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FINAL

GENERAL WORK PLAN ADDENDUM
DOT&PF Statewide PFAS
Addendum 019-SNP-01 St. Paul
Island Airport WSW Search
ST. PAUL ISLAND, ALASKA

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Submitted To: Alaska Department of Transportation & Public Facilities
2301 Peger Road
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Subject: FINAL GENERAL WORK PLAN ADDENDUM, DOT&PF STATEWIDE PFAS
ADDENDUM 019-SNP-01 ST. PAUL ISLAND AIRPORT WSW SEARCH, ST.
PAUL ISLAND, 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, 019-SNP-01, describes the DOT&PF planned activities for water supply well (WSW) search and sampling associated with per- and polyfluorinated substances (PFAS) for the St. Paul Island Airport (SNP).

The scope of services was specified in the 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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Important Information

ACRONYMS

AAC	Alaska Administrative Code
AFFF	aqueous film forming foam
ARFF	Airport Rescue and Firefighting
COPC	contaminant of potential concern
CSD	contaminated sites database
CSM	Conceptual Site Model
DEC	Alaska Department of Environmental Conservation
DOT&PF	Alaska Department of Transportation & Public Facilities
DVPP	Data-Validation Program Plan
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
GWP	General Work Plan
IDW	investigative-derived waste
LHA	lifetime health advisory
ng/L	nanograms per liter
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
POC	point of contact
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RL	reporting limit
SNP	St. Paul Airport
SSHP	Site Safety and Health Plan
USGS	U.S. Geological Survey
WSW	water supply well

1 INTRODUCTION

This Addendum, 019-SNP-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 well (WSW) search and sampling event for per- and polyfluoroalkyl substances (PFAS) near and at the St. Paul Island Airport (SNP) on St. Paul Island, 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) March 2017 *Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites*, and 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 SNP is a state-owned airport managed by the Alaska Department of Transportation & Public Facilities (DOT&PF). Additional information regarding the SNP is listed in Exhibit 1-1 below.

Exhibit 1-1: Airport Information

Airport Name:	Ralph Wien Memorial Airport
Airport Code:	SNP
DEC File No. / Hazard ID:	No PFAS-related file listing or Hazard ID
Airport Address:	Jeff Trail, St. Paul Island, Alaska
DOT&PF Region:	Southcoast Region
DOT&PF Regional POC:	Spencer Gates
DOT&PF PFAS POC:	Sammy Cummings
Airport Type:	Current Part 139 Airport
Airport Coordinates (Lat/Long):	57.1576, -170.2300

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 SNP 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.

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 (PFBS), 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.

Areas of known and potential use of AFFF at the SNP are shown on Figure 2. The quantity and timing of AFFF releases are unknown.

1.1.1 Previous Investigations

The following sections summarize previous environmental investigations and cleanup actions performed at the SNP that may be of interest to understand PFAS contamination at the site. Additional environmental investigations are reported in the DEC Contaminated Sites database (CSD) for the SNP; 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 SNP. To Shannon & Wilson’s knowledge, PFAS soil, groundwater, surface water, or sediment samples have not been collected from St. Paul Island for the analysis of PFAS.

1.1.1.1 DOT&PF St. Paul Airport

The summary report and comments on the CSD site report indicate that petroleum contamination was identified at a DOT&PF lease property. Contaminated soils were

excavated and stockpiled onsite. Excavated soils were later approved for reuse as fill material in areas not environmentally sensitive. It is unknown where excavated soil was reused, or if it contained PFAS.

1.1.1.2 St. Paul Airport TDX Poss Camp

The CSD summary report indicates that in 2014, a diesel tank overflowed spilling fuel to the ground surface. Contaminated soil was excavated, and land farmed. As of 2021, petroleum odors were still present in the soils excavated from the site. To our knowledge, soil samples collected from the stockpile have not been analyzed for PFAS. It is unknown where the soil has been stockpiled or if it contains PFAS.

1.1.1.3 SNP Aviation Accident Reports

One crash report for a 1983 aircraft accident at the SNP is available in the National Transportation Safety Board Aviation Accident Database. The report indicates the crash did not involve an aircraft fire; in our opinion it is unlikely AFFF was used during this incident.

1.1.2 Climate

The climate of St. Paul Island is maritime, with prevalent cloudy and foggy weather. Annual precipitation averages approximately 24 inches (USGS, 1980).

