



April 11, 2018

Esther Ashton, Tribal Administrator  
Wrangell Cooperative Association  
P.O. Box 2021  
Wrangell, AK 99929

RE: Wrangell Monofill Project – CSP2 Report

Dear Ms. Ashton:

DEC received the report titled, *CSP2 Comments on Junkyard Cleanup* on Wednesday, March 7, 2018 from the Wrangell Cooperative Association and authored by Dr. Kendra Zamzow of Center for Science and Public Participation (CSP2). Following are the recommendations raised in Dr. Zamzow's report and how DEC has addressed or plans to address them. Included herewith are several supplemental documents and figures.

### **Recommendations to be addressed prior to construction**

I. CSP2 - Sample stockpiled soils and pore water; rock pit groundwater well; and surface water

Evaluate the stockpiled soil and water that has collected in the stockpile for a full suite of contaminants. Evaluate the potential for metals, phosphate and sulfate to leach under reducing and oxidative conditions.

DEC Response

**Stockpile Pore water:** Samples were collected in late March of 2018 from three PVC well points that had been installed in driven borings. These samples were analyzed for the full suite of contaminants where the volume was sufficient. This includes VOCs, SVOCs, dissolved metals (full suite) for water, total phosphorus, sulfate, and petroleum hydrocarbons. In addition, the pore water was evaluated for oxygen reduction potential (ORP). Analysis of dissolved metals in water by EPA 200.8 for the stockpile pore water meet the necessary limits of detection (LODs) for comparison to aquatic life standards in the DEC water quality criteria manual.

**Rock Pit Groundwater:** Samples were collected in late March from MW-03, located within Pat's Creek Rock Pit #2, and were analyzed for the full suite of contaminants where the volume was sufficient. This includes VOCs, SVOCs, dissolved metals (full suite), total phosphorus, sulfate, and petroleum hydrocarbons. Petroleum analyses were included because sheen was previously observed in groundwater from MW-02 and MW-03 at the pit during installation of these wells in 2016. However, no analytical sampling for petroleum was performed at the time. No sheen was reported in MW-03, the remaining well at the pit, during sampling in October 2017 or in March 2018. Incidental sheen previously observed on the groundwater is likely the result of past equipment operations and maintenance and other activities inside the pit over the past 40 years. Groundwater was also evaluated for oxygen reduction potential (ORP) during the recent sampling.

**Surface Water:** A sample was collected in late March from a surface water stream near the rock pit and analyzed for total phosphorus and sulfate for comparison to results from the stockpile pore water samples.

**Stockpiled soil:** 20 soil samples from two different depths at ten locations throughout the stockpile were also collected in late March 2018 and analyzed for total and TCLP metals, VOCs, SVOCs, GRO, DRO, RRO, and sulfate and total phosphorus, unless the volume at a particular location was insufficient.

Based on discussion with the ADEC approved, SGS Laboratories in Anchorage, there is no test they can conduct to determine if reducing or oxidizing conditions are occurring within a soil sample. The closest is the 18 hours a sample spends in acetic acid while undergoing to TCLP extraction process, for which DEC has extensive information from the 2016 cleanup. In terms of the CSP2 recommendation that soil sample jars be filled completely to limit oxygen, sample jars, regardless of whether conditions are reducing or oxidizing must be filled to laboratory specifications in order for the analysis to be valid.

In terms of a leaching analysis method other than TCLP or SPLP (which each have the same LOD) that can be run for soil that will achieve the much lower chronic and acute aquatic life standard of 0.54 ug/L or 14 ug/L, we provide the following response:

The table from the CSP2 with chronic and acute aquatic life contaminant levels is incorrectly compared with TCLP results. The numbers listed for aquatic life in the DEC's Water Quality Criteria Manual are for dissolved metals. DEC's criteria for dissolved metals are hardness dependent, such that the hardness must be measured in the surface water body where the sample is being collected. The aquatic life numbers listed in CSP2's table are incorrect since the criteria are hardness dependent and therefore site-specific. As a result, the TCLP and SPLP numbers from the 2016 Byford Junkyard Cleanup report cannot be compared to aquatic life criteria. It is also important to note that the monofill location is not an aquatic habitat – the nearest downgradient aquatic habitat is 0.2 miles away.

**Timeframe:** During March 22 through March 28, 2018, DEC's contractor, Nortech carried out the requested sampling, which is detailed in the March 22, 2018 Sampling and Analysis Plan approved by DEC. Results of this work are detailed in the April 11, 2018 Sampling and Analysis Report, enclosed as an attachment.

## Discussion of the Results

Please refer to the Nortech Sampling and Analysis Report (April 2018) for complete detail about the sampling. To summarize, the results show that pore water in the stockpile contain concentrations of dissolved lead and zinc slightly above the DEC hardness-based chronic values for aquatic life, and concentrations of naphthalene and DRO above the DEC values for consumption of drinking water. Although sufficient volume of water for DRO re-analysis with silica gel cleanup was not available, the chromatograms for these analyses indicated biogenic interference from natural organic carbon was present. In addition the total phosphorus levels are elevated in comparison with the sample collected from the surface water stream near the rock pit, which had a non-detect result for total phosphorus. (Please note that results are reported as total phosphorus and therefore may not represent actual values for phosphate alone.) Sulfate was detected in the pore water and groundwater at levels above those found in the surface water, but no standards are available with which to compare this data. Oxidation/reduction potential (ORP) readings were negative for the pore water and the groundwater at the pit, indicating both are somewhat reducing environments.

TCLP results for all metals in soil were all below the regulatory criteria. Nearly all VOCs and PAHs results were non-detect or below regulatory criteria except for naphthalene. DRO in the stockpile samples were consistently elevated, at or slightly above the default migration to groundwater pathway cleanup level listed in Table B2 of 18 AAC 75; however re-analysis with silica gel cleanup and chromatogram review showed that these levels are elevated due to biogenic interference from organic matter in the soil. Naphthalene, and in one soil sample, benzo(a)anthracene and benzo[a]pyrene, were reported in excess of the migration to groundwater cleanup level, however, only naphthalene was reported in pore water as stated above. No petroleum or VOCs were reported in the groundwater sampled at the rock pit.

II. CSP2- Explore hand-held or other XRD instruments are sensitive enough and economical viable to determine forms of metal phosphates in the treated soil at the junkyard

### DEC Response

Investigation into hand held, or other field portable equipment to determine crystalline form of phosphates found such devices are not available.

III. CSP2- Evaluate the infiltration rates of the cover system proposed for the monofill and whether another cover design is more appropriate to limit the volume of water predicted by EPA's modeled infiltration study. Provide a simple itemized comparison of the amount of water and seepage rates that each design will allow to infiltrate into soil along with an itemized comparison of the costs.

### DEC Response

The DEC is contracting with a consulting firm to take a closer look at the landfill infiltration modeling results. The firm will review the modeling performed by EPA's contractor, Ecology & Environment, for the monofill design and compare it with the modeling done by Geosyntec (Ahtna) for the original leachability assessment. The firm will identify any errors or assumptions and generate an updated modeling run. DEC does not see justification for providing an itemized comparison of the costs if we can show that the cover system as designed sufficiently limits the volume of water infiltration and meets all regulatory criteria.

**Timeframe:** Modeling is proposed to be completed by April 16, 2018.

IV. CSP2: Provide an itemized cost analysis for a select group of potential monofill locations, and include an option for shipping off-island.

DEC Response

Based on the state's detailed analysis of 14 other potential sites, no other viable option was found. Each site had physical characteristics, environmental conditions, preferred uses, or ownership that made them unviable. Therefore, DEC does not see justification for generating detailed cost analyses for unviable sites and will refer CSP2 to the Summary of Sites Evaluated for the Monofill, updated February 2018, and the October 2017 Shipping Fact Sheet Letter from NRC for the cost to ship the material off-island (both documents previously provided to WCA).

V. CSP2: Describe how soil moisture affects transport, compaction, monofill stability, and monofill pore water volume available for leaching.

DEC Response

Soil moisture strongly impacts transport, compaction and monofill stability. Therefore hauling and compaction of the material will only occur for material that has the least moisture content and only on days with low or no precipitation. Monofill pore water volume available for "leaching" or migrating through the repository to the underlying bedding material will therefore be minimized as much as possible. The EcoBond product used to stabilize the lead in the soil further contributes to drying of the material.

VI. CSP2-Determine the source of the oily contamination at Rock Pit #2

DEC Response

The source of the oily sheen reported in the groundwater within the floor of the pit is likely due to the historical activities over the last 40 years in the pit that have included equipment operation and maintenance, the dumping, burying, and burning of vehicles and other incidentals spills from vehicles and equipment. Images of vehicles that were removed from the pit in 2017 during the site preparation work are included with the enclosures to this letter. Samples from the remaining groundwater well collected in October 2017 and March 2018 were non-detect for GRO, DRO and RRO. DEC will collect additional samples for petroleum analyses from all three groundwater wells once installed, post-construction. However, in-situ remediation options for the intermittent contamination in the groundwater are likely limited to monitored natural attenuation.

VII. CSP2- Conduct a fate and transport analysis of EcoBond treated material through changes in soil geochemistry

DEC Response

The lead contaminated soil from the Junkyard cleanup was treated in the early summer of 2016. It has had two years in its present location to undergo changes in geochemistry under what may be determined to be reducing conditions due to lack of oxygen. To evaluate the changes in geochemistry, sampling for a full suite of parameters has been conducted on pore water in the stockpile and TCLP-RCRA metals on the stockpile soil. ORP was measured in the pore water and reported reducing conditions. TCLP-lead results from soil are low and show that the lead remains stabilized in the soil under these reducing conditions. TCLP-chromium results were detected, but below the 5.0 mg/L threshold. Arsenic is consistently reported at levels indicative of natural background concentrations for Southeast Alaska and the rest of the state, but not in elevated

concentrations indicative of geochemistry changes causing mobilization of this metal. The March 2018 TCLP results for arsenic in the stockpiled material were non-detect. Total phosphorus is present at elevated levels in pore water and this would be normal based on the phosphate component in EcoBond used to bind the lead. The total phosphorus concentrations do not indicate a de-stabilization of the lead, since the TCLP –lead results continue to verify non-leachable concentrations.

VIII. CSP2- Evaluate leachate potential with analytical methods more sensitive than TCLP to address ecoreceptor concerns.

#### DEC Response

The TCLP and SPLP results from the 2016 sampling are the most appropriate for demonstrating that the treated soil is not leaching lead under acidic and precipitation conditions, but should not be compared to aquatic life standards. Total dissolved metals analysis along with hardness determination of the pore water is more appropriate for any comparison to Alaska water quality criteria. That said, it is important to remember that the pore water is not and will not come in contact with surface water bodies without significant dilution over distance and time. What is detected in the pore water represents the worst case conditions of any water in the pile.

IX. CSP2- Conduct sampling and analysis of soil and pore water for all contaminants; exposing the soil to oxidative conditions to observe what changes may be occurring.

#### DEC Response

Sampling has been conducted for all contaminants, but the soil has not been exposed to artificial oxidative conditions, since the material tends naturally to be subject to reducing conditions. This is due, as stated earlier, to the tight, compacted nature of the stockpile, limited aeration and infiltration, and the naturally high level of organic matter in the soil, which contribute to anaerobic conditions and are consistent with what conditions will be like in the completed monofill. It therefore is not appropriate to create an artificial oxidative condition that would otherwise not exist.

X. CSP2- Evaluate the potential for arsenic to be mobilized via the EcoBond treatment

#### DEC Response

Total arsenic concentrations in the soil, as sampled and analyzed in March of 2018, were found consistently at levels indicative of natural background concentrations for Southeast Alaska and the rest of the state, but not in elevated concentrations indicative of geochemistry changes causing mobilization of this metal. The March 2018 TCLP results for arsenic in the stockpiled material were non-detect and arsenic in the pore water was also non-detect. This indicates that after nearly two years, there is no evidence that concentration or mobilization of arsenic is occurring or will occur. This is partly due to the fact that total arsenic concentrations in soil range from 2.7 mg/kg to 17 mg/kg, which are considered low to average natural background concentrations.

XI. CSP2- Study potential reducing conditions that may occur in a low oxygen environment within the monofill.

#### DEC Response

Samples collected from pore water were evaluated for oxygen reducing potential (ORP), and pH. ORP readings indicated a slightly reducing environment with an average of -31.2 mV (millivolts).

The pH of the pore water was slightly acidic at 5.4. For comparison, the pH of the tributary creek sampling location was between 3.6 and 3.9 which is significantly more acidic. The ORP readings, after nearly 2 years of storage at this location are good indicators of the conditions that can be expected in the completed monofill.

Likewise, the ORP readings of the groundwater average -23 mV. To interpret the ORP results, note that a hypothetical reading of -400 mV would be four times as reducing as -100 mV. The stream water measured for ORP had a result about three times as oxygenated as the groundwater and pore water, with an average reading of 336 mV, which is normal for a fresh water stream.

XII. CSP2- Based on a percent soil moisture and soil volume, provide information on the volume of soil pore water that could drain down after a cover is in place.

#### DEC Response

The percent soil moisture is calculated at between 1.1 million gallons at 15% moisture content and 1.8 million gallons at 25% moisture content; however, this represents moisture captured in pore spaces, rather than free flowing water. The percentage of this moisture that is available for drain-down is significantly less. Furthermore, the material, once placed in the repository, will be compacted to specific compaction standards, limiting the water carrying capacity of interstitial space in the soil and resisting infiltration, thereby causing precipitation to preferentially flow through the perforated pipe drainage layer above the cap liner and out the sides to the chimney drains.

XIII. CSP2- conduct more evaluation on potential impacts to aquatic life

#### DEC Response

Figures 1 and 3 show surface drainage flows inside the pit and area hydrologic flows. Note that groundwater flow direction (see groundwater contour map) is different from the base layer flow direction. DEC is currently conducting fate and transport modeling in conjunction with the re-evaluation of the HELP Model calculations, based on the concentrations of contaminants detected in the pore water of the stockpile. The DEC will use these concentrations coupled with the annual infiltration rate through the monofill cover design to model the contaminant concentration that may exit the monofill through the drainage base layer and its relationship to regulatory criteria for groundwater and surface water aquatic life.

**Timeframe: To be completed the week of April 16.**

### **Recommendations to be addressed during construction**

XIV. CSP2- Provide mitigation options to control, treat, or divert seepage if contaminant levels increase at testing locations.

#### DEC Response

DEC will install a catch basin at or near the discharge point of the French drain system. This system is shown on Figure 2. It measures approximately three feet wide, 1.5-2.5 feet deep, and approximately 65 feet in length. This system drains nearly 100% of the stormwater and surface water from the pit. The roadside drainage only collects surface water from the east side of the parking area and the driveway to the pit. Therefore, monitoring the discharge point (catch basin) of the French drain system, is proposed for once during each storm event of >1" precipitation and not

less than once a week during a sustained precipitation event, and analyzing surface water samples for dissolved and total lead will provide worst-case conditions. If water shows evidence of lead above area background concentrations for surface water, the DEC will install a passive bioreactor with zeolite or other treatment system to treat the water during construction and if necessary, after construction. Figure 3 shows hydrologic flow pathways from the rock pit to the closest downgradient surface water tributary. However, water discharging from the French drain disappears almost immediately into the ground to the northeast of the parking pad.

XV. CSP2: There has also been no discussion of whether spraying herbicide on rock fill prior to placing it in the quarry poses a risk.

#### DEC Response

The requirement to spray herbicide on rock that will be used in the monofill construction is stipulated by the USFS; however, the use of herbicide is dictated only should the rock show indication of hawkweed. This is not anticipated. All rock sources will be visually inspected for the presence of hawkweed prior to transport to the rock pit.

### **Recommendations to be addressed post construction**

XVI. CSP2- Verify that the remaining groundwater well is downgradient of the rock pit. Provide a figure showing groundwater contours, including flow direction and depth to groundwater, for the upper aquifer. Describe where the remaining monitoring well intersects this aquifer, and whether it intersects it during all periods of the year so that quarterly groundwater monitoring can be conducted. Install a new well if necessary.

#### DEC Response

Attached is the groundwater contour map developed by Ahtna as part of their 2016 study of the pit. It clearly shows that the remaining groundwater well is sited hydrologically downgradient of the pit. In addition, DEC has installed a data logger on the well to report groundwater elevations. Once the monofill is constructed, DEC will install a second well at the toe of the monofill, and a third “control” or background monitoring well located on the east side of the parking area. A fourth well may be proposed for installation between the road and the creek.

**Timeframe:** Installation of additional wells will occur after the monofill is constructed.

XVII. CSP2-Provide mitigation options to control, treat, or divert seepage if contaminant levels increase at testing locations. Monitoring plans – essentially checking for erosion on the cover and quarterly groundwater sampling in the first year – should be improved. Require sampling of the monofill drainage outfall monthly for a year and quarterly after that for the next four years or the duration under which the most concentrated leachate from soil pore water would drain down. In surface and groundwater sampling, the first two samples should include a suite of metals and organics, including arsenic, phosphate, sulfate, and total petroleum hydrocarbons and PAHs due to the presence of an oily substance in Rock Pit #2 groundwater. Subsequent samples should be conducted for contaminants of concern as determined from the first two samples and from pore water sampling in treated soil.

#### DEC Response

As part of the post-closure monitoring under the DEC Solid Waste Regulations (18 AAC 60) DEC will be required to conduct monthly inspections of the monofill for five years. Per DEC regulations, quarterly groundwater sampling is the required level of effort. DEC will also install up to three additional groundwater wells- one at the toe of the completed monofill, one in a background location on the west side of the parking area north of the pit and a third may be installed between the road and the creek, across from the entrance to the pit. In addition, the DEC will conduct water and/or sediment sampling in the catch basin system on a quarterly basis, along with stream water quality sampling if an appropriate location can be identified that is not influenced by other pollution sources such as road runoff. Based on the analytical results from the pore water, stockpiled soil, and groundwater monitoring well, parameters for the first two rounds will include lead, total phosphorus, VOCs (naphthalene) and DRO/RRO for groundwater and surface water. Arsenic concentrations in the stockpile are at background levels, other VOCs and SVOCs are below cleanup criteria, and it is unclear how sulfate data would be used.

We look forward to continuing to work with WCA, the City and the community to complete this project in a timely manner that is both protective of human health and the environment and compliant with applicable requirements.

Sincerely,



Sally Schlichting  
Southeast Unit Manager

cc: Kendra Zamzow, CSP2  
Lisa Von Barga, Manager, City and Borough of Wrangell  
Lee Cole, Division of Mining Land and Water, DNR Juneau  
Robert Dalrymple, District Ranger, USFS Wrangell  
John Halverson, DEC Contaminated Sites Program Manager

Enclosures

- Geosyntec/Ahtna- groundwater contour map for the rock pit
- Figure 1 Monofill Site with rock pit survey showing base layer drainage, French drain system, and proposed catch basin
- Figure 2 Monofill Site detail view of French drain, catch basin
- Figure 3 Monofill Site vicinity surface water flow diagram
- Images of crushed and buried vehicles encountered in the pit
- Nortech Sampling and Analysis Report – Treated Stockpile and Monofill Sites, April 11, 2018





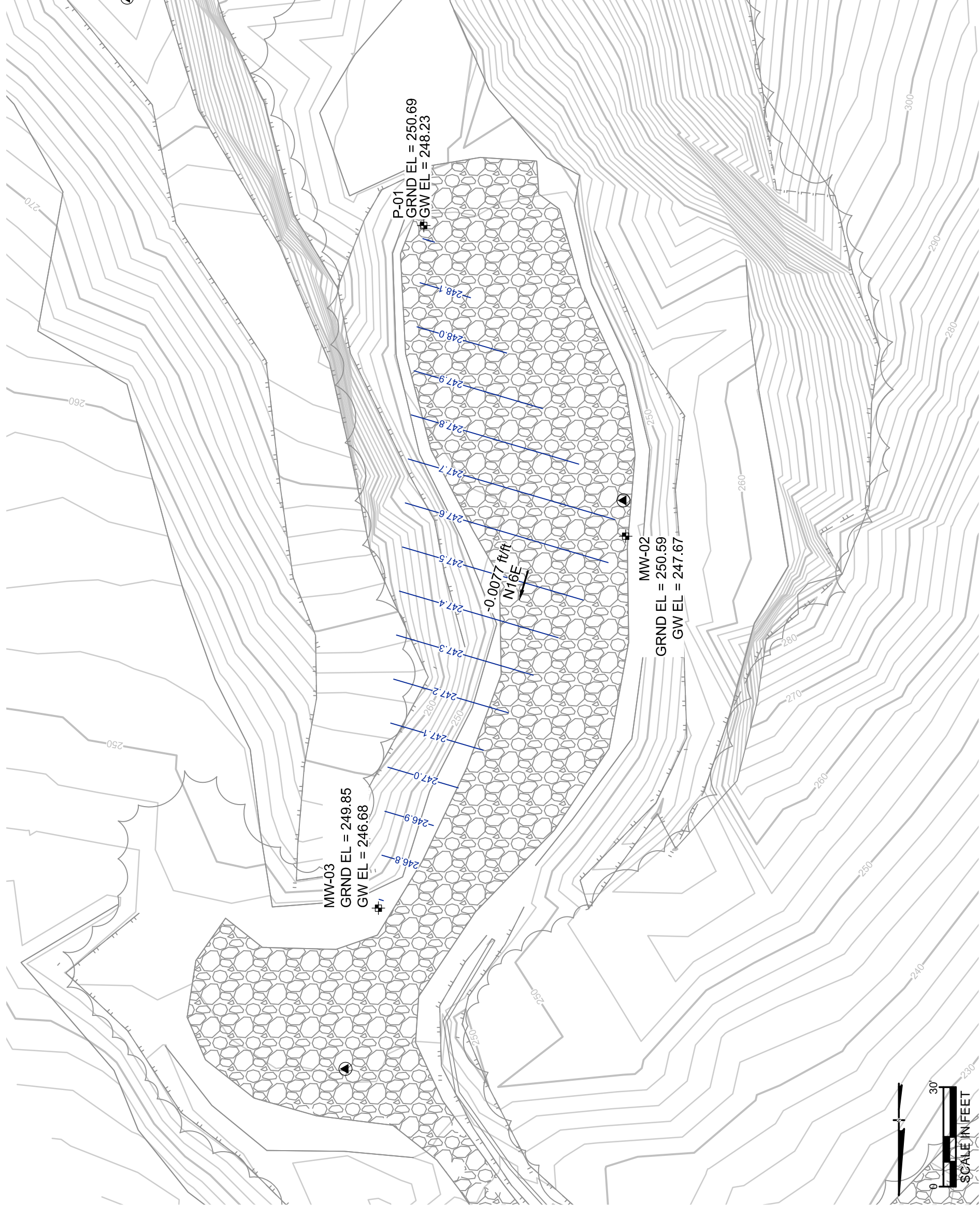
Photo 1: Image of crushed vehicles removed from the pit in August 2017.



