# LIMITED SITE INVESTIGATION
# ENVIRONMENTAL WORK PLAN

## VALDEZ AIRPORT SREB AND DMSB PROJECT
## VALDEZ, ALASKA

ADEC FILE NO.: NOT APPLICABLE
ADEC HAZARD IDENTIFICATION NO.: NOT APPLICABLE


PREPARED BY:

R&M CONSULTANTS, INC.
9101 VANGUARD DRIVE
ANCHORAGE, ALASKA 99507


PREPARED FOR:

DEPARTMENT OF TRANSPORTATION & PUBLIC FACILITIES – NORTHERN REGION
2301 PEGER ROAD
FAIRBANKS, ALASKA 99709

FINAL
14 NOVEMBER 2022

# TABLE OF CONTENTS

# LIST OF TABLES



# LIST OF APPENDICES

# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| °C | degrees Celsius |
| °F | degrees Fahrenheit |
| 9Cl-PF3ONS | 9-chlorohexadecafluoro-3-oxanonane-1sulfonic acid |
| 11Cl-PF3OUdS | 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid |
| AAC | Alaska Administrative Codes |
| ADEC | Alaska Department of Environmental Conservation |
| ADONA | 4,8-dioxa-3H-perfluorononanoic acid |
| bgs | below ground surface |
| COPC | contaminant of potential concern |
| DMSB | deicing storage material building |
| DoD | Department of Defense |
| DOT&PF | Department of Transportation and Public Facilities (Alaska) |
| DRO | diesel-range organics |
| DQA | data quality assessment |
| DQO | data quality objectives |
| EPA | U.S. Environmental Protection Agency |
| ESA | Environmental Site Assessment |
| EWP | environmental work plan |
| GPS | Global Positioning System |
| GRO | gasoline-range organics |
| HFPO-DA | hexafluoropropylene oxide dimer acid |
| HDPE | high density polyethylene |
| HHCL | human health cleanup level |
| IATA | International Air Transport Association |
| IDW | investigation derived waste |
| L | liter |
| LCL | lower control limit |
| LCS | laboratory control spike |
| LCSD | laboratory control spike duplicate |
| LOD | limit of detection |
| LOQ | limit of quantitation |
| LSI | limited site investigation |
| MB | method blank |
| mg/kg | milligrams per kilogram |

| | |
|---|---|
| MGCL | migration to groundwater cleanup level |
| ml | milliliter |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| MQO | measurement quality objective |
| NMeFOSAA | n-methylperfluorooctanesulfonamidoacetic acid |
| NEtFOSAA | n-ethylperfluorooctanesulfonamidoacetic acid |
| PAH | polycyclic aromatic hydrocarbons |
| PFAS | per- and polyfluoroalkyl substances |
| PFBS | perfluorobutanesulfonic acid |
| PFDA | perfluorodecanoic acid |
| PFDoA | perfluorododecanoic acid |
| PFHpA | perfluoroheptanoic acid |
| PFHxA | perfluorohexanoic acid |
| PFHxS | perfluorohexanesulfonic acid |
| PFNA | perfluorononanoic acid |
| PFOA | perfluorooctanoic acid |
| PFOS | perfluorooctanesulfonic acid |
| PFTriA | perfluorotridecanoic acid |
| PFTeA | perfluorotetradecanoic acid |
| PFUnA | perfluoroundecanoic acid |
| R&M | R&M Consultants, Inc. |
| RPD | relative percent difference |
| RRO | residual-range organics |
| QC | Quality Control |
| QEP | qualified environmental professional |
| SDG | sample delivery group |
| SREB | snow removal equipment building |
| SVOC | semi-volatile organic compounds |
| USDOT | U.S. Department of Transportation |
| UST | underground storage tank |
| VOC | volatile organic compounds |
| WELTS | Well Log Tracking System (State of Alaska) |

# 1.0 INTRODUCTION

The Alaska Department of Transportation and Public Facilities (DOT&PF) – Northern Region retained R&M Consultants, Inc. (R&M) under Professional Service Agreement 25232012, Notice to Proceed Number 1 to perform a Phase II Environmental Site Assessment (ESA) limited site investigation (LSI) to investigate the site for the proposed snow removal equipment building (SREB) and deicing storage material building (DMSB) project for potential environmental contamination associated with past site use at the Valdez Airport in Valdez, Alaska. Environmental investigation and sampling will be conducted to investigate for the potential presence of per- and polyfluoroalkyl substances (PFAS) in soil from the planned geotechnical test boring locations. The investigation will be performed in accordance with 18 Alaska Administrative Code (AAC) 75 (ADEC, 2021), Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites (ADEC, 2017a), ADEC Guidelines for Data Reporting (ADEC, 2022b), ADEC Field Sampling Guidance (ADEC, 2022a), and this Environmental Work Plan (EWP).

The site is not listed as an active or closed-with institutional controls contaminated site by ADEC and is not considered regulated under 18 AAC 75 based on a review of the ADEC Contaminated Sites Database. There is an informational listing for the Valdez Airport (ADOT&PF Valdez Airport Sitewide PFAS) under File Number 2264.38.045 and Hazard ID 27095. PFAS were detected in three wells in the immediate vicinity of the Valdez Airport but were below ADEC drinking water screening levels.

## 1.1 INVESTIGATION OBJECTIVES

Proposed improvements to the DOT&PF facilities at Valdez Airport include replacement of the existing SREB and construction of a DMSB immediately west of the existing sand storage building. These buildings are located on the north side of Valdez Glacier Road that runs along the south side of the Valdez Airport. R&M is conducting environmental investigation and geotechnical testing services to inform design and construction recommendations. Environmental investigation services include sampling soil for PFAS to evaluate if PFAS contamination is present in the proposed construction area. The proposed investigation is not intended to characterize the nature and extent of PFAS at the Valdez Airport. **Drawings A-1, A-2, and A-3** of **Appendix A** provide location and vicinity, site features, and proposed investigation location maps.

The field objectives of the environmental portion of the investigation are as follows:

- Field screen soil samples from test borings for potential non-PFAS contamination.
- Collect soil samples for chemical analysis from the potential zone of soil disturbance expected during construction of the SREB/DMSB
- Analyze soil samples for contaminants of potential concern (COPCs) as detailed in **Section 3.1.**
- Containerize investigation derived waste (IDW) in accordance with **Section 3.5.**

## 1.2 PROJECT FIELD PERSONNEL AND QUALIFICATIONS

The following personnel are proposed to perform the field tasks outlined by this plan. A qualified environmental professional (QEP) as defined in 18 AAC 75.333(a) (ADEC, 2021) will be onsite when

environmental data or chemical samples are being collected. Both primary and alternate personnel are listed.

**TABLE 1-1: PROPOSED FIELD PERSONNEL AND QUALIFICATIONS**

| Name / Role | Qualifications |
|---|---|
| **Primaries** | |
| Alex Brown / ADEC QEP | ADEC QEP |
| Vanessa Crandell, CPG/ ADEC QEP | ADEC QEP |
| **Alternates** | |
| Christopher Fell, CPG / ADEC QEP | ADEC QEP |
| Amy Rodman / ADEC QEP | ADEC QEP |
| Brian Mullen, PE / ADEC QEP | ADEC QEP |

**NOTES:**
For definitions, see the Acronyms and Abbreviations table.

## 1.3 TENTATIVE SCHEDULE

Field work is tentatively planned for late fall 2022. A draft report on LSI field activities including conclusions and recommendations will be produced approximately eight to 12 weeks following conclusion of field work to allow for receipt and analysis of environmental laboratory results. Following DOT&PF review, a final LSI report will be prepared for submission to DOT&PF and ADEC approximately two weeks following receipt of DOT&PF comments.

# 2.0 SITE DESCRIPTION

The site is located on the south side of the existing Valdez Airport apron in a previously developed area and is in Township 8 South, Range 6 West, and Section 35 of the Seward Meridian. The site is located on the north side of Valdez Glacier Road (Airport Road) east of the intersection with Salcha Way. The site location and vicinity is shown on Drawing A-1 and investigation locations are shown on Drawing A-3.

## 2.1 TOPOGRAPHY

The site is situated on relatively flat ground that appears to have been graded during development of the airport and associated facilities.

## 2.2 SURFACE DRAINAGE

Precipitation is expected to sheet flow across the site towards Valdez Glacier Road. There is a small unnamed pond located approximately 1,200 feet southwest of the site on the southwest side of Salcha Way. The Valdez Glacier Stream (river) and Port Valdez (bay) are located more than a mile to the southeast, south, and southwest of the site.

## 2.3 GENERAL GEOLOGY

Allison Lake lies within the Chugach Mountains physiographic province (Wahrhaftig, 1965), which forms an extremely rugged barrier along the north coast of the Gulf of Alaska. The entire range was covered with glacial ice during advances of late Pleistocene-age (Coulter et al, 1965), as evidenced by the local topography and soil stratigraphy. The topography is dominated by the horns, cirques, and "U"-shaped valleys typical of areas which have been subjected to heavy glaciation. This region is considered to be generally permafrost free (Ferrains, 1965).

The physical character of the Valdez area consists of a central fjord (Port Valdez) accompanied by subsidiary U-shaped valleys; the valleys are separated by jagged bedrock ridge crests. The regional bedrock is part of the Valdez group consisting of late Cretaceous marine sedimentary/metasedimentary rocks which, in the Valdez area, are dominated by graywacke with lesser amounts of argillite and slate (Palmer, 1981). This rock occurs in thin beds that typically strike east-west, dip steeply to the north, and are strongly jointed, folded and extensively faulted. Along the eastern shore of Port Valdez, bedrock is covered with thick, unconsolidated Pleistocene and Holocene-aged outwash and floodplain deposits, transported by the glacier-fed Valdez Glacier stream and Lowe River (Moffit, 1954). These sediments form a thick wedge of silt, sand and gravel which have been trapped behind and within east-west striking graywacke ridges paralleling the shoreline.

## 2.4 GROUNDWATER CONDITIONS

Groundwater is not well studied in the area, but water well logs (78436, 16563, and 16562) available on the State of Alaska Well Log Tracking System (WELTS) show static water at 10 to 28 feet below ground surface (bgs). Groundwater is expected to flow from the north to the southeast or southwest based on regional topography.

## 2.5 CLIMATE

Based on climate data recorded at the Valdez WSO (509686) weather station: the mean annual air temperature is approximately 38.5 °F, with minimum and maximum monthly averages of approximately 22.7 °F (January) and 55.3 °F (July), respectively; and the area received an average of approximately 65.4 inches of precipitation per year, with maximum monthly mean of approximately 8.99 inches in August (WRCC, 2022).

# 3.0 INVESTIGATION METHODS

This section details sample collection methods and procedures for project field activities. Field activities include geotechnical and environmental investigation to depths of approximately 3 to 10 feet bgs to characterize areas where disturbance of site soils or existing pavement are proposed by the civil design team to construct the proposed SREB and DMSB.

Geotechnical and chemical samples will be collected from the same borings. Test borings will be advanced using hollow stem auger methods and discrete soil samples will be collected using split-spoon samplers. Field activities will be guided by this EWP, ADEC Field Sampling Guidance (ADEC, 2022a), and standard procedures provided in **Appendix B**, as tabulated in **Table 3-1**.

**TABLE 3-1: STANDARD FIELD PROCEDURES**

| Procedure Name | Purpose |
|---|---|
| 10-RM-SP Soil and Sediment Sampling | Provides standard soil sampling procedures to meet ADEC Field Sampling Guidance requirements for chemical sample collection. |
| 31-RM-SP Soil Classification, Logging, and Sampling | Provides standard procedures for classification, logging, and sampling of geotechnical or geological soil conditions. |
| 71-RM-SP Decontamination | Provides standard decontamination procedures for environmental projects to comply with ADEC Field Sampling Guidance and ADEC Monitoring Well Guidance. |
| 72-RM-SP Per- and Polyfluoroalkyl Substances (PFAS) Sampling | Provides standard procedures for handling samples for PFAS analysis (including PFOA and PFOS) to mitigate the potential for cross contamination. |
| 90-RM-SP Environmental Field Documentation | Guides collection of documentation of field observations and sampling to support reporting and data analysis. |
| 91-RM-SP Cooler Packing for Sample Shipment | Guides packing and field use of coolers for sample preservation and shipment. |

**NOTES:**
For definitions, see the Acronyms and Abbreviations table.

## 3.1 CONTAMINANTS OF POTENTIAL CONCERN

Based on the ADEC Contaminated Sites Database informational listing (File Number 2264.38.045) and ADEC Field Sampling Guidance Appendix F, COPC for the site include PFAS compounds perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS). The full list of 18 PFAS analytes analyzed by a modification of EPA Method 537.1 for soil will be reported as tabulated in **Table 4-3**.

An underground storage tank (UST) used for heating fuel is present near the southeast corner of the existing SREB. This adds COPC for potential petroleum hydrocarbon analytes near the UST location including: gasoline-range organics (GRO), diesel-range organics (DRO), residual-range organics (RRO), volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), and polycyclic aromatic hydrocarbons (PAH).

## 3.2 FIELD SCREENING

Typical field screening methods for contaminants include visual and olfactory screening methods of soil samples collected during the geotechnical investigation. Visual and olfactory screening will

be used to look for visual signs of non-PFAS contamination including discoloration of soil, sheen on groundwater or pore water, and unusual odors (i.e., petroleum or solvent).

Field screening techniques do not work for PFAS, however field screening will be performed for this project in the event evidence of other contaminants are present (e.g. petroleum hydrocarbons). Field screening will not affect the location of sampling activities as investigation for potential impact on the study area due to use of PFAS compounds at the Valdez Airport represent the primary data objective.

## 3.3 CHEMICAL SAMPLING METHODOLOGY

Soil samples for chemical analysis will be collected by an ADEC QEP using grab methods for select samples located in reach from the ground surface, or at depth using hollow-stem auger or air-rotary casing advancer drill tooling and split-spoon samplers. Recovered soil samples will be characterized and logged in accordance with standard procedure **31-RM-SP**. The procedure uses ASTM methods for soil and permafrost classification.

Most site work will be concentrated on asphalt paved or gravel surfaced areas at 0 to 5 feet bgs. A few locations will require deeper ground disturbance to allow for utility or foundation work. Ground disturbance during construction is expected to be limited to 10 feet bgs. Environmental sampling will be collocated with geotechnical investigations. Sampling will occur as detailed in **Table 3-2.** Upper and lower soil sample collection depth for general test borings will be based on QEP professional judgement or based on planned site improvement excavation depths and soil conditions observed in soil samples recovered. Collection depths for the two specialized test borings are described in **Table 3-2.** Test boring locations are shown on **Drawing A-3.**

**TABLE 3-2: CHEMICAL TESTING SAMPLING LOCATIONS**

| Media | Sampling Location | Location Selection Description[1] | Notes |
|---|---|---|---|
| Soil (General Test Borings) | Upper Soil Sample | Located between 0 and 2 feet bgs, but below the pavement section. | All test borings except RM22-C and RM22-G |
| | Lower Soil Sample | Located between 2 and 10 feet bgs as geotechnical excavation recommendations are not anticipated below that depth. | |
| Soil (UST investigation) | Upper Soil Sample | Located at or up to 5 feet below the estimated bottom of the UST. | RM22-C |
| | Lower Soil Sample | Located within 2 feet above or below the groundwater interface. | |
| Soil (PFAS extent) | Surface Soil | Surface sample from 0 to 2 feet bgs. | RM22-G |

**NOTES:**
For definitions, see the Acronyms and Abbreviations table.
1. As samples will be collocated with geotechnical sample intervals, samples will be collected at 2.5-foot intervals to 10 feet and at 5-foot intervals thereafter. Each sample will be collected with a length of approximately 1.5 to 2 feet due to geotechnical standard penetration test guidelines (ASTM D1586).