1.1.3 Vegetation

St. Paul Island is treeless. The dominant vegetation consists of grasses (USGS, 1980)

1.1.4 Geology and Soils

The SNP is located on St. Paul Island, a volcanic island in the Bering Sea. The U.S. Geological Survey (USGS) conducted a survey of water resources near the City of St. Paul in 1980, the resulting report, *Water-Resources Reconnaissance of the Southeastern Part of St. Paul Island*, noted the island is primarily composed of basaltic lava flows and sills, as well as ejecta from fissures. The report indicates the volcanic material appears to be highly permeable. The eastern section of St. Paul Island contains large sections of sand and volcanic scoria (USGS, 1980).

1.1.5 Hydrology

Hydrologic conditions include rapid infiltration of precipitation, and consequent movement of groundwater to the ocean by subsurface flow. USGS identified several freshwater lakes but did not identify established surface water drainage in their survey area (USGS, 1980).

1.2 Project Objectives and Scope

The project objectives are to evaluate the potential for human exposure to PFAS in WSWs at and near the SNP and understand the approximate extent of PFAS contamination resulting from the historic use of AFFF by the DOT&PF at the SNP, if any.

The scope for this initial well search and sampling effort includes:

- conducting a WSW search to evaluate drinking water sources at and downgradient of the SNP;
- sampling identified WSWs or water sources for PFAS, where permitted;
- investigating potential AFFF release sites at the SNP through interviews with airport personnel; and
- sampling up to seven groundwater wells used as drinking water sources for the City of St. Paul water system.

According to the City of St. Paul's 2014 Annual Water Quality Report, the primary source of drinking water on St. Paul Island is groundwater wells. The water utility obtains water from seven wells on a rotating basis. The wells extend to approximately four feet below sea level, approximately 30 to 100 feet below ground surface. Groundwater flow direction in St. Paul is noted to be south and west. The source wells are located to the southwest of the SNP; the nearest WSW is approximately one mile from the airport boundary according to the DEC Drinking Water website. We have depicted their locations on Figure 2. Out of an abundance of caution, we are recommending these wells be sampled for PFAS during our WSW search.

2 SITE AND PROJECT DESCRIPTION

The following sections provide a site and project description. The SNP is located on the southeast coast of St. Paul Island, the largest island in the Pribilof Islands, a group of volcanic islands in the Bering Sea.

2.1 Site Location and Boundaries

The SNP is located off Jeep Trail in St. Paul, Alaska. Multiple lakes are located to the south and east of the SNP. The airport consists of a single, asphalt runway that is 6,500 feet long by 150 feet wide. The geographic coordinates of the SNP terminal are latitude 57.1576, longitude -170.2300.

2.2 Potential Sources of Contamination

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

- two areas identified by DOT&PF as AFFF release sites (Figure 2);
- FAA required AFFF systems testing areas at various, unidentified locations along SNP runway; and
- AFFF storage areas at the SNP.

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* 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* and the 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 ^a (ng/L)	DEC Drinking Water Action Level (ng/L)	Laboratory RLs ^b (ng/L)
DoD QSM	PFOS	400	70	2.0
Table B-15 ^c	PFOA	400		2.0

Notes:

- a. 18 AAC 75 Table C. *Groundwater Cleanup Levels*
- b. Current RLs from Eurofins TestAmerica, Inc. 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= Alaska 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 Model

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. The 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 SNP. 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., WSWs) 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 investigations are needed following the initial WSW 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	Spencer Gates	(907) 465-4655
	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/ TestAmerica, Inc.	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 of groundwater from WSWs at and near the SNP. Field activities are anticipated to occur during winter 2022/2023.

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 – November 2022
- Work Plan Implementation (field activities) – December 2022
- Analytical summary of data reported to DOT&PF and DEC – within two business days of data receipt
- Analytical data table and map reported to DOT&PF and DEC – within three business days of data receipt
- WSW owner/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. We will inform DOT&PF regarding any scheduling changes.

3 FIELD ACTIVITIES

The following sections describe the WSW sampling activities to be conducted at and near the SNP. Sampling procedures and analytical methods are described in Section 4. A Quality Assurance Program Plan (QAPP) is included in Section 5 of this Addendum, and references pertinent sections of the GWP. Proposed well search and sampling areas are presented in Figure 2.

3.1 Water Supply Well Search and Sampling

Groundwater characterization activities for this project include groundwater sample collection from WSWs as described in the following sections. General information regarding WSW activities is 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 St. Paul, Shannon & Wilson will review utility-connection and property ownership records for information on water sources in St. Paul, where available. Following records review, Shannon & Wilson will conduct a WSW search near the SNP using the following methods.

