

Permission Statement

The material in this report reflects the judgment of Canada's Oil Sands Innovation Alliance (COSIA) Joint Industry Project (JIP) Participants: Canadian Natural Resources Ltd., Imperial Oil Resources Ltd., Suncor Energy Inc. and Syncrude Canada Ltd., as well as Paragon Soil and Environmental Consulting Inc. (Paragon), in light of the information available at the time of document preparation. Permission for non-commercial use, publication or presentation of excerpts or figures is granted, provided appropriate attribution is cited. Commercial reproduction, in whole or in part, is not permitted without prior written consent from COSIA. An original copy is on file with COSIA and is the primary reference with precedence over any other reproduced copies of the document.

Reliance upon third party use of these materials is at the sole risk of the end user. COSIA, the JIP Participants and Paragon accept no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document. The use of these materials by a third party is done without any affiliation with or endorsement by COSIA, the JIP Participants and Paragon.

Additional information on the report may be obtained by contacting COSIA.

The report may be cited as:

Paragon Soil and Environmental Consulting Inc. 2018. *Tree Growth on Reclaimed Overburden Sites Containing Petroleum Hydrocarbons at the Suncor Base Mine*. Canada's Oil Sands Innovation Alliance, 2020, www.cosia.ca.

Tree Growth on Reclaimed Overburden Sites Containing Petroleum Hydrocarbons at the Suncor Base Mine

Prepared for:

Canada's Oil Sands Innovation Alliance Joint Industry Partners

Synchrude Canada Limited
Imperial Oil Resources Limited
Canadian Natural Resources Limited
Suncor Energy Inc.

Prepared by:

Paragon Soil and Environmental Consulting Inc.

August 2018

CONTENTS

1	Introduction	1
2	Field Survey Location	1
3	Methods	4
3.1	Site Description	4
3.2	Tree and Vegetation Measurements	4
3.3	Soil Inspections	5
3.4	Soil Sampling	6
3.4.1	Soil Sample Analysis	6
4	Results	7
4.1	Site Index Calculations	9
4.2	NPHCs, Salinity and pH at Sample Sites	11
4.2.1	Coversoil	11
4.2.2	Upper Subsoil	11
4.2.3	Lower Subsoil	11
4.3	Extended Range High Temperature Gas Chromatography	12
4.4	Site Index Correlation with Reclamation Site Parameters	14
5	Discussion	14
5.1	NPHC Composition and Concentration	14
5.2	NPHC Concentration and Site Index	17
6	Closure	19
Appendix A	Field Survey Data	A-1
Appendix B	Laboratory Analysis Data	B-1
Appendix C	Extended Temperature Range Gas Chromatograms	C-1
Appendix D	Plots of White Spruce and Aspen Site Indices for pH, SAR and EC	D-1
Appendix E	Sample Site Photos	E-1
Appendix F	Laboratory Analysis Files and Certificates	F-1

LIST OF TABLES

Table 1 Suncor Base Mine Reclamation Sites Used for Field Survey..... 2

Table 2 Sample Plot Characteristics for Suncor Reclamation Areas..... 8

Table 3 Site Index Values for Tree Species Measured at Suncor Reclamation Areas..... 10

Table 4. Summary of NPHC Content 13

Table 5 Reclamation Area Site Index Information for White Spruce and Trembling Aspen from Syncrude (2016), Suncor (2018), CEMA and Archibald and Beckingham (2006) in Comparison to Site Index from the Current Study 18

LIST OF FIGURES

Figure 1. Field Survey Site Locations on the Suncor Base Mine 3

Figure 2. Correlation between White Spruce and Total NPHC Content in the Top 100 cm of Soil 15

Figure 3. Correlation between Trembling Aspen and Total NPHC Content in the Top 100 cm of Soil..... 16

ABBREVIATIONS

CCME.....	Canadian Council of Ministers of the Environment
CEMA.....	Cumulative Environmental Management Association
cm.....	centimetre
COSIA.....	Canada's Oil Sands Innovation Alliance
EC.....	Electrical Conductivity
GPS.....	Global Positioning System
GYPSY.....	Growth and Yield Projection System
HTGC.....	High Temperature Gas Chromatography
JIP.....	Joint Industry Project
LTPN.....	Long Term Plot Network
m.....	metre
NPHC.....	naturally-occurring Petroleum Hydrocarbon
Paragon.....	Paragon Soil and Environmental Consulting Inc.
PMM.....	Peat-mineral Mix
SAR.....	Sodium Adsorption Ratio
UCM.....	Unresolved Complex Mixtures
UTM.....	Universal Transverse Mercator

1 INTRODUCTION

Paragon Soil and Environmental Consulting Inc. (Paragon) was contracted to complete a field program and analysis for the Canada's Oil Sands Innovation Alliance (COSIA) Joint Industry Project (JIP) partners Syncrude Canada Limited (Syncrude), Imperial Oil Resources Limited (Imperial), Canadian Natural Resources Ltd. (CNRL) and Suncor Energy Inc. (Suncor), for tree growth on reclaimed overburden sites containing elevated naturally-occurring petroleum hydrocarbons (NPHCs) at the Suncor Base Mine site. Health and Safety preparation for the field team was completed at the Suncor site from November 7 to 9, 2017, and the field program completed thereafter from November 10 to 14, 2017.

The field program is one of a suite of projects directed at collating existing information related to reclamation performance on soil materials, interburden and overburden containing NPHCs, and identifying and assessing key environmental risks in consideration of reclamation cover design and capping thickness. The field survey was designed to sample reclamation soils with mature tree stands on the Suncor Base Mine on overburden containing NPHCs. Although reclamation and research with NPHCs is taking place at some oil sands mine operations, reclamation of areas containing NPHCs is still in the early years of vegetation growth and has not reached a suitable age to confidently predict growth at/to maturity.

2 FIELD SURVEY LOCATION

The Suncor Base Mine is located approximately 30 kilometres north of Fort McMurray, Alberta. Suncor provided access to reclaimed sites located within Lease 86/17, that consisted of reclamation material applied over overburden containing varying concentrations of NPHCs (Table 1).

Potential field survey plot coordinates were identified in an office exercise, based on prior reclamation assessments, monitoring programs (e.g., Cumulative Environmental Management Association [CEMA] Long-term Plot Network [LTPN]) and research carried out on Suncor Lease 86/17 (Figure 1). Proposed field survey plots were provided to Suncor, who marked plot centres and completed Ground Disturbance sweeps prior to the field team arriving on site. Thirty (30) potential plots were identified as candidates for field survey, of which 20 plots were selected once the field team mobilized to the reclamation areas (Figure 1). Criteria for selection included confirmation of an overburden substrate that contain NPHCs (for plots that were located close to tailings sand dyke walls), accessibility (as field survey was completed in winter weather conditions that prevented access to some areas), and feasibility of access (some plots were located in areas that had been subsequently fenced off or otherwise managed, and could not be reasonably accessed on foot).

Table 1 Suncor Base Mine Reclamation Sites Used for Field Survey

Sample Site	Reclamation Substrate	Peat-Mineral Mix Placement Date	Peat-Mineral Mix Placement Depth (cm)*	Direct Placement or Stockpile Source	Initial Planting Date	Species Planted
Plot 2	Overburden	1984	16	Direct Placement	1984	Sw, Pl, Ah
Plot 3	Overburden	1992	22	Stockpile	1992	Sw
Extra 3	Overburden	1992	22	Stockpile	1992	Sw
Plot 4	Overburden	1996	36	Direct Placement	1996	Sw, Pl, Pj, Pb, Ah
Plot 5	Overburden	1992	21	Stockpile	1992	Sw, Pl, Ah
Extra 5	Overburden	1996	36	Direct Placement	1996	Sw, Pl, Pj, Pb, Ah
Plot 7	Overburden	1994	25	Stockpile	1994	Sw, Pl, Ah
Plot 8	Overburden	1990	16	Stockpile	1990	Sw
Plot 9	Overburden	1991	33	Direct Placement	1991	Sw, Ah, Pl
Plot 10	Overburden	1983	16	Unknown	1983	Sw, Lt
Plot 11	Overburden	1983	16	Unknown	1983	Sw, Lt
Plot 12	Overburden	1981	13	Stockpile	1981	Pj, Sw, Pb, Ah
Plot 13	Overburden	1982	15	Stockpile	1982	Sw
Plot 14	Overburden	1983	16	Unknown	1983	Sw, Lt
Plot 15	Overburden	1988	19	Stockpile	1988	Sw, Ah
Plot 16	Overburden	1984	17	Direct Placement	1984	Sw, Pl, Ah
Plot 17	Overburden	1987	21	Direct Placement	1987	Sw, Ah, Pl
Plot 18	Overburden	1994	19	Direct Placement	1994	Sw, Ah
Plot 19	Overburden	1997	24	Direct Placement	1997	Sw, Pj
Plot 20	Overburden	2000	32	Stockpile	2000	Sw, Aw

Notes: Sw – white spruce, Pl – lodgepole pine, Pj – jack pine, Pb- balsam poplar, Ah – hybrid poplar, Lt – tamarack, Aw – aspen.

* Depths based on reclamation information provided by Suncor.

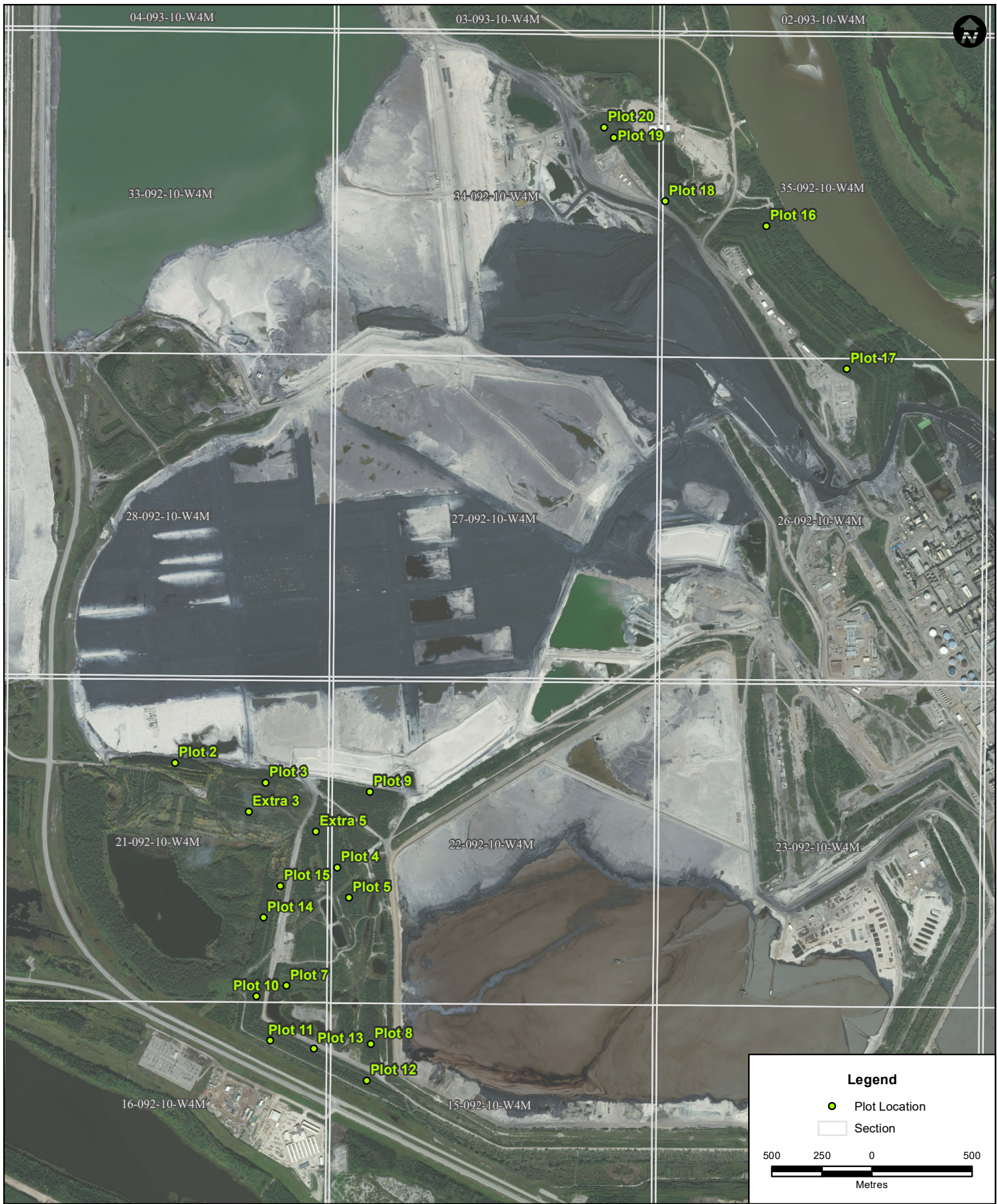


Figure 1. Plot Locations - Site Detail

*COSIA JIP Tree Growth on Reclaimed Overburden Sites
Containing Petroleum Hydrocarbons at the Suncor Base Mine*

PARAGON
soil and environmental consulting inc.

Paragon Map No. 17152-180315-01

Projection:	Scale:
UTM 12N	1:25,000
NAD83	Drawn:
	JC
	Approved:
	SD

3 METHODS

Prior to field departure, the Global Positioning System (GPS) location of each pre-selected plot sample area was provided to the field team, along with supporting maps and electronic tablets pre-loaded with site data collection forms.

Each sample plot was a circular 100 square metre (m) (5.64 m radius) plot centered at the sample plot coordinate, and identified during the ground disturbance sweep with a stake. A GPS reading was taken at the center stake and post-processed to improve the accuracy of plot locations (Figure 1).

The field survey at each sample plot consisted of four main activities: site description, tree measurements, soil inspections, and soil sampling. These activities are described in further detail below.

3.1 Site Description

Within each sample plot site, the following site information was collected:

- Sample Plot Identification
- Location (Universal Transverse Mercator [UTM] Coordinates in NAD83 projection)
- Orientation of soil auger and pit sample locations around measured tree(s) and sample plot point
- Landform surface expression (design)
- Topography (slope position, percent, aspect) and microtopography
- Estimated drainage and moisture regime
- Presence of wind and/or water erosion
- Geo-referenced photographs facing north, east, south, and west, as well as the soil surface and any other features of interest (Appendix E). Photos of the site included landform surface, any wind or water erosion features, canopy tree species, and the soil pit. Photos of the understory community at each plot were not possible due to the snow cover present on the site.

3.2 Tree and Vegetation Measurements

The top-height of all healthy, undamaged and unsuppressed tree species present in the canopy were eligible for measurement, and one of each canopy tree species was selected for measurement as below. Tree and vegetation measurements collected for each sample plot included:

- Number of eligible top height trees by species
- Top height tree species code
- Tree condition code (Alberta - PSP Manuals Master Condition Code List)
- Total tree height (in m - to the nearest 0.1 m)
- Tree height estimation method (Vertex or clinometer)
- Distance from tree when estimating tree height (in m - to the nearest 0.1 m)
- Diameter at breast height (in cm – to the nearest centimetre)
- Age at breast height (in years - estimate based on 2 acceptable cores)

Cores were taken from the selected trees at breast height (1.3 m), using a Haglöf™ increment borer with a 4.3 mm tip. When a branch whorl was located at 1.3 m, the core was taken below the whorl. The age was counted and recorded in the field and in the lab. Cores were marked with plot number, tree number, and species, stored in plastic straws, and brought back to the office to be scanned and stored as a digital image.

A batch site index calculator in Microsoft Excel utilizing Visual Basic for Applications macros translated from a formula based on Huang et al. (2009) and provided by Syncrude, was used to calculate site index using the Growth and Yield Projection System (GYPSY) growth curves for tree species measured in this field survey. Tree species, stand initial planting date (from information provided by Suncor, and total (top) height in m were copied into the calculator, and site index values were calculated for all trees with valid data records. There was uncertainty in the ages established with the tree cores, so total tree age based on revegetation records provided by Suncor (year of planting date plus age of planted seedling) were used to calculate total tree age. Jack pine (Pj) site index was calculated using the same formula for lodgepole pine (Pl), while balsam poplar (Pb) site index was calculated using the same formula for aspen (Aw).

3.3 Soil Inspections

Soil inspections were focused around the tree(s) selected for site index measurement. If there was one site index tree in the sample plot, three soil sample locations were triangulated within 2 m of the tree, of which two were auger holes and one was a pit. If more than one tree species was measured within a sample plot, four soil sample locations were advanced in four quadrants of the circular plot, of which three were auger holes and one was a pit.

At each sample plot soil pits were excavated to a depth of 1 m, using a tarp to separate soil layers. A shovel and Dutch auger were used to reach a minimum depth of 100 centimetres (cm) unless there was auger refusal (noted in the data records in Appendix A). Horizons and their characteristics within the soil pit were described, and the profile photographed (Appendix E) along with other plot photos capturing overall plot vegetation and landscape conditions (Appendix E). A tarpaulin was used to collect the excavated soil, and minimize any disturbance to the sample plot location. The soil was replaced in the same order as it was excavated.

Soil information collected at auger sample locations included:

- Horizon (reclamation material type)
- Horizon depth
- Manual texture (as an indicator of variation between inspection points)
- Soil colour (as an indicator of variation between inspection points)
- Inclusions (and description of type and proportion of inclusion)
- Additional soil profile notes (e.g., presence of mottles, gleying, carbonates, stones, hydrocarbons)
- Sample collection details (e.g., inclusion in composite sample of site; see soil sampling details below)

Soil information collected at the soil pit sample location included:

- Horizon (reclamation material type, including forest floor LFH horizon)
- Horizon depth

- Horizon boundary (distinctness, form, maximum and minimum)
- Horizon color (moist or dry)
- Manual texture
- Horizon stoniness (% volume)
- Structure (grade, size and kind)
- Consistence
- Presence of mottles (abundance, size and contrast)
- Soil horizon rooting characteristics (quantity, size and orientation) and maximum profile root depth
- Evidence of compaction or root restricting layers
- Soil profile photo showing horizon and structure

3.4 Soil Sampling

Soil samples were collected from each horizon, composited from the pit and three (or four) auger holes. All auger samples and the pit within the sample plot were composited to derive three soil samples, at three sample depths:

- a coversoil sample of the peat or peat-mineral mix (PMM)
- an upper subsoil sample of the overburden
- a lower subsoil sample of the overburden

The coversoil design of the sample plots was anticipated to have been a one-lift design of PMM with a range of thickness from 13 to 36 cm based on reclamation information provided by Suncor. The upper subsoil depth is dependent on the depth of weathering observed during the field assessment. Some degree of weathering was expected in the near surface of the overburden, and the upper subsoil depth therefore followed the weathering depth observed in the field. The lower subsoil depth was assumed to approximately represent overburden conditions at the time of soil placement, prior to any weathering post-placement.

If there were indications that the overburden was variable within the profile inspection depth (e.g., significant textural differences between the upper and lower subsoils) it was recorded and an additional lower subsoil overburden sample depth was collected. It was expected that a lower subsoil sample could be captured within 100 cm of the surface; therefore, the lower subsoil depth was considered to be the bottom of the upper subsoil down to 100 cm.

3.4.1 Soil Sample Analysis

Samples were packaged and handled according to standard lab quality assurance and quality control protocols, and sent to Exova™ in Edmonton for analysis. Some hydrocarbon samples were transported by Exova™ to their Calgary laboratory to provide access to extended temperature range gas chromatography. Laboratory data for sampled profiles is presented in Appendices B and C, and laboratory records in Appendix F.

Parameters analyzed included the following:

- pH (2:1 CaCl₂)

- salinity (electrical conductivity [EC])
- sodicity (sodium adsorption ratio [SAR])
- soluble chloride, calcium, magnesium, sodium, potassium and sulphate
- percent saturation
- petroleum hydrocarbons (F1/BTEX, F2, F3, F4 and F4G fractions)

In addition, coversoil samples were collected for bulk density, using the core method, and sent to Exova™ for analysis.

Samples collected for PHCs were completed using nitrile gloves to avoid cross-contamination and for personal safety. After discussion with the COSIA JIP partners, two 125 mL glass jars with zero headspace were filled for hydrocarbon analysis for each plot horizon. The Government of Alberta now mandates use of pre-filled methanol vials with a plunger to collect the soil sample, however the cold field conditions and challenges in plot access precluded their use for this project. Because of the typically long-carbon-chain content of lean oil sand and tar balls, and very cold conditions, the risk of losing F1/BTEX fractions during sampling was considered to be low. Based on laboratory results collected by JIP partners for reclamation substrates, the F1/BTEX content is typically very low or below detection limits for overburden containing NPHCs, therefore accurately characterizing F1/BTEX was not a key requirement for the analysis.

Analysis of hydrocarbon samples was discussed with the COSIA JIP partners and Exova™, to provide additional information beyond the analysis typically required for Canadian Council of Ministers of the Environment (CCME) reporting. Petroleum hydrocarbons including F1 (C₆-C₁₀), F2 (C₁₀ to C₁₆), F3 (C₁₆ to C₃₄) and F4 (C₃₄+) fractions were evaluated according to the *Reference Method for the Canada –Wide Standard for Petroleum Hydrocarbons in Soil – Tier 1 Method* (CCME 2001). For F2, F3 and F4 fractions, the CCME Tier 1 method involved Soxhlet extraction of the soil material in hexane-acetone, followed by extract analysis by gas chromatography with a flame ionization detector (GC/FID). A silica gel clean-up step was used in the analysis of NPHCs, however the efficacy of this step is variable depending on the sample.

Chromatograms for the CCME-regulated PHCs were provided by the laboratory, and in addition, F4 and F4G distillates were sent to Exova™ Calgary for extended high-temperature range gas chromatography to generate chromatograms with an increased level of detail for hydrocarbons in excess of C₃₄. Samples of NPHCs with carbon numbers up to C₁₀₀ for 12 samples from upper and lower subsoil horizons at six sampling locations were reported as F4HTGC results separate to the hydrocarbon analysis noted above for all samples.

4 RESULTS

Twenty plots (Figure 1) were surveyed, with soil samples and tree cores removed for analysis. The soil survey attributes of each plot and lab analysis results are presented in Appendices A and B, respectively.

No wind or water erosion issues were noted for any sample plot, and all plots were located on flat (0.5 to 2%) to strong slopes (30 to 45 %) (Appendix A). A range of aspects were represented by the sample plots (Table 2) due to the varied terrain of the Suncor reclamation areas. Information on the plot locations, soil horizons and presence of PHCs, and tree species measured are provided in Table 2.

**Tree Growth on Reclaimed Sites
Containing Petroleum Hydrocarbons**

Table 2 Sample Plot Characteristics for Suncor Reclamation Areas

Plot Number	Aspect	Horizons Present	Horizon Depth (cm)	Presence of PHCs Noted in Field Conditions (Yes/No for visual and olfactory observation)	Tree Species Measured
2	North	Coversoil – PMM	0-8	N	White Spruce
		USS - OB	8-50	N	
		LSS – OB	50-70*	Y	
3	North	Coversoil – PMM	0-19	N	White Spruce Trembling Aspen
		USS - OB	19-44	N	
		LSS – OB	44-100	Y	
Extra 3	North	Coversoil – PMM	0-38	N	White Spruce
		USS – PMM	38-75	N	
		LSS – OB	75-100	N	
4	Southwest	Coversoil – PMM	0-28	N	White Spruce
		USS - OB	28-58	N	
		LSS – OB	58-75*	N	
5	North	Coversoil – PMM	0-20	N	White Spruce Lodgepole Pine
		USS - OB	20-45	N	
		LSS – OB	45-100	Y	
Extra 5	North	Coversoil – PMM	0-27	N	White Spruce Trembling Aspen Jack Pine
		USS - OB	27-56	N	
		LSS – OB	56-80*	N	
7	Southwest	Coversoil – PMM	0-46	N	White Spruce
		USS - OB	46-64	N	
		LSS – OB	64-100	Y	
8	East	Coversoil – PMM	0-18	N	White Spruce
		USS - OB	18-33	N	
		LSS – OB	33-100	N	
9	North	Coversoil – PMM	0-26	N	White Spruce
		USS - OB	26-58	N	
		LSS – OB	58-100	NA	
10	East	Coversoil – PMM	0-22	N	White Spruce
		USS - OB	22-58	N	
		LSS – OB	58-100	N	
11	South	Coversoil – PMM	0-30	N	Trembling Aspen
		USS - PMM	30-70	Y	
		LSS - PMM	70-100	Y	
12	Southwest	Coversoil – PMM	0-26	N	White Spruce
		USS - OB	26-50	Y	
		LSS – OB	50-100	Y	
13	South	Coversoil – PMM	0-16	N	White Spruce
		USS - OB	16-65	N	
		LSS - OB	65-100	Y	
14	Northeast	Coversoil – PMM	0-18	N	White Spruce
		USS - OB	18-42	N	

**Tree Growth on Reclaimed Sites
Containing Petroleum Hydrocarbons**

		LSS – OB	42-100	Y	
15	West	Coversoil – PMM	0-26	N	White Spruce Trembling Aspen
		USS - OB	26-46	N	
		LSS – OB	46-100	Y	
16	Northeast	Coversoil – PMM	0-25	N	White Spruce Trembling Aspen
		USS - OB	25-50	N	
		LSS – OB	50-100	Y	
17	Northeast	Coversoil – PMM	0-11	N	White Spruce Trembling Aspen Balsam Poplar
		USS - OB	11-43	N	
		LSS – OB	43-100	Y	
18	Northeast	Coversoil – PMM	0-30	N	White Spruce
		USS - OB	30-43	N	
		LSS – OB	43-100	Y	
19	Northwest	Coversoil – PEAT	0-34	N	White Spruce Jack Pine
		USS - OB	34-50	N	
		LSS - OB	50-100	Y	
20	East	Coversoil – PEAT	0-21	N	White Spruce
		USS - OB	21-38	N	
		LSS - OB	38-78*	Y	

Notes: * - auger refusal before 100 cm was reached.

PMM – peat-mineral mix; OB - overburden; USS- upper subsoil; LSS- lower subsoil

NA – not available

The overburden texture for most sites was sandy clay loam to sandy loam. In Plots 2, 4, and Extra 5 compaction of the overburden layer caused auger refusal within or before the lower subsoil. In Plot 20, coarse fragments caused auger refusal within the lower subsoil.

Tree species were generally in good health, with the exceptions that Spruce Gall Adelgid (generally present in the region) was noted on most white spruce trees, and pine species in Plots 19 and 20 tended to be swayed at the bottom potentially due to movement of reclamation materials on the slope.

4.1 Site Index Calculations

Table 3 presents the Site Index values for each plot.

Tree Growth on Reclaimed Sites
Containing Petroleum Hydrocarbons

Table 3 Site Index Values for Tree Species Measured at Suncor Reclamation Areas

Plot Number	Reclamation Area	Reclamation Year	Total Age (as of 2018)	Top Height (m)	Site Index_BH50 (GYPSY formula)
White Spruce					
2	Waste Area 16	1985	33	11.8	19.3
3	Waste Area 16	1985	33	11.1	18.5
Extra 3	Waste Area 16	1985	33	11.9	19.4
4	Waste Area 18	1996	22	8.0	20.3
5	Waste Area 16	1992	26	8.8	19
Extra 5	Waste Area 18	1996	22	7.9	20.1
7	Waste Area 16	1994	24	9.0	20.4
7	Waste Area 16	1994	24	9.0	20.4
8	Waste Area 16	1990	28	12.2	22.2
9	Waste Area 16	1991	27	9.0	18.7
10	Waste Area 16	1979	39	10.5	15.6
12	Waste Area 16	1981	37	12.8	18.8
13	Waste Area 16	1982	36	11.8	18.1
14	Waste Area 16	1981	37	10.9	16.7
15	Waste Area 16	1981	37	7.3	12.4
16	Waste Area 8	1984	34	15.2	22.6
17	Waste Area 8	1990	28	10.7	20.4
18	Horseshoe Substation	1994	24	9.4	21
19	Horseshoe Substation	1997	21	8.0	21
20	Horseshoe Substation	2000	18	5.1	18.1
Mean				10.0	19.5
Standard Deviation				2.31	2.31
Trembling Aspen					
3	Waste Area 16	1985	33	10.9	15.4
Extra 5	Waste Area 18	1996	22	14.6	23.7
11	Waste Area 16	1978	40	16.0	18.9
15	Waste Area 16	1981	37	11.9	15.4
16	Waste Area 8	1984	34	14.1	18.5
17	Waste Area 8	1990	28	13.5	19.9
Mean				13.5	18.6
Standard Deviation				1.85	3.10
Lodgepole Pine					
5	Waste Area 16	1992	26	7.9	16
Jack Pine					
Extra 5	Waste Area 18	1996	22	8.6	19.6
19	Horseshoe Substation	1997	21	9.2	21.4
Mean				8.9	20.5

**Tree Growth on Reclaimed Sites
Containing Petroleum Hydrocarbons**

Plot Number	Reclamation Area	Reclamation Year	Total Age (as of 2018)	Top Height (m)	Site Index_BH50 (GYPSY formula)
<i>Standard Deviation</i>				0.42	1.27
Balsam Poplar					
3	Waste Area 16	1985	33	10.7	15.2
17	Waste Area 8	1990	28	13.6	20
<i>Mean</i>				12.2	17.6
<i>Standard Deviation</i>				2.05	3.39

4.2 NPHCs, Salinity and pH at Sample Sites

Laboratory analysis data for NPHCs and other soil parameters is provided in Appendix B:

- Table B-1 presents NPHC results for soil horizons and totals for the top 100 cm for all sample sites
- Table B-2 presents pH, salinity, EC and SAR results for all sample sites
- Table B-3 presents bulk density for all sample sites

Averages, range and standard deviation for NPHCs, EC, SAR, pH and base saturation are provided by horizon depth aggregated for all sample sites in Table 4.

4.2.1 Coversoil

Coversoil depth ranged between 8 and 56 cm, with an average depth of 24 cm (Table 4). F1 and BTEX did not exceed *Alberta Tier 1 Guidelines* (AEP, 2016), and BTEX was below detection limit for all samples. The maximum F2 concentration of 897 mg/kg exceeded *Alberta Tier 1 Guidelines* (AEP, 2016), but the average did not. All F3 concentrations exceeded *Alberta Tier 1 Guidelines* (AEP, 2016), as did a combination of F4 and F4G concentrations (although F4 alone exceeded only for maximum concentrations). The percentage of NPHCs above C₅₀ ranged between 23 and 40 %, with an average of 31 %. Soil pH averaged 7 (range 5 to 8) and EC and SAR were all below *Alberta Soil Quality Guidelines* (AAFRD, 1998).

4.2.2 Upper Subsoil

Upper subsoil, which was defined as the depth of overburden with evidence of weathering, ranged between 13 and 49 cm, with an average depth of 27 cm (Table 4). F1 and BTEX did not exceed *Alberta Tier 1 Guidelines* (AEP, 2016), and BTEX was below detection limit for all samples. The average and maximum F2 concentrations exceeded *Alberta Tier 1 Guidelines* (AEP, 2016), and all F3 concentrations exceeded *Alberta Tier 1 Guidelines* (AEP, 2016). A combination of F4 and F4G concentrations also exceeded *Alberta Tier 1 Guidelines* (AEP, 2016) (although F4 alone exceeded only for maximum concentrations). The percentage of NPHCs above C₅₀ ranged between 13 and 42 %, with an average of 26 %. Soil pH averaged 7 (range 5 to 8) and EC and SAR were all below *Alberta Soil Quality Guidelines* (AAFRD, 1998).

4.2.3 Lower Subsoil

Lower subsoil (overburden) depth ranged between 25 and 69 cm, with an average depth of 48 cm (Table 4). F1 and BTEX did not exceed *Alberta Tier 1 Guidelines* (AEP, 2016), and BTEX was below detection limit for all samples. The average and maximum F2 concentrations exceeded *Alberta Tier 1 Guidelines* (AEP,

2016), and all F3 concentrations exceeded *Alberta Tier 1 Guidelines* (AEP, 2016). F4 concentrations were in exceedance and combined F4 and F4G concentrations also exceeded *Alberta Tier 1 Guidelines* (AEP, 2016). The percentage of NPHCs above C₅₀ ranged between 13 and 40 %, with an average of 24 %. Soil pH averaged 7 (range 5 to 8) and EC and SAR were all below *Alberta Soil Quality Guidelines* (AAFRD, 1998).

4.3 Extended Range High Temperature Gas Chromatography

Based on HTGC analysis, NPHC constituents with carbon numbers greater than 50 ranged from 12.6 % to 42 % with a mean of 27.3 % of the total petroleum hydrocarbon content for all samples (Table 4). Chromatograms (Figures C-1 to C-12, Appendix C) resulting from the HTGC analysis of subsoil samples demonstrated an undifferentiated curve centered around C₂₈ representing unresolved complex mixtures (UCM) typically observed in weathering of PHCs (Yang et al., 2011).

A smaller UCM hump eluting between C₂₇ to C₃₁ is seen on the shoulder of the main UCM hump in all samples. This shoulder UCM hump likely contains a complex mixture of branched cyclic and aromatic hydrocarbons that are relatively highly resistant to biodegradation, similar to previous GC-FID analysis of raw Alberta oil sands (Yang et al., 2011). The exception was the chromatogram from the upper subsoil from NMPlot 13-03 (Appendix C, Figure C-3), which eluted differentiated carbon peaks typical of more moderately weathered product such as diesel, in addition to the undifferentiated UCM characteristic of weathered NPHC. Distinct chromatogram peaks at C₁₃ (methyl dodecane), C₁₅ (methyl tetradecane) and C₁₇ (methyl pyrene) (as examples) are more typical of diesel (USDHHS, 1999) than NPHC material, as can be seen in comparison to Figures C-1, C-2 and C-4 to C-12 (Appendix C).

Another possibility is the inclusion of biogenic carbon sources from peat. High biological organic carbon content can exceed the capacity of silica gel to clean up the sample, resulting in chromatogram signatures with increased F3 and F4 content (Kelly-Hooper et al., 2013). High F4HTGC content relative to F1, F2, and F3 fractions and extended range chromatogram signatures of all samples show that NPHC material is predominantly composed of heavier molecular hydrocarbons.

Table 4. Summary of NPHC Content and Salinity Parameters by Depth Interval (Horizon)

Sample Identification	Horizon Thickness (cm)	Petroleum Hydrocarbons											Soil pH (CaCl ₂)	Soil pH (H ₂ O)	EC (dS/m)	SAR	Base saturation (%)	
		Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	F1 (C6-C10) - BTEX (mg/kg)	F2 (C10-C16) (mg/kg)	F3 (C16-C34) (mg/kg)	F4 (C34-C50) (mg/kg)	F4HTGC (C34-C50+) (mg/kg)	Total Petroleum Hydrocarbons	% C50+						Soil Moisture (% by weight)
Detection Limit	--	0.005	0.02	0.005	0.03	10	50	50	100	100	--	--	--	6-8.5	6-8.5	0.01	--	--
Tier 1 Guideline	--	0.078	0.12	0.14	1.9	210	150	300	2,800	--	--	--	--	6-8.5	6-8.5	--	--	--
Horizon 1 (Coversoil)																		
mean	24	<0.005	<0.02	<0.005	0	20	92	1,627	1,282	3,155	4,806	31	19	7.1	6.7	1.3	0.6	95
min	8	<0.005	<0.02	<0.005	0	15	50	380	300	500	880	23	11	5.0	6.0	0.5	0.1	51
max	56	<0.005	<0.02	<0.005	0	24	897	7,050	3,670	9,450	17,397	40	31	7.7	7.6	3.3	3.1	163
st. dev.	9	0	0	0	0	6	38	924	647	1,776	2,718	6	8	0.7	0.5	0.7	0.8	46
Horizon 2 (Upper Subsoil – overburden with observed weathering)																		
mean	27	<0.005	<0.02	<0.005	<0.03	10	502	3,991	2,321	5,305	9,623	26	11	7.2	7.2	1.8	0.7	57
min	13	<0.005	<0.02	<0.005	<0.03	10	60	440	400	1,100	1,540	13	6	4.6	6.9	0.4	0.1	38
max	49	<0.005	<0.02	<0.005	<0.03	10	2,050	11,400	4,580	11,000	22,290	42	25	7.7	7.4	3.7	3.7	192
st. dev.	10	0	0	0	0	0	511	2,903	1,325	2,981	6,154	7	5	0.6	0.2	1.0	1.0	33
Horizon 3 (Lower Subsoil – overburden)																		
mean	48	<0.005	<0.02	<0.005	<0.03	26	972	6,208	3,219	7,421	14,557	24	10	7.3	7.1	2.4	0.8	47
min	25	<0.005	<0.02	<0.005	<0.03	12	65	580	500	1,200	1,780	13	5	4.5	6.6	0.5	0.1	33
max	67	<0.005	<0.02	<0.005	<0.03	46	4,380	20,900	9,930	21,900	47,226	40	14	7.8	7.6	4.5	5.5	91
st. dev.	11	0	0	0	0	15	1,178	4,771	2,110	4,769	10,556	7	3	0.7	0.4	1.0	1.3	12

EC = electrical conductivity; SAR = sodium adsorption ratio; st. dev. = standard deviation

Shaded cells - values in exceedance of Alberta Tier 1 Soil Guidelines for Natural Area Land Use - coarse-grained soil (AEP, 2016)

4.4 Site Index Correlation with Reclamation Site Parameters

The R statistics package has been used to correlate site index values for white spruce and trembling aspen measured in the sample plots, with analytical parameters measured from soil samples of each horizon. Site index correlations for poplar, jack pine and lodgepole pine were not possible due to the small number of data points.

The plots for total NPHC content (F1, F2, F3, F4 and F4G fractions) by species are presented below for white spruce (Figure 2) and trembling aspen (Figure 3). Plots for pH, EC and SAR for white spruce and trembling aspen are presented in Appendix D (Figures D-1 to D-6). Correlation lines are provided on each figure, and indicate a weak negative correlation between increasing NPHC concentration and white spruce, and a weak negative correlation between increasing NPHC concentration and trembling aspen.

5 DISCUSSION

The composition and concentration of NPHCs in 20 sampling sites within reclamation areas at the Suncor Base Mine were analysed, and the performance of tree species growing at each sampling site was calculated. This section considers two main discussion questions about these reclamation area sampling sites:

1. Was the NPHC composition and concentration similar between sampling sites, and is it similar to NPHC characteristics from other oil sands mine lease areas?
2. Did the NPHC concentration have an effect on tree growth at the sampling sites, as measured by site index?

5.1 NPHC Composition and Concentration

The average concentrations of NPHC fractions varied between sampling sites at the Suncor Base Mine (see Appendix B, Table B-1), but were highest in the lower subsoil horizons at Plots 19 and 20 (close to the Horseshoe Substation area and the most northerly reclamation area in this study). There was otherwise no discernible pattern to sample sites with higher or lower NPHC concentrations, which suggests that the inclusion of NPHC material in overburden used for reclamation substrates in these areas was variable. This field study identified soil horizons by changes in soil physical attributes and consistency rather than as set depths below ground surface, which mean that the inclusion of accidental coversoil (peat-mineral mix) or subsoil horizon attributes was avoided as much as possible.

The range of NPHC concentration by fraction (Table 4) over all sample sites was similar to NPHC concentrations recorded for overburden materials analyzed at Imperial Kearn and Syncrude (Paragon, 2018) and followed the same general pattern of very low or undetectable concentrations of F1 NPHCs, low concentrations of F2, and similar concentrations of F3 and F4/F4G NPHCs that are at least an order of magnitude higher than F2. With the exceptions of Plots 2, 5, 9 and 13 (where upper subsoil contained higher concentrations of F3 and F4 than lower subsoil), there was an increased concentration of each fraction with depth. Plots 2, 5, 9 and 13 do not have an obvious distinction from nearby plots in terms of slope position, aspect or erosion features. The discontinuous nature of NPHCs present in these reclamation areas was apparent as sample sites were identified for study, so the relationship between sample sites even relatively close together is difficult to judge.

The issue of biogenic NPHC identification was clearly demonstrated by the concentration results obtained for the coversoil layer at each sample site. Peat-mineral mix used as coversoil for all sample sites was not observed to contain petrogenic PHCs, but yielded average NPHC concentrations that were comparable to upper subsoil samples. As noted above, effort was made in the field to separate soil horizons and prevent

Figure 2. Correlation Between White Spruce Site Index and Total NPHC in the Top 100 cm of Soil

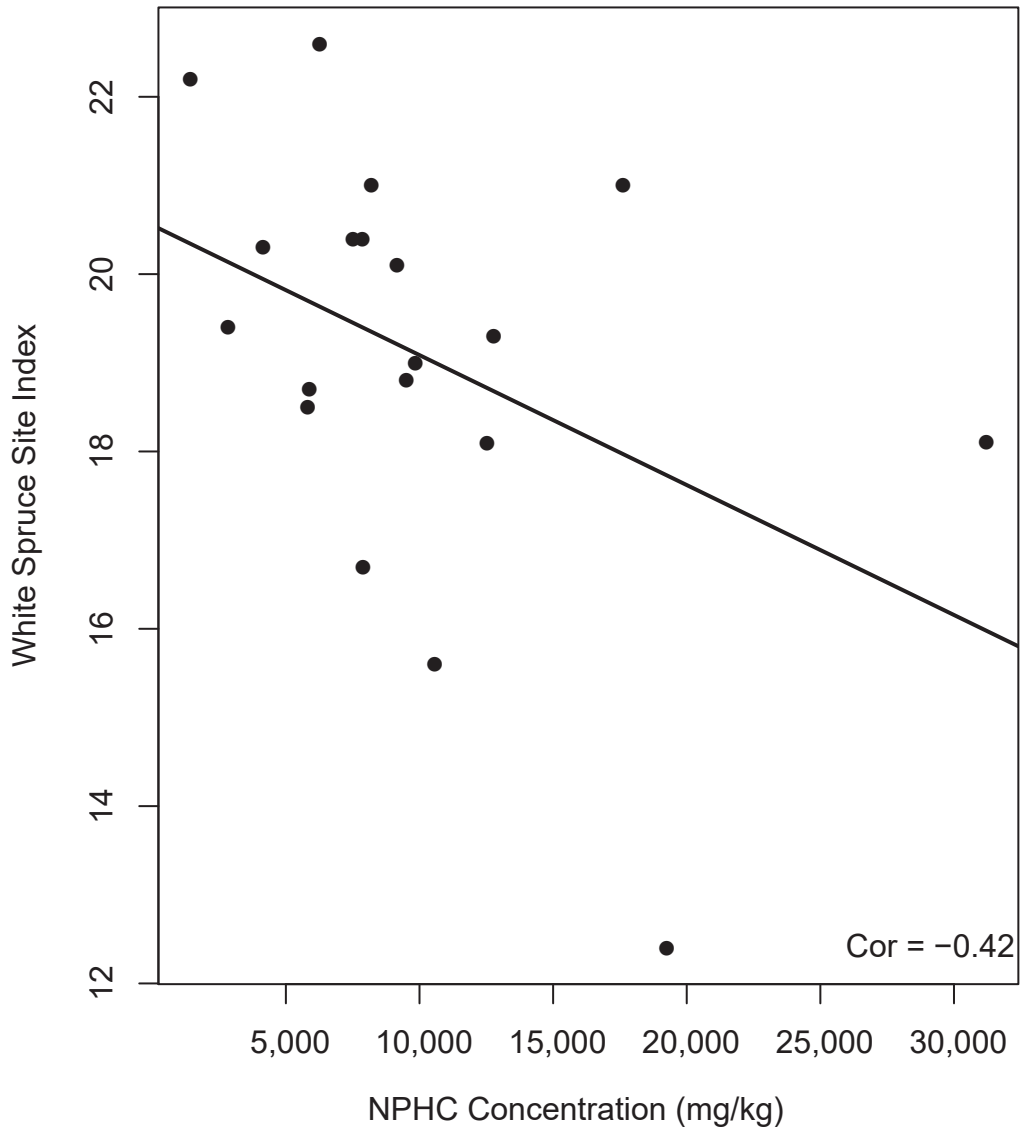
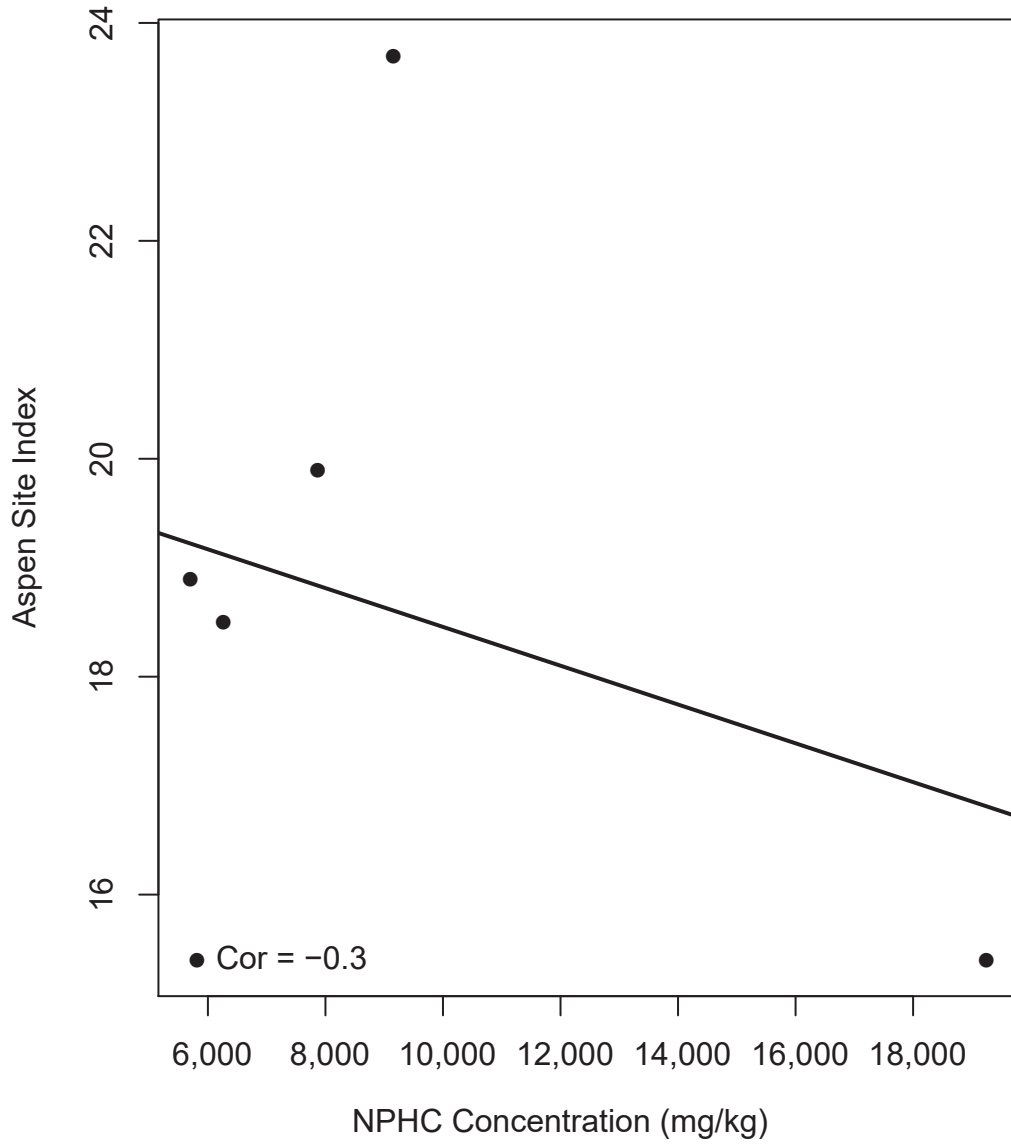


Figure 3. Correlation Between Aspen Site Index and Total NPHC in the Top 100 cm of Soil



peat material from contaminating subsoil overburden samples. Although this may not have been completely successful (especially from auger samples where small amounts of coversoil may have been inadvertently dragged through subsoil samples), the contribution from peat in subsoil samples was still relatively small. There have been studies examining methods to discern biogenic (peat) NPHCs from diesel and Federated crude oil contaminants (Kelly-Hooper et al. 2013, 2014) but these have relied on proportions of F3 fractions from these two sources that may not be relevant to F3 types found in LOS and tarballs. Reviewing the chromatograms from coversoil versus subsoil samples (Appendix F) does not reveal any obvious differences in the distribution of C numbers in F3 fractions, as all samples contain the “hump” of UCM between C₂₇ and C₃₁, however subsoil samples (at both subsoil depths) tend to exhibit an extended UCM hump between C₁₈ and C₂₄.

5.2 NPHC Concentration and Site Index

Sample sites at the Suncor Base Mine were specifically identified from previous work to have NPHCs present, and this was confirmed by the analysis results for all sample sites in this study. Despite choosing trees growing directly in NPHCs from LOS content in the OB subsoil at each sample site, site index for white spruce and aspen was shown to have only a weak correlation to NPHC concentration (Figures 2 and 3), and no observable correlation to pH, SAR and EC (Appendix D).

The sample size was small for this study, as locating revegetation plots of this age (18 to 37 years old – Table 1) with a confirmed NPHC content in the substrate was not straightforward. The very small sample size for lodgepole pine, jack pine and balsam poplar did not allow a comparison with soil attributes, and the sample size for aspen and white spruce does not allow definitive conclusions to be made at this stage. Regardless of these limitations, the performance of both white spruce and aspen appears to show that there is no substantial negative effect of NPHC content on tree growth of these species, even at sample sites with high NPHC content such as sample Plots 19 and 20 (Table 3).

To provide some context for the range of site index values measure in this study, site index data for reclamation at Syncrude and Suncor has been compiled into Table 5, as well as ecosite site index information from Archibald and Beckingham (2006). Table 5 has been compiled to give two types comparison:

- comparison to natural ecosite site indices to see how the trees in this study compare relative to the undisturbed environment
- comparison to performance on other mine reclamation substrates.

Table 5 Reclamation Area Site Index Information for White Spruce and Trembling Aspen from Syncrude (2016), Suncor (2018), CEMA and Archibald and Beckingham (2006) in Comparison to Site Index from the Current Study

Ecosite	Trembling Aspen			White Spruce		
	Mean	Standard Deviation	<i>n</i>	Mean	Standard Deviation	<i>n</i>
CURRENT STUDY						
-	18.6	3.10	6	19.5	2.31	20
RECLAMATION SOILS						
<i>Suncor (2018) Performance Surveys – Overburden Substrate*</i>						
b	20.9	-	-	15.5	-	-
d	16.2	-	-	17.6	-	-
e	11.5	-	-	14.4	-	-
<i>Syncrude (2016) Permanent Sample Plots</i>						
b	14.3	3.2	9	19.0	-	1
d	18.0	4.5	16	19.4	2.5	14
<i>Syncrude (2016) Performance Surveys</i>						
b	15.0	3.1	6	18.3	3.2	8
d	18.2	2.6	4	19.0	1.4	12
NATIVE SOILS						
<i>Archibald and Beckingham (2006)</i>						
a	-	-	-	-	-	-
b	15.8	0.5	56	17.5	0.7	28
c	-	-	-	-	-	-
d	18.2	0.2	397	16.8	0.2	502
e	21.4	0.4	58	17.8	0.3	175

Note (*): Some performance survey sites may include LOS substrate and potentially in close proximity of some of the current study plots.

The site index values of white spruce and trembling aspen from this study are comparable to a reclaimed *d* ecosite site index from Syncrude’s (2016) Performance Surveys and Permanent Sample Plots, and a reclaimed *d* ecosite from Suncor’s (2018) Performance Surveys (Table 5). Mean site index from Syncrude’s permanent sample plots and performance surveys from the Mildred Lake Mine Site are sorted by substrate type – ecosite *b* are tailings sand substrate reclamation sites and ecosite *d* are overburden substrate reclamation sites. The site index values of white spruce and trembling aspen from this study are also comparable to Archibald and Beckingham (2006) site indices for native *b* and *d* ecosites of the region.

The data set for this study is limited but comparable to the Syncrude (2016) site index data in sample size. Notwithstanding the small sample size (*n*= 20 for white spruce, *n*= 6 for aspen), the data from this study do not indicate a substantial negative impact on tree growth (as measured by site index) from the presence of NPHCs in the overburden subsoil, even at the highest concentrations.

6 CLOSURE

The field survey of tree growth on reclaimed overburden sites containing elevated NPHCs was completed successfully at the Suncor Base Mine site. Analysis of the soil and tree growth data found that the NPHC concentration was variable even between sample sites in the same reclamation area, and that there was no indication of a substantial negative impact on site index from the presence of NPHCs in overburden subsoil.

The sample sites selected for this work were specifically chosen for confirmed previous NPHC presence, which resulted in a relatively small sample size. Further sampling of reclamation areas containing NPHCs in substrate materials will assist in clarifying the relationship between NPHC concentration and tree growth.

We trust that the above information meets your needs. If you have any questions or need further detail please do not hesitate to contact the undersigned at (403) 681-9072.

Sincerely,

A handwritten signature in cursive script that reads "Vivienne R. Wilson". The ink is dark and the signature is centered on the page.

Vivienne Wilson, Ph.D., P.Biol.

Principal Environmental Scientist

Per: Paragon Soil and Environmental Consulting Inc.

REFERENCES

- Archibald, J.H., Beckingham, J.D. 2006. Field Guide to Ecosites of Northern Alberta. Canadian Forest Service.
- Canadian Council of Ministers of the Environment (CCME). 2001. Reference method for the Canada-Wide Standard for Petroleum hydrocarbons in soil - Tier 1 Method. *Canadian Council of Ministers of the Environment*. Winnipeg, MB.
- CCME 1993. Guidance Manual on Sampling Analysis and Data Management for Contaminated Sites, Volume 1, p. 79.
- Huang S., Meng X. S., Yang Y. 2009. A growth and yield projection system (GYPSY) for natural and post-harvest stands in Alberta. Alberta Sustainable Resource Development, Edmonton AB.
- Kelly-Hooper, F., A.J. Farwell, G. Pike, J. Kennedy, Z. Wang, E.C. Grunsky, D. G. Dixon. 2013. Is it clean or contaminated soil? Using petrogenic versus biogenic GC-FID chromatogram patterns to mathematically resolve false petroleum hydrocarbon detections in clean organic soils: A crude oil-spiked microcosm experiment. *Environmental Toxicology and Chemistry*. 32:10, p 2197-2206.
- Suncor Energy Ltd. 2018. Site Index Tracking for Reclamation Areas. Provided by Lelaynia Wells, May 2018.
- Syncrude Canada Ltd. 2016. Syncrude 2016 EPEA Renewal Application. Regulatory submission to the Alberta Energy Regulator.
- U.S. Department of Health and Human Services. 1999. Toxicological Profile for Total Petroleum Hydrocarbons. Prepared by the Agency of Toxic Substances and Disease Registry, September 1999.
- Yang, Chun, Z. Wang , Z. Yang , B. Hollebhone , C. E. Brown , M. Landriault, Fieldhouse, B. 2011. Chemical Fingerprints of Alberta Oil Sands and Related Petroleum Products. *Environmental Forensics*, 12:2, p 173-188.

Appendix A Field Survey Data

Table A-2. Field Survey Tree Data

Plot ID	Inspection Type	# of eligible top height trees by species	Top height tree species code	Orientation from plot centre to tree (degrees)	Condition code	Total tree height (in m - to the nearest 0.1 m)	Height estimation method	Estimation of distance to tree (m)	Tree diameter at breast height (cm)	Initial Planting Date
Plot 2	Plot									
Plot 2	Tree	10 Sw	Sw	140	0	11.8	vertex	10.0	17.5	1984
Plot 3	Plot									
Plot 3	Tree	10 Sw	Sw	50	NA	11.1	clinometer	10.0	14.8	1992
Plot 3	Tree	6 Aw	Aw	230	46	10.9	clinometer	10.0	9.0	1992
Plot 3	Tree	12 Pb	Pb	140	9	10.7	clinometer	9.0	11.5	1992
Extra 3	Plot									
Extra 3	Tree	16 Sw	Sw	176	0	11.9	vertex	11.9	17.2	1992
Plot 4	Plot									
Plot 4	Tree	25 Sw	Sw	192	0	8.0	vertex	9.8	11.6	1996
Plot 5	Plot									
Plot 5	Tree	19 Sw	Sw	56	0	8.8	vertex	11.0	12.2	1992
Plot 5	Tree	4 Pl	Pl	194	0	7.9	vertex	10.1	13.1	1992
Extra 5	Plot									
Extra 5	Tree	3 Pj	Pj	220	0	8.6	vertex	8.9	11.6	1996
Extra 5	Tree	17 Aw	Aw	110	0	14.6	vertex	12.2	13.5	1996
Extra 5	Tree	1 Sw	Sw	140	0	7.9	vertex	9.7	7.7	1996
Plot 7	Plot									
Plot 7	Tree	17 Sw	Sw	160	0	9.0	clinometer	10.0	14.4	1994
Plot 7	Tree	17 Sw	Sw	200	31	9.0	clinometer	10.0	17.5	1994
Plot 8	Plot									
Plot 8	Tree	1 Sw	Sw	80	0	12.2	vertex	10.0	19.5	1990
Plot 9	Plot									
Plot 9	Tree	33 Sw	Sw	276	31	9.0	clinometer	10.0	11.5	1991
Plot 10	Plot									
Plot 10	Tree	26 Sw	Sw	350	2	10.4	clinometer	9.0	12.5	1983
Plot 11	Plot									
Plot 11	Tree	19 Aw	Aw	268	0	16.0	vertex	10.3	23.2	1983
Plot 12	Plot									
Plot 12	Tree	11 Sw	Sw	15	2	12.8	clinometer	10.0	16.9	1981
Plot 13	Plot									
Plot 13	Tree	23 Sw	Sw	236	0	11.8	vertex	7.4	16.1	1982
Plot 14	Plot									
Plot 14	Tree	26 Sw	Sw	215	0	10.9	vertex	12.8	16.2	1983
Plot 15	Plot									
Plot 15	Tree	8 Sw	Sw	100	2	7.3	clinometer	10.0	10.2	1988
Plot 15	Tree	6 Aw	Aw	274	0	11.9	clinometer	10.0	12.3	1988
Plot 16	Plot									
Plot 16	Tree	2 Aw	Aw	116	0	14.1	vertex	12.3	14.8	1984
Plot 16	Tree	5 Sw	Sw	303	0	15.2	vertex	11.0	19.4	1984
Plot 17	Plot									
Plot 17	Tree	4 Aw	Aw	23	0	13.5	vertex	10.8	12.1	1987
Plot 17	Tree	4 Pb	Pb	178	0	13.6	vertex	18.2	22.4	1987
Plot 17	Tree	5 Sw	Sw	263	0	10.7	vertex	14.3	12.6	1987
Plot 18	Plot									

Plot ID	Inspection Type	# of eligible top height trees by species	Top height tree species code	Orientation from plot centre to tree (degrees)	Condition code	Total tree height (in m - to the nearest 0.1 m)	Height estimation method	Estimation of distance to tree (m)	Tree diameter at breast height (cm)	Initial Planting Date
Plot 18	Tree	19 Sw	Sw	77	0	9.4	vertex	11.9	12.7	1994
Plot 19	Plot									
Plot 19	Tree	9 Sw	Sw	40	2	8.0	clinometer	10.0	11.8	1997
Plot 19	Tree	9 Pj	Pj	264	46	9.2	clinometer	8.0	12.4	1997
Plot 20	Plot									
Plot 20	Tree	13 Sw	Sw	126	2	5.1	clinometer	10.0	9.2	2000

Appendix B Laboratory Analysis Data

Table B-1 Petroleum Hydrocarbon Data

Sample Identification	Substrate	Sample Date	Sample Depth (cm)	Horizon Thickness (cm)	Petroleum Hydrocarbons													
					Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	F1 (C6-C10) - BTEX (mg/kg)	F2 (C10-C16) (mg/kg)	F3 (C16-C34) (mg/kg)	F4 (C34-C50) (mg/kg)	FAHTGC (C34-C50+) (mg/kg)	Total Petroleum Hydrocarbons ¹	% C50+	Silica Gel Cleanup	Methanol Field Preservation	Soil Moisture (% by weight)
Detection Limit					0.005	0.02	0.005	0.03	10	50	50	100	100	--	--	--	--	--
Alberta Tier 1 Guidelines																		
Natural Area Land Use - coarse grained					0.078	0.12	0.14	1.9	210	150	300	2,800	--	--	--	--	--	--
NMPlot2-02-HC	PMM	2017-11-09	0-8	8	<0.005	<0.02	<0.005	<0.03	<10	<50	1,800	1,500	3,500	5,300	39	Done	No	--
NMPlot2-03-HC	OB	2017-11-09	8-50	42	<0.005	<0.02	<0.005	<0.03	<10	700	6,600	4,000	8,000	15,300	30	Done	No	--
NMPlot2-04-HC	OB	2017-11-09	50-70*	50	<0.005	<0.02	<0.005	<0.03	<10	500	5,200	3,000	7,000	12,700	30	Done	No	--
DSPlot3-02-HC	PMM	2017-11-10	0-19	19	<0.005	<0.02	<0.005	<0.03	<10	<50	1,040	885	1,860	2,900	24.7	Done	No	20.9
DSPlot3-03-HC	OB	2017-11-10	19-44	25	<0.005	<0.02	<0.005	<0.03	<10	<50	1,760	1,100	2,200	3,960	19.1	Done	No	18.9
DSPlot3-04-HC	OB	2017-11-10	44-100	56	<0.005	<0.02	<0.005	<0.03	<10	166	3,720	2,170	4,730	8,616	20.7	Done	No	14.3
DSExtra3-02-HC	PMM	2017-11-13	0-38	38	<0.005	<0.02	<0.005	<0.03	<10	<50	511	435	976	1,487	26.8	Done	No	34.4
DSExtra3-03-HC	PMM	2017-11-13	38-75	37	<0.005	<0.02	<0.005	<0.03	<10	<50	1,210	913	2,020	3,230	24.9	Done	No	24.8
DSExtra3-04-HC	OB	2017-11-13	75-100	25	<0.005	<0.02	<0.005	<0.03	<10	65	2,280	1,670	4,220	6,565	28.8	Done	No	13.4
NMPlot4-02-HC	PMM	2017-11-10	0-28	28	<0.005	<0.02	<0.005	<0.03	<10	<50	1,370	1,180	2,620	3,990	26.8	Done	No	10.6
NMPlot4-03-HC	OB	2017-11-10	28-58	30	<0.005	<0.02	<0.005	<0.03	<10	102	2,200	1,480	3,560	5,862	25.8	Done	No	8.51
NMPlot4-04-HC	OB	2017-11-10	58-85*	42	<0.005	<0.02	<0.005	<0.03	<10	172	2,250	1,300	3,260	5,682	24.7	Done	No	7.1
NMPlot5-02-HC	PMM	2017-11-10	0-20	20	<0.005	<0.02	<0.005	<0.03	<10	<50	2,000	1,700	4,400	6,400	42	Done	No	--
NMPlot5-03-HC	OB	2017-11-10	20-45	25	<0.005	<0.02	<0.005	<0.03	<10	400	7,400	4,000	11,000	18,800	30	Done	No	--
NMPlot5-04-HC	OB	2017-11-10	45-100	55	<0.005	<0.02	<0.005	<0.03	<10	150	3,400	2,300	5,800	9,350	38	Done	No	--
NMExtra5-02-HC	PMM	2017-11-13	0-27	27	<0.005	<0.02	<0.005	<0.03	<10	<50	1,610	1,230	2,940	4,550	27.6	Done	No	20.1
NMExtra5-03-HC	OB	2017-11-13	27-56	29	<0.005	<0.02	<0.005	<0.03	<10	<50	1,650	1,350	3,520	5,170	31.7	Done	No	14.6
NMExtra5-04-HC	OB	2017-11-13	56-80*	44	<0.005	<0.02	<0.005	<0.03	<10	897	7,050	3,670	9,450	17,397	23.6	Done	No	7.69
DSPlot7-02-HC	PMM	2017-11-10	0-46	46	<0.005	<0.02	<0.005	<0.03	15	<50	873	771	1,710	2,598	27.2	Done	No	30.7
DSPlot7-03-HC	OB	2017-11-10	46-64	18	<0.005	<0.02	<0.005	<0.03	<10	<50	1,150	935	2,080	3,230	26	Done	No	8.69
DSPlot7-04-HC	OB	2017-11-10	64-100	36	<0.005	<0.02	<0.005	<0.03	30	1,250	7,470	4,040	10,500	19,250	24.2	Done	No	8.19
NMPlot8-02-HC	PMM	2017-11-09	0-18	18	<0.005	<0.02	<0.005	<0.03	<10	<50	460	400	1,100	1,560	40	Done	No	NA
NMPlot8-03-HC	OB	2017-11-09	18-33	15	<0.005	<0.02	<0.005	<0.03	<10	<50	440	400	1,100	1,540	40	Done	No	NA
NMPlot8-04-HC	OB	2017-11-09	33-100	67	<0.005	<0.02	<0.005	<0.03	<10	<50	580	500	1,200	1,780	40	Done	No	NA
DSPlot9-02-HC	PMM	2017-11-13	0-26	26	<0.005	<0.02	<0.005	<0.03	<10	65	2,530	2,110	5,490	8,085	31.8	Done	No	14.1
DSPlot9-03-HC	OB	2017-11-13	26-58	32	<0.005	<0.02	<0.005	<0.03	<10	500	5,910	3,200	6,760	13,170	18.7	Done	No	8.14
DSPlot9-04-HC	OB	2017-11-13	58-100	42	<0.005	<0.02	<0.005	<0.03	<10	187	1,770	836	2,020	3,977	20.6	Done	No	5.33
DSPlot10-02-HC	PMM	2017-11-11	0-22	22	<0.005	<0.02	<0.005	<0.03	<10	<50	1,800	1,400	2,900	4,700	23	Done	No	12.7
DSPlot10-03-HC	OB	2017-11-11	22-58	36	<0.005	<0.02	<0.005	<0.03	<10	<50	2,310	1,750	4,090	6,400	26.7	Done	No	14
DSPlot10-04-HC	OB	2017-11-11	58-100	42	<0.005	<0.02	<0.005	<0.03	<10	1,110	8,070	4,300	10,500	19,680	22.3	Done	No	8.21
NMPlot11-02-HC	PMM	2017-11-11	0-30	30	<0.005	<0.02	<0.005	<0.03	<10	<60	3,000	2,000	6,000	9,000	40	Done	No	--
NMPlot11-03-HC	PMM	2017-11-11	30-70	40	<0.005	<0.02	<0.005	<0.03	<10	<50	1,100	1,000	2,500	3,600	42	Done	No	--
NMPlot11-04-HC	PMM	2017-11-11	70-100	30	<0.005	<0.02	<0.005	<0.03	<10	400	5,800	3,000	8,000	14,200	30	Done	No	--
DSPlot12-02-HC	PMM	2017-11-11	0-26	26	<0.005	<0.02	<0.005	<0.03	<10	<50	1,700	1,560	3,580	5,280	28.8	Done	No	15.6
DSPlot12-03-HC	OB	2017-11-11	26-50	24	<0.005	<0.02	<0.005	<0.03	<10	131	3,680	2,460	5,940	9,751	25.9	Done	No	11.2
DSPlot12-04-HC	OB	2017-11-11	50-100	50	<0.005	<0.02	<0.005	<0.03	<10	608	6,050	3,320	7,680	14,338	21.4	Done	No	11.2

Sample Identification	Substrate	Sample Date	Sample Depth (cm)	Horizon Thickness (cm)	Petroleum Hydrocarbons													
					Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	F1 (C6-C10) - BTEX (mg/kg)	F2 (C10-C16) (mg/kg)	F3 (C16-C34) (mg/kg)	F4 (C34-C50) (mg/kg)	F4HTGC (C34-C50+) (mg/kg)	Total Petroleum Hydrocarbons ¹	% C50+	Silica Gel Cleanup	Methanol Field Preservation	Soil Moisture (% by weight)
Detection Limit					0.005	0.02	0.005	0.03	10	50	50	100	100	--	--	--	--	--
NMPlot13-02-HC	PMM	2017-11-11	0-16	16	<0.005	<0.02	<0.005	<0.03	<10	91	2,010	1,570	4,030	6,131	30.2	Done	No	12.4
NMPlot13-03-HC	OB	2017-11-11	16-65	49	<0.005	<0.02	<0.005	<0.03	<10	632	6,500	3,700	8,990	16,122	23.4	Done	No	5.81
NMPlot13-04-HC	OB	2017-11-11	65-100	35	<0.005	<0.02	<0.005	<0.03	<10	975	5,770	2,790	6,490	13,235	19.5	Done	No	12.3
NMPlot14-02-HC	PMM	2017-11-11	0-18	18	<0.005	<0.02	<0.005	<0.03	<10	<50	1,100	855	1,760	2,860	22.7	Done	No	16
NMPlot14-03-HC	OB	2017-11-11	18-42	24	<0.005	<0.02	<0.005	<0.03	<10	132	2,640	1,580	3,500	6,272	21.5	Done	No	11
NMPlot14-04-HC	OB	2017-11-11	42-100	58	<0.005	<0.02	<0.005	<0.03	<10	736	4,930	2,450	5,350	11,016	18.2	Done	No	11.4
DSPlot15-02-HC	PMM	2017-11-11	0-26	26	<0.005	<0.02	<0.005	<0.03	<10	149	3,380	2,430	5,680	9,209	25.8	Done	No	11.8
DSPlot15-03-HC	OB	2017-11-11	26-46	20	<0.005	<0.02	<0.005	<0.03	<10	575	7,180	4,080	9,120	16,875	21	Done	No	7.43
DSPlot15-04-HC	OB	2017-11-11	46-100	54	<0.005	<0.02	<0.005	<0.03	16	2,380	12,100	6,090	14,900	29,396	21.2	Done	No	11.1
NMPlot16-02-HC	PMM	2017-11-10	0-25	25	<0.005	<0.02	<0.005	<0.03	<10	<50	380	300	500	880	30	Done	No	--
NMPlot16-03-HC	OB	2017-11-10	25-50	25	<0.005	<0.02	<0.005	<0.03	<10	60	1,300	900	2,100	3,460	35	Done	No	--
NMPlot16-04-HC	OB	2017-11-10	50-100	50	<0.005	<0.02	<0.005	<0.03	<10	600	5,200	3,000	5,000	10,800	20	Done	No	--
NMPlot17-02-HC	PMM	2017-11-13	0-11	11	<0.005	<0.02	<0.005	<0.03	<10	<50	1,050	913	2,630	3,680	36.2	Done	No	15.6
NMPlot17-03-HC	OB	2017-11-13	11-43	32	<0.005	<0.02	<0.005	<0.03	<10	368	5,530	3,180	7,430	13,328	22.5	Done	No	9.56
NMPlot17-04-HC	OB	2017-11-13	43-100	57	<0.005	<0.02	<0.005	<0.03	<10	88	2,520	1,630	3,710	6,318	23.5	Done	No	5.4
NMPlot18-02-HC	PMM	2017-11-12	0-30	30	<0.005	<0.02	<0.005	<0.03	<10	<50	400	400	900	1,300	40	Done	No	--
NMPlot18-03-HC	OB	2017-11-12	30-43	13	<0.005	<0.02	<0.005	<0.03	<10	500	5,200	3,000	7,000	12,700	30	Done	No	--
NMPlot18-04-HC	OB	2017-11-12	43-100	57	<0.005	<0.02	<0.005	<0.03	<10	400	5,100	3,000	6,000	11,500	30	Done	No	--
DSPlot19-02-HC	PEAT	2017-11-12	0-34	34	<0.005	<0.02	<0.005	0.03	24	104	3,120	2,120	5,980	9,228	31.4	Done	No	31.1
DSPlot19-03-HC	OB	2017-11-12	34-50	16	<0.005	<0.02	<0.005	<0.03	10	2,050	11,400	4,580	8,830	22,290	12.6	Done	No	8.14
DSPlot19-04-HC	OB	2017-11-12	50-100	50	<0.005	<0.02	<0.005	<0.03	12	3,400	14,000	5,380	10,700	28,112	12.6	Done	No	10.4
DSPlot20-02-HC	PEAT	2017-11-12	0-21	21	<0.005	<0.02	<0.005	<0.03	<10	50	2,400	1,880	4,540	6,990	28.4	Done	No	15.2
DSPlot20-03-HC	OB	2017-11-12	21-38	17	<0.005	<0.02	<0.005	<0.03	<10	381	4,650	2,810	6,360	11,391	22.1	Done	No	6.34
DSPlot20-04-HC	OB	2017-11-12	38-78*	62	<0.005	<0.02	<0.005	<0.03	46	4,380	20,900	9,930	21,900	47,226	17.5	Done	No	7.11

NOTE:

¹ Sum of benzene, toluene, ethylbenzene, total xylenes, F1-BTEX, F2, F3 and F4HTGC values.

* auger refusal - assumed that remaining material PHC concentration to 100 cm is similar

-- not available

Table B-2. Soil Salinity Data

Sample ID	Substrate ¹	Sample Date	Sample Depth	Soil pH (CaCl ₂)	Soil pH (H ₂ O)	Salinity (Saturated Paste Method)																										
						EC ²		SAR ²		BSat ²		Calcium			Magnesium			Sodium			Potassium			Chloride			Sulphate (SO ₄)			Sulphate-S		
						dS/m	µS/cm	%	meq/L	mg/L	mg/kg	meq/L	mg/L	mg/kg	meq/L	mg/L	mg/kg	meq/L	mg/L	mg/kg	meq/L	mg/L	mg/kg	meq/L	mg/L	mg/kg	meq/L	mg/L	mg/kg	meq/L	mg/L	mg/kg
Detection Limit	--	--	--	--	--	0.01	--	--	0.01	0.2	--	0.02	0.2	--	0.04	1	--	0.03	1	--	0.06	2	--	0.06	3	--	1	0.06	--			
NMPlot2-02-AN	PMM	2017-11-09	0-8	7.1	6.8	1.44	1.3	83	8.98	180	148	5.69	68.8	56.9	3.51	81	67	0.35	13.5	11	0.39	14	12	9.91	476	394	159	9.92	131			
NMPlot2-03-AN	OB	2017-11-09	8-50	7.4	7.4	1.63	1.8	47	9.38	188	88.1	5.63	68.2	32	4.83	111	52	0.25	9.6	5	0.23	8	4	17.9	858	403	286	17.9	134			
NMPlot2-04-AN	OB	2017-11-09	50-70*	7.7	7.6	1.53	3.1	44	5.72	114	50.2	4.37	52.8	23.2	7.06	162	71	0.33	13	6	0.26	9	4	15.5	743	326	248	15.5	109			
DSPlot3-02-AN	PMM	2017-11-10	0-19	7.6	--	2.42	<0.1	83	--	--	615	--	--	59	--	8	--	--	13	--	--	9	--	--	1490	--	--	--	--			
DSPlot3-03-AN	OB	2017-11-10	19-44	7.2	--	2.84	0.2	63	--	--	462	--	--	96.4	--	16	--	--	<6	--	--	9	--	--	1260	--	--	--	--			
DSPlot3-04-AN	OB	2017-11-10	44-100	7.2	--	3.16	0.4	65	--	--	438	--	--	156	--	31	--	--	10	--	--	11	--	--	1490	--	--	--	--			
DSExtra3-02-AN	PMM	2017-11-13	0-38	6.9	--	1.37	0.1	235	--	--	625	--	--	102	--	23	--	--	18	--	--	21	--	--	1490	--	--	--	--			
DSExtra3-03-AN	PMM	2017-11-13	38-75	7.3	--	2.98	0.3	192	--	--	1240	--	--	302	--	71	--	--	<19	--	--	18	--	--	3470	--	--	--	--			
DSExtra3-04-AN	OB	2017-11-13	75-100	7.6	--	3.24	0.3	53	--	--	377	--	--	87.3	--	20	--	--	6	--	--	8	--	--	1030	--	--	--	--			
NMPlot4-02-AN	PMM	2017-11-10	0-28	7.5	--	1.8	<0.1	51	--	--	195	--	--	31.1	--	4	--	--	7	--	--	4	--	--	415	--	--	--	--			
NMPlot4-03-AN	OB	2017-11-10	28-58	7.4	--	2.74	0.2	51	--	--	320	--	--	74.4	--	14	--	--	7	--	--	4	--	--	1010	--	--	--	--			
NMPlot4-04-AN	OB	2017-11-10	58-85*	7.7	--	3.25	0.8	39	--	--	222	--	--	102	--	34	--	--	11	--	--	4	--	--	948	--	--	--	--			
NMPlot5-02-AN	PMM	2017-11-10	0-20	7.3	--	2.54	<0.1	81	--	--	390	--	--	146	--	<8	--	--	15	--	--	15	--	--	1090	--	--	--	--			
NMPlot5-03-AN	OB	2017-11-10	20-45	7.5	--	2.4	<0.1	38	--	--	206	--	--	42.6	--	<4	--	--	6	--	--	4	--	--	609	--	--	--	--			
NMPlot5-04-AN	OB	2017-11-10	45-100	7.6	--	2.87	0.2	41	--	--	245	--	--	82.5	--	10	--	--	10	--	--	4	--	--	875	--	--	--	--			
NMExtra5-02-AN	PMM	2017-11-13	0-27	7.1	--	0.84	0.1	71	--	--	107	--	--	15.5	--	4	--	--	14	--	--	7	--	--	154	--	--	--	--			
NMExtra5-03-AN	OB	2017-11-13	27-56	7	--	1.04	0.2	43	--	--	76.5	--	--	16.9	--	4	--	--	3	--	--	4	--	--	137	--	--	--	--			
NMExtra5-04-AN	OB	2017-11-13	56-80*	7.4	--	1.51	0.1	33	--	--	101	--	--	15.6	--	2	--	--	4	--	--	3	--	--	264	--	--	--	--			
DSPlot7-02-AN	PMM	2017-11-10	0-46	6.9	--	0.89	0.2	157	--	--	245	--	--	58.9	--	16	--	--	11	--	--	21	--	--	504	--	--	--	--			
DSPlot7-03-AN	OB	2017-11-10	46-64	7.4	--	2.74	0.7	46	--	--	273	--	--	54.4	--	31	--	--	<5	--	--	16	--	--	845	--	--	--	--			
DSPlot7-04-AN	OB	2017-11-10	64-100	7.7	--	2.68	0.5	44	--	--	266	--	--	52.9	--	24	--	--	7	--	--	5	--	--	854	--	--	--	--			
NMPlot8-02-AN	PMM	2017-11-09	0-18	5.8	6	0.77	0.4	103	4.84	96.7	100	2.76	33.4	34.6	0.82	19	20	0.5	19.6	20	2.19	78	80	2.74	131	136	44	2.74	45.3			
NMPlot8-03-AN	OB	2017-11-09	18-33	7.2	7.3	1.1	0.3	50	9.87	197	98.8	3.19	38.6	19.3	0.67	15	8	0.18	7.1	4	1.24	44	22	7.98	383	192	128	7.98	63.9			
NMPlot8-04-AN	OB	2017-11-09	33-100	7.3	7.1	3.07	0.2	49	36.9	738	365	10.6	128	63.4	0.96	22	11	<0.26	<10	<5	0.62	22	11	35.5	1700	843	568	35.5	281			
DSPlot9-02-AN	PMM	2017-11-13	0-26	7.4	--	2.79	0.3	73	--	--	459	--	--	102	--	21	--	--	9	--	--	10	--	--	1380	--	--	--	--			
DSPlot9-03-AN	OB	2017-11-13	26-58	7.7	--	2.53	0.2	47	--	--	283	--	--	52.6	--	11	--	--	5	--	--	5	--	--	860	--	--	--	--			
DSPlot9-04-AN	OB	2017-11-13	58-100	7.7	--	2.55	0.2	49	--	--	290	--	--	66.1	--	11	--	--	10	--	--	3	--	--	928	--	--	--	--			
DSPlot10-02-AN	PMM	2017-11-11	0-22	7.7	--	0.53	0.1	73	--	--	64.5	--	--	14.7	--	4	--	--	3	--	--	6	--	--	90.7	--	--	--	--			
DSPlot10-03-AN	OB	2017-11-11	22-58	7.7	--	0.57	0.1	56	--	--	52.8	--	--	10.8	--	3	--	--	2	--	--	4	--	--	99.4	--	--	--	--			
DSPlot10-04-AN	OB	2017-11-11	58-100	7.8	--	0.63	0.1	45	--	--	41.9	--	--	11.5	--	3	--	--	3	--	--	3	--	--	113	--	--	--	--			
NMPlot11-02-AN	PMM	2017-11-11	0-30	7.5	7	0.78	0.2	116	5.54	111	129	3.65	44.1	51.2	0.39	9	10	0.34	13.4	16	0.51	18	21	3.49	167	194	56	3.49	64.7			
NMPlot11-03-AN	PMM	2017-11-11	30-70	7.3	6.9	0.87	0.2	81	7.6	152	123	4.61	55.8	45.1	0.56	13	11	0.17	6.5	5	0.59	21	17	5.43	261	211	87	5.43	70.3			
NMPlot11-04-AN	PMM	2017-11-11	70-100	7.2	6.6	2.16	0.2	91	19.4	389	354	11.8	142	130	0.96	22	20	0.16	6.2	6	0.45	16	14	24.4	1170	1070	391	24.4	356			
DSPlot12-02-AN	PMM	2017-11-11	0-26	7.4	--	0.87	1.2	71	--	--	80.6	--	--	18.6	--	39	--	--	6	--	--	24	--	--	194	--	--	--	--			
DSPlot12-03-AN	OB	2017-11-11	26-50	7.5	--	0.95	1.1	51	--	--	63.4	--	--	17.1	--	27	--	--	5	--	--	15	--	--	171	--	--	--	--			
DSPlot12-04-AN	OB	2017-11-11	50-100	7.5	--	1.67	1	47	--	--	127	--	--	30.6	--	32	--	--	6	--	--	10	--	--	426	--	--	--	--			
NMPlot13-02-AN	PMM	2017-11-11	0-16	7.1	--	1.22	0.3	58	--	--	107	--	--	36.2	--	9	--	--	9	--	--	10	--	--	124	--	--	--	--			
NMPlot13-03-AN	OB	2017-11-11	16-65	7	--	1.34	0.3	45	--	--	92	--	--	31	--	9	--	--	6	--	--	6	--	--	283	--	--	--	--			
NMPlot13-04-AN	OB	2017-11-11	65-100	7.2	--	2.99	0.5	42	--	--	243	--	--	90.5	--	26	--	--	11	--	--	6	--	--	928	--	--	--	--			
NMPlot14-02-AN	PMM	2017-11-11	0-18	7.6	--	1.95	2.5	60	--	--	133	--	--	45.9	--	102	--	--	6	--	--	8	--	--	594	--	--	--	--			
NMPlot14-03-AN	OB	2017-11-11	18-42	7.5	--	1.96	2.4	48	--	--	111	--	--	35	--	80	--	--	5	--	--	5	--	--	511	--	--	--	--			
NMPlot14-04-AN	OB	2017-11-11	42-100	7.5	--	3.15	2.1	42	--	--	237	--	--	56.6	--	91	--	--	9	--	--	3	--	--	952	--	--	--	--			
DSPlot15-02-AN	PMM	2017-11-11	0-26	7.6	--	0.58	0.2	63	--	--	57.2	--	--	15.3	--	4	--	--	5	--	--	5	--	--	50.6	--	--	--	--			
DSPlot15-03-AN	OB	2017-11-11	26-46	7.4	--	0.37	0.2	50	--	--	25	--	--	7.9	--	3	--	--	2	--	--	3	--	--	42	--	--	--	--			
DSPlot15-04-AN	OB	2017-11-11	46-100	7.4	--	0.53	0.2	46	--	--	26.6	--	--	12.4	--	4	--	--	4	--	--	3	--	--	82.3	--	--	--	--			
NMPlot16-02-AN	PMM	2017-11-10	0-25	6.4	--	1.83	2.3	140	--	--	286	--	--	98.9	--	214	--	--	38	--	--	29	--	--	1040	--	--	--	--			
NMPlot16-03-AN	OB	2017-11-10	25-50																													

Sample ID	Substrate ¹	Sample Date	Sample Depth	Soil pH (CaCl ₂)	Soil pH (H ₂ O)	Salinity (Saturated Paste Method)																								
						EC ²	SAR ²	BSat ²	Calcium			Magnesium			Sodium			Potassium			Chloride			Sulphate (SO ₄)			Sulphate-S			
Unit	--	d/m/y	cm	--	--	dS/m	--	%	meq/L	mg/L	mg/kg	meq/L	mg/L	mg/kg	meq/L	mg/L	mg/kg	meq/L	mg/L	mg/kg	meq/L	mg/L	mg/kg	meq/L	mg/L	mg/kg	meq/L	mg/L	mg/kg	
Detection Limit	--	--	--	--	--	0.01	--	--	0.01	0.2	--	0.02	0.2	--	0.04	1	--	0.03	1	--	0.06	2	--	0.06	3	--	1	0.06	--	
DSPlot19-02-AN	PEAT	2017-11-12	0-34	5	--	1.58	0.4	163	--	--	477	--	--	108	--	--	50	--	--	11	--	--	41	--	--	1570	--	--	--	--
DSPlot19-03-AN	OB	2017-11-12	34-50	4.6	--	1.73	0.3	48	--	--	160	--	--	37.1	--	--	13	--	--	2	--	--	9	--	--	545	--	--	--	--
DSPlot19-04-AN	OB	2017-11-12	50-100	4.5	--	1.42	0.3	45	--	--	120	--	--	24.9	--	--	9	--	--	2	--	--	5	--	--	406	--	--	--	--
DSPlot20-02-AN	PEAT	2017-11-12	0-21	7.1	--	0.65	0.3	92	--	--	96.3	--	--	23.4	--	--	10	--	--	2	--	--	14	--	--	185	--	--	--	--
DSPlot20-03-AN	OB	2017-11-12	21-38	7	--	0.73	0.2	47	--	--	61.2	--	--	11.6	--	--	5	--	--	1	--	--	5	--	--	119	--	--	--	--
DSPlot20-04-AN	OB	2017-11-12	38-78*	7.2	--	1.88	0.1	47	--	--	201	--	--	28.6	--	--	5	--	--	4	--	--	3	--	--	575	--	--	--	--

Notes:

¹ Substrates - PMM = Peat-mineral mix; PEAT = Peat; OB = Overburden

² EC = Electrical conductivity; SAR = Sodium adsorption ratio; BSat = Base saturation

* auger refusal - assumed that remaining material PHC concentration to 100 cm is similar

t available or not applicable

Table B-3. Soil Bulk Density Data

Sample Identification	Substrate*	Sample Date	Sample Depth	Physical and Aggregate Properties					
				Bulk Density	Bulk Density	Wet Bulk Density	Porosity	Volume	Moisture
<i>Unit</i>	--	<i>d/m/y</i>	<i>cm</i>	<i>kg/L</i>	<i>Mg/m³</i>	<i>kg/L</i>	<i>%</i>	<i>mL</i>	<i>%</i>
Detection Limit	--	--	--	--	--	--	--	--	0.1
NMPlot2-02-BD1	PMM	2017-11-09	0-8	0.64	0.64	0.81	--	298	21
NMPlot2-02-BD2	PMM	2017-11-09	0-8	0.61	0.61	0.80	--	298	24
NMPlot2-03-BD1	OB	2017-11-09	8-50	1.50	1.50	1.60	43	298	6
NMPlot2-03-BD2	OB	2017-11-09	8-50	1.40	1.40	1.53	46	298	6
DSPlot3-02-BD1	PMM	2017-11-10	0-19	0.56	0.56	0.80	--	298	30
DSPlot3-02-BD2	PMM	2017-11-10	0-19	0.63	0.63	0.82	--	298	23
DSExtra3-02-BD1	PMM	2017-11-13	0-38	0.53	0.53	0.87	--	298	39
DSExtra3-02-BD2	PMM	2017-11-13	0-38	0.46	0.46	0.75	--	298	39
NMPlot4-02-BD1	PMM	2017-11-10	0-28	1.00	1.00	1.24	62	313	19
NMPlot4-02-BD2	PMM	2017-11-10	0-28	1.13	1.13	1.25	57	313	9.5
NMPlot5-02-BD1	PMM	2017-11-10	0-20	0.75	0.75	0.97	--	313	22
NMPlot5-02-BD2	PMM	2017-11-10	0-20	0.70	0.70	0.80	--	313	12
NMExtra5-02-BD1	PMM	2017-11-13	0-27	0.41	0.41	0.64	--	313	36.7
NMExtra5-02-BD2	PMM	2017-11-13	0-27	0.36	0.36	0.58	--	313	39
DSPlot7-02-BD1	PMM	2017-11-10	0-46	0.66	0.66	0.97	--	298	31.8
DSPlot7-02-BD2	PMM	2017-11-10	0-46	0.81	0.81	1.00	--	298	19
NMPlot8-02-BD1	PMM	2017-11-09	0-18	0.38	0.38	0.58	--	298	35
NMPlot8-02-BD2	PMM	2017-11-09	0-18	0.42	0.42	0.58	--	298	27.2
DSPlot9-02-BD1	PMM	2017-11-13	0-26	0.96	0.96	1.14	--	298	15
DSPlot9-02-BD2	PMM	2017-11-13	0-26	0.90	0.90	1.14	--	298	22
DSPlot10-02-BD1	PMM	2017-11-11	0-22	0.81	0.81	0.94	--	298	14
DSPlot10-02-BD2	PMM	2017-11-11	0-22	0.51	0.51	0.76	--	298	33
NMPlot11-02-BD1	PMM	2017-11-11	0-30	0.61	0.61	0.79	--	313	23
NMPlot11-02-BD2	PMM	2017-11-11	0-30	0.90	0.90	1.04	--	313	13
DSPlot12-02-BD1	PMM	2017-11-11	0-26	0.84	0.84	1.03	--	298	18
DSPlot12-02-BD2	PMM	2017-11-11	0-26	0.88	0.88	1.06	--	298	17
NMPlot13-02-BD1	PMM	2017-11-11	0-16	0.94	0.94	1.11	--	313	15
NMPlot13-02-BD2	PMM	2017-11-11	0-16	1.10	1.10	1.20	60	313	11
NMPlot14-02-BD1	PMM	2017-11-11	0-18	0.70	0.70	0.86	--	313	19
NMPlot14-02-BD2	PMM	2017-11-11	0-18	0.78	0.78	0.93	--	313	17
DSPlot15-02-BD1	PMM	2017-11-11	0-26	0.63	0.63	0.88	--	298	28
DSPlot15-02-BD2	PMM	2017-11-11	0-26	0.93	0.93	1.07	--	298	13
NMPlot16-02-BD1	PMM	2017-11-10	0-25	0.37	0.37	0.47	--	313	21.4
NMPlot16-02-BD2	PMM	2017-11-10	0-25	0.39	0.39	0.54	--	313	27.9
NMPlot17-02-BD1	PMM	2017-11-13	0-11	0.93	0.93	1.05	--	313	11
NMPlot17-02-BD2	PMM	2017-11-13	0-11	1.10	1.10	1.27	59	313	14
NMPlot17-03BD1	OB	2017-11-13	11-43	1.30	1.30	1.50	50	313	11
NMPlot17-03DD2	OB	2017-11-13	11-43	1.52	1.52	1.69	43	313	10
NMPlot18-02-BD1	PMM	2017-11-12	0-30	0.72	0.72	0.91	--	313	21
NMPlot18-02-BD2	PMM	2017-11-12	0-30	0.73	0.73	1.00	--	313	27
DSPlot19-02-BD1	PMM	2017-11-12	0-34	0.24	0.24	0.41	--	298	39.8
DSPlot19-02-BD2	PMM	2017-11-12	0-34	0.25	0.25	0.42	--	298	39.4
DSPlot20-02-BD1	PMM	2017-11-12	0-21	0.68	0.68	0.96	--	298	29
DSPlot20-02-BD2	PMM	2017-11-12	0-21	0.69	0.69	0.96	--	298	28

Notes:

* Substrate - PMM = Peat-mineral mix; OB = Overburden

-- not applicable

Appendix C Extended Temperature Range Gas Chromatograms

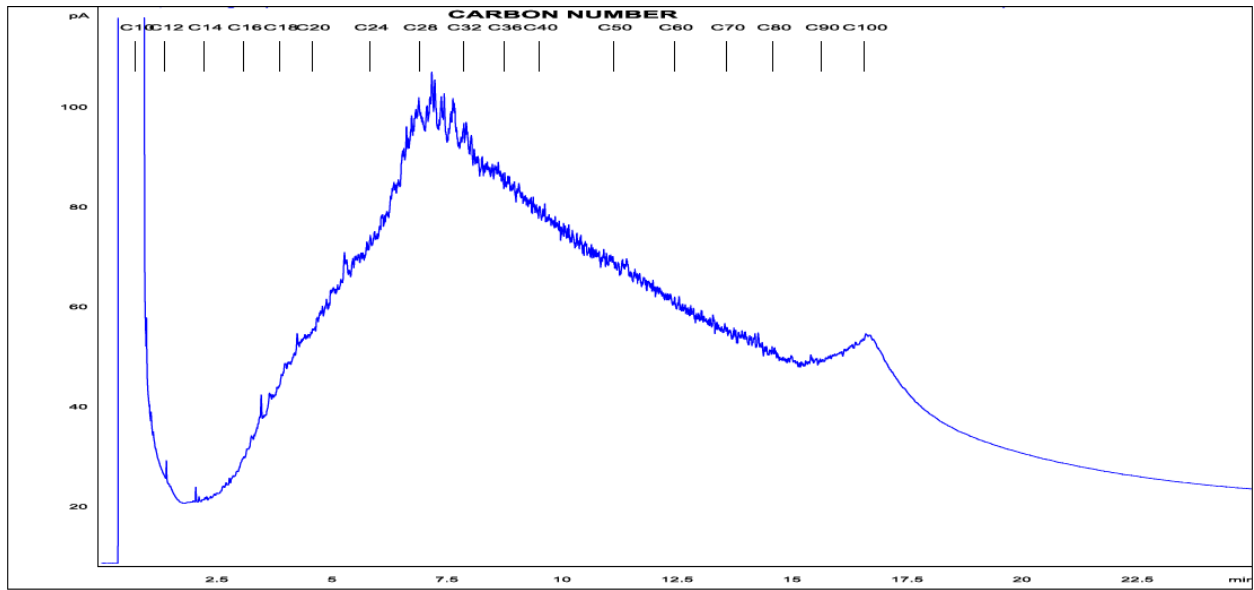


Figure C-1 DSPlot 3-03-HC – Upper Subsoil

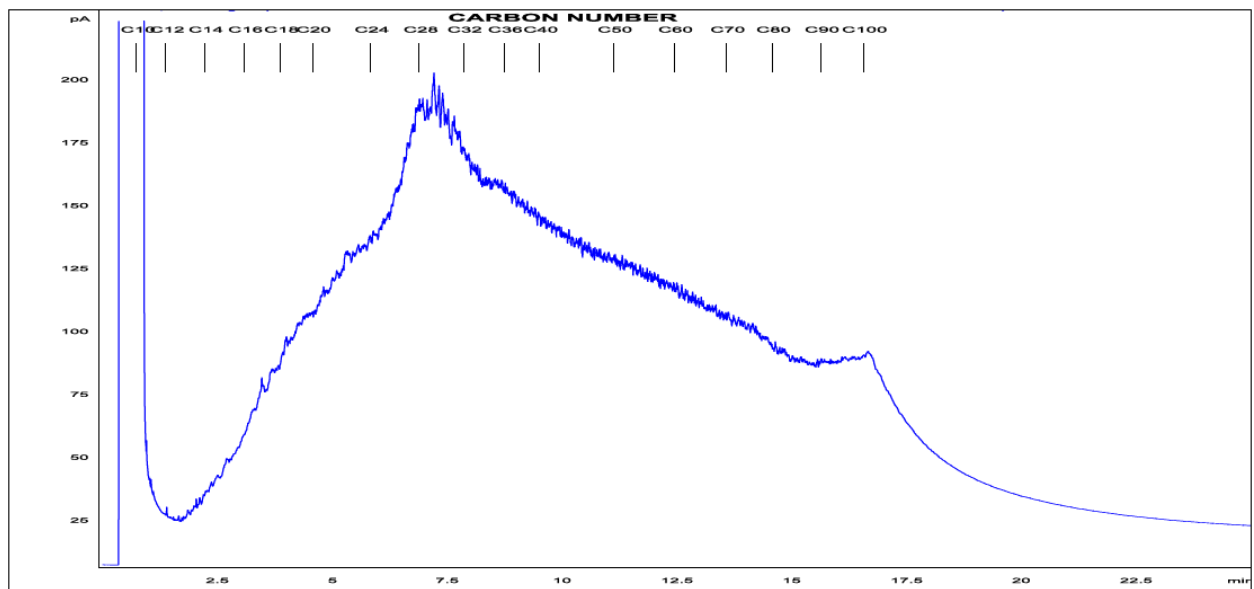


Figure C-2 DSPlot 3-04-HC – Lower Subsoil

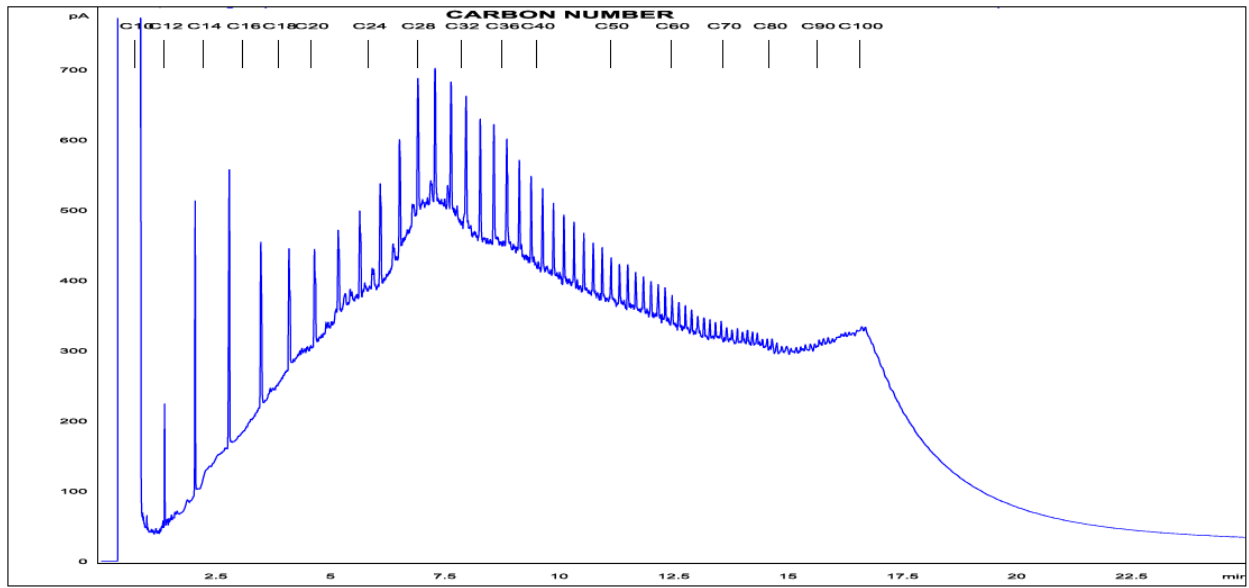


Figure C-3 NMPlot 13-03-HC – Upper Subsoil

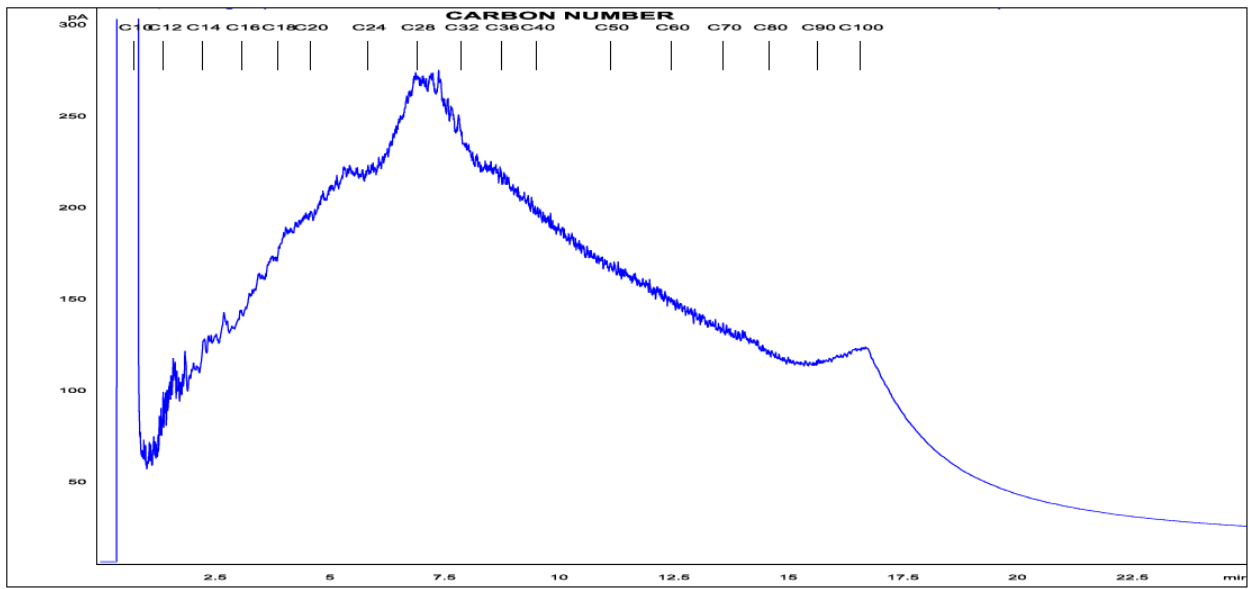


Figure C-4 NMPlot 13-04-HC – Lower Subsoil

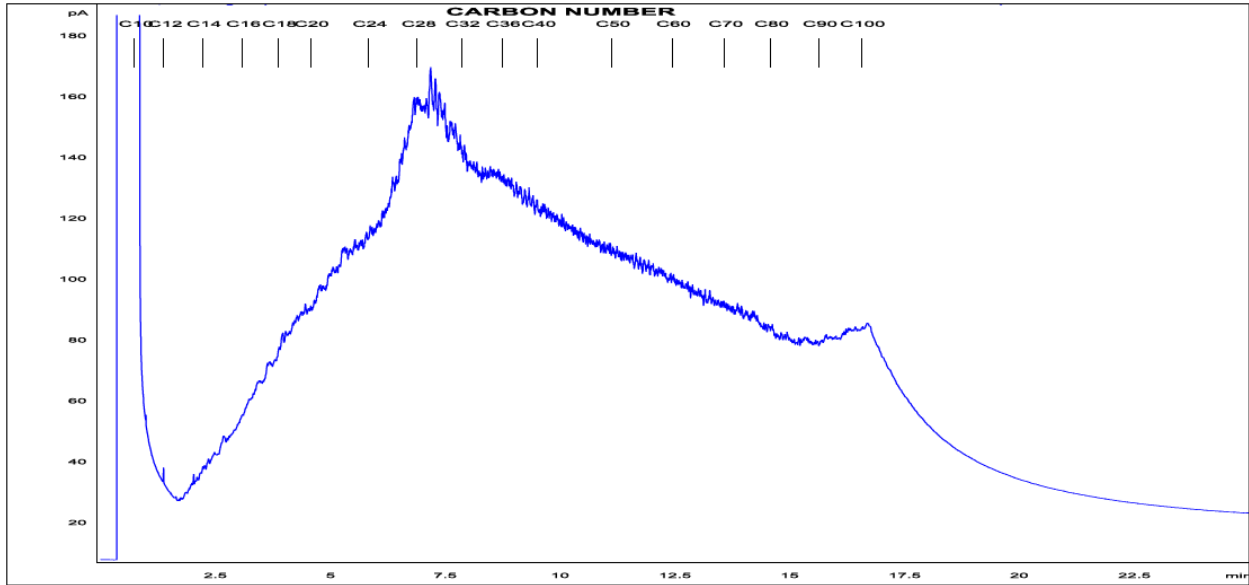


Figure C-5 NMPlot 14-03-HC – Upper Subsoil

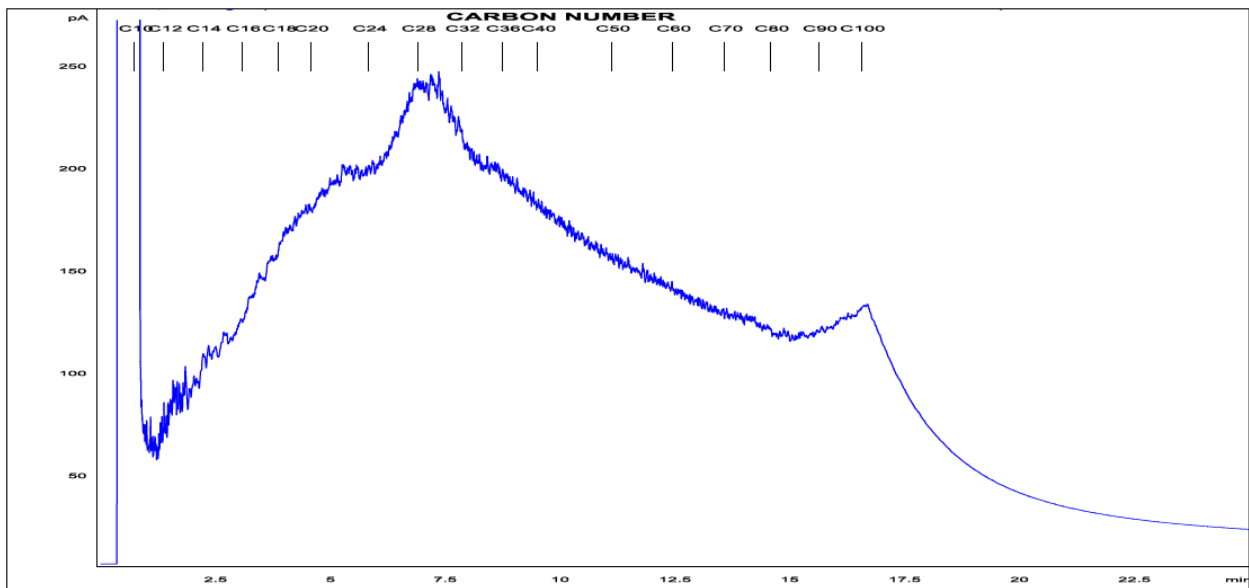


Figure C-6 NMPlot 14-04-HC – Lower Subsoil

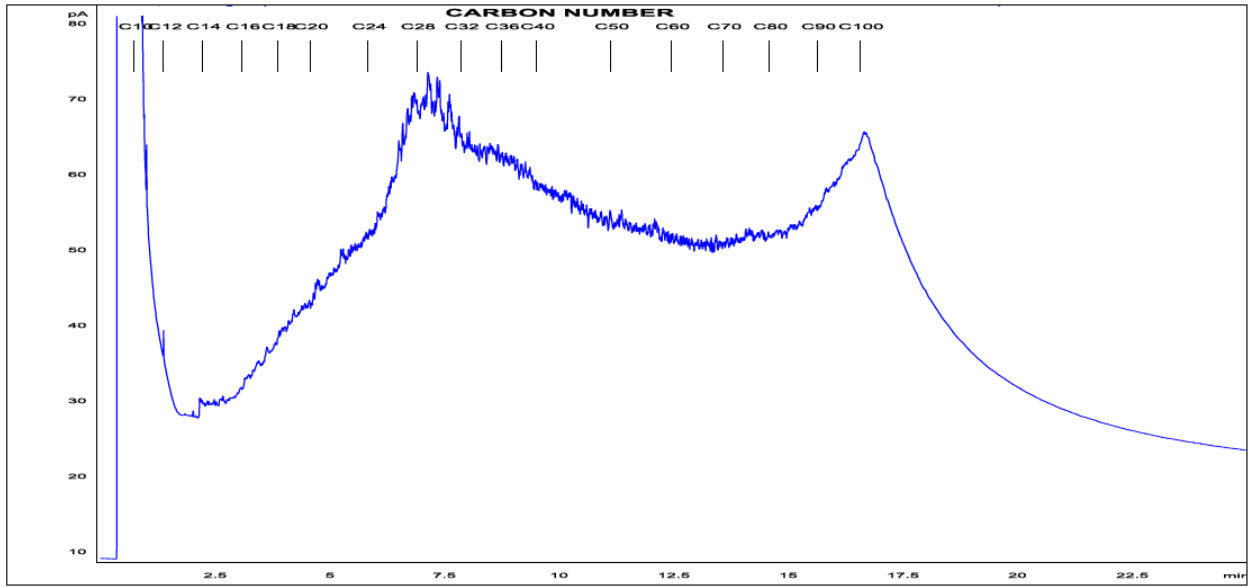


Figure C-7 NMPlot 16-03-HC – Upper Subsoil

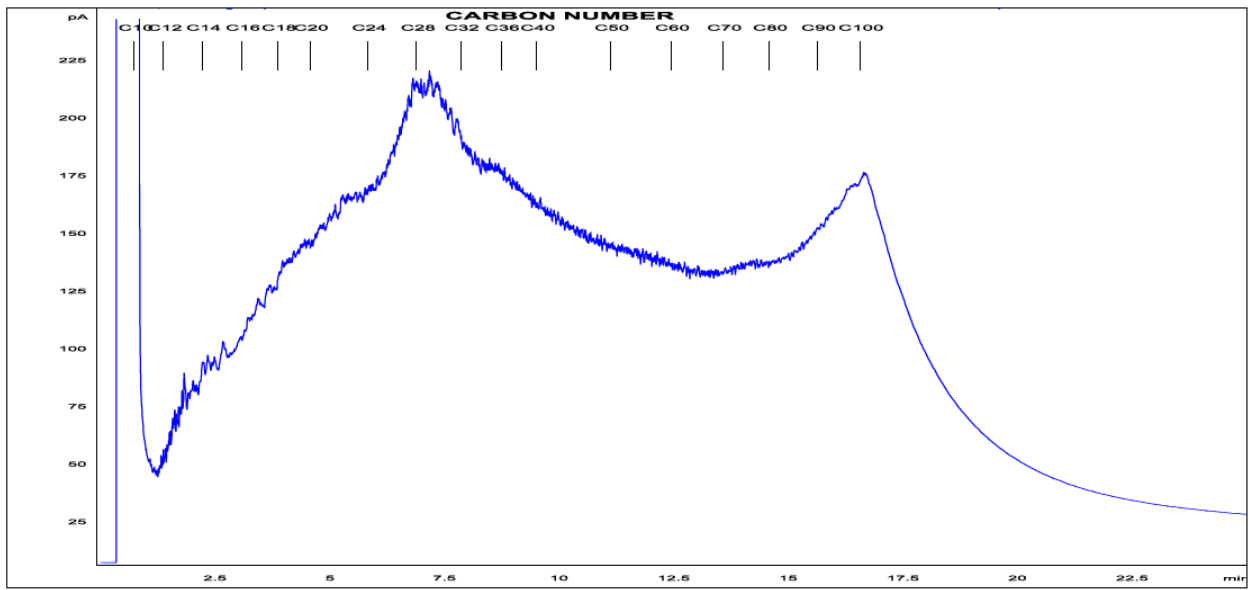


Figure C-8 NMPlot 16-04-HC – Lower Subsoil

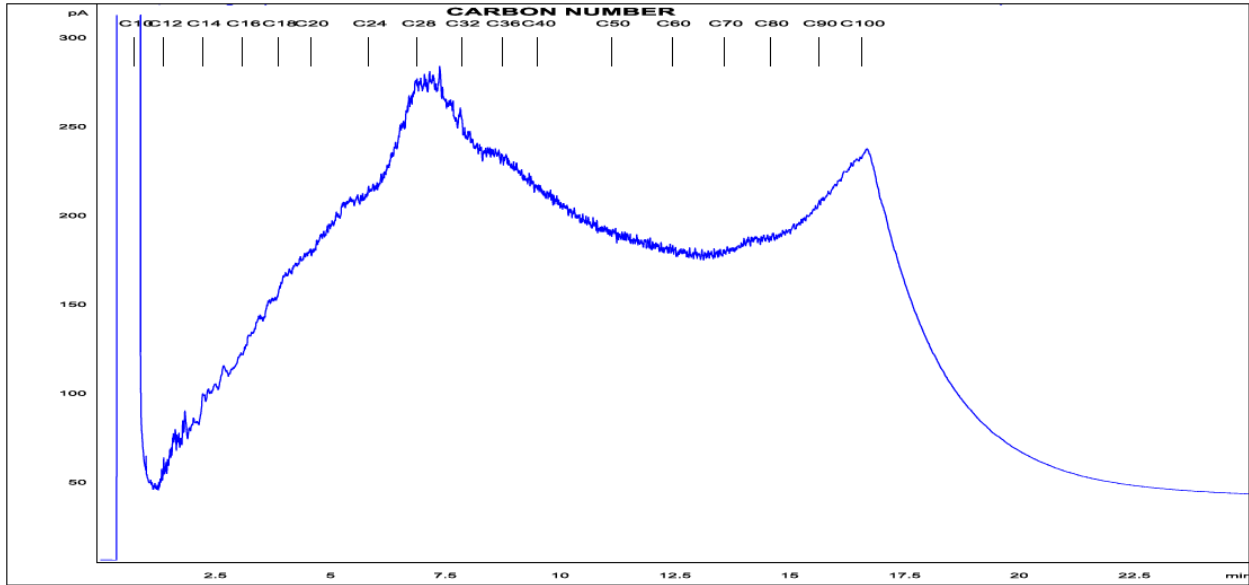


Figure C-9 NMPlot 18-03-HC – Upper Subsoil

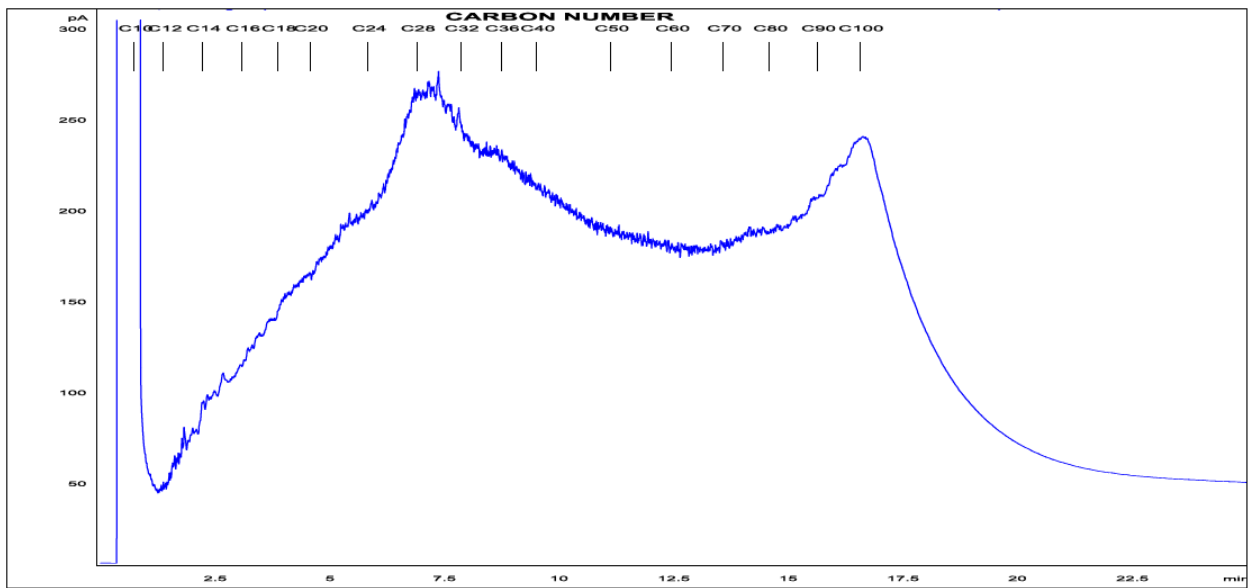


Figure C-10 NMPlot 18-04-HC – Lower Subsoil

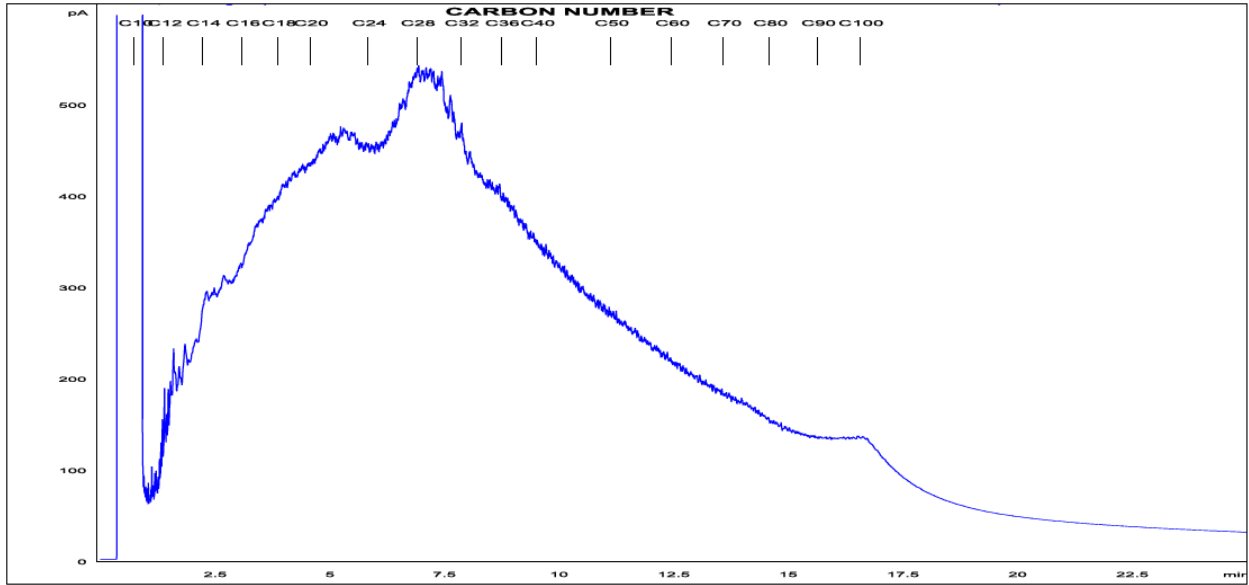


Figure C-11 NMPlot 19-03-HC – Upper Subsoil

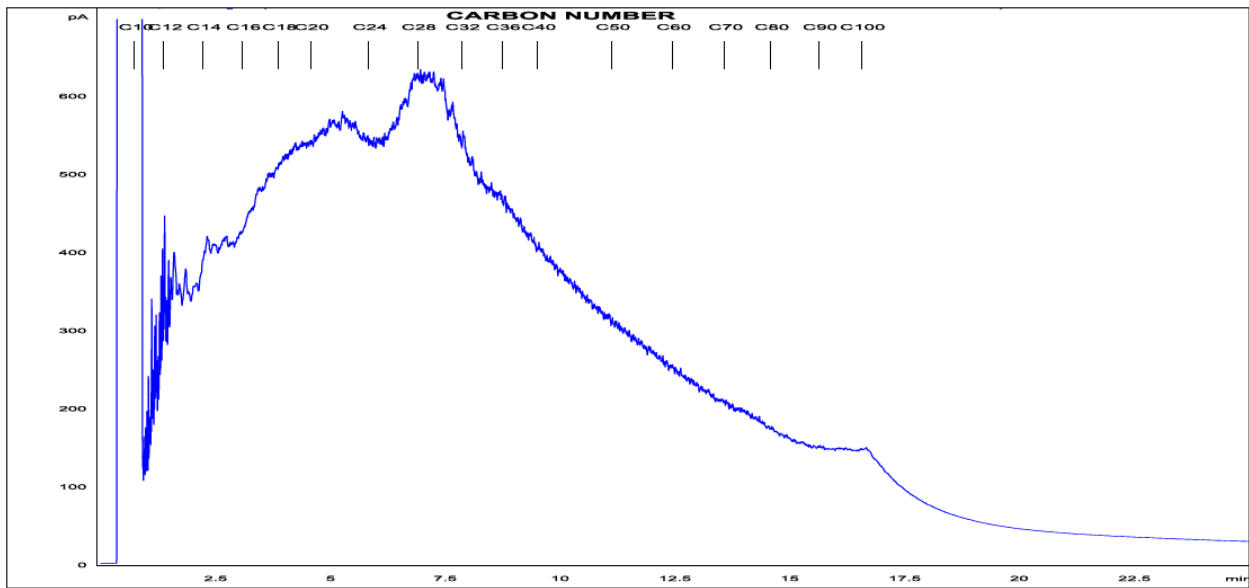


Figure C-12 NMPlot 19-04-HC – Lower Subsoil

Appendix D Plots of White Spruce and Aspen Site Indices for pH, SAR and EC

Figure D-1. Plots of Site Index and pH by Soil Horizon for White Spruce

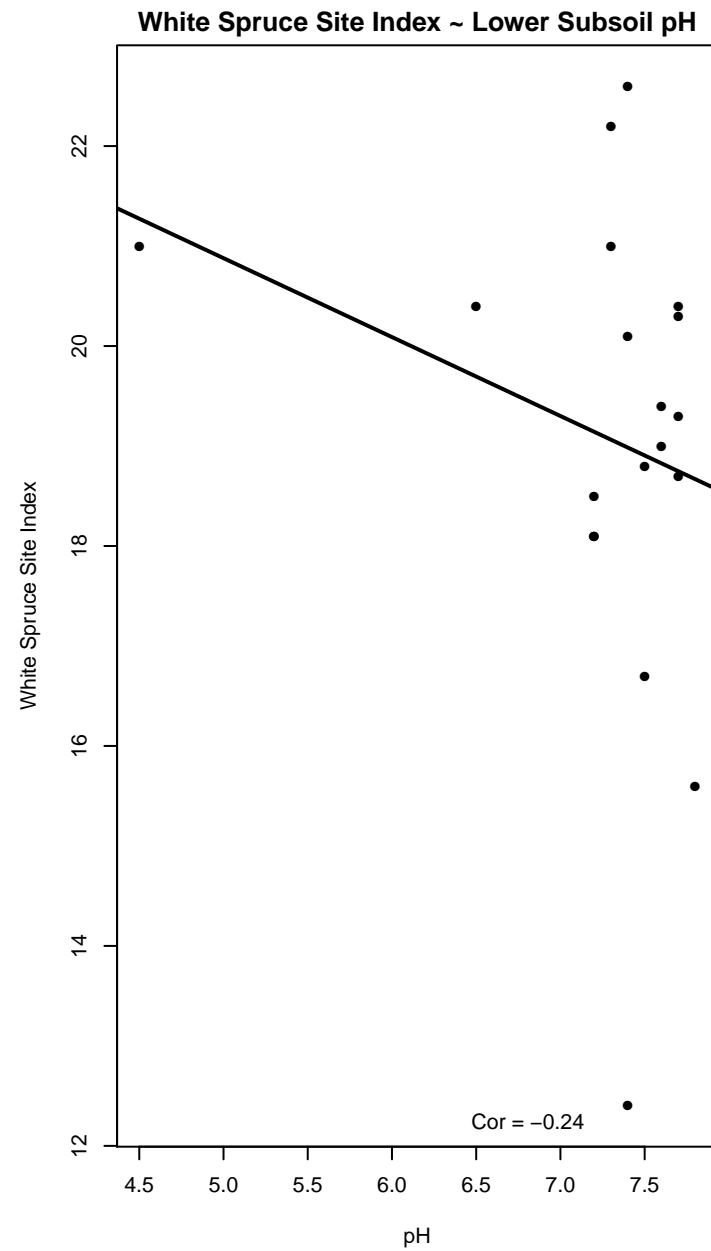
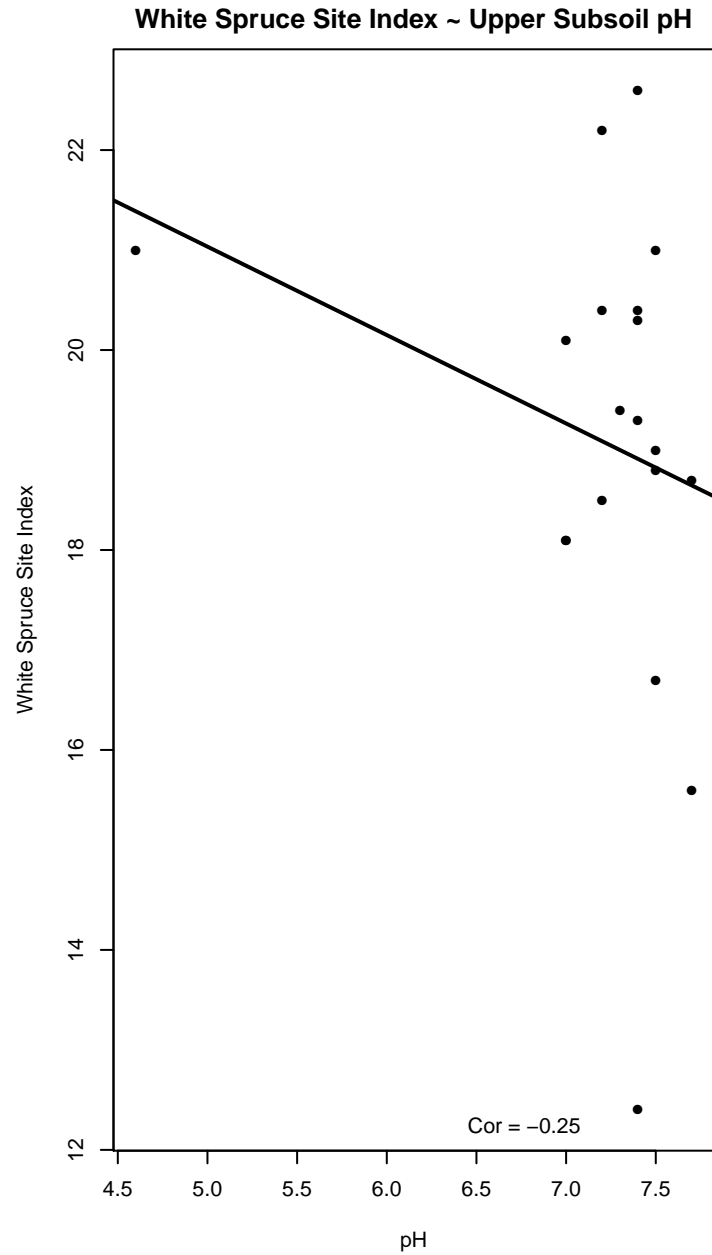
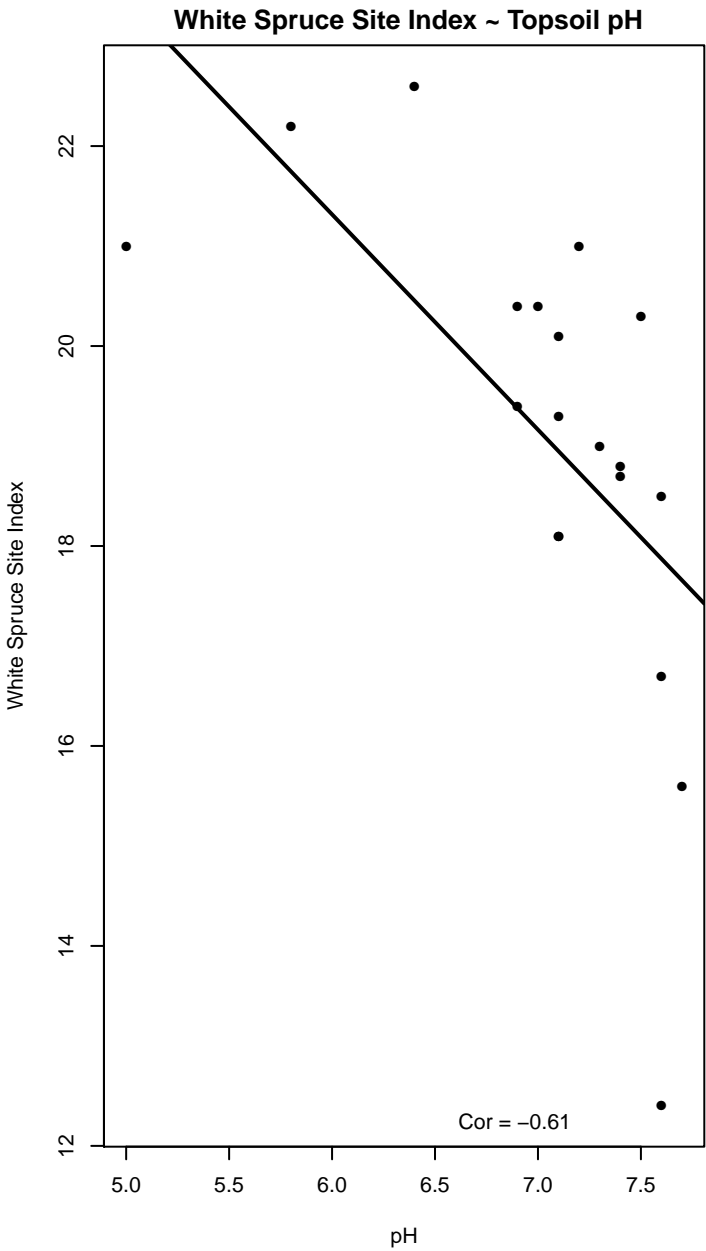
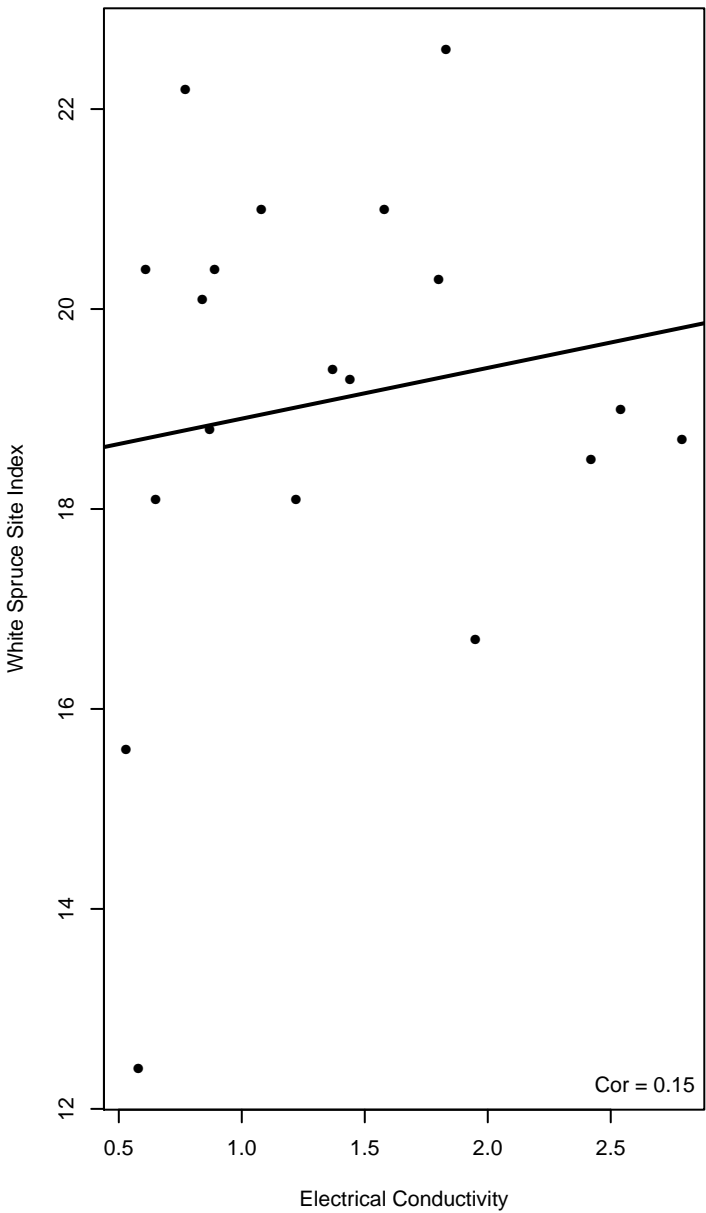
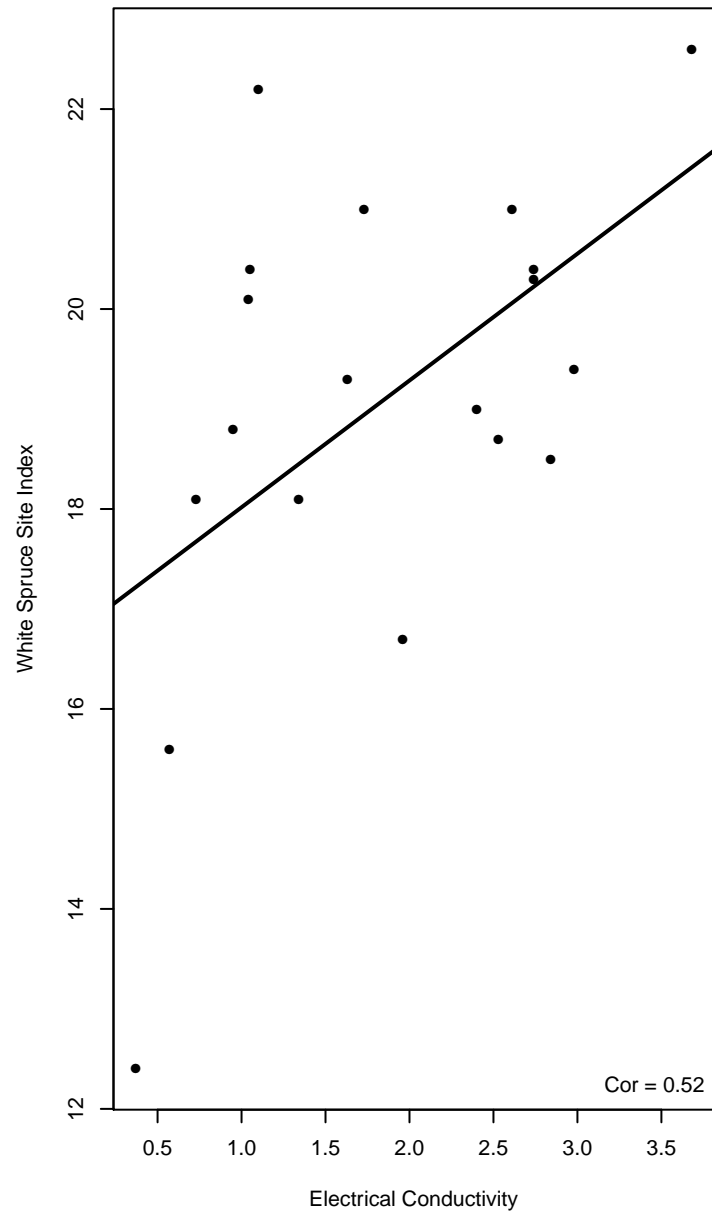