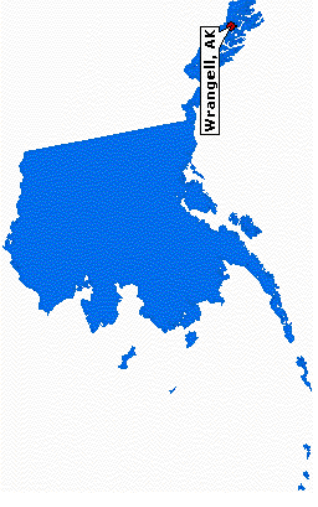
Photo 2: Location inside the pit entrance where the vehicles were encountered.



Photo 3: Close-in view of where the crushed vehicles were found.



VICINITY MAP



LOCATION MAP



LEGEND

- 300 — EXISTING GROUND MAJOR CONTOURS (5')
- 248.0 — EXISTING GROUND MINOR CONTOURS (1')
- 248.0 — GROUNDWATER CONTOURS (0.1')
- ⊕ GROUNDWATER WELL
- ⊙ SURVEY CONTROL MONUMENT

NOTES

1. TOPOGRAPHIC SURVEY PERFORMED BY R&M ENGINEERING/PDC, INC. ENGINEERS ON OCTOBER 25 - 28, 2016.
2. THE HORIZONTAL DATUM FOR THIS SURVEY IS NORTH AMERICAN DATUM 1983, ALASKA STATE COORDINATE SYSTEM ZONE 1 (NAD83 AK SPC Z1)[5001].
3. THE VERTICAL DATUM FOR THIS SURVEY IS NORTH AMERICAN VERTICAL DATUM '1988 (NAVD88).

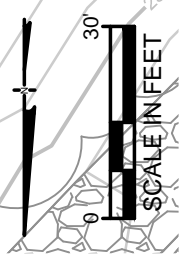
GROUNDWATER CONTOURS  
WRANGELL MONOFILL  
WRANGELL ISLAND, ALASKA

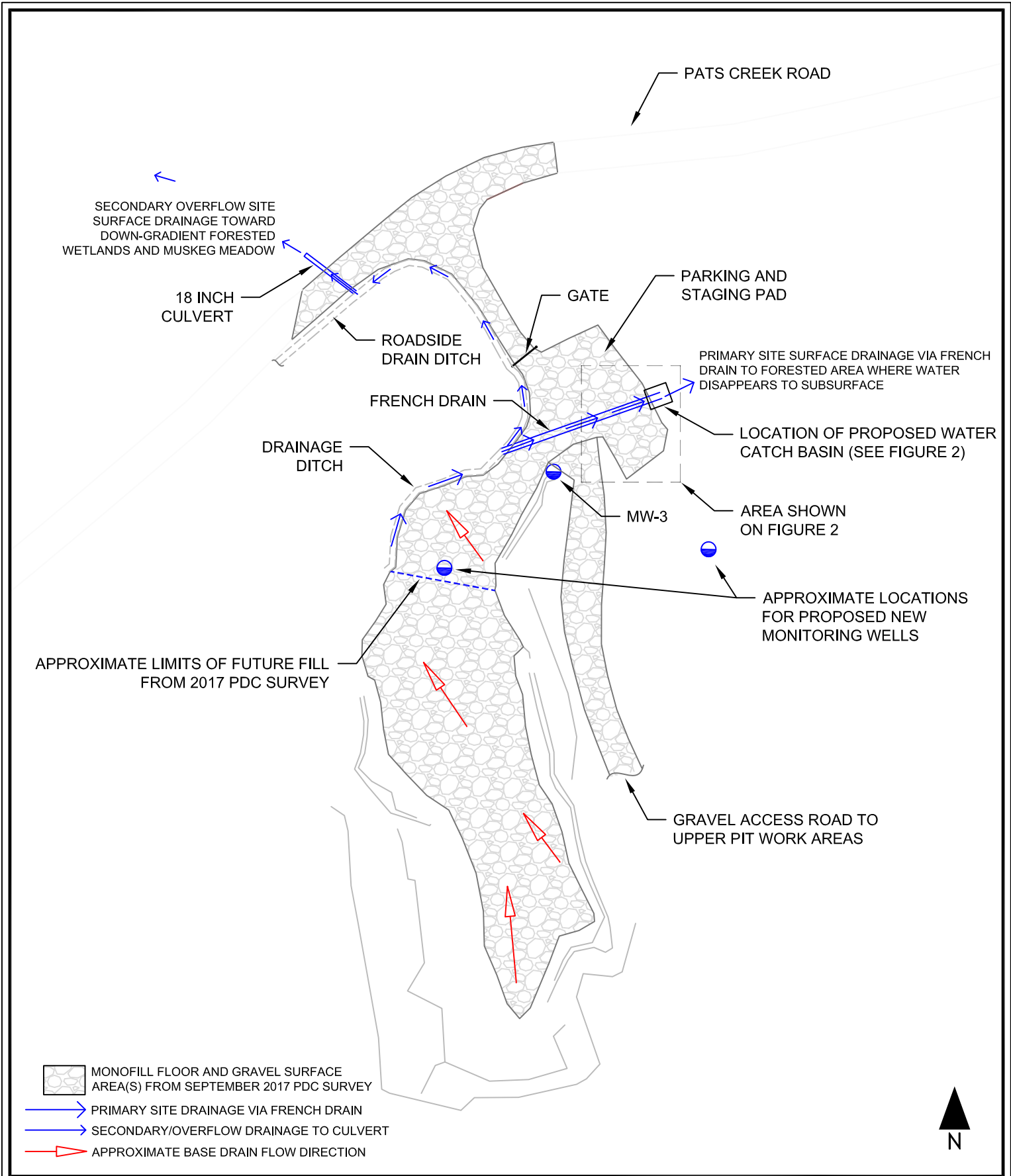


FIGURE  
1

PROJECT NO: PNG0736

JANUARY 2017

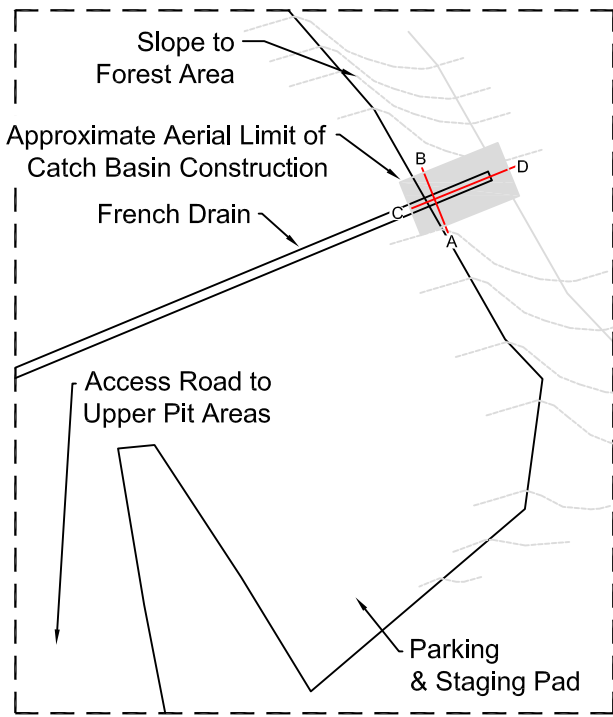




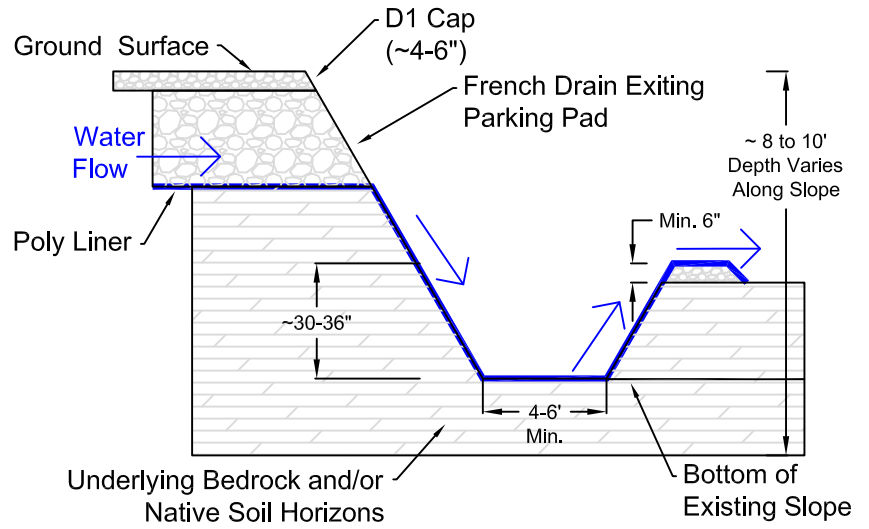
ENVIRONMENT, ENERGY, HEALTH & SAFETY CONSULTANTS  
 2400 College Road, Fairbanks, AK. 99709, 907-452-5688  
 3105 Lakeshore Dr., Anchorage, AK. 99517 907-222-2445  
 5438 Shaune Dr., Juneau, Alaska 99801 907-586-6813

Monofill Site Diagram  
 Construction of Solid Waste Monofill for Lead Contaminated Soil  
 ADEC AR Term Contract 18-70020-01  
 Pat's Creek Rd, DNR Rock Pit #2 Wrangell, Alaska 99929

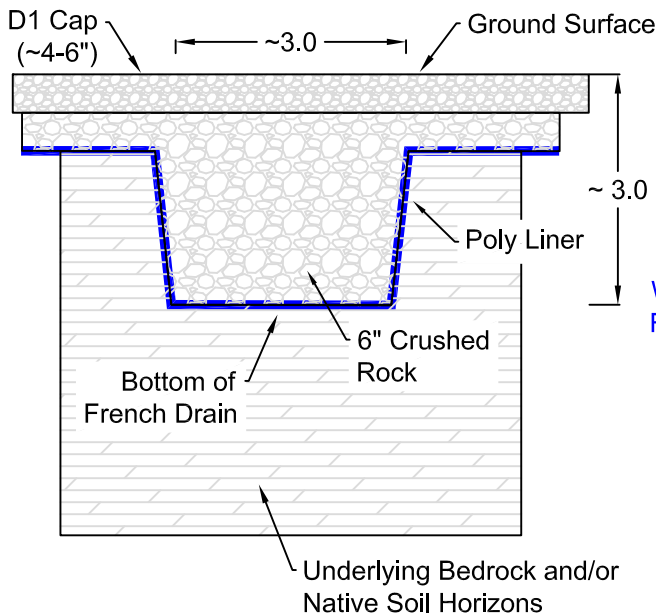
SCALE: 1" = 80'	FIGURE:
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DRAWN: RJP	
PROJECT NO: 17-1048	
DWG: 171048e(01)	
DATE: 04/11/2018	



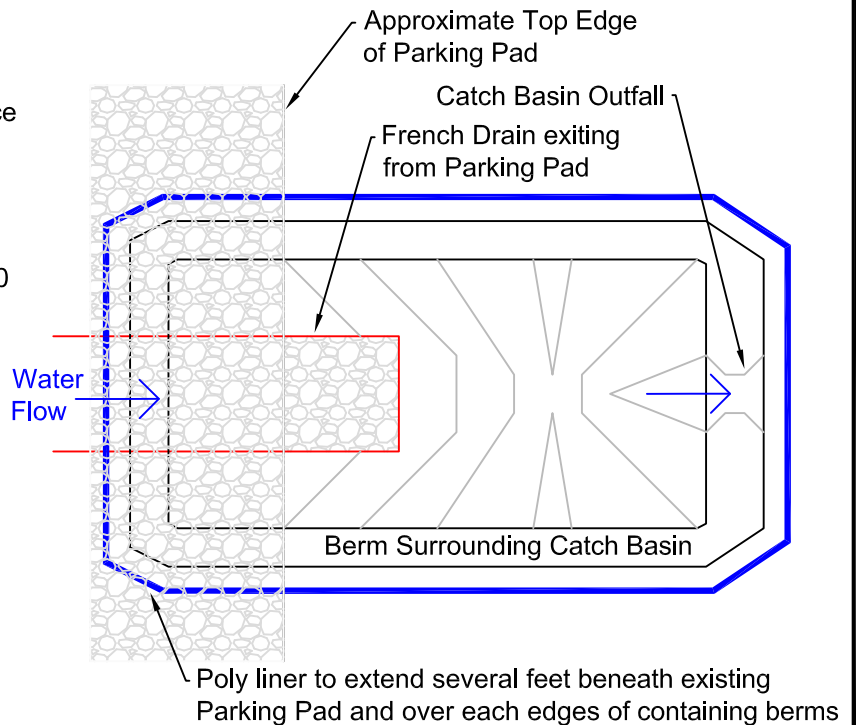
Profile View of French Drain and Catchment Basin Along Section Line C to D



Profile View of French Drain Exiting the Parking Pad Along Section Line A to B



Aerial View of French Drain and Catch Basin



NOTE: All depths and dimensions are approximate. Schematic drawings are not to scale (vertical or horizontal) and are intended to show generalized details for the conceptual construction design of the catch basin. Dimensions may vary based on site conditions during construction. Catch Basin to be constructed to store minimum volume of 300 gallons of water. As Built drawings will be made subsequent to final construction.



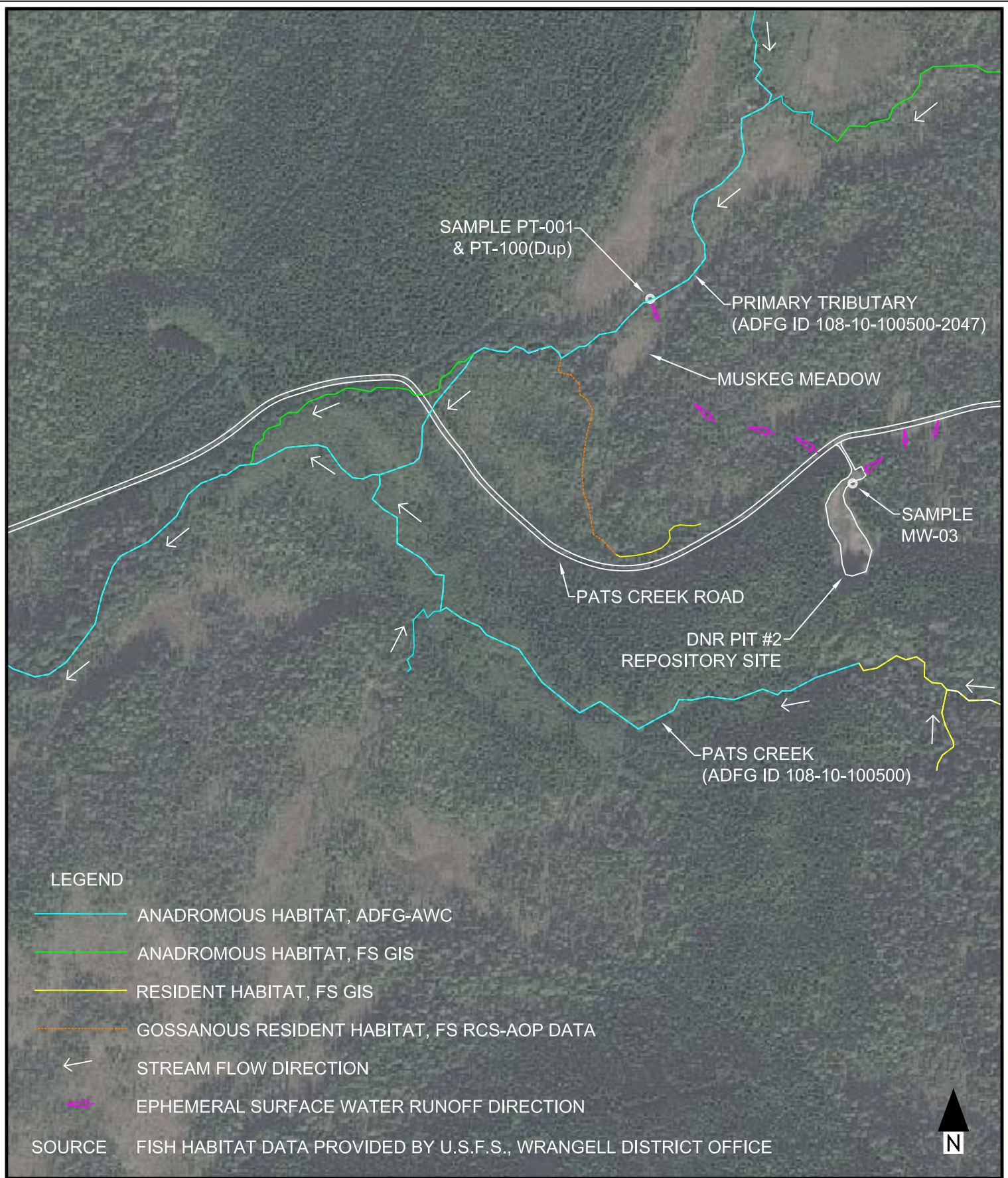
ENVIRONMENT, ENERGY, HEALTH & SAFETY CONSULTANTS  
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Monofill French Drain and Catch Basin Diagrams  
 Construction of Solid Waste Monofill for Lead Contaminated Soil

ADEC AR Term Contract 18-70020-01

Pat's Creek Rd, DNR Rock Pit #2 Wrangell, Alaska 99929

SCALE: NTS	FIGURE:
DESIGN: JJG	2
DRAWN: RJP	
PROJECT NO: 17-1048	
DWG: 171048e(2)	
DATE: 04/11/2018	



 ENVIRONMENT, ENERGY, HEALTH & SAFETY CONSULTANTS 2400 College Road, Fairbanks, AK. 99709, 907-452-5688 3105 Lakeshore Dr., Anchorage, AK. 99517 907-222-2445 5438 Shaune Dr., Juneau, Alaska 99801 907-586-6813	Monofill Site Vicinity Surface Water Flow Diagram Construction of Solid Waste Monofill for Lead Contaminated Soil ADEC AR Term Contract 18-70020-01 Pat's Creek Rd, DNR Rock Pit #2 Wrangell, Alaska 99929	SCALE: 1" = 500' DESIGN: JJG DRAWN: RJP PROJECT NO: 17-1048 DWG: 171048e(03) DATE: 04/11/2018	FIGURE: <span style="font-size: 2em; font-weight: bold;">3</span>
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**SAMPLING AND ANALYSIS REPORT**  
**TREATED STOCKPILE AND MONOFILL SITES**  
**WRANGELL, ALASKA**  
**ADEC File # 1529.38.006**  
**APRIL 11, 2018**



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**Appendix 4: Laboratory Analysis Reports and Laboratory Data Review Checklists**

**Appendix 5: Approved Sampling and Analysis Plan**



## ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish & Game
Ahtna	Ahtna Engineering Services, LLC
CSP2	Center for Science in Public Participation
DL	Detection Limit (maximum method detection limit)
DNR	Alaska Department of Natural Resources
DRO	Diesel Range Organics
E&E	Ecology & Environment
EPA	Environmental Protection Agency
FSG	Field Sampling Guidance (ADEC)
GRO	Gasoline Range Organics
IGAP	Indian Environmental General Assistance Program
LOD	Limit of Detection (i.e. ½ of the LOQ)
LOQ	Limit of Quantitation (i.e. reporting or practical quantitation limit)
mg/Kg	Milligrams per kilogram
MWG	Monitoring Well Guidance (ADEC)
NRC	NRC Alaska LLC
ORP	Oxidative Reduction Potential
PAH	Polycyclic Aromatic Hydrocarbon(s)
QA/QC	Quality Assurance and Quality Control
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SPLP	Synthetic Precipitation Leaching Procedure
START	Superfund Technical Assessment and Response Team
SVOC	Semivolatile Organic Compound(s)
TAqH	Total aqueous hydrocarbons
TAH	Total aromatic hydrocarbons
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
VOC	Volatile Organic Compound(s)
WCA	Wrangell Cooperative Association
WQCM	Alaska Water Quality Criteria Manual for Toxic and other Deleterious Organic and Inorganic Substances
WQS	Water Quality Standards
µg/L	Microgram per Liter



## **1.0 EXECUTIVE SUMMARY**

In response to the March 14<sup>th</sup> e-mailed Request for Proposal received from the Alaska Department of Environmental Conservation's (ADEC) Contaminated Sites Program, NRC Alaska, LLC. (NRC) will provide all materials, labor, and equipment required to perform additional sampling and investigation needed to respond to the report from the Center for Science in Public Participation (CSP2) for the Wrangell Cooperative Association. **NORTECH** Inc is subcontracted to NRC to provide qualified environmental sampling personnel and environmental engineering services in support of this project.

**NORTECH's** investigation included the installation and sampling of three (3) pore water collection points in the EcoBond treated soil stockpile at the former Wrangell Junkyard Site. Ten soil borings were advanced into the stockpile and 22 soil samples were collected for analysis. The investigation also included the collection of one groundwater sample from the well at DNR Pit #2 (Monofill Site) and the two (2) surface water samples from a stream down-gradient from the proposed Monofill Site.

Soil and pore water sample analysis results identified various metals, petroleum, oil and lubricants (POL), PAH, and VOC contaminants in the stockpiled material. Detected contaminants with concentrations exceeding the ADEC Cleanup Limits are discussed below.

