Fact Sheet for National Pollutant Discharge Elimination System and State Waste Discharge Permit WA0024651

Port of Seattle
Seattle-Tacoma International Airport
Effective Date: January 1, 2016

Purpose of this fact sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for Port of Seattle, Seattle-Tacoma International Airport (STIA).

This fact sheet complies with Section 173-220-060 of the Washington Administrative Code (WAC), which requires Ecology to prepare a draft permit and accompanying fact sheet for public evaluation before issuing an NPDES permit.

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for STIA, NPDES Permit No. WA0024651, were available for public review and comment from November 5, 2015, until December 7, 2015. For more details on preparing and filing comments about these documents, please see *Appendix A--Public Involvement Information.*

STIA reviewed the draft permit and fact sheet for factual accuracy. Ecology corrected any errors or omissions regarding the facility's location, history, discharges, or receiving water prior to publishing this draft fact sheet for public notice.

After the public comment period closes, Ecology will summarize substantive comments and provide responses to them. Ecology will include the summary and responses to comments in this fact sheet as *Appendix I--Response to Comments*, and publish it when issuing the final NPDES permit. Ecology generally will not revise the rest of the fact sheet. The full document will become part of the legal history contained in the facility's permit file.

2015 Summary

This permit is divided into three parts, each for different types of water discharged. Appendices E & F describe the Industrial Wastewater system covered in Part 1 of the permit. Appendix G describes the Industrial Stormwater system covered in Part 2. Appendix H describes the stormwater associated with construction activities covered in Part 3. Industrial wastewater discharges to both local sewage systems and directly to Puget Sound after treatment, depending on the strength of the wastewater. The airport discharges treated stormwater to local fresh water streams, ponds, and wetlands around the airport.

The new permit requires the use of Ecology's webDMR system for submitting monitoring data. Other changes include:

Part 1 – Industrial Wastewater

- Mass limits are calculated based on maximum clarifier overflow rate as requested by the Port. This change corrects a technical error; mass limits should have been revised after completion of flow segregation measures in 2007. The mass limits calculations for BOD are included in *Appendix D* and are done per Ecology's *Permit Writer's Manual.*

- Priority Metals testing is reduced. Testing has demonstrated no reasonable potential to exceed water quality standards for longer than five years. Testing for Priority Metals will continue twice per year in year three of the permit cycle along with other Priority Pollutants.

Part 2 – Industrial Stormwater

- Discharge from some ponds sometimes violated the pH limit in the 2009 permit. Stormwater discharge pH limits have been relaxed from a range of 6.5 to 8.5 to a range of 6.3 to 9 based on the Port's study of pH range in stormwater treatment ponds and demonstrated compliance with the WQ standards in the receiving water at this wider range. WAC 173-221 sets AKART for pH range in treatment ponds at 6.0 to 9.0.
- WET testing for stormwater discharges is reduced. Testing has demonstrated no toxicity in the discharges for longer than five years. In-situ testing in the receiving waters remains as it was in the last permit.

Part 3 – Construction Stormwater

- Benchmarks for pH and total dissolved solids are added to provide for meeting groundwater standards. The benchmark applies to Portable Batch Plant and/or Concrete Crusher Operations construction stormwater associated with concrete discharged into unlined ponds and designated infiltration systems.

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I. Introduction

The Federal Clean Water Act (FCWA, 1972, and later amendments in 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System (NPDES), administered by the federal Environmental Protection Agency (EPA). The EPA authorized the state of Washington to manage the NPDES permit program in our state. Our state legislature accepted the delegation and assigned the power and duty for conducting NPDES permitting and enforcement to Ecology. The Legislature defined Ecology's authority and obligations for the wastewater discharge permit program in 90.48 RCW (Revised Code of Washington).

The following regulations apply to industrial NPDES permits:

- Procedures Ecology follows for issuing NPDES permits (chapter 173-220 WAC).
- Water quality criteria for surface waters (chapter 173-201A WAC).
- Water quality criteria for ground waters (chapter 173-200 WAC).
- Whole effluent toxicity testing and limits (chapter 173-205 WAC).
- Sediment management standards (chapter 173-204 WAC).
- Submission of plans and reports for construction of wastewater facilities (chapter 173-240 WAC).

These rules require any industrial facility owner/operator to obtain an NPDES permit before discharging wastewater to state waters. They also help define the basis for limits on each discharge and for performance requirements imposed by the permit.

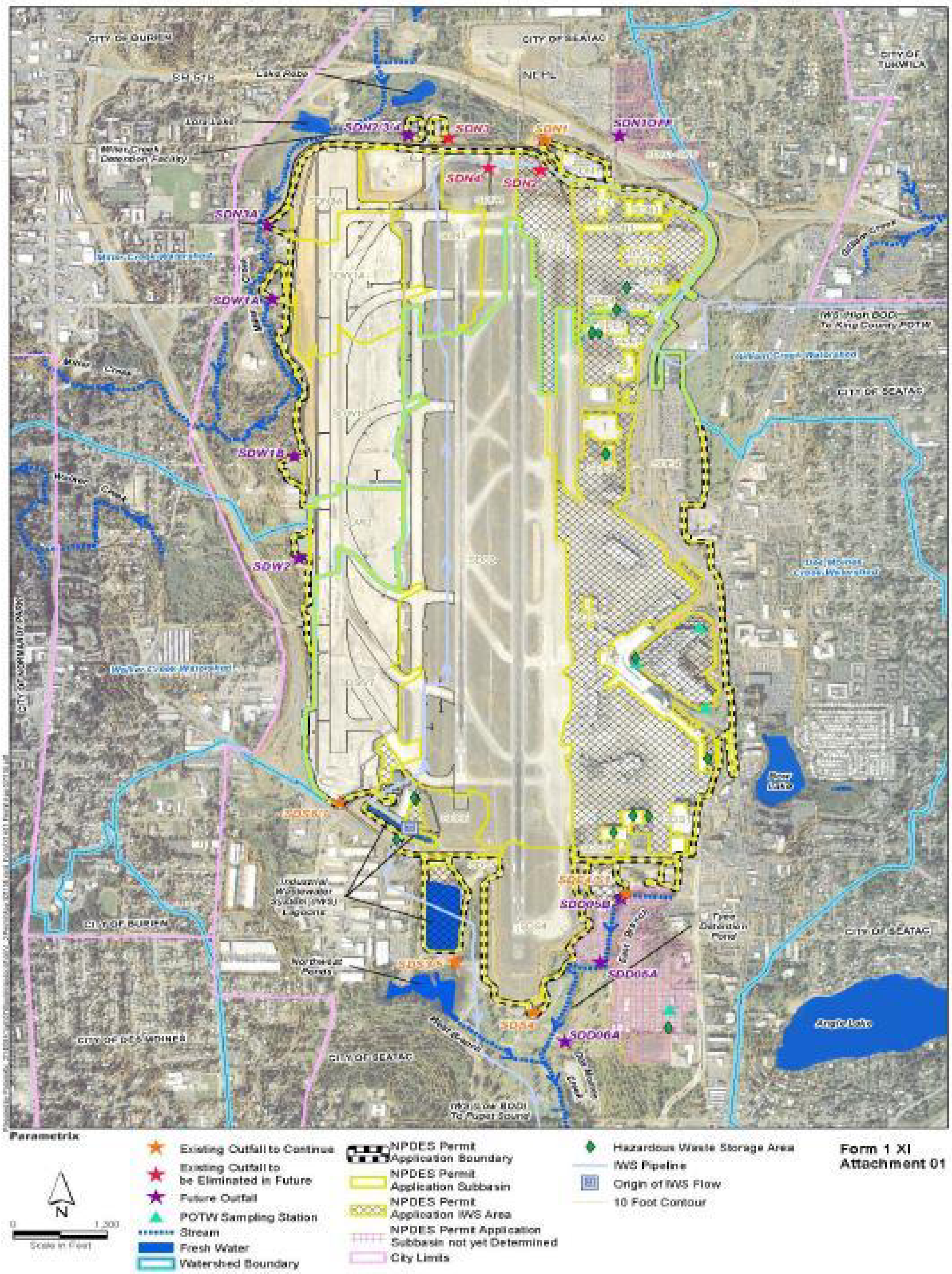
Under the NPDES permit program and in response to a complete and accepted permit application, Ecology must prepare a draft permit and accompanying fact sheet, and make them available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a period of thirty days (WAC 173-220-050). (See *Appendix A--Public Involvement Information* for more detail about the public notice and comment procedures). After the public comment period ends, Ecology may make changes to the draft NPDES permit in response to comment(s). Ecology will summarize the responses to comments and any changes to the permit in *Appendix I.*

II. Background Information

Table 1. General Facility Information

Applicant:	PORT OF SEATTLE
Facility Name and Address:	Seattle-Tacoma International Airport P.O. Box 68727 Seattle, WA 98168
Type of Treatment:	Oil and water separation, dissolved air floatation, settling
Type of Facility:	Air-Transportation
SIC Code:	4581 (Airport, Air Terminal) 4512 (Air Transportation) 4513 (Air Courier Services) 5171 (Bulk Petroleum Storage)
Discharge Location:	Part I – Marine Discharge Location: East End Diffuser Latitude: 47.403056 N Longitude: -122.336944 W West End Diffuser Latitude: 47.403056 N Longitude: -122.337778 W Part II – Freshwater Discharge Locations: See Section II.B Discharge Locations. Part III – Freshwater Discharge Locations: See Section II.BC for Discharge Locations.
Waterbody ID Number:	(i) WA-PS-0270 (ii) WA-09-2000 (iii) WA-09-2005
Receiving Water:	(i) Puget Sound (Industrial Wastewater and Stormwater Runoff) (ii) Des Moines Creek (Stormwater) (iii) Miller Creek (Stormwater) (iv) City of SeaTac Storm Sewer, tributary to Gillian Creek and the Green River (Stormwater) (v) Walker Creek (Stormwater) (vi) Northwest Ponds (Stormwater) (vii) Lake Reba (Stormwater)

Figure 1. Seattle-Tacoma International Airport Stormwater Site Map



A. Industrial wastewater discharge locations

OUTFALL #	OUTFALL LOCATION	RECEIVING WATER
001	East End Diffuser Latitude: 47.403056 N Longitude: -122.336944 W West End Diffuser Latitude: 47.403056 N Longitude: -122.337778 W	Puget Sound

B. Stormwater associated with industrial activities discharge locations

Table II-S1A(1): Existing and New Outfalls and Subbasins			
OUTFALL #	**OUTFALL LOCATIONS**	**SAMPLING POINT**	**RECEIVING WATER**
SDE4/S1	Latitude: 47.433056 N Longitude: -122.301944 W	At the Point of Discharge	Des Moines Creek (East Branch) (DME)
SDD06A	Latitude: 47.426389 N Longitude: -122.30556 W	At the Point of Discharge	Des Moines Creek (East Branch) (DME)
SDN1	Latitude: 47.466944 N Longitude: -122.306111 W	At the Point of Discharge	Lake Reba RB
SDS3/5	Latitude: 47.43 N Longitude: -122.311667 W	At the Point of Discharge	Northwest Pond NP
SDS4	Latitude: 47.42778 N Longitude: -122.30722 W	At the Point of Discharge	Northwest Pond NP
SDS6/7	Latitude: 47.437222 N Longitude: - 122.31806 W	At the Point of Discharge	Northwest Pond NP
SDN2/3/4	Latitude: 47.468056 N Longitude: -122.313056 W	At the Point of Discharge	Lake Reba RB
SDN3A	Latitude: 47.463333 N Longitude: -122.321944 W	At the Point of Discharge	Miller Creek MC
SDW1A	Latitude: 47.46 N Longitude: -122.32167 W	At the Point of Discharge	Miller Creek MC
SDW1B	Latitude: 47.452778 N Longitude: -122.32028 W	At the Point of Discharge	Miller Creek MC
SDW2	Latitude: 47.448333 N Longitude: -122.32028 W	At the Point of Discharge	Walker Creek WC
Future Outfalls to be Activated			
SDD05A	Latitude: 47.43 N Longitude: -122.30333 W	At the Point of Discharge	Des Moines Creek (East Branch)
SDD05B	Latitude: 47.432778 N Longitude: -122.302222 W	At the Point of Discharge	Des Moines Creek (East Branch)

C. Stormwater associated with construction activities discharge locations

EXISTING OUTFALL LOCATION 1	RECEIVING WATER	SAMPLING POINT
Latitude: 47˚ 28’ 15” N Longitude: -122˚ 19’ 00” W	Miller Creek #14	At the Point of Discharge
Latitude: 47˚ 28’ 15” N Longitude: -122˚ 19’ 00” W	Miller Creek #14-A	At the Point of Discharge
Latitude: 47˚ 28’ 00” N Longitude: -122˚ 19’ 00” W	Miller Creek #15	At the Point of Discharge
Latitude: 47˚ 28’ 00” N Longitude: -122˚ 19’ 00” W	Miller Creek #15-A	At the Point of Discharge
Latitude: 47˚ 28’ 00” N Longitude: -122˚ 19’ 00” W	Miller Creek #15-B	At the Point of Discharge
Latitude: 47˚ 28’ 00” N Longitude: -122˚ 19’ 15” W	Miller Creek #16	At the Point of Discharge
Latitude: 47˚ 28’ 00” N Longitude: -122˚ 19’ 15” W	Miller Creek #16-A	At the Point of Discharge
Latitude: 47˚ 27’ 45” N Longitude: -122˚ 19’ 15” W	Miller Creek #17	At the Point of Discharge
Latitude: 47˚ 27’ 45” N Longitude: -122˚ 19’ 15” W	Miller Creek #17-A	At the Point of Discharge
Latitude: 47˚ 27’ 30” N Longitude: -122˚ 19’ 30” W	Miller Creek #18	At the Point of Discharge
Latitude: 47˚ 27’ 30” N Longitude: -122˚ 19’ 30” W	Miller Creek #18-A	At the Point of Discharge
Latitude: 47˚ 27’ 30” N Longitude: -122˚ 19’ 15” W	Miller Creek #19	At the Point of Discharge
Latitude: 47˚ 27’ 30” N Longitude: -122˚ 19’ 15” W	Miller Creek #19-A	At the Point of Discharge
Latitude: 47˚ 27’ 15” N Longitude: -122˚ 19’ 30” W	Miller Creek #20	At the Point of Discharge
Latitude: 47˚ 27’ 15” N Longitude: -122˚ 19’ 30” W	Miller Creek #20-A	At the Point of Discharge
Latitude: 47˚ 27’ 15” N Longitude: -122˚ 19’ 15” W	Miller Creek #21	At the Point of Discharge
Latitude: 47˚ 27’ 15” N Longitude: -122˚ 19’ 15” W	Miller Creek #21-A	At the Point of Discharge
Latitude: 47˚ 28’ 15” N Longitude: -122˚ 18’ 45” W	Lake Reba # 28	At the Point of Discharge
Latitude: 47˚ 28’ 15” N Longitude: -122˚ 18’ 45” W	Lake Reba # 28 -A	At the Point of Discharge
Latitude: 47˚ 28’ 15” N Longitude: -122˚ 18’ 45” W	Lake Reba # 28 - B	At the Point of Discharge
Latitude: 47˚ 28’ 00” N Longitude: -122˚ 18’ 45” W	Lake Reba # 29	At the Point of Discharge
Latitude: 47˚ 28’ 00” N Longitude: -122˚ 18’ 45” W	Lake Reba # 29-A	At the Point of Discharge
Latitude: 47˚ 28’ 00” N Longitude: -122˚ 18’ 30” W	Lake Reba # 30	At the Point of Discharge
Latitude: 47˚ 28’ 00” N Longitude: -122˚ 18’ 30” W	Lake Reba # 30-A	At the Point of Discharge
Latitude: 47˚ 28’ 00” N Longitude: -122˚ 18’ 30” W	Lake Reba # 30-B	At the Point of Discharge

EXISTING OUTFALL LOCATION 1	***RECEIVING WATER***	***SAMPLING POINT***
Latitude: 47˚ 28' 00" N Longitude: -122˚ 18' 30" W	Lake Reba # 30-C	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 18' 30" W	Lake Reba # 30-D	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 18' 30" W	Lake Reba # 30-E	At the Point of Discharge
Latitude: 47˚ 25' 45" N Longitude: -122˚ 19' 00" W	Northwest Ponds #4	At the Point of Discharge
Latitude: 47˚ 25' 45" N Longitude: -122˚ 19' 00" W	Northwest Ponds #4-A	At the Point of Discharge
Latitude: 47˚ 25' 45" N Longitude: -122˚ 18' 45" W	Northwest Ponds #5	At the Point of Discharge
Latitude: 47˚ 25' 45" N Longitude: -122˚ 18' 45" W	Northwest Ponds #5-A	At the Point of Discharge
Latitude: 47˚ 25' 45" N Longitude: -122˚ 18' 45" W	Northwest Ponds #5-B	At the Point of Discharge
Latitude: 47˚ 25' 30" N Longitude: -122˚ 18' 30" W	Des Moines Creek #7	At the Point of Discharge
Latitude: 47˚ 25' 30" N Longitude: -122˚ 18' 30" W	Des Moines Creek #7-A	At the Point of Discharge
Latitude: 47˚ 26' 00" N Longitude: -122˚ 17' 45" W	Des Moines Creek #9	At the Point of Discharge
Latitude: 47˚ 26' 00" N Longitude: -122˚ 18' 00" W	Des Moines Creek #10	At the Point of Discharge
Latitude: 47˚ 26' 00" N Longitude: -122˚ 18' 00" W	Des Moines Creek #10-A	At the Point of Discharge
Latitude: 47˚ 26' 00" N Longitude: -122˚ 18' 00" W	Des Moines Creek #10-B	At the Point of Discharge
Latitude: 47˚ 26' 00" N Longitude: -122˚ 18' 15" W	Des Moines Creek # 11	At the Point of Discharge
Latitude: 47˚ 26' 00" N Longitude: -122˚ 18' 15" W	Des Moines Creek # 11-A	At the Point of Discharge
Latitude: 47˚ 25' 45" N Longitude: -122˚ 18' 15" W	Des Moines Creek #12	At the Point of Discharge
Latitude: 47˚ 25' 45" N Longitude: -122˚ 18' 15" W	Des Moines Creek #12-A	At the Point of Discharge
Latitude: 47˚ 25' 45" N Longitude: -122˚ 18' 15" W	Des Moines Creek #12-B	At the Point of Discharge
Latitude: 47˚ 25' 30" N Longitude: -122˚ 18' 15" W	Des Moines Creek #13	At the Point of Discharge
Latitude: 47˚ 25' 30" N Longitude: -122˚ 18' 15" W	Des Moines Creek #13-A	At the Point of Discharge
Latitude: 47˚ 25' 30" N Longitude: -122˚ 18' 15" W	Des Moines Creek #13-B	At the Point of Discharge
Latitude: 47˚ 25' 15 N Longitude: -122˚ 18' 15" W	Des Moines Creek #25	At the Point of Discharge
Latitude: 47˚ 25' 15 N Longitude: -122˚ 18' 15" W	Des Moines Creek #25-A	At the Point of Discharge
Latitude: 47˚ 25' 15 N Longitude: -122˚ 18' 15" W	Des Moines Creek #25-B	At the Point of Discharge
Latitude: 47˚ 26' 30 N Longitude: -122˚ 17' 30" W	Des Moines Creek #29	At the Point of Discharge

EXISTING OUTFALL LOCATION 1	*RECEIVING WATER*	*SAMPLING POINT*
Latitude: 47˚ 27' 45" N Longitude: -122˚ 17' 15" W	Gilliam Creek #26	At the Point of Discharge
Latitude: 47˚ 27' 45" N Longitude: -122˚ 17' 00" W	Gilliam Creek #27	At the Point of Discharge
Latitude: 47˚ 27' 45" N Longitude: -122˚ 17' 00" W	Gilliam Creek #27-A	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 17' 15" W	Gilliam Creek #28	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 17' 15" W	Gilliam Creek #28-A	At the Point of Discharge
Latitude: 47˚ 27' 00" N Longitude: -122˚ 19' 30" W	Walker Creek #22	At the Point of Discharge
Latitude: 47˚ 27' 00" N Longitude: -122˚ 19' 30" W	Walker Creek #22-A	At the Point of Discharge
Latitude: 47˚ 26' 45" N Longitude: -122˚ 19' 30" W	Walker Creek #23	At the Point of Discharge
Latitude: 47˚ 26' 45" N Longitude: -122˚ 19' 30" W	Walker Creek #23-B	At the Point of Discharge
Latitude: 47˚ 26' 45" N Longitude: -122˚ 19' 15" W	Walker Creek #24	At the Point of Discharge
Latitude: 47˚ 26' 45" N Longitude: -122˚ 19' 15" W	Walker Creek #24-A	At the Point of Discharge
Note: The geographic coordinates included in Table 1 are based on the NAD 83 datum. This existing outfall may also be used for future construction outfall.		

D. Facility description

Seattle-Tacoma International Airport (STIA) is a major airport that serves the Pacific Northwest. The airport opened in 1944 and is owned and operated by the Port of Seattle (Port). STIA is situated entirely within the city of SeaTac and occupies more than 2,500 acres of land. The Port provides facilities for tenants engaged in passenger and air cargo transportation. In addition to the main terminal, which has four concourses, there are two satellite terminals. Industrial activities at the airport include aircraft and ground vehicle maintenance, fueling, washing, aircraft and ground deicing/anti-icing, and miscellaneous airport-related activities. This NPDES permit addresses industrial wastewater, uncontaminated construction dewatering water, and stormwater associated with industrial activity from airport operations to the waters of the state of Washington, sanitary sewers, and municipal storm drains. This permit also addresses stormwater associated with construction activity.

See *Appendix E-H* for complete descriptions of the facilities, permit status and compliance, wastewater characterization, and receiving water outfall locations, history, and wastewater and stormwater treatment pertaining to Parts I, II, and III of the permit.

E. Permit status

Port of Seattle, Seattle-Tacoma International Airport submitted an application for permit renewal on **September 12, 2013**. Ecology accepted it as complete on **March 11, 2014**.

Ecology issued the previous permit for this facility on **March 13, 2009**. The previous permit placed effluent limits on BOD, oil and grease, TSS, pH, turbidity, ammonia, nitrite, total copper, total zinc, and total lead. Oil and Grease, BOD, TSS, and pH limits were applied to discharges under Part I. pH, Oil and Grease, Ammonia, Nitrate/Nitrites as N, Total Copper, Lead and Zinc limits were applied to Part II. Turbidity, pH, and Oil and Grease limits were applied to discharges under Part III.

F. Summary of compliance with previous permit issued on March 13, 2009

STIA's wastewater treatment discharge has been in relatively good compliance during the history of the last permit issued on March 13, 2009**.** However, the Port had few repeated violations of pH limits under part II that resulted in Ecology issuance of Agreed Order number 8755 in October 2012. The Port studied the repeated violations and submitted a comprehensive report in response. The report showed that the pH range in the treatment ponds was due to biological activity and that even when out of range of 6.5 to 8.5, still maintained acceptable pH levels in receiving waters.

Ecology assessed facility compliance based on our review of the facility's discharge monitoring reports (DMRs) and on inspections conducted by Ecology.

G. Wastewater characterization

The concentration of pollutants in the discharge was reported in the NPDES application and in discharge monitoring reports. Ecology's monitoring results are included in the data that follows. The effluent is characterized for three separate sources.

H. Description of the receiving water

The IWTP facility discharges treated wastewater to **Puget Sound, a marine water**. Discharge from this facility shares outfalls with Midway Sewage Treatment Facility (POTW). Runoff from other parts outside of IWS area is discharged to freshwater streams (Miller Creek, Des Moines Creek, Walker Creek, Lake Reba, and Northwest Pond) in the vicinity.

I. State environmental policy act (SEPA) compliance

State law exempts the issuance, reissuance, or modification of any wastewater discharge permit from the SEPA process as long as the permit contains conditions that are no less stringent than federal and state rules and regulations (RCW 43.21C.0383). The exemption applies only to existing discharges, not to new discharges.

III. Proposed Permit Conditions

Federal and state regulations require that effluent limits in an NPDES permit must be either technology- or water quality-based.

- Technology-based limits are based upon the treatment methods available to treat specific pollutants. Technology-based limits are set by the EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and chapter 173-220 WAC).

- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (chapter 173-201A WAC), Ground Water Standards (chapter 173-200 WAC), Sediment Quality Standards (chapter 173-204 WAC), or the National Toxics Rule (40 CFR 131.36).
- Ecology must apply the most stringent of these limits to each parameter of concern. These limits are described below.

The limits in this permit reflect information received in the application and from supporting reports (engineering, hydrogeology, etc.). Ecology evaluated the permit application and determined the limits needed to comply with the rules adopted by the state of Washington. Ecology does not develop effluent limits for all reported pollutants. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation.

Ecology does not usually develop limits for pollutants not reported in the permit application but may be present in the discharge. The permit does not authorize discharge of the non-reported pollutants. During the five-year permit term, the facility's effluent discharge conditions may change from those conditions reported in the permit application. The facility must notify Ecology if significant changes occur in any constituent [40 CFR 122.42(a)]. Until Ecology modifies the permit to reflect additional discharge of pollutants, a permitted facility could be violating its permit.

A. Design criteria

Storm events that exceed the hydraulic design criteria of stormwater treatment systems may bypass the treatment system when Ecology has determined the system meets AKART requirements. Ecology would not consider this a violation of the conditions of the permit, if the bypass can meet water quality criteria. AKART for stormwater is constantly progressing and, as technology advances, facilities will have more cost effective, more efficient, and higher capacity treatment system options available. Ecology expects the facility to meet AKART and make the necessary improvements to its treatment system as the treatment technology evolves.

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. The design criteria for this treatment facility are taken from the Engineering Report prepared by Kennedy/Jenks Consultants and are as follows:

Table 2: Design criteria for the IWTP

Parameter	Design Quantity
Daily Peak Flow [a] @ Maximum Overflow Rate of 4.1 GPM	7.1 MGD

[a] Reported Daily Peak Flow is limited by the capacity of existing outfall shared with Midway Sewer District.

Design criteria for Parts II and III of the permit are based on general design criteria as specified by the *Western Washington Stormwater Manual*. The manual provides guidelines for design and operation of stormwater treatment and flow control facilities.

B. Technology-based effluent limits

See Appendix D-H for discussion of AKART and technology-based effluent limits pertaining to Parts I, II, and III of the permit.

C. Surface water quality-based effluent limits

The Washington State surface water quality standards (chapter 173-201A WAC) are designed to protect existing water quality and preserve the beneficial uses of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet the surface water quality standards (WAC 173-201A-510). Water quality-based effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin wide total maximum daily load study (TMDL).

Numerical criteria for the protection of aquatic life and recreation

Numerical water quality criteria are listed in the water quality standards for surface waters (chapter 173-201A WAC). They specify the maximum levels of pollutants allowed in receiving water to protect aquatic life and recreation in and on the water. Ecology uses numerical criteria along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limits, the discharge must meet the water quality-based limits.

Numerical criteria for the protection of human health

The U.S. EPA has published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State (EPA, 1992). These criteria are designed to protect humans from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The water quality standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Narrative criteria

Narrative water quality criteria (e.g., WAC 173-201A-240(1); 2006) limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge to levels below those which have the potential to:

- Adversely affect designated water uses.
- Cause acute or chronic toxicity to biota.
- Impair aesthetic values.
- Adversely affect human health.

Narrative criteria protect the specific designated uses of all fresh waters (WAC 173-201A-200, 2006) and of all marine waters (WAC 173-201A-210, 2006) in the state of Washington.

Antidegradation

Description--The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2006) is to:

- Restore and maintain the highest possible quality of the surface waters of Washington.

- Describe situations under which water quality may be lowered from its current condition.
- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply all known, available, and reasonable methods of prevention, control, and treatment (AKART).
- Apply three tiers of protection (described below) for surface waters of the state.

Tier I ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollutions. Tier II ensures that waters of a higher quality than the criteria assigned are not degraded unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities. Tier III prevents the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

A facility must prepare a Tier II analysis when all three of the following conditions are met:

- The facility is planning a new or expanded action.
- Ecology regulates or authorizes the action.
- The action has the potential to cause measurable degradation to existing water quality at the edge of a chronic mixing zone.

