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SUMMARY REPORT

May to December 2018 Private Well Sampling

FAIRBANKS, ALASKA

SHANNON & WILSON

March 2019

Shannon & Wilson No: 31-1-20060-002

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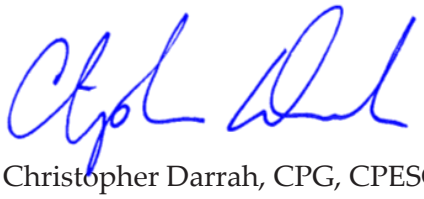
Subject: SUMMARY REPORT, MAY TO DECEMBER 2018 PRIVATE WELL SAMPLING, FAIRBANKS, ALASKA

Shannon & Wilson participated in this project as a consultant to the Fairbanks International Airport (FAI) and Alaska Department of Administration's Division of Risk Management (DRM). Our services were authorized under contract amendment 2518311-2, issued on March 15, 2018 by the Alaska Department of Transportation & Public Facilities (ADOT&PF) Northern Region Procurement Office. Our scope of services for the time period summarized this report is based on our approved cost estimates dated December 7, 2017, and May 4 and June 11, 2018. The DRM approved our intent to exceed the value of this contract on June 12, 2018. Since July 2018, our efforts have been on behalf of the DRM.

This report was prepared and reviewed by:

Marcy Nadel
Geologist
Role: Project Manager



Christopher Darrah, CPG, CPESC
Vice President
Role: Contract Manager

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ACRONYMS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADOT&PF	Alaska Department of Transportation & Public Facilities
AFFF	aqueous film-forming foam
ARFF	Aircraft Rescue and Fire Fighting
°C	degrees Celsius
CEI	Central Environmental, Inc.
COC	chain-of-custody
CUC	College Utilities Corporation
DGGS	Alaska Division of Geological & Geophysical Surveys
DHSS	Alaska Department of Health and Social Services
DNR	Alaska Department of Natural Resources
DQO	data quality objective
DRM	Alaska Department of Administration's Division of Risk Management
EB	equipment blank
EPA	Environmental Protection Agency
FAI	Fairbanks International Airport
FNSB	Fairbanks North Star Borough
IDA	isotope dilution analyte
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LHA	Lifetime Health Advisory
MAROS	Monitoring and Remediation Optimization System
MB	method blank
MDL	method detection limit
MS	matrix spike
ng/L	nanograms per liter
PAN	Parcel Account Number
PFAS	per- and polyfluoroalkyl substance
PFBS	perfluorobutanesulfonic acid
PFHpA	perfluoroheptanoic acid
PFHxS	perflurohexanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PFNA	perfluorononanoic acid
ppt	parts per trillion
QA	quality assurance
QC	quality control
RL	reporting limit
RPD	relative percent difference
TestAmerica	TestAmerica Laboratories, Inc.

ACRONYMS

UCMR	Unregulated Contaminant Monitoring Rule
USGS	United States Geological Survey
WELTS	Well Log Tracking System
WO	work order
YSI	Yellow Springs Instrument multiprobe water quality meter

1 INTRODUCTION

Shannon & Wilson, Inc. has prepared this report to document our well search and private well sampling effort near the Fairbanks International Airport (FAI) in Fairbanks, Alaska. This summary report covers May 2018 to December 2018; a previous report addressed November 2017 to April 2018. The FAI is an active, Alaska Department of Environmental Conservation (ADEC) listed contaminated site due to the presence of per- and polyfluoroalkyl substances (PFAS) in groundwater and surface water (File Number 100.38.277, Hazard ID 26816).

This report was prepared for the FAI in accordance with the terms and conditions of our contract with the Alaska Department of Transportation & Public Facilities (ADOT&PF), relevant ADEC guidance documents, and 18 Alaska Administrative Code (AAC) 75.335.

1.1 Purpose and Objectives

The purpose of the services described in this report was to evaluate the potential for human exposure to PFAS-containing water in private water-supply wells. Our objectives were to:

- identify private water-supply wells in neighborhoods near the FAI,
- offer to sample any active private well within the well search areas for PFAS, and
- resample private wells meeting the quarterly and annual sampling criteria. Sampling criteria is described in Section 2.5.

Private water-supply well search Areas 1 through 9 are depicted in Figure 1, Well Search Extent.

1.2 Background

The FAI terminal is located at 6450 Airport Way in Fairbanks, Alaska. The geographic coordinates of the primary FAI runway, 2L-20R, are latitude 64.816034, longitude -147.861289.

The FAI Aircraft Rescue and Firefighting (ARFF) program used aqueous film-forming foam (AFFF) for training, systems testing, and emergency response at the FAI for many years. The existing burn pit (combustible-liquids pit) was constructed in 1993. Prior to 1993, AFFF training was conducted near the Airport Response Center, and at what is now the southwest end of the small aircraft runway (Figure 1). The precise timeline of AFFF use at the FAI is unknown. AFFF contains PFAS, a category of persistent organic compounds considered as

emerging contaminants. Perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) are two PFAS compounds commonly found at sites where AFFFs were used.

In August 2017, a FAI consultant encountered PFOS above the 2016 ADEC groundwater-cleanup level in one of four temporary well point samples near the Don Bennett shooting range, located on the southern portion of FAI property adjacent to the existing burn pit and former training area (Figure 1). This PFOS exceedance triggered additional PFAS testing on FAI property.

In late October 2017, the consultant received the results of PFAS water testing in six onsite groundwater monitoring wells and five surface-water bodies. PFOS or PFOA were encountered above their respective groundwater-cleanup levels in three samples, collected from two monitoring wells near the Airport Response Center and a surface-water body to the north of the existing burn pit (Figure 1).

We were contracted on November 3, 2017 to identify and sample private water-supply wells near the FAI. In November 2017, we began sampling private wells connected to indoor plumbing in well search Areas 1 through 4. We expanded the well search to include Areas 5 through 8 in December 2017. This effort is summarized in our *November 2017 to April 2018 Private Well Sampling Summary Report*, submitted to ADEC on September 28, 2018.

We used information obtained from completed well surveys (Appendix B, Field Notes) and subsequent conversations with property owners and/or occupants to categorize private water-supply wells based on use. These category designations were developed in coordination with the FAI and ADEC, and are described as follows:

- Category 1: wells used for drinking or cooking, as reported by owners or occupants.
- Category 2: wells used for dish washing and other domestic purposes. Homes or businesses where occupants report they do not drink the water, but where the wells lead to kitchen or bathroom faucets, are considered possible future drinking-water wells.
- Category 3: wells used for vegetable gardening, not plumbed to indoor faucets or spigots. These wells are considered non-drinking-water wells.
- Category 4: wells used for outdoor purposes other than vegetable gardening, such as irrigation, or cleaning. These wells are considered non-drinking-water wells.
- Category 5: wells currently not in use. Wells that have been abandoned in place, are inoperable, disconnected, or intended for future use. These wells are considered non-drinking-water-wells.

For the purposes of this project, a private well is defined as a privately-owned water-supply well. Please note this definition of private well does not match the ADEC Drinking Water

Program regularity classification of a private water system, "a potable water system serving one single-family residence or duplex" (18 AAC 80, 2014).

1.3 Geology and Hydrology

The FAI sampling area lies at the northern edge of the Tanana Lowlands physiographic province that forms a large, arcuate band of alluvial sediments between the Alaska Range and the Yukon-Tanana Uplands. The Lowlands consist of vegetated floodplains and low benches cut by the Tanana River, and sloughs and oxbow lakes at former channel positions of the Tanana or Chena Rivers. The floodplain generally slopes to the west or northwest by approximately five feet per mile (Nelson, 1978).

Based on our experience and knowledge of hydrogeology in the Fairbanks area, the horizontal regional gradient in this area is relatively flat, typically averaging two to four feet per mile. Depth to groundwater ranges from 5 feet to 12 feet below ground surface, depending on local topography. Seasonal fluctuation in groundwater levels can range from 0.2 to 9 feet (Glass et. al., 1996).

A more detailed summary of the geology and hydrology of the FAI study area is included in our first private well summary report, dated September 28, 2018. This report includes a figure summarizing regional United States Geological Survey (USGS) groundwater contours.

1.4 Contaminants of Concern and Action Levels

The primary contaminants of concern for the FAI site are PFOS, PFOA, perfluoroheptanoic acid (PFHpA), perflurohexanesulfonic acid (PFHxS), and perfluorononanoic acid (PFNA).

On August 20, 2018, the ADEC published a Technical Memorandum describing a new state action level for PFAS in drinking water. The action level is 70 parts per trillion (ppt) for the sum of five PFAS compounds: PFOS, PFOA, PFHpA, PFHxS, and PFNA. Following ADEC guidance, we consider combined concentrations greater than or equal to 65 ppt to be exceedances of the action level. The Technical Memorandum includes a separate action level for perfluorobutanesulfonic acid (PFBS). The current cleanup levels for PFOS and PFOA are summarized in Exhibit 1-1, below; these levels where promulgated in November 2016.

Prior to the publication of recent ADEC guidance, private well sample results were compared to the effective Environmental Protection Agency (EPA) Lifetime Health Advisory (LHA) level of 65 ppt for PFOS, PFOA, or the sum of the two.

Exhibit 1-1: Applicable Regulatory and Action Levels

Agency	Media	Compound	Level
ADEC	Drinking water	PFOS + PFOA + PFHpA + PFHxS + PFNA	70 ppt[1]
ADEC	Drinking water	PFBS	2,000 ppt[2]
ADEC	Groundwater	PFOS	400 ppt[3]
ADEC	Groundwater	PFOA	400 ppt[3]
EPA	Drinking water	PFOS + PFOA	70 ppt[4]

Notes: Part per trillion (ppt) is equivalent to nanograms per liter (ng/L).

1 Action level is reported in ADEC Technical Memorandum. Following ADEC guidance, results are compared to 65 ppt.

2 Action levels are reported in ADEC Technical Memorandum.

3 ADEC groundwater-cleanup levels are reported in 18 AAC 75.345, Table C.

4 Following ADEC guidance, LHA combined results are compared to 65 ppt.

1.5 Scope of Services

Our scope of services summarized in this report includes private well search and sampling efforts in nine geographic search areas (Figure 1, Well Search Extent). The objective was to identify private wells in the sampling area, first by targeting properties reportedly not connected to the College Utilities Corporation (CUC) water system and more likely to have wells connected to indoor plumbing. We collected first-time water samples from current and possible future drinking water (category 1 and 2) wells and outdoor wells (category 3 and 4) between May and December 2018.

This report also describes quarterly and annual sampling of select private wells, per criteria discussed in Section 2.5, Quarterly and Annual Sampling. The quarterly sampling events occurred in May, August/September, and November/December 2018; the annual sampling event occurred in August/September 2018.

This report was prepared for the exclusive use of the FAI, Alaska Department of Administration's Division of Risk Management (DRM), and their representatives. This effort presents our professional judgment as to the conditions of the site. Information presented here is based on the sampling and analyses we performed. This report should not be used for other purposes without our approval or if any of the following occurs:

- Project details change, or new information becomes available, such as revised regulatory levels or the discovery of additional source areas.
- Conditions change due to natural forces or human activity at, under, or adjacent to the project site.

- Assumptions stated in this report have changed.
- If the site ownership or land use has changed.
- Regulations, laws, cleanup levels, or applicable action levels change.
- If the site's regulatory status has changed.

If any of these occur, we should be retained to review the applicability or our analyses and recommendations. This report should not be used for other purposes without Shannon & Wilson's review. If a service is not specifically indicated in this report, do not assume it was performed.

2 FIELD ACTIVITIES

This section summarizes activities performed between May 1 and December 31, 2018. Private well sampling occurred between May 8 and December 12, 2018.

2.1 Well Search

During the time period covered in this report we continued attempts to contact owners and occupants we were unable to reach during our initial well search in search Areas 1 through 8 (Figure 1, Well Search Extent). We also sampled seasonal category 3 and 4 wells we identified during the 2017 to 2018 winter but were unable to sample. On June 13, 2018, we began a secondary well search to target properties reportedly connected to the CUC water system per utility records. In some cases, we already had records for these properties because they are owned by individuals contacted during the initial well search.

During the secondary well search we visited properties within Areas 1 through 3 primarily to identify category 3 and 4 wells that are typically inoperable in the wintertime. We also sought to identify any category 1 or 2 wells that may serve other structures on these properties or as a secondary, indoor water source in addition to CUC water. If occupants were not present at the time we visited the property, we left a personalized door tag. Where we were unable to make contact in person, we used public telephone and business records, made multiple visits to the property, and/or spoke with neighbors. In many cases we returned to the same property several times until we reached the occupants. In September, we expanded our secondary well search to include remaining properties in Areas 4, 7, and 8. Areas 5 and 6 were not served by the CUC water system at the time.

Using completed Private Well Inventory Survey Forms for each identified private well (Appendix B), we designated well categories based on well use as described in Section 1.2. We offered to sample each active well (i.e., categories 1 through 4) identified during the well

search, with an emphasis on category 1 and 2 wells within Areas 1 through 3. We did not offer to sample category 5 wells, or seasonally active wells without operable pumps. Properties with removed or decommissioned wells are not considered to have a well. Exceptions are noted in Section 2.8, Deviations.

We identified one category 1 well in Area 2, Property Account Number (PAN) 174734, whose owner refused a sample for the well on their property. This location is considered an active refusal to sample and is shown in Figure 2, PFAS Sample and Section Locations. The owners of some category 1 and 2 wells outside Areas 1 through 3, or category 3 and 4 wells closer to the FAI, also declined sampling. These locations are not considered refusals because they are not high-priority samples.

We provided owners and occupants with an information packet including a letter from the FAI, one-page fact sheet including project contacts, Private Well Inventory Survey Form, and five-page fact sheet prepared by the Alaska Department of Health and Social Services (DHSS). Copies of these items are provided in Appendix A, Public Correspondence.

In coordination with FAI and ADEC, on October 19, 2018, we expanded the well search and sampling area to include Area 9. This area is located on the west side of the Chena River, opposite the FAI, near the confluence of the Chena and Tanana Rivers (Figure 1). We began by downloading a list of parcels within the designated search area from the Fairbanks North Star Borough (FNSB) property database. We tracked our well search activities using PANs from this database. We also referenced the Alaska Department of Natural Resources (DNR) Well Log Tracking System (WELTS) and subsurface water rights files listed on the DNR Water Estate Map. This area is not served by CUC, therefore we did not request utility records.

For Area 9, we began with a door-to-door well search and by contacting individuals whose contact information was known form previous well search efforts. Where owners or occupants were not home during our first visit, we prepared and mailed an advisory letter to the FNSB-listed mailing address for the property. The Area 9 materials are provided in Appendix A, Public Correspondence, and included a pre-stamped return envelope.

The results of our cumulative November 2017 to December 2018 well search are summarized in Exhibit 2-1.

Exhibit 2-1: Well Status by Parcel as of December 31, 2018

Well Status	Number of Parcels
Well present	281
Unknown – probable well	4
Unknown – possible well	6
Unknown – improbable well	5
No well present	548
Total	844

We were unable to contact all owners and occupants in Areas 1 through 9. Parcels classified as "Unknown" are locations we were unable to reach as part of the well search. We have grouped these properties based on information obtained through site visits, talking to neighbors and law enforcement officials, and public database searches. These locations are considered passive refusals to sample, and are displayed in Figure 2, PFAS Sample and Section Locations. We will not continue to follow up with these properties.

PANs 152625/152633, 151955/151963, 526797, 560774/153591, 172987, and 173096/173274 are considered passive refusals and appear occupied. We were unable to reach the owner or occupants following the advisory letter and five or more contact attempts, typically in-person visits. CUC reportedly serves each of these properties; however, it's possible they have more than one source of water.

PANs 173061, 174301, and 174513 are considered passive refusals and appear uninhabited. We did not observe signs of residency such as building maintenance, landscaping, vehicle or foot tracks, or visible interior lights.

Adjacent PANs 150932, 150941, and 150959 are considered refusals due to a possible security concern, based on information provided by law enforcement and neighbors. We did not visit this property in person. These PANs are owned by the same entity, an advisory letter was delivered to the FNSB-listed address via certified mail but we did not receive a response.

2.2 Private Well Sampling

Shannon & Wilson conducted private well sampling between May 1, 2018 and December 31, 2018.

The following Shannon & Wilson personnel collected analytical water samples for this project. These individuals are State of Alaska Qualified Samplers per 18 AAC 75.333[b] and 18 AAC 78.088[b].

- Amber Masters, Environmental Scientist
- Marcy Nadel, Geologist
- Craig Beebe, Geologist
- Christian Canfield, Environmental Engineer

Exhibit 2-2: Photographs of Typical Private Well Purge and Sample Locations

We collected private-well samples from a location in the plumbing upstream of water-treatment systems or water softeners, where possible. For the purposes of this project we do not consider small (i.e., less than 18 inches in height) particulate filters to be treatment systems.

We purged water systems prior to sampling by allowing the water to run until clear and water-quality parameters stabilized. We recorded parameters using a multiprobe water quality meter (YSI) recording: pH, temperature, and conductivity, approximately once every

three minutes until sample collection. The following values were used to indicate stability for a minimum of three consecutive readings: ±0.1 pH, ±0.5 degrees Celsius (°C) temperature, and ±3 percent conductivity.

We discharged purge water to an indoor sink or to the ground surface. In some cases, indoor plumbing leads to the municipal sewer system; in other cases, it leads to a private septic system. Following parameter stabilization, we collected PFAS water samples using laboratory-supplied containers. Copies of our Private Well Sampling Logs are included in Appendix B.

We are aware of the potential for cross-contamination of PFAS water samples from numerous everyday household items. We took appropriate precautions to prevent cross-contamination, including hand washing and donning a fresh pair of disposable nitrile gloves before sample collection, avoiding the use of personal protective equipment and field supplies known to contain PFAS, and using liner bags for storing and shipping sample containers.

2.3 Sample Custody, Storage, and Transport

Immediately after sample collection, we placed the sample containers in a Ziploc bag. We maintained custody of the samples in a designated sample cooler kept between 0 °C and 6 °C, using ice substitute separated from the sample jars by a liner bag.

We submitted analytical samples and chain-of-custody (COC) forms in a hard-plastic cooler with an adequate quantity of frozen-ice substitute and packing material as necessary to prevent bottle breakage. We applied custody seals to the cooler, and shipped sample coolers to TestAmerica Laboratories, Inc. (TestAmerica) in West Sacramento, California using Alaska Air Cargo priority overnight service, also known as Goldstreak.

Samples were submitted to the analytical laboratory between once per week and once per month, depending on the pace of our well search and sampling efforts. This allowed sufficient time for the laboratory to analyze the samples within holding-time requirements of the analytical method. We requested a standard turnaround time for most work orders (WOs). TestAmerica laboratory reports are included in Appendix C.

2.4 Notification of Results

Following the receipt of analytical data and completion of Quality Assurance/Quality Control (QA/QC) review procedures described in Section 3.2, we prepared analytical data tables and maps for the project team.

Prior to August 17, 2018, results for private wells were compared to the EPA LHA level, or the sum of PFOS and PFOA concentrations. After this date, results were compared to the ADEC action level, or the sum of five PFAS concentrations, regardless of well use.

The FAI notified the owners and occupants of properties with concentrations about the applicable action level by phone. We called to notify the owners and occupants of properties with lower concentrations, where their wells were sampled for the first time or as requested.

We prepared results letters to property owners and/or occupants informing them of the results of samples collected from their wells. We mailed or emailed the letters depending on each individual's preference. The letters were tailored to each property and included:

- sample name(s);
- analytical results for the PFAS sample(s) collected from their well(s);
- comparison of analytical results to the applicable action level;
- a one-page fact sheet describing the project and listing agency contacts; and
- pages of the TestAmerica laboratory report that apply to the property's sample(s), including other PFAS results.

2.5 Quarterly and Annual Sampling

We performed three well quarterly or annual private well monitoring events during the time period covered in this report, one each in May, August/September, and November/December 2018 (Figure 5, Quarterly and Annual Monitoring Network). The resampling criteria varied with each event and is described below.

2.5.1 May 2018 - Quarterly Sampling

In May, we resampled private wells meeting the following criteria:

- active category 1 and 2 wells whose maximum combined PFOS and PFOA concentration was greater than or equal to 35 ppt; or
- active category 1 and 2 wells within 750 lateral feet of and on the same side of the Chena River as any private well (i.e., categories 1 through 5) whose combined PFOS and PFOA concentration was greater than or equal to 35 ppt; and
- where connection to the CUC water system was not planned for 2018.

Lateral distance was measured from parcel center to parcel center. On parcels with more than one well, we tested only those wells with PFOS and PFOA combined concentrations exceeding 35 ppt. Please note these criteria are different than that discussed in our

November 2017 to March 2018 Private Well Sampling Summary Report. The following wells were resampled in May 2018.

Exhibit 2-3: May Quarterly Locations

Sample Name(s)	Address	Sample Name(s)	Address
151203	[redacted]	*176222*	[redacted]
151637		*407372*	
153699		*407364*	
173860		*510220.1, 510220.2*	
173908		*521809*	
569712		*542512*	
173916		*542547*	
174254		*550116*	
174271		*550124*	
176044		*176397*	
176095		*550132*	

The following locations were part of the May sampling event but were not sampled:

- [redacted] (sample *407313*) due to a malfunctioning well pump, and
- [redacted] (sample *407330*) and [redacted] (sample *407348*) due to the owners' availability.

