Aqueous Film-Forming Foam Collection and Disposal Program

DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

December 2023
Publication 23-04-064

DEPARTMENT OF ECOLOGY
State of Washington

PUBLICATION INFORMATION

This report is available on Ecology's website at:
https://apps.ecology.wa.gov/publications/summarypages/2304064.html.

CONTACT INFORMATION

Sean Smith, Product Replacement Program Manager
Washington State Department of Ecology
Northwest Region Office
P.O. Box 330316
Shoreline, WA 98133-9716

Telephone: 206-594-0000

Email: Sean.Smith@ecy.wa.gov

Website: Washington State Department of Ecology[1]

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Aqueous Film-Forming Foam Collection and Disposal Program:

Draft Programmatic Environmental Impact Statement

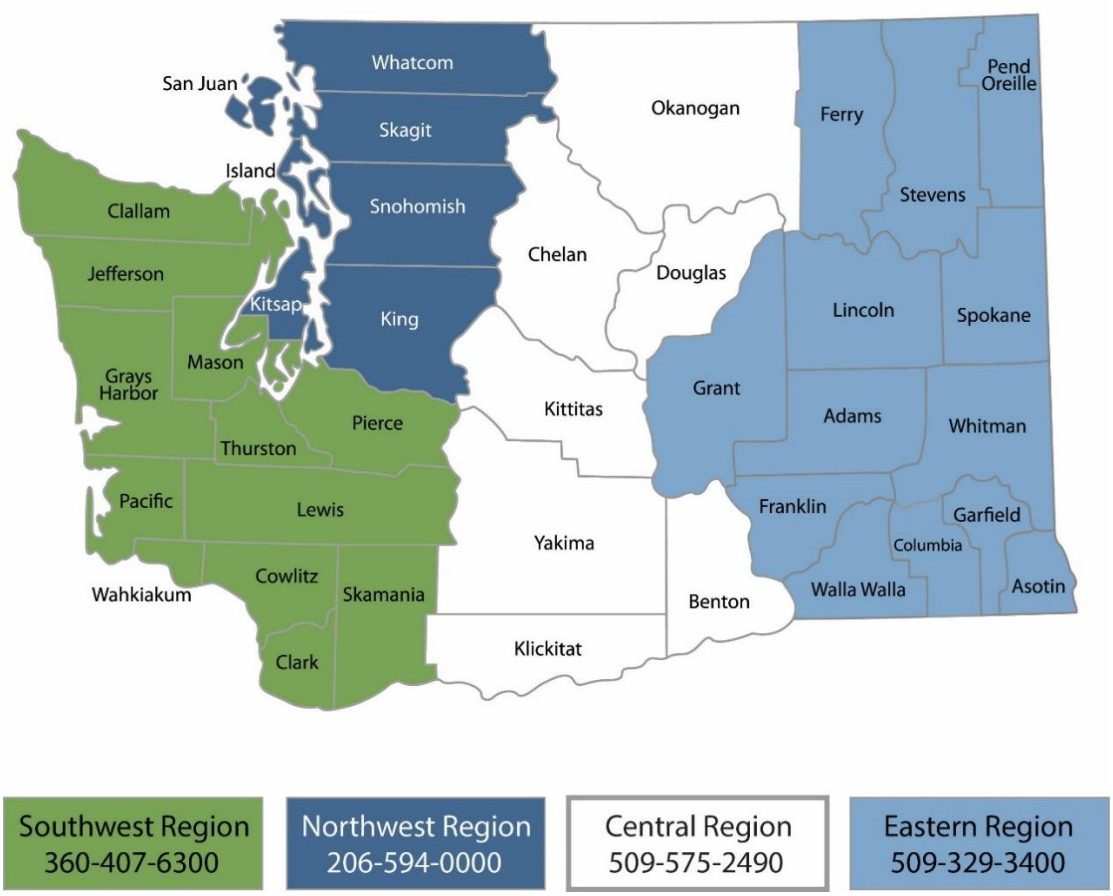
Hazardous Waste and Toxics Reduction Program
Washington State Department of Ecology
Olympia, Washington

December 2023 | Publication 23-04-064

DEPARTMENT OF
ECOLOGY
State of Washington

DEPARTMENT OF ECOLOGY'S REGIONAL OFFICES

Map of Counties Served



Region	Counties served	Mailing Address	Phone
Southwest	Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, Wahkiakum	PO Box 47775 Olympia, WA 98504	360-407-6300
Northwest	Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom	PO Box 330316 Shoreline, WA 98133	206-594-0000
Central	Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima	1250 W Alder St Union Gap, WA 98903	509-575-2490
Eastern	Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman	4601 N Monroe Spokane, WA 99205	509-329-3400
Headquarters	Across Washington	PO Box 46700 Olympia, WA 98504	360-407-6000

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600, Olympia, WA 98504-7600 • 360-407-6000

December 20, 2023

Dear interested parties, Tribal leaders, agencies, organizations, and concerned Washingtonians:

The Washington Department of Ecology is pleased to present for public comment the **Aqueous Film Forming Foam (AFFF) Collection and Disposal Program: Draft Programmatic Environmental Impact Statement (DEIS)**. This document describes potential environmental and public health impacts associated with the collection, transport, and disposal of AFFF stock at municipal fire stations.

AFFF is a firefighting foam used to extinguish flammable liquid fires, such as those involving oil or gasoline. While it is an effective fire suppression tool, AFFF contains per- and polyfluoroalkyl substances (PFAS), which are concerning due to their persistence and potential environmental and human health impacts. AFFF is a leading cause of PFAS contamination in drinking water.

This DEIS is undertaken in accordance with the Washington State Environmental Policy Act (SEPA). Its purpose is to comprehensively assess impacts of AFFF collection and disposal options and develop alternatives to address or mitigate those impacts.

The 45-day public comment period for this DEIS begins December 20, 2023, and closes February 5, 2024. We invite you to provide input during this time. Helpful comments include those that describe which alternatives are preferred, identify where our analysis can be improved, or suggest additional resources and materials to incorporate or reference.

After the comment period closes, we will consider all comments received and finalize the EIS. Your comments will inform our selection of an AFFF disposal method that is responsive to public input and addresses potential impacts to environmental and public health.

For questions or further information about the DEIS or public comment period, contact Sean Smith at sean.smith@ecy.wa.gov or 425-324-0328.

Thank you,

Katrina Lassiter, Manager
Hazardous Waste & Toxics Reduction Program

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- Appendix A.3: Department of Ecology Regulations, Permits, and Certifications
- Appendix A.4: Biological Resource Characteristics of Fire Stations Enrolled in the AFFF Program and 10-Day Hold Sites

Fact Sheet

Aqueous Film-Forming Foam Collection and Disposal Program: Draft Programmatic Environmental Impact Statement

Date of Issuance
December 20, 2023

Date Comments Are Due
February 5, 2024

Description
Aqueous film-forming foam (AFFF) is used to put out fires fueled by flammable liquids, such as oil or gasoline. AFFF is concerning because it contains per- and polyfluoroalkyl substances (PFAS). These toxic chemicals do not easily break down and can negatively impact human health and the environment.

In 2018, Washington passed the Firefighting Agents and Equipment law,[3] which restricts AFFF manufacture, sale, and use for firefighting training. This leaves municipal fire departments and other first responders with unused AFFF stored on site. In response, the Washington State Department of Ecology (Ecology, we) proposed the AFFF Collection and Disposal Program to help fire departments safely dispose of their on-site AFFF at little to no cost to participants.

This Draft Programmatic Environmental Impact Statement (DEIS) provides the environmental and public health information needed for an informed and transparent decision on how to safely dispose of AFFF stockpiled at the state's municipal fire departments.

We prepared this DEIS in compliance with the State Environmental Policy Act (SEPA) requirements described in chapter 43.21C RCW (Revised Code of Washington)[4] and chapter 197-11 WAC (Washington Administrative Code).[5] SEPA provides guidance to state and local governments involved in environmental policy decisions. The SEPA process is intended to ensure that environmental values are considered during decision-making actions by state and local agencies.

Included in this DEIS
As required under SEPA guidance, this DEIS includes:

- Information on existing uses of AFFF.
- Analysis of current laws and regulations governing hazardous materials.
- Policies for the protection of important and sensitive ecological areas and their existing uses.
- Commitments to coordinate with key stakeholders, which include government agencies, organizations, Native American Tribes, and interested individuals.

[3] Chapter 70A.400 RCW (https://app.leg.wa.gov/rcw/default.aspx?cite=70A.400)
[4] https://app.leg.wa.gov/RCW/default.aspx?cite=43.21C
[5] https://apps.leg.wa.gov/WAC/default.aspx?cite=197-11

Alternatives Considered

Alternatives presented in this DEIS are:

- Alternative 1: Approved Hold in Place.
- Alternative 2: Incineration.
- Alternative 3: Solidification and Landfilling.
- Alternative 4: Class I Deep Well Injection.
- Alternative 5: No Action.

Timing of Additional Environmental Review

The analysis in this DEIS is programmatic in nature. It has been prepared to disclose probable significant adverse impacts associated with adopting and implementing the alternatives. Any individual projects or activities that are proposed or carried out may require additional, more detailed, project-level environmental review prior to implementation. These projects and activities could require SEPA compliance, National Environmental Policy Act compliance, or both, depending on the location of the proposal and/or types of permits required.

Public Comment on the DEIS

We are conducting a public comment period from **December 20, 2023 to February 5, 2024**, in accordance with WAC 197-11-455.[6] All comments on the DEIS received during the public comment period will be addressed in the Final Environmental Impact Statement, planned for issuance in May 2024.

How to Submit Comments

You can submit comments on the DEIS in the following ways:

Online: ecology.wa.gov/AFFF-comment

Email: AFFFDisposal@ecy.wa.gov

Mail: Washington State Department of Ecology
Attn: Sean Smith
P.O. Box 330316
Shoreline, WA 98133-9716

Document Availability

The DEIS for the AFFF Collection and Disposal Program is available on Ecology's website at: https://apps.ecology.wa.gov/publications/summarypages/2304064.html.

Print copies of this document may be obtained by written request to Sean Smith at Sean.Smith@ecy.wa.gov, or by calling 425-324-0328.

[6] https://app.leg.wa.gov/WAC/default.aspx?cite=197-11-455

Information Session

At this informal online meeting, you'll learn more about the DEIS from a presentation by our staff. You can ask questions, but we won't collect public comments at this time.

Date: January 17, 2024

Time: 10 a.m. – 11:30 a.m.

Zoom link:
us02web.zoom.us/j/89520569255

Public Hearing

At this formal online hearing, you can submit verbal or written public comments on the DEIS, following a brief overview by our staff. We'll collect formal public comments for the DEIS record.

Date: January 31, 2024

Time: 1 p.m. – 4 p.m.

Zoom link: us02web.zoom.us/j/88449630921

For More Information

During the past several years, we coordinated a team of state agencies and worked with a wide range of experts to study and collect information on the program area. We collaborated with residents, stakeholders, Tribes, and other state agencies to present the most accurate, science-based information possible. The DEIS builds off this work. Background materials and other information are available in the appendices to this DEIS and online through the following:

Our Webpages:

- AFFF Draft Environmental Impact Statement[7]
- PFAS in firefighting foam EZView page[8]
- Aqueous film-forming foam[9]
- AFFF Collection and Disposal Program[10]

Our Publications:

- How Should We Dispose of Toxic Firefighting Foam?[11]
- AFFF Collection and Disposal Program Alternatives[12]
- Focus on: What Is an EIS?[13]
- PFAS in Firefighting Foam[14]

[7] ecology.wa.gov/AFFF-DEIS
[8] www.ezview.wa.gov/site/alias__1962/37693/pfas_in_firefighting_foam.aspx
[9] ecology.wa.gov/AFFF
[10] ecology.wa.gov/AFFF-Disposal
[11] apps.ecology.wa.gov/publications/SummaryPages/2304052.html
[12] apps.ecology.wa.gov/publications/SummaryPages/2304013.html
[13] apps.ecology.wa.gov/publications/SummaryPages/2304012.html
[14] apps.ecology.wa.gov/publications/SummaryPages/2204037.html

Contact

Sean Smith, M.S.
Product Replacement Program Manager
Washington State Department of Ecology
Northwest Region Office
P.O. Box 330316
Shoreline, WA 98133-9716
425-324-0328
sean.smith@ecy.wa.gov

Executive Summary

Aqueous film-forming foam (AFFF) is used to put out fires fueled by flammable liquids, such as oil or gasoline. AFFF is concerning because it contains per- and polyfluoroalkyl substances (PFAS). These toxic chemicals don't easily break down, and they can negatively impact human health and the environment.

In 2018, Washington passed the Firefighting Agents and Equipment law (chapter 70A.400 RCW),[15] which restricts AFFF manufacture, sale, and use for firefighting training. This leaves municipal fire departments and other first responders with on-site stockpiles of AFFF that they may never use.

In response, Washington State Department of Ecology (Ecology, we) proposed the Aqueous Film-Forming Foam Collection and Disposal Program, intended to help fire departments safely dispose of stockpiles of AFFF at little to no cost to participants. The Washington Legislature appropriated funds for this program because it recognized the threat AFFF and PFAS pose to the state's environment and public health.

The program is not specific to a particular site or location. All Washington State municipal fire departments storing AFFF may elect to participate at their individual discretion.

Project History

- **September 1, 2020**: We released a State Environmental Policy Act (SEPA) checklist containing an initial Determination of Non-Significance (DNS) relative to the proposed collection, transportation, treatment, and disposal of AFFF at the Clean Harbors federally permitted incinerator in Aragonite, Utah.
- **October 1, 2020**: We closed a 30-day comment period on the SEPA checklist and DNS.
- **January 15, 2021**: After reviewing the comments, we decided to withdraw the DNS.
- **January 19, 2021**: We issued a Determination of Significance (DS), finding that the foam disposal program could potentially generate significant adverse impacts on the environment. We initiated an Environmental Impact Statement to evaluate alternative ways to implement the AFFF program.

What is the Purpose of a Programmatic Environmental Impact Statement?

An Environmental Impact Statement (EIS) is a report that details the potential environmental and public health impacts of a proposed action. A programmatic EIS assesses these impacts for a proposed program or plan, rather than a specific action or project. A programmatic EIS provides the basis for review of related actions or projects undertaken at a later date.

An EIS does not approve or deny a proposed project. It provides information about the probable significant adverse environmental impacts of a proposal. We prepared this draft EIS

[15] https://app.leg.wa.gov/rcw/default.aspx?cite=70A.400

(DEIS) in accordance with SEPA requirements.[16] The results of the DEIS must be considered by Ecology and any other relevant agency in decisions regarding selection and implementation of a proposed action.

For more information, see the publication Focus on: What Is an EIS?[17]

What Is Addressed in this Programmatic EIS?

This DEIS addresses the potential impacts of AFFF collection, storage, transport, and disposal on public health and the environment. Issues addressed in this DEIS include:

- A reasonable range of alternative approaches to addressing the AFFF concern.
- Potential adverse environmental impacts. Potential impacts by alternative are summarized in Chapter 4: Mitigation Measures.
- Possible mitigation measures to reduce or eliminate significant impacts.

For each resource area addressed in the DEIS, the following information is presented:

- Analytical methodology and thresholds of significance determinations.
- Potential significant impacts on the resource area.
- Potential adverse effects on human health and the environment.
- Mitigation measures and best practices.
- Data gaps.
- Significant, unavoidable, adverse impacts.

Alternatives

SEPA requires that an EIS provides a reasonable range of alternative approaches to the proposed action. Usually, the alternatives considered could achieve the project objectives, and some may have lower environmental costs. Four alternatives and a "no action" alternative have been identified and are analyzed in this DEIS:

- **Alternative 1: Approved Hold in Place.** AFFF would be held in place at participating fire stations. Suitable containment would be approved and reimbursed by Ecology until acceptable advanced treatment technology becomes available.
- **Alternative 2: Incineration.** AFFF would be collected and transported to a selected existing treatment facility for incineration.

[16] Chapter 197-11 WAC: https://apps.leg.wa.gov/WAC/default.aspx?cite=197-11
[17] https://apps.ecology.wa.gov/publications/SummaryPages/2304012.html

- **Alternative 3: Solidification and Landfilling.** AFFF would be collected and transported to a selected landfill facility or facilities for solidification and disposal.
- **Alternative 4: Class I Deep Well Injection.** AFFF would be collected and transported to a selected Class I deep well injection facility or facilities for disposal.
- **Alternative 5: No Action**. AFFF would be left as is at participating fire stations.

Legal Requirements

Numerous regulations, laws, and treaty obligations have guided the development of this DEIS. Chapter 2: Project Description and Alternatives describes specific laws and regulations for dangerous waste treatment, storage, and disposal. These include Washington State regulations as well as federal regulations and permitting requirements under the Resource Conservation and Recovery Act (RCRA). Chapter 3: Affected Environment and Environmental Consequences offers crucial insights into Tribal treaties and federal management areas within the AFFF study area.

Regardless of the chosen alternative, we commit to conducting necessary engagement, consultations, and coordination with federally recognized Tribes. In addition, for all alternatives except the no action alternative, we will adhere to the state's regional spill response plans before foam collection, including mandatory communication and coordination with federal, state, Tribal, and local entities.

Required Permits, Licenses, and Approvals

Because any Washington State municipal fire department with qualifying foam may participate, the AFFF collection program is not specific to a particular site or location. Also, because this is a programmatic DEIS, the specific method of AFFF collection, transport, and disposal remains undetermined. Thus, a comprehensive list of potential required permits, licenses, and approvals cannot be provided at this time. A list of fire departments that would likely participate in the collection program is included as Appendix A.2.[18]

Of the five proposed alternatives analyzed in this DEIS, four (incineration, solidification and landfilling, deep well injection, and no action) do not require Ecology to secure additional permits, licenses, or approvals.

Key Programmatic Concerns

The following key areas of potential environmental concern are addressed in the DEIS.

Risks to public health

PFAS within AFFF are water soluble and highly mobile, meaning they can easily contaminate groundwater and can be hard to filter out. There are no known natural processes that can break down these substances. Exposures could continue for hundreds of years or more.

[18] https://apps.ecology.wa.gov/publications/summarypages/2304064.html

Lack of uniform regulations

Currently, EPA has not identified any PFAS compounds as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act, and no PFAS compounds have National Drinking Water Standards established under the Safe Drinking Water Act. EPA's Strategic Roadmap,[19] released in October 2021, identifies actions they plan to complete over the next several years. These include:

1) Proposing to list perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and possibly other PFAS compounds as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act.
2) Establishing final National Drinking Water Standards for PFOA and PFOS.

In addition, the PFAS Action Act (HR 2467)[20] is being considered by Congress to address both of these issues, but the fate of the bill is uncertain.

Program Implementation

The following actions would be necessary to implement each program alternative:

- **For Alternative 1: Approved Hold in Place**, we may need to draft new regulations, policies, permits, or guidance on proper storage of AFFF for fire departments. We may need to acquire approval from the receiving state before foam disposal can proceed. We may also need to develop a treatment, storage, and disposal permit.

- **For Alternative 2: Incineration**, we would authorize our existing waste contractor to transport AFFF to either the Clean Harbors facility in Aragonite, Utah, or the Kimball facility in Nebraska for incineration.

- **For Alternative 3: Solidification and Landfilling and Alternative 4: Class I Deep Well Injection**, we would solicit bids from qualified dangerous waste contractors. This process would include public notice, a request for bids, transparent bid review, announcement of the chosen hazardous waste transporter/disposal company, and opportunity to challenge or review the selected bid.

We would require existing or newly selected hazardous waste transporter/disposal companies to adhere to all local, state, and federal rules for regulated waste collection, transport, and disposal. This includes, but is not limited to:

- Compliance with U.S. Department of Transportation transporter permits, regulations, and spill response plans.

- U.S. Environmental Protection Agency (EPA) Air and Water Quality discharge permits.

- Washington's dangerous waste rules.

[19] https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf
[20] H.R.2467 - PFAS Action Act of 2021. https://www.congress.gov/bill/117th-congress/house-bill/2467

- ► Other states' regulated waste rules.

Finally, prior to foam collection, we would enter into participation agreements with fire departments taking part in the program. We would gather updated foam inventories, including foam volume, the number of containers and their sizes, and the foam locations. Participating fire departments would also be required to file all required dangerous waste paperwork with Ecology. Some fire stations may also be required to apply for an EPA Site ID number, if they do not already have one.

Significance Determination

Our analysis determined that none of the proposed alternatives would result in significant adverse impacts to communities or natural resources. Alternatives 2, 3 and 4, will not adversely affect natural resources, communities, and Tribes' usual and accustomed areas or treaty rights when appropriate mitigation measures are implemented.

What Happens Next?

The public comment period for this DEIS is open from December 20, 2023, to February 5, 2024. After the comment period ends, we'll review and consider all comments received. We may make changes based on your comments. We plan to issue the Final Environmental Impact Statement in May 2024.

How to Submit Comments

You may submit comments from December 20, 2023, to February 5, 2024.

Online: ecology.wa.gov/AFFF-Public-Comment

Email: AFFFDisposal@ecy.wa.gov

Mail: Washington State Department of Ecology
Attn: Sean Smith
P.O. Box 330316
Shoreline, WA 98133-9716

1 INTRODUCTION AND BACKGROUND

1.1 Statement of Purpose and Need

Aqueous film-forming foam (AFFF) is used by fire departments to put out fires fueled by flammable liquids (such as those started by oil or gasoline). AFFF is concerning because it contains per- and polyfluoroalkyl substances (PFAS). These toxic chemicals do not break down easily, and they can negatively impact human health and the environment.

In 2018, Washington passed a law that restricts AFFF manufacture, sale, and use for training. This leaves municipal fire departments and other first responders with on-site stockpiles of AFFF that they may never use.

In response, Washington State Department of Ecology (Ecology, we) proposed the Aqueous Film-Forming Foam Collection and Disposal Program, intended to help fire departments safely dispose of stockpiles of AFFF at no cost to participants. The Washington Legislature appropriated funds for this program because it recognizes the threat AFFF and PFAS pose to the state's environment and public health.

This Draft Programmatic Environmental Impact Statement (DEIS) provides the environmental and public health information needed for an informed and transparent decision on how to safely dispose of AFFF stockpiled at the state's municipal fire departments.

1.2 Project History

1.2.1 2018

The Washington State Legislature recognized that AFFF containing PFAS posed a threat to public health and the environment. It responded by passing the Firefighting Agents and Equipment law.[21] This law was among the first in the nation to restrict PFAS in firefighting foam and personal protective equipment. It also prohibits firefighters from using this foam for training and, with certain exceptions, its sale and manufacture in the state.

The Legislature recognized the burden these restrictions place on the fire departments, including the safe disposal of their PFAS-containing foam stockpiles. In response, it appropriated money for Ecology to spend on an AFFF collection, transport, and disposal program. This program's intent is to dispose of the foam safely and effectively for fire departments, as soon as feasible.

1.2.2 Spring 2019

With the assistance of the Washington Fire Marshall's office and the Washington Fire Chiefs Association, we sent an electronic survey to the more than 400 fire departments in the state. The survey asked whether the individual department has PFAS-containing AFFF and inquired as

[21] Firefighting Agents and Equipment—Toxic Chemical Use law (Chapter 70A.400 RCW)

to its location, amount, and condition. The survey asked if the fire department wished to participate in the disposal program administered by Ecology.

Over 100 fire departments completed the survey and identified roughly 59,000 gallons of AFFF for disposal. This foam is currently held at participating fire departments throughout the state and is stored in various containers, from 5-gallon buckets to 1,000-gallon tanks.

After reviewing fire department survey responses, we began planning a program to collect the AFFF and dispose of it through incineration at a pre-selected facility. Specifically, the proposed program intended to send the foam to the existing Clean Harbors Incineration Facility in Aragonite, Utah.

Consistent with regulatory requirements, Ecology completed a State Environmental Policy Act (SEPA) environmental checklist review of the proposed program and issued a Determination of Non-Significance (DNS) for public review (Ecology 2020).

1.2.3 September–October 2020

Ecology held a public comment period to solicit comments on its SEPA environmental checklist[22] and the DNS. Ecology received ten letters totaling 325 pages of comments during the comment period.

1.2.4 January–February 2021

After reviewing DNS public scoping comments, on January 15, 2021, Ecology decided to withdraw its DNS (Ecology 2021a) and initiate an environmental analysis of AFFF collection, transport, and disposal alternatives. On January 19, 2021, Ecology issued a Determination of Significance (DS), finding that the foam disposal program could potentially generate significant adverse impact(s) to the environment. Consistent with state law, Ecology determined that an EIS was required to assess the environmental concerns associated with various collection, treatment, and disposal alternatives (Ecology 2021b).

Ecology invited the public to provide comments during a second comment period, addressing both the DS and the potential scope of the EIS. The purpose of this comment period was to gather feedback on potential project alternatives, mitigation measures, potential adverse impacts, and other information to help develop the scope of the additional environmental review. The comment period ended on February 19, 2021. An overview of EIS scoping activities is provided in Chapter 6, and the scoping comment summary report is included in Appendix A.1.

1.2.5 May 2021

In May 2021, Ecology issued guidance to participating fire departments[23] on how to use, store, and (if necessary) dispose of the foam to facilitate proper management of AFFF stockpiles during EIS development. The guidance was revised in June 2022.

[22] WAC 197-11-960

[23] https://apps.ecology.wa.gov/publications/SummaryPages/2104031.html

1.2.6 June–November 2021

During the summer of 2021, Ecology completed a Request for Quotes and Qualification bid process and selected TRC to prepare the EIS report. Work on the EIS began November 21, 2021.

1.3 PFAS Toxicity, Persistence, and Environmental Mobility

PFAS are a family of more than 9,000 synthetic organic chemicals. Their molecular structures are characterized by a chain of carbon atoms, each or some of which are bonded to fluorine atoms. These carbon-fluorine bonds are among the strongest in chemistry, don't readily break down, and give PFAS their notable environmental stability and persistence.

PFAS withstand high temperatures and resist oil, grease, and water. They're used to manufacture coatings, surface treatments, and specialty chemicals in cookware, carpets, food packaging, clothing, cosmetics, and other common consumer products. PFAS also have many industrial applications and are an active ingredient in AFFF.

Some PFAS compounds are less stable and break down in the environment; these are referred to as precursors. When these precursors transform, it is often into stable and persistent PFAS, such as perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) (Buck et al., 2011; ITRC 2022a, b).

If released into the environment, PFAS can contaminate soil, sediment, surface water, and groundwater. Many PFAS are highly mobile and, due to their unique structures, can strongly sorb[24] to soils and sediments. If PFAS compounds reach groundwater or surface water, they can travel long distances due to their chemical stability.

In general, shorter-chain compounds (typically six or fewer carbons in the chain), are more mobile in water. Longer-chain compounds (typically eight or more carbons in the chain), are less mobile, more readily sequestered in soil and sediment, and generally travel limited distances from their point of origin.

PFOS and PFOA are the most widely studied PFAS. However, the state of the science continues to rapidly evolve, with considerable information now available for perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), perfluorobutanoic acid (PFBA), perfluorobutanesulfonic acid (PFBS), and hexafluoropropylene oxide dimer acid (HFPO-DA, also known as GenX).

Through various laboratory animal toxicology studies and human epidemiology studies, several health effects have been reported, including liver effects, immunological effects, developmental effects, endocrine effects, reproductive effects, cardiovascular effects, and cancer (PFOA only) in both animals and humans.

[24] To take up and hold by either adsorption or absorption.

1.4 AFFF History and Use

1.4.1 Use of PFAS in AFFF

Class B firefighting foams are used to put out fires fueled by flammable liquids, such as oil, gas, or solvents. There are two broad categories of Class B foam:

- Fluorinated foams that contain PFAS (such as AFFF)
- Fluorine-free foams (FFF)

AFFF is the most widely used and available type of Class B foam. AFFF formulations have been used since the late 1960s.

PFAS in AFFF lowers the foam's surface tension and allows the AFFF to spread more efficiently, meaning better control of the fire. AFFF concentrates are usually sold and applied as 3 or 6 percent concentrations by volume. This results in high concentrations of PFAS that may enter the environment during firefighting, fire training, fire truck accidents, or equipment malfunction. Thousands of gallons of firefighting foam solution may be applied during a given fire. As a result, AFFF is a primary source of PFAS in the environment.

1.4.2 Categories of AFFF

All legacy and current use AFFF contain complex mixtures of PFAS, but those mixtures have changed over time. Legacy AFFF mixtures contained long-chain PFAS. In contrast, current use AFFF is reported by manufacturers to consist exclusively of short-chain PFAS. The use of AFFF for firefighting, emergency response, and firefighter training (as well as the production and use of many PFAS-containing commercial and industrial products) has resulted in detectable concentrations of PFAS in soils, sediments, groundwater, surface water, and wildlife throughout the United States and the world. AFFF formulations are complex and proprietary. However, they can be generally divided into three categories:

- **Legacy PFOS-based AFFF:** "First-generation" AFFF formulations where PFOS is an active ingredient. 3M manufactured these formulations through electrochemical fluorination and sold them under the brand name Light Water™ in the United States from the 1970s to 2002.
- **Legacy fluorotelomer-based AFFF:** "Second-generation" AFFF formulations containing precursors and long-chain PFAS (such as PFOA). These were manufactured in the United States from 1970s to 2016.
- **Modern fluorotelomer-based AFFF:** AFFF formulations containing four- and six-carbon fluorotelomer chemistries (short-chain), developed in response to the PFOA

Stewardship Program.[25] These AFFF formulations are currently commercially sold in the United States market.

1.4.3 AFFF Sources and Transport in the Environment

AFFF has been—and continues to be—stored and used at military installations, industrial facilities, petroleum refineries, airports, and municipal fire stations. Military and commercial airport AFFF applications historically subject to the Department of Defense (DoD) Mil-Spec (military specification) MIL-PRF-24385[26] account for more than 75 percent of AFFF used in the United States. The collection, transport, and disposal of military and commercial airport AFFF stockpiles, however, are outside the scope of this EIS.

PFAS are often found in the environment in multiple areas on sites where AFFF was applied, stored, or released. These areas include emergency response locations, fuel spill areas, hazardous waste storage facilities, hangar-related AFFF storage tanks and pipelines, firefighting equipment test areas, stormwater and/or surface water drainage features, and outfalls. Landfills that received AFFF and wastewater treatment plants that receive stormwater and landfill biosolids may become secondary sources. AFFF is responsible for some of the largest PFAS releases to the environment. These are also the most complex, costly, and difficult to investigate and remediate.

When AFFF was historically used, the foam residual wasn't always collected or pretreated prior to discharge, and may have reached drinking water sources, such as groundwater and surface water. PFAS-containing Class B firefighting foam has been associated with drinking water contamination in Washington. In their risk-based efforts to identify and mitigate PFAS in drinking water, both the military and Washington Department of Health focused on firefighting foam release sites.

However, Class B firefighting foam isn't the only likely source of PFAS in state drinking water. Other states expanding testing for PFAS in drinking water identified manufacturing and commercial facilities as other potential sources.

1.5 Environmental Policy and Regulatory Setting

Numerous regulations, laws, and treaty obligations have guided the development of this DEIS. Because this is a programmatic EIS and the specific method of AFFF collection, transport, and disposal remains undetermined, a comprehensive list of potential required permits, licenses, and approvals cannot be provided. However, Chapter 3.9 of this EIS offers crucial insights into tribal treaties and federal management areas within the AFFF study area. An overview of existing state and local regulations and authorizations are discussed below.

Of the five proposed alternatives analyzed in this DEIS, four (incineration, solidification and landfilling, deep well injection, and no action) do not require Ecology to secure additional permits, licenses, or approvals. Regardless of the chosen alternative, we will conduct necessary

[25] PFOA Stewardship Program, EPA docket EPA-HQ-OPPT-2006-0621. https://www.regulations.gov/docket/EPA-HQ-OPPT-2006-0621

[26] In January 2023, a new Mil-Spec, MIL-PRF-32725, was issued; see Section 1.5.1.

engagement, consultations, and coordination with federally recognized Tribes. In addition, for all alternatives except the no action alternative, we will adhere to the state's regional spill response plans before foam collection, including mandatory communication and coordination with federal, state, Tribal, and local partners.

More information on each disposal option can be found in Chapter 2: Project Description and Alternatives.

If Alternative 1: Approved Hold in Place is used prior to collecting the foam, Ecology could be required to draft new regulations, policies, permits, and/or procedures to properly manage the waste. Under this alternative, the foam would be held at fire stations until such time as emerging technologies are available. If Ecology were to select this alternative, it may require the foam's final disposal at a non-RCRA permitted facility outside of Washington. In that case, Ecology must obtain prior written approval from the receiving state's relevant regulatory agency.

For the implementation of Alternative 1: Approved Hold in Place, Alternative 3: Solidification and Landfilling, and Alternative 4: Deep Well Injection, Ecology will solicit Requests for Qualifications and Quotes from qualified dangerous waste contractors. This procedure will include public notice and a request for bids, a transparent bid review, the announcement of the chosen hazardous waste transporter/disposal company, and the opportunity to challenge or review the selected bid.

Ecology will require the selected hazardous waste transporter/disposal company to adhere to all local, state, and federal rules for hazardous waste collection, transport, and disposal. This includes, but is not limited to, compliance with U.S. Department of Transportation transporter permits, regulations, and spill response plans, Environmental Protection Agency Air and Water Quality discharge permits, Washington's dangerous waste rules, and other states hazardous waste rules.

Finally, prior to the foam's collection, Ecology will enter into participation agreements with fire departments/entities taking part in the program and gather updated foam inventories including foam volume, the number of containers and their sizes, and foam locations. Participating fire departments will also be required to file with Ecology all required dangerous waste paperwork, such as the Episodic Generation Form, prior to the foam's collection. Some departments may also be required to apply for an EPA Site ID number, if they do not already have one. Visit Ecology's website for guidance on the episodic generation of dangerous waste.[27]

PFAS environmental policy and regulations are continually changing at the national and state levels. We described the policies and regulations applicable to this EIS in the sections below; they're current as of the date of issuance of this DEIS. We identified anticipated potential future policies and regulations regarding PFAS where possible and relevant.

[27] https://ecology.wa.gov/Regulations-Permits/Reporting-requirements/Dangerous-waste-reporting-requirements/Notification-of-dangerous-waste/Episodic-generation

1.5.1 National

The United States Environmental Protection Agency (EPA) is responsible for determining policy and establishing federal regulations for PFAS to safeguard public health and protect the environment. In their February 2019 PFAS Action Plan (EPA 2019), EPA explained they plan to address PFAS by both:

- Reducing or restricting PFAS from entering the environment.
- Broadening and accelerating the remediation of PFAS-impacted air, water, and soil.

The EPA outlined planned actions for PFAS for 2021 through 2024 in their October 2021 PFAS Strategic Roadmap.

Below, we discuss existing and near-term anticipated federal policies and regulations addressing PFAS that are potentially applicable to this DEIS. This discussion isn't meant to be a comprehensive listing of all existing and potentially upcoming federal PFAS regulations.

1.5.1.1 Clean Water Act and Safe Drinking Water Act

The Clean Water Act (CWA) of 1972 is the primary federal law governing water pollution. Its objective is to restore and maintain the chemical, physical, and biological integrity of the nation's waters.

The Safe Drinking Water Act (SDWA) is the principal federal law Congress passed in 1974 (and amended in 1986 and 1996) to ensure safe public drinking water. Under the SDWA, the EPA sets the drinking water quality and monitoring standards. EPA also oversees local regulatory agencies and water suppliers who enforce those standards.

In March 2023, EPA published a proposed national primary drinking water regulation. The proposed regulation includes maximum contaminant level goals (MCLGs) in drinking water for six PFAS and maximum contaminant levels (MCLs) for PFOA and PFOS, shown in Table 1-1. The public comment period for the proposed regulation ended on May 30, 2023, and EPA anticipates finalizing the regulation, in full or in part, by the end of 2023. The EPA has also published drinking water health advisory levels, shown in Table 1-1.

TABLE 1-1: EPA and State Drinking Water Criteria

Chemical	EPA Proposed MCLG[a]	EPA Proposed MCL[a] ng/L[b] (ppt)[c]	EPA Health Advisory ng/L (ppt)	State Action Level[d] ng/L (ppt)
PFBS	see Note a	see Note a	2,000 (final)	345
PFHxS	see Note a	see Note a	not available	65
PFNA	see Note a	see Note a	not available	9
GenX	see Note a	see Note a	10 (final)	not available
PFOS	zero	4.0	0.02 (interim)	15
PFOA	zero	4.0	0.004 (interim)	10

Table Notes: Adapted from EPA's Technical Fact Sheet: Drinking Water Health Advisories for Four PFAS (PFOA, PFOS, GenX chemicals, and PFBS), number 822-F-22-002, published June 15, 2022 (https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P10154ST.txt); and from EPA's Proposed PFAS National Primary Drinking Water Regulation webpage (https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas).

[a] MCLG = maximum contaminant level goal. MCL = maximum contaminant level. EPA is proposing MCLGs and MCLs for six PFAS in drinking water: PFOA and PFOS as individual contaminants, and PFHxS, PFNA, PFBS, and GenX as a PFAS mixture hazard index of 1.0. Details are provided on the website cited above, and also in the March 29, 2023 EPA document: https://www.epa.gov/system/files/documents/2023-04/PFAS%20NPDWR%20Public%20Presentation_Full%20Technical%20Presentation_3.29.23_Final.pdf.

[b] ng/L = nanograms per liter.

[c] ppt = parts per trillion.

[d] Washington Board of Health state action level (SAL) shown for comparison and discussed in Section 1.3.2.

MCLGs and health advisories are non-enforceable. They're established to provide information on contaminants that can cause human health effects and are known to occur in drinking water. The MCLs, if adopted after public comment review by EPA, will be enforceable limits.

Between May 2022 and November 2023, EPA added 14 PFAS to a list of risk-based values for site cleanups, shown in Table 1-2. These values, known as Regional Screening Levels (RSLs), help the EPA determine if response or remediation activities are needed. The RSLs aren't cleanup goals and aren't enforceable.

TABLE 1-2: EPA's Regional Screening Levels[c]

Chemical	Residential Soil (mg/kg)[a]	Industrial Soil (mg/kg)	Tap Water ng/L[b] (ppt)	Soil for Protection of Groundwater (mg/kg)
PFOS	0.13	1.6	40	3.1 x 10-4
PFOA	0.19	2.5	60	9.1 x 10-4
PFNA	0.19	2.5	59	2.5 x 10-4
PFHxS	1.3	16	390	1.7 x 10-4
HFPO-DA (GenX)	0.23	3.5	15	1.5 x 10-5
PFBS	19	250	6,000	3 x 10-3
PFBA	78	1,200	18,000	6.5 x 10-3
PFHxA	32	410	9,900	2.4 x 10-3
PFDoDA	3.2	41	1,000	1.7 x 10-1
PFODA	2,500	33,000	800,000	220
PFPrA	39	580	9,800	2.1 x 10-3
PFTetA	63	820	20,000	9.4
PFUDA	19	250	6,000	4.5 x 10-2
TFSI	23	350	5,900	1.9 x 10-3

Table Notes

[a] mg/kg = milligrams per kilogram.

[b] ng/L = nanograms per liter (also parts per trillion).

[c] For target cancer risk of 1.0 x 10^{-6} and target hazard quotient of 1.0; see EPA's Regional Screening Level Summary Table (TR=1E-06, HQ=1) November 2023 (https://semspub.epa.gov/work/HQ/404330.pdf).

As part of the PFAS Strategic Roadmap, EPA published draft water quality criteria for PFOA and PFOS in April 2022. The criteria are intended to be protective of fish, invertebrates, and other aquatic life. Similar to the drinking water criteria and screening levels listed in Tables 1-1 and 1-2, the water quality criteria are non-enforceable. The criteria are summarized in Table 1-3.

TABLE 1-3: Water Quality Criteria for PFOA and PFOS

Criteria Component	Acute Water Column (CMC)[a]	Chronic Water Column (CCC)[b]	Invertebrate Whole Body	Fish Whole Body	Fish Muscle
PFOA Magnitude	49 mg/L	0.094 mg/L	1.11 mg/kg ww[c]	6.10 mg/kg ww	0.125 mg/kg ww
PFOS Magnitude	3.0 mg/L	0.0084 mg/L	0.937 mg/kg ww	6.75 mg.kg ww	2.91 mg/kg ww
Duration	1 hour average	4-day average	Instantaneous	Instantaneous	Instantaneous
Frequency	Not to be exceeded more than once in three years, on average	Not to be exceeded more than once in three years, on average	Not to be exceeded more than once in 10 years, on average	Not to be exceeded more than once in 10 years, on average	Not to be exceeded more than once in 10 years, on average

Table Notes

[a] CMC is criterion maximum concentration.

[b] CCC is criterion continuous concentration.

[c] ww is wet weight.

In April and December 2022, the EPA issued memos that outlined permitting mechanisms to restrict PFAS discharges from industrial sources by both:

- Leveraging federally issued National Pollutant Discharge Elimination System (NPDES) discharge permits.
- Issuing guidance to state permitting authorities to address PFAS in state-issued NPDES permits.

The guidance included PFAS sampling and implementing best management practices (BMPs) to reduce PFAS in discharges. The EPA is also working on developing numeric effluent limitations guidelines (ELGs) for wastewater.

Lastly, under the SDWA, the EPA previously required monitoring for six PFAS in public drinking water systems in the United States through the third Unregulated Contaminant Monitoring Rule, issued May 2, 2012. On December 27, 2021, the EPA issued the fifth Unregulated Contaminant Monitoring Rule, which requires the collection of 29 additional PFAS from public water systems between 2023 and 2025.

1.5.1.2 Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), also known as Superfund, is designed to investigate and clean up sites contaminated with hazardous substances.

On August 26, 2022, the EPA issued a proposal to designate PFOS and PFOA as hazardous substances under CERCLA. This rulemaking is in process. If completed, it would increase transparency around releases of PFAS and ultimately facilitate cleanup of sites contaminated with PFOS and PFOA.

1.5.1.3 National Defense Authorization Act

The National Defense Authorization Act (NDAA) specifies the annual budget and expenditures for the DoD and establishes policies applicable to the DoD. Since 2020, the NDAA has included several PFAS provisions, such as:

- Prohibiting the DoD from using PFAS-containing AFFF during training exercises.
- Requiring the DoD to phase out PFAS-containing AFFF by 2024.
- Requiring the United States Geological Survey to carry out a nationwide sampling of PFAS in surface water, groundwater, and soil.

As directed under the NDAA, the EPA issued their Interim Guidance on the Destruction and Disposal of PFAS and Materials Containing PFAS (EPA 2020a). In this document, EPA tentatively recommends four approaches in order of uncertainty (lowest to highest) for disposal of PFAS:

- Interim storage, pending development of other disposal options.
- Injection into permitted deep wells (Class I) for liquid waste streams.
- Disposal in Resource Conservation and Recovery Act (RCRA) Subtitle C permitted hazardous waste landfills, which have stringent environmental controls for managing hazardous waste.
- Disposal in RCRA Subtitle D non-hazardous waste landfills with composite liners and leachate collection treatment systems.

Other potential options discussed in EPA's document (having greater uncertainty than those listed above) are hazardous waste combustors and other thermal treatment devices, including hazardous waste incinerators. Such devices can achieve 99.9999 percent destruction (for non-PFAS wastes) and are, in fact, required to achieve this percent destruction for certain wastes (for example, see 40 CFR Section 264.342).

PFAS destruction with these treatment devices remains uncertain due to concerns about products of incomplete combustion (PICs) and release of non-PFAS pollution. EPA is conducting research and gathering information to conclude whether PICs are adequately controlled by existing incinerators in the United States.

In April 2022, under the NDAA, the DoD issued a temporary moratorium on the incineration of PFAS materials, including AFFF. In July 2023, the DoD published guidance[28] seeking to lift this moratorium.

As of January 2023, the DoD is requiring any new firefighting foam they buy to be made without PFAS and published a new Mil-Spec (MIL-PRF-32725). That same month, the Federal Aviation Administration adopted the new Mil-Spec[29] authorizing the use of fluorine free foams at applicable airports.

1.5.2 Washington State

1.5.2.1 AFFF Disposal—Regulatory Roadmap and Overview

In Washington, unused commercial and Mil-Spec AFFF stored at municipal fire stations, airports, and military facilities would be designated as a state-only dangerous waste once the product can no longer be used as-is or cannot be used due to legal restrictions (such as bans or moratoriums) and is determined to be a waste.[30]

The distinction between a product and waste is important, because the state dangerous waste regulations and federal RCRA regulations apply only to solid wastes and not products. Once the AFFF is determined to be a waste, certain requirements must be followed based on the generator category of the facility generating the waste.

AFFF waste would be considered a persistent criteria state-only waste based on the percentage of halogenated organic compounds (HOCs) present.[31]

- If the AFFF contains between 0.01 and 1.0 percent of HOCs, then the waste designation would be persistent waste (WP02).
- If the AFFF contains greater than 1.0 percent HOCs then the waste would designate as WP01 and qualify as an Extremely Hazardous Waste (EHW).

WP01 criteria listing affects how the waste may be disposed of as it relates to the state land disposal restrictions (Ecology 2022a).[32]

With very few exceptions, state-only dangerous waste generators aren't allowed to treat their waste on site. As defined in the Washington Administrative Code (WAC),[33] treatment means the physical, chemical, or biological processing of dangerous waste to make such wastes non-dangerous or less dangerous, safer for transport, amenable for energy or material resource

[28] https://www.acq.osd.mil/eie/eer/ecc/pfas/docs/news/Memorandum-for-Incineration-Prohibition-Policy-Update.pdf
[29] https://www.faa.gov/sites/faa.gov/files/part-139-cert-alert-23-01-F3.pdf
[30] WAC 173-303-100: Dangerous Waste Criteria.
[31] WAC 173-303-100(6)
[32] WAC 173-303-140(4)(a)
[33] WAC 173-303-040

recovery, amenable for storage, or reduced in volume, with the exception of compacting, repackaging, and sorting.[34]

1.5.2.2 PFAS Chemical Action Plan

In November 2021, the State of Washington published its PFAS chemical action plan (CAP). The CAP identified the potential health and environmental effects of PFAS chemicals and recommended strategies to reduce or eliminate those impacts in Washington. CAP recommendations relevant to this EIS include:

- Identifying funding and providing technical support for investigation and treatment of PFAS-contaminated drinking water and site sources, including human health impact studies.
- Establishing PFAS cleanup levels for five PFAS (PFOA, PFOS, PFNA, PFHxS, and PFBS) in soil and groundwater, and eventually in sediment and surface water.
- Focusing on PFAS communications, especially to overcome barriers in low-income and other historically overburdened communities.
- Preventing PFAS releases from firefighting foam use and manufacturing.
- Understanding and managing PFAS in waste streams, including wastewater treatment plants, landfills, and biosolids.

1.5.2.3 Other Actions

As discussed in Section 1.2: Project History, Washington enacted legislation to restrict the use of Class B firefighting foam through the Firefighting Agents and Equipment law (chapter 70A.400 RCW). This established Class B firefighting foam restrictions, which contain intentionally added PFAS chemicals.

- As of July 1, 2018, the law prohibited the use of Class B firefighting foam for training.
- As of July 1, 2020, the law prohibited the manufacture, sale, and distribution of Class B firefighting foam.[35]

In November 2021, the Washington State Board of Health adopted state action levels (SALs) for five PFAS in drinking water (under chapter 246-290 WAC[36]). PFAS levels are measured in parts per trillion (ppt).

- PFOA (10 ppt)

[34] All unused AFFF waste collected under this disposal program will likely designate as WP01/EHW, because the HOC concentrations present in all AFFF formulations researched were found to be greater than 1 percent.

[35] This law doesn't require disposal of unused PFAS-containing foam and doesn't restrict its use in emergencies involving flammable liquid fires.

[36] https://apps.leg.wa.gov/wac/default.aspx?cite=246-290.

- PFOS (15 ppt)
- PFNA (9 ppt)
- PFBS (345 ppt)
- PFHxS (65 ppt)

This action requires water suppliers to test for PFAS, provide public notification of SAL exceedances, and possibly take other action. Unlike MCLs, SALs aren't enforceable drinking water limits. MCLs haven't been set for PFAS by the EPA or Washington State.

In July 2022, 15 new hazardous substances, including six PFAS compounds, were added to Clean-up Levels and Risk Calculation under the Model Toxics Control Act (MTCA), Washington's environmental cleanup law compendium. Until further notice, the PFAS cleanup levels, listed below in Table 1-4, are considered preliminary screening levels at cleanup sites.

In December 2022, Ecology (2022c) published *Draft Guidance for Investigating and Remediating PFAS Contamination in Washington State*. Among other items, the document establishes protective concentrations for ecological receptors in marine waters, freshwater, and uplands soils. The guidance is based on a literature review for 10 PFAS chemicals. Table 1-5 lists the draft concentrations.

TABLE 1-4: Model Toxics Control Act Preliminary Soil and Groundwater Cleanup Levels (CULs) for New PFAS Compounds

Chemical	Groundwater CUL (ng/L)	Soil CUL Protective of Groundwater (ng/kg), Vadose Zone	Soil CUL Protective of Groundwater (ng/kg), Saturated Zone	Soil Direct Contact CUL (mg/kg), Method B	Soil Direct Contact CUL (mg/kg), Method C
Perfluorootanoic acid (PFOA)	10	63	4	0.24	11
Perfluorootane sulfonic acid (PFOS)	15	170	9.9	0.24	11
Perfluorononanoic sulfonic acid (PFNA)	9	80	4.8	0.02	8.8
Perfluorohexane sulfonic acid (PFHxS)	65	410	26	0.78	34
Perfluorobutane sulfonic acid (PFBS)	345	1,800	120	24	1,100
Hexafluoropropylene oxide dimer acid (HFPO-DA; GenX)	24	100	7.2	0.24	11

Table Notes

ng/kg = nanograms per kilogram.

ng/L = nanograms per liter.

mg/kg = milligrams per kilogram.

TABLE 1-5: PFAS Concentrations Protective of Ecological Receptors in Surface Waters and Upland Soils

Contaminant	Organism	PFBS	PFDA	PFNA	PFHxA	PFHxS	PFOA	PFOS	PFBA	PFUnA	PFDoA
Marine (µg/L)	Invertebrates	1.27+05	7.80E+01	1.04E+01	X	X	5.94E+02	3.30E+01	X	X	X
Marine (µg/L)	Fish	X	X	X	X	X	1.50E+03	1.50E+01	X	X	X
Marine (µg/L)	Other	X	X	X	X	X	1.19E+02	1.10E+00	X	X	X
Marine (µg/L)	Total Protection	1.27+05	7.80E+01	1.04E+01	X	X	1.19E+02	1.10E+00	X	X	X
Freshwater (µg/L)	Invertebrates	5.02E+05	1.00E+01	8.00E+00	7.24E+05	X	4.91E+01	2.30E+00	8.30E+02	100E+01	2.00E+01
Freshwater (µg/L)	Fish	8.88E+05	X	1.00E+01	6.28E+03	X	8.28E+00	5.00E+00	X	X	X
Freshwater (µg/L)	Other	1.08E+06	X	X	5.00E+04	1.00E+01	5.00E+03	1.00E+02	X	X	X
Freshwater (µg/L)	Total Protection	5.02E+05	1.00E+01	8.00E+00	6.38#+03	1.00E+01	8.28E+00	2.30E+00	8.30E+02	100E+01	2.00E+01
Uplands (mg/kg)	Plants	X	X	X	X	X	5.00E+01	X	X	X	X
Uplands (mg/kg)	Soil biota	X	X	X	X	X	2.50E+01	1.00E+02	X	X	X
Uplands (mg/kg)	Wildlife	2.02E+01	1.37E-01	2.06E-01	5.92E+01	3.49E-02	4.60E-01	7.84E-02	X	X	1.78E-01
Uplands (mg/kg)	Total Protection	2.02E+01	1.37E-01	2.06E-01	5.92E+01	3.49E-02	4.60E-01	7.84E-02	X	X	1.78E-01

Table Notes:

X = no protective concentration developed.

µg/L = micrograms per liter.

mg/kg = milligrams per kilogram.

1.6 Overview of EIS Process Under SEPA

SEPA provides guidance to state and local governments involved in environmental policy decisions. The SEPA process is intended to ensure that environmental values are considered during decision-making actions by state and local agencies. The process helps agency decision-makers, applicants, and the public understand how the proposed project will affect the environment. The environmental review process in SEPA is intended to work with other regulations and documents to provide a comprehensive review of a proposal.

Ecology prepared this DEIS under SEPA requirements described in chapter 43.21C RCW and chapter 197-11 WAC.

1.7 DEIS Organization

Ecology organized this DEIS to provide information in two ways:

- The Executive Summary provides quick, high-level information on key findings and significant impacts.
- The DEIS chapters provide details on technical methodology, impact analysis, and findings.

Here's an overview of this DEIS:

- Publication and Contact Information
- Table of Contents
- Cover Letter from Ecology
- Fact Sheet
- Executive Summary
- Chapter 1: Introduction and Background
- Chapter 2: Project Description and Alternatives
- Chapter 3: Affected Environment and Environmental Consequences
- Chapter 4: Mitigation Measures
- Chapter 5: Cumulative Impacts
- Chapter 6: Consultation and Coordination
- Chapter 7: References
- Chapter 8: Report Contributors

- Chapter 9: Acronyms/Glossary of Terms

1.7.1 Overview of Resource Topics

- Air Quality
- Greenhouse Gas Emissions
- Earth and Water Resources
- Aquatic Resources
- Terrestrial Species and Habitats
- Vegetation
- Human Health and Safety
- Cultural, Historical, and Archaeological Resources
- Tribal Resources
- Transportation and Truck Safety
- Environmental Justice
- Public Services and Utilities
- Cumulative Impacts

2 PROJECT DESCRIPTION AND ALTERNATIVES

2.1 Summary of Proposed Action

Ecology (we) propose a statewide program to collect, transport, and dispose of aqueous film-forming foam (AFFF) containing per- and polyfluoroalkyl substances (PFAS) used by municipal fire departments in Washington.

In 2019, the Washington State Legislature allocated funds authorizing Ecology to oversee the administration of a statewide program to collect, transport, and dispose of PFAS-containing firefighting foam currently owned by municipal fire departments and select state agencies. To implement alternatives 2, 3, or 4 described in Section 2.2, we will utilize a third-party contractor or contractors(s) to collect, transport, treat, and/or dispose of the foam. All Washington State municipal fire departments storing Class B foam may elect to participate at their individual discretion. The program is not specific to a particular site or location. Figure 2-1 shows locations of participating fire stations.

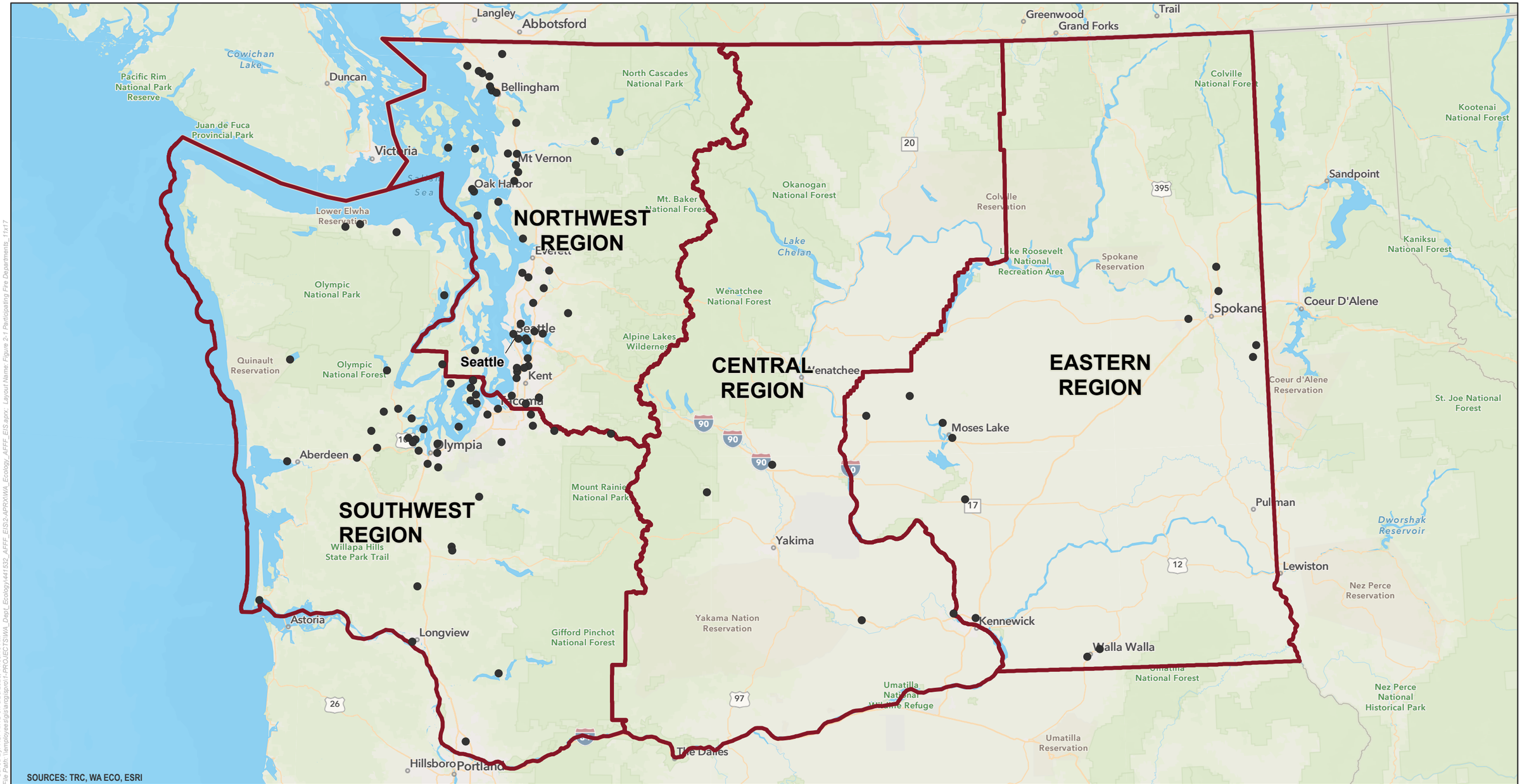
Because implementation of the proposed action could potentially generate adverse impacts on the environment, we prepared this Draft Environmental Impact Study (DEIS) in compliance with Washington's State Environmental Policy Act (SEPA). This chapter describes several options for the transport and disposal of AFFF. We analyzed the proposed alternatives with respect to potential adverse effects on human health and the environment.

The intent of this DEIS, as detailed in Chapter 1, is to provide sufficient information on the best options for AFFF disposal that align with the protection of human health and the environment. With this information, we will make an informed decision on which alternative or alternatives should be selected for implementation.

2.1.1 Ecology's Product Replacement Program and Washington State Fire Departments

In 2019, we, assisted by the State Fire Marshal's Office and Washington Fire Chief's Association, conducted a survey of 457 fire service agencies, seeking their interest in participating in a foam disposal program, as well as basic information about foam stockpiles. Over 100 fire departments in Washington have responded to the survey to date. We have identified roughly 59,000 gallons of PFAS-containing AFFF for disposal. Responding fire departments and AFFF locations are shown in Figure 2-1.

25-AUG-2023



LEGEND

- FIRE STATION STORING AFFF
- ECOLOGY REGIONS

FIGURE 2-1: WASHINGTON STATE PARTICIPATING FIRE DEPARTMENTS STORING AFFF

AFFF COLLECTION AND DISPOSAL PROGRAM
DRAFT ENVIRONMENTAL IMPACT STATEMENT

1:2,000,000
1" = 32 mi
0 25 50 MILES

DEPARTMENT OF ECOLOGY
State of Washington

TRC

The fire departments are depicted based on their physical location in Ecology's four administrative regions. Appendix A.2 lists the fire departments that responded to our request for information and interest in the proposed AFFF collection program.

2.1.2 Washington Fire Department AFFF Storage Inventory and Spill and Release Reporting

Washington has 457 fire service agencies (Washington State Fire Marshal's Office 2021). The 113 fire departments that responded to our 2019 survey stored the majority of AFFF in containers holding at least 55 gallons of foam. Approximately 25 percent of the fire departments currently store 25 gallons or less of PFAS-containing foam, 25 percent store between 50 and 100 gallons, and the remaining 50 percent report stockpiles of 100 to 500 gallons or more.

There are additional AFFF stockpiles at Washington's 11 commercial airports, as well as at military bases, refineries, terminals, and railyards. These stockpiles are likely equal to or greater than those stored at the fire departments. However, as mentioned in Chapter 1, environmental consequences associated with airports, military sites, and industrial sites is not within the scope of this EIS.

Table 2-1 lists 24 release incidents of PFAS-containing foam, including both firefighting application and spills, reported by Washington State fire departments between 2016 and 2021. The majority of incidents occurred in King County. Nine of these releases were spills, and quantities of AFFF released ranged from 0.096 to 280 gallons. Figure 2-2 shows the location of each release.

2.1.3 Dangerous Waste Treatment, Storage, and Disposal

Dangerous wastes,[37] as designated by Washington State, can be generated from the operation of machinery, structural maintenance, construction, laboratories, research activities, vehicles, manufacturing, and other institutional, commercial, or industrial activities. Key terms addressing the process of storing, disposing, and/or treating dangerous waste are as follows:

- **Facilities**: A facility includes all contiguous land, structures, and equipment on or in the land used for treating, storing, or disposing of dangerous waste. A single facility may consist of several types or combinations of operational units.
- **Treatment:** Treatment is defined as any method, technique, or process designed to change the physical, chemical, or biological character or composition of any dangerous waste so as to neutralize such waste, or so as to recover energy or material resources from the waste, or so as to render such waste non-dangerous, or less dangerous; safer to transport, store, or dispose of; or amenable for recovery, amenable for storage, or reduced in volume.

