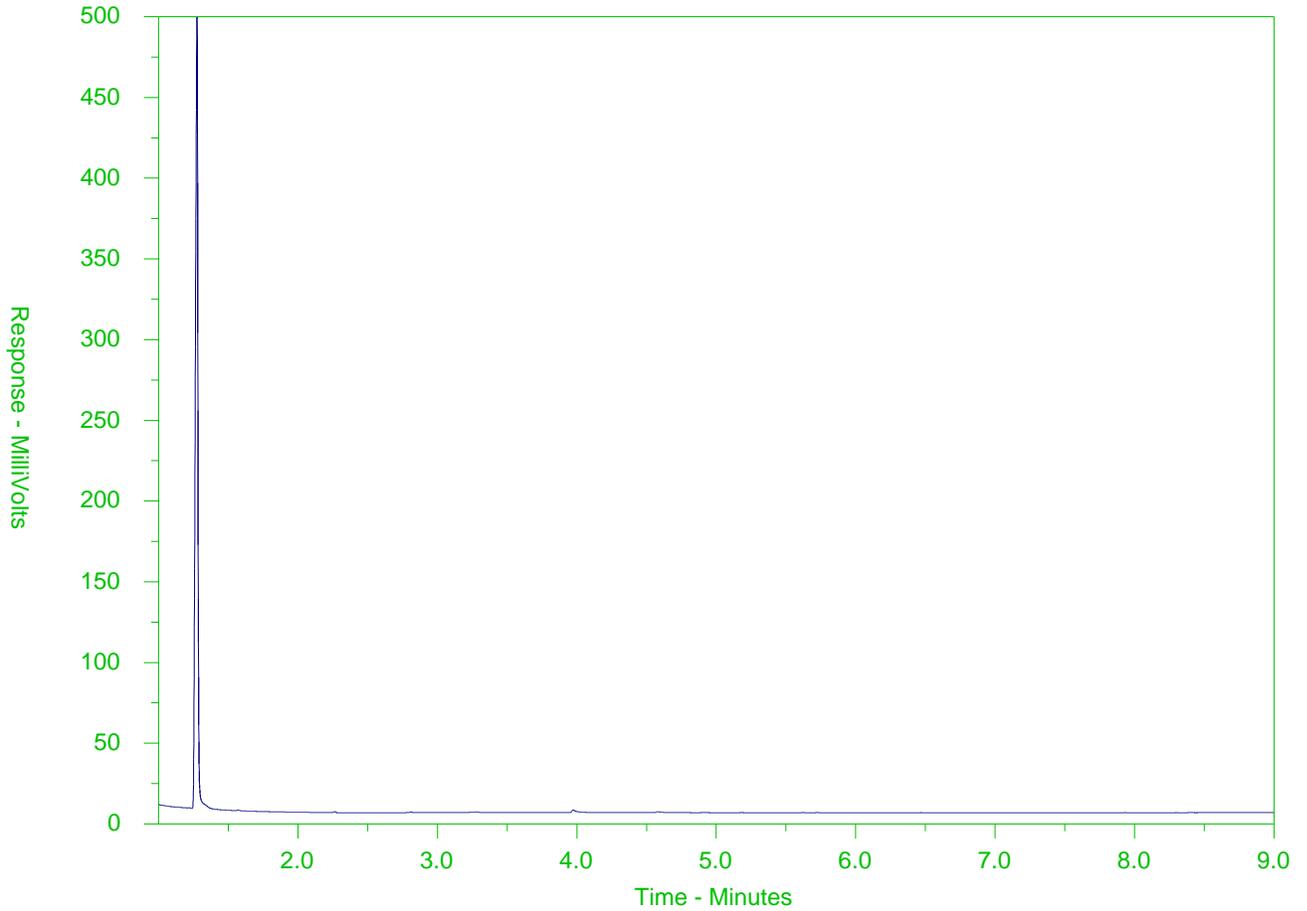
- mg/kg - milligrams per kilogram based on dry weight of sample.*
- mg/kg wwt - milligrams per kilogram based on wet weight of sample.*
- mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*
- mg/L - milligrams per litre.*
- < - Less than.*

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2507597-1
 Client Sample ID: AND1



← EPH10-19 →		← EPH19-32 →	
nC10	nC19	nC32	
174°C	330°C	467°C	
346°F	626°F	873°F	
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

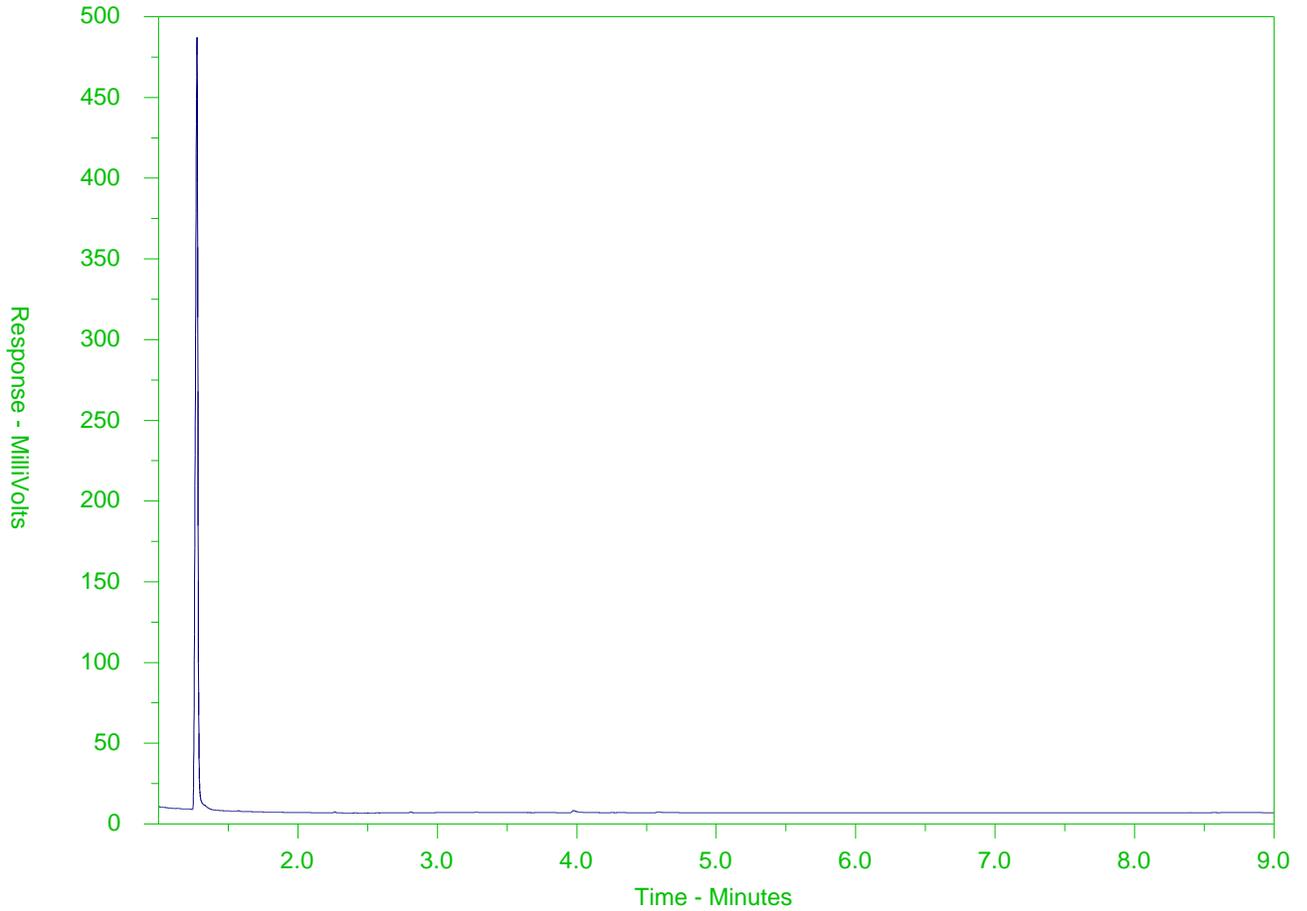
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2507597-2
 Client Sample ID: MICH-33.8



← EPH10-19 →		← EPH19-32 →	
nC10	nC19	nC32	
174°C	330°C	467°C	
346°F	626°F	873°F	
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

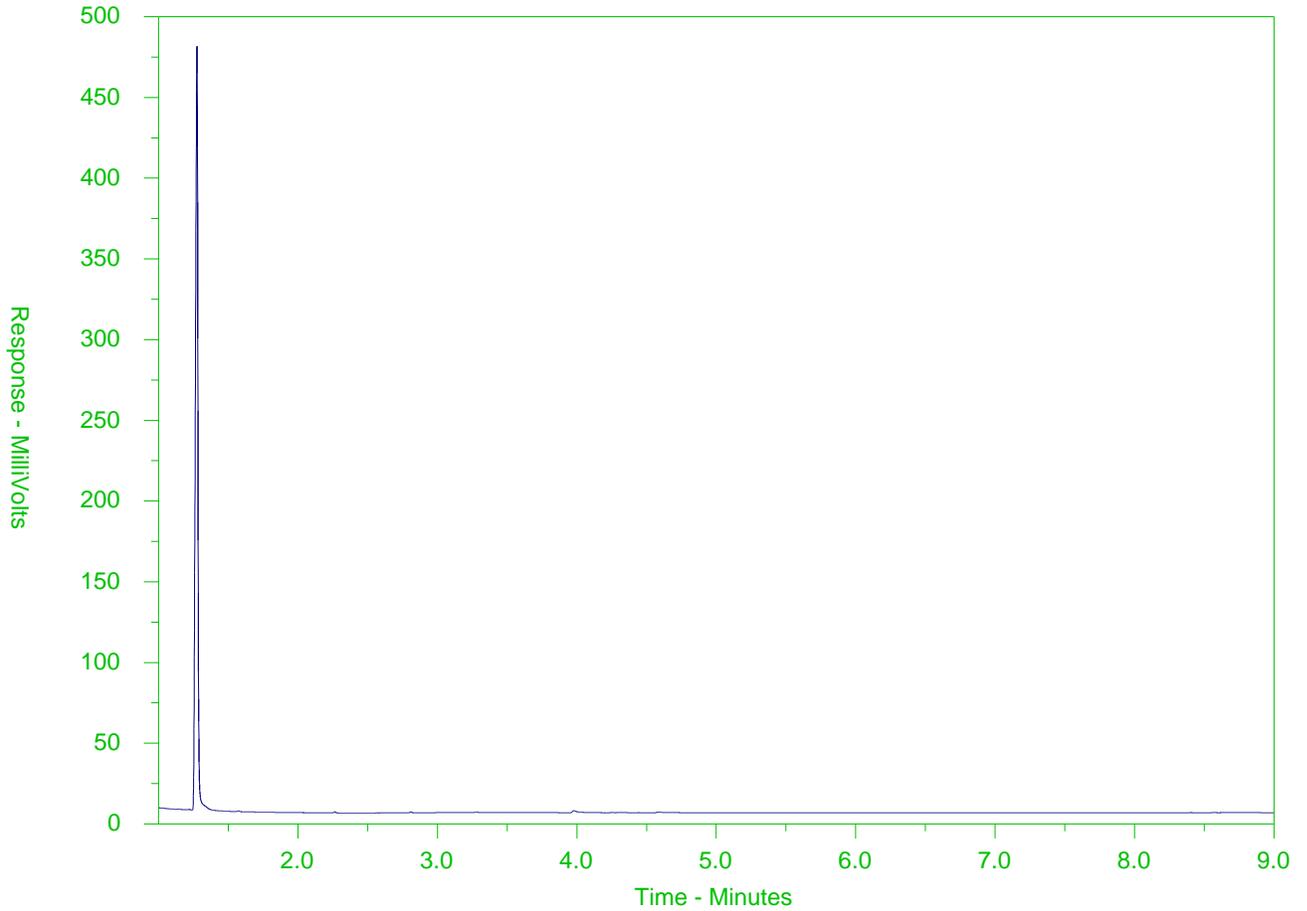
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2507597-3
 Client Sample ID: MICH-13



← EPH10-19 →		← EPH19-32 →	
nC10	nC19	nC32	
174°C	330°C	467°C	
346°F	626°F	873°F	
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

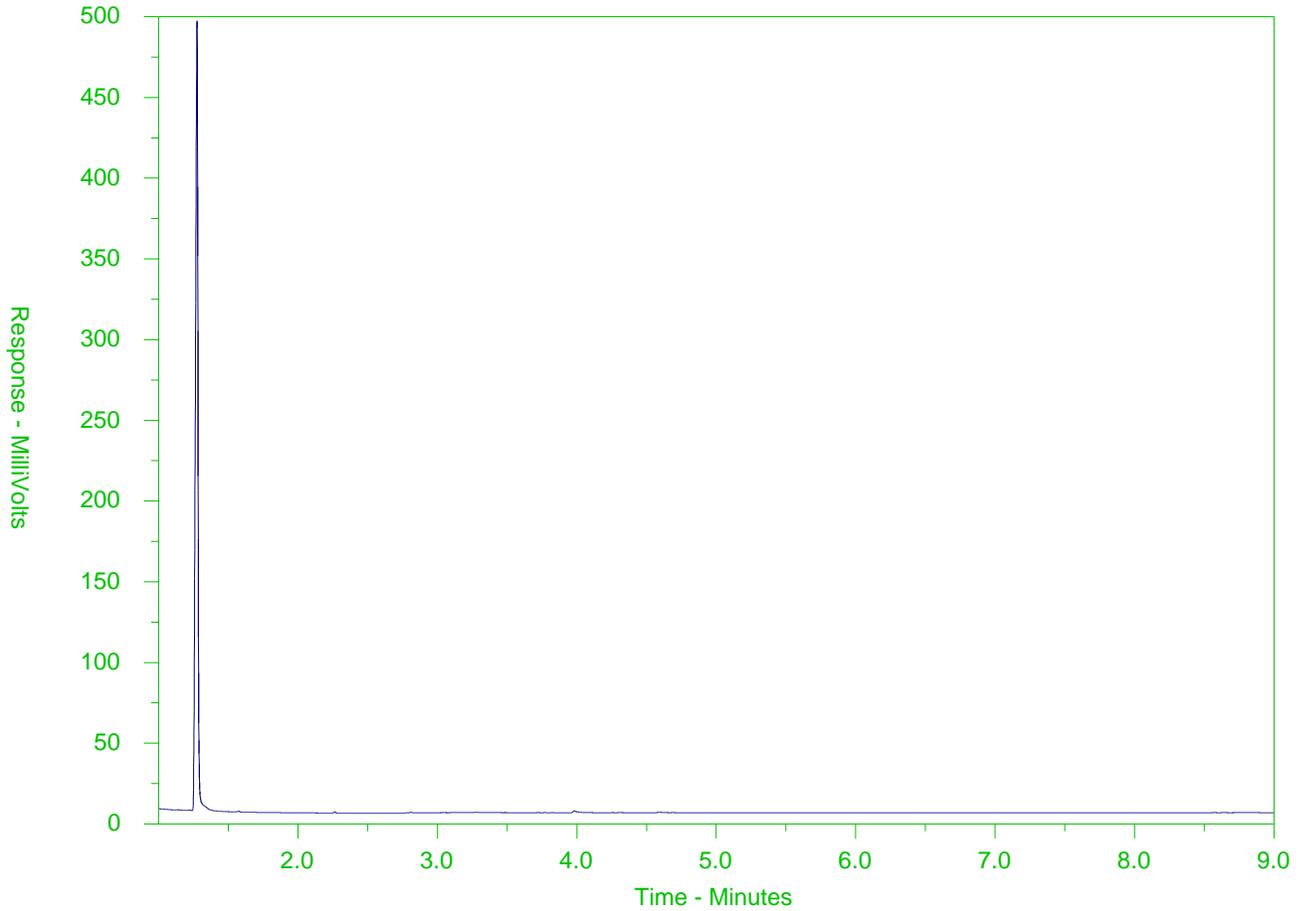
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2507597-4
 Client Sample ID: DUPLICATE



← EPH10-19 →		← EPH19-32 →	
nC10	nC19	nC32	
174°C	330°C	467°C	
346°F	626°F	873°F	
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