Soil samples for chemical analysis will be collected in accordance with standard procedure **10-RM-SP**, standard procedure **72-RM-SP**, and ADEC Field Sampling Guidance (ADEC, 2022a). Soil samples

will be analyzed by the methods specified in **Section 4.3**. Sample depths have been selected in advance of drilling with depths selected to provide a chemical cross-section of the site.

The project is designed to collect soil samples to assess the potential presence of PFAS contamination in soils at the Valdez Airport within proposed improvement areas. Based on the statement of work, **Table 3-3** provides the proposed number of chemical samples. Sampling protocols are described in the following sections.

**TABLE 3-3: PFAS CHEMICAL TESTING SAMPLE QUANTITIES**

| Investigation Type | Primary Samples | Duplicate Samples | Total Quantity of Samples |
|---|---|---|---|
| Test Boring to 2 feet bgs | 1 | 0 | 1 |
| Test Borings to 10 feet bgs (4 locations, 2 samples each) | 8 | 1 | 9 |
| Test Borings to 30 feet bgs (2 locations, 2 samples each) | 4 | 1 | 5 |
| **Planned Sampling Quantities** | **13** | **2** | **15** |

**NOTES:**
For definitions, see the Acronyms and Abbreviations table.
Quality control samples are discussed in **Section 5.0.**

The COPC identified for the site are location specific based on site history. **Table 3-4** presents the analyte testing schedule for test boring locations.

**TABLE 3-4:ANALYTE TESTING SCHEDULE**

| Test Boring | GRO | DRO | RRO | VOC | SVOC | PAH* | PFAS |
|---|---|---|---|---|---|---|---|
| RM22-A | | | | | | | X |
| RM22-B | | | | | | | X |
| RM22-C | X | X | X | X | X | X | X |
| RM22-D | | | | | | | X |
| RM22-E | | | | | | | X |
| RM22-F | | | | | | | X |
| RM22-G | | | | | | | X |

**NOTES:**
For definitions, see the Acronyms and Abbreviations table.
* PAH only collected from the upper soil sample in Test Boring RM22-C.

## 3.4 DECONTAMINATION PROCEDURES

Reusable sampling equipment that contacts potentially contaminated soil or water, including direct push core barrel samplers, will be decontaminated before each use to prevent cross contamination. Due to the length of the samples being collected, only direct push core barrel drill tooling will be used.

## 3.5 INVESTIGATION DERIVED WASTE

IDW includes contaminated solid wastes generated during field activities. Disposal or reuse options are described in detail in the following sections and summarized in **Table 3-5.** Investigation derived wastewater will not be discharged to the ground surface within 100 feet of surface water in accordance with 18 AAC 72.020(b) (ADEC, 2017b).

**TABLE 3-5: IDW DISPOSAL SUMMARY**

| Waste Type | Determination Criteria | Reuse Criteria | Disposal Location |
|---|---|---|---|
| Soil Cuttings | None | Pour into test boring cuttings during backfill. | Test Boring |
| Decontamination Water | None | Pour into test boring cuttings during backfill. | Test Boring |
| Other Solid Waste | None | None | Disposal as general garbage. |

### 3.5.1 IDW SOIL CUTTINGS

Soil cuttings will be used to backfill the test borings following completion of drilling at each location.

### 3.5.2 IDW WASTEWATER

Decontamination water from each test boring will be poured into that test boring following completion.

### 3.5.3 OTHER SOLID WASTE

Miscellaneous solid wastes, such as personal protective equipment and disposable sampling equipment, will be temporarily stored in the appropriate waste receptacle. Final disposal of the materials will be at the local permitted sanitary landfill.

## 3.6 WORK PLAN DEVIATIONS AND MODIFICATIONS

If methods or material substitutions comply with ADEC Field Sampling Guidance, approval will not be sought prior to making a change. Any deviations will be logged in the field notebook by the QEP and provided in the report. If a proposed change does not comply with ADEC Field Sampling Guidance, the ADEC project manager will be consulted prior to making a change.

## 3.7 INVESTIGATION LOCATION DOCUMENTATION

Investigation locations will be documented using swing ties from existing buildings or other infrastructure observable on existing aerial photography of the site. Recreational grade Global Positioning System (GPS) coordinates will also be collected after allowing the GPS unit to acquire satellites. The field user will observe the GPS units satellite acquisition screen to confirm that expected accuracy is obtained. Recreational grade GPS is considered accurate to approximately 10

feet by the equipment manufacturers, precision is expected to be better if all coordinates are collected within a short time frame (hours).

# 4.0 ANALYTICAL METHODS

This section details analytical procedures for project field activities. Environmental data will be collected using field screening procedures and by analysis of chemical soil samples. Laboratory analysis of chemical samples will be performed at an ADEC-approved laboratory. Chemical laboratory data will be compared to ADEC migration to groundwater (MGCL) and human health (HHCL) cleanup levels (ADEC, 2021).

## 4.1 PROPOSED CLEANUP LEVELS

Chemical laboratory data will be compared to the ADEC migration to groundwater and human health cleanup levels for COPC identified in **Section 3.1** (ADEC, 2021).

## 4.2 PROJECT ANALYTICAL LABORATORY

The proposed analytical method and testing laboratory is presented in **Table 4-1**. The laboratory will provide a report for the project. This laboratory is ADEC approved for the analytical method being performed.

**TABLE 4-1: PROPOSED ANALYTICAL TESTING LOCATION**

| Laboratory (Type) | Shipping Address | Analytical Methods | Analyte Groups |
|---|---|---|---|
| Eurofins Test America – Sacramento, California (Primary) | 880 Riverside Pkwy West Sacramento, CA 95605 | EPA 537.1 modified, with isotope dilution* | PFAS (18 Compounds) |
| SGS – Anchorage, Alaska (Primary) | 200 W. Potter Dr. Anchorage, AK 99518 | AK101, AK102, AK103, SW8260, SW8270, SW8270 SIM | GRO, DRO, RRO, VOC, SVOC, and PAH |

**NOTES:**
For definitions, see the Acronyms and Abbreviations table.
*This method is PFAS by EPA 537.1 modified, with isotope dilution, and includes the analytes included in **Table 4-3.**

## 4.3 CHEMICAL ANALYSIS METHODS AND COLLECTION DETAILS

Soil analytical methods and sampling details are presented in **Table 4-2** and includes the required sample containers, sample preservation, and holding times. Containers will be new, pre-cleaned containers. Samples will be preserved as defined in the following tables until delivered to the laboratory for analysis. The specific PFAS analytes that will be reported for EPA 537 analysis are listed in **Table 4-3**.

**TABLE 4-2: SOIL MATRIX ANALYTICAL ANALYSES**

| Analyte Class | Method | Holding Time | Preservative | Containers |
|---|---|---|---|---|
| PFAS (full suite) | EPA 537 (modified) | 14/28 days[1] | 0 to 6°C | (1) 4-ounce HDPE container |
| GRO | AK 101 | 28 days | Methanol (MeOH), 0 to 6°C | (1) 4oz amber glass, TLS lid. |
| VOC | SW 8260B | 14 days | | |
| DRO/RRO | AK 102 / AK103 | 14/40 days[1] | 0 to 6°C | (1) 4oz amber glass, TLC lid. |
| SVOC | SW 8270D | | | |
| PAH | SW 8270D SIM | | | |

**NOTES:**
For definitions, see the Acronyms and Abbreviations table.
1: Collection-extraction/extraction-analysis dual holding times apply. PFOS and PFOA holding times are from Method 537 for water samples; there are no soil sample holding times for this method.

**TABLE 4-3: INVESTIGATION ANALYTE LIST FOR PFAS BY EPA 537**

| CAS Number | Analyte |
|---|---|
| 2355-31-9 | n-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA) |
| 2991-50-6 | n-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA) |
| 375-73-5 | perfluorobutanesulfonic acid (PFBS) |
| 335-76-2 | perfluorodecanoic acid (PFDA) |
| 307-55-1 | perfluorododecanoic acid (PFDoA) |
| 375-85-9 | perfluoroheptanoic acid (PFHpA) |
| 307-24-4 | perfluorohexanoic acid (PFHxA) |
| 355-46-4 | perfluorohexanesulfonic acid (PFHxS) |
| 375-95-1 | perfluorononanoic acid (PFNA) |
| 335-67-1 | perfluorooctanoic acid (PFOA) |
| 1763-23-1 | perfluorooctanesulfonic acid (PFOS) |
| 72629-94-8 | perfluorotridecanoic acid (PFTriA) |
| 376-06-7 | perfluorotetradecanoic acid (PFTeA) |
| 2058-94-8 | perfluoroundecanoic acid (PFUnA) |
| 13252-13-6 | hexafluoropropylene oxide dimer acid (HFPO-DA) |
| 763051-92-9 | 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) |
| 756426-58-1 | 9-chlorohexadecafluoro-3-oxanonane-1sulfonic acid (9Cl-PF3ONS) |
| 919005-14-4 | 4,8-dioxa-3H-perfluorononanoic acid (ADONA) |

**NOTES:**
For definitions, see the Acronyms and Abbreviations table.

# 5.0 QUALITY ASSURANCE/QUALITY CONTROL

Field activities and reporting will be conducted by a QEP, as defined 18 AAC 75.333 (ADEC, 2021).

## 5.1 SAMPLE CUSTODY

The objective of sample custody is to create an accurate, verified written record, which is traceable from the time of sample collection to receipt by the laboratory. Adequate sample custody will be achieved by means of appropriate field and analytical documentation. A sample is defined as in someone's custody if:

- In actual possession.
- In view, after being in physical possession.
- In physical possession and subsequently locked or otherwise sealed so that tampering will be evident.
- Kept in a secure area, restricted to authorized personnel.

In the event samples are shipped to an analytical laboratory using a means where the samples will leave the custody of the QEP the following guidance will be followed.

- Sample coolers/containers must arrive at the lab with an intact and correctly applied custody seal.
- If the seal was broken at some point during transport, the reason for breaking the seal, condition of the container contents, the cooler temperature, and anything added to or removed from the container must be documented on the chain-of-custody form.
- The container must then be sealed with a new custody seal if still in transit.

## 5.2 SAMPLE STORAGE, PRESERVATION AND HOLDING TIMES

Sample containers are pre-cleaned and treated according to EPA specifications for the appropriate methods. Clean containers will be supplied by the laboratory and stored separately to prevent exposure to fuels and solvents, and other chemicals. Sample storage and preservation is provided in **Table 4-2**. Standard procedure **10-RM-SP** (**Appendix B**) outlines soil collection and preservation.

## 5.3 SAMPLE HANDLING, PACKAGING AND SHIPMENT

Samples will be packaged and shipped in accordance with US Department of Transportation (USDOT) and International Air Transport Association (IATA), as applicable. Sampling handling procedures are designed to transport samples to the laboratory intact, at the proper temperature and free of external contamination. The chain-of-custody record which identifies the method of shipment, courier name(s), and other pertinent information, accompanies all sample shipments. The original chain-of-custody accompanies the shipment, and a copy is retained in the project file.

Sample handling, packaging and shipment will follow the guidance in standard procedures **10-RM-SP, 31-RM-SP,** and **91-RM-SP** (Appendix B).

## 5.4 QUALITY CONTROL SAMPLES (DUPLICATE SAMPLES)

The following quality control samples will be collected to assist with chemical data evaluation. Duplicate soil samples will be collected at the rate of one per 10 primary samples with collection of the planned duplicate quantities spread out across multiple sampling days and test borings. Duplicates will be submitted to the laboratory in the same manner as regular samples for all contaminants of concern, and the results compared to the primary samples. An ADEC laboratory data review checklist will be prepared for each set of laboratory data and included with the report (ADEC, 2022c).

# 6.0 LABORATORY DATA REVIEW

Data reduction, validation and reporting procedures are designed to produce complete documentation, minimize transcription and reporting errors, and facilitate proper review of data received from laboratories.

## 6.1 DATA REDUCTION

Data reduction is the process of converting measurement system outputs into an expression of parameters and information from which conclusions about a site can be made. The analytical laboratory is responsible for the reduction and reporting of analytical data. Laboratory results and procedures will be reviewed to check the accuracy of this process. Sample data that has not been rejected, including blanks and duplicates, will be presented in the investigation report.

## 6.2 DATA QUALITY REVIEW

Data quality reviews are conducted to verify whether field measurements and analytical methods have been performed according to method and project specifications and whether the results have been correctly calculated and reported. Data quality reviews involve the evaluation of documentation and analytical reports associated with selected samples or groups of samples. Data review will meet the requirements for data quality assurance assessment and reporting from the ADEC Technical Memorandum on Minimum Quality Assurance Requirements for Sample Handling, Reports, and Laboratory Data (ADEC, 2019). This review will include data validation, considering field quality control (QC) samples and preparatory-batch-level laboratory QC samples. Instrument-level QC information will not be reviewed; however, laboratories typically report analytical challenges (e.g., calibration verification issues) in their case narrative provided as part of the laboratory report. If issues are identified, impacted data will be discussed and qualified. Findings will be documented in the investigation report and in ADEC Laboratory Data Review Checklists (ADEC, 2022c).

### 6.2.1 FIELD MEASUREMENTS

Identifying valid samples involves interpreting and evaluating field records to detect problems affecting the representativeness of environmental samples. Data obtained from field measurements will be validated by checking procedures utilized in the field. Anomalous field data will be identified and explained to the extent possible. Data that cannot be validated will be so documented.

### 6.2.2 LABORATORY ANALYTICAL DATA PACKAGES

Each laboratory data package will be checked to verify that necessary data is provided. The packages should contain enough information to demonstrate that data quality objectives, including measurement quality objectives, have been fulfilled. The pages should be sequentially numbered. Data verification will include (but is not limited to) examination of the data package to check the following:

- Data for samples submitted to the laboratory are provided
- Relevant laboratory internal quality control data have been provided

- Specified analytical methods were utilized by the laboratory
- Narrative cover letter is provided explaining any corrective actions taken on reported data and/or data falling outside the method or Quality Control specifications
- Sample information is complete (matrix, date sampled, date received, date of extraction, and date of analysis)
- Parameter, result, and test methods are identified
- Results have not been corrected for any blank contamination
- Sample-specific detection limits (DL), LODs, and limits of quantitation (LOQs) are reported for each parameter
- Results of laboratory control data, method blanks, spikes, and replicates are reported
- Copies of chain-of-custody forms are included and complete

### 6.2.3 REPORTING AND ADEC CHECKLISTS

Data review will be performed on laboratory data packages and the findings reported in the investigation report along with ADEC Laboratory Data Review Checklist(s) (ADEC, 2022c). The DQA and ADEC Checklists will document possible effects on the project data resulting from quality control failures.