A survey will be mailed to the locations within the well search areas to notify residents and property owners of our intent to collect groundwater samples in the area, where possible. We understand that groundwater is the primary source of drinking water in St. Paul, as well as the source for the City of St. Paul public water system. Our letter will serve to determine if groundwater wells exist either as a primary or secondary water source for structures within the search area (Figure 2). The letter/survey will be approved by DOT&PF and the public relations team prior to being mailed.

Where possible, we will collect groundwater samples from structures within the search area. If results of these analyses indicate detections of PFAS in groundwater wells, we will coordinate with DOT&PF and DEC to expand the well search in subsequent visits to St. Paul to define the approximate extent of PFAS in WSWs.

During our visit to St. Paul Island, we will visit homes, businesses, and other structures within the search area to confirm the building's water supply with the occupants and/or property owners. Shannon & Wilson will collect groundwater samples from wells that we are notified of after receiving permission from the property owner. We will complete a well survey with owners and/or occupants to record information regarding well use, and well details such as depth and diameter.

Where a well is discovered that is not connected to the structure's plumbing, a sample will be collected using a battery-operated 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).

4 SAMPLING AND ANALYSIS PLAN

This section describes the analytical sampling approach for investigating PFAS contamination associated with the SNP. 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 in Area 1 using Google Earth, and including the seven municipal water wells. We assume the public water utility is the prevalent water supply in St. Paul, and approximately ten percent of structures identified may have a primary or secondary well.

Exhibit 4-1: Analytical Sample Summary

Number of Samples	Matrix	PFAS (DOD QSM Table B-15 PFAS)
	Groundwater	10 + 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 Sacramento, California for the analysis of 18 PFAS by EPA 537 compliant method DoD QSM Table B-15 Method.

4.4 Sample Containers, Preservation, and Holding Times

General information regarding sample containers, preservation, and holding times 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 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:

°C = degrees Celsius; DoD= Department of Defense; HDPE = high-density polyethylene; PFAS = per- and polyfluoroalkyl substances, QC= quality control sample; QSM= quality systems manual

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 WSW 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 consider of purge water generated during WSW sampling. Purge water will be filtered using a granulated activated carbon filter and then disposed of to the ground surface or using the septic disposal method utilized at the property (e.g., septic system). 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

No deviations from the GWP are anticipated at this time. Deviations from the GWP and/or this Addendum will be detailed in the summary report.

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 OTZ, 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 Samples¹

Analyte	Method	Matrix	Precision	Accuracy	Completeness
PFAS	DoD QSM Table B-15 ¹	Water	±30%	(analyte dependent)	85%

NOTES:

DoD= Department of Defense; PFAS = per- and polyfluoroalkyl substances, QSM= quality systems manual

