Remedial Action Report
Wrangell Junkyard
Wrangell, Alaska

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Prepared for:

State of Alaska
Department of Environmental Conservation
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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADNR	Alaska Department of Natural Resources
AMHT	Alaska Mental Health Trust
AL	Action Level (concentration requiring regulatory action)
BDL	Below detection limit
bgs	Below ground surface
BMP	Best Management Practice
BTEX	Benzene, Toluene, Ethyl Benzene, Xylene
CBW	City and Borough of Wrangell
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System (EPA)
CS	Contaminated Sites (ADEC)
CY	Cubic yard(s)
DCRA	Division of Community and Regional Affairs (Alaska)
DL	Detection Limit (i.e., maximum method detection limit)
DMR	Discharge Monitoring Report (APDES)
DOT	United States Department of Transportation
DRO	Diesel range organics
E&E	Ecology and Environment, Inc.
EMP	Environmental Management Plan
EPA	United States Environmental Protection Agency
FSAL	Field Screening Action Level
FSG	Field Sampling Guidance (ADEC)
GPS	Global Positioning System
ICP	Inductively Coupled Plasma (Mass Spectrometry)
IRAP	Interim Remedial Action Plan
JWO	Job Work Order (NRC Alaska)
LDPE	Low Density Polyethylene
LDRC	Laboratory Data Review Checklist (ADEC)
LOQ	Limit of Quantitation (the reporting or practical quantitation limit)
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
N	North
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOT	Notice of Termination
NTP	Notice to Proceed
PAH	Polycyclic Aromatic Hydrocarbons
PA-SI	Preliminary Assessment - Site Investigation

Pb	Lead
PCB	Polychlorinated Biphenyls
PID	Photoionization detector
POL	Petroleum, oil and lubricants
ppm	parts per million
QA/QC	Quality Assurance and Quality Control
QEP	Qualified Environmental Professional
RCRA	Resource Conservation and Recovery Act (EPA)
REC	Recognized Environmental Condition
RP	Responsible Party
RPD	Relative Percent Difference (between field and lab tested duplicate samples)
RRO	Residual range organics
SAP	Sampling and Analysis Plan
SCP	Site Control Plan
SCTP	Site Characterization Test Pit
SDS	Safety Data Sheet (formerly MSDS)
SGS	SGS Environmental Services, Inc.
SPAR	Spill Prevention and Response (ADEC)
SPLP	Synthetic Precipitation Leaching Procedure
SSHASP	Site Specific Health and Safety Plan
START	Superfund Technical Assessment and Response Team (EPA)
SQuiRT	Screening Quick Reference Tables (NOAA)
SVOC	Semi-volatile organic compound
TBA	Targeted Brownfields Assessment
TCLP	Toxicity Characteristic Leaching Procedure
TEL	Threshold Effects Level
USCG	United States Coast Guard
USS	United States Survey
VOC	Volatile organic compound
W	West
WMP	Waste Management Plan
XRF	X-ray Fluoroscope

1.0 EXECUTIVE SUMMARY

The Alaska Department of Environmental Conservation (ADEC) contracted NRC Alaska LLC (NRC Alaska) to conduct a Remedial Action at the Wrangell Junkyard Site under the Spill Prevention and Response (SPAR) Term Contract 18-7002-01. The City and Borough of Wrangell is located on Wrangell Island in Southeast Alaska, with the City at the northern end of the island, near the mouth of the Stikine River. The Wrangell Junkyard (Site) is located south of the City, at Mile 4 of the Zimovia Highway. The edge of the highway right-of-way is the southern boundary of the Site, and lies adjacent to the marine waters of Zimovia Strait, an area where residents and visitors routinely harvest clams and mussels.

Lead (Pb) was the primary contaminant of concern at the Site. Previous investigations found lead concentrations of up to 155,000 mg/Kg in surface soil and concentrations up to 8,440 mg/Kg at 3.0 feet below ground surface. These investigations also confirmed that the lead was leachable (i.e., mobile) and posed a significant threat to residents on adjacent properties and biological resources in the marine waters of Zimovia Strait. Drums, debris, and pockets of POL contamination were also identified in multiple locations across the Site. The approved Remedial Action Plan called for the excavation, removal of debris and oversized fraction, chemical treatment, and off-site disposal of the contaminated soil.

Initial remedial action at the Site began in February 2016 with the installation of SWPPP measures, removal of drums, visible lead plates and other surface debris and vegetation from the Site. NRC Alaska began excavating contaminated material closest to Zimovia Highway to develop clean access to the Site. The initial observations and laboratory results showed that lead contamination extended to the glacial till, up to six feet below grade, across the Site. This increased the expected quantity of contaminated soil to 19,000 cubic yards, significantly higher than the 4,000 cubic yards described in the project documents. The total included approximately 300 cubic yards from adjoining land owned by the Alaska Mental Health Trust (AMHT), and a total of approximately 620 cubic yards from the two neighboring residential properties.

Based on the increased quantities, excavation and treatment occurred as planned and the soil was placed in lined, engineered containment cells on the Site instead of being shipped out of state. Approximately 18,350 cubic yards of treated soil is stockpiled in containment cells at the Site. This material has been treated with ECOBOND®, and TCLP and SPLP results confirm the lead in the containment cells is non-leachable and non-hazardous. Oversized rocky material (6”+) was segregated and used as backfill in the northeast portion of the Site. Other debris consisted mainly of automotive parts, including axles, tires, engine blocks and transmissions, which were loaded into shipping containers with POL contaminated soils for off-site disposal. NRC Alaska burned woody debris at the former Wrangell Institute site and ash was disposed of with other debris. NRC Alaska shipped a total of 22 drums and 57 containers contaminated debris from the Site to appropriately permitted facilities in the Lower 48.

This report details the remediation activities that occurred at the Wrangell Junkyard Site, from the beginning of the Interim Remedial Action Phase that began in February 2016, through project completion and demobilization in early August 2016. The closure samples show that the residential cleanup criteria of 400 mg/kg has been attained at the excavation limits with the AMHT land, the adjacent residential properties, and the ADOT&PF right-of-way. Based on these results, NRC Alaska has successfully completed the requested cleanup at the Site.

2.0 INTRODUCTION

2.1 Purpose

This Remedial Action Report describes the cleanup actions completed at the Wrangell Junkyard Site (the Site) located at Mile 4 of the Zimovia Highway, adjacent to Zimovia Strait in Wrangell, Alaska. Environmental sampling conducted in 2000 and 2002 identified high levels of lead (Pb) in surface soils, elevated concentrations of lead in surface water and groundwater, and trace concentrations of lead and other metals in sediments and bi-valve tissue in the intertidal area downgradient of the site. The City and Borough of Wrangell (CBW) has advised residents who might clam on the beach in near the Wrangell Junkyard Site that shellfish harvested in this area may contain lead and other contaminants transported by storm water run-off.

The ADEC contracted NRC Alaska under the SPAR Term Contract 18-7002-01. NRC Alaska contracted ***NORTECH*** Environment, Health and Safety Services (***NORTECH***) to perform environmental sampling during excavation of contaminated debris and near surface soils, prior to onsite treatment of lead contaminated soil, and after treatment of excavated soil at the Site. These tasks were overseen by ***NORTECH*** Qualified Environmental Professionals Ronald Pratt and Jennifer Stoutamore.

Site activities were carefully planned and executed to prevent accidental or inadvertent releases of contaminants to adjacent properties or Zimovia Strait from hazardous materials and debris at the Site (e.g., drums, batteries, soil, etc.), and from on-site equipment used during the remedial action (e.g., fuel, lubricants, coolants, etc.).

2.2 Project Design and Objectives

ADEC's primary goal for this project was to reduce the risk posed to human health and the environment from environmental contamination generated by historic junkyard operations. Cleanup of the Site occurred in two phases:

- Interim Removal Action
- Remedial Action

2.2.1 Project Planning Documents

NRC Alaska conducted Remedial Action activities in accordance with the requirements of two permits:

- General Permit for Discharges from Large and Small Construction Activities (Construction General Permit) - Permit authorization # AKR10FG27
- Alaska Pollutant Discharge Elimination System General Permit for Excavation Dewatering General Permit (Dewatering Permit) - Permit authorization # AKG002040

ADEC also reviewed and approved numerous planning documents prior to initiation of site cleanup actions. These work plans included:

- The *Storm Water Pollution Prevention Plan for Contaminated Soil & Hazardous Materials Cleanup, Shipment & Disposal, Wrangell Junkyard Site,* dated January 14, 2016 and included as Appendix 9.

- *Interim Removal Action Plan* (IRAP) prepared by NRC Alaska and ***NORTECH***, dated January 16, 2016 and included in Appendix 13
- The *Site Cleanup Plan (SCP), Wrangell Junkyard, Wrangell, Alaska,* dated April 4, 2016, Appendix 13.

Section 2.3 and Section 2.4 provide additional details about project permits and planning documents, respectively.

2.3 Project Permits

2.3.1 Construction General Permit

The Alaska Construction General Permit (CGP) authorizes discharges of storm water, and some non-storm water, from construction sites in which the total disturbed ground equals or exceeds one acre and run off from the site will enter waters of the U.S. The CGP was necessary due to the projected total disturbed ground on the site exceeding one acre and the Site's proximity to Zimovia Strait, a water of the U.S. NRC Alaska filed a Notice of Intent (NOI) form for coverage under the CGP in February 2016. ADEC approved the NOI on February 22, 2016. The project was assigned CGP authorization number AKR10FG27.

The CGP requires a permitee to install and implement erosion and sediment control measures throughout the Site to the extent practicable. While the CGP details the requirements for these control measures, it also details the requirements of the SWPPP. The SWPPP describes the specific erosion and sediment control measures actually used on Site. Section 2.4.1 and Appendix 9 provide information on the SWPPP.

As applicable to this project, the CGP requires a permitee to, at a minimum:

- Select, design, and install erosion control and sediment control measures (control measures) on Site
- Control storm water discharges and flow rates by:
    - Diverting storm water around the site when possible
    - Slow the flow of storm water on site to decrease erosion of exposed soils
- Minimize discharge of sediment into nearby water bodies
- Stabilize or cover soil stockpiles and protect with sediment control measures
- Minimize non-storm water discharges that are authorized by the permit
- Permanently stabilize soil after excavation
- Maintain control measures used on site
- Periodically inspect control measures used on site
- Employ corrective actions when a control measures is not working properly

A ***NORTECH*** CESCL (Certified Erosion and Sedimentation Control Lead) inspected erosion and sediment control measures at least once a week. Appropriate corrective actions occurred when a control measure was inadequate, required repair or replacement, or was no longer needed due to permanent stabilization of an area. The CESCL logged corrective actions in a SWPPP appendix. The remaining requirements of the CGP are dealt with in the SWPPP, and further discussed in Section 6.2 and Appendix 9 of this report.

Final stabilization of the Site, as defined in 4.5.2 of the CGP, was achieved on July 27, 2016. In compliance with Section 10.2.1 of the CGP, NRC Alaska filed a Notice of Termination (NOT) on August 19, 2016. A full copy of the Construction General Permit, NOI and NOT, is available in Appendix 10.

2.3.2 Excavation Dewatering General Permit

Previous studies conducted by E&E found elevated levels of lead within water draining from the Site. In order to address the contaminated water and aid with storm water management, NRC Alaska installed a water treatment system (WTS) on site. Section 4.5.4 provides more information on the WTS. An Alaska Pollutant Discharge Elimination System (APDES) General Permit for Excavation Dewatering (Dewatering Permit) stipulated requirements for sampling and discharge of the WTS.

NRC Alaska filed an APDES Dewatering Permit NOI in April 2016. The ADEC Division of Water approved the NOI on April 15, 2016, and issued Dewatering Permit authorization number AKG002040 for the project.

As it pertains to the project, at a minimum the Dewatering Permit requires:

- Discharges to meet Alaska Water Quality Standards in 18 AAC 70
- Select, install, implement and maintain control measures at the Site
- Discharge waters free of any additives
- Contact ADEC Division of Spill Response if a petroleum sheen occurs on discharged waters
- Compliance with applicable testing methods and frequencies
- Compliance with applicable reporting requirements

The CESCL inspected control measures at least once a week. Appropriate corrective actions occurred when a control measure was inadequate, required repair or replacement, or was no longer needed due to permanent stabilization of an area. The CESCL logged corrective actions in a SWPPP appendix.

Weekly sampling of the WTS and Zimovia Strait ensured that discharges met the Alaska Water Quality Standards for discharges to land surface. Laboratory samples complied with permit listed testing methods and were conducted by an ADEC approved laboratory. NRC Alaska submitted monthly reports to ADEC using the Discharge Monitoring Report (DMR) form to meet reporting requirements. The WTS was decommissioned beginning on July 2, 2016. NRC Alaska filed a NOT on July 11, 2016.