[37] WAC 173-303-100(6)

TABLE 2-1: State of Washington Fire Department AFFF Release Reporting (2016-2021)

Fire Station	Case Name	Incident Date	Address	City	County	Source Type	Affected Medium	Spill Quantity (GAL)
Belleview Fire Dept.	Bellevue Fire Dep. Fire Fighting Foam Spill	12/3/20	4216 Factoria Blvd SE	Bellevue	King	Vehicle	Land	20
Bellevue Fire Dept.	Bellevue Fire Fighting Foam Electronic Reporting Tool 59459	9/12/15	4385 150th Ave SE	Bellevue	King	Private Property	Land	1
Bellevue Fire Dept.	Bellevue Firefighting Foam Release	5/12/16	601 108th Ave NE	Bellevue	King	Vehicle	Impermeable surface	20
Bellevue Fire Dept.	Structural Fire Bellevue	10/24/16	100 100th Ave SE	Bellevue	King	Private Property	Fresh water	unknown
Bellevue Fire Dept.	AFFF to storm system	5/30/18	2050 89th Ave NE	Clyde Hill	King	Private Property	Land	15
Bellevue Fire Dept.	Vehicle fire fluid release Bellevue 5/1/19	5/1/19	1543 145th Pl SE	Bellevue	King	Vehicle	Land	6
Bellevue Fire Dept.	Vehicle fire release Bellevue 2/4/20	2/4/20	1543 145th Pl SE	Bellevue	King	Vehicle	Land	0.5
Bellingham Airport Fire Dept.	Bellingham Airport AFFF spill 8/7/21	8/7/21	2005 W Bakerview Rd	Bellingham	Whatcom	Vehicle	Impermeable surface	0.096
Bothell Fire Dept.	WWTF Foam (FFF) to catch basin Bothell 3/17/19	3/17/19	10726 Beardslee Blvd	Bothell	King	Facility	Impermeable surface	100
Bothell Fire Dept.	Firefighting foam release Bothell	3/16/18	10726 Beardslee Blvd	Bothell	King	Vehicle	Fresh water	1
Bothell Fire Dept.	Bothell AFFF	4/29/18	10445 NE 201st St	Bothell	King	Private Property	Land	25

Fire Station	Case Name	Incident Date	Address	City	County	Source Type	Affected Medium	Spill Quantity (GAL)
Bothell Fire Dept.	FFF to catch basin Bothell 3/17/19	3/17/19	10726 Beardslee Blvd	Bothell	King	Facility	Impermeable surface	100
Bothell Fire Dept.	AFFF Release Bothell 12/18/2019	12/18/19	10726 Beardslee Blvd	Bothell	King	Facility	Fresh water	280[a]
Kirkland Fire Dept.	ERTS# 649644 - 06/21/2014	6/21/14	I-405 Northbound & NE 116th St	Kirkland	King	Vehicle	Land	50
Mason County Fire District 16	MCFD 16 Container - Shelton 6-2-17	6/2/17	140 W Shelton Valley Rd	Shelton	Mason	Public Lands	Land	10[b]
Fire Training Academy AFFF Disposal North Bend	Fire Training Academy AFFF Disposal North Bend	7/3/18	50810 Grouse Ridge Rd	North Bend	King	Facility	Impermeable surface	0
Olympia Fire Dept.	Firestone Complete Autocare Fire - Olympia 11-28-18	11/28/18	2800 Harrison Ave NW	Olympia	Thurston	Facility	Fresh water	30
Redmond Fire Dept.	5-gallons firefighting foam to private drain 4/23/2019	4/15/19	4211 148th Ave NE	Bellevue	King	Vehicle	Land	5
Renton Fire Dept.	Firefighting foam release Renton	1/28/18	13265 89th Ave S	Renton	King	Private Property	Fresh water	18[c]
Richland Fire Dept.	Richland Cooking Oil to Storm Drain	8/4/19	1524 Jadwin Ave	Richland	Benton	Facility	Fresh water	20
Seattle Fire Dept.	Roxhill Park FFF Seattle	10/12/17	2850 SW Roxbury St	Seattle	King	Vehicle	Land	unknown
Seattle Fire Dept.	Firefighting Foam Release Seattle	5/11/18	42nd Ave SW & California Ave SW	Seattle	King	Facility	Land; improper procedure	unknown

Fire Station	Case Name	Incident Date	Address	City	County	Source Type	Affected Medium	Spill Quantity (GAL)
Shoreline Fire Dept.	Firefighting foam to Creek Shoreline	11/17/17	145 NE 155TH ST	Shoreline	King	Vehicle	Fresh water	unknown
Stevens County Fire District 1	Spruce Canyon Wildfire Support - Colville	7/26/21	990 S Cedar	Colville	Stevens	Facility	Fresh water	0

Table Notes

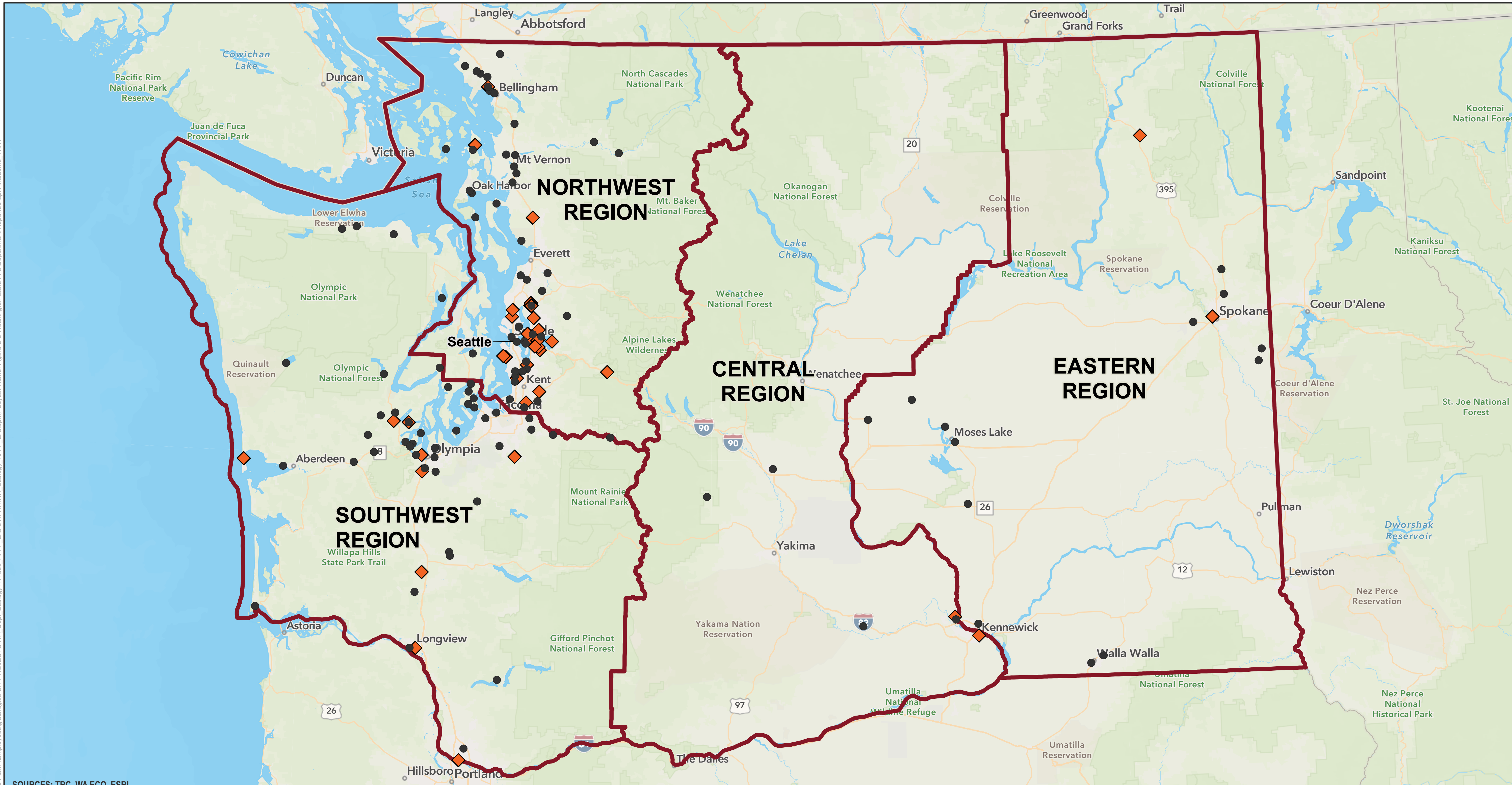
Source: Ecology's spills database.

[a] Mixture of foam and water unknown.

[b] Quantity indicates total volume of a container found at the fire station.

[c] Product spilled is reported as Novacool; non-PFAS.

10-OCT-2023


NORTHWEST REGION
CENTRAL REGION
EASTERN REGION
SOUTHWEST REGION
Seattle
Bellingham
Mt Vernon
Oak Harbor
Everett
Kent
Tacoma
Olympia
Aberdeen
Astoria
Longview
Portland
Hillsboro
The Dalles
Yakima
Wenatchee
Moses Lake
Kennewick
Walla Walla
Spokane
Pullman
Lewiston
Coeur D'Alene
Sandpoint
Langley
Abbotsford
Greenwood
Grand Forks
Trail
Duncan
Victoria
Cowichan Lake
Pacific Rim National Park Reserve
Juan de Fuca Provincial Park
Lower Elwha Reservation
Olympic National Park
Olympic National Forest
Quinault Reservation
Willapa Hills State Park Trail
North Cascades National Park
Mt. Baker National Forest
Okanogan National Forest
Lake Chelan
Wenatchee National Forest
Alpine Lakes Wilderness
Mount Rainier National Park
Gifford Pinchot National Forest
Yakama Nation Reservation
Umatilla National Wildlife Refuge
Umatilla Reservation
Umatilla National Forest
Colville Reservation
Colville National Forest
Lake Roosevelt National Recreation Area
Spokane Reservation
Coeur d'Alene Reservation
Kootenai National Forest
Kaniksu National Forest
St. Joe National Forest
Dworshak Reservoir
Nez Perce Reservation
Nez Perce National Historical Park
SOURCES: TRC, WA ECO, ESRI

LEGEND

- FIRE STATION STORING AFFF
- REPORTED AFFF SPILL INCIDENTS
- ECOLOGY REGIONS

FIGURE 2-2: WASHINGTON STATE FIRE DEPARTMENT REPORTED AFFF SPILL INCIDENTS (2016-2021)

AFFF COLLECTION AND DISPOSAL PROGRAM
DRAFT ENVIRONMENTAL IMPACT STATEMENT

N
1:2,000,000
1" = 166,667'
0 25 50 MILES

DEPARTMENT OF ECOLOGY
State of Washington

TRC

- **Storage**: Storage is defined as holding dangerous waste for a temporary period, at the end of which the dangerous waste is treated, disposed of, or stored elsewhere.

- **Disposa**l: Disposal is the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid or dangerous waste on or in the land or water. A disposal facility[38] is any site where dangerous waste is intentionally placed and at which the waste will remain after closure.

2.1.4 Regulatory Analysis of AFFF Waste in Washington State

In Washington, unused commercial and Mil-Spec (military specification) AFFF typically stored and used at municipal fire stations, airports, and military facilities is designated as a state-only dangerous waste once the product:

1. Can no longer be used as-is or cannot be used due to legal restrictions (such as bans or moratoriums); and
2. Is determined to be a waste.

The distinction between a product and waste is important, because the state dangerous waste regulations and federal regulations under the Resource Conservation and Recovery Act (RCRA)[39] only apply to solid wastes and not products. Once the AFFF is determined to be a waste, anyone who is defined as a generator of the waste is required to comply with the dangerous waste regulations.[40]

Dangerous waste management is regulated under Washington Administrative Code (WAC) 173-303-141. In Washington, only facilities with a dangerous waste permit may treat other businesses' dangerous waste or store dangerous waste on a long-term basis. Permitted facilities are often called treatment, storage, disposal, or recycling facilities (TSDs or TSDRs). Ecology is authorized by the EPA to implement and oversee the dangerous waste permitting process in Washington. The EPA authorizes TSDs and TSDRs permits throughout the United States. TSDs selected for evaluation in the DEIS are shown in Figure 2-3.

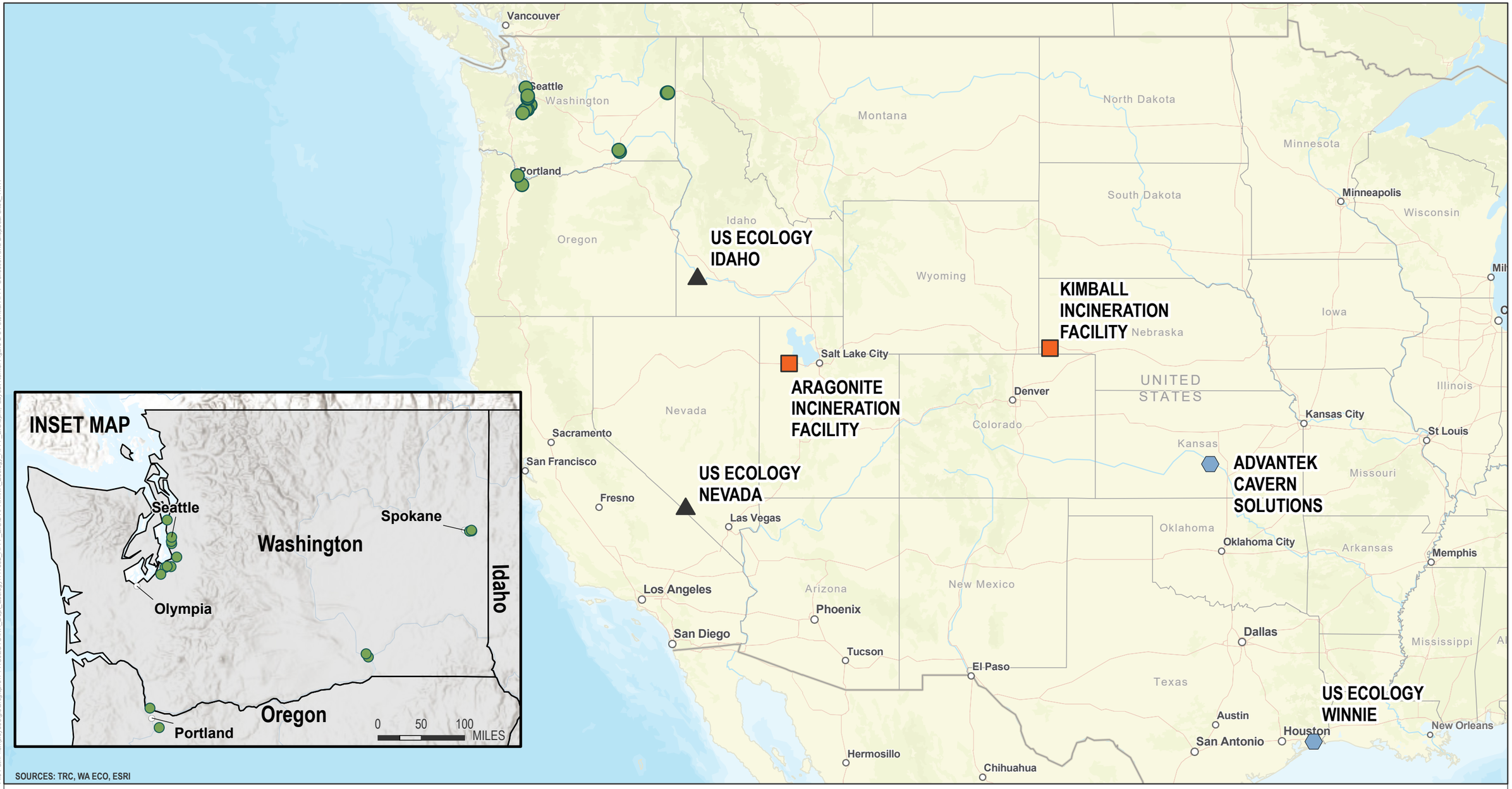
2.1.5 Dangerous Waste Handling, Treatment, and Disposal Service Requirements

2.1.5.1 General Requirements

Dangerous waste handling, treatment, and disposal service contractors in Washington agree to comply with all applicable federal, state, and local laws, regulations, rules, and standards and conditions of required permits, both in Washington and from regulatory authorities in states receiving hazardous and dangerous waste.

[38] WAC 173-303-170 and 173-303-171
[39] Code of Federal Regulations (CFR) parts 239 through 282
[40] WAC 173-303-040

25-AUG-2023



SOURCES: TRC, WA ECO, ESRI

LEGEND

- 10-DAY HOLD SITES
- INCINERATOR
- LANDFILL
- DEEP WELL INJECTION

FIGURE 2-3: POTENTIAL AFFF COLLECTION AND DISPOSAL SITES

AFFF COLLECTION AND DISPOSAL PROGRAM
DRAFT ENVIRONMENTAL IMPACT STATEMENT

1:15,000,000
1" = 1,250,000'
0 125 250 MILES

DEPARTMENT OF ECOLOGY
State of Washington

TRC

2.1.5.2 Permits and Licenses

Contractors must be licensed and permitted to handle, transport, and dispose of dangerous waste, and maintain any current licenses and permits necessary for compliance with federal, state, and local laws, regulations, rules, and standards. These include, but are not limited to, the following:

a) RCRA interim status or final status permits for TSDs or equivalent state permits.

b) EPA identification numbers and any permits necessary for transportation of dangerous waste in Washington and any other states through which wastes will be transported.[41]

2.1.5.3 Land Disposal

Waste handling service providers must comply with all aspects of the EPA's land disposal restrictions and treatment standards as promulgated from the Hazardous and Solid Waste Amendments of 1984 (as amended) and all subsequent amendments. Upon request, the contractor must assist contract users in preparing notifications, certifications, and related paperwork to fulfill land disposal restrictions and treatment standards.

Contractors must comply with all aspects of the EPA land disposal restrictions and treatment standards as promulgated from the RCRA Hazardous and Solid Waste Amendments of 1984 (as amended) and all subsequent amendments. RCRA Subtitle C establishes the national hazardous waste management program. This includes the identification and listing of hazardous wastes; standards applicable to generators and transporters and to owners and operators of TSDs; and provisions for permitting, inspections, and enforcement.[42]

2.1.5.4 Accidental releases

Contractors are solely responsible for any spills, leaks, or releases occurring as a result of actions by its personnel, including subcontractors. Contractors must provide all notifications and reports as specified by federal, state, and local laws, regulations, rules, standards, and permits. Dangerous waste handling and disposal requirements are available through the Washington Department of Enterprise Services. See Appendix A.3 for descriptions of dangerous waste TSDs in Washington. Appendix A.3 includes facility identification (ID) numbers with links to the EPA's Enforcement and Compliance History Online (ECHO) database. ECHO provides more information about a facility's location, reports, and compliance status.

Dangerous waste handling and disposal services are required to obtain and maintain any current licenses and permits necessary for compliance, including:

- ► RCRA interim status or final status permits or equivalent state permits, for transfer, storage, disposal facilities, and recycling facilities, if applicable.

[41] WAC 173-303-170 and 173-303-171

[42] Resource Conservation and Recovery Act (RCRA) and Federal Facilities. EPA website visited February 21, 2022. https://www.epa.gov/enforcement/resource-conservation-and-recovery-act-rcra-and-federal-facilities.

- ► EPA identification numbers and any permits necessary for transportation of dangerous waste in Washington and any other states through which wastes will be transported.

Regulatory compliance for TSD service providers in Washington is similar to federally permitted service providers under RCRA. However, Washington requires the use of different disposal technologies or special segregation and packaging of reactive dangerous wastes. These state requirements are more restrictive than federal requirements. Entities in Washington that generate dangerous waste must follow proper disposal procedures. Individual fire departments seeking to dispose of AFFF may need to determine if they classify as large quantity, medium quantity, or small quantity generators as specified in WAC 173-303-169. Disposal requirements may vary depending on the classification. We can advise qualifying fire departments on maintaining current generator status through the use of episodic generation rules.

Waste that cannot be accepted must either be rejected and returned to the generator or shipped to another facility that can appropriately store, treat, or dispose of the waste. For waste streams that are at the facility for a maximum of 10 days and then shipped to another TSD facility, there are no requirements for sampling or profile verification. This differs from wastes that are accepted for storage only and then subsequently shipped to another facility.

2.1.5.5 Transporting dangerous waste

A dangerous waste transfer facility is defined as any transportation-related facility, such as loading docks, parking areas, storage areas, and other similar areas, where dangerous waste shipments are temporarily held. A dangerous waste transporter may hold waste without a storage permit in containers at a transfer facility for 10 days or less if the waste is manifested and kept in containers meeting U.S. Department of Transportation (USDOT) specifications. Transporters accepting dangerous waste from facilities that produce dangerous materials, or from another transporter, may need to hold waste temporarily during the normal course of transportation.

Wastes that are manifested to another facility may be held temporarily (10 days or fewer) at the facility during transit. The waste can be part of a load for which some is destined for municipal waste facilities. When this material is shipped off-site, the original manifest shall accompany the waste. The 10-day transfer loads shall be documented as part of the operating record.

TSDs may also serve as "transfer facilities"[43] and may hold the waste that is appropriately packaged in accordance with USDOT regulations for up to 10 days, provided the TSD is not the final destination (the designated facility) for that waste and that the facility meets the definition of a “transfer facility.” If a transporter stores waste in containers at a transfer facility for more than 10 days, the transfer facility becomes a storage facility subject to all applicable requirements for TSDs. Permit requirements are different for transfer facilities and disposal facilities.

[43] 40 CFR 260.10

2.1.5.6 Storage Only Facilities

Under our proposed collection program, AFFF material currently stored at Washington fire departments may be transferred to one of sixteen 10-day hold TSD facilities permitted for handling dangerous waste (Table 2-2) prior to being shipped to its final disposal location.

TABLE 2-2: 10-Day Hold Facility Locations

10-Day Hold Facility Name	Owner	Address
Pasco Facility Clean Harbors	Clean Harbors	4123 E B St, Pasco, WA 99301
Spokane Facility	Clean Harbors	407 N Thierman Rd, Spokane Valley, WA 99212
Kent Facility	Clean Harbors	26328 79th Ave S, Kent WA 98032
Clackamas Facility	Clean Harbors	16540 SE 130th Ave, Clackamas, OR 97015
Milton Facility US Ecology	US Ecology	300 Birch St, Milton, WA
Seattle WWTF	Heritage Crystal Clean	1901 E D St, Tacoma, WA 98421
Seattle Branch	Heritage Crystal Clean	2212 Port of Tacoma Rd, Tacoma, WA 98421
US Ecology Seattle	US Ecology	9520 10th Ave S, Seattle, WA 98108
Heritage Crystal Clean Lakewood	Heritage Crystal Clean	9612 47th Ave SW Lakewood WA 98499
NRC Environmental- Seattle	US Ecology	20500 Richmond Beach Dr NW SE Corner Seattle WA 98177
NRC Environmental- Spokane	US Ecology	21 N Julia St Spokane WA 99202
Emerald Services- Seattle (Marginal Way)	Clean Harbors	6851 E Marginal Way S Seattle WA 98108
Emerald Services- Vancouver WA	Clean Harbors	1300 W 12th St Vancouver WA 98660
Emerald Services- Spokane Valley WA	Clean Harbors	6308 E Sharp Ave Spokane Valley WA 99212-1274
Emerald Services- Seattle (Airport Way)	Clean Harbors	1500 Airport Way S Seattle WA 98134
Pasco Facility US Ecology	US Ecology	3425 King Ave Pasco, WA 99301

2.1.5.7 Intrastate Waste Handling Services

Dangerous waste must be transported to an approved (RCRA-permitted) facility that can accept dangerous waste for treatment and/or disposal. Dangerous waste generators may ship waste to non-RCRA-permitted facilities, but only after receiving permission from the controlling state agency. Dangerous waste handling services with facilities located outside of Washington are allowed to operate under interim status pursuant to chapter 173-303 WAC, under an EPA-issued permit under 40 CFR Part 270, or under interim status or a permit issued by another state that has been authorized by EPA pursuant to 40 CFR Part 271.

Service contractors who do not meet the requirements for state and federal regulations and are not regulated by the EPA may transport state-designated dangerous waste to a facility outside Washington if the facility receiving the waste will legitimately treat or recycle, but not dispose of, dangerous waste. Waste generators transporting dangerous waste to another state must use services of an EPA-permitted transport service and must keep a signed letter on file from a state regulatory authority confirming the receiving facility may accept waste. The transport service must display a valid EPA/state identification number. Waste generators must otherwise comply with applicable manifesting, packaging, and labeling requirements with respect to the shipping of the waste.

2.1.5.8 Tracking Dangerous Waste Shipments

In 2018, the EPA established and implemented a national waste tracking system authorized under the Hazardous Waste Electronic Manifest Establishment Act of 2012. The Hazardous Waste Electronic Manifest Establishment Act (the Act) authorizes the U.S. EPA to establish a national e-Manifest system to track hazardous waste shipments. The e-Manifest system was built as a module component of the existing RCRA information system. The Act gives the EPA authority to adopt regulations that:

1) Accept and allow electronic manifests in addition to the existing paper manifests.
2) Set up user fees to offset the costs of developing and operating the e-Manifest system.

The EPA completed two final rules and one proposed rule regarding e-Manifest. The final "One Year Rule" (2014) established the legal and policy framework for the use of electronic manifests. The final "User Fee Rule" (2023) established user fees and other actions necessary to set up the system, which provides the stakeholders listed below with the following functions:

- **Hazardous waste generators and transporters**: Generators and transporters can create, edit, view, and sign manifests, as well as submit post-receipt corrections electronically. E-Manifest stores final copies and status information on electronic and paper manifests.
- **Receiving facilities**: Using e-Manifest, facilities receiving waste shipped on a manifest can sign manifests when the waste is received, submit the manifests to the EPA, make corrections to submitted manifests, and retrieve copies of manifests submitted.
- **States and Tribes**: State and Tribal government users are able to retrieve copies and status information on any manifests associated with entities in their state.
- **General Public**: E-Manifest data is accessible to the general public 90 days after receipt at the designated facility through the system's public-facing webpage (EPA 2022b).

2.1.5.9 Dangerous Waste Storage Container Requirements

A container is defined as any portable device in which a material is stored, transported, treated, disposed of, or otherwise handled. The definition is intentionally broad to encompass all the different types of portable devices that may be used to handle hazardous or dangerous waste. Storage means holding hazardous or dangerous waste for a regulatory set period, at the end of which the hazardous waste is treated, disposed of, or stored elsewhere.

In order to prevent mixing of incompatible materials, avoid potential spills, and protect worker safety, transferring the contents of multiple containers into a single container is prohibited at collection sites without specific authorization by waste-receiving site coordinators. Empty containers must be decontaminated and all rinsate requires disposal as a dangerous waste. RCRA and Washington State regulations for handling dangerous waste require permitted waste treatment and disposal contractors to prepare a safety, emergency, and contingency plan for each collection event.

2.1.5.10 Dangerous Waste Transport, Treatment, and Disposal Facilities Contracted with Washington Department of Ecology

A full listing of permitted waste facilities is included in Appendix A.2 of this DEIS.

Clean Harbors

Clean Harbors is a commercial hazardous waste hauler with hazardous and dangerous waste treatment, storage, and disposal facilities across the United States. Among other services, Clean Harbors operates facilities that can incinerate PFAS-containing foams and other PFAS waste. Clean Harbors operates two incineration facilities that could process the foam collected from fire departments in Washington: The Aragonite Facility in Utah and the Kimball Facility in Nebraska.

The Clean Harbors Aragonite Facility (EPA RCRA ID: UTD981552177) operates as a commercial waste incineration, transfer, and storage facility located in a remote area of Tooele County, Utah. Aragonite is a RCRA-permitted Class C TSD facility that is managing PFAS waste streams within RCRA regulatory requirements for dangerous waste. The incinerator consists of a slagging rotary kiln[44] with a vertical afterburn[45] chamber. The gas-cleaning train consists of a spray dryer, baghouse, saturator, and wet scrubber. The permitted waste feed rate is approximately 13 tons per hour (UDEQ 2022c). Permitted waste storage areas include a bulk liquid tank farm consisting of 16 tanks holding up to 30,000 gallons of liquid waste. Container storage areas include 55-gallon to 12,000-gallon drums; direct burn tanker storage areas with a 30,000-gallon total capacity; sludge storage tanks holding up to 38,000 gallons; and bulk solids storage tanks with a capacity of up to 1,100 cubic yards. Produced ash is collected in a roll-off container, analyzed for land disposal restrictions (LDRs), and sent to Clean Harbors Grassy Mountain, LLC, a one square-mile Subtitle C TSD landfill (UDEQ 2022c). The gas stream is

[44] Rotary kiln incinerators are the most common type of hazardous waste incinerator used by commercial operators. The combustion gases emanating from the kiln are passed through a high temperature afterburner chamber to more completely destroy organic pollutants entrained in the flue gases. Rotary kilns can be designed to operate at temperatures as high as 2,580 °C (4,676 °F), but more commonly operate at about 1,100 °C (2012 °F)
EPA Toxics Release Inventory (TRI) Program, *Guidance for Reporting the Dioxin and Dioxin-like Compounds Category. Hazardous Waste Incineration (HWI) Facilities.* (Website accessed September 3, 2022) https://ordspub.epa.gov/ords/guideme_ext/f?p=guideme:gd:::::gd:dioxin_4_5_4.

[45] Afterburn refers to a secondary combustion chamber or stack for the purpose of incinerating smoke, fumes, gases, unburned carbon, and other combustible material not consumed during primary combustion.

discharged to the atmosphere via a 150-foot-high, 5-foot diameter stack fitted with environmental monitors.

The wastes that are handled at the facility include hazardous wastes, industrial wastes, and non-hazardous wastes. The facility is designed to handle high and low British Thermal Unit (BTU) liquid wastes, sludges, bulk solids, compressed gas cylinders, and containerized wastes. The current permitted capacity of the incinerator is approximately 13 tons per hour (UDEQ 2022). It typically processes about 50,000 tons per year. Operations occur 24 hours a day, and there are approximately 120 employees at the site. The facility is located 2.5 miles south of Interstate 80 at the Aragonite exit. The nearest residential area is Grantsville, about 34 miles from Aragonite. The nearest single dwelling is at Delle, approximately 16 miles to the east of Aragonite.

Under current operating conditions, the Clean Harbors Aragonite incinerator has shown destruction of "99.9999 percent of common legacy PFAS compounds" (for example, perfluorooctane sulfonamide (PFOS), perfluorooctanoate (PFOA), PFHxS, GenX) (EA and Montrose 2021). The facility monitors emissions for a number of pollutants, including dioxins and furans, carbon monoxide, total hydrocarbons, hydrochloric acid and chlorine, cadmium, lead, arsenic, beryllium, chromium, mercury, and particulate matter.

Clean Harbors also operates a 640-acre hazardous waste storage and treatment/incinerator facility located five miles south of Interstate 80 on Highway 71 in Kimball County, Nebraska. Opened in 1995, the facility conducts storage and transfer of customer waste (including 10-day transfer), fuel blending of customer waste (for either on-site incineration or off-site energy recovery) and shredding of incoming solids to preprocess waste for the incinerator. The Kimball Nebraska facility is currently permitted as follows:

- Hazardous Waste Incinerator and Storage Facility Modified Permit (RCRA Permit) No. NED981723513.
- Regulatory Amendment to Title 128, Appendix IV (Delisting).[46]
- National Pollutant Discharge Elimination System (NPDES) Authorization to Discharge Stormwater Discharge Permit No. NER900840.
- Solid Waste Management Permit (Monofill Permit) No. NE0203238.
- Class I Air Operating Permit #03-RI-001.

There is an on-site landfill for site-generated incineration residuals only. The Kimball plant currently operates a fluidized bed incinerator with a reported capacity of 57.79 million British thermal units per hour (MMBtu/hr) for hazardous waste and a wide variety of feeds. An application has been filed to construct a rotary kiln with a secondary combustion chamber similar to the Aragonite incinerator in Utah.

[46] Nebraska Universal Waste Regulations Chapter 25 Title 128

Clean Harbors Industrial Waste Handling Process

Clean Harbors collects and transports industrial wastes to and between its facilities for treatment or bulking for shipment to final disposal locations. These collection and transport cycles occur once a week or more, depending on waste volumes received. Clean Harbors 10-day transfer facilities in Kent, Washington, and Clackamas, Oregon, collect containerized waste throughout Washington and Oregon. The containerized waste is transferred by truck to one of Clean Harbors' primary TSD facilities (DES 2015).

For the proposed program, AFFF would be collected from individual fire departments located in larger urban areas. AFFF transported from fire departments in rural areas would be collected in mixed loads from various suppliers and temporarily stored at hold facilities prior to being transported to facilities for treatment and disposal.

US Ecology

US Ecology North America operates four RCRA-permitted hazardous waste treatment, storage, and disposal facilities with landfills in Beatty, Nevada; Robstown, Texas; Grand View, Idaho; and Belleville, Michigan. The company also operates TSD and waste solutions facilities located throughout the United States. Waste solutions involve the transportation, treatment, recycling, and disposal of hazardous, non-hazardous, and radioactive wastes, and includes physical treatment, recycling, landfill, and deep well injection disposal and wastewater treatment services. Three of these facilities are being considered under the program for AFFF disposal: RCRA-permitted landfills near Grand View, Idaho, and Beatty, Nevada, and deep well injection near Winnie, Texas.

The US Ecology Idaho facility in Owyhee County provides RCRA and Toxic Substances and Control Act (TSCA) treatment and disposal services. Treatment methods include chemical fixation, chemical oxidation, absorption, evaporation, and debris management to reduce the solubility and leachability of contaminants in hazardous waste (US Ecology 2016). The northern boundary of the facility encompasses 309 acres of undeveloped land on which new construction of hazardous waste treatment and storage units are prohibited, except for inspection, corrective action, and other activities required under the permit (US Ecology 2016). The facility is required to conduct groundwater monitoring, leachate monitoring, post-closure care, and corrective actions (US Ecology 2016).

US Ecology Nevada is located on land owned by the state of Nevada in the northern Mojave Desert near the town of Beatty. This RCRA- and TSCA- permitted facility specializes in industrial recycling and treatment and disposal services and accepts containers in bulk.[47] Wastes managed include RCRA hazardous waste, polychlorinated biphenyl (PCB) waste, state-designated hazardous wastes, and non-hazardous wastes. The facility may receive, store, and process bulk or containerized wastes and dispose of these wastes. Treatment technology includes methods of chemical fixation, chemical oxidation, and debris management. The facility

[47] US Ecology Nevada, Inc, Permit No. NEVHW0025; Issued December 8, 2011. Permit renewal is in process as of July 14, 2022.

is required to conduct groundwater monitoring, leachate monitoring, post-closure care, and corrective actions (US Ecology 2021b).

Treatment technology includes methods of chemical fixation, chemical oxidation, and debris management. The facility consists of six container storage units, four PCB storage tanks, two lab rinse storage tanks, one evaporation tank, one aerosol container recycling unit, one drum reuse management area, four batch stabilization tanks, and four Subtitle C landfills with a total capacity of 8.6 million cubic yards.

US Ecology's deep well injection facility in Winnie, Texas, is permitted for treatment and disposal of Class 1 and 2 non-hazardous industrial solid waste and wastewater,[48] with large volume capacity capable of accepting high-concentration PFAS liquid waste. The Winnie facility operates deep -well injection technology, handling non-hazardous industrial wastewater disposal for multiple industries, including refineries, petrochemical, and environmental services industries.

The facility has three active wells, which are governed under the Underground Injection Control division with the Texas Commission on Environmental Quality (TCEQ). The facility also holds permits for four additional wells that have not been drilled. US Ecology's disposal capacity runs to a depth of 13,700 feet, with currently permitted depths between 880 feet and 1,980 feet. The wells accommodate processing of hazardous and non-hazardous wastes generated on-site from the operation of the storage, processing, and disposal units.

Overall, Class I deep well injection facilities must adhere to siting and structural requirements. Injection wells must be located at least 0.25 mile apart. Receiving wells and fluids must be free of geologic risks including transmissive fissures or faults. Receiving formations must be large enough to prevent pressure buildup and it must be determined that injected fluid would not reach aquifer recharge areas. Injection zones must be capable of holding hazardous materials for 10,000 years or longer if required for substances to be rendered non-hazardous.

Fluids must be injected into a formation that is below the lowest formation that contain an underground source of drinking water (within 0.25 mile of the well). Wells must be constructed to prevent fluids from entering underground sources of drinking water. Facilities perform internal and external mechanical integrity tests every five years.

Advantek Cavern Solutions

Advantek Cavern Solutions, LLC offers non-hazardous waste management services, including deep -well injection sites located in Hutchinson, Kansas under the facility's Underground Injection Control Class I permit (No. KS-01-155-012). The Class I permit was issued November 24, 2020, and will expire September 23, 2024.

In December 2021, the Kansas Department of Health and Environment prepared a draft 5-year pilot permit (Permit No. KS-05-155-002) for the emplacement of biosolids and other approved organics in a new well at the existing facility (Kansas Register 2021).

[48] Winnie Solid Waste Permit 39098 and WDW344-350

2.2 Alternatives Development and Assessment

To determine the safest and most effective collection, treatment, and disposal of AFFF stored at Washington fire departments, we identified a range of options for the treatment, disposal, and long-term lower risk storage of the AFFF material (shown in Figure 2-4: Overview of Alternatives). The alternatives analysis will examine potential adverse environmental effects on earth, water, and air quality, and sensitive biological species and communities. Impacts on public health and safety, disadvantaged communities, and Tribal communities will also be examined. Development of the alternatives includes:

- Identification of facilities appropriate to receive and treat dangerous waste defined by the State of Washington.
- Identification of facilities with permits to operate under the federal Clean Air Act (CAA) and Clean Water Act (CWA).
- Review of facilities authorized to receive state-only dangerous waste.
- Review of technical studies on the efficiency and effectiveness of disposal technologies, including landfill disposal, incineration, deep well injection, and emerging technologies.
- Consultation with Ecology's Product Replacement, Pollution Prevention, Regulatory Affairs, Toxic Reduction, and Reducing Toxic Threats teams; Air Quality Program leads; the Native American Tribal Liaison office; and the Washington Attorney General's Office.

10-OCT-2023

SOURCES: TRC, WA ECO, ESRI

LEGEND

ALTERNATIVE 1: APPROVED HOLD IN PLACE

- 10-DAY HOLD SITES
- 10-DAY HOLD SITES ROUTE QUARTER MILE STUDY AREA

ALTERNATIVE 2: INCINERATION

- INCINERATOR
- ROUTES TO INCINERATORS

ALTERNATIVE 3: SOLIDIFICATION AND LANDFILLING

- LANDFILL
- ROUTES TO LANDFILLS

ALTERNATIVE 4: CLASS 1 DEEP WELL INJECTION

- DEEP WELL INJECTION
- ROUTES TO DEEP WELL INJECTION SITES

FIGURE 2-4: OVERVIEW OF ALTERNATIVES

AFFF COLLECTION AND DISPOSAL PROGRAM
DRAFT ENVIRONMENTAL IMPACT STATEMENT

1:15,000,000
1" = 1,250,000'
0 125 250 MILES

DEPARTMENT OF ECOLOGY
State of Washington

TRC

- ► We also reached out to state agencies, universities, and the EPA about regulatory standards for the incineration and disposal of PFAS foam and other wastes, factors to consider when disposing of PFAS foam, PFAS foam destruction options and research opportunities, PFAS destruction technologies, and PFAS fate and transport.

- ► Once a program is in place, we will implement the program, working with local fire departments and other first responders who have stockpiles of PFAS-containing firefighting foam.

2.2.1 Alternative 1: Approved Hold in Place

AFFF would be held in place at participating fire stations with suitable containment approved and reimbursed by Ecology until acceptable advanced treatment technology becomes available.

Under this alternative, fire departments in the Ecology disposal program would sign a document defining participation agreement conditions. The agreement would require fire departments to tag or label surplus AFFF PFAS-containing foam product and stored in appropriate containers in good condition.

AFFF stored in containers that are in fair to poor condition would be transferred to new appropriate containers. Fire department personnel, with our guidance, would designate an area for the storage of the foam. The approved location would be indoors with secondary containment, or outdoors with secondary containment and a tent or canopy to cover most of the foam-handling area. Canopies would be required to have an operational center gutter system to ensure that the area under the canopy remains dry. The AFFF containers would be regularly inspected to confirm their condition. While participating in the program, fire departments would forgo using the foam, barring a change to our agreement.

Forklifts would be required at all AFFF collection sites unless the quantity of foam does not require the use of a forklift. All personnel working in an AFFF containment area would be equipped with minimum Level C Personal Protective Equipment (PPE) and individual respirators. Personnel would be trained in the safe handling of AFFF.

Firefighting organizations that are considering opting into our AFFF collection and disposal program must comply with state regulations for toxic chemicals in firefighting agents and equipment.[49] Fire departments who no longer wish to retain stockpiled foam must manage and dispose of AFFF as a dangerous waste outside of the program.[50]

2.2.1.1 Advantages

- ► AFFF would be held on-site, eliminating any risk of release during transport.

[49] Chapter 70A.400 RCW

[50] As required under the Dangerous Waste Regulations, Chapter 173-303 WAC

- ► We would wait for an advanced destruction technology to be developed, or for EPA developments and guidance on disposal, which would minimize long-term environmental risk.

2.2.1.2 Disadvantages

- ► Washington's regulations for medium and large quantity generators (MQGs and LQGs) are not intended to encourage long-term storage of dangerous waste.[51] For MQGs and LQGs, the regulations[52] require that waste be shipped offsite 180 days and 90 days after the waste is generated. We have authority to grant an additional time extension of 90 days to MQGs and an additional 30 days to LQGs, but these are one-time extensions for the purpose of unforeseen, temporary, and uncontrollable circumstances. Extensions for multiple months, if not years, is not supported by existing regulations. However, most of the fire stations are small quantity generators (SOGs).

- ► For SQGs, there is not a regulatory time limit by which waste must be shipped offsite. However, SQGs must stay under a 2,200-pound threshold of total dangerous waste accumulated onsite, with no more than 220 pounds generated in a single month.

2.2.2 Alternative 2: Incineration

AFFF would be collected and transported to a selected existing treatment facility for incineration.

Under this alternative, both liquid and solid AFFF materials, including containers, would be transported to one of two incineration facilities owned and operated by Clean Harbors. These facilities are in Aragonite, Utah, and Kimball, Nebraska. These facilities are permitted to handle hazardous waste under RCRA.

2.2.2.1 Advantages

- ► Incineration is one of only a few technologies that can potentially destroy PFAS, thus reducing future risks to public health and adverse effects on the environment. Under current operating conditions, Clean Harbors incinerators have shown destruction of "99.9999 percent of common legacy PFAS compounds" (for example, PFOS, PFOA, PFHxS, and GenX) (EA and Montrose 2021; test performed at the Aragonite facility).

- ► Incineration facilities are permitted and monitored, requiring a Title V major facility review program permit compliant with federal CAA and hazardous waste combustion rules (40 CFR [Code of Federal Regulations] 63 Subpart EEE), applicable emissions standards (40 CFR 63.1219(a); 40 CFR 63.1209), wastewater treatment (40 CFR 63 Subpart PPP), and remediation (40 CFR 63 Subpart DD).

[51] WAC 173-303-016(4)(c)
[52] WAC 173-303-172 & -200

2.2.2.2 Disadvantages

- The EPA research on incineration continues to evaluate effective destruction temperatures and treatment time, the potential to generate products of incomplete combustion, stack gas analyses, deposition onto land, and other risk factors.
- There are currently no applicable incinerators in Washington, and therefore, AFFF must be transported out of state for incineration.
- Transportation, energy use, regulatory approvals, and final disposition of process waste residues will need to be considered for the incineration alternative, as these will differ among incineration facilities.

2.2.3 Alternative 3: Solidification and Landfilling

AFFF would be collected and transported to a selected landfill facility or facilities for solidification and disposal.

Under this alternative, AFFF would be solidified in a neutral matrix, such as concrete, to minimize PFAS mobility. Then it would be buried in a RCRA-permitted hazardous waste landfill (Subtitle C). Containers would also be buried.

2.2.3.1 Advantages

- Permitted hazardous waste landfills are designed, per RCRA requirements, with rigorous liner and cap systems to limit the risk of releases.
- As part of landfill management, leachate is collected and properly treated or disposed, and groundwater is monitored under state and federal oversight.
- Solidification is expected to significantly reduce PFAS leachability.

2.2.3.2 Disadvantages

- Disposed AFFF concentrate mass remains in place with no known or documented destruction mechanisms for PFAS.
- PFAS mass from disposed wastes can form mobile leachates, which require long-term collection, management, and disposal.
- Some PFAS may be emitted by the landfill gas collection and management system.
- Rapidly changing regulations regarding the classification of PFAS-containing substances can complicate implementation of this option. Overall, issues related to disposal of PFAS in landfills are similar to issues commonly encountered with other contaminants (Masoner et. al. 2020).

- Only permitted RCRA Subtitle C landfills are being considered in this EIS. There are currently no permitted RCRA Subtitle C landfills in Washington, and therefore, AFFF must be transported out of state for landfill disposal.

2.2.4 Alternative 4: Class I Deep Well Injection

AFFF would be collected and transported to a selected Class I deep well injection facility or facilities for disposal.

Under this alternative, liquid AFFF would be collected and transported to facilities operated by US Ecology in Winnie, Texas, or Advantek Cavern Solutions in Hutchinson, Kansas. US Ecology is permitted to perform deep well injection of hazardous waste; Advantek is not, so Ecology would have to secure Kansas' permission for disposal there. Before disposal, AFFF containers would be triple-rinsed with an appropriate commercial product (such as PerfluorAd). The rinsate would be disposed of through deep well injection. Containers would either be landfilled or incinerated.

2.2.4.1 Advantages

- Deep well injection sites are located in remote settings with low population densities.
- The process is designed for long-term, secure disposal.
- Waste is injected well below drinking water aquifers, reducing potential for future impacts to drinking water resources.

2.2.4.2 Disadvantages

- Disposed AFFF concentrate mass remains in place with no method for verifying PFAS destruction.
- Deep well injection facilities are generally operated under limited compliance monitoring; therefore, the long-term stability of injected wastes is undocumented.
- Because AFFF is classified as a dangerous waste in the state of Washington, transporting foam to non-hazardous deep well injection sites, as would be the case for the Advantek facility, would require Kansas' pre-approval prior to any foam being shipped for disposal.

2.2.5 Alternative 5: No Action Alternative

AFFF would be left as is at participating fire stations.

Under this alternative, fire departments would continue to use, store, and dispose of their supply of commercial-use AFFF in their individually selected manner without our support. Under state of Washington law, SQGs, which most fire stations are, may dispose of their waste in a municipal landfill (provided they meet all other conditions for exemption under WAC 173-303-171). Because the intent of this EIS is to inform decision makers of the best options for

disposal that align with the protection of human health and the environment, municipal landfilling is not being considered a viable disposal option.

2.2.6 Alternatives and Actions Eliminated from Further Consideration

2.2.6.1 Collection and Storage of AFFF at a Centralized Location

We considered collecting and transporting the AFFF to a storage facility that we would construct and operate. The facility would serve the purpose of storing the AFFF until acceptable advanced treatment technology becomes available. Due to fiscal limitations and liability concerns, we decided not to consider this alternative further.

We determined it is infeasible to collect and transport Class B foam to either a private or government-operated facility. We investigated TSDs outside of Washington capable of storing, managing, and monitoring foam indefinitely in an indoor environment. However, no public or private waste facilities were identified at the time of this publication.

2.2.6.2 Non-Vehicle Transport of AFFF Materials

Initial consideration was given to the possibility of AFFF collection and subsequent airborne or maritime shipment of the AFFF for storage, disposal, or treatment. Due to the unacceptable risk of accidental release of AFFF to air or water, we eliminated these modes of transport from further consideration.

2.2.7 Emerging Technologies for Commercial PFAS Treatment

Consideration was also given to emerging PFAS treatment technologies. Given the uncertainty of when these technologies could be available for commercial use, and the uncertainty of acquiring the receiving state's approval to ship the AFFF, they were eliminated from further consideration as well. However, if one or more of these emerging treatments is further developed and becomes technically and commercially viable, the technology could be implemented under Alternative 1 in the future. A listing of these emerging technologies is presented in Table 2-3.

TABLE 2-3: PFAS Destruction Technologies Considered and Eliminated as Alternatives

Treatment	Treatment Description	State of Research
Aqueous Electrostatic Concentrator	Combined use of ion exchange (IX) membrane and electrodes to separate PFAS from solution and initiate oxidation reactions.	Lab-scale study of the patented technology reports 99% removal of both PFOA and PFOS.
Bismuth Oxyhydroxyphosphate (BOHP)	Photocatalytic process in which BOHP ($Bi_3O(OH)(PO_4)_2$) is activated by ultraviolet light to degrade PFAS through oxidation or reduction reactions.	A pilot-scale study from the DOD's Strategic Environmental Research and Development Program (SERDP) reports up to 95% destruction of perfluorocarboxylic acids (PFCAs) and 90% degradation of fluorotelomers.
Boron Nitride Oxidation	Use of activated boron nitride and ultraviolet light to degrade compounds.	One lab-scale study reports 99% removal of PFOA and 20% removal of hexafluoropropylene oxide dimer acid (HFPO-DA).
Electrochemical Oxidation	Uses electrical currents passed through a solution to oxidize pollutants which are separated and subsequently defluorinated.	Assessed to have an intermediate technology readiness level. Further work is needed to improve technology readiness (EPA 2021c).
Electron Beam (E-beam)	Use of an accelerator to generate a stream of highly energetic electrons that are bombarded onto contaminated water, initiating both reduction and oxidation reactions.	Reports from SERDP state E-beam technology reduced PFOA and PFOS concentrations by up to 99.99% in soil samples and up to 87.91% in groundwater samples.
Enhanced Contact Plasma Reactors (ECPR)	Plasma-based water treatment uses electricity to convert water into a mixture of highly reactive species (i.e., plasma) that rapidly and nonselectively degrade PFAS.	Lab-scale studies report up to 99% removal of PFAS for lab-prepared solutions and landfill leachate samples.

Treatment	Treatment Description	State of Research
Mechanochemical Degradation	Destruction method using a high-energy ball-milling device and co-milling reagents to produce localized high temperatures and radicals that break down contaminants.	One lab-scale study reports 99% destruction of target PFAS in AFFF-impacted soil. Identified by the EPA's PFAS Innovative Treatment Team (PITT) as a potential non-combustion destruction method for PFAS that would not require high temperatures or solvents.
Pyrolysis and Gasification	Thermal treatment that decomposes materials at moderately elevated temperatures in oxygen free or very low oxygen environments. Used to transform biosolids into biochar and hydrogen-rich synthetic gas.	Limited data available on PFAS destruction. Identified by the EPA's PITT as a potential non-combustion destruction method for PFAS in biosolids.
Sonochemical Oxidation/ Ultrasound	Use of sound waves to facilitate cavitation in water, which in turn releases large amounts of thermal energy and hydroxyl radicals to initiate PFAS degradation reactions.	One lab-scale study reports 90% destruction of PFOS. Identified by the EPA's PITT as a potential non-combustion destruction method for PFAS in biosolids.
Supercritical Water Oxidation (SCWO)	Wastewater is mixed with hydrogen peroxide, isopropanol, and sodium hydroxide as a neutralizing agent. After passing through a heat exchanger, a furnace removes the salts. Then the water goes into the reactor at a designed temperature and pressure to break the carbon-fluorine bond. The resulting output is carbon dioxide and hydrofluoric acid, which is neutralized with sodium hydroxide.	In over 30 independent trials, SCWO showed >99% reduction of total PFAS (Battelle 2022; Krause et al. 2022).

Source: EPA Multi-Industry Per- and Polyfluoroalkyl Substances (PFAS) Study –2021 Preliminary Report. Table 13 Summary of Available PFAS Treatment Technologies. September 2021.

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The following sections in Chapter 3 describe the proposed actions' environmental consequences for each project alternative. Key topics include state and federal regulations pertaining to the permitting and environmental setting for built and natural environmental approach to analysis and methodology, the thresholds of significance, and metrics and applicable criteria. Both quantitative and qualitative analysis are presented in this Draft Environmental Impact Statement (DEIS).

The resource sections include statement of impacts, levels of determination, and mitigation to lessen the severity of environmental impacts. Impacts and mitigation measure(s) are discussed for each issue and the corresponding alternative under which it would occur.

3.1: Air Quality

3.2: Greenhouse Gas Emissions

3.3: Earth and Water Resources

3.4: Aquatic Resources

3.5: Terrestrial Species and Habitats

3.6: Vegetation

3.7: Human Health and Safety

3.8: Cultural, Historical, and Archaeological Resources

3.9: Tribal Resources

3.10: Transportation and Truck Safety

3.11: Environmental Justice

3.12: Public Services and Utilities

Significant, adverse impacts of the AFFF Collection and Disposal Program and alternatives are summarized in Chapter 4: Mitigation Measures.

3.1 Air Quality

3.1.1 Affected Environment

The affected environment includes the ambient air at and near the fire stations participating in our AFFF collection and disposal program; temporary storage facilities; identified potential treatment and disposal sites for the collected AFFF; and identified transportation routes.

3.1.1.1 Existing and Evolving Regulations

Clean Air Act

The Clean Air Act (CAA) is the comprehensive federal law that regulates air emissions from stationary and mobile sources. Among other things, this law authorizes the United States Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and to regulate emissions of hazardous air pollutants.

Federal

Under the CAA, the EPA is authorized to regulate emissions of hazardous air pollutants for both stationary and mobile emissions sources. Areas not meeting national standards are referred to as non-attainment areas. As of November 2023, the EPA has not designated PFAS as a hazardous pollutant, has not established national emissions standards for PFAS, and has not established Regional Screening Levels (RSLs).

The EPA issues updated RSL tables twice a year, in May and November, on its RSL webpage (EPA 2023b).

Washington Clean Air Act

The Washington Clean Air Act was enacted to meet several goals, including securing and maintaining levels of air quality that protect human health and safety. The Washington Clean Air Act meets federal CAA air emissions standards and is not a designated non-attainment area.

Utah and Nebraska

Treatment options under consideration would include incineration of AFFF at facilities located in Utah and Nebraska. Neither of these states has established ambient air quality standards for PFAS release mechanisms.

3.1.2 Significance Criteria

3.1.2.1 Impact Assessment and Methodology

Given the scope of this EIS, it is not feasible to conduct a solely quantitative analysis for potentially impacted air resources. Instead, a combined qualitative and quantitative analysis of each alternative's expected impacts on air resources is presented.

Air emissions may result from:

- Air contaminants, principally criteria pollutants and their precursors and greenhouse gases (GHG), emitted during the routine transport of AFFF.
- Evaporation of PFAS compounds in AFFF.
- Compounds emitted during the routine handling, transport, and disposal of AFFF.
- Compounds emitted because of a spill or accidental release of AFFF.
- PFAS compounds, criteria pollutants, GHG, and products of incomplete combustion (PICs) emitted during the AFFF incineration.

Criteria Pollutant and GHG Emissions

Criteria pollutant and GHG will be emitted by the motor vehicles that transport AFFF to storage, treatment, and disposal sites. Travel distances and road types for one-way trips to disposal sites are shown in Table 3.1-1 (see also Section 3.10: Transportation and Truck Safety).

TABLE 3.1-1: PFAS Transport Summary

ROAD TYPE	Vehicle Miles Traveled (Single One-Way Trip)						
	Ecology 10-Day Hold Sites	Kimball, Incineration Facility	US Ecology Nevada	US Ecology Idaho	Advantek Cavern Solutions	US Ecology Winnie	Aragonite Incineration Facility
Rural Restricted Access	---	1,052.4	495.9	233.7	1,465.0	1,515.6	131.5
Rural Unrestricted Access	---	4.6	312.4	55.9	144.2	756.6	512.3
Urban Restricted Access	---	---	---	---	---	---	---
Urban Unrestricted Access	1,050	0.7	7.2	7.8	0.7	0.7	8.1
Total	1,050	1,057.7	815.5	297.4	1,609.9	2,272.9	651.9

Emissions for the transport vehicles were obtained from the EPA's Motor Vehicle Emission Simulator (MOVES) version MOVES3 (EPA 2020c). The results are summarized in Table 3.1-2. The following inputs options were specified:

- The vehicle type would be a combination diesel truck.
- The emissions factors represent the average for the vehicle fleet in Spokane County, Washington in calendar year 2024.

- ► Road types are as described in Table 3.1-1. Particulate matter emissions account for contributions from tailpipe, brake wear, and tire wear.
- ► Emissions account for a single one-way vehicle trip.

TABLE 3.1-2: Vehicle Particulate Matter Emissions During PFAS Transport

FACILITY	Pollutant Emissions—Single One-Way Trip (Tons)						
	CO	NO_X	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO_2e
Ecology 10-Day Hold Sites Various Location, WA	2.6E-3	5.1E-3	6.5E-6	1.2E-4	3.3E-4	9.8E-5	1.94
Aragonite Incineration Facility Aragonite, UT	1.1E-3	2.1E-3	3.6E-6	5.2E-5	8.1E-5	3.5E-5	1.08
Kimball Incineration Facility Kimball, NE	1.6E-3	3.1E-3	5.8E-6	7.7E-5	9.3E-5	4.9E-5	1.75
US Ecology Nevada Beaty, NV	1.3E-3	2.5E-3	4.5E-6	6.2E-5	8.6E-5	4.1E-5	1.35
US Ecology Idaho Grand View, ID	4.6E-4	9.1E-4	1.6E-6	2.2E-5	3.0E-5	1.5E-5	0.49
Advantek Cavern Solutions Hutchinson, KS	2.4E-3	4.8E-3	8.9E-6	1.2E-4	1.5E-4	7.6E-5	2.66
US Ecology Winnie Winnie, TX	3.5E-3	6.9E-3	1.3E-5	1.7E-4	2.3E-4	1.1E-4	3.76

Table Notes:

CO = carbon monoxide

NOx = nitrogen oxides [an ozone (O_3) precursor; includes nitrogen dioxide (NO_2)]

SO_2 = sulfur dioxide

VOC = volatile organic compounds (an O_3 precursor)

PM_{10} = particulate matter with a nominal aerodynamic diameter of 10 microns or less

$PM_{2.5}$ = particulate matter with a nominal aerodynamic diameter of 2.5 microns or less

CO_2e = carbon dioxide equivalents

One ton = approximately 0.907 metric tons

By way of comparison and perspective, a typical Washington State residence emits approximately 4.54 tons per year[53] (ton/yr) of carbon dioxide in a year, which is the same order of magnitude as the estimated amount of GHG emissions for most of the one-way trips listed in Table 3.1-2.

[53] In 2021, 1,251,963 Washington State residential customers used 89,508 million standard cubic feet (MMscf) of natural gas (USEIA). Thus, the average Washington State residential customer used 71,500 cubic feet of natural gas that year. This is equivalent to 77.6 million British thermal units per year (MMBtu/yr), or 4.54 tons per year (ton/yr) of carbon dioxide emissions. (Note: 715,000 scf/yr X 0.001086 MMBtu/scf = 77.6 MMBtu/yr, and 77.6 MMBtu/yr X 53.06 kg CO_2/MMBtu X 1 lb/0.454 kg X 0.0005 ton/lb = 4.54 tons CO_2/yr.)

Evaporation of PFAS Compounds in AFFF

AFFF is available as a concentrate, such as 3 percent or 6 percent depending on the recommended concentrate-to-water mixture ratio. A typical 3 percent AFFF concentrate contains less than 2 percent by weight PFAS (EPA 2020a).

During routine handling or in the event of a spill or leak, PFAS may evaporate and enter the ambient air. The rate at which spilled material enters the ambient air depends on the volatility of the material. When mixed with water and applied to a liquid fuel fire, AFFF forms an aqueous film that extinguishes the fire and smothers it to prevent burnback. AFFF has very low volatility, or it could not serve this purpose.

Vapor pressure (VP) is indicative of a chemical's volatility and evaporation rate. It is the pressure exerted by a vapor in thermodynamic equilibrium with its condensed solid or liquid phase at a given temperature in a closed system. For material handling, VP is typically quoted at a standard temperature of or near 25 degrees Centigrade (°C) which is equivalent to 77 degrees Fahrenheit (°F). A chemical with a higher VP will evaporate more readily and rapidly than a chemical with a lower VP. Published measured VP data for PFAS are scarce, and much of the available data are extrapolated or modeled. The VPs of PFOA, PFOS, FTSA, and FTCA chemicals are reported as follows:

- PFOA: 0.525 mm Hg at 25 °C (as acid) (EPA 2017)
- PFOS: 0.002 mm Hg at 25 °C (as acid) (EPA 2017)
- FTSA: ≤ 0.002 mm Hg (temperature not reported)[54]
- FTCA: 0.04 - 0.44 mm Hg (temperature not reported)[55]

For comparison, atmospheric pressure at sea level is 760 mm Hg, and the VP of common liquids are:

- Water: 18 mm Hg
- Isopropyl alcohol (rubbing alcohol): 33 mm Hg
- WD40: 4,900 to 5,950 mm Hg (W-40)

Note that the PFAS VP values listed above are for pure chemicals, not mixtures. Raoult's law states that the partial pressure of each component of an ideal mixture of liquids is equal to the vapor pressure of the pure component multiplied by its mole fraction in the mixture. The composition of AFFF products differ, and the exact composition cannot be determined from safety data sheets. The typical composition of a 3 percent AFFF concentrate is as follows:

- Water: >60 percent by weight
- Solvents: <20 percent by weight

[54] Table 4.1 Interstate Technology and Regulatory Council (ITRC). 2022, PFAS Technical and Regulatory Guidance Document. Available at: https://pfas-1.itrcweb.org/. Accessed in December 2022.

[55] Ibid.

- Surfactants/modifiers: <18 percent by weight
- PFAS: <2 percent by weight

The particular solvents, surfactants, and modifiers are not known. The molecular weight (MW) of water is 18 grams per gram-mole (g/g-mole). The MWs of PFOA, PFOS, FTSA, and FTCA range from 326 to 628 g/g-mole. Consequently, in the event of a spill or release of AFFF, the partial pressure[56] (that is, the pressure that would control the rate of evaporation) of PFAS constituent would be two orders of magnitude (hundreds of times) smaller than the VP values of pure PFAS compounds listed above.

Given this information, in the event of a spill or discharge of AFFF during storage, handling, or transport, PFAS evaporation rate would be very slow and the resulting ambient concentrations very low. Factors that might increase the rate of PFAS compound evaporation (for example, higher wind speeds or warmer temperature) would also cause any PFAS compounds released to the ambient air to disperse more rapidly.

PFAS Compounds and Products of Incomplete Combustion (PICs) Emitted During AFFF Incineration
Significance criteria have been established for criteria pollutants and, to a limited degree, certain PFAS compounds. These take the form of an ambient air concentration [parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$)] and averaging period.

Criteria Pollutants

Criteria air pollutants or air toxics are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects as determined by the federal Center for Disease Control (CDC).

The EPA has promulgated National Ambient Air Quality Standards (NAAQS) to protect human health and welfare. The NAAQS include primary and secondary standards. The primary standards are designed to protect human health, including the health of sensitive subpopulations, such as children, the elderly, and those with chronic respiratory problems. The secondary standards are designed to protect public welfare, including economic interests, visibility, vegetation, animal species, and other concerns not directly related to human health. Federal standards currently apply to the following criteria pollutants:

- Particulate matter (PM_{10})
- Fine particulate matter ($PM_{2.5}$)
- Nitrogen dioxide (NO_2)
- Sulfur dioxide (SO_2)
- Ozone (O_3)
- Carbon monoxide (CO)
- Lead (Pb)

Each NAAQS is expressed in terms of a concentration level and a statistically based averaging period in Table 3.1-3.

[56] Every gas in a mixture of gases exerts partial pressure, which is the pressure it would exert if it occupied the same volume on its own. The total pressure of a mixture of gases is the sum of partial pressures of individual gases in the mixture.

TABLE 3.1-3: National Ambient Air Quality Standards

Pollutant	Averaging Time	Primary Standard		Secondary Standard		Statistical Form
		(ppm)	(µg/m^3)	(ppm)	(µg/m^3)	
PM_{10}	24-hour	---	150	---	150	Not to be exceeded more than once per year on average over 3 years
$PM_{2.5}$	24-hour	---	35	---	35	98th percentile, averaged over 3 years
	Annual	---	12	---	15	Annual mean, averaged over 3 years
NO_2	1-hour	0.100	188	---	---	98th percentile, averaged over 3 years
	Annual	0.053	100	0.053	100	Annual mean
SO_2 [a]	1-hour	0.075	196	---	---	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	3-hour	---	---	0.5	1,300	Not to be exceeded more than once per year
O_3	8-hour (2015)	0.070 [b]	137	0.070 [b]	137	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
	8-hour (2008)	0.075	147	0.075	147	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
CO	1-hour	35	40,100	35	40,000	Not to be exceeded more than once per year
	8-hour	9	10,300	9	10,000	Not to be exceeded more than once per year
Pb	3-month rolling	---	0.15 [c]	---	0.15 [c]	Not to be exceeded

Table Notes:

a. The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas.

b. For O_3, final rule was signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

c. In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar quarter average) also remain in effect.

PFAS Compounds

Five states have established ambient air standards for certain PFAS compounds. These are summarized in Table 3.1-4.

TABLE 3.1-4: PFAS Ambient Air Concentration Standards

State	Description	PFAS Compound	Standard ($\mu g/m^3$)	Averaging Period	Applicability/ Purpose
Michigan [a]	Screening Standard (Enforceable)	PFOA PFOS PFOA + PFOS	0.070	24-hour	New and modified stationary sources
Minnesota [b]	Air Guidance Values (Not Enforceable)	PFBS	0.3	24 hours – 30 days	Assessing risks in the environmental review process, developing air pollution permits, health risk assessments, and other site-specific assessments.
		PFBA	10	30 days – 8 years	
		PFHxS	0.034	> 8 years	
		PFHxA	1.0	24 hours – 30 days	
			0.5	30 days – 8 years; > 8 years	
		PFOA	0.063	24 hours – 30 days	
		PFOS	0.011	30 days – 8 years; > 8 years	
New Hampshire [c]	Ambient Air Limits (Enforceable)	APFO	0.05	24-hour	New and modified stationary sources
			0.042	Annual	
New York [d]	Annual Guideline Concentration (Enforceable)	PFOA	0.053	Annual	New and modified stationary sources
Texas [e]	Effects Screening Levels (Enforceable)	PFOA	0.05	1-hour	New and modified stationary sources
		PFOS	0.1		
		APFO	0.1		
		PFOA	0.005	Annual	
		PFOS	0.01		
		APFO	0.01		

Table Notes:

a. Michigan Department of Environment, Great Lakes, and Energy - Air Quality Division List of Screening Levels (ITSL, IRSL, & SRSL) in Alphabetical Order Revised October 3, 2022. https://www.michigan.gov//media/Project/Websites/egle/Documents/Programs/AQD/toxics/screening-levels-alphabetical.pdf?rev=125edba8edb64ceeaa57d03738939190 page 37.

b. Air Guidance Values https://www.health.state.mn.us/communities/environment/risk/guidance/air/table.html.

c. Env-A 1400 Regulated Toxic Air Pollutants https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/env-a%201400-adptpstd.pdf.
d. DAR-1 Guidelines for the Evaluation and Control of Ambient Air Contaminants Under 6NYCRR Part 212 https://www.dec.ny.gov/docs/air_pdf/dar1.pdf.
e. Effects Screening Levels Used in the Review of Air Permitting Data https://www.tceq.texas.gov/toxicology/esl/list_main.html.

3.1.3 Impacts and Mitigation Measures

Measures to reduce the likelihood and consequences of a AFFF release are described below.

Alternatives 1 through 4:

- Administrative controls:
  - Proper training and handling of AFFF by experienced personnel.
  - Ensure all personnel are aware of emergency response in the event of a spill.
  - Safe driving habits during the transportation of the material.
  - Treatment and disposal of AFFF at properly licensed facilities.
- Engineered controls:
  - Storage and transport of AFFF in U.S. Department of Transportation (US DOT) approved containers.
  - Locating all AFFF containers inside secondary containment that is in good condition and with adequate capacity to contain all credible releases.
  - Locating spill cleanup supplies and equipment adjacent to AFFF container storage areas.

In addition, waste incinerators (Alternative 2) would incorporate the following:

- Administrative controls:
  - Permit conditions, which restrict waste feed into the incinerator to periods during which operating parameters (for example, temperature, air flow, and fuel flow) are within the ranges established during incinerator testing.
  - Operating and maintenance procedures.
  - Containers are handled by trained personnel in accordance with the permit conditions and operating procedures.
- Engineered controls:
  - During operation, the combustion chamber is maintained at negative pressure to prevent fugitive emissions.

- Automatic waste feed shutoff, which terminates waste feed to the incinerator when operating parameters deviate outside the prescribed limits.
- Secondary containments at container storage area.

In addition, hazardous waste landfills (Alternative 3) would incorporate the following:

- Administrative controls:
  - Operating and maintenance procedures.
  - Containers are handled by trained personnel in accordance with the permit conditions and operating procedures.
- Engineered controls:
  - Two or more liner systems.
  - Leak detection system.
  - Leachate collection and recovery system.
  - Monitoring wells located upgradient and downgradient of the landfill.

In addition, Class I injection wells (Alternative 4) would incorporate the following:

- Administrative controls:
  - Operating and maintenance procedures.
  - Containers are handled by trained personnel in accordance with the permit conditions and operating procedures.
- Engineered controls:
  - Class I wells are drilled thousands of feet below the lowermost underground source of drinking water (USDW).
  - Disposal is prohibited unless the waste is non-hazardous or it is demonstrated that it will remain in place for 10,000 years.

