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FINAL

GENERAL WORK PLAN ADDENDUM  
DOT&PF Statewide PFAS  
Addendum 022-BRW-01 Utqiagvik  
Water Supply Sampling  
UTQIAGVIK, ALASKA

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Submitted To: Alaska Department of Transportation & Public Facilities  
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Subject: FINAL GENERAL WORK PLAN ADDENDUM, DOT&PF STATEWIDE PFAS  
ADDENDUM 022-BRW-01 UTQIAGVIK  
WATER SUPPLY SAMPLING, UTQIAGVIK, ALASKA

Shannon & Wilson has prepared this Work Plan Addendum on behalf of the Alaska Department of Transportation & Public Facilities (DOT&PF). This Addendum is a supplement to the *DOT&PF Statewide PFAS General Work Plan (GWP)*, dated July 2020. The services proposed in this GWP Addendum, 022-BRW-01, describe the DOT&PF planned activities for water supply search and sampling associated with per- and polyfluoroalkyl substances (PFAS) at and near the Wiley Post-Will Rogers Memorial Airport (BRW), in Utqiagvik, Alaska.

The scope of services was specified in our proposal dated June 16, 2022 and authorized by a notice to proceed (NTP) on August 26, 2022 by DOT&PF under Professional Services Agreement Number 25-19-013 *Per- and Polyfluorinated Substances (PFAS) Related Environmental & Engineering Services*.

This GWP Addendum was prepared and reviewed by:

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## ACRONYMS

AAC	Alaska Administrative Code
AFFF	aqueous film forming foam
ARFF	Airport Rescue and Firefighting
bgs	below ground surface
BRW	Wiley Post-Will Rogers Memorial Airport
BUECI	Barrow Utilities & Electric Cooperative, Inc.
COPC	contaminant of potential concern
CSD	DEC Contaminated Sites database
CSM	Conceptual Site Model
DEC	Alaska Department of Environmental Conservation
DoD	Department of Defense
DOT&PF	Alaska Department of Transportation & Public Facilities
DVPP	Data-Validation Program Plan
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
GAC	granular activate carbon
GWP	<i>DOT&amp;PF Statewide PFAS General Work Plan – Revision 1</i>
IDW	investigative-derived waste
LHA	lifetime health advisory
ng/L	nanograms per liter
PFAS	per- and polyfluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
POC	point of contact
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RL	reporting limit
SSHP	Site Safety and Health Plan
USGS	U.S. Geological Survey

# 1 INTRODUCTION

This Addendum, 022-BRW-01, is a supplement to the *DOT&PF Statewide PFAS General Work Plan – Revision 1* (GWP). This Addendum, in collaboration with the GWP provides guidance to conduct a water supply search and sampling event for per- and polyfluoroalkyl substances (PFAS) near the Wiley Post-Will Rogers Memorial Airport (BRW) in Utqiagvik, Alaska (Figure 1, Exhibit 1-1).

Shannon & Wilson has prepared the GWP and this Addendum in accordance with Alaska Department of Environmental Conservation’s (DEC’s) March 2017 *Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites*, and DEC’s January 2022 *Field Sampling Guidance* document. If additional activities are required that are not covered in the GWP or deviations are made to the GWP, they will be described in this Addendum.

The BRW is a state-owned airport managed by the Alaska Department of Transportation & Public Facilities (DOT&PF). Additional information regarding the BRW is listed in Exhibit 1-1 below and Section 2.0.

## Exhibit 1-1: Airport Information

<b>Airport Name:</b>	<b>Ralph Wien Memorial Airport</b>
Airport Code:	BRW
DEC File No. / Hazard ID:	310.38.036
Airport Address:	1749 Akavak Street, Utqiagvik, Alaska 99723
DOT&PF Region:	Northern
DOT&PF Regional POC:	Daniel Phillips
DOT&PF PFAS POC:	Sammy Cummings
Airport Type:	Current Part 139 Airport
Airport Coordinates (Lat/Long):	71.2855, -156.7611

POC = point of contact

## 1.1 Background

General background information relating to sites covered under the GWP is included in Section 1.1 of the GWP. Background information specific to the BRW is detailed below.

DOT&PF Aircraft Rescue and Firefighting (ARFF) services has used aqueous film forming foam (AFFF) for training and systems testing for many years. Part 139 Airports are required

to conduct annual AFFF systems testing to maintain their certification through the Federal Aviation Administration (FAA). Prior to 2019, FAA inspections required the release of AFFF to the ground surface. One area of known use of AFFF at the BRW is shown on Figure 2.

Perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) are two PFAS commonly found at sites where AFFF were used. Due to their persistence, toxicity, and bioaccumulative potential, these compounds are of increasing concern to environmental and health agencies. In May 2016 the U.S. Environmental Protection Agency (EPA) published a recommended Lifetime Health Advisory (LHA) level of 70 nanograms per liter (ng/L) for the sum of PFOS and PFOA in drinking water. In June 2022, the EPA published interim LHAs of 0.004 ng/L for PFOA and 0.02 ng/L PFOS, and final LHAs of 2,000 ng/L for perfluorobutanesulfonic acid, and 10 ng/L for hexafluoropropylene oxide dimer acid and its ammonium salt (together referred to as “GenX chemicals”).

The DEC Contaminated Sites Program published groundwater-cleanup levels of 400 ng/L for PFOS and PFOA in November 2016. Prior to the publication of these levels, there were no state-level cleanup levels established for PFAS. On October 2, 2019, DEC published a Technical Memorandum amending the April 9, 2019 Technical Memorandum to include additional PFAS analytes to the testing requirements. Per DEC guidance, the current drinking water action level remains 70 ng/L for the sum of PFOS and PFOA. A summary of the changes to action levels and regulatory requirements is also described in Section 1.1 of the GWP.

### 1.1.1 Previous Investigations

The following sections summarize previous environmental investigations and cleanup actions performed at the BRW that may be of interest to understand PFAS contamination at the site. Additional environmental investigations are reported in the DEC Contaminated Sites database (CSD) near the BRW; however, due to their distance from the ARFF building and lack of PFAS-containing contaminants (i.e. AFFF releases), it is unlikely these sites have contributed to PFAS contamination at or from the BRW.

#### 1.1.1.1 Barrow Airport Lease Lot 2A Block 300

In the 1990's, diesel range organics, residual range organics, and gasoline range organics were discovered during a site assessment of the former DOT&PF maintenance and operations shop. Excavated soil from the site was stockpiled on a liner and aerated multiple times to reduce contamination. In 2000, the remediated soil was approved for re-use at the BRW. It is unknown where excavated soil was used, or if the soil contained PFAS.