2.5.2 August 2018 - Quarterly and Annual Sampling

In August, we resampled private wells meeting the above quarterly sampling criteria, and added annual sampling of:

- active wells (i.e., categories 1 through 4) with a detected PFOS or PFOA concentration greater than 2.0 ppt;
- wells within the previously-defined PFAS-impacted area (Figure 5, Quarterly and Annual Well Monitoring Network); and
- wells where connection to the College Utilities water system was not planned for 2018.

The August quarterly and annual resampling event added the following locations to the private well monitoring network.

Exhibit 2-4: August Quarterly and Annual Additions

Sample Name(s)	Address
176435	[redacted]
483541	
173002	
579645	
120774	
136891	
391247	
152617	

Two locations were resampled on June 28, 2018 due to owner availability. [redacted] (sample *407330*) and [redacted] (sample *407348*) are grouped with the August quarterly and annual sampling event although sampling occurred between quarters.

The following locations were removed from the network because connection to the CUC water system was planned for 2018, per the EPA LHA level:

- [redacted] (sample *174254*)
- [redacted] (sample *176044*)
- [redacted] (samples *510220.1* and *510220.2*)

On August 17, during our quarterly and annual sampling event, the FAI adopted a new action level for drinking water. The ADEC action level is discussed in Section 1.4. In coordination with the FAI, we removed the following locations from the network during our August quarterly sampling effort because connection to CUC water was planned for 2018, per the ADEC action level:

- [redacted] (sample *174271*)
- [redacted] (sample *542547*)
- [redacted] (sample *153419*)

The following location was part of the August sampling event but was not sampled:

- [redacted] (sample *443239*) because the initial sample was collected less than three months prior.

2.5.3 November 2018 - Quarterly Sampling

In November, we resampled private wells meeting the following criteria:

- active category 1 and 2 wells whose maximum combined ADEC action level (i.e., sum of five PFAS) concentration was below 65 ppt;
- within the previously-defined PFAS-impacted area (Figure 5).

We did not resample wells with a sum of five PFAS concentration exceeding 65 ppt because an alternate water source is planned for these properties. The following wells were resampled in November 2018.

Exhibit 2-5: November Quarterly Locations

Sample Name(s)	Address	Sample Name(s)	Address
136891	[redacted]	*176095*	[redacted]
151203		*176222*	
151637		*176435*	
153699		*407313*	
173002		*407364*	
173363		*407372*	
173860		*483532*	
173916		*550132*	
173975		*561711*	

The following locations were part of the November sampling event but were not sampled:

- [redacted] (sample *120774*) and [redacted] (sample *482919*) because the owners declined sampling; and
- [redacted] (sample *176729*) because it is seasonally inactive.

2.6 Alternative Water Sources

During the time period covered in this report, we offered one-gallon jugs of bottled water and ongoing water deliveries to the occupants of properties with category 1, 2, and 3 wells within the PFAS-impacted area. We typically offered water while sampling; in some cases, residents requested bottled water after sampling. The FAI Airport Response Center at 5195 Brumbaugh Boulevard also serves as a water distribution depot for affected properties.

The FAI has contracted water-delivery company Vision Construction to provide bottled water deliveries to property owners and occupants. They primarily offer water dispensers

and reusable five-gallon jugs but have other options available depending on resident preferences. Table 1, Water Delivery Recipients as of December 31, 2018, lists properties that have received bottled water deliveries. Unless otherwise noted, water deliveries are ongoing.

In July 2018, the FAI awarded a construction contract to Central Environmental, Inc. (CEI) to connect households and businesses to the CUC water system. Additional construction was completed by CUC personnel.

Exhibit 2-6: Photographs of Land Clearing and Newly Installed Water Line

The following properties with category 1 and 2 wells exceeding applicable action levels were connected to the CUC water system in summer or fall 2018 as a permanent source of alternate water. Please note additional connections are planned for 2019.

Exhibit 2-7: Properties Connected to CUC Water System

Sample Name(s)	Address	Sample Name(s)	Address
119938	[redacted]	*173908*	[redacted]
119946		*174254*	
119954		*174271*	
119971		*174467*	
119989		*174483*	
119997		*174491*	
120014		*174696*	
120057		*174718*	
120090		*174742*	
120103		*174751*	
120189		*174769*	
120197		*174777*	
120201		*174785*	
120219		*174793*	
120235		*174963*	
120286		*174971*	
120316		*174998*	
120324		*175005*	
120341		*175013*	
120359		*176044, 176044.1*	
120405		*176052*	
120529		*176061*	
120537.1, 120537.2		*176061*	
120553		*176265, 521809*	
150843		*367770*	
152315		*367788*	
153338		*542539*	
153575		*542547*	
153648		*669097*	

2.7 Public Information

The DHSS updated their health fact sheet to address additional PFAS compounds on November 2, 2018. This information was provided to owners and occupants with health-related questions during sampling appointments, and is included in Appendix A.

The FAI hosts a webpage describing the PFAS water testing project, including a project summary, list of contacts, simplified regional results map, and links to additional resources. The map is updated periodically following the receipt of analytical data; Appendix A includes an example from December 31, 2018.

2.8 Deviations

We conducted our services in general accordance with our scopes of services dated December 7, 2017, and May 4 and June 11, 2018. The following are the deviations from these documents.

Exhibit 2-8: Photograph of Owner-Supplied Generator Pump

The following locations were unavoidably sampled in a manner inconsistent with our standard sampling procedures due to differences in well, pump, or plumbing configurations: *120332*, *120472*, *153354*, and *462659*. These analytical results are therefore flagged J* in Table 2.

Water-quality parameter stabilization criteria was not met for samples *153699* and *510220.2*. These analytical results are therefore flagged J* in Tables 2 and 3.

- Our scope of services stated we would complete the secondary well in Areas 1 through 3 only. However, we expanded the secondary well search to include remaining properties in Areas 4, 7, and 8.
- Our scope called for sampling from active wells only. Upon request by property owners and the FAI, we collected samples *176044.5*, *510238.1*, and *510238.2* from category 5 wells using either submersible or peristaltic pumps.

3 ANALYTICAL RESULTS

We submitted analytical water samples to TestAmerica for determination of six PFAS using Method WS-LC-0025 or EPA 537 modified, the laboratory's in-house method. This method analyzes for the PFAS listed in the EPA Unregulated Contaminant Monitoring Rule (UCMR): PFOS, PFOA, PFHpA, PFNA, PFBS, and PFHxS. Laboratory reports and ADEC Laboratory Data Review Checklists for each WO are provided in Appendix C.

The TestAmerica laboratory reports and ADEC Laboratory Data Review Checklists for each work order (WO) are listed in chronological order in Appendix C (WOs *39183*, *39184*, *39463*, *43917*, *39845*, *40406*, *40844*, *41182*, *41852*, *42091*, *42344*, *42568*, *43141*, *43820*, *43916*, *43917*, *45444-3*, *45633*, *45879*, and *46123*).

3.1 Private Well Samples

Table 2 summarizes PFAS results for each private well sampled between May and December 2018, including both first-time sample locations and quarterly or annual samples. Figure 2, PFAS Sample and Section Locations, depicts the sum of five PFAS concentrations for each private well sampled since November 2017. There were no exceedances of the PFBS action level.

The highest individual PFAS analyte concentrations were:

- PFOS at 1,300 ppt in sample *120181*,
- PFHxS at 470 ppt in sample *176044.5*,
- PFOA at 170 ppt in sample *176044.5*,
- PFHpA at 87 ppt in sample *176044.4*, and
- PFNA at 54 ppt in sample *176397*.

Table 3 summarizes historical PFAS results for quarterly and annual locations sampled during the time period covered in this report. In many cases these wells were first sampled between November 2017 and April 2018.

3.2 Quality Assurance/Quality Control

QA/QC procedures assist in producing data of acceptable quality and reliability. We reviewed the analytical results for laboratory QC samples and conducted our own QA assessment for this project. We reviewed the COC records and laboratory-receipt forms to check custody was not breached, sample holding-times were met, and the samples were properly handled from the point of collection through analysis by the laboratory. Our QA

review procedures allowed us to document the accuracy and precision of the analytical data, as well as check the analyses were sufficiently sensitive to detect analytes at levels below regulatory standards.

Laboratory QC procedures included evaluating surrogate recovery, performing continuing calibration checks, and analyzing method blanks, laboratory control samples (LCS), and matrix spikes (MS) to assess accuracy and precision. LCS, LCS duplicate (LCSD), and surrogate recovery analyses were performed to evaluate the accuracy of the analytical process. Analytical precision was assessed by comparing the results of duplicate analyses performed on LCS/LCSD and duplicate-sample pairs.

QC procedures in the field included using single-use equipment in most cases to reduce the potential for sample cross-contamination. When using reusable equipment such as a submersible pump, we collected an equipment blank (EB) sample using laboratory-grade PFAS-free water. The laboratory reports contain a case narrative and forms documenting sample-receipt conditions. Details regarding the results of our QA review are presented below. The TestAmerica laboratory reports (20 WOs) and corresponding ADEC Laboratory Data Review Checklist are presented in Appendix C. During our QC review we applied a standardized set of flags indicating estimated data or analytical bias for data brought into question during the review.

3.2.1 Sample Handling

Private-well samples collected by Shannon & Wilson were shipped to TestAmerica in Sacramento, California as described in Section 3.3. Sample-receipt forms for each WO were checked to verify samples were received in good condition and within the acceptable temperature range. The ADEC considers samples received free of ice and at temperatures between 0 °C and 6 °C as acceptable. Samples were generally received in good condition, properly preserved, and within the acceptable temperature range upon arrival at the laboratory.

COC records for each WO were also reviewed to confirm information was complete, custody was not breached, and samples were analyzed within the acceptable holding time. COC records were complete and correct, with the exception of some minor discrepancies that did not have an effect on data quality or usability (see checklists for details).

Samples were collected in accordance with our sampling procedures described in Section 2.2, with the following exceptions:

- Project samples *120332, 120472, 153354, 462659, 153699,* and *510220.2* are considered estimated due to sampling method deviations and flagged 'J*' in the analytical tables.

- Sample *152251* exceeded instrument calibration range for PFOS. The PFOS result for this sample is considered estimated and has been flagged 'J*' in the analytical tables.

3.2.2 Analytical Sensitivity

The laboratory's method detection limit (MDL) is the lowest analyte concentration that can be measured. The laboratory's reporting limit (RL) is the lowest analyte concentration that can be routinely measured in the sampled matrix with confidence, the point at which a concentration is considered quantitative. Sample matrix, instrument performance, sample dilutions, and other factors may affect the MDL and RL. Analytes may be present in samples at concentrations below the reporting limits. In cases where analytes were not detected at concentrations above their MDL, the analytical results are presented in our data-summary tables with reference to their RLs. For example, a sample that does not contain an analyte at a concentration greater than its MDL and has an RL of 2.0 ppt would be tabulated as "<2.0 ppt," where "<" indicates the analyte was not detected above the MDL. If the analyte is detected between the MDL and the RL, its concentration is considered an estimate; in our tables, this value is flagged with a 'J'. This flag is applied by the laboratory. Laboratory RLs of the requested PFAS analysis for analytical samples collected between May and December 2018 were adequate for report preparation and data analysis.

Laboratory method blanks (MBs) were also analyzed in association with samples collected for this project to check for contributions to the analytical results possibly attributable to laboratory-based contamination. Project samples are only affected by the MB detections if the sample has a reported detection within ten times the method blank detection in the associated preparatory batch.

The project analytes were not detected in the reported MB samples at affected concentrations with one exception. Project sample *407330* was affected by the method blank detection for PFOS. The PFOS result for this sample is considered estimated, biased high, and flagged 'JH*' in the analytical tables.

EBs were collected to assess the possibility of sample contamination from sampling equipment. EBs were collected following equipment decontamination procedures after collecting project samples *120782* and *510238.2*. Project analytes were not detected in the EB samples associated with this project.

3.2.3 Accuracy

Accuracy refers to determining the correct analyte concentration and is a comparison between the measured value and a known or expected value. Laboratory analytical accuracy is assessed through the analyte recoveries from LCS/LCSD analyses, and the recovery of

isotopes added to project samples. The LCS/LCSDs are spikes of known analyte concentrations added to a clean matrix. Isotope dilution analyte (IDA) recovery, which entails adding a 13C-isotope of each target analyte and assessing its recovery, are discussed as surrogates for this method.

The laboratories LCS, LCSD, and surrogate recoveries were within laboratory acceptance criteria, with one exception. Sample *173363* had an IDA recovery failure for PFNA. The associated analyte was not detected in the project sample. The result is considered estimated and flagged "J*" in the analytical tables.

3.2.4 Precision

Field-duplicate samples were collected at a frequency of approximately 10 percent of the overall number of samples collected during the reporting period, to evaluate the precision of analytical measurements, as well as the reproducibility of the sampling technique. The relative percent difference (RPD; difference between the sample and its field duplicate divided by the mean of the two) was calculated to evaluate the precision of the data. An RPD was evaluated only if the results of the analyses for both duplicates were detected.

Results of RPD calculations for each of these duplicate-sample sets met the data quality objective (DQO) of 30 percent for water samples, where calculable, with the following exceptions:

- Field-duplicate sample pair *120081* and *120181* have RPD failures for PFOS. The results for these samples are considered estimated (no direction of bias) and are flagged 'J*' for both samples in the analytical tables.
- Field-duplicate sample pair *511238.1* and *510338.1* have RPD failures for PFHpA and PFNA. The results for these samples are considered estimated (no direction of bias) and are flagged 'J*' for both samples in the analytical tables.

Laboratory analytical precision can also be evaluated by laboratory RPD calculations using the LCS/LCSD or laboratory duplicate sample results. Results of RPD calculations for each of these duplicate samples met laboratory limits.

3.2.5 Data Quality Summary

By working in general accordance with our proposed scope of services, we consider the samples we collected for this project to be representative of site conditions at the locations and times they were obtained. Based on our QA review, no samples were rejected as unusable due to QC failures. In general, the quality of the analytical data for this project does not appear to have been compromised by analytical irregularities and is adequate for the purposes of our assessment.

4 DISCUSSION AND RECOMMENDATIONS

We present here our discussion relevant to PFAS in groundwater at and downgradient of the FAI.

4.1 Comparison to Action Levels

Of the 190 private wells sampled near the FAI from November 2017 to December 2018, 104 wells were found to have PFAS concentrations exceeding the ADEC action level in one or more sampling event. Of these, 41 exceeded the ADEC action level in a sample collected from May to December 2018 (Table 2, May 2018 to December 2018 Private Well Analytical Results). These locations are categorized as follows:

- 13 are category 1 wells,
- 4 are category 2 wells,
- 17 are category 3 wells,
- 5 are category 4 wells, and
- 2 are category 5 wells.

Most private-well exceedances are located on and near Dale Road in Area 2, followed by Areas 3 and 1 (Figure 1, Well Search Extent). Two private-well exceedances are in Area 6, across the Chena River from the FAI (Figure 2, PFAS Sample and Section Locations). There are no properties with private well exceedances in Areas 4, 5, 7, 8, or 9.

Our first private well summary report proposed a working definition of the PFOS and PFOA PFAS-impacted area (Figure 5, Quarterly and Annual Well Monitoring Network). Although the action level has changed since this working definition was prepared, each well with a concentration above one-half of the ADEC action level falls within the previously defined area. We do not recommend re-defining the impacted area. However, please note the boundaries are based on our interpretation of available private-well samples and should not be construed as a precise plume boundary. We anticipate the impacted area boundary will be refined as part of the site-characterization process.

PFOS was most frequently the highest detected PFAS in private wells tested to date, followed by PFHxS. In most cases, the other three compounds summed as part of the ADEC action level (PFOA, PFNA, and PFHpA) had concentrations well below that of PFOS and PFHxS. The sum of five PFAS concentrations for nearby and adjacent private wells varied widely, in some cases by over an order of magnitude (Figure 2).

In addition to exceedances of the ADEC action level and proposed groundwater-cleanup level, there were seven wells sampled during this time period with PFOS results exceeding the current ADEC groundwater-cleanup level of 400 ppt. There are no PFOA results exceeding the current groundwater-cleanup level for PFOA, also 400 ppt (Table 2).

4.2 Concentrations with Depth

As part of our well search we collected data on well depth and presence or absence of permafrost, where known. We divided well depths into three categories: confident (i.e., measured, from well log or well driller); reported by owner, occupant, or developer; and estimated. Well depth is considered confident or reported for 50 percent of identified private wells, and considered estimated for another 12 percent. Permafrost information is known for only approximately 3 percent.

We have prepared cross-sections depicting sum of five PFAS concentrations with depth at two locations within the study area. Please note the sections include estimated depths. Well depth is plotted with respect to the approximately local ground surface, per the Alaska Division of Geological & Geophysical Surveys (DGGS, 2010).

Figure 3, Cross Section A-A', extends from south-southeast to north-northwest across the Chena River, approximately perpendicular to the inferred summertime groundwater flow direction (Glass et. al., 1996). The end points are the North Terminal Pond near the FAI exit to Airport Way and Chena Small Tracks Road. Cross Section A-A' includes private wells within a search radius of 1,000 feet from the section line, as shown in Figure 2. Permafrost information is projected from greater than 1,000 feet because there were no well logs containing permafrost within the search radius.

Most of the wells displayed in Cross Section A-A' have concentrations exceeding the ADEC action level. However, in the northern portion of Area 3 wells with self-reported depths greater than approximately 85 feet appear to have lower PFAS concentrations. The wells with concentrations below the action level, from south to north, were an estimated 158 feet, reported 110 feet, reported 87 feet, reported 165 feet, and reported 115 feet.

Sample locations are projected onto the cross-section by right angle, therefore some wells located on the Chena Pump Road or north side of the Chena River appear to plot on the south side of the river. In Cross Section A-A', PFAS were not detected in each well sampled on the north side of the river, regardless of depth.

Figure 4, Cross Section B-B', extends approximately 1.5 miles parallel to the Chena River and includes a search radius of 500 feet. The B-B' location is unchanged from our first private well summary report. Its end points are Tall Spruce Road in Area 6, and near the

intersection of Dale Road and Mail Trail Road in Area 1. On the FAI side of the Chena River, we continue to observe high variability in concentrations between nearby wells of reportedly similar depths. On Tall Spruce Road, the deeper wells appear to contain lower levels of PFAS than the shallower wells.

4.3 Trend Analysis

Table 3, Historical PFAS Results for Resampled Wells, compares results over time for private wells sampled during quarterly or annual monitoring events. We assessed trends using a Mann-Kendall nonparametric trend analysis at a 95 percent confidence level and Monitoring and Remediation Optimization System (MAROS) evaluation (Gilbert, 1987; Aziz, et. al., 2016). The MAROS evaluation was developed by the Air Force Center for Engineering and the Environment to assess concentration trends with confidence levels below 95 percent. MAROS further discriminates between "no trend" and "stable" contaminant concentrations by evaluating the Mann- Kendall trend statistic, confidence in trend, and coefficient of variation. We performed these tests on PFOS, PFOA, PFHpA, PFHxS, PFNA, and the sum of five PFAS concentrations using the EPA's Statistical Software ProUCL, version 5.1.

Trends analysis requires analytical data from a minimum of four sampling events to evaluate temporal trends. However, eight or more data points are preferred for reliable statistical analyses (EPA Office of Recourse Conservation and Recovery, 2009). We did not evaluate trends for analytes with one or more non-detected results. The PFOS, PFOA, PFHxS, and sum of five PFAS concentration for the ten locations meeting these requirements are plotted as individual line graphs in Figure 6, and displayed in Table 3. Please note the line graphs are scaled for comparison within each sample location.

Our analysis did not identify a trend in sum of five PFAS concentrations for seven locations: samples *151637, 153699, 173860, 173916, 176222, 407364*, and *550132*. However, a "no-trend" determination based on four data points may not equate to a long-term lack of a discernable increasing, decreasing, or stable trend. The MAROS evaluation identified three locations with stable trends in sum of five PFAS concentrations: samples *151203, 176095,* and *521809*. Samples *176095* and *521809* are from adjacent wells in the center of Area 1. As we continue to sample private wells in the PFAS-impacted area on a quarterly and annual basis, we will further evaluate temporal trends in these wells.

If seasonal variation in PFAS concentrations exists, it would not be identified as part of a standard Mann-Kendall or MAROS evaluation. A statistical evaluation of seasonal trends requires multiple analytical results for each season. For the 11 private wells sampled during four consecutive quarterly events (February, May, August, and November 2018), the August

sum of five PFAS result is typically among the highest. More information it needed to determine if August is the seasonal maximum for most private wells in the impacted area.

4.4 Future Work

Additional quarterly sampling took place in February 2019, following the same criteria used to resample wells in November 2018 (see Section 2.5.3). The results of this private well monitoring event will be reported separately.

The FAI has contracted three other environmental consulting firms to participate in their PFAS assessment effort from May 2017 to present. Following our review of the other consultants' reports and analytical data, we will develop a plan for additional site-characterization activities to address data gaps on and off FAI property. Site characterization may include groundwater monitoring well installation to assess the lateral and vertical extent of the PFAS groundwater plume, additional soil sampling near ARFF training and testing areas, or other related activities.

4.5 Recommendations

Based on our private well search and sampling effort completed between November 2017 and December 2018, we recommend the FAI continue to:

- provide an interim alternate water source to the occupants of homes and businesses with category 1 and 2 wells exceeding the ADEC action level;
- implement the current plan to connect remaining homes and businesses with category 1 and 2 wells exceeding the ADEC action level to the CUC water system;
- request that property owners discontinue use of wells exceeding the ADEC action level;
- sample select private wells in the PFAS-impacted area quarterly or annually, depending on PFAS concentrations and well use (Figure 5);
- work with the ADEC and DHSS to educate the public regarding the potential health effects of exposure to PFAS-containing water; and
- refrain from discharging PFAS-containing AFFF to the groundwater from ARFF training and equipment testing.