2.4 Supporting Project Documents

2.4.1 Storm Water Pollution Prevention Plan

The SWPPP describes measures to minimize erosion and reduce or eliminate the discharge of pollutants, such as sediment carried in storm water runoff, from the Site through implementation of appropriate control measures. Significant portions of the SWPPP were installed and implemented during Interim Removal activities, including the following activities and best management practices (BMPs):

- Installation of various BMPs to minimize sediment runoff into the culverts that cross beneath Zimovia Highway
- Re-contouring on-site drainages to eliminate and/or reduce water run-on

Installation, maintenance, and removal of BMPs across the Site continued throughout the duration of the project. NRC Alaska crews removed the temporary BMPs prior to demobilization from the Site. Closure of the permit AKR10FG27 was obtained when the Notice of Termination was filed by NRC Alaska on August 19, 2016.

2.4.2 Interim Remedial Action Plan and Site Control Plan (IRAP-SCP)

The primary IRAP objectives were to remove major contaminant sources and prepare the Site for Remedial Action operations. ADEC reviewed and approved the IRAP prior to field mobilization on February 20, 2016. Specific tasks performed during the IRAP included:

- Verification of the project area by site surveying
- Site grubbing to clear trees and vegetation from areas for remediation
- Implementation of Storm Water Pollution Prevention Plan (SWPPP) control measures
- Collection, characterization, and preparation of drum wastes for shipment and offsite treatment and disposal
- Collection of batteries and battery fragments from the ground surface in preparation for shipment and offsite treatment and disposal
- Collection and offsite disposal of solid waste, such as tires, lumber, concrete, and stumps
- Excavation of contaminated surface material from the area being prepped for use as a staging/ storage/ laydown area during Remedial Action activities
- Verification of existing characterization data for lead, petroleum, and VOC contamination in order to conduct final planning for Remedial Action operations

2.4.3 Revised Site Cleanup Plan (SCP)

ADEC's goal for the Remedial Action was to achieve complete cleanup by removing lead contaminated soil and other hazardous materials from the Site to meet residential land use standards. Achieving this goal meant excavating soil with lead concentrations greater than 400 mg/kg. When ADEC expanded the scope of work to address the increased volume of contaminated soils, NRC Alaska and ***NORTECH*** prepared and submitted a revised site cleanup plan (SCP) on April 4, 2016 for ADEC approval.

The revised SCP described how the overall Site cleanup would be conducted during Remedial Action operations. It also included the following supporting documents:

- Soil Treatment Plan: NRC Alaska contracted with MT2 Environmental Solutions for Life to prepare the *Ex-Situ ECOBOND® Treatment: Lead-Impacted Soils, Wrangell Junkyard* plan. This plan describes how chemical stabilization treatment of lead-contaminated soils would progress in order for treated soils to meet the RCRA TCLP requirement of less than 5.0 mg/L Pb to allow for classification as a non-hazardous solid waste.

- Site Specific Health and Safety Plan (SSHASP): The SSHASP includes an analysis of site-specific hazards and describes the programmatic approach to plan for hazardous conditions and protect site workers during remedial operations. Site workers were HAZWOPER certified. Blood testing of lead levels was also required for site workers that spent more than four weeks onsite, to ensure that adequate protection measures were taken to prevent uptake of lead to site workers.
- Waste Management Plan (WMP): The WMP includes descriptions of the waste characterization process NRC Alaska utilized in the identification, segregation, shipping, and disposal of various waste streams, such as RCRA-regulated hazardous wastes versus non-hazardous solid wastes.
- Sampling and Analysis Plan (SAP): The SAP described the methodology for collecting and analyzing interim and final soil samples from the excavation areas to verify that excavated portions of the Site met regulatory requirements following completion of the remedial action.

2.4.4 Regulatory Requirements and Guidance

In addition to the procedures described in the site-specific planning documents identified in the above sections, project-related activities, including soil excavation, transportation, treatment/disposal, and associated field screening and analytical sampling were performed in general accordance with:

- ADEC 18 AAC 70, Water Quality Standards
- ADEC 18 AAC 75, Oil and Hazardous Substance Pollution Control
- ADEC 18 AAC 83, Alaska Pollutant Discharge Elimination System Program
- ADEC Draft Field Sampling Guidance (2011)

3.0 SITE BACKGROUND AND PHYSICAL SETTING

The Wrangell Junkyard Site is located on Wrangell Island, near the southern end of Alaska's panhandle region.

3.1 Site Environmental Setting

Wrangell Island is located within the Tongass National Forest, a coastal temperate rainforest with the dominant tree species being Sitka spruce, western hemlock and yellow cedar. The Site backs up to heavily forested land to the north.

3.1.1 Climate

Wrangell Island is located within the southeast maritime climate zone, characterized by cool summers, mild winters and heavy rain throughout the year. The area averages approximately 80 inches of precipitation per year, most of that falling as rain or snow during the period between August and March.

3.1.2 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. Soils at the site consist of Kupreanof-Mitkof complex on 5% to 35% slopes. This soil forms from colluvium over glacio-fluvial deposits typically found on mountains and till plains, and considered somewhat poorly drained.

The typical soil profile consists of strongly acid, silt loam from 0 to 1 inch below ground surface (bgs) and strongly acid, gravelly sandy loam from 1 to 8 inches bgs. These upper layers are underlain by strongly acid, gravelly coarse sandy loam from 8 to 25 inches bgs; and strongly acid, gravelly sandy loam from 25 to 60 inches. The soil layers are underlain by bedrock comprised of Cretaceous and Jurassic-age, fine-grained, rhythmically bedded, graywacke turbidities of the Seymour Canal Formation. This metamorphic formation has been recrystallized regionally to sericitic slate or subphyllite, with isoclinal folding and kink bands. The depth to bedrock varies, but is generally encountered at less than 25 feet bgs (E&E, 2001).

The soil profile found during Site activities 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 with metal debris 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 site.

3.1.3 Hydrology

The Site had slopes up to 18%, which created the potential for erosion from precipitation and surface water run-on and run-off. In addition, groundwater in this area is usually shallow with variable depths due to the presence of the glacial till that controls groundwater flow. Although ground water exists within surficial sediments and bedrock surrounding Wrangell, there is no known substantial ground water supply capable of sustaining the entire community of Wrangell (Cederstrom 1952). However, domestic wells supplied drinking water to residences near the site prior to the City of Wrangell providing municipal water to this area. Presently, these wells are no longer in use.

Prior to the Remedial Action, the Site had a man-made water retention pond, small drainage channels, and an existing drainage ditch that transmitted storm water runoff to three existing culverts under the Zimovia Highway and into the marine waters of Zimovia Strait. These have been removed as part of this remedial action.

3.2 Site Location

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 56.4227º N and longitude 132.3563º W. Since lead contaminated soils and debris extended offsite, surveying conducted during remedial action operations indicates that the Site cleanup area encompassed approximately the 2.5 acres of the subject property and an additional 0.3 acres of off-site contamination located on the adjoining properties.

3.3 Site History

The E&E reports contain information on the Site history described in this section. Site use prior to the 1960s is unknown, but is presumed to have been undeveloped. Property records and other sources indicate that Mr. Virgil Byford purchased the property from a private owner in the early 1960s and began salvage yard operations shortly after under the name Byford Salvage. The salvage yard accepted most solid waste, including drums and other containers, tires, car and boat batteries, boats, and scrap metal. In addition, Mr. Byford operated a lead foundry in one of the two main shop buildings, and disposed of approximately 1,500 automobiles at the site (E&E, 2001).

In 1994, Mr. Byford sold the property to Mr. Curtis Gibb, who intended to continue salvage operations. Mr. Gibb removed several loads of scrap metal from the Site for recycling. Between 2001 and 2002, EPA and DEC conducted site assessment work on the property because the responsible parties were unable to do so. However, much of the site was not accessible due to the large volume of debris/waste on the surface. In 2008, the City and Borough of Wrangell (CBW) foreclosed on the property due to unpaid property taxes.

In 2009, the CBW began the process of applying for technical assistance from EPA Region 10 through their Brownfields Program. The application was approved in 2010 and a Targeted Brownfields Assessment (TBA) was conducted in 2014. A TBA is an environmental investigation that documents environmental conditions at a property under consideration for redevelopment. The CBW currently owns the property, and is in the process of determining future use of the Site.

3.4 Previous Environmental Investigations

Previous environmental investigations are detailed in the following three documents, each of which were prepared by E&E, for ADEC and EPA review:

- *Final Preliminary Assessment (PA), Wrangell Junkyard Site; Wrangell, Alaska*, NTP No. 1820121142A, February 2001.
- *Wrangell Junkyard Site Characterization and Removal Cost Estimate, Wrangell, Alaska*, NTP No. 1820121162, June 2002.
- *Wrangell Junkyard: Targeted Brownfields Assessment, Wrangell, Alaska*, Technical Direction Document 13-07-0010, July 2015.

Information from these documents is referenced in this report to provide a comprehensive summary of the site conditions before and after the completion of the Interim Removal and Remedial Actions.

The EPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) identification number for the Wrangell Junkyard Site is AKSFN1002224. ADEC has assigned it Site Hazard ID 3295 and File ID 1529.38.006.

3.5 Recognized Environmental Conditions

Analytical results for samples collected during the investigations conducted by E&E confirmed the presence of multiple metals, petroleum hydrocarbons, volatile and semi-volatile organic compounds and other contaminants at the site in concentrations above ADEC Method Two Soil Cleanup Levels for the Over 40 Inches Zone (herein applicable ADEC soil cleanup levels) contained in 18 AAC 75. TBA report Section 5: *Findings and Summary* provides the most complete summary of the Site operations and conditions prior to the Interim Removal and Remedial Actions conducted by NRC Alaska. Seven categories of Recognized Environmental Conditions (RECs) were identified in the TBA report. These RECs, and the contaminants associated with them, are summarized below:

3.5.1 Lead Contaminated Soil/Debris Pile Remnants

Virtually the full extent of the Site surface was contaminated with lead at some concentration above normal background levels. In addition, debris pile remnants with extremely high lead concentrations also were present. These piles included visible lead acid battery fragments, lead plates and shards. Laboratory results from E&E's efforts confirmed that lead was present above both ADEC residential and industrial cleanup levels of 400 mg/kg and 1200 mg/kg, respectively, at depths up to three feet below grade (the maximum sample depth). Soil characterization samples collected by ***NORTECH*** during the remedial action found lead contaminant levels up to 103,000 mg/Kg for total lead and 17.9 mg/L for leachable lead.

3.5.2 Drum Caches

E&E described two drum caches on Site, described as the northern drum cache and the eastern drum cache. Each drum cache had at least six drums and stained soil. Laboratory results confirmed that soils contained metals, diesel-range organics (DRO), poly-aromatic hydrocarbons (PAHs), and semi-volatile organic compounds (SVOCs) at concentrations above the applicable ADEC soil cleanup levels. NRC Alaska removed a total of 22 drums from the Site, the contents of which were consolidated into 22 drums that were shipped to Clean Harbors disposal facility in Aragonite, UT for disposal. These drums contained PRM (paint related material), grease, waste battery acid and mixed petroleum products.

3.5.3 Wood Piles/Burn Areas

Six wood / burn piles containing creosoted wood poles, tires, and battery fragments were located at the Site. These piles were burned during site activities and during debris removal in 2012. Laboratory results confirmed surface soils contained metals, DRO, polychlorinated biphenyls (PCBs), PAHs, and SVOCs at concentrations above the applicable ADEC soil cleanup levels. Concentrations of metals and DRO were also present above ADEC cleanup levels in subsurface soils (2.0 to 2.5 feet bgs exploration depth).

3.5.4 Overland Drainages

Multiple surface water run-off routes were present at the Site, and drained into Zimovia Strait via three culverts under the highway. Sediment and surface water samples collected and analyzed from various drainage areas confirmed that these media contained metals, DRO, and residual-range organics (RRO) at concentrations above ADEC cleanup levels. Sediment samples also exceeded the 5.0 mg/L limit for leachable lead using the TCLP method, and concentrations of PAHs and SVOCs exceeded applicable regulatory standards in surface water samples.

3.5.5 Areas Around Former Onsite Structures

There is anecdotal evidence that transformer oil containing PCBs may have been applied to the former residence and shop buildings for weatherproofing. Several structures on the Site were burned during previous site cleanup and debris removal efforts. Laboratory results from previous Site investigations confirmed that concentrations of metals, PAHs, and SVOCs were above applicable ADEC soil cleanup levels in samples collected around both the former residence and the shop buildings.