The initial inspection of the data screens for errors and inconsistencies. Chain of custody forms, sample handling procedures, analyses requested, sample description and ID, and cooler receipt forms will be reviewed. Sample holding times and preservation are also checked against analysis standards for the methods used.

The next phase of data quality review is an examination of the actual data. By examining data from blind duplicates, method blanks, laboratory control samples, and surrogate recoveries, an evaluation of whether the data quality meets requirements can be made. Each of these data quality indicators, as well as a comparison of reported results with project-specific sensitivity requirements (LODs below relevant cleanup levels), will be included in the DQA.

## 6.3 CHEMICAL DATA FLAGGING

Analytical results with data quality issues will be qualified or rejected based on review of field sample and laboratory quality assurance / quality control data using the criteria summarized below. **Tables 6-1 and 6-2** outline the definitions of the qualifiers to be used and the conditions for which they may be applied. Data qualifiers will be added to data presented in Characterization Report data tables.

**TABLE 6-1: QUALIFIER DEFINITIONS**

| Qualifier | Definition |
|---|---|
| J | Result refers to a concentration greater than the method detection limit but below the LOQ. |
| B | Indicates that the reported value is similar in concentration to the result of a related blank sample and may be biased high or a false positive detection. |
| QH, QL, QN | Indicates that the reported result is estimated value (high, low, unknown) due to a deficiency in related quality criteria. |
| X | Indicates that the reported result is inherently unreliable due to quality control deficiencies and is not recommended for project use. |

**NOTES:**
For definitions, see the Acronyms and Abbreviations table.

**TABLE 6-2: FLAGGING CRITERIA**

| QC Type | Criteria | Qualifier (Reported Result) | Qualifier (ND) | Applied To |
|---|---|---|---|---|
| Holding Time | Exceeded for Extraction/Analysis | QL | QL | All analytes in sample with holding time exceedances |
| | Holding Time Exceeded 2X | QL | QL or X | |
| Sample Preservation[1] | Requirements not met | QL | QL or X | All analytes in sample with preservation issue |
| Blanks | Within 10X of the MB | B | NA | Specific analyte in associated extraction batch |
| | Within 10X of the RB | B | NA | Specific analyte in all samples sampled similarly |
| LCS/LCSD | High Recovery | QH | None | Specific analyte project samples in associated batch extraction |
| | Low Recovery | QL | QL | |
| | RPD>Control Limit | QN | None | |
| Surrogates[2] | %R>Control Limits | QH | None | All analytes for effected method in sample with surrogate issue |
| | %R<Control Limits | QL | QL | |
| Field Duplicate | Agreement per ADEC Checklist | QN | QN | Specific analyte in samples from the same site |

**NOTES:**
For definitions, see the Acronyms and Abbreviations table.
1: Project data may be rejected for non-detect values if samples are not properly preserved based on professional judgement of the QEP
2: Project data will not be qualified for surrogate recovery failures where the dilution factor was 10 times or greater.

To determine if the overall project data completeness goal has been met, percent usable data (not rejected) will be compared to the completeness goal of 95 percent.

# 7.0 REPORTING

After the sampling event, a report will be submitted to DOT&PF to include:

- A summary of field efforts and field data, including:
    - Site conditions
    - Work plan/standard procedure deviations
    - Issues encountered and how resolved
    - Sample dates
    - Tabulated field screening results
    - Copies of field notes
    - Site Photos
- Final analytical sample results and laboratory data reports
- ADEC Laboratory Review Checklist
- Discussion of findings and recommendations for additional site work, if warranted
- Site maps

# 8.0 CLOSURE

This work plan has been prepared for the exclusive use of DOT&PF and their representatives in the study of this site. The investigation procedures and historical site information presented within this report are based on ADEC guidance current at the time of preparation, limited records review conducted by R&M, and information provided by the client. Since opinions of conditions prevailing on a particular site must be based on the work authorized by the client, the investigation is designed to be representative of the site at a particular moment in time and the result of services performed within the scope, limitations, and cost of the work requested. Changes in the conditions of this site may occur with the passage of time and may be due to natural processes or the works of humans. In addition, changes in government codes, either State or Federal regulations or laws, may occur. Due to such changes, which are beyond our control, observations and recommendations applicable to this site may need to be revised wholly or in part from time to time.

R&M performed this work in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No warranty, express or implied, beyond exercise of reasonable care and professional diligence, is made. Should you require additional information regarding the investigation or this report, please contact us.

Sincerely,

R&M CONSULTANTS, INC

Christopher D. Fell, CPG
Senior Geologist
Qualified Environmental Professional

Kristi M. McLean, LEED AP BD+C
Group Manager – Environmental Services
Qualified Environmental Professional

# 9.0 REFERENCES

ADEC (Alaska Department of Environmental Conservation), 2022a. "Field Sampling Guidance." 21 January 2022.

ADEC, 2022b. "Guidelines for Data Reporting." Technical Memorandum. 15 August 2022.

ADEC, 2022c. "Laboratory Data Review Checklist." September 2022.

ADEC, 2021. "18 AAC 75: Oil and Other Hazardous Substances Pollution Control." 18 November 2021.

ADEC, 2019. "Data Quality Objectives, Checklists, Quality Assurance Requirements for Laboratory Data, and Sample Handling." Technical Memorandum. October 2019.

ADEC, 2017a, "Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites." 7 March 2017.

ADEC, 2017b. "18 AAC 72: Wastewater Disposal." 7 November 2017.

Coulter, H.W. et al (Coulter et al, 1965). "Map Showing Extent of Glaciations in Alaska". U.S. Geological Survey Miscellaneous Geologic Investigations Map I-415, 1965.

Ferrains, Jr., O.J. (Ferrains, 1965). "Permafrost Map of Alaska". U.S. Geological Survey Miscellaneous Geological Investigations Map I-445, 1965.

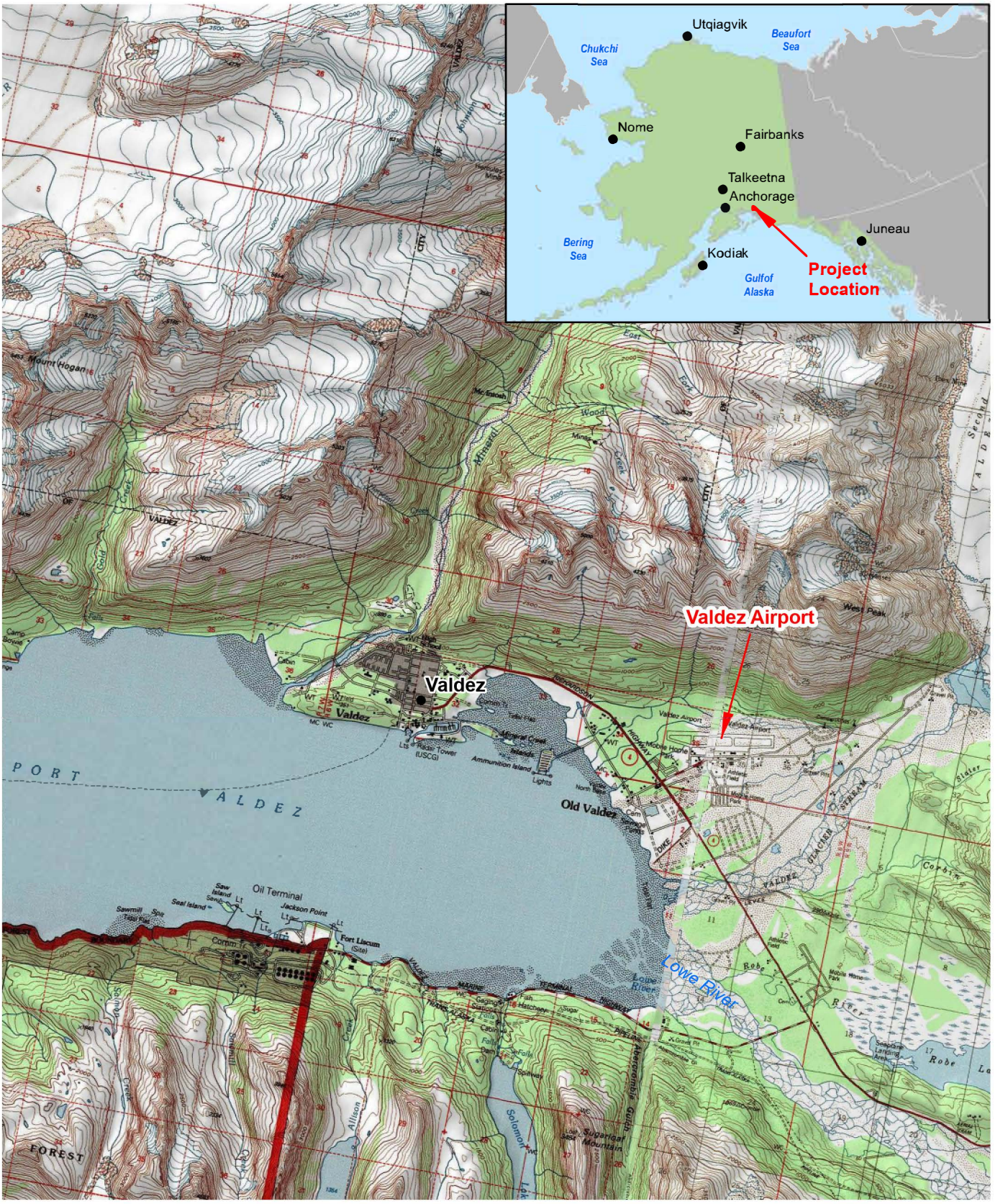
Moffit, F. (Moffit, 1954). "Geology of the Prince William Sound Region, Alaska". U.S. Geological Survey Bulletin 989-E, 1954.

Palmer, H.D. (Palmer, 1981), "Recent Sedimentation, Northeastern Port Valdez, Alaska". Geo-Marine Letters 1, 1981: pp. 207-212.

Wahrhaftig, Clyde, (Wahrhaftig, 1965). "Physiographic Divisions of Alaska", U.S. Geological Survey Professional Paper 482, 1965.

WRCC (Western Regional Climate Center), 2022. http://www.wrcc.dri.edu/index.html, accessed October 2022.

# APPENDIX A
# SITE MAPS




ALL LOCATIONS ARE APPROXIMATE

0 0.5 1 2 3

Miles

**NOTES:**
- USGS Quadrangle, Valdez A-6 and A-7
- Image Source, ESRI USA Topo Map

N

Date Saved: 9/15/2022 10:36 AM by EBetts Z:_GIS\Projects\3020.01 DOT_SWPF Valdez SREB\Map Documents\Valdez_SREB_env.aprx

STATE OF ALASKA
**DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES**
NORTHERN REGION

PREPARED BY:
R&M CONSULTANTS, INC

# VALDEZ SNOW REMOVAL EQUIPMENT BUILDING & DEICING MATERIAL STORAGE BUILDING

## LOCATION AND VICINITY MAP

| | |
|---|---|
| PROJ. NO.: | 3020.01 |
| DATE: | SEP 2022 |
| REF: | CE |
| DRAWING NO.: | A-1 |


ALL LOCATIONS ARE APPROXIMATE

0 500 1,000 2,000 3,000

Feet

SOURCE:
ESRI World Imagery

N

Coordinate System: NAD 1983 StatePlane Alaska 2 FIPS 5002 Feet

Date Saved: 9/15/2022 10:36 AM by EBetts Z:_GIS\Projects\3020.01 DOT_SWPF Valdez SREB\Map Documents\Valdez_SREB_env.aprx

STATE OF ALASKA
**DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES**
NORTHERN REGION

PREPARED BY:
R&M CONSULTANTS, INC

# VALDEZ SNOW REMOVAL EQUIPMENT BUILDING & DEICING MATERIAL STORAGE BUILDING

## SITE MAP

| | |
|---|---|
| PROJ. NO: | 3020.01 |
| DATE: | SEP 2022 |
| REF: | CE |
| DRAWING NO.: | A-2 |

| | |
|---|---|
| Designed By: | RLC |
| Drawn By: | CP |
| Checked By: | NK |

| | |
|---|---|
| Date Revised: | 11/08/2022, 11:37 AM |
| Layout Name: | TEST BORING LOCATIONS |
| File Path and Name: | Z:\project\3020.01 DOT_SWPF Valdez SREB\Earth\ACAD\3020.01 Test Hole Locations.dwg |

ASPHALT APRON

TYP. AIRCRAFT TIEDOWN

SDCB
E. INV.=71.0' (12" CMP)
NW. INV.=70.5' (24" CMP)

SDCB
E. INV.=73.2' (4" CMP)
S. INV.=73.3' (8" CMP)
W. INV.=73.2' (12" CMP)

SDCB
W. INV.=73.8' (8" CMP)

RM22-A

RM22-B

RM22-C

RM22-D

RM22-E

RM22-F

RM22-G

F.F.=75.32'

F.F.=75.37'

F.F.=75.38'

9' CHAIN LINK

B.R.L. 300' RIGHT

SREB

ARFF

SAND STORAGE

WATER CONN. FOR FIRE

GRAVEL

LOT 1

LOT 4

LOT 5

LOT 6

EDGE OF PAVEMENT

GRAVEL PILE

CHAIN LINK

TBM

VALDEZ GLACIER ROAD

0 50 100
SCALE FEET

KEY

RM22-XX — PROPOSED TEST BORING LOCATION

SOURCES:
1) BASEMAP DRAWING FROM R&M CONSULTANTS, INC. SURVEY CONDUCTED SEPTEMBER 2022.
2) AERIAL IMAGERY FROM ESRI ARCGIS WORLD IMAGERY AND IS APPROXIMATE.


PLANS DEVELOPED BY:
R&M CONSULTANTS, INC.
9101 VANGUARD DR.
ANCHORAGE, AK 99507
(907) 522-1707
CERT. OF AUTH. NO. AECC111


| BY | DATE | REVISION |
|---|---|---|
| | | |


STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
NORTHERN REGION
2720 PICKETT PL., FAIRBANKS ALASKA 99709
PHONE (907) 451-5424


**VALDEZ AIRPORT**
VALDEZ, ALASKA
VALDEZ AIRPORT SREB & DMSB DESIGN
PROJECT No. Z61860000
AIP No. 3-02-0311-XXX-2024
PROPOSED GEOTECHNICAL INVESTIGATION LOCATIONS (REVISED)

DATE: 11/08/2022

DRAWING NO.: A-3

# APPENDIX B
# STANDARD PROCEDURES

## Purpose and Scope

To provide standard soil and sediment sampling procedures for environmental projects complying with the Alaska Department of Environmental Conservation (ADEC) Field Sampling Guidance. This procedure is designed to work in conjunction with ADEC Field Sampling Guidance. If project specific procedures in the work plan conflict with this standard procedure, the approved work plan shall apply.

