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FINAL

GENERAL WORK PLAN ADDENDUM

DOT&PF Statewide PFAS Addendum 020-MCG-01 Initial Site Characterization

MCGRATH, ALASKA

SHANNON & WILSON

November 2022

Shannon & Wilson No: 102219-015

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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 020-MCG-01
INITIAL SITE CHARACTERIZATION, MCGRATH, ALASKA

Shannon & Wilson has prepared this Work Plan Addendum on behalf of the Alaska Department of Transportation & Public Factifies (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, 014-MCG-01, describes the DOT&PF planned activities for a water supply well (WSW) search and sampling event to evaluate per- and polyfluoroalkyl substances (PFAS) associated with the McGrath Airport (MCG).

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:

Amber Masters
Environmental Scientist

Kristen Freiburger
Associate, Statewide Project Manager

ARM:KRF:CBD/arm

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ACRONYMS

AAC	Alaska Administrative Code
AFFF	aqueous film forming foam
ARFF	Airport Rescue and Firefighting
BLM	U.S. Bureau of Land Management
COPC	contaminant of potential concern
CSD	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
GWP	*DOT&PF Statewide PFAS General Work Plan – Revision 1*
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
MCG	McGrath Airport
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual 5.3
RL	reporting limit
SSHP	Site Safety and Health Plan
UST	underground storage tank
WSW	water supply well

1 INTRODUCTION

This Addendum, 020-MCG-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) at and near the McGrath Airport (MCG) in McGrath, 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* (DEC, 2017) and January 2022 *Field Sampling Guidance* document (DEC, 2022a). 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 MCG is a state-owned airport managed by the Alaska Department of Transportation and Public Facilities (DOT&PF). Additional information regarding the MCG is listed in Exhibit 1-1 below.

Exhibit 1-1: Airport Information

Airport Name:	McGrath Airport
Airport Code:	MCG
DEC File No. / Hazard ID:	No PFAS-related file listing or Hazard ID
Airport Address:	McGrath, Alaska 99627
DOT&PF Region:	Central Region
DOT&PF Regional POC:	Jeremy Thompson
DOT&PF PFAS POC:	Sammy Cummings
Airport Type:	Current Part 139 Airport
Airport Coordinates (Lat/Long):	62.9527, -155.6070

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 MCG 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, 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 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 described in Section 1.1 of the GWP.

Areas of known and potential use of AFFF at the MCG are unknown.

1.1.1 Previous Environmental Investigations

The following sections summarize various environmental investigations that may be of interest to understand PFAS contamination at the site in the future. Additional environmental investigations are reported in the DEC Contaminated Sites database (CSD); however, due to the 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 MCG.

1.1.1.1 DOT&PF - McGrath Airport Retardant Ramp

According to the CSD summary, DOT&PF leases this property to the U.S. Bureau of Land Management (BLM) and it has been subleased to the Alaska Department of Natural Resources, Division of Forestry for fire suppression activities since the 1960s. The site was

investigated in response to a report of a leaking underground storage tank (UST). The investigation revealed extensive soil and groundwater contamination in the area. In a Record of Decision document dated February 12, 2008, the expected future use of the site was a staging area for wildland fire suppression activities. AFFF is not typically used for wildland firefighting; however, we note that the CSD summary does not describe the type or volume of fire suppressants used during fire suppression activities (DEC, 2008).

1.1.1.2 BLM Alaska Fire Service McGrath Airport

The DEC CSD summary indicates 10 fuel tanks were removed from the BLM Alaska Fire Service Wildland Fire Operations Facility at the MCG. The fuel tanks stored fire retardant, aviation fuel, heating oil, and various other materials. Contaminated soil excavated from this site was treated by on-site land spreading.

1.1.1.3 DOT&PF McGrath Airport Maintenance Station

The DEC CSD summary notes that samples collected from the area of two removed USTs indicated petroleum contamination above cleanup levels. During the investigation DEC noted migration to groundwater was likely and mentioned the possibility of groundwater wells near the MCG. The surface water source for the McGrath public water system is approximately one mile from the DOT&PF Maintenance Building.