3.1.2.2 Alternative 1: Approved Hold in Place

The participating Washington fire stations store AFFF in fixed and mobile AFFF systems or storage areas, including bladder tanks, mobile totes, fire extinguishers, drums, and small containers. Per fire station responses to our questionnaire, fire stations may possess anywhere from 3 gallons of AFFF to more than 500 gallons of AFFF. Most fire stations have less than 55 gallons of AFFF on hand; two fire stations possess significant quantities of AFFF (5,000 gallons and 12,000 gallons). For this alternative, any AFFF now stored in substandard containers would be transferred to new US DOT containers. To the extent practicable, all containers would be placed in secondary containment.

Anticipated Operations

Anticipated operations include routine AFFF material transfers, container transfers, and storage. The release mechanism during routine operation is the evaporation of PFAS compounds when the AFFF is exposed to the air. The risk of PFAS release is very low due to the engineered and administrative controls described above. The consequences would be insignificant because, as described above, the partial pressure of PFAS in AFFF is very low and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

Accidents or Upset Conditions

In the event of an accident or upset condition, the release mechanisms for the AFFF at fire stations are container leaks, spills, and piping leaks.

The release mechanism during accidents or upset conditions is the evaporation of PFAS compounds when the AFFF is exposed to the air. The risk of PFAS release is very low due to the engineered and administrative controls described above. The consequences would be insignificant because, as described above, the partial pressure of PFAS in AFFF is very low and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

Thus, the air quality impacts of Alternative 1 would not be significant.

3.1.2.3 Alternative 2: Incineration

Two options have been identified for the incineration option:

- Aragonite Incineration Facility (EPA RCRA ID: UTD981552177) is a hazardous waste disposal facility located outside the abandoned desert town of Aragonite, approximately 25 miles west of the Great Salt Lake in western Utah. As discussed in Chapter 2, the facility's reported capacity is 155.7 million British thermal units per hour (MMBtu/hr) (EPA 2022a) and permitted waste feed rate is approximately 13 tons per hour (ton/hr) (UDEQ 2022a). As discussed above, testing has demonstrated that the incinerator can achieve a 99.9999 percent DRE of common PFAS compounds.

- Kimball Incineration Facility (EPA RCRA ID: NED981723513) is an industrial waste storage and treatment facility in southwest Nebraska and is described further in Chapter 2. The facility's reported capacity is 57.79 MMBtu/hr (EPA 2015).

Anticipated Operations

Anticipated operations include:

- Transport of the AFFF containers from the fire stations to a temporary holding center in Washington.

- Transport of the AFFF containers from the temporary holding center to an incinerator facility.

- ► Routine AFFF material transfers, container transfers, and storage.
- ► AFFF incineration.

As is shown Table 3.1-2, the estimated criteria pollutant and GHG emissions from the transport vehicle would be small. These emissions would be temporary and widely spread geographically. The resulting ambient concentrations would be much less than the NAAQS summarized in Table 3.1-3.

The release mechanism during routine handling and transfers is the evaporation of PFAS compounds when the AFFF is exposed to the air. The risk of PFAS release is very low due to the engineered and administrative controls described above. The consequences would be insignificant because, as described above, the partial pressure of PFAS in AFFF is very low and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

As discussed in Chapter 2, it is estimated that 59,000 gallons (228,625 liters, 252 tons) of AFFF are present in participating fire departments. AFFF has a density of 1.00 kilogram per liter (Chemguard 2022) and contains approximately 2 percent by weight PFAS. June 2021 testing demonstrated that common PFAS compounds (for example, PFOA, PFOS, and PFHxS) were effectively destroyed in the Clean Harbors' Aragonite Incinerator system at "levels exceeding 99.9999 percent destruction and removal efficiency" (DRE) (EA, 2021). If all the Washington State AFFF were incinerated at conditions sufficient to achieve a DRE of 99.9999 percent, the resulting PFAS emissions would be 4.6 grams (0.16 ounce)[57] for the 59,000 gallons. This is a constrained estimate given the data gaps listed in Section 3.1.5.

The exact duration of PFAS emissions from the incinerator is unknown. The feed rate of AFFF into the incinerator is unknown, but as discussed in Chapter 2, it is reported that Aragonite's permitted waste feed rate is approximately 13 ton/hr. Therefore, the estimated duration of AFFF feed collected from the participating fire stations into the incinerator would be on the order of a few days. At its reported capacity, the Aragonite incinerator's estimated CO_2 emissions are up to 12.68 ton/hr.[58]

As is stated above, the reported capacity of Kimball Incineration Facility is 57.79 MMBtu/hr (approximately 37 percent of Aragonite's reported capacity). Although the maximum waste feed rate is not known, duration of AFFF feed from the participating fire stations into the incinerator would likely also be on the order of a few days.

As is discussed above, it is estimated that approximately 4.6 grams of PFAS compounds would be released to the ambient air during AFFF incineration. These would be released from a tall stack over a duration of at least one day, and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

[57] 228,625 liters x 0.02 x 1.00 kilogram/liter x (1-0.999999) x 1,000 grams/kilogram = 4.6 grams.

[58] For propane: 155.7 MMBtu/hr x 62.87 kg CO2/MMBtu x 1 lb/0.454 kg x 0.0005 ton/lb = 10.78 tons CO2/hr.
For fuel oil: 155.7 MMBtu/hr x 73.96 kg CO2/MMBtu x 1 lb/0.454 kg x 0.0005 ton/lb = 12.68 tons CO2/hr.

The emissions of criteria pollutants from the incinerators are unknown. The incinerators were required to apply for and obtain air permits to construct and operate. As part of the permitting process, the applicants submitted air quality analysis is to demonstrate that the incinerators would not cause or contribute to a violation of any applicable NAAQS. Therefore, the ambient concentrations of criterial pollutants resulting from AFFF incineration would be much less than the NAAQS summarized in Table 3.1-3.

Accidents or Upset Conditions

Potential accidents or upset conditions include the following:

- Transportation accidents resulting in the release of AFFF.
- Mishandling of containers during truck loading or at the incinerator facility.
- Incinerator upsets.

The probability and extent of credible transportation accidents are addressed in Section 3.10. The release mechanism during transportation accidents is the evaporation of PFAS compounds when the AFFF is exposed to the air. The consequences would be insignificant because, as described above, the partial pressure of PFAS in AFFF is very low and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

The release mechanism during mishandling of containers is the spillage of AFFF and the subsequent evaporation of PFAS compounds when exposed to the air. The risk of PFAS release is very low due to the engineered and administrative controls described above. The consequences would be insignificant because, as described above, the partial pressure of PFAS in AFFF is very low and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

The release mechanism during an incineration upset is the continued injection of AFFF when incinerator operating conditions are outside the ranges that support thorough PFAS destruction. Since the incinerators are equipped with automatic waste feed shutoff, which terminates waste feed to the incinerator when operating parameters deviate outside the prescribed limits, PFAS releases to the ambient air resulting from an incinerator upset would be minimal. The consequences would be insignificant because, as described above, the partial pressure of PFAS in AFFF is very low. The resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

Thus, the air quality impacts of Alternative 2 would not be significant.

3.1.2.4 Alternative 3: Solidification and Landfilling

Two options have been identified for the solidification and landfilling alternative:

- US Ecology Nevada (EPA RCRA ID NVT330010000) is a permitted landfill located in the Nevada desert approximately 11 miles south of the city of Beatty, Nevada. The facility is

surrounded by national lands managed by the Bureau of Land Management (BLM) for multiple uses, including extractive uses such as mining or logging.

- US Ecology Idaho (EPA RCRA ID: IDD073114654) is a permitted landfill located within a rural agricultural area outside of Grand View, Idaho. National lands managed by the BLM for multiple uses, including extractive uses such as mining or logging, are located south and west of the facility.

Anticipated Operations

Anticipated operations include:

- Transport of the AFFF containers from the fire stations to a temporary holding center(s) in Washington State.
- Transport of the AFFF containers from the temporary holding center(s) to a solidification and landfill facility.
- Routine AFFF material transfers, container transfers, and storage.
- Solidification of AFFF and placing the solidified material in a landfill cell.

As is shown Table 3.1-2, the estimated criteria pollutant and GHG emissions from the transport vehicle would be small. These emissions would be temporary and widely spread geographically. The resulting ambient concentrations would be much less than the NAAQS summarized in Table 3.1-3.

The release mechanism during routine handling, transfers, solidification, and landfilling is the evaporation of PFAS compounds when the AFFF or PFAS-contaminated leachate is exposed to the air. The risk of PFAS release is very low due to the engineered and administrative controls described above. The consequences would be insignificant because, as described above, the partial pressure of PFAS in AFFF is very low and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

Accidents or Upset Conditions

Potential accidents or upset conditions include the following:

- Transportation accidents resulting in the release of AFFF.
- Mishandling of containers during truck loading or at the landfill facility.
- Leaching of PFAS compounds from solidified AFFF, migration of these compounds into groundwater, and eventual evaporation from the groundwater.

The probability and extent of credible transportation accidents are addressed in Section 3.10. The release mechanism during transportation accidents is the evaporation of PFAS compounds when the AFFF is exposed to the air. The consequences would be insignificant because, as

described above, the partial pressure of PFAS in AFFF is very low and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

The release mechanism during mishandling of containers is the spillage of AFFF and evaporation of PFAS compounds when exposed to the air. The risk of PFAS release is very low due to the engineered and administrative controls described above. The consequences would be insignificant because, as described above, the partial pressure of PFAS in AFFF is very low and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

The release mechanism following landfilling is the leaching of PFAS compounds from solidified AFFF and migration of these compounds to groundwater. The risk of PFAS release is very low due to the engineered and administrative controls described above. PFAS compounds would tend to bind to the solid matrix. Leaching of PFAS compounds would be detected by leak detection system and PFAS compounds would be captured by the leachate collection and recovery system. Statistically significant migration of PFAS compounds from the landfill would be identified by the monitoring well system. The consequences would be insignificant because, as described above, the partial pressure of PFAS in AFFF in the groundwater would be very low and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

3.1.2.5 Alternative 4: Class I Deep Well Injection

Two options have been identified for the deep well injection option:

- Advantek Cavern Solutions is a deep well injection, non-hazardous waste site approximately five miles south of the City of Hutchinson in central Kansas. The facility is in a predominantly rural agricultural area.
- US Ecology Winnie is a deep-well injection, non-hazardous industrial wastewater disposal facility located approximately 10 miles north of the Gulf of Mexico near the town of Winnie, Texas.

Anticipated Operations

Anticipated operations include:

- Transport of the AFFF containers from the fire stations to a temporary holding center in Washington State.
- Transport of the AFFF containers from the temporary holding center to a deep well injection facility.
- Routine AFFF material transfers, container transfers, and storage.
- Injection of AFFF into a deep well.

As shown in Table 3.1-2, the estimated criteria pollutant and GHG emissions from the transport vehicle would be small. These emissions would be temporary and widely spread geographically. The resulting ambient concentrations would be much less than the NAAQS summarized in Table 3.1-3.

The release mechanism during routine handling, transfers, and well injection is the evaporation of PFAS compounds when the AFFF is exposed to the air. The risk of PFAS release is very low due to the engineered and administrative controls described above. The consequences would be insignificant because, as described above, the partial pressure of PFAS in AFFF is very low and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

Accidents or Upset Conditions

Potential accidents or upset conditions include the following:

- Transportation accidents resulting in the release of AFFF.
- Mishandling of containers during truck loading or at the incinerator facility.
- Catastrophic failure of the well system.

The probability and extent of credible transportation accidents are addressed in Section 3.10. The release mechanism during transportation accidents is the evaporation of PFAS compounds when the AFFF is exposed to the air. The consequences would be insignificant because, as described above, the partial pressure of PFAS in AFFF is very low and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

The release mechanism during mishandling of containers is the spillage of AFFF and evaporation of PFAS compounds when exposed to the air. The risk of PFAS release is very low due to the engineered and administrative controls described above. The consequences would be insignificant because, as described above, the partial pressure of PFAS in AFFF is very low and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

The release mechanism following injection is a catastrophic failure of the well system and discharge of PFAS vapors to the ambient air, which is potentially possible during a large earthquake. As the deep well injection locations are not in areas of high seismicity, this is unlikely, and the AFFF would be sequestered in a stable geological formation thousands of feet below ground.

The consequences would be insignificant and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

3.1.2.6 Alternative 5: No Action Alternative

The participating Washington fire stations store AFFF in fixed and mobile AFFF systems or storage areas, including bladder tanks, mobile totes, fire extinguishers, drums, and small containers.

Anticipated Operations

Anticipated operations include routine AFFF use, transfers, container transfers, storage, and disposal by the fire department. The release mechanism during routine operations is the evaporation of PFAS compounds when the AFFF is exposed to the air. The risk of release is unknown. The consequences would be insignificant because, as described above, the partial pressure of PFAS in AFFF is very low and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

Accidents or Upset Conditions

In the event of an accident or upset condition, the release mechanisms for the AFFF at fire stations are container leaks, spills, and piping leaks. As described in Section 2.1.2, our data from 2016 to 2021 shows a total of 26 reported spills at Washington fire stations. Most of the spills (for which there are spill quantity data) are less than 50 gallons.

Information regarding participating fire stations' current and future AFFF management practices is unknown. Fire departments are aware of the hazards associated with AFFF, and fire department personnel are trained in the chemicals hazards that they may encounter in their jobs. It is reasonable to presume that in most cases they will follow good practices.

The release mechanism during accidents or upset conditions is the evaporation of PFAS compounds when the AFFF is exposed to the air. The risk of PFAS release is unknown. Data on current and future practices is not available, and the duration for which the AFFF will be held is not defined. The consequences would be insignificant because, as described above, the partial pressure of PFAS in AFFF is very low and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.

3.1.2.7 Analysis Summary

For all alternatives, there is a low risk of a significant impact on air resources.

3.1.3 Cumulative Impacts

Cumulative impacts are discussed in Chapter 5.

3.1.4 Data Gaps

Data gaps include the following:

- Potential quantities and locations of AFFF released are unknown and therefore cannot be precisely evaluated.

- Data regarding the specific AFFF chemicals held at fire stations and the chemical constituents of these chemicals are not available. Safety data sheets typically list percentage ranges for the chemical composition, and do not necessarily list all chemical constituents.

- Clean Harbors reports that testing demonstrates that the Aragonite Incinerator destruction and removal efficiencies (DREs) exceed 99.9999 percent for common PFAS compounds (EA, 2021). It is not reported if these results have been subjected to peer review or scrutiny by regulatory agencies.

- PFAS are difficult to destroy due to the strength of the carbon-fluorine bond. Incomplete destruction or recombination of reactive intermediates can potentially result in the formation of new PFAS or other PICs of concern (EPA 2020c). Information regarding the emissions of PICs from PFAS incineration and their control is lacking.

- There are few toxicity studies on the health risks for most airborne PFAS compounds. The EPA is currently working on toxicity assessments for certain common PFAS compounds (EPA 2020b; 2021a).

- The number of truck trips required to transport AFFF to out-of-state treatment and disposal facilities is not known.

- Reasonable estimates of distances traveled by trucks while hauling AFFF are available. The distances traveled by truck when they are dispatched but not actually hauling AFFF are unknown.

- PFAS chemicals are not specifically addressed in incinerator RCRA permits. The optimal conditions for PFAS destruction, allowable feed rates, and emissions have not been characterized.

- Standardized methods for testing levels of PFAS emissions from stationary sources remain under development.

- It is not known if AFFF would be incinerated alone, or along with other waste streams.

- The total amount of natural gas combusted to incinerate the project's AFFF is unknown.

- It is not always evident which PFAS compounds are present in AFFF.

- The rate of AFFF injection into an incinerator is unknown.

3.2 Greenhouse Gas Emissions

3.2.1 Affected Environment

Greenhouse gases (also known as GHGs) are gases in the earth's atmosphere that trap heat. During the day, the sun shines through the atmosphere, warming the earth's surface. At night the earth's surface cools, releasing heat back into the air. But some of the heat is trapped by the greenhouse gases in the atmosphere. Unlike other types of air emissions where effects are primarily local/proximal to the release location, the release of GHGs affects the environment in a global sense, contributing to global warming and climate change.

GHGs include carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, perfluorocarbons, and hydroperfluorocarbons. In this section, each of the GHGs are expressed as (that is, normalized to) carbon dioxide equivalents (CO_2e) by applying the individual GHG's 100-year global warming potential (GWP; GHG Protocol 2016) relative to carbon dioxide's GWP.

Emissions of PFAS are not classified as GHGs and do not contribute to climate change. However, GHG emissions will result from the combustion of fossil fuels required to transport and dispose of AFFF as well as combustion of AFFF for the incineration alternative.

3.2.1.1 Existing and Evolving Regulations

Federal

U.S. Clean Air Act

The Clean Air Act (CAA) is the comprehensive federal law that regulates air emissions from stationary and mobile sources. Among other things, this law authorizes EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and to regulate emissions of hazardous air pollutants. The Inflation Reduction Act passed in August 2022 amends the CAA to better define existing authority, in particular, defining GHGs produced by the burning of fossil fuels as an "air pollutant," giving the EPA authority to regulate GHGs. To date, no limits on GHGs relevant to this evaluation have been developed or implemented.

EPA Air Programs

The EPA has two Air Programs (40 United States Code, Chapter 1, Subchapter C) related to GHG, including setting GHG emission standards for heavy-duty vehicles (Part 86, Subpart S, 86.1819-14) and mandatory GHG reporting for stationary sources emitting over 25,000 metric tons of carbon dioxide equivalent (MT CO_2e) per year. Emission sources under evaluation for our AFFF Collection, Transportation, and Disposal Program are primarily associated with mobile sources related to the truck transportation of AFFF; however, the Aragonite Incineration Facility is covered under the GHG reporting program (EPA 2022a).

Washington

Clean Air Rule (Chapters 173-441 & 173-442 WAC)

The Clean Air Rule (chapter 173-442 WAC) requires significant in-state stationary sources, petroleum product producers, importers, and distributors, and natural gas distributors

operating within Washington State that emit 10,000 MT CO_2e or more annually to report their GHG emissions. Emission sources under evaluation in this DEIS analysis are primarily mobile and not covered by this rule. Some stationary facility sources are included in the overall DEIS analysis, although these stationary sources are outside of Washington State and therefore also not covered under the WAC rule.[59]

Climate Commitment Act (Chapter 70A.65 RCW)
The Climate Commitment Act (CCA) establishes Washington State emissions reduction targets. Using 1990 emissions levels as the baseline, Washington State is required to reduce its emissions by:

- 45 percent by 2030
- 70 percent by 2040
- 95 percent by 2050

The CCA also develops and implements a "Cap-and-Invest" Program. Facilities that are required to participate in the program have stationary sources emitting at least 25,000 MT CO_2e annually. Emission sources under evaluation for our AFFF Collection, Transportation, and Disposal Program are either mobile, or out of state, and therefore not covered by this rule.

State Environmental Policy Act (Chapter 43.21C RCW[60])
The State Environmental Policy Act (SEPA) requires an analysis of reasonably foreseeable impacts to the environment. While SEPA does not explicitly require an analysis of GHGs and climate change, these impacts must be considered if a proposed action makes them reasonably likely to occur. Washington law does not set any specific, quantified thresholds to determine whether GHG emissions are significant under SEPA. Instead, GHG and climate change significance is analyzed on a case-by-case basis. The level of detail in these analyses can vary depending on the extent of a project's potential GHG emissions but must provide enough information to consider the extent of reasonably likely impacts.

State Clean Air Agencies
Certain Clean Air Agencies regulate stationary sources of GHG in Washington State counties, specifically requiring that facilities operate with covered stationary sources if emitting at least 10,000 MT CO_2e annually. No stationary sources of GHG emissions are anticipated to be utilized in Washington State for the EIS alternatives being evaluated.

Utah and Nebraska

Treatment options under consideration in the DEIS include incineration of AFFF at facilities located in Utah and Nebraska. Neither of these states have established GHG regulations.

[59] Website visited January 4, 2023. https://ghgdata.epa.gov/ghgp/service/facilityDetail/2021?id=1014032&ds=E&et=&popup=true
[60] Chapter 43.21C RCW. https://app.leg.wa.gov/rcw/default.aspx?cite=43.21c&full=true.

3.2.1.2 Release mechanisms

GHG Emissions Related to Transportation

GHGs would be emitted by the motor vehicles that transport AFFF to treatment, storage, and disposal (TSD) sites. Table 3.1-1 in Section 3.1: Air Quality, lists the travel distances and road types for a single one-way trip to each of the TSD sites under consideration in this DEIS.

GHG emissions for the transport vehicles were obtained from EPA's Motor Vehicle Emission Simulator (MOVES) version MOVES3 (EPA 2020c). The results are summarized in Table 3.1-2 in Section 3.1: Air Quality. The following input options were specified:

- The vehicle type would be a combination diesel truck.
- The emissions factors represent the average for the vehicle fleet in Spokane County, Washington in calendar year 2024.
- Road types are as described in Table 3.1-1.
- Emissions account for a single one-way vehicle trip.

By way of comparison and perspective (as discussed in Section 3.1, Air Quality), projected total GHG emissions associated with transport (i.e., a single one-way trip) of the AFFF for any of the 7 potential destinations for the TSD sites under consideration for this EIS would range from 0.49 to 3.76 tons CO_2e—well below the average annual GHG emissions for a single Washington State residential natural gas customer (4.54 tons CO_2e) in 2021. For additional perspective, projected emissions from these mobile sources would be well below the threshold for participation in the CCA's Cap-and-Invest Program for stationary sources (25,000 MT CO_2e annually, discussed above).

Not included in these estimates are the *de minimis*[61] emissions related to the fuel required to transfer the AFFF material from their original containers to intermediate containers or the *de minimis* emissions associated with the transfer to and from the transport equipment.

GHG Emissions from AFFF Incineration

It is infeasible to accurately calculate the amount of GHG emissions that would result from incineration of the estimated 59,000 gallons (228,625 liters, 252 tons) of AFFF in storage at fire departments in Washington State (Ecology 2022d) as there is significant uncertainty regarding operation of the incinerators and the byproducts of PFAS combustion. Optimal operating conditions such as temperature, pressures, and allowable feed rates to achieve high destruction and removal efficiencies (DREs) for PFAS have not been characterized (EPA 2020a). As such, it is infeasible to calculate fossil fuel requirements and corresponding GHG emissions to start up and maintain those operating conditions. There is also significant uncertainty regarding the logistics and timing for incineration of AFFF stored by Washington State fire departments,

[61] *De minimis* emissions means that emission rate of a regulated air pollutant that is 50 percent of the synthetic minor margin for that pollutant. De minimis emissions means trivial levels of emissions or increases of emissions that have been determined to do not pose a threat to human health or the environment.

including the number of startups and shutdowns of the incinerator that would occur during that time. Finally, the AFFF material is likely to be mixed with other feedstock material to be combusted within the incinerators, and the impact of that variable feedstock on GHG emissions is also unknown.

For the purposes of this DEIS, the analysis presents a simple, order-of-magnitude estimation of the GHG emissions that may result from incineration. As discussed above, it is estimated that in 2021 there were 252 tons of AFFF in storage at fire departments in Washington State (Ecology 2022d). The feed rate of AFFF into an incinerator is unknown; however, it is reported that Aragonite Incineration Facility's permitted waste feed rate is approximately 13 tons/hr. Therefore, the estimated duration of AFFF feed collected from the participating fire stations into the incinerator would likely be on the order of a few days. The Aragonite facility's total emissions ranges between 115,292 MT CO_2e to 138,531 MT CO_2e annually, averaging between approximately 320 and 380 MT CO_2e per day. At an estimated 5 days to incinerate the 252 tons of AFFF in storage, the total emissions would be no more than approximately 2,000 MT CO_2e.

Direct GHG emissions from the combustion of PFAS also includes significant uncertainty. PFAS are difficult to destroy due to the strength of the carbon-fluorine bond. Incomplete destruction or recombination of reactive intermediates can potentially result in the formation of new PFAS or other products of incomplete combustion (PICs) (EPA 2020a), some of which have a global warming potential (GWP) that is thousands of times greater than CO_2. However, as discussed in Section 3.1, June 2021 testing demonstrated that common PFAS compounds (e.g., PFOA, PFOS, and PFHxS) were effectively destroyed in the Clean Harbors' Aragonite Incinerator system at "levels exceeding 99.9999 percent destruction and removal efficiency" (DRE) (EA 2021). If all the Washington State AFFF were incinerated at conditions sufficient to achieve a DRE of 99.9999 percent, then trace amounts of CO_2 may be created as the carbon atoms in the material are oxidized. For example, PFOA contains 23.2 weight percent carbon[62] and AFFF contains up to about 2 percent by weight PFAS. Combustion of 252 tons of AFFF would generate about 194 metric tons of CO_2.[63]

For perspective, the approximate one-time GHG emissions associated with incineration of the AFFF, along with an unlikely worst-case scenario for Products of Incomplete Combustion (PICs) GHG emissions, would be well below the federal reporting limit threshold, and below Washington State's threshold to participate in the Cap-and-Invest Program, both 25,000 MT CO_2e annually.

GHG Emissions Related to Solidification

Table 3.1-2 provides estimates of the GHG emissions required to transport the AFFF to the solidification facilities. These one-time transport emissions represent very minor contributions to climate change and are insignificant.

[62] Molecular weight of PFOA ($C_8HF_{15}O_2$) = 414 grams/gram-mole; (12 × 8) ÷ 414 = 0.232 = 23.2 percent carbon.
[63] 252 short tons × 0.02 × 0.232 × (44 ÷ 12) = 214 short tons = 194 MT

GHG Emissions Related to Deep Well Injection

Table 3.1-2 provides estimates of the GHG emissions required to transport the AFFF to the deep well injection facility. These one-time emissions make minor contributions to climate change and are insignificant. GHG emissions from injection and storage of AFFF are limited to those associated with energy that powers these operations. These GHG emissions represent minor contributions to climate change and are insignificant.

3.2.2 Significance Criteria

"Significant" as used in SEPA means a reasonable likelihood of more than a moderate adverse impact on environmental quality. Significance involves context and intensity (WAC 197-11-330) and does not lend itself to a formula or quantifiable test. Numerical limits for GHG emissions from mobile sources have not been established by federal or state regulatory bodies. For stationary sources, both the federal reporting limit and Washington State's threshold to participate in the Cap-and-Invest Program are 25,000 MT CO_2e annually. While this is not an emissions threshold under SEPA, it can provide context and perspective on the potential impact of GHG emissions anticipated under the alternatives presented in this EIS.

3.2.3 Impacts Assessment

3.2.3.1 Alternative 1: Approved Hold in Place

The participating Washington State fire stations store AFFF in fixed and mobile AFFF systems or storage areas, including bladder tanks, mobile totes, fire extinguishers, drums, and small containers. This would prevent or limit future exposures of AFFF into the environment.

Anticipated Operations

Anticipated operations include routine AFFF material transfers, container transfers, and storage. No substantive increase in GHG emissions is anticipated with Alternative 1.

Thus, the GHG impacts of Alternative 1 would not be significant.

3.2.3.2 Alternative 2: Incineration

Two options have been identified for the incineration alternative:

- Aragonite Incineration Facility (EPA RCRA ID: UTD981552177) is a hazardous waste disposal facility located outside the abandoned desert town of Aragonite, approximately 25 miles west of the Great Salt Lake in western Utah. As discussed in Chapter 2, the facility's reported capacity is 155.7 million British thermal units per hour (MMBtu/hr) (EPA 2022a) and permitted waste feed rate is approximately 13 tons per hour (ton/hr) (UDEQ 2022a). As discussed above, testing has demonstrated that the incinerator can achieve a 99.9999 percent DRE of common PFAS compounds.

- Kimball Incineration Facility (EPA RCRA ID: NED981723513) is an industrial waste storage and treatment facility in southwest Nebraska and is described further in Chapter 2. The facility's reported capacity is 57.79 MMBtu/hr (EPA 2015).

Anticipated Operations

Anticipated operations include:

- Transport of the AFFF containers from the fire station to a temporary holding center in Washington State.
- Transport of the AFFF containers from the temporary holding center to an incinerator facility.
- Routine AFFF material transfers, container transfers, and storage.
- AFFF incineration.

As is shown Table 3.1-2 in Section 3.1, Air Quality, the GHG emissions from the transport vehicles would be small and occur one time. As estimated above, approximately 2,194 MT CO_2e may result from the one-time incineration of the AFFF in storage at fire departments in Washington State. For perspective, the federal reporting limit threshold for stationary sources (which applies to thousands of facilities nationwide), and Washington State's threshold to participate in the Cap-and-Invest Program, are both 25,000 MT CO_2e annually. The incineration alternative would contribute a minor, one-time amount to global GHGs that would be much lower than the amounts that most regulated sources of GHGs emit.

Accidents / Upset Conditions

Potential accidents / upset conditions would likely include incomplete combustion resulting in GHG emissions that are expected to be small, even in a worst-case scenario.

Thus, the GHG impacts of Alternative 2 would not be significant.

3.2.3.3 Alternative 3: Solidification and Landfill

Two options have been identified for the solidification and landfill option:

- US Ecology Nevada (EPA RCRA ID NVT330010000) is a permitted landfill located in the Nevada desert approximately 11 miles south of the city of Beatty. The facility is surrounded by national lands managed by the Bureau of Land Management (BLM) for multiple uses, including extractive uses such as mining or logging.
- US Ecology Idaho (EPA RCRA ID: IDD073114654) is a permitted landfill located within a rural agricultural area outside of Grand View, Idaho. National lands managed by BLM for multiple uses, including extractive uses such as mining or logging, are located south and west of the facility.

Anticipated Operations

Anticipated operations include:

- Transport of the AFFF containers from the fire station to a temporary holding center in Washington State.

- ► Transport of the AFFF containers from the temporary holding center to a solidification and landfill facility.

- ► Routine AFFF material transfers, container transfers, and storage.

- ► Solidification of AFFF and placing the solidified material in a landfill cell.

As is shown Table 3.1-2, the estimated GHG emissions from the transport vehicle would be small and occur one time.

The release mechanism for GHG emissions during routine handling, transfers, solidification, and landfilling is combustion of fossil fuels. These emissions would be small compared with the transport to the facilities. Overall, the consequences would be insignificant. As described above, and for perspective, the GHG emitted would be below the annual GHG emissions associated with the average Washington State residential natural gas user in 2021 and below any threshold for participating in federal or Washington State GHG programs relating to stationary sources of GHG. The addition of AFFF containers to the landfill would represent minimal increases in GHG emissions associated with operation of the landfill.

Thus, the GHG impacts of Alternative 3 would not be significant.

Accidents / Upset Conditions
None. Solid waste facilities are known to be a common source of GHG emissions in the form of fugitive methane generated from the microbial breakdown of organic material. AFFF is stable, inorganic, and not considered a source of methane generation in a landfill.

3.2.3.4 Alternative 4: Class I Deep Well Injection

Two options have been identified for the deep well injection alternative:

- ► Advantek Cavern Solutions is a deep well injection, non-hazardous waste site approximately five miles south of the City of Hutchinson in central Kansas. The facility is in a predominantly rural agricultural area.

- ► US Ecology Winnie is a deep-well injection, non-hazardous industrial wastewater disposal facility located approximately 10 miles north of the Gulf of Mexico near the town of Winnie, Texas.

Anticipated Operations
Anticipated operations include:

- ► Transport of the AFFF containers from the fire station to a temporary holding center in Washington State.

- ► Transport of the AFFF containers from the temporary holding center to a deep well injection facility.

- ► Routine AFFF material transfers, container transfers, and storage.

- ► Injection of AFFF into a deep well.

As is shown Table 3.1-2, the estimated GHG emissions from the transport vehicle would be small and occur one time.

The release mechanism for GHG emissions during routine handling, transfers, storage, and injection is combustion of fossil fuels. These emissions would be small compared with the transport to the facilities. Overall, the consequences would be insignificant. As described above, and for perspective, the GHG emitted would be below the annual GHG emissions associated with the average Washington State residential natural gas user in 2021 and below any threshold for participating in federal or Washington State GHG programs relating to stationary sources of GHG. The addition of AFFF containers to the injection site would represent minimal increases in GHG emissions associated with operation of the injection site.

Thus, the GHG impacts of Alternative 3 would not be significant.

Accidents / Upset Conditions
None.

3.2.3.5 Alternative 5: No Action

The participating Washington State fire stations store AFFF in fixed and mobile AFFF systems or storage areas, including bladder tanks, mobile totes, fire extinguishers, drums, and small containers.

Anticipated Operations
No substantive increase in GHG emissions is anticipated with Alternative 5.

Thus, the GHG impacts of Alternative 5 would not be significant.

Accidents / Upset Conditions
None.

3.2.3.6 Analysis Summary

For all alternatives, there is a low risk of a significant impact to GHG emissions.

3.2.4 Mitigation Measures

For all alternatives, mitigation measures to reduce amount of GHG emissions:

Implementation of the collection and treatment/disposal alternatives would incorporate the following measures to avoid GHG impacts. No additional measures would be required to avoid potential significant environmental impacts.

- ► Administrative controls
  - Safe driving habits during the transportation of the material.

- Treatment and disposal of AFFF at properly licensed facilities.

Waste incinerators typically incorporate the following:

► Administrative controls

- Permit conditions which restrict waste feed into the incinerator to periods during which parameters (e.g., temperature, air flow, fuel flow) are within operating spans established during incinerator testing.

► Operating and maintenance procedures.

- Containers are handled by trained personnel in accordance with the permit conditions and operating procedures.

► Engineered controls.

- During operation, the combustion chamber is maintained at negative pressure to prevent fugitive emissions.

- Automatic waste feed shutoff, which terminates waste feed to the incinerator when operating parameters deviate outside the established operating spans.

3.2.5 Cumulative Impacts

Chapter 5, Cumulative Impacts, discusses potential cumulative impacts related to the AFFF program.

3.2.6 Data Gaps

Data gaps include the following:

► Potential quantities and locations of AFFF release are unknown and therefore cannot be precisely evaluated. Estimates for this analysis were based on data reported for 2011.

► Clean Harbors reports that testing demonstrates that the Aragonite Incinerator DREs exceed 99.9999 percent for common PFAS compounds (EA, 2021). It is not reported if these results have been subjected to peer review or scrutiny by regulatory agencies.

► PFAS are difficult to destroy due to the strength of the carbon-fluorine bond. Incomplete destruction or recombination of reactive intermediates can potentially result in the formation of new PFAS or other products of incomplete combustion PICs of concern (EPA 2020c). Information regarding the emissions of PICs from PFAS incineration and their control is lacking.

► The number of truck trips required to transport AFFF to out-of-state treatment and disposal facilities is not known.

- Reasonable estimates of distances traveled by trucks while hauling AFFF are available. The distances traveled by truck when they are dispatched for the Project but not actually hauling AFFF is unknown.
- PFAS chemicals are not specifically addressed in incinerator RCRA permits. The optimal conditions for PFAS destruction, allowable feed rates, and emissions have not been characterized.
- It is not known if AFFF would be incinerated alone or along with other waste streams.
- The total amount of natural gas combusted to incinerate the Project's AFFF is unknown.
- The rate of AFFF injection into an incinerator is unknown.

3.3 Earth and Water Resources

This section describes the earth and water resources in the area of the project alternatives and describes the potential environmental consequences of each alternative on these resources. Earth and water resources considered in this section include soil, surface water, and groundwater.

3.3.1 Affected Environment

The potentially affected environment includes soil, surface water, and groundwater resources at and near the fire stations participating in our AFFF collection project; the potential temporary storage facilities; the identified potential treatment and disposal sites for the collected AFFF; and the identified potential transportation routes.

The study area for earth and water resources is defined as the soil, the surface water, and the groundwater with the potential to be affected by collection, transport, and disposal of AFFF stockpiles under alternatives considered in this EIS. The study area includes a 0.25-mile offset from potential AFFF storage locations, disposal facilities, and transportation corridors to assess the typical range of potentially impacted soil, surface water, and groundwater.

For study area locations within 0.25-mile of a water feature, the study area is expanded to include the water corridor up to 10 miles downstream of its intersection with the 0.25-mile buffer.

3.3.1.1 Existing and Evolving Regulations

Federal

As discussed in Chapter 1, the EPA, under the Clean Water Act, the Safe Drinking Water Act, and its PFAS Strategic Roadmap, has issued drinking water health advisory levels, regional screening levels for soil and tap water, and water quality criteria for aquatic life. These PFAS levels are meant to provide information for the protection of human health and the environment, and they are non-enforceable. The published levels are provided in Chapter 1, Tables 1-1, 1-2, and 1-3.

Also as discussed in Chapter 1, in March 2023 the EPA proposed maximum contaminant levels (MCLs) in drinking water for six PFAS. EPA is evaluating public comments and anticipates finalizing a regulation by the end of 2023. The proposed MCLs are not enforceable as of this writing.

State

The information below comprises regulations in Washington and other states that include potential transportation routes to disposal facilities under consideration in this EIS. The potential transportation routes are shown in Figure 3.10-1.

Washington

Model Toxics Control Act

The Model Toxics Control Act (MTCA) is Washington's environmental cleanup law. MTCA funds and directs the investigation, cleanup, and prevention of sites contaminated by hazardous substances. It works to protect people's health and the environment, and to preserve natural resources for the future. Establishing protective concentrations for ecological receptors is an essential aspect of site cleanup work under MTCA. Our PFAS Chemical Action Plan includes recommendations to address PFAS levels in soil, sediment, fresh water, and salt water to protect ecological receptors (see Recommendation 2.1, Ecology 2022d).

In June 2023, we published *Guidance for Investigating and Remediating PFAS Contamination in Washington State* (Ecology 2023b). Among other items, the document established preliminary cleanup levels for soil and groundwater, as well as protective concentrations for ecological receptors in marine waters, freshwater, and uplands soils based on a literature review for 10 PFAS chemicals. The concentrations are listed in Chapter 1, Tables 1-4 and 1-5.

State Environmental Policy Act

The State Environmental Policy Act (SEPA) requires state and local governments to identify possible environmental impacts that may result from governmental decisions. The SEPA review process helps the department, applicants, and the public understand how a proposed project could affect the environment. SEPA gives agencies the authority to condition or deny a proposal based on the agency's adopted SEPA policies and the environmental impacts identified in a SEPA document.

Water Pollution Control Act

The Water Pollution Control Act was established to maintain the highest possible water standards in state waters, which include all lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within Washington State jurisdiction. Industries and others are required to use all known available and reasonable methods to prevent and control the pollution of the waters of the state. Pollutants include any material that makes the water harmful, detrimental, or injurious to wild animals, birds, fish, or other aquatic life.

Water Resources Act of 1971

The Water Resources Act of 1971 (chapter 90.54 RCW) was codified in 1971 to provide comprehensive water resource planning for the state of Washington. Through this regulation, we were tasked to establish and maintain a "waters resource information system" with the intent of studying and regulating water resources in the state. We typically study and regulate water resources by watershed, also known as Water Resource Inventory Areas (WRIAs). In cooperation with other state natural resources agencies, Ecology delineated the state's major watersheds into 62 WRIAs. The WRIA watershed boundaries were formalized by law in 1971 to be used as the basis for state management purposes. Additional information on WRIAs can be found on our find your WRIA webpage.[64]

[64] https://ecology.wa.gov/watershed-lookup

Environmental Health and Safety

Washington State law (chapter 70A.400 RCW) places several restrictions on the use, sale, and manufacturer of firefighting foam with intentionally added PFAS. Specifically, fire departments may not use this foam for training purposes, nor may manufacturers or retailers conducting business in Washington, sell, offer for sale, or manufacture firefighting foam with intentionally added PFAS. State law, however, does not prohibit fire departments from using firefighting foam with intentionally added PFAS in emergencies.

Idaho

Idaho's Department of Environmental Quality adopts final primary drinking water standards set by the EPA, and because the EPA has not finalized primary MCLs for PFAS in drinking water, there are currently no Idaho state regulations for PFAS in surface water, groundwater, or soil (Idaho 2022).

Nebraska

Nebraska's Department of Environmental Quality (NDEQ) has formed a multi-program team to track issues associated with PFAS. Initial sampling for PFAS compounds was conducted at 25 public water systems between 2013 and 2015. None of those samples had detections of PFAS. In 2017, NDEQ completed a statewide PFAS inventory identifying 990 sites that potentially used or produced PFAS compounds. Based on the inventory, NDEQ conducted initial PFAS sampling of nearby private wells. While levels of concern have not been detected, NDEQ is early in the investigation (NDEQ 2023). As of this writing, Nebraska has not set state PFAS standards for soil, surface water, or groundwater.

Nevada

Nevada State Assembly Bill 97 required the Nevada Department of Environmental Protection (NDEP) to establish a working group to evaluate and address PFAS contamination in Nevada. The working group was established in 2021 and developed the Nevada PFAS Action Plan in 2022, which makes several recommendations regarding PFAS monitoring, containment, and clean-up, including making monitoring data available to the public, developing trigger and threshold levels and reporting requirements for PFAS release, and making PFAS outreach tools available for use within Nevada (NDEP 2022b). With respect to regulation, NDEP plans to follow EPA recommendations, including Health Advisory Levels (HALs) and MCLs (NDEP, 2022a).

Kansas

The Kansas Department of Health and Environment is working with the Department of Environmental Remediation and the Bureau of Water to address PFAS in drinking water; however, no state regulations have been implemented (KDHE 2022).

Texas

The Texas Commission on Environmental Quality (TCEQ) has not implemented state drinking water standards for PFAS. They plan to publish standards once the EPA has published final drinking water rules (TCEQ 2022b). TCEQ has developed Tier 1 protective concentration levels (PCLs) for several PFAS under Texas Risk Reduction Program (TRRP) which provides human health risk-based guidance values and requirements for environmental assessment and remediation programs (TCEQ 2022a).

Utah

Currently, there are no state regulations for PFAS in Utah; however, the Utah Department of Environmental Quality (DEQ) formed a PFAS workgroup in 2019 to study the potential for PFAS contamination in Utah. Results and recommendations were published in DEQ's Reconnaissance Plan for PFAS in Utah, dated April 2020.

Study Area

The study area for the potentially affected environment includes the fire stations participating in our AFFF collection project; possible temporary storage hold facilities; identified potential treatment and disposal sites for the collected AFFF; and identified transportation routes. The study areas include an additional 0.25-mile adjacent to each of these facilities and transportation routes; this is a radius or distance from facilities or transportation routes that could be reasonably affected by AFFF collection and disposal activities. For study area locations within 0.25-mile of a water feature, the study area was expanded to include the water corridor up to 10 miles downstream of its intersection with the 0.25-mile buffer.

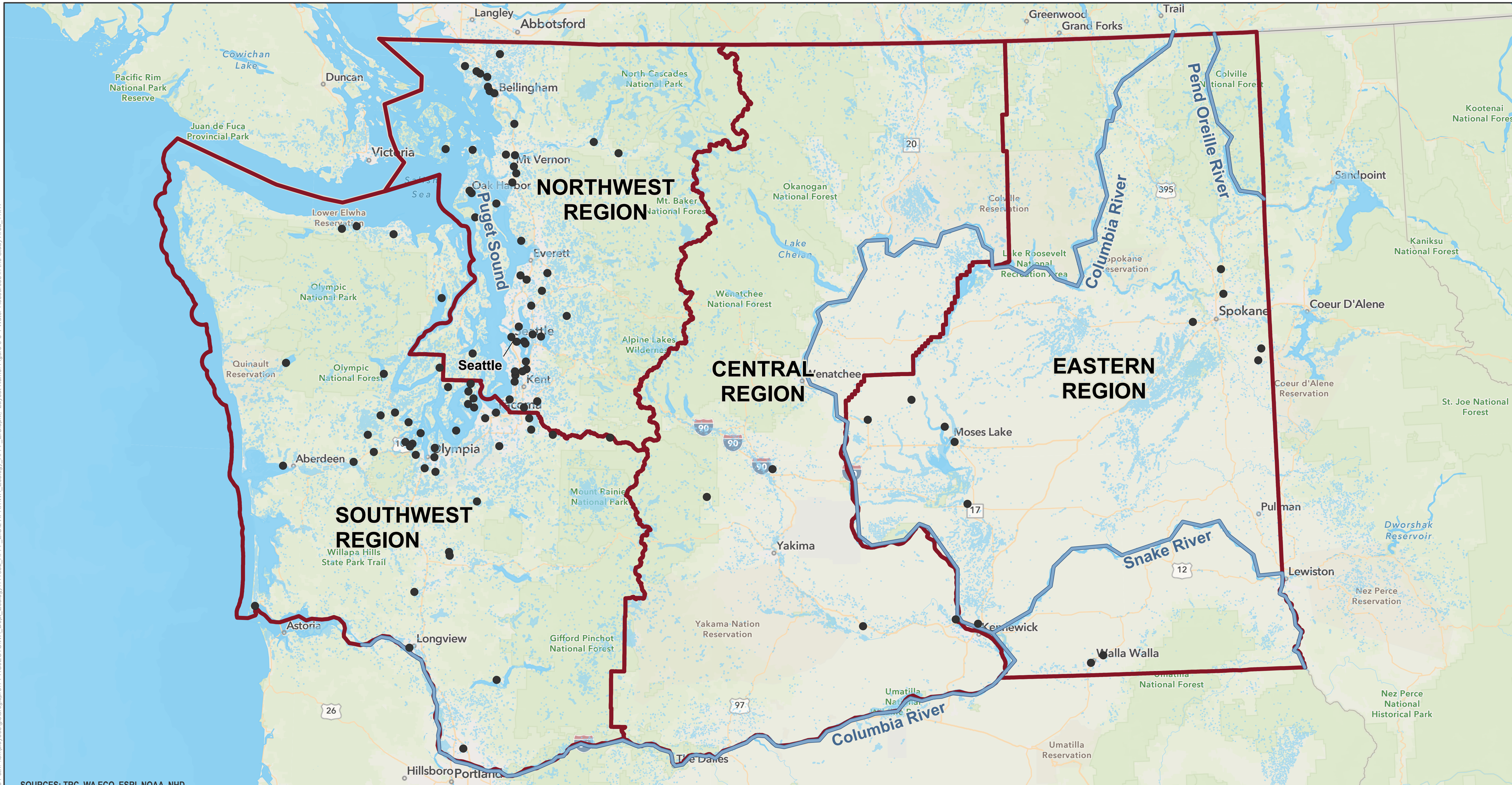
3.3.2 Environmental Setting

In this section, soil resources are discussed as the predominant surface soil types according to the National Resource Conservation Survey (NRCS). Surface water resources are discussed in terms of the large-scale watersheds delineated by the United States Geologic Survey (USGS), which are based on surface hydrologic features and drainages.[65] Groundwater resources are discussed in terms of principal aquifer systems, which are defined by the USGS as, "A regionally extensive aquifer or aquifer system that has the potential to be used as a source of potable (drinkable) water" (USGS 2021).

Figure 3.3-1 shows the Washington State regions (Southwest, Northwest, Central, and Eastern) and the major surface waterbodies in the state. Figure 3.3-2 shows the two major aquifers in the state.

[65] A listing of the local-scale (USGS HUC-12) watersheds for each fire station is provided in Appendix A.4.

25-AUG-2023



LEGEND

- FIRE STATION STORING AFFF
- ECOLOGY REGIONS
- MAJOR RIVERS
- SURFACE WATERS

FIGURE 3.3-1: WATER RESOURCES IN THE STUDY AREA

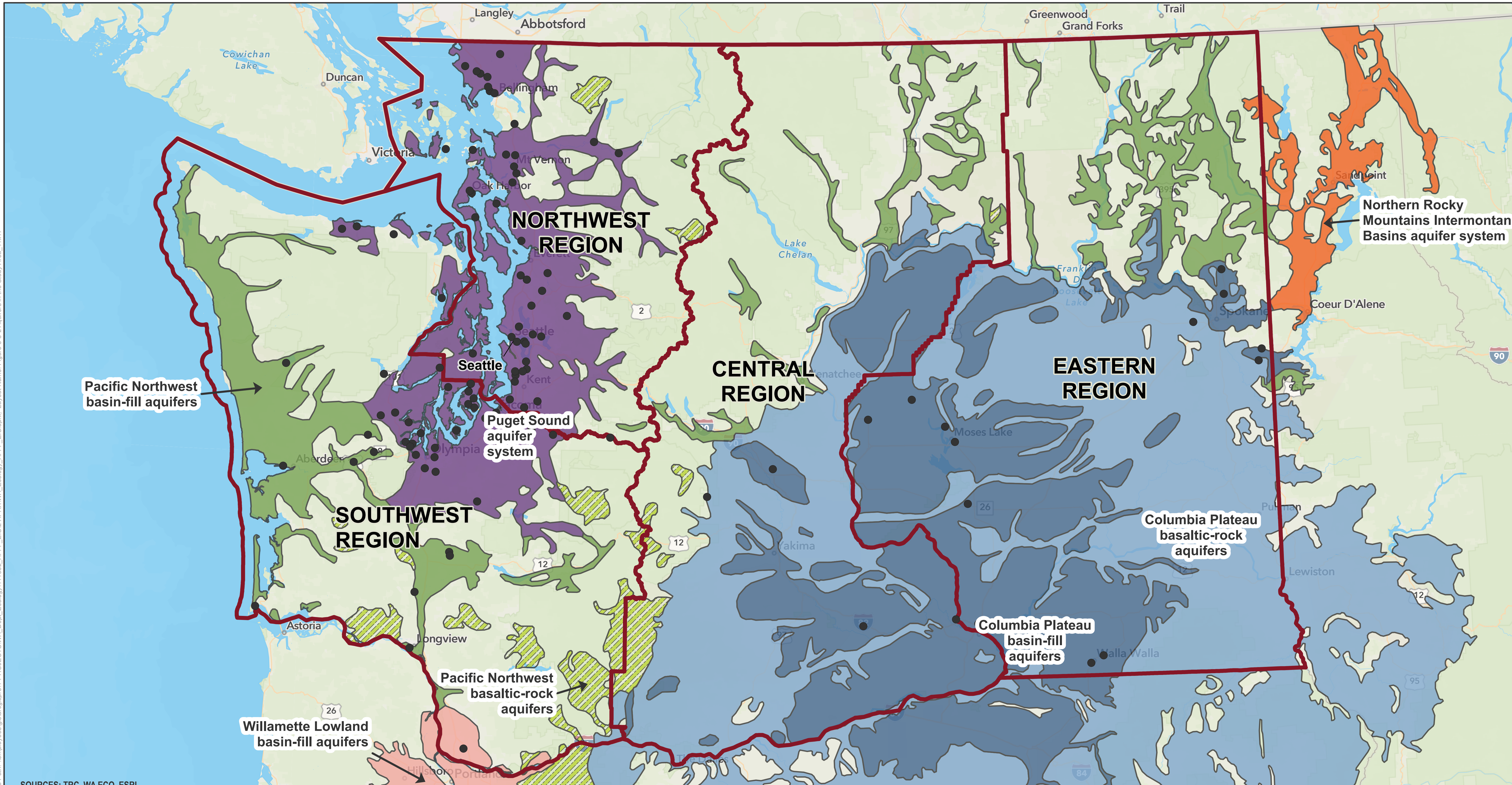
AFFF COLLECTION AND DISPOSAL PROGRAM
DRAFT ENVIRONMENTAL IMPACT STATEMENT

1:2,000,000
1" = 32 mi
0 25 50 MILES

DEPARTMENT OF ECOLOGY State of Washington

TRC

10-OCT-2023



LEGEND

- FIRE STATION STORING AFFF
- ECOLOGY REGIONS
- COLUMBIA PLATEAU BASALTIC-ROCK AQUIFERS
- COLUMBIA PLATEAU BASIN-FILL AQUIFERS
- NORTHERN ROCKY MOUNTAINS INTERMONTANE BASINS AQUIFER SYSTEM
- PACIFIC NORTHWEST BASALTIC-ROCK AQUIFERS
- PACIFIC NORTHWEST BASIN-FILL AQUIFERS
- PUGET SOUND AQUIFER SYSTEM
- WILLAMETTE LOWLAND BASIN-FILL AQUIFERS

FIGURE 3.3-2: AQUIFERS IN THE STUDY AREA

AFFF COLLECTION AND DISPOSAL PROGRAM
DRAFT ENVIRONMENTAL IMPACT STATEMENT

1:2,000,000
1" = 32 mi
0 25 50 MILES

DEPARTMENT OF ECOLOGY State of Washington

TRC

3.3.2.1 Fire Stations

Soils

Surface soils vary across the state geologic areas where the participating fire stations are located. A detailed description of surface resources is omitted here given that the majority of the fire stations are paved or covered with gravel. Regional geology is discussed in the Groundwater section below.

Surface Water

Participating fire stations are located across all four regions of Washington State (Southwest, Northwest, Central, and Eastern) and within the Pacific Northwest hydrologic region. This region includes drainages within the United States that ultimately discharge into the Strait of Georgia and the Strait of Juan de Fuca; drainages that discharge to the Pacific Ocean within the states of Washington and Oregon; and the part of the Great Basin that discharges into the state of Oregon (USGS 1994).

Most of the participating fire stations are in urban areas within the Puget Sound subregion, where surface water discharges into the Puget Sound, the Strait of Georgia, the Strait of Juan De Fuca, and the Fraser River Basin (USGS 1994). Several fire stations are in more rural areas of the state, including the Oregon-Washington Coastal subregion where surface water drains into the Pacific Ocean, and several subregions where surface waters drain into the Columbia River and ultimately into the Pacific Ocean, including the Lower Columbia subregion, the Middle Columbia subregion, the Upper Columbia subregion, the Yakima subregion, and the Kootenai-Pend Oreille-Spokane subregion (USGS 1994).

Groundwater

As stated above, most of the participating fire stations are located within the Puget Sound metropolitan area. This overlays the Puget-Willamette Trough Aquifer System that stretches from the Canadian Border to Central Oregon. This is an unconsolidated deposit aquifer system in the Puget Sound lowland areas to the north and a mix of unconsolidated deposit and Miocene basaltic-rock aquifers that extend south of Puget Sound to the Willamette River Valley (USGS, 1994). The unconsolidated deposit aquifer generally comprises glacial deposits of sands and gravel, often in discontinuous or interbedded layers. These deposits can be found near the surface to depths greater than 2,000 feet below the surface, and can yield substantial volumes of water for domestic, commercial, and agricultural purposes (USGS 1994). The depth to groundwater in this region is generally between 20 and 40 feet (USGS 2023).

Several fire stations overlie the Columbia Plateau Aquifer System, which occupies most of rural southeastern Washington and parts of northern Oregon and eastern Idaho. This principal aquifer system consists of three Miocene basalt formations—the Saddle Mountain Basalt, Wanapum Basalt, and Grande Ronde Basalt—overlain by unconsolidated deposits. The Grande Ronde Basalt is the oldest of the three and has the largest horizontal and vertical extent. The Wanapum Basalt sits on top of the Grande Ronde Basalt with a smaller footprint and a thickness exceeding 1,000 feet in some places. The Saddle Mountain Basalt is the youngest and smallest of the three, with a thickness reaching 800 feet in some places. These basalt formations can have extensive facture networks and void spaces where bubbles formed during

cooling of the lava flows and can yield substantial volumes of water. Unconsolidated deposits from glacial outwash overlie the basaltic rock formations and can range from 200 to 800+ feet thick. The basaltic-rock aquifers serve as the primary water-bearing units in the Columbia Plateau Aquifer System; however, the unconsolidated deposit aquifers can provide significant amounts of water in areas where the deposits are thick (USGS 1994). Groundwater from the Columbia Plateau is primarily used for agricultural purposes with some domestic and commercial uses.

The handful of fire stations that exist outside of these two principal aquifer systems generally overlie smaller regional aquifers that consist of either pre-Miocene rocks or unconsolidated deposits. These smaller regional aquifers are typical in the more rural and mountainous regions of Washington State. The pre-Miocene rock aquifers typically yield less water than the pockets of unconsolidated-deposit aquifers, which generally serve as the primary source of groundwater for commercial, industrial, agricultural, and domestic purposes (USGS 1994).

The depth to groundwater in the rural areas is generally between 40 and 90 feet (USGS 2023).

Potential Short-Term Holding Facilities

Soils

We have identified 16 potential short-term holding facilities where AFFF may be collected and stored for up to 10 days. These potential short-term storage sites are located throughout the state and in the city of Clackamas, Oregon. Surface soils vary across these areas. A detailed description is omitted here given that the potential storage facilities are paved.

Surface Water

Temporary 10-day holding facilities are located in urban areas and are used as centralized facilities for consolidating containers of AFFF from participating fire stations before transport to the ultimate disposal facility. Most of the 10-day holding facilities are located within the Puget Sound subregion; six facilities are in subregions that drain to the Columbia River, including the Kootenai-Pend Oreille-Spokane subregion, the Upper Columbia subregion, and the Lower Columbia subregion; and one facility is in Clackamas, Oregon, within the Willamette subregion, which drains to the Willamette River before discharging to the Columbia River (USGS 1994).

Groundwater

Nine temporary 10-day holding facilities in the Puget Sound metropolitan area and two 10-day holding facilities in the Portland metropolitan area overlie unconsolidated sand and gravel deposits of the Puget-Willamette Trough Aquifer System. Three temporary 10-day holding facilities in Spokane and two facilities in Pasco overlay unconsolidated sand and gravel deposits of the Columbia Plateau Aquifer System. The depth to groundwater is generally 20 to 40 feet (USGS 2023).

Landfills

US Ecology Idaho Facility

The US Ecology Idaho facility is a permitted landfill located within a rural agricultural area outside of Grand View, Idaho. The facility is located approximately 3 miles south of the confluence of Castle Creek and the Snake River (USGS 2022).

Soils

Surface soils are primarily comprised of sandy loam and gravelly sandy loam.

Surface Water

No surface water bodies are present within the 0.25-mile study area around the facility.

Groundwater

The US Ecology Idaho facility is situated in the Snake River Plain Aquifer System, which extends from the western boundary of Yellowstone National Park to the Idaho-Oregon border. The aquifer system can be divided into the eastern and western plains based on abrupt hydrogeologic changes that occur between Salmon Falls Creek and King Hill, Idaho. The US Ecology Idaho facility is within the western plain on the southern side of the Snake River, which consists primarily of unconsolidated deposits that can be a few thousand feet thick on top of Pliocene and younger basaltic rocks (USGS 1994). These unconsolidated deposits generally comprise fine-grained sands and gravels and serve as the primary water supply for domestic, commercial, industrial, and agricultural purposes in the area (USGS 1994). Depth to groundwater at the facility ranges from 130 feet to 200 feet (US Ecology 2019).

US Ecology Nevada Facility

The US Ecology Nevada facility is a hazardous waste permitted landfill located in the Nevada desert approximately 11 miles south of the city of Beatty.

Soils

Surface soils primarily consist of alluvium derived from mixed rock sources and are described as very gravelly sandy loam.

Surface Water

The facility is located within the Carrara Canyon watershed of the Upper Amargosa River basin, a closed basin where surface water is landlocked. Several desert washes are visible in aerials of the facility site, including one that appears to connect to the south end of the facility. Washes generally flow only after heavy winter rains.

Groundwater

The US Ecology Nevada facility is situated in the Basin and Range Aquifer System, which comprises of three principal formations: the volcanic-rock aquifers made up of primarily tuff, rhyolite, or basalt; limestone and dolomite aquifers; and basin-fill aquifers made up of unconsolidated sands and gravels. The basin-fill aquifer systems are alluvial in nature and form in the lowland areas between mountains with coarse sands and gravels deposited near the mountains and fine sands and clay deposited in the center of the playas. The basin-fill aquifers are the more productive units in the Basin and Range Aquifer System; however, they are discontinuous due to the extensive faulting throughout the province. Except for relatively small areas that discharge to the Colorado River, the water in the Basin and Range Aquifer Systems does not discharge to any major surface water bodies. The water in this area is primarily lost through evapotranspiration (USGS 1994). Depth to groundwater at the facility ranges from 285 feet to over 360 feet (US Ecology 2021a).

Incineration Sites

Aragonite Incineration Facility

Soils

The surface soil unit at the facility is the Tooele fine sandy loam.

Surface Water

The Aragonite Incineration Facility is located outside of Aragonite, Utah, within the Great Salt Lake subregion of the Great Basin Hydrologic Region. The facility itself is located within the Upper Ripple Valley subwatershed, which is a closed basin that discharges to a playa east of the Great Salt Lake.

Groundwater

The Aragonite facility is situated in the Basin and Range Aquifer system within the Great Salt Lake Desert, which is comprised of deposits from Lake Bonneville, a Pleistocene era lake. Larger sediments, such as sands, gravels, and boulders, were deposited near the toe of the mountains, and finer sediments including fine sands, silts, and clays were deposited in the center of the lake. Evaporation of the lake formed halite (rock salt) at the surface. As such, primarily saline waters are encountered in shallow aquifers in the central parts of the playas (USGS 1995).

Kimball Incineration Facility

Soils

Surface soils at the Kimball Incineration Facility primarily comprise loams and sandy loams with some exposures of weathered bedrock.

Surface Water

The Kimball Incineration Facility is located outside of Kimball, Nebraska, within the South Platte River Basin subregion of the Missouri Hydrologic Region. The facility itself is in the Cederburg Reservoir subwatershed, where surface water discharges into Lodgepole Creek which flows into the South Platte River. No surface water bodies are present within the 0.25-mile study area around the facility.

Groundwater

The Kimball Incineration Facility is located within the High Plains aquifer system, which includes the Ogallala Formation—the principal aquifer in the High Plains region. The Ogallala Formation consists of unconsolidated gravel, sand, silt, and clay, with pockets of caliche, formed through deposits of braided streams that drained the eastern slopes of the Rocky Mountains. In some areas deposits of loess (windblown silts and clay) or dune sands overlie the Ogallala Formation. The primary use of water from the Ogallala Formation is for agricultural purposes in the Great Plains (USGS, 1997). The depth to groundwater near the facility is approximately 19 feet (USGS, 2023).

Deep Well Injection Sites

US Ecology Facility Winnie

US Ecology in Winnie, Texas is a hazardous waste processing, storage, and disposal facility that operates seven Class I underground injection wells (Permit Nos. WDW344-350) for the disposal of non-hazardous waste. The permitted injection zones are within the Miocene, Caprock, Pliocene, and Lafayette Formation at approximate depths between 880 and 1,980 feet below ground level.

Soils

Surface soils are comprised of silt loam, loam, and clay loam.

Surface Water

The facility is located outside of Winnie, Texas, within the Spindletop Ditch subwatershed, which discharges into Galveston Bay and ultimately into the Gulf of Mexico. The bayou wetlands that border the Gulf of Mexico have their northern extent approximately 0.5 miles south of the facility and are hydrologically connected to the site by coastal prairie pondshore habitats.

Groundwater

The coastal lowlands aquifer system is located adjacent to the Gulf of Mexico along the southeastern portion of Texas and is comprised of unconsolidated deposits of sand, silt, and clay that lie above and coastward of the Vicksburg-Jackson confining unit (USGS, 1996). The aquifer dips towards the coast in a wedge shape from the inland contact with the Vicksburg-Jackson confining unit to more than 2,000 feet at the coast. Oscillations in ancient shorelines have resulted in complex interbedded layers of sand, silt, and clay. The aquifer system supports a public water supply that is utilized for domestic, commercial, industrial, and agricultural purposes. Drawdown of the water table in the metropolitan area around Houston has created a cone of depression influencing the groundwater gradient (USGS 1996). Depth to groundwater in the Houston region is approximately 88 feet to 103 feet (USGS 2023).

Advantek Cavern Solutions

Advantek Cavern Solutions is a permitted non-hazardous waste disposal facility that operates multiple Class V injection wells designed to inject non-hazardous waste into old salt caverns previously used to store liquified petroleum gas. The material is injected at depths between 526 feet and 781 feet below ground. The salt caverns are nonporous and isolated from the surrounding lithology (Advantek 2022).

Soils

The surface soils primarily consist of well drained fine sandy loam and sandy clay loam. According to the NRCS Web Soil Survey, the depth to the water table exceeds 6.5 feet at the site, except in a southern portion of the site where the predominant surface soils are poorly drained clay loams that are subject to ponding.

Surface Water

The facility is located outside of Hutchinson, Kansas, within the Sand Creek-Arkansas River subwatershed, which discharges into Sand Creek and flows into the Arkansas River. An

unnamed tributary to Sand Creek is located within 300 feet of the facility. Sand Creek is located approximately 0.25-mile north of the facility.

Groundwater

The Advantek Cavern Solutions facility is located within the High Plains aquifer system, which includes the extensive Ogallala Formation, its principal aquifer. The primary use of water from the Ogallala Formation is for agricultural purposes in the Great Plains (USGS, 1997).

Transportation Routes

Transportation routes to end-point locations range in length from approximately 650 to 2,773 miles and cross through most of the western United States. Route lengths are detailed in Section 3.10: Transportation and shown in Figure 3.10-1: Transportation Study Area.

3.3.3 Significance Criteria

"Significant" as used in SEPA means a reasonable likelihood of more than a moderate adverse impact on environmental quality. Significance involves context and intensity (WAC 197-11-330) and does not lend itself to a formula or quantifiable test. Under SEPA, the severity of an impact should also be weighed along with the likelihood of its occurrence. An impact may be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred.

For purposes of this analysis, an impact was considered significant if it:

- Had a reasonable likelihood of more than a moderate adverse impact on surface soils, perennial surface waters, or potable groundwater resources;
- Conflicted with local, state, or federal laws or requirements for the protection of the environment; or
- Established a precedent for future actions with significant effects or involved unique and unknown risks to the environment.

3.3.4 Impacts and Methodology

3.3.4.1 Impact Assessment and Methodology

Database searches and literature reviews were conducted to describe the soil, surface water, and groundwater resources within the project study area. Potential impacts were identified for each project alternative. For impacts related to PFAS, the potential release mechanism was identified and the relative risk of the PFAS release was analyzed. The significance of the project-related impact was then evaluated to determine whether the alternative was likely to adversely affect soil, surface water, or groundwater resources.