## Key Responsibilities

The sampler must meet the requirements of one of the following roles:

- ADEC Qualified Environmental Professional (18 AAC 75 and 18 AAC 78)
- ADEC Qualified Sampler (18 AAC 75 and 18 AAC 78)

## Procedure Preparation

This process can be broken into discreet steps that include preparation and documentation.

### Preparation

Prior to sample collection the following tasks should be performed to streamline the process.

- Decontaminate re-usable sampling equipment between collection of each sample or clear away any disposable sampling equipment and deposit into the appropriate waste stream
- Lay out sample containers and collection tools on a clean surface (i.e. unused trash bag, cooler top)
- Make sure the appropriate mix of containers are available
- Complete portions of sample labels that will not vary between samples
- Begin sample entry in the field log book or on a boring log (see Documentation)

### Documentation

Proper documentation of sampling activities is critical to generation of defensible data and quality control review. At a minimum, the following data should be on sample labels, logbook, and chain of custody.

Sample Labels

The following information must be present on a sample label affixed to each sample container:

- Sample number or ID
- Sampler name or initials
- Date/time collected
- Analyses requested (may vary from container to container when multiple analyses requested)
- Preservative (may vary per container, i.e. MeOH, HCl, etc.)

Logbook

The following information should be entered into the logbook:

- Sample location (drawing or sketch preferred), recreational grade GPS coordinates (optional)
- Information included on the sample label
- Number and type of containers used
- Tare mass of containers for certain analyses (e.g. VOCs, GRO, BTEX)
- Type of sample (e.g. primary, duplicate, trip blank, MS/MSD)

Chain-of-Custody

- Quality Control Verification
  - Complete from the logbook entries
  - Check sample labels to chain-of-custody, correct and document any errors found
- Custody Tracking
  - Shipping: signed, dated, and time stamped immediately before sealing cooler
  - Laboratory Drop: signed, dated, and time stamped at drop off with lab technician

## Collection Methods

Collect samples in accordance with the procedures detailed in the ADEC Field Sampling Guidance. General practices are presented as follows:

- Collect samples from freshly uncovered or exposed soil or sediment
- Don a new pair of nitrile gloves between each sample, if damaged, or when gloves are soiled
- Avoid placing large material (gravel) in sample containers as the lab cannot use the material

### Collection Order

Sample containers should be filled based on the analyses to be performed in order of decreasing volatility.

- VOC, GRO, BTEX (volatiles)
- DRO, RRO, SVOC, PAH, PCB, pesticides, herbicides (semi-volatiles)
- Total organic carbon, metals (non-volatiles)

### Collection for Volatile Analyses

- DO NOT homogenize soil is it will cause volatile loss resulting in low biased results
- DO NOT place tape or additional labels on the container. Fill out the label affixed by the laboratory
- Collect at least a 2 ounce jar for percent moisture determination if only volatiles are being tested.
- Handle soil or sediment with an unused or decontaminated steel spoon
- Place approximately 25 to 50 grams of soil or sediment in the container
- Clean off container threads with a clean paper towel if necessary
- Place methanol (MeOH) in 25ml aliquots into the container until the soil or sediment is covered within 10 seconds of placing soil in the jar
- Tightly place the septa lid back on the container
- Mark the meniscus of the methanol on the jar with a ball-point pen.

### Collection for Semi and Non-Volatile Analyses

- Handle soil or sediment with an unused or decontaminated metal spoon
- Homogenize the sample in-situ (aluminum pie pan, split spoon, sample core liner, or in the ground)
- Fill sample containers using the metal spoon
- Clean off container threads with a clean paper towel if necessary
- Tightly place the lid back on the container
- Finish filling out sample label and affix to sample jar

## Preservation

Immediately following sample collection and labeling, the sample container(s) should be placed in a pre-chilled cooler maintained under the direct control of the ADEC QEP or QS until custody is relinquished through a chain-of-custody to another responsible party.

## References


18 AAC 75. Oil and Other Hazardous Substances. Alaska Department of Environmental Conservation.
18 AAC 78. Underground Storage Tanks. Alaska Department of Environmental Conservation.
ADEC Field Sampling Guidance.

## Purpose and Scope

To provide a standard classification system for R&M Consultants, Inc. (R&M) field geologists and engineers to use while logging soil, permafrost and incidental bedrock for engineering or environmental purposes in accordance with ASTM International (ASTM) procedures ASTM D2488, ASTM D4083, and the Alaska Department of Transportation and Public Facilities (DOT&PF) Alaska Geotechnical Procedures Manual (DOT&PF, 2007). Soil classification is based on Unified Soil Classification System (USCS). If project specific procedures in the work plan conflict with this standard procedure, the approved work plan shall apply.

## Key Responsibilities

- Field Geologist/Engineer
  - Onsite coordination, log and classify subsurface conditions, collect geologic samples
- Project Manager or Field Coordinator (as applicable)
  - Ensure adherence to this procedure

## Typical Soil Logging Equipment

| Documentation/General | |
|---|---|
| Log book and Clipboard | Sample Tags |
| Mechanical Pencil, Indelible Pen | Log Forms |
| Felt-tip Markers (Fine and Standard) | Field References (Procedures and Standards) |
| Maps and Location Drawings | Final Exploration or Work Plan |
| Digital Camera | Watch |
| Pocket Knife | Calculator |
| **Locating Equipment** | |
| Compass | Stakes (Marking Explorations) |
| Recreational Grade GPS | Survey Flagging |
| 100-foot Cloth Tape (Engineering) | 6-inch Scale (Engineering) |
| **Logging Tools** | |
| Putty Knife | Tape Measure (Engineering & Standard) |
| Hand Lens (10x or 20x) | 4-mil Plastic Bags |
| Rock Hammer | Electrical Tape (Cold-weather Rated) |
| Adjustable Wide-Jaw Locking Pliers | Woven Bags (Sample Transport) |
| Pocket Penetrometer (PROJECT SPECIFIC) | 5-gallon Buckets & Lids (Large Sample Collection) |
| Torvane (PROJECT SPECIFIC) | Paper Towels |
| **Permafrost or Frozen Ground Equipment** | |
| Digital Thermometer | Cooler (Sample transport and preservation) |
| | Synthetic Ice |

## Measurement Precision

- Depth of Boring: Nearest 0.5 feet, unless specialty equipment is used.
- Sample Interval and Recovery: Nearest 0.1 feet.
- Water Levels and Stick-Up:
  - 0.5 feet if estimating based on tooling or samples
  - Nearest 0.1 to 0.01 feet with a water level indicator (to top of casing or tooling)
- Installed Instrumentation Components: Nearest 0.1 feet.

## Geologic Field Log Production

A field log documents field geologist/engineer observations, data collected, interpretations, and/or opinions collected during exploration via test boring, test pit, trench, or hand tool investigation. The information documented needs to be complete, accurate, precise, and legible. The field geologist/engineer collecting data may or may not produce the final (formal) log for inclusion in a report. Field logs that are not complete, accurate, precise, and/or legible can be misleading, readily misinterpreted, and in some cases so confusing as to be of doubtful value. Whereas a complete, detailed log is easily interpreted and converted to the final, formal log.

### Standard Field Log Completion Guidelines

- Use a standard field log form (**Attachment A**).
- Use standard logging procedures and classification systems.
  - ASTM D2488 for soil classification.
  - ASTM D4083 for frozen soil classification.
  - DOT&PF 2007 and R&M internal procedures (**Attachment B**) for organic soil classification.
  - ASTM D1586 for standard penetration testing.
  - ASTM D1587 for thin-walled sampling (i.e. Shelby Tube).
  - ASTM D2573 for field vane shear testing.
- Field logs and other data collection forms must be completed in the field.
  - Annotations made after leaving the site shall be made in another color ink or pencil to highlight out-of-field changes or additions.
  - Information **MUST NOT** be left to memory.
  - Generation of the formal log should not need the field geologist/engineer for information about the field site, the documentation should speak for them.

### Exploration Identification and Logging

Unless a project defines a specific naming convention, the following identification system will be used.

| Company ID | Year | Type | Exploration ID | Example |
|---|---|---|---|---|
| RM | 21 | TB, TP, TR, HA | 01 | RM21-TB01 |

TB = Test Boring, TP = Test Pit, TR = Trench, and HA = Hand Auger

Exploration ID will be incremented sequentially for a site, regardless of the exploration type (i.e. the numeric sequence will not reset between different exploration types).

Repeated Test Borings

Drilling problems occasionally require the original test boring to be abandoned. In these cases, the field geologist/engineer should use their own judgment as to which of the following procedures should be taken:

- Discard the log of the original attempt (if it is very shallow) and note the original attempt on the new log sheet.
- Continue logging on the original sheet including a note indicating the distance and direction of the move. In no case will the separate test borings receive separate numbers and in no case will duplicate samples be submitted. The test borings will be treated as one boring.

Extended Test Borings

A test boring drilled to obtain data from deeper strata than a previous test boring in the same area, shall be numbered in regular sequence as are all other holes. The relation of the extended test boring to the original test boring shall be noted as will the fact that it was drilled for the purpose of extending our information. Sampling and logging should be made consistent with the information sought in the new test boring and

unnecessary duplication of samples should be avoided. The field geologist/engineer should have a copy of the original log for reference purposes.

**Geologic Unit and Sample Description Callouts**

- Sample descriptions. Each sample or significant change in soil core or test pit wall should be described in detail on the field log.
- Geologic Units (generalization of single or multiple samples) should be identified based on shared traits between subsequent samples (e.g., a series of poorly graded sand and gravel samples with occasional silt stringers that appear to have been formed in the same depositional environment).

## Soil Classification and Description

Soil will be classified and described in accordance with ASTM D2488 using USCS visual-manual methods. Based on laboratory sampling results, descriptions may be updated in accordance with ASTM D2487. Attachment B presents a quick reference guide to assist with soil description, standard terms, and description order. A quick reference guide for seepage and caving is also included.

Descriptions will include a complete soil description as shown in Attachment C and outlined in the Soil Classification and Logging Reference in Attachment B. Key features are listed as follows.

- Color, estimated grain size percentages (gravel/sand/fines) by volume, shape of large particles, stratification, and probable provenance (landform).
- Other features that will help accurately depict subsurface soils conditions.
- Bedrock features should be described including the rock name, degree and nature of weathering, and fracturing. In some sedimentary rocks it may be difficult to distinguish between “weathered” and “poorly consolidated.”
- Describe bedrock as fully and carefully as possible. Don’t just log it as bedrock! See the Rock Classification, Logging, and Sampling Standard Procedure for rock specific procedures.

**Standard Information Summary**

- Describe all grain sizes present and applicable characteristics.
- Note any field tests performed, along with the results.
- Include textural notes and color variations.
- Optionally, describe provenance of the soil (landform/terrain unit), if apparent.
- Include notes about how equipment being used to advance the investigation reacted while penetrating the material.
- Interpret groundwater conditions and note caving or seepage conditions during the investigation.

## Frozen Ground Ice Classification and Description

Frozen ground (seasonal or permafrost) will be classified and described in accordance with ASTM D4083. Ice descriptions will be amended to the soil descriptions as part of the field log.

Complete descriptions of ice content of samples are imperative. Greater detail on how visible ice presents in samples increases data value when evaluating the soils for a report. Symbols outlined in ASTM D4083 can only be used if accompanied by complete, clear and detailed descriptions. An effective technique is to draw a small diagram of the sample showing the actual orientation or occurrence of the ice.

In the case of thin veins, lenses or small scattered crystals, use considerable care in estimating the volume. When large ice lenses or masses are encountered, it is frequently possible to simply measure the thickness of the ice and soil layers to determine the volume of the ice.

**Standard Information Summary**

- Percent visible ice
- Size of ice lenses/crystals/formations
- Ice color
- Temperature of the soil core
- Ice description symbol (**Attachment B**)

## Organic Soil Classification and Description

Organic soil will be classified and described in accordance with ASTM D2488 in conjunction with the DOT&PF Geotechnical Investigation Manual and R&M procedures for organic soil classifications. Field soil descriptions will be amended by organic descriptions. R&M procedures for organic classification are provided in **Attachment B.** The following information should be recorded regarding organic content:

- Do the organics affect the engineering properties of the material?
- Percent visible organics
- Description of the nature of the organics (fibrous, fine, woody, etc.)

## Log of Test Boring Completion Notes

This section details the type of information that should be entered into the fields and is split between header and data column portions of the log form. **Attachment C** provides an Example Log of Test Boring for training purposes.

**Title Block**

Complete these fields as they provide important information regarding any test boring

**Location Diagram**

Draw a generalized location diagram and include general location notes. It is difficult to overemphasize the need for concise and complete location notes, particularly when coordinates or field stationing are not available. To provide value, the diagram should include easily recognized features from air photos, site plans, topographic maps, USGS quadrangle maps, etc. The reference used should be cited. A generalized profile is valuable if there is room (possibly on separate page). Include a north arrow and the direction of the slope of the ground in the general area of a test boring.

**Groundwater Table**

The presence or absence of water in soils is important when computing and evaluating engineering data. Complete this box in the presence or absence of groundwater. Record the following information:

- Date and time of day
- Measured while drilling (WD) of after boing (AB)
- Draw a standard groundwater symbol in “Depth in Feet”
- Add a brief explanation in “Description of Strata”

If water enters the hole from an organic mat or from active layer, add those observations to the explanation. These details are very important and generate considerable concern if neglected. The effect of water on engineering properties of soil is extremely important and must not be overlooked.

The influence of drilling procedures on water level observations is an important consideration and the timing of actual readings should allow for stabilization of groundwater movement into the test boring. In instances where interpretation of groundwater conditions includes uncertainty, the situation should be reviewed with the project manager or field coordinator to determine if special monitoring techniques are required.

The water table symbol on the soil graph should be accompanied with a description of the following:

- Actual or perched groundwater table
- Immediately above permafrost or bedrock (if applicable)
- Seepage rate of water and if artesian conditions are present
- Any other pertinent observations

**Notes/Surface Conditions**

Include a complete and detailed description of vegetation (Viereck & Little, 2007) or surface conditons in the general area of the test boring. Include the heights and density of trees and brush along with varieties growing in the general area. Any form of ground disturbance that may have influenced vegetative growth, such as previous burns, clearing, etc., should be noted.

**Sampling and Data Columns**

Sampling method codes are provided in **Attachment B**. Each column is also described below.

Sampling Method and Sample Number

Maintaining a proper sequence for sample numbers is extremely important in order to prevent confusion at the laboratory. A sample that is taken which encounters two or more major soil changes requires that the sample be divided and given two individual sample numbers. In the case of long samples such as soil core runs, split the sample into manageable segments. Label the top end of each section to enable reconstruction. Samples will be identified and documented as follows:

- Record sample identification number and depth interval
  - Identify geologically distinct samples with separate numbers
  - Samples from an investigation will be assigned sequential numbers (1, 2, 3, … n), if a sample run is split for shipment assign sequential alphabetic characters (1a, 1b, …, 1z)
  - If splitting a sample into separate, geologically distinct samples assign sequential numbers
- Record the type of container used (plastic bag, Shelby tube, brass liner, etc)
- Record the amount of recovery and sampling method

**Every sample attempted** shall be logged and numbered as described in this section (Sampling Method and Sample Number), including cases where there was no recovery, the sample was not sent to the laboratory, or was collected for field observation only. Information collected from that sample (e.g. blow counts, heave information, no recovery, thermal state, etc.) should be entered on the field log of test boring.