### 1.1.1.2 Previous PFAS Investigations

In 2017, PFOS and PFOA surface water samples were collected from Isatkoak Reservoir, the drinking water source for the Barrow Water Treatment System. According to the DEC CSD summary, multiple samples were collected from locations across the reservoir. Results of sampling indicated detections of PFOS and PFOA exceeding the DEC drinking water action level. Samples collected from an area off the east end of the BRW runway indicated concentrations greater than results of samples collected from other areas of the reservoir. PFOS and PFOA were not detected in drinking water samples collected post-treatment. It is unclear if other PFAS analytes were reported for these samples.

The Barrow Utilities & Electric Cooperative, Inc. (BUECI) collects monthly pre- and post-treatment drinking water samples for analysis of PFOS and PFOA. The DEC Drinking Water Watch website includes results for PFOS and PFOA. In September 2022, the PFOS and PFOA concentrations were reported at approximately 50 ng/L in samples collected from the reservoir intake, and in November 2022, PFOS and PFOA were not detected in the effluent for the water system. PFOS and PFOA have not been detected in post-treatment drinking water samples since monitoring began in 2017.

The water system facility details available through the Alaska Certified Water/Wastewater Operator Database indicate the BUECI treatment plant uses a variety of treatment and filtration methods, including membrane filtration. The disposal method for concentrated waste from the filtration system is unknown.

### 1.1.1.3 BRW Aviation Accident Reports

Multiple crash reports for aircraft accidents near the BRW are available in the National Transportation Safety Board Aviation Accident Database. It is unknown whether AFFF was used at these crash sites.

## 1.1.2 Climate

Climate near the BRW consists of long, cold winters; short, cool summers; and persistent wind. The Arctic Ocean cools Utqiagvik in the summer. A large proportion of precipitation in Utqiagvik occurs as fog and trace rainfall events (USGS, 1994).

## 1.1.3 Vegetation

Vegetation near the BRW is limited due to the cooling effect of the Arctic Ocean. Sedges, grasses, mosses, and liverworts are the dominant vegetation types found in Utqiagvik (USGS, 1994)

#### 1.1.4 Geology and Soils

Utqiagvik is characterized by numerous lakes, ponds, and drained thaw-lake basins and continuous permafrost. Permafrost extends up to 1,000 feet below ground surface (bgs). There is an active layer above the permafrost that thaws and re-freezes seasonally. Typically, the active layer is less than 2 feet bgs in undisturbed areas (USGS, 1994).

The uppermost bedrock in the BRW area consists primarily of shale. The bedrock is overlain by unconsolidated marine, eolian, and lacustrine-lagoonal deposits. Deposits are a mixture of sand, silt, clay, and gravel. Soils are classified as wet, loamy, histic pergelic cryaquepts (USGS, 1994).

#### 1.1.5 Hydrology

Permafrost strongly influences hydrology in Utqiagvik, acting as a confining layer and limiting vertical movement of water. Water remains at the surface or shallow subsurface. As a result, many lakes and ponds are found throughout the region. Streams and drainage channels are sometimes impeded by un-melted snowdrifts. This can alter surface and subsurface drainage patterns, and subsequently groundwater flow directions. Thermal taliks beneath large lakes and chemical taliks due to saltwater intrusion occur in Utqiagvik. Saline groundwater is common. Utqiagvik receives less than five inches of precipitation annually, designating the area as a desert.

### 1.2 Project Objectives and Scope

The project objectives are to evaluate the potential for human exposure to PFAS in water supply sources at and near the BRW; and understand the extent of PFAS contamination, if present, resulting from the historic use of AFFF by the DOT&PF at the BRW. This Addendum describes methods used to identify PFAS and evaluate the lateral extent of contamination.

The scope for this initial water supply search and sampling effort includes:

- conducting a water supply search to evaluate drinking water sources near and downgradient of the BRW;
- sampling identified water supply locations for PFAS, where they exist and access is permitted; and
- discussing potential AFFF release sites at the BRW through interviews with airport personnel.

## 2 SITE AND PROJECT DESCRIPTION

The following sections provide a site and project description. The BRW lies east to west on the coast of the Chukchi Sea in the Arctic Ocean (Figure 1).

### 2.1 Site Location and Boundaries

The BRW is located at 1749 Akavak Street in Utqiagvik, Alaska. BRW has one asphalt runway measuring 7,100 feet long, and 150 feet wide. Runway 8/26 is bordered by the Chukchi Sea on the west end of the runway, and the Isatkoak Reservoir to the east. The geographic coordinates of the BRW terminal are latitude 71.2855, longitude -156.7611.

### 2.2 Potential Sources of Contamination

General information regarding potential sources of contamination at DOT&PF airport sites to be covered under the GWP is included in Section 2.1 of the GWP. Specific potential sources of contamination at the BRW to be investigated as a part of this Addendum are listed below.

- An area of the BRW where AFFF was believed to have been used (Figure 2);
- FAA-required AFFF-systems testing areas at various, unidentified locations along BRW runways; and
- AFFF storage areas at the BRW.

### 2.3 Contaminants of Potential Concern and Regulatory Levels

General information regarding contaminants of potential concern (COPCs) and regulatory levels is included in Section 2.2 of the GWP. The primary COPCs for this project are PFAS, specifically PFOS and PFOA. DEC's *Field Sampling Guidance* (2022) also identifies gasoline range organics, diesel range organics, residual range organics, benzene, toluene, ethylbenzene, and xylenes, and polynuclear aromatic hydrocarbons as COPCs at ARFF training areas. We note these additional analytes are outside the scope of this Addendum.

Groundwater and surface water samples will be compared to Alaska's 18 Alaska Administrative Code (AAC) 75.341 *Table C, Groundwater Human Health Cleanup Level* or the applicable DEC drinking water action level at the time of sampling. The current cleanup levels and analytical reporting limits for the site COPCs are summarized below in Exhibit 2-1.

**Exhibit 2-1: COPCs, Regulatory and Laboratory Reporting Limits**

Method	Analyte	DEC Regulatory Limit <sup>a</sup> (ng/L)	DEC Drinking Water Action Level (ng/L)	Laboratory RLs <sup>b</sup> (ng/L)
DoD QSM	PFOS	400	70	2.0
Table B-15 <sup>c</sup>	PFOA	400		2.0

Notes:

- a. 18 AAC 75 Table C. Groundwater Cleanup Levels.
- b. Current RLs from Eurofins Environment Testing for PFAS analyses.
- c. All available PFAS analytes will be requested for analytical reports. However, only PFOS and PFOA have DEC Cleanup Levels and are reported in this table.