3.3.4.2 Impacts Common to All Action Alternatives

Accidental Release of AFFF

For all action alternatives, the greatest potential risk to surface soils, surface water, and groundwater resources is the release of AFFF due to spills, leaks, upset conditions, or other accidental releases to the environment. Because AFFF concentrate contains organic solvents, chemical stabilizers, and surfactants, it is a serious eye irritant, may cause skin and respiratory irritation, and is harmful when swallowed. It also contains PFAS compounds, which are persistent in the environment and known to adversely impact human health and the environment, including terrestrial and aquatic organisms. Sections 3.4 and 3.5 present a discussion of potential impacts to aquatic and terrestrial organisms, respectively, and Section 3.7 presents a discussion of potential impacts to human health and safety.

Release Mechanism

AFFF concentrate may leak from corroded containers, distribution pipes, or storage tanks and may spill during transfer of AFFF between containers or while containers are being transported between locations.

PFAS are referred to as "forever chemicals" because they are stable and persistent in the environment. This means that an accidental release of AFFF, if not cleaned up immediately, has the potential to contaminate surface soils, surface water, and groundwater as PFAS cycles through the environment. If a release to surface soil occurs, soil would be impacted and PFAS could infiltrate into groundwater and/or runoff into surface waters following a precipitation event. The fate and transport of PFAS is dependent upon the amount of AFFF spilled, surface soil conditions (for example, well drained or poorly drained), the depth to groundwater, the proximity to surface water, and regional rainfall conditions.

Humans may be exposed to PFAS in surface soils, surface waters, or groundwater either directly or indirectly. Direct exposure can occur through physical contact with impacted surface soils or surface waters, or through ingestion of contaminated drinking water, sourced from surface water or groundwater. Indirect routes of exposure include ingestion of contaminated fish or crops. Aquatic life may be directly exposed to PFAS in surface waters, and terrestrial organisms may also be directly or indirectly exposed to PFAS in surface waters (see Sections 3.4 and 3.5).

Relative Risk of Release

The relative risk of an accidental release of AFFF to the environment, with respect to surface soils, surface water, and groundwater, depends on several factors:

- The amount of AFFF spilled; the larger the spill the more likely it will reach surface waters or infiltrate into groundwater at elevated concentrations.
- The substrate onto which the material is spilled (for example, paved surfaces, exposed dirt or gravel, vegetated surfaces, or directly into surface waters), which determines the ability of AFFF to migrate, infiltrate, and be cleaned up.

- The proximity to or isolation from water resources. For example, engineered containment, like curbs and paved surfaces, can prevent spills from reaching the natural environment through runoff or infiltration, and confining clay layers in the subsurface can inhibit spills from reaching potable groundwater.

- The level of spill response planning. Fire stations, 10-Day Holding facilities, waste disposal facilities, and waste transportation companies are required to prepare and implement spill response plans to prevent, contain, and clean up spills.

Fire Stations

Storage and handling of AFFF at fire stations participating in the AFFF program presents a low risk of release to soils, surface water, and groundwater. AFFF is stored at fire stations in buckets, containers, storage tanks, fire engine tanks, and carboys. Most of the participating fire stations are in urban areas like the Puget Sound metropolitan area, with paved surfaces to mitigate against soil contamination and infiltration. Although urban areas with paved surfaces are susceptible to storm water runoff reaching surface waters, all fire stations are required to prepare and implement a Facility Spill Response Plan (FSRP) to prevent, contain, and clean up spills. The FSRP requires that each station maintain a spill kit and establish spill response clean-up procedures and reporting requirements.

Our data shows that the reported AFFF spills at fire stations are predominantly confined to paved areas. As described in Section 2.1.2, our data from 2016 to 2021 shows a total of 26 reported spills at Washington fire stations between 2016 and 2021. Of the nine reported spills at facilities, four were to water and occurred during routine maintenance. All spills were captured in catch basins and no AFFF moved into receiving waters.

Overall, the relative risk to soils, surface water, and groundwater from a project related accidental release of AFFF at a fire-station is low. As demonstrated by our data, a spill at a fire department would be cleaned up promptly by trained personnel, reducing the already low likelihood of off-site movement of the AFFF.

10-Day Holding Facilities and Disposal Sites

If accidental releases occur during routine handling of AFFF concentrate within a 10-day holding facility, incineration facility, landfill facility, or deep-well injection facility, the AFFF would be contained within the facility and promptly cleaned up by appropriately trained personnel, and would therefore not be expected to reach the environment.

Transportation

The risk of release of AFFF to the environment during transportation is discussed generally in Section 3.10: Transportation. Based on the use of heavy trucks to transport the waste, the use of containers appropriate for hazardous waste during transport, the low probability of an accident, and the high degree of emergency response preparedness along interstate highways, the relative risk of release was assessed to be low.

Table 3.3-1 summarizes the approximate mileage of each route; the approximate number of waterbody water crossings; the number of miles traveled within 0.25-mile of surface waters; and the approximate acreage of wetlands within 0.25-mile of the transportation route.

TABLE 3.3-1: Approximate Flowlines, Waterbodies, and Wetlands Proximal to Transportation Routes

Disposal Facility	Route Starting Location	Route Miles[1]	Number of Flowline Crossings[2]	Miles of Proximal Waterbodies[3]	NWI Wetlands (acres)[4]
Aragonite Incineration Facility	Hermiston, Oregon	651.83	593	300	11,929.10
Kimball Incineration Facility	Spokane, Washington	1,057.70	1,193	561	14,023.40
US Ecology Nevada Landfill	Hermiston, Oregon	815.61	1,320	145	9,409.00
US Ecology Idaho Landfill	Hermiston, Oregon	297.41	337	82	3,290.50
Advantek Hutchinson, KS Deep Well Injection	Spokane, Washington	1,609.88	1,742	903	16,739.40
US Ecology Winnie, TX Deep Well Injection	Spokane, Washington	2,272.87	2,431	2,867	26,099.60

Table Notes:

1. Disposal facility transportation routes evaluated from nearest common intersection with transportation routes between 10-Day Hold Facilities.
2. Flowlines crossing transportation route centerline. Flowlines include major rivers and streams, as well as numerous minor depressions and ditches that may seldom contain water.
3. Miles of NHD waterbodies within a 0.25-mile buffer of transportation route centerline.
4. Approximate acreage of NWI-designated wetlands within a 0.25-mile buffer of transportation route centerline.

NHD – National Hydrography Data Set
NWI – National Wetlands Inventory

In the unlikely event that an accidental release of AFFF occurs during transportation, the relative risk to water resources is considered very low during transportation to out-of-state facilities.

3.3.4.3 Alternative 1: Approved Hold in Place

Under this alternative, AFFF would be held in place at participating fire stations until a later date. As previously discussed, any AFFF that might spill during transfer into new containers would be promptly cleaned up and not expected to migrate to soil or water. Construction of any required AFFF storage facilities or secondary containment would occur within the developed area of the fire department and would not affect soils, surface water, or groundwater.

If the held PFAS-containing AFFF were used for firefighting, PFAS could come in contact with soil and migrate to nearby surface water, and/or eventually migrate to groundwater. Although Washington State law (chapter 70A.400 RCW) places several restrictions on the use, sale, and manufacturer of firefighting foam with intentionally added PFAS, the law does not prohibit fire departments from using firefighting foam with intentionally added PFAS in emergencies. Under Alternative 1, it is unknown whether or how many fire departments would use their held foam.

3.3.4.4 Alternative 2: Incineration

Under this alternative, both liquid and solid AFFF materials, including containers, would be transported out of state to a permitted facility and incinerated. Incineration of AFFF produces residual ash and air emissions (discussed in Section 3.1: Air Quality). Residual ash would be properly disposed of in a hazardous waste landfill.

Release Mechanism

Although many PFAS have low volatility, PFAS compounds may become airborne from some industrial releases (for example, stack emissions). The release mechanism of PFAS into the environment from incineration is discussed in Section 3.1: Air Quality. Incomplete incineration of AFFF may deposit residual PFAS in the surrounding soils and nearby surface waterbodies if thermal treatment does not adequately control fluorinated products of incomplete combustion (PICs).

Relative Risk of Release

If PFAS particulates were to be deposited in significant quantities, they could impact soils or surface water. As described in Section 3.1: Air Quality, common PFAS compounds are effectively destroyed by incineration. The mass of PFAS remaining following incineration of all AFFF from participating fire stations would be approximately 4.6 grams.

The Aragonite Incineration Facility in Utah is located in a remote arid region comprising dry, saline lakes and saline groundwater, which is not suitable for potable use. For the Kimball Incineration Facility in Nebraska, no surface water bodies are present within the 0.25-mile study area around the facility, and the depth to groundwater in the area is approximately 19 feet, a depth at which infiltration of trace PFAS concentrations is unlikely. Therefore, any PFAS discharge from the incineration of AFFF from the project would not affect water resources. Deposition onto soils could occur in trace or very low measurable quantities. Therefore, the risk to these resources from incineration is low.

3.3.4.5 Alternative 3: Solidification and Landfilling

Under this alternative, both liquid and solid AFFF materials, including containers, would be disposed of at one of the two identified hazardous waste landfills. AFFF concentrate would be solidified at the landfill, to minimize leaching of PFAS, before being placed into a disposal module.

Release Mechanisms

Leachate is the liquid waste that migrates through a disposal module under gravity and is removed from the landfill unit through the leachate collection and recovery system (LCRS). AFFF would be solidified under this alternative, minimizing the leaching of PFAS from the AFFF. Because US Ecology Idaho and US Ecology Nevada are operated as zero-discharge facilities, all leachate is managed on site through leachate evaporation ponds, which is possible in the arid environments. As discussed in Section 3.1: Air Quality, AFFF and PFAS have low volatility. As such, there is no release mechanism, outside of an accidental release discussed above, that could discharge PFAS into the environment.

Relative Risk of Release

The relative risk of release of AFFF to the environment from either US Ecology Idaho or US Ecology Nevada is considered insignificant because leachate is managed on site through evaporation ponds. Accidental surface releases during handling would be contained within the facility and cleaned up promptly, with a low chance of reaching the environment.

3.3.4.6 Alternative 4: Class I Deep Well Injection

Under this alternative, AFFF would be injected into receiving formations at either the Advantek Cavern Solutions facility in Kansas or the US Ecology facility in Texas. Advantek Cavern solutions injects non-hazardous liquid waste into salt caverns through a set of Class V underground injection wells at depths between 526 feet and 781 feet below ground (Advantek, 2022). US Ecology Texas injects non-hazardous waste into the Miocene, Caprock, Pliocene, and Lafayette Gravel Formation at approximate depths between 880 and 1,980 feet below ground level (TCEQ 2009).

Release Mechanisms

Under this alternative, AFFF is injected directly into a non-potable geologic formation isolated by depth and/or by geology from shallower freshwater aquifers. Although highly unlikely, AFFF injected underground may migrate away from the injection zone in wells that are not properly sited, constructed, or maintained, and potentially contaminate drinking water aquifers.

Relative Risk of Release

The Advantek and US Ecology facilities are designed, permitted, and operated to isolate received waste from potable water supplies, representing a low risk of release of PFAS to groundwater. Over long periods of time, subsurface conditions could change and the risk could increase. AFFF could be released during the well injection process if there were an equipment malfunction that released AFFF aboveground into the facility. In this event, the spill would be promptly cleaned up and the site remediated to prevent further transport of PFAS compounds.

3.3.4.7 Alternative 5: No Action Alternative

Because no actions would take place under the no action alternative, there would be no project-related impacts to soils, surface water, or groundwater. The risk would remain for AFFF stored in degraded containers to leak PFAS compounds to the environment. As in Alternative 1, if the PFAS-containing AFFF were used for firefighting, PFAS could come in contact with soil and

migrate to nearby surface water, and/or eventually migrate to groundwater. Under Alternative 5, it is unknown if or how many fire departments would use their held foam.

3.3.4.8 Analysis Summary

For all alternatives, there is a low risk of a significant impact on soils, surface water, or groundwater. The risk may be somewhat higher, though still low, for Alternatives 1 and 5, as fire stations may use PFAS-containing AFFF in emergencies. It is unknown if or how many fire stations would use the foam.

3.3.5 Mitigation Measures

Operational measures, including administrative and engineering controls for the each of the alternatives, are listed in Section 3.1.3 of Section 3.1: Air Quality.

3.3.6 Cumulative Impacts

Cumulative impacts are discussed in Chapter 5.

3.3.7 Data Gaps

Although protective criteria have been published for select PFAS compounds by the EPA and by Washington State, resultant concentrations of PFAS in the environment that may result from an AFFF release are incident specific, site-specific, and not possible to predict in a general sense with any certainty.

The analysis above indicates that PFAS may be deposited in trace quantities from incineration. Many uncertainties regarding PFAS incineration are discussed in Section 3.1: Air Quality, including the precise amount of PFAS in the AFFF from the fire stations, the destruction and removal efficiency of the incinerators, and the lack of standardized stack testing methods, among others.

For deep well injection, the risk of release to groundwater is very low in the short term, in a geologically stable environment. However, over the very long term, geologic changes and shifts that could result in a release are unknown.

For Alternatives 1 and 5, it is unknown if or how many fire stations would continue to use their PFAS-containing AFFF for emergencies.

3.4 Aquatic Resources

This section describes sensitive aquatic resources and their habitats in the area of the project alternatives. It also describes the environmental consequences of each alternative on these resources.

Sensitive aquatic resources include:

- Endangered or threatened aquatic life that live in water bodies, such as fish and invertebrates.
- Endangered or threatened aquatic-dependent wildlife that consume fish and other aquatic life, such as birds and mammals.
- Sensitive aquatic habitats, including freshwater and marine waters that provide habitats for endangered or threatened wildlife, wetlands, and other waters that are protected by local, state, or federal laws or regulations.

3.4.1 Affected Environment

The affected environment includes sensitive aquatic species and habitats at and near the fire stations participating in Ecology's AFFF collection project, temporary storage facilities, identified potential treatment and disposal sites for the collected AFFF, and identified transportation routes.

The study area for aquatic species and habitats is defined as the terrestrial environments with the potential to be affected by collection, transport, and disposal of AFFF stockpiles under alternatives considered in this EIS. It includes a 0.25-mile offset from AFFF storage locations, disposal facilities, and transportation corridors to include the typical range of aquatic species and habitats. For study area locations within 0.25-mile of a water feature, the study area was expanded to include the water corridor up to 10 miles downstream of its intersection with the 0.25-mile buffer.

3.4.1.1 Existing and Evolving Regulations

Federal

Clean Water Act

Section 304(a)(1) of the Clean Water Act directs EPA to develop criteria to determine when water has become unsafe for people and wildlife using the latest scientific knowledge. State and Tribal governments may use these criteria or use them as guidance in developing their own.

Endangered Species Act

Provisions of the federal Endangered Species Act (ESA) (16 United States Code, Sections 1531–1544) protect federally listed threatened or endangered species and their habitats from unlawful take. Activities that may result in take of individuals are regulated by the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS).

Take is defined under the ESA as to, "Harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any of the specifically enumerated conduct." USFWS regulations define harm as, "An act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering."

Pursuant to the ESA, the USFWS or NMFS may also designate areas that are essential to the conservation of threatened and endangered species as "critical habitat." Areas of critical habitat are specified "to the maximum extent prudent and determinable," and may, therefore, be quite large to encompass and protect the primary constituent elements (PCEs) required to aid recovery and delisting of the species. PCEs include habitat for movement, foraging, shelter, and reproduction within the historical geographic or ecological range of the species. Projects require consultation if they affect areas containing PCEs. Developed areas such as roads and buildings that fall within designated critical habitat are normally excluded from critical habitat.

PFAS Strategic Roadmap

As discussed in Chapter 1, as part of the PFAS Strategic Roadmap, EPA published draft water quality criteria for PFOA and PFOS. The criteria are intended to be protective of fish, invertebrates, and other aquatic life, but the criteria are non-enforceable. The criteria are summarized in Chapter 1, Table 1-3.

State

Model Toxics Control Act

The Model Toxics Control Act (MTCA) is Washington's environmental cleanup law. MTCA funds and directs the investigation, cleanup, and prevention of sites that are contaminated by hazardous substances. It works to protect people's health and the environment, and to preserve natural resources for the future.

Establishing protective concentrations for ecological receptors is an essential aspect of site cleanup work under the Model Toxics Control Act. Ecology's PFAS Chemical Action Plan includes recommendations to address PFAS levels in soil, sediment, fresh water, and salt water to protect ecological receptors (See Recommendation 2.1, Ecology 2022d).

In December 2022, Ecology published *Draft Guidance for Investigating and Remediating PFAS Contamination in Washington State* (Ecology 2022c). Among other items, the document established protective concentrations for ecological receptors in marine waters, freshwater, and uplands soils based on a literature review for 10 PFAS. The concentrations are listed in Chapter 1, Table 1-5.

State Environmental Policy Act

The State Environmental Policy Act (SEPA) requires state and local governments to identify possible environmental impacts that may result from governmental decisions. The SEPA review process helps the department, applicants, and the public understand how a proposed project will affect the environment. Washington Department of Fish and Wildlife (WDFW) reviews proposed projects to identify potential impacts to fish, wildlife, and their habitats. SEPA gives

agencies the authority to condition or deny a proposal based on the agency's adopted SEPA policies and the environmental impacts identified in a SEPA document.

Washington Natural Area Preserves Act

The Washington Natural Heritage Program was established by the Washington State Legislature in 1981 to meet the needs for objective information to guide biodiversity conservation and land use decisions. Goals of the program include maintaining a classification of the state's natural heritage resources; conducting inventories of the locations of these resources; and sharing information with agencies, organizations, and individuals for environmental assessment purposes. The State of Washington 2022 Natural Heritage Plan[66] was approved by the Natural Heritage Commission in January 2022. The plan provides information on whether species and communities with special status are present in a given location.

Water Pollution Control Act

The Water Pollution Control Act was established to maintain the highest possible water standards in state waters, which include all lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington. Industries and others are required to use all known available and reasonable methods to prevent and control the pollution of the waters of the state. Pollutants include any material that makes the water harmful, detrimental, or injurious to wild animals, birds, fish, or other aquatic life.

Water Resources Act of 1971

The Water Resources Act of 1971 (chapter 90.54 RCW) was codified in 1971 to provide comprehensive water resource planning for the state of Washington. Through this regulation, the Department of Ecology (Ecology) was tasked to establish and maintain a "waters resource information system" with the intent of studying and regulating water resources in the state. Ecology typically studies and regulates water resources by watershed, also known as Water Resource Inventory Areas (WRIAs).

In cooperation with other state natural resources agencies, Ecology delineated the state's major watersheds into 62 WRIAs. The WRIA watershed boundaries were formalized by law in 1971 to be used as the basis for state management purposes. Additional information on WRIAs can be found on our Find Your WRIA webpage.[67]

Salmon Recovery Act

The Salmon Recovery Act (chapter 77.85 RCW) was codified in 1998 to develop and implement a statewide coordinated watershed-based salmon recovery strategy. The state is divided into eight regions, which develop regionally specific, scientifically rigorous, and locally produced recovery strategies. Within each region, shareholders consisting of lead entities identify, rank, select, and implement habitat restoration and monitoring projects deemed most beneficial for local salmon recovery. The Washington State Recreation and Conservation Office is required to

[66] https://www.dnr.wa.gov/NHPconservation
[67] https://ecology.wa.gov/watershed-lookup

report on the recovery process through the biannual publication of the *State of Salmon in Watersheds* report.[68]

Environmental Health and Safety
Washington State law (chapter 70A.400 RCW) places several restrictions on the use, sale, and manufacturer of firefighting foam with intentionally added PFAS. Specifically, fire departments may not use this foam for training purposes, nor may manufacturers or retailers conducting business in Washington, sell, offer for sale, or manufacture firefighting foam with intentionally added PFAS. State law, however, does not prohibit fire departments from using firefighting foam with intentionally added PFAS in emergencies.

3.4.1.2 Environmental Setting

Study Area
The study area for the affected environment includes the fire stations participating in Ecology's AFFF collection project, temporary storage hold facilities, identified potential treatment and disposal sites for the collected AFFF, and identified transportation routes. The study areas include an additional 0.25-mile adjacent to each of these facilities and transportation routes; this is a radius or distance from facilities or transportation routes that could be reasonably affected by AFFF collection and disposal activities. For study area locations within 0.25-mile of a water feature, the study area was expanded to include the water corridor up to 10 miles downstream of its intersection with the 0.25-mile buffer.

Fire Stations
The participating fire stations are located throughout the state's WRIAs. Roughly two-thirds of the state's WRIAs empty into the Columbia River. The remaining WRIAs ultimately drain into coastal waters of either the Pacific Ocean or Puget Sound. Sensitive species in Washington's marine waters include overfished species such as yellow-eye rockfish and boccacio, and marine mammals such as orca, blue whale, and sea otter. Sensitive anadromous species—which are those that spend a portion of their life cycle in marine waters and a portion in freshwater—include 16 salmonid species, eulachon, and green sturgeon. Sensitive freshwater species include amphibians such as northern spotted frog and Oregon spotted frog. In addition to sensitive wildlife species, many of Washington's waterways, lakes, and wetlands are considered sensitive because of their high wildlife value.

While more than half of the participating fire stations are located in urban areas, approximately 55 of the participating fire stations are located in relatively close proximity to streams, rivers, wetlands, or other waters that have potential to support sensitive aquatic species, such as anadromous fish or endemic amphibian species, or that provide habitat for important fisheries. Appendix A.4 contains additional information on sensitive aquatic resources in the vicinity of currently enrolled fire stations. Additional fire stations may enroll in the program following this environmental review.

[68] https://stateofsalmon.wa.gov/

10-Day Hold Facilities

Ecology has identified 16 temporary hold facilities where AFFF may be collected and stored for up to 10 days. Storage sites are located throughout the state and in the City of Clackamas, Oregon. In general, the proposed storage sites consist of existing paved and/or industrial sites located within a wider matrix of industrial land uses. Seven storage sites are located within 0.25-mile of wetlands or waters. Six storage sites are within 0.25-mile of waters that support sensitive aquatic life or aquatic-dependent wildlife. Additional information for all storage sites can be found in Appendix A.4.

Landfills

US Ecology Idaho is a permitted landfill located within a rural agricultural area outside of Grand View, Idaho. The facility is located approximately 3 miles south of the confluence of Castle Creek and the Snake River, where it straddles three Hydrologic Unit Code (HUC) 12 watersheds: Catherine Creek-Castle Creek, Foremans Reservoir-Castle Creek, and Cloudburst Wash-Snake River (USGS 2022).

US Ecology Nevada is a permitted landfill located in the Nevada desert approximately 11 miles south of the city of Beatty. The facility is located within the Carrara Canyon watershed of the Upper Amargosa River basin. Several desert washes are visible in aerials of the facility site, including one that connects to the south end of the facility. Washes generally flow only after heavy winter rains, which minimizes the opportunity for these areas to be colonized by aquatic vertebrates. Sensitive fish species associated with this river basin include the Devils hole pupfish.

Incineration Sites

Aragonite Incineration Facility is a hazardous waste disposal facility located outside the abandoned desert town of Aragonite, approximately 25 miles west of the Great Salt Lake in western Utah. The facility is located within the Grayback Hills watershed of the Great Basin Region. The region is arid to semi-arid desert. Annual precipitation ranges between 4 and 9 inches. Desert washes are present north and south of the facility and appear to convey winter rain flow into a large seasonal impoundment approximately 3 miles west of the facility.

Kimball Incineration Facility is an industrial waste storage and treatment facility in southwest Nebraska. The facility straddles the Cederburg Reservoir watershed and the Yung South Reservoir watershed in the Missouri Region. Water from these watersheds ultimately flows into Sand Draw, approximately 3.5 miles east of the facility.

Deep Well Injection Sites

US Ecology Winnie is a deep well injection, non-hazardous industrial wastewater disposal facility located approximately 10 miles north of the Gulf of Mexico near the town of Winnie, Texas. The facility is located within the Spindletop Ditch HUC 12 watershed of the Texas-Gulf Region. It is bordered on the north by the Big Hill National Oil Reserve. Coastal prairie pondshore habitat is found west and south of the facility congruent with emergent wetlands located to the south, east, and west (TPWD 2022, USFWS 2022). The extensive bayou wetlands that border the Gulf of Texas have their northern extent approximately 0.5 miles south of the

facility and are hydrologically connected to the site by coastal prairie pondshore habitats. Sensitive aquatic species found in the Gulf of Texas include federally listed species including the oceanic whitetip shark and six whale species: blue whale, Gulf of Mexico Bryde's whale, humpback whale, North Atlantic right whale, sperm whale, and sei whale. Shallower estuarine waters in the Gulf of Texas are home to four federally listed species of sea turtle: Kemp's Ridley sea turtle, leatherback sea turtle, green sea turtle, and loggerhead sea turtle.

Advantek Cavern Solutions is a deep well injection, non-hazardous waste site approximately 5 miles south of the City of Hutchinson in central Kansas. The facility is located within the Sand Creek-Arkansas River HUC 12 watershed in the Arkansas-White-Red Region. An unnamed tributary to Sand Creek is located within 300 feet of the facility. Sand Creek is located approximately 0.25-mile north of the facility. Sensitive aquatic species in this region include peppered chub.

Transportation Routes

Transportation routes to end-point locations range in length from approximately 650 to 2,773 miles and cross through most of the western United States. Route lengths are detailed in Section 3.10: Transportation and shown in Figure 3.10-1: Transportation Study Area. A summary of waters crossed by each route is provided in Section 3.3: Earth and Water Resources.

3.4.2 Significance Criteria

"Significant" as used in SEPA means a reasonable likelihood of more than a moderate adverse impact on environmental quality. Significance involves context and intensity (WAC 197-11-330) and does not lend itself to a formula or quantifiable test. Under SEPA, the severity of an impact should also be weighed along with the likelihood of its occurrence. An impact may be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred.

For purposes of this analysis, an impact was considered significant if it:

- Had a reasonable likelihood of more than a moderate adverse impact on environmentally sensitive or special areas, such as loss or destruction of wetlands, wild and scenic rivers, or wilderness;
- Had a reasonable likelihood of more than a moderate adverse impact on endangered or threatened species or their habitat;
- Conflicted with local, state, or federal laws or requirements for the protection of the environment; or
- Established a precedent for future actions with significant effects or involved unique and unknown risks to the environment.

3.4.3 Impact Assessment and Methodology

Database searches and literature reviews were conducted to determine which sensitive aquatic resources were known to occur within the project study area. Potential impacts were identified for each project alternative. For impacts related to PFAS, the potential release mechanism was identified and the relative risk of the PFAS release was analyzed. The significance of the project-related impact on aquatic resources was then evaluated to determine whether the alternative was likely to adversely affect aquatic resources.

3.4.3.1 Impacts Common to All Alternatives

Accidental Release of AFFF

For all action alternatives, the greatest potential risk to aquatic resources is the release of AFFF due to spills, leaks, upset conditions, or other accidental releases to the environment. Because AFFF concentrate contains organic solvents, chemical stabilizers, and surfactants, it is a serious eye irritant, may cause skin and respiratory irritation, and is harmful when swallowed. It also contains PFAS compounds, which are persistent in the environment and known to adversely impact the health of aquatic organisms.

Surface waters are particularly susceptible to PFAS contamination from AFFF releases. Because of the unique chemical properties of PFAS compounds, once released to water they are highly mobile. PFAS may reach surface waters through run-off or from percolation of groundwater to surface water where aquatic life may be directly exposed to PFAS. Because it is a surfactant, PFAS accumulates on water surfaces, so birds and mammals that drink from contaminated waters may also be directly exposed to PFAS. Aquatic-dependent wildlife may also be indirectly exposed to PFAS if they consume aquatic plants, invertebrates, or fish that contain PFAS (Conder et al. 2019).

Once exposed, PFAS compounds may adversely affect the immune system, fetal development, cause hormone disruption, accumulate in the liver, or result in tumor induction. The severity of the impact is species-specific and depends on the dose of the exposure. Overall, PFAS are classified as having moderate to low toxicity to aquatic invertebrates from acute exposure; aquatic organisms appear to be more susceptible to impacts from chronic exposure. In general, freshwater habitats are more susceptible than marine habitats, perhaps because PFAS precipitates into sediment faster in saline waters. Aquatic organisms that live on the bottom of a water body, such as crabs, are more affected by PFAS contamination than those that occupy the water column, like fish. Amphibians can be highly sensitive to chronic PFAS exposure, especially those species with a prolonged larval development, such as frogs and salamanders (Flynn et al 2022).

Once within an aquatic habitat, some PFAS may bioaccumulate within individual organisms or biomagnify from the base of the food chain up to higher level predators, such as seagulls or polar bears. Bioaccumulation is both species dependent and tissue dependent, while biomagnification appears to be more pronounced in aquatic-dependent wildlife than in aquatic life, possibly because the respiratory elimination of PFAS via gills to water is much greater than elimination from lungs to air (ITRC 2022).

Release Mechanism

AFFF concentrate may leak from corroded containers, distribution pipes, or storage tanks and may spill during transfer of AFFF between containers or while containers are being transported between locations.

Relative Risk of Release

Accidental releases during routine handling of AFFF concentrate within an existing permitted waste management facility or at a 10-day storage facility would be contained within the facility and promptly cleaned up by appropriately trained personnel, and would therefore not be expected to reach sensitive aquatic habitats.

The risk of release of AFFF to the environment during transportation is discussed generally in Section 3.10: Transportation. Based on the use of heavy trucks to transport the waste, the use of containers appropriate for hazardous waste during transport, low probability of an accident, and high degree of emergency response preparedness along interstate highways, the relative risk of release was determined to be low. The relative risk specifically to water resources from transportation of AFFF is discussed in Section 3.3: Earth and Water Resources, which considers the severity of the resulting environmental impact in the low probability event of a spill during transportation. Based on the low probability of a spill, the relative risk to water resources, and by extension aquatic resources, was determined to be very low for transportation to US Ecology Idaho and low for all other out-of-state destinations.

Storage and handling of AFFF at fire stations participating in the AFFF program presents a low risk of release to aquatic resources. AFFF is stored at fire stations in buckets, containers, storage tanks, fire engine tanks, and carboys. Foam residue may be present in sprinkler systems, storage pipes, and charged pipes. If AFFF reaches surface waters during a spill or for improperly stored containers to leak AFFF directly to the environment, aquatic resources could be impacted. The potential for a spill at a fire station to represent a risk to aquatic habitat depends on several factors:

- **The amount spilled.** Per fire station responses to Ecology's questionnaire, the majority of AFFF is stored in containers holding at least 55 gallons of foam. Approximately 25 percent of the fire departments are currently storing 25 gallons or less of PFAS-containing foam, 25 percent are storing between 50 and 100 gallons, and the remaining 50 percent report stockpiles of 100 to 500 gallons or more of AFFF.
- **The substrate onto which the material is spilled.** Based on review of aerial photographs, most exterior spills at fire stations would occur over paved surfaces from which they could be readily vacuumed. However, in some areas exterior spills could occur over gravel or vegetated surfaces through which spilled AFFF could percolate into the soil and move into groundwater, and then migrate off site.
- **The ability of the spill to move off site.** Many fire stations are curbed to separate pavement from vegetated areas. These curbed, paved areas may also contain vaults which would keep the spill from moving off site. Other fire stations are not curbed; spills at these locations may move off site. Depending on the fire station, off-site spills may

flow either into a developed stormwater system, which contain vaults from which spilled material can be suctioned, or into vegetated ditches which connect to nearby creeks and rivers.

- **The proximity of the fire station to aquatic habitats.** If the fire station is not adjacent or proximal to aquatic habitat, then there's little to no risk of exposure to aquatic resources from a spill.
- **Facility spill response planning.** All fire stations are required to prepare and implement a Facility Spill Response Plan (FSRP) to prevent, contain, and clean up spills. The FSRP requires that each station maintain a spill kit and establish spill response cleanup procedures and reporting requirements.

Specific details regarding these criteria for each of the currently enrolled fire stations can be found in Appendix A.2.

Ecology data show that the reported AFFF spills at fire stations are predominantly confined to paved areas. As described in Section 2.1.2, Ecology data from 2016 to 2021 shows a total of 26 reported spills at Washington fire stations between 2016 and 2021. Of the nine reported spills at facilities, four were to water and occurred during routine maintenance. All spills were captured in catch basins and no AFFF moved into receiving waters.

Overall, the relative risk to the aquatic environment from a project related accidental release of AFFF at a fire station is low. As demonstrated by Ecology data, a spill at a fire department would be cleaned up promptly by trained personnel, reducing the already low likelihood of off-site movement of the AFFF.

3.4.3.2 Alternative 1: Approved Hold in Place

Under this alternative, AFFF would be held in place at participating fire stations until a later date. As previously discussed, any AFFF that might spill during transfer into new containers would be promptly cleaned up and not expected to migrate into aquatic habitats. Construction of any required AFFF storage facilities or secondary containment would occur within the developed area of the fire department and would not affect aquatic species or habitats.

If the held PFAS-containing AFFF were used for firefighting, PFAS could come in contact with soil and migrate to nearby surface water and potentially to aquatic habitats. Although Washington State law (chapter 70A.400 RCW) places several restrictions on the use, sale, and manufacturer of firefighting foam with intentionally added PFAS, the law does not prohibit fire departments from using firefighting foam with intentionally added PFAS in emergencies. Under Alternative 1, it is unknown if or how many fire departments would use their held foam.

3.4.3.3 Alternative 2: Incineration

Under this alternative, both liquid and solid AFFF materials, including containers, would be transported out of state to a permitted facility and incinerated. Incineration of AFFF produces residual ash and air emissions (discussed in Section 3.1: Air Quality). Residual ash would be properly disposed in a hazardous waste landfill.

Release Mechanism

Although many PFAS have low volatility, PFAS compounds may become airborne from some industrial releases (for example, stack emissions). The release mechanism of PFAS into the environment from incineration is discussed in Section 3.1: Air Quality. Commenters on the Determination of Non-Significance for Ecology's AFFF program expressed concern that incomplete incineration of AFFF may deposit residual PFAS in the surrounding soils if thermal treatment does not adequately control fluorinated products of incomplete combustion (PICs) (Appendix A.1: Outreach). Commenters state that deposition of PFAS particulates into the soil would potentially enter the terrestrial food web and bioaccumulate in higher trophic level terrestrial birds and mammals.

Relative Risk of Release

If PFAS particulates were to enter aquatic habitats in significant quantities, they could impact sensitive aquatic resources. As described in Section 3.1: Air Quality, common PFAS compounds are effectively destroyed by incineration. The volume of PFAS remaining following incineration of all AFFF from participating fire stations would be approximately 4.6 grams. PFAS particulates due to the incomplete combustion of project related AFFF would therefore not be deposited in sufficient quantities to cause population level ecological effects within the study area at either potential incineration site. Incineration of AFFF presents a low risk of release of PFAS compounds to sensitive aquatic resources.

3.4.3.4 Alternative 3: Solidification and Landfilling

Under this alternative, AFFF would be solidified in concrete and disposed of in containers at an approved hazardous waste landfill.

Release Mechanism

Leaching may occur if AFFF is disposed in landfill waste without an adequate liner system and leachate control. Additionally, AFFF may be released onto unlined areas of the landfill during transport. PFAS compounds can leach from AFFF into unsaturated soils during precipitation events, ultimately entering groundwater. Once in groundwater, PFAS may move into surface water where aquatic species can be exposed.

Relative Risk of Release

As discussed in Section 3.4: Aquatic Resources, Action Alternative 3: Solidification and Landfilling of AFFF presents no risk of release into sensitive terrestrial environments.

The landfills identified as end locations for the program are permitted hazardous waste facilities. Their liner systems and leachate control systems are described in more detail in Section 3.3.4.5: Earth and Water Resources, Impacts and Mitigation Measures, Alternative 3. In summary, the facilities are both "zero-discharge" facilities, with no release mechanism for AFFF to migrate off site.

Materials spilled on site would be cleaned up promptly by appropriately trained personnel, and the cleanup materials would be buried along with other solid waste within the landfill.

3.4.3.5 Alternative 4: Class I Deep Well Injection

Under this alternative, AFFF would be injected into receiving formations located beneath multiple impermeable layers of rock hundreds to almost 2,000 feet below the surface of the earth.

Release Mechanism

AFFF that is injected underground may migrate away from the injection zone if the injection wells are not properly constructed or maintained. PFAS compounds could then migrate through the surrounding geological formations and potentially end up in aquifers or groundwater. Once in groundwater, PFAS compounds can migrate into surface waters where aquatic species could be exposed.

Relative Risk of Release

The relative risk to water from underground injection at US Ecology Winnie or Advantek Cavern Solutions is discussed in detail in Section 3.3: Water Resources, Action Alternative 4. The discussion finds that the relative risk of release of AFFF from underground injection is generally low (however, neither facility is presently permitted to inject hazardous waste). Also, the risk of PFAS compounds migrating from groundwater to surface water is very low, as the injection depths are so deep that surface water is not intersected. Class I deep well injection of AFFF therefore presents a low risk of release into aquatic environments.

AFFF could be released during the well injection process if there were an equipment malfunction that released AFFF aboveground into the facility. In this event, the spill would be promptly cleaned up and the site remediated to prevent further transport of PFAS compounds.

3.4.3.6 Alternative 5: No Action Alternative

Because no actions would take place under the no action alternative, there would be no project-related impacts to fish and aquatic resources. The risk would remain for AFFF stored in degraded containers to leak PFAS compounds to the environment. Because participating fire stations are located throughout the state, sensitive aquatic resources potentially exposed to PFAS contamination would be widespread.

As in Alternative 1, if the PFAS-containing AFFF were used for firefighting, PFAS could come in contact with soil and migrate to nearby surface water and potentially to aquatic habitats. Under Alternative 5, it is unknown if or how many fire departments would use their held foam.

3.4.3.7 Analysis Summary

For all alternatives, there is a low risk of a significant impact on aquatic resources. The risk may be somewhat higher, though still low, for Alternatives 1 and 5, as fire stations may use PFAS-containing AFFF in emergencies. It is unknown whether or how many fire stations would use the foam.

3.4.4 Mitigation Measures

Operational measures, including administrative and engineering controls for the each of the alternatives, are listed in Section 3.1.3 of Section 3.1: Air Quality.

3.4.5 Cumulative Impacts

Cumulative impacts are discussed in Chapter 5.

3.4.6 Data Gaps

Gaps exist in our knowledge of exposure pathways in aquatic wildlife communities, how individual species are affected by individual PFAS compounds, and the degree to which PFAS compounds persist in sufficient quantities to impact the health of aquatic ecosystems. Health impacts to aquatic species are generally extrapolated from laboratory experiments and may not represent how PFAS compounds affect species in the wild. Because impacts to PFAS are species-specific, species for which impacts have been studied might not be extrapolatable to other species.

Additionally, although protective criteria have been published for select PFAS compounds by the EPA and by Washington State, resultant concentrations of PFAS in the environment that may result from an AFFF release are incident specific, site-specific, and not possible to predict in a general sense, with any certainty.

For Alternatives 1 and 5, it is unknown if or how many fire stations would continue to use their PFAS-containing AFFF for emergencies.

3.5 Terrestrial Species and Habitats

This section describes sensitive terrestrial species and their habitats in the area of the project alternatives and describes the environmental consequences of each alternative on these resources.

Sensitive terrestrial species include:

- Endangered or threatened wildlife, such as birds, mammals, or invertebrates, which live most of their life on land.
- Sensitive terrestrial areas that provide habitat for endangered or threatened wildlife.

3.5.1 Affected Environment

The affected environment includes sensitive terrestrial species and habitat at and near: the fire stations participating in Ecology's AFFF collection project; temporary storage facilities; identified potential treatment and disposal sites for the collected AFFF; and identified transportation routes.

The study area for terrestrial species and habitats is defined as the terrestrial environments with the potential to be affected by collection, transport, and disposal of AFFF stockpiles under alternatives considered in this EIS. It includes a .25-mile offset from AFFF storage locations, disposal facilities, and transportation corridors to include the typical range of biological species and habitats.

3.5.1.1 Existing and Evolving Regulations

Federal

Endangered Species Act

Provisions of the federal Endangered Species Act (ESA) (16 United States Code [USC] Sections 1531-1544) protect federally listed threatened or endangered species and their habitats from unlawful taking. Activities that may result in take of individuals are regulated by the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS). A take, or taking, is defined under the ESA as to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any of the specifically enumerated conduct." USFWS regulations define harm as "an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering."

Pursuant to the ESA, the USFWS or NMFS may also designate areas that are essential to the conservation of threatened and endangered species as "critical habitat." Areas of critical habitat are specified "to the maximum extent prudent and determinable," and may, therefore, be quite large to encompass and protect the primary constituent elements (PCEs) required to aid recovery and delisting of the species. PCEs include habitat for movement, foraging, shelter, and reproduction within the historical geographic or ecological range of the species. Projects

require consultation if they affect areas containing PCEs. Developed areas such as roads and buildings that fall within designated critical habitat are normally excluded from critical habitat.

PFAS Strategic Roadmap

As discussed in Chapter 1, as part of the PFAS Strategic Roadmap, EPA published draft water quality criteria for PFOA and PFOS. The criteria are intended to protect fish, invertebrates, and other aquatic life, but the criteria are non-enforceable. The criteria are summarized in Appendix A.4 Table X3-1.

Washington

Model Toxics Control Act

The Model Toxics Control Act (MTCA) is Washington's environmental cleanup law. MTCA funds and directs the investigation, cleanup, and prevention of sites that contaminated by hazardous substances. It works to protect people's health and the environment, and to preserve natural resources for the future. Establishing protective concentrations for ecological receptors is an essential aspect of site cleanup work under the Model Toxics Control Act. Ecology's PFAS Chemical Action Plan includes recommendations to address PFAS levels in soil, sediment, fresh water, and salt water to protect ecological receptors (See Recommendation 2.1, Ecology 2022d). Ecology published draft ecological protection levels in December 2022 as discussed in "Evolving Regulations" above.

State Environmental Policy Act

The State Environmental Policy Act (SEPA) requires state and local governments to identify possible environmental impacts that may result from governmental decisions. Washington Administrative Code (WAC) 197-11-444 requires an analysis of potential threatened and endangered species that could potentially be affected for both project and non-project actions. The SEPA review process helps the department, applicants, and the public understand how a proposed project will affect the environment. Washington Department of Fish and Wildlife (WDFW) reviews proposed projects to identify potential impacts to fish, wildlife, and their habitats. SEPA gives agencies the authority to condition or deny a proposal based on the agency's adopted SEPA policies and the environmental impacts identified in a SEPA document.

Natural Area Preserves Act

The Washington Natural Heritage Program was established by the Washington State Legislature in 1981 to meet the needs for objective information to guide biodiversity conservation and land use decisions. Goals of the program include maintaining a classification of the state's natural heritage resources; conducting inventories of the locations of these resources; and sharing information with agencies, organizations, and individuals for environmental assessment purposes.[69] The Natural Heritage Plan was approved by the Natural Heritage Commission in January 2022. The plan provides information on whether species and communities with special status are present in a given location.

[69] https://www.dnr.wa.gov/NHPconservation

Water Pollution Control Act

The Water Pollution Control Act was established to maintain the highest possible water standards in state waters, which include all lakes, rivers, ponds, streams, inland waters, underground waters, salt waters and all other surface waters and watercourses within the jurisdiction of the state of Washington. Regulated entities are required to use all known available and reasonable methods to prevent and control the pollution of the waters of the state. Pollutants include any material that makes the water harmful, detrimental, or injurious to wild animals, birds, fish, or other aquatic life.

Environmental Health and Safety

Washington State law (chapter 70A.400 RCW) places several restrictions on the use, sale, and manufacturer of firefighting foam with intentionally added PFAS. Specifically, fire departments may not use this foam for training purposes, nor may manufacturers or retailers conducting business in Washington, sell, offer for sale, or manufacture firefighting foam with intentionally added PFAS. State law, however, does not prohibit fire departments from using firefighting foam with intentionally added PFAS in emergencies.

3.5.1.2 Environmental Setting

Study Area

The study area for the affected environment includes: the fire stations participating in Ecology's AFFF collection project; temporary storage hold facilities; identified potential treatment and disposal sites for the collected AFFF; and identified transportation routes. The study areas include an additional 0.25 miles adjacent to each of these facilities and transportation routes; this is a radius or distance from facilities or transportation routes that could be reasonably affected by AFFF collection and disposal activities. For study area locations within 0.25 miles of a water feature, the study area was expanded to include the water corridor up to 10 miles downstream of its intersection with the 0.25-mile buffer.

Fire Stations

Participating fire stations are located throughout the Pacific Northwest's ecoregions. Following is a brief discussion of terrestrial wildlife in these regions:

- **Northwest Coast:** This ecoregion, which is dominated by temperate coniferous forests, contains some of the richest wildlife diversity in the world. Special habitats in this ecoregion include old growth forest, sand dunes, estuaries, headlands, native grasslands, and extensive wetlands. Among the rare and endangered species in this ecoregion are the Oregon silverspot butterfly, Columbian white-tailed deer, snowy plover, marbled murrelet, and northern spotted owl.

- **Puget Trough:** The Puget Trough ecoregion encompasses the forested foothills of the Cascade and Olympic Mountains to the islands and aquatic habitats of the Puget Sound. Biodiversity and productivity of the Puget Trough ecoregion is very high; however, populations of many terrestrial wildlife species in this ecoregion have declined over the past century due to habitat conversion and degradation. Among the rare and endangered species in this ecoregion are the western gray squirrel, Columbian white-

tailed deer, marbled murrelet, northern spotted owl, western pond turtle, Oregon spotted frog, and Mardon skipper.

- **North Cascades:** The North Cascades ecoregion includes the Cascade Mountains north of Snoqualmie Pass stretching northward to Canada. This ecoregion has high biodiversity and provides important habitat for rare and endangered species, including wide-ranging carnivores, such as lynx, gray wolf, grizzly bear, and fisher, as well as marbled murrelet, northern spotted owl, and Oregon spotted frog.

- **West Cascades:** This ecoregion extends from the south border of the state between the west side of the Cascade Mountains crest and the Puget lowlands as far north as Snoqualmie Pass. This ecoregion is notable for having comparatively high numbers of endemic amphibian species. Rare and endangered species of this ecoregion include western gray squirrel, fisher, marbled murrelet, northern spotted owl, western pond turtle, and Mardon skipper.

- **East Cascades:** This ecoregion lies along the east side of the Cascade Mountains crest between Lake Chelan and the southern border and extends east to the transition between montane forest and the shrub-steppe habitat that dominates eastern Washington. Rare and endangered species in this ecoregion include western gray squirrel, gray wolf, grizzly bear, fisher, lynx, greater sandhill crane, northern spotted owl, western pond turtle, Oregon spotted frog, and Mardon skipper.

- **Okanogan:** This ecoregion stretches from the east side of the Cascade Mountains crest in the North Cascades to the Selkirk Mountains. Terrestrial wildlife in this ecoregion is relatively diverse due to the variety of landforms. Native bird species diversity is especially high. Rare and endangered species in this ecoregion include western gray squirrel, gray wolf, grizzly bear, fisher, lynx, American white pelican, sharp-tailed grouse, greater sandhill crane, and northern leopard frog.

- **Colombia Plateau:** This ecoregion is bounded by four mountain ranges: the Cascade Mountains, the Okanogan Mountains, the Blue Mountains, and the Rocky Mountains. Over half of this ecoregion has been converted to agriculture or urban uses. The habitat is primarily sagebrush shrubland but contains other areas of steppe plant communities, including salt desert scrub, desert playa, and native grasslands. Despite the high levels of habitat conversion, unique habitats of this ecoregion contain high numbers of endemic species. Rare and endangered species of this ecoregion include pygmy rabbit, western gray squirrel, American white pelican, ferruginous hawk, greater sage-grouse, sharp-tailed grouse, greater sandhill crane, upland sandpiper, and northern leopard frog.

- **Canadian Rocky Mountains:** This ecoregion is located in the northeastern corner of the state. The habitat is dominated by coniferous forests, though native grasslands occur along the foothills and south-facing slopes of higher elevations. This ecoregion supports some of the most rare and imperiled species in the state, including woodland caribou, as well as large populations of game species. Other rare and endangered species in this ecoregion include gray wolf, grizzly bear, fisher, lynx, and northern leopard frog.

Many of the participating fire stations are located in urban areas with little to no habitat value for sensitive terrestrial wildlife species. However, more than half of the participating fire stations are situated in rural areas and/or in close proximity to open spaces, such as forests, woodlands, wetlands, waterways, grasslands, and other areas that provide habitat for sensitive terrestrial wildlife or corridors through which they may pass. Twenty-eight fire stations are located within 0.25 miles of an area identified in WDFW Priority Habitat or Species GIS data as supporting sensitive terrestrial wildlife, including marbled murrelet, Rocky Mountain elk, harlequin duck, spotted owl, and black-tailed jackrabbit. Additional fire stations may enroll in the program following this environmental review.

10-day Hold Sites

Ecology has identified 16 storage sites where AFFF may be collected and stored for up to 10 days. Storage sites are located throughout the state and in the City of Clackamas, Oregon. In general, the proposed storage sites consist of existing paved and/or industrial sites located within a wider matrix of industrial land uses. One storage site is located within 0.25 miles of a known terrestrial sensitive wildlife occurrence. Additional information for all storage sites can be found in Appendix A.4.

Landfills

US Ecology Idaho is a permitted landfill located within a rural agricultural area outside of Grand View, Idaho. National lands managed by the Bureau of Land Management (BLM) for multiple uses, including extractive uses such as mining or logging, are located south and west of the facility. The facility is located within a wider context of sagebrush habitat, which provides habitat for sensitive species including the greater sage-grouse, yellow-billed cuckoo, pronghorn antelope, and pygmy rabbits (IDFG 2022).

US Ecology Nevada is a permitted landfill located in the Nevada desert approximately 11 miles south of the city of Beatty. The facility is surrounded by national lands managed by the Bureau of Land Management (BLM) for multiple uses, including extractive uses such as mining or logging. The facility is located within the Amargosa Desert, which provides habitat for sensitive terrestrial wildlife including the desert tortoise, Gila monster, and golden eagle.

Incineration Sites

Aragonite Incineration Facility is a hazardous waste disposal facility located outside the abandoned desert town of Aragonite, approximately 25 miles west of the Great Salt Lake in western Utah. The facility is bordered on the north, east, and south by national lands managed by the Bureau of Land Management (BLM) for multiple uses, including extractive uses such as mining or logging. Habitat in the vicinity of the facility consists predominantly of cheatgrass, an annual invasive grass native to Europe (UDWR 2022). Few sensitive terrestrial wildlife species are associated with this area due to its low productivity. Those that are known to occur in the area are predators, such as golden eagle, ferruginous hawk, western burrowing owl, and kitfox, that forage primarily on rodents and rabbits. The Cedar Mountain Wilderness is approximately six miles east of the facility.

Kimball Incineration Facility is an industrial waste storage and treatment facility in southwest Nebraska. The industrial facility is located within a wider context of short-grass prairie habitat.

A large area of relatively intact habitat for at-risk species is located north of the facility (NGP 2022). This habitat supports diverse raptors, including ferruginous hawk and burrowing owl, and the state listed mountain plover and swift fox are documented as occurring within one mile of the site. This habitat also supports numerous state species of conservation concern, including bird, lizard, invertebrate, and mammalian species.

Deep Well Injection Sites

US Ecology Winnie is a deep well injection, non-hazardous industrial wastewater disposal facility located approximately 10 miles north of the Gulf of Mexico near the town of Winnie, Texas. It is bordered on the north by the Big Hill National Oil Reserve and set within a wider ecological context of wetlands and grassland/savannah containing patches of timberland and non-native pasture. Marshes and wetlands in this region provide nesting habitat for several sensitive species of birds, including the federally listed black rail, piping plover, and rufa red knot.

Advantek Cavern Solutions is a deep well injection, non-hazardous waste site approximately 5 miles south of the City of Hutchinson in central Kansas. The facility is located in a predominantly rural agricultural area. The facility is bordered on the north by agricultural fields and fragmented woodland and on the south by a grassland-woodland mosaic. It is located within the whooping crane sightings corridor (KARS 2022). Sensitive terrestrial wildlife species in the facility vicinity include bald eagle, northern long-eared bat, whooping crane, and the state listed eastern spotted skunk.

Transportation Routes

Transportation routes to end-point locations range in length from approximately 650 to 2,773 miles and cross through most of the western United States. Route lengths are detailed in Section 3.10: Transportation and shown in Figure 3.10-1: Transportation Study Area. A summary of waters crossed by each route is provided in Section 3.3, Earth and Water Resources.

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Accidental Release of AFFF

For all action alternatives, the greatest potential risk to terrestrial wildlife and habitats is the release of AFFF due to spills, leaks, upset conditions, or other accidental releases to the environment. Because AFFF contains organic solvents, chemical stabilizers, and surfactants, it is a serious eye irritant, may cause skin and respiratory irritation, and is harmful when swallowed. It also contains PFAS compounds, which are persistent in the environment and known to adversely impact wildlife health.

Ecotoxicity data for terrestrial receptors is limited, with the majority of available studies specific to plants and earthworms (ITRC 2021). The impact from PFAS chemicals on terrestrial wildlife is greatest for small mammals and birds with limited home ranges (Conder et al. 2020). For these individuals, the body burden is greatest because of their lower body weight and potential to forage exclusively on contaminated environmental media. Potential exposure to PFAS may occur from incidental ingestion of soil or from PFAS in diet items. For this reason, avian and mammalian insectivores or invertivores are at the greatest risk from direct exposure to AFFF (e.g., house wren, little brown bat; Divine et al. 2020). PFAS compounds may bioaccumulate in tissue or biomagnify in the food chain.

Health impacts may be direct or indirect. For example, PFAS compounds may reduce bird reproduction directly by affecting chick development during incubation. Birds may also be indirectly impacted by AFFF release if foams are released in quantities that cause a reduction in prey. Wildlife may accumulate PFAS from direct exposure to contaminated water, accidental ingestion of contaminated soil or sediments, as well as through diet. PFAS compounds can cross the placenta and may affect fetal development. At sufficient levels, exposure to PFAS may result in adverse effects on the hepatic, endocrine, and immune systems; development; and contribute to certain types of cancers in wildlife. Wildlife can also be indirectly exposed to PFAS through ingestion of contaminated prey.

Health impacts from exposure to PFAS compounds are dose-dependent and species-specific. The biological half-life of some PFAS compounds is lower for rodents and cattle/rabbit than

humans due to differences in how waste is eliminated from each species. While PFOA can persist in humans for two years, in rodents PFOA persists for 7 to 20 days, and in cattle/rabbit (ruminants and hind gut fermenters) PFOA persists less than one day. There are also differences between PFAS persistence in males and females, with females typically excreting PFAS materials faster than males.

Release Mechanism

AFFF may leak from containers, distribution pipes, or storage tanks and may spill during transfer of AFFF between containers or while containers are being transported between locations.

Relative Risk of Release

Accidental releases during routine handling of AFFF within an existing permitted waste management facility or at a 10-day storage facility would be contained within the facility and promptly cleaned up by appropriately trained personnel and would therefore not be expected to reach terrestrial wildlife habitats.

The risk of release of AFFF to the environment during transportation is discussed in Section 3.11, Transportation. Based on the use of appropriate Department of Transportation (U.S. DOT)-rated trucks to transport the waste, the use of containers appropriate for hazardous waste during transport, low probability of an accident and high degree of emergency response preparedness along interstate highways, the relative risk of release of AFFF from transportation related spills was determined to be low.

Storage and handling of AFFF at fire stations participating in the AFFF program presents a low risk of release to terrestrial resources. AFFF is stored at fire stations in buckets, containers, storage tanks, fire engine tanks, and carboys. Foam residue may be present in sprinkler systems, storage pipes, and charged pipes. If AFFF reaches a natural habitat where plants and soil dwelling animals are present, there is potential that plants and animals may become contaminated and then consumed by birds, amphibians, small mammals, and/or reptiles. The potential for a spill at a fire station to represent a risk to natural habitat depends on several factors:

1. The amount spilled. Per fire station responses to Ecology's questionnaire, the majority of AFFF is stored in containers holding at least 55 gallons of foam. Approximately 25 percent of the fire departments are currently storing 25 gallons or less of PFAS-containing foam, 25 percent are storing between 50 and 100 gallons, and the remaining 50 percent report stockpiles of 100 to 500 gallons or more of AFFF.

2. The substrate onto which the material is spilled. Based on review of aerial photographs, most exterior spills at fire stations would occur over paved surfaces from which they could be readily vacuumed. However, in some areas exterior spills could occur over gravel or vegetated surfaces through which spilled AFFF could percolate into the soil and groundwater, and then migrate offsite.

3. The ability of the spill to move offsite. Many fire stations are curbed to separate pavement from vegetated areas. These curbed, paved areas may also contain vaults

which would keep the spill from moving offsite. Other fire stations are not curbed; spills at these locations may move offsite. Depending on the fire station, offsite spills may flow either into a developed stormwater system, which contain vaults from which spilled material can be suctioned, or into vegetated ditches which connect to nearby creeks and rivers.

4. The proximity of the fire station to natural habitats. If the fire station is not adjacent or proximal to natural habitat, then there's little to no risk of exposure to the terrestrial biological resources from a spill.

5. Facility spill response planning. All fire stations are required to prepare and implement a Facility Spill Response Plan (FSRP) to prevent, contain, and clean up spills. The FSRP requires that each station maintain a spill kit and establish spill response clean-up procedures and reporting requirements.

Specific details regarding these criteria for each of the currently enrolled fire stations can be found in Appendix A.2.

Ecology data show that the reported AFFF spills at fire stations are predominantly confined to paved areas. As described in Section 2.3.2, Ecology data from 2016 to 2021 shows a total of 26 reported spills at Washington fire stations between 2016 and 2021. Of the nine reported spills at facilities, five were to land, four of which were to impervious surfaces. The fifth spill is reported as to "land; improper procedure." Spills to land (for which there are spill quantity data) were of quantities up to 100 gallons. Spills to vegetated areas were managed through soil removal and replacement. Spills that migrated into the storm drain system were detained within drain vaults or catch basins, from which the material was retrieved through vacuum.

Overall, the relative risk of release of AFFF from a fire station to terrestrial habitat is low. As demonstrated by Ecology data, a spill at a fire department would be cleaned up promptly by trained personnel, reducing the already low likelihood of offsite movement of the PFAS-containing AFFF.

3.5.4 Impacts Specific to Each Alternative

3.5.4.1 Alternative 1: Approved Hold in Place

Under this alternative, AFFF would be held in place at participating fire stations until a later date. As previously discussed, any AFFF that might spill during transfer into new containers would be promptly cleaned up and not expected to migrate into terrestrial habitats. Construction of any required AFFF storage facilities or secondary containment would occur within the developed area of the fire department and would not affect terrestrial species or habitats.

If the held PFAS-containing AFFF were used for firefighting, PFAS could come in contact with soil and potentially migrate to terrestrial habitats. Although Washington State law (chapter 70A.400 RCW) places several restrictions on the use, sale, and manufacturer of firefighting foam with intentionally added PFAS, the law does not prohibit fire departments from using

firefighting foam with intentionally added PFAS in emergencies. Under Alternative 1, it is unknown whether or how many fire departments would use their held foam.

3.5.4.2 Alternative 2: Incineration

Under this alternative, both liquid and solid AFFF materials, including containers, would be transported out of state to a permitted facility and incinerated. Incineration of AFFF produces residual ash and air emissions (discussed in Section 3.1). Residual ash would be properly disposed in a hazardous waste landfill.

Release Mechanism

Although many PFAS have low volatility, PFAS compounds may become airborne from some industrial releases (for example, stack emissions). The potential release of PFAS into the environment from incineration is described in Section 3.1, Air Quality. Commenters on the Determination of Non-Significance for the Ecology AFFF Program expressed concern that incomplete incineration of AFFF may deposit residual PFAS in the surrounding soils if thermal treatment does not adequately control fluorinated products of incomplete combustion (PICs) (Appendix A.1). Commenters state that deposition of PFAS particulates into the soil would potentially enter the terrestrial food web and bioaccumulate in higher trophic level terrestrial birds and mammals.

Relative Risk of Release

If PFAS particulates were to enter terrestrial habitats in significant quantities, they could impact sensitive terrestrial wildlife and habitat. However, as described in Section 3.1, Air Quality, common PFAS compounds are effectively destroyed by incineration, and the volume of PFAS remaining following incineration of AFFF from all participating fire stations would be approximately 4.6 grams. PFAS particulates due to the incomplete combustion of project related AFFF would therefore not be deposited in sufficient quantities to cause population level ecological effects within the study area at either potential incineration site. Incineration of AFFF therefore presents a low risk of release of PFAS compounds to terrestrial wildlife or habitats.

Furthermore, the area surrounding the Aragonite facility contains few sensitive terrestrial wildlife species due to the low productivity of the cheat-grass dominated habitat. Although short-grass prairie terrestrial habitat is located within the study area north of the Kimball facility, PICs would not be carried and deposited in the soil in sufficient quantities to adversely impact this habitat.

3.5.4.3 Alternative 3: Solidification and Landfilling

Under this alternative, AFFF would be solidified in concrete or a similar matrix and disposed at an approved hazardous waste landfill.

Release Mechanism

Leaching may occur if AFFF is disposed in landfill waste without an adequate liner system and leachate control. Additionally, AFFF may be released onto unlined areas of the landfill during transport. PFAS compounds can leach from AFFF into unsaturated soils during precipitation

events, ultimately entering groundwater. Once in groundwater, PFAS may move into surface water where terrestrial wildlife drink or forage.

Relative Risk of Release
As discussed in Section 3.4, Aquatics, Action Alternative 3, solidification and landfill storage of AFFF presents no risk of release into sensitive terrestrial environments.

The landfills identified as end locations for the program are permitted hazardous waste facilities. Their liner systems and leachate control systems are described in more detail in Section 3.3.4.5: Earth and Water Resources, Impacts and Mitigation Measures, Alternative 3. In summary, the facilities are both "zero-discharge" facilities, with no release mechanism for AFFF to migrate offsite.

Materials spilled onsite would be cleaned up promptly by appropriately trained personnel, and the cleanup materials would be buried along with other solid waste within the landfill.

3.5.4.4 Alternative 4: Class I Deep Well Injection

Under this option, AFFF would be injected into receiving formations located beneath multiple impermeable layers of rock several hundred to almost 2,000 feet below the surface of the earth.

Release Mechanism

AFFF that is injected underground may migrate away from the injection zone if the injection wells are not properly constructed or maintained. PFAS compounds could then migrate through the surrounding geological formations and potentially end up in aquifers or groundwater. Once in groundwater, PFAS compounds can migrate into surface waters where terrestrial wildlife drink or forage.

Relative Risk of Release
The relative risk to water from underground injection at US Ecology Winnie or Advantek Cavern Solutions is discussed in detail in Section 3.3, Water Resources, Action Alternative Four. The discussion finds that the relative risk of release of AFFF from underground injection is generally low (however, neither facility is presently permitted to inject hazardous waste). Also, the risk of PFAS compounds migrating from groundwater to surface water is very low, as the injection depths are so deep that surface water is not intersected. Class I deep well injection of AFFF therefore presents a low risk of release into terrestrial environments.

AFFF could be released during the well injection process if there were an equipment malfunction that released AFFF aboveground into the facility. In this event, the spill would be promptly cleaned up and the site remediated to prevent further transport of PFAS compounds.

3.5.4.5 Alternative 5: No Action Alternative

Because no actions would take place under the no action alternative, there would be no project-related impacts to terrestrial wildlife resources. The risk would remain for AFFF stored in its original containers to leak PFAS compounds to the environment. Because participating fire

stations are located throughout the state, the number of discrete locations potentially exposed to PFAS contamination would be widespread. As in Alternative 1, if the PFAS-containing AFFF were used for firefighting, PFAS could come in contact with soil and potentially migrate to nearby terrestrial habitats. Under Alternative 5, it is unknown whether or how many fire departments would use their held foam.

Analysis Summary

For all alternatives, there is a low risk of a significant impact on soils, surface water, or groundwater. The risk may be somewhat higher, though still low, for Alternatives 1 and 5, as fire stations may use PFAS-containing AFFF in emergencies. It is unknown whether or how many fire stations would use the foam.

3.5.5 Mitigation Measures

Operational measures, including administrative and engineering controls for the each of the alternatives, are listed in Section 3.1, Air Quality (Section 3.1.3).

3.5.6 Cumulative Impacts

Cumulative impacts are discussed in Chapter 5.

3.5.7 Data Gaps

Gaps exist in the knowledge of exposure pathways in terrestrial wildlife communities and how individual species are affected by individual PFAS compounds. Health impacts to terrestrial wildlife species are generally extrapolated from laboratory experiments and may not represent how PFAS compounds affect species in the wild. Because impacts to PFAS are species-specific, species for which impacts have been studied might not be extrapolatable to other species.

Additionally, although protective criteria have been published for select PFAS compounds by the EPA and by Washington State, resultant concentrations of PFAS in the environment that may result from an AFFF release are incident specific, site-specific, and not possible to predict in a general sense, with any certainty.

For Alternatives 1 and 5, it is unknown whether or how many fire stations would continue to use their PFAS-containing AFFF for emergencies.

3.6 Vegetation

This section describes sensitive vegetation in the area of the project alternatives and describes the environmental consequences of each alternative on vegetation.

Sensitive vegetation includes:

- Endangered or threatened plant species.
- Vegetation alliances that have been identified as sensitive by the Washington Department of Fish and Wildlife.

3.6.1 Affected Environment

The affected environment includes sensitive vegetation at and near: the fire stations participating in Ecology's AFFF collection project; temporary storage facilities; identified potential treatment and disposal sites for the collected AFFF; and identified transportation routes.

The study area for sensitive vegetation is defined as the environment with the potential to be affected by the collection, transport, and disposal of AFFF stockpiles under alternatives considered in this EIS. It includes a .25-miles offset from AFFF storage locations, disposal facilities, and transportation corridors to include the typical range of vegetation.

3.6.1.1 Existing and Evolving Regulations

Existing and evolving regulations applicable to vegetation are described in Section 3.5.2, Terrestrial Biology.