3.5.6 Downgradient Adjacent Properties

Two properties adjacent to the Site, one to the north and one to the south, are at lower elevations. Consequently, the potential for surface water run-off from the Site onto these properties increased during times of heavy rain and snowmelt. Laboratory results for samples collected from these properties indicated that arsenic was the only analyte to exceed ADEC soil cleanup levels. However, background concentrations of arsenic exceeding ADEC cleanup levels are common in the area, indicating that arsenic was likely naturally occurring.

3.5.7 Zimovia Strait

The intertidal area of Zimovia Strait is downgradient from the Site and receive site run-off via three culverts that run under the highway. Laboratory results sediment samples collected from areas around the culvert ends confirmed the presence of metals at concentrations above marine sediment Screening Quick Reference Table (SQuiRT) Threshold Effects Level (TEL) values set by the National Oceanic and Atmospheric Administration (NOAA). One SVOC was also detected; however, a NOAA SQuiRT value has not been established for the analyte.

3.6 Interim Removal Action

The objective of the Interim Removal Action was to remove major contaminant sources from the Site and prepare it for subsequent cleanup work. Site activities performed during the removal action included:

- Surveying of site to verify the project area. Surveying showed that known, identified contaminated material, drums and debris exist off property, and onto the adjoining properties on the north, south and east sides of the junkyard site.
- Breakdown of the site into four work areas for ease of discussion and documentation. The four areas, known as A, B, C and D, are shown on Figure 2 located in Appendix 1.
- Clearing of trees and vegetation from the Site. NRC Alaska collected, transported, and burned lumber, stumps, and other clean woody debris at an off-site location.
- Implementation of SWPPP measures for handling storm water run-on and run-off.
- Collection and consolidation of solid waste, including tires, lumber, concrete, and stumps. Solid wastes that were not caked in contaminated soil were collected and disposed of at the Wrangell Landfill. Solid wastes such as tires, automotive parts, and large pieces of scrap metal that were caked in contaminated soil were collected in 20 cubic yard containers and shipped to a hazardous waste disposal site in Arlington, Oregon.
- Collection and packaging of batteries and battery fragments for shipment to a hazardous waste treatment and disposal facility.
- Excavation of lead and petroleum contaminated surface material from the lower portion of the Site (Area A) to prepare it for use as a staging/ storage/ laydown Area. Preparation activities included:
  - Excavation of contaminated soils from the majority of Area A.
  - Construction of an access road through the site using clean, imported rock materials.
  - Moving contaminated soils to stockpile areas located on Areas C and D.
  - Construction of rock pad on Area A for a staging area and water treatment system.
  - Construction of rock pad for installation of screen plant.
- Collection, characterization, and packaging of drums containing non-hazardous and hazardous wastes for shipment to an offsite disposal or treatment facility. Field characterization of drums was completed by NRC Alaska Hazardous Materials Specialists in accordance with procedures specified in the IRAP-SCP. NRC consolidated the 22 drums located at the Site into six 85 gallon overpack drums that were shipped off for disposal.
- Soil excavation areas were mapped into 10-foot grid sections and soil samples were collected for field screening for every one-foot lift removed. NITON XRF field screening samples consistently showed lead contamination extending throughout surface soils to the depth of the glacial till layer. The depth of the glacial till varied between one and six feet bgs in the areas explored during the Interim Removal Action.
- Roughly 4,600 cubic yards (CY) of lead contaminated material, including about 250 CY of POL contaminated soil were excavated and stockpiled from Area A as part of the Interim Removal Action.

NRC Alaska conducted interim removal activities in February and March 2016. During these operations, it became apparent to NRC Alaska and ***NORTECH*** that the quantity of lead contaminated soil at the Site was substantially greater than the original estimates of 4,000 CY. NRC Alaska and ***NORTECH*** presented new data to the ADEC Contaminated Sites (CS) Program staff, which included a revised estimated of the amount of contaminated soil having lead above the residential cleanup level. A revised cost estimate to complete the work in accordance with the approved IRAP-SCP (January 2016) was also prepared. The revised estimates presented to ADEC are summarized below:

- Volume of lead contaminated soil increased from 4,000 to 19,000 CY assuming that 10% of excavated materials would be screened out as oversize materials (cobbles, boulders) or debris (tires, metal scrap). The volume increase resulted from documentation of contaminated soil to depths up to 6 feet bgs.
- Total remedial action project duration increased from 3 months to 5 months.

Since the revised estimate exceeded the authorized budget for the project, ADEC requested alternatives to offsite disposal of chemically treated soils. NRC Alaska and ***NORTECH*** recommended construction of an onsite containment cell to hold ECOBOND® stabilized soil until ADEC secured additional funding for offsite disposal. ADEC approved construction of onsite containment as the preferred alternative for short-term storage of treated soil. ADEC approved additional funding for design and construction of onsite containment for handling the increased volume of contaminated soil.

4.0 REMEDIAL ACTION METHODOLOGY

This report summarizes the cleanup activities completed during the second mobilization of personnel and equipment to the Site. Site cleanup procedures are described in the ADEC approved work plans listed in Section 2.4. Remedial action operations began in early April 2016 and continued through early August 2016.

Due to the presence of drums, solid waste, whole batteries, and battery fragments in sub-surface soils throughout the Site, collection and offsite disposal of various solid wastes and woody debris continued throughout the remedial action operations. Implementation of SWPPP BMPs also continued as needed throughout the entire project duration.

4.1 Project Organization and Responsibilities

NRC Alaska and its subcontractors executed the project for ADEC under the direction of NRC Alaska's Project Manager and Site Supervisor. The ADEC CS Project Manager was Bruce Wanstall. NRC Alaska kept the ADEC CS Project Manager apprised of site actions by providing weekly reports via email. These reports included information documented by the ***NORTECH*** QEPs to ensure that completed work met the requirements of the approved plans.

NRC Alaska notified ADEC of changes to remedial operations that did not materially affect the approved plans, such as changing locations of storage areas or equipment through phone calls and weekly reports. NRC Alaska requested ADEC approval in writing for proposed operational changes considered as deviations from the work plans.

4.2 Equipment

Heavy construction equipment, including tracked excavators, loaders, and dump trucks was rented from a local contractor, BW Enterprises. The equipment operators used throughout the project duration were provided by NRC Alaska and the local contractor. A listing of the equipment utilized each day is included in the daily JWOs maintained by the NRC Alaska Site Supervisor.

4.3 Work Flow

Workflow on the site was coordinated to allow for the most efficient use of space and equipment. The road constructed through the middle of Area A during the interim removal was extended into Areas C and D to allow for vehicle access to the majority of the Site. Adjustments to the road occurred as excavation and project work necessitated.

4.3.1 Water Treatment Work Flow

A WTS installed adjacent to the road and in a downgradient portion of the Site (Area A) treated surface water runoff from contaminated Site areas prior to discharge onto a clean portion of the Site. A retention pond installed downgradient of the untreated stockpile area (Area D) and directly up gradient of the WTS allowed sediment to settle out prior pumping the water into the first WTS tank. Configuring the WTS in this way minimized migration of contaminated soil particulates in surface water.

4.3.2 Soil Treatment Work Flow

NRC Alaska stockpiled soil excavated from contaminated areas of the Site in the upper portion of Area D for subsequent treatment by chemical stabilization with ECOBOND®. To maximize efficiency of the treatment process, the shaker was located adjacent to the lower edge of the untreated stockpile. An excavator loaded soil directly from the untreated stockpile into the shaker; sorting the screened materials into three dump trucks. Oversized material (six or more inches in diameter) were transported to the upper most portion of Area D for further sorting. Materials that passed the screen (i.e., 6-inch minus material) were transported to the soil treatment pad.

The soil treatment pad was located northwest of the untreated stockpile, adjacent to the treated stockpile cell. Trucks were able to back directly onto the pad to unload the contaminated soil, and then return to their designated area by the shaker. This created a loop that allowed for unobstructed traffic flow between the shaker pad and the treatment area.

NRC Alaska staged pallets of ECOBOND® near the soil treatment pad to minimize unnecessary equipment movement across the Site. An excavator mixed ECOBOND® into the soil on the treatment pad, and then a second excavator placed the treated soil into the treated stockpile for curing and subsequent sampling. This configuration allowed for minimum handling and transport of treated soils.

4.4 Surveying

Site surveying for this project was conducted using Real Time Kinematic (RTK) surveying methodology using a Trimble™ R10 GNSS (Global Navigation Satellite System). The R10 system included a Trimble 360 Satellite Receiver installed at the project Site used in conjunction with a Trimble Rover unit. This GNSS survey system is capable of approximately one centimeter horizontal and 1.5 centimeter vertical level accuracy.

A survey of the property boundaries and siting of the property corners was completed by Gregg Scheff of R&M Engineering, Wrangell, Alaska. The property corners were stored on the GPS unit in the project database for future reference.

A 10 foot by 10 foot site grid was also established at the Site prior to beginning excavation and a copy of the sampling grid was uploaded to the survey unit. The X axis baseline for the grid was established along the north side of Zimovia Highway where two temporary survey reference points were installed. The Y axis of the grid extended perpendicular to the edge of the Highway to the northeast. and the site grid. Figure 5 shows the Site, the 10 by 10 foot sampling grid and includes the temporary reference survey points used.

Project sampling locations were located with the Trimble Survey Instrument and named using the X and Y coordinates at each unique sampling point.

In general, excavation bottom sample locations were sited by following the survey instrument using horizontal offsets from the established baseline to each grid node which was marked for subsequent sampling. Occasionally, bottom samples were collected from locations which were not located on a grid node. Most of the sidewall sampling points were not on a grid node.

Site surveying for this project also included pre and post-excavation elevations across the Site. Pre-excavation elevation surveying was completed on undisturbed portions of the Site at each 10 foot by 10 foot grid node. Post-excavation elevation surveying was completed at each sampling location after field screening confirmation that clean limits had been reached.

4.5 Field Screening

4.5.1 Excavation Control

NORTECH personnel field screened on a 10-foot-by-10-foot grid pattern throughout the duration of the excavation activities to identify contaminated soils and determine the depth at which excavation could cease. Excavated materials with average X-ray Fluorescence (XRF) readings that met or exceeded 35 ppm were considered contaminated. When field-screening results indicated *in-situ* soils contained contamination above cleanup levels, ***NORTECH*** personnel instructed excavation crews to remove another foot of material in the area indicated to be contaminated. The field screening process was repeated until XRF readings indicated the area was below cleanup levels for lead.

NORTECH QEPs collected samples for testing by the XRF field-screening methodology at the following frequency:

- One bottom sample from each grid node
- One sample collected from each 10 linear feet of excavation sidewall
- One sample collected from each one vertical foot of side wall at each linear sidewall sample location

Crews considered material within the excavation clean when the average XRF reading for the samples were below the field-screening action level (FSAL). Once field screening indicated that contaminated soil had been removed, closure samples were collected for laboratory analysis to ensure cleanup levels were met throughout the Site. Field screening and laboratory testing methods are detailed below.

4.5.2 Lead (Soil)

NORTECH QEPs used a handheld, Thermo Fischer Scientific NITON XRF instrument to screen soil samples for lead and guide soil excavation and soil treatment operations performed by NRC Alaska. Samples were collected and tested in re-sealable plastic bags. The approved SCP describes the sample collection methodology. ***NORTECH*** QEPs visually classified each soil sample and documented this information in the field notes. Samples were homogenized in the bags by manual manipulation (i.e., kneading) to break up clods and ensure oversize rocks were removed.

The level of accuracy of the NITON XRF increases with increased analysis time. For soil field-testing during this project, ***NORTECH*** allowed for a minimum instrument time of 30 seconds (“nomsec” as displayed on the instrument) which is usually adequate to achieve a precision of +/- 20%. Using this protocol, readings were collected at three separate sample locations. The average of those results was reported as the concentration of lead for that sample location in milligrams per kilogram (mg/kg) or parts per million (ppm) and is discussed as ppm in this report.

Based upon a comparison of the results of soil samples that were field screened with the XRF, and then submitted to the analytical lab for total lead analysis, ***NORTECH*** determined that a FSAL of less than 35 ppm on the XRF corresponded to less than 400 mg/kg of total lead by laboratory analysis. This FSAL was used during the Remedial Action operations to guide excavation operations. This FSAL has a 95% certainty that field screening readings of 35 ppm would fall below the 400 mg/kg cleanup level and a 99% pass rate.

4.5.3 Petroleum (Soil)

NORTECH QEPs used warm water sheen tests and direct visual observation to assess for the presence of petroleum hydrocarbons in excavated soil when POL contamination was suspected. The petroleum sheen test is a quick and easy field method that used to determine if a soil sample is saturated with petroleum. To conduct the warm water sheen test:

- Place a small quantity of petroleum-contaminated soil in a jar or on a large spoon.
- Add enough water to break apart and submerge the soil particles.
- If droplets of product or rainbow sheen are present on the water surface, the soil is considered saturated with petroleum.