DEC = Department of Environmental Conservation, DoD = Department of Defense, ng/L = nanogram per liter, PFAS = per- and polyfluoroalkyl substances, PFOA = perfluorooctanoic acid, PFOS = perfluorooctanesulfonic acid, QSM= Quality Systems Manual, RL = reporting limit

## 2.4 Conceptual Site Models

A conceptual site model (CSM) describes potential pathways between a contaminant source and possible receptors (i.e., people, animals, and plants) and is used to determine who may be at risk of exposure to those contaminants. A DEC *Human Health Conceptual Site Model Graphic Form and Human Health Conceptual Site Model Scoping Form* were completed based on the preliminary understanding of site conditions. These forms are included in Appendix A of this Addendum.

Little is known about the potential PFAS-affected media at and near the BRW. The draft CSM will be revised and presented in the final report following receipt of analytical data. Potentially affected media include soil, groundwater, surface water, sediment, and biota.

Potential human pathways include:

- Incidental soil ingestion;
- Dermal absorption of contaminants from soil, groundwater, or surface water;
- Inhalation of fugitive dust;
- Ingestion of groundwater (e.g., groundwater wells) and surface water;
- Direct contact with sediment; and
- Ingestion of wild or farmed foods.

## 2.5 Project Team

Chris Darrah will be Shannon & Wilson’s Principal-in-Charge and Kristen Freiburger will serve as the overall Statewide Project Manager. A site project manager will be selected if additional PFAS investigative efforts are needed following the initial water supply search and sampling effort. Shannon & Wilson’s project team also includes other State of Alaska Qualified Environmental Professionals to support the various field and reporting tasks required to achieve the project objectives. The project team and their associated responsibilities are summarized in Exhibit 2-2 below.

**Exhibit 2-2: Project Team**

Affiliation	Responsibility	Representative	Contact Number
DOT&PF	Client – Regional POC	Daniel Phillips	(907) 451-2926
	Client – Statewide PFAS POC	Sammy Cummings	(907) 888-5671
DEC	Regulatory agency POC	Bill O’Connell	(907) 269-3057
Shannon & Wilson	Principal-in-charge	Christopher Darrah	(907) 458-3143
	Statewide Project Manager	Kristen Freiburger	(907) 458-3146
	Project Manager	TBD	TBD
Eurofins Environment Testing	PFAS analytical laboratory services	David Alltucker	(916) 374-4383

POC = point of contact

## 2.6 Project Schedule and Submittals

Section 2.5 of GWP provides general information regarding project schedules (i.e. the general order of occurrence of site characterization activities) and associated submittals.

Once DEC approval is received for the proposed scope of services outlined in this Addendum, Shannon & Wilson will coordinate with DOT&PF staff to collect samples from water supply sources at and near the BRW. Field activities are anticipated to occur during January and February 2023. Laboratory analysis will be requested on a standard 15-business-day turn-around time. After field work is complete, we will prepare a summary of analytical data including a data table and results map. Results letters will be drafted and mailed to property owners and residents via the U.S Postal Service or email, whichever is preferred.

The following is the anticipated schedule:

- DEC comments addressed; approval received – January 2023
- Mail Initial Letter to properties near BRW – January 2023

- Field activities – February 2023
- Summary of analytical data reported to DOT&PF and DEC- within two business days of receiving analytical laboratory report.
- Analytical data table and map reported to DOT&PF and DEC- within three business days of receiving analytical laboratory report.
- Water supply user notification of results- following DEC delivery of results

Seasonal factors, including depth to groundwater and freezing conditions, may impact Shannon & Wilson’s ability to perform the field effort outlined in this document.

## 3 WATER SUPPLY SAMPLING ACTIVITIES

The following sections describe the water supply sampling activities to be conducted at and near the BRW. Sampling procedures and analytical methods are described in Section 4. A Quality Assurance Program Plan (QAPP) is included in Section 5. A Site Safety and Health Plan is provided as Appendix B. Proposed well search and sampling area is presented in Figure 2.

### 3.1 Water Supply Search and Sampling

Groundwater characterization activities for this project include sample collection from water supply locations as described in the following sections. General information regarding our water supply well activities are described in Section 3.1 of the GWP. Field personnel will document field activities with field notes and photographs as well as applicable field forms (Appendix B of GWP), as detailed in Section 5.2.

Prior to mobilization to Utqiagvik, Shannon & Wilson will review available utility-connection and property ownership records for information on water sources in Utqiagvik, where information is available. Following records review, Shannon & Wilson will conduct a water supply well search near the BRW using the following methods.

A survey will be mailed to the locations within the search area (Figure 2) to notify them of our intent to collect groundwater samples in the area, where possible. We understand that water used in homes in Utqiagvik is generally supplied by BUECI. We also understand the potential for brackish water to be encountered in the subsurface. Our letter will serve to determine if groundwater wells exists either as a primary or secondary water source for the location. This letter/survey will be approved by DOT&PF and the public relations team prior to being mailed.

The Utqiagvik well search is depicted on Figure 2 and includes airport property and neighboring properties. Where possible, we will collect groundwater samples from locations in the search area. If results of these analyses indicate detections of PFAS in groundwater wells at the edges of the search area, we will expand the well search in subsequent visits to Utqiagvik to define the approximate extent of PFAS in groundwater wells. We note, the Department of Natural Resources Well Log Tracking System, accessed on January 9, 2023, did not identify groundwater wells near the BRW.

During our visit to Utqiagvik, we will visit homes, businesses, and other structures that have indicated there is a groundwater wells to confirm the building's water supply with the occupants or property owners. Shannon & Wilson will collect water samples from any wells that we are notified of after receiving permission from the property owner. We will complete a well survey with owners or occupants to record information regarding well use, and well details such as depth and diameter. Due to arctic conditions and prevalence of shallow, saline groundwater, we do not anticipate many water supply wells in use near the BRW.

Where a well is discovered that is not connected to plumbing, a sample will be collected using a battery-operated peristaltic pump and new, PFAS-free silicone tubing. Samples will be collected following stabilization of parameters (pH, temperature, conductivity, dissolved oxygen (DO), and redox potential). Groundwater parameters will be measured with a multiprobe water quality meter (YSI model 600XL or equivalent) to determine when sampling can begin. Parameters and stabilization criteria will be documented on a Monitoring Well Sampling Log (Appendix B of the GWP).

If responses to the survey are not received, we will assume groundwater wells are not being used for household/drinking water use. We will coordinate with DOT&PF and DEC to determine if mobilization to the site is necessary.

