

**Memo**

<b>To</b>	Trevor Boyd, P. Geo, Canadian North Resources Inc.
<b>From</b>	Tonia Robb and François Landry
<b>Date</b>	12 November 2021
<b>Reference</b>	0598256
<b>Subject</b>	Ferguson Lake: 2021 Fuel Containment Area, Waste Storage Area and Drill Staging Area Water and Soil Sampling

**1. INTRODUCTION**

The previous owner (Starfield Resources Inc.) constructed and operated a fuel containment area (FCA) as part of their Ferguson Lake Project (the Project). The FCA consists of a lined embankment acting as a secondary containment and allows contact water from snowmelt and rainfall to collect seasonally in the containment area. The FCA is approximately 40 m x 40 m (Photo 1-1) and was constructed using local materials for the embankments and an HDPE liner was welded as the impermeable membrane. The liner was keyed into the top of the embankment and was covered with a non-woven geotextile fabric. A layer of sand and gravel was placed on top of the fabric to form a ramp and a working area within the embankment.



**Photo 1-1. The Fuel Containment Area, Ferguson Lake Project (September 2021)**

A waste storage area (WSA) is also located at the Project site that stores hazardous waste, scrap steel, and empty fuel barrels before transportation off site for disposal. Clean-up of the WSA was initiated with consolidation of waste and removal of waste for off-site disposal in the spring of 2021. A Water Licence inspection (on August 21, 2014) of a drill staging area (DSA) located at N 62° 52' 9.768" W 96° 55' 29 7.48 (approximately 2 km south of camp) noted erosion and weathering of the area. The inspector requested that additional samples of the surficial soils in the area be collected in 2021, as a follow-up to sampling completed in 2015.

Canadian North Resources Inc. (CNRI) has acquired the property in 2013 and requested that ERM visit the site in September to assess the quality of the FCA impounded water and soil, the soil in the WSA, and pooled water and soil at the DSA. This visit was in follow-up to the water and soil sampling program completed by ERM on the property in 2015 on behalf of CNRI.

## 2. OBJECTIVES

As part of the necessary maintenance procedures ("duty to care" of the facility and surroundings situated on Kivalliq Inuit Association surface lands), the following tasks were completed:

- Independent assessment of the physical condition of the FCA;
- Independent sampling and analysis of water in the FCA and inspection and surface soil sampling at the FCA;
- Inspection and surface soil sampling at the WSA; and
- Inspection and pooled water and surface soil sampling at the DSA.

## 3. METHODS

### 3.1 Sample Locations

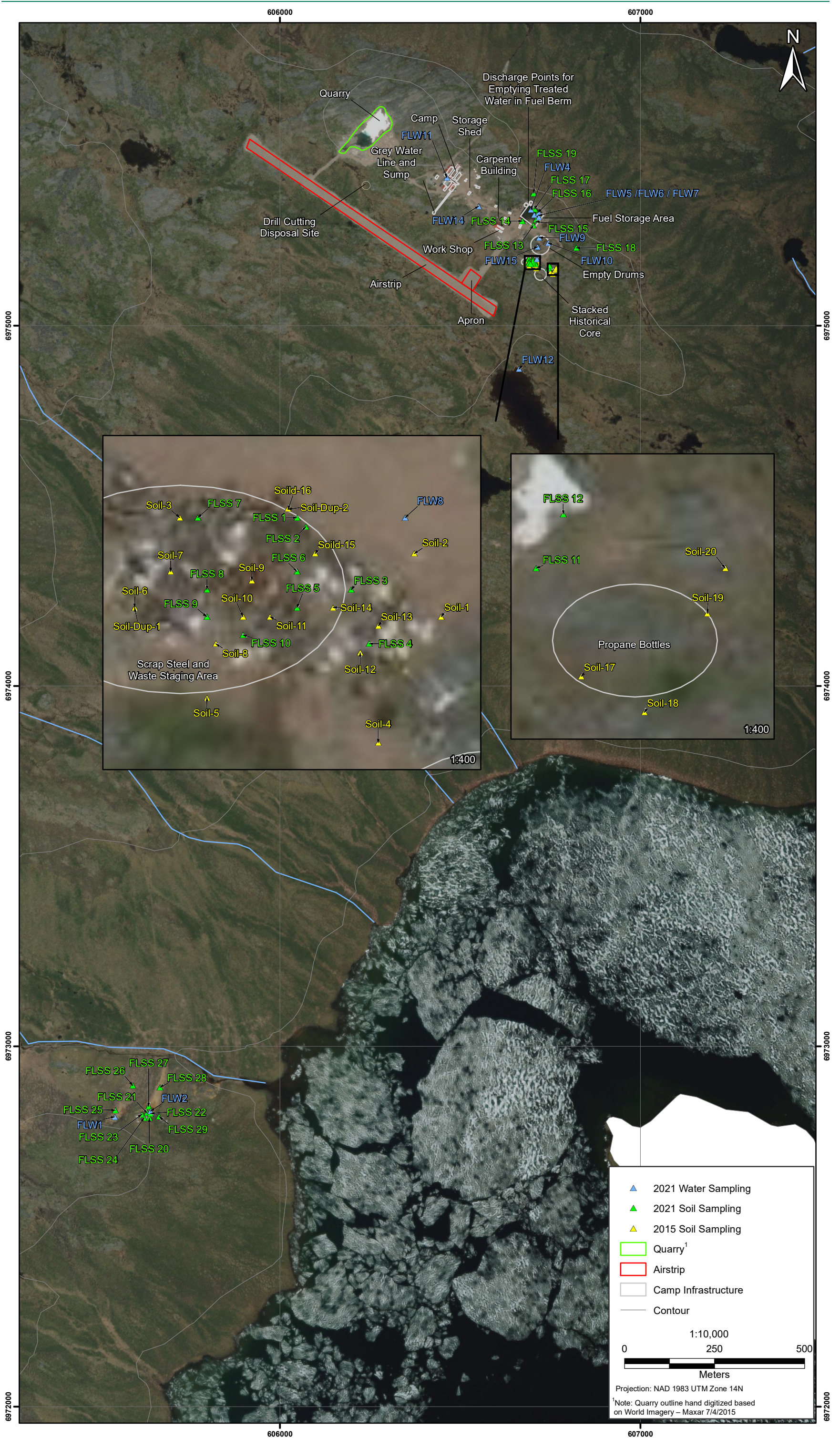
Water and soil sampling was conducted on September 8 and 9, 2021. Water was collected from 15 locations within the FCA, as well as ponded water within the DSA (Appendix A). Soil samples were collected from 29 locations, which were similar to locations sampled in 2015, within the FCA and WSA in addition to the DSA (Appendix A; Figure 3.1-1).

### 3.2 Sampling and Analysis of Water

To assess the quality of the impounded FCA water, grab samples were collected from the FCA water surface as well as next to six berms. Samples were also collected from the surface of ponded water at two locations within the DSA. A single reference sample was collected from a waterbody southeast of the landing strip. Two duplicate samples in addition to a field and travel blank were collected for the purpose of quality assurance and quality control (QA/QC). A visual assessment of the physical condition of the FCA was also conducted.

All samples were kept cool and immediately sent to ALS Environmental Laboratories in Burnaby, BC, for analysis. The FCA and berm samples were analyzed for volatile organic compounds (VOCs), hydrocarbons, and polycyclic aromatic hydrocarbons (PAHs). Water samples from the DSA were analyzed for physical parameters, nutrients, and metals.





**Figure 3.1-1: Ferguson Lake Soil and Water Sample Locations**



All water quality samples were compared to Canadian Council of Ministers of the Environment (CCME) short and long-term guidelines for the protection of freshwater aquatic life (CCME 2021). DCA samples were also compared to a field blank (FLW-3).

Sample concentrations that exceeded CCME water quality guidelines were flagged (Appendix B, C, and D – bolded and outlined values). In the instances where water quality parameter concentrations did not exceed CCME guidelines or there were no CCME guidelines to compare against, concentrations were compared against analytical detection limits. If concentrations of VOCs, hydrocarbons, or PAHs were higher than the detection limits in these cases, they were secondarily flagged in the Appendix section (bolded values).

### 3.3 Sampling and Analysis of Soil

Soil samples were collected at the surface by hand with a spade. A duplicate sample was collected at the FCA, WSA, and DSA. Samples were collected using dedicated sample containers provided by ALS Laboratories following standard protocols. Samples were immediately placed in a cooler for storage until they could be shipped to ALS Laboratories for analysis.

Soil samples were stored and shipped in a cooler to ALS Laboratories (Burnaby, BC). Soil samples were analyzed for metals, VOCs, petroleum hydrocarbons, and PAHs. Soil samples were compared to Canada-wide standards for industrial ecological soil contact criteria (CCME 2008) and the Industrial CCME soil quality guidelines for the protection of environmental and human health (CCME 2010). For FCA and WSA soil results, concentrations were also compared against concentrations found at the reference sites FLSS-18 and FLSS-19.

Sample concentrations that exceeded CCME soil quality guidelines were flagged (Appendix B, C, and D – bolded and outlined values). In the instances where soil quality parameter concentrations did not exceed CCME guidelines or there were no CCME guidelines to compare against, concentrations were compared against analytical detection limits. If concentrations of VOCs, hydrocarbons, or PAHs were higher than the detection limits in these cases, they were secondarily flagged in the Appendix section (bolded values).

## 4. RESULTS AND DISCUSSION

### 4.1 Physical Condition of Containment Areas

The non-permeable barrier did not appear to have any rips or tears, and extended up and over the sides of the berms and other containment frames. The FCA berm (FLW-4 to FLW-6) appeared to be in good condition, with sufficient space to hold any pooled water. The whole can berm (FLW-10), furnace fuel berm (FLW-11), and helicopter fuel berm (FLW-14) all appeared to be intact.

A secondary berm in the fuel containment area (FLW-8) showed evidence of being filled almost to capacity at some point, as indicated by water level lines on the fabric; however, there is no evidence that water overflowed this berm in the past. The crushed can berm (FLW-9) also appeared to be nearing capacity to hold water. The berm sides for this containment area may need to be raised in the future. Adding more crushed cans to this containment area may further reduce space available for water to pool and displace the water that is currently pooled.

## 4.2 Fuel Containment Area (FCA)

### 4.2.1 Water Quality

There were ten water quality samples taken in the FCA (Appendix A.1). This included Ponded Water A, B, and C (FLW-4, FLW-5, and FLW-6), a water filled crate within the FCA (FLW-7), a secondary berm (FLW-8), the crushed can berm (FLW-9), a whole can berm (FLW-10), a furnace fuel berm (FLW-11), a helicopter fuel berm (FLW-14), and a tall white tank beside the secondary berm (FLW-15). A reference water body south east of the landing strip (FLW-12) was also sampled.

**Oil and grease** – There are no published CCME oil and grease guidelines; however, analysis results from all samples other than FLW-7 (Photo 4.2-1) were below the analytical detection limit (<1.0 mg/L) and in line with the reference site (FLW-12). The oil and grease concentration at FLW-7 was 7.7 mg/L.



**Photo 4.2-1. Water filled crate within the FCA (water sampling site FLW-7) sampled during the September 2021 visit**

**VOCs** – A number of VOC parameters in the FLW-6 sample were above detection limit. The concentration of toluene was 0.64 mg/L, higher than the detection limit (0.50 mg/L) and the reference site FLW-12 (<0.50 mg/L). The concentration of m+p-xylene was 0.88 mg/L. The concentration of o-xylene was 2.25 mg/L. The concentration of total xylenes was 3.13 mg/L. These concentrations of xylenes were higher than analytical detection limits (0.5 mg/L, 0.4 mg/L, 0.3 mg/L, and 0.5 mg/L, respectively). These concentrations were also greater than the various xylene concentrations at FLW-12, which were below the detection limit (Appendix B.1). All other VOC concentrations in the FCA water samples from FLW-4 to FLW-15 were below the detection limit.