Facility specific requirements--This facility must meet Tier I requirements.

Dischargers must maintain and protect existing and designated uses. Ecology must not allow any degradation that will interfere with, or become injurious to, existing or designated uses, except as provided for in chapter 173-201A WAC.

D. Mixing zones

A mixing zone is the defined area in the receiving water surrounding the discharge port(s), where wastewater mixes with receiving water. Within mixing zones the pollutant concentrations may exceed water quality numeric standards, so long as the discharge doesn't interfere with designated uses of the receiving water body (for example, recreation, water supply, and aquatic life and wildlife habitat, etc.) The pollutant concentrations outside of the mixing zones must meet water quality numeric standards.

State and federal rules allow mixing zones because the concentrations and effects of most pollutants diminish rapidly after discharge, due to dilution. Ecology defines mixing zone sizes to limit the amount of time any exposure to the end-of-pipe discharge could harm water quality, plants, or fish.

The state's water quality standards allow Ecology to authorize mixing zones for the facility's permitted wastewater discharges only if those discharges already receive all known, available, and reasonable methods of prevention, control, and treatment (AKART). Mixing zones typically require compliance with water quality criteria within a specified distance from the point of discharge and must not use more than 25% of the available width of the water body for dilution [WAC 173-201A-400 (7)(a)(ii-iii)].

Ecology uses modeling to estimate the amount of mixing within the mixing zone. Through modeling Ecology determines the potential for violating the water quality standards at the edge of the mixing zone and derives any necessary effluent limits. Steady-state models are the most frequently used tools for conducting mixing zone analyses. Ecology chooses values for each effluent and for receiving water variables that correspond to the time period when the most critical condition is likely to occur (see Ecology's *Permit Writer's Manual*). Each critical condition parameter, by itself, has a low probability of occurrence and the resulting dilution factor is conservative. The term "reasonable worst-case" applies to these values.

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 4 means the effluent is 25% and the receiving water is 75% of the total volume of water at the boundary of the mixing zone. Ecology uses dilution factors with the water quality criteria to calculate reasonable potentials and effluent limits. Water quality standards include both aquatic life-based criteria and human health-based criteria. The former are applied at both the acute and chronic mixing zone boundaries; the latter are applied only at the chronic boundary. The concentration of pollutants at the boundaries of any of these mixing zones may not exceed the numerical criteria for that zone.

Each aquatic life *acute* criterion is based on the assumption that organisms are not exposed to that concentration for more than one hour and more often than one exposure in three years. Each aquatic life *chronic* criterion is based on the assumption that organisms are not exposed to that concentration for more than four consecutive days and more often than once in three years.

The two types of human health-based water quality criteria distinguish between those pollutants linked to non-cancer effects (non-carcinogenic) and those linked to cancer effects (carcinogenic). The human health-based water quality criteria incorporate several exposure and risk assumptions. These assumptions include:

- A 70-year lifetime of daily exposures.
- An ingestion rate for fish or shellfish measured in kg/day.
- An ingestion rate of two liters/day for drinking water.
- A one-in-one-million cancer risk for carcinogenic chemicals.

For part I, discharges from IWTP, this permit authorizes acute mixing zone, surrounded by a chronic mixing zone around the point of discharge (WAC 173-201A-400).

The water quality standards impose certain conditions before allowing the discharger a mixing zone:

1. **Ecology must specify both the allowed size and location in a permit.**

   The proposed permit specifies the size and location of the allowed mixing zone (as specified below) for part I.

   The maximum boundaries of the mixing zones are defined as follows:

   Chronic Mixing Zone: AC 173-201A-400(7)(b)(i) specifies mixing zones must not extend in any horizontal direction from the discharge ports for a distance greater than 200 feet plus the depth of water over the discharge ports as measured during mean lower low water (MLLW). Given a MLLW water depth of 148 feet (45.1 meters) for the Permittee's outfall, the horizontal distance therefore is 348 feet (106.1 meters). The mixing zone is a circle with radius of **348 feet (106.1 meters)** measured from the center of each discharge port. The mixing zone extends from the seabed to the top of the water surface. Chronic aquatic life criteria and human health criteria must be met at the edge of the chronic zone**.** The dilution factors associated with the chronic mixing zone is 202:1.

Acute Mixing Zone: WAC 173-201A-400(8)(b) specifies that in estuarine waters a zone where acute criteria may be exceeded must not extend beyond 10% of the distance established for the maximum or chronic zone as measured independently from the discharge ports. The acute mixing zone is a circle with radius of **34.8 feet (10.6 meters)** measured from the center of each discharge port. The mixing zone extends from the seabed to the top of the water surface. Acute aquatic life criteria must be met at the edge of the acute zone. The dilution factors associated with the acute mixing zones is 72:1.

PARTS II & III: For discharges specified under Part II of this permit, the Permittee did not request Ecology any mixing zone. Therefore, Ecology did not grant mixing zones for outfalls discharging from areas identified under parts II and III of this permit. The effluent limits for part II are based on water quality criteria after application of Water Effect Ratio and are to be met at the end of the pipe. For discharges specified under Part III of this permit, for in-stream sampling, the Permittee is allowed to sample downstream at the point of complete mix that is not more than 100 feet from the point of discharge.

2. **The facility must fully apply "all known, available, and reasonable methods of prevention, control and treatment" (AKART) to its discharge.**

   Ecology has determined that the treatment provided and the pollution prevention activities practiced at STIA under **Parts I, II, and III** of the permit meet the requirements of AKART.

3. **Ecology must consider critical discharge conditions.**

   Surface water quality-based limits are derived for the water body's critical condition (the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or designated water body uses). The critical discharge condition is often pollutant-specific or water body-specific.

   Critical discharge conditions are those conditions that result in reduced dilution or increased effect of the pollutant. Factors affecting dilution include the depth of water, the density stratification in the water column, the currents, and the rate of discharge. Density stratification is determined by the salinity and temperature of the receiving water. Temperatures are warmer in the surface waters in summer. Therefore, density stratification is generally greatest during the summer months. Density stratification affects how far up in the water column a freshwater plume may rise. The rate of mixing is greatest when an effluent is rising. The effluent stops rising when the mixed effluent is the same density as the surrounding water. After the effluent stops rising, the rate of mixing is much more gradual. Water depth can affect dilution when a plume might rise to the surface when there is little or no stratification. Ecology uses the water depth at mean lower low water (MLLW) for marine waters. Ecology's *Permit Writer's Manual* describes additional guidance on criteria/design conditions for determining dilution factors. The manual can be obtained from Ecology's website at: http://www.ecy.wa.gov/biblio/92109.html.

4. **Supporting information must clearly indicate the mixing zone would not:**
   - **Have a reasonable potential to cause the loss of sensitive or important habitat,**
   - **Substantially interfere with the existing or characteristic uses,**
   - **Result in damage to the ecosystem, or**
   - **Adversely affect public health.**

   Ecology established Washington State water quality criteria for toxic chemicals using EPA criteria. EPA developed the criteria using toxicity tests with numerous organisms, and set the criteria to protect all aquatic species.

   EPA sets acute criteria for toxic chemicals assuming organisms are exposed to the pollutant at the criteria concentration for one hour. They set chronic criteria assuming organisms are exposed to the pollutant at the criteria concentration for four days. Dilution modeling under critical conditions generally shows that both acute and chronic criteria concentrations are reached within minutes of being discharged.

   The discharge plume does not impact drifting and non-strong swimming organisms because they cannot stay in the plume close to the outfall long enough to be affected. Strong swimming fish could maintain a position within the plume, but they can also avoid the discharge by swimming away. Mixing zones generally do not affect benthic organisms (bottom dwellers), because the buoyant plume rises in the water column. Ecology has additionally determined that this effluent will not exceed 33 degrees C for more than 2 seconds after discharge; and that the temperature of the water will not create lethal conditions or blockages to fish migration.

   Ecology evaluates the cumulative toxicity of an effluent by testing the discharge with whole effluent toxicity (WET) testing.

   Ecology reviewed the above information, the specific information on the characteristics of the discharge, the receiving water characteristics, and the discharge location. Based on this review, we conclude that the discharge does not have a reasonable potential to cause the loss of sensitive or important habitat, substantially interfere with existing or characteristics uses, result in damage to the ecosystem or adversely affect public health.

5. **The discharge/receiving water mixture must not exceed water quality criteria outside the boundary of a mixing zone.**

   Ecology conducted a reasonable potential analysis, using procedures established by the EPA and by Ecology, for each pollutant. We concluded the discharge/receiving water mixture will not violate water quality criteria outside the boundary of the mixing zone.

6. **The size of the mixing zone and the concentrations of the pollutants must be minimized.**

   At any given time, the effluent plume uses only a portion of the acute and chronic mixing zone, which minimizes the volume of water involved in mixing. Because tidal currents change direction, the plume orientation within the mixing zone changes. The plume rises through the water column as it mixes, therefore, much of the receiving water volume at lower depths in the mixing zone is not mixed with discharge. Similarly, because the discharge may stop rising at some depth due to density stratification, waters above that depth will not mix with the discharge. Ecology determined it is impractical to specify in the permit the actual, much more limited volume in which the dilution occurs as the plume rises and moves with the current.

   Ecology minimizes the size of mixing zones by requiring dischargers to install diffusers when they are appropriate to the discharge and the specific receiving water body. When a diffuser is installed, the discharge and the receiving water are more completely mixed in a shorter time period. Ecology also minimizes the size of the mixing zone (in the form of the dilution factor) using design criteria with a low probability of occurrence. For example, Ecology uses the expected 95th percentile pollutant concentration, the 90th percentile background concentration, the centerline dilution factor, and the lowest flow occurring once in every ten years to perform the reasonable potential analysis.

   Because of the above reasons, Ecology has effectively minimized the size of the mixing zone authorized in the proposed permit.

7. **Maximum size of mixing zone.**

   The authorized mixing zone does not exceed the maximum size restriction.

8. **Acute mixing zone.**

   - **The discharge/receiving water mixture must comply with acute criteria as near to the point of discharge as practicably attainable.**

     Ecology determined the acute criteria will be met at 10% of the distance (or of the chronic mixing zone at the ten-year low flow).

   - **The pollutant concentration, duration, and frequency of exposure to the discharge will not create a barrier to migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.**

     As described above, the toxicity of any pollutant depends upon the exposure, the pollutant concentration, and the time the organism is exposed to that concentration. Authorizing a limited acute mixing zone for this discharge assures that it will not create a barrier to migration. The effluent from this discharge will rise as it enters the receiving water, assuring that the rising effluent will not cause translocation of indigenous organism near the point of discharge (below the rising effluent).

- **Comply with size restrictions**.

  The mixing zone authorized for this discharge complies with the size restrictions published in chapter 173-201A WAC.

9. **Overlap of mixing zones.**

   This mixing zone does not overlap another mixing zone.

E. Designated uses and surface water quality criteria

Applicable designated uses and surface water quality criteria are defined in Chapter 173-201A WAC. In addition, the U.S. EPA set human health criteria for toxic pollutants (EPA 1992). Criteria applicable to this facility's discharge are summarized below.

Marine discharges:

Aquatic life uses are designated using the following general categories. All indigenous fish and non-fish aquatic species must be protected in waters of the state.

(a) **Extraordinary quality** salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

(b) **Excellent quality** salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

(c) **Good quality** salmonid migration and rearing; other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

(d) **Fair quality** salmonid and other fish migration.

STIA, Part I, IWS discharges to Puget Sound, an Extraordinary Marine waters. The Aquatic Life Uses and associated criteria for extraordinary marine waters are identified below.

Aquatic life uses and associated criteria

Extraordinary Quality	
Temperature Criteria - Highest 1D MAX	13°C (55.4°F)
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	7.0 mg/L
Turbidity Criteria	• 5 NTU over background when the background is 50 NTU or less; or • a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
pH Criteria	pH must be within the range of 7.0 to 8.5 with a human-caused variation within the above range of less than 0.2 units.

- To protect **shellfish harvesting**, fecal coliform organism levels must not exceed a geometric mean value of 14 colonies/100 mL, and not have more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 43 colonies/100 mL.
- The **recreational uses** are primary contact recreation and secondary contact recreation.

STIA, Part I, IWS discharges to Puget Sound, the recreational uses are identified as primary contact, as shown below.

Recreational Use	Criteria
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 14 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 43 colonies /100 mL.

- The **miscellaneous marine water uses** are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

Freshwater discharges:

Aquatic life uses. Aquatic life uses are designated based on the presence of, or the intent to provide protection for, the key uses identified in (a) of this subsection. It is required that all indigenous fish and non-fish aquatic species be protected in waters of the state in addition to the key species described below.

The categories for aquatic life uses are:

Salmonid spawning, rearing, and migration. The key identifying characteristic of this use is salmon or trout spawning and emergence that only occur outside of the summer season (September 16 - June 14). Other common characteristic aquatic life uses for waters in this category include rearing and migration by salmonids.

General criteria. General criteria that apply to all aquatic life fresh water uses are described in WAC 173-201A-260 (2)(a) and (b), and are for:
(i) Toxic, radioactive, and deleterious materials; and
(ii) Aesthetic values.

STIA, Parts II and III discharge to Miller Creek, Des Moines Creek, Walker Creek, Northwest Pond, and Lake Reba, Part III has potential to discharge to Gilliam Creek. This freshwater system has an aquatic life use of rearing and migration only and a recreation classification of secondary contact. The Aquatic Life Uses and associated criteria for rearing and migration only are identified below.

- Aquatic Life Uses are designated based on the presence of, or the intent to provide protection for, the key uses. All indigenous fish and non-fish aquatic species must be protected in waters of the state in addition to the key species. The Aquatic Life Uses for this receiving water are identified below.

Aquatic life uses & associated criteria

Salmonid Rearing and Migration	
Temperature Criteria – Highest 7DAD MAX	17.5°C (63.5°F)
Dissolved Oxygen Criteria – Lowest 1-Day	Minimum 8.0 mg/L
Turbidity Criteria	• 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Total Dissolved Gas Criteria	Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.
pH Criteria	pH shall be within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

- The recreational uses are extraordinary primary contact recreation, primary contact recreation, and secondary contact recreation. The recreational uses for this receiving water are identified below.

Recreational uses and associated criteria

Recreational Use	Criteria
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies /100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies /100 mL.

- The **water supply uses** are domestic, agricultural, industrial, and stock watering.
- The **miscellaneous freshwater use**s are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

F. Evaluation of surface water quality-based effluent limits for narrative criteria

For discharges under Part I, pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants—their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as biological oxygen demand (BOD) is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating surface water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

Pollutant concentrations in the proposed discharge exceed water quality criteria despite using technology-based controls which Ecology determined fulfills AKART. Ecology therefore authorizes a mixing zone in accordance with the geometric configuration, flow restriction, and other restrictions imposed on mixing zones described in chapter 173-201A WAC.

Ecology determined the dilution factors of effluent to receiving water for discharges under Part I that occur within these zones at the critical condition using list models, dye studies used. The dilution factors are listed in Table 3:

Table 3. Dilution factors (DF)

Criteria	Acute	Chronic
Aquatic Life	72:1	202:1
Human Health, Carcinogen		202:1
Human Health, Non-carcinogen		202:1

Ecology determined the impacts of immediate oxygen deficiency, pH, metals, and other toxics as described below, using the dilution factors in the above table. The derivation of surface water quality-based limits also takes into account the variability of pollutant concentrations in both the effluent and the receiving water.

Dissolved Oxygen—BOD_5, Ammonia, and COD Effects—Natural decomposition of organic material in wastewater effluent impacts dissolved oxygen in the receiving water at distances far outside of the regulated mixing zone. The 5-day Biochemical Oxygen Demand (BOD_5) of an effluent sample indicates the amount of biodegradable material in the wastewater and estimates the magnitude of oxygen consumption the wastewater will generate in the receiving water. The amount of ammonia-based nitrogen in the wastewater also provides an indication of oxygen demand in the receiving water. This discharge results in a small amount of oxygen demand loading relative to the large amount of dilution occurring in the receiving water at critical conditions.

pH—For Part I, compliance with the technology-based limits of 6.0 to 9.0 will assure compliance with the water quality standards of surface waters because of the high buffering capacity of marine water.

For Part II Ecology will adjust the pH limit in several ponds due to natural pH variability in the ponds and a study for the airport that shows that discharge pH slightly outside of water quality standards range does not change pH in receiving water (*Stormwater pH Study, 2012*). pH in ponds ranges outside of the 6.5 to 8.5 in response to sunlight and biological activity. The low alkalinity of the pond immediately moderates the pH at the outfall. Slight excursion of predict no violation of the pH criteria under critical conditions. Based on extensive studies of various ponds within the Port of Seattle drainage basin, the Port has shown that pH as low as 6.3 and as high as 9.0 shall not cause violation of water quality standards. Also, the technology-based limit for treatment ponds in state and federal regulation is 6.0 to 9.0, this pH range is normal for treatment ponds. The limits for ponds SDN3A, SDW1A, SDW1B and SDW2 are set at 6.3 to 9.0. The Port can demonstrate compliance with standards in the receiving water for other outfalls as well. For Part III – Construction runoff, the pH limits is set to match the standards of 6.5 to 8.5 and will assure compliance with standards.

Turbidity—For discharges under Part I, Ecology evaluated the impact of turbidity based on the range of turbidity in the effluent and turbidity of the receiving water. Due to the large degree of dilution, Ecology expects no violations of the turbidity criteria outside the designated mixing zone. For discharges to freshwater under Part II , the permit requires turbidity limit of 25 NTU to insure compliance with water quality criteria. For discharges to freshwater under Part III, the permit requires turbidity in the receiving water not exceed 5 NTU over background.

Toxic pollutants—Federal regulations (40 CFR 122.44) require Ecology to place limits in NPDES permits on toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. Ecology does not exempt facilities with technology-based effluent limits from meeting the surface water quality standards.

There are heavy metals and organic pollutants present in the discharge under Parts I and II. We conducted a reasonable potential analysis (See *Appendix D)* for discharges from Part I for these parameters to determine whether effluent limits would be required in this permit.

Calculations using all applicable data at applicable dilution factors, it showed no reasonable potential for this discharge to cause a violation of water quality standards. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

For discharges from Part II, Port of Seattle provided demonstrating the seasonal partitioning of the dissolved metal in the ambient water in relation to an effluent discharge. Ecology adjusted metals criteria on a site-specific basis and adjusted metals criteria using the water effects ratio approach established by the EPA, as generally guided by the procedures in *U.S. EPA Water Quality Standards Handbook*, December 1983, as supplemented or replaced.

G. Development of water quality effluent limits for the STIA

Site-specific study

The Port has completed a site-specific study (e.g., Water Effects Ratio) for copper and zinc. The study was required by the STIA's 401 Certification for Master Plan Update (MPU) projects and the current NPDES permit. The study developed site-specific water quality objectives (SSWQOs) that incorporated water effect ratios and dissolved to total translators for each stream segment that receives existing and future STIA stormwater runoff. SSWQO-based effluent limits were subsequently derived using the10th percentile hardness associated with the receiving water and assumed no dilution.

The study results are described in greater detail in *Appendix G* of this fact sheet. A summary of current and derived SSWQO-based limits are summarized below.

H. Human health

Washington's water quality standards include 91 numeric human health-based criteria that Ecology must consider when writing NPDES permits. These criteria were established in 1992 by the U.S. EPA in its National Toxics Rule (40 CFR 131.36). The National Toxics Rule allows states to use mixing zones to evaluate whether discharges comply with human health criteria.

Ecology determined the applicant's discharges from Parts I, II, and III are unlikely to contain chemicals regulated to protect human health.

I. Sediment quality

The aquatic sediment standards (Chapter 173-204 WAC) protect aquatic biota and human health. Under these standards Ecology may require a facility to evaluate the potential for its discharge to cause a violation of sediment standards (WAC 173-204-400).

Through a review of the discharger characteristics and of the effluent characteristics, Ecology determined that this discharge has no reasonable potential to violate the sediment management standards. In addition, the Port in conjunction with the Midway Sewer District completed a sediment monitoring program. Sampling was initially conducted in 2006 in the vicinity of Midway's old and new outfall to Puget Sound. After Ecology review of these results, supplemental monitoring was conducted in 2007. Ecology determined that data from the 2007 sampling event demonstrated that sediment conditions are below sediment quality standards in the vicinity of the outfall.

J. Groundwater quality limits

The ground water quality standards (Chapter 173-200 WAC) protect beneficial uses of ground water. Permits issued by Ecology must not allow violations of those standards (WAC 173-200-100).

STIA may passively discharge stormwater and wastewater to ground through direct surface infiltration and infiltration through unlined stormwater treatment ponds. These discharges have a low potential to impact groundwater because the management practices and treatment methods applied for surface water discharge provide adequate pollution treatment to prevent groundwater pollution. This permit does not impose permit limits to protect ground water quality.

The permit construction section requires monitoring of unlined ponds or other designed infiltration systems that receive stormwater runoff or process water related to Portable Batch Plant and/or Concrete Crusher Operations. Groundwater standards specify pH of 6.5 to 8.5 and total dissolved solids (TDS) below 500 mg/L in the groundwater table. Monitoring for these parameters in unlined ponds that receive water contaminated by concrete work is required. The Permittee must treat discharges to maintain pH of 9 or less and TDS levels below 500 mg/L in unlined ponds. This requirement will be added as a benchmark to prevent exceeding ground water standards (best professional judgment determination).

K. Whole effluent toxicity

The water quality standards for surface waters forbid discharge of effluent that has the potential to cause toxic effects in the receiving waters. Many toxic pollutants cannot be measured by commonly available detection methods. However, laboratory tests can measure toxicity directly by exposing living organisms to the wastewater and measuring their responses. These tests measure the aggregate toxicity of the whole effluent, so this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

- *Acute toxicity tests measure mortality as the significant response* to the toxicity of the effluent. Dischargers who monitor their wastewater with acute toxicity tests find early indications of any potential lethal effect of the effluent on organisms in the receiving water.
- *Chronic toxicity tests measure various sub-lethal toxic responses*, such as reduced growth or reproduction. Chronic toxicity tests often involve either a complete life cycle test on an organism with an extremely short lifecycle, or a partial lifecycle test during a critical stage of a test organism's life. Some chronic toxicity tests also measure organism survival.

Laboratories accredited by Ecology for WET testing know how to use the proper WET testing protocols, fulfill the data requirements, and submit results in the correct reporting format. Accredited laboratory staff know about WET testing and how to calculate an NOEC, LC50, EC50, IC25, etc. Ecology gives all accredited labs the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* (https://fortress.wa.gov/ecy/publications/SummaryPages/9580.html), which is referenced in the permit. Ecology recommends that Permittee send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

WET testing conducted during effluent characterization showed no reasonable potential for the effluent to cause receiving water acute toxicity. The proposed permit will not include an acute WET limit, but will require rapid screening tests.

- If a rapid screening test indicates acute toxicity has appeared, this facility operator must investigate immediately, take appropriate action, and report to Ecology.
- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization. Permittee may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing and/or chemical analyses after

the process or material changes have been made. Ecology recommends that the Permittee check with it first to make sure that Ecology will consider the demonstration adequate to support a decision to not require an additional effluent characterization.

- If WET testing conducted as a follow-up to rapid screening tests fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased.

WET testing conducted during effluent characterization showed no reasonable potential for effluent discharges to cause receiving water chronic toxicity. The proposed permit will not include a chronic WET limit. Permittee must retest the effluent before submitting an application for permit renewal.

- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization
- If WET testing conducted for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased. Permittee may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing after the process or material changes have been made.

L. Comparison of effluent limits with the previous permit Issued on March 13, 2009

Part I – Outfall #001 Discharges to Puget Sound

	2009 Permit Limit		*Proposed Permit Limit*	
Parameter	**Average Monthly [a]**	**Maximum Daily [b]**	**Average Monthly [a]**	**Maximum Daily [b]**
Flow [c]	Report, MGD	Report, MGD	Report, MGD	Report, MGD
Oil and Grease	8 mg/L	15 mg/L	8 mg/L	15 mg/L
BOD_5 November through March	45 mg/L 500 lbs/day	Report, mg/L 3115 lbs/day	45 mg/L	Report, mg/L 2665 lbs/day
BOD_5 April through October	25 mg/L 130 lbs/day	Report, mg/L 1340 lbs/day	25 mg/L	Report, mg/L 1480 lbs/day
TSS	21 mg/L	33 mg/L	21 mg/L	33 mg/L
pH [d]	Daily minimum is equal to or greater than 6, and the daily maximum is less than 9.		Daily minimum is equal to or greater than 6, and the daily maximum is less than 9.	

Footnote:

[a] The Average Daily Maximum effluent limits are based on the arithmetic mean of the samples taken during a day.

[b] The maximum daily effluent limitation is defined as the highest allowable daily discharge. The daily discharge means the discharge of a pollutant measured during a calendar day. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For other units of measurement, the daily discharge is the average measurement of the pollutant over the day.

[c] The daily maximum flow is based on the Port's agreement with the Midway Sewer District. Based on this agreement, the combined flow from the IWS and Midway Sewer District must not exceed 90% of the capacity of the outfall, which is 18 MGD.

[d] Indicates the range of permitted values. When pH is continuously monitored, excursions between 5.0 and 6.0, or 9.0 and 10.0 shall not be considered violations provided no single excursion exceeds 60 minutes in length and total excursions do not exceed 7 hours and 30 minutes per month. Any excursions below 5.0 and above 10.0 are violations. The instantaneous maximum and minimum pH shall be reported monthly.

Part II: Industrial Stormwater to Vicinity Freshwater Streams

Parameter[1]	Existing Permit		Proposed Permit	
	Maximum Daily		Maximum Daily	
Flow – MG/Event	Report		N/A	
Turbidity[2]	**25 NTU**		**25 NTU**	
pH[3] – S.U.	Between 6.5 – 8.5 S.U.		Between 6.5 – 8.5 S.U	
Oil and Grease[4]	15 mg/L – No visible sheen		15 mg/L – No visible sheen	
Total Glycol	Report – mg/L		N/A	
Ethylene Glycol	Report – mg/L		N/A	
Propylene Glycol	Report – mg/L		Report – mg/L	
Ammonia	19 mg/L		14.7 mg/L	
Nitrate / Nitrite as N [5]	0.68 µg/L		0.68 µg/L	
Total Copper	SDE4/SDS1, SDD06A, SDD05A, SDD05B	25.6 µg/L	SDE4/SDS1, SDD06A, SDD05A, SDD05B	25.6 µg/L
	SDN1, SDN2/3/4	28.5 µg/L	SDN1, SDN2/3/4	28.5 µg/L
	SDS3/5, SDS6/7, SDS4	32.2 µg/L	SDS3/5, SDS6/7, SDS4	32.2 µg/L
	SDN3A, SDW1A, SDW1B	59.7 µg/L	SDN3A, SDW1A, SDW1B	59.7 µg/L
	SDW2	47.9 µg/L	SDW2	47.9 µg/L
Total Zinc	SDE4/SDS1, SDD06A, SDD05A, SDD05B, SDN1, SDN2/3/4, SDN3A, SDW1A, SDW1B, SDW2	117 µg/L	SDE4/SDS1, SDD06A, SDD05A, SDD05B, SDN1, SDN2/3/4, SDN3A, SDW1A, SDW1B, SDW2	117 µg/L
	SDS3/5, SDS6/7, SDS4	71.4 µg/L	SDS3/5, SDS6/7, SDS4	71.4 µg/L
Total Lead	81.6 µg/L		N/A	
Priority Pollutants[6]	Report µg/L		Report µg/L	

1 Sampling shall be performed in accordance with the latest approved monitoring plan.
2 Turbidity effluent limits are at the end of the pipe. When this limit is exceeded, Permittee must immediately conduct in-stream sampling (i.e., upstream and downstream) to measure turbidity water quality criteria. Failure to meet the criteria is considered permit violation.
3. For outfalls SDN3A, SDW1A, SDW1B, and SDW2, pH as low as 6.31 and as high as 9.04 shall not be considered a violation if results of concurrence sampling at the point of complete mix with receiving water indicates pH range of 6.5 – 8.5 S.U
4 Oil and Grease shall be measured by Ecology Method NWTPH-DX.
5 Required only if urea is applied. If urea is not applied, Permittee must certify it and this parameter need not be measured.
6 See Ecology *Permit Writer's Manual*, Table VI-5. Report single analytical values below detection as "less than (detection level)". Report single analytical values between the detection and quantitation levels with qualifier code of "j" following the value. Samples must be taken twice per year, once during wet season and once during dry season in year three (3), and the report must be submitted to Ecology in conjunction with permit application.