Arsenic, cadmium, lead, DRO, naphthalene, benzo[a]anthracene and benzo[a]pyrene were detected in one or more soil samples in concentrations exceeding ADEC Soil cleanup limits. Arsenic was found in concentrations that are considered background. Cadmium was detected in one sample above the cleanup limit. Lead was found in each of the 22 samples above cleanup limits, but TCLP analysis results show that the lead is not leachable in concentrations exceeding EPA RCRA Waste Regulation Criteria. Furthermore, no other metals were found to be leachable in concentrations exceeding EPA RCRA Waste Regulation Criteria. DRO exceeded the cleanup limits in six samples, naphthalene exceeded the cleanup limits in 11 samples, and benzo[a]anthracene and benzo[a]pyrene were each found in one sample exceeding the cleanup limits. Laboratory analysis confirmed biogenic interferences in the DRO and RRO soil results biasing the results high.

No cleanup limit criteria exists for pore water. At the request of ADEC and for the purposes of this report, pore water analysis results were compared to ADEC groundwater cleanup limits and Aquatic Life for Fresh Water Acute and Chronic levels in the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances* as amended through December 12, 2008 (WQCM). However, it is important to place these comparisons in an appropriate context, since pore water criteria do not exist. Pore water is not groundwater or surface water containing aquatic life. Pore water is the water that fills the voids between soil, sediment or rocks, and, while the water remains within the stockpiled soil, it is an integral portion of the stockpile matrix.

Lead, DRO, RRO and naphthalene were detected in concentrations exceeding ADEC groundwater cleanup limits in one or more pore water samples. Lead was detected in concentrations below the calculated acute toxicity cleanup criteria in each sample tested, and exceeded the calculated cleanup criteria for chronic toxicity in three of the four samples analyzed. Zinc was detected in concentrations above the calculated acute toxicity cleanup criteria in one sample and exceeded the calculated cleanup criteria for chronic toxicity in one sample. The remaining three samples were below the acute and chronic cleanup criteria.



Review of chromatograms indicated biogenic interferences in the pore water DRO and RRO analysis results but insufficient volumes were available for confirmation via additional analysis. When the pore water analysis results were compared to soil cleanup limits, all analytes detected were in concentration below the respective soil cleanup limits.

No contaminants were detected in the groundwater sample collected at the Monofill Site above the laboratory limits of quantification. Surface water sampling of the tributary stream was for sulfates and phosphorous for which there are no established cleanup limits. Sulfates were identified in both stream samples, but phosphorous was not detected in either sample.

Sampling procedures and analytical results are further detailed in this report.

## **2.0 BACKGROUND**

### **2.1 Site Location and Description**

In February 2016, DEC and its contractors initiated an emergency response cleanup action at a former junkyard property known as the Wrangell (Byford) Junkyard located at Mile 4 Zimovia Highway in Wrangell, Alaska. The junkyard property is on City and Borough of Wrangell property accessible by road. The cleanup was completed at the end of July 2016.

The Wrangell Junkyard property address is 4 Mile Zimovia Highway, Zimovia Straits, Wrangell, Alaska 99929. Situated north of the highway, the property is located approximately 150 feet from Zimovia Strait. The parcel number of the property is 03-006-303, Lot Y2, Tract Y, United States Survey (USS) 2321, and is recorded as covering 2.51 acres. The property is located in Township 63 South; Range 38 East; Section 7; Copper River Meridian. The Site latitude is 56.4227° N and longitude 132.3563° W.

The cleanup action consisted of excavation, screening, EcoBond-stabilization, and stockpiling of approximately 18,500 cubic yards of soil heavily contaminated with lead. The stockpiled soil is temporarily stored on the Junkyard site in a securely lined and covered containment cell. Post stabilization sampling of the stockpiled soil by Toxicity Characteristic Leaching Procedure (TCLP) and Synthetic Precipitation Leaching Procedure (SPLP) testing confirmed that lead remaining in the soil does not leach. However, lead is still present in the material, and the current stockpile was not constructed or intended to be a long term storage repository.

The test results show that the stockpiled material is not a RCRA regulated hazardous waste, but it is lead contaminated soil under State regulations. The test results also confirm that the material meets the criteria for disposal in an unlined, solid waste monofill meeting the requirements of the ADEC solid waste regulations 18 AAC 60. Construction of a monofill at a site on the Wrangell road system was the State's selected preferred alternative for final disposition of the material.

The proposed monofill site is located within the Pats Creek watershed and is described as the DNR Rock Pit #2 off of Pats Creek Road, located on Wrangell Island. Pats Creek is topographically downgradient from the DNR Rock Pit #2. For the purposes of this report, the areas of interest are identified as:

- The monofill repository site (DNR Rock Pit #2)
- Wrangell Junkyard located at 4 Mile Zimovia Highway



The repository site is located in the former borrow pit identified as DNR Rock Pit #2 located at 56°21'11.76"N, 132°18'42.57"W in Section 4, Township 64 South, Range 84 East of the Copper River Meridian (Figure 2). The Site is owned by the State of Alaska and is managed by the DNR.

Access to the repository Site is via Pats Creek road. The rock pit is located approximately 1.7 miles east of Zimovia Highway. No structures or utilities exist at the repository Site or on any of the adjacent areas subject to this investigation.

### **2.1.1 Geology**

Wrangell Island is characterized by relatively low, rugged mountains that were cut by steep-sided glacial valleys. Glaciation deepened pre-existing valleys to form U-shaped valleys and rounded mountain peaks and ridges. The bedrock on Wrangell Island consists primarily of sedimentary and intrusive rocks of Cretaceous and Jurassic age. The sedimentary rocks consist of marine mudstone and fine-grained, rhythmically bedded, greywacke turbidities of the Seymour Canal Formation. Minor amounts of limestone are also present in the sedimentary complex. Regional metamorphism has resulted in recrystallization of the sedimentary rocks to sericitic slate or subphyllite, with isoclinal folding and kink bands. Other rock types on the island include andesitic to basaltic volcanic rocks. Intrusive rocks in the vicinity of the site include small plutons and batholiths of granodiorite, tonalite, and subordinate quartz diorite that are part of the Coast Range. Bedrock is exposed at low tide on northern Wrangell Island. Further inland, where covered by surficial deposits, bedrock may be more than 30 feet below land surface.

### **2.1.2 Soils**

Soils within the area of the soil repository Site vary in terms of soil types, depths, and physical properties such as drainage. A review of the United States Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) Soil Survey for the Stikine Area showed multiple unique soil complexes at and surrounding the area investigated. A generalized summary of Soils within the portion of the watershed investigated is as follows:

Soils of the Kupreanof-Mitkof complex, the Kupreanof-Mossman Complex, and the Mossman-Kupreanof complex are present and derived primary from colluvium and glaciofluvial parent materials. A generalized soil profile for the first two complexes includes a thin organic humic layer overlying silty loam, gravelly silty loam, very gravelly coarse sandy loam to very gravelly sandy loam. Both complexes are classified as somewhat poorly drained. The Mossman-Kupreanof complex is comprised of very gravelly loam overlying unweathered bedrock, is generally thinner and is classified as well drained.

The other three soil complexes are Kushneahin-mucky peat, the Kushneahin-Kina Association, and the Kushneahin-Maybeso complex. The first is derived primary from organic parent materials and includes mucky peat overlying muck (decomposed organic material) which is classified as very poorly drained. Soils of the second association and the third complex are similar, being composed primarily of mucky peat overlying muck, and differ from the first by being situated on steeper slopes and classified as very poorly drained.

Treated soils from the Byford Junkyard Site differed from the typical soil profile found in the area around Wrangell. Past activities associated with the junkyard and scrapping operations disturbed the soil layers to the depth of the glacial till. Disturbed soil generally consisted of silty sand or gravel and occasional shot rock and boulders mixed into the matrix. In areas where



undisturbed soil was encountered, silty loam dominated the soil profile from ground surface down to the depth of the glacial till. Thin layers of sandy loam were observed embedded in the silty loam at various depth throughout the undisturbed soil horizon. Bedrock was not encountered at the Junkyard Site.

### **2.1.3 Groundwater**

The following groundwater data for the repository site is based on a single sampling event completed during the geotechnical and hydrologic investigation of the Site conducted by Ahtna in November and December 2016. Three groundwater monitoring wells at DNR Pit #2 were monitored and sampled during the effort. Groundwater existed between 2.5 to 3.2 feet below the base floor of the repository site at the time of the December 2016 investigation, and flowed in a north-northeasterly direction at a measured gradient of 0.0077 feet per foot.

### **2.1.4 Surface Water**

The nearest surface water body to the repository Site is Pats Creek, which is located approximately 0.1 miles south, upgradient of the Site. Pats Creek is identified by the Alaska Department of Fish & Game (ADF&G) Anadromous Waters Catalog ID number 108-10-100500.

The nearest topographically down-gradient surface water to the repository site is an un-named tributary to Pats Creek located approximately 0.2 miles or 1000 feet to the northwest. This tributary is designated with an ADF&G ID of 108-10-100500-2047 and is herein referred to as the principal tributary (Figure 3, Appendix 1). This tributary confluences with Pats Creek approximately 0.3 miles west of the repository site. Although no continuous surface drainage connects the repository site to this tributary, this tributary indirectly receives the surface water runoff originating from the repository site after filtering through a forested wetland and muskeg meadow complex located to the north and topographically below the repository site.

The Pats Creek watershed contains numerous tributary drainages into Pats Creek. In general, most of these drainages are short, un-named, have not been cataloged by ADF&G and are of no consequence to this investigation.

Pats Creek and its tributaries drain into Pats Lake approximately 0.9 miles west of the repository site. Pats Lake outlets to the southwest via a continuation of Pats Creek and drains to Zimovia Strait approximately 0.5 miles to the southwest of Pats Lake.

The nearest surface water body to the Wrangell Junkyard is Zimovia Strait, which is located directly downgradient from the Site across Zimovia Highway.

## **2.2 Prior Site Activities**

The chosen repository Site is DNR Rock Pit #2 which was historically a borrow source for rock and aggregate. Quarrying activities have not been conducted at the Site for numerous years.

A Topographical Survey Plan was completed by R&M Engineering, Ketchikan, Alaska at the Site in November 2016.

In January 2017, Ahtna Engineering Services, LLC (Ahtna) completed a geotechnical and hydrologic assessment of the repository Site. The purpose of the investigation was to characterize the subsurface conditions at the site and to gather site-specific geotechnical and



hydrological information, including rock characteristics, groundwater depth, and groundwater quality. This information was used, along with climatological data for the site and conceptual engineered cap designs, to model groundwater infiltration and evaluate the suitability of the site as a treated soil repository.

Under a DEC-issued contract to Ahtna, three exploratory borings (P-01, MW-02 and MW-03) were advanced by Discovery Drilling, Anchorage, Alaska at the site late fall 2016 to characterize subsurface conditions, determine groundwater impacts (if any) from metals for background information, and determine depth to groundwater. Boring P-01 was completed to a depth of 34 feet below ground surface (bgs). Borings MW-02 and MW-03 were terminated at the top of bedrock (approximately 10 feet bgs and 6 feet bgs, respectively) due to an oily sheen observed in the encountered groundwater. All three borings were subsequently converted into groundwater monitoring wells.

Groundwater sampling during the fall 2016 work was conducted only at well P-01. Oil impacts in this well were not observed until development of the well. Groundwater samples (a primary and duplicate) were collected from P-01 and submitted to SGS laboratory and analyzed for full suite metals. Petroleum contaminants were not assessed in the samples. Groundwater samples were not collected from MW-02 or MW-03.

Analytical samples from this investigation indicated that baseline concentrations of metal contaminants are below drinking water maximum contamination levels.

In June 2017, Ecology & Environment (E&E), Environmental Protection Agency (EPA) Superfund Technical Assessment and Response Team (START) completed the Wrangell Junkyard Repository Basis of Design and Design Package. The START document provides the engineering specifications for construction of the monofill at the Site.

Between July and October 2017, preparatory construction was completed at the repository Site. These activities included the removal of debris and unsuitable rock and soil material from the repository, the construction of an access road along the east perimeter of the rock pit providing access to the top of the pit, the placement of a two-foot base drain layer over the bedrock floor of the repository and the preliminary construction of a three-foot chimney drain along the rock walls surrounding the monofill. Additional activities included the construction of a French drain at the repository site and routine maintenance of Pats Creek Road.

A Base Course Topographical Survey was completed at the Site in September 2017 after completion of the construction of the two-foot drain rock base for the repository site. The survey was conducted by PDC Engineers, Juneau, Alaska.

Further information regarding the monofill site for long term storage of the treated material can be found following the following link:

<http://dec.alaska.gov/spar/csp/RFPWebsiteDocuments/WrangellJunkyardRepository-BasisofDesignandDesignPackage.pdf>

In September 2017, **NORTECH** completed a Baseline Sampling Investigation for the Solid Waste Monofill Repository Site at the request of ADEC. The investigation included the collection of groundwater, surface water and sediment samples from the Monofill Site (DNR Pit #2), from Pats Creek and selected tributary streams entering into Pats Creek and soil samples at several locations adjacent to Pats Lake along Pats Creek Road. A total of eight sediment



samples, eight surface water samples, two groundwater samples and four soil samples were collected during the investigation. Each sample was analyzed for DRO, RRO, VOCs and Total lead.

The purpose of this investigation was to characterize existing conditions present at the repository Site, in selected downgradient drainages and along the proposed haul route to the Monofill Site. The analytical results also establish a baseline of conditions prior to beginning the transport of contaminated soil material from the Wrangell Junkyard Site to the solid waste Monofill Repository Site for which any future sampling results may be compared.

Lead was detected in seven sediment samples and four soil samples, all in concentrations below cleanup limits. Lead was detected in only one water sample, MFD-01 at a concentration which exceeded the cleanup limit.

DRO was not detected in any surface water or groundwater samples. DRO was detected in one soil and four sediment samples. With one exception, all DRO detections were below the cleanup limits. Sample MFD-01 had a DRO concentration which exceeded the cleanup limit.

RRO was not detected in any surface water or groundwater samples. RRO was detected in four soil and seven sediment samples. With one exception, all RRO results were below the cleanup limits. Sample MFD-01 had an initial RRO concentration which exceeds the cleanup limit. The sample was re-analyzed using silica gel cleanup techniques due to the apparent interference of biogenic compound biasing the original sample results. The post silica gel analysis result was below the cleanup limit.

With few exceptions, VOC contaminants were not detected in any of the soil, sediment, groundwater or surface water samples collected during the investigation. Toluene and 4-isopropyltoluene were detected in one sediment sample (MFD-02) and Chloromethane was detected in one water sample (MW-13). All results were below respective cleanup limits.

### **3.0 SCOPE OF WORK**

At the request of ADEC, the NRC Alaska Project Team developed a Sampling and Analysis Plan (SAP) to collect additional laboratory soil and water data from the EcoBond treated stockpile currently located at the former Byford Junkyard site, additional groundwater data from the remaining monitoring well located within DNR Rock Pit #2, and surface water data from the down-gradient stream from DNR Pit #2 in Wrangell, AK.

Approval of the SAP was provided by ADEC on March 22, 2018. A copy of the approved SAP is included in Appendix 5. The following is a summary of the approved Scope of Work for this investigation:

#### **3.1 Approved Scope of Work**

##### **Treated Stockpile Pore Water Sampling**

- Install three temporary driven PVC water collection points into the treated stockpile
- Collect three pore water samples and one duplicate
- Submit pore water samples to SGS America Laboratories in Anchorage for analysis
  - Dissolved Metals (Method 200.8)
    - RCRA 8 Metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver) plus thallium and zinc





- Hardness (Method 2340)
- Sulfate (Method 300.0)
- Phosphorous (Method SM 4500)
- GRO (Method AK 101)
- DRO (Method AK 102)
- RRO (Method AK 103)
- VOCs (Method 8260)
- SVOCs (Method 8270)
- Where sufficient water volume is available, collect the following water field measurements using a YSI 556 Multi-parameter water meter:
  - Temperature
  - pH
  - Conductivity Specific Conductivity
  - Dissolved Oxygen (DO)
  - Oxidation Reduction Potential (ORP)
  - Total Suspended Solids (TSS)
  - Salinity

#### Monitoring Well Sampling

- Purge and sample the existing groundwater monitoring well at DNR Rock Pit #2 (one water sample and one duplicate)
- Collect the following water field measurements during purging using a YSI 556 Multi-parameter water meter:
  - Temperature
  - pH
  - Conductivity
  - Specific conductivity
  - Dissolved Oxygen
  - Oxidizing and reducing potential (ORP)
  - Total Dissolved Solids (TSS)
  - Salinity
- Submit groundwater water samples to SGS America Laboratories in Anchorage for analysis
  - GRO (Method AK101)
  - VOCs (Method 8260C)
  - DRO (Method AK102)
  - RRO (Method AK103)
  - PAHs (Method 8270)
  - Dissolved Metals (Method 200.8)
    - RCRA 8 plus Thallium and Zinc
  - Hardness (Method 2340)
  - Total Phosphorous (Method SM 4500)
  - Sulfate (Method 300.0)

#### Downgradient Surface Water Sampling

- Collect the following water field measurements using a YSI 556 Multi-parameter water meter:
  - Temperature
  - pH

- Conductivity
- Specific conductivity
- Dissolved Oxygen
- Oxidizing and reducing potential (ORP)
- Total Dissolved Solids (TSS)
- Salinity
- Sample surface water from the principal tributary at a point downgradient of the soil repository site
- Submit surface water samples to SGS America Laboratories in Anchorage for analysis
  - Total Phosphorous (Method SM 4500)
  - Sulfate (Method 300.0)

#### Treated Stockpile Soil Characterization

- Collect up to 20 primary and 2 duplicate samples from up to 10 ten locations within the treated stockpile
- Within each location, soil samples will be collected from:
  - 1.5 – 2.0 feet below the surface of the stockpile
  - 5.0 – 6.0 feet below the surface of the stockpile
- Submit soil samples to SGS America Laboratories in Anchorage for analysis
  - GRO (Method AK101)
  - VOCs (Method 8260C)
  - DRO (Method AK102)
  - RRO (Method AK103)
  - PAHs (Method 8270)
  - Total Metals (Method 6020A)
    - RCRA 8 plus Thallium and Zinc
  - TCLP Metals (Method SW1311)
    - RCRA 8

### 3.2 Lines of Authority

The Alaska Department of Environmental Conservation (ADEC) Spills Prevention and Response (SPAR) is the administrator of the project to construct a solid waste monofill for the lead contaminated material from the Wrangell Junkyard Cleanup Site. This project is being completed under the State Emergency Response Fund as ADEC AR Term Contract 18-7002-01. The DEC Contaminated Sites (CS) Project Manager for this effort is Sally Schlichting.

NRC was awarded the contract for construction of the solid waste monofill. **NORTECH** has sub-contracted by NRC to provide qualified environmental personnel and professional environmental engineering services in support of the solid waste monofill construction project. SGS Laboratory, Anchorage, Alaska was sub-contracted by **NORTECH** to provide analysis of project related samples.

### 4.0 METHODOLOGY

Pore water, groundwater, surface water, and soil sampling for this project was conducted in general accordance with the ADEC's *Field Sampling Guidance* dated August 2017 (FSG), the ADEC's *Groundwater Monitoring Well Guidance* dated September 2013 (MWG), and the ADEC approved Sampling and Analysis Plan.



NORTECH completed the investigation in general accordance with the Scope of Work described in the ADEC approved "Sampling and Analysis Plan, Solid Waste Monofill Repository, Wrangell, Alaska" dated March 22 (Appendix 5). Variances to the approved SAP and/or methodologies employed to complete this investigation are discussed in Section 4.6 below.

#### 4.1 Contaminants of Potential Concern and Pertinent Cleanup Levels

The contaminants of concern identified for this investigation were based on known contaminants present in the soil at the former Junkyard Site as determined by previous soil sampling and laboratory analysis results conducted both prior to, and subsequent to the excavation, treatment and stockpiling of contaminated soil at this Site. Contaminants of concern in the soil included the following:

- Arsenic
- Cadmium
- Chromium
- Lead
- Mercury
- Thallium
- Zinc
- DRO
- RRO

Due to the historic usage of the Site as a junkyard, concerns have been expressed regarding other potential contaminants that may be present in the treated stockpiled soil (and pore water) that have not been previously characterized. Additional contaminants of potential concern identified for investigation include the following:

- VOCs
- SVOCs
- PAHs

The ADEC Method Two cleanup levels for soil and groundwater are typically used as cleanup goals for sites managed through the DEC contaminated sites program. DEC has developed the Method 2 cleanup levels to be protective of human health and the environment under the wide range of conditions found in Alaska. These cleanup levels are provided in 18 AAC 75. All project sample results were compared to current ADEC cleanup levels for soil (Tables B1 and B2) and groundwater (Table C). As pore water within the treated soils stockpile could potentially impact surface water, pore water samples were compared to 18 AAC 70 *Water Quality Standards* for growth and propagation of fish, shellfish, other aquatic life, and wildlife (WQS) in accordance with 18 AAC 75.345.

In order to ensure the protection of aquatic life, laboratory results for pore water samples were also compared to water quality criteria for toxics and other deleterious substances to aquatic life for freshwater chronic criteria (when applicable) as listed in the ADEC's *Alaska Water Quality Criterial Manual for Toxic and other Deleterious Organic and Inorganic Substances* as amended through December 12, 2008 (WQCM). Acceptable levels for some WQCM analytes are dependent on water hardness and were calculated after laboratory results for water hardness became available. Calculations for these analytes are listed in Appendix A of the WQCM. Table 1 lists contaminants of concern and their applicable cleanup levels.