Blow Count

Record the number of blows per each 6-inch interval (ASTM D1586). Sampler refusal is typically determined when a sampler is not advancing and damage to the equipment may occur with additional blows.

Location Sampled and Recovery

Use arrows to indicate the location sampled. Record recovery rounded to the nearest 0.1 feet. If an indication of where recovery was lost is observed, record on the log graphically and/or in the text description.

% Visible Ice and Frozen Columns

Visually estimate percent ice (by volume) in the soil (**Attachment B)**. Shade the frozen column black when frozen material is encountered and leave blank for unfrozen material.

T °F

This column is used to record the soil temperature as obtained by use of the soil thermometer provided.

Soil Graph

Utilizes the standard soil and ice symbols provided in **Attachment B** to depict soil conditions. Strata changes should be clearly indicated. Although gradational strata changes can be difficult to identify, they should be

determined in the field as a field determination is more accurate than an office determination. The shape of larger fragments and rocks can be clearly illustrated.

**Narrative Section (Description of Strata)**
Descriptions should be concise, but with enough detail to adequately describe conditions. Readily identifiable abbreviations may be used. Do not use abbreviations that may be misunderstood.

General statements regarding caving, drill rate (e.g. drill easy/hard/very hard, etc), reason for no sample recovery, hydraulic pressure used to push Shelby tubes, drill reaction (e.g. drills smooth/rough, etc.), bit usage, unusual circumstances or other pertinent details for log interpretation in the office should be recorded. The field log should stand alone.

Sections on Soil Classification and Description, Frozen Ground Classification and Description, and Organic Soil Classification and Description provide specific instructions on logging soil, frozen ground, and organics.

## References

ASTM (ASTM International) D1586. Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils. ASTM International, West Conshohocken, Pennsylvania.

ASTM D1587. Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes. ASTM International, West Conshohocken, Pennsylvania.

ASTM D2487. Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). ASTM International, West Conshohocken, Pennsylvania.

ASTM D2488. Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). ASTM International, West Conshohocken, Pennsylvania.

ASTM D2573. Standard Test Method for Field Vane Shear Test in Saturated Fine-Grained Soils. ASTM International, West Conshohocken, Pennsylvania.

ASTM D4083. Standard Practice for Description of Frozen Soils (Visual-Manual Procedure), Reapproved 2007. ASTM International, West Conshohocken, Pennsylvania.

DOT&PF (Alaska Department of Transportation and Public Facilities), 2007. Alaska Geotechnical Investigation Manual.

Viereck, Leslie A. and Little, Jr., Elbert L., 2007, Alaska Trees and Shrubs, Second Edition, University of Alaska Press, Fairbanks, Alaska. (The definitive work on woody plants of Alaska since 1975.

## List of Attachments

**Attachment A: Standard Form**
Log of Test Boring

**Attachment B: Logging References**
R&M Soil Classification and Logging Reference
Classification of Soils with Organic Matter

**Attachment C: Example Log of Test Boring**
Example Log of Test Boring

## ATTACHMENT A: STANDARD FORM

# LOG OF TEST BORING

Hole No: .

Total Depth:

Project Name: .

Project No: .

Log Page _____ of _____

**NOTES/SURFACE CONDITIONS**

**LOCATION DIAGRAM**

| SAMPLE | | | | | GROUNDWATER | | | Date(s) Drilled: | Lat: |
|---|---|---|---|---|---|---|---|---|---|
| SAMPLER TYPE | SAMPLE NO. | BLOW COUNT | LOCATION SAMPLED | RECOVERY | DEPTH: | | | Logged By: | Lon: |
| | | | | | DATE: | | | Drilling Company: Discovery Drilling | Elev: |
| | | | | | WD/AB: | | | Drill Crew: | STA/OFF: |
| | | | | | SOIL DETAILS | | | Rig/Method: | Plunge: |

| DEPTH (FT) | VISIBLE ICE | TEMP °F | FROZEN | GRAPHIC LOG | UNIT DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | | | . |
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 0 | | | | | |
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 0 | | | | | |

R&M CONSULTANTS, INC.

# ATTACHMENT B: LOGGING REFERENCES

# R&M FIELD LOGGING REFERENCE FOR SOIL

## SOIL DESCRIPTION ORDER (R&M, ASTM D2488)

| | |
|---|---|
| 1) SAMPLE NUMBER | 2) PERCENTAGES (gr/sa/fn) |
| 3) DEPTH INTERVAL | 4) GRADING (PG, WG, WPG) |
| 5) USCS GROUP NAME AND SYMBOL | 6) COLOR, MOISTURE |
| 7) GRAVEL DESCRIPTION (size, angularity, shape, hardness) | |
| 8) SAND DESCRIPTION (size, angularity [coarse sand only]) | |
| 9) FINES DESCRIPTION (>15% by volume) | |
| 10) DRILLING NOTES:<br>Cobbles and Boulders (size, angularity, shape, hardness), Fines, Drill Reaction | |

## SAMPLER TYPES (R&M)

| | | | |
|---|---|---|---|
| A | Auger Sample | SI | 2.5in Split Spoon w/140lb Hammer |
| C | Cuttings Sample | Ss | 1.4in Split Spoon w/140lb Man Hmr |
| Cs | Auger Core Barrel | Ssa | 1.4in Split Spoon w/140lb Auto Hammer |
| G | Grab Sample | Sz | 1.4in Split Spoon w/340lb Hammer |
| Sh | 2.5in Split Spoon w/340lb Man Hmr | Ts | Shelby Tube |
| Sha | 2.5in Split Spoon w/340lb Auto Hammer | Tm | Modified Shelby Tube |
| MC5 | 1.5-in Macrocore | Mc7 | 3.0-in Macrocore |

## USCS SOIL DESCRIPTION (ASTM D2488)

### Coarse-Grained Soils (>50 Sa & Gr)

| Type | Grading | Fines % | USCS | <15% Sa/Gr | >15% Sa/Gr |
|---|---|---|---|---|---|
| Gravel | Well | <5% | GW | WG Gr | WG Gr w/ Sa |
| | Poorly | | GP | PG Gr | PG Gr w/ Sa |
| | Well | 10% Clay or Silt | GW-GM | WG Gr w/ Si | WG Gr w/ Si & Sa |
| | | | GW-GC | WG Gr w/ Cl | WG Gr w/ Cl & Sa |
| | Poorly | | GP-GM | PG Gr w/ Si | PG Gr w/ Si & Sa |
| | | | GP-GC | PG Gr w/ Cl | PG Gr w/ Cl & Sa |
| | N/A | >15% Clay or Silt | GM | Si Gr | Si Gr w/ Sa |
| | | | GC | Cl Gr | Cl Gr w/ Sa |
| Sand | Well | <5% | SW | WG Sa | WG Sa w/ Gr |
| | Poorly | | SP | PG Sa | PG Sa w/ Gr |
| | Well | 10% Clay or Silt | SW-SM | WG Sa w/ Si | WG Sa w/ Si & Gr |
| | | | SW-SC | WG Sa w/ Cl | WG Sa w/ Cl & Gr |
| | Poorly | | SP-SM | PG Sa w/ Si | PG Sa w/ Si & Gr |
| | | | SP-SC | PG Sa w/ Cl | PG Sa w/ Cl & Gr |
| | N/A | >15% Clay or Silt | SM | Si Sa | Si Sa w/ Gr |
| | | | SC | Cl Sa | Cl Sa w/ Gr |

### Fine-Grained Soils (>50% Fines)

| Type | Fines % | Grain Size Ratio | USCS | <15% Sa/Gr | >15% Sa/Gr |
|---|---|---|---|---|---|
| Clay | <30% plus # 200 | <15% plus # 200 | CL | Lean Cl | |
| | | 15-25% plus # 200 | | Lean Cl w/ Sa | Lean Cl w/ Gr |
| | ≥30% plus # 200 | Sa ≥ Gr | | Sa Lean Cl | Sa Lean Cl w/ Gr |
| | | Gr ≥ Sa | | Gr Lean Cl | Gr Lean Cl w/ Sa |
| | <30% plus # 200 | <15% plus # 200 | CH | Fat Cl | |
| | | 15-25% plus # 200 | | Fat Cl w/ Sa | Fat Cl w/ Gr |
| | ≥30% plus # 200 | Sa ≥ Gr | | Sa Fat Cl | Sa Fat Cl w/ Gr |
| | | Gr ≥ Sa | | Gr Fat Cl | Gr Fat Cl w/ Sa |
| Silt | <30% plus # 200 | <15% plus # 200 | ML | Lean Si | |
| | | 15-25% plus # 200 | | Lean Si w/ Sa | Lean Si w/ Gr |
| | ≥30% plus # 200 | Sa ≥ Gr | | Sa Lean Si | Sa Lean Si w/ Gr |
| | | Gr ≥ Sa | | Gr Lean Si | Gr Lean Si w/ Sa |
| | <30% plus # 200 | <15% plus # 200 | MH | Elastic Si | |
| | | 15-25% plus # 200 | | Elastic Si w/ Sa | Elastic Si w/ Gr |
| | ≥30% plus # 200 | Sa ≥ Gr | | Sa Elastic Si | Sa Elastic Si w/ |
| | | Gr ≥ Sa | | Gr Elastic Si | Gr Elastic Si w/ |
| Organic Soil | <30% plus # 200 | <15% plus # 200 | OL/OH | Org Soil | |
| | | 15-25% plus # 200 | | Org Soil w/ Sa | Org Soil w/ Gr |
| | ≥30% plus # 200 | Sa ≥ Gr | | Sa Org Soil | Sa Org Soil w/ Gr |
| | | Gr ≥ Sa | | Gr Org Soil | Gr Org Soil w/ Sa |

## ORGANIC SOIL DESCRIPTION (DOT&PF, R&M)

| | |
|---|---|
| PEAT (PT) | Mostly org.carbon fibers and/or decayed veg. Dk brwn to blk, v. spongy w/ strong organic odor. |
| PEATY-ORGANIC SOIL (PTO) | Min. particles & org. carbon fibers and/or decayed veg. matter. Lt brwn to blk, spongy w/organic odor. |
| ORGANIC SOIL (O) | Mostly min. particles, fraction org. affects geotech prop. Fiber content often insignificant. Gen. brwn to blkish-brwn. |
| MINERAL SOIL W/ ORG (oUSC) | Mostly min. constituents, small fraction of org. matter. Color and odor often unaffected. |

## GRAIN SIZES AND SOIL/ICE/ORGANIC SYMBOLS (ASTM D2488, R&M)

| | | |
|---|---|---|
| | Boulder | >12 inches (30cm) |
| | Cobble | 12 to 3 inches (30 to 7.6 cm) |
| | Gravel | 3 inch to #4 sieve (75 to 4.75 mm)<br>Fn (#4 to ¾ in), Crse (3/4 to 3 in) |
| | Sand | #4 to #200 sieve (4.75 to 0.075 mm) Fn (#200 to 0.43mm), Med.(0.43mm to2mm), Crse(2mm to ¾in) |
| | Silt / Clay | <#200 sieve(<0.075mm) |

| | | | |
|---|---|---|---|
| | Organics | | Ice crystals in clay |
| | Massive Ice | | Ice lense in silt |
| | Ice w/soil inclusions | Mix Symbols to represent conditions | |

## GRAVEL/COARSE SAND DESCRIPTION (ASTM D2488)

| Particle Shape (ASTM D2488]) | | Hardness (ASTM D2488]) | |
|---|---|---|---|
| Flat | Width/Thickness >3 | Hard | Based on what happens with a considerable hammer blow |
| Enlongated | Length/Thickness >3 | Cracks | |
| Flat and Enlongated | Meets both criteria | Fractures | |
| | | Crumbles | |

### Angularity

| | |
|---|---|
| Angular | sharp edges and relatively plane sides with unpolished surfaces |
| Subangular | similar to angular description but have rounded edges |
| Subrounded | nearly plane sides but have well-rounded corners and edges |
| Rounded | smoothly curved sides and no edges |

## FINES DESCRIPTION (ASTM D2488)

### Classification Matrix

| | |
|---|---|
| ML | No-low DS, slow-rapid DL, low TN and PS, or is non-plastic |
| MH | Low-medium DS, no-slow DL, low-medium TN and PS |
| CL | Medium-high DS, no-slow DL, medium TN and PS |
| CH | High-very high DS, no DL, high TN and PS |

### (DS) Dry Strength (ASTM 2488)

| | |
|---|---|
| None | Crumbles to powder with mere handling. |
| Low | Crumbles to powder with some finger pressure. |
| Medium | Breaks to pieces or crumbles considerable finger pressure. |
| High | Cannot break with fingers. Breaks to pieces between thumb & hard surface. |
| Very High | Cannot break with fingers or between thumb & hard surface. |

### (DL) Dilatency (ASTM 2488)

| | |
|---|---|
| None | No visible change in specimen. |
| Slow | Water appears slowly and does not disappear or disappears slowly. |
| Rapid | Water appears quickly and disappears quickly upon squeezing. |

### (TN) Toughness (ASTM D2488)

| | |
|---|---|
| Low | Slight pressure to roll thread near PL. Thread/lump weak/soft |
| Medium | Medium pressure to roll thread near PL. Thread/lump medium stiffness. |
| High | Considerable pressure to roll thread near Pl. Thread/lump v. high stiffness. |

### (PS) Plasticity (ASTM D2488) 1/8 inch thread and ½ inch lump

| | |
|---|---|
| Nonplastic | Cannot be rolled at any water content |
| Low | Barely rolled, no lump drier than plastic limit. |
| Medium | Plastic limit quickly reached and the lump crumbles. |
| High | Considerable time reaching plastic limit w/ multiple re-rolls. Lump doesn't crumble. |

| Consistency Descriptors (ASTM D2488) | | Shelby Tube Collection Guidelines | |
|---|---|---|---|
| Very Soft | Thumb penetrates > 1 in | Collection Guidelines | Measure hydraulic pressure |
| Soft | Thumb penetrates = 1 in | | Measure advance distance/recovery |
| Firm | Thumb indents ¼ in | | WAIT 10-minutes and then rotate |
| Hard | Thumbnail indents readily | | Keep upright |
| Very Hard | Thumbnail will not indent | | Seal ends w/caps and tape |