We recommend collecting additional private wells samples from within the PFAS-impacted area if property owners or occupants who initially declined sampling request that we do so, properties with unknown well status respond, new construction occurs, or property ownership changes. We further recommend continuing to follow up with properties under construction and those where sales are pending, that we have observed or may observe during private well monitoring within the impacted area.

Our recommendations are based on:

- Offsite groundwater conditions inferred through private well analytical water samples collected from May 8 and December 12, 2018.
- The results of testing performed on water samples we collected from the private wells at, near, and downgradient from the FAI.
- Our previous experience at and near the FAI.
- Well construction details reported by owners and occupants, and well logs obtained from the DNR WELTS beginning in November 2017.
- Publicly available literature and data including Aziz, et. al., 2016; Gilbert, 1987; Glass et. al., 1996; and Nelson, 1978.
- Our understanding of the project and information provided by the FAI, ARFF, DRM, and other members of the project team.
- The limitations of our approved scope, schedule, and budget described in our approved Scope of Services dated December 7, 2017, and May 4 and June 11, 2018.

The information included in this report is based on limited sampling and should be considered representative of the times and locations at which the sampling occurred. Regulatory agencies may reach different conclusions than Shannon & Wilson. We have prepared and included the attachment "Important Information about your Geotechnical/Environmental Report" to assist you and others in understanding the use and limitations of this report.

5 REFERENCES

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Table 1 contains personal information. Content has been removed for confidentiality.

Table 2 - MAY 2018 TO DECEMBER 2018 PRIVATE WELL ANALYTICAL RESULTS

			Analyte	Perluoro-butane sulfonic acid (PFBS)	Perfluoro-heptanoic acid (PFHpA)	Perfluoro-octanoic acid (PFOA)	Perfluoro-nonanoic acid (PFNA)	Perfluoro-hexane sulfonic acid (PFHxS)	Perfluoro-octane sulfonate (PFOS)	LHA Combined (PFOS + PFOA)	Sum of 5 PFAS§
			Action Level	2,000	70§					70†	70§
Sample Name	Address	Sample Date	Well Category	ppt	ppt	ppt	ppt	ppt	ppt	ppt	ppt
120006	[redacted]	06/18/18	4	33	16	22	<2.0	130	590	612	758 ‡
120081		06/15/18	3	32	21	27	3.3	150	940 J*	967 J*	1,141 J*
120181		06/15/18	3	33	21	29	4.4	150	1,300 J*	1,329 J*	1,504 J*
120227		05/24/18	3	6.1	4.7	6.0	<2.0	30	250	256	291 ‡
120332		08/17/18	1	15 J*	7.1 J*	15 J*	<2.0 J*	78 J*	470 J*	485 J*	570 J*‡
120413		05/15/18	3	23	6.8	16	<2.0	110	470	486	603 ‡
120513		05/15/18	3	23	6.6	17	<2.0	110	450	467	584 ‡
120472		08/16/18	4	20 J*	12 J*	16 J*	<2.0 J*	97 J*	530 J*	546 J*	655 J*‡
120774		08/21/18	1	1.4 J	<2.0	2.1	<2.0	6.0	3.1	5.2	11 ‡
120874		08/21/18	1	1.4 J	<2.0	2.0	<2.0	6.1	3.0	5.0	11 ‡
120782		05/29/18	1	1.8 J	<2.0	2.2	<2.0	6.9	4.8	7.0	14 ‡
120804		11/15/18	2	49	59	49	<2.0	180	110	159	398 ‡
136891		08/27/18	4	15	3.7	3.0	<2.0	44	8.0	11	59 ‡
136891		11/14/18	4	20	4.5	2.5	<2.0	52	7.1	9.6	66 ‡
151203		05/09/18	1	5.2	1.7 J	3.4	<2.0	12	36	39	53 J‡
151203		08/08/18	1	4.5	1.9 J	3.4	1.6 J	12	40	43	59 J
151203		11/15/18	1	4.4	1.8 J	2.7	<2.0	11	36	39	52 J‡
151637		05/08/18	1	1.2 J	<2.0	0.88 J	<2.0	2.9	6.2	7.1 J	10.0 J‡
151637		08/27/18	1	1.8 J	<2.0	1.0 J	<2.0	3.9	6.6	7.6 J	12 J‡
151637		11/15/18	1	1.9 J	<2.0	0.79 J	<2.0	4	6.4	7.2 J	11 J‡
152251		09/14/18	3	15	13	13	1.9 J	71	390 J *	403 J *	489 J *
152315		06/13/18	1	9.3	4.6	7.3	1.6 J	25	120	127	159 J
152471		05/24/18	3	7.2	3.7	5.3	0.95 J	22	74	79	106 J
152480		09/26/18	4	15	4.7	4.5	0.65 J	39	55	60	104 J
152617		05/16/18	3	94	6.1	6.8	<2.0	20	21	28	54 ‡
152617		08/21/18	3	73	5.8	7.4	<2.0	21	24	31	58 ‡
152889		07/03/18	3	20	7.0	8.1	0.84 J	41	88	96	145 J
153354		06/18/18	3	34 J*	9.0 J*	11 J*	1.7 J*	55 J*	76 J*	87 J*	153 J*
153419		05/24/18	3	23	9.0	11	0.66 J	41	30	41	92 J
153699		05/11/18	1	41	5.1	2.3	<2.0	38	4.9	7.2	50 ‡
153699		08/21/18	1	42	5.4	2.7	<2.0	43	5.4	8.1	57 ‡
153699		11/15/18	1	43 J*	5.2 J*	2.2 J*	<2.0 J*	42 J*	4.9 J*	7.1 J*	54 J*‡
153826		06/11/18	3	31	10	43	1.3 J	80	90	133	224 J
153907		05/11/18	3	21	7.0	11	1.4 J	60	100	111	179 J
153915		05/11/18	3	18	7.5	7.6	1.1 J	71	93	101	180 J
153982		05/24/18	3	16	6.8	6.6	0.99 J	51	81	88	146 J
173002		08/16/18	1	5.1	2.4	2.9	<2.0	29	4.7	7.6	39 ‡
173002		11/12/18	1	2.9	1.5 J	1.7 J	<2.0	18	3.8	5.5 J	25 J‡
173363		11/15/18	1	<2.0	<2.0	<2.0	<2.0 J*	<2.0	<2.0	N/A	N/A
173463		11/15/18	1	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	N/A	N/A
173860		05/09/18	1	50	5.8	3.4	<2.0	40	6.7	10	56 ‡
173860		08/23/18	1	53	6.0	3.4	<2.0	43	6.7	10	59 ‡
173860		11/14/18	1	50	5.7	2.8	<2.0	41	6	8.8	56 ‡

Table 2 - MAY 2018 TO DECEMBER 2018 PRIVATE WELL ANALYTICAL RESULTS

Analyte				Perluoro-butane sulfonic acid (PFBS)	Perfluoro-heptanoic acid (PFHpA)	Perfluoro-octanoic acid (PFOA)	Perfluoro-nonanoic acid (PFNA)	Perfluoro-hexane sulfonic acid (PFHxS)	Perfluoro-octane sulfonate (PFOS)	LHA Combined (PFOS + PFOA)	Sum of 5 PFAS§
Action Level				2,000	70§					70†	70§
Sample Name	Address	Sample Date	Well Category	ppt	ppt	ppt	ppt	ppt	ppt	ppt	ppt
173908	[redacted]	05/09/18	2	49	18	9.8	<2.0	220	6.7	17	255 ‡
173908		08/16/18	2	42	13	8.4	<2.0	180	6.2	15	208 ‡
173916		05/09/18	1	<2.0	<2.0	0.87 J	<2.0	2.0	1.7 J	2.6 J	4.6 J‡
173916		08/15/18	1	<2.0	<2.0	0.77 J	<2.0	1.8 J	1.6 J	2.4 J	4.2 J‡
173916		11/14/18	1	<2.0	<2.0	0.78 J	<2.0	2.2	1.6 J	2.4 J	4.6 J‡
174016		11/14/18	1	<2.0	<2.0	<2.0	<2.0	2.3	1.6 J	1.6 J‡	3.9 J‡
173924		06/18/18	4	3.5	<2.0	<2.0	<2.0	3.7	<2.0	N/A	3.7 ‡
173975		11/30/18	1	<2.0	<2.0	<2.0	<2.0	1.7 J	1.7 J	1.7 J‡	3.4 J‡
174254		05/16/18	1	9.1	5.4	10	1.3 J	25	71	81	113 J
174271		05/08/18	1	11	4.9	7.5	<2.0	21	52	60	85 ‡
174751		06/19/18	3	18	8.5	13	<2.0	68	360	373	450 ‡
174947		06/11/18	3	14	7.2	10	<2.0	58	340	350	415 ‡
176044		05/08/18	1	4.5	<2.0	15	<2.0	32	42	57	89 ‡
176044.4		08/15/18	3	45	87	86	<2.0	310	450	536	933 ‡
176044.5		08/15/18	5	68	<2.0	170	<2.0	470	1,000	1,170	1,640 ‡
176095		05/09/18	2	0.96 J	<2.0	3.2	<2.0	5.1	3.8	7.0	12 ‡
176095		08/07/18	2	<2.0	1.4 J	2.9	6.9	4.9	3.4	6.3	20 J
176095		11/20/18	2	1.0 J	1.7 J	3.1	<2.0	5.5	3.8	6.9	14 J‡
176222		05/08/18	1	1.6 J	0.96 J	5.4	<2.0	10	6.3	12	23 J‡
176222		08/10/18	1	1.3 J	2.2	4.7	9.3	8.2	5.3	10	30
176222		12/05/18	1	1.7 J	2.8	5.8	<2.0	11	6.4	12	26 ‡
176397		05/09/18	1	10	74	40	<2.0	78	24	64	216 ‡
176397		08/08/18	1	7.7	60	53	54	65	23	76	255
176435		08/15/18	1	9.4	2.6	3.9	<2.0	41	7.5	11	55 ‡
176435		11/14/18	1	10	3	3.8	<2.0	47	7.7	12	62 ‡
176729		05/09/18	1	0.95 J	<2.0	1.7 J	<2.0	5.1	2.3	4.0 J	9.1 J‡
375896		05/24/18	3	11	6.3	8.6	1.2 J	46	91	100	153 J
391247		08/16/18	3	4.7	2.3	2.7	<2.0	31	4.1	6.8	40 ‡
407313		08/10/18	1	<2.0	<2.0	<2.0	<2.0	0.92 J	<2.0	N/A	0.92 J‡
407313		11/15/18	1	<2.0	<2.0	1.3 J	<2.0	1.2 J	<2.0	1.3 J‡	2.5 J‡
407364		05/10/18	1	<2.0	0.80 J	2.1	<2.0	2.1	1.9 J	4.0 J	6.9 J‡
407364		08/10/18	1	3.2	7.2	17	11	23	4.7	22	63
407464		08/10/18	1	3.3	6.8	17	10	23	4.5	22	61
407364		11/15/18	1	2.1	4.2	11	<2.0	15	5.2	16	35 ‡
407372		05/10/18	1	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	N/A	N/A
407372		11/12/18	1	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	N/A	N/A
443239		06/21/18	4	<2.0	<2.0	5.9	<2.0	5.8	<2.0	5.9 ‡	12 ‡
462659		08/02/18	2	<2.0 J*	<2.0 J*	<2.0 J*	<2.0 J*	1.4 J*	<2.0 J*	N/A	1.4 J*‡
483532		11/14/18	1	2.8	1.0 J	1.2 J	<2.0	9.3	1.5 J	2.7 J	13 J‡
483541		08/16/18	1	18	5.5	3.8	<2.0	71	3.6	7.4	84 ‡
510220.1		05/11/18	1	43	21 J*	63	<2.0	170	140	203	394 J*‡
510320.1		05/11/18	1	44	7.5 J*	62	<2.0	170	140	202	380 J*‡
510220.2		05/11/18	1	55 J*	11 J*	83 J*	<2.0 J*	210 J*	160 J*	243 J*	464 J*‡

Table 2 - MAY 2018 TO DECEMBER 2018 PRIVATE WELL ANALYTICAL RESULTS

				Perluoro-butane sulfonic acid (PFBS)	Perfluoro-heptanoic acid (PFHpA)	Perfluoro-octanoic acid (PFOA)	Perfluoro-nonanoic acid (PFNA)	Perfluoro-hexane sulfonic acid (PFHxS)	Perfluoro-octane sulfonate (PFOS)	LHA Combined (PFOS + PFOA)	Sum of 5 PFAS§
			Analyte								
			Action Level	2,000	70§					70†	70§
Sample Name	Address	Sample Date	Well Category	ppt	ppt	ppt	ppt	ppt	ppt	ppt	ppt
510238.1	[redacted]	10/03/18	5	38	<2.0 J*	100	<2.0	190	76	176	366 J*‡
510338.1		10/03/18	5	38	29 J*	100	12 J*	200	77	177	418 J*
510238.2		10/04/18	5	51	<2.0	100	<2.0 J*	240	70	170	410 J*‡
521809		05/15/18	2	3.4	7.4	13	<2.0	20	19	32	59 ‡
521809		08/16/18	2	4.2	<2.0	15	<2.0	23	20	35	58 ‡
526932		05/15/18	3	17	4.6	6.6	0.76 J	27	60	67	99 J
542512		05/10/18	1	83	21	11	<2.0	250	6.3	17	288 ‡
542512		08/10/18	1	69	19	11	1.8 J	240	6.0	17	278 J
542547		05/16/18	2	100	34	31	<2.0	130	1.9 J	33 J	197 J‡
550116		05/09/18	1	10	2.7	5.5	<2.0	41	12	18	61 ‡
550216		05/09/18	1	9.5	2.6	5.4	<2.0	40	12	17	60 ‡
550116		08/29/18	1	7.9	4.5	5.1	8.4	36	13	18	67
550124		05/08/18	1	5.3	11	19	<2.0	30	19	38	79 ‡
550124		08/08/18	1	5.0	12	16	46	26	17	33	117
550132		05/11/18	1	2.9	<2.0	3.1	<2.0	13	10	13	26 ‡
550132		08/08/18	1	2.4	1.8 J	3.2	7.0	12	10	13	34 J
550132		11/14/18	1	2.4	1.8 J	2.8	<2.0	12	10	13	27 J‡
561711		11/12/18	1	<2.0	<2.0	0.97 J	<2.0	<2.0	<2.0	0.97 J‡	0.97 J‡
569712		05/08/18	2	50	15	9.2	<2.0	190	6.8	16	221 ‡
569712		08/03/18	2	53	17	11	1.8 J	240	7.2	18	277 J
579645		08/14/18	1	5.5	3.5	3.5	<2.0	59	4.5	8.0	71 ‡
604691		12/12/18	1	4.8	2	2.9	<2.0	6.1	<2.0	2.9 ‡	11 ‡

ppt parts per trillion, equivalent to nanograms per liter
LHA Lifetime Health Advisory
† LHA level is 70 ppt for PFOS and PFOA combined; following ADEC guidance results are compared to 65 ppt.
§ Sum of 5 PFAS is equal to the sum of PFOS, PFOA, PFHxS, PFHpA, and PFNA. ADEC action level is 70 ppt; results are compared to 65 ppt.
< Analyte not detected; listed as less than the reporting limit (RL) unless otherwise flagged due to quality-control (QC) failures.
J Estimated concentration, detected greater than the method detection limit (MDL) and less than the RL. Flag applied by the laboratory.
J* Result considered estimated due to a QC failure. Flag applied by Shannon & Wilson, Inc.
‡ Minimum concentration, the LHA Combined or Sum of 5 PFAS concentration includes one or more result that is not detected greater than the MDL.
Bold Concentration exceeds action level
DUP Field-duplicate sample
N/A Not applicable. The LHA Combined or Sum of 5 PFAS concentration could not be calculated because one or more PFAS was not detected in the project sample.
Sample names are the Fairbanks North Star Borough (FNSB) Parcel Account Number (PAN). A sample name ending in .1, .2. 3, etc. indicates a location with more than one well per parcel.

Table 3 - HISTORICAL PFAS RESULTS FOR RESAMPLED WELLS

				Analyte	Perluorobutane sulfonic acid (PFBS)	Perfluoro-heptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluoro-nonanoic acid (PFNA)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonate (PFOS)	LHA Combined (PFOS + PFOA)	Sum of 5 PFAS§	Exceed LHA Level?	Exceed Sum of 5	Trend Analysis
				Action Level	2,000	70§					70†	70§			
Sample Name	Address	Sample Date	Well Category		ppt	ppt	ppt	ppt	ppt	ppt	ppt	ppt			
120774	[redacted]	01/10/18	1		1.2 J	<2.0	2.1	<2.0	5.4	2.8	4.8	10 ‡	No	No	Sample size too small
		08/21/18	1		1.4 J	<2.0	2.1	<2.0	6.1	3.1	5.2	11 ‡			
121401		12/13/17	1		<2.0	<2.0	0.81 J	<2.0	3.5	25	26 J	29 J‡	No	No	Sample size too small
		03/20/18	1		<2.0	<2.0	<2.0	<2.0	<2.0	9.6	9.6 ‡	9.6 ‡			
136891		01/02/18	4		20	4.0	2.7	<2.0	51	7.0	9.7	65 ‡	No	No to YES	Sample size too small
		08/27/18	4		15	3.7	3.0	<2.0	44	8.0	11	59 ‡			
		11/14/18	4		20	4.5	2.5	<2.0	52	7.1	9.6	66 ‡			
151203		01/24/18	1		4.8	2.1	3.8	1.6 J	12	41	45	60 J	No	No	Stable
		05/09/18	1		5.2	1.7 J	3.4	<2.0	12	36	39	53 J‡			
		08/08/18	1		4.5	1.9 J	3.4	1.6 J	12	40	43	59 J			
		11/15/18	1		4.4	1.8 J	2.7	<2.0	11	36	39	52 J‡			
151637		11/13/17	1		1.5 J	<2.0	0.76 J	<2.0	3.0	5.6	6.4 J	9.4 J‡	No	No	No trend
		05/08/18	1		1.2 J	<2.0	0.88 J	<2.0	2.9	6.2	7.1 J	10.0 J‡			
		08/27/18	1		1.8 J	<2.0	1.0 J	<2.0	3.9	6.6	7.6 J	12 J‡			
		11/15/18	1		1.9 J	<2.0	0.79 J	<2.0	4.0	6.4	7.2 J	11 J‡			
152617		05/16/18	3		94	6.1	6.8	<2.0	20	21	28	54 ‡	No	No	Sample size too small
		08/21/18	3		73	5.8	7.4	<2.0	21	24	31	58 ‡			
153338		11/14/17	1		31	11	12	<2.0	51	51	63	125 ‡	No to YES	YES	Sample size too small
		02/20/18	1		31	9.7	12	2.9	51	55	67	131			
153699		12/22/17	1		34	4.4	2.5	<2.0	32	5.1	7.6	44 ‡	No	No	No trend
		05/11/18	1		41	5.1	2.3	<2.0	38	4.9	7.2	50 ‡			
		08/21/18	1		42	5.4	2.7	<2.0	43	5.4	8.1	57 ‡			
		11/15/18	1		43 J*	5.2 J*	2.2 J*	<2.0 J*	42 J*	4.9 J*	7.1 J*	54 J*‡			
173002		11/24/17	1		2.5	1.1 J	1.4 J	<2.0	12	3.7	5.1 J	18 J‡	No	No	Sample size too small
		08/16/18	1		5.1	2.4	2.9	<2.0	29	4.7	7.6	39 ‡			
		11/12/18	1		2.9	1.5 J	1.7 J	<2.0	18	3.8	5.5 J	25 J‡			
173363		11/17/17	1		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	N/A	N/A	No	No	Sample size too small
		11/15/18	1		<2.0	<2.0	<2.0	<2.0 J*	<2.0	<2.0	N/A	N/A			
173860		11/16/17	1		41	4.7	2.7	<2.0	31	6.2	8.9	45 ‡	No	No	No trend
		05/09/18	1		50	5.8	3.4	<2.0	40	6.7	10	56 ‡			
		08/23/18	1		53	6.0	3.4	<2.0	43	6.7	10	59 ‡			
		11/14/18	1		50	5.7	2.8	<2.0	41	6.0	8.8	56 ‡			