**Table 1  
Applicable Soil and Water Cleanup Levels**

Analyte	ADEC Soil (mg/Kg)	ADEC Water (µg/L)	Aquatic Life for Fresh Water, Chronic (µg/L)
GRO	230	2200	N/A
DRO	260	1500	N/A
RRO	9700	1100	N/A
VOCs	See 18 AAC 75 Table B1	See 18 AAC 75 Table C	See WQCM for Specific Compound
SVOCs	See 18 AAC 75 Table B1	See 18 AAC 75 Table C	See WQCM for Specific Compound
Phosphorous	N/A	N/A	N/A
Sulfate	N/A	N/A	N/A
Arsenic	0.20	0.52	150
Barium	2100	3800	N/A
Cadmium <sup>1</sup>	9.1	9.2	0.33
Chromium III <sup>1</sup>	1.0 x 10 <sup>5</sup>	22000	230.67
Chromium VI	0.089	0.35	11
Lead <sup>1</sup>	400	15	10.94
Mercury	0.36	0.52	0.77
Selenium	6.9	100	5.0
Silver <sup>2</sup>	11	94	N/A
Thallium	0.19	0.20	N/A
Zinc <sup>1</sup>	4900	6000	382.40

Notes:

<sup>1</sup>Analyte                      Levels based on water hardness as measured in pore water samples

<sup>2</sup>Analyte                      Chronic levels for Silver have not been established in the WQCM

#### 4.2 Pore Water Collection Points

Three temporary collection points were installed in the southwestern portion of the treated stockpile for the collection of pore water samples from the treated soil. This location was chosen because the southwest corner was engineered to be the low point of the stockpile, allowing for water within stockpiled soils to drain in this direction and this area was considered most likely to contain water for pore water sampling.

Steel rods were mechanically advanced used to create three soil borings within the existing treated soil stockpile. Care was taken to ensure the soil borings did not extend past the bottom of the stockpile cell and that the bottom liner remained intact. Once each boring has been extended to the appropriate depth, the rods were removed and slotted one-inch diameter PVC well casings were installed within the borings. All penetrations to the treated stockpile cover were repaired subsequent to sample collection to protect the stockpile from weather in accordance with 18 AAC 75.370(a)(6).

Pore water sampling was completed using a peristaltic pump and low-flow methodologies.

#### 4.3 Monofill Repository Groundwater Sampling

During this pre-construction sampling effort, **NORTECH** collected one primary and one duplicate sample from the single remaining groundwater monitoring well currently in place at the monofill repository site (DNR Rock Pit #2).



**NORTECH** collected purge water within properly labeled five-gallon buckets. Buckets containing purge water were clearly labeled, covered, and stored within the locked garage at the Byford property adjacent to the Wrangell Junkyard site. Purge water will be properly disposed of once **NORTECH** returns to Wrangell.

#### 4.4 Downgradient Surface Water

At ADEC's request, **NORTECH** collected one primary and one duplicate sample from the nearest body of surface water downgradient from the soil repository site. The principal tributary (Figure 2, Appendix 1) is the nearest downgradient body of surface water to the repository site and was sampled at a point downgradient of the soil repository. **NORTECH** recorded the location of the surface water sample and results of the field measurements in the field book.

#### 4.5 Quality Control Measures

In order to ensure data is of sufficient quality to compare to 18 AAC 75 Tables B1 and B2, 18 AAC 75 Table C, 18 AAC 70 WQS, and ADEC WQCM Cleanup Levels, collection of field duplicate(s) and sample Trip Blanks followed the ADEC FSG Table 3 – *Minimum Quality Control Requirements*. One duplicate sample was collected for each matrix sampled, and per each ten samples submitted to the laboratory. Duplicate samples were submitted to the lab blind.

One trip blank was submitted to the laboratory per cooler containing volatile samples submitted to the laboratory. **NORTECH** used SGS America in Anchorage Alaska for analysis of all laboratory samples collected for this project. SGS is an ADEC certified laboratory for all listed analytes.

#### 4.6 Variances from the Approved SAP and Methodologies

At the request of ADEC, the three pore water sample points were not removed from the treated stockpile. Each sampling point was cut below the surrounding soil stockpile elevation, capped and covered with a piece of flat plywood to protect the stockpile cover from being damaged by the sampling points prior to securing and taping the stockpile cover.

A duplicate sample was not collected from groundwater monitoring well MW-3 at the Monofill Site due to low water output at this location.

Water quality parameters measured in the surface water stream were taken subsequent to sample collection, not prior to sampling as described in the approved SAP. Furthermore, the water quality parameters were collected at a location approximately 50 feet down-stream from the sampling location at the nearest accessible location deep enough to fully submerge the instrument probe. This was due to low-flow winter stream conditions.

Due to the low available volumes of water in the pore water sampling points and the slow rate of pore water recharge, sample collection was completed over a time period from March 23 through March 27. A complete set of analytical parameters was not obtained from sampling point W1 due to an insufficient volume of water available to collect a SVOC sample at this location. Furthermore, insufficient pore water was available to collect a complete duplicate analysis set from any one sampling point. A duplicate analysis sample set was collected for the majority of analytes being tested for from W3. With the exception of SVOCs, the remaining duplicate samples were collected from either W1 or W2. Insufficient water was available to collect a duplicate sample for SVOC analysis from any of the sampling points.



Water parameters measured during this investigation using a YSI 556 Multi-parameter water quality meter included the following:

- Temperature
- pH
- Conductivity
- Specific conductivity
- Dissolved Oxygen (DO)
  - DO (%)
  - DO (mg/L)
- Oxidative Reduction Potential (ORP)

The YSI 556 instrument was not configured to display salinity and total suspended solids (TSS) and these parameters were not recorded in the field notes for the investigation.

Numerous rocks exist in the treated stockpile soil matrix which resulted in refusal of hand tools prior to reaching the targeted sampling depths (2 feet to 6 feet into the stockpile). After completion of only two soil borings (TSP1 and TSP-2) to a maximum depth of four (4) feet during the first day of soil sampling, it was apparent that hand tools alone would not be sufficient to allow sampling at the deeper targeted depth interval. The alternative method employed for the soil sampling of the remaining eight sampling locations (TSP-3 through TSP-10) involved the mechanically advancing a seven (7) foot long, three (3) inch diameter steel pipe with a cone shaped driving point into the stockpile using a mini-excavator. The pipe was advanced to the desired depth intervals and then removed for soil sample collection with a hand auger.

## 5.0 FIELD ACTIVITIES

On March 20, 2018, Ron Pratt with **NORTECH** mobilized to Wrangell to implement the Sampling and Analysis Plan for this investigation. Field activities were completed on March 28, 2018. For the purposes of this report, field activities are discussed according to the following primary tasks:

- Pore Water Sampling (Treated stockpile-Byford Site)
- Soil Sampling (Treated stockpile-Byford Site)
- Groundwater Sampling (Monofill Site)
- Surface Water Sampling (Downgradient of Monofill Site)
- Ancillary Tasks

Ms. Kim Wickman with the Wrangell Cooperative Association, Indian Environmental General Assistance Program (WCA IGAP) was present on-site as an observer throughout the soil and pore water sampling and other associated activities conducted at the Byford Site during this Site investigation. Ms. Chris Hatton (WCA IGAP) was also on-site as an observer for a portion of the soil sampling conducted on March 27 at the Byford Site.

### 5.1 Pore Water Sampling (Treated Stockpile-Byford Site)

On March 23, Mr. Pratt oversaw the installation of three pore water sampling points (W1, W2 and W3) in the southwestern corner of the existing treated soil stockpile (Refer to Figure 2). Each sampling point was completed by first mechanically advancing a 1 ¼ inch diameter steel



rod(s) into the stockpile, then removing the steel rods and inserting one (1) inch diameter PVC well casings into the existing hole(s) (Photo 1). Each sampling point was advanced to a depth within approximately 1 to 1.5 feet from the bottom of the stockpile and was constructed with five (5) feet of slotted PVC at the bottom and un-slotted PVC above this to the stockpile surface.

After installation, each sample collection point was assessed for the presence of water by lowering an electronic water meter into the casing. Dedicated clean disposable sample tubing was then inserted into each sample point so that available water could be extracted via a peristaltic pump (Photo 2).

On March 24, Mr. Pratt began sample collection of pore water from each sample collection point (W1, W2 and W3). Pore water extraction and sample collection was completed with the peristaltic pump using low flow methodologies. Pore water was extracted from each sampling point until it was dry. The extracted water was pumped directly into clean sample containers provided by the laboratory.

Due to low volumes of available pore water and slow recharge rates encountered in each sampling point, multiple extraction events were required to collect sufficient volume(s) of water to fill the appropriate sample containers necessary to meet the analytical objectives for the investigation. Pore water sample collection was completed over the time period beginning on March 24 and was completed on March 27.

Initially, the extractable volume of pore water from each sample point yielded approximately 750 ml to 1000 ml in volume. In general extraction volumes declined daily in the sample points over the duration of the sampling effort. In an effort to increase the volume of pore water drawn into the sampling points, a 2.5 HP wet/dry shop vacuum was utilized to attempt to increase water drawn toward the sampling point. Subsequent to removal of the available water from W3 on the morning of March 25, the vacuum was attached to W3, turned on, and ran continuously until the afternoon sampling event (Photo 3). This effort did not prove to show any increase in pore water volume available to be sampled and was discontinued. Table 9 (Appendix 2) provides a summary of the approximate extraction volumes from each sample point throughout the project effort.

The initial pore water extracted from each sampling point was visually turbid and contained significant amount of suspended sediments in the water. In general, the amount of suspended sediments decreased over the next few days of extraction, however, observable sediments remained present in the extracted water.

All pore water samples were collected directly into clean sample containers provided by the laboratory with the following exception. The total dissolved metals samples were first collected into an unpreserved HPDE container provided by the laboratory and then passed through a 0.45 micron filter into the appropriately preserved sample container as per the approved analytical test methodology procedures for dissolved metals analysis.

None of the sampling points maintained sufficient water volume and recharge capacity to assess water quality parameters using a flow through cell. On March 27, Mr. Pratt was able to collect a sufficient volume of pore water from W3 to measure water quality parameters. The pore water was collected into a clean unpreserved glass sample jar and YSI 556 Water Quality Meter sensors were lowered into the jar. Measurements of temperature, conductivity, specific conductivity, dissolved oxygen pH and oxidation/reduction potential (ORP) were recorded every



3 minutes over a fifteen-minute time period and recorded in the field notes. Water quality measurements are summarized in Table 8 (Appendix 2).

## **5.2 Soil Sampling (Treated Stockpile-Byford Site)**

On March 24, Ron Pratt began collection of soil samples from the treated stockpile. Soil was collected from the stockpile by advancing a two (2) inch diameter hand auger into the stockpile. Numerous rocks in the soil matrix resulted in auger refusal to the target sampling depths of two (2) feet and six (6) feet into the stockpile. As a result, a total of only four soil samples were collected on March 24 from two soil borings, TSP-1 and TSP-2 (TSP=Treated Stockpile). Both borings were manually advanced to a maximum depth of four (4) feet to rock refusal. Two other soil boring attempts met refusal before the two (2) foot depth and were abandoned.

It was apparent that hand tools alone would not allow the collection of deeper soil samples from the stockpile and that an alternative method of sample collection would be required to meet the project objectives of collecting soil samples from the two (2) foot and six (6) foot depth intervals at 10 discreet locations.

To collect soil samples, a seven (7) foot long, three (3) inch diameter steel pipe with a cone shaped driving point was mechanically pushed into the treated stockpile using a mini-excavator situated on the top of the containment cell's perimeter rock berm (Photo 4). This process only allowed for sampling around the perimeter of the stockpiled soil cell, as the mini-excavator could not be driven onto the cover liner. The pipe was advanced approximately 18 to 20 inches into the soil and then removed prior to sample collection. The hand auger was then inserted into the hole and advanced into the stockpile to collect soil samples at this depth interval. Upon completion of sample collection at this interval, the steel pipe was re-inserted into the hole and mechanically pushed to a depth of approximately 60 to 66 inches and the process was repeated to collect soil with the hand auger at the deeper interval.

Borings TSP-3, TSP-4 and TSP-5 were completed and sampled by Mr. Pratt on March 25. Borings TSP-6 through TSP-10 were completed and sampled on March 27. All soil removed from each boring location that was not collected into sample jars was returned to the boring from which it originated. All stockpile cover penetrations were repaired at the completion each day.

On March 27, Mr. Pratt and Ms. Wickman (WCA-IGAP) completed the field mapping of the pore water sampling points and the treated stockpile soil sampling locations. Field mapping was conducted using swing ties and two, 300 foot measuring tapes. All sampling locations are shown on Figure 2 (Appendix 1).

## **5.3 Groundwater Sampling (Monofill Site)**

On March 27, Ron Pratt mobilized to DNR Pit #2 to monitor and sample the groundwater monitoring well (MW-3) at the Site (Photo 5). The location of this well is shown on Figure 3 (Appendix 1). The well was opened and the depth to water and total depth of the well were measured using an electronic water depth meter and a purging well volume was calculated based on this information.

Clean sample tubing was inserted into the well, connected to a peristaltic pump and purging was initiated. The well was purged of approximately one gallon of water until water was visibly observed to be flowing clear of observable turbidity and discoloration. The sample tubing was





then connected to a flow through cell, the YSI 556 water meter sensors were placed in the cell and purging continued.

Measurements of temperature, conductivity, specific conductivity, dissolved oxygen, pH and ORP were recorded every 2 to 3 minutes over a fifteen-minute time period and recorded in the field notes. Water quality measurements are summarized in Table 8 (Appendix 2). After stabilization of the water quality parameters was observed, Mr. Pratt disconnected the sample tubing from the flow through cell and analytical sample collection commenced.

All water samples were collected directly into appropriate sample containers provided by the laboratory with the following exception:

The total dissolved metals samples were first collected into an unpreserved HPDE container provided by the laboratory and then passed through a 0.45-micron filter into the appropriately preserved sample container as per the approved analytical test methodology procedures. The groundwater samples were collected in order of volatility.

Approximately 3.5 gallons of purge water was collected and containerized during the sampling event. The purge water was transported back to the Byford Site to be stored in a secure location pending analytical results.

#### **5.4 Surface Water Sampling (Downgradient of Monofill Site)**

On March 27, Mr. Pratt also collected surface water samples from the un-named tributary to Pats Creek located to the north and topographically down gradient from DNR Pit #2. This creek is identified as ADF&G ID 108-10-100500-2047 (herein referred to as the principal tributary), and was identified as the receiving body of surface water run-off from DNR Pit #2 during previous Site survey conducted in September 2017. Although no continuous surface drainage connects the Monofill Site to this principal tributary, this tributary indirectly receives the surface water runoff originating from the repository site after filtering through a forested wetland and muskeg meadow complex located to the north and topographically below DNR Pit #2.

Surface water samples PT-001 and PT-100 (a duplicate) were collected from the principal tributary at the location where water from the forested wetland and muskeg meadow(s) drains into the tributary stream (Photos 6 and 7). The sampling location is shown on Figure 3. After sample collection, a YSI 556 water meter was lowered into the creek to collect measurements of temperature, conductivity, specific conductivity, dissolved oxygen, pH and ORP which were recorded every 2 to 3 minutes over a ten-minute time period and recorded in the field notes. The water parameters were collected from a location approximately 50 feet downstream from the sampling location at the nearest accessible location where water was deep enough to submerge the sampling probe. Water quality measurements are summarized in Table 8 (Appendix 2).

#### **5.5 Ancillary Tasks**

Several relevant ancillary tasks were conducted concurrent with this sampling investigation and are discussed below.

On March 22, Mr. Pratt verbally discussed the status of the stockpile covering with Mr. Ron Sowle whom had been conducting routine inspections of the stockpile throughout the winter at



the request of ADEC. He informed Mr. Pratt that the tires holding the cover down on the stockpile had shifted recently after a wet and heavy snow event.

On March 22, Ron Pratt conducted an inspection of the treated stockpile. The primary purpose of this inspection was to assess the integrity of the stockpile cover, to identify any holes or penetrations of the cover and to repair any observed damage to the cover. A total of 11 small penetrations were observed in the cover during this inspection and were repaired with six inch wide rubberized repair tape.

During the inspection, Mr. Pratt confirmed that the tires securing the cover have shifted over the winter and that the stockpile cover has also shifted. In several areas it was observed that the cover has been stretched and pulled taut. In other areas, the cover was wrinkled and/or folded over upon itself. It was also observed that a taped seam between two layers of covering was stressed and beginning to pull apart on the northwestern portion of the stockpile. This is likely the result of the shifting of the cover that has occurred in the past six months.

## 6.0 ANALYSIS RESULTS WITH DISCUSSION

The complete sample set collected for this investigation effort included the following:

- 22 soil samples collected from the treated stockpile
  - 20 primary samples
  - 2 duplicate samples
- 6 pore water samples collected from the treated stockpile
  - 3 primary samples
    - 2 primary samples for SVOCs due to low water volume in W1
  - 3 duplicate samples
    - Duplicates for select analysis were collected from different sample points
- 1 groundwater sample from well at DNR Pit #2
- 2 surface water samples from tributary stream down-gradient from DNR Pit #2
  - 1 primary
  - 1 duplicate
- 2 soil trip blanks
- 1 water trip blank

All project samples were submitted to SGS Laboratory in Anchorage, Alaska for analysis. All soil samples were submitted for the analysis identified in Section 3.1 above with the following exception. A TCLP sample could not be collected from sampling location TSP 1-4 due to an obstruction which prevented the collection of adequate soil to fill all of the sample jars at this location.

After reviewing the preliminary analytical results provided by the laboratory, and due to the organic nature of the soils within the stockpile, **NORTECH** requested soil samples be analyzed again for DRO using a silica gel cleanup methodology. **NORTECH** requested silica gel cleanup of soil samples in order to identify and quantify potential biogenic interferences within the soil samples. Laboratory results with and without silica gel cleanup were reported for comparison purposes.

All pore water sample were submitted for the analysis identified in Section 3.1 above with the following exceptions:



An inadequate volume of water was available at W1 for the collection of a sample for SVOC analysis. Also, an inadequate volume of water was available from any sampling point for the collection of a complete set of duplicate analysis.

Sampling point W3 yielded the highest volume of pore water and most of the duplicate analysis was obtained from this location. Duplicates for analysis for DRO and RRO were obtained from sampling point W1. In addition, a duplicate sample was collected for phosphorous and sulfates from sampling point W2. No SVOC duplicate sample was collected during this investigation due to insufficient water volumes.

The groundwater sample collected from MW-3 at DNR Pit #2 and the surface water samples (primary and duplicate) collected from the tributary stream down-gradient from DNR Pit #2 were submitted for the analysis identified in Section 3.1 above. A duplicate sample from MW-3 was not collected during this investigation.

All laboratory analysis results are summarized in Tables 1 through 9 (Appendix 2). It should be noted that tabulated results for TCLP metals, VOCs (both in soil and water) and SVOCs (water), and PAH (soils) include only those analytes which were detected in one or more samples. All other analytes tested for by the aforementioned analysis methodologies were not detected at the laboratory limits of quantification (LOQs).

For the purposes of this report, the analytical results are discussed below by the following:

- Treated Stockpile Soil Samples Results
- Treated Stockpile Pore Water Sample Results
- Groundwater Sample Results
- Surface Water Sample Results
- QC Samples

## **6.1 Treated Stockpile Soil Sample Results**

### **Total Metals**

The total metals analysis for this investigation included the RCRA 8 Metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver) as well as thallium and zinc. Barium, chromium, mercury, selenium, silver and zinc were detected in one or more of the 22 samples analyzed in concentrations below their respective ADEC Cleanup Limits. Thallium was not detected in submitted samples. Arsenic, cadmium and lead were detected in one or more soil samples in concentrations above their respective ADEC Cleanup limits.

Arsenic was detected in 22 of the 22 soil samples analyzed in concentrations ranging between 2.72 mg/kg and 17.4 mg/kg. Arsenic concentrations exceeded the ADEC cleanup limit in all 22 samples. However, it should be noted that the arsenic concentrations observed at the Site are either lower than or commensurate with background concentrations of arsenic typical throughout the State. Note 11 in 18 AAC 75 Table B1 Method Two – Soil Cleanup Levels Table states: “Due to the prevalence of naturally occurring arsenic throughout the state, arsenic at a site will be considered background arsenic unless anthropogenic contribution from a source, activity or mobilization by means of another introduced contaminant is known or suspected” (ADEC, 2016).



Lead was detected in 22 of the 22 soil samples analyzed in concentrations ranging between 406 mg/kg and 6250 mg/kg. Lead concentrations exceeded the ADEC cleanup limit in all 22 samples.

Cadmium was detected in 22 of the 22 soil samples analyzed in concentrations ranging between 2.65 mg/kg and 9.22 mg/kg. Cadmium was found to exceed ADEC Cleanup Limit in only one of 22 samples.

Chromium was detected 22 of the 22 soil samples analyzed in concentrations ranging between 84.1 mg/kg and 191 mg/kg, which are below the ADEC Cleanup Limit of 100,000 mg/Kg.

It should be noted that the laboratory analytical results for chromium reported total chromium concentrations without speciation of chromium as Cr<sup>+3</sup> versus Cr<sup>+6</sup>. Note 12 in 18 AAC 75 Table B1 Method Two – Soil Cleanup Levels Table states: “Due to the prevalence of naturally occurring chromium III throughout the state, sample results reported for total chromium detected at a site will be considered background chromium III unless anthropogenic contribution of chromium III or chromium VI from a source, activity or mobilization by means of another introduced contaminant is known or suspected (ADEC, 2016).

### **TCLP Metals**

The TCLP metals analysis for this investigation included the RCRA 8 Metals mentioned previously. The TCLP analytical results detected leachable concentrations of chromium and lead only. Lead was detected in 16 of 21 samples in concentrations ranging between 0.0758 mg/L and 0.783 mg/L, results which are all below the RCRA regulatory limit of 5.0 mg/L. Chromium was detected in 6 of 21 samples in concentrations ranging between 0.205 mg/L and 0.28 mg/L, results which are all below the RCRA Waste Regulations Criteria limit of 5.0 mg/L. All other TCLP metals analysis were below the laboratory LOQs.

### **Petroleum Oils and Lubricants (POL)**

POL analysis for this investigation included analysis for GRO, DRO and RRO contaminants. GRO contaminants were not detected above the associated laboratory LOQs in any of the 22 samples analyzed.

DRO contaminants were detected in 20 of the 22 samples analyzed in concentrations ranging between 77.5 mg/kg and 278.0 mg/kg. At **NORTECH's** request, SGS reviewed the chromatograms for DRO and RRO analysis. The laboratory noted that the chromatograms for the DRO and RRO analysis showed a graphic signature that indicated potential biogenic interference with the analysis results.