Part III: Construction Stormwater Runoff

Part III – Discharges to Vicinity Freshwater Streams		
Parameter	*Existing Permit*	*Proposed Permit*
	Maximum Daily	**Maximum Daily**
Turbidity	***Turbidity in the*** *receiving water* ***shall not exceed 5 nephelometric turbidity units (NTU) over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.***[b]	***Turbidity in the*** *receiving water* ***shall not exceed 5 nephelometric turbidity units (NTU) over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.***[b]
Turbidity [c] (Batch or Continuous Treatment)	The maximum daily average shall not exceed 5 NTU [d].	The maximum daily average shall not exceed 5 NTU [d].
Total Petroleum Hydrocarbons	5 mg/L - No visible sheen at any time [e]	5 mg/L - No visible sheen at any time [e]
pH[f]	In the range of 6.5 to 8.5 – With the human-caused variation within the above range of less than 0.2 units.	In the range of 6.5 to 8.5 – With the human-caused variation within the above range of less than 0.2 units.

[a] The maximum daily effluent limitation is defined as the highest allowable daily discharge.
[b] In the **receiving water** here means at the point of complete mix to be determined by the Permittee.
[c] The chemical treatment referred here is for batch or continuous treatment with aids of polymer (as specified by the DOE SWMM) or chitosan. Chitosan includes multiple products under various trade names and have been approved for use by Ecology. The average daily effluent limitation is based on the arithmetic mean of number of samples taken per day from the continuous discharge, or in case of batch treatment, based on the number of batch discharged per day.
[d] The maximum daily average is defined as maximum value of daily averages taken during a calendar month.
[e] TPH numerical limit shall be applied and a sample shall be taken only when visible sheen is observed. The numerical limit will not apply when there is no visible sheen observed.
[f] Indicates the range of permitted values. In the receiving water here means at the point of complete mix to be determined by the Permittee.

Total Dissolved Solids (TDS) and pH Benchmarks for Portable Batch Plant and/or Concrete Crusher Operation

Runoff or waste water discharged to unlined ponds or other designed infiltration systems from Portable Batch Plant and/or Concrete Crusher Operation shall be monitored at least monthly at the infiltration location. The Permittee must maintain pH and TDS levels as set forth below.

Parameter	**Benchmark**
pH	Maximum of 9
Total Dissolved Solids	500 mg/L maximum

The permit requires increased monitoring, cessation of discharge, additional treatment, and discussion in the SWPPP of meeting these benchmark.

IV. Monitoring Requirements

Ecology requires monitoring, recording, and reporting (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and that the discharge complies with the permit's effluent limits.

If a facility uses a contract laboratory to monitor wastewater, it must ensure that the laboratory uses the methods and meets or exceeds the method detection levels required by the permit. The permit describes when facilities may use alternative methods. It also describes what to do in certain situations when the laboratory encounters matrix effects. When a facility uses an alternative method as allowed by the permit, it must report the test method, detection level (DL), and quantitation level (QL) on the discharge monitoring report or in the required report.

A. Lab accreditation

Ecology requires that facilities must use a laboratory registered or accredited under the provisions of chapter 173-50 WAC, Accreditation of Environmental Laboratories, to prepare all monitoring data (with the exception of certain parameters).

V. Other Permit Conditions

A. Reporting and record keeping

Ecology based Special Condition S3 on its authority to specify any appropriate reporting and record keeping requirements to prevent and control waste discharges (WAC 173-220-210).

B. Non-routine and unanticipated wastewater

Occasionally, this facility may generate wastewater which was not characterized in the permit application because it is not a routine discharge and was not anticipated at the time of application. These wastes typically consist of waters used to pressure-test storage tanks or fire water systems or of leaks from drinking water systems.

The permit authorizes the discharge of non-routine and unanticipated wastewater under certain conditions. The facility must characterize these waste waters for pollutants and examine the opportunities for reuse. Depending on the nature and extent of pollutants in this wastewater and on any opportunities for reuse, Ecology may:

- Authorize the facility to discharge the wastewater.
- Require the facility to treat the wastewater.
- Require the facility to reuse the wastewater.

C. Spill plan

This facility stores a quantity of chemicals on-site that have the potential to cause water pollution if accidentally released. Ecology can require a facility to develop best management plans to prevent this accidental release [Section 402(a)(1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080].

STIA developed a plan for preventing the accidental release of pollutants to state waters and for minimizing damages if such a spill occurs. The proposed permit requires the facility to update this plan and submit it to Ecology.

D. Solid waste control plan

STIA could cause pollution of the waters of the state through inappropriate disposal of solid waste or through the release of leachate from solid waste.

This proposed permit requires this facility to update the approved solid waste control plan designed to prevent solid waste from causing pollution of waters of the state. The facility must submit the updated plan to Ecology for approval (RCW 90.48.080). You can obtain an Ecology guidance document, which describes how to develop a Solid Waste Control Plan, at: http://www.ecy.wa.gov/pubs/0710024.pdf

E. Stormwater pollution prevention plan

In accordance with 40 CFR 122.44(k) and 40 CFR 122.44 (s), the proposed permit includes requirements for the development and implementation of a SWPPP along with BMPs to minimize or prevent the discharge of pollutants to waters of the state. BMPs constitute Best Conventional Pollutant Control Technology (BCT) and Best Available Technology Economically Achievable (BAT) for stormwater discharges. Ecology has determined that STIA must develop a SWPPP and implement adequate BMPs in order to meet the requirements of "all known, available, and reasonable methods of prevention, control, and treatment" (AKART). A SWPPP requires a facility to implement actions necessary to manage stormwater to comply with the state's requirement under chapter 90.48 RCW to protect the beneficial uses of waters of the state.

The SWPPP must identify potential sources of stormwater contamination from industrial activities and identify how it plans to manage those sources of contamination to prevent or minimize contamination of stormwater. STIA must continuously review and revise the SWPPP as necessary to assure that stormwater discharges do not degrade water quality. It must retain the SWPPP on-site or within reasonable access to the site and available for review by Ecology.

Best management practices (BMPs)

BMPs are the actions identified in the SWPPP to manage, prevent contamination of, and treat stormwater. BMPs include schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs also include treatment systems, operating procedures, and practices used to control plant site runoff, spillage or leaks, sludge or waste disposal, and drainage from raw material storage. STIA must ensure that its SWPPP includes the operational and structural source control BMPs listed as "applicable" in Ecology's stormwater management manuals. Many of these "applicable" BMPs are sector-specific or activity-specific, and are not required at facilities engaged in other industrial sectors or activities.

Ecology-approved stormwater management manuals

Consistent with RCW 90.48.555 (5) and (6), the proposed permit requires the facility to implement BMPs contained in the *Stormwater Management Manual for Western Washington* (*2005* edition), or any revisions thereof, or practices that are demonstrably equivalent to practices contained in stormwater technical manuals approved by Ecology. This should ensure that BMPs will prevent violations of state water quality standards, and satisfy the state AKART requirements and the federal technology-based treatment requirements under 40 CFR part 125.3. The SWPPP must document that the BMPs selected provide an equivalent level of pollution prevention, compared to the applicable stormwater management manuals, including: The technical basis for the selection for all stormwater BMPs (scientific, technical studies, and/or modeling) which support the performance claims for the BMPs selected.

An assessment of how the BMPs will satisfy AKART requirements and the applicable technology-based treatment requirements under 40 CFR part 125.3.

Operational source control BMPs

Operational source control BMPs include a schedule of activities, prohibition of practices, maintenance procedures, employee training, good housekeeping, and other managerial practices to prevent or reduce the pollution of waters of the state. These activities do not require construction of pollution control devices but are very important components of a successful SWPPP. Employee training, for instance, is critical to achieving timely and consistent spill response. Pollution prevention is likely to fail if the employees do not understand the importance and objectives of BMPs. Prohibitions might include eliminating outdoor repair work on equipment and certainly would include the elimination of intentional draining of crankcase oil on the ground. Good housekeeping and maintenance schedules help prevent incidents that could result in the release of pollutants. Operational BMPs represent a cost-effective way to control pollutants and protect the environment. The SWPPP must identify all the operational BMPs and how and where they are implemented. For example, the SWPPP must identify what training will consist of, when training will take place, and who is responsible to assure that employee training happens.

Structural source control BMPs

Structural source control BMPs include physical, structural, or mechanical devices or facilities intended to prevent pollutants from entering stormwater. Examples of source control BMPs include erosion control practices, maintenance of stormwater facilities (e.g., cleaning out sediment traps), construction of roofs over storage and working areas, and direction of equipment wash water and similar discharges to the sanitary sewer or a dead end sump. Structural source control BMPs likely include a capital investment but are cost effective compared to cleaning up pollutants after they have entered stormwater.

Treatment BMPs

Operational and structural source control BMPs are designed to prevent pollutants from entering stormwater. However, even with an aggressive and successful program, stormwater may still require treatment to achieve compliance with water quality standards. Treatment BMPs remove pollutants from stormwater. Examples of treatment BMPs are detention ponds, oil/water separators, biofiltration, and constructed wetlands.

Volume/flow control BMPs

Ecology recognizes the need to include specific BMP requirements for stormwater runoff quantity control to protect beneficial water uses, including fish habitat. New facilities and existing facilities undergoing redevelopment must implement the requirements for peak runoff rate and volume control identified by volume 1 of the *Western Washington SWMM* and chapter 2 in the *Eastern Washington SWMM* as applicable to their development. Chapter 3 of volume 3 *Western Washington SWMM* and chapter 6 in the *Eastern Washington SWMM* lists BMPs to accomplish rate and volume control. Existing facilities in western Washington should also review the requirements of volumes 1 (Minimum Technical Requirements) and chapter 3 of volume 3 in the *Western Washington SWMM*. Chapter 2 (Core Elements for New Development and Redevelopment) in the *Eastern Washington SWMM* contains the minimum technical requirements for facilities east of the Cascades. Although not required to implement these BMPs, controlling rate and volume of stormwater discharge maintains the health of the watershed. Existing facilities should identify control measures that they can implement over time to reduce the impact of uncontrolled release of stormwater.

F. Compliance schedule

The proposed permit includes a compliance schedule ……

G. General conditions

Ecology bases the standardized General Conditions on state and federal law and regulations. They are included in all individual industrial NPDES permits issued by Ecology.

VI. Permit Issuance Procedures

A. Permit modifications

Ecology may modify this permit to impose numerical limits, if necessary, to comply with water quality standards for surface waters, with sediment quality standards, or with water quality standards for groundwaters, after obtaining new information from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

Ecology may also modify this permit to comply with new or amended state or federal regulations.

B. Proposed permit Issuance

This proposed permit includes all statutory requirements for Ecology to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. Ecology proposes to issue this permit for a term of five (5) years.

VII. References for Text and Appendices

Environmental Protection Agency (EPA)

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. *Technical Support Document for Water Quality-based Toxics Control*. EPA/505/2-90-001.

1988. *Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling*. USEPA Office of Water, Washington, D.C.

1985. *Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water*. EPA/600/6-85/002a.

1983. *Water Quality Standards Handbook*. USEPA Office of Water, Washington, D.C.

Tsivoglou, E.C., and J.R. Wallace.

1972. *Characterization of Stream Reaeration Capacity*. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

December 2011. *Permit Writer's Manual*. Publication Number 92-109 (https://fortress.wa.gov/ecy/publications/SummaryPages/92109.html)

September 2011. *Water Quality Program Guidance Manual – Supplemental Guidance on Implementing Tier II Antidegradation*. Publication Number 11-10-073 (https://fortress.wa.gov/ecy/publications/summarypages/1110073.html)

October 2010 (revised). *Water Quality Program Guidance Manual – Procedures to Implement the State's Temperature Standards through NPDES Permits*. Publication Number 06-10-100 (https://fortress.wa.gov/ecy/publications/summarypages/0610100.html)

Laws and Regulations (http://www.ecy.wa.gov/laws-rules/index.html)

Permit and Wastewater Related Information (http://www.ecy.wa.gov/programs/wq/permits/guidance.html)

February 2007. *Focus Sheet on Solid Waste Control Plan, Developing a Solid Waste Control Plan for Industrial Wastewater Discharge Permittees*, Publication Number 07-10-024. http://www.ecy.wa.gov/pubs/0710024.pdf

Wright, R.M., and A.J. McDonnell.

1979. *In-stream Deoxygenation Rate Prediction*. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

Permit Specific References

Final Report, *Stormwater pH Study for Seattle-Tacoma International Airport.*

Prepared for Port of Seattle by Cardno TEC and SAIC in compliance with Agreed Order 8755, October 2012.

Transportation Research Board.

2012. *Guidebook for Selecting Methods to Monitor Airport and Aircraft Deicing Materials*. ACRP Report 72. *ISBN 978-0-309-25835-7, Library of Congress Control Number 2012941521.*

Appendix A--Public Involvement Information

Ecology proposes to reissue a permit to Port of Seattle, Seattle-Tacoma International Airport. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology placed a Public Notice of Application on March 17, 2014, and March 24, 2014, in *The Seattle Times* to inform the public about the submitted application and to invite comment on the reissuance of this permit.

Ecology placed a Public Notice of Draft on November 5, 2015, in *The Seattle Times* to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice:

- Told where copies of the draft permit and fact sheet were available for public evaluation (a local public library, the closest regional or field office, posted on our website).
- Offered to provide the documents in an alternate format to accommodate special needs.
- Urged people to submit their comments, in writing, before the end of the comment period.
- Told how to request a public hearing of comments about the proposed NPDES permit.
- Explained the next step(s) in the permitting process.

Ecology has published a document entitled *Frequently Asked Questions about Effective Public Commenting* which is available on our website at https://fortress.wa.gov/ecy/publications/SummaryPages/0307023.html.

You may obtain further information from Ecology by telephone, 425-649-7201, or by writing to the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

The primary author of this permit and fact sheet is Bobb Nolan.

Appendix B--Your Right to Appeal

You have a right to appeal this permit to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of the final permit. The appeal process is governed by chapter 43.21B RCW and chapter 371-08 WAC. “Date of receipt” is defined in RCW 43.21B.001(2) (see glossary).

To appeal you must do the following within 30 days of the date of receipt of this permit:

- File your appeal and a copy of this permit with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this permit on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in chapter 43.21B RCW and chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel RD SW STE 301 Tumwater, WA 98501	**Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

Appendix C--Glossary

1-DMax or 1-day maximum temperature -- The highest water temperature reached on any given day. This measure can be obtained using calibrated maximum/minimum thermometers or continuous monitoring probes having sampling intervals of thirty minutes or less.

7-DADMax or 7-day average of the daily maximum temperatures -- The arithmetic average of seven consecutive measures of daily maximum temperatures. The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date.

Acute toxicity -- The lethal effect of a compound on an organism that occurs in a short time period, usually 48 to 96 hours.

AKART -- The acronym for "all known, available, and reasonable methods of prevention, control and treatment." AKART is a technology-based approach to limiting pollutants from wastewater discharges, which requires an engineering judgment and an economic judgment. AKART must be applied to all wastes and contaminants prior to entry into waters of the state in accordance with RCW 90.48.010 and 520, WAC 173-200-030(2)(c)(ii), and WAC 173-216-110(1)(a).

Alternate point of compliance -- An alternative location in the groundwater from the point of compliance where compliance with the groundwater standards is measured. It may be established in the groundwater at locations some distance from the discharge source, up to, but not exceeding the property boundary and is determined on a site specific basis following an AKART analysis. An "early warning value" must be used when an alternate point is established. An alternate point of compliance must be determined and approved in accordance with WAC 173-200-060(2).

Ambient water quality -- The existing environmental condition of the water in a receiving water body.

Ammonia -- Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Annual average design flow (AADF) -- The average of the daily flow volumes anticipated to occur over a calendar year.

Average monthly (intermittent) discharge limit -- The average of the measured values obtained over a calendar month's time taking into account zero discharge days.

Average monthly discharge limit -- The average of the measured values obtained over a calendar month's time.

Background water quality -- The concentrations of chemical, physical, biological or radiological constituents or other characteristics in or of groundwater at a particular point in time upgradient of an activity that has not been affected by that activity [WAC 173-200-020(3)]. Background water quality for any parameter is statistically defined as the 95% upper tolerance interval with a 95% confidence based on at least eight hydraulically upgradient water quality samples. The eight samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

Best management practices (BMPs) -- Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD5 -- Determining the five-day Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD5 is used in modeling to measure the reduction of dissolved oxygen in receiving waters after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD_5 is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass -- The intentional diversion of waste streams from any portion of a treatment facility.

Categorical pretreatment standards -- National pretreatment standards specifying quantities or concentrations of pollutants or pollutant properties, which may be discharged to a POTW by existing or new industrial users in specific industrial subcategories.

Chemical Oxygen Demand (COD) – A measure of the capacity of water to consume oxygen during the decomposition of organic matter and the oxidation of inorganic chemicals such as ammonia and nitrite.

Chlorine -- A chemical used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic toxicity -- The effect of a compound on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Acute Critical Effluent Concentration (ACEC) -- The maximum concentration of effluent during critical conditions at the boundary of the zone of acute criteria exceedance assigned in accordance with WAC 173-201A-100.

Chronic Critical Effluent Concentration (CCEC) -- The maximum concentration of effluent during critical conditions at the boundary of the mixing zone assigned in accordance with WAC 173-201A-100.

Clean water act (CWA) -- The federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Compliance inspection-without sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance inspection-with sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations. In addition it includes as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Ecology may conduct additional sampling.

Composite sample -- A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction activity -- Clearing, grading, excavation, and any other activity, which disturbs the surface of the land. Such activities may include road building; construction of residential houses, office buildings, or industrial buildings; and demolition activity.

Continuous monitoring -- Uninterrupted, unless otherwise noted in the permit.

Critical condition -- The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Date of receipt -- This is defined in RCW 43.21B.001(2) as five business days after the date of mailing; or the date of actual receipt, when the actual receipt date can be proven by a preponderance of the evidence. The recipient's sworn affidavit or declaration indicating the date of receipt, which is unchallenged by the agency, constitutes sufficient evidence of actual receipt. The date of actual receipt, however, may not exceed forty-five days from the date of mailing.

Detection limit -- The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the pollutant concentration is above zero and is determined from analysis of a sample in a given matrix containing the pollutant.

Dilution factor (DF) -- A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the percent effluent fraction, for example, a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Distribution uniformity -- The uniformity of infiltration (or application in the case of sprinkle or trickle irrigation) throughout the field expressed as a percent relating to the average depth infiltrated in the lowest one-quarter of the area to the average depth of water infiltrated.

Early warning value -- The concentration of a pollutant set in accordance with WAC 173-200-070 that is a percentage of an enforcement limit. It may be established in the effluent, groundwater, surface water, the vadose zone or within the treatment process. This value acts as a trigger to detect and respond to increasing contaminant concentrations prior to the degradation of a beneficial use.

Enforcement limit -- The concentration assigned to a contaminant in the groundwater at the point of compliance for the purpose of regulation, [WAC 173-200-020(11)]. This limit assures that a groundwater criterion will not be exceeded and that background water quality will be protected.

Engineering report -- A document that thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report must contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal coliform bacteria -- Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab sample -- A single sample or measurement taken at a specific time or over as short a period of time as is feasible.

Groundwater -- Water in a saturated zone or stratum beneath the surface of land or below a surface water body.

Industrial user -- A discharger of wastewater to the sanitary sewer that is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial wastewater -- Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business; from the development of any natural resource; or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated stormwater and, also, leachate from solid waste facilities.

In-situ Monitoring - Is defined here as the use of analytical instruments for monitoring that can be taken to the stream rather than samples brought back to the laboratory for testing.

Interference -- A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

- Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and
- Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Local limits -- Specific prohibitions or limits on pollutants or pollutant parameters developed by a POTW.

Major facility -- A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum daily discharge limit -- The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Maximum day design flow (MDDF) -- The largest volume of flow anticipated to occur during a one-day period, expressed as a daily average.

Maximum month design flow (MMDF) -- The largest volume of flow anticipated to occur during a continuous 30-day period, expressed as a daily average.

Maximum week design flow (MWDF) -- The largest volume of flow anticipated to occur during a continuous 7-day period, expressed as a daily average.

Method detection level (MDL) -- See Detection Limit.

Minor facility -- A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing zone -- An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The permit specifies the area of the authorized mixing zone that Ecology defines following procedures outlined in state regulations (chapter 173-201A WAC).

National pollutant discharge elimination system (NPDES) -- The NPDES (Section 402 of the Clean Water Act) is the federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both state and federal laws.

pH -- The pH of a liquid measures its acidity or alkalinity. It is the negative logarithm of the hydrogen ion concentration. A pH of 7 is defined as neutral and large variations above or below this value are considered harmful to most aquatic life.

Pass-through -- A discharge which exits the POTW into waters of the State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

Peak hour design flow (PHDF) -- The largest volume of flow anticipated to occur during a one-hour period, expressed as a daily or hourly average.

Peak instantaneous design flow (PIDF) -- The maximum anticipated instantaneous flow.

Point of compliance -- The location in the groundwater where the enforcement limit must not be exceeded and a facility must comply with the Ground Water Quality Standards. Ecology determines this limit on a site-specific basis. Ecology locates the point of compliance in the groundwater as near and directly downgradient from the pollutant source as technically, hydrogeologically, and geographically feasible, unless it approves an alternative point of compliance.

Potential significant industrial user (PSIU) --A potential significant industrial user is defined as an Industrial User that does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day; or

b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

Ecology may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation level (QL) -- Also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer (64 FR 30417).
ALSO GIVEN AS:
The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency, December 2007).

Reasonable potential -- A reasonable potential to cause a water quality violation, or loss of sensitive and/or important habitat.

Responsible corporate officer -- A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or have gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures (40 CFR 122.22).

Sample maximum -- No sample may exceed this value.

Significant industrial user (SIU) --

1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N; and

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

   Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

Slug discharge -- Any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge to the POTW. This may include any pollutant released at a flow rate that may cause interference or pass through with the POTW or in any way violate the permit conditions or the POTW's regulations and local limits.

Soil scientist -- An individual who is registered as a Certified or Registered Professional Soil Scientist or as a Certified Professional Soil Specialist by the American Registry of Certified Professionals in Agronomy, Crops, and Soils or by the National Society of Consulting Scientists or who has the credentials for membership. Minimum requirements for eligibility are possession of a baccalaureate, masters, or doctorate degree from a U.S. or Canadian institution with a minimum of 30 semester hours or 45 quarter hours professional core courses in agronomy, crops or soils, and have 5, 3, or 1 year(s), respectively, of professional experience working in the area of agronomy, crops, or soils.

Solid waste -- All putrescible and non-putrescible solid and semisolid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and construction wastes, abandoned vehicles or parts thereof, contaminated soils and contaminated dredged material, and recyclable materials.

Soluble BOD_5 -- Determining the soluble fraction of Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of soluble organic material present in an effluent that is utilized by bacteria. Although the soluble BOD_5 test is not specifically described in Standard Methods, filtering the raw sample through at least a 1.2 um filter prior to running the standard BOD_5 test is sufficient to remove the particulate organic fraction.

State waters -- 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.

Stormwater -- That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a stormwater drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based effluent limit -- A permit limit based on the ability of a treatment method to reduce the pollutant.

Total coliform bacteria -- A microbiological test, which detects and enumerates the total coliform group of bacteria in water samples.

Total dissolved solids -- That portion of total solids in water or wastewater that passes through a specific filter.

Total maximum daily load (TMDL) -- A determination of the amount of pollutant that a water body can receive and still meet water quality standards.

Total suspended solids (TSS) -- Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset -- An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water quality-based effluent limit -- A limit imposed on the concentration of an effluent parameter to prevent the concentration of that parameter from exceeding its water quality criterion after discharge into receiving waters.

Appendix D--Technical Calculations

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found in the PermitCalc workbook on Ecology's webpage at: http://www.ecy.wa.gov/programs/wq/permits/guidance.html.

Simple Mixing:

Ecology uses simple mixing calculations to assess the impacts of certain conservative pollutants, such as the expected increase in fecal coliform bacteria at the edge of the chronic mixing zone boundary. Simple mixing uses a mass balance approach to proportionally distribute a pollutant load from a discharge into the authorized mixing zone. The approach assumes no decay or generation of the pollutant of concern within the mixing zone. The predicted concentration at the edge of a mixing zone (C_{mz}) is based on the following calculation:

$$C_{mz} = Ca + \frac{(Ce - Ca)}{DF}$$

where: Ce = Effluent Concentration
Ca = Ambient Concentration
DF = Dilution Factor

Reasonable Potential Analysis:

The spreadsheets Input 2 – Reasonable Potential, and LimitCalc in Ecology's PermitCalc Workbook determine reasonable potential (to violate the aquatic life and human health water quality standards) and calculate effluent limits. The process and formulas for determining reasonable potential and effluent limits in these spreadsheets are taken directly from the *Technical Support Document for Water Quality-based Toxics Control*, (EPA 505/2-90-001). The adjustment for autocorrelation is from EPA (1996a), and EPA (1996b).

Calculation of Water Quality-Based Effluent Limits:

Water quality-based effluent limits are calculated by the two-value wasteload allocation process as described on page 100 of the TSD (EPA, 1991) and shown below.

1. Calculate the acute wasteload allocation WLA_a by multiplying the acute criteria by the acute dilution factor and subtracting the background factor. Calculate the chronic wasteload allocation (WLA_c) by multiplying the chronic criteria by the chronic dilution factor and subtracting the background factor.

$$WLA_a = (\text{acute criteria} \times DF_a) - [(\text{background conc.} \times (DF_a - 1)]$$

$$WLA_c = (\text{chronic criteria} \times DF_c) - [(\text{background conc.} \times (DF_c - 1)]$$

where: DF_a = Acute Dilution Factor
DF_c = Chronic Dilution Factor

2. Calculate the long term averages (LTA_a and LTA_c) which will comply with the wasteload allocations WLA_a and WLA_c.

$$LTA_a = WLA_a \times e^{[0.5\sigma^2 - z\sigma]}$$

where: $\sigma^2 = \ln[CV^2 + 1]$

$z = 2.326$

CV = coefficient of variation = std. dev/mean

$$LTA_c = WLA_c \times e^{[0.5\sigma^2 - z\sigma]}$$

where: $\sigma^2 = \ln[(CV^2 \div 4) + 1]$

$z = 2.326$

3. Use the smallest LTA of the LTA_a or LTA_c to calculate the maximum daily effluent limit and the monthly average effluent limit.

MDL = Maximum Daily Limit

$$MDL = LTA \times e^{(Z\sigma - 0.5\sigma^2)}$$

where: $\sigma^2 = \ln[CV^2 + 1]$

z = 2.326 (99th percentile occurrence)

LTA = Limiting long term average

AML = Average Monthly Limit

$$AML = LTA \times e^{(Z\sigma_n - 0.5\sigma_n^2)}$$

where: $\sigma^2 = \ln[(CV^2 \div n) + 1]$

n = number of samples/month

z = 1.645 (95^{th} % occurrence probability)

LTA = Limiting long term average

Permit Part I BOD Limits Calculation

This permit adjusts BOD limits in relation to the 2009 permit. In 2015, the Port submitted an application supplement requesting that Ecology correct a technical error in calculating mass limits for BOD. Concentration limits are intended to be equivalent to secondary treatment. In establishing permit limits Ecology determined that 45 mg/l in winter and 25 mg/l in summer was AKART. State regulations discourage sending stormwater to sewage treatment plants. The Port's approved system is intended to avoid sending low strength stormwater to the King County WWTP. Design treatment capacity of the industrial waste treatment systems is 7.1 MGD based on the chemical flocculation and dissolved air flotation treatment capacity. The 500 lb/day limit allows only 1.3 MGD to discharge at the associated concentration limits; the 130 lb/day dry weather limit allows 0.6 MGD. In 2007, the Permittee finished construction of the wastewater segregation and storage system. The mass limits should have been reevaluated after the 2007 completion of the treatment system to optimize treatment capacity at both the airport and the King County wastewater treatment plant.