Figure D-2. Plots of Site Index with Electrical Conductivity by Soil Horizon for White Spruce

White Spruce Site Index ~ Topsoil EC



White Spruce Site Index ~ Upper Subsoil EC



White Spruce Site Index ~ Lower Subsoil EC

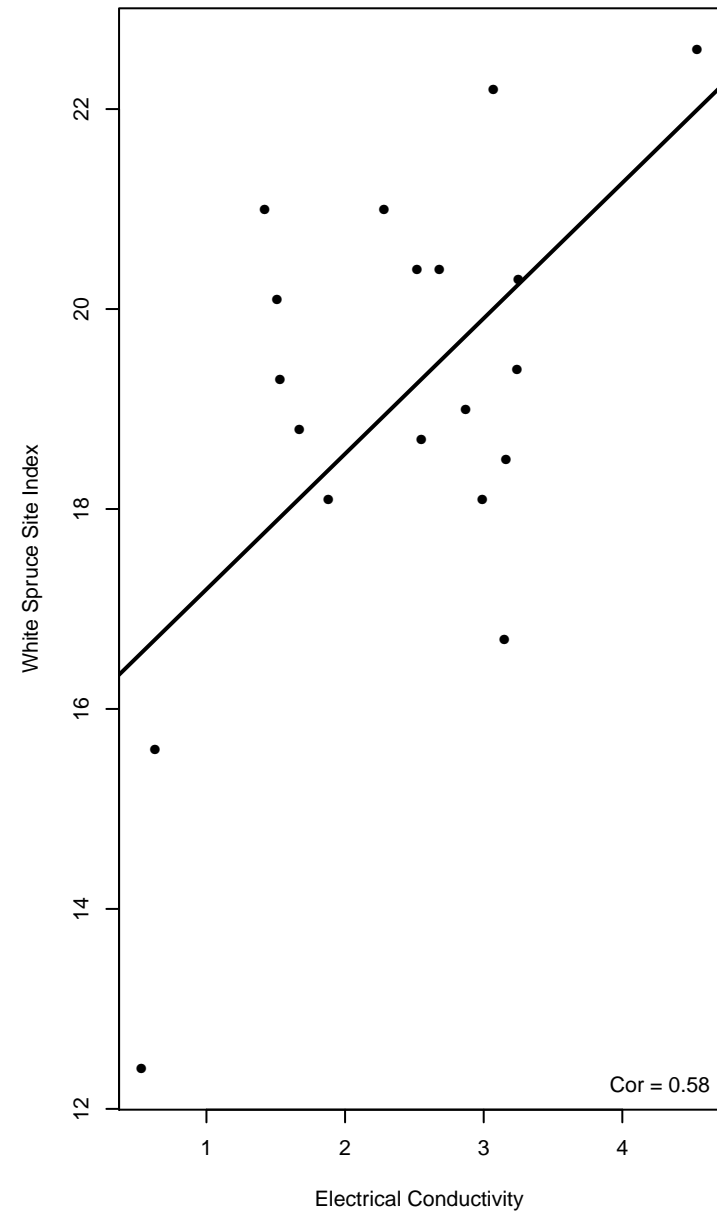
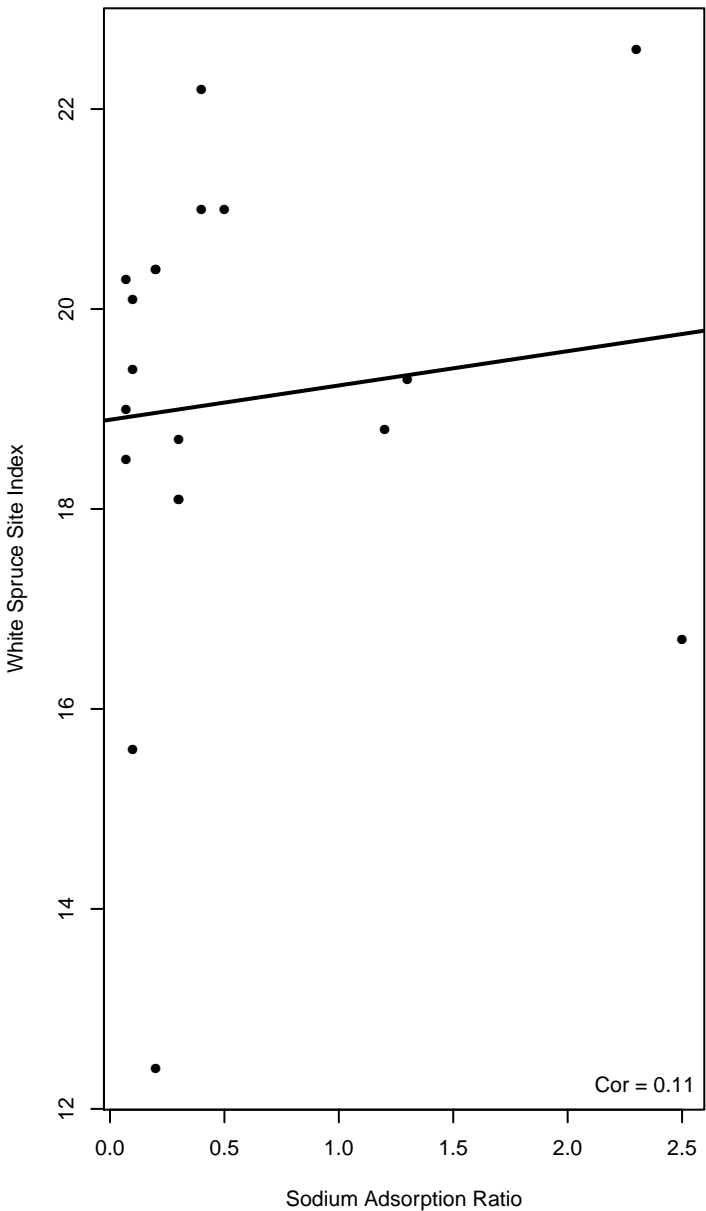
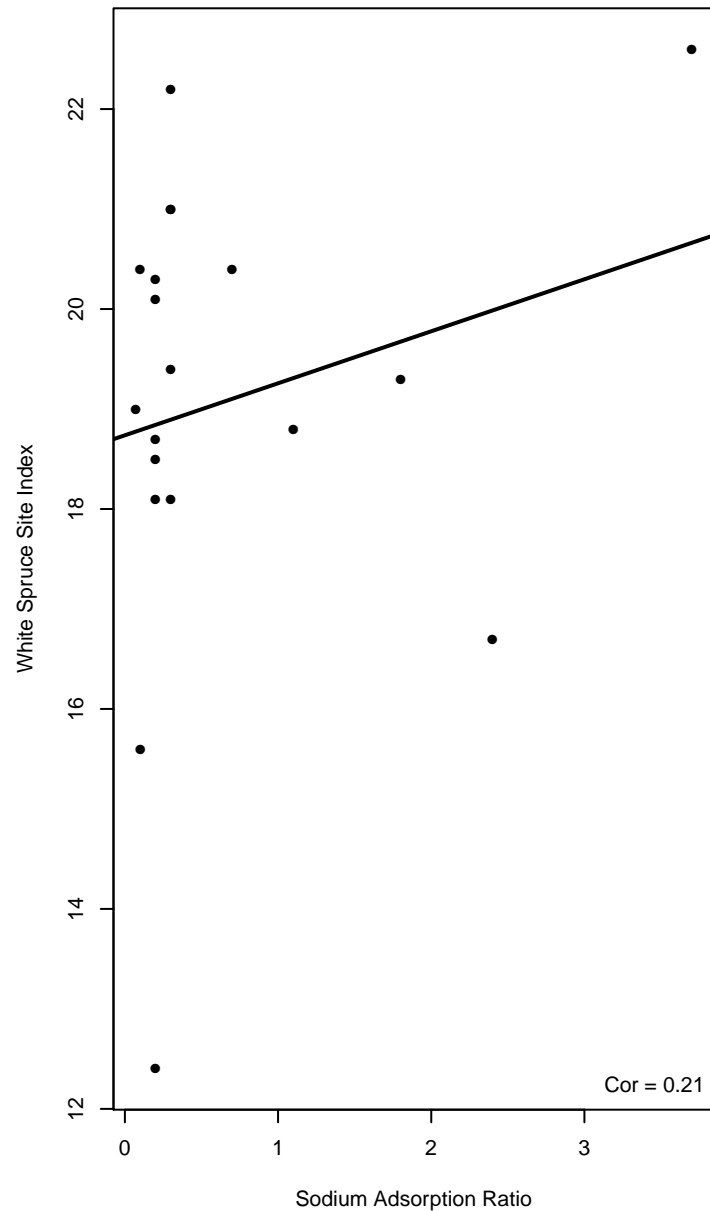


Figure D-3. Plots of Site Index with Sodium Adsorption Ratio by Soil Horizon for White Spruce

White Spruce Site Index ~ Topsoil SAR



White Spruce Site Index ~ Upper Subsoil SAR



White Spruce Site Index ~ Lower Subsoil SAR

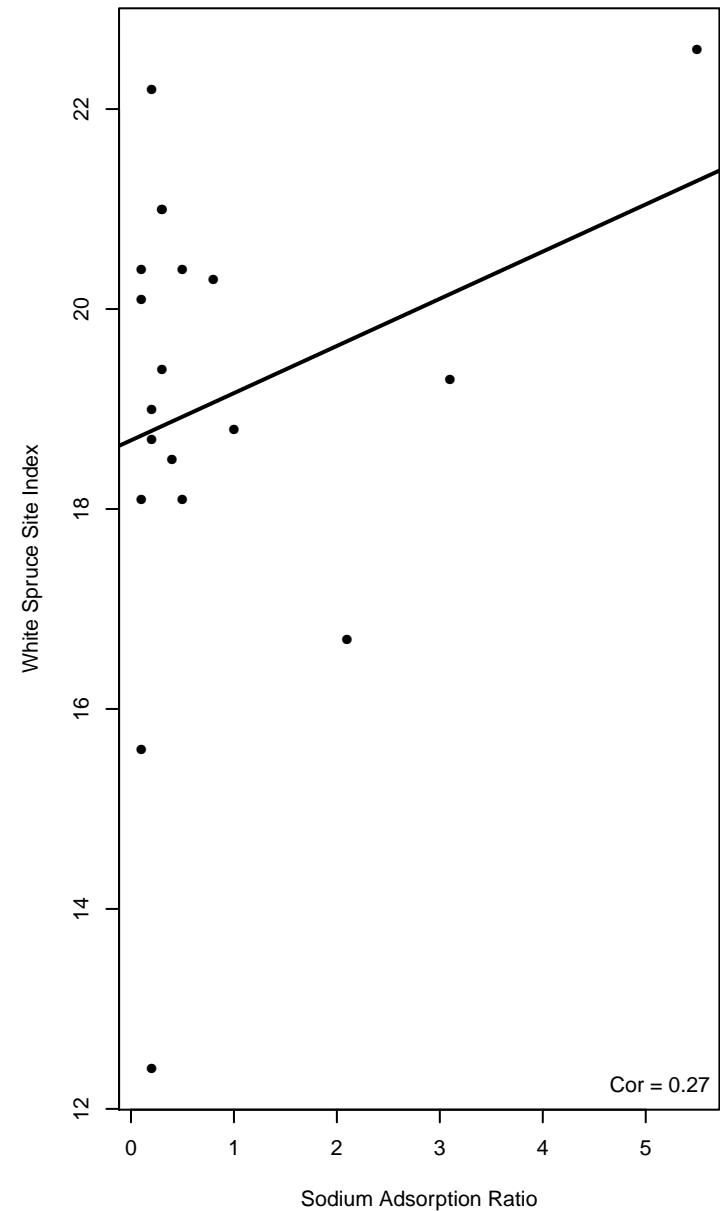


Figure D-4. Plots of Site Index with pH by Soil Horizon for Aspen

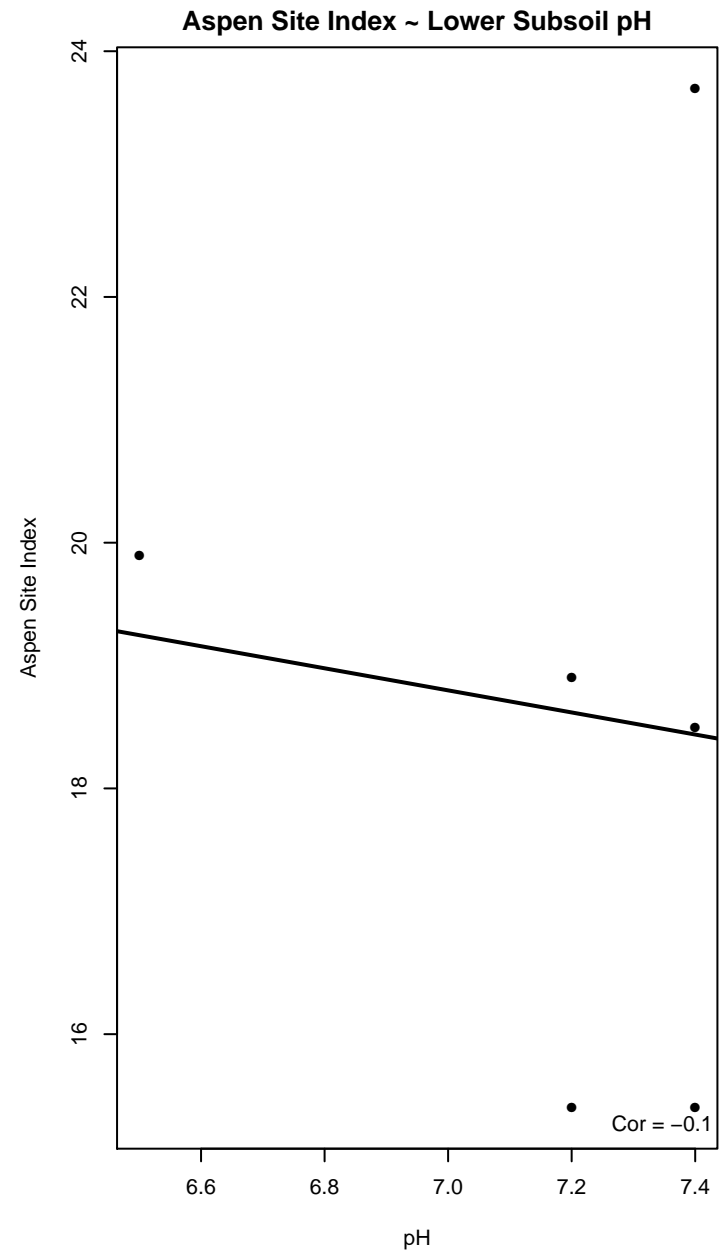
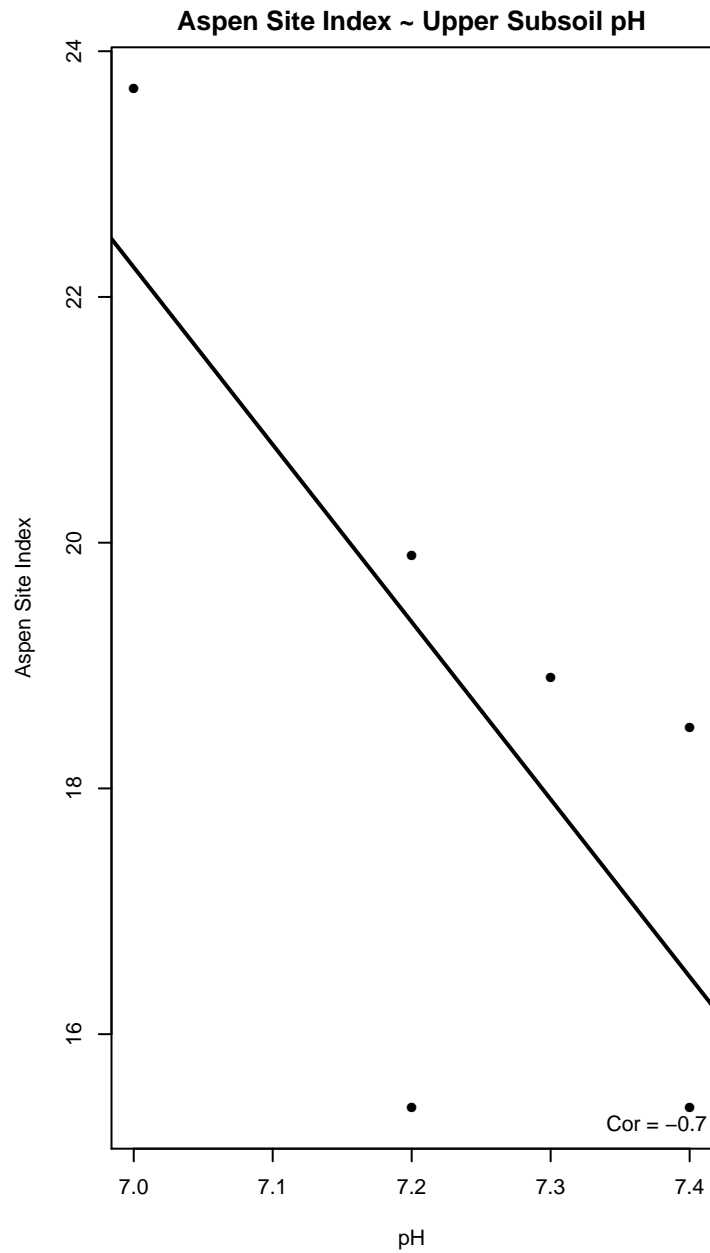
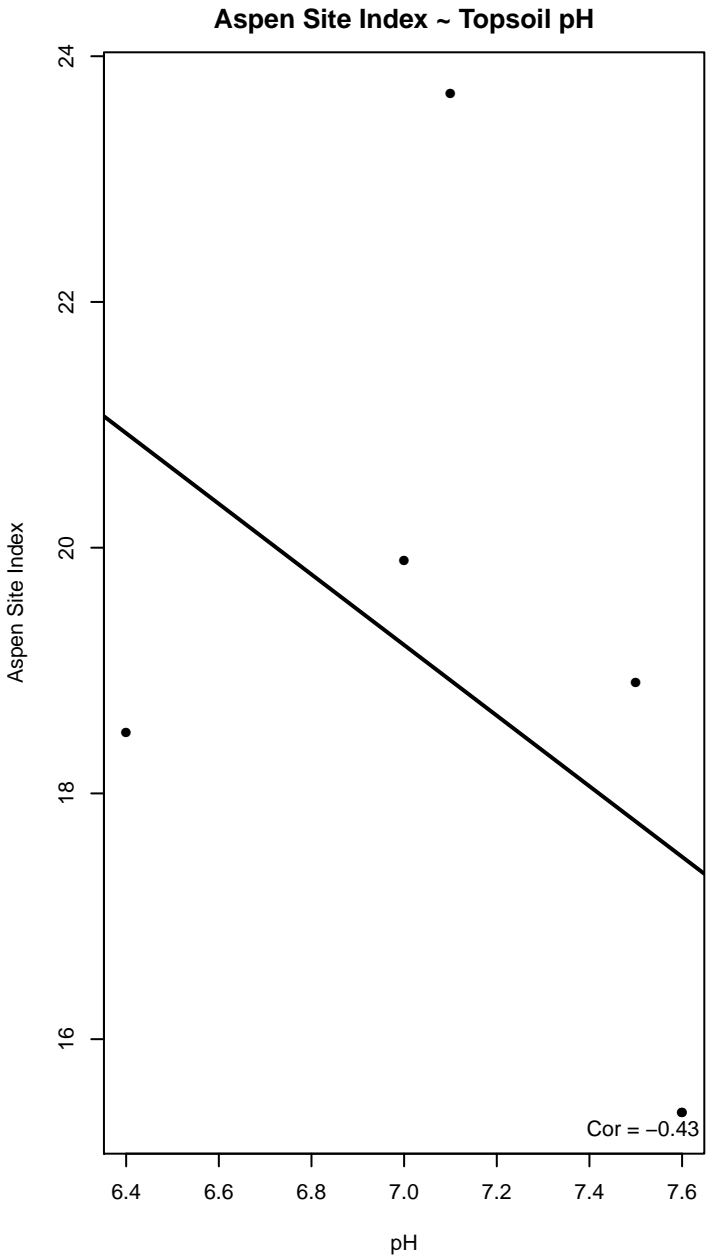


Figure D-5. Plots of Site Index with Electrical Conductivity by Soil Horizon for Aspen

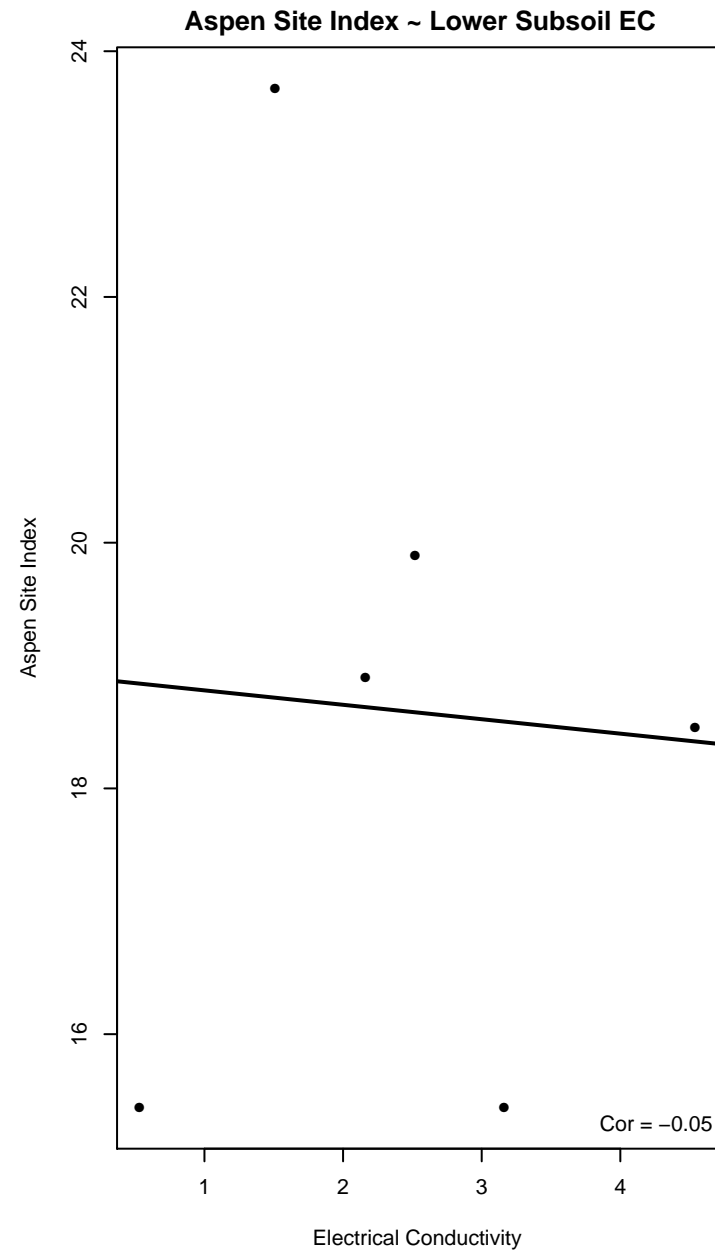
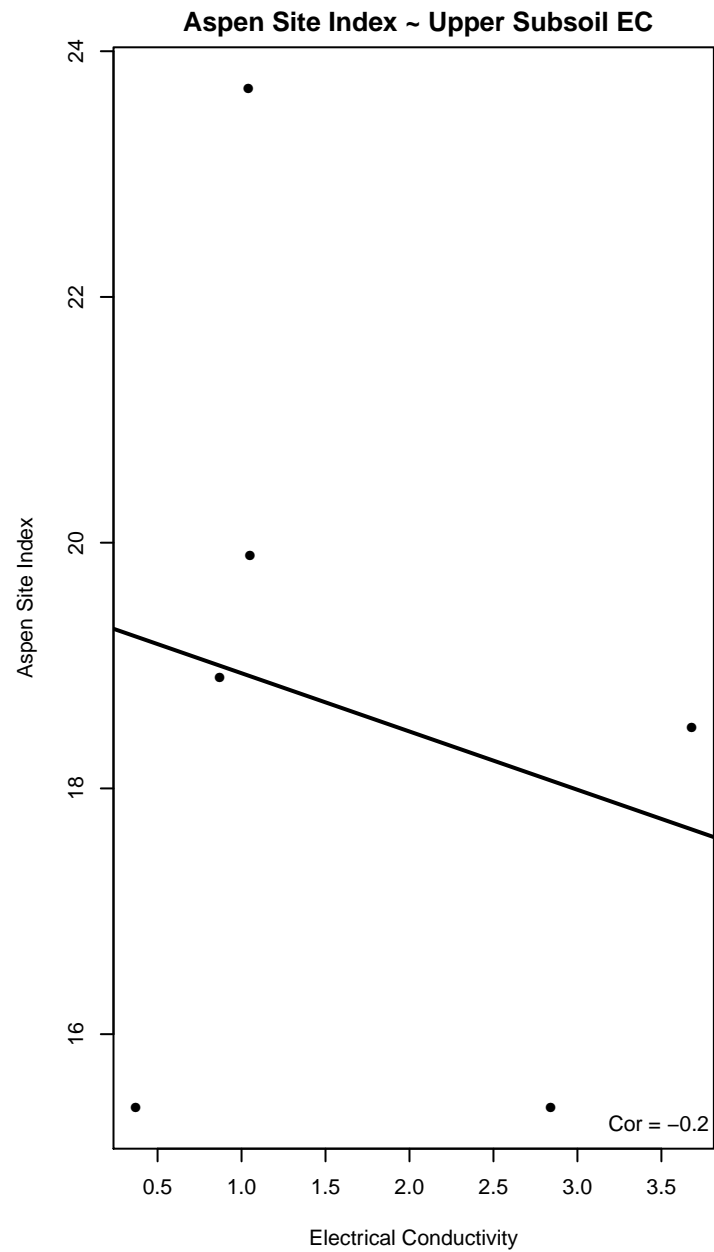
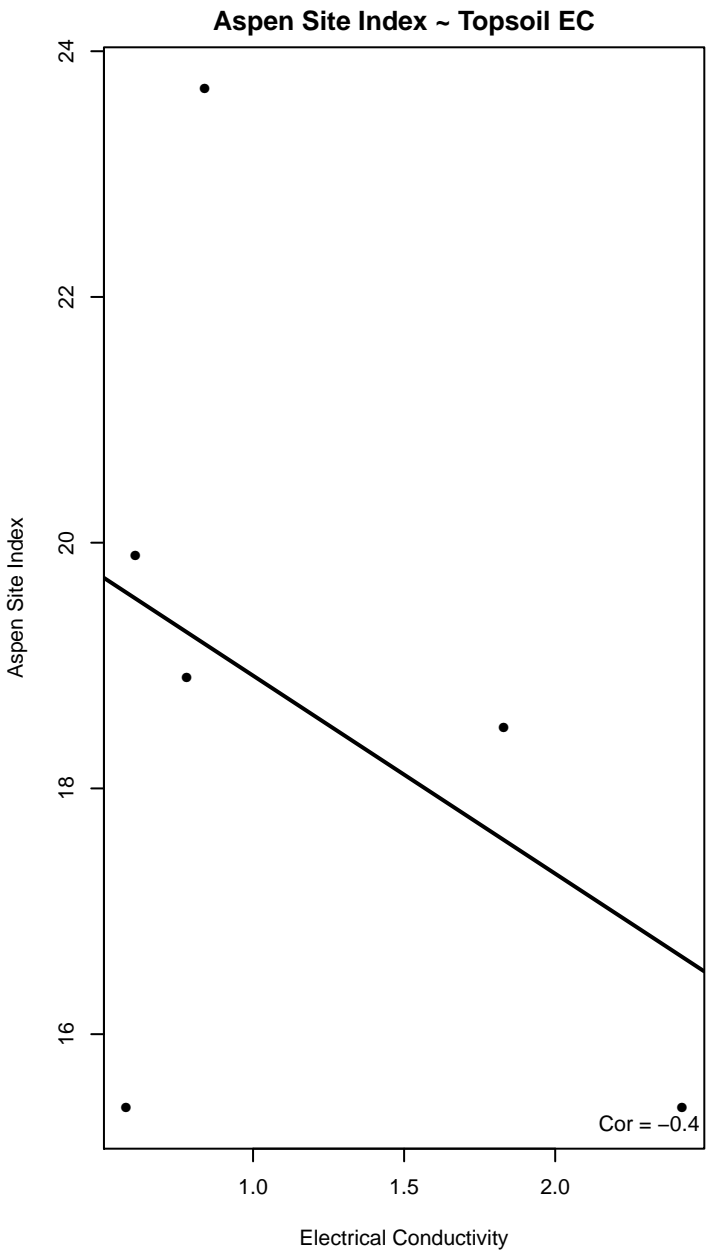
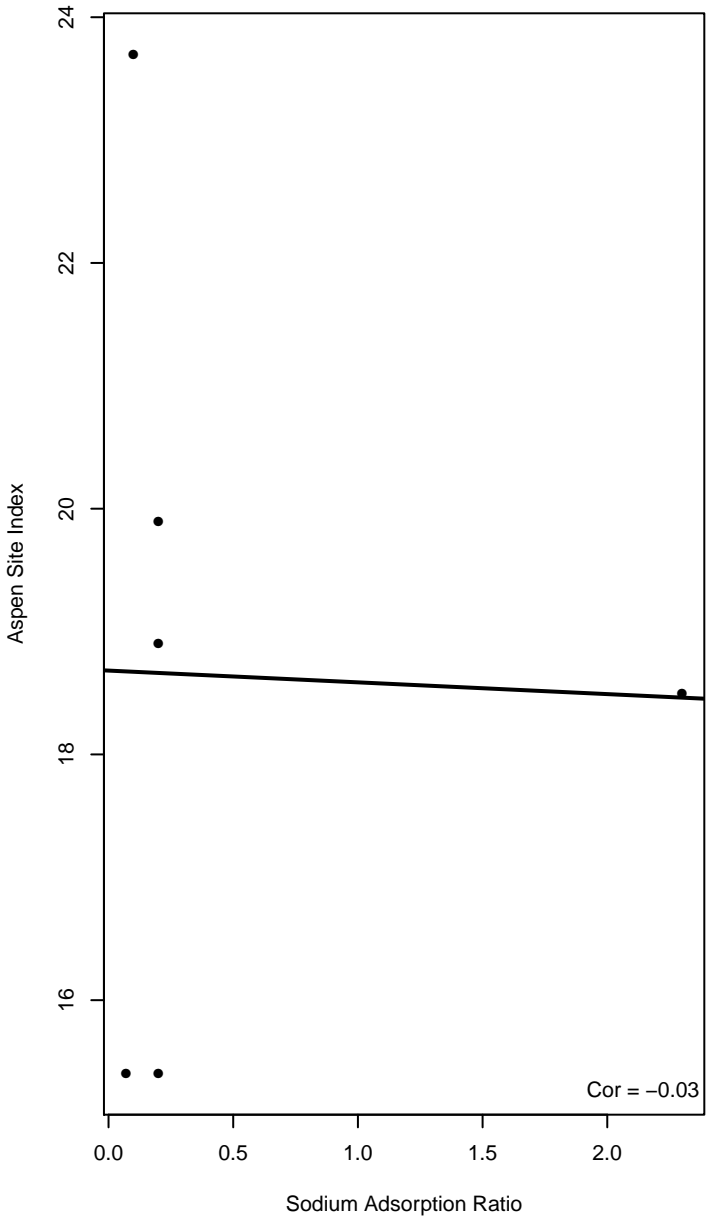
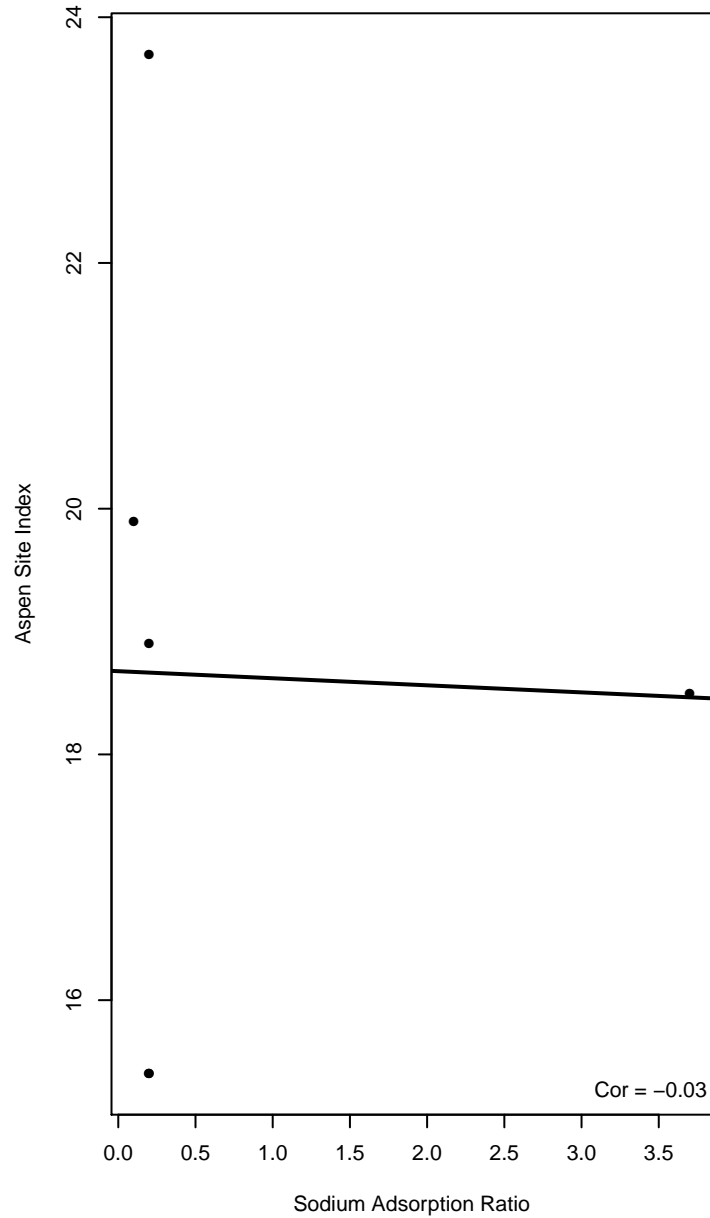


Figure D-6. Plots of Site Index with Sodium Adsorption Ratio by Soil Horizon for Aspen

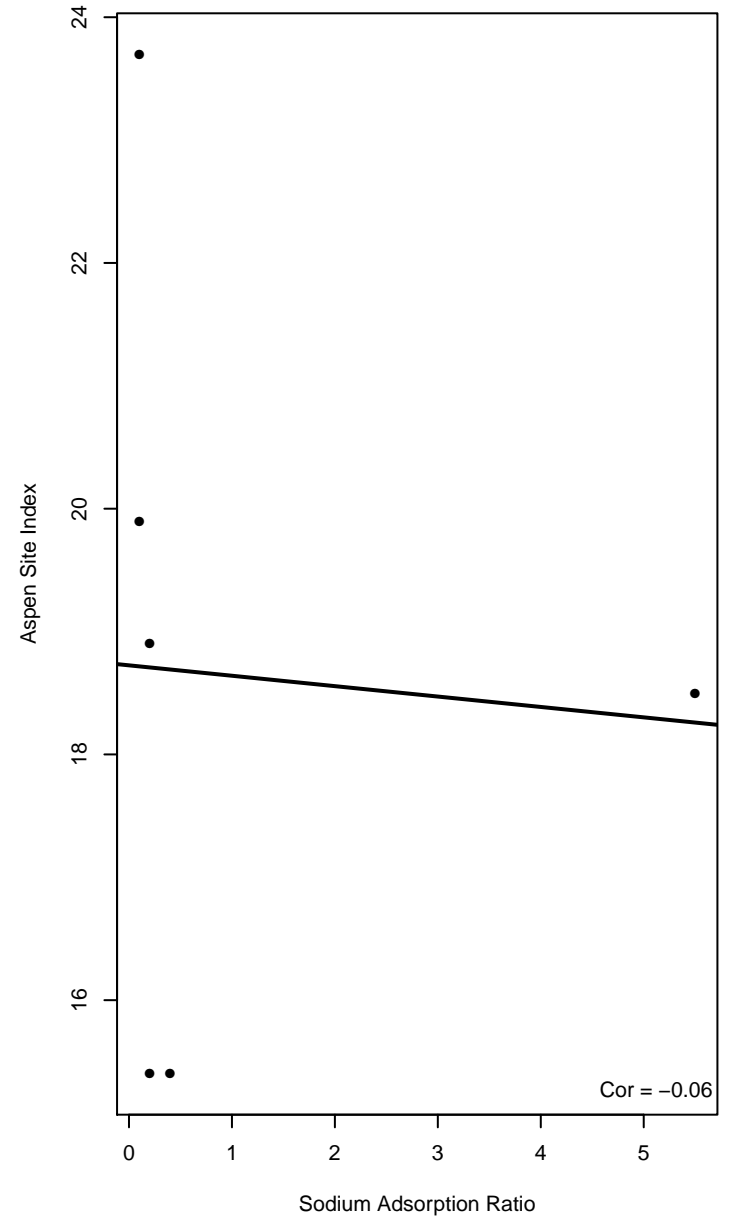
Aspen Site Index ~ Topsoil SAR



Aspen Site Index ~ Upper Subsoil SAR



Aspen Site Index ~ Lower Subsoil SAR



Appendix E Sample Site Photos



Photo 2 Plot 3 facing north



Photo 3 Plot 3 facing east



Photo 4 Plot 3 facing south



Photo 5 Plot 3 facing west



Photo 6 Plot 3 soil pit



Photo 7 Extra 3 soil pit



Photo 8 Plot 4 facing north



Photo 9 Plot 4 facing east



Photo 10 Plot 4 facing south



Photo 11 Plot 4 facing west



Photo 12 Plot 4 soil pit



Photo 13 Plot 5 facing north



Photo 14 Plot 5 facing east



Photo 15 Plot 5 facing south



Photo 16 Plot 5 facing west



Photo 17 Plot 5 soil pit



Photo 18 Extra 5 facing north



Photo 19 Extra 5 facing east



Photo 20 Extra 5 facing south



Photo 21 Extra 5 facing west



Photo 22 Extra 5 soil pit



Photo 23 Plot 7 facing north



Photo 24 Plot 7 facing east



Photo 25 Plot 7 facing south



Photo 26 Plot 7 facing west



Photo 27 Plot 7 soil pit



Photo 28 Plot 8 facing north



Photo 29 Plot 8 facing east



Photo 30 Plot 8 facing south



Photo 31 Plot 8 facing west



Photo 32 Plot 8 soil pit and spoil



Photo 33 Plot 9 facing north



Photo 34 Plot 9 facing east



Photo 35 Plot 9 facing south



Photo 36 Plot 9 facing west



Photo 37 Plot 9 soil pit



Photo 38 Plot 10 facing north



Photo 39 Plot 10 facing east



Photo 40 Plot 10 facing south



Photo 41 Plot 10 facing west



Photo 42 Plot 10 soil pit



Photo 43 Plot 11 facing north



Photo 44 Plot 11 facing east



Photo 45 Plot 11 facing south



Photo 46 Plot 11 facing west



Photo 47 Plot 11 soil pit



Photo 48 Plot 12 facing north



Photo 49 Plot 12 facing east



Photo 50 Plot 12 facing south



Photo 51 Plot 12 facing west



Photo 52 Plot 12 soil pit



Photo 53 Plot 13 facing north



Photo 54 Plot 13 facing east



Photo 55 Plot 13 facing south



Photo 56 Plot 13 facing west



Photo 57 Plot 13 soil pit



Photo 58 Plot 14 facing north



Photo 59 Plot 14 facing east



Photo 60 Plot 14 facing south



Photo 61 Plot 14 facing west



Photo 62 Plot 14 soil pit



Photo 63 Plot 15 facing north



Photo 64 Plot 15 facing east



Photo 65 Plot 15 facing south



Photo 66 Plot 15 facing west



Photo 67 Plot 15 soil pit



Photo 68 Plot 16 facing north



Photo 69 Plot 16 facing east



Photo 70 Plot 16 facing south



Photo 71 Plot 16 facing west



Photo 72 Plot 16 soil pit



Photo 73 Plot 17 facing north



Photo 74 Plot 17 facing east



Photo 75 Plot 17 facing south



Photo 76 Plot 17 facing west



Photo 77 Plot 17 soil pit



Photo 78 Plot 18 facing north



Photo 79 Plot 18 facing east



Photo 80 Plot 18 facing south



Photo 81 Plot 18 facing west



Photo 82 Plot 18 soil pit



Photo 83 Plot 19 facing north



Photo 84 Plot 19 facing east



Photo 85 Plot 19 facing south



Photo 86 Plot 19 facing west



Photo 87 Plot 19 soil pit



Photo 88 Plot 20 facing north



Photo 89 Plot 20 facing east



Photo 90 Plot 20 facing south



Photo 91 Plot 20 facing west



Photo 92 Plot 20 soil pit

Appendix F Laboratory Analysis Files and Certificates



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.:	Lot ID: 1239535 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243552
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil	Proj. Acct. code:	

		Reference Number	1239535-1	1239535-2	1239535-3	
		Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017	
		Sample Time	09:00	09:00	09:00	
		Sample Location				
		Sample Description	DSPlot10-02-AN	DSPlot10-03-AN	DSPlot10-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.53	0.57	0.63	0.01
SAR	Saturated Paste		0.1	0.1	0.1	
% Saturation		%	73	56	45	
Calcium	Saturated Paste	mg/kg	64.5	52.8	41.9	
Magnesium	Saturated Paste	mg/kg	14.7	10.8	11.5	
Sodium	Saturated Paste	mg/kg	4	3	3	
Potassium	Saturated Paste	mg/kg	3	2	3	
Chloride	Saturated Paste	mg/kg	6	4	3	
Sulfate (SO ₄)	Saturated Paste	mg/kg	90.7	99.4	113	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl ₂ sol.	pH	7.7	7.7	7.8	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.:	Lot ID: 1239535 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243552
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil	Proj. Acct. code: E6687	

	Reference Number	1239535-4	1239535-5	1239535-6		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	09:00	09:00	09:00		
	Sample Location					
	Sample Description	DSPlot10-02-HC	DSPlot10-03-HC	DSPlot10-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	1110	50
F3c C16-C34	Dry Weight	mg/kg	1800	2310	8070	50
F4c C34-C50	Dry Weight	mg/kg	1400	1750	4300	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	2900	4090	10500	100
% C50+	%		23.0	26.7	22.3	
Silica Gel Cleanup						
Silica Gel Cleanup			Done	Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	12.70	14.00	8.21	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.:	Lot ID: 1239535 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243552
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil	Proj. Acct. code: E6687	

	Reference Number	1239535-7	1239535-8	1239535-15		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	09:00	09:00	11:00		
	Sample Location					
	Sample Description	DSPlot10-02-BD1 / 298CM3	DSPlot10-02-BD2 / 298CM3	DSPlot15-02-BD1 / 298CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	14	33.0	28	0.1
Bulk Density		kg/L	0.81	0.51	0.63	
Bulk Density		kg/m³	810	507	630	
Wet Bulk Density		kg/L	0.94	0.76	0.88	
Porosity		%	na	na	na	
Volume	Declared Value	mL	298	298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.:	Lot ID: 1239535 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243552
Sampled By: Nikki McPhee Company: Paragon Soil	Proj. Acct. code: E6687	

		Reference Number	1239535-9	1239535-10	1239535-11	
		Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017	
		Sample Time	11:00	11:00	11:00	
		Sample Location				
		Sample Description	DSPlot15-02-AN	DSPlot15-03-AN	DSPlot15-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.58	0.37	0.53	0.01
SAR	Saturated Paste		0.2	0.2	0.2	
% Saturation		%	63	50	46	
Calcium	Saturated Paste	mg/kg	57.2	25.0	26.6	
Magnesium	Saturated Paste	mg/kg	15.3	7.9	12.4	
Sodium	Saturated Paste	mg/kg	4	3	4	
Potassium	Saturated Paste	mg/kg	5	2	4	
Chloride	Saturated Paste	mg/kg	5	3	3	
Sulfate (SO4)	Saturated Paste	mg/kg	50.6	42.0	82.3	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.6	7.4	7.4	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.:	Lot ID: 1239535 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243552
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil	Proj. Acct. code: E6687	

	Reference Number	1239535-12	1239535-13	1239535-14		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	11:00	11:00	11:00		
	Sample Location					
	Sample Description	DSPlot15-02-HC	DSPlot15-03-HC	DSPlot15-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	16	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	16	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	149	575	2380	50
F3c C16-C34	Dry Weight	mg/kg	3380	7180	12100	50
F4c C34-C50	Dry Weight	mg/kg	2430	4080	6090	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	5680	9120	14900	100
% C50+	%		25.8	21.0	21.2	
Silica Gel Cleanup						
Silica Gel Cleanup			Done	Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	11.80	7.43	11.10	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.:	Lot ID: 1239535 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243552
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil	Proj. Acct. code: E6687	

	Reference Number	1239535-16	1239535-23	1239535-24		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	11:00	14:00	14:00		
	Sample Location					
	Sample Description	DSPlot15-02-BD2 / 298CM3	DSPlot12-02-BD1 / 298CM3	DSPlot12-02-BD2 / 298CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	13	18	17	0.1
Bulk Density		kg/L	0.93	0.84	0.88	
Bulk Density		kg/m³	930	840	880	
Wet Bulk Density		kg/L	1.07	1.03	1.06	
Porosity		%	na	na	na	
Volume	Declared Value	mL	298	298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: Proj. Acct. code: E6687	Lot ID: 1239535 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243552
Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239535-17	1239535-18	1239535-19	
		Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017	
		Sample Time	14:00	14:00	14:00	
		Sample Location				
		Sample Description	DSPlot12-02-AN	DSPlot12-03-AN	DSPlot12-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.87	0.95	1.67	0.01
SAR	Saturated Paste		1.2	1.1	1.0	
% Saturation		%	71	51	47	
Calcium	Saturated Paste	mg/kg	80.6	63.4	127	
Magnesium	Saturated Paste	mg/kg	18.6	17.1	30.6	
Sodium	Saturated Paste	mg/kg	39	27	32	
Potassium	Saturated Paste	mg/kg	6	5	6	
Chloride	Saturated Paste	mg/kg	24	15	10	
Sulfate (SO4)	Saturated Paste	mg/kg	194	171	426	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.4	7.5	7.5	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.:	Lot ID: 1239535 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243552
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil	Proj. Acct. code: E6687	

	Reference Number	1239535-20	1239535-21	1239535-22		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	14:00	14:00	14:00		
	Sample Location					
	Sample Description	DSPlot12-02-HC	DSPlot12-03-HC	DSPlot12-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	131	608	50
F3c C16-C34	Dry Weight	mg/kg	1700	3680	6050	50
F4c C34-C50	Dry Weight	mg/kg	1560	2460	3320	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	3580	5940	7680	100
% C50+	%		28.8	25.9	21.4	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	15.60	11.20	11.20	

Approved by: 
Anthony Neumann, MSc
Laboratory Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.:	Lot ID: 1239535 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243552
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil	Proj. Acct. code: E6687	

Extractable Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	0	-10	10	yes
F3c C16-C34	µg/mL	0	-30	30	yes
F4c C34-C50	µg/mL	0	-20	20	yes
F4HTGCc C34-C50+	µg/mL	0	-20	20	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	89.04	80	120	yes
F3c C16-C34	µg/mL	94.80	80	120	yes
F4c C34-C50	µg/mL	90.21	80	120	yes
F4HTGCc C34-C50+	µg/mL	88.72	80	120	yes

Date Acquired: November 17, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	89	70	130	yes
F3c C16-C34	mg/kg	108	70	130	yes
F4c C34-C50	mg/kg	103	70	130	yes
F4HTGCc C34-C50+	mg/kg	106	70	130	yes

Date Acquired: November 17, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.00442867	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.005	0.005	yes
Toluene	ng	0	-0.06	0.06	yes
Ethylbenzene	ng	0	-0.030	0.030	yes
Total Xylenes (m,p,o)	ng	0	-0.09	0.09	yes
Styrene	ng	0	-0.030	0.030	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	96.40	80	120	yes
Toluene	ng	90.00	80	120	yes
Ethylbenzene	ng	94.60	80	120	yes
Total Xylenes (m,p,o)	ng	94.00	80	120	yes
Styrene	ng	83.60	80	120	yes

Date Acquired: November 17, 2017

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	19	21	10	0.3	yes

Date Acquired: November 20, 2017

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.:	Lot ID: 1239535 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243552
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil	Proj. Acct. code: E6687	

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0829174	-0.4	0.5	yes
Magnesium	mg/L	0.0355841	-0.1	0.1	yes
Sodium	mg/L	0.0649487	-0	2	yes
Potassium	mg/L	0.0337593	-0.5	0.7	yes
Chloride	mg/L	2.1572	0	5	yes
Sulfate-S	mg/L	0.0251397	-0	1	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Electrical Conductivity	dS/m	2.98	2.71	3.25	yes
% Saturation	%	47	38	52	yes
Calcium	mg/L	710	596.2	767.8	yes
Magnesium	mg/L	147	121.8	154.8	yes
Sodium	mg/L	77	58	79	yes
Potassium	mg/L	23	17.8	24.6	yes
Chloride	mg/L	66	57	78	yes
Sulfate-S	mg/L	644	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.3	26.80	35.20	yes
Calcium	mg/L	246	230.2	261.4	yes
Magnesium	mg/L	95.3	92.7	99.7	yes
Sodium	mg/L	244	229	269	yes
Potassium	mg/L	241	229.4	265.4	yes
Chloride	mg/L	2000	1871	2231	yes
Sulfate-S	mg/L	146	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	7.4	7.4	0	0.3	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 17, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	0	-10	10	yes

Date Acquired: November 17, 2017

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: Proj. Acct. code: E6687	Lot ID: 1239535 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243552
--	---	--

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME - Soil	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary
BTEX-CCME - Soil	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Calgary
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl ₂ (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME-Soil (Shake)	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary

** Reference Method Modified*

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Hydrocarbon Chromatogram

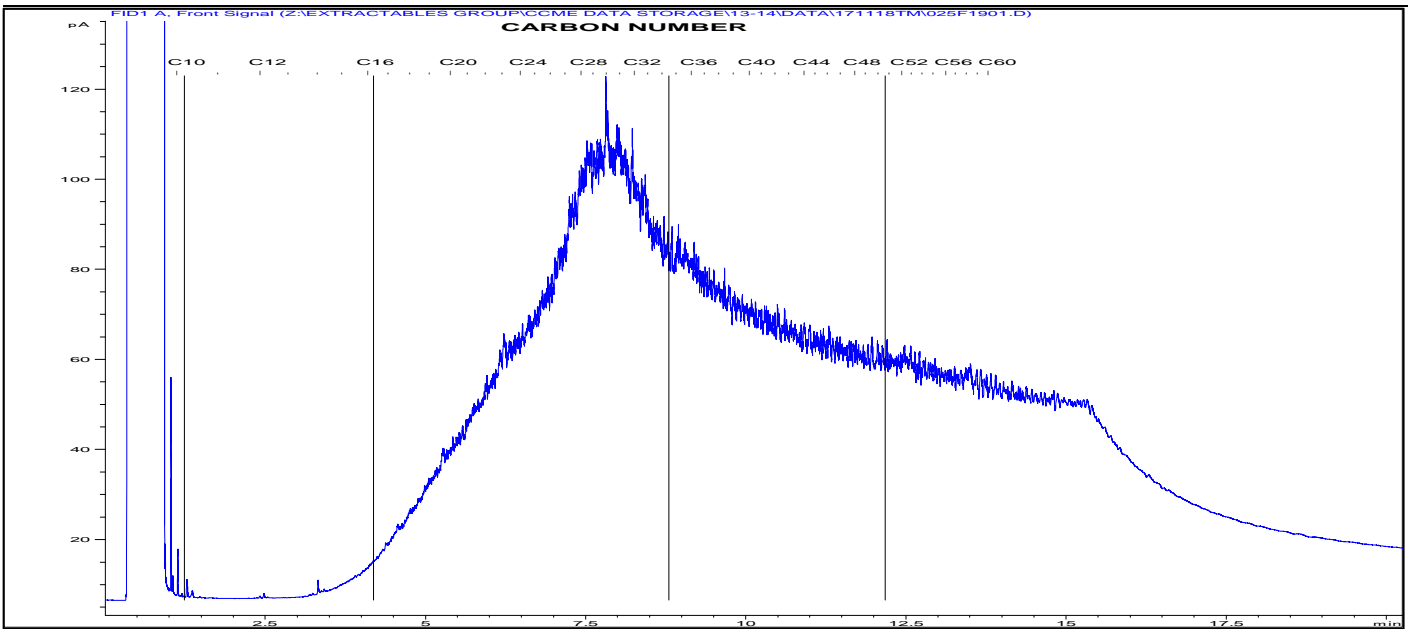
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239535
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.:	Report Number: 2243552
Company: Paragon Soil		

Exova Number: 1239535-4

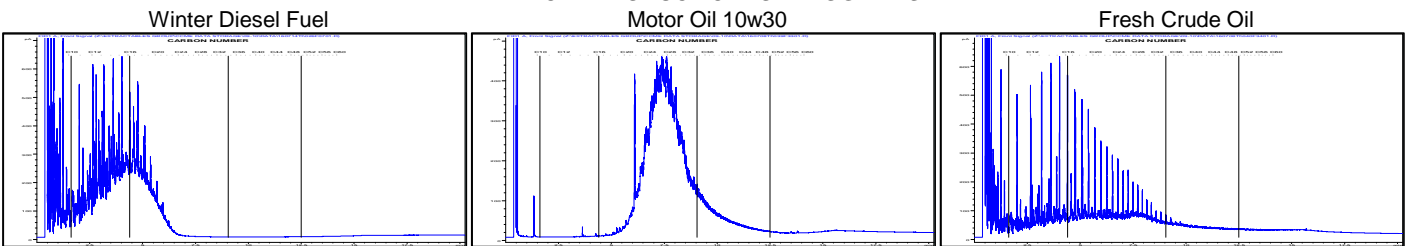
Sample Description: DSPlot10-02-HC

Silica Gel Treated

Sample Date: Nov 11, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

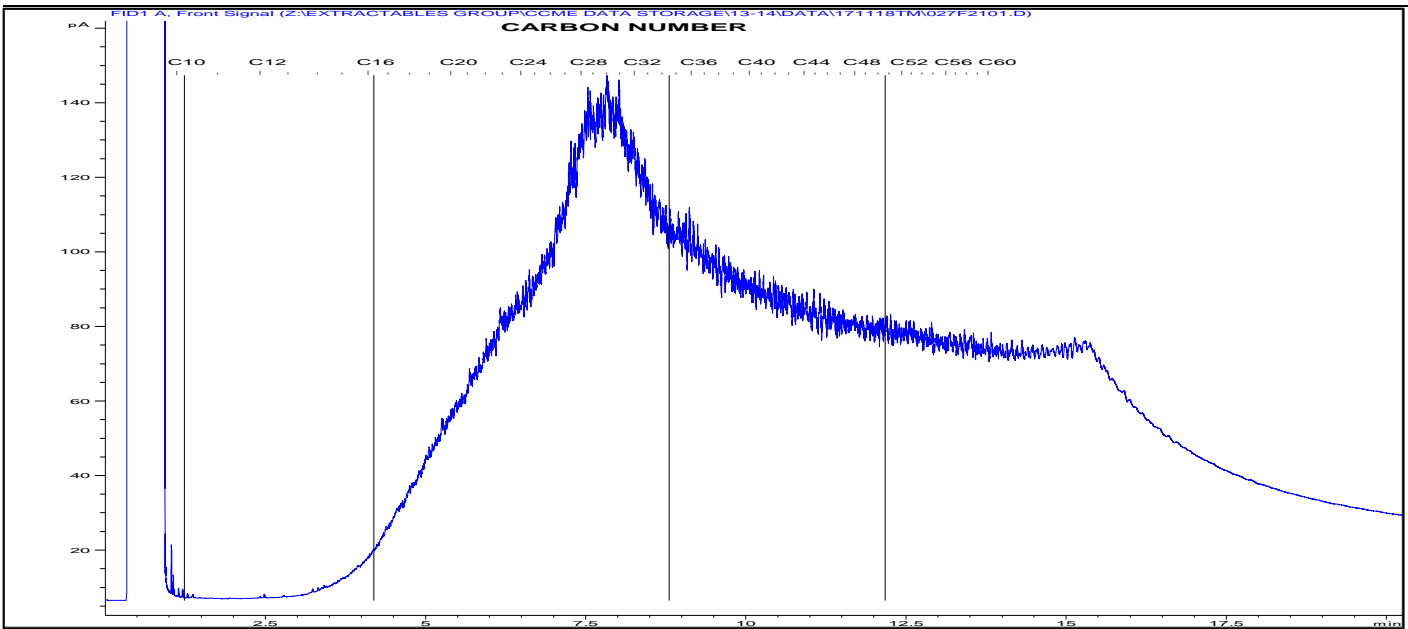
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239535
Report To: Syncrude Canada Ltd.	Name: Suncor LOS	Control Number: C0056638
P. O. 4009, MD 0078	Location: Suncor Basemine	Date Received: Nov 15, 2017
Fort McMurray, AB, Canada	LSD:	Date Reported: Nov 20, 2017
T9H 3L1	P.O.:	Report Number: 2243552
Attn: Marty Yarmuch		
Sampled by: Nikki McPhee		
Company: Paragon Soil		

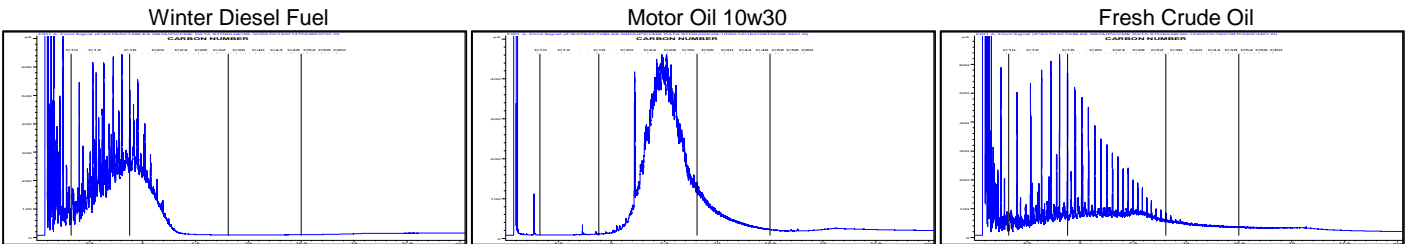
Exova Number: 1239535-5
 Sample Date: Nov 11, 2017

Sample Description: DSPlot10-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

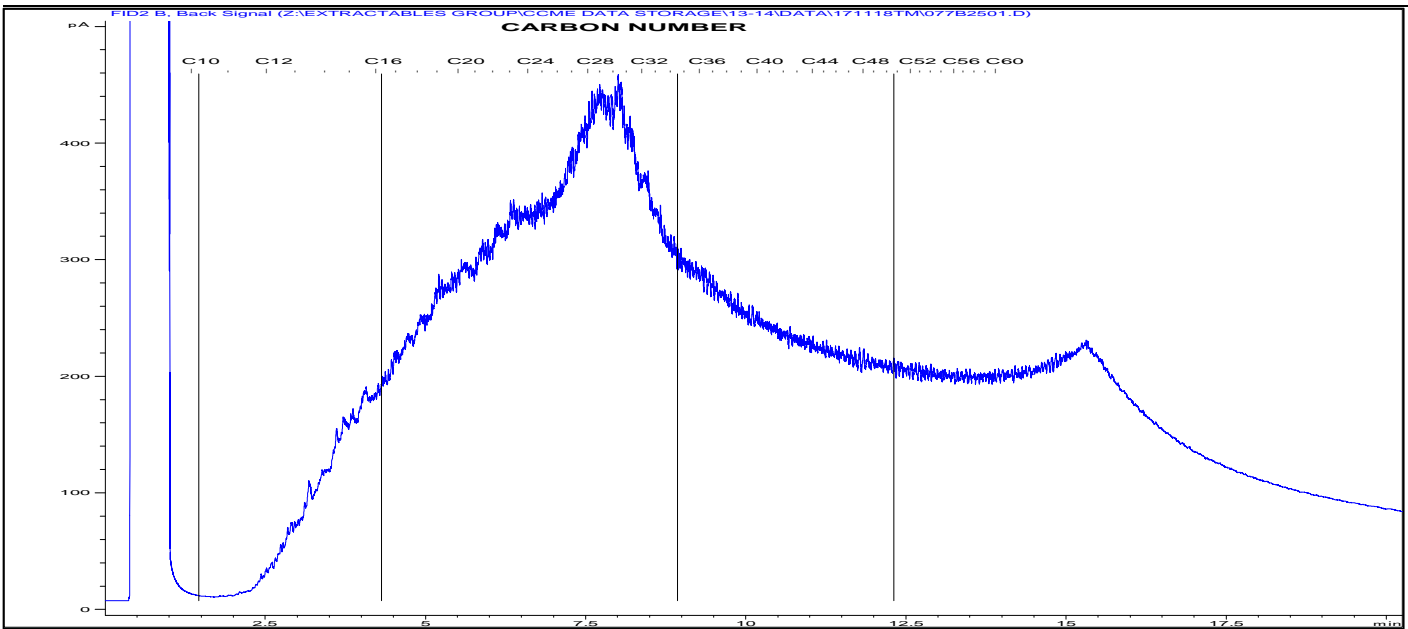
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239535
Report To: Syncrude Canada Ltd.	Name: Suncor LOS	Control Number: C0056638
P. O. 4009, MD 0078	Location: Suncor Basemine	Date Received: Nov 15, 2017
Fort McMurray, AB, Canada	LSD:	Date Reported: Nov 20, 2017
T9H 3L1	P.O.:	Report Number: 2243552
Attn: Marty Yarmuch		
Sampled by: Nikki McPhee		
Company: Paragon Soil		

Exova Number: 1239535-6

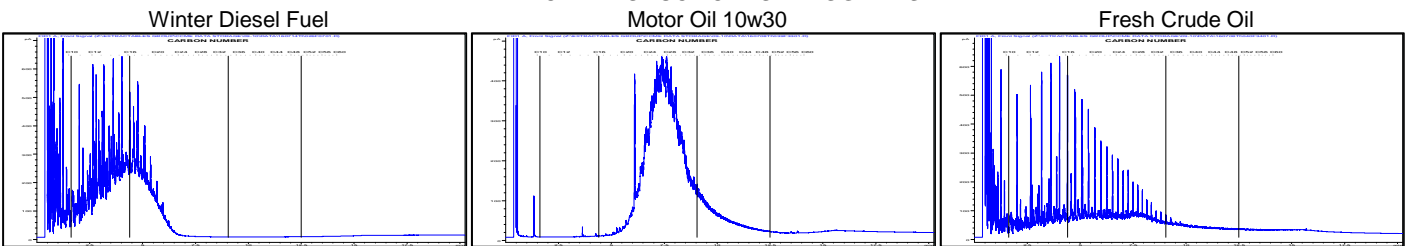
Sample Description: DSPlot10-04-HC

Silica Gel Treated

Sample Date: Nov 11, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

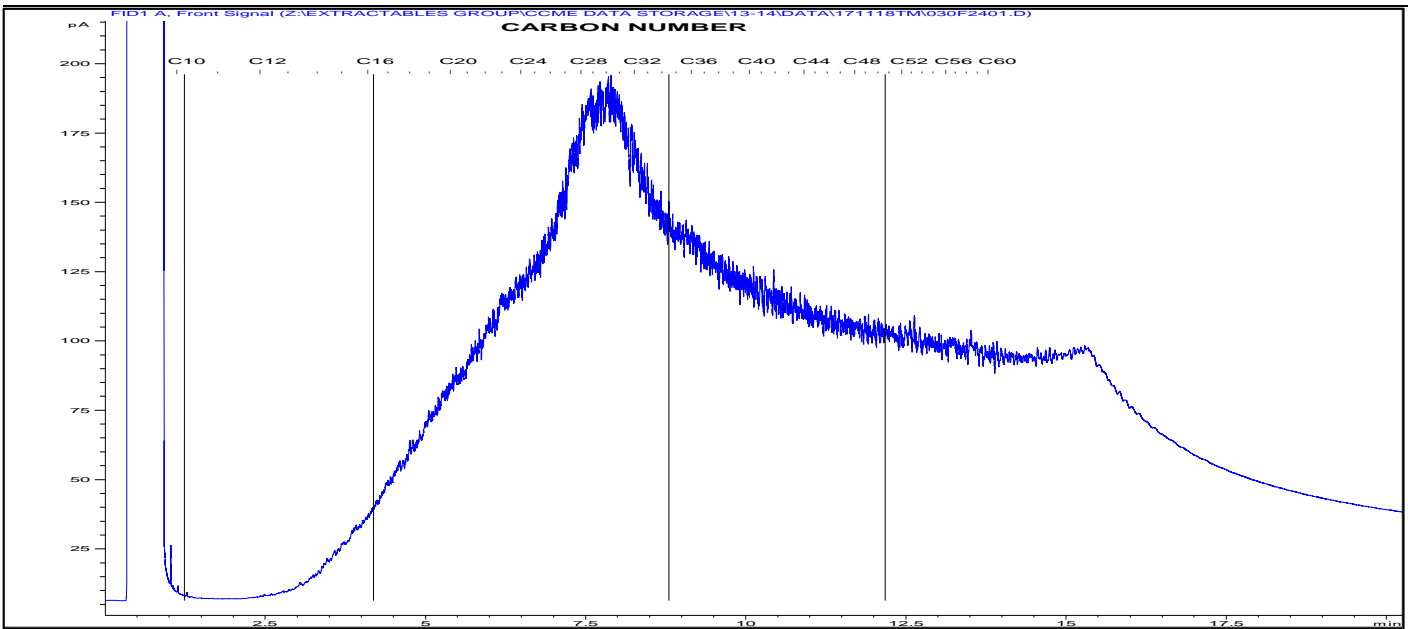
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239535
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.:	Report Number: 2243552
Company: Paragon Soil		

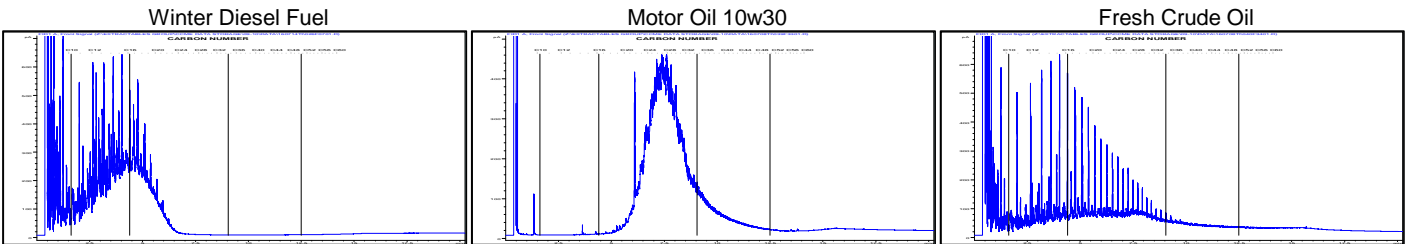
Exova Number: 1239535-12
 Sample Date: Nov 11, 2017

Sample Description: DSPlot15-02-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

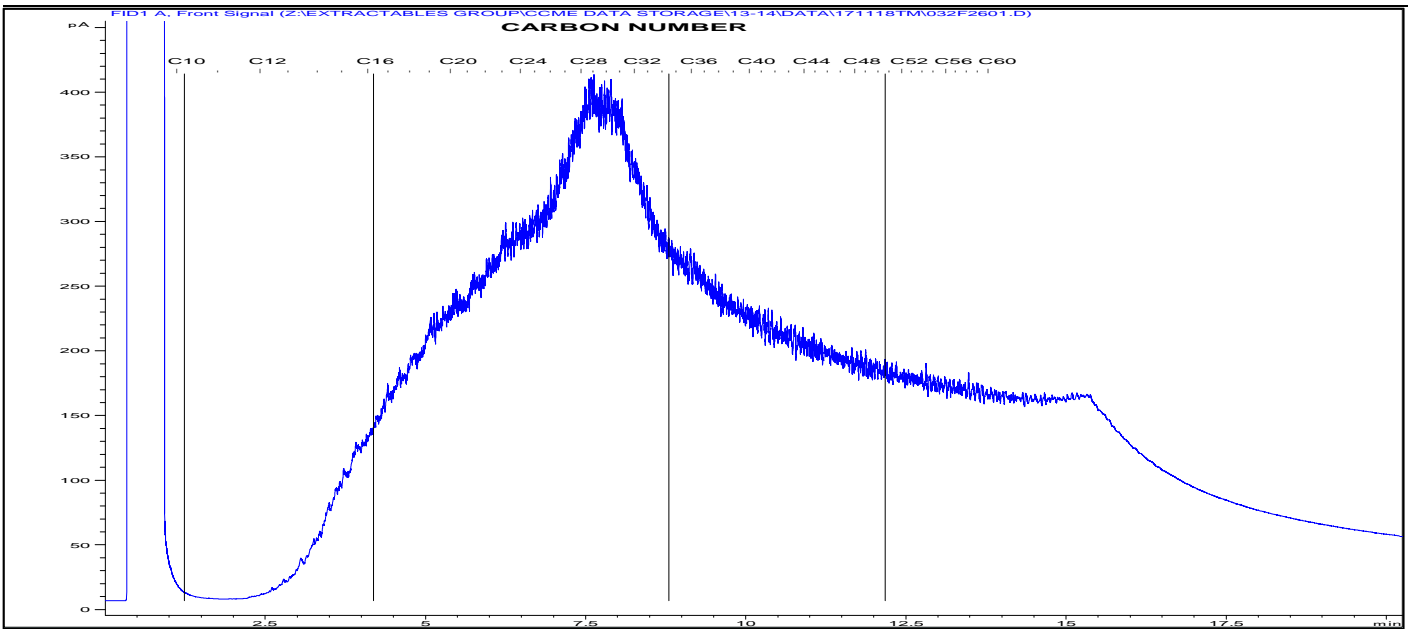
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239535
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.:	Report Number: 2243552
Company: Paragon Soil		

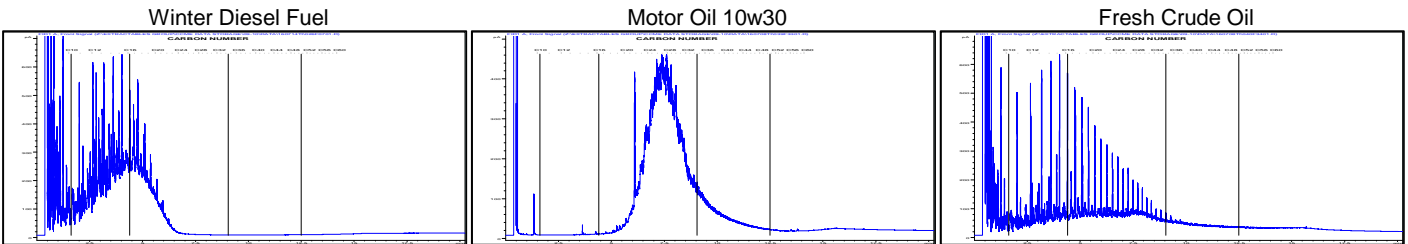
Exova Number: 1239535-13
 Sample Date: Nov 11, 2017

Sample Description: DSPlot15-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

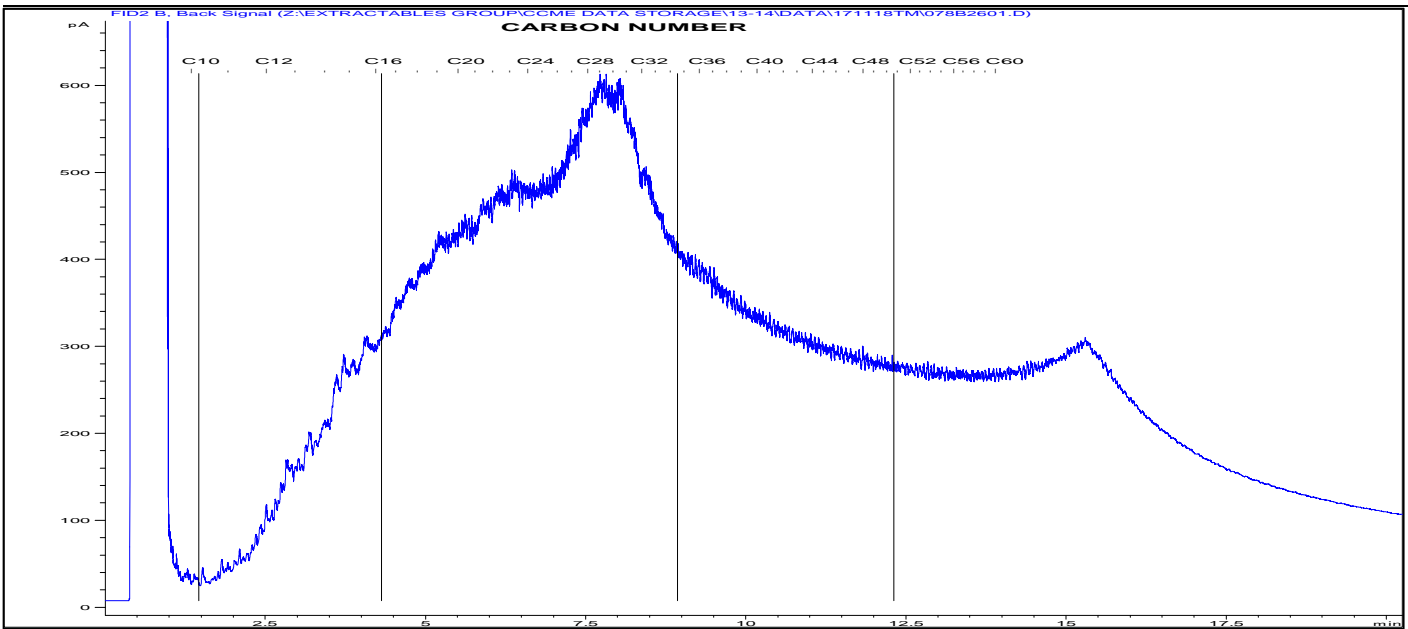
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239535
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.:	Report Number: 2243552
Company: Paragon Soil		

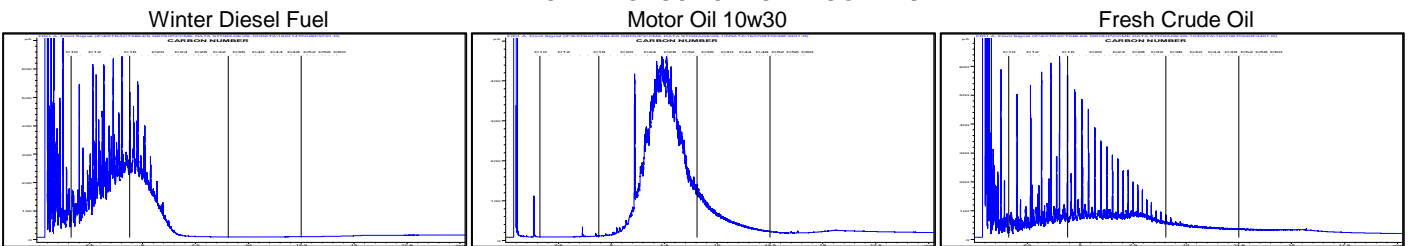
Exova Number: 1239535-14
 Sample Date: Nov 11, 2017

Sample Description: DSPlot15-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

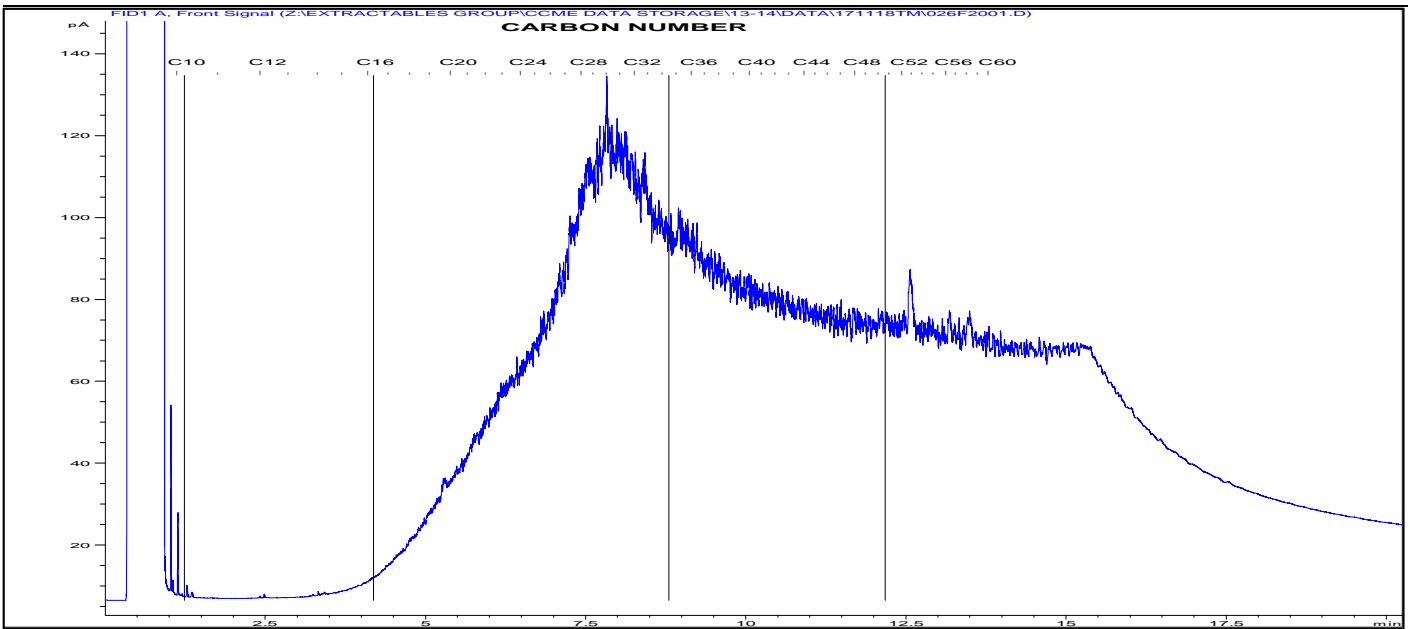
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239535
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.:	Report Number: 2243552
Company: Paragon Soil		

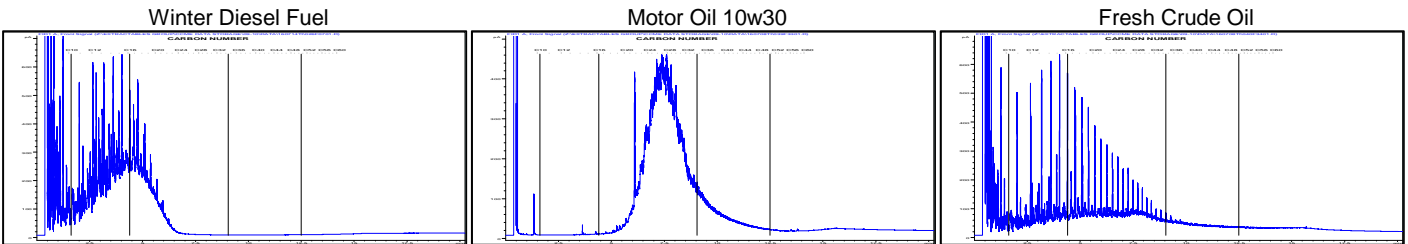
Exova Number: 1239535-20
 Sample Date: Nov 11, 2017

Sample Description: DSPlot12-02-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

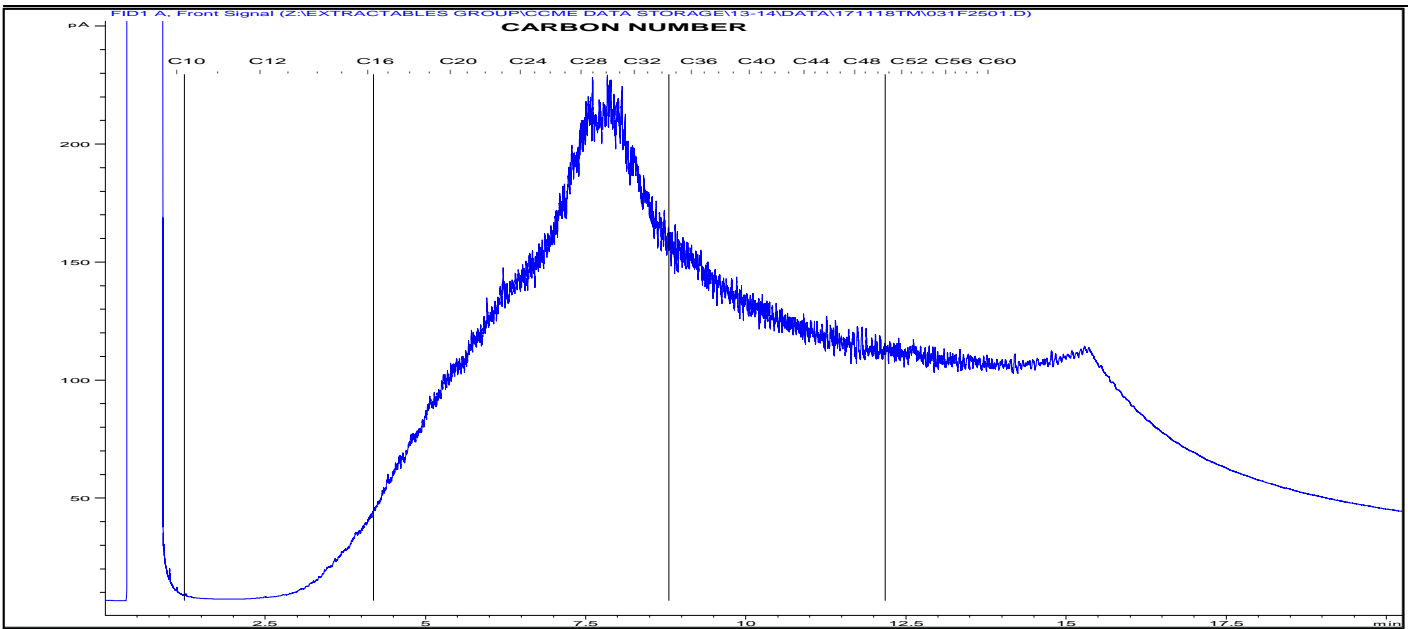
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239535
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.:	Report Number: 2243552
Company: Paragon Soil		

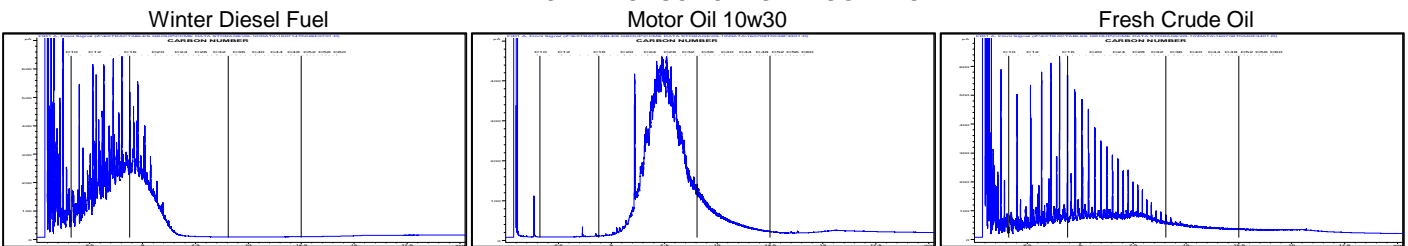
Exova Number: 1239535-21
 Sample Date: Nov 11, 2017

Sample Description: DSPlot12-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

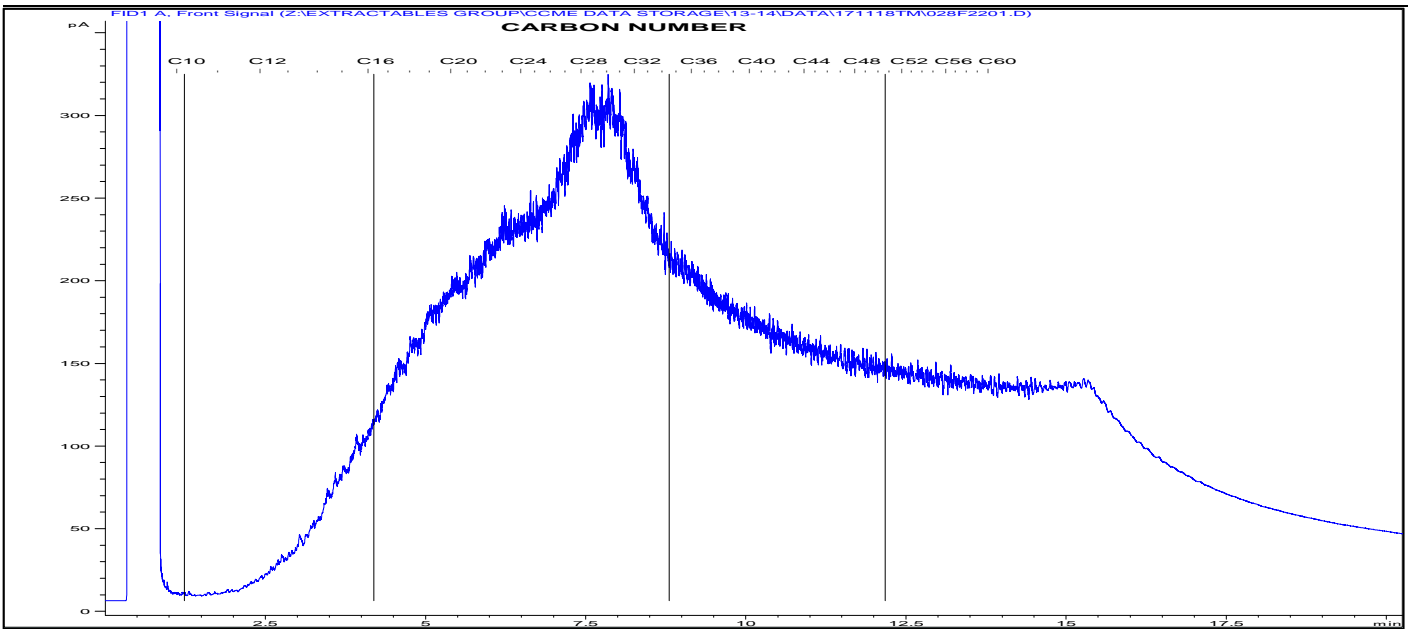
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239535
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.:	Report Number: 2243552
Company: Paragon Soil		

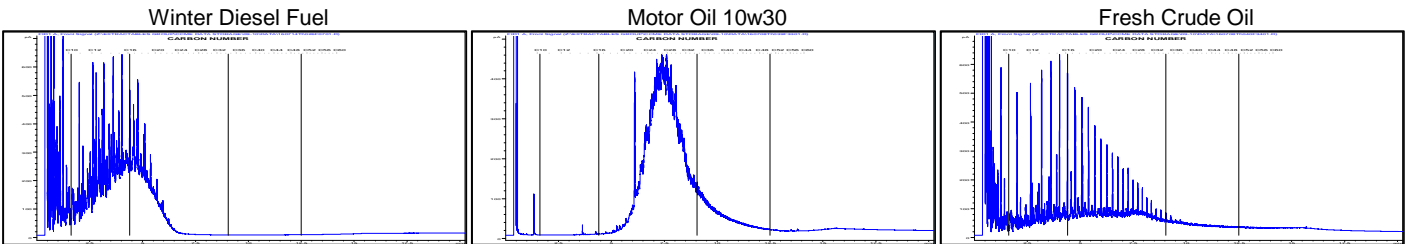
Exova Number: 1239535-22
 Sample Date: Nov 11, 2017

Sample Description: DSPlot12-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.:	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil	Proj. Acct. code: E6687	

		Reference Number	1239545-1	1239545-2	1239545-3	
		Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	DSPlot20-02-AN	DSPlot20-03-AN	DSPlot20-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.65	0.73	1.88	0.01
SAR	Saturated Paste		0.3	0.2	0.1	
% Saturation		%	92	47	47	
Calcium	Saturated Paste	mg/kg	96.3	61.2	201	
Magnesium	Saturated Paste	mg/kg	23.4	11.6	28.6	
Sodium	Saturated Paste	mg/kg	10	5	5	
Potassium	Saturated Paste	mg/kg	2	1	4	
Chloride	Saturated Paste	mg/kg	14	5	3	
Sulfate (SO ₄)	Saturated Paste	mg/kg	185	119	575	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl ₂ sol.	pH	7.1	7.0	7.2	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239545-4	1239545-5	1239545-6		
	Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	DSPlot20-02-HC	DSPlot20-03-HC	DSPlot20-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	46	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	46	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	50	381	4380	50
F3c C16-C34	Dry Weight	mg/kg	2400	4650	20900	50
F4c C34-C50	Dry Weight	mg/kg	1880	2810	9930	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	4540	6360	21900	100
% C50+	%		28.4	22.1	17.5	
Silica Gel Cleanup						
Silica Gel Cleanup			Done	Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	15.20	6.34	7.11	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239545-7	1239545-8	1239545-15		
	Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	12:00		
	Sample Location					
	Sample Description	DSPlot20-02-BD1 / 298CM3	DSPlot20-02-BD2 / 298CM3	DSPlot3-02-BD1 / 298CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	29	28	30	0.1
Bulk Density		kg/L	0.68	0.69	0.56	
Bulk Density		kg/m³	680	690	560	
Wet Bulk Density		kg/L	0.96	0.96	0.80	
Porosity		%	na	na	na	
Volume	Declared Value	mL	298	298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.:	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Sampled By: Nikki McPhee Company: Paragon Soil	Proj. Acct. code: E6687	

		Reference Number	1239545-9	1239545-10	1239545-11	
		Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
		Sample Time	12:00	12:00	12:00	
		Sample Location				
		Sample Description	DSPlot3-02-AN	DSPlot3-03-AN	DSPlot3-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	2.42	2.84	3.16	0.01
SAR	Saturated Paste		<0.1	0.2	0.4	
% Saturation		%	83	63	65	
Calcium	Saturated Paste	mg/kg	615	462	438	
Magnesium	Saturated Paste	mg/kg	59	96.4	156	
Sodium	Saturated Paste	mg/kg	8	16	31	
Potassium	Saturated Paste	mg/kg	13	<6	10	
Chloride	Saturated Paste	mg/kg	9	9	11	
Sulfate (SO4)	Saturated Paste	mg/kg	1490	1260	1490	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.6	7.2	7.2	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.:	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil	Proj. Acct. code: E6687	

	Reference Number	1239545-12	1239545-13	1239545-14		
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017		
	Sample Time	12:00	12:00	12:00		
	Sample Location					
	Sample Description	DSPlot3-02-HC	DSPlot3-03-HC	DSPlot3-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	166	50
F3c C16-C34	Dry Weight	mg/kg	1040	1760	3720	50
F4c C34-C50	Dry Weight	mg/kg	885	1100	2170	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	1860	2200	4730	100
% C50+		%	24.7	19.1	20.7	
Silica Gel Cleanup						
Silica Gel Cleanup			Done	Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	20.90	18.90	14.30	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.:	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Sampled By: Nikki McPhee Company: Paragon Soil	Proj. Acct. code: E6687	

	Reference Number	1239545-16	1239545-23	1239545-24		
	Sample Date	Nov 10, 2017	Nov 12, 2017	Nov 12, 2017		
	Sample Time	12:00	16:00	16:00		
	Sample Location					
	Sample Description	DSPlot3-02-BD2 / 298CM3	DSPlot19-02-BD1 / 298CM3	DSPlot19-02-BD2 / 298CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	23	39.8	39.4	0.1
Bulk Density		kg/L	0.63	0.24	0.25	
Bulk Density		kg/m³	630	244	253	
Wet Bulk Density		kg/L	0.82	0.41	0.42	
Porosity		%	na	na	na	
Volume	Declared Value	mL	298	298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.:	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil	Proj. Acct. code: E6687	

		Reference Number	1239545-17	1239545-18	1239545-19	
		Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017	
		Sample Time	16:00	16:00	16:00	
		Sample Location				
		Sample Description	DSPlot19-02-AN	DSPlot19-03-AN	DSPlot19-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.58	1.73	1.42	0.01
SAR	Saturated Paste		0.4	0.3	0.3	
% Saturation		%	163	48	45	
Calcium	Saturated Paste	mg/kg	477	160	120	
Magnesium	Saturated Paste	mg/kg	108	37.1	24.9	
Sodium	Saturated Paste	mg/kg	50	13	9	
Potassium	Saturated Paste	mg/kg	11	2	2	
Chloride	Saturated Paste	mg/kg	41	9	5	
Sulfate (SO4)	Saturated Paste	mg/kg	1570	545	406	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	5.0	4.6	4.5	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.:	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil	Proj. Acct. code: E6687	

	Reference Number	1239545-20	1239545-21	1239545-22		
	Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017		
	Sample Time	16:00	16:00	16:00		
	Sample Location					
	Sample Description	DSPlot19-02-HC	DSPlot19-03-HC	DSPlot19-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	24	10	12	10
F1 -BTEX	Dry Weight	mg/kg	24	10	12	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	104	2050	3400	50
F3c C16-C34	Dry Weight	mg/kg	3120	11400	14000	50
F4c C34-C50	Dry Weight	mg/kg	2120	4580	5380	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	5980	8830	10700	100
% C50+	%		31.4	12.6	12.6	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	31.10	8.14	10.40	

Approved by: 
Anthony Neumann, MSc
Laboratory Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Extractable Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	0	-10	10	yes
F3c C16-C34	µg/mL	0	-30	30	yes
F4c C34-C50	µg/mL	0	-20	20	yes
F4HTGCc C34-C50+	µg/mL	0	-20	20	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	94.60	80	120	yes
F3c C16-C34	µg/mL	96.74	80	120	yes
F4c C34-C50	µg/mL	93.01	80	120	yes
F4HTGCc C34-C50+	µg/mL	90.88	80	120	yes

Date Acquired: November 17, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.00442867	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.005	0.005	yes
Toluene	ng	0	-0.06	0.06	yes
Ethylbenzene	ng	0	-0.030	0.030	yes
Total Xylenes (m,p,o)	ng	0	-0.09	0.09	yes
Styrene	ng	0	-0.030	0.030	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	95.60	80	120	yes
Toluene	ng	83.80	80	120	yes
Ethylbenzene	ng	93.40	80	120	yes
Total Xylenes (m,p,o)	ng	94.00	80	120	yes
Styrene	ng	82.20	80	120	yes

Date Acquired: November 17, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Benzene	mg/kg	<0.005	<0.005	50	0.010	yes
Toluene	mg/kg	<0.02	<0.02	50	0.04	yes
Ethylbenzene	mg/kg	<0.005	<0.005	50	0.020	yes
m,p-Xylene	mg/kg	<0.02	<0.02	50	0.04	yes
o-Xylene	mg/kg	<0.02	<0.02	50	0.04	yes
Total Xylenes (m,p,o)	mg/kg	<0.03	<0.03	50	0.06	yes
Styrene	mg/kg	<0.01	<0.01	50	0.020	yes

Date Acquired: November 17, 2017

Physical and Aggregate Properties

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	29	30	10	0.3	yes
Date Acquired: November 20, 2017						

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0829174	-0.4	0.5	yes
Magnesium	mg/L	0.0355841	-0.1	0.1	yes
Sodium	mg/L	0.0649487	-0	2	yes
Potassium	mg/L	0.0337593	-0.5	0.7	yes
Chloride	mg/L	2.1572	0	5	yes
Sulfate-S	mg/L	0.0251397	-0	1	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Electrical Conductivity	dS/m	2.98	2.71	3.25	yes
% Saturation	%	47	38	52	yes
Calcium	mg/L	710	596.2	767.8	yes
Magnesium	mg/L	147	121.8	154.8	yes
Sodium	mg/L	77	58	79	yes
Potassium	mg/L	23	17.8	24.6	yes
Chloride	mg/L	66	57	78	yes
Sulfate-S	mg/L	644	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.3	26.80	35.20	yes
Calcium	mg/L	246	230.2	261.4	yes
Magnesium	mg/L	95.3	92.7	99.7	yes
Sodium	mg/L	244	229	269	yes
Potassium	mg/L	241	229.4	265.4	yes
Chloride	mg/L	2000	1871	2231	yes
Sulfate-S	mg/L	146	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	7.7	7.6	0	0.3	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 17, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	0	-10	10	yes

Date Acquired: November 17, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
--------------------------	-------	-------------	-------------	----------------	-------------------	-----------



Quality Control

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
P. O. 4009, MD 0078	Project Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada	Project Location: Suncor Basemine	Date Received: Nov 15, 2017
T9H 3L1	LSD:	Date Reported: Nov 22, 2017
Attn: Marty Yarmuch	P.O.: 4410252962	Report Number: 2243562
Sampled By: Nikki McPhee	Proj. Acct. code: E6687	
Company: Paragon Soil		

Volatile Petroleum Hydrocarbons - Soil -

Continued

Client Sample	Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F1 C6-C10		mg/kg	10	10	50	0	yes
F1 -BTEX		mg/kg	10	10	50	0	yes
Date Acquired: November 17, 2017							
Matrix Spike		Units	% Recovery	Lower Limit	Upper Limit		Passed QC
F1 C6-C10		mg/kg	84	80	120		yes
Date Acquired: November 17, 2017							

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME - Soil	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary
BTEX-CCME - Soil	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Calgary
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl2 (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME-Soil (Shake)	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary

** Reference Method Modified*

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Hydrocarbon Chromatogram

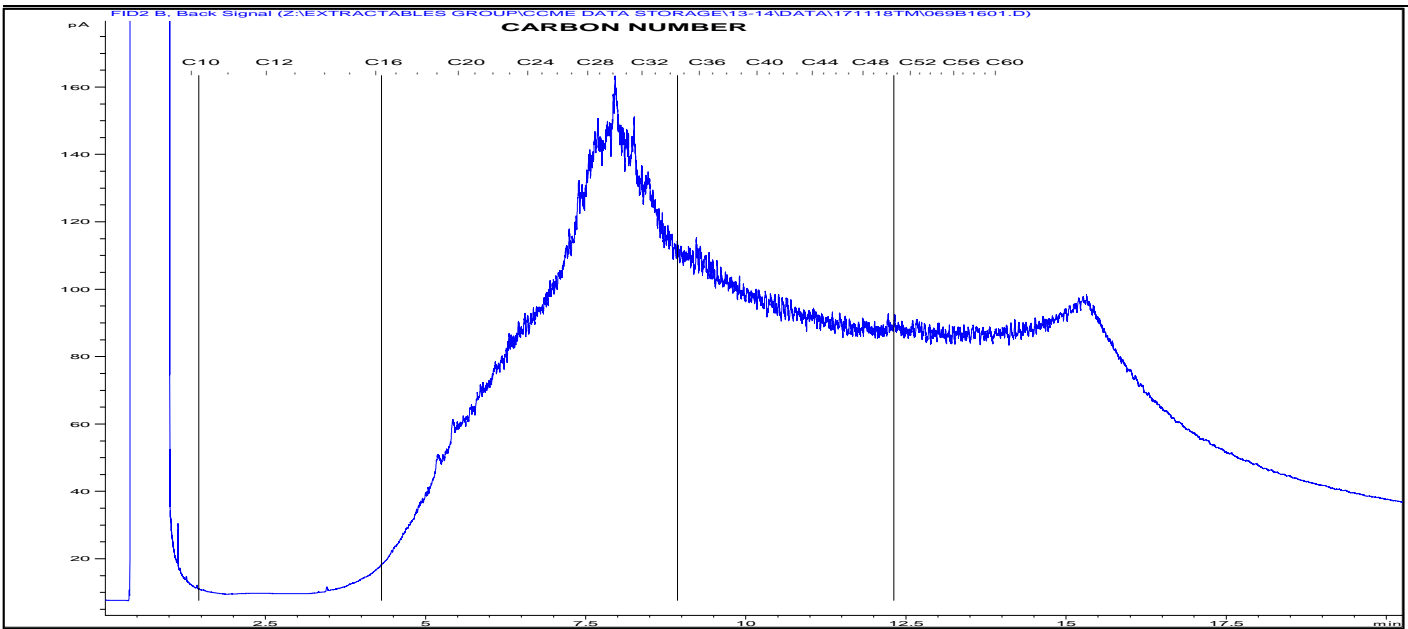
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

Exova Number: 1239545-4

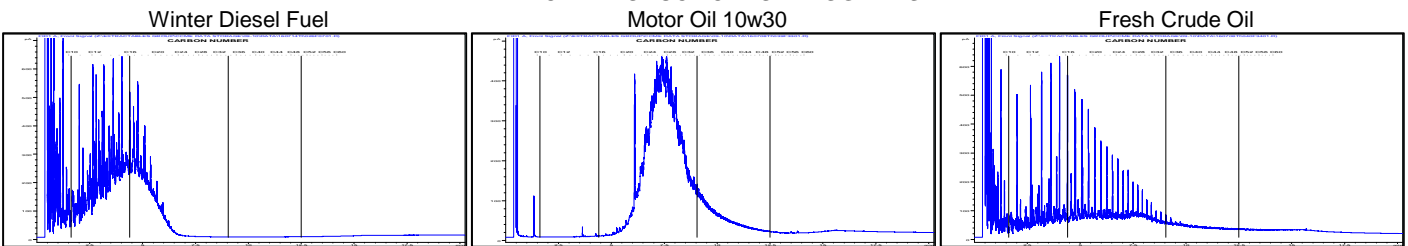
Sample Description: DSPlot20-02-HC

Silica Gel Treated

Sample Date: Nov 12, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

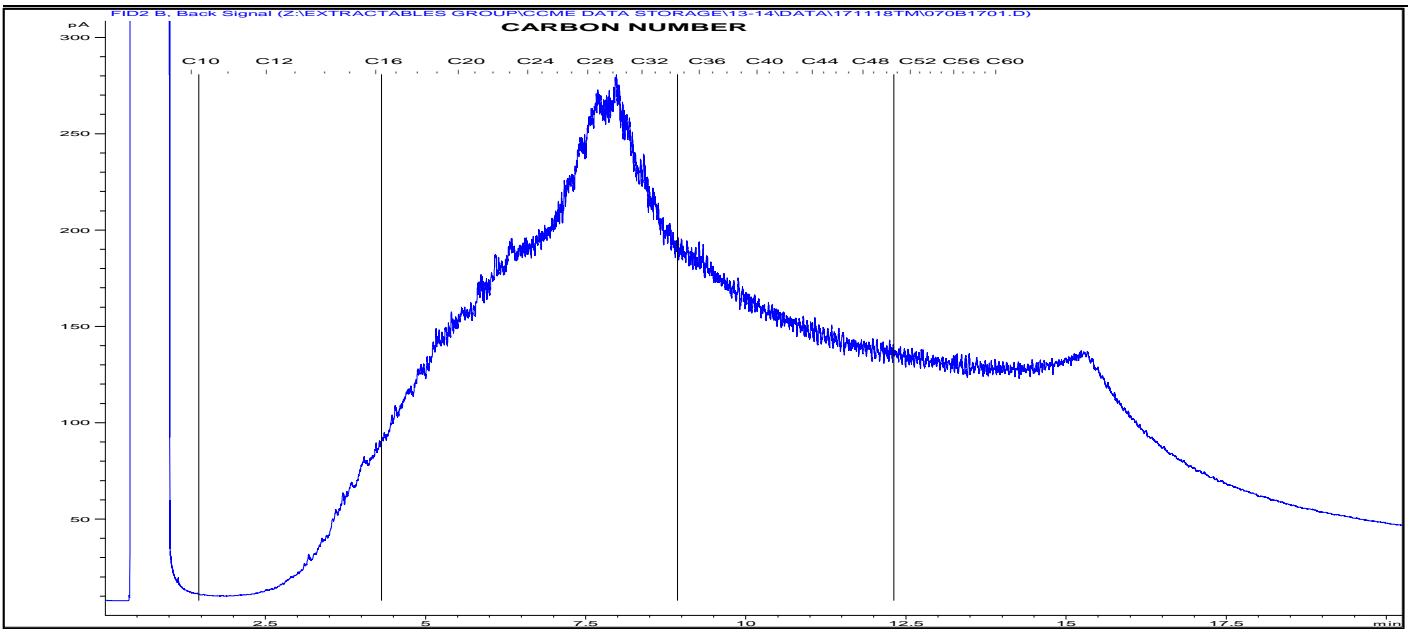
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

Exova Number: 1239545-5

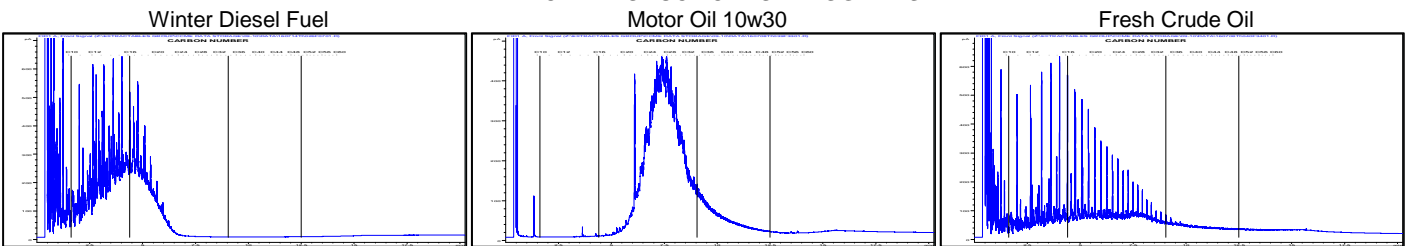
Sample Description: DSPlot20-03-HC

Silica Gel Treated

Sample Date: Nov 12, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

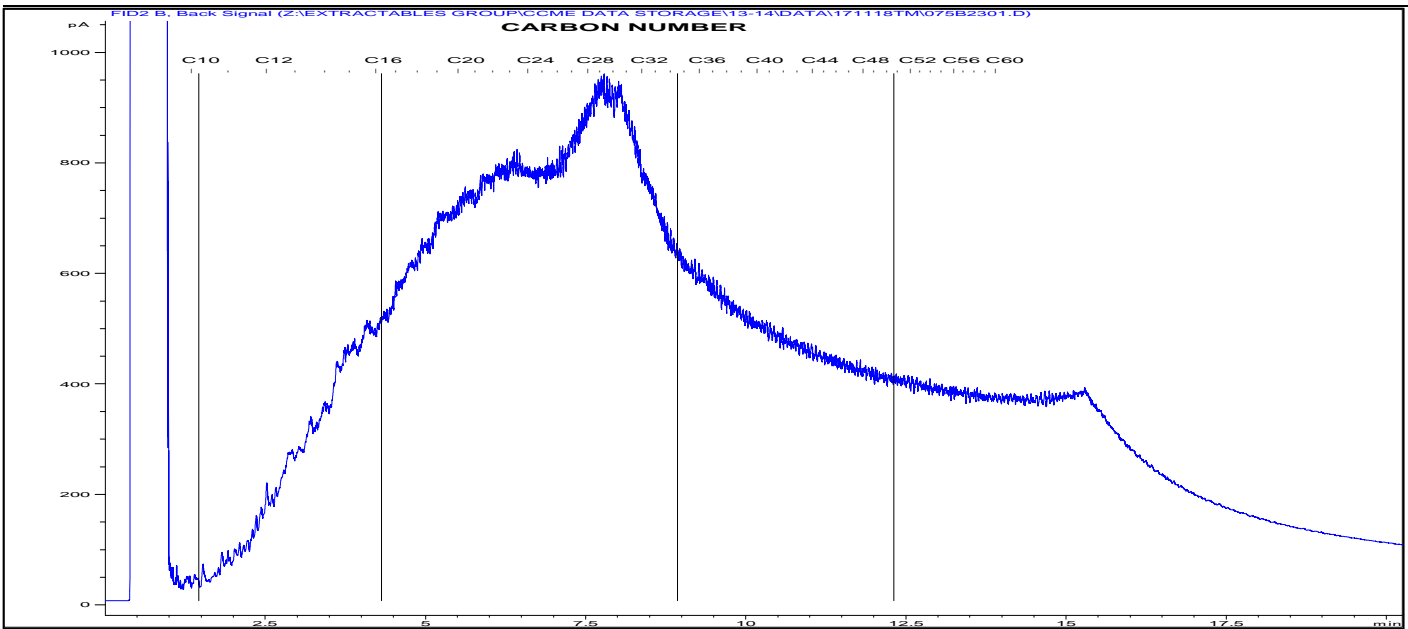
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

Exova Number: 1239545-6

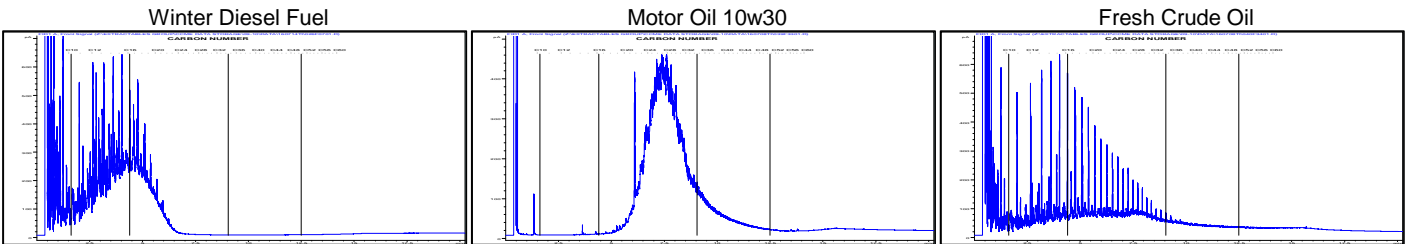
Sample Description: DSPlot20-04-HC

Silica Gel Treated

Sample Date: Nov 12, 2017



TYPICAL PRODUCT CHROMATOGRAMS



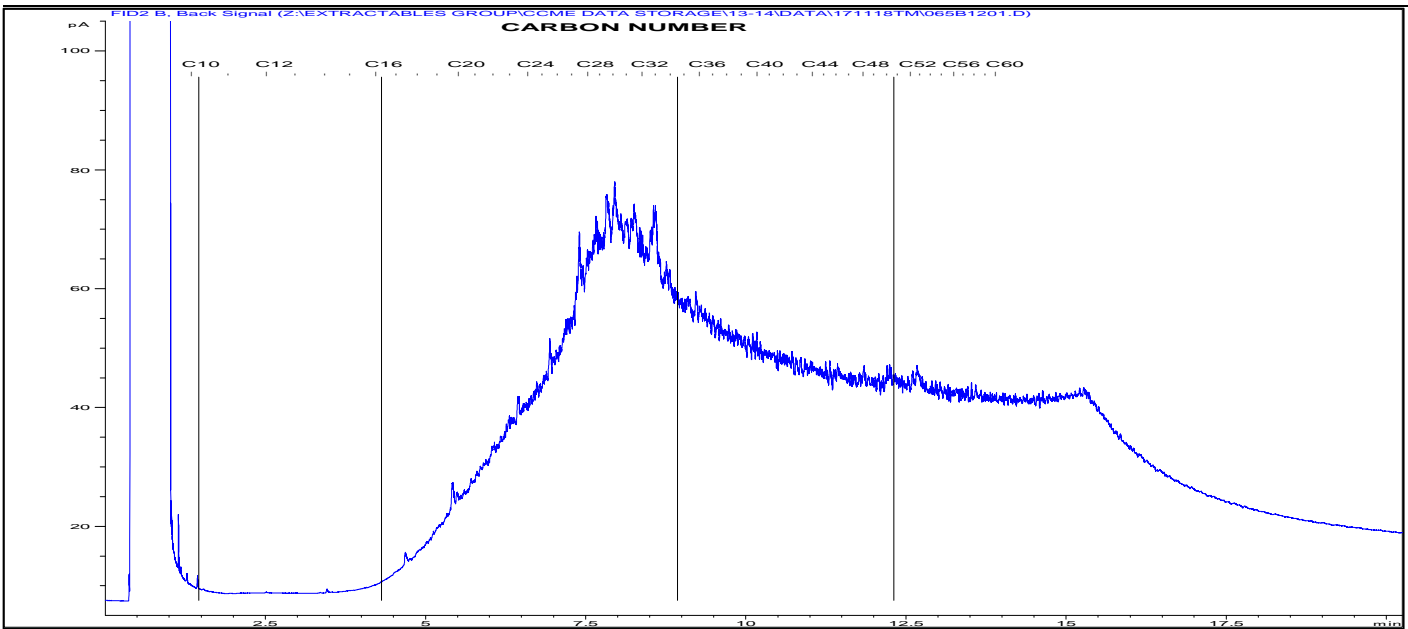
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

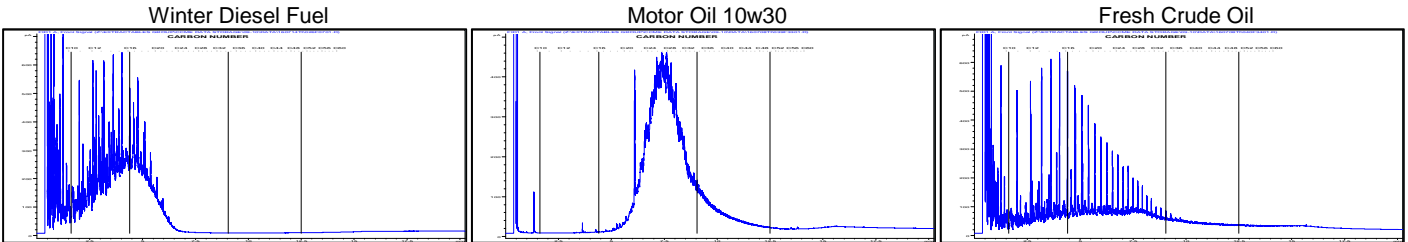
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

Exova Number: 1239545-12 Sample Description: DSPlot3-02-HC Silica Gel Treated
 Sample Date: Nov 10, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