In a 2006 memorandum on biogenic interference in soils, the ADEC noted “It is well established that the AK102 and AK103 methods for petroleum range organic analysis (DRO and RRO, respectively) are complicated by biogenic interference. Naturally occurring organic material (NOM) or biogenics are present in many soils and especially prevalent in certain Alaskan soils. Alaskan samples containing organic plant material are especially susceptible to background biogenic interference and may result in false positive results for DRO or RRO defined petroleum hydrocarbon ranges.



As a result, biogenic interference is the term that is used to describe the NOM that is quantified and reported as DRO and/or RRO in accordance with the AK102 and AK103 methods. Biogenic interference concentrations may occur at levels well above regulatory cleanup levels” (ADEC, 2006).<sup>1</sup>

Based on the laboratory’s interpretation of the chromatographs, **NORTECH** requested SGS re-run soil samples using a silica gel cleanup method. After the second analysis of samples for DRO, DRO was detected in each of the 22 samples pre-silica gel cleanup in concentrations between 79.8 mg/kg and 496 mg/kg. Post-silica gel cleanup, DRO concentrations ranged between 54.1 mg/kg and 313 mg/kg. DRO concentrations exceeded the ADEC cleanup limit of 230 mg/kg in 3 of the samples.

In each sample, the pre-silica gel result was greater than the post-silica gel results. This confirms that biogenic interferences have biased all of the soil DRO and RRO sample results high.

RRO contaminants were detected in 22 of the 22 samples analyzed in concentrations ranging between 77.5 mg/kg and 278.0 mg/kg, all in concentrations well below the ADEC cleanup limit of 8300 mg/kg.

### **VOCs**

A total of 72 VOC contaminants were analyzed for and five (5) VOC compounds were detected in one or more soil sample. Only one VOC analyte (naphthalene) was found in concentrations exceeding the cleanup limits.

1,2,4-Trimethylbenzene was detected in 2 of the 22 samples analyzed in concentrations ranging between 0.089 mg/kg and 0.0929 mg/kg, both in concentrations below the ADEC cleanup limit of 0.16 mg/kg.

Toluene was detected in 3 of the 22 samples analyzed in concentrations ranging between 0.0397 mg/kg and 0.112 mg/kg, all in concentrations below the ADEC cleanup limit of 6.7 mg/kg.

Total xylenes were detected in 3 of the 22 samples analyzed in concentrations ranging between 0.13 mg/kg and 0.268 mg/kg, all in concentrations below the ADEC cleanup limit of 1.5 mg/kg.

Trichlorofluoromethane was detected in 2 of the 22 samples analyzed in concentrations ranging between 0.0851 mg/kg and 0.496 mg/kg, both in concentrations below the ADEC cleanup limit of 41.0 mg/kg.

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<sup>1</sup> ADEC Technical Memorandum - 06-001, May 18, 2006, addresses the issue of “naturally occurring organic material” (NOM) and/or “biogenic interference” specifically in relation to methods AK102 and AK103. It also provides the laboratory and reporting requirements for utilizing a silica gel cleanup procedure as a method for evaluating the presence of biogenics and their contribution to the AK102/AK103 sample results. procedure as a method for evaluating the presence of biogenics and their contribution to the AK102/AK103 sample results.



Naphthalene was detected in 8 of the 22 samples analyzed in concentrations ranging between 0.044 mg/kg and 1.99 mg/kg, all in concentrations exceeding the ADEC cleanup limit of 0.038 mg/kg.

### **PAHs**

A total of 18 PAH contaminants were analyzed for and 17 PAH analytes were detected in one or more of the 22 soil sample analyzed. With the exception of Naphthalene, benzo(a)anthracene and benzo(b)pyrene, all detected PAH concentrations were below their respective ADEC cleanup limits.

Naphthalene was detected in 9 of the 22 samples analyzed in concentrations ranging between 0.0406 mg/kg and 2.65 mg/kg, all in concentrations exceeding the ADEC cleanup limit of 0.038 mg/kg.

Benzo(a)anthracene was detected in 22 of the 22 samples analyzed in concentrations ranging between 0.0357 mg/kg and 0.424 mg/kg with only one sample exceeded the ADEC cleanup limit of 0.028 mg/kg.

Benzo(a)pyrene was detected in 21 of the 22 samples analyzed in concentrations ranging between 0.0389 mg/kg and 0.382 mg/kg, with only one sample exceeding the ADEC cleanup limit of 0.027 mg/kg.

Historic data is not available from which to make comparison for most of the soil analysis conducted during this investigation. However, more than 70 soil samples were collected from the treated stockpiled soil material in 2016 for TCLP analysis for lead.

TCLP results for each of the samples collected during this investigation are commensurate with the findings of the previous analytical results collected during the 2016 investigations. The results show that while lead remains present in the treated stockpile soil, the lead is not leachable above RCRA Waste regulations.

Mr. Pratt observed that the soil samples collected from each TSP boring at the two-foot and four-foot depth intervals were typically drier and looser than the samples collected from the six-foot depth interval. Samples collected in the shallower depth intervals were easily crumbled in the hand, whereas samples collected from each boring at the six-foot depth interval were observed to be sticky and plastic in consistency (soil holds together when compacted in the hand). The soil collected from TSP-5 at six feet which was also observed to be moist at this depth.

Percent solid results for each soil sample were provided by the laboratory and are reported on Table 1. Percent moisture is also summarized on the table and was calculated by subtracting the % solid value from 100%.

## **6.2 Treated Stockpile Pore Water Sample Results**

Pore water sampling was conducted to characterize potential contaminant concentrations existing within the treated stockpiled soil matrix.



No defined cleanup standards exist for pore water. For the purposes of this report, pore water sample results were compared to the ADEC groundwater cleanup standards and aquatic life freshwater chronic and acute levels from the WQCM. However, it is imperative that these comparisons are placed in an appropriate context.

Pore water is the water that fills the existing pore space of soil, sediment or rock. In the context of a soil stockpile, the pore water is an integral portion of the stockpiled matrix. Pore water is not groundwater, nor is it surface water.

It must also be pointed out that “pore water samples collected via active sampling methods [as was conducted during this investigation], are likely to capture colloidal material, onto which contaminants of concern may adhere (e.g., PAHs, metals, etc.). Colloids may or may not be removed during laboratory extraction and analysis, depending on project objectives and laboratory procedures used. It may be important to consider colloids when interpreting pore water data or comparing to other sampling methods (ADEC, 2017). All pore water samples collected during this investigation contained visually observable suspended sediments. Pore water present within the stockpile was collected from a known low point within the stockpile, where we could reasonably expect water to accumulate, yet pore water recovery even at this location was poor.

In regards to a comparative analysis, it must also be pointed out that pore water that could potentially exit the existing treated stockpiled may not contain the same levels of aqueous phase contaminants and/or constituents that were found present in the pore water while it is still part of the stockpiled matrix.

### **Total Dissolved Metals**

The total dissolved metals analysis for this investigation included the RCRA 8 Metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver) as well as thallium and zinc. Only lead and zinc were detected in concentrations above the laboratory LOQs.

Lead was detected in each of the four samples analyzed. Dissolved lead concentrations ranged between 5.26 ug/L and 144 ug/L, with one sample exceeding the ADEC Groundwater Cleanup Limit of 15 ug/L for lead in groundwater. Based on water hardness, the WQCM Aquatic Life for Freshwater chronic level (four day average) for lead is 10.94 ug/L and the acute level (one hour average) is 280.85 ug/L. Dissolved metals results are not averaged over any time frame. Based on the available dissolved metals laboratory results, lead results exceeded chronic lead levels in three samples. Lead results did not exceed WQCM Aquatic Life for Freshwater acute levels.

Zinc was detected in each of the four samples analyzed. Dissolved zinc concentrations ranged between 75.6 ug/L and 418 ug/L, and all results were below the ADEC Groundwater Cleanup Limit of 6000 ug/L for zinc in groundwater. Based on water hardness, the WQCM Aquatic Life for Freshwater chronic level (four day average) for zinc is 382.40 ug/L and the acute level (one hour average) is 379.30 ug/L. Dissolved metals results are not averaged over any time frame. Based on the available dissolved metals laboratory results, zinc results exceeded both WQCM Aquatic Life for Freshwater chronic and acute levels in one sample.

### **Petroleum Oils and Lubricants (POL)**

POL analysis of pore water for this investigation included analysis for GRO, DRO and RRO contaminants.



GRO contaminants were detected in three of the five samples analyzed in concentrations ranging between 123 ug/L and 497 ug/L. All GRO concentrations were below the ADEC Groundwater Cleanup Limit of 2200 ug/L.

DRO contaminants were detected in each of the four samples analyzed in concentrations ranging between 3230 ug/L and 7900 ug/L. DRO concentrations exceeded the ADEC Groundwater Cleanup limit of 1500 ug/L in each sample.

RRO contaminants were detected in each of the four samples analyzed in concentrations ranging between 56.3 ug/L and 2000 ug/L. RRO concentrations exceeded the ADEC Groundwater Cleanup limit of 1100 ug/L in three samples.

As with the treated stockpile soil samples, the laboratory noted that the chromatographs for the DRO and RRO analysis showed a graphic signature that indicated potential biogenic interference with the analysis results. The laboratory also noted that an insufficient volume of water remained from the pore water samples to complete the re-analysis using silica gel cleanup methods.

### **VOCs**

A total of 72 VOC contaminants were analyzed for and 13 VOC compounds were detected in one or more pore water sample. Only one VOC analyte (naphthalene) was found in concentrations exceeding the ADEC Groundwater Cleanup Limits.

Naphthalene was detected in three of the four samples analyzed in concentrations ranging between 3.43 ug/L and 18.5 ug/L, all in concentrations exceeding the ADEC Groundwater Cleanup limit of 1.7 ug/L.

1,3,5-Trimethylbenzene was detected in each of the four samples analyzed in concentrations ranging between 2.57 ug/L and 4.27 ug/L, all in concentrations below the ADEC Groundwater Cleanup limit of 15 ug/L.

1,2,4-Trimethylbenzene was detected in two of the four samples analyzed in concentrations ranging between 1.37 ug/L and 1.45 ug/L, all in concentrations below the ADEC Groundwater Cleanup limit of 120 ug/L.

2-Butanone (MEK) was detected in each of the four samples analyzed in concentrations ranging between 296 ug/L and 571 ug/L, all in concentrations below the ADEC Groundwater Cleanup limit of 5600 ug/L.

2-Hexanone was detected in each of the four samples analyzed in concentrations ranging between 24.8 ug/L and 115 ug/L, all in concentrations below the ADEC Groundwater Cleanup limit of 380 ug/L.

4-Isopropyltoluene was detected in one of the four samples analyzed in a concentration of 1.15 ug/L. No ADEC Groundwater Cleanup limit has been established for this analyte.

4-Methyl-2-pentanone (MIBK) was detected in each of the four samples analyzed in concentrations ranging between 43.1 ug/L and 51.5 ug/L, all in concentrations below the ADEC Groundwater Cleanup limit of 6300 ug/L.





Benzene was detected in each of the four samples analyzed in concentrations ranging between 2.07 ug/L and 3.61 ug/L, all in concentrations below the ADEC Groundwater Cleanup limit of 46 ug/L.

Dichlorofluoromethane was detected in one of the four samples analyzed in a concentration of 1.49 which is below the ADEC Groundwater Cleanup limit of 200 ug/L.

Ethylbenzene was detected in two of the four samples analyzed in concentrations ranging between 1.01 ug/L and 2.62 ug/L, all in concentrations below the ADEC Groundwater Cleanup limit of 15 ug/L.

Toluene was detected in three of the four samples analyzed in concentrations ranging between 4.51 ug/L and 248 ug/L, all in concentrations below the ADEC Groundwater Cleanup limit of 1100 ug/L.

Total xylenes were detected in three of the four samples analyzed in concentrations ranging between 5.65 ug/L and 7.43 ug/L, all in concentrations below the ADEC Groundwater Cleanup limit of 190 ug/L.

Trichlorofluoromethane was detected in two of the four samples analyzed in concentrations ranging between 4.25 ug/L and 4.65 ug/L, all in concentrations below the ADEC Groundwater Cleanup limit of 5600 ug/L.

### **SVOCs**

A total of 72 SVOC contaminants were analyzed for and three SVOC analytes were detected in one or more of the two pore water samples analyzed. No detected SVOCs exceeded their respective cleanup limits

3- & 4- Methylphenol (p&m cresol) was detected in each of the two samples analyzed in concentrations ranging between 213 ug/L and 557 ug/L, all in concentrations below the ADEC Groundwater Cleanup limit of 930 ug/L.

Benzoic acid was detected in each of the two samples analyzed in concentrations ranging between 292 ug/L and 1590 ug/L, all in concentrations below the ADEC Groundwater Cleanup limit of 75000 ug/L.

Phenol was detected in each of the two samples analyzed in concentrations ranging between 82.6 ug/L and 397 ug/L, all in concentrations below the ADEC Groundwater Cleanup limit of 5800 ug/L.

### **Additional Parameters and Analytes**

Each pore water sample was additionally analyzed for sulfates, phosphorous and Hardness (which includes analytical results for calcium, magnesium and total hardness as CaCO<sub>3</sub> (calcium carbonate). Cleanup limits for these analytes are not established for these compounds. Hardness was analyzed as it is used in the calculation of the Acute and Chronic toxicity of individual dissolved metals. Because all hardness results were above 400,000 ug/L, the default hardness value of 400,000 ug/L was used to calculated water quality criteria for metals, per the WQCM (2008).



Sulfate was detected in each of the five pore water samples analyzed in concentrations ranging between 44,300 ug/L to 566,000 ug/L. There is no ADEC water quality criterion established for this analyte.

Phosphorous was detected in each of the five pore water samples analyzed in concentrations ranging between 584,000 ug/L to 2,160,000 ug/L. There is no ADEC water quality criterion established for this analyte.

Calcium was detected in each of the four pore water samples analyzed in concentrations ranging between 229,000 ug/L to 464,000 ug/L. There is no ADEC water quality criterion established for this analyte.

Magnesium was detected in each of the four pore water samples analyzed in concentrations ranging between 197,000 ug/L to 627,000 ug/L. There is no ADEC water quality criterion established for this analyte.

Total Hardness (as CaCO<sub>3</sub>) was detected in each of the four pore water samples analyzed in concentrations ranging between 1,360,000 ug/L to 3,740,000 ug/L.

Water quality parameters were measured on one sample collected from W3. These parameters were measured by lowering a YSI 556 water quality monitoring instrument into a clean unpreserved sample jar containing water purged from W3 and recording the various parameters over a period of 15 minutes. These readings are shown in Appendix 2, Table 8. Dissolved oxygen within the pore water averaged 41.2%, the pH readings were consistent with tannic soils at 5.4, and the ORP readings were negative, indicating a reducing environment.

No historical data for pore water is available for this project.

### **6.3 Groundwater Sample Results**

One groundwater sample was collected from monitoring well MW-3 located in the northern portion of DNR Pit #2.

#### **Total Dissolved Metals**

The analysis showed no detectable concentrations of any dissolved metals (RCRA 8 plus thallium and zinc) in the sample above the laboratory LOQs.

#### **Petroleum Oils and Lubricants (POL)**

The analysis showed no detectable concentrations of GRO, DRO or RRO contaminants in the sample above the laboratory LOQs.

#### **VOCs**

The analysis showed no detectable concentrations of any of the 67 VOC compounds analyzed for in the sample above the laboratory LOQs.

#### **PAHs**

The analysis showed no detectable concentrations of any of the 18 PAH VOC compounds analyzed for in the sample above the laboratory LOQs.

#### **Additional Analytes**



Sulfate was detected in a concentration of 93700 ug/L in the sample collected from MW-3. There is no ADEC cleanup level established for this analyte.

Phosphorous was not detected in a concentration above the laboratory LOQ in the sample collected from MW-3.

Calcium and Magnesium were detected in concentrations of 53,700 ug/L and 3320 ug/L in the sample, respectively. Total Hardness (as CaCO<sub>3</sub>) was detected at a concentration of 148,000. There are no ADEC cleanup levels established for these analytes.

Water quality parameters were measured during purging of this well. The parameters were measured by lowering a YSI 556 water quality monitoring instrument into a flow through cell while purging this well. The various parameters were recorded over a period of 15 minutes. These results are compiled in Table 8 of Appendix 2. Dissolved oxygen averaged 2.98%, pH readings were 6.9, and ORP readings were slightly negative, indicating a mild reducing environment.

Monitoring well MW-3 was previously sampled in September 2017 during the Baseline Sampling Investigation. MW-3 and a duplicate sample MW-13 were collected at this time and analyzed for DRO, RRO and Lead. The laboratory results showed no detectable concentration for any of these analytes tested for above the laboratory LOQs. These findings are commensurate with the analytical results collected during the current investigation.

#### **6.4 Surface Water Sample Results**

Two surface water samples (a primary and duplicate) were collected from the tributary stream located to the north and downgradient from the monofill Site.

Sulfate was detected in both the primary (PT-001) and duplicate (PT-100) samples in concentration of 1590 ug/L and 1580 ug/L, respectively.

Phosphorous was not detected in either sample above the laboratory LOQs.

No water quality criteria exist for either analyte. Furthermore, no historic analytical data is available for comparison of any of the water analyses conducted during this investigation.

One surface water sample (PDC-01) was previously collected at this sampling location during the Baseline Sampling Investigation in September 2017. PDC-01 was analyzed for DRO, RRO and Lead. Turbidity and pH measurements were also collected during the 2017 investigation.

The only available parameter for comparison is pH. In the fall of 2017, pH at this location was measured to be 6.6. During the current investigation, the surface water pH at this location was recorded as ranging between 3.63 and 3.94. Other parameters collected during this event are shown in Table 8 of Appendix 2. These include dissolved oxygen, which was present at 101%, ORP readings ranged from 325 to 340, indicative of an oxidizing environment, which matches the high dissolved oxygen, and is to be expected in a turbulent, flowing stream.

It should be noted that the September 2017 monitoring event was conducted immediately following a significant rain event and that the water level was several feet higher than observed during the March 2018 sampling event. Although free of ice, the surrounding terrain was



covered in more than a foot of snow during the March sampling event and the water level was low.

## 6.5 Quality Control Summary

Data quality objectives for the project were to meet the requirements of the SAP which were generally in agreement with the FSG. The goal of the project was to produce data of adequate quality for comparison to 18 AAC 75 Table B1 (soils) and Table C (groundwater) cleanup levels, as well as comparison to chronic and acute WQCM levels. The primary tool used to assess the quality of the data was the ADEC Laboratory Data Review Checklist (LDRC). A LDRC was completed for each individual laboratory work order and is included in Appendix 4. In addition, Table 6 provides a QC summary of the duplicate samples collected during this investigation.

A total of two soil and one water trip blanks were submitted along with the samples to the laboratory. The analysis results showed no detectable concentrations for any analytes in both soil trip blanks and the water trip blank.

The sampling conducted during this investigation included three laboratory work orders. Quality control (QC) issues were identified in each of the laboratory report and are summarized in the report's Case Narrative and the associated Laboratory Data Review Checklist (LDRC) (Appendix X). QC issues identified within the reports' Case Narratives that do not affect data quality or usability are discussed within the LDRCs only. QC issues that may impact data quality or usability are discussed below.

A total of seven VOCs had Limits of Quantitation (LOQs), Limits of Detection (LOD) and Detection Limits (DL) greater than applicable ADEC Cleanup Levels in all submitted soil samples. None of the seven VOCs were detected in submitted soil samples in concentrations above their associated LOQs. These QC violations do not affect data quality, but do affect data usability for these analytes. Due to these elevated DL, **NORTECH** cannot determine if the following analytes are present within the soil in concentrations below applicable ADEC Cleanup Levels:

- 1,1,2,2-Tetrachloroethane
- 1,1,2-Trichloroethane
- 1,2,3-Trichloropropane
- Bromodichloromethane
- Bromomethane
- Chloroform
- Vinyl chloride

One VOC and two metals had LOQs, LODs, and DLs greater than applicable ADEC cleanup levels in all submitted pore water and groundwater samples. A single SVOC had LOQs, LODs, and DLs greater than applicable ADEC cleanup levels in the two pore water samples analyzed for SVOCs. Groundwater was analyzed for PAHs only, and a third pore water sample was not submitted due to low water volume from W1. The VOC, two metals, and one SVOC were not detected in concentrations above their associated LOQ in submitted water samples. These QC violations do not affect data quality, but do affect data usability for these analytes. Due to these elevated DL, **NORTECH** cannot determine if the following analytes are present within pore water and/or groundwater in concentrations below applicable ADEC Cleanup Levels:

- 1,2,3-Trichloropropane (pore water and groundwater)

- Arsenic (pore water and groundwater)
- Thallium (pore water and groundwater)
- N-Nitrosodimethylamine (pore water only)

The QC issues identified above do not adversely affect data quality and usability of other analytes within the data set. The seven soil VOCs with DL greater than ADEC Cleanup Levels have not been identified as potential contaminants of concern in Site soils. The VOC and SVOC with DL greater than associated ADEC Cleanup Levels have not been identified as potential contaminants of concern in groundwater. Arsenic and Thallium have previously been detected in soil samples, but have not been previously assessed in groundwater.

The soil and pore water samples collected from the treated stockpile during the investigation were intended to characterize potential contaminants and their respective concentrations. The groundwater sample collected from the Monofill Site was collected for assess the potential presence of contaminants of concern and various water quality parameters which may exist at the Site. These results also serve as baseline of conditions existing in the groundwater environment at the Site prior to moving the treated soil to the monofill Site.