If the sample failed the warm water sheen test, ***NORTECH*** personnel instructed the excavation crew to continue to excavate in the contaminated area. Once a sample passed the warm water sheen test, excavation ceased and ***NORTECH*** personnel collected a sample for laboratory analysis for GRO, DRO, RRO, and BTEX for laboratory confirmation of clean.

4.5.4 Water Treatment System

The Water Treatment System (WTS) installed onsite began operating in April. The work flow for the WTS is described in Section 4.3.2. Treated water samples were collected to meet the requirements for the Site’s Excavation Dewatering General Permit (Permit # AKG002040). ***NORTECH*** personnel collected water samples for field and laboratory testing either weekly or prior to discharging the holding tank. Treated water was discharged to the land surface, which required daily monitoring of erosion, sheen, and flow rate for permit compliance.

Water samples were collected from both the onsite WTS and Zimovia Strait, located approximately 150 feet downgradient from the Site. Samples were collected from the WTS from a sampling valve located after both the carbon and zeolite filters. Samples from Zimovia Strait were collected by submerging the bottle in an easily accessible area of the Strait. ***NORTECH*** personnel used a portable, pocket-sized pH meter to measure the sample pH at both locations. An Oakton T100 turbidity meter measured sample turbidity. ***NORTECH*** personnel visually inspected the samples for evidence of sheen from POL contamination. Once field parameters were measured, the samples were prepared for shipment to SGS for analysis of total lead and/or total settle-able solids. Section 4.6 provides additional laboratory sampling and analysis details.

4.6 Laboratory Sampling & Analysis

Although lead was the primary contaminant of concern at the Site, ***NORTECH*** personnel collected laboratory samples for other contaminants present at the Site. In total, soil samples were collected for laboratory analysis using one or more of the following methods:

- Total Lead by ICP 6010
- Toxicity Characteristic Leaching Procedure (TCLP) by EPA Method SW6020A TCLP
- Synthetic Precipitation Leaching Procedure (SPLP) by EPA Method SW6020A SPLP
- Gasoline Range Organics (GRO) by AK Method 101
- Benzene, toluene, ethylbenzene and xylenes (BTEX) by EPA Method 8021
- Diesel range organics (DRO) by AK Method 102
- Residual range organics (RRO) by AK Method 103
- Polychlorinated Biphenyls (PCBs) by EPA Method SW8082A
- Polyaromatic hydrocarbons (PAHs) by EPA Method 8270
- Semi-volatile organic compounds (SVOCs) by EPA Method 8270D
- Volatile organic compounds (VOCs) by EPA Method SW8260B

Water samples from the re-routed drainage ditches and the on-site WTS were collected and analyzed for:

- Total Lead by Method SW6020A
- Total Aqueous Hydrocarbons (TAqH) by EPA Method 602/624
- Total Aromatic Hydrocarbons (TAH) by EPA Method 625M SIM (PAH) LV
- Total Settleable Solids by Method SM21 2540F

Samples were also collected from various other media found on Site. Lumber found onsite that appeared to be coated with creosote was sampled and tested for PCBs. Suspected asbestos pipe was found in several areas along the eastern and southern property boundaries of the Site was sampled for asbestos in order to determine proper disposal methods.

Project samples were collected in accordance with the methodologies and procedures identified in the SAP that was included in the approved cleanup plan. SGS North America in Anchorage, Alaska was the project laboratory and completed the analysis of the project samples. SGS is an

ADEC certified laboratory for the listed analyses with the exception of asbestos. The asbestos sample was transferred to White Environmental of Anchorage, Alaska for analysis.

Samples were collected using clean containers provided by the laboratory. The laboratory containers and preservative (if applicable) complied with the ADEC Draft FSG, other standard guidance for sample collection provided by ADEC, and the laboratory's standard operating procedures. Samples were collected using disposable sampling devices, such as gloves, and reusable devices such as spoons or trowels. Samplers discarded disposable sampling tools between sample locations and decontaminated reusable sampling tools prior to reuse to prevent cross contamination of samples.

Sample containers were filled and adequately sealed, with rims cleaned before being hand-tightened. Containers were labeled with laboratory-supplied labels, placed in a laboratory-supplied cooler and immediately cooled to between 0 and 6 degrees Celsius (°C), if applicable.

The approved work plans provide a comprehensive description of the field sampling methodologies, frequencies, locations, sample identification, handling, shipping, chain of custody documentation, and other field sampling related activities. The approved work plans also provide descriptions of the laboratory instrumentation, analysis methodologies, practical quantitation limits, laboratory control samples, and other related internal laboratory quality control requirements for the project. ***NORTECH*** managed the reported data and completed the required validation and data quality reviews.

Section 6.4 summarizes details regarding the data management and validation methodology used for the project.

4.6.1 Total Lead (Soil)

NORTECH collected laboratory samples from post excavation areas following contaminated soil removal. Samples were tested for total lead. The sampling frequency was in accordance with the ADEC Draft FSG and was at a minimum:

- 10% of clean bottom samples; and,
- One sample for each 100 linear feet of clean sidewalls of the excavation

In addition to laboratory samples, one field duplicate sample was collected for every 10 primary samples or portion thereof. Field duplicate soil samples were collected at the same time and place as the laboratory sample. Field duplicates were given unique sample numbers and submitted blind to the lab.

Due to NRC Alaska's request to SGS for Level 1 reporting for the project, Quality Control (QC) data such as matrix spikes, method blanks, and laboratory control samples were not routinely reported by the laboratory. Copies of laboratory reports and associated ADEC Laboratory Data Review Checklists (LDRCs) are included in Appendix 6 and 7, respectively.

4.6.2 TCLP/SPLP Lead

NORTECH also collected samples from lead contaminated soil treated with ECOBOND®. One composite sample was taken for every 300 CY of treated soil. Composite samples were taken after the ECOBOND® was thoroughly mixed with the contaminated soil and prior to the treated soil being incorporated into the treated stockpile. Samples were sent to SGS for analysis by the TCLP method. A subset of the TCLP samples were also sent to SGS for analysis by the SPLP testing method. Field duplicate samples were not required. Copies of laboratory reports and associated ADEC LDRCs are included in Appendix 6 and 7 respectively.

4.6.3 Petroleum Fractions (Soil)

Several areas of petroleum contamination were discovered during Site activities. After being excavated to lead field screening limits for clean, ***NORTECH*** personnel collected laboratory samples for analysis of petroleum fractions. Laboratory samples for petroleum fractions were analyzed for GRO, DRO, RRO, and BTEX using the methods listed in Section 4.6 above. Selected samples were submitted for PAH, SVOC, and VOC analysis. Two samples were submitted to SGS for PCB analysis.

In addition to laboratory samples, one field duplicate sample was collected for every 10 primary samples per analysis and matrix. Field duplicate soil samples were collected from the same sample bag as the laboratory sample. This assured that duplicate samples were collected from the same location and at the same time as their corresponding laboratory samples. Field duplicates were given unique sample numbers and submitted as blind samples to SGS.

Laboratory supplied trip blanks accompanied the sample containers to and from the laboratory and remained unopened. One trip blank was submitted per 20 volatile samples with a minimum of one trip blank per work order. Copies of laboratory reports and associated ADEC LDRCs are included in Appendix 6 and 7, respectively.

4.6.4 Total Lead / Total Settleable Solids (water)

Water sampling was conducted as part of the requirements for the Site's Dewatering Permit (Permit # AKG002040). Due to the Site being listed on the ADEC Contaminated Site Database, treatment of water prior to discharging was also required. The WTS (described in Section 6.8) treatment train fulfilled the treatment requirement of the Dewatering Permit.

To ensure that discharged waters did not adversely affect the water quality of nearby Zimovia Strait, ***NORTECH*** collected water samples from the WTS discharge for laboratory analysis. Samples were collected either weekly or prior to discharging treated water from the WTS. ***NORTECH*** personnel used laboratory supplied, clean, plastic bottles to collect water samples. WTS samples were collected from a sampling valve located downstream of the carbon and zeolite filters. WTS samples were sent to SGS for analysis of total lead. In addition, water samples from the WTS and Zimovia Strait were collected for laboratory analysis of total settleable solids. Sampling conducted under the Dewatering Permit did not require field duplicates. Copies of laboratory reports and associated ADEC LDRCs are included in Appendix 6 and 7.

4.6.5 TAH / TAqH (water)

The Dewatering Permit required laboratory testing of water if a sheen was observed on discharges from the WTS. Although a sheen was never observed on water in either the pre-treatment settling pond or the WTS discharge, water samples were collected and analyzed from the first discharge of the WTS for TAH and TAqH as a precaution. ***NORTECH*** personnel used laboratory supplied, clean, plastic bottles to collect water samples from the post filter treatment system sampling valve. Copies of laboratory reports and associated ADEC LDRCs are included in Appendix 6 and 7.

4.7 Regulatory Cleanup Criteria

4.7.1 Total Lead (Soil)

The ADEC uses a total concentration of 400 mg/kg Pb as the soil cleanup level for residential properties. As described in the SCP and Section 4.5.2 above, the sample results and analysis data gathered during the Interim Removal Action were used to develop an XRF FSAL of 35 ppm Pb to guide Remedial Action operations. Confirmation soil samples collected from excavation bottom and sidewalls were tested for total lead by ICP 6010 to verify that the residential soil cleanup level was met.

4.7.2 Total Lead (Water)

The APDES General Permit for Excavation Dewatering does not state cleanup criteria for lead if water is discharged to land surfaces.

4.7.3 TCLP and SPLP Lead

Lead is one of the special group of toxic metals regulated under the Resource Conservation and Recovery Act (RCRA) requirements for waste disposal. Solid wastes tested by the TCLP method are categorized as D008 hazardous wastes if the concentration of lead in the leachate exceeds 5.0 mg/L.

Both tests simulate, and then analyze, “leachate” which is defined as any liquid that, in passing through matter, extracts solutes, suspended solids or any other component of the material through which it has passed. Both tests utilize similar sample processes and extraction processes. The TCLP test is designed to simulate material sitting inside a landfill for a number of years under acidic conditions. The SPLP test is designed to simulate material below or on top of the ground surface exposed to rainfall to determine the mobility of both organic and inorganic analytes present in liquids, soils, and wastes from the leachate the material would produce. Because the SPLP test simulates actual environmental precipitation (assuming that the rainfall is slightly acidic), it offers a straightforward method to assess chemical mobility in the environment.

4.7.4 POL Contaminants

Cleanup limits for GRO, DRO, and RRO were determined using the ADEC Method Two Table B2 Migration to Groundwater limits for the Over 40 Inches Zone. Cleanup limits for BTEX and PAH contaminants for petroleum-impacted soils were determined using the ADEC Method Two Table B1 Migration to Groundwater limits for the Over 40 Inches Zone. The respective cleanup limits for each contaminant are shown on the laboratory sample analysis summary tables included in Appendix B. Obvious POL contamination was segregated, ECOBOND® treated and then deposited in bulk containers for transport and disposal at Columbia Ridge Landfill in Oregon.

4.7.5 Other Contaminants

Other contaminants found in detectable concentrations onsite included:

- Arsenic
- Barium
- Cadmium
- Total Chromium
- Aroclor-1254
- Asbestos

These contaminates were not considered contaminants of concern for this project. A very limited number of samples were analyzed for any of the above contaminates. Laboratory results can be found in Table 5. Cleanup limits for metals were determined using the ADEC Method Two Table B1 Migration to Groundwater limits for the Over 40 Inches Zone. Cleanup limits for Aroclor-1254, a PCB, was determined using the ADEC Method Two Table B1 direct contact limits. Asbestos was found in transite pipes and was analyzed for disposal classification purposes only. The respective cleanup limits for each contaminant are shown on the laboratory analysis summary tables included in Appendix B.

4.8 Recordkeeping and Reporting

NRC Alaska and their subcontractors utilized a number of methods to document Remedial Action activities. The most detailed of these was handwritten notes in field notebooks. Notebooks were compiled by individual crew members and/or subcontractors and contain information about the project personnel and equipment onsite, weather conditions, work activities performed, field tests and results, laboratory sample collection, discussions with inspectors, quantities of materials moved and/or collected, occurrence of site meetings, swing ties, GPS coordinates, photo log, and other relevant information.