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 WSW 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/>.
- Alaska Department of Environmental Conservation (DEC), 2019b, 18 AAC 75.345, Groundwater Cleanup Levels: Juneau, Alaska, AAC Title 18, Chapter 75, Section 341, January, available: <http://dec.alaska.gov/commish/regulations/>.
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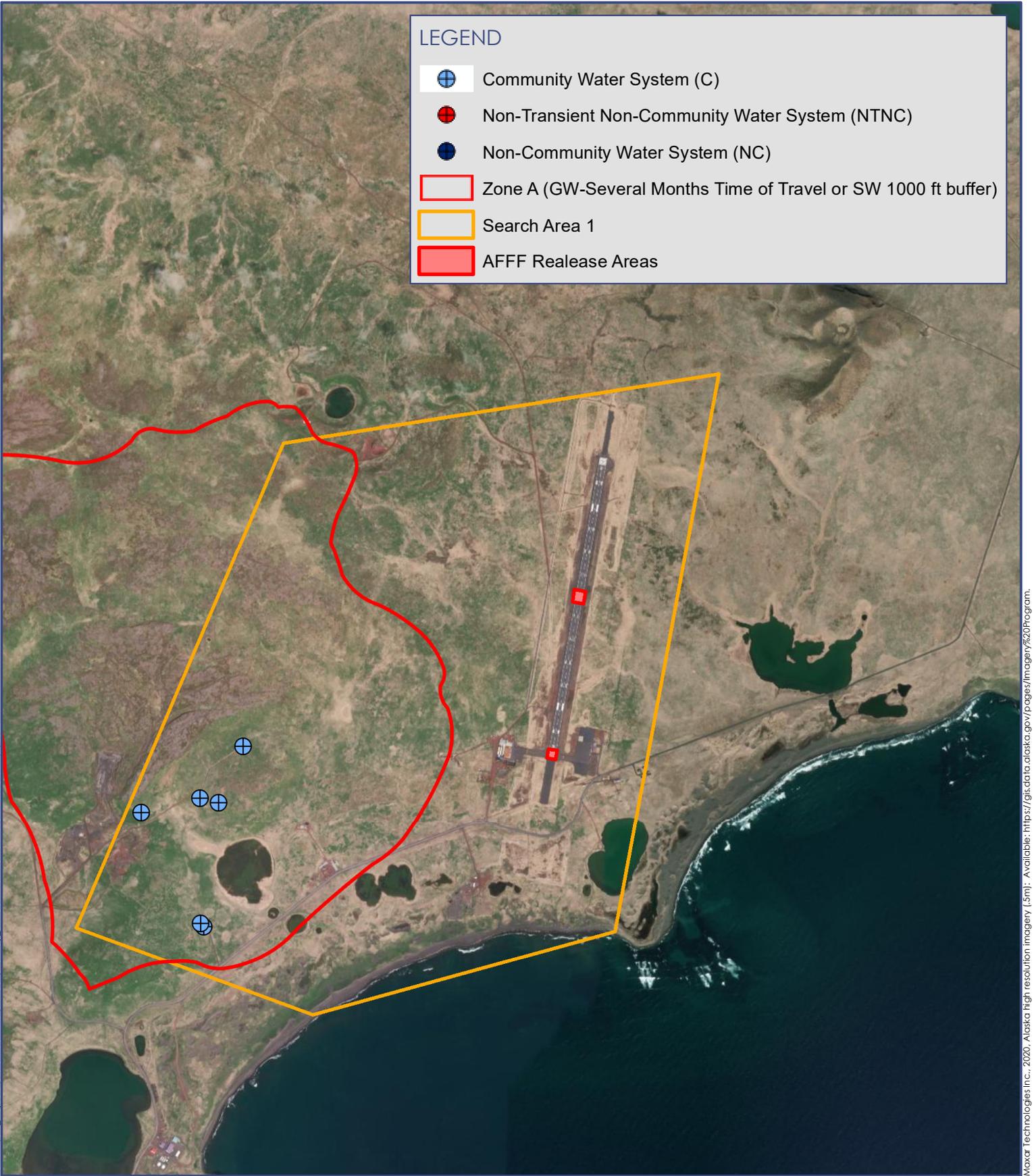


Path: \\A:\GIS\Projects\Statewide PFAS\St. Paul\Vicinity Map_St. Paul.mxd Author: User:TXG Date: 9/15/2022

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



November 2022
VICINITY MAP
Figure 1



Notes:

- 1. AFFF: Aqueous Film Foaming Foam
- 2. Search area is approximate

November 2022

SITE MAP

Figure 2

Path: T:\GIS\Projects\Statewide PFAS\St. Paul\Site Map St. Paul.mxd Author: User:KRF Date: 11/4/2022

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

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:

No surface soil samples have been collected at the SNP. However, 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 SNP. 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:

No water supply well samples have been collected at or downgradient of the SNP. However, PFAS contaminated groundwater is possible.

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:

Incomplete

Comments:

It is unlikely the surface water near SNP would be used as a drinking water source. If our investigative efforts determine this to be false, we will update this CSM.

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:

See comments for 3.c.1.

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:

According to the Alaska Department of Health and Social Services, PFOS and PFOA are not appreciably absorbed through the skin. However, Appendix B of the 2017 Guidance on Developing Conceptual Site Models lists both PFOS and PFOA. We consider dermal exposure to these compounds to be insignificant for the purposes of this CSM.

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:

PFAS are not included in Appendix D.