1.1.1.4 McGrath Hangar - Tanana Air Service

Tanana Air Service is located adjacent to the DOT&PF Maintenance Station. Approximately 126 cubic yards of petroleum contaminated soil were excavated from the site and transported offsite for land spreading.

1.1.1.5 MCG Aviation Accident Reports

Multiple crash reports for aircraft accidents at the MCG 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 conditions in McGrath are continental with some maritime conditions in summer with large diurnal and annual temperature variations. Maximum rainfall occurs in August. Average annual precipitation is approximately 16 inches. Annual snowfall averages approximately 88 inches (USGS, 1994).

1.1.3 Vegetation

Vegetation in and around McGrath is varied including densely forested areas of white spruce, black spruce, tamarack, white birch, poplar, cottonwood, alder, and willow, as well as wetland areas with mosses and shrubs. Alpine tundra conditions with small shrubs, lichen, mosses, and sedges are present on slopes of nearby hills (USGS, 1994).

1.1.4 Geology and Soils

McGrath and the Kuskokwim River floodplain are underlain by Mesozoic sedimentary and metamorphic bedrocks. The McGrath area is also underlain with discontinuous permafrost. Well logs indicate frost or ice layers at as shallow as 3 feet below ground surface (bgs) to approximately 33 feet bgs.

Surficial geology generally consists of fluvial soils. The primary soil type in the south and east sides of the Kuskokwim River are Takotna silt loam which is developed on the flood plain and deposits in well-drained, frequently flooded areas. Peat deposits are present in drained depressions and low-lying areas of the flood plain. These deposits are typically saturated by water perched over permafrost and can be indicative of a permafrost barrier to groundwater infiltration or movement (USGS, 1994).

1.1.5 Hydrology

McGrath is located adjacent to a sharp loop of the Kuskokwim River. The river flows east to west past McGrath. The Kuskokwim is a meandering river, resulting in oxbow lakes and meander scroll topography in the area. Groundwater flow direction is dominated by the interactions with the Kuskokwim River. Groundwater is assumed to flow across the meander loops, generally towards the south; however, local trends can be reversed during rising and falling stages of the river. Floods are a frequent occurrence in the McGrath area (USGS, 1994).

1.2 Project Objectives and Scope

The project objective is to search for and sample WSWs, if any, and interview airport personnel on possible AFFF release sites at the MCG. This Addendum describes methods used to identify PFAS and evaluate the lateral extent of contamination in WSWs on and near the MCG, where such wells exist. Refer to Section 2.3 for contaminants of potential concern (COPCs) and Exhibit 4-1 for proposed samples and analyses.

The scope of this initial WSW search and sampling effort includes:

- conducting a WSW search to confirm if groundwater is the source of drinking water near and downgradient of the MCG;
- sampling identified WSWs for PFAS, where access is provided; and
- if the Kuskokwim River intake for the municipal water system is discovered to be within a distance of the airport that it could reasonably be affected by activities at the airport, as sample will be collected from the water system influent.

The proposed well search areas for the sampling event are presented in Figure 2.

2 SITE AND PROJECT DESCRIPTION

The following sections provide a site and project description.

2.1 Site Location and Boundaries

McGrath is located in interior Alaska, approximately 270 miles southwest of Fairbanks. Traditionally, the location was as a seasonal meeting and trading village for Athabaskan villages. Later, McGrath was a refueling stop for equipment in World War II as a part of the U.S. and Russia Lend-lease program. The MCG is located on a meandering oxbow of the Kuskokwim River. The main asphalt runway 16/34 lies north to south on a loop of land nearly surrounded by the river. The gravel runway 5/23 is located adjacent to a bend in the Kuskokwim River. Runway 16/34 is 5,396 feet long by 100 feet wide; runway 5/23 is 2,000 feet long by 60 feet wide. According to a DEC summary of a contaminated site at the MCG (details provided in Section 1.1.1.1), the main runway was built over an old military dumpsite. The geographic coordinates of the MCG terminal are latitude 62.9527 and longitude -155.6070.