Beginning on the first day of mobilization and at the completion of each day's activities for every stage of the project, NRC Alaska also completed daily Job Work Order (JWO) reports, which included the following information:

- Evidence of daily "tailgate" safety meetings
- A summary of the day's activities
- Copies of delivery tickets
- Bills of lading for materials removed from the site
- Manifests for materials removed from the site
- Challenges encountered and resolution
- Schedule status
- Summary sheets from environmental sampling and delineation work, survey efforts, and other activities performed by ***NORTECH*** environmental professionals
- Other relevant information from NRC Alaska or their subcontractors

Detailed field notes were attached to the JWO reports as necessary. The daily JWO reports were summarized into a weekly report transmitted electronically to the ADEC Project Manager throughout the duration of the project.

5.0 VARIANCE FROM SITE CLEANUP PLAN

One of the objectives of the Interim Removal Action was to verify the historical site characterization data, prior to initiating Remedial Action operations. A substantial change to field conditions was identified during site exploration activities. The original estimate for the amount of lead contaminated material to be excavated and removed from the Site was 4,000CY.

NRC Alaska and ***NORTECH*** determined that the surface soil/organic layer containing debris and high lead concentrations extended to depths up to 6 feet bgs above the glacial till layer (which had low lead concentrations). NRC Alaska re-estimated the volume of contaminated soil and debris to be approximately 18,350 CY. NRC Alaska also estimated that roughly 10% of the contaminated materials were debris or oversize, gravel, cobble and small boulders. Screening excavated materials to remove oversize material greater than 6-inches in diameter generated a revised volume of approximately 16,500 CY of lead contaminated soil requiring treatment and offsite disposal in order to meet complete cleanup criteria.

The changed field conditions were discussed with ADEC and modifications to the remedial action plan and project schedule were made as insufficient funding was available to treat and dispose offsite the increased volume of lead contaminated soils to meet the two original project goals stated below:

- Remove contaminated soil and hazardous materials from the Site.
- Achieve Cleanup Complete status by meeting residential land use cleanup standards in onsite soils.

The resulting change in field conditions led the following changes in Site Scope of Work:

- Quantities of material; original estimate was 4,000 CY to be excavated, screened, and about ~3,000 CY shipped out for offsite disposal. Based upon final removal data, a total of ~18,300 CY was excavated, treated and is now stored on-site.
- Material was screened, treated with ECOBOND®, and stockpiled on site (was supposed to be screened treated containerized and shipped) due to the larger quantity
- Materials less than 6” in diameter, instead of less than 1.5” in diameter, were stabilized using ECOBOND®.
    - o The muddy nature of the material caused too many fines to adhere to the 1.5” – 6” diameter material, necessitating this change
- About 170 CY of grossly contaminated POL soils were shipped with debris for offsite disposal
- A revised SCP was developed following the Interim Removal Action to capture changes to the Remedial Action to address the increased volume of soils.
- The project schedule was extended due to the increase in quantity of lead contaminated soil.
- Excavation extended beyond the property line, onto neighboring parcels owned by the Mental Health Trust, Bill Byford, and the Goodwins.

6.0 FIELD ACTIVITIES

Field activities for the Remedial Action began in April following completion of the Interim Removal Action activities, which had begun on February 20, 2016.

6.1 Mobilization and Site Preparation

The site is located a few miles south of the city center. NRC Alaska personnel and subcontractors arranged lodging in Wrangell for site workers, so crews mobilized to the site on a daily basis. Heavy equipment remained on the site for the duration of site-specific activities to reduce the amount of decontamination that was necessary.

6.2 SWPPP

The Site operated under a Storm Water Pollution Prevention Plan (SWPPP) implemented under General Construction Permit # AKR10FG27. The SWPPP (portions included in Appendix 9) discusses water and sediment transport control measures. This section provides additional details of the BMPs employed onsite.

While the majority of SWPPP BMPs were installed during Interim Removal activities, SWPPP measures were installed and modified throughout the project as site conditions changed due to excavation and stabilization activities. In order to minimize areas that were disturbed and not stabilized, grubbing and Site excavation occurred in one area at a time. Sequencing excavation activities in this manner decreased the potential for sediment to be transported offsite before the disturbed area was stabilized.

In addition to sequencing excavation activities, physical BMPs were also used throughout the site to minimize erosion onsite and sediment transport offsite. The following paragraphs describe the various BMPs used as SWPPP measures throughout the project.

6.2.1 Silt Fence

Silt fences are a form of sediment control. Generally, silt fences are installed around the perimeter of a site, downgradient from where construction activities will disturb soil. Silt fences act as a sediment filter to keep sediment onsite.

Silt fences were installed following APDES guidelines. Due to silt fences being installed on top of the hardpan (glacial till) the bottom edges of silt fences were weighed down using D-1 gravel imported from an offsite quarry. Silt fences were installed downgradient of excavation activities at the property boundary adjacent to Zimovia Highway, as well as downgradient of the untreated soil storage area to aid in directing water run-off to appropriate channels.

6.2.2 Rock Check Dams

Check dams were installed within the southern drainage ditch, at the overflow outfall of the WTS holding pond, in the roadside ditches adjacent to Zimovia Highway, and at the outflow of the middle culvert adjacent to Zimovia Strait. Check dams were constructed using six-inch minus rock from a local quarry. With the exception of the check dam at the middle culvert outflow, check dams were considered temporary and were removed during excavation activities.

Check dams provide erosion protection to narrow waterways by slowing the water velocity and allowing it to pool, thus reducing sediment transport offsite. Rock check dams are also able to trap sediment, further minimizing sediment transport offsite. Eight check dams (one at the overflow outfall of the WTS pond, and seven within the southern drainage ditch itself) were installed in series to control water flow and sediment transport along the southern edge of the Site. The two check dams constructed within the roadside ditches were placed so that water run-off from the Site passed through the check dams prior to flowing into culverts that passed under Zimovia Highway and offsite.

6.2.3 Fiber Rolls

Fiber rolls, also known as straw wattles, reduce sediment loads to receiving waters by filtering runoff from the site and capturing sediments within the straw matrix. Fiber rolls were installed following APDES guidelines in areas throughout the Site throughout the duration of the project as excavation activities and conditions of the fiber rolls warranted. Locations of fiber rolls installed on-Site can be found in the SWPPP BMP map located in Appendix 9. Crews removed fiber rolls prior to demobilizing from the Site.

6.2.4 Silt Dikes

Silt dikes are skirted, triangular foam barriers that can be used to contain sediment, minimize erosion, and direct site runoff to appropriate drainages. Crews placed silt dikes at the toe of the untreated soil storage area to direct runoff towards the WTS collection basin, along the southern drainage to protect the drainage from potential increased sediment loads during excavation activities, and along portions of the western property line to delineate site boundaries and protect offsite wooded areas.

Due to the rocky and uneven nature of Site soils, staples were not used to secure the silt dyke to the ground surface as indicated in the product specifications. Instead, the edges of the silt dike were weighed down with D-1 gravel from a local quarry. Silt dikes were temporary and removed prior to demobilizing from the Site.

6.2.5 Geotextile Fabric

Geotextile fabrics are synthetic, porous fabrics that provide erosion control and/or help stabilize soft soils. Geotextile fabric was used in areas where the soil would not support a layer of rock (permanent stabilization measure, see below) such as areas with silty, loamy soil. The use of geotextile fabric provided a stabile base for the rocks used as permanent stabilization as well as minimized the erosion of soil from areas of the site that were not excavated to the glacial till. Geotextile fabric was used in some areas of the lower portion of the Site and within the northern drainage.

6.2.6 Sediment Trap

A sediment trap is a temporary ponding area with a rock outflow used to detain run-off and allow sediment to settle out of the water column. A single sediment trap was constructed at the outfall of the northern culvert after drainage patterns altered during excavation activities caused significant storm water run-off to exit the Site via the northern culvert. The sediment trap was constructed of plastic sheeting placed over a sandbag berm. The trap was a temporary BMP and was removed prior to demobilizing from the Site.

6.2.7 Permanent Stabilization

Permanent stabilization of the site was achieved by placing rock over Site soils confirmed to be clean (i.e., less than 400 mg.kg Pb). Rock used for permanent Site stabilization was obtained from the oversized material (greater than six inches in diameter) screened from excavated soils, or 6-inch minus rock imported from a local quarry. Rocks greater than 6-inches in diameter were considered clean by definition because testing of a representative sample of ground rock would yield results less than the required cleanup level.

Oversized rock used for site stabilization was obtained from excavated materials; NRC Alaska either manually segregated oversize material during excavation activities or sorted out debris from the oversized material that came off the shaker. Once sorted, oversized rock was used as fill in portions of the excavation on the northeast portion of the Site. Six-inch minus rock from a local quarry was spread on top of the oversized rock to finish filling in excavated areas and then compacted. Figure 4 depicts areas where oversized rock was used as fill.

Large boulders were also uncovered during excavation activities. Boulders were moved out of the active excavation area if possible and used as fill once excavation activities ceased in that area. If the boulders were too big to move out of the excavation, they were rolled onto a clean portion of the excavation and left in place.

In areas of the Site where oversized rock was not used, permanent stabilization was achieved by laying 6-inch minus rock on clean soil. The rock layer was then compacted by repeatedly driving heavy equipment over it. Rock was compacted to the point where it would remain in place despite heavy rainfall or normal Site activities (e.g. being driven over). The rock layer was no less than one foot in depth after compaction.

Several long term or permanent BMPs were left onsite. The covered treated stockpile and associated containment cell are SWPPP BMPs used to stabilize the soil contained therein. The covered, treated stockpile will remain on Site until funds are available to move it to a permanent monofill. Encompassing the treated stockpile in an impermeable liner meets the intent of a final stabilization measure and does not require weekly inspection after SWPPP closeout.

The north drainage, located on both Wrangell Junkyard property and AMHT property, was excavated to clean soil. This soil, categorized as the native silty loam, is susceptible to offsite migration during periods of heavy rain. To prevent this, ***NORTECH*** and NRC Alaska decided to line the drainage with imported rock in the same manner as the rest of the site. Original contouring of the drainage was preserved, and the rock lining is considered a permanent erosion control measure. Permanent erosion control measures do not require inspection after SWPPP closeout.

A large rock check dam was installed at the outfall of the middle culvert. Although the Site was re-contoured so that most surface run-off exits the Site from the northern culvert, ***NORTECH*** personnel left the rock dam in place to prevent scouring of the area by the culvert outflow during periods of high water run-off. This permanent erosion control measure does not require inspection after SWPPP closeout.

6.3 Soil and Debris Excavation

Soil excavation was performed using multiple tracked excavators and under the supervision a ***NORTECH*** QEP. During Remedial Action operations, excavation continued to a depth where debris was no longer present in the soil matrix. Debris was typically found from the ground surface to just above the glacial till layer. Excavated soil containing debris and/or with an XRF reading above 35 ppm was moved to an onsite temporary stockpile. The stockpiled soil was then screened to remove gravel, cobbles and debris greater than 6-inches. The 6-inch minus materials that passed the screen were then treated with ECOBOND® in 300 CY batches.

6.3.1 Excavation Bottom and Sidewall Sampling

Once excavation activities reached a depth where debris was no longer present in the soil matrix, bottom and/or sidewall sampling and XRF field-screening began. ***NORTECH*** personnel field screened the excavation bottom on nodes of a ten by ten-foot grid that had been established at the beginning of the project. Sampling locations were located via a Trimble™ R10 GNSS and marked on the sample bag. Samples were then field-screened and a subset of clean samples were prepared for laboratory analysis of total lead and POL fractions, if necessary. Field screening and laboratory sampling methodologies are discussed in Section 4.0.

Prior to beginning excavation activities near the Wrangell Junkyard property boundaries, ***NORTECH*** personnel collected and field screened off site test samples to determine the approximate distance contamination extended onto adjoining properties. Sampling of the excavation sidewall began in the general area test samples indicated would field screen below the FSAL. Sidewalls were sampled every ten lateral feet and once every vertical foot per sampling location. The number of vertical samples was dependent upon the depth of the excavation at that location. If field screening indicated any of the vertical samples at a sample location were above cleanup levels, ***NORTECH*** personnel instructed the excavation crew to excavate into the sidewall in one foot intervals until field screening indicated the sample location was clean throughout the soil column. A subset of clean sidewall samples was prepared for laboratory analysis of total lead and POL fractions if necessary. Field screening and laboratory sampling methodologies are discussed in Section 4.0.

Due to the slope of the Site and variances in depth to clean soil, sidewalls were not present at excavation edges. If the excavation depth was less than one foot below the surrounding grade, a sidewall sample was not collected. When this occurred, a sample was taken at the edge of the excavation and labeled as an excavation bottom sample. Sidewalls were not present at the edge of excavation adjoining DOT roadside ditches and in portions of Areas C and D.