**Hydrocarbons** – Hydrocarbon concentrations at FLW-7 for F2 (C6-C10), F3 (C10-C16), F4 (C16-C34), TEH (C10-C50), TEH (C16-C50) were higher than detection limits but do not have CCME guidelines. The concentrations of these hydrocarbons at FLW-7 were also higher than concentrations at FLW-12, where hydrocarbon concentrations were below detection limits. Hydrocarbon concentrations were below detection limits for all the other FCA water samples from FLW-4 to FLW-15.

**PAHs** – At FLW-7, the pyrene concentration was 0.392 µg/L, higher than the CCME guideline of 0.010 µg/L. The concentration of B(a)P total potency equivalents [B(a)P TPE] was 0.207 µg/L and was higher than the detection limit of 0.010 µg/L. PAH concentrations were below detection limits for all the other FCA water samples from FLW-4 to FLW-15, including the reference site.

#### 4.2.2 Soil Quality

There were nine soil quality samples collected in the FCA (Appendix A.2). These included two samples from the propane tank area (FLSS-11 and FLSS-12), two samples from the fuel berm upper lip (FLSS-13 and FLSS-14), and three samples from the fuel containment area itself (FLSS-15, FLSS-16, and FLSS-17). Samples from two FCA reference areas (FLSS-18 and FLSS-19) were also collected.

**Physical tests** – Soil pH for sites in the FCA (FLSS-11 to FLSS-17) was within the range (4.91 to 5.70) of reference sites (FLSS-18 and FLSS-19). Some of the sampled sites (FLSS-12, FLSS-13, FLSS-15, FLSS-16) had lower soil moisture than reference sites.

**Metals** – In all samples, concentrations of soil metals were below CCME guidelines (Appendix B.2). Some metals did not have published CCME guidelines, and were compared against the reference sites. Soil metal concentrations from samples taken in the propane tank area, locations A and B (FLSS-11 and FLSS-12), the fuel berm upper lip, location A (FLSS-13), Location A of the FCA (FLSS-15), and Location C of the FCA (FLSS-17) all ranged between ~ 0.13 to 1.6 times higher than the reference sites (FLSS-18 and FLSS-19). These metals at the above-mentioned sampling locations with similar concentrations than the reference sites included aluminum, iron, lithium, magnesium, manganese, phosphorus, potassium, strontium, and thallium (Appendix B.2).

**VOCs** – The ethylbenzene concentration at FLSS-15 (Photo 4.2-2) was 0.131 mg/kg, higher than the CCME guidelines of 0.082 mg/kg for coarse-grain soil and 0.018 mg/kg for fine-grain soil (Table 4.4-1). The concentration of toluene at FLSS-17 was 0.161 mg/kg, higher than the CCME guidelines (0.37 mg/kg coarse-grain and 0.08 mg/kg fine-grain; Table 4.4-1). The toluene concentration at FLSS-18 was 0.051 mg/kg, and slightly higher than the analytical detection limit (0.050 mg/kg), but below the CCME coarse- and fine-grain soil guidelines. At FLSS-19, PAH concentrations were below the detection limit (Appendix B.2). Concentrations of xylenes (m+p-xylene, o-xylene, total xylene) at FLSS 15 were greater than the reference sites, but below CCME guidelines.



**Photo 4.2-2. Fuel containment area, Location A (soil sampling site FLSS-15), sampled during the September 2021 visit**

**Hydrocarbons** – F2 (C10-C16) concentrations (4,420 mg/kg) were significantly higher at FLSS-15 than the CCME guideline of 30 mg/kg. Concentrations of F2-naphthalene, F3, F1-BTEX, F3 and F4 were higher at FLSS-15 than FLSS-18 and FLSS-19, but were not higher than CCME guidelines. Hydrocarbon concentrations at FLSS-11 and FLSS-14 (fuel berm upper lip, location B) were also higher than reference sites (Appendix B.2). Hydrocarbon concentrations were below detection limits for all the other FCA soil samples from FLSS-11 to FLSS-17 and the reference sites FLSS-18 and FLSS-19.

**PAHs** – Fluorene and pyrene concentrations at FLSS-15 were above the analytical detection limit (0.010 mg/kg for both analytes), and above reference site concentrations. PAH concentrations were below detection limits for all the other FCA soil samples from FLSS-11 to FLSS-17 and the reference sites FLSS-18 and FLSS-19.

### **4.3 Waste Storage Area (WSA)**

There were ten soil quality samples collected from different points around the WSA (Locations A to J, FLSS-1 to FLSS-10) (Appendix A.2).

**Physical tests** – Soil moisture in these sites (various locations around the WSA, FLSS-1 to FLSS-10) were between 6 and 20% moisture, and the soil was slightly acidic, ranging from pH 5.14 to 6.74. Both of these soil quality concentrations were in the range of the reference sites (FLSS-18 and FLSS-19; Appendix C.1).



**Metals** – Similar to the FCA, metal concentrations did not exceed CCME guidelines in the WSA, but not all metal analytes had CCME guidelines to compare against. In these cases, metals were compared to FLSS-18 and FLSS-19. The concentrations of one or a combination of aluminum, iron, lithium, manganese, phosphorus, sodium, strontium, and titanium were similar at ~ 1.2 to 1.4 times higher at FLSS-1 to FLSS-10 compared to FLSS-18 and FLSS-19 (Appendix C.1).

**VOCs** – VOC concentrations at all sampled sites were below the analytical detection limit and available CCME guidelines in the WSA, although at reference site FLSS-18, toluene concentrations (0.051 mg/kg) were barely higher than the detection limit of 0.050 mg/kg (Appendix C.1).

**Hydrocarbons** – Hydrocarbon concentrations were below published CCME guidelines for coarse- and fine-grain soil. Concentrations of F2-naphthalene, F2 (C16-C34) and F4G-sg at Location J in the WSA (FLSS-10) were higher than their respective detection limits. Concentrations of F3-PAH and F3 (C16-C34) were higher than the detection limit at all sites in the WSA except for Location B (FLSS-2) and Location I (FLSS-9). In comparison, hydrocarbon concentrations at the reference sites (FLSS-18 and FLSS-19) were below detection limits (Appendix C.1).

**PAHs** – The fluorene concentration at Location D in the WSA (FLSS-4) was 0.013 mg/kg, higher than the reference sites (<0.010 mg/kg) and detection limit (0.010 mg/kg). At Location J in the WSA (FLSS-10), the concentrations of benzo(g,h,i)perylene (0.013 mg/kg), chrysene (0.012 mg/kg), and pyrene (0.072 mg/kg) were higher than concentrations at the reference sites (<0.010 mg/kg) and the detection limit (0.010 mg/kg).

## 4.4 Drill Staging Area (DSA)

### 4.4.1 Water Quality

There were three water quality samples taken from the DSA (Appendix A.1). One sample was taken from the natural gossan site (FLW-1) and one sample was taken from disturbed gossan (FLW-2). A metals field blank (FLW-3) was also taken to this location.

**Physical tests** – Specific conductivity (> 2,000 µS/cm) and total dissolved solids (> 2,000 mg/L) were higher at FLW-1 and FLW-2 than the field blank (FLW-3). Turbidity at FLW-1 and FLW-2 was also higher than FLW-3. The pH at FLW-1 and FLW-2 was also lower (average 2.80) than the CCME guideline (6.5 to 9).

**Nutrients** – The concentration of ammonia was 0.125 mg/L and the concentration of fluoride was 0.406 mg/L at FLW-1. At FLW-2, the concentration of ammonia was 0.220 mg/L (0.221 mg/L in the duplicate) and fluoride was 0.423 mg/L (0.427 mg/L in the duplicate). Concentrations for ammonia and fluoride at these two sites was higher than CCME guidelines of 0.019 mg/L for ammonia and 0.12 mg/L for fluoride (Table 4.4-1, Appendix D.1). Total Kjeldahl nitrogen (TKN), dissolved orthophosphate, total phosphorus, and sulphate concentrations were above detection limits, but these parameters do not have CCME guidelines (Appendix D.1).

**Metals** – Iron concentrations were 356 mg/L at FLW-1, 971 mg/L at FLW-2, and 1,020 mg/L in the FLW-2 duplicate; these concentrations were higher than the CCME long-term guideline for iron of 0.30 mg/L (Table 4.4.1 and Appendix D.1). Many of the other metals sampled at FLW-1 and



FLW-2 had concentrations above the analytical detection limit (Appendix D.1) and below CCME guidelines; these metals include aluminum, barium, beryllium, cadmium, calcium, lithium, magnesium, manganese, nickel, potassium, rubidium, silicon, sodium, sulphur, thorium, titanium, and zinc (Appendix D.1).

**Table 4.4-1: Summary Table of Samples Measured Exceeding CCME Guidelines**

Site Description	Sample	Analyte(s)	Parameter Concentration	CCME Guideline
FCA, Water filled crate	Water (FLW-7)	Oil & Grease	7.7 mg/L	1.0 mg/L
	Water (FLW-7)	Pyrene	0.392 µg/L	0.010 µg/L
DSA, Natural Gossan	Water (FLW-1)	pH	pH 2.66	pH 6.5-9
	Water (FLW-1)	Total iron	356 mg/L	0.30 mg/L
DSA, Disturbed Gossan	Water (FLW-2)	pH	pH 2.87	pH 6.5-9
	Water (FLW-2)	Total iron	971 mg/L	0.30 mg/L
DSA, Disturbed Gossan	Water (FLW-2 Duplicate)	pH	pH 2.88	pH 6.5-9
	Water (FLW-2 Duplicate)	Total iron	1,020 mg/L	0.30 mg/L
DSA, metals field blank	Water (FLW-3 )	pH <6.5	pH 4.77	pH 6.5-9
FCA, Location A	Soil (FLSS-15)	Ethylbenzene	0.131 mg/kg	0.018 mg/kg (fine) 0.082 mg/kg (coarse)
	Soil (FLSS-15)	F2 (C10-C16)	4,420 mg/kg	260 mg/kg
FCA, Location C	Soil (FLSS-17)	Toluene	0.161 mg/kg	0.08 mg/kg (fine) 0.37 mg/kg (coarse)
DSA, Grease shack	Soil (FLSS-20)	Toluene	0.489 mg/kg	0.08 mg/kg (fine) 0.37 mg/kg (coarse)
DSA, Upslope between staging area and bulk sample area	Soil (FLSS-21)	Fluorene	0.018 mg/kg	0.010mg/kg (Detection limit)
DSA, West side of Laydown, Location A	Soil (FLSS-23)	Fluorene	0.038 mg/kg	0.010 mg/kg (Detection limit)

Site Description	Sample	Analyte(s)	Parameter Concentration	CCME Guideline
DSA, Natural Iron Gossan, Location B	Soil (FLSS-26)	Copper	104 mg/kg	91 mg/kg
DSA, Disturbed Gossan, Location A	Soil (FLSS-27)	Copper	711 mg/kg	91 mg/kg
	Soil (FLSS-27)	Selenium	6.41 mg/kg	2.9 mg/kg
	Soil (FLSS-27 Duplicate)	Copper	998 mg/kg	91 mg/kg
	Soil (FLSS-27 Duplicate)	Selenium	7.14 mg/kg	2.9 mg/kg
DSA, Disturbed Gossan, Location B	Soil (FLSS-28)	Copper	132 mg/kg	91 mg/kg

#### 4.4.2 Soil Quality

There were nine soil quality samples collected in the DSA (Appendix A.2). These samples were collected at the grease shack (FLSS-20), upslope between the laydown and bulk sample area (FLSS-21), the drillers mud area (FLSS-22), two samples from the west side of the laydown (FLSS-23 and FLSS-24), two locations in the natural iron gossan (FLSS-25 and FLSS-26), two locations in the disturbed gossan (FLSS-27 and FLSS-28), and the laydown eastside (FLSS-29). The reference areas (FLSS-18 and FLSS-19) were the same as was used for FCA sample comparisons.