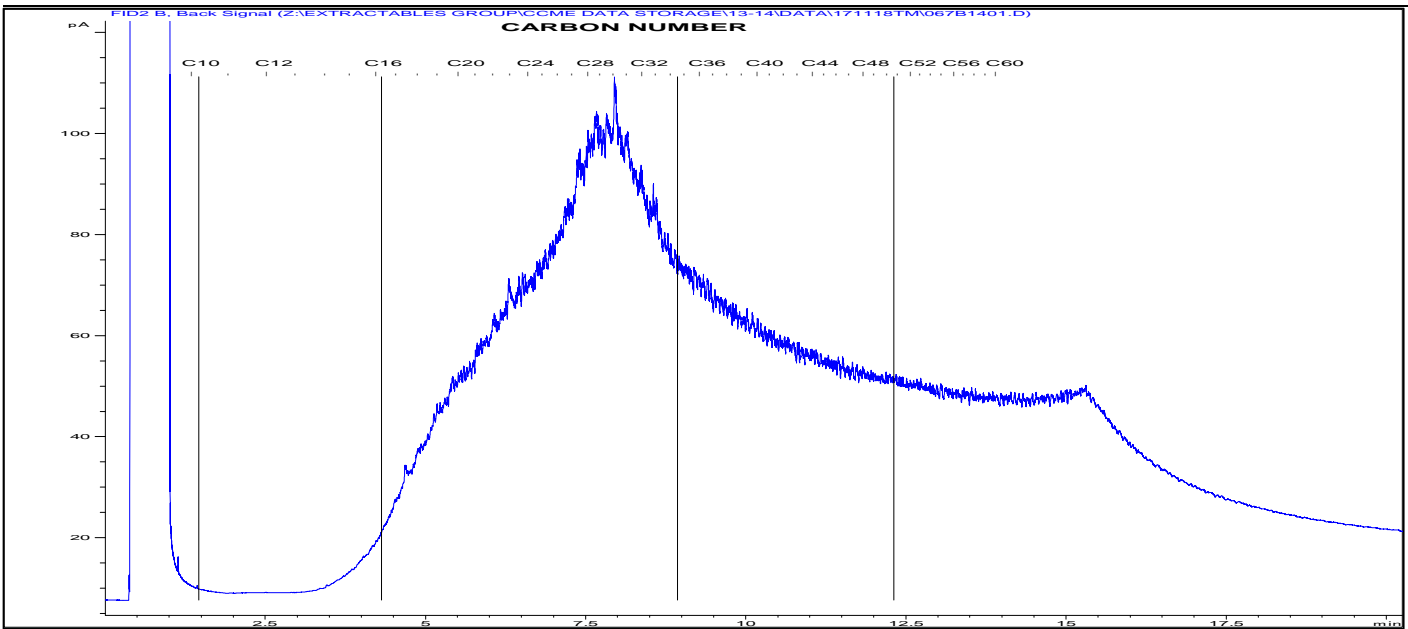
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

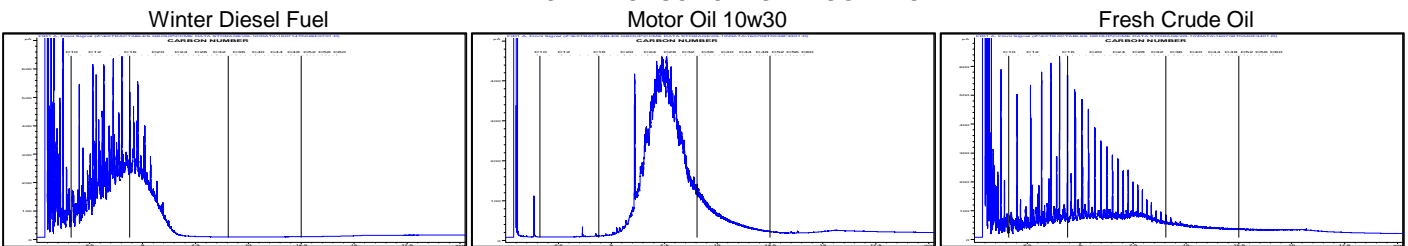
Exova Number: 1239545-13
 Sample Date: Nov 10, 2017

Sample Description: DSPlot3-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

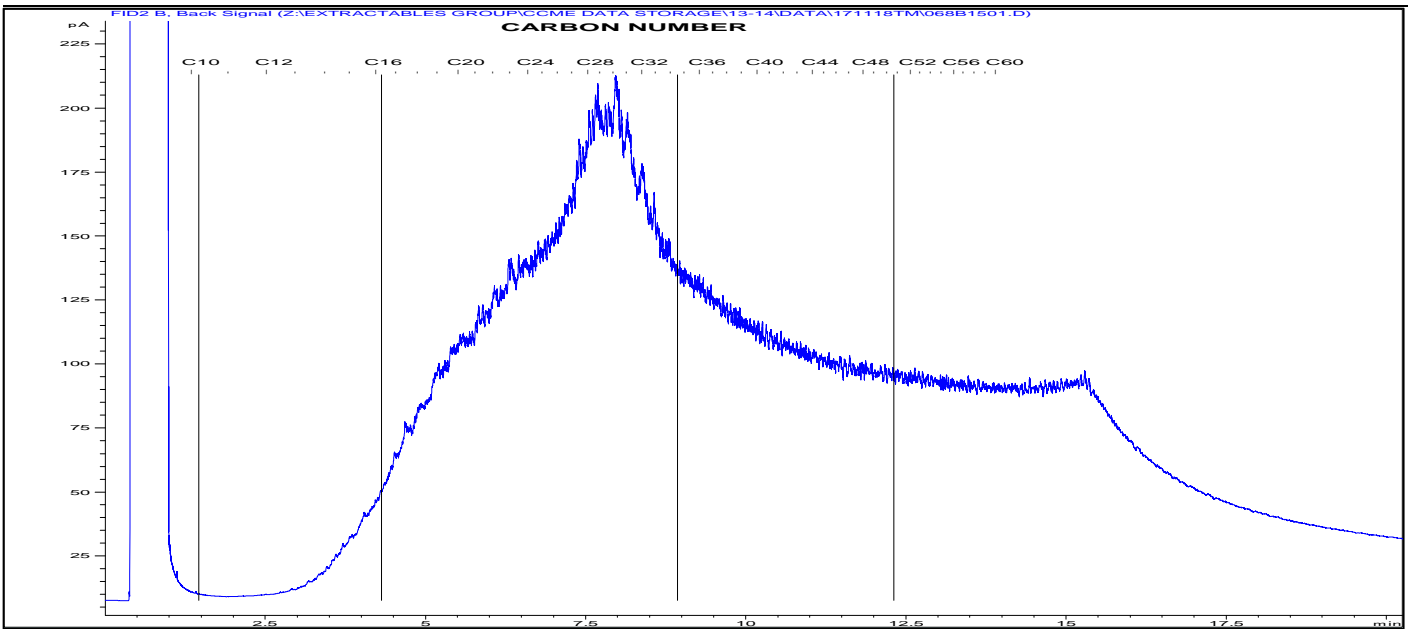
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

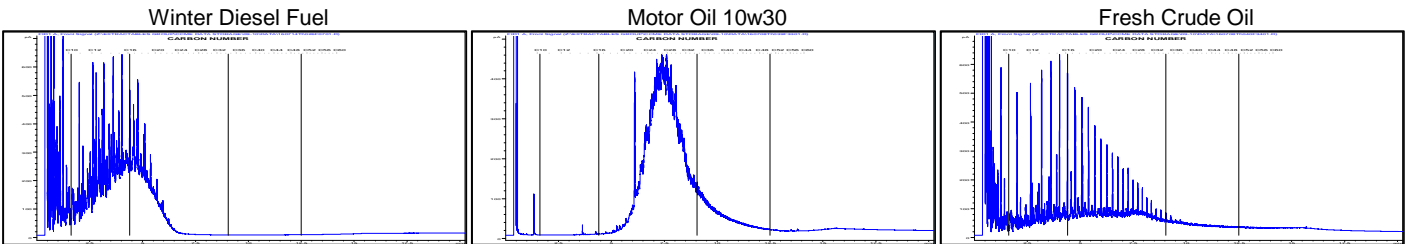
Exova Number: 1239545-14
 Sample Date: Nov 10, 2017

Sample Description: DSPlot3-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

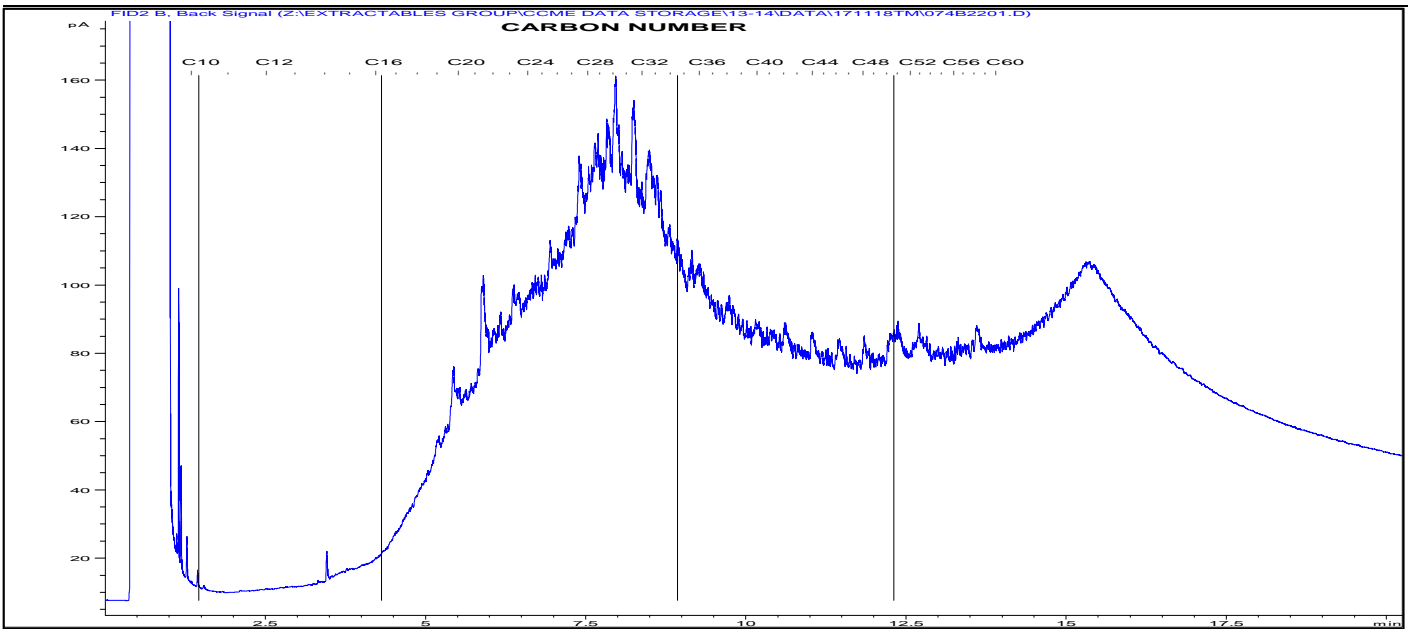
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

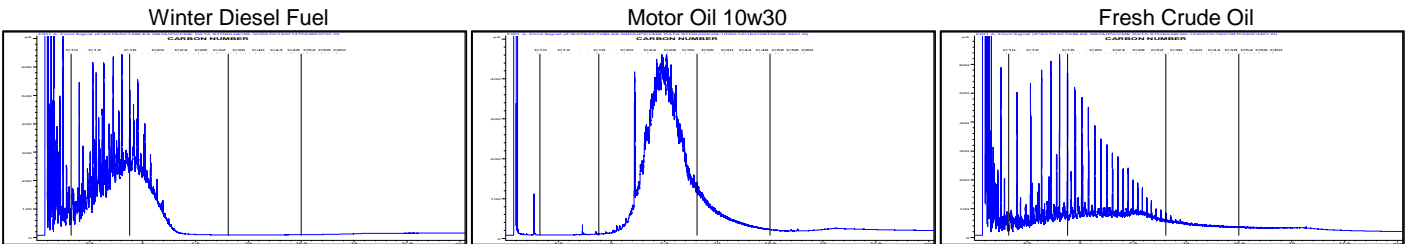
Exova Number: 1239545-20
 Sample Date: Nov 12, 2017

Sample Description: DSPlot19-02-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

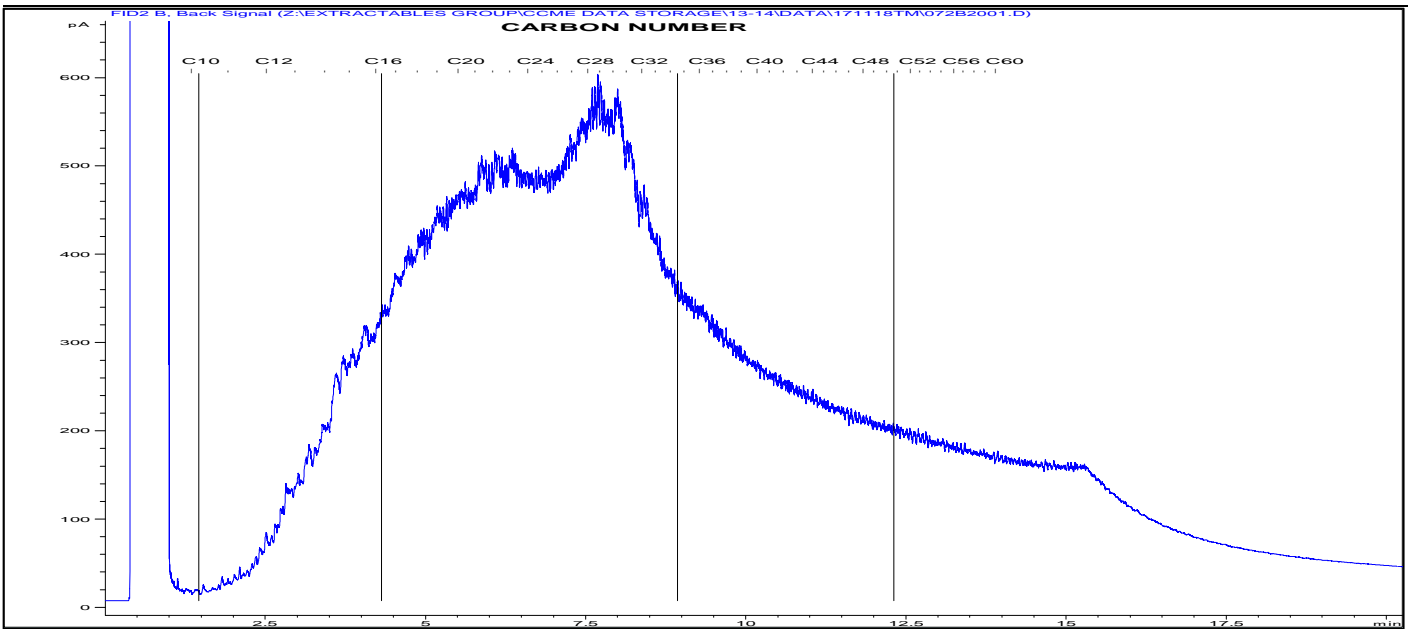
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

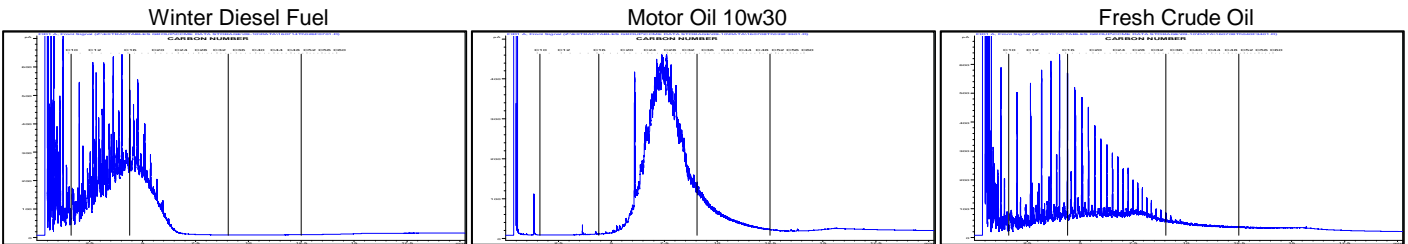
Exova Number: 1239545-21
 Sample Date: Nov 12, 2017

Sample Description: DSPlot19-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

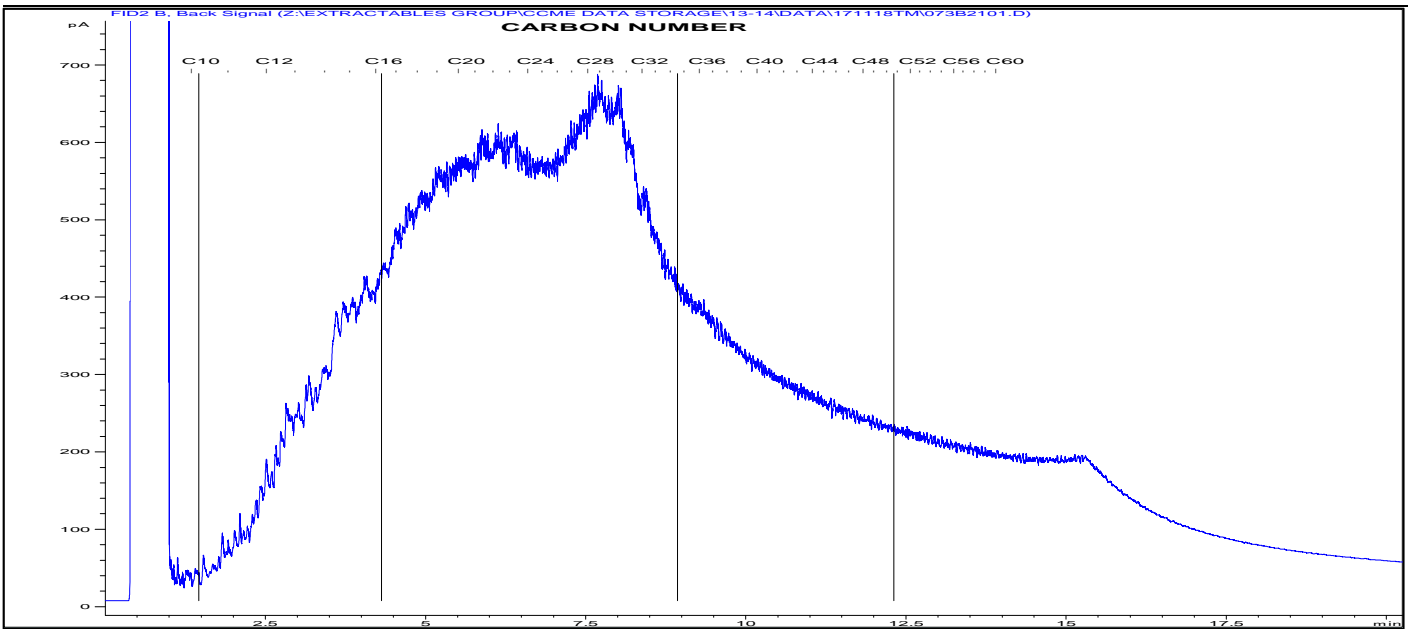
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

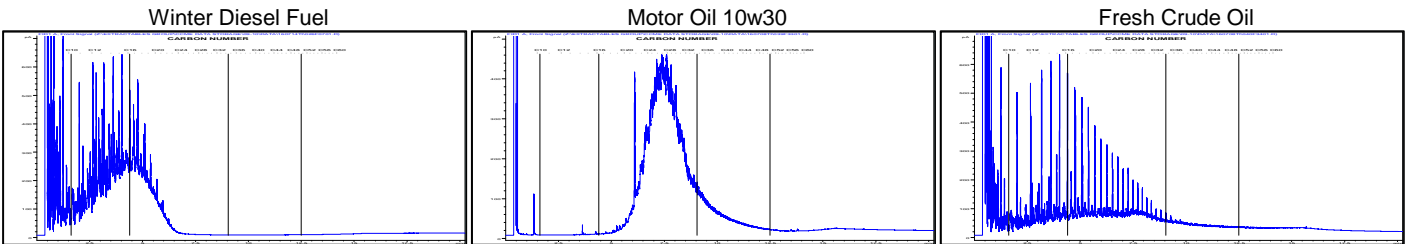
Exova Number: 1239545-22
 Sample Date: Nov 12, 2017

Sample Description: DSPlot19-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Report Transmission Cover Page

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

Contact	Company	Address
	Paragon Soils and Environment	Suite #5100, Suncor Energy Center, West Tower, 150-6th Ave. SW Calgary, AB T2P 3Y7 Phone: (403) 681-9072 Fax:

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	PDF	COA
Email - Single Report	Standard Crosstab	Test Report

Notes To Clients:

The information contained on this and all other pages transmitted, is intended for the addressee only and is considered confidential. If the reader is not the intended recipient, you are hereby notified that any use, dissemination, distribution or copy of this transmission is strictly prohibited. If you receive this transmission by error, or if this transmission is not satisfactory, please notify us by telephone.

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239553-1	1239553-2	1239553-3		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	14:00	14:00	14:00		
	Sample Location					
	Sample Description	NMPlot17-02-HC	NMPlot17-03-HC	NMPlot17-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	368	88	50
F3c C16-C34	Dry Weight	mg/kg	1050	5530	2520	50
F4c C34-C50	Dry Weight	mg/kg	913	3180	1630	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	2630	7430	3710	100
% C50+	%		36.2	22.5	23.5	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	15.60	9.56	5.40	

Analytical Report

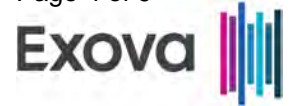
Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239553-4	1239553-5	1239553-9		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	14:00	14:00	14:00		
	Sample Location					
	Sample Description	NMPlot17-02-BD1 / 313CM3	NMPlot17-02-BD2 / 313CM3	NMPlot17-03BD1 / 313CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	11	14	11	0.1
Bulk Density		kg/L	0.93	1.1	1.3	
Bulk Density		kg/m³	930	1100	1300	
Wet Bulk Density		kg/L	1.05	1.27	1.50	
Porosity		%	na	59	50	
Volume	Declared Value	mL	313	313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

		Reference Number	1239553-6	1239553-7	1239553-8	
		Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017	
		Sample Time	14:00	14:00	14:00	
		Sample Location				
		Sample Description	NMPlot17-02-AN	NMPlot17-03-AN	NMPlot17-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.61	1.05	2.52	0.01
SAR	Saturated Paste		0.2	0.1	0.1	
% Saturation		%	62	38	42	
Calcium	Saturated Paste	mg/kg	58.0	77.8	258	
Magnesium	Saturated Paste	mg/kg	13.6	10.5	48.5	
Sodium	Saturated Paste	mg/kg	4	3	5	
Potassium	Saturated Paste	mg/kg	6	4	7	
Chloride	Saturated Paste	mg/kg	7	4	3	
Sulfate (SO4)	Saturated Paste	mg/kg	83.6	163	775	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.0	7.2	6.5	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239553-10	1239553-14	1239553-15		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	14:00	10:00	10:00		
	Sample Location					
	Sample Description	NMPlot17-03DD2 / 313CM3	NMExtra5-02-BD1 / 313CM3	NMExtra5-02-BD2 / 313CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	10	36.7	39	0.1
Bulk Density		kg/L	1.52	0.41	0.36	
Bulk Density		kg/m³	1520	408	360	
Wet Bulk Density		kg/L	1.69	0.64	0.58	
Porosity		%	43	na	na	
Volume	Declared Value	mL	313	313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239553-11	1239553-12	1239553-13		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	NMExtra5-02-HC	NMExtra5-03-HC	NMExtra5-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	897	50
F3c C16-C34	Dry Weight	mg/kg	1610	1650	7050	50
F4c C34-C50	Dry Weight	mg/kg	1230	1350	3670	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	2940	3520	9450	100
% C50+	%		27.6	31.7	23.6	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	20.10	14.60	7.69	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

		Reference Number	1239553-16	1239553-17	1239553-18	
		Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	NMExtra5-02-AN	NMExtra5-03-AN	NMExtra5-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.84	1.04	1.51	0.01
SAR	Saturated Paste		0.1	0.2	0.1	
% Saturation		%	71	43	33	
Calcium	Saturated Paste	mg/kg	107	76.5	101	
Magnesium	Saturated Paste	mg/kg	15.5	16.9	15.6	
Sodium	Saturated Paste	mg/kg	4	4	2	
Potassium	Saturated Paste	mg/kg	14	3	4	
Chloride	Saturated Paste	mg/kg	7	4	3	
Sulfate (SO4)	Saturated Paste	mg/kg	154	137	264	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.1	7.0	7.4	


 Approved by:
 Anthony Neumann, MSc
 Laboratory Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

Extractable Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	0	-10	10	yes
F3c C16-C34	µg/mL	0	-30	30	yes
F4c C34-C50	µg/mL	0	-20	20	yes
F4HTGCc C34-C50+	µg/mL	0	-20	20	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	106.41	80	120	yes
F3c C16-C34	µg/mL	106.87	80	120	yes
F4c C34-C50	µg/mL	102.33	80	120	yes
F4HTGCc C34-C50+	µg/mL	101.40	80	120	yes

Date Acquired: November 17, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	84	70	130	yes
F3c C16-C34	mg/kg	112	70	130	yes
F4c C34-C50	mg/kg	104	70	130	yes
F4HTGCc C34-C50+	mg/kg	104	70	130	yes

Date Acquired: November 18, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0021	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.005	0.005	yes
Toluene	ng	0	-0.06	0.06	yes
Ethylbenzene	ng	0	-0.030	0.030	yes
Total Xylenes (m,p,o)	ng	0	-0.09	0.09	yes
Styrene	ng	0	-0.030	0.030	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	80.20	80	120	yes
Toluene	ng	96.20	80	120	yes
Ethylbenzene	ng	101.20	80	120	yes
Total Xylenes (m,p,o)	ng	105.33	80	120	yes
Styrene	ng	101.00	80	120	yes

Date Acquired: November 17, 2017

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	10	10	10	0.3	yes

Date Acquired: November 20, 2017

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Sampled By: Company:		

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.1153	-0.4	0.5	yes
Magnesium	mg/L	0.0224	-0.1	0.1	yes
Sodium	mg/L	0.0462	-0	2	yes
Potassium	mg/L	0.0081	-0.5	0.7	yes
Chloride	mg/L	3.6358	0	5	yes
Sulfate-S	mg/L	0.0028	-0	1	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Electrical Conductivity	dS/m	2.99	2.71	3.25	yes
% Saturation	%	47	38	52	yes
Calcium	mg/L	625	596.2	767.8	yes
Magnesium	mg/L	131	121.8	154.8	yes
Sodium	mg/L	70	58	79	yes
Potassium	mg/L	20	17.8	24.6	yes
Chloride	mg/L	67	57	78	yes
Sulfate-S	mg/L	615	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.3	26.80	35.20	yes
Calcium	mg/L	246	230.2	261.4	yes
Magnesium	mg/L	95.4	92.7	99.7	yes
Sodium	mg/L	238	229	269	yes
Potassium	mg/L	241	229.4	265.4	yes
Chloride	mg/L	2050	1871	2231	yes
Sulfate-S	mg/L	144	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.9	6.8	0	0.3	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 17, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	0	-10	10	yes

Date Acquired: November 17, 2017

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch Sampled By: Company:	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
--	--	--

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME - Soil	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary
BTEX-CCME - Soil	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Calgary
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl ₂ (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME-Soil (Shake)	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary

** Reference Method Modified*

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Hydrocarbon Chromatogram

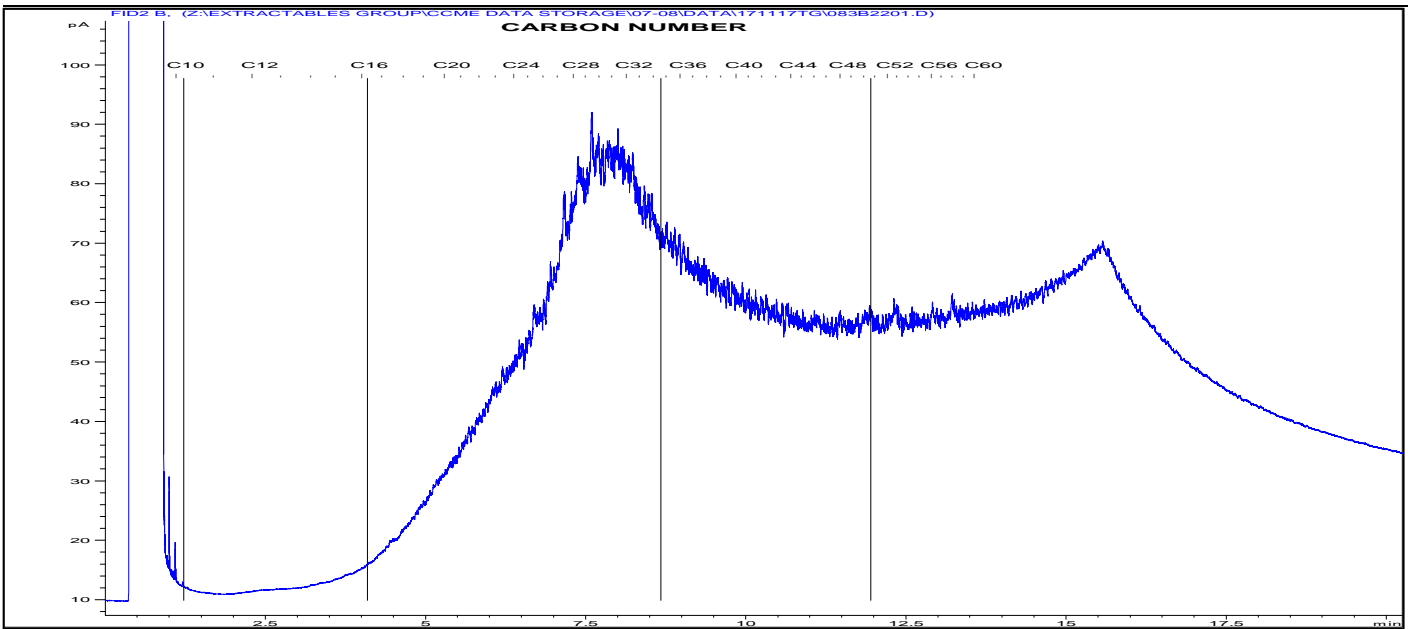
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-1

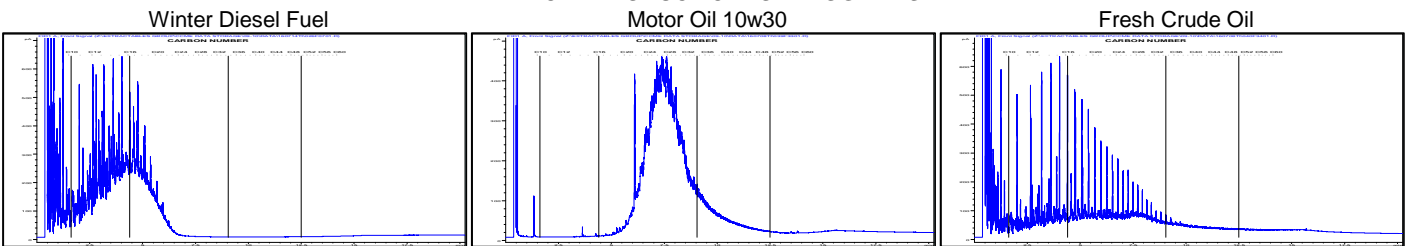
Sample Description: NMPlot17-02-HC

Silica Gel Treated

Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



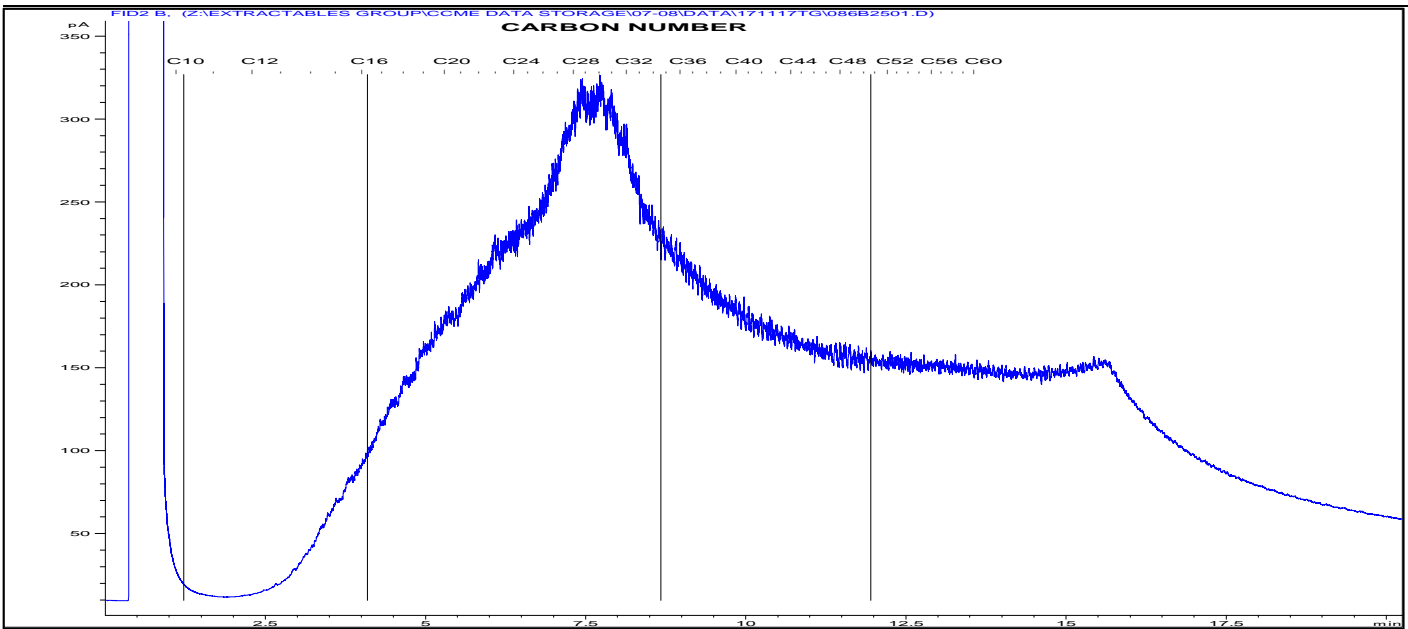
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

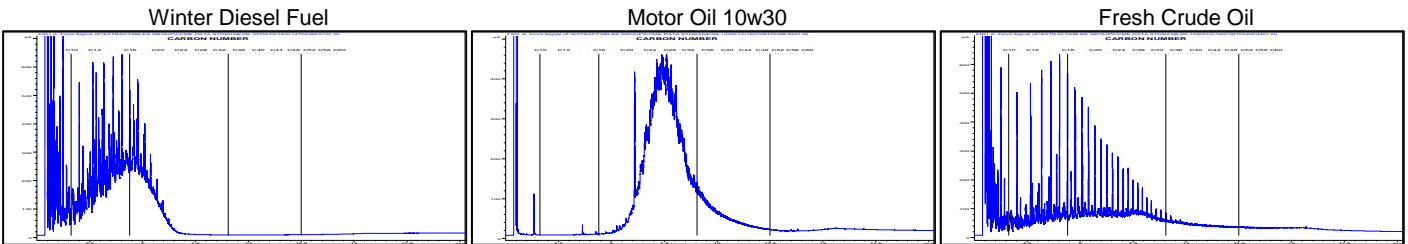
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-2 Sample Description: NMPlot17-03-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



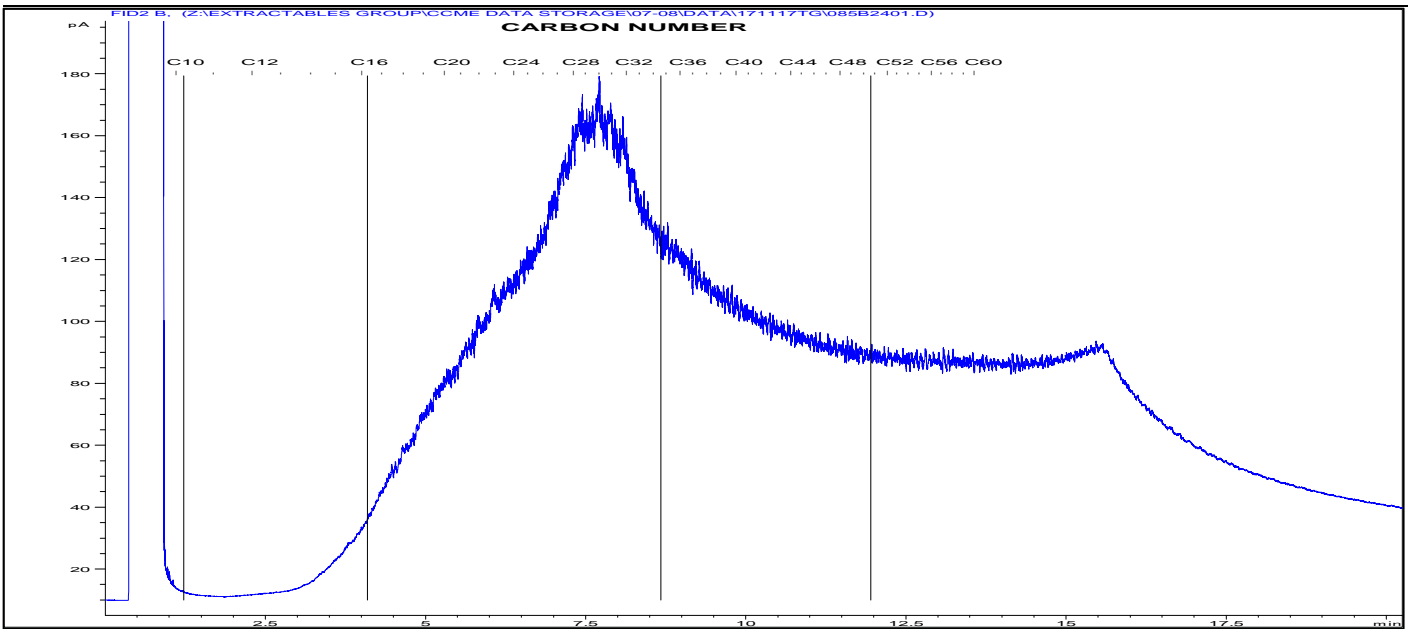
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

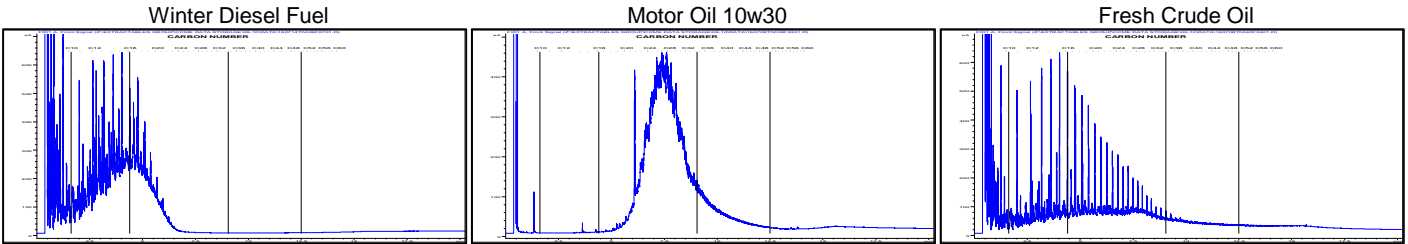
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-3 Sample Description: NMPlot17-04-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



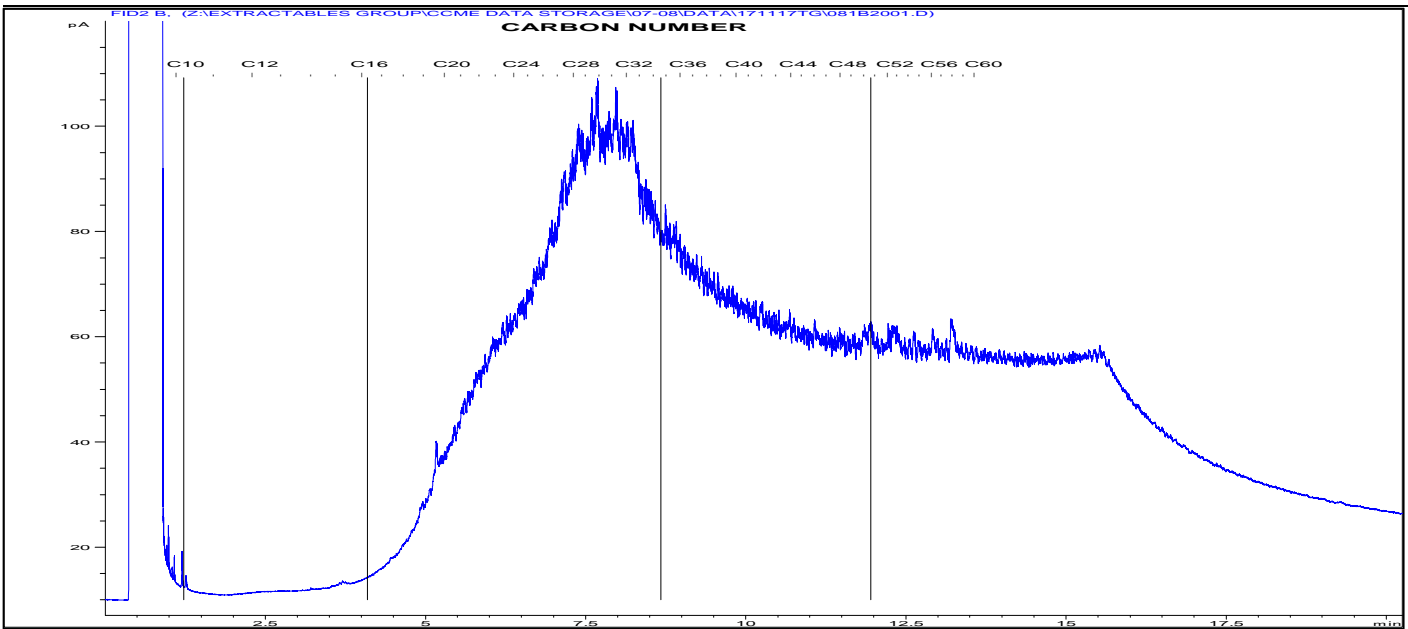
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

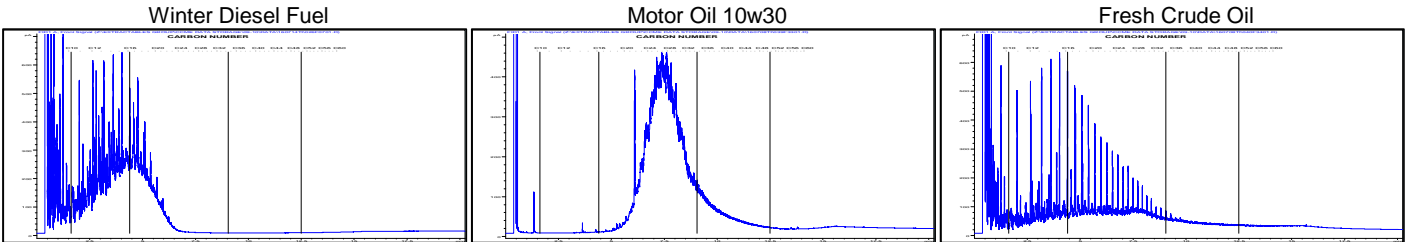
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-11 Sample Description: NMExtra5-02-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



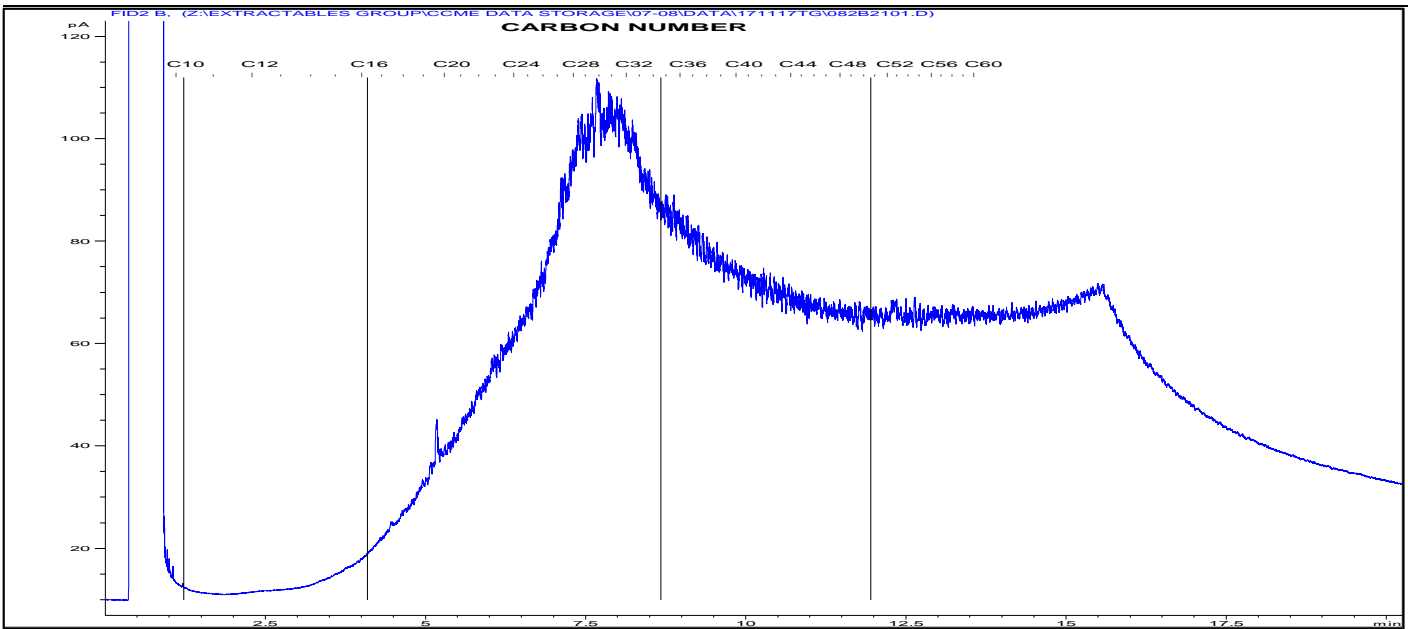
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

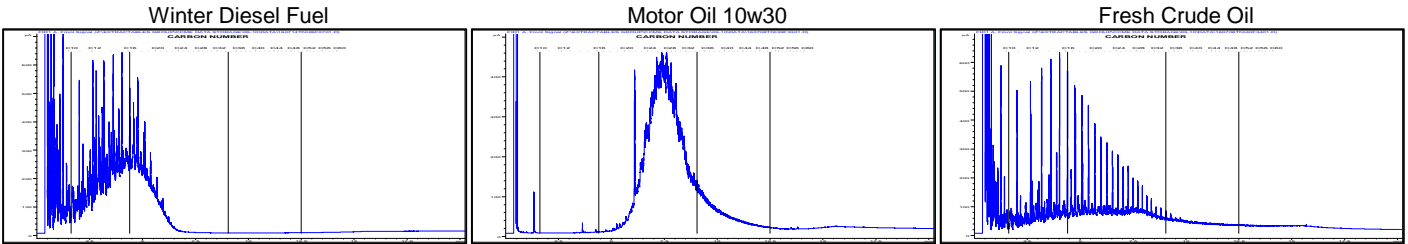
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-12 Sample Description: NMExtra5-03-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



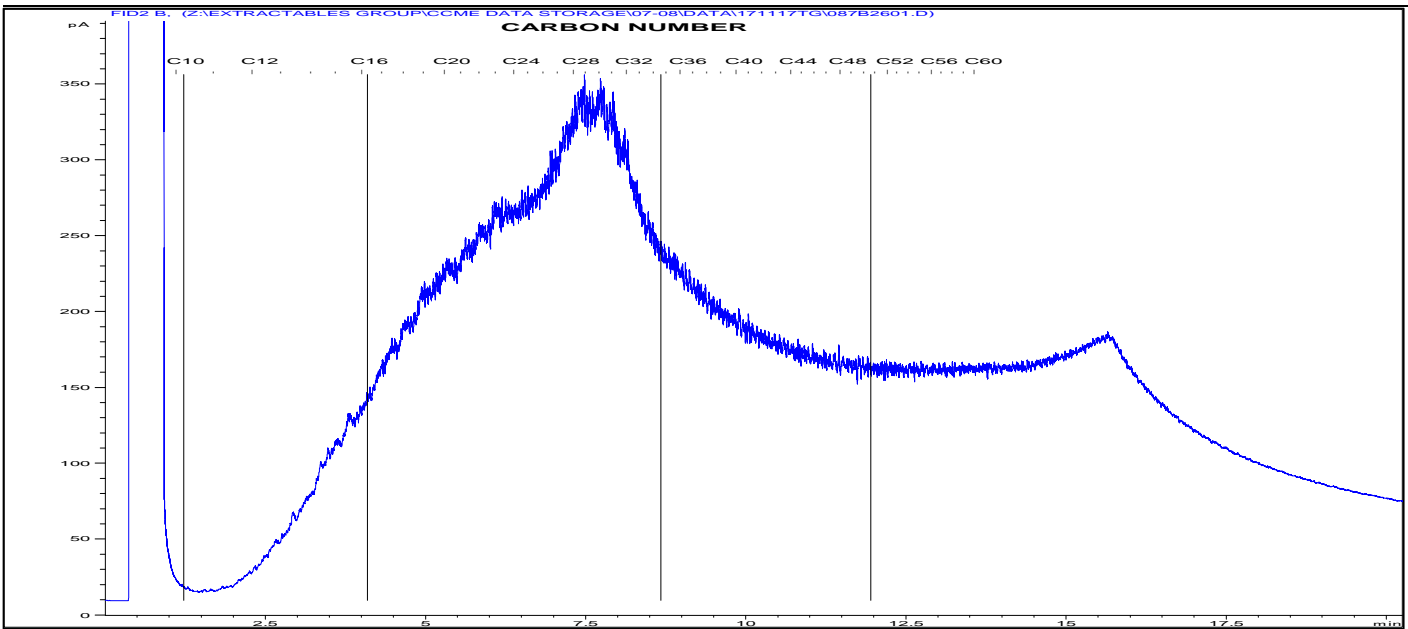
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

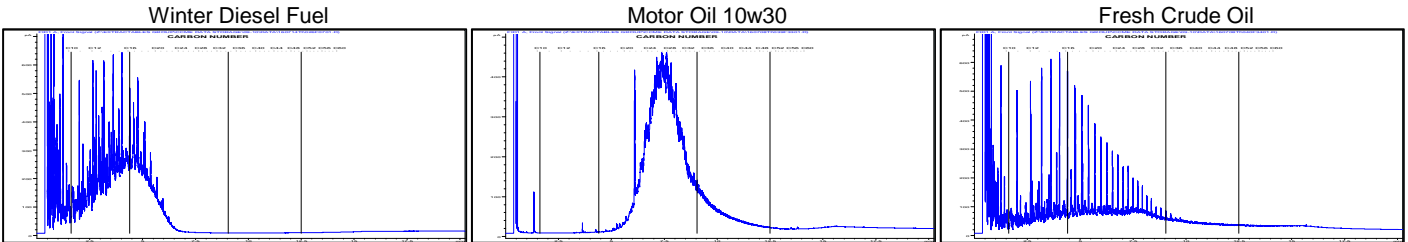
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-13 Sample Description: NMExtra5-04-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Report Transmission Cover Page

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Contact	Company	Address
	Paragon Soils and Environment	Suite #5100, Suncor Energy Center, West Tower, 150-6th Ave. SW Calgary, AB T2P 3Y7 Phone: (403) 681-9072 Fax:

<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	PDF	COA
Email - Single Report	Standard Crosstab	Test Report

Notes To Clients:

The information contained on this and all other pages transmitted, is intended for the addressee only and is considered confidential. If the reader is not the intended recipient, you are hereby notified that any use, dissemination, distribution or copy of this transmission is strictly prohibited. If you receive this transmission by error, or if this transmission is not satisfactory, please notify us by telephone.

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
--	--	---

	Reference Number	1239726-1	1239726-2	1239726-3		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	16:00	16:00	16:00		
	Sample Location					
	Sample Description	NMPlot11-02-HC / cm	NMPlot11-03-HC / cm	NMPlot11-04-HC / cm		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	18	18	10	0.1
Mono-Aromatic Hydrocarbons - Soil						
Methanol Field Preservation			No	No	No	
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		16-NOV-17	16-NOV-17	16-NOV-17	
Silica Gel Cleanup			Done	Done	Done	
F2c C10-C16	Dry Weight	mg/kg	<60	<50	400	50
F3c C16-C34	Dry Weight	mg/kg	3000	1100	5800	50
F4c C34-C50	Dry Weight	mg/kg	2000	1000	3000	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	6000	2500	8000	100
% C50+		%	40	42	30	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-4	1239726-5	1239726-9	
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 12, 2017	
	Sample Time	16:00	16:00	16:00	
	Sample Location				
	Sample Description	313 cm3 / NMPlot11-02-BD1 / cm	313 cm3 / NMPlot11-02-BD2 / cm	NMPlot18-02-HC / cm	
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Physical and Aggregate Properties					
Moisture	Wet Weight @ 105°C	%	23	13	16
Bulk Density		kg/L	0.61	0.90	
Bulk Density		kg/m³	610	900	
Wet Bulk Density		kg/L	0.79	1.04	
Porosity		%	na	na	
Volume	Declared Value	mL	313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

		Reference Number	1239726-6	1239726-7	1239726-8	
		Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017	
		Sample Time	16:00	16:00	16:00	
		Sample Location				
		Sample Description	NMPlot11-02-AN / cm	NMPlot11-03-AN / cm	NMPlot11-04-AN / cm	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
pH	Saturated Paste	pH	7.0	6.9	6.6	
Electrical Conductivity	Saturated Paste	dS/m	0.78	0.87	2.16	0.01
SAR	Saturated Paste		0.2	0.2	0.2	
% Saturation		%	116	81	91	
Calcium	Saturated Paste	meq/L	5.54	7.60	19.4	0.01
Calcium	Saturated Paste	mg/L	111	152	389	0.2
Calcium	Saturated Paste	mg/kg	129	123	354	
Magnesium	Saturated Paste	meq/L	3.65	4.61	11.8	0.02
Magnesium	Saturated Paste	mg/L	44.1	55.8	142	0.2
Magnesium	Saturated Paste	mg/kg	51.2	45.1	130	
Sodium	Saturated Paste	meq/L	0.39	0.56	0.96	0.04
Sodium	Saturated Paste	mg/L	9	13	22	1
Sodium	Saturated Paste	mg/kg	10	11	20	
Potassium	Saturated Paste	meq/L	0.34	0.17	0.16	0.03
Potassium	Saturated Paste	mg/L	13.4	6.5	6.2	1
Potassium	Saturated Paste	mg/kg	16	5	6	
Chloride	Saturated Paste	meq/L	0.51	0.59	0.45	0.06
Chloride	Saturated Paste	mg/L	18	21	16	2
Chloride	Saturated Paste	mg/kg	21	17	14	
Sulfate (SO4)	Saturated Paste	meq/L	3.49	5.43	24.4	0.06
Sulfate (SO4)	Saturated Paste	mg/L	167	261	1170	3
Sulfate (SO4)	Saturated Paste	mg/kg	194	211	1070	
Sulfate-S	Saturated Paste	mg/L	56	87	391	1
Sulfate-S	Saturated Paste	meq/L	3.49	5.43	24.4	0.06
Sulfate-S	Saturated Paste	mg/kg	64.7	70.3	356	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.5	7.3	7.2	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-9	1239726-10	1239726-11		
	Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017		
	Sample Time	16:00	16:00	16:00		
	Sample Location					
	Sample Description	NMPlot18-02-HC / cm	NMPlot18-03-HC / cm	NMPlot18-04-HC / cm		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables	16-NOV-17	16-NOV-17	16-NOV-17		
Silica Gel Cleanup		Done	Done	Done		
F2c C10-C16	Dry Weight	mg/kg	<50	500	400	50
F3c C16-C34	Dry Weight	mg/kg	400	5200	5100	50
F4c C34-C50	Dry Weight	mg/kg	400	3000	3000	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	900	7000	6000	100
% C50+	%		40	30	30	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-10	1239726-11	1239726-12		
	Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017		
	Sample Time	16:00	16:00	16:00		
	Sample Location					
	Sample Description	NMPlot18-03-HC / cm	NMPlot18-04-HC / cm	313 cm3 / NMPlot18- 02-BD1 / cm		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	7	8.3	21	0.1
Bulk Density		kg/L			0.72	
Bulk Density		kg/m³			720	
Wet Bulk Density		kg/L			0.91	
Porosity		%			na	
Volume	Declared Value	mL			313	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Reference Number	1239726-13	1239726-17	1239726-18
Sample Date	Nov 12, 2017	Nov 09, 2017	Nov 09, 2017
Sample Time	16:00	12:00	12:00
Sample Location			
Sample Description	313 cm3 / NMPlot18- NMPlot2-02-HC / cm NMPlot2-03-HC / cm 02-BD2 / cm		

Analyte	Matrix	Units	Results			Nominal Detection Limit
			Soil	Soil	Soil	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	27	16	7	0.1
Bulk Density		kg/L	0.73			
Bulk Density		kg/m³	730			
Wet Bulk Density		kg/L	1.00			
Porosity		%	na			
Volume	Declared Value	mL	313			

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

		Reference Number	1239726-14	1239726-15	1239726-16	
		Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017	
		Sample Time	16:00	16:00	16:00	
		Sample Location				
		Sample Description	NMPlot18-02-AN / cm	NMPlot18-03-AN / cm	NMPlot18-04-AN / cm	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
pH	Saturated Paste	pH	6.9	7.1	7.2	
Electrical Conductivity	Saturated Paste	dS/m	1.08	2.61	2.28	0.01
SAR	Saturated Paste		0.5	0.3	0.3	
% Saturation		%	73	42	40	
Calcium	Saturated Paste	meq/L	8.28	29.7	22.6	0.01
Calcium	Saturated Paste	mg/L	166	594	452	0.2
Calcium	Saturated Paste	mg/kg	121	246	182	
Magnesium	Saturated Paste	meq/L	3.78	10.9	7.92	0.02
Magnesium	Saturated Paste	mg/L	45.7	132	95.9	0.2
Magnesium	Saturated Paste	mg/kg	33.5	54.7	38.5	
Sodium	Saturated Paste	meq/L	1.19	1.3	1.29	0.04
Sodium	Saturated Paste	mg/L	27	29	30	1
Sodium	Saturated Paste	mg/kg	20	12	12	
Potassium	Saturated Paste	meq/L	0.47	<0.26	0.26	0.03
Potassium	Saturated Paste	mg/L	18.2	<10	10.2	1
Potassium	Saturated Paste	mg/kg	13	<4	4	
Chloride	Saturated Paste	meq/L	1.11	0.69	0.71	0.06
Chloride	Saturated Paste	mg/L	39	24	25	2
Chloride	Saturated Paste	mg/kg	29	10	10	
Sulfate (SO4)	Saturated Paste	meq/L	6.58	37.5	29.7	0.06
Sulfate (SO4)	Saturated Paste	mg/L	316	1800	1420	3
Sulfate (SO4)	Saturated Paste	mg/kg	232	747	573	
Sulfate-S	Saturated Paste	mg/L	105	600	475	1
Sulfate-S	Saturated Paste	meq/L	6.59	37.5	29.7	0.06
Sulfate-S	Saturated Paste	mg/kg	77.2	249	191	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.2	7.5	7.3	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-17	1239726-18	1239726-19	
	Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 09, 2017	
	Sample Time	12:00	12:00	12:00	
	Sample Location	Sample Description			
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil					
Methanol Field Preservation		No	No	No	
Benzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil					
F1 C6-C10	Dry Weight	mg/kg	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil					
Extraction Date	Total Extractables	16-NOV-17	16-NOV-17	16-NOV-17	
Silica Gel Cleanup		Done	Done	Done	
F2c C10-C16	Dry Weight	mg/kg	<50	700	50
F3c C16-C34	Dry Weight	mg/kg	1800	6600	50
F4c C34-C50	Dry Weight	mg/kg	1500	4000	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	3500	8000	100
% C50+		%	39	30	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-19	1239726-20	1239726-21		
	Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 09, 2017		
	Sample Time	12:00	12:00	12:00		
	Sample Location					
	Sample Description	NMPlot2-04-HC / cm	298 cm 3 / NMPlot2-02-BD1 / cm	298 cm 3 / NMPlot2-02-BD2 / cm		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	9.8	21	24	0.1
Bulk Density		kg/L		0.64	0.61	
Bulk Density		kg/m³		640	610	
Wet Bulk Density		kg/L		0.81	0.80	
Porosity		%		na	na	
Volume	Declared Value	mL		298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Reference Number	1239726-22	1239726-23
Sample Date	Nov 09, 2017	Nov 09, 2017
Sample Time	12:00	12:00
Sample Location		
Sample Description	298 cm 3 / NMPlot2-03-BD1 / cm	298 cm 3 / NMPlot2-03-BD2 / cm
Matrix	Soil	Soil

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Physical and Aggregate Properties					
Moisture	Wet Weight @ 105°C	%	6	6	0.1
Bulk Density		kg/L	1.5	1.4	
Bulk Density		kg/m³	1500	1400	
Wet Bulk Density		kg/L	1.60	1.53	
Porosity		%	43	46	
Volume	Declared Value	mL	298	298	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
--	--	---

		Reference Number	1239726-24	1239726-25	1239726-26		
		Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 09, 2017		
		Sample Time	12:00	12:00	12:00		
		Sample Location					
		Sample Description	NMPlot2-02-AN / cm	NMPlot2-03-AN / cm	NMPlot2-04-AN / cm		
		Matrix	Soil	Soil	Soil		
Analyte		Units	Results	Results	Results	Nominal Detection Limit	
Salinity							
pH	Saturated Paste	pH	6.8	7.4	7.6		
Electrical Conductivity	Saturated Paste	dS/m	1.44	1.63	1.53	0.01	
SAR	Saturated Paste		1.3	1.8	3.1		
% Saturation		%	83	47	44		
Calcium	Saturated Paste	meq/L	8.98	9.38	5.72	0.01	
Calcium	Saturated Paste	mg/L	180	188	114	0.2	
Calcium	Saturated Paste	mg/kg	148	88.1	50.2		
Magnesium	Saturated Paste	meq/L	5.69	5.63	4.37	0.02	
Magnesium	Saturated Paste	mg/L	68.8	68.2	52.8	0.2	
Magnesium	Saturated Paste	mg/kg	56.9	32.0	23.2		
Sodium	Saturated Paste	meq/L	3.51	4.83	7.06	0.04	
Sodium	Saturated Paste	mg/L	81	111	162	1	
Sodium	Saturated Paste	mg/kg	67	52	71		
Potassium	Saturated Paste	meq/L	0.35	0.25	0.33	0.03	
Potassium	Saturated Paste	mg/L	13.5	9.6	13.0	1	
Potassium	Saturated Paste	mg/kg	11	5	6		
Chloride	Saturated Paste	meq/L	0.39	0.23	0.26	0.06	
Chloride	Saturated Paste	mg/L	14	8	9	2	
Chloride	Saturated Paste	mg/kg	12	4	4		
Sulfate (SO4)	Saturated Paste	meq/L	9.91	17.9	15.5	0.06	
Sulfate (SO4)	Saturated Paste	mg/L	476	858	743	3	
Sulfate (SO4)	Saturated Paste	mg/kg	394	403	326		
Sulfate-S	Saturated Paste	mg/L	159	286	248	1	
Sulfate-S	Saturated Paste	meq/L	9.92	17.9	15.5	0.06	
Sulfate-S	Saturated Paste	mg/kg	131	134	109		
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1		
Soil Acidity							
pH	1:2 Soil:CaCl2 sol.	pH	7.1	7.4	7.7		

Approved by: 
Nathan Brilz, Chem. Technologist
Client Service Representative

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Extractable Petroleum Hydrocarbons - Soil

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F2c C10-C16	mg/kg	230	270	30		yes
F3c C16-C34	mg/kg	958	1090	30		yes
F4c C34-C50	mg/kg	200	300	30		yes
F4c+ C50+	mg/kg	<100	<100	30		yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	99	74	116	yes
F3c C16-C34	mg/kg	160	124	160	yes
F4c C34-C50	mg/kg	200	169	229	yes

Date Acquired: November 16, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	82	65	135	yes
F3c C16-C34	mg/kg	98	65	135	yes
F4c C34-C50	mg/kg	75	65	135	yes

Date Acquired: November 16, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0031	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.500	0.500	yes
Toluene	ng	0	-2.00	2.00	yes
Ethylbenzene	ng	0	-0.500	0.500	yes
m,p-Xylene	ng	0	-1.00	1.00	yes
o-Xylene	ng	0	-1.00	1.00	yes

Date Acquired: November 16, 2017

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Benzene	mg/kg	2.73	2.73	20	0.004	yes
Toluene	mg/kg	2.58	2.57	20	0.01	yes
Ethylbenzene	mg/kg	2.86	2.72	20	0.010	yes
m,p-Xylene	mg/kg	5.76	5.48	20	0.01	yes
o-Xylene	mg/kg	2.85	2.71	20	0.01	yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	mg/kg	5.08	4.250	5.750	yes
Toluene	mg/kg	5.04	4.25	5.75	yes
Ethylbenzene	mg/kg	4.92	4.250	5.750	yes
m,p-Xylene	mg/kg	9.79	8.50	11.50	yes
o-Xylene	mg/kg	4.92	4.25	5.75	yes

Date Acquired: November 16, 2017

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Mono-Aromatic Hydrocarbons - Soil - Continued

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	mg/kg	89	80	120	yes
Toluene	mg/kg	85	80	120	yes
Ethylbenzene	mg/kg	94	80	120	yes
m,p-Xylene	mg/kg	95	80	120	yes
o-Xylene	mg/kg	93	80	120	yes

Date Acquired: November 16, 2017

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	18	18	10	0.3	yes

Date Acquired: November 20, 2017

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0124	-0.4	0.5	yes
Magnesium	mg/L	0.0036	-0.1	0.1	yes
Sodium	mg/L	0.0345	-0	2	yes
Potassium	mg/L	0.0519	-0.5	0.7	yes
Chloride	mg/L	2.0275	0	5	yes
Sulfate-S	mg/L	0.0419	-0	1	yes

Date Acquired: November 17, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.6	6.6	0	0.3	yes
Electrical Conductivity	dS/m	0.19	0.19	10	0.01	yes
Calcium	mg/kg	16.3	16.6	10	0.6	yes
Magnesium	mg/kg	5.0	5.0	10	0.6	yes
Sodium	mg/kg	3	3	10	1	yes
Potassium	mg/kg	2	2	10	1	yes
Chloride	mg/kg	5	5	15	3	yes
Sulfate-S	mg/kg	3.8	3.8	10	1.2	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.1	6.5	8.0	yes
Electrical Conductivity	dS/m	3.16	2.71	3.25	yes
% Saturation	%	46	38	52	yes
Calcium	mg/L	671	596.2	767.8	yes
Magnesium	mg/L	139	121.8	154.8	yes
Sodium	mg/L	72	58	79	yes
Potassium	mg/L	21	17.8	24.6	yes
Chloride	mg/L	67	57	78	yes
Sulfate-S	mg/L	606	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.1	26.80	35.20	yes
-------------------------	------	------	-------	-------	-----

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Salinity - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	244	230.2	261.4	yes
Magnesium	mg/L	94.7	92.7	99.7	yes
Sodium	mg/L	242	229	269	yes
Potassium	mg/L	239	229.4	265.4	yes
Chloride	mg/L	2020	1871	2231	yes
Sulfate-S	mg/L	148	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample	Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		pH	7.4	7.3	0	0.3	yes

Date Acquired: November 21, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 21, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	-38.25	-1000	1000	yes

Date Acquired: November 16, 2017

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F1 C6-C10	mg/kg	74	73	20	4	yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	mg/kg	69	64	86	yes

Date Acquired: November 16, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	mg/kg	98	80	120	yes

Date Acquired: November 16, 2017

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME in Soil EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 16, 2017	Exova Edmonton
BTEX-CCME in Soil EDM	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 16, 2017	Exova Edmonton
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl ₂ (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 21, 2017	Exova Edmonton
Saturated Paste in General Soil	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME in Soil (Shake) EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 16, 2017	Exova Edmonton

* Reference Method Modified

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
APHA	Standard Methods for the Examination of Water and Wastewater
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-1	1239775-2	1239775-3		
	Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 09, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	NMPlot8-02-HC	NMPlot8-03-HC	NMPlot8-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	27	10	10	0.1
Mono-Aromatic Hydrocarbons - Soil						
Methanol Field Preservation			No	No	No	
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		16-NOV-17	16-NOV-17	16-NOV-17	
Silica Gel Cleanup			Done	Done	Done	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	<50	50
F3c C16-C34	Dry Weight	mg/kg	460	440	580	50
F4c C34-C50	Dry Weight	mg/kg	400	400	500	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	1100	1100	1200	100
% C50+		%	40	40	40	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

		Reference Number	1239775-4	1239775-5	1239775-6	
		Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 09, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	NMPlot8-02-AN	NMPlot8-03-AN	NMPlot8-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
pH	Saturated Paste	pH	6.0	7.3	7.1	
Electrical Conductivity	Saturated Paste	dS/m	0.77	1.10	3.07	0.01
SAR	Saturated Paste		0.4	0.3	0.2	
% Saturation		%	103	50	49	
Calcium	Saturated Paste	meq/L	4.84	9.87	36.9	0.01
Calcium	Saturated Paste	mg/L	96.7	197	738	0.2
Calcium	Saturated Paste	mg/kg	100	98.8	365	
Magnesium	Saturated Paste	meq/L	2.76	3.19	10.6	0.02
Magnesium	Saturated Paste	mg/L	33.4	38.6	128	0.2
Magnesium	Saturated Paste	mg/kg	34.6	19.3	63.4	
Sodium	Saturated Paste	meq/L	0.82	0.67	0.96	0.04
Sodium	Saturated Paste	mg/L	19	15	22	1
Sodium	Saturated Paste	mg/kg	20	8	11	
Potassium	Saturated Paste	meq/L	0.50	0.18	<0.26	0.03
Potassium	Saturated Paste	mg/L	19.6	7.1	<10	1
Potassium	Saturated Paste	mg/kg	20	4	<5	
Chloride	Saturated Paste	meq/L	2.19	1.24	0.62	0.06
Chloride	Saturated Paste	mg/L	78	44	22	2
Chloride	Saturated Paste	mg/kg	80	22	11	
Sulfate (SO4)	Saturated Paste	meq/L	2.74	7.98	35.5	0.06
Sulfate (SO4)	Saturated Paste	mg/L	131	383	1700	3
Sulfate (SO4)	Saturated Paste	mg/kg	136	192	843	
Sulfate-S	Saturated Paste	mg/L	44	128	568	1
Sulfate-S	Saturated Paste	meq/L	2.74	7.98	35.5	0.06
Sulfate-S	Saturated Paste	mg/kg	45.3	63.9	281	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	5.8	7.2	7.3	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-7	1239775-8	1239775-9		
	Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	14:00		
	Sample Location					
	Sample Description	298 CM3 / NMPlot8-02-BD1	298 CM3 / NMPlot8-02-BD2	NMPlot5-02-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	35	27.2	19	0.1
Bulk Density		kg/L	0.38	0.42		
Bulk Density		kg/m³	380	423		
Wet Bulk Density		kg/L	0.58	0.58		
Porosity		%	na	na		
Volume	Declared Value	mL	298	298		

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-9	1239775-10	1239775-11	
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
	Sample Time	14:00	14:00	14:00	
	Sample Location				
	Sample Description	NMPlot5-02-HC	NMPlot5-03-HC	NMPlot5-04-HC	
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil					
Methanol Field Preservation		No	No	No	
Benzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil					
F1 C6-C10	Dry Weight	mg/kg	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil					
Extraction Date	Total Extractables	17-NOV-17	17-NOV-17	17-NOV-17	
Silica Gel Cleanup		Done	Done	Done	
F2c C10-C16	Dry Weight	mg/kg	<50	400	50
F3c C16-C34	Dry Weight	mg/kg	2000	7400	50
F4c C34-C50	Dry Weight	mg/kg	1700	4000	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	4400	11000	100
% C50+		%	42	30	38



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Sampled By: Company:		

	Reference Number	1239775-10	1239775-11	1239775-12	
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
	Sample Time	14:00	14:00	14:00	
	Sample Location				
	Sample Description	NMPlot5-03-HC	NMPlot5-04-HC	313 CM3 / NMPlot5-02-BD1	
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Physical and Aggregate Properties					
Moisture	Wet Weight @ 105°C	%	5	6	22
Bulk Density		kg/L			0.75
Bulk Density		kg/m³			750
Wet Bulk Density		kg/L			0.97
Porosity		%			na
Volume	Declared Value	mL			313



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Sampled By: Company:		

	Reference Number	1239775-13	1239775-17	1239775-18		
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017		
	Sample Time	14:00	10:00	10:00		
	Sample Location					
	Sample Description	313 CM3 / NMPlot5-02-BD2	NMPlot16-02-HC	NMPlot16-03-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	12	35	11	0.1
Bulk Density		kg/L	0.70			
Bulk Density		kg/m³	700			
Wet Bulk Density		kg/L	0.80			
Porosity		%	na			
Volume	Declared Value	mL	313			

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

		Reference Number	1239775-14	1239775-15	1239775-16	
		Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
		Sample Time	14:00	14:00	14:00	
		Sample Location				
		Sample Description	NMPlot5-02-AN	NMPlot5-03-AN	NMPlot5-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	2.54	2.40	2.87	0.01
SAR	Saturated Paste		<0.1	<0.1	0.2	
% Saturation		%	81	38	41	
Calcium	Saturated Paste	mg/kg	390	206	245	
Magnesium	Saturated Paste	mg/kg	146	42.6	82.5	
Sodium	Saturated Paste	mg/kg	<8	<4	10	
Potassium	Saturated Paste	mg/kg	15	6	10	
Chloride	Saturated Paste	mg/kg	15	4	4	
Sulfate (SO4)	Saturated Paste	mg/kg	1090	609	875	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.3	7.5	7.6	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-17	1239775-18	1239775-19	
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
	Sample Time	10:00	10:00	10:00	
	Sample Location				
	Sample Description	NMPlot16-02-HC	NMPlot16-03-HC	NMPlot16-04-HC	
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil					
Methanol Field Preservation		No	No	No	
Benzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil					
F1 C6-C10	Dry Weight	mg/kg	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil					
Extraction Date	Total Extractables	17-NOV-17	17-NOV-17	17-NOV-17	
Silica Gel Cleanup		Done	Done	Done	
F2c C10-C16	Dry Weight	mg/kg	<50	60	50
F3c C16-C34	Dry Weight	mg/kg	380	1300	50
F4c C34-C50	Dry Weight	mg/kg	300	900	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	500	2100	100
% C50+		%	30	35	20

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-19	1239775-20	1239775-21		
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	NMPlot16-04-HC	313 CM3 / NMPlot16-02-BD1	313 CM3 / NMPlot16-02-BD2		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	11	21.4	27.9	0.1
Bulk Density		kg/L		0.37	0.39	
Bulk Density		kg/m³		367	387	
Wet Bulk Density		kg/L		0.47	0.54	
Porosity		%		na	na	
Volume	Declared Value	mL		313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

		Reference Number	1239775-22	1239775-23	1239775-24	
		Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	NMPlot16-02-AN	NMPlot16-03-AN	NMPlot16-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.83	3.68	4.54	0.01
SAR	Saturated Paste		2.3	3.7	5.5	
% Saturation		%	140	49	44	
Calcium	Saturated Paste	mg/kg	286	253	222	
Magnesium	Saturated Paste	mg/kg	98.9	78.3	84.7	
Sodium	Saturated Paste	mg/kg	214	185	251	
Potassium	Saturated Paste	mg/kg	38	10	11	
Chloride	Saturated Paste	mg/kg	29	7	7	
Sulfate (SO4)	Saturated Paste	mg/kg	1040	1240	1330	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	6.4	7.4	7.4	

Approved by: 
Nathan Brilz, Chem. Technologist
Client Service Representative

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

Extractable Petroleum Hydrocarbons - Soil

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F2c C10-C16	mg/kg	230	270	30		yes
F3c C16-C34	mg/kg	958	1090	30		yes
F4c C34-C50	mg/kg	200	300	30		yes
F4c+ C50+	mg/kg	<100	<100	30		yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	99	74	116	yes
F3c C16-C34	mg/kg	160	124	160	yes
F4c C34-C50	mg/kg	200	169	229	yes

Date Acquired: November 16, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	82	65	135	yes
F3c C16-C34	mg/kg	98	65	135	yes
F4c C34-C50	mg/kg	75	65	135	yes

Date Acquired: November 16, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0031	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.500	0.500	yes
Toluene	ng	0	-2.00	2.00	yes
Ethylbenzene	ng	0	-0.500	0.500	yes
m,p-Xylene	ng	0	-1.00	1.00	yes
o-Xylene	ng	0	-1.00	1.00	yes

Date Acquired: November 16, 2017

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Benzene	mg/kg	2.73	2.73	20	0.004	yes
Toluene	mg/kg	2.58	2.57	20	0.01	yes
Ethylbenzene	mg/kg	2.86	2.72	20	0.010	yes
m,p-Xylene	mg/kg	5.76	5.48	20	0.01	yes
o-Xylene	mg/kg	2.85	2.71	20	0.01	yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	mg/kg	5.08	4.250	5.750	yes
Toluene	mg/kg	5.04	4.25	5.75	yes
Ethylbenzene	mg/kg	4.92	4.250	5.750	yes
m,p-Xylene	mg/kg	9.79	8.50	11.50	yes
o-Xylene	mg/kg	4.92	4.25	5.75	yes

Date Acquired: November 16, 2017

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

Mono-Aromatic Hydrocarbons - Soil - Continued

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	mg/kg	89	80	120	yes
Toluene	mg/kg	85	80	120	yes
Ethylbenzene	mg/kg	94	80	120	yes
m,p-Xylene	mg/kg	95	80	120	yes
o-Xylene	mg/kg	93	80	120	yes

Date Acquired: November 16, 2017

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	10	10	10	0.3	yes

Date Acquired: November 20, 2017

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0124	-0.4	0.5	yes
Magnesium	mg/L	0.0036	-0.1	0.1	yes
Sodium	mg/L	0.0345	-0	2	yes
Potassium	mg/L	0.0519	-0.5	0.7	yes
Chloride	mg/L	2.0275	0	5	yes
Sulfate-S	mg/L	0.0419	-0	1	yes

Date Acquired: November 17, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.6	6.6	0	0.3	yes
Electrical Conductivity	dS/m	0.19	0.19	10	0.01	yes
Calcium	mg/kg	16.3	16.6	10	0.6	yes
Magnesium	mg/kg	5.0	5.0	10	0.6	yes
Sodium	mg/kg	3	3	10	1	yes
Potassium	mg/kg	2	2	10	1	yes
Chloride	mg/kg	5	5	15	3	yes
Sulfate-S	mg/kg	3.8	3.8	10	1.2	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.1	6.5	8.0	yes
Electrical Conductivity	dS/m	3.16	2.71	3.25	yes
% Saturation	%	46	38	52	yes
Calcium	mg/L	671	596.2	767.8	yes
Magnesium	mg/L	139	121.8	154.8	yes
Sodium	mg/L	72	58	79	yes
Potassium	mg/L	21	17.8	24.6	yes
Chloride	mg/L	67	57	78	yes
Sulfate-S	mg/L	606	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.1	26.80	35.20	yes
-------------------------	------	------	-------	-------	-----

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Sampled By: Company:		

Salinity - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	244	230.2	261.4	yes
Magnesium	mg/L	94.7	92.7	99.7	yes
Sodium	mg/L	242	229	269	yes
Potassium	mg/L	239	229.4	265.4	yes
Chloride	mg/L	2020	1871	2231	yes
Sulfate-S	mg/L	148	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample	Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		pH	7.4	7.3	0	0.3	yes

Date Acquired: November 21, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 21, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	-38.25	-1000	1000	yes

Date Acquired: November 16, 2017

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F1 C6-C10	mg/kg	74	73	20	4	yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	mg/kg	69	64	86	yes

Date Acquired: November 16, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	mg/kg	98	80	120	yes

Date Acquired: November 16, 2017

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME in Soil EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 16, 2017	Exova Edmonton
BTEX-CCME in Soil EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Edmonton
BTEX-CCME in Soil EDM	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 16, 2017	Exova Edmonton
BTEX-CCME in Soil EDM	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Edmonton
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl ₂ (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 21, 2017	Exova Edmonton
Saturated Paste in General Soil	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME in Soil (Shake) EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 16, 2017	Exova Edmonton
TEH-CCME in Soil (Shake) EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Edmonton

* Reference Method Modified

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
APHA	Standard Methods for the Examination of Water and Wastewater
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

	Reference Number	1239814-1	1239814-2	1239814-3		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	NMPlot14-02-HC	NMPlot14-03-HC	NMPlot14-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	132	736	50
F3c C16-C34	Dry Weight	mg/kg	1100	2640	4930	50
F4c C34-C50	Dry Weight	mg/kg	855	1580	2450	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	1760	3500	5350	100
% C50+	%		22.7	21.5	18.2	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	16.00	11.00	11.40	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

	Reference Number	1239814-4	1239814-5	1239814-12		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	313 CM3 / NMPlot14-02-BD1	313 CM3 / NMPlot14-02-BD2	313cm3 / NMPlot4- 02-BD1		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	19	17	19	0.1
Bulk Density		kg/L	0.70	0.78	1.0	
Bulk Density		kg/m³	700	780	1000	
Wet Bulk Density		kg/L	0.86	0.93	1.24	
Porosity		%	na	na	62	
Volume	Declared Value	mL	313	313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

		Reference Number	1239814-6	1239814-7	1239814-8	
		Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	NMPlot14-02-AN	NMPlot14-03-AN	NMPlot14-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.95	1.96	3.15	0.01
SAR	Saturated Paste		2.5	2.4	2.1	
% Saturation		%	60	48	42	
Calcium	Saturated Paste	mg/kg	133	111	237	
Magnesium	Saturated Paste	mg/kg	45.9	35.0	56.6	
Sodium	Saturated Paste	mg/kg	102	80	91	
Potassium	Saturated Paste	mg/kg	6	5	9	
Chloride	Saturated Paste	mg/kg	8	5	3	
Sulfate (SO4)	Saturated Paste	mg/kg	594	511	952	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.6	7.5	7.5	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Sampled By: C.K. Company: Paragon		

	Reference Number	1239814-9	1239814-10	1239814-11		
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	NMPlot4-02-HC	NMPlot4-03-HC	NMPlot4-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	102	172	50
F3c C16-C34	Dry Weight	mg/kg	1370	2200	2250	50
F4c C34-C50	Dry Weight	mg/kg	1180	1480	1300	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	2620	3560	3260	100
% C50+	%		26.8	25.8	24.7	
Silica Gel Cleanup						
Silica Gel Cleanup			Done	Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	10.60	8.51	7.10	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

	Reference Number	1239814-13	1239814-20	1239814-21		
	Sample Date	Nov 10, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	10:00	14:00	14:00		
	Sample Location					
	Sample Description	313cm3 / NMPlot4-02-BD2	313cm3 / NMPlot13-02-BD1	313cm3 / NMPlot13-02-BD2		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	9.5	15	11	0.1
Bulk Density		kg/L	1.13	0.94	1.1	
Bulk Density		kg/m³	1130	940	1100	
Wet Bulk Density		kg/L	1.25	1.11	1.20	
Porosity		%	57	na	60	
Volume	Declared Value	mL	313	313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

		Reference Number	1239814-14	1239814-15	1239814-16	
		Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	NMPlot4-02-AN	NMPlot4-03-AN	NMPlot4-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.80	2.74	3.25	0.01
SAR	Saturated Paste		<0.1	0.2	0.8	
% Saturation		%	51	51	39	
Calcium	Saturated Paste	mg/kg	195	320	222	
Magnesium	Saturated Paste	mg/kg	31.1	74.4	102	
Sodium	Saturated Paste	mg/kg	4	14	34	
Potassium	Saturated Paste	mg/kg	7	7	11	
Chloride	Saturated Paste	mg/kg	4	4	4	
Sulfate (SO4)	Saturated Paste	mg/kg	415	1010	948	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.5	7.4	7.7	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

	Reference Number	1239814-17	1239814-18	1239814-19		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	14:00	14:00	14:00		
	Sample Location					
	Sample Description	NMPlot13-02-HC	NMPlot13-03-HC	NMPlot13-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	91	632	975	50
F3c C16-C34	Dry Weight	mg/kg	2010	6500	5770	50
F4c C34-C50	Dry Weight	mg/kg	1570	3700	2790	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	4030	8990	6490	100
% C50+	%		30.2	23.4	19.5	
Silica Gel Cleanup						
Silica Gel Cleanup			Done	Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	12.40	5.81	12.30	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

		Reference Number	1239814-22	1239814-23	1239814-24	
		Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017	
		Sample Time	14:00	14:00	14:00	
		Sample Location				
		Sample Description	NMPlot13-02-AN	NMPlot13-03-AN	NMPlot13-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.22	1.34	2.99	0.01
SAR	Saturated Paste		0.3	0.3	0.5	
% Saturation		%	58	45	42	
Calcium	Saturated Paste	mg/kg	107	92.0	243	
Magnesium	Saturated Paste	mg/kg	36.2	31.0	90.5	
Sodium	Saturated Paste	mg/kg	9	9	26	
Potassium	Saturated Paste	mg/kg	9	6	11	
Chloride	Saturated Paste	mg/kg	10	6	6	
Sulfate (SO4)	Saturated Paste	mg/kg	124	283	928	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.1	7.0	7.2	

Approved by: 
Nathan Brilz, Chem. Technologist
Client Service Representative

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

Extractable Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	0	-10	10	yes
F3c C16-C34	µg/mL	0	-30	30	yes
F4c C34-C50	µg/mL	0	-20	20	yes
F4HTGCc C34-C50+	µg/mL	0	-20	20	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	105.92	80	120	yes
F3c C16-C34	µg/mL	111.61	80	120	yes
F4c C34-C50	µg/mL	104.79	80	120	yes
F4HTGCc C34-C50+	µg/mL	100.56	80	120	yes

Date Acquired: November 17, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	-0.0032	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.005	0.005	yes
Toluene	ng	0	-0.06	0.06	yes
Ethylbenzene	ng	0	-0.030	0.030	yes
Total Xylenes (m,p,o)	ng	0	-0.09	0.09	yes
Styrene	ng	0	-0.030	0.030	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	87.40	80	120	yes
Toluene	ng	100.80	80	120	yes
Ethylbenzene	ng	104.00	80	120	yes
Total Xylenes (m,p,o)	ng	118.67	80	120	yes
Styrene	ng	113.80	80	120	yes

Date Acquired: November 17, 2017

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	29	29	10	0.3	yes

Date Acquired: November 20, 2017

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0563	-0.4	0.5	yes
Magnesium	mg/L	0.0269	-0.1	0.1	yes
Sodium	mg/L	0.0086	-0	2	yes

Quality Control

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
P. O. 4009, MD 0078	Project Name:	Control Number: C0056631
Fort McMurray, AB, Canada	Project Location: Suncor Base Mine	Date Received: Nov 15, 2017
T9H 3L1	LSD:	Date Reported: Nov 21, 2017
Attn: Marty Yarmuch	P.O.: 4410252962	Report Number: 2244025
Sampled By: C.K.	Proj. Acct. code: E6687	
Company: Paragon		

Salinity - Continued

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Potassium	mg/L	-0.0166	-0.5	0.7	yes
Chloride	mg/L	2.7414	0	5	yes
Sulfate-S	mg/L	0.0111	-0	1	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.5	8.0	yes
Electrical Conductivity	dS/m	3.01	2.71	3.25	yes
% Saturation	%	45	38	52	yes
Calcium	mg/L	663	596.2	767.8	yes
Magnesium	mg/L	140	121.8	154.8	yes
Sodium	mg/L	74	58	79	yes
Potassium	mg/L	20	17.8	24.6	yes
Chloride	mg/L	70	57	78	yes
Sulfate-S	mg/L	641	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.3	26.80	35.20	yes
Calcium	mg/L	244	230.2	261.4	yes
Magnesium	mg/L	94.7	92.7	99.7	yes
Sodium	mg/L	241	229	269	yes
Chloride	mg/L	2040	1871	2231	yes
Sulfate-S	mg/L	145	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.4	6.6	0	0.3	yes

Date Acquired: November 21, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 21, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	0	-10	10	yes

Date Acquired: November 17, 2017

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME - Soil	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary
BTEX-CCME - Soil	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Calgary
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl ₂ (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 21, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME-Soil (Shake)	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary

** Reference Method Modified*

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Hydrocarbon Chromatogram

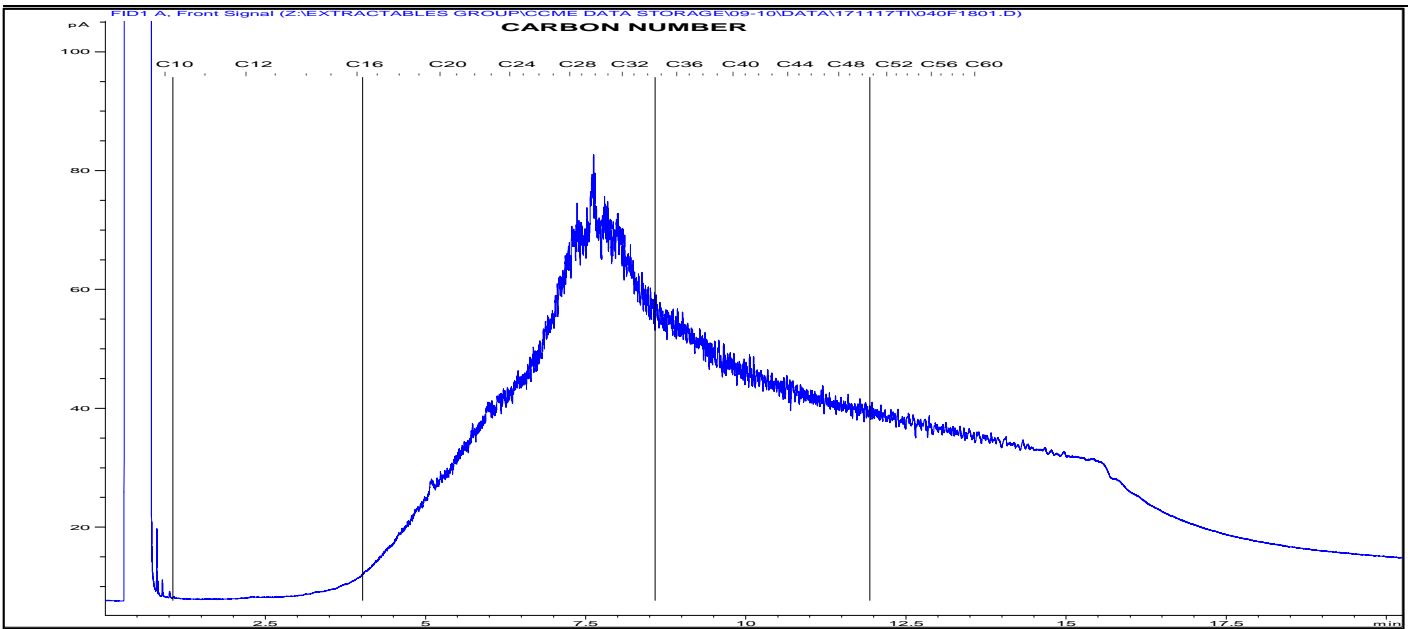
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

Exova Number: 1239814-1

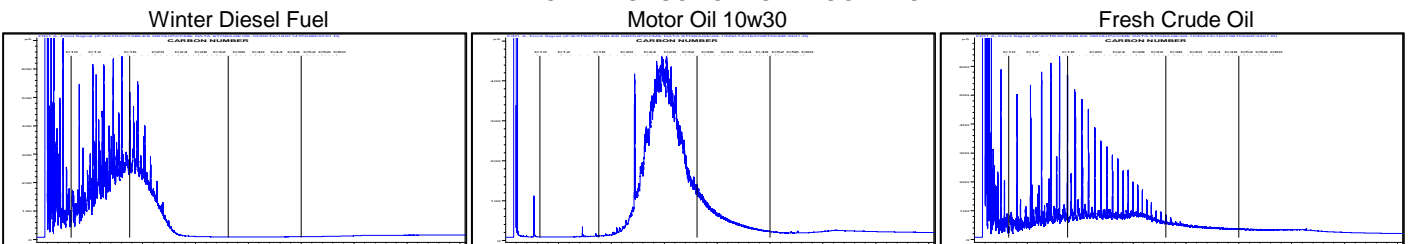
Sample Description: NMPlot14-02-HC

Silica Gel Treated

Sample Date: Nov 11, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

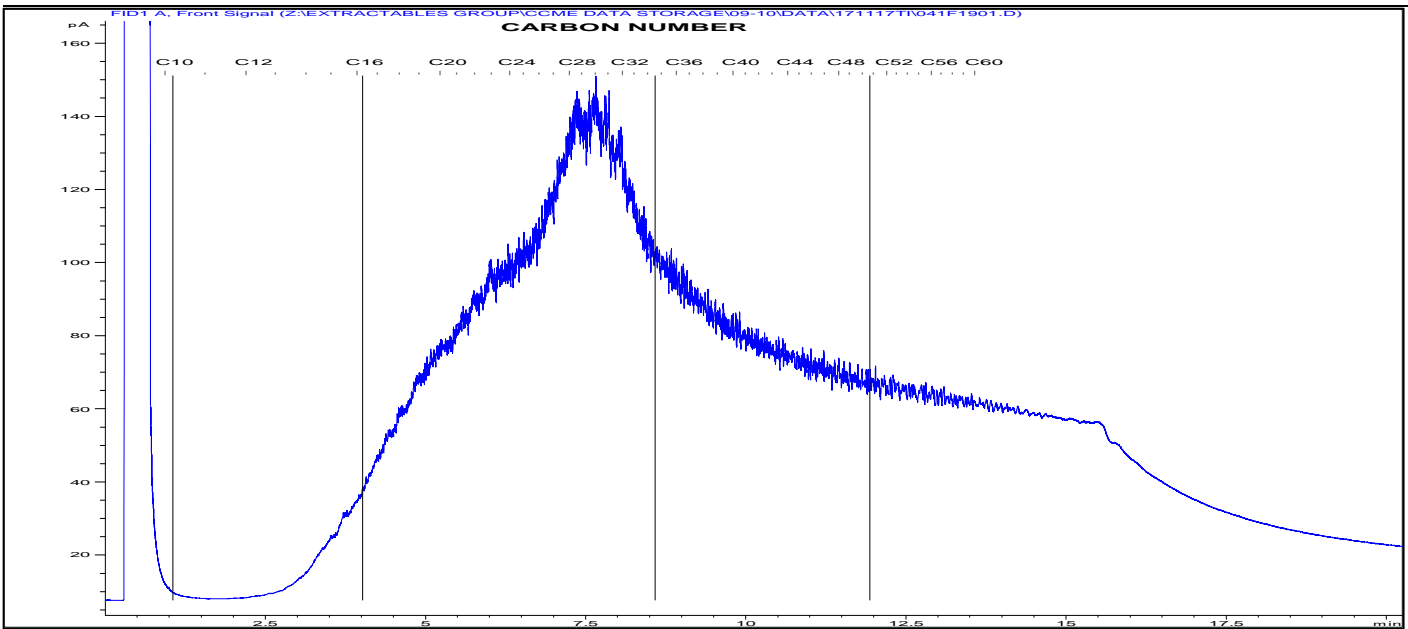
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

Exova Number: 1239814-2

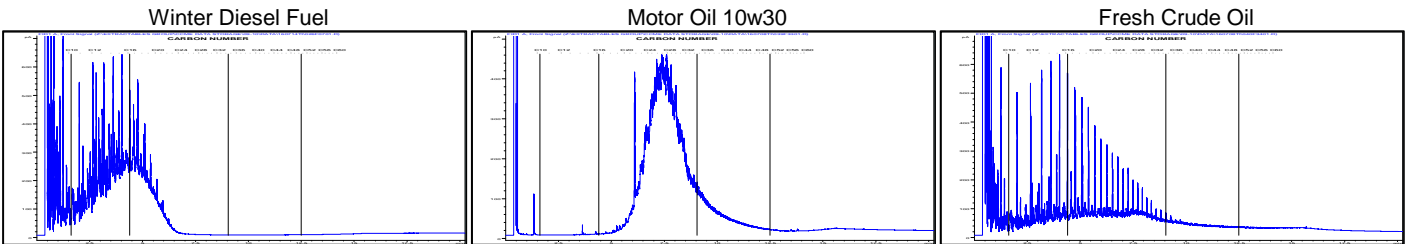
Sample Description: NMPlot14-03-HC

Sample Date: Nov 11, 2017

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



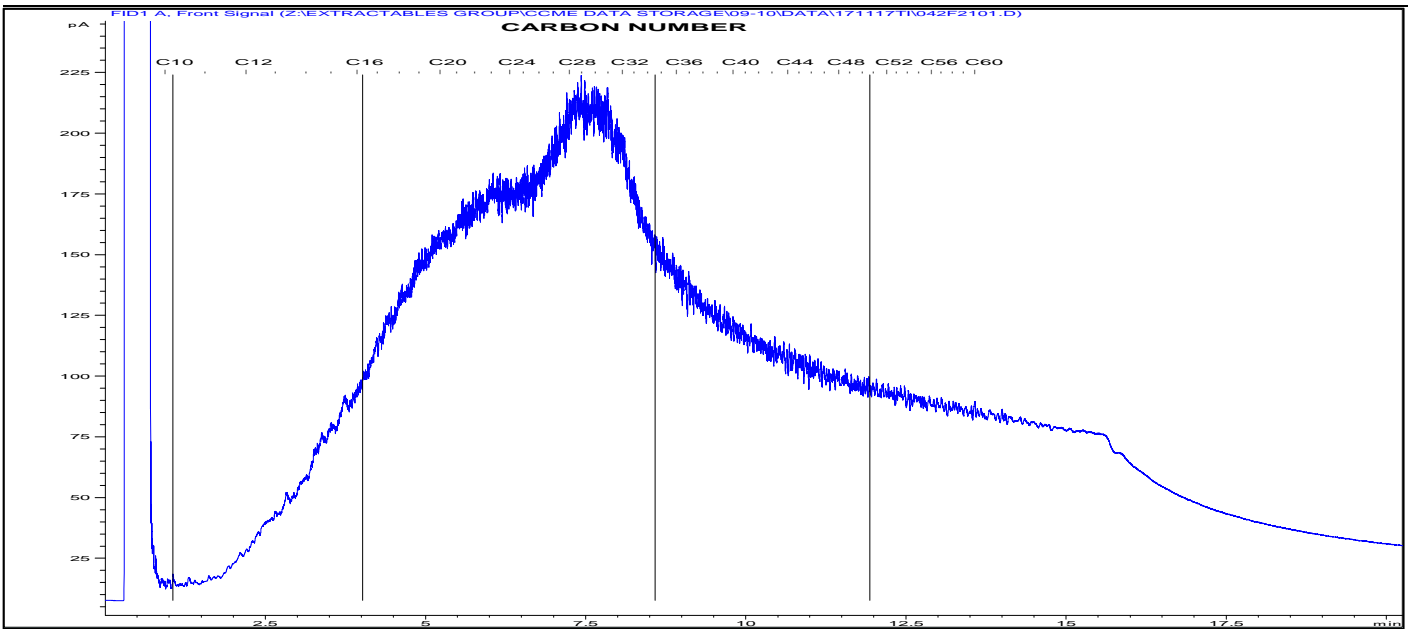
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

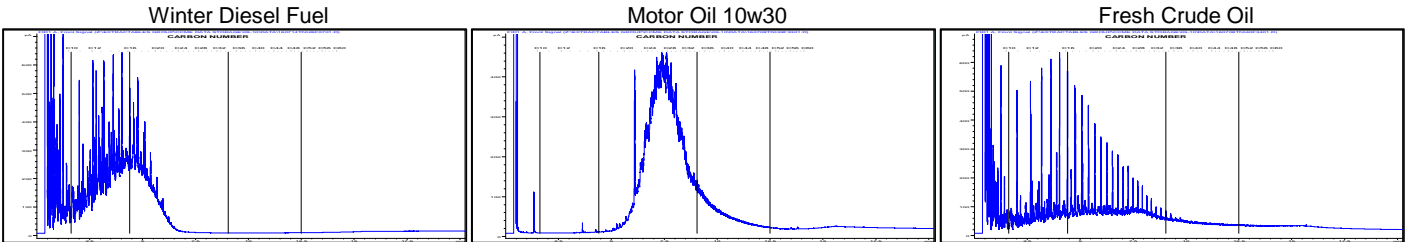
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

Exova Number: 1239814-3 Sample Description: NMPlot14-04-HC Silica Gel Treated
 Sample Date: Nov 11, 2017



TYPICAL PRODUCT CHROMATOGRAMS



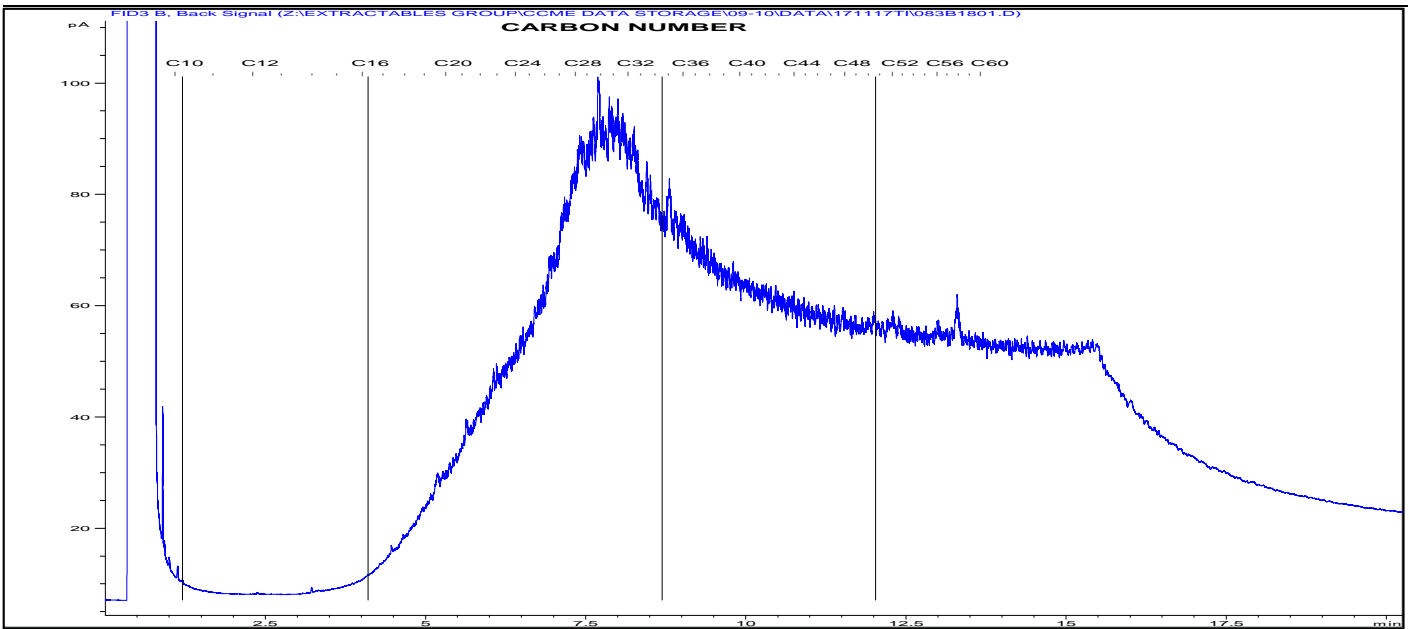
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

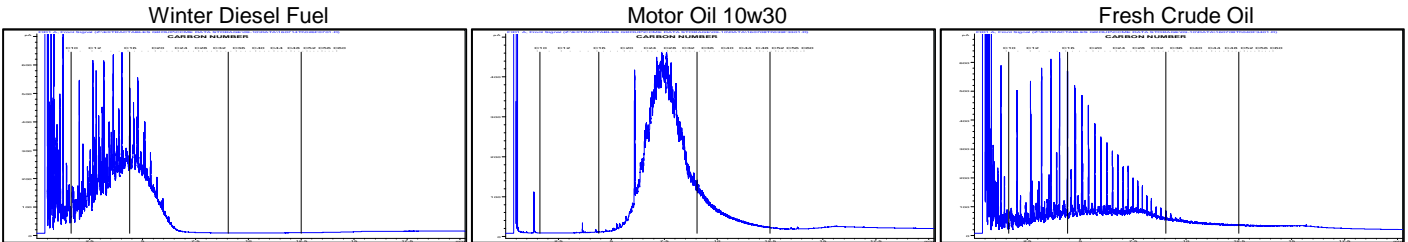
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

Exova Number: 1239814-9 Sample Description: NMPlot4-02-HC Silica Gel Treated
 Sample Date: Nov 10, 2017



TYPICAL PRODUCT CHROMATOGRAMS



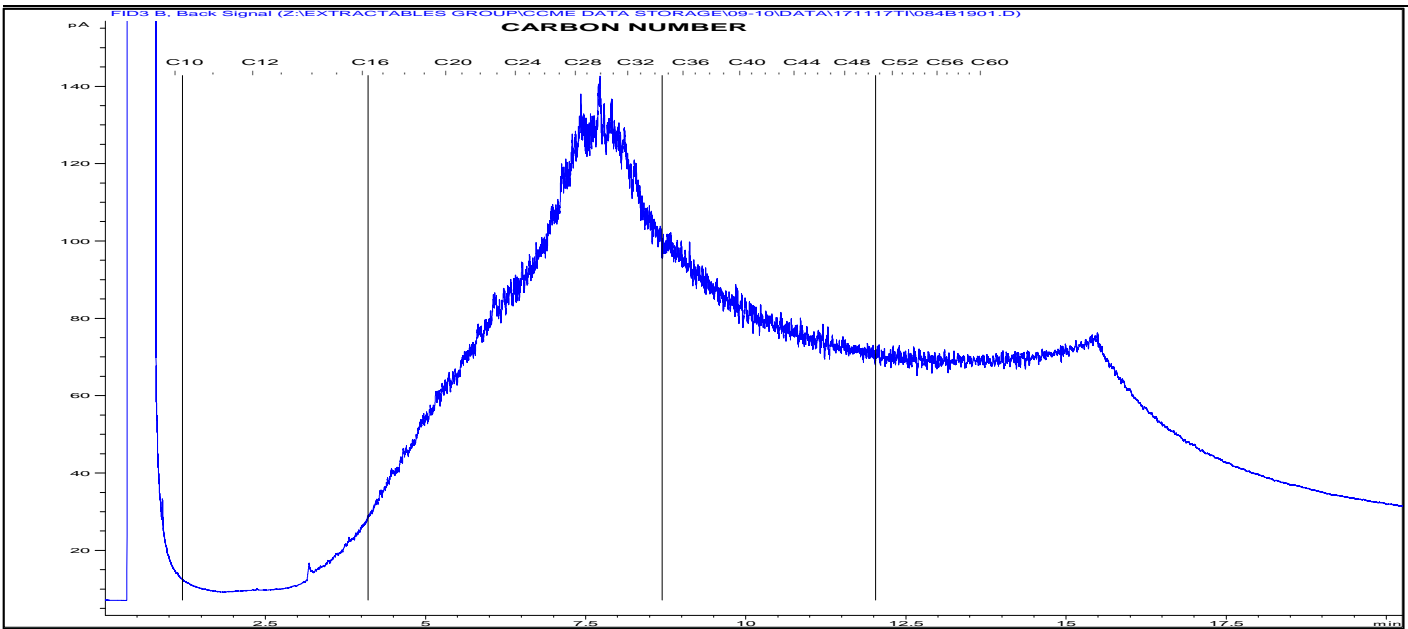
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

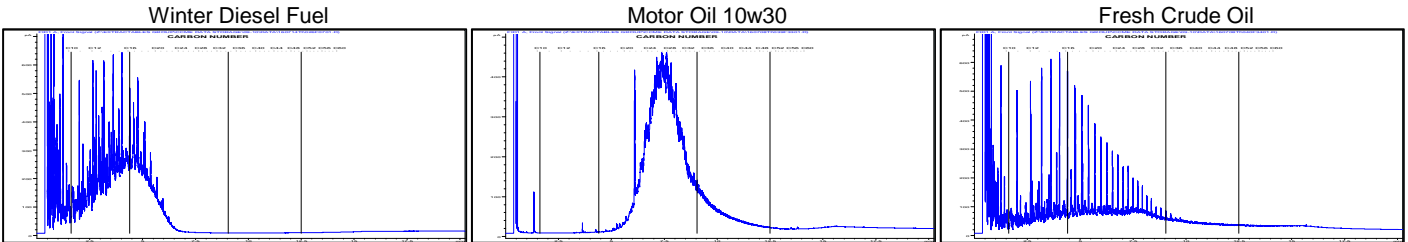
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

Exova Number: 1239814-10 Sample Description: NMPlot4-03-HC Silica Gel Treated
 Sample Date: Nov 10, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

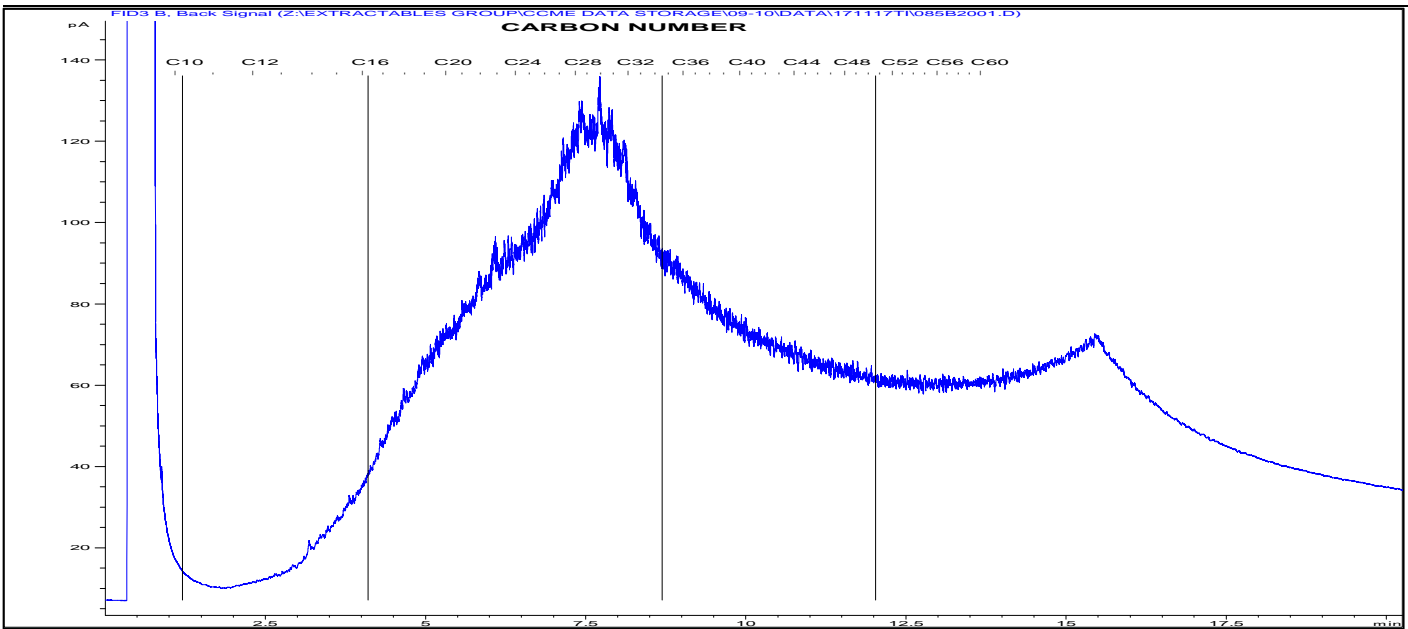
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

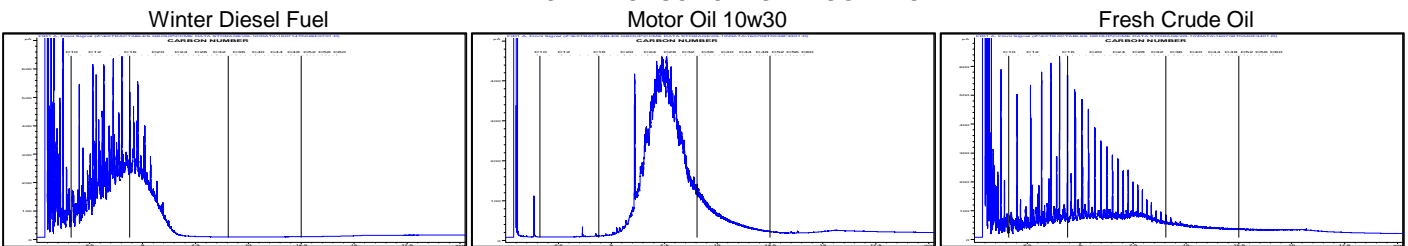
Exova Number: 1239814-11
 Sample Date: Nov 10, 2017

Sample Description: NMPlot4-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

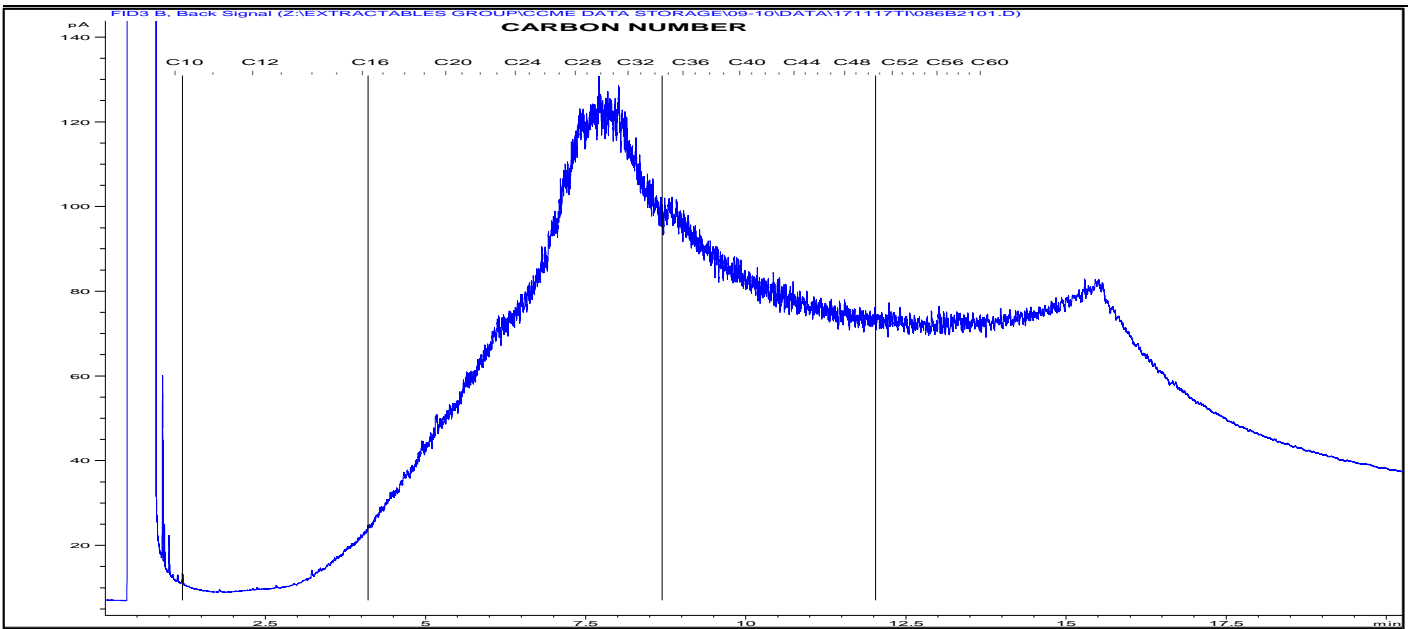
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

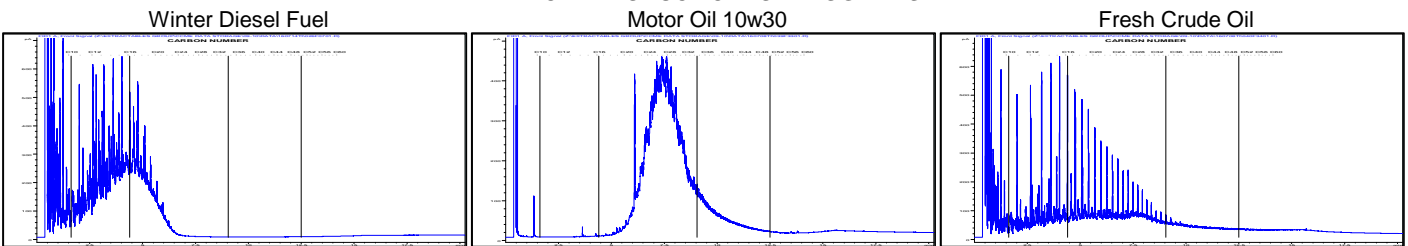
Exova Number: 1239814-17
 Sample Date: Nov 11, 2017

Sample Description: NMPlot13-02-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

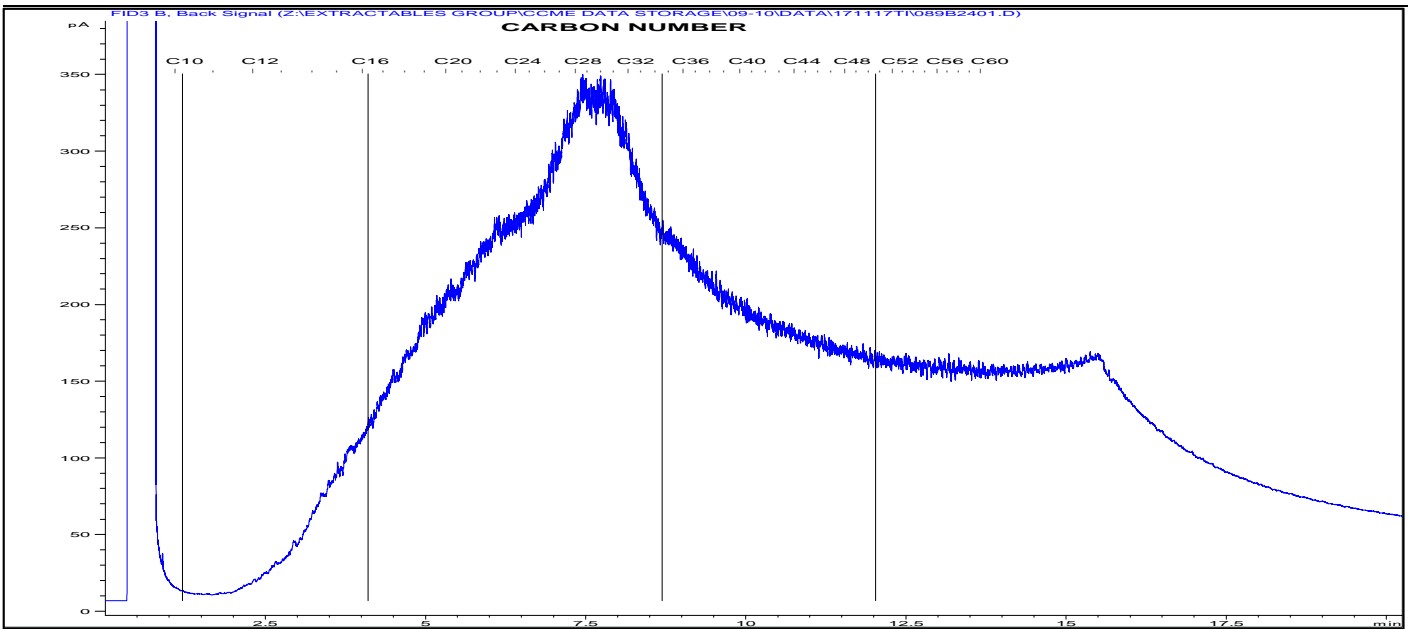
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

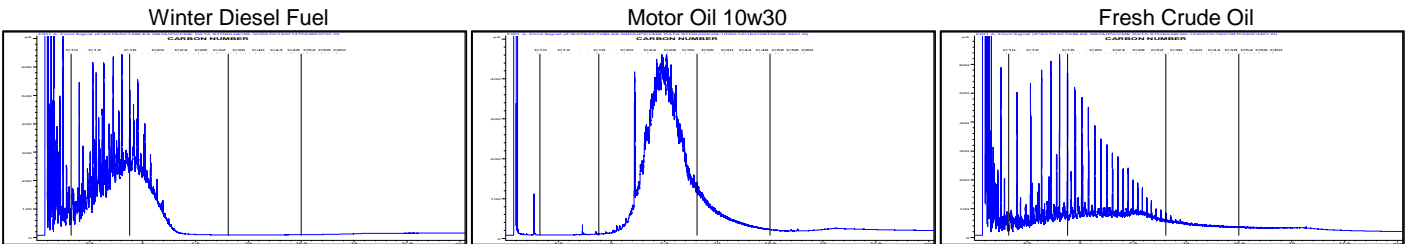
Exova Number: 1239814-18
 Sample Date: Nov 11, 2017

Sample Description: NMPlot13-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

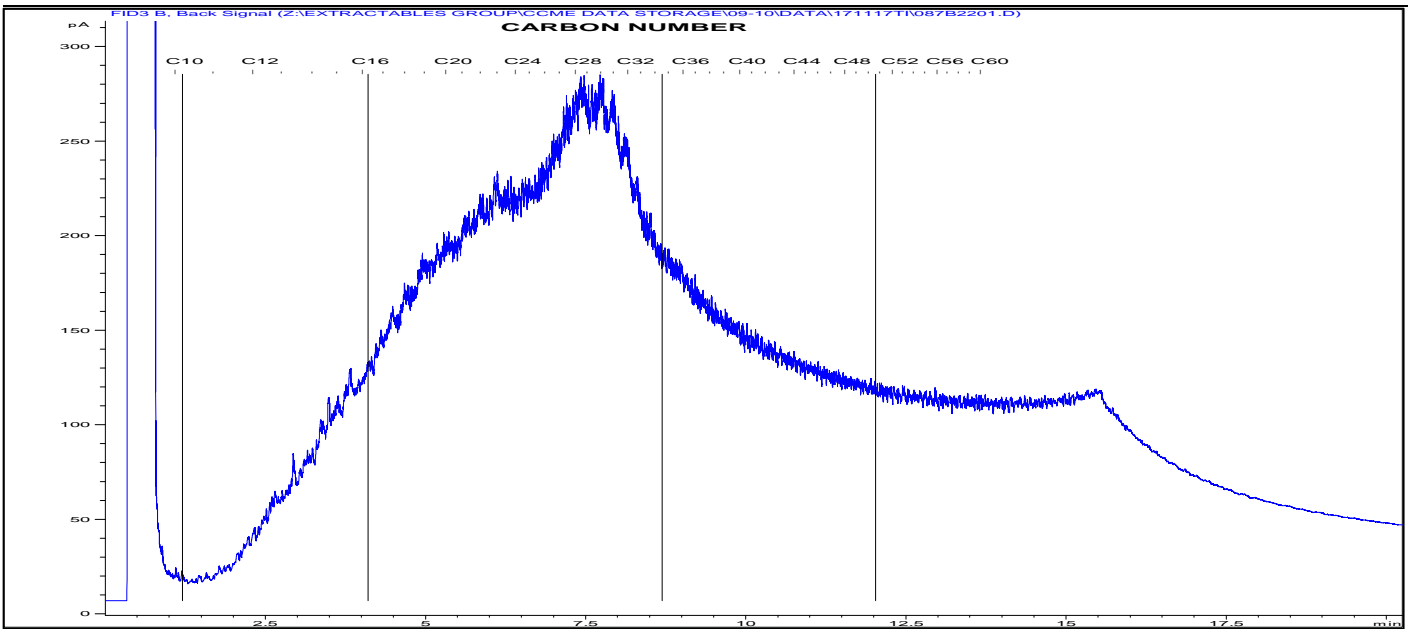
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

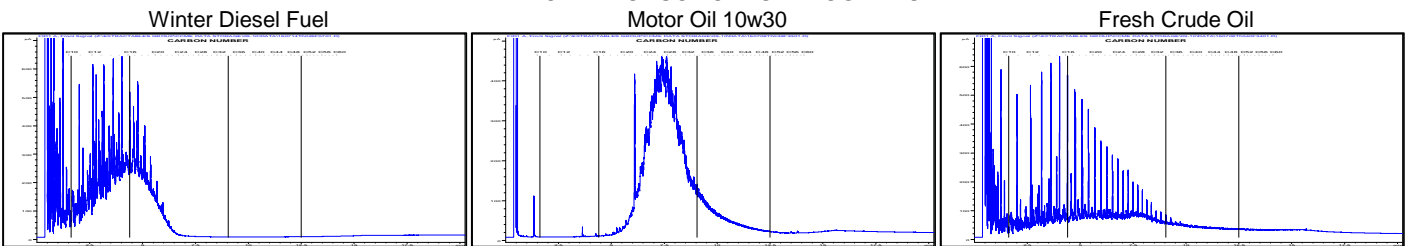
Exova Number: 1239814-19
 Sample Date: Nov 11, 2017