Study Area

The study area for the affected environment includes the fire stations participating in Ecology's AFFF collection project; temporary storage hold facilities; identified potential treatment and disposal sites for the collected AFFF; identified transportation routes. The study areas include an additional 0.25 miles adjacent to each of these facilities and transportation routes; this is a radius or distance from facilities or transportation routes that could be reasonably affected by AFFF collection and disposal activities. For study area locations within 0.25 miles of a water feature, the study area was expanded to include the water corridor up to 10 miles downstream of its intersection with the 0.25-miles buffer.

Environmental Setting

Fire Stations

The participating fire stations and project alternative locations are located throughout Washington State. A general discussion of Washington's ecoregions is provided in Section 3.5.1 Terrestrial Biology, Affected Environment.

Many of the participating fire stations are in urban areas with little habitat value for sensitive vegetation. However, approximately half of the currently participating fire stations are situated

in rural areas and/or in close proximity to open spaces, such as forests, woodland, wetlands, waterways, grasslands, and other areas that potentially provide habitat for sensitive plants species. Eighteen fire stations are located within 0.25 miles of a habitats identified as either priority habitat or sensitive habitat, such as shrub-steppe or oak woodland habitat. Additional fire stations may enroll in the program following this environmental review.

Temporary Hold Sites

Ecology has identified 16 storage sites where AFFF may be collected and stored for up to 10 days. Storage sites are located throughout the state and in the City of Clackamas, Oregon. In general, the proposed storage sites consist of existing paved and/or industrial sites located within a wider matrix of industrial land uses. Five storage sites are located within 0.25 miles of WDFW priority habitats. Additional information for all storage sites can be found in Appendix A.4.

Landfills

US Ecology Idaho is a permitted landfill located within a rural agricultural area outside of Grand View, Idaho. The facility is located within a wider context of sagebrush-steppe habitat within the Snake River Plain. Steppes are fairly dry ecoregions, with the most precipitation occurring in the summer. They are home to numerous rare plant species, including the federally threatened slickspot peppergrass (*Lepidium papilliferum*). Sagebrush-steppe habitat is in decline on the Snake River Plain.

US Ecology Nevada is a permitted landfill located in the Nevada desert approximately 11 miles south of the city of Beatty. The facility is located within the Amargosa Desert. Vegetation is sparse in the vicinity of the facility and, based on a review of aerial photographs, appears to be dominated by creosote bush (*Larrea tridentata*). Special status plant species associated with this habitat include spring-loving centaury (*Centaurium namophilum*).

Incineration Sites

Aragonite Incineration Facility is a hazardous waste disposal facility located outside the abandoned desert town of Aragonite, approximately 25 miles west of the Great Salt Lake in western Utah. The facility is located in the Shadscale-Dominated Saline Basins region of the Central Basin and Range Region (Woods et al 2001). The area is arid, internally drained, and nearly flat. Soils are salty, alkali, and dry for extended periods, so vegetation must be salt- and drought-tolerant. Few plants can tolerate these harsh environments. The predominant vegetation in the vicinity of the facility is mapped as cheatgrass (*Bromus tectorum*), an annual invasive grass native to Europe (UDWR 2022).

Kimball Incineration Facility is an industrial waste storage and treatment facility in southwest Nebraska. The facility is located in the Flat to Rolling Cropland ecoregion of the Western High Plains (Chapman et al. 2001). The facility is located within the Kimball Grasslands landscape, which is considered a Biological Unique Landscape by the Nebraska Natural Legacy Program. Kimball grasslands are located within the wider short-grass prairie habitat. Threadleaf Sedge Western Mixed-grass Prairie, a state-mapped natural community, occurs on site.

Injection Sites

US Ecology Winnie is a deep well injection, non-hazardous industrial wastewater disposal facility located approximately 10 miles north of the Gulf of Mexico near the town of Winnie, Texas. The facility is located within the Gulf Coast ecological area of Texas. The facility is bordered on the north by the Big Hill National Oil Reserve and on the east and west by, respectively, patches of pine plantation and non-native invasive shrubland. Coastal prairie pondshore is located west and south of the facility; coastal prairie is located southeast of the facility. Rare plants known to occur in these habitats include Chapman's orchid (*Platanthera chapmanii*) and corkwood (*Leitneria pilosa* ssp. *pilosa*).

Advantek Cavern Solutions is a deep well injection, non-hazardous waste site approximately 5 miles south of the City of Hutchinson in central Kansas. The facility is located in the Great Bend Sand Prairie ecoregion of Kansas. The ecoregion substrate consists of windblown sand, sandy outwash, and dunes, which in some areas supports sand prairie bunchgrass, though natural grasslands are not visible on aerials. The facility is bordered on the north by agricultural fields and fragmented woodland and on the south by a grassland-woodland mosaic.

Transportation Routes

Transportation routes to end-point locations range in length from approximately 650 to 2,773 miles and cross through most of the western United States, including through a diversity of vegetation types. Route lengths are detailed in Section 3.10:, Transportation and shown in Figure 3.10-1: Transportation Study Area.

3.6.2 Significance Criteria

"Significant" as used in SEPA means a reasonable likelihood of more than a moderate adverse impact on environmental quality. Significance involves context and intensity (WAC 197-11-330) and does not lend itself to a formula or quantifiable test. Under SEPA, the severity of an impact should also be weighed along with the likelihood of its occurrence. An impact may be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred.

For purposes of this analysis, an impact was considered significant if it:

- Had a reasonable likelihood of more than a moderate adverse impact on environmentally sensitive or special areas, such as loss or destruction of wilderness;
- Had a reasonable likelihood of more than a moderate adverse impact on endangered or threatened species or their habitat;
- Conflicted with local, state, or federal laws or requirements for the protection of the environment; or
- Established a precedent for future actions with significant effects, or involved unique and unknown risks to the environment.

3.6.2.1 Impact Assessment and Methodology

Database searches and literature reviews were conducted to determine which sensitive terrestrial resources were known to occur within the project study area. Potential impacts were identified for each project alternative. For impacts related to PFAS, the potential release mechanism was identified and the relative risk of the PFAS release was analyzed. The significance of the project-related impact on vegetation was then evaluated to determine whether the alternative was likely to adversely affect vegetation.

3.6.3 Impacts and Mitigation Measures

3.6.3.1 Impacts Common to All Alternatives

Accidental Release of AFFF

For all action alternatives, the greatest potential risk to vegetation is the release of AFFF due to spills, leaks, upset conditions, or other accidental releases to the environment. AFFF contains PFAS compounds, which are persistent in the environment and are known to adversely impact plant health.

Vegetation may be directly exposed to PFAS from the release of AFFF that enters the environment in the soil. Compared to various other terrestrial organisms, plants have a higher threshold for toxicity, meaning they can withstand a higher concentration before harmful effects are observed. PFAS can affect seedling emergence, survival, and shoot height and weight (ITRC 2022b). The effects of PFAS appear to be influenced by the amount of organic matter in soil. Plants grown in soils with higher organic carbon content show a decrease in both PFAS compound accumulation and phytotoxicity, meaning that vegetative habitats with low organic carbon content, such as shrub steppe habitat, may be more vulnerable to adverse effects from AFFF spills.

Release mechanisms and relative risk of release for AFFF spills from project alternatives is discussed in detail in Terrestrial Biology Section 3.5.3, Impacts Common to All Action Alternatives. Because AFFF will be appropriately handled by trained individuals, the risk of a spill migrating into natural areas is low, and accidental spills will be promptly contained and cleaned up, and the risk to vegetation from an accidental spill is low.

3.6.3.2 Alternative 1: Approved Hold in Place

Under this alternative, AFFF would be held in place at participating fire stations until a later date. As previously discussed, any AFFF that might spill during transfer into new containers would be promptly cleaned up and not expected to migrate into terrestrial habitats. Construction of any required AFFF storage facilities or secondary containment would occur within the developed area of the fire department and would not affect natural vegetation.

If the held PFAS-containing AFFF were used for firefighting, PFAS could come in contact with and affect natural vegetation. Although Washington State law (chapter 70A.400 RCW) places several restrictions on the use, sale, and manufacturer of firefighting foam with intentionally added PFAS, the law does not prohibit fire departments from using firefighting foam with

intentionally added PFAS in emergencies. Under Alternative 1, it is unknown whether or how many fire departments would use their held foam.

3.6.3.3 Alternative 2: Incineration

Under this alternative, both liquid and solid AFFF materials, including containers, would be transported out of state to a permitted facility and incinerated. Incineration of AFFF produces residual ash and air emissions (discussed in Section 3.1). Residual ash would be properly disposed of in a hazardous waste landfill.

Release Mechanism

Although many PFAS have low volatility, PFAS compounds may become airborne from some industrial releases (for example, stack emissions). The potential release of PFAS into the environment from incineration is described in Section 3.1, Air Quality. Commenters on the Determination of Non-Significance for the Ecology AFFF Program expressed concern that incomplete incineration of AFFF may deposit residual PFAS in the surrounding soils if thermal treatment does not adequately control fluorinated products of incomplete combustion (PICs) (Appendix A.1).

Relative Risk of Release

If PFAS particulates were to enter terrestrial habitats in significant quantities, they could impact sensitive terrestrial wildlife and habitat. However, as described in Section 3.1, Air Quality, common PFAS compounds are effectively destroyed by incineration, and the volume of PFAS remaining following incineration of AFFF from all participating fire stations would be approximately 4.6 grams. PFAS particulates due to the incomplete combustion of project-related AFFF would therefore not be deposited in sufficient quantities to cause population-level ecological effects within the study area at either potential incineration site. Incineration of AFFF, therefore, presents a low risk of release of PFAS compounds to sensitive vegetation.

Further, the Aragonite facility is located in an extremely dry and harsh environment. Few plants can tolerate this type of environment, which is why it is dominated by cheatgrass, an invasive species. With a lack of sensitive, and diverse vegetation community, in the event of a spill or release, there would not be significant impacts on the surrounding vegetation.

The Kimball facility is located in a more sensitive and abundant grassland that is considered a Biological Unique Landscape and contains short-grass prairie habitat. PFAS particulates released to the environment could have an impact on this area, but it is unlikely that a substantial quantity of PFAS particulates would be released into the environment from incomplete combustion (see Section 3.1, Air Quality for additional information on PFAS incineration).

3.6.3.4 Alternative 3: Solidification and Landfilling

Under this alternative, AFFF would be solidified in concrete or a similar matrix and disposed at an approved hazardous waste landfill. Due to the negligible risk of release from the identified end-point landfills as previously described in Terrestrial Biological Resources Section 3.5.3, there will not be a significant impact to the vegetation community through the solidification and landfilling alternative.

3.6.3.5 Alternative 4: Class I Deep Well Injection

Under this option, AFFF would be injected into receiving formations located beneath multiple impermeable layers of rock several hundred to almost 2,000 feet below the surface of the earth. Due to the low risk of release of AFFF during the deep well injection as previously described in Terrestrial Biological Resources Section 3.5.3, there will not be a significant impact on the vegetation community.

3.6.3.6 Alternative 5: No Action Alternative

Because no actions would take place under the no action alternative, there would be no project-related impacts on vegetation. The risk would remain for AFFF stored in its original containers to leak PFAS compounds into the environment. Because participating fire stations are located throughout the state, the number of discrete locations potentially exposed to PFAS contamination would be widespread. As in Alternative 1, if the PFAS-containing AFFF were used for firefighting, PFAS could come in contact with soil and migrate to nearby surface water, and/or eventually migrate to groundwater. Under Alternative 5, it is unknown whether or how many fire departments would use their held foam.

3.6.3.7 Analysis Summary

For all alternatives, there is a low risk of a significant impact on vegetation resources. The risk may be somewhat higher, though still low, for Alternatives 1 and 5, as fire stations may use PFAS-containing AFFF in emergencies. It is unknown whether or how many fire stations would use the foam.

Operational mitigation measures, including administrative and engineering controls for the each of the alternatives, are listed in Section 3.1, Air Quality (Section 3.1.3).

3.6.4 Cumulative Impacts

Cumulative impacts are discussed in Section 5.0.

3.6.5 Data Gaps

Gaps exist in our knowledge of how exposure pathways in plant communities and how individual species are affected by individual PFAS compounds. Health impacts to plant species are generally extrapolated from laboratory experiments and may not represent how PFAS compounds affect individuals in the wild. Because impacts to PFAS are species-specific, species for which impacts have been studied might not be extrapolatable to other species. Additionally, although protective criteria have been published for select PFAS compounds by the EPA and by Washington State, resultant concentrations of PFAS in the environment that may result from an AFFF release are incident specific, site-specific, and not possible to predict in a general sense, with any certainty.

For Alternatives 1 and 5, it is unknown whether or how many fire stations would continue to use their PFAS-containing AFFF for emergencies.

3.7 Human Health and Safety

This section describes human health and safety impacts from PFAS in AFFF associated with the project alternatives.

3.7.1 Affected Environment

The affected environment includes workers at the fire stations participating in Ecology's AFFF collection project; temporary holding facilities; and identified potential treatment and disposal sites for the collected AFFF.

Sections 3.1, Air Quality; 3.3, Earth and Water Resources; and 3.4, Aquatic Resources, describe AFFF and PFAS release mechanisms and impacts on air, soil, and water for the project alternatives. The risk of a release for all of the alternatives was determined to be low, and in the event of a release, engineering controls, and spill response regulations exist to prevent spills from reaching the environment. Therefore, impacts of PFAS on human health beyond the limits of the operational facilities are discussed in this chapter only in a general sense.

3.7.1.1 Existing Conditions

As discussed in Chapter 5: Cumulative Impacts, the combination of widespread use and chemical persistence means that PFAS are already ubiquitous in the global environment. Studies have shown that PFAS have been detected in snow and ice cores collected from some of the most remote places, including the Tibetan Plateau, Canadian Artic, and Antarctica (J. Garnett, et al. 2022).

Several states in the Northeast, including Maine, Vermont, and Massachusetts, have undertaken PFAS background studies to evaluate the presence of PFAS in shallow soils and establish background threshold values (BTVs). In Maine, PFOS was detected in over 80 percent of the background soil samples (at or above the method detection limit of 0.13 nanograms per gram [ng/g]) collected from both rural and urban environments (Maine DEP 2022).

In another background study, soil PFAS concentration data were aggregated from available journal articles and included soil samples collected from various locations across the world. PFAS were detected in nearly all of the soil samples collected across a variety of environments, rural and urban, including residential yards, gardens, agricultural fields, school yards, commercial sites, and parks. Although PFAS concentrations were generally orders of magnitude higher in samples collected in areas of known contamination, PFAS were also detected in samples collected from remote regions far from potential PFAS sources (Brusseau ML, et al. 2020).

In Washington State, PFAS have been detected in soils, surface waters, groundwater, wastewater treatment plant effluent, fresh water and marine sediments, fresh water and marine organisms, and terrestrial wildlife. Statewide testing is underway to test drinking water for PFAS at over 2,400 public water systems. With approximately 45 percent of the testing complete, 84 percent of water sources have tested below detection for any PFAS, and fewer than 2 percent report detections over a state action level (WTN 2023). Nearly all exceedances are for PFOS (>15 ppt) or PFOA (>10 ppt). Although PFAS are not manufactured in the state,

they may be used in certain manufacturing and industrial processes within the state or used in firefighting foams (Ecology 2022).

PFAS are also found in many commercial and consumer products, such as paper and packaging; clothing and carpets; outdoor textiles and sporting equipment; ski and snowboard waxes; non-stick cookware (e.g., Teflon); cleaning agents and fabric softeners; polishes, waxes, and latex paints; pesticides and herbicides; hydraulic fluids; paints, varnishes, dyes, and inks; adhesives; medical products; personal care products, like shampoo, hair conditioners, cosmetics, sunscreen, toothpaste, and dental floss (ITRC 2020).

Numerous studies have demonstrated that PFAS are present in the blood serum of most people and that a "background" range of PFAS contamination of blood serum exists even where there is no identified source of PFAS. The general population is most likely exposed to PFAS by consuming water or food that contains PFAS, contact with consumer products that contain PFAS, and swallowing or breathing indoor dust and air containing PFAS that escape from consumer products. Much higher PFAS serum levels have been documented in people with occupational exposures or who spend time in areas with local PFAS contamination of air, soil, and drinking water (ITRC 2022; Ecology 2022).

3.7.1.2 Existing and Evolving Regulations

The regulations presented below are also discussed in Chapter 1, Introduction, and in Sections 3.1: Air Quality; 3.3: Earth and Water Resources; and 3.4: Aquatic Resources.

Federal

There are no provisions of the federal Clean Air Act (42 United States Code Chapter 85) that explicitly address PFAS air emissions. The EPA has not promulgated ambient air quality standard regulations for PFAS. As of November 2023, the EPA has not published Regional Screening Levels (RSLs) for residential or industrial air on its RSL website (EPA 2023b). The EPA issues updated RSL tables twice a year in May and in November.

Under the Clean Water Act, the Safe Drinking Water Act, and its PFAS Strategic Roadmap, the EPA has issued drinking water health advisory levels, RSLs for soil and tap water, and water quality criteria for aquatic life. These PFAS levels are meant to provide information for the protection of human health and the environment, and they are non-enforceable. In March 2023 the EPA proposed maximum contaminant levels (MCLs) in drinking water for six PFAS. These proposed MCLs are not yet enforceable.

Washington State

Washington Clean Air Act

The Washington Clean Air Act was enacted to meet several goals, including securing and maintaining levels of air quality that protect human health and safety, and complying with the requirements of the federal clean air act. It does not address ambient air quality standards for PFAS.

Model Toxics Control Act
The Model Toxics Control Act (MTCA) is Washington's environmental cleanup law. MTCA funds and directs the investigation, cleanup, and prevention of sites that are contaminated by hazardous substances. It works to protect people's health and the environment and to preserve natural resources for the future.

Other Actions – State Action Levels and Protective Concentrations
As discussed in Chapter 1, in November 2021, the Washington State Board of Health adopted state action levels (SALs) for five PFAS in drinking water:

- PFOA (10 ppt)
- PFOS (15 ppt)
- PFNA (9 ppt)
- PFBS (345 ppt)
- PFHxS (65 ppt)

In June 2023, Ecology published Guidance for Investigating and Remediating PFAS Contamination in Washington State. Among other items, the document established protective concentrations for human receptors in soil and groundwater (see Table 1-4 in Chapter 1).

Utah and Nebraska
Treatment options under consideration include incineration of AFFF at facilities located in Utah and Nebraska. Neither of these states has established ambient air quality standards for PFAS, soil standards, or standards for drinking water, surface water, or groundwater.

3.7.1.3 Study Area and Environmental Setting

The study area for the affected environment includes workers at the fire stations participating in Ecology's AFFF collection project; temporary holding facilities; and identified potential treatment and disposal sites for the collected AFFF. The environmental settings are described in Sections 3.1, Air Quality, 3.3, Earth and Water Resources, and 3.4, Aquatic Resources.

3.7.2 Significance Criteria

"Significant" as used in SEPA means a reasonable likelihood of more than a moderate adverse impact on environmental quality. Significance involves context and intensity (WAC 197-11-330) and does not lend itself to a formula or quantifiable test. Under SEPA, the severity of an impact should also be weighed along with the likelihood of its occurrence. An impact may be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred.

For purposes of this analysis, an impact was considered significant if it:

- Had a reasonable likelihood of more than a moderate adverse impact on human health;

- ► Conflicted with local, state, or federal laws or requirements for the protection of the environment; or

- ► Established a precedent for future actions with significant effects or involved unique and unknown risks to the environment.

3.7.3 Impact Assessment and Methodology

The analysis focuses on impacts to human health related to PFAS. The potential release mechanisms and the relative risk of the PFAS releases were analyzed. The significance of the project-related impacts to human health was then evaluated.

3.7.3.1 Release mechanisms

Release mechanisms during handling of AFFF at fire stations, temporary holding facilities and identified potential treatment and disposal sites (incinerators, landfills, and deep well injection facilities) are discussed in detail in Sections 3.1, Air Quality, 3.3, Earth and Water Resources, and 3.4, Aquatic Resources. These comprise leaks from containers or pipes, or accidental spills during product transfer.

Relative Risk of Release

The risk of a release for all of the alternatives was determined to be low, and in the event of a release, engineering controls and spill response regulations exist to prevent spills from reaching the environment. Therefore, the impact of PFAS to human health beyond the limits of the operational facilities is discussed below only in a general sense.

In the unlikely case of a release at a facility, the predominant exposure pathways to workers are:

- ► **Ingestion:** AFFF could be accidentally ingested during cleanup activity. As discussed below in Mitigation Measures, this already low risk would be mitigated by proper use of personal protective equipment (PPE) and adhering to safety standards during cleanup activity.

- ► **Inhalation:** PFAS may evaporate and enter the ambient air. As detailed in Section 3.1, Air Quality, the evaporation rate would be very slow, and the resulting ambient concentrations would be very low, as well as transient due to rapid cleanup. As discussed in Section 3.1.3 and below in Mitigation Measures, this already low risk could be mitigated, if necessary, by proper training and handling of AFFF by experienced personnel and ensuring personnel are aware of emergency response in the event of a spill.

- ► **Dermal contact:** Workers could come into direct physical contact with AFFF during cleanup. This already low risk would be mitigated by proper use of personal protective equipment (PPE) and adhering to safety standards during cleanup activity.

In the case of a release to the environment, the predominant exposure pathways to humans are:

- **Inhalation:** As detailed in Section 3.1, Air Quality, PFAS compounds may be released due to incomplete combustion. The estimated mass that may be released from the project, 4.6 grams, would be released from a tall stack over a duration of at least several hours, and the resulting ambient PFAS concentrations would be much less than the significance criteria listed in Table 3.1-4.[70]

- **Soil Ingestion:** Humans could become exposed by incidental ingestion of PFAS compounds that may be transported via air and deposited to the soil surface in trace quantities during the incineration process or spilled during an accident. As discussed in Section 3.3, Earth and Water Resources, the incineration facilities are located in remote regions with low human population. Direct contact with nearby soils by humans is a low risk.

- **Water Ingestion:** As discussed in Section 3.3, Earth and Water Resources, the risk of release of AFFF into surface water or groundwater is low for all of the project alternatives. Additionally, the State of Washington has State Action Levels for 6 PFAS in drinking water, which requires water suppliers to test for PFAS, provide public notification of SAL exceedances, and possibly take other action. The risk of water ingestion for all project alternatives is low.

3.7.3.2 Impacts

Toxicology and epidemiology studies have been focused on end-product perfluoroalkyl acids, specifically PFOS and PFOA. Considerable information is also available for some other PFAS compounds. Studies indicate that higher exposure to certain PFAS may lead to increased cholesterol levels; decreased birth weights; decreased immune response to vaccines; changes in liver enzymes that indicate liver damage; increased risk of blood pressure problems during pregnancy; increased risk of thyroid disease; and increased risk of testicular and kidney cancer. However, in part, because the human health effects caused by exposure to PFAS are still being studied, the EPA has not yet promulgated enforceable PFAS limits in environmental media or drinking water. Table 3.7-1 presents a summary of currently available health effects data for several PFAS that are associated with AFFF, published by the EPA (2020, 2023), ASTDR (2021), and available from ITRC (2022).

[70] Table 3.1-4 lists PFAS ambient air standards for five states that have developed them. Air standards have not been developed for the State of Washington, any of the states through which transportation routes pass, or any of the states where the final disposal facilities considered in this EIS are located.

TABLE 3.7-1: Summary of Select Health Effects Information for Select PFAS

	6:2 FTSA	6:2 FTOH	PFHxS	PFBS	PFOA	PFOS
Current Industrial Applications	Modern AFFF; certain food packaging and cookware; metal finishing mist and fume suppressants	Modern AFFF; certain food packaging and cookware; chemical/resin manufacturing	Chemical coatings, additives, and surface treatments; largely phased out in 2002	Chemical coatings, additives, and surface treatments	Manufacture, use, and import restricted in the United States since 2002	Manufacture, use, and import restricted in the United States since 2002
Chronic RfD (mg/kg-day)	None identified	None identified	2.0E-05	3.0E-04	3.0E-06	2.0E-06
Oral LD50 (mg/kg)	300 – 2,000	1,750 – 2,000	None identified	430	430 – 680	251 - 579
Toxicity Effects	Skin irritation, kidney and liver effects	Kidney, liver, immune system, and developmental effects	Kidney, liver, spleen, heart, thyroid, reproductive and developmental effects	Thyroid, liver, kidney, developmental, and reproductive effects	Liver, kidney, reproductive, developmental, and carcinogenic effects	Liver, kidney, thyroid, immune system, developmental, cardiovascular, and carcinogenic effects
Bioaccumulation Factors (BAF)	None identified	None identified	204	< 10	7,670	1,900
Human Serum Half-Life[4]	None identified	None identified	4.7-8.5 years	26 days	3.1-4.6 years	3.1 – 5.4 years

[1] RfD = reference dose, from EPA Regional Screening Level Summary Table, May 2023; https://semspub.epa.gov/work/HQ/404087.pdf. Note that in its June 2022 Health Advisory update, lower RfDs were used, based on health effects in children (1.5E-9 mg/kg/day for PFOA and 7.9E-9 mg/kg/day for PFOS).

[2] LD50 = concentration of chemical lethal to 50 percent of the experimental animals exposed to it

[3] BAF is the ratio of the concentration in biota (for example, animal tissue) versus the concentration in the route of exposure (for example, in the water the animal drinks)

3.7.3.3 Analysis Summary

Based on the impact assessment above, for all project alternatives, there would be a low risk of a significant impact to human health.

3.7.4 Mitigation Measures

Mitigation measures to further reduce the likelihood of human exposure to AFFF and PFAS are presented in Section 3.1.3, Air Quality.

3.7.5 Cumulative Impacts

Cumulative impacts are discussed in Section 5.0.

3.7.6 Data Gaps

PFAS are considered emerging contaminants by the EPA. Although considerable information is available for some PFAS compounds, there is little publicly available information available on the health effects of many of the PFAS that are commercially used.

As discussed in Section 3.7.1, there exists a global background of PFAS in the environment from decades of widespread use in manufacturing, AFFF, food packaging, and household consumer products. PFAS are present in the blood serum of most people, including in locations where there is no specific source of PFAS in drinking water. Although protective criteria have been published for select PFAS compounds by the EPA and by Washington State, resultant concentrations of PFAS in the environment that may result from an AFFF release are incident specific, site-specific, and not possible to predict in a general sense, with any certainty. It is not possible to discern or predict the effects of this project on human health from the global background.

Toxicology and epidemiological studies on exposure to PFAS are ongoing. A comprehensive listing and discussion are beyond the scope of this EIS. Additional resources include ITRC's PFAS Technical and Regulatory Guidance Document, United States EPA's Per- and Polyfluoralkyl Substances webpage, the Agency for Toxic Substances and Disease Registry (ATSDR), the Center for Disease Control (CDC), the National Academies of Science, and the National Library of Medicine's PubMed database, among others.

3.8 Cultural, Historical, and Archaeological Resources

3.8.1 Affected Environment

This section describes the affected environment for cultural and historic (i.e., built environment), archaeological resources, or Traditional Cultural Properties (TCPs) and effects on resources that would result from the proposed actions and alternatives.

Cultural resources are often grouped together as "historic properties." These resources include village settlements with residential areas and sometimes cemeteries; temporary camps where food and raw materials were collected; smaller, briefly occupied sites where tools were manufactured or repaired; and special-use areas like caves, rock shelters, and sites of rock art. Historic archeological sites may include foundations or features such as privies, corrals, and trash dumps. Historic properties are prehistoric or historic districts as well as historic and archaeological sites, structures, or objects which include architectural, engineering, or landscape resources from the historic period such as buildings, roads, wells, bridges, aqueducts, or agricultural properties that are listed in (or eligible for listing in) preservation registers such as the National Register of Historic Places (NRHP), the Washington Heritage Register, or local preservation registers. The cultural resources terminology used in this section is primarily adopted from the NRHP program because the program has extensive guidance on describing and evaluating historic properties. In addition, archaeological sites are protected under chapter 27.53 RCW regardless of whether they are eligible for a preservation register.

An NRHP-eligible site, structure, object, or district may also qualify as a TCP or Cultural Landscape (CL). TCPs and CLs are defined by the National Park Service, in recognition that some historic properties have significant cultural meaning, use, or organization (Parker and King 1992; Birnbaum 1994). The identification of TCPs and CLs allows for the consideration of ongoing cultural meaning and holistic function in inventory and evaluation of historic properties. Several TCPs have been identified in the project vicinity.

Under chapter 27.53 RCW, an archaeological site is "a geographic locality in Washington, including but not limited to, submerged and submersible lands and the bed of the sea within the state's jurisdiction, which contains archaeological objects."

Some groups of NRHP-eligible resources are connected by their association to a shared historic context, whether or not they are spatially grouped together. These resources may together be documented on a Multiple Property Documentation (MPD) form. An MPD group is not an NRHP district, but rather a way to document individual NRHP-eligible properties to emphasize their connectedness and shared expression of a theme. Although MPDs are not a common method of documenting properties, several have been identified in the project vicinity that include both archaeological sites and TCPs.

Tribal resources, archaeological sites, TCPs, and natural resources often can be interconnected and overlapping with Tribal resources.

3.8.1.1 Existing and Evolving Regulations

Numerous laws and regulations require federal, state, and local agencies to consider the effects of a project on cultural resources. These laws and regulations stipulate a process for compliance, define the responsibilities of the various agencies proposing the action, and prescribe the relationship among other involved agencies (e.g., State Historic Preservation Office and the Advisory Council on Historic Preservation). The National Historic Preservation Act (NHPA) of 1966, as amended, the State Environmental Policy Act (SEPA), the Washington Heritage Register, and chapter27.53 RCW are the primary federal and state laws governing and affecting preservation of cultural resources of national, state, regional, and local significance. Local jurisdictions enact regulations that determine the degree to which protections or redevelopment opportunities apply to recognized historic structures or resources.

Federal

Section 106 of the National Historic Preservation Act

Archaeological resources are protected through the NHPA of 1966, as amended (54 USC 300101), and its implementing regulation, Protection of Historic Properties (36 CFR Part 800), the Archaeological and Historic Preservation Act of 1974, and the Archaeological Resources Protection Act of 1979. Prior to implementing an "undertaking" (e.g., issuing a federal permit), Section 106 of the NHPA requires federal agencies to consider the effects of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation and the State Historic Preservation Officer (SHPO) a reasonable opportunity to comment on any undertaking that would adversely affect properties eligible for listing in the National Register of Historic Places (NRHP). As indicated in Section 101(d)(6)(A) of the NHPA, properties of traditional religious and cultural importance to a tribe are eligible for inclusion in the NRHP. Under the NHPA, a resource is considered significant if it meets the NRHP listing criteria at 36 CFR 60.4.

National Register of Historic Places

The National Register of Historic Places (NRHP) was established by the National Historic Preservation Act (NHPA) as "an authoritative guide to be used by federal, state, and local governments, private groups and citizens to identify the Nation's cultural resources and to indicate what properties should be considered for protection from destruction or impairment."[71] The National Register recognizes properties that are significant at the national, state, and/or local levels.

To be eligible for listing in the National Register, a resource must be significant in American history, architecture, archaeology, engineering, or culture. Four criteria for evaluation have been established to determine the significance of a resource:

- ► It is associated with events that have made a significant contribution to the broad patterns of our history.
- ► It is associated with the lives of persons significant in our past.

[71] 36 CFR Section 60.2.

- ► It embodies the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.
- ► It yields, or may be likely to yield, information important in prehistory or history.[72]

Districts, sites, buildings, structures, and objects that are 50 years in age must meet one or more of the above criteria and retain integrity to be eligible for listing. Under the National Register, a property can be significant not only for the way it was originally constructed, but also for the way it was adapted at a later period, or for the way it illustrates changing tastes, attitudes, and uses over a period of time.[73] Within the concept of integrity, the National Register recognizes seven aspects or qualities that, in various combinations, define integrity: location, design, setting, materials, workmanship, feeling, and association.

To retain historic integrity, a property will always possess most of the aspects and depending upon its significance, retention of specific aspects of integrity that may be paramount for a property to convey its significance.[74] Determining which of these aspects are most important to a particular property requires knowing why, where and when a property is significant.[75] For properties that are considered significant under National Register Criteria A and B, *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation ("National Register Bulletin 15")* explains, "a property that is significant for its historic association is eligible if it retains the essential physical features that made up its character or appearance during the period of its association with the important event, historical pattern, or person(s)."[76] In assessing the integrity of properties that are considered significant under National Register Criterion C, *National Register Bulletin 15* states, "a property important for illustrating a particular architectural style or construction technique must retain most of the physical features that constitute that style or technique."[77]

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[72] "Guidelines for Completing National Register Forms," in National Register Bulletin 16, U.S. Department of Interior, National Park Service, September 30, 1986. This bulletin contains technical information on comprehensive planning, survey of cultural resources and registration in the NRHP.

[73] National Register Bulletin 15, p. 19.

[74] The National Register defines a property as an "area of land containing a single historic resource or a group of resources, and constituting a single entry in the National Register of Historic Places." A "Historic Property" is defined as "any prehistoric or historic district, site, building, structure, or object at the time it attained historic significance. Glossary of National Register Terms, http://www.nps.gov/nr/publications/bulletins/nrb16a/nrb16a_appendix_IV.htm, accessed June 1, 2013.

[75] National Register Bulletin 15, p. 44.

[76] "A property retains association if it is the place where the event or activity occurred and is sufficiently intact to convey that relationship to an observer. Like feeling, association requires the presence of physical features that convey a property's historic character. Because feeling and association depend on individual perceptions, their retention alone is never sufficient to support eligibility of a property for the National Register." Ibid, p. 46.

[77] "A property that has lost some historic materials or details can be eligible if it retains the majority of the features that illustrate its style in terms of the massing, spatial relationships, proportion, pattern of windows and doors, texture of materials, and ornamentation. The property is not eligible, however, if it retains some basic features conveying massing but has lost the majority of the features that once characterized its style." Ibid.

State

State Environmental Policy Act

The State Environmental Policy Act (SEPA) provides guidance to state and local governments involved in environmental policy decisions. The SEPA process is intended to ensure that environmental values are considered during decision-making actions by state and local agencies. The process helps agency decision-makers, applicants, and the public understand how the proposed project would affect the environment. SEPA requires that impacts on air; earth and water resources/water rights; terrestrial biology; aquatic biology; and vegetation and historic and cultural resources be considered during the public environmental review process; Local development proposals evaluated under SEPA consider adverse impacts to those environmental resources and may require avoidance, minimization, or mitigation. As described in the relevant resource sections in this Draft EIS, multiple state and local government agencies consider environmental consequences of programs or projects undergoing SEPA review.

Archaeological Sites and Resources Act

Within the State of Washington, the Department of Archaeology and Historic Preservation (DAHP) is responsible for conservation, preservation and protection of Washington's historic and archaeological resources and includes the Archaeological Sites and Resources Act (chapter 27.53 RCW), which prohibits disturbance or excavation of historic or prehistoric archaeological resources on state or private land without a permit. In addition, state laws and regulations prohibit knowingly disturbing Native American or historic grave sites (chapter 27.44 RCW) and states that records, maps, or other information identifying the location of archaeological sites are exempt from disclosure in order to prevent looting or depredation of such sites (RCW 42.56.300). The DAHP is also responsible for issuing formal opinions on the significance, eligibility and impacts to sites of historic significance. The DAHP maintains the official state list of historic places, termed the Washington Heritage Register.

3.8.1.2 Study Area for Cultural Resources

The Study Area includes:

- 113 fire stations participating in the AFFF project.
- Proposed 10-day hold facilities.
- Potential AFFF treatment and disposal site: incineration sites, solidification and landfilling sites, or deep well injection sites.

According to the Department of Archaeology and Historic Preservation, less than 20 percent of the study area sites are within high-risk areas for the possibility of encountering archaeological sites (DAHP 2023).

3.8.2 Impact Assessment and Methodology

Past, present, and future actions related to AFFF transport and disposal alternatives could impact cultural resources in the following ways:

- Direct impacts to cultural, historical, or archeological resources.

3.8.2.1 Impacts Common to All Alternatives

For this EIS, the greatest potential risk to cultural resources is the release of AFFF due to spills, leaks, upset conditions, or other accidental releases to the environment. Because AFFF concentrate contains organic solvents, chemical stabilizers, and surfactants, it could potentially contaminate or damage a cultural resource.

However, the risk of impacts to cultural resources for this EIS is considered to be low, given that cultural resources are not located close enough to fire stations, holding facilities, or disposal treatment facilities that may participate in the AFFF program. If a release did occur at one of these locations, spill containment and cleanup best management practices would be implemented promptly by trained personnel promptly. Therefore, AFFF would likely not be exposed to a cultural resource.

3.8.3 Mitigation Measures

It is anticipated that any spills or release will not impact any cultural resources because such resources are not in close proximity to the Clean-up site locations. However, Ecology will implement spill response plans such as the geographic response plan[78] (GRP) if a spill occurs near a cultural resource. (This is not anticipated to be necessary). GRPs are region-specific actions to reduce injury to sensitive cultural resources at risk from oil and hazardous waste spills.

3.8.4 Cumulative Impacts

Cumulative impacts are discussed in Chapter 5.

[78] https://ecology.wa.gov/Regulations-Permits/Plans-policies/Contingency-planning-for-oil-industry/Geographic-response-plans-for-oil-spills

3.9 Tribal Resources

This section describes the affected environment for cultural Tribal resources. It also describes effects on resources that would result from the proposed actions and alternatives. Historic and cultural resources specifically relate to archaeological sites and Tribal lands and activities described in Chapter 2: Project Description and Alternatives. This section also includes a summary of findings from the environmental resource sections (air; earth and water resources/water rights; terrestrial biology; aquatic biology; and vegetation) and discusses the potential impacts to the Tribal resources that fall under these categories. In this Section 3.9, the terms "Tribal lands," "Tribal reservations," or "Indian reservations" all refer to Tribal resources.

3.9.1 Affected Environment

Tribal resources refer to the collective rights related to access to traditional areas, time periods for gathering resources for cultural practices, tribal sovereignty, or formal treaty rights. These resources include plants, wildlife, or fish used for commercial, subsistence, and ceremonial purposes and cultural resources. Collective rights are implemented by treaties, which allow Native American Tribes to create reservations and assign land use and water rights agreements. Geographic locations of potentially affected Tribes by proposed alternative are shown in Figure 3.9-1: Tribal Lands Transecting Study Area. Additionally, Table 3.9-1 lists the 29 Indian reservations in Washington, including whether those reservations are in the vicinity of fire stations or 10-day hold facilities in the study area.

3.9.1.1 Study Area

The study area includes:

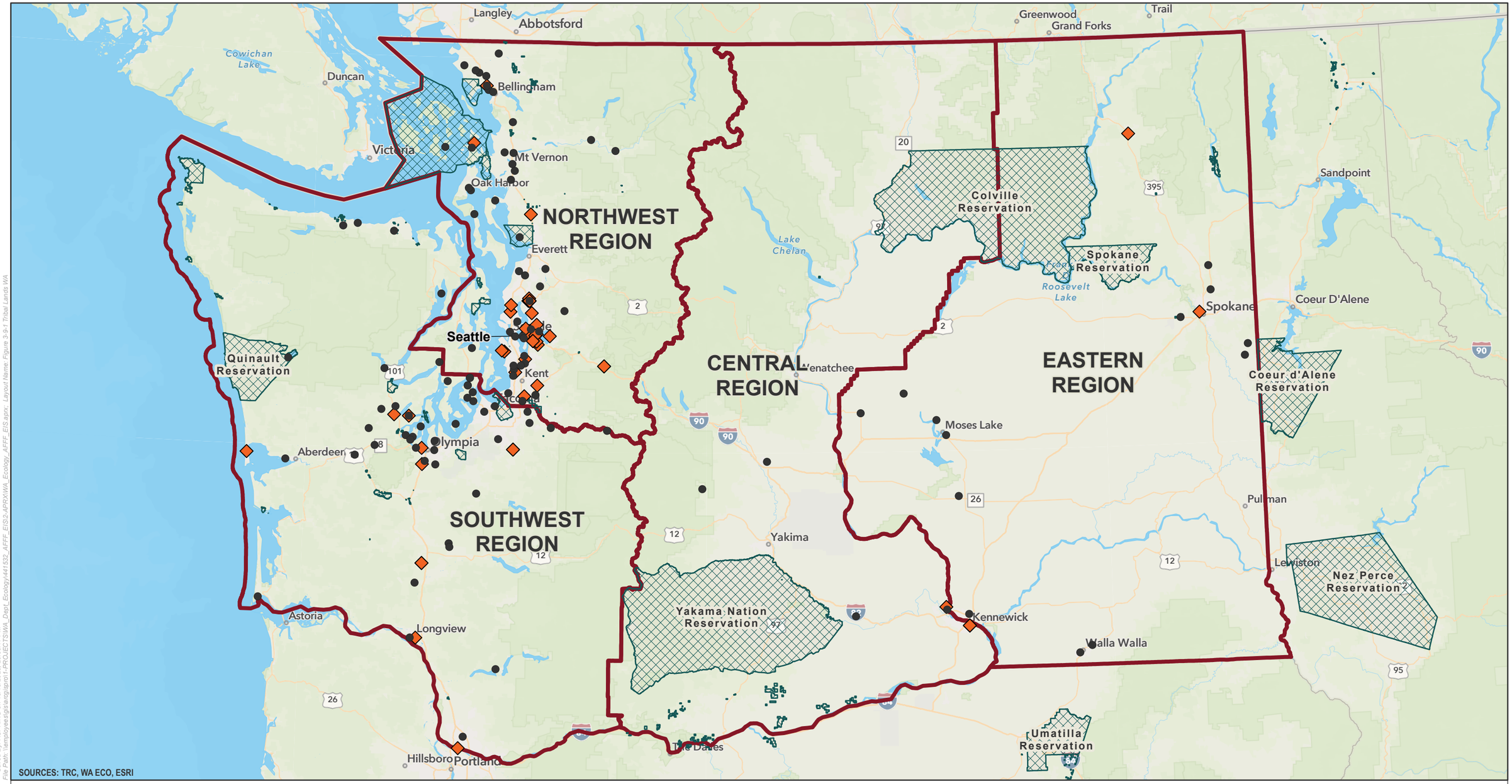
- Tribal/reservation lands within 10 miles of a fire station participating in the AFFF project.
- Tribal/reservation lands within 10 miles of a proposed 10-day hold facility.
- Tribal/reservation lands within 10 miles of a potential AFFF treatment and disposal site: incineration sites, solidification and landfilling sites, or deep well injection sites.
- Tribal/reservation lands within 10 miles of identified potential transportation routes, unless adjacent to waterbodies. If adjacent to a waterbody, then the entire lake or the river or stream for 10 miles downstream are included.

Fire Stations

Certain participating fire stations and potential AFFF treatment and disposal site are located near reservations. Table 3.9-1 identifies 75 fire stations within 10 miles of at least 15 reservations in Washington. In addition, there are ten 10-day hold facilities on or within 10 miles of four reservations in Washington. The single 10-day hold facility in Clackamas, Oregon, is not within 10 miles of a Native American reservation.

For potential AFFF treatment and disposal sites outside Washington, the analysis relied primarily on national scale datasets.

10-OCT-2023



SOURCES: TRC, WA ECO, ESRI

LEGEND

- FIRE STATION STORING AFFF
- REPORTED AFFF SPILL INCIDENTS
- ECOLOGY REGIONS
- TRIBAL LANDS

FIGURE 3.9-1: TRIBAL LANDS TRANSECTING STUDY AREA

AFFF COLLECTION AND DISPOSAL PROGRAM
DRAFT ENVIRONMENTAL IMPACT STATEMENT

1:2,000,000
1" = 32 MILES
0 25 50 MILES

DEPARTMENT OF ECOLOGY
State of Washington

TRC

Ecology Storage Sites

AFFF may be collected into 10-day hold facilities and stored for up to 10 days. Sixteen hold sites are located in Washington and in the City of Clackamas, Oregon. The single 10-day hold facility in Clackamas, Oregon is not located within a Native American reservation or within 10 miles of one.

Transportation Routes

Transportation routes to end-point locations range in length from approximately 300 to 2,300 miles and cross through most of the western United States. A summary of Tribal lands crossed by each potential transportation route is shown in Table 3.9-2.

3.9.1.2 Existing and Evolving Regulations

Federal

Section 106 of the National Historic Preservation Act

Section 106 of the National Historic Preservation Act requires federal agencies to consider the effects of their undertakings on historic properties. Historic properties are prehistoric or historic sites, districts, structures, or objects that are eligible for listing in the National Register of Historic Places (NRHP).

Stevens Treaties (1854-1855)

The Stevens Treaties encompass a series of eight treaties establishing reservations for the exclusive use of the recognized Tribes in Washington state. In these Treaties, the Tribes reserved their right to continue traditional activities on lands beyond these reserved areas and reserved the right to hunt, fish, and conduct other traditional activities on lands on and off the reservations.

TABLE 3.9-1: Locations of Fire Stations and 10-Day Hold Facilities on or in the Vicinity of Indian Reservations in Washington

#	Official Name	Population	Area (in acres)	Location of Reservation	Fire Station on Reservation or in 10-mile Radius	10-day hold sites on Reservation or in 10-mile Radius
1	Confederated Tribes of the Chehalis Reservation	833	4,215	Southeastern Grays Harbor County and southwestern Thurston County	0	0
2	Colville Indian Reservation	7,587	1,400,000	Primarily in the southeastern section of Okanogan County and the southern half of Ferry County	0	0
3	Cowlitz Reservation	2,000	152	Near La Center, in northern Clark County (not on map)	0	0
4	Hoh Indian Reservation	102	443	The Pacific Coast of Jefferson County	0	0
5	Jamestown S'Klallam Indian Reservation	594	12	Near Sequim Bay, in extreme eastern Clallam County	1	0
6	Kalispel Indian Reservation	470	4,629	The town of Cusick, in Pend Oreille County	0	0
7	Lower Elwha Indian Reservation	776	991	The mouth of the Elwha River, in Clallam County	2	0
8	Lummi Indian Reservation	6,590	21,000	West of Bellingham, in western Whatcom County	8	0
9	Makah Indian Reservation	1,356	27,950	On Cape Flattery in Clallam County	0	0
10	Muckleshoot Indian Reservation	3,300	3,850	Southeast of Auburn in King County	7	3
11	Nisqually Indian Reservation	588	4,800	Western Pierce County and eastern Thurston County	5	0

#	Official Name	Population	Area (in acres)	Location of Reservation	Fire Station on Reservation or in 10-mile Radius	10-day hold sites on Reservation or in 10-mile Radius
12	Nooksack Indian Reservation	1,800	2,500	Town of Deming, Washington in western Whatcom County	4	0
13	Port Gamble Indian Reservation	1,234	1,301	Port Gamble Bay in Clallam County	0	1
14	Port Madison Reservation (Suquamish Indian Reservation)	approx. 507	7,486	Western and northern shores of Port Madison, northern Kitsap County	2	1
15	Puyallup Indian Reservation	4,000	18,061	Primarily northern Pierce County	16	5
16	Quileute Indian Reservation	371	1,003.4	Southwestern portion of the Olympic Peninsula in Clallam County	0	0
17	Quinault Indian Nation	2,535	208,150	Primarily the north coast of Grays Harbor County	1	0
18	Samish Indian Reservation	1,835	79 (Samish also owns another ~130 acres of non-trust land)	Anacortes	6	0
19	Sauk-Suiattle Indian Reservation	200	96	Near Darrington in southern Skagit County	0	0
20	Shoalwater Bay Indian Reservation	70	334	Along Willapa Bay in northwestern Pacific County	0	0
21	Skokomish Indian Reservation	796	5,000	Just north of Shelton in Mason County	4	0

#	Official Name	Population	Area (in acres)	Location of Reservation	Fire Station on Reservation or in 10-mile Radius	10-day hold sites on Reservation or in 10-mile Radius
22	Snoqualmie Indian Reservation	650	56	Snoqualmie Valley in east King and Snohomish Counties	0	0
23	Spokane Indian Reservation	2,708	154,898	Entirely in southern Stevens County and in northeastern Lincoln County along the Spokane River	0	0
24	Squaxin Island Indian Reservation	936	1,979	The entirety of Squaxin Island and the town of Kamilche in Mason County	12	0
25	Stillaguamish Indian Reservation	237	40	Along the Stillaguamish River in Snohomish County	0	0
26	Swinomish Indian Reservation	778	7,169	The southeastern side of Fidalgo Island in Skagit County	0	0
27	Tulalip Indian Reservation	2,600	11,500	Port Susan in western Snohomish County	3	0
28	Upper Skagit Indian Reservation	200	99	Western Skagit County near the towns of Sedro-Woolley and Burlington	3	0
29	Yakama Indian Reservation	10,851	1,372,000	Primarily in southern Yakima County and in the northern edge of Klickitat County	1	0

United States v. Washington, 138 S. Ct. 1832, 584 U.S.

In 2018, a case arose from the Stevens Treaties noted above: *United States v. Washington*. An equally divided U.S. Supreme Court affirmed the Ninth Circuit decision upholding the grant of summary judgment to the Tribes and an injunction requiring salmon passage at all state-owned culverts. Writing for the Ninth Circuit Court Panel, Judge William Fletcher stated:

> The Indians did not understand the Treaties to promise that they would have access to their usual and accustomed fishing places, but with a qualification that would allow the government to diminish or destroy the fish runs. Governor Stevens did not make, and the Indians did not understand him to make, such a cynical and disingenuous promise. The Indians reasonably understood Governor Stevens to promise not only that they would have access to their usual and accustomed fishing places, but also that there would be fish sufficient to sustain them.[79]

Treaty of Olympia (1856)

The Treaty of Olympia set aside reservation land and reserved fishing, gathering, and hunting rights for the Quinault Indian Nation throughout their usual and accustomed grounds.

United States v. Washington (1974)

Washington's salmon and steelhead fisheries are managed cooperatively in a unique co-management relationship (WDFW 2019). Co-management of fisheries occurs through government-to-government cooperation, communications, and negotiations. One government is the State of Washington, and the others are Indian Tribes whose rights were preserved in treaties signed with the federal government in the 1850s. In those treaties, Tribes ceded vast areas of what is now Washington while preserving their continued right to fish, gather shellfish, hunt in their "usual and accustomed" areas, and exercise other sovereign rights. In United States v. Washington (1974), U.S. District Court Judge George Boldt reaffirmed the Tribes' rights to harvest salmon and steelhead and established them as co-managers of Washington fisheries.

Washington

State Environmental Policy Act

The State Environmental Policy Act (SEPA) provides guidance to state and local governments involved in environmental policy decisions. The SEPA process is intended to ensure that environmental values are considered during decision-making actions by state and local agencies. The process helps agency decision-makers, applicants, and the public understand how the proposed project would affect the environment. SEPA requires that impacts on the following be considered during the public environmental review process:

- Air
- Earth and water resources/water rights
- Terrestrial biology

[79] United States v. Washington, 853 F.3d 946, 964; 9th Cir. 2017

- Aquatic biology
- Vegetation
- Historic and cultural resources

Local development proposals evaluated under SEPA consider adverse impacts to those environmental resources and may require avoidance, minimization, or mitigation. As described in the relevant resource sections in this DEIS, multiple state and local government agencies consider environmental consequences of programs or projects undergoing SEPA review.

Washington Natural Area Preserves Act

The Washington Natural Heritage Program was established by the state legislature in 1981 to meet the needs for objective information to guide biodiversity conservation and land use decisions. Goals of the program include maintaining a classification of the state's natural heritage resources; conducting inventories of the locations of these resources; and sharing information with agencies, organizations, and individuals for environmental assessment purposes. The Washington Natural Heritage Plan was approved by the Natural Heritage Commission in January 2022. The plan provides information on whether species and communities with special status, including Tribal lands, are present within a given location.

3.9.2 Significance Criteria

Standards of significance consider identified impacts to natural resources and cultural resources. Given the scope of this EIS, it is not feasible to conduct a quantitative analysis in the form of an ecological or human health assessment for potentially impacted Tribal resources at each fire department, each potential 10-day hold facility, and each potential disposal location. Instead, a qualitative analysis capturing the general impacts to Tribal resources will be presented. Section 3.11: Environmental Justice makes note of whether Tribal communities bear a disproportionate share of potential negative consequences associated with each alternative.

3.9.3 Impact Assessment and Methodology

To assess the potential impacts of the AFFF Collection and Disposal program on Tribal resources, it is pertinent to understand whether the exposure, or potential exposure, associated with any of these alternatives poses a risk to Tribal resources and, thus, disproportionately negatively affects Tribal communities.

The analysis of impacts to Tribal resources differs in approach when compared to other impact analysis for other natural resources. Natural resources are analyzed elsewhere in this chapter and in Chapter 4: Mitigation Measures to determine if the proposed project would have significant adverse effects from a non-Tribal perspective, and whether or not they could be mitigated. The analysis for Tribal resources references those analyses, but also considers the Tribes' unique and powerful connection to and reliance on natural resources. As a result of this connection, Tribes hold a deep, intimate knowledge and understanding of the ecosystem, often referred to as Tribal Ecological Knowledge.

The U.S. Fish and Wildlife Service defines Tribal Ecological Knowledge as "the evolving knowledge acquired by Indigenous and local peoples over hundreds or thousands of years through direct contact with the environment" (Rinkevich et al. 2011). Tribal Ecological Knowledge is a valuable source of information and we will continue to consider it as we evaluate impacts from the proposed project. To honor the Tribes' perspectives, the analysis considers all identified impacts to natural resources and cultural resources.

For that, we first need to understand the locations of AFFF in each project alternative and the vicinity of these locations to Indian reservations. These include fire stations, 10-day hold facilities, endpoint/disposal locations, and transportation routes. Second, we need to assess whether any reservations/Tribal resources are close enough to such facilities and routes to be of concern in the event of a spill and how quickly such spills can be cleaned up before affecting tribal resources.

Of the 113 fire departments responding to Ecology's AFFF inventory survey (Appendix A.2), five fire stations are located on four reservations in the state, including two on Samish Indian Reservation and one each on Kalispel, Quinault, and Tulalip Indian reservations (see Figure 3.9-1). Two potential 10-day hold facilities are located on the Puyallup Indian Reservation and another eight facilities within 10 miles of Native American reservations in the state. There are four Indian reservations within 10 miles of any of the potential treatment and disposal sites, including incineration sites, solidification and landfill sites, and deep well injection sites. Table 3.9-2 provides the list of reservations within 10 miles of potential transportation routes. There are 18 reservations that meet this criterion. Four of them (Coeur d' Alene, Flathead, Crow, and Umatilla) are near multiple routes.

In addition, within the states of Washington and Oregon, there are 17 Native American reservations near transportation routes. These reservations include Kalispel, Spokane, Snoqualmie, Tulalip, Stillaguamish, Swinomish, Samish, Upper Skagit, Nooksack, Muckleshoot, Puyallup, Nisqually, Chehalis, Yakama Nation, Warm Springs, and Umatilla.

TABLE 3.9-2: Indian Reservations in the Vicinity of Potential Transportation Routes to Alternative Facilities in the State of Washington

Transportation Routes to Alternative Facilities	Number of Reservations within 10 miles of Route
Kimball Incineration Facility Transportation Route	3 (Crow, Coeur d' Alene, Flathead)
Aragonite Incineration Facility Transportation Route	1 (Umatilla)
Grand Rapids South WWTF Super Critical Water Oxidation Transportation Route	5 (Crow, Ho-Chunk Nation, Pokagon, Coeur d' Alene, Flathead)
US Ecology Nevada (Beatty) Landfill Transportation Route	6 (Umatilla, Fort McDermitt, Winnemucca, Battle Mountain, Yomba, Timbi-sha Shoshone)
US Ecology Idaho (Grand View) Landfill Transportation Route	1 (Umatilla)

Transportation Routes to Alternative Facilities	Number of Reservations within 10 miles of Route
Advantek Hutchinson, Kansas Deep Well Injection Transportation Route	3 (Coeur d' Alene, Flathead, Crow)
US Ecology Winnie, Texas Deep Well Injection Transportation Route	10 (Coeur d' Alene, Flathead, Crow, Kaw, Kaw/Ponca, Ponca, Tonkawa, Otoe-Missouria, Iowa, Chickasaw, Citizen Potawatomi Nation-Absentee Shawnee)

Past, present, and future actions related to AFFF transport and disposal alternatives could impact Tribal resources in the following ways:

- Restricting or reducing access to recreation or ceremonial sites.
- Resulting in a loss of critical habitat, wildlife, and vegetation communities that are known Tribal resources.
- Restricting Tribal water rights.

3.9.3.1 Impacts Common to All Alternatives

For all action alternatives, the greatest potential risk to Tribal trust resources is the release of AFFF due to spills, leaks, upset conditions, or other accidental releases to the environment. AFFF concentrate contains organic solvents, chemical stabilizers, and surfactants. As a result, it is a serious eye irritant, may cause skin and respiratory irritation, and is harmful when swallowed. AFFF also contains PFAS compounds, which are persistent in the environment and may adversely impact the health of living organisms.

Release Mechanism

AFFF may leak from containers, distribution pipes, or storage tanks and may spill during transfer of AFFF between containers or while containers are being transported between locations.

Tribal lands in proximity to fire stations participating in the AFFF collection and disposal program could be subject to impacts of potential leaks or spills that cause accidental releases containing AFFF. As discussed in Chapter 2: Project Description and Alternatives, of a total of 26 previously reported spills at these facilities, the majority of spills (for which there are spill quantity data) were less than 50 gallons. This generally represents a small portion of total AFFF typically stored at individual fire departments.

Additionally, reported AFFF spills were generally confined to paved areas. Spills to vegetated areas have been managed through soil removal and replacement. Spills that migrate into the storm drain system were typically detained within drain vaults, from which the material can be retrieved through vacuum, but some large spills have traveled off-site. If AFFF travels off-site, it could potentially affect air, water, and land quality. In turn, this could potentially affect

terrestrial vegetation, wildlife, and water and aquatic resources. However, these effects would be minimal.

Storage and handling of AFFF at fire stations participating in the AFFF program would present a low risk of release to Tribal lands. AFFF is stored at fire stations in buckets, containers, storage tanks, fire engine tanks, and carboys. Foam residue may be present in sprinkler systems, storage pipes, and charged pipe related to dispersion apparatus. If AFFF reached surface waters during a spill or improperly stored containers leaked AFFF directly to the environment, Tribal trust resources could be impacted. The potential for a spill at a fire station to represent a risk to Tribal trust resources depends on several factors:

- **The amount spilled**. Per fire station responses to our questionnaire, fire stations may possess anywhere from three gallons of AFFF to more than 500 gallons of AFFF. Most fire stations have less than 55 gallons of AFFF on hand. Two fire stations possess larger quantities of AFFF (5,000 gallons and 12,000 gallons).

- **The substrate onto which the material is spilled**. Based on review of aerial photographs, most exterior spills at fire stations would occur over paved surfaces from which they could be readily vacuumed. However, in some areas exterior spills could occur over gravel or vegetated surfaces through which spilled AFFF could percolate into the soil.

- **The ability of the spill to move offsite**. Many fire stations are curbed to separate pavement from vegetated areas. These curbed, paved areas may also contain vaults which would keep the spill from moving off-site. Other fire stations are not curbed; spills at these locations may move offsite. Depending on the fire station, off-site spills may flow either into a developed stormwater system, which contain vaults from which spilled material can be suctioned, or into vegetated ditches which connect to nearby creeks and rivers.

- **The proximity of the fire station to tribal lands**. If the fire station is not adjacent or proximal to Tribal land, then there is little to no risk of exposure to Tribal trust resources from a spill. As noted above, 75 fire stations participating in the AFFF program are within 10 miles of tribal lands.

- **Facility spill response planning**. All fire stations are required to prepare and implement a Facility Spill Response Plan (FSRP) to prevent, contain, and clean up spills. The FSRP requires that each station maintain a spill kit and establish spill response clean-up procedures and reporting requirements.

Overall, the relative risk to Tribal trust resources from an accidental release of AFFF at a fire station would be low. As discussed in Chapter 2, a spill at a fire department would be cleaned up promptly and in a timely manner, likely within one to two days, by trained personnel. This reduces the risk of potential impacts from intense rain or stormwater runoff events.

Accidental releases during routine handling of AFFF within an existing permitted waste management facility or at a potential 10-day hold facility would be contained within the facility.

Releases would be promptly cleaned up by appropriately trained personnel and would therefore not be expected to reach Tribal resources.

The risk of release of AFFF to the environment during transportation is discussed generally in Section 3.10: Transportation. The relative risk of release was assessed to be low based on:

- The use of permitted trucks to transport the waste.
- The use of containers permitted for hazardous waste during transport,
- The low probability of an accident.
- The high degree of emergency response preparedness along interstate highways.

Based on the above factors, the relative risk to Tribal trust resources would be less than significant.

3.9.3.2 Impacts Specific to Each Alternative

When we identified significant adverse impacts for elements of the environment, we also assessed whether these environmental impact determinations had the potential to disproportionately affect Tribal trust resources and, therefore, Native American communities. We considered the mitigation measures that were identified in the discipline reports that could avoid, minimize, or reduce the identified impact. We do not anticipate that effectively mitigated implementation of one or more of the proposed alternatives would result in disproportionate impacts on Tribal trust resources and Tribal communities, although they are addressed as appropriate below.

3.9.3.3 Alternative 1: Approved Hold in Place

Based on the data and analysis presented above, leaving the AFFF in place would not have significant effect on Tribal resources. Only a few reservations are located within 10 miles of a fire station or storage facility. Additionally, the relative risk of release of AFFF from fire stations or storage facilities to Tribal lands is based on professional judgement and the criteria/resources described above. Overall, the relative risk of accidental release of AFFF at a fire station is low. A spill at a fire department or storage facility would be cleaned up promptly by trained personnel and, therefore, would most likely not be exposed to a potential rain or stormwater runoff event. This reduces the likelihood of further transportation of the AFFF, thus reducing the already low likelihood of off-site movement of the AFFF.

- ► Number of reservations within 10 miles of a fire station: 18.
- ► Number of fire stations within 10 miles of a reservation: 75.
- ► Number of reservations within 10 miles of a 10-day hold facility: 4.

Based on the above factors, Alternative 1 would have minimal effects on Tribal cultural resources, and these effects would not be significant.

3.9.3.4 Alternative 2: Incineration

Release Mechanism

Although many PFAS have low volatility, PFAS compounds may become airborne from some industrial releases (for example, stack emissions). The potential release of PFAS into the environment from incineration is described in Section 3.1: Air Quality.

Relative Risk of Release

It is unlikely that PFAS would enter any Indian reservation through accidental spills or releases through this disposal alternative. There are no reservations located within one mile of an incineration site and only two reservations located within one mile of transportation routes to incineration facilities.

- Number of reservations within 10 miles of treatment and disposal facilities, including incineration sites, landfills, and injection sites: None.
- Number of reservations within 10 miles of transportation routes to an incineration site: 4.

Based on the above factors, Alternative 2 would have minimal effects on Tribal resources, and these effects would not be significant.

3.9.3.5 Alternative 3: Solidification and Landfilling

Release Mechanism

Leaching may occur if AFFF is disposed of in landfill waste without adequate leachate control. PFAS compounds can leach from AFFF into unsaturated soils during precipitation events, ultimately entering groundwater. Once in groundwater, PFAS may move into surface water where terrestrial wildlife drink or forage.

The landfills identified as end locations for the program are permitted hazardous waste facilities. Their leachate control systems are described in more detail in Section 3.3.4.5: Earth and Water Resources, Impacts and Mitigation Measures, Alternative 3. In summary, the facilities are both “zero-discharge” facilities, with no release mechanism for AFFF to migrate offsite.

Relative Risk of Release

It is unlikely that PFAS would enter any Indian reservation through accidental spills or releases through this disposal alternative. There are no reservations located within 10 miles of a landfill and only seven reservations located within 10 miles of transportation routes to landfills.

- Number of reservations within 10 miles of a landfill: None.
- Number of reservations within 10 miles of transportation routes to a landfill: 7.

Based on the above factors, Alternative 3 would have minimal effects on Tribal trust resources, and these effects would not be significant.

3.9.3.6 Alternative 4: Class I Deep Well Injection

Release Mechanism

AFFF that is injected underground may migrate away from the injection zone if injection wells are not properly constructed or maintained. PFAS compounds could then migrate through the surrounding geological formations and potentially end up in aquifers or groundwater. Once in groundwater, PFAS compounds can migrate into surface waters where terrestrial wildlife drink or forage.

Relative Risk of Release

The relative risk to water from underground injection at US Ecology Winnie or Advantek Cavern Solutions is discussed in detail in Section 3.3: Earth and Water Resources, Alternative 4. The discussion finds that the relative risk of release of AFFF from underground injection is low; however, neither facility is presently permitted to treat hazardous waste. Class I deep well injection of AFFF therefore presents a low risk of release into terrestrial environments.

AFFF could be released during the well injection process if there were an equipment malfunction that released AFFF aboveground into the facility. In this event, the spill would be promptly cleaned up and the site remediated to prevent further transport of PFAS compounds.

The attached EPA study on risks of Class I deep well injection sites (Executive Summary and Conclusion section) clearly explains that deep well injection is low risk because the wells are 10,000 feet (or more) below grade level. Deep well injection sites are designed so that hazardous liquid waste won't migrate from the disposal site for at least 10,000 years. There aren't that many deep well injection sites and none are anywhere near a reservation or transportation corridor.

It is unlikely that PFAS would enter any Indian reservation through accidental spills or releases through this disposal alternative because there are no reservations located within 10 miles of an injection site, and 11 reservations located within 10 miles of transportation routes to injection sites (three reservations within 10 miles of Advantek transportation route and 11 reservations within 10 miles of transportation route to Winnie Texas site).

- Number of reservations within 10 miles of an injection site: None.
- Number of reservations within 10 miles of transportation routes to an injection: 11.

Based on the above factors, Alternative 4 would have minimal effects on Tribal resources, and these effects would not be significant.

3.9.3.7 Alternative 5: No Action Alternative

Because no actions would take place under Alternative 5, there would be no project-related impacts to Tribal resources. The risk would remain for AFFF stored in its original containers to leak PFAS compounds to the environment. This alternative would potentially have minimal effects on Tribal trust resources, and these effects would not be significant.