2.2 Potential Sources of PFAS 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 MCG are listed below:

- The wildland fire suppression activities adjacent to the southwest end of runway 16/34. It is unknown if AFFF has been used in this area.
- Previous use of this site as a military dumpsite, and other military activities near the MCG. Available documents do not detail military activities at the MCG or nearby areas. It is possible AFFF or other PFAS-containing materials were used at the former military site and/or disposed of at the former dumpsite.

- Potential leaks or spills from AFFF storage areas such as the DOT&PF maintenance building.
- PFAS-contaminated material that was accepted for reuse following the treatment of the petroleum contamination. It is unknown where this material was reused at the site or if it contained PFAS.

2.3 Contaminants of Potential Concern and Regulatory Levels

General information regarding COPCs and regulatory levels is included in Section 2.2 of the GWP. The primary COPCs for this project are PFAS compounds, 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. However, we note this is outside the scope of this Addendum.

Groundwater 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 of 70 ng/L for the sum of PFOS and PFOA. The current regulatory 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	Regulatory Limit[a] (ng/L)	DEC Drinking Water Action Level (ng/L)	Laboratory RLs[b] (ng/L)
DoD QSM Table B-15[c]	PFOS	400	70	2.00
	PFOA	400		2.00

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.

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. A DEC *Human Health Conceptual Site Model Graphic Form* and a *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.

Very little is known about potential PFAS-affected media at and beneath the MCG. The draft CSM will be revised and presented in the final report following the receipt of analytical data. Potentially affected media include contaminated soil, groundwater, surface water, sediment, and biota. Potential human exposure 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);
- Ingestion of 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 this first round of sampling. 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	Jeremy Thompson	(907) 269-0767
	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 the 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 WSWs at and near the MCG. Field activities are anticipated to occur during December 2022 or January 2023, weather permitting. Laboratory analysis will be requested on a standard 15-business-day turn-around time. Following receipt of the analytical results, we will provide DOT&PF and DEC with a map and table of the results. Results letters will also be prepared and mailed to the sampled WSW owner/user.

The following is the anticipated schedule:

- DEC comments addressed; approval received – Mid-November 2022
- Work Plan Implementation (field activities) – December 2022 or January 2023
- Analytical summary of data reported to DOT&PF and DEC – within 2 business days of data receipt
- Analytical data table and map reported to DOT&PF and DEC – within 3 business days of data receipt
- WSW owner/user notification of results – following delivery of results to DEC

Seasonal factors, including depth MCG 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 WATER SUPPLY WELL SAMPLING ACTIVITIES

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

3.1 Water Supply Well Search

General information regarding WSW search activities is described in Section 3.1 of the GWP.

Available information indicates water is available through the McGrath Water Plant, although groundwater may be a drinking water source near the MCG.

Prior to mobilization to McGrath, Shannon & Wilson will review available utility-connection and property ownership records and contact to local government or other resources to collect information on water sources. If records review indicates potential for water supply wells to be impacted by PFAS contamination from the MCG, Shannon & Wilson carry out a WSW search. We will prepare detailed maps detailing well search areas for field visits.

The McGrath well search has been divided into two areas. Area 1 consists of airport property and the nearby neighborhoods. Field staff will begin by visiting properties in Area 1 to identify structures that may use groundwater wells. We will make a reasonable attempt to contact the owners or occupants to inquire about their water source and obtain permission to collect samples. Shannon & Wilson will collect PFAS samples from any identified WSWs in the search area that are used for drinking, indoor plumbing, or gardening after receiving permission to sample from the owner(s) or occupant(s).

If results of analysis of samples collected from Area 1 indicate detections of PFAS, we will mobilize a second event to expand the search to Area 2, to approximate the extent of PFAS in groundwater wells in McGrath. If few wells are discovered in Area 1, field staff will communicate with project managers to assess the need to proceed with the well search in Search Area 2 during the initial WSW search and sampling effort.

During our site visit, we will also interview the local DOT&PF staff to determine the historical use of AFFF. However, we note that recent discussions with the local DOT&PF airport manager indicate that AFFF may not have been used at MCG. If PFAS is detected in WSWs near the airport, we will work with DEC and DOT&PF to determine the next steps for the site.