## 4 SAMPLING AND ANALYSIS PLAN

This section describes the analytical sampling approach for investigating contamination associated with the BRW. A DEC-qualified sampler will collect and handle the samples for projects covered under this GWP and collect required quality control (QC) samples in accordance with DEC's *Field Sampling Guidance*. A general Sampling and Analysis Plan is included as Section 4 of the GWP. Sample containers, preservation methods, and holding times are included in Section 4.4. Sample custody, storage, and transport will be followed as

described in Section 4.5. Investigative-derived waste management is described in Section 4.7.

## 4.1 Analytical Sample Summary

An analytical sample summary is detailed in Exhibit 4-1 below. The number of groundwater samples is estimated based on the number of structures identified using Google Earth. We assume the public water utility is the prevalent water supply in Utqiagvik, and approximately one percent of structures identified in the well search area may have a primary or secondary well that we could sample.

**Exhibit 4-1: Analytical Sample Summary**

	Matrix	PFAS (DoD QSM 5.3 Table B-15 PFAS)
Number of Samples	Groundwater	4 + 1 QC

Notes:

DoD = Department of Defense, PFAS = per- and polyfluoroalkyl substances, QC= quality control sample, QSM = Quality Systems Manual

## 4.2 Special Considerations for PFAS Sampling

Special considerations for PFAS sampling are outlined in Section 4.10 of the GWP.

## 4.3 Analytical Laboratories and Methods

Groundwater and surface water samples will be submitted to Eurofins Environmental Testing in West Sacramento, California for the analysis of 18 PFAS by EPA 537 compliant method documented in the Department of Defense (DoD) Quality Systems Manual (QSM) 5.3, Table B-15.

## 4.4 Sample Containers, Preservation, and Holding Times

General information regarding sample containers, preservation, and holding times is described in Section 4.12 of the GWP. This information is provided in Exhibit 4-2, below, for the analytical methods employed for this project.



**Exhibit 4-2: Sample Containers, Preservation, and Holding Time Requirements**

Analyte	Method	Media	Container and Sample Volume	Preservation	Holding Time
PFAS	DOD QSM 5.3 Table B-15	Water	2 X 250 mL HDPE	0 °C to 6 °C	14 days to extraction, analyzed within 40 days of extraction

NOTES:  
 PFAS = per- and polyfluoroalkyl substances,

#### 4.5 Sample Custody, Storage, and Transport

Sample custody, storage, and transport procedures are described in Section 4.13 of the GWP.

#### 4.6 Equipment Decontamination

Equipment decontamination procedures are described in Section 4.14 of the GWP. We note that disposable sampling equipment is typically used to collect water supply samples and equipment decontamination is not likely to be needed for this project.

#### 4.7 Investigative Derived Waste Management

Investigative Derived Waste (IDW) will generally consist of purge water generated during water supply sampling. Purge water will be disposed of to the ground surface or using the septic disposal method utilized at the property. Where a submersible pump is used to collect a sample from a well not connected to indoor plumbing, purge water will be filtered using granular activated carbon (GAC) prior to disposal to ground surface. Other IDW will primarily consist of disposable sampling equipment (nitrile gloves, transfer cups, tubing, etc.) and will be disposed at the nearest landfill.

#### 4.8 Deviations from the General Work Plan

Shannon & Wilson will perform the scope of work described in this work plan in general accordance with the GWP. There are no planned deviations at this time.

### 5 QUALITY ASSURANCE PROJECT PLAN

The QAPP is intended to guide activities during assessment and review of resulting data. Shannon & Wilson will be responsible for conducting data reduction, evaluation, and reporting under this QAPP. A general QAPP is provided as Section 5 of the GWP. Additionally, a Data-Validation Program Plan (DVPP) which describes the procedures for

qualifying analytical data in a consistent manner, has been prepared, and is included as Appendix C in the GWP. We note, an updated DVPP was provided to DEC in June 2022. The following sections describe specific procedures to be followed during sampling at the BRW, so sampling and documentation are effective, laboratory data are usable, and the information acquired is of high quality and reliable.

## 5.1 Quality Assurance Objectives

Data quality objectives are detailed in Section 5.1 of the GWP. Numeric QA objectives for this project are presented in Exhibit 5-1 below.

**Exhibit 5-1: Quality Assurance Objectives for Analytical Samples**

Analyte	Method	Matrix	Precision	Accuracy	Completeness
PFAS	DOD QSM 5.3 Table B-15	Water	±30%	(analyte dependent)	85%

NOTES:

PFAS = per- and polyfluoroalkyl substances,

## 5.2 Field Documentation

Field documentation is described in Section 5.2 of the GWP. Field forms to be used for this project are included in Appendix B of GWP.

## 5.3 Field Instrument Calibration

Field instrument calibration is discussed in Section 5.3 of the GWP.

## 5.4 Field Quality Control Samples

The field quality assurance (QA)/QC program for this project includes the collection of the following QA/QC samples as described below.

### 5.4.1 Field Duplicate Sample

Field duplicate sample collection procedures are described in Section 5.4.1 of the GWP.

### 5.4.2 Equipment Blank Samples

Equipment blank sample collection procedures are described in Section 5.4.4 of the GWP. We note it is unlikely equipment blanks will be needed for water supply or surface water sampling.

### 5.4.3 Temperature Blank Samples

Temperature blanks are described in Section 5.4.6 of the GWP.

### 5.5 Laboratory Quality Control Samples

Laboratory quality control samples are described in Section 5.5 of the GWP.

### 5.6 Laboratory Data Deliverables

Laboratory data deliverables are described in Section 5.6 of the GWP.

### 5.7 Data Reduction, Evaluation, and Reporting

Data reduction, evaluation, and reporting are discussed in Section 5.7 of the GWP.