**Physical tests** – The drill staging area was located approximately 2 km away from the FCA and WSA. The soil at the DSA generally had a higher moisture content than at the FCA and WSA (~10 to 20% moisture; Appendix D.2). At the reference areas (FLSS-18 and FLSS-19), FLSS-20, FLSS-21, FLSS-22, FLSS-23 and FLSS-24, and FLSS-29, the soil pH range was 5.23 to 5.93. The soil pH ranged from 2.37 to 2.90 at FLSS-25, FLSS-27, and FLSS-28.

**Metals** – The copper concentration was 104 mg/kg at FLSS-26, 711 mg/kg at FLSS-27, 998 mg/kg in the FLSS-27 duplicate, and 132 mg/kg at FLSS-28. These concentrations were higher than the CCME copper guideline of 91 mg/kg (Table 4.4-1). The concentration of selenium was 6.42 mg/kg at FLSS-27 and 7.14 mg/kg in the FLSS-27 duplicate. Both these concentrations were higher than the selenium CCME guideline of 2.9 mg/kg. Silver concentrations at FLSS-21 and FLSS-23 were higher than detection limit but below the CCME guideline of 40mg/kg.

**VOCs** – VOCs were collected only at FLSS-20, FLSS-21, FLSS-22, and FLSS-23. The toluene concentration was 0.489 mg/kg at FLSS-20, higher than CCME guidelines of 0.37 mg/kg (short-term) and 0.08 mg/kg (long-term). VOC concentrations collected from FLSS-21 to FLSS-23 were below detection limits.

**Hydrocarbons** – Hydrocarbon concentrations were lower than CCME guidelines in all samples collected. At FLSS-21, the F3-PAH concentration was higher than the detection limit. At FLSS-23,



the F3-PAH, F3 (C16-C34), F4 (C34-C50), F3G-sg concentrations were higher than their respective detection limits. Hydrocarbon concentrations collected from all other sites in the DSA (FLSS-20, FLSS-22, FLSS-24 to FLSS-29) were below detection limits (Appendix D.2).

**PAHs** – The fluorene concentration was 0.018 mg/kg at FLSS-21 and 0.038 mg/kg at FLSS-23. These fluorene concentrations were higher than the analytical detection limit of 0.010 mg/kg. PAH concentrations collected from all other sites in the DSA (FLSS-20, FLSS-22, FLSS-24 to FLSS-29) were below detection limits (Appendix D.2).

## 5. SUMMARY

This work was carried out as part of the “duty to care” of the facility and surrounding areas on the Kivalliq Inuit Association surface lands. ERM conducted the following tasks; brief summaries of outcomes for each objective immediately follows each task point:

- Independent assessment of the physical condition of the FCA.

Based on visual assessment, the FCA appears to be intact. The non-permeable barrier was not ripped or torn, and berms appeared to have enough capacity to hold any pooled water in the FCA. The crushed can berm may be nearing its capacity to hold water, and may need to be raised in the future.

- Independent sampling and analysis of water in the FCA and inspection and surface soil sampling at the FCA.

The water filled crate (FLW-7) in the FCA contained oil & grease and pyrene concentrations above the CCME guideline. Location A in the FCA (FLSS-15) had concentrations of ethylbenzene and F2 (C10-C16) higher than CCME guidelines, and Location C in the FCA (FLSS-17) toluene concentrations were higher than the CCME guideline. In both water and soil samples, a number of VOC, hydrocarbons, and PAH concentrations did not exceed CCME guidelines, but were above detection limits.

- Inspection and surface soil sampling at the WSA.

The WSA did not have any sample parameters that exceeded CCME guidelines, although some VOCs, hydrocarbons, and PAHs concentrations were slightly above the detection limit.

- Inspection and pooled water and surface soil sampling at the DSA.

Water samples from natural gossan (FLW-1) and disturbed gossan (FLW-2) from the DSA had pH levels below the CCME guideline and total iron concentrations higher than the CCME guideline. pH in the metals field blank (FLW-3) was also lower than the CCME guideline. Soil toluene concentrations were higher than the CCME guideline at the grease shack (FLSS-20) and fluorene concentrations were higher than the CCME guideline at the upslope area (FLSS-21) and drillers mud area (FLSS-23). Copper concentrations were higher than the CCME guideline at the natural iron gossan (FLSS-26) and disturbed gossan (FLSS-27 and FLSS-28) sites. Selenium concentrations were higher than the CCME guideline at FLSS-27 and the duplicate taken at FLSS-27. In both water and soil samples, a number of VOC, hydrocarbons, and PAH concentrations did not exceed CCME guidelines, but were above detection limits.

## 6. REFERENCES

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- ERM. 2015. *2015 Fuel Containment Area Water and Soil Sampling Memorandum*. Prepared for Canadian North Resources and Development Corp. by ERM Consultants Inc., Yellowknife, NT.



## APPENDIX A      2021 WATER AND SOIL SAMPLING LOCATIONS

**Table A.1: 2021 Water Sampling Locations, Ferguson Lake Project**

Sample ID	Easting	Northing	Description
FLW-1	6972805	605542	Drill Staging Area - Natural Gossan
FLW-2 *	6972821	605641	Drill Staging Area - Disturbed Gossan
FLW-3	-	-	Drill Staging Area - Field blank (metals)
FLW-4	6975322	606696	FCA - ponded water A
FLW-5	6975308	606705	FCA - ponded water B
FLW-6	6975313	606717	FCA - ponded water C
FLW-7	6975302	606718	FCA - Water filled crate within FCA area
FLW-8 *	6975185	606713	FCA - Secondary Berm
FLW-9	6975245	606719	FCA - Crushed can berm
FLW-10	6975230	606744	FCA - Whole can berm
FLW-11	6975411	606463	FCA - Furnace fuel berm
FLW-12	6974880	606663	FCA - Reference water body south east of landing strip
FLW-13	-	-	FCA - Field blank (hydrocarbons)
FLW-14	6975332	606551	FCA - Helicopter fuel berm
FLW-15	6975220	606715	FCA - Tall white tank beside secondary berm

*Note: \* indicates locations where duplicate soil samples were collected*



**Table A.2: 2021 Soil Sampling Locations, Ferguson Lake Project**

Sample ID	Easting	Northing	Description
FLSS-1	6975185	606701	WSA, Location A
FLSS-2	6975184	606702	WSA, Location B
FLSS-3	6975177	606707	WSA, Location C
FLSS-4	6975171	606709	WSA, Location D
FLSS-5	6975175	606701	WSA, Location E
FLSS-6 *	6975179	606701	WSA, Location F
FLSS-7	6975185	606690	WSA, Location G
FLSS-8	6975177	606691	WSA, Location H
FLSS-9	6975174	606691	WSA, Location I
FLSS-10	6975172	606695	WSA, Location J
FLSS-11	6975160	606745	FCA - Propane tank area, Location A
FLSS-12	6975166	606748	FCA - Propane tank area, Location B
FLSS-13	6975279	606703	FCA - Fuel berm upper lip, Location A
FLSS-14	6975291	606672	FCA - Fuel berm upper lip, Location B
FLSS-15	6975294	606710	FCA - Fuel containment area, Location A
FLSS-16 *	6975314	606715	FCA - Fuel containment area, Location B
FLSS-17	6975324	606706	FCA - Fuel containment area, Location C
FLSS-18	6975216	606822	FCA - Reference area, Location A
FLSS-19	6975368	606704	FCA - Reference area, Location B
FLSS-20	6972802	605638	DSA - Grease shack
FLSS-21	6972816	605632	DSA -Upslope between Laydown and Bulk sample area
FLSS-22	6972814	605641	DSA -Drillers mud area
FLSS-23	6972812	605617	DSA -West side of Laydown, Location A
FLSS-24	6972802	605623	DSA -West side of Laydown, Location B
FLSS-25	6972824	605544	DSA -Natural Iron Gossan, Location A
FLSS-26	6972892	605592	DSA -Natural Iron Gossan, Location B
FLSS-27 *	6972834	605636	DSA -Disturbed Gossan, Location A
FLSS-28	6972887	605667	DSA -Disturbed Gossan, Location B
FLSS-29	6972806	605665	DSA -Laydown Eastside

Note: \* indicates locations where duplicate soil samples were collected.