3.2 Water Supply Well Activities

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 4.1 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. Analytical laboratories and methods employed as a part of this Addendum are identified in Section 4.3.

4 SAMPLING AND ANALYSIS PLAN

This section describes the analytical sampling approach for investigating PFAS contamination associated with the MCG. A DEC-qualified sampler will collect and handle the samples for projects covered under the GWP and this Addendum 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 (IDW) management is described in Section 4.7.

4.1 Analytical Sample Summary

We estimate there are approximately 155 structures in Area 1 and 55 structures in Area 2. We understand the City of McGrath offers piped public water distribution and provides a public potable water source for haul systems. We estimate that approximately 90% of residents use public utility systems for a water source.

An analytical sample summary is detailed in Exhibit 4-1 below.

Exhibit 4-1: Analytical Sample Summary

Number of Samples	Matrix	PFAS (DoD QSM 5.3 Table B-15)
	Groundwater Area 1	15 + 2 QC
	Groundwater Area 2	5 + 1 QC

Notes:
DoD = Department of Defense; PFAS = per- and polyfluoroalkyl substances; QC = quality control sample (field duplicate)

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

PFAS samples will be submitted to Eurofins TestAmerica of West Sacramento, California. Based on the DEC Technical Memorandum issued on October 2, 2019, PFAS analysis will report the 18 approved PFAS compounds as listed in EPA 537 Modified Method that complies with the Department of Defense/Department of Energy (DoD/DOE) Quality Systems Manual (QSM) Version 5.3 Table B-15. Upon receipt of the samples, authorized

personnel will store and prepare the samples for analysis, taking into consideration sample holding times for the analysis.

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	Drinking Water	2 x 250 mL polycarbonate	0 °C to 6 °C	14 days to extraction, analyzed within 40 days of extraction

NOTES:
DoD = Department of Defense, PFAS = per- and polyfluoroalkyl substances, 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

IDW will generally consist of purge water generated during WSW sampling. Purge water will be filtered using either a granulated activated carbon filter and then discharged to the ground surface or using the disposal method utilized at the property (e.g., septic system). Other IDW will primarily consist of disposable sampling equipment (nitrile gloves, transfer cups, etc.) and will be disposed of at the nearest landfill.

4.8 Deviations from the General Work Plan

No deviations to the GWP are planned at this time.

5 QUALITY ASSURANCE PROJECT PLAN

This 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 to the GWP. We note an updated DVPP was submitted to DEC in June 2022. The following sections describe specific procedures to be followed during sampling at the MCG so that 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 the GWP.

5.3 Field Instrument Calibration

Field instrument calibration (e.g., YSI) 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 QA/QC samples described in the following sections.

5.4.1 Field Duplicate Sample

Field duplicate sample collection procedures are described in Section 5.4.1 of the GWP. One field duplicate will be collected for every 10 primary samples. Refer to Exhibit 4-1 for the planned number of field duplicates.

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 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 requirements are discussed in Section 5.7 of the GWP.

6 REFERENCES

Alaska Department of Environmental Conservation (DEC), 2017, Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites: Juneau, Alaska, DEC Division of Spill Prevention and Response, Contaminated Sites Program, March, available: http://dec.alaska.gov/spar/csp/guidance_forms/csguidance.htm.

