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HISTORICAL RECORDS REVIEW FOR USE, STORAGE, SPILLS, AND DISCHARGES OF PFAS-CONTAINING MATERIALS

North Boeing Field/Georgetown Steam Plant
Seattle, Washington

February 6, 2025

Prepared for

The Boeing Company

The City of Seattle

King County

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Historical Records Review for Use, Storage, Spills, and Discharges of PFAS-Containing Materials North Boeing Field/Georgetown Steam Plant Remedial Investigation Seattle, Washington

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LIST OF ABBREVIATIONS AND ACRONYMS

AFFF	aqueous film-forming foam
AO	Agreed Order No. DE 5685
Boeing	The Boeing Company
City	City of Seattle
County	King County
Ecology	Washington State Department of Ecology
ft	feet, foot
GTSP	Georgetown Steam Plant
IWWTP	industrial wastewater treatment plant
KCDNR	King County Department of Natural Resources
KCIA	King County International Airport
LDW	Lower Duwamish Waterway
LTST	long-term stormwater treatment
MTCA	Model Toxics Control Act
NBF	North Boeing Field
PEL	Propulsion Engineering Lab
PFAS	per- and polyfluoroalkyl substances
PLP	potentially liable party
RI	remedial investigation
Site	NBF/GTSP site
SWPPP	stormwater pollution prevention plan

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1.0 INTRODUCTION

The Boeing Company (Boeing), King County (the County), and the City of Seattle (City) are potentially liable parties (PLPs) conducting a remedial investigation (RI) under Agreed Order No. DE 5685 (AO) with the Washington State Department of Ecology (Ecology) for the North Boeing Field/Georgetown Steam Plant (NBF/GTSP) site (Site; Ecology 2008). This report responds to Ecology's September 15, 2022 letter re: Direction to Investigate Sources, Nature, and Extent of Per- and Polyfluoroalkyl Substances (PFAS) at the Site (2022 PFAS Letter; Ecology 2022). In the letter, Ecology recognized that the PLPs are currently working on an updated version of the RI report for the Site. In recognition of that, Ecology noted that the PFAS investigation may be conducted concurrently with the development of the RI report with the expectation that the results of the PFAS investigation will be submitted as an addendum to the RI Report. The PLPs submitted the Draft RI Report to Ecology in September 2023 (Landau 2023) and received comments on the Draft RI Report in April 2024 (Ecology 2024a). The PLPs are currently coordinating with Ecology to address the April 2024 comments on the Draft RI Report.

Since 2021, Ecology has defined PFAS as listed hazardous substances regulated under the Model Toxics Control Act (MTCA; Ecology 2021). The group of chemical compounds that comprises PFAS includes thousands of unique synthetic organic chemicals that are extremely stable and persistent in the environment (Ecology 2023). In general, PFAS are compounds characterized as having carbon atoms linked to each other and bonded to fluorine atoms at most or all of the available carbon bonding sites (ITRC 2023). Since the 1940s, PFAS have been widely used in the manufacturing of everyday consumer products. These products include carpeting, clothing, furniture, outdoor equipment, and food packaging. Additionally, PFAS also have applications in many industries, including aerospace, semiconductor, medical, automotive, construction, electronics, and aviation (ITRC 2023). PFAS are included in aqueous film-forming foam (AFFF), which is used for fire training and extinguishing petroleum fires and other flammable liquids (Ecology 2023).[1] AFFF is specifically intended for use on Class B hydrocarbon fuel and solvent fires (high heat fires) at airports and firefighting training facilities, along with other industrial locations. Hangars and fuel storage areas at airports also may be equipped with AFFF fire suppression systems.

As requested by Ecology (Ecology 2022),[2] this report provides (1) a summary of areas where PFAS-containing materials have previously been or are currently stored and/or used at the Site and (2) a summary of documented spills and discharges at the Site. The 2022 PFAS Letter also requested phased investigation to characterize the nature and extent of PFAS in potentially impacted Site media. A separate PFAS Investigation Work Plan will be submitted following Ecology's review of this report.

[1] Under Washington State law (Chapter 70A.400 Revised Code of Washington), AFFF can no longer be manufactured, sold, or used for fire training, although it can still be used for emergencies and actual fire situations when mandated by federal law.

[2] Ecology requested that the Former Fire Training Center, located on KCIA property, in an area upgradient of the GTSP, be included in the NBF/GTSP PFAS investigation. On January 18, 2024, the PLPs invoked dispute resolution under Section VIII.G of the AO. In accordance with the dispute resolution letter from Ecology dated March 14, 2024, "*the presence or absence of PFAS at the Former Fire Training Center will be investigated by the County as an independent investigation (KCIA investigation) not under the AO"* (Ecology 2024b). King County International Airport (KCIA) has agreed to provide Ecology with the opportunity to provide input to the County on the objectives and scope of the KCIA PFAS investigation during development of the KCIA work plan.

In this report, "spills" refer to unintentional events, and "discharges" refer to legally authorized events.

1.1 Objective

The objective of this report is to:

- Describe the PLPs' process for conducting a detailed review of records of historical activities related to PFAS products and usage at the Site.
- Identify areas where PFAS-containing materials have been or are currently stored at the Site.
- Identify areas at the Site where PFAS-containing materials were released via spills or discharges and where the potential for transport to the environment exists.

1.2 Background

1.2.1 Site Setting

The Site includes two properties: (1) the portion of the Boeing-owned or -leased NBF property; and (2) the GTSP property, owned by the City, as shown in Figure 1. Nearby, the County owns property that is not part of the Site, including King County International Airport (KCIA; Figure 1). The Site is bounded by KCIA to the east, by East Marginal Way to the west and southwest, and by a County-owned property formerly leased by the Washington Army National Guard to the north. Land use at and around the Site is primarily industrial, although there are also commercial and residential areas in the vicinity.

The NBF property is currently operated by Boeing. NBF is approximately 113 acres and is generally flat. Nearly all of the area at NBF is covered by buildings, parking lots, or other pavement with minimal landscaped areas located adjacent to some buildings. Land use includes office and industrial buildings, automobile parking, aircraft parking, and related facilities (Figure 1). Boeing has conducted operations at NBF since the 1940s, including the manufacture, maintenance, refurbishing, and delivery of commercial and military aircraft. Primary industrial activities currently conducted at NBF include research and development; painting, functional testing, final airplane delivery checks and associated tasks, and related support activities for Boeing military and commercial aircraft.

The GTSP property is a 2.6-acre parcel at the northeast corner of the Site, located near the intersection of Warsaw Avenue South and Ellis Avenue South (Figure 1). A 19,400-square foot (ft) decommissioned power plant known as the Georgetown Steam Plant (GTSP), built in 1906, is located on the GTSP property. The GTSP property is covered by structures, gravel driveways, and grass. The GTSP property slopes gently to the south. Fuel oil and coal were historically used at the GTSP to fire the boilers. The GTSP's last production run was in the winter of 1964. The GTSP was maintained on standby for emergency situations from 1971 to 1977 (ASME 1980) before the City permanently shut it down in 1977.

Remedial actions have been conducted at the Site over the past several decades, including investigations and cleanups focusing particularly in the NBF Propulsion Engineering Lab (PEL) area and the southern portion of the GTSP property. The primary contaminants of concern that were addressed during previous remedial actions are polychlorinated biphenyls, petroleum hydrocarbons, and chlorinated solvents. Previous remedial actions are described in detail in the 2007 Data Gaps report

(SAIC 2007), the 2009 Supplemental Data Gaps report (SAIC 2009b), and the RI/FS Work Plan (Leidos 2013).

1.2.2 Groundwater

The Site is located in the central Puget Sound Lowland, a broad glacial drift plain that is dissected by a network of deep marine embayments and lakes. The Site is situated within the north-south trending Duwamish Valley on the Duwamish floodplain. The Duwamish River originates approximately 5 miles south of the Site; for the last 5 miles the river is called the Lower Duwamish Waterway or the LDW. The LDW flows northward and drains into Elliott Bay on Puget Sound. Surface water in the NBF/GTSP vicinity drains primarily to the LDW, which is located approximately 1,300 ft southwest of the Site, beyond East Marginal Way South. Groundwater flow directions across the Site are generally toward the southwest. Groundwater in the northern half of the Site generally flows south-southwesterly, toward the LDW; groundwater flow in the southern half of the Site is more variable but generally flows in a west/southwesterly direction.

1.2.3 Stormwater

Stormwater from the NBF portion of the Site is collected and conveyed through a network of stormwater catch basins, manholes, drains, inlets, and pipes to outfall KCIA SD#3 at the head of Slip 4 (Figure 1). Outfall KCIA SD#3 discharges stormwater from the NBF property and the upstream KCIA into Slip 4.

Approximately two-thirds of the stormwater that discharges through outfall KCIA SD#3 to Slip 4 is treated at the Boeing long-term stormwater treatment (LTST) system prior to discharge. The LTST system has been operational since 2012 and consists of a chitosan-enhanced sand filtration system. Boeing operates the LTST system under the National Pollutant Discharge Elimination System industrial stormwater general permit program (Permit No. WAR000226).

Stormwater from the GTSP property and some northern areas of the Site previously discharged to Slip 4 via the former Georgetown Flume. The Georgetown Flume was removed in 2009 and replaced with a storm drain line that now discharges to Slip 4 via a City outfall (Figure 1). In 2011, stormwater bioinfiltration cells were constructed to provide additional infiltration capacity of stormwater on the GTSP property and prevent stormwater from flowing off the GTSP property onto NBF (Seattle City Light 2014). Currently at the GTSP property, stormwater infiltrates into the ground; there are no storm drain structures at GTSP that drain stormwater off property through the City Outfall. Additionally, there are no storm drain connections at NBF that drain to the City Outfall.

1.2.4 Wastewater

Wastewater discharged from NBF is subject to a King County Department of Natural Resources (KCDNR) Industrial Wastewater Discharge Permit (KCDNR Permit). An industrial wastewater treatment plant (IWWTP) that provides pre-treatment prior to discharge to the County sanitary sewer under the KCDNR Permit is located at NBF. The wastewater pretreatment system is located at the south side of Building 3-369 and treats process wash waters, including wash waters from the paint hangars (Buildings 3-380 and

3-369) at NBF (Boeing 2020). The IWWTP may also treat stormwater from the secondary containment for the IWWTP and non-hazardous water from Plant 2. The IWWTP is a batch treatment system and the entire area, including transfer areas, has containment (Boeing 2020).

1.2.5 GTSP South Yard

In the southern portion of the GTSP property, significant excavation was completed as part of an interim remedy (Integral 2012). Prior to remedy implementation, older reports indicated that a low-lying area was present along southern GTSP fence line (Figure 2). The low-lying area formed a broad swale that received runoff from the northern portion of the GTSP property (Leidos 2013). A shallow ditch within the low-lying area drained westward; shallow depressions were reportedly present where infiltration likely occurred (Leidos 2013). No documents were identified that indicated AFFF use in this area.

From 1967 to 1974, Boeing conducted training in an area approximately 50 ft southeast of the GTSP main building under a temporary permit issued by the City (City of Seattle 1967, SAIC 2009b). While some past reports had referenced this area as a "Former Boeing Fire Training Pit" (e.g., SAIC 2007),[3] there is no indication that it was ever a "pit." This area was used for airplane smoke testing to train crews to respond to smoke in aircraft and is more appropriately referred to as the "Former Boeing Smoke Test Area" (SAIC 2009b). Based on review of historical aerial photographs (1969 and 1974), an airplane fuselage was present in this area during the time the temporary permit was in place (Bridgewater Group 2000). Interviews with Boeing Fire Department personnel indicated that the Former Boeing Smoke Test Area was used to train firefighters on how to enter an aircraft that had an interior fire and perform rescue operations; typical smoke-testing activities would have been conducted using artificial smoke under controlled settings, and likely would have not involved large fires. If a fire was used, it would have likely been a Class A (ordinary combustibles) fire and AFFF would not have been used for fire suppression. Boeing did not find any documents stating whether AFFF was used at this location; this area is shown on Figure 2 but is not included in Table 1 as a former/historic AFFF storage or use area.

[3] This area is separate from the Former Fire Training Center, located on KCIA property.

2.0 HISTORICAL REVIEW APPROACH

Historical review activities included a records review, database searches, and personnel interviews as described in greater detail below. The historical review was limited to the Site and did not include adjacent areas, such as KCIA, where PFAS-containing materials may have been used, stored, spilled, or discharged. Records review consisted of: (1) an in-depth search of internal Boeing document repositories; (2) review of additional Boeing Site documents and reports; (3) document and information inquiries with the City and County; and (4) interviews and inquiries with Boeing personnel from various departments. Information gathered during this historical records review was used to prepare the summary of PFAS storage, use, spill, and discharge locations presented in Section 3.0.

2.1 Records Review and Database Searches

Records review initially consisted of an in-depth search of internal Boeing document repositories for documents related to PFAS storage, use, spills, or discharges on the Site, including those related to AFFF. Documents included reports, emails, logs, and other records; a keyword search was performed to identify relevant documents. The document review produced approximately 2,500 documents (ranging in time from 1985 to 2010) that potentially included information relevant to historic PFAS storage, use, spills, or discharges to guide the preparation of this report.

The document repository included thousands of documents; search of the repository identified documents related to fire prevention involving AFFF at NBF from 1985 to 2010. Recognizing that the repository only included documents through 2010, additional sources were searched to identify any remaining information relevant for inclusion in this report (2010 to 2024). The additional document sources listed below were identified and reviewed for information related to PFAS:

- Available documents related to NBF's Industrial Stormwater General Permit through Ecology's Water Quality Permitting and Reporting Information System.
- Boeing's Stormwater Pollution Prevention Plan (SWPPP) documents.
- Previous environmental reports prepared by other consultants.
- Boeing's internal Environmental Health and Safety database, which includes reports on NBF onsite tank inventories and historic spills.

The City and County did not identify any documents or information regarding use, storage, spills, or discharges of PFAS-containing materials at the Site (Crowley 2024, Dumaliang 2024).

2.2 Consultations with Boeing Personnel

Boeing personnel in the following groups were conferred with as part of preparation of this report:

- Boeing Security and Fire Protection
- Boeing Environmental Health and Safety
- Boeing Global Real Estate and Facilities
- Boeing Global Enterprise Sustainability

3.0 STORAGE, USE, SPILL, AND DISCHARGE LOCATIONS

This section presents information on storage, use, spills, and discharges of materials that are known or suspected to contain PFAS, including AFFF.

The majority of the historical information and documentation regarding the storage, use, spills, and discharges of PFAS-containing materials pertains to AFFF. Areas where PFAS-containing materials have been stored, spilled, or discharged are shown on Figure 2. Locations where PFAS-containing materials have been stored are described in Table 1. Historic spills and discharges are summarized in Table 2.

Boeing also did a search for other materials that may have contained PFAS at the Site. Other materials Boeing used that may have contained PFAS identified during document review include hydraulic fluids, coatings, and mechanical seals, specifically the following products: Skydrol, Teflon, Braycote, Fluorinert, Krytox, Novec, Scotchgard, Tyco Thermofit, and Viton. Although these products are known to possibly contain PFAS, the specific chemical formulations and exact product details of these materials were not identified during document review; including whether they contained PFAS. As such, these products are not discussed further in this document. Document review identified that fire prevention activities involving AFFF at the Site have taken place since at least the mid-1980s; AFFF is still present in some areas of the Site today. Locations of AFFF storage, use, spills, and discharges are described below.

3.1 Storage and Use

AFFF is typically stored in a concentrated solution that contains less than 2 percent PFAS compounds (Kempisty et al. 2018). When the AFFF system is activated, the concentrated AFFF solution is mixed with water, with the AFFF typically being between 3 percent and 6 percent of the mixture, and then aerated using a proportioning nozzle before being applied.

Currently, Buildings 3-369/3-374, 3-380, 3-390, and 3-626 (and the adjacent fuel test pad) have fire suppression systems that use AFFF, including tanks that store the AFFF before use.

Historically, former Building 3-321 and Buildings 3-811/3-812 also had fire suppression systems that used AFFF, and AFFF drums were formerly stored at Building 3-315. No other current or historical AFFF storage locations were identified.

3.1.1 Aboveground Storage Tank Inspections

The tank inspections referenced in the following sections typically include visual inspection of each aboveground storage tank, the associated piping, and pumps for leak identification, as well as a check of the leak detector alarm panels, if present. If there is no alarm panel, the secondary containment is checked. Any identified leaks are noted and repaired.

The level of detail provided for each storage and use area varies depending on information that was included in the documents reviewed. In some cases, available information was limited and that is reflected below.

3.1.2 Building 3-369/3-374

Building 3-369 is a paint hangar that was built in 1967 (Leidos 2013). The fire suppression system in Building 3-369 is serviced by two 2,500-gallon tanks of AFFF located in the southern side of the adjacent Building 3-374. The AFFF storage tanks have been in place in Building 3-374 since at least 1997 and are inspected monthly by Boeing Environmental Health and Safety personnel. The types of AFFF in the tanks have included 3M Manufactured AFFF (FC-783F), and Ansulite 3 percent AFFF (AFC3B) Foam Concentrate.[4] Wash water from operations in this building is contained, conveyed, and treated at the IWWTP before discharge to the sanitary sewer.

3.1.3 Building 3-380

Building 3-380, which records show was likely built in late 1990, is a paint hangar with a foam riser system and tank room. The tank room has two 1,600-gallon AFFF tanks and one 1,000-gallon AFFF tank that were installed in 1991. All three tanks contain Chemguard 3 percent AFFF (C301MS). The tanks are inspected monthly by Boeing Environmental Health and Safety personnel.

Four smaller, mobile 50-gallon AFFF tanks are stored in two paint bays in Building 3-380. Additionally, bulk AFFF product transfer takes place at Building 3-380, where AFFF is unloaded from tanker trucks into designated storage tanks on an as needed, infrequent basis.

3.1.4 Building 3-390

Building 3-390, which was built by at least 1955, is an aircraft storage and maintenance hangar with an overhead water-based fire suppression system. Additionally, there are seven 50-gallon fixed wall-mounted AFFF hose reel stations in various locations throughout the hangar. The stations contain 3M Manufactured AFFF (FC-783F). Based on information gathered from Boeing personnel, Building 3-390 floor drains are connected to a vault outside the building, which connects to the storm drain lines. There is a valve to the vault that is closed during normal operations and opens automatically upon fire detection with a signal from the fire alarm panel.

3.1.5 Building 3-626

Building 3-626, which was built in 1980, is in the PEL area and adjacent to the Fuel Test Pad (Figure 2). There are two 3,600-gallon AFFF tanks in Building 3-626. The two AFFF tanks were installed in 1987. The AFFF tanks are inspected monthly by Boeing Environmental Health and Safety personnel. The AFFF tanks in Building 3-626 supply the foam cannons that surround the Fuel Test Pad to provide fire-suppression measures to the area in the event of a fire. The AFFF tanks from Building 3-626 have lines that run to the Fuel Test Pad via below-ground piping in contained utility trenches.

3.1.6 Former AFFF Storage or Systems

The following buildings at the Site previously had AFFF systems that have been removed or decommissioned and are shown on Figure 2:

[4] Specific information on foam replacement dates was not identified.

- Former Building 3-321: This building was located at the current Building 3-335 and was built by at least 1955. It had three 400-gallon tanks of AFFF (type and manufacturer unknown). Building 3-321 was demolished between 1993 and 1998. There was no information on how the tanks were decommissioned in the documents that were reviewed.
- Building 3-315: AFFF was stored in steel drums at Building 3-315 between 1989 and 1997. The specific number of drums was not recorded; however, 1994 and 1997 records indicate 167 to 168 gallons of AFFF were stored in steel drums at Building 3-315. AFFF drums are not currently stored at Building 3-315.
- Buildings 3-811 and 3-812: These buildings were built in 2008 and are fabric hangars located at the southern end of the Site. Each hangar previously had two 850-gallon AFFF tanks that were in installed in 2009 and decommissioned in 2020. The AFFF tanks contained Chemguard AFFF (C301MS). There was no information on how the tanks were decommissioned in the documents that were reviewed.

3.2 Spills

A summary of spills identified during document review is provided in Table 2 and described below; locations of spills are shown on Figure 2. The level of detail provided for each storage and use area varies depending on information that was included in the documents reviewed. In some cases, available information was limited and that is reflected below.

3.2.1 Building 3-812

One spill was identified at Building 3-812:

- November 13, 2017: A spill of an estimated 50 gallons of AFFF occurred due to an equipment malfunction (Boeing 2020). Most of the spill was captured by secondary containment at the 3-812 Fabric Hangar; residuals beyond the secondary containment were captured throughout the storm drain system with final capture at the LTST treatment system (Boeing 2020). Boeing was able to contain and recover all material spilled. No offsite discharge occurred.

3.2.2 Stall B-14

One spill was identified at Stall B-14:

- May 23, 1994: Boeing Fire used AFFF on a 757 airplane at airplane stall B-14 (Boeing 1994g, 2016). As a result of this use, approximately 20–30 gallons of a water and AFFF mixture reached the Site storm drain system.

3.2.3 Building 3-380

Spills were identified at Building 3-380 as follows:

- November 23, 1991: During testing of a sprinkler system, approximately 100 gallons of a water and AFFF mixture reached the Site storm drain system due to an unblocked drainpipe from the building (Boeing 1991a, c, Ecology 1991, SAIC 2009a). Boeing immediately diverted the mixture to the sanitary sewer system by plugging the drainpipe. Samples were collected from two downstream catch basins that indicated that foaming was not occurring (Boeing 1991a).

- April 22, 1992 (estimate): A contractor is suspected to have dumped an unknown amount of AFFF into an electrical chase instead of the sanitary sewer drain. Boeing subsequently pumped the contents of the electrical chase into the sanitary sewer system and cleaned the chase (Boeing 1992).
- March 13, 2001: A mixture of approximately 5,000 gallons of AFFF and 15,000 gallons of water was spilled inside the P6 paint hangar due to a malfunction/accidental activation of the foam suppression system. All of the spilled mixture was contained in the floor trenches and pumped to a storage tank. No offsite discharge occurred (Boeing 2001b).
- April 15, 2001: Approximately 5 gallons of AFFF was spilled during transfer between a Baker tank and Vactor truck. The small spill was immediately contained and cleaned up; no discharge to the sanitary sewer system or storm drain system occurred (Boeing 2001c, 2016).

3.2.4 Former Building 3-321

One spill was identified at Former Building 3-321:

- March 12, 1996: Between 3 gallons and 400 gallons of a water and AFFF mixture spilled after a contractor inadvertently set off the fire suppression system. Boeing subsequently took action to clean storm drain lines, indicating that some of the mixture may have reached the storm drain system (Boeing 1996).

3.2.5 Building 3-335

One spill was identified at Building 3-335:

- June 11, 2004: Approximately 300 gallons of water mixed with less than 3 gallons of AFFF spilled at the Site during annual testing of the fire suppression system at the fuel test pad adjacent to Building 3-335. The spill occurred due to operator error (Boeing 2003, 2004a, Ecology 2005, 2006). An unknown amount reached the Site storm drain system and discharged to the Slip 4 outfall.

3.2.6 Former F&G Fuel Slabs

One spill was identified at the Former F&G Fuel Slabs:

- July 8, 1994: An estimated 50–200 gallons of a water and AFFF mixture spilled into a drain (suspected to be the storm drain system) during testing of fire systems (Boeing 1994f).

3.2.7 Fuel Test Pad

Spills were identified at the Fuel Test Pad as follows:

- December 18, 1991: Approximately 50 gallons of a water and AFFF mixture spilled during fire system testing at the Power Plant Test Center Fuel Test Slab. A portion of the 50 gallons reached the storm drain system (Boeing 1991b).
- July 20, 1994: A mixture of an estimated 100–500 gallons of AFFF and 600,000 gallons of water was released due to the inadvertent activation of the fire protection system. Most of the mixture remained within the fuel farm containment area; however, due to a misdirected sprinkler head, an unknown quantity was released to the storm drain system. The lift station was taken out of service immediately after the spill was reported; however, a small amount of

the AFFF mixture was discharged to Slip 4. Boeing reported this spill to Ecology (Boeing 1994a, b, e, Ecology 1994).

- Summer 1994: An unspecified amount of a water and AFFF mixture spilled into the storm drain system during a scheduled fire protection system test. The spill resulted from the inadvertent closure of a valve that connects the fuel farm containment area to the apron (Boeing 1994d).
- January 27, 2002: A mixture of approximately 1,000 gallons of AFFF and 45,800 gallons of water spilled outside the 3-326 Fuel Test Support Building after the inadvertent activation of the fire protection system. Boeing took action to prevent the mixture from reaching the Slip 4 outfall by taking the lift station out of service, and the mixture was instead diverted to the County sanitary sewer system with approval from the County (Boeing 2000, 2002a, b, 2016). Foam was observed in the lift station but no foam was observed at Slip 4.
- June 21, 22, and 23, 2004: Approximately 5,000 gallons of a water and AFFF mixture spilled at the Fuel Test Pad (Boeing 2004b, c). The spilled material was captured in a containment system and transferred to the IWWTP for treatment prior to discharge to the County's sanitary sewer system with County approval under the KCDNR Permit.
- August 22, 2023: Up to 50,000 gallons of a water and AFFF mixture was inadvertently sprayed from the foam cannons at the Fuel Test Pad into the containment area during the testing of the fire suppression system. The majority of the mixture was captured by the containment trench and underground vault. A small amount of the mixture entered the stormwater system. Boeing pumped the mixture out of the stormwater system, including the LTST. Boeing did not observe foam or other evidence of the mixture reaching Slip 4. The spill was reported to Ecology on August 22 (ERTS#: 724921).

3.3 Discharges

A summary of discharges identified during document review is provided in Table 2 and described below; locations of discharges are shown on Figure 2. The level of detail provided for each discharge varies depending on information that was included in the documents reviewed; the information provided is reflective of the limited amount of detail and data that may be available for each source.

3.3.1 Buildings 3-811/3-812

Discharges were identified at Buildings 3-811/3-812 as follows:

- February 5, 2009: With the County's approval (email communication between Boeing and King County [Badger 2009]), Boeing discharged an AFFF/water mixture to the County's sanitary sewer system as part of testing the new fire suppression system in Buildings 3-811 and 3-812. The County required that Boeing apply foam suppressant to control the foam after the test and before the washdown. The authorized discharge to the County's sanitary sewer system included approximately 162 gallons of AFFF (0.93 percent by volume) and 17,200 gallons of water (99.07 percent by volume).
- May 21, 2009: Pursuant to the KCDNR Permit (Boeing 2009a), Boeing discharged approximately 4,668 gallons of a mixture of potable water and AFFF to the County sanitary sewer system as part of systems testing. The discharged mixture of water and AFFF came from two double-walled underground storage tanks (2,334 gallons from UBF-760 and 2,334 gallons from UBF-759) located beneath a concrete pad between the 3-811 Fabric Hangar and the 3-812 Fabric Hangar.

3.3.2 C10 Wash Stall

Discharges were identified at the C10 Wash Stall as follows:

- March 3, 2009: A mixture of approximately 6,000 gallons of water containing 150 gallons of AFFF was discharged to the County's sanitary sewer system pursuant to the KCDNR Permit (email communication between Boeing and the County; Turner 2009).
- June 4, 2009: A mixture of approximately 3,000 gallons of water containing an unknown quantity of AFFF was discharged to the County's sanitary sewer system (Boeing 2009b).

3.3.3 Building 3-369

One discharge was identified at Building 3-369:

- July 1, 1997: With authorization from the County, Boeing discharged approximately 36,000 gallons of a water and 1.5 percent AFFF mixture to the sanitary sewer system in connection with the testing of two foam tanks (Boeing 1997).

3.3.4 Sweeper Dump Vault

One discharge was identified at the Sweeper Dump Vault:

- December 22, 1997: Approximately 4,000 gallons of fire suppression water were discharged to the sanitary sewer system with the approval of KCDNR (Boeing 1998). An anti-foaming agent known as Halt foam suppressant was applied at periodic intervals during discharge to prevent foam from being generated in the sanitary sewer system.

4.0 SUMMARY

As requested by Ecology (Ecology 2022), this report provides a summary of areas where PFAS-containing materials have previously been or are currently stored and/or used at the Site and a summary of documented spills and discharges at the Site between 1991 and 2023; documents reviewed to prepare this summary were dated between 1967 and 2024.

The 2022 PFAS Letter also requested a phased investigation to characterize the nature and extent of PFAS in potentially impacted Site media. A separate PFAS Investigation Work Plan will be submitted to Ecology, following Ecology's review of this report.

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Legend

- City Outfall
- KCIA SD#3 Outfall
- North Boeing Field Property
- Georgetown Steam Plant Property
- Site Boundary

0 350 700

Scale in Feet

Notes

1. Site includes both North Boeing Field and Georgetown Steam Plant.
2. IWWTP = Industrial Wastewater Treatment Plant
   LTST = Long-Term Stormwater Treatment System
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Data Source: King County GIS.

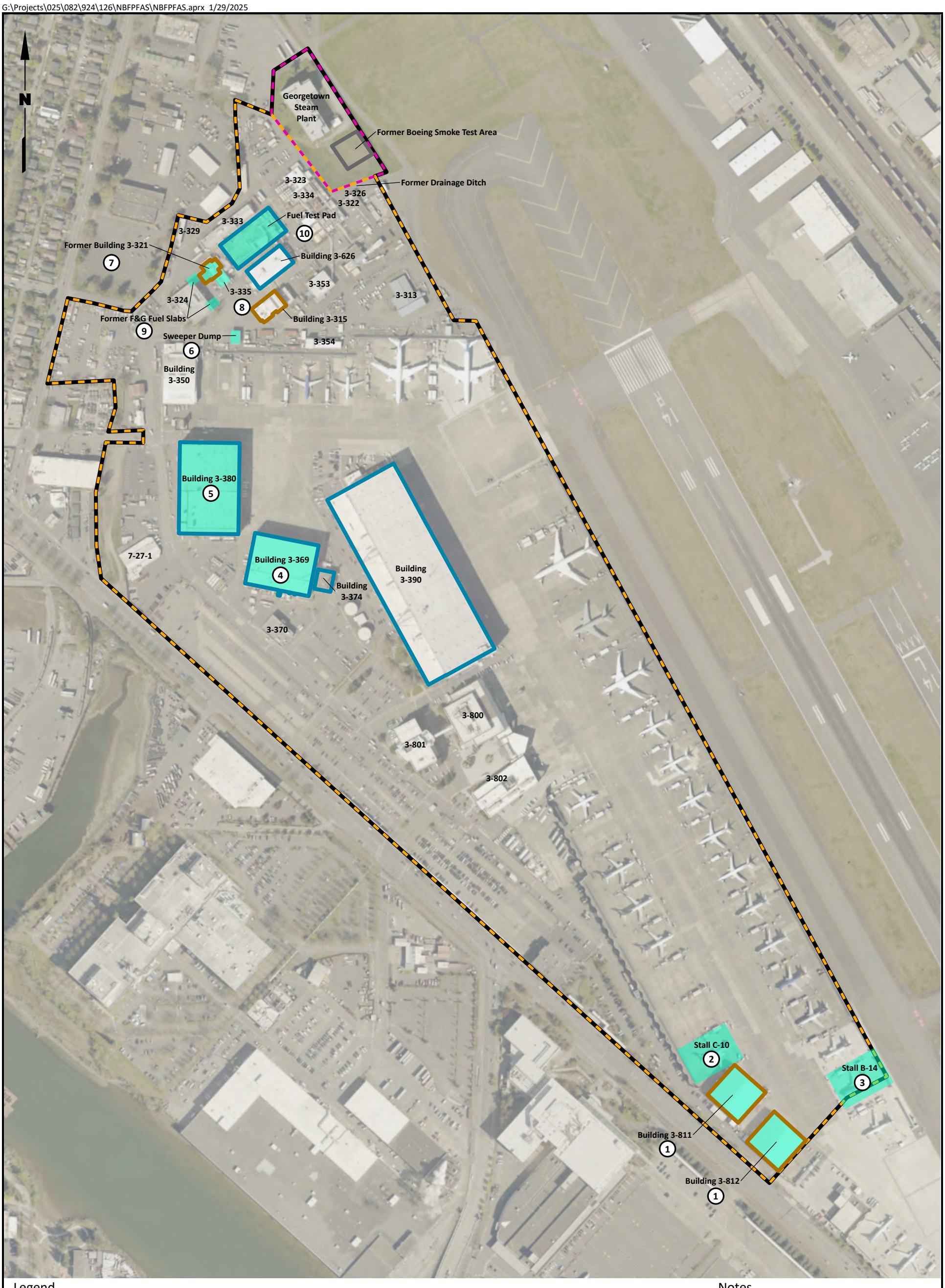
LANDAU ASSOCIATES

North Boeing Field
Seattle, Washington

Site Map

Figure 1

G:\Projects\025\082\924\126\NBFPFAS\NBFPFAS.aprx 1/29/2025



Legend

- Area with AFFF Spills/Discharges
- Building/Area with Existing AFFF Storage/System
- Building/Area with Former/Historic AFFF Storage/System/Use
- North Boeing Field Property
- Georgetown Steam Plant Property
- Site Boundary

(1) Numbers associated with spill and discharge areas correspond to Table 2 of the Historical Records Review for Use, Storage, Spills, and Discharges of PFAS-Containing Materials. Refer to table for specific information on spills and discharges in each area.

Notes

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Data Source: King County GIS.

0 350 700

Scale in Feet

LANDAU ASSOCIATES

North Boeing Field
Seattle, Washington

AFFF
Storage, Spills, and Discharge Areas

Figure
2

Table 1
AFFF Storage/Use Locations
NBF/GTSP RI PFAS Historical Records Review
Seattle, Washington

Building/Location	AFFF Storage	Capacity (gallons)	Install Date	Decommissioning Date If Applicable	Notes Including Foam Manufacturer/Type Where Known	Inspections
3-369/3-374	Tank ABF-134	2,500	6/30/1997	NA	Has included 3M Manufactured AFFF (FC-783F) and Ansulite 3 percent AFFF (AFC3B) Foam Concentrate. Specific information on foam replacement dates was not identified.	Monthly tank inspection - JPS000587
	Tank ABF-135	2,500	6/30/1997	NA	Has included 3M Manufactured AFFF (FC-783F) and Ansulite 3 percent AFFF (AFC3B) Foam Concentrate. Specific information on foam replacement dates was not identified.	Monthly tank inspection - JPS000587
3-380	Tank ABF-127	1,600	12/28/1991	NA	Chemguard 3% AFFF (C301MS)	Monthly tank inspection - JPS000587
	Tank ABF-128	1,600	12/28/1991	NA	Chemguard 3% AFFF (C301MS)	Monthly tank inspection - JPS000587
	Tank ABF-129	1,000	12/28/1991	NA	Chemguard 3% AFFF (C301MS)	Monthly tank inspection - JPS000587
	50-Gallon Tanks	50	NI	NA	Chemguard 3% AFFF (C301MS); four 50-gallon tanks in Paint Bays P5 and P6	NI
	AFFF Product Transfer	Bulk transfer	NI	NA	AFFF is unloaded from tanker trucks into designated storage tanks.	NI
3-390	Hand Hose Stations	50	NI	NA	Seven 50-gallon tanks of 3M Manufactured AFFF (FC-783F) in fixed wall-mounted AFFF hose reel stations throughout Hangar. Overhead suppression system is water-only.	NI
3-626	Tank ABF-113	3,600	1/1/1987	NA	6% AFFF (manufacturer information not available)	Monthly tank inspection - JPS000587
	Tank ABF-114	3,600	1/1/1987	NA	6% AFFF (manufacturer information not available)	Monthly tank inspection - JPS000587
Fuel Test Pad	Foam Cannons	NA	NI	NA	Foam cannons supplied by the 3-626 Building via underground contained utility trench.	NI
Former Building 3-321	Tanks	400	NI	NI	Three 400-gallon tanks. Building was demolished between 1993 and 1998.	NA
3-315	Steel Drum	167	NI	NI	FC 206 CE Light Water Aqueous Film Forming Form; records indicate drum storage in 1987 and 1997	NA
3-811	Tank ABF-423	850	3/13/2009	10/27/2020	Chemguard 3% AFFF (C301MS)	NA
	Tank ABF-424	850	3/13/2009	10/27/2020	Chemguard 3% AFFF (C301MS)	NA
3-812	Tank ABF-425	850	3/13/2009	10/27/2020	Chemguard 3% AFFF (C301MS)	NA
	Tank ABF-426	850	3/13/2009	10/27/2020	Chemguard 3% AFFF (C301MS)	NA

Notes:

Information in this table was compiled during PFAS review activities as part of preparation of the NBF/GTSP RI PFAS Historical Records Review Report and included discussions, conversations, and internal Boeing communications over the time period including October 2023 to May 2024.

Former/Historic AFFF Storage/System/Use

Abbreviations and Acronyms:

% = percent
AFFF = aqueous film-forming foam
Boeing = The Boeing Company
GTSP = Georgetown Steam Plant
NA = not applicable
NBF = North Boeing Field
NI = not identified
PFAS = per- and polyfluoroalkyl substances
RI = remedial investigation

Table 2
AFFF Spills and Discharges
NBF/GTSP RI PFAS Historical Records Review
Seattle, Washington

Figure Lookup	Building/Area	Date	Substance	Spill or Discharge Quantity (Approximate)[2]	Location	Spill Pathway (if known)	Discharge Pathway (if known)	References[1]
AFFF								
1	Buildings 3-811/3-812	2/5/2009	Water and AFFF	162 gal. AFFF 17,200 gal. Water	Manhole adjacent to construction area	---	Sanitary Sewer System	Badger 2009
		5/21/2009	Water and AFFF	2,334 gal.	UBF-760	---	Sanitary Sewer System	Boeing 2009a
		5/21/2009	Water and AFFF	2,334 gal.	UBF-759	---	Sanitary Sewer System	Boeing 2009a
		11/13/2017	Chemguard 3% AFFF	50 gal. estimated	Bldgs 3-812	Storm Drain System - no offsite discharge	---	Boeing 2020
2	C-10 Wash Stall	3/3/2009	Water and 3% AFFF	6,000 gal. (including approximately 150 gal. AFFF)	C-10 Wash Stall	---	Sanitary Sewer System	Turner 2009
		6/4/2009	Water and 3% AFFF	3,000 gal.	C-10 Wash Stall	---	Sanitary Sewer System	Boeing 2009b
3	Stall B-14	5/23/1994	Water and 6% AFFF	20–30 gal.	Apron in front of airplane stall B-14	Storm Drain System	---	Boeing 1994g, Boeing 2016
4	Building 3-369	7/1/1997	Water and 1.5% AFFF	36,000 gal.	Boiler House by Bldg. 3-369	---	Sanitary Sewer System	Boeing 1997
5	Building 3-380	11/23/1991	Water and 3–6% AFFF	100 gal.	Bldg. 3-380, the Paint Hangar	Storm Drain System on the outside of the north end of the Building, and Sanitary Sewer	---	SAIC 2009a, Boeing 1991a, Boeing 1991c, Ecology 1991
		4/22/1992 (estimate)	Suspected AFFF	Not specified	Chase north of Bldg. 3-380	Sanitary Sewer System	---	Boeing 1992
		3/13/2001	Water and AFFF	5,000 gal. AFFF 15,000 gal. water	Bldg. 3-380, P-6 Paint Hangar	Retained in Bldg 3-380 drainage trench	---	Petersen 2001a, Boeing 2001a
		4/15/2001	AFFF	5 gal.	Bldg. 3-380	None; small spill contained and cleaned	---	Boeing 2016, Boeing 2001c
6	Sweeper Dump Vault	12/22/1997	Fire suppression water	4,000 gal.	Sweeper Dump Vault	---	Sanitary Sewer System	Boeing 1998
7	Former Building 3-321	3/12/1996	Water and AFFF	3–400 gal. estimated	Fuel test cell east of the 3-321 Building	Drain (suspected Storm Drain System)	---	Boeing 1996

Table 2
AFFF Spills and Discharges
NBF/GTSP RI PFAS Historical Records Review
Seattle, Washington

Figure Lookup	Building/Area	Date	Substance	Spill or Discharge Quantity (Approximate)[2]	Location	Spill Pathway (if known)	Discharge Pathway (if known)	References[1]
8	Building 3-335	6/11/2004	Water and AFFF	3 gal. AFFF Up to 300 gal. water	Bldg. 3-333 Fuel Test Facility	Storm Drain System	---	SAIC 2009a, Boeing 2003, Ecology 2006, Boeing 2004a, Ecology 2005
9	Former F&G Fuel Slabs	7/8/1994	Water and 6% AFFF	50-200 gal. estimated	F&G Fuel Slabs	Storm Drain System (suspected)	---	Boeing 2016, Boeing 1994f
10	Fuel Test Pad	12/18/1991	Water and 3% AFFF	50 gal.	Power Plant Test Center Fuel Test Slab	Storm Drain System	---	SAIC 2009a, Boeing 1991b, Boeing 1994c
		7/20/1994	Water and 3% AFFF	100–500 gal. AFFF estimated 600,000 gal. water and AFFF	Fuel Farm at Power Plant Test Center	Storm Drain System	---	SAIC 2009a, Boeing 1994b, Boeing 1994a, Boeing 1994e, Ecology 1994
		Summer 1994	Water and AFFF	Not specified	Not specified	Storm Drain System	---	Boeing 1994d
		1/27/2002	Water and AFFF	1,000 gal. AFFF 45,800 gal. water and AFFF	Outside of the NBF 3-626 Bldg.	Storm Drain System (no offsite discharge observed) and Sanitary Sewer	---	Boeing 2000, Boeing 2016, Boeing 2002a, Boeing 2002b
		June 21, 22, and 23, 2004	Water and AFFF	5,000 gal.	Fuel Test Pad	Sanitary Sewer System	---	Boeing 2004c, Boeing 2004b
		8/22/2023	Water and AFFF	Up to 50,000 gal. estimated	Fuel Test Pad	Storm Drain System (no offsite discharge observed)	---	Lago 2024

Notes:

[1]References information provided in the main text of the *Historical Records Review for Use, Storage, Spills, and Discharges of PFAS-Containing Materials, NBF/GTSP Remedial Investigation, Seattle, Washington,* from Landau Associates, Inc. dated October 28, 2024.
[2]Approximate volumes are included based on the available information and volumes of AFFF diluted in water are not to be extrapolated.

Spill or Discharge Pathway to Storm Drain System
Spill or Discharge Pathway to Sanitary Sewer System
Contained, or Spill or Discharge to Containment

Abbreviations and Acronyms:

% = percent
AFFF = aqueous film-forming foam
Bldg = building
Boeing = The Boeing Company
Ecology = Washington State Department of Ecology
gal = gallons
GTSP = Georgetown Steam Plant
NBF = North Boeing Field
PFAS = per- and polyfluoroalkyl substances

From:	Schwarz, Julia (ECY)
To:	"Taptich (US), Molly H"
Cc:	Dube, Tom E.; Crowley, Allison; Dumaliang, Peter; Elisabeth Hawley; Thomas Wanzek; Colette Gaona; Shannon Ashurst
Subject:	RE: NBF/GTSP - PFAS Investigation Work Plan - Historical Records Report Comment
Date:	Tuesday, June 10, 2025 3:35:39 PM

Thanks, Molly. No further revisions to the Historical Records Review Report are needed; Ecology will post the finalized memo and this related correspondence on the project website.

Thanks,
Julia

Julia Schwarz, LHG (she/her)
Site Manager, Toxics Cleanup Program
Department of Ecology Northwest Region Office
Cell: 425-515-5992

From: Taptich (US), Molly H <molly.h.taptich@boeing.com>
Sent: Friday, May 23, 2025 3:44 PM
To: Schwarz, Julia (ECY) <jusc461@ECY.WA.GOV>
Cc: Dube, Tom E. <THOMAS.E.DUBE@leidos.com>; Crowley, Allison <Allison.Crowley@seattle.gov>; Dumaliang, Peter <peter.dumaliang@kingcounty.gov>; Elisabeth Hawley <EHawley@Geosyntec.com>; Thomas Wanzek <Thomas.Wanzek@Geosyntec.com>; Colette Gaona <CGaona@landauinc.com>; Shannon Ashurst <sashurst@integral-corp.com>
Subject: RE: NBF/GTSP - PFAS Investigation Work Plan - Historical Records Report Comment

External Email

Hi Julia,

Thank you for your response. That works for us, we will add a sample location in that area, and will communicate with you on the final location.

Thank you and have a good long weekend!

Molly Taptich, P.G.
Environmental Remediation Project Manager
Global Enterprise Sustainability
(206) 883-7494 (cell)
molly.h.taptich@boeing.com
BOEING

From: Schwarz, Julia (ECY) <jusc461@ECY.WA.GOV>

Sent: Wednesday, May 21, 2025 1:04 PM
To: Taptich (US), Molly H <molly.h.taptich@boeing.com>
Cc: Dube, Tom E. <THOMAS.E.DUBE@leidos.com>; Crowley, Allison <Allison.Crowley@seattle.gov>; Dumaliang, Peter <peter.dumaliang@kingcounty.gov>; Elisabeth Hawley <EHawley@Geosyntec.com>; Thomas Wanzek <Thomas.Wanzek@Geosyntec.com>; Colette Gaona <CGaona@landauinc.com>; Shannon Ashurst <sashurst@integral-corp.com>
Subject: [EXTERNAL] RE: NBF/GTSP - PFAS Investigation Work Plan - Historical Records Report Comment

> EXT email: be mindful of links/attachments.

Hi Molly,

Thanks for your response on the Historical Records Review. Given the uncertainty about the use of AFFF in this area, please add a sample location near the former air and water vault and foam lines to the PFAS Investigation Work Plan.

Please let me know if you would like to discuss this.

Thanks,
Julia

Julia Schwarz, LHG (she/her)
Site Manager, Toxics Cleanup Program
Department of Ecology Northwest Region Office
Cell: 425-515-5992

From: Taptich (US), Molly H <molly.h.taptich@boeing.com>
Sent: Friday, May 16, 2025 2:44 PM
To: Schwarz, Julia (ECY) <jusc461@ECY.WA.GOV>
Cc: Dube, Tom E. <THOMAS.E.DUBE@leidos.com>; Crowley, Allison <Allison.Crowley@seattle.gov>; Dumaliang, Peter <peter.dumaliang@kingcounty.gov>; Elisabeth Hawley <EHawley@Geosyntec.com>; Thomas Wanzek <Thomas.Wanzek@Geosyntec.com>; Colette Gaona <CGaona@landauinc.com>; Shannon Ashurst <sashurst@integral-corp.com>
Subject: RE: NBF/GTSP - PFAS Investigation Work Plan - Historical Records Report Comment

External Email

Julia,

This email provides our response to Ecology's comment on the PFAS Historical Records Review

Report:

Comment:

Historical Records Review for Use, Storage, Spills, and Discharges of PFAS-Containing Materials dated February 6, 2025, and the corresponding Response to Comments document:

- Comment 2 (Section 1.0): SEACOR 1992 (N1240) Figure 4 shows a 3-inch foam line and a 10-inch foam water line in the flightline utility corridor just east of the main fuel farm. These are called out in Section 7.1.6.4 of the RIFS Work Plan. Are these AFFF lines?

Response:

Boeing has followed up with the lead NBF facilities engineer and lead fire engineer to gather additional information related to the foam line shown on the referenced drawing from the SEACOR 1992 Report. Both engineers confirmed that the Concourse C utility bank shown on the figure in the SEACOR 1992 Report was accurate and demolished in 1992. We were unable to locate any drawings that showed the broader foam system/tank/source these lines were connected to or if the foam referenced was AFFF. The document review and additional consultation with the lead facilities engineer and fire engineer did not identify or confirm any AFFF-related sources for these utilities, or any documented releases associated with these lines. The only drawing we were able to locate referencing "foam" (foam control cabinets) was dated 1954 and predated the use of AFFF. Typically, an AFFF system would not be designed to have multiple lines running in parallel for fire water, foam/water, and concentrated foam. It is unclear what historical purpose these lines served or if they were ever used for AFFF.

Let me know if you have any additional questions or comments related to our response.

Thank you,

Molly Taptich, P.G.
Environmental Remediation Project Manager
Global Enterprise Sustainability
(206) 883-7494 (cell)
molly.h.taptich@boeing.com

From: Schwarz, Julia (ECY) <jusc461@ECY.WA.GOV>
Sent: Tuesday, March 25, 2025 1:42 PM
To: Taptich (US), Molly H <molly.h.taptich@boeing.com>
Cc: Dube, Tom E. <THOMAS.E.DUBE@leidos.com>; Crowley, Allison <Allison.Crowley@seattle.gov>; Dumaliang, Peter <peter.dumaliang@kingcounty.gov>; Elisabeth Hawley <EHawley@Geosyntec.com>; Thomas Wanzek <Thomas.Wanzek@Geosyntec.com>; Colette Gaona <CGaona@landauinc.com>; Shannon Ashurst <sashurst@integral-corp.com>
Subject: [EXTERNAL] RE: NBF/GTSP - PFAS Investigation Work Plan

Hi Molly,

Thank you for providing the revised PFAS memo, associated RTC document, and the PFAS work plan for Ecology's review. Comments on these documents are provided below. Please let me know if you would like to discuss.

Depending on the timing of field work, Ecology would like to observe some of the field activities. Please keep us posted on your field work schedule.

For grab groundwater locations, are you planning to collect soil samples and archive them while you are already mobilized out there with equipment?

Historical Records Review for Use, Storage, Spills, and Discharges of PFAS-Containing Materials dated February 6, 2025, and the corresponding Response to Comments document:

- Comment 2 (Section 1.0): SEACOR 1992 (N1240) Figure 4 shows a 3-inch foam line and a 10-inch foam water line in the flightline utility corridor just east of the main fuel farm. These are called out in Section 7.1.6.4 of the RIFS Work Plan. Are these AFFF lines?

Per- and Polyfluoroalkyl Substances (PFAS) Investigation Work Plan, North Boeing Field/Georgetown Steam Plant, Seattle, Washington dated February 13, 2025:

- Acronyms: IDW in the main text acronym section uses a hyphen, and in the QAPP Addendum it does not.
- Section 1.1, 1st paragraph: PLPs should be potentially liable persons.
- Section 1.1, last paragraph: the revised draft PFAS memo was dated February 6, 2025. Please update this date in the revised work plan.
- Section 1.2, 1st paragraph: Please rephrase to "The purpose of the proposed sampling activities is to evaluate the presence or absence of PFAS in groundwater at the Site" that than "to evaluate the potential presence of PFAS at the Site".
- Section 2.1, 1st paragraph: The site includes at least four properties (tax parcels), though you could describe these as operational areas instead. Ecology suggests the use of "properties" or other terminology instead of Site throughout this paragraph and section as the Site extent could be changed by this investigation and extend into other areas described in the first paragraph. Please also consider adding a bit more detail about the distance and direction of residential areas near the site.
- Section 2.2, description of the former smoke test area (page 3): Since Table 1 indicated that sampling activities are occurring in this area, please add a clarifying sentence in this section that notes that due to the uncertainty of AFFF usage in this area, sampling is being proposed at this location.
- Section 2.2, description of the southern portion of the GTSP Property (page 3), text that says, "No documents were identified that indicated AFFF use in this area.": Water from the Boeing Fire Training area, located on Boeing Field, may have drained to the GTSP. This ditch was downstream of two catchment basins and piping, which formed part of the drainage collection system for the NBF fire training center to the northeast. So, AFFF would be suspected of being present in this ditch area. Please also clarify the terminology used; this "low-lying area" is labeled "former drainage ditch" on Figure 3.
- Section 3.1, first paragraph: Note: Given the Site knowledge regarding leaking storm drain lines, it cannot be ruled out that releases of PFAS-containing products has not reached the soil from subsurface piping of any kind. The shallow water table increases the likelihood that any releases from subsurface piping has reached groundwater.
- Section 3.1, last paragraph on page 5: It is possible that even if PFAS are not detected in groundwater, additional phases may still be requested, or that additional groundwater sampling could be needed. If PFAS are not detected in groundwater, Ecology expects that

additional sampling could be targeted to areas of active cleanup work for other COCs and/or could be included in later phases of the cleanup process, as needed. As another example, depending on sample results, additional sampling could also be needed downgradient of the 3-369 or 3-390 buildings, where there are no proximal wells located. We have not yet determined the results that would be expected to trigger additional sampling in this, or other, areas. Suggest modifying the last sentence on this page to say, "The need for additional phase(s) of investigation, including sampling of other media (e.g. soil, catch basin solids), will be discussed with Ecology following receipt of the initial phase sampling results."

- Section 3.4: Use of a peristaltic pump is preferable to a bailer, as you may be able to use low-flow purging to hopefully reduce the amount of turbidity in the sample compared to a bailer.
- Section 3.4 and SAP/QAPP Section 3.2.4: Please note what material the filter pack sock will be made of.
- Section 3.4, end of 2nd paragraph: Reference WA state well construction regulations with regards to decommissioning of resource protection wells.
- Section 3.5: The QAPP states that the low-flow rate will be from 100-500 ml/minute, and notes different stabilization criteria for parameters. Please standardize this between the main text and the QAPP. See also comments on down-hole equipment removal (SAP/QAPP Section 3.2.1).
- Section 4.1, third bullet: Please tabulate all results even though screening values are only available for some compounds. Please use the most recent (February 2025) CLARC and/or PCUL workbook as some PFAS screening values have been updated. Add a table to the work plan with the PFAS screening values.
- Section 4.1, fourth bullet: Please include a photo log of field sampling activities with the field forms and/or sampling logs. Photographs are noted in QAPP Section 4.3 as "will be saved in the Geosyntec project file."
- QAPP Section 2/Table 1: Please list the selected laboratory in the subsequent version of this work plan. Please also confirm that the reporting limits listed in Table 1 are accurate for the selected laboratory, and note the screening values for PFAS to show where the reporting limits are sufficient. It would also be helpful to show the method detection limit. If needed for data screening, you should report down to the detection limit.
- QAPP Section 3.2.1: These materials should be removed from wells long before sampling begins. Ecology suggests 2 weeks as a minimum. If possible, this material should not be placed back in the well.
- QAPP Section 3.2.4 and 3.2.5: Low-flow purging is not compatible with a bailer. Ecology suggests not using a bailer. For turbidity, if it is not possible to attain 10 NTU, what will the field protocol be?
- QAPP Section 3.2.6: Generally, Ecology does not allow for centrifuging of aqueous samples to reduce turbidity. However, EPA Method 1633 notes that if samples are too turbid to be extracted effectively, the lab can centrifuge and analyze the supernatant and solid portions as separate samples, then add their concentrations to get the total aqueous concentration. If this is what is indicated by Section 3.2.6, please clarify this in the text. Ecology does not approve of centrifuging samples and analyzing only the aqueous portion; you must either run both the aqueous and solid portion, or you may analyze the sample both with and without centrifugation.
- QAPP Section 3.3.1: In addition to noting "Per Ecology guidance," please add a reference to the guidance.
- QAPP Section 3.5: There will also be some soil waste. This is noted in the main text, but please add a description of that here. Please also note that the disposable sampling equipment will be disposed of as municipal waste, if that is the plan. Please make sure that the process described in the main text and the QAPP is consistent.

Thanks,

Julia

Julia Schwarz, LHG (she/her)

Site Manager, Toxics Cleanup Program

Department of Ecology Northwest Region Office

Cell: 425-515-5992

From: Taptich (US), Molly H <molly.h.taptich@boeing.com>
Sent: Thursday, February 13, 2025 12:43 PM
To: Schwarz, Julia (ECY) <jusc461@ECY.WA.GOV>
Cc: Dube, Tom E. <THOMAS.E.DUBE@leidos.com>; Crowley, Allison <Allison.Crowley@seattle.gov>; Dumaliang, Peter <peter.dumaliang@kingcounty.gov>; Elisabeth Hawley <EHawley@Geosyntec.com>; Thomas Wanzek <Thomas.Wanzek@Geosyntec.com>; Colette Gaona <CGaona@landauinc.com>; Shannon Ashurst <sashurst@integral-corp.com>
Subject: NBF/GTSP - PFAS Investigation Work Plan

External Email

Julia,

On behalf of Boeing, The City of Seattle, and King County, please find attached the *PFAS Investigation Work Plan* for the North Boeing Field /Georgetown Steam Plant Site.

If you have any questions, please call or email myself, Allison Crowley, or Peter Dumaliang.

Thank you,

Molly Taptich, P.G.
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Global Enterprise Sustainability
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