## 6 REFERENCES

- Alaska Department of Environmental Conservation (DEC), 2019a, 18 Alaska Administrative Code (AAC) 75, Oil and Other Hazardous Substances Pollution Control: Juneau, Alaska, AAC Title 18, Chapter 75, January available: <http://dec.alaska.gov/commish/regulations/>.
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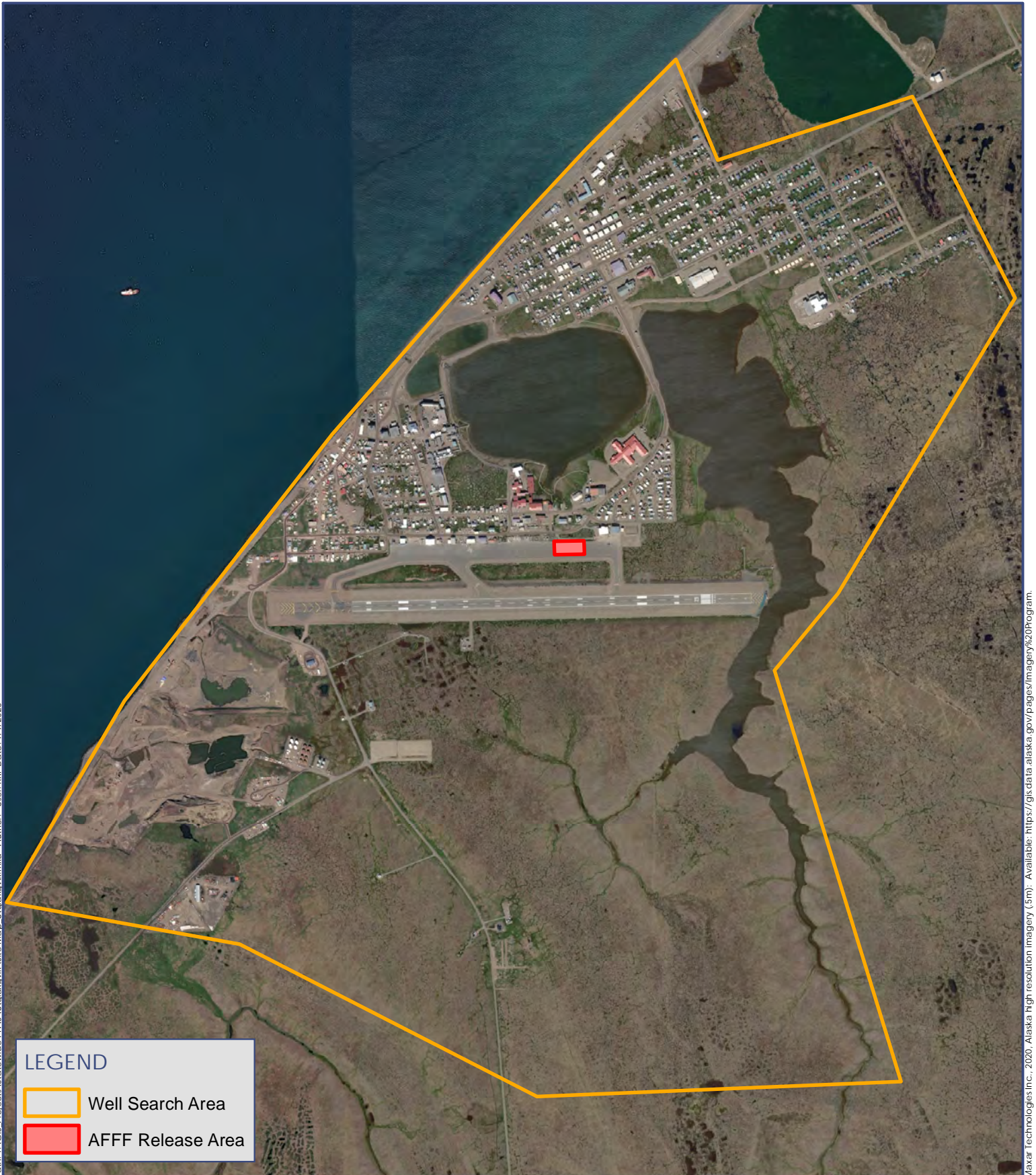


Path: I:\GIS\Projects\Statewide PFAS\Utqiakgvik\Vicinity Map\_Utqiakgvik.mxd Author: User: TXG Date: 9/15/2022

Maxar Technologies Inc., 2020, Alaska high resolution imagery (5m). Available: <https://ghs.data.alaska.gov/pages/imagery%20Program>.



January 2023  
VICINITY MAP  
Figure 1



Path: I:\GIS\Projects\Statewide PFAS\Utgiaikgvik\Site Map\_Utgiaikgvik.mxd Author: User: KRF Date: 1/9/2023

Maxar Technologies Inc., 2020, Alaska High resolution Imagery (5m). Available: <https://gls.data.alaska.gov/pages/imagery%20Program>.



January 2023  
**SITE MAP**  
Figure 2

Appendix A

# Conceptual Site Model

Scoping and Graphics Forms

## CONTENTS

- Human Health Conceptual Site Model Scoping Form and Standardized Graphic
- Human Health Conceptual Site Model Graphic Form

# Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

**Site Name:**

**File Number:**

**Completed by:**

### Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

*General Instructions: Follow the italicized instructions in each section below.*

### 1. General Information:

**Sources** *(check potential sources at the site)*

- USTs
- ASTs
- Dispensers/fuel loading racks
- Drums
- Vehicles
- Landfills
- Transformers
- Other:

**Release Mechanisms** *(check potential release mechanisms at the site)*

- Spills
- Leaks
- Direct discharge
- Burning
- Other:

**Impacted Media** *(check potentially-impacted media at the site)*

- Surface soil (0-2 feet bgs\*)
- Subsurface soil (>2 feet bgs)
- Air
- Sediment
- Groundwater
- Surface water
- Biota
- Other:

**Receptors** *(check receptors that could be affected by contamination at the site)*

- Residents (adult or child)
- Commercial or industrial worker
- Construction worker
- Subsistence harvester (i.e. gathers wild foods)
- Subsistence consumer (i.e. eats wild foods)
- Site visitor
- Trespasser
- Recreational user
- Farmer
- Other:

\* bgs - below ground surface



**2. Exposure Pathways:** *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) Direct Contact -

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

*If the box is checked, label this pathway complete:*

Complete

Comments:

AFFF releases to the ground surface could cause soil contamination.

2. Dermal Absorption of Contaminants from Soil

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Can the soil contaminants permeate the skin (see Appendix B in the guidance document)?

*If both boxes are checked, label this pathway complete:*

Complete

Comments:

No surface soil samples have been collected at the BRW. However, AFFF releases to the ground surface could cause soil contamination.

According to the Alaska Department of Health and Social Services, PFOS and PFOA are not appreciably

b) Ingestion -

1. Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, or are contaminants expected to migrate to groundwater in the future?

Could the potentially affected groundwater be used as a current or future drinking water source? Please note, only leave the box unchecked if DEC has determined the groundwater is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350.

*If both boxes are checked, label this pathway complete:*

Complete

Comments:

We note it is unlikely that groundwater is used as a drinking water source in Utqiagvik; however, the potential exists and we consider the pathway complete.

## 2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

*If both boxes are checked, label this pathway complete:*

Complete

Comments:

PFAS have been detected in surface water samples collected from a reservoir used as a drinking water source in Utqiagvik.