The sample identification format (e.g., nomenclature) utilized throughout the project is described in the table below:

Sample ID	Description	Example
X#Y#	Denotes the X and Y coordinates of the Site grid where the sample was collected.	X100Y200 is a sample collected from grid point X100 Y200
X#Y#-#	The number after the X, Y coordinates denotes the approximate depth bgs where the sample was collected.	X100Y200-2 is a sample collected from grid point X100 Y200 at a depth of 2 feet bgs
X#Y#-#-B or X#Y#-#-F	Denotes that this sample was taken from the depth at which excavation ceased. B is “bottom” sample and F is “Final” sample and were used interchangeably.	X100Y200-2-B is a sample collected from grid point X100 Y200 at a depth of 2 feet bgs when excavation ceased
X#Y#-OE	Denotes an “over excavation”, or a sample taken from a depth greater than the surrounding excavation depth due to the bottom sample field screening above 35 ppm.	X100Y200-OE would be a sample from grid point X100 Y200 collected at a depth greater than that of the surrounding excavation.
X#Y#-POL	Denotes a sample collected in an area of POL contamination.	Naming convention same as OE samples.
GX#Y#-# or X#Y#-G#	Denotes a grab sample, or a sample not collected at a grid node and/or regularly sampled depth	GX103Y217-2 or X103Y217-G3 is a grab sample from grid point X103 Y217 collected at a depth of 2 feet bgs
SWX#Y#-# or X#Y#-SW#	Denotes a Sidewall Sample. SW samples will have an associated depth in their sample name.	SWX100Y200-3 or X100Y200-SW3 is a sidewall sample from grid point X100 Y200 collected at a depth of 3 feet from the top of the excavation edge
TP-#	Denotes a test pit sample. These samples do not have associated coordinates in their sample names, only test pit numbers.	TP-13 is a sample collected from test pit number thirteen
SP-#-#	Denotes a sample collected from an untreated soil stockpile. These samples do not have associated coordinates in their sample names, only stockpile numbers and sample numbers.	SP2-9 is the ninth sample taken from untreated stockpile number two
TSP	Denotes a treated stockpile sample. TSP samples are composite soil samples treated with ECOBOND® that will be incorporated into the treated stockpile cell. These samples do not have coordinates in their names, only sample numbers.	TSP-10 is a composite sample collected from the tenth batch of 300 CY of soil treated with ECOBOND®
ND	Denotes a sample taken from sediment located within the Site’s north drainage ditch.	Sample naming follows the same pattern as grab samples
EI-## or NI-## or SI-##	Denotes samples taken from the Wrangell Institute. EI denotes eastern pullout area, NI denotes northern pullout area, and SI denotes southern pullout area. These samples do not have coordinates in their names, only sample numbers.	EI-01 is the first sample collected from the eastern pullout area of the Wrangell Institute.

6.4 Excavated Materials

Material from the onsite temporary stockpile was run through a screening machine that sorted material into three categories: oversized (greater than 6-inches in diameter), greater than 1.5-inches but less than 6-inches in diameter, and fines (less than 1.5-inches in diameter). Oversized material was stockpiled on a rock pad in the upper portion of Area D to be manually sorted.

Rock fractions greater than 6-inches in diameter were considered clean. This oversize fraction material was defined clean because lead testing of representative samples (i.e., ground rock) would yield lead concentrations below the residential cleanup level. Oversize material was sorted into one of three categories:

- Rock
- Woody debris
- Non-woody debris (comprised primarily of metal scrap and automotive debris)

Oversized rock fractions were used as backfill for permanent stabilization in select areas of the Site. Use of oversized rocks for backfill is discussed in depth in Section 6.2.7. Metal and non-woody debris were placed into bulk containers for offsite disposal as discussed in Section 6.7 (Solid Waste Disposal). Most batteries and battery fragments were removed from the soil prior to soil being temporarily stockpiled. Any batteries or battery fragments found during screening activities were containerized in drums for disposal as hazardous waste as discussed in Section 6.7.2. Woody debris was taken to an offsite location and burned as described in Section 6.7.1.

6.5 Soil Treatment

The Site soils were treated by chemically stabilizing the lead before placing the soils in the onsite containment cells. ECOBOND® was used to treat lead contaminated soils. The ECOBOND® product does not change the total concentration of lead in the soil; instead, it reduces the leachability of the lead. ***NORTECH*** personnel collected samples for each 300 CY batch of lead contaminated soil prior to treatment with ECOBOND®. Each composite sample was thoroughly homogenized and field screened following the same procedure outlined in Section 4.5.2.

To verify treated soils met RCRA TCLP limits of < 5.0 mg/L of leachable lead, ***NORTECH*** personnel collected laboratory composite samples from each 300 CY batch of treated soil. Field screening and laboratory sampling followed the same protocols described above. These samples were referred to as TSP samples (see nomenclature in Section 6.3.1). Samples were prepared for shipment to SGS as described in Section 4.6. Because there was limited area available onsite to store individual batches of treated soil while awaiting laboratory results, each treated soil batch was incorporated into the treated stockpile containment cell immediately after being sampled. Each post-treatment sample was below the 5.0 mg/L leachable lead, so while the material still contains elevated levels of lead, it is considered non-hazardous.

6.6 Onsite Stockpiling of Treated Soil

The onsite treated stockpile containment cell conformed to regulations set forth in 18 AAC 75.370. Berms, measuring between six and 15 feet high, were constructed using six-inch minus rock from a local quarry. One edge of the treated stockpile cell remained open during treatment activities so that treated soil could be easily moved into the cell. Once three of the four sides of the cell were bermed, a D1 gravel layer was placed atop the 6-inch minus rock to prevent puncturing of the liner. A 20 mil HDPE liner, extending over the top of the berms, was laid atop the D1 gravel, followed by a layer of felt, then a second liner. Both liners were sealed with adhesive at the seams to ensure water that collected within the cell while it was actively being filled did not travel off-Site. Once the cell was filled, the berms were extended along the open edge and the process repeated.

After excavated soil had been treated and placed into the containment cell, the leading edge of the cell was bermed and lined as described above. The cell was then covered with a 60 mil HDPE liner that extended over the outside edge of each berm, overlapping the edge of the lower liner. The seams on the cover were sealed as described above. At completion, the cell encompassed Area B, the upper portion of Area C, and extended into Area D. Cell construction was accomplished in accordance with the approved Site Cleanup Plan. The extent of the completed cell can be seen in Appendix 3.

Water that collected in the treated stockpile cell prior to it being covered was pumped from the cell to the WTS holding pond as needed. The water was treated in the WTS prior to being discharged to the ground surface at the bottom portion of the Site.

Treated and stockpiled soil will remain on-Site until funds are available for transport and disposal of the material at an offsite location to allow for redevelopment of the property.

6.7 Solid Waste Disposal

Both hazardous and non-hazardous waste was found throughout the Site. Solid waste consisted of various metal and automotive debris, batteries and battery fragments, drums, appliances, small amounts of dried lead paint, and POL contaminated soils. Solid waste was appropriately sorted for transportation and disposal off-Site. Disposal of the most common solid wastes found on site are described below.

6.7.1 Non-Hazardous Solid Wastes

A variety of non-hazardous debris was present at the Site. This debris was separated into the following waste streams:

- Woody debris was cleaned of loose soil and burned at the former Wrangell Institute site located about ½ mile south of the Site on Zimovia Highway.
- Scrap metal that was free of contaminated soil was hauled to the Wrangell landfill for disposal.
- Tires and other debris coated with lead and/or POL contaminated soils were placed into containers for shipping and disposal in OR.

6.7.2 Battery Fragments

Intact batteries and battery shards and pieces were continuously separated from other debris as discovered. These materials were mixed with debris and found throughout the Site's surface and subsurface soils. The interim removal work began removal of visible battery fragments from the Site surface, and this work continued as subsurface soils were excavated during the Remedial Action.

Loose battery plates, battery shards, and other lead debris are considered hazardous wastes. Battery fragments were stored in containers at the site. The shipping containers were watertight and covered when not being actively loaded to reduce collection of precipitation. Once full, containers were prepared for shipment by permanently sealing the container. Sealed containers were stored off site at a designated storage location and then shipped as quickly as possible. Once shipped, these containers were handled in accordance with DOT regulations.

6.7.3 POL Contaminated Wastes

During excavation activities, about 120 CY of grossly contaminated POL soils were found. POL contaminated soils were temporarily stockpiled separately from soils containing only lead contamination. POL soils were treated with ECOBOND® to prevent lead leaching and placed in containers with other debris for offsite disposal at Columbia Ridge Landfill in Arlington, Oregon.

In addition to POL contaminated soils, 22 drums containing various amounts of petroleum products were found on Site. Drums were in various states of repair, from intact and filled to crushed and leaking. If possible, the NRC Alaska Hazardous Waste Specialist placed intact or mostly intact drums into over pack drums prior to offsite disposal. Crushed drums were placed in the 20CY containers with other contaminated metallic debris for offsite disposal.

6.8 Treatment of Surface Water Runoff

NRC Alaska mobilized a WTS to the Site to treat surface water run-off and water run-off from dewatering activities. The WTS was located on a clean area of the Site within Area A, and consisted of:

- A lined collection and settling pond with a capacity of approximately 19,000 gallons.
- A 10,000 gallon sediment settling tank.
  - Water from the collection and settling pond was pumped into this tank and filtered through both 100 and 10 micron filters.
- A flatbed trailer with two filter pods units.
  - The first pod contained zeolite for lead removal, and the second pod contained granular activated carbon for removal of petroleum.
- A 10,000 gallon water holding tank.
  - Treated water was held in this tank until the tank reached capacity and was discharged.
  - Water was discharged to the ground surface downgradient of the WTS via a hose.

A total of 114,383 gallons of water was processed through the WTS during the course of the project.

7.0 ANALYTICAL DATA

Data collected during Remedial Action operations were required to meet certain Data Quality Objectives (DQOs), depending on the type of data collected, which included:

- Field screening data (i.e., XRF readings for lead)
- Analytical laboratory testing of soil
- Solid waste determinations
- Discharged effluent from onsite water treatment system

7.1 Data Categories

Data generated during this project was either definitive data or screening data. Screening data were obtained by portable field instrumentation that produces rapid but less precise results when compared to laboratory analysis. The XRF results fall into the screening data category. While these measurements are repeatable and accurate, they may lack the precision to provide direct correlation with the absolute values for concentration units.

Definitive data were generated as the result of rigorous methodology, including direct and indirect quality control verifications, and extensive evaluation and documentation. The results are quantitative and accurate. Definitive data was used to establish compliance with ADEC's site-specific cleanup requirements.

7.2 Project Data Summary

7.2.1 XRF Field Screening

The NITON hand-held XRF instrument provides an increasing level of accuracy with increased sampling time. For soil field testing, ***NORTECH*** allowed for a minimum instrument time of 10 seconds ("nomsec" as displayed on the instrument). This duration is usually adequate to achieve a precision of +/- 20%. In addition, each sample is tested at three different locations. This helps confirm the adequacy of homogenization efforts. The average of the three readings is reported in ppm as the result for that sample.

Although a specific protocol does not exist for field screening lead in soil, ***NORTECH*** has used XRF field screening at multiple lead contaminated sites. At the beginning of each project, a number of locations are field screened with the XRF and then representative samples submitted to the laboratory to develop a site-specific field screening action level (FSAL). The intent of this is not to develop a correlation between the XRF and laboratory data, but to identify a FSAL that will have at least a 95% pass rate (ie samples below the FSAL will have laboratory results below the regulatory criteria). Due to the large volume of contaminated soil and limited site space, the objective for the FSAL was to have 98% of the samples that field screened below the FSAL return laboratory results below the ADEC residential cleanup criteria of 400 mg/kg.

Initial screening results using the XRF and additional laboratory data indicated that the FSAL should be between 30 ppm and 40 ppm. Based on this, the IRAP was developed using an FSAL of 35 ppm. During the Interim Removal effort, 758 field screening samples were collected and analyzed to confirm previous results, delineate contaminated areas, and evaluate the depth of contamination in the proposed staging areas. Of these, 120 samples were submitted to the laboratory for confirmation analysis. A subset of 45 samples, with XRF field screening results between 10 ppm (known clean) and 100 ppm (known contaminated) were analyzed to confirm and refine the FSAL. Based on data collected during the Interim Removal, the 35 ppm FSAL had a 98% pass rate. For the entire project, the 35 ppm FSAL had a 99% pass rate. Conversely, of the 35 samples sent in for characterization of the untreated stockpile with XRF results above the FSAL, only three samples (8%) had laboratory results less than 400 mg/Kg. This high level of accuracy minimized the quantity of clean soil that was excavated, while avoiding the cost and delays associated with having to return to specific locations to remove remaining hot spots.