Table 3 - HISTORICAL PFAS RESULTS FOR RESAMPLED WELLS

				Analyte	Perluorobutane sulfonic acid (PFBS)	Perfluoro-heptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluoro-nonanoic acid (PFNA)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonate (PFOS)	LHA Combined (PFOS + PFOA)	Sum of 5 PFAS§	Exceed LHA Level?	Exceed Sum of 5	Trend Analysis
				Action Level	2,000	70§					70†	70§			
Sample Name	Address	Sample Date	Well Category		ppt	ppt	ppt	ppt	ppt	ppt	ppt	ppt			
173908	[redacted]	11/14/17	2		45	14	7.3	<2.0	170	6.7	14	198 ‡	No	YES	Sample size too small
		05/09/18	2		49	18	9.8	<2.0	220	6.7	17	255 ‡			
		08/16/18	2		42	13	8.4	<2.0	180	6.2	15	208 ‡			
173916		11/14/17	1		<2.0	<2.0	<2.0	<2.0	2.0	1.7 J	1.7 J‡	3.7 J‡	No	No	No trend
		05/09/18	1		<2.0	<2.0	0.87 J	<2.0	2.0	1.7 J	2.6 J	4.6 J‡			
		08/15/18	1		<2.0	<2.0	0.77 J	<2.0	1.8 J	1.6 J	2.4 J	4.2 J‡			
		11/14/18	1		<2.0	<2.0	0.78 J	<2.0	2.3	1.6 J	2.4 J	4.6 J‡			
173975		11/16/17	1		<2.0	<2.0	<2.0	<2.0	2.0	2.0	2.0 ‡	4.0 ‡	No	No	Sample size too small
		11/30/18	1		<2.0	<2.0	<2.0	<2.0	1.7 J	1.7 J	1.7 J‡	3.4 J‡			
174254		11/21/17	1		8.9	5.2	8.6	<2.0	23	46	55	83 ‡	No to YES	YES	Sample size too small
		02/28/18	1		8.1	4.5	8.6	2.1	23	46	55	84			
		05/16/18	1		9.1	5.4	10	1.3 J	25	71	81	113 J			
		11/28/17	1		11	4.9	8.0	0.67 J	23	50	58	87 J			
174271		02/20/18	1		9.1	4.5	8.4	3.0	24	56	64	96	No	YES	Sample size too small
		05/08/18	1		11	4.9	7.5	<2.0	21	52	60	85 ‡			
174751		12/11/17	3		18	9.8	13	6.9	76	390	403	496	YES	YES	Sample size too small
		06/19/18	3		18	8.5	13	<2.0	68	360	373	450 ‡			
176044		11/18/17	1		2.9	8.9	10	<2.0	20	25	35	64 ‡	No	No to YES	Sample size too small
		02/13/18	1		3.4	10	13	26	25	32	45	106			
		05/08/18	1		4.5	<2.0	15	<2.0	32	42	57	89 ‡			
176095		11/17/17	2		1.2 J	1.8 J	3.6	<2.0	5.7	3.5	7.1	15 J‡	No	No	Stable
		05/09/18	2		0.96 J	<2.0	3.2	<2.0	5.1	3.8	7.0	12 ‡			
		08/07/18	2		<2.0	1.4 J	2.9	6.9	4.9	3.4	6.3	20 J			
		11/20/18	2		1.0 J	1.7 J	3.1	<2.0	5.5	3.8	6.9	14 J‡			
176222		11/15/17	1		1.4 J	2.5	4.9	<2.0	9.3	5.3	10	22 ‡	No	No	No trend
		05/08/18	1		1.6 J	0.96 J	5.4	<2.0	10	6.3	12	23 J‡			
		08/10/18	1		1.3 J	2.2	4.7	9.3	8.2	5.3	10	30			
		12/05/18	1		1.7 J	2.8	5.8	<2.0	11	6.4	12	26 ‡			
176397		11/14/17	1		10	57	32	40	88	26	58	243	No to YES	YES	Sample size too small
		05/09/18	1		10	74	40	<2.0	78	24	64	216 ‡			
		08/08/18	1		7.7	60	53	54	65	23	76	255			

Table 3 - HISTORICAL PFAS RESULTS FOR RESAMPLED WELLS

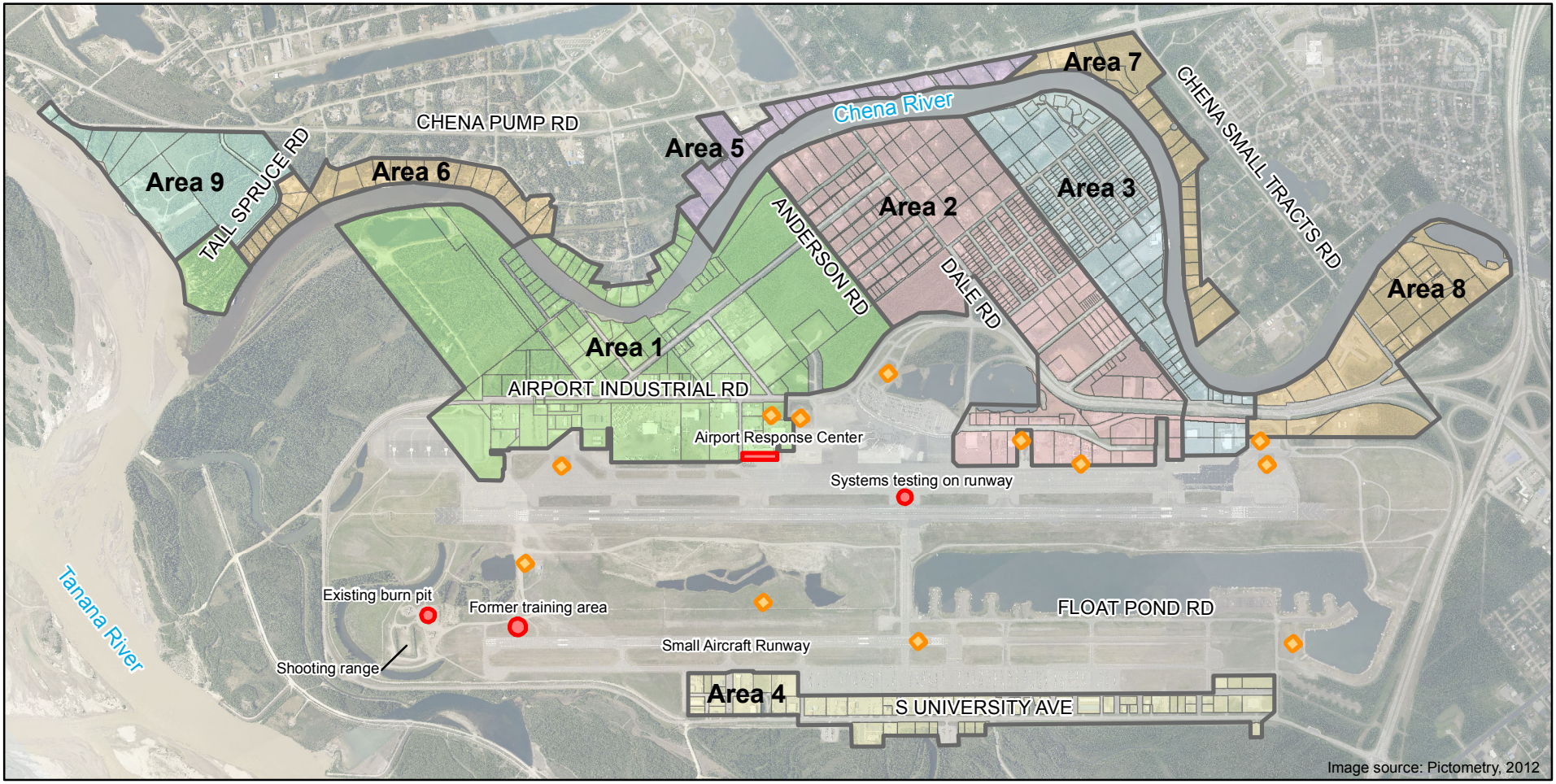
				Analyte	Perluorobutane sulfonic acid (PFBS)	Perfluoro-heptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluoro-nonanoic acid (PFNA)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonate (PFOS)	LHA Combined (PFOS + PFOA)	Sum of 5 PFAS§	Exceed LHA Level?	Exceed Sum of 5	Trend Analysis
				Action Level	2,000	70§					70†	70§			
Sample Name	Address	Sample Date	Well Category		ppt	ppt	ppt	ppt	ppt	ppt	ppt	ppt			
176435	[redacted]	11/17/17	1		9.8	2.6	3.5	<2.0	41	7.3	11	54 ‡	No	No	Sample size too small
		08/15/18	1		9.4	2.6	3.9	<2.0	41	7.5	11	55 ‡			
		11/14/18	1		10	3.0	3.8	<2.0	47	7.7	12	62 ‡			
391247		11/24/17	3		2.0	0.95 J	1.2 J	<2.0	9.2	3.5	4.7 J	15 J‡	No	No	Sample size too small
		08/16/18	3		4.7	2.3	2.7	<2.0	31	4.1	6.8	40 ‡			
407313		03/12/18	1		<2.0	1.4 J	9.8	<2.0	1.4 J	12	22	25 J‡	No	No	Sample size too small
		08/10/18	1		<2.0	<2.0	<2.0	<2.0	0.92 J	<2.0	N/A	0.92 J‡			
		11/15/18	1		<2.0	<2.0	1.3 J	<2.0	1.2 J	<2.0	1.3 J‡	2.5 J‡			
407330		03/12/18	1		4.3	8.0	26	17	34	9.7	36	95	No to YES	YES	Sample size too small
		06/28/18	1		11	<1.7	64	<1.7	82	21 JH*	85 JH*	167 JH*‡			
407348		12/22/17	1		5.9	12	37	<2.0	45	9.6	47	104 ‡	No to YES to No	YES	Sample size too small
		02/14/18	1		7.6	16	51	29	62	14	65	172			
		06/28/18	1		5.6	<1.9	30	<1.9	44	9.9	40	84 ‡			
		12/06/17	1		1.8 J	3.9	9.8	5.8 JH*	13	5.0	15	38 JH*			
407364		05/10/18	1		<2.0	0.80 J	2.1	<2.0	2.1	1.9 J	4.0 J	6.9 J‡	No	No	No trend
		08/10/18	1		3.3	7.2	17	11	23	4.7	22	63			
		11/15/18	1		2.1	4.2	11	<2.0	15	5.2	16	35 ‡			
407372		01/30/18	1		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	N/A	N/A	No	No	Insufficient data to calculate trend
		05/10/18	1		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	N/A	N/A			
		09/07/18	1		<2.0	<2.0	0.85 J	<2.0	1.0 J	<2.0	0.85 J‡	1.9 J‡			
		11/12/18	1		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	N/A	N/A			
483532		11/14/17	1		1.4 J	<2.0	<2.0	<2.0	1.9 J	1.4 J	1.4 J‡	3.3 J‡	No	No	Sample size too small
		11/14/18	1		2.8	1.0 J	1.2 J	<2.0	9.3	1.5 J	2.7 J	13 J‡			
483541		11/15/17	1		26	7.7	4.3	<2.0	92	4.2	8.5	108 ‡	No	YES	Sample size too small
		08/16/18	1		18	5.5	3.8	<2.0	71	3.6	7.4	84 ‡			
510220.1		11/14/17	1		39	20	56	<2.0	160	120	176	356 ‡	YES	YES	Sample size too small
		05/11/18	1		44	21 J*	63	<2.0	170	140	203	394 J*‡			
510220.2		11/14/17	1		48	26	74	<2.0	210	160	234	470 ‡	YES	YES	Sample size too small
		05/11/18	1		55 J*	11 J*	83 J*	<2.0 J*	210 J*	160 J*	243 J*	464 J*‡			
521809		11/17/17	2		4.2	9.9	17	<2.0	27	23	40	77 ‡	No	YES to No	Stable
		02/13/18	2		4.5	9.8	19	35	28	25	44	117			
		05/15/18	2		3.4	7.4	13	<2.0	20	19	32	59 ‡			
		08/16/18	2		4.2	<2.0	15	<2.0	23	20	35	58 ‡			

Table 3 - HISTORICAL PFAS RESULTS FOR RESAMPLED WELLS

Analyte				Perluorobutane sulfonic acid (PFBS)	Perfluoro-heptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluoro-nonanoic acid (PFNA)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonate (PFOS)	LHA Combined (PFOS + PFOA)	Sum of 5 PFAS§	Exceed LHA Level?	Exceed Sum of 5	Trend Analysis
Action Level				2,000	70§					70†	70§			
Sample Name	Address	Sample Date	Well Category	ppt	ppt	ppt	ppt	ppt	ppt	ppt	ppt			
542512	[redacted]	12/07/17	1	89	22	9.8	<2.0	240	6.0	16	278 ‡	No	YES	Sample size too small
		05/10/18	1	83	21	11	<2.0	250	6.3	17	288 ‡			
		08/10/18	1	69	19	11	1.8 J	240	6.0	17	278 J			
542547		03/19/18	2	80	30	34	1.9 J	97	1.8 J	36 J	165 J	No	YES	Sample size too small
		05/16/18	2	100	34	31	<2.0	130	1.9 J	33 J	197 J‡			
550116		11/16/17	1	8.2	4.5	4.7	<2.0	33	12	17	54 ‡	No	No to YES	Sample size too small
		05/09/18	1	10	2.7	5.5	<2.0	41	12	18	61 ‡			
		08/29/18	1	7.9	4.5	5.1	8.4	36	13	18	67			
550124		11/17/17	1	4.8	15	17	50	28	16	33	126	No	YES	Sample size too small
		05/08/18	1	5.3	11	19	<2.0	30	19	38	79 ‡			
		08/08/18	1	5.0	12	16	46	26	17	33	117			
550132		11/16/17	1	2.4	<2.0	2.7	<2.0	12	8.7	11	23 ‡	No	No	No trend
		05/11/18	1	2.9	<2.0	3.1	<2.0	13	10	13	26 ‡			
		08/08/18	1	2.4	1.8 J	3.2	7.0	12	10	13	34 J			
		11/14/18	1	2.4	1.8 J	2.8	<2.0	12	10	13	27 J‡			
561711		01/30/18	1	<2.0	<2.0	1.0 J	<2.0	0.90 J	<2.0	1.0 J‡	1.9 J‡	No	No	Sample size too small
		11/12/18	1	<2.0	<2.0	0.97 J	<2.0	<2.0	<2.0	0.97 J‡	0.97 J‡			
569712		11/17/17	2	39	11	5.8	1.3 J	130	6.0	12	154 J	No	YES	Sample size too small
		05/08/18	2	50	15	9.2	<2.0	190	6.8	16	221 ‡			
		08/03/18	2	53	17	11	1.8 J	240	7.2	18	277 J			
579645		11/10/17	1	20	8.5	4.7	<2.0	110	5.4	10	129 ‡	No	YES	Sample size too small
		08/14/18	1	5.5	3.5	3.5	<2.0	59	4.5	8.0	71 ‡			

NOTES:

ppt	parts per trillion, equivalent to nanograms per liter
LHA	Lifetime Health Advisory
†	LHA level is 70 ppt for PFOS and PFOA combined; following ADEC guidance results are compared to 65 ppt.
§	Sum of 5 PFAS is equal to the sum of PFOS, PFOA, PFHxS, PFHpA, and PFNA. ADEC action level is 70 ppt; results are compared to 65 ppt.
<	Analyte not detected; listed as less than the reporting limit (RL) unless otherwise flagged due to quality-control (QC) failures.
J	Estimated concentration, detected greater than the method detection limit (MDL) and less than the RL. Flag applied by the laboratory.
J*	Result considered estimated due to a QC failure. Flag applied by Shannon & Wilson, Inc.
JH*	Result considered estimated and biased high, due to a QC failure. Flag applied by Shannon & Wilson, Inc.
‡	Minimum concentration, the LHA Combined or Sum of 5 PFAS concentration includes one or more result that is not detected greater than the MDL.
**	Sample results from 6/28/18 are reported for comparison purposes only. Laboratory reports and associated documents for these samples were reported separately and are not included as a part of this report.
Bold	Concentration exceeds action level
DUP	Field-duplicate sample
N/A	Not applicable. The LHA Combined or Sum of 5 PFAS concentration could not be calculated because one or more PFAS was not detected in the project sample.
	Mann-Kendall trend analysis at a 95% confidence level, and Monitoring and Remediation Optimization System (MAROS) evaluation, using the EPA statistics software ProUCL.
	Sample names are the Fairbanks North Star Borough (FNSB) Parcel Account Number (PAN). A sample name ending in .1, .2. 3, etc. indicates a location with more than one well per parcel.



LEGEND

- Area 1 Parcels
- Area 2 Parcels
- Area 3 Parcels
- Area 4 Parcels
- Area 5 Parcels
- Areas 6, 7, and 8 Parcels
- Area 9 Parcels
- Well Search Areas
- Aircraft Rescue and Firefighting (ARFF) Training Sites
- ARFF Emergency Response Sites

0 0.5

Miles

N

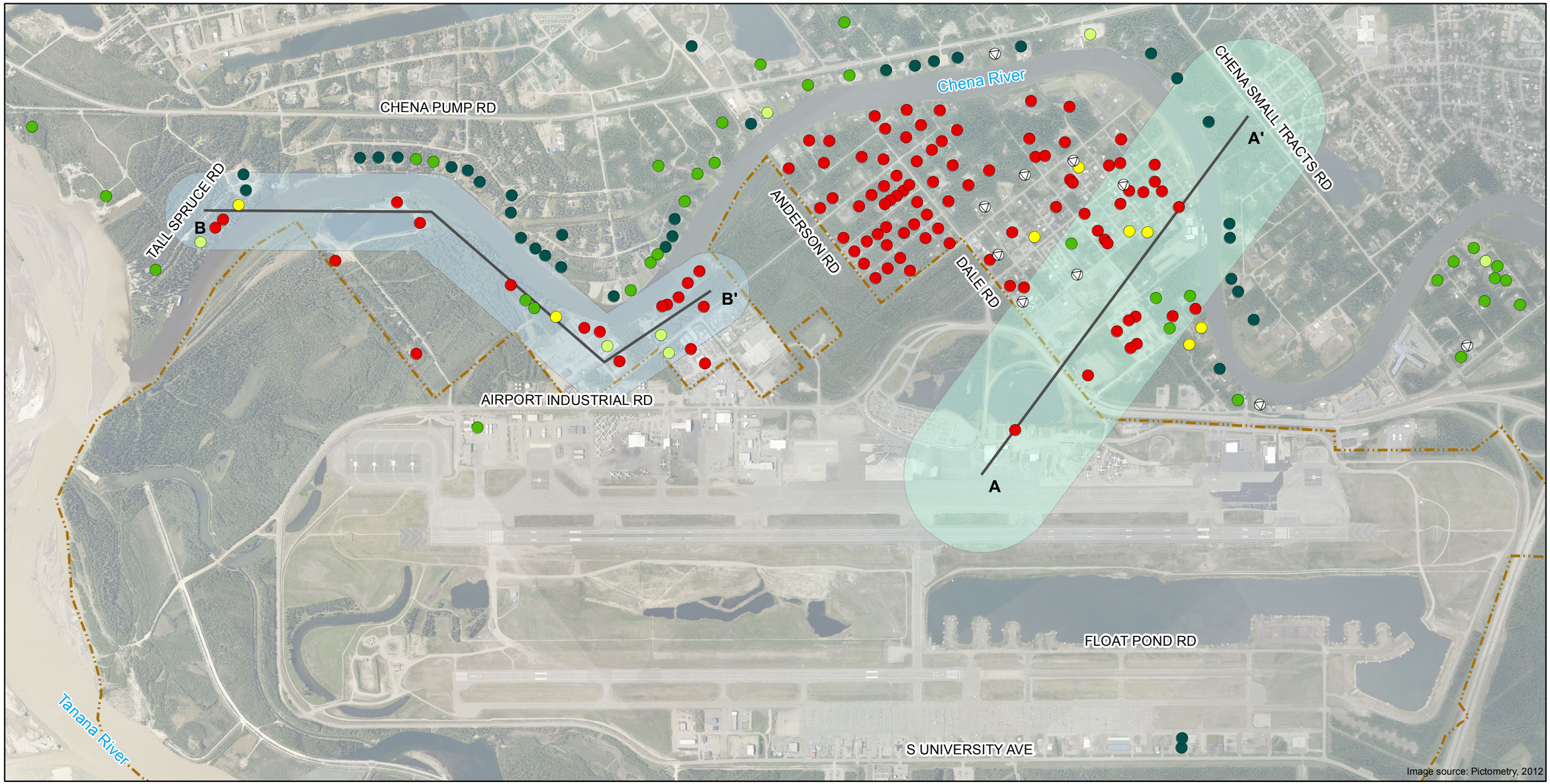
Fairbanks International Airport
Fairbanks, Alaska

WELL SEARCH EXTENT

March 2019 31-1-20060-002

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Figure 1



LEGEND

Maximum sum of PFOS, PFOA, PFHxS, PFHpA, and PFNA result for each well:

- ≤2.0 ppt
- 2.1 to 17 ppt
- 18 to 34 ppt
- 35 to 64 ppt
- ≥65 ppt

- Profile Location
- Profile A Search Radius
- Profile B Search Radius
- Refusal
- FAI Boundary

0 — 0.5 Miles

N

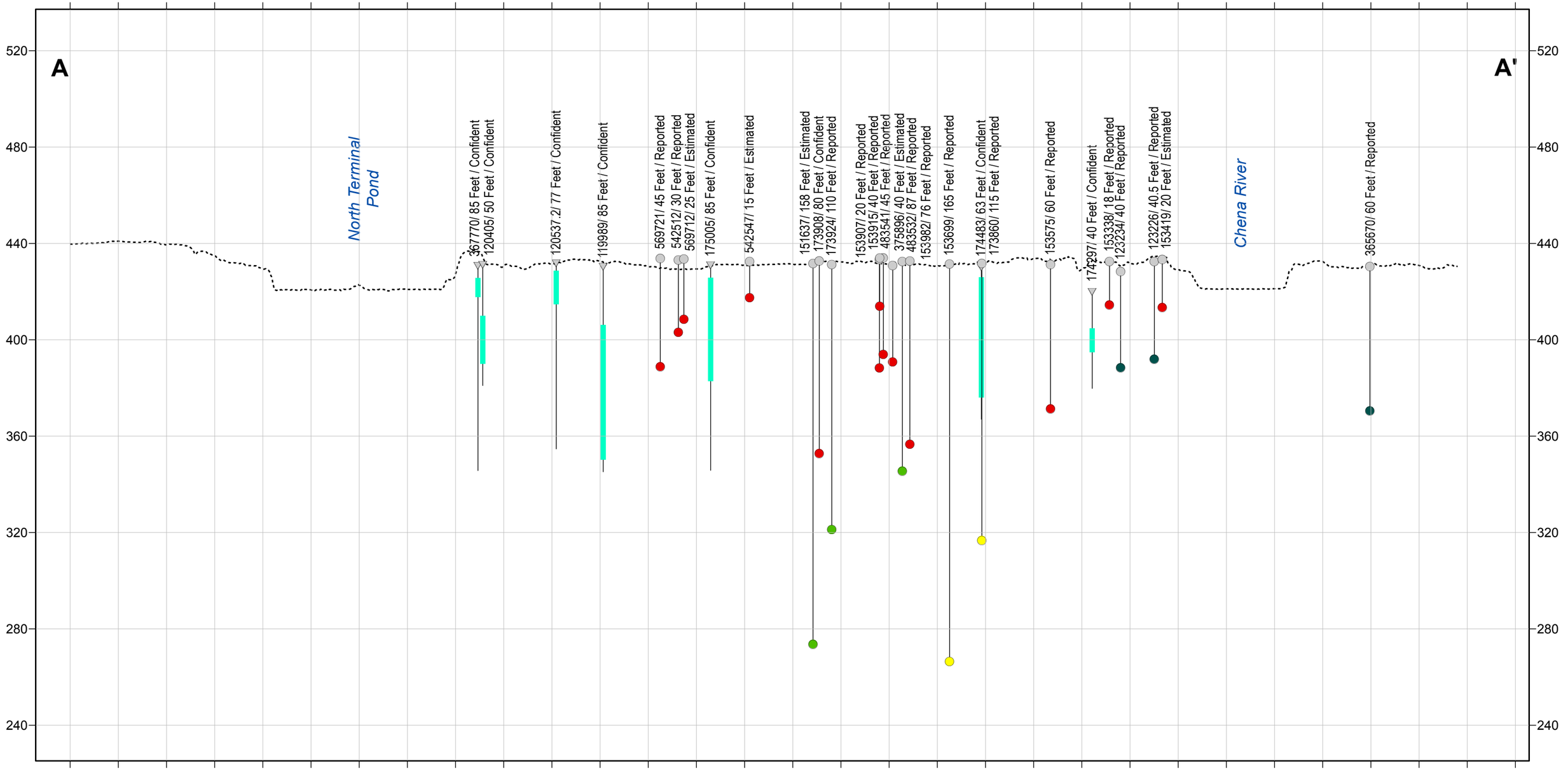
Fairbanks International Airport
Fairbanks, Alaska

PFAS SAMPLE AND SECTION LOCATIONS

March 2019 — 31-1-20060-002

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Figure 2



LEGEND

- Sample Name/ Well Depth/ Depth Description
- Log with Permafrost (outside search radius)

Well depths are self-reported by property owners and occupants.