Previous BOD Limits

Permit limits from 2004 to 2014	Average Monthly	Maximum Daily	Comments
BOD_5 November through March	45 mg/L 500 lbs/day	3115 lbs/day	Permit fact sheets have no explanation for how these limits were calculated, PCHB ruling directed Ecology to set limits equal to secondary treatment.
BOD_5 April through October	25 mg/L 130 lbs/day	1340 lbs/day	Permittee said the concentration limits were agreed to for meeting a long term average equivalent to secondary sewage treatment. Permit fact sheets omit calculation of lb/day limits. 3115 lb/day max day is product of 45 mg/L at 8.3 MGD design flow, the standard calculation method to convert concentration-based to mass-based limits, allowable DAF overflow rates of 7.1 MGD are the appropriate design constraint.

Previous fact sheets do not explain the above mass- based limits. Over the last five years, the system has averaged a long term BOD concentration of about 12 mg/L over the year, so the current concentration limits provide for meeting the goal of AKART for STIA. Typically in sewage treatment plants, mass-based limits are set by design flow and the matching concentration limits. For this facility, flows vary with rainstorms and concentrations vary with glycol use. The SeaTac treatment/flow segregation system performs differently than a typical sewage treatment facility meeting secondary treatment standards.

Setting a ceiling with the daily maximum mass and retaining the average concentration limits provides for meeting AKART for STIA and ensuring the plant is operated within design limits on a daily basis. BOD limits below set the levels at which the Permittee diverts higher strength organic loads to further treatment. The limits below reflect the 2007 upgrade, form mass limits, retains the established concentration limits, and meets the directive by the Pollution Control Hearings Board to require secondary treatment for direct discharge to Puget Sound.

Proposed BOD Limits	Average Monthly	Maximum Daily	Comments
BOD_5 November through March	45 mg/L	45 mg/L *7.1 MGD*8.34 conversion factor = **2665 lb/day**	Recalculated the maximum daily mass limit based on treatment plant design flow.
BOD_5 April through October	25 mg/L	25 mg/L *7.1MGD*8.34 conversion factor = **1480 lbs/day**	Recalculated the maximum daily mass limit based on treatment plant design flow.
TSS	21 mg/L	33 mg/L	Carry over the average monthly and daily maximum TSS limits from previous permits.

This change to the permit limits is not subject to TIER 2 antidegradation because the changes to the mass limits result in no net increase of discharge of BOD to Puget Sound. For low strength stormwater, the sewage treatment plant affords little or no treatment. STIA flows either discharge via the Midway outfall or the King County outfall at the same BOD levels. Increasing the direct discharge flows at Midway balances with an equal reduction of flows discharges from King County's outfall to Puget Sound.

This change does not qualify as backsliding under 40 CFR 122.44 because of the tradeoff scenario discussed above. Ecology may increase technology-based limits determined on a case-by-case (BPJ) basis [40 CFR 125.3(d)] if any of the following apply:

1. Material and substantial alterations to the permitted facility occurred after permit issuance justifying the application of a less stringent effluent limitation.
2. Ecology made a mistake when it calculated limits or when it interpreted law or regulation when it issued the permit.

This change corrects a technical error. Mass limits were subject to revision after the 2007 upgrade when the Port instituted segregation of high and low strength flows.

Since the last permit in 2009, EPA has issued effluent guidelines for the STIA deicing point source category in 40 CFR part 449; COD is limited for new sources in that regulation. For new sources, the guidelines set chemical oxygen demand limits of 271 mg/L daily maximum, 154 mg/L weekly average. The 2009 permit had more stringent limits than the federal effluent guidelines.

EPA selected COD for regulation and not BOD_5 for the following reasons:

- COD analyses are simple to conduct and can be measured in real time compared to a 5-day test for BOD.
- COD eliminated the need to consider receiving water temperature when evaluating water quality concerns; and
- Toxic ADF additive compounds in deicing stormwater may have a negative and variable effect on the acclimation of the active culture used in BOD analysis, making the method less robust than COD analysis for these wastewaters.

COD and BOD correlate poorly. Evaluating the COD to BOD ratio for the data gathered from 2007 to 2009 yields a COD:BOD ratio of about 1.9 overall. The winter ratio is about 1.7. The summer ratio is highly variable – about 2.3 at BOD levels near the effluent limit. These ratios are based on manipulating the data by ignoring low BOD values. Port staff concluded that:

"*Some observations*

- *BOD and COD do not correlate well at BOD concentration at or below 25 mg/L. The BOD test has a lot of inherent variability to it.*
- *Regressions indicate that COD is present, ~ 15 mg/L, when BOD is near detection limit. So, simple COD/BOD ratios may misrepresent the relationship.*
- *Correlations improve when you look at data by season. However, correlations of dry season data where BOD concentrations are less than or equal to 25 are poor.* "

The Federal Aviation Administration guidebook for airport monitoring lists a COD to BOD ratio of 1.8 as typical (listed in the reference as a BOD to COD ratio of 0.55). In summary, the EPA's daily maximum limit of 275 mg/L is equivalent to a BOD limit ranging from 120 to 162 mg/L based on conversions listed above. The BOD concentration limits in the permit are more stringent than effluent guidelines for new sources and meet AKART for secondary treatment.

It may be possible to correlate permit BOD to Total Organic Carbon (TOC). TOC analysis is instantaneous, and the Port already uses it as an indicator of BOD.

Calculations & Data Summary

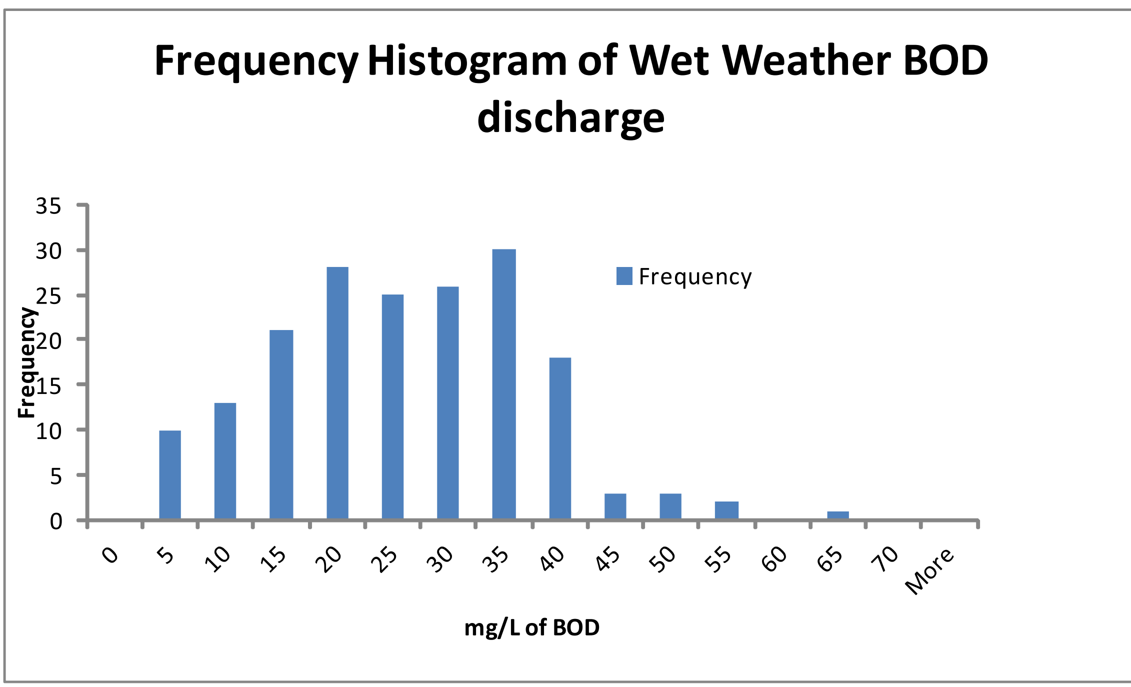
Winter Performance-based BOD Effluent Limits
November through March 2009 to 2014

INPUT	
LogNormal Transformed Mean:	2.9900
LogNormal Transformed Variance:	0.5140
Number of Samples per month for compliance monitoring:	7
Autocorrelation factor (n_e) (use 0 if unknown):	0
OUTPUT	
E(X) =	25.7131
V(X) =	444.279
VARn	0.0917
MEANn=	3.2012
VAR(Xn)=	63.468
RESULTS	
Maximum Daily Effluent Limit:	**105.4**
Average Monthly Effluent Limit:	**40.4**
40.41521797	38.81831394

Use spreadsheet on right to calculate the log-normal

Mean	**2.999**
Variance	**0.514**

Max daily limit to average monthly ratio is 2.6 to 1



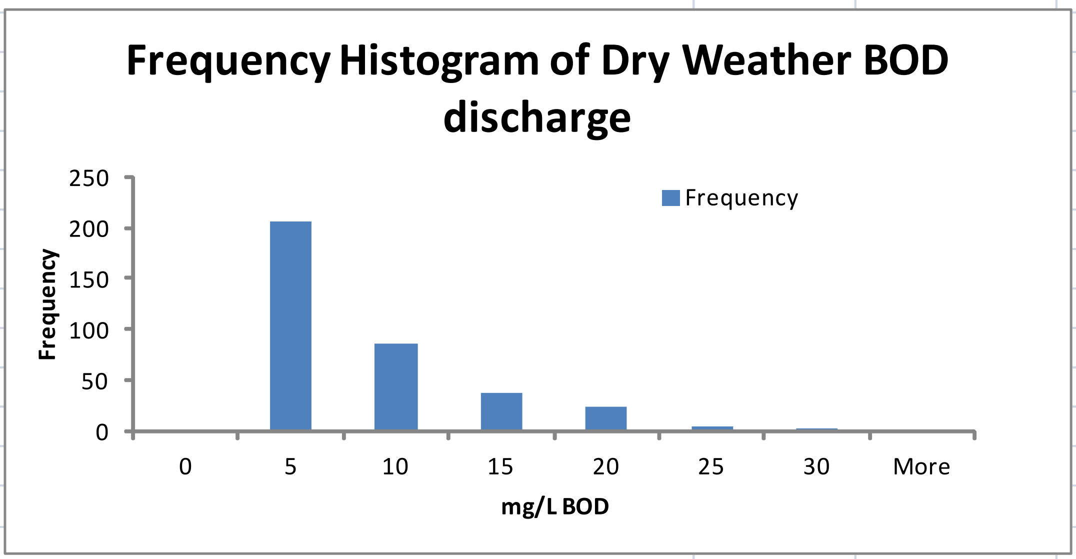
Summer Performance-based BOD Effluent Limits April through October 2009 to 2014

INPUT	
LogNormal Transformed Mean:	1.4920
LogNormal Transformed Variance:	0.6930
Number of Samples per month for compliance monitoring:	8
Autocorrelation factor (n_e) (use 0 if unknown):	0
OUTPUT	
E(X) =	6.2871
V(X) =	39.516
VARn	0.1178
MEANn=	1.7796
VAR(Xn)=	4.939
RESULTS	
Maximum Daily Effluent Limit:	**30.8**
Average Monthly Effluent Limit:	**10.4**
10.42391587	9.943110655

Use spreadsheet on right to calculate the log-normal

Mean	**1.492**
Variance	**0.693**

max daily limit to average monthly ratio is 3 to 1



9/15/2015 6:53 AM
SeaTac tsdcalc0.9-15-15_checked.xlsx

REASONABLE POTENTIAL CALCULATION

NPDES Permit No.

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56. User input columns are shown with red headings. Corrected formulas in col G and H on 5/98 (GB)

				State Water Quality Standard		Max concentration at edge of...			CALCULATIONS									
	Metal Criteria Translator as decimal	Metal Criteria Translator as decimal	Ambient Concentration (metals as dissolved)	Acute	Chronic	Acute Mixing Zone	Chronic Mixing Zone	LIMIT REQ'D?	Effluent percentile value		Max effluent conc. measured (metals as total recoverable)	Coeff Variation		# of samples	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor	
Parameter	Acute	Chronic	ug/L	ug/L	ug/L	ug/L	ug/L			Pn	ug/L	CV	s	n				COMMENTS
ARSENIC (	1.00	1.00		69.00	36.00	0.04	0.01	NO	0.95	0.86	2.04	0.60	0.55	20.00	1.36	72.00	202.00	
CADMIUM	0.99	0.99		42.00	9.30	0.01	0.00	NO	0.95	0.86	0.27	0.60	0.55	20.00	1.36	72.00	202.00	
CHROMIUM	0.99	0.99		1100.00	50.00	0.05	0.02	NO	0.95	0.86	2.50	0.60	0.55	20.00	1.36	72.00	202.00	
COPPER	0.83	0.83		4.80	3.10	0.22	0.08	NO	0.95	0.86	14.30	0.60	0.55	20.00	1.36	72.00	202.00	
LEAD -	0.95	0.95		210.00	8.10	0.04	0.01	NO	0.95	0.86	2.07	0.60	0.55	20.00	1.36	72.00	202.00	
MERCURY	0.85	0.85		1.80	0.03	0.00	0.00	NO	0.95	0.86	0.10	0.60	0.55	20.00	1.36	72.00	202.00	
NICKEL -	0.99	0.99		74.00	8.20	0.06	0.02	NO	0.95	0.86	3.02	0.60	0.55	20.00	1.36	72.00	202.00	
SELENIUM				290.00	71.00	0.02	0.01	NO	0.95	0.86	1.02	0.60	0.55	20.00	1.36	72.00	202.00	
SILVER -	0.85	0.85		1.90		0.00	0.00	NO	0.95	0.86	0.21	0.60	0.55	20.00	1.36	72.00	202.00	
ZINC-	0.95	0.95		90.00	81.00	0.83	0.30	NO	0.95	0.86	46.31	0.60	0.55	20.00	1.36	72.00	202.00	
CYANIDE				1.00	1.00	0.24	0.09	NO	0.95	0.86	12.75	0.60	0.55	20.00	1.36	72.00	202.00	
DIELDRIN 60571 10P				0.71	0.00	0.00	0.00	NO	0.95	0.37	0.05	0.60	0.55	3.00	3.00	72.00	202.00	
ENDOSULFAN				0.03	0.01	0.00	0.00	NO	0.95	0.05	0.03	0.60	0.55	1.00	6.20	72.00	202.00	
ENDRIN 72208 14P				0.04	0.00	0.00	0.00	NO	0.95	0.37	0.05	0.60	0.55	3.00	3.00	72.00	202.00	
HEPTACHLOR				0.05	0.00	0.00	0.00	NO	0.95	0.37	0.05	0.60	0.55	3.00	3.00	72.00	202.00	
HEPTACHLOR EPOXIDE				0.05	0.00	0.00	0.00	NO	0.95	0.37	0.05	0.60	0.55	3.00	3.00	72.00	202.00	
PENTACHLOROPHENOL				13.00	7.90	0.10	0.04	NO	0.95	0.37	2.50	0.60	0.55	3.00	3.00	72.00	202.00	
Polychlorinated Biphenyls				10.00	0.03	0.02	0.01	NO	0.95	0.37	0.50	0.60	0.55	3.00	3.00	72.00	202.00	
DDT 50293 7P				0.13	0.00	0.00	0.00	NO	0.95	0.22	0.05	0.60	0.55	2.00	3.79	72.00	202.00	
DDT METABOLITE (DDE)				0.13	0.00	0.00	0.00	NO	0.95	0.22	0.05	0.60	0.55	2.00	3.79	72.00	202.00	
DDT METABOLITE (DDD)				0.13	0.00	0.00	0.00	NO	0.95	0.22	0.05	0.60	0.55	2.00	3.79	72.00	202.00	

For all those parameters specified in the application as "Less Than Detection Value", half of the "Given Detection Value" were used in calculations.

Appendix E--Part I Industrial Wastewater System

The Industrial Waste System (IWS) manages stormwater associated with industrial activities from aircraft fueling and maintenance operations as well as wastewater from other airport related operations. Contaminants from these activities consist primarily of spilled fuel, de-icing and anti-icing fluids, detergents, and lubricants. The IWS includes collection and conveyance facilities, biochemical oxygen demand runoff segregation, runoff storage, and the industrial wastewater treatment plant (IWTP). These facilities are described below along with additional information on all known, available, and reasonable methods of treatment (AKART) determination for IWS, aircraft deicing and anti-icing operations of STIA, discharge characterization, stormwater pollution prevention and the mixing zone study.

IWS collection and conveyance

The Port of Seattle restricts aircraft maintenance, fueling and deicing operations to those areas served by the IWS stormwater collection and conveyance system. As such, the IWS collects stormwater and industrial wastewater from the terminal areas, air cargo, deicing areas, hangars, and aircraft maintenance areas. These areas are contained within two IWS drainage basins: the North Service Basin and the South Service Basin. The IWS North Service Basin includes portions of the STIA between Taxiways A and B and Air Cargo Road as well as the Weyerhaeuser Hanger and General Aviation area on the west side of the airfield. The IWS South Service Basin includes areas the Fuel Farm, Passenger Gate Ramp Areas, as well as aircraft hangers. Each drainage basin accounts for approximately half of the 375 acre IWS runoff collection area (see Figure E-1).

The conveyance system includes approximately 21 miles of piping, 510 manholes and catch basins, two below grade vaults in the parking garage, and 11 pump stations. Table E-1 summarizes the pump stations that serve the IWS. These facilities area maintained on a regular basis as described in the Port's Stormwater Pollution Prevention Plan (SWPPP) and the Inspection, Maintenance, and Operation Procedures Manual. Each pump station listed in Table E-1 functions as a key structural source control (SSC) BMP by diverting runoff to IWS treatment from various drainage areas associated with aircraft fueling and maintenance operations.

The existing IWS conveyance piping was originally designed for the 10-year, 24-hour storm event, consistent with the stormwater regulations in effect at that time. Currently, new storm drainage systems are designed for the 25-year, 24-hour storm event. Computer modeling of the conveyance system determined that portions of the system might be overloaded during 25-year, 24-hour storm events. Overloading may cause local ponding in the area of manhole tops during the storm event. As a result of this analysis, the Port installed watertight manhole covers in 1997 through 1998 to prevent flooding in areas that would pose a safety problem or may overflow to the storm drainage system (SDS).

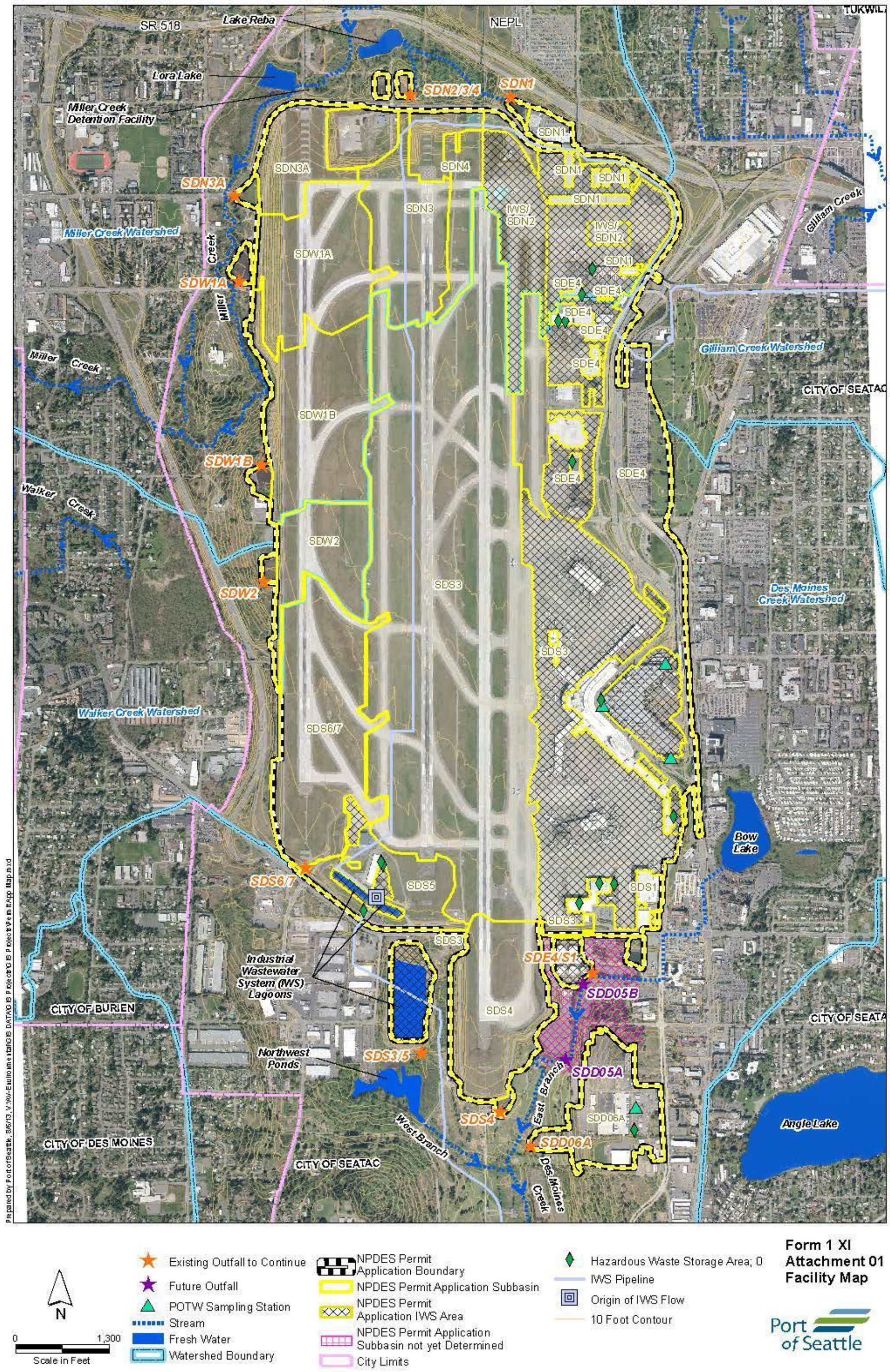

Existing Outfall to Continue
Future Outfall
POTW Sampling Station
Stream
Fresh Water
Watershed Boundary
NPDES Permit Application Boundary
NPDES Permit Application Subbasin
NPDES Permit Application IWS Area
NPDES Permit Application Subbasin not yet Determined
City Limits
Hazardous Waste Storage Area; 0
IWS Pipeline
Origin of IWS Flow
10 Foot Contour
Scale in Feet
Form 1 XI
Attachment 01
Facility Map
Port of Seattle

Figure E-1

Table E-1. IWS Pump Stations

Location	Drainage Area (acres)	Design Flow (gpm)	Function	Flow Sources
Transiplex (North Cargo)	35.6	2 @ 1350 each	Transfer water from ramp and taxiway areas to IWS.	North Cargo ramps, Taxiways A and B (formerly SDS subbasin SDN2)
North Runway Snowmelt	6.6	2 @300 each	Divert snowmelt water from snow storage area to IWS. Also serves as a back-up station for the Transiplex pump station.	North Snowmelt/snow storage area (formerly drained to SDS subbasin SDN2)[1]
North Satellite (Central) Snowmelt Facility	0.7	750	Divert snowmelt water from snow storage area to IWS.	Snowmelt/snow storage area (formerly drained to SDS subbasin SDE4)
Fire Station (North Satellite)	18.7	2150	Transfer water from ramp and taxiway areas to IWS.	North Satellite ramp vicinity (formerly SDS subbasin SDE4)
South Snowmelt (Tank Farm)	0.3	750	Divert snowmelt water from snow storage area to IWS.	South snowmelt/snow storage area
Parking garage	24.6 [2]	2 @1300 each	Diverts stormwater runoff from the parking garage to IWS.	Parking garage
Fuel Farm	5.1	2 @ 2,500 each	Designed to transfer runoff and washdown water to IWS.	Tank Farm
A Concourse (STEP) Lift Station	~ 1.3	950	Provides IWS lift over STS tunnel.	South terminal ramp area
C-1 List Station	~ 27	4 @ 4,700 each	Lift Station for Concourse C	Gates and apron areas north of Concourse C

Stormwater Drainage System (SDS) collects runoff from airport runways, taxiways and roadways and discharges to local receiving waters (i.e. Miller, Walker, and Des Moines Creeks) following detention and treatment. The SDS is further described in Appendix G.
1. The SDN2 runoff is pumped to the IWS for all flows up to the 6-month, 24-hour event.
2. Roof top drainage area calculation from Parametrix Technical Memorandum, March 29, 2005.

IWS BOD segregation

Prior to the storage and treatment, the IWS stormwater and wastewater is automatically analyzed and segregated based upon high or low biochemical oxygen demand (BOD) concentration. The primary source of BOD in the industrial wastewater is aircraft deicing/anti-icing fluids (glycols), although plane and vehicle wash water also exert BOD. Measuring the BOD of an effluent is an indirect way of measuring the quantity of organic material present in an effluent and the potential reduction of dissolved oxygen in receiving water after an effluent is discharged.

As noted below, the IWTP is highly effective in treating stormwater pollutants including fuel-related contamination. However, the plant is not capable of reducing high BOD concentrations caused by aircraft deicing operations. Runoff with BOD with concentrations below those found to impact receiving water quality can be discharging directly to Puget Sound after treatment for fuel-related contamination under the STIA's NPDES permit. High BOD runoff must be segregated and pumped to the Valley View Sewer District which in turn is conveyed to King County's South Wastewater Treatment Plant (SWTP) for secondary treatment and discharge. The Port's discharges to King

County are performed under a separate Industrial Waste Discharge Permit issued by the King County Department of Natural Resources (No. 7810-02). This permit allows the Port to discharge to the SWTP 60,000 pounds per day of BOD at a maximum rate of 1,600 gallons per minute (2.3 million gallons per day (mgd)). As specified in the Industrial Waste Discharge Permit, Port and King County personnel collaboratively work together to meet the operational and permit needs of each other's treatment facilities.

BOD segregation is facilitated by in-stream monitoring for total organic carbon (TOC). TOC is used as an analytical surrogate for BOD because it can be quickly analyzed in the field with a high level of accuracy, precision and correlation with BOD. This near real-time capability allows the Port to continuously monitor influent and effluent quality, effectively segregate high BOD runoff and manage lagoon storage capacity.

As described further below, the STIA's IWS includes three lagoons with capacities of 1.6, 3.3 and 76 million gallons (see Figure E-1). Using information provided by the influent TOC analyzers, plant operators segregate high concentration runoff to designated lagoons. Flexibility designed into the IWTP allows for separate and if necessary simultaneous processing and discharging of high BOD runoff to King County and low BOD runoff to Puget Sound. Effluent TOC meters are used by the IWTP operators to monitor the concentration and mass loading of treated effluent being sent to the King County's SWTP or directly to Puget Sound via Outfall 001. Since the segregation process became operational in January of 2007, the STIA has reduced BOD loading to Puget Sound by over 95% while reducing unnecessary use of the sanitary sewer conveyance and treatment capacity and overall energy consumption (see IWS Stormwater Characterization below).

IWS lagoon storage

The storage of runoff from the IWS collection system is a critical component of the overall system as it allows for temporary containment of flows in excess of plant's treatment capacity. The three IWS lagoons were originally designed to have a combined storage volume of 25.1 million gallons at the maximum normal operating water depth. Lagoon 1 was completed in 1965 and holds approximately 1.6 million. Lagoon 2 was constructed in 1972 and has a capacity of approximately 3.3 million gallons. Lagoon 1 was cleaned and lined with a polyethylene liner in 1996. Lagoon 2 was cleaned and lined in 1997. Lagoon 3 was constructed in 1979, held approximately 20.2 million gallons at the maximum normal operating water depth, and was unlined. Lagoon 3 was cleaned, lined and expanded to 76 million gallons in 2002. A summary of these and other recent system improvements is presented below (see IWS AKART Determination and System Improvements).