3.9.4 Mitigation Measures

Mitigation measures to reduce the likelihood of a spill or release are described in Aquatic Resources Section 3.4.4, Mitigation Measures. Implementation of these mitigation measures would further reduce less than significant impacts to terrestrial wildlife and habitat in the event of an accidental release of AFFF.

Specific to Tribal resources, there is no Washington State or Department of Ecology policy on mitigating impacts to Tribal resources and concerns. Mitigation is developed on a case-by-case basis. Ecology would work in consultation with Tribes to determine mitigation needs, which would be developed after EIS finalization.

Tribal engagement is key to minimizing impacts to Tribal resources and concerns. Tribes would be provided with early notice of actions that could impact their land and resources, allowing Tribes the opportunity to propose mitigation or take actions to reduce risk and impacts.

The risk of impacts to Tribes for any of the alternatives would be low. Tribal lands are not located close enough to fire stations, potential 10-day hold facilities, potential transportation routes, or final destinations for AFFF or PFAS to reasonably impact them. However, we would ensure that foam collection and transport is conducted on dates and times that minimize potential impacts to Tribal operations and activities. We would select routes, including modifying those presented in this EIS if applicable, to minimize impacts to Tribal issues, as well as avoid transport over sensitive resources when possible.

We would also implement regional spill response plans if a spill were to occur on Tribal lands or traditional use areas. (This is not anticipated to be necessary, as routes do not traverse Tribal lands).

After the EIS is finalized, we would develop and implement regional Tribal engagement plans. These plans would identify Ecology and tribal AFFF points of contact through which information can be communicated on the AFFF collection and transport. The plan would provide information such as the location and amount of foam to be collected. The plan would also include early notice regarding the foam's collection, allowing time for Tribal input on these activities.

3.9.5 Cumulative Impacts

Cumulative impacts are discussed in Chapter 5.

3.10 Transportation and Truck Safety

This section describes the transportation of AFFF associated with the project alternatives and describes the environmental consequences of each alternative. Proposed AFFF transport corridors are shown in Figure 3.10-1 Transportation Study Area.

3.10.1 Affected Environment

3.10.1.1 Existing and Evolving Regulations

The Federal Highway Administration and the U.S. Department of Transportation (USDOT) govern Interstate Highways, state routes, and bridges. The Washington State Department of Transportation (WSDOT) governs state roads. County and other local streets may have additional local governing oversight. In all cases, specific standards apply to the planning, design, and operation of roadways and intersections. Not all governing agencies impose the same criteria. For example, cross-sections and rights-of-way for the same street may differ from jurisdiction to jurisdiction. Therefore, this section focuses on specific federal or state regulations covering hazardous materials transportation.

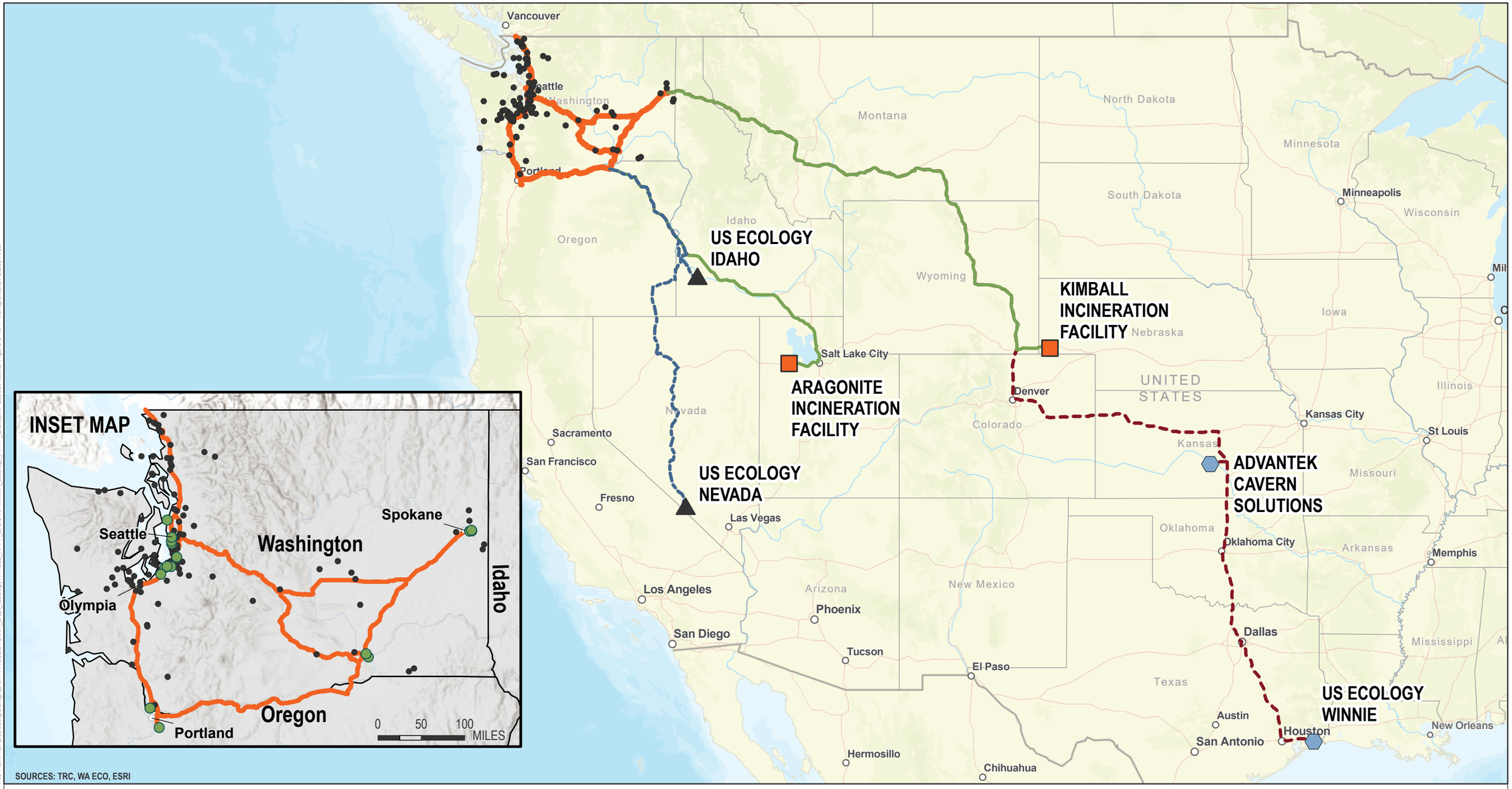
Currently, no specific federal or state regulations cover the transportation of AFFF. In the United States, the U.S. Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA) have regulatory guidance initiatives for AFFF, and the EPA has the authority to regulate PFAS under several different acts and programs. However, the EPA has not yet listed AFFF as a hazardous waste or substance under its available statutory authorities, including:

- Resource Conservation and Recovery Act (RCRA).
- Comprehensive Environmental Response, Compensation, and Liability Act.
- Emergency Planning and Community Right-to-Know Act.
- Clean Air Act.

However, in this chapter, we evaluate the transportation of AFFF against regulations governing the transportation of hazardous materials and waste.

The main authority for the transportation of hazardous materials and waste is the United States Department of Transportation (USDOT; 49 CFR Parts 100-185). USDOT administers all aspects of hazardous materials packaging, handling, and transportation. These regulations would apply to all proposed project alternatives except Alternative 1: Approved Hold in Place and Alternative 5: No Action Alternative.

25-AUG-2023



SOURCES: TRC, WA ECO, ESRI

LEGEND

- FIRE STATION STORING AFFF
- 10-DAY HOLD SITES
- 10-DAY HOLD SITES ROUTE QUARTER MILE STUDY AREA
- INCINERATOR
- LANDFILL
- DEEP WELL INJECTION
- ROUTES TO INCINERATORS
- ROUTES TO LANDFILLS
- ROUTES TO DEEP WELL INJECTION SITES

FIGURE 3.10-1: TRANSPORTATION STUDY AREA

AFFF COLLECTION AND DISPOSAL PROGRAM
DRAFT ENVIRONMENTAL IMPACT STATEMENT

1:15,000,000
1" = 1,250,000'
0 125 250 MILES

DEPARTMENT OF ECOLOGY
State of Washington

TRC

The federal Hazardous Materials Transportation Act (HMTA) regulates the transportation of hazardous materials. The primary goal of the HMTA is to provide adequate protection against the risks to life and property inherent in the transportation of hazardous material in commerce by improving the regulatory and enforcement authority of the U.S. Secretary of Transportation. The HMTA requires that carriers report accidental releases of hazardous materials to the USDOT at the earliest practical moment. Carriers must also report all incidents that include deaths, injuries requiring hospitalization, and property damage exceeding $50,000. In Washington, unused AFFF stored at municipal fire stations would designate as dangerous waste once the product can no longer be used as-is or cannot be used due to legal restrictions (such as bans or moratoriums) and is determined to be a waste.

The distinction between a product and waste is important because the state dangerous waste regulations and federal RCRA regulations apply only to wastes and not to products. Once the AFFF is determined to be a waste, certain rules must be followed based on the generator status of the facility generating the waste.

Under Washington's episodic generator rule, we allow small and medium quantity generators like fire stations to maintain their current generator status even when they generate a larger-than-normal amount of waste. These rules can be used twice a year and must either be part of a planned event (such as the AFFF disposal program) or an unplanned event. An unplanned event is unexpected like a large spill, natural disaster, or product recall.

Chapter 173-303 of the Washington Administrative Code (WAC) classifies AFFF as a dangerous waste once it will no longer be used and is identified for disposal. AFFF waste would be considered a persistent criteria state-only waste based on the amount of halogenated organic compounds (HOCs) it contains:

- If the AFFF contains between 0.01 percent and 1.0 percent HOCs, then the waste would designate as persistent waste WP02.[80]

- If the AFFF contains greater than 1.0 percent HOCs, the waste would designate as WP01 and additionally qualify as an Extremely Hazardous Waste (EHW).

All unused AFFF waste collected under this disposal program will likely designate as WP01 and EHW because the HOC concentrations present in all AFFF formulations we researched were greater than 1.0 percent.[81]

The transportation of AFFF is regulated by the Washington State Utilities and Transportation Commission (UTC). Additionally, all contractors hired by a Washington agency for the handling,

[80] Persistent wastes (coded WP01, WP02, WPCB, or WP03) include polycyclic aromatic hydrocarbons (PAHs) halogenated organic compounds (HOCs), and some polychlorinated biphenyls (PCBs). Source: Department of Ecology Dangerous Waste Technical Guidance. Website accessed February 10, 2022 https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Dangerous-waste-guidance/Dangerous-waste-basics/Designation/Check-Washington-state-only-criteria

[81] WAC 173-303-100(6), page 2 of 6

transportation, and/or disposal of dangerous waste must meet the requirements and qualifications specified by the Washington Department of Enterprise Services.[82]

As discussed above, all proposed project alternatives would involve the transport of AFFF except Alternative 1: Approved Hold in Place and Alternative 5: No Action Alternative. The additional states beyond Washington that are currently part of the proposed transportation routes include Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, Oklahoma, Oregon, Texas, Utah, and Wyoming. All states except for Colorado, Idaho, Nebraska, Oregon, Utah, and Wyoming have exclusively adopted the federal regulations governing the transportation of hazardous materials and waste. Colorado, Idaho, Nebraska, Oregon, Utah, and Wyoming have promulgated specific state regulations to control the intrastate and interstate transportation of federally regulated types and quantities of hazardous waste.

3.10.1.2 Release Mechanisms

The affected environment would be any transportation route from the fire stations participating in the AFFF project to the locations of the 10-day hold facilities, landfills, treatment facilities, and deep well injection locations identified as potential end sites for the collected foam. Proposed transport, hold, and disposal facilities are presented in Figure 3.10-2: 10-Day Hold Facility Haul Routes, and in Chapter 2, Figure 2-3: Potential AFFF Collection and Disposal Sites.

We expect that waste AFFF would be picked up as part of a single transportation event. Most of the fire stations participating in the program are located in urban areas, where traffic patterns are typically heavier than in rural areas, increasing the chance of collisions resulting in an accidental spill or release. The people who could potentially be affected by AFFF releases from an accident would include:

- The public in the vicinity of the accident.
- Personnel responsible for transporting the containers.
- Emergency responders.

Although AFFF substances are not federally recognized as hazardous wastes or substances, we assume that the transportation of AFFF would follow current USDOT and applicable state requirements that define standards for shipping hazardous materials. The requirements include container types and labels. Handling would be managed by trained personnel following best practices and appropriate physical and administrative controls, such as manifesting and chain-of-custody records. These requirements and procedures would reduce the likelihood of a release, should an accident occur.

[82] Washington State Department of Enterprise Services: "Contractor General Requirements Dangerous Waste Handling & Disposal Services." Effective dates: June 30, 2016, to June 29, 2026.

25-AUG-2023

LEGEND

- FIRE STATION STORING AFF
- 10-DAY HOLD SITES
- 10-DAY HOLD SITES ROUTE QUARTER MILE STUDY AREA
- ECOLOGY REGIONS

FIGURE 3.10-2: 10-DAY HOLD FACILITY HAUL ROUTES

AFFF COLLECTION AND DISPOSAL PROGRAM
DRAFT ENVIRONMENTAL IMPACT STATEMENT

1:1,380,000
1" = 22 MILES
0 10 20 MILES

DEPARTMENT OF ECOLOGY
State of Washington

TRC

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File Path: \\employees\gis\arcgis\pro\PROJECTS\WA_Dept_Ecology\441530_AFFF_EIS\2-APRX\WA_Ecology_AFFF_EIS apnx_Layout Name: Figure 3.10-2 10 Day Hold

Once the waste AFFF reaches the selected disposal or treatment facility, the transfer of waste AFFF would be the responsibility of the facility. We assume that trained personnel would handle materials and that containers would be transferred in areas designed with spill controls to mitigate any potential spills to soil or surface waters.

Relative Risk of Release

The relative risk of an accidental release of AFFF to the environment is dependent on several factors:

- **The proximity of the spill to emergency response services.** The farther away from those services, the longer it will take to clean up the release, increasing the likelihood of environmental effects.
- **The amount of AFFF spilled.** The larger the spill, the more likely it will infiltrate soil and reach surface waters or infiltrate into groundwater at elevated concentrations.
- **The substrate (or underlying substance or layer) where the material is spilled.** Whether AFFF can migrate, infiltrate, and be cleaned up depends on what type of substrate it is spilled onto, like:
    - Paved surfaces.
    - Exposed dirt or gravel.
    - Vegetated surfaces.
    - Surface waters.
- **The proximity to water or isolation from water.** Engineered containment like curbs and paved surfaces can prevent spills from reaching the natural environment through runoff or infiltration. Confining clay layers in the subsurface can also inhibit spills from reaching potable groundwater.
- **The level of spill response planning.** Places like fire stations, 10-day hold facilities, waste disposal facilities, and waste transportation companies must prepare and implement spill response plans to prevent, contain, and clean up spills.

The analysis of transportation impacts is based on total miles of travel and number of trips. Trips are assumed to consist of a single transportation event for each geographic area to the selected 10-day hold facility, with an inbound trip to the respective fire departments, an outbound trip to the 10-day hold facilities where all AFFF would be temporally stored, followed by final transport to disposal locations of landfills, treatment facilities, and deep well injection locations identified by us as potential end sites for the collected foam.

At this time, we don't know which facilities would be grouped in one trip and how many trips would be made to the 10-day hold facilities. Therefore, routes to all 10-day hold locations in Washington and Oregon would be the same, and route length would be approximately 1,050 miles. Mid-size cargo trucks would transport AFFF from the fire stations to the 10-day hold

facilities. Then heavy-duty trucks would transport the AFFF from the storage facilities to the final disposal or treatment location. The estimated mileages from the selected 10-day hold facilities to the disposal or treatment facilities are in Table 3.10-1.

Affected Communities

The communities potentially exposed to PFAS from releases during AFFF transport include fire stations and surrounding communities near the 10-day hold and final disposal sites. People who could be exposed to PFAS from an accidental release include:

- Personnel responsible for PFAS container management and transportation.
- Emergency response personnel responding to the accident if the release was caused by a vehicle accident.
- Residents living in the vicinity of the accidental release.

TABLE 3.10-1: Mileages from Selected 10-Day Hold Facilities to Treatment and Disposal Facilities

Route Name	Route Miles (Approximate)
Route to Clean Harbors Aragonite Utah Incineration Facility (Starts in Hermiston, OR)	651.83
Route to Clean Harbors Kimball Nebraska Incineration Facility (Starts in Spokane, WA)	1,057.70
Route to US Ecology Nevada (Beatty) Landfill (Starts in Hermiston, OR)	815.61
Route to US Ecology Idaho (Grand View) Landfill (Starts in Hermiston, OR)	297.41
Route to Advantek Hutchinson, Kansas Deep Well Injection (Starts in Spokane, WA)	1,609.88
Route to US Ecology Winnie, Texas Deep Well Injection (Starts in Spokane, WA)	2,272.87

In addition, the following transportation routes have the potential to affect the listed Tribal communities if there is a release caused by a vehicle accident:

- **Fire stations to the 10-hold facilities**: Lummi, Puyallup, Samish, Tulalip, and Yakama Nation.
- **Route to US Ecology Nevada (Beatty) Landfill**: Fort McDermitt Paiute and Shoshone and Umatilla.
- **Route to Clean Harbors Aragonite Utah Incineration Facility**: Umatilla.
- **Route to Clean Harbors Kimball Nebraska Incineration Facility**: Crow.

- **Route to US Ecology Idaho (Grand View) Landfill**: Umatilla.
- **Route to Advantek Hutchinson, Kansas Deep Well Injection**: Crow.
- **Route to US Ecology Winnie, Texas Deep Well Injection**: Chickasaw Crow, Kaw, and Tonkawa.

There would be a low potential for release of AFFF during routine transportation by trained personnel. AFFF state and federal requirements that define standards for shipping hazardous materials, including container types and labeling, would reduce the likelihood of releases from containers should an accident occur during transportation.

A review of Washington regulatory records relative to historical AFFF and other chemical spills or releases related to the fire stations between 2016 and 2021 is summarized in Chapter 2: Project Description and Alternatives. According to the records, 26 spills occurred; however, only nine of the spills were related to vehicles, and most of the spills were related to routine use and application of firefighting foam.

We reviewed "in transit" incident data obtained from the USDOT Pipeline and Hazardous Materials Safety Administration (PHMSA) database for incidents related to the transportation of hazardous materials. We reviewed data from January 2015 to July 2022 to identify:

- The types of releases.
- The number and types of incidents.
- Whether each spill was recorded.
- The state routes/road names where incidents occurred.

We found 131 reported incidents between 2015 and 2022 in states where the routes for transportation of AFFF are proposed. Total mileage covered by proposed routes to the proposed facilities for disposal and treatment is estimated at 6,700 miles. Specific data was not available on the number of truck trips along the proposed routes over the period evaluated. However, according to PHMSA, there are an estimated 3.3 billion tons of hazardous materials shipped each year and around one million shipments every day in the United States (PHMSA 2022).

Only four of the incidents were in Washington. Most of the incidents were in Oklahoma and Texas. These states are included in the proposed route to the deep well injection site. Most of the reported incidents resulted in spills to the ground surface and the most common materials released were petroleum fuels or flammable liquids related to the fuel tanks of the trucks or vehicles involved in the incidents. In almost all of the cases, the incidents were related to vehicle accidents.

Consequences

In a typical accident where a release to the environment occurs, emergency response personnel would mitigate potential impacts to the environment by responding to the accident quickly and controlling and cleaning up the release. Response personnel would be trained to address the release. They would wear personal protective equipment to prevent contact with the material, further mitigating potential exposure to hazardous compounds.

The transportation of AFFF would pose low risk to the environment and human health. Chemicals like PFOA, PFOS, FTSA, and FTCA have an extremely low vapor pressure, so the potential for PFAS vapors to release into the air is low. This means the potential exposure risk to the surrounding communities would also be low.

3.10.2 Impact Assessment and Methodology

3.10.2.1 Alternative 1: Approved Hold in Place

There would be no risk of a release because transporting AFFF waste is not part of this alternative.

3.10.2.2 Alternatives 2 to 4: AFFF Container Collection, Transportation, and Offloading to Treatment or Disposal Facility

If containers or a vehicle accident are mishandled, PFAS substances could be released into the environment. We assume that trained professionals would perform AFFF container collection, transportation, and offloading of containers at the treatment/disposal facilities. We also assume that AFFF would be put in USDOT-rated containers for transport.

The consequences of an AFFF release would be minimal because the AFFF would be transported following current USDOT regulations and applicable state rules for shipping hazardous materials, including:

- Approved container types.
- Accurate labeling.
- Appropriate handling by trained personnel using best practices.

If there was an AFFF spill or container leakage, the impact on health and environmental resources would be very low, because any spilled AFFF material would be contained and cleaned up quickly by appropriately trained workers.

Implementation of the selected transportation route would cause a negligible increase in traffic and there would be no significant adverse impacts with respect to traffic interference, congestion, or damage to the roadways during project operations. Based on current project plans, fire stations would be grouped by geographic area for a single transportation event to the selected 10-day hold facility. Based on the current estimated volume of AFFF in storage at

fire departments in Washington, there would be an estimated four trips to the selected treatment/disposal facility.

Once the containers reach the treatment/disposal facility, the facility would be responsible for the transfer of AFFF waste. We assume that trained personnel would handle the materials and that containers would be transferred from the trucks in areas with spill control to mitigate any potential spill to soil or surface waters.

We estimate that in 2021 there were 52,240 liters, or approximately 13,800 gallons, of AFFF in storage at fire departments in Washington (Ecology 2021), and this could be transported in four trucks. Each truck would have with an average maximum load of 4,500 gallons. A hypothetical release to the environment could happen if a truck spilled 10 percent of its contents (450 gallons)[83] during a transportation incident. We assume that a spill like this would be cleaned up within 24 hours.

3.10.2.3 Alternative 5: No Action Alternative

There would be no risk of a release because transporting AFFF waste is not part of this alternative.

3.10.3 Impacts and Mitigation Measures

3.10.3.1 Alternative 1: Approved Hold in Place

There would be no impacts or mitigation measures because transporting AFFF waste is not part of this alternative.

3.10.3.2 Alternatives 2 to 4: AFFF Container Collection, Transportation, and Offloading to Treatment/Disposal Facility

Table 3.10-2 summarizes the risks associated with alternatives 2 to 4.

The impact of a hypothetical release during container collection and offloading of containers would be the estimated release of AFFF to the subsurface over a 24-hour period, the estimated maximum time it would take to clean up the release. A survey of fire stations identified the maximum storage amount of AFFF to be 500 gallons. Therefore, a worst-case scenario release during the collection of AFFF would be 500 gallons. If AFFF is stored in containers at the fire stations, the largest container that AFFF would be transferred to would be a 330-gallon tote.

[83] We assume that AFFF would be packaged in new US DOT-certified containers and packaged securely in the truck. As part of the US DOT certification process, a drum must be shown not to leak after it is filled with water and dropped multiple times from different heights and with different orientations. Even in a severe transportation accident, only a fraction of drums would be expected to leak, and these would not necessarily leak their entire contents.

TABLE 3.10-2: Transportation Risks for Alternatives 2 to 4

Phase	Exposure Mechanism	Likelihood	Potential Communities Exposed	Consequences	Duration	Overall Risk Level
Collection/ Offloading	Leak /spill	Low	Hazmat-trained drivers/technicians; emergency response personnel; population in vicinity	Low	Days	Low
Transportation	Leak/spill or collision	Low	Hazmat trained drivers/ technicians; emergency response personnel; population in vicinity	Low	Days	Low

If the AFFF can be transferred as a bulk material from the fire stations, then it would be transferred to a tanker, with an average maximum load of 4,500 gallons. A hypothetical release to the environment during offloading to the treatment/disposal facility would result in the spill of 10 percent of the container (between 30 and 450 gallons depending on the type of container that is used to transport the AFFF).

The impact of a hypothetical transport accident would be the estimated release of AFFF to the subsurface over a 24-hour period, the estimated maximum time it would take to clean up the release. We estimate that each transport truck would contain a maximum of 4,500 gallons of AFFF and a hypothetical release to the environment during a transportation incident would result in the spill of 10 percent of the truck contents (450 gallons).

3.10.3.3 Alternative 5: No Action Alternative

There would be no impacts or mitigation measures because transporting AFFF waste is not part of this alternative.

3.10.4 Mitigation Measures

The collection and treatment/disposal alternatives would incorporate the following measures to avoid environmental impacts during transportation. No other measures would be required to avoid potential significant environmental impacts.

- AFFF would be managed by trained hazardous materials personnel using best practices. Personnel protective equipment (PPE) would be readily available and proper physical and administrative controls would be utilized.
- Transfer of AFFF would be performed with secondary containment in place and spill cleanup materials will be readily available.

- AFFF would be stored and transported in containers that meet the USDOT's current standards for shipping hazardous materials. Required labels would be affixed to each container.

- AFFF would be transported by persons trained to transport hazardous materials and accompanied by proper documentation (for example, manifest, chain-of-custody). The facilities have written emergency response and hazardous materials management procedures.

3.10.5 Cumulative Impacts

We discuss potential cumulative impacts related to the AFFF program in Chapter 5: Cumulative Impacts.

3.10.6 Data Gaps

Data gaps include the following:

- Data about the specific AFFF chemicals held at fire stations and the chemical constituents of these substances are not available. Safety data sheets typically list percentage ranges for the chemical composition and do not necessarily list all chemical constituents.

- Accurate volumes of AFFF chemicals held at fire stations.

- Number of trips from AFFF locations to 10-day hold facilities.

- Final transportation routes.

3.11 Environmental Justice

The goal of an environmental justice (EJ) assessment is to ensure that minority, low income, and Tribal populations and communities do not bear disproportionately high or adverse human or environmental impacts from a proposed program, policy, or action. An environmental justice evaluation examines whether or not individuals and communities that meet certain criteria are disproportionally impacted by exposure that may occur as a result of any of the proposed alternatives.

This section identifies environmental justice (EJ) communities in the areas where project alternatives would be implemented. It describes the impacts of these alternatives on EJ communities to determine if they are disproportionately impacted.

In Washington, there is a legal requirement to obtain letters of approval from a receiving state's governing regulatory body when dealing with dangerous waste and the potential disposal of state-only dangerous waste at non-treatment, storage, and disposal (TSD) sites outside the state.[84] Since several of the alternatives potentially involve sites in other states, this report also evaluated the potential EJ impacts at out-of-state sites.

3.11.1 Affected Environment

The U.S. Environmental Protection Agency defines environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.[85]

This chapter identifies and describes populations that may be disproportionally impacted by the proposed alternatives for the removal and disposal of AFFF. The section also addresses potentially significant environmental impacts that may have a disproportionate impact on populations of interest.

For the purposes of this chapter, populations of interest may include:

- Minorities and communities of color.
- Low-income populations.
- Potentially affected Tribal populations.
- Populations with limited English proficiency (LEP).

[84] WAC 173-303-141(2)(b)

[85] U.S. Environmental Protection Agency (EPA), 1998. *Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses*. April 1998. Accessed at: https://www.epa.gov/sites/production/files/2015-02/documents/ej_guidance_nepa_epa0498.pdf.

3.11.1.1 Conducting an EJ Assessment

The first step in an EJ assessment is to identify the study area. The study area is defined as the geographic area where the proposed project has the potential for human health or environmental effects. The exact boundaries will depend upon the project type but would typically be no further than 0.25 mile from the epicenter of the project (including each of the project alternatives under consideration).

Once the study area is defined, the next step is to determine if there are readily identifiable minority and/or low-income EJ populations in the EJ study area. This is accomplished by compiling relevant demographic data, conducting a field review of the proposed study area via online maps/photography (Google maps) and/or being on-the-ground (walking or driving the area), consulting local representatives who are knowledgeable about community demographics, and conducting public outreach with a focus on EJ population engagement. This process is outlined in Figure 3.11-1 below and includes:

- Meaningful engagement.
- Scoping and screening.
- Defining affected environments.
- Identifying alternatives.
- Identifying affected populations.

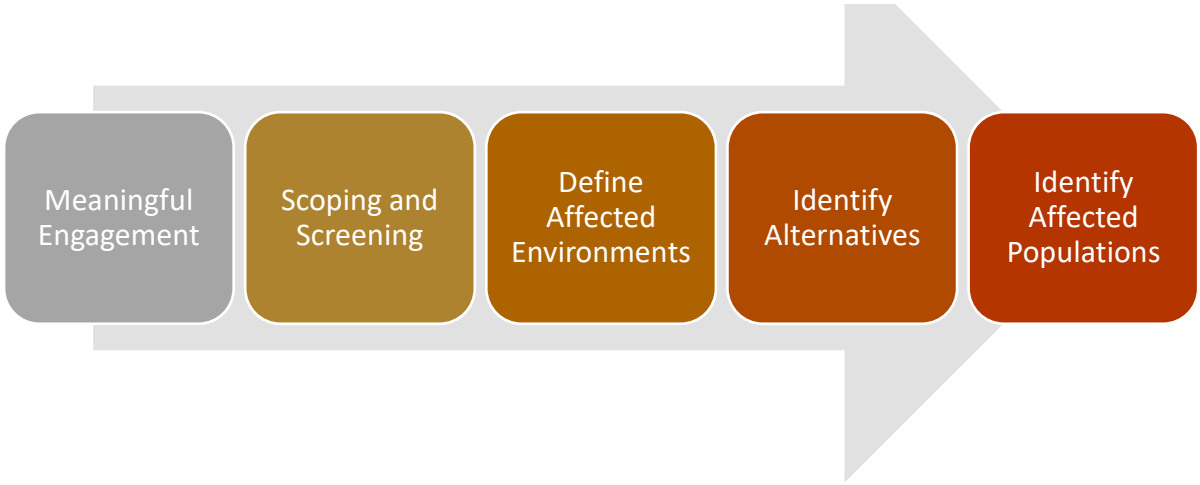

FIGURE 3.11-1: EPA Steps to an EJ Assessment[86]

[86] Promising Practices for EJ Methodologies in NEPA Reviews Report of the Federal Interagency Working Group on Environmental Justice & NEPA Committee. Website visited March 2016. https://www.epa.gov/sites/default/files/2016-08/documents/nepa_promising_practices_document_2016.pdf.

Washington State offers further guidance to ensure that the process is inclusive and comprehensive, as illustrated in Figure 3.11-2.

- During project development, strive to avoid/minimize adverse impacts on identified EJ populations.
- Analyze proportionality of impacts on populations.
- Identify any off-setting benefits to the affected EJ population.
- Consider feasibility of project refinements and/or additional mitigation to avoid disproportionate impacts to EJ population.
- Document the previous steps in the environmental document.
- Conclude with the formal environmental justice finding.[87]

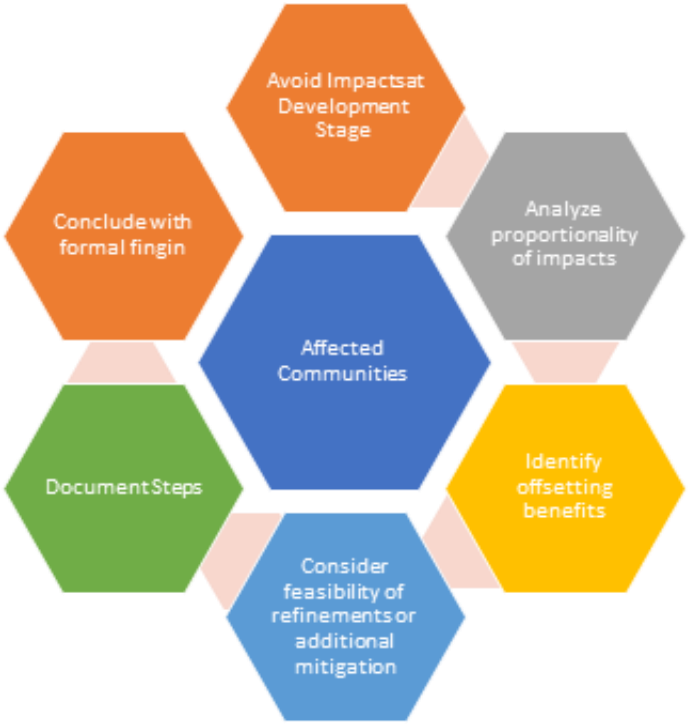

FIGURE 3.11-2: Washington State Environmental Justice Process Guidance

3.11.1.2 Tools to Identify, Map and Compare Communities and Impacts

The EPA has developed an environmental justice mapping and screening tool (EJ Screen) that provides a nationally consistent data set and approach for evaluating the relationship between environmental and demographic indicators. The tool includes 12 environmental indicators, 7

[87] Adapted from Determining Project Effect on EJ Populations. Washington Department of Transportation. 2020. https://wsdot.wa.gov/sites/default/files/2021-10/Env-EJ-Tsk458dDetProjEffect.pdf

demographic indicators, and 12 specific EJ indexes (which combine each environmental indicator with the demographic data). EJ Screen provides a consistent way to identify and compare areas that may be of interest.

An EJ Screen is not a risk assessment tool. Rather, it is a screening tool that can be useful as a first step to identify locations that may be candidates for further review. The screening results "Do not, by themselves, determine the existence or absence of environmental justice concerns in a given location…do not provide a risk assessment and may have other significant limitations."[88]

The state of Washington uses the Environmental Health Disparities (EHD) rankings from the State Department of Health's Washington Tracking Network program to identify and compare the impacts of environmental hazards across impacted communities. The program uses 19 different environmental public health indicators to create a cumulative score (Figure 3.11-3).[89] The cumulative score ranks each census tract on a scale from 1 to 10.

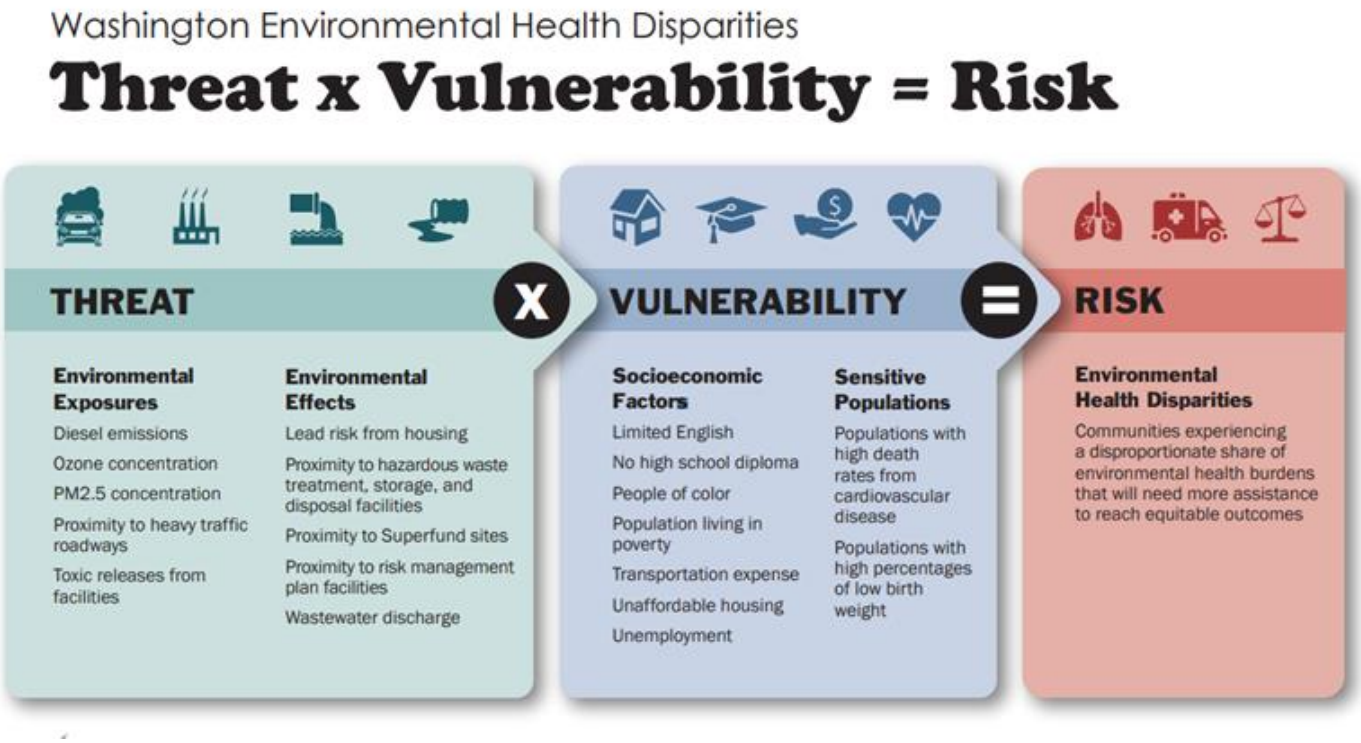

FIGURE 3.11-3: Washington Environmental Health Disparities Index

The 19 EHD indicators are divided into four categories:

[88] https://www.epa.gov/ejscreen/purposes-and-uses-ejscreen

[89] The Washington Environmental Health Disparities Map. Cumulative Impacts of Environmental Health Risk Factors Across Communities of Washington State. DOH 311-011 July 2022. Updated July 2022. Version 2.0, pg 16. https://doh.wa.gov/sites/default/files/2022-07/311-011-EHD-Map-Tech-Report_0.pdf?uid=6323acbe8c195

- **Environmental Exposures**: PM2.5-diesel emissions; ozone concentration; PM2.5 concentration; proximity to heavy traffic roadways; toxic release from facilities.
- **Environmental Effects**: Lead risk from housing; proximity to hazardous waste treatment, storage, and disposal facilities; proximity to Superfund sites; proximity to risk management plan facilities; wastewater discharge.
- **Socioeconomic Factors**: Limited English; no high school diploma; poverty; people of color; transportation expense; unaffordable housing; unemployment.
- **Sensitive Populations**: Death from cardiovascular disease; low birth weight.

Communities experiencing a disproportionate share of environmental health burdens will need more assistance to reach equitable outcomes.

As shown in Figure 3.11-4 below, each "rank" is equivalent to 10 percent of the census tracts in the state. So, if a community has a rank of 8, that means that about 20 percent of the other communities have a higher proportion of their population living below the poverty level, while 70 percent have a lower proportion of their population living below the poverty level.[90]

FIGURE 3.11-4: Impacted Communities as a Percent of Total

It is important to note that this ranking and the associated maps do not reflect the actual number of individuals impacted by a threat, nor does it capture the magnitude of health impacts in a community that can be attributed to a factor.

3.11.1.3 Existing and Evolving Regulations

A number of state and federal regulations outline the need for environmental justice assessments. The relevant statutes are briefly discussed below.

Federal

Executive Order 12898

In February of 1994, President Clinton signed Executive Order 12898. This executive order required federal agencies to focus on human health and environmental conditions and address hazards in minority and low-income communities. In subsequent years, through executive order and legislative action, state and federal regulatory agencies have taken specific steps to

[90] *Ibid.* pg. 19.

"ensure that disproportionally high and adverse human health or environmental effects on minority communities and low-income communities are identified and addressed."[91]

NEPA

Subsequent memoranda and guidance[92] identified that agencies responsible for compliance with environmental regulations under the national and state environmental policy acts (NEPA and SEPA, respectively) were best situated to develop and implement policies and procedures to comply with this executive order.

Consequently, as part of the NEPA/SEPA compliance process, all assessments now include an analysis of the Environmental Justice (EJ) impacts of the proposed project or intervention: [93]

- Environmental Impact Assessments (EIS)
- Environmental Assessments (EA)
- Projects with Findings of No Significant Impact (FONSI)
- Records of Decision (ROD)

Environmental Justice (EJ) analysis is not intended to shift risk, but rather to ensure "fair treatment." EPA's Office of Environmental Justice defines "fair treatment" as:

> The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local and tribal programs, and policies.[94]

Washington State

Model Toxics Control Act

The Model Toxics Control Act (MTCA) is Washington's environmental cleanup law. MTCA directs and funds the investigation, cleanup, and prevention of sites that are contaminated by hazardous substances. It works to protect people's health and the environment and to preserve natural resources for the future. Establishing protective concentrations for ecological receptors

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[91] Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analysis, US EPA, April 1996, pg. 1. https://www.epa.gov/sites/default/files/2014-08/documents/ej_guidance_nepa_epa0498.pdf

[92] Environmental Justice Guidance Under the National Environmental Policy Act. Council on Environmental Quality, Office of the President, December 1997. https://ceq.doe.gov/docs/ceq-regulations-and-guidance/regs/ej/justice.pdf

[93] *Ibid.* pg. 4.

[94] Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analysis, US EPA, April 1996, pg. 2. https://www.epa.gov/sites/default/files/2014-08/documents/ej_guidance_nepa_epa0498.pdf

is an essential aspect of site cleanup work under the Model Toxics Control Act. Our PFAS Chemical Action Plan includes recommendations to address PFAS levels in soil, sediment, fresh water, and salt water to protect ecological receptors (Ecology 2022d, see Recommendation 2.1).

Washington Healthy Environment for All Act

As the first state agency in the country to focus on environmental protection, we were an early leader in addressing EJ issues. We conducted our first EJ assessment in 1995.[95] Additionally, the Healthy Environment for All (HEAL) Act, enacted in 2021, requires us (as well as the departments of Agriculture, Commerce, Health, Natural Resources, Transportation, and the Puget Sound Partnership) to address "disproportionate environmental health impacts in all laws, rules, and policies with environmental impacts by prioritizing vulnerable populations and overburdened communities, the equitable distribution of resources and benefits, and eliminating harm."[96]

State Environmental Policy Act

The State Environmental Policy Act (SEPA) requires state and local governments to identify possible environmental impacts that may result from governmental decisions. The SEPA review process helps the department, applicants, and the public understand how a proposed project will affect the environment. The Washington Department of Fish and Wildlife (WDFW) reviews proposed projects to identify potential impacts to fish, wildlife, and their habitats. SEPA gives agencies the authority to condition or deny a proposal based on the agency's adopted SEPA policies and the environmental impacts identified in a SEPA document.

Water Pollution Control Act

The Water Pollution Control Act was established to maintain the highest possible water standards in state waters, which include all lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington. Industries and others are required to use all known available and reasonable methods to prevent and control the pollution of the waters of the state. Pollutants include any material that makes the water harmful, detrimental, or injurious to wild animals, birds, fish, or other aquatic life.

3.11.1.4 Study Area

Section 2.1 in Chapter 2 of this report outlines the statewide program to collect, transport, and dispose of aqueous film-forming foam (AFFF) containing per- and polyfluoroalkyl substances (PFAS) used by municipal fire departments in Washington. EPA's EJ Screen Online Mapping tool and the Washington Department of Health Environmental Health Disparities Mapping tool were both used to identify communities in proximity to fire stations that met relevant EJ criteria. No field or on-site visits were made for this EIS.

[95] Ajmera, Charmi, K. Dubytz, E. Lih, S. Rahman & J. Six; Embedding Environmental Justice into the Washington State Department of Ecology: Promising Practices for Advancing Equity and Environmental Justice". Evans School of Public Policy, University of Washington. June 2020. Pg. 21

[96] https://doh.wa.gov/community-and-environment/health-equity/environmental-justice

The study area under consideration for this analysis included any community falling within a 10-mile radius of a fire station participating in the AFFF project, a potential storage site, or a location identified as a potential end site for the collected foam.

Fire Stations

As detailed in Chapter 2: Section 2.1.2, based on data collected from the 113 fire departments that responded to our 2019 survey, approximately 25 percent of the fire stations store 25 gallons or less of PFAS- containing foam, 25 percent store between 50 and 100 gallons and 50 percent store between 50 and 100 gallons. In addition to the fire stations, there are stockpiles at military bases, refineries, terminals, railyards and 11 commercial airports; however, as mentioned in Chapter 1, the environmental and EJ consequences associated with these sites is not within the scope of this EIS.

For all action alternatives, the greatest potential risk to surface soils, surface water, and groundwater resources and communities is the release of AFFF due to spills, leaks, upset conditions, or other accidental releases to the environment. AFFF concentrate contains organic solvents, chemical stabilizers, and surfactants. As a result, it is a serious eye irritant, may cause skin and respiratory irritation, and is harmful when swallowed. AFFF also contains PFAS compounds, which are persistent in the environment and known to adversely impact human health and the environment.

These releases can be from fixed or mobile AFFF systems or storage areas (i.e., bladder tanks, mobile totes, fire extinguishers, containment, etc.). Additionally, low volume releases may occur during AFFF concentrate transfer or from operational requirements that mandate periodic equipment calibration. Finally, there is the potential for release of AFFF from accidental leaks from foam distribution piping between storage and pumping locations and from storage tanks. The focus of this EIS is not on the direct discharge of AFFF during fire training activities or during emergency response activities. In general, the release from leaks/spills is of lower volume than those from emergency or training activities.

As described in Chapter 2: Section 2.1.2 and Table 2-1, our data from 2016 to 2021 show a total of 24 reported spills at Washington fire stations. The majority of the spills (for which there are spill quantity data) were less than 50 gallons, which generally represents a small portion of total AFFF stored at fire departments.

Additionally, our data show that the reported AFFF spills were generally confined to paved areas. Spills to vegetated areas were managed through soil removal and replacement. Spills that migrate into the storm drain system are typically detained within drain vaults, from which the material can be retrieved through vacuum, but some large spills have traveled offsite.

Dangerous Waste Storage Sites

Under our proposed collection program, AFFF may be collected into centralized storage sites and stored for up to 10 days. Temporary 10-day hold facilities are located in urban areas and are used as centralized facilities for consolidating containers of AFFF from participating fire stations before transport to the ultimate disposal facility. As noted in Chapter 2 (Table 2-2),

there are sixteen storage sites located throughout the state and in the City of Clackamas, Oregon.

The primary release mechanism for AFFF at dangerous waste storage sites is leaks or spills that cause accidental releases of PFAS-containing AFFF. AFFF stored in older or compromised containers may leak. Additionally, the transfer of AFFF from one container to another, whether to consolidate materials or to ensure proper containment in new hazmat containers, may contribute to the release of AFFF.

The same risk factors described for fire stations are applicable to the selected storage sites (see the fire station section above for more detail).

Endpoint/Disposal Locations

As described in Chapter 2, Alternatives 2, 3 and 4 involve the collection, transportation, incineration and/or disposal at injection or landfill sites outside of Washington. Each of these sites are identified and described in Chapter 2, including the permit and license requirements, applicable land disposal restrictions and treatment standards, responsibilities for spills, leaks, or releases, and any applicable regulations.

For reference, a brief description of each of the sites, the potential release mechanism, and the relative risk of release for each of the incineration and landfill sites under consideration is provided below.

Incineration Sites

Clean Harbors Aragonite Incineration Facility

Clean Harbors Aragonite Incineration Facility is a hazardous waste disposal facility located outside the abandoned desert town of Aragonite, approximately 25 miles west of the Great Salt Lake in western Utah. The facility is bordered on the north, east, and south by national lands managed by the Bureau of Land Management (BLM) for multiple uses, including extractive uses such as mining or logging.

Clean Harbors Kimball Incineration Facility

Clean Harbors Kimball Incineration Facility is an industrial waste storage and treatment facility located five miles south of Interstate 80 on Highway 71 in Kimball County, Nebraska.

Release Mechanism

The incineration of AFFF may deposit residual PFAS in the surrounding soils. The complete efficacy of PFAS destruction via incineration is currently lacking and it is unknown if thermal treatment adequately controls fluorinated products of incomplete combustion (PICs) (USEPA, 2020). However, as stated in Chapter 2, under current operating conditions, the Clean Harbors Aragonite incinerator has shown destruction of “99.9999 percent of common legacy PFAS compounds” (for example, perfluorooctane sulfonamide (PFOS), perfluorooctanoate (PFOA), PFHxS, and GenX) (EA and Montrose 2021).

Relative Risk of Release

The deposition of PFAS particulates into the soil could potentially enter the terrestrial and aquatic food web and bioaccumulate to higher-level terrestrial and aquatic birds, fish, and mammals. However, given the relatively small emission amounts and low risk level (see sections 3.4: Aquatic Resources and 3.5: Terrestrial Species and Habitats), it is unlikely that this is a significant impact on the terrestrial and aquatic environments.

Landfills

US Ecology Idaho

US Ecology Idaho is a permitted landfill located within a rural agricultural area outside of Grand View, Idaho. The northern boundary of the facility encompasses 309 acres of undeveloped land. The new construction of hazardous waste treatment and storage units are prohibited on this land, except for inspection, corrective action, and other activities required under the permit (US Ecology 2016).

US Ecology Nevada

US Ecology Nevada is a permitted landfill located in the Nevada desert on land owned by the state of Nevada in the northern Mojave Desert approximately 11 miles south of the city of Beatty. The facility is surrounded by national lands managed by the Bureau of Land Management (BLM) for multiple uses, including extractive uses such as mining or logging.

Release Mechanism

At landfills, the primary release mechanism of AFFF that contains PFAS is through leaks and spills during the handling of AFFF containers. AFFF disposed of at landfills will be stabilized through solidification before being disposed of in a designated waste management unit. The landfills identified as end locations for the program are permitted hazardous waste facilities. Their leachate control systems are described in more detail in Section 3.3.4.5: Earth and Water Resources, Impacts and Mitigation Measures, Alternative 3. In summary, both facilities are "zero-discharge" facilities with no release mechanism for AFFF to migrate offsite.

Relative Risk of Release

The relative risk of release or exposure resulting from leachate, accidental spills, or releases through this disposal alternative is low.

Injection sites

US Ecology Winnie

US Ecology Winnie is a deep well injection facility in Winnie, Texas. It is permitted for treatment and disposal of Class 1 and 2 non-hazardous industrial solid waste and wastewater.[97] Located approximately 10 miles north of the Gulf of Mexico near the town of Winnie, Texas, it is bordered on the north by the Big Hill National Oil Reserve. The facility is set within a wider ecological context of wetlands and grassland/savannah that contain patches of timberland and non-native pasture.

[97] Winnie Solid Waste Permit 39098 and WDW344-350

Advantek Cavern Solutions

Advantek Cavern Solutions is a deep well injection, non-hazardous waste site. Advantek Cavern Solutions, LLC offers non-hazardous waste management services. These services include deep well injection sites located in Hutchinson, Kansas, approximately 5 miles south of the City of Hutchinson in central Kansas.

Release Mechanism

The primary release mechanism for the injection site would be the accidental release or spilling of AFFF during the injection process into a deep-water aquifer. While rinsing the AFFF containers used to transport the waste, it is possible that AFFF may be released to the soil. Additionally, during the disposal of the AFFF into the deep water well, there could be a malfunction in the injection procedure. A malfunction could result in the accidental release of AFFF to the environment.

Relative Risk of Release

The relative risk of release at injection sites is low. The thorough rinsing process could result in small quantities of AFFF spilling, but it is unlikely that AFFF would enter the environment due to secondary containment and other precautionary best management practices used when handling hazardous waste. Additionally, AFFF may be released during the well injection process, but only if there were an equipment malfunction that released AFFF aboveground onto the soil. If this were to happen, the spill would likely be promptly cleaned up and the soil remediated to prevent further transport of the material.

Transportation Routes

Alternative 2: Incineration, Alternative 3: Solidification and Landfill, and Alternative 4: Deep Well Injection would require transportation out of state. Beyond Washington, the additional states that are currently part of the proposed transportation routes include Colorado, Idaho, Illinois, Kansas, Montana, Nebraska, Nevada, Oklahoma, Oregon, Texas, Utah, and Wyoming. With the exception of Colorado, Idaho, Nebraska, Illinois, Oregon, Utah, and Wyoming, all the states have exclusively adopted the Federal regulations governing transportation of hazardous materials and waste.

Spills, leaks, and accidental releases of AFFF containing PFAS are also the main form of AFFF releases into the environment along transportation routes to the potential disposal facilities. All routes have the potential to spill AFFF and affect communities. The following communities/personnel could potentially be affected by AFFF releases from an accident:

- The public in the vicinity of the accident.
- The personnel responsible for transporting the containers.
- The emergency response workers responding to the accident.

Transportation of the AFFF would follow current DOT and applicable State requirements. These requirements define standards for shipping hazardous materials that include container types and labeling. The handling would be managed by trained personnel in accordance with best practices and appropriate physical and administrative controls (e.g., manifesting, chain-of-

custody). The implementation of these procedures during transportation would reduce the likelihood of a release should an accident occur.

As defined and discussed in Chapter 3.10: Transportation and Truck Safety, there is a low potential for the release of PFAS during routine transportation of AFFF by trained personnel. State and federal requirements that define standards for shipping hazardous materials (including container types and labeling) will reduce the likelihood of releases from containers should an accident occur during transportation. Additionally, the handling of PFAS would be managed by trained personnel in accordance with best practices. Appropriate physical, engineering, and administrative controls would be utilized to transport the AFFF.

Overall, the relative risk of release for the transportation routes is low. For additional information on the risk of release for transportation route, see the discussion in Chapter 3.10: Transportation.

3.11.2 Significance Criteria

This section describes the environmental consequences of the project alternatives on EJ communities. Due to the scope of this EIS, it is not feasible to conduct a quantitative ecological risk assessment for potentially impacted EJ communities near each fire department, storage facility, and potential disposal location. Instead, we present a qualitative analysis capturing the general impacts to EJ communities. The section also makes note of whether EJ communities bear a disproportionate share of negative consequences associated with each alternative.

3.11.3 Impact Assessment and Methodology

From an environmental justice perspective, the question is whether the exposure or potential exposure associated with any of these alternatives poses a disproportionate share of negative environmental consequences to vulnerable communities.

The first step in establishing “disproportionality” is understanding:

1) The geography and demography of current locations where PFAS-containing AFFF is located; and

2) The communities around those locations.

In order to identify communities that might be disproportionally impacted, the TRC/Greene team performed an EJ screening using EPA’s EJ Screen Online Mapping tool and the Washington Department of Health Environmental Health Disparities Mapping tool. These tools are described in depth in Section 3.11.1.

A multi-stage process was used to identify potentially affected communities in Washington state.

First, census tract data was overlayed with the Washington Environmental Health Disparities Index, and census tracts that had a ranking of either 9 or 10 were identified. These census tracts

represent tracts that fall in the 80th percentile or greater for environmental health risks. For this analysis, these tracts represent EJ communities.

Second, a 10-mile buffer was established around each of those tracts using QGIS, a free and open-source Geographic Information System.

Next, MyGeodata Cloud[98] was used to identify fire stations in Washington State using Open Street Map Data. These points and polygons were overlain onto the census tract data using QGIS. Any duplicates were redacted.

We then identified fire stations that intersected with the 10-mile buffers around census tracts with a ranking of 9 or 10 (EJ communities).

Finally, we compared the identified fire stations within the buffer zones with the list of fire stations responding to the 2019 Washington Department of Ecology survey that assessed foam stockpiles (see Section 2.1.1).

Thirty of the stations that responded to our survey were located within 10 miles of a census tract that had an EHD ranking of 9 or 10, as seen in Table 3.11-1. The communities associated with these 30 stations have the potential to suffer adverse impacts from the proposed alternatives.

[98] https://mygeodata.cloud/data/download/osm/fire-stations/united-states-of-america--washington

TABLE 3.11-1: Fire Stations in Washington State within 10 Miles of an EJ Community

NO.	FIRE STATION OR AFFF SITE
1	Burlington Fire Department
2	Central Pierce Fire & Rescue
3	East Pierce Fire
4	East Pierce Fire & Rescue Station 192
5	Grandview City Fire Department
6	King County Fire District 20
7	Lacey Fire District 3
8	Mount Vernon Fire Department Station 1
9	Pasco Fire Department Airport Station
10	Pierce County Fire District 5
11	Pierce County Fire District 5 Station 51
12	Pierce County Fire District 5 Station 52
13	Pierce County Fire District 5 Station 58
14	Port of Seattle Fire Department
15	Renton Regional Fire Authority
16	Richland Fire & Emergency Services
17	SeaTac Airport Fuel Facility
18	Skagit County Fire District 3
19	Solvay Chemicals, Inc.
20	South King Fire & Rescue
21	South King Fire & Rescue Station 67
22	Spokane County Fire District 4
23	Spokane County Fire District 11
24	Spokane County Fire District 9
25	Tacoma Fire Department Vehicle Maintenance Shop
26	Tacoma fire Department Station 6
27	Tukwila Fire Department
28	Valley Regional Fire Authority
29	WSDOT
30	WSDOT – Seattle Convention Center

We used the same process to evaluate the 15 Washington storage sites listed in Chapter 2, Table 2-2. All 15 were found to be within a 10-mile buffer range of an EJ community and are listed in Table 3.11-2.

TABLE 3.11-2: 10-Day Hold Facilities in Washington State Within 10 Miles of an EJ Community

NO.	Facility Name and Location
1	Pasco Facility Clean Harbors
2	Spokane Facility
3	Kent Facility
4	Milton Facility US Ecology
5	Seattle WWTF
6	Seattle Branch
7	US Ecology Seattle
8	Heritage Crystal Clean Lakewood
9	NRC Environmental- Seattle
10	NRC Environmental- Spokane
11	Emerald Services- Seattle (Marginal Way)
12	Emerald Services- Vancouver WA
13	Emerald Services- Spokane Valley WA
14	Emerald Services- Seattle (Airport Way)
15	Pasco Facility US Ecology
16	Clackamas [a]

Table Note

a The Clackamas facility is located in Oregon. For this facility, a 10-mile radius was used to scope areas of concern for potentially impacted communities.

The EPA EJ screening tool identified twelve census blocks with a Demographic Index greater than or equal to the 80th percentile within the 10-mile buffer surrounding the Clackamas Facility. Any blocks that had the Demographic Index in the 80th percentile or above were then analyzed more closely using relevant environmental metrics, including proximity to superfund sites and proximity to wastewater discharge points. Upon further evaluation, only two of the twelve blocks exceed the 80th percentile threshold for the relevant environmental metrics.[99] With only two census blocks meeting both criteria, there is little to no chance for EJ communities to experience disproportionate impacts if a spill were to occur at this facility.

Across the state of Washington, 20 percent of all communities are deemed EJ communities under the criteria described in Section 3.11.1 above. Using the methodology and process described above, 29 percent of all census tracts within 10 miles of a fire station or a 10-day hold facility are EJ communities. Since the EJ census tracts within 10 miles of fire stations and hold facilities account for more than 20 percent of the total number of tracts within this buffer zone,

[99] US Environmental Protection Agency. Environmental Justice Screening and Mapping Tool (Version 2.2). Available at: https://ejscreen.epa.gov/mapper/

there is the potential for EJ communities to bear a slightly larger burden than other communities relative to their prevalence if any environmental impacts are expected.

As noted above, in the state of Washington there is an added step when dealing with dangerous waste and potential disposal of state only dangerous waste at non-TSD's outside the state. While the requirement does not specify the need for consultation with the receiving state, or give guidance on "adequate consultation, best practice would suggest that the EJ analysis extend to potentially impacted sites and that communities impacted by the alternative be included in the analysis. Because several of the alternatives use sites that are located outside of Washington, additional analysis was done to gauge the potential impact on receiving communities from an environmental justice perspective. Examined sites included:

- Incineration Sites
  - Aragonite Incineration Facility in western Utah.
  - Kimball Incineration Facility in southwest Nebraska.
- Landfills
  - US Ecology Idaho is a permitted landfill outside of Grand View, Idaho.
  - US Ecology Nevada is a permitted landfill in Nevada
- Injection Sites
  - US Ecology Winnie near the town of Winnie, Texas
  - Advantek Cavern Solutions in central Kansas.

For each facility, a 10-mile radius was used to scope areas of concern for potentially impacted communities. Any site that had a Demographic Index in the 80th percentile or above was then analyzed more closely using relevant environmental metrics, including proximity to superfund sites and proximity to wastewater discharge points. Using this criterion, only US Ecology Winnie had a community above the 80th percentile for the Demographic Index within the 10-mile radius. Upon further inspection, no communities within the 10-mile buffer exceed the 80th percentile threshold for relevant environmental metrics. This indicates that there is no potential for disproportionate impacts if a spill were to occur at this site. The remaining sites did not require further consideration, as none of the communities within a 10-mile radius fell above the 80th percentile for the Demographic Index.

The same methodology was used to evaluate transportation routes in Washington and those associated with transporting material to the above sites and the 10-day hold facility in Oregon. Using this criterion, none of the routes met the criteria for further consideration.

3.11.3.1 Impacts Common to All Action Alternatives

Accidental Release of AFFF

For all action alternatives, the greatest potential risk to communities is the release of AFFF due to spills, leaks, upset conditions, or other accidental releases to the environment. AFFF

concentrate contains organic solvents, chemical stabilizers, and surfactants. As a result, it is a serious eye irritant, may cause skin and respiratory irritation, and is harmful when swallowed. It also contains PFAS compounds, which are persistent in the environment and known to adversely impact the health of living organisms.

Release Mechanism

AFFF concentrate may leak from corroded containers, distribution pipes, or storage tanks and may spill during transfer of AFFF between containers or while containers are being transported between locations.

Relative Risk of Release

Accidental releases during routine handling of AFFF concentrate within an existing permitted waste management facility or at a 10-day hold facility would be contained within the facility and promptly cleaned up by appropriately trained personnel.

The risk of release of AFFF to the environment during transportation is discussed generally in Section 3.10, Transportation. Based on the use of heavy trucks to transport the waste, the use of containers appropriate for hazardous waste during transport, the low probability of an accident, and the high degree of emergency response preparedness along interstate highways, the relative risk of release was determined to be low.

Storage and handling of AFFF at fire stations participating in the AFFF program presents a low risk of release. AFFF is stored at fire stations in buckets, containers, storage tanks, fire engine tanks, and carboys. Foam residue may be present in sprinkler systems, storage pipes, and charged pipes. Were AFFF to leak from an AFFF location during a spill, or improperly stored containers to leak AFFF directly to the environment, communities could be impacted. The potential for a spill at a fire station to present a risk to EJ communities depends on several factors:

- **The amount spilled**. Per fire station responses to our questionnaire, fire stations may possess anywhere from 3 gallons of AFFF to more than 500 gallons of AFFF. Most fire stations have less than 55 gallons of AFFF on hand; however, a few fire stations possess significant quantities of AFFF (5,000 gallons and 12,000 gallons).
- **The substrate onto which the material is spilled**. Based on review of aerial photographs, most exterior spills at fire stations would occur over paved surfaces from which they could be readily vacuumed. However, in some areas, exterior spills could occur over gravel or vegetated surfaces, through which spilled AFFF could percolate into the soil and move into groundwater.
- **The ability of the spill to move offsite**. Many fire stations are curbed to separate pavement from vegetated areas. These curbed, paved areas may also contain vaults which would keep the spill from moving offsite. Other fire stations are not curbed. Spills at these locations may move offsite if not cleaned up promptly. Depending on the fire station, offsite spills may flow into a community through the air, soil or water source.

- **The proximity of the fire station to EJ communities**. If the fire station is not adjacent or proximal to a community, then there's little to no risk of exposure to these communities from a spill.
- **Facility spill response planning**. All fire stations are required to prepare and implement a Facility Spill Response Plan (FSRP) to prevent, contain, and clean up spills. The FSRP requires that each station maintain a spill kit and establish spill response cleanup procedures and reporting requirements.

3.11.3.2 Impacts Specific to Each Action Alternative

This section reviews the impact of each alternative to air, greenhouse gas exposure, earth and water resources, aquatic resources, terrestrial biology, vegetation, and human health and safety. We then describe the potential environmental justice impacts. When significant adverse impacts were identified for elements of the environment, we assessed these environmental impact determinations for the potential to disproportionately affect environmental justice populations of interest. We also considered mitigation measures that could avoid, minimize, or reduce the identified impact below the level of significance. Project impacts that would be effectively mitigated are not anticipated to result in disproportionate impacts on environmental justice populations of interest, but those significant impacts and mitigations are also noted here.

3.11.3.3 Alternative 1: Approved Hold in Place

Under this alternative, AFFF would be held in place at participating fire stations until a later date. As discussed elsewhere, any AFFF that might spill during transfer into new containers on-site at a station would be promptly cleaned up and not expected to migrate. Construction of any required AFFF storage facilities or secondary containment would occur within the developed area of the fire department and would not affect surrounding communities.

TABLE 3.11-3: Relative Risk Associated with Alternative 1 by Resource

Air Quality Impacts	Greenhouse Gas Impacts	Earth and Water Resources Impacts	Aquatic Resources Impacts	Terrestrial Biology Impacts	Vegetation Impacts	Human Health & Safety Impacts
Risk: low. Consequences: insignificant.	Risk: none. Consequences: none.	AFFF that might spill during transfer into new containers would be promptly cleaned up and not expected to migrate.	AFFF that might spill during transfer into new containers would be promptly cleaned up and not expected to migrate.	AFFF that might spill during transfer into new containers would be promptly cleaned up and not expected to migrate.	AFFF that might spill during transfer into new containers would be promptly cleaned up and not expected to migrate.	AFFF that might spill during transfer into new containers would be promptly cleaned up and not expected to migrate.

Relative Risk of Release

Based on the information in Table 3.11-3, there are no impacts associated with leaving AFFF in place that would have the potential to disproportionately affect communities with high environmental justice concerns.

3.11.3.4 Alternative 2: Incineration

Under this alternative, both liquid and solid AFFF materials, including containers, would be transported out of state to a permitted facility and incinerated. Incineration of AFFF produces residual ash and air emissions (discussed in Section 3.1: Air Quality). Residual ash would be properly disposed of in a hazardous waste landfill.

Release Mechanism

Although many PFAS have low volatility, PFAS compounds may become airborne from some industrial releases (for example, stack emissions). The release mechanism of PFAS into the environment from incineration is discussed in Section 3.1: Air Quality. Incomplete incineration of AFFF may deposit residual PFAS in the surrounding soils and nearby surface water bodies if thermal treatment does not adequately control fluorinated products of incomplete combustion (PICs).