7.2.2 Laboratory Testing of Confirmation Samples

Confirmation samples were submitted to SGS for both soil (total lead, TCLP, SPLP) and water (total lead, total settleable solids). A total of 268 excavation bottom soil samples, 46 excavation sidewall soil samples, 62 treated soil TCLP, 30 treated soil SPLP, and 10 water samples from the WTS were collected during the project field effort for laboratory analysis. In addition to the primary samples, 44 soil duplicate samples were submitted for total lead analysis, and three water duplicate samples were analyzed for total lead.

The analytical sample results for the project samples are summarized in Tables 1 through 8 in Appendix 2. Complete copies of the laboratory analysis reports are provided in Appendix 6. Copies of the Laboratory Data Review Checklists (LDRC) for each data report are included in Appendix 7. A discussion of data quality control is provided in Section 6.4 of this report.

Based on the results of previous investigations and the Interim Removal Action, lead was identified as the primary contaminant of concern for this project effort. Although not a primary contaminant of concern, pockets of POL contamination were found throughout the site and samples from those areas were analyzed to confirm removal of any POL contamination above applicable soil cleanup levels.

7.3 Data Quality Review and Validation

Project samples were analyzed using the laboratory methodologies described Section 4.6. Field quality control samples included field duplicates, matrix spike/ matrix spike duplicates (MS/MSD), and trip blanks (TB) in accordance with the QAPP and Work Plan. Confirmation and characterization samples were submitted to SGS Environmental Services (SGS) in Anchorage, Alaska. Samples were packaged as a group and each group was handled as a work order by SGS. A single sample for analysis of asbestos was sent by SGS to a subcontracted laboratory (White Environmental) for analysis. Analytical results generated from White Laboratories were provided to ***NORTECH*** by SGS. Analytical results were provided by SGS in PDF formats. PDF copies of the data packages for each work order are in Appendix 6.

Data quality failures did not significantly affect data usability. Data quality failures for confirmation samples were the result of Site soil not being homogenous for lead. The most common data quality failures were lead recovery in the Matrix Spike (MS) and Matrix Spike Duplicate (MSD) exceeding QC criteria and Relative Percent Differences (RPD) between field duplicates exceeding QC criteria. SGS noted QC failures of the MS/MSD were due to samples being non-homogenous for lead, which also explains the differences in total lead within some field duplicate pairs. Due to the origin of the lead contamination onsite, non-homogeneity of lead concentrations in Site soils was expected. The data collected during this effort was usable as intended at the time of collection and as discussed in this report.

8.0 DISCUSSION BY AREA AND ANALYSIS

8.1 Characterization Samples

The two main purposes of characterization samples were to provide information on the presence or concentrations of various analytes in order to determine proper disposal of materials or to guide excavation activities. A total of 57 total lead (39 soil, 13 WTS effluent, and 6 drainage water), four TSS, seven POL, six RCRA metals, three PAH, six PCB, and one asbestos characterization samples were sent to SGS throughout the duration of the project. Characterization samples for TCLP are discussed in Section 8.4.2.

Total lead characterization soil samples served two purposes: to document lead concentrations of soils that were excavated from the Site and to use with confirmation samples to develop a site-specific FSAL (see Sections 4.5.2 and 7.2.1 for further discussion of the FSAL). Total lead characterization samples are samples that field screened above the FSAL of 35 ppm and were analyzed for total lead. Total lead samples that field screened below the FSAL and had laboratory total lead concentrations above the cleanup level of 400 mg/kg are discussed in Section 8.2. Field duplicate samples are discussed in Section 8.5. Laboratory results for total lead soil characterization samples can be found in Table 2 of Appendix 2.

Total lead characterization water samples were taken from various on-Site drainages and the WTS. Samples taken from Site drainages were analyzed to compare to WTS discharge samples to determine if the system was reducing lead concentrations. Samples from drainages had lead concentrations ranging from 2,640 mg/L to 217 mg/L and samples from the WTS discharge had lead concentrations ranging from 202 mg/L to 2.63 mg/L. Samples collected from the WTS, including TSS samples, are discussed further in Section 8.10.

Three of the seven POL characterization samples were collected in order to determine the concentrations of GRO, DRO, RRO, and BTEX contamination present in temporarily stockpiled soils during Interim Removal activities. Results from these samples were used to determine options for disposal of site soils.

The remaining four POL characterization samples were collected to determine if excavation activities had removed POL contamination above cleanup levels near Site boundaries. Results from these samples guided excavation activities. Results for POL characterization samples can be found in Table 4 of Appendix 2.

Samples analyzed for RCRA metals, PAHs, PCBs, and/or asbestos were used to characterize soils or solid wastes for proper disposal. Results for each of these analysis can be found in Table 6 of Appendix 2.

8.2 Sample Coverage and Anomalies

Verification of the excavation limits was completed through field screening and laboratory sampling. Throughout the project ***NORTECH*** personnel collected a total of 1,275 excavation bottom samples that field screened below residential cleanup levels for total lead. These samples were collected in each area excavated during project activities. A subset of 268 samples were sent to SGS for analysis of total lead, resulting in greater than 20% of clean field screened bottoms samples being sent in for confirmation. The ADEC approved SAP required 10% of clean field screened bottom samples to be sent in for laboratory confirmation.

At the end of the project, 1,338 linear feet of excavation sidewall was present. A total of 46 sidewall samples were sent to SGS for laboratory analysis of total lead to confirm clean. The ADEC approved SAP required one confirmation sample per 100 linear feet of excavation sidewall. With 46 samples, one sample per 29 linear feet were collected and confirmed clean by the laboratory.

Throughout field screening activities, ***NORTECH*** personnel observed a clear trend in lead levels present in the Site soils. Lead levels did not begin high at the surface and gradually decrease with depth. Rather, lead levels continued to be high throughout the soil profile until a point where levels would suddenly drop to at or near non-detect levels. This point was almost always at the glacial till interface. This trend is the reason the majority of bottom and sidewall samples sent to SGS for confirmation analysis had non-detect field screenings for total lead.

8.3 Confirmation Samples above 400 mg/kg of Lead

Of the 268 excavation bottom samples sent in for confirmation, three samples which field screened below the FSAL of 35 ppm had laboratory levels of lead above residential cleanup levels of 400 mg/kg total lead. This calculated to a failure rate of the FSAL of 1.1%. These three samples were located at coordinates X100Y210 (Area A), X90Y150 (Area A), and X350Y140 (Area D).

Sample X100Y210 was taken at the beginning of the project during Interim Removal activities, and had an average field screening of 29.9 ppm and laboratory results of 418 mg/kg of total lead. The area surrounding the sample was excavated to deeper depth during Remedial activities and a new sample was taken at that location. The sample taken from this depth had a field screening average of 9.8 and was accidentally sent in for laboratory analysis twice. Laboratory analysis returned total lead levels of 67.4 mg/kg and 3.97 mg/Kg.

Sample X90Y150 was also collected during Interim Removal activities. This sample had an average field screening of 15.7 ppm and laboratory results of 32,400 mg/Kg. After laboratory results were returned, the remaining sample field screened again (six additional NITON shots were made) and yielded an average NITON reading of 32.3 ppm. The remaining sample was then sent in for laboratory analysis a second time. The second analysis, containing soil from the same collection as the first analysis, had a laboratory results of 288 mg/kg of total lead. Due to a second analysis of the sample having results under the residential cleanup level of 400 mg/kg of total lead and the known non-homogeneity of lead in the Site's soils, the area was considered clean and was not re-excavated.

Sample X350Y140 was collected from near the base of the untreated stockpile and had had an average field screening of 26.4 ppm and laboratory results of 1,550 mg/Kg. While it field screened below the FSAL, soil from the untreated stockpile (which contained excavated soils that field screened above FSAL) may have been inadvertently collected with the glacial till of the sample and caused the elevated laboratory result. After the untreated soil stockpile had been completely removed for screening and treatment, this area was again field screened and sampled. Removal of lead contamination in this area is complete.

8.4 Field Duplicates

Collection of Field Duplicate samples were in accordance with the ADEC 2010 Field Sampling Guidance. A total of 42 field duplicate samples for total lead, eight duplicate samples for POL, and one duplicate sample for PCBs were submitted blind to SGS. One TCLP field duplicate was submitted to SGS. Three additional confirmation samples for total lead were submitted multiple times to the lab and will be used with the blind field duplicates to determine precision of laboratory analysis. One sample was submitted twice for analysis of both TCLP and SPLP and will treated as a duplicate pair as well. The ADEC considers Relative Percent Differences (RPD) between soil duplicate pairs of 50% or less to be acceptable. RPDs for the duplicate pairs ranged from 0.8% to 196.5%. Of the eight duplicate pairs for POL, only one sample had concentrations of any analyte above detection levels and can be used to calculate an RPD. The one POL duplicate pair with RRO concentrations above the detection limit had an RPD of 13.39%. The single PCB duplicate pair had an RPD of 29.43%. Both duplicate pairs are within the acceptable 50% limit. The single SPLP duplicate pair had an RPD of 2.87% and was within acceptable limits. One TCLP duplicate pair had an RPD of 0.80%. The second TCLP duplicate pair and the remaining 45 duplicate pairs for total lead are discussed below.

Of the 45 duplicate pairs for total lead, 28 (or 62.2% of samples) had an RPD of 50% or less and 17 duplicate pairs (37.8%) exceeded the ADEC recommended RPD. Ten of the 16 total lead duplicate pairs and one of the TCLP duplicate pairs had RPDs over 100%. For a complete list of duplicate pairs, see Table 7 in Appendix B.

As discussed in Section 7.3, SGS noted in many of their laboratory reports that samples were non-homogenous for lead. Due to the source of contamination on Site, non-homogenous distribution of lead throughout the soil matrix was expected. The large differences in concentrations of total lead that were found between some duplicate pairs can be explained by this non-homogenous distribution of lead. Non-homogeneity of lead within the sample would also explain the large differences in TCLP results for TSP-22-01. Normally, a high percentage of field duplicate pairs with RPDs above 50% would signify a problem with the precision of the Laboratory's analysis of the samples. However, non-homogenous distribution of lead throughout the sample matrix explains these large RPDs and precision of the laboratory analysis of samples is therefore not an issue.

8.5 Wrangell Junkyard Property

The Wrangell Junkyard property encompasses an area of 2.5 acres and comprises the bulk of the Site. This property was divided into four areas (Areas A, B, C, and D) in order to more easily discuss Site activities. In addition to lead contaminated soil, tires, scrap metal, automotive parts, drums, and appliances were found throughout the property. Batteries and battery burn piles were found throughout the property. Asbestos pipe was also found in Area A along the Goodwin property line. ***NORTECH*** personnel documented the presence of solid waste in the field notebook. Solid wastes were disposed of properly. The following sections describe excavation of lead and petroleum contaminated soils within the Wrangell Junkyard property.

8.5.1 Excavation Bottom Confirmation Samples

A total of 268 excavation bottom confirmation samples were selected randomly with additional samples added non-randomly in order to achieve even coverage of the bottom of the excavation. Three confirmation samples that field screened below the FSAL had laboratory results above 400 mg/kg and are discussed in depth in Section 8.3. The other 265 excavation bottom samples submitted for the Wrangell Junkyard had laboratory results under 400 mg/kg of total lead. According to field screening and confirmation sampling, the bottom of the excavation is below residential the cleanup level of 400 mg/kg total lead.

8.5.2 Excavation Sidewall Confirmation Samples

Excavation sidewalls did not fall along straight lines and many times would wind back and forth across property lines. Due to the relatively small number of sidewall confirmation samples and the difficulty in determining which side of the property line some samples were collected, the sidewall confirmation samples will be discussed in this section. Methodologies for determining the lateral extent of excavation can be found in 6.3.1.

A total of 46 excavation sidewall confirmation samples were sent in for analysis of total lead. Confirmation samples were selected non-randomly in order to achieve relatively even coverage of the excavation sidewalls. Each excavation sidewall sample had laboratory results under 400 mg/kg of total lead, confirming excavation sidewalls meet the residential cleanup level.

8.5.3 POL Confirmation Samples

Although POL contamination was not a concern, areas of POL contamination were discovered on Site. One drum cache identified in previous E&E studies was located on Junkyard property. This cache contained drums which had been leaking petroleum product into the surrounding soil. In addition to this drum cache, many crushed drums were found throughout the property. ***NORTECH*** personnel recorded the locations of crushed drums and any observed sheen from petroleum factions in the field notebook.

A total of 29 confirmation samples from the Wrangell Junkyard property were sent to SGS for analysis of DRO, RRO, and BTEX. The results were below detection limits for GRO, Ethylbenzene, Total Xylenes, and Toluene.

One sample from the excavation bottom in Area A (X240Y270) tested above cleanup limits for Benzene (0.0594 mg/kg), and a characterization sample from the bottom of the excavation (X115Y221) in Area A was above cleanup levels for DRO (7,120 mg/kg). Further excavation in these two locations removed remaining contamination in those areas and final bottom samples met the ADEC cleanup levels for POL contaminants.