## 3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods?

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

*If all of the boxes are checked, label this pathway complete:*

Complete

Comments:

### c) Inhalation-

#### 1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

*If both boxes are checked, label this pathway complete:*

Incomplete

Comments:

PFAS are not included in Appendix D. If volatile organic compounds are reported during site characterization activities, this section will be updated with the new information.

## 2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminated soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

*If both boxes are checked, label this pathway complete:*

Incomplete

Comments:

**3. Additional Exposure Pathways:** *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

**Dermal Exposure to Contaminants in Groundwater and Surface Water**

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

*Check the box if further evaluation of this pathway is needed:*

Comments:

**Inhalation of Volatile Compounds in Tap Water**

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

*Check the box if further evaluation of this pathway is needed:*

Comments:

## Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter - PM<sub>10</sub>). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

*Check the box if further evaluation of this pathway is needed:*



Comments:

AFFF was likely released to the ground surface that may be dusty in the summertime.

## Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

*Check the box if further evaluation of this pathway is needed:*



Comments:

To our knowledge, no sediment samples have been collected at the BRW. Due to the potential for residents to access potentially contaminated surface water bodies, this has been marked as a pathway in need of further evaluation.

**4. Other Comments** *(Provide other comments as necessary to support the information provided in this form.)*

This initial CSM will be revised following the receipt of analytical data.

# HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: ADOT&PF Utqiagvik Airport - Statewide PFAS

Completed By: Shannon & Wilson, Inc.

Date Completed: January 2023

**Instructions:** Follow the numbered directions below. Do not consider contaminant concentrations or engineering/land use controls when describing pathways.

(1) Media	(2) Transport Mechanisms
<input checked="" type="checkbox"/> Surface Soil (0-2 ft bgs)	<input checked="" type="checkbox"/> Direct release to surface soil <i>check soil</i> <input checked="" type="checkbox"/> Migration to subsurface <i>check soil</i> <input checked="" type="checkbox"/> Migration to groundwater <i>check groundwater</i> <input checked="" type="checkbox"/> Volatilization <i>check air</i> <input checked="" type="checkbox"/> Runoff or erosion <i>check surface water</i> <input checked="" type="checkbox"/> Uptake by plants or animals <i>check biota</i> <input type="checkbox"/> Other (list): _____
<input checked="" type="checkbox"/> Subsurface Soil (2-15 ft bgs)	<input checked="" type="checkbox"/> Direct release to subsurface soil <i>check soil</i> <input checked="" type="checkbox"/> Migration to groundwater <i>check groundwater</i> <input type="checkbox"/> Volatilization <i>check air</i> <input checked="" type="checkbox"/> Uptake by plants or animals <i>check biota</i> <input type="checkbox"/> Other (list): _____
<input checked="" type="checkbox"/> Ground-water	<input checked="" type="checkbox"/> Direct release to groundwater <i>check groundwater</i> <input type="checkbox"/> Volatilization <i>check air</i> <input type="checkbox"/> Flow to surface water body <i>check surface water</i> <input type="checkbox"/> Flow to sediment <i>check sediment</i> <input type="checkbox"/> Uptake by plants or animals <i>check biota</i> <input type="checkbox"/> Other (list): _____
<input checked="" type="checkbox"/> Surface Water	<input checked="" type="checkbox"/> Direct release to surface water <i>check surface water</i> <input type="checkbox"/> Volatilization <i>check air</i> <input checked="" type="checkbox"/> Sedimentation <i>check sediment</i> <input checked="" type="checkbox"/> Uptake by plants or animals <i>check biota</i> <input type="checkbox"/> Other (list): _____
<input checked="" type="checkbox"/> Sediment	<input checked="" type="checkbox"/> Direct release to sediment <i>check sediment</i> <input checked="" type="checkbox"/> Resuspension, runoff, or erosion <i>check surface water</i> <input checked="" type="checkbox"/> Uptake by plants or animals <i>check biota</i> <input type="checkbox"/> Other (list): _____

(3) Exposure Media	(4) Exposure Pathway/Route	(5) Current & Future Receptors						
		Residents (adults or children)	Commercial or Industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
<input checked="" type="checkbox"/> soil	<input checked="" type="checkbox"/> Incidental Soil Ingestion <input checked="" type="checkbox"/> Dermal Absorption of Contaminants from Soil <input checked="" type="checkbox"/> Inhalation of Fugitive Dust	C/F	C/F	C/F	C/F	C/F	C/F	
<input checked="" type="checkbox"/> groundwater	<input checked="" type="checkbox"/> Ingestion of Groundwater <input checked="" type="checkbox"/> Dermal Absorption of Contaminants in Groundwater <input type="checkbox"/> Inhalation of Volatile Compounds in Tap Water	C/F	C/F	C/F	C/F	C/F	C/F	
<input type="checkbox"/> air	<input type="checkbox"/> Inhalation of Outdoor Air <input type="checkbox"/> Inhalation of Indoor Air <input type="checkbox"/> Inhalation of Fugitive Dust							
<input checked="" type="checkbox"/> surface water	<input checked="" type="checkbox"/> Ingestion of Surface Water <input checked="" type="checkbox"/> Dermal Absorption of Contaminants in Surface Water <input type="checkbox"/> Inhalation of Volatile Compounds in Tap Water	C/F	C/F	C/F	C/F	C/F	C/F	
<input checked="" type="checkbox"/> sediment	<input checked="" type="checkbox"/> Direct Contact with Sediment	C/F	C/F	C/F	C/F	C/F	C/F	
<input checked="" type="checkbox"/> biota	<input checked="" type="checkbox"/> Ingestion of Wild or Farmed Foods	C/F	C/F	C/F	C/F	C/F	C/F	

Appendix B

# Site Safety and Health Plan

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## SITE SAFETY AND HEALTH PLAN

Shannon & Wilson prepared this Site Safety and Health Plan (SSHP) for the initial site characterization activities at the Kotzebue Airport (BRW). The purpose of this SSHP is to protect the health and safety of field personnel from physical and chemical hazards associated with work at this site.

The provisions of this plan apply to Shannon & Wilson personnel who will potentially be exposed to safety and/or health hazards during this investigation. Shannon & Wilson employees are covered under its Corporate Safety and Health Program. General safety and health requirements described in that program will be met. Each Shannon & Wilson employee on the site will complete the personal acknowledgement form documenting they have read and understand this SSHP and agree to abide by its requirements. A copy of this SSHP will be kept on-site throughout the duration of sampling operations.

### B.1. SITE HAZARD ANALYSIS

There are two categories of hazards that may occur during the field work: potential chemical exposure hazards and physical hazards associated with site characterization activities. These hazards are discussed below.