TABLE 3.11-4: Relative Risk Associated with Alternative 2 by Resource

Air Quality Impacts	Greenhouse Gas Impacts	Earth and Water Resources Impacts	Aquatic Resources Impacts	Terrestrial Biology Impacts	Vegetation Impacts	Human Health & Safety Impacts
Risk: low. Consequence: insignificant.	Impacts: below federal and WA thresholds; see Section 3.2.2.	The relative risk of release of PFAS to surface water or groundwater resources from incineration of AFFF is low to insignificant.	Incineration of AFFF presents a low risk of release of PFAS compounds to sensitive aquatic resources.	Incineration of AFFF therefore presents a low risk of release of PFAS compounds to terrestrial wildlife or habitats.	The low relative risk of release for the incineration alternative would result in very little impact on the vegetation community.	Incomplete incineration of AFFF may deposit residual PFAS in the surrounding soils and nearby surface waterbodies if thermal treatment does not adequately control fluorinated products of incomplete combustion. Discharge from the incineration of AFFF from the project would not affect water resources. Deposition onto soils could occur in trace or very low measurable quantities. Therefore, the risk to these resources from incineration is low.

Relative Risk of Release

Since no impacts of significance were identified for any of the resources under consideration, as outlined in Table 3.11-4, and since the EJ screening analysis did not identify any communities of concern within a 10- mile radius of either the Aragonite or Kimball facilities, there are no disproportionate impacts. Incineration of AFFF at either the Aragonite or Kimball facilities will not disproportionately affect communities with high environmental justice concerns.

3.11.3.5 Alternative 3: Solidification and Landfilling

Under this alternative, AFFF would be solidified in a neutral matrix, such as concrete, to minimize PFAS mobility. Then it would be buried in a RCRA-permitted hazardous waste landfill. Containers would also be buried.

Release Mechanism

The primary release mechanism of AFFF containing PFAS at landfills is through leaks and spills during handling of AFFF containers. AFFF disposed of at the landfills will need to be stabilized through solidification before being disposed of in a designated waste management unit. During this process, there is the possibility that a spill or leak can occur. However, this process shall occur within secondary containment such that any leaks or spills are contained and can be properly managed. For more details see Section 3.3.4.5: Alternative 3: Solidification and Landfilling.

TABLE 3.11-5: Relative Risk Associated with Action Alternative 3 by Resource

Air Quality Impacts	Greenhouse Gas Impacts	Earth and Water Resources Impacts	Aquatic Resources Impacts	Terrestrial Biology Impacts	Vegetation Impacts	Human Health & Safety Impacts
Risk: low. Consequences: insignificant.	Risk: high. Consequences: insignificant.	The relative risk of release of AFFF to the environment from either US Ecology Idaho or US Ecology Nevada is considered insignificant because leachate is managed on site through collection, liners, and evaporation ponds.	Solidification and landfill storage of AFFF presents a low risk of release into sensitive aquatic environments.	Solidification and landfill storage of AFFF presents minimal risk of release into sensitive terrestrial environments.	Would not be a significant impact to the vegetation community through the solidification and landfilling alternative.	Risk:low. Leachate would be removed from the landfill unit through the leachate collection and recovery system (LCRS). AFFF would be solidified under this alternative, minimizing the leaching of PFAS from the AFFF.

Relative Risk of Release

Since no impacts of significance were identified for any of the resources under consideration, as outlined in Table 3.11-5, and since the EJ screening analysis did not identify any communities of concern within a 10-mile radius of either the US Ecology Nevada or US Ecology Idaho sites, there are no disproportionate impacts. Solidification and disposal will not disproportionately affect communities with high environmental justice concerns.

3.11.3.6 Alternative 4: Class I Deep Well Injection

Under this alternative, AFFF would be injected into receiving formations at either Advantek Cavern Solutions in Kansas or US Ecology Winnie, Texas. Advantek Cavern solutions injects non-hazardous liquid waste into salt caverns through a set of Class V underground injection wells at depths between 526 feet and 781 feet below ground (Advantek, 2022). US Ecology Texas injects

non-hazardous waste into the Miocene, Caprock, Pliocene, and Lafayette Gravel Formation at approximate depths between 880 and 1,980 feet below ground level (TCEQ, 2009).

Release Mechanism

The primary release mechanism for the injection site would be the accidental release or spilling of AFFF during the injection process into a deep-water aquifer. While rinsing the AFFF containers used to transport the waste, it is possible that AFFF may be released to the soil. Additionally, during the disposal of the AFFF into the deep water well, there could be a malfunction in the injection procedure that could result in the accidental release of AFFF to the environment.

TABLE 3.11-6: Relative Risk Associated with Action Alternative 4 by Resource

Air Quality Impacts	Greenhouse Gas Impacts	Earth and Water Resources Impacts	Aquatic Resources Impacts	Terrestrial Biology Impacts	Vegetation Impacts	Human Health & Safety Impacts
Risk: low. Conse-quences: insignificant.	Risk: low. Conse-quences: insignificant.	Relative risk of release is considered low.	Class I deep well injection of AFFF presents a low risk of release into sensitive aquatic environments.	Class I deep well injection of AFFF presents a low risk of release into sensitive aquatic environments.	There will not be a significant impact to the vegetation community.	Risk:low. Although unlikely, AFFF injected underground may migrate away from the injection zone in wells that are not properly sited, constructed, or maintained, and potentially contaminate drinking water aquifers.

Relative Risk of Release

Since no impacts of significance were identified for any of the resources under consideration, as outlined in Table 3.11-6, and since the EJ screening analysis did not identify any communities of concern within a 10-mile radius of either Advantek Cavern Solutions in Kansas or US Ecology Winnie, Texas sites, there are no disproportionate impacts. Solidification and disposal will not disproportionately affect communities with high environmental justice concerns.

3.11.3.7 Alternative 5: No Action

While the no action alternative generally has the same significance impacts as Alternative 1: Approved Hold in Place, there are some differences. Under Alternative 1, it is assumed that action would be taken at some point to stabilize and contain the materials left on-site. Under Alternative 5, the assumption is that no action of any kind would be taken.

As noted in Section 3.3: Earth and Water Resources, because no immediate actions would take place, the relative risk of any release (other than accidental release) cannot be evaluated until an action is taken. Sections 3.4: Aquatic Resources and 3.5: Terrestrial Biology also note that there is a risk associated with degradation of storage containers and that the risk is likely to increase over time. Here again, however, there is no information available with respect to potential time horizons or durability of storage containers. As a result, it is impossible to evaluate the relative risk associated with this alternative.

That said, because there are no communities in proximity that met the EJ criteria for designation as a community of concern, there is no potential for disproportionate risk associated with this alternative.

3.11.4 Mitigation Measures

For all alternatives, mitigation measures to reduce the likelihood of a spill or a release would help reduce the impact on EJ communities. The following practices would be beneficial in the handling and transportation of AFFF from the fire stations in Washington State to the various storage and disposal facilities:

- Proper training and handling of AFFF by experienced personnel.
- Awareness of emergency response protocols by all personnel in the event of a spill – simulate response for various potential situations.
- Immediate cleanup and rapid emergency response in the event of an AFFF spill.
- Secondary containment of AFFF whenever possible.
- Safe driving habits during the transportation of the material.

3.11.5 Cumulative Impacts

Chapter 5: Cumulative Impacts discusses potential cumulative impacts related to the AFFF program.

3.12 Public Services and Utilities

3.12.1 Affected Environment

Affected environment involves potential impacts on public services and utilities resulting from the collection and transportation of AFFF from Washington's municipal fire departments on public services and utilities. The four proposed alternatives and no action alternative analyzed in this EIS may affect the demand and availability of public services and utilities, including fire protection and emergency medical response, police and security services, hospital services, and water supply.

3.12.1.1 Existing and Evolving Regulations

Police, Fire Departments, and Emergency Services

The Emergency Planning and Community Right-to-Know Act (EPCRA)

The Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 was authorized by Title III of the Superfund Amendments and Reauthorization Act to help communities plan for chemical emergencies. It requires industry to report on the storage, use, and releases of certain chemicals to federal, state, tribal, territorial, and/or local governments. It also requires these reports to be used to prepare for and protect their communities from potential risks.

The emergency planning provisions of EPCRA (Sections 301-305) are designed to develop state and local government hazardous chemical emergency preparedness and response capabilities through better coordination and planning, especially at the local level.

Other community right-to-know provisions of EPCRA require the owners and/or operators of facilities to provide information about the nature, quantity, and location of reportable chemicals manufactured, processed, stored, or used at their facility sites. The purpose of these provisions is to increase public knowledge of the presence of hazardous chemicals in communities and to better prepare for potential emergencies.

National Fire Incident Reporting System (NFIRS)

RCW 43.44.060 requires fire incidents to be reported to the Washington State Fire Marshal's Office (SFMO) in accordance with the National Fire Incident Reporting System (NFIRS). The SFMO maintains the statewide NFIRS database. The reporting system that enables every fire agency to document incidents electronically in a uniform format. Many agencies document and report all incidents, while some agencies only report fires as required by statute.

Medical Services and Facilities

Engrossed Substitute Senate Bill 5084

The Washington Legislature passed ESHB 1714 in 2017 to address staffing practices at state medical facilities. The law requires hospitals to submit their nurse staffing plans to the Department of Health by January 1, 2019 and annually thereafter. Details of the requirements are in found in Washington's revised code of regulations[100]

[100] RCW 70.41.420.

Recreation Resources

Washington State Recreation and Conservation Plan 2018-2022

Provides a strategic direction for how local, regional, state, and federal agencies, tribal governments, and private and non-profit partners can work to together to make sure Washington residents' outdoor recreation and conservation needs are being met.

Wastewater and Water Quality

Clean Water Act

The federal Clean Water Act (CWA) of 1972 as amended establishes water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the CWA is the National Pollutant Discharge Elimination System (NPDES), administered by the U.S. Environmental Protection Agency (EPA). The EPA authorized the State of Washington to manage the NPDES permit program through the Washington State Legislature. Ecology is authorized to enforce obligations for the state wastewater discharge permit program[101] Current requirements for water treatment are in the NPDES General Permit Factsheet (Ecology 2019).

Water Pollution Control Act

The Water Pollution Control Act water quality standards ensure the purity of all waters of the state are consistent with public health and public enjoyment thereof, the propagation and protection of wildlife, birds, game, fish and other aquatic life. It also ensures that the industrial development of Washington's water quality programs are consistent with federal laws governing navigable U.S. waters. Washington's state and regional water control agencies carry out provisions of the federal Clean Water Act in a joint effort to extinguish the sources of water quality degradation and preserve and vigorously exercise state powers to insure that present and future standards of water quality are maintained.

The Washington State Department of Health

Washington's Department of Health provides most of the regulatory control over water pollution production, specifically regarding their production of potable and industrial water. It focuses on the equipment, chemicals, and operations used by water treatment plants during production of finished water. Ecology's regulatory interest in water treatment plants focuses on their generation, treatment, and disposal of wastewater created during production.

Permits for solid waste generation include a site-specific solid waste control plan that describes the details of the characteristics and sources of solid waste, the rate of generation, and disposal methods. The plan must comply with any applicable requirements of the jurisdictional health department and any local requirements for a solid waste permit. The Permittee must update the plan as necessary to reflect changes in solid waste handling and disposal and keep the plan on site and available for inspection by Ecology.

Energy Resources

Federal Powers Act (FPA)

The federal Public Utility Act of 1935 (PUA) Title II PUA created the Federal Power Act. Part I of the FPA addressed licensing of nonfederal hydropower projects on navigable waters. Part II of

[101] RCW 90.48.

the FPA addressed the regulation of electric utilities engaged in interstate commerce, delineating federal and state jurisdiction, respectively, with respect to wholesale and retail sales. Under the FPA, the Federal Energy Regulatory Commission (FERC) has the authority to regulate electric transmission policy in the continental United States.

Energy Policy Act (EPA)
In 2005, the FPA was amended to include the Energy Reliability Act, which gives FERC jurisdiction to approve and enforce electric reliability standards implemented by energy reliability organizations and regional entities pursuant to sections 201(f) and section 215 of the FPA, authorizes FERC to approve and enforce compliance with FPA reliability standards.

Washington Utilities and Transportation Commission (UTC)

The UTC has a responsibility to help create, monitor, and enforce reliability standards and promote activities that ensure the reliability of the Bulk Power System in the Western Interconnection.

3.12.1.2 Environmental Setting

The study area for assessing impacts of proposed alternatives on public services and utilities varies by individual public service or utility. The program study area for police departments, fire departments, and medical services, and other public services includes the following:

- The geographic extent of Washington's police department's jurisdiction for police services and security services coverage.

The geographic limits of Washington's fire department's jurisdiction for fire protection, emergency medical response services, and major hospitals throughout the state.

The transportation corridors for each alternative consists of the geographic limits served by police departments, fire protection districts, and emergency medical responders, schools, water and utility services.

The use and availability of utility services would differ by utility type and extent of service territory for each utility. The study area used to assess effects to utility infrastructure is defined by activities involving collection of AFFF at each of the 113 fire stations and transport to 10-day hold facilities where AFFF is prepared for final disposal.

Recreational activities occur on state waterways, public lands, recreational sites, and within state and local parks. Residents and visitors from throughout the state use these areas for fishing, kayaking, whitewater rafting, hiking, hunting, birdwatching, camping, and other recreational activities.

Washington Police and Emergency Services

Washington State Patrol (WSP)
Commissioned Washington State Patrol (WSP) troopers carry out the agency's primary goal of providing a safe motoring environment for the public. They are responsible for enforcing traffic laws, investigating collisions, and assisting motorists on 17,524 miles of the state's highways.

WSP employs 2,211 commissioned and civil service employees, including 91 troopers, 43 canine handlers, 6 commercial vehicle officers, and 8 commercial vehicle safety officers and commercial vehicle troopers.

WSP also employs two full-time tribal liaisons responsible for providing guidance on the inclusion of tribal issues in the development of agency plans, programs, and policies, including Ecology's AFFF collection, transportation and disposal program.

The Field Operation Bureau oversees eight geographic districts. Each district is faced with unique characteristics and challenges. The bureau is responsible for the safety of the motoring public on interstate highways and state routes across Washington[102].

According to the Washington State Patrol Annual Report (2021), WSP:

- Made 847,286 contacts.
- Answered 215,695 calls for service.
- Investigated 35,505 collisions.
- Arrested 12,582 impaired drivers.

Specific responsibilities of WSP include, but are not limited to, the following duties:

- Advising the State Emergency Response Commission (SERC) on emergency response and coordination of on-scene activities on state and interstate highways and other areas where it has been designated as an incident command agency.

Providing first responder training and maintaining related records for state hazardous materials training as authorized through Section 305 of the EPCRA explained in section 3.13.2.

Serving as advisor for emergency responder equipment and training needs at the state and local levels.[103]

Washington State Fire Service

Washington encompasses 457 fire departments and service agencies (see Chapter 2, Project Description and Alternatives). These are staffed by career firefighters, volunteer firefighters, or a combination of both. In addition to the agencies described above, fire and emergency response organizations in the study area are associated with the Washington Department of Natural Resources and U.S. Forest Service. The state fire service provides fire protection with its own personnel and equipment or through various cooperative agreements with local fire jurisdictions (Washington State Fire Marshal's Office 2018).

Of the 39 counties in Washington, 13 have populations of over 100,000, representing 86 percent of the state's population. As shown in Table 3.12-1, in 2021, approximately 87 percent

[102] Washington State Patrol Website. Accessed July 23, 2023. https://www.wsp.wa.gov/driver/enforcement/.
[103] WAC § 118-40-080

of reported incidents were a result of fire occurring in the most densely populated counties. Structure fires accounted for 83 percent of that amount. Vehicle fires represented 11 percent, and vegetation fires (both natural and cultivated) were responsible for just under 1 percent of the total (SFMO 2021).

In 2021 Washington fire agencies responded to over 884,000 incidents, including 617,000 emergency medical service calls, 91,000 good intent calls, 102,000 service calls, over 48,000 false alarms, and over 30,000 fire calls (SFMO 2021).

Section 3.12-2, Existing and Evolving Regulations explains that Washington's fire agencies are required to report fire incidents to the SFMO. In 2021, 322 of the state's 457 fire agencies submitted incident reports to the national reporting system, representing 70 percent of active fire departments.

These incidents translate to one fire department response every 36 seconds, one fire every 17.52 seconds, and one EMS/Rescue incident every 51 seconds (SFMO 2021).

The 2021 annual report shows that there were more than 30,364 fire incidents reported in the state in 2021. This is an increase of 19 percent over 2020. Natural vegetation fires were the leading type of fire reported over the past five years, accounting for just over 27 percent of the total. Structure fires were the second leading type of fire incident type reported, accounting for approximately 27 percent of the fires reported.

TABLE 3.12-1: Washington State National Fire Incident Fire Reporting 2021

Incident Type	13 Counties with Populations over 100,000		26 Counties with Populations under 100,000		Statewide	
	Total # of Incidents	% of Total	Total # of Incidents	% of Total	Total # of Incidents	% of Total
Rescue and Emergency Medical Service	537,264	60.76%	79,912	9.04%	617,176	69.80%
Good Intent Calls	92,503	10.46%	10,046	1.14%	102,549	11.60%
Service Calls	56,374	6.38%	9,333	1.06%	65,707	7.43%
False Alarms and False Calls Total	43,469	4.92%	5,274	0.60%	48,743	5.51%
Fire Protection System Malfunction	12,527	1.42%	1,475	0.17%	14,002	1.58%
Malicious or Mischievous False Alarm	9,967	1.13%	1,245	0.14%	11,212	1.27%
Unintentional False Fire Protection System Activation	20,975	2.37%	2,554	0.29%	23,529	2.66%
Fire Total	25,884	2.93%	4,480	0.51%	30,364	3.43%
Cultivated Vegetation Fires	83	0.01%	36	0.00%	119	0.01%
Fire, other	1,316	0.15%	329	0.04%	1,645	0.19%
Fixed Mobile Property Fires	276	0.03%	88	0.01%	364	0.04%
Natural Vegetation Fires	6,503	0.74%	1,510	0.17%	8,013	0.91%
Outside Rubbish Fires	6,781	0.77%	412	0.05%	7,193	0.81%
Outside Storage & Equipment Fires	2,147	0.24%	127	0.01%	2,274	0.26%
Structure Fires (including Confined Fires)	5,705	0.65%	1,371	0.16%	7,076	0.80%
Vehicle Fires (Mobile Properties)	3,073	0.35%	607	0.07%	3,680	0.42%
Hazardous Conditions (No Fire)	11,628	1.32%	1,887	0.21%	13,515	1.53%
Other Types of Incidents	3,876	0.44%	557	0.06%	4,433	0.50%
Overpressure Rupture, Explosion, Overheat (No Fire)	796	0.09%	244	0.03%	895	0.10%
Severe Weather and Natural Disaster	577	0.07%	99	0.01%	821	0.09%
Grand Total	**772,371**	**87.35%**	**111,832**	**12.65%**	**884,203**	**100%**

Table adapted from: 2021 Fire in Washington Annual Report. Washington State Patrol, Washington State Fire Marshal's Office. https://www.wsp.wa.gov/wp-content/uploads/2022/04/Fire_in_Washington_Report.pdf.

Hospitals and Medical Facilities

The Washington State Department of Health works with the state's 35 local health agencies, tribal health partners, and the state's healthcare system offering technical assistance and services to support Washington's public health system. The cities of Seattle and Spokane are home to four and two of the 10 largest general hospitals in Washington State, respectively. The remaining top four hospitals are in Everett, Vancouver, Tacoma, and Olympia. Washington's 10 largest hospitals as of 2021 range in numbers of beds from 385 to 697 (Hospital Management Net. 2021). Three types of hospitals are licensed in Washington State: acute care, alcohol and chemical dependency hospitals, and private psychiatric hospitals. The Department of Health regularly collects data from hospitals and Emergency Medical Services (EMS). Data are collected on the pre-hospital EMS system, hospital discharges, hospital financial reports, charity care and adverse events that occur in hospitals. This information describes important elements of healthcare in Washington (Washington State Department of Health 2023a).

Education

Washington Public School System

The Washington public school system (prekindergarten through grade 12) operates within districts governed by locally elected school boards and superintendents. In 2022, Washington had 1,138,272 students enrolled in a total of 2,474 schools in 306 school districts. There were 62,310 teachers in the public schools, or roughly one teacher for every 18 students, compared to the national average of 1:16. In 2020, Washington spent on average $14,556 per pupil (US Census Bureau 2020). The state's graduation rate was 81 percent in the 2018-2019 school year.

Washington's higher education system is composed of 87 colleges and universities. Of these, 43 are public institutions, 29 are nonprofit private schools, and 15 are for-profit private institutions.

Recreation Resources

Washington's public recreation and open spaces are managed by several state agencies including:

- Washington Department of Ecology.
- Washington Department of Health.
- Washington Department of Fish and Wildlife Nature Tourism.
- Washington Department of Natural Resources.
- Washington State Parks and Recreation Commission.
- Washington Tourism.
- National Park Service.
- U.S. Forest Service.
- Bureau of Land Management.

The Washington State Recreation and Conservation Office (RCO) provides grants for protection and restoration of plant and animal resources, farmlands, and forestlands.

Water Quality, Stormwater, and Wastewater Treatment

More than 6.2 million Washington State residents, 85 percent of the state's population, get their drinking water from public water systems (Washington State Department of Public Health 2023c). The Washington Department of Public Health and Ecology work together to integrated common directives to ensure wastewater regulations are implemented.

Wastewater Management

Wastewater and solid waste utilities are typically provided by counties and cities. In rural communities, wastewater is primarily treated through private septic systems. The Wastewater

Management Program is responsible for the safe treatment and dispersion of domestic, non-industrial wastewater in areas of Washington not served by municipal sewage treatment works. Wastewater is the water that leaves industries, businesses, farms, and homes. This includes water from sources like sinks, showers, toilets, pulp mills, and manufacturing companies. Different contaminants and pollutants enter wastewater depending on how and where water is used.

Wastewater is treated at regulated facilities called wastewater treatment plants (WWTP). There are more than 600 WWTPs in Washington. Each plant's discharge must meet federal and state water quality standards. All of the WWTP operators in charge of running the municipal plants must also be state certified. Plant size and treatment methods vary depending on the climate, wastewater source, population served and/or industry size.

There are four levels of full certification that are based on wastewater operating experience and education. The requirements and allowable substitutions for each level are listed in the rule (WAC 173-230-250). Each level also requires passing an exam.

If a municipality or commercial industry releases wastewater into state or federal waters (groundwater or surface water), they must obtain a permit.

Stormwater Management

Stormwater is rain and snow melt that runs off rooftops, paved streets, highways, and parking lots. As it runs off, it picks up pollution like oil, fertilizers, pesticides, soil, trash, and animal manure. Stormwater runoff from construction sites can carry muddy water, debris, and chemicals into local waterways.

Regulated construction sites in Washington must be covered under the Construction Stormwater General Permit (CSWGP). Following the requirements in this permit helps control and reduce water pollution.

Under the CSWGP, operators of regulated construction sites are required to:

- Develop stormwater pollution prevention plans.
- Implement sediment, erosion, and pollution prevention control measures.
- Obtain coverage under the permit.

The current CSWGP permit went into effect on Jan. 1, 2021, and expires on Dec. 31, 2025 (Ecology 2023a).

Municipal stormwater permits both require discharge monitoring and options to continue discharge monitoring at a stormwater outfall.

Associated Permits

Ecology issues permits under federal and state laws to control surface and groundwater pollution from runoff. The most populated cities and counties, as well as industrial sites, construction sites, and many businesses have stormwater permits.

- State Waste Discharge permits (SWD permits) regulate discharges from municipalities or industries to groundwater; or commercial industry to a publicly owned treatment works (POTWs).

- Water Quality Permits**.** National Pollutant Discharge Elimination System (NPDES) Wastewater Discharge Permits regulate direct discharges to surface water from POTWs or commercial industry. The EPA delegates Ecology to write these federal permits. These permits are a requirement under section 401 of the Clean Water Act. General water quality permits regulate specific categories of discharge, such as stormwater or wineries, which release treated storm/wastewater to either surface or groundwater. General permits are required for facilities that have treatment plant discharges of wastewater to surface and groundwater and that meet the following criteria:

    - Produce 35,000 gallons per day or more (monthly total divided by the number of days in the month) of finished drinking and industrial water.
    - The primary function of the facility is treatment and distribution of potable or industrial water.
    - Produces wastewater by filtration processes.
    - Is not a part of a larger permitted facility.

Phase II Permit Audit Program

Implemented in 2015, Ecology's compliance strategy reviews Stormwater Management Program (SWMP) elements and focuses on counties and cities. The SWMP components to be evaluated will be selected based on permit requirements and deadlines. In addition to improving knowledge of local operations, priorities and constraints, the audit program:

- Clarifies permit requirements and implementation expectations for permittees.
- Assesses compliance.
- Helps determine if improvements are needed to more effectively implement permit requirements.
- Documents positive elements of programs that may benefit other permittees.

Energy

The Washington Utilities and Transportation Commission (UTC) regulates private, investor-owned electric and natural gas utilities in Washington. It is the commission's responsibility to ensure regulated companies provide safe, reliable, and equitable services to customers at reasonable rates, while allowing them the opportunity to earn a fair profit (UTC 2023).

The Northwest Regional Planning Area is the area defined by the Pacific Northwest Electric Power Planning and Conservation Act. It includes the states of Oregon, Washington, and Idaho; Montana west of the Continental Divide; portions of Nevada, Utah, and Wyoming that lie within the Columbia River drainage basin; and any rural electric cooperative customer not in the geographic area.

The Columbia River provides water for vast hydroelectric projects including Washington's Grand Coulee Dam, one of the largest hydroelectric power plants in the world and the largest hydroelectric power producer in the US. Washington's agricultural areas in the east and those from the state's western forests provide ample biomass resources, and many areas of the state have significant wind power development potential. The state has five petroleum refineries, which provide the only crude oil refining capacity in the Pacific Northwest. Washington also is the only Pacific state other than California that generates nuclear power (US Energy Information Administration 2023).

Washington's 2021 energy distribution by source:

- Biomass and other: 1.6 percent.
- Coal: 2.9 percent.
- Nuclear: 7.8 percent.
- Wind: 8.7 percent.
- Natural Gas: 14.4 percent.
- Hydro Power: 64.6 percent.

Renewable energy was the leading source of electricity production in Washington State in 2021, with hydropower alone accounting for almost two-thirds of the power generated. Natural gas ranked second, but by a wide margin, representing some 14.4 percent of Washington's electricity generation that year (Statista Research Department 2023).

Washington State Public Utility Providers

Washington Public Utility Districts (PUDs) provide energy, water, sewer, and wholesale telecommunications services. Twenty-eight PUDs serve customers across the state. PUDs provide electric, water, sewer, and telecommunications services and have the authority to produce and distribute renewable natural gas and renewable hydrogen.

PUDs are not-for-profit, locally regulated utilities authorized in 1930 by a voter-approved initiative. Their charter under state law is to "conserve the water and power resources of the State of Washington for the benefit of the people thereof, and to supply public utility service, including water and electricity for all uses."[104]

[104] RCW 54

The Washington Public Utility Districts Association (WPUDA) represents 27 not-for-profit, community-owned public utility districts as well as one joint operating agency, Washington State Department of Labor and Industries (Washington State Department of Labor and Industries 2023).

The probability of risk to energy resources and reliability will significantly increase over the next decade. Factors include temperature extremes, changing loads, and trends in energy transmission.

In 2021, Washington generated almost 111 million megawatt-hours of electricity and imported slightly more than 5 million. The state used slightly more than 88 million megawatt-hours and exported just over 25 million. That translates to roughly 20 million megawatt-hours in net exports. By 2050, the state's power needs are estimated to increase by 97 percent, or almost 230 million megawatt-hours. As of 2023, the Pacific Northwest generated more than 7 gigawatts (GW) of wind and solar power. PNUCC estimates an additional 17 GW of new resources are expected to be interconnected in the next decade (PNUCC 2023)

In 2023, utilities focused on the need for sufficient capacity to meet a rising demand for electricity on top of the transition to clean energy. The 2023 forecast shows northwestern US utilities are anticipating a significant increase in loads over the next five years and working to meet a growing demand for electricity with renewable resources, energy storage and dependable capacity.

The 2023 forecast reflects accelerated and steeper regional load growth compared to previous years. Much of this load growth is attributed to more certainty in prospective new industrial loads over the next five years. The 2023 loads reflect a markedly different trajectory than past forecasts, with a 20 percent increase in load growth in the first five years. Much of the expected growth can be attributed to new industrial customers' solidifying plans and schedules for development. The projected loads flatten out over the latter five years of the 2023 forecast. Annual energy, winter and summer peak forecasts, increase at roughly the same magnitude in the first five years, indicating that prospective new loads are flat and not necessarily seasonal.

Energy Efficiency

The majority of Northwest generation is carbon-free, and hydropower with an annual capacity of 55,400 megawatts. Hydro power provides over half of total utility generation on an energy basis and clean energy resources make up almost 70 percent of the total annual utility generation. With increasing projected loads and the push to decarbonize the power sector, wind, solar, and other clean resources will increase in share. Hydropower will continue to play an important role in reliability because of the Northwest's hydropower storage and flexibility characteristics.

Over the past 40 years, the region has achieved over 7,500 average megawatts of energy efficiency savings, 60 percent of which are from utility programs (PNUCC 2023)

3.12.2 Impact Analysis and Significance Criteria

This section describes the public service and utility providers that could be affected by the proposed project and alternatives and assesses the potential impacts on these public services and utilities.

3.12.2.1 Methodology

To determine if the proposed action and alternative could result in potential impacts on certain public services and utilities, this section of the EIS describes the study area and regulatory setting by services category. Assessments of public services and utilities are primarily qualitative based on an evaluation of how collection, transport, and disposal of AFFF collected from fire departments could alter or reduce access to these services, either directly or indirectly; temporarily or permanently. Descriptions of affected environments consisted of researching publicly available information documented on the websites of water, sewer, and energy service providers. Police, fire departments, emergency services, health care and education services, public schools and recreational facilities includes types of services offered, increases in demand for services, response times, staffing levels, geographic locations, and overlapping responsibilities with other service providers. Such impacts include temporary or permanent loss of access to areas for recreation because of risks to human and environmental health (use of hiking trails, harvesting of plants), changes to water quality or water-based recreation (fishing, swimming, rafting). Recreational areas could also be impacted due to changes in state and local plans and policies relating to recreation areas.

3.12.2.2 Significance Criteria

Police, Fire Departments, and Emergency Services

The proposed action and alternatives would not be expected to have a significant impact on police, fire agencies, or emergency services. Washington's law enforcement and fire protection agencies collectively employ 6,500 state-wide police and fire department personnel. Emergency service calls have noticeably increased in urban locations such as Seattle and Tacoma. While wildfire incidents have increased in number and severity in Washington and elsewhere, the Washington State Patrol (WSP), State Fire Marshal's Office (SFMO), and 457 state, regional, and local fire departments have cooperative and overlapping services, training, certification, and reporting programs that improve incident response reporting and coordination of services. Although actions under alternatives 2, 3, and 4 would involve active collection and transport of AFFF, it is unlikely that collection and transport of AFFF stockpiles at participating fire departments would result in a catastrophic event. Both fire department personnel and Washington's contracted hazardous materials staff would be permitted, trained, and certified in dangerous waste collection and transport procedures. Alternative 1: Approved Hold in Place and Alternative 5: No Action, would not involve removing PFAS-containing foam from Washington's fire prevention and suppression stockpiles. These alternatives would not be consistent with program objectives and legislative code. *Impacts on police, fire and emergency services would be less than significant.*

Schools, Health Care, and Recreation Resources

The geographic extent of public services, including schools, hospitals, libraries, parks, and other recreational uses extend to the entire state. Washington has hundreds of schools, parks and recreational opportunities, and dozens of school districts and park/recreation providers in 39 counties. The exact number of fire and emergency services agency personnel involved in the collection and transport of AFFF is unknown. However, most existing and potential employees live in Washington State and these workers would not require hiring additional employees at schools, hospitals, or recreation facilities. Removal and replacement of PFAS foam would not result in substantial new demands for schools, parks, or recreation facilities in any one location. Therefore, the proposed project and alternatives would not result in significant adverse impacts to schools, park, or recreation facilities.

Tribal Resources and Collective Rights Access

As discussed in Section 3.9 Tribal Resources, tribal lands in proximity to fire stations participating in the AFFF collection and disposal program could be subject to impacts caused by an accidental or intentional release of AFFF in the course of firefighting activities.

The mitigation measures and BMPs presented in Chapters 3 and 4 of this EIS emphasize early consultation and information to potential impacted Tribes. Ecology will prepare traffic control plans, spill response plans, and geographic response plans (GRPs) that include actions designed to reduce or avoid serious injury to sensitive natural and cultural resources exposed to hazardous waste.

Water Quality, Wastewater, and Stormwater Treatment

Activities involving collection, transport, and disposal of AFFF involve stormwater runoff or wastewater treatment of dangerous waste from either groundwater or surface water within the study area. For all program alternatives, the greatest potential risk to surface soils, surface water, and groundwater resources is the release of AFFF due to spills, leaks, upset conditions, or other accidental releases to the environment. Potential impacts to water quality from wastewater and stormwater discharge include fire stations participating in Ecology's product replacement program; 10-day hold facilities, and potential treatment and disposal sites for each alternative. Storage and handling of AFFF at fire stations participating in the AFFF program presents a low risk of release to surface water, and groundwater. Most of the participating fire stations are in urban areas are located on impermeable surface areas susceptible to storm water runoff reaching surface waters, all fire stations are required to prepare and implement a Facility Spill Response Plan (FSRP) to and apply for a general NPDES permit to compliance surface water runoff, and a SWD which regulates infiltration of hazardous and dangerous waste into the state's groundwater supply.

At publication of this Draft EIS, 113 fire departments have reported 59,000 gallons of inventoried AFFF. It is likely that additional fire departments will participate in Ecology's AFFF reporting program, significantly increasing quantities of stockpiled foam to be collected and transported; and potentially increase the risk of accidental release. However, the primary objective in this EIS is to help Ecology make an informed decision for developing and implementing disposal of Class B firefighting foam and provide assistance to fire departments

on how to safely dispose of unused foam. Potential impacts from collection, handling, and transport of AFFF foam would be short-term and temporary.

Energy Resources

The majority of Washington and the Northwest energy generation is carbon-free. Hydropower with an annual capacity of 55,400 megawatts provides over half of total utility generation. Clean energy resources make up almost 70 percent of the total annual utility generation. With increasing projected loads and the push to decarbonize the power sector, wind, solar, and other clean resources will increase in share. Hydropower will continue to play an important role in reliability because of the Northwest's hydropower storage and flexibility characteristics. Over the past 40 years, the region has achieved over 7,500 average megawatts of energy efficiency savings, 60 percent of which are from utility programs. Proposed actions under the AFFF Collection and Disposal program would have no impact on energy resources in Washington State.

4 MITIGATION MEASURES

4.1 AFFF Program Study Area

The study areas for the potentially affected environment include:

- The fire stations participating in our AFFF project.
- The possible temporary storage hold facilities.
- The identified potential AFFF treatment and disposal sites.
- The identified transportation routes.

The study areas include an additional 0.25-mile radius beyond each site, facility, and transportation route. This is the additional area that could reasonably be affected by AFFF collection and disposal activities. For resources within 0.25 miles of a water feature, the study area was expanded to include the water corridor up to 10 miles downstream of its intersection with the 0.25-mile buffer.

4.2 Significance Criteria for Non-Project Actions

An EIS is required for legislation proposals and other major actions significantly affecting the quality of the environment. The lead agency decides whether an EIS is required in the threshold determination process, as directed by the Washington Administrative Code.[105]

In making a threshold determination,[106] the responsible official should determine whether:

- All or part of the proposal, alternatives, or impacts have been analyzed in a previously prepared environmental document, which can be adopted or incorporated by reference.
- Environmental analysis would be more useful or appropriate in the future in which case, the agency shall commit to timely, subsequent environmental review.

In determining an impact's significance,[107] the responsible official shall consider whether:

- The same proposal may have a significant adverse impact in one location but not in another location.
- Absolute quantitative effects of a proposal are also important, and they may result in a significant adverse impact regardless of the nature of the existing environment.

[105] WAC 197-11-330
[106] WAC 197-11-794
[107] WAC 197-11-055 through 197-11-070 and Part Six

- Several marginal impacts when considered together may result in a significant adverse impact when considered together.

4.3 Significant, Adverse Impacts Under SEPA

- Non-project proposals could result in significant, adverse impacts to the following resources:
    - Sensitive or special areas such as historic, scientific, and cultural resources, parks, prime farmlands, wetlands, wild and scenic rivers, or wilderness.
    - Endangered or threatened species or their habitat.
- Non-project proposals may conflict with local, state, or federal laws or requirements for the protection of the environment.
- Program implementation could set a precedent for future actions with significant effects, unique and unknown risks to the environment, or may affect public health or safety.

For some proposed actions, it may be impossible to precisely forecast the environmental impacts because some variables cannot be predicted, and values cannot be quantified. A threshold determination shall not balance whether the beneficial aspects of a proposal outweigh its adverse impacts, but rather, shall consider whether a proposal has any probable significant adverse environmental impacts under SEPA. [108]

The lead agency should consider mitigation measures that will be implemented as part of the proposal, including any mitigation measures required by development regulations.

4.3.1 Hazardous and Dangerous Waste Policy in Washington State

In Washington, unused Class B AFFF stored and used at municipal fire stations, airports, and military facilities is considered a "product." Once the product can no longer be used for its existing purpose or because of legal restrictions, AFFF would become "state-only" dangerous waste. The distinction between a product and waste is important as the state dangerous waste regulations and federal RCRA regulations only apply to solid wastes and not products. Once the AFFF is determined to be a waste, certain requirements must be followed based on the generator status of the facility generating the waste.[109]

4.4 Impacts and Mitigation Measures

A potentially significant, adverse impact common to all project alternatives would be the risk of accidental release of AFFF during collection, transport, and disposal activities. Chapter 3 analyzes potentially significant impacts by:

[108] WAC 197-11-055 through 197-11-070 and Part Six

[109] Department of Ecology Interoffice Memo: AFFF Disposal – Regulatory Roadmap and Overview. Prepared by Jason Landskron, Permit Engineer HWTR-HQ/Regulatory Assistance Unit. December 16, 2022

- Resource area.
- Mitigation measures.
- Avoidance measures.
- Best practices to reduce potentially significant impacts to less-than-significant levels.

A summary of impacts and levels of significance is presented in Table 4-1. The cumulative impacts of the proposed AFFF Collection and Disposal Program are analyzed in Chapter 5.

Alternatives must meet the primary goal: provide us with the environmental and public health information needed to make an informed and transparent decision on how best to safely dispose of the AFFF within the next five years.

To meet acceptable criteria, we must:

- Provide information on environmental and public health risks.
- Involve the public with an appropriate level of collaboration and transparency.
- Provide the best available information on how to safely dispose of AFFF.

Table 4-1 below provides a comparison of environmental impacts and significance levels by alternative.

TABLE 4-1: Comparison of Program Impacts by Alternative

Table notes: Significance determinations: NI = no impact; LTS = less than significant; LSM = less than significant with mitigation; S = significant; SU = significant (adverse, unmitigable); NA=not applicable.

Resource	Significance Determination for Alternative 1: Approved Hold in Place	Significance Determination for Alternative 2: Incineration	Significance Determination for Alternative 3: Solidification and Landfilling	Significance Determination for Alternative 4: Class I Deep Well Injection	Significance Determination for Alternative 5: No Action Alternative
Air Quality: Air contaminants, criteria pollutants, and greenhouse gases (GHG), emitted during the routine transport of AFFF	LTS	LTS	LTS	LTS	LTS
Greenhouse Gas (GHG) Emissions: AFFF contribution to climate change	NI	NI	NI	NI	NI
Greenhouse Gas (GHG) Emissions: GHG emissions from transport and disposal activities	LTS	LTS	LTS	LTS	LTS
Greenhouse Gas (GHG) Emissions: Combustion emissions from AFFF incineration	NA	LTS	NA	NA	NA
Earth and Water Resources: Potentially Adverse impact on surface soils, perennial surface waters, or potable groundwater resources	LTS	LTS	LTS	LTS	LTS
Earth and Water Resources: Conflicts with local, state, or federal laws or requirements for the protection of the environment	LTS	NI	LTS	LTS	LTS
Earth and Water Resources: Reasonably foreseeable actions with significant effects or unique and unknown risks to the environment	LTS	LTS	LTS	LTS	LTS
Aquatic Resources: Potentially significant impacts on endangered or threatened aquatic life, such as fish and invertebrates, that live in water bodies	LTS	LTS	LTS	LTS	LTS
Aquatic Resources: Potentially significant impacts on endangered or threatened aquatic-dependent wildlife, such as birds and mammals, that consume fish and other aquatic life	LTS	LTS	LTS	LTS	LTS

Resource	Significance Determination for Alternative 1: Approved Hold in Place	Significance Determination for Alternative 2: Incineration	Significance Determination for Alternative 3: Solidification and Landfilling	Significance Determination for Alternative 4: Class I Deep Well Injection	Significance Determination for Alternative 5: No Action Alternative
Aquatic Resources: Potentially significant impacts on sensitive aquatic habitat, including freshwater and marine waters that provide habitat for endangered or threatened wildlife, wetlands, and other waters that are protected by local, state, or federal laws or regulations	LTS	LTS	LTS	LTS	LTS
Terrestrial Biology: Potentially significant impacts on environmentally sensitive or special areas, such as loss or destruction of wilderness	LTS	LTS	LTS	LTS	LTS
Terrestrial Biology: Potentially significant impacts on endangered or threatened terrestrial species or their habitat	LTS	LTS	LTS	LTS	LTS
Terrestrial Biology: Conflicts with local, State, or federal laws or requirements for the protection of the environment	LTS	LTS	LTS	LTS	LTS
Terrestrial Biology: Establishes a precedent for future actions with significant effects or involved unique and unknown risks to the environment	LTS	LTS	LTS	LTS	LTS
Vegetation Resources: Potentially significant impacts on environmentally sensitive or special areas, such as loss or destruction of wilderness	LTS	LTS	LTS	LTS	LTS
Vegetation Resources: Potentially significant impacts on listed plant species, resulting in loss of critical habitat	LTS	LTS	LTS	LTS	LTS
Vegetation Resources: Conflicts with local, State, or federal laws or requirements for the protection of the environment	LTS	LTS	LTS	LTS	LTS

Resource	Significance Determination for Alternative 1: Approved Hold in Place	Significance Determination for Alternative 2: Incineration	Significance Determination for Alternative 3: Solidification and Landfilling	Significance Determination for Alternative 4: Class I Deep Well Injection	Significance Determination for Alternative 5: No Action Alternative
Vegetation Resources: Establishes a precedent for future actions with significant effects or involved unique and unknown risks to the environment	LTS	LTS	LTS	LTS	LTS
Human Health and Safety: Potentially significant, adverse impact on human health	LTS	LTS	LTS	LTS	LTS
Human Health and Safety: Conflicts with local, State, or federal laws or requirements for the protection of the environment; or	LTS	LTS	LTS	LTS	LTS
Human Health and Safety: Establishes a precedent for future actions with significant effects or involved unique and unknown risks to the environment	LTS	LTS	LTS	LTS	LTS
Cultural Resources: Potentially significant impacts to previously recorded culturally significant resources, historic architectural resources	LTS	LTS	LTS	LTS	LTS
Cultural Resources: Potentially significant impacts to undiscovered remains or burial grounds	LTS	LTS	LTS	LTS	LTS
Tribal Resources: Significant, unavoidable impacts to Tribal Resources by restricting or reducing access to recreation or ceremonial sites	LTS	LSM	LSM	LSM	NI
Tribal Resources: Significant, unavoidable loss of critical habitat, wildlife, and vegetation communities that are known Tribal resources	LTS	LSM	LSM	LSM	NI

Resource	Significance Determination for Alternative 1: Approved Hold in Place	Significance Determination for Alternative 2: Incineration	Significance Determination for Alternative 3: Solidification and Landfilling	Significance Determination for Alternative 4: Class I Deep Well Injection	Significance Determination for Alternative 5: No Action Alternative
Tribal Resources: Loss of collective rights through restricted access to water resources/water rights and unique vegetation accessed by Tribal communities on and off Tribal reservations	NI	LSM	LSM	LSM	NI
Transportation and Truck Safety: Risk of spill or accidental release of AFFF through collection, transport, or off-loading to a treatment or disposal facility	NI	LTS	LTS	LTS	NI
Environmental Justice Communities: Risk of spill or accidental release of AFFF through collection, transport, or off-loading to a treatment or disposal facility	NI	LTS	LTS	LTS	NI
Public Services and Utilities: Potentially significant impacts on Recreation PFAS exposure to recreational, Tribal, or subsistence fishers is considered limited. We have conducted several surveys of PFAS in different waterbodies of the state	NI	LTS	LTS	LTS	NI

4.4.1 Potentially Significant, Adverse Impacts for the Proposed AFFF Collection and Disposal Program

Chapter 4 discusses potential adverse impacts on Tribal resources and potential mitigation measures. These impacts are presented in Section 3.9: Tribal Resources, Section 3.12: Public Services and Utilities, and Chapter 5: Cumulative Impacts.

Chapter 3, Section 3.9 refers to Tribal resources as "the collective rights related to access to traditional areas, time periods for gathering resources for cultural practices, Tribal sovereignty, or formal treaty rights." These resources include plants, wildlife, or fish used for commercial, subsistence, and ceremonial purposes and cultural resources. Collective rights are implemented through treaties, that allow Native American Tribes to create reservations, assign land use, and water rights agreements.

We work in consultation with Tribes to determine appropriate mitigation, which would be developed during all phases of EIS preparation. Proposed mitigation may be approved, denied, or revised as needed.

Impact 1: Tribal engagement minimizing impacts on their traditional use of environmental resources on Indian reservations in Washington and Oregon.

Mitigation of Impact 1: Frequent and consistent communication with affected Tribes by:

- Providing early notice to Tribes regarding AFFF collection and transport activities.
- Working with the selected federally permitted hazardous waste hauler on selecting routes to minimize impacts upon Tribal issues.
- Avoiding transport over sensitive resources such as drinking water supplies.

Impact 2: Spill incidents on Tribal lands or traditional use areas.

Mitigation of Impact 2: Implement State and regional spill response plans.

- **Northwest Regional Contingency Plan (NWRCP)**: In the Pacific Northwest, planning for significant oil and hazardous substance incidents is coordinated by the states of Washington, Oregon, and Idaho along with the United States Coast Guard and the EPA. The comprehensive plan ensures coordinated, efficient, and effective support of the federal, state, Tribal, local, and international responses to significant oil and hazardous substance incidents. The Northwest Regional Contingency Plan (NWRCP) is mandated by the National Contingency Plan. The NWRCP is maintained by the Northwest Regional Committee and the Region 10 Regional Response Team.
- **Spill Prevention, Preparedness, and Response Program (Ecology's Spills Program)**: In 2018, the Washington State Legislature passed the Strengthening Oil Transportation Safety Act (E2SSB 6269, WA 2018). Our Spills Program focuses on preventing, preparing for, and responding to the worst-case incidents in Washington state waters through

inspections of vessels, facilities, and oil transfers. The Spills Program supports the work of four state agencies:

  - Washington Department of Fish and Wildlife (WDFW).
  - Washington Military Department Emergency Management Division.
  - Washington Sea Grant.
  - Washington National Guard.

- **The WDFW Oil Spill Team (Spill Team)**: The Spill Team supports our Spills Program by specializing in the protection of fish, wildlife, and habitat from oil spills. Washington Sea Grant's Small Oil Spill Prevention Education Program focuses on providing information about preventing small oil spills to the following audiences:

  - Small vessel operators and facilities.
  - Commercial and recreational boaters.
  - Boating facilities like ports and marinas.

- **The Emergency Management Division**: The Emergency Management Division helps local emergency planning committees in the development and annual review of their local emergency response plans. The National Guard maintains its "just in time" training program, which provides guidance for volunteer management, hazardous materials training, and bridging the gap between the Emergency Operations Center and the Incident Command System (ICS).

- **Geographic Response Plans (GRPs)**: GRPs guide oil spill response in Washington, Oregon, and Idaho. Each GRP is written for a specific area (for example a river, a lake, or a section of Puget Sound) and includes tactical response strategies tailored to a particular shore or waterway at risk of injury from oil. GRPs have two main objectives:

  - Identify sensitive natural, cultural, or significant economic resources at risk of injury from oil spills.
  - Describe and prioritize response strategies to reduce injury to sensitive natural, cultural, and economic resources at risk from oil spills.

- **Incident Command System**: The ICS toolkit website contains frequently used forms, templates, and documents that have been developed as best practices or tools in the Northwest Area Contingency Plan.

PFAS exposure to recreational, Tribal, or subsistence fishers is considered limited. We have conducted several surveys of PFAS in different waterbodies of the state. Recreational and subsistence fishers, and Tribal communities that consume fish from urban waters and areas downstream of wastewater treatment plant discharges may have higher exposures to PFAS that accumulate in fish. Work is underway to fill data gaps for Puget Sound fish and for the most

commonly purchased fish in Washington markets. The Washington Department of Health is developing public health advice for PFAS in fish and will consider prioritizing impacted populations and engaging in tailored outreach to impacted communities, including Native American Tribes (Ecology 2022d).

In addition to mitigation identified above, we will adhere to federal, state, and local regulations and guidelines protecting public safety and environmental health. Specific regulations are discussed in the Chapter 3 topics on water resources, terrestrial and aquatic resources, and human health and safety.

4.5 Conclusion

By consulting with the Tribes about "case-by-case" mitigation strategies and implementation plans, potential impacts on Tribal resources will be minimized and remain less than significant through the development of this program.

5 CUMULATIVE IMPACTS

5.1 Introduction and Methodology

This chapter discusses potential cumulative impacts related to the Washington Department of Ecology's aqueous film-forming foam (AFFF) collection and disposal program for fire departments with stockpiles of PFAS-containing AFFF products. Cumulative impacts are effects that would result from the incremental addition of the proposed AFFF program alternatives to the impacts from past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant, actions that occur over time. The purpose of the cumulative impacts analysis is to ensure that decision-makers consider the full range of consequences for the alternatives under expected future conditions.

The cumulative impacts analysis was prepared in accordance with SEPA requirements (WAC 197.11.060) and considered the federal Council on Environmental Quality approach for analyzing cumulative impacts (40 CFR 1508.7). The following steps were used:

1. Identify the resources that could be adversely affected by the proposed alternatives (see Chapter 3 of this DEIS).
2. Consider other actions in the same geographic study area for each resource.
3. Identify past, present, and reasonably foreseeable actions with effects during the same time period as effects from the proposed alternatives.
4. Analyze cumulative impacts using the best available data.

5.1.1 Cumulative Analysis for Non-Project Actions

As discussed above, cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. The proposed alternatives analyzed in this DEIS review a range of options and processes to collect, transport, treat, and dispose of AFFF appropriately. Under SEPA guidelines, the alternatives would be considered "non-project" actions. SEPA checklist guidance, Section D: Non-project Actions[110] states, "Non-project actions are governmental actions involving decisions about policies, plans, or programs containing standards for controlling use or modifying the environment, or will govern a series of connected actions. Non-project action analysis provides an opportunity to evaluate planned actions before projects begin and permit applications are prepared."

Chapter 2: Project Description and Alternatives describes the AFFF program as intended to mitigate environmental risks from PFAS-containing materials. The alternatives reviewed in this EIS would thus not directly contribute to cumulative environmental effects as could occur from an infrastructure project. An infrastructure project, for example, that would expand a roadway would in turn have potential cumulative impacts from land development supported by roadway capacity. Therefore, this chapter appropriately identifies cumulative impacts of the AFFF

[110] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-D-Non-project-actions

program in relation to relevant environmental topics, such as potential hazardous materials upsets or air quality conditions.

5.1.2 Past, Present, and Reasonably Foreseeable Future Actions

The analysis considered the potential cumulative impacts that could result when impacts of the proposed AFFF program are considered in combination with impacts of other past, present, and reasonably foreseeable future projects. Reasonably foreseeable actions are considered in this EIS under one or more of the following criteria:

- Projects are currently within the planning stage and have funding secured for the action.
- Projects are currently undergoing SEPA review.
- Projects have completed the SEPA process and review is in another permitting phase.

5.2 Cumulative Projects Related to Tribal Lands and Environmental Justice Areas

Section 3.9: Tribal Resources discusses the collective rights and access to traditional areas and times for gathering resources associated with a Tribe's sovereignty or formal treaty rights. Those resources may include plants, wildlife, or fish used for commercial, subsistence, and ceremonial purposes. Section 3.9 addresses potential environmental impacts on Tribal/reservation lands:

- Tribal/reservation lands within 10 miles of a fire station participating in the AFFF project.
- Tribal/reservation lands within 10 miles of a selected 10-day hold facility.
- Tribal/reservation lands within 10 miles of a selected AFFF treatment and disposal site, such as incineration sites, solidification and landfilling sites, or deep well injection sites.
- Tribal/reservation lands within 10 miles of identified potential transportation routes, unless adjacent to waterbodies; if so, then the entire lake or the river or stream for 10 miles downstream are included.

This section evaluates the potential cumulative impacts on Tribal resources analyzed in Section 3.9. The analyses discuss the potential impacts from the alternatives that could result in significant adverse impacts and could contribute to cumulative impacts. If the alternative would not result in significant adverse impacts on a resource, then it would not have the potential to contribute to cumulative impacts on that resource area, and no cumulative analysis for the resource area is warranted.

Table 3.9-1 identifies 75 fire stations within 10 miles of at least 15 reservations in Washington. In addition, there are ten 10-day hold facilities on or within 10 miles of four reservations in Washington. The single 10-day hold facility in Clackamas, Oregon is not within 10 miles of a Native American Reservation. Section 3.9 concludes that the AFFF program alternatives would

not have significant adverse environmental impacts on Tribal resources within the areas defined above.

Section 3.9 also concludes that the AFFF program alternatives would not have significant adverse impacts on Tribal resources within 10 miles of treatment and disposal sites in out-of-state locations, or on Tribal resources within 10 miles of transportation corridors to those sites.

Section 3.9 further notes that we would implement AFFF collection and transport such that spill risks or other hazards to Tribal resources would be minimized.

Section 3.11: Environmental Justice discusses environmental justice (EJ) to ensure that minority, low-income, and Tribal populations and communities would not bear disproportionately high or adverse human or environmental impacts from the proposed AFFF program. Section 3.11 identifies and maps the locations of EJ communities within 0.25 mile of participating fire stations, 10-day hold facilities, and treatment and disposal sites in out-of-state locations, and within one mile of transportation corridors to those sites.

Section 3.11 concludes that the AFFF program alternatives would not have significant adverse impacts on EJ communities within the study areas. Mitigation measures as detailed throughout Chapter 3 will either minimize or eliminate the disposal program's adverse impacts, resulting in their remaining less than significant and therefore not contributing to the cumulative impact on environmental justice communities.

5.3 Cumulative Projects Outside Washington

Chapter 2: Project Description and Alternatives describes AFFF programs that, depending on the alternative implemented, would involve transport to, and treatment and disposal at, out-of-Washington State locations in Utah, Idaho, Nebraska, Texas, or Kansas. Transportation routes could include corridors in Colorado, Montana, Nevada, Oklahoma, Oregon, and Wyoming. Potential cumulative impacts could occur along transportation outside Washington State, or at the treatment and disposal sites.

As discussed further below in Section 5.4: Cumulative Impacts by Resource Topic, transportation of AFFF through out-of-state corridors would be subject to applicable state and federal regulations and permits mandating safe handling of such materials. Therefore, transportation operation would not be expected to contribute to cumulative environmental effects. As also presented in Chapter 2, all potential treatment and disposal sites outside Washington are RCRA-permitted facilities and subject to other federal and state regulations. Therefore, treatment and disposal of AFFF at those locations would not be expected to contribute to cumulative environmental impacts.

5.4 Cumulative Impacts by Resource Topic

This section evaluates the potential cumulative impacts on environmental resources analyzed in Chapter 3. The analyses discuss the potential impacts from the alternatives that could result in significant adverse impacts and could contribute to cumulative impacts. If the alternative would not result in significant adverse impacts in a particular resource area, then it would not have

the potential to contribute to cumulative impacts in that resource area, and no cumulative analysis for the resource area is warranted. There is a possibility that, while the alternative would result in a minor impact on a resource, cumulative actions could cause substantial impacts. This section includes a description of the following for each resource with the potential to have cumulative impacts:

- Review of probable significant adverse impacts on the resource from the proposed alternatives.
- The reasonably foreseeable future actions and the specific individual impacts on the resource that may contribute to cumulative impacts.
- Any cumulative impacts.

Table 5-1, Summary of Cumulative Impacts, presents conclusions on significant cumulative impacts for each project alternative by identified resource topic and conclusions.

5.4.1 Air Quality

All proposed alternatives would entail potential air quality effects, except Alternative 1: Approved Hold in Place and Alternative 5: No Action Alternative. Criteria air pollutants would be emitted by the motor vehicles that would transport AFFF to storage, treatment, and disposal sites. During routine handling or use of AFFF or in the event of a spill or leak, PFAS may evaporate and enter the ambient air.

The Clean Air Act (CAA) is the comprehensive federal law that regulates air emissions from stationary and mobile sources. Among other things, this law authorizes the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and to regulate emissions of hazardous air pollutants. Under the CAA, the EPA is authorized to regulate emissions of hazardous air pollutants for both stationary and mobile emissions sources. Areas not meeting national standards are referred to as non-attainment areas. The EPA has not designated PFAS as a hazardous pollutant and has not established national emissions standards for PFAS Regional Screening Levels (RSLs).

The Washington Clean Air Act established several goals, including securing and maintaining levels of air quality that protect human health and safety. The Washington Clean Air Act meets federal CAA air emissions standards and Washington is not a designated non-attainment area.

The incineration alternative would include treatment of AFFF at facilities in Utah and Nebraska. Neither of those states has established ambient air quality standards for PFAS release mechanisms.

Section 3.1 presents a combined qualitative and quantitative analysis of each alternative's expected impacts on air resources. Those air emissions may result from:

- Air contaminants, principally criteria pollutants and their precursors and greenhouse gases (GHG), emitted during the routine transport of AFFF.

- Evaporation of PFAS compounds in AFFF.
- Compounds emitted during the routine handling, transport, and disposal of AFFF.
- Compounds emitted because of a spill or accidental release of AFFF.
- PFAS compounds, criteria pollutants, GHG, and products of incomplete combustion (PICs) emitted during the AFFF incineration.

TABLE 5-1: Summary of Cumulative Impacts

Environmental Resource	Alternative 1: Approved Hold in Place	Alternative 2: Incineration	Alternative 3: Solidification/ Landfill	Alternative 4: Deep Well Injection	Alternative 5: No Action	Cumulative Impacts
Air Quality	LTS	LTS	LTS	LTS	LTS	LTS
Greenhouse Gas Emissions	LTS	LTS	LTS	LTS	LTS	LTS
Earth and Water Resources	LTS	LTS	LTS	LTS	LTS	LTS
Aquatic Resources	LTS	LTS	LTS	LTS	LTS	LTS
Terrestrial Biology	LTS	LTS	LTS	LTS	LTS	LTS
Vegetation Resources	LTS	LTS	LTS	LTS	LTS	LTS
Human Health and Safety	LTS	LTS	LTS	LTS	LTS	LTS
Cultural Resources	LTS	LTS	LTS	LTS	LTS	LTS
Tribal Resources	LTS	LTS	LTS	LTS	LTS	LTS
Transportation and Truck Safety	LTS	LTS	LTS	LTS	LTS	LTS
Environmental Justice	LTS	LTS	LTS	LTS	LTS	LTS
Public Services and Utilities	LTS	LTS	LTS	LTS	LTS	LTS

Table Note:

LTS – Less than significant effect

The analysis noted that the likelihood and consequences of criteria air pollutants or PFAS releases would be reduced through administrative controls, such as personnel training and facility permitting requirements, and engineering controls, such as storage and containment measures.

The analysis found that that emissions from transportation, treatment, and disposal through incineration, solidification and landfilling, or deep well injection would not result in significant releases of criteria air pollutants or PFAS. The analysis also found that potential accident or upset conditions during AFFF transport or treatment operations would not result in significant air quality impacts or PFAS releases.

Section 3.1 concludes that Alternative 2: Incineration, Alternative 3: Solidification and Landfilling, and Alternative 4: Class I Deep Well Injection would not have significant adverse impacts on air quality conditions from transportation and disposal of AFFF, including PFAS emissions.

The proposed AFFF program alternatives, in combination with the activities described above in Section 5.2, therefore would not contribute to cumulative impacts with respect to air quality conditions.

5.4.2 Greenhouse Gas Emissions

All proposed alternatives would entail potential greenhouse gas (GHG) emissions, except Alternative 1: Hold in Place and Alternative 5: No Action Alternative. With the action alternatives, GHG would be emitted by the motor vehicles that would transport AFFF to storage, treatment, and disposal sites. GHG emissions related to AFFF incineration, solidification and landfilling, or deep well injection are also addressed.

The Clean Air Act (CAA) authorizes EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare, and to regulate emissions of hazardous air pollutants. The Inflation Reduction Act passed in August 2022 amends the CAA to better define existing authority, in particular defining GHGs produced by the burning of fossil fuels as an "air pollutant," giving the EPA authority to regulate GHGs. To date, no limits on GHGs relevant to this evaluation have been developed or implemented.

The EPA has two Air Programs related to GHG, including setting GHG emission standards for heavy-duty vehicles (Part 86, Subpart S, 86.1819-14) and mandatory GHG reporting for stationary sources emitting over 25,000 metric tons of carbon dioxide equivalent (MT CO_2e) per year. Emission sources under evaluation for our AFFF Collection, Transportation, and Disposal Program are primarily associated with mobile sources related to the truck transportation of AFFF; however, the Aragonite Incineration Facility and the Kimball Incineration Facility in Nebraska are covered under the GHG reporting program.

The Washington State Clean Air Rule requires significant in-state stationary sources, petroleum product producers, importers, distributors, and natural gas distributors operating within Washington State that emit 10,000 MT CO_2e or more annually to report their GHG emissions.

Emission sources under evaluation in this draft environmental impact statement (DEIS) analysis would be primarily mobile and not covered by this rule.

The analysis therefore assumed that transportation and disposal of AFFF under the proposed alternatives would follow current EPA and Washington State requirements for regulation and reporting of GHG emissions.

For Alternative 2: Incineration, the DEIS analysis presents an order-of-magnitude estimate of the GHG emissions that may result from AFFF disposal at the Aragonite Incineration Facility in Utah. That facility and the Kimball Incineration Facility in Nebraska operate under the EPA GHG reporting program.

Section 3.2 concludes that Alternative 2: Incineration, Alternative 3: Solidification and Landfilling, and Alternative 4: Class I Deep Well Injection would not have significant adverse impacts on GHG emissions from transportation and disposal of AFFF.

Alternative 1: Approved Hold in Place and Alternative 5: No Action Alternative would not impact GHG emissions.

To some degree, the proposal's GHG emissions exacerbate global warming and climate change, which is already causing a range of negative impacts and will continue to do so. However, Sections 3.3.2 and 3.3.5 clarify that the proposal's potential GHG emissions are very minor compared to the sources of emissions largely responsible for global warming and climate change. Thus, the project's cumulative impacts do not represent any significant impacts to the environment under SEPA.

The proposed AFFF program alternatives, in combination with the activities described above in Section 5.2, therefore would not contribute to cumulative impacts with respect to GHG conditions.

5.4.3 Earth and Water Resources

All proposed alternatives would entail potential effects on soils, surface water, or groundwater, except Alternative 1: Hold in Place and Alternative 5: No Action Alternative. PFAS could be released from upsets or spills during transport of AFFF, with potential adverse impacts on soils, surface water, or groundwater. PFAS could also reach the environment during AFFF incineration, solidification and landfilling, or deep well injection.

The EPA, under the Clean Water Act, the Safe Drinking Water Act, and its PFAS Strategic Roadmap, has issued drinking water health advisory levels, regional screening levels for soil and tap water, and water quality criteria for aquatic life. Those PFAS levels are meant to provide information for the protection of human health and the environment, and they are non-enforceable.

As discussed in Chapter 1, in March 2023 the EPA proposed maximum contaminant levels (MCLs) in drinking water for six PFAS. Those proposed MCLs are undergoing public comment through May 30, 2023 and are not enforceable as of the publication of this DEIS.

The Washington Model Toxics Control Act (MTCA) funds and directs the investigation, cleanup, and prevention of sites contaminated by hazardous substances. Under MTCA, Ecology's PFAS Chemical Action Plan includes recommendations to address PFAS levels in soil, sediment, fresh water, and salt water to protect ecological receptors.

In December 2022, Ecology published *Draft Guidance for Investigating and Remediating PFAS Contamination in Washington* (Ecology 2022c). Among other items, the document established protective concentrations for ecological receptors in marine waters, freshwater, and uplands soils based on a literature review for 10 PFAS chemicals.

Washington's Water Pollution Control Act was established to maintain the highest possible water standards in state waters, which include all lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of Washington State. Industries and others are required to use all known available and reasonable methods to prevent and control the pollution of the waters of the state. Pollutants include any material that makes the water harmful, detrimental, or injurious to wild animals, birds, fish, or other aquatic life.

The Water Resources Act of 1971 provides comprehensive water resource planning for Washington State. Through this regulation, Ecology was tasked to establish and maintain a "waters resource information system" with the intent of studying and regulating water resources in the state. In cooperation with other state natural resources agencies, Ecology delineated the state's major watersheds into 62 Water Resource Inventory Areas.

Other states with AFFF incineration, solidification and landfilling, or deep well injection sites—Idaho, Nebraska, Nevada, Kansas, Texas, and Utah—have, to a various extent, reviewed conditions related to PFAS in surface water, groundwater, or soil. Those states have initiated monitoring or sampling studies or are considering potential standards or reporting requirements. However, none of those jurisdictions have adopted formal PFAS regulations at this time.