One excavation sidewall sample, collected at the sidewall between the Wrangell Junkyard property and Bill Byford's property (X110Y248) tested above cleanup levels for DRO and the LOQ for benzene was above the cleanup level. Additional excavation was undertaken at this location to remove the remaining contamination. New sidewall and bottom samples in this area met the cleanup levels and LOQs for POL contaminants.

8.6 Alaska Mental Health Trust Property

Alaska Mental Health Trust (AMHT) property lies adjacent to the northeast Wrangell Junkyard property line. Test samples collected during Interim Removal activities determined that lead contamination above residential cleanup limits was present on AMHT property. In addition to lead contamination, one of the drum caches noted during previous E&E studies was located on MHTA property. Batteries, battery plates, crushed drums, and scrap metal were also found during excavation of lead contaminated soil on MHTA property. ***NORTECH*** personnel documented the presence of solid waste in the field notebook. Solid wastes were properly disposed of. The following sections describe excavation of lead and petroleum contaminated soils within the MHTA property.

8.6.1 Excavation Bottom Confirmation Samples

32 excavation bottom confirmation samples from Alaska Mental Health Trust property were sent in for analysis of total lead. Confirmation samples were selected non-randomly in order to achieve even coverage of the entire area. Submitted samples had laboratory results under 400 mg/kg of total lead. According to field screening and confirmation sampling, the AMHT property portion of the Site is below residential cleanup levels of 400 mg/kg total lead at the bottom of the excavated area. A total of 300CY of lead contaminated soils were removed from the AMHT property during the remedial action work.

8.6.2 POL Confirmation Samples

As previously noted, one of the drum caches identified in previous E&E studies was located on AMHT property. This drum cache was located in an area of small seeps and drainages at the base of mature trees. Multiple drums within the cache contained petroleum product which had been leaking into the surrounding soil. In addition to the drum cache, crushed drums were also found throughout the excavated area. ***NORTECH*** personnel recorded the locations of crushed drums and any observed sheen from petroleum in the field notebook.

A total of 10 POL confirmation samples from AMHT property were sent to SGS for analysis of DRO, RRO, and BTEX. Excavation bottom confirmation samples had analyte concentrations below ADEC cleanup levels. One excavation sidewall sample located on Alaska Mental Health Trust Alliance property (X515Y300) tested above cleanup levels for DRO. Further excavation in this area removed remaining POL contamination above ADEC cleanup levels.

8.7 Goodwin Property

The Goodwin's property lies adjacent to the southeast Wrangell Junkyard property line on the eastern edge of Area A. Sampling during previous E&E investigations as well as test samples collected during Interim Removal activities determined that lead contamination above residential cleanup limits was present on the Goodwin's property. Batteries, battery plates, and asbestos pipes were also found during excavation activities on the Goodwin's property. ***NORTECH*** personnel documented the presence of solid waste in the field notebook. Solid wastes were properly disposed of by NRC Alaska.

In order to remove the lead contaminated soil, NRC Alaska crews removed the line of mature alder trees and berry bushes that separated the Goodwin's property and the Wrangell Junkyard Property. ***NORTECH*** personnel noted numerous batteries were present within the root wads of the removed trees. Once excavation activities were completed, NRC Alaska built a fence along the property line to delineate the Goodwin's property from Wrangell Junkyard property. The awning and floor on the western side of the Goodwin's wood shed were also removed so that NRC Alaska crews could remove contaminated soil. The awning and floor were rebuilt once excavation was completed. A total of about 450CY of lead contaminated material was removed from the Goodwin property.

8.7.1 Excavation Bottom Confirmation Samples

A total of 12 excavation bottom confirmation samples from the Goodwin's property were sent in for analysis of total lead. Confirmation samples were selected non-randomly in order to achieve even coverage of the entire area. Submitted samples had laboratory results under 400 mg/kg of total lead. According to field screening and confirmation sampling, the Goodwin property portion of the Site is below residential cleanup levels of 400 mg/kg total lead at the bottom of the excavated area.

8.8 Byford Property

The property adjacent to the Wrangell Junkyard to the southwest (western portion of Area A) is owned by Bill and Maria Byford. Sampling during previous E&E investigations as well as test samples collected during Interim Removal activities determined that lead contamination above residential cleanup limits was present on the Byford's property. Batteries, battery plates, POL contaminated soil and dried lead paint were found during excavation activities on the Byford's property. ***NORTECH*** personnel documented the presence of solid waste in the field notebook. Other solid wastes encountered during excavation activities on the Byford's property were properly disposed of. Roughly 170CY of lead contaminated material was removed from the Byford property during this work.

8.8.1 Excavation Bottom Closure Samples

A total of 10 excavation bottom confirmation samples from Byford property were sent in for analysis of total lead. Confirmation samples were selected non-randomly in order to achieve even coverage of the entire area. Submitted samples had laboratory results under 400 mg/kg of total lead. According to field screening and confirmation sampling, the Byford property portion of the Site is below residential cleanup levels of 400 mg/kg total lead at the excavation bottom.

8.9 Soil Treatment and Containment

Once excavated, lead contaminated soils were placed in a temporary stockpile located within Area D of the Site. Soil was removed from this temporary stockpile and treated as described in Section 6.5. Treated soil was then placed into a treated soil stockpile cell as described in Section 6.6. The following sections discuss the laboratory results from untreated characterization samples analyzed for TCLP, as well as TCLP and SPLP samples collected after lead contaminated soil was treated with ECOBOND®.

8.9.1 TCLP Characterization Samples

Seven TCLP characterization samples were collected throughout the project. Six of the seven TCLP characterization samples were analyzed to determine if it was possible to determine if soils containing under a specific amount of total lead would pass leachability requirements without treatment. Leachability of lead within the analyzed soils did not correlate with specific levels of total lead. NRC and ***NORTECH*** used this data to determine that the excavated soils on-Site would be treated with ECOBOND®.

One TCLP characterization sample was collected to determine the leachability of lead in POL contaminated soils that had been temporarily stockpiled. The POL contaminated soils had been separated from other soils for disposal off-Site. According to TCLP analysis, Sample CZ-POL-COMP-1 had 17.90 mg/L of leachable lead, well above the RCRA limit of 5.0 mg/L and determined that the temporarily stockpiled POL soils would have to be treated with ECOBOND®

prior to off-Site disposal. Results of the TCLP characterization samples can be found in Table 3 of Appendix 2.

8.9.2 Treated Stockpile Samples

Composite samples of soil treated with ECOBOND® were collected for laboratory analysis of TCLP and SPLP as described in Section 6.5.2. Lead contaminated soils from excavation activities were placed into a single temporary stockpile and therefore TCLP and SPLP samples will be discussed once as a whole and not by areas.

A total of 62 TCLP samples were collected from soil treated with ECOBOND® for laboratory analysis. A subset of 30 TCLP samples were also analyzed for SPLP. All but two TCLP and two SPLP samples had results under 1.0 mg/L. Results for TCLP analysis ranged from below detection limits (0.0500 mg/L) to a high of 4.29 mg/L. Results for SPLP analysis ranged from below detection limits (0.0500 mg/L) to 1.42 mg/L. Each result was below the RCRA TCLP limit of 5.0 mg/L and the SPLP limit of 5.0 mg/L.

8.10 Water Treatment and Discharge

In order to treat surface water runoff and water from dewatering activities, NRC Alaska installed a water treatment system (WTS) on Site. The system is described in Section 6.8. Thirteen samples were collected from the WTS and sent to SGS for analysis of total lead. An additional four samples (two from the WTS and two from Zimovia Strait) were collected for analysis of total settleable solids (TSS). Laboratory results for total lead ranged from 210 mg/L to 2.63 mg/L. Laboratory results for TSS in WTS discharge water were non-detect (detection limit of 0.100 ml/L/hr) and ranged from non-detect to 0.200 in Zimovia Strait samples.

In addition to Laboratory sampling, ***NORTECH*** personnel collected field data on pH and turbidity of the WTS discharge and Zimovia Strait. Discharge from the WTS ranged from a pH of 11 to a pH of 5.54. Zimovia Strait had a pH range of 8.0 to 8.5. Turbidity of WTS discharge ranged from 0.27 NTUs to 210 NTUs, and turbidity in Zimovia Strait ranged from 15.89 NTUs to 68.7 NTUs.

Generally, lead levels in the discharge water were lowest at the end of the project. Lead levels in water were expected to drop as the project continued due to excavation activities removing the source of contamination.

9.0 CONCLUSIONS AND RECOMMENDATIONS

The Alaska Department of Environmental Conservation (ADEC) contracted NRC Alaska LLC (NRC Alaska) to conduct a Remedial Action at the Wrangell Junkyard Site under the Spill Prevention and Response (SPAR) Term Contract 18-7002-01. The Wrangell Junkyard (Site) is located south of the City of Wrangell, at Mile 4 of the Zimovia Highway. The edge of the highway right-of-way is the southern boundary of the Site, residential properties are located on the east and west, and land managed by the Alaska Mental Health Trust is located to the north. Zimovia Strait is located across the Zimovia Highway from the Site.

The Site was operated as a junkyard for many decades and operations included the salvage of automotive components and smelting of batteries to reuse the lead. The junkyard operations, as well as the subsequent scrap salvage operations, resulted in lead (Pb) contamination and vehicle debris across the site, as well as pockets of petroleum contamination and more than a dozen drums. The objective of the project was to reduce the risk to human health and the environment through excavation, treatment, and off-site disposal of contaminated materials at the Site. The following is a summarizes the work that was undertaken:

Surface Waste Identification and Disposal

- 22 drums were disposed of based on the contents
- Clean scrap metal was disposed of at the Wrangell Landfill
- Batteries and battery shards on the surface of the site were collected for disposal

Contaminated Material Disposal

- A total area of 2.81 acres was identified as contaminated by field screening and laboratory analysis and was excavated and treated
    - 2.51 acres was encompassed by the subject Wrangell Junkyard parcel, with an additional 0.3 acres of contaminated area located on the neighboring lots
- Nearly 19,000 cubic yards of material was excavated for treatment
    - 57 20-ton containers of contaminated metallic debris were segregated and shipped to Arlington, OR for disposal
    - Roughly 1,000 cubic yards of rocks larger than six inches were segregated and used for backfill in the northeast portion of the Site
    - About 350 cubic yards of woody debris was incinerated
        - This occurred at the former Wrangell Institute property
        - Ash from the incineration was disposed of with the vehicle debris
- 170 cubic yards of grossly petroleum contaminated soil were disposed of with the vehicle debris
- 18,350 cubic yards of lead contaminated soil (six inch minus) was treated using ECOBOND®
    - TCLP and SPLP testing confirms the lead is not leaching from the soil and is not a hazardous waste
    - This contaminated material is located in lined containment cells on the property

Site Assessment

- XRF field screening and laboratory sampling during excavation indicated:

    - Lead was present above the cleanup level across the site within the organic surface soil layer
    - Lead did not penetrate into the glacial till
    - The site specific field screening cleanup criteria correlated well with laboratory results
- Field screening and laboratory results at the limits of excavation indicated:
    - Clean glacial till was reached at the bottom of the excavation
    - Clean sidewalls were attained at the AMHT land, the neighboring residential properties, and the ADOT&PF right-of-way

Based on the field observations and laboratory data gathered during the remedial actions, the Site now meets the residential cleanup criteria for lead, petroleum, and other suspected contaminants of concern. The excavated area has been backfilled with clean material and is stabilized to reduce the potential for erosion while the surface naturally revegetates. The existing contaminated soil stockpiles are expected to be relocated to an off-site disposal location under a separate contract. The objectives of the project have been met and additional remedial action is necessary to complete the work as outlined in the contract documents.

10.0 LIMITATIONS AND NOTIFICATION

NORTECH provides a level of service performed within the standards of care and competence of the environmental engineering profession. However, it must be recognized that limitations exist within any site investigation or assessment. This report provides results based on a restricted work scope and from the analysis and observation of a limited number of samples. Therefore, while it is our opinion that these limitations are reasonable and adequate for the purposes of this report, actual site conditions may differ. 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.

The report is a record of observations and measurements made on the subject site as described. The data should be considered representative only of the time the site investigation was completed. No other warranty or presentation, either expressed or implied, is included or intended. We certify that except as specifically noted in this report, the statements and data appearing in this report are in conformance with ADEC's FSG. NRC Alaska and ***NORTECH*** performed the work, made the findings, and proposed the recommendations described in this report in accordance with generally accepted environmental remediation and engineering practices.

11.0 SIGNATURES OF ENVIRONMENTAL PROFESSIONALS

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