Lagoons 1 and 2 are located just north of the IWTP, while Lagoon 3 is located southeast, across South 188th Street (see Figure E-1). Piping and valves allow diversion of either service basin to either Lagoon 1 or 2. Flow may also be conveyed between Lagoons 1 and 2 or diverted directly to Lagoon 3. Two valves located in the Lagoon 1 and Lagoon 2 outlet structures, respectively, control the discharges from these lagoons into the IWTP. A pump station next to Lagoon 3 transfers water from Lagoon 3 to the IWTP influent head box. The Lagoon 3 design provides both an overflow spillway and an emergency decant drain drawing from mid-depth of the lagoon. The spillway and emergency decant drain discharge to Northwest Ponds and Des Moines Creek. The drain can be used as an alternative to allowing the lagoon to overflow from the spillway thereby avoiding the release of any product that may be floating on the surface. As part of its normal operating procedures, IWTP staff maintain lagoon levels as low as practical at all times, thus reducing the probability of lagoon overflows.

Lagoon 3 was designed to contain estimated run-off resulting from an isolated 100-year storm assuming the entire capacity is available. However, multiple or continuous storm events are more typical of winter weather patterns in the Pacific Northwest region. A continuous simulation of the IWS performance was completed using the King County Regional Time Series (KCTRS) to demonstrate the system's capacity under various winter season operational scenarios (Parametrix, 2000). This analysis determined that zero overflows would occur when the 50-year KCTRS period of record was simulated and the plant was processing 2,847 gpm (4.1 mgd). At a reduced combined discharge rate of 2,152 gpm (3.1 mgd), the 50-year KCTRS period of record simulation predicted that one overflow would occur. At a combined discharge rate of 1,667 gpm (2.4 mgd), the 50-year KCTRS period of record simulation predicted two overflows would occur.

During the 2009 NPDES permit cycle, mass based effluent limitations for IWS discharges to Puget Sound as well as to King County's SWTP dictated the volume of treated runoff the plant discharged. The IWTP's average flow to Outfall 001 was 2.29 MGD and to King County's SWTP was 1.61 MGD during the months of November through March when deicing fluids are typically applied.

Industrial Wastewater Treatment Plant (IWTP)

The Industrial Wastewater Treatment Plant (IWTP) is located inside a building south of Lagoons 1 and 2 and north of South 188th Street, just west of the tunnel under the west airport runway. The IWTP was originally designed and constructed in 1963/1964 for the purpose of capturing and treating fuel spills.

Prior to treatment, the influent water flows through mechanical screening devices. The screens are sized to remove objects larger than 0.5 square inches. Following screening, the treatment process consists of adding coagulation chemicals (normally aluminum sulfate) to the influent wastewater in a rapid mix chamber, gently mixing the chemicals in a flocculation tank for approximately 10 minutes to coagulate particulates and oil droplets, and removing the floc and other oil particles in a dissolved air flotation (DAF) unit. There are a total of six treatment trains, each consisting of the above unit processes.

The solids captured from the DAFs are discharged into a trough that runs the length of the building. This trough leads to a small sump and pump station located outside of the east end of the IWTP. The sump contents are pumped into a system of two decant tanks, which are piped together to allow sedimentation of the solids. Liquid decant is cycled back to Lagoons 1 or 3. The settled sludge is periodically removed by pump to a portable tanker for offsite disposal.

The IWTP generally operates after periods of significant rainfall. Even during winter months, operation may be intermittent depending on weather conditions. At temperatures below 35° F, the efficiency of the plant declines. The drop in treatment efficiency at low temperatures is caused by a reduction of the chemical reaction rate in the coagulation process. During the summer months, there is a potential for algal blooms in the IWS lagoons. IWTP operators may lower flow rates and switch coagulants from aluminum sulfate (alum) to aluminum chloride to enhance algae removal. However, some microalgal blooms may result in elevated concentrations of suspended solids that are unrelated to airport activities.

The treated effluent flows by gravity from the DAFs to the IWS Pump Station. High and Low BOD effluent flows to separate wet wells in the pump station. Effluent from the pump station is routed to one of three locations:

- High BOD effluent to the Valley View Sewer District sewer system and King County's SWTP for secondary treatment under KCDNR Permit No. No. 7810-02.
- Low BOD effluent to the Midway Sewer District outfall (001) for direct discharge to Puget Sound under Ecology NPDES Permit No. WA0024651.
- Recycled back to Lagoon 1, 2 or 3 in cases where the effluent discharge determined otherwise result in a permit limit exceedance.

The hydraulic capacity of the IWTP is 5,764 gpm (8.3 mgd). The plant's treatment capacity is 7.1 MGD based on a maximum rate of 4.1 gpm/sf. However, due to an interim restriction in the conveyance pipe downstream of the IWTP, the maximum flow that can be discharged to the Midway Sewer District outfall (001) is 3,500 gpm (5.0 mgd).

The Midway Sewer District and the Port of Seattle entered into a thirty (30)-year agreement in February 1995, for the joint use of the Midway Sewer District outfall. This agreement set forth the terms of the treated water discharge as follows:

> "Under the terms of the agreement, the Port will cease to discharge effluent into the Airport Trunk Line in excess of 2,500 gpm, whenever the combined flow from the Port and Midway exceeds ninety percent (90%) of the present outfall capacity of twelve thousand five hundred (12,500) gpm."

The IWTP AKART pump station and pipeline are capable of discharging up to 2,990 gpm (4.3 mgd) to the King County's SWTP. However, these plant hydraulic capacities are effectively limited by either the mass-based effluent limitations as described above, hydraulic restrictions imposed by the Midway Sewer District, or permitted flow limits and at times other processing limitations imposed by King County.

The King County Department of Natural Resources (KCDNR) Permit limits discharges to the SWTP to 1,600 gpm (2.3 mgd) and 60,000 pounds per day of BOD. In addition the permit reserves King County's and Valley View Sewer District's authority to request that discharges to their system stop as necessary to prevent hydraulic overloading of the sewer conveyance systems or the County's SWTP.

IWS AKART determination and system improvements

In previous permit cycles, the Port was required to complete engineering evaluations as needed to support a determination of AKART for runoff contaminated with aircraft deicing fluids. In response, the Port prepared an Engineering Report which was submitted to Ecology in December 1995. Two more addenda were also submitted in April 1987 and April 2002. These reports addressed AKART as well as several immediate improvement needs to the IWS collection and treatment system. The Engineering Reports and AKART analysis together with the two addenda were approved by Ecology in May 2002.

The NPDES Permit No. WA0024651, Special Condition S4 issued in 1998 stated that the Port "shall take all available and reasonable means to implement the AKART determination in the shortest practicable time, but no later than June 30, 2004." The actual date for implementing the AKART recommendation was tied to the completion dates for the embankment and utilities associated with the new runway because the proposed alignment of the AKART force main was along the utility corridor in the western portion of the proposed third runway embankment. Delays in obtaining the 401/404 permit and subsequent appeals caused embankment construction to fall behind schedule. As a result, AKART implementation was delayed beyond 2004.

Based on the AKART engineering evaluations noted above, Ecology established a final effluent limitation of 250 mg/L of BOD for Outfall 001 in the September 2003 NPDES permit. That permit also stipulated that the "BOD_5 limits will be applicable one year after successful implementation and completion of AKART, i.e., July 1, 2007". This condition was appealed to the Pollution Control Hearings Board by the Airport Communities Coalition (ACC). The Board subsequently ruled that the AKART determination for the IWTP was improper and should be revised. Following a review of "Supplemental Information to Support Economic Reasonableness Determination of Industrial Waste System AKART Alternatives " (Kennedy Jenks, 2005) and other relevant information, Ecology revised the STIA's NPDES permit on October 7, 2005 and reestablished the final BOD effluent concentration and established new mass limitations. In addition, Ecology specified that AKART must be achieved no later than January 1, 2007.

In preparation for AKART compliance as well as overall plant improvement, the Port began implementing a series of upgrades early as 1995. Final improvements to meet AKART were completed in the summer of 2006 to allow for the segregation of IWS low and high BOD runoff. Following issuance of a King County Waste Discharge Permit on July 21, 2006, the Port began start up testing of its segregation systems in December 2006. The plant was fully operational and compliant with AKART on January 1, 2007. A history of recent IWS improvements is provided in Table E-2. The total capital cost of these improvements is over $65 million.

Table E-2: IWS and IWTP Improvements		
Improvement	**Year(s)**	**Purpose/Description**
Lagoons #1 and #2 were cleaned of all sludge and lined.	1996-1997	Lined with two-sided textured 100 mil polyethylene (PE). The lining includes a bottom-only geoweb and concrete liner placed on sand above the PE liner. This allows the operators to clean the pond easily. The concrete bottom also allows heavy equipment access to the Lagoon.
New level controls installed on the existing dissolved air flotation (DAF) float sump on the east side of the IWTP building.	1996-1997	Alarm on high sump levels. Low-level alarm disables sludge transfer pump.
Metering pumps for flocculation chemical	1996-1997	New Milton Roy metering pumps were installed to feed chemicals proportional to the DAF flow rate. The programmable logic controller (PLC) regulates pump speed to maintain a set point concentration of chemicals in the process. These pumps have a 100-to-1 turndown ratio. This turndown ratio allows a wide range of flocculent concentrations at varying flow rates. This ensures that the right concentration is used in the process. The pumps also rapidly adjust to different speeds.
Electric operators on all IWS conveyance system valves at the lagoons.	1997	Allow remote operation from the IWTP or the Maintenance Duty Officer (MDO).
New electrical supply installed for the IWTP, with replacement of the Motor Control Center (MCC), transformer, and incoming power feed.	1997	The new 800 amp Allen Bradley MCC provided the extra capacity required for the new DAF installation. The new transformer and power feed will provide a more reliable source of power to the IWTP.
A new Allen Bradley SLC/500 series PLC was installed to control and monitor the IWTP operations.	1997	A special program was written to allow the PLC to monitor all IWTP processes, adjust all pumps and control valves to meet set point values, and alarm all out-of-tolerance conditions. The program and PLC are expandable to provide for future changes needed to update the plant. Sufficient space exists at the PLC cabinet location to install a new panel for additional instruments.
New DAF influent flow controls	1997	Installed new Krohne 6-inch magnetic meters and actuated 8-inch Pratt butterfly valves to measure and control the flow influent to the DAFs. Three new Fisher-Potter single-loop controllers were installed to replace the local pneumatic control panel. These single-loop controllers work in conjunction with the new single-loop controllers in the control room and the new PLC. Flow totalizers are coupled to the single-loop controllers for each DAF to record the total flow passing through each DAF unit.
Final effluent sample pumping system.	1997	The air-driven double diaphragm pump draws a continuous stream system of liquid from the effluent manhole, providing a real-time sample for the effluent monitoring system.
A new final pH monitoring system was installed.	1997	Redundant in-line pH probes were installed in the final effluent sample pump pipeline feeding the effluent sampler.
A new effluent pH control system	1997	Monitor the pH of the effluent and add sodium hydroxide to keep the pH within the range of 6 to 9.
New manually operated isolation 42-inch Pratt butterfly valve was installed on the influent pipeline to Lagoon #2	1997	Isolates all influent to Lagoon #2 when training occurs at adjacent firefighting pit. Required because the fire pit drain is connected to the influent piping of Lagoon #2. Firefighting water can be directed any one of the three lagoons.

Table E-2: IWS and IWTP Improvements		
Improvement	**Year(s)**	**Purpose/Description**
New IWS influent piping to the lagoons was increased in size from 42-inch concrete pipe to 48-inch polyethylene. New IWS manholes 333A, 148A, and 334C	1997	Accommodates the projected flows and route flows to the various lagoons as flow and level conditions demand.
IWS conveyance pipeline revisions in the IWTP vicinity.	1997	Accommodates increased IWS flows and minimize manhole surcharge problems. New IWS manholes 333A, 148A, and 334C with watertight, bolt-down covers. New Lagoon #3 inlet valve (Hydrogate) in IWS 334C operated remotely from the IWTP. New 42-inch pipe from IWS 333 to IWS 333A and IWS 334C. New 48-inch pipe from IWS 148 to IWS 148A and IWS 334C. New 48-inch pipe from IWS 334 to IWS 334C. - New 42-inch pipe from IWS 334C under South 188th Street to IWS 334D, IWS 334E, and Lagoon #3 wing wall (entrance).
New Lagoon #3 pump station	1997	Two new Hydromatic 200 HP pumps are capable of lifting 7.1 million gallons per day (mgd) up to the IWTP. This increase in size matches the capability of the effluent line from the IWTP to the Midway outfall. The pumps selected were submersible centrifugal to match other pump stations installed elsewhere at STIA. The pumps were installed in a pre-cast 28-foot-deep, 12-foot-diameter pump station wet well north of Lagoon #3. A 6,000-pound (lb) capacity jib crane was installed at the pump station for pump removal.
Installed 20-inch force main from new Lagoon #3 pump station to IWTP	1997	Required to accommodate the 7.1 million gallons per day (mgd) from the lift station.
New Onan 350 kW standby generator was installed to provide backup power to the new pump station at Lagoon #3.	1997	The generator and new pump station controls were installed in a new 22-foot by 20-foot concrete block building located just west of the new pump station. The generator switches to backup power through an automatic transfer switch.
Sloped paving around the south side of IWTP building to two catch basins. Constructed new stormwater pump station.	1997	Sloped paving directs run-off to catch basins. The new pump station, activated by level switches, transfers collected fluids to Lagoons #1 or #2. The pump station consists of two submersible Hydromatic pumps in a sub grade vault. Each pump is sized to pump half of the projected stormwater collection for the 25-year, 24-hour storm. High-level alarm in the vault signals the IWTP to indicate a possible overflow condition. The roof drains from the IWTP building were left connected to the IWTP outfall.
New polyethylene tanks for storage of sodium hydroxide, aluminum sulfate, and aluminum chloride were installed in the IWTP.	1997	The tanks allow for bulk storage of treatment chemicals.
Two new Great Lakes Environmental 250-square-foot DAF units, including chemical feed pumps, re-aeration system, and controls, were installed.	1997 - 1998	Increased the average plant capacity to 4 mgd. Because the STIA land outfall has a limiting capacity of approximately 7.1 mgd, the peak DAF overflow rate is limited to approximately 4.1 gallons per minute per square feet (gpm/sf) with 1,200 square feet (sf) of installed DAF capacity. The new DAF units' effluent meets or exceeds the quality of the existing DAF units.
New Lagoon #1 and #2 wash down pump station was installed.	1997 - 1998	Allows for cleaning the sides of the lagoons for reduced odors. On-demand pump station pressurizes two pipelines that

Table E-2: IWS and IWTP Improvements		
Improvement	**Year(s)**	**Purpose/Description**
		encircle Lagoons #1 and #2. Wash down hydrants located at intervals around the lagoons. Designed to spray 160 gallons per minute (gpm) of wash down water 60 feet.
A new sanitary 8-inch polyvinyl chloride (PVC) sanitary sewer line was constructed from the IWTP across South 188th Street to the Midway Sewer District sewer pipeline in 16th Avenue South.	1997 - 1998	Replaced IWTP septic system with a new sanitary sewer line that connects the IWTP restroom, break room, and janitor's closet. The old septic system was disconnected, cleaned, and abandoned in place.
Programmable time-based influent and effluent samplers were installed.	1997 - 1998	The Sigma 900 MAX all-weather refrigerated sampler samples the influent and effluent at regular intervals. In addition, the samplers are programmed to sample when the pH is outside the control range. In this manner, the sample can be tested in the lab to verify the pH at the time of an excursion.
Watertight covers on manholes IWS 117 through IWS 120 serving the North Service Basin and IWS 144 through 147 and IWS 333 to 334 in the vicinity of the IWTP.	1997 - 1998	Watertight covers prevent manhole surcharging and ponding of water.
Catwalks were built around the Lagoon #1 and #2 skimmer houses. Catwalks were placed in the IWTP around the new DAFs. Catwalks were built around the Lagoon #1 and #2 skimmer houses. Catwalks were placed in the IWTP around the new DAFs.	1997-1998	Catwalks allow for better access and monitoring of the lagoons and DAFs. The IWTP catwalks were installed to allow the operator to walk the length of the plant at catwalk level.
A DAF washdown system was built on the catwalks above the DAFs.	1998	Washdown allows for more efficient cleaning of the DAF units.
Telemetry cable from IWTP to Lagoon #3 installed.	1998	Cable to provide telemetry between the IWTP and the Lagoon #3 pump station and generator building. The cable was installed in the abandoned 12-inch force main pipe from the demolished Lagoon #3 pump station.
Fiber optic cable to IWTP installed	1999	Cable provided e-mail access and phone upgrade at IWTP.
Flowmeter signal to website	2000 - 2001	Signal allows for remote monitoring of IWTP effluent flow rate.
Bird netting installed at Lagoons #1 and #2	2000	A bird-deterrent measure. Consists of 1.25-inch square polypropylene netting stretched over a cable support system. The netting entirely covers, but allows operator access to, Lagoons #1 and #2.
IWS pipe lining	1999-2007	Nearly all conveyance system piping has been inspected and cured in place pipe lining completed where found to be necessary.
BOD/TOC analyzer	2000-2007	Online TOC analyzers currently provide near real time BOD data for IWTP influent and effluent. BOD Analyzer installed in 2000, replaced by TOC analyzers in 2006 due to higher reliability. BOD has been found to correlate closely with TOC.
Lagoon #3 Expansion	2000-2002	Lagoon cleaned, expanded to approximately 76 million gallons (mg) capacity, and lined with a two-sided textured 100-mil polyethylene. The lining includes a bottom-only concrete-filled geoweb as in Lagoons #1 and #2.
AKART Pipeline and Pump Station	2006	Construction of an effluent pump station, pipeline, and appurtenances to convey treated IWS flows to the King County (KC) South Treatment Plant (STP), fulfilling the recommended

Table E-2: IWS and IWTP Improvements		
Improvement	**Year(s)**	**Purpose/Description**
		AKART alternative identified in the 1995 Engineering Report, with minor modifications.
IWTP Improvements	2006	Various improvements have been installed at the IWTP to increase operational flexibility and enhanced reliability.
Lagoon 3 Pump Station Improvements	2007	A traveling screen was added to Lagoon 3 in front of the effluent pumps to remove debris that could clog the pumps. In addition, the power sources feeding the Lagoon 3 pump station (including relocating the emergency generator) were implemented to improve the reliability of the electrical systems.
Hydraulic Improvements	2008-2009	Modifications to the piping to maximize storage volume in Lagoons 1 and 2 were implemented in late 2009.

Deicing/anti-icing operations

Deicing measures remove ice from the surface of aircraft, airfield, or runway. Anti-icing measures prevent ice accumulation on the surface of the aircraft, airfield, or runway. Deicing and anti-icing are normally conducted during freezing conditions, although some aircraft types such as MD-80s and 737's require deicer application at temperatures above the freezing point. Deicing may be conducted at a gate, on a cargo ramp, or occasionally at airline hangar complexes. All aircraft deicing occurs within the IWS collection area. Once a plane has been deiced or coated with an anti-icing fluid, the plane must take off within a specific amount of time or the chemicals must be reapplied.

Aircraft deicing and anti-icing is mandated by the Federal Aviation Authority (FAA) to ensure public safety. The application of aircraft deicers is under the control of the individual airlines. Airlines or ground service companies provide deicing/anti-icing services. The airline or ground service provider submits daily deicing/anti-icing usage reports to the Port.

Currently the FAA authorizes ethylene glycol-based and propylene glycol-based deicing/anti-icing for aircraft deicing or anti-icing. The amount of deicing/anti-icing fluid applied per plane is variable, based upon the size and type of aircraft, temperature of the aircraft, temperature of the fuel, outside temperature, humidity, length of time the plane has been on the ground, location of the aircraft, and the type and characteristics of the precipitation, frost, or ice. Table E-3 summarizes the aircraft deicing/anti-icing product usage reported by the Port during the previous permit cycle.

Ecology's Hazardous Waste and Toxics Reduction Program regulate hazardous waste in Washington State through Chapter 173-303 WAC, the Dangerous Waste Regulations. Ecology has determined that wastes containing more than ten percent ethylene glycol book-designate as state-only dangerous waste (DW) under WAC 173-303-100(5)(b). While that determination was made in the context of evaluating the toxicity of waste ethylene glycol-based as automobile and truck anti-freeze, it may be sufficiently broad to apply to aircraft deicing fluids as well. Wastes containing propylene or diethylene glycol are not included in the state-only waste designation. In September 1995, the Port of Seattle applied for certification of the waste aircraft deicing fluids generated at STIA under WAC 173-303-075. The application included static acute fish and acute oral rat bioassays in accordance with the requirements of WAC 173-303-110(3)(b). Based on the results of the bioassays, Ecology certified that waste aircraft deicing fluids containing ethylene glycol generated at STIA are not dangerous wastes on October 20, 1995. This 5-year certificate was renewed in October 2000 and October 2005. Airlines discontinued applying ethylene glycol based deicer at STIA in the 2008-2009 deicing season.

Table E-3: Annual Aircraft Deicing/Anti-icing Fluid Usage (Gallons)						
	Type I		**Type IV**		**Type II**	
Application Period	**Ethylene Glycol**	**Propylene Glycol**	**Ethylene Glycol**	**Propylene Glycol**	**Propylene Glycol**	**Total**
4/14 – 3/15	--	79,158	--	1593	--	80,751
4/13 – 3/14	--	148,733	--	3795	--	152,528
4/12 – 3/13	--	156,268	--	2049	--	158,317
4/11 – 3/12	--	343,521	--	18,517	--	362,038
4/10 – 3/11	--	184,873	--	10,273	--	195,146
4/09 – 3/10	--	25,879	--	396	--	26,275
4/08 – 3/09	985	296,854	--	21,187	--	319,026
4/07--3/08	--	163,844	--	4,870	--	168,714
4/06--3/07	--	189,298	--	9,438	--	198,736
4/05--3/06	1,820	77,608	55	2,800	--	82,283
4/04--3/05	15,137	117,245	--	8,275	--	140,657
4/03--3/04	11,423	99,083	45	4,102	1,625	116,278
4/02--3/03	1,305	104,185	--	800	275	106,565
4/01--3/02	15,137	117,245	--	8,275	--	140,657
4/00--3/01	11,423	99,083	45	4,102	1,625	116,278
4/99--3/00	1,305	104,185	--	800	275	106,565
4/98--3/99	8,580	197,954	--	475	1,745	208,754
Type I Fluids - Anti-ice/deice chemicals applied in an unthickened, liquid form, either diluted or undiluted. Type II Fluids - Anti-ice/deice chemicals applied in a jelled or thickened form. Type II fluids are intended to adhere to aircraft surfaces up to approximately 80 knots. Type IV Fluids - Similar to Type II but has longer holdover times. Type IV is normally used in severe icing conditions.						

Discharge characterization

Treated stormwater and wastewater from the IWS and discharged to Outfall 001 have been monitored on a daily basis for BOD. Discharges are monitored weekly for TSS, oil and grease and total glycols. Total recoverable metals are monitored quarterly. In addition to these parameters pH and flow are monitored continuously.

Table E-4 summarizes sampling results for BOD, total glycol, TSS, and oil and grease along with the effluent limitation at time of sampling. The data is segregated into summer (April through October) and winter (November through March), consistent with the current BOD effluent limitations.

Sampling results for metals monitored on a quarterly basis are summarized in Table E-5. Metals data from both seasons are included in the metals summary.

The previous NPDES permit required that Priority Pollutants be analyzed once during the wet season and once during the dry season in year three of the permit cycle. The complete list of EPA Priority Pollutants (122 total) were analyzed for each season. The results of the wet season and dry season priority pollutant characterization are included in Table E-6. Table E-6 only includes data for those parameters that were detected at or above the Method Detection Limit (MDL) in at least one of the two samples.

Stormwater pollution prevention

STIA has implemented a Stormwater Pollution Prevention Plan (SWPPP) since 1994. The SWPPP describes the overall facility, site inspections, operations, activities and corresponding BMPS. The SWPPP also includes monitoring protocols. SWPPP implementation includes many operational and capital improvements to prevent the discharge of contaminants to surface waters.

Treatment as provided by the IWTP is the primary BMP used within the IWS. In addition to treatment, the Port and its tenants employ various operational source controls as part of the STIA's SWPPP and demonstration of the Port's adaptive management process for stormwater management at STIA. Table E-7 describes the industrial activity, pollutants associated with each activity within the IWS, and the associated BMPs.

Table E-4. Summary of BOD, Glycol, TSS and Oil and Grease Results During Winter and Summer (mg/L)

		BOD_5	Total Glycols[3]	TSS	Oil and Grease
Summer[2]	Effluent Limit[1]	25/Rpt	7 NA	21/33	8/15
	No. of Samples	312	NA	87	83
	Median	4.5	NA	8	1.21
	95th Percentile	16	NA	21.1	2.59
	No. of Limit Exceedances	0	NA	1/2	0/0
Winter[2]	Effluent Limit[1]	45/Rpt	NA	21/33	8/15
	No. of Samples	140	31	31	31
	Median	22	5	5	0.97
	95th Percentile	38	23.4	11.5	2.1
	No. of Limit Exceedances	0	NA	0/0	0/0

Data summarize overall median ("med"), 95th percentile and number of representative stormwater samples collected per the NPDES permit.

[1] Average monthly/maximum daily effluent limits as contained in permit at time of data collection.

[2] The data is segregated into summer (April through October) and winter (November through March), consistent with the current BOD effluent limitations.

[3] Samples were not analyzed for glycols during the summer months.

Table E-5. Summary of Metals Results for Discharges to Outfall 001 (µg/L)

Parameter	No. of Samples	Percent Not Detected	Median[1]	95th Percentile [1]	Maximum
Arsenic	20	0%	1.00	2.04	2.85
Cadmium	20	0%	0.15	0.27	0.38
Chromium	20	40%	0.86	2.5	2.50
Copper	20	0%	6.94	14.30	20.00
Lead	20	0%	0.67	2.07	3.35
Mercury	20	65%	0.05	0.10	0.10
Nickel	20	0%	0.91	3.02	3.30
Selenium	20	50%	0.39	1.02	5.00
Silver	20	50%	0.05	0.21	0.31
Zinc	20	0%	27.70	46.31	56.00
Cyanide	20	50%	5.00	12.75	27.0

[1] Median and 95th percentile values calculated using ½ the reported detection limit went parameter not detected.

Table E-6. Summary of Priority Pollutant Results for Discharges to Outfall 001 (µg/L)		
Parameter[1]	**Dry Season**	**Wet Season**
Antimony	1.2	0.8
Arsenic	1.4	0.8
Cadmium	0.2	0.1
Copper	7.4	2.9
Lead	1.3	0.3
Nickel	5.4	2.5
Zinc	21	23
Phenol	<MDL	1.3

[1] Parameters listed include those detected in at least one sample. All others were reported as not detected.

Table E-7. Part I OSC BMP Summary Table[1]

Activity	Targeted Activities	Targeted Pollutants	BMP Key Approaches
General Industrial Activities	• Aircraft/vehicle/ equipment maintenance • Aircraft, ground vehicle, and equipment cleaning • Aircraft, ground vehicle equipment storage • Outdoor handling, storage, and disposal of waste materials • Fuel storage and delivery • Building and grounds maintenance • Vehicle and equipment painting • Garbage handling and disposal • Aircraft de-icing and anti-icing • Aircraft lavatory servicing • Potable water system flushing • Roadway, ramp, and runway maintenance and cleaning • Fire suppression and AFFF • Animal handling	• Anti-freeze chemicals • Batteries • De-icing chemicals • Fuel • Herbicides • Lavatory chemicals • Oil and Grease • Paint • Pesticides • Soap/cleaning chemicals • Solvents • Other	• Maintain good housekeeping practices. • Minimize exposure to stormwater. • Perform preventative maintenance. • Follow spill prevention and response procedures. • Conduct facility inspections. • Provide training.
Aircraft, Vehicle, and Equipment Maintenance	• Aircraft/vehicle/equipment maintenance • Aircraft/vehicle/equipment painting or stripping • Apron/floor washdown • Potable water system cleaning	• Oil and grease • Vehicle fluids • Solvents/cleaning solutions • Fuel • Battery acid • Paint	• Conduct maintenance indoors or in a covered area. • Perform outdoor maintenance in IWS drainage areas only. • Clean catch basins regularly. • Collect and properly dispose of all fluids.
Aircraft, Vehicle, and Equipment Cleaning	• Aircraft/vehicle/equipment painting or stripping • Aircraft/vehicle/equipment washing or cleaning	• Oil and Grease • Solvents • Vehicle fluids • Cleaning Solutions	• Use wash rack or designated area in IWS drainage area only. • Use dry washing techniques. • Recycle wash water or discharge appropriately. • Provide training.
Aircraft De-icing and Anti-icing	• Aircraft de-icing and anti-icing • Apron/floor washdown	• Ethylene glycol • Propylene glycol • BOD	• Perform de-icing/anti-icing in IWS Areas. • Apply only required amounts of fluid • Clean ramp area when done • Implement FAA recommendations. • Maintain tanks and secondary containment for de-icing and anti-icing chemicals.
Vehicle and Equipment Painting	• Vehicle and equipment painting • Pavement painting • Outdoor wash down	• Paint • Metals • Solvents	• Use permitted paint booths. • Perform touch-up painting indoors. • Store paint indoors. • Manage paint waste.
Aircraft and Vehicle Potable	• Aircraft potable water system cleaning and flushing	• Purine • Chlorine bleach	• Perform water truck flushing in designated areas only.