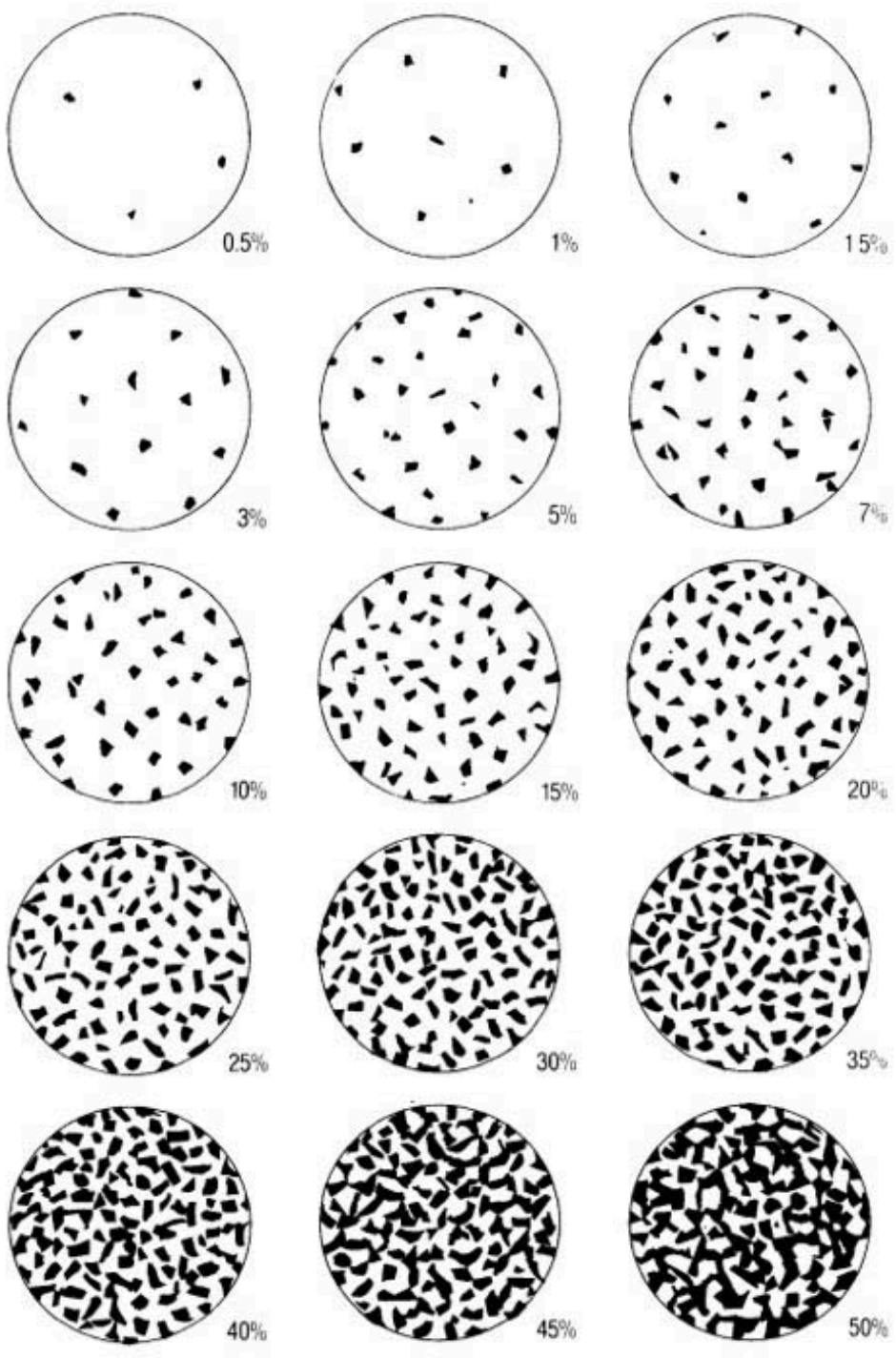
## ICE DESCRIPTIONS (ASTM D4083)

| Ice Visibility & Content | Description | | Symbol | |
|---|---|---|---|---|
| Ice is not visible to the unaided eye. (Placing a sample in a jar for later classification may help) | Poorly bonded or Friable | | Nf | |
| | Well Bonded | No Excess Ice | Nb | Nbn |
| | | Excess Ice | | Nbe |
| Significant segregated ice is visible to the unaided eye, but individual ice masses or layers are less than 1 inch thick. | Ind. ice crystals/inclusions | | Vx | |
| | Ice coatings on particles | | Vc | |
| | Random/irregular orient. ice formations | | Vr | |
| | Stratified or oriented ice formations. | | Vs | |
| | Uniform ice distribution | | Vu | |
| Strata are greater than 1 inch thick. | Ice with soil inclusions | | ICE+USCS | |
| | Ice without soil inclusions | | ICE | |

| CAVING (R&M) | |
|---|---|
| No Caving | Sidewalls do not collapse during excavation or after active excavation ceases. |
| Minor Caving | Some intermittent sidewall collapse that tends toward small blocks or sloughing. Collapse debris cleared as part of advancing the excavation. |
| Moderate Caving | Significant sidewall collapse while the excavation is being advanced with some small blocks or sloughing releasing when active excavation ceases. Collapse debris must be cleared as a separate task to continue advancing the excavation but tends to be episodic. |
| Severe Caving | Frequent sidewall collapse while the excavation is being advanced with large blocks or sloughing from the sidewalls, which continues when active excavation ceases. Collapse debris inhibits to prevent the advance of the excavation. Frequently occurs when the groundwater table is crossed in certain soil types. |

| SEEPAGE (R&M) | |
|---|---|
| No Seepage | No water weeps into the excavation. |
| Minor Seepage | Water weeps into the excavation but does not affect sidewall stability or inhibit excavation. Rarely accumulates in the excavation bottom when there is a long pause in excavation unless bottom soils act as an aquitard or aquiclude. |
| Moderate Seepage | Water steadily enters the excavation and may cause a decrease in sidewall stability. Readily accumulates in the excavation when excavation is paused, but slower than it can be removed. |
| Rapid Seepage | Water pours into the excavation and often causes moderate to severe sidewall caving. Accumulation is faster than can be removed, with or without a pause in excavation. |

**ESTIMATING PERCENT COMPOSITION BY VOLUME**



## CLASSIFICATION[1] OF SOILS WITH ORGANIC MATTER

**PEAT (Pt)**
Soil comprised of predominantly organic carbon fibers (macroscopic) and/or decayed (microscopic) vegetal matter. Peat is generally dark brown to black, with a very spongy feel and strong organic odor; typically, the ash content (ASTM D 2974) is <20%, the moisture content is >500%, the fiber content is >50% (by volume), the specific gravity is <1.7, and the dry unit weight is <17 pounds per cubic-foot (pcf).

**PEATY-ORGANIC SOIL (PtO )**
Transitional soil group comprised of significant proportions, by mass, of both mineral particles and organic carbon fibers and/or decayed vegetal matter. Peaty-Organic Soil is generally light brown to black, with a spongy feel and organic odor; typically, the ash content ranges from 20 to 40%, the moisture content is between 150 and 800%, the fiber content is <50%, the specific gravity ranges from 1.6 to 1.9, and the dry unit weight is between 11 and 19 pcf.

**ORGANIC SOIL (O)**
Soil comprised predominately of mineral particles, with a fraction of organic matter sufficient to notably effect the geotechnical properties (i.e. plasticity, dry strength and compactability). Most of the organic matter formed in-place (sedentary deposit), and is typically comprised of microscopic particles (the fiber content is often insignificant). Organic Soil is generally brown to blackish-brown, and soft to loose; typically, the ash content ranges from 40 to 95%, the moisture content is between 100 and 500%, the specific gravity is >1.7, the liquid limit is >50% and/or the liquid limit measured on an oven-dried sample ("Dry Preparation") is <70% of the liquid limit measured on a fresh sample ("Wet Preparation"), and the dry unit weight is >13 to 15 pcf.

**MINERAL SOIL WITH ORGANIC CONTENT (oUSC)[2]**
Transitional soil group consisting predominately of mineral constituents with a small fraction of organic matter which may, under certain conditions, effect the geotechnical properties. Most of the organic matter is macroscopic and likely formed in-place; but may also include roots, or fibrous particles that likely originated elsewhere and were transported to the site by wind or very low energy lacustrine-environment (sedimentary deposit). The soil color and odor is often not effected by the organic matter; typically, the ash content ranges from 90 to 99%, the moisture content is <100%, the specific gravity is >2.4, and the liquid limit is <50%.

**MINERAL SOIL (USC)**
Soil is comprised predominately of mineral particles, but may contain a trace of organic (or apparent organic) matter that has no significant effect on the geotechnical properties. Ash contents are typically >97 to 99%, and the loss of mass may be more from ignition of interstitial water or non-vegetal, carbon-based matter. Most of the organic matter likely originated elsewhere and was transported to the site by wind or very low energy lacustrine-environment, and is typically comprised of fine-woody particles or roots.

**Notes:**
1 Callout (Group Symbol) for a general stratigraphic unit consisting predominately of this type soil.
2 Use an annotated group symbol; a small caps "o", proceeded by the mineral constituents based on the Unified Soil Classification (USC) System (following ASTM D 2487, Classification of Soil for Engineering Purposes).

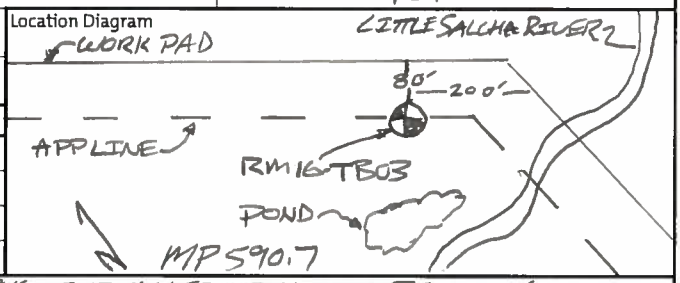
# ATTACHMENT C: EXAMPLE LOG OF TEST BORING

R&M CONSULTANTS, INC.

# LOG OF TEST BORING

| | | | |
|---|---|---|---|
| Project No.: 1429.03 | Project Name: ALASKA PIPELINE PROJECT | | Sheet: 1 of 2 |
| Logged by: A. BANKS | Contractor: BRAND X | Crew: B. GRINDER, J. FORD | Hole No.: RM16-TB03 |
| Rig Type: CME 75 | Drill Method: 8" HOLLOW STEM AUGER | | Date Begun: 11/18/12 Date Completed: 11/18/12 |
| Location (Lat., Long., Elev): 61.60158, -150.51287, 87' | | | Total Depth: 40.0' |
| Weather: CLEAR CALM, +10°F | | | |
| Vegetation: SCATTERED BLACK SPRUCE TO 20' W/BRUSH & MOSS | | | |

Location Diagram




Groundwater

| | | |
|---|---|---|
| Depth: | 6.0' | 5.5' |
| Time: | 0830 | 1500 |
| Date: | 11/18 | 11/18 |
| WD/AB | WD | AB |

Instrumentation: 1" PVC INSTALLED TO 40.0' BGS W/ 3' OF STICK-UP FOR THERMISTOR.

| Sampling Method | Sample No. | Blow Count | Location Sampled | Recovery | Depth in Feet | % Visible Ice | Frozen? | Soil Graph | Moisture | Consistency | T, °F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sh | 1 | 2 | | 1.5 | 0 | Ø | | | | | |
| | 2 | 12 | | | 1 | | | | | | 31 |
| | | 14 | | | 2 | | | | | | |
| Sh | 3 | 3 | | 1.5 | 3 | | | | | | 32 |
| | | 15 | | | 4 | | | | | | |
| | | 17 | | | 5 | | | | | | |
| Sh | 4 | 8 | | 1.5 | 6 | | | | W | MD | |
| | | 6 | | | 7 | | | | | | |
| | | 9 | | | 8 | | | | | | |
| Sh | 5 | SC/SR | | .4 | 9 | | | | | | |
| | | | | | 10 | | | | | | |
| | | | | | 11 | | | | | | |
| | | | | | 12 | | | | | | |
| | | | | | 13 | | | | | | |
| Sh | 6 | — | — | — | 14 | | | | | | |
| | | | | | 15 | | | | | | |
| | | | | | 16 | | | | | | |
| | | | | | 17 | <3 | | | | | |
| | | | | | 18 | | | | | | |
| | | | | | 19 | | | | | | |
| | | | | | 20 | | | | | | |

Description of Strata

① 0.0 - 0.5 ORGANIC MAT. MOSS W/ TWIGS & NEEDLES. NOT COLLECTED.

② 0.5 - 1.5 SILT W/ 45% ORGANICS, OML, 0/0/100 LT. BROWN, FRZN-Nf, PLASTIC BAG.

③ 2.0 - 3.5 SILT, ML, 0/0/100, LT. BROWN, MICACEOUS, FRZN-Nf, PLASTIC BAG.

[0.0 - 0.5] ORGANIC MAT, MOSS W/ TWIGS & NEEDLES.

[0.5 - 5.5] SILT W/ ORGS TO SILT, FRZN-Nf (SEASONAL) ORGS TO 2" BECOMING DARKER W/ DEPTH.

WATER TABLE @ 6' WD - PERCHED -

④ 6.0 - 7.5 PGGR W/ SA CONT C&B, 6P, SS/40/5, LT. BROWN, GR= SR-SA, HARD, SA= FN TO CRSE, MD, WET. SAMPLE WAS WASHED BY GW & MAY NOT BE REPRESENTATIVE OF - 200. PLAS BAG.

[5.5 - 13.5] GRW/SA CONT C&B, LT. BROWN, GR= SR-SA, HARD, SA= FN TO CRSE, MD, WET. VERY EASY TO DRILL.

⑤ 11.0 - 11.5 50 BLOWS FOR 6". SAMPLE REFUSAL ON C&B. LOW RECOVERY - WASHED OUT. SAME AS ABOVE. PGGR W/ SA CONT C&B. PLAS. BAG.

[13.5 - 17.5] PGSA, SA: FN TO MED, WET, FAST DRILLING. LOGGED MAINLY FROM DRILL REACTION & CUTTINGS.

⑥ 15.0 2' OF HEAVING SANDS. NO SAMPLE DRIVEN OR COLLECTED.

- PERMAFROST ENCOUNTERED @ 17' -

[17.5 - 21.0] SISA, GREY-BROWN, SA= FN, FRZN W/ <3% VISICE, VX TO VC, XTALS TO 1/8", CLOUDY.

R&M CONSULTANTS, INC.