#### B.1.1 Chemical-Exposure Hazards

Contaminated soil and water may be encountered during site exploration activities. PFAS are believed to be the primary contaminants of potential concern and may be encountered in soils and water at unknown concentrations.

Shannon & Wilson personnel will implement skin protection when they are to contact potentially contaminated soil or water. Field personnel will wear work gloves or nitrile gloves and Level D personal protective equipment (PPE), as needed. Field personnel will not require respiratory protection based on the current understanding of site conditions and scope of services.

#### B.1.2 Physical Hazards

Primary physical hazards associated with site characterization activities include temperature stress; lifting, slipping, tripping, falling; risks associated with working near bodies of water and/or frozen water bodies; and risk of eye injuries. In addition, wildlife may be a hazard in Kotzebue. The best means of protection against accidents related to

physical hazards are careful control of equipment and activities in the planned work area and use of experienced and safety-trained field personnel.

Field personnel will not enter confined spaces for site characterization activities, nor will they enter trenches or excavations greater than four feet in depth.

#### B.1.2.1 Temperature Stress

Wearing PPE may put a worker at risk of developing heat stress; however, since the field activities will be conducted in general work clothing or Level D PPE and during the colder months, the risk of heat stress is considered low. Cold stress or injury due to hypothermia will be guarded against by wearing appropriate clothing, having warm shelter available, scheduling rest periods, adequate hydration, and self-monitoring physical and mental conditions.

#### B.1.2.2 Lifting Hazards

Moving coolers of water samples or other heavy objects presents a lifting hazard. Personnel will use proper lifting techniques and obtain assistance when lifting objects weighing more than 40 pounds.

#### B.1.2.3 Slips, Trips, and Falls

The most common hazards on a job site are typically slips, trips, and falls. These hazards will be reduced through the following practices:

- Personnel will stay alert.
- All access-ways will be kept free of materials, supplies, and obstructions.
- Tools and other materials will be located so as not to cause tripping or other hazards.
- Personnel should be aware of potential tripping hazards associated with vegetation, debris, and uneven ground.
- Personnel should be aware of limitations imposed by work clothing and PPE.

The project site may be inherently hazardous due to the potential presence of rain, snow, and ice, which can alter the character of the ground surface. The risk for slips, trips, and falls by site workers is increased due to wet or icy surfaces; therefore, workers will use caution when walking at the site.

#### B.1.2.4 Insects and Animals

During the summer months in Alaska, mosquitoes and other insects are common in areas predominantly covered with vegetation. Wearing PPE should be sufficient to protect site workers. Animals such as moose and bears are also commonly seen in Alaska. If a large animal approaches the site, workers should keep their distance or seek shelter in their vehicles.

#### B.1.2.5 Congested Areas

The site investigation may at times require field personnel to work adjacent to or in roadways. Field personnel will observe the speed and frequency of traffic proximal to the work site. Appropriate cones, barricades, or signs to secure the work area will be used when required.

#### B.1.3 Bodies of Water

Surface water samples will be collected from shallow, shoreline areas. Field staff will avoid wading into a body of water. Collection of surface water samples may require field personnel to collect water samples through ice. Field personnel will not walk on ice that is of unknown thickness. During collection of a surface water sample through ice, a second person will be present and remain on the banks to alert emergency services in the event of an accident.

#### B.1.4 Other Hazards

Biological, ionizing radiation, and other hazards are not expected to be present. However, be aware of the surroundings and maintain safe work practices in accordance with Shannon & Wilson's Corporate Health & Safety Plan.

### B.2. PERSONAL RESPONSIBILITIES, TRAINING, AND MEDICAL SURVEILLANCE

Below is a summary of the assignment of responsibilities, training requirements, and medical surveillance information for Shannon & Wilson personnel.

#### B.2.1 Assignment of Responsibilities

Shannon & Wilson is responsible for understanding and complying with the requirements of this SSHP. Following is a list of responsibilities of all Shannon & Wilson personnel working on the site:

- Review and follow this SSHP.
- Attend and participate in safety meetings.
- Take appropriate action as described in this SSHP regarding accidents, fires, or other emergency situations.
- Take all reasonable precautions to prevent injury to themselves and their fellow workers.
- Perform only those tasks they believe they can do safely, and immediately report any accidents or unsafe conditions to Shannon & Wilson's Project Manager or Office Health and Safety Manager.
- Halt work, by themselves or by others, when they observe an unsafe act or potentially unsafe working condition.
- Report accidents, illnesses, and near-misses to the local contact and to Shannon & Wilson's Fairbanks office Health and Safety Manager.

#### B.2.2 Personal Training

Shannon & Wilson personnel performing activities on this site and under this plan have completed the appropriate training requirements specified in 29 CFR 1910.120(e). Everyone has completed an annual eight-hour refresher-training course and/or initial 40-hour training course within the last year.

A personal acknowledgement form will be completed by field personnel prior to commencing field activities. This acknowledgment form will document that they have read and understand this SSHP.

#### B.2.3 Medical Surveillance Program

All field personnel performing activities on this site covered by this SSHP have undergone baseline and annual physical/medical examinations as part of Shannon & Wilson's Corporate Health and Safety Program. All field personnel are active participants in Shannon & Wilson's Medical Monitoring Program or in a similar program, which complies with 29 CFR 1910.120(f).

### B.3. PERSONAL PROTECTIVE EQUIPMENT

PPE may be required during the field work. PPE selection will be based primarily on work-task requirements and potential exposure. Personnel may wear the following, depending on the area of sampling:

- standard work clothes or cotton overalls;
- reflective, high-visibility safety vest;
- safety-toe boots;
- safety glasses;
- hearing protection;
- gloves; and,
- hard hat.

Disposable nitrile gloves will be worn during any activity that may require dermal contact with potentially contaminated media.

#### B.4. DECONTAMINATION PROCEDURES

Equipment decontamination procedures are necessary for any reusable equipment that touches contaminated water. Decontamination procedures will consist of a rinse with non-phosphate-based detergent, a second rinse with plain tap water, and a final rinse with distilled water. Sampling equipment and PPE that is expendable will be disposed of at the site or in a landfill off-site.

Shannon & Wilson will conduct all site characterization activities in Level D PPE, where necessary. For this reason, personnel will not be decontaminated when leaving the work site unless gross visual contamination of protective clothing is present.