Table E-7. Part I OSC BMP Summary Table[1]			
Activity	**Targeted Activities**	**Targeted Pollutants**	**BMP Key Approaches**
Water System Flushing	• Water truck cleaning and flushing		• Collect all discharge from aircraft potable water flushing or water truck flushing, and discharge to a permitted sanitary sewer connection. • Do not discharge water to the ground or SDS.
Aircraft lavatory waste servicing	• Aircraft lavatory service • Lavatory truck cleanout/back-flushing	• Lavatory chemicals • Lavatory waste • Lavatory truck wash water	• Do not discharge lavatory waste to sanitary sewer connections other than the STIA "biffy dump". • Do not perform lavatory truck cleanout or back-flushing at any location other than the STIA "biffy dump". • Use buckets or pans to capture drippage from aircraft lavatory access fittings. • Carry absorbent and other containment equipment on the lavatory service equipment.
Animal Handling	• Animal handling and cargo	• Fecal coliform	• Manage animal waste.

[1] This table is a brief summary of operational source control BMPs at STIA. For a detailed list of all OSC BMPs, please refer to the Storm Water Pollution Prevention Plan (SWPPP).

Mixing zone study

In September 2006, a technical memorandum addendum was prepared to supplement the mixing zone evaluations conducted in the original *Outfall Modeling Technical Memorandum No. 1* (*TM-1*) dated September 24, 2002 (URS 2002). *TM-1* documented mixing zone and hydraulics analyses that were performed in support of the Des Moines Creek Wastewater Treatment Plant Outfall Project for the Midway Sewer District (District), and identified the design criteria established for the new diffuser design. *TM-1* was submitted to the Washington Department of Ecology (Ecology) as a Mixing Zone Study, in compliance with the National Pollutant Discharge Elimination System (NPDES) permit requirements for the new outfall. The outfall, now completed and in use, serves the District (NPDES No. WA-002095-8) and STIA's IWTP.

TM-1 included preliminary dilution modeling which evaluated various design options and operating conditions for the new outfall diffuser. The results of the preliminary analysis formed the design basis for the new diffuser. Subsequent to the preparation of *TM-1*, the detailed design of the diffuser were completed and the original modeling was updated using the most current dilution modeling software (Visual Plumes). The September 2006 addendum was prepared to provide an updated mixing zone analysis for the final diffuser configuration to verify compliance with water quality standards at the mixing zone limits, in accordance with the requirements of the NPDES discharge permits.

Based on the results of the reasonable potential calculations using the model derived dilution factors and effluent analysis, the new outfall diffuser was found to provide adequate mixing to meet Washington State Water Quality Standards. The final dilution factors to be applied for the new outfall were determined to be 72 for the acute boundary and 202 for the chronic boundary based on year 2020 District flows and maximum IWTP flows. These dilutions translate to an acute critical effects concentration (ACEC) of 1.4% and a chronic critical effects concentration (CCEC) of 0.50% for whole effluent toxicity (WET) bioassays for both the District and IWTP discharges.

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Appendix F--Industrial Wastewater Discharges to Midway Sewer District

During the previous permitting period effective starting April 1, 2009, the STIA discharged industrial wastewaters to the Midway Sewer District from the following operations:

- Rental Car Wash Blowdown
- Boiler Blowdown
- Cooling Tower Blowdown
- Equipment Wash Rack

The rental car wash blowdown ceased discharging to Midway Sewer District on May 17, 2012, and is no longer operational.

Two industrial discharges from the bus maintenance began discharging to Midway Sewer District on May 17, 2012. These are the chassis wash and the bus wash. These discharges are combined and pass through an oil-water separator and a common sampling point prior to entering the sanitary sewer.

In addition to these past discharges the STIA anticipates a New Equipment Wash Rack discharges to the Midway Sewer District within the next five year period.

Boiler blowdown

The STIA boiler room is located on the bottom level of the parking garage. The boilers provide steam which is used to heat the airport terminal, concourses, and other areas, as well as to heat water for domestic and commercial usage.

Makeup water to the boilers is drawn from the municipal water supply. Boiler additives are injected to control corrosion and scale, and to disperse precipitates. The blowdown stream from the boilers has been connected to the Midway sanitary sewer since about 1971. Blowdown of the boilers is performed manually, with blowdown occurring approximately 5 days per week. The boiler waste stream typically includes both a surface and a bottom blow. Surface blow is discharged via a needle valve located at the top of the boiler water level. Bottom blowdown occurs once per day via a manual valve. The duration of bottom blowdown is determined based on field assay for chlorine.

Blowdown discharge is measured by a flow meter. The maximum average monthly discharge to the Midway Sewer District sewer system between April 1, 2009 and March 31, 2013 was 164 gpd. The maximum daily discharge flow over this period was 4,320 gpd. The relatively large maximum daily flow occurs when annual maintenance is performed on each of the four boilers.

Cooling tower blowdown

The cooling tower blowdown stream was connected to the Midway sanitary sewer in August 1995. The existing cooling loop, including basins for all cooling tower cells, has a capacity of about 200,000 gallons of water. Occasionally, the entire system is drained for facility maintenance. There are currently eight chillers in the Central Mechanical Plant that provide chilled water to air handling units located throughout the terminal and satellites. The air handling units provide air conditioning to these areas. Air conditioning is needed all year round.

Makeup water to the cooling tower is drawn from the City of Seattle supply to the airport. Biocides and corrosion and scale inhibitors are added to the cooling water.

Heat is rejected by the chillers into the circulating cooling tower water, raising the water temperature. The heated circulating cooling tower water is pumped to up to five cooling towers, where heat is rejected due to evaporation. Dissolved solids build up in the circulating cooling tower water, requiring occasional blow down of a portion of the water to the sanitary sewer. The blow down occurs in batches from the cooling tower sumps.

The blow down amount is based on measurements of the circulating cooling tower water chemistry. The maximum average monthly discharge to the Midway Sewer District sewer system between April 1, 2009 and March 31, 2013 was 4,646 gpd. The maximum daily discharge flow over this period was 104,191 gpd.

As of the late 2013, a $48 million project to provide pre-conditioned air to aircraft at all gates is being put into service. As a result of this project, the average monthly discharge is expected to increase by a maximum 20%. The maximum average monthly discharge is projected to reach 16,700 gpd as the additional loads from aircraft cooling using the pre-conditioned air system. This increased volume was included in the discharge values provided in the permit renewal application.

Equipment wash rack

The Port may install a new wash facility for Port and STIA tenant equipment. The Port's Equipment Wash Rack is still in the preliminary design phase. However, demand surveys indicate that 20 to 50 pieces of equipment may be washed per day in the new facility. The new system is expected to minimize the amount of water consumed by maintaining a recycle ratio of 10 to 20 percent. On this basis, it is assumed that system blowdown from the Port operated Equipment Wash Rack will average approximately 20,000 gpd. The wash rack blowdown is expected to be of a wastewater composition similar to that from the rental car wash.

Bus maintenance facility bus wash

A new bus maintenance facility (BMF) opened on May 17, 2012. The BMF site includes buildings, landscaping, bus parking and employee parking, which is located on approximately two acres. There are two buildings onsite. The western building has maintenance and chassis wash bays, tire and part storage, general repair, administrative offices, fleet and employee parking. The eastern building includes fueling using compressed natural gas, and a drive-through bus wash, including a vacuuming area.

Industrial discharges to the Midway Sewer system primarily consist of blowdown from a bus wash. Bus wash blowdown is derived from a drive thru automated bus wash bay and a separate chassis wash bay. Trenched drains serving the chassis wash bay, bus wash bay, and reclaim water room drain to an underground oil/water separator and then to the sanitary sewer system.

Based on records to date, the maximum average monthly discharge from bus wash system blowdown was 421 gpd. The maximum daily discharge flow was 3548 gpd.

IWS water reuse

The Port is evaluating using the portion of stormwater collected within the industrial wastewater system as a water source for toilets and urinals. The IWS water reuse is currently conceptual and will be evaluated on a project by project basis. Ecology is currently working with the State Building Code Council's Plumbing Code Technical Advisory Group (TAG) on amendments to the 2009 Uniform Plumbing Code that is expected to set standards for this practice. The

IWS reuse volumes are a conservative estimate based upon stormwater from non-pollution generating sources (rooftops and IWS lagoons). The IWS water reuse will average approximately 28,000 gpd. The permit requires monitoring of flow volume into this system when put in practice. Ecology may modify the permit to set conditions for this discharge or may depend on the Plumbing Code changes to set standards. The final discharge is expected to be similar to domestic wastewater and will flow to the Midway sewer system as does other airport sewage.

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Appendix G--PART II, Non-Construction Stormwater

Introduction

The STIA has managed a storm drainage system since commissioning in the 1940s. Stormwater drainage at STIA is separated into two different collection systems, the Industrial Wastewater System (IWS) and the Storm Drainage System (SDS). The IWS receives stormwater runoff from areas involved with aircraft servicing and maintenance, providing treatment before discharge to Puget Sound through a separate outfall. A total of 375 acres are diverted to the IWS. Discharges from the IWS are regulated under Part I of the STIA's NPDES permit. The Storm Drainage System (SDS) located within STIA's NPDES Permit boundary drains over 1,200 acres. Approximately one-half of this area is impervious and primarily associated with airport industrial activities with the remainder being pervious landscaped or fallow open spaces.

Receiving water

Stormwater runoff from STIA drains to Miller Creek, Des Moines Creek, and Walker Creek. Approximately 26 percent of STIA are conveyed to the Miller Creek either directly or first through Lake Reba. This drainage represents about six percent of Miller Creek's watershed. A little more than three percent of STIA drains west to Walker Creek, representing about five percent of the creek's watershed. Approximately 70 percent of the STIA SDS area drains south to the Northwest Ponds and Des Moines Creek representing about 23 percent of the creek's watershed.

Miller Creek

Miller Creek is six miles in length. Miller Creek's watershed includes portions of Normandy Park, the City of SeaTac, and the City of Burien. Approximately 62 percent of the land use in the Miller Creek Basin is residential, 19 percent is commercial/industrial, and the remainder is open (parks, cemeteries, or forests/wetlands) (CH2MHILL, 2008). The creek flows south under SR 518 and through the in-stream Miller Creek Regional Detention Facility, passing Lake Reba and Lora Lake.

The Port constructed Lake Reba in 1973 in compliance with a stipulated order (King County Superior Court No. 726259). Originally identified as the North Clear Zone Detention Pond, the water body was designed to provide 13.5 acre-foot of active storage, limit release rates to Miller Creek to 40 cubic feet per second and treat runoff from the northern portion of STIA. Although initially operated as a stormwater facility, in April 2005 Ecology determined that Lake Reba was constructed in a wetland and therefore constituted waters of the state, subject to regulation as a natural water body.

Miller Creek continues southward through land owned by the Port. Portions of the creek in this vicinity have been relocated and restored as mitigation during construction of the third runway. The creek then turns west and flows two miles to Puget Sound.

The Miller Creek Basin is urbanized and exhibits rapid changes in stream flow typical of developed basins. The large amount of impervious areas produce much more runoff than occurred under native, forested conditions, and this runoff reaches surface water much more quickly. In 1992, King County constructed the in-stream Miller Creek Regional Detention Facility and the 1st Avenue South Regional Detention Facility (Ambaum Pond) as partial mitigation for increased flows attributed to regional development within the watershed (Miller and Walker Creek Basin Plan, 2006).

Miller Creek Subbasins

There are five active STIA subbasins in the Miller Creek Basin: SDN-1, SDN-2/3/4, SDN3-A, SDW1-A, and SDW1-B. Characteristics of each subbasin are described in Table G-1.

SDN-1. The SDN-1 subbasin is located in the northeastern portion of the airport and discharges to Miller Creek via Lake Reba. Runoff from the subbasin includes flight kitchens, roads, and the roofs of several buildings. Several galvanized rooftops are painted in the SDN-1 subbasin as a source control measure to reduce zinc concentrations in stormwater. Bioswales along Air Cargo Road treat runoff from this roadway within the SDN1 subbasin. A stormwater detention pond was constructed to detain and treat stormwater from the SDN-1 subbasin. The detention pond was put into service in December 2006 and provides Level 2 (duration based) flow control. In 2011, a bioretention swale and solar pump system was constructed next to the SDN-1 pond to provide additional treatment during the summer months.

SDN-2/3/4: The SDN-2/3/4 subbasin is located on the north end of the airport and combines the SDN-2, SDN-3, and SDN-4 subbasins into a single outfall. The SDN-2/3/4 subbasin discharges to Miller Creek via Lake Reba.

The individual outfalls were eliminated from the permit and combined into a single temporary outfall, Pond M, on October 12, 2010 during reconstruction of the Pond M (SDN2/3/4) detention facility. The Pond M outfall was eliminated from the permit and the SDN2/3/4 outfall was activated in November 2011. A detention pond provides Level 2 (duration-based) flow control. For BMP administrative management purposes the SDN2, SDN3, and SDN4 Subbasins remain.

- **SDN-2:** The SDN-2 subbasin is primarily an IWS drainage area that collects runoff from over 42 acres of taxiways and cargo ramp areas. Runoff from the subbasin is collected and diverted to the IWS using two pump stations designed to divert runoff up to the water quality design flow rate (6-month/24-hour event). Peak flows exceeding the capacity of the pump stations drain to the SDN-2/3/4 outfall. SDN-2 collects runoff from aircraft cargo areas and some taxiways. Within these areas industrial activities include cargo aircraft servicing/deicing and pavement deicing/anti-icing chemical applications.
- **SDN-3:** SDN-3 subbasin is located on the northern portion of the airport. SDN-3 contains airfield activities at the north end of the airport, including service roads, runways, taxiways, and associated infield areas. The infields are the open, grassed areas between taxiways and runways portions of which are managed as filter strips to treat runoff from the adjacent pollution-generating surfaces (runways).

SDN-4: SDN-4 subbasin is located on the northern portion of the airport and consists of service roads, runways, taxiways, and associated infield areas. Reconstruction of Runway 16L during the summer of 2009 allowed the Port to relocate catch basins further away from the edge of the runway. This work lengthened the effective treatment area of the filter strips.

SDN-3A. The SDN3-A outfall was activated upon commissioning of the third runway (16R/34L). The SDN3-A subbasin discharges directly to Miller Creek and collects stormwater from the northwest portion of the third runway and taxiways. A Level 2 flow control detention pond and filter strips located along the runway provide flow control and treatment.

SDW-1A. The SDW-1A outfall was activated upon commissioning of 16R/34L. The SDW-1A subbasin discharges directly to Miller Creek and collects stormwater from the northwest portion of the third runway taxiways. A Level 2 flow control detention pond and filter strips located along the runways provide flow control and treatment.

SDW-1B. The SDW-1B outfall was activated upon commissioning of 16R/34L. The SDW-1B subbasin discharges directly to Miller Creek and collects stormwater from the western portion of the third runway and taxiways. A Level 2 flow control detention pond and filter strips located along the runways provide flow control and treatment.

Des Moines Creek East

Des Moines Creek East begins at Bow Lake, one-quarter mile east of STIA. The creek flows mostly within pipes through the City of SeaTac and along the east side of STIA. The creek daylights in the southeast portion of STIA, flows through a golf course, and the Tyee Detention Facility (constructed by King County in 1989). Des Moines Creek East joins with Des Moines Creek West a short distance downstream of Tyee Detention Facility, south of the runways, and then crosses under South 200th Street. Des Moines Creek flows an additional 2 miles south and west to Puget Sound. The Des Moines Creek basin covers the cities of Des Moines, Normandy Park, SeaTac, and a small portion of the City of Burien.

The area draining to the east branch of Des Moines Creek is approximately 1,030 acres. The majority of this area lies west of STIA in the city of SeaTac. Off-airport land uses include single family residential, a large mobile home park, a highly commercialized area along International Boulevard, and a golf course. Approximately 218 acres draining to the east branch are associated with STIA SDS subbasins as described below.

Des Moines Creek is urbanized and exhibits large variations in stream flow that are characteristic of developed basins, similar to Miller Creek. The current level of development has increased the peak discharges in the creek system enough to cause flooding and erosion problems. In addition to the Tyee Detention Facility, the Des Moines Creek Regional Detention Facility and Des Moines Creek High Flow Bypass have been constructed to reduce high flows in the creek through Des Moines Creek Basin Planning efforts.

Des Moines Creek East Subbasins

SDE-4/S1.

The SDE-4/S1 subbasin is located along the eastern portion of the airport and combines the SDE-4 and the SDS-1 subbasins into a single outfall (August 2007 by NPDES Permit Minor Modification) which discharges to the East Branch of Des Moines Creek.

- **SDS-1.** The SDS-1 area receives runoff from aircraft maintenance building rooftops, parking areas, cargo building rooftops, roads, and parking lots. In October 2006, a galvanized maintenance building rooftop was painted along with galvanized portions of an HVAC-I-beam superstructure on an adjacent office building (source control). Two bioswales were constructed in SDS-1. They are located in an approximately one-acre area along South 188th Street at the downstream end of the subbasin. In August 2011 improvements were made to the SDE-4/S1 flow splitter vault and bioswale. This bioswale was converted into a bioretention media bed with an underdrain system along with modifications to the flow splitter to allow the ability to effectively direct SDS-1 flows to the modified SDS-1 bioretention swale for additional stormwater treatment.
- **SDE-4.** The SDE-4 subbasin drains the passenger terminal area on the east side of STIA. This area receives runoff from roads, parking lots, terminal area roofs, and taxiways. Multiple BMPs constructed in the SDE-4 subbasin were designed to meet AKART requirements (basic treatment) and provide additional enhanced treatment for dissolved metals. The first was the SE Pond Tunnel Diversion Pipe. The pipe was designed to divert flows from the existing 60-inch storm drain pipeline that lies under International Boulevard and connects below grade with Des Moines Creek East and discharges from Bow Lake. This diversion pipe allowed the Port to segregate the SDE-4 subbasin stormwater from city of SeaTac drainage plus Bow Lake discharges and conveys the SDE-4 subbasin stormwater to a site where airport runoff could be separately detained and treated. Construction on this tunnel and diversion pipe was complete on May 31, 2006, but it did not become active until the SE Pond detention and treatment project was completed in June 2007. The SE Pond detention and treatment project involved construction of an end-of-pipe facility incorporating an enhanced Level 1 flow control extended detention pond, a 600-cartridge media filtration vault providing enhanced treatment, and a bioswale. The SDE-4 subbasin was routed through the diversion pipe and into the pond, treatment system, and bioswale in June 2007. A gravity drain system was added to the SDE-4 pond to allow the dead storage volume to be routed to an adjacent bioretention/media treatment swale during the summer. For BMP management purposes the SDE4 and SDS1subbasins continue to be shown separately on maps and figures.

SDD-06A. The SDD-06A subbasin and outfall was activated in 2010 and is monitored under Part II of the permit. This area receives runoff from public roads, vehicle parking areas, rooftops, Port Bus Maintenance Facility and Distribution Center, landscaped areas, and construction laydown. Water quality treatment for SDD-06A consists of bioretention swales with oyster shells placed at the end for additional treatment, oil-water separators. The subbasin is also served by a Level 1 flow-control detention pond. The SDD-06A outfall drains to the East Branch of Des Moines Creek.

SDD-05A and SDD-05B. Subbasins SDD-05A and SDD-05B were added to the 2009 NPDES permit based on the potential for future growth and industrial activities. Currently these subbasins SDD-05A and SDD-05B have no industrial activity and are not monitored under the current NPDES permit.

Des Moines Creek West

Des Moines Creek West originates in a highly developed area southwest of the runways. The creek flows into a series of ponds known as the Northwest Ponds. Historical aerial photos indicate that the area occupied by the ponds was farmland until the late 1950s. The ponds were dredged during the following decade. Approximately 1,240 acres drain to the West Branch of Des Moines Creek. Approximately 630 acres are within the boundaries of the STIA. Off-airport land uses include streets, single family residential, warehouses, and a large wetland area south of the ponds.

The Northwest Ponds were enlarged to provide regional detention to control high flows in the middle and lower reaches of Des Moines Creek by the Des Moines Creek Basin Committee which consists of the Port of Seattle, City of SeaTac, and City of Des Moines. Additional committee projects include a high creek flow bypass pipe that conveys flows directly to Puget Sound via an existing outfall. Habitat improvements have been added to the stream channel both on and off of Airport Property. Downstream, an undersized culvert under Marine View Drive has been replaced by a bridge to improve fish passage. Additional stream habitat improvement projects will continue to be constructed as further funding is secured. As a result of these enhancements, Ecology approved a basin-wide alternative flow control standard in 2008 consisting of Level 1 with a 1994 existing condition target.

There are three STIA subbasins in Des Moines West Basin: SDS-3/5, SDS-4, and SDS-6/7. All of these subbasins receive runoff from runways, taxiways, and service roads. During 2003-2008, the Des Moines West Basin STIA subbasins were improved through the addition of a variety of water quality and flow control BMPs.

Des Moines Creek West Subbasins

SDS-3/5. The SDS-3/5 subbasin is located in the southern portion of the airport and combines the SDS-3 and the SDS-5 subbasins into one single outfall which discharges to the West Fork of Des Moines Creek via Northwest Ponds. This outfall was combined on August 7, 2007 by NPDES Permit Minor Modification. SDS-3/5 drainage area is the largest at STIA, consisting primarily of runway, taxiway, limited/maintenance access roadways and runway infield. The SDS-3/5 subbasin is treated by filter strips, bioswales, and two Level 1 flow control detention facilities.

SDS-5 was rerouted to the SDS-3 detention facility on August 28, 2007, in accordance with the Des Moines Creek flow-control plan update. Existing filter strips in SDS-3 and SDS-5 were improved in October 2006 through edge dam removal, regrading, and reseeding. As part of the 2009 Runway 16L/34R reconstruction, filterstrips were widened to provide additional stormwater treatment in the SDS-3 basin. For BMP management purposes the SDS3 and SDS5 subbasins continue to be shown separately on maps and figures.

SDS-4. SDS-4 drainage basin is located on the southern portion of the airport. Runway filter strips provide water quality treatment and a Level 1 flow control pond provides detention prior to discharging to Northwest Ponds and Des Moines Creek West. SDS-4 formerly discharged directly to Des Moines Creek East just upstream of its confluence with Des Moines Creek West. Re-construction of Runway 16L during the summer of 2009 allowed the Port to move the catch basins further away from the edge of the runway. This work lengthened the effective treatment area of the filter strips within the SDS-4 subbasin. In August 2011, a bioretention/media bed swale was constructed west of the SDS-4 detention pond to provide additional treatment for the SDS-4 basin.

SDS-6/7

SDS6/7 is located on the southwestern portion of the airport and the drainage basin receives runoff from runways, taxiways, infield, and perimeter roads. In the summer of 2005, SDS-6 and SDS-7 were combined as a single discharge as a result of 16R/34L construction. The SDS-7 outfall was subsequently eliminated from the permit by Minor Modification on August 7, 2007. The combined outfall discharges into the West Branch of Des Moines Creek via Northwest Ponds. A Level 1 flow control vault was constructed in the fall of 2006 to provide detention for the SDS-6 subbasin. Areas formally associated with the SDS-7 subbasin have been incorporated into the SDS-6 subbasin and are served by this facility. As part of the 16R/34L construction, filter strips and bioswales were created to treat runoff from the runways and taxiways. The SDS-6/7 Flow Control Vault was also constructed as part of the 16R/34L project and became operational in 2010.

Walker Creek Basin

Walker Creek is approximately 2 miles in length. It begins immediately west of Des Moines Memorial Drive, just inside the City of SeaTac and heads westward through a series of wetlands and open water areas in the City of Burien and Normandy Park. Walker Creek joins Miller Creek before discharging into the Puget Sound. SDW-2 is the only STIA drainage basin that discharges to Walker Creek. The SDW-2 outfall was activated in November 2008 with the opening of 16R/34L.

Walker Creek Subbasins

SDW-2. The SDW-2 drainage basin is located on the south-western corner of the airfield. This area receives runoff from runway, taxiways and infield areas associated with the west portion of 16R/34L. Runway filter strips provide treatment. Flow control is provided by a Level 2 11.9 acre detention pond.

SDS subbasin activities

STIA stormwater discharges through a variety of outfalls and corresponding drainage areas. Acreages for each stormwater subbasin were calculated using data from a land use survey conducted by Parametrix in 2011. The land use survey used the March 2011 aerial photo to refine the 2010 Port subbasin boundaries to reflect changes to the subbasin boundaries as the result of airport development.

STIA stormwater subbasins are categorized according to their dominant activities: landside or airfield. These categories group subbasins together by similar land use and other characteristics. In general passenger vehicle operations are absent from the airfield drainage subbasins while aircraft operations are absent from the landside subbasins except for SDE4/S1. Previous reports showed that concentrations of TPH, TSS and other constituents were different for the landside and airfield categories (POS 1996a, 1997a.)

Table G-1, STIA Subbasins and Associated Activity, describes each active and future subbasin, receiving water, activities within each subbasin and total pervious and non-pervious surfaces. The pervious and non-pervious acreage totals for future subbasins are provided for estimated areas upon activation.

These areas will continue to change with the implementation of various capital improvement projects and drainage modifications. Changes to subbasin boundaries and acreages are tracked and reported annually in the Port's Stormwater Pollution Prevention Plan.