## **APPENDIX B      FUEL CONTAINMENT AREA WATER AND SOIL QUALITY RESULTS**

Table B.1: Fuel Containment Area Water Quality Results

Area					FCA - Ponded Water			Water-filled Crate within FCA Area	Secondary Berm		Crushed Can Berm	Whole Can Berm	Furnace Fuel Berm	Helicopter Berm	Tall White Tank beside Secondary Berm	Reference	Blanks	
Client Sample ID					FLW4	FLW5	FLW6	FLW7	FLW8	DUP2 (FLW8)	FLW9	FLW10	FLW11	FLW14	FLW15	FLW12	FLW13 - Field	TRAVEL
Date Sampled					09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021
Time Sampled					09:50	10:00	10:15	10:30	11:00	11:00	12:00	12:20	12:45	15:00	15:30	13:45	14:15	00:00
ALS Sample ID					YL2101262-005	YL2101262-006	YL2101262-007	YL2101262-008	YL2101262-009	YL2101262-011	YL2101262-010	YL2101262-012	YL2101262-013	YL2101262-016	YL2101262-017	YL2101262-014	YL2101262-015	YL2101262-018
Parameter	Lowest Detection Limit	Units	CCME Guideline Freshwater Short-term (µg/L)	CCME Guideline Freshwater Long-term (µg/L)	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water
Aggregate Organics (Matrix: Water)																		
oil & grease (gravimetric)	1.0	mg/L	NA	NA	<1.0	<1.0	<1.0	7.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Volatile Organic Compounds Surrogates (Matrix: Water)																		
bromofluorobenzene, 4-	1.0	%	NA	NA	118	112	123	129	114	124	124	121	121	114	124	117	115	129
difluorobenzene, 1,4-	1.0	%	NA	NA	108	107	108	99.6	110	96.6	106	106	108	105	107	106	107	108
Volatile Organic Compounds [Fuels] (Matrix: Water)																		
benzene	0.50	µg/L	ND	370	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
ethylbenzene	0.50	µg/L	ND	90	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
methyl-tert-butyl ether [MTBE]	0.50	µg/L	ND	10000	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
styrene	0.50	µg/L	ND	72	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
toluene	0.50	µg/L	ND	2	<0.50	<0.50	0.64	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
xylene, m+p-	0.40	µg/L	ND	ND	<0.40	<0.40	0.88	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
xylene, o-	0.30	µg/L	ND	ND	<0.30	<0.30	2.25	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
xylenes, total	0.50	µg/L	ND	ND	<0.50	<0.50	3.13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Hydrocarbons (Matrix: Water)																		
F1 (C6-C10)	100	µg/L	NA	NA	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
F2 (C10-C16)	100	µg/L	NA	NA	<100	<100	<100	280	<100	<100	<100	<100	<100	430	<100	<100	<100	<100
F3 (C16-C34)	250	µg/L	NA	NA	<250	<250	<250	129000	<250	<250	<250	<250	<250	800	<250	<250	<250	<250
F4 (C34-C50)	250	µg/L	NA	NA	<250	<250	<250	14700	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250
VHw (C6-C10)	100	µg/L	NA	NA	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
F1-BTEX	100	µg/L	NA	NA	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
VPHw	100	µg/L	NA	NA	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
TEH (C10-C50)	400	µg/L	NA	NA	<400	<400	<400	144000	<400	<400	<400	<400	<400	1230	<400	<400	<400	<400
TEH (C16-C50)	400	µg/L	NA	NA	<400	<400	<400	144000	<400	<400	<400	<400	<400	800	<400	<400	<400	<400
Hydrocarbons Surrogates (Matrix: Water)																		
bromobenzotrifluoride, 2- (F2-F4 surr)	1.0	%	NA	NA	80.8	80.9	73.0	89.7	81.2	86.6	86.4	85.5	87.5	79.3	89.8	84.9	79.0	76.0
dichlorotoluene, 3,4-	1.0	%	NA	NA	93.4	81.8	95.7	141	85.9	89.0	77.9	90.5	87.9	91.7	89.9	95.8	90.4	85.8
Polycyclic Aromatic Hydrocarbons (Matrix: Water)																		
acenaphthene	0.010	µg/L	ND	5.8	<0.010	<0.010	<0.040	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
acenaphthylene	0.010	µg/L	ND	ND	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
acridine	0.010	µg/L	ND	4.4	<0.010	<0.010	<0.010	<0.400	<0.010	<0.010	<0.010	<0.010	<0.015	<0.010	<0.010	<0.010	<0.010	<0.010
anthracene	0.010	µg/L	ND	0.012	<0.010	<0.010	<0.010	<0.120	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benz(a)anthracene	0.010	µg/L	NA	0.018	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(a)pyrene	0.0050	µg/L	NA	0.015	<0.0050	<0.0050	<0.0050	<0.0842	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
benzo(b+j)fluoranthene	0.010	µg/L	NA	NA	<0.010	<0.010	<0.010	<1.70	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b+j+k)fluoranthene	0.015	µg/L	NA	NA	<0.015	<0.015	<0.015	<1.78	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
benzo(g,h,i)perylene	0.010	µg/L	NA	NA	<0.010	<0.010	<0.010	<0.120	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(k)fluoranthene	0.010	µg/L	NA	NA	<0.010	<0.010	<0.010	<0.520	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
chrysene	0.010	µg/L	ND	insufficient data	<0.010	<0.010	<0.010	<0.120	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
dibenz(a,h)anthracene	0.0050	µg/L	NA	NA	<0.0050	<0.0050	<0.0050	<0.0950	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
fluoranthene	0.010	µg/L	ND	0.04	<0.010	<0.010	<0.010	<0.080	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
fluorene	0.010	µg/L	ND	3.00	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
indeno(1,2,3-c,d)pyrene	0.010	µg/L	ND	ND	<0.010	<0.010	<0.010	<0.084	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
methylnaphthalene, 1+2-	0.015	µg/L	NA	NA	<0.015	<0.015	<0.015	<0.036	<0.015	<0.015	<0.015	<0.015	<0.015	0.061	<0.015	0.059	<0.015	<0.015
methylnaphthalene, 1-	0.010	µg/L	NA	NA	<0.010	<0.010	<0.010	<0.030	<0.010	<0.010	<0.010	<0.010	0.040	<0.010	0.033	0.011	<0.010	<0.010
methylnaphthalene, 2-	0.010	µg/L	ND	ND	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010	<0.010	0.021	<0.010	0.026	<0.010	<0.010	<0.010	<0.010
naphthalene	0.050	µg/L	ND	1.1	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050



Table B.1: Fuel Containment Area Water Quality Results

Area					FCA - Ponded Water			Water-filled Crate within FCA Area	Secondary Berm		Crushed Can Berm	Whole Can Berm	Furnace Fuel Berm	Helicopter Berm	Tall White Tank beside Secondary Berm	Reference	Blanks	
Client Sample ID					FLW4	FLW5	FLW6	FLW7	FLW8	DUP2 (FLW8)	FLW9	FLW10	FLW11	FLW14	FLW15	FLW12	FLW13 - Field	TRAVEL
Date Sampled					09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021
Time Sampled					09:50	10:00	10:15	10:30	11:00	11:00	12:00	12:20	12:45	15:00	15:30	13:45	14:15	00:00
ALS Sample ID					YL2101262-005	YL2101262-006	YL2101262-007	YL2101262-008	YL2101262-009	YL2101262-011	YL2101262-010	YL2101262-012	YL2101262-013	YL2101262-016	YL2101262-017	YL2101262-014	YL2101262-015	YL2101262-018
Parameter	Lowest Detection Limit	Units	CCME Guideline Freshwater Short-term (µg/L)	CCME Guideline Freshwater Long-term (µg/L)	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water
phenanthrene	0.020	µg/L	ND	0.40	<0.020	<0.020	<0.020	<0.040	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
pyrene	0.010	µg/L	ND	0.025	<0.010	<0.010	<0.010	0.392	<0.010	<0.010	<0.010	<0.010	<0.012	<0.010	<0.010	<0.010	<0.010	<0.010
quinoline	0.050	µg/L	ND	3.40	<0.050	<0.050	<0.050	<0.170	<0.075	<0.075	<0.050	<0.050	<0.050	<0.050	<0.075	<0.050	<0.050	<0.050
B(a)P total potency equivalents [B(a)P TPE]	0.010	µg/L	NA	NA	<0.010	<0.010	<0.010	0.207	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PAHs, high molecular weight (BC AWQ)	0.030	µg/L	NA	NA	<0.030	<0.030	<0.030	<1.80	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
PAHs, low molecular weight (BC AWQ)	0.060	µg/L	NA	NA	<0.060	<0.060	<0.069	<0.139	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060
PAHs, total (EPA 16)	0.065	µg/L	NA	NA	<0.065	<0.065	<0.075	<1.80	<0.065	<0.065	<0.065	<0.065	<0.065	<0.065	<0.065	<0.065	<0.065	<0.065
Polycyclic Aromatic Hydrocarbons Surrogates (Matrix: Water)																		
chrysene-d12	0.1	%	NA	NA	85.3	78.3	73.9	81.4	83.2	80.9	80.3	81.2	85.3	81.6	82.8	80.3	78.9	75.8
naphthalene-d8	0.1	%	NA	NA	79.3	74.8	72.2	73.0	97.4	101	104	102	99.4	102	101	101	97.4	90.5
phenanthrene-d10	0.1	%	NA	NA	108	99.6	95.6	107	106	107	106	105	107	108	106	104	103	97.8

Note: Bolded and shaded boxed values indicate greater than published CCME guidelines. Bolded values without shading indicate greater than detection limit. These criteria only apply to values that are not expressed in percentage units and not to physical properties of water samples, except pH

ND = no data; NA = not applicable

\* Detection limit raised above stated

Table B.2: Fuel Containment Area Soil Quality Results

Area						Propane Tank Area		Fuel Berm Upper Lip		Fuel Containment Area				Reference Area	
Client Sample ID						FLSS11	FLSS12	FLSS13	FLSS14	FLSS15	FLSS16	FLSS17	DUP2 (FLSS16)	FLSS18	FLSS19
Date Sampled						08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021
Time Sampled						09:45	09:50	10:05	10:15	10:30	11:00	11:05	11:00	11:50	12:05
ALS Sample ID						YL2101264-012	YL2101264-013	YL2101264-014	YL2101264-015	YL2101264-016	YL2101264-017	YL2101264-018	YL2101264-019	YL2101264-020	YL2101264-021
Parameter	Lowest Detection Limit	Units	Standard Coarse Grain (mg/kg)	Standard Fine (≤75µm) grain (mg/kg)	CMME Guideline (mg/kg, industrial)	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil
Physical Tests (Matrix: Soil/Solid)															
moisture	0.25	%	NA	NA	NA	13.7	5.69	6.41	13.5	9.28	6.45	10.9	6.55	12.4	13.0
pH (1:2 soil:water)	0.10	pH units	NA	NA	NA	4.95	5.54	5.56	5.06	5.43	5.58	5.61	5.56	4.91	5.70
Metals (Matrix: Soil/Solid)															
aluminum	50	mg/kg	NA	NA	ND	5020	4000	4490	3900	4140	3820	4250	3840	3040	4820
antimony	0.10	mg/kg	NA	NA	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic	0.10	mg/kg	NA	NA	12	1.47	1.58	1.69	1.49	1.38	1.55	1.61	1.41	1.18	1.77
barium	0.50	mg/kg	NA	NA	2000	49.2	26.1	25.8	27.1	20.2	23.4	32.4	25.0	14.3	35.1
beryllium	0.10	mg/kg	NA	NA	8	0.38	0.36	0.34	0.34	0.31	0.36	0.36	0.34	0.22	0.38
bismuth	0.20	mg/kg	NA	NA	NA	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.30	<0.20	<0.20	<0.20
boron	5.0	mg/kg	NA	NA	ND	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cadmium	0.020	mg/kg	NA	NA	22	0.052	0.028	0.036	0.033	0.031	0.026	0.028	0.023	0.028	<0.020
calcium	50	mg/kg	NA	NA	ND	2680	2310	2420	2470	2300	2340	2820	2470	2150	3090
chromium	0.50	mg/kg	NA	NA	87 (total)	21.3	17.1	16.5	15.1	16.5	14.5	18.1	15.8	23.5	20.1
cobalt	0.10	mg/kg	NA	NA	300	4.66	3.74	3.80	3.42	3.65	3.30	4.20	3.42	2.19	4.18
copper	0.50	mg/kg	NA	NA	91	8.89	8.59	7.27	6.91	6.13	7.71	7.72	7.44	2.14	8.78
iron	50	mg/kg	NA	NA	ND	11600	10400	10400	9850	8940	9110	10300	9180	8830	10300
lead	0.50	mg/kg	NA	NA	600	6.34	6.17	6.34	6.39	5.86	5.86	6.21	5.83	6.21	6.23
lithium	2.0	mg/kg	NA	NA	ND	12.2	8.5	10.3	8.4	9.2	8.4	9.2	7.8	5.8	9.8
magnesium	20	mg/kg	NA	NA	NA	3820	2830	3210	2890	3330	2700	3250	2770	2440	3550
manganese	1.0	mg/kg	NA	NA	ND	149	121	140	113	125	110	143	108	72.2	119
mercury	0.0050	mg/kg	NA	NA	50	0.0250	0.0079	0.0052	0.0107	<0.0050	<0.0050	<0.0050	<0.0050	0.0054	<0.0050
molybdenum	0.10	mg/kg	NA	NA	40	0.20	0.18	0.24	0.20	0.16	0.16	0.18	0.27	0.20	0.21
nickel	0.50	mg/kg	NA	NA	89	13.0	9.76	9.78	8.86	11.2	8.04	11.8	9.33	10.7	12.7
phosphorus	50	mg/kg	NA	NA	ND	703	616	467	510	477	477	594	546	593	557
potassium	100	mg/kg	NA	NA	NA	1460	790	910	640	750	700	1040	710	800	1110
selenium	0.20	mg/kg	NA	NA	2.9	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
silver	0.10	mg/kg	NA	NA	40	<0.10	<0.10	0.14	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
sodium	50	mg/kg	NA	NA	NA	65	58	77	59	60	65	64	61	<50	117
strontium	0.50	mg/kg	NA	NA	NA	32.3	30.1	33.5	34.2	35.0	34.3	43.1	30.8	33.5	37.0
sulfur	1000	mg/kg	NA	NA	ND	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
thallium	0.050	mg/kg	NA	NA	1	0.173	0.094	0.103	0.088	0.091	0.088	0.160	0.089	0.087	0.128
tin	2.0	mg/kg	NA	NA	300	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
titanium	1.0	mg/kg	NA	NA	NA	548	561	596	546	483	577	625	521	495	645
tungsten	0.50	mg/kg	NA	NA	NA	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
uranium	0.050	mg/kg	NA	NA	300	1.07	1.03	1.01	1.14	0.982	1.18	1.10	1.05	0.846	1.02
vanadium	0.20	mg/kg	NA	NA	130	19.8	17.8	17.6	16.0	14.8	15.1	17.1	15.3	15.2	18.0
zinc	2.0	mg/kg	NA	NA	410	27.7	18.7	22.8	19.0	19.1	17.1	18.8	17.3	13.8	18.6
zirconium	1.0	mg/kg	NA	NA	NA	2.2	1.9	2.0	2.1	1.4	2.6	2.6	2.3	2.2	6.3
Volatile Organic Compounds Surrogates (Matrix: Soil/Solid)															
bromofluorobenzene, 4-	0.10	%	NA	NA	NA	97.2	88.3	74.9	84.5	126	94.3	101	84.4	78.4	78.2
difluorobenzene, 1,4-	0.10	%	NA	NA	NA	114	110	97.6	105	101	95.6	116	95.7	86.3	92.7
Volatile Organic Compounds [Fuels] (Matrix: Soil/Solid)															
benzene	0.0050	mg/kg	0.03	0.0068	NA	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
ethylbenzene	0.015	mg/kg	0.082	0.018	NA	<0.015	<0.015	<0.015	<0.015	0.131	<0.015	<0.015	<0.015	<0.015	<0.015
methyl-tert-butyl ether [MTBE]	0.200	mg/kg	NA	NA	NA	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
styrene	0.050	mg/kg	NA	NA	NA	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
toluene	0.050	mg/kg	0.37	0.08		0.052	<0.050	<0.050	<0.050	<0.050	<0.050	0.161	<0.050	0.051	<0.050
xylene, m+p-	0.050	mg/kg	NA	NA	NA	<0.050	<0.050	<0.050	<0.050	0.506	<0.050	<0.050	<0.050	<0.050	<0.050
xylene, o-	0.050	mg/kg	NA	NA	NA	<0.050	<0.050	<0.050	<0.050	0.444	<0.050	<0.050	<0.050	<0.050	<0.050
xylenes, total	0.075	mg/kg	11	2.4	NA	<0.075	<0.075	<0.075	<0.075	0.950	<0.075	<0.075	<0.075	<0.075	<0.075