Maximum Sum of 5 PFAS Result For Each Private Well:

- ≤2.0 ppt
- 2.1 to 17 ppt
- 18 to 34 ppt
- 35 to 64 ppt
- ≥65 ppt

- Permafrost Noted in Well Log
- Well Depth
- Approximate Ground Surface (DGGS, 2010)

0 200 400
Feet

Vertical Exaggeration = 10X
1" = 400 feet
Search Radius = 1,000 Feet

Fairbanks International Airport
Fairbanks, Alaska

CROSS SECTION A-A'

March 2019 31-1-20060-002

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Figure 3

B

B'

560
520
480
440
400
360
320
280
240

407313/ 90 Feet/ Estimated
407330/ 40 Feet / Reported
407348/ 20 Feet / Reported
407364/ 60 Feet / Confident
561711/ 95 Feet / Reported
407372/ 80 Feet / Reported
Chena River
510220.2/ 25 Feet / Reported
510220.1/ 50 Feet / Estimated
120804/ 23 Feet / Reported
120782/ 80 Feet / Confident
120774/ 80 Feet / Reported
176435/ 60 Feet / Estimated
550124/ 40 Feet / Reported
550132/ 25 Feet / Reported
176397/ 30 Feet / Estimated
176222/ 95 Feet / Reported
176044.4/ 25 Feet / Estimated
176044.1/ 55 Feet / Reported
176044/ 80 Feet / Confident
176061/ 45 Feet / Reported

LEGEND

Sample Name/ Well Depth/ Depth Description

Well depths are self-reported by property owners and occupants.

Maximum Sum of 5 PFAS Result For Each Private Well:

- ≤2.0 ppt
- 2.1 to 17 ppt
- 18 to 34 ppt
- 35 to 64 ppt
- ≥65 ppt

Well Depth

Approximate Ground Surface (DGGS, 2010)

0 250 500
Feet

Vertical Exaggeration = 10X
1" = 600 feet
Search Radius = 500 feet

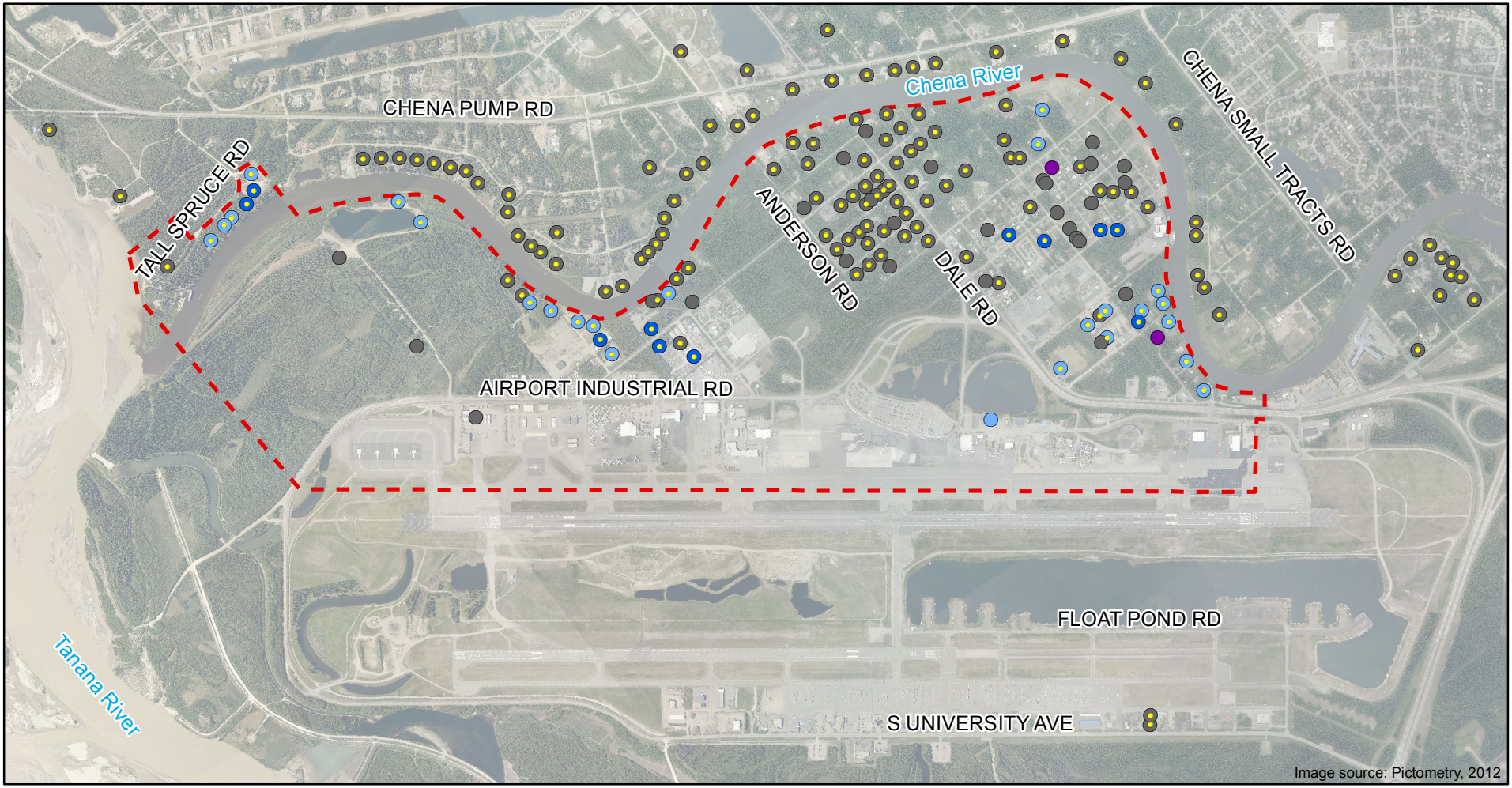
Fairbanks International Airport
Fairbanks, Alaska

CROSS SECTION B-B'

March 2019 31-1-20060-002

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Figure 4



LEGEND

- Quarterly in May, August, or November
- Quarterly, four or more samples
- Annual
- Not included
- Category 1 or 2 Well
- Impacted Area

0 0.5

Miles

N

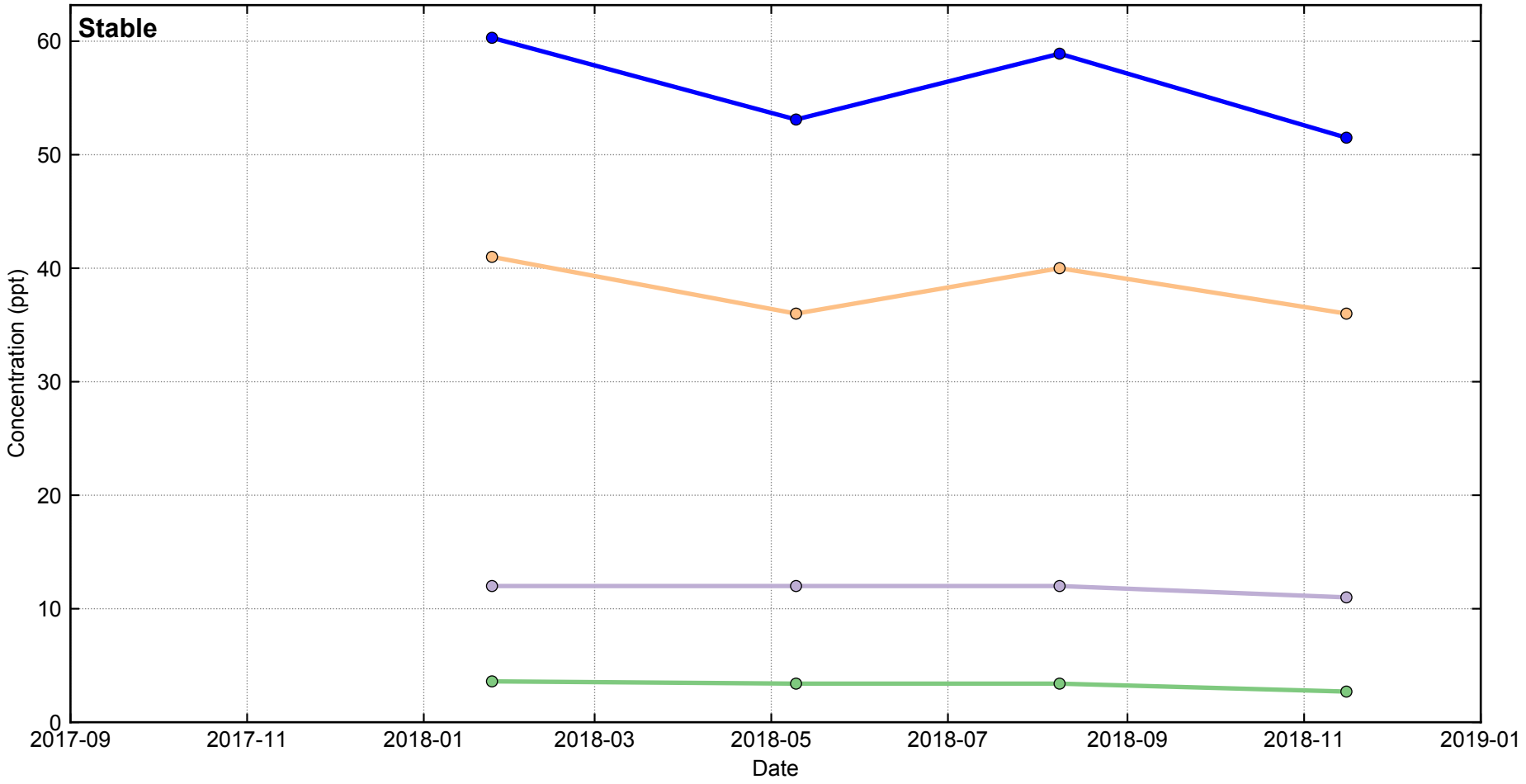
Fairbanks International Airport
Fairbanks, Alaska

QUARTERLY AND ANNUAL WELL MONITORING NETWORK

March 2019 31-1-20060-002

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Figure 5



Fairbanks International Airport
Fairbanks, Alaska

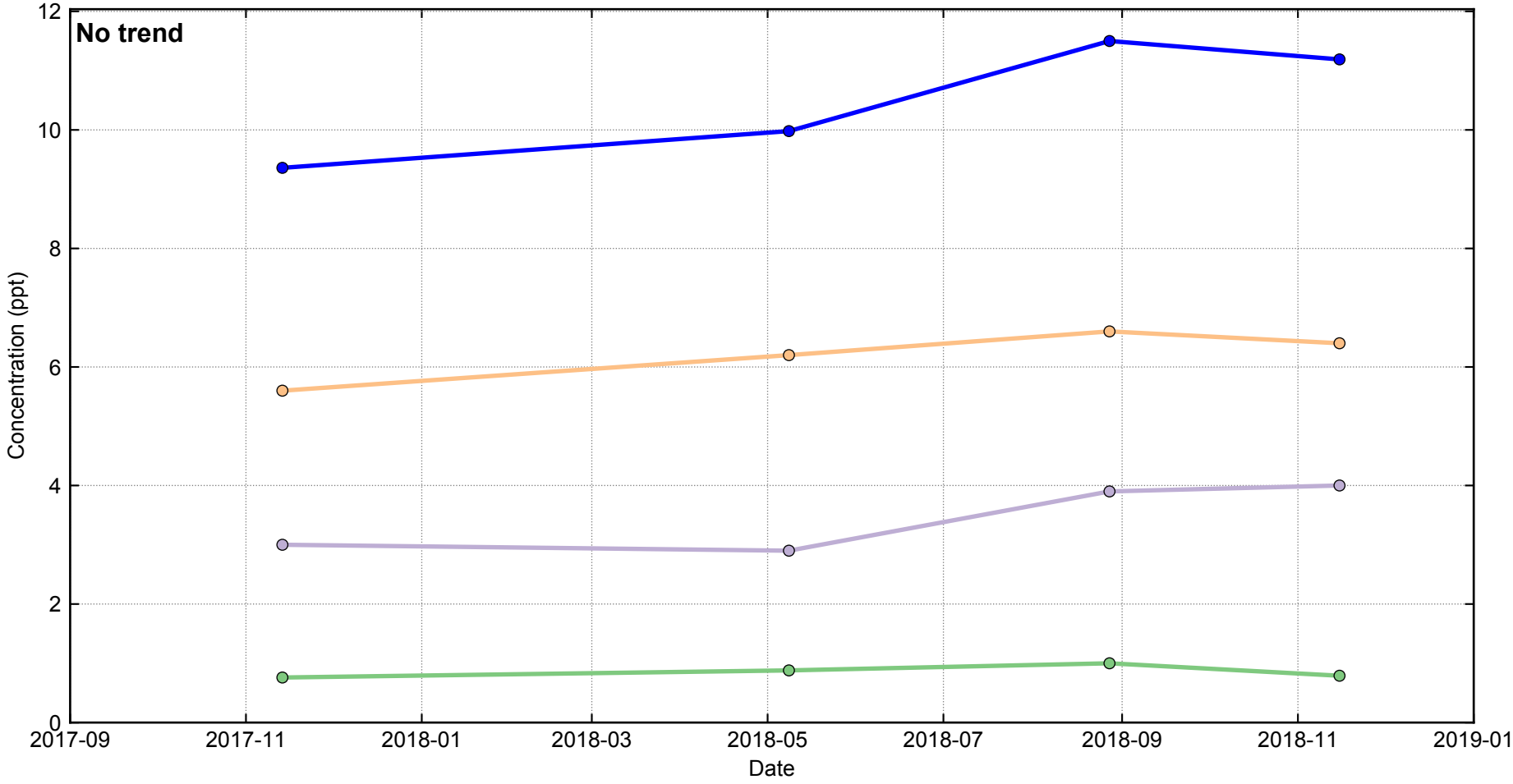
Quarterly Line Graph *151203*

March 2019 31-1-20060-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Figure 6
Sheet 1 of 10

FIG.6
Sheet 1 of 10



Fairbanks International Airport
Fairbanks, Alaska

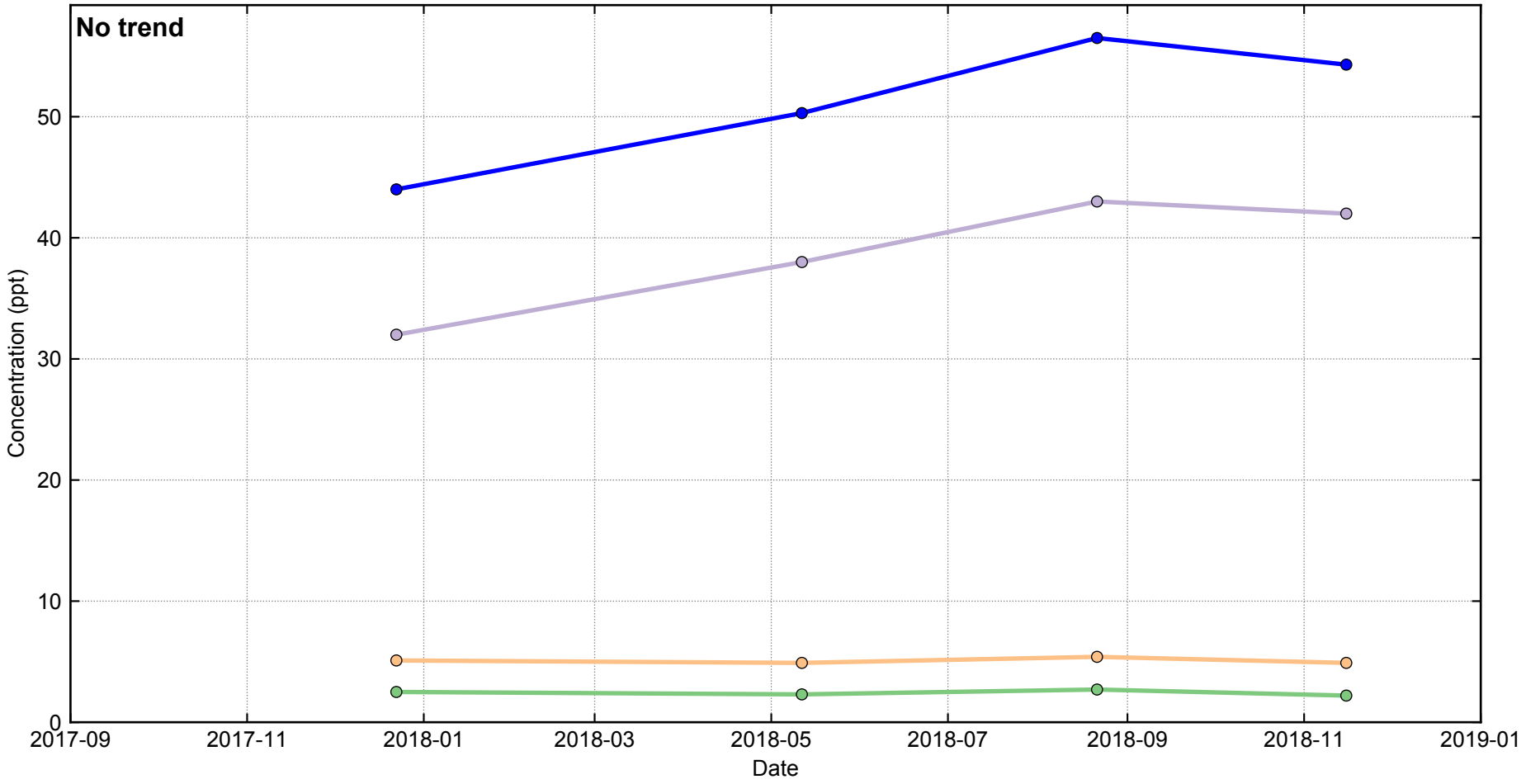
Quarterly Line Graph *151637*

March 2019 31-1-20060-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Figure 6
Sheet 2 of 10