Table G-1. STIA Subbasins and Associated Activities							
Outfall Name	**Receiving Water**	**General Category**	**Industrial Activity**	**Non-Industrial Activity**	**Pervious Area (acres)**	**Impervious Area (acres)**	**Total Area (acres)**
Existing Outfalls and Subbasins							
SDE4/S1[a]	Des Moines Creek (East Branch)	Landside	Limited portions of the airfield taxiways.	Public roads, vehicle parking areas, rooftops (terminal, hangar, cargo and other) and landscaped areas.	41.71	130.47	172.18
SDN1	Miller Creek via Lake Reba	Landside	Flight service kitchens.	Public roads, building rooftops and vehicle parking.	3.8	16.0	19.8
SDS3/5 [b]	Des Moines Creek (West Branch) via NW Ponds	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, open areas and building rooftops.	212.44	244.98	457.42
SDS4	Des Moines Creek (West Branch) via NW Ponds	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Runway infield and open areas.	41.6	24.8	66.4
SDS6/7 [c]	Des Moines Creek (West Branch) via NW Ponds	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Access roads, runway infield and open areas.	63.94	45.94	109.88
SDN2/3/4 [d,e]	Miller Creek via Lake Reba	Airfield	Ground surface deicing/anti-icing, snow storage, aircraft service, equipment parking, aircraft taxi, takeoff and landings.	Perimeter road, taxiway infield, runway infield, access road and open areas.	71.83	41.04	112.87
SDN3A	Miller Creek	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, runway infield and open areas.	22.9	8.62	31.5
SDW1A	Miller Creek	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, runway infield and open areas.	44.35	25.78	70.1
SDW1B	Miller Creek	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, runway infield and open areas.	59.7	25.0	84.7

Table G-1. STIA Subbasins and Associated Activities							
Outfall Name	**Receiving Water**	**General Category**	**Industrial Activity**	**Non-Industrial Activity**	**Pervious Area (acres)**	**Impervious Area (acres)**	**Total Area (acres)**
SDW2	Walker Creek	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, runway infield and open areas.	27.04	10.5	37.51
SDD06A [f]	Des Moines Creek (East Branch)	Landside	Loading docks, vehicle maintenance and washing, equipment parking and maintenance.	Public roads, vehicle parking areas, rooftops, and landscaped areas.	17.08	28.35	45.43
Future Outfalls and Subbasins							
SDD05A[f]	Des Moines Creek (East Branch)	Landside	TBD	Public roads, vehicle parking areas, rooftops, and landscaped areas	6.4	4.34	10.74
SDD05B[f]	Des Moines Creek (East Branch)	Landside	TBD	Public roads, vehicle parking areas, rooftops, and landscaped areas	16.03	15.57	31.60

Acreages were calculated using data from 2011 Parametrix land use survey using a March 2011 aerial and the Port 2010 subbasins GIS layer.

a. The SDE4/S1 subbasin area is calculated by adding SDE4 (159.34 acres) plus SDS1 (12.79 acres). It is anticipated that ongoing changes resulting from planned construction will change these totals in the future.

b. The SDS3/5 subbasin area is calculated by adding SDS3, SDS3A, and SDS5 which share the same outfall.

c. The SDS6/7 subbasin acreage includes SDS6/7A combined with SDS6/7B.

d. The SDN2 runoff is pumped to IWS for all flows up to the 6 month 24-hour event. The SDN2 subbasin comprises approximately 46.5 acres, 36.6 of which are impervious. This area is included in acreages reported to the IWS. SDN2X drains to SDN-2/3/4.

e. The SDN-2/3/4 outfall was activated November 2011 as part of construction of the SDN-2/3/4 detention facility. This eliminated the SDN-2, SDN-3, and SDN-4 outfalls. The new outfall collects the combined SDN-2, SDN-3, and SDN-4 subbasins. For BMP management purposes the SDN2, SDN3, and SDN4 Subbasins remain.

f. Multiple outfalls and Subbasins are identified for the future development in the SDD05 and SDD06 subbasins. Attempts will be made to consolidate the outfalls however, multiple outfalls may be needed for hydraulic reasons.

Stormwater pollution prevention plan

STIA has implemented a stormwater pollution prevention plan (SWPPP) since 1994. The SWPPP describes the overall facility, site inspections, operations, activities and corresponding BMPS. The SWPPP also includes monitoring protocols. SWPPP implementation includes many operational source control and structural BMPs to prevent the discharge of contaminants to surface waters.

Operational source control BMPs

The STIA employs a wide variety of operational source control BMPs specific to activities performed and targeted pollutants. These BMPs are to a great extent based on recommendations provided in Ecology's *Stormwater Management Manual for Western Washington (2005)* and include development of a pollution prevention team, good housekeeping, preventative maintenance, spill prevention and emergency cleanup, employee training and inspections, and record keeping. In addition the STIA employs a number of BMPs to minimize pollution runoff from STIA-specific practices such as those associated with runway deicing. Annual runway rubber removal of those portions of the runway subject to accumulation of aircraft tire tread worn off by repeated aircraft touchdowns is an activity unique to the airport and helps to reduce metals in stormwater. The operational source control BMPs are a critical component to the SWPPP and demonstrate the Port's adaptive management process for stormwater management at STIA. Table G-2, *Industrial Activity and Operational Source Control BMP Summary Table* describes the industrial activity, pollutants associated with each SDS activity, and the BMPs.

Table G-2. Industrial Activity and Operational Source Control BMP Summary Table [1]

Activity	Targeted Activities	Targeted Pollutants	BMP Key Approaches
Ground Surface De-icing	Ground surface de-icing Snow and ice management	De-icing/anti-icing materials (e.g., Potassium Acetate, Sodium Acetate), Traction Sand	Do not use urea or chloride containing de-icing materials. Use approved materials for road, ramp, and runway anti-icing/deicing (potassium acetate, sodium acetate, calcium/magnesium acetate).
Aircraft, Vehicle, and Equipment Storage	Aircraft/vehicle/ equipment storage Apron/floor wash down	Oil and grease Vehicle fluids Metals	Store ground surface equipment in IWS drainage areas only Store under cover. Remove batteries and drain fluids prior to long-term storage. Use drip pans or absorbent materials under equipment that may leak.
Outdoor Handling, Storage, and Disposal of Wastes and Materials	Loading/unloading Cargo/handling Fuel/Chemical Storage AVE fueling AVE Maintenance Aircraft lavatory servicing Pesticide/herbicide usage	Anti-freeze chemicals Batteries De-icing chemicals Fuel Herbicides Lavatory chemicals Oil and Grease Paint Pesticides Soap/cleaning chemicals Solvents Other	Conduct loading/unloading undercover. Store materials and waste under cover. Use appropriate secondary containment. Transfer materials in paved areas away from drain inlets. Follow POS spill response procedures. Maintain readily accessible spill kits.

Table G-2. Industrial Activity and Operational Source Control BMP Summary Table [1]			
Activity	**Targeted Activities**	**Targeted Pollutants**	**BMP Key Approaches**
Fuel Storage and Delivery	Aircraft/vehicle/ equipment Mobile fueling Aircraft hydrant fueling Stationary fueling stations Fuel storage	Petroleum Products	Keep spill response kits at fueling locations, including mobile fueling locations. Construct berms or curbing around fueling areas. Use absorbent materials and/or, vacuum equipment for spills. Use Proper equipment for fuel dispensing and tank monitoring to prevent spills, leaks, and overflows.
Building and Grounds Maintenance	Building Maintenance Grounds Maintenance Pesticide/herbicide use Outdoor wash down	Pesticides/herbicides/ fertilizers Oil and grease Zinc Sediment Landscape waste Wash down waste Building maintenance materials (paint, roofing, etc.)	Keep paved Surfaces clean and swept. Clean catch basins regularly using vacuum trucks. Manage use of Herbicides/fertilizers.
Garbage handling and disposal	Garbage/solid waste management and disposal Food service	Dumpster waste, Trash compactor fluids Foreign Object Debris (FOD) Biological Oxygen Demand (BOD)	Cover Dumpsters. Perform dumpster washing offsite. Regularly inspect and clean waste storage areas. Recycle materials. Properly dispose of all fluids. Properly recycle or dispose of all Universal Wastes (e.g., batteries, fluorescent bulbs).
Roadway, Ramp, and Runway Maintenance and Cleaning	Snow and Ice management Road, Ramp, and Runway, Cleaning/ Maintenance. Outdoor power washing. Runway rubber removal	Oil & Grease Fuel, Aqueous film-forming foam (AFFF) De-icing/anti-icing materials (e.g., Potassium Acetate, Sodium Acetate, Solvent/cleaning solutions, Sediments FOD	Use dry sweepers to keep paved area clean. Maintain catch basins and oil/water separators. Use approved materials for road, ramp, and runway anti-icing/deicing. Collect and discharge road and ramp wash water to IWS.
Fire Suppression and Aqueous Film Forming Foam Discharge	Firefighting equipment testing and flushing	Aqueous film-forming foam (AFFF)	Make proper notifications prior to testing per ENV SOG 3. Perform testing operations in designated areas. Properly dispose or recycle AFFF discharge.
[1] This table is a brief summary of operational source control BMPs at STIA. For a detailed list of all OSC BMPs, please refer to the Storm Water Pollution Prevention Plan (SWPPP).			

<u>Structural source control, treatment and stormwater peak runoff and volume control BMPs</u>

The Port has completed many studies and capital improvement projects to improve water quality and flow control over the past 10 years. These studies and subsequent improvements resulted in a flow control and water quality retrofit of the entire STIA to standards specified in the Comprehensive Stormwater Management Plan (Parametrix, July 2001) as modified by specified 401 Certification and NPDES permit, AKART (all known, available and reasonable methods of stormwater treatment) Analysis and Engineering Report.

Each of the NPDES drainage subbasins was evaluated to determine whether AKART requirements were met and, if not, what additional BMPs are needed. The Port performed an AKART engineering analysis for the STIA stormwater system (R. W. Beck 2005) and submitted the report to Ecology for review in January 2005. Ecology subsequently issued a letter in May 2005 stating concurrence with the Port's findings regarding AKART for STIA. A principal finding of the analysis is that to meet AKART, the Port must, to the greatest extent practicable, provide basic treatment for pollution-generating surfaces (PGS) draining to the existing outfalls.

A Facility Assessment (PMX, 2004, 2005) was completed to map existing drainage areas and site activities at STIA. Included were the delineation of pollution-generating surfaces and an inventory of structural BMPs, including a delineation of the areas tributary to each BMP. This information formed the basis for much of the analyses in the Engineering Report, assisting in determining pollution contributions from various activities or land uses and the extent of treatment that is currently being provided by existing BMPs.

The subsequent Engineering Report described the existing BMPs and proposed new stormwater treatment facilities and other BMPs at STIA that would enable attainment of AKART and water quality objectives, defined as meeting the previous NPDES Permit requirements. The Engineering Report evaluated water quality at each outfall to determine if each basin was meeting NPDES permit water quality limitations under existing conditions and AKART. The analysis also determined what, if any, additional BMPs (i.e., enhanced treatment menu BMPs for metals) would be required to meet effluent limits. The analysis was carried out for total suspended solids (TSS), zinc, copper, and lead.

New water quality treatment BMPs were constructed in response to Engineering Report recommendations. These improvements were completed by July 31, 2007 and supported by previously existing structural source control and treatment facilities. Included are a number of pump stations which function as key source control BMPs by diverting runoff to the IWS from various drainage areas formerly within the SDS. In addition to the water quality retrofits, the Port built a series of flow control ponds and vaults that detain all stormwater runoff from the STIA. The facility requirements were described in two design refinements to the Comprehensive Stormwater Management Plan, one for Miller Creek basin facilities, and a second for Des Moines Creek facilities (Parametrix, 2005 and Parametrix/RW Beck, 2004).

The Port continues to assess and as needed implement new stormwater BMPs as part of its ongoing adaptive management program and SWPPP. The adaptive management program takes a proactive approach and evaluates effluent monitoring results to determine if additional BMPs are necessary to prevent effluent limit exceedances. If additional BMPs are needed, the program first evaluates if low impact development (LID) stormwater BMPs are feasible to meet effluent limits followed by evaluation of traditional grey stormwater infrastructure. LID BMPs are evaluated on a project by project basis due to FAA restrictions related to compaction requirements and wildlife attractants, along with restrictions associated with industrial activities and structural limitations associated with infiltration within embankment areas.

The Adaptive Management Program has added additional treatment in the SDE-4/S1, SDS-4, and SDN-1 subbasins. These treatment systems include enhanced bioretention/media treatment swales that include a treatment media layer specifically designed for metals removal. In addition, energy dissipation was added to the SDN-1 wet pond to prevent re-suspension of sediment during storm events. There has been significant improvement in the copper and zinc effluent results after construction of the additional treatment. Reconstruction of Runway 16L/34R during the summer of 2009 allowed the Port to relocate catch basins further away from the edge of the runway. This work lengthened the effective treatment area of the filterstrips located in the SDS-3, SDS-4, and SDN-3 subbasins.

Table G-3 provides a summary of previously existing and new structural source control, treatment and runoff and flow control BMPs within each subbasin.

Table G-3. Structural Source Control, Treatment and Stormwater Peak Runoff and Volume Control BMPs

BMP Description	Port Drainage Basin	Port Drainage Subbasin	BMP TYPE
South Sea-Tac Substation Detention Pipe and Infiltration	Des Moines	SDE4	Stormwater Peak Runoff Rate and Volume Control
SDE4 Pond	Des Moines	SDE4	Stormwater Peak Runoff Rate and Volume Control/Treatment
Biffy Drainage Structural Source Control	Sanitary Sewer	SDE4	Structural Source Control
Garage / IWS Pump Station	Des Moines	SDE4	Structural Source Control
North Satellite Drainage Improvement	Des Moines	SDE4	Structural Source Control
Paint ~4000ft of POS Guardrail	Des Moines	SDE4	Structural Source Control
Rooftop Painting - Fed Ex & SW Air Cargo	Des Moines	SDE4	Structural Source Control
ARFF Training Tower Star and Railing Painting	Des Moines	SDE4	Structural Source Control
Air Cargo Rd N. Bioswale for STEP	Des Moines	SDE4	Treatment
Air Cargo Rd S. Bioswale for STEP	Des Moines	SDE4	Treatment
Bioswale (next to UA Fuel Farm)	Des Moines	SDE4	Treatment
SDE4/Bus Lot Swale/Emergency Pond Overflow Swale	Des Moines	SDE4	Treatment
Doug Fox Infiltration Pipes	Des Moines	SDE4	Treatment
Doug Fox Infiltration Trench	Des Moines	SDE4	Treatment
North Expressway Ecology Embankment	Des Moines	SDE4	Treatment
NER Stormwater Quality Vault	Des Moines	SDE4	Treatment
NCBL (North Cruise ship Bus Lot) Infiltration/Sand filter	Des Moines	SDE4	Treatment
Rooftop Treatment (Aeroground)	Des Moines	SDE4	Treatment
SDE4 Stormfilter Vault	Des Moines	SDE4	Treatment
STEP Stormfilter Vault	Des Moines	SDE4	Treatment
Doug Fox BioswaleSDE4	Des Moines	SDE4	Treatment
Radison Bioswale	Des Moines	SDE4	Treatment
Logistics Pond (SDD06a)	Des Moines	SDD06A	Stormwater Peak Runoff Rate and Volume Control/Treatment
Logistics Bioswales (3)	Des Moines	SDD06A	Treatment
Distribution Center Bioswale	Des Moines	SDD06A	Treatment
Logistics Oil/Water Separator	Des Moines	SDD06A	Treatment
Bus Maintenance Facility Oil/Water Separator	Des Moines	SDD06A	Treatment
Delta Hangar/Cargo (Water Quality Vault 1)	Des Moines	SDS1	Treatment
Delta Hangar/Cargo (Water Quality Vault 2)	Des Moines	SDS1	Treatment
South Alaska Bioswale	Des Moines	SDS1	Treatment
SDS1 Bioswale (formerly SDE4/S1)	Des Moines	SDS1	Treatment
Paint Alaska Rooftop and HVAC I-Beams	Des Moines	SDS1	Structural Source Control
SDN1 Pond (Wet/Level 2)	Miller Creek	SDN1	Stormwater Peak Runoff Rate and Volume Control/Treatment
Afco Building(s) Roof Painting	Miller Creek	SDN1	Structural Source Control
Air Cargo Road Bioswales	Miller Creek	SDN1	Treatment
Flight Kitchen Constructed Wetland	Miller Creek	SDN1	Treatment
Flight Kitchen Drainage Ditch / Bioswale	Miller Creek	SDN1	Treatment
Oil Water Separator - Flight Kitchen	Miller Creek	SDN1	Treatment

Table G-3. Structural Source Control, Treatment and Stormwater Peak Runoff and Volume Control BMPs

BMP Description	Port Drainage Basin	Port Drainage Subbasin	BMP TYPE
SDN1 Bioretention Swale	Miller Creek	SDN1	Treatment
SDN1 Solar Pumps	Miller Creek	SDN1	Treatment
SDN2/3/4 Pond	Miller Creek	SDN2/3/4	Stormwater Peak Runoff Rate and Volume Control
Runway Filter Strips	Miller Creek	SDN2	Treatment
Runway Filter Strips	Miller Creek	SDN3	Treatment
SDN3A Pond	Miller Creek	SDN3A	Stormwater Peak Runoff Rate and Volume Control
Runway Filter Strips	Miller Creek	SDN3A	Treatment
Runway Filter Strips	Miller Creek	SDN4	Treatment
SDS3 Vault	Des Moines	SDS3	Stormwater Peak Runoff Rate and Volume Control
Snow shed Structural Source Control	Des Moines	SDS3	Structural Source Control
Biofiltration channel	Des Moines	SDS3	Treatment
S. 188th St. Bioswale	Des Moines	SDS3	Treatment
SDS3A Vault	Des Moines	SDS3	Treatment
Weyerhaeuser Bioswale	Des Moines	SDS3	Treatment
Runway Filter Strips	Des Moines	SDS3	Treatment
SDS4 Pond	Des Moines	SDS4	Stormwater Peak Runoff Rate and Volume Control
SDS4 Bioswale	Des Moines	SDS4	Treatment
Runway Filter Strips	Des Moines	SDS4	Treatment
SDS4 Oil Water Separator	Des Moines	SDS4	Treatment
Runway Filter Strips	Des Moines	SDS5	Treatment
SDS6-7 Vault	Des Moines	SDS6/7	Stormwater Peak Runoff Rate and Volume Control
Runway Filter Strips	Des Moines	SDS6/7	Treatment
SDW1A Pond	Miller Creek	SDW1A	Stormwater Peak Runoff Rate and Volume Control
Runway Filter Strips	Miller Creek	SDW1A	Treatment
SDW1B Pond	Miller Creek	SDW1B	Stormwater Peak Runoff Rate and Volume Control
Runway Filter Strips	Miller Creek	SDW1B	Treatment
SDW2 Pond	Walker Creek	SDW2	Stormwater Peak Runoff Rate and Volume Control
Runway Filter Strips	Walker Creek	SDW2	Treatment

Stormwater characterization

Stormwater monitoring program and protocols

The Port has implemented a stormwater monitoring program since the NPDES permit began regulating stormwater discharges from STIA (July 1994). This program covers the required stormwater monitoring (flows and water quality) and other supplemental sampling elected by the Port. The 1998 NPDES permit required the Port to prepare and submit a *Procedure Manual for Stormwater Monitoring* (POS, 1999) which describes the target storms, sampling protocols, quality assurance, and representativeness criteria needed to ensure proper sampling and reporting. Ecology reviewed and approved this manual in March 1997 (Ecology, 1997a). The Port has submitted subsequent revisions to incorporate the requirements of reissued permits and permit modifications. The *Non-Construction Stormwater Runoff Monitoring, Quality Assurance Project Plan* (QAPP) (TEC 2011) is the most recent revision and was submitted to Ecology in October 2011.

The QAPP provides quality assurance and quality control procedures for field activities, laboratory analyses, and reporting. The QAPP also describes the criteria for sampling storm events and describes all relevant sampling, programming and handling necessary to comply with permit requirements. The Port utilizes automatic samplers which generally take a grab sample and then a flow-weighted composite sample. Each of these samples is analyzed for a different suite of constituents according to the NPDES permit. The Port reports data on Discharge Monitoring Reports (DMRs) where results from storms and samples meet the representative sampling criteria of the QAPP.

Stormwater quality

The outfall sampling locations described in Table G-1 have been used to characterize STIA runoff and provide feedback for adaptive management relative to the overall STIA stormwater management program. Over the past two permit cycles the Port has invested over $80 million in stormwater infrastructure improvements through the construction of AKART BMPS followed by an adaptive management program. This investment has led to water quality improvements that are evident in the overall high attainment of permit effluent limits and low variability in STIA stormwater data.

The following discussion summarizes water quality data associated with STIA stormwater discharges for each constituent required for monitoring under the NPDES permit. Table G-4 summarizes stormwater data for each of the STIA outfalls from April 1, 2009 through March 31, 2013. Summary statistics for all outfalls are presented along with statistics for each outfall individually. Subbasins retrofitted with adaptive management BMPs during the permit cycle (SDE-4/S1, SDS-4, and SDN-1) are summarized in Table G-5 with data segregated into pre-adaptive management and post-adaptive management periods.

STIA stormwater data is also compared to a subset of airport specific stormwater data collected under Washington's Industrial General Stormwater Permit which was summarized in a report prepared for Ecology by EnviroVision and Herrera Environmental Consultants in November 2006 (EnviroVision 2006). The permit effluent limit for each constituent is included in each table as a reference.

Turbidity

During the monitoring period, the median turbidity was 2.1 NTU with 95 percent of all turbidity results less than 12.5 NTU. The coefficient of variation (CV) for turbidity of 3.36 is comparable to other industrial general NPDES permit data for airports of 3.3 (Ecology 2006). The permit effluent limit for turbidity (25 NTU) was only exceeded on four occasions. Each exceedance was prior to implementation of adaptive management BMPs. Following adaptive management BMP implementation there were no exceedances of the turbidity limit. Adaptive management BMPS resulted in significant reductions in median, mean, and coefficient of variation (CV) values (median 3.8 to 3.1, mean 10.9 to 3.9 and CV 9.91 to 0.80). Low turbidity values and the low variability of turbidity data also correlate with similarly low values and low variability of copper, lead, and zinc in STIA stormwater discharges.

pH

The permit effluent limit for pH is a range between 6.5 Standard Units (S.U.) and 8.5 S.U. The median pH value was 7.7 S.U. with 95 percent of all pH measurements less than 8.8 S.U. There were 24 instances during the monitoring period when pH was measured outside of the 6.5-8.5 S.U. range. These exceedances were limited to five STIA subbasins where stormwater ponds were constructed to provide detention. Reoccurring pH excursions led to an extensive study conducted under an Agreed Order between the Port and Ecology. Results of the study found that the natural process of photosynthesis within the ponds was the cause of pH excursions. Receiving water monitoring conducted as part of the study and found that there was no impact to the receiving water downstream of Port subbasins. The pH study and results are described in greater detail following this section.

TPH

During the monitoring period there were no exceedances of the Total Petroleum Hydrocarbons (TPH) permit effluent limit of 15 mg/L. The median TPH concentration was 0.15 mg/L with 95 percent of all values less than 0.5 mg/L. The maximum TPH concentration measured during the monitoring period was 8.8 mg/L, which is half of the permit limit. Results from the monitoring period continue to demonstrate the effectiveness of the IWS in preventing fuel and other petroleum products associated with aircraft and vehicle servicing from entering the SDS.

Ethylene glycol and propylene glycol

Ethylene and propylene glycol were generally not detected in stormwater samples associated with STIA SDS discharges. Glycols were only detected on four occasions out of 284 samples collected during the monitoring period. Similar to TPH results, the low frequency of glycol detection demonstrates the effectiveness of the IWS in preventing glycol applied during aircraft deicing from entering the SDS.

Copper

There were only four copper permit limit exceedances out of 334 STIA stormwater samples during the monitoring period. Site-specific copper effluent limits vary depending on the receiving water and range from 26.2 µg/L to 59.2 µg/L. The median copper concentration was 5.7 µg/L with 95 percent of all samples below 17.7 µg/L. The coefficient of variation of 0.79 is low in comparison to other industrial general NPDES permit data for airports of 1.3. All of the permit limit exceedances for copper occurred during the pre-adaptive management period.

Adaptive management improvements implemented midway through the monitoring period were specifically designed to reduce copper discharge concentrations and were found to be highly effective. Following implementation of adaptive management BMPs there were no effluent limit exceedances for copper. Implementation of adaptive management BMPs in the SDE4/S1, SDN1 and SDS4 subbasins reduced mean copper concentrations from 14.5 µg/L to 11.3 µg/L. The 95th percentile concentration decreased from 28.1 µg/L to 18.2 µg/L as well. Overall variability of the data was also reduced with the CV decreasing from 0.86 to 0.44. The maximum copper value prior to implementation of adaptive management was 64.5 µg/L compared to a post adaptive management maximum of 25.2 µg/L.

<u>Lead</u>

During the monitoring period the median lead concentration was 0.5 µg/L with 95 percent of all values less than 3 µg/L and a maximum value of 19 µg/L. Lead concentrations measured in STIA stormwater discharges are close to an order of magnitude lower than those from other airports which had a median concentration of 40 µg/L and maximum concentration of 50 µg/L.

<u>Zinc</u>

There was only one exceedance of the zinc effluent limit during the monitoring period, which occurred prior to adaptive management BMP implementation. The median zinc concentration was 6.0 µg/L, close to an order of magnitude lower than the median zinc concentration from other airports of 50 µg/L. In addition, the coefficient of variation of 1.26 is less than half of other airports which had a CV of 3.0. The low zinc concentrations and low variability of zinc data at STIA is the result of successful source control and AKART implementation over the past two permit cycles.

Overall, stormwater discharges from STIA are well below permit limits. Variability of STIA stormwater data is low in comparison to other airports and industrial stormwater data. There were only four permit limit exceedances for turbidity out of 342 samples collected with no permit limit exceedances for TPH. The permit limit for zinc was only exceeded once out of 334 samples collected. Copper also had a very low rate of permit limit exceedances at only four out of 334 samples collected during the period. The low variability of stormwater data and high rate of compliance with effluent limits demonstrate the success of implementation of AKART BMPs and the Port's adaptive management stormwater program. Following implementation of adaptive management BMPs there have been no permit limit exceedances of copper, zinc or turbidity during the monitoring period. The adaptive management program will continue to evaluate monitoring data with the goal of making water quality improvements beyond the requirements of the permit.