Table B.2: Fuel Containment Area Soil Quality Results

Area						Propane Tank Area		Fuel Berm Upper Lip		Fuel Containment Area				Reference Area	
Client Sample ID						FLSS11	FLSS12	FLSS13	FLSS14	FLSS15	FLSS16	FLSS17	DUP2 (FLSS16)	FLSS18	FLSS19
Date Sampled						08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021
Time Sampled						09:45	09:50	10:05	10:15	10:30	11:00	11:05	11:00	11:50	12:05
ALS Sample ID						YL2101264-012	YL2101264-013	YL2101264-014	YL2101264-015	YL2101264-016	YL2101264-017	YL2101264-018	YL2101264-019	YL2101264-020	YL2101264-021
Parameter	Lowest Detection Limit	Units	Standard Coarse Grain (mg/kg)	Standard Fine (≤75µm) grain (mg/kg)	CMME Guideline (mg/kg, industrial)	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil
Hydrocarbons (Matrix: Soil/Solid)															
F1 (C6-C10)	5.0	mg/kg	320	320	NA	<5.0	<5.0	<5.0	<5.0	182	<5.0	<5.0	<5.0	<5.0	<5.0
F2-naphthalene	30	mg/kg	NA	NA	NA	<30	<30	<30	<30	4420	<30	<30	<30	<30	<30
F3-PAH	50	mg/kg	NA	NA	NA	83	<50	<50	134	1420	<50	<50	<50	<50	<50
F1-BTEX	5.0	mg/kg	NA	NA	NA	<5.0	<5.0	<5.0	<5.0	181 *	<5.0	<5.0	<5.0	<5.0	<5.0
F2 (C10-C16)	30	mg/kg	260	260	NA	<30	<30	<30	<30	4420	<30	<30	<30	<30	<30
F3 (C16-C34)	50	mg/kg	1700	2500	NA	83	<50	<50	134	1420	<50	<50	<50	<50	<50
F4 (C34-C50)	50	mg/kg	3300	6600	NA	55	<50	<50	94	225	<50	<50	<50	<50	<50
F4G-sg	500	mg/kg	NA	NA	NA	720									
chromatogram to baseline at nC50						No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hydrocarbons Surrogates (Matrix: Soil/Solid)															
bromobenzotrifluoride, 2- (F2-F4 surr)	1.0	%	NA	NA	NA	86.8	89.4	88.6	87.0	152 *	88.2	89.9	85.2	87.3	75.2
dichlorotoluene, 3,4-	1.0	%	NA	NA	NA	114	118	98.5	102	72.1	93.3	118	110	76.3	96.6
Polycyclic Aromatic Hydrocarbons (Matrix: Soil/Solid)															
acenaphthene	0.0050	mg/kg	NA	NA	NA	<0.0050	<0.0050	<0.0050	<0.0050	<0.0700 *	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
acenaphthylene	0.0050	mg/kg	NA	NA	NA	<0.0050	<0.0050	<0.0050	<0.0050	<0.0200 *	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
anthracene	0.0040	mg/kg	NA	NA	32	<0.0040	<0.0040	<0.0040	<0.0040	0.0096 *	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
benz(a)anthracene	0.010	mg/kg	NA	NA	10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(a)pyrene	0.010	mg/kg	NA	NA	72	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b+j)fluoranthene	0.010	mg/kg	NA	NA	10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b+j+k)fluoranthene	0.015	mg/kg	NA	NA	10	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
benzo(g,h,i)perylene	0.010	mg/kg	NA	NA	NA	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(k)fluoranthene	0.010	mg/kg	NA	NA	10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
chrysene	0.010	mg/kg	NA	NA	NA	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
dibenz(a,h)anthracene	0.0050	mg/kg	NA	NA	10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
fluoranthene	0.010	mg/kg	NA	NA	180	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
fluorene	0.010	mg/kg	NA	NA	NA	<0.010	<0.010	<0.010	<0.010	0.032	<0.010	<0.010	<0.010	<0.010	<0.010
indeno(1,2,3-c,d)pyrene	0.010	mg/kg	NA	NA	10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
methylnaphthalene, 1-	0.010	mg/kg	NA	NA	NA	<0.010	<0.010	<0.010	<0.010	<0.180 *	<0.010	<0.010	<0.010	<0.010	<0.010
methylnaphthalene, 2-	0.010	mg/kg	NA	NA	NA	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
naphthalene	0.010	mg/kg	NA	NA	0.013	<0.010	<0.010	<0.010	<0.010	<0.370 *	<0.010	<0.010	<0.010	<0.010	<0.010
phenanthrene	0.010	mg/kg	NA	NA	0.05	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
pyrene	0.010	mg/kg	NA	NA	100	<0.010	<0.010	<0.010	<0.010	0.043	<0.010	<0.010	<0.010	<0.010	<0.010
quinoline	0.050	mg/kg	NA	NA	NA	<0.050	<0.050	<0.050	<0.050	<0.275 *	<0.050	<0.050	<0.050	<0.050	<0.050
B(a)P total potency equivalents [B(a)P TPE]	0.020	mg/kg	NA	NA	NA	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
IACR (CCME)	0.150		NA	NA	NA	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150
Polycyclic Aromatic Hydrocarbons Surrogates (Matrix: Soil/Solid)															
acridine-d9	0.1	%	NA	NA	NA	97.9	110	106	71.5	122	102	114	122	94.3	115
chrysene-d12	0.1	%	NA	NA	NA	127	114	115	117	127	110	118	126	109	110
naphthalene-d8	0.1	%	NA	NA	NA	102	94.6	95.0	97.9	119	89.5	102	104	93.7	109
phenanthrene-d10	0.1	%	NA	NA	NA	107	97.1	96.6	101	108	90.8	102	108	94.4	104

Note: Bolded and shaded boxed values indicate greater than published CCME guidelines. Bolded values without shading indicate greater than detection limit. These criteria only apply to values that are not expressed in percentage units and not to physical properties of water samples, except pH  
ND = no data; NA = not applicable  
\* Detection limit raised above stated