# LOG OF TEST BORING

| | | | |
|---|---|---|---|
| Project No.: 1429.03 | Project Name: ALASKA PIPELINE PROJECT | | Sheet: 2 of 2 |
| Logged by: A. BANICS | Contractor: BRAND X | Crew: B. GRINDER, J. FORD | Hole No.: RM16-TB03 |
| Rig Type: CME 75 | Drill Method: 8" HOLLOW STEM AUGER | | Date Begun: 11/18/12 / Date Completed: 11/18/12 |
| Location (Lat., Long., Elev): 61.60158, -150.51287, 87' | | | Total Depth: 40.0' |
| Weather: CLEAR, CALM, +10°F | | | |
| Vegetation: SCATTERED BLACK SPRUCE TO 20' W/ BRUSH & MOSS | | | |

Location Diagram


Groundwater

| | | |
|---|---|---|
| Depth: | 6.0' | 5.5' |
| Time: | 0830 | 1500 |
| Date: | 11/18 | 11/18 |
| WD/AB | WD | AB |

Instrumentation: 1" PVC INSTALLED TO 40.0' RGS W/ 3' OF STICK-UP FOR THERMISTOR.

| Sampling Method | Sample No. | Blow Count | Location Sampled | Recovery | Depth in Feet | % Visible Ice | Frozen? | Soil Graph | Moisture | Consistency | T, °F | Description of Strata |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SH | 7 | 20 | | 1.5 | 20 | <3 | | | | | 31 | (7) 20.0-21.0 SI SA, SM, 0/65/35, GREY-BROWN, SA-FN, FRZN W/ <3% VIS ICE, VX TO VC, XTALS TO 1/8", CLOUDY. PLAS. BAG. |
| | 8 | 24 | | | | | | | | | | (8) 21.0-21.5 SI, ML, 0/0/100, DK. BROWN, MICACEOUS, FRZN W/ 20% VIS ICE, VX TO VR, XTALS TO 1/8" W/ RANDOM INCLUSIONS TO 1/2", CLOUDY, PLAS. BAG. |
| | | 27 | | | | | | | | | | [21.0-25.0] SAME AS ABOVE W/ <5% ORGS (NON-DECOMPOSED) WOODY STEMS OBSERVED IN CUTTINGS 24'-25'. |
| SH | 9 | 22 | | 1.5 | 90 | | | | | | 30 | (9) 25.0-26.5 ICE+ML, 0/0/100, DK. BROWN TO GREY, FRZN W/ 90% VIS ICE, CLOUDY. PLAS. BAG. |
| | | 27 | | | | | | | | | | [25.0-28.5] SAME AS ABOVE. |
| | | 32 | | | | | | | | | | |
| | | | | | 100 | | | | | | | [28.5-32.0] AS SAMPLE 10. VERY HARD TO CUT W/ AUGERS. |
| SH | 10 | 30 | | 1.5 | 30 | | | | | | 31 | (10) 30.0-31.5 MASSIVE ICE, FRZN W/ 100% VIS ICE, CLEAR TO CLOUDY. NOT COLLECTED. |
| | | 34 | | | | | | | | | | |
| | | 40 | | | | | | | | | | |
| | | | | | 0 | | | | | | | 31.5-36.5 CLAYEY SILT, ML/CL, 0/0/100, BLUE-GREY, LOW PLASTICITY, FRZN W/ 0% VIS ICE, WELL BONDED, NBE. PLAS. BAG. LOGGED VIA CUTTINGS OBSERVATION. SLOW DRILLING. |
| | | | | | | | | | | | | -TRACE ANGULAR ROCK FRAGMENTS 35'-36.5' (5%) |
| | | | | | | | | | | | | [36.5-40.0] HIGHLY WEATHERED BEDROCK - QUARTZ MICA SCHIST, FRZN, NF, STRUCTURES & TEXTURE PRESENT. DRILLING SMOOTH & STEADY. DRILL RATE W/ AUGER ≈ 3'/HR. |
| SH | 11 | 30 | | 1.0 | 40 | | | | | | | (11) 38.5-40.0 HIGHLY WX'D SX, SHOWING STRUCTURE & TEXTURE, LT. BROWN, SCHISTOCITY 10°, FRZN W/ 0% VIS ICE, POORLY BONDED, NF. |
| | | 45 | | | | | | | | | | |
| | | 62 | | | | | | | | | | |

## Purpose and Scope

To provide standard decontamination procedures for environmental projects to comply with the following guidance documents: Alaska Department of Environmental Conservation (ADEC) Field Sampling Guidance (ADEC, 2017c), ADEC Monitoring Well Guidance (ADEC 2013), 18 AAC 75 (ADEC, 2017a), and 18 AAC 78 (ADEC, 2017b).

This procedure applies to R&M Consultants, Inc. (R&M) employees. This procedure is designed to work in conjunction with ADEC Field Sampling Guidance (ADEC, 2017c). If project specific procedures in the work plan conflict with this standard procedure, the approved work plan shall apply.

## Key Responsibilities

**ADEC Qualified Environmental Professional (18 AAC 75 and 18 AAC 78)**

- Develops and executes the work plan and associated procedures in accordance with regulatory guidance and instructs the ADEC Qualified Sampler (if present) on project procedures prior to initiating the field sampling effort.
- Meets the 18 AAC 75 or 18 AAC 78 qualifications as a Qualified Environmental Professional.
- Oversees or performs decontamination and completes field documentation.
- Manages and supervises the work of ADEC Qualified Samplers, if present.

**ADEC Qualified Sampler (18 AAC 75 and 18 AAC 78)**

- Meets the 18 AAC 75 or 18 AAC 78 qualifications as a Qualified Sampler
- Performs decontamination and completes field documentation.

## Equipment

Decontamination procedures require containers to hold wash and rinse solutions for wet-decontamination or to catch debris and mitigate dust generation for dry-decontamination. Lists of suggested equipment for wet and dry decontamination are provided below.

Wet-Decontamination Equipment List (Minimum)

- Alconox® powdered soap.
- Distilled, deionized water, or potable water (drill tooling decontamination only)
- 1 container for Alconox® wash (sized to type of equipment being decontaminated).
- 2 containers for rinse water (sized to type of equipment being decontaminated).
- Container to catch debris (i.e. tarp, plastic sheeting, duck pond, etc).
- Brush(s) for scrubbing in the Alconox® wash.
- [OPTIONAL] 5-gallon bucket for spent decontamination water.
- [OPTIONAL] Sprayers for Alconox® wash and rinse water.
- [OPTIONAL] Open container to collect wash and rinse water if sprayers are used or overflow is expected (i.e. duck pond, bucket, etc.)

Dry-Decontamination Equipment List (Minimum)

- [OPTIONAL] Ground cover or container to catch debris (i.e. tarp, plastic sheeting, duck pond, etc).
- Brush(s) for removing soil and debris.
- [OPTIONAL] Shovel (typical for heavy equipment decontamination).
- [OPTIONAL] Sprayer to provide water mist to minimize dust generation.

## Decontamination Method Selection

The work plan should specify if wet or dry decontamination will be used. Wet-decontamination is typically used for reusable sampling or investigation equipment that will come into direct contact with a sample or where there are human-health or environmental concerns. Dry-decontamination is typically used with heavy equipment used to advance excavations or test pits within contaminated soils where gross contamination is not present and dry-decontamination is likely to remove exposure risks related to human-health and the environment. In situations where equipment is heavily soiled, a combination of dry and wet decontamination may be necessary.

## Wet-Decontamination Procedure

Wet-decontamination procedures can be broken down into preparation, decontamination, and investigation derived waste management. These steps are discussed below. Investigation derived waste shall be managed in accordance with the approved work plan.

### Wash Solution and Rinse Water Preparation

- Mix Alconox® with potable, distilled or deionized water per manufacture specifications in wash container or sprayer. Container should be filled to approximately 1/2 to 3/4 capacity to prevent overflow while decontaminating.
    - If a sprayer is used it can be filled to capacity.
- Fill rinse water containers to approximately 1/2 to 3/4 capacity with potable, distilled or deionized water to prevent overflow while decontaminating. Distilled or deionized should be used if sampling for analytes such as metals, sulfates, nitrates, etc.
    - If a sprayer is used it can be filled to capacity.
- Rinse containers should be labeled (Rinse 1 and Rinse 2)
- Prepare new Alconox® wash and rinse water if the original preparation becomes soiled and water running off equipment contains significant sediment or foreign materials.
- [OPTIONAL] Place an open container beneath the Alconox® wash and rinse containers if overflow is expected.
- [OPTIONAL] Place an open container beneath the piece of equipment being decontaminated if sprayers are being used.

### Wet-Decontamination

- Scrub reusable equipment in the Alconox® wash container or spray with Alconox® wash using the sprayer and then scrub to loosen sediment or other foreign materials.
    - Equipment should be disassembled to the extent practicable and within manufacturer recommendations.
        - If disassembly is not feasible and would leave sediment or other foreign materials behind if not accomplished, the equipment should be considered single use disposed of instead of decontaminated (i.e. bailers, pie tins).
    - Submersible pumps can be placed in the container and allowed to run, but should also be disassembled to make sure sediment and other foreign materials are removed.
        - Disassembly should be in accordance with the manufacturer specifications.
- Rinse equipment in the Rinse 1 container or spray with distilled water from a sprayer until all soap and sediment or other foreign materials are removed.
    - Submersible pumps can be placed in the container and allowed to run.
- Repeat the rinse process in the Rinse 2 container.

**Investigation Derived Waste Management**

- Spent wash and rinse water shall be temporarily containerized in a 5-gallon bucket.
- At the end of each day or as volume dictates: any spent wash or rinse water shall be containerized in accordance with the approved work plan for investigation derived waste.

## Dry-Decontamination Procedure

Dry-decontamination procedures can be broken down into preparation, decontamination, and investigation derived waste management. These steps are discussed below. Investigation derived waste shall be managed in accordance with the approved work plan.

**Preparation**

- Place the ground cover or container beneath the piece of equipment being decontaminated. If no ground cover or container are used, decontamination should be performed over the associated excavation.
- [SITUATIONAL] containment is necessary if using water during decontamination.
- [OPTIONAL] fill a sprayer with water for dust mitigation.

**Dry-Decontamination**

- Use brushes and/or shovels to remove soil and other material from the equipment.
- [OPTIONAL/SITUATIONAL] If dust is generated, a mist of water from a sprayer can be used to knock the dust from the air or to lightly wet the surface being decontaminated to prevent dust generation.
    - Containment is necessary if using water during decontamination.
    - Care must be taken to prevent making removal of soil or other foreign matter more difficult due to over-wetting the surface.

**Thermal Decontamination**

- A propane or methylacetylene-propadiene propane (MAPP gas) torch will be used to heat the equipment to dry out soil to allow it to be removed using dry decontamination techniques.

**Investigation Derived Waste Management**

- Collect material generated from dry-decontamination and containerize in accordance with the approved work plan.
- Decontaminate the ground cover or container and brushes or dispose in accordance with the approved work plan.

## References

18 AAC 75. Oil and Other Hazardous Substances. Alaska Department of Environmental Conservation.
18 AAC 78. Underground Storage Tanks. Alaska Department of Environmental Conservation.
ADEC, 2017c. Field Sampling Guidance. August 2017.

## Purpose and Scope

To provide standard sampling procedures where per- and polyfluoroalkyl substances (PFAS)) are analytes of concern for environmental projects complying with the Alaska Department of Environmental Conservation (ADEC) Field Sampling Guidance (ADEC, 2017c) and emerging PFC sampling guidelines.

This procedure applies to R&M Consultants, Inc. (R&M) Earth Sciences Department employees. This procedure is designed to work in conjunction with ADEC Field Sampling Guidance (ADEC, 2017c). This procedure is meant to modify practices detailed in other R&M environmental standard procedures (10 and 20 series, e.g. 10-RM-SP) to mitigate potential cross contamination due to the presence of widespread PFAS present in typical field clothing and equipment. If project specific procedures in the work plan conflict with this standard procedure, the approved work plan shall apply.

## Key Responsibilities

**ADEC Qualified Environmental Professional (18 AAC 75 and 18 AAC 78)**

- Develops and executes the work plan and associated sampling plan/procedures in accordance with regulatory guidance and instructs the ADEC Qualified Sampler (if present) on project procedures prior to initiating the field sampling effort.
- Meets the 18 AAC 75 or 18 AAC 78 qualifications as a Qualified Environmental Professional.
- Collects samples, completes field documentation, and performs site work in accordance with regulatory guidance.
- Manages and supervises the work of ADEC Qualified Samplers, if present.

**ADEC Qualified Sampler (18 AAC 75 and 18 AAC 78)**

- Meets the 18 AAC 75 or 18 AAC 78 qualifications as a Qualified Sampler.
- Collects samples and performs site work in accordance with regulatory guidance.
- Completes field documentation regarding the collected samples.

## Procedure

PFAS are present as fire retardants in many common materials used in field equipment, field clothing and PPE, sampling containers, and decontamination procedures. The widespread nature of PFAS combined with the parts per billion cleanup levels for soil and groundwater (migration to groundwater (soil) and groundwater) create significant cross contamination challenges from sources not usually considered during typical sediment, soil, surface water, and groundwater sampling.

The table on the following page provides common items that present potential cross contamination pathways and provides various mitigation options.

## References


18 AAC 75. Oil and Other Hazardous Substances. Alaska Department of Environmental Conservation.
18 AAC 78. Underground Storage Tanks. Alaska Department of Environmental Conservation.
ADEC, 2017c. Field Sampling Guidance. August 2017.

| Potential Cross Contaminations Sources | Mitigation Description |
|---|---|
| **Field Equipment** | |
| Teflon® materials | High-density polyethylene (HDPE) materials |
| Low-density polyethylene (LDPE) materials | Acetate Liners or Silicon Tubing |
| Waterproof field books | Change nitrile gloves after handling and before touching a sample or sample container |
| Plastic clipboards, binders, or spiral hard cover notebooks | Aluminum clipboards or Masonite |
| Post-It Notes® | NONE, do not use. |
| Chemical (blue) ice packs | Water ice, or double bag chemical ice packs with Ziploc® bags (water ice CANNOT be used for air cargo shipment) |
| **Field Clothing and PPE** | |
| New cotton clothing or synthetic water resistant, waterproof, or stain-treated clothing, clothing containing Gore-Tex™ | Change nitrile gloves after handling or touching and before touching a sample or sample container |
| Clothing laundered using fabric softener | Do not use fabric softener on field clothing |
| Boots containing Gore-Tex™ | Wear boots made with polyurethane and PVC, or prevent contact between boots and sampling equipment, nitrile gloves, or the media being sampled. Change nitrile gloves if they come into contact with boots and before touching a sample or sample container. |
| Tyvek® | Cotton clothing |
| Cosmetics, moisturizers, hand cream, or other related products as a part of personal cleaning/showering routine on the day of sampling | Sunscreens – Alba Organics Natural Sunscreen, Yes to Cucumbers, Aubrey Organics, Jason Natural Sun Block, Kiss my face, baby sunscreens that are “free” or “natural”<br><br>Insect Repellents –Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect repellant, Herbal Armor, California Baby Natural Bug Spray, BabyGanics, or a bug net.<br><br>Sunscreen and Insect Repellant – Avon Skin So Soft Bug Guard Plus – SPF 30 Lotion |
| **Sample Containers** | |
| LDPE or glass containers | HDPE or polypropylene |
| Teflon-lined caps | Unlined polypropylene caps |
| **Rain Events** | |
| Waterproof of resistant rain gear | Use a Gazebo tent that is only touched or moved prior to and following sampling activities, or change nitrile gloves if they come into contact with rain gear and before touching a sample or sample container. Prevent runoff of water from rain gear into the sampling containers. |
| **Equipment Decontamination** | |
| Decon 90® | Alconox® and or Liquinox® |
| Water from an on-site well | Potable water from municipal drinking water supply, distilled water, or deionized water. |

## Purpose and Scope

To provide standard documentation procedures for environmental projects complying with the Alaska Department of Environmental Conservation (ADEC) Field Sampling Guidance (ADEC, 2017b).