## 7.0 CONCLUSION AND RECOMMENDATIONS

Based on the results and findings of this investigation, including available historic results and data, **NORTECH** provides the following conclusions:

The treated stockpiled soil:

- Is not a hazardous waste by EPA RCRA Waste Regulation Criteria
- Is lead contaminated by ADEC regulatory criteria
- Contains lead in concentrations exceeding ADEC Cleanup Criteria
  - Analysis shows lead is not leachable above RCRA Waste Regulation Criteria
- Contains arsenic in concentrations exceeding ADEC Cleanup Criteria
  - Arsenic present in background concentration
  - Analysis shows arsenic is not leachable above RCRA Waste Regulation Criteria
- Contains cadmium:
  - 1 of 22 samples contained cadmium in concentrations exceeding ADEC Cleanup Criteria
  - Analysis shows cadmium is not leachable above RCRA Waste Regulation Criteria
- Contains barium, chromium, mercury, selenium, silver and zinc, all in concentrations below the respective ADEC Cleanup Limits.
  - Analysis shows barium, chromium, mercury, selenium, and silver are not leachable above RCRA Waste Regulation Criteria
- Does not contain GRO contaminants
- Contains DRO contaminants
  - DRO concentrations exceeded the Cleanup Limits in 6 of 22 samples
  - All DRO results are less than 345 mg/kg, within the +/- 50% accuracy for the AK102 analysis
- Contains RRO contaminants, all in concentrations below ADEC Cleanup Criteria
- Biogenic interference was identified in each of the 22 samples analyzed for DRO and RRO and biases all the reported DRO and RRO concentrations high
- Four VOC compounds were detected in one or more samples

- Naphthalene concentrations exceeded ADEC Cleanup limits in 8 of 22 samples
  - All concentrations were below respective ADEC Cleanup Criteria.
- 17 PAH compounds were detected in one or more samples
  - Naphthalene concentrations exceeded ADEC Cleanup limits in 9 of 22 samples
  - Benzo[a]anthracene concentration exceeded ADEC Cleanup limits in 1 of 22 sample
  - Benzo[a]pyrene concentration exceeded ADEC Cleanup limits in 1 of 22 samples
  - All other detected PAH compounds were below ADEC Cleanup Criteria

The pore water within the treated stockpiled material:

- Is neither groundwater nor surface water
- Analytical results were compared to:
  - ADEC groundwater Cleanup Limits
  - ADEC Surface Water Acute and Chronic Toxicity Limits
- Contains lead
  - 1 of 4 samples analyzed exceeded ADEC Groundwater Cleanup Limits
  - 3 of 4 samples exceed the Acute Surface Water toxicity Limits
  - All four samples were below the Chronic Surface Water Toxicity Limits
- Contains zinc
  - All 4 samples analyzed were below ADEC Groundwater Cleanup Limits
  - 1 of 4 samples exceeded the Acute Surface Water toxicity Limits
  - 1 of 4 samples exceeded the Chronic Surface Water Toxicity Limits
- Arsenic, barium, cadmium, chromium, mercury, selenium, silver and thallium were not detected above the laboratory LOQs in any samples
  - 1 of 4 samples analyzed exceeded ADEC groundwater standards
  - 3 of 4 samples exceed the Chronic Surface Water toxicity Limits
  - All four samples were below the Acute Surface Water Toxicity Limits
- Contains arsenic in concentrations exceeding ADEC Cleanup Criteria
  - Arsenic present in background concentration
  - Arsenic is not leachable above RCRA Waste Regulation Criteria
- Contains cadmium:
  - 1 of 22 samples contained cadmium in concentrations exceeding ADEC Cleanup Criteria
  - Cadmium is not leachable above RCRA Waste Regulation Criteria
- Contains barium, chromium, mercury, selenium, silver and zinc, all in concentrations below the respective ADEC Cleanup Limits.
  - Barium, chromium, mercury, selenium, and silver are not leachable above RCRA Waste Regulation Criteria
  
- GRO contaminants detected in 3 of 4 samples, all in concentrations below ADEC Groundwater Cleanup Limits
- DRO contaminants detected in 4 of 4 samples, all in concentrations above ADEC Groundwater Cleanup Limits
- RRO contaminants detected in 4 of 4 samples, with 3 samples in concentrations above ADEC Groundwater Cleanup Limits Contains DRO contaminants
- Biogenic interference of DRO and RRO results indicated by analysis chromatograms but not insufficient volume was available to confirm via additional analysis
- 15 VOC compounds were detected in one or more pore water samples



- Naphthalene concentrations exceeded ADEC Cleanup limits in 4 of 5 samples
- All other VOC compounds detected were in concentrations below respective ADEC Cleanup Limits.
- 3 SVOC compounds were detected in one or more pore water samples
  - All SVOC compounds detected were in concentrations below respective ADEC Cleanup Limits
- All 5 samples contained detectable concentrations of sulfate, phosphorous and the following hardness constituents; calcium, magnesium and hardness as CaCO<sub>3</sub>
  - No ADEC Cleanup Criteria exists for any of these analytes
  - Samples for these analytes were for comparative purposes

The groundwater at the Monofill Site:

- Does not contain any dissolved metals, GRO, DRO, RRO, VOC or PAH contaminants in concentrations above the laboratory LOQs
  - Contained detectable concentrations of Sulfate and the following hardness constituents; calcium, magnesium and hardness as CaCO<sub>3</sub>
  - No ADEC Cleanup Criteria exists for any of these analytes

The surface water from the tributary stream down-gradient of the Monofill Site:

- Contained a detectable concentrations of Sulfate

## 8.0 LIMITATIONS

**NORTECH** provides a level of service that is performed within the standard of care and competence of the environmental engineering profession. However, it must be recognized that limitations exist within any site investigation. This report provides results based on a restricted work scope, from the analysis and observation of a limited number of samples and for Site conditions which were present at the time of investigation. Therefore, while these limitations are considered reasonable and adequate for the purposes of this report, actual site conditions may differ and change over time. Specifically, the unknown nature of exact subsurface physical conditions, sampling locations, the analytical procedures' inherent limitations, as well as financial and time constraints are limiting factors.



**9.0 SIGNATURES OF ENVIRONMENTAL PROFESSIONALS**

**Ronald J. Pratt**, Senior Environmental Scientist for **NORTECH**, is a Qualified Environmental Professional as defined in 18 AAC 75.390(b). Mr. Pratt has a B.S. in Geography/Earth Science and a Masters in Environmental Studies and more than 20 year of professional environmental consulting experience in California, Washington, and Alaska. Ron has experience conducting all phases of environmental site investigations, underground storage tank decommissioning/closures, underground injection well assessment and closure projects, contaminated site remediation projects, spill prevention countermeasure and control inspections and radiologic soil screening and sampling. Mr. Pratt is also has experience conducting stormwater pollution prevention inspections and is an Alaska Certified Erosion and Sediment Control Lead (AK-CESCL) DES-003.

**Jason Ginter**, PMP, Principal and Juneau Technical Manager for **NORTECH**, is a Qualified Environmental Professional as defined in 18 AAC 75.390(b), and has extensive experience conducting hazardous materials investigations, property assessments, and other environmental fieldwork over 21 years throughout Alaska.

Primary Author Signature

**Ronald J Pratt**  
Senior Environmental Scientist

Principal Reviewer

**Jason Ginter, PMP**  
Principal, Juneau Technical Manager



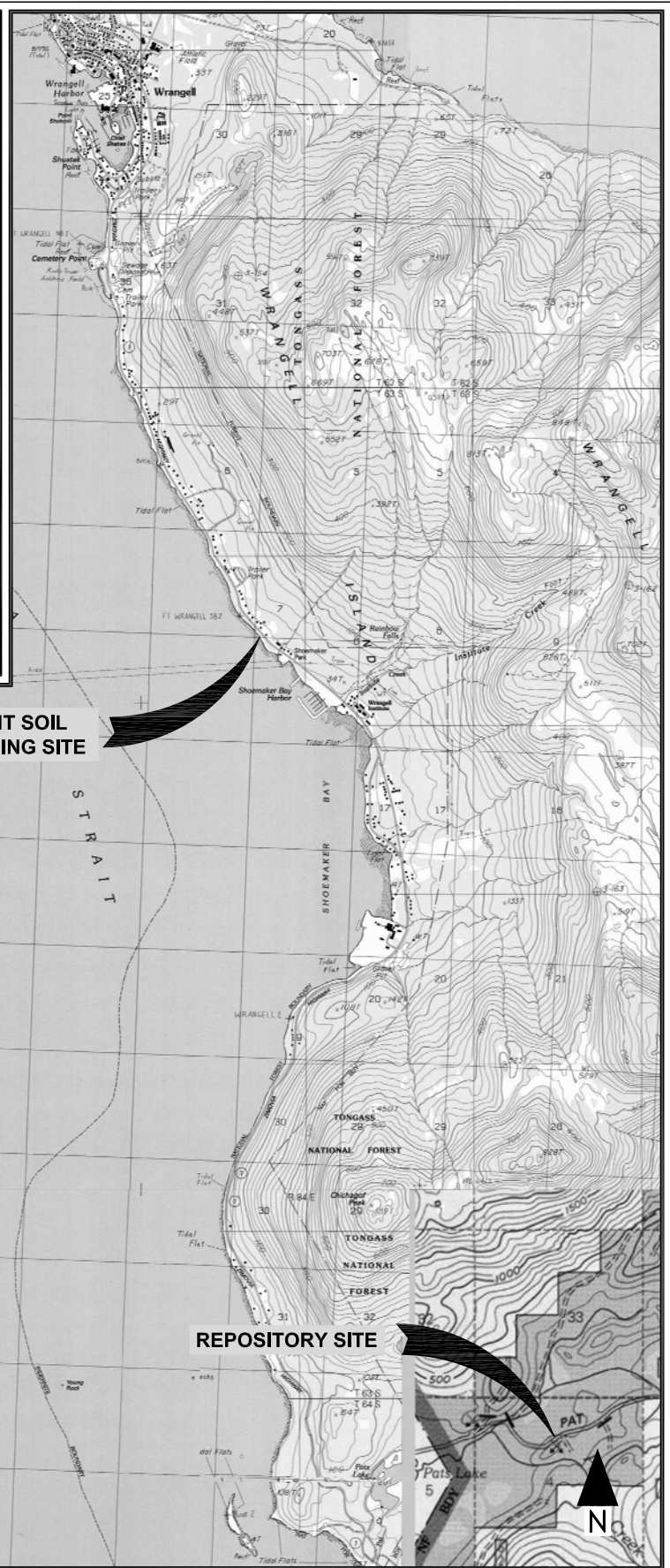
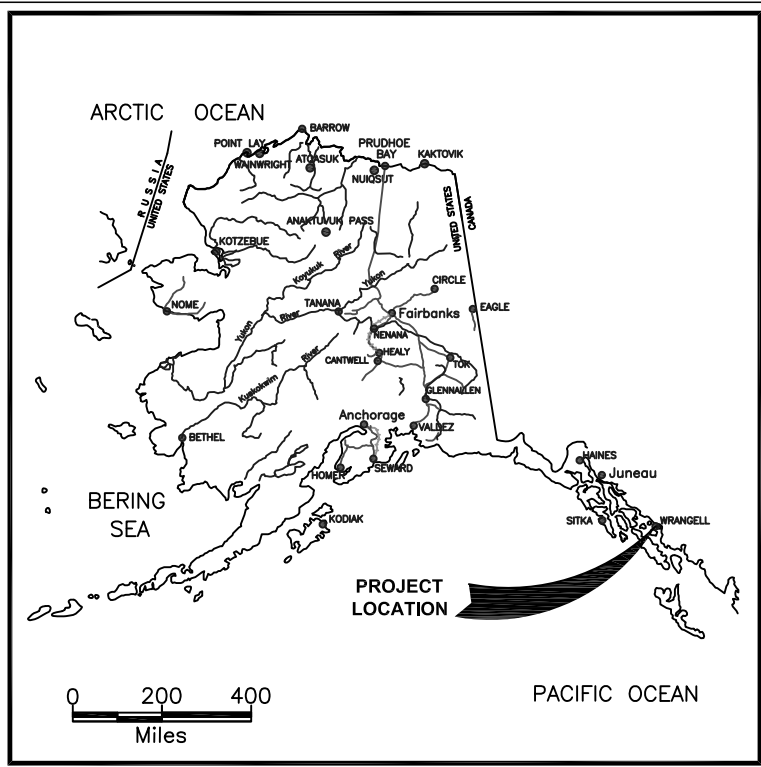



**SUSTAINABLE ENVIRONMENT, ENERGY,  
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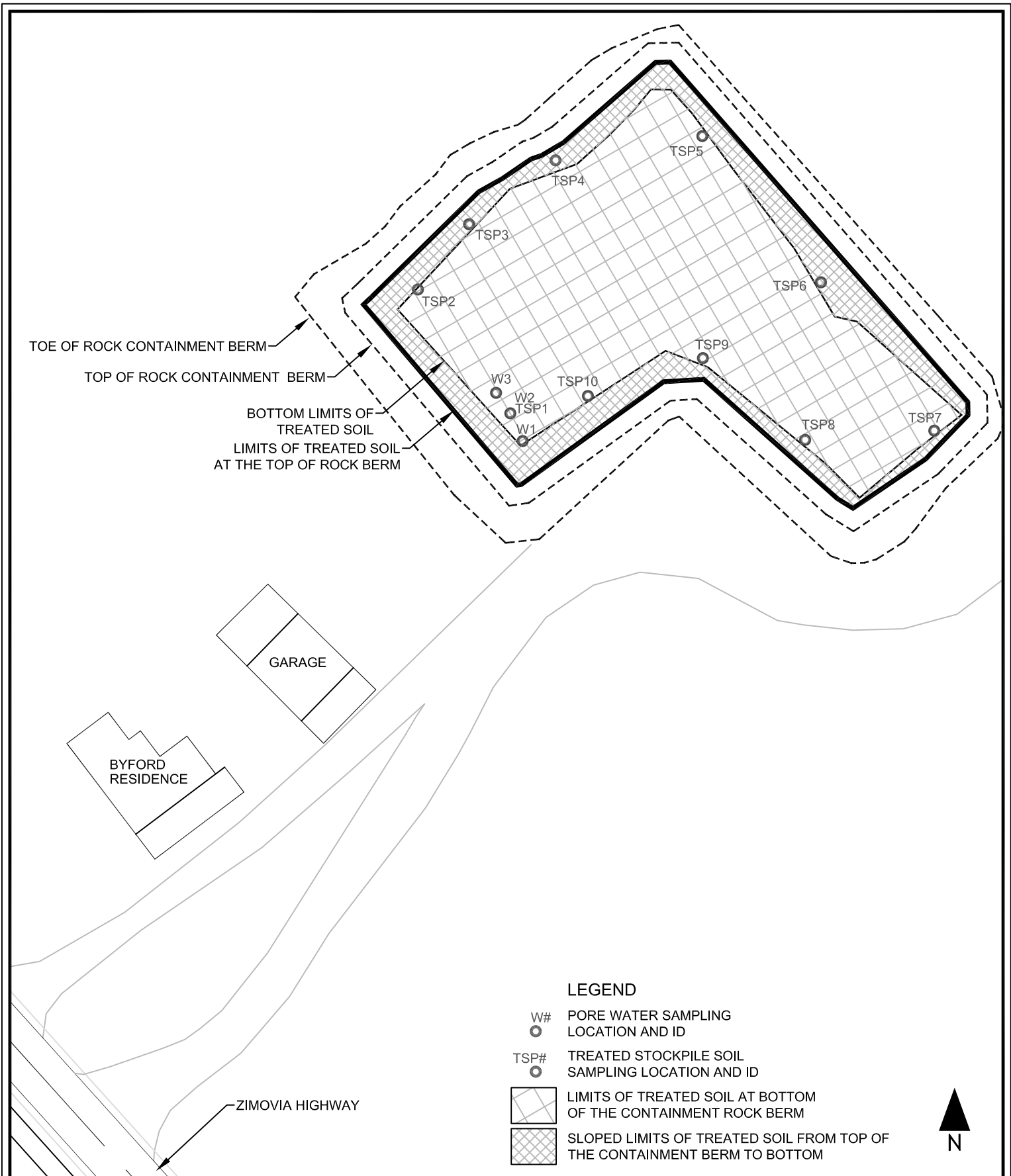
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## APPENDIX 1

## FIGURES



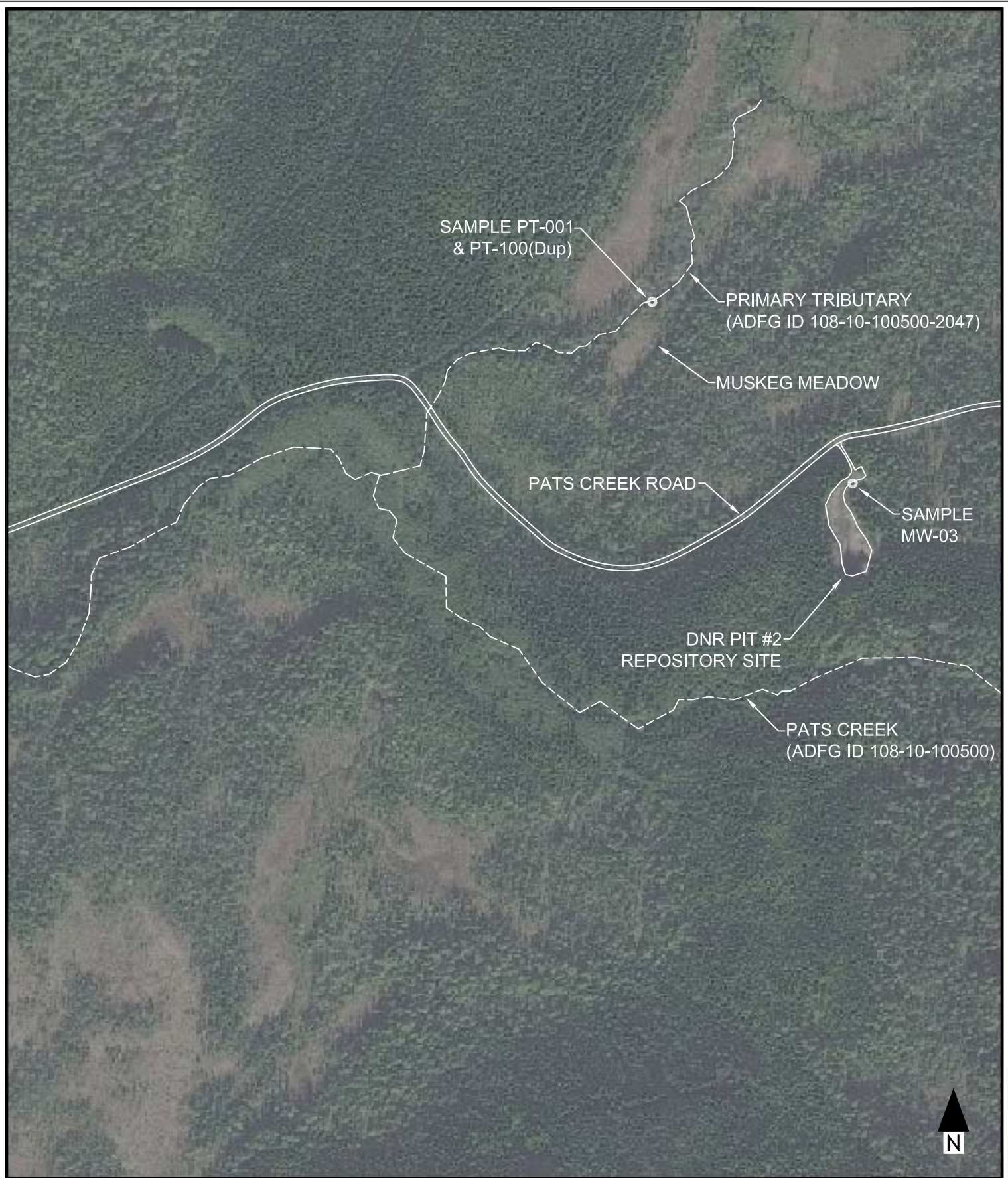
 <p>ENVIRONMENT, ENERGY, HEALTH &amp; SAFETY CONSULTANTS 2400 College Road, Fairbanks, AK. 99709, 907-452-5688 3105 Lakeshore Dr., Anchorage, AK. 99517 907-222-2445 5438 Shaune Dr., Juneau, Alaska 99801 907-586-6813</p>	Location Map		SCALE: 1" = 1 Mile	FIGURE:	
	Construction of Solid Waste Monofill for Lead Contaminated Soil			1	
	ADEC AR Term Contract 18-70020-01				
	Pat's Creek Rd., DNR Rock Pit #2 Wrangell, Alaska 99929				
				DWG: 171048d(01)	DATE: 11/16/2017



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2018 Treated Stockpile Sampling Diagram  
 Construction of Solid Waste Monofill for Lead Contaminated Soil  
 ADEC AR Term Contract 18-70020-01  
 Byford Junkyard Site, Zimovia Hwy, Wrangell, Alaska

SCALE: 1" = 50'	FIGURE:
DESIGN: JJG	2
DRAWN: RJP	
PROJECT NO: 17-1048	
DWG: 171048e(02)	
DATE: 04/03/2018	



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 3105 Lakeshore Dr., Anchorage, AK. 99517 907-222-2445  
 5438 Shaune Dr., Juneau, Alaska 99801 907-586-6813

2018 Monofill Site and Vicinity Sampling Diagram  
 Construction of Solid Waste Monofill for Lead Contaminated Soil  
 ADEC AR Term Contract 18-70020-01  
 Pat's Creek Rd, DNR Rock Pit #2 Wrangell, Alaska 99929