#### B.5. ACCIDENTS AND EMERGENCIES

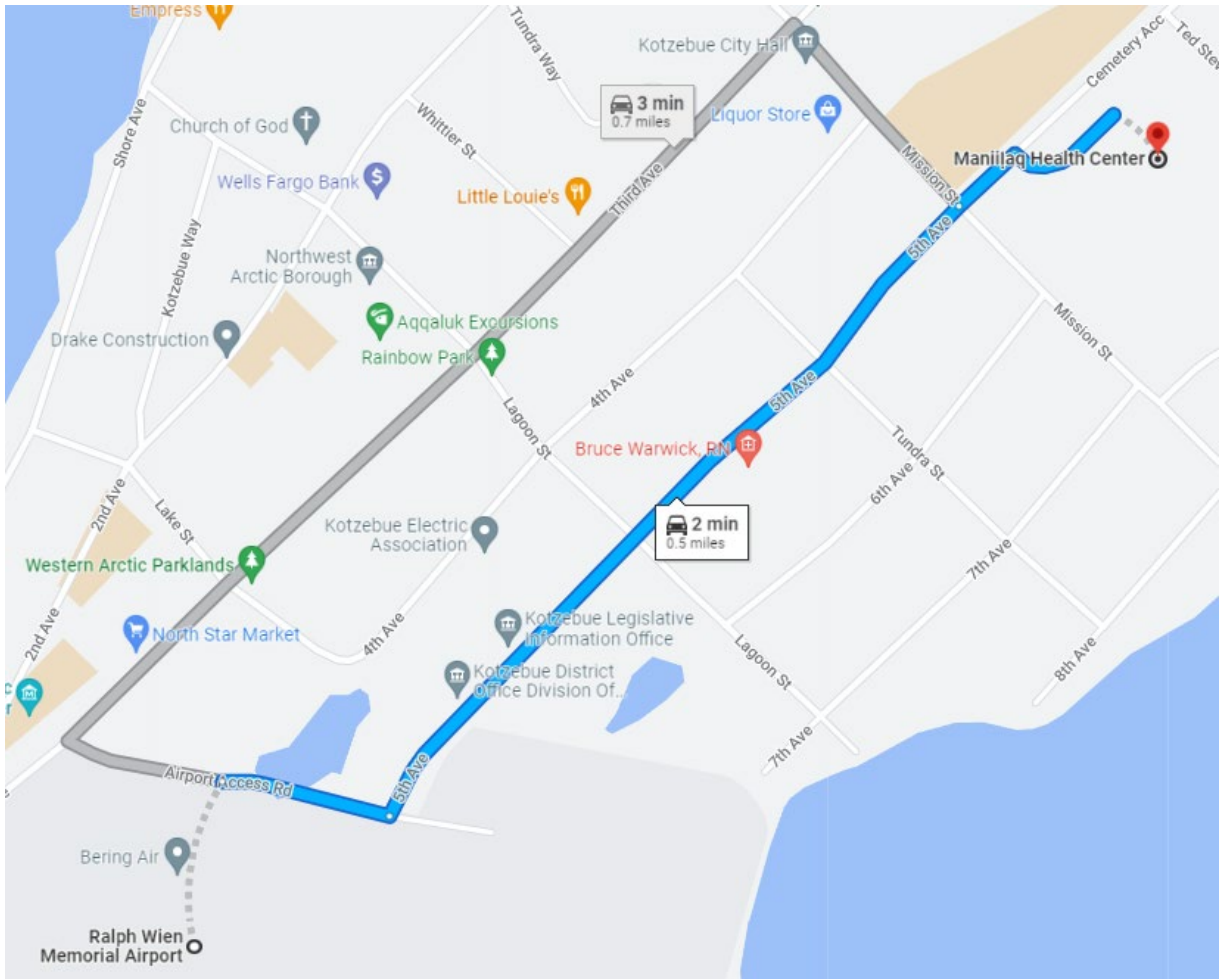
Shannon & Wilson field personnel are current in first aid and cardiopulmonary resuscitation training. At a minimum, the following site safety equipment and first aid supplies shall be available in the field:

- PPE and clothing specialized for known site hazards;
- first aid kit, including first aid booklet;
- portable eye wash;
- clean water in portable containers; and
- other decontamination supplies.

The primary emphasis of any health and safety plan is accident prevention. If an injury or illness occurs during field work, the severity of the problem will dictate the level of

response. Minor injuries or illness will be addressed with basic first aid measures as recommended by a registered nurse through Shannon & Wilson’s corporate Medcor service (1-800-775-5866). More serious injuries will require assistance from the medical staff at the Manilaq Health Center located at 436 5<sup>th</sup> Avenue, in Utqiagvik, Alaska. The telephone number for the Manilaq Health Center is (907) 442-3321. Field phones will be kept easily accessible in the case of an emergency.

**Exhibit B-1: Map Showing Manilaq Health Center**



Shannon & Wilson’s Corporate Health and Safety Program requires accident reporting when there is a site-related accident, near-miss incident, or medical emergency. If an employee is treated by medical personnel, the medical attendant will complete an Incident Medical Treatment Documentation form. Completion of an Alaska Department of Labor Report of Occupational Injury or Illness is also required within 10 days for any work-related injury or illness.

## B.6. GENERAL SITE SAFETY REQUIREMENTS

The following measures are designed to augment the specific health and safety guidelines provided in this plan:

- Field personnel should avoid contact with potentially contaminated surfaces such as: walking through puddles or pools of liquid; kneeling on the ground; or leaning, sitting, or placing equipment on contaminated soil or containers.
- Field personnel will be familiar with procedures for initiating an emergency response.
- Hazard assessment is a continual process; personnel must be aware of their surroundings and any chemical/physical hazards present.
- Personnel in the exclusion area shall be the minimum number necessary to perform work tasks in a safe and efficient manner.
- Equipment contacting potentially contaminated soil or water must be decontaminated or properly discarded before leaving the site.

Field personnel will be familiar with the physical characteristics of the work site including wind direction, site access, and location of communication devices and safety equipment.

## SITE SAFETY AND HEALTH PLAN PERSONAL ACKNOWLEDGEMENT FORM

DOT&PF STATEWIDE GENERAL WORK PLAN  
ADDENDUM 022-BRW-01: UTQIAGVIK INITIAL SITE CHARACTERIZATION

I have reviewed this document and understand its contents and requirements. A copy of the above-referenced document has been made available to me. I agree to abide by the requirements of this Site Safety and Health Plan.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name (printed)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Representing



# Important Information

About Your Geotechnical/Environmental Report

IMPORTANT INFORMATION

## CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

## THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors that were considered in the development of the report have changed.

## SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events and should be consulted to determine if additional tests are necessary.

## MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent

such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

#### A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary, because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

#### THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

#### BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

**READ RESPONSIBILITY CLAUSES CLOSELY.**

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

**The preceding paragraphs are based on information provided by the ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland**