Northwest
Oak Harbor, Washington

Final

Preliminary Assessment for Per- and Polyfluoroalkyl Substances (PFAS) Ault Field

Naval Air Station Whidbey Island
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Prepared for NAVFAC Northwest
by CH2M HILL, Inc.
Bellevue, Washington
Contract N62470-16-D-9000
CTO 4041

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Acronyms and Abbreviations

µg/L	micrograms per liter
AEMT	Advanced Emergency Medical Technician
AFFF	aqueous film forming foam
bgs	below ground surface
BOSC	Base Operating Support Services Contract
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CH2M	CH2M HILL, Inc.
CLEAN	Comprehensive Long-term Environmental Action—Navy
DoD	Department of Defense
FTA	fire training area
LHA	lifetime health advisory
msl	mean sea level
NASWI	Naval Air Station Whidbey Island
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NIRIS	Naval Installation Restoration Information Solution
OLF	Outlying Landing Field
PA	Preliminary Assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutane sulfonate
PFC	perfluorinated compound
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
ppt	parts per trillion
RPM	Remedial Project Manager
RSL	Regional Screening Level
SI	Site Inspection
SDWA	Safe Drinking Water Act
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VSI	visual site inspection
WWTP	wastewater treatment plant

SECTION 1

Introduction

The Department of the Navy (Navy) Environmental Restoration Program at Naval Air Station Whidbey Island (NASWI), which is within the Naval Facilities Engineering Command (NAVFAC) Northwest Division, contracted with CH2M HILL, Inc. (CH2M) to perform preliminary assessment (PA) activities at all NASWI installations (Ault Field, Outlying Landing Field (OLF) Coupeville, and Seaplane Base) to determine probable environmental release of per- and polyfluoroalkyl substances (PFAS). This report focuses on Ault Field–specifically, completing PA activities to identify locations at Ault Field where PFAS may have been released into the environment and to provide an initial assessment of possible migration pathways and receptors of potential contamination. This work is being performed under Comprehensive Long-term Environmental Action—Navy (CLEAN) 9000 Contract N62470-16-D-9000, Contract Task Order 4041.

CH2M conducted PA visits at Ault Field during the months of October through December 2017. Ault Field is an active Navy installation in the City of Oak Harbor, Washington. The location of the NASWI installations including Ault Field are shown on **Figure 1-1** and the potential PFAS release locations identified at Ault Field during this PA are shown on **Figure 1-2**.

1.1 Background

PFAS are compounds found in a variety of commercial and industrial sources and have been widely used since the 1970s, including in the generation of aqueous film forming foam (AFFF), which was utilized by the Navy for fire training exercises, fire suppression systems, and suppressing aircraft fires or other fires. The first fire-fighting foam containing PFAS was marketed by the 3M Corporation in 1964 (3M Corporation, 2018), and the Military Specification for AFFF (MIL-F-24385) was issued in late 1969. AFFF suppresses combustion by coating the fuel source of the fire, and subsequently preventing oxygen from entering. Areas located within Ault Field may have used, stored, disposed of, or released AFFF during historical operations.

PFAS have been identified by United States Environmental Protection Agency (USEPA) as emerging contaminants, which is defined by the Department of Defense (DoD) as contaminants that have a reasonably possible pathway to enter the environment, present a potential unacceptable human health or environment risk, and lack or have evolving published regulatory standards (Navy, 2017a). As detailed in the NAVFAC Interim PFAS Site Guidance (Navy, 2017b), there are no Safe Drinking Water Act (SDWA) federal regulations or Clean Water Act Ambient Water Quality Human Health Criteria for any PFAS. For contaminants not subject to national primary drinking water regulation, the SDWA authorizes the USEPA to publish nonregulatory lifetime health advisories (LHAs) or take other appropriate actions. These LHAs are created to assist state and local officials in evaluating risks from these contaminants in drinking water. In May 2016, the USEPA issued an LHA for two PFAS, specifically perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS). Each LHA was established as 70 parts per trillion (ppt) or 0.07 microgram per liter (µg/L), and in addition, included an LHA for the total concentration of PFOA and PFOS combined of 70 ppt when both PFOA and PFOS have been detected. Additionally, a risk-based Regional Screening Level (RSL) has been set for one other PFAS compound, perfluorobutane sulfonate (PFBS). As of June 2017, this level was 400 µg/L (400,000 ppt) for tap water.

PFAS are chemically and biologically stable, and resist natural degradation processes, allowing them to persist in the environment. Recognized sources of PFAS in groundwater and soil include (NGWA, 2017):

- Storage, transfer, and use of AFFF for firefighting and fire training
- Disposal and land application of biosolids
- Discharge of effluent from municipal wastewater treatment systems
- Release from landfill leachate
- Release from commercial and industrial sources

1.2 Purpose and Objectives

The purpose of this PA report is to assess potential PFAS releases into the environment at Ault Field. Specific objectives are to:

- Identify locations related to the potential use, storage, and disposal of AFFF.
- Provide initial overview of potential contaminant migration pathways from areas where AFFF was potentially used and identify potential receptors that may be exposed.
- Provide recommendations for areas requiring further investigation.

This PA Report considers and documents known fire training areas (FTAs), as well as non-fire training locations where PFAS may have been released into the environment (**Table 1-1**).

Table 1-1. Fire Training Areas and Non-Fire Training Areas Identified for Potential PFAS Releases
NASWI Ault Field, Washington

Fire Training Areas
Former Chapel Fire School (Area 28*)
Former Clover Valley Fire School (Area 29*)
Former 1966 Fire School (Area 27*)
Former Runway Fire School (Area 31*)
Current Fire Training Area
Hangars/Buildings
Hangar 1 (Building 112)
Hangar 5 (Building 386)
Hangar 6 (Building 410)
Hangar 7 (Building 2544)
Hangar 8 (Building 2642)
Hangar 9 (Building 2681)
Hangar 10 (Building 2699)
Hangar 11 (Building 2733)
Hangar 12 (Building 2737)
Hangar 14
Fire Stations
Former/Current Fire Station (Building 2897)
Emergency Response Locations
1976 EA-6 Crash Site
1981 P-3A Crash Site
1985 EA-6B Crash Site
1989 A-6 Crash Site
1990 A-6 Crash Site
2006 F-18 Crash Site

Table 1-1. Fire Training Areas and Non-Fire Training Areas Identified for Potential PFAS Releases
NASWI Ault Field, Washington

AFFF Spray Test Areas
Indoor Wash Rack (Building 2903)
Wastewater Treatment Plants
Former Wastewater Treatment Plant (Building 420)
Former Sewage Lagoons
Wastewater Treatment Plant
Landfills
1959-1969 Landfill (Area 2*)
1968-1970 Landfill (Area 3*)
Area 6*
Other Sites
P3 Wash Rack
Walker Barn Storage Area (Area 4*)
Pesticide Rinsate Disposal Area (Area 14*)
Fire School Can Disposal Area (Area 30*)
Hot Pit 1 (Refueling Area 1)
Hot Pit 2 (Refueling Area 2)
Hardstand Area
Gallery Golf Course
Runway Drainage Ditch System (Area 16*)
Former Avionics Facility (Building 2547)

Note:
*Area numbers were previously designated by the Environmental Restoration, Navy Program.

1.3 Preliminary Assessment Methods

This PA was conducted in accordance with the USEPA's *Guidance for Performing Preliminary Assessments under CERCLA* (USEPA, 1991) with additional guidance from the Navy's *Interim Per-and Polyfluoroalkyl Substances (PFAS) Site Guidance for NAVFAC Remedial Project Managers (RPMs)/ September 2017 Update* (Navy, 2017b). The following steps of the PA process were completed:

- A review of existing site documentation was performed to identify and characterize potential PFAS storage, use, release, or disposal activities and to focus the activities conducted during a visual site inspection (VSI).
- Interviews were conducted with relevant site personnel to identify and characterize potential PFAS storage, use, release, or and disposal activities and to focus the activities conducted during the VSI.
- A VSI was conducted to identify evidence of PFAS storage, use, release, or disposal activities to fill data gaps identified in the preliminary review, and to observe physical site characteristics (for example, surface flow, drainage conditions) for areas identified during the preliminary review and interviews.

- Environmental data records were identified and reviewed to identify nearby populations, drinking water sources, and environmental sensitive areas.

The preliminary document review, interviews, VSI, and environmental data record review activities and conclusions are summarized in this report, along with recommendations for each potential PFAS release area. Potential PFAS exposure routes were also evaluated, with consideration of current and potential future land and groundwater use.

1.4 Report Organization

This PA contains the following sections:

- **Section 1 – Introduction,** describes the background, purpose, and organization of the report.
- **Section 2 – Background,** describes facility and relevant history.
- **Section 3 – Archive Sources,** identifies the sources of information used to identify and assess potential PFAS release areas.
- **Section 4 – Identification and Assessment of Potential PFAS Release Areas,** presents each potential release area along with a description and operational history; PFAS storage, use, or release; and a pathway and environmental hazard assessment.
- **Section 5 – Conclusions and Recommendations,** summarizes the findings of this PA and makes recommendations regarding future actions.
- **Section 6 – References,** provides the references used in compiling this report.

SECTION 2

Background

2.1 Facility Description and Background

The NASWI complex is located in Island County, Washington on Whidbey Island and consists of Ault Field, OLF Coupeville, and Seaplane Base. Ault Field occupies approximately 4,300 acres 3 miles northwest of the City of Oak Harbor, Washington (**Figure 1-1**). Ault Field was commissioned in 1942 and was used for the rearming and refueling of Navy patrol planes and other tactical aircraft operating in the Puget Sound region (Navy, 2016). Currently, Ault Field supports Navy tactical electronic attack squadrons flying the EA-18G Growler aircraft, the P-3 Orion Maritime Patrol squadrons, and two Fleet Reconnaissance squadrons flying the EP-3E Aries aircraft (Navy, 2017b).

2.2 Environmental Setting

Ault Field is situated on the northern end of Whidbey Island in the Clover Valley, with elevated areas to the south, northeast, and east (**Figure 1-1**). The far eastern and western extents are bounded by Dugualla Bay and the Strait of Juan de Fuca, respectively. The central and most developed portion of Ault Field, which includes operations buildings, runways, taxiways, and barracks, is relatively flat with elevations ranging from approximately 10 to 50 feet above mean sea level (msl). Steep slopes and coastal bluffs occur mainly along the shoreline along the western side of Ault Field.

Whidbey Island is a temperate climate with mild, dry summers and cool, wet winters. On average, January is the coolest month and August is the hottest. The mean temperature for Whidbey Island is 50 degrees Fahrenheit. Whidbey Island has a mean annual precipitation of 19 inches per year, which is lower than most locations in western Washington due to a “rain shadow” effect as storm systems move over the Olympic Mountain Range (USGS, 2007).

2.2.1 Geologic Setting

Whidbey Island lies within the Puget Lowland, a topographic and structural depression between the Olympic Mountains and the Cascade Range (**Figure 1-1**). The geology of the area is heavily influenced by glacial advances and retreats. At the height of the most recent glaciation, ice is estimated to have reached a thickness of about 4,500 feet in the Oak Harbor area. The geologic units on Whidbey Island thus consist of a sequence of Quaternary-age (less than 2 million years old) glacial and interglacial deposits that may be over 3,000 feet thick (USGS, 2005) with near-surface deposits being mostly glacial sediment of the Fraser glaciation (20,000 to 10,000 years old).

The Everson and Vashon units of the Fraser glaciation, post-glacial sediment, and artificial fill make up most of the surface and near-surface soil underlying Ault Field. In general, stratigraphic units up to 100 feet thick, consisting of relatively impermeable clay, silt, and silty fine sand (Everson glaciomarine drift and Vashon till), form the near-surface layers. Underlying the Vashon outwash in most places are sand, silt, and clay of the Whidbey Formation.

Three parallel active fault zones exist at Ault Field that are regionally significant. The Devil’s Mountain, Strawberry Point, and Utsalady Point fault zones trend from southeast to northwest across Ault Field. Fault movement is oblique with both horizontal and vertical components. In general, the horizontal component is left-lateral, while the vertical component is normal with the north wedge up (USGS, 2005).

2.2.2 Hydrogeologic Setting

The United States Geological Survey (USGS) has identified five major hydrogeologic units, labeled A through E, on Whidbey Island. However, only Units D and E are present at Ault Field (USGS, 2005). Units D and E are termed intermediate and shallow aquifers, respectively (URS, 1993). Locally perched zones may exist over discontinuous areas of till or other clay-rich units (MMEC & AECOM, 2016).

The shallow aquifer (Unit E) is a locally discontinuous unconfined aquifer consisting of sand and gravel with an average groundwater elevation of 20 feet msl. At Ault Field, the shallow aquifer is found in the Vashon Outwash deposits at or near the surface. The intermediate aquifer (Unit D) is a moderately continuous sandy unit that is generally confined. Potentiometric surface elevations vary from 10 to 75 feet msl (URS, 1993).

Groundwater beneath Ault Field is recharged by infiltration of precipitation. Groundwater flow in specific regions of Ault Field was documented in previous environmental investigations (URS, 1993; MMEC & AECOM, 2016). However, there is a lack of monitoring wells in the flight line and along the eastern boundary of Ault Field, thus groundwater flow in this area is unknown. In general, groundwater flows to the northeast towards Dugualla Bay and mimics the topography of the Clover Valley. A groundwater divide extends southwest to northeast along the topographic high of the coastal bluff in the southwestern part of Ault Field. Groundwater to the northwest of the divide flows west towards the Strait of Juan de Fuca, and groundwater to the southeast of the divide flows east towards the interior of the island.

2.2.3 Hydrologic Setting

Surface water on Whidbey Island occurs on soils with low infiltration rates resulting from surficial clays or at locations with high water tables. Streams tend to be shallow and flow is reduced significantly during the summer months (Navy, 2016). The primary surface water feature on Ault Field, Clover Valley Stream, flows northeast towards Dugualla Bay (**Figure 1-2**). Clover Valley Stream is one of two outfalls for stormwater at Ault Field. Stormwater from the central and southeastern portions of Ault Field is diverted into a complex system of drainage ditches and culverts adjacent to the runways and taxiways (referred to as Area 16, Runway Drainage Ditch System) and eventually discharges into Clover Valley Stream east of Ault Field. Stormwater from the northern and southwestern portions of Ault Field is captured by the stormwater system which discharges into the Strait of Juan de Fuca.

2.2.4 Ecological Receptors

The occurrence of ecological receptors in a study area encompassing Ault Field, Seaplane Base, OLF Coupeville, and the surrounding areas are summarized in the following subsections.

Federally Threatened and Endangered Species

There are seven federally listed terrestrial species that could potentially occur at Ault Field and the surrounding area (USFWS, 2017). These are:

- Golden paintbrush (plant, threatened)
- Taylor's checkerspot butterfly (invertebrate, endangered)
- Bull trout (fish, threatened)
- Marbled murrelet (bird, threatened)
- Northern spotted owl (bird, threatened)
- Streaked horned lark (bird, threatened)
- Yellow-billed cuckoo (bird, threatened)

Other Fish and Wildlife Species

Reptile and amphibian species potentially occurring in the study area encompassing Ault Field, Seaplane Base, OLF Coupeville, and the surrounding areas include several species of lizards, snakes, salamanders, and frogs. Birds occurring in the study area include about 230 migratory bird species protected under the Migratory Bird Treaty Act. Six common year-round bird species may also occur, including the ring-necked pheasant (*Phasianus colchicus*), rock pigeon (*Columba livia*), Eurasian collared-dove (*Streptopelia decaocto*), European starling, house sparrow (*Passer domesticus*), and the California quail (Callipepla californica). Thirty-six species of terrestrial mammals were identified as potentially occurring in the study area. Large mammals that regularly occur are the Columbian black-tailed deer (*Odocoileus hemionus columbianus*) and the coyote (*Canis latrans*), which occur in the mixed forest, alder forest, and freshwater marsh habitat types, as well as in grasslands. The eastern cottontail (*Sylvilagus*

floridanus), European rabbit (*Oryctolagus cuniculus*), river otter (*Lontra canadensis*), mink (*Mustella vison*), opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), Douglas squirrel (*Tamiasciurus douglasii*), Townsend's vole (*Microtus townsendii*), masked shrew (*Sorex cinereus*), and deer mouse (*Peromyscus maniculatus*) also are among the most commonly occurring mammals within the study area. Bat species are also commonly occurring. Many fish and marine mammals may potentially occur in the marine areas that surround Whidbey Island (Navy, 2016).

2.2.5 Water Usage

The Ault Field water supply comes from the drinking water treatment plant facility at Mount Vernon 16 miles to the northwest, which is owned and operated by the City of Anacortes. Water from the Skagit River is pumped into the Mount Vernon water treatment plant and transported to NASWI via pipeline. The pipeline was constructed in 1942 to service the newly developed installation at Ault Field. The pipeline was extended to Oak Harbor in 1970 to supplement the city water supply; however, residences surrounding Ault Field are mainly supplied by private or community drinking water wells (Economic and Engineering Services, 1990).

A seasonal water supply well used to water the golf course exists in the southeastern portion of Ault Field. The well is operated by the Navy on an as-needed basis in cooperation with surrounding private well owners to ensure limited drawdown in adjacent wells.

The USEPA has designated the Whidbey Island aquifer system as a sole-source aquifer as it is the only potable water source for half the island's residents. The aquifer boundaries have been clearly defined and there is no alternative source for drinking water on the island.

2.3 Previous and Current PFAS Investigations

The following is a summary of both the on-Base and the off-Base PFAS-related investigation activities completed to date.

2.3.1 Groundwater Investigation

In September of 2015, the Navy conducted on-Base groundwater sampling at Ault Field to evaluate the presence of PFAS in groundwater at Areas 16, 31, and Hangar 5 (MMEC, 2016). Concentrations of PFOA and PFOS exceeded applicable 2009 USEPA Provisional Health Advisory screening levels (PFOA – 0.4 µg/L; PFOS – 0.2 µg/L) from two monitoring wells in Area 31 (referred to in this report as Former Runway Fire School) (MMEC, 2016). Additional detections of PFAS were obtained from two monitoring wells near Hangar 5, however, both detections were below the Provisional Health Advisory screening levels. There were no detections in two wells sampled at Area 16.

In December 2017, CH2M conducted an on-Base groundwater study for PFAS at Area 6, the former landfill and former industrial waste disposal area. During this event, 13 monitoring wells were sampled along with influent and effluent samples from the current groundwater treatment system. Preliminary results indicate that one of the 13 monitoring wells sampled exceeded the USEPA LHA for PFOA, although none of the groundwater samples exceeded the LHA for PFOS individually. Additional detections of PFAS were recorded in seven of the monitoring wells; however, the concentrations were below the LHA for both PFOA and PFOS individually, and for the sum of the two.

Following the on-Base PFAS sampling event, an off-Base PFAS groundwater sampling event was conducted in Spring 2018 in which 13 monitoring wells were sampled. Preliminary results indicate detections of PFOA and/or PFOS in five of the thirteen wells; however, the concentrations were all below the LHAs for PFOA and/or PFOS. Five of the remaining eight off-Base wells were sampled in July of 2018 and one additional well was sampled in August of 2018. The other two monitoring wells will not be sampled due to access restrictions. Validated results have not been received to date, thus, are not included in this report.

2.3.2 Drinking Water Well Investigation

From November 2016 to June 2017, off-Base drinking water wells were sampled under a voluntary sampling program. Due to the uncertainty of groundwater flow direction at the time, the Navy used the Current Fire Fighting School (referred to in this report as Current Fire Training Area), Runway and Drainages, and Former Fire Fighting School (referred to in this report as Former Runway Fire School) as the center points to draw a 1-mile radius to initiate the Phase 1 off-Base drinking water sampling. The Phase 1 results indicate that PFOS and/or PFOA are above the LHA in one off-Base drinking water well south of Ault Field (CH2M, 2017a). Based on the Phase 1 results, the Navy expanded the drinking water investigation an additional half-mile. This additional area is referred to as the Phase 2 sampling area. The Phase 2 results indicate that PFOS and/or PFOA are above the USEPA LHA in one off-Base drinking water well east of Ault Field (CH2M, 2017a). Based on the Phase 2 results, the Navy expanded the drinking water investigation an additional half-mile from this property. This additional area is referred to as the Phase 3 sampling area. There were no exceedances of the USEPA LHA for PFOS/PFOA or the USEPA RSL for PFBS in the Phase 3 area. Based on the Phase 3 results, the Navy did not expand the drinking water sampling area near Ault Field beyond the Phase 3 area.

Due to the detection of PFOA above the LHA in one of the Area 6 monitoring wells during the December 2017 groundwater sampling event, a voluntary off-Base drinking water well sampling event was conducted for wells hydraulically downgradient of Area 6 in Spring 2018. Preliminary results from this sampling event indicate 5 of the 17 drinking water wells sampled contain PFOS and/or PFOA above the LHA.

SECTION 3

Archive Sources

This section summarizes the sources of information used to perform the PA.

3.1 Preliminary Review

Information was gathered and evaluated during the preliminary review to identify and characterize locations of potential PFAS storage, use, or disposal, and to focus the activities to be conducted during the VSI. The information was obtained from existing documents and interviews conducted with relevant individuals. A summary of information reviewed is provided as **Appendix A**.

3.1.1 Document Review

Internet Records

Internet search engines were utilized to find historical information on crashes, fires, use of AFFF, spills, and other pertinent information at Ault Field. Information obtained through Internet search engines was confirmed either through visual observation, interviews, or review of official documentation.

Facility Operations Records

Navy staff provided inventory lists for AFFF, including installed storage in trucks, trailers, or dispensing tanks, and uninstalled storage in manufacturers' shipping containers (cans, pails, drums, or totes). A building inventory list was obtained from the Naval Installation Restoration Information Solution (NIRIS) geographic information system records.

Naval Installation Restoration Information Solution Records

NIRIS records were searched for key terms to identify potential PFAS release areas and to obtain information on physical investigations and identification of potential pathways and receptors for those areas. A complete list of NIRIS records used in the development of this PA are provided in **Appendix A**. Additional information from these reports was gathered to identify whether any receptors (with consideration of reasonably anticipated current and future land and water use) or habitats (for example, waterways) may have been affected by AFFF releases.

Aircraft Incident Reports

A summary of NASWI aircraft incidents that occurred near Ault Field during flight operations from 1975 to approximately May 2005 was obtained from an Air Installation Compatible Use Zones report for NASWI (Onyx, 2005) and supplemented with findings from internet searches and interviews. Aircraft incident reports were requested but were not received in time for inclusion in this report.

3.1.2 Interviews

Interviews were conducted with current and former NASWI personnel to gather pertinent information regarding the history and operations at NASWI, including Ault Field. The goal of these interviews was to validate and verify data collected during the desktop studies and documents and records reviews, and to identify other information related to PFAS not previously found in historical documents. Interviews with specific information related to Ault Field are referenced in **Section 4.**

The interviews were conducted in person, by telephone, or via email. Each interview session was logged using an Interview Log Sheet (**Appendix B**). Completed log sheets are provided in **Appendix B**. Information from the interviews was also used to confirm and select additional locations to observe during site visits. This information is referenced in **Section 4**.

The following personnel were interviewed:

- Retired Director of Research, Principal Investigator for International Arrow, and Goal Technologies
- NAVFAC Northwest Regional Hazardous Waste Program Manager
- NAVFAC Northwest Engineering Technician
- NAVFAC Northwest Public Works, Hazardous Waste Manager
- NASWI Fire Chief, 2008 to present
- NASWI Crash Captain, 1985 to 2001
- NASWI Advanced Emergency Medical Technician (AEMT)/Firefighter
- Regional Fire Chief, Navy Region NW, 2006 to present; NASWI Fire Chief, 1999 to 2006
- NASWI Public Works Officer
- NAVFAC Lead Engineering Technician, NASWI Facility Engineering & Acquisition Division

3.2 Visual Site Inspection

The VSIs were conducted from October to December 2017. The information obtained during the review/interview process was used to identify potential PFAS-related areas for the VSI. All identified, accessible areas were visited to inspect for signs of potential AFFF releases such as surficial debris, stained soils, areas devoid of vegetation or with stressed vegetation; to locate receptors and distances from potential releases; and to identify significant topographical features affecting local drainage patterns and overland flow routes to nearby surface water bodies. The areas identified for the VSI (potential PFAS release areas) are shown on **Figure 1-2** and are discussed in more detail in **Section 4**. Field notes obtained during the VSI are provided in **Appendix C**.

SECTION 4

Identification and Assessment of Potential PFAS Release Areas

This section summarizes the characteristics of each area identified for the VSI; the potential for PFAS to have been stored, used, or released at each area; and assesses the migration pathways and potential exposures that could result from a PFAS release. If no PFAS storage, use, or release was identified at an area, the potential migration pathways and exposures were not assessed for the area because they would not be applicable. The locations of each area are shown on **Figures 4-1** to **4-5**.

A complete exposure pathway typically includes the following components: a source of contamination (an environmental medium contaminated at the source or a release mechanism by which chemicals are released from a source medium and transported), an exposure medium by which a receptor comes into contact, and a route of intake for the contaminant into the receptor's body. If any of these elements are missing, the pathway is incomplete. Other release mechanisms resulting in exposure media for receptors may include the uptake of soil contaminants by plants and animals and the emission of soil contaminants into the air in association with dust particles (USEPA, 1989).

Database research shows 12 schools, 15 daycare facilities, 12 retirement homes, and 2 hospitals within a 4-mile radius of Ault Field. The City of Oak Harbor is approximately 3 miles south. A total of 169 residential and commercial land parcels are within 200 feet of the Base boundary (no schools or daycare facilities were identified within 200 feet of the boundary).

4.1 Fire Training Areas

4.1.1 Former Chapel Fire School (Area 28)

Description and Operational History

The Former Chapel Fire School (Area 28) was located in a grass-covered area northeast of Building 960 (the Chapel Building) north of West Intruder Street (**Figure 4-3**). The Former Chapel Fire School and associated structures were deconstructed at an unknown date. Currently, no visible structures or materials from the Former Chapel Fire School remain. The approximate geographic coordinates for the Former Chapel Fire School are 48°20'27.276"N and 122°40'43.358"W.

The Former Chapel Fire School consisted of a burn pad where an estimated 300,000 to 550,000 gallons of flammable liquids were used from 1942 to the early 1950s (Navy, 1984). Specific details of the burn pad and layout of the surrounding structures are not known.

PFAS Storage, Use, or Release

The first fire-fighting foam containing PFAS was sold by the 3M Corporation in 1964 (3M Corporation, 2018), and the Military Specification for AFFF (MIL-F-24385) was issued in late 1969. Since the Former Chapel Fire School was not used after the early 1950s, no potential release of PFAS to the environment exists.

Pathway and Environmental Hazard Assessment

Not applicable.

4.1.2 Former Clover Valley Fire School (Area 29)

Description and Operational History

The Former Clover Valley Fire School (Area 29) was located west of the intersection of Clover Valley Road and Golf Course Road (**Figure 4-1**). The Gallery Golf Course surrounds the area to the south with Clover Valley Road to the north and Golf Course Road to the east. The Former Clover Valley Fire School is currently fenced, encapsulating approximately 4 acres of land that is now overgrown with vegetation. Land use control signs are posted on the area fence warning pedestrians and workers that the soil and groundwater in the area contain contaminants above unrestricted levels. No visible structures or materials from the Former Clover Valley Fire School remain. The approximate geographic coordinates for the Clover Valley Fire School are 48°19'33.670"N and 122°41'30.192"W.

Fire training activities took place at the Former Clover Valley School from 1951 to 1966. During that period, an estimated 50,000 to 70,000 gallons of flammable liquids may have been discharged to the ground surrounding the burn pad (Navy, 1984). Specific details of the burn pad and layout of the surrounding structures are not known.

PFAS Storage, Use, or Release

Although the Military Specification for AFFF (MIL-F-24385) was issued in late 1969, the 3M Corporation first marketed AFFF containing PFAS in 1964 (3M Corporation, 2018). Since the Former Clover Valley Fire School was operational until 1966, PFAS-based AFFF could have potentially been tested, used, and released into the environment at this location.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

Any AFFF exposed to the surrounding grass-covered areas or soil would have infiltrated the subsurface and potentially leached into the groundwater at this location. Apparent groundwater flow near the Former Clover Valley Fire School is assumed to be to the northeast (**Figure 4-1**). Depth to the surficial aquifer at this location is assumed to be approximately 55 to 65 feet below ground surface (bgs). Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, seven of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 3.1 miles to the northeast and 0.2 mile to the east, while five of the wells are grouped in a relatively small cluster 2.4 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the northeast within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Overland flow of AFFF would have collected in topographical depressions and infiltrated the subsurface. Due to the subtle slope of the area, overland flow of AFFF into surface water bodies is unlikely. Surface water is not used as a drinking water source at Ault Field; therefore, there is no current exposure pathway for surface water to residents through drinking water. Additionally, there are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (3.3 miles to the northeast), the Strait of Juan de Fuca (0.4 mile to the west), and Oak Harbor (3.4 miles to the southeast).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water through direct exposure with surface water.

Soil and Air Pathways and Targets

AFFF that washed into the surrounding grass-covered and topographically low areas could have contaminated the surface and subsurface soil in the area. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of grass-covered areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.1.3 Former 1966 Fire School (Area 27)

Description and Operational History

The Former 1966 Fire School (Area 27) was located in a grass-covered area northeast of the intersection of Midway Street and Saratoga Street (**Figure 4-3**). The Former 1966 Fire School and associated structures were deconstructed at an unknown date. Currently, no visible structures or materials from the Former 1966 Fire School remain. The approximate geographic coordinates for the Former 1966 Fire School are 48°20'20.308"N and 122°40'46.993"W.

The Former 1966 Fire School was used for fire training activities during a 6-month period in 1966. During that time, an estimated 300,000 to 550,000 gallons of flammable liquids were used at the fire school (Navy, 1984). Specific details of the burn pad and layout of the surrounding structures are not known.

PFAS Storage, Use, or Release

Although the Military Specification for AFFF (MIL-F-24385) was issued in late 1969, the 3M Corporation first marketed AFFF containing PFAS in 1964 (3M Corporation, 2018). Since the Former 1966 Fire School was operational in 1966, PFAS-based AFFF could have potentially been tested, used, and released into the environment at this location.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

Any AFFF exposed to the surrounding grass-covered areas or soil would have infiltrated the subsurface and potentially leached into the groundwater at this location. Apparent groundwater flow near the Former 1966 Fire School is assumed to be to the east (**Figure 4-3**). Depth to the surficial aquifer at this location is not known due to a lack of groundwater monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 2.7 miles to the east and 1 mile to the south, while five of the wells are grouped in a relatively small cluster 2.6 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the northeast within

the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Overland flow of AFFF would have collected in topographical depressions and infiltrated the subsurface. Due to the subtle slope of the area, overland flow of AFFF into surface water bodies is unlikely. Surface water is not used as a drinking water source at Ault Field; therefore, there is no current exposure pathway for surface water to residents through drinking water. Additionally, there are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (2.5 miles to the northeast), the Strait of Juan de Fuca (0.4 mile to the west), and Dugualla Bay (4.2 miles to the northeast).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water through direct exposure with surface water.

Soil and Air Pathways and Targets

AFFF that washed into the surrounding grass-covered and topographically low areas could have contaminated the surface and subsurface soil in the area. There are no residences, schools, or daycare facilities within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of grass-covered areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.1.4 Former Runway Fire School (Area 31)

Description and Operational History

The Former Runway Fire School (Area 31) is located in the northeast corner of Ault Field, approximately 400 yards northeast of the intersection of Runways 13-31 and 7-25 (**Figure 4-5**). The Former Runway Fire School was used for fire training activities from 1967 to 1982 and consisted of a concrete-lined, shallow 50-foot by 50-foot burn pad. The area is now covered in grass and slopes gently to the southwest towards the runways. The approximate geographic coordinates for the Former Runway Fire School are 48°21'18.115"N and 122°39'13.259"W.

During fire training activities, fuels such as JP-5, aviation gasoline, and waste oil were extinguished in the shallow concrete pad connected to an oil/water separator located approximately 200 feet to the southwest of the burn pad. Once the water was separated from the floating product, it was discharged to a drainage ditch, which led to a depression in the southwest portion of Area 31 and discharged to the runway drainage ditches (URS, 1995).

PFAS Storage, Use, or Release

The former director of research reported that weekly fire training activities involving AFFF were performed at the Former Runway Fire School (Director or Research, 2017, pers. comm.; **Appendix B**). Training activities consisted of spraying AFFF on the mock fire until the fire was extinguished. According to the retired director of research, AFFF use in training activities was limited to the second half of the last day of training because reignition of burn materials was known to be difficult following the application of AFFF (Director of Research, 2017, pers. comm.; **Appendix B**). The mixture of AFFF, fuel, and water would have flowed into the oil/water separator prior to being discharged into the unlined drainage ditch system north of Runway 07-25 (URS, 1995). The drainage ditch flows to the east before merging with the Clover Valley Stream.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

If AFFF infiltrated the subsurface in the surrounding grass-covered areas or unlined drainage ditch to the southwest, PFAS could have been released to groundwater at this location. Apparent groundwater flow near the Former Runway Fire School is generally to the south-southwest toward the runways (**Figure 4-5**). Depth to the surficial aquifer at this location is assumed to range from 16 to 18 feet bgs measured from site monitoring wells (GTGS, 1996). Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.4 miles to the southeast and 2.5 miles to the southwest, while five of the wells are grouped in a relatively small cluster 3.2 miles to the south. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the southeast within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Overland flow of surface water or AFFF from fire training activities would have either drained into catchments, flowed through an oil/water separator and eventually discharged into an unlined drainage ditch southwest of the burn pad, or would have run off directly onto the adjacent grass-covered areas. The unlined drainage ditch is connected to the runway drainage ditch system, which eventually discharges into the Clover Valley Stream 1.2 miles to the east. Surface water is not used as a drinking water source at Ault Field; therefore, there is no current exposure pathway for surface water to residents through drinking water. Additionally, there are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.2 miles to the east), the Strait of Juan de Fuca (0.8 mile to the west), and Dugualla Bay (3 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water through direct exposure with surface water.

Soil and Air Pathways and Targets

AFFF that washed into the surrounding grass-covered areas and the unlined drainage ditch to the southwest could have contaminated the surface and subsurface soil in the area. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved or grass-covered areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.1.5 Current Fire Training Area

Description and Operational History

The Current Fire Training Area is located in the southwestern portion of Ault Field along an unnamed road south of Cliffside Park Drive (**Figure 4-1**). Reportedly, this facility has been operational since before 1981 (Foster, 2001). The area currently consists of two classroom structures, the current fire training building (Building 2923), a concrete-lined burn pad with a mock aircraft in the center, an open detention pond, and two aboveground storage tanks for oil/water separation (Foster, 2001). An unpaved gravel and dirt buffer separates the burn pad from grass areas to the north, west, and south and the unnamed road to the east. The ground surrounding the

area slopes gently to the southeast towards the unnamed road. The current fire training building (Building 2923) is approximately 200 feet to the southwest of the burn pad. The approximate geographic coordinates for the Current Fire Training Area are 48°20'2.268"N and 122°41'14.021"W.

Fire training for all NASWI installations has occurred at this location since the closure of the Former Runway Fire School (Area 31) in 1982. Activities have consisted of burning JP-5, aviation gasoline, waste oil, and propane and extinguishing the fires with various agents, including AFFF. Fire training activities have been conducted on a weekly basis since the Current Fire Training Area has been operational (Navy Region NW Fire Chief, 2017, pers. comm.; **Appendix B**).

Several modifications have been made to the Current Fire Training Area to control migration of fluids offsite. In 1993, an underground storage tank used for fuel storage was removed, and in 1998 the old unlined burn pad was removed and replaced with the current lined pad (Foster, 2001). The disposal location for soil removed during the replacement of the burn pad is unknown. According to the current Fire Chief, the current fire system was updated in 2007, burns propane, and forms a closed loop system by using recycled water filtered through the oil/water separator to perform fire training exercises (Navy Region NW Fire Chief, 2017, pers. comm.; **Appendix B**).

PFAS Storage, Use, or Release

Both the former and current Fire Chiefs reported occasional accidental releases of AFFF into the lined burn pad since 1999 (Navy Region NW Fire Chief, 2017, pers. comm.; **Appendix B**; NASWI Fire Chief, 2017, pers. comm.; **Appendix B**). This occurred when the “selector knob” for releasing the water was pulled too far to the left triggering the release of foam into the pit. This reportedly happened one to two times per year on average. No foam was documented spilling outside of the burn pad or detention pond; however, the possibility of this occurring could not be excluded (Navy Region NW Fire Chief, 2017, pers. comm.; **Appendix B**; NASWI Fire Chief, 2017, pers. comm.; **Appendix B**).

Potential releases and use of AFFF at the Current Fire Training Area prior to 1999 is not known (Navy Region NW Fire Chief, 2017, pers. comm.; **Appendix B**; NASWI Fire Chief, 2017, pers. comm.; **Appendix B**). However, the use of AFFF at this location can be assumed based on standard fire-fighting practices during the 1980s and 1990s. No visual signs of a release were noted during the VSI; however, the potential for PFAS release into the environment exists.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

If AFFF infiltrated the subsurface in the surrounding dirt or gravel, PFAS could have been released to groundwater at this location. Apparent groundwater flow near the Current Fire Training Area is generally to the east towards the interior of the island (**Figure 4-1**). Depth to the surficial aquifer at this location is assumed to be 10 to 14 feet bgs. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 2.6 miles to the east and 0.6 mile to the southeast, while five of the wells are grouped in relatively small cluster 2.6 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Prior to the current closed loop containment system, AFFF sprayed during training activities would have flowed overland to the unpaved gravel and dirt areas to the east of the burn pad. Due to the gradual slope in this area, the AFFF and water would have likely infiltrated the subsurface at this location. The old fire training system was likely connected to an oil/water separator and outfall to surface water (similar to the system at the Former Runway Fire School); however, the specific location of the old outfall (if they exist) is not known. Surface water is not used as a drinking water source at Ault Field; therefore, there is no current exposure pathway for surface water to residents through drinking water. Additionally, there are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (2.8 miles to the northeast), Strait of Juan de Fuca (0.3 mile to the west), and Dugualla Bay (4.7 miles to the northeast).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

AFFF that washed into the surrounding unpaved gravel and dirt area to the northeast could have contaminated the surface and subsurface soil in the area. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved or grass-covered areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.2 Hangars/Buildings

All existing hangars were included and investigated as part of this PA report and are not sequentially numbered.

4.2.1 Hangar 1 (Building 112)

Description and Operational History

Hangar 1 (Building 112) is located in the western portion of the installation along the flight line (**Figure 4-3**). Hangar 1 was constructed in the 1940s and is currently used for general aircraft maintenance activities. The hangar is surrounded by the runway apron to the north, south, and east, and by Hangar 12 to the west. The slope of the ground surface within the hangar directs water and other solutions to the hangar floor drains. Hangar floor trench drains located inside the building are connected to either the sanitary sewer system through an oil/water separator or the stormwater system. Due to discrepancies in as-builts and geospatial data, the specific discharge location for the Hangar 1 trench drains is not entirely known. In December 2017 and January 2018, dye tests were performed by the Navy to determine flow directions and locations of all stormwater infrastructure; however, Hangar 1 trench drains were not included in this study since the hangar is scheduled for demolition. The geographic coordinates for Hangar 1 are 48°20'46.393"N and 122°40'11.687"W.

PFAS Storage, Use, or Release

Four hand-held AFFF/water hose systems are located in the four corners of Hangar 1. The hoses are attached to approximately 5 gallons of a 3 percent AFFF concentrate manufactured in 1988. The AFFF is contained in wall-mounted stainless-steel boxes with approximately 5 inches of headspace observed in each. No deterioration of the containment boxes or evidence of any spills was noted during the VSI. Any AFFF discharged would have entered the floor trench drains.

It was reported that annual testing of the AFFF fire suppression systems in hangars is conducted; however, the specific procedures followed during these events, including the use of AFFF during annual testing, are not known

(Public Works Officer, 2017, pers. comm.; **Appendix B**). Aside from the potential release of AFFF during annual testing, no known documented AFFF discharges or spills have occurred at Hangar 1 (Regional Hazardous Waste Program Manager, 2017, pers. comm.; **Appendix B**; Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**).

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

The entire area surrounding Hangar 1 is paved; therefore, PFAS migration from the surface to groundwater would likely be minimal. However, significant groundwater contamination could occur from leaking storm or sanitary sewer lines transporting AFFF or PFAS-containing solutions. Hangar 1 is located near a groundwater divide. The groundwater to the east of the divide flows towards Dugualla Bay and groundwater to the west flows towards the Strait of Juan de Fuca (**Figure 4-3**). Depth to the surficial aquifer at this location is assumed to range from 4 to 6 feet bgs. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.9 miles to the east and 1.6 miles to the south, while five of the wells are grouped in relatively small cluster 2.8 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Any AFFF captured by the floor trench drains in Hangar 1 would have either been directed to the sanitary sewer system through an oil/water separator and directed to the wastewater treatment plant (WWTP), or discharged into the Runway Drainage Ditch System at Stormwater Outfall 1. The exact discharge location for the Hangar 1 floor drains is not known at this time. Any AFFF washed outside the hangar into stormwater inlets on the runway apron, would discharge into the Runway Drainage Ditch System at Stormwater Outfall 1. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.9 miles to the east), Strait of Juan de Fuca (0.5 mile to the west), and Dugualla Bay (3.8 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

It is unlikely that AFFF would have washed into surface and subsurface soil in the area since the surrounding area around Hangar 1 consists of impermeable surfaces; however, cracks and joints in the concrete or pavement would present a potential migration pathway to soil. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.2.2 Hangar 5 (Building 386)

Description and Operational History

Hangar 5 (Building 386) is located in the western portion of the installation along the flight line (**Figure 4-3**). Hangar 5 was constructed in 1954 and is used for general aircraft maintenance activities. The hangar is surrounded by the runway apron to the north, east, and south and by a parking lot to the west. The slope of the ground surface within the hangar directs water and other solutions to the hangar floor drains. Hangar floor trench drains located inside the building are connected to containment tanks located outside the building. Exterior stormwater catchments in this section of the flight line are connected to an oil/water separator north of the runway apron, which discharges into the Strait of Juan de Fuca (**Figure 4-4**). The approximate geographic coordinates for Hangar 5 are 48°20'47.884"N and 122°40'18.734"W.

PFAS Storage, Use, or Release

Hangar 5 is equipped with an AFFF fire suppression system including a 2,000-gallon polymer storage tank containing 3 percent AFFF concentrate by volume. Two 20,000-gallon steel aboveground containment tanks are located to the southwest of Hangar 5 and are equipped with pump systems. The containment tanks are intended to store AFFF following a release event until the most appropriate disposal method is determined. Hangar 5 has no known connection to the stormwater system. Any AFFF discharged would have entered the floor trench drains and diverted to the two aboveground containment tanks outside the building.

It was reported that annual testing of the AFFF fire suppression systems in hangars is conducted; however, the specific procedures followed during these events, including the use of AFFF during annual testing, are not known (Public Works Officer, 2017, pers. comm.; **Appendix B**). Aside from the potential release of AFFF during annual testing, no known documented AFFF discharges or spills have occurred at Hangar 5 (Regional Hazardous Waste Program Manager, 2017, pers. comm.; **Appendix B**; Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**).

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

The entire area surrounding Hangar 5 is paved; therefore, PFAS migration from the surface to groundwater would likely be minimal. However, significant groundwater contamination could occur from leaking utility lines transporting AFFF or PFAS-containing solutions to the exterior containment tanks. Hangar 5 is located near a groundwater divide. The groundwater to the east of the divide flows towards Dugualla Bay and groundwater to the west flows towards the Strait of Juan de Fuca (**Figure 4-3**). Depth to the surficial aquifer at this location is assumed to range from 4 to 6 feet bgs (MMEC & AECOM, 2016). Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.9 miles to the east and 1.6 miles to the south, while five of the wells are grouped in relatively small cluster 2.9 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF outside of Hangar 5 to stormwater catchments on the runway apron would be unlikely due to the ground surface slope within the building, which directs surface flow towards hangar floor drains connected to the exterior containment tanks. If AFFF was captured by the exterior stormwater catchments, it would have been directed to the stormwater oil/water separator located north of the runway apron, then discharged into the Strait of Juan de Fuca (**Figure 4-4**). There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (2.0 miles to the east), Strait of Juan de Fuca (0.4 mile to the west), and Dugualla Bay (3.9 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

It is unlikely that AFFF would have washed into surface and subsurface soil in the area since the surrounding area around Hangar 5 consists of impermeable surfaces; however, cracks and joints in the concrete or pavement would present a potential migration pathway to soil. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.2.3 Hangar 6 (Building 410)

Description and Operational History

Hangar 6 (Building 410) is located in the central portion of the installation along the flight line (**Figure 4-2**). Hangar 6 was constructed in 1956 and is used for general aircraft maintenance activities. The hangar is surrounded by the runway apron to the north, east, and south and by a parking lot to the west. The slope of the ground surface within the hangar directs water and other solutions to the hangar floor drains. Hangar floor trench drains located inside the building are connected to aboveground containment tanks outside the building. Exterior stormwater inlets in this section of the flight line discharge into the Runway Drainage Ditch System at Stormwater Outfall 2 east of Taxiways A and E. The approximate geographic coordinates for Hangar 6 are 48°20'19.247"N and 122°39'49.375"W.

PFAS Storage, Use, or Release

Hangar 6 currently has an AFFF fire suppression system. The foam within the fire suppression system was replaced in 2017 with the C6 formulation of AFFF. Sampling and analysis of the C6 was performed by the Navy in March 2018. While the C6 conforms to the 2017 military specification of AFFF (MIL-PRF-24385F[SH]), and is included on the qualified product list, PFOA is confirmed to be present in both AFFF tanks containing the C6 concentrate. The C6-based foam is stored in two 2,000-gallon polymer tanks that are filled to half-capacity within a newly constructed fire suppression system control room on the southern half of Hangar 6. Two 750-gallon polymer AFFF tanks containing the old formulation remain in the old fire suppression system control room on the northern half of Hangar 6. Hangar 6 floor drains have no known connection to the stormwater system. Any AFFF discharge would have entered the floor trench drains and diverted to two 30,000-gallon steel aboveground containment tanks located to the southwest outside the building.

In May 2018, a stormwater sample was collected from an exterior catchment located south of Hangar 6. The sample contained concentrations of PFOA and PFOS above the LHA. In response to the detection of PFOA and PFOS, the Hangar 6 fire suppression system was inspected; however, no leaks or missing AFFF were observed. The

stormwater catchment with the detections discharges directly into the Runway Drainage Ditch System at Stormwater Outfall 1 east of Taxiways A and E.

It was reported that annual testing of the AFFF fire suppression systems in hangars is conducted; however, the specific procedures followed during these events, including the use of AFFF during annual testing, are not known (Public Works Officer, 2017, pers. comm.; **Appendix B**). Aside from the potential release of AFFF during annual testing, no known documented AFFF discharges or spills have occurred at Hangar 6 (Regional Hazardous Waste Program Manager, 2017, pers. comm.; **Appendix B**; Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**).

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

The entire area surrounding Hangar 6 is paved; therefore, PFAS migration from the surface to groundwater would likely be minimal. However, significant groundwater contamination could occur from leaking utility lines transporting AFFF or PFAS-containing solutions to the exterior containment tanks. Apparent groundwater flow near Hangar 6 is generally to the northeast towards the runways (**Figure 4-2**). Depth to the surficial aquifer at this location is assumed to range from 4 to 6 feet bgs. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.6 miles to the east and 1.4 miles to the south, while five of the wells are grouped in relatively small cluster 2.2 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the northeast within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF outside of Hangar 6 to stormwater catchments on the runway apron would be unlikely due to the ground surface slope within the building, which directs surface flow towards hangar trench drains connected to the exterior containment tanks. If AFFF was captured by the stormwater catchments, it would have been directed to an oil/water separator, then discharged into the Runway Drainage Ditch System at Stormwater Outfall 2 east of Taxiways A and E. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.8 miles to the northeast), Strait of Juan de Fuca (1 mile to the west), and Dugualla Bay (3.6 miles to the northeast).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

It is unlikely that AFFF would have washed into surface and subsurface soil in the area since the surrounding area around Hangar 6 consists of impermeable surfaces; however, cracks and joints in the concrete or pavement would present a potential migration pathway to soil. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-

disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.2.4 Hangar 7 (Building 2544)

Description and Operational History

Hangar 7 (Building 2544) is located in the central portion of the installation along the flight line (**Figure 4-2**). Hangar 7 was constructed in 1974 and is used for general aircraft maintenance activities. The hangar is surrounded by the runway apron to the north, east, and west and by a parking lot to the south. Hangar floor trench drains located inside the building are connected to an underground containment vault outside the hangar. Exterior stormwater inlets in this section of the flight line discharge into the Runway Drainage Ditch System at Stormwater Outfall 2 east of Taxiways A and E. The approximate geographic coordinates for Hangar 7 are 48°20'12.043"N and 122°39'40.548"W.

PFAS Storage, Use, or Release

Hangar 7 currently contains an AFFF fire suppression system equipped with a 1,000-gallon polymer storage tank of 3 percent AFFF concentrate by volume. An additional four 55-gallon drums filled with AFFF are stored in the main fire system control room next to the large polymer AFFF storage tank. The floor trench drains are connected to a 30,000 gallon (8 feet by 30 feet by 20 feet) precast concrete underground containment vault located just outside the northwest corner of the hangar which previously had overflow piping connected directly to the stormwater system. Overflow piping from the vault was known to discharge at Stormwater Outfall 2 (**Figure 4-2**).

According to the Hazardous Waste Manager and other Navy personnel, an accidental discharge of approximately 700 gallons of AFFF was recorded at Hangar 7 on 20 September 2016. AFFF reportedly entered the floor drains at Hangar 7 and, along with water, was washed into the underground containment vault. Following the event, approximately 30,000 gallons of water and AFFF were reportedly pumped via pump truck and delivered to the Former WWTP (Building 420), where it is currently being stored. Details about the planned treatment and disposal of the contaminated water at the Former WWTP are discussed in **Section 4.6.1**. On 3 October 2016, a Base Operating Support Contractor (BOSC) inspected the underground containment tank and noted that the tank was again full (Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**). It was assumed that the containment vault was cracked, causing groundwater around the vault to refill it. The groundwater remained in the vault until 12 July 2017 when an additional 30,000 gallons of water and AFFF mixture (sampled and tested above the applicable PFAS LHAs) was again transferred from the vault via pump truck to the clarifier tanks at the Former WWTP. Discharge from the stormwater system at Stormwater Outfall 2, which occurred during this timeframe, was assumed to be from the Hangar 7 containment vault, which at the time was connected to the stormwater system through overflow piping. The vault cracks and overflow outlet to the stormwater system were sealed after pumping the vault dry on July 12, 2017. Currently, the vault holds approximately 3 to 6 inches of water (Public Works Officer, 2017, pers. comm.; **Appendix B;** Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**). The remaining water has not been sampled or tested for PFAS.

It was reported that annual testing of the AFFF fire suppression systems in hangars is conducted; however, the specific procedures followed during these events, including the use of AFFF during annual testing, are not known (Public Works Officer, 2017, pers. comm.; **Appendix B**). Aside from the 2016 event and the potential release of AFFF during annual testing, no other documented AFFF discharges or spills are known to have occurred at Hangar 7 (Regional Hazardous Waste Program Manager, 2017, pers. comm.; **Appendix B**; Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**).

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

The Hangar 7 underground containment vault likely released AFFF into groundwater during the 2- to 3-week span in September 2016 following the discharge event. If hydraulic equilibrium between the water level in the vault and the groundwater table occurred, PFAS would have migrated directly to groundwater through the crack in the vault. Apparent groundwater flow near Hangar 7 is generally to the northeast towards the runways (**Figure 4-2**). Depth to the surficial aquifer at this location is assumed to range from 4 to 6 feet bgs. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.5 miles to the east and 1.4 miles to the south, while five of the wells are grouped in relatively small cluster 2 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the northeast within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF outside of Hangar 7 to stormwater catchments on the runway apron would be unlikely due to the ground surface slope within the building, which directs surface flow towards catchments leading to the exterior containment tanks. If AFFF was captured by the stormwater catchments, it would have been directed to an oil/water separator, then discharged into the Runway Drainage Ditch System at Stormwater Outfall 2 east of Taxiways A and E. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.8 miles to the northeast), Strait of Juan de Fuca (1.1 miles to the west), and Dugualla Bay (3.6 miles to the northeast).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

PFAS was likely released into subsurface soil through a crack in the containment vault during the 2- to 3-week span in September 2016 following the discharge event. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.2.5 Hangar 8 (Building 2642)

Description and Operational History

Hangar 8 (Building 2642) is located in the central portion of the installation along the flight line (**Figure 4-3**). Hangar 8 was constructed in 1978 and is used for general aircraft maintenance activities. The hangar is surrounded by the runway apron to the east, flight line access to the north and south, and by a parking lot to the west. Hangar floor trench drains located inside the building are connected to the stormwater system which discharges into the Runway Drainage Ditch System at Stormwater Outfall 1. Exterior stormwater inlets in this

section of the flight line are also believed to discharge at Stormwater Outfall 1. The approximate geographic coordinates for Hangar 8 are 48°20'28.707"N and 122°39'54.355"W.

PFAS Storage, Use, or Release

Hangar 8 is equipped with an AFFF fire suppression system including four 500-gallon steel bladder tanks, two 1,000-gallon steel bladder tanks, and two 1,200-gallon steel bladder tanks containing 3 percent AFFF concentrate by volume. Hangar floor drains are connected to a 220-gallon precast concrete oil/water separator that connects directly to the stormwater system.

It was reported that annual testing of the AFFF fire suppression systems in hangars is conducted; however, the specific procedures followed during these events, including the use of AFFF during annual testing, are not known (Public Works Officer, 2017, pers. comm.; **Appendix B**). Aside from the potential of AFFF release during annual testing, no known documented AFFF discharges or spills have occurred at Hangar 8 (Regional Hazardous Waste Program Manager, 2017, pers. comm.; **Appendix B**; Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**).

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

The entire area surrounding Hangar 8 is paved; therefore, PFAS migration from the surface to groundwater would likely be minimal. However, significant groundwater contamination could occur from leaking stormwater lines transporting AFFF or PFAS-containing solutions. Apparent groundwater flow near Hangar 8 is generally to the east-northeast towards the runways (**Figure 4-3**). Depth to the surficial aquifer at this location is assumed to range from 4 to 6 feet bgs. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.6 miles to the east and 1.5 miles to the south, while five of the wells are grouped in relatively small cluster 2.4 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the northeast within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF outside of Hangar 6 to stormwater catchments on the runway apron would be unlikely due to the ground surface slope within the building, which directs surface flow towards floor trench drains inside the building. AFFF captured by the floor drains would have discharged into the Runway Drainage Ditch System at Stormwater Outfall 1 east of Taxiways A and E. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.8 miles to the northeast), Strait of Juan de Fuca (0.9 mile to the west), and Dugualla Bay (3.6 miles to the northeast).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

It is unlikely that AFFF would have washed into surface and subsurface soil in the area since the surrounding area around Hangar 8 consists of impermeable surfaces; however, cracks and joints in the concrete or pavement would present a potential migration pathway to soil. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.2.6 Hangar 9 (Building 2681)

Description and Operational History

Hangar 9 (Building 2681) is located in the south-central portion of the installation along the southern part of the flight line (**Figure 4-2**). Hangar 9 was constructed in 1982 and is used for general aircraft maintenance activities. The hangar is surrounded by the runway apron to the east, flight line access to the north and south, and by a parking lot to the west. Hangar floor trench drains located inside the building are connected to the stormwater system, which discharges into the Runway Drainage Ditch System at Stormwater Outfall 2. Exterior stormwater catchments in this section of the flight line are also believed to discharge at Stormwater Outfall 2. The approximate geographic coordinates for Hangar 9 are 48°20'6.535"N and 122°39'31.120"W.

PFAS Storage, Use, or Release

Hangar 9 is equipped with an AFFF fire suppression system including two 300-gallon steel bladder tanks and two 500-gallon steel bladder tanks containing 3 percent AFFF concentrate by volume. Hangar floor drains are connected to a 220-gallon precast concrete oil/water separator that connects directly to the stormwater system.

It was reported that annual testing of the AFFF fire suppression systems in hangars is conducted; however, the specific procedures followed during these events, including the use of AFFF during annual testing, are not known (Public Works Officer, 2017, pers. comm.; **Appendix B**). Aside from the potential release of AFFF during annual testing, no known documented AFFF discharges or spills have occurred at Hangar 9 (Regional Hazardous Waste Program Manager, 2017, pers. comm.; **Appendix B**; Hazardous Waste Manger, 2017, pers. comm.; **Appendix B**).

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

The area surrounding Hangar 9 is paved with the exception of two small grass-covered areas to the north and south. Although unlikely, it is possible that AFFF could have run off to these grass-covered areas during a discharge event and infiltrated the groundwater. Apparent groundwater flow near Hangar 9 is generally to the northeast towards the runways (**Figure 4-2**). Depth to the surficial aquifer at this location is assumed to range from 4 to 6 feet bgs. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.4 miles to the east and 1.4 miles to the south, while five of the wells are grouped in relatively small cluster 1.9 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the northeast within

the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF outside of Hangar 9 to stormwater catchments on the runway apron would be unlikely due to the ground surface slope within the building, which directs surface flow towards floor drains in the interior of the building. Interior floor drains are directly tied in to the stormwater system. AFFF captured by the stormwater catchments, would have been directed to an oil/water separator, then discharged at Stormwater Outfall 2 east of Taxiways A and E. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.7 miles), Strait of Juan de Fuca (1.3 miles), and Dugualla Bay (3.5 miles).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

The area surrounding Hangar 9 is surrounded by impermeable surfaces except for two small grass-covered areas to the north and south. It is possible that AFFF could have run off to these grass-covered areas or passed through cracks and joints in the concrete or pavement during a discharge event and infiltrated the surface and subsurface soil. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved or grass-covered areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.2.7 Hangar 10 (Building 2699)

Description and Operational History

Hangar 10 (Building 2699) is located in the central portion of the installation along the flight line (**Figure 4-3**). Hangar 10 was constructed in 1984 and is used for general aircraft maintenance activities. The hangar is surrounded by the runway apron to the east, Fire Station and Hangar 8 to the north and south, respectively, and by a parking lot to the west. The slope of the ground surface within the hangar directs water and other solutions to the hangar floor drains. Hangar floor trench drains located inside the building are connected to containment tanks located outside the building. Exterior stormwater inlets in this section of the flight line discharge into the runway drainage ditches into the Runway Drainage Ditch System at Stormwater Outfall 1 east of Taxiways A and E. The approximate geographic coordinates for Hangar 10 are 48°20'32.596"N and 122°39'58.353"W.

PFAS Storage, Use, or Release

Hangar 10 is equipped with an AFFF fire suppression system. The foam within the fire suppression system was replaced in 2016/2017 with the C6 formulation of AFFF. Sampling and analysis of the C6 was performed by the Navy in March 2018. While the C6 conforms to the 2017 military specification of AFFF (MIL-PRF-24385F[SH]), and is included on the qualified product list, PFOA is confirmed to be present in both AFFF tanks containing the C6 concentrate. An additional 375-gallon polymer tank is located on the south side of the hanger which remains from the previous fire suppression system and likely contains the old formulation of AFFF. Hangar floor drains are connected to two 11,750-gallon steel aboveground containment tanks located northwest of the hangar and have no apparent connection to stormwater. According to a NAVFAC Engineering Technician, AFFF from the old suppression system was transported and disposed of off-Base by the fire suppression system contractor (Engineering Technician, 2017, pers. comm; **Appendix B**).

It was reported that annual testing of the AFFF fire suppression systems in hangars is conducted; however, the specific procedures followed during these events, including the use of AFFF during annual testing, are not known (Public Works Officer, 2017, pers. comm.; **Appendix B**). Aside from the potential release of AFFF during annual testing, no known documented AFFF discharges or spills have occurred at Hangar 10 (Regional Hazardous Waste Program Manager, 2017, pers. comm.; **Appendix B**; Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**).

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

The entire area surrounding Hangar 10 is paved; therefore, PFAS migration from the surface to groundwater would likely be minimal. However, significant groundwater contamination could occur from leaking utility lines transporting AFFF or PFAS-containing solutions to the containment tanks. Apparent groundwater flow near Hangar 10 is generally to the east towards the runways (**Figure 4-3**). Depth to the surficial aquifer at this location is assumed to range from 4 to 6 feet bgs. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.7 miles to the east and 1.5 miles to the south, while five of the wells are grouped in relatively small cluster 2.5 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF outside of Hangar 10 to stormwater catchments on the runway apron would be unlikely due to the ground surface slope within the building, which directs surface flow towards catchments in the interior of the building. Interior catchments are directly tied in to the containment tanks outside the building. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.8 miles to the east), Strait of Juan de Fuca (0.8 mile to the west), and Dugualla Bay (3.6 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

It is unlikely that AFFF would have washed into surface and subsurface soil in the area since the surrounding area around Hangar 10 consists of impermeable surfaces; however, cracks and joints in the concrete or pavement would create a potential migration pathway to soil. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.2.8 Hangar 11 (Building 2733)

Description and Operational History

Hangar 11 (Building 2733) is located in the central portion of the installation along the flight line (**Figure 4-3**). Hangar 11 was constructed in 1989 and is used for general aircraft maintenance activities. The hangar is surrounded by the runway apron to the east, grass-covered area to the north, Fire Station to the south, and by Charles Porter Avenue to the west. The slope of the ground surface within the hangar directs water and other solutions to the hangar floor drains. Hangar floor trench drains located inside the building are connected to the sanitary sewer system. Exterior stormwater inlets in this section of the flight line discharge into the Runway Drainage Ditch System at Stormwater Outfall 1. The approximate geographic coordinates for Hangar 11 are 48°20'37.420"N and 122°40'3.768"W.

PFAS Storage, Use, or Release

Hangar 11 is equipped with an AFFF fire suppression system including two 300-gallon steel bladder tanks and two 500-gallon steel bladder tanks containing 3 percent AFFF concentrate by volume. Hangar floor drains are connected to a precast concrete oil/water separator that connects directly to the sanitary sewer system. Any AFFF discharged prior to 1998 would have entered the floor drains and eventually drained into the sanitary sewer system and transferred to the Former WWTP, while any AFFF discharged after 1998 would eventually be directed to the current WWTP.

During the 2014 to 2015 timeframe, approximately 3 gallons of AFFF was released at Hangar 11 when a contractor accidentally cut a conduit connected to the fire system. One of the AFFF fire suppression system nozzles was activated for approximate 2 to 3 minutes before the system was shut off. AFFF was observed entering the floor drains in the hangar (Engineering Technician, 2017, pers. comm.; **Appendix B**).

It was reported that annual testing of the AFFF fire suppression systems in hangars is conducted; however, the specific procedures followed during these events, including the use of AFFF during annual testing, are not known (Public Works Officer, 2017, pers. comm.; **Appendix B**). Aside from the 2014 discharge event and the potential release of AFFF during annual testing, no other documented AFFF discharges or spills are known to have occurred at Hangar 11 (Regional Hazardous Waste Program Manager, 2017, pers. comm.; **Appendix B**; Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**).

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

The area surrounding Hangar 11 is paved except for two small grass-covered areas to the north and south. Although unlikely, it is possible that AFFF could have run off to these grass-covered areas during a discharge event and infiltrated the groundwater. Apparent groundwater flow near Hangar 11 is generally to the northeast towards the runways (**Figure 4-3**). Depth to the surficial aquifer at this location is assumed to range from 4 to 6 feet bgs. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, seven of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.7 miles to the east and 1.5 miles to the south, while five of the wells are grouped in relatively small cluster 2.6 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the

Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF outside of Hangar 11 to stormwater catchments on the runway apron would be unlikely due to the ground surface slope within the building, which directs surface flow towards catchments in the interior of the building. Interior floor drains are directly tied in to the sanitary sewer system. AFFF captured by the floor drains, would have been directed to an oil/water separator, then transferred to the WWTP. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.8 miles to the east), Strait of Juan de Fuca (0.7 mile to the west), and Dugualla Bay (3.7 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

The area surrounding Hangar 11 is surrounded by impermeable surfaces except for two small grass-covered areas to the north and south. Although unlikely, it is possible that AFFF could have run off to these grass-covered areas during a discharge event or passed through cracks and joints in the concrete or pavement and infiltrated the surface and subsurface soil. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.2.9 Hangar 12 (Building 2737)

Description and Operational History

Hangar 12 (Building 2737) is located in the north central portion of the installation along the flight line (**Figure 4-3**). Hangar 12 was constructed in 1989 and is used for general aircraft maintenance activities. The hangar is surrounded by the runway apron to the north, Hangar 14 to the east, and by grass-covered areas to the south and west. The slope of the ground surface within the hangar directs water and other solutions to the hangar floor drains. Hangar floor trench drains located inside the building are connected to the stormwater system. Stormwater inlets in this section of the flight line discharge into the Strait of Juan de Fuca through an oil/water separator north of the flight line (**Figure 4-4**). The approximate geographic coordinates for Hangar 12 are 48°20'44.100"N and 122°40'16.048"W.

PFAS Storage, Use, or Release

Hangar 12 is equipped with an AFFF fire suppression system including two 500-gallon steel bladder tanks containing 3 percent AFFF concentrate by volume. Two empty 500-gallon steel bladder tanks were also observed during the VSI. It is unknown whether these two tanks previously contained AFFF. Hangar floor drains are connected to a 1,000-gallon precast concrete oil/water separator that connects directly to the stormwater system. Any AFFF discharge would have entered the floor drains and eventually entered the stormwater system.

It was reported that annual testing of the AFFF fire suppression systems in hangars is conducted; however, the specific procedures followed during these events, including the use of AFFF during annual testing, are not known (Public Works Officer, 2017, pers. comm.; **Appendix B**). Aside from the potential release of AFFF during annual testing, no known documented AFFF discharges or spills have occurred at Hangar 12 (Regional Hazardous Waste Program Manager, 2017, pers. comm.; **Appendix B**; Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**).

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

The area surrounding Hangar 12 is paved except for two small grass-covered areas to the south and west. Although unlikely, it is possible that AFFF could have run off to these grass-covered areas during a discharge event and infiltrated the groundwater. Apparent groundwater flow near Hangar 12 is generally to the east towards the runways (**Figure 4-3**). Depth to the surficial aquifer at this location is assumed to range from 4 to 6 feet bgs. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.9 miles to the east and 1.6 miles to the south, while five of the wells are grouped in relatively small cluster 2.8 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF outside of Hangar 12 to stormwater catchments on the runway apron would be unlikely due to the ground surface slope within the building, which directs surface flow towards catchments in the interior of the building. Interior catchments are directly tied in to the stormwater system. AFFF captured by the stormwater catchments, would have discharged into the Strait of Juan de Fuca through an oil/water separator north of the flight line (**Figure 4-4**). There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (2 miles to the east), Strait of Juan de Fuca (0.5 mile to the west), and Dugualla Bay (3.8 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

The area surrounding Hangar 12 is surrounded by impermeable surfaces except for two small grass-covered areas to the south and west. Although unlikely, it is possible that AFFF could have run off to these grass-covered areas or passed through cracks and joints in the concrete or pavement during a discharge event and infiltrated the surface and subsurface soil. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.2.10 Hangar 14

Description and Operational History

Hangar 14 is located in the north central portion of the installation along the flight line (**Figure 4-3**). Hangar 14 completed construction in 2017 and will be used for general aircraft maintenance activities. The hangar is surrounded by the runway apron to the north, south, and east, and by Hangar 12 to the west. The geographic coordinates for Hangar 14 are 48°20'39.393"N and 122°40'5.75"W.

PFAS Storage, Use, or Release

An AFFF fire suppression system was installed during the 2017 construction of Hangar 14. The foam within the fire suppression system contains the C6 formulation of AFFF. Sampling and analysis of the C6 was performed by the Navy in March 2018. While the C6 conforms to the 2017 military specification of AFFF (MIL-PRF-24385F[SH]), and is included on the qualified product list, PFOA is confirmed to be present in both AFFF tanks containing the C6 concentrate. The C6 foam is contained in one 1,000-gallon polymer tank. Trench floor drains in Hangar 14 are tied to an underground containment tank through diverter valves. The underground containment tank is equipped with a pump system. Hangar 14 has no known connection to the stormwater system. No known documented AFFF discharges or spills have occurred at Hangar 14 (Regional Hazardous Waste Program Manager, 2017, pers. comm.; **Appendix B**; Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**).

Pathway and Environmental Hazard Assessment

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

The area surrounding Hangar 14 is paved except for a small grass-covered area to the south. Although unlikely, it is possible that AFFF could have run off to these grass-covered areas during a discharge event and infiltrated the groundwater. Apparent groundwater flow near Hangar 14 is generally to the east towards the runways (**Figure 4-3**). Depth to the surficial aquifer at this location is assumed to range from 4 to 6 feet bgs. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.8 miles to the east and 1.5 miles to the south, while five of the wells are grouped in relatively small cluster 2.7 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF outside of Hangar 14 to stormwater catchments on the runway apron would be unlikely due to the ground surface slope within the building, which directs surface flow towards catchments in the interior of the building. Interior floor drains are connected to an underground containment tank. If AFFF was captured by the exterior stormwater catchments, it would have discharged into the Strait of Juan de Fuca through an oil/water separator north of the flight line (**Figure 4-4**). There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.9 miles to the east), Strait of Juan de Fuca (0.6 mile to the west), and Dugualla Bay (3.7 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

The area surrounding Hangar 14 is surrounded by impermeable surfaces except for a small grass-covered area to the south. Although unlikely, it is possible that AFFF could have run off to these grass-covered areas or passed through cracks and joints in the concrete or pavement during a discharge event and infiltrated the surface and subsurface soil. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.3 Fire Stations

4.3.1 Former/Current Fire Station (Building 2897)

Description and Operational History

The Former/Current Fire Station (Building 2897), also known as Station 71, is located in the central portion of Ault Field along the flight line (**Figure 4-3**). The fire station is surrounded by the flight line to the east, a parking lot to the west, and by Hangars 10 and 11 to the south and north, respectively. The approximate geographic coordinates for the Former/Current Fire Station are 48°20'35.683"N and 122°40'0.765"W.

Since 2007, the Former/Current Fire Station has been used for storage, housing, and all other fire-fighting operational needs. In 2007, the former fire station was demolished and the current fire station was reconstructed in its place. Fire crash trucks, engines, and trailers are parked in five bays within the southern part of the fire station. Offices and storage rooms make up the northern half of the station.

PFAS Storage, Use, or Release

Three fire engines, one fire tender, and one crash truck were observed at the current fire station. Each of the three fire trucks are equipped with approximately 130-gallon AFFF tanks, while the fire tender and crash truck are equipped with 1,000-gallon and 500-gallon AFFF tanks, respectively. According to the current and former fire chiefs, AFFF refilling and servicing was performed on the paved ramp just outside the parking bays directly to the west of the fire station. General fire truck maintenance was also reportedly performed at Building 18 on Seaplane Base. It was reported that occasional spills would occur during the old AFFF refilling process which required the manual dumping of 5-gallon buckets filled with AFFF into the tanks. However, the new pumping system used in the refilling process has greatly reduced the potential for AFFF spills. Any AFFF spilled would have likely entered the stormwater drains which are connected to Stormwater Outfall 1 located on the east side of Taxiway A (Navy Region NW Fire Chief, 2017, pers. comm.; **Appendix B**; NASWI Fire Chief, 2017, pers. comm.; **Appendix B**).

Per National Fire Protection Association 1911 Chapter 20 (Performance Testing of Foam Proportioning Systems), Section 20.1.1, foam (AFFF) proportioning systems on fire response trucks are to be tested annually. Testing of the foam proportioning systems, also known as refractometer testing, includes flowing AFFF out of each turret, handline, and ground nozzles to measure the concentrate (Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**). The former fire chief recalled that in 1999, there was one occasion where refractometer spray testing was conducted on the apron east of the fire station. Although the exact location of the refractory spray testing is unknown, AFFF likely entered stormwater catchments on the apron which are connected to Stormwater

Outfall 1 east of Taxiways A and E. However, refractometer foam testing on the runway apron was not part of normal procedure (Navy Region NW Fire Chief, 2017, pers. comm.; **Appendix B**).

In addition to the AFFF tanks on the fire trucks, approximately 550 gallons of AFFF remains stored in a caged area at the Former/Current Fire Station (Aviation Emergency Medical Technician/Fire Fighter, 2017, pers. comm.; **Appendix B**). The remaining inventory is only to be used to refill the tanks on the trucks in the event of a discharge.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

The entire area surrounding the Former/Current Fire Station is paved; therefore, PFAS migration from the surface to groundwater would likely be minimal. However, significant groundwater contamination could occur from leaking stormwater lines transporting AFFF or PFAS-containing solutions. Apparent groundwater flow near the Former/Current Fire Station is generally to the northeast towards the runways (**Figure 4-3**). Depth to the surficial aquifer at this location is assumed to range from 4 to 6 feet bgs. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.7 miles to the east and 1.5 miles to the south, while five of the wells are grouped in relatively small cluster 2.6 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

The fire station is equipped with catchments connected to the stormwater system. Any AFFF spilled during refilling or leaking from the trucks would have been washed into the catchments and eventually discharge into the Runway Drainage Ditch System at Stormwater Outfall 1 east of Taxiways A and E. Additionally, AFFF sprayed during refractory spray testing conducted on the runway apron east of the fire station would also enter the stormwater system through catchments and discharge at Stormwater Outfall 1. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.8 miles to the east), Strait of Juan de Fuca (0.7 mile to the west), and Dugualla Bay (3.7 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

It is unlikely that AFFF would have washed into surface and subsurface soil in the area since the surrounding area around Former/Current Fire Station consists of impermeable surfaces. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-

disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.4 Emergency Response

4.4.1 1976 EA-6 Crash Site

Description and Operational History

The 1976 EA-6 Crash Site is located in a grass-covered field west of the Gallery Golf Course in the southwestern portion of Ault Field (**Figure 4-1**). Based on historical documentation, the crash resulted from failed instrument operation (Onyx, 2005). The approximate geographic coordinates for the 1976 EA-6 Crash Site are 48°18'56.164"N and 122°41'53.354"W.

PFAS Storage, Use, or Release

Based on the date of the aircraft crash, AFFF likely would have been used to put out any petroleum fires resulting from the impact. Despite the absence of documented usage or witness accounts, the use of AFFF at this location cannot be ruled out.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

If AFFF was used, it likely infiltrated and contaminated groundwater at the crash location. Apparent groundwater flow near the 1976 EA-6 Crash Site is assumed to be to the south-southwest adhering to topography (**Figure 4-1**). Depth to the shallow aquifer at this location is not known due to a lack of monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, seven of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 3.7 miles to the northeast and 0.8 miles to the northeast, while five of the wells are grouped in relatively small cluster 2.6 miles to the east. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the northeast within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Overland flow of AFFF would have collected in topographical depressions and infiltrated the subsurface. Due to the subtle slope, overland flow of AFFF into surface water bodies is unlikely. Surface water is not used as a drinking water source at Ault Field; therefore, there is no current exposure pathway for surface water to residents through drinking water. Additionally, there are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (4 miles to the northeast), Strait of Juan de Fuca (0.4 mile to the west), and Oak Harbor (3.1 miles to the southeast).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

If AFFF was used, it likely infiltrated and contaminated surface and subsurface soil in the surrounding grass-covered areas. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of grass-covered areas, fugitive dust emissions and potential exposure through dust is possible. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.4.2 1981 P-3A Crash Site

Description and Operational History

The 1981 P-3A Crash Site is located on the northern portion of the 13-31 runway on Ault Field (**Figure 4-4**). Based on historical documentation, the crash occurred during landing; however, the exact cause was not included in the report (Onyx, 2005). The approximate geographic coordinates for the 1981 P-3A Crash Site are 48°21'19.249"N and 122°39'28.853"W.

PFAS Storage, Use, or Release

Based on the date of the aircraft crash, AFFF would have likely been used to put out any petroleum fires resulting from the impact. The former Crash Captain recalled the crash, although he was unable to remember whether AFFF was used in the crash response (Crash Captain, 2017, pers. comm.; **Appendix B**). Despite the absence of documented usage or witness accounts, the use of AFFF at this location cannot be ruled out.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

If AFFF was used, it likely infiltrated and contaminated groundwater at grass-covered areas on either side of the crash location. Apparent groundwater flow near the 1981 P-3A Crash Site is generally to the southeast (**Figure 4-4**). Depth to the shallow aquifer at this location is not known due to a lack of monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.6 miles to the southeast and 2.5 miles to the southwest, while five of the wells are grouped in relatively small cluster 3.2 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Overland flow of AFFF would have collected in the runway drainage ditches on either side of the runway. The runway drainage ditches in this section of the runway flow to the north and eventually discharge through the Wastewater Treatment Plant Outfall into the Strait of Juan de Fuca (**Figure 4-4**). Surface water is not used as a drinking water source at Ault Field; therefore, there is no current exposure pathway for surface water to residents through drinking water. Additionally, there are no fisheries or sensitive habitats within 15 miles of the location.

The nearest major surface water bodies are Clover Valley Stream (1.4 miles to the southeast), Strait of Juan de Fuca (0.7 mile to the west), and Dugualla Bay (3.1 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

If AFFF was used, it likely infiltrated and contaminated surface and subsurface soil in the surrounding grass-covered areas. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of grass-covered areas, fugitive dust emissions and potential exposure through dust is possible. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.4.3 1985 EA-6B Crash Site

Description and Operational History

The 1985 EA-6B Crash Site is located on the eastern portion of the 07-25 runway on Ault Field (**Figure 4-5**). According to the former Crash Captain who was active at the time, the crash occurred due to the landing gear getting stuck, which caused a wheel fire (Crash Captain, 2017, pers. comm., **Appendix B**). The approximate geographic coordinates for the 1985 EA-6B Crash Site are 48°21'7.609"N and 122°38'55.586"W.

PFAS Storage, Use, or Release

The former Crash Captain recalled AFFF being sprayed over the aircraft during the crash response (Crash Captain, 2017, pers. comm.; **Appendix B**). It is not known if the AFFF was contained or how it was disposed of. According to the Crash Captain, plane parts contaminated with AFFF would have been sent to the P3 Wash Rack for rinsing prior to disposal (Crash Captain, 2017, pers. comm.; **Appendix B**).

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

Any AFFF not controlled by spill containment procedures used likely infiltrated and contaminated groundwater at grass-covered areas on either side of the crash location. Apparent groundwater flow near the 1985 EA-6B Crash Site is generally to the east (**Figure 4-5**). Depth to the shallow aquifer at this location is not known due to a lack of monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedance are located 1.1 miles to the southeast and 2.5 miles to the southwest, while five of the wells are grouped in relatively small cluster 3 miles to the south. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Overland flow of AFFF would have either collected in the runway drainage ditches on either side of the runway or flowed into stormwater catchments which line both sides of Runway 07-25. The runway drainage ditches flow to the east and eventually discharge through the Runway Drainage Ditch Outfall into the Clover Valley Stream. The runway stormwater catchments flow to the west and eventually discharge into the Strait of Juan de Fuca through an oil/water separator north of the flight line (**Figure 4-4**). Surface water is not used as a drinking water source at Ault Field; therefore, there is no current exposure pathway for surface water to residents through drinking water. Additionally, there are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (0.9 mile to the east), Strait of Juan de Fuca (1.2 miles to the west), and Dugualla Bay (2.7 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

AFFF used likely infiltrated and contaminated surface and subsurface soil in the surrounding grass-covered areas. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of grass-covered areas, fugitive dust emissions and potential exposure through dust is possible. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil

4.4.4 1989 A-6 Crash Site

Description and Operational History

The 1989 A-6 Crash Site is located at the eastern end of the 07-25 runway on Ault Field (**Figure 4-5**). According to the former Crash Captain who was active at the time, the crash occurred due to a backwards pin in the tail section of the aircraft (Crash Captain, 2017, pers. comm., **Appendix B**). The crash occurred during a practice routine for an upcoming airshow (Onyx, 2005). The approximate geographic coordinates for the 1989 Crash Site are 48°21'8.449"N and 122°38'34.675"W.

PFAS Storage, Use, or Release

The former Crash Captain recalled the crash, although he did not have knowledge of any AFFF usage in the crash response (Crash Captain, 2017, pers. comm.; **Appendix B**). Despite the absence of documented usage or witness accounts, the use of AFFF at this location cannot be ruled out.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

If AFFF was used, any not controlled by spill containment procedures likely infiltrated and contaminated groundwater at grass-covered areas on either side of the crash location. Apparent groundwater flow near the 1989 A-6 Crash Site is generally to the east (**Figure 4-5**). Depth to the shallow aquifer at this location is not known due to a lack of monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are

located 0.9 mile to the southeast and 2.7 miles to the southwest, while five of the wells are grouped in relatively small cluster 3 miles to the south. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Overland flow of AFFF would have either collected in the runway drainage ditches on either side of the runway or flowed into stormwater catchments which line both sides of Runway 07-25. The runway drainage ditches flow to the east and eventually discharge through the Runway Drainage Ditch Outfall into the Clover Valley Stream. The runway stormwater catchments flow to the west and eventually discharge into the Strait of Juan de Fuca through an oil/water separator north of the flight line (**Figure 4-4**). Surface water is not used as a drinking water source at Ault Field; therefore, there is no current exposure pathway for surface water to residents through drinking water. Additionally, there are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (0.7 mile to the east), Strait of Juan de Fuca (1.4 miles to the west), and Dugualla Bay (2.5 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

If AFFF was used, it likely infiltrated and contaminated surface and subsurface soil in the surrounding grass-covered areas. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of grass-covered areas, fugitive dust emissions and potential exposure through dust is possible. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.4.5 1990 A-6 Crash Site

Description and Operational History

The 1990 A-6 Crash Site is located on the western portion of the 07-25 runway on Ault Field (**Figure 4-4**). Based on historical documentation, the crash occurred during a post maintenance flight; however, the exact cause was not included in the report (Onyx, 2005). The approximate geographic coordinates for the 1990 A-6 Crash Site are 48°21'6.132"N and 122°39'40.490"W.

PFAS Storage, Use, or Release

The former Crash Captain did not recall this crash, nor did he have any knowledge of AFFF usage in the crash response (Crash Captain, 2017, pers. comm.; **Appendix B**). Despite the absence of documented usage or witness accounts, the use of AFFF at this location cannot be ruled out.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

If AFFF was used, any not controlled by spill containment procedures likely infiltrated and contaminated groundwater at grass-covered areas on either side of the crash location. Apparent groundwater flow near the 1990 A-6 Crash Site is generally to the east (**Figure 4-4**). Depth to the shallow aquifer at this location is not known due to a lack of monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.6 miles to the southeast and 2.2 miles to the south, while five of the wells are grouped in relatively small cluster 3 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Overland flow of AFFF would have either collected in the runway drainage ditches on either side of the runway or flowed into stormwater catchments which line both sides of Runway 07-25. The runway drainage ditches flow to the east and eventually discharge through the Runway Drainage Ditch Outfall into the Clover Valley Stream. The runway stormwater catchments flow to the west and eventually discharge into the Strait of Juan de Fuca through an oil/water separator north of the flight line (**Figure 4-4**). Surface water is not used as a drinking water source at Ault Field; therefore, there is no current exposure pathway for surface water to residents through drinking water. Additionally, there are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.5 miles to the east), Strait of Juan de Fuca (0.6 mile to the west), and Dugualla Bay (3.3 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

If AFFF was used, it likely infiltrated and contaminated surface and subsurface soil in the surrounding grass-covered areas. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of grass-covered areas, fugitive dust emissions and potential exposure through dust is possible. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.4.6 2006 F-18 Crash Site

Description and Operational History

The 2006 F-18 Crash Site is located at the northern end of the 13-31 Runway in the northern portion of Ault Field (**Figure 4-4**). The crash occurred at approximately the 2,000-foot marker on the paved portion of the runway. The crash site is bordered by drainage ditches to the northeast and southwest. The approximate geographic coordinates for the 2006 F-16 Crash Site are 48°21'23.555"N and 122°39'31.888"W.

The 2006 F-18 Crash occurred on 30 April 2006 when the plane caught fire upon landing. According to one of the firefighters who responded to the crash, the aircraft was extinguished using AFFF (AEMT/Fire Fighter, 2017, pers. comm.; **Appendix B**). A photograph of the crash response and AFFF application is provided in **Appendix B**.

PFAS Storage, Use, or Release

During the crash response, AFFF was applied to the nose, tail, and burning fuel hose on the F-18 aircraft. AFFF was applied to the flames for approximately 3 to 5 seconds at each of the three locations on the aircraft. The quantity of AFFF used to put out the fire is not known; however, the responding firefighter recalled that 80 to 90 percent of the water was left in the tank on the truck. AFFF was reportedly contained on the paved portion of the runway using dikes and spill containment methods. The remainder of cleanup and disposal of the AFFF was reportedly performed by NAVFAC Environmental (AEMT/Fire Fighter, 2017, pers. comm., **Appendix B**). The transportation and disposal of AFFF-contaminated materials used during the crash response is not known; therefore, PFAS could have potentially been released into the environment at the 2006 F-18 Crash Site.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

Any AFFF not controlled by spill containment procedures likely infiltrated and contaminated groundwater at grass-covered areas on either side of the crash location. Apparent groundwater flow near the 2006 F-18 Crash Site is generally to the southeast (**Figure 4-4**). Depth to the shallow aquifer at this location is not known due to a lack of monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.7 miles to the southeast and 2.5 miles to the southwest, while five of the wells are grouped in relatively small cluster 3.3 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Overland flow of AFFF would have collected in the runway drainage ditches on either side of the runway. The runway drainage ditches in this portion of the runway flow to the north and eventually discharge through the Wastewater Treatment Plant Outfall into the Strait of Juan de Fuca. Surface water is not used as a drinking water source at Ault Field; therefore, there is no current exposure pathway for surface water to residents through drinking water. Additionally, there are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.5 miles to the southeast), Strait of Juan de Fuca (0.6 mile to the west), and Dugualla Bay (3.2 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

Any AFFF not controlled by spill containment procedures likely infiltrated and contaminated surface and subsurface soil in the surrounding grass-covered areas. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of grass-covered areas, fugitive dust emissions and potential exposure through dust is possible. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.5 AFFF Spray Test Areas

4.5.1 Indoor Wash Rack (Building 2903)

Description and Operational History

The Indoor Wash Rack is located in Building 2903 in the central portion of Ault Field (**Figure 4-2**). The building is surrounded by the runway apron to the south and east, a small grass-covered area to the north, and by a parking lot to the west. The geographic coordinates for the Indoor Wash Rack are approximate 48°20'24.171"N and 122°39'49.828"W.

The Indoor Wash Rack located in Building 2903 was constructed in 2010. Vehicles, aircraft, and equipment are brought to the wash rack for cleaning and decontamination daily. Floor drains at the Indoor Wash Rack are reportedly connected to the sanitary sewer system through an oil/water separator (Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**).

PFAS Storage, Use, or Release

According to the Hazardous Waste Manager, annual AFFF refractometer spray testing of fire truck hoses and nozzles (**Section 4.3.1**) may have been performed at the Indoor Wash Rack (Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**). The volume of AFFF released and number of trucks that performed these annual spray tests is not known. All AFFF released into the wash rack system would have entered into the sanitary sewer system through an oil-water separator eventually reaching the current WWTP (**Section 4.6.3**). However, it is possible that AFFF flowed out of the wash rack and into stormwater catchments on the runway apron. Due to the lack of specific procedures involved in the refractory spray testing, the possibility of this occurring cannot be ruled out. Stormwater catchments on the runway apron in this section of the flight line are connected to Stormwater Outfall 1 east of Taxiways A and E.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

The entire area surrounding the Building 2903 is paved; therefore, PFAS migration from the surface to groundwater would likely be minimal. However, significant groundwater contamination could occur from leaking sanitary sewer lines transporting AFFF or PFAS-containing solutions to the WWTP. Apparent groundwater flow near the Indoor Wash Rack is generally to the northeast towards the runways (**Figure 4-3**). Depth to the surficial aquifer at this location is assumed to range from 4 to 6 feet bgs. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.6 miles to the east and 1.5 miles to the south, while five of the wells are grouped in relatively small

cluster 2.3 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF outside of Building 2903 to stormwater catchments on the runway apron would be unlikely due to the ground surface slope within the building, which directs surface flow towards catchments in the interior of the building. Interior floor drains are directly tied in to the sanitary sewer system. AFFF captured by the interior floor drains would have been directed to an oil/water separator, then transferred to the WWTP. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.8 miles to the east), Strait of Juan de Fuca (0.8 mile to the west), and Dugualla Bay (3.6 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

The entire area surrounding the Indoor Wash Rack is paved; therefore, PFAS migration from the surface to surface and subsurface soil would likely be minimal. However, significant soil contamination could occur from leaking sanitary sewer lines transporting AFFF or PFAS-containing solutions to the WWTP. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.6 Wastewater Treatment Plants

4.6.1 Former Wastewater Treatment Plant (Building 420)

Description and Operational History

The Former WWTP (Building 420) is located in the western portion of Ault Field along W Enterprise Road (**Figure 4-3**). The building is surrounded by grass areas to the west, east, and south, and by a small parking lot to the north. The approximate geographic coordinates for Building 420 are 48°20'50.598"N and 122°40'36.734"W.

The Former WWTP was constructed in 1956 and processed all the wastewater for Ault Field until 1996 when the current WWTP (**Section 4.6.3**, **Figure 4-4**) was constructed. Solids were processed at the Former Sewage Lagoons (**Section 4.6.2**, **Figure 4-4**) while the Former WWTP was operational. The Former WWTP remains connected to the sanitary sewer system and houses two 40,000-gallon concrete overflow clarifier tanks. The current function of the Former WWTP is to handle and store overflow from the sanitary sewer system and current WWTP. Any flow exceeding the capacity of the current WWTP will flow into these clarifier tanks to prevent system overload. Piping near the top of the clarifier tanks is connected to an outfall in the Strait of Juan de Fuca; however, the tanks have reportedly never reached this level while the AFFF has been stored at the Former WWTP (Wastewater Manager, 2017, pers. comm.; **Appendix C**).

PFAS Storage, Use, or Release

As detailed in **Section 4.2.4**, approximately 65,000 gallons of AFFF and water was transferred to the two clarifier tanks behind Building 420 following the 2016 accidental release at Hangar 7. The AFFF and water is currently being stored within the tanks, and is scheduled to be treated using granulated activated carbon in early 2018 (Hazardous Waste Manager, 2017, pers. comm.; **Appendix B;** Wastewater Manager, 2017, pers. comm.; **Appendix C**). No visual signs of a release were noted during this VSI; however, leakage from the clarifier tanks presents the potential for PFAS to be released into the environment.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

Water and AFFF are contained in the sanitary sewer system infrastructure at the Former WWTP. However, it is possible significant groundwater contamination could occur from leakage through cracks or faulty joints in the clarifier tanks. Apparent groundwater flow near the Former WWTP is generally to the west towards the Strait of Juan de Fuca (**Figure 4-3**). Depth to the surficial aquifer at this location is not known due to a lack of monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 2.2 miles to the east and 1.6 miles to the south, while five of the wells are grouped in relatively small cluster 3 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF outside of the Former WWTP would be unlikely unless a pipe carrying wastewater effluent broke above ground. If the clarifier tanks ever reached maximum capacity (40,000 gallons each), water and AFFF would discharge through an outfall located in the Strait of Juan de Fuca. This has reportedly never occurred while the water and AFFF has been stored in the clarifier tanks at the Former WWTP. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (2.2 miles to the east), Strait of Juan de Fuca (0.2 mile to the west), and Dugualla Bay (4 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

It is unlikely that AFFF would have washed into surface and subsurface soil; however, corrosion from the AFFF and water could potentially cause the clarifier tanks to leak. There are no residences, schools, or daycares within 200 feet of the Former WWTP.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of pavement, fugitive dust emissions and potential exposure is minimal. Construction or other ground-disturbing

activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.6.2 Former Sewage Lagoons

Description and Operational History

The Former Sewage Lagoons were located in the northern part of Ault Field along the Strait of Juan de Fuca, south of the WWTP (**Figure 4-4**). The former lagoons currently consist of a large grass field with no remaining structures. The approximate geographic coordinates for the Former Sewage Lagoons are 48°21'29.113"N and 122°40'10.136"W.

The sewage lagoons were constructed in 1972 and operated until 2005 when they were officially closed. From 1972 to 1996, the sewage lagoons processed all sanitary sewer solid waste, while wastewater was processed at the Former WWTP (**Section 4.6.1**, **Figure 4-3**). After the construction of the current WWTP (**Section 4.6.3**), the lagoons were decommissioned until deconstruction in 2005. The lagoons covered approximately 17 acres of land northwest of the runways (USGS, 2007). The outline of the former lagoons is visible due to man-made cuts in the topography surrounding a large flat area of grass. The location was confirmed by historical aerial photographs of the area.

PFAS Storage, Use, or Release

If AFFF was released before 1996 in Hangar 11, it would have been directed to the Former WWTP and potentially transported to the Former Sewage Lagoons through contaminated solid waste. During deconstruction of the sewage lagoons, sludge was transported to Area 6 for composting and disposal (**Figure 4-6**). The location was regraded for drainage and seeded with native grasses (USGS, 2007).

According to the Regional Hazardous Waste Program Manager and Hazardous Waste Manager, in 2014 a request was made for spreading AFFF over the Former Sewage Lagoons footprint after an accidental release by the Fire Department (Hazardous Waste Manager, 2017, email correspondence). However, it is not known whether spreading as a means of disposal actually occurred. No visual signs of a release were noted during this VSI; however, the potential for PFAS release into the environment exists.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

Any AFFF mixed with solids which entered the Former Sewage Lagoons from the WWTP, or which has been spread on the Former Sewage Lagoons for disposal, would have likely infiltrated the subsurface and contaminated the groundwater. Apparent groundwater flow near the Former Sewage Lagoons is generally to the west towards the Strait of Juan de Fuca (**Figure 4-4**). Depth to the surficial aquifer at this location is not known due to a lack of monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 2.1 miles to the southeast and 2.3 miles to the south, while five of the wells are grouped in relatively small cluster 3.5 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF to surface water bodies at the Former Sewage Lagoons is unlikely due to the subtle slope of the ground surface in the area. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (2 miles to the east), Strait of Juan de Fuca (0.1 mile to the west), and Dugualla Bay (3.7 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

Any AFFF spread over the Former Sewage Lagoons would have likely infiltrated and contaminated the surface and subsurface soil. Sludge from the Former Sewage Lagoons has historically been transported to the composting facility within Area 6, located next to the wood chipping facility (**Figure 4-6**). There are no residences, schools, or daycares within 200 feet of the Former Sewage Lagoons.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of gravel and dirt, fugitive dust emissions and potential exposure are possible. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.6.3 Wastewater Treatment Plant

Description and Operational History

The WWTP is located in the northern part of Ault Field along the Strait of Juan de Fuca, north of the runways (**Figure 4-4**). The plant consists of three separate structures (Buildings 2614, 2796, and 2886) and four treatment ponds. The ground between the structures is unpaved, consisting of gravel and dirt, and grass areas surround the facility on all sides. The approximate geographic coordinates for the WWTP are 48°21'34.600"N and 122°40'8.856"W.

The current WWTP was constructed in 1996 and includes a sequential batch reactor to treat wastewater pumped through the sanitary sewer system. Since 1996, all wastewater and sewage from the installation has been pumped to this location for processing and treatment. Following treatment and appropriate testing, biosolids are transported to the composting facility at Area 6 (**Section 4.7.3**; **Figure 4-6**). Compost is often distributed to various parts of the installation for beautification and construction projects. Treated wastewater is pumped to an outfall in the Strait of Juan de Fuca (**Figure 4-4**) (Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**).

PFAS Storage, Use, or Release

Hangar floor drains in hangars where AFFF has reportedly been released (Hangar 11 and Indoor Wash Rack) are known to be connected to the sanitary sewer system. Any AFFF from a spill or discharge after 1996 would have entered the hangar floor drains and flowed to the WWTP. No visual signs of a release were noted during this VSI; however, there is potential for PFAS release into the environment at the plant due to leaking tanks or pipes. Additionally, PFAS in treated wastewater and biosolids could potentially be released at the composting facility near Area 6 or the WWTP outfall into the Strait of Juan de Fuca.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

Any AFFF released into the sanitary sewer system from 1996 to the present would eventually be directed to the current WWTP. PFAS within the effluent or wastewater would be contained in the sanitary sewer system infrastructure. Although unlikely, it is possible that minor amounts of PFAS could have infiltrated groundwater if a pipe carrying effluent or wastewater was to break or spill. Additionally, PFAS in biosolids transported to the composting facility could potentially leach into the groundwater at Area 6 (**Section 4.7.3**; **Figure 4-6**). Apparent groundwater flow near the WWTP is generally to the west towards the Strait of Juan de Fuca (**Figure 4-4**). Depth to the surficial aquifer at this location is not known due to a lack of monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, seven of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 2.2 miles to the southeast and 2.5 miles to the south, while five of the wells are grouped in relatively small cluster 3.7 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF outside of the WWTP would be unlikely unless a pipe carrying effluent of wastewater broke above ground. Treated wastewater is discharged through an outfall located in the Strait of Juan de Fuca (**Figure 4-4**). Current waste treatment processes do not account for PFAS; therefore, PFAS was likely released into the environment at the wastewater outfall and could potentially impact marine life near this location. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (2 miles to the east), Strait of Juan de Fuca (0.1 mile to the west), and Dugualla Bay (3.6 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

It is unlikely that AFFF would have washed into surface and subsurface soil; however, it is possible if a wastewater effluent pipe was to break or leak. Treated biosolids are transported to the composting facility at Area 6, located next to the wood chipping facility (**Section 4.7.3**; **Figure 4-6**). It is possible that subsurface and surface soils could be contaminated at that location. There are no residences, schools, or daycares within 200 feet of the WWTP.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of gravel and dirt, fugitive dust emissions and potential exposure are possible. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.7 Landfills

4.7.1 1959-1969 Landfill (Area 2)

Description and Operational History

The 1959-1969 Landfill (Area 2) covers approximately 10 acres and is located in the southwestern portion of Ault Field (**Figure 4-1**). Native grasses and vegetation now blanket the entire extent of the former landfill. The approximate geographic coordinates for the 1959-1969 Landfill are 48°19'52.215"N and 122°41'21.581"W.

The landfill consisted of several open unlined earthen disposal pits approximately 5 feet deep; however, the exact locations of the pits are not known. Materials disposed of include metals, paints, solvents, thinners, fuels, asbestos-containing materials, and municipal waste (URS, 1993). Several monitoring wells from previous environmental investigations still exist at the 1959-1969 Landfill.

PFAS Storage, Use, or Release

Although the Military Specification for AFFF (MIL-F-24385) was issued in late 1969, the 3M Corporation first marketed AFFF containing PFAS in 1964 (3M Corporation, 2018). Since the 1959-1969 Landfill was operational until 1969, AFFF or PFAS-contaminated materials could have been disposed of and released into the environment at this location.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

Any AFFF or PFAS-containing solutions disposed of at the 1959-1969 Landfill would have likely leached into the groundwater. Apparent groundwater flow near the landfill is generally to the east-northeast towards the interior of the island (**Figure 4-1**). Depth to the surficial aquifer at this location is assumed to be highly variable ranging from 15 to 100 feet bgs due to perched groundwater zones. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 2.8 miles to the northeast and 0.4 mile to the south, while five of the wells are grouped in relatively small cluster 2.6 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the northeast within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF to surface water bodies would be unlikely given the relatively flat topography of the area. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (3.1 miles to the northeast), Strait of Juan de Fuca (0.2 mile to the west), and Oak Harbor (3.7 miles to the southeast).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

Any AFFF or PFAS-containing solutions disposed of at the 1959-1969 Landfill would have migrated into the surrounding surface and subsurface soil. There are no residences, schools, or daycares within 200 feet of the 1968-1970 Landfill.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of vegetated brushland, fugitive dust emissions and potential exposure is minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.7.2 1968-1970 Landfill (Area 3)

Description and Operational History

The 1968-1970 Landfill (Area 3) covers approximately 1.5 acres and is located in the southwestern portion of Ault Field (**Figure 4-1**). Native grasses and vegetation now blanket the entire extent of former landfill. The approximate geographic coordinates for the 1968-1970 Landfill are 48°19'57.077"N and 122°40'59.849"W.

The landfill consisted of several open unlined earthen trenches approximately 25 feet deep. Materials disposed of include metals, paints, solvents, thinners, fuels, asbestos-containing materials, and municipal waste (URS, 1993). Several monitoring wells from previous environmental investigations still exist at the 1968-1970 Landfill.

PFAS Storage, Use, or Release

Due to the time frame of operation, PFAS-contaminated material could potentially have been disposed of at the landfill; however, no visual signs of a release were noted during the VSI.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

Any AFFF or PFAS-containing solutions disposed of at the 1968-1970 Landfill would have likely leached into the groundwater. Apparent groundwater flow near the landfill is generally to the east towards the interior of the island (**Figure 4-1**). Depth to the surficial aquifer at this location is assumed to be 55-60 feet bgs. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 2.5 miles to the east and 0.5 mile to the south, while five of the wells are grouped in relatively small cluster 2.4 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the northeast within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF to surface water bodies would be unlikely given the relatively flat topography of the area. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (2.8 miles to the northeast), Strait of Juan de Fuca (0.5 mile to the west), and Oak Harbor (3.7 miles to the southeast).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

Any AFFF or PFAS-containing solutions disposed of at the 1968-1970 Landfill would have migrated into the surrounding surface and subsurface soil. There are no residences, schools, or daycares within 200 feet of the 1968-1970 Landfill.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of vegetated brushland, fugitive dust emissions and potential exposure is minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.7.3 Area 6

Description and Operational History

Area 6 is a 260-acre tract of land located in the southeastern corner of Ault Field (**Figure 4-6**). The area is bordered by Ault Field Road to the north, State Highway 20 to the east, and the City of Oak Harbor Landfill on the south and southwest. Area 6 consists of the former Area 6 landfill, former industrial waste disposal area, wood chipping facility, compositing facility, biosolids compost application area, and groundwater treatment plant (URS, 2015). The approximate geographic coordinates for the center of Area 6 are 48°19'17.7594"N and 122°38'12.12"W.

Several remediation projects have taken place at Area 6 since the early 1990s, including capping the former Area 6 landfill (Foster, 1997), soil removal at the former industrial waste disposal area (Foster, 2002), and groundwater pump and treatment at the groundwater treatment plant (URS-AECOM, 2016). Multiple groundwater contaminant plumes are being monitored and treated; however, AFFF and PFAS have not previously been investigated or sampled at Area 6, and the current groundwater treatment system does not treat for potential PFAS contamination. The Navy is conducting an ongoing investigation into on- and off-Base PFAS groundwater contamination associated with the former Area 6 Landfill.

PFAS Storage, Use, or Release

Of the various facilities within Area 6, the former Area 6 landfill, former industrial waste disposal area, and biosolids compost application area were investigated as potential PFAS release locations (**Figure 4-6**). Because all three locations are encompassed within the Area 6 designated boundary, they will be treated as a single potential PFAS release location.

From 1969 to 1983 the Area 6 landfill received both sanitary solid and industrial wastes which may have contained AFFF or PFAS-contaminated materials along with hazardous wastes. After 1983 the landfill continued to receive waste, construction debris, and soils and sediments classified as non-hazardous until 1996 (URS, 1993). Wastes were disposed within 23 cut-and-fill trenches with native soils in between (URS, 1993).

The former industrial waste disposal area is located northwest of the Area 6 landfill (**Figure 4-6**). It is estimated that approximately 700,000 to 3,000,000 gallons of acids, caustics, solvents, and potentially PFAS-containing solutions between the 1970s and 1980s (CH2M, 2017c).

The composting facility is located north of the Area 6 landfill and west of the wood chipping facility (**Figure 4-6**). According to the Hazardous Waste Manager, starting in 2009, biosolids from the current WWTP have been sent to the composting facility and eventually spread out at the application area east of the wood chipping facility (Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**). In 2014, a release of approximately 3 gallons of AFFF occurred in Hangar 11 which drains to the current WWTP potentially resulting in PFAS-contamination of the biosolids (Engineering Technician, 2017, pers. comm.; **Appendix B)**. Additional biosolid contamination may have

resulted from the potential disposal of AFFF at the current WWTP after an accidental release at the Current Fire Training Station in 2014 (Hazardous Waste Manager, 2017, email correspondence)**.**

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

Any AFFF or PFAS-contaminated wastes or biosolids disposed of or composted at Area 6 would have likely leached through the vadose zone into the groundwater. Apparent groundwater flow at Area 6 is generally to the south towards Oak Harbor (**Figure 4-6**). However, there is a potential groundwater divide north of Area 6 that may direct water discharged from the Navy's groundwater treatment plant north towards Clover Valley Stream. Depth to the surficial aquifer at this location is assumed to be 5 to 20 feet bgs. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.4 miles to the north and 2.3 miles to the west, while five of the wells are grouped in relatively small cluster 0.8 mile to the southwest. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field and nearby off-Base properties where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system, to Oak Harbor to the south, or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface water runoff from AFFF of PFAS-contaminated wastes to surface water bodies would be unlikely since the landfill waste was placed in subsurface trenches, although small amounts of surface runoff is possible at the biosolids application area. If runoff was to occur at the biosolids application location, it would likely collect in the adjacent topographically low areas and infiltrate the subsurface. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.9 miles to the north), Strait of Juan de Fuca (2.6 miles to the northwest), and Crescent Harbor (2.1 miles to the south). There is a small unnamed stream that flows north northwest under Ault Field Road and disperses into a wetland north of Ault Field Road, which is hydraulically connected to the Clover Valley Stream (**Figure 4-6**). The stream is partially, if not primarily, formed through the discharge of Area 6 groundwater treatment effluent directly north of the former Area 6 landfill.

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

Any AFFF or PFAS-contaminated wastes or biosolids disposed of or composted at Area 6 would have likely migrated into the surrounding surface and subsurface soil. There are no residences, schools, or daycares within 200 feet of Area 6.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of vegetated brushland, fugitive dust emissions and potential exposure is minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.8 Other Sites

4.8.1 P3 Wash Rack

Description and Operational History

The P3 Wash Rack was located in the south-central portion of Ault Field northeast of Building 2528 on the flight line (**Figure 4-2**). Currently, that section of the airfield is under construction, and the P3 Wash Rack no longer exists. The wash rack was situated on a strip of taxiway connecting Taxiway A and Taxiway D. Three trench drains seen in aerial photographs run perpendicular to the taxiway and likely would have collected any AFFF washed from aircrafts or aircraft parts. The discharge location for the trench drains is not known; however, discharge would have been to either the stormwater system or sanitary sewer system. Prior to deconstruction, grass-covered areas lined both sides of the paved taxiway. The approximate geographic coordinates for the P3 Wash Rack are 48°20'17.8794"N and 122°39'30.96"W.

PFAS Storage, Use, or Release

According to the former Crash Captain, AFFF-contaminated materials from aircraft crash response activities in the 1980s would have been brought to a wash rack. The P3 Wash Rack was reported as the wash rack that would most likely be used due to its proximity to the runway (Crash Captain, 2017, pers. comm., **Appendix B**).

Pathway and Environmental Hazard

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

While the P3 Wash Rack was in operation, the surrounding area was paved except for grass-covered areas to the east and west. It is possible that small amounts of AFFF or water could have flowed off the pavement and infiltrated to groundwater. Apparent groundwater flow near the P3 Wash Rack location is generally to the east towards the runways (**Figure 4-2**). Depth to the surficial aquifer at this location is not known due to a lack of groundwater monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.4 miles to the east and 1.6 miles to the south, while five of the wells are grouped in relatively small cluster 2.1 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF at the P3 Wash Rack would most likely have been captured by trench drains running perpendicular to the taxiway. The discharge location for the trench drains is not known; however, discharge would have been to either the stormwater system or sanitary sewer system. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.6 miles to the northeast), Strait of Juan de Fuca (1.2 miles to the west), and Dugualla Bay (3.4 miles to the northeast).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic

ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

Any AFFF not captured by trench drains would have infiltrated and contaminated the surface and subsurface soil in the surrounding grass-covered areas. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved or grass-covered areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.8.2 Walker Barn Storage Area (Area 4)

Description and Operational History

The Walker Barn Storage Area (Area 4) is located in the southwestern portion of Ault Field, directly northeast of the Current Fire Training Area (**Figure 4-1**). The area is now a grass-covered field surrounded by the current fire training burn pad to the southwest, Franklin Street to the south and west, and by open areas to the north and east. The approximate geographic coordinates for the Walker Barn Storage Area are 48°20'5.995"N and 122°41'7.022"W.

The Walker Barn Storage Area (Area 4) covers an area approximately 240 feet wide and 440 feet long. The barn was in use until it burned down in 1982. The barn was used to store a variety of supplies and materials including polychlorinated biphenyls, which reportedly leaked and contaminated the surrounding soils (URS, 1993). Several monitoring wells from previous environmental investigations still exist at the Walker Barn Storage Area.

PFAS Storage, Use, or Release

There is no record of AFFF or any other PFAS-containing solutions being stored at the Walker Barn Storage Area.

Pathway and Environmental Hazard Assessment

Not applicable.

4.8.3 Pesticide Rinsate Disposal Area (Area 14)

Description and Operational History

The Pesticide Rinsate Disposal Area (Area 14) is located in the southern portion of Ault Field, directly south of Building 2555 (**Figure 4-2**). The area is surrounded by grass-covered fields to the south, Langley Boulevard to the east, and by a paved area to the north followed by Building 2555. The geographic coordinates for the Pesticide Rinsate Disposal Area are 48°20'7.017"N and 122°40'14.083"W.

Building 2555 was used for pesticide storage and mixing from 1973 to 1983 (GTGS, 1996). Pesticide containers, equipment, and vehicles contaminated with pesticides were often rinsed on the paved area south of Building 2555. Runoff from equipment rinsing drained into the grass-covered field south of the paved area. Additionally, in 1973, a 12- to 15-foot-deep drywell was installed for disposal of pesticide rinsate directly south of the paved area (GTGS, 1996).

PFAS Storage, Use, or Release

There are no records indicating that AFFF was ever stored at Building 2555 or the Pesticide Rinsate Disposal Area; however, it is known that PFAS are used in several types of pesticides. Preliminary research suggests that PFAS was used in the United States as a surfactant in pesticides and insecticides to increase coverage when sprayed. During this PA, little information was uncovered about procedures and activities involving pesticides usage at Ault Field, both currently and historically; however, it is known that pesticides were released directly to surface and

subsurface soil at this location. If pesticides containing PFAS were used, they would have likely been released into the environment at this location.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

If pesticides containing PFAS were used and disposed of at this location, PFAS would have likely leached into the groundwater. Groundwater flow direction at the Pesticide Rinsate Disposal Area is generally to the northeast towards the runway apron (**Figure 4-2**). Depth to the surficial aquifer at this location is not known due to a lack of monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.9 miles to the northeast and 1.2 miles to the south, while five of the wells are grouped in relatively small cluster 2.2 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

If pesticides containing PFAS were used and disposed of at this location, PFAS could have flowed overland into nearby drainage ditches. There are no fisheries or sensitive habitats within 15 miles of the Former Avionics Facility. The nearest major surface water bodies are Clover Valley Stream (2.1 miles to the northeast), Strait of Juan de Fuca (0.9 mile to the west), and Dugualla Bay (3.9 miles to the northeast).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

If pesticides containing PFAS were used and disposed of at this location, PFAS would have likely contaminated surface and subsurface soils. There are no residences, schools, or daycares within 200 feet. Construction workers, maintenance/ industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved and grass areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.8.4 Fire School Can Disposal Area (Area 30)

Description and Operational History

The Fire School Can Disposal Area (Area 30) is located in a grass-covered field in the southwestern portion of Ault Field south of the 1959-1969 Landfill (Area 2) (**Figure 4-1**). The disposal area is located near the tree line along the western edge of the former Skeet Range. The approximate geographic coordinates for the Fire School Can Disposal Area are 48°19'42.099"N and 122°41'30.490"W.

A pile of approximately 150 cans was discovered bearing labels indicating that the contents consisted of horse blood (also referred to as oxblood or protein foam)-based fire-fighting foaming agent. Cans were observed to be empty and badly deteriorated. The time frame for the disposal is not known; however, it is estimated to have occurred in the early to middle 1970s based on the degree of deterioration observed on the cans (Navy, 1984).

PFAS Storage, Use, or Release

The Fire School Can Disposal Area cannot be eliminated as a potential source for PFAS contamination due to the possibility that AFFF cans may have been discarded at this location. Because the cans are thought to have been discarded after 1964, it is possible AFFF could have been accidentally disposed of along with the horse blood-derivative foaming agent.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

Any AFFF in deteriorated cans or drums disposed of at the Fire School Can Disposal Area likely would have infiltrated the subsurface and contaminated the groundwater. Apparent groundwater flow near the disposal area is generally to the east-northeast towards the interior of the island (**Figure 4-1**). Depth to the surficial aquifer at this location is not known due to a lack of groundwater monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 3 miles to the northeast and 0.3 mile to the southeast, while five of the wells are grouped in relatively small cluster 2.5 miles to the southeast. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the northeast within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Overland runoff of AFFF to a surface water body would be unlikely given the flat topography and lack of surface drainage features in the area. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (3.3 miles to the northeast), Strait of Juan de Fuca (0.2 mile to the west), and Oak Harbor (3.6 miles to the southeast).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

Any AFFF in deteriorated cans or drums disposed of at the Fire School Can Disposal Area likely would have infiltrated surface and subsurface soil. There are no residences, schools, or daycares within 200 feet of the Fire School Can Disposal Area (Area 30).

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of vegetated brushland, fugitive dust emissions and potential exposure is minimal. Construction or other ground-

disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.8.5 Hot Pit 1 (Refueling Area 1)

Description and Operational History

Hot Pit 1 (Refueling Area 1) is located in the north central portion of Ault Field on the runway apron (**Figure 4-3**). The hot pit is surrounded by paved concrete on all sides. The approximate geographic coordinates for Hot Pit 1 are 48°20'52.320"N and 122°40'7.190"W.

Hot Pit 1 was a temporary refueling station for approximately 6 months during the middle 2000s. The exact dates of operation have not been confirmed.

PFAS Storage, Use, or Release

According to fire-fighting personnel stationed during the period in which Hot Pit 1 was operational, no AFFF was used at the hot pit location (AEMT/Fire Fighter, 2017, pers. comm.; **Appendix B**). Additionally, there is no record of AFFF or any other PFAS-containing solutions ever being used at Hot Pit 1.

Pathway and Environmental Hazard Assessment

Not applicable.

4.8.6 Hot Pit 2 (Refueling Area 2)

Description and Operational History

Hot Pit 2 is located in the north central portion of Ault Field directly north of Taxiway C (**Figure 4-3**). The hot pit is surrounded by paved concrete followed by grass-covered areas in all directions. The approximate geographic coordinates for Hot Pit 2 are 48°20'47.445"N and 122°39'40.400"W.

Hot Pit 2 is the current refueling station and has been operational since 1997. The exact dates of operation have not been confirmed.

PFAS Storage, Use, or Release

According to fire-fighting personnel, no AFFF has been used at the hot pit location (AEMT/Fire Fighter, 2017, pers. comm.; **Appendix B**). Additionally, there is no record of AFFF or any other PFAS-containing solutions ever being used at Hot Pit 2.

Pathway and Environmental Hazard Assessment

Not applicable.

4.8.7 Hardstand Area

Description and Operational History

The Hardstand Area is located in the northeastern portion of Ault Field directly south of the Former Runway Fire School (Area 31), adjacent to Building 2577 (**Figure 4-5**). The Hardstand Area is along an unnamed road leading to the Former Runway Fire School and is surrounded by grass-covered areas. The approximate geographic coordinates for the Hardstand Area are 48°21'14.360"N and 122°39'12.058"W.

The Hardstand Area is the staging area for fire-fighting crash trucks during refueling activities at the hot pits. According to current fire-fighting personnel, the trucks would be parked here anytime refueling activities were ongoing. Personnel were stationed at the Hardstand Area in 8-hour rotations, 24 hours a day, during aircraft refueling (AEMT/Fire Fighter, 2017, pers. comm.; **Appendix B**).

PFAS Storage, Use, or Release

According to the former Fire Chief, the AFFF tanks on the fire trucks occasionally leaked foam, and this could have happened while the trucks were stationed at the Hardstand Area (Navy Region NW Fire Chief, 2017, pers. comm.; **Appendix B**). Any AFFF leaked from the trucks would have flowed off the pavement into the surrounding grass-covered areas.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

It is possible that minor amounts of AFFF or water could have leaked or spilled from the fire crash trucks as they were stationed here. Any AFFF would have flowed off the pavement to topographically low areas along the edge of the road and infiltrated to groundwater. Apparent groundwater flow near the Hardstand Area is generally to the south towards the runways (**Figure 4-5**). Depth to the surficial aquifer at this location is assumed to range from 5 to 8 feet bgs. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, seven of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.4 miles to the southeast and 2.5 miles to the southwest, while five of the wells are grouped in relatively small cluster 3.1 miles to the south. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF at the Hardstand Area would most likely drain to topographically low areas parallel to the road. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (1.2 miles to the southeast), Strait of Juan de Fuca (0.9 mile to the west), and Dugualla Bay (3 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

Any AFFF released at the Hardstand Area would have infiltrated and contaminated the surface and subsurface soil in the surrounding grass-covered areas. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved or grass-covered areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.8.8 Gallery Golf Course

Description and Operational History

The Gallery Golf Course is located in the southwestern portion of Ault Field (**Figure 4-1**). The course is surrounded by Golf Course Road to the east, Rocky Point Road to the north, Transmitter Road to the west, and Crosby Road to the south. The approximate geographic coordinates for the Gallery Golf Course clubhouse are 48°19'10.339"N and 122°41'37.512"W.

The Gallery Golf Course consists of 18 holes covering approximately 135 acres of land. The course is owned and operated by NASWI and is open to the public.

PFAS Storage, Use, or Release

According to a BOSC employee (BOSC employee, 2017, pers. comm.; **Appendix C**), biosolids from the current WWTP have been transferred to various locations at the golf course; however, the current Hazardous Waste Manager has no recollection of this being done during his time at Ault Field (Hazardous Waste Manager, 2017, pers. comm.; **Appendix B**). The potential for a release exists if biosolids containing PFAS were placed at various locations on the golf course. Based on current knowledge, the possibility of a release at the Gallery Golf Course cannot be eliminated; therefore, it will be considered as a potential PFAS release area.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

If biosolids from the current WWTP were used as fill material on the golf course, PFAS could have leached into the groundwater at application locations. Groundwater flow direction varies across the golf course. In the northwest, groundwater is assumed to flow northeast towards the Clover Valley, and in the south, it is assumed to flow to the southwest towards the Strait of Juan de Fuca (**Figure 4-1**). Depth to the surficial aquifer at this location is not known due to a lack of monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 3.3 miles to the northeast and 0.5 miles to the northeast, while five of the wells are grouped in relatively small cluster 2.4 miles to the east. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the northeast within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of water at the Gallery Golf Course is controlled by the contours of the course and tends to collect in topographically low areas. Runoff into surface water bodies is unlikely due to the amount of grass and vegetation. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (3.6 miles to the northeast), Strait of Juan de Fuca (0.4 mile to the west), and Oak Harbor (3.3 miles to the southeast).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

If biosolids from the current WWTP were used as fill material on the golf course, PFAS could have infiltrated into the surrounding surface and subsurface soil at the application locations. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of grass-covered areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.8.9 Runway Drainage Ditch System (Area 16)

Description and Operational History

The Runway Drainage Ditch System (Area 16) is a large system of ditches and culverts designed to capture runoff from the runways and taxiways (**Figures 4-2, 4-3, 4-4,** and **4-5**). The system consists of two primary inflow outfalls, referred to as Stormwater Outfall 1 (**Figure 4-3**) and Stormwater Outfall 2 (**Figure 4-2**), which collect stormwater from the taxiways and hangars to the west. Stormwater Outfalls 1 and 2 are surrounded by grass-covered areas. The sole outflow outfall, referred to as the Runway Drainage Ditch Outfall, is located on the far eastern edge of Ault Field (**Figure 4-5**). All surface water within the Runway Drainage Ditch System flows through the Runway Drainage Ditch Outfall into the Clover Valley Stream. The approximate geographic coordinates for Runway Drainage Ditch System (Runway Drainage Ditch Outfall) are 48°20'55.407"N and 122°38'21.632"W.

PFAS Storage, Use, or Release

Any AFFF released in hangars without containment systems, aircraft emergency response, or wash racks would have eventually discharged into either the Strait of Juan de Fuca or the Runway Drainage Ditch System (Navy Region NW Fire Chief, 2017, pers. comm.; **Appendix B**).

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

Any AFFF or PFAS-contaminated water flowing through the Runway Drainage Ditch System could have leached into groundwater at this location. Groundwater flow direction in the vicinity of the Runway Drainage Ditch System is generally to the east towards Dugualla Bay (**Figure 4-5**). Depth to the surficial aquifer at this location is not known due to a lack of monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, seven of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 0.6 mile to the southeast and 3.2 miles to the southwest, while five of the wells are grouped in relatively small cluster 2.9 miles to the south. The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface runoff of AFFF and water is controlled by the contours and slopes of the Runway Drainage Ditch System. All drainage ditches eventually discharge into the Clover Valley Stream at the Runway Drainage Ditch Outfall at the eastern most extent of the system. There are no fisheries or sensitive habitats within 15 miles of the location. The nearest major surface water bodies are Clover Valley Stream (0 mile), Strait of Juan de Fuca (2 miles to the west), and Dugualla Bay (1.8 miles to the east).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

Any AFFF or PFAS-contaminated water flowing through the Runway Drainage Ditch System could have infiltrated into the surrounding surface and subsurface soils at this location. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of grass-covered areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

4.8.10 Former Avionics Facility (Building 2547)

Description and Operational History

The Former Avionics Facility (Building 2547) is located in the central portion of Ault Field (**Figure 4-3**). The facility is bordered by Charles Porter Avenue to the west, Hornet Road to the north, N. Ranger Street to the east, and W. Essex Road to the south. The geographic coordinates for the Former Avionics Facility are 48°20'27.196"N and 122°40'1.076"W.

PFAS Storage, Use, or Release

According to interviewed personnel, operations at the Former Avionics Facility included chrome plating, which is known to involve the use of PFAS-containing solutions (Regional Hazardous Waste Program Manager, 2017, pers. comm; **Appendix B**). During this PA, little information was uncovered about procedures and activities involving chrome plating and potential storage, use, or release of PFAS-containing materials at the Former Avionics Facility. Since there are many unknowns associated with the chrome plating that occurred at this facility, the release of PFAS into the environment at this location cannot be ruled out.

Pathway and Environmental Hazard Assessment

The pathway and environmental hazard assessment includes analyses of groundwater, surface water, sediment, soil, and air pathways and targets. These analyses are included in the following subsections.

Groundwater Pathway and Targets

Groundwater flow direction at the Former Avionics Facility is generally to the northeast towards the runways (**Figure 4-3**). Depth to the surficial aquifer at this location is not known due to a lack of monitoring wells in the area. Groundwater at Ault Field is not used as a drinking water source; therefore, there is no current exposure pathway for groundwater to on-Base residents or workers through drinking water. There are 630 private and/or community water wells within 4 miles, 7 of which have concentrations of PFOS or PFOA above the LHA (**Section 2.3**). Two of the seven wells with exceedances are located 1.7 miles to the east and 1.4 miles to the south, while five of the wells are grouped in relatively small cluster 2.4 miles to the southeast. The groundwater flow direction

between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents (CH2M, 2017b).

In areas of Ault Field where shallow groundwater is within the potential depth of construction activities, workers could be exposed to PFAS through dermal contact with contaminated groundwater. Additionally, groundwater within perched zones at Ault Field may be hydraulically connected to surface water bodies to the east within the Clover Valley drainage system or to the Strait of Juan de Fuca to the west, presenting a potential exposure pathway for aquatic ecological receptors.

Surface Water and Sediment Pathways and Targets

Surface water and runoff near the Former Avionics facility is controlled by storm catchments and drainage ditches. Sediments are likely to collect in topographically low areas adjacent to paved surfaces such as roads or parking lots. There are no fisheries or sensitive habitats within 15 miles of the Former Avionics Facility. The nearest major surface water bodies are Clover Valley Stream (1.9 miles to the northeast), Strait of Juan de Fuca (0.8 mile to the west), and Dugualla Bay (3.7 miles to the northeast).

Residents, construction workers, maintenance/industrial workers, and trespassers could be exposed to PFAS through incidental ingestion of and dermal contact with surface water and sediment. Terrestrial and aquatic ecological receptors could be exposed to PFAS in surface water primarily through direct exposure to surface water.

Soil and Air Pathways and Targets

Any AFFF released outside the Former Avionics Facility could have infiltrated and contaminated the surface and subsurface soil in the surrounding grass-covered areas. There are no residences, schools, or daycares within 200 feet.

Construction workers, maintenance/ industrial workers, and trespassers could be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil. Because the area consists primarily of paved and grass-covered areas, fugitive dust emissions and potential exposure should be minimal. Construction or other ground-disturbing activities could result in potential worker exposure to dust. Terrestrial ecological receptors could be exposed to PFAS in soil through direct exposure with soil.

SECTION 5

Conclusions and Recommendations

This PA Report identified 39 areas that were evaluated for potential PFAS releases. Each of these areas is located near or (potentially) upgradient of private drinking water supply wells and may pose an immediate risk to human health and the environment. PFAS compounds have been detected above the LHA in seven off-Base residential water supply wells.

In accordance with DoD Instruction 4715.18, *Emerging Contaminants* (June 2009, certified through June 2016), DoD policy requires that "Risks to people, the environment, and DoD missions, programs, and resources shall be assessed and, when appropriate, actions shall be taken to reduce risks related to ECs [emerging contaminants] development, use, or release." Additionally, Navy *Interim Per- and Polyfluoroalkyl Substances (PFAS) Site Guidance for NAVFAC Remedial Project Managers (RPMs)/September 2017 Update* (Navy, 2017b) recommends:

"RPMs should consider investigating ER sites for PFAS when the conceptual site model indicates:

a. Historical release or use of aqueous film forming foam (AFFF), or

b. Historical use of an area for other industrial activities (e.g., plating operations) that may have released PFAS.

Based on recent Navy experience, sites at Naval and Marine Corps Air Stations (NAS and MCAS respectively), including outlying or auxiliary landing fields, other applicable installations with potential repeated (e.g., former firefighting training areas) or significant (e.g., crashes) AFFF releases should be prioritized for investigation."

This PA report has identified sites that meet the first criterion, triggering the need for further investigation to determine whether a release to the environment occurred resulting in impacts to soil, sediment, surface water, or groundwater at levels that warrant remedial actions.

Based on background research, interviews, and visits to Ault Field, 35 of the 39 potential areas have been evaluated as being potential areas for the release of PFAS into the environment. The 35 PFAS release areas include 4 FTAs, 10 hangars, 1 fire station, 6 aircraft crash locations, 1 AFFF spray test location, 3 WWTP facilities, 3 landfills, and 7 additional "miscellaneous" locations. Based on all information discovered in this PA, the rationale for each location and associated recommendations are provided in **Table 5-1**.