## APPENDIX C      WASTE STORAGE AREA SOIL QUALITY RESULTS



Table C.1: Waste Storage Area Soil Quality Results

Area						Waste Staging Area											Reference Area	
Client Sample ID						FLSS1	FLSS2	FLSS3	FLSS4	FLSS5	FLSS6	FLSS7	FLSS8	FLSS9	FLSS10	DUP1 (FLSS6)	FLSS18	FLSS19
Date Sampled						08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021
Time Sampled						08:15	08:20	08:30	08:35	08:40	08:50	09:00	09:20	09:30	09:40	08:50	11:50	12:05
ALS Sample ID						YL2101264-001	YL2101264-002	YL2101264-003	YL2101264-004	YL2101264-005	YL2101264-006	YL2101264-007	YL2101264-008	YL2101264-009	YL2101264-010	YL2101264-011	YL2101264-020	YL2101264-021
Parameter	Lowest Detection Limit	Units	Standard Coarse Grain (mg/kg)	Standard Fine (≤75µm) grain (mg/kg)	CMME Guideline (mg/kg, industrial)	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil
Physical Tests (Matrix: Soil/Solid)																		
moisture	0.25	%	NA	NA	NA	8.68	7.11	18.1	20.8	10.3	8.91	9.28	5.66	6.32	10.2	7.27	12.4	13.0
pH (1:2 soil:water)	0.10	pH units	NA	NA	NA	5.32	5.14	5.41	5.34	6.74	5.90	5.17	5.34	5.50	5.45	5.95	4.91	5.70
Metals (Matrix: Soil/Solid)																		
aluminum	50	mg/kg	NA	NA	ND	5400	4850	3630	3600	4730	4250	5120	4970	5390	4960	3930	3040	4820
antimony	0.10	mg/kg	NA	NA	40	0.11	<0.10	0.15	0.10	0.11	<0.10	0.13	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic	0.10	mg/kg	NA	NA	12	1.86	1.32	1.22	1.18	1.34	1.43	1.54	1.62	1.59	1.31	1.31	1.18	1.77
barium	0.50	mg/kg	NA	NA	2000	27.8	25.8	25.1	27.7	17.9	18.7	25.3	21.9	21.6	29.7	15.1	14.3	35.1
beryllium	0.10	mg/kg	NA	NA	8	0.36	0.28	0.26	0.22	0.32	0.29	0.34	0.35	0.40	0.32	0.32	0.22	0.38
bismuth	0.20	mg/kg	NA	NA	NA	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
boron	5.0	mg/kg	NA	NA	ND	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cadmium	0.020	mg/kg	NA	NA	22	0.065	0.062	0.060	0.092	0.066	0.047	0.066	0.052	0.044	0.060	0.043	0.028	<0.020
calcium	50	mg/kg	NA	NA	ND	2320	2060	1860	1670	1870	1970	2320	2480	2500	2130	1960	2150	3090
chromium	0.50	mg/kg	NA	NA	87 (total)	19.2	19.8	12.4	12.3	16.4	15.0	17.2	17.0	14.8	18.6	12.0	23.5	20.1
cobalt	0.10	mg/kg	NA	NA	300	4.12	3.74	2.78	2.42	3.76	3.58	3.80	4.31	4.09	3.73	3.04	2.19	4.18
copper	0.50	mg/kg	NA	NA	91	7.31	5.33	7.10	4.48	5.50	7.20	26.6	7.92	8.12	5.60	7.17	2.14	8.78
iron	50	mg/kg	NA	NA	ND	11900	11900	9460	8450	9980	10200	11700	11500	10500	10600	8560	8830	10300
lead	0.50	mg/kg	NA	NA	600	9.10	8.92	6.45	6.38	6.08	7.46	10.9	5.95	6.32	6.08	5.86	6.21	6.23
lithium	2.0	mg/kg	NA	NA	ND	11.6	9.6	7.3	6.2	10.2	10.2	10.9	11.1	11.2	10.0	10.0	5.8	9.8
magnesium	20	mg/kg	NA	NA	NA	3620	3160	2310	2070	3140	3190	3320	3350	3360	3100	2680	2440	3550
manganese	1.0	mg/kg	NA	NA	ND	147	159	120	84.5	152	136	147	149	156	162	120	72.2	119
mercury	0.0050	mg/kg	NA	NA	50	0.0184	0.0200	0.0176	0.0239	0.0134	0.0085	0.0207	0.0096	0.0106	0.0206	0.0094	0.0054	<0.0050
molybdenum	0.10	mg/kg	NA	NA	40	0.48	0.33	0.32	0.51	0.82	0.26	0.32	0.16	0.20	0.41	0.18	0.20	0.21
nickel	0.50	mg/kg	NA	NA	89	10.8	9.47	6.68	6.00	8.70	8.77	10.1	9.83	9.87	9.56	7.34	10.7	12.7
phosphorus	50	mg/kg	NA	NA	ND	500	383	365	422	412	512	586	480	496	438	382	593	557
potassium	100	mg/kg	NA	NA	NA	900	930	600	620	870	860	830	770	800	920	680	800	1110
selenium	0.20	mg/kg	NA	NA	2.9	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
silver	0.10	mg/kg	NA	NA	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
sodium	50	mg/kg	NA	NA	NA	79	82	68	141	173	66	74	65	106	72	59	<50	117
strontium	0.50	mg/kg	NA	NA	NA	39.1	31.6	29.2	22.8	24.8	26.1	35.6	31.8	28.1	28.8	26.5	33.5	37.0
sulfur	1000	mg/kg	NA	NA	ND	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
thallium	0.050	mg/kg	NA	NA	1	0.120	0.107	0.073	0.065	0.109	0.113	0.104	0.094	0.105	0.101	0.080	0.087	0.128
tin	2.0	mg/kg	NA	NA	300	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
titanium	1.0	mg/kg	NA	NA	NA	740	699	438	441	468	460	664	459	466	525	412	495	645
tungsten	0.50	mg/kg	NA	NA	NA	<0.50	<0.50	0.57	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
uranium	0.050	mg/kg	NA	NA	300	1.29	0.954	0.793	0.854	0.886	1.01	1.28	0.986	1.21	0.888	0.970	0.846	1.02
vanadium	0.20	mg/kg	NA	NA	130	19.1	23.6	13.8	12.6	16.5	15.0	19.6	19.0	14.8	17.8	12.2	15.2	18.0
zinc	2.0	mg/kg	NA	NA	410	30.1	30.6	32.3	24.4	24.1	27.1	25.1	25.4	32.0	33.5	21.9	13.8	18.6
zirconium	1.0	mg/kg	NA	NA	NA	3.1	2.7	1.5	2.1	1.5	1.9	2.1	1.1	1.2	1.3	1.3	2.2	6.3
Volatile Organic Compounds Surrogates (Matrix: Soil/Solid)																		
bromofluorobenzene, 4-	0.10	%	NA	NA	NA	83.0	96.0	75.3	82.3	90.2	77.5	83.1	81.3	83.6	82.0	79.0	78.4	78.2
difluorobenzene, 1,4-	0.10	%	NA	NA	NA	96.3	104	89.5	92.3	98.5	94.8	107	100	96.4	98.1	94.2	86.3	92.7
Volatile Organic Compounds [Fuels] (Matrix: Soil/Solid)																		
benzene	0.0050	mg/kg	0.03	0.0068	NA	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
ethylbenzene	0.015	mg/kg	0.082	0.018	NA	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
methyl-tert-butyl ether [MTBE]	0.200	mg/kg	NA	NA	NA	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
styrene	0.050	mg/kg	NA	NA	NA	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
toluene	0.050	mg/kg	0.37	0.08		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.051	<0.050
xylene, m+p-	0.050	mg/kg	NA	NA	NA	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
xylene, o-	0.050	mg/kg	NA	NA	NA	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
xylenes, total	0.075	mg/kg	11	2.4	NA	<0.075	<0.075	<0.075	<0.075	<0.075	<0.075	<0.075	<0.075	<0.075	<0.075	<0.075	<0.075	<0.075

Table C.1: Waste Storage Area Soil Quality Results

Area						Waste Staging Area											Reference Area	
Client Sample ID						FLSS1	FLSS2	FLSS3	FLSS4	FLSS5	FLSS6	FLSS7	FLSS8	FLSS9	FLSS10	DUP1 (FLSS6)	FLSS18	FLSS19
Date Sampled						08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021
Time Sampled						08:15	08:20	08:30	08:35	08:40	08:50	09:00	09:20	09:30	09:40	08:50	11:50	12:05
ALS Sample ID						YL2101264-001	YL2101264-002	YL2101264-003	YL2101264-004	YL2101264-005	YL2101264-006	YL2101264-007	YL2101264-008	YL2101264-009	YL2101264-010	YL2101264-011	YL2101264-020	YL2101264-021
Parameter	Lowest Detection Limit	Units	Standard Coarse Grain (mg/kg)	Standard Fine (≤75µm) grain (mg/kg)	CMME Guideline (mg/kg, industrial)	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil
Hydrocarbons (Matrix: Soil/Solid)																		
F1 (C6-C10)	5.0	mg/kg	320	320	NA	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
F2-naphthalene	30	mg/kg	NA	NA	NA	<30	<30	<30	<30	<30	<30	<30	<30	<30	44	<30	<30	<30
F3-PAH	50	mg/kg	NA	NA	NA	63	<50	266	325	58	80	55	63	<50	1390	79	<50	<50
F1-BTEX	5.0	mg/kg	NA	NA	NA	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
F2 (C10-C16)	30	mg/kg	260	260	NA	<30	<30	<30	<30	<30	<30	<30	<30	<30	44	<30	<30	<30
F3 (C16-C34)	50	mg/kg	1700	2500	NA	63	<50	266	325	58	80	55	63	<50	1390	79	<50	<50
F4 (C34-C50)	50	mg/kg	3300	6600	NA	<50	<50	95	146	<50	<50	<50	<50	<50	540	<50	<50	<50
F4G-sg	500	mg/kg	NA	NA	NA				790						1220			
chromatogram to baseline at nC50						Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Hydrocarbons Surrogates (Matrix: Soil/Solid)																		
bromobenzotrifluoride, 2- (F2-F4 surr)	1.0	%	NA	NA	NA	90.3	87.8	87.7	91.5	87.8	86.2	88.9	89.2	91.1	87.0	88.4	87.3	75.2
dichlorotoluene, 3,4-	1.0	%	NA	NA	NA	103	110	90.4	88.1	99.0	94.7	104	98.6	110	91.0	97.0	76.3	96.6
Polycyclic Aromatic Hydrocarbons (Matrix: Soil/Solid)																		
acenaphthene	0.0050	mg/kg	NA	NA	NA	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
acenaphthylene	0.0050	mg/kg	NA	NA	NA	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
anthracene	0.0040	mg/kg	NA	NA	32	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
benz(a)anthracene	0.010	mg/kg	NA	NA	10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(a)pyrene	0.010	mg/kg	NA	NA	72	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b+j)fluoranthene	0.010	mg/kg	NA	NA	10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b+j+k)fluoranthene	0.015	mg/kg	NA	NA	10	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
benzo(g,h,i)perylene	0.010	mg/kg	NA	NA	NA	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	<0.010	<0.010
benzo(k)fluoranthene	0.010	mg/kg	NA	NA	10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
chrysene	0.010	mg/kg	NA	NA	NA	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	<0.010	<0.010
dibenz(a,h)anthracene	0.0050	mg/kg	NA	NA	10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
fluoranthene	0.010	mg/kg	NA	NA	180	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
fluorene	0.010	mg/kg	NA	NA	NA	<0.010	<0.010	<0.010	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
indeno(1,2,3-c,d)pyrene	0.010	mg/kg	NA	NA	10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
methylnaphthalene, 1-	0.010	mg/kg	NA	NA	NA	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
methylnaphthalene, 2-	0.010	mg/kg	NA	NA	NA	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
naphthalene	0.010	mg/kg	NA	NA	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
phenanthrene	0.010	mg/kg	NA	NA	0.05	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
pyrene	0.010	mg/kg	NA	NA	100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.072	<0.010	<0.010
quinoline	0.050	mg/kg	NA	NA	NA	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
B(a)P total potency equivalents [B(a)P TPE]	0.020	mg/kg	NA	NA	NA	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
IACR (CCME)	0.150		NA	NA	NA	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150
Polycyclic Aromatic Hydrocarbons Surrogates (Matrix: Soil/Solid)																		
acridine-d9	0.1	%	NA	NA	NA	110	87.6	90.6	68.9	104	95.3	89.8	117	114	92.9	110	94.3	115
chrysene-d12	0.1	%	NA	NA	NA	124	115	129	119	126	108	118	129	128	128	123	109	110
naphthalene-d8	0.1	%	NA	NA	NA	110	93.4	97.7	93.0	100	84.8	96.6	104	104	93.2	96.8	93.7	109
phenanthrene-d10	0.1	%	NA	NA	NA	114	99.2	104	97.3	103	87.7	99.5	111	109	100	100	94.4	104

Note: Bolded and shaded boxed values indicate greater than published CCME guidelines. Bolded values without shading indicate greater than detection limit. These criteria only apply to values that are not expressed in percentage units and not to physical properties of water samples, except pH  
ND = no data; NA = not applicable