FIG. 6
Sheet 2 of 10



Fairbanks International Airport
Fairbanks, Alaska

Quarterly Line Graph *153699*

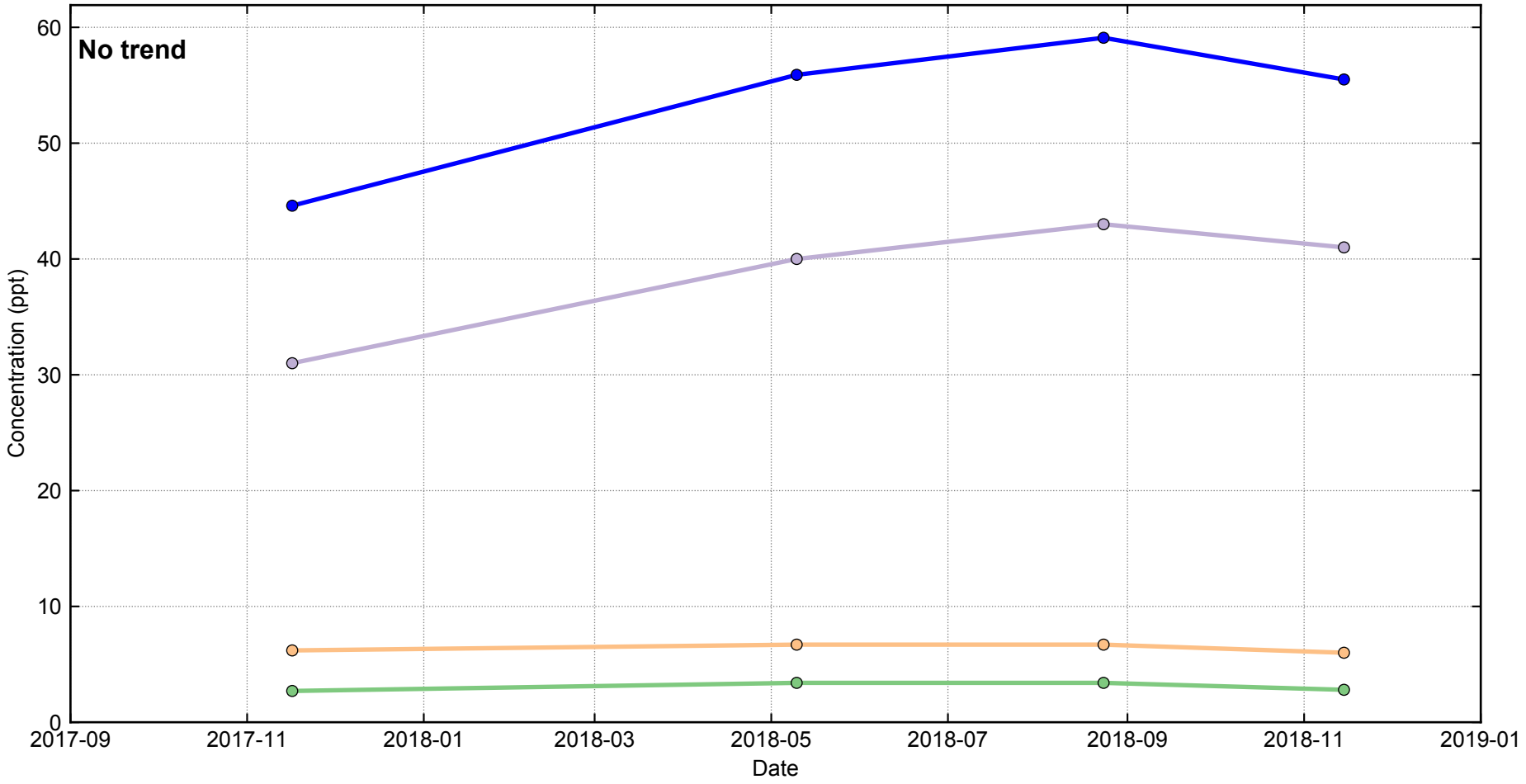
March 2019

31-1-20060-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Figure 6
Sheet 3 of 10

FIG. 6
Sheet 3 of 10



Fairbanks International Airport
Fairbanks, Alaska

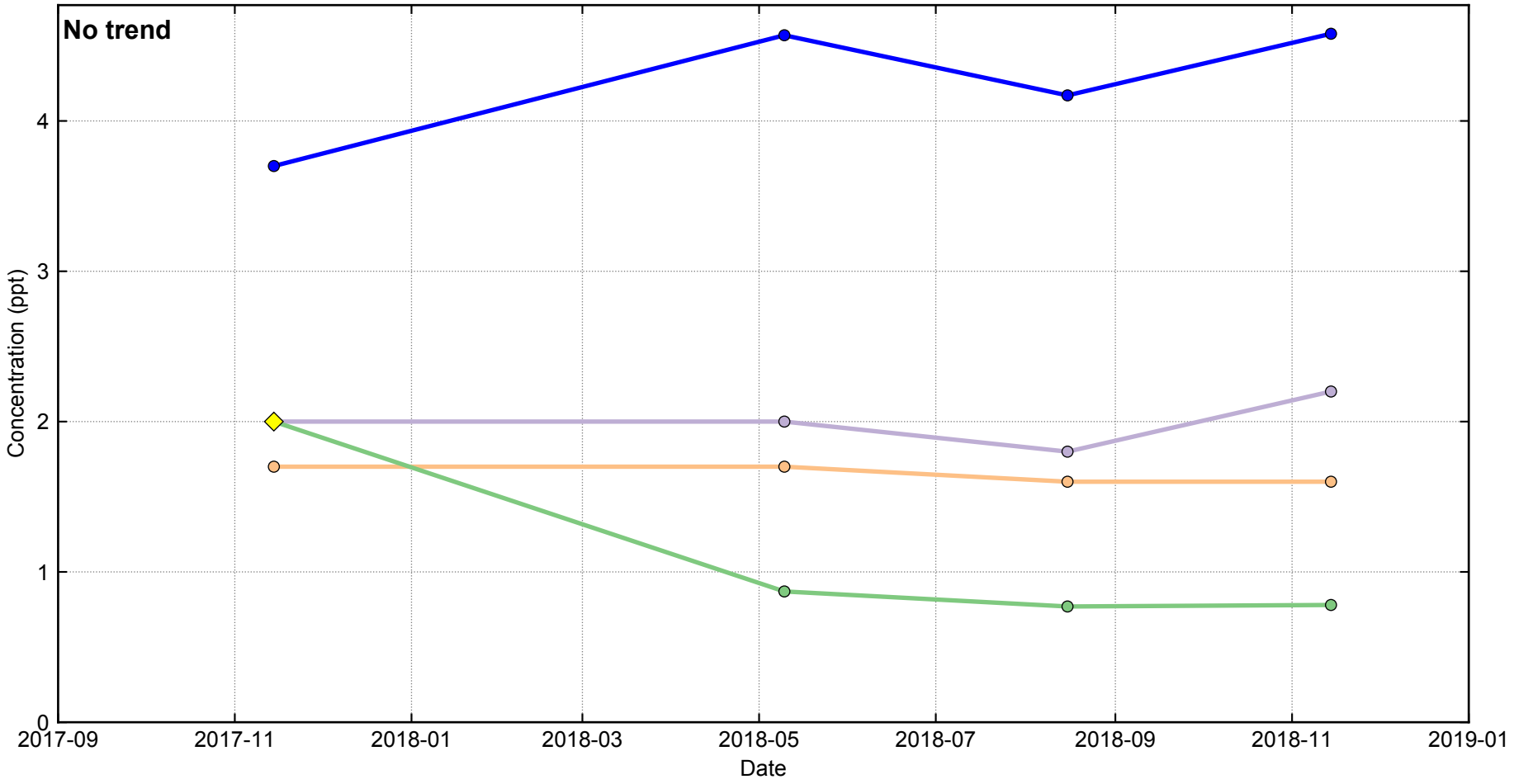
Quarterly Line Graph *173860*

March 2019 31-1-20060-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Figure 6
Sheet 4 of 10

FIG. 6
Sheet 4 of 10



Fairbanks International Airport
Fairbanks, Alaska

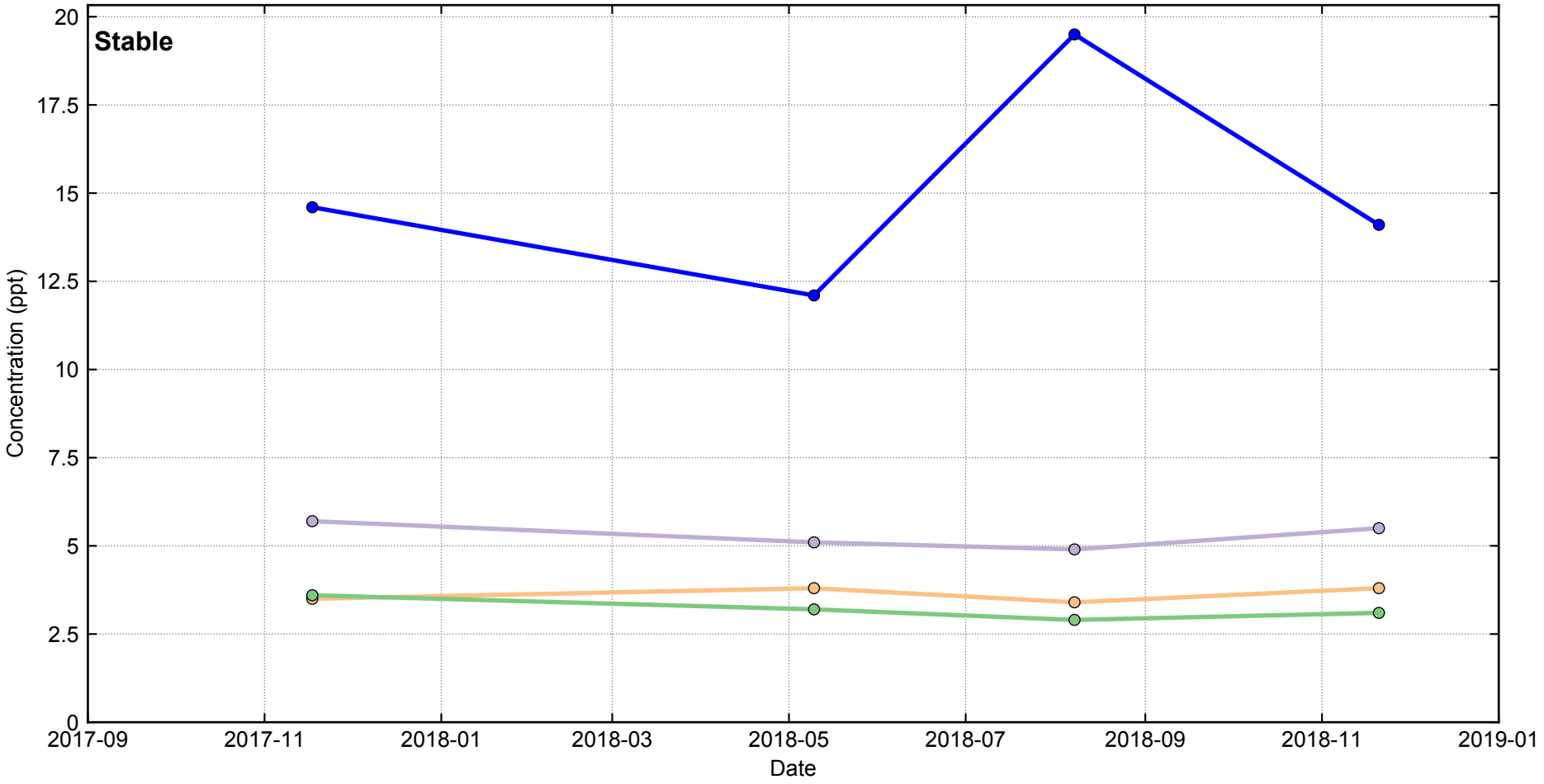
Quarterly Line Graph *173916*

March 2019 31-1-20060-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Figure 6
Sheet 5 of 10

FIG. 6
Sheet 5 of 10



Fairbanks International Airport
Fairbanks, Alaska

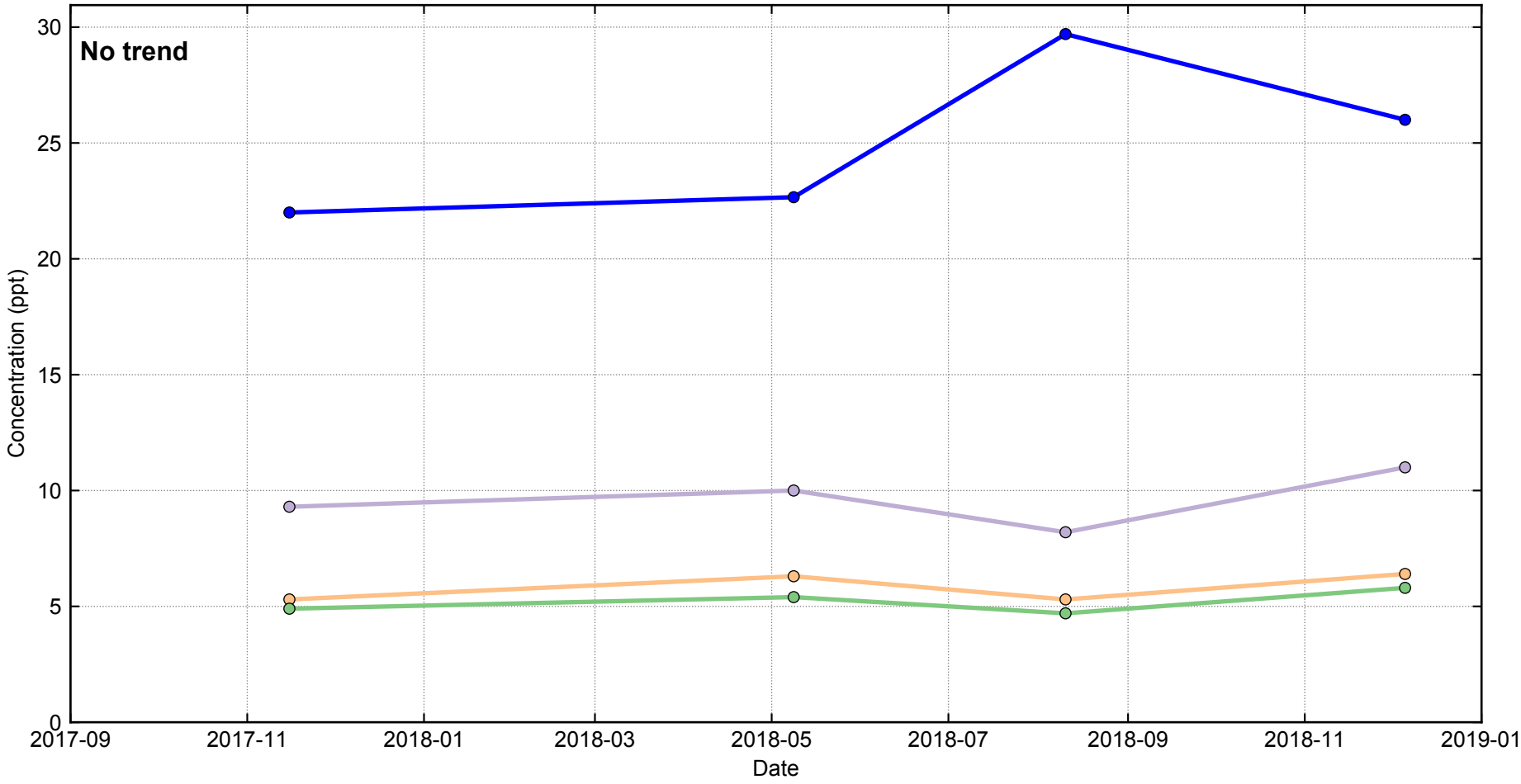
Quarterly Line Graph *176095*

March 2019 31-1-20060-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Figure 6
Sheet 6 of 10

FIG. 6
Sheet 6 of 10



Fairbanks International Airport
Fairbanks, Alaska

Quarterly Line Graph *176222*

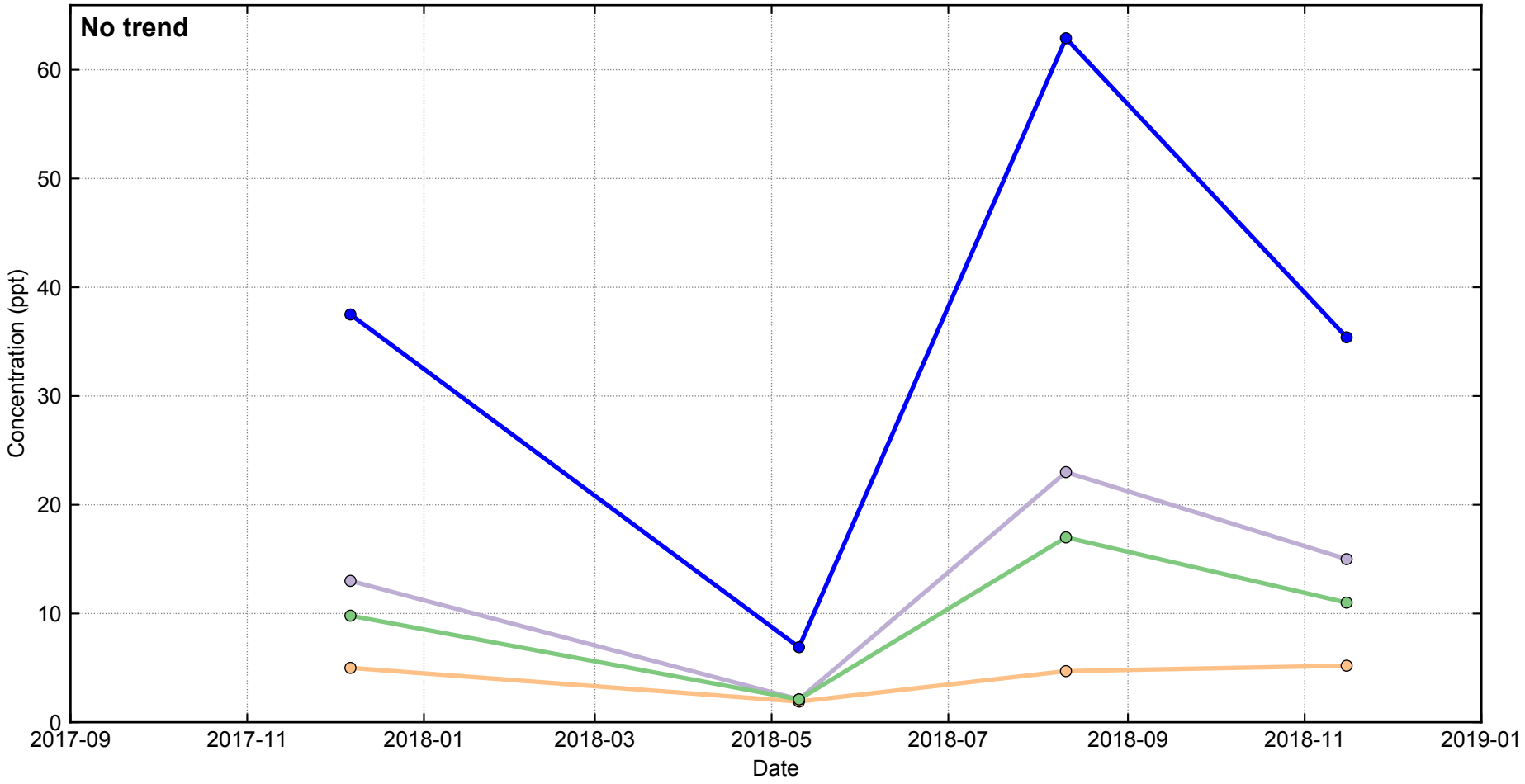
March 2019

31-1-20060-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Figure 6
Sheet 7 of 10

FIG. 6
Sheet 7 of 10



Fairbanks International Airport
Fairbanks, Alaska

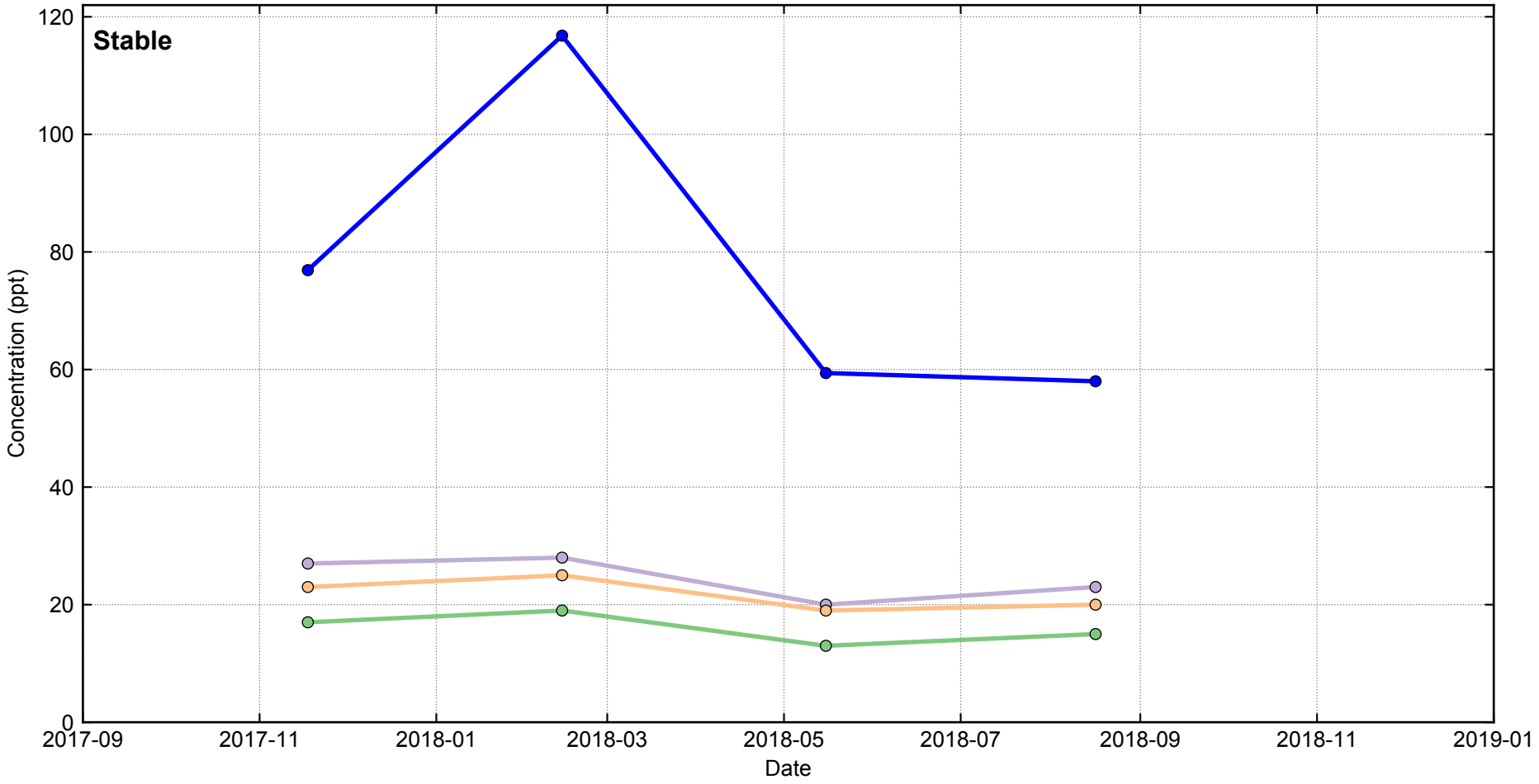
Quarterly Line Graph *407364*

March 2019 31-1-20060-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Figure 6
Sheet 8 of 10