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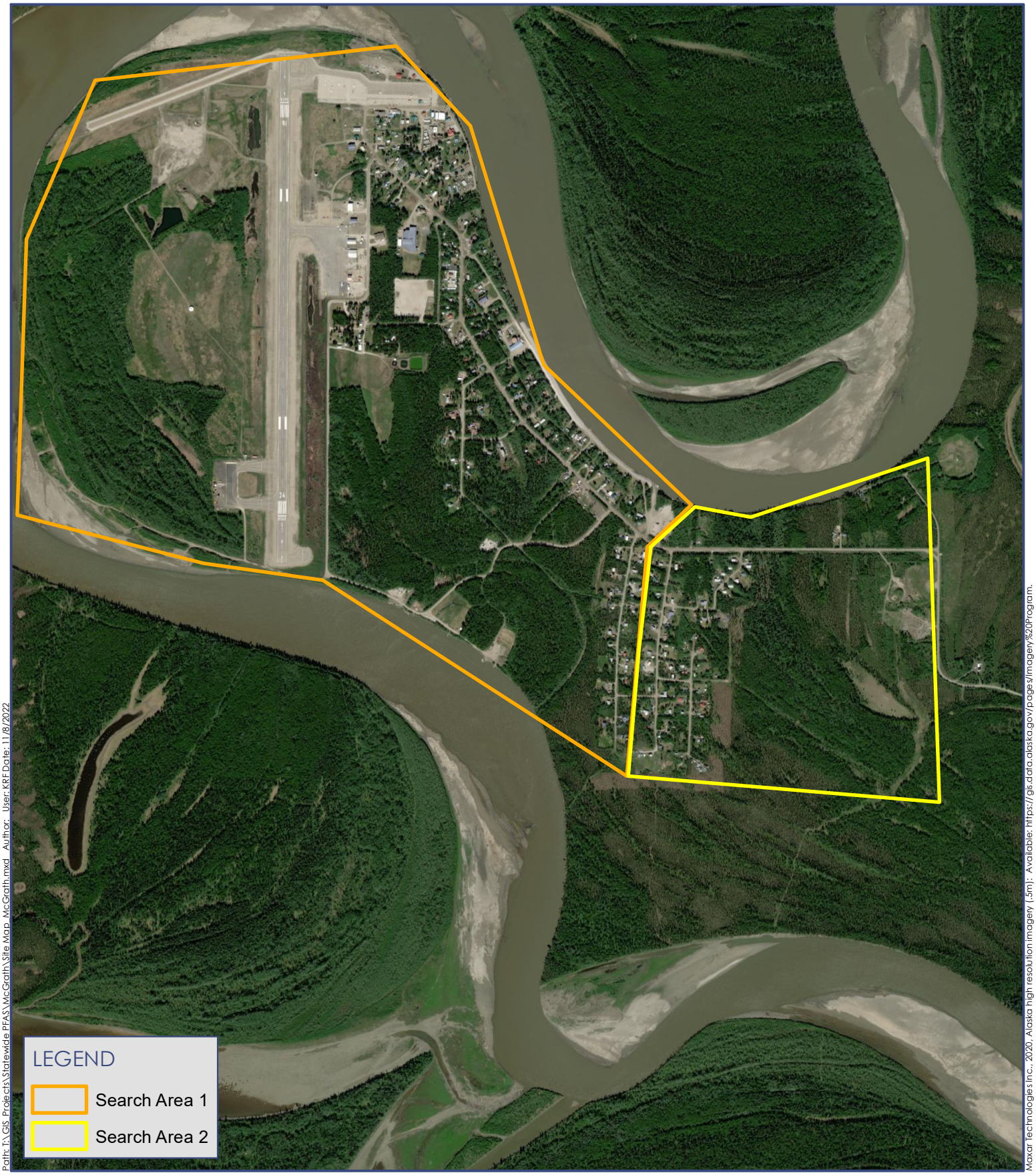
Miles

November 2022

VICINITY MAP

Figure 1



Notes:

1. Search area is approximate

November 2022

SITE MAP

Figure 2

APPENDIX A: CONCEPTUAL SITE MODEL

Appendix A

Conceptual Site Model

Scoping and Graphics Forms

CONTENTS

Print Form

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

Site Name: ADOT&PF McGrath Airport - Statewide PFAS

File Number:

Completed by: Amber Masters, Shannon & Wilson, Inc.

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: Aqueous Film Forming Foam (AFFF) releases

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 MCG. 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 MCG. 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 MCG. 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: Complete

Comments:

Surface water is used as a drinking water source for McGrath.

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 contaminted 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 - PM_{10}). 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 MCG. However, 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:

No sediment samples have been collected at the MCG. Due to the potential for residents to access potentially contaminated surface water bodies (i.e. Kuskokwim River), 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 McGrath Airport - Statewide PFAS

Completed By: Amber Masters Shannon & Wilson, Inc.