Sample Description: NMPlot13-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239524-1	1239524-2	1239524-3	
		Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017	
		Sample Time	16:00	16:00	16:00	
		Sample Location				
		Sample Description	DSEExtra3-02-AN	DSEExtra3-03-AN	DSEExtra3-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.37	2.98	3.24	0.01
SAR	Saturated Paste		0.1	0.3	0.3	
% Saturation		%	235	192	53	
Calcium	Saturated Paste	mg/kg	625	1240	377	
Magnesium	Saturated Paste	mg/kg	102	302	87.3	
Sodium	Saturated Paste	mg/kg	23	71	20	
Potassium	Saturated Paste	mg/kg	18	<19	6	
Chloride	Saturated Paste	mg/kg	21	18	8	
Sulfate (SO ₄)	Saturated Paste	mg/kg	1490	3470	1030	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl ₂ sol.	pH	6.9	7.3	7.6	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239524-4	1239524-5	1239524-6		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	16:00	16:00	16:00		
	Sample Location					
	Sample Description	DSEExtra3-02-HC	DSEExtra3-03-HC	DSEExtra3-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	65	50
F3c C16-C34	Dry Weight	mg/kg	511	1210	2280	50
F4c C34-C50	Dry Weight	mg/kg	435	913	1670	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	976	2020	4220	100
% C50+		%	26.8	24.9	28.8	
Silica Gel Cleanup						
Silica Gel Cleanup			Done	Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	34.40	24.80	13.40	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239524-7	1239524-8	1239524-15		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 10, 2017		
	Sample Time	16:00	16:00	10:00		
	Sample Location					
	Sample Description	DSEExtra3-02-BD1 / 298CM3	DSEExtra3-02-BD2 / 298CM3	DSPlot7-02-BD1 / 298CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	39	39	31.8	0.1
Bulk Density		kg/L	0.53	0.46	0.66	
Bulk Density		kg/m³	530	460	659	
Wet Bulk Density		kg/L	0.87	0.75	0.97	
Porosity		%	na	na	na	
Volume	Declared Value	mL	298	298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239524-9	1239524-10	1239524-11	
		Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	DSPlot7-02-AN	DSPlot7-03-AN	DSPlot7-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.89	2.74	2.68	0.01
SAR	Saturated Paste		0.2	0.7	0.5	
% Saturation		%	157	46	44	
Calcium	Saturated Paste	mg/kg	245	273	266	
Magnesium	Saturated Paste	mg/kg	58.9	54.4	52.9	
Sodium	Saturated Paste	mg/kg	16	31	24	
Potassium	Saturated Paste	mg/kg	11	<5	7	
Chloride	Saturated Paste	mg/kg	21	16	5	
Sulfate (SO4)	Saturated Paste	mg/kg	504	845	854	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	6.9	7.4	7.7	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239524-12	1239524-13	1239524-14		
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	DSPlot7-02-HC	DSPlot7-03-HC	DSPlot7-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	15	<10	30	10
F1 -BTEX	Dry Weight	mg/kg	15	<10	30	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	1250	50
F3c C16-C34	Dry Weight	mg/kg	873	1150	7470	50
F4c C34-C50	Dry Weight	mg/kg	771	935	4040	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	1710	2080	10500	100
% C50+	%		27.2	26.0	24.2	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	30.70	8.69	8.19	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239524-16	1239524-23	1239524-24		
	Sample Date	Nov 10, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	10:00	08:00	08:00		
	Sample Location					
	Sample Description	DSPlot7-02-BD2 / 298CM3	DSPlot9-02-BDI / 298CM3	DSPlot9-02-BD2 / 298CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	19	15	22	0.1
Bulk Density		kg/L	0.81	0.96	0.90	
Bulk Density		kg/m³	810	960	900	
Wet Bulk Density		kg/L	1.00	1.14	1.14	
Porosity		%	na	na	na	
Volume	Declared Value	mL	298	298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239524-17	1239524-18	1239524-19	
		Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017	
		Sample Time	08:00	08:00	08:00	
		Sample Location				
		Sample Description	DSPlot9-02-AN	DSPlot9-03-AN	DSPlot9-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	2.79	2.53	2.55	0.01
SAR	Saturated Paste		0.3	0.2	0.2	
% Saturation		%	73	47	49	
Calcium	Saturated Paste	mg/kg	459	283	290	
Magnesium	Saturated Paste	mg/kg	102	52.6	66.1	
Sodium	Saturated Paste	mg/kg	21	11	11	
Potassium	Saturated Paste	mg/kg	9	5	10	
Chloride	Saturated Paste	mg/kg	10	5	3	
Sulfate (SO4)	Saturated Paste	mg/kg	1380	860	928	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.4	7.7	7.7	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239524-20	1239524-21	1239524-22	
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017	
	Sample Time	08:00	08:00	08:00	
	Sample Location				
	Sample Description	DSPlot9-02-HC	DSPlot9-03-HC	DSPlot9-04-HC	
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil					
Benzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil					
Methanol Field Preservation		No	No	No	
F1 C6-C10	Dry Weight	mg/kg	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil					
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17
F2c C10-C16	Dry Weight	mg/kg	65	500	187
F3c C16-C34	Dry Weight	mg/kg	2530	5910	1770
F4c C34-C50	Dry Weight	mg/kg	2110	3200	836
F4HTGCc C34-C50+	Dry Weight	mg/kg	5490	6760	2020
% C50+	%		31.8	18.7	20.6
Silica Gel Cleanup					
Silica Gel Cleanup			Done	Done	Done
Soil % Moisture					
Moisture	Soil % Moisture	% by weight	14.10	8.14	5.33

Approved by: 
Randy Neumann, BSc
Vice President

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Extractable Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	0	-10	10	yes
F3c C16-C34	µg/mL	0	-30	30	yes
F4c C34-C50	µg/mL	0	-20	20	yes
F4HTGCc C34-C50+	µg/mL	0	-20	20	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	105.52	80	120	yes
F3c C16-C34	µg/mL	108.46	80	120	yes
F4c C34-C50	µg/mL	94.07	80	120	yes
F4HTGCc C34-C50+	µg/mL	90.70	80	120	yes

Date Acquired: November 17, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F2c C10-C16	mg/kg	<50	<50	50	10	yes
F3c C16-C34	mg/kg	1210	1280	50	10	yes
F4c C34-C50	mg/kg	913	927	50	10	yes
F4HTGCc C34-C50+	mg/kg	2020	2170	50	10	yes

Date Acquired: November 17, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	86	70	130	yes
F3c C16-C34	mg/kg	114	70	130	yes
F4c C34-C50	mg/kg	113	70	130	yes
F4HTGCc C34-C50+	mg/kg	120	70	130	yes

Date Acquired: November 17, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0016	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.005	0.005	yes
Toluene	ng	0	-0.06	0.06	yes
Ethylbenzene	ng	0	-0.030	0.030	yes
Total Xylenes (m,p,o)	ng	0	-0.09	0.09	yes
Styrene	ng	0	-0.030	0.030	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	98.20	80	120	yes
Toluene	ng	101.40	80	120	yes
Ethylbenzene	ng	97.20	80	120	yes
Total Xylenes (m,p,o)	ng	108.67	80	120	yes
Styrene	ng	115.00	80	120	yes

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Mono-Aromatic Hydrocarbons - Soil - Continued

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Date Acquired:	November 17, 2017				

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	29	30	10	0.3	yes
Date Acquired:	November 20, 2017					

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	-0.1619	-0.4	0.5	yes
Magnesium	mg/L	-0.0096	-0.1	0.1	yes
Sodium	mg/L	-0.0842	-0	2	yes
Potassium	mg/L	-0.2372	-0.5	0.7	yes
Chloride	mg/L	3.4225	0	5	yes
Sulfate-S	mg/L	0.0314	-0	1	yes
Date Acquired:	November 17, 2017				

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Electrical Conductivity	dS/m	3.09	2.71	3.25	yes
% Saturation	%	46	38	52	yes
Calcium	mg/L	646	596.2	767.8	yes
Magnesium	mg/L	138	121.8	154.8	yes
Sodium	mg/L	71	58	79	yes
Potassium	mg/L	19	17.8	24.6	yes
Chloride	mg/L	61	57	78	yes
Sulfate-S	mg/L	581	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.1	26.80	35.20	yes
Calcium	mg/L	245	230.2	261.4	yes
Magnesium	mg/L	95.5	92.7	99.7	yes
Sodium	mg/L	243	229	269	yes
Potassium	mg/L	243	229.4	265.4	yes
Chloride	mg/L	2040	1871	2231	yes
Sulfate-S	mg/L	148	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	8.4	8.5	0	0.3	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 17, 2017



Quality Control

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
P. O. 4009, MD 0078	Project Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada	Project Location: Suncor Basemine	Date Received: Nov 15, 2017
T9H 3L1	LSD:	Date Reported: Nov 21, 2017
Attn: Marty Yarmuch	P.O.: 4410252962	Report Number: 2243539
Sampled By: Nikki McPhee	Proj. Acct. code: E6687	
Company: Paragon Soil		

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	0	-10	10	yes
Date Acquired: November 17, 2017					

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME - Soil	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary
BTEX-CCME - Soil	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Calgary
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl ₂ (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME-Soil (Shake)	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary

** Reference Method Modified*

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Hydrocarbon Chromatogram

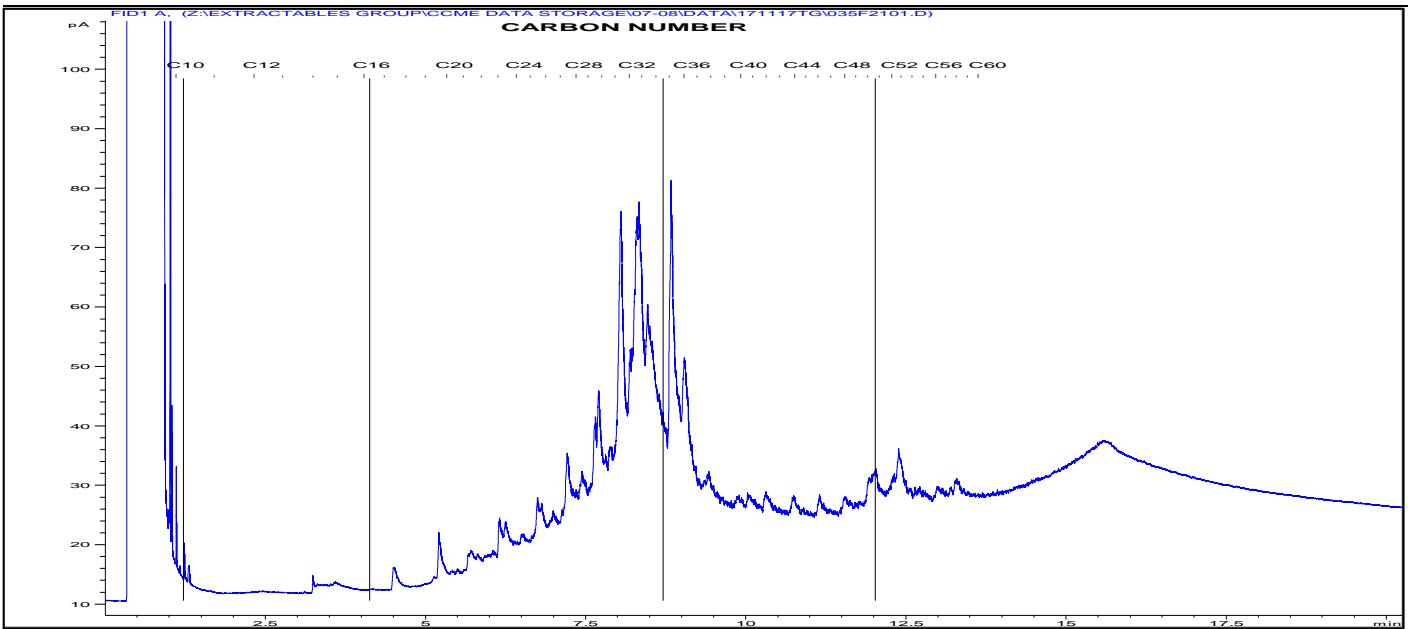
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

Exova Number: 1239524-4

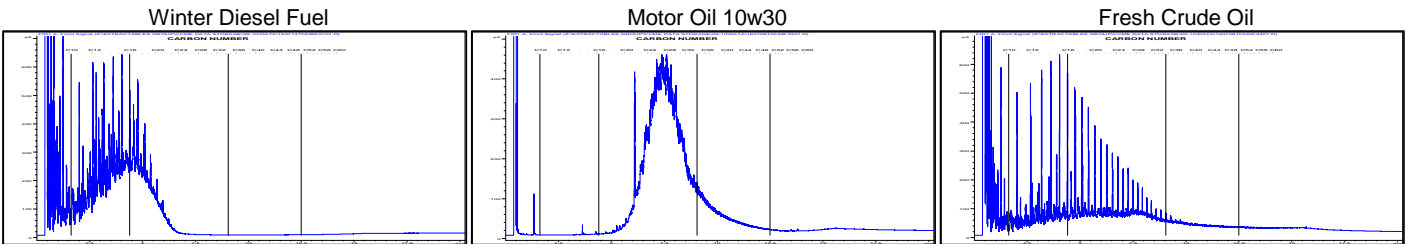
Sample Description: DSEExtra3-02-HC

Silica Gel Treated

Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

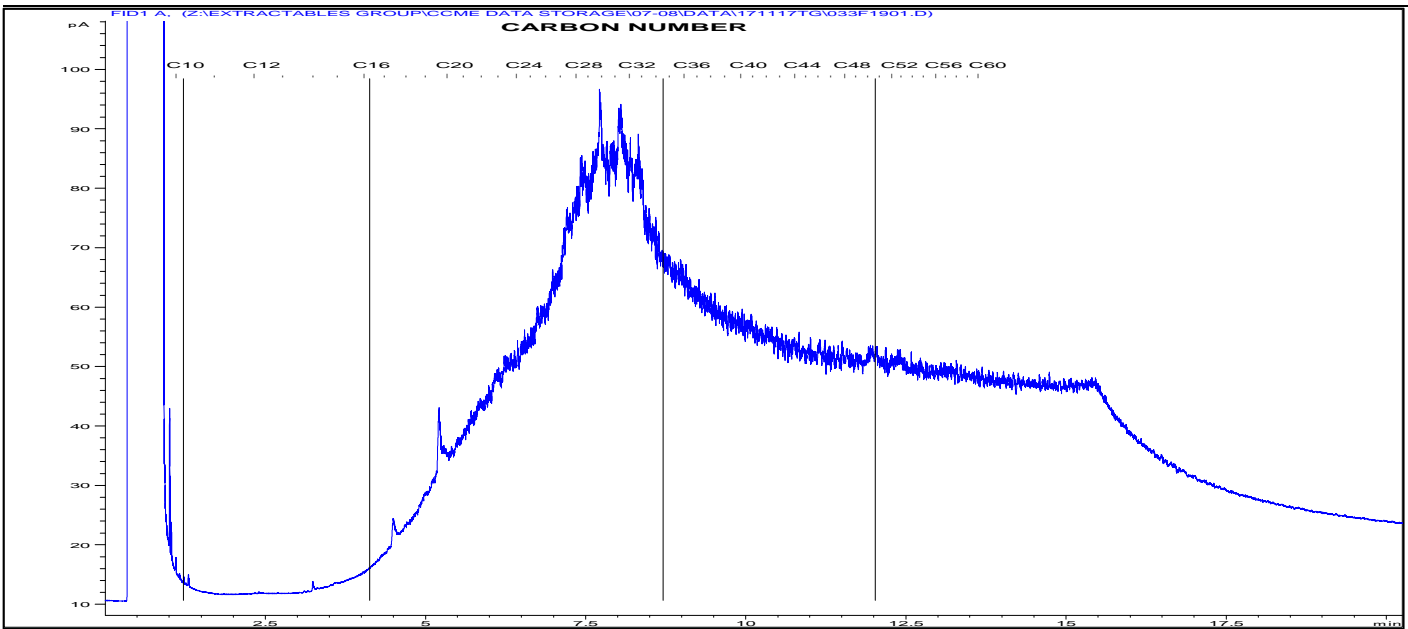
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



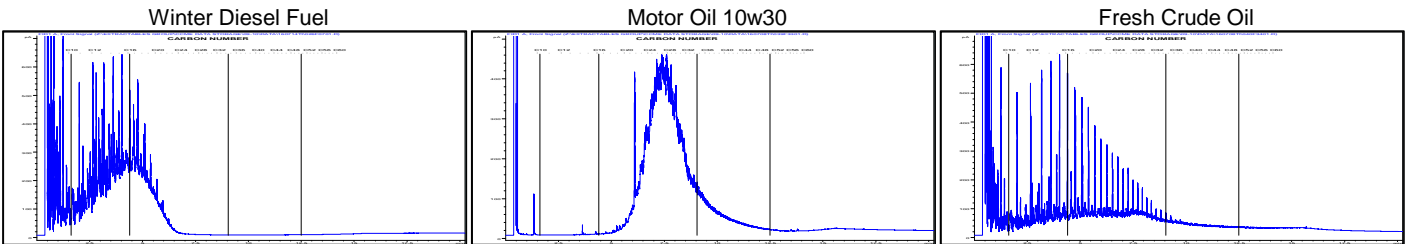
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

Exova Number: 1239524-5 Sample Description: DSEExtra3-03-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

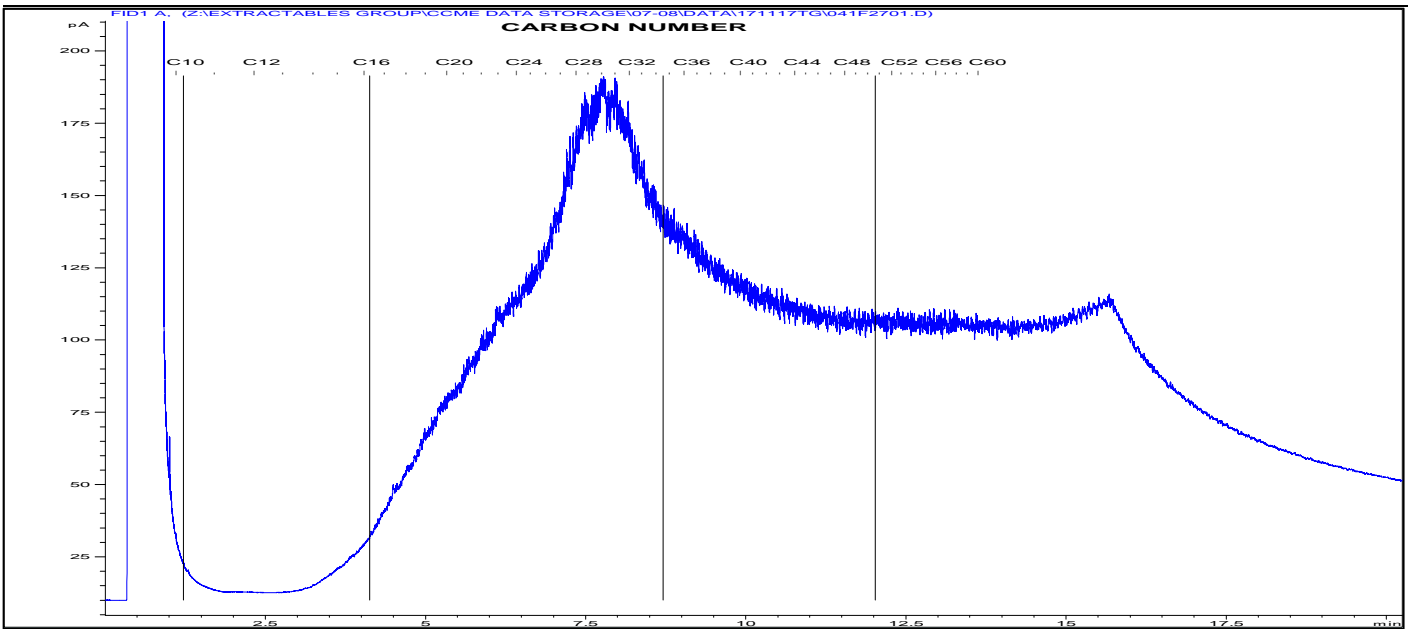
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

Exova Number: 1239524-6

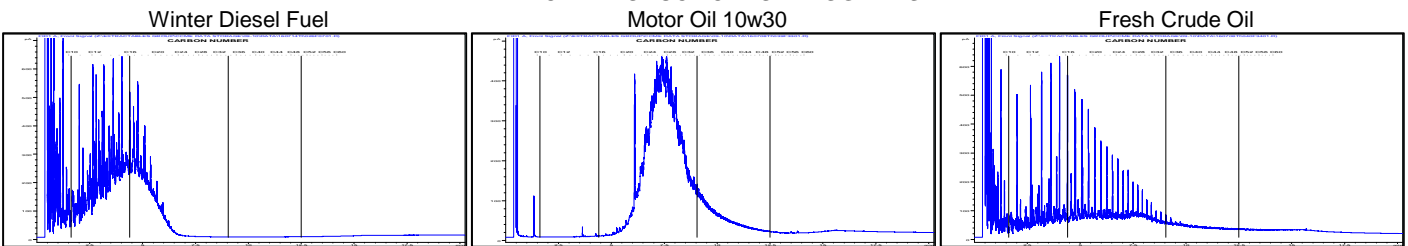
Sample Description: DSEExtra3-04-HC

Silica Gel Treated

Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

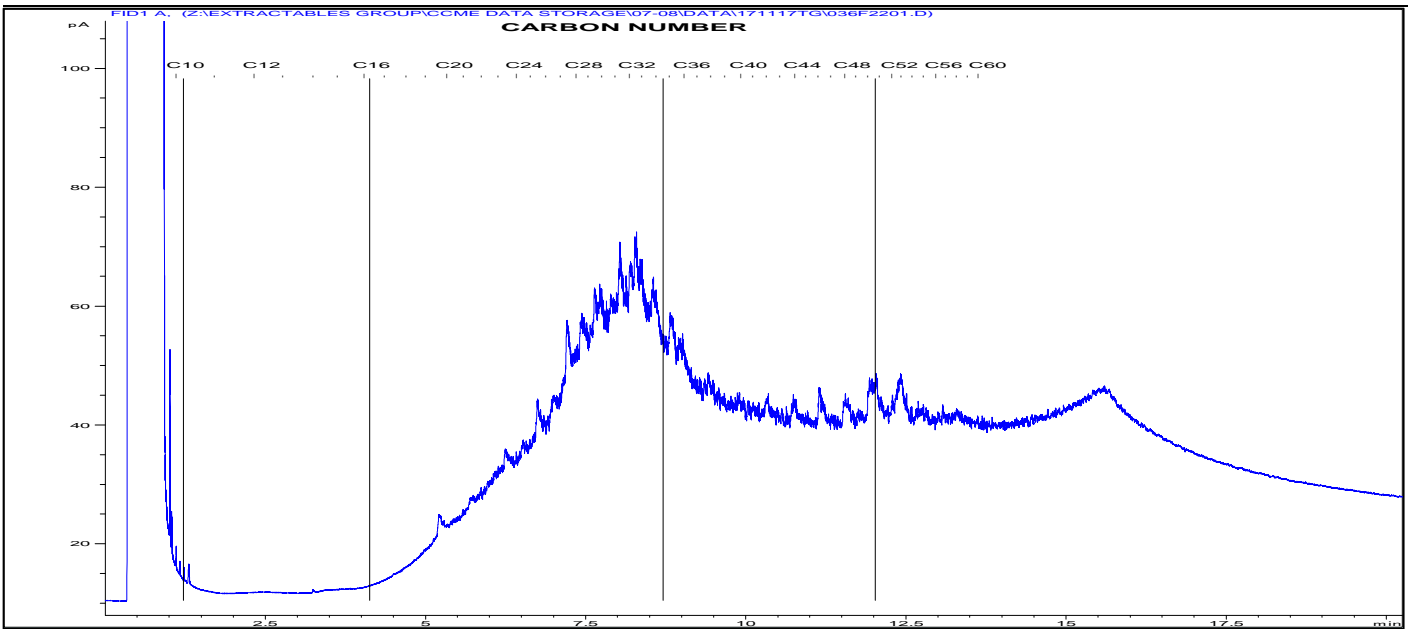
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



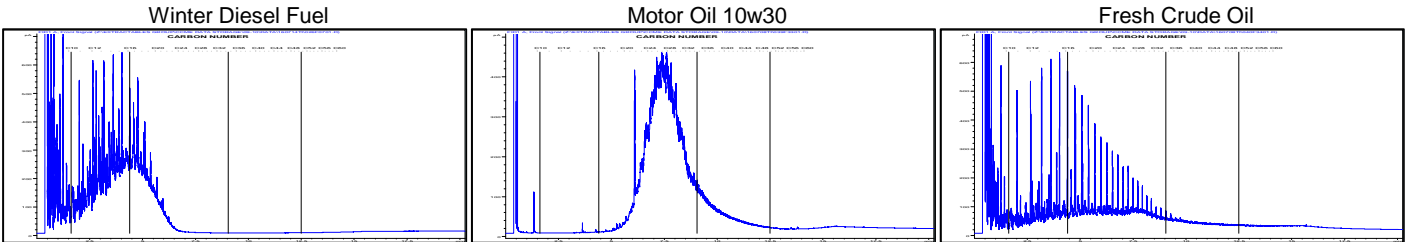
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

Exova Number: 1239524-12 Sample Description: DSPlot7-02-HC Silica Gel Treated
 Sample Date: Nov 10, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

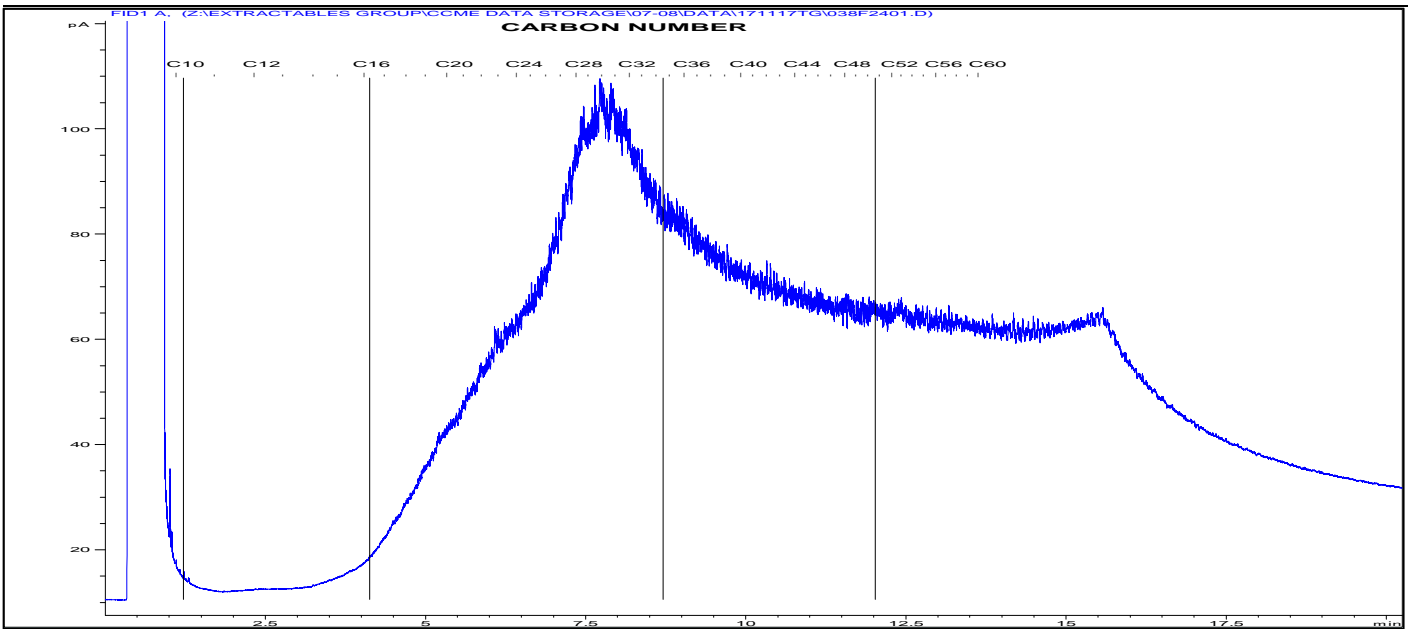
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

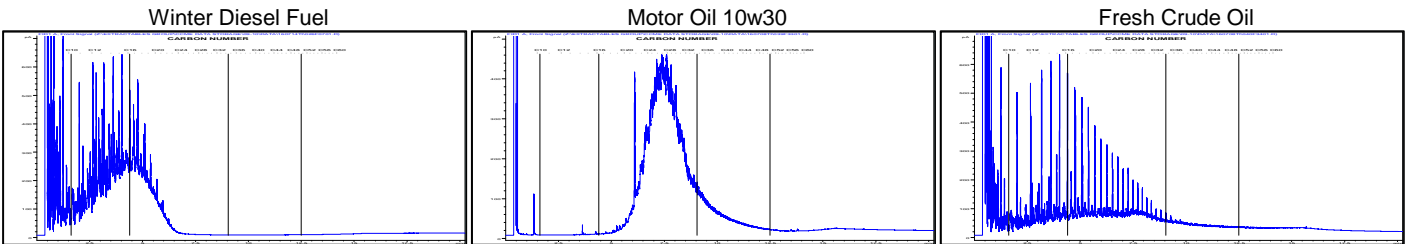
Exova Number: 1239524-13
 Sample Date: Nov 10, 2017

Sample Description: DSPlot7-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

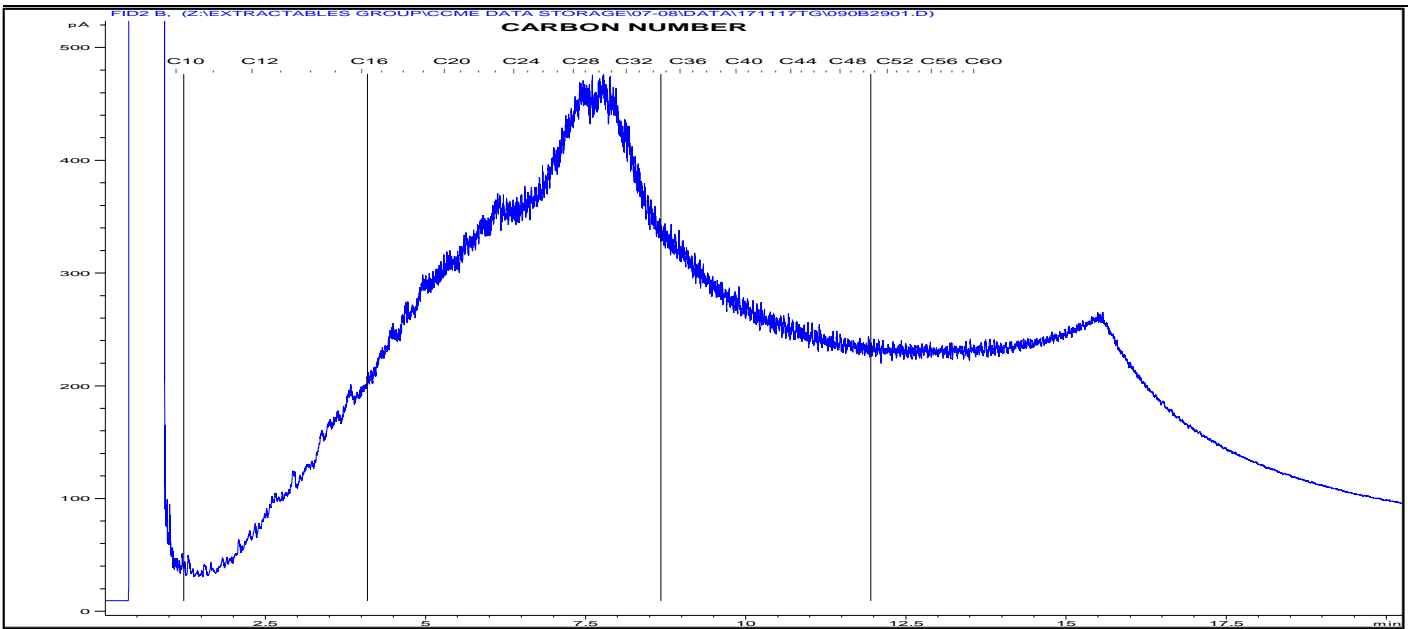
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

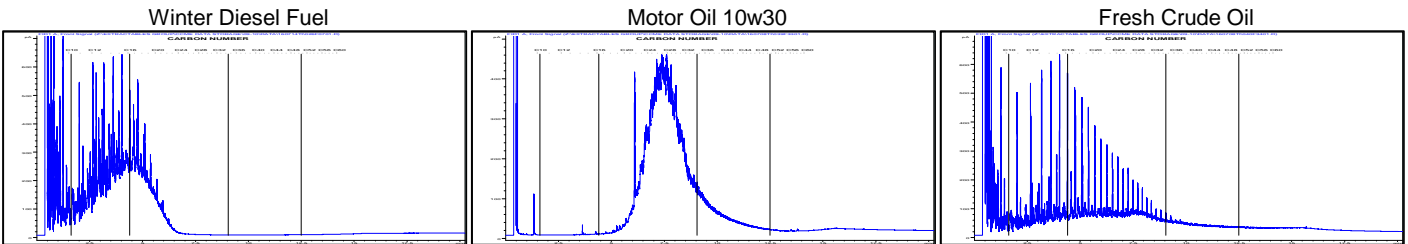
Exova Number: 1239524-14
 Sample Date: Nov 10, 2017

Sample Description: DSPlot7-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



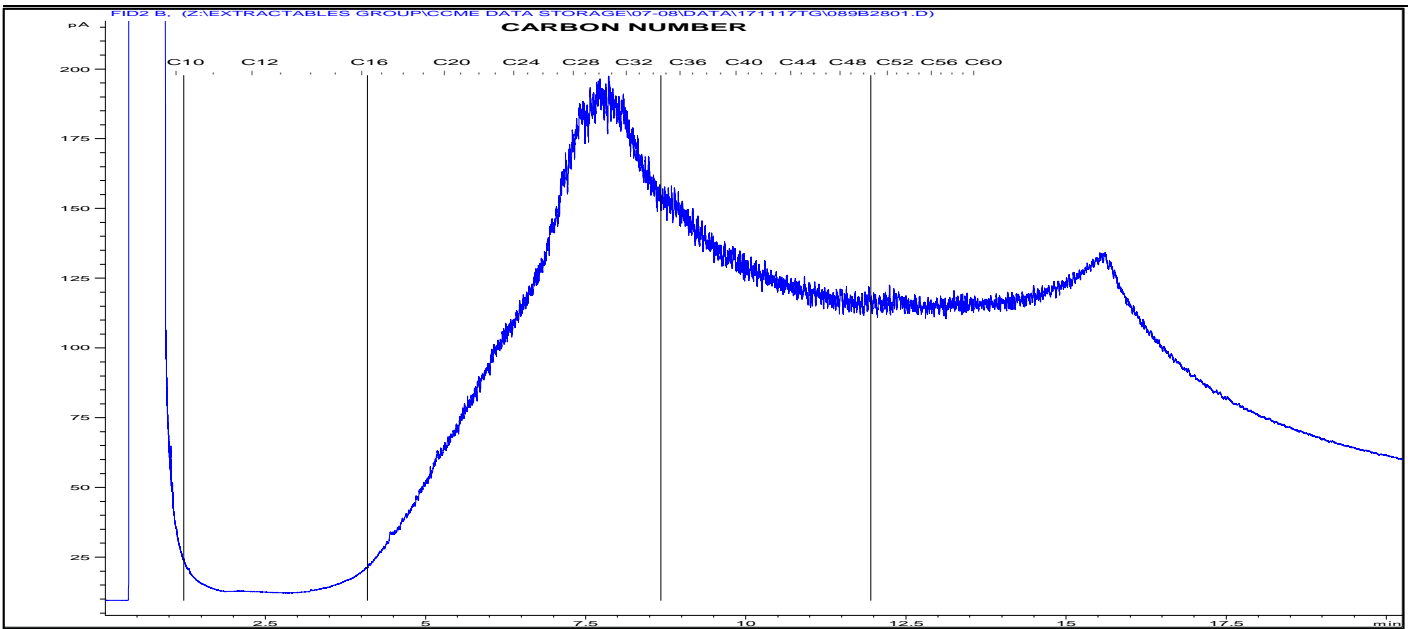
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

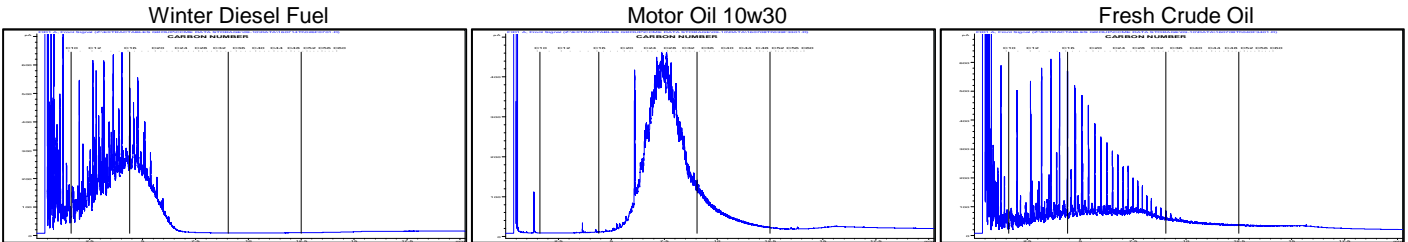
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

Exova Number: 1239524-20 Sample Description: DSPlot9-02-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



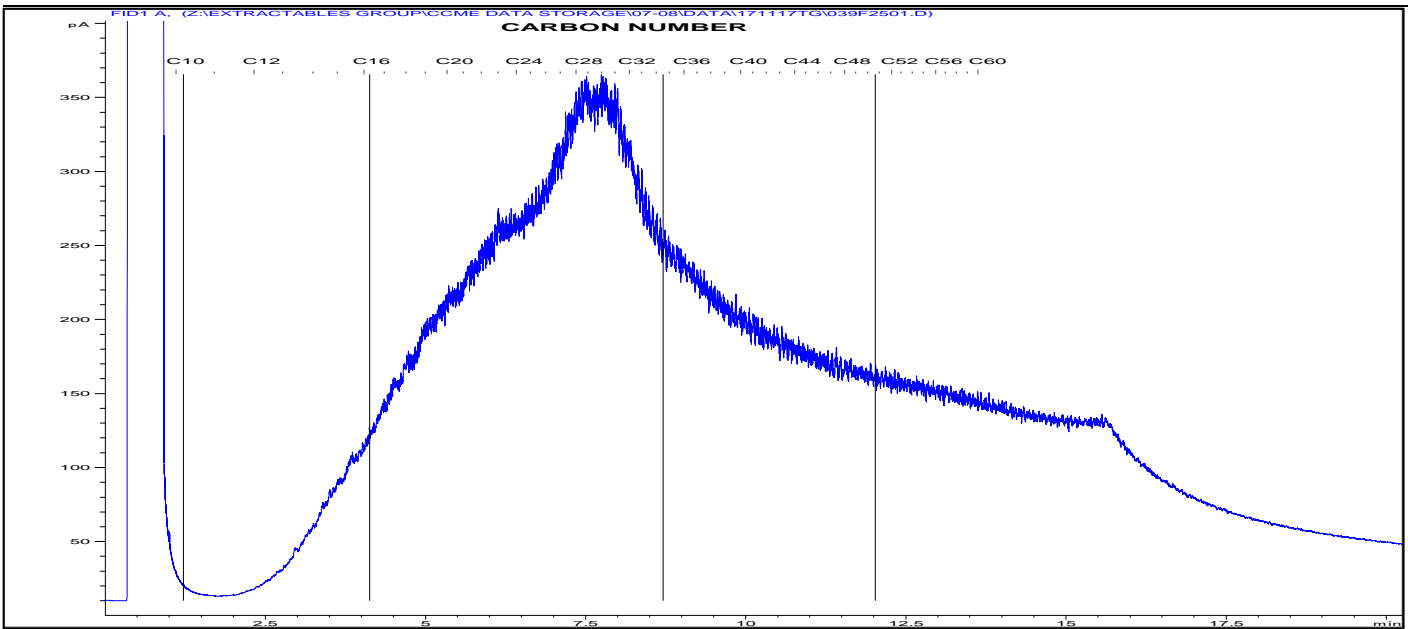
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

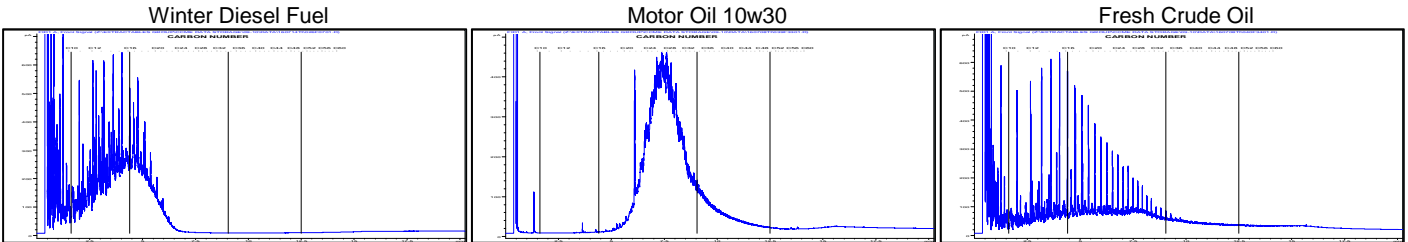
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

Exova Number: 1239524-21 Sample Description: DSPlot9-03-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

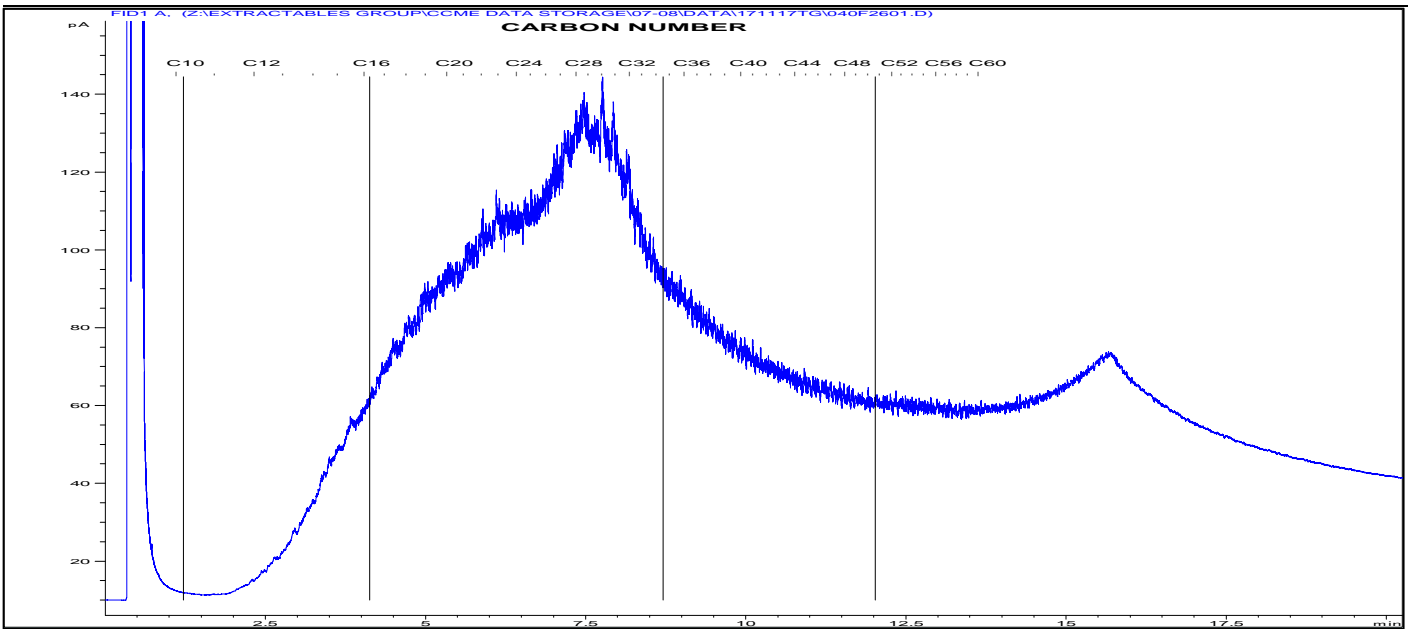
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

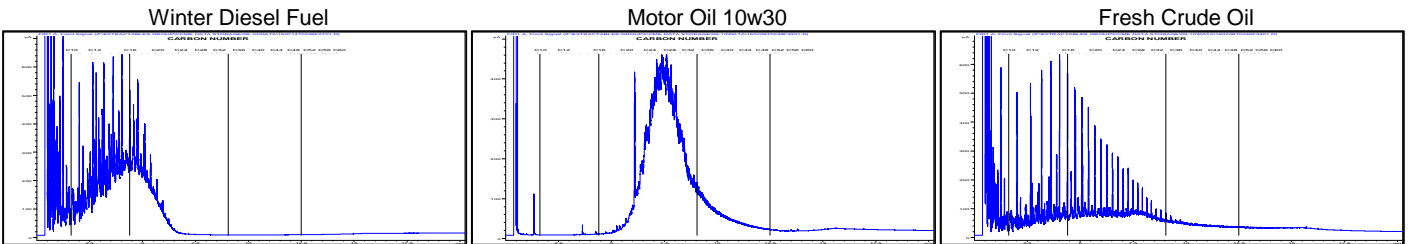
Exova Number: 1239524-22
 Sample Date: Nov 13, 2017

Sample Description: DSPlot9-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239524-1	1239524-2	1239524-3	
		Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017	
		Sample Time	16:00	16:00	16:00	
		Sample Location				
		Sample Description	DSEExtra3-02-AN	DSEExtra3-03-AN	DSEExtra3-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.37	2.98	3.24	0.01
SAR	Saturated Paste		0.1	0.3	0.3	
% Saturation		%	235	192	53	
Calcium	Saturated Paste	mg/kg	625	1240	377	
Magnesium	Saturated Paste	mg/kg	102	302	87.3	
Sodium	Saturated Paste	mg/kg	23	71	20	
Potassium	Saturated Paste	mg/kg	18	<19	6	
Chloride	Saturated Paste	mg/kg	21	18	8	
Sulfate (SO ₄)	Saturated Paste	mg/kg	1490	3470	1030	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl ₂ sol.	pH	6.9	7.3	7.6	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239524-4	1239524-5	1239524-6		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	16:00	16:00	16:00		
	Sample Location					
	Sample Description	DSEExtra3-02-HC	DSEExtra3-03-HC	DSEExtra3-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	65	50
F3c C16-C34	Dry Weight	mg/kg	511	1210	2280	50
F4c C34-C50	Dry Weight	mg/kg	435	913	1670	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	976	2020	4220	100
% C50+	%		26.8	24.9	28.8	
Silica Gel Cleanup						
Silica Gel Cleanup			Done	Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	34.40	24.80	13.40	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239524-7	1239524-8	1239524-15		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 10, 2017		
	Sample Time	16:00	16:00	10:00		
	Sample Location					
	Sample Description	DSEExtra3-02-BD1 / 298CM3	DSEExtra3-02-BD2 / 298CM3	DSPlot7-02-BD1 / 298CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	39	39	31.8	0.1
Bulk Density		kg/L	0.53	0.46	0.66	
Bulk Density		kg/m³	530	460	659	
Wet Bulk Density		kg/L	0.87	0.75	0.97	
Porosity		%	na	na	na	
Volume	Declared Value	mL	298	298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239524-9	1239524-10	1239524-11	
		Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	DSPlot7-02-AN	DSPlot7-03-AN	DSPlot7-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.89	2.74	2.68	0.01
SAR	Saturated Paste		0.2	0.7	0.5	
% Saturation		%	157	46	44	
Calcium	Saturated Paste	mg/kg	245	273	266	
Magnesium	Saturated Paste	mg/kg	58.9	54.4	52.9	
Sodium	Saturated Paste	mg/kg	16	31	24	
Potassium	Saturated Paste	mg/kg	11	<5	7	
Chloride	Saturated Paste	mg/kg	21	16	5	
Sulfate (SO4)	Saturated Paste	mg/kg	504	845	854	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	6.9	7.4	7.7	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239524-12	1239524-13	1239524-14		
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	DSPlot7-02-HC	DSPlot7-03-HC	DSPlot7-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	15	<10	30	10
F1 -BTEX	Dry Weight	mg/kg	15	<10	30	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	1250	50
F3c C16-C34	Dry Weight	mg/kg	873	1150	7470	50
F4c C34-C50	Dry Weight	mg/kg	771	935	4040	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	1710	2080	10500	100
% C50+	%		27.2	26.0	24.2	
Silica Gel Cleanup						
Silica Gel Cleanup			Done	Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	30.70	8.69	8.19	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239524-16	1239524-23	1239524-24		
	Sample Date	Nov 10, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	10:00	08:00	08:00		
	Sample Location					
	Sample Description	DSPlot7-02-BD2 / 298CM3	DSPlot9-02-BDI / 298CM3	DSPlot9-02-BD2 / 298CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	19	15	22	0.1
Bulk Density		kg/L	0.81	0.96	0.90	
Bulk Density		kg/m³	810	960	900	
Wet Bulk Density		kg/L	1.00	1.14	1.14	
Porosity		%	na	na	na	
Volume	Declared Value	mL	298	298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239524-17	1239524-18	1239524-19	
		Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017	
		Sample Time	08:00	08:00	08:00	
		Sample Location				
		Sample Description	DSPlot9-02-AN	DSPlot9-03-AN	DSPlot9-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	2.79	2.53	2.55	0.01
SAR	Saturated Paste		0.3	0.2	0.2	
% Saturation		%	73	47	49	
Calcium	Saturated Paste	mg/kg	459	283	290	
Magnesium	Saturated Paste	mg/kg	102	52.6	66.1	
Sodium	Saturated Paste	mg/kg	21	11	11	
Potassium	Saturated Paste	mg/kg	9	5	10	
Chloride	Saturated Paste	mg/kg	10	5	3	
Sulfate (SO4)	Saturated Paste	mg/kg	1380	860	928	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.4	7.7	7.7	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239524-20	1239524-21	1239524-22	
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017	
	Sample Time	08:00	08:00	08:00	
	Sample Location				
	Sample Description	DSPlot9-02-HC	DSPlot9-03-HC	DSPlot9-04-HC	
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil					
Benzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil					
Methanol Field Preservation		No	No	No	
F1 C6-C10	Dry Weight	mg/kg	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil					
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17
F2c C10-C16	Dry Weight	mg/kg	65	500	187
F3c C16-C34	Dry Weight	mg/kg	2530	5910	1770
F4c C34-C50	Dry Weight	mg/kg	2110	3200	836
F4HTGCc C34-C50+	Dry Weight	mg/kg	5490	6760	2020
% C50+	%		31.8	18.7	20.6
Silica Gel Cleanup					
Silica Gel Cleanup			Done	Done	Done
Soil % Moisture					
Moisture	Soil % Moisture	% by weight	14.10	8.14	5.33

Approved by: 
Randy Neumann, BSc
Vice President

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Extractable Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	0	-10	10	yes
F3c C16-C34	µg/mL	0	-30	30	yes
F4c C34-C50	µg/mL	0	-20	20	yes
F4HTGCc C34-C50+	µg/mL	0	-20	20	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	105.52	80	120	yes
F3c C16-C34	µg/mL	108.46	80	120	yes
F4c C34-C50	µg/mL	94.07	80	120	yes
F4HTGCc C34-C50+	µg/mL	90.70	80	120	yes

Date Acquired: November 17, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F2c C10-C16	mg/kg	<50	<50	50	10	yes
F3c C16-C34	mg/kg	1210	1280	50	10	yes
F4c C34-C50	mg/kg	913	927	50	10	yes
F4HTGCc C34-C50+	mg/kg	2020	2170	50	10	yes

Date Acquired: November 17, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	86	70	130	yes
F3c C16-C34	mg/kg	114	70	130	yes
F4c C34-C50	mg/kg	113	70	130	yes
F4HTGCc C34-C50+	mg/kg	120	70	130	yes

Date Acquired: November 17, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0016	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.005	0.005	yes
Toluene	ng	0	-0.06	0.06	yes
Ethylbenzene	ng	0	-0.030	0.030	yes
Total Xylenes (m,p,o)	ng	0	-0.09	0.09	yes
Styrene	ng	0	-0.030	0.030	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	98.20	80	120	yes
Toluene	ng	101.40	80	120	yes
Ethylbenzene	ng	97.20	80	120	yes
Total Xylenes (m,p,o)	ng	108.67	80	120	yes
Styrene	ng	115.00	80	120	yes

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Mono-Aromatic Hydrocarbons - Soil - Continued

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Date Acquired:	November 17, 2017				

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	29	30	10	0.3	yes
Date Acquired:	November 20, 2017					

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	-0.1619	-0.4	0.5	yes
Magnesium	mg/L	-0.0096	-0.1	0.1	yes
Sodium	mg/L	-0.0842	-0	2	yes
Potassium	mg/L	-0.2372	-0.5	0.7	yes
Chloride	mg/L	3.4225	0	5	yes
Sulfate-S	mg/L	0.0314	-0	1	yes
Date Acquired:	November 17, 2017				

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Electrical Conductivity	dS/m	3.09	2.71	3.25	yes
% Saturation	%	46	38	52	yes
Calcium	mg/L	646	596.2	767.8	yes
Magnesium	mg/L	138	121.8	154.8	yes
Sodium	mg/L	71	58	79	yes
Potassium	mg/L	19	17.8	24.6	yes
Chloride	mg/L	61	57	78	yes
Sulfate-S	mg/L	581	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.1	26.80	35.20	yes
Calcium	mg/L	245	230.2	261.4	yes
Magnesium	mg/L	95.5	92.7	99.7	yes
Sodium	mg/L	243	229	269	yes
Potassium	mg/L	243	229.4	265.4	yes
Chloride	mg/L	2040	1871	2231	yes
Sulfate-S	mg/L	148	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	8.4	8.5	0	0.3	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 17, 2017



Quality Control

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
P. O. 4009, MD 0078	Project Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada	Project Location: Suncor Basemine	Date Received: Nov 15, 2017
T9H 3L1	LSD:	Date Reported: Nov 21, 2017
Attn: Marty Yarmuch	P.O.: 4410252962	Report Number: 2243539
Sampled By: Nikki McPhee	Proj. Acct. code: E6687	
Company: Paragon Soil		

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	0	-10	10	yes
Date Acquired: November 17, 2017					

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME - Soil	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary
BTEX-CCME - Soil	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Calgary
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl ₂ (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME-Soil (Shake)	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary

** Reference Method Modified*

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

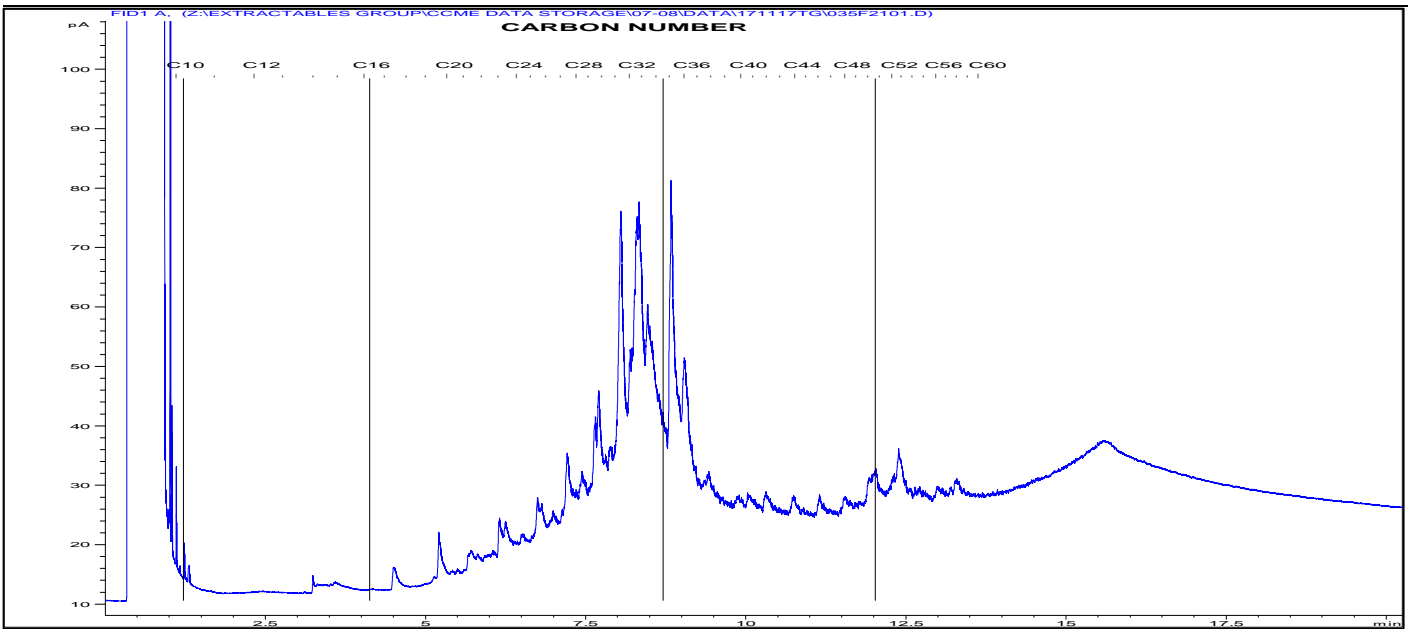
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

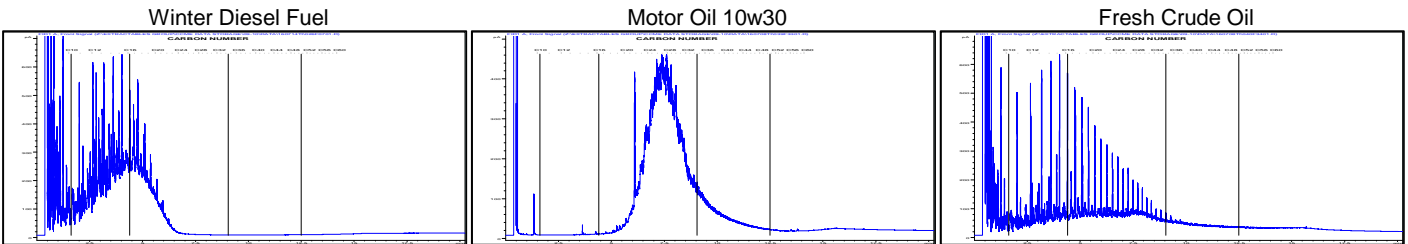
Exova Number: 1239524-4
 Sample Date: Nov 13, 2017

Sample Description: DSEExtra3-02-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

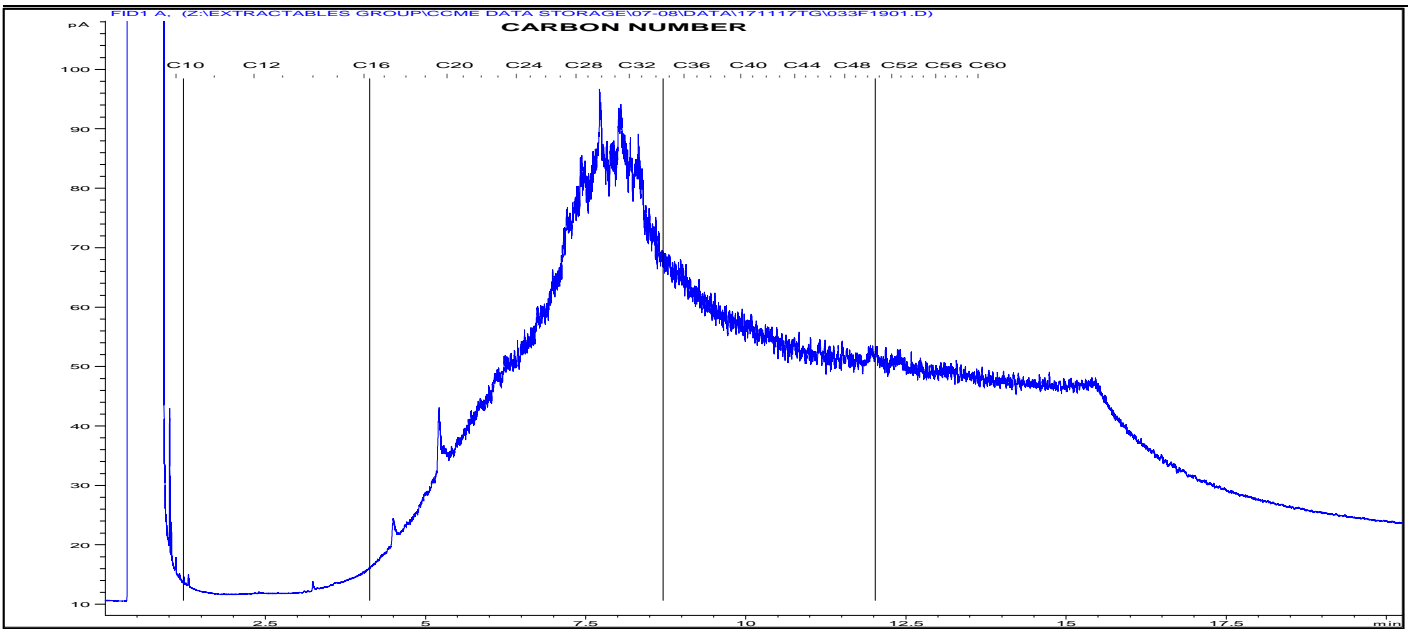
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



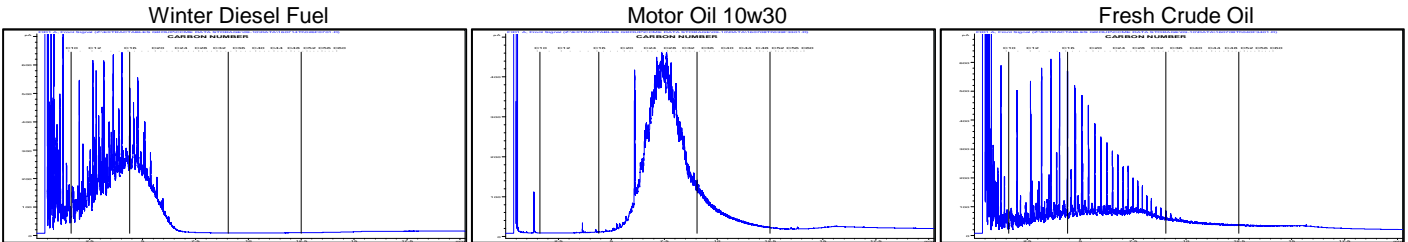
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

Exova Number: 1239524-5 Sample Description: DSEExtra3-03-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

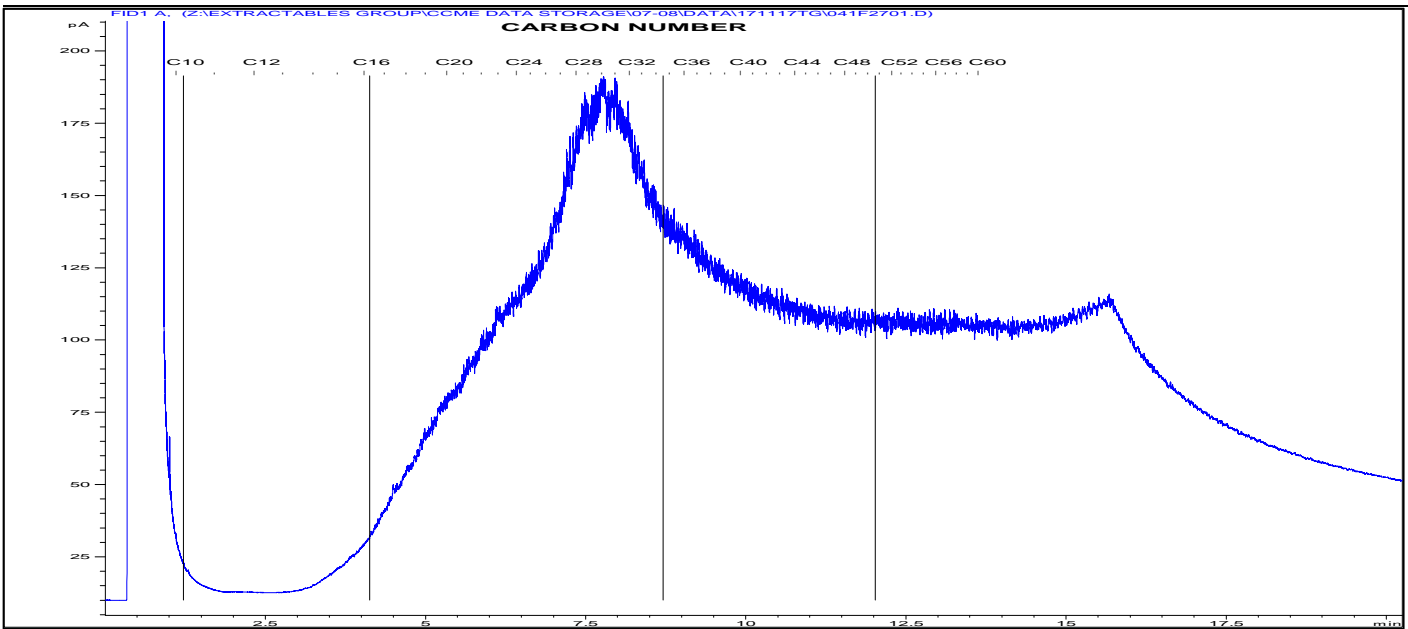
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

Exova Number: 1239524-6

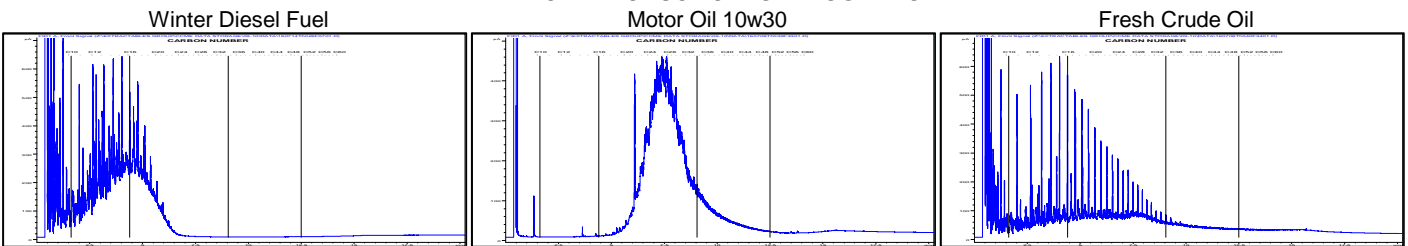
Sample Description: DSExtra3-04-HC

Silica Gel Treated

Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

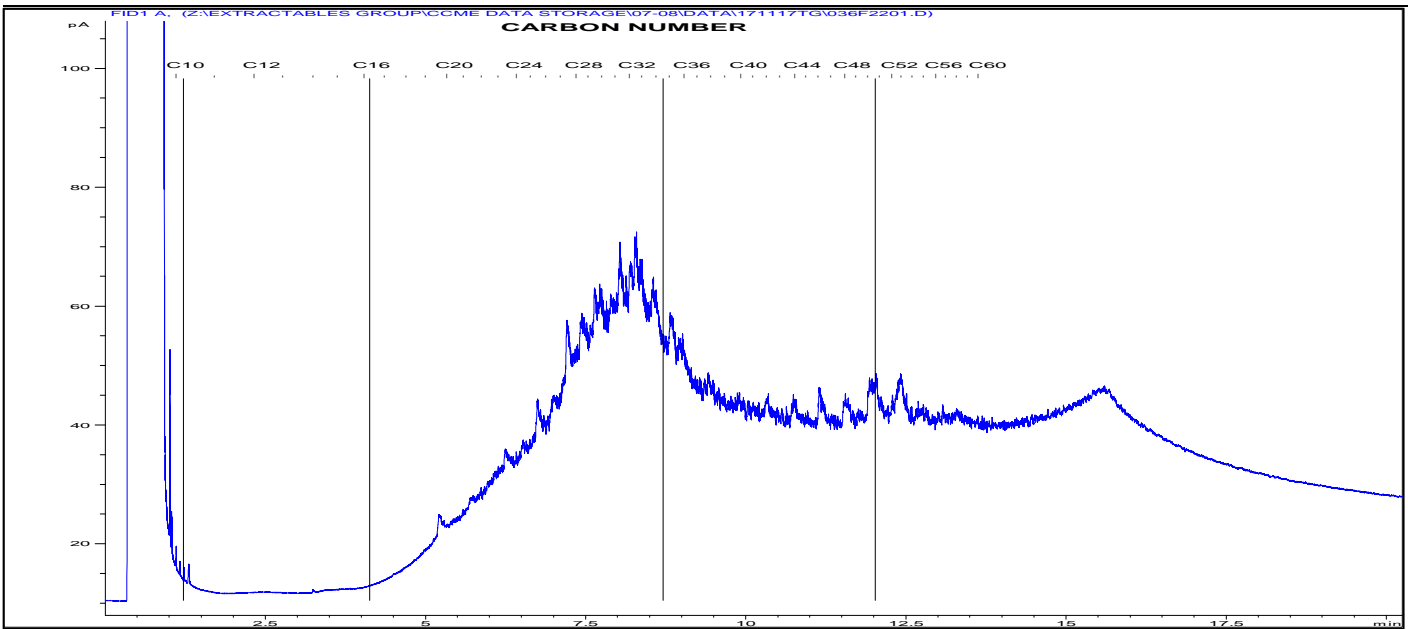
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

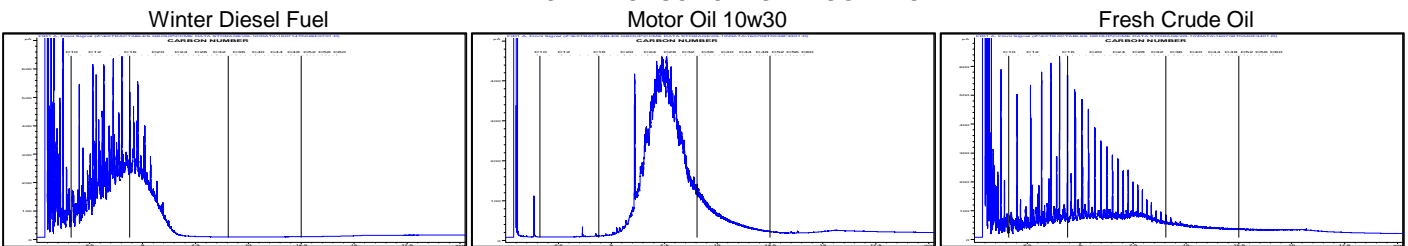
Exova Number: 1239524-12
 Sample Date: Nov 10, 2017

Sample Description: DSPlot7-02-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

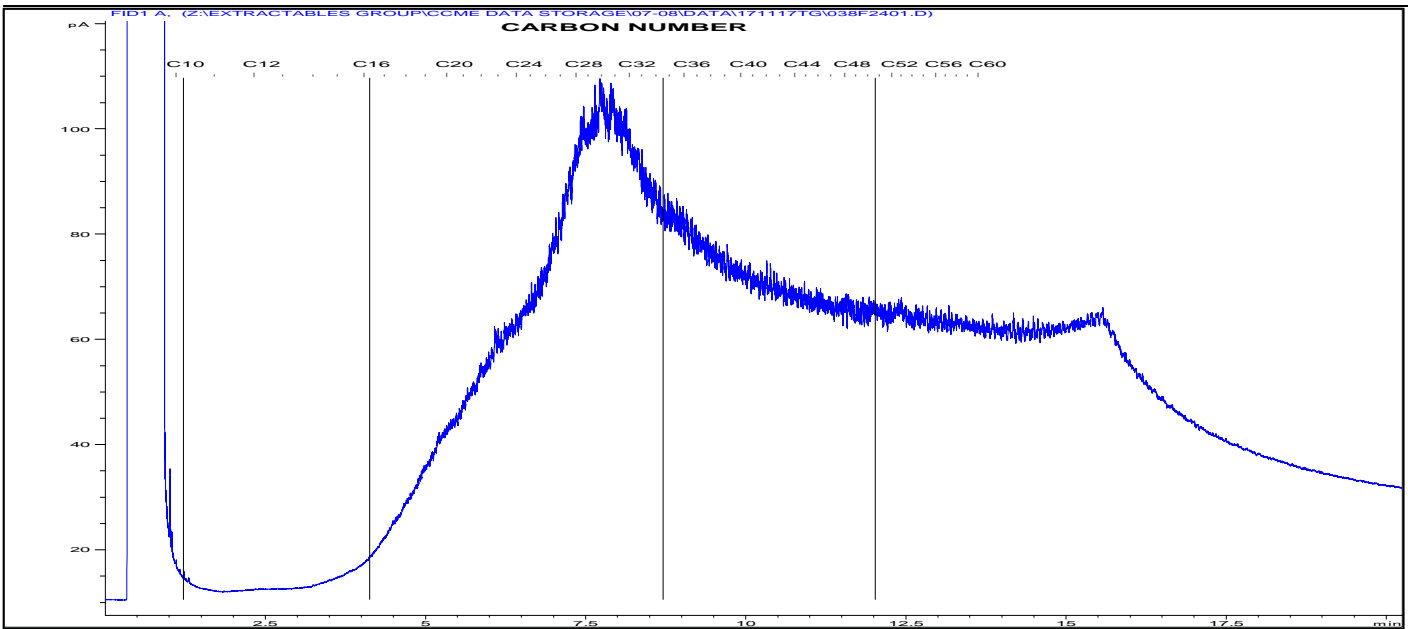
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

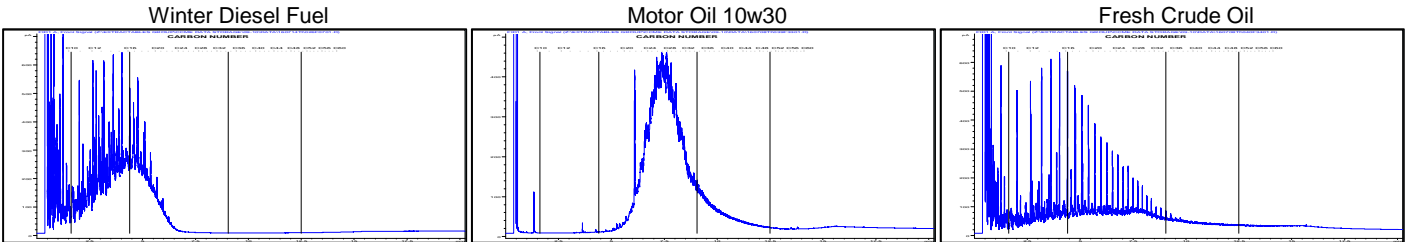
Exova Number: 1239524-13
 Sample Date: Nov 10, 2017

Sample Description: DSPlot7-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

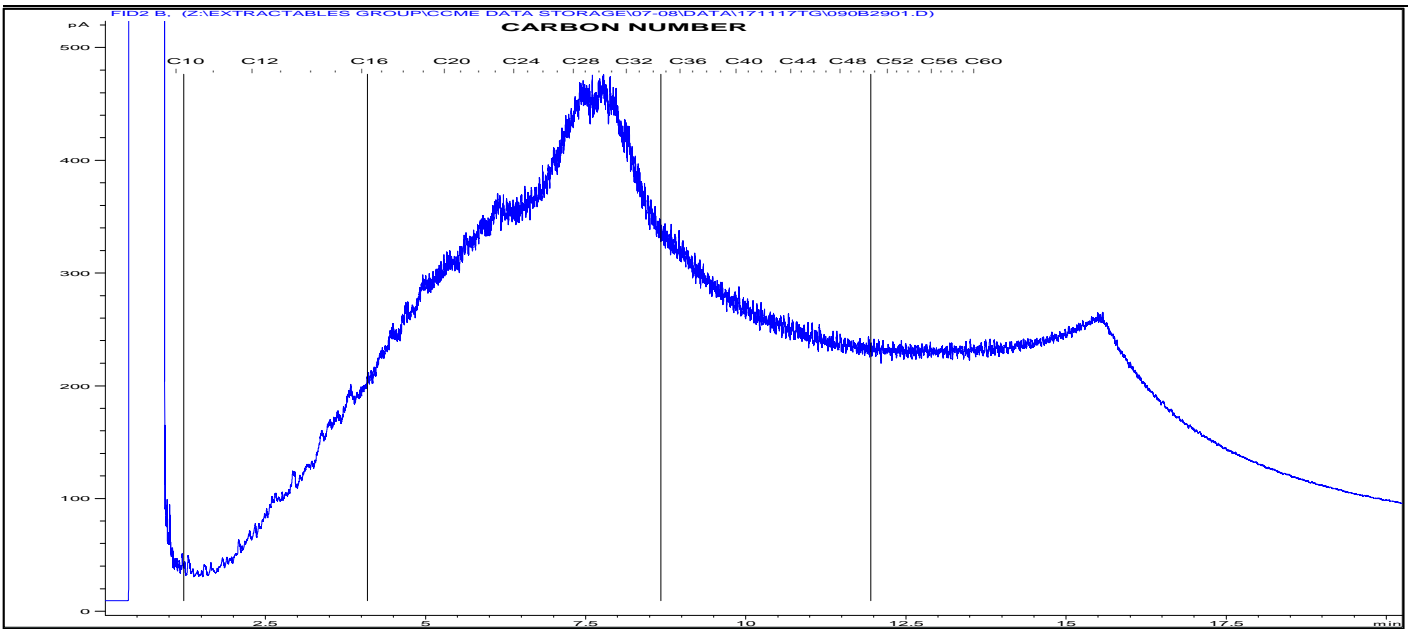
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

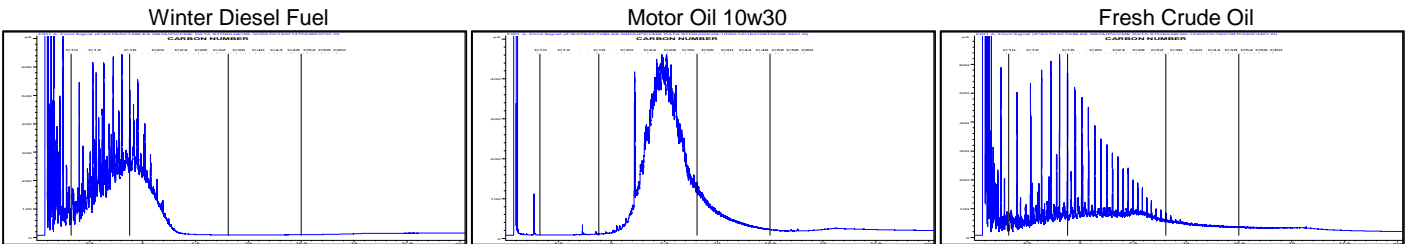
Exova Number: 1239524-14
 Sample Date: Nov 10, 2017

Sample Description: DSPlot7-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

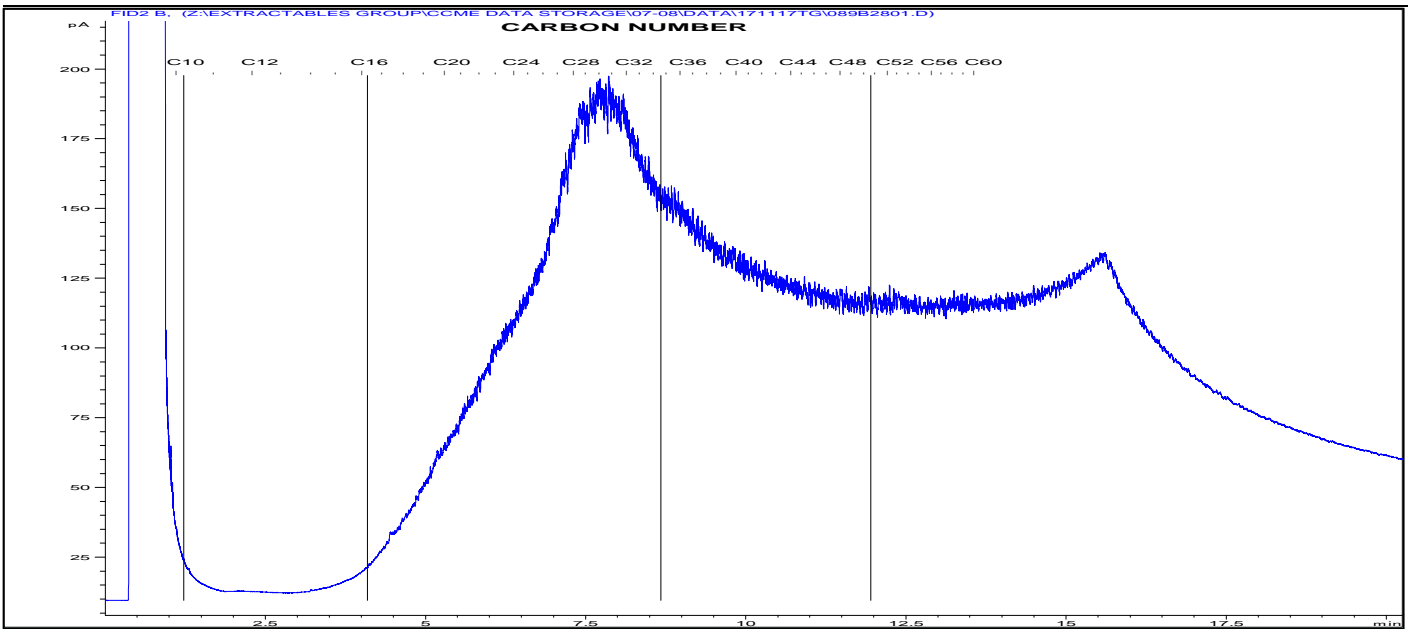
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

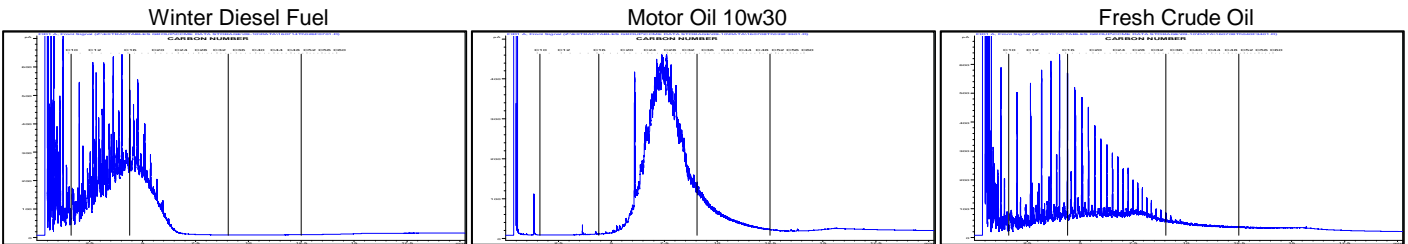
Exova Number: 1239524-20
 Sample Date: Nov 13, 2017

Sample Description: DSPlot9-02-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

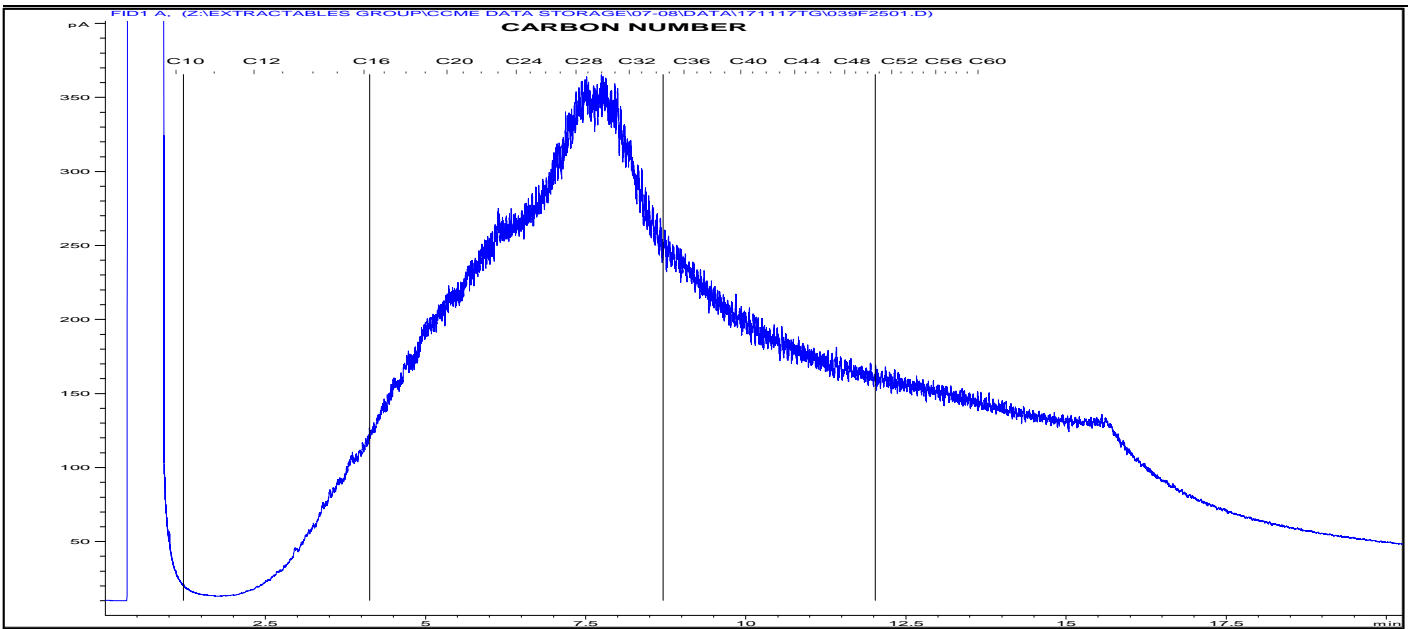
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

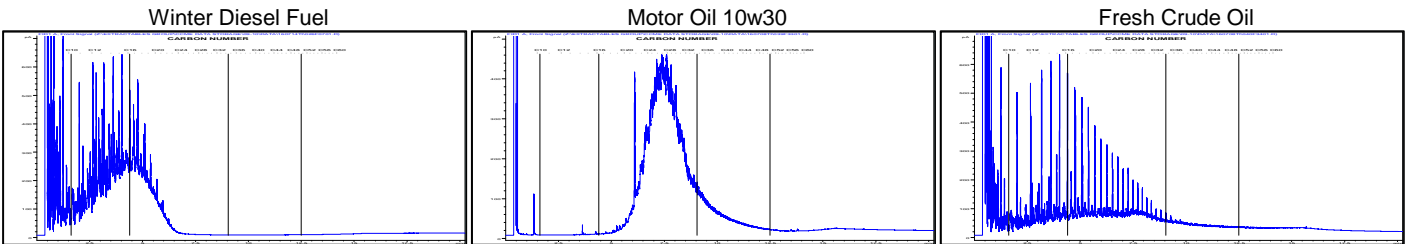
Exova Number: 1239524-21
 Sample Date: Nov 13, 2017

Sample Description: DSPlot9-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

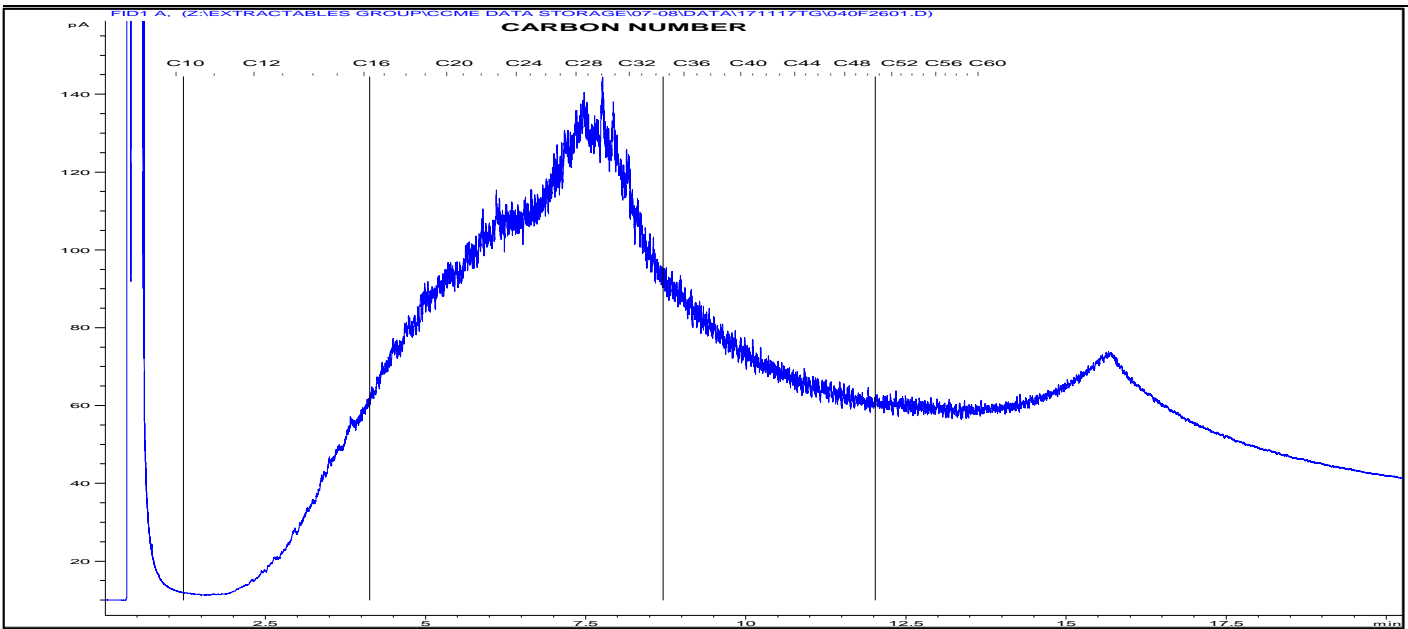
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

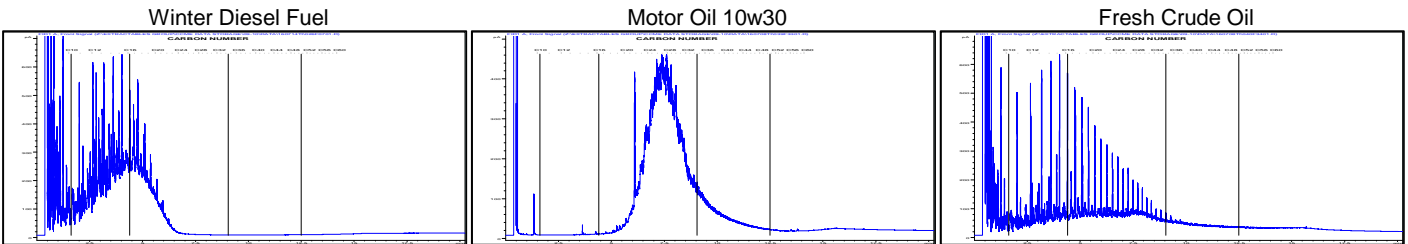
Exova Number: 1239524-22
 Sample Date: Nov 13, 2017

Sample Description: DSPlot9-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239545-1	1239545-2	1239545-3	
		Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	DSPlot20-02-AN	DSPlot20-03-AN	DSPlot20-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.65	0.73	1.88	0.01
SAR	Saturated Paste		0.3	0.2	0.1	
% Saturation		%	92	47	47	
Calcium	Saturated Paste	mg/kg	96.3	61.2	201	
Magnesium	Saturated Paste	mg/kg	23.4	11.6	28.6	
Sodium	Saturated Paste	mg/kg	10	5	5	
Potassium	Saturated Paste	mg/kg	2	1	4	
Chloride	Saturated Paste	mg/kg	14	5	3	
Sulfate (SO ₄)	Saturated Paste	mg/kg	185	119	575	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl ₂ sol.	pH	7.1	7.0	7.2	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239545-4	1239545-5	1239545-6		
	Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	DSPlot20-02-HC	DSPlot20-03-HC	DSPlot20-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	46	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	46	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	50	381	4380	50
F3c C16-C34	Dry Weight	mg/kg	2400	4650	20900	50
F4c C34-C50	Dry Weight	mg/kg	1880	2810	9930	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	4540	6360	21900	100
% C50+	%		28.4	22.1	17.5	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	15.20	6.34	7.11	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239545-7	1239545-8	1239545-15		
	Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	12:00		
	Sample Location					
	Sample Description	DSPlot20-02-BD1 / 298CM3	DSPlot20-02-BD2 / 298CM3	DSPlot3-02-BD1 / 298CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	29	28	30	0.1
Bulk Density		kg/L	0.68	0.69	0.56	
Bulk Density		kg/m³	680	690	560	
Wet Bulk Density		kg/L	0.96	0.96	0.80	
Porosity		%	na	na	na	
Volume	Declared Value	mL	298	298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239545-9	1239545-10	1239545-11	
		Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
		Sample Time	12:00	12:00	12:00	
		Sample Location				
		Sample Description	DSPlot3-02-AN	DSPlot3-03-AN	DSPlot3-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	2.42	2.84	3.16	0.01
SAR	Saturated Paste		<0.1	0.2	0.4	
% Saturation		%	83	63	65	
Calcium	Saturated Paste	mg/kg	615	462	438	
Magnesium	Saturated Paste	mg/kg	59	96.4	156	
Sodium	Saturated Paste	mg/kg	8	16	31	
Potassium	Saturated Paste	mg/kg	13	<6	10	
Chloride	Saturated Paste	mg/kg	9	9	11	
Sulfate (SO4)	Saturated Paste	mg/kg	1490	1260	1490	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.6	7.2	7.2	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239545-12	1239545-13	1239545-14		
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017		
	Sample Time	12:00	12:00	12:00		
	Sample Location					
	Sample Description	DSPlot3-02-HC	DSPlot3-03-HC	DSPlot3-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	166	50
F3c C16-C34	Dry Weight	mg/kg	1040	1760	3720	50
F4c C34-C50	Dry Weight	mg/kg	885	1100	2170	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	1860	2200	4730	100
% C50+	%		24.7	19.1	20.7	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	20.90	18.90	14.30	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239545-16	1239545-23	1239545-24		
	Sample Date	Nov 10, 2017	Nov 12, 2017	Nov 12, 2017		
	Sample Time	12:00	16:00	16:00		
	Sample Location					
	Sample Description	DSPlot3-02-BD2 / 298CM3	DSPlot19-02-BD1 / 298CM3	DSPlot19-02-BD2 / 298CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	23	39.8	39.4	0.1
Bulk Density		kg/L	0.63	0.24	0.25	
Bulk Density		kg/m³	630	244	253	
Wet Bulk Density		kg/L	0.82	0.41	0.42	
Porosity		%	na	na	na	
Volume	Declared Value	mL	298	298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239545-17	1239545-18	1239545-19	
		Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017	
		Sample Time	16:00	16:00	16:00	
		Sample Location				
		Sample Description	DSPlot19-02-AN	DSPlot19-03-AN	DSPlot19-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.58	1.73	1.42	0.01
SAR	Saturated Paste		0.4	0.3	0.3	
% Saturation		%	163	48	45	
Calcium	Saturated Paste	mg/kg	477	160	120	
Magnesium	Saturated Paste	mg/kg	108	37.1	24.9	
Sodium	Saturated Paste	mg/kg	50	13	9	
Potassium	Saturated Paste	mg/kg	11	2	2	
Chloride	Saturated Paste	mg/kg	41	9	5	
Sulfate (SO4)	Saturated Paste	mg/kg	1570	545	406	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	5.0	4.6	4.5	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239545-20	1239545-21	1239545-22	
	Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017	
	Sample Time	16:00	16:00	16:00	
	Sample Location				
	Sample Description	DSPlot19-02-HC	DSPlot19-03-HC	DSPlot19-04-HC	
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil					
Benzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil					
Methanol Field Preservation		No	No	No	
F1 C6-C10	Dry Weight	mg/kg	24	10	12
F1 -BTEX	Dry Weight	mg/kg	24	10	12
Extractable Petroleum Hydrocarbons - Soil					
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17
F2c C10-C16	Dry Weight	mg/kg	104	2050	3400
F3c C16-C34	Dry Weight	mg/kg	3120	11400	14000
F4c C34-C50	Dry Weight	mg/kg	2120	4580	5380
F4HTGCc C34-C50+	Dry Weight	mg/kg	5980	8830	10700
% C50+	%		31.4	12.6	12.6
Silica Gel Cleanup					
Silica Gel Cleanup		Done	Done	Done	
Soil % Moisture					
Moisture	Soil % Moisture	% by weight	31.10	8.14	10.40

Approved by: 
Anthony Neumann, MSc
Laboratory Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Extractable Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	0	-10	10	yes
F3c C16-C34	µg/mL	0	-30	30	yes
F4c C34-C50	µg/mL	0	-20	20	yes
F4HTGCc C34-C50+	µg/mL	0	-20	20	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	94.60	80	120	yes
F3c C16-C34	µg/mL	96.74	80	120	yes
F4c C34-C50	µg/mL	93.01	80	120	yes
F4HTGCc C34-C50+	µg/mL	90.88	80	120	yes

Date Acquired: November 17, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.00442867	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.005	0.005	yes
Toluene	ng	0	-0.06	0.06	yes
Ethylbenzene	ng	0	-0.030	0.030	yes
Total Xylenes (m,p,o)	ng	0	-0.09	0.09	yes
Styrene	ng	0	-0.030	0.030	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	95.60	80	120	yes
Toluene	ng	83.80	80	120	yes
Ethylbenzene	ng	93.40	80	120	yes
Total Xylenes (m,p,o)	ng	94.00	80	120	yes
Styrene	ng	82.20	80	120	yes

Date Acquired: November 17, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Benzene	mg/kg	<0.005	<0.005	50	0.010	yes
Toluene	mg/kg	<0.02	<0.02	50	0.04	yes
Ethylbenzene	mg/kg	<0.005	<0.005	50	0.020	yes
m,p-Xylene	mg/kg	<0.02	<0.02	50	0.04	yes
o-Xylene	mg/kg	<0.02	<0.02	50	0.04	yes
Total Xylenes (m,p,o)	mg/kg	<0.03	<0.03	50	0.06	yes
Styrene	mg/kg	<0.01	<0.01	50	0.020	yes

Date Acquired: November 17, 2017

Physical and Aggregate Properties

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	29	30	10	0.3	yes
Date Acquired: November 20, 2017						

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0829174	-0.4	0.5	yes
Magnesium	mg/L	0.0355841	-0.1	0.1	yes
Sodium	mg/L	0.0649487	-0	2	yes
Potassium	mg/L	0.0337593	-0.5	0.7	yes
Chloride	mg/L	2.1572	0	5	yes
Sulfate-S	mg/L	0.0251397	-0	1	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Electrical Conductivity	dS/m	2.98	2.71	3.25	yes
% Saturation	%	47	38	52	yes
Calcium	mg/L	710	596.2	767.8	yes
Magnesium	mg/L	147	121.8	154.8	yes
Sodium	mg/L	77	58	79	yes
Potassium	mg/L	23	17.8	24.6	yes
Chloride	mg/L	66	57	78	yes
Sulfate-S	mg/L	644	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.3	26.80	35.20	yes
Calcium	mg/L	246	230.2	261.4	yes
Magnesium	mg/L	95.3	92.7	99.7	yes
Sodium	mg/L	244	229	269	yes
Potassium	mg/L	241	229.4	265.4	yes
Chloride	mg/L	2000	1871	2231	yes
Sulfate-S	mg/L	146	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	7.7	7.6	0	0.3	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 17, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	0	-10	10	yes

Date Acquired: November 17, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
--------------------------	-------	-------------	-------------	----------------	-------------------	-----------



Quality Control

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
P. O. 4009, MD 0078	Project Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada	Project Location: Suncor Basemine	Date Received: Nov 15, 2017
T9H 3L1	LSD:	Date Reported: Nov 22, 2017
Attn: Marty Yarmuch	P.O.: 4410252962	Report Number: 2243562
Sampled By: Nikki McPhee	Proj. Acct. code: E6687	
Company: Paragon Soil		

Volatile Petroleum Hydrocarbons - Soil -

Continued

Client Sample	Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F1 C6-C10		mg/kg	10	10	50	0	yes
F1 -BTEX		mg/kg	10	10	50	0	yes
Date Acquired: November 17, 2017							
Matrix Spike		Units	% Recovery	Lower Limit	Upper Limit		Passed QC
F1 C6-C10		mg/kg	84	80	120		yes
Date Acquired: November 17, 2017							

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME - Soil	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary
BTEX-CCME - Soil	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Calgary
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl2 (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME-Soil (Shake)	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary

** Reference Method Modified*

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

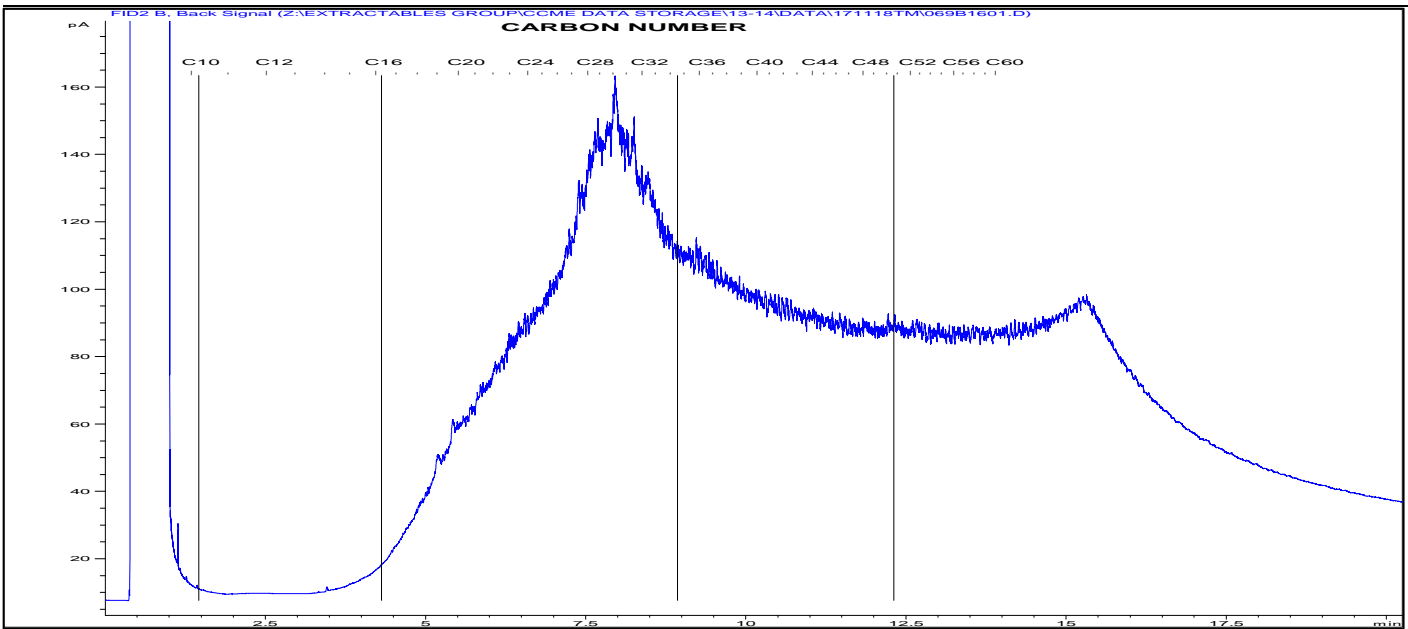
The test report shall not be reproduced except in full, without the written approval of the laboratory.



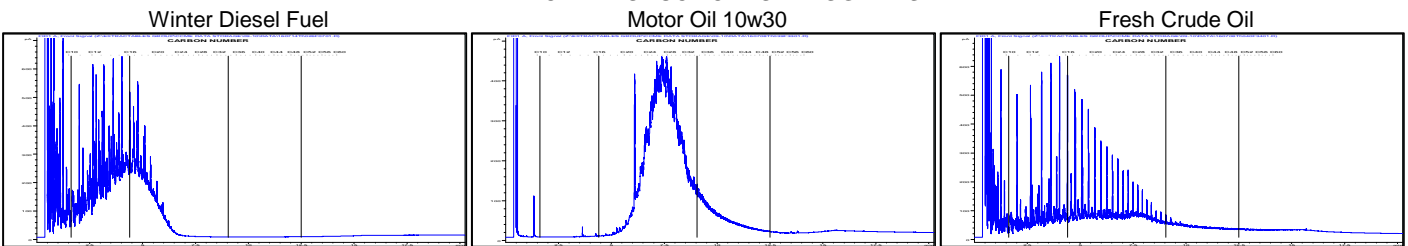
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

Exova Number: 1239545-4 Sample Description: DSPlot20-02-HC Silica Gel Treated
 Sample Date: Nov 12, 2017



TYPICAL PRODUCT CHROMATOGRAMS



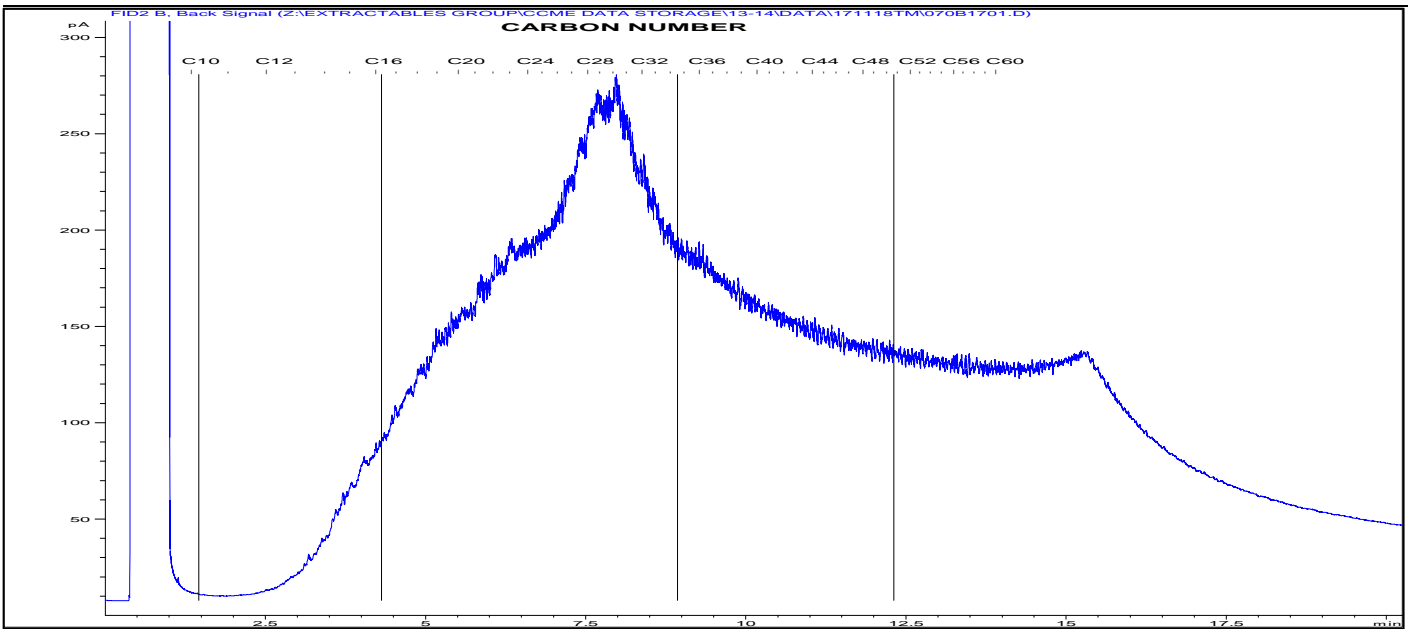
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

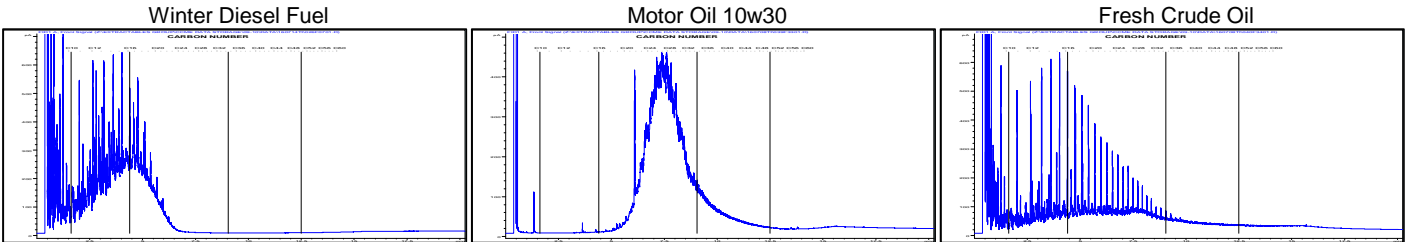
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

Exova Number: 1239545-5 Sample Description: DSPlot20-03-HC Silica Gel Treated
 Sample Date: Nov 12, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

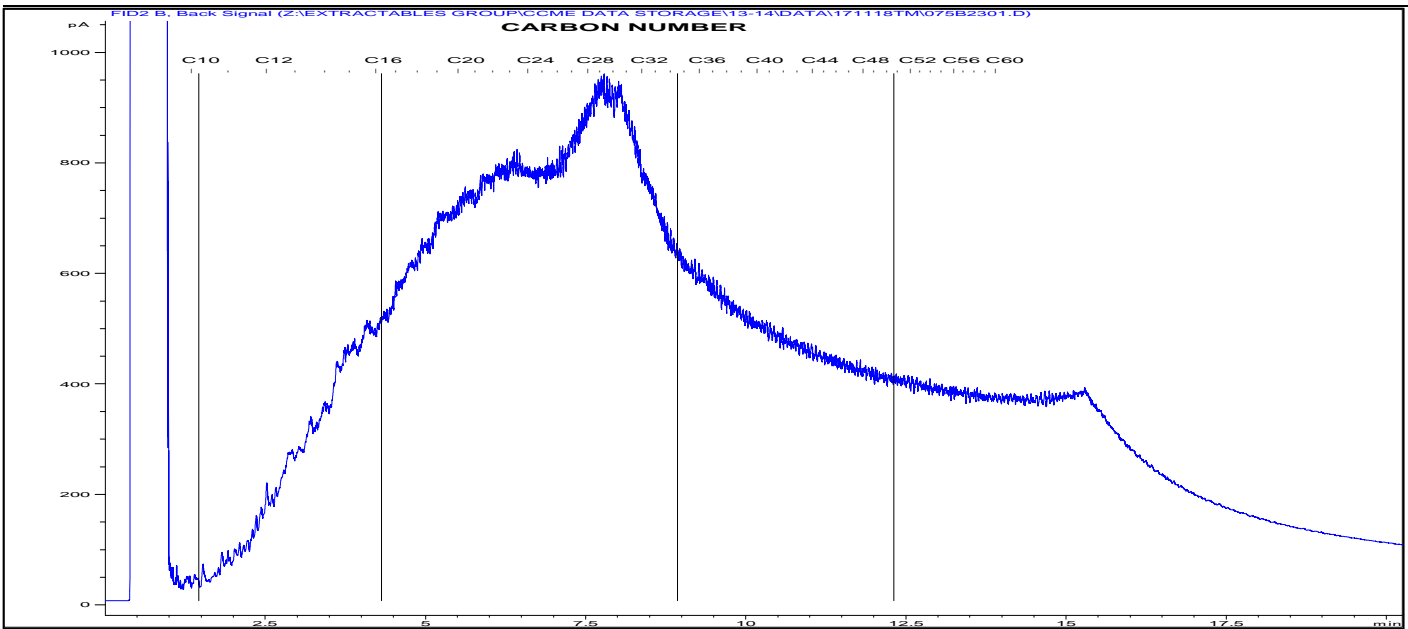
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

Exova Number: 1239545-6

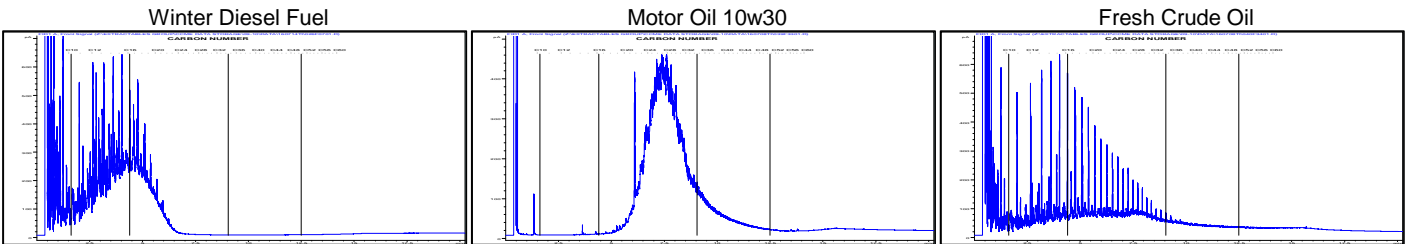
Sample Description: DSPlot20-04-HC

Silica Gel Treated

Sample Date: Nov 12, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

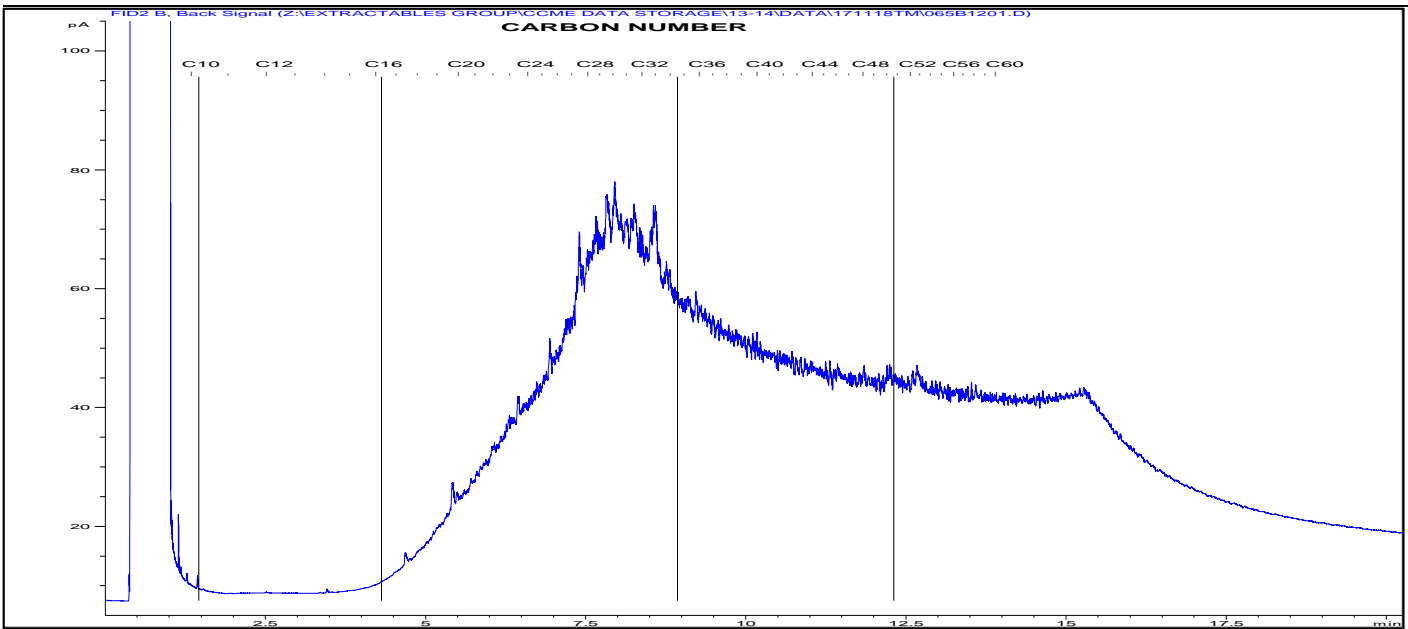
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

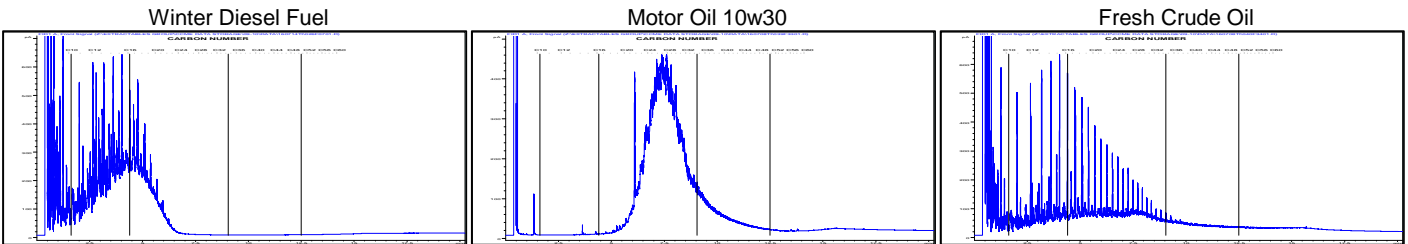
Exova Number: 1239545-12
 Sample Date: Nov 10, 2017

Sample Description: DSPlot3-02-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

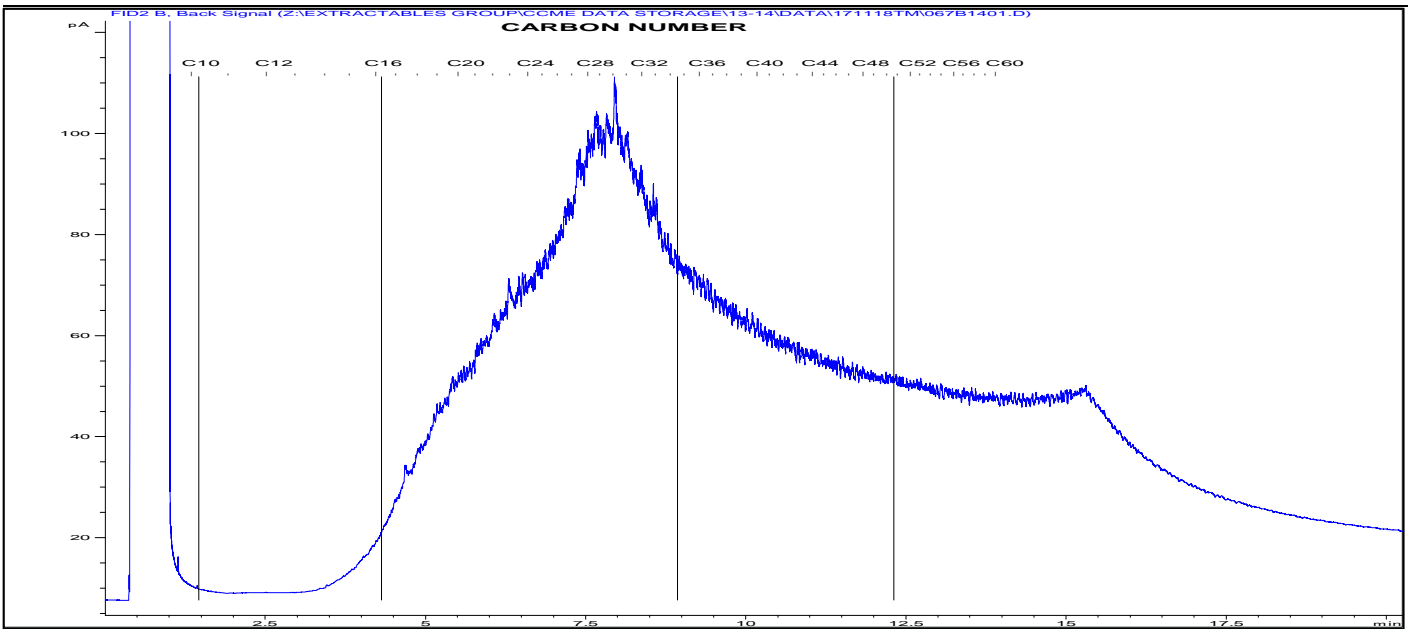
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

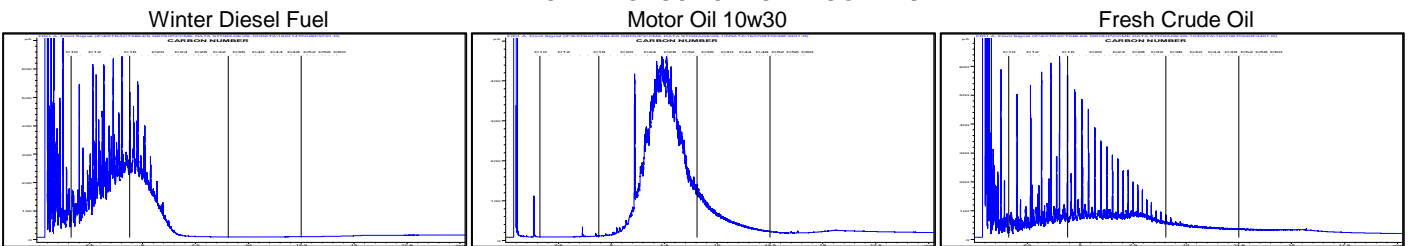
Exova Number: 1239545-13
 Sample Date: Nov 10, 2017

Sample Description: DSPlot3-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

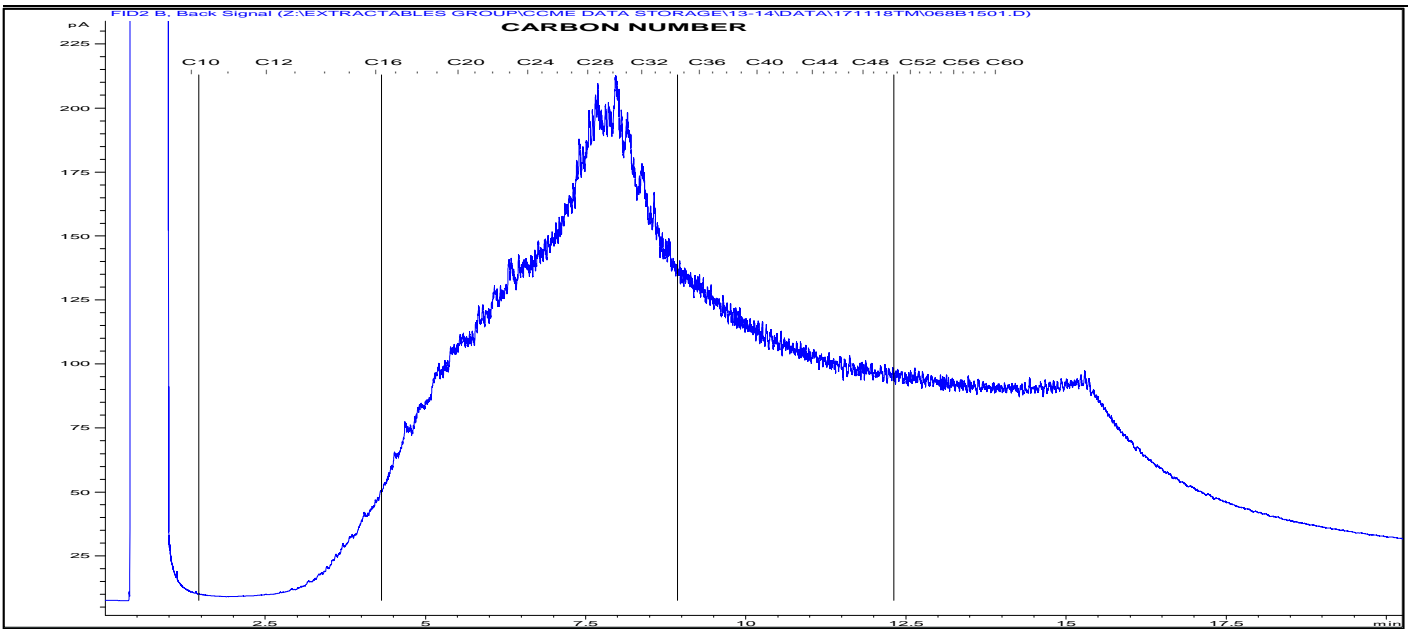
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

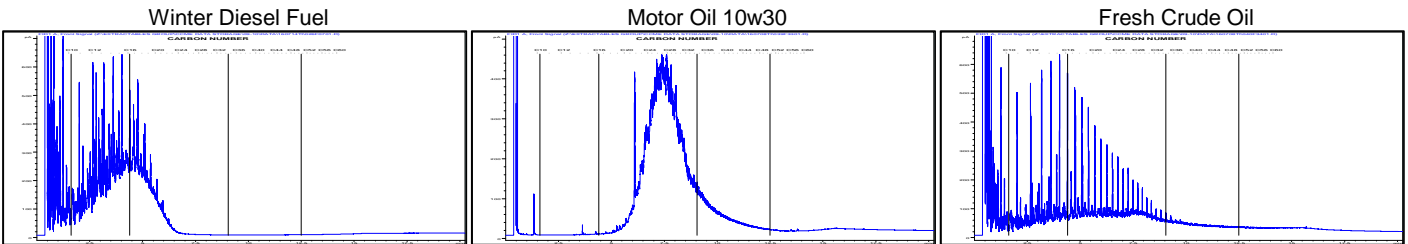
Exova Number: 1239545-14
 Sample Date: Nov 10, 2017

Sample Description: DSPlot3-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

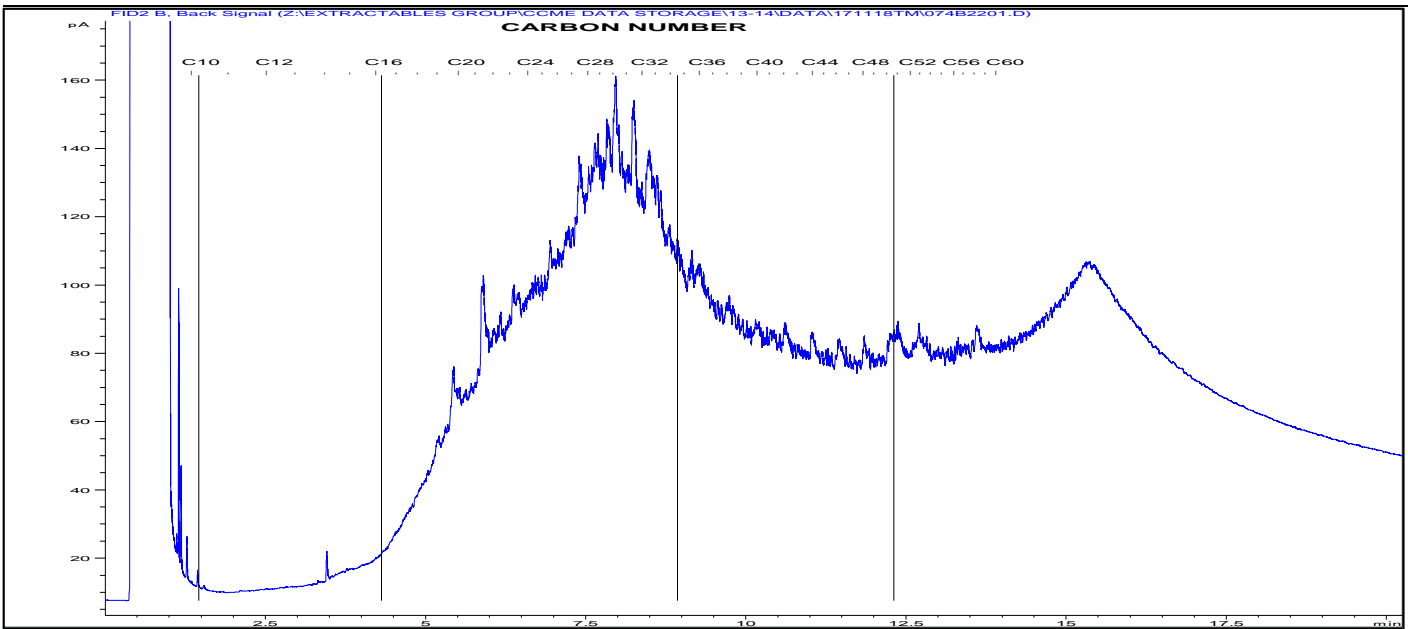
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

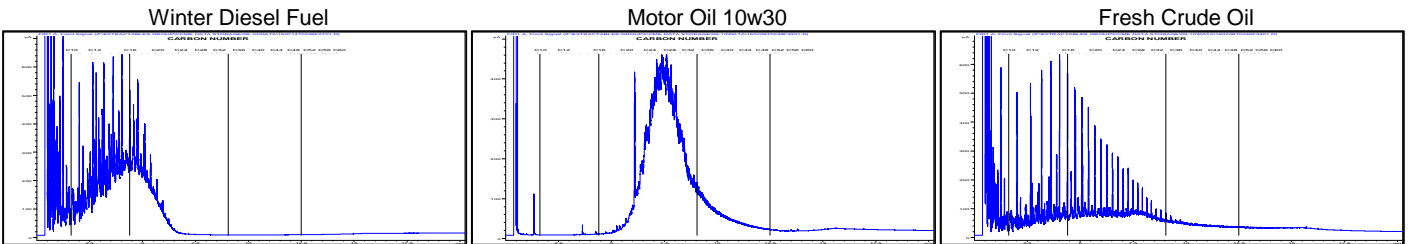
Exova Number: 1239545-20
 Sample Date: Nov 12, 2017

Sample Description: DSPlot19-02-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

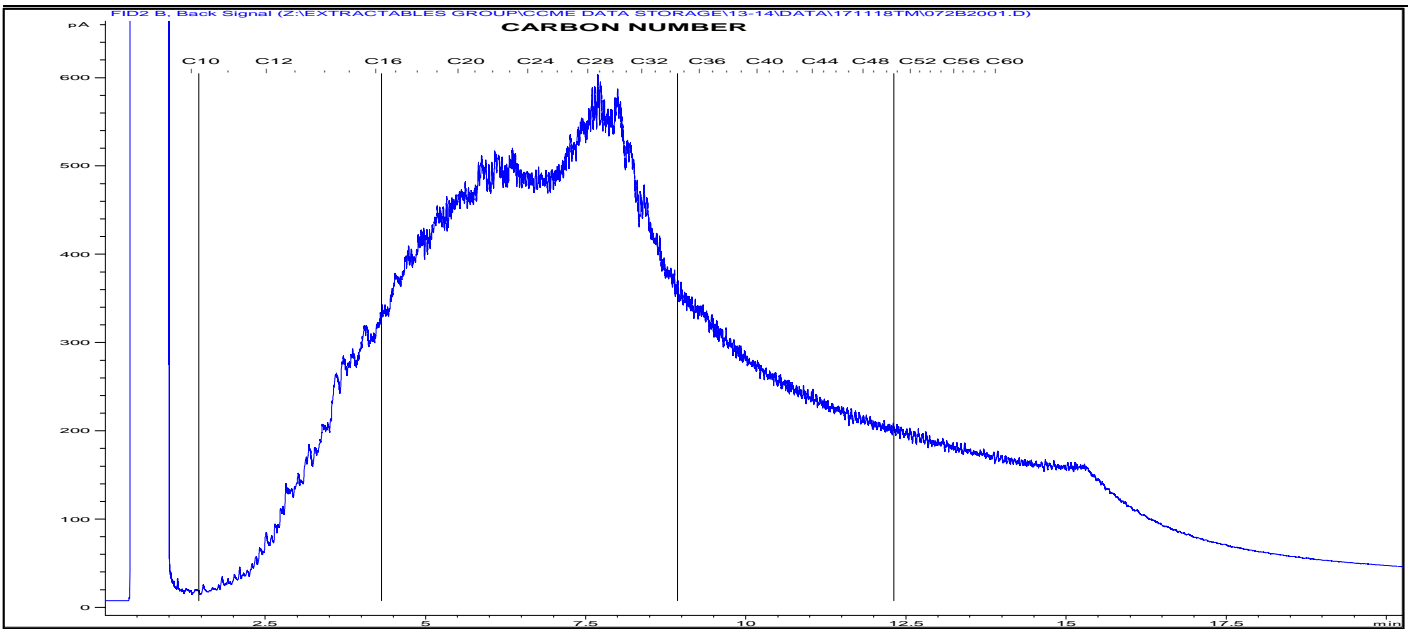
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd.	Name: Suncor LOS	Control Number: C0056636
P. O. 4009, MD 0078	Location: Suncor Basemine	Date Received: Nov 15, 2017
Fort McMurray, AB, Canada	LSD:	Date Reported: Nov 20, 2017
T9H 3L1	P.O.: 4410252962	Report Number: 2243562
Attn: Marty Yarmuch		
Sampled by: Nikki McPhee		
Company: Paragon Soil		

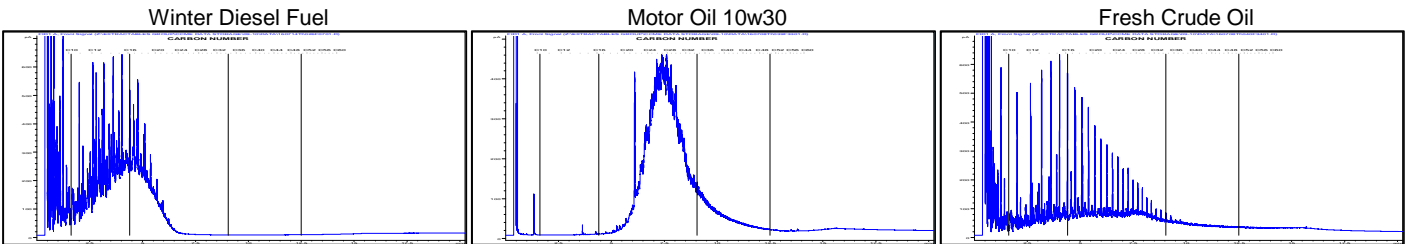
Exova Number: 1239545-21
 Sample Date: Nov 12, 2017

Sample Description: DSPlot19-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

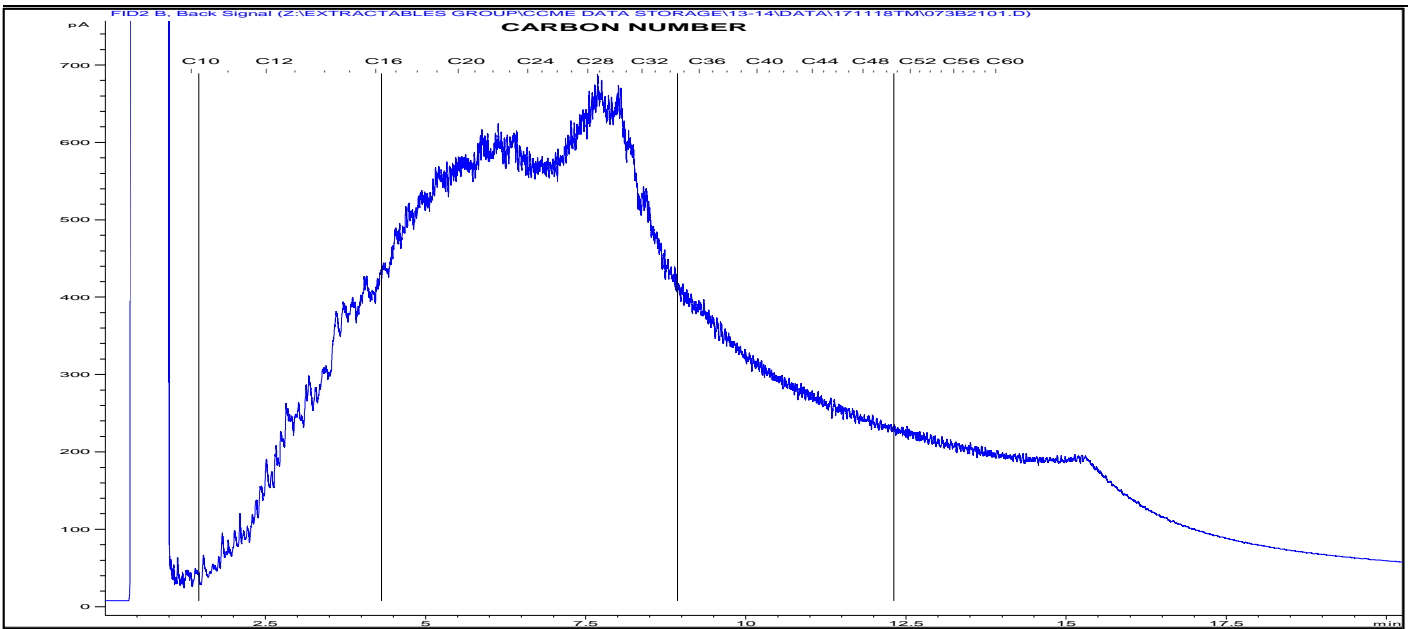
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd.	Name: Suncor LOS	Control Number: C0056636
P. O. 4009, MD 0078	Location: Suncor Basemine	Date Received: Nov 15, 2017
Fort McMurray, AB, Canada	LSD:	Date Reported: Nov 20, 2017
T9H 3L1	P.O.: 4410252962	Report Number: 2243562
Attn: Marty Yarmuch		
Sampled by: Nikki McPhee		
Company: Paragon Soil		

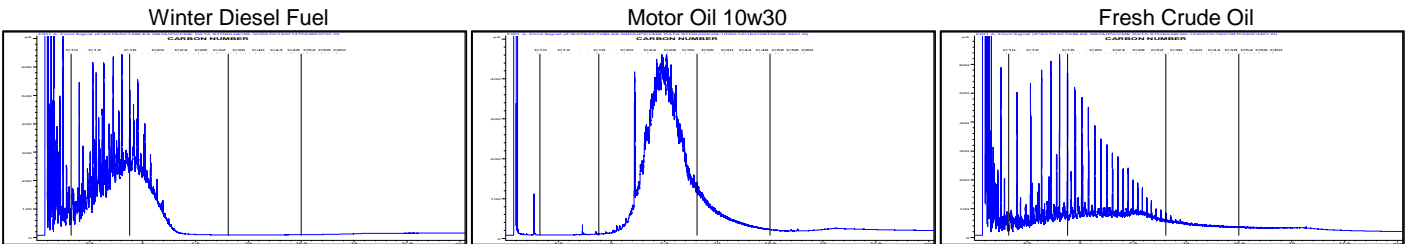
Exova Number: 1239545-22
 Sample Date: Nov 12, 2017

Sample Description: DSPlot19-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239545-1	1239545-2	1239545-3	
		Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	DSPlot20-02-AN	DSPlot20-03-AN	DSPlot20-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.65	0.73	1.88	0.01
SAR	Saturated Paste		0.3	0.2	0.1	
% Saturation		%	92	47	47	
Calcium	Saturated Paste	mg/kg	96.3	61.2	201	
Magnesium	Saturated Paste	mg/kg	23.4	11.6	28.6	
Sodium	Saturated Paste	mg/kg	10	5	5	
Potassium	Saturated Paste	mg/kg	2	1	4	
Chloride	Saturated Paste	mg/kg	14	5	3	
Sulfate (SO ₄)	Saturated Paste	mg/kg	185	119	575	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl ₂ sol.	pH	7.1	7.0	7.2	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239545-4	1239545-5	1239545-6		
	Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	DSPlot20-02-HC	DSPlot20-03-HC	DSPlot20-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	46	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	46	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	50	381	4380	50
F3c C16-C34	Dry Weight	mg/kg	2400	4650	20900	50
F4c C34-C50	Dry Weight	mg/kg	1880	2810	9930	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	4540	6360	21900	100
% C50+	%		28.4	22.1	17.5	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	15.20	6.34	7.11	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239545-7	1239545-8	1239545-15		
	Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	12:00		
	Sample Location					
	Sample Description	DSPlot20-02-BD1 / 298CM3	DSPlot20-02-BD2 / 298CM3	DSPlot3-02-BD1 / 298CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	29	28	30	0.1
Bulk Density		kg/L	0.68	0.69	0.56	
Bulk Density		kg/m³	680	690	560	
Wet Bulk Density		kg/L	0.96	0.96	0.80	
Porosity		%	na	na	na	
Volume	Declared Value	mL	298	298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239545-9	1239545-10	1239545-11	
		Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
		Sample Time	12:00	12:00	12:00	
		Sample Location				
		Sample Description	DSPlot3-02-AN	DSPlot3-03-AN	DSPlot3-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	2.42	2.84	3.16	0.01
SAR	Saturated Paste		<0.1	0.2	0.4	
% Saturation		%	83	63	65	
Calcium	Saturated Paste	mg/kg	615	462	438	
Magnesium	Saturated Paste	mg/kg	59	96.4	156	
Sodium	Saturated Paste	mg/kg	8	16	31	
Potassium	Saturated Paste	mg/kg	13	<6	10	
Chloride	Saturated Paste	mg/kg	9	9	11	
Sulfate (SO4)	Saturated Paste	mg/kg	1490	1260	1490	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.6	7.2	7.2	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239545-12	1239545-13	1239545-14		
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017		
	Sample Time	12:00	12:00	12:00		
	Sample Location					
	Sample Description	DSPlot3-02-HC	DSPlot3-03-HC	DSPlot3-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	166	50
F3c C16-C34	Dry Weight	mg/kg	1040	1760	3720	50
F4c C34-C50	Dry Weight	mg/kg	885	1100	2170	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	1860	2200	4730	100
% C50+	%		24.7	19.1	20.7	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	20.90	18.90	14.30	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239545-16	1239545-23	1239545-24		
	Sample Date	Nov 10, 2017	Nov 12, 2017	Nov 12, 2017		
	Sample Time	12:00	16:00	16:00		
	Sample Location					
	Sample Description	DSPlot3-02-BD2 / 298CM3	DSPlot19-02-BD1 / 298CM3	DSPlot19-02-BD2 / 298CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	23	39.8	39.4	0.1
Bulk Density		kg/L	0.63	0.24	0.25	
Bulk Density		kg/m³	630	244	253	
Wet Bulk Density		kg/L	0.82	0.41	0.42	
Porosity		%	na	na	na	
Volume	Declared Value	mL	298	298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239545-17	1239545-18	1239545-19	
		Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017	
		Sample Time	16:00	16:00	16:00	
		Sample Location				
		Sample Description	DSPlot19-02-AN	DSPlot19-03-AN	DSPlot19-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.58	1.73	1.42	0.01
SAR	Saturated Paste		0.4	0.3	0.3	
% Saturation		%	163	48	45	
Calcium	Saturated Paste	mg/kg	477	160	120	
Magnesium	Saturated Paste	mg/kg	108	37.1	24.9	
Sodium	Saturated Paste	mg/kg	50	13	9	
Potassium	Saturated Paste	mg/kg	11	2	2	
Chloride	Saturated Paste	mg/kg	41	9	5	
Sulfate (SO4)	Saturated Paste	mg/kg	1570	545	406	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	5.0	4.6	4.5	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239545-20	1239545-21	1239545-22	
	Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017	
	Sample Time	16:00	16:00	16:00	
	Sample Location				
	Sample Description	DSPlot19-02-HC	DSPlot19-03-HC	DSPlot19-04-HC	
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil					
Benzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil					
Methanol Field Preservation		No	No	No	
F1 C6-C10	Dry Weight	mg/kg	24	10	12
F1 -BTEX	Dry Weight	mg/kg	24	10	12
Extractable Petroleum Hydrocarbons - Soil					
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17
F2c C10-C16	Dry Weight	mg/kg	104	2050	3400
F3c C16-C34	Dry Weight	mg/kg	3120	11400	14000
F4c C34-C50	Dry Weight	mg/kg	2120	4580	5380
F4HTGCc C34-C50+	Dry Weight	mg/kg	5980	8830	10700
% C50+	%		31.4	12.6	12.6
Silica Gel Cleanup					
Silica Gel Cleanup		Done	Done	Done	
Soil % Moisture					
Moisture	Soil % Moisture	% by weight	31.10	8.14	10.40

Approved by: 
Anthony Neumann, MSc
Laboratory Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Extractable Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	0	-10	10	yes
F3c C16-C34	µg/mL	0	-30	30	yes
F4c C34-C50	µg/mL	0	-20	20	yes
F4HTGCc C34-C50+	µg/mL	0	-20	20	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	94.60	80	120	yes
F3c C16-C34	µg/mL	96.74	80	120	yes
F4c C34-C50	µg/mL	93.01	80	120	yes
F4HTGCc C34-C50+	µg/mL	90.88	80	120	yes

Date Acquired: November 17, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.00442867	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.005	0.005	yes
Toluene	ng	0	-0.06	0.06	yes
Ethylbenzene	ng	0	-0.030	0.030	yes
Total Xylenes (m,p,o)	ng	0	-0.09	0.09	yes
Styrene	ng	0	-0.030	0.030	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	95.60	80	120	yes
Toluene	ng	83.80	80	120	yes
Ethylbenzene	ng	93.40	80	120	yes
Total Xylenes (m,p,o)	ng	94.00	80	120	yes
Styrene	ng	82.20	80	120	yes

Date Acquired: November 17, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Benzene	mg/kg	<0.005	<0.005	50	0.010	yes
Toluene	mg/kg	<0.02	<0.02	50	0.04	yes
Ethylbenzene	mg/kg	<0.005	<0.005	50	0.020	yes
m,p-Xylene	mg/kg	<0.02	<0.02	50	0.04	yes
o-Xylene	mg/kg	<0.02	<0.02	50	0.04	yes
Total Xylenes (m,p,o)	mg/kg	<0.03	<0.03	50	0.06	yes
Styrene	mg/kg	<0.01	<0.01	50	0.020	yes

Date Acquired: November 17, 2017

Physical and Aggregate Properties

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	29	30	10	0.3	yes
Date Acquired: November 20, 2017						

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0829174	-0.4	0.5	yes
Magnesium	mg/L	0.0355841	-0.1	0.1	yes
Sodium	mg/L	0.0649487	-0	2	yes
Potassium	mg/L	0.0337593	-0.5	0.7	yes
Chloride	mg/L	2.1572	0	5	yes
Sulfate-S	mg/L	0.0251397	-0	1	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Electrical Conductivity	dS/m	2.98	2.71	3.25	yes
% Saturation	%	47	38	52	yes
Calcium	mg/L	710	596.2	767.8	yes
Magnesium	mg/L	147	121.8	154.8	yes
Sodium	mg/L	77	58	79	yes
Potassium	mg/L	23	17.8	24.6	yes
Chloride	mg/L	66	57	78	yes
Sulfate-S	mg/L	644	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.3	26.80	35.20	yes
Calcium	mg/L	246	230.2	261.4	yes
Magnesium	mg/L	95.3	92.7	99.7	yes
Sodium	mg/L	244	229	269	yes
Potassium	mg/L	241	229.4	265.4	yes
Chloride	mg/L	2000	1871	2231	yes
Sulfate-S	mg/L	146	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	7.7	7.6	0	0.3	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 17, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	0	-10	10	yes

Date Acquired: November 17, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
--------------------------	-------	-------------	-------------	----------------	-------------------	-----------



Quality Control

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
P. O. 4009, MD 0078	Project Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada	Project Location: Suncor Basemine	Date Received: Nov 15, 2017
T9H 3L1	LSD:	Date Reported: Nov 22, 2017
Attn: Marty Yarmuch	P.O.: 4410252962	Report Number: 2243562
Sampled By: Nikki McPhee	Proj. Acct. code: E6687	
Company: Paragon Soil		

Volatile Petroleum Hydrocarbons - Soil -

Continued

Client Sample	Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F1 C6-C10		mg/kg	10	10	50	0	yes
F1 -BTEX		mg/kg	10	10	50	0	yes
Date Acquired: November 17, 2017							
Matrix Spike		Units	% Recovery	Lower Limit	Upper Limit		Passed QC
F1 C6-C10		mg/kg	84	80	120		yes
Date Acquired: November 17, 2017							

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239545 Control Number: C0056636 Date Received: Nov 15, 2017 Date Reported: Nov 22, 2017 Report Number: 2243562
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME - Soil	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary
BTEX-CCME - Soil	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Calgary
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl2 (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME-Soil (Shake)	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary

** Reference Method Modified*

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.



Hydrocarbon Chromatogram

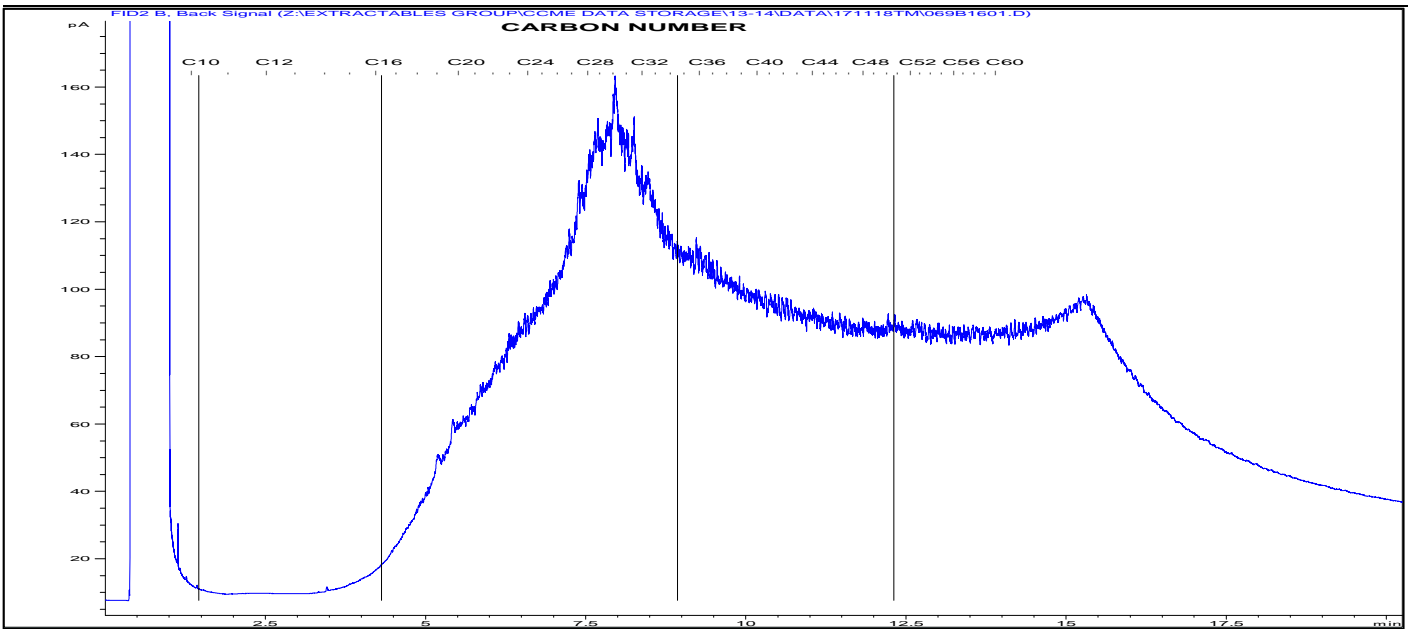
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

Exova Number: 1239545-4

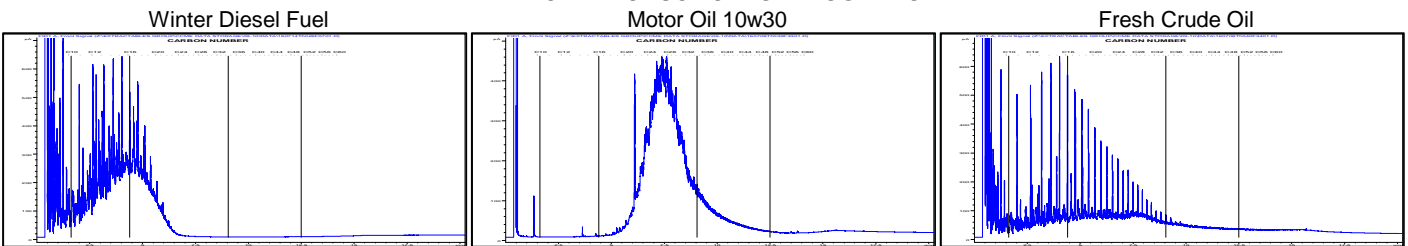
Sample Description: DSPlot20-02-HC

Silica Gel Treated

Sample Date: Nov 12, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

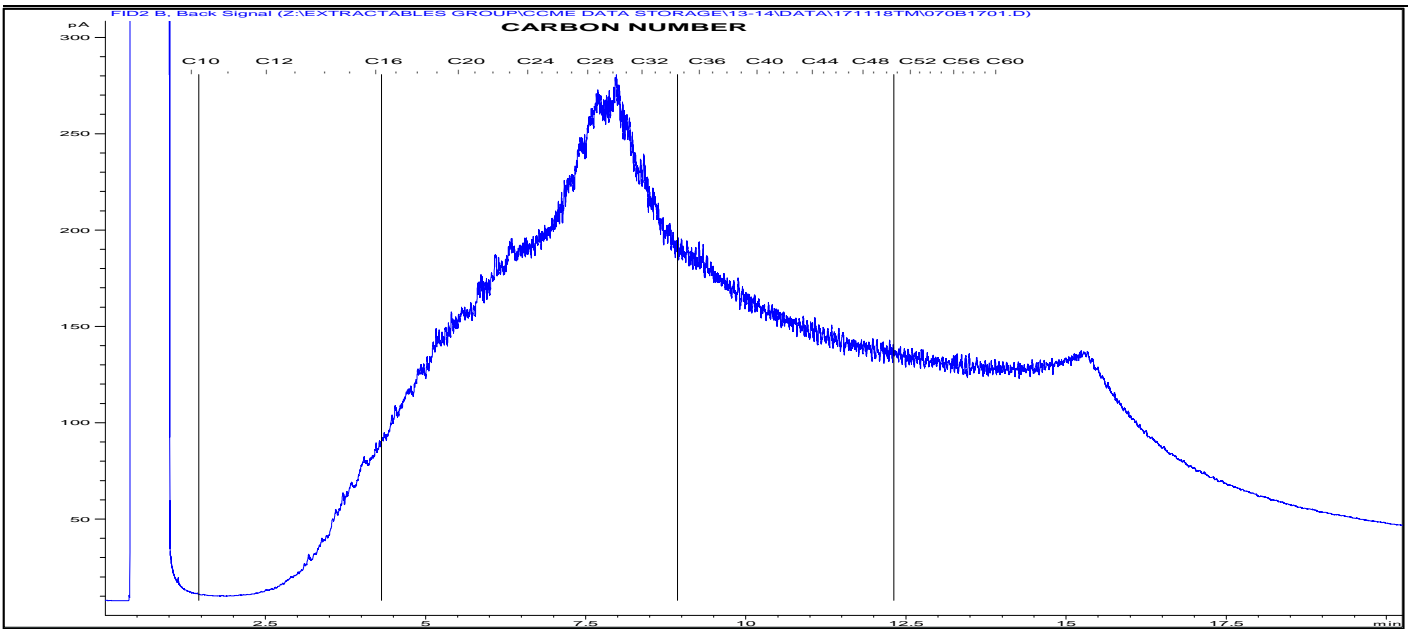
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

Exova Number: 1239545-5

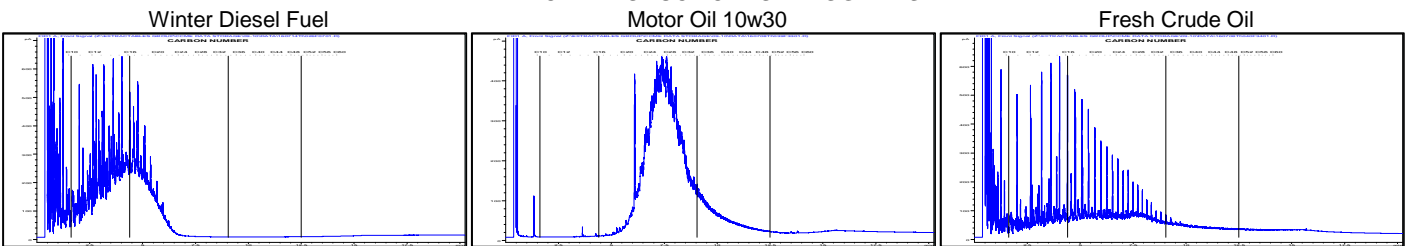
Sample Description: DSPlot20-03-HC

Silica Gel Treated

Sample Date: Nov 12, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

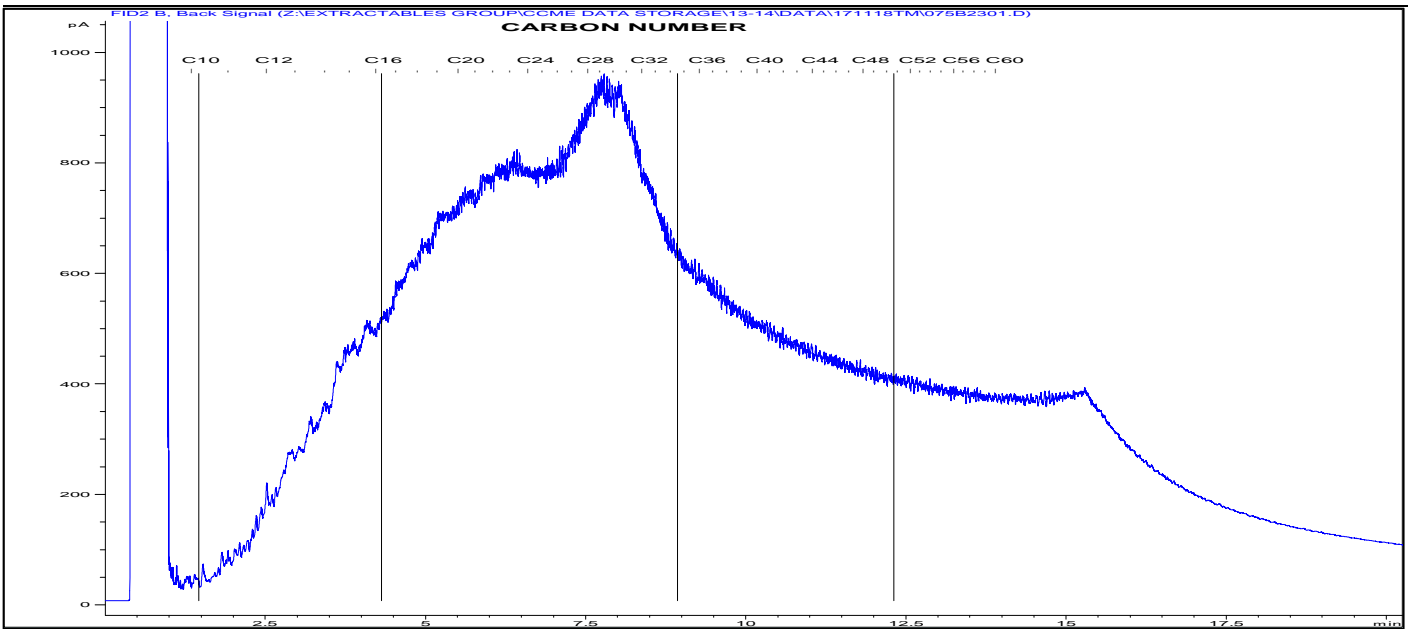
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

Exova Number: 1239545-6

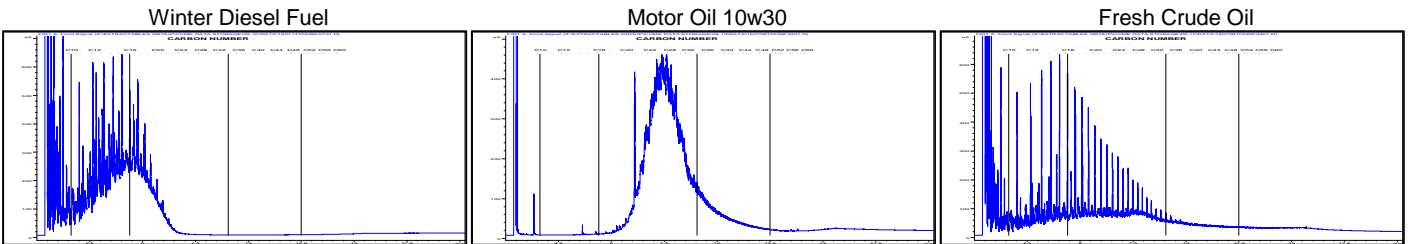
Sample Description: DSPlot20-04-HC

Sample Date: Nov 12, 2017

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

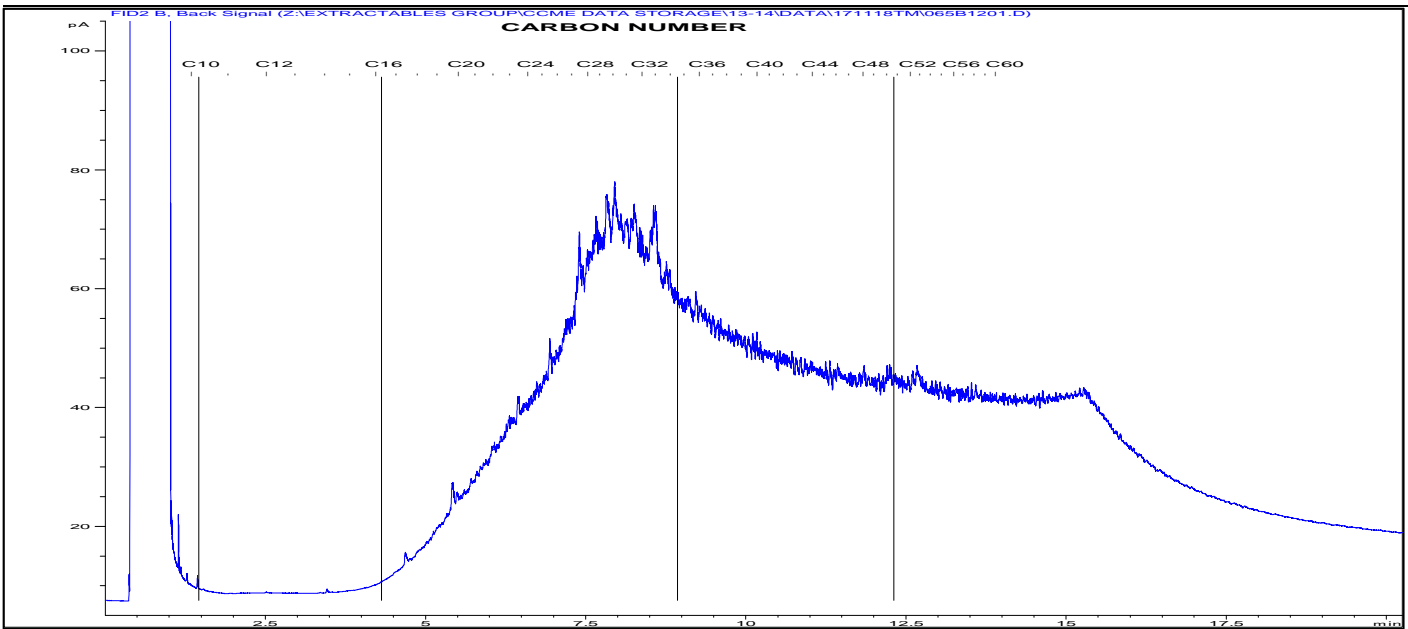
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

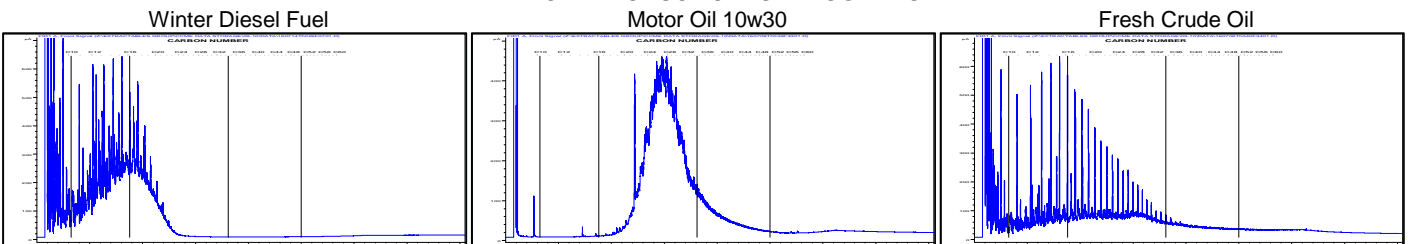
Exova Number: 1239545-12
 Sample Date: Nov 10, 2017

Sample Description: DSPlot3-02-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

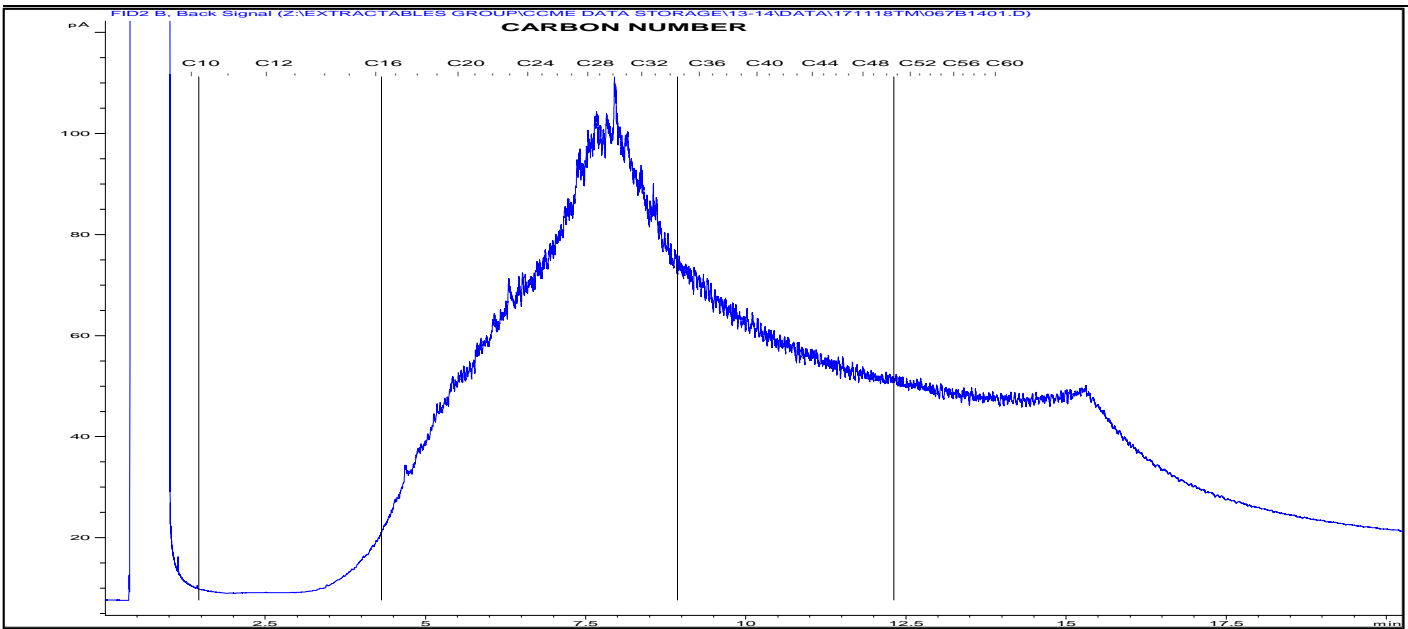
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

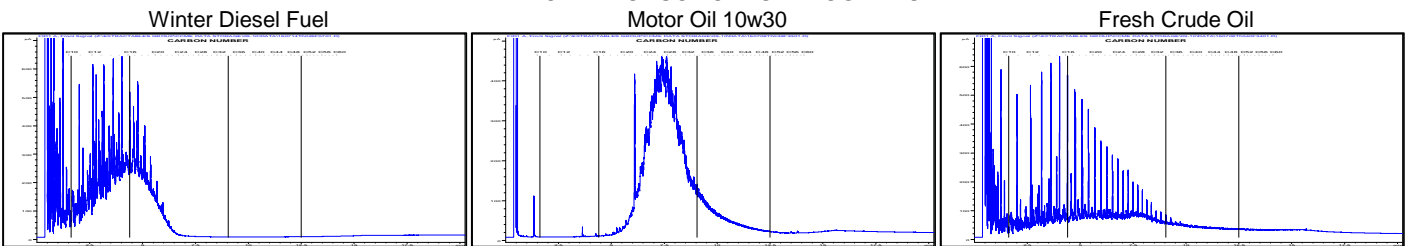
Exova Number: 1239545-13
 Sample Date: Nov 10, 2017

Sample Description: DSPlot3-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

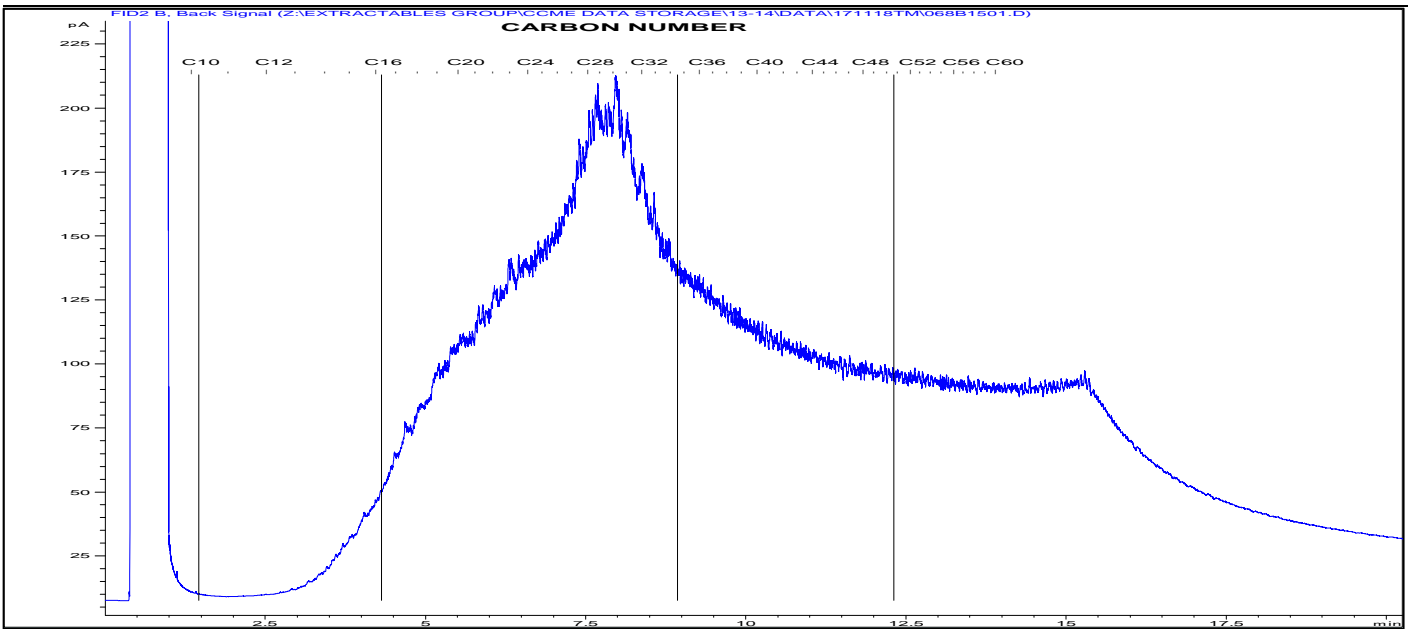
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

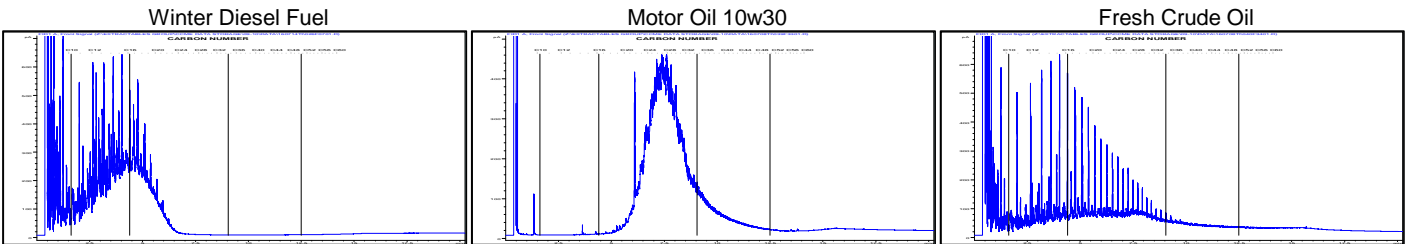
Exova Number: 1239545-14
 Sample Date: Nov 10, 2017

Sample Description: DSPlot3-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

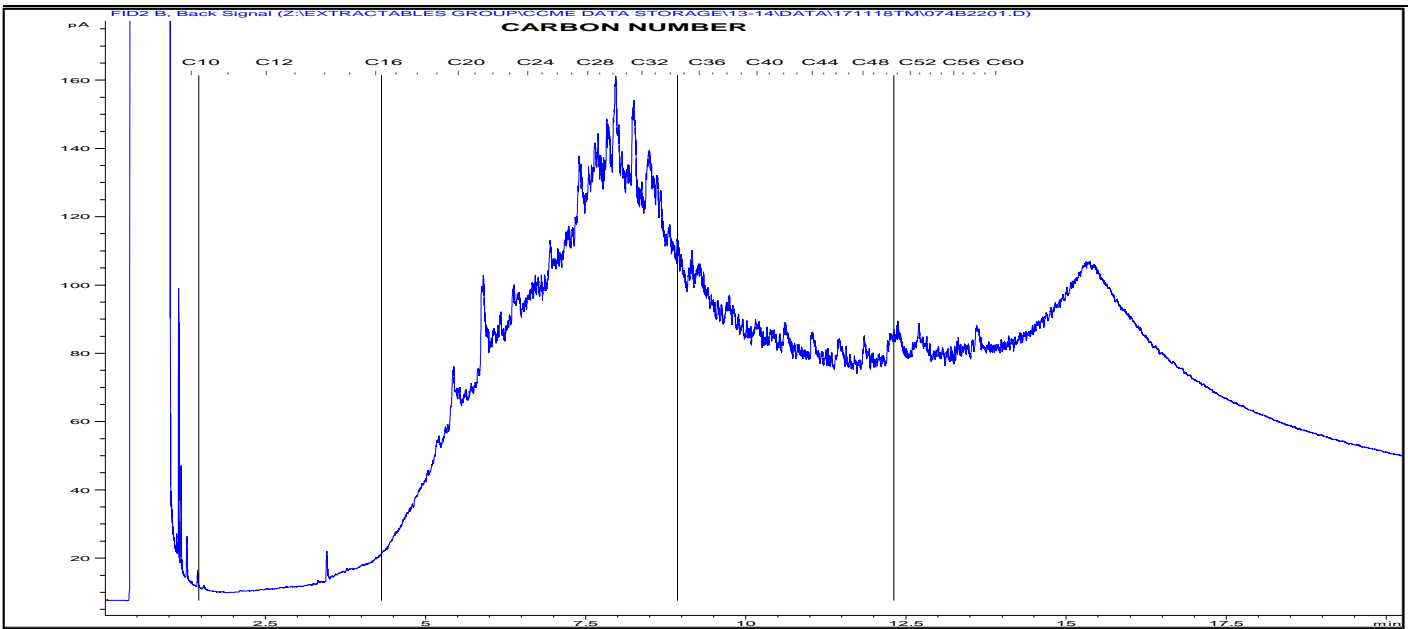
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

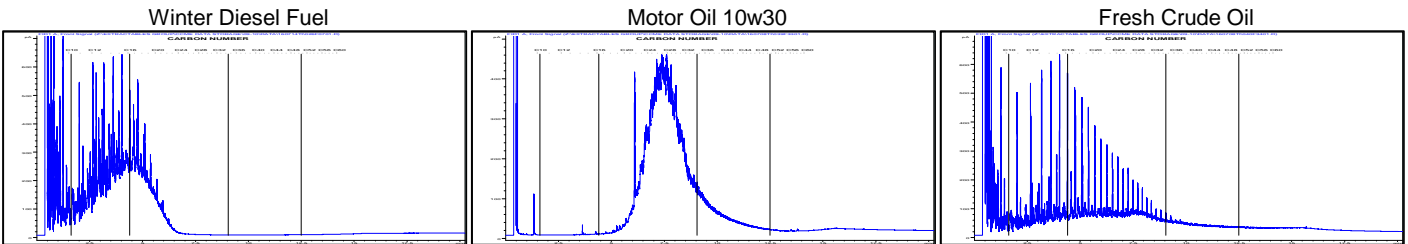
Exova Number: 1239545-20
 Sample Date: Nov 12, 2017

Sample Description: DSPlot19-02-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

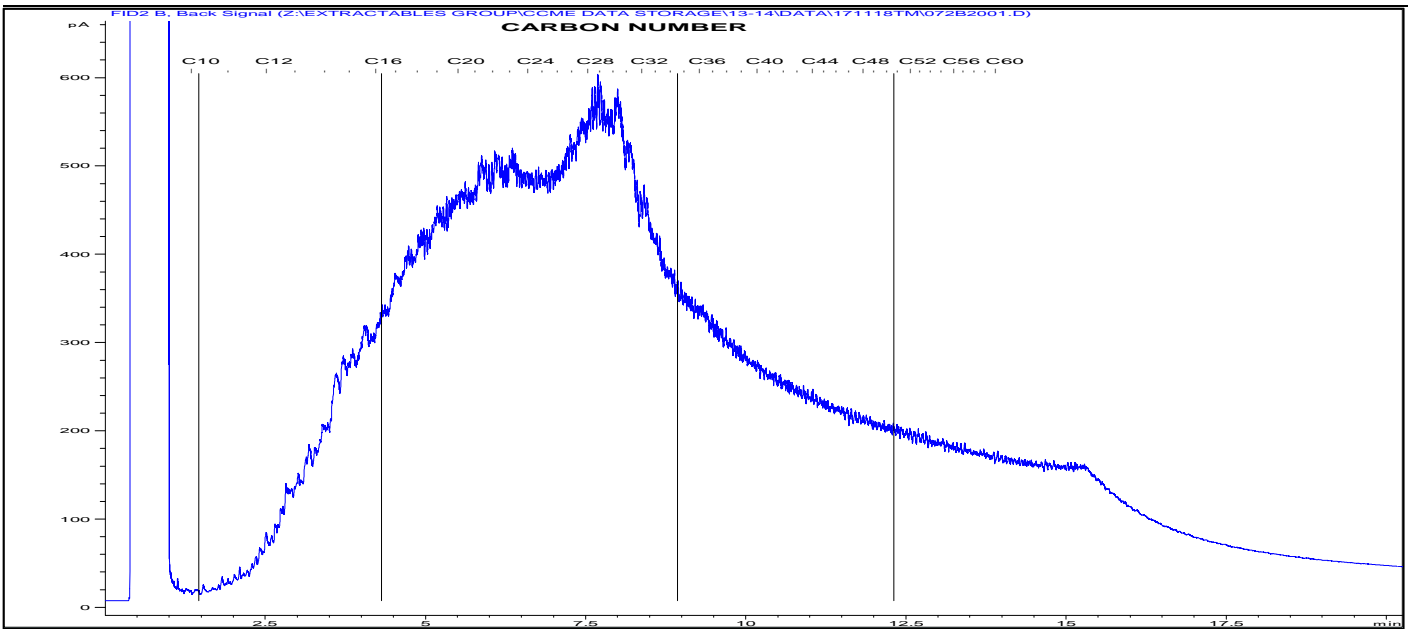
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056636
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 20, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243562
Company: Paragon Soil		

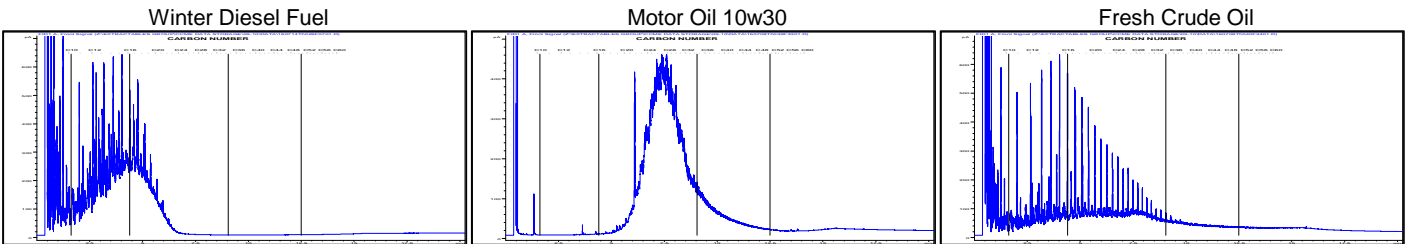
Exova Number: 1239545-21
 Sample Date: Nov 12, 2017

Sample Description: DSPlot19-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

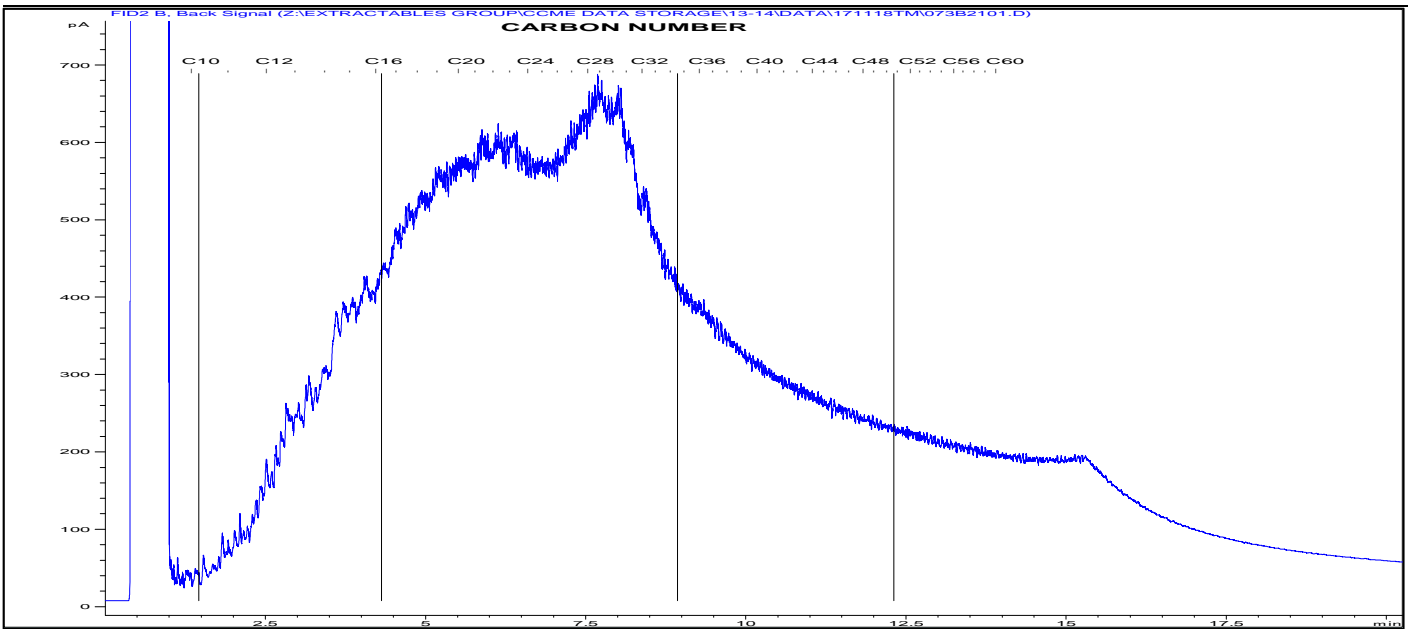
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239545
Report To: Syncrude Canada Ltd.	Name: Suncor LOS	Control Number: C0056636
P. O. 4009, MD 0078	Location: Suncor Basemine	Date Received: Nov 15, 2017
Fort McMurray, AB, Canada	LSD:	Date Reported: Nov 20, 2017
T9H 3L1	P.O.: 4410252962	Report Number: 2243562
Attn: Marty Yarmuch		
Sampled by: Nikki McPhee		
Company: Paragon Soil		

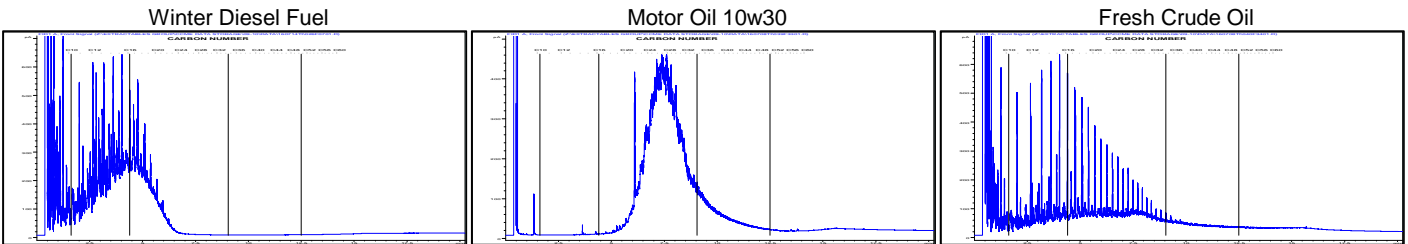
Exova Number: 1239545-22
 Sample Date: Nov 12, 2017

Sample Description: DSPlot19-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Sampled By: Company:		

	Reference Number	1239553-1	1239553-2	1239553-3		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	14:00	14:00	14:00		
	Sample Location					
	Sample Description	NMPlot17-02-HC	NMPlot17-03-HC	NMPlot17-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	368	88	50
F3c C16-C34	Dry Weight	mg/kg	1050	5530	2520	50
F4c C34-C50	Dry Weight	mg/kg	913	3180	1630	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	2630	7430	3710	100
% C50+	%		36.2	22.5	23.5	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	15.60	9.56	5.40	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239553-4	1239553-5	1239553-9		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	14:00	14:00	14:00		
	Sample Location					
	Sample Description	NMPlot17-02-BD1 / 313CM3	NMPlot17-02-BD2 / 313CM3	NMPlot17-03BD1 / 313CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	11	14	11	0.1
Bulk Density		kg/L	0.93	1.1	1.3	
Bulk Density		kg/m³	930	1100	1300	
Wet Bulk Density		kg/L	1.05	1.27	1.50	
Porosity		%	na	59	50	
Volume	Declared Value	mL	313	313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

		Reference Number	1239553-6	1239553-7	1239553-8	
		Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017	
		Sample Time	14:00	14:00	14:00	
		Sample Location				
		Sample Description	NMPlot17-02-AN	NMPlot17-03-AN	NMPlot17-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.61	1.05	2.52	0.01
SAR	Saturated Paste		0.2	0.1	0.1	
% Saturation		%	62	38	42	
Calcium	Saturated Paste	mg/kg	58.0	77.8	258	
Magnesium	Saturated Paste	mg/kg	13.6	10.5	48.5	
Sodium	Saturated Paste	mg/kg	4	3	5	
Potassium	Saturated Paste	mg/kg	6	4	7	
Chloride	Saturated Paste	mg/kg	7	4	3	
Sulfate (SO4)	Saturated Paste	mg/kg	83.6	163	775	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.0	7.2	6.5	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239553-10	1239553-14	1239553-15		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	14:00	10:00	10:00		
	Sample Location					
	Sample Description	NMPlot17-03DD2 / 313CM3	NMExtra5-02-BD1 / 313CM3	NMExtra5-02-BD2 / 313CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	10	36.7	39	0.1
Bulk Density		kg/L	1.52	0.41	0.36	
Bulk Density		kg/m³	1520	408	360	
Wet Bulk Density		kg/L	1.69	0.64	0.58	
Porosity		%	43	na	na	
Volume	Declared Value	mL	313	313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239553-11	1239553-12	1239553-13		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	NMExtra5-02-HC	NMExtra5-03-HC	NMExtra5-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	897	50
F3c C16-C34	Dry Weight	mg/kg	1610	1650	7050	50
F4c C34-C50	Dry Weight	mg/kg	1230	1350	3670	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	2940	3520	9450	100
% C50+	%		27.6	31.7	23.6	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	20.10	14.60	7.69	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

		Reference Number	1239553-16	1239553-17	1239553-18	
		Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	NMExtra5-02-AN	NMExtra5-03-AN	NMExtra5-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.84	1.04	1.51	0.01
SAR	Saturated Paste		0.1	0.2	0.1	
% Saturation		%	71	43	33	
Calcium	Saturated Paste	mg/kg	107	76.5	101	
Magnesium	Saturated Paste	mg/kg	15.5	16.9	15.6	
Sodium	Saturated Paste	mg/kg	4	4	2	
Potassium	Saturated Paste	mg/kg	14	3	4	
Chloride	Saturated Paste	mg/kg	7	4	3	
Sulfate (SO4)	Saturated Paste	mg/kg	154	137	264	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.1	7.0	7.4	


 Approved by: Anthony Neumann, MSc
 Laboratory Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

Extractable Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	0	-10	10	yes
F3c C16-C34	µg/mL	0	-30	30	yes
F4c C34-C50	µg/mL	0	-20	20	yes
F4HTGCc C34-C50+	µg/mL	0	-20	20	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	106.41	80	120	yes
F3c C16-C34	µg/mL	106.87	80	120	yes
F4c C34-C50	µg/mL	102.33	80	120	yes
F4HTGCc C34-C50+	µg/mL	101.40	80	120	yes

Date Acquired: November 17, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	84	70	130	yes
F3c C16-C34	mg/kg	112	70	130	yes
F4c C34-C50	mg/kg	104	70	130	yes
F4HTGCc C34-C50+	mg/kg	104	70	130	yes

Date Acquired: November 18, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0021	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.005	0.005	yes
Toluene	ng	0	-0.06	0.06	yes
Ethylbenzene	ng	0	-0.030	0.030	yes
Total Xylenes (m,p,o)	ng	0	-0.09	0.09	yes
Styrene	ng	0	-0.030	0.030	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	80.20	80	120	yes
Toluene	ng	96.20	80	120	yes
Ethylbenzene	ng	101.20	80	120	yes
Total Xylenes (m,p,o)	ng	105.33	80	120	yes
Styrene	ng	101.00	80	120	yes

Date Acquired: November 17, 2017

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	10	10	10	0.3	yes

Date Acquired: November 20, 2017

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.1153	-0.4	0.5	yes
Magnesium	mg/L	0.0224	-0.1	0.1	yes
Sodium	mg/L	0.0462	-0	2	yes
Potassium	mg/L	0.0081	-0.5	0.7	yes
Chloride	mg/L	3.6358	0	5	yes
Sulfate-S	mg/L	0.0028	-0	1	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Electrical Conductivity	dS/m	2.99	2.71	3.25	yes
% Saturation	%	47	38	52	yes
Calcium	mg/L	625	596.2	767.8	yes
Magnesium	mg/L	131	121.8	154.8	yes
Sodium	mg/L	70	58	79	yes
Potassium	mg/L	20	17.8	24.6	yes
Chloride	mg/L	67	57	78	yes
Sulfate-S	mg/L	615	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.3	26.80	35.20	yes
Calcium	mg/L	246	230.2	261.4	yes
Magnesium	mg/L	95.4	92.7	99.7	yes
Sodium	mg/L	238	229	269	yes
Potassium	mg/L	241	229.4	265.4	yes
Chloride	mg/L	2050	1871	2231	yes
Sulfate-S	mg/L	144	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.9	6.8	0	0.3	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 17, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	0	-10	10	yes

Date Acquired: November 17, 2017

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME - Soil	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary
BTEX-CCME - Soil	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Calgary
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl ₂ (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME-Soil (Shake)	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary

** Reference Method Modified*

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

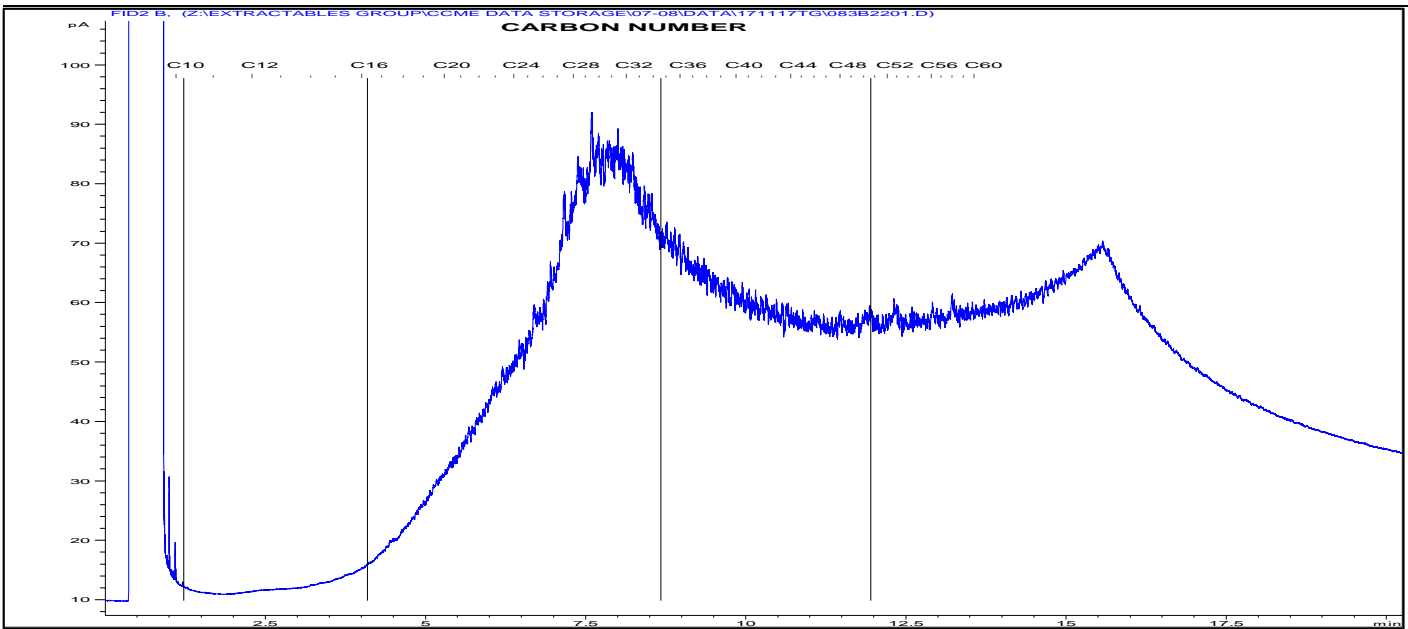
Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

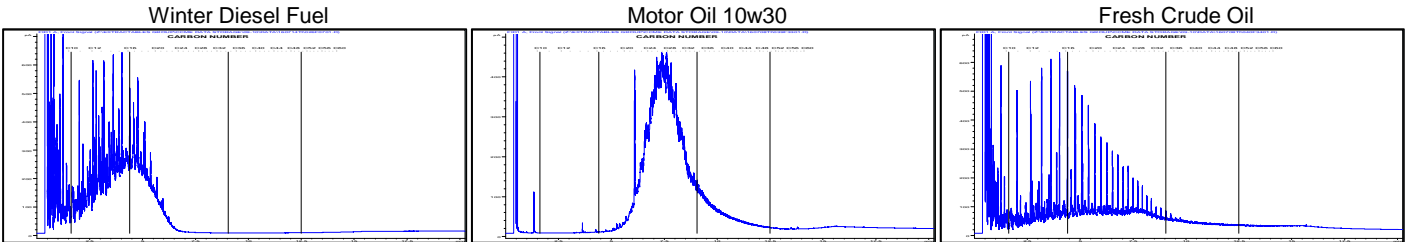
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-1 Sample Description: NMPlot17-02-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



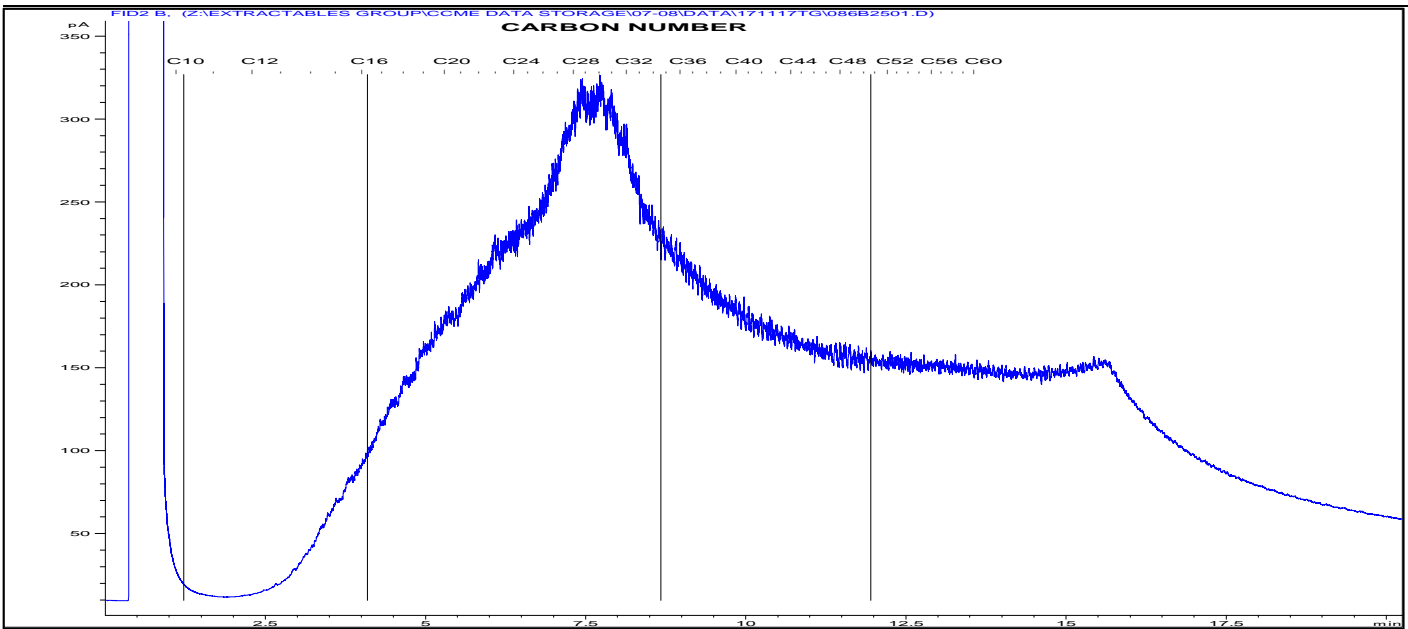
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

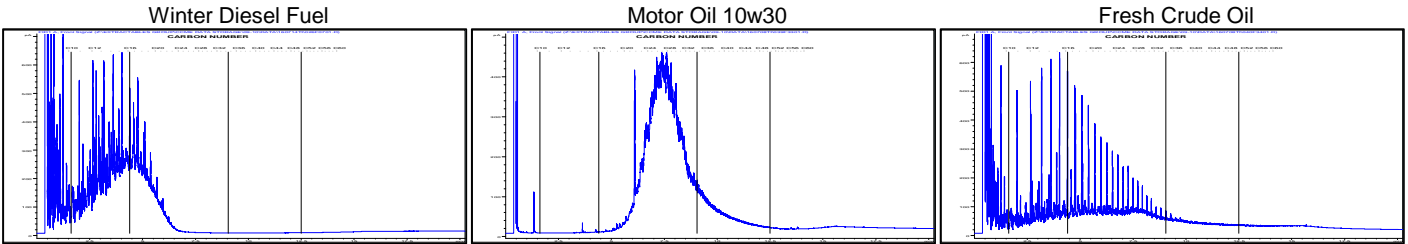
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-2 Sample Description: NMPlot17-03-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



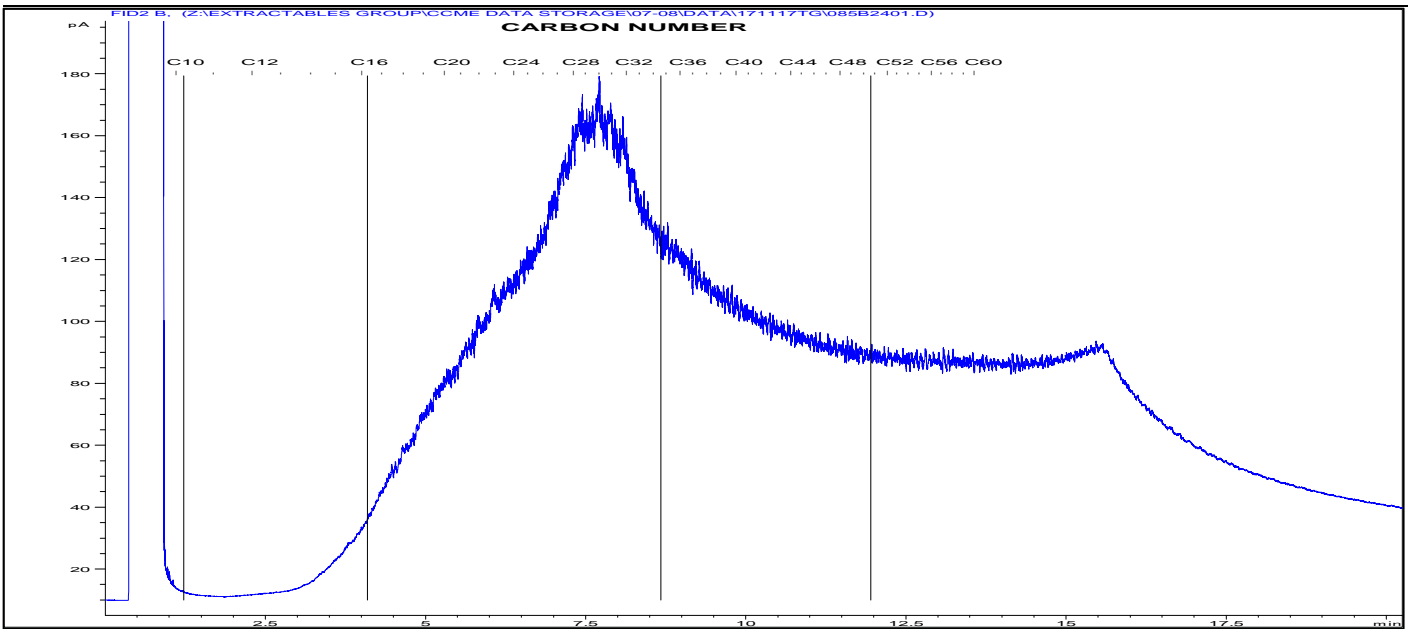
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

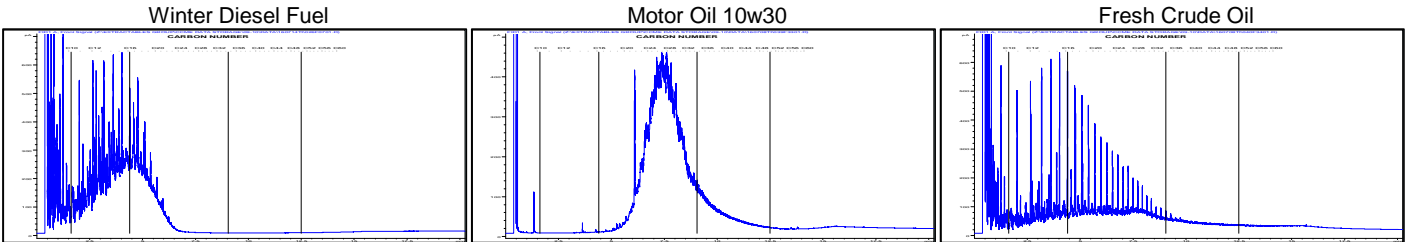
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-3 Sample Description: NMPlot17-04-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



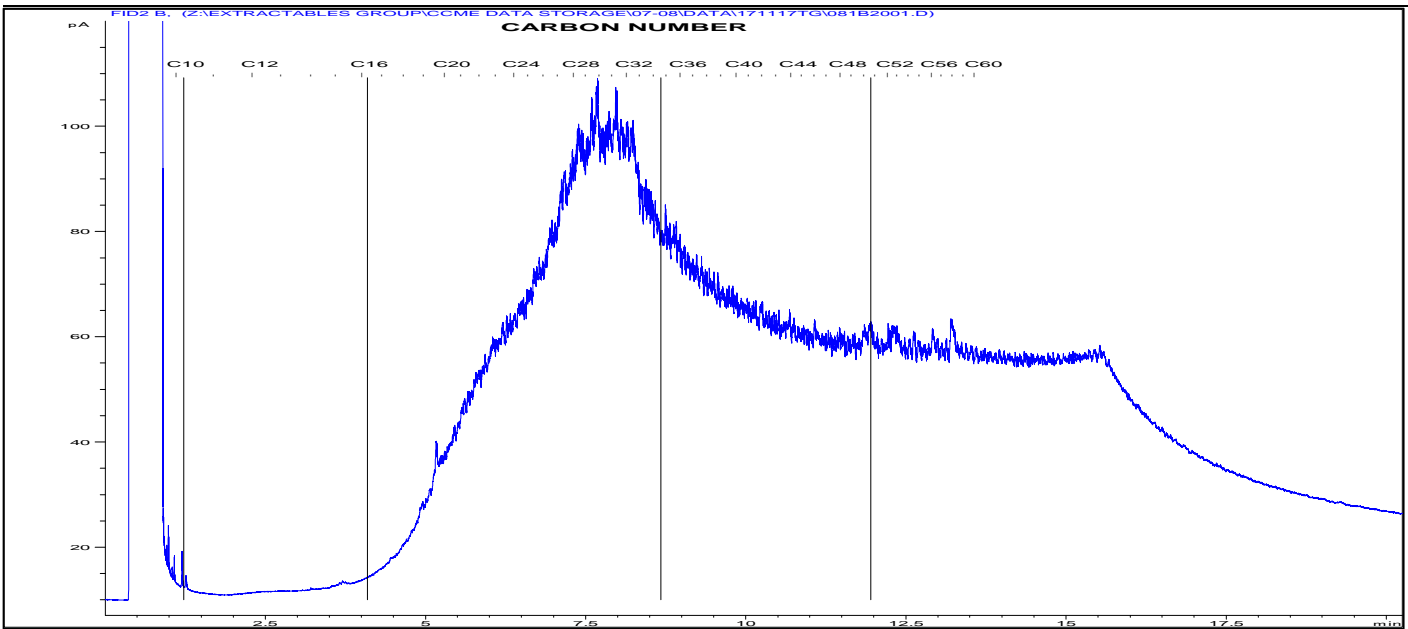
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

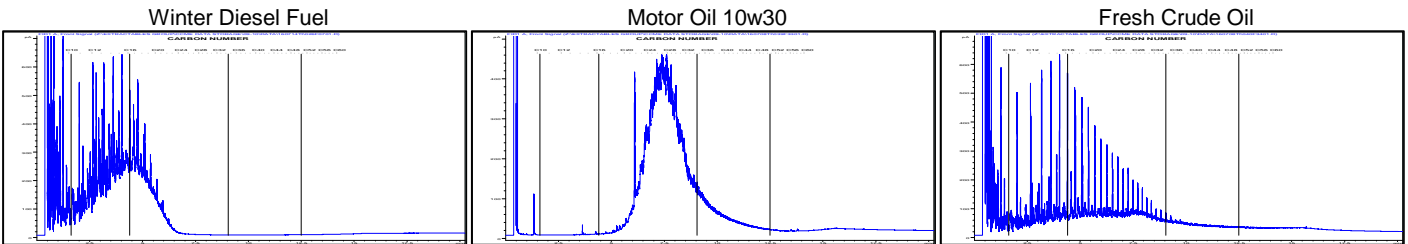
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-11 Sample Description: NMExtra5-02-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

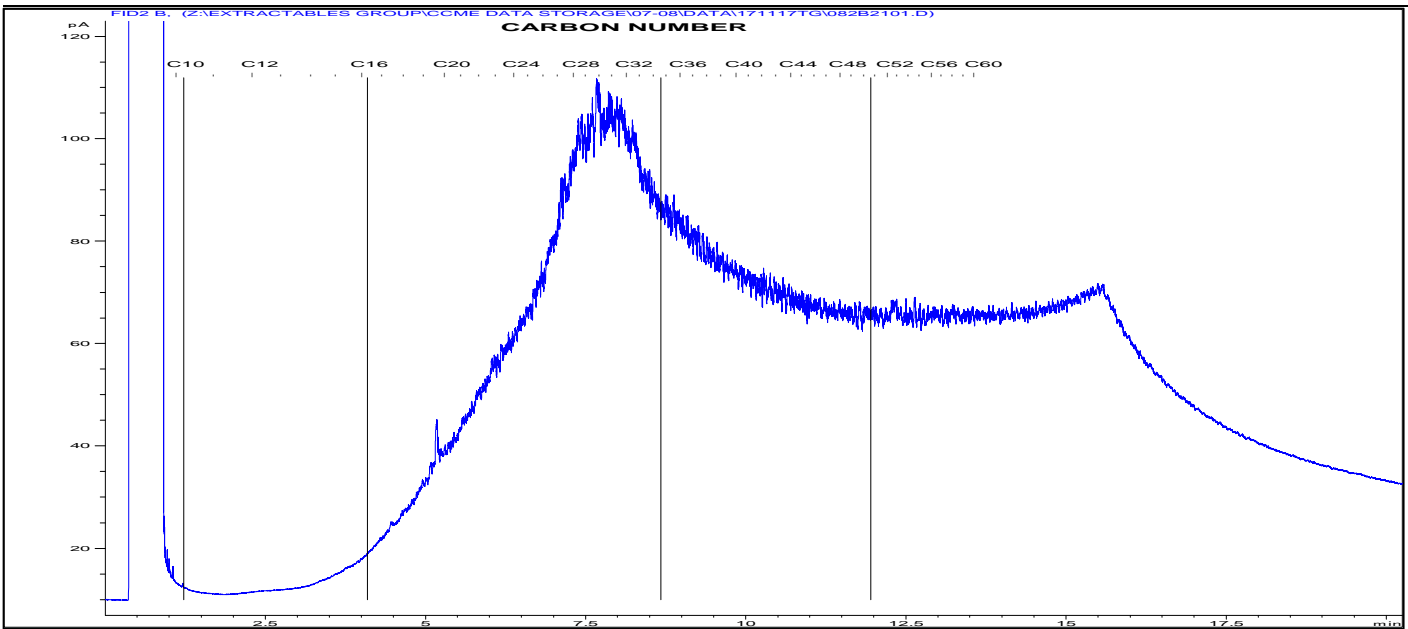
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

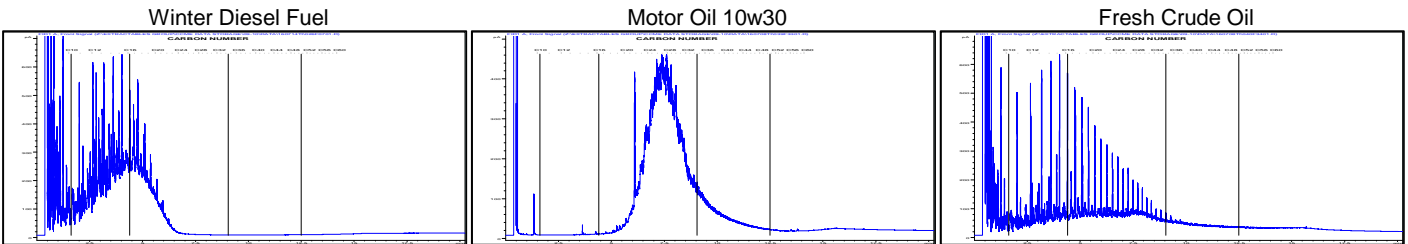
Exova Number: 1239553-12
 Sample Date: Nov 13, 2017

Sample Description: NMExtra5-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

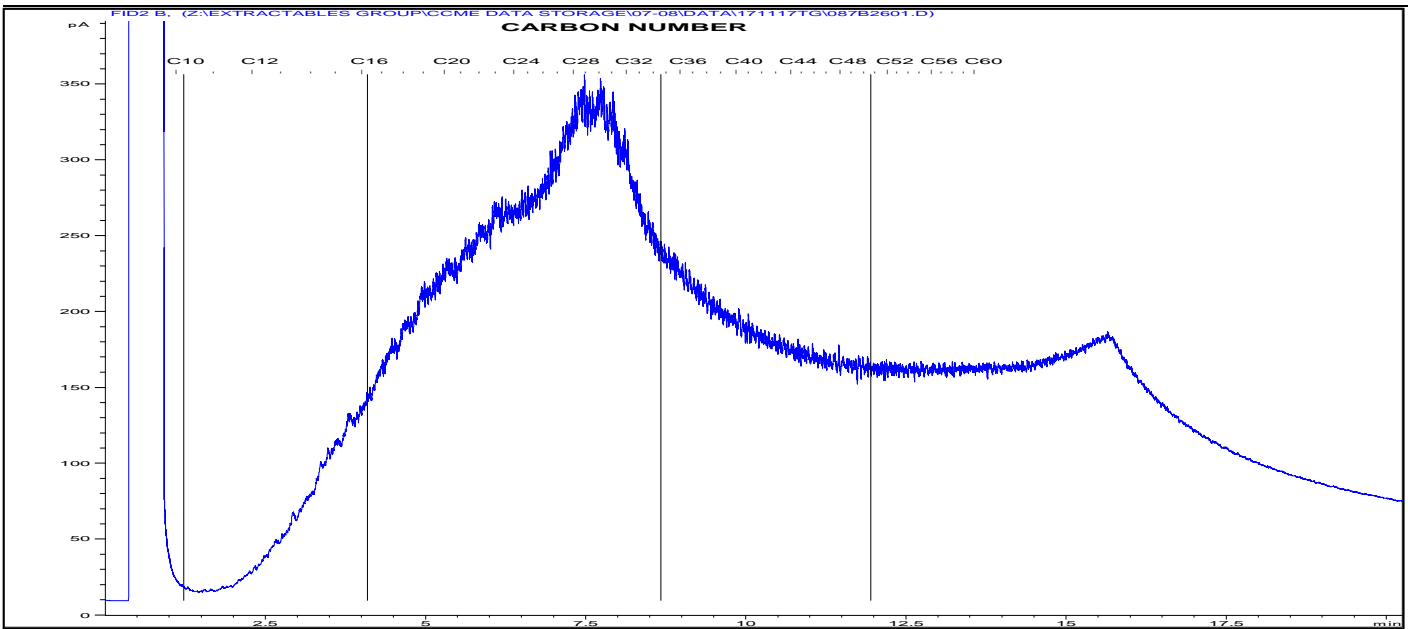
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



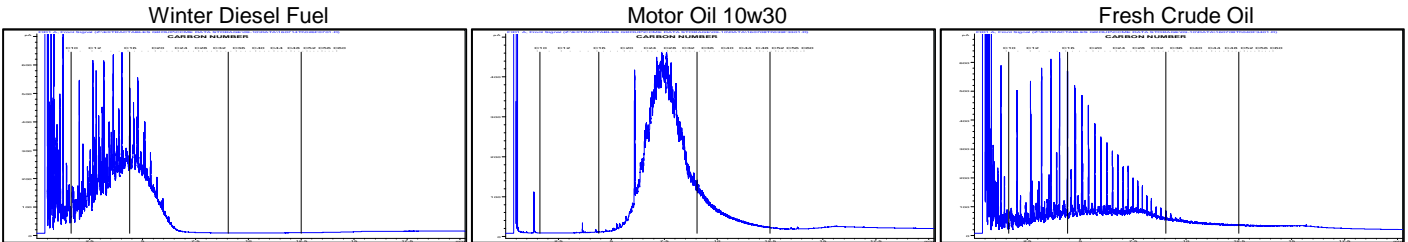
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-13 Sample Description: NMExtra5-04-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Sampled By: Company:		

	Reference Number	1239553-1	1239553-2	1239553-3		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	14:00	14:00	14:00		
	Sample Location					
	Sample Description	NMPlot17-02-HC	NMPlot17-03-HC	NMPlot17-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	368	88	50
F3c C16-C34	Dry Weight	mg/kg	1050	5530	2520	50
F4c C34-C50	Dry Weight	mg/kg	913	3180	1630	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	2630	7430	3710	100
% C50+	%		36.2	22.5	23.5	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	15.60	9.56	5.40	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239553-4	1239553-5	1239553-9		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	14:00	14:00	14:00		
	Sample Location					
	Sample Description	NMPlot17-02-BD1 / 313CM3	NMPlot17-02-BD2 / 313CM3	NMPlot17-03BD1 / 313CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	11	14	11	0.1
Bulk Density		kg/L	0.93	1.1	1.3	
Bulk Density		kg/m³	930	1100	1300	
Wet Bulk Density		kg/L	1.05	1.27	1.50	
Porosity		%	na	59	50	
Volume	Declared Value	mL	313	313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

		Reference Number	1239553-6	1239553-7	1239553-8	
		Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017	
		Sample Time	14:00	14:00	14:00	
		Sample Location				
		Sample Description	NMPlot17-02-AN	NMPlot17-03-AN	NMPlot17-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.61	1.05	2.52	0.01
SAR	Saturated Paste		0.2	0.1	0.1	
% Saturation		%	62	38	42	
Calcium	Saturated Paste	mg/kg	58.0	77.8	258	
Magnesium	Saturated Paste	mg/kg	13.6	10.5	48.5	
Sodium	Saturated Paste	mg/kg	4	3	5	
Potassium	Saturated Paste	mg/kg	6	4	7	
Chloride	Saturated Paste	mg/kg	7	4	3	
Sulfate (SO4)	Saturated Paste	mg/kg	83.6	163	775	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.0	7.2	6.5	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch Sampled By: Company:	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
--	--	--

	Reference Number	1239553-10	1239553-14	1239553-15		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	14:00	10:00	10:00		
	Sample Location					
	Sample Description	NMPlot17-03DD2 / 313CM3	NMExtra5-02-BD1 / 313CM3	NMExtra5-02-BD2 / 313CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	10	36.7	39	0.1
Bulk Density		kg/L	1.52	0.41	0.36	
Bulk Density		kg/m³	1520	408	360	
Wet Bulk Density		kg/L	1.69	0.64	0.58	
Porosity		%	43	na	na	
Volume	Declared Value	mL	313	313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239553-11	1239553-12	1239553-13		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	NMExtra5-02-HC	NMExtra5-03-HC	NMExtra5-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	897	50
F3c C16-C34	Dry Weight	mg/kg	1610	1650	7050	50
F4c C34-C50	Dry Weight	mg/kg	1230	1350	3670	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	2940	3520	9450	100
% C50+	%		27.6	31.7	23.6	
Silica Gel Cleanup						
Silica Gel Cleanup			Done	Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	20.10	14.60	7.69	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

		Reference Number	1239553-16	1239553-17	1239553-18	
		Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	NMExtra5-02-AN	NMExtra5-03-AN	NMExtra5-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.84	1.04	1.51	0.01
SAR	Saturated Paste		0.1	0.2	0.1	
% Saturation		%	71	43	33	
Calcium	Saturated Paste	mg/kg	107	76.5	101	
Magnesium	Saturated Paste	mg/kg	15.5	16.9	15.6	
Sodium	Saturated Paste	mg/kg	4	4	2	
Potassium	Saturated Paste	mg/kg	14	3	4	
Chloride	Saturated Paste	mg/kg	7	4	3	
Sulfate (SO4)	Saturated Paste	mg/kg	154	137	264	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.1	7.0	7.4	


 Approved by:
 Anthony Neumann, MSc
 Laboratory Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
P. O. 4009, MD 0078	Project Name:	Control Number: C0056629
Fort McMurray, AB, Canada	Project Location: Suncor Base Mine	Date Received: Nov 15, 2017
T9H 3L1	LSD:	Date Reported: Nov 21, 2017
Attn: Marty Yarmuch	P.O.: 4410252962	Report Number: 2243612
Sampled By:	Proj. Acct. code: E6687	
Company:		

Extractable Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	0	-10	10	yes
F3c C16-C34	µg/mL	0	-30	30	yes
F4c C34-C50	µg/mL	0	-20	20	yes
F4HTGCc C34-C50+	µg/mL	0	-20	20	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	106.41	80	120	yes
F3c C16-C34	µg/mL	106.87	80	120	yes
F4c C34-C50	µg/mL	102.33	80	120	yes
F4HTGCc C34-C50+	µg/mL	101.40	80	120	yes

Date Acquired: November 17, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	84	70	130	yes
F3c C16-C34	mg/kg	112	70	130	yes
F4c C34-C50	mg/kg	104	70	130	yes
F4HTGCc C34-C50+	mg/kg	104	70	130	yes

Date Acquired: November 18, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0021	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.005	0.005	yes
Toluene	ng	0	-0.06	0.06	yes
Ethylbenzene	ng	0	-0.030	0.030	yes
Total Xylenes (m,p,o)	ng	0	-0.09	0.09	yes
Styrene	ng	0	-0.030	0.030	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	80.20	80	120	yes
Toluene	ng	96.20	80	120	yes
Ethylbenzene	ng	101.20	80	120	yes
Total Xylenes (m,p,o)	ng	105.33	80	120	yes
Styrene	ng	101.00	80	120	yes

Date Acquired: November 17, 2017

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	10	10	10	0.3	yes

Date Acquired: November 20, 2017

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.1153	-0.4	0.5	yes
Magnesium	mg/L	0.0224	-0.1	0.1	yes
Sodium	mg/L	0.0462	-0	2	yes
Potassium	mg/L	0.0081	-0.5	0.7	yes
Chloride	mg/L	3.6358	0	5	yes
Sulfate-S	mg/L	0.0028	-0	1	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Electrical Conductivity	dS/m	2.99	2.71	3.25	yes
% Saturation	%	47	38	52	yes
Calcium	mg/L	625	596.2	767.8	yes
Magnesium	mg/L	131	121.8	154.8	yes
Sodium	mg/L	70	58	79	yes
Potassium	mg/L	20	17.8	24.6	yes
Chloride	mg/L	67	57	78	yes
Sulfate-S	mg/L	615	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.3	26.80	35.20	yes
Calcium	mg/L	246	230.2	261.4	yes
Magnesium	mg/L	95.4	92.7	99.7	yes
Sodium	mg/L	238	229	269	yes
Potassium	mg/L	241	229.4	265.4	yes
Chloride	mg/L	2050	1871	2231	yes
Sulfate-S	mg/L	144	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.9	6.8	0	0.3	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 17, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	0	-10	10	yes

Date Acquired: November 17, 2017

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239553 Control Number: C0056629 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243612
Attn: Marty Yarmuch Sampled By: Company:		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME - Soil	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary
BTEX-CCME - Soil	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Calgary
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl ₂ (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME-Soil (Shake)	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary

** Reference Method Modified*

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Hydrocarbon Chromatogram

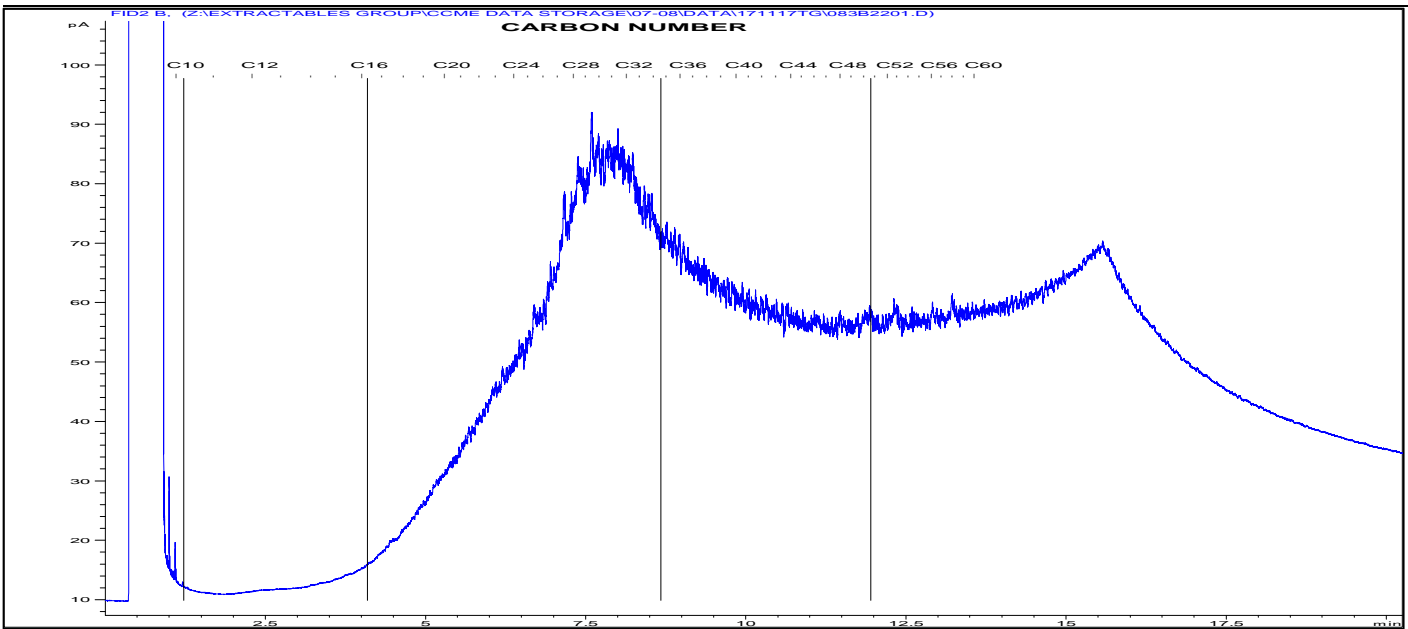
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-1

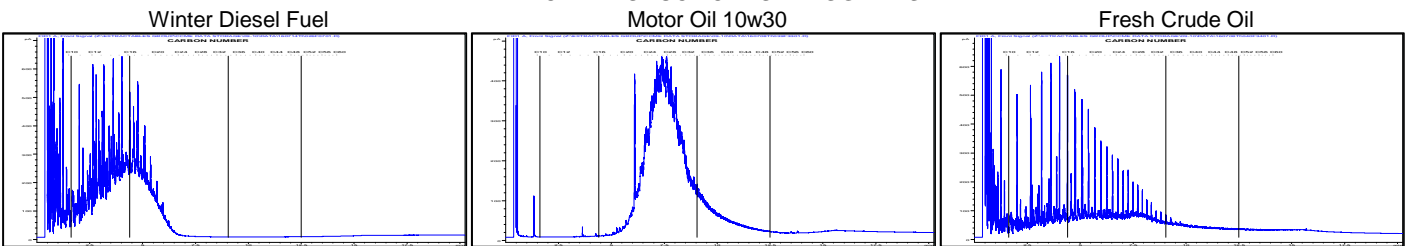
Sample Description: NMPlot17-02-HC

Silica Gel Treated

Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

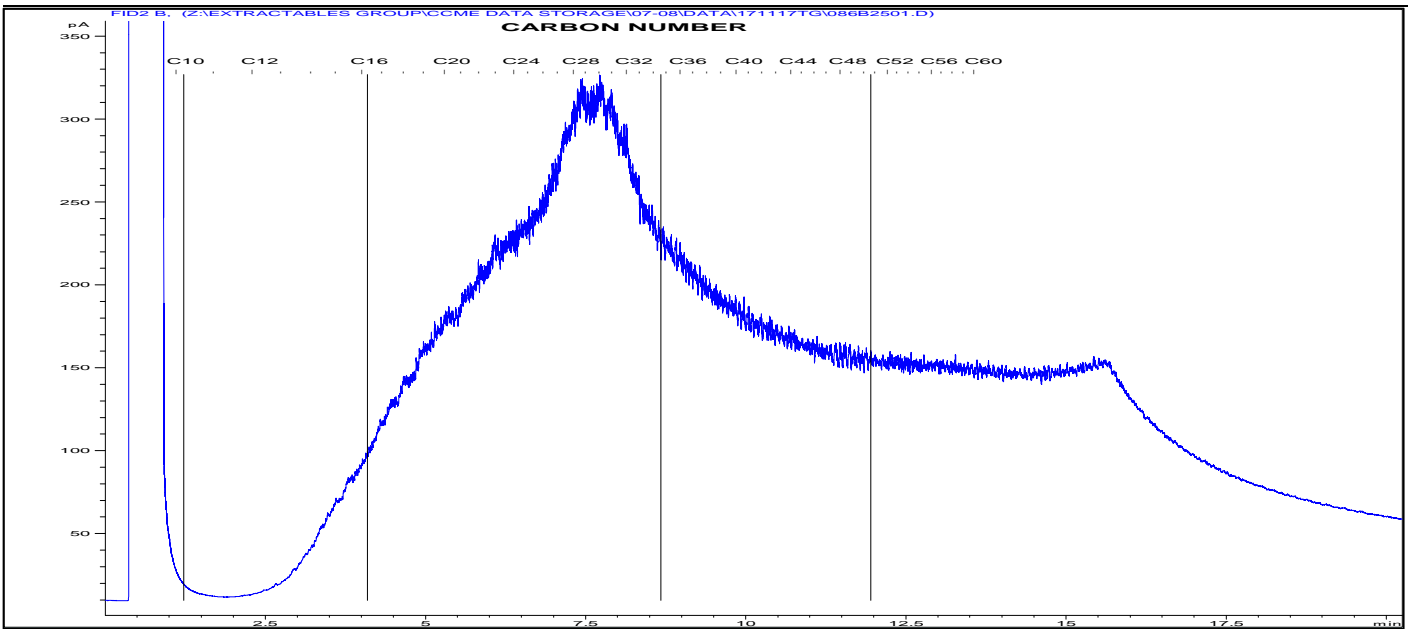
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-2

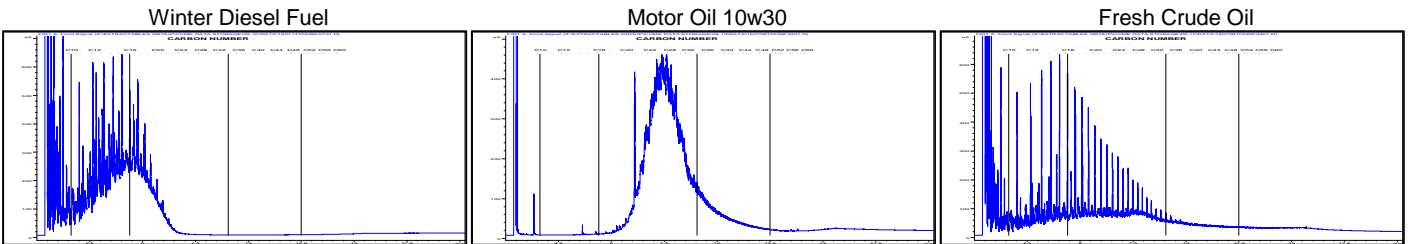
Sample Description: NMPlot17-03-HC

Silica Gel Treated

Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



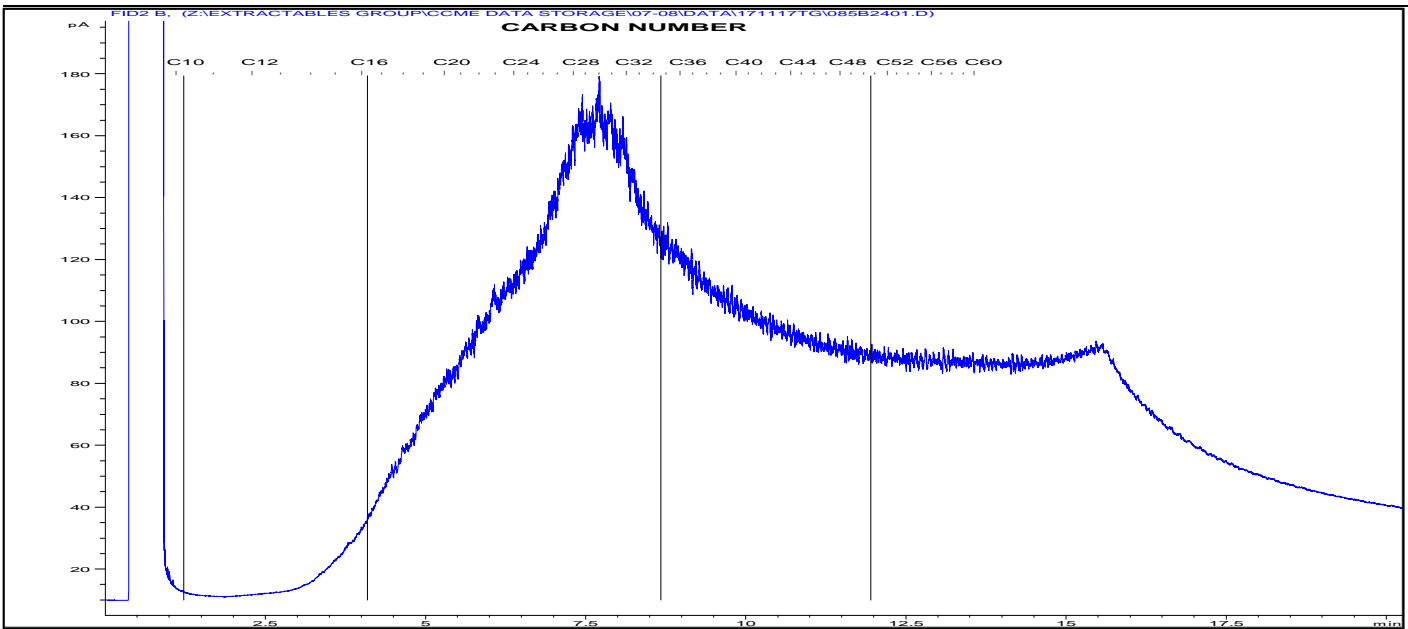
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

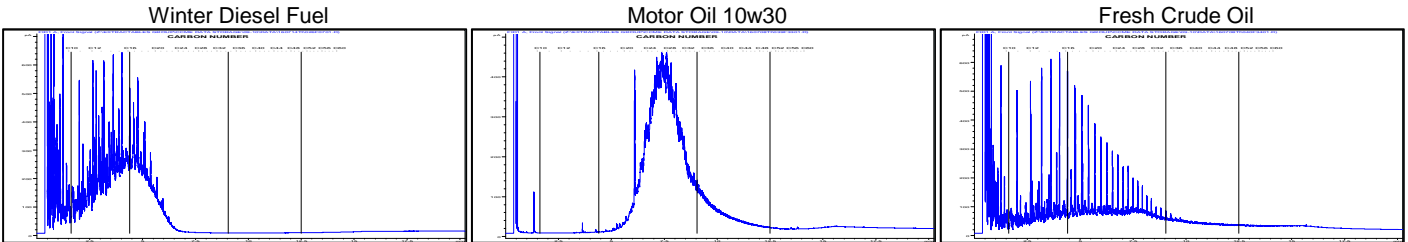
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-3 Sample Description: NMPlot17-04-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

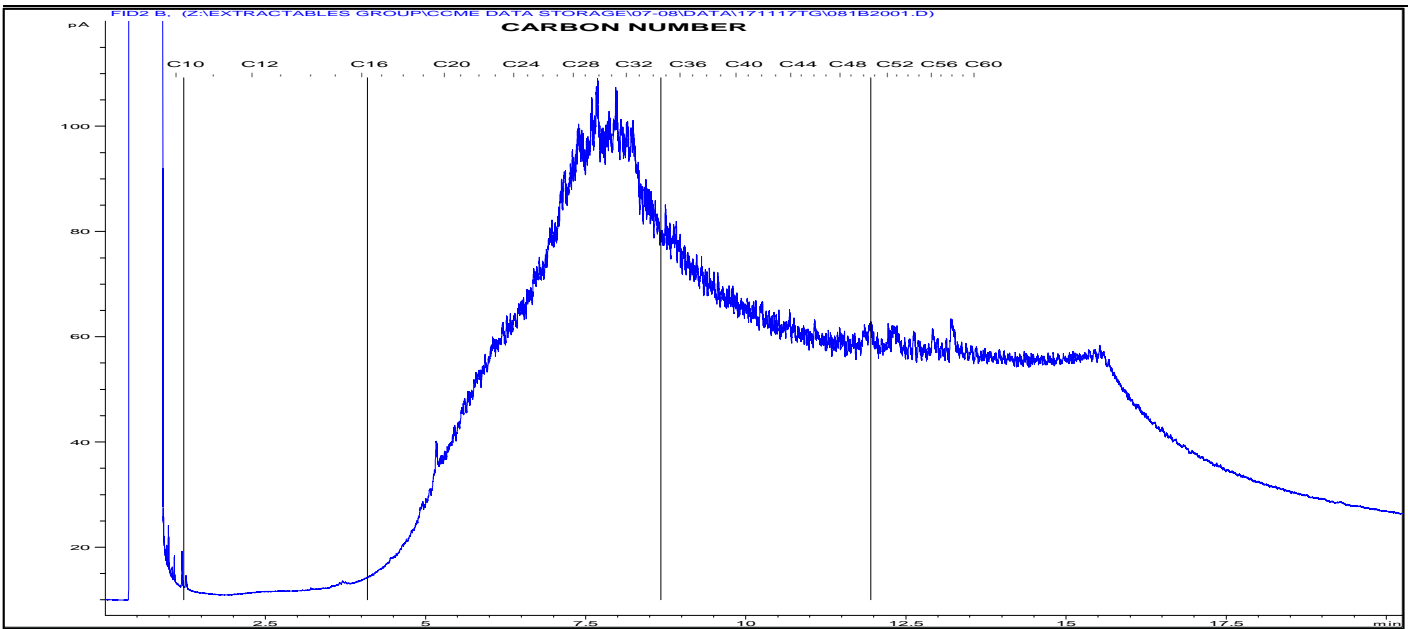
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



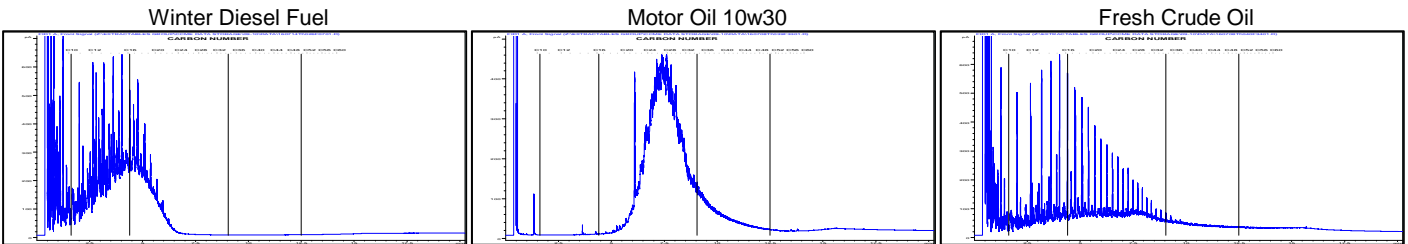
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-11 Sample Description: NMExtra5-02-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



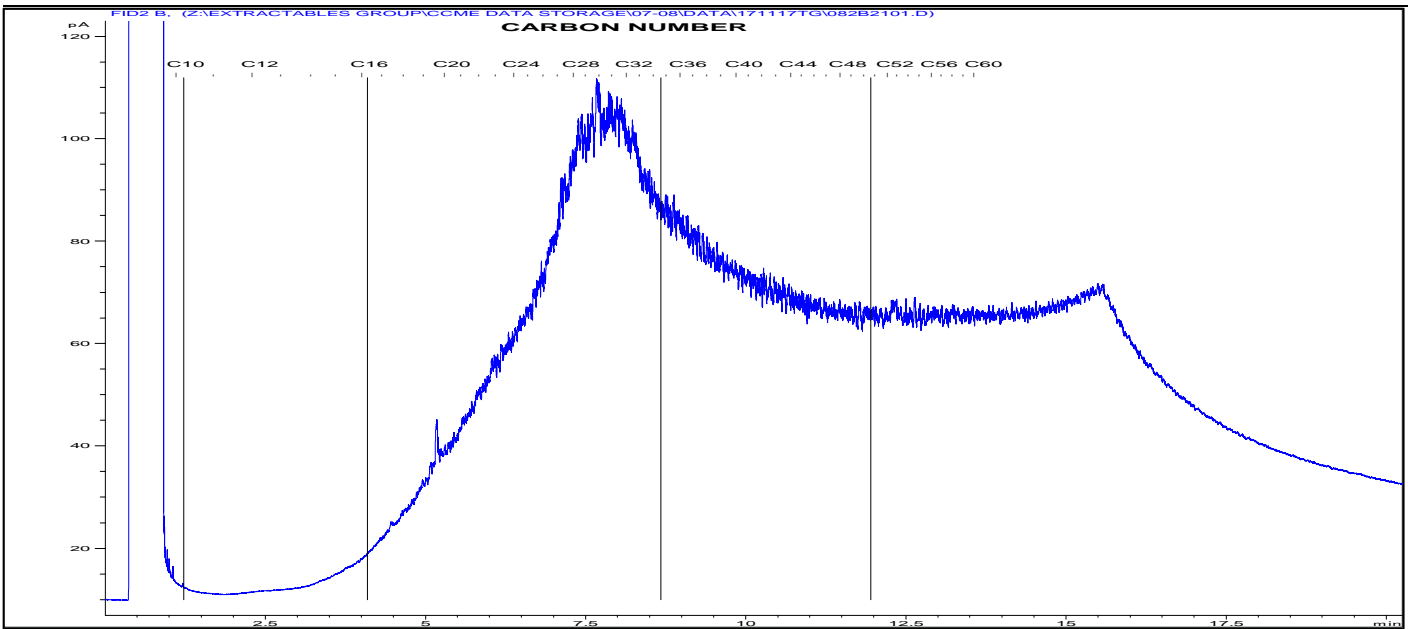
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

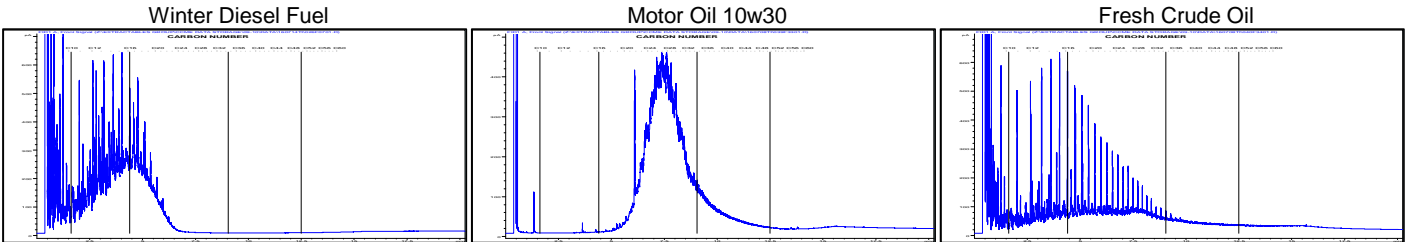
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada	Location: Suncor Base Mine	Date Received: Nov 15, 2017
T9H 3L1	LSD:	Date Reported: Nov 19, 2017
Attn: Marty Yarmuch	P.O.: 4410252962	Report Number: 2243612
Sampled by:		
Company:		

Exova Number: 1239553-12 Sample Description: NMExtra5-03-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

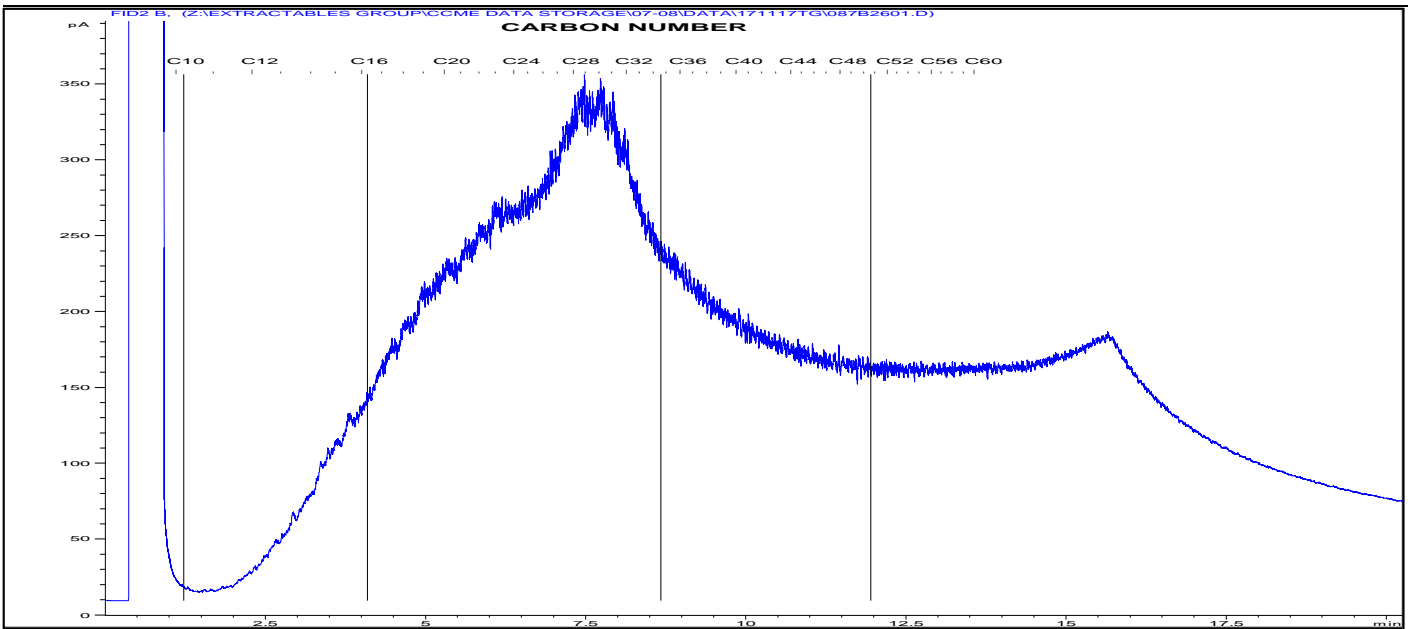
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



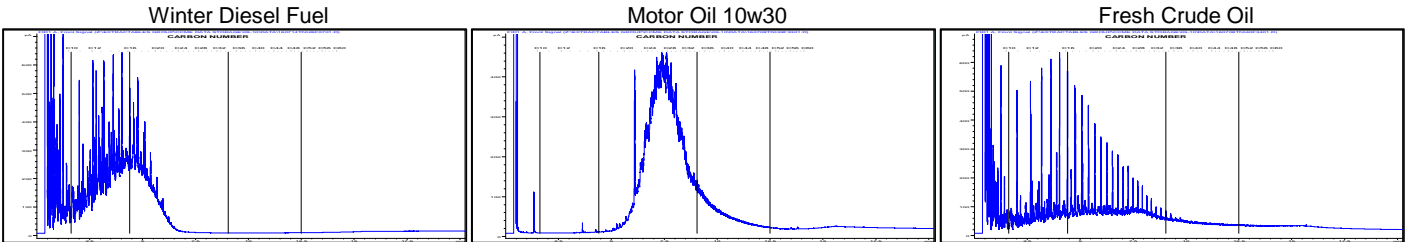
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239553
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056629
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by:	P.O.: 4410252962	Report Number: 2243612
Company:		

Exova Number: 1239553-13 Sample Description: NMExtra5-04-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
--	--	---

	Reference Number	1239726-1	1239726-2	1239726-3		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	16:00	16:00	16:00		
	Sample Location					
	Sample Description	NMPlot11-02-HC / cm	NMPlot11-03-HC / cm	NMPlot11-04-HC / cm		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	18	18	10	0.1
Mono-Aromatic Hydrocarbons - Soil						
Methanol Field Preservation			No	No	No	
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		16-NOV-17	16-NOV-17	16-NOV-17	
Silica Gel Cleanup			Done	Done	Done	
F2c C10-C16	Dry Weight	mg/kg	<60	<50	400	50
F3c C16-C34	Dry Weight	mg/kg	3000	1100	5800	50
F4c C34-C50	Dry Weight	mg/kg	2000	1000	3000	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	6000	2500	8000	100
% C50+		%	40	42	30	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-4	1239726-5	1239726-9		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 12, 2017		
	Sample Time	16:00	16:00	16:00		
	Sample Location					
	Sample Description	313 cm3 / NMPlot11-02-BD1 / cm	313 cm3 / NMPlot11-02-BD2 / cm	NMPlot18-02-HC / cm		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	23	13	16	0.1
Bulk Density		kg/L	0.61	0.90		
Bulk Density		kg/m³	610	900		
Wet Bulk Density		kg/L	0.79	1.04		
Porosity		%	na	na		
Volume	Declared Value	mL	313	313		

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

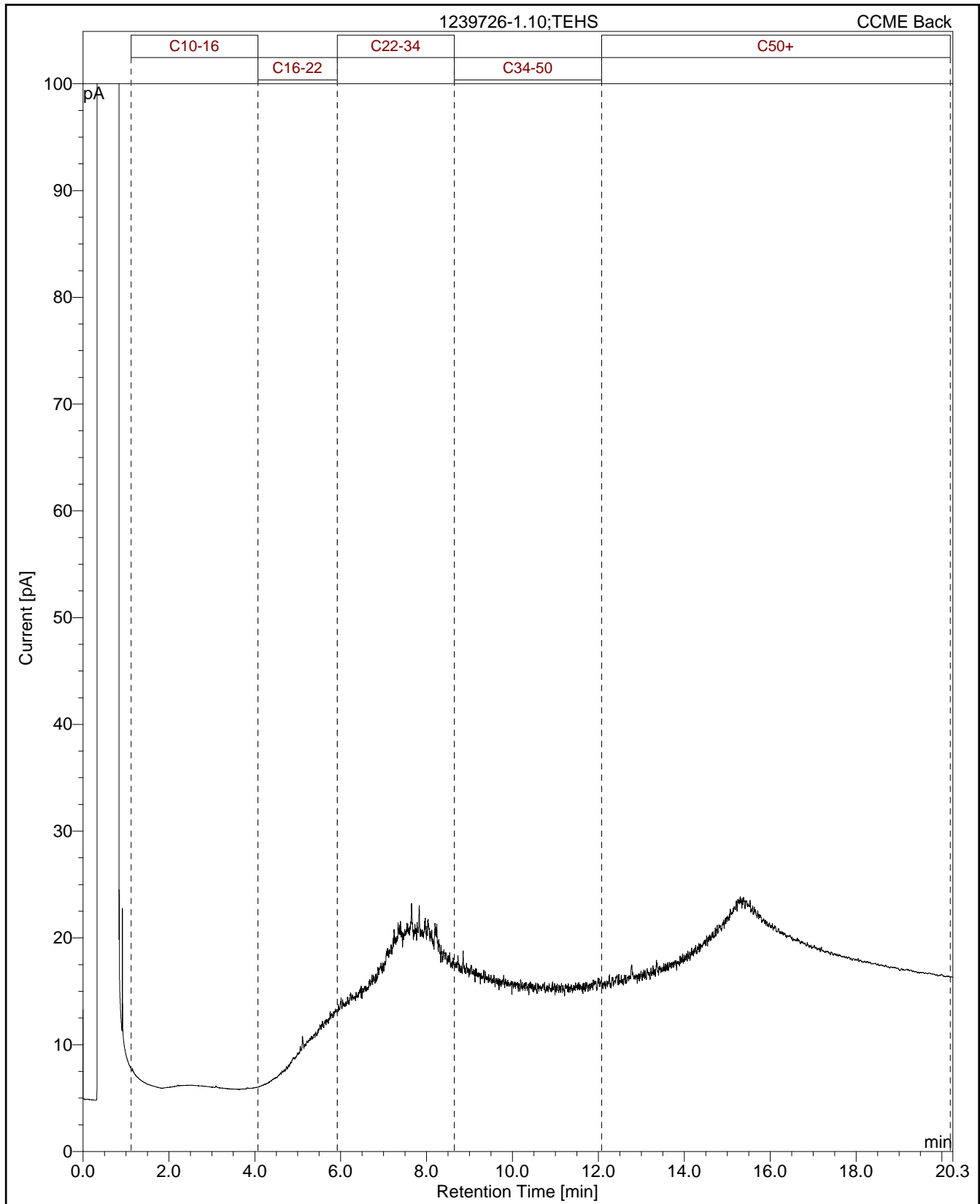
		Reference Number	1239726-6	1239726-7	1239726-8	
		Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017	
		Sample Time	16:00	16:00	16:00	
		Sample Location				
		Sample Description	NMPlot11-02-AN / cm	NMPlot11-03-AN / cm	NMPlot11-04-AN / cm	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
pH	Saturated Paste	pH	7.0	6.9	6.6	
Electrical Conductivity	Saturated Paste	dS/m	0.78	0.87	2.16	0.01
SAR	Saturated Paste		0.2	0.2	0.2	
% Saturation		%	116	81	91	
Calcium	Saturated Paste	meq/L	5.54	7.60	19.4	0.01
Calcium	Saturated Paste	mg/L	111	152	389	0.2
Calcium	Saturated Paste	mg/kg	129	123	354	
Magnesium	Saturated Paste	meq/L	3.65	4.61	11.8	0.02
Magnesium	Saturated Paste	mg/L	44.1	55.8	142	0.2
Magnesium	Saturated Paste	mg/kg	51.2	45.1	130	
Sodium	Saturated Paste	meq/L	0.39	0.56	0.96	0.04
Sodium	Saturated Paste	mg/L	9	13	22	1
Sodium	Saturated Paste	mg/kg	10	11	20	
Potassium	Saturated Paste	meq/L	0.34	0.17	0.16	0.03
Potassium	Saturated Paste	mg/L	13.4	6.5	6.2	1
Potassium	Saturated Paste	mg/kg	16	5	6	
Chloride	Saturated Paste	meq/L	0.51	0.59	0.45	0.06
Chloride	Saturated Paste	mg/L	18	21	16	2
Chloride	Saturated Paste	mg/kg	21	17	14	
Sulfate (SO4)	Saturated Paste	meq/L	3.49	5.43	24.4	0.06
Sulfate (SO4)	Saturated Paste	mg/L	167	261	1170	3
Sulfate (SO4)	Saturated Paste	mg/kg	194	211	1070	
Sulfate-S	Saturated Paste	mg/L	56	87	391	1
Sulfate-S	Saturated Paste	meq/L	3.49	5.43	24.4	0.06
Sulfate-S	Saturated Paste	mg/kg	64.7	70.3	356	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.5	7.3	7.2	

Analytical Report

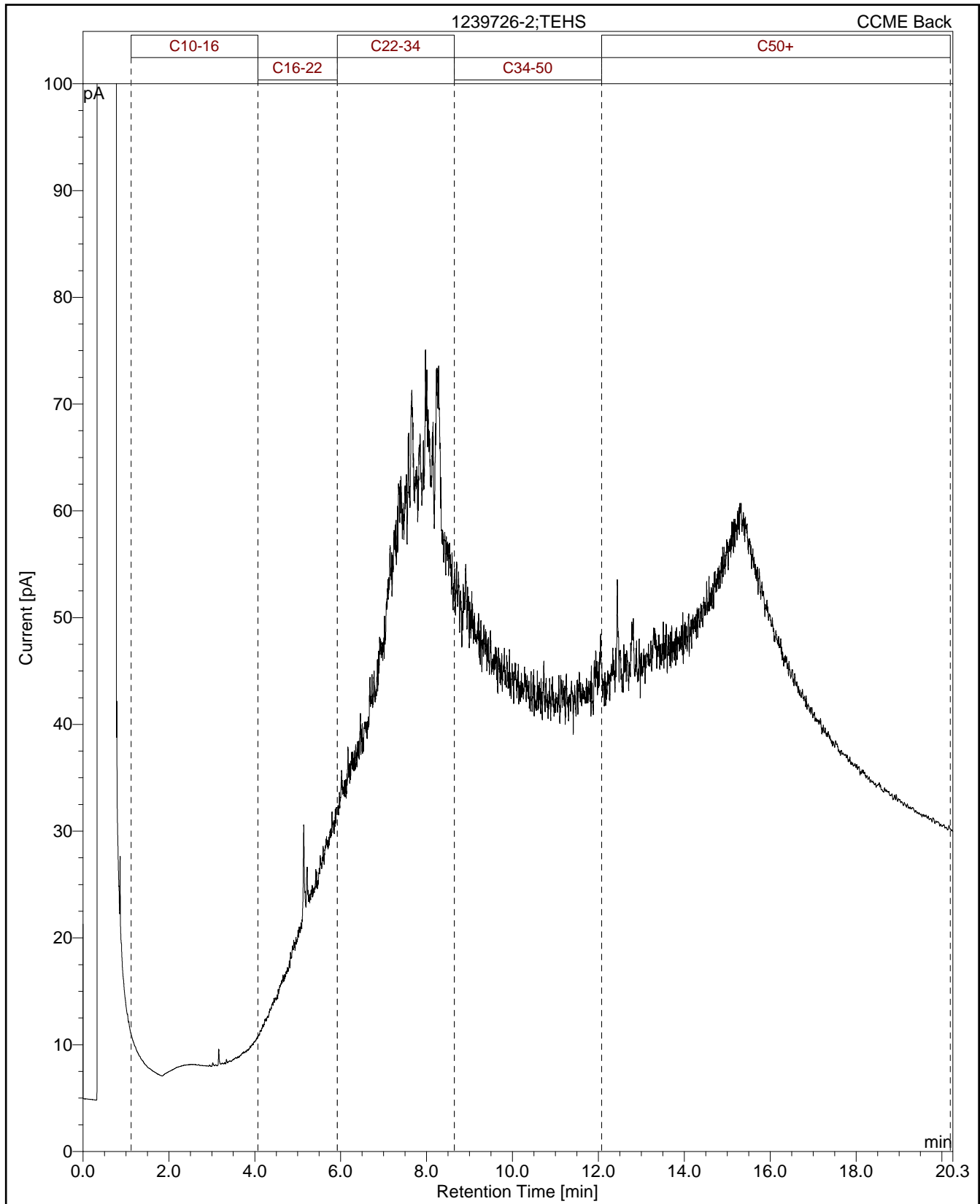
Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-9	1239726-10	1239726-11		
	Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017		
	Sample Time	16:00	16:00	16:00		
	Sample Location					
	Sample Description	NMPlot18-02-HC / cm	NMPlot18-03-HC / cm	NMPlot18-04-HC / cm		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables	16-NOV-17	16-NOV-17	16-NOV-17		
Silica Gel Cleanup		Done	Done	Done		
F2c C10-C16	Dry Weight	mg/kg	<50	500	400	50
F3c C16-C34	Dry Weight	mg/kg	400	5200	5100	50
F4c C34-C50	Dry Weight	mg/kg	400	3000	3000	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	900	7000	6000	100
% C50+	%		40	30	30	

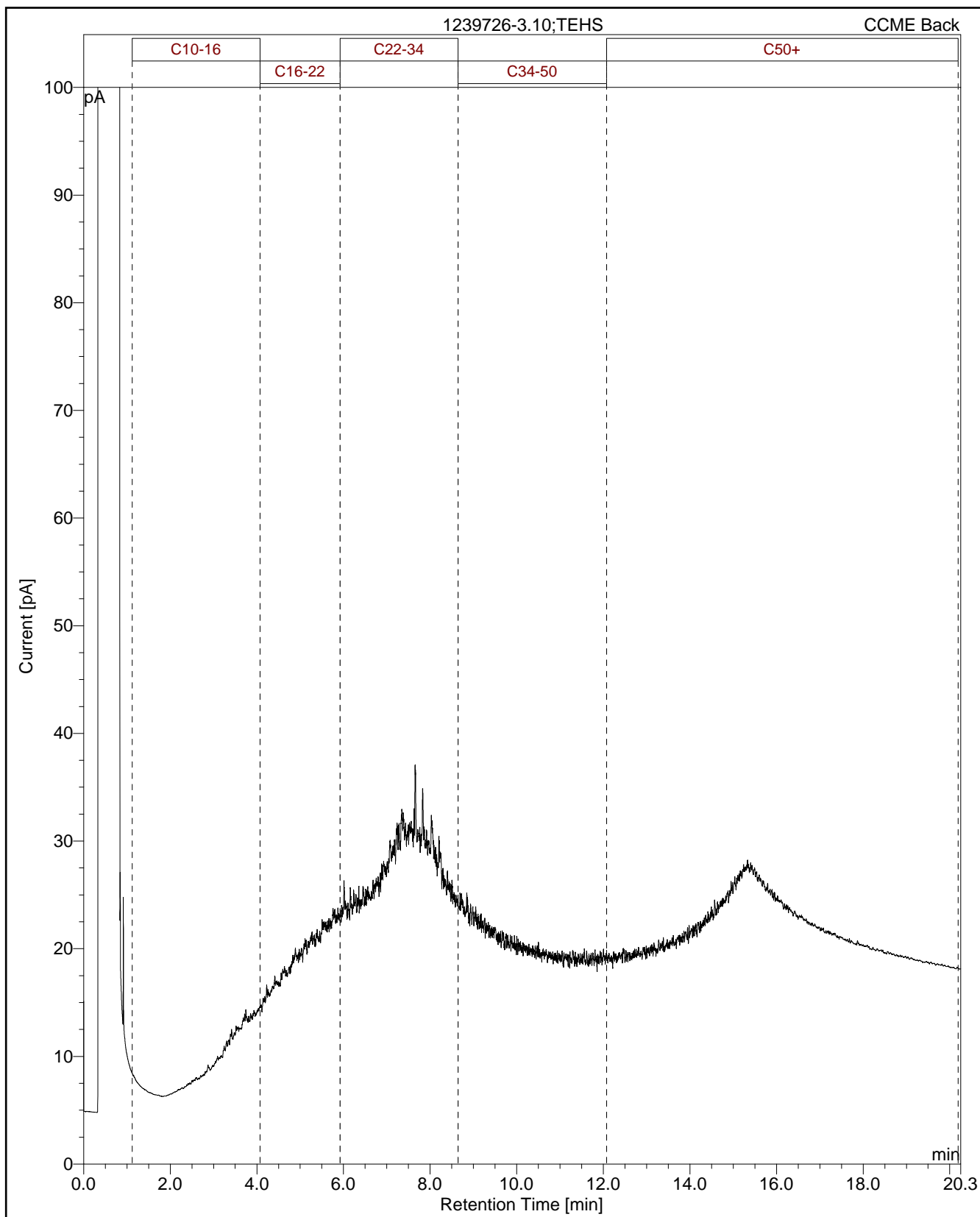
20 1239726-1.10;TEHS



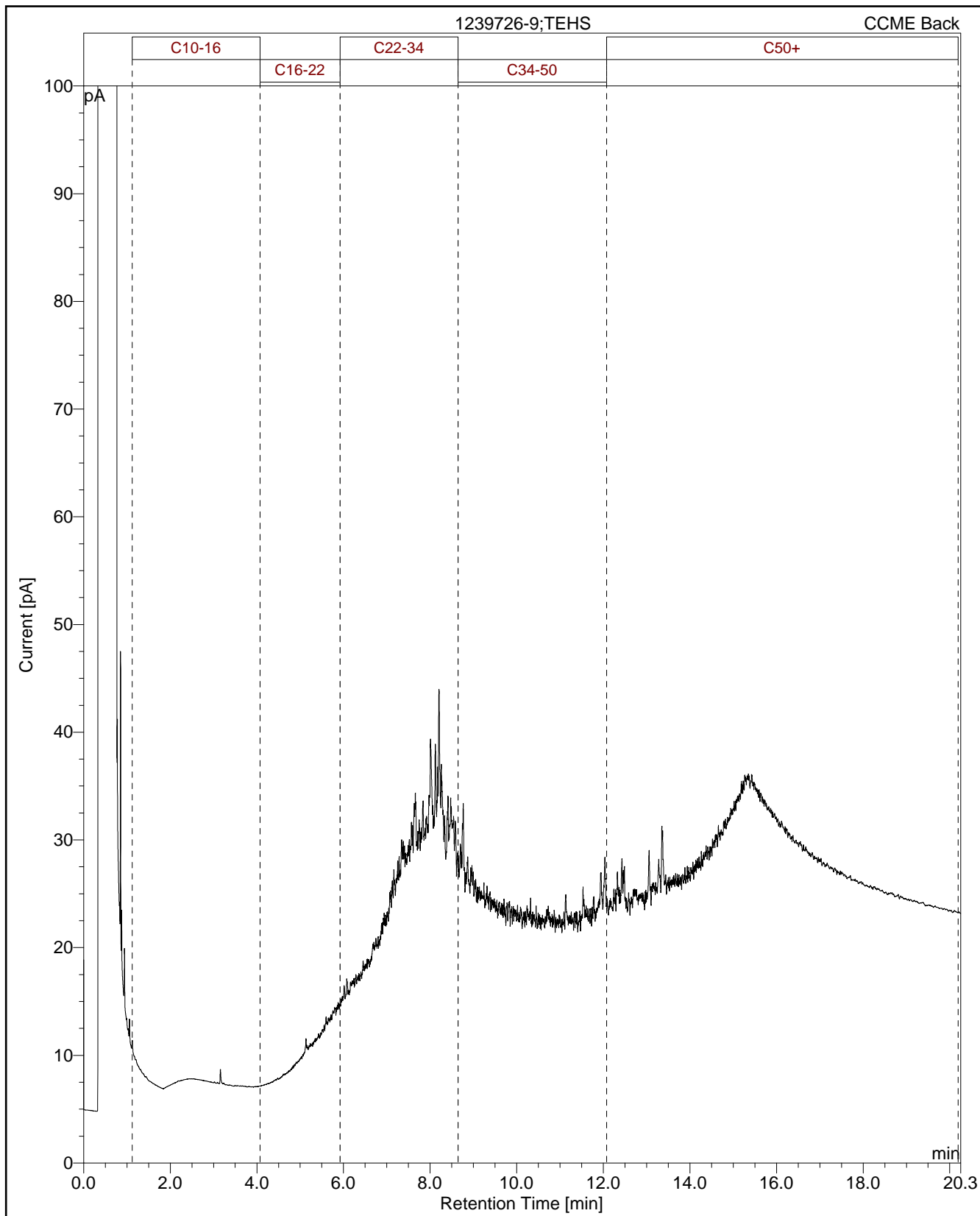
33 1239726-2;TEHS



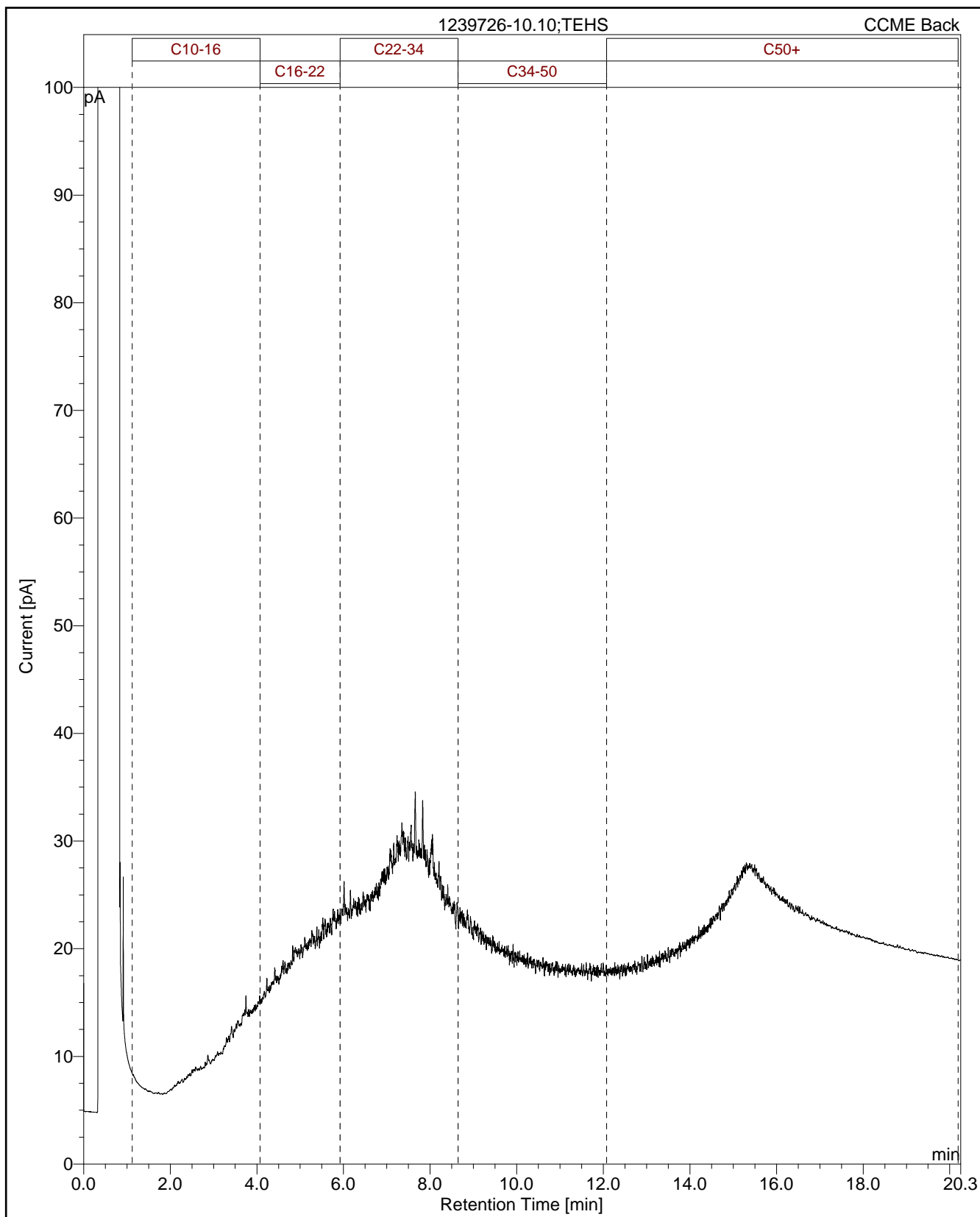
21 1239726-3.10;TEHS



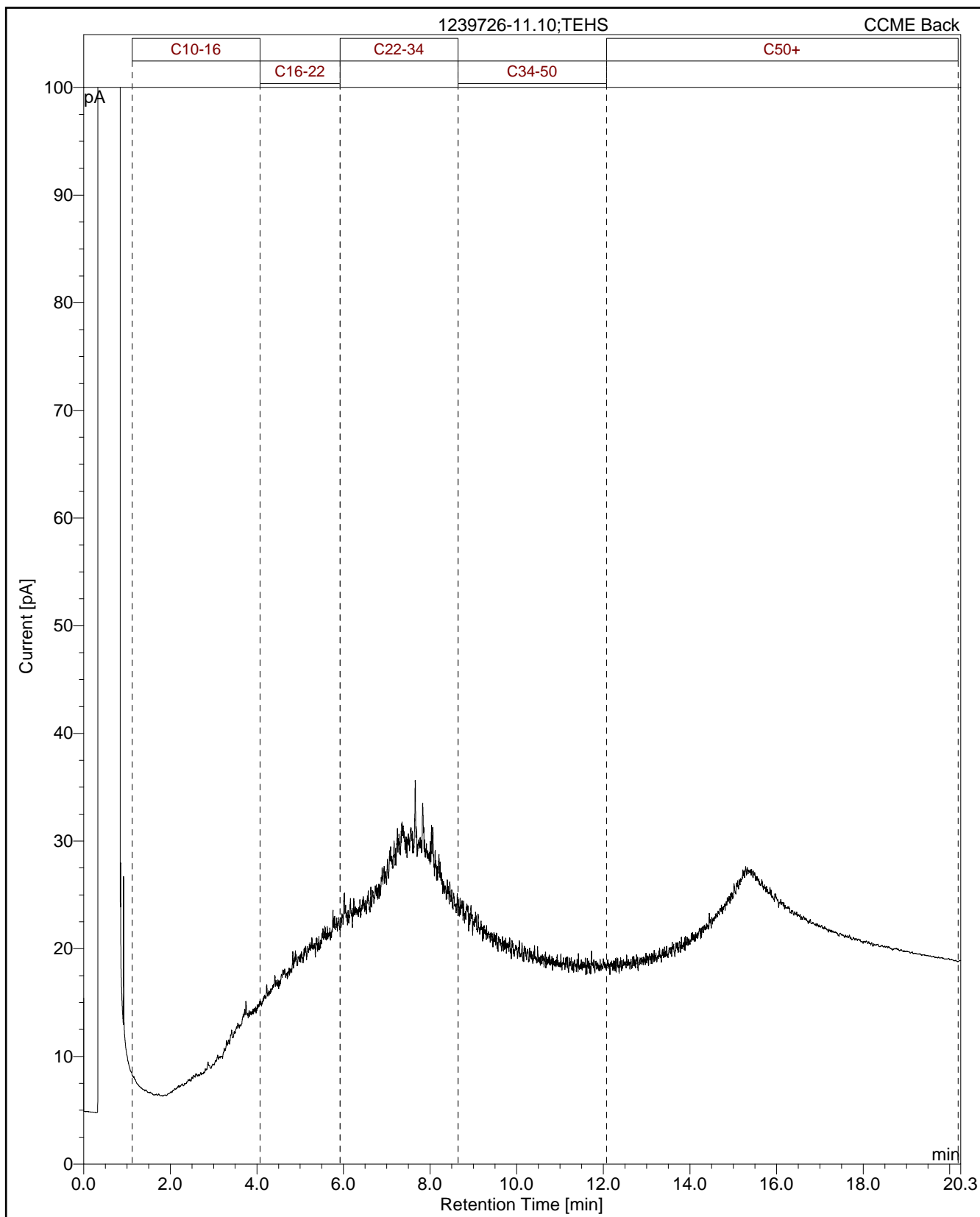
32 1239726-9;TEHS



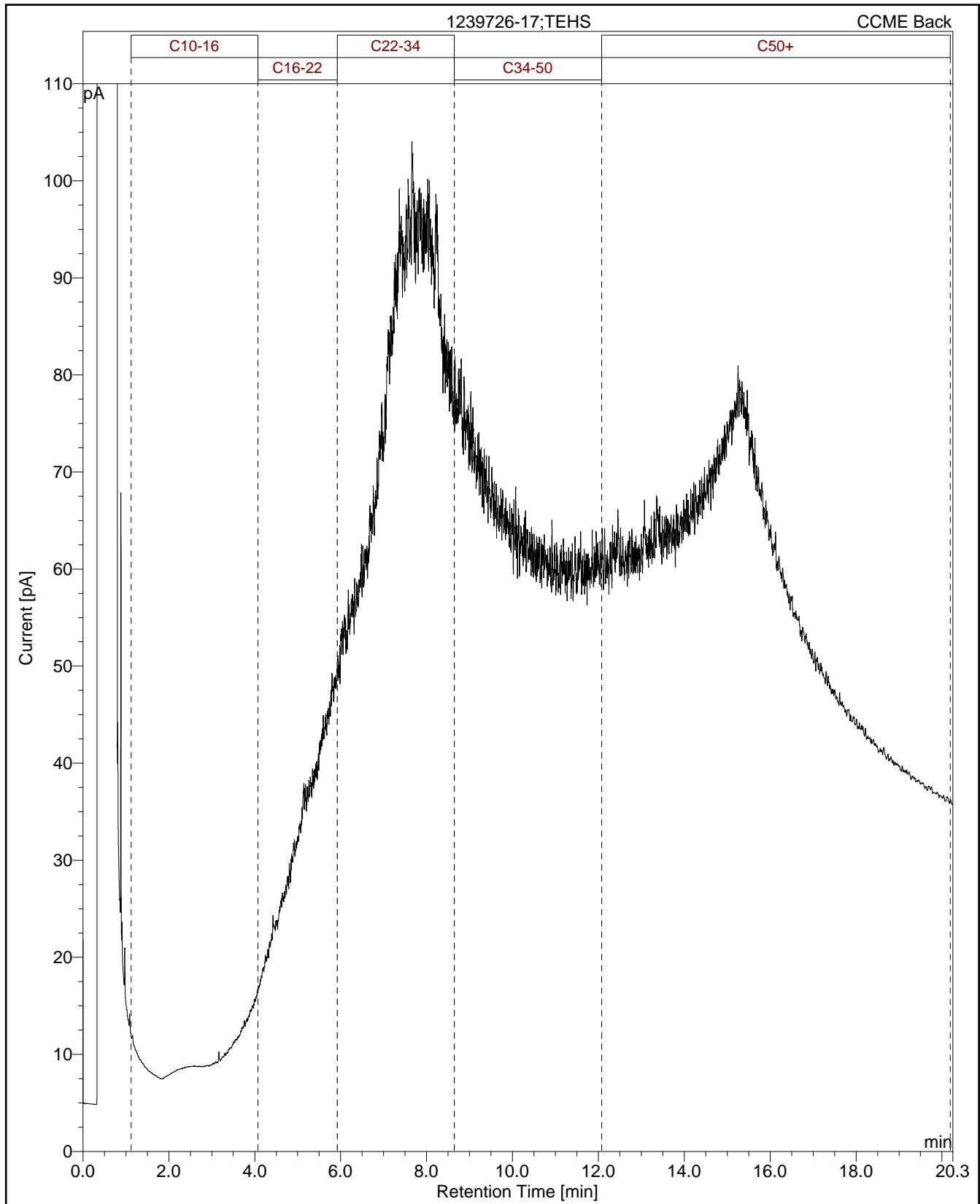
22 1239726-10.10;TEHS



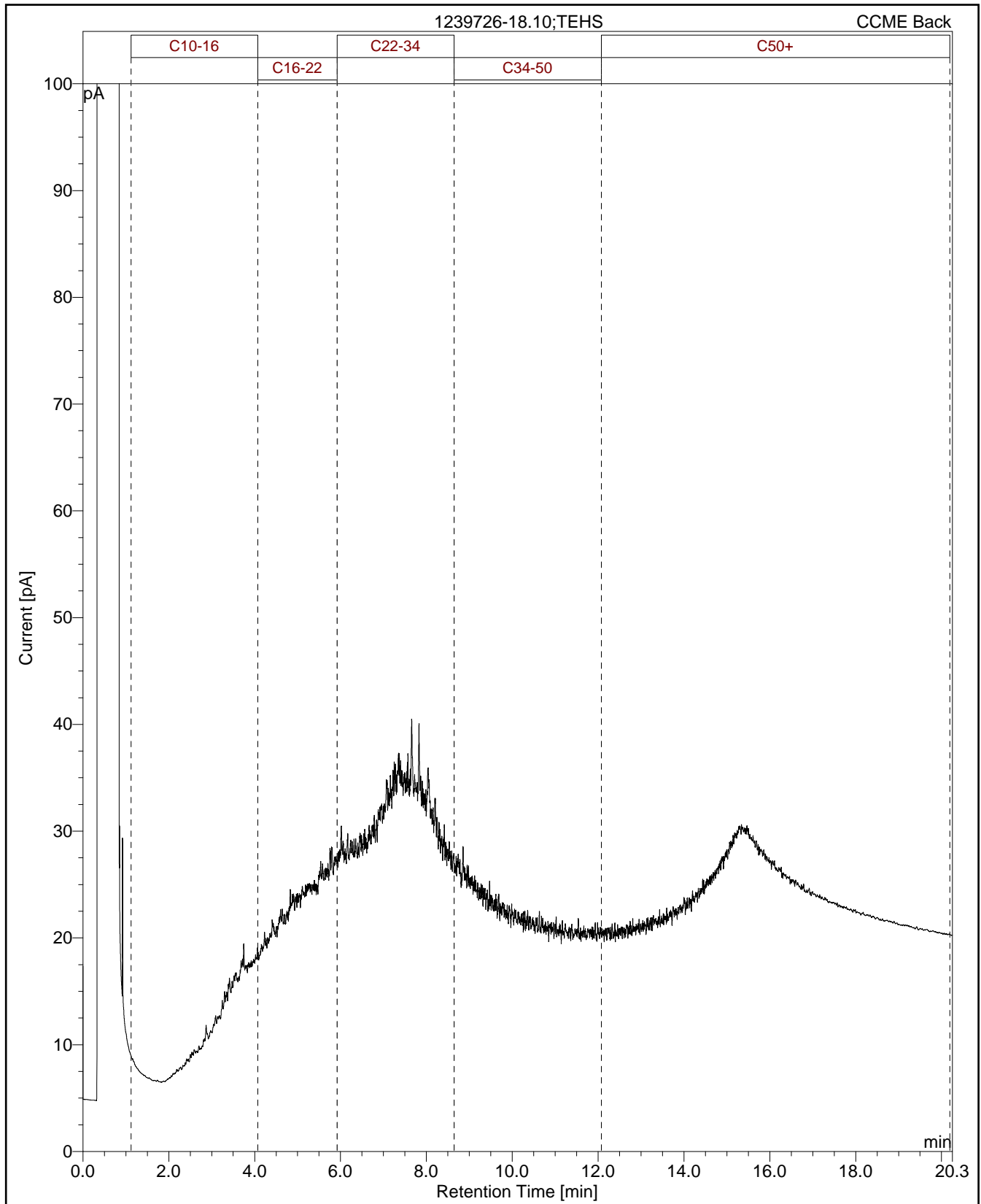
24 1239726-11.10;TEHS



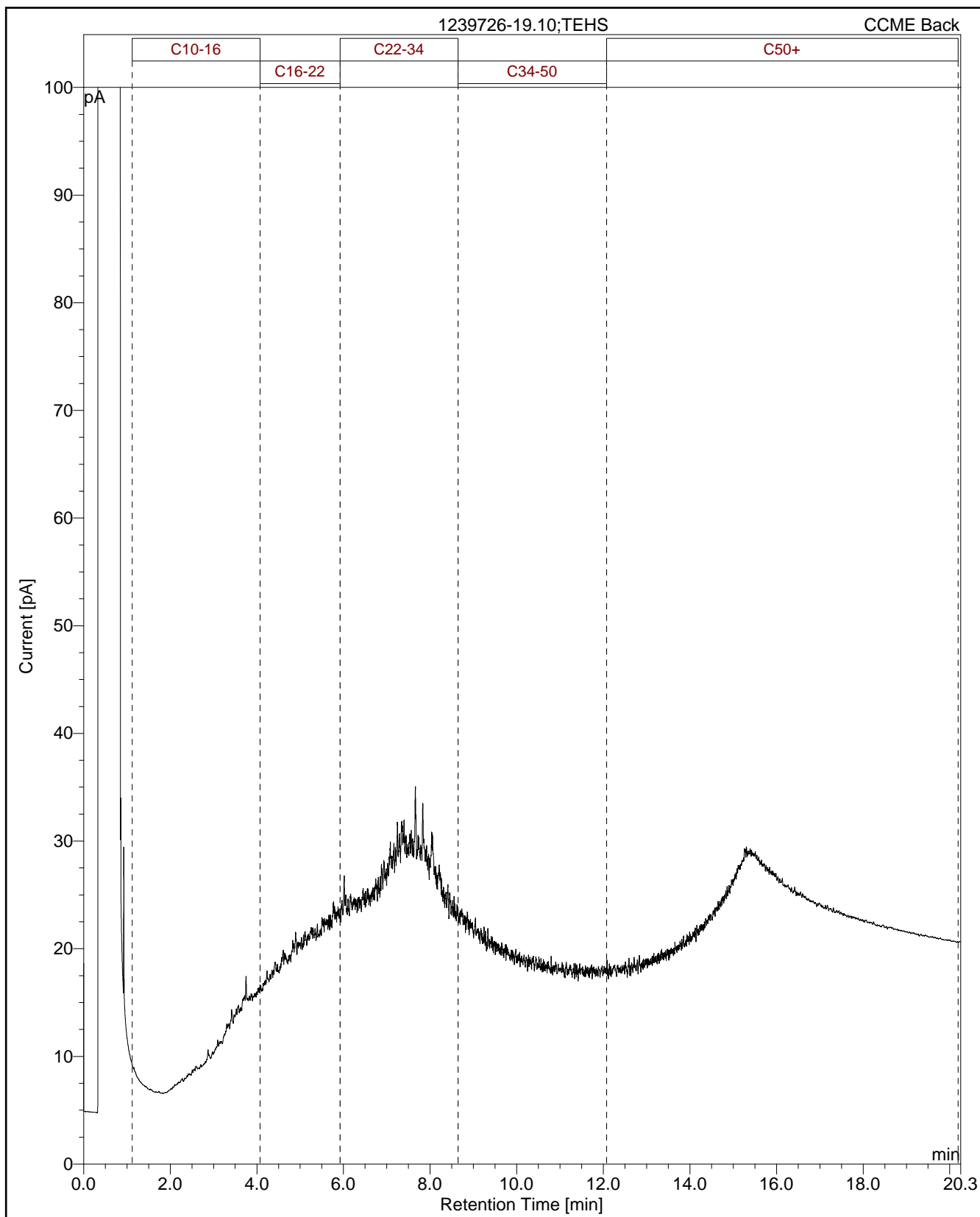
35 1239726-17;TEHS



25 1239726-18.10;TEHS



26 1239726-19.10;TEHS



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-10	1239726-11	1239726-12		
	Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017		
	Sample Time	16:00	16:00	16:00		
	Sample Location					
	Sample Description	NMPlot18-03-HC / cm	NMPlot18-04-HC / cm	313 cm3 / NMPlot18- 02-BD1 / cm		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	7	8.3	21	0.1
Bulk Density		kg/L			0.72	
Bulk Density		kg/m³			720	
Wet Bulk Density		kg/L			0.91	
Porosity		%			na	
Volume	Declared Value	mL			313	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Reference Number	1239726-13	1239726-17	1239726-18
Sample Date	Nov 12, 2017	Nov 09, 2017	Nov 09, 2017
Sample Time	16:00	12:00	12:00
Sample Location			
Sample Description	313 cm3 / NMPlot18- NMPlot2-02-HC / cm NMPlot2-03-HC / cm 02-BD2 / cm		

Analyte	Matrix	Units	Results			Nominal Detection Limit
			Soil	Soil	Soil	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	27	16	7	0.1
Bulk Density		kg/L	0.73			
Bulk Density		kg/m³	730			
Wet Bulk Density		kg/L	1.00			
Porosity		%	na			
Volume	Declared Value	mL	313			

Analytical Report

Bill To: Syncrude Canada Ltd.
P. O. 4009, MD 0078
Fort McMurray, AB, Canada
T9H 3L1
Attn: Marty Yarmuch
Sampled By: C.K.
Company: Paragon Soil

Project ID: 17-152
Project Name: Suncor Base Mine
Project Location:
LSD:
P.O.: 4410252962
Proj. Acct. code: E6687

Lot ID: **1239726**
Control Number:
Date Received: Nov 15, 2017
Date Reported: Nov 21, 2017
Report Number: 2243953

			Reference Number	1239726-14	1239726-15	1239726-16	
			Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017	
			Sample Time	16:00	16:00	16:00	
			Sample Location				
			Sample Description	NMPlot18-02-AN / cm	NMPlot18-03-AN / cm	NMPlot18-04-AN / cm	
			Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit	
Salinity							
pH	Saturated Paste	pH	6.9	7.1	7.2		
Electrical Conductivity	Saturated Paste	dS/m	1.08	2.61	2.28	0.01	
SAR	Saturated Paste		0.5	0.3	0.3		
% Saturation		%	73	42	40		
Calcium	Saturated Paste	meq/L	8.28	29.7	22.6	0.01	
Calcium	Saturated Paste	mg/L	166	594	452	0.2	
Calcium	Saturated Paste	mg/kg	121	246	182		
Magnesium	Saturated Paste	meq/L	3.78	10.9	7.92	0.02	
Magnesium	Saturated Paste	mg/L	45.7	132	95.9	0.2	
Magnesium	Saturated Paste	mg/kg	33.5	54.7	38.5		
Sodium	Saturated Paste	meq/L	1.19	1.3	1.29	0.04	
Sodium	Saturated Paste	mg/L	27	29	30	1	
Sodium	Saturated Paste	mg/kg	20	12	12		
Potassium	Saturated Paste	meq/L	0.47	<0.26	0.26	0.03	
Potassium	Saturated Paste	mg/L	18.2	<10	10.2	1	
Potassium	Saturated Paste	mg/kg	13	<4	4		
Chloride	Saturated Paste	meq/L	1.11	0.69	0.71	0.06	
Chloride	Saturated Paste	mg/L	39	24	25	2	
Chloride	Saturated Paste	mg/kg	29	10	10		
Sulfate (SO4)	Saturated Paste	meq/L	6.58	37.5	29.7	0.06	
Sulfate (SO4)	Saturated Paste	mg/L	316	1800	1420	3	
Sulfate (SO4)	Saturated Paste	mg/kg	232	747	573		
Sulfate-S	Saturated Paste	mg/L	105	600	475	1	
Sulfate-S	Saturated Paste	meq/L	6.59	37.5	29.7	0.06	
Sulfate-S	Saturated Paste	mg/kg	77.2	249	191		
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1		
Soil Acidity							
pH	1:2 Soil:CaCl2 sol.	pH	7.2	7.5	7.3		

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-17	1239726-18	1239726-19	
	Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 09, 2017	
	Sample Time	12:00	12:00	12:00	
	Sample Location	Sample Description			
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil					
Methanol Field Preservation		No	No	No	
Benzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil					
F1 C6-C10	Dry Weight	mg/kg	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil					
Extraction Date	Total Extractables	16-NOV-17	16-NOV-17	16-NOV-17	
Silica Gel Cleanup		Done	Done	Done	
F2c C10-C16	Dry Weight	mg/kg	<50	700	50
F3c C16-C34	Dry Weight	mg/kg	1800	6600	50
F4c C34-C50	Dry Weight	mg/kg	1500	4000	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	3500	8000	100
% C50+		%	39	30	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-19	1239726-20	1239726-21		
	Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 09, 2017		
	Sample Time	12:00	12:00	12:00		
	Sample Location					
	Sample Description	NMPlot2-04-HC / cm	298 cm 3 / NMPlot2-02-BD1 / cm	298 cm 3 / NMPlot2-02-BD2 / cm		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	9.8	21	24	0.1
Bulk Density		kg/L		0.64	0.61	
Bulk Density		kg/m³		640	610	
Wet Bulk Density		kg/L		0.81	0.80	
Porosity		%		na	na	
Volume	Declared Value	mL		298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Reference Number	1239726-22	1239726-23
Sample Date	Nov 09, 2017	Nov 09, 2017
Sample Time	12:00	12:00
Sample Location		
Sample Description	298 cm 3 / NMPlot2-03-BD1 / cm	298 cm 3 / NMPlot2-03-BD2 / cm
Matrix	Soil	Soil

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Physical and Aggregate Properties					
Moisture	Wet Weight @ 105°C	%	6	6	0.1
Bulk Density		kg/L	1.5	1.4	
Bulk Density		kg/m³	1500	1400	
Wet Bulk Density		kg/L	1.60	1.53	
Porosity		%	43	46	
Volume	Declared Value	mL	298	298	



Analytical Report

Bill To: Syncrude Canada Ltd.
P. O. 4009, MD 0078
Fort McMurray, AB, Canada
T9H 3L1
Attn: Marty Yarmuch
Sampled By: C.K.
Company: Paragon Soil

Project ID: 17-152
Project Name: Suncor Base Mine
Project Location:
LSD:
P.O.: 4410252962
Proj. Acct. code: E6687

Lot ID: **1239726**
Control Number:
Date Received: Nov 15, 2017
Date Reported: Nov 21, 2017
Report Number: 2243953

		Reference Number	1239726-24	1239726-25	1239726-26	
		Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 09, 2017	
		Sample Time	12:00	12:00	12:00	
		Sample Location				
		Sample Description	NMPlot2-02-AN / cm	NMPlot2-03-AN / cm	NMPlot2-04-AN / cm	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
pH	Saturated Paste	pH	6.8	7.4	7.6	
Electrical Conductivity	Saturated Paste	dS/m	1.44	1.63	1.53	0.01
SAR	Saturated Paste		1.3	1.8	3.1	
% Saturation		%	83	47	44	
Calcium	Saturated Paste	meq/L	8.98	9.38	5.72	0.01
Calcium	Saturated Paste	mg/L	180	188	114	0.2
Calcium	Saturated Paste	mg/kg	148	88.1	50.2	
Magnesium	Saturated Paste	meq/L	5.69	5.63	4.37	0.02
Magnesium	Saturated Paste	mg/L	68.8	68.2	52.8	0.2
Magnesium	Saturated Paste	mg/kg	56.9	32.0	23.2	
Sodium	Saturated Paste	meq/L	3.51	4.83	7.06	0.04
Sodium	Saturated Paste	mg/L	81	111	162	1
Sodium	Saturated Paste	mg/kg	67	52	71	
Potassium	Saturated Paste	meq/L	0.35	0.25	0.33	0.03
Potassium	Saturated Paste	mg/L	13.5	9.6	13.0	1
Potassium	Saturated Paste	mg/kg	11	5	6	
Chloride	Saturated Paste	meq/L	0.39	0.23	0.26	0.06
Chloride	Saturated Paste	mg/L	14	8	9	2
Chloride	Saturated Paste	mg/kg	12	4	4	
Sulfate (SO4)	Saturated Paste	meq/L	9.91	17.9	15.5	0.06
Sulfate (SO4)	Saturated Paste	mg/L	476	858	743	3
Sulfate (SO4)	Saturated Paste	mg/kg	394	403	326	
Sulfate-S	Saturated Paste	mg/L	159	286	248	1
Sulfate-S	Saturated Paste	meq/L	9.92	17.9	15.5	0.06
Sulfate-S	Saturated Paste	mg/kg	131	134	109	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.1	7.4	7.7	

Approved by:
Nathan Brilz, Chem. Technologist
Client Service Representative

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Extractable Petroleum Hydrocarbons - Soil

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F2c C10-C16	mg/kg	230	270	30		yes
F3c C16-C34	mg/kg	958	1090	30		yes
F4c C34-C50	mg/kg	200	300	30		yes
F4c+ C50+	mg/kg	<100	<100	30		yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	99	74	116	yes
F3c C16-C34	mg/kg	160	124	160	yes
F4c C34-C50	mg/kg	200	169	229	yes

Date Acquired: November 16, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	82	65	135	yes
F3c C16-C34	mg/kg	98	65	135	yes
F4c C34-C50	mg/kg	75	65	135	yes

Date Acquired: November 16, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0031	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.500	0.500	yes
Toluene	ng	0	-2.00	2.00	yes
Ethylbenzene	ng	0	-0.500	0.500	yes
m,p-Xylene	ng	0	-1.00	1.00	yes
o-Xylene	ng	0	-1.00	1.00	yes

Date Acquired: November 16, 2017

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Benzene	mg/kg	2.73	2.73	20	0.004	yes
Toluene	mg/kg	2.58	2.57	20	0.01	yes
Ethylbenzene	mg/kg	2.86	2.72	20	0.010	yes
m,p-Xylene	mg/kg	5.76	5.48	20	0.01	yes
o-Xylene	mg/kg	2.85	2.71	20	0.01	yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	mg/kg	5.08	4.250	5.750	yes
Toluene	mg/kg	5.04	4.25	5.75	yes
Ethylbenzene	mg/kg	4.92	4.250	5.750	yes
m,p-Xylene	mg/kg	9.79	8.50	11.50	yes
o-Xylene	mg/kg	4.92	4.25	5.75	yes

Date Acquired: November 16, 2017

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Mono-Aromatic Hydrocarbons - Soil - Continued

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	mg/kg	89	80	120	yes
Toluene	mg/kg	85	80	120	yes
Ethylbenzene	mg/kg	94	80	120	yes
m,p-Xylene	mg/kg	95	80	120	yes
o-Xylene	mg/kg	93	80	120	yes

Date Acquired: November 16, 2017

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	18	18	10	0.3	yes

Date Acquired: November 20, 2017

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0124	-0.4	0.5	yes
Magnesium	mg/L	0.0036	-0.1	0.1	yes
Sodium	mg/L	0.0345	-0	2	yes
Potassium	mg/L	0.0519	-0.5	0.7	yes
Chloride	mg/L	2.0275	0	5	yes
Sulfate-S	mg/L	0.0419	-0	1	yes

Date Acquired: November 17, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.6	6.6	0	0.3	yes
Electrical Conductivity	dS/m	0.19	0.19	10	0.01	yes
Calcium	mg/kg	16.3	16.6	10	0.6	yes
Magnesium	mg/kg	5.0	5.0	10	0.6	yes
Sodium	mg/kg	3	3	10	1	yes
Potassium	mg/kg	2	2	10	1	yes
Chloride	mg/kg	5	5	15	3	yes
Sulfate-S	mg/kg	3.8	3.8	10	1.2	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.1	6.5	8.0	yes
Electrical Conductivity	dS/m	3.16	2.71	3.25	yes
% Saturation	%	46	38	52	yes
Calcium	mg/L	671	596.2	767.8	yes
Magnesium	mg/L	139	121.8	154.8	yes
Sodium	mg/L	72	58	79	yes
Potassium	mg/L	21	17.8	24.6	yes
Chloride	mg/L	67	57	78	yes
Sulfate-S	mg/L	606	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.1	26.80	35.20	yes
-------------------------	------	------	-------	-------	-----

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Salinity - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	244	230.2	261.4	yes
Magnesium	mg/L	94.7	92.7	99.7	yes
Sodium	mg/L	242	229	269	yes
Potassium	mg/L	239	229.4	265.4	yes
Chloride	mg/L	2020	1871	2231	yes
Sulfate-S	mg/L	148	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample	Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		pH	7.4	7.3	0	0.3	yes

Date Acquired: November 21, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 21, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	-38.25	-1000	1000	yes

Date Acquired: November 16, 2017

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F1 C6-C10	mg/kg	74	73	20	4	yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	mg/kg	69	64	86	yes

Date Acquired: November 16, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	mg/kg	98	80	120	yes

Date Acquired: November 16, 2017

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME in Soil EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 16, 2017	Exova Edmonton
BTEX-CCME in Soil EDM	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 16, 2017	Exova Edmonton
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl ₂ (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 21, 2017	Exova Edmonton
Saturated Paste in General Soil	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME in Soil (Shake) EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 16, 2017	Exova Edmonton

* Reference Method Modified

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
APHA	Standard Methods for the Examination of Water and Wastewater
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-1	1239726-2	1239726-3		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	16:00	16:00	16:00		
	Sample Location					
	Sample Description	NMPlot11-02-HC / cm	NMPlot11-03-HC / cm	NMPlot11-04-HC / cm		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	18	18	10	0.1
Mono-Aromatic Hydrocarbons - Soil						
Methanol Field Preservation			No	No	No	
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		16-NOV-17	16-NOV-17	16-NOV-17	
Silica Gel Cleanup			Done	Done	Done	
F2c C10-C16	Dry Weight	mg/kg	<60	<50	400	50
F3c C16-C34	Dry Weight	mg/kg	3000	1100	5800	50
F4c C34-C50	Dry Weight	mg/kg	2000	1000	3000	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	6000	2500	8000	100
% C50+		%	40	42	30	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-4	1239726-5	1239726-9		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 12, 2017		
	Sample Time	16:00	16:00	16:00		
	Sample Location					
	Sample Description	313 cm3 / NMPlot11-02-BD1 / cm	313 cm3 / NMPlot11-02-BD2 / cm	NMPlot18-02-HC / cm		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	23	13	16	0.1
Bulk Density		kg/L	0.61	0.90		
Bulk Density		kg/m³	610	900		
Wet Bulk Density		kg/L	0.79	1.04		
Porosity		%	na	na		
Volume	Declared Value	mL	313	313		

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

		Reference Number	1239726-6	1239726-7	1239726-8	
		Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017	
		Sample Time	16:00	16:00	16:00	
		Sample Location				
		Sample Description	NMPlot11-02-AN / cm	NMPlot11-03-AN / cm	NMPlot11-04-AN / cm	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
pH	Saturated Paste	pH	7.0	6.9	6.6	
Electrical Conductivity	Saturated Paste	dS/m	0.78	0.87	2.16	0.01
SAR	Saturated Paste		0.2	0.2	0.2	
% Saturation		%	116	81	91	
Calcium	Saturated Paste	meq/L	5.54	7.60	19.4	0.01
Calcium	Saturated Paste	mg/L	111	152	389	0.2
Calcium	Saturated Paste	mg/kg	129	123	354	
Magnesium	Saturated Paste	meq/L	3.65	4.61	11.8	0.02
Magnesium	Saturated Paste	mg/L	44.1	55.8	142	0.2
Magnesium	Saturated Paste	mg/kg	51.2	45.1	130	
Sodium	Saturated Paste	meq/L	0.39	0.56	0.96	0.04
Sodium	Saturated Paste	mg/L	9	13	22	1
Sodium	Saturated Paste	mg/kg	10	11	20	
Potassium	Saturated Paste	meq/L	0.34	0.17	0.16	0.03
Potassium	Saturated Paste	mg/L	13.4	6.5	6.2	1
Potassium	Saturated Paste	mg/kg	16	5	6	
Chloride	Saturated Paste	meq/L	0.51	0.59	0.45	0.06
Chloride	Saturated Paste	mg/L	18	21	16	2
Chloride	Saturated Paste	mg/kg	21	17	14	
Sulfate (SO4)	Saturated Paste	meq/L	3.49	5.43	24.4	0.06
Sulfate (SO4)	Saturated Paste	mg/L	167	261	1170	3
Sulfate (SO4)	Saturated Paste	mg/kg	194	211	1070	
Sulfate-S	Saturated Paste	mg/L	56	87	391	1
Sulfate-S	Saturated Paste	meq/L	3.49	5.43	24.4	0.06
Sulfate-S	Saturated Paste	mg/kg	64.7	70.3	356	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.5	7.3	7.2	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-9	1239726-10	1239726-11		
	Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017		
	Sample Time	16:00	16:00	16:00		
	Sample Location					
	Sample Description	NMPlot18-02-HC / cm	NMPlot18-03-HC / cm	NMPlot18-04-HC / cm		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables	16-NOV-17	16-NOV-17	16-NOV-17		
Silica Gel Cleanup		Done	Done	Done		
F2c C10-C16	Dry Weight	mg/kg	<50	500	400	50
F3c C16-C34	Dry Weight	mg/kg	400	5200	5100	50
F4c C34-C50	Dry Weight	mg/kg	400	3000	3000	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	900	7000	6000	100
% C50+	%		40	30	30	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-10	1239726-11	1239726-12		
	Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017		
	Sample Time	16:00	16:00	16:00		
	Sample Location					
	Sample Description	NMPlot18-03-HC / cm	NMPlot18-04-HC / cm	313 cm3 / NMPlot18- 02-BD1 / cm		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	7	8.3	21	0.1
Bulk Density		kg/L			0.72	
Bulk Density		kg/m³			720	
Wet Bulk Density		kg/L			0.91	
Porosity		%			na	
Volume	Declared Value	mL			313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Reference Number	1239726-13	1239726-17	1239726-18
Sample Date	Nov 12, 2017	Nov 09, 2017	Nov 09, 2017
Sample Time	16:00	12:00	12:00
Sample Location			
Sample Description	313 cm3 / NMPlot18- NMPlot2-02-HC / cm NMPlot2-03-HC / cm 02-BD2 / cm		

Analyte	Matrix	Units	Results			Nominal Detection Limit
			Soil	Soil	Soil	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	27	16	7	0.1
Bulk Density		kg/L	0.73			
Bulk Density		kg/m³	730			
Wet Bulk Density		kg/L	1.00			
Porosity		%	na			
Volume	Declared Value	mL	313			

Analytical Report

Bill To: Syncrude Canada Ltd.
P. O. 4009, MD 0078
Fort McMurray, AB, Canada
T9H 3L1
Attn: Marty Yarmuch
Sampled By: C.K.
Company: Paragon Soil

Project ID: 17-152
Project Name: Suncor Base Mine
Project Location:
LSD:
P.O.: 4410252962
Proj. Acct. code: E6687

Lot ID: **1239726**
Control Number:
Date Received: Nov 15, 2017
Date Reported: Nov 21, 2017
Report Number: 2243953

			Reference Number	1239726-14	1239726-15	1239726-16	
			Sample Date	Nov 12, 2017	Nov 12, 2017	Nov 12, 2017	
			Sample Time	16:00	16:00	16:00	
			Sample Location				
			Sample Description	NMPlot18-02-AN / cm	NMPlot18-03-AN / cm	NMPlot18-04-AN / cm	
			Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit	
Salinity							
pH	Saturated Paste	pH	6.9	7.1	7.2		
Electrical Conductivity	Saturated Paste	dS/m	1.08	2.61	2.28	0.01	
SAR	Saturated Paste		0.5	0.3	0.3		
% Saturation		%	73	42	40		
Calcium	Saturated Paste	meq/L	8.28	29.7	22.6	0.01	
Calcium	Saturated Paste	mg/L	166	594	452	0.2	
Calcium	Saturated Paste	mg/kg	121	246	182		
Magnesium	Saturated Paste	meq/L	3.78	10.9	7.92	0.02	
Magnesium	Saturated Paste	mg/L	45.7	132	95.9	0.2	
Magnesium	Saturated Paste	mg/kg	33.5	54.7	38.5		
Sodium	Saturated Paste	meq/L	1.19	1.3	1.29	0.04	
Sodium	Saturated Paste	mg/L	27	29	30	1	
Sodium	Saturated Paste	mg/kg	20	12	12		
Potassium	Saturated Paste	meq/L	0.47	<0.26	0.26	0.03	
Potassium	Saturated Paste	mg/L	18.2	<10	10.2	1	
Potassium	Saturated Paste	mg/kg	13	<4	4		
Chloride	Saturated Paste	meq/L	1.11	0.69	0.71	0.06	
Chloride	Saturated Paste	mg/L	39	24	25	2	
Chloride	Saturated Paste	mg/kg	29	10	10		
Sulfate (SO4)	Saturated Paste	meq/L	6.58	37.5	29.7	0.06	
Sulfate (SO4)	Saturated Paste	mg/L	316	1800	1420	3	
Sulfate (SO4)	Saturated Paste	mg/kg	232	747	573		
Sulfate-S	Saturated Paste	mg/L	105	600	475	1	
Sulfate-S	Saturated Paste	meq/L	6.59	37.5	29.7	0.06	
Sulfate-S	Saturated Paste	mg/kg	77.2	249	191		
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1		
Soil Acidity							
pH	1:2 Soil:CaCl2 sol.	pH	7.2	7.5	7.3		

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-17	1239726-18	1239726-19	
	Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 09, 2017	
	Sample Time	12:00	12:00	12:00	
	Sample Location	Sample Description			
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil					
Methanol Field Preservation		No	No	No	
Benzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil					
F1 C6-C10	Dry Weight	mg/kg	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil					
Extraction Date	Total Extractables	16-NOV-17	16-NOV-17	16-NOV-17	
Silica Gel Cleanup		Done	Done	Done	
F2c C10-C16	Dry Weight	mg/kg	<50	700	50
F3c C16-C34	Dry Weight	mg/kg	1800	6600	50
F4c C34-C50	Dry Weight	mg/kg	1500	4000	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	3500	8000	100
% C50+		%	39	30	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

	Reference Number	1239726-19	1239726-20	1239726-21		
	Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 09, 2017		
	Sample Time	12:00	12:00	12:00		
	Sample Location					
	Sample Description	NMPlot2-04-HC / cm	298 cm 3 / NMPlot2-02-BD1 / cm	298 cm 3 / NMPlot2-02-BD2 / cm		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	9.8	21	24	0.1
Bulk Density		kg/L		0.64	0.61	
Bulk Density		kg/m³		640	610	
Wet Bulk Density		kg/L		0.81	0.80	
Porosity		%		na	na	
Volume	Declared Value	mL		298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Reference Number	1239726-22	1239726-23
Sample Date	Nov 09, 2017	Nov 09, 2017
Sample Time	12:00	12:00
Sample Location		
Sample Description	298 cm 3 / NMPlot2-03-BD1 / cm	298 cm 3 / NMPlot2-03-BD2 / cm
Matrix	Soil	Soil

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Physical and Aggregate Properties					
Moisture	Wet Weight @ 105°C	%	6	6	0.1
Bulk Density		kg/L	1.5	1.4	
Bulk Density		kg/m³	1500	1400	
Wet Bulk Density		kg/L	1.60	1.53	
Porosity		%	43	46	
Volume	Declared Value	mL	298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

		Reference Number	1239726-24	1239726-25	1239726-26	
		Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 09, 2017	
		Sample Time	12:00	12:00	12:00	
		Sample Location				
		Sample Description	NMPlot2-02-AN / cm	NMPlot2-03-AN / cm	NMPlot2-04-AN / cm	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
pH	Saturated Paste	pH	6.8	7.4	7.6	
Electrical Conductivity	Saturated Paste	dS/m	1.44	1.63	1.53	0.01
SAR	Saturated Paste		1.3	1.8	3.1	
% Saturation		%	83	47	44	
Calcium	Saturated Paste	meq/L	8.98	9.38	5.72	0.01
Calcium	Saturated Paste	mg/L	180	188	114	0.2
Calcium	Saturated Paste	mg/kg	148	88.1	50.2	
Magnesium	Saturated Paste	meq/L	5.69	5.63	4.37	0.02
Magnesium	Saturated Paste	mg/L	68.8	68.2	52.8	0.2
Magnesium	Saturated Paste	mg/kg	56.9	32.0	23.2	
Sodium	Saturated Paste	meq/L	3.51	4.83	7.06	0.04
Sodium	Saturated Paste	mg/L	81	111	162	1
Sodium	Saturated Paste	mg/kg	67	52	71	
Potassium	Saturated Paste	meq/L	0.35	0.25	0.33	0.03
Potassium	Saturated Paste	mg/L	13.5	9.6	13.0	1
Potassium	Saturated Paste	mg/kg	11	5	6	
Chloride	Saturated Paste	meq/L	0.39	0.23	0.26	0.06
Chloride	Saturated Paste	mg/L	14	8	9	2
Chloride	Saturated Paste	mg/kg	12	4	4	
Sulfate (SO4)	Saturated Paste	meq/L	9.91	17.9	15.5	0.06
Sulfate (SO4)	Saturated Paste	mg/L	476	858	743	3
Sulfate (SO4)	Saturated Paste	mg/kg	394	403	326	
Sulfate-S	Saturated Paste	mg/L	159	286	248	1
Sulfate-S	Saturated Paste	meq/L	9.92	17.9	15.5	0.06
Sulfate-S	Saturated Paste	mg/kg	131	134	109	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.1	7.4	7.7	

Approved by:

Nathan Brilz, Chem. Technologist
Client Service Representative

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Extractable Petroleum Hydrocarbons - Soil

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F2c C10-C16	mg/kg	230	270	30		yes
F3c C16-C34	mg/kg	958	1090	30		yes
F4c C34-C50	mg/kg	200	300	30		yes
F4c+ C50+	mg/kg	<100	<100	30		yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	99	74	116	yes
F3c C16-C34	mg/kg	160	124	160	yes
F4c C34-C50	mg/kg	200	169	229	yes

Date Acquired: November 16, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	82	65	135	yes
F3c C16-C34	mg/kg	98	65	135	yes
F4c C34-C50	mg/kg	75	65	135	yes

Date Acquired: November 16, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0031	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.500	0.500	yes
Toluene	ng	0	-2.00	2.00	yes
Ethylbenzene	ng	0	-0.500	0.500	yes
m,p-Xylene	ng	0	-1.00	1.00	yes
o-Xylene	ng	0	-1.00	1.00	yes

Date Acquired: November 16, 2017

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Benzene	mg/kg	2.73	2.73	20	0.004	yes
Toluene	mg/kg	2.58	2.57	20	0.01	yes
Ethylbenzene	mg/kg	2.86	2.72	20	0.010	yes
m,p-Xylene	mg/kg	5.76	5.48	20	0.01	yes
o-Xylene	mg/kg	2.85	2.71	20	0.01	yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	mg/kg	5.08	4.250	5.750	yes
Toluene	mg/kg	5.04	4.25	5.75	yes
Ethylbenzene	mg/kg	4.92	4.250	5.750	yes
m,p-Xylene	mg/kg	9.79	8.50	11.50	yes
o-Xylene	mg/kg	4.92	4.25	5.75	yes

Date Acquired: November 16, 2017

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Mono-Aromatic Hydrocarbons - Soil - Continued

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	mg/kg	89	80	120	yes
Toluene	mg/kg	85	80	120	yes
Ethylbenzene	mg/kg	94	80	120	yes
m,p-Xylene	mg/kg	95	80	120	yes
o-Xylene	mg/kg	93	80	120	yes

Date Acquired: November 16, 2017

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	18	18	10	0.3	yes

Date Acquired: November 20, 2017

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0124	-0.4	0.5	yes
Magnesium	mg/L	0.0036	-0.1	0.1	yes
Sodium	mg/L	0.0345	-0	2	yes
Potassium	mg/L	0.0519	-0.5	0.7	yes
Chloride	mg/L	2.0275	0	5	yes
Sulfate-S	mg/L	0.0419	-0	1	yes

Date Acquired: November 17, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.6	6.6	0	0.3	yes
Electrical Conductivity	dS/m	0.19	0.19	10	0.01	yes
Calcium	mg/kg	16.3	16.6	10	0.6	yes
Magnesium	mg/kg	5.0	5.0	10	0.6	yes
Sodium	mg/kg	3	3	10	1	yes
Potassium	mg/kg	2	2	10	1	yes
Chloride	mg/kg	5	5	15	3	yes
Sulfate-S	mg/kg	3.8	3.8	10	1.2	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.1	6.5	8.0	yes
Electrical Conductivity	dS/m	3.16	2.71	3.25	yes
% Saturation	%	46	38	52	yes
Calcium	mg/L	671	596.2	767.8	yes
Magnesium	mg/L	139	121.8	154.8	yes
Sodium	mg/L	72	58	79	yes
Potassium	mg/L	21	17.8	24.6	yes
Chloride	mg/L	67	57	78	yes
Sulfate-S	mg/L	606	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.1	26.80	35.20	yes
-------------------------	------	------	-------	-------	-----

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Salinity - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	244	230.2	261.4	yes
Magnesium	mg/L	94.7	92.7	99.7	yes
Sodium	mg/L	242	229	269	yes
Potassium	mg/L	239	229.4	265.4	yes
Chloride	mg/L	2020	1871	2231	yes
Sulfate-S	mg/L	148	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample	Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		pH	7.4	7.3	0	0.3	yes

Date Acquired: November 21, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 21, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	-38.25	-1000	1000	yes

Date Acquired: November 16, 2017

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F1 C6-C10	mg/kg	74	73	20	4	yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	mg/kg	69	64	86	yes

Date Acquired: November 16, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	mg/kg	98	80	120	yes

Date Acquired: November 16, 2017

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor Base Mine Project Location: LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239726 Control Number: Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243953
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon Soil		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME in Soil EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 16, 2017	Exova Edmonton
BTEX-CCME in Soil EDM	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 16, 2017	Exova Edmonton
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl2 (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 21, 2017	Exova Edmonton
Saturated Paste in General Soil	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME in Soil (Shake) EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 16, 2017	Exova Edmonton

* Reference Method Modified

References

Agronomy No 9, Part	Methods of Soil Analysis, Part 1
APHA	Standard Methods for the Examination of Water and Wastewater
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-1	1239775-2	1239775-3		
	Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 09, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	NMPlot8-02-HC	NMPlot8-03-HC	NMPlot8-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	27	10	10	0.1
Mono-Aromatic Hydrocarbons - Soil						
Methanol Field Preservation			No	No	No	
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		16-NOV-17	16-NOV-17	16-NOV-17	
Silica Gel Cleanup			Done	Done	Done	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	<50	50
F3c C16-C34	Dry Weight	mg/kg	460	440	580	50
F4c C34-C50	Dry Weight	mg/kg	400	400	500	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	1100	1100	1200	100
% C50+		%	40	40	40	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch Sampled By: Company:	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
--	--	--

		Reference Number	1239775-4	1239775-5	1239775-6	
		Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 09, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	NMPlot8-02-AN	NMPlot8-03-AN	NMPlot8-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
pH	Saturated Paste	pH	6.0	7.3	7.1	
Electrical Conductivity	Saturated Paste	dS/m	0.77	1.10	3.07	0.01
SAR	Saturated Paste		0.4	0.3	0.2	
% Saturation		%	103	50	49	
Calcium	Saturated Paste	meq/L	4.84	9.87	36.9	0.01
Calcium	Saturated Paste	mg/L	96.7	197	738	0.2
Calcium	Saturated Paste	mg/kg	100	98.8	365	
Magnesium	Saturated Paste	meq/L	2.76	3.19	10.6	0.02
Magnesium	Saturated Paste	mg/L	33.4	38.6	128	0.2
Magnesium	Saturated Paste	mg/kg	34.6	19.3	63.4	
Sodium	Saturated Paste	meq/L	0.82	0.67	0.96	0.04
Sodium	Saturated Paste	mg/L	19	15	22	1
Sodium	Saturated Paste	mg/kg	20	8	11	
Potassium	Saturated Paste	meq/L	0.50	0.18	<0.26	0.03
Potassium	Saturated Paste	mg/L	19.6	7.1	<10	1
Potassium	Saturated Paste	mg/kg	20	4	<5	
Chloride	Saturated Paste	meq/L	2.19	1.24	0.62	0.06
Chloride	Saturated Paste	mg/L	78	44	22	2
Chloride	Saturated Paste	mg/kg	80	22	11	
Sulfate (SO4)	Saturated Paste	meq/L	2.74	7.98	35.5	0.06
Sulfate (SO4)	Saturated Paste	mg/L	131	383	1700	3
Sulfate (SO4)	Saturated Paste	mg/kg	136	192	843	
Sulfate-S	Saturated Paste	mg/L	44	128	568	1
Sulfate-S	Saturated Paste	meq/L	2.74	7.98	35.5	0.06
Sulfate-S	Saturated Paste	mg/kg	45.3	63.9	281	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	5.8	7.2	7.3	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-7	1239775-8	1239775-9		
	Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	14:00		
	Sample Location					
	Sample Description	298 CM3 / NMPlot8-02-BD1	298 CM3 / NMPlot8-02-BD2	NMPlot5-02-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	35	27.2	19	0.1
Bulk Density		kg/L	0.38	0.42		
Bulk Density		kg/m³	380	423		
Wet Bulk Density		kg/L	0.58	0.58		
Porosity		%	na	na		
Volume	Declared Value	mL	298	298		

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-9	1239775-10	1239775-11	
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
	Sample Time	14:00	14:00	14:00	
	Sample Location				
	Sample Description	NMPlot5-02-HC	NMPlot5-03-HC	NMPlot5-04-HC	
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil					
Methanol Field Preservation		No	No	No	
Benzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil					
F1 C6-C10	Dry Weight	mg/kg	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil					
Extraction Date	Total Extractables	17-NOV-17	17-NOV-17	17-NOV-17	
Silica Gel Cleanup		Done	Done	Done	
F2c C10-C16	Dry Weight	mg/kg	<50	400	50
F3c C16-C34	Dry Weight	mg/kg	2000	7400	50
F4c C34-C50	Dry Weight	mg/kg	1700	4000	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	4400	11000	100
% C50+		%	42	30	38



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-10	1239775-11	1239775-12	
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
	Sample Time	14:00	14:00	14:00	
	Sample Location				
	Sample Description	NMPlot5-03-HC	NMPlot5-04-HC	313 CM3 / NMPlot5-02-BD1	
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Physical and Aggregate Properties					
Moisture	Wet Weight @ 105°C	%	5	6	22
Bulk Density		kg/L			0.75
Bulk Density		kg/m³			750
Wet Bulk Density		kg/L			0.97
Porosity		%			na
Volume	Declared Value	mL			313



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch Sampled By: Company:	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
--	--	--

	Reference Number	1239775-13	1239775-17	1239775-18		
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017		
	Sample Time	14:00	10:00	10:00		
	Sample Location					
	Sample Description	313 CM3 / NMPlot5-02-BD2	NMPlot16-02-HC	NMPlot16-03-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	12	35	11	0.1
Bulk Density		kg/L	0.70			
Bulk Density		kg/m³	700			
Wet Bulk Density		kg/L	0.80			
Porosity		%	na			
Volume	Declared Value	mL	313			

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

		Reference Number	1239775-14	1239775-15	1239775-16	
		Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
		Sample Time	14:00	14:00	14:00	
		Sample Location				
		Sample Description	NMPlot5-02-AN	NMPlot5-03-AN	NMPlot5-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	2.54	2.40	2.87	0.01
SAR	Saturated Paste		<0.1	<0.1	0.2	
% Saturation		%	81	38	41	
Calcium	Saturated Paste	mg/kg	390	206	245	
Magnesium	Saturated Paste	mg/kg	146	42.6	82.5	
Sodium	Saturated Paste	mg/kg	<8	<4	10	
Potassium	Saturated Paste	mg/kg	15	6	10	
Chloride	Saturated Paste	mg/kg	15	4	4	
Sulfate (SO4)	Saturated Paste	mg/kg	1090	609	875	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.3	7.5	7.6	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-17	1239775-18	1239775-19	
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
	Sample Time	10:00	10:00	10:00	
	Sample Location				
	Sample Description	NMPlot16-02-HC	NMPlot16-03-HC	NMPlot16-04-HC	
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil					
Methanol Field Preservation		No	No	No	
Benzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil					
F1 C6-C10	Dry Weight	mg/kg	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil					
Extraction Date	Total Extractables	17-NOV-17	17-NOV-17	17-NOV-17	
Silica Gel Cleanup		Done	Done	Done	
F2c C10-C16	Dry Weight	mg/kg	<50	60	50
F3c C16-C34	Dry Weight	mg/kg	380	1300	50
F4c C34-C50	Dry Weight	mg/kg	300	900	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	500	2100	100
% C50+		%	30	35	20

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-19	1239775-20	1239775-21		
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	NMPlot16-04-HC	313 CM3 / NMPlot16-02-BD1	313 CM3 / NMPlot16-02-BD2		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	11	21.4	27.9	0.1
Bulk Density		kg/L		0.37	0.39	
Bulk Density		kg/m³		367	387	
Wet Bulk Density		kg/L		0.47	0.54	
Porosity		%		na	na	
Volume	Declared Value	mL		313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

		Reference Number	1239775-22	1239775-23	1239775-24	
		Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	NMPlot16-02-AN	NMPlot16-03-AN	NMPlot16-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.83	3.68	4.54	0.01
SAR	Saturated Paste		2.3	3.7	5.5	
% Saturation		%	140	49	44	
Calcium	Saturated Paste	mg/kg	286	253	222	
Magnesium	Saturated Paste	mg/kg	98.9	78.3	84.7	
Sodium	Saturated Paste	mg/kg	214	185	251	
Potassium	Saturated Paste	mg/kg	38	10	11	
Chloride	Saturated Paste	mg/kg	29	7	7	
Sulfate (SO4)	Saturated Paste	mg/kg	1040	1240	1330	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	6.4	7.4	7.4	

Approved by: 
Nathan Brilz, Chem. Technologist
Client Service Representative

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

Extractable Petroleum Hydrocarbons - Soil

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F2c C10-C16	mg/kg	230	270	30		yes
F3c C16-C34	mg/kg	958	1090	30		yes
F4c C34-C50	mg/kg	200	300	30		yes
F4c+ C50+	mg/kg	<100	<100	30		yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	99	74	116	yes
F3c C16-C34	mg/kg	160	124	160	yes
F4c C34-C50	mg/kg	200	169	229	yes

Date Acquired: November 16, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	82	65	135	yes
F3c C16-C34	mg/kg	98	65	135	yes
F4c C34-C50	mg/kg	75	65	135	yes

Date Acquired: November 16, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0031	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.500	0.500	yes
Toluene	ng	0	-2.00	2.00	yes
Ethylbenzene	ng	0	-0.500	0.500	yes
m,p-Xylene	ng	0	-1.00	1.00	yes
o-Xylene	ng	0	-1.00	1.00	yes

Date Acquired: November 16, 2017

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Benzene	mg/kg	2.73	2.73	20	0.004	yes
Toluene	mg/kg	2.58	2.57	20	0.01	yes
Ethylbenzene	mg/kg	2.86	2.72	20	0.010	yes
m,p-Xylene	mg/kg	5.76	5.48	20	0.01	yes
o-Xylene	mg/kg	2.85	2.71	20	0.01	yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	mg/kg	5.08	4.250	5.750	yes
Toluene	mg/kg	5.04	4.25	5.75	yes
Ethylbenzene	mg/kg	4.92	4.250	5.750	yes
m,p-Xylene	mg/kg	9.79	8.50	11.50	yes
o-Xylene	mg/kg	4.92	4.25	5.75	yes

Date Acquired: November 16, 2017

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

Mono-Aromatic Hydrocarbons - Soil - Continued

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	mg/kg	89	80	120	yes
Toluene	mg/kg	85	80	120	yes
Ethylbenzene	mg/kg	94	80	120	yes
m,p-Xylene	mg/kg	95	80	120	yes
o-Xylene	mg/kg	93	80	120	yes

Date Acquired: November 16, 2017

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	10	10	10	0.3	yes

Date Acquired: November 20, 2017

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0124	-0.4	0.5	yes
Magnesium	mg/L	0.0036	-0.1	0.1	yes
Sodium	mg/L	0.0345	-0	2	yes
Potassium	mg/L	0.0519	-0.5	0.7	yes
Chloride	mg/L	2.0275	0	5	yes
Sulfate-S	mg/L	0.0419	-0	1	yes

Date Acquired: November 17, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.6	6.6	0	0.3	yes
Electrical Conductivity	dS/m	0.19	0.19	10	0.01	yes
Calcium	mg/kg	16.3	16.6	10	0.6	yes
Magnesium	mg/kg	5.0	5.0	10	0.6	yes
Sodium	mg/kg	3	3	10	1	yes
Potassium	mg/kg	2	2	10	1	yes
Chloride	mg/kg	5	5	15	3	yes
Sulfate-S	mg/kg	3.8	3.8	10	1.2	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.1	6.5	8.0	yes
Electrical Conductivity	dS/m	3.16	2.71	3.25	yes
% Saturation	%	46	38	52	yes
Calcium	mg/L	671	596.2	767.8	yes
Magnesium	mg/L	139	121.8	154.8	yes
Sodium	mg/L	72	58	79	yes
Potassium	mg/L	21	17.8	24.6	yes
Chloride	mg/L	67	57	78	yes
Sulfate-S	mg/L	606	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.1	26.80	35.20	yes
-------------------------	------	------	-------	-------	-----

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Sampled By: Company:		

Salinity - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	244	230.2	261.4	yes
Magnesium	mg/L	94.7	92.7	99.7	yes
Sodium	mg/L	242	229	269	yes
Potassium	mg/L	239	229.4	265.4	yes
Chloride	mg/L	2020	1871	2231	yes
Sulfate-S	mg/L	148	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample	Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		pH	7.4	7.3	0	0.3	yes

Date Acquired: November 21, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 21, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	-38.25	-1000	1000	yes

Date Acquired: November 16, 2017

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F1 C6-C10	mg/kg	74	73	20	4	yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	mg/kg	69	64	86	yes

Date Acquired: November 16, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	mg/kg	98	80	120	yes

Date Acquired: November 16, 2017

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME in Soil EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 16, 2017	Exova Edmonton
BTEX-CCME in Soil EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Edmonton
BTEX-CCME in Soil EDM	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 16, 2017	Exova Edmonton
BTEX-CCME in Soil EDM	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Edmonton
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl ₂ (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 21, 2017	Exova Edmonton
Saturated Paste in General Soil	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME in Soil (Shake) EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 16, 2017	Exova Edmonton
TEH-CCME in Soil (Shake) EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Edmonton

* Reference Method Modified

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
APHA	Standard Methods for the Examination of Water and Wastewater
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-1	1239775-2	1239775-3		
	Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 09, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	NMPlot8-02-HC	NMPlot8-03-HC	NMPlot8-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	27	10	10	0.1
Mono-Aromatic Hydrocarbons - Soil						
Methanol Field Preservation			No	No	No	
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		16-NOV-17	16-NOV-17	16-NOV-17	
Silica Gel Cleanup			Done	Done	Done	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	<50	50
F3c C16-C34	Dry Weight	mg/kg	460	440	580	50
F4c C34-C50	Dry Weight	mg/kg	400	400	500	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	1100	1100	1200	100
% C50+		%	40	40	40	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

		Reference Number	1239775-4	1239775-5	1239775-6	
		Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 09, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	NMPlot8-02-AN	NMPlot8-03-AN	NMPlot8-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
pH	Saturated Paste	pH	6.0	7.3	7.1	
Electrical Conductivity	Saturated Paste	dS/m	0.77	1.10	3.07	0.01
SAR	Saturated Paste		0.4	0.3	0.2	
% Saturation		%	103	50	49	
Calcium	Saturated Paste	meq/L	4.84	9.87	36.9	0.01
Calcium	Saturated Paste	mg/L	96.7	197	738	0.2
Calcium	Saturated Paste	mg/kg	100	98.8	365	
Magnesium	Saturated Paste	meq/L	2.76	3.19	10.6	0.02
Magnesium	Saturated Paste	mg/L	33.4	38.6	128	0.2
Magnesium	Saturated Paste	mg/kg	34.6	19.3	63.4	
Sodium	Saturated Paste	meq/L	0.82	0.67	0.96	0.04
Sodium	Saturated Paste	mg/L	19	15	22	1
Sodium	Saturated Paste	mg/kg	20	8	11	
Potassium	Saturated Paste	meq/L	0.50	0.18	<0.26	0.03
Potassium	Saturated Paste	mg/L	19.6	7.1	<10	1
Potassium	Saturated Paste	mg/kg	20	4	<5	
Chloride	Saturated Paste	meq/L	2.19	1.24	0.62	0.06
Chloride	Saturated Paste	mg/L	78	44	22	2
Chloride	Saturated Paste	mg/kg	80	22	11	
Sulfate (SO4)	Saturated Paste	meq/L	2.74	7.98	35.5	0.06
Sulfate (SO4)	Saturated Paste	mg/L	131	383	1700	3
Sulfate (SO4)	Saturated Paste	mg/kg	136	192	843	
Sulfate-S	Saturated Paste	mg/L	44	128	568	1
Sulfate-S	Saturated Paste	meq/L	2.74	7.98	35.5	0.06
Sulfate-S	Saturated Paste	mg/kg	45.3	63.9	281	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	5.8	7.2	7.3	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Sampled By: Company:		

	Reference Number	1239775-7	1239775-8	1239775-9		
	Sample Date	Nov 09, 2017	Nov 09, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	14:00		
	Sample Location					
	Sample Description	298 CM3 / NMPlot8-02-BD1	298 CM3 / NMPlot8-02-BD2	NMPlot5-02-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	35	27.2	19	0.1
Bulk Density		kg/L	0.38	0.42		
Bulk Density		kg/m³	380	423		
Wet Bulk Density		kg/L	0.58	0.58		
Porosity		%	na	na		
Volume	Declared Value	mL	298	298		

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-9	1239775-10	1239775-11	
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
	Sample Time	14:00	14:00	14:00	
	Sample Location				
	Sample Description	NMPlot5-02-HC	NMPlot5-03-HC	NMPlot5-04-HC	
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil					
Methanol Field Preservation		No	No	No	
Benzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil					
F1 C6-C10	Dry Weight	mg/kg	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil					
Extraction Date	Total Extractables	17-NOV-17	17-NOV-17	17-NOV-17	
Silica Gel Cleanup		Done	Done	Done	
F2c C10-C16	Dry Weight	mg/kg	<50	400	50
F3c C16-C34	Dry Weight	mg/kg	2000	7400	50
F4c C34-C50	Dry Weight	mg/kg	1700	4000	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	4400	11000	100
% C50+	%		42	30	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-10	1239775-11	1239775-12		
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017		
	Sample Time	14:00	14:00	14:00		
	Sample Location					
	Sample Description	NMPlot5-03-HC	NMPlot5-04-HC	313 CM3 / NMPlot5-02-BD1		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	5	6	22	0.1
Bulk Density		kg/L			0.75	
Bulk Density		kg/m³			750	
Wet Bulk Density		kg/L			0.97	
Porosity		%			na	
Volume	Declared Value	mL			313	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Sampled By: Company:		

	Reference Number	1239775-13	1239775-17	1239775-18	
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
	Sample Time	14:00	10:00	10:00	
	Sample Location				
	Sample Description	313 CM3 / NMPlot5-02-BD2	NMPlot16-02-HC	NMPlot16-03-HC	
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit

Physical and Aggregate Properties

Moisture	Wet Weight @ 105°C	%	12	35	11	0.1
Bulk Density		kg/L	0.70			
Bulk Density		kg/m³	700			
Wet Bulk Density		kg/L	0.80			
Porosity		%	na			
Volume	Declared Value	mL	313			

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

		Reference Number	1239775-14	1239775-15	1239775-16	
		Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
		Sample Time	14:00	14:00	14:00	
		Sample Location				
		Sample Description	NMPlot5-02-AN	NMPlot5-03-AN	NMPlot5-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	2.54	2.40	2.87	0.01
SAR	Saturated Paste		<0.1	<0.1	0.2	
% Saturation		%	81	38	41	
Calcium	Saturated Paste	mg/kg	390	206	245	
Magnesium	Saturated Paste	mg/kg	146	42.6	82.5	
Sodium	Saturated Paste	mg/kg	<8	<4	10	
Potassium	Saturated Paste	mg/kg	15	6	10	
Chloride	Saturated Paste	mg/kg	15	4	4	
Sulfate (SO4)	Saturated Paste	mg/kg	1090	609	875	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.3	7.5	7.6	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-17	1239775-18	1239775-19	
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
	Sample Time	10:00	10:00	10:00	
	Sample Location				
	Sample Description	NMPlot16-02-HC	NMPlot16-03-HC	NMPlot16-04-HC	
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil					
Methanol Field Preservation		No	No	No	
Benzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil					
F1 C6-C10	Dry Weight	mg/kg	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil					
Extraction Date	Total Extractables	17-NOV-17	17-NOV-17	17-NOV-17	
Silica Gel Cleanup		Done	Done	Done	
F2c C10-C16	Dry Weight	mg/kg	<50	60	50
F3c C16-C34	Dry Weight	mg/kg	380	1300	50
F4c C34-C50	Dry Weight	mg/kg	300	900	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	500	2100	100
% C50+		%	30	35	20



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

	Reference Number	1239775-19	1239775-20	1239775-21		
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	NMPlot16-04-HC	313 CM3 / NMPlot16-02-BD1	313 CM3 / NMPlot16-02-BD2		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	11	21.4	27.9	0.1
Bulk Density		kg/L		0.37	0.39	
Bulk Density		kg/m³		367	387	
Wet Bulk Density		kg/L		0.47	0.54	
Porosity		%		na	na	
Volume	Declared Value	mL		313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

		Reference Number	1239775-22	1239775-23	1239775-24	
		Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	NMPlot16-02-AN	NMPlot16-03-AN	NMPlot16-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.83	3.68	4.54	0.01
SAR	Saturated Paste		2.3	3.7	5.5	
% Saturation		%	140	49	44	
Calcium	Saturated Paste	mg/kg	286	253	222	
Magnesium	Saturated Paste	mg/kg	98.9	78.3	84.7	
Sodium	Saturated Paste	mg/kg	214	185	251	
Potassium	Saturated Paste	mg/kg	38	10	11	
Chloride	Saturated Paste	mg/kg	29	7	7	
Sulfate (SO4)	Saturated Paste	mg/kg	1040	1240	1330	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	6.4	7.4	7.4	

Approved by: 
Nathan Brilz, Chem. Technologist
Client Service Representative

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

Extractable Petroleum Hydrocarbons - Soil

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F2c C10-C16	mg/kg	230	270	30		yes
F3c C16-C34	mg/kg	958	1090	30		yes
F4c C34-C50	mg/kg	200	300	30		yes
F4c+ C50+	mg/kg	<100	<100	30		yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	99	74	116	yes
F3c C16-C34	mg/kg	160	124	160	yes
F4c C34-C50	mg/kg	200	169	229	yes

Date Acquired: November 16, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	82	65	135	yes
F3c C16-C34	mg/kg	98	65	135	yes
F4c C34-C50	mg/kg	75	65	135	yes

Date Acquired: November 16, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0031	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.500	0.500	yes
Toluene	ng	0	-2.00	2.00	yes
Ethylbenzene	ng	0	-0.500	0.500	yes
m,p-Xylene	ng	0	-1.00	1.00	yes
o-Xylene	ng	0	-1.00	1.00	yes

Date Acquired: November 16, 2017

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Benzene	mg/kg	2.73	2.73	20	0.004	yes
Toluene	mg/kg	2.58	2.57	20	0.01	yes
Ethylbenzene	mg/kg	2.86	2.72	20	0.010	yes
m,p-Xylene	mg/kg	5.76	5.48	20	0.01	yes
o-Xylene	mg/kg	2.85	2.71	20	0.01	yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	mg/kg	5.08	4.250	5.750	yes
Toluene	mg/kg	5.04	4.25	5.75	yes
Ethylbenzene	mg/kg	4.92	4.250	5.750	yes
m,p-Xylene	mg/kg	9.79	8.50	11.50	yes
o-Xylene	mg/kg	4.92	4.25	5.75	yes

Date Acquired: November 16, 2017

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

Mono-Aromatic Hydrocarbons - Soil - Continued

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	mg/kg	89	80	120	yes
Toluene	mg/kg	85	80	120	yes
Ethylbenzene	mg/kg	94	80	120	yes
m,p-Xylene	mg/kg	95	80	120	yes
o-Xylene	mg/kg	93	80	120	yes

Date Acquired: November 16, 2017

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	10	10	10	0.3	yes

Date Acquired: November 20, 2017

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0124	-0.4	0.5	yes
Magnesium	mg/L	0.0036	-0.1	0.1	yes
Sodium	mg/L	0.0345	-0	2	yes
Potassium	mg/L	0.0519	-0.5	0.7	yes
Chloride	mg/L	2.0275	0	5	yes
Sulfate-S	mg/L	0.0419	-0	1	yes

Date Acquired: November 17, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.6	6.6	0	0.3	yes
Electrical Conductivity	dS/m	0.19	0.19	10	0.01	yes
Calcium	mg/kg	16.3	16.6	10	0.6	yes
Magnesium	mg/kg	5.0	5.0	10	0.6	yes
Sodium	mg/kg	3	3	10	1	yes
Potassium	mg/kg	2	2	10	1	yes
Chloride	mg/kg	5	5	15	3	yes
Sulfate-S	mg/kg	3.8	3.8	10	1.2	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.1	6.5	8.0	yes
Electrical Conductivity	dS/m	3.16	2.71	3.25	yes
% Saturation	%	46	38	52	yes
Calcium	mg/L	671	596.2	767.8	yes
Magnesium	mg/L	139	121.8	154.8	yes
Sodium	mg/L	72	58	79	yes
Potassium	mg/L	21	17.8	24.6	yes
Chloride	mg/L	67	57	78	yes
Sulfate-S	mg/L	606	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.1	26.80	35.20	yes
-------------------------	------	------	-------	-------	-----

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Sampled By: Company:		

Salinity - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	244	230.2	261.4	yes
Magnesium	mg/L	94.7	92.7	99.7	yes
Sodium	mg/L	242	229	269	yes
Potassium	mg/L	239	229.4	265.4	yes
Chloride	mg/L	2020	1871	2231	yes
Sulfate-S	mg/L	148	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample	Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		pH	7.4	7.3	0	0.3	yes

Date Acquired: November 21, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 21, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	-38.25	-1000	1000	yes

Date Acquired: November 16, 2017

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F1 C6-C10	mg/kg	74	73	20	4	yes

Date Acquired: November 16, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	mg/kg	69	64	86	yes

Date Acquired: November 16, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	mg/kg	98	80	120	yes

Date Acquired: November 16, 2017

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239775 Control Number: C0056635 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243981
Attn: Marty Yarmuch Sampled By: Company:		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME in Soil EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 16, 2017	Exova Edmonton
BTEX-CCME in Soil EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Edmonton
BTEX-CCME in Soil EDM	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 16, 2017	Exova Edmonton
BTEX-CCME in Soil EDM	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Edmonton
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl ₂ (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 21, 2017	Exova Edmonton
Saturated Paste in General Soil	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME in Soil (Shake) EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 16, 2017	Exova Edmonton
TEH-CCME in Soil (Shake) EDM	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Edmonton

* Reference Method Modified

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
APHA	Standard Methods for the Examination of Water and Wastewater
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods



Methodology and Notes

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239775
P. O. 4009, MD 0078	Project Name:	Control Number: C0056635
Fort McMurray, AB, Canada	Project Location: Suncor Base Mine	Date Received: Nov 15, 2017
T9H 3L1	LSD:	Date Reported: Nov 21, 2017
Attn: Marty Yarmuch	P.O.: 4410252962	Report Number: 2243981
Sampled By:	Proj. Acct. code: E6687	
Company:		

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

	Reference Number	1239814-1	1239814-2	1239814-3		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	NMPlot14-02-HC	NMPlot14-03-HC	NMPlot14-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	132	736	50
F3c C16-C34	Dry Weight	mg/kg	1100	2640	4930	50
F4c C34-C50	Dry Weight	mg/kg	855	1580	2450	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	1760	3500	5350	100
% C50+	%		22.7	21.5	18.2	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	16.00	11.00	11.40	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

	Reference Number	1239814-4	1239814-5	1239814-12		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	313 CM3 / NMPlot14-02-BD1	313 CM3 / NMPlot14-02-BD2	313cm3 / NMPlot4- 02-BD1		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	19	17	19	0.1
Bulk Density		kg/L	0.70	0.78	1.0	
Bulk Density		kg/m³	700	780	1000	
Wet Bulk Density		kg/L	0.86	0.93	1.24	
Porosity		%	na	na	62	
Volume	Declared Value	mL	313	313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

		Reference Number	1239814-6	1239814-7	1239814-8	
		Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	NMPlot14-02-AN	NMPlot14-03-AN	NMPlot14-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.95	1.96	3.15	0.01
SAR	Saturated Paste		2.5	2.4	2.1	
% Saturation		%	60	48	42	
Calcium	Saturated Paste	mg/kg	133	111	237	
Magnesium	Saturated Paste	mg/kg	45.9	35.0	56.6	
Sodium	Saturated Paste	mg/kg	102	80	91	
Potassium	Saturated Paste	mg/kg	6	5	9	
Chloride	Saturated Paste	mg/kg	8	5	3	
Sulfate (SO4)	Saturated Paste	mg/kg	594	511	952	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.6	7.5	7.5	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

	Reference Number	1239814-9	1239814-10	1239814-11		
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	NMPlot4-02-HC	NMPlot4-03-HC	NMPlot4-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	102	172	50
F3c C16-C34	Dry Weight	mg/kg	1370	2200	2250	50
F4c C34-C50	Dry Weight	mg/kg	1180	1480	1300	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	2620	3560	3260	100
% C50+	%		26.8	25.8	24.7	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	10.60	8.51	7.10	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

	Reference Number	1239814-13	1239814-20	1239814-21		
	Sample Date	Nov 10, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	10:00	14:00	14:00		
	Sample Location					
	Sample Description	313cm3 / NMPlot4-02-BD2	313cm3 / NMPlot13-02-BD1	313cm3 / NMPlot13-02-BD2		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	9.5	15	11	0.1
Bulk Density		kg/L	1.13	0.94	1.1	
Bulk Density		kg/m³	1130	940	1100	
Wet Bulk Density		kg/L	1.25	1.11	1.20	
Porosity		%	57	na	60	
Volume	Declared Value	mL	313	313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
---	--	--

		Reference Number	1239814-14	1239814-15	1239814-16	
		Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	NMPlot4-02-AN	NMPlot4-03-AN	NMPlot4-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.80	2.74	3.25	0.01
SAR	Saturated Paste		<0.1	0.2	0.8	
% Saturation		%	51	51	39	
Calcium	Saturated Paste	mg/kg	195	320	222	
Magnesium	Saturated Paste	mg/kg	31.1	74.4	102	
Sodium	Saturated Paste	mg/kg	4	14	34	
Potassium	Saturated Paste	mg/kg	7	7	11	
Chloride	Saturated Paste	mg/kg	4	4	4	
Sulfate (SO4)	Saturated Paste	mg/kg	415	1010	948	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.5	7.4	7.7	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

	Reference Number	1239814-17	1239814-18	1239814-19		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	14:00	14:00	14:00		
	Sample Location					
	Sample Description	NMPlot13-02-HC	NMPlot13-03-HC	NMPlot13-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	91	632	975	50
F3c C16-C34	Dry Weight	mg/kg	2010	6500	5770	50
F4c C34-C50	Dry Weight	mg/kg	1570	3700	2790	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	4030	8990	6490	100
% C50+	%		30.2	23.4	19.5	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	12.40	5.81	12.30	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

		Reference Number	1239814-22	1239814-23	1239814-24	
		Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017	
		Sample Time	14:00	14:00	14:00	
		Sample Location				
		Sample Description	NMPlot13-02-AN	NMPlot13-03-AN	NMPlot13-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.22	1.34	2.99	0.01
SAR	Saturated Paste		0.3	0.3	0.5	
% Saturation		%	58	45	42	
Calcium	Saturated Paste	mg/kg	107	92.0	243	
Magnesium	Saturated Paste	mg/kg	36.2	31.0	90.5	
Sodium	Saturated Paste	mg/kg	9	9	26	
Potassium	Saturated Paste	mg/kg	9	6	11	
Chloride	Saturated Paste	mg/kg	10	6	6	
Sulfate (SO4)	Saturated Paste	mg/kg	124	283	928	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.1	7.0	7.2	

Approved by: 
Nathan Brilz, Chem. Technologist
Client Service Representative

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

Extractable Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	0	-10	10	yes
F3c C16-C34	µg/mL	0	-30	30	yes
F4c C34-C50	µg/mL	0	-20	20	yes
F4HTGCc C34-C50+	µg/mL	0	-20	20	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	105.92	80	120	yes
F3c C16-C34	µg/mL	111.61	80	120	yes
F4c C34-C50	µg/mL	104.79	80	120	yes
F4HTGCc C34-C50+	µg/mL	100.56	80	120	yes

Date Acquired: November 17, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	-0.0032	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.005	0.005	yes
Toluene	ng	0	-0.06	0.06	yes
Ethylbenzene	ng	0	-0.030	0.030	yes
Total Xylenes (m,p,o)	ng	0	-0.09	0.09	yes
Styrene	ng	0	-0.030	0.030	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	87.40	80	120	yes
Toluene	ng	100.80	80	120	yes
Ethylbenzene	ng	104.00	80	120	yes
Total Xylenes (m,p,o)	ng	118.67	80	120	yes
Styrene	ng	113.80	80	120	yes

Date Acquired: November 17, 2017

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	29	29	10	0.3	yes

Date Acquired: November 20, 2017

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0563	-0.4	0.5	yes
Magnesium	mg/L	0.0269	-0.1	0.1	yes
Sodium	mg/L	0.0086	-0	2	yes

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

Salinity - Continued

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Potassium	mg/L	-0.0166	-0.5	0.7	yes
Chloride	mg/L	2.7414	0	5	yes
Sulfate-S	mg/L	0.0111	-0	1	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.5	8.0	yes
Electrical Conductivity	dS/m	3.01	2.71	3.25	yes
% Saturation	%	45	38	52	yes
Calcium	mg/L	663	596.2	767.8	yes
Magnesium	mg/L	140	121.8	154.8	yes
Sodium	mg/L	74	58	79	yes
Potassium	mg/L	20	17.8	24.6	yes
Chloride	mg/L	70	57	78	yes
Sulfate-S	mg/L	641	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.3	26.80	35.20	yes
Calcium	mg/L	244	230.2	261.4	yes
Magnesium	mg/L	94.7	92.7	99.7	yes
Sodium	mg/L	241	229	269	yes
Chloride	mg/L	2040	1871	2231	yes
Sulfate-S	mg/L	145	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.4	6.6	0	0.3	yes

Date Acquired: November 21, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 21, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	0	-10	10	yes

Date Acquired: November 17, 2017

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
---	--	--

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME - Soil	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary
BTEX-CCME - Soil	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Calgary
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl ₂ (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 21, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME-Soil (Shake)	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary

** Reference Method Modified*

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Hydrocarbon Chromatogram

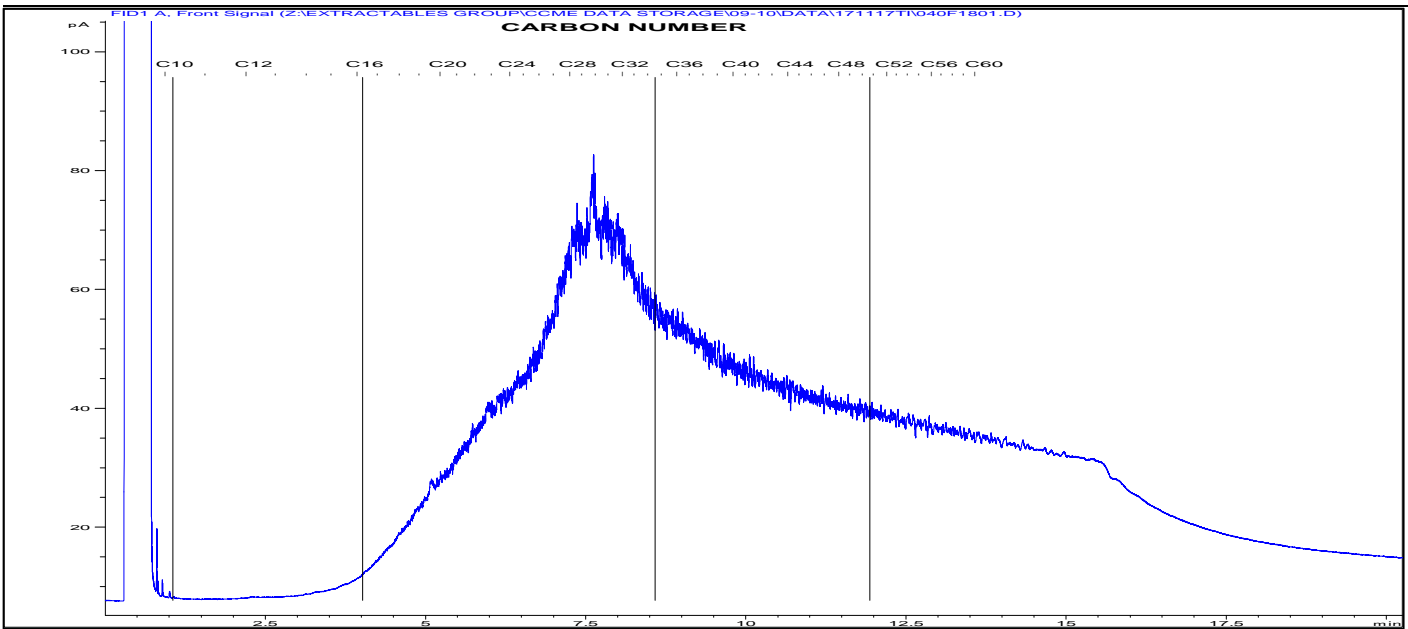
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

Exova Number: 1239814-1

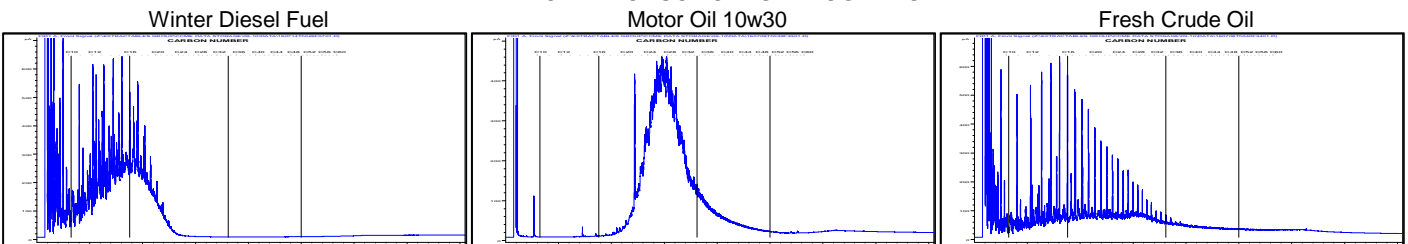
Sample Description: NMPlot14-02-HC

Silica Gel Treated

Sample Date: Nov 11, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

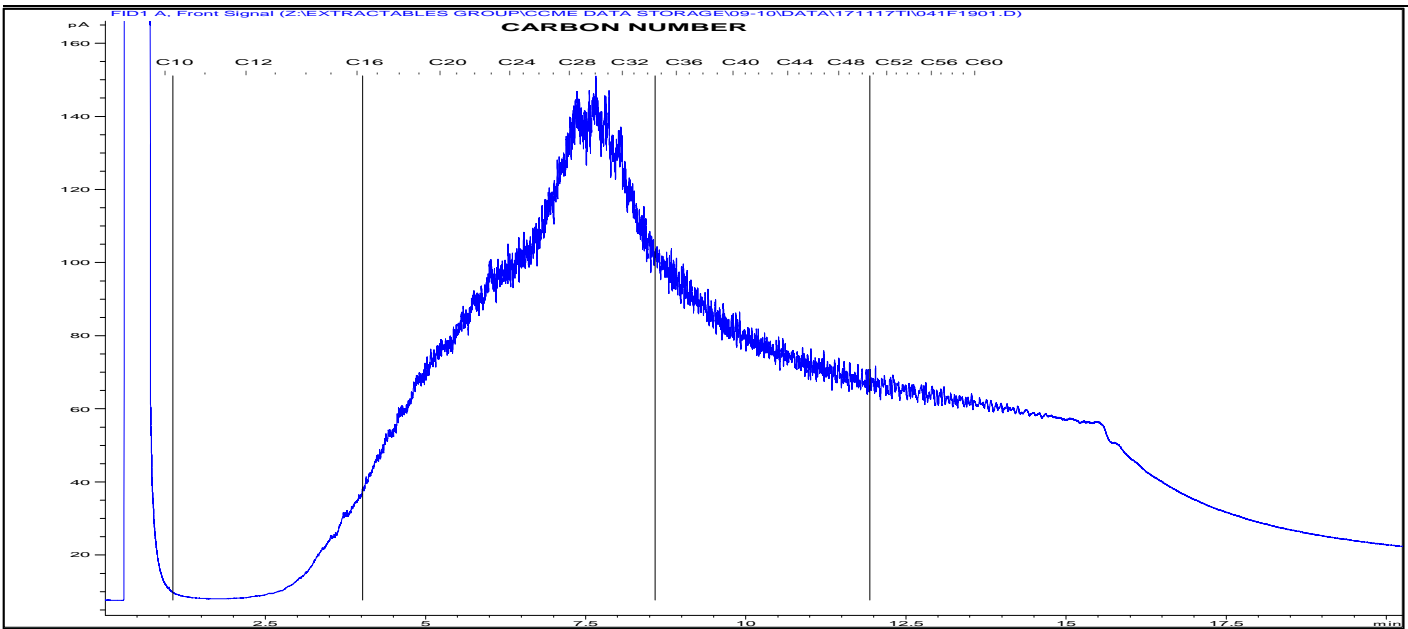
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

Exova Number: 1239814-2

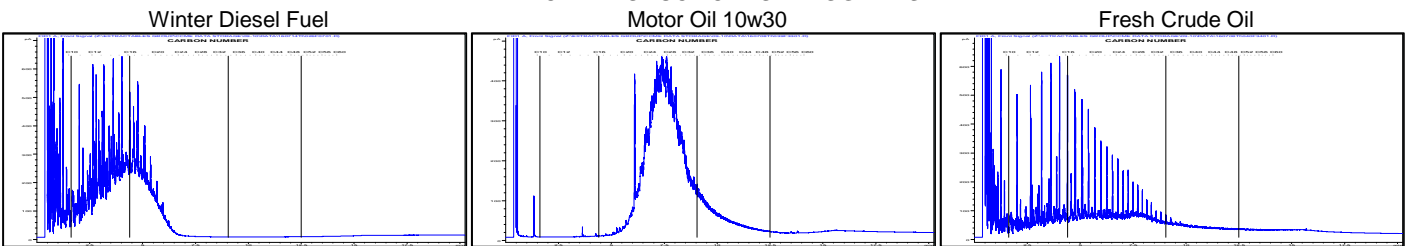
Sample Description: NMPlot14-03-HC

Silica Gel Treated

Sample Date: Nov 11, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

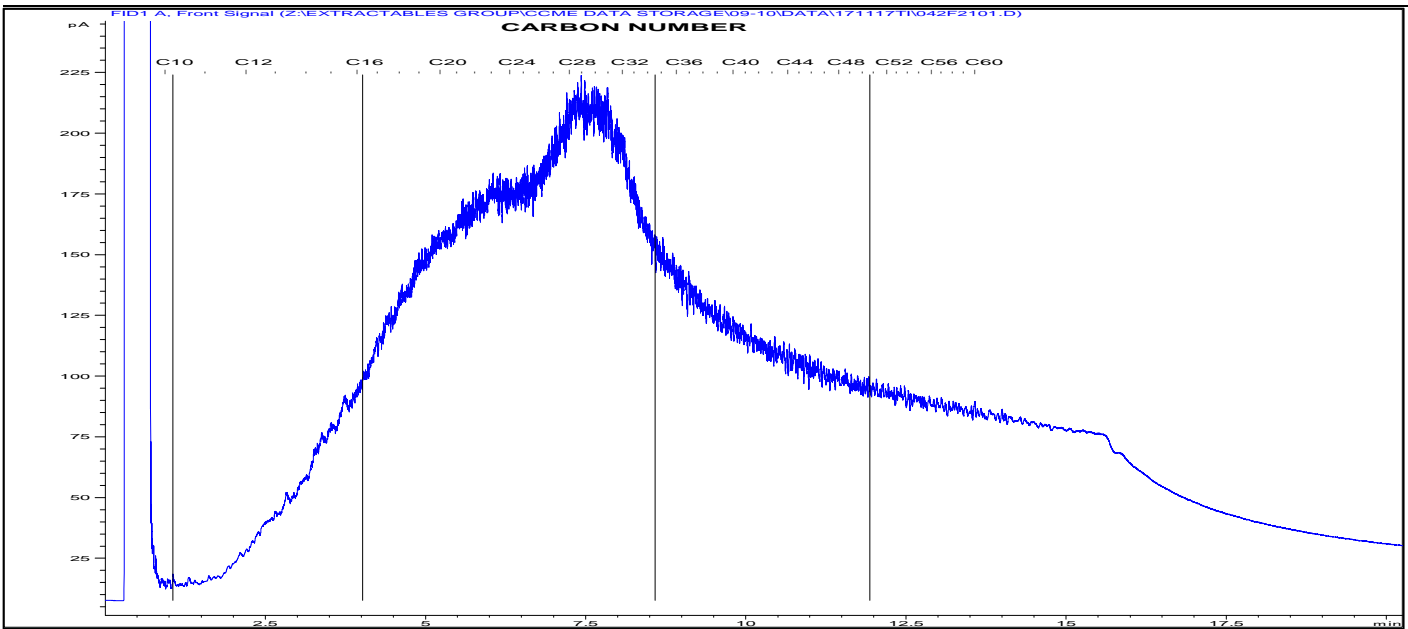
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada	Location: Suncor Base Mine	Date Received: Nov 15, 2017
T9H 3L1	LSD:	Date Reported: Nov 19, 2017
Attn: Marty Yarmuch	P.O.: 4410252962	Report Number: 2244025
Sampled by: C.K.		
Company: Paragon		

Exova Number: 1239814-3

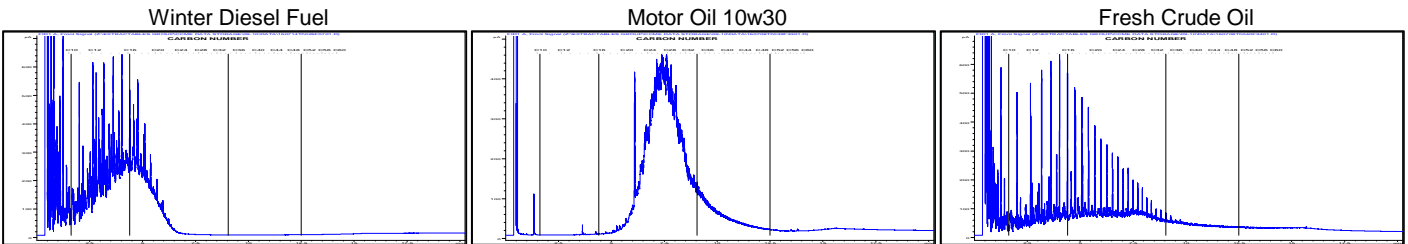
Sample Description: NMPlot14-04-HC

Silica Gel Treated

Sample Date: Nov 11, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

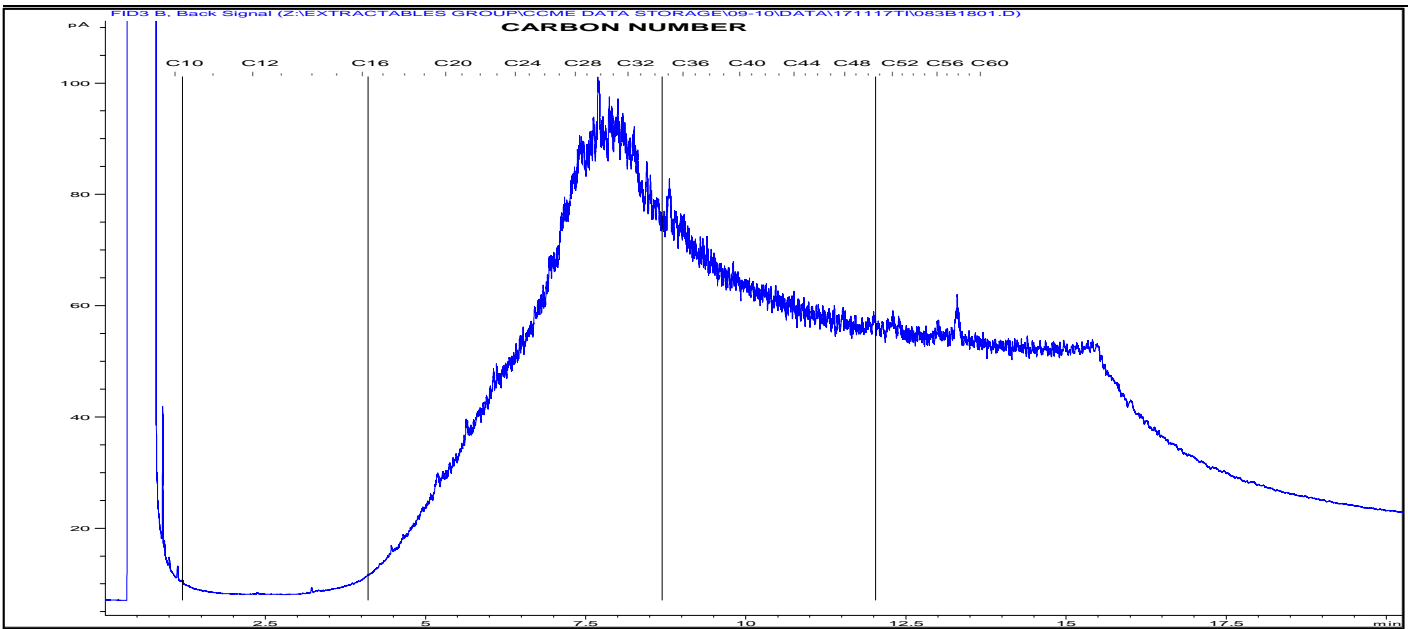
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

Exova Number: 1239814-9

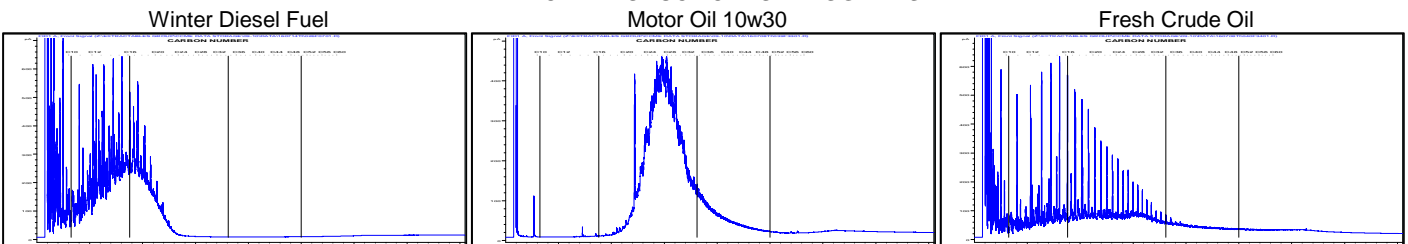
Sample Description: NMPlot4-02-HC

Silica Gel Treated

Sample Date: Nov 10, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

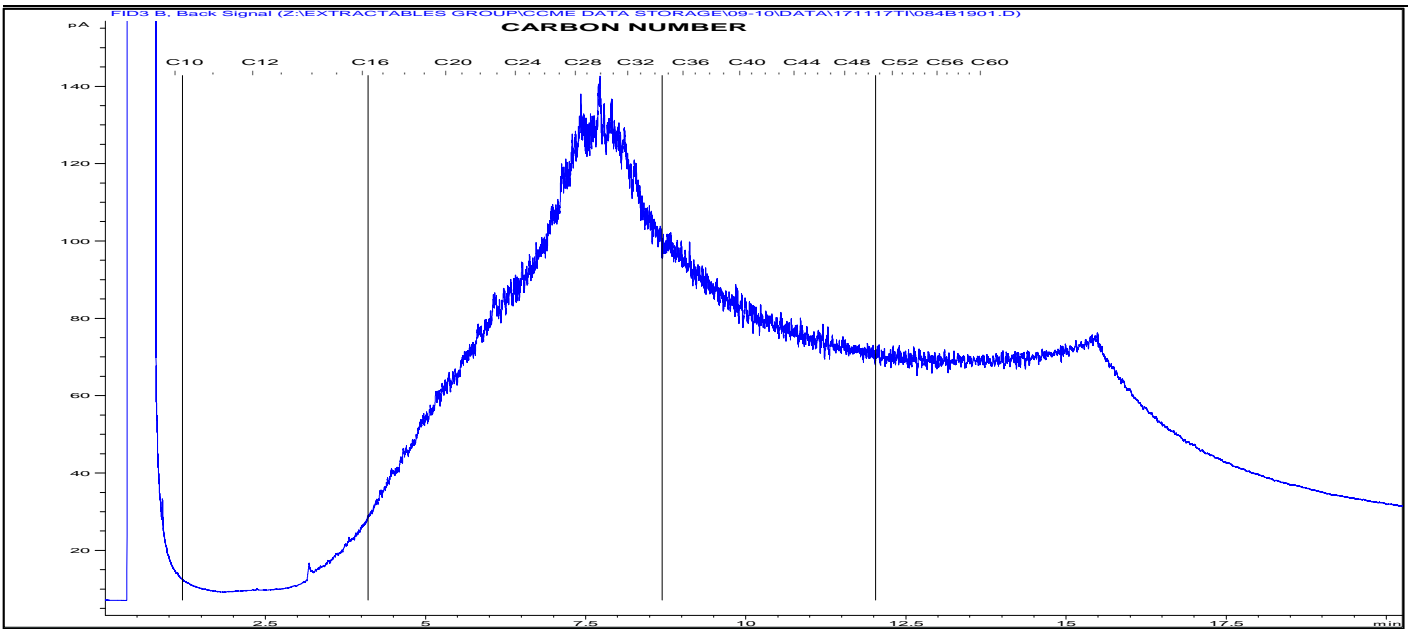
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

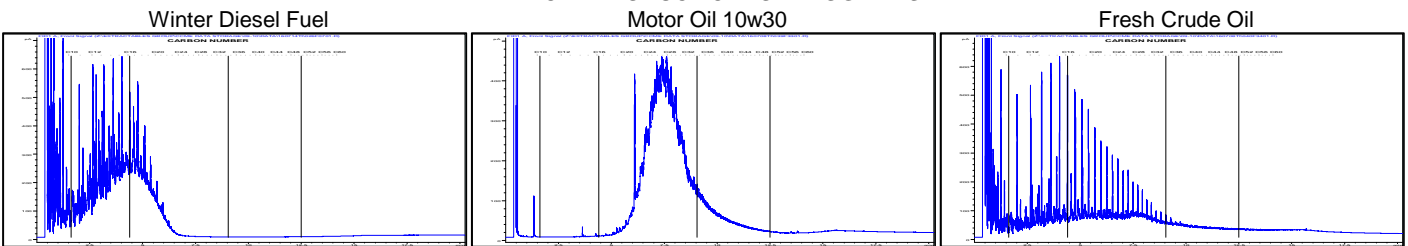
Exova Number: 1239814-10
 Sample Date: Nov 10, 2017

Sample Description: NMPlot4-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

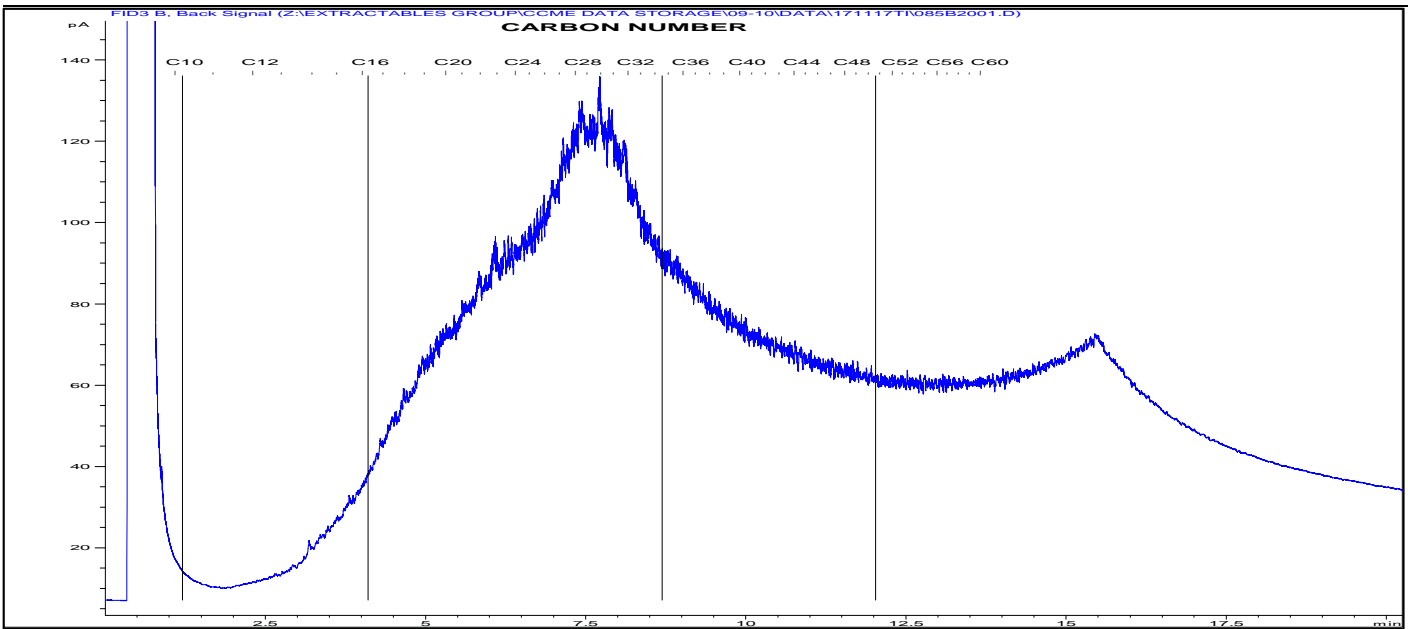
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

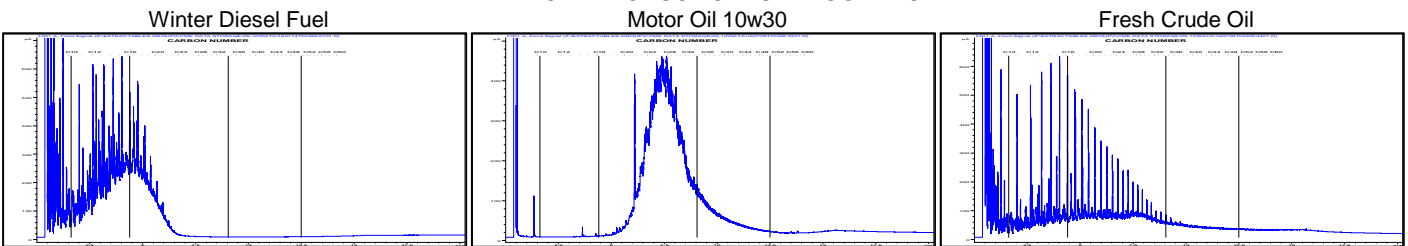
Exova Number: 1239814-11
 Sample Date: Nov 10, 2017

Sample Description: NMPlot4-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

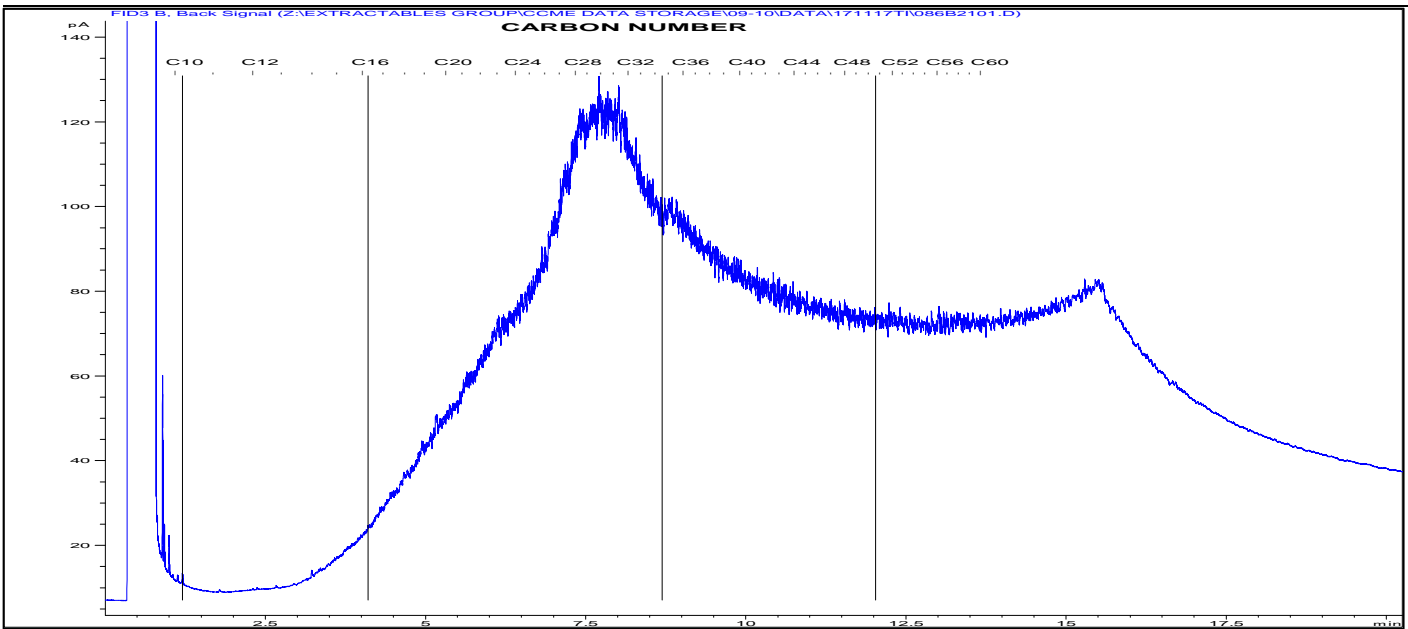
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