The study area for earth and water resources is defined as the soil, the surface water, and the groundwater with the potential to be affected by collection, transport, and disposal of AFFF under alternatives considered in this DEIS. The study area includes a 0.25-mile offset from potential AFFF storage locations, disposal facilities, and transportation corridors to assess the typical range of potentially impacted soil, surface water, and groundwater. For study area locations within 0.25 mile of a water feature, the study area includes the water corridor up to 10 miles downstream of its intersection with the 0.25-mile buffer.

For all action alternatives, Section 3.3 found that, the relative risk to soils, surface water, and groundwater from a project related accidental release of AFFF at a fire station would be low. A spill at a fire department would be cleaned up promptly by trained personnel, reducing the already low likelihood of off-site movement of the AFFF.

If accidental releases were to occur during routine handling of AFFF concentrate at a 10-day hold facility, incineration facility, landfill facility, or deep well injection facility, the AFFF would

be contained within the facility and promptly cleaned up by appropriately trained personnel and would therefore not be significant.

The risk of release of AFFF to the soil, surface water, or groundwater environment during transportation is discussed in Section 3.10: Transportation and Truck Safety. Based on the use of heavy trucks to transport the waste, the use of containers appropriate for hazardous waste during transport, low probability of an accident, and high degree of emergency response preparedness along interstate highways, the relative risk of release would be low.

For Alternative 2: Incineration, AFFF incineration would produce residual ash and air emissions. As discussed in Section 3.1: Air Quality, PFAS emissions would be less than significant; residual ash would be properly disposed of in a hazardous waste landfill. Any PFAS discharge from the incineration of AFFF from the project would not affect water resources. Deposition onto soils could occur in trace or very low measurable quantities.

For Alternative 3: Solidification and Landfilling, the risk of PFAS release during the solidification process, including disposal of leachate, would be controlled on site and would have a low chance of reaching the environment.

For Alternative 4: Class I Deep Well Injection, AFFF would be injected directly into a non-potable geologic formation isolated by depth and/or by geology from shallower freshwater aquifers. Although highly unlikely, AFFF injected underground may migrate away from the injection zone in wells that are not properly sited, constructed, or maintained, and potentially contaminate drinking water aquifers.

The Advantek and US Ecology facilities are designed, permitted, and operated to isolate received waste from potable water supplies, representing a low risk of release of PFAS to groundwater. Over long periods of time, subsurface conditions could change, and the risk could increase. AFFF could be released during the well injection process if there were an equipment malfunction that released AFFF aboveground into the facility. In this event, the spill would be promptly cleaned up and the site remediated to prevent further transport of PFAS to the environment.

Section 3.3 concludes that Alternative 2: Incineration, Alternative 3: Solidification and Landfilling, and Alternative 4: Class I Deep Well Injection would not have significant adverse impacts on soil, surface water, or groundwater conditions.

The proposed AFFF program alternatives, in combination with the activities described above in Section 5.2, therefore would not contribute to cumulative impacts with respect to the soil, surface water, or groundwater environment.

5.4.4 Aquatic Resources

All proposed alternatives would entail potential effects on aquatic resources (aquatic species and their habitats) except Alternative 1: Hold in Place and Alternative 5: No Action Alternative. PFAS could be released from upsets or spills during transport of AFFF, with potential adverse

impacts on aquatic species and their habitats. PFAS could also reach the aquatic environment during AFFF incineration, solidification and landfilling, or deep well injection.

At the federal level, in May 2022 the EPA proposed, under the Clean Water Act, the first aquatic life criteria for both short-term and long-term toxic effects from PFOA and PFOS. Aquatic life criteria are established for ambient water to protect fish, invertebrates, and other aquatic life from adverse effects associated with the exposure to pollutants. The aquatic life criteria are the highest concentrations of PFOA and PFOS that can exist in ambient waters that are not expected to pose a significant risk to the majority of species in a given environment or water body. The recommended values are intended to protect aquatic life and provide a basis for controlling the discharge of pollutants but are not legally enforceable.

Provisions of the federal Endangered Species Act (ESA) protect federally listed threatened or endangered species and their habitats, including aquatic species and their habitat, from unlawful take. Activities that may result in take of individuals are regulated by the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS).

Pursuant to the ESA, the USFWS or NMFS may also designate areas that are essential to the conservation of threatened and endangered species as “critical habitat.” Areas of critical habitat are specified “to the maximum extent prudent and determinable,” and may, therefore, be quite large to encompass and protect the primary constituent elements (PCEs) required to aid recovery and delisting of the species. Projects require consultation if they affect areas containing PCEs. Developed areas such as roads and buildings that fall within designated critical habitat are normally excluded from critical habitat.

In Washington State, SEPA requires state and local governments to identify possible environmental impacts that may result from governmental decisions. The SEPA review process helps the department, applicants, and the public understand how a proposed project will affect the environment. Washington Department of Fish and Wildlife reviews proposed projects to identify potential impacts to fish, wildlife, and their habitats. SEPA gives agencies the authority to condition or deny a proposal based on the agency's adopted SEPA policies and the environmental impacts identified in a SEPA document.

The 1981 Washington Natural Heritage Program was established to meet the needs for objective information to guide biodiversity conservation and land use decisions. Goals of the program include maintaining a classification of the state’s natural heritage resources; conducting inventories of the locations of these resources; and sharing information with agencies, organizations, and individuals for environmental assessment purposes. The 2022 Natural Heritage Plan was approved in January 2022 and provides information on whether species and communities with special status are present in a given location.

The Water Pollution Control Act was established to maintain the highest possible water standards in state waters, which include all lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within Washington State. Industries and others are required to use all known available and reasonable methods to prevent and control the pollution of the waters of the state. Pollutants include any

material that makes the water harmful, detrimental, or injurious to wild animals, birds, fish, or other aquatic life.

The Water Resources Act of 1971 provides for water resource planning for Washington State. We were tasked to establish and maintain a "waters resource information system" with the intent of studying and regulating water resources in the state. We typically study and regulate water resources by watershed, also known as Water Resource Inventory Areas (WRIA). The 62 WRIA watershed boundaries were formalized by law in 1971 to be used for state management purposes.

The 1998 Salmon Recovery Act called for development and implementation of a statewide watershed-based salmon recovery strategy. Washington State is divided into eight regions, which develop regionally specific, scientifically rigorous, and locally produced recovery strategies. Within each region, shareholders consisting of lead entities identify, rank, select, and implement habitat restoration and monitoring projects deemed most beneficial for local salmon recovery. The Washington State Recreation and Conservation Office is required to report on the recovery process through the biannual publication of the *State of Salmon in Watersheds* report.

Section 3.4 presented the relative risk of release of AFFF from fire stations to an aquatic habitat on a scale from 0 (no risk) to 5 (high risk). It is assumed that a spill at a fire department would be cleaned up in a timely manner (1–2 days) and therefore would most likely not be exposed to a potential rain or stormwater runoff event, which reduces the likelihood of further transportation of the PFAS-containing AFFF. Section 3.4 concluded that the relative risk of release of AFFF from fire stations to an aquatic habitat would be between 1 to 2, very low to moderate risk.

The same factors for the relative risk of release for fire stations are applicable to the 10-day hold facilities. Section 3.4 concluded that the relative risk of release of AFFF from 10-day hold facilities to an aquatic habitat would be between 1 to 2.25, very low to moderate risk.

For Alternative 2: Incineration, neither incineration facilities are located near bodies of water or aquatic resources. There is a very low level of risk to aquatic resources for the Aragonite facility, located in a very arid, desert habitat. Incineration of AFFF would therefore have a very low risk level of 1 of release to an aquatic community.

For Alternative 3: Solidification and Landfilling, the closest body of water to the US Ecology Idaho site is over two miles away; for the US Ecology Nevada site there is no apparent body of water within a 10-mile radius of the site. The overall relative risk of release for the two landfills is negligible (0-1).

For Alternative 4: Class I Deep Well Injection, AFFF would be injected directly into a non-potable geologic formation isolated by depth and/or by geology from shallower freshwater aquifers. AFFF may be released during the well injection process, but only if there were an equipment malfunction that released AFFF aboveground onto the soil. If this were to happen, the spill would likely be promptly cleaned up and the soil remediated to prevent further transport of the material. It is unlikely that the nearby aquatic environment will be affected after the deep well

injection as the aquifers are thousands of feet underground, where aquatic species are not present.

Section 3.3 concludes that Alternative 2: Incineration, Alternative 3: Solidification and Landfilling, and Alternative 4: Class I Deep Well Injection would not have significant adverse impacts on aquatic resources.

The proposed AFFF program alternatives, in combination with the activities described above in Section 5.2, therefore would not contribute to cumulative impacts with respect to aquatic resources.

5.4.5 Terrestrial Biology

All proposed alternatives could entail potential accidental release of AFFF during collection, transport, treatment, and disposal of AFFF, except Alternative 1: Hold in Place and Alternative 5: No Action Alternative.

As described in Section 3.5: Terrestrial Species and Habitats, biological resources within the DEIS study area are protected by state and federal regulations, including the Washington Model Toxics Control Act, State Environmental Policy Act, Washington Natural Area Preserves Act, and Water Pollution Control Act. Applicable federal legislation includes the Endangered Species Act.

The study area for the affected terrestrial biology environment includes the areas within 0.25 miles of fire stations participating in the AFFF project, potential 10-day hold facilities, and transportation corridors to potential treatment and disposal sites. For such locations in Washington State within 0.25 mile of a water feature, the study area would include the water corridor up to 10 miles downstream of its intersection with the 0.25-mile boundary.

Many of the participating fire stations are in urban areas with little to no habitat value for sensitive terrestrial wildlife species. However, more than half of the participating fire stations are in rural areas or in close proximity to open spaces, such as forests, woodland, wetlands, waterways, grasslands, and other areas that provide habitat for sensitive terrestrial wildlife or corridors through which they may pass.

Twenty-eight fire stations are within 0.25-miles of an area identified in Washington Department of Fish and Wildlife Priority Habitat or Species GIS data as supporting sensitive terrestrial wildlife, including marbled murrelet, Rocky Mountain elk, harlequin duck, spotted owl, and black-tailed jackrabbit.

Section 3.5 concluded that the relative risk of release of AFFF from a fire station would be low, and any spill at a fire department would be cleaned up promptly by trained personnel, reducing the already low likelihood of off-site movement of the PFAS-containing AFFF that could affect terrestrial habitat.

For Alternative 2: Incineration, the area surrounding the Aragonite facility in Utah contains few sensitive terrestrial wildlife due to the low productivity of the cheat-grass dominated habitat. Although short-grass prairie terrestrial habitat is within the study area north of the Kimball

facility in Nebraska, fluorinated products of incomplete combustion would not be carried and deposited in the soil in sufficient quantities to adversely impact this habitat.

For Alternative 3: Solidification and Landfilling, US Ecology solidification and landfill sites in Nevada or Idaho are permitted hazardous waste facilities. The leachate control systems at both facilities, described in Section 3.3.4.5: Earth and Water Resources, Impacts and Mitigation Measures, Alternative 3, are "zero-discharge" operations, with no release mechanism for AFFF to migrate off site.

Solidification and landfill of AFFF would present no risk of release into sensitive terrestrial environments. Materials spilled on site, should that occur, would be cleaned up promptly by appropriately trained personnel, and the cleanup materials would be buried along with other solid waste within the landfill.

For Alternative 4: Class I Deep Well Injection, the relative risk of release of AFFF from deep-well injection would be generally low; however, neither potential facility is presently permitted to inject hazardous waste. The deep well injection sites are in areas that do not contain special-status species. Class I deep well injection of AFFF therefore would present a low risk of release into the terrestrial environment at the Advantek site in Kansas or the US Ecology site in Texas. AFFF could be released during the well injection process if there were an equipment malfunction that released AFFF above ground into the facility. In this event, the spill would be promptly cleaned up and the site remediated to prevent further transport of PFAS compounds.

Section 3.5 concludes that Alternative 2: Incineration, Alternative 3: Solidification and Landfilling, and Alternative 4: Class I Deep Well Injection would not have significant adverse impacts on terrestrial biology.

The proposed AFFF program alternatives, in combination with the activities described above in Section 5.2, therefore would not contribute to cumulative impacts with respect to terrestrial biology.

5.4.6 Vegetation Resources

All proposed alternatives could entail potential accidental release of AFFF during collection, transport, treatment, and disposal of AFFF, except Alternative 1: Hold in Place and Alternative 5: No Action Alternative.

As described in Section 3.5: Terrestrial Species and Habitats and Section 5.4.5: Terrestrial Biology, biological resources, vegetation resources within the study area are protected by state and federal regulations, including the Washington Model Toxics Control Act, State Environmental Policy Act, Washington Natural Area Preserves Act, and Water Pollution Control Act. Applicable federal legislation includes the Endangered Species Act.

The study area for the affected terrestrial biology environment includes the areas within 0.25 miles of fire stations participating in the AFFF project, 10-day hold facilities, and transportation corridors to potential treatment and disposal sites. For such locations in Washington within

0.25 mile of a water feature, the study area would include the water corridor up to 10 miles downstream of its intersection with the 0.25-mile boundary.

Many of the participating fire stations are in urban areas with little habitat value for sensitive vegetation. Approximately half of the currently participating fire stations are in rural areas or close proximity to open spaces, such as forests, woodland, wetlands, waterways, grasslands, and other areas that potentially provide habitat for sensitive plants species. Eighteen fire stations are within 0.25 mile of a habitats identified as either priority habitat or sensitive habitat, such as shrub-steppe or oak woodland habitat. Additional fire stations may enroll in the program following this environmental review.

The analysis concluded that the relative risk of release of AFFF from a fire station would be low, and any spill at a fire department would be cleaned up promptly by trained personnel, reducing the already low likelihood of off-site movement of the PFAS-containing AFFF that could affect vegetation resources.

For Alternative 2: Incineration, the area surrounding the Aragonite incineration facility in Utah contains few sensitive terrestrial wildlife due to the low productivity of the cheat-grass dominated habitat. Although short-grass prairie terrestrial habitat is within the study area north of the Kimball facility in Nebraska, fluorinated products of incomplete combustion would not be carried and deposited in the soil in sufficient quantities to adversely impact this habitat.

For Alternative 3: Solidification and Landfilling, US Ecology solidification and landfill sites in Nevada or Idaho are permitted hazardous waste facilities. The leachate control systems at both facilities, described in Section 3.3.4.5: Earth and Water Resources, Impacts and Mitigation Measures, Alternative 3, are “zero-discharge” operations, with no release mechanism for AFFF to migrate off site and potentially affect vegetation resources.

Solidification and landfill of AFFF would present no risk of release into sensitive vegetation resources. Materials spilled on site, should that occur, would be cleaned up promptly by appropriately trained personnel, and the cleanup materials would be buried along with other solid waste within the landfill.

For Alternative 4: Class I Deep Well Injection, the relative risk of release of AFFF from deep well injection would be generally low. The deep well injection sites are in areas that do not contain special vegetation resources. Class I deep well injection of AFFF therefore would present a low risk of release into the terrestrial environment at the Advantek site in Kansas or the US Ecology site in Texas. AFFF could be released during the well injection process if there were an equipment malfunction that released AFFF above ground into the facility. In this event, the spill would be promptly cleaned up and the site remediated to prevent further transport of PFAS compounds.

The proposed AFFF program alternatives, in combination with the activities described above in Section 5.2, therefore would not contribute to cumulative impacts with respect to vegetation resources.

5.4.7 Human Health and Safety

Section 3.1: Air Quality, Section 3.3: Earth and Water Resources, and Section 3.4: Aquatic Resources describe AFFF and PFAS release mechanisms and impacts to air, soil, and water for the AFFF program alternatives. The risk of a release for all of the alternatives was determined to be low, and in the event of a release, engineering controls and spill response regulations would prevent spills from reaching the environment. Therefore, impacts of PFAS to human health beyond the limits of the operational facilities are discussed in the DEIS only in a general sense.

The combination of wide-spread use and chemical persistence means that PFAS are already ubiquitous in the global environment. In Washington State, PFAS have been detected in soils, surface waters, groundwater, wastewater treatment plant effluent, fresh water and marine sediments, fresh water and marine organisms, and terrestrial wildlife. Although PFAS are not manufactured in the state, they may be used in certain manufacturing and industrial processes within the state or used in firefighting foams.

PFAS are also found in many commercial and consumer products.[111] Studies have demonstrated that PFAS are present in the blood serum of most people, and that a "background" range of PFAS contamination of blood serum exists—even where there is no specific source of PFAS in drinking water. Outside of drinking water, the primary sources of exposure to PFAS appear to be food and food packaging, consumer products, and dust formed from PFAS-treated consumer products.

Existing and evolving PFAS regulations are discussed in Chapter 1, Section 3.1: Air Quality, Section 3.3: Earth and Water Resources, and Section 3.4: Aquatic Resources, and are also summarized above in cumulative impacts Sections 5.4.1, 5.4.3, and 5.4.4.

The DEIS analysis found that, in the unlikely case of a release at a facility, the predominant exposure pathways to workers from ingestion, inhalation, or dermal contact would be a low risk, further mitigated by adherence to safety standards.

For Alternative 2: Incineration, PFAS compounds may be released due to incomplete combustion. The estimated mass that would be released from the incineration process, 4.6 grams, would be released from a tall stack over a duration of at least several hours, and the resulting ambient PFAS concentrations would be much less than the significance criteria in Section 3.1, Table 3.1-4. Humans could become exposed by incidental ingestion of PFAS compounds that may be transported via air and deposited to the soil surface in trace quantities during the incineration process. As discussed in Section 3.3: Earth and Water Resources, the incineration facilities are located in remote regions with low human population. Direct contact with nearby soils by humans is a low risk.

[111] Consumer products include paper and packaging; clothing and carpets; outdoor textiles and sporting equipment; ski and snowboard waxes; non-stick cookware (for example, Teflon); cleaning agents and fabric softeners; polishes, waxes, and latex paints; pesticides and herbicides; hydraulic fluids; paints, varnishes, dyes, and inks; adhesives; medical products; and personal care products like shampoo, hair conditioners, cosmetics, sunscreen, toothpaste, and dental floss.

As also discussed in Section 3.3: Earth and Water Resources, the risk of release of AFFF into surface water or groundwater is low for all of the AFFF program alternatives. Additionally, Washington State has State Action Levels (SALs) for six PFAS in drinking water, which requires water suppliers to test for PFAS, provide public notification of SAL exceedances, and possibly take other action. The risk of water ingestion for all project alternatives is low.

Section 3.7 concludes that all project alternatives would have a low risk of significant adverse impacts on human health.

Therefore, the proposed AFFF program alternatives, in combination with the activities described above would not contribute to cumulative impacts with respect to human health and safety.

5.4.8 Cultural Resources

All proposed alternatives could entail potential accidental release of AFFF during collection, transport, treatment, and disposal of AFFF, except Alternative 1: Hold in Place and Alternative 5: No Action Alternative. Section 3.8 concluded that the risk of impacts to cultural resources would be low, given that the fire stations participating in the AFFF collection and disposal program or the 10-day hold facilities are not located close enough to any cultural resources to reasonably impact them.

Section 3.8 also reviewed the potential effects on cultural resources at 18 sites currently subject to environmental cleanup activities within 0.25 mile of a storage site at fire departments participating in the AFFF collection and disposal program.

Cultural resources and historic properties are prehistoric or historic districts, as well as historic and archaeological sites, structures, or objects that include architectural, engineering, or landscape resources from the historic period, such as buildings, roads, wells, bridges, aqueducts, or agricultural properties. Laws and regulations stipulate a process for compliance, define the responsibilities of the various agencies proposing the action, and prescribe the relationship among other involved agencies. The primary federal and state laws governing and affecting preservation of cultural resources of national, state, regional, and local significance are the National Historic Preservation Act (NHPA) of 1966, as amended, the State Environmental Policy Act (SEPA), the Washington Heritage Register, and chapter 27.53 RCW.

Archaeological resources are protected through the NHPA and its implementing regulation, Protection of Historic Properties, the Archaeological and Historic Preservation Act of 1974, and the Archaeological Resources Protection Act of 1979. Prior to implementing an “undertaking” (for example, issuing a federal permit), Section 106 of the NHPA requires federal agencies to consider the effects of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation and the State Historic Preservation Officer a reasonable opportunity to comment on any undertaking that would adversely affect eligible properties. As indicated in the NHPA, properties of traditional religious and cultural importance to a tribe are eligible for inclusion in the National Register of Historic Places.

SEPA provides guidance to state agencies and local governments involved in environmental policy decisions. It also requires that impacts on historic and cultural resources be considered during the public environmental review process. The Washington Department of Archaeology and Historic Preservation (DAHP) is responsible for conservation, preservation, and protection of Washington's historic and archaeological resources. It includes the Archaeological Sites and Resources Act (chapter 27.53 RCW), which prohibits disturbance or excavation of historic or prehistoric archaeological resources on state or private land without a permit. In addition, state laws and regulations prohibit knowingly disturbing Native American or historic grave sites (chapter 27.44 RCW). The DAHP is also responsible for issuing formal opinions on the significance, eligibility and impacts to sites of historic significance. The DAHP maintains the official state list of historic places, the Washington Heritage Register.

The greatest potential risk to cultural resources is the release of AFFF due to spills, leaks, upset conditions, or other accidental releases to the environment. Because AFFF concentrate contains organic solvents, chemical stabilizers, and surfactants, it could potentially contaminate a cultural resource if the concentrate migrates subsurface into the ground.

Section 3.8 concluded that the risk of impacts to cultural resources is low. If a spill at a cleanup site did occur, it would be cleaned up promptly and in a timely manner by trained personnel.

Section 3.8 found that the treatment and disposal of AFFF with Alternative 2: Incineration, Alternative 3: Solidification and Landfilling, and Alternative 4: Class I Deep Well Injection would not have significant adverse impacts on cultural resources.

The proposed AFFF program alternatives, in combination with the activities described above in Section 5.2, therefore would not contribute to cumulative impacts with respect to the cultural resources.

5.4.9 Tribal Resources

All proposed alternatives could entail potential accidental release of AFFF during collection, transport, treatment, and disposal of AFFF, except Alternative 1: Approved Hold in Place and Alternative 5: No Action Alternative.

Tribal resources are protected through federal regulatory measures, such as Section 106 of the National Historic Preservation Act, which requires federal agencies to consider the effects of their undertakings on historic properties. Tribal resources are also protected through the Stevens Treaties, other treaties, and case law that established reservations for the exclusive use of the recognized Tribes in Washington State. In those treaties, the Tribes reserved their right to continue traditional activities on lands beyond these reserved areas and reserved the right to hunt, fish, and conduct other traditional activities on lands on and off of the reservations.

Other Tribal resources include Washington's salmon and steelhead fisheries, managed cooperatively. Co-management of fisheries occurs through government-to-government cooperation, communications, and negotiations. One government is Washington State, and the others are Indian Tribes whose rights were preserved in treaties signed with the federal government in the 1850s. In those treaties, Tribes ceded vast areas of what is now Washington

while preserving their continued right to fish, gather shellfish, hunt in their "usual and accustomed" areas, and exercise other sovereign rights. In 1974, in United States v. Washington, the U.S. District Court reaffirmed the Tribes' rights to harvest salmon and steelhead, and established them as co-managers of Washington fisheries.

SEPA provides guidance to state agencies and local governments involved in environmental policy decisions. It also requires that impacts on Tribal cultural resources be considered during the public environmental review process. In addition, state laws and regulations prohibit knowingly disturbing Native American or historic grave sites.

In Section 3.9, the analysis of impacts to Tribal resources differs in its approach compared to impact analysis for other natural resources. Natural resources are analyzed in Chapter 3: Affected Environment and Environmental Consequences, and in Chapter 4: Mitigation Measures, to determine if the proposed AFFF program would have significant adverse effects from a non-Tribal perspective, and whether or not they could be mitigated. The analysis for Tribal resources references those analyses, but also considers the Tribes' unique and powerful connection to and reliance on natural resources. As a result of this connection, Tribes hold a deep, intimate knowledge and understanding of the ecosystem, often referred to as Tribal Ecological Knowledge. Tribal Ecological Knowledge will continue to be considered as impacts from the proposed project are evaluated. To honor the Tribes' perspective, Section 3.9 considered all identified impacts to natural resources and cultural resources. The analysis reviewed locations of AFFF in each project alternative, and the vicinity of these locations to Indian reservations. These include fire stations, 10-day hold facilities, treatment and disposal locations, and transportation routes. The analysis further assessed whether any reservations/Tribal resources are close enough to such facilities and routes to be of concern in the event of a spill, and how quickly such spills can be cleaned up before affecting Tribal resources. Section 3.9 then concluded that the risk of impacts to Tribal resources would be low, given that Tribal lands are not located close enough to fire stations, potential 10-day hold facilities, potential transportation routes, or treatment and disposal locations for AFFF or PFAS to reasonably impact them.

Section 5.2: Cumulative Projects Related to Tribal Lands and Environmental Justice Areas found impacts to Tribal resources will be less than significant and minimized through development in consultation with the Tribes through "case by case" mitigation strategies and implementation plans, and therefore would not contribute to cumulative impacts upon Tribal resources.

5.4.10 Transportation and Truck Safety

All proposed alternatives would involve transporting AFFF by truck, except Alternative 1: Hold in Place and Alternative 5: No Action Alternative.

There are currently no specific federal or state regulations covering the transportation of AFFF. For the purposes of the transportation analysis, however, the transportation of AFFF was evaluated against regulations governing transportation of hazardous materials and waste. Those regulations include 49 CFR Parts 100-185, which administers all aspects of hazardous materials packaging, handling and transportation and would apply to all proposed alternatives except Alternative 1: Hold in Place and Alternative 5: No Action Alternative.

The federal Hazardous Materials Transportation Act (HMTA) regulates transportation of hazardous materials. The HMTA requires that carriers report accidental releases of hazardous materials to the U.S. Department of Transportation (USDOT) at the earliest practical moment and all incidents that must be reported include deaths, injuries requiring hospitalization, and property damage exceeding $50,000.

Additionally, under Washington Administrative Code (WAC) 173-303-141, AFFF is classified as a designated waste once it will no longer be used and is identified for disposal. The transportation of AFFF is regulated by the Washington Utilities and Transportation Commission.

The analysis therefore assumed that transportation of AFFF would follow current USDOT and applicable state requirements for shipping hazardous materials.

The affected environment would be any transportation route from the fire stations participating in the AFFF program to 10-day hold facilities and subsequently to treatment and disposal sites. For the alternatives involving AFFF collection and disposal, AFFF pick-ups would primarily be from fire stations in urban areas where traffic patterns are typically heavier than rural areas. However, the transportation impacts of those truck movements would be minimal in the context of urban traffic conditions. There would be no significant adverse impacts with respect to traffic interference, congestion, or damage to the roadways during project operations.

Transportation of AFFF, however, would increase the potential of an accident that could cause a spill to the environment. The communities/persons that could potentially be affected by AFFF releases would be the public in the vicinity of the accident, personnel responsible for transport, and emergency responders to the accident. The federal and state requirements noted above include container types and labeling, handling by trained personnel in accordance with best practices, and appropriate physical and administrative controls. PFAS substances could be released to the environment as a result of mishandling containers or a vehicle accident. Trained professionals would perform AFFF container collection, transportation, and off-loading of containers at the treatment/disposal facilities, and AFFF would be transferred to USDOT-rated containers for transport. Because transportation of AFFF would follow current USDOT and applicable state requirements for shipping hazardous materials, including container types, labeling, and handling by trained personnel in accordance with best practices and appropriate physical and administrative controls, the consequences of an AFFF release would be low. In the event of an AFFF spill or container leakage, the impact on health and environmental resources would be very low, because any spilled AFFF material would be contained and cleaned up in an expedited fashion by appropriately trained workers.

Once AFFF was transported to the selected treatment/disposal site, those materials would be handled under applicable Resource Conservation and Recovery Act (RCRA) and other safety requirements. Handling of materials would be performed by trained personnel, and containers would be transferred from the trucks in areas designed with spill control to mitigate any potential spill to soil or surface waters. The risk of release or environmental upset involving AFFF would be minimal.

Truck movements along routes from 10-day hold facilities to states beyond Washington would include Colorado, Idaho, Illinois, Kansas, Montana, Nebraska, Nevada, Oklahoma, Oregon, Texas, Utah, and Wyoming. With the exception of Colorado, Idaho, Nebraska, Illinois, Oregon, Utah, and Wyoming, all the states have exclusively adopted the federal regulations governing transportation of hazardous materials and waste. There would be a low potential for release of AFFF during transportation. A review of data for those states indicated limited occurrence of hazardous materials spills, primarily involving vehicle accidents and fuel spills.

Section 3.10 concluded that AFFF-related transportation operations with Alternative 2: Incineration, Alternative 3: Solidification and Landfilling, and Alternative 4: Class I Deep Well Injection, would have minimal adverse effects on traffic conditions or on hazardous materials risks during transportation operations. Cumulatively, those operations would not affect conditions on out-of-state transportation corridors or at treatment/disposal sites.

The proposed AFFF program alternatives, in combination with the activities described above, therefore would not contribute to cumulative impacts with respect to transportation conditions.

5.4.11 Environmental Justice

Section 3.11 identifies environmental justice (EJ) communities in the program study area, alternatives and describes the impacts of those alternatives on these communities to determine if EJ communities would be disproportionately impacted by the alternative. Several of the alternatives potentially involve sites in other states, and Section 3.11 evaluated the potential EJ impacts at out of state sites.

The EPA defines environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Section 3.11 identifies and describes populations that may be disproportionally impacted by the AFFF program alternatives and addresses potentially significant environmental impacts that may have a disproportionate impact on populations of interest. Populations of interest may include:

- Minorities and communities of color.
- Low income populations.
- Potentially affected Tribal populations.
- Populations with limited English proficiency (LEP).

In Washington, further guidance ensures that the process is inclusive and comprehensive:

- During project development, strive to avoid/minimize adverse impacts to identified EJ populations.
- Analyze proportionality of impacts on populations.

- ► Identify any off-setting benefits to the affected EJ population.
- ► Consider feasibility of project refinements and/or additional mitigation to avoid disproportionate impacts to EJ population.
- ► Document the previous steps in the environmental document.
- ► Conclude with the formal environmental justice finding.

Federal EJ regulations include the 1994 Executive Order 12898, which required federal agencies to focus on human health and environmental conditions and address hazards in minority and low-income communities. In subsequent years, through Executive Order and through legislative action, state and federal regulatory agencies have taken specific steps to, "Ensure that disproportionally high and adverse human health or environmental effects on minority communities and low-income communities are identified and addressed" (US EPA 1996).

The National and State level Environmental Policy Acts' compliance process includes analysis of the EJ impacts of the proposed project. EJ analysis is intended to ensure:

> The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local and tribal programs and policies. (EPA 1996)

In Washington, the Model Toxics Control Act funds and directs the investigation, cleanup, and prevention of sites that are contaminated by hazardous substances. It works to protect people's health and the environment, and to preserve natural resources for the future. Establishing protective concentrations for ecological receptors is an essential aspect of site cleanup work under the Model Toxics Control Act.

The 2021 Healthy Environment for All Act requires the Department of Ecology (as well as the departments of Agriculture, Commerce, Health, Natural Resources, Transportation, and the Puget Sound Partnership) to "identify and address environmental health disparities in overburdened communities and underserved populations."

SEPA requires state and local governments to identify possible environmental impacts that may result from governmental decisions. The SEPA review process helps the department, applicants, and the public understand how a proposed project will affect the environment. Washington Department of Fish and Wildlife reviews proposed projects to identify potential impacts to fish, wildlife, and their habitats. SEPA gives agencies the authority to condition or deny a proposal based on the agency's adopted SEPA policies and the environmental impacts identified in a SEPA document.

The study area for EJ analysis included any community within 0.25 miles of a fire station participating in the AFFF program, 10-day hold facilities, AFFF treatment and disposal sites, and any EJ community within 0.25 miles of identified transportation routes.

Section 3.11 presents Environmental Health Disparities (EHD) rankings from the Washington Department of Health's Washington Tracking Network program. If the percentage of EJ communities within 0.25 miles of a fire station, 10-day hold facility, or transportation route was greater than 20 percent, there would be a disproportionate impact on those communities. The analysis showed that 13.79 percent of all census tracts within close proximity to a fire station have an EHD of 9 or 10. Since 20 percent of all Washington communities are deemed EJ communities under the criteria described above, EJ communities share a smaller potential burden of environmental impacts than other communities relative to their prevalence.

For Alternative 2: Incineration, the EJ analysis found that treatment of AFFF at either the Aragonite or Kimball facilities would not disproportionately affect communities with high environmental justice concerns.

For Alternative 3: Solidification and Landfilling, the EJ analysis did not identify any communities of concern within a one-mile radius of either the US Ecology Nevada or US Ecology Idaho sites, and solidification and disposal would not disproportionately affect communities with high environmental justice concerns.

For Alternative 4: Class I Deep Well Injection, the EJ analysis did not identify any communities of concern within a one-mile radius of either Advantek Cavern Solutions in Kansas or US Ecology Winnie, Texas. Solidification and disposal would not disproportionately affect communities with high environmental justice concerns.

Section 3.11 concludes that Alternative 2: Incineration, Alternative 3: Solidification and Landfilling, and Alternative 4: Class I Deep Well Injection would not have significant adverse EJ impacts.

The proposed AFFF program alternatives, in combination with the activities described above in Section 5.2, therefore would not contribute to cumulative impacts with respect to environmental justice communities.

5.4.12 Public Services and Utilities

Section 3.12 assesses the potential impacts on public services and utilities resulting from the AFFF program. The four AFFF program alternatives and Alternative 5: No Action Alternative may affect the demand and availability of public services and utilities, including fire protection and emergency medical response, police and security services, hospital services, recreation resources, wastewater treatment, and energy resources. Alternative 1: Hold in Place would not affect demand and availability of public services and utilities.

Section 3.12 presents the availability of those public services and utilities, and the federal and state legislation, regulations, and boards and agencies that provide oversight of those services.

The four AFFF program alternatives and Alternative 5: No Action Alternative would not be expected to have a significant impact on police, fire agencies and emergency services. Washington's law enforcement and fire protection agencies collectively employ 6,500 state-wide police and fire department personnel. Although Alternatives 2, 3, and 4 would involve collection and transport of AFFF, it is unlikely that collection and transport of AFFF stockpiles at participating fire departments would result in a catastrophic event. Both fire department personnel and Washington's contracted hazardous materials staff would be permitted, trained, and certified in dangerous waste collection and transport procedures. Alternative 1: Approved Hold in Place and Alternative 5: No Action Alternative would not involve removing PFAS-containing foam from Washington's fire prevention and suppression products; those alternatives would not be consistent with program objectives and legislative code. The AFFF program impacts on police, fire, and emergency services would be less than significant.

The geographic extent of public services, including schools, hospitals, libraries, parks, and other recreational uses extend across the state of Washington, providing hundreds of schools, parks, and recreational opportunities, and dozens of school districts and park/recreation providers in 39 counties. The exact number of fire and emergency services agency personnel involved in AFFF collection and transport is unknown. However, most existing and potential employees live in Washington state and those workers would not place new staffing demands on schools, hospitals, and recreation facilities. The AFFF program would not result in substantial new demands for hospital services, schools, parks, and recreation facilities in any one location. Therefore, the AFFF program would not result in significant adverse impacts to hospitals, schools, parks, and recreation facilities.

Section 3.9: Tribal Resources, Table 3.9-1 lists fire departments, emergency services, 10-day hold facilities, and hazardous materials cleanup sites located on or within 10 miles of an Indian reservation or traditional use lands. Section 3.9 concluded that the risk of impacts to Tribal resources would be low, given that Tribal lands are not located close enough to fire stations, potential 10-day hold facilities, potential transportation routes, or treatment and disposal locations for AFFF or PFAS to reasonably impact them.

Mitigation of impacts on Tribal resources is developed on a "case-by-case" basis. Ecology will develop best management practices (BMPs) and guidelines that will emphasize early consultation and information with potential impacted Tribes. Ecology will prepare traffic control plans, spill response plans, and geographic response plans that include actions to reduce or avoid serious injury to sensitive natural and cultural resources exposed to hazardous waste. Implementing BMPs and other measures would not decrease severity of potential impacts caused by AFFF exposure on Tribal or traditional use lands.

Section 5.2: Cumulative Projects Related to Tribal Lands and Environmental Justice Areas notes that future AFFF collection and transportation activities, beyond the AFFF program under review in this DEIS, would have the potential for significant and unavoidable adverse impacts on Tribal and cultural resources, including hunting and traditional gathering of wildlife and vegetation used for camping and traditional Tribal rituals, such as ceremonies and vision quests. Without effective mitigation that would reduce significant impacts to Tribal resources, those potential cumulative impacts would be considered unavoidable. Therefore, there would be

significant and unavoidable cumulative adverse impacts to Tribal resources related to use of recreation lands.

For all AFFF program alternatives, there would be potential release of AFFF due to spills, leaks, upset conditions, or other accidental releases to surface soils, surface water, and groundwater resources. Potential impacts to water quality from wastewater and stormwater discharge include fire stations participating in our product replacement program, 10-day hold facilities, and potential treatment and disposal sites for each alternative. Storage and handling of AFFF at fire stations participating in the AFFF program presents a low risk of release to surface water and groundwater. Most of the participating fire stations are in urban areas located on impermeable surfaces susceptible to stormwater runoff reaching surface waters. All fire stations are required to prepare and implement a facility spill response plan.

The AFFF program will implement informed decisions for collection, treatment, and disposal of AFFF, and for replacement of Class B foam. AFFF program impacts from collection, handling, and transport of AFFF foam would be short-term and temporary. Therefore, the AFFF program would not result in significant adverse impacts to groundwater resources, stormwater management, or wastewater treatment services.

Section 3.12 found that the proposed AFFF program alternatives, in combination with the activities described above in Section 5.2, therefore would not contribute to cumulative impacts with respect to most public services and utilities, including fire protection and emergency medical response, police and security services, hospital services, wastewater treatment, and energy resources.

For recreation resources, Section 5.2: Cumulative Projects Related to Tribal Lands and Environmental Justice Areas, notes that future AFFF collection and transportation activities, beyond the AFFF program under review in this DEIS, would have the potential for significant and unavoidable adverse impacts on Tribal and cultural resources, including hunting and traditional gathering of wildlife and vegetation used for camping and traditional Tribal rituals, on recreational lands. Without effective mitigation that would reduce significant impacts to Tribal resources, those potential cumulative impacts would be considered unavoidable. Therefore, there would be significant and unavoidable cumulative adverse impacts to Tribal resources related to use of recreation lands.

6 CONSULTATION AND COORDINATION

This section describes how Ecology (we) shared information during development of the proposed AFFF Collection, Transportation and Disposal Program Draft EIS. This chapter describes our outreach activities, from initial scoping in 2020 to the release of this Public Review Draft EIS. Appendix A.1 provides notices, determinations, and a scoping summary report and responses to request for public comment.

6.1 EIS Scoping Process

The scoping process was a joint effort between Ecology, the Washington Department of Public Health, and the State Fire Marshal's office on state and federal environmental reviews. The scoping period went from September 2020 to January 2021.

In 2020, we conducted outreach to municipal fire departments, identifying over 70 departments with approximately 30,000 gallons of AFFF that qualify for disposal. Over 100 fire departments have participated in our foam reporting program and received updates on collection and disposal activities. The AFFF fire department reporting results are discussed in Chapter 2: Project Description and Alternatives. Appendix A.2 is a listing of fire departments that participated in the program.

In September of 2020, we completed an environmental review of the project and released a SEPA checklist and a determination of non-significance (DNS) for public comment. We closed a 30-day comment period on October 1, 2020. After reviewing public comments, we decided to withdraw the DNS to do additional analysis of the project's environmental impacts, potential alternatives, and mitigation. On January 19, 2021, Ecology invited agencies, affected Tribes, members of the public, and all interested parties to comment on the scope of the EIS. The comment period was open for 30 days.

6.2 Notification Process

We notified agencies, affected Tribes, members of the public, and all interested parties of the request for comments via our email listserv and EZView website (webpage links are in section 6.5).

Requests for comments were made through the SEPA register, the agency's email list which included the participating fire departments, SEPA contacts at local and county governments, other state government entities, and Tribal governments. The outreach also included interested parties with Non-governmental entities, academic institutions, federal agencies, private industry, and the general public. Additional outreach on requests for comments on the DS were conducted on the agency's website, blog, public presentations, and through the online comment web portal. A distribution list appears later in this chapter.

Scoping comments were accepted using online forms, by mail, and at two public scoping meetings. Ecology and the Corps held two joint scoping meetings: one in Montesano on October 16, 2018, and one in Centralia on October 17, 2018. Agencies, Tribes, the public, businesses, and organizations provided 265 comments on the scope of the EIS. These included

comments on the Proposed Project, alternatives, fish, wildlife, wetlands, plants, earth, water, Tribal resources, climate change, health, and safety. The comments were used by Ecology to help identify what to study in the EIS. Additional details on the scoping process and the comments received are included in Appendix A.1, *AFFF Collection and Disposal – Scoping Comment Summary Report.*

6.3 Tribal Coordination

Four Tribal Forums were held on September 8th, 9th, 15th, and 16th of 2022. The goals of these Forums were to:

- Inform Tribes about the purpose for AFFF collection and disposal.
- Consult with Tribes and solicit their feedback and perspectives about the EIS scope.
- Communicate with Tribes about known risks, uncertainties, and potential impacts to human health and the environment of each disposal/treatment alternative.
- Cultivate relationships with Tribal representatives to ensure Tribes can continue to be involved throughout the lifecycle of the EIS, and during AFFF collection and disposal.

Email follow-up with a link to a recording of the forum was sent to the federally listed Tribes on November 15, 2022. A presentation was also given before the NW Indian Fisheries Commission on the AFFF disposal program on December 13th, 2022.

6.4 Public Notice and Commenting

Below are Ecology's public notice and public comment obligations for the AFFF EIS as required by state law. In short, Ecology must hold at least a 30-day public comment period on the draft EIS. If requested, Ecology may extend the comment period by an additional 15 days. In addition, lead agencies (this is Ecology in this case) may also extend the comment period.

The DEIS at a minimum must be circulated to:

- Ecology's HQ SEPA Unit (1 hardcopy, 1 electronic version).
- Agencies with jurisdiction.
- Agencies with expertise.
- Each city/county where impacts may occur.
- Local agencies whose public services would be changed.
- Applicable local, area-wide, or regional agencies if any.
- Any person requesting a copy.
- Affected Tribes.

- ► Local, regional, and/or state libraries (optional).
- ► Either a copy of the EIS or a notice of availability should be sent to anyone who has expressed an interest in the proposal.

Ecology is required to provide the following public notice of its DEIS.

- ► Mail to persons interested in the proposal.
- ► Publish notice in a newspaper of general circulation where the project is located.
- ► Post a notice on the site if site specific.

TABLE 6-1: Public Notice Procedure

Action	Details	Legislative Code
Distribute the DEIS for a 45-day comment period. Upon request, the lead agency may grant a 15-day extension. For their own proposals, the lead agency may extend the comment period.	Distribute the Public Draft EIS to: • HQ SEPA Unit (1 hardcopy, 1 electronic version). • Agencies with jurisdiction. • Agencies with expertise. • Each city/county where impacts may occur. • Local agencies whose public services would be changed. • Applicable local, area-wide, or regional agencies, if any. • Any person requesting a copy. • Affected Tribes. • Local, regional, and/or state libraries (optional). Either a copy of the EIS or a notice of availability should be sent to anyone who has expressed an interest in the proposal.	WAC 197-11-455[112]
Give public notice.	If possible, combine the SEPA notice with the permit notice. If not combined, select one or more of the following options: • Mail to persons interested in the proposal. • Publish notice in a newspaper of general circulation where the project is located. • Post a notice on the site if site-specific.	WAC 197-11-510[113] WAC 173-802-100[114]

[112]https://app.leg.wa.gov/wac/default.aspx?cite=197-11-455
[113] https://apps.leg.wa.gov/WAC/default.aspx?cite=197-11-510
[114] https://apps.leg.wa.gov/WAC/default.aspx?cite=173-802-100

6.5 Useful Websites

We've prepared mailouts, fact sheets, and online resources to inform the public explaining what PFAS is, how it is used in Washington State's municipal fire departments, and the environmental review process under the State Environmental Policy Act (SEPA).

- PFAS in FireFighting Foam EZView website[115] provides information on the Firefighting Agents and Equipment law and several background documents.
- Ecology's Toxics in Firefighting Law webpage[116] and Ecology's PFAS webpage[117] provide regulatory context.
- The AFFF Collection, Transportation, and Disposal EIS virtual website includes an overview of the SEPA EIS environmental review process, links to the DEIS content, and related material. The interactive website provides an opportunity for the public to comment on the scope of the proposed program.
- Interested parties can receive email updates[118] about the AFFF collection and disposal program though Ecology.

6.6 Distribution List

Here is a list of partners, Tribal groups, fire departments, industries, universities, NGOs, state and federal agencies, and others that have been contacted regarding the AFFF DEIS.

6.6.1 Fire Departments

- Adams County Fire District 5
- Anacortes Fire Department
- Bald Hills Fire District #17
- Bellingham Fire Department
- Bellingham Fire Department
- Bothell Fire Department
- Burlington Fire Dept.
- Central Pierce Fire & Rescue
- Central Whidbey Fire & Rescue
- City of Bellevue Fire Department
- City of Buckley Fire Dept
- City of Elma
- City of Port Angeles Fire Department
- Clallam 2 Fire-Rescue
- Clallam County Fire District 3
- Cowlitz County Fire District 6
- Cowlitz-Lewis FD #20
- Cowlitz-Skamania Fire District #7
- Duvall King County Fire District 45
- East Olympia Fire District #6
- East Pierce Fire and Rescue
- Fire Agency
- Grandview City
- Grant County Fire District #3
- Grant County Fire District #5
- Grays Harbor Fire Dist. #4
- King County Fire District 20
- Lynden Fire Department

[115] https://www.ezview.wa.gov/site/alias__1962/37693/pfas_in_firefighting_foam.aspx
[116] https://ecology.wa.gov/waste-toxics/reducing-toxic-chemicals/washingtons-toxics-in-products-laws/toxics-in-firefighting
[117] https://ecology.wa.gov/waste-toxics/reducing-toxic-chemicals/addressing-priority-toxic-chemicals/pfas
[118] https://public.govdelivery.com/accounts/WAECY/subscriber/new?topic_id=WAECY_89

- Mason County Fire District #13
- Mason County Fire District 11
- McCleary Fire/GHFD#12
- MCFD 18
- Mercer Island Fire Department
- Mount Vernon Fire Department
- Mountain View Fire and Rescue
- Nile Cliffdell Fire Department
- North Mason RFA
- Oak Harbor Fire Department
- Paine Field Fire Department
- Pasco Fire Department
- Pierce County Fire Dist 5
- Pierce County Fire District 16
- Pierce County Fire District 26 (Greenwater)
- Port of Bellingham/Bellingham International Airport
- Port Of Moses Lake Fire Department
- Port of Seattle Fire Department
- Richland Fire & Emergency Services
- Skagit County FD #3
- Skagit County FD 10
- Skagit County Fire District 14
- Skagit County Fire District 19
- Skagit County Fire District No. 6
- Snohomish Co. Fire District #4
- Snohomish County Fire District #15
- Snohomish County Fire District 7
- South Bay Fire Department
- South King Fire and Rescue
- South Kitsap Fire Rescue
- South Snohomish County Fire and Rescue RFA
- Spokane Co. Fire Dist 4
- Spokane County Fire District 10
- Spokane County Fire District 11
- Tacoma Fire Department
- Thurston County Fire District 9
- Thurston County Fire Protection District 13
- Tumwater Fire Department
- Valley Regional Fire Authority
- Valley Regional Fire Authority
- Walla Walla Regional Airport
- West Mason Fire Mason County
- Whatcom County Fire District No. 7
- WA Department Of Transportation

6.6.2 Tribes

- Coeur d'Alene Tribe
- Yakama Tribal Council
- Confederated Tribes of the Chehalis Reservation
- Confederated Tribes of the Colville Reservation
- Confederated Tribes of Warm Springs Reservation of Oregon
- Cowlitz Indian Tribe
- Hoh Indian Tribe
- Jamestown S'Klallam Tribe
- Kalispel Tribe of Indians
- Lower Elwha Klallam Tribe
- Lummi Nation
- Makah Tribe
- Muckleshoot Indian Tribe
- Nez Perce Tribe
- Nisqually Indian Tribe
- Nisqually Tribal Council
- Nooksack Indian Tribe
- Nooksack Tribal Council
- Port Gamble S'Klallam Tribe
- Puyallup Tribe
- Quileute Tribe
- Quinault Indian Nation
- Samish Indian Nation
- Sauk-Suiattle Indian Tribe
- Shoalwater Bay Indian Tribe
- Skokomish Indian Tribe
- Snoqualmie Indian Tribe
- Spokane Tribe of Indians
- Squaxin Island Tribe

- Stillaguamish Tribe of Indians
- Suquamish Tribe
- Swinomish Indian Tribal Community
- Tulalip Tribes
- Upper Skagit Indian Tribe

6.6.3 Universities

- Clarkson University
- Colorado School of Mines
- Oregon State University
- University of Missouri
- University of Vermont
- University of Washington

6.6.4 Governmental Entities

6.6.4.1 Washington State County Governments

- Adams
- Asotin
- Benton
- Chelan
- Clallam
- Clark
- Columbia
- Cowlitz
- Douglas
- Ferry
- Franklin
- Garfield
- Grant
- Grays Harbor
- Island
- Jefferson
- King
- Kitsap
- Kittitas
- Klickitat
- Lewis
- Lincoln
- Mason
- Okanogan
- Pacific
- Pend Oreille
- Pierce
- San Juan
- Skagit
- Skamania
- Snohomish
- Spokane
- Stevens
- Thurston
- Wahkiakum
- Walla Walla
- Whatcom
- Whitman
- Yakima

6.6.4.2 Local Agencies

- City of Aberdeen
- City of Anacortes
- Port of Anacortes
- Port of Bellingham
- Port of Columbia
- Port of Everett
- Port of Grays Harbor
- Port of Olympia
- Port of Port Angeles
- Port of Tacoma
- Port of Shelton
- Port of Vancouver
- Port of Seattle
- Benton Clean Air Agency
- Northwest Clean Air Agency
- Olympic Clean Air Agency

- Puget Sound Clean Air Agency
- Southwest Clean Air Agency
- Spokane Clean Air Agency
- Yakima Regional Clean Air Agency
- City of San Francisco
- Spokane International Airport
- King County Metro

6.6.4.3 State Agencies

- Alaska Department of Environmental Conservation
- Arkansas Department of Environmental Quality
- Colorado Department of Public Health and Environment
- Connecticut Department of Energy and Environmental Conservation
- Kentucky Department of Environmental Protection
- Maine Department of Environmental Protection
- Massachusetts Department of Environmental Protection
- Michigan Department of the Environment, Great Lakes, and Energy
- Michigan Department of Transportation
- Minnesota Pollution Control Agency
- New Hampshire Department of Environmental Services
- New Jersey Department of Environmental Protection
- New Mexico Environment Department
- New York Department of Environmental Conservation
- Ohio Environmental Protection Agency
- Oregon Department of Environmental Quality
- Rhode Island Department of Environmental Management
- South Dakota Department of Agriculture and Natural Resources
- Texas Commission on Environmental Quality
- Utah Department of Environmental Quality
- Vermont Department of Environmental Conservation
- Wisconsin Department of Natural Resources

6.6.4.4 Washington State Agencies

- Attorney General's Office
- Department of Agriculture
- Department of Archeology and Historic Preservation
- Department of Commerce
- Department of Fish and Wildlife
- Department of Health
- Department of Natural Resources
- Department of Transportation
- State Patrol

6.6.4.5 Federal Agencies

- Defense Logistics Agency
- Department of Defense/Strategic Environmental Research and Development Program/Environmental Security Technology Certification Program
- Department of the Navy
- Department of Transportation
- Environmental Protection Agency
- Federal Aviation Administration
- National Park Service
- United States Air Force
- United States Coast Guard

6.6.5 Industry

- 374 Water
- Advantek
- American Chemistry Council
- American Petroleum Institute
- Amerizorb
- Ampol
- Aquagga
- Arcadis
- Battelle
- Baum's Nova Cool
- British Petroleum
- Clean Harbors
- DuPont
- Ecologic
- Fire Technologies Innovation
- GreenFire
- Heritage Crystal Clean
- Jensen and Hughes Consulting
- Millennium Consulting
- NoFoam System
- Oshkosh Airport Services
- Rosenbauer America, LLC
- Santa Energy
- Sierra 5
- TRS Group Inc.
- US Ecology
- Western Fire & Safety Co., Inc.
- Western States Petroleum Association

6.6.6 Other Organizations and Interested Parties

- Airport Rescue and Firefighting Working Group
- Earth Justice
- Fire Fighter Cancer Foundation
- National Fire Prevention Association
- National Tribal Water Council
- Northeast Waste Management Officials
- Sierra Club
- Skagit River System Cooperative
- Toxic Free Future
- Tribal PFAS Working Group
- Washington Fire Chiefs Association
- Washington Fire Commissioners Association
- Zero Waste Washington
- Bridge and Diamond Law Firm

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8 REPORT CONTRIBUTORS

Department of Ecology

NAME	AFFF EIS Program Title
Sean Smith	Project Proponent and Program Manager, Hazardous Waste and Toxics Reduction Program, Northwest Region Office
Elaine Snouwaert:	Project Liaison for Ecology Hazardous Waste and Toxics Reduction Program, Eastern Region Office
Jason Landskron	Environmental Engineer Ecology Subject Matter Expert (SME) existing and evolving PFAS disposal methods and regulatory requirements for Dangerous Waste
Myles Perkins	Acting Manager, Environmental Engineer, Ecology Northwest Region Office Toxics Reduction Unit Supervisor. Ecology SME—regulatory permitting, compliance assistance; PFAS technical analysis
Millie Piazza	Executive Manager, Environmental Justice Ecology Headquarters (HQ)
Tyson Oreio	Tribal Liaison and Program Manager
Meg Bommarito	Regional Planner, Ecology Northwest Region Office; SME SEPA
Teague Powell	Research Analyst, Ecology HWT Program; SME metrics, GIS services
Jon Thompson	Assistant Attorney General, Ecology Division with the State of Washington. Jon is providing risk management assessment guidance for the project

Consultants

TRC Companies	EIS Services
Kevin Freeman	EIS Project Manager, SME—SEPA
Paula DeMichele	Deputy PM, EIS content author
Amy Wilson	Senior Technical Advisor—PFAS, Groundwater/Surface Water Quality, Human Health Risks
Matthew Hazleton	Senior Technical Advisor, SME—Air Quality, GHG Emissions
Michael Rice	Senior Technical Advisor, SME—Cumulative Impacts
Gary Lieberman	SME Transportation and Truck Safety, Human Health Risks
Matthew Wetherbee	SME Cultural, Tribal Resources
Molly Sandomire	Biology and Aquatic Resources
Patrick Fennel	SME Air Resources

TRC Companies	EIS Services
Lee Hovey	SME—Earth and Water Resources, Surface/Groundwater Resources
Rebecca Spring, Rachel Jordan	GIS services, web mapping data
Susan Crespin, Christy Wyborny, Chris Muňoz	Graphics, formatting
Katie Burton	Project Coordinator and accounting services

Cascadia Consulting Group Inc	EIS Services
Gretchen Muller	Outreach and Coordination Management
Alle Brown Law, Caroline Burney	Public outreach materials, graphics, coordination

Greene Economics, Inc.	EIS Services
Gretchen Greene	Environmental Justice, Tribal Resources Scoping Report Preparation
Bea Covington	Environmental Justice

9 ACRONYMS/GLOSSARY OF TERMS

Acronym/Abbreviation	Definition
µg/m^3	micrograms per cubic meter
AFFF	aqueous film-forming foam/aqueous firefighting foam
ALT	alanine aminotransferase
AM	arithmetic mean
AOF	adsorbable organic fluorine
APFN	ammonium perfluorononanoate
APFO	ammonium perfluorooctanoate
ARP	advanced reduction processes
ATSDR	Agency for Toxic Substances and Disease Registry
BAF	bioaccumulation factor
BLM	Bureau of Land Management
BMPs	best management practices
BOHP	Bi3O(OH)(PO4)2
BuFASA	N-butyl perfluoroalkane sulfonamide
BuFASAA	N-butyl perfluoroalkane sulfonamido acetic acid
BuFASE	N-butyl perfluoroalkane sulfonamido ethanols
C	carbon
°C	Degrees centigrade (temperature)
C8	historical name for PFOA
CAA	Clean Air Act
CAAA	federal Clean Air Act Amendments of 1990
CAP	chemical action plan, or corrective action plan
CAS	Chemical Abstracts Service
CCC	criterion continuous concentration
CDC	United States Centers for Disease Control and Prevention

Acronym/Abbreviation	Definition
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CL	clearance factor
CLARC	Cleanup Levels and Risk Calculation
CMC	criterion maximum concentration
CO	Carbon monoxide
CO_2e	Carbon dioxide equivalents
CWA	federal Clean Water Act
Da	Dalton (unit of mass)
DAHP	Washington Department of Archaeology and Historic Preservation
DEIS	Draft environmental impact statement
DEQ	Utah Department of Environmental Quality
DNS	Determination of Non-Significance
DOC	dissolved organic carbon
DoD	United States Department of Defense
DRE	Destruction and removal efficiency
DS	Determination of Significance
DW	Dangerous Waste
DW	drinking water
E2SSB	Engrossed Second Substitute Senate Bill
ECHO	Enforcement and Compliance History Online
Ecology	Washington State Department of Ecology
ECT	Emerging Compound Treatment Technologies, Inc.
EHD	Environmental health disparities
EHW	Extremely hazardous waste
EIS	Environmental Impact Statement

Acronym/Abbreviation	Definition
EJ	Environmental justice
ELG	effluent limitation guidelines
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ERA	ecological risk assessment
ESA	Federal Endangered Species Act
ESS	Environmental Sequence Stratigraphy
ESTCP	Environmental Security Technology Certification Program
F	fluorine
°F	degrees Fahrenheit
F3	fluorine-free foams
F-53B	chlorinated polyfluorinated ether sulfonate (PFOS substitute for plating)
FAA	Federal Aviation Administration
FASA	perfluoroalkane sulfonamide
FD	fire department
FDA	U.S. Food and Drug Administration
FEC	Foam Exposure Committee
FECA	fluorinated ether carboxylate
FEP	perfluorinated ethylene-propylene
FFF	fluorine-free foams
FFFC	Fire Fighting Foam Coalition
FFFP	film-forming fluoroprotein foam
FhxSA	perfluorohexane sulfonamide
foc	fraction of organic carbon
FOSA, or PFOSA	perfluorooctane sulfonamide
FSRP	Facility Spill Response Plan

Acronym/Abbreviation	Definition
FTA	fire training area
FTCA	fluorotelomer carboxylic acid
FTOH	fluorotelomer alcohol
FTSA or FTS	fluorotelomer sulfonate, fluorotelomer sulfonic acid
FtTAoS	fluorotelomer thioether amido sulfonate
GenX	trade name for a polymerization processing aid formulation that contains ammonium 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy)propanoate
g/g-mole	grams per gram-mole
GHG	Greenhouse gas
GRP	Geographic response plan
HA	health advisory
HALs	Health advisory levels
HMTA	federal Hazardous Materials Transportation Act
Health	Washington State Department of Health
HED	Human equivalent
HFPO-DA	hexafluoropropylene oxide dimer acid, also known as GenX
Hg	mercury
HI	hazard index
HOCs	Halogenated organic compounds
HQ	hazard quotient
HUC	Hydrologic Unit Code watersheds
I	Interstate
IRIS	Integrated Risk Information System
ITRC	Interstate Technology and Regulatory Council
IX	ion exchange
kg	kilogram
L	liter

Acronym/Abbreviation	Definition
LC50	lethal concentration to 50 percent of population
LCRS	Leachate collection and recovery system
LD50	lethal dose to 50 percent of population
LEP	Limited English proficiency
LOQ	limit of quantitation
LTS	Less than significant effect
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
mg	Milligram
mg/kg	milligrams per kilogram
Mil-Spec	U.S. Military Defense Specification
MMBtu; MMBtu/yr	Million British thermal units; million British thermal units per year
MMscf	Million standard cubic feet
MOA	mode of action
MOVES	EPA's Motor Vehicle Emission Simulator
MOVES3	Motor Vehicle Emission Simulator (latest version)
MTCA	Model Toxics Control Act
MT CO_2e	Metric tons of carbon dioxide equivalent
MW	molecular weight
NAAQS	National Ambient Air Quality Standards
NaPFO	sodium perfluorooctanoate
NDAA	National Defense Authorization Act
NDEP	Nevada Department of Environmental Protection
NDEQ	Nebraska's Department of Environmental Quality
NER	non-extractable residues
NF	nanofiltration
ng/kg	Nanograms per kilogram

Acronym/Abbreviation	Definition
ng/L	nanograms per liter
NHD	National hydrography data set
NHPA	National Historic Preservation Act
NHTSA	National Highway Traffic Safety Administration
NMFS	National Marine Fisheries Service
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Survey
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O_3	Ozone
ORD	Office of Research and Development (USEPA)
PAF	perfluoroalkanoyl fluorides
PAH	polycyclic aromatic hydrocarbon
PASF	perfluoroalkane sulfonyl fluoride
Pb	Lead
PCBs	polychlorinated biphenyls
PCEs	Primary constituent elements
PCLs	Protective concentration levels
PFA	perfluoroalkoxy polymer
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutanoate, perfluorobutanoic acid, perfluorobutyrate, perfluorobutyric acid
PFBS	perfluorobutane sulfonate, perfluorobutanesulfonic acid
PFC	perfluorocarbon (CnF2n+1, for example, perfluorooctane)
PFCA	perfluoroalkyl carboxylate, perfluoroalkyl carboxylic acid

Acronym/Abbreviation	Definition
PFCAs	perfluorocarboxylic acids
PFDA	perfluorodecanoate, perfluorodecanoic acid
PFDoDA	Perfluorododecanoic acid
PFDoS, or PFDoDS	perfluorododecane sulfonate, perfluorododecane sulfonic acid
PFDS	perfluorodecane sulfonate, perfluorodecane sulfonic acid
PFECA	per- or polyfluoroalkyl ether carboxylic acid
PFEI	perfluoroethyl iodide (aka fluorotelomer iodide)
PFESA	per- or poly- fluoroalkyl ether sulfonic acid
PFHxA	Perfluorohexanoic acid
PFHxS	Perfluorohexane sulfonate, Perfluorohexanesulfonic acid
PFNA	perfluorononanoate, perfluorononanoic acid
PFNS	perfluorononane sulfonate, perfluorononane sulfonic acid
PFOA	perfluorooctanoate, perfluorooctanoic acid, perfluorooctane carboxylate
PFODA	Perfluorooctadecanoic acid
PFOS	Perfluorooctanesulfonic acid
PFOSA, or FOSA	perfluorooctane sulfonamide
PFPA	perfluorophosphonic acid
PFPE	perfluoropolyether
PFPeA	perfluoropentanoate, perfluoropentanoic acid
PFPeS	perfluoropentane sulfonate, perfluoropentane sulfonic acid
PFPiA	perfluorophosphinic acid
PFPrA	Perfluoropropanoic acid
PFSA	perfluoroalkyl sulfonate, perfluoroalkane sulfonic acid
PFTetA	Perfluorotetradecanoic acid
PFUDA	Perfluoroundecanoic acid
pH	negative log of hydrogen ion concentration (measure of acidity)

Acronym/Abbreviation	Definition
PHxSF	perfluorohexane sulfonyl fluoride
PICs	products of incomplete combustion
$PM_{2.5}$	particulate matter with a nominal aerodynamic diameter of 2.5 microns or less
PM_{10}	particulate matter with a nominal aerodynamic diameter of 10 microns or less
POTW	Publicly owned treatment works
POU	point of use
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
ppt	parts per trillion
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RfD	reference dose
RL	reporting limit
RO	reverse osmosis
RSL	EPA's regional screening level (Note: In many commercial venues RSL means "restricted substances list.")
SAF	secondary acute factor
SAL	State action level
SCWO	Supercritical Water Oxidation
s.d. or SD	standard deviation
SDWA	Safe Drinking Water Act
SEPA	State Environmental Policy Act
SERDP	Strategic Environmental Research and Development Program
SL	screening level
SO_2	Sulfur dioxide

Acronym/Abbreviation	Definition
SPE	solid-phase extraction
SQG	Small quantity generator
SRSL	secondary risk screening level
TCEQ	Texas Commission for Environmental Quality
TCP	Traditional cultural properties
TFSI	Bis(trifluoromethylsulfonyl)amine
Ton/hr	Tons per hour
Ton/yr	Tons per year
TRC	TRC Solutions; TRC Companies
TRI	Toxics release inventory
TRRP	Texas Risk Reduction Program
TSCA	Toxic Substances Control Act
TSD	Treatment, storage, and disposal facility
TSDR	Treatment, storage, disposal, and recycling Facility
USFWS	United States Fish and Wildlife Service
USDOT	United States Department of Transportation
USDW	Underground source of drinking water; aquifer
USGS	United States Geological Survey
UTC	Washington State Utilities and Transportation Commission
VOC	volatile organic compound
VP	Vapor pressure
WAC	Washington Administrative Code
WDFW	Washington State Department of Fish and Wildlife
WP01	Washington State–only persistent waste code for wastes with halogenated organic compound concentrations greater than 1%. This is also an extremely hazardous waste.
WP02	Washington State–only persistent waste code for wastes with halogenated organic compound concentrations from 0.01% to 1%.

Acronym/Abbreviation	Definition
WRIAs	water resource inventory areas
WSDOT	Washington State Department of Transportation
WWTP	Wastewater treatment plant