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 - PM₁₀). 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:

No surface soil samples have been collected at the SNP. However, AFFF was likely released to the ground surface on the lightly graveled runways that can 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:

No sediment samples have been collected at the SNP. 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 Saint Paul Island Airport - Statewide PFAS

Completed By: Amber Masters, Shannon & Wilson, Inc.
 Date Completed: November 2022

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

(1) Check the media that could be directly affected by the release.	(2) For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Check additional media under (1) if the media acts as a secondary source.
Media	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) Check all exposure media identified in (2).	(4) Check all pathways that could be complete. The pathways identified in this column must agree with Sections 2 and 3 of the Human Health CSM Scoping Form.	(5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, "C/F" for both current and future receptors, or "I" for insignificant exposure.						
Exposure Media	Exposure Pathway/Route	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 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							
<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 St. Paul Airport (SNP). 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 as needed, and Level D personal protective equipment. 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; risk of eye injuries. In addition, wildlife may be a hazard in St. Paul. The best means of protection against accidents related to physical hazards are careful control of equipment activities in the planned work area and use of experienced and safety- and health-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 personal protective equipment (PPE) may put a worker at risk of developing heat stress; however, since the field screening activities will be conducted in Level D PPE and during cooler months so 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, although we

note unlikely on St. Paul Island. 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 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 will 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 soil and/or 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. For this reason, personnel will not be decontaminated when leaving the work site unless gross visual contamination of protective clothing is present.

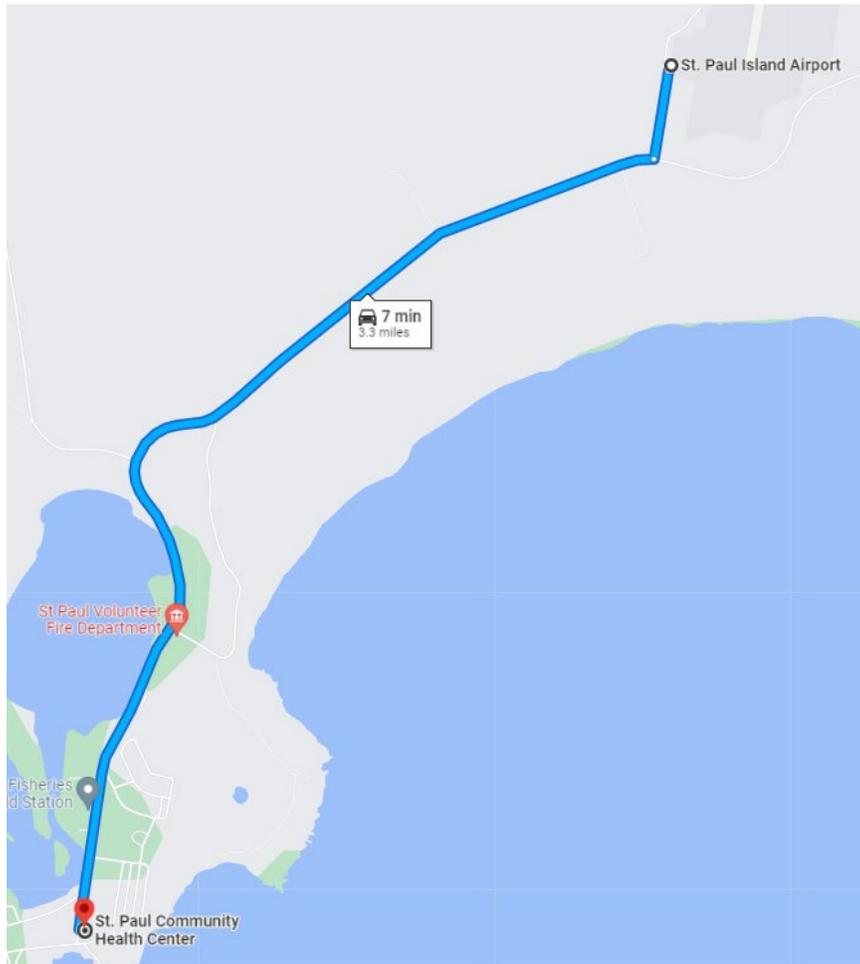
Employees will wash their hands and face with soap and water before eating, drinking, smoking, or applying cosmetics. These activities will be restricted to designated rest area(s).

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 St. Paul Community Health Center located at 1000 Polovina Turnpike, in St. Paul, Alaska. The telephone number for the St. Paul Community Health Center is (907) 546-8300. Field phones will be kept easily accessible in the case of an emergency.

Exhibit B-1: Map Showing St. Paul Community 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.
- The use of contact lenses is prohibited; soft lenses may absorb irritants, and all lenses concentrate irritants.
- 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 019-SNP-01: ST. PAUL WSW SEARCH

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

Important Information

About Your Geotechnical/Environmental Report

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

IMPORTANT INFORMATION