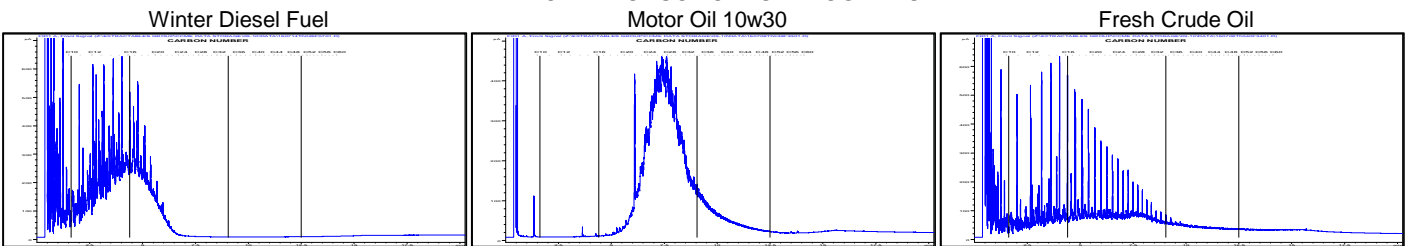
Exova Number: 1239814-17
 Sample Date: Nov 11, 2017

Sample Description: NMPlot13-02-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

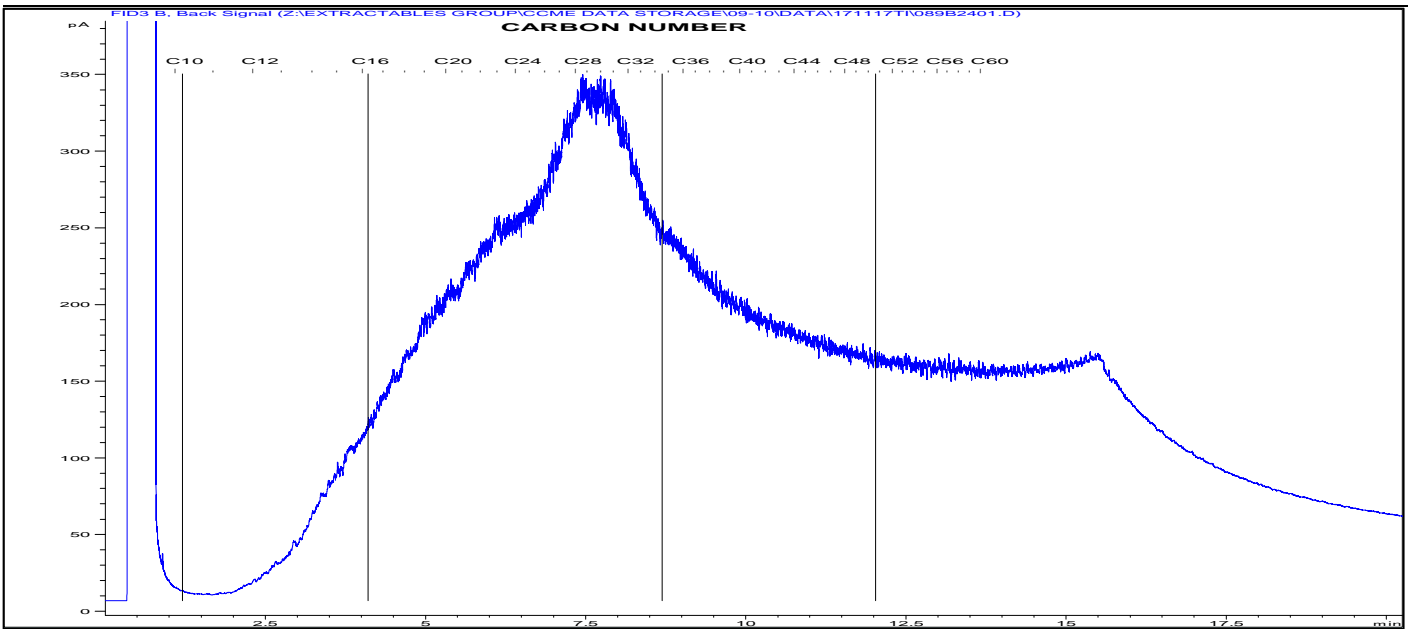
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

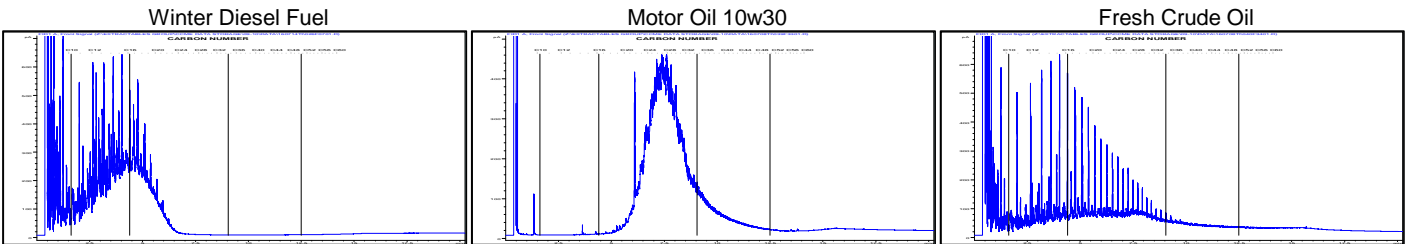
Exova Number: 1239814-18
 Sample Date: Nov 11, 2017

Sample Description: NMPlot13-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

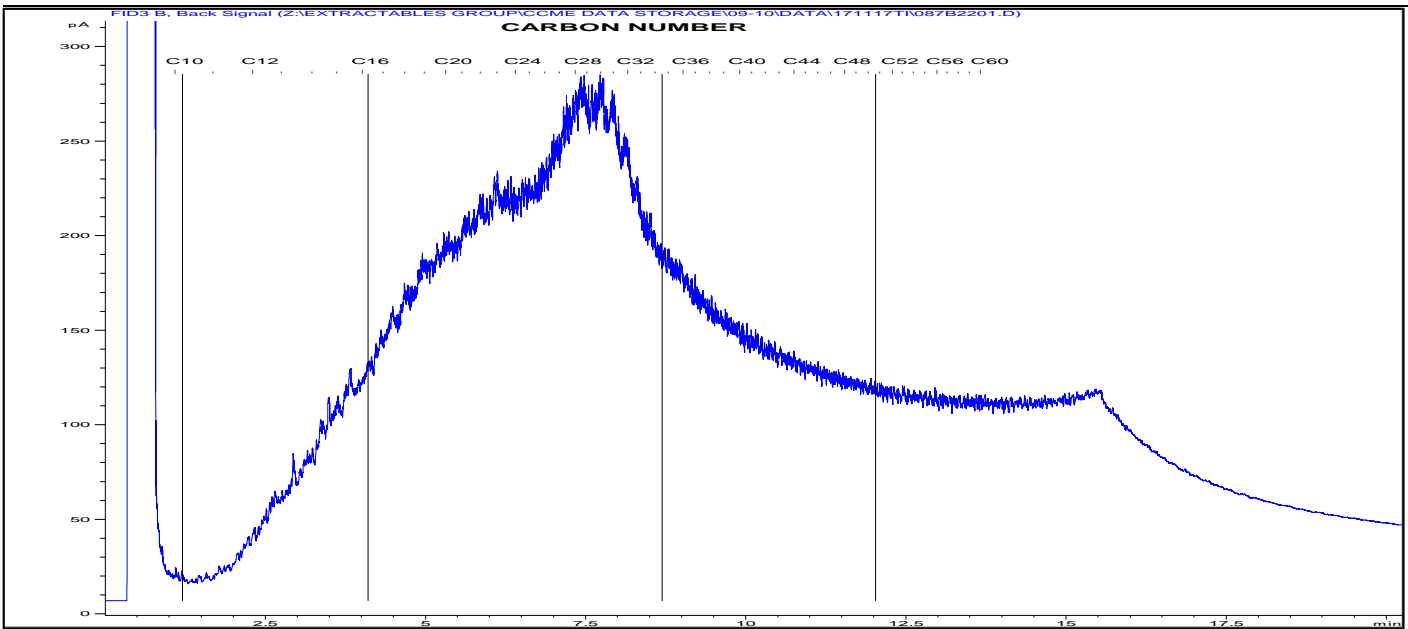
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

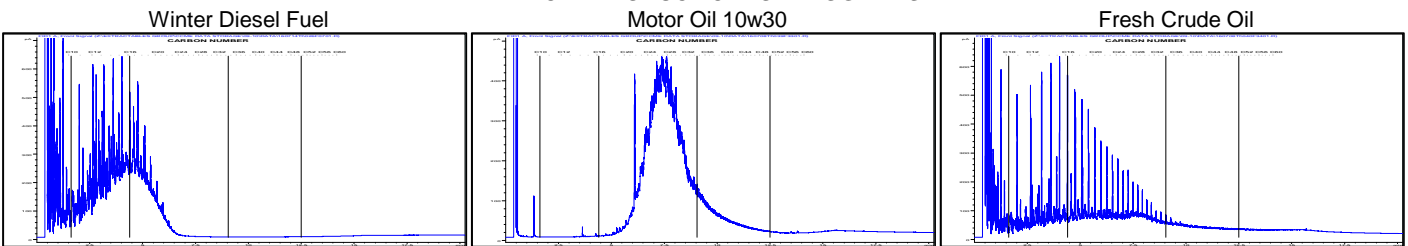
Exova Number: 1239814-19
 Sample Date: Nov 11, 2017

Sample Description: NMPlot13-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

	Reference Number	1239814-1	1239814-2	1239814-3		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	NMPlot14-02-HC	NMPlot14-03-HC	NMPlot14-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	132	736	50
F3c C16-C34	Dry Weight	mg/kg	1100	2640	4930	50
F4c C34-C50	Dry Weight	mg/kg	855	1580	2450	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	1760	3500	5350	100
% C50+	%		22.7	21.5	18.2	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	16.00	11.00	11.40	



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

	Reference Number	1239814-4	1239814-5	1239814-12		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	313 CM3 / NMPlot14-02-BD1	313 CM3 / NMPlot14-02-BD2	313cm3 / NMPlot4- 02-BD1		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	19	17	19	0.1
Bulk Density		kg/L	0.70	0.78	1.0	
Bulk Density		kg/m ³	700	780	1000	
Wet Bulk Density		kg/L	0.86	0.93	1.24	
Porosity		%	na	na	62	
Volume	Declared Value	mL	313	313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Sampled By: C.K. Company: Paragon		

		Reference Number	1239814-6	1239814-7	1239814-8	
		Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	NMPlot14-02-AN	NMPlot14-03-AN	NMPlot14-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.95	1.96	3.15	0.01
SAR	Saturated Paste		2.5	2.4	2.1	
% Saturation		%	60	48	42	
Calcium	Saturated Paste	mg/kg	133	111	237	
Magnesium	Saturated Paste	mg/kg	45.9	35.0	56.6	
Sodium	Saturated Paste	mg/kg	102	80	91	
Potassium	Saturated Paste	mg/kg	6	5	9	
Chloride	Saturated Paste	mg/kg	8	5	3	
Sulfate (SO4)	Saturated Paste	mg/kg	594	511	952	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.6	7.5	7.5	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

	Reference Number	1239814-9	1239814-10	1239814-11		
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	NMPlot4-02-HC	NMPlot4-03-HC	NMPlot4-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	102	172	50
F3c C16-C34	Dry Weight	mg/kg	1370	2200	2250	50
F4c C34-C50	Dry Weight	mg/kg	1180	1480	1300	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	2620	3560	3260	100
% C50+	%		26.8	25.8	24.7	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	10.60	8.51	7.10	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

	Reference Number	1239814-13	1239814-20	1239814-21		
	Sample Date	Nov 10, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	10:00	14:00	14:00		
	Sample Location					
	Sample Description	313cm3 / NMPlot4-02-BD2	313cm3 / NMPlot13-02-BD1	313cm3 / NMPlot13-02-BD2		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	9.5	15	11	0.1
Bulk Density		kg/L	1.13	0.94	1.1	
Bulk Density		kg/m ³	1130	940	1100	
Wet Bulk Density		kg/L	1.25	1.11	1.20	
Porosity		%	57	na	60	
Volume	Declared Value	mL	313	313	313	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

		Reference Number	1239814-14	1239814-15	1239814-16	
		Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	NMPlot4-02-AN	NMPlot4-03-AN	NMPlot4-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.80	2.74	3.25	0.01
SAR	Saturated Paste		<0.1	0.2	0.8	
% Saturation		%	51	51	39	
Calcium	Saturated Paste	mg/kg	195	320	222	
Magnesium	Saturated Paste	mg/kg	31.1	74.4	102	
Sodium	Saturated Paste	mg/kg	4	14	34	
Potassium	Saturated Paste	mg/kg	7	7	11	
Chloride	Saturated Paste	mg/kg	4	4	4	
Sulfate (SO4)	Saturated Paste	mg/kg	415	1010	948	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.5	7.4	7.7	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

	Reference Number	1239814-17	1239814-18	1239814-19		
	Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017		
	Sample Time	14:00	14:00	14:00		
	Sample Location					
	Sample Description	NMPlot13-02-HC	NMPlot13-03-HC	NMPlot13-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	91	632	975	50
F3c C16-C34	Dry Weight	mg/kg	2010	6500	5770	50
F4c C34-C50	Dry Weight	mg/kg	1570	3700	2790	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	4030	8990	6490	100
% C50+	%		30.2	23.4	19.5	
Silica Gel Cleanup						
Silica Gel Cleanup			Done	Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	12.40	5.81	12.30	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

		Reference Number	1239814-22	1239814-23	1239814-24	
		Sample Date	Nov 11, 2017	Nov 11, 2017	Nov 11, 2017	
		Sample Time	14:00	14:00	14:00	
		Sample Location				
		Sample Description	NMPlot13-02-AN	NMPlot13-03-AN	NMPlot13-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.22	1.34	2.99	0.01
SAR	Saturated Paste		0.3	0.3	0.5	
% Saturation		%	58	45	42	
Calcium	Saturated Paste	mg/kg	107	92.0	243	
Magnesium	Saturated Paste	mg/kg	36.2	31.0	90.5	
Sodium	Saturated Paste	mg/kg	9	9	26	
Potassium	Saturated Paste	mg/kg	9	6	11	
Chloride	Saturated Paste	mg/kg	10	6	6	
Sulfate (SO4)	Saturated Paste	mg/kg	124	283	928	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.1	7.0	7.2	

Approved by: 
Nathan Brilz, Chem. Technologist
Client Service Representative

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon		

Extractable Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	0	-10	10	yes
F3c C16-C34	µg/mL	0	-30	30	yes
F4c C34-C50	µg/mL	0	-20	20	yes
F4HTGCc C34-C50+	µg/mL	0	-20	20	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	105.92	80	120	yes
F3c C16-C34	µg/mL	111.61	80	120	yes
F4c C34-C50	µg/mL	104.79	80	120	yes
F4HTGCc C34-C50+	µg/mL	100.56	80	120	yes

Date Acquired: November 17, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	-0.0032	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.005	0.005	yes
Toluene	ng	0	-0.06	0.06	yes
Ethylbenzene	ng	0	-0.030	0.030	yes
Total Xylenes (m,p,o)	ng	0	-0.09	0.09	yes
Styrene	ng	0	-0.030	0.030	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	87.40	80	120	yes
Toluene	ng	100.80	80	120	yes
Ethylbenzene	ng	104.00	80	120	yes
Total Xylenes (m,p,o)	ng	118.67	80	120	yes
Styrene	ng	113.80	80	120	yes

Date Acquired: November 17, 2017

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	29	29	10	0.3	yes

Date Acquired: November 20, 2017

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0563	-0.4	0.5	yes
Magnesium	mg/L	0.0269	-0.1	0.1	yes
Sodium	mg/L	0.0086	-0	2	yes

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
---	--	--

Salinity - Continued

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Potassium	mg/L	-0.0166	-0.5	0.7	yes
Chloride	mg/L	2.7414	0	5	yes
Sulfate-S	mg/L	0.0111	-0	1	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.5	8.0	yes
Electrical Conductivity	dS/m	3.01	2.71	3.25	yes
% Saturation	%	45	38	52	yes
Calcium	mg/L	663	596.2	767.8	yes
Magnesium	mg/L	140	121.8	154.8	yes
Sodium	mg/L	74	58	79	yes
Potassium	mg/L	20	17.8	24.6	yes
Chloride	mg/L	70	57	78	yes
Sulfate-S	mg/L	641	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.3	26.80	35.20	yes
Calcium	mg/L	244	230.2	261.4	yes
Magnesium	mg/L	94.7	92.7	99.7	yes
Sodium	mg/L	241	229	269	yes
Chloride	mg/L	2040	1871	2231	yes
Sulfate-S	mg/L	145	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.4	6.6	0	0.3	yes

Date Acquired: November 21, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 21, 2017

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	0	-10	10	yes

Date Acquired: November 17, 2017

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1 Attn: Marty Yarmuch Sampled By: C.K. Company: Paragon	Project ID: 17-152 Project Name: Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239814 Control Number: C0056631 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2244025
---	--	--

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME - Soil	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary
BTEX-CCME - Soil	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Calgary
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl ₂ (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 21, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME-Soil (Shake)	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary

** Reference Method Modified*

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Hydrocarbon Chromatogram

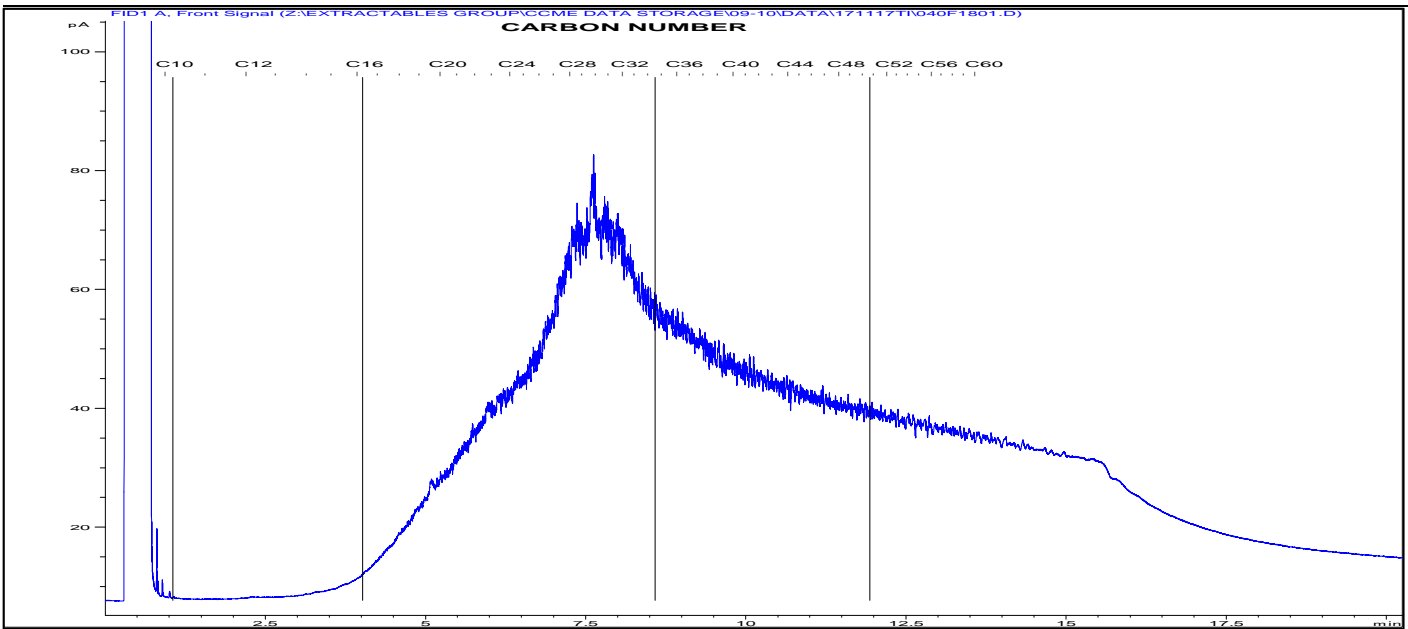
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

Exova Number: 1239814-1

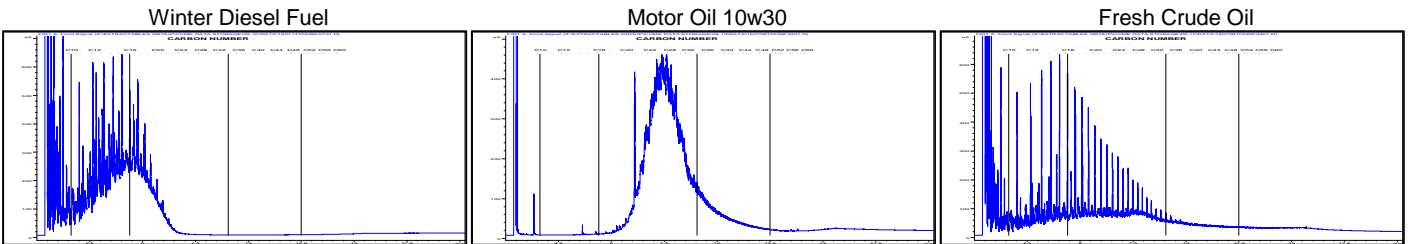
Sample Description: NMPlot14-02-HC

Sample Date: Nov 11, 2017

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

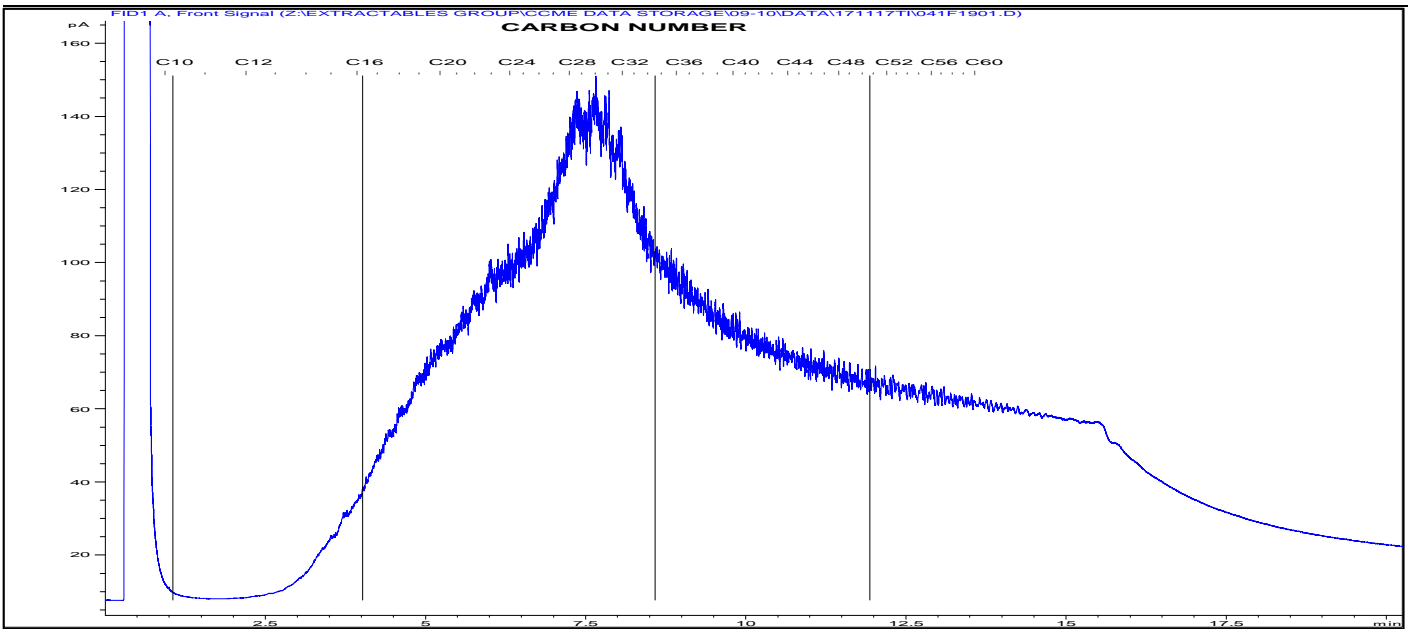
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

Exova Number: 1239814-2

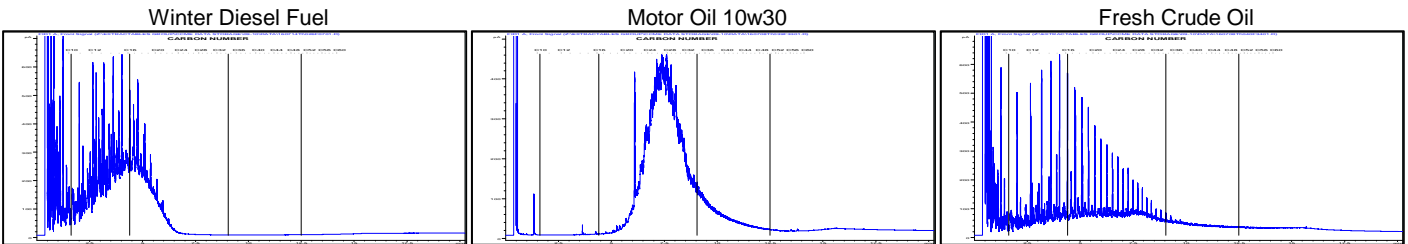
Sample Description: NMPlot14-03-HC

Silica Gel Treated

Sample Date: Nov 11, 2017



TYPICAL PRODUCT CHROMATOGRAMS



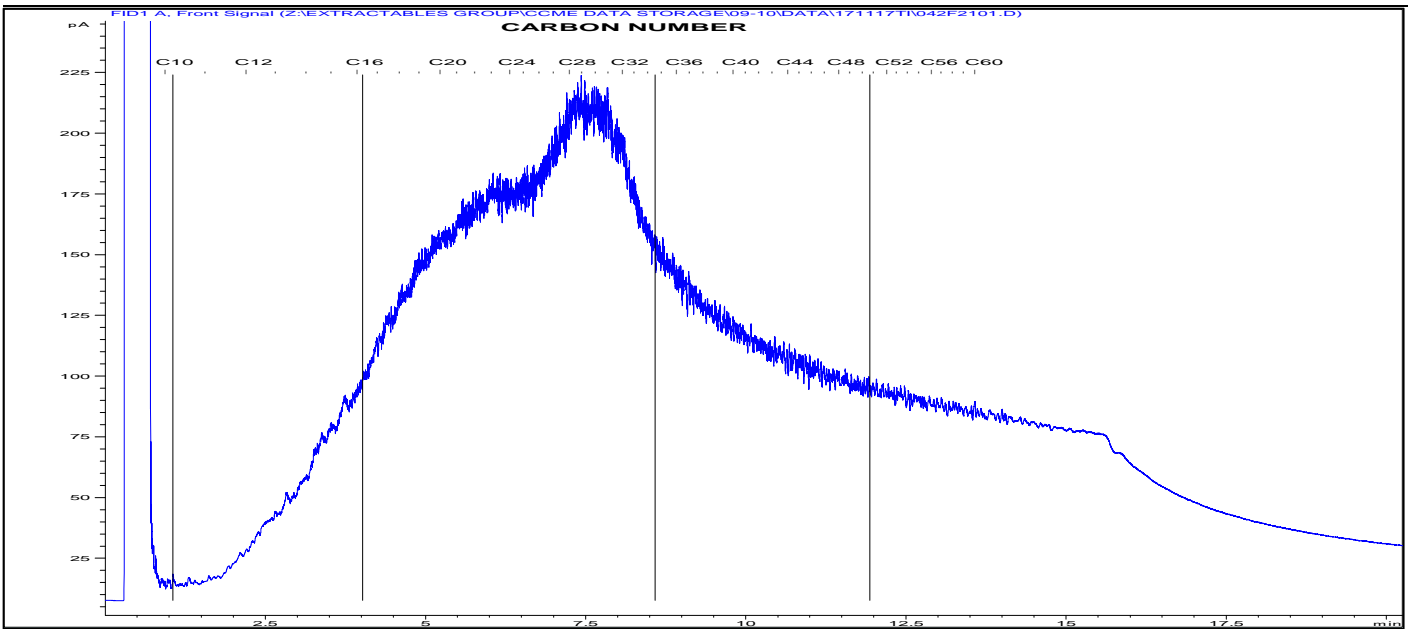
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

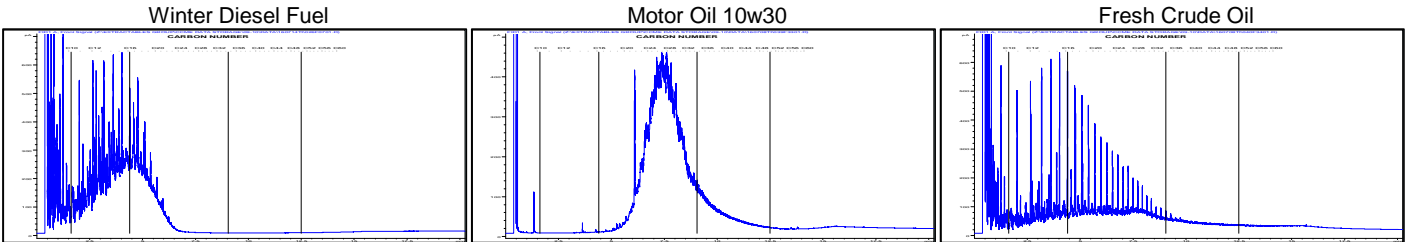
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

Exova Number: 1239814-3 Sample Description: NMPlot14-04-HC Silica Gel Treated
 Sample Date: Nov 11, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

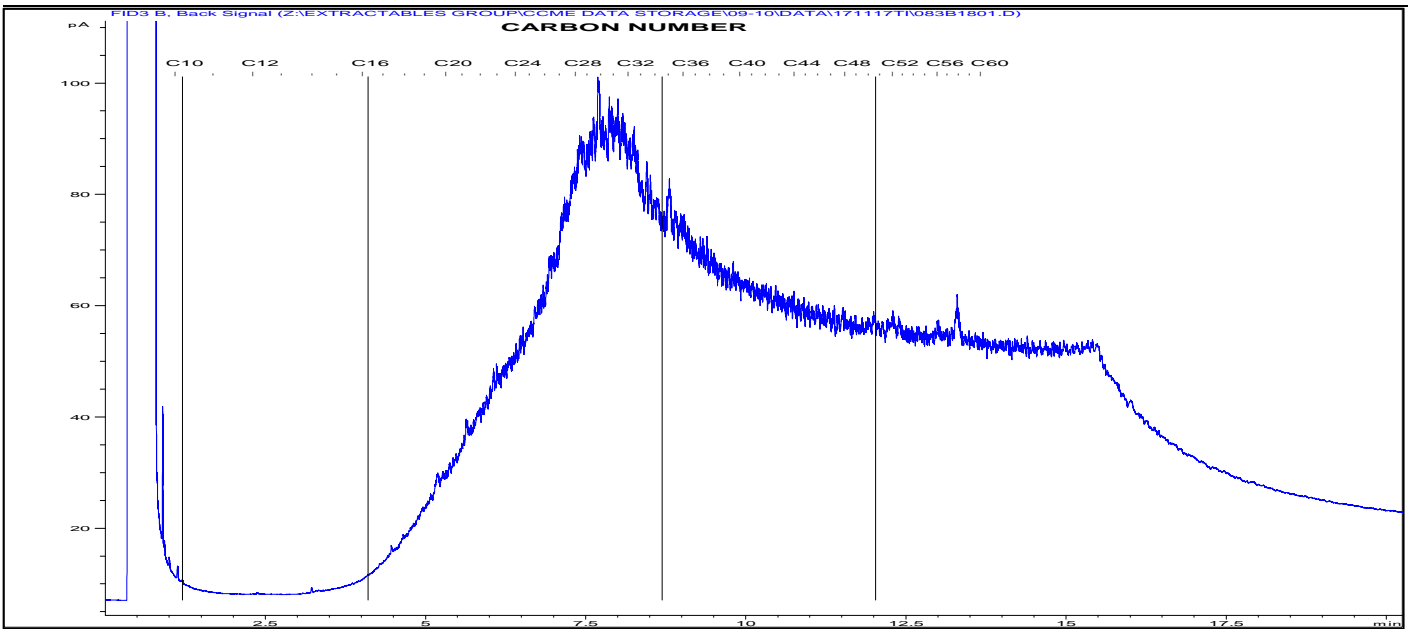
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

Exova Number: 1239814-9

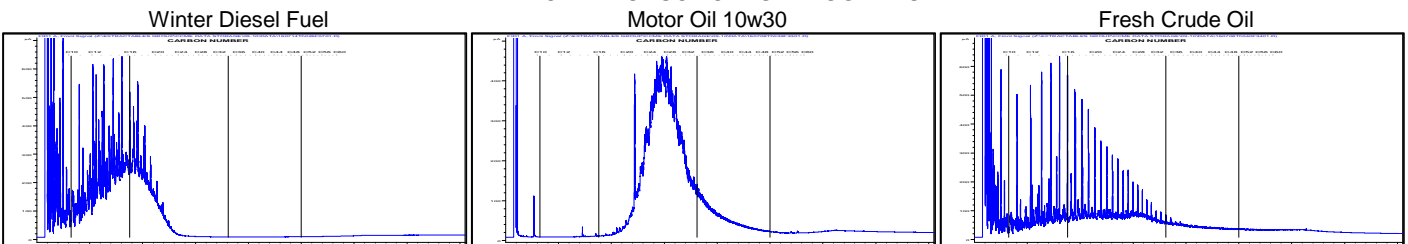
Sample Description: NMPlot4-02-HC

Silica Gel Treated

Sample Date: Nov 10, 2017



TYPICAL PRODUCT CHROMATOGRAMS



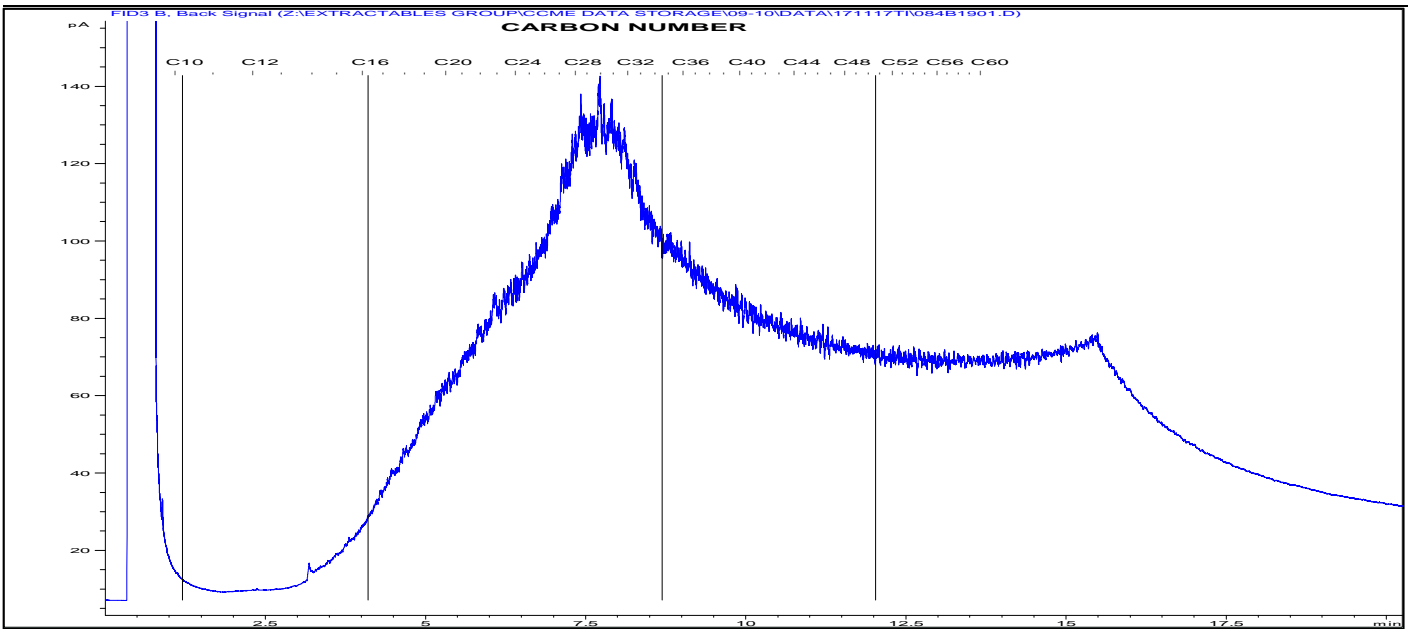
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

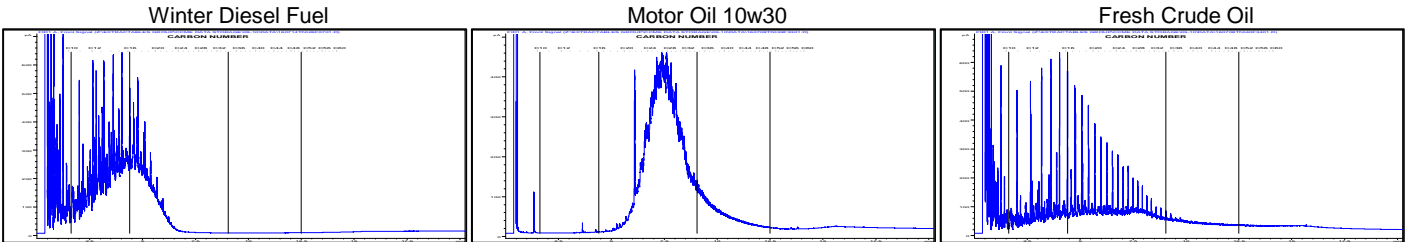
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

Exova Number: 1239814-10 Sample Description: NMPlot4-03-HC Silica Gel Treated
 Sample Date: Nov 10, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

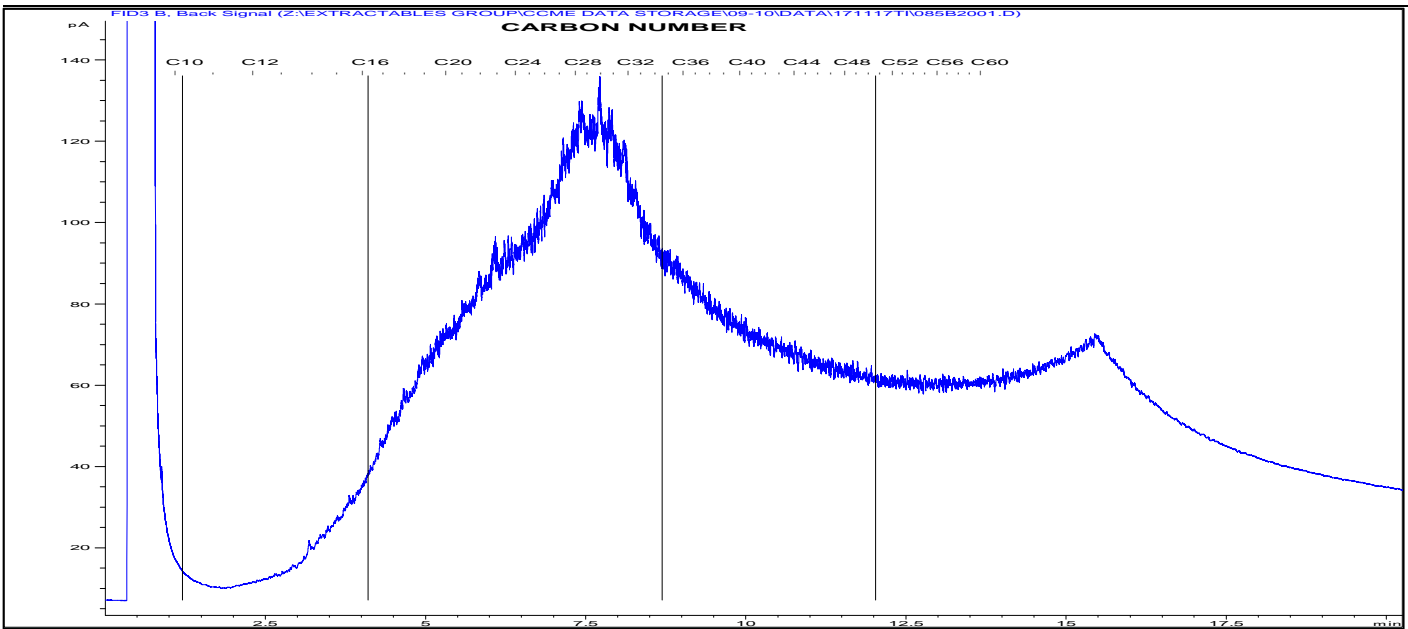
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

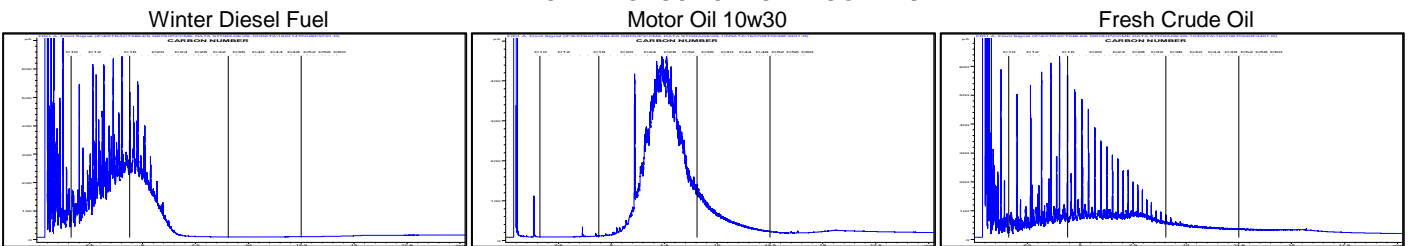
Exova Number: 1239814-11
 Sample Date: Nov 10, 2017

Sample Description: NMPlot4-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



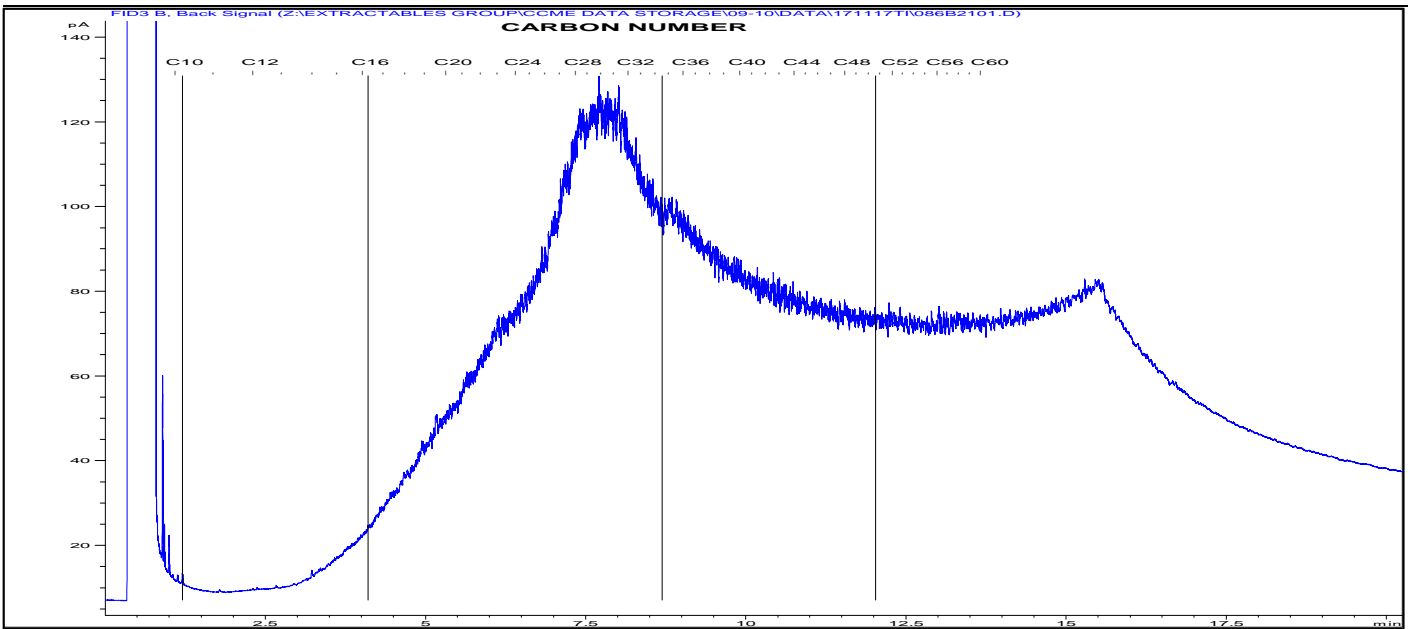
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

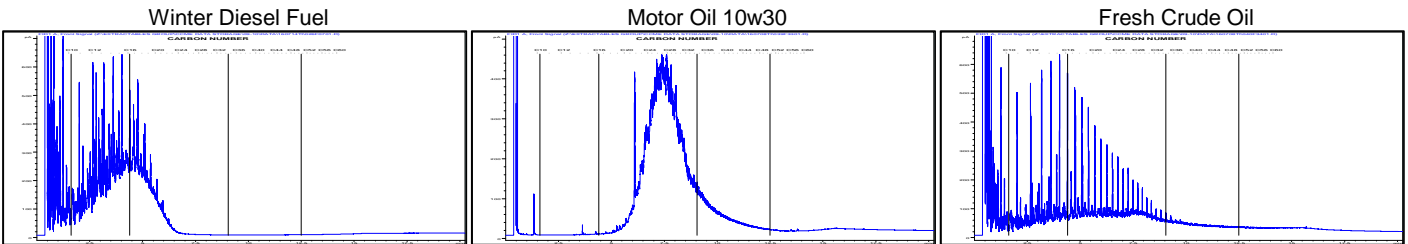
Exova Number: 1239814-17
 Sample Date: Nov 11, 2017

Sample Description: NMPlot13-02-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

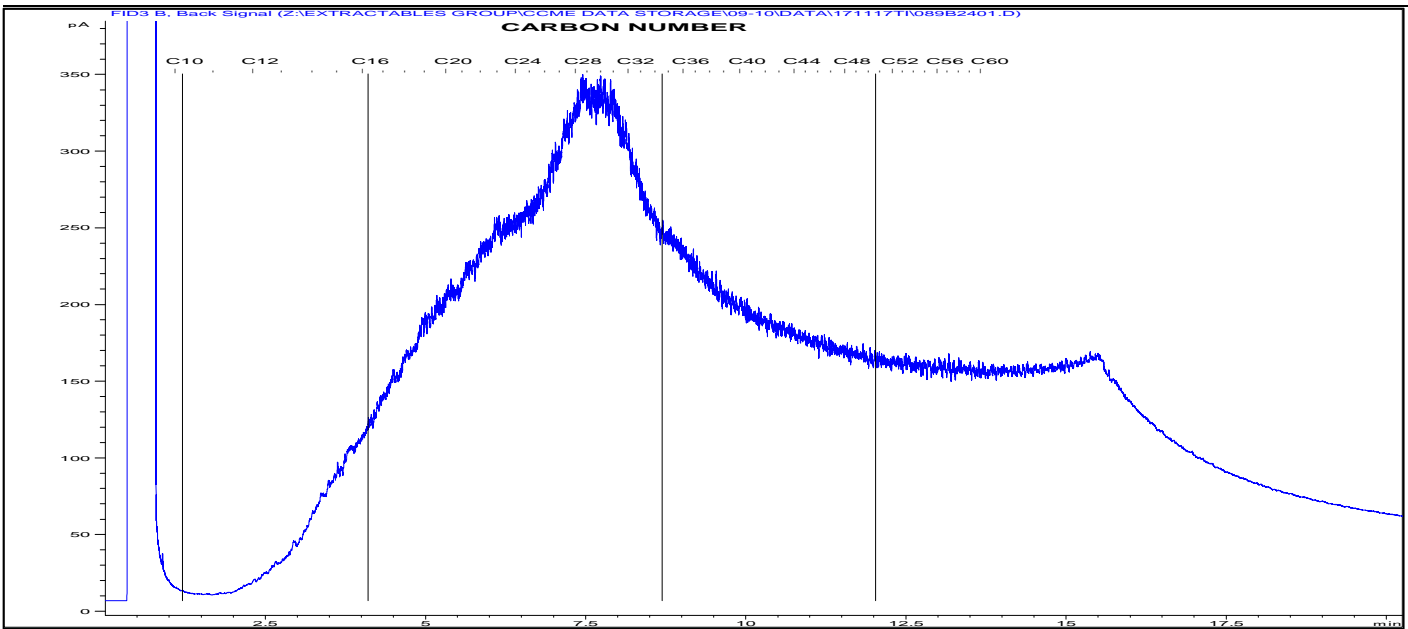
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

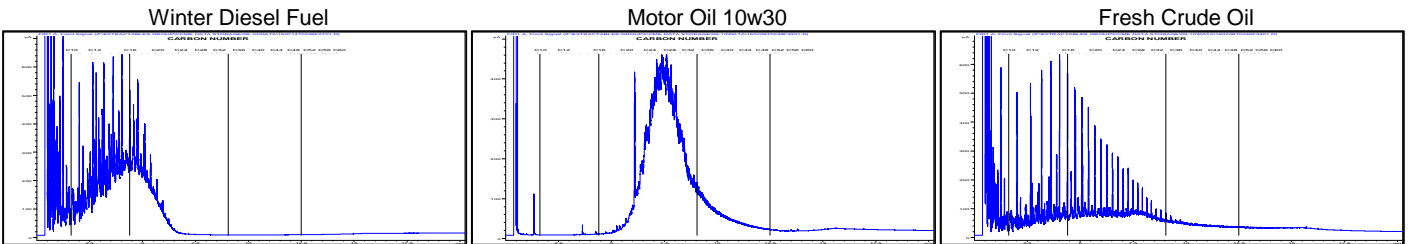
Exova Number: 1239814-18
 Sample Date: Nov 11, 2017

Sample Description: NMPlot13-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

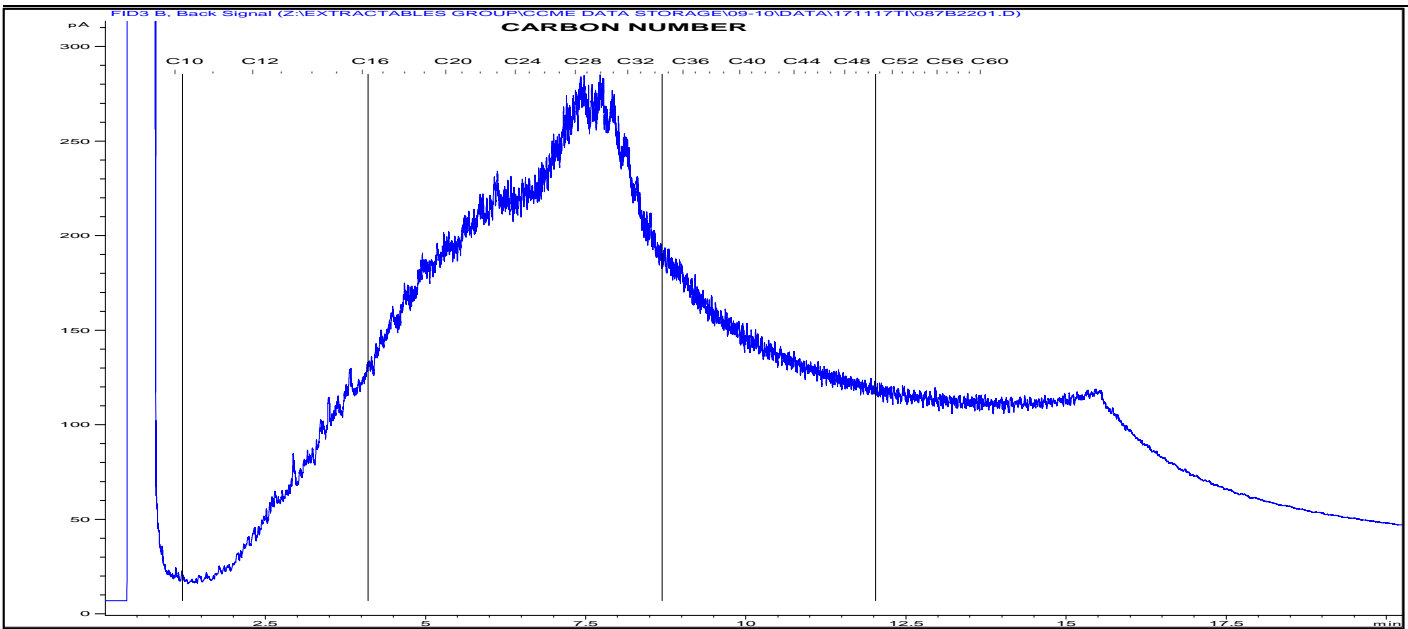
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239814
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name:	Control Number: C0056631
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Base Mine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: C.K.	P.O.: 4410252962	Report Number: 2244025
Company: Paragon		

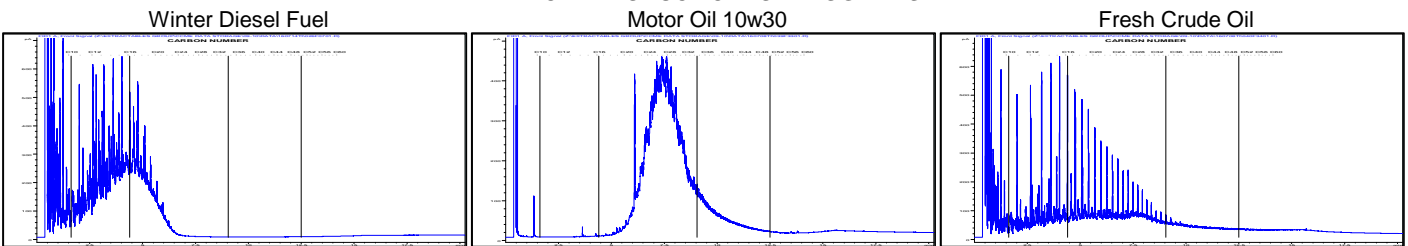
Exova Number: 1239814-19
 Sample Date: Nov 11, 2017

Sample Description: NMPlot13-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239524-1	1239524-2	1239524-3	
		Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017	
		Sample Time	16:00	16:00	16:00	
		Sample Location				
		Sample Description	DSEExtra3-02-AN	DSEExtra3-03-AN	DSEExtra3-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.37	2.98	3.24	0.01
SAR	Saturated Paste		0.1	0.3	0.3	
% Saturation		%	235	192	53	
Calcium	Saturated Paste	mg/kg	625	1240	377	
Magnesium	Saturated Paste	mg/kg	102	302	87.3	
Sodium	Saturated Paste	mg/kg	23	71	20	
Potassium	Saturated Paste	mg/kg	18	<19	6	
Chloride	Saturated Paste	mg/kg	21	18	8	
Sulfate (SO ₄)	Saturated Paste	mg/kg	1490	3470	1030	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl ₂ sol.	pH	6.9	7.3	7.6	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239524-4	1239524-5	1239524-6		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	16:00	16:00	16:00		
	Sample Location					
	Sample Description	DSEExtra3-02-HC	DSEExtra3-03-HC	DSEExtra3-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	65	50
F3c C16-C34	Dry Weight	mg/kg	511	1210	2280	50
F4c C34-C50	Dry Weight	mg/kg	435	913	1670	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	976	2020	4220	100
% C50+	%		26.8	24.9	28.8	
Silica Gel Cleanup						
Silica Gel Cleanup			Done	Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	34.40	24.80	13.40	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239524-7	1239524-8	1239524-15		
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 10, 2017		
	Sample Time	16:00	16:00	10:00		
	Sample Location					
	Sample Description	DSExtra3-02-BD1 / 298CM3	DSExtra3-02-BD2 / 298CM3	DSPlot7-02-BD1 / 298CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	39	39	31.8	0.1
Bulk Density		kg/L	0.53	0.46	0.66	
Bulk Density		kg/m³	530	460	659	
Wet Bulk Density		kg/L	0.87	0.75	0.97	
Porosity		%	na	na	na	
Volume	Declared Value	mL	298	298	298	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239524-9	1239524-10	1239524-11	
		Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017	
		Sample Time	10:00	10:00	10:00	
		Sample Location				
		Sample Description	DSPlot7-02-AN	DSPlot7-03-AN	DSPlot7-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.89	2.74	2.68	0.01
SAR	Saturated Paste		0.2	0.7	0.5	
% Saturation		%	157	46	44	
Calcium	Saturated Paste	mg/kg	245	273	266	
Magnesium	Saturated Paste	mg/kg	58.9	54.4	52.9	
Sodium	Saturated Paste	mg/kg	16	31	24	
Potassium	Saturated Paste	mg/kg	11	<5	7	
Chloride	Saturated Paste	mg/kg	21	16	5	
Sulfate (SO4)	Saturated Paste	mg/kg	504	845	854	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	6.9	7.4	7.7	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239524-12	1239524-13	1239524-14		
	Sample Date	Nov 10, 2017	Nov 10, 2017	Nov 10, 2017		
	Sample Time	10:00	10:00	10:00		
	Sample Location					
	Sample Description	DSPlot7-02-HC	DSPlot7-03-HC	DSPlot7-04-HC		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil						
Methanol Field Preservation		No	No	No		
F1 C6-C10	Dry Weight	mg/kg	15	<10	30	10
F1 -BTEX	Dry Weight	mg/kg	15	<10	30	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17	
F2c C10-C16	Dry Weight	mg/kg	<50	<50	1250	50
F3c C16-C34	Dry Weight	mg/kg	873	1150	7470	50
F4c C34-C50	Dry Weight	mg/kg	771	935	4040	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	1710	2080	10500	100
% C50+	%		27.2	26.0	24.2	
Silica Gel Cleanup						
Silica Gel Cleanup		Done	Done	Done		
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	30.70	8.69	8.19	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239524-16	1239524-23	1239524-24		
	Sample Date	Nov 10, 2017	Nov 13, 2017	Nov 13, 2017		
	Sample Time	10:00	08:00	08:00		
	Sample Location					
	Sample Description	DSPlot7-02-BD2 / 298CM3	DSPlot9-02-BDI / 298CM3	DSPlot9-02-BD2 / 298CM3		
	Matrix	Soil	Soil	Soil		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Physical and Aggregate Properties						
Moisture	Wet Weight @ 105°C	%	19	15	22	0.1
Bulk Density		kg/L	0.81	0.96	0.90	
Bulk Density		kg/m³	810	960	900	
Wet Bulk Density		kg/L	1.00	1.14	1.14	
Porosity		%	na	na	na	
Volume	Declared Value	mL	298	298	298	

Analytical Report


Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

		Reference Number	1239524-17	1239524-18	1239524-19	
		Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017	
		Sample Time	08:00	08:00	08:00	
		Sample Location				
		Sample Description	DSPlot9-02-AN	DSPlot9-03-AN	DSPlot9-04-AN	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	2.79	2.53	2.55	0.01
SAR	Saturated Paste		0.3	0.2	0.2	
% Saturation		%	73	47	49	
Calcium	Saturated Paste	mg/kg	459	283	290	
Magnesium	Saturated Paste	mg/kg	102	52.6	66.1	
Sodium	Saturated Paste	mg/kg	21	11	11	
Potassium	Saturated Paste	mg/kg	9	5	10	
Chloride	Saturated Paste	mg/kg	10	5	3	
Sulfate (SO4)	Saturated Paste	mg/kg	1380	860	928	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.4	7.7	7.7	

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

	Reference Number	1239524-20	1239524-21	1239524-22	
	Sample Date	Nov 13, 2017	Nov 13, 2017	Nov 13, 2017	
	Sample Time	08:00	08:00	08:00	
	Sample Location				
	Sample Description	DSPlot9-02-HC	DSPlot9-03-HC	DSPlot9-04-HC	
	Matrix	Soil	Soil	Soil	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil					
Benzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03	<0.03	0.03
Volatile Petroleum Hydrocarbons - Soil					
Methanol Field Preservation		No	No	No	
F1 C6-C10	Dry Weight	mg/kg	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil					
Extraction Date	Total Extractables		17-Nov-17	17-Nov-17	17-Nov-17
F2c C10-C16	Dry Weight	mg/kg	65	500	187
F3c C16-C34	Dry Weight	mg/kg	2530	5910	1770
F4c C34-C50	Dry Weight	mg/kg	2110	3200	836
F4HTGCc C34-C50+	Dry Weight	mg/kg	5490	6760	2020
% C50+	%		31.8	18.7	20.6
Silica Gel Cleanup					
Silica Gel Cleanup			Done	Done	Done
Soil % Moisture					
Moisture	Soil % Moisture	% by weight	14.10	8.14	5.33

Approved by: 
Randy Neumann, BSc
Vice President

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Extractable Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	0	-10	10	yes
F3c C16-C34	µg/mL	0	-30	30	yes
F4c C34-C50	µg/mL	0	-20	20	yes
F4HTGCc C34-C50+	µg/mL	0	-20	20	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	105.52	80	120	yes
F3c C16-C34	µg/mL	108.46	80	120	yes
F4c C34-C50	µg/mL	94.07	80	120	yes
F4HTGCc C34-C50+	µg/mL	90.70	80	120	yes

Date Acquired: November 17, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F2c C10-C16	mg/kg	<50	<50	50	10	yes
F3c C16-C34	mg/kg	1210	1280	50	10	yes
F4c C34-C50	mg/kg	913	927	50	10	yes
F4HTGCc C34-C50+	mg/kg	2020	2170	50	10	yes

Date Acquired: November 17, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	mg/kg	86	70	130	yes
F3c C16-C34	mg/kg	114	70	130	yes
F4c C34-C50	mg/kg	113	70	130	yes
F4HTGCc C34-C50+	mg/kg	120	70	130	yes

Date Acquired: November 17, 2017

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0016	-0.05	0.07	yes

Date Acquired: November 17, 2017

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.005	0.005	yes
Toluene	ng	0	-0.06	0.06	yes
Ethylbenzene	ng	0	-0.030	0.030	yes
Total Xylenes (m,p,o)	ng	0	-0.09	0.09	yes
Styrene	ng	0	-0.030	0.030	yes

Date Acquired: November 17, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	98.20	80	120	yes
Toluene	ng	101.40	80	120	yes
Ethylbenzene	ng	97.20	80	120	yes
Total Xylenes (m,p,o)	ng	108.67	80	120	yes
Styrene	ng	115.00	80	120	yes

Quality Control

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Mono-Aromatic Hydrocarbons - Soil - Continued

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Date Acquired:	November 17, 2017				

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Moisture	%	29	30	10	0.3	yes
Date Acquired:	November 20, 2017					

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	-0.1619	-0.4	0.5	yes
Magnesium	mg/L	-0.0096	-0.1	0.1	yes
Sodium	mg/L	-0.0842	-0	2	yes
Potassium	mg/L	-0.2372	-0.5	0.7	yes
Chloride	mg/L	3.4225	0	5	yes
Sulfate-S	mg/L	0.0314	-0	1	yes
Date Acquired:	November 17, 2017				

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Electrical Conductivity	dS/m	3.09	2.71	3.25	yes
% Saturation	%	46	38	52	yes
Calcium	mg/L	646	596.2	767.8	yes
Magnesium	mg/L	138	121.8	154.8	yes
Sodium	mg/L	71	58	79	yes
Potassium	mg/L	19	17.8	24.6	yes
Chloride	mg/L	61	57	78	yes
Sulfate-S	mg/L	581	551	695	yes

Date Acquired: November 17, 2017

Electrical Conductivity	dS/m	32.1	26.80	35.20	yes
Calcium	mg/L	245	230.2	261.4	yes
Magnesium	mg/L	95.5	92.7	99.7	yes
Sodium	mg/L	243	229	269	yes
Potassium	mg/L	243	229.4	265.4	yes
Chloride	mg/L	2040	1871	2231	yes
Sulfate-S	mg/L	148	139	157	yes

Date Acquired: November 17, 2017

Soil Acidity

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	8.4	8.5	0	0.3	yes

Date Acquired: November 17, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.0	6.2	8.4	yes

Date Acquired: November 17, 2017



Quality Control

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
P. O. 4009, MD 0078	Project Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada	Project Location: Suncor Basemine	Date Received: Nov 15, 2017
T9H 3L1	LSD:	Date Reported: Nov 21, 2017
Attn: Marty Yarmuch	P.O.: 4410252962	Report Number: 2243539
Sampled By: Nikki McPhee	Proj. Acct. code: E6687	
Company: Paragon Soil		

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	0	-10	10	yes
Date Acquired: November 17, 2017					

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Basemine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1239524 Control Number: C0056638 Date Received: Nov 15, 2017 Date Reported: Nov 21, 2017 Report Number: 2243539
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon Soil		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME - Soil	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary
BTEX-CCME - Soil	US EPA	* Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Nov 17, 2017	Exova Calgary
Bulk Density of soil	Agronomy No 9, Part 1	* Core Method, 13-2	Nov 17, 2017	Exova Edmonton
Moisture	Carter	* Gravimetric Method with Oven Drying, 51.2	Nov 20, 2017	Exova Edmonton
pH by CaCl ₂ (1:2 ratio) in soil	McKeague	* pH in 0.01M Calcium Chloride, 3.11	Nov 17, 2017	Exova Edmonton
Saturated Paste in General Soil	Carter	* Electrical Conductivity and Soluble Ions, Chapter 15	Nov 17, 2017	Exova Edmonton
TEH-CCME-Soil (Shake)	CCME	* Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Nov 17, 2017	Exova Calgary

** Reference Method Modified*

References

Agronomy No 9, Part 1	Methods of Soil Analysis, Part 1
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

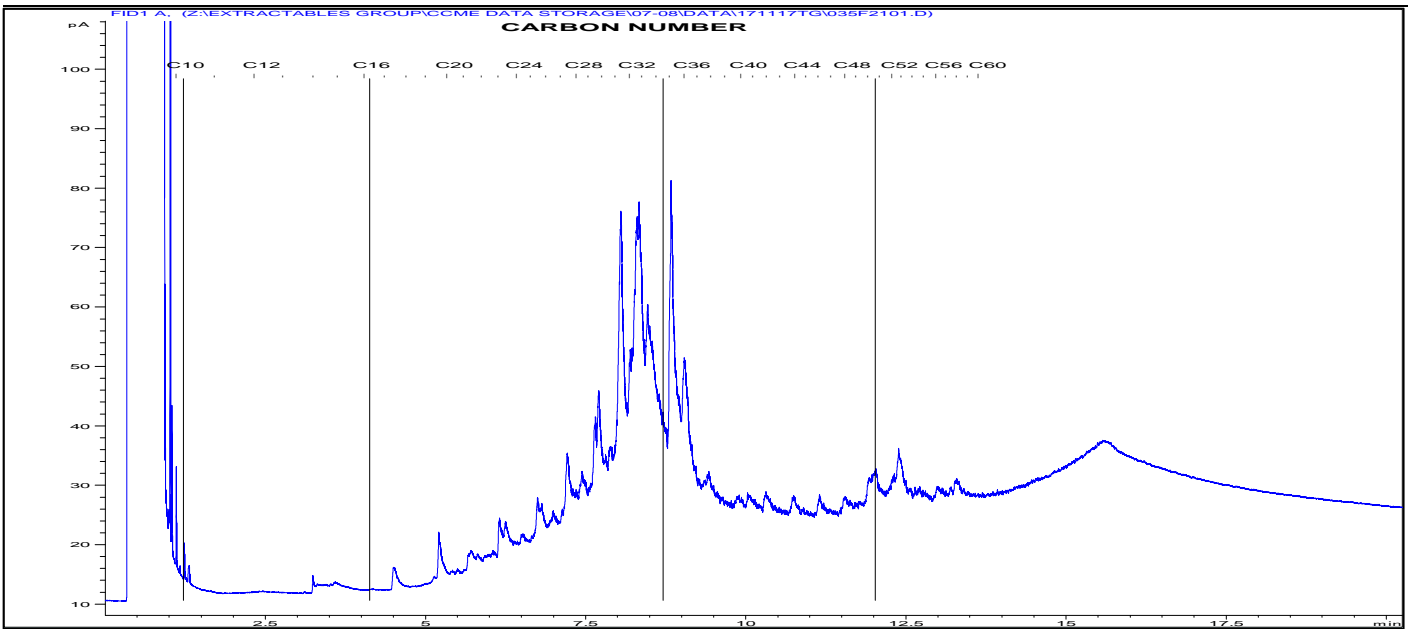
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

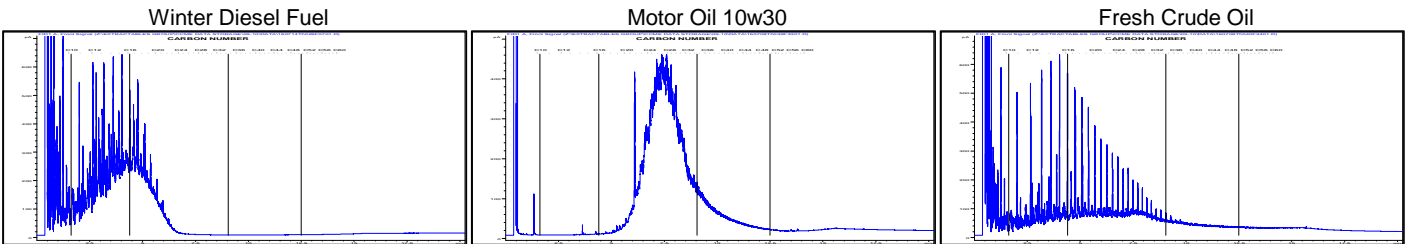
Exova Number: 1239524-4
 Sample Date: Nov 13, 2017

Sample Description: DSExtra3-02-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

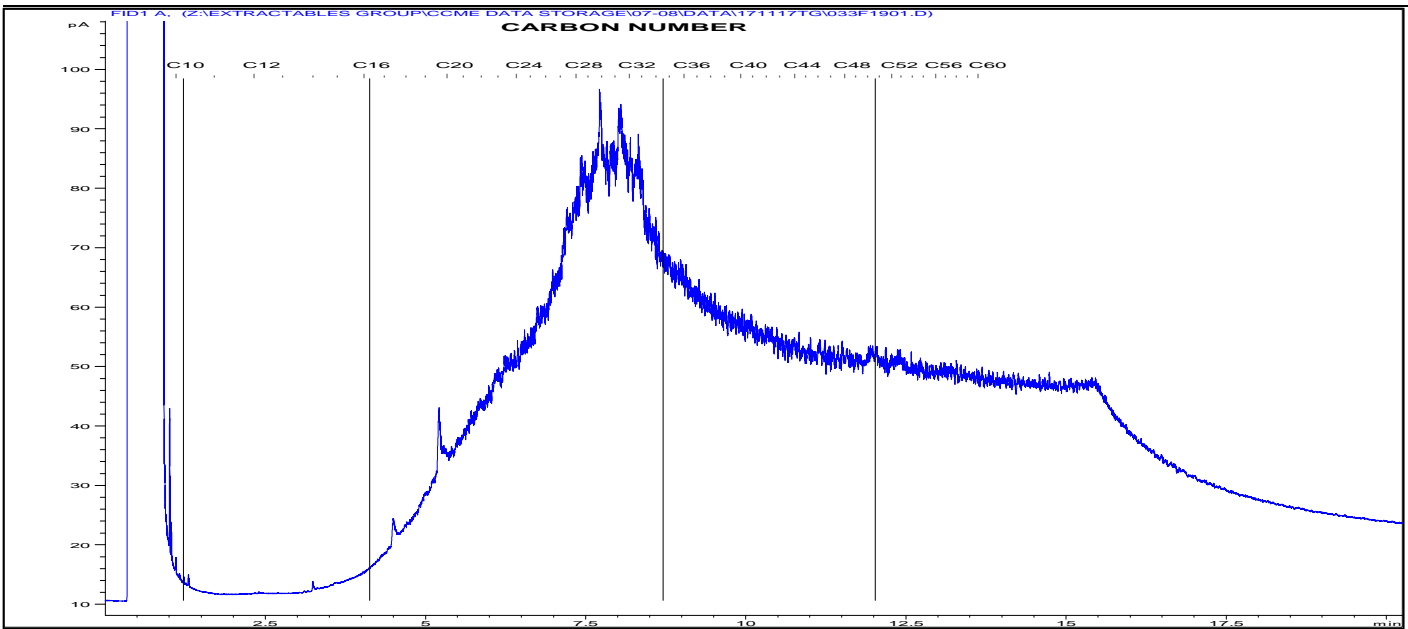
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

Exova Number: 1239524-5

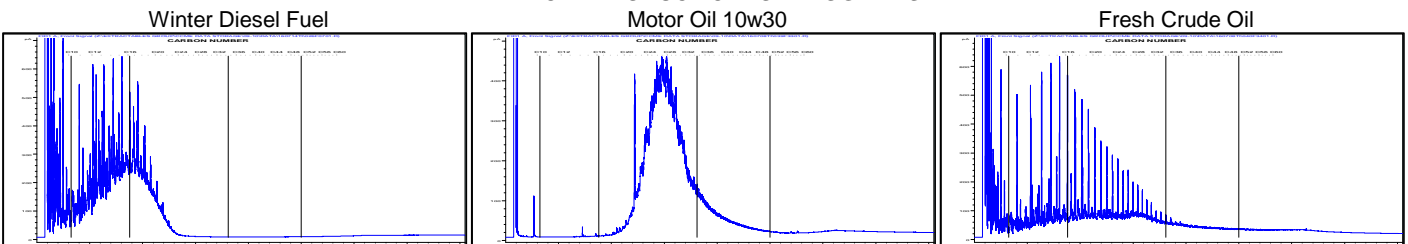
Sample Description: DSEExtra3-03-HC

Silica Gel Treated

Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Hydrocarbon Chromatogram

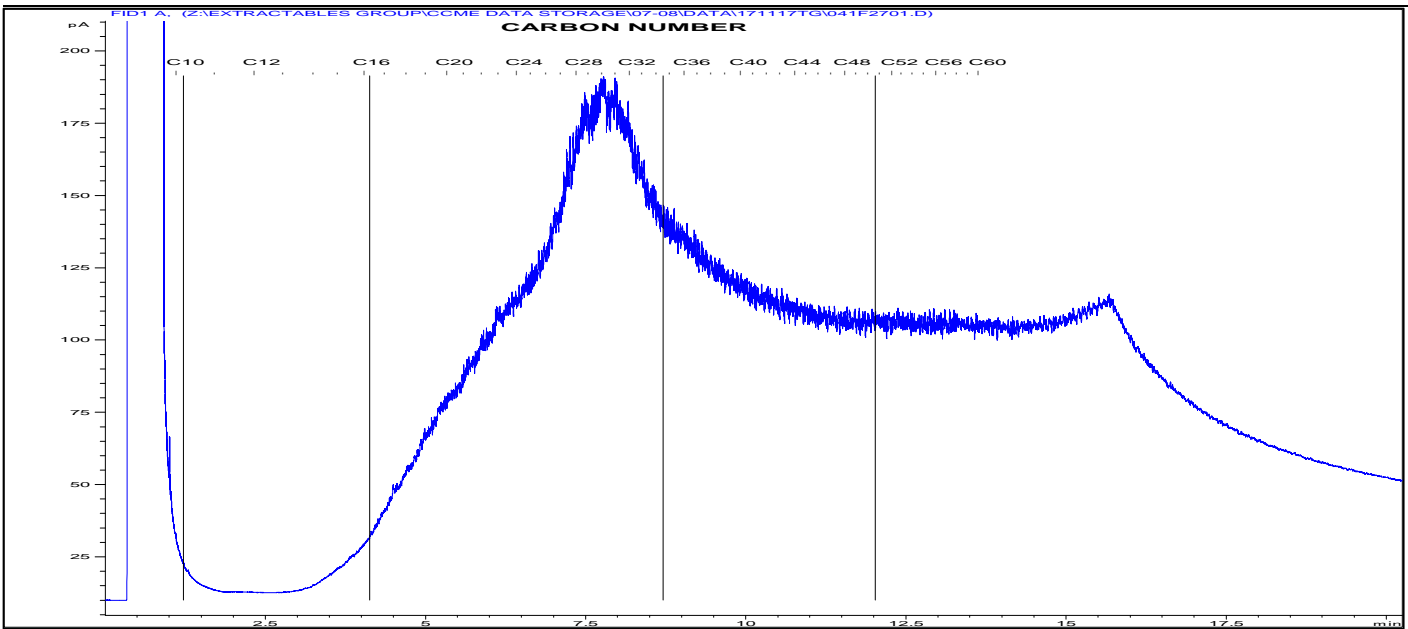
Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

Exova Number: 1239524-6

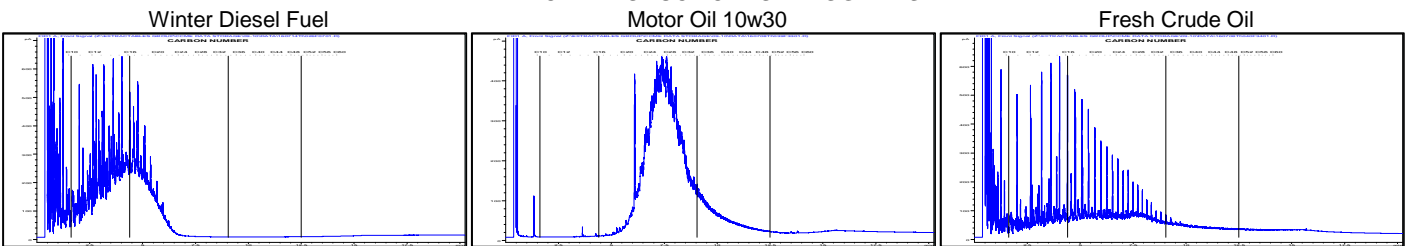
Sample Description: DSExtra3-04-HC

Silica Gel Treated

Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

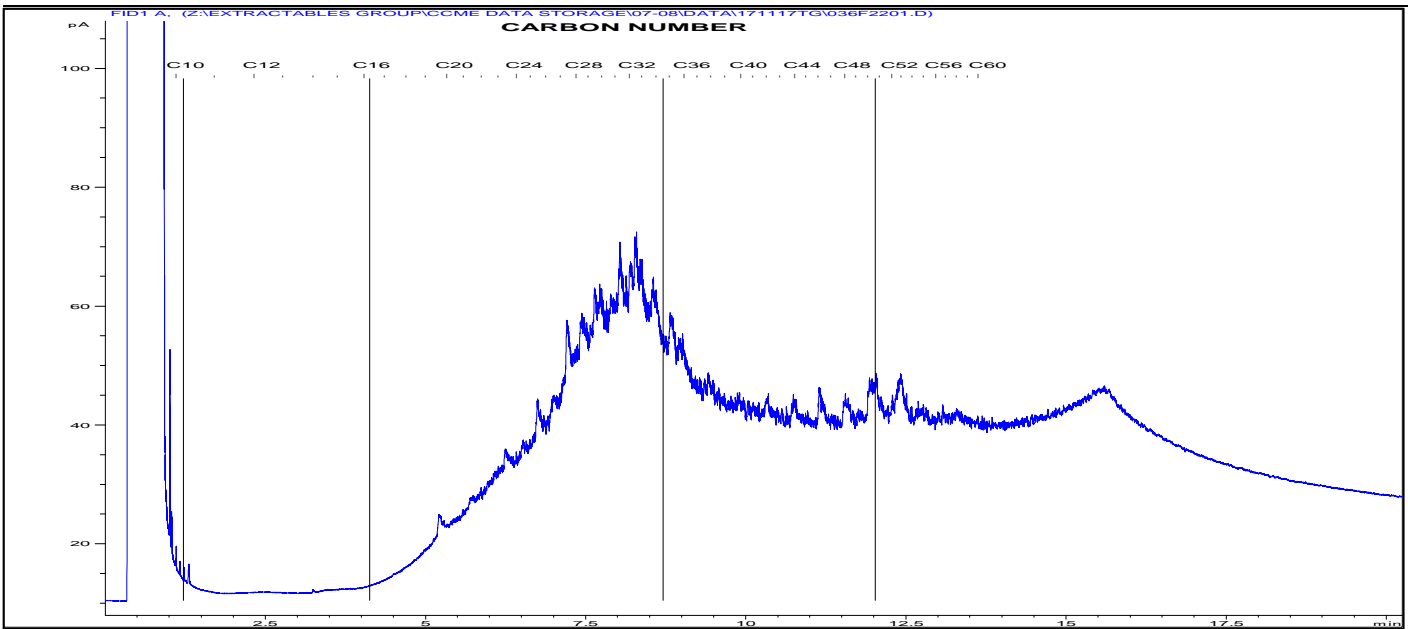
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



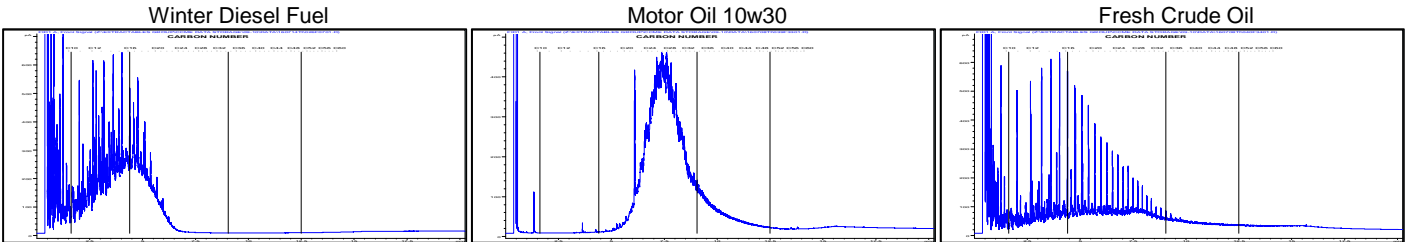
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

Exova Number: 1239524-12 Sample Description: DSPlot7-02-HC Silica Gel Treated
 Sample Date: Nov 10, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

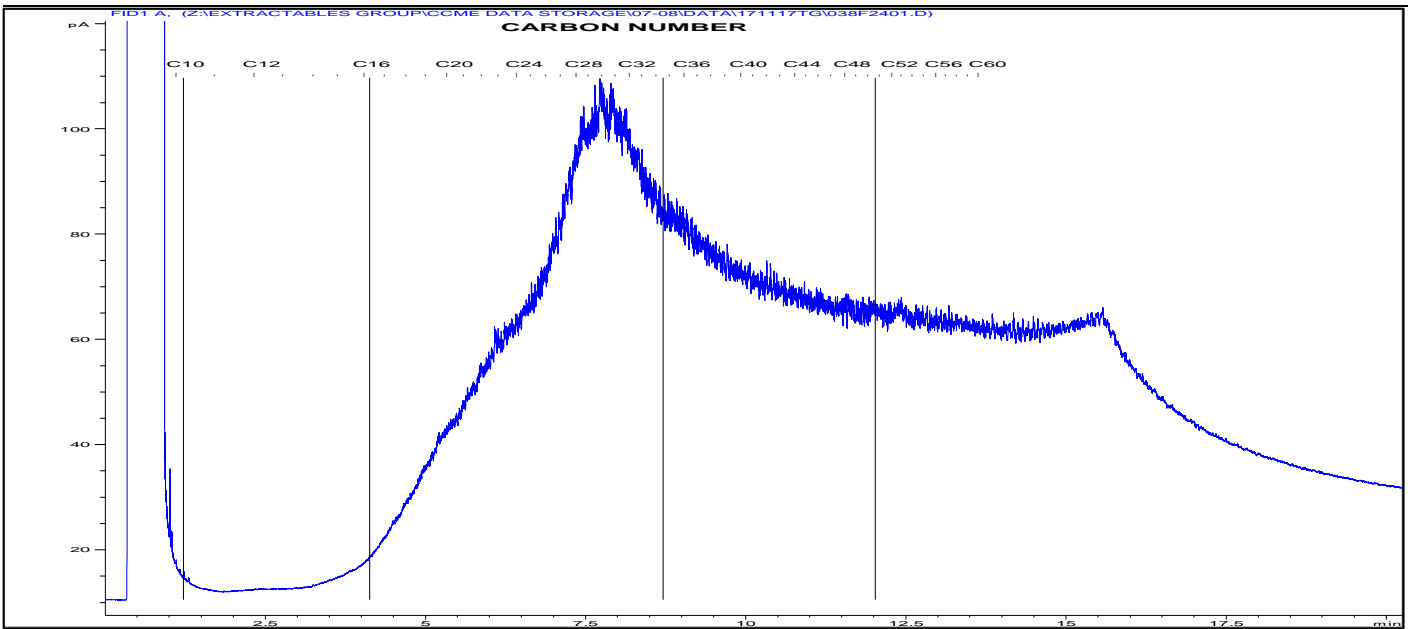
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

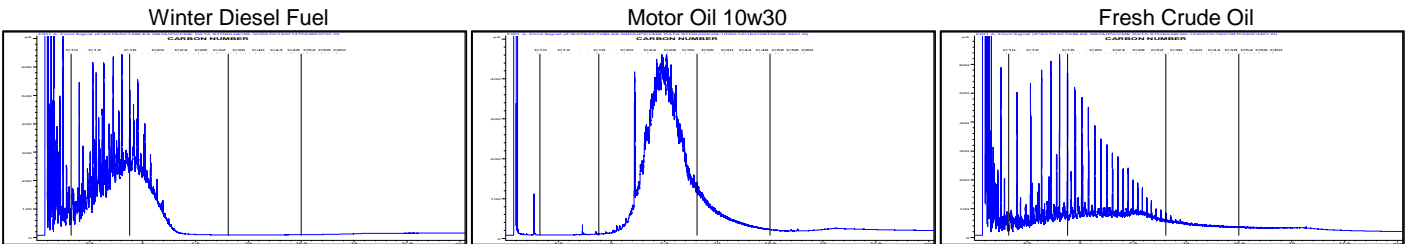
Exova Number: 1239524-13
 Sample Date: Nov 10, 2017

Sample Description: DSPlot7-03-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

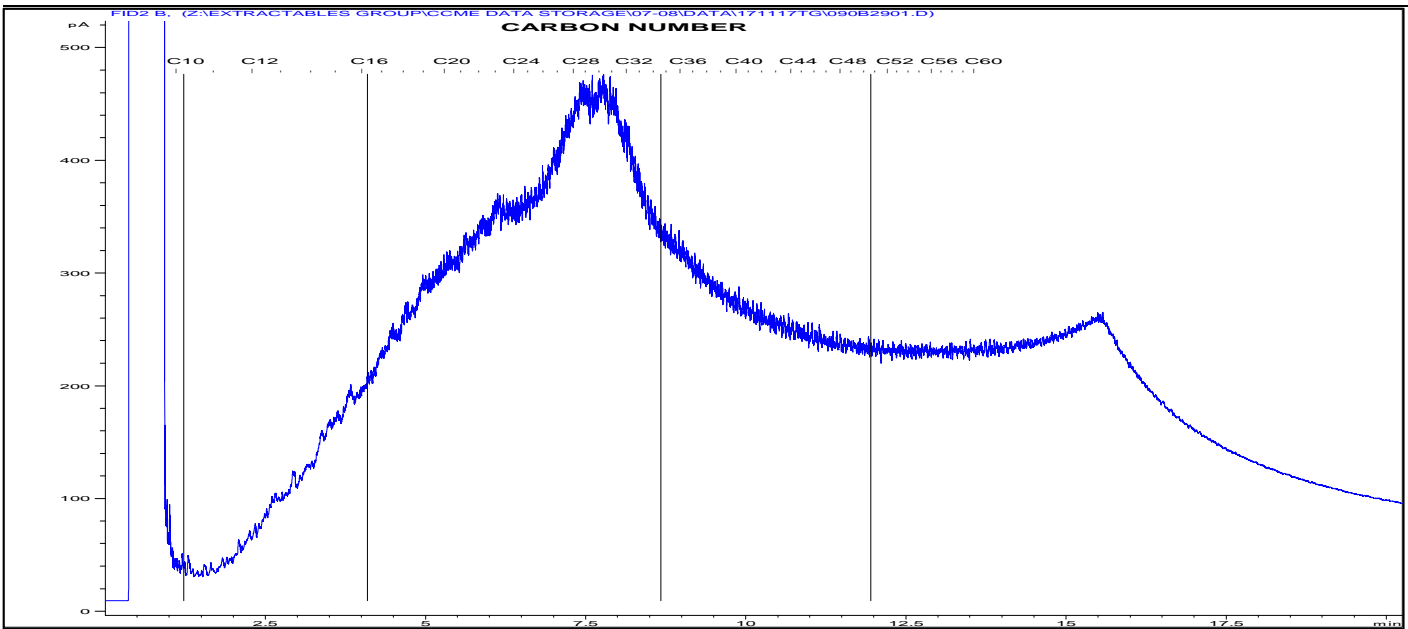
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

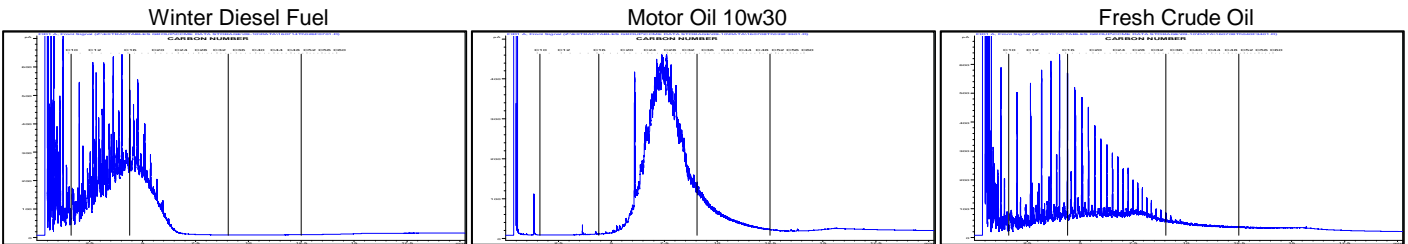
Exova Number: 1239524-14
 Sample Date: Nov 10, 2017

Sample Description: DSPlot7-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

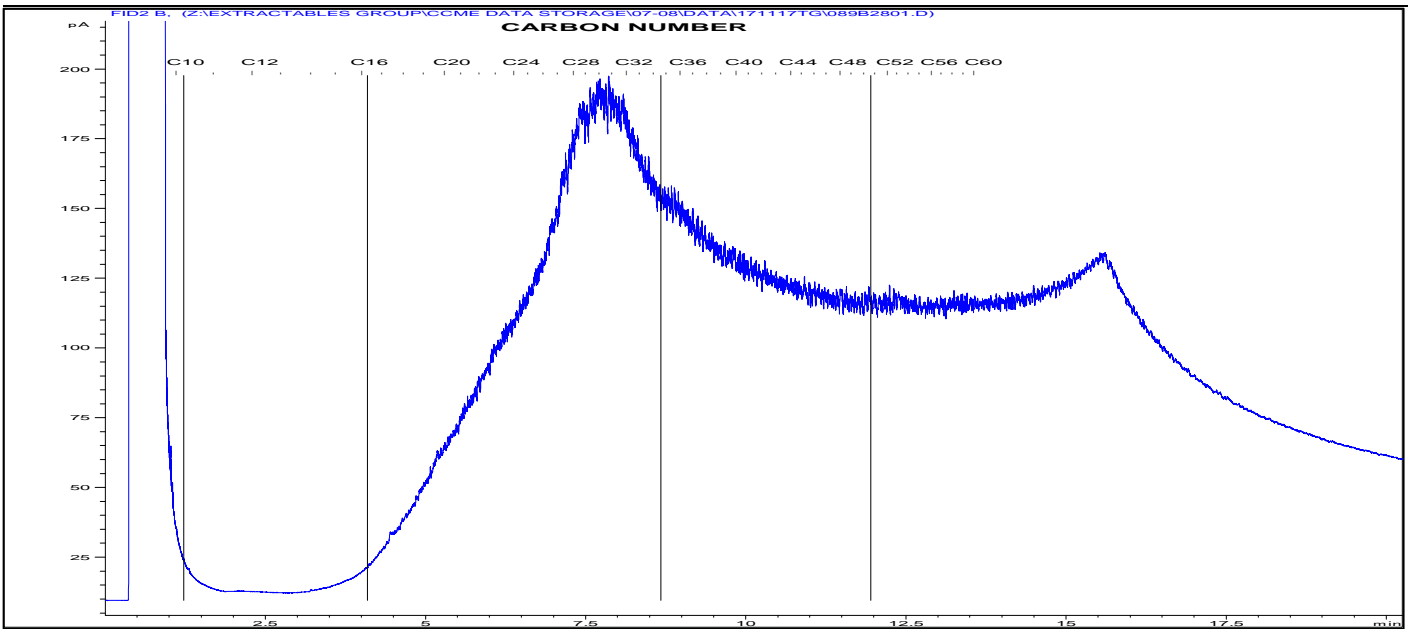
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

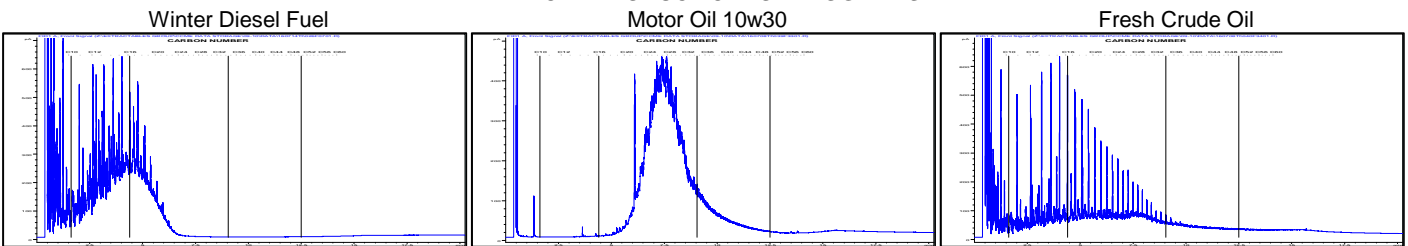
Exova Number: 1239524-20
 Sample Date: Nov 13, 2017

Sample Description: DSPlot9-02-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



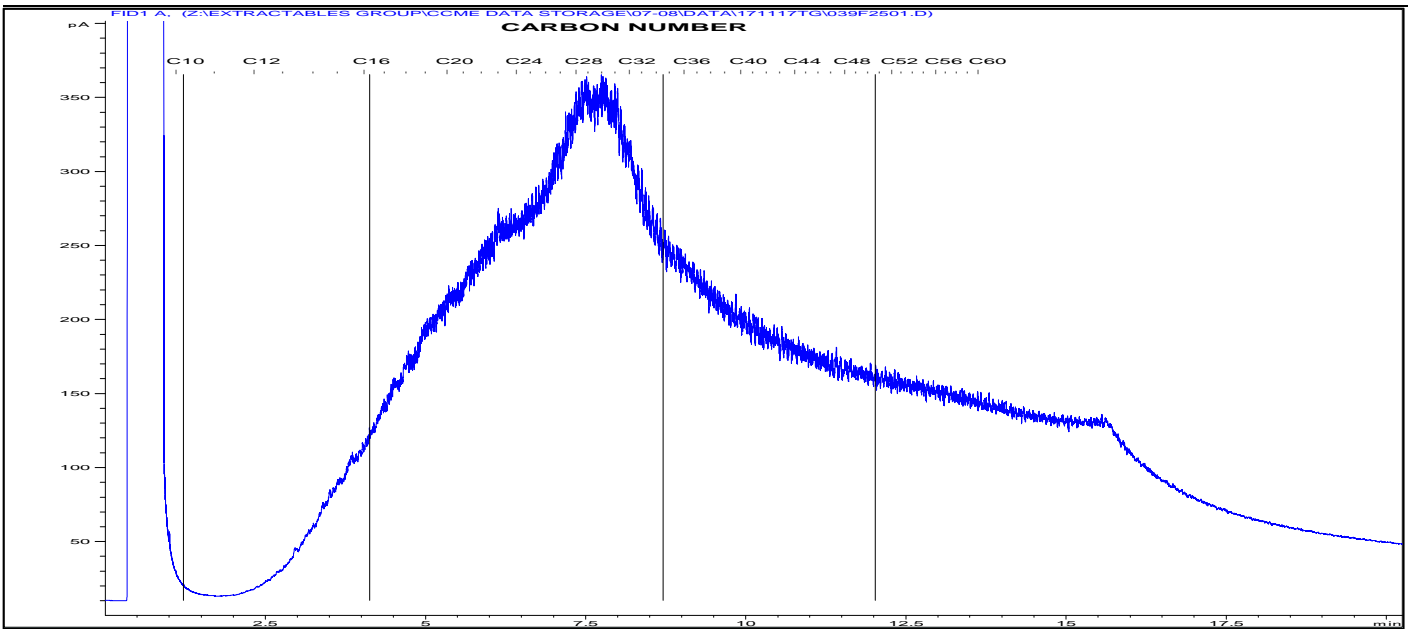
Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

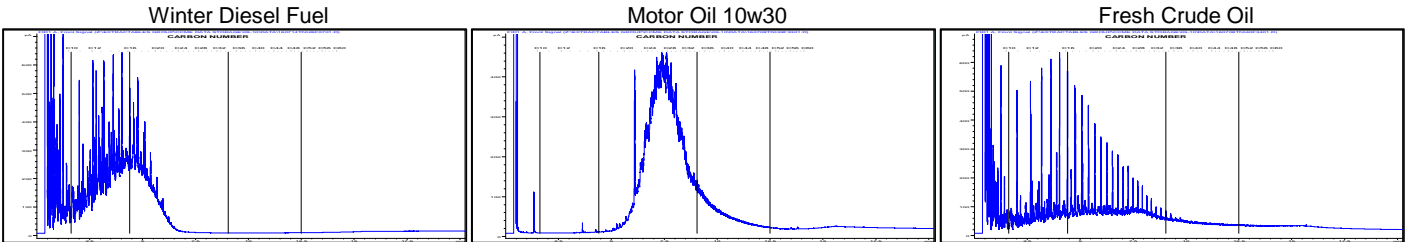
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

Exova Number: 1239524-21 Sample Description: DSPlot9-03-HC Silica Gel Treated
 Sample Date: Nov 13, 2017



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

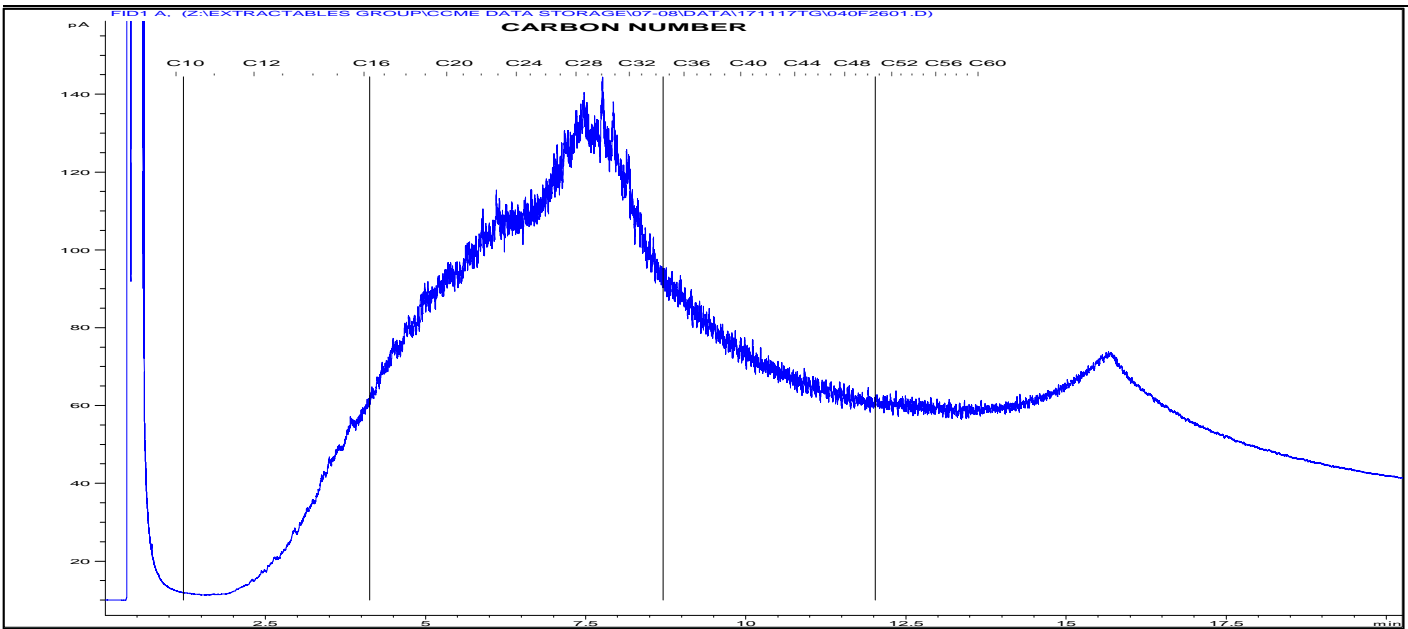
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd.	Project ID: 17-152	Lot ID: 1239524
Report To: Syncrude Canada Ltd. P. O. 4009, MD 0078	Name: Suncor LOS	Control Number: C0056638
Fort McMurray, AB, Canada T9H 3L1	Location: Suncor Basemine	Date Received: Nov 15, 2017
Attn: Marty Yarmuch	LSD:	Date Reported: Nov 19, 2017
Sampled by: Nikki McPhee	P.O.: 4410252962	Report Number: 2243539
Company: Paragon Soil		

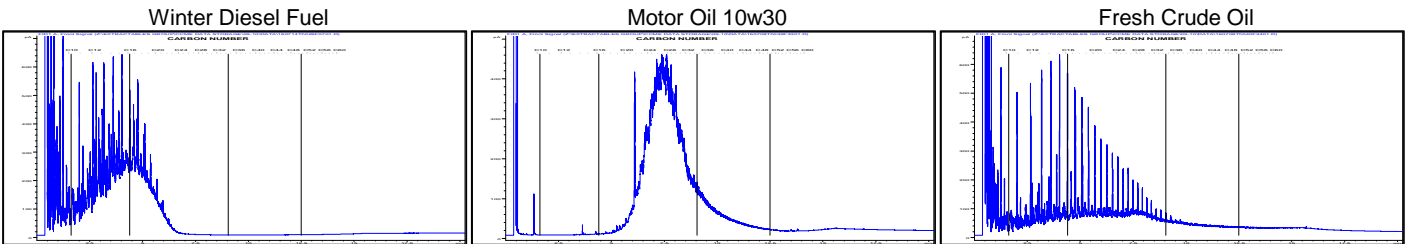
Exova Number: 1239524-22
 Sample Date: Nov 13, 2017

Sample Description: DSPlot9-04-HC

Silica Gel Treated



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



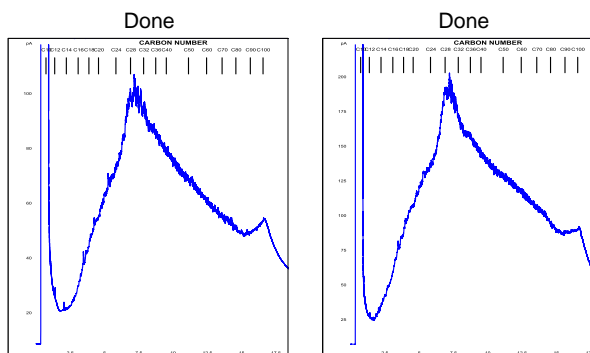
Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number	1240009-1	1240009-2
Sample Date	Nov 10, 2017	Nov 10, 2017
Sample Time	NA	NA
Sample Location		
Sample Description	DSPlot 3-03-HC / 4.6C / Suncor Base Mine	DSPlot 3-04-HC / 4.6C / Suncor Base Mine
Matrix	Soil	Soil

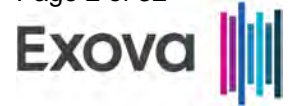
Analyte	Units	Results	Results	Nominal Detection Limit
---------	-------	---------	---------	-------------------------

Chromatogram
 CTGM



Hydrocarbon Analysis (C100) - Product

Carbon Number	Units	1240009-1	1240009-2	Nominal Detection Limit
C11	mass fraction	0.0002	0.0001	0.0001
C12	mass fraction	0.0019	0.0011	0.0001
C13	mass fraction	0.0018	0.0019	0.0001
C14	mass fraction	0.0024	0.0039	0.0001
C15	mass fraction	0.0040	0.0070	0.0001
C16	mass fraction	0.0068	0.0102	0.0001
C17	mass fraction	0.0103	0.0133	0.0001
C18	mass fraction	0.0139	0.0163	0.0001
C19	mass fraction	0.0156	0.0175	0.0001
C20	mass fraction	0.0182	0.0199	0.0001
C21	mass fraction	0.0181	0.0191	0.0001
C22	mass fraction	0.0208	0.0215	0.0001
C23	mass fraction	0.0212	0.0217	0.0001
C24	mass fraction	0.0223	0.0224	0.0001
C25	mass fraction	0.0216	0.0212	0.0001
C26	mass fraction	0.0237	0.0229	0.0001
C27	mass fraction	0.0237	0.0228	0.0001
C28	mass fraction	0.0269	0.0264	0.0001
C29	mass fraction	0.0275	0.0271	0.0001
C30	mass fraction	0.0262	0.0259	0.0001
C31	mass fraction	0.0226	0.0218	0.0001
C32	mass fraction	0.0218	0.0210	0.0001
C33	mass fraction	0.0213	0.0199	0.0001
C34	mass fraction	0.0204	0.0192	0.0001
C35	mass fraction	0.0202	0.0190	0.0001



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

	Reference Number	1240009-1	1240009-2	
	Sample Date	Nov 10, 2017	Nov 10, 2017	
	Sample Time	NA	NA	
	Sample Location			
	Sample Description	DSPlot 3-03-HC / 4.6C / Suncor Base Mine	DSPlot 3-04-HC / 4.6C / Suncor Base Mine	
	Matrix	Soil	Soil	
Analyte	Units	Results	Results	Nominal Detection Limit
Hydrocarbon Analysis (C100) - Product - Continued				
C36	mass fraction	0.0198	0.0189	0.0001
C37	mass fraction	0.0167	0.0159	0.0001
C38	mass fraction	0.0155	0.0148	0.0001
C39	mass fraction	0.0168	0.0161	0.0001
C40	mass fraction	0.0164	0.0158	0.0001
C41	mass fraction	0.0137	0.0132	0.0001
C42	mass fraction	0.0135	0.0130	0.0001
C43	mass fraction	0.0139	0.0135	0.0001
C44	mass fraction	0.0137	0.0133	0.0001
C45	mass fraction	0.0119	0.0117	0.0001
C46	mass fraction	0.0109	0.0107	0.0001
C47	mass fraction	0.0115	0.0113	0.0001
C48	mass fraction	0.0106	0.0105	0.0001
C49	mass fraction	0.0106	0.0104	0.0001
C50	mass fraction	0.0105	0.0104	0.0001
C51	mass fraction	0.0103	0.0102	0.0001
C52	mass fraction	0.0096	0.0095	0.0001
C53	mass fraction	0.0093	0.0094	0.0001
C54	mass fraction	0.0085	0.0086	0.0001
C55	mass fraction	0.0090	0.0092	0.0001
C56	mass fraction	0.0083	0.0084	0.0001
C57	mass fraction	0.0081	0.0083	0.0001
C58	mass fraction	0.0080	0.0083	0.0001
C59	mass fraction	0.0073	0.0075	0.0001
C60	mass fraction	0.0077	0.0081	0.0001
C61	mass fraction	0.0070	0.0073	0.0001
C62	mass fraction	0.0069	0.0073	0.0001
C63	mass fraction	0.0063	0.0066	0.0001
C64	mass fraction	0.0067	0.0071	0.0001
C65	mass fraction	0.0061	0.0064	0.0001
C66	mass fraction	0.0065	0.0069	0.0001
C67	mass fraction	0.0059	0.0063	0.0001
C68	mass fraction	0.0053	0.0056	0.0001
C69	mass fraction	0.0058	0.0061	0.0001
C70	mass fraction	0.0057	0.0061	0.0001
C71	mass fraction	0.0051	0.0054	0.0001
C72	mass fraction	0.0055	0.0059	0.0001



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

	Reference Number	1240009-1	1240009-2	
	Sample Date	Nov 10, 2017	Nov 10, 2017	
	Sample Time	NA	NA	
	Sample Location			
	Sample Description	DSPlot 3-03-HC / 4.6C / Suncor Base Mine	DSPlot 3-04-HC / 4.6C / Suncor Base Mine	
	Matrix	Soil	Soil	
Analyte	Units	Results	Results	Nominal Detection Limit
Hydrocarbon Analysis (C100) - Product - Continued				
C73	mass fraction	0.0050	0.0053	0.0001
C74	mass fraction	0.0049	0.0053	0.0001
C75	mass fraction	0.0049	0.0052	0.0001
C76	mass fraction	0.0049	0.0051	0.0001
C77	mass fraction	0.0047	0.0050	0.0001
C78	mass fraction	0.0042	0.0045	0.0001
C79	mass fraction	0.0045	0.0049	0.0001
C80	mass fraction	0.0045	0.0047	0.0001
C81	mass fraction	0.0044	0.0046	0.0001
C82	mass fraction	0.0043	0.0046	0.0001
C83	mass fraction	0.0043	0.0045	0.0001
C84	mass fraction	0.0043	0.0044	0.0001
C85	mass fraction	0.0041	0.0044	0.0001
C86	mass fraction	0.0037	0.0039	0.0001
C87	mass fraction	0.0041	0.0043	0.0001
C88	mass fraction	0.0041	0.0042	0.0001
C89	mass fraction	0.0037	0.0038	0.0001
C90	mass fraction	0.0040	0.0042	0.0001
C91	mass fraction	0.0040	0.0042	0.0001
C92	mass fraction	0.0036	0.0038	0.0001
C93	mass fraction	0.0040	0.0042	0.0001
C94	mass fraction	0.0036	0.0037	0.0001
C95	mass fraction	0.0040	0.0042	0.0001
C96	mass fraction	0.0036	0.0038	0.0001
C97	mass fraction	0.0036	0.0037	0.0001
C98	mass fraction	0.0036	0.0037	0.0001
C99	mass fraction	0.0036	0.0037	0.0001
C100+	mass fraction	0.1095	0.0950	0.0001
Total	mass fraction	1.0000	1.0000	



Analytical Report

Bill To: Syncrude Canada Ltd.
 P. O. 4009, MD 0078
 Fort McMurray, AB, Canada
 T9H 3L1
 Attn: Marty Yarmuch
 Sampled By: Nikki McPhee
 Company: Paragon

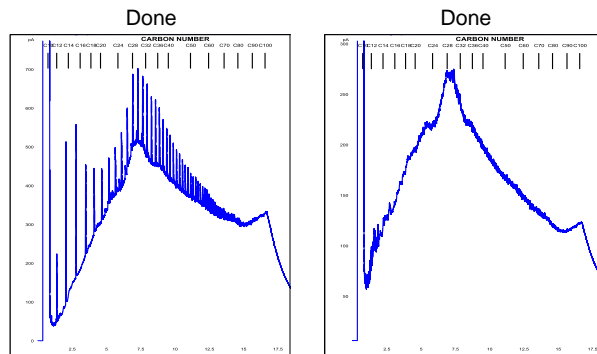
Project ID: 17-152
 Project Name: Suncor LOS
 Project Location: Suncor Base Mine
 LSD:
 P.O.: 4410252962
 Proj. Acct. code: E6687

Lot ID: **1240009**
 Control Number:
 Date Received: Nov 17, 2017
 Date Reported: Dec 13, 2017
 Report Number: 2251173

Reference Number	1240009-3	1240009-4
Sample Date	Nov 11, 2017	Nov 11, 2017
Sample Time	NA	NA
Sample Location		
Sample Description	NMPlot 13-03-HC / 4.6C / Suncor Base Mine	NMPlot 13-04-HC / 4.6C / Suncor Base Mine
Matrix	Soil	Soil

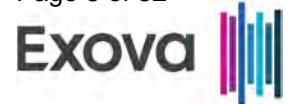
Analyte	Units	Results	Results	Nominal Detection Limit
---------	-------	---------	---------	-------------------------

Chromatogram
 CTGM



Hydrocarbon Analysis (C100) - Product

Product	Units	Results	Results	Nominal Detection Limit
C11	mass fraction	0.0002	0.0008	0.0001
C12	mass fraction	0.0020	0.0067	0.0001
C13	mass fraction	0.0039	0.0132	0.0001
C14	mass fraction	0.0077	0.0155	0.0001
C15	mass fraction	0.0100	0.0184	0.0001
C16	mass fraction	0.0138	0.0199	0.0001
C17	mass fraction	0.0146	0.0207	0.0001
C18	mass fraction	0.0157	0.0230	0.0001
C19	mass fraction	0.0171	0.0228	0.0001
C20	mass fraction	0.0181	0.0245	0.0001
C21	mass fraction	0.0180	0.0228	0.0001
C22	mass fraction	0.0200	0.0247	0.0001
C23	mass fraction	0.0195	0.0241	0.0001
C24	mass fraction	0.0207	0.0240	0.0001
C25	mass fraction	0.0195	0.0221	0.0001
C26	mass fraction	0.0198	0.0233	0.0001
C27	mass fraction	0.0199	0.0224	0.0001
C28	mass fraction	0.0226	0.0248	0.0001
C29	mass fraction	0.0225	0.0250	0.0001
C30	mass fraction	0.0226	0.0238	0.0001
C31	mass fraction	0.0197	0.0199	0.0001
C32	mass fraction	0.0181	0.0191	0.0001
C33	mass fraction	0.0185	0.0181	0.0001
C34	mass fraction	0.0179	0.0175	0.0001
C35	mass fraction	0.0173	0.0173	0.0001



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number	1240009-3	1240009-4
Sample Date	Nov 11, 2017	Nov 11, 2017
Sample Time	NA	NA
Sample Location		
Sample Description	NMPlot 13-03-HC / 4.6C / Suncor Base Mine	NMPlot 13-04-HC / 4.6C / Suncor Base Mine
Matrix	Soil	Soil

Analyte	Units	Results	Results	Nominal Detection Limit
Hydrocarbon Analysis (C100) - Product - Continued				
C36	mass fraction	0.0171	0.0171	0.0001
C37	mass fraction	0.0151	0.0144	0.0001
C38	mass fraction	0.0140	0.0133	0.0001
C39	mass fraction	0.0146	0.0145	0.0001
C40	mass fraction	0.0148	0.0141	0.0001
C41	mass fraction	0.0124	0.0117	0.0001
C42	mass fraction	0.0122	0.0115	0.0001
C43	mass fraction	0.0123	0.0119	0.0001
C44	mass fraction	0.0124	0.0117	0.0001
C45	mass fraction	0.0110	0.0102	0.0001
C46	mass fraction	0.0101	0.0094	0.0001
C47	mass fraction	0.0105	0.0098	0.0001
C48	mass fraction	0.0097	0.0091	0.0001
C49	mass fraction	0.0098	0.0090	0.0001
C50	mass fraction	0.0097	0.0088	0.0001
C51	mass fraction	0.0095	0.0087	0.0001
C52	mass fraction	0.0086	0.0081	0.0001
C53	mass fraction	0.0088	0.0079	0.0001
C54	mass fraction	0.0081	0.0073	0.0001
C55	mass fraction	0.0086	0.0077	0.0001
C56	mass fraction	0.0079	0.0071	0.0001
C57	mass fraction	0.0077	0.0070	0.0001
C58	mass fraction	0.0077	0.0069	0.0001
C59	mass fraction	0.0071	0.0063	0.0001
C60	mass fraction	0.0076	0.0067	0.0001
C61	mass fraction	0.0069	0.0061	0.0001
C62	mass fraction	0.0068	0.0060	0.0001
C63	mass fraction	0.0061	0.0055	0.0001
C64	mass fraction	0.0067	0.0059	0.0001
C65	mass fraction	0.0061	0.0053	0.0001
C66	mass fraction	0.0066	0.0057	0.0001
C67	mass fraction	0.0060	0.0051	0.0001
C68	mass fraction	0.0054	0.0046	0.0001
C69	mass fraction	0.0060	0.0050	0.0001
C70	mass fraction	0.0059	0.0050	0.0001
C71	mass fraction	0.0053	0.0045	0.0001
C72	mass fraction	0.0058	0.0049	0.0001



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number	1240009-3	1240009-4		
Sample Date	Nov 11, 2017	Nov 11, 2017		
Sample Time	NA	NA		
Sample Location				
Sample Description	NMPlot 13-03-HC / 4.6C / Suncor Base Mine	NMPlot 13-04-HC / 4.6C / Suncor Base Mine		
Matrix	Soil	Soil		
Analyte	Units	Results	Results	Nominal Detection Limit

Hydrocarbon Analysis (C100) - Product - Continued				
Analyte	Units	Results	Results	Nominal Detection Limit
C73	mass fraction	0.0053	0.0044	0.0001
C74	mass fraction	0.0053	0.0044	0.0001
C75	mass fraction	0.0053	0.0043	0.0001
C76	mass fraction	0.0052	0.0043	0.0001
C77	mass fraction	0.0052	0.0042	0.0001
C78	mass fraction	0.0047	0.0037	0.0001
C79	mass fraction	0.0051	0.0041	0.0001
C80	mass fraction	0.0051	0.0040	0.0001
C81	mass fraction	0.0050	0.0039	0.0001
C82	mass fraction	0.0050	0.0039	0.0001
C83	mass fraction	0.0050	0.0038	0.0001
C84	mass fraction	0.0050	0.0038	0.0001
C85	mass fraction	0.0050	0.0038	0.0001
C86	mass fraction	0.0045	0.0034	0.0001
C87	mass fraction	0.0050	0.0037	0.0001
C88	mass fraction	0.0050	0.0037	0.0001
C89	mass fraction	0.0045	0.0033	0.0001
C90	mass fraction	0.0050	0.0037	0.0001
C91	mass fraction	0.0051	0.0037	0.0001
C92	mass fraction	0.0046	0.0033	0.0001
C93	mass fraction	0.0052	0.0037	0.0001
C94	mass fraction	0.0046	0.0033	0.0001
C95	mass fraction	0.0052	0.0037	0.0001
C96	mass fraction	0.0047	0.0033	0.0001
C97	mass fraction	0.0047	0.0033	0.0001
C98	mass fraction	0.0048	0.0034	0.0001
C99	mass fraction	0.0048	0.0034	0.0001
C100+	mass fraction	0.1255	0.0903	0.0001
Total	mass fraction	1.0000	1.0000	

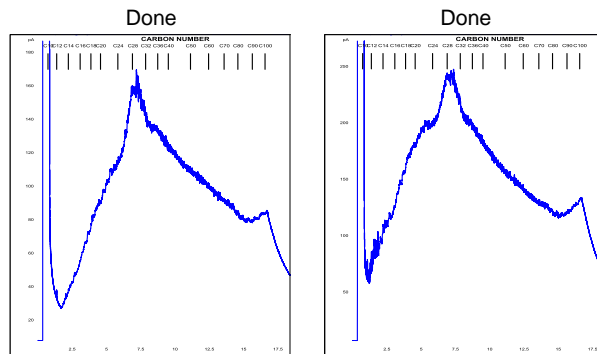
Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number	1240009-5	1240009-6
Sample Date	Nov 11, 2017	Nov 11, 2017
Sample Time	NA	NA
Sample Location		
Sample Description	NMPlot 14-03-HC / 4.6C / Suncor Base Mine	NMPlot 14-04-HC / 4.6C / Suncor Base Mine
Matrix	Soil	Soil

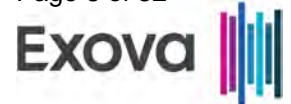
Analyte	Units	Results	Results	Nominal Detection Limit
---------	-------	---------	---------	-------------------------

Chromatogram
 CTGM



Hydrocarbon Analysis (C100) - Product

Product	Units	1240009-5	1240009-6	Nominal Detection Limit
C11	mass fraction	0.0005	0.0010	0.0001
C12	mass fraction	0.0027	0.0062	0.0001
C13	mass fraction	0.0029	0.0114	0.0001
C14	mass fraction	0.0052	0.0138	0.0001
C15	mass fraction	0.0083	0.0166	0.0001
C16	mass fraction	0.0111	0.0185	0.0001
C17	mass fraction	0.0134	0.0198	0.0001
C18	mass fraction	0.0161	0.0222	0.0001
C19	mass fraction	0.0170	0.0221	0.0001
C20	mass fraction	0.0192	0.0241	0.0001
C21	mass fraction	0.0185	0.0224	0.0001
C22	mass fraction	0.0209	0.0241	0.0001
C23	mass fraction	0.0209	0.0233	0.0001
C24	mass fraction	0.0216	0.0232	0.0001
C25	mass fraction	0.0205	0.0214	0.0001
C26	mass fraction	0.0223	0.0225	0.0001
C27	mass fraction	0.0222	0.0214	0.0001
C28	mass fraction	0.0257	0.0236	0.0001
C29	mass fraction	0.0262	0.0238	0.0001
C30	mass fraction	0.0250	0.0227	0.0001
C31	mass fraction	0.0208	0.0190	0.0001
C32	mass fraction	0.0201	0.0183	0.0001
C33	mass fraction	0.0191	0.0174	0.0001
C34	mass fraction	0.0187	0.0169	0.0001
C35	mass fraction	0.0187	0.0168	0.0001



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number	1240009-5	1240009-6		
Sample Date	Nov 11, 2017	Nov 11, 2017		
Sample Time	NA	NA		
Sample Location				
Sample Description	NMPlot 14-03-HC / 4.6C / Suncor Base Mine	NMPlot 14-04-HC / 4.6C / Suncor Base Mine		
Matrix	Soil	Soil		
Analyte	Units	Results	Results	Nominal Detection Limit

Hydrocarbon Analysis (C100) - Product - Continued				
Analyte	Units	Results	Results	Nominal Detection Limit
C36	mass fraction	0.0185	0.0165	0.0001
C37	mass fraction	0.0157	0.0140	0.0001
C38	mass fraction	0.0145	0.0129	0.0001
C39	mass fraction	0.0158	0.0141	0.0001
C40	mass fraction	0.0155	0.0138	0.0001
C41	mass fraction	0.0130	0.0115	0.0001
C42	mass fraction	0.0128	0.0114	0.0001
C43	mass fraction	0.0134	0.0118	0.0001
C44	mass fraction	0.0131	0.0115	0.0001
C45	mass fraction	0.0115	0.0101	0.0001
C46	mass fraction	0.0106	0.0093	0.0001
C47	mass fraction	0.0112	0.0098	0.0001
C48	mass fraction	0.0104	0.0090	0.0001
C49	mass fraction	0.0102	0.0089	0.0001
C50	mass fraction	0.0102	0.0088	0.0001
C51	mass fraction	0.0100	0.0087	0.0001
C52	mass fraction	0.0093	0.0080	0.0001
C53	mass fraction	0.0092	0.0079	0.0001
C54	mass fraction	0.0085	0.0073	0.0001
C55	mass fraction	0.0090	0.0077	0.0001
C56	mass fraction	0.0083	0.0071	0.0001
C57	mass fraction	0.0082	0.0070	0.0001
C58	mass fraction	0.0081	0.0070	0.0001
C59	mass fraction	0.0074	0.0063	0.0001
C60	mass fraction	0.0079	0.0068	0.0001
C61	mass fraction	0.0072	0.0062	0.0001
C62	mass fraction	0.0071	0.0061	0.0001
C63	mass fraction	0.0064	0.0055	0.0001
C64	mass fraction	0.0069	0.0060	0.0001
C65	mass fraction	0.0063	0.0054	0.0001
C66	mass fraction	0.0067	0.0059	0.0001
C67	mass fraction	0.0062	0.0053	0.0001
C68	mass fraction	0.0055	0.0048	0.0001
C69	mass fraction	0.0060	0.0052	0.0001
C70	mass fraction	0.0060	0.0052	0.0001
C71	mass fraction	0.0054	0.0047	0.0001
C72	mass fraction	0.0059	0.0051	0.0001



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number	1240009-5	1240009-6		
Sample Date	Nov 11, 2017	Nov 11, 2017		
Sample Time	NA	NA		
Sample Location				
Sample Description	NMPlot 14-03-HC / 4.6C / Suncor Base Mine	NMPlot 14-04-HC / 4.6C / Suncor Base Mine		
Matrix	Soil	Soil		
Analyte	Units	Results	Results	Nominal Detection Limit

Hydrocarbon Analysis (C100) - Product - Continued				
Analyte	Units	Results	Results	Nominal Detection Limit
C73	mass fraction	0.0053	0.0046	0.0001
C74	mass fraction	0.0052	0.0046	0.0001
C75	mass fraction	0.0052	0.0046	0.0001
C76	mass fraction	0.0052	0.0046	0.0001
C77	mass fraction	0.0050	0.0045	0.0001
C78	mass fraction	0.0044	0.0040	0.0001
C79	mass fraction	0.0049	0.0044	0.0001
C80	mass fraction	0.0048	0.0043	0.0001
C81	mass fraction	0.0047	0.0042	0.0001
C82	mass fraction	0.0046	0.0042	0.0001
C83	mass fraction	0.0046	0.0043	0.0001
C84	mass fraction	0.0045	0.0042	0.0001
C85	mass fraction	0.0045	0.0041	0.0001
C86	mass fraction	0.0040	0.0038	0.0001
C87	mass fraction	0.0045	0.0042	0.0001
C88	mass fraction	0.0045	0.0042	0.0001
C89	mass fraction	0.0039	0.0038	0.0001
C90	mass fraction	0.0044	0.0042	0.0001
C91	mass fraction	0.0043	0.0042	0.0001
C92	mass fraction	0.0040	0.0038	0.0001
C93	mass fraction	0.0044	0.0042	0.0001
C94	mass fraction	0.0039	0.0038	0.0001
C95	mass fraction	0.0043	0.0043	0.0001
C96	mass fraction	0.0039	0.0039	0.0001
C97	mass fraction	0.0040	0.0039	0.0001
C98	mass fraction	0.0040	0.0039	0.0001
C99	mass fraction	0.0039	0.0039	0.0001
C100+	mass fraction	0.1036	0.1022	0.0001
Total	mass fraction	1.0000	1.0000	