Table 5-1. Preliminary Assessment Report Summary and Findings

NASWI Ault Field, Washington

Areas Investigated	Rationale	Recommendation
Chapel Fire School (Area 28)	• The fire school closed in the 1950s, and was not operational during the time span when Navy used AFFF.	No Further Action
Clover Valley Fire School (Area 29)	• Due to the time frame of operation, AFFF could have been used in fire-fighting training activities. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 3.1 miles to the northeast and 0.2 mile to the east, and a cluster of five private and/or community wells with exceedances is located 2.4 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
1966 Fire School (Area 27)	• Due to the time frame of operation, AFFF could have been used in fire-fighting training activities. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 2.7 miles to the east and 1 mile to the south, and a cluster of five private and/or community wells with exceedances is located 2.6 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
Former Runway Fire School (Area 31)	• Interviewed personnel confirmed the use of AFFF during weekly fire training activities. • Fuel, water, and extinguishing agent (including AFFF) sprayed on the concrete-lined burn pad was directed through oil/water separator and discharged into adjacent drainage ditch which eventually flows into the Clover Valley Stream. • An unknown amount of AFFF was used at this location during the years of operation. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.4 miles to the southeast and 2.5 miles to the southwest, and a cluster of five private and/or community wells with exceedances is located 3.2 miles to the south. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
Current Fire Training Area	• Interviewed personnel confirmed the accidental release of small amounts of AFFF during fire training activities post-1999. • There is no record of procedures followed during fire training activities from 1982 to 1999; however, the use of AFFF at this location can be assumed based on standard fire-fighting practices during the 1980s and 1990s. • An unknown amount of AFFF was used at this location during the years of operation. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 2.6 miles to the east and 0.6 mile to the southeast, and a cluster of five private and/or community wells with exceedances is located 2.6 miles to the southeast.	Initiate Site Inspection

Table 5-1. Preliminary Assessment Report Summary and Findings

NASWI Ault Field, Washington

Areas Investigated	Rationale	Recommendation
	• The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	
Hangar 1 (Building 112)	• Four hand-held AFFF/water hose systems are located in the four corners of Hangar 1 containing approximately 20 gallons of 3 percent AFFF concentrate. • AFFF systems in the hangars were reportedly tested annually; however, specific procedures followed during these events, including the use of AFFF during annual testing, are not known. • Due to discrepancies in as-builts and geospatial data, the specific discharge location for the Hangar 1 trench drains is not entirely known. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.9 miles to the east and 1.6 miles to the south, and a cluster of five private and/or community wells with exceedances is located 2.8 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents.	Initiate Site Inspection
Hangar 5 (Building 386)	• Hangar 5 has an AFFF fire suppression system equipped with a 2,000-gallon polymer storage tank containing 3 percent AFFF concentrate by volume. • Hangar floor trench drains are currently connected to two 20,000-gallon steel above containment tanks; however, it is not known whether the floor drains have always been connected to containment tanks. • AFFF systems in the hangars were reportedly tested annually; however, specific procedures followed during these events, including the use of AFFF during annual testing, are not known. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.9 miles to the east and 1.6 miles to the south, and a cluster of five private and/or community wells with exceedances is located 2.9 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
Hangar 6 (Building 410)	• Hangar 6 has an AFFF fire suppression system constructed in 2017 that is equipped with two 2,000-gallon polymer tanks (half-full) of the C6 formulation of foam, which contains PFOA. • Previous fire suppression system was equipped with the old PFAS-based AFFF formulation. • AFFF from the old suppression system was reportedly transported and disposed of off-Base by the fire suppression system contractor. • The current fire suppression system has a containment system in place that will divert the hangar trench drains to the containment tanks, although, prior to the current system, hangar trench drains were connected to the stormwater system. • AFFF systems in the hangars were reportedly tested annually; however, specific procedures followed during these events, including the use of AFFF during annual testing, are not known.	Initiate Site Inspection

Table 5-1. Preliminary Assessment Report Summary and Findings

NASWI Ault Field, Washington

Areas Investigated	Rationale	Recommendation
	• A stormwater sample collected from an exterior stormwater catchment at Hangar 6 contained concentrations of PFOA and PFOS. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.6 miles to the east and 1.4 miles to the south, and a cluster of five private and/or community wells with exceedances is located 2.2 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	
Hangar 7 (Building 2544)	• Hangar 7 has an AFFF fire suppression system equipped with a 1,000-gallon polymer storage tank containing 3 percent AFFF concentrate by volume. • Interviewed personnel reported an accidental triggering of the AFFF fire suppression system in September 2016 resulting in the release of approximately 750 gallons of AFFF, which flowed into floor trench drains within the hangar. • AFFF and water washed into the floor drains was directed to a 30,000-gallon concrete underground vault. • The underground vault reportedly contained overflow piping to the stormwater system which discharged to Stormwater Outfall 2. • Following the discharge event, approximately 35,000 gallons of water and AFFF were reportedly pumped via pump truck and delivered to the Former WWTP (Building 420). • Interviewed personnel reported the containment tank had a crack in it, which allowed groundwater to flow into the tank creating a direct migration pathway to groundwater for approximately 1 week before an additional 30,000 gallons of AFFF and water was pumped to the Former WWTP and the vault was able to be repaired. • AFFF systems in the hangars were reportedly tested annually; however, specific procedures followed during these events, including the use of AFFF during annual testing, are not known. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.5 miles to the east and 1.4 miles to the south, and a cluster of five private and/or community wells with exceedances is located 2 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
Hangar 8 (Building 2642)	• Hangar 8 has an AFFF fire suppression system equipped with four 500-gallon, two 1,000-gallon, and two 1,200-gallon steel bladder tanks containing 3 percent AFFF concentrate by volume. • There is no AFFF containment system in place, and hangar floor drains are connected directly to stormwater system which discharges at Stormwater Outfall 1. • AFFF systems in the hangars were reportedly tested annually; however, specific procedures followed during these events, including the use of AFFF during annual testing, are not known.	Initiate Site Inspection

Table 5-1. Preliminary Assessment Report Summary and Findings

NASWI Ault Field, Washington

Areas Investigated	Rationale	Recommendation
	• Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.6 miles to the east and 1.5 miles to the south, and a cluster of five private and/or community wells with exceedances is located 2.4 miles to the southeast. • The groundwater flow direction between this location and the private water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	
Hangar 9 (Building 2681)	• Hangar 9 has an AFFF fire suppression system equipped with four 300-gallon and two 500-gallon steel bladder tanks containing 3 percent AFFF concentrate by volume. • There is no AFFF containment system in place, and hangar floor drains are connected directly to stormwater system which discharges at Stormwater Outfall 2. • Any AFFF not captured by hangar floor drains could have run off to nearby grass-covered areas. • AFFF systems in the hangars were reportedly tested annually; however, specific procedures followed during these events, including the use of AFFF during annual testing, are not known. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.4 miles to the east and 1.4 miles to the south, and a cluster of five private and/or community wells with exceedances is located 1.9 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
Hangar 10 (Building 2699)	• Hangar 10 has an AFFF fire suppression system constructed in 2017 that is equipped with a 750-gallon polymer tanks of the C6 formulation of foam, which contains PFOA. • Previous fire suppression system was equipped with the old PFAS-based AFFF formulation. • AFFF from the old suppression system was reportedly transported and disposed of off-Base by the fire suppression system contractor. • The current fire suppression system has a containment system in place directing the trench drains to exterior containment tanks, although it is not known whether the previous system also had containment tanks. • Any AFFF not captured by hangar floor drains could have run off to nearby grass-covered areas. • AFFF systems in the hangars were reportedly tested annually; however, specific procedures followed during these events, including the use of AFFF during annual testing, are not known. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.7 miles to the east and 1.5 miles to the south, and a cluster of five private and/or community wells with exceedances is located 2.5 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection

Table 5-1. Preliminary Assessment Report Summary and Findings

NASWI Ault Field, Washington

Areas Investigated	Rationale	Recommendation
Hangar 11 (Building 2733)	• Hangar 11 has an AFFF fire suppression system equipped with four 300-gallon and two 500-gallon steel bladder tanks containing 3 percent AFFF concentrate by volume. • Reportedly, approximately 3 gallons of AFFF was accidentally released during 2014-2015 and entered the hangar floor drains which are connected to the sanitary sewer system and current WWTP through an oil/water separator. • Any AFFF not captured by hangar floor drains could have run off to nearby grass-covered areas. • AFFF systems in the hangars were reportedly tested annually; however, specific procedures followed during these events, including the use of AFFF during annual testing, are not known. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.7 miles to the east and 1.5 miles to the south, and a cluster of five private and/or community wells with exceedances is located 2.6 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
Hangar 12 (Building 2737)	• Hangar 12 has an AFFF fire suppression system equipped with four 500-gallon steel bladder tanks containing 3 percent AFFF concentrate by volume. • There is no AFFF containment system in place, and hangar floor drains are connected directly to stormwater system which discharges at Stormwater Outfall 1. • Any AFFF not captured by hangar floor drains could have run off to nearby grass-covered areas. • AFFF systems in the hangars were reportedly tested annually; however, specific procedures followed during these events, including the use of AFFF during annual testing, are not known. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.9 miles to the east and 1.6 miles to the south, and a cluster of five private and/or community wells with exceedances is located 2.8 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
Hangar 14	• Hangar 14 has an AFFF fire suppression system constructed in 2017 that is equipped with the C6 formulation of foam, which contains PFOA. • Hangar floor trench drains are currently connected to an underground containment tank. • Any AFFF not captured by hangar floor drains could have run off to nearby grass-covered areas. • AFFF systems in the hangars were reportedly tested annually; however, specific procedures followed during these events, including the use of AFFF during annual testing, are not known. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.8 miles to the east and 1.5 miles to the south, and a cluster of five private and/or community wells with exceedances is located 2.7 miles to the southeast.	Initiate Site Inspection

Table 5-1. Preliminary Assessment Report Summary and Findings
NASWI Ault Field, Washington

Areas Investigated	Rationale	Recommendation
	• The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	
Former/Current Fire Station (Building 2897)	• Fire trucks observed at the current fire station are equipped with approximately 130-gallon AFFF tanks. • Interviewed personnel reported occasional leaks and spills of AFFF from fire trucks during refilling activities. • Interviewed personnel reported the testing of AFFF refractometer spray nozzles occurred at least once on the runway apron east of the fire station; however, this reportedly was not a routine procedure at this location. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.7 miles to the east and 1.5 miles to the south, and a cluster of five private and/or community wells with exceedances is located 2.6 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
1976 EA-6 Crash Site	• Based on the date of the aircraft crash, AFFF would likely have been used to put out any petroleum fires resulting from the impact. • Despite the absence of documented usage or witness accounts, the use of AFFF at this location cannot be ruled out. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 3.7 miles to the northeast and 0.8 miles to the northeast, and a cluster of five private and/or community wells with exceedances is located 2.6 miles to the east. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
1981 P-3A Crash Site	• Based on the date of the aircraft crash, AFFF would likely have been used to put out any petroleum fires resulting from the impact. • Despite the absence of documented usage or witness accounts, the use of AFFF at this location cannot be ruled out. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.6 miles to the southeast and 2.5 miles to the southwest, and a cluster of five private and/or community wells with exceedances is located 3.2 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
1985 EA-6B Crash Site	• Interviewed personnel reported the use of AFFF during emergency response activities (**Appendix B**).	Initiate Site Inspection

Table 5-1. Preliminary Assessment Report Summary and Findings

NASWI Ault Field, Washington

Areas Investigated	Rationale	Recommendation
	• An unknown amount of AFFF was used in the crash response, and likely flowed into adjacent runway drainage ditches and infiltrated the subsurface in surrounding grass-covered areas. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.1 miles to the southeast and 2.5 miles to the southwest, and a cluster of five private and/or community wells with exceedances is located 3 miles to the south. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	
1989 A-6 Crash Site	• Based on the date of the aircraft crash, AFFF would likely have been used to put out any petroleum fires resulting from the impact. • Despite the absence of documented usage or witness accounts, the use of AFFF at this location cannot be ruled out. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 0.9 mile to the southeast and 2.7 miles to the southwest, and a cluster of five private and/or community wells with exceedances is located 3 miles to the south. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
1990 A-6 Crash Site	• Based on the date of the aircraft crash, AFFF would likely have been used to put out any petroleum fires resulting from the impact. • Despite the absence of documented usage or witness accounts, the use of AFFF at this location cannot be ruled out. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.6 miles to the southeast and 2.2 miles to the south, and a cluster of five private and/or community wells with exceedances is located 3 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
2006 F-18 Crash Site	• Interviewed personnel reported the use of AFFF during emergency response and provided picture of AFFF on runway (**Appendix B**). • An unknown amount of AFFF was used. • AFFF was reportedly contained on a paved section of runway using spill containment equipment; however, it is possible that some AFFF flowed into adjacent runway drainage ditches and/or infiltrated the subsurface in surrounding grass-covered areas. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.7 miles to the southeast and 2.5 miles to the southwest, and a cluster of five private and/or community wells with exceedances is located 3.3 miles to the southeast.	Initiate Site Inspection

Table 5-1. Preliminary Assessment Report Summary and Findings
NASWI Ault Field, Washington

Areas Investigated	Rationale	Recommendation
	• The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	
Indoor Wash Rack (Building 2903)	• Interviewed personnel reported that annual AFFF refractometer spray testing of fire truck hoses and nozzles may have been performed at this location in the past. • AFFF from refractometer spray testing would have been washed into floor trench drains connected to the sanitary sewer system and the current WWTP. • It is possible that AFFF flowed out of the wash rack and into stormwater catchments on the runway apron, and due to the lack of specific procedures involved in the refractometer spray testing, the possibility of this occurring cannot be ruled out. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.6 miles to the east and 1.5 miles to the south, and a cluster of five private and/or community wells with exceedances is located 2.3 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
Former Wastewater Treatment Plant (Building 420)	• Approximately 65,000 gallons of AFFF and water is currently stored in two clarifier tanks at the Former WWTP. • No visual signs of a release were noted during this VSI; however, leakage from the clarifier tanks presents the potential for PFAS to be released into the environment. • Clarifier tanks are reportedly equipped with overflow piping that discharges directly into the Strait of Juan de Fuca, although discharge from the tanks has reportedly not occurred during the time span in which the tanks have contained AFFF. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 2.2 miles to the east and 1.6 miles to the south, and a cluster of five private and/or community wells with exceedances is located 3 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
Former Sewage Lagoons	• Interviewed personnel reported AFFF refractometer spray testing at the Former Sewage Lagoons post 2005 (**Appendix B**). • An unknown amount of AFFF was used in the tests. • Any AFFF released before 1996 in Hangar 11, it would have been directed to the Former WWTP and potentially transported to the Former Sewage Lagoons through contaminated solid waste. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 2.1 miles to the east and 2.3 miles to the south, and a cluster of five private and/or community wells with exceedances is located 3.5 miles to the southeast.	Initiate Site Inspection

Table 5-1. Preliminary Assessment Report Summary and Findings

NASWI Ault Field, Washington

Areas Investigated	Rationale	Recommendation
	• The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	
Wastewater Treatment Plant	• AFFF released at the Indoor Wash Rack and Hangar 11 would have been directed to the WWTP. • Current treatment processes do not effectively remove PFAS; therefore, PFAS has likely been discharged as wastewater through the WWTP outfall into the Strait of Juan de Fuca. • PFAS could have also been transported through solid waste as biosolids to the composting facility at Area 6. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 2.2 miles to the southeast and 2.5 miles to the south, and a cluster of five private and/or community wells with exceedances is located 3.7 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
1959-1969 Landfill (Area 2)	• Due to the time frame of operation, PFAS-contaminated material could potentially have been disposed of at the landfill. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 2.8 miles to the east and 0.4 mile to the south, and a cluster of five private and/or community wells with exceedances is located 2.6 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
1968-1970 Landfill (Area 3)	• Due to the time frame of operation, PFAS-contaminated material could potentially have been disposed of at the landfill. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 2.5 miles to the east and 0.5 mile to the south, and a cluster of five private and/or community wells with exceedances is located 2.5 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
Area 6	• Due to the timeframe of operation, PFAS-contaminated material could potentially have been disposed of at the former Area 6 landfill and former industrial waste disposal area. • Potentially contaminated biosolids from the current WWTP have been brought to the composting facility and applied over a grass-covered area east of the wood chipping facility. • The City of Oak Harbor is located downgradient of Area 6.	Initiate Site Inspection

Table 5-1. Preliminary Assessment Report Summary and Findings

NASWI Ault Field, Washington

Areas Investigated	Rationale	Recommendation
	• Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.4 miles to the north and 2.3 miles to the west, and a cluster of five private and/or community wells with exceedances is located 0.8 mile to the southwest. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	
P3 Wash Rack	• Interviewed personnel reported that AFFF-contaminated materials from aircraft crash response activities would have been brought to a wash rack, and the P3 Wash Rack was reported as the wash rack that would most likely have been used (**Appendix B**). • Any AFFF washed from planes or fire-fighting vehicles would have been washed into trench drains connected to the either the stormwater system or sanitary sewer system. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.4 miles to the east and 1.6 miles to the south, and a cluster of five private and/or community wells with exceedances is located 2.1 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
Walker Barn Storage Area (Area 4)	• There is no record of use, storage, or release of AFFF or PFAS-containing solutions at the Walker Barn Storage Area.	No Further Action
Pesticide Rinsate Disposal Area (Area 14)	• There are no records indicating that AFFF has ever being stored at Building 2555 or the Pesticide Rinsate Disposal Area; however, it is known that PFAS are used in several types of pesticides. • During this PA, little information was uncovered about procedures and activities involving pesticides usage, both currently and historically; however, previous investigations have reported that pesticides were released directly to surface and subsurface soil at this location. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.9 miles to the northeast and 1.2 miles to the south, and a cluster of five private and/or community wells with exceedances is located 2.2 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
Fire School Can Disposal Area (Area 30)	• Approximately 150 cans of badly deteriorated horse blood-based fire-fighting foaming agent were found at this location, which indicates that AFFF may have also been disposed at the Fire School Can Disposal Area. • Based on the deterioration of the cans, the Navy estimated that the disposal occurred sometime in the 1970s during the time when AFFF was being used by the Navy. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 3 miles to the northeast and 0.3 mile to the southeast, and a cluster of five private and/or community wells with exceedances is located 2.5 miles to the southeast.	Initiate Site Inspection

Table 5-1. Preliminary Assessment Report Summary and Findings
NASWI Ault Field, Washington

Areas Investigated	Rationale	Recommendation
	• The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	
Hot Pit 1 (Refueling Area 1)	• Interviewed personnel reported that no knowledge of AFFF usage at the hot pit locations (**Appendix B**). • There is no record of use, storage, or release of AFFF or PFAS-containing solutions at Hot Pit 1.	No Further Action
Hot Pit 2 (Refueling Area 2)	• Interviewed personnel reported that no knowledge of AFFF usage at the hot pit locations (**Appendix B**). • There is no record of use, storage, or release of AFFF or PFAS-containing solutions at Hot Pit 2.	No Further Action
Hardstand Area	• Interviewed personnel reported that fire crash trucks stationed at the Hardstand Area during refueling could have leaked AFFF onto the ground surface (**Appendix B**). • AFFF leaked from the trucks would have flowed off the pavement into the surrounding grass-covered areas. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.4 miles to the southeast and 2.5 miles to the southwest, and a cluster of five private and/or community wells with exceedances is located 3.1 miles to the south. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
Gallery Golf Course	• Interviewed personnel reported that biosolids and sludge from the current WWTP could have been transported to golf course for use as fill (**Appendix B**). • Any PFAS remaining in biosolids could have been reintroduced into the environment at the golf course. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 3.3 miles to the northeast and 0.5 mile to the northeast, and a cluster of five private and/or community wells with exceedances is located 2.4 miles to the east. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection
Runway Drainage Ditch System (Area 16)	• Any AFFF released in hangars without containment systems, aircraft emergency response, or wash racks would have eventually discharged into either the Strait of Juan de Fuca or the Runway Drainage Ditch System. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 0.6 mile to the southeast and 3.2 miles to the southwest, and a cluster of five private and/or community wells with exceedances is located 2.9 miles to the south. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection

Table 5-1. Preliminary Assessment Report Summary and Findings

NASWI Ault Field, Washington

Areas Investigated	Rationale	Recommendation
Former Avionics Facility (Building 2547)	• Interviewed personnel confirmed that chrome plating operations were performed at the Former Avionics Facility (**Appendix B**). • Chrome plating is known to involve PFAS-containing solutions. • Other than the knowledge that chrome plating took place at this location, little information was known about the use, storage, and disposal of PFAS-containing solutions; therefore, the release of PFAS into the environment at this location cannot be ruled out. • Two private residential water wells with concentrations of PFOS or PFOA above the LHA are located 1.7 miles to the east and 1.4 miles to the south, and a cluster of five private and/or community wells with exceedances is located 2.4 miles to the southeast. • The groundwater flow direction between this location and the water wells is not entirely known, which presents a potential exposure pathway for off-Base residents. • Ecological and residential exposure to PFAS-contaminated surface water, soil, and dust could occur.	Initiate Site Inspection

SECTION 6

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Figures

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DATA SOURCE: ESRI & NIRIS
IMAGERY SOURCE: ESRI 2017

Legend
- City
- Secondary Road
- Local Connecting Road
- Important Local Road
- Base Boundary

N

0 0.75 1.5 3 Miles

1 inch = 1.5 miles

Figure 1-1
Ault Field Base Reference Map
Naval Air Station Whidbey Island
Oak Harbor, Washington

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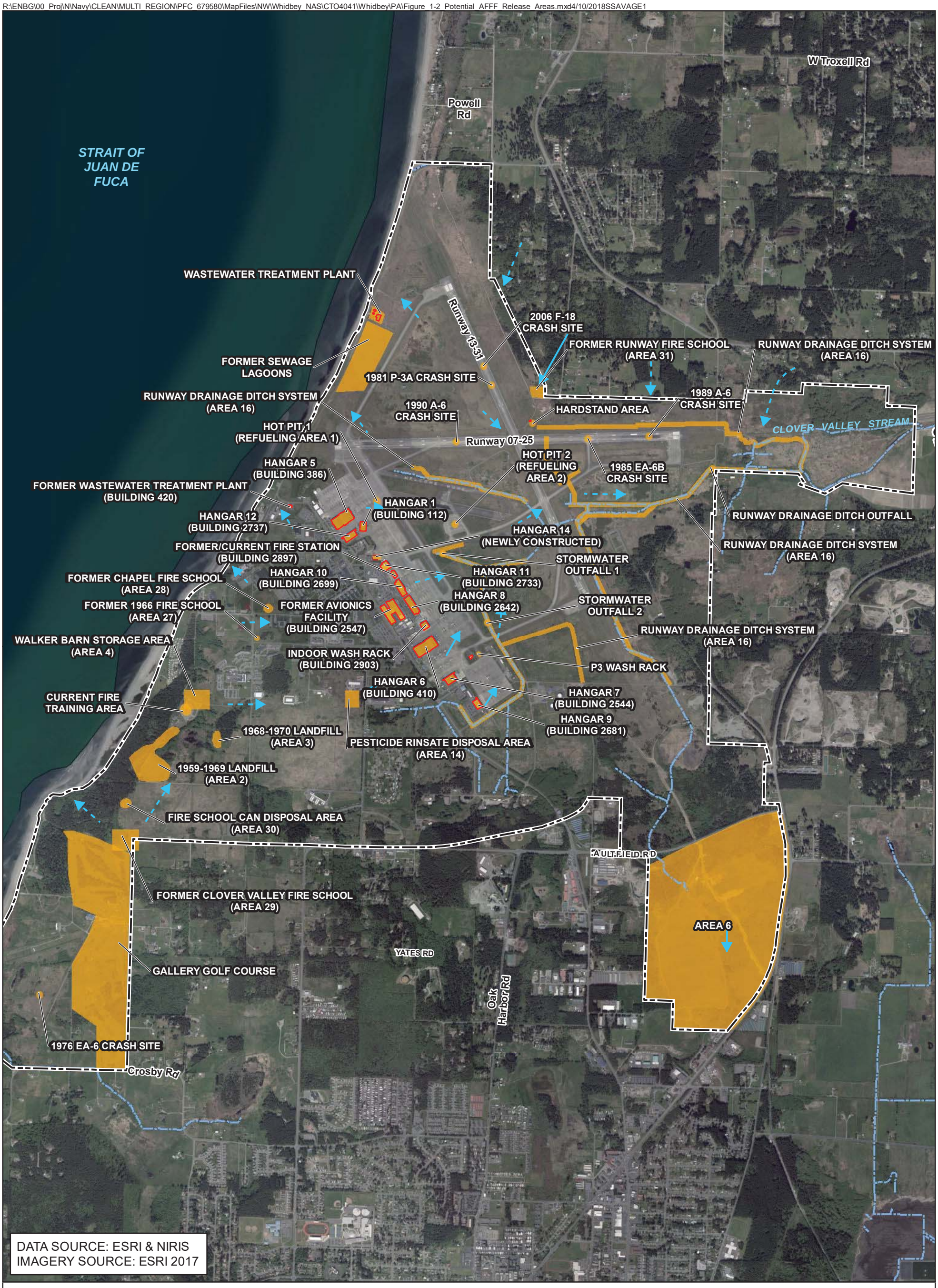
R:\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\PFC_679580\MapFiles\NW\Whidbey_NAS\CTO4041\Whidbey\PA\Figure_1-2_Potential_AFFF_Release_Areas.mxd4/10/2018SSAVAGE1



Legend

- Potential PFAS Release Area
- Building
- Surface Water
- Approximate Groundwater Flow Direction
- Inferred Groundwater Flow Direction (dashed)
- Base Boundary

N

0 0.2 0.4 Miles

1 inch = 0.4 miles

Figure 1-2
Potential PFAS Release Areas
Naval Air Station Whidbey Island
Oak Harbor, Washington

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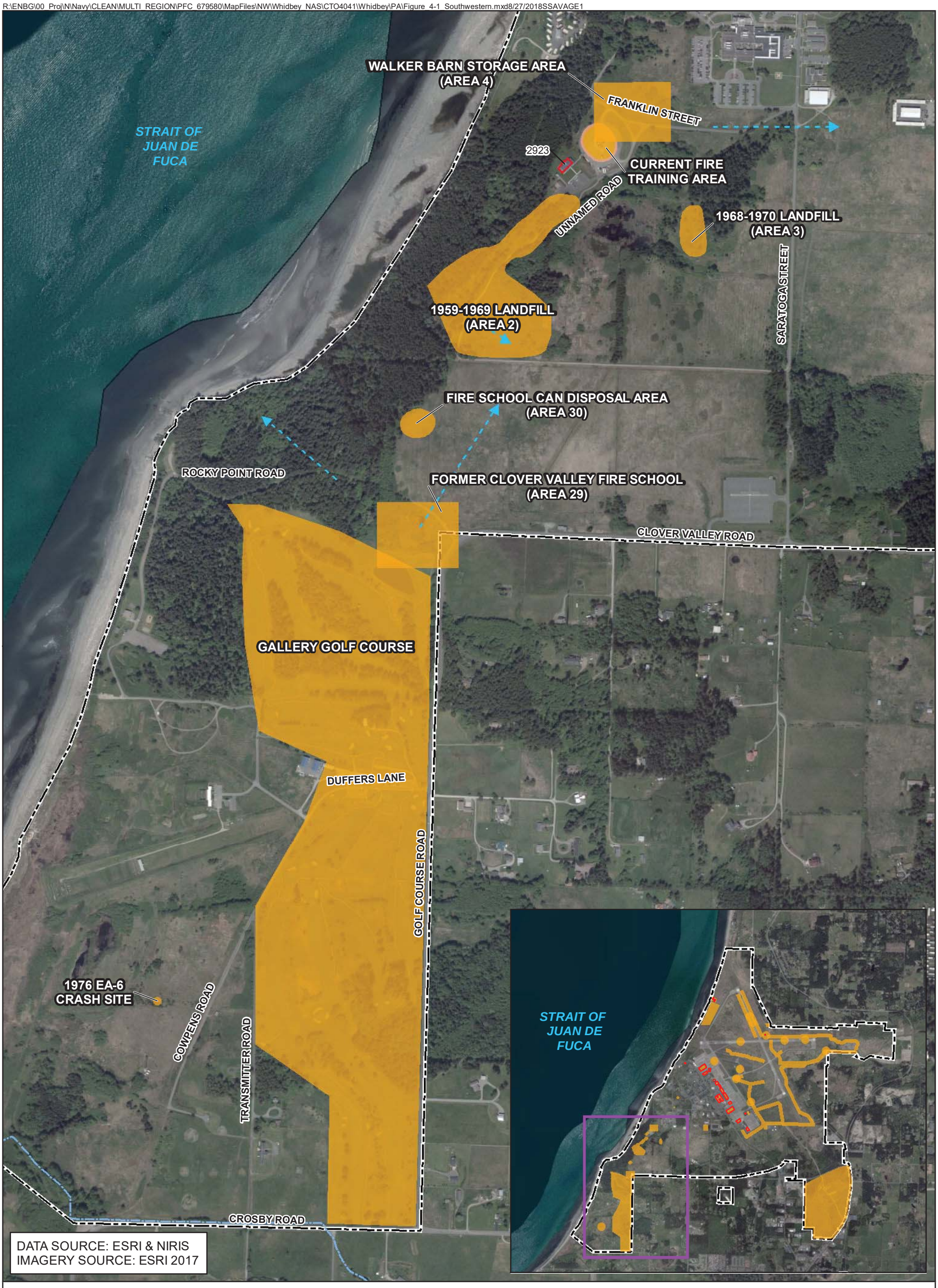
R:\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\PFC_679580\MapFiles\NW\Whidbey_NAS\CTO4041\Whidbey\PA\Figure_4-1_Southwestern.mxd8/27/2018SSAVAGE1