FIG. 6
Sheet 8 of 10



Fairbanks International Airport
Fairbanks, Alaska

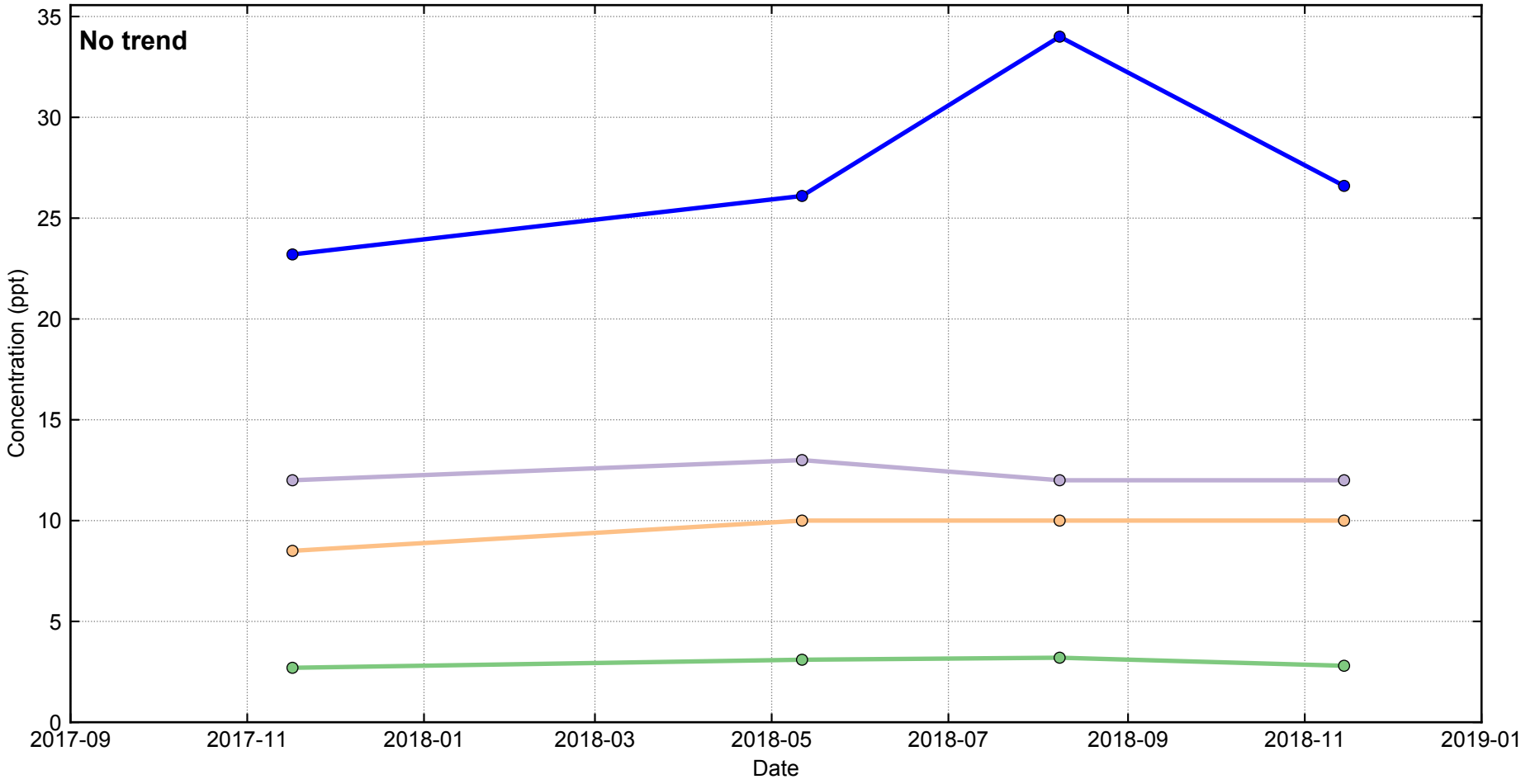
Quarterly Line Graph *521809*

March 2019 31-1-20060-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Figure 6
Sheet 9 of 10

FIG. 6
Sheet 9 of 10



Fairbanks International Airport
Fairbanks, Alaska

Quarterly Line Graph *550132*

March 2019 31-1-20060-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Figure 6
Sheet 10 of 10

FIG. 6
Sheet 10 of 10

APPENDIX A: PUBLIC CORRESPONDENCE

Appendix A

Public Correspondence

CONTENTS

- Secondary well search information packet dated June 11, 2018
- Area 9 information packet dated October 23, 2018
- DHSS Perfluoroalkyl Substances - Fairbanks International Airport fact sheet dated November 2, 2018
- PFAS Well Search and Sample Locations map dated December 31, 2018

Alaska International Airport System
Ted Stevens Anchorage International Airport
Fairbanks International Airport

6450 Airport Way, Suite 1
Fairbanks, Alaska 99709

June 11, 2018

Dear Property Owner:

Fairbanks International Airport (FAI) was recently alerted to concentrations of Per- and Polyfluoroalkyl substances (PFAS) in the groundwater at the Aircraft Rescue and Firefighting (ARFF) Training Areas. In late November, the FAI encountered PFAS in groundwater in the Dale Road area, east of the Chena River.

Firefighters from the FAI Fire Department and other agencies used Aqueous Film Forming Foam, a standard firefighting agent that contains PFAS, during training exercises and emergency events to extinguish hydrocarbon fires. The PFAS discovered in the groundwater at the ARFF Training Areas are in concentrations higher than the U.S. Environmental Protection Agency's lifetime health advisory level for drinking water.

FAI is working with the environmental consulting firm, Shannon & Wilson, Inc., and the Alaska Department of Environmental Conservation to identify and sample private water wells near the airport to determine if these substances are present and above health advisory levels. PFAS are considered emerging contaminants and the health effects are not well known.

Previous water testing has focused on properties that are not connected to the College Utilities water system, but Shannon & Wilson, Inc. continues to sample wells in your area. Enclosed is a Private Well Inventory Survey Form, agency contact information to help address questions, and more information about PFAS.

Please return the attached Private Well Inventory Survey form using the envelope provided, to let us know if you have a private well. We understand that your property may be connected to the municipal water system. Your participation in the survey helps ensure that the study is thorough.

For more information please see the PFAS Fact Sheet on reverse, or visit dot.alaska.gov/faigroundwater. We appreciate your patience as we work through this process and look forward to receiving your completed survey.

Fairbanks International Airport

_____

Angie Spear
Division Operations Manager, C.M.

Alaska International Airport System
Ted Stevens Anchorage International Airport
Fairbanks International Airport

6450 Airport Way, Suite 1
Fairbanks, Alaska 99709

PFAS Fact Sheet

June 2018

Per- and Polyfluoroalkyl substances (PFAS) are a group of manmade chemicals that have been used for a wide variety of residential, commercial, and industrial uses. PFAS are considered emerging environmental contaminants and the health effects are not well known. The presumed source of PFASs in groundwater near the Fairbanks International Airport (FAI) is the use of fire-fighting foams at Aircraft Rescue and Firefighting (ARFF) training areas. The FAI has hired Shannon & Wilson to test private water-supply wells for PFASs.

The FAI has tested over 160 private water-supply wells starting in November 2017. Some properties in the well testing area are connected to the College Utilities water system and do not have water wells.

We are testing water for perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and several other PFASs.

The U.S. Environmental Protection Agency's (EPA) health advisory level for drinking water is **70 parts per trillion** for PFOS, PFOA, or the sum of the two.

We advise that residents with test results above this level do not use their water for drinking or cooking. The health advisory level has been set based on the latest peer-reviewed science. However, the human health risks associated with PFAS exposure are not well established.

Test results are typically available within two to four weeks of sample collection.

PFASs are used in a large number of products ranging from fabric waterproofing compounds, non-stick cookware, stain-resistant carpeting, some food packaging, and firefighting foams.

An updated PFAS results map is available at:
www.dot.alaska.gov/faigroundwater

For questions about well testing and study:
Shannon & Wilson Inc.
Marcy Nadel, Project Manager
Phone: 907-458-3150 Email: mdn@shanwil.com

For regulatory questions:
Alaska Dept. of Environmental Conservation
Robert Burgess, Contaminated Sites Program
Phone: 907-451-2153 Email: robert.burgess@alaska.gov

For questions about PFAS health effects:
Alaska Dept. of Health & Social Services
Stacey Cooper, Health Assessor
Phone: 907-269-8016 Email: stacey.cooper@alaska.gov

To arrange your next water delivery:
Vision Construction
Phone: 907-479-0380 Email: water@visionunited.com

To file an insurance claim:
Alaska Dept. of Admin., Risk Management
Jack Albrecht, Claims Administrator
Phone: 907-465-2183 Email: jack.albrecht@alaska.gov

For questions about ARFF training & other inquiries:
Angie Spear, Division Operations Manager
Phone: 907-474-2529
Sammy Loud, Communications Specialist
Phone: 907-474-2522
Email: FAIgroundwater@alaska.gov

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Private Well Inventory Survey Form

Date: _____

Parcel: _____

Name (Owner): _____

Name (Occupant): _____

Physical Address: _____

Mailing Address: _____

Email Address (optional): _____

Contact Phone Number: (owner) _____ (occupant) _____

Number of persons residing at this location:
Adults (18 and over) _____
Teenagers (13 to 17) _____
Children (12 and under) _____

Years at this residence: _____ Full-Time ☐ Seasonal ☐

---

1) From where do you obtain your drinking water?
   a) College Utilities Water Supply ☐ b) Well Water ☐
   c) Water Delivery ☐ d) Other ☐

2) If you have a water well, please answer the following questions:
   a) Where is the well located on the property? _____
   b) Is the well in use? Yes ☐ No ☐
   c) If yes, please check all that apply regarding the usage of your well water:
      Drinking ☐ Cooking ☐ Gardening ☐ Pets ☐ Other _____
   d) If no, is the well usable, unusable, or properly abandoned?
      Usable ☐ Unusable ☐ Abandoned ☐ Method _____
   e) When was the well installed? _____
   f) What is the well depth? _____
   g) What is the well diameter? _____
   h) What is the well type? ☐ Dug Well ☐ Driven ☐ Drilled ☐ Unknown
   i) Do you have any treatment on your well (e.g. water softener)? Please describe. _____
      _____

3) Sample Permission
   Does the Fairbanks International Airport have permission to sample your private water well?
   ☐ Yes ☐ No

_____ _____
Signature Date

THE STATE of ALASKA
GOVERNOR BILL WALKER

Department of
Health and Social Services

DIVISION OF PUBLIC HEALTH
Section of Epidemiology

3601 C Street, Suite 540
Anchorage, Alaska 99503
Main: 907.269.8000
Fax: 907.562.7802

December 18, 2017

Perfluoroalkyl Substances — Fairbanks International Airport

Introduction

Recently, chemicals called perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) were found at the Fairbanks International Airport (FAI) — and in water wells nearby. Contact with these chemicals — such as drinking contaminated water — may cause health problems. Below you'll find information you need to know about PFOS and PFOA.

Summary

- PFOS and PFOA are chemicals that may harm your health.
- If your well has levels of PFOS and PFOA higher than the health advisory (70 nanograms/liter or parts per trillion), you should use another water source for drinking water and cooking.
- You can still use your water to bathe, clean, wash dishes, and do laundry.
- FAI is providing drinking water to people whose well water is above EPA's advisory level for PFOS and PFOA.

About PFOS and PFOA

What are PFOS and PFOA?

PFOS and PFOA are perfluoroalkyl substances (PFAS) — human-made chemicals that have been used for both residential and industrial purposes. PFAS have been found in some products that resist fire, stains, grease, and water such as:

- Furniture
- Carpeting
- Clothing
- Firefighting foams
- Food Packaging

At the FAI, the source(s) of PFAS is certain firefighting foams that contained PFAS.

How could I come into contact with PFAS?
Because PFAS were widely used worldwide, stay in the environment for a long time, and travel long distances in water and air, there are small amounts in many water and some food sources. Most people have come into contact with low levels of PFAS. PFAS are also found in the blood or tissue of wildlife, like fish and marine mammals such as seals and sea lions.

Usually, people come into contact with PFAS by eating or drinking them in food and water. Additionally:

- Women who are exposed to PFAS pass it to their unborn babies during pregnancy — and to their infants through breastfeeding.
- Children may come into contact with small amounts of PFAS in the home by touching products (such as carpet) with PFAS and then putting their hands in their mouths.

How can PFAS affect my health?
Some, but not all, scientific literature suggests that certain PFAS may affect a variety of systems in the body. Additional research is needed to better understand possible human health effects from exposure to PFAS in water and food.

Scientists are not yet certain about the possible health effects resulting from human exposure to PFAS at levels typically found in our food and water. Some, but not all studies in humans have suggested that certain PFAS may affect the developing fetus and child. Potential health effects from exposure to PFAS may include:

- Affect the development of unborn babies and breastfeeding infants — including possible changes in growth, learning, and behavior
- Decrease fertility and interfere with the body's natural hormones
- Increase cholesterol
- Affect the immune system
- Increase the risk of certain types of cancer

More research is needed to confirm or rule out possible links between health effects of potential concern and exposure to PFAS. At this time, we cannot tell if drinking well water near the FAI in Fairbanks could be causing any current health problems — or if it will cause problems in the future.

How can I tell if I have come into contact with PFAS?
PFAS can be measured in the blood, however, there are some limitations on blood tests to consider. Individuals who feel they may have been exposed to high levels of PFOA or PFOS and would like to have their blood levels measured should keep in mind that this is not a routine test that health care providers offer. The test results will not provide clear answers for existing or possible health effects. Individuals who feel the need to be tested should consult with their health care provider, local and state health department or other health professionals on how to move forward. The body's natural elimination processes are the only way to remove PFAS from the body.

What is the health advisory for PFOS and PFOA?
The U.S. Environmental Protection Agency (EPA) has set a lifetime health advisory (LHA) level for PFOS and PFOA — individually or combined— of no more than 70 nanograms per liter of water (ng/L or ppt - parts per trillion). The LHA is designed to protect people from contact with PFOS and PFOA in drinking water — including unborn babies and infants.

Safety Information for Fairbanks Residents

Can I drink my well water? What about my pets?
If levels of PFOS or PFOA (or the 2 combined) are at or above the health advisory level (70 ng/L or parts per trillion), do **not** drink your tap water or use it to prepare baby formula. Also avoid giving it to pets and other animals.

Is it safe to cook with my well water?
If your well water has levels of PFOS or PFOA (or the 2 combined) at or above the health advisory, do **not** use your well water to cook — even if you heat or boil it first. Boiling water doesn't remove PFOS and PFOA.

Is it safe to shower, take baths, and brush my teeth with my well water?
It is very unlikely that showering or taking baths with well water could cause any health problems. This is because:

- Your skin does not absorb (take in) enough PFOS and PFOA to cause problems. PFOS and PFOA also do not irritate the skin.
- PFOS and PFOA do not move easily from water to air — that means it is unlikely that you will breathe it in when using well water.

It is safe to shower and bathe in PFAS- contaminated water. If your water contains PFAS, particularly if levels exceed the LHA, you can reduce exposure by using an alternative or treated water source for brushing teeth, and any activity that might result in ingestion of water.

Can I clean, wash dishes, wash clothes, and rinse food with my well water?
It is safe to use well water to clean your house, wash dishes, and do laundry. However, we recommend that you rinse food with clean water.

Can I breastfeed my child if I have been drinking my well water?
Breastfeeding is linked with numerous health benefits for both infants and mothers. At this time, it is recommended that nursing mothers continue to breastfeed. The science on the health effects of PFAS for mothers and babies is evolving. However, given the scientific understanding at this time, the benefits of breastfeeding outweigh any known risk. To better weigh the risks and benefits of breastfeeding, please talk to your doctor.

Is it safe to water my vegetable garden with my well water?
We do not have a clear answer to this question at this time. Some studies have shown that vegetables grown in soil with high levels of PFAS may absorb the chemicals. But this could depend on a lot of different factors (e.g., level of PFAS in water, the type of PFAS contamination, the amount of garden watering, and the type of produce grown).

One study showed that garden plants watered with water contaminated with PFAS took in only very small amounts of the chemicals. The study also noted that the health benefits of eating fresh vegetables outweigh any health risks from small amounts of PFAS.

Soil particles can stick to plants, vegetables, and fruits. Low-lying plants, leafy vegetables (e.g., spinach and lettuce) and root crops (e.g., potatoes and carrots) are more likely to have soil particles on them and possibly contribute to human exposure through incidental ingestion. Some studies show that PFAS can accumulate at low levels in plant roots. Uptake of contaminants by the roots of a plant may move into other portions of the plant but usually at even lower concentrations. Your exposure to PFAS through garden vegetables is not likely to be significant compared to other primary exposure routes such as drinking contaminated water.

In the end it is up to you. Some people living near the FAI may feel more comfortable using a different water source with confirmed lower PFAS levels for their vegetable gardens. However, if you choose to use your well for your garden, we recommend you wash your vegetables with clean water and peel root vegetables.

Next Steps

How often will my well water be tested for PFAS?
The FAI is currently checking wells near the airport. How often the wells are checked will depend on how high the levels of PFAS are. Wells that contain concentrations of PFAS exceeding 35 ng/L (half the LHA) will be sampled quarterly. Homes that have wells that exceed the LHA will not be resampled, as interim water is being provided and they will be connected to a permanent source of municipal drinking water as soon as possible.

What is the Alaska Section of Epidemiology doing to address concerns about PFAS in drinking water?
The Section of Epidemiology is taking steps to protect Fairbanks residents, including:

- Working with the Alaska Department of Environmental Conservation (ADEC) and the Agency for Toxic Substances and Disease Registry (ATSDR) to understand how PFAS from well water may affect people living near the FAI.
- Finding more information about PFAS and updating our recommendations as data become available.

Where can I get more information?

- To learn more about health effects of PFAS, contact the Alaska Section of Epidemiology at **907-269-8000.**
- To learn more about well water testing, contact the Alaska Department of Environmental Conservation at **907-451-2153.**
- If you have health concerns about PFAS, please talk with your health care provider.

You can also find additional information in the following resources:

- ATSDR's PFAS web page: https://www.atsdr.cdc.gov/pfc/index.html
- PFOS and PFOA Drinking Water Health Advisories (EPA) https://www.epa.gov/sites/production/files/2016-06/documents/drinkingwaterhealthadvisories_pfoa_pfos_updated_5.31.16.pdf
- Alaska Environmental Public Health Program http://dhss.alaska.gov/dph/Epi/eph/Pages/default.aspx

Fairbanks International Airport
AeroNexus®

Alaska International Airport System
Ted Stevens Anchorage International Airport
Fairbanks International Airport

6450 Airport Way, Suite 1
Fairbanks, Alaska 99709

October 23, 2018

Dear Property Owner:

Fairbanks International Airport (FAI) was alerted to concentrations of Per- and Polyfluoroalkyl substances (PFAS) in the groundwater at the Aircraft Rescue and Firefighting (ARFF) Training Areas in 2017. The FAI has since encountered PFAS in groundwater in the Dale Road area, east of the Chena River.

Firefighters from the FAI Fire Department and other agencies used Aqueous Film Forming Foam, a standard firefighting agent that contains PFAS, during training exercises and emergency events to extinguish hydrocarbon fires. The PFAS discovered in the groundwater at the ARFF Training Areas are in concentrations higher than the U.S. Environmental Protection Agency's lifetime health advisory level.

FAI is working with the environmental consulting firm, Shannon & Wilson, Inc., and the Alaska Department of Environmental Conservation to identify and sample private water wells near the airport to determine if these substances are present and above action levels. PFAS are considered emerging contaminants and the health effects are not well known.