Analytical Report

Bill To: Syncrude Canada Ltd.
 P. O. 4009, MD 0078
 Fort McMurray, AB, Canada
 T9H 3L1
 Attn: Marty Yarmuch
 Sampled By: Nikki McPhee
 Company: Paragon

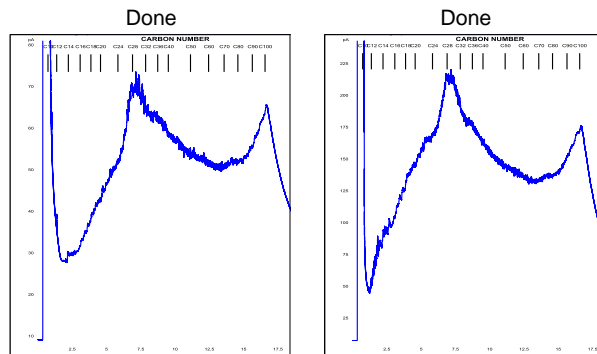
Project ID: 17-152
 Project Name: Suncor LOS
 Project Location: Suncor Base Mine
 LSD:
 P.O.: 4410252962
 Proj. Acct. code: E6687

Lot ID: **1240009**
 Control Number:
 Date Received: Nov 17, 2017
 Date Reported: Dec 13, 2017
 Report Number: 2251173

Reference Number	1240009-7	1240009-8
Sample Date	Nov 10, 2017	Nov 10, 2017
Sample Time	NA	NA
Sample Location		
Sample Description	NMPlot 16-03-HC / 4.6C / Suncor Base Mine	NMPlot 16-04-HC / 4.6C / Suncor Base Mine
Matrix	Soil	Soil

Analyte	Units	Results	Results	Nominal Detection Limit
---------	-------	---------	---------	-------------------------

Chromatogram
 CTGM



Hydrocarbon Analysis (C100) - Product

Product	Units	Results	Results	Nominal Detection Limit
C11	mass fraction	0.0015	0.0004	0.0001
C12	mass fraction	0.0059	0.0032	0.0001
C13	mass fraction	0.0056	0.0085	0.0001
C14	mass fraction	0.0066	0.0119	0.0001
C15	mass fraction	0.0086	0.0142	0.0001
C16	mass fraction	0.0100	0.0155	0.0001
C17	mass fraction	0.0115	0.0165	0.0001
C18	mass fraction	0.0135	0.0183	0.0001
C19	mass fraction	0.0140	0.0182	0.0001
C20	mass fraction	0.0157	0.0198	0.0001
C21	mass fraction	0.0153	0.0185	0.0001
C22	mass fraction	0.0170	0.0202	0.0001
C23	mass fraction	0.0170	0.0198	0.0001
C24	mass fraction	0.0178	0.0200	0.0001
C25	mass fraction	0.0170	0.0186	0.0001
C26	mass fraction	0.0188	0.0198	0.0001
C27	mass fraction	0.0190	0.0192	0.0001
C28	mass fraction	0.0214	0.0215	0.0001
C29	mass fraction	0.0220	0.0217	0.0001
C30	mass fraction	0.0208	0.0207	0.0001
C31	mass fraction	0.0177	0.0174	0.0001
C32	mass fraction	0.0171	0.0167	0.0001
C33	mass fraction	0.0166	0.0159	0.0001
C34	mass fraction	0.0164	0.0154	0.0001
C35	mass fraction	0.0164	0.0153	0.0001



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

	Reference Number	1240009-7	1240009-8	
	Sample Date	Nov 10, 2017	Nov 10, 2017	
	Sample Time	NA	NA	
	Sample Location			
	Sample Description	NMPlot 16-03-HC / 4.6C / Suncor Base Mine	NMPlot 16-04-HC / 4.6C / Suncor Base Mine	
	Matrix	Soil	Soil	
Analyte	Units	Results	Results	Nominal Detection Limit
Hydrocarbon Analysis (C100) - Product - Continued				
C36	mass fraction	0.0162	0.0152	0.0001
C37	mass fraction	0.0139	0.0128	0.0001
C38	mass fraction	0.0129	0.0119	0.0001
C39	mass fraction	0.0142	0.0129	0.0001
C40	mass fraction	0.0137	0.0126	0.0001
C41	mass fraction	0.0115	0.0106	0.0001
C42	mass fraction	0.0113	0.0104	0.0001
C43	mass fraction	0.0119	0.0108	0.0001
C44	mass fraction	0.0119	0.0106	0.0001
C45	mass fraction	0.0103	0.0093	0.0001
C46	mass fraction	0.0095	0.0087	0.0001
C47	mass fraction	0.0100	0.0091	0.0001
C48	mass fraction	0.0093	0.0084	0.0001
C49	mass fraction	0.0092	0.0084	0.0001
C50	mass fraction	0.0092	0.0083	0.0001
C51	mass fraction	0.0091	0.0082	0.0001
C52	mass fraction	0.0086	0.0077	0.0001
C53	mass fraction	0.0084	0.0076	0.0001
C54	mass fraction	0.0077	0.0070	0.0001
C55	mass fraction	0.0083	0.0075	0.0001
C56	mass fraction	0.0077	0.0069	0.0001
C57	mass fraction	0.0077	0.0069	0.0001
C58	mass fraction	0.0076	0.0068	0.0001
C59	mass fraction	0.0069	0.0063	0.0001
C60	mass fraction	0.0074	0.0067	0.0001
C61	mass fraction	0.0068	0.0062	0.0001
C62	mass fraction	0.0068	0.0061	0.0001
C63	mass fraction	0.0062	0.0056	0.0001
C64	mass fraction	0.0067	0.0061	0.0001
C65	mass fraction	0.0061	0.0056	0.0001
C66	mass fraction	0.0066	0.0060	0.0001
C67	mass fraction	0.0061	0.0055	0.0001
C68	mass fraction	0.0055	0.0050	0.0001
C69	mass fraction	0.0060	0.0055	0.0001
C70	mass fraction	0.0060	0.0055	0.0001
C71	mass fraction	0.0055	0.0050	0.0001
C72	mass fraction	0.0061	0.0056	0.0001



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number	1240009-7	1240009-8
Sample Date	Nov 10, 2017	Nov 10, 2017
Sample Time	NA	NA
Sample Location		
Sample Description	NMPlot 16-03-HC / 4.6C / Suncor Base Mine	NMPlot 16-04-HC / 4.6C / Suncor Base Mine
Matrix	Soil	Soil

Analyte	Units	Results	Results	Nominal Detection Limit
Hydrocarbon Analysis (C100) - Product - Continued				
C73	mass fraction	0.0055	0.0051	0.0001
C74	mass fraction	0.0055	0.0051	0.0001
C75	mass fraction	0.0056	0.0051	0.0001
C76	mass fraction	0.0055	0.0052	0.0001
C77	mass fraction	0.0055	0.0051	0.0001
C78	mass fraction	0.0050	0.0046	0.0001
C79	mass fraction	0.0054	0.0051	0.0001
C80	mass fraction	0.0054	0.0051	0.0001
C81	mass fraction	0.0055	0.0051	0.0001
C82	mass fraction	0.0055	0.0052	0.0001
C83	mass fraction	0.0054	0.0052	0.0001
C84	mass fraction	0.0054	0.0052	0.0001
C85	mass fraction	0.0055	0.0053	0.0001
C86	mass fraction	0.0049	0.0048	0.0001
C87	mass fraction	0.0055	0.0054	0.0001
C88	mass fraction	0.0056	0.0054	0.0001
C89	mass fraction	0.0050	0.0049	0.0001
C90	mass fraction	0.0056	0.0056	0.0001
C91	mass fraction	0.0056	0.0056	0.0001
C92	mass fraction	0.0052	0.0051	0.0001
C93	mass fraction	0.0058	0.0058	0.0001
C94	mass fraction	0.0053	0.0053	0.0001
C95	mass fraction	0.0059	0.0059	0.0001
C96	mass fraction	0.0054	0.0054	0.0001
C97	mass fraction	0.0054	0.0055	0.0001
C98	mass fraction	0.0054	0.0056	0.0001
C99	mass fraction	0.0054	0.0056	0.0001
C100+	mass fraction	0.1613	0.1512	0.0001
Total	mass fraction	1.0000	1.0000	



Analytical Report

Bill To: Syncrude Canada Ltd.
 P. O. 4009, MD 0078
 Fort McMurray, AB, Canada
 T9H 3L1
 Attn: Marty Yarmuch
 Sampled By: Nikki McPhee
 Company: Paragon

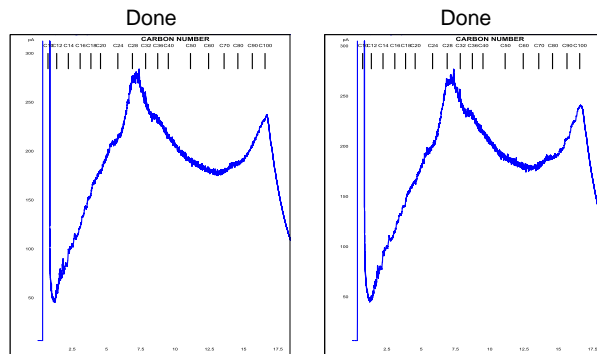
Project ID: 17-152
 Project Name: Suncor LOS
 Project Location: Suncor Base Mine
 LSD:
 P.O.: 4410252962
 Proj. Acct. code: E6687

Lot ID: **1240009**
 Control Number:
 Date Received: Nov 17, 2017
 Date Reported: Dec 13, 2017
 Report Number: 2251173

Reference Number	1240009-9	1240009-10
Sample Date	Nov 12, 2017	Nov 12, 2017
Sample Time	NA	NA
Sample Location		
Sample Description	NMPlot 18-03-HC / 4.6C / Suncor Base Mine	NMPlot 18-04-HC / 4.6C / Suncor Base Mine
Matrix	Soil	Soil

Analyte	Units	Results	Results	Nominal Detection Limit
---------	-------	---------	---------	-------------------------

Chromatogram
 CTGM



Hydrocarbon Analysis (C100) - Product

Product	Units	Results	Results	Nominal Detection Limit
C11	mass fraction	0.0002	0.0002	0.0001
C12	mass fraction	0.0026	0.0020	0.0001
C13	mass fraction	0.0069	0.0056	0.0001
C14	mass fraction	0.0093	0.0089	0.0001
C15	mass fraction	0.0120	0.0120	0.0001
C16	mass fraction	0.0138	0.0136	0.0001
C17	mass fraction	0.0149	0.0144	0.0001
C18	mass fraction	0.0169	0.0162	0.0001
C19	mass fraction	0.0170	0.0162	0.0001
C20	mass fraction	0.0185	0.0177	0.0001
C21	mass fraction	0.0174	0.0167	0.0001
C22	mass fraction	0.0192	0.0185	0.0001
C23	mass fraction	0.0189	0.0184	0.0001
C24	mass fraction	0.0192	0.0188	0.0001
C25	mass fraction	0.0180	0.0177	0.0001
C26	mass fraction	0.0192	0.0191	0.0001
C27	mass fraction	0.0187	0.0187	0.0001
C28	mass fraction	0.0209	0.0210	0.0001
C29	mass fraction	0.0212	0.0214	0.0001
C30	mass fraction	0.0203	0.0206	0.0001
C31	mass fraction	0.0171	0.0175	0.0001
C32	mass fraction	0.0165	0.0169	0.0001
C33	mass fraction	0.0158	0.0163	0.0001
C34	mass fraction	0.0154	0.0159	0.0001
C35	mass fraction	0.0153	0.0158	0.0001



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number	1240009-9	1240009-10
Sample Date	Nov 12, 2017	Nov 12, 2017
Sample Time	NA	NA
Sample Location		
Sample Description	NMPlot 18-03-HC / 4.6C / Suncor Base Mine	NMPlot 18-04-HC / 4.6C / Suncor Base Mine
Matrix	Soil	Soil

Analyte	Units	Results	Results	Nominal Detection Limit
Hydrocarbon Analysis (C100) - Product - Continued				
C36	mass fraction	0.0152	0.0157	0.0001
C37	mass fraction	0.0129	0.0133	0.0001
C38	mass fraction	0.0120	0.0124	0.0001
C39	mass fraction	0.0130	0.0134	0.0001
C40	mass fraction	0.0128	0.0132	0.0001
C41	mass fraction	0.0107	0.0110	0.0001
C42	mass fraction	0.0105	0.0109	0.0001
C43	mass fraction	0.0110	0.0114	0.0001
C44	mass fraction	0.0108	0.0111	0.0001
C45	mass fraction	0.0094	0.0097	0.0001
C46	mass fraction	0.0087	0.0090	0.0001
C47	mass fraction	0.0092	0.0095	0.0001
C48	mass fraction	0.0085	0.0088	0.0001
C49	mass fraction	0.0085	0.0087	0.0001
C50	mass fraction	0.0084	0.0087	0.0001
C51	mass fraction	0.0083	0.0086	0.0001
C52	mass fraction	0.0077	0.0080	0.0001
C53	mass fraction	0.0076	0.0079	0.0001
C54	mass fraction	0.0071	0.0073	0.0001
C55	mass fraction	0.0076	0.0079	0.0001
C56	mass fraction	0.0070	0.0072	0.0001
C57	mass fraction	0.0069	0.0072	0.0001
C58	mass fraction	0.0069	0.0072	0.0001
C59	mass fraction	0.0063	0.0066	0.0001
C60	mass fraction	0.0068	0.0071	0.0001
C61	mass fraction	0.0063	0.0065	0.0001
C62	mass fraction	0.0063	0.0065	0.0001
C63	mass fraction	0.0057	0.0059	0.0001
C64	mass fraction	0.0062	0.0065	0.0001
C65	mass fraction	0.0057	0.0059	0.0001
C66	mass fraction	0.0062	0.0064	0.0001
C67	mass fraction	0.0057	0.0059	0.0001
C68	mass fraction	0.0052	0.0053	0.0001
C69	mass fraction	0.0057	0.0059	0.0001
C70	mass fraction	0.0057	0.0060	0.0001
C71	mass fraction	0.0052	0.0054	0.0001
C72	mass fraction	0.0058	0.0060	0.0001



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number	1240009-9	1240009-10		
Sample Date	Nov 12, 2017	Nov 12, 2017		
Sample Time	NA	NA		
Sample Location				
Sample Description	NMPlot 18-03-HC / 4.6C / Suncor Base Mine	NMPlot 18-04-HC / 4.6C / Suncor Base Mine		
Matrix	Soil	Soil		
Analyte	Units	Results	Results	Nominal Detection Limit

Hydrocarbon Analysis (C100) - Product - Continued				
Analyte	Units	Results	Results	Nominal Detection Limit
C73	mass fraction	0.0053	0.0055	0.0001
C74	mass fraction	0.0053	0.0055	0.0001
C75	mass fraction	0.0054	0.0056	0.0001
C76	mass fraction	0.0054	0.0056	0.0001
C77	mass fraction	0.0054	0.0056	0.0001
C78	mass fraction	0.0048	0.0050	0.0001
C79	mass fraction	0.0054	0.0055	0.0001
C80	mass fraction	0.0054	0.0055	0.0001
C81	mass fraction	0.0054	0.0056	0.0001
C82	mass fraction	0.0054	0.0056	0.0001
C83	mass fraction	0.0054	0.0055	0.0001
C84	mass fraction	0.0055	0.0056	0.0001
C85	mass fraction	0.0055	0.0057	0.0001
C86	mass fraction	0.0050	0.0051	0.0001
C87	mass fraction	0.0056	0.0057	0.0001
C88	mass fraction	0.0057	0.0057	0.0001
C89	mass fraction	0.0052	0.0053	0.0001
C90	mass fraction	0.0058	0.0059	0.0001
C91	mass fraction	0.0059	0.0059	0.0001
C92	mass fraction	0.0053	0.0053	0.0001
C93	mass fraction	0.0060	0.0061	0.0001
C94	mass fraction	0.0055	0.0056	0.0001
C95	mass fraction	0.0061	0.0063	0.0001
C96	mass fraction	0.0056	0.0057	0.0001
C97	mass fraction	0.0057	0.0057	0.0001
C98	mass fraction	0.0057	0.0058	0.0001
C99	mass fraction	0.0058	0.0059	0.0001
C100+	mass fraction	0.1628	0.1541	0.0001
Total	mass fraction	1.0000	1.0000	



Analytical Report

Bill To: Syncrude Canada Ltd.
 P. O. 4009, MD 0078
 Fort McMurray, AB, Canada
 T9H 3L1
 Attn: Marty Yarmuch
 Sampled By: Nikki McPhee
 Company: Paragon

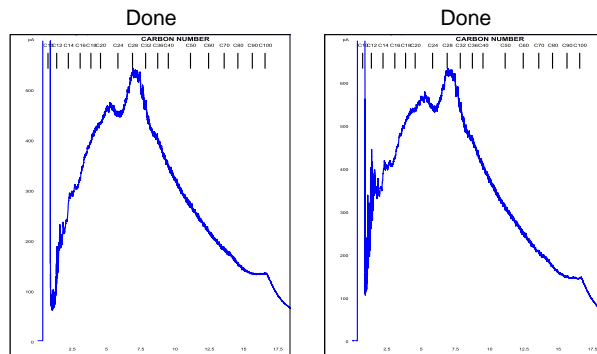
Project ID: 17-152
 Project Name: Suncor LOS
 Project Location: Suncor Base Mine
 LSD:
 P.O.: 4410252962
 Proj. Acct. code: E6687

Lot ID: **1240009**
 Control Number:
 Date Received: Nov 17, 2017
 Date Reported: Dec 13, 2017
 Report Number: 2251173

Reference Number	1240009-11	1240009-12
Sample Date	Nov 12, 2017	Nov 12, 2017
Sample Time	NA	NA
Sample Location		
Sample Description	DSPlot 19-03-HC / 4.6C / Suncor Base Mine	DSPlot 19-04-HC / 4.6C / Suncor Base Mine
Matrix	Soil	Soil

Analyte	Units	Results	Results	Nominal Detection Limit
---------	-------	---------	---------	-------------------------

Chromatogram
 CTGM



Hydrocarbon Analysis (C100) - Product

Product	Units	Results	Results	Nominal Detection Limit
C11	mass fraction	0.0004	0.0019	0.0001
C12	mass fraction	0.0051	0.0143	0.0001
C13	mass fraction	0.0152	0.0234	0.0001
C14	mass fraction	0.0200	0.0251	0.0001
C15	mass fraction	0.0250	0.0286	0.0001
C16	mass fraction	0.0267	0.0294	0.0001
C17	mass fraction	0.0277	0.0297	0.0001
C18	mass fraction	0.0303	0.0321	0.0001
C19	mass fraction	0.0292	0.0304	0.0001
C20	mass fraction	0.0311	0.0320	0.0001
C21	mass fraction	0.0288	0.0292	0.0001
C22	mass fraction	0.0308	0.0309	0.0001
C23	mass fraction	0.0291	0.0290	0.0001
C24	mass fraction	0.0284	0.0280	0.0001
C25	mass fraction	0.0256	0.0251	0.0001
C26	mass fraction	0.0265	0.0258	0.0001
C27	mass fraction	0.0251	0.0243	0.0001
C28	mass fraction	0.0277	0.0267	0.0001
C29	mass fraction	0.0279	0.0269	0.0001
C30	mass fraction	0.0265	0.0255	0.0001
C31	mass fraction	0.0220	0.0213	0.0001
C32	mass fraction	0.0208	0.0201	0.0001
C33	mass fraction	0.0196	0.0190	0.0001
C34	mass fraction	0.0187	0.0180	0.0001
C35	mass fraction	0.0182	0.0175	0.0001



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

	Reference Number	1240009-11	1240009-12	
	Sample Date	Nov 12, 2017	Nov 12, 2017	
	Sample Time	NA	NA	
	Sample Location			
	Sample Description	DSPlot 19-03-HC / 4.6C / Suncor Base Mine	DSPlot 19-04-HC / 4.6C / Suncor Base Mine	
	Matrix	Soil	Soil	
Analyte	Units	Results	Results	Nominal Detection Limit
Hydrocarbon Analysis (C100) - Product - Continued				
C36	mass fraction	0.0179	0.0172	0.0001
C37	mass fraction	0.0149	0.0144	0.0001
C38	mass fraction	0.0137	0.0131	0.0001
C39	mass fraction	0.0146	0.0140	0.0001
C40	mass fraction	0.0142	0.0135	0.0001
C41	mass fraction	0.0117	0.0111	0.0001
C42	mass fraction	0.0113	0.0109	0.0001
C43	mass fraction	0.0117	0.0112	0.0001
C44	mass fraction	0.0113	0.0108	0.0001
C45	mass fraction	0.0098	0.0094	0.0001
C46	mass fraction	0.0089	0.0085	0.0001
C47	mass fraction	0.0093	0.0089	0.0001
C48	mass fraction	0.0085	0.0081	0.0001
C49	mass fraction	0.0083	0.0079	0.0001
C50	mass fraction	0.0081	0.0077	0.0001
C51	mass fraction	0.0079	0.0075	0.0001
C52	mass fraction	0.0073	0.0069	0.0001
C53	mass fraction	0.0071	0.0067	0.0001
C54	mass fraction	0.0065	0.0061	0.0001
C55	mass fraction	0.0068	0.0064	0.0001
C56	mass fraction	0.0062	0.0058	0.0001
C57	mass fraction	0.0060	0.0057	0.0001
C58	mass fraction	0.0059	0.0056	0.0001
C59	mass fraction	0.0053	0.0050	0.0001
C60	mass fraction	0.0056	0.0053	0.0001
C61	mass fraction	0.0051	0.0048	0.0001
C62	mass fraction	0.0050	0.0047	0.0001
C63	mass fraction	0.0045	0.0042	0.0001
C64	mass fraction	0.0048	0.0045	0.0001
C65	mass fraction	0.0043	0.0040	0.0001
C66	mass fraction	0.0046	0.0043	0.0001
C67	mass fraction	0.0041	0.0039	0.0001
C68	mass fraction	0.0037	0.0034	0.0001
C69	mass fraction	0.0040	0.0037	0.0001
C70	mass fraction	0.0039	0.0037	0.0001
C71	mass fraction	0.0035	0.0033	0.0001
C72	mass fraction	0.0038	0.0035	0.0001



Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number	1240009-11	1240009-12		
Sample Date	Nov 12, 2017	Nov 12, 2017		
Sample Time	NA	NA		
Sample Location				
Sample Description	DSPlot 19-03-HC / 4.6C / Suncor Base Mine	DSPlot 19-04-HC / 4.6C / Suncor Base Mine		
Matrix	Soil	Soil		
Analyte	Units	Results	Results	Nominal Detection Limit

Hydrocarbon Analysis (C100) - Product - Continued				
Analyte	Units	Results	Results	Nominal Detection Limit
C73	mass fraction	0.0034	0.0032	0.0001
C74	mass fraction	0.0033	0.0031	0.0001
C75	mass fraction	0.0033	0.0031	0.0001
C76	mass fraction	0.0032	0.0030	0.0001
C77	mass fraction	0.0031	0.0029	0.0001
C78	mass fraction	0.0027	0.0026	0.0001
C79	mass fraction	0.0030	0.0028	0.0001
C80	mass fraction	0.0029	0.0027	0.0001
C81	mass fraction	0.0028	0.0026	0.0001
C82	mass fraction	0.0028	0.0026	0.0001
C83	mass fraction	0.0027	0.0025	0.0001
C84	mass fraction	0.0027	0.0025	0.0001
C85	mass fraction	0.0026	0.0024	0.0001
C86	mass fraction	0.0023	0.0021	0.0001
C87	mass fraction	0.0025	0.0024	0.0001
C88	mass fraction	0.0025	0.0023	0.0001
C89	mass fraction	0.0022	0.0020	0.0001
C90	mass fraction	0.0024	0.0022	0.0001
C91	mass fraction	0.0024	0.0022	0.0001
C92	mass fraction	0.0021	0.0020	0.0001
C93	mass fraction	0.0024	0.0022	0.0001
C94	mass fraction	0.0021	0.0019	0.0001
C95	mass fraction	0.0023	0.0022	0.0001
C96	mass fraction	0.0021	0.0019	0.0001
C97	mass fraction	0.0021	0.0019	0.0001
C98	mass fraction	0.0020	0.0019	0.0001
C99	mass fraction	0.0020	0.0019	0.0001
C100+	mass fraction	0.0536	0.0450	0.0001
Total	mass fraction	1.0000	1.0000	

Approved by: 
 Mike Yohemas, BSc
 Laboratory Operations Manager

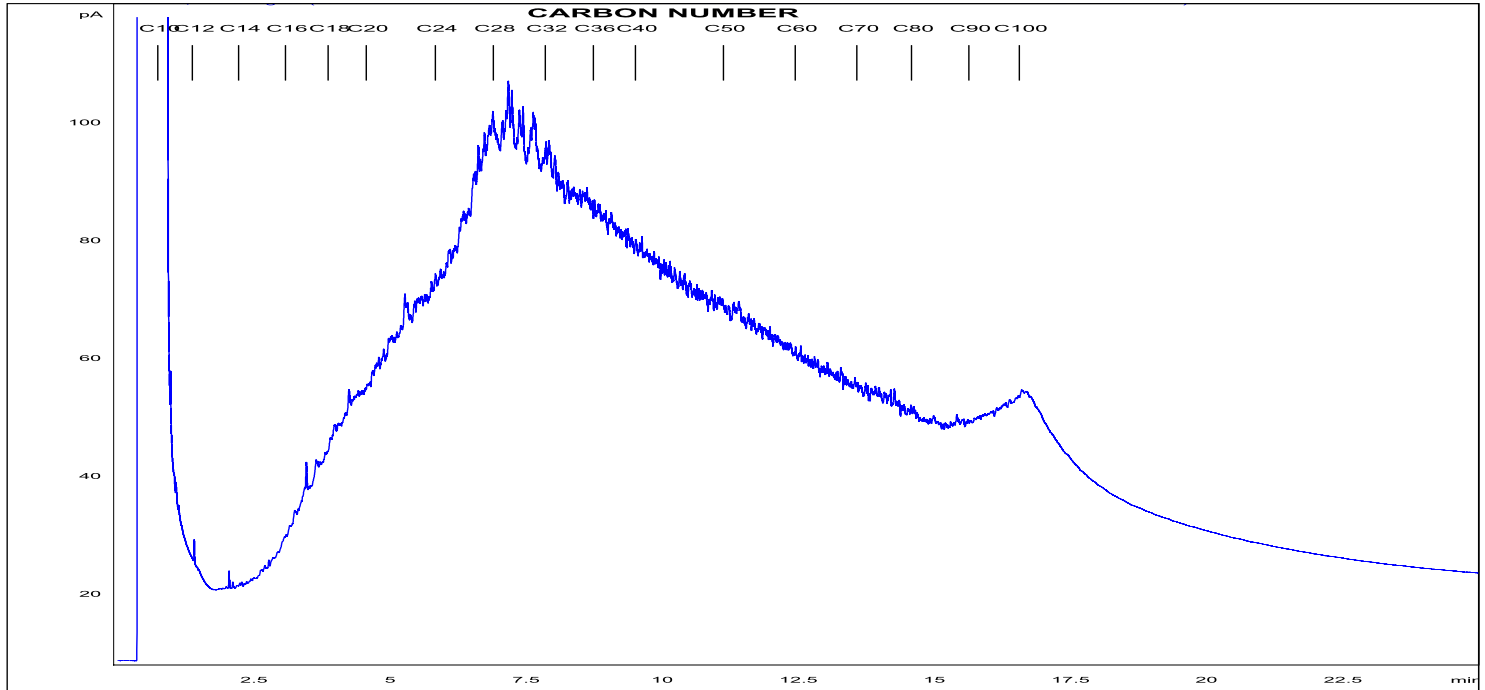
Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).
 Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.



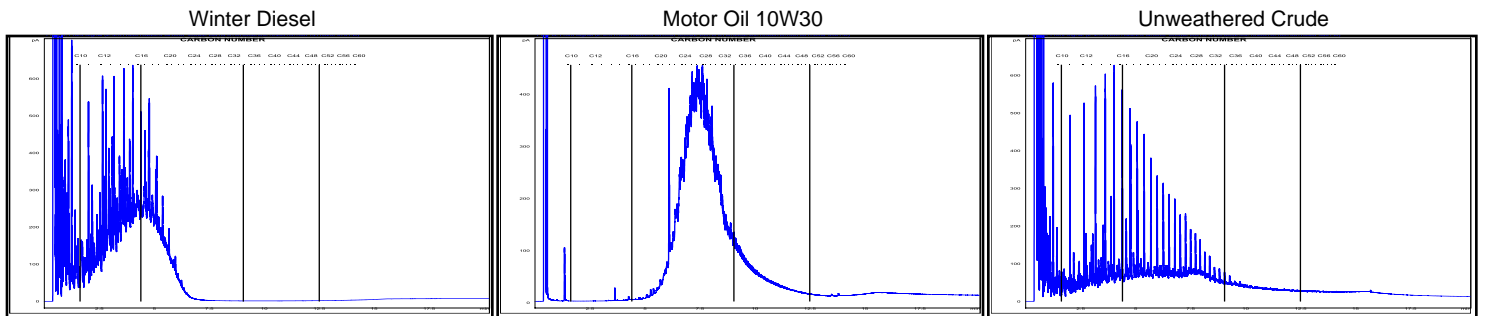
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number: 1240009-1 Sample Description: DSPlot 3-03-HC / 4.6C / Suncor Base Mine
 Sample Date: November 10, 2017 Location: Matrix: Soil



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

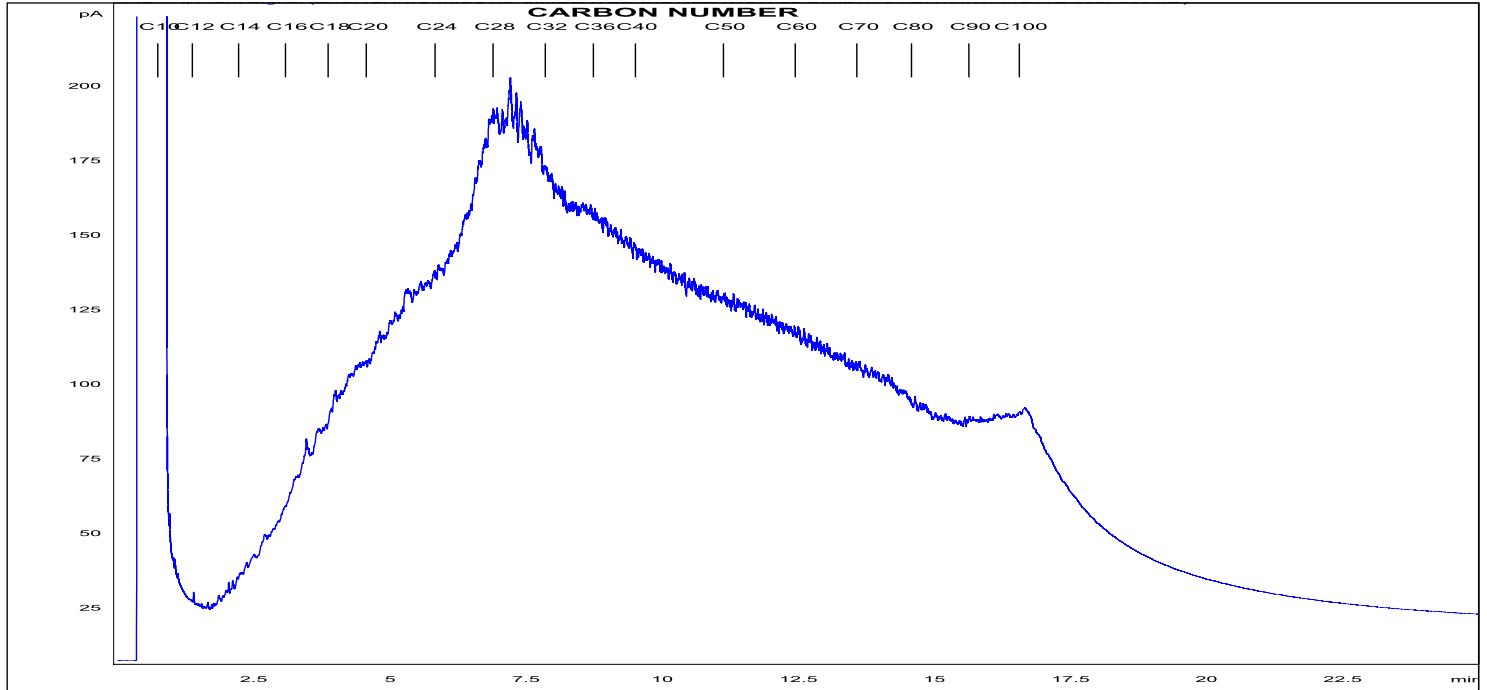
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



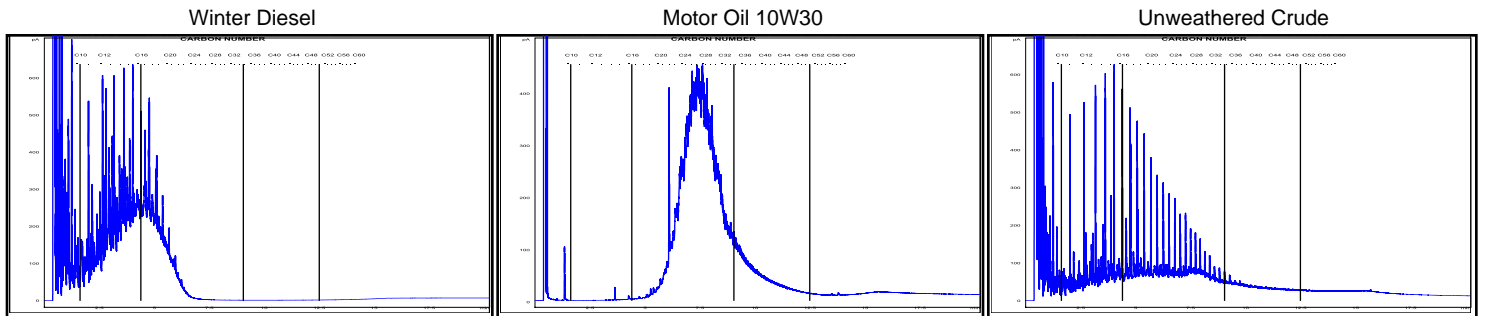
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number: 1240009-2 Sample Description: DSPlot 3-04-HC / 4.6C / Suncor Base Mine
 Sample Date: November 10, 2017 Location: Matrix: Soil



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

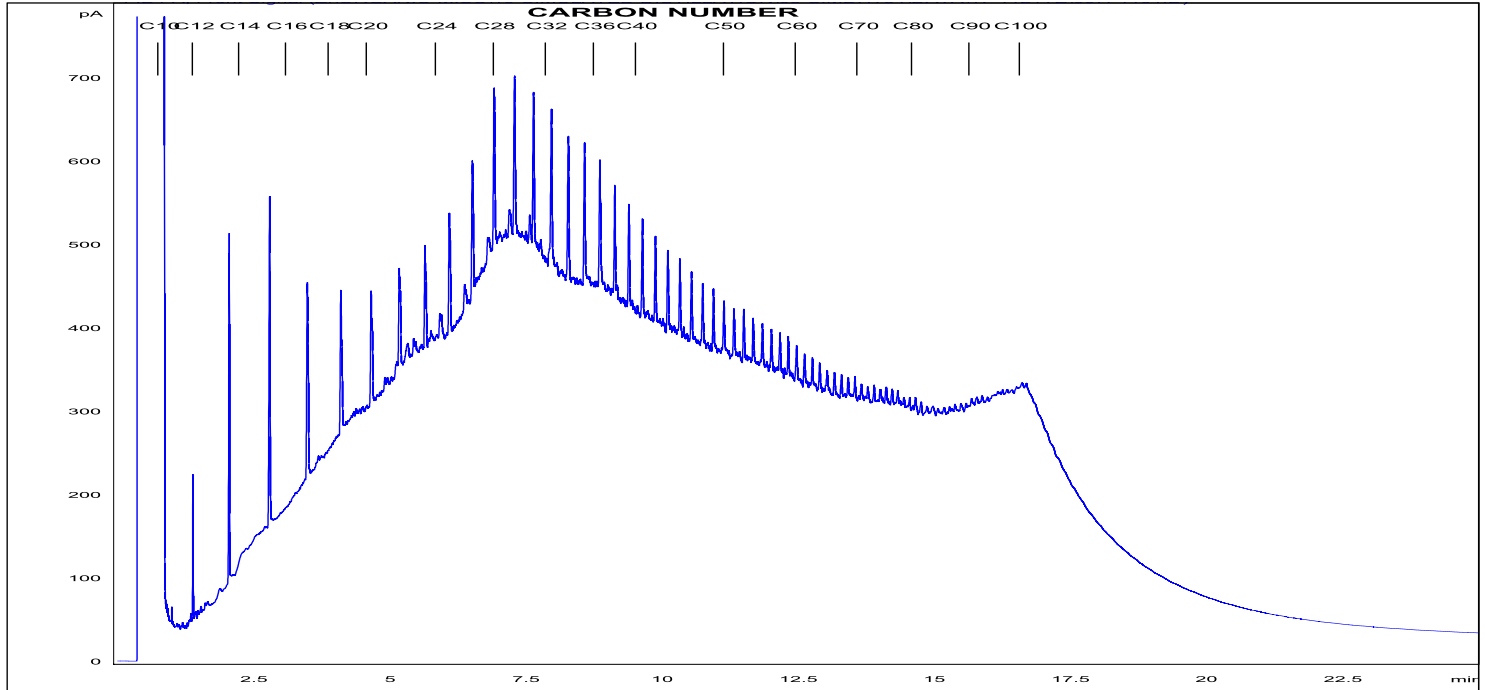
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



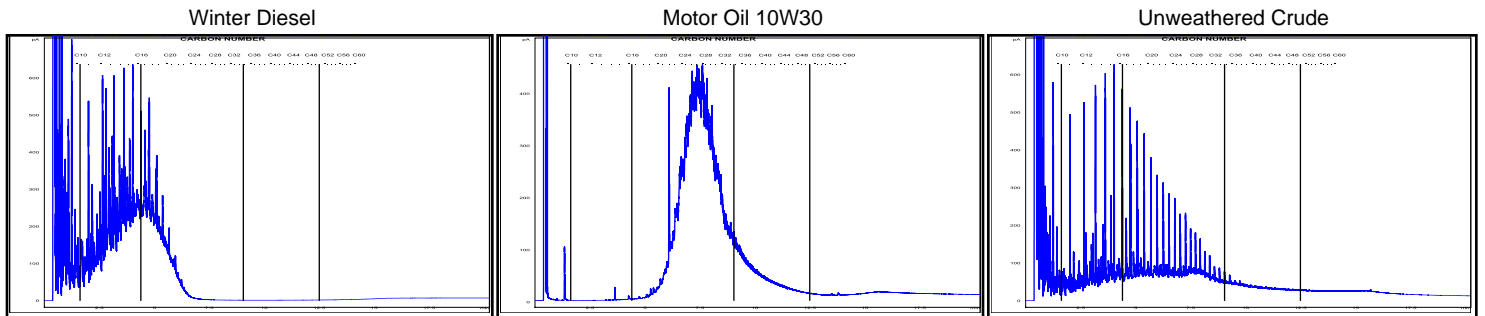
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number: 1240009-3 Sample Description: NMPlot 13-03-HC / 4.6C / Suncor Base Mine
 Sample Date: November 11, 2017 Location: Matrix: Soil



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

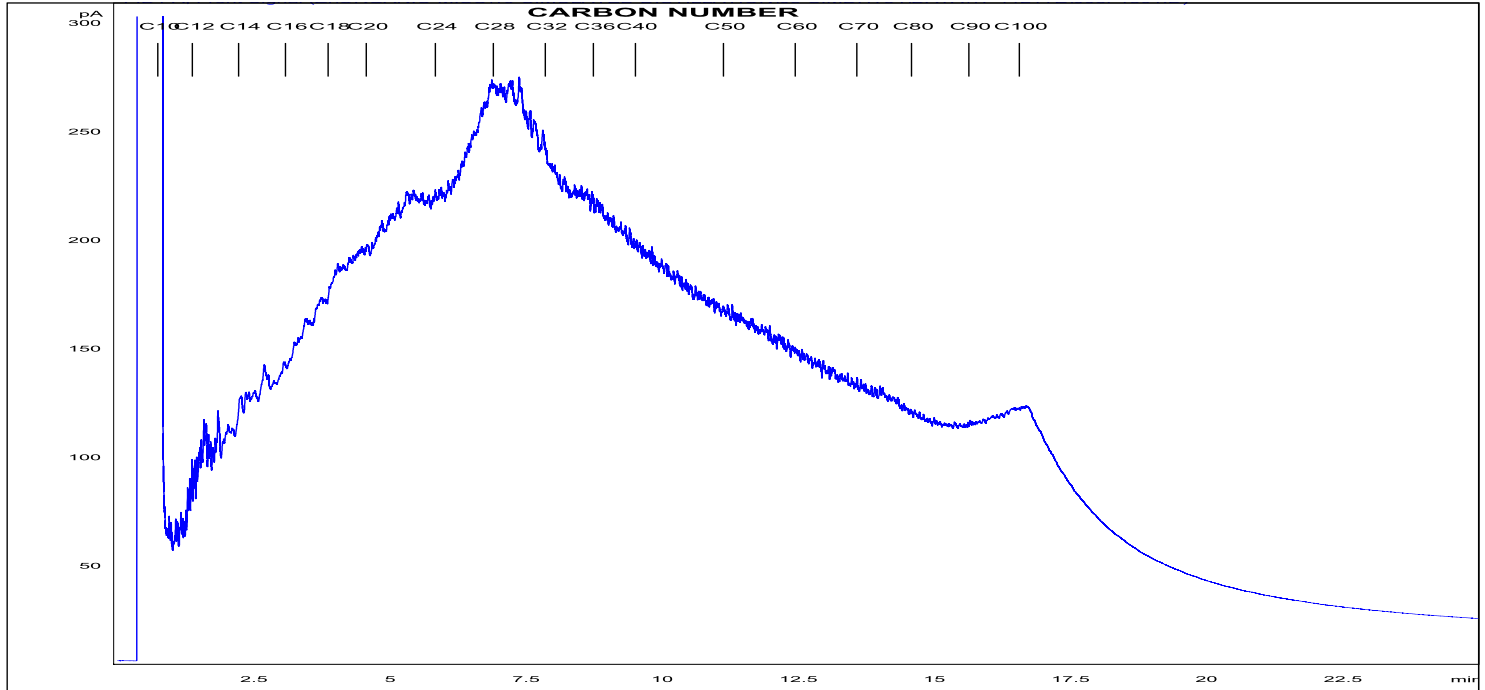
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



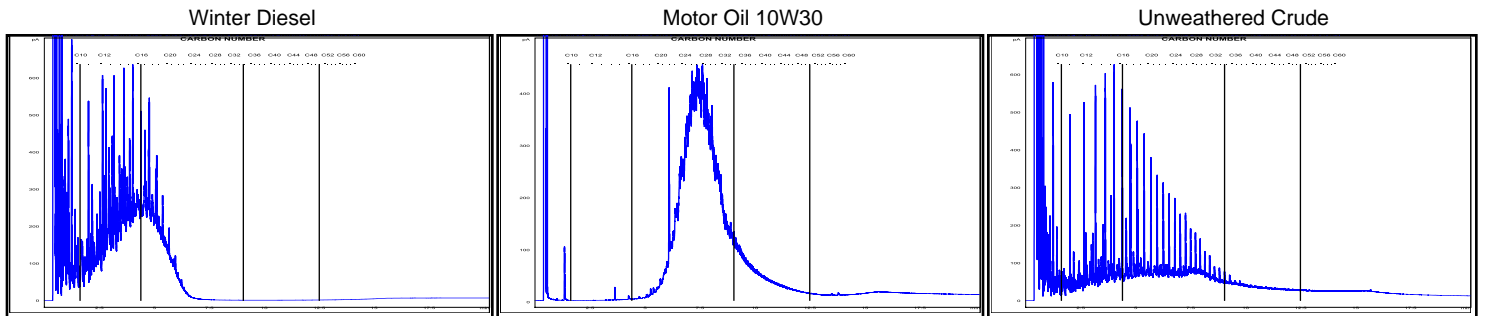
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number: 1240009-4 Sample Description: NMPlot 13-04-HC / 4.6C / Suncor Base Mine
 Sample Date: November 11, 2017 Location: Matrix: Soil



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

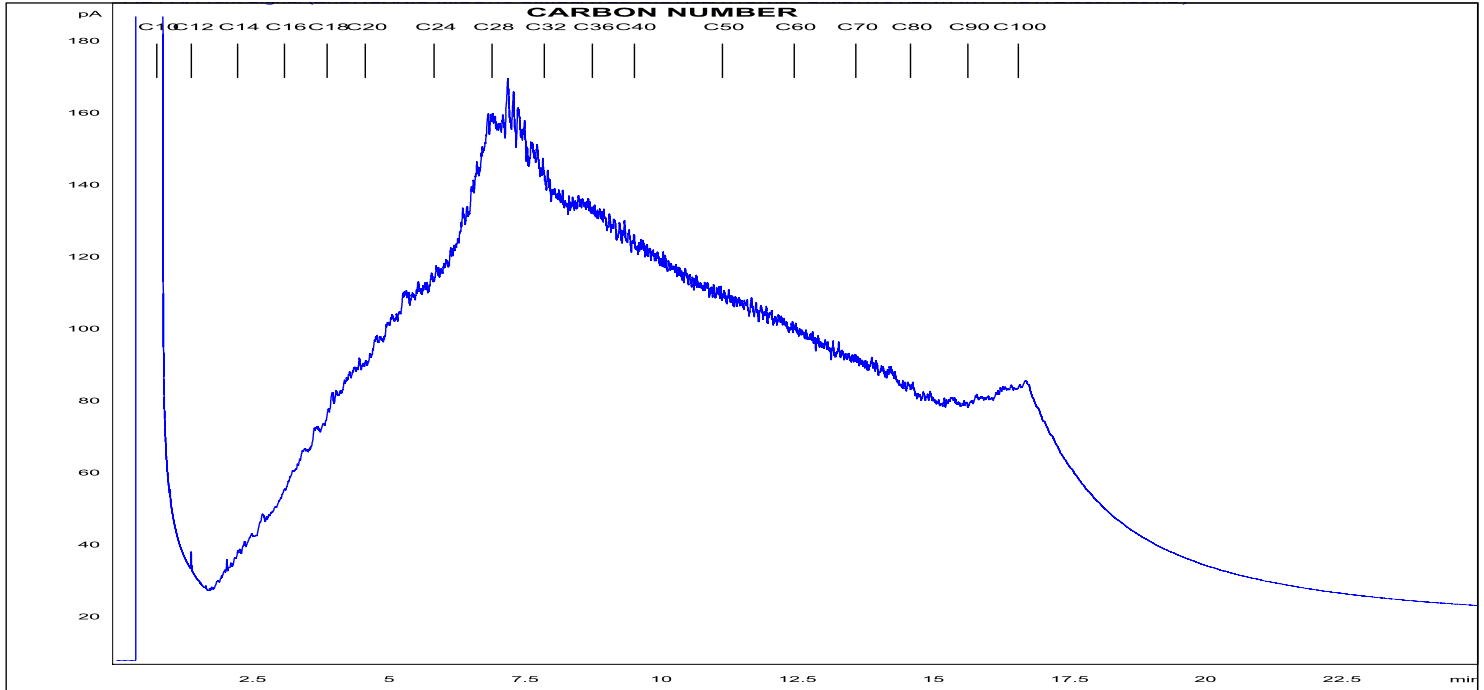
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



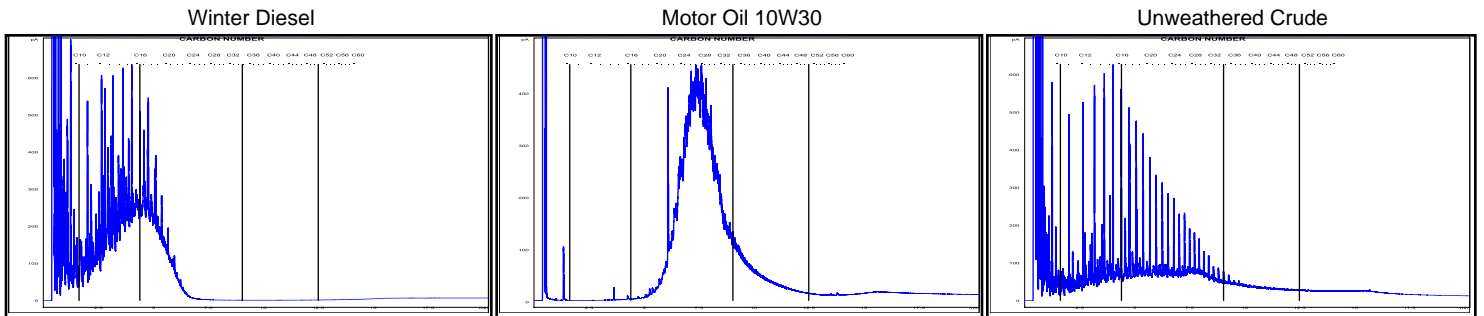
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number: 1240009-5 Sample Description: NMPlot 14-03-HC / 4.6C / Suncor Base Mine
 Sample Date: November 11, 2017 Location: Matrix: Soil



TYPICAL PRODUCT CHROMATOGRAMS



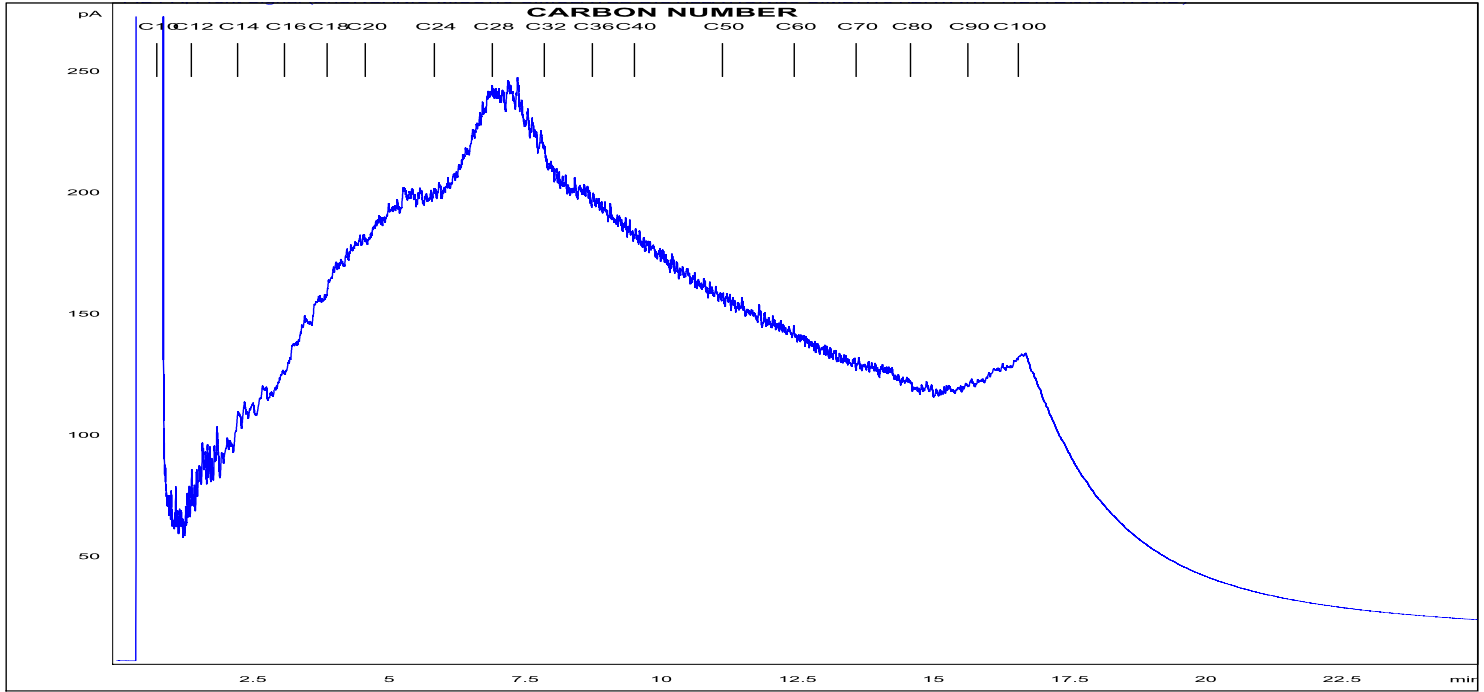
Product Carbon Number Ranges					
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



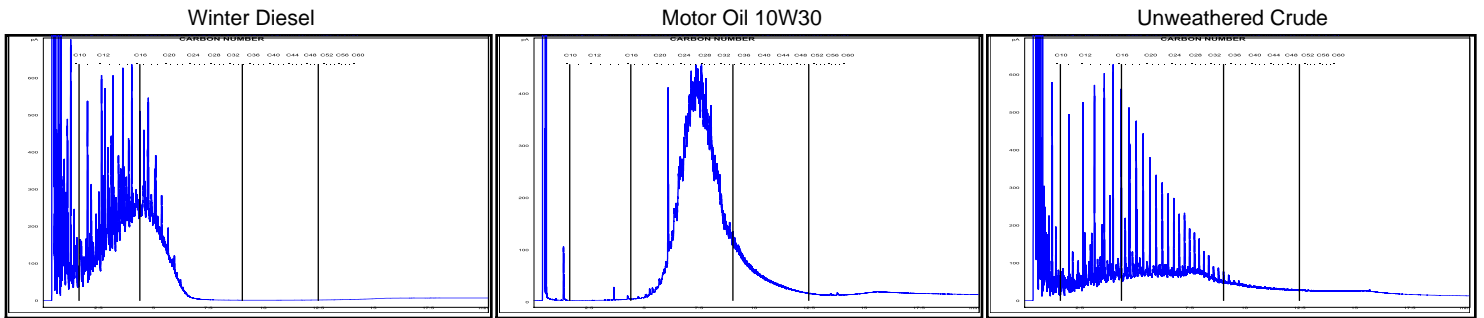
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number: 1240009-6 Sample Description: NMPlot 14-04-HC / 4.6C / Suncor Base Mine
 Sample Date: November 11, 2017 Location: Matrix: Soil



TYPICAL PRODUCT CHROMATOGRAMS



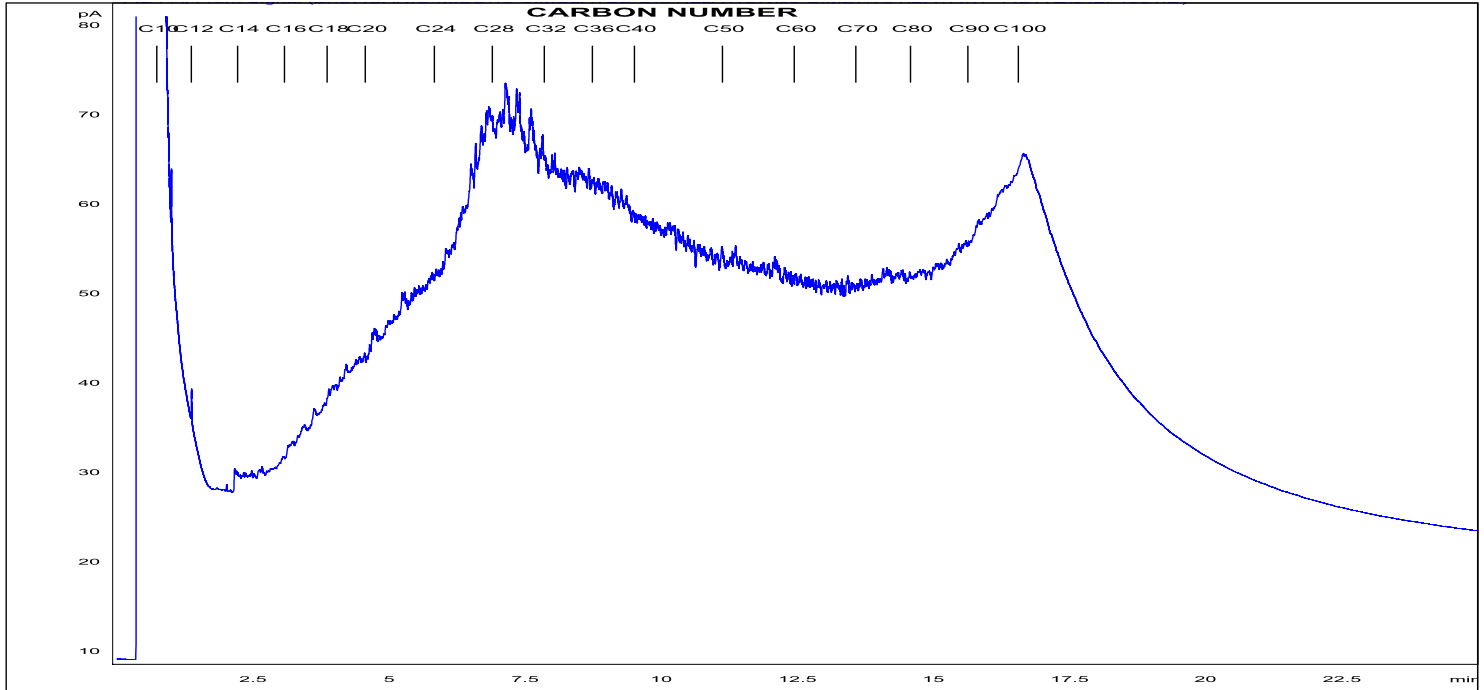
Product Carbon Number Ranges					
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



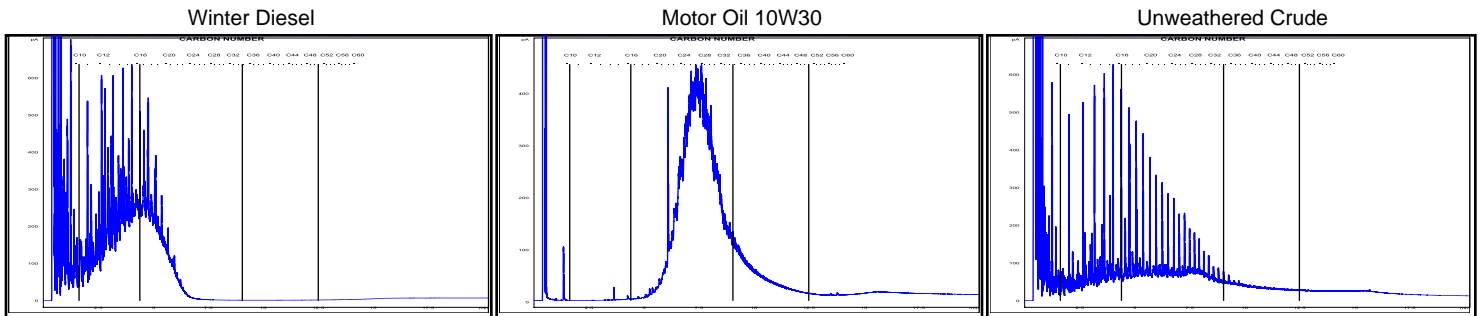
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number: 1240009-7 Sample Description: NMPlot 16-03-HC / 4.6C / Suncor Base Mine
 Sample Date: November 10, 2017 Location: Matrix: Soil



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

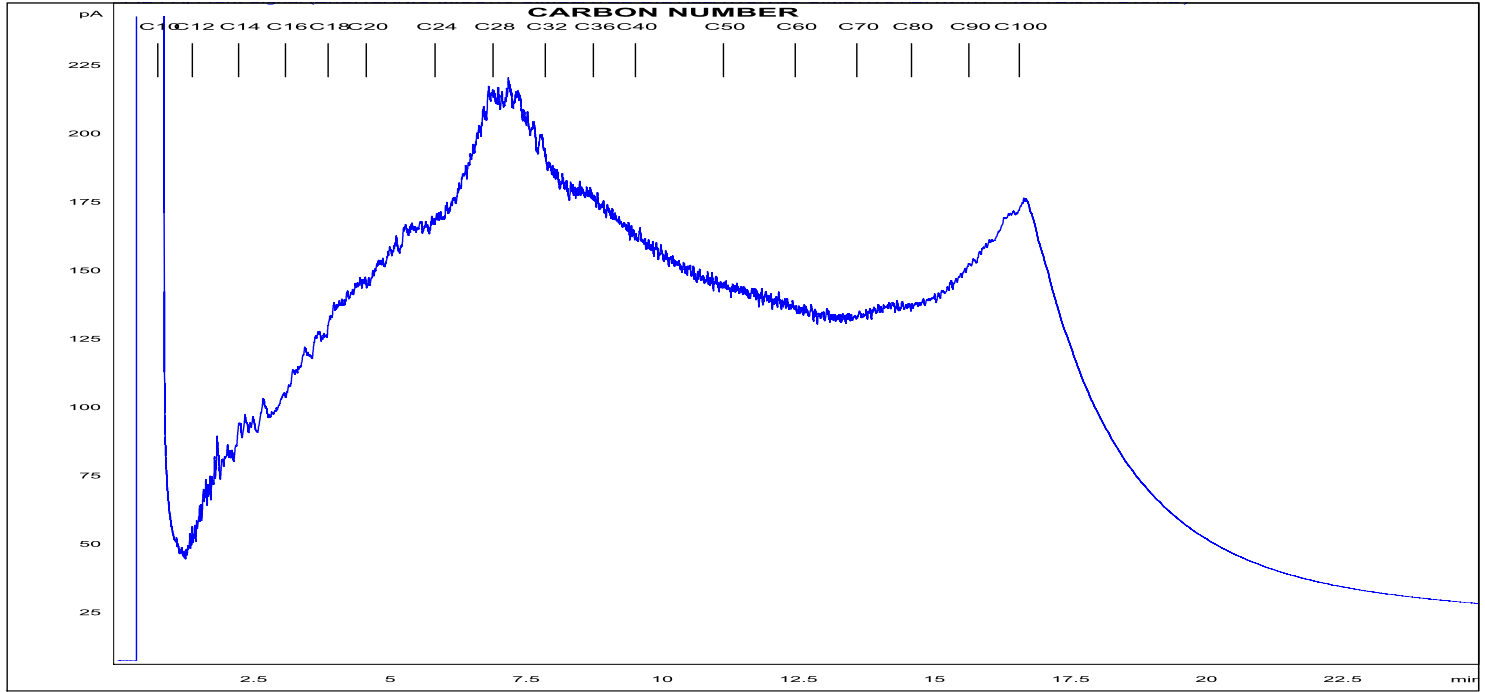
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



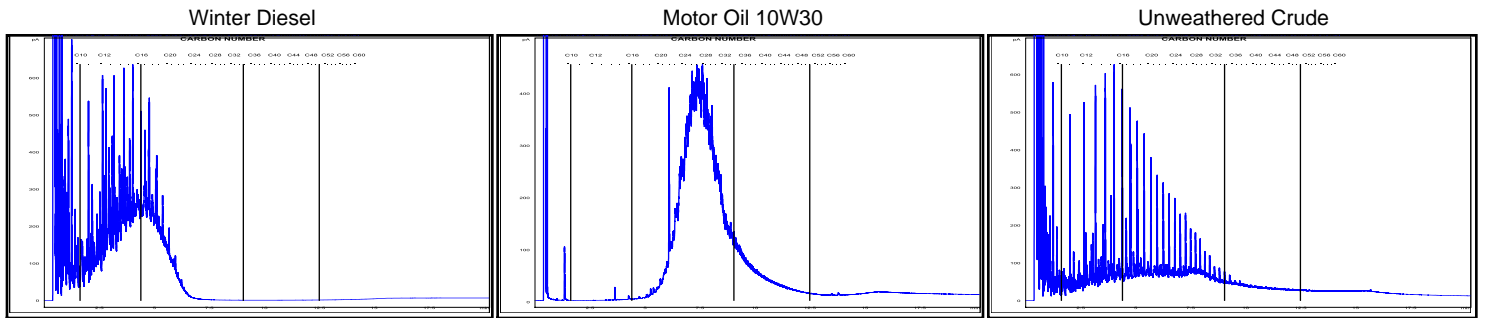
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number: 1240009-8 Sample Description: NMPlot 16-04-HC / 4.6C / Suncor Base Mine
 Sample Date: November 10, 2017 Location: Matrix: Soil



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

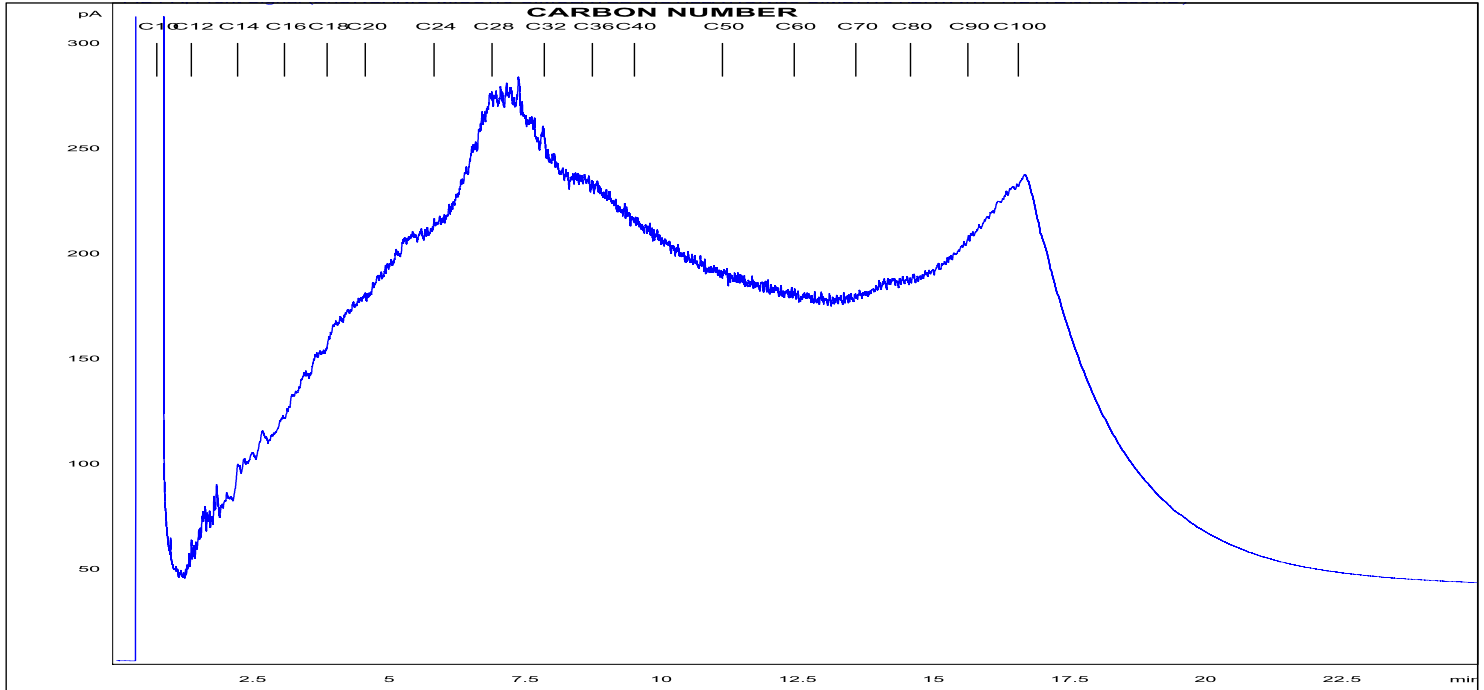
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



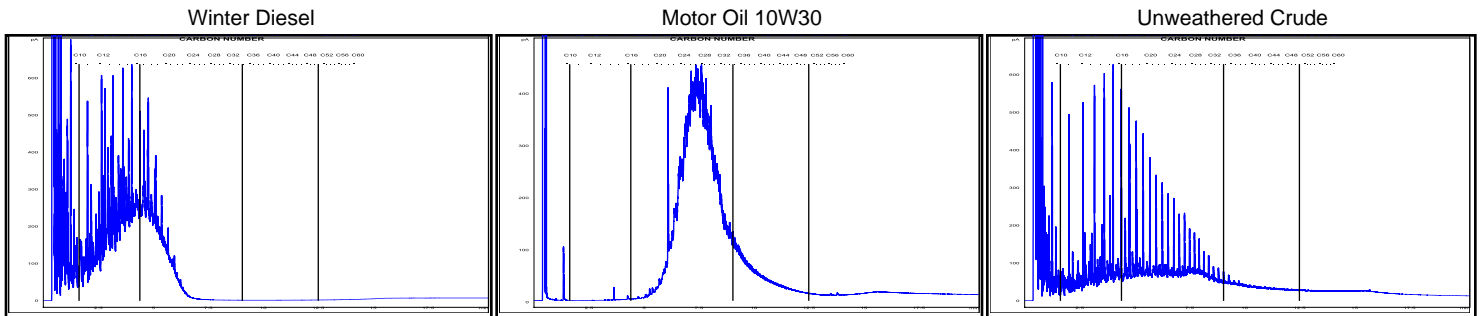
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number: 1240009-9 Sample Description: NMPlot 18-03-HC / 4.6C / Suncor Base Mine
 Sample Date: November 12, 2017 Location: Matrix: Soil



TYPICAL PRODUCT CHROMATOGRAMS



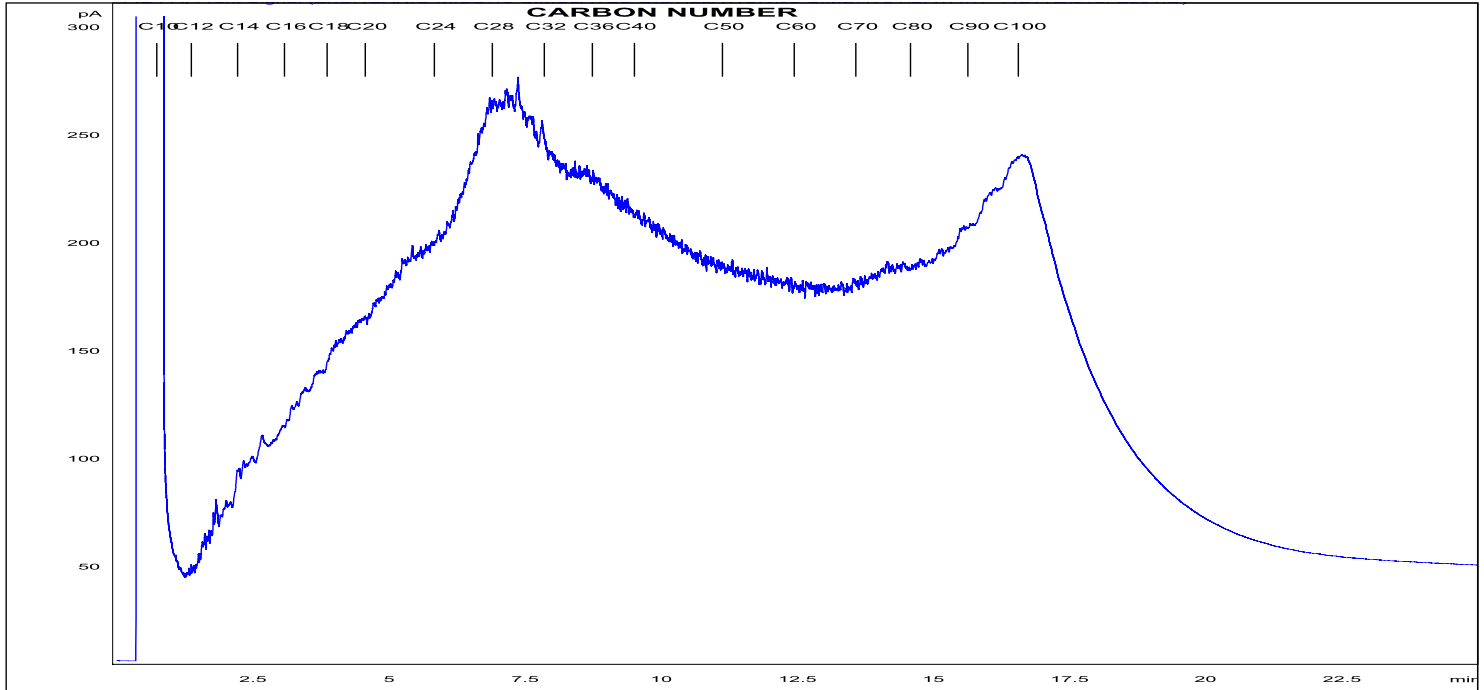
Product Carbon Number Ranges					
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



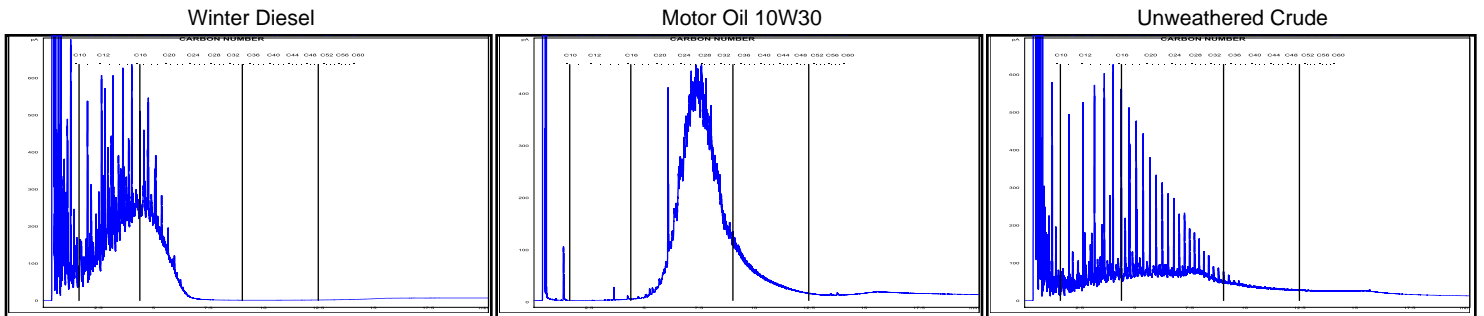
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number: 1240009-10 Sample Description: NMPlot 18-04-HC / 4.6C / Suncor Base Mine
 Sample Date: November 12, 2017 Location: Matrix: Soil



TYPICAL PRODUCT CHROMATOGRAMS



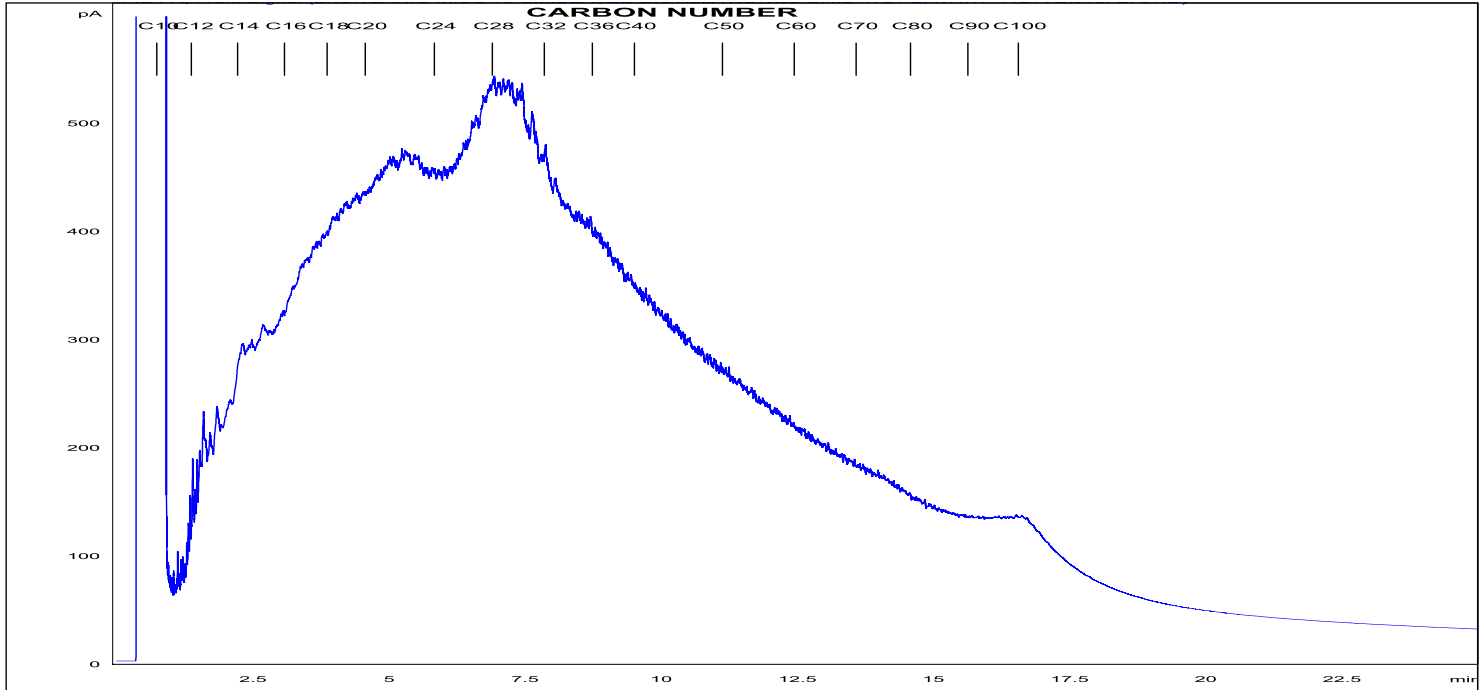
Product Carbon Number Ranges					
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



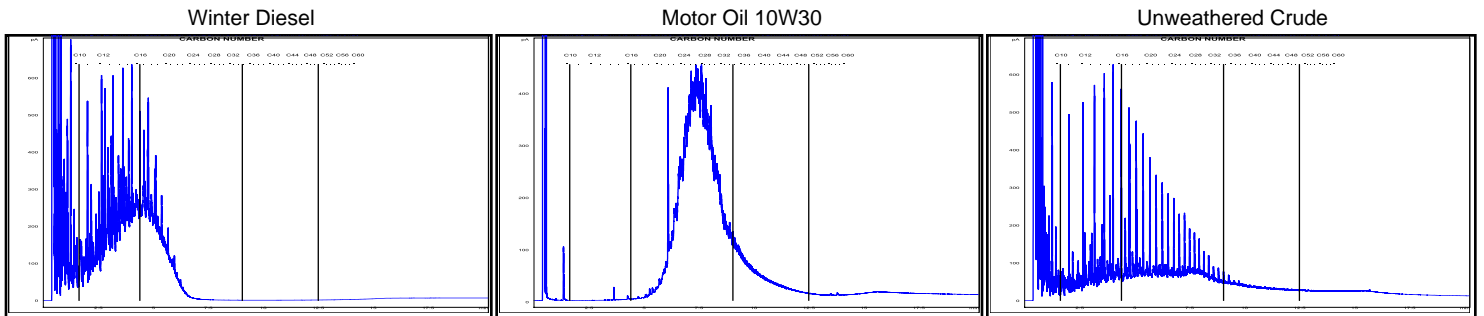
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number: 1240009-11 Sample Description: DSPlot 19-03-HC / 4.6C / Suncor Base Mine
 Sample Date: November 12, 2017 Location: Matrix: Soil



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

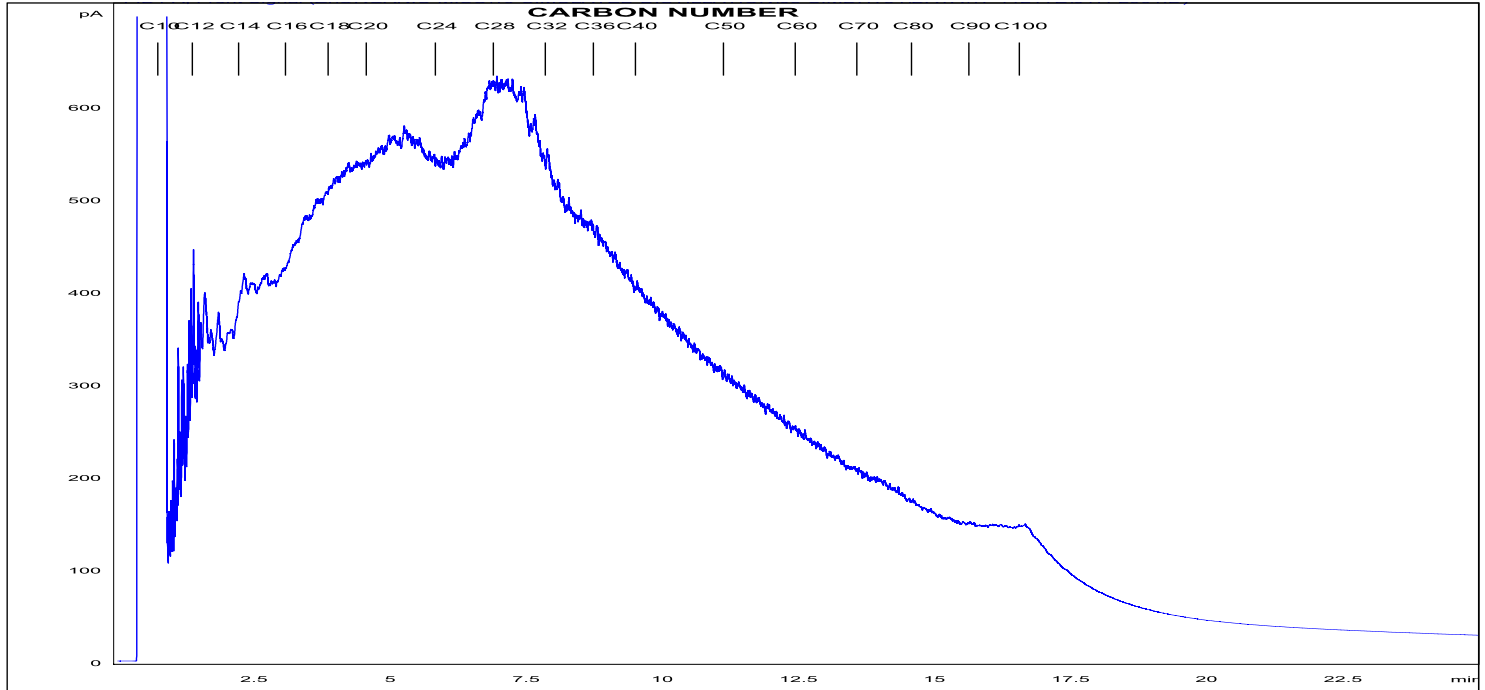
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+



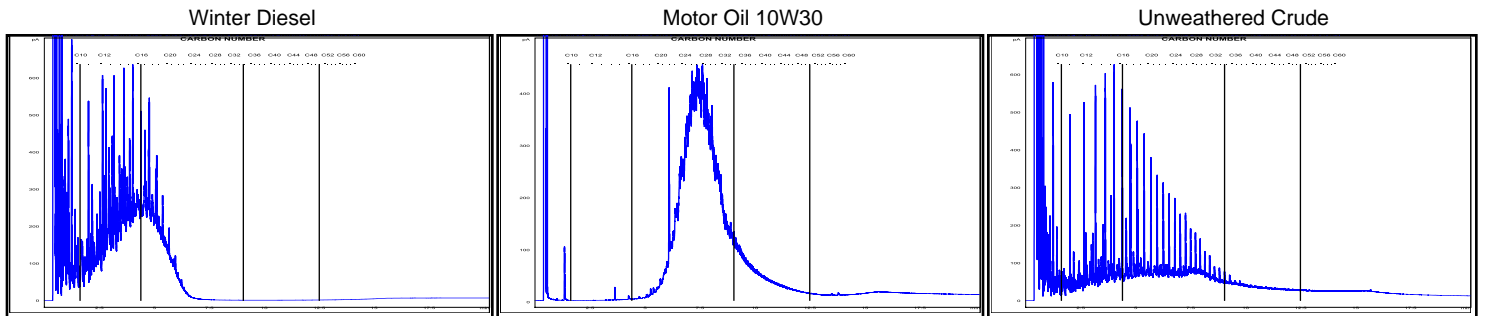
Hydrocarbon Chromatogram

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Reference Number: 1240009-12 Sample Description: DSPlot 19-04-HC / 4.6C / Suncor Base Mine
 Sample Date: November 12, 2017 Location: Matrix: Soil



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Methodology and Notes

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
TE100 - Product	ASTM	Standard Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography, D 2887-84	Nov 23, 2017	Exova Calgary

References

ASTM Annual Book of ASTM Standards

Comments:

- Dec 07, 2017 - Mass fraction of hydrocarbons performed on sample extracts prepared for extractable hydrocarbon analysis which included the silica gel clean-up.
- Dec 13, 2017 - Report was issued to include addition of chromatograms requested by Vivienne of Paragon. Previous report 2244794.

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Analytical Report

Bill To: Syncrude Canada Ltd. P. O. 4009, MD 0078 Fort McMurray, AB, Canada T9H 3L1	Project ID: 17-152 Project Name: Suncor LOS Project Location: Suncor Base Mine LSD: P.O.: 4410252962 Proj. Acct. code: E6687	Lot ID: 1240009 Control Number: Date Received: Nov 17, 2017 Date Reported: Dec 13, 2017 Report Number: 2251173
Attn: Marty Yarmuch Sampled By: Nikki McPhee Company: Paragon		

Petroleum Hydrocarbons in Soil

Batch Notes

1. The method used complies with the *Reference Method for the Canada Wide Standards for Petroleum Hydrocarbons in Soil - Tier 1*, April 2001, including Addendum 1, and is accredited for use in Exova.
2. Modifications of the method: See *Notes and Methodology* for nonconformances (if applicable).
3. Qualifications on results: See *Notes and Methodology* for nonconformances (if applicable).
4. Silica gel treatment is performed for fractions F2, F3, F4.
5. F1-BTEX: BTEX has been subtracted from the F1 fraction.
6. If analyzed, naphthalene has been subtracted from fraction F2 and selected PAHs have been subtracted from fraction F3.
7. F4HTGC is reported when more than 5% of the total carbon envelope elutes past C₅₀.
8. Exova does not routinely report Gravimetric Heavy Hydrocarbons (F4G or F4G-sg), F4HTGC through extended range high temperature GC is reported instead.
9. When both F4(C₃₄-C₅₀) and F4HTGC are reported, F4HTGC is the final F4 that is to be used for interpreting the CWS.
10. Quality criteria met for the batch: Data is reported in Quality Control Section of report (if requested).
 - nC₆ and nC₁₀ response factors (RF) are within 30% of RF for toluene
 - nC₁₀, nC₁₆ and nC₃₄ RFs are within 10% of each other
 - nC₅₀ RF is within 30% of the average RF for nC₁₀+nC₁₆+nC₃₄
 - linearity is within 15% for each of the calibrated carbon ranges
11. Batch data for analytical quality control are available on request.
12. Extraction and analysis holding times were met: See *Notes and Methodology* for nonconformances (if applicable).

Approved by:



Mike Yohemas, BSc
Laboratory Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Confirmation of Service Request

Lot ID: 1239535
Number of Samples: 24
Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Agreement Id	548	Control Id	C0056638
Project Id	17-152	Report Due Date	Nov 22, 2017
Project Name	Suncor LOS	Received Date	Nov 15, 2017
Project Location	Suncor Basemine	Sampled By	Nikki McPhee
Legal Location		Sampling Company	Paragon Soil
PO#		Est. Disposal Date	Feb 20, 2018
Proj. Acct. Code			

Service Information

Sample Id		Service	Service Name
1 5921685		DISP	Environmental Disposal Fee
Date Sampled	Nov 11, 2017 9:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	DSPlot10-02-AN	S	
2 5921686		DISP	Environmental Disposal Fee
Date Sampled	Nov 11, 2017 9:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	DSPlot10-03-AN	S	
3 5921687		DISP	Environmental Disposal Fee
Date Sampled	Nov 11, 2017 9:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	DSPlot10-04-AN	S	
4 5921688		CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 11, 2017 9:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	DSPlot10-02-HC		

Confirmation of Service Request

Lot ID: 1239535

Number of Samples: 24

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	Service	Service Name
5 5921689	CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	DISP	Environmental Disposal Fee
Priority	CTGM	B Chromatogram supplied
Sample Description		
Nov 11, 2017 9:00 Normal DSPlot10-03-HC		
6 5921690	CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	DISP	Environmental Disposal Fee
Priority	CTGM	B Chromatogram supplied
Sample Description		
Nov 11, 2017 9:00 Normal DSPlot10-04-HC		
7 5921691	57	Bulk density - w/vol
Date Sampled	DISP	Environmental Disposal Fee
Priority		
Description 2		
Sample Description		
Nov 11, 2017 9:00 Normal 298CM3 DSPlot10-02-BD1		
8 5921692	57	Bulk density - w/vol
Date Sampled	DISP	Environmental Disposal Fee
Priority		
Description 2		
Sample Description		
Nov 11, 2017 9:00 Normal 298CM3 DSPlot10-02-BD2		
9 5921693	DISP	Environmental Disposal Fee
Date Sampled	05	Drying,Grinding, 2mm sieve
Priority	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	S	
Nov 11, 2017 11:00 Normal DSPlot15-02-AN		
10 5921694	DISP	Environmental Disposal Fee
Date Sampled	05	Drying,Grinding, 2mm sieve
Priority	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	S	
Nov 11, 2017 11:00 Normal DSPlot15-03-AN		
11 5921695	DISP	Environmental Disposal Fee
Date Sampled	05	Drying,Grinding, 2mm sieve
Priority	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	S	
Nov 11, 2017 11:00 Normal DSPlot15-04-AN		

Confirmation of Service Request

Lot ID: 1239535

Number of Samples: 24

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	12	Service	Service Name
	5921696	CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 11, 2017 11:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	DSPlot15-02-HC		
Sample Id	13	Service	Service Name
	5921697	CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 11, 2017 11:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	DSPlot15-03-HC		
Sample Id	14	Service	Service Name
	5921698	CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 11, 2017 11:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	DSPlot15-04-HC		
Sample Id	15	Service	Service Name
	5921699	57	Bulk density - w/vol
Date Sampled	Nov 11, 2017 11:00	DISP	Environmental Disposal Fee
Priority	Normal		
Description 2	298CM3		
Sample Description	DSPlot15-02-BD1		
Sample Id	16	Service	Service Name
	5921700	57	Bulk density - w/vol
Date Sampled	Nov 11, 2017 11:00	DISP	Environmental Disposal Fee
Priority	Normal		
Description 2	298CM3		
Sample Description	DSPlot15-02-BD2		
Sample Id	17	Service	Service Name
	5921701	DISP	Environmental Disposal Fee
Date Sampled	Nov 11, 2017 2:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	DSPlot12-02-AN	S	
Sample Id	18	Service	Service Name
	5921702	DISP	Environmental Disposal Fee
Date Sampled	Nov 11, 2017 2:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	DSPlot12-03-AN	S	

Confirmation of Service Request

Lot ID: 1239535

Number of Samples: 24

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	19 5921703	Service	Service Name
Date Sampled	Nov 11, 2017 2:00	DISP	Environmental Disposal Fee
Priority	Normal	05	Drying,Grinding, 2mm sieve
Sample Description	DSPlot12-04-AN	ABT1SAL-S	Alberta Tier 1 Soil Salinity
Sample Id	20 5921704	Service	Service Name
Date Sampled	Nov 11, 2017 2:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	DSPlot12-02-HC	CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Sample Id	21 5921705	Service	Service Name
Date Sampled	Nov 11, 2017 2:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	DSPlot12-03-HC	CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Sample Id	22 5921706	Service	Service Name
Date Sampled	Nov 11, 2017 2:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	DSPlot12-04-HC	CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Sample Id	23 5921707	Service	Service Name
Date Sampled	Nov 11, 2017 2:00	DISP	Environmental Disposal Fee
Priority	Normal	57	Bulk density - w/vol
Description 2	298CM3		
Sample Description	DSPlot12-02-BD1		
Sample Id	24 5921708	Service	Service Name
Date Sampled	Nov 11, 2017 2:00	DISP	Environmental Disposal Fee
Priority	Normal	57	Bulk density - w/vol
Description 2	298CM3		
Sample Description	DSPlot12-02-BD2		

Service Count		
Service Name	Service Code	Quantity
Alberta Tier 1 Soil Salinity	ABT1SAL-S	9
Bulk density - w/vol	57	6
CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction	CCMEC	9
Chromatogram supplied	CTGM	9

Confirmation of Service Request

Lot ID: 1239545

Number of Samples: 24

Printed Date: Nov 20, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Agreement Id	548	Control Id	C0056636
Project Id	17-152	Report Due Date	Nov 22, 2017
Project Name	Suncor LOS	Received Date	Nov 15, 2017
Project Location	Suncor Basemine	Sampled By	Nikki McPhee
Legal Location		Sampling Company	Paragon Soil
PO#		Est. Disposal Date	Feb 20, 2018
Proj. Acct. Code			

Service Information

Sample Id		Service	Service Name
1 5921740		DISP	Environmental Disposal Fee
Date Sampled	Nov 12, 2017 10:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	DSPlot20-02-AN	S	
2 5921741		DISP	Environmental Disposal Fee
Date Sampled	Nov 12, 2017 10:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	DSPlot20-03-AN	S	
3 5921742		DISP	Environmental Disposal Fee
Date Sampled	Nov 12, 2017 10:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	DSPlot20-04-AN	S	
4 5921743		CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 12, 2017 10:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	DSPlot20-02-HC		

Confirmation of Service Request

Lot ID: 1239545

Number of Samples: 24

Printed Date: Nov 20, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	Service	Service Name
5 5921744	CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	DISP	Environmental Disposal Fee
Priority	CTGM	B Chromatogram supplied
Sample Description		
Nov 12, 2017 10:00		
Normal		
DSPlot20-03-HC		
6 5921745	CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	DISP	Environmental Disposal Fee
Priority	CTGM	B Chromatogram supplied
Sample Description		
Nov 12, 2017 10:00		
Normal		
DSPlot20-04-HC		
7 5921746	57	Bulk density - w/vol
Date Sampled	DISP	Environmental Disposal Fee
Priority		
Description 2		
Sample Description		
Nov 12, 2017 10:00		
Normal		
298CM3		
DSPlot20-02-BD1		
8 5921747	57	Bulk density - w/vol
Date Sampled	DISP	Environmental Disposal Fee
Priority		
Description 2		
Sample Description		
Nov 12, 2017 10:00		
Normal		
298CM3		
DSPlot20-02-BD2		
9 5921748	DISP	Environmental Disposal Fee
Date Sampled	05	Drying,Grinding, 2mm sieve
Priority	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	S	
Nov 10, 2017 12:00		
Normal		
DSPlot3-02-AN		
10 5921749	DISP	Environmental Disposal Fee
Date Sampled	05	Drying,Grinding, 2mm sieve
Priority	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	S	
Nov 10, 2017 12:00		
Normal		
DSPlot3-03-AN		
11 5921750	DISP	Environmental Disposal Fee
Date Sampled	05	Drying,Grinding, 2mm sieve
Priority	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	S	
Nov 10, 2017 12:00		
Normal		
DSPlot3-04-AN		

Confirmation of Service Request

Lot ID: 1239545

Number of Samples: 24

Printed Date: Nov 20, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	12	Service	Service Name
	5921751	CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 10, 2017 12:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	DSPlot3-02-HC		
Sample Id	13	Service	Service Name
	5921752	CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 10, 2017 12:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	DSPlot3-03-HC		
Sample Id	14	Service	Service Name
	5921753	CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 10, 2017 12:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	DSPlot3-04-HC		
Sample Id	15	Service	Service Name
	5921754	57	Bulk density - w/vol
Date Sampled	Nov 10, 2017 12:00	DISP	Environmental Disposal Fee
Priority	Normal		
Description 2	298CM3		
Sample Description	DSPlot3-02-BD1		
Sample Id	16	Service	Service Name
	5921755	57	Bulk density - w/vol
Date Sampled	Nov 10, 2017 12:00	DISP	Environmental Disposal Fee
Priority	Normal		
Description 2	298CM3		
Sample Description	DSPlot3-02-BD2		
Sample Id	17	Service	Service Name
	5921756	DISP	Environmental Disposal Fee
Date Sampled	Nov 12, 2017 4:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	DSPlot19-02-AN	S	
Sample Id	18	Service	Service Name
	5921757	DISP	Environmental Disposal Fee
Date Sampled	Nov 12, 2017 4:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	DSPlot19-03-AN	S	

Confirmation of Service Request

Lot ID: 1239545

Number of Samples: 24

Printed Date: Nov 20, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	19 5921758	Service DISP 05 ABT1SAL-S	Service Name Environmental Disposal Fee Drying,Grinding, 2mm sieve Alberta Tier 1 Soil Salinity
Date Sampled	Nov 12, 2017 4:00		
Priority	Normal		
Sample Description	DSPlot19-04-AN		
Sample Id	20 5921759	Service CCMEC DISP CTGM	Service Name B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction Environmental Disposal Fee B Chromatogram supplied
Date Sampled	Nov 12, 2017 4:00		
Priority	Normal		
Sample Description	DSPlot19-02-HC		
Sample Id	21 5921760	Service CCMEC DISP CTGM	Service Name B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction Environmental Disposal Fee B Chromatogram supplied
Date Sampled	Nov 12, 2017 4:00		
Priority	Normal		
Sample Description	DSPlot19-03-HC		
Sample Id	22 5921761	Service CCMEC DISP CTGM	Service Name B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction Environmental Disposal Fee B Chromatogram supplied
Date Sampled	Nov 12, 2017 4:00		
Priority	Normal		
Sample Description	DSPlot19-04-HC		
Sample Id	23 5921762	Service 57 DISP	Service Name Bulk density - w/vol Environmental Disposal Fee
Date Sampled	Nov 12, 2017 4:00		
Priority	Normal		
Description 2	298CM3		
Sample Description	DSPlot19-02-BD1		
Sample Id	24 5921763	Service 57 DISP	Service Name Bulk density - w/vol Environmental Disposal Fee
Date Sampled	Nov 12, 2017 4:00		
Priority	Normal		
Description 2	298CM3		
Sample Description	DSPlot19-02-BD2		

Service Count		
Service Name	Service Code	Quantity
Alberta Tier 1 Soil Salinity	ABT1SAL-S	9
Bulk density - w/vol	57	6
CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction	CCMEC	9
Chromatogram supplied	CTGM	9

Confirmation of Service Request

Lot ID: 1239553

Number of Samples: 18

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Agreement Id	548	Control Id	C0056629
Project Id	17-152	Report Due Date	Nov 21, 2017
Project Name		Received Date	Nov 15, 2017
Project Location	Suncor Base Mine	Sampled By	
Legal Location		Sampling Company	
PO#		Est. Disposal Date	Feb 19, 2018
Proj. Acct. Code			

Service Information

Sample Id		Service	Service Name
1 5921803		CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 13, 2017 2:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	NMPlot17-02-HC		
2 5921804		CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 13, 2017 2:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	NMPlot17-03-HC		
3 5921805		CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 13, 2017 2:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	NMPlot17-04-HC		
4 5921806		57 DISP	Bulk density - w/vol Environmental Disposal Fee
Date Sampled	Nov 13, 2017 2:00		
Priority	Normal		
Description 2	313CM3		
Sample Description	NMPlot17-02-BD1		

Confirmation of Service Request

Lot ID: 1239553

Number of Samples: 18

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	Service	Service Name
5 5921807	57 DISP	Bulk density - w/vol Environmental Disposal Fee
Date Sampled	Nov 13, 2017 2:00	
Priority	Normal	
Description 2	313CM3	
Sample Description	NMPlot17-02-BD2	
Sample Id	Service	Service Name
6 5921808	DISP 05 ABT1SAL-S	Environmental Disposal Fee Drying,Grinding, 2mm sieve Alberta Tier 1 Soil Salinity
Date Sampled	Nov 13, 2017 2:00	
Priority	Normal	
Sample Description	NMPlot17-02-AN	
Sample Id	Service	Service Name
7 5921809	DISP 05 ABT1SAL-S	Environmental Disposal Fee Drying,Grinding, 2mm sieve Alberta Tier 1 Soil Salinity
Date Sampled	Nov 13, 2017 2:00	
Priority	Normal	
Sample Description	NMPlot17-03-AN	
Sample Id	Service	Service Name
8 5921810	DISP 05 ABT1SAL-S	Environmental Disposal Fee Drying,Grinding, 2mm sieve Alberta Tier 1 Soil Salinity
Date Sampled	Nov 13, 2017 2:00	
Priority	Normal	
Sample Description	NMPlot17-04-AN	
Sample Id	Service	Service Name
9 5921811	57 DISP	Bulk density - w/vol Environmental Disposal Fee
Date Sampled	Nov 13, 2017 2:00	
Priority	Normal	
Description 2	313CM3	
Sample Description	NMPlot17-03BD1	
Sample Id	Service	Service Name
10 5921812	57 DISP	Bulk density - w/vol Environmental Disposal Fee
Date Sampled	Nov 13, 2017 2:00	
Priority	Normal	
Description 2	313CM3	
Sample Description	NMPlot17-03DD2	
Sample Id	Service	Service Name
11 5921813	CCMEC DISP CTGM	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction Environmental Disposal Fee B Chromatogram supplied
Date Sampled	Nov 13, 2017 10:00	
Priority	Normal	
Sample Description	NMExtra5-02-HC	

Confirmation of Service Request

Lot ID: 1239553

Number of Samples: 18

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	12	Service	Service Name
	5921814	CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 13, 2017 10:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	NMExtra5-03-HC		
Sample Id	13	Service	Service Name
	5921815	CCMEC	B CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 13, 2017 10:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM	B Chromatogram supplied
Sample Description	NMExtra5-04-HC		
Sample Id	14	Service	Service Name
	5921816	57	Bulk density - w/vol
Date Sampled	Nov 13, 2017 10:00	DISP	Environmental Disposal Fee
Priority	Normal		
Description 2	313CM3		
Sample Description	NMExtra5-02-BD1		
Sample Id	15	Service	Service Name
	5921817	57	Bulk density - w/vol
Date Sampled	Nov 13, 2017 10:00	DISP	Environmental Disposal Fee
Priority	Normal		
Description 2	313CM3		
Sample Description	NMExtra5-02-BD2		
Sample Id	16	Service	Service Name
	5921818	DISP	Environmental Disposal Fee
Date Sampled	Nov 13, 2017 10:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	NMExtra5-02-AN	S	
Sample Id	17	Service	Service Name
	5921819	DISP	Environmental Disposal Fee
Date Sampled	Nov 13, 2017 10:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	NMExtra5-03-AN	S	
Sample Id	18	Service	Service Name
	5921820	DISP	Environmental Disposal Fee
Date Sampled	Nov 13, 2017 10:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	NMExtra5-04-AN	S	



Confirmation of Service Request

Lot ID: 1239553

Number of Samples: 18

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Service Count		
Service Name	Service Code	Quantity
Alberta Tier 1 Soil Salinity	ABT1SAL-S	6
Bulk density - w/vol	57	6
CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction	CCMEC	6
Chromatogram supplied	CTGM	6
Drying, Grinding, 2mm sieve	05	6
Environmental Disposal Fee	DISP	18

Notes

If required for invoice approval, please sign and return to the address indicated at the top of the page.

(Signature) _____



Confirmation of Service Request

Lot ID: 1239726

Number of Samples: 26

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Agreement Id	548	Control Id	
Project Id	17-152	Report Due Date	Nov 21, 2017
Project Name	Suncor Base Mine	Received Date	Nov 15, 2017
Project Location		Sampled By	C.K.
Legal Location		Sampling Company	Paragon Soil
PO#	4410252962	Est. Disposal Date	Feb 19, 2018
Proj. Acct. Code	E6687		

Service Information

Sample Id	1	Service	Service Name
	5923218	CCMEC-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 11, 2017 4:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM-E	Chromatogram supplied from Edmonton
Sample depth	cm		
UOM			
Sample Description	NMPlot11-02-HC		
Sample Id	2	Service	Service Name
	5923219	CCMEC-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 11, 2017 4:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM-E	Chromatogram supplied from Edmonton
Sample depth	cm		
UOM			
Sample Description	NMPlot11-03-HC		
Sample Id	3	Service	Service Name
	5923220	CCMEC-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 11, 2017 4:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM-E	Chromatogram supplied from Edmonton
Sample depth	cm		
UOM			
Sample Description	NMPlot11-04-HC		

Confirmation of Service Request

Lot ID: 1239726

Number of Samples: 26

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	4	Service	Service Name
	5923221	57 DISP	Bulk density - w/vol Environmental Disposal Fee
Date Sampled	Nov 11, 2017 4:00		
Priority	Normal		
Sample depth	cm		
UOM			
Sample Description	NMPlot11-02-BD1		
Site I.D.	313 cm3		
Sample Id	5	Service	Service Name
	5923222	57 DISP	Bulk density - w/vol Environmental Disposal Fee
Date Sampled	Nov 11, 2017 4:00		
Priority	Normal		
Sample depth	cm		
UOM			
Sample Description	NMPlot11-02-BD2		
Site I.D.	313 cm3		
Sample Id	6	Service	Service Name
	5923223	DISP 05 ABT1SAL-S	Environmental Disposal Fee Drying,Grinding, 2mm sieve Alberta Tier 1 Soil Salinity
Date Sampled	Nov 11, 2017 4:00		
Priority	Normal		
Sample depth	cm		
UOM			
Sample Description	NMPlot11-02-AN		
Sample Id	7	Service	Service Name
	5923224	DISP 05 ABT1SAL-S	Environmental Disposal Fee Drying,Grinding, 2mm sieve Alberta Tier 1 Soil Salinity
Date Sampled	Nov 11, 2017 4:00		
Priority	Normal		
Sample depth	cm		
UOM			
Sample Description	NMPlot11-03-AN		
Sample Id	8	Service	Service Name
	5923225	DISP 05 ABT1SAL-S	Environmental Disposal Fee Drying,Grinding, 2mm sieve Alberta Tier 1 Soil Salinity
Date Sampled	Nov 11, 2017 4:00		
Priority	Normal		
Sample depth	cm		
UOM			
Sample Description	NMPlot11-04-AN		

Confirmation of Service Request

Lot ID: 1239726

Number of Samples: 26

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	9	Service	Service Name
	5923226	CCMEC-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 12, 2017 4:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM-E	Chromatogram supplied from Edmonton
Sample depth	cm		
UOM			
Sample Description	NMPlot18-02-HC		
Sample Id	10	Service	Service Name
	5923227	CCMEC-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 12, 2017 4:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM-E	Chromatogram supplied from Edmonton
Sample depth	cm		
UOM			
Sample Description	NMPlot18-03-HC		
Sample Id	11	Service	Service Name
	5923228	CCMEC-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 12, 2017 4:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM-E	Chromatogram supplied from Edmonton
Sample depth	cm		
UOM			
Sample Description	NMPlot18-04-HC		
Sample Id	12	Service	Service Name
	5923229	57	Bulk density - w/vol
Date Sampled	Nov 12, 2017 4:00	DISP	Environmental Disposal Fee
Priority	Normal		
Sample depth	cm		
UOM			
Sample Description	NMPlot18-02-BD1		
Site I.D.	313 cm3		
Sample Id	13	Service	Service Name
	5923230	57	Bulk density - w/vol
Date Sampled	Nov 12, 2017 4:00	DISP	Environmental Disposal Fee
Priority	Normal		
Sample depth	cm		
UOM			
Sample Description	NMPlot18-02-BD2		
Site I.D.	313 cm3		

Confirmation of Service Request

Lot ID: 1239726

Number of Samples: 26

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	14	Service	Service Name
	5923231	DISP	Environmental Disposal Fee
Date Sampled	Nov 12, 2017 4:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample depth	cm	S	
UOM			
Sample Description	NMPlot18-02-AN		
Sample Id	15	Service	Service Name
	5923232	DISP	Environmental Disposal Fee
Date Sampled	Nov 12, 2017 4:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample depth	cm	S	
UOM			
Sample Description	NMPlot18-03-AN		
Sample Id	16	Service	Service Name
	5923233	DISP	Environmental Disposal Fee
Date Sampled	Nov 12, 2017 4:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample depth	cm	S	
UOM			
Sample Description	NMPlot18-04-AN		
Sample Id	17	Service	Service Name
	5923234	CCMEC-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 9, 2017 12:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM-E	Chromatogram supplied from Edmonton
Sample depth	cm		
UOM			
Sample Description	NMPlot2-02-HC		
Sample Id	18	Service	Service Name
	5923235	CCMEC-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 9, 2017 12:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM-E	Chromatogram supplied from Edmonton
Sample depth	cm		
UOM			
Sample Description	NMPlot2-03-HC		
Sample Id	19	Service	Service Name
	5923236	CCMEC-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 9, 2017 12:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM-E	Chromatogram supplied from Edmonton
Sample depth	cm		
UOM			
Sample Description	NMPlot2-04-HC		

Confirmation of Service Request

Lot ID: 1239726

Number of Samples: 26

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	20	Service	Service Name
	5923237	57 DISP	Bulk density - w/vol Environmental Disposal Fee
Date Sampled	Nov 9, 2017 12:00		
Priority	Normal		
Sample depth	cm		
UOM			
Sample Description	NMPlot2-02-BD1		
Site I.D.	298 cm 3		
Sample Id	21	Service	Service Name
	5923238	57 DISP	Bulk density - w/vol Environmental Disposal Fee
Date Sampled	Nov 9, 2017 12:00		
Priority	Normal		
Sample depth	cm		
UOM			
Sample Description	NMPlot2-02-BD2		
Site I.D.	298 cm 3		
Sample Id	22	Service	Service Name
	5923239	57 DISP	Bulk density - w/vol Environmental Disposal Fee
Date Sampled	Nov 9, 2017 12:00		
Priority	Normal		
Sample depth	cm		
UOM			
Sample Description	NMPlot2-03-BD1		
Site I.D.	298 cm 3		
Sample Id	23	Service	Service Name
	5923240	57 DISP	Bulk density - w/vol Environmental Disposal Fee
Date Sampled	Nov 9, 2017 12:00		
Priority	Normal		
Sample depth	cm		
UOM			
Sample Description	NMPlot2-03-BD2		
Site I.D.	298 cm 3		
Sample Id	24	Service	Service Name
	5923241	DISP 05 ABT1SAL- S	Environmental Disposal Fee Drying,Grinding, 2mm sieve Alberta Tier 1 Soil Salinity
Date Sampled	Nov 9, 2017 12:00		
Priority	Normal		
Sample depth	cm		
UOM			
Sample Description	NMPlot2-02-AN		



Confirmation of Service Request

Lot ID: 1239726

Number of Samples: 26

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	25 5923242	Service	Service Name
Date Sampled	Nov 9, 2017 12:00	DISP	Environmental Disposal Fee
Priority	Normal	05	Drying,Grinding, 2mm sieve
Sample depth	cm	ABT1SAL-	Alberta Tier 1 Soil Salinity
UOM		S	
Sample Description	NMPlot2-03-AN		

Sample Id	26 5923243	Service	Service Name
Date Sampled	Nov 9, 2017 12:00	DISP	Environmental Disposal Fee
Priority	Normal	05	Drying,Grinding, 2mm sieve
Sample depth	cm	ABT1SAL-	Alberta Tier 1 Soil Salinity
UOM		S	
Sample Description	NMPlot2-04-AN		

Service Count		
Service Name	Service Code	Quantity
Alberta Tier 1 Soil Salinity	ABT1SAL-S	9
Bulk density - w/vol	57	8
CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction	CCMEC-E	9
Chromatogram supplied from Edmonton	CTGM-E	9
Drying,Grinding, 2mm sieve	05	9
Environmental Disposal Fee	DISP	26

Notes

If required for invoice approval, please sign and return to the address indicated at the top of the page.

(Signature) _____



Confirmation of Service Request

Lot ID: 1239775

Number of Samples: 24

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Agreement Id	548	Control Id	C0056635
Project Id	17-152	Report Due Date	Nov 21, 2017
Project Name		Received Date	Nov 15, 2017
Project Location	Suncor Base Mine	Sampled By	
Legal Location		Sampling Company	
PO#		Est. Disposal Date	Feb 19, 2018
Proj. Acct. Code			

Service Information

Sample Id		Service	Service Name
1 5923413		CCMEC-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 9, 2017 10:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM-E	Chromatogram supplied from Edmonton
Sample Description	NMPlot8-02-HC		
2 5923414		CCMEC-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 9, 2017 10:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM-E	Chromatogram supplied from Edmonton
Sample Description	NMPlot8-03-HC		
3 5923415		CCMEC-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 9, 2017 10:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM-E	Chromatogram supplied from Edmonton
Sample Description	NMPlot8-04-HC		
4 5923416		DISP 05	Environmental Disposal Fee Drying, Grinding, 2mm sieve
Date Sampled	Nov 9, 2017 10:00	ABT1SAL-	Alberta Tier 1 Soil Salinity
Priority	Normal	S	
Sample Description	NMPlot8-02-AN		

Confirmation of Service Request

Lot ID: 1239775

Number of Samples: 24

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	Service	Service Name
5 5923417	DISP	Environmental Disposal Fee
Date Sampled	05	Drying,Grinding, 2mm sieve
Priority	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	S	
NMPlot8-03-AN		
6 5923418	DISP	Environmental Disposal Fee
Date Sampled	05	Drying,Grinding, 2mm sieve
Priority	ABT1SAL-	Alberta Tier 1 Soil Salinity
Sample Description	S	
NMPlot8-04-AN		
7 5923419	57	Bulk density - w/vol
Date Sampled	DISP	Environmental Disposal Fee
Priority		
Sample Description		
NMPlot8-02-BD1		
Site I.D.		
298 CM3		
8 5923420	57	Bulk density - w/vol
Date Sampled	DISP	Environmental Disposal Fee
Priority		
Sample Description		
NMPlot8-02-BD2		
Site I.D.		
298 CM3		
9 5923421	CCMEC-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	DISP	Environmental Disposal Fee
Priority	CTGM-E	Chromatogram supplied from Edmonton
Sample Description		
NMPlot5-02-HC		
10 5923422	CCMEC-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	DISP	Environmental Disposal Fee
Priority	CTGM-E	Chromatogram supplied from Edmonton
Sample Description		
NMPlot5-03-HC		
11 5923423	CCMEC-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	DISP	Environmental Disposal Fee
Priority	CTGM-E	Chromatogram supplied from Edmonton
Sample Description		
NMPlot5-04-HC		

Confirmation of Service Request

Lot ID: 1239775

Number of Samples: 24

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	12	Service	Service Name
	5923424	57 DISP	Bulk density - w/vol Environmental Disposal Fee
Date Sampled	Nov 10, 2017 2:00		
Priority	Normal		
Sample Description	NMPlot5-02-BD1		
Site I.D.	313 CM3		
Sample Id	13	Service	Service Name
	5923425	57 DISP	Bulk density - w/vol Environmental Disposal Fee
Date Sampled	Nov 10, 2017 2:00		
Priority	Normal		
Sample Description	NMPlot5-02-BD2		
Site I.D.	313 CM3		
Sample Id	14	Service	Service Name
	5923426	DISP 05 ABT1SAL-S	Environmental Disposal Fee Drying,Grinding, 2mm sieve Alberta Tier 1 Soil Salinity
Date Sampled	Nov 10, 2017 2:00		
Priority	Normal		
Sample Description	NMPlot5-02-AN		
Sample Id	15	Service	Service Name
	5923427	DISP 05 ABT1SAL-S	Environmental Disposal Fee Drying,Grinding, 2mm sieve Alberta Tier 1 Soil Salinity
Date Sampled	Nov 10, 2017 2:00		
Priority	Normal		
Sample Description	NMPlot5-03-AN		
Sample Id	16	Service	Service Name
	5923428	DISP 05 ABT1SAL-S	Environmental Disposal Fee Drying,Grinding, 2mm sieve Alberta Tier 1 Soil Salinity
Date Sampled	Nov 10, 2017 2:00		
Priority	Normal		
Sample Description	NMPlot5-04-AN		
Sample Id	17	Service	Service Name
	5923429	CCMEC-E DISP CTGM-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction Environmental Disposal Fee Chromatogram supplied from Edmonton
Date Sampled	Nov 10, 2017 10:00		
Priority	Normal		
Sample Description	NMPlot16-02-HC		
Sample Id	18	Service	Service Name
	5923430	CCMEC-E DISP CTGM-E	CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction Environmental Disposal Fee Chromatogram supplied from Edmonton
Date Sampled	Nov 10, 2017 10:00		
Priority	Normal		
Sample Description	NMPlot16-03-HC		

Confirmation of Service Request

Lot ID: 1239775

Number of Samples: 24

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	19 5923431	Service CCMEC-E	Service Name CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction
Date Sampled	Nov 10, 2017 10:00	DISP	Environmental Disposal Fee
Priority	Normal	CTGM-E	Chromatogram supplied from Edmonton
Sample Description	NMPlot16-04-HC		
Sample Id	20 5923432	Service 57	Service Name Bulk density - w/vol
Date Sampled	Nov 10, 2017 10:00	DISP	Environmental Disposal Fee
Priority	Normal		
Sample Description	NMPlot16-02-BD1		
Site I.D.	313 CM3		
Sample Id	21 5923433	Service 57	Service Name Bulk density - w/vol
Date Sampled	Nov 10, 2017 10:00	DISP	Environmental Disposal Fee
Priority	Normal		
Sample Description	NMPlot16-02-BD2		
Site I.D.	313 CM3		
Sample Id	22 5923434	Service DISP	Service Name Environmental Disposal Fee
Date Sampled	Nov 10, 2017 10:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-S	Alberta Tier 1 Soil Salinity
Sample Description	NMPlot16-02-AN		
Sample Id	23 5923435	Service DISP	Service Name Environmental Disposal Fee
Date Sampled	Nov 10, 2017 10:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-S	Alberta Tier 1 Soil Salinity
Sample Description	NMPlot16-03-AN		
Sample Id	24 5923436	Service DISP	Service Name Environmental Disposal Fee
Date Sampled	Nov 10, 2017 10:00	05	Drying,Grinding, 2mm sieve
Priority	Normal	ABT1SAL-S	Alberta Tier 1 Soil Salinity
Sample Description	NMPlot16-04-AN		

Service Count		
Service Name	Service Code	Quantity
Alberta Tier 1 Soil Salinity	ABT1SAL-S	9
Bulk density - w/vol	57	6
CCME Hydrocarbons: BTEX, F1-F4 in Soil by Cold Extraction	CCMEC-E	9
Chromatogram supplied from Edmonton	CTGM-E	9



Confirmation of Service Request

Lot ID: 1239775

Number of Samples: 24

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Service Count		
Service Name	Service Code	Quantity
Drying,Grinding, 2mm sieve	05	9
Environmental Disposal Fee	DISP	24

Notes

If required for invoice approval, please sign and return to the address indicated at the top of the page.

(Signature) _____

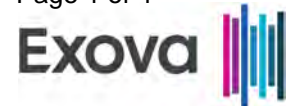
Report Delivery Plan

Contact	Company	Address
	Syncrude Canada Ltd.	

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	PDF	COA
Email - Single Report	Standard Crosstab	Test Report

Paragon Soils and Environment		
-------------------------------	--	--

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	PDF	COA
Email - Single Report	Standard Crosstab	Test Report



Confirmation of Service Request

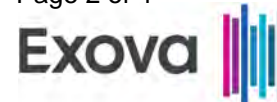
Lot ID: 1240009
Number of Samples: 12
 Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Agreement Id	548	Control Id	
Project Id	17-152	Report Due Date	Dec 05, 2017
Project Name	Suncor LOS	Received Date	Nov 17, 2017
Project Location	Suncor Base Mine	Sampled By	Nikki McPhee
Legal Location		Sampling Company	Paragon
PO#	4410252962	Est. Disposal Date	Mar 05, 2018
Proj. Acct. Code	E6687		

Service Information

Sample Id	1	Service	Service Name
	5925193	DISP	Environmental Disposal Fee
Date Sampled	Nov 10, 2017 12:00	TE100P	C11-C100 Hydrocarbons in oil
Priority	Normal		
Description 2	Suncor Base Mine		
Sample Description	DSPlot 3-03-HC		
Temp: Received	4.6C		
Sample Id	2	Service	Service Name
	5925194	DISP	Environmental Disposal Fee
Date Sampled	Nov 10, 2017 12:00	TE100P	C11-C100 Hydrocarbons in oil
Priority	Normal		
Description 2	Suncor Base Mine		
Sample Description	DSPlot 3-04-HC		
Temp: Received	4.6C		
Sample Id	3	Service	Service Name
	5925195	DISP	Environmental Disposal Fee
Date Sampled	Nov 11, 2017 12:00	TE100P	C11-C100 Hydrocarbons in oil
Priority	Normal		
Description 2	Suncor Base Mine		
Sample Description	NMPlot 13-03-HC		
Temp: Received	4.6C		



Confirmation of Service Request

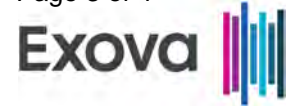
Lot ID: 1240009

Number of Samples: 12

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	4	Service	Service Name
	5925196	DISP TE100P	Environmental Disposal Fee C11-C100 Hydrocarbons in oil
Date Sampled	Nov 11, 2017 12:00		
Priority	Normal		
Description 2	Suncor Base Mine		
Sample	NMPlot 13-04-HC		
Description			
Temp: Received	4.6C		
Sample Id	5	Service	Service Name
	5925197	DISP TE100P	Environmental Disposal Fee C11-C100 Hydrocarbons in oil
Date Sampled	Nov 11, 2017 12:00		
Priority	Normal		
Description 2	Suncor Base Mine		
Sample	NMPlot 14-03-HC		
Description			
Temp: Received	4.6C		
Sample Id	6	Service	Service Name
	5925198	DISP TE100P	Environmental Disposal Fee C11-C100 Hydrocarbons in oil
Date Sampled	Nov 11, 2017 12:00		
Priority	Normal		
Description 2	Suncor Base Mine		
Sample	NMPlot 14-04-HC		
Description			
Temp: Received	4.6C		
Sample Id	7	Service	Service Name
	5925199	DISP TE100P	Environmental Disposal Fee C11-C100 Hydrocarbons in oil
Date Sampled	Nov 10, 2017 12:00		
Priority	Normal		
Description 2	Suncor Base Mine		
Sample	NMPlot 16-03-HC		
Description			
Temp: Received	4.6C		
Sample Id	8	Service	Service Name
	5925200	DISP TE100P	Environmental Disposal Fee C11-C100 Hydrocarbons in oil
Date Sampled	Nov 10, 2017 12:00		
Priority	Normal		
Description 2	Suncor Base Mine		
Sample	NMPlot 16-04-HC		
Description			
Temp: Received	4.6C		



Confirmation of Service Request

Lot ID: 1240009

Number of Samples: 12

Printed Date: Nov 22, 2017

Please verify the following service request. If you have corrections or questions, please contact Client Services.

Sample Id	9 5925201	Service DISP TE100P	Service Name Environmental Disposal Fee C11-C100 Hydrocarbons in oil
Date Sampled	Nov 12, 2017 12:00		
Priority	Normal		
Description 2	Suncor Base Mine		
Sample Description	NMPlot 18-03-HC		
Temp: Received	4.6C		

Sample Id	10 5925202	Service DISP TE100P	Service Name Environmental Disposal Fee C11-C100 Hydrocarbons in oil
Date Sampled	Nov 12, 2017 12:00		
Priority	Normal		
Description 2	Suncor Base Mine		
Sample Description	NMPlot 18-04-HC		
Temp: Received	4.6C		

Sample Id	11 5925203	Service DISP TE100P	Service Name Environmental Disposal Fee C11-C100 Hydrocarbons in oil
Date Sampled	Nov 12, 2017 12:00		
Priority	Normal		
Description 2	Suncor Base Mine		
Sample Description	DSPlot 19-03-HC		
Temp: Received	4.6C		

Sample Id	12 5925204	Service DISP TE100P	Service Name Environmental Disposal Fee C11-C100 Hydrocarbons in oil
Date Sampled	Nov 12, 2017 12:00		
Priority	Normal		
Description 2	Suncor Base Mine		
Sample Description	DSPlot 19-04-HC		
Temp: Received	4.6C		

Service Count		
Service Name	Service Code	Quantity
C11-C100 Hydrocarbons in oil	TE100P	12
Environmental Disposal Fee	DISP	12

Notes

If required for invoice approval, please sign and return to the address indicated at the top of the page.

(Signature) _____