SCALE: 1" = 500'	FIGURE:
DESIGN: JJG	3
DRAWN: RJP	
PROJECT NO: 17-1048	
DWG: 171048e(03)	
DATE: 04/04/2018	



## APPENDIX 2

## TABLES

**Table 1**  
**Laboratory Soil Analysis Results Summary (Total Metals, TCLP Metals and POL)**

Sample ID	ADEC Cleanup Level	TSP1-2	TSP1-4	TSP2-2	TSP2-4	TSP3-2 (DUP1)	TSP20-2 (DUP1)	TSP3-6	TSP4-2	TSP4-6	TSP5-2	TSP5-6	Trip Blank
Analyte	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
<b>Total Metals (RCRA 8, Thallium and Zinc)</b>													
Arsenic	0.2	6.6	3.36	10.9	3.58	6.67	9.94	3.93	3.93	3.57	4.39	2.9	NA
Barium	2100	79.1	98.2	97.1	84.5	104	144	83	102	87.7	96.2	93.1	NA
Cadmium	9.1	6.46	6.13	6.08	4.6	4.87	6.52	9.22	4.32	6.45	4.99	4.66	NA
Chromium	10000	110	128	147	105	96.9	123	191	94.5	112	117	105	NA
Lead	400	497	564	1470	610	2980	6250	1140	720	698	518	406	NA
Mercury	0.36	0.0681	0.0778	0.0747	0.0872	0.144	0.147	0.0527	0.12	0.0945	0.0882	0.0871	NA
Selenium	6.9	1.31U	1.40U	1.43U	1.33U	1.22U	1.32U	1.30U	1.26U	1.32U	1.30U	1.22U	NA
Silver	11	0.261U	0.280U	0.287U	0.267U	0.246	0.263U	0.260U	0.252U	0.264U	0.260U	0.245U	NA
Thallium	0.19	0.261U	0.280U	0.287U	0.267U	0.244U	0.263U	0.260U	0.252U	0.264U	0.260U	0.245U	NA
Zinc	4900	325	353	385	328	386	445	356	464	436	282	274	NA
<b>Detected TCLP Metals (RCRA 8)</b>													
Chromium	5.0 <sup>Note1</sup>	0.200U	NA	0.200U	0.200U	0.200U	0.200U	0.200U	0.200U	0.200U	0.200U	0.200U	NA
Lead	5.0 <sup>Note1</sup>	0.341	NA	0.0823	0.0782	0.085	0.0815	0.0505	0.0874	0.0758	0.0500U	0.0500U	NA
<b>Petroleum Fuels, Gasoline, Diesel and Residual Range (Oils and Lubricants)</b>													
GRO	260	4.04U	4.59U	4.75U	5.06U	4.06U	4.33U	4.73U	4.07U	3.68U	4.08U	3.73U	2.52U
DRO	230	113	209	77.5	155	169	284	141U	232	213	278	212	NA
DRO <sup>2-Pre</sup>	230	211	238	106	188	244	339	199	496	204	181	375	NA
DRO <sup>2-Post</sup>	230	127	149	58.3	111	149	238	116	260	124	120	313	NA
RRO	8300	379	765	329	505	695	1200	342	1040	871	819	419	NA
<b>Percent Solid and Moisture (by weight)</b>													
% Solid	NE	71.8	67.8	68.9	69.8	77.4	74.1	70	75.7	75.6	74.6	76.1	NA
% Moisture	NE	28.2	32.2	31.1	30.2	22.6	25.9	30	24.3	24.4	25.4	23.9	NA

**Notes:**

- #/SHADE Analyte detected above the limits of quantification but below the cleanup limits
- #/BOLD Analyte detected above the limits of quantification and above the cleanup limits
- #/U Analyte was not detected at the listed limits of quantification
- ID (Dup#) Denotes duplicate sample pairings
- NA Sample was not analyzed for this analyte
- ND Analyte was not detected at the laboratory limits of quantification
- NE Cleanup Limit for analyte has not been established
- Note 1 TCLP results are compared to the U.S. EPA RCRA Waste Regulations Criteria.
- 2-Pre Second DRO analysis before silica gel cleanup
- 2-Post Results after silica gel cleanup

**Table 1 Continued**  
**Laboratory Soil Analysis Results Summary (Total Metals, TCLP Metals and POL)**

Sample ID	ADEC Cleanup Level	TSP6-2	TSP6-6 (Dup2)	TSP22-6 (Dup2)	TSP7-2	TSP7-6	TSP8-2	TSP8-6	TSP9-2	TSP9-6	TSP10-2	TSP10-6	Trip Blank
Analyte	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
<b>Total Metals (RCRA 8, Thallium and Zinc)</b>													
Arsenic	0.2	<b>3.11</b>	<b>3.85</b>	<b>2.84</b>	<b>2.72</b>	<b>2.77</b>	<b>2.73</b>	<b>2.97</b>	<b>17.4</b>	<b>3.7</b>	<b>3.3</b>	<b>3.39</b>	NA
Barium	2100	96.2	86.3	92.5	116	106	108	85.4	82.5	81	91.8	97.3	NA
Cadmium	9.1	4.16	2.65	3.61	4.5	5.55	3.92	3.78	7.46	7.47	4.79	6.66	NA
Chromium	10000	117	84.1	117	122	92.1	111	106	150	141	116	152	NA
Lead	400	<b>1320</b>	<b>1430</b>	<b>1140</b>	<b>954</b>	<b>765</b>	<b>810</b>	<b>1460</b>	<b>914</b>	<b>946</b>	<b>791</b>	<b>502</b>	NA
Mercury	0.36	0.0569	0.0548U	0.0532	0.0511	0.0527U	0.0507	0.0601	0.0708	0.0598	0.0598	0.101	NA
Selenium	6.9	1.53	1.37U	1.33	1.35	1.32U	1.24U	1.45	1.33U	1.74	1.42	1.49	NA
Silver	11	0.268U	0.274U	0.245U	0.252U	0.263U	0.247U	0.260U	0.267U	0.267U	0.267U	0.257U	NA
Thallium	0.19	0.268U	0.274U	0.245U	0.252U	0.263U	0.247U	0.260U	0.267U	0.267U	0.267U	0.257U	NA
Zinc	4900	239	212	225	230	208	228	199	292	253	343	345	NA
<b>Detected TCLP Metals (RCRA 8)</b>													
Chromium	5.0 <sup>Note1</sup>	0.200U	0.235	0.200U	0.205	0.28	0.223	0.213	0.208	0.200U	0.200U	0.200U	NA
Lead	5.0 <sup>Note1</sup>	0.783	0.151	0.336	0.141	0.0911	0.114	0.0500U	0.0500U	0.0609	0.106	0.0500U	NA
<b>Petroleum Fuels, Gasoline, Diesel and Residual Range (Oils and Lubricants)</b>													
GRO	260	3.66U	4.07U	3.12U	3.11U	3.44U	3.68U	3.91U	4.07U	3.99U	4.18U	4.07U	2.50U
DRO	230	<b>272</b>	<b>267</b>	157	154	133U	<b>238</b>	201	173	<b>240</b>	108	103	NA
DRO <sup>2-Pre</sup>	230	139	85.9	114	85.1	79.8	191	<b>272</b>	129	129	92.9	<b>236</b>	NA
DRO <sup>2-Post</sup>	230	92.7	54.4U	67.2	54.1	55.6	123	211	80.8	79.2	56.1U	185	NA
RRO	8300	772	749	449	614	437	778	531	520	602	556	331	NA
<b>Percent Solid and Moisture (by weight)</b>													
% Solid	NE	73.9	72.7	74.6	78.5	75.4	77.2	74.6	73.6	72.8	70.3	71.5	NA
% Moisture	NE	26.1	27.3	25.4	21.5	24.6	22.8	25.4	26.4	27.2	29.7	28.5	NA

**Notes:**

- #/SHADE** Analyte detected above the limits of quantification but below the cleanup limits
- #/BOLD** Analyte detected above the limits of quantification and above the cleanup limits
- #/U** Analyte was not detected at the listed limits of quantification
- ID (Dup#)** Denotes duplicate sample pairings
- NA** Sample was not analyzed for this analyte
- NE** Cleanup Limit for analyte has not been established
- Note 1** TCLP results are compared to the U.S. EPA RCRA Waste Regulations Criteria.
- 2-Pre** Second DRO analysis before silica gel cleanup

**Table 2**  
**Laboratory Soil Analysis Results Summary (Detected VOCs)**

Sample ID	ADEC Cleanup Level	TSP1-2	TSP1-4	TSP2-2	TSP2-4	TSP3-2 (Dup1)	TSP20-2 (Dup1)	TSP3-6	TSP4-2	TSP4-6	TSP5-2	TSP5-6	Trip Blank
Analyte	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1,2,4-Trimethylbenzene	0.16	0.0929	0.0917U	0.095U	0.101U	0.0812U	0.0865U	0.0473U	0.0815U	0.0368U	0.0816U	0.0746U	NA
Napthalene	0.038	<b>0.0537</b>	<b>0.067</b>	0.0475U	<b>0.0607</b>	0.0406U	0.0433U	<b>0.0611</b>	0.0407U	<b>0.106</b>	0.0408U	0.0373U	NA
Toluene	6.7	0.0477	0.112	0.0475U	0.0506U	0.0406U	0.0433U	0.0473U	0.0407U	0.0397	0.0408U	0.0373U	NA
Total Xylenes	1.5	0.13	0.138U	0.143U	0.152U	0.122U	0.130U	0.142U	0.122U	0.249	0.122U	0.112U	NA
Trichloro-fluoromethane	41	0.0808U	0.0917U	0.496	0.101U	0.0812U	0.0865U	0.0947U	0.0815U	0.0736U	0.0816U	0.0746U	NA

Sample ID	ADEC Cleanup Level	TSP6-2	TSP6-6 (Dup2)	TSP22-2 (Dup2)	TSP7-2	TSP7-6	TSP8-2	TSP8-6	TSP9-2	TSP9-6	TSP10-2	TSP10-6	Trip Blank
Analyte	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1,2,4-Trimethylbenzene	0.16	0.0366U	0.0815U	0.0623U	0.0622U	0.0689U	0.0735U	0.0783U	0.0814U	0.089	0.0836U	0.0814U	NA
Napthalene	0.038	0.0366U	0.0407U	0.0312U	0.0311U	0.0344U	0.0368U	0.0391U	<b>0.203</b>	<b>1.99</b>	0.0418U	<b>0.044</b>	NA
Toluene	6.7	0.0366U	0.0407U	0.0312U	0.0311U	0.0344U	0.0368U	0.0391U	0.0407U	0.0399U	0.0418U	0.0407U	NA
Total Xylenes	1.5	0.110U	0.122U	0.0935U	0.0932U	0.103U	0.110U	0.117U	0.122U	0.268	0.125U	0.122U	NA
Trichloro-fluoromethane	41	0.0731U	0.0815U	0.0623U	0.0622U	0.0689U	0.0735U	0.0783U	0.0814U	0.0798U	0.0836U	0.0851	NA

**Notes:**

- #/SHADE Analyte detected above the limits of quantification but below the cleanup limits
- #/BOLD Analyte detected above the limits of quantification and above the cleanup limits
- #/U Analyte was not detected at the listed limits of quantification
- ID (Dup#) Denotes duplicate sample pairings
- NA Sample was not analyzed for this analyte



**Table 3**  
**Laboratory Soil Analysis Results Summary (PAHs)**

Sample ID	ADEC Cleanup Level	TSP1-2	TSP1-4	TSP2-2	TSP2-4	TSP3-2 (Dup1)	TSP20-2 (Dup1)	TSP3-6	TSP4-2	TSP4-6	TSP5-2	TSP5-6
Analyte	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1-Methylnaphthalene	0.41	0.0964	0.0712	0.0357U	0.0396	0.0322U	0.0336U	0.0351U	0.0329U	0.033U	0.0349	0.0328U
2-Methylnaphthalene	1.3	0.132	0.104	0.0357U	0.0507	0.0322U	0.0336U	0.0351U	0.0329U	0.033U	0.042	0.0328U
Acenaphthene	37	0.0922	0.0784	0.0357U	0.0609	0.0322U	0.0336U	0.0351U	0.0329U	0.033U	0.0363	0.0328U
Acenaphthylene	18	0.0347U	0.0367U	0.0357U	0.0357U	0.0322U	0.0336U	0.0351U	0.04	0.033U	0.0329U	0.0328U
Anthracene	390	0.168	0.0677	0.0357U	0.0549	0.0322U	0.0518	0.0351U	0.0448	0.0373	0.0341	0.0328U
Benzo(a)Anthracene	0.28	0.168	0.105	0.102	0.0664	0.0889	0.134	0.0708	0.0797	0.0837	0.0534	0.0357
Benzo[a]pyrene	0.27	0.157	0.092	0.0953	0.0597	0.0695	0.0916	0.0632	0.0861	0.0851	0.0429	0.0328U
Benzo[b]Fluoranthene	2.7	0.146	0.123	0.136	0.0927	0.116	0.145	0.0827	0.16	0.135	0.0622	0.0442
Benzo[g,h,i]perylene	15000	0.0877	0.0611	0.0626	0.0398	0.0447	0.0627	0.0401	0.0802	0.0629	0.0329U	0.0328U
Benzo[k]fluoranthene	27	0.049	0.0418	0.0434	0.0357U	0.0339	0.0529	0.0351U	0.0492	0.0389	0.0329U	0.0328U
Chrysene	82	0.216	0.122	0.11	0.104	0.106	0.192	0.0789	0.114	0.112	0.0617	0.0426
Dibenzo[a,h]anthracene	0.87	0.0347U	0.0367U	0.0357U	0.0357U	0.0322U	0.0336U	0.0351U	0.0329U	0.033U	0.0329U	0.0328U
Fluoranthene	590	0.403	0.279	0.261	0.214	0.114	0.144	0.179	0.135	0.145	0.144	0.0954
Fluorene	36	0.116	0.0838	0.0357U	0.0562	0.0322U	0.0336U	0.0351U	0.0329U	0.033U	0.0417	0.0328U
Indeno[1,2,3-c,d] pyrene	8.8	0.0656	0.0502	0.0548	0.0357U	0.0348	0.046	0.0351U	0.062	0.0483	0.0329U	0.0328U
Naphthalene	0.038	<b>0.12</b>	<b>0.106</b>	0.0285U	<b>0.0511</b>	0.0258U	0.0269U	<b>0.0425</b>	0.0263U	0.0264U	<b>0.0406</b>	0.0263U
Phenanthrene	39	0.75	0.315	0.163	0.175	0.0495	0.0804	0.136	0.0628	0.0711	0.14	0.126
Pyrene	87	0.519	0.249	0.214	0.177	0.106	0.131	0.147	0.125	0.135	0.13	0.0873

**Notes:**

- #/SHADE Analyte detected above the limits of quantification but below the cleanup limits
- #/BOLD Analyte detected above the limits of quantification and above the cleanup limits
- #/U Analyte was not detected at the listed limits of quantification
- ID (Dup#) Denotes duplicate sample pairings
- NA Sample was not analyzed for this analyte

**Table 3 Continued**  
**Laboratory Soil Analysis Results Summary (PAHs)**

Sample ID	ADEC Cleanup Level	TSP6-2	TSP6-6 (Dup2)	TSP22-6 (Dup2)	TSP7-2	TSP7-6	TSP8-2	TSP8-6	TSP9-2	TSP9-6	TSP10-2	TSP10-6
Analyte	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1-Methylnaphthalene	0.41	0.0333U	0.0341U	0.0333U	0.0316U	0.0329U	0.0322U	0.188	0.0667	0.665	0.0355U	0.0344U
2-Methylnaphthalene	1.3	0.0333U	0.0341U	0.0358	0.0316U	0.0329U	0.0322U	0.248	0.109	1.33	0.0355U	0.0377
Acenaphthene	37	0.0333U	0.0341U	0.0333U	0.0316U	0.0329U	0.0322U	0.112	0.106	0.941	0.0355U	0.0344U
Acenaphthylene	18	0.0333U	0.0341U	0.0333U	0.0316U	0.0329U	0.0322U	0.0334U	0.0336U	0.0341U	0.0355U	0.0344U
Anthracene	390	0.0333U	0.0341U	0.0371	0.0479	0.0329U	0.0559	0.149	0.075	0.0975	0.0355U	0.0344U
Benzo(a)Anthracene	0.28	0.0463	0.0506	0.0589	0.12	0.0794	0.173	0.424	0.134	0.0778	0.0413	0.102
Benzo[a]pyrene	0.27	0.0431	0.0467	0.0575	0.11	0.055	0.16	0.382	0.108	0.0557	0.0389	0.114
Benzo[b]Fluoranthene	2.7	0.0656	0.0659	0.0679	0.142	0.0814	0.212	0.456	0.15	0.076	0.0563	0.155
Benzo[g,h,i]perylene	15000	0.0333U	0.0341U	0.0398	0.0633	0.0329U	0.0916	0.18	0.0672	0.0384	0.0355U	0.0818
Benzo[k]fluoranthene	27	0.0333U	0.0341U	0.0333U	0.0495	0.0329U	0.0704	0.159	0.0507	0.0341U	0.0355U	0.0543
Chrysene	82	0.0657	0.0647	0.0799	0.148	0.0956	0.207	0.548	0.143	0.11	0.0571	0.165
Dibenzo[a,h]anthracene	0.87	0.0333U	0.0341U	0.0333U	0.0316U	0.0329U	0.0322U	0.0334U	0.0336U	0.0341U	0.0355U	0.0344U
Fluoranthene	590	0.0861	0.0962	0.0894	0.204	0.201	0.286	0.629	0.433	0.311	0.0871	0.211
Fluorene	36	0.0333U	0.0341U	0.0333U	0.0316U	0.0329U	0.0322U	0.132	0.121	0.607	0.0355U	0.0344U
Indeno[1,2,3-c,d] pyrene	8.8	0.0333U	0.0341U	0.0333U	0.0539	0.0329U	0.0825	0.16	0.0574	0.0341U	0.0355U	0.0698
Naphthalene	0.038	0.0266U	0.0273U	0.0266U	0.0252U	0.0263U	0.0257U	0.171	0.154	2.65	0.0284U	0.0502
Phenanthrene	39	0.0414	0.0639	0.0983	0.151	0.0839	0.122	0.593	0.371	0.751	0.0355U	0.141
Pyrene	87	0.0923	0.106	0.115	0.186	0.179	0.263	0.735	0.358	0.254	0.0928	0.188

**Notes:**

- #/SHADE Analyte detected above the limits of quantification but below the cleanup limits
- #/BOLD Analyte detected above the limits of quantification and above the cleanup limits
- #/U Analyte was not detected at the listed limits of quantification
- ID (Dup#) Denotes duplicate sample pairings
- NA Sample was not analyzed for this analyte

**Table 4  
Laboratory Water Analysis Results Summary (Dissolved Metals, Water Parameters and POL)**

Sample ID	ADEC Cleanup Level	W1	W10	W2	W20	W3	W30	MW-3	PT-001	PT-100	Trip Blank
Analyte	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
<b>Dissolved Metals (RCRA 8, Thallim and Zinc)</b>											
Arsenic	0.52 <sup>Note 1</sup>	50.0U	NA	50.0U	NA	50.0U	50.0U	50.0U	NA	NA	NA
Barium	3800 <sup>Note 1</sup>	30.0U	NA	30.0U	NA	30.0U	30.0U	30.0U	NA	NA	NA
Cadmium	92 <sup>Note 1</sup>	5.00U	NA	5.00U	NA	5.00U	5.00U	5.00U	NA	NA	NA
Chromium	22000 <sup>Note 1</sup>	20.0U	NA	20.0U	NA	20.0U	20.0U	20.0U	NA	NA	NA
Lead	15 <sup>Note 1</sup>	12.3	NA	144	NA	14.3	5.26	2.00U	NA	NA	NA
Lead	280.85 <sup>Note 2</sup>	12.3	NA	144	NA	14.3	5.26	2.00U	NA	NA	NA
Lead	10.94 <sup>Note 2</sup>	12.3	NA	144	NA	14.3	5.26	2.00U	NA	NA	NA
Mercury	0.52 <sup>Note 1</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	100 <sup>Note 1</sup>	50.0U	NA	50.0U	NA	50.0U	50.0U	50.0U	NA	NA	NA
Silver	94 <sup>Note 1</sup>	10.0U	NA	10.0U	NA	10.0U	10.0U	10.0U	NA	NA	NA
Thallium	0.2 <sup>Note 1</sup>	10.0U	NA	10.0U	NA	10.0U	10.0U	10.0U	NA	NA	NA
Zinc	6000 <sup>Note 1</sup>	75.6	NA	103	NA	418	371	50.0U	NA	NA	NA
Zinc	379.3 <sup>Note 2</sup>	75.6	NA	103	NA	418	371	50.0U	NA	NA	NA
Zinc	382.4 <sup>Note 2</sup>	75.6	NA	103	NA	418	371	50.0U	NA	NA	NA
<b>Water Quality Parameters (Sulfate, Total Phosphorous and Hardness)</b>											
Sulfate	NE	104000	NA	49700	44300	566000	396000	93700	1590	1580	NA
Phosphorous	NE	739000	NA	584000	833000	2160000	1890000	0.000200U	20U	20U	NA
Calcium	NE	229,000	NA	248,000	NA	400000	464000	53700	NA	NA	NA
Hardness as CaCO3	NE	1380000	NA	1360000	NA	2980000	3740000	148000	NA	NA	NA
Magnesium	NE	197000	NA	179,000	NA	480000	627000	3320	NA	NA	NA
<b>Petroleum Fuels; Gasoline, Diesel and Residual Range Oil and Lubricants</b>											
GRO	2200	208	NA	497	NA	123	113	100U	NA	NA	NA
DRO	1500	5690	6850	7900	NA	3230	NA	566U	NA	NA	NA
RRO	1100	1130	1640	2000	NA	56.3	NA	472U	NA	NA	NA

**Notes:**

- #/SHADE Analyte detected above the limits of quantification but below the cleanup limits
- #/BOLD Analyte detected above the limits of quantification and above the cleanup limits
- #/U Analyte was not detected at the listed limits of quantification
- ID (Dup#) Denotes duplicate sample pairings
- NA Sample was not analyzed for this analyte
- NE Cleanup Limit for analyte has not been established
- Note 1 Cleanup level for analyte in groundwater
- Note 2 Acute and Chronic Cleanup Level Calculations are based on Appendix A of the Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances

**Table 5**  
**Laboratory Water Analysis Results Summary (Detected VOCs)**

Sample ID	ADEC Cleanup Level	W1	W10	W2	W20	W3	W30	MW-3	PT-001	PT-100	Trip Blank
Analyte	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
1,2,4-Trimethylbenzene	15	4.27	NA	4.09	NA	2.63	2.57	1.00U	NA	NA	NA
1,3,5-Trimethylbenzene	120	1.45	NA	1.37	NA	1.00U	1.00U	1.00U	NA	NA	NA
2-Butanone(MEK)	5600	296	NA	301	NA	565	571	10.0U	NA	NA	NA
2-Hexanone	380	39.8	NA	24.8	NA	115	99	10.0U	NA	NA	NA
4-Isopropyltoluene	NE	1.00U	NA	1.15	NA	1.00U	1.00U	1.00U	NA	NA	NA
4-Methyl-2-pentanone(MIBK)	6300	49.3	NA	51.5	NA	43.1	49.5	10.0U	NA	NA	NA
Benzene	46	2.95	NA	3.61	NA	2.07	2.2	0.400U	NA	NA	NA
Dichlorodifluoromethane	200	9.55	NA	1.49	NA	1.00U	1.00U	1.00U	NA	NA	NA
Ethylbenzene	15	1.5	NA	2.62	NA	1.01	1.00U	1.00U	NA	NA	NA
Naphthalene	1.7	<b>5.49</b>	NA	<b>18.5</b>	NA	<b>4.02</b>	<b>3.43</b>	1.00U	NA	NA	NA
Toluene	1100	45.2	NA	248	NA	4.51	5.28	1.00U	NA	NA	NA
P&M-Xylene	NE	4.9	NA	4.75	NA	3.59	3.29	2.00U	NA	NA	NA
O-Xylene	NE	2.86	NA	2.68	NA	2.56	2.36	1.00U	NA	NA	NA
Total Xylenes	190	7.76	NA	7.43	NA	6.15	5.65	3.00U	NA	NA	NA
Trichlorofluoromethane	5200	1.00U	NA	3.06	NA	4.25	4.62	1.00U	NA	NA	NA

**Notes:**

**#/SHADE**

Analyte detected above the limits of quantification but below the cleanup limits

**#/BOLD**

Analyte detected above the limits of quantification and above the cleanup limits

**#/U**

Analyte was not detected at the listed limits of quantification

**NE**

Cleanup Limit for analyte has not been established

**Table 6**  
**Laboratory Water Analysis Results Summary (Detected SVOCs)**

Sample ID	ADEC Cleanup Level	W1	W10	W2	W20	W3	W30	MW-3	PT-001	PT-100	Trip Blank
Analyte	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
3&4 Methylphenol (p&m-cresol)	930 <sup>Note1</sup>	NA	NA	557	NA	213	NA	NA	NA	NA	NA
Benzoic acid	75000	NA	NA	1590	NA	292	NA	NA	NA	NA	NA
Phenol	5800	NA	NA	397	NA	82.6	NA	NA	NA	NA	NA

**Notes:**

#/SHADE Analyte detected above the limits of quantification but below the cleanup limits

NA Sample was not analyzed for this analyte

**Note 1** Listed cleanup limit is for m-cresol which is more stringent than cleanup limit for p-cresol (1.9 mg/L)

**Table 7**  
**Quality Control Summary; Duplicate Pair Analysis**

Soil Duplicate Pair 1					
Sample ID	TSP3-2	TSP20-2	Difference	Average	RPD
Analyte	mg/kg	mg/kg	mg/kg	mg/kg	%
GRO	ND	ND	NA	NA	NA
DRO	169	284	115	226.5	50.8%
RRO	695	1200	505	947.5	53.3%
Arsenic	6.67	9.94	3.27	8.305	39.4%
Barium	104	144	40	124	32.3%
Cadmium	4.87	6.52	1.65	5.695	29.0%
Chromium	96.9	123	26.1	109.95	23.7%
Lead	2980	6250	3270	4615	70.9%
Mercury	0.144	0.147	0.003	0.1455	2.1%
Selenium	ND	ND	NA	NA	NA
Silver	0.246	ND	NA	NA	NA
Thallium	ND	ND	NA	NA	NA
Zinc	386	445	59	415.5	14.2%
TCLP Chromium	ND	ND	NA	NA	NA
TCLP Lead	0.085	0.0815	0.0035	0.08325	4.2%
1-Methylnaphthalene	ND	ND	NA	NA	NA
2-Methylnaphthalene	ND	ND	NA	NA	NA
Acenaphthene	ND	ND	NA	NA	NA
Acenaphthylene	ND	ND	NA	NA	NA
Anthracene	ND	0.0518	NA	NA	NA
Benzo(a)Anthracene	0.0889	0.134	0.0451	0.11145	40.5%
Benzo[a]pyrene	0.0695	0.0916	0.0221	0.08055	27.4%
Benzo[b]Fluoranthene	0.116	0.145	0.029	0.1305	22.2%
Benzo[g,h,i]perylene	0.0447	0.0627	0.018	0.0537	33.5%
Benzo[k]fluoranthene	0.0339	0.0529	0.019	0.0434	43.8%
Chrysene	0.106	0.192	0.086	0.149	57.7%
Dibenzo[a,h]anthracene	ND	ND	NA	NA	NA
Fluoranthene	0.114	0.144	0.03	0.129	23.3%
Fluorene	ND	ND	NA	NA	NA
Indeno[1,2,3-c,d] pyrene	0.0348	0.046	0.0112	0.0404	27.7%
Naphthalene	ND	ND	NA	NA	NA
Phenanthrene	0.0495	0.0804	0.0309	0.06495	47.6%
Pyrene	0.106	0.131	0.025	0.1185	21.1%
Note: No VOC compounds were detected in either the Primary or Duplicate sample					

Soil Duplicate Pair 2					
Sample ID	TSP6-6	TSP22-6	Difference	Average	RPD
Analyte	mg/kg	mg/kg	mg/kg	mg/kg	%
GRO	4.07U	3.12U	NA	NA	NA
DRO	267	157	110	212	51.9%
RRO	749	449	300	599	50.1%
Arsenic	3.85	2.84	1.01	3.345	30.2%
Barium	86.3	92.5	6.2	89.4	6.9%
Cadmium	2.65	3.61	0.96	3.13	30.7%
Chromium	84.1	117	32.9	100.55	32.7%
Lead	1430	1140	290	1285	22.6%
Mercury	ND	0.0532	NA	NA	NA
Selenium	ND	1.33	NA	NA	NA
Silver	ND	ND	NA	NA	NA
Thallium	ND	ND	NA	NA	NA
Zinc	212	225	13	218.5	5.9%
TCLP Chromium	0.235	ND	NA	NA	NA
TCLP Lead	0.151	0.336	0.185	0.2435	76.0%
1-Methylnaphthalene	ND	ND	NA	NA	NA
2-Methylnaphthalene	ND	0.0358	NA	NA	NA
Acenaphthene	ND	ND	NA	NA	NA
Acenaphthylene	ND	ND	NA	NA	NA
Anthracene	ND	0.0371	NA	NA	NA
Benzo(a)Anthracene	0.0506	0.0589	0.0083	0.05475	15.2%
Benzo[a]pyrene	0.0467	0.0575	0.0108	0.0521	20.7%
Benzo[b]Fluoranthene	0.0659	0.0679	0.002	0.0669	3.0%
Benzo[g,h,i]perylene	ND	0.0398	NA	NA	NA
Benzo[k]fluoranthene	ND	ND	NA	NA	NA
Chrysene	0.0647	0.0799	0.0152	0.0723	21.0%
Dibenzo[a,h]anthracene	ND	ND	NA	NA	NA
Fluoranthene	0.0962	0.0894	0.0068	0.0928	7.3%
Fluorene	ND	ND	NA	NA	NA
Indeno[1,2,3-c,d] pyrene	ND	ND	NA	NA	NA
Naphthalene	ND	ND	NA	NA	NA
Phenanthrene	0.0639	0.0983	0.0344	0.0811	42.4%
Pyrene	0.106	0.115	0.009	0.1105	8.1%

Note: No VOC compounds were detected in either the Primary or Duplicate sample

Pore Water Duplicate Pair 1					
Sample ID	W1	W10	Difference	Average	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
DRO	5.69	6.85	1.16	6.27	18.5%
RRO	1.13	1.64	0.51	1.385	36.8%
Pore Water Duplicate Pair 2					
Sample ID	W2	W20	Difference	Average	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
Sulfate	49.7	44.3	5.4	47	11.5%
Phosphorous	584	833	249	708.5	35.1%
Pore Water Duplicate Pair 3					
Sample ID	W3	W30	Difference	Average	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
GRO	0.123	ND	NA	NA	NA
Arsenic	ND	ND	NA	NA	NA
Barium	ND	ND	NA	NA	NA
Cadmium	ND	ND	NA	NA	NA
Chromium	ND	ND	NA	NA	NA
Lead	0.0143	0.00526	0.00904	0.00978	92.4%
Mercury	ND	ND	NA	NA	NA
Selenium	ND	ND	NA	NA	NA
Silver	ND	ND	NA	NA	NA
Thallium	ND	ND	NA	NA	NA
Zinc	0.418	0.371	0.047	0.3945	11.9%
Sulfate	566	396	170	481	35.3%
Phosphorous	2160	1890	270	2025	13.3%
Calcium	400	464	64	432	14.8%
Hardness as CaCO3	2980	3740	760	3360	22.6%
Magnesium	480	627	147	553.5	26.6%
1,2,4-Trimethylbenzene	0.00263	0.00257	6E-05	0.0026	2.3%
1,3,5-Trimethylbenzene	ND	ND	NA	NA	NA
2-Butanone(MEK)	0.565	0.571	0.006	0.568	1.1%
2-Hexanone	0.115	0.099	0.016	0.107	15.0%
4-Isopropyltoluene	ND	ND	NA	NA	NA
4-Methyl-2-pentanone(MIBK)	0.0431	0.0495	0.0064	0.0463	13.8%
Benzene	0.00207	0.0022	0.00013	0.002135	6.1%
Dichlorofluoro-methane	ND	ND	NA	NA	NA
Ethylbenzene	0.00101	ND	NA	NA	NA
Naphthalene	0.00402	0.00343	0.00059	0.003725	15.8%
Toluene	0.00451	0.00528	0.00077	0.004895	15.7%
P&M Xylene	0.00359	0.00329	0.0003	0.00344	8.7%
O-Xylene	0.00256	0.00236	0.0002	0.00246	8.1%
Total Xylenes	0.00615	0.00565	0.0005	0.0059	8.5%
Trichloro-fluoromethane	0.00425	0.00462	0.00037	0.004435	8.3%



Surface Water Duplicate Pair 4					
Sample ID	PT-001	PT-100	Difference	Average	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
Sulfate	1.59	1.58	0.01	1.585	0.6%
Phosphorous	ND	ND	NA	NA	NA

Notes:

ND

Analyte not detected at the laboratory detection limit

NA

The calculation is not applicable.

RPD

Relative percent difference

**Table 8**  
**Water Quality Monitoring Results Summary**

Sampling Location	Monitoring Well MW-03 (at DNR Pit #2)							
Water Parameter	Time	1205	1208	1210	1212	1215	1217	1220
Temperature ©		1.8	1.81	1.81	1.82	1.82	1.81	1.81
Specific Conductivity (mS/cm3)		0.314	0.309	0.307	0.308	0.305	0.306	0.307
Conductivity (µS/cm)		174	171	171	172	170	171	171
Dissolved O2 (%)		4.4	2.9	2.4	2.3	1.9	2.0	2.0
Dissolved O2 (mg/L)		0.59	0.36	0.31	0.29	0.27	0.28	0.28
pH		6.89	6.91	7.01	7.01	6.91	6.91	6.91
ORP		69.3	20.7	-3.0	-20.2	-22.2	-22.8	-27.6

Sampling Location	Tributary Stream Down-gradient from DNR Pit #2				
Water Parameter	Time	1342	1345	1348	1351
Temperature ©		0.65	0.63	0.63	0.63
Specific Conductivity (mS/cm3)		0.038	0.013	0.01	0.011
Conductivity (µS/cm)		10	7	5	5
Dissolved O2 (%)		103.7	101.4	101.4	101.3
Dissolved O2 (mg/L)		14.88	14.56	14.57	14.57
pH		3.94	3.78	3.63	3.66
ORP		325	341.4	340	341.1

Sampling Location	W3 Pore Water (Ex-Situ Monitoring Results)						
Water Parameter	Time	1542	1545	1548	1551	1555	1640
Temperature (°C)		14.69	15.00	15.05	15.01	15.00	15.11
Specific Conductivity (mS/cm3)		1.774	1.82	1.82	1.823	1.826	1.825
Conductivity (µS/cm)		1427	1472	1472	1474	1474	1472
Dissolved O2 (%)		53.7	35.4	32.7	44.4	39.5	41.4
Dissolved O2 (mg/L)		5.69	3.81	3.8	4.43	3.99	4.33
pH		5.44	5.44	5.44	5.44	5.43	5.44
ORP		-10.9	-27.2	-30.9	-34.8	-36.4	-46.9

Notes

All readings recorded using a YSI 556 Multi-parameter Water Meter

Table 9  
Pore Water Extraction Data

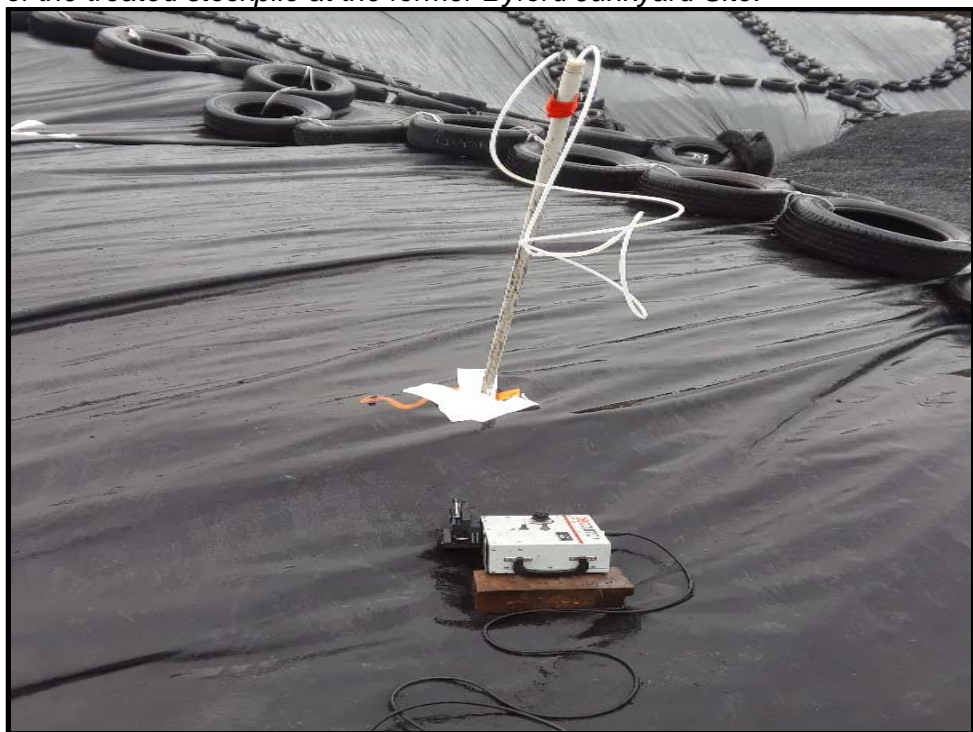
Sampling Location		W1	W2	W3	Notes
Date	Event	Approximate Volume Extracted (mL)			
3/23/2018	p.m.	350	350	50	Day of installation-all very turbid
3/24/2018	a.m.	1100	1100	750	
3/24/2018	p.m.	400	650	500	
3/25/2018	a.m.	300	350	1100	
3/25/2018	p.m.	400	350	800	after ~5 hr. vacuum on casing
3/26/2018	p.m.	200	350	700	
3/27/2018	p.m.	180	350	800	
Total Volume Extracted		2930	3500	4700	



APPENDIX 3  
PHOTO PAGES



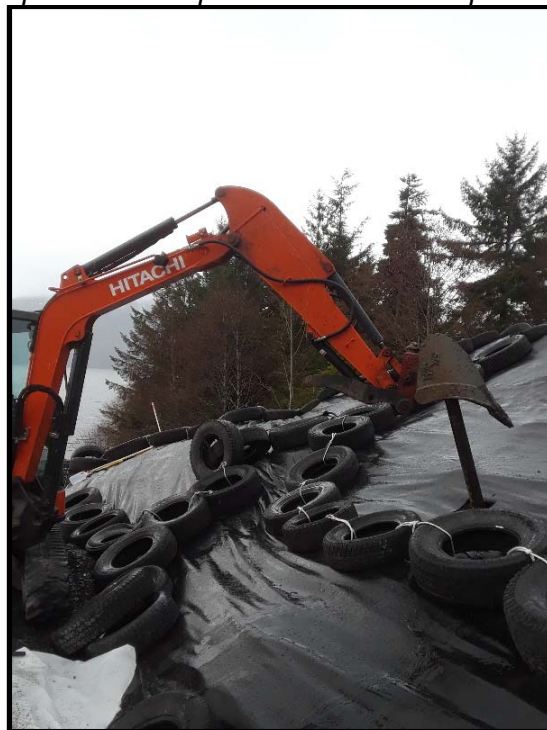
**Photo 1:** Looking northwest at the pore water sampling points installed in the southwestern corner of the treated stockpile at the former Byford Junkyard Site.



**Photo 2:** Looking east at sampling point W3 at the Byford Junkyard Site being prepared for pore water purging and sample collection.



**Photo 3:** Looking east at sampling point W3 at the Byford Junkyard Site. Note vacuum suction being applied to sample point in attempt to draw additional pore water for sample collection.



**Photo 4:** Looking southwest during the soil sampling of TSP-10. Note mini excavator used to advance steel pipe into the stockpile to desired depth. Pipe was then removed and a hand auger was used for collection of soil for analysis at desired depth interval(s).



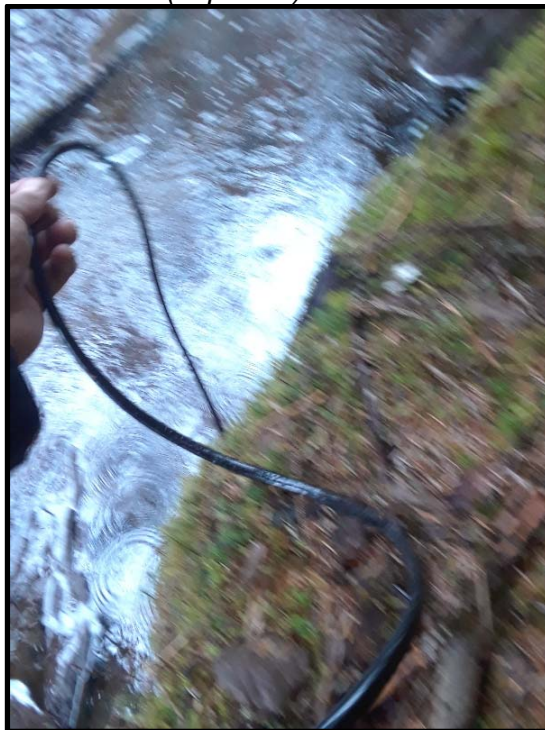
**Photo 5:** Looking south at MW-3 in DNR Pit #2 (Monofill Site) during well purging and water quality monitoring.



**Photo 6:** Looking southeast at surface water sample collection location (PT-001) in the principal tributary located down-gradient of the Monofill Site. Note the low volume of water in the stream at time of sampling.



**Photo 7:** Looking south at location where water from the forested wetland and muskeg meadow(s) conflues the principal tributary down-gradient from the Monofill Site. Surface water samples PT-001 and PT-100 (duplicate) were collected at far right of image.



**Photo 8:** Looking south during water quality monitoring of the principal tributary down-gradient from the Monofill Site. Note this location is approximately 50 feet downstream from sampling location PT-001 at the nearest location deep enough to submerge the instrument probe.





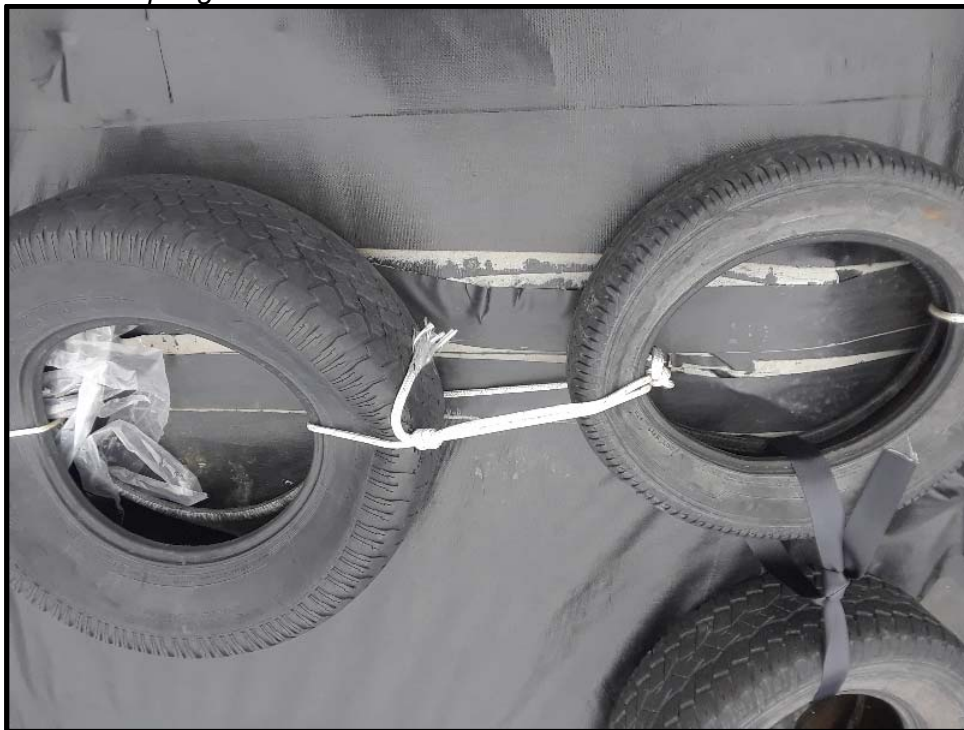
**Photo 9:** Looking down at pore water sampling point W1 after cutting and capping the PVC casing and tape repairs to the stockpile covering.



**Photo 10:** Looking north at the treated stockpile prior to investigation. Note the tires piled up near the toe of the stockpile slope which resulted when snow load on the stockpile shifted the securing "tire chains" during the winter/spring of 2018.



**Photo 11:** Looking northwest at the treated stockpile and location of TSP-2 after tape repairs to the stockpile cover. Note wrinkles in the cover resulting from tire shifting that occurred during the winter/spring of 2018.



**Photo 12:** Looking down at one of the taped seams on the stockpile covering. Note the apparent stress on the taped seam resulting from the shifting of the tires and stockpile cover which occurred during the winter/spring of 2018.