This procedure applies to R&M Consultants, Inc. (R&M) Earth Sciences Department employees. This procedure is designed to work in conjunction with ADEC Field Sampling Guidance (ADEC, 2017b). If project specific procedures in the work plan conflict with this standard procedure, the approved work plan shall apply.

## Key Responsibilities

**ADEC Qualified Environmental Professional (18 AAC 75 and 18 AAC 78)**

- Develops and executes the work plan and associated sampling plan/procedures in accordance with regulatory guidance and instructs the ADEC Qualified Sampler (if present) on project procedures prior to initiating the field sampling effort.
- Meets the 18 AAC 75 or 18 AAC 78 qualifications as a Qualified Environmental Professional.
- Collects samples, completes field documentation, and performs site work in accordance with regulatory guidance.
- Manages and supervises the work of ADEC Qualified Samplers, if present.

**ADEC Qualified Sampler (18 AAC 75 and 18 AAC 78)**

- Meets the 18 AAC 75 or 18 AAC 78 qualifications as a Qualified Sampler
- Collects samples and performs site work in accordance with regulatory guidance.
- Completes field documentation regarding the collected samples.

## Standard Field Documentation

Field documentation is meant to allow a reader to understand sampling activities and to allow assessment of the adequacy of the practices used. Field notes should be comprehensive, legible, and descriptive. Any changes or errors need to be clearly marked and tracked to maintain data integrity. This section is based on 18 AAC 75 and ADEC, 2017a.

Error/Edit Tracking

- Errors should be crossed out with a single line and initialed and dated
- Edits should be initialed and dated, preferably with a different color indelible ink.
- Unused cells in a table, or large blank spaces on logbook pages should be lined out, signed, and dated.
- A key should be present to cross-reference initials or signatures with a specific person.

Standard Requirements

- Logbooks pages or loose forms must be paginated
- Notes must be indelible, waterproof ink is preferred, colored pencil may be appropriate on drawings.

Typical Logbook Entries

The following information should be entered into the logbook.

- Page Header
  - Date, Project Number, Project Name, Name of Person taking notes (Each Page)
- Page Text
  - Entries should include time stamps
  - Weather and other environmental observations
  - Names and purpose/title of each person on site that day
  - Description of safety or tailgate meetings
  - PPE level used
  - Daily objectives
  - Summaries of discussions with site visitors
  - Instrumentation calibration data
    - Expiration date of standard measures, if applicable
    - Calibration readings
    - Readings meet specification or manual
  - Location of activity and site conditions
    - Sketches and tables are most valuable
    - Photo locations (may need a separate sketch)
      - Use dots with arrows to show location and direction facing
    - Sampling and field screening locations
  - Field Observations and comments
  - Deviations from work plan or standard procedure protocols (Include why the change was made)
  - Sample collection information (should match sample labels and follow standard procedure documentation protocols).
  - Global positioning system (GPS) coordinates in NAD83 or WGS84 and the projection using a recreational grade GPS. Alternatively, mark locations with swing ties to site features on a sketch.
  - Presence of standalone field maps or forms that would be needed to understand site activities (e.g. groundwater sampling or boring log forms).
- Sketches
  - May be generated over multiple days, just make a note on the sketch that indicates the date range over which the sketch was generated.
  - Include an orientation arrow (typically north, but may be a prominent site feature in rare occasions).
  - Actual scale, or not to scale (N.T.S.).
- Include site features to allow the sketch to be located (e.g. building corners, concrete structures, cliffs/major slope breaks, and/or poles)
- Include descriptions of chains-of-custody (COC) and any relevant sample handling notes.
  - COC number
  - Date shipped, name of shipper, tracking number, intended destination
  - Description of cooler packing (e.g. number of ice gel packs, use of custody seals)

Typical Form Data Entry

- Fill out all fields on the form. Unused sections should be lined out, signed, and dated.
- At a minimum, forms should include the date, project number, project name, name of person taking notes.

## Sample Naming Convention

If a project has a historic sample naming convention, such as for long term groundwater monitoring projects, then the historical naming convention will be continued and this section will not apply.

Table 1A: Soil / Water / Vapor Analytical Sample Identification

| Project Location ID | Year | Sample Type | Sample Type Location | Sample Number | Example |
|---|---|---|---|---|---|
| ANC | 16 | [See Below] | 01 | 01 | ANC16-TH01-01 |

Table 1B: Soil Sample Type Codes

| Sample Type Code | Definition | Sample Type Code | Definition |
|---|---|---|---|
| TH | Test Boring/Hole | ES | Excavation Clearance Sidewall |
| TP | Test Pit | EF | Excavation Clearance Floor |
| TT | Test Trench | LF | Land Farm |
| HA | Hand Auger | WC | Waste Characterization (General) |
| SE | Sediment | SP | Stockpile Characterization |

Table 1C: Water / Vapor Sample Type Codes

| Sample Type Code | Definition | Sample Type Code | Definition |
|---|---|---|---|
| MW | Monitoring Well / Piezometer | WW | Waste Water Characterization |
| TW | Temporary Monitoring Well | OV | Outdoor Air (Vapor) |
| SW | Surface Water | IV | Indoor Air (Vapor) |
| TW | Tap Water | SV | Soil Gas (Vapor) |

Table 2A: Trip Blank Analytical Sample Identification

| Project Location ID | Year | Media Type | Trip Blank Code | Sample Number | Example |
|---|---|---|---|---|---|
| ANC | 16 | [See Below] | QC | 01 | ANC16-WA-QC01 |

Table 2B: Equipment/Rinsate Blank Analytical Sample Identification

| Project Location ID | Year | Media Type | Blank Code | Sample Number | Example |
|---|---|---|---|---|---|
| ANC | 16 | [See Below] | RB | 01 | ANC16-WA-RB01 |

Table 2C: Media Type Codes

| Media Type Code | Definition | Media Type Code | Definition |
|---|---|---|---|
| WA | Water | VA | Vapor / Soil Gas |
| SO | Soil | SE | Sediment |

Common features in soil, water, vapor, and trip blank sampling identification include the following:

- **Project Location ID:** 3 letter alphanumeric code for the project or site location (e.g. ANC for Anchorage or KBK for Kalsin Bay, Kodiak).
- **Year:** 2 digit numeric code for the last 2 digits of the year.
- **Sample Number:** 2 digit code that auto-increments per sample type/per location.

- **Duplicates/Triplicates:** Utilize the next auto-incrementing sample number, **LOG DUPLICATES / TRIPLICATES IN NOTES**
- **Matrix Spike/Matrix Spike Duplicates:** Use the same auto-incrementing sample number as the primary, **LOG MS/MSDs IN NOTES**

## Chain of Custody Record

Prior to shipment or transport of samples to an analytical laboratory, a chain of custody record must be completed (See Attached). The chain of custody is designed to provide a verifiable written record tracing samples from the time of collection to receipt by a laboratory. The chain of custody shall be completely filled out by the QEP and signed along with date and time in the event that samples pass out of the possession of the QEP. If custody seals are required, the time and date should match the chain of custody.

## References

18 AAC 75. Oil and Other Hazardous Substances. Alaska Department of Environmental Conservation.
18 AAC 78. Underground Storage Tanks. Alaska Department of Environmental Conservation.
ADEC, 2017a. Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites. 7 March 2017.
ADEC, 2017b. Field Sampling Guidance. August 2017.
RAE (RAE Systems, Inc.), 2010. Technical Note TN-106, Correction Factors, Ionization Energies, and calibration characteristics.

## List of Attachments

R&M CONSULTANTS, INC.

# CHAIN OF CUSTODY RECORD

| Client: | R&M Consultants, Inc | Analytical Laboratory | | DOD Project?: | | Cooler ID: | | Page | | of | |
|---|---|---|---|---|---|---|---|---|---|---|---|

| Project No. / NPDL No.: | | Project Name: | |
|---|---|---|---|
| Contact Name: | | Phone Number: | |
| Reports To: | Chris Fell<br>Kristi McLean | Email: | cfell@rmconsult.com<br>kmclean@rmconsult.com |

Invoice To: R&M Consultants, Inc
Attn: Accounting Department/Courtney Maillet
9101 Vanguard Drive, Anchorage, AK, 99507
cmaillet@rmconsult.com / 907.522.1707

PO #:

Quote #:

| RESERVED for lab use | Sample Identification | LocID | Sampler | Date (mm/dd/yy) | Time (hhmm) | Matrix/ Matrix Code | No. Containers | Sample Type (i.e. Grab(G), Comp.(c), etc) | Preservative/Analysis | | | | | | | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

| Relinquished By (1): | Date: | Time: | Received By (1): | Date: | Time: |
|---|---|---|---|---|---|
| Relinquished By (2): | Date: | Time: | Received By (2): | Date: | Time: |
| Relinquished By (3): | Date: | Time: | Received By (3): | Date: | Time: |
| Relinquished By (4): | Date: | Time: | Received For By Laboratory: | Date: | Time: |

Turnaround Time, Deliverable Req., and/or Special Instructions

Laboratory Check In Information

| Temp Blank °C | Chain of Custody Seal (Circle): |
|---|---|
| | Intact |
| | Broken |
| | Absent |

## Purpose and Scope

To provide standard cooler use and packing procedures for environmental projects complying with the Alaska Department of Environmental Conservation (ADEC) Field Sampling Guidance (ADEC, 2017) and the International Air Transport Association (IATA) Dangerous Goods Regulations (IATA, most recent).

This procedure applies to R&M Consultants, Inc. (R&M) Earth Sciences Department employees. This procedure is designed to work in conjunction with ADEC Field Sampling Guidance (ADEC, 2017). If project specific procedures in the work plan conflict with this standard procedure, the approved work plan shall apply.

## Key Responsibilities

**ADEC Qualified Environmental Professional (18 AAC 75 and 18 AAC 78)**

- Develops and executes the work plan and associated sampling plan/procedures in accordance with regulatory guidance and instructs the ADEC Qualified Sampler (QS) (if present) on project procedures prior to initiating the field sampling effort.
- Meets the 18 AAC 75 or 18 AAC 78 qualifications as a Qualified Environmental Professional (QEP).
- Collects samples, completes field documentation, and performs site work in accordance with regulatory guidance.
- Manages and supervises the work of ADEC Qualified Samplers, if present.

**ADEC Qualified Sampler (18 AAC 75 and 18 AAC 78)**

- Meets the 18 AAC 75 or 18 AAC 78 qualifications as a QS.
- Collects samples and performs site work in accordance with regulatory guidance.
- Completes field documentation regarding the collected samples.

## General

Coolers are used to provide a secure way to ship environmental samples to protect against breakage, maintain the chain-of-custody (CoC), and maintain sample temperature. Sampling often requires shipment of excepted quantities of hazardous materials (HazMat) as defined by the U.S. Department of Transportation and IATA. R&M corporate policy requires that any HazMat materials be shipped using a professional service to ensure compliance with federal, state, and local regulations. As a majority of environmental work in Alaska requires air travel, IATA regulations apply to most projects when shipping field supplies (IATA, most recent).

Typical Sample Preservation HazMat Items Include:

- Methanol (MeOH).
- Nitric Acid ($HNO_3$).
- Hydrochloric Acid (HCl).

The preservatives listed above should be shipped in one or more coolers, as necessary, to keep total quantities below the IATA regulations for excepted quantities (IATA, most recent). The HazMat shipping service can help determine specific quantities.

Coolers should be packed to protect the contents from breakage during shipment. These practices are outlined below. **If the HazMat shipping service packs a cooler in variance to this procedure, their procedures will apply.**

Most sample coolers will only need to be refrigerated between 0 and 6°C to follow ADEC Field Sampling Guidance (ADEC, 2017). In the case of samples that must be kept frozen, specific procedures should be included in the project work plan and the additional HazMat shipping regulations adhered to.

## Cooler Packing – Mobilization

Coolers should be set up as follows:

- Place 2 layers of bubble wrap on the bottom of the cooler.
- Line the cooler with a plastic trash bag.
- If liquids are being transported, place enough water absorbent diapers on the bottom of the trash bag to soak up any spilled liquid in the case of a leak or breakage.
- Place sampling containers in the cooler in the original packaging, or each individually wrapped in bubble wrap and secured with tape or a rubber band. The contract laboratory typically will prepare the sampling containers appropriately.
- Make sure any trip blanks are included with the sample containers.
- Place an adequate number of gel-ice packs in the cooler, typically 8 for a large cooler and 5 for a small cooler.
- **Take the cooler to the HazMat shipper if it contains any HazMat (i.e. MeOH vials) for sites accessible by aircraft.**

## Cooler Packing – Site Work

While sampling, a cooler should be ready to receive samples as they are collected:

- Place frozen ice packs in the cooler before beginning sampling activities.
- Firmly close the cooler after placing a sample inside to maintain temperature.

## Cooler Packing – Demobilization

Ensure the cooler is packed as follows for transport to the analytical lab by the QEP or QS via road:

- As described in Cooler Packing – Mobilization
- Place frozen ice packs on the bottom of the cooler, beneath the bubble wrap.
- Place remaining ice packs on the sides or on top of the samples.

Ensure the cooler is packed as follows for transport by aircraft to the analytical lab (See Photo 1):

- As described in Cooler Packing – Mobilization
- Place frozen ice packs on the bottom of the cooler, beneath the bubble wrap.
- Place remaining ice packs on the sides or on top of the samples.
- Seal the trash bag closed with tape or a zip tie.
- Complete the CoC and relinquish custody.

- Fill out 2 custody seals with the same date/time as the relinquish line on the CoC.
- Place the CoC in a ziplock and tape to the inside of the cooler lid.
- Make sure any remaining space in the cooler is filled with packing materials to prevent movement of the contents.
- Place appropriate shipping labels on the sides of the cooler.
    - Up arrows, refrigerate only, and fragile stickers on front, back and sides
    - Wrap the cooler with at least one wrap of packing tape to secure the labels to the cooler
- Place 1 custody seal on the side opposite the hinges and 1 custody seal on the side of the hinges, making sure that the signature crosses the cooler opening. Cover the custody seals with a piece of packing tape.
- Seal the cooler with strapping or duct tape wrapped all the way around in at least 2 to 3 complete wraps. This should be done on both sides of the lid, parallel to the custody seals, making sure each one of the closures catches the edge of each custody seal without covering up the signature or date on the seals.
- Place appropriate shipping labels and address information on the cooler lid.
    - Address of who is shipping and who is receiving the cooler (just like a letter).
    - Refrigerate only and fragile stickers.
    - Cover labels with packing tape to protect against weather and abrasion.

## Photo 1


## References


18 AAC 75. Oil and Other Hazardous Substances. Alaska Department of Environmental Conservation.
18 AAC 78. Underground Storage Tanks. Alaska Department of Environmental Conservation.
ADEC, 2017. Field Sampling Guidance. August 2017.
IATA (International Air Transport Association, most recent. Dangerous Goods Regulations.