Results of the water samples will be shared with property residents. Where wells are found to have PFAS levels at concentrations higher than advised, the FAI is assisting those property owners with access to clean drinking water.

Shannon & Wilson Inc. is conducting water sampling in your area. On the Chena Pump Road side of the Chena River, we have encountered PFAS above the action level for drinking water in two of the over 50 wells sampled. Enclosed is PFAS results map and Private Well Inventory Survey Form. If you have a well please return the attached Private Well Inventory Survey form using the envelope provided, or contact Shannon & Wilson, Inc. at 458-3150.

For more information please see the enclosed PFAS Fact Sheet or visit dot.alaska.gov/faigroundwater. We look forward to receiving your completed survey.

Fairbanks International Airport

Angie Spear
Division Operations Manager, C.M.

Alaska International Airport System
Ted Stevens Anchorage International Airport
Fairbanks International Airport

6450 Airport Way, Suite 1
Fairbanks, Alaska 99709

PFAS Fact Sheet

October 2018

Per- and Polyfluoroalkyl substances (PFAS) are a group of manmade chemicals that have been used for a wide variety of residential, commercial, and industrial uses. PFAS are considered emerging environmental contaminants, the human health risks associated with PFAS exposure are not well established. The presumed source of PFAS in groundwater near the Fairbanks International Airport (FAI) is the use of fire-fighting foams at Aircraft Rescue and Firefighting (ARFF) training areas. The FAI has hired Shannon & Wilson to test private water-supply wells for PFAS.

The FAI has tested over 180 private water-supply wells starting in November 2017. Some properties in the well testing area are connected to the College Utilities water system and do not have water wells.

We are testing water for six PFAS. The two most common are perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA).

As of August, the Alaska Dept. of Environmental Conservation action level for drinking water is **70 parts per trillion** for the sum of five compounds: PFOS, PFOA, PFHpA, PFHxS, and PFNA. Results are rounded from 65 parts per trillion.

We advise that residents with test results above this level do not use their water for drinking or cooking. If your well is considered affected, you can continue to shower, clean, and do laundry.

Test results are typically available within two to four weeks of sample collection.

Central Environmental Inc. has been hired to extend College Utilities water to additional homes and businesses near the FAI.

PFAS are used in a large number of products ranging from fabric waterproofing compounds, non-stick cookware, stain-resistant carpeting, some food packaging, and firefighting foams.

An updated PFAS results map is available at:
www.dot.alaska.gov/faigroundwater

For questions about well testing and study:
Shannon & Wilson Inc.
Marcy Nadel, Project Manager
Phone: 907-458-3150 Email: mdn@shanwil.com

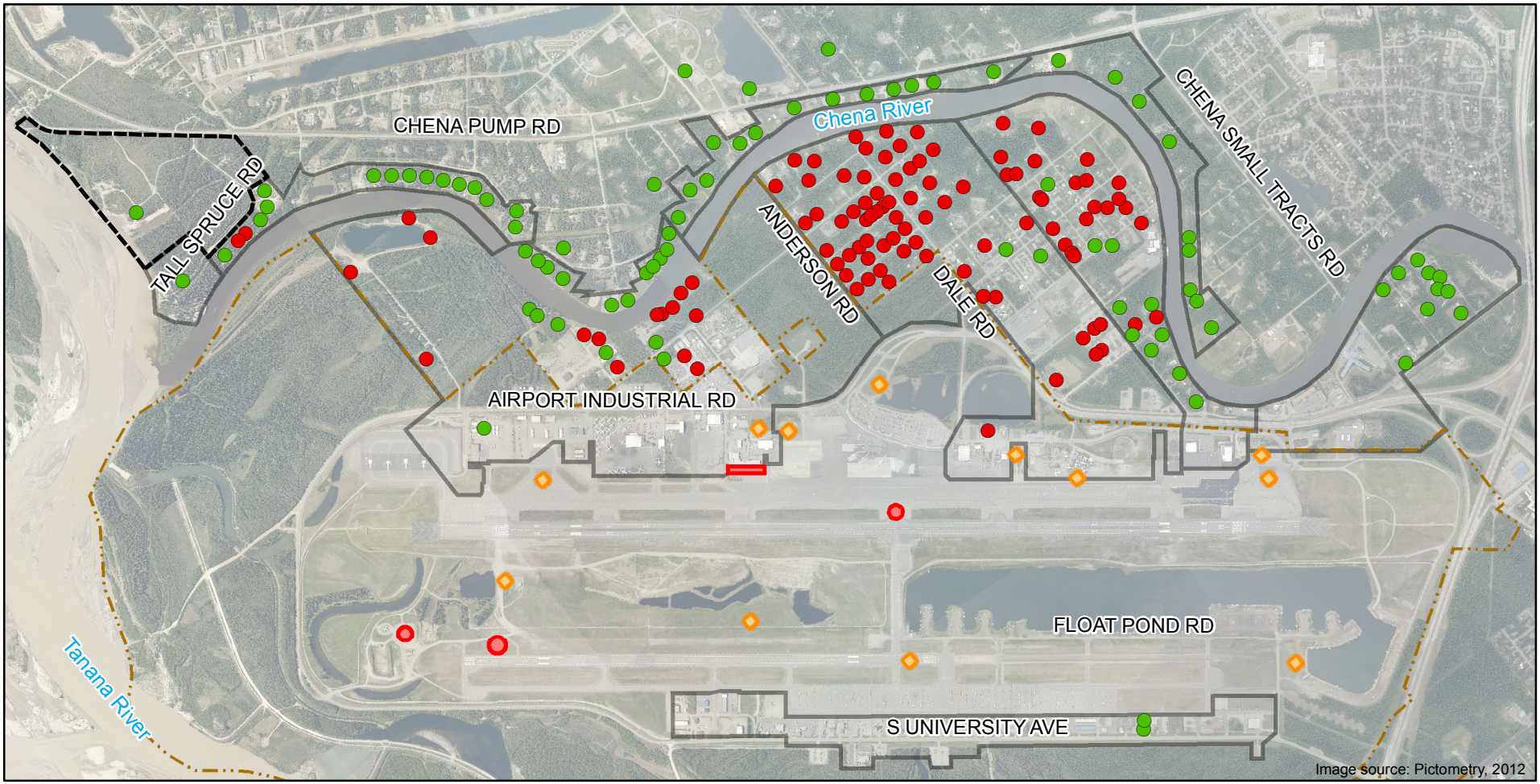
For regulatory questions:
Alaska Dept. of Environmental Conservation
Robert Burgess, Contaminated Sites Program
Phone: 907-451-2153 Email: robert.burgess@alaska.gov

For questions about PFAS health effects:
Alaska Dept. of Health & Social Services
Stacey Cooper, Health Assessor
Phone: 907-269-8016 Email: stacey.cooper@alaska.gov

To arrange your next water delivery:
Vision Construction
Phone: 907-479-0380 Email: water@visionunited.com

To file an insurance claim:
Alaska Dept. of Admin., Risk Management
Sheri Gray, Risk Manager
Phone: 907-465-5724 Email: sheri.gray@alaska.gov

For questions about ARFF training & other inquiries:
Angie Spear, Division Operations Manager
Phone: 907-474-2529
Sammy Loud, Communications Specialist
Phone: 907-474-2522
Email: FAIgroundwater@alaska.gov



LEGEND

- Sum of PFOS, PFOA, PFHxS, PFHpA, and PFNA results under ADEC action level for drinking water (65 ppt)
- Over 65 ppt
- New Well Search Area
- Aircraft Rescue and Firefighting (ARFF) Training Sites
- ARFF Emergency Response Sites
- FAI Boundary
- Well Search Areas

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Fairbanks International Airport
Fairbanks, Alaska

PFAS WELL SEARCH AND SAMPLE LOCATIONS

October 2018 31-1-20060-002

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Figure 1

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Private Well Inventory Survey Form

Date: _____

Parcel: _____

Name (Owner): _____

Name (Occupant): _____

Physical Address: _____

Mailing Address: _____

Email Address (optional): _____

Contact Phone Number: (owner) _____ (occupant) _____

Number of persons residing at this location:
Adults (18 and over) _____
Teenagers (13 to 17) _____
Children (12 and under) _____

Years at this residence: _____ Full-Time ☐ Seasonal ☐

---

1) From where do you obtain your drinking water?
   a) College Utilities Water Supply ☐ b) Well Water ☐
   c) Water Delivery ☐ d) Other ☐

2) If you have a water well, please answer the following questions:
   a) Where is the well located on the property? _____
   b) Is the well in use? Yes ☐ No ☐
   c) If yes, please check all that apply regarding the usage of your well water:
      Drinking ☐ Cooking ☐ Gardening ☐ Irrigation ☐ Pets ☐ ☐ Other _____
   d) If no, is the well usable, unusable, or properly abandoned?
      Usable ☐ Unusable ☐ Abandoned ☐ Method _____
   e) When was the well installed? _____
   f) What is the well depth? _____
   g) What is the well diameter? _____
   h) What is the well type? ☐ Dug Well ☐ Driven ☐ Drilled ☐ Unknown
   i) Do you have any treatment on your well (e.g. water softener)? Please describe. _____
      _____

3) Sample Permission
   Does the Fairbanks International Airport have permission to sample your private water well?
   ☐ Yes ☐ No

_____ _____
Signature Date

THE STATE of ALASKA
GOVERNOR BILL WALKER

Department of Health and Social Services

DIVISION OF PUBLIC HEALTH
Section of Epidemiology

3601 C Street, Suite 540
Anchorage, Alaska 99503
Main: 907.269.8000
Fax: 907.562.7802

November 2, 2018

Perfluoroalkyl Substances — Fairbanks International Airport

Why am I receiving this fact sheet?

- Chemicals called perfluoroalkyl substances (PFAS) were found at the Fairbanks International Airport (FAI) and in some water wells nearby.
- Prolonged contact with high concentrations of PFAS, including drinking contaminated water, may cause adverse health effects.

What are PFAS?

- PFAS are human-made chemicals that have been used in industry and consumer products worldwide since the 1950s.
- PFAS are manufactured for their heat, water, and stain-resistant properties. These properties make PFAS beneficial for a wide variety of industrial, commercial, and residential applications, such as non-stick cookware, water-repellent clothing, stain- resistant fabrics, and firefighting foams.
- PFAS are emerging contaminants, and limited data on the effects of PFAS on human health are available.

How could I come into contact with PFAS?

- Most people have been exposed to low levels of PFAS from one or more sources. These may include drinking contaminated water, eating contaminated food, or exposure to PFAS-containing consumer products. PFAS do not break down easily, and can be transported long distances in water and air, so they are widespread in the environment.
- Some types of aqueous firefighting foams (AFFF) contain PFAS. Use of these firefighting foams at the airport is the most likely source of PFAS contamination at the Fairbanks International Airport.
- PFAS can also be transferred from exposed mothers to babies during pregnancy and while breastfeeding. Young children may transfer small amounts of PFAS from their hands into their mouths after touching contaminated items at home.

What levels of PFAS are considered unsafe?

- The U.S. Environmental Protection Agency (EPA) has issued a drinking water lifetime health advisory (LHA) for two types of PFAS, called PFOS (perfluorooctanesulfonic acid) and PFOA (perfluorooctanoic acid) — individually or combined — of 70 parts per trillion (ppt or nanograms per liter). The EPA's LHA is intended to prevent adverse health effects associated with consuming water containing PFOS and PFOA over a lifetime, even for sensitive populations.

- The EPA's LHA value was based on the available scientific evidence in 2016 regarding the potential health effects of PFAS. Historically, most research has been done on PFOS and PFOA. Recently, new scientific studies have become available that suggest other PFAS compounds (e.g., PFNA, PFHxS, and PFHpA) may also pose a health risk.
- Because of this new information, the Alaska Department of Environmental Conservation (ADEC) issued more stringent guidelines on PFAS in groundwater in August, 2018. The new guidelines state that the sum of all five PFAS compounds of concern (i.e., PFOS, PFOA, PFNA, PFHxS, and PFHpA) should be below 70 ppt in drinking water, to ensure that human health is protected. The new ADEC guidelines are available online (http://dec.alaska.gov/spar/csp/guidance-forms).

How can PFAS affect my health?

- Research with animals has shown that exposure to certain types of PFAS can cause developmental, endocrine, liver, metabolic, and immune toxicity. However, it is important to note that these studies typically use much higher exposure levels than humans commonly experience.
- Scientists are still determining how long-term, low-level exposure to PFAS may impact human health. However, potential health effects from exposure to PFAS are thought to include:
    - Developmental effects on unborn babies and breastfeeding infants — including possible changes in growth, learning, and behavior
    - Decreased fertility and interference with the body's hormones
    - Increased cholesterol and abnormal metabolism of fats
    - Decreased immune function
    - Increased risk of some types of cancer

Are some populations more susceptible to PFAS?

The US Agency for Toxic Substances and Disease Registry considers developing embryos and children through age 18 to be more vulnerable to PFAS.

How can I tell if I have come into contact with PFAS?

PFAS can be measured in the blood; however, this is not a routine test and the results do not provide clear answers for one's potential risk of experiencing health effects. If you would like to have a blood test, please consult with your health care provider.

How can I remove PFAS from my body?

There are no medical interventions that will remove PFAS from the body. The best intervention is to stop the source of exposure.

Safety Information for Fairbanks Residents

Can I drink my well water? What about my pets?

Do not drink your well water or use it to prepare baby formula if the sum concentration of the five PFAS of concern (i.e., PFOS, PFOA, PFNA, PFHxS, and PFHpA) is above the ADEC action level of 70 parts per trillion (ppt). You should also find an alternative water source for pets and other animals.

Is it safe to cook with my well water?

You should not use your well water when cooking or washing food if the sum concentration of the five PFAS of concern is 70 ppt or more. Heating or boiling water doesn't remove PFAS.

Can I clean, wash dishes, wash clothes, and rinse food with my well water?

If your well water is contaminated with PFAS, it is safe to use well water to clean your house, wash dishes, and do laundry.

Is it safe to shower, take baths, and brush my teeth with my well water?

If your well water is contaminated with PFAS, you can reduce exposure by using an alternative (or treated) water source for brushing teeth or any other activity that might result in inadvertent ingestion of water. This is especially true for young children who may swallow water during bathing or brushing teeth. However, it is very unlikely that showering or taking baths with well water will cause any health problems for the following reasons:

- Your skin does not absorb PFAS very well, and PFAS are not skin irritants
- PFAS do not easily move from water to air, so inhalation of much PFAS during showering is unlikely

Can I breastfeed my child if I have been drinking my well water?

It is recommended that nursing mothers continue to breastfeed. This is because breastfeeding provides a number of health benefits for both infants and mothers, which outweigh any known risk associated with transfer of PFAS through breast milk.

Is it safe to water my vegetable garden with my well water?

Some people may feel more comfortable using an alternative water source (which includes rainwater) for their vegetable gardens. Some studies show that certain types of vegetables may absorb small amounts of PFAS through their roots (which can be distributed throughout the plant), but the amount taken up depends on many different factors. These include the levels of PFAS in the water, the frequency of watering, the types of PFAS in the water, and the type of produce grown. However, these studies also note that the health benefits of eating fresh vegetables outweigh the health risks associated with exposure to the small amounts of PFAS that may be present in vegetables. Ultimately, your exposure to PFAS through garden vegetables is not likely to be significant compared to other primary exposure routes such as drinking contaminated water.

If you are concerned about the PFAS content of your soil, produce can either be grown in raised beds with clean soil, or clean compost can be added to the soil to reduce the uptake of PFAS. Regardless of which options you select, we recommend you wash your vegetables with clean water and peel root vegetables.

How often will my well water be tested for PFAS?

The FAI is currently checking wells near the airport. How often the wells are checked will depend on how high the levels of PFAS are. Wells are sampled quarterly or annually, depending on well use, location, and PFAS concentration. Homes that have wells that exceed the LHA will not be resampled, as interim water is being provided and they are being connected to the municipal system as a permanent drinking water source.

What is the Alaska Section of Epidemiology doing to address concerns about PFAS in drinking water?

The Section of Epidemiology is taking steps to protect Fairbanks residents, including:

- Working with the ADEC and the Agency for Toxic Substances and Disease Registry (ATSDR) to understand how PFAS from well water may affect people living near the FAI.
- Finding more information about PFAS and updating our recommendations as data become available.

Where can I get more information?

Helpful Phone Numbers:

State of Alaska Environmental Public Health Program (EPHP) at *907-269-8000* to learn more about the health effects of PFAS

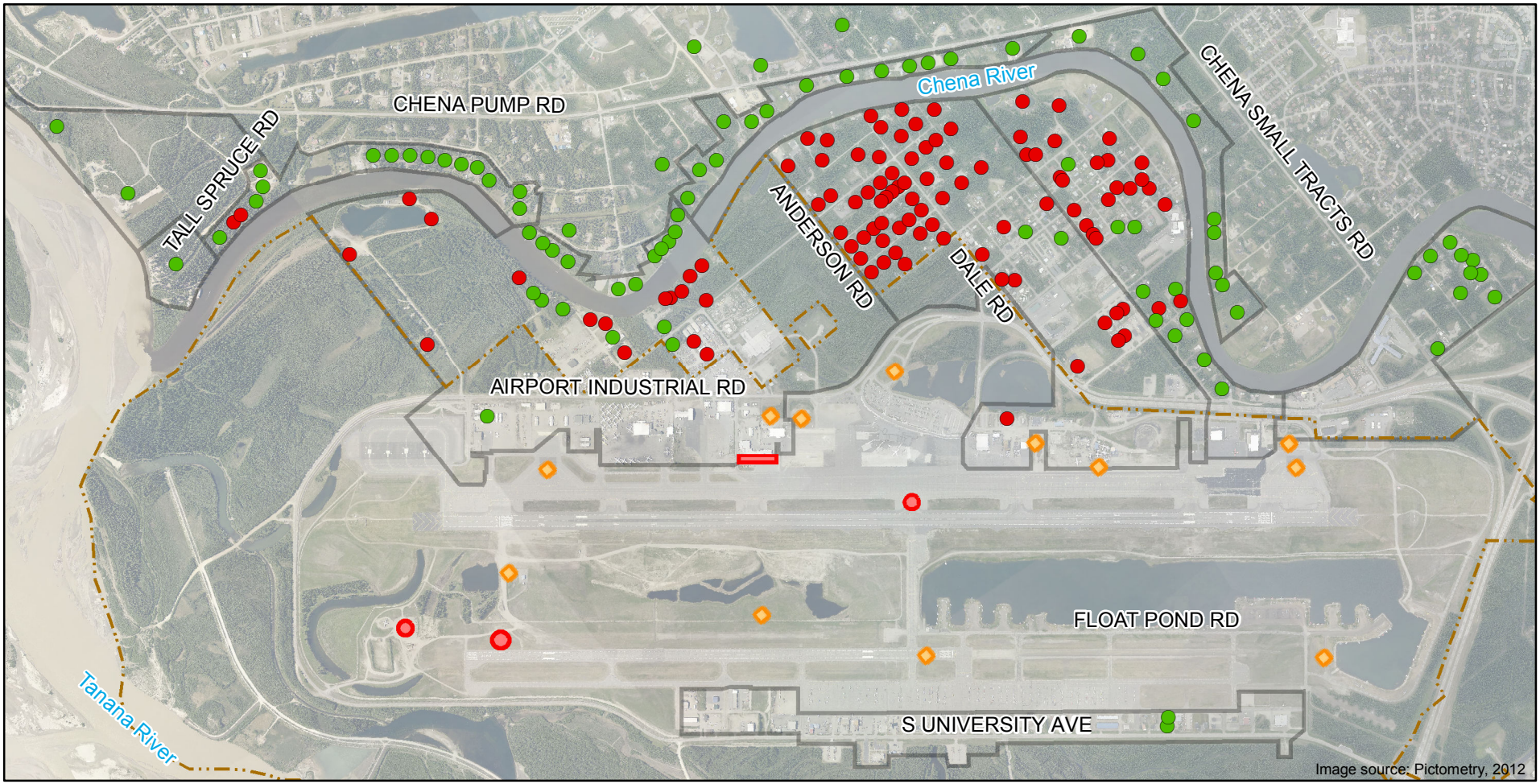
ADEC at *907-451-2153* to learn more about testing for PFAS

Helpful Links:

EPHP's PFAS website: *http://dhss.alaska.gov/dph/Epi/eph/Pages/default.aspx*

ADEC's PFAS website: *http://dec.alaska.gov/spar/csp/pfas-contaminants/*

Fairbanks International Airport website: *www.dot.alaska.gov/faigroundwater*



LEGEND

- Sum of PFOS, PFOA, PFHxS, PFHpA, and PFNA results under ADEC action level for drinking water (65 ppt)
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- Aircraft Rescue and Firefighting (ARFF) Training Sites
- ARFF Emergency Response Sites
- FAI Boundary
- Well Search Areas

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Fairbanks International Airport
Fairbanks, Alaska

PFAS WELL SEARCH AND SAMPLE LOCATIONS

December 31, 2018 31-1-20060-002

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Figure 1

APPENDIX B: FIELD NOTES

Appendix B

Field Notes

CONTENTS

- Residential Well Sampling Logs and corresponding Private Well Inventory Survey Forms for wells sampled between May 8 and December 12, 2018
- Private Well Inventory Survey Forms for unsampled wells

This appendix contains personal information. Content has been removed for confidentiality.

APPENDIX C: LABORATORY REPORTS

Appendix C

Laboratory Reports

and ADEC Data Review Checklists

This appendix is located in a separate PDF.

IMPORTANT INFORMATION

Important Information

About Your 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.