Legend

- Potential PFAS Release Area
- Surface Water
- Building
- Inferred Groundwater Flow Direction (dashed)
- Base Boundary

N

0 350 700 1,400 Feet

1 inch = 700 feet

Figure 4-1
Potential PFAS Release Areas - Southwestern Areas
Naval Air Station Whidbey Island
Oak Harbor, Washington

R:\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\PFC_679580\MapFiles\NW\Whidbey_NAS\CTO4041\Whidbey\PA\Figure_4-2_South.mxd8/27/2018SSAVAGE1

Legend
- Potential PFAS Release Area
- Building
- Area Under Construction
- Surface Water
- Inferred Groundwater Flow Direction (dashed)
- Base Boundary

N

0 150 300 Feet

1 inch = 300 feet

Figure 4-2
Potential PFAS Release Areas - Southern Areas
Naval Air Station Whidbey Island
Oak Harbor, Washington

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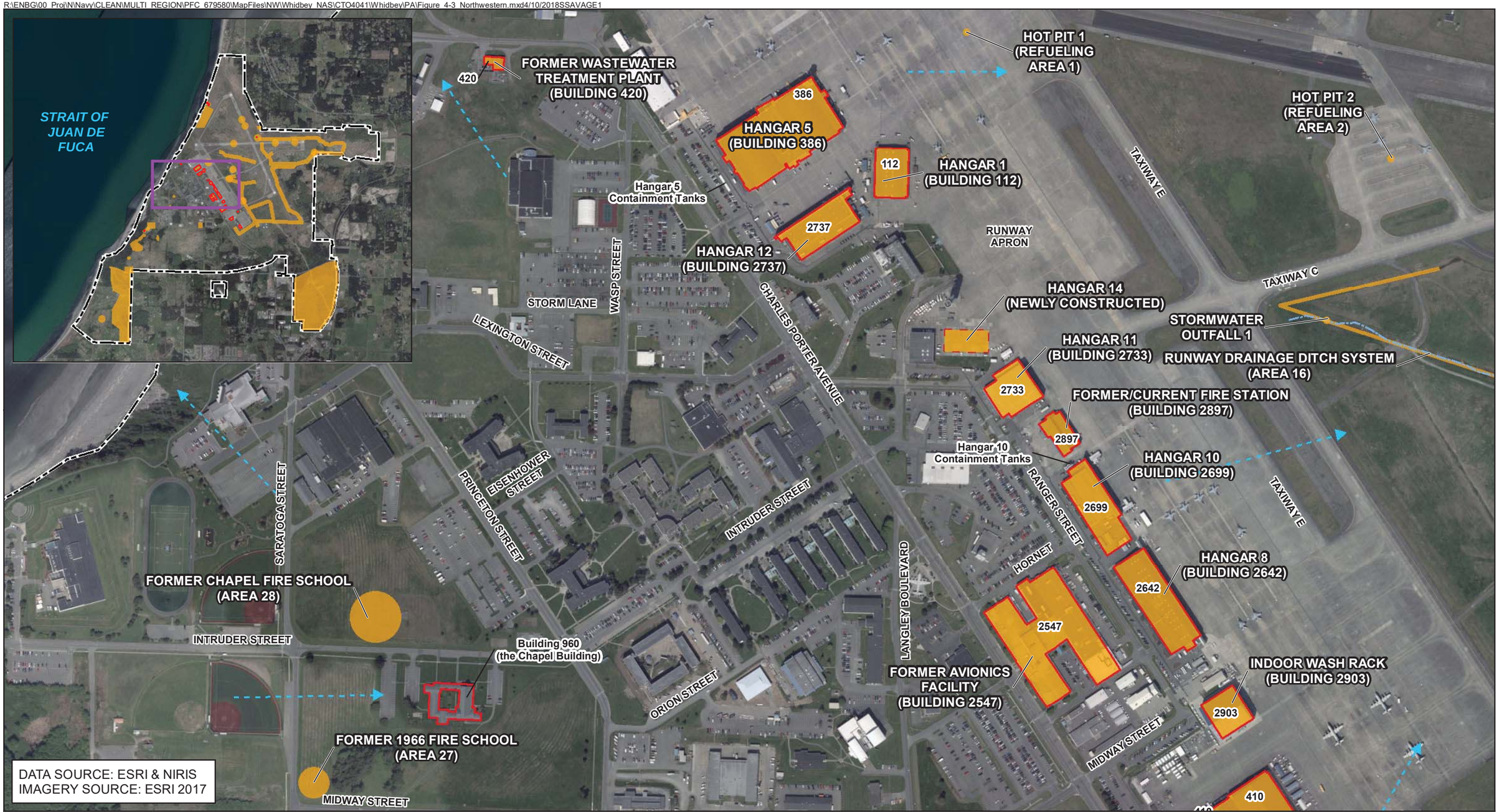
R:\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\PFC_679580\MapFiles\NW\Whidbey_NAS\CTO4041\Whidbey\PA\Figure_4-3_Northwestern.mxd4/10/2018SSAVAGE1



Legend
- Potential PFAS Release Area
- Building
- Surface Water
- Inferred Groundwater Flow Direction (dashed)
- Base Boundary

N

0 200 400 Feet

1 inch = 400 feet

Figure 4-3
Potential PFAS Release Areas - Northwestern Area
Naval Air Station Whidbey Island
Oak Harbor, Washington

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Legend
- Potential PFAS Release Area
- Building
- Surface Water
- Inferred Groundwater Flow Direction (dashed)
- Base Boundary

N

0 250 500 Feet

1 inch = 600 feet

Figure 4-4
Potential PFAS Release Areas - North Areas
Naval Air Station Whidbey Island
Oak Harbor, Washington

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R:\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\PFC_679580\MapFiles\NW\Whidbey_NAS\CTO4041\Whidbey\PA\Figure_4-5_Eastern.mxd4/10/2018SSAVAGE1

Legend
- Potential PFAS Release Area
- Surface Water
- Building
- Inferred Groundwater Flow Direction (dashed)
- Base Boundary

N

0 200 400 Feet

1 inch = 400 feet

Figure 4-5
Potential PFAS Release Areas - East
Naval Air Station Whidbey Island
Oak Harbor, Washington

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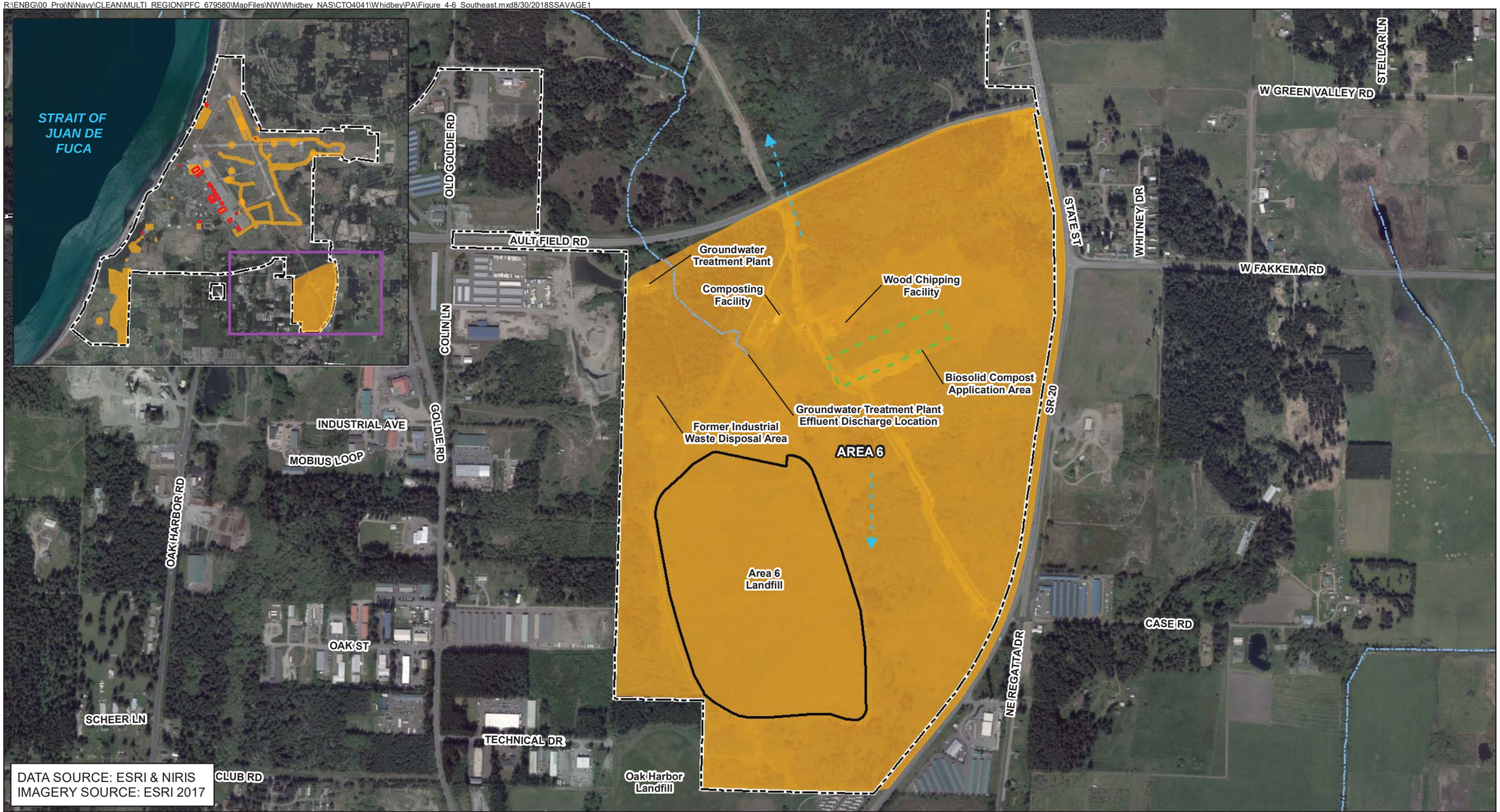
R:\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\PFC_679580\MapFiles\NW\Whidbey_NAS\CTO4041\Whidbey\PA\Figure_4-6_Southeast.mxd8/30/2018SSAVAGE1



DATA SOURCE: ESRI & NIRIS
IMAGERY SOURCE: ESRI 2017

Legend
- Potential PFAS Release Area
- Biosolid Compost Application Area
- Surface Water
- Inferred Groundwater Flow Direction (dashed)
- Base Boundary

N

0 175 350 700
Feet

1 inch = 700 feet

Figure 4-6
Potential PFAS Release Areas - Area 6
Naval Air Station Whidbey Island
Oak Harbor, Washington

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Appendix A
Summary of Records Reviewed

Documents Reviewed from the Naval Installation Restoration Information Solution Record

CH2M HILL, Inc. 2017b. *Sampling and Analysis Plan, Investigation of Per- and Polyfluoroalkyl Substances in Drinking Water, Ault Field and Outlying Landing Field Coupeville, Naval Air Station Whidbey Island, Oak Harbor and Coupeville, Washington*. October.

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Brooks, John, International Arrow, and Goal Technologies, Retired Director of Research, Principal Investigator. Personal communication (meeting). November 2.

Crain, Allison, NAVFAC Northwest, Regional Hazardous Waste Program Manager. Personal communication (meeting). November 2.

Hardy, Blaine, NAVFAC Northwest Public Works, Hazardous Waste Manager. Personal communication (meeting and email). November 2; December 6.

Hornsby, John, NASWI, Crash Captain, 1985 to 2001. Personal communication (meeting). November 8.

Merrill, Sean, NASWI, Fire Chief, 2008 to present. Personal communication (phone meeting). October 17.

Potter, Lloyd, NAVFAC Northwest Facility Engineering & Acquisition Division, Lead Engineering Technician. Personal communication (meeting). November 2.

Prince, Tom, NASWI, Aviation Emergency Medical Technician/Fire Fighter, 1997 to present. Personal communication (meeting). November 8.

Waeschle, Kurt, Navy Northwest Region, Fire Chief, 2006 to present; NASWI, Fire Chief, 1999-2006. Personal communication (meeting and email). October 17; December 4; and December 8.

Willey, Allan, CDR, USN, NAVFAC Northwest Public Works Officer. Personal communication (meeting). November 2.

Appendix B
Interview Notes

Communication Record[1]	
Date 10-17-17	Time 1210-1400
Name of Base, State: Keyport, WA – regarding Ault Field/OLF Coupeville /Seaplane Base	
Interviewer: J. Horton, J. Hauser	
Organization: CH2M HILL	Phone: (360) 556-0621
Position/role on this project: Task Managers	Email: Janice.horton@ch2m.com
Interviewee: Kurt Waeschle (Sean Merrill via phone)	
Organization: Navy Regional NW Fire and Emergency Services	Phone: (360) 340-1342
Position/Job Title: Fire Chief	Email: kurt.waeschle@navy.mil
How long in this position? 2008 to present	
How long in current and previous positions? Naval Air Station Whidbey Island (NASWI) Fire Chief 1999 to 2006	
Have you held similar positions at other Bases? N/A	
Which Base? N/A	
How long? N/A	
General Discussion Notes and Information:	
Assumed responsibility for fire and emergency at Outlying Landing Field (OLF) Coupeville in March/April 2012. NASWI AirOps had responsibility for OLF Coupeville prior to March 2012.	
Two documented events exist for OLF Coupeville – neither utilized foam, and both are recorded in the Navy Installation Restoration Information System (NIRIS).	
One event was a hard landing for a helicopter; the other was a light civil event that occurred within the last 2 years. There is no information prior to October 1, 2012.	
See Bill MacMillan[2] from NASWI AirOps for further information.	
Mr. Waeschle provided a list of names of key firefighting personnel to legal department dating back to 1972.	

[1] This interview record contains information relevant to Ault Field, Seaplane Base, and OLF Coupeville. Information not directly relevant to Ault Field has been shaded in gray.

[2] Bill MacMillan was contacted via email on 10/30/2017. In a response sent on 10/31/2017 he said that he had "no knowledge of storage or use of AFFF at NASWI."

A barn fire is reported to have occurred at OLF Coupeville some years ago. The Navy responded with “buckets of chemical,” according to statements from onlookers. Navy personnel involved were “contacted” and stated that no aqueous film forming foam (AFFF) was used.
* Mr. Waeschle stated that emails are part of the litigation hold. All emails sent to Mr. Waeschle from this team will be included in the litigation hold.
In the 1970s, protein foam containing Ox blood was used. NASWI Hangar 7 used protein foam until a couple of years ago.
At Ault Field, all foam storage and crash truck reservicing was done at Building 121 before it was demolished and turned into a parking lot. The new fire station is known as Building 2687. During the normal AFFF truck-filling procedure, the foam would bubble over the top of the truck and may have dripped onto the ground. Five-gallon buckets of foam were poured into the truck, then hoses were used to fill the remainder of the truck with water. After filling the trucks, the garden hoses were usually put in 5-gallon buckets that people would “take home.” This was done from 1999 to 2006. This filling method has not been practiced since 2008. The new filling procedure is not prone to leaks or releases, as the hose fills the tank from the bottom via piping, rather than pouring from the top.
For filling, each truck has approximately 130 gallons of foam. At times, trucks would lose foam on the fire station floor from leaking tanks. Crash response trucks also leaked foam when parked near Area 31 at the Hardstand parking. Trucks were parked for approximately 4-hour intervals.
Naval Air Systems Command (NAVAIR) 80-R-14 has a specification direction for AFFF.
Refractory testing to check the viscosity of foam was not conducted as part of normal procedure. It was conducted once in 1999 on the taxiway at the airfield drains.
Operational testing at the NASWI waste treatment plant may have been done but not when Mr. Merrill was on duty. It was proposed to NAVFAC Northwest Environmental, but to either Fire Chief’s knowledge, it wasn’t actually performed.
JP-8 jet fuel was burned at the NASWI fire school (500 gallon-per-minute [gpm] nozzles). The agent selector knob on the fire truck was operated as right applied more water, left applied more foam; one to two times per year someone would pull it too far left and release foam into the pit, which required reservicing of the truck. Overfoaming created water/foam separator issues from too much foam in the pit (at current fire training school). This has been at the same location during Mr. Waeschle’s time. He suggests looking at that pit as there may be JP-8 issues there in addition to foam-related issues. Eventually the JP-8 tanks were replaced with propane tanks.
In Mr. Waeschle’s career, he has never directed the use of foam due to any event at NASWI or elsewhere. During 2006-2007, foam was used on an F-18 crash (note, Mr. Waeschle and Mr. Merrill were not Fire Chiefs during this time). Mr. Waeschle stated that the biggest instance of foam deployment that he has observed, is due to training and accidental releases. Most training and actual firefighting is done using water, due to the low flash point of JP-8. Firefighters are trained to know that foam is only to be used in actual emergencies.

Currently, all foam is stored at NASWI Building 2687 (at Ault Field).
Firefighters would train for crashes, but rarely would use foam. On structure fires, it was generally not used, and the higher likelihood of use was on car fires.
Mr. Waeschle has previously provided an inventory of all foam to NAVFAC Northwest Environmental. Currently, he has two trucks that have foam that failed third-party refractory testing (adopted in 2008). He is unsure of the chemical composition of the foam in each truck, his primary concern is viscosity.
At NASWI, trucks have also been washed at the P3 washrack. Foam was rinsed into the grass when the trucks were being washed there.
At OLF Coupeville, from an operational perspective, there was no reason for trucks to deploy foam at Building 2807. In 2009, there was an agreement with AirOps where the NASWI Fire Department was to provide OLF Coupeville personal protective equipment and apparatus (fire trucks), but AirOps would provide staffing.
During 2004-2005, the Navy responded to a smoking dump truck at the waste transfer facility approximately ½ mile away from OLF Coupeville. (The transfer facility was owned by OLF Coupeville.) Foam may or may not have been used at that event.
For major fuel spills, foam was not deployed because JP-8 generally doesn't burn due to the weather conditions here. The preferred spill response method was to dike, divert, and dam. Mr. Waeschle recommends looking at the Area 16 drainage system available on NIRIS.
Other than at hangars, no known large-scale AFFF was deployed by the Fire Department during Mr. Waeschle's time.
At Seaplane Base, foam loading occurred at Building 19 and at the washrack. Truck washing also occurred at the washrack (recalling that foam during reservicing or leaking tank trucks would have AFFF residue on the outer portion of the truck). Additionally, Building 12 behind the fire station may have had foam used.
At OLF Coupeville, truck washing occurs just outside the fire station.
Mr. Waeschle has no knowledge of high-expansion foam being used at NASWI.
Mr. Waeschle also suggested speaking to the assistant fire chiefs for more information.[3]

[3] Contact information was obtained for Scott Style (assistant fire chief in 2007). Attempts made to contact Mr. Style were unsuccessful (he was out of the country at the time).

Communication Record[1]	
Date: 11-02-2017	Time: 1430
Name of Base, State: Naval Air Station Whidbey Island (NASWI)	
Interviewer: Janice Horton, Eric Cutler	
Organization: CH2M HILL	Phone: (360) 556-0621
Position/role on this project: Task Manager	Email: Janice.Horton@CH2M.com
Interviewee: John Brooks	
Organization: Retired Navy and Former Lab Research Manager in charge of AFFF specification, verification, and fire research/testing.	Phone: (360) 941-2358
Position/Job Title: N/A	Email: JBrooks@PYROGEN.COM
How long in this position? N/A	
How long in current and previous positions? Stationed at NASWI late 1960s to late 1970s.	
Have you held similar positions at other Bases? Yes	
Which Base? NASWI and Former Naval Air Facility Adak during active duty	
How long? N/A	
General Discussion Notes and Information: Charles (Charlie) Escola, NAVFAC NW Naval Technical Representative (NTR) was also in attendance during the interview.	
Mr. Brooks stated that perfluorooctane sulfonate (PFOS) was first invented in 1968 and its manufacture was discontinued around 2000 (including as a component in aqueous film forming foam [AFFF]). In the spring of 2000, 3M (the only PFOS manufacturer at the time) ceased production of PFOS-based AFFF due to a toxicity issue. Up until 2001, AFFF was said to only have 5-year shelf life. In 2002, perfluorooctanoic acid (PFOA)-based AFFF was produced and all PFOS production had ended.	
Mr. Brooks stated that from the late 1960s, when he was stationed at NASWI, during fire training activities at Area 31, only the last half of Friday was designated for foam usage during training. The first day of fire training was in-class and the second through fourth days were live fire training at Area 31 where only water was used to extinguish the 500 gallons of JP-5 jet fuel lit on fire on the 50-foot by 50-foot concrete burn pad. There was approximately ¼ inch of water on top of the jet fuel-covered concrete when only water was used. On the last day of training, typically the fifth day, AFFF would be sprayed to put out the fire.	

[1] This interview record contains information relevant to Ault Field, Seaplane Base, and OLF Coupeville. Information not directly relevant to Ault Field has been shaded in gray.

AFFF was only used on the last day because AFFF coated the burn pad and would prevent fires from being able to be started for subsequent training days. When water was used to extinguish the fire, it took several minutes to put the fire out. When the AFFF was used, it took about 30 seconds to extinguish the fire. Mr. Brooks recalled the Area 31 burn pad drained to a tank and there may have been some minor spillage from the pad to ground surfaces. After the Area 31 fire training area was shut down, fire training activities were moved to the state facility in Enumclaw where training occurred for a couple of years before being moved back to the current fire training area. Mr. Brooks recalled the current fire training area used propane and water to start and extinguish fires. He is not aware of any AFFF used at the current fire training area during his time stationed at NASWI.
Mr. Brooks recalled that municipalities likely did not use AFFF foam until the mid-1970s due to the price. He stated that AFFF also would likely not be used on non-petroleum based fires (Class A fires) such as building fires and wildfires because it is not as effective as water.
Mr. Brooks recalled an agricultural lease program up until 8 to 10 years ago, specifically at OLF Coupeville, and a local farmer cutting hay from the fields within the OLF property boundary. Mr. Brooks recalled that during his research days he was aware of the use of PFOS as a surfactant in agricultural use (herbicides, insecticides, etc.). He also stated the Naval Research Laboratory (NRL) did a worldwide inventory of AFFF in the 2000 to 2001 timeframe and quarterly, and annual reports of that data may be available.
Mr. Brooks stated that PFOA releases likely occurred from refueling activities at the former fire station and parking area near Area 31.
Mr. Brooks recalled a golf course crash in approximately 1972, and an A-6 runway crash in the late 1980s. Mr. Brooks stated Chief Hadder was Ault Field Fire Chief in 1979 while Mr. Brooks was stationed in Adak, Alaska, and may have more information on crashes.
At OLF Coupeville, Mr. Brooks recalled a crash west of the OLF Coupeville flight lines in 1982 and suspects AFFF was used.

Communication Record[1]	
Date: 11-08-2017	Time: 1200
Name of Base, State: Naval Air Station Whidbey Island (NASWI)	
Interviewer: Janice Horton, Eric Cutler	
Organization: CH2M HILL	Phone: (360) 556-0621
Position/role on this project: Task Manager	Email: Janice.Horton@CH2M.com
Interviewee: John Hornsby	
Organization: Retired	Phone: (360) 675-6139
Position/Job Title: Former Crash Captain (1985 to 2001)	Email: jnahornsby@comcast.net
How long in this position? Retired in 2001	
How long in current and previous positions?	
Have you held similar positions at other Bases?	
Which Base?	
How long?	
General Discussion Notes and Information: Also in attendance Charles (Charlie) Escola, NAVFAC NW Naval Technical Representative (NTR).	
Mr. Hornsby volunteers at the Oak Harbor Fire Department.	
Mr. Hornsby came to NASWI in 1977 from Kingsville, Texas. He was promoted to Crash Captain in 1985 and remained in that position until retiring in 2001. The role of the Crash Captain was to take control of all flight operations when a pilot called in for an incident (crash landing). Mr. Hornsby would station three crash trucks along the length of the runway, one at the approach, one at the roll out, and one mid-field.	
Mr. Hornsby recalled that the P3A crash occurred farther north at Runway 13-31 than what was presented on the figure (location #15 on **Figure 1**).	
Mr. Hornsby stated the Fire Department logbooks could be a source for crash information, which may include Aircraft Incident Reports. Mr. Hornsby said Allen Sprouse[2], the Fire Inspector at the Fire Station, has access to the logbooks. Those records could be available from Aviation Safety or AirOps, and may include the volume of aqueous film forming foam (AFFF) used when the crashes occurred.	

[1] This interview record contains information relevant to Ault Field, Seaplane Base, and OLF Coupeville. Information not directly relevant to Ault Field has been shaded in gray.

[2] Attempts to identify contact information for Allen Sprouse were unsuccessful.