Date Completed: October 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
☑ Surface Soil (0-2 ft bgs)	☑ Direct release to surface soil — check soil ☑ Migration to subsurface — check soil ☑ Migration to groundwater — check groundwater ☐ Volatilization — check air ☑ Runoff or erosion — check surface water ☑ Uptake by plants or animals — check biota ☐ Other (list):
☑ Subsurface Soil (2-15 ft bgs)	☑ Direct release to subsurface soil — check soil ☑ Migration to groundwater — check groundwater ☐ Volatilization — check air ☑ Uptake by plants or animals — check biota ☐ Other (list):
☑ Ground-water	☑ Direct release to groundwater — check groundwater ☐ Volatilization — check air ☑ Flow to surface water body — check surface water ☐ Flow to sediment — check sediment ☑ Uptake by plants or animals — check biota ☐ Other (list):
☑ Surface Water	☑ Direct release to surface water — check surface water ☐ Volatilization — check air ☑ Sedimentation — check sediment ☑ Uptake by plants or animals — check biota ☐ Other (list):
☑ Sediment	☑ Direct release to sediment — check sediment ☑ Resuspension, runoff, or erosion — check surface water ☑ Uptake by plants or animals — check biota ☐ 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.*

Current & Future Receptors

Exposure Media	Exposure Pathway/Route	Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
☑ soil	☑ Incidental Soil Ingestion	C/F	C/F	C/F	C/F	C/F	C/F	
	☑ Dermal Absorption of Contaminants from Soil	I	I	I	I	I	I	
	☑ Inhalation of Fugitive Dust	C/F	C/F	C/F	C/F			
☑ groundwater	☑ Ingestion of Groundwater	C/F	C/F	C/F	C/F	C/F	C/F	
	☑ Dermal Absorption of Contaminants in Groundwater	I	I	I	I	I	I	
	☐ Inhalation of Volatile Compounds in Tap Water							
☐ air	☐ Inhalation of Outdoor Air							
	☐ Inhalation of Indoor Air							
	☐ Inhalation of Fugitive Dust							
☑ surface water	☑ Ingestion of Surface Water	C/F	C/F	C/F	C/F	C/F	C/F	
	☑ Dermal Absorption of Contaminants in Surface Water	C/F	C/F	C/F	C/F	C/F	C/F	
	☐ Inhalation of Volatile Compounds in Tap Water							
☑ sediment	☑ Direct Contact with Sediment	C/F	C/F	C/F	C/F	C/F	C/F	
☑ biota	☑ Ingestion of Wild or Farmed Foods	C/F	C/F	C/F	C/F	C/F	C/F	

Revised, 10/01/2010

APPENDIX B: SITE SAFETY AND HEALTH PLAN

Appendix B

Site Safety and Health Plan

CONTENTS

APPENDIX B: SITE SAFETY AND HEALTH PLAN

SITE SAFETY AND HEALTH PLAN

Shannon & Wilson prepared this Site Safety and Health Plan (SSHP) for the water supply well (WSW) well search and sampling activities at and near the McGrath Airport (MCG). 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 water may be encountered during site exploration activities. PFAS are believed to be the primary contaminants of potential concern and may be encountered in 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, 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; and risk of eye injuries. In addition, wildlife may be a hazard in forested areas around the airport. 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 may put a worker at risk of developing heat stress; however, since the field work will be conducted during cooler 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 at all times.
- 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 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). Each individual 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 course of 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;
- 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 comes into contact with 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.

B.5. ACCIDENTS AND EMERGENCIES

Shannon & Wilson field personnel are current in first aid and cardiopulmonary resuscitation (CPR) 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 the course of 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 McGrath Regional Health Center Clinic located near the airport in McGrath, Alaska. The telephone number for the Clinic is (907) 837-2208 and the hours of operation are 9 a.m. to 3 p.m. Field phones will be kept easily accessible in the case of an emergency.

Exhibit B-1: Map Showing McGrath Regional 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 020-MCG-01: MCGRATH MCG 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

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

IMPORTANT INFORMATION

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.

IMPORTANT INFORMATION

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