## APPENDIX D      FUEL CONTAINMENT AREA WATER AND SOIL QUALITY RESULTS

**Table D.1: Drill Staging Area Water Quality Results**

Area					Natural Gossan	Disturbed Gossan		Blanks	
Client Sample ID					FLW1	FLW2	DUP1 (FLW2)	FLW3 - Field	TRAVEL
Date Sampled					09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021
Time Sampled					08:10	08:30	08:30	08:50	00:00
ALS Sample ID					YL2101262-001	YL2101262-002	YL2101262-004	YL2101262-003	YL2101262-018
Parameter	Lowest Detection Limit	Units	CCME Guideline Freshwater Short-term (mg/L)	CCME Guideline Freshwater Long-term (mg/L)	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water
<b>Physical Tests (Matrix: Water)</b>									
conductivity	2.0	µS/cm	ND	ND	2090	2970	2980	16.5	<2.0
alkalinity, bicarbonate (as CaCO <sub>3</sub> )	1.0	mg/L	NA	NA	<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, carbonate (as CaCO <sub>3</sub> )	1.0	mg/L	NA	NA	<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO <sub>3</sub> )	1.0	mg/L	NA	NA	<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO <sub>3</sub> )	1.0	mg/L	NA	NA	<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO <sub>3</sub> )	1.0	mg/L	NA	NA	<1.0	<1.0	<1.0	<1.0	<1.0
hardness (as CaCO <sub>3</sub> , from total Ca/Mg)	0.60	mg/L	NA	NA	143	124	130	<0.60	<0.60
pH	0.10	pH units	ND	6.5 to 9	<b>2.66</b>	<b>2.87</b>	<b>2.88</b>	<b>4.77</b>	<b>5.61</b>
solids, total dissolved [TDS]	10	mg/L	ND	ND	2390 *	4060 *	4170 *	<10	<10
solids, total suspended [TSS]	3.0	mg/L	NA	NA	<3.0	<3.0	<3.0	<3.0	<3.0
turbidity	0.10	NTU	ND	narrative	0.36	0.18	0.14	<0.10	<0.10
<b>Anions and Nutrients (Matrix: Water)</b>									
Kjeldahl nitrogen, total [TKN]	0.050	mg/L	NA		0.317	0.443	0.481	<0.050	<0.050
ammonia, total (as N)	0.0050	mg/L	ND	0.02	<b>0.125</b>	<b>0.220</b>	<b>0.221</b>	<b>&lt;0.0050</b>	<0.0050
bromide	0.050	mg/L	NA		<0.500 *	<1.00 *	<1.00 *	<0.050	<0.050
chloride	0.50	mg/L	0.64	120	<5.00 *	<10.0 *	<10.0 *	<0.50	<0.50
fluoride	0.020	mg/L	ND	0.12	<b>0.406 *</b>	<b>0.423 *</b>	<b>0.427 *</b>	<0.020	<0.020
nitrate (as N)	0.0050	mg/L	0.55	13	<0.0500 *	<0.100 *	<0.100 *	<0.0050	<0.0050
nitrite (as N)	0.0010	mg/L	ND	0.06	<0.0100 *	<0.0200 *	<0.0200	<0.0010	<0.0010
phosphate, ortho-, dissolved (as P)	0.0010	mg/L	NA	NA	<b>0.0140</b>	<b>0.0023</b>	<b>0.0021</b>	<0.0010	<0.0010
phosphorus, total	0.0030	mg/L	ND	guidance	<b>0.0487</b>	<b>0.0250</b>	<b>0.0245</b>	<0.0030	<0.0030
sulfate (as SO <sub>4</sub> )	0.30	mg/L	ND	ND	<b>1230 *</b>	<b>2190 *</b>	<b>2210 *</b>	<0.30	<0.30
<b>Organic / Inorganic Carbon (Matrix: Water)</b>									
carbon, total organic [TOC]	0.50	mg/L			<b>4.53</b>	<b>6.32</b>	<b>5.97</b>	<0.50	<0.50
<b>Total Metals (Matrix: Water)</b>									
aluminum, total	0.0030	mg/L	ND	variable	25.2 *	27.3 *	28.1 *	<0.0030	<0.0030
antimony, total	0.00010	mg/L	ND	ND	<0.00050 *	<0.00100 *	<0.00100 *	<0.00010	<0.00010
arsenic, total	0.00010	mg/L	ND	0.005	<b>0.00304 *</b>	<b>0.00380 *</b>	<b>0.00145 *</b>	<0.00010	<0.00010
barium, total	0.00010	mg/L	ND	ND	<b>0.00135 *</b>	<b>0.00562 *</b>	<b>0.00562 *</b>	<0.00010	<0.00010
beryllium, total	0.000100	mg/L	ND	ND	<b>0.000879 *</b>	<0.00100 *	<0.00100 *	<0.000100	<0.000100
bismuth, total	0.000050	mg/L	NA	NA	<0.000250 *	<0.000500	<0.000500 *	<0.000050	<0.000050
boron, total	0.010	mg/L	0.029	0.0015	<0.050 *	<0.100 *	<0.100 *	<0.010	<0.010
cadmium, total	0.0000050	mg/L	equation	equation	<b>0.000699 *</b>	<b>0.00173 *</b>	<b>0.00189 *</b>	<0.0000050	<0.0000050
calcium, total	0.050	mg/L	ND	ND	<b>41.3 *</b>	<b>23.3 *</b>	<b>24.2 *</b>	<0.050	<0.050
cesium, total	0.000010	mg/L	NA	NA	0.00107 *	0.00556 *	0.00578 *	<0.000010	<0.000010



**Table D.1: Drill Staging Area Water Quality Results**

Area					Natural Gossan	Disturbed Gossan		Blanks	
Client Sample ID					FLW1	FLW2	DUP1 (FLW2)	FLW3 - Field	TRAVEL
Date Sampled					09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021
Time Sampled					08:10	08:30	08:30	08:50	00:00
ALS Sample ID					YL2101262-001	YL2101262-002	YL2101262-004	YL2101262-003	YL2101262-018
Parameter	Lowest Detection Limit	Units	CCME Guideline Freshwater Short-term (mg/L)	CCME Guideline Freshwater Long-term (mg/L)	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water
chromium, total	0.00050	mg/L	ND	ND	0.0524 *	0.0368 *	0.0369 *	<0.00050	<0.00050
cobalt, total	0.00010	mg/L	ND	ND	2.04 *	3.52 *	3.51 *	<0.00010	<0.00010
copper, total	0.00050	mg/L	ND	equation	11.7 *	12.3 *	12.1 *	<0.00050	<0.00050
iron, total	0.010	mg/L	ND	0.30	<b>356 *</b>	<b>971 *</b>	<b>1020 *</b>	<0.010	<0.010
lead, total	0.000050	mg/L	ND	equation	<0.000250 *	<0.000500 *	<0.000500 *	<0.000050	<0.000050
lithium, total	0.0010	mg/L	ND	ND	<b>0.0188 *</b>	<b>0.0305 *</b>	<b>0.0326 *</b>	<0.0010	<0.0010
magnesium, total	0.0050	mg/L	NA	NA	<b>9.68 *</b>	<b>16.0 *</b>	<b>16.9 *</b>	<0.0050	<0.0050
manganese, total	0.00010	mg/L	equation	variable	<b>0.572 *</b>	<b>0.622 *</b>	<b>0.615 *</b>	<0.00010	<0.00010
mercury, total	0.0000050	mg/L	ND	0.000026	<0.0000050	<0.0000050	<b>&lt;0.0000050 *</b>	<0.0000050	<0.0000050
molybdenum, total	0.000050	mg/L	ND	0.07	<0.000250 *	<0.000500 *	<0.000500 *	<0.000050	<0.000050
nickel, total	0.00050	mg/L	ND	equation	<b>18.6 *</b>	<b>32.8 *</b>	<b>33.2 *</b>	<0.00050	<0.00050
phosphorus, total	0.050	mg/L	NA	NA	<0.250 *	<0.500 *	<0.500 *	<0.050	<0.050
potassium, total	0.050	mg/L	NA	NA	<b>0.344 *</b>	<b>0.702 *</b>	<b>0.590 *</b>	<0.050	<0.050
rubidium, total	0.00020	mg/L	NA	NA	<b>0.00818 *</b>	<b>0.00938 *</b>	<b>0.0104 *</b>	<0.00020	<0.00020
selenium, total	0.000050	mg/L	NA	0.001	0.00242 *	0.00683 *	0.00667 *	<0.000050	<0.000050
silicon, total	0.10	mg/L	NA	NA	<b>30.2 *</b>	<b>26.3 *</b>	<b>27.6 *</b>	<0.10	<0.10
silver, total	0.000010	mg/L	NRG	0.00025	<0.000050 *	<0.000100 *	<0.000100 *	<0.000010	<0.000010
sodium, total	0.050	mg/L	NA	NA	<b>4.01 *</b>	<b>5.50 *</b>	<b>5.75 *</b>	<0.050	<0.050
strontium, total	0.00020	mg/L	NA	NA	0.0997 *	0.0916 *	0.0960 *	<0.00020	<0.00020
sulfur, total	0.50	mg/L	ND	ND	<b>417 *</b>	<b>750 *</b>	<b>785 *</b>	<0.50	<0.50
tellurium, total	0.00020	mg/L	ND	ND	<0.00100 *	<0.00200 *	<0.00200 *	<0.00020	<0.00020
thallium, total	0.000010	mg/L	ND	0.001	<b>0.000068 *</b>	<b>0.000159 *</b>	<b>0.000169 *</b>	<0.000010	<0.000010
thorium, total	0.00010	mg/L	NA	NA	<b>0.0146 *</b>	<b>0.00258 *</b>	<b>0.00271 *</b>	<0.00010	<0.00010
tin, total	0.00010	mg/L	ND	ND	<0.00050 *	<0.00100 *	<0.00100 *	<0.00010	<0.00010
titanium, total	0.00030	mg/L	NA	NA	<b>0.0158 *</b>	<b>0.0113 *</b>	<b>0.0117 *</b>	<0.00030	<0.00030
tungsten, total	0.00010	mg/L	NA	NA	<0.00050 *	<0.00100 *	<0.00100 *	<0.00010	<0.00010
uranium, total	0.000010	mg/L	0.033	0.015	<b>0.00387 *</b>	<b>0.00202 *</b>	<b>0.00220 *</b>	<0.000010	<0.000010
vanadium, total	0.00050	mg/L	ND	ND	<0.00250 *	<b>0.0174 *</b>	<b>0.0172 *</b>	<0.00050	<0.00050
zinc, total	0.0030	mg/L	equation	equation	<b>0.119 *</b>	<b>0.261 *</b>	<b>0.274 *</b>	<0.0030	<0.0030
zirconium, total	0.00020	mg/L	NA	NA	<0.00100 *	<0.00200 *	<0.00200 *	<0.00020	<0.00020

Note: Bolded and shaded boxed values indicate greater than published CCME guidelines. Bolded values without shading indicate greater than detection limit. These criteria only apply to values that are not expressed in percentage units and not to physical properties of water samples, except pH