Mr. Hornsby recalled an EA-6B crash to the east part of runway 07-25 in the mid-1990s. A gear stuck and caused a wheel fire. The crash truck used AFFF to put out the fire. Mr. Hornsby stated this was the only incident he could recall where AFFF was used. *Note: Mr. Hornsby circled the approximate location of this incident on the map and the location will be included on applicable figures.*
Mr. Hornsby recalled an A6 crash occurring sometime after 1990. The crash was caused by a pin being put in backward in the tail section. This crash occurred at the east end of the 07-25 runway.
Mr. Hornsby stated the Fire Chief would fill out the reports for crashes. Joe Hader[3] was the Fire Chief from the mid-1970s until his retirement prior to Mr. Hornsby's retirement. Mr. Hornsby does not recall Fire Chief Kurt Waeschle.
Mr. Hornsby recalled a fire set by an employee in the Chapel Building, but to his knowledge AFFF was not used to extinguish the fire.
Mr. Hornsby stated that pre-foaming of the runway was performed with protein foam, but this procedure ceased in the mid-1990s because it was determined to be ineffective. Pilots declined foaming the runways, so to Mr. Hornsby's knowledge no AFFF was used to pre-foam the runways.
Mr. Hornsby stated that in Hangar 7, protein foam in the system was replaced by AFFF. The only known use of AFFF during his time was when the sprinkler system was accepted and the AFFF was deluged.
Mr. Hornsby recalled that the hangar fire suppression systems were tested when they were newly installed or when work was performed on them, including AFFF systems. Drip pans were positioned under discharge sprinklers to capture discharged AFFF, and the percentage of foam was measured.
Mr. Hornsby stated that any planes with AFFF, crash parts, and other potentially contaminated materials were taken to the wash rack between Hangars 7 and 9. The wash rack was installed in the mid-1980s. Mr. Hornsby recalled that the wash rack was installed prior to the eruption of Mt. St. Helens. He recalled the timeline because newly purchased trucks were traveling to Ault Field from eastern Washington and were covered in ash, so when they arrived at Ault Field they went through the wash rack. At the wash rack there is an oil-water separator and "once the valve was thrown to get AFFF out of the o/w separator, the pump needed to be cleaned out as well." Mr. Hornsby said the cleaning records could be obtained from the Base Operating Support Contract (BOSC).
Mr. Hornsby recalled there was/is a stormwater weir at the eastern extent of the runway drainage ditches.
Mr. Hornsby stated that it is common practice to put out hay fires with AFFF foam since the foam is effective at penetrating hay bales, but to his knowledge nothing like this occurred at Ault Field.

[3] Attempts to contact Joe Hader were unsuccessful. The information gathered suggested that Mr. Hader was deceased at the time of the Preliminary Assessment information search.

Mr. Hornsby stated that at the hardstand area near Area 31, the trucks did not leak foam "frequently." He did recall that in the 1970s 5-gallon buckets of AFFF were kept on top of the MB-5 crash trucks because those trucks did not have an AFFF tank. Mr. Hornsby stated OLF Coupeville had one or two of those trucks during his timeframe.
Mr. Hornsby recalled that during his time as Crash Captain, his crew performed 32 in a 9-hour period, which is the record for arrestments. When each arrestment was made, the cable would have to be respooled around the drums by hand. The new arrestment system uses hydraulics to brake and control the planes.
Mr. Hornsby recalled at Seaplane Base there was a fuel transfer tank overflow. He does not recall whether a fire occurred, nor the timeframe for that tank overflow.
Mr. Hornsby stated that Oak Harbor Fire Department (Dist. 2) has used AFFF. Contact names provided are: Mike Bugston (Battalion Chief), Ray Merrill, and Craig Anderson (Training Officer).[4]

[4] The named Oak Harbor Fire Department personnel were not contacted, as this was outside of the scope of this Preliminary Assessment.

Figure 1
Ault Field

Communication Record[1]	
Date: 11-02-2017	Time: 1300
Name of Base, State: Naval Air Station Whidbey Island (NASWI)	
Interviewer: Janice Horton, Eric Cutler	
Organization: CH2M HILL	Phone: (360) 556-0621
Position/role on this project: Task Manager	Email: Janice.Horton@CH2M.com
Interviewees: Blaine Hardy (Public Works, Environmental, Hazardous Waste Manager), Allison Crain (NAVFAC NW), Officer Allen Willey (Public Works Officer), Lloyd Potter (FEAD, Lead Engineering Tech)	
Organization: NAVFAC, Public Works	Phone:
Position/Job Title:	Email:
How long in this position?	
How long in current and previous positions?	
Have you held similar positions at other Bases?	
Which Base?	
How long?	
General Discussion Notes and Information: The format of the interview was an open discussion on what the group recalls from storage/use/disposal of AFFF. Charles (Charlie) Escola, NAVFAC NW Naval Technical Representative was also in attendance during the interview.	
Mrs. Crain was Environmental Manager/Hazardous Waste Manager from 2011 to 2015, preceding Mr. Hardy. Mr. Potter was stationed at NASWI from 1984 to 1987, and has been at NASWI since 1993.	
Mr. Hardy stated the transition to AFFF from protein foam was not instantaneous. After 1970, protein foam was used up before AFFF was put into circulation. The date when protein foam ceased being used is unknown.	
Mr. Potter stated the crash response to the 1986 EA-6B crash was large and AFFF was likely used.	
Hangar 7 AFFF Release – AFFF was released during an accidental triggering of the Hangar 7 fire suppression system in Sept 2016. The AFFF/water was captured in the Hangar 7	

[1] This interview record contains information relevant to Ault Field, Seaplane Base, and OLF Coupeville. Information not directly relevant to Ault Field has been shaded in gray.

containment (concrete) tank. The AFFF/water was transferred to Building 420 via pump truck, as approved by Officer Willey. The transfer trucks were triple-rinsed, with all AFFF/water and rinsate going into the concrete tank at Building 420. Within a couple of days of the Hangar 7 tank being emptied, it was observed to be full of water again. Upon further investigation, it was determined the tank was cracked and had filled back up with water surcharged around the tank. The tank was sealed within the last 3 to 6 months, and presently there is approximately 3 to 6 inches of water in the tank. The tank is configured with a 10-inch-diameter inlet on the wall, and is buried approximately 4 to 5 feet below ground surface. Mr. Potter recalled that during construction, coffer dams were built around the tank to keep water out of the excavation because the groundwater in the area was so shallow. The AFFF/water mixture is still in the concrete tanks, and will be stored there until a granular activated carbon (GAC) filtration system is funded. The resultant carbon from the GAC filters is to be incinerated as per a 2016 Navy mandate.
Mrs. Crain stated that as of 2016 a Navy mandate requires all AFFF materials to undergo either incineration or solidification. She can provide a copy of that policy.
Mrs. Crain stated that, in general, most stormwater drains lead to the oil/water separator north of the hangars, then to the Strait of Juan de Fuca. Officer Willey stated the storm utility GIS data is currently being updated as it does not accurately reflect what ground truthing shows. Mr. Hardy stated that there have been no known direct discharges of storm to sanitary sewer or vice-versa and it is believed that none of the stormwater drains that could have contained AFFF are connected to the sewer system, since AFFF causes issues with the sanitary sewer treatment. Dye tests are tentatively planned for stormwater lines from and in the vicinity of the hangars.
Mr. Hardy stated AFFF previously had been disposed of by spray disposal or it was sent to the sanitary sewer. Mr. Hardy said he could provide emails from the former Program Manager with requests to dispose of AFFF by spraying on the wastewater treatment plant (WWTP) lagoons. Sending the AFFF through the sewer system was corrosive to piping. Spray disposal from the fire trucks was metered. It was stated by the interviewees that in the last 10 years, small amounts of AFFF have been sent to the current WWTP as a means of viable disposal.
Mr. Hardy stated that AFFF was sprayed on the former WWTP lagoons directly south of the current WWTP during the 2005-2009 timeframe. The lagoons were closed 12 to 14 years ago. Olivia Sumaway (Environmental) conducted the sampling of those lagoons.
The interviewees have no knowledge of any official record of AFFF discharges in the hangars other than the confirmed discharge at Hangar 7 within the last year.
Mr. Potter stated that sometime between 1984 and 1987, there was a house fire south of the old security buildings where AFFF could potentially have been sprayed.
Mrs. Crain confirmed chrome plating was performed at Building 2547. The closure date of the chrome plating building is unknown.
Mr. Hardy stated there is a component of per- and polyfluroalkyl substances (PFAS) in Glycol. The 2016 Superfund Amendments and Reauthorization Act (SARA) report includes the Glycol quantity stored at the site.

Mr. Hardy stated that Building 2713 (now Building 2757) is used for waste handling; however, there have been no documented releases of AFFF. Mrs. Crain stated if there were any releases due to spills, a Maximo work request could be obtained from the Base Operating Support Contract (BOSC). The BOSC should have spill reports dating back to the 1980s. Environmental records of spills may not be available prior to Mrs. Crain's time.
Mr. Hardy stated that every 45 to 90 days, another container of AFFF is found from various locations across the Base. In May 2017, AFFF drums were found in storage at Hangar 14.
Officer Willey stated all hangar fire suppression systems are tested annually as part of the Preventative Maintenance (PM) Program and that these PMs would be included on the Maximo list. In general, testing goes to collection drains. Some collection drains go to stormwater. Officer Willey stated a big culprit could be hangars and storm drain outfalls from hangars.
Mr. Hardy stated he did not recall any biosolids being taken to the golf course. To his knowledge, biosolids are now composted and disposed of at Area 6 (adjacent to the wood chipper), and are often given away for construction, campgrounds, or beautification projects on-Base, or are land-applied at Area 6 and at Seaplane Base east of the munitions storage areas. This occurred in 2015 and 2017.
Mrs. Crain stated that information on hotpits could be obtained from Karen Campbell (NAVFAC SE). Karen was the CERCLA Tank Manager. Mr. Potter stated there were aboveground storage tanks at the temporary hotpits, which were refueling locations in service for a couple of years. The interviewees stated there are no known spills or application of AFFF at the temporary hotpits.
Mr. Potter stated that at one time Ault Field held land leases with farmers.
Seaplane Base had primarily industrial operations. There were four fuel farms on Seaplane Base, all of which were shut down during the 1990s. Mr. Potter was part of the shutdown project. Wells were installed with analytical testing done on the wells and tanks. the tanks were decommissioned as part of the shutdown project.
Potential interviewees for additional information:
Karen Campbell[2] (NAVFAC SE) (317) 491-2929
Rolando Ferris[3] (Environmental, Fleet Readiness Center (FRC) contact for information on the chrome plating facility) (360) 257-8646
Rick Dutton[4] (Supply Manager at Fleet Logistics Center [FLC]) Richard.dutton@navy.mil for information on AFFF managed as waste at Building 2757

[2] Karen Campbell was contacted as part of the Preliminary Assessments at NASWI. She stated that she did not have any records relevant to this investigation.

[3] Attempts made to contact Rolando Ferris were unsuccessful.

[4] Rick Dutton was not contacted as part of the Preliminary Assessments at NASWI as the information he may have provided was obtained from Navy environmental personnel.

Dave Krause[5] (Public Works, retired), Allison may have his contact information
Bobbi Holly[6] (for issues at Fuel Farms) (360) 672-1204 Don Hill[7] (for issues at Fuel Farms) currently works in Mr. Potter's department

[5] Contact information was not obtained for Rick Dutton and no attempts were made to contact him. Multiple other staff from Public Works were interviewed.

[6] Bobbi Holly was not contacted as part of the Preliminary Assessments at NASWI as it was determined that only water was used for fire suppression at the fuel farms.

[7] Don Hill was not contacted as part of the Preliminary Assessments at NASWI as it was determined that only water was used for fire suppression at the fuel farms.

Communication Record[1]	
Date: 11-08-2017	Time: 1000
Name of Base, State: Naval Air Station Whidbey Island (NASWI)	
Interviewer: Janice Horton, Eric Cutler	
Organization: CH2M HILL	Phone: (360) 556-0621
Position/role on this project: Task Manager	Email: Janice.Horton@CH2M.com
Interviewee: Tom Prince	
Organization: Navy Fire and Emergency Services	Phone: (360) 257-2532
Position/Job Title: Advanced Emergency Medical Technician (AEMT)/Firefighter	Email: thomas.prince@navy.mil
How long in this position? Since December 1997	
How long in current and previous positions? N/A	
Have you held similar positions at other Bases? N/A	
Which Base? N/A	
How long? N/A	
General Discussion Notes and Information: Charles (Charlie) Escola, NAVFAC NW Navy Technical Representative (NTR) was also present during the interview.	
When Mr. Prince was stationed at the hardstand area, which was the crash truck parking location during refueling at the hotpits. He did not see any AFFF leaking from the crash truck tanks; however, he stated it was possible leaks could have occurred. The trucks stationed at the hardstand were there for 8 hours in rotation as the hardstand was manned all day during refueling.	
Mr. Prince confirmed the locations of the two hotpits, but during his time as a firefighter, he said that, to his knowledge, no foam was used at either location.	
Mr. Prince provided a photo of an F-18 plane crash and the approximate location (**Figures 1 and 2**) at the north end of Runway 13-31 at approximately the 2,000-foot marker on 30 April 2006. Mr. Prince was the firefighter who responded, and applied AFFF to three portions of the F-18, over the nose of the F-18, the tail, and on a burning fuel hose. He recalled that each of the three applications of AFFF lasted approximately 3 to 5 seconds. The quantity of AFFF used to put out the fire was unknown, but Mr. Prince recalls that 80 to 90 percent of the water was left in the truck tank. Mr. Prince stated that runoff of AFFF was controlled with	

[1] This interview record contains information relevant to Ault Field, Seaplane Base, and OLF Coupeville. Information not directly relevant to Ault Field has been shaded in gray.

dikes and spill containment and runoff of AFFF into ditches was unlikely. He stated the cleanup was performed by NAVFAC Environmental.
Mr. Prince stated fires on the runway ramp are put out using halon extinguishers, not AFFF. Wheel-unit halon extinguishers are typically spaced out on runway aprons at designed intervals and would be used prior to the fire truck arrival. Therefore, the fires would have already been extinguished so no AFFF would be used.
Mr. Prince stated that foam is not intentionally used at the current Fire Training Area (FTA), but every once in a while, someone may accidentally release foam. If this occurs, the foam shutoff would be immediate. The foam would have to overflow the containment tank in order to escape the closed loop system. The water used to fight training fires at the current FTA comes from the containment tank onsite, and is not used offsite because of the JP-5 jet fuel and propane in the water. The system is an enclosed loop and closed pit system.
Mr. Prince is only aware of the current FTA, which has been in use since 1997 when Mr. Prince began.
Mr. Prince stated protein foam is used at Hangar 7 and suggested obtaining the BOSC Preventative Maintenance (PM) records for the changeover date. **Note: the 2016 Hangar 7 discharge has been documented as an AFFF release.*
Mr. Prince stated AFFF is stored in 55-gallon drums at the current fire station at Ault Field. A pump is used to transfer the AFFF from the drums into the truck. Any spills, even small amounts of AFFF, would be noticed immediately because AFFF leaves a sticky white residue on anything it touches, which is difficult to clean off and eats away at the material it touches.
Mr. Prince stated truck leaks could have occurred if personnel were not careful during reservicing at the former fire station, although leaks were unlikely due to the filling box being of sufficient size to accommodate the entire contents of the 5-gallon bucket without spillage. Again, he stated that personnel pouring AFFF into the filling box would be immediately aware of any spills, and that the difficulty of cleaning up AFFF would likely ensure personnel being careful during truck reservicing.
Mr. Prince stated that presently there is AFFF stored in the caged area at the current Fire Station at Ault Field.
Mr. Prince verified that the current Ault Field Fire Station (Building 2897) is built on the same footprint as the former Fire Station. The demolition and new construction of the Fire Station took 2 to 3 years to complete, and a portion of the former Fire Station concrete slab still exists at the new Fire Station.
Mr. Prince stated that all fire training activities for Ault Field, Seaplane Base, and OLF Coupeville have occurred at Ault Field at either the Runway Fire School (Area 31), or the current FTA.
Mr. Prince confirmed that the Fire Station and adjacent maintenance facility at Seaplane Base have been in the same locations since World War II. Mr. Prince circled the location of both (**Figure 3**).
Mr. Prince stated the only AFFF stored at Seaplane Base is in the fire trucks.

Mr. Prince stated that at OLF Coupeville, the FP Tank 11 (aboveground water tank on top of a well head building) was used to refill the fire trucks with water faster. The process of filling the truck with water this way should not have created any spillage of AFFF because the water filling box on top of the truck is separate from the AFFF filling box. The water and AFFF are in separate tanks on the truck and the water/AFFF mixing does not occur in the tanks, but at a valve on the truck only during foam spraying.
Mr. Prince verified the house fire (previously discussed by Mr. Potter during the interview on November 2, 2017) occurred at a residence in the southern part of Ault Field. Mr. Prince verified the fire was put out with water only and recalled it was Ladder 71 that responded. Mr. Prince also stated that typically all house fire training exercises are done with water, and during an actual housefire, firefighters would naturally react as they would from the training, which is to just use water.
Mr. Prince said AFFF was not used on car fires during his time at Ault Field.
Mr. Prince suggested accessing the NAVFAC Enterprise Safety Applications Management System (ESAMS) for any firefighting records. ESAMS records should show National Fire Incident Reporting System entries. Mr. Escola stated he can request those records for CH2M as he has access to ESAMS.[2]

Figure 1
Ault Field

[2] This information was requested several times during this Preliminary Assessment, but was not obtained.

Figure 2
Ault Field

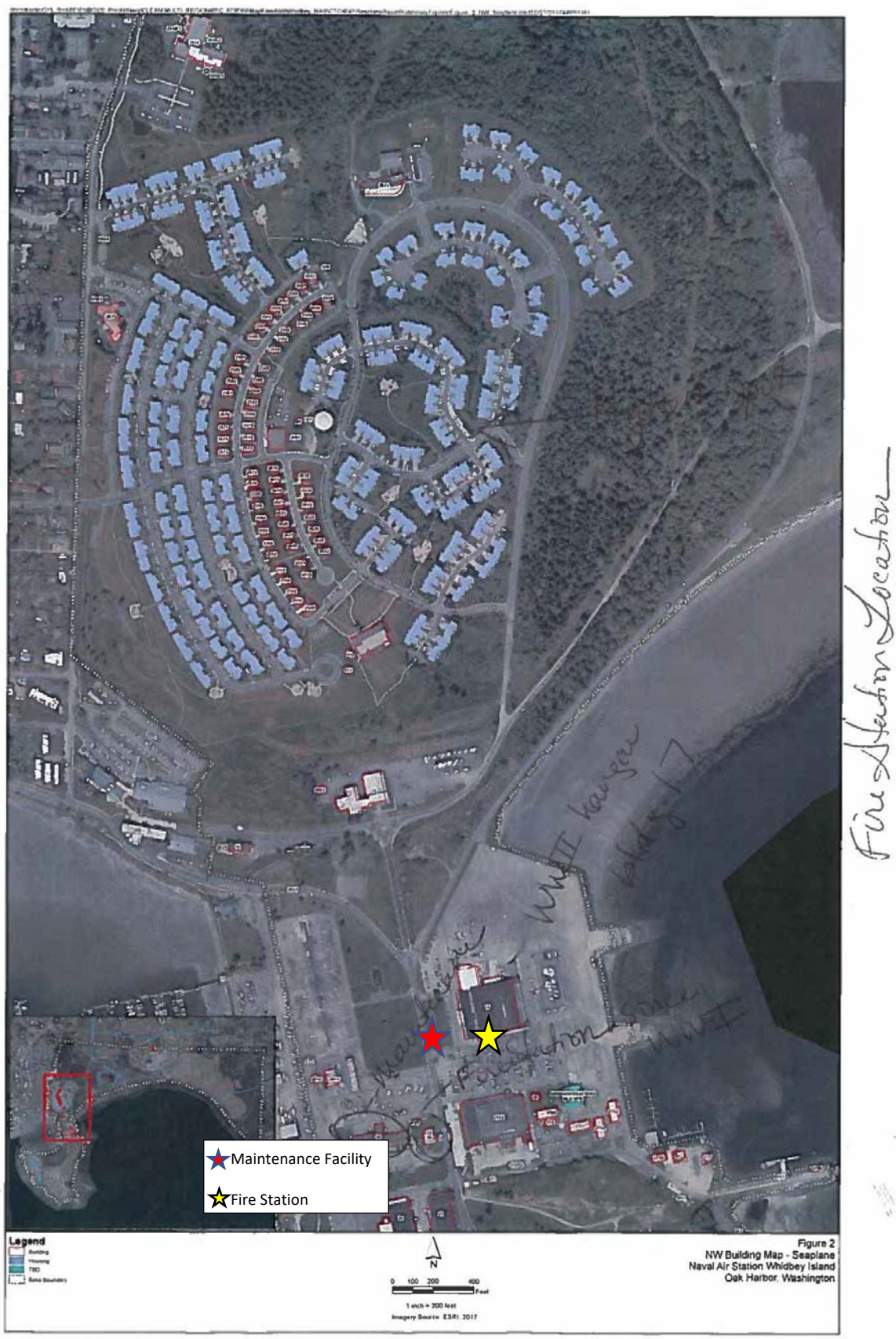

Figure 3
Seaplane Base

Communication Record	
Date: 12-19-17	Time: 0848
Name of Base, State: Naval Air Station Whidbey Island (NASWI)	
Interviewer: Eric Cutler	
Organization: CH2M Hill	Phone: (650) 823-4947
Position/role on this project: Lead Author	Email: Eric.Cutler@CH2M.com
Interviewee: Tim Bright	
Organization: NAVFAC NW	Phone: (360) 257-8833
Position/Job Title: Engineering Technician	Email: N/A
How long in this position? N/A	
How long in current and previous positions? N/A	
Have you held similar positions at other Bases? N/A	
Which Base? NASWI	
How long? N/A	
General Discussion Notes and Information: Interview was conducted via telephone. Eric Cutler and Tim Bright were the only two individuals who participated in the conversation.	
Mr. Bright stated that 730-750 gallons of 3 percent AFFF concentrate by volume was released at Hangar 7 sometime in September of 2016. The AFFF and water mixture was washed into hangar floor trench drains, which are connected to a concrete underground containment tank. The initial discharge and clean up resulted in approximately 35,000 gallons of AFFF and water to the underground containment tank which was transported to Building 420 via pump truck shortly after the event. One week later the containment tank was observed to be full again resulting from groundwater recharge. A sample of the water was sampled for AFFF and the water was contained AFFF. Following the detection, an additional 30,000 gallons of AFFF and water was transferred to Building 420.	
Mr. Bright stated that during this time frame, water was observed flowing out of an outfall east of Taxiway A and E (referred to in the PA as Stormwater Outfall 2). After the second pumping event, it was discovered that the vault was connected to overflow piping leading to this outfall location. Additionally, a crack at the base of the vault (where the walls joint the floor) was observed. Both the overflow inlet and crack were sealed after second pumping event.	

Mr. Bright stated that the containment tank was only full for approximately 1-2 weeks following the discharge event.
Mr. Bright stated that during the 2014 to 2015 timeframe, approximately 3 gallons of AFFF was released at Hangar 11 when a contractor accidentally cut a conduit connected to the fire system. One of the AFFF fire suppression system nozzles was activated for approximate 2 to 3 minutes before the system was shut off. AFFF was observed entering the floor drains in the hangar, however most of the AFFF was contained with spill prevention equipment. Mr. Bright was no aware of how spill equipment was disposed of.
Other than these two events, Mr. Bright was not aware of any other AFFF discharges in the hangars during his time at Ault Field.

Appendix C
Visual Site Inspection Notes

Field Activity Report	
Date: 11-15-2017	
Name of Base: NAS Whidbey Island (Ault Field, Seaplane Base)	
Field Personnel: Eric Cutler	
Organization: CH2M Hill	Phone: (650) 823-4947
NAVFAC Escort(s): Charlie Escola, Steve Skeehan	
Organization: NAVFAC NW	

Time	General Notes/Photo Log:
1055	-Arrive Ault Field
1100	-Arrive at Ault Field Wastewater Treatment Plant
	 -WTP facilities (Buildings 2886[right] 2614[left]) operated by Skookum Contract Services (Facing northwest)
1105	-Talked briefly with Kyle Piddle (Skookum): • Mr. Piddle stated that biosolids are taken to the Composting Facility at Area 6 and have also been transferred to the golf course for use as fill.

	• Mr. Piddle stated that the water level in the clarifier tanks has receded since the AFFF and water was transferred to Building 420. • Mr. Piddle stated that he has observed corrosion of the concrete on the side of the clarifier tanks. • Suggested we speak with Scott Lenke (Wastewater Operations Manager) at Building 420.
	 -Wastewater treatment pond (facing west)

	 -Treatment pond (facing northwest)
	 -Looking through fence at Former Sewage lagoons, couldn't get on other side of fence since it is too close to flight line (facing southwest). Extent of former ponds is visible through abrupt elevation changes around the edges.
1115	-Drove to Building 420 to take pictures and speak with Scott Lenke

	 -Confirmed this to be one of the two clarifier tanks holding AFFF-contaminated water (approximately 60,000 gallons in this tank-Scott Lenke) (facing east)
	 -Confirmed to be the second clarifier tank holding AFFF-contaminated water (approximately 20,000 gallons-Scott Lenke)
1125	-Spoke with Scott Lenke: • Mr. Lenke estimated 80,000 gallons of AFFF-contaminated water transferred from Hangar 7 in June 2017 timeframe. Transferred via pump truck, supposed to be removed/taken away within next 2 months.

1135	-Steve and Charlie go to repair silt fence at Area 1, while I review notes and answer emails.
1155	-Drive to Building 103 to talk with Lloyd and Blaine Hardy
1200	-Set up date for flight line training with Lloyd (11-27-17), discuss date for hangar ground-truthing (Lloyd will get back to us)
1210	-Talk to Blaine about Glycol inventory and relationship with AFFF. Obtain 2016 SARA report for Glycol. Discussed which inventories of AFFF are used and which are brought to him for disposal.
1225	-Drive to Current Fire Training Area to take pictures.
	 -Current fire training pit and mock aircraft (facing northwest)

-Propane truck connected to mock aircraft (propane used since 2007)(facing east)

-Control tower for fire training area (facing southeast)

-Water storage tanks (all water used onsite is stored and recycled) (facing southeast)

-Aboveground oil/water separator (facing southeast)

	 -Detention pond – water was stored here prior to entering oil/water separator (facing east)
1235	-Drive to Area 3 and walk around
	

	 -Area 3 (facing the southwest)
1300	-Depart with Charlie and Steve and head to Badge and ID office to pick up DBIDS pass
1430	-Receive DBIDS pass