ND = no data; NA = not applicable; NRG = no recommended guideline

\* Detection limit raised above stated

Table D.2: Drill Staging Area Soil Quality Results

Area						Grease Shack	Upslope between Laydown and Bulk Sample Area	Drillers Mud Area	West Side of Laydown		Natural Iron Gossan		Disturbed Gossan			Laydown Eastside	Reference Area	
Client Sample ID						FLSS20	FLSS21	FLSS22	FLSS23	FLSS24	FLSS25	FLSS26	FLSS27	DUP3 (FLSS27)	FLSS28	FLSS29	FLSS18	FLSS19
Date Sampled						08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021
Time Sampled						14:40	14:45	15:00	15:05	15:10	15:20	15:30	15:40	15:40	15:45	15:55	11:50	12:05
ALS Sample ID						YL2101264-022	YL2101264-023	YL2101264-024	YL2101264-025	YL2101264-026	YL2101264-027	YL2101264-028	YL2101264-029	YL2101264-030	YL2101264-031	YL2101264-032	YL2101264-020	YL2101264-021
Parameter	Lowest Detection Limit	Units	Standard Coarse Grain (mg/kg)	Standard Fine (≤75µm) grain (mg/kg)	CMME Guideline (mg/kg, industrial)	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil
Physical Tests (Matrix: Soil/Solid)																		
moisture	0.25	%	NA	NA	NA	10.4	22.7	11.4	32.8	10.9	11.9	14.3	14.6	13.6	12.7	11.5	12.4	13.0
pH (1:2 soil:water)	0.10	pH units	NA	NA	NA	5.53	4.36	5.66	4.40	5.23	2.63	3.59	2.37	2.36	2.90	5.93	4.91	5.70
Metals (Matrix: Soil/Solid)																		
aluminum	50	mg/kg	NA	NA	ND	2670	3650	3370	2960	3660	2810	10800	2560	2400	3340	2470	3040	4820
antimony	0.10	mg/kg	NA	NA	40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic	0.10	mg/kg	NA	NA	12	1.16	1.19	1.44	1.05	1.61	1.36	3.04	1.40	1.19	1.60	1.27	1.18	1.77
barium	0.50	mg/kg	NA	NA	2000	15.0	14.6	13.0	37.4	18.8	75.3	85.2	172	168	94.6	18.0	14.3	35.1
beryllium	0.10	mg/kg	NA	NA	8	0.23	0.16	0.23	0.18	0.27	0.15	0.46	<0.10	<0.10	0.15	0.20	0.22	0.38
bismuth	0.20	mg/kg	NA	NA	NA	<0.20	0.37	<0.20	<0.20	<0.20	<0.20	0.22	1.01	1.16	<0.20	<0.20	<0.20	<0.20
boron	5.0	mg/kg	NA	NA	ND	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	7.2	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cadmium	0.020	mg/kg	NA	NA	22	0.022	0.028	0.034	0.100	0.023	<0.020	0.020	<0.020	<0.020	<0.020	<0.020	0.028	<0.020
calcium	50	mg/kg	NA	NA	ND	1920	876	2280	1080	2250	700	2500	531	384	579	2080	2150	3090
chromium	0.50	mg/kg	NA	NA	87 (total)	14.4	13.8	13.2	10.5	13.0	19.0	32.8	29.7	27.1	17.8	18.9	23.5	20.1
cobalt	0.10	mg/kg	NA	NA	300	2.18	2.33	2.93	1.52	2.57	7.35	9.64	12.0	4.65	5.04	2.52	2.19	4.18
copper	0.50	mg/kg	NA	NA	91	5.54	653	14.8	23.1	3.96	87.9	104	711	998	132	4.95	2.14	8.78
iron	50	mg/kg	NA	NA	ND	7630	28000	8620	16100	8520	35800	19800	168000 +	178000 +	51200	7620	8830	10300
lead	0.50	mg/kg	NA	NA	600	4.84	5.54	5.09	5.35	5.72	6.48	10.3	7.52	8.40	7.72	4.44	6.21	6.23
lithium	2.0	mg/kg	NA	NA	ND	5.8	3.3	6.2	2.5	7.6	3.6	10.7	2.1	<2.0	4.0	5.4	5.8	9.8
magnesium	20	mg/kg	NA	NA	NA	2000	1260	1740	798	1840	1760	4430	1640	1360	1640	1770	2440	3550
manganese	1.0	mg/kg	NA	NA	ND	66.0	43.5	69.7	41.1	74.3	49.5	146	41.6	35.1	49.7	66.1	72.2	119
mercury	0.0050	mg/kg	NA	NA	50	0.0053	0.0283	0.0051	0.0698	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0054	<0.0050
molybdenum	0.10	mg/kg	NA	NA	40	0.18	0.37	0.18	0.41	0.23	0.39	0.62	0.66	0.72	0.40	0.17	0.20	0.21
nickel	0.50	mg/kg	NA	NA	89	7.30	14.9	11.0	6.67	6.37	51.7	60.6	43.8	43.2	37.6	6.66	10.7	12.7
phosphorus	50	mg/kg	NA	NA	ND	452	353	571	428	491	545	705	495	497	508	527	593	557
potassium	100	mg/kg	NA	NA	NA	520	410	570	450	630	2150	2540	5180	5700	2860	520	800	1110
selenium	0.20	mg/kg	NA	NA	2.9	<0.20	1.84	<0.20	0.72	<0.20	0.27	<0.20	6.41	7.14	0.21	<0.20	<0.20	<0.20
silver	0.10	mg/kg	NA	NA	40	<0.10	0.34	<0.10	0.16	<0.10	<0.10	<0.10	0.81	1.03	<0.10	<0.10	<0.10	<0.10
sodium	50	mg/kg	NA	NA	NA	<50	<50	68	<50	60	243	167	645	672	537	52	<50	117
strontium	0.50	mg/kg	NA	NA	NA	22.1	11.9	28.3	18.3	28.2	49.6	49.4	40.2	41.7	37.4	24.5	33.5	37.0
sulfur	1000	mg/kg	NA	NA	ND	<1000	<1000	<1000	<1000	<1000	4300	1000	19700	21800	6800	<1000	<1000	<1000
thallium	0.050	mg/kg	NA	NA	1	0.068	0.055	0.057	0.075	0.055	0.152	0.187	0.226	0.264	0.157	0.062	0.087	0.128
tin	2.0	mg/kg	NA	NA	300	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
titanium	1.0	mg/kg	NA	NA	NA	463	404	512	375.00	555	696	889	927	842	654	418	495	645
tungsten	0.50	mg/kg	NA	NA	NA	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
uranium	0.050	mg/kg	NA	NA	300	0.786	0.749	0.736	0.655	0.860	0.649	1.44	0.184	0.197	0.455	0.639	0.846	1.02
vanadium	0.20	mg/kg	NA	NA	130	12.2	27.1	14.1	19.9	14.6	22.0	28.6	62.9	59.1	20.2	12.4	15.2	18.0
zinc	2.0	mg/kg	NA	NA	410	14.1	10.0	12.6	14.8	12.4	8.0	23.2	6.1	5.6	8.7	10.0	13.8	18.6
zirconium	1.0	mg/kg	NA	NA	NA	1.8	1.5	2.8	1.8	3.4	1.8	6.4	6.3	6.9	4.0	4.2	2.2	6.3
Volatile Organic Compounds Surrogates (Matrix: Soil/Solid)																		
bromofluorobenzene, 4-	0.10	%	NA	NA	NA	105	77.7	75.4	83.2								78.4	78.2
difluorobenzene, 1,4-	0.10	%	NA	NA	NA	113	90.6	94.9	88.6								86.3	92.7
Volatile Organic Compounds [Fuels] (Matrix: Soil/Solid)																		
benzene	0.0050	mg/kg	0.03	0.0068	NA	<0.0050	<0.0050	<0.0050	<0.0050								<0.0050	<0.0050
ethylbenzene	0.015	mg/kg	0.082	0.018	NA	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
methyl-tert-butyl ether [MTBE]	0.200	mg/kg	NA	NA	NA	<0.200	<0.200	<0.200	<0.200								<0.200	<0.200
styrene	0.050	mg/kg	NA	NA	NA	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
toluene	0.050	mg/kg	0.37	0.08		0.489	<0.050	<0.050	<0.050								0.051	<0.050
xylene, m+p-	0.050	mg/kg	NA	NA	NA	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
xylene, o-	0.050	mg/kg	NA	NA	NA	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050

Table D.2: Drill Staging Area Soil Quality Results

Area						Grease Shack	Upslope between Laydown and Bulk Sample Area	Drillers Mud Area	West Side of Laydown		Natural Iron Gossan		Disturbed Gossan			Laydown Eastside	Reference Area	
Client Sample ID						FLSS20	FLSS21	FLSS22	FLSS23	FLSS24	FLSS25	FLSS26	FLSS27	DUP3 (FLSS27)	FLSS28	FLSS29	FLSS18	FLSS19
Date Sampled						08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021	08-Sep-2021
Time Sampled						14:40	14:45	15:00	15:05	15:10	15:20	15:30	15:40	15:40	15:45	15:55	11:50	12:05
ALS Sample ID						YL2101264-022	YL2101264-023	YL2101264-024	YL2101264-025	YL2101264-026	YL2101264-027	YL2101264-028	YL2101264-029	YL2101264-030	YL2101264-031	YL2101264-032	YL2101264-020	YL2101264-021
Parameter	Lowest Detection Limit	Units	Standard Coarse Grain (mg/kg)	Standard Fine (≤75µm) grain (mg/kg)	CMME Guideline (mg/kg, industrial)	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil	Sub-Matrix: Soil
xylenes, total	0.075	mg/kg	11	2.4	NA	<0.075	<0.075	<0.075	<0.075								<0.075	<0.075
Hydrocarbons (Matrix: Soil/Solid)																		
F1 (C6-C10)	5.0	mg/kg	320	320	NA	<5.0	<5.0	<5.0	<5.0								<5.0	<5.0
F2-naphthalene	30	mg/kg	NA	NA	NA	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
F3-PAH	50	mg/kg	NA	NA	NA	<50	262	<50	469	<50	<50	<50	<50	<50	<50	<50	<50	<50
F1-BTEX	5.0	mg/kg	NA	NA	NA	<5.0	<5.0	<5.0	<5.0								<5.0	<5.0
F2 (C10-C16)	30	mg/kg	260	260	NA	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
F3 (C16-C34)	50	mg/kg	1700	2500	NA	<50	262	<50	469	<50	<50	<50	<50	<50	<50	<50	<50	<50
F4 (C34-C50)	50	mg/kg	3300	6600	NA	<50	165	<50	333	<50	<50	<50	<50	<50	<50	<50	<50	<50
F4G-sg	500	mg/kg	NA	NA	NA				1280									
chromatogram to baseline at nC50						Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hydrocarbons Surrogates (Matrix: Soil/Solid)																		
bromobenzotrifluoride, 2- (F2-F4 surr)	1.0	%	NA	NA	NA	85.1	84.1	84.7	86.4	85.8	83.0	77.6	87.6	88.3	77.4	75.1	87.3	75.2
dichlorotoluene, 3,4-	1.0	%	NA	NA	NA	126	93.9	106	94.0								76.3	96.6
Polycyclic Aromatic Hydrocarbons (Matrix: Soil/Solid)																		
acenaphthene	0.0050	mg/kg	NA	NA	NA	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
acenaphthylene	0.0050	mg/kg	NA	NA	NA	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
anthracene	0.0040	mg/kg	NA	NA	32	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
benz(a)anthracene	0.010	mg/kg	NA	NA	10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(a)pyrene	0.010	mg/kg	NA	NA	72	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b+j)fluoranthene	0.010	mg/kg	NA	NA	10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b+j+k)fluoranthene	0.015	mg/kg	NA	NA	10	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
benzo(g,h,i)perylene	0.010	mg/kg	NA	NA	NA	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(k)fluoranthene	0.010	mg/kg	NA	NA	10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
chrysene	0.010	mg/kg	NA	NA	NA	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
dibenz(a,h)anthracene	0.0050	mg/kg	NA	NA	10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
fluoranthene	0.010	mg/kg	NA	NA	180	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
fluorene	0.010	mg/kg	NA	NA	NA	<0.010	0.018	<0.010	0.038	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
indeno(1,2,3-c,d)pyrene	0.010	mg/kg	NA	NA	10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
methylnaphthalene, 1-	0.010	mg/kg	NA	NA	NA	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
methylnaphthalene, 2-	0.010	mg/kg	NA	NA	NA	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
naphthalene	0.010	mg/kg	NA	NA	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
phenanthrene	0.010	mg/kg	NA	NA	0.05	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
pyrene	0.010	mg/kg	NA	NA	100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
quinoline	0.050	mg/kg	NA	NA	NA	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
B(a)P total potency equivalents [B(a)P TPE]	0.020	mg/kg	NA	NA	NA	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
IACR (CCME)	0.150		NA	NA	NA	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150
Polycyclic Aromatic Hydrocarbons Surrogates (Matrix: Soil/Solid)																		
acridine-d9	0.1	%	NA	NA	NA	108	73.6	117	68.0	106	60.9	65.6	52.8 †	47.7 †	44.1 †	93.4	94.3	115
chrysene-d12	0.1	%	NA	NA	NA	100	115	119	124	104	98.2	89.7	84.6	69.5	70.3	61.7	109	110
naphthalene-d8	0.1	%	NA	NA	NA	99.3	99.3	106	103	98.1	105	99.3	113	101	99.0	104	93.7	109
phenanthrene-d10	0.1	%	NA	NA	NA	98.5	102	104	110	98.0	95.9	96.3	105	96.0	92.8	96.0	94.4	104

Note: Bolded and shaded boxed values indicate greater than published CCME guidelines. Bolded values without shading indicate greater than detection limit. These criteria only apply to values that are not expressed in percentage units and not to physical properties of water samples, except pH

ND = no data; NA = not applicable

\* Detection limit raised above stated

† Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.

\* Final result exceeds test system