Table G-4. Summary of STIA Outfall Data 4/1/09 - 3/31/13

	Constituent	Units	Permit Limit	Median	Mean	95th %	Maximum	CV	n	Permit Limit Exceedances
All Outfalls	Turbidity	NTU	25	2.1	4.6	12.5	260	3.36	342	4
	pH	S.U.	6.5-8.5	7.67	NA	8.77	9.56	NA	341	24
	TPH	mg/L	15	0.15	0.30	0.50	8.80	1.70	342	0
	E. Glycol	mg/L	na	5	5	5	22	0.21	284	0
	P. Glycol	mg/L	na	5	5.3	5	94	0.99	284	0
	Cu	µg/L	25.6 - 59.2	5.7	7.9	17.7	64.5	0.79	334	4
	Pb	µg/L	na	0.5	0.8	3.0	19.0	2.10	334	0
	Zn	µg/L	71.4 - 117	6.0	13.0	47.0	150.0	1.26	334	1
SDE4/S1	Turbidity	NTU	25	5.2	6.0	12.1	15.0	0.58	31	0
	pH	S.U.	6.5-8.5	7.24	NA	7.60	8.12	NA	31	0
	TPH	mg/L	15	0.38	0.46	1.12	1.92	0.80	31	0
	E. Glycol	mg/L	na	5	6	5	22	0.60	25	NA
	P. Glycol	mg/L	na	5	5	5	5	0.00	25	NA
	Cu	µg/L	25.6	13.3	15.6	27.5	36.0	0.41	31	3
	Pb	µg/L	na	3.0	4.3	12.5	19.0	0.90	31	NA
	Zn	µg/L	117	35.0	36.2	52.0	61.0	0.26	31	0
SDN1	Turbidity	NTU	25	3.9	13.9	9.28	260.0	3.69	25	1
	pH	S.U.	6.5-8.5	7.06	NA	7.51	7.75	NA	25	0
	TPH	mg/L	15	0.38	0.82	1.76	8.80	2.07	25	0
	E. Glycol	mg/L	na	5	5	5	5	0.00	23	NA
	P. Glycol	mg/L	na	5	5	5	5	0.00	23	NA
	Cu	µg/L	28.5	11.8	13.6	16.3	64.5	0.80	25	1
	Pb	µg/L	na	0.7	1.2	1.9	11.0	1.68	25	NA
	Zn	µg/L	117	47.0	49.0	64.4	150.0	0.47	25	1
SDS3/5	Turbidity	NTU	25	1.36	2.1	5.55	8.1	0.87	31	0
	pH	S.U.	6.5-8.5	7.71	NA	7.85	7.86	NA	31	0
	TPH	mg/L	15	0.15	0.22	0.38	0.38	0.48	31	0
	E. Glycol	mg/L	na	5	5	5	5	0.00	24	NA
	P. Glycol	mg/L	na	5	9.1	12.7	94	2.00	24	NA
	Cu	µg/L	32.2	11.4	12.6	22.3	25.1	0.35	29	0
	Pb	µg/L	na	0.5	0.5	0.9	1.0	0.35	29	NA
	Zn	µg/L	117	10.0	11.0	23.0	27.0	0.46	29	0

Table G-4. Summary of STIA Outfall Data 4/1/09 - 3/31/13

	Constituent	Units	Permit Limit	Median	Mean	95th %	Maximum	CV	n	Permit Limit Exceedances
SDS4	Turbidity	NTU	25	2.4	3.7	6.48	35.0	1.66	30	1
	pH	S.U.	6.5-8.5	7.66	NA	8.24	8.31	NA	30	0
	TPH	mg/L	15	0.15	0.22	0.38	0.38	0.48	30	0
	E. Glycol	mg/L	na	5	5	5	5	0.00	24	NA
	P. Glycol	mg/L	na	5	5	5	5	0.00	24	NA
	Cu	µg/L	32.2	10.5	11.9	22.4	31.5	0.49	30	0
	Pb	µg/L	na	0.4	0.6	2.6	4.0	1.32	30	NA
	Zn	µg/L	71.4	10.5	11.8	30.0	36.0	0.72	30	0
SDS6/7	Turbidity	NTU	25	3.05	3.8	8.89	12.6	0.75	40	0
	pH	S.U.	6.5-8.5	7.68	NA	7.90	8.01	NA	40	0
	TPH	mg/L	15	0.15	0.25	0.38	0.50	0.45	40	0
	E. Glycol	mg/L	na	5	5	5	11	0.21	31	NA
	P. Glycol	mg/L	na	5	5	5	5	0.00	31	NA
	Cu	µg/L	32.2	5.5	6.2	11.9	17.5	0.50	39	0
	Pb	µg/L	na	0.5	0.3	0.5	1.0	0.69	39	NA
	Zn	µg/L	117	2.0	4.9	11.6	31.0	1.09	39	0
SDN2/3/4	Turbidity	NTU	25	2.7	11.0	50	78.8	2.11	11	1
	pH	S.U.	6.5-8.5	7.82	NA	8.08	8.11	NA	11	0
	TPH	mg/L	15	0.15	0.15	0.15	0.15	0.00	11	0
	E. Glycol	mg/L	na	5	5	5	5	0.00	10	NA
	P. Glycol	mg/L	na	5	5	5	5	0.00	10	NA
	Cu	µg/L	28.5	7.1	7.3	9.8	9.9	0.22	11	0
	Pb	µg/L	na	0.2	0.6	2.6	4.0	1.90	11	NA
	Zn	µg/L	117	7.0	7.8	13.0	14.0	0.46	11	0
SDN3A	Turbidity	NTU	25	1.9	2.8	6.5	16.0	1.04	38	0
	pH	S.U.	6.5-8.5	8.07	NA	8.69	8.95	NA	38	4
	TPH	mg/L	15	0.15	0.30	0.54	1.50	0.99	38	0
	E. Glycol	mg/L	na	5	5	5	5	0.00	31	NA
	P. Glycol	mg/L	na	5	5	5	5	0.00	31	NA
	Cu	µg/L	59.2	2.8	3.2	5.2	6.9	0.35	35	0
	Pb	µg/L	na	0.5	0.3	0.5	0.5	0.69	35	NA
	Zn	µg/L	117	2.0	6.0	20.2	69.0	2.03	35	0
SDW1A	Turbidity	NTU	25	1.8	3.4	14	14.8	1.09	38	0
	pH	S.U.	6.5-8.5	7.91	NA	8.98	9.04	NA	37	**7**
	TPH	mg/L	15	0.15	0.24	0.38	0.38	0.46	38	0
	E. Glycol	mg/L	na	5	5	5	5	0.00	32	NA
	P. Glycol	mg/L	na	5	5	5	5	0.00	32	NA
	Cu	µg/L	59.2	3.6	3.7	6.2	7.5	0.32	37	0
	Pb	µg/L	na	0.5	0.3	0.5	0.5	0.65	37	NA
	Zn	µg/L	117	2.0	3.4	8.4	17.0	0.91	37	0

Table G-4. Summary of STIA Outfall Data 4/1/09 - 3/31/13

	Constituent	Units	Permit Limit	Median	Mean	95th %	Maximum	CV	n	Permit Limit Exceedances
SDW1B	Turbidity	NTU	25	1.8	3.7	13.4	24.0	1.37	36	0
	pH	S.U.	6.5-8.5	7.80	NA	8.93	9.46	NA	36	4
	TPH	mg/L	15	0.15	0.24	0.38	0.38	0.47	36	0
	E. Glycol	mg/L	na	5	5	5	5	0.00	30	NA
	P. Glycol	mg/L	na	5	5	5	5	0.00	30	NA
	Cu	µg/L	59.2	4.2	4.8	10.2	12.2	0.44	35	0
	Pb	µg/L	na	0.5	0.4	0.7	3.0	1.22	35	NA
	Zn	µg/L	117	2.0	2.9	9.3	12.0	0.85	35	0
SDW2	Turbidity	NTU	25	1.4	4.7	16.6	68.0	2.48	35	1
	pH	S.U.	6.5-8.5	8.13	NA	9.23	9.56	NA	35	8
	TPH	mg/L	15	0.15	0.26	0.38	0.91	0.60	35	0
	E. Glycol	mg/L	na	5	5	5	5	0.00	31	NA
	P. Glycol	mg/L	na	5	5	5	5	0.00	31	NA
	Cu	µg/L	47.9	5.0	5.5	10.6	13.6	0.39	35	0
	Pb	µg/L	na	0.5	0.3	0.5	0.5	0.68	35	NA
	Zn	µg/L	117	4.0	5.1	12.9	23.0	0.90	35	0
SDD06A	Turbidity	NTU	25	1.6	1.7	2.9	3.2	0.41	27	0
	pH	S.U.	6.5-8.5	7.18	NA	8.04	9.01	NA	27	**1**
	TPH	mg/L	15	0.15	0.18	0.38	0.38	0.41	27	0
	E. Glycol	mg/L	na	5	5	5	5	0.00	23	NA
	P. Glycol	mg/L	na	5	5	5	5	0.00	23	NA
	Cu	µg/L	25.6	4.4	5.3	10.6	12.6	0.50	27	0
	Pb	µg/L	na	0.5	0.4	0.6	2.0	0.77	27	NA
	Zn	µg/L	117	15.0	16.0	26.8	33.0	0.39	27	0

Table G-5. Summary of STIA Pre and Post Adaptive Management Outfall Data

	Constituent	Units	Permit Limit	Median		Mean		Maximum		95th Percentile		Coefficient of Variation		Permit Limit Exceedances	
				Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Adaptive Management Summary	Turbidity	NTU	25	3.75	3.05	10.9	3.9	260.0	15.0	10.8	10.1	9.91	0.80	2	0
	pH	S.U.	6.5-8.5	7.41	7.1	NA	NA	8.31	8.12	8.22	7.77	NA	NA	0	0
	TPH	mg/L	15	0.38	0.18	0.56	0.40	8.80	1.93	0.87	1.07	3.21	1.05	0	0
	E. Glycol	mg/L	na	5	5	5	5	22	5	5	5	0.6	0	NA	NA
	P. Glycol	mg/L	na	5	5	5	5	5	5	0.87	1.07	0	0	NA	NA
	Copper	µg/L	25.6,32.2	11.8	11.7	14.5	11.3	64.5	25.2	28.1	18.2	0.86	0.44	4	0
	Lead	µg/L	na	1.0	0.7	3.0	1.2	19.0	4.2	11.8	3.4	3.45	0.93	NA	NA
	Zinc	µg/L	117	30.5	31.0	30.9	27.9	150.0	67.0	53.9	49.9	0.87	0.63	1	0
SDE4/S1	Turbidity	NTU	25	5.45	4.9	6.1	5.8	10.9	15.0	10.4	14.0	0.48	0.73	0	0
	pH	S.U.	6.5-8.5	7.29	7.05	7.27	7.12	7.64	8.12	7.56	7.68	0.04	0.05	0	0
	TPH	mg/L	15	0.38	0.43	0.45	0.48	1.32	1.92	1.02	1.25	0.59	1.03	0	0
	E. Glycol	mg/L	na	5	5	6	5	22	5	11.8	5	0.7	0	NA	NA
	P. Glycol	mg/L	na	5	5	5	5	5	5	5	5	0	0	NA	NA
	Copper	µg/L	25.6	13.8	12.5	16.4	14.6	36.0	25.2	29.5	23.0	0.47	0.31	3	0
	Lead	µg/L	na	4.0	2.2	5.6	2.5	19.0	4.2	13.9	4.1	0.82	0.40	NA	NA
	Zinc	µg/L	117	32.5	38.0	36.5	35.8	61.0	47.0	54.2	44.6	0.30	0.20	0	0
	Pre-Adaptive Management Period - 4/1/09 - 10-31/2011 Post-Adaptive Management Period - 11/1/2011- 3/31/13														
SDS4	Turbidity	NTU	25	2.5	1.78	4.5	2.5	35.0	7.2	11.5	5.5	1.74	0.73	1	0
	pH	S.U.	6.5-8.5	7.86	7.29	7.84	7.32	8.31	7.88	8.27	7.82	0.05	0.05	0	0
	TPH	mg/L	15	0.38	0.15	0.27	0.15	0.38	0.15	0.38	0.15	0.43	0.00	0	0
	E. Glycol	mg/L	na	5	5	5	5	5	5	5	5	0	0	NA	NA
	P. Glycol	mg/L	na	5	5	5	5	5	5	5	5	0	0	NA	NA
	Cu	µg/L	32.2	11.3	10.1	13.5	9.8	31.5	16.8	26.3	16.6	0.48	0.43	0	0
	Pb	µg/L	na	0.5	0.3	0.9	0.3	4.0	0.4	3.2	0.4	1.14	0.42	NA	NA
	Zn	µg/L	71.4	13.0	7.0	15.6	6.8	36.0	13.0	34.4	11.8	0.59	0.58	0	0
	Pre-Adaptive Management Period - 4/1/09 - 10/31/2011 Post-Adaptive Management Period - 11/1/2011 - 3/31/13														
SDN1	Turbidity	NTU	25	4.1	3.45	32.4	3.5	260.0	10.2	158.2	5.85	2.63	0.60	1	0
	pH	S.U.	6.5-8.5	7.17	7.06	7.14	7.08	7.75	7.55	7.58	7.33	0.04	0.03	0	0
	TPH	mg/L	15	0.38	0.40	1.33	0.54	8.80	1.93	5.48	1.29	2.11	0.85	0	0
	E. Glycol	mg/L	na	5	5	5	5	5	5	5	5	0	0	NA	NA
	P. Glycol	mg/L	na	5	5	5	5	5	5	5	5	0	0	NA	NA
	Cu	µg/L	28.5	11.3	12.0	16.6	11.9	64.5	16.6	43.9	15.6	1.09	0.22	1	0
	Pb	µg/L	na	0.5	0.7	1.8	0.9	11.0	2.0	7.0	1.7	1.88	0.54	NA	NA
	Zn	µg/L	117	47.0	46.5	56.4	44.8	150.0	67.0	111.2	57.3	0.63	0.23	1	0
	Pre-Adaptive Management Period - 4/1/09 - 9/30/2010 Post-Adaptive Management Period - 10/1/2010 - 3/31/13														

Priority pollutants

Part II, Special Condition S1. A. Table 1 from the 2009-2014 NPDES permit required that priority pollutants be analyzed from all permitted outfalls once during the wet season and once during the dry season in year three of the permit cycle. The complete list of EPA Priority Pollutants (122 compounds) were analyzed at 11 active outfalls in each season for a total of 22 samples collected and analyzed for each constituent. The results of the wet season and dry season priority pollutant characterization is included in Table G-6, *Priority Pollutant Detection Summary*. Table G-6 only includes summary data for those parameters that were detected at or above the Method Detection Limit (MDL) in at least one sample.

Table G-6. Priority Pollutant Detection Summary

Priority Pollutant Detected Constituents	Units	Number of Samples	% Non Detect	Median	Maximum
Antimony	µg/L	22	14%	0.65	7
Arsenic	µg/L	22	0%	1.05	3.9
Cadmium	µg/L	22	91%	<0.1	0.4
Chromium	µg/L	22	59%	<0.5	2.4
Copper	µg/L	22	0%	6.95	28.4
Lead	µg/L	22	36%	0.2	11.9
Nickel	µg/L	22	0%	3.45	5.9
Selenium	µg/L	22	95%	<0.5	0.6
Zinc	µg/L	22	32%	7	53
Endosulfan I	µg/L	22	95%	<0.05	0.11
Toluene (methylbenzene)	µg/L	22	95%	<1	1.4
Bis(2-ethylhexyl)phthalate	µg/L	22	50%	<1	3.8
Di-n-octylphthalate	µg/L	22	91%	<1	5.1
Phenol	µg/L	22	95%	<1	1.6

Whole effluent toxicity

The 2009 NPDES permit required acute toxicity testing on stormwater samples, laboratory sub-lethal toxicity testing on receiving water samples and a plan to conduct *in-situ* toxicity testing on receiving water samples. All of the testing and analysis was performed by Nautilus Environmental.

Acute toxicity testing

Acute toxicity effluent characterization was conducted once in the last summer and once in the last winter prior to submission of the permit application at all eleven outfalls. No acute toxicity was observed in any of the samples tested during the permit cycle. Toxicity is defined as survival of less than 65% in the full-strength sample. The lack of toxicity demonstrates a general lack of toxicity for the treated stormwater from this area.

The permit required that new outfalls be characterized for acute toxicity along with the existing outfalls for the permit renewal. Effluent characterizations were conducted quarterly with *Daphnia pulex* and fathead minnow (*Pimephales promelas*) on new outfalls SDS6/7, SDN3A, SDW1A, SDW1B, SDW2 and SDD06A during the current permit cycle. No toxicity was observed in any of the samples tested during the permit cycle. A full year of effluent characterization was not completed on the SDN2/3/4 outfall since each individual subbasin (SDN2, SDN3, and SDN4) was characterized in the previous permit with no toxicity observed. In addition, the permit renewal characterization schedule overlapped with quarterly sampling schedule and would provide redundant data. The SDN2/3/4 summer and winter effluent characterization found no toxicity consistent with past results from the individual subbasins and confirmed that quarterly characterization is not required.

Sub-lethal toxicity testing

The laboratory sub-lethal toxicity test is a 7-day trout embryo test using rainbow trout gametes. This test is initiated with freshly fertilized eggs and measures adverse effects on embryonic development after a 7-day exposure to the samples. The in-situ test described in the following section differs from the laboratory test in that it involves placing eyed rainbow trout embryos in the stream channel for an extended period until the trout reach the swim-up developmental stage where the egg sack has been fully absorbed by the fish.

Five water bodies that receive stormwater discharges were identified in the NPDES permit for sub-lethal toxicity testing: Miller Creek, Des Moines Creek, Northwest Pond, Walker Creek and Lake Reba. Samples were collected from the following six stations:

- East Branch of Des Moines Creek (DME)
- East-West Confluence (EWCONF), downstream of the confluence of the east and west branches of Des Moines Creek
- Northwest Pond Outlet (NPOUT)
- Walker Creek (WALKRCK)
- Lake Reba Outlet (RBOUT)
- Miller Creek (MC8th) downstream of all Port discharges on Miller Creek

Sample collection was required each year during the spring and fall, as well as once during runoff associated with a deicing/anti-icing activities event. During the permit cycle 48 samples were collected during spring and fall seasons and 20 samples were collected during deicing events. Samples were not collected from EWCONF in 2009 because there were no active outfalls discharging to this reach during that period. In 2010, only DME was sampled during deicing due to limited roadway deicing activity around the STIA. Samples were not collected in Fall 2011 due to a lack of trout eggs during storm testing periods and sample transport restrictions to the Nautilus toxicity testing laboratory in British Columbia. Samples were only collected from DME and EWCONF in 2012 due to deicing activities being limited to roadways around the airport.

Sample stations were located to characterize potential effects associated with outfalls discharging runoff from airfield and landside operations. Receiving water samples consistently showed no evidence of sub-lethal toxicity downstream of airfield outfalls. Sub-lethal toxicity downstream of landside outfalls was infrequent and limited to sites draining to Des Moines Creek. Only three of 20 samples collected in association with deicing events (one from EWCONF and two from DME) exhibited an EC50 of less than 100 percent sample. A Toxicity Identification/Reduction Evaluation (TI/RE) was conducted and determined that the sub-lethal toxicity resulted from the simultaneous presence (i.e., a mixture) of copper and potassium. Elevated concentrations of potassium were attributed to the use of potassium acetate, a commonly used roadway deicing agent. The TI/RE also reviewed data collected as part of the Winter Event-based (WEBS) Receiving Water/Stormwater Study (Taylor 2008) which documented that the duration of potassium in receiving waters following deicing events was limited to a maximum of one day. On this basis, the TI/RE concluded that the results from the 7-day trout embryo over-estimates actual exposure due to the use of a single sample collected at the onset of the testing event. In addition the TI/RE recognized that the concentration of copper in STIA discharges during the sub-lethal testing events were below effluent limitations and that in stream concentrations were influenced by sources upstream of the STIA.

In-Situ toxicity

Condition S9 of the 2009 NPDES permit required that a plan be developed to determine if it is appropriate to replace the 7-day trout embryo tests from the permit with an *in-situ* salmonid monitoring program involving 6- to 8-week exposure periods. The September 2010, Seattle-Tacoma International Airport *In-Situ* Monitoring Plan described a two phased implementation approach for applying the *in-situ* testing method in the receiving waters around the STIA. Phase I focused on the development of the *in-situ* test method and demonstration of both the method and site suitability. A watershed approach was used for Phase I implementation with test sites located downstream of all Port outfalls within each respective watershed with the exception of Walker Creek. The headwater wetlands of Walker Creek located on Port property did not have stream gravel that would support hatchbox deployment.

During the first year of testing (2010/2011), significant modifications were made to the deployment technique which resulted in improved weekly access to the hatch boxes and decreased the likelihood of sediment impacts on the trout embryos. Phase I was originally intended to last for one year and include testing during the spring and fall season. Due to changes in the deployment methodology and the need to further evaluate site suitability, Phase I was extended for the remainder of the permit cycle. An additional testing site was added as a control site upstream of all Port outfalls to Des Moines Creek in response to toxicity observed at the downstream location during Phase I testing.

A comparison of the laboratory sub-lethal test to the *in-situ* test found good agreement with results in the field (*in-situ*) and laboratory. In some cases a lack of toxicity observed in the laboratory testing was helpful in interpreting whether dissolved contaminants or suspended sediments were causing toxicity in the *in-situ* exposures. There was no toxicity observed in any of the corresponding laboratory sub-lethal tests which supports the conclusion that suspended sediments and physical impacts due to sedimentation in-stream caused toxicity at some field sites.

There have been limited instances where adverse effects were observed during *in-situ* testing. In each case where the *in-situ* testing has shown evidence of adverse effects, the effects have been coincident with either upstream impacts or physical processes within the stream. This has primarily been associated with the upstream station located on Des Moines Creek, which does not receive any input from the STIA. These data also suggest that upstream inputs are largely responsible for any adverse effects observed at the downstream station on Des Moines Creek. There has been limited evidence of adverse effects at the Miller Creek station, most likely related to physical effects of the fine particulates in the stream (total suspended solids) and not with dissolved contaminants. Concentrations of metals from airport outfalls upstream of the Miller Creek site are consistently low, which is in agreement with the lack of toxicity in acute tests conducted on samples from airport outfalls that discharge to Miller Creek. The *in-situ* testing has shown that the streams surrounding the airport have the ability to support salmonids and that the permit effluent limits are protective of the receiving waters.

Stormwater pH Study – Agreed Order 8755

From July 2010 through May 2011, elevated pH concentrations (over the upper pH effluent limit of 8.5 S.U.) were measured in grab samples from several outfalls associated with recently constructed stormwater detention ponds. Repeated permit limit exceedances were associated with the SDW1A, SDW1B, and SDW2 outfalls. Initial investigations indicated that the elevated pH was caused by algal growth within each pond. The Port entered into Agreed Order 8755 with Ecology to evaluate the source of elevated pH and implement corrective actions. Per the Agreed Order Study Plan, the Port monitored the pH of runoff entering each pond, effluent discharged from each pond, and the receiving water downstream of each pond's outfall from November 2011 through May 2012 following the frequency specified in the Port's NPDES permit.

The study initially assessed the SDW1A, SDW1B and SDW2 stormwater detention ponds. During the study period, pH effluent limit exceedances at the SDN3A pond outfall resulted in that site being added to the study. All four ponds are located on the west side of the third runway and detain stormwater that drains the airfield.

The results of the study indicated that primary productivity within the ponds, through the process of photosynthesis, caused elevated pH levels at the pond outfalls. The pH levels observed in pond influent samples did not suggest that stormwater coming into the ponds caused elevated pH levels in the ponds or at the pond outfalls. Matt-forming and branched filamentous green algae were present in the four stormwater ponds throughout the study period. Continuous pH and dissolved oxygen data collected over extended wet and dry periods present obvious diurnal patterns which indicated that the processes of photosynthesis and respiration control pH in the ponds. These diurnal patterns were particularly evident during dry periods, when flows through the ponds had receded.

Results of continuous pH monitoring in the receiving waters found that the pH downstream from the pond discharge locations met the water quality criterion in both wet and dry weather conditions. During sampled storms, the pH in Miller Creek decreased slightly from pre-storm levels, while the pH in Walker Creek either remained steady or rose slightly for short periods during the peak of these storms.

The final study report recommended actions based on the variable nature of the algae growth in the ponds and no detrimental effects to receiving water from pond discharges. The Port has implemented the operational BMPs that were recommended which include closing the pond outlets for extended periods during the summer and continuing the Port's nutrient control measures within the pond drainage basins. Closing the ponds during the summer period has been effective at promoting infiltration during the summer periods and eliminating pond discharges during the summer when flows in the receiving waters are low and could be prone to pH impacts. Nutrient control measures such as restricting fertilizer application within the pond drainage basins and continued wildlife control on the airfield has been effective in minimizing nutrient inputs to the ponds.

Outfall monitoring conducted following the implementation of the operational BMPs has shown a significant reduction in the frequency of pH excursions with only three occurrences during the 2013 monitoring period in comparison to five in 2012 and twelve in 2011.

STUDIES PERFORMED DURING PREVIOUS PERMIT CYCLES

Site-specific study

The site-specific water quality assessment study was prepared by Nautilus Environmental and their reports are entitled:

- *Derivation of Site-Specific Water Quality Objectives and Effluent Limits for Copper in Stormwater (April 2008), and*
- *Derivation of Site-Specific Water Quality Objectives and Preliminary Effluent Limits for Zinc in Stormwater (April 2008).*

The Nautilus reports present the development of site-specific water quality objectives (SSWQOs) for copper and zinc in streams that receive stormwater discharges from the Seattle-Tacoma International Airport (STIA). On the basis of these objectives, a methodology for determining SSWQO-based discharge limits for copper and zinc was derived.

Nautilus based its overall approach on guidelines promulgated by the U.S. Environmental Protection Agency (USEPA) and consisted of water-effect ratio studies (WERs) conducted with *Ceriodaphnia dubia*. Strict QA/QC standards were applied to ensure that a rigorous approach was used and that data quality objectives were met. A minimum of four to five WER comparisons were used to derive a final WER for each site; this number exceeds the minimum required by USEPA and further ensures that the final WER is a robust measure of the bioavailability of copper and zinc in each stream. Supplemental comparisons were also conducted with rainbow trout to ensure that the site-specific objectives derived from data obtained with *C. dubia* were also protective of salmonids. Finally, the calculated values were then compared with the original dataset to confirm that they were, indeed, appropriate.

Nautilus determined water-effect ratios for sites located in the Des Moines, Miller, and Walker Creek drainages. The water-effect ratios varied among the sites and ranged from 1.79 to 4.89, based on dissolved copper and 0.91 to 3.86 for zinc. In addition to WER values, the study determined site-specific dissolved to total translators. The translator values varied among the sites and ranged from 0.60 to 0.89 for copper and 0.58 to 0.78 for zinc. SSWQOs were calculated by multiplying the generic water quality criterion for copper and dissolved zinc (based on hardness) by the final adjustment factor (WER divided by translator) appropriate for each site.

TSS versus turbidity sampling and monitoring study summary

The TSS versus turbidity sampling and monitoring study provided a comparative analysis of turbidity and total suspended solids (TSS) data from STIA outfall monitoring to assess compliance with the respective in-stream aquatic life criteria.

During the data collection period for this study, numerous substantial water quality BMPs were constructed and put into service. As a result most outfalls had two distinct data sets, pre- and post-BMP. Measured outfall turbidity was found to be consistently less than 25 NTU in the post-BMP period. In-stream water quality met the 5 NTU over background standard each time the outfall turbidity was at or less than 25 NTUs. Instream turbidity exceeded the 5 NTU over background state water quality standard once. In this case the outfall turbidity was above 25 NTU. Based on this analysis the study concluded that 25 NTU outfall turbidity is protective of in-stream aquatic life turbidity criteria (5 NTU over background).

Additional details can be found in the *TSS-turbidity Data Analysis per Requirement in Port of Seattle NPDES Permit (No. WA-002465-1, Part II, Section S1. G.) Memorandum Taylor and Associates (June 2008).ujhy*

Appendix H--Part III, Construction Stormwater

INTRODUCTION

STIA has undergone significant facility upgrades and expansion. Construction activities from future development will continue. The Port is undergoing a Sustainable Airport Master Plan which will evaluate development needs over the next twenty years. Projects outside of this master plan include the 16C Runway Rehabilitation, Emergency Generators and Baggage System Redevelopment. In addition to these projects, ongoing maintenance and infrastructure projects continue.

The procedures that the Port employs to develop the construction stormwater management requirements for a project are spelled out in detail in the Programmatic Construction Stormwater Pollution Prevention Plan (SWPPP). In addition, each individual project has a project-specific SWPPP that covers its particular stormwater requirements, including those for monitoring and erosion control.

Construction stormwater management in general and the development of the project-specific SWPPP in particular, are managed in a systematic manner throughout the life of a project. The goal is to identify the construction stormwater requirements early and incorporate them into the project. At the outset, capital projects are initiated in response to a business opportunity or a regulatory requirement. The Port uses a formal project plan and definition process to identify the project goals and scope. Regulatory compliance is a standard objective of all projects. Once the general scope of a project is defined, an Environmental Review Questionnaire is completed to identify whether the project will have any environmental issues, such as air quality, hazardous materials, contaminated sites, or water quality. The Aviation Environmental staff reviews the information from the Questionnaire. They advise the project managers and designers about the environmental considerations and best management practices (BMPs) that are appropriate for the specific job.

During the design phase, the Port's in-house engineers or architect/engineer consultant design teams create the plans and specifications for the contract. Environmental considerations are an important element in the design phase. Each project is evaluated for determining project-specific design and/or performance requirements necessary to ensure runoff meets permit limitations and the applicable standards. Erosion and sediment control design is addressed in all earth disturbing projects and other construction projects that have the potential to impact stormwater. Over the years the Port has developed expertise managing construction projects under the increasing demands of the STIA's NPDES permit. This experience has been applied toward the development of a master specification for stormwater (called "Section 02270-Temporary Erosion and Sediment Control Planning and Execution"). This master specification and accompanying drawings clearly identify responsibilities and requirements. This master guide specification is modified during the design phase to fit the requirements of a particular project.

The NPDES permit includes construction stormwater outfalls and stormwater pollution prevention plan. Construction stormwater discharges may utilize the same stormwater conveyance system and outfalls as non-construction stormwater section or create additional stormwater outfalls.

STORMWATER POLLUTION PREVENTION PLAN

Each project has a project-specific Stormwater Pollution Prevention Plan (SWPPP) that consists of three documents: a monitoring plan (developed by the Port); a Pollution Prevention Plan (PPP); and Contractor Erosions and Sediment Control Plan (CESCP). Both the PPP and the CESCP are prepared by the Contractor but must be reviewed and accepted before the Contractor begins ground disturbing activities.

The SWPPP is a living document and is updated as site changes or unforeseen issues arise. Updates are reviewed and approved by Port staff.

Monitoring plan

The monitoring plan includes a site assessment, monitoring and inspections, project stabilization, and reporting and recordkeeping requirements. All projects that disturb greater than one acre require a monitoring plan. The monitoring plan is submitted to Ecology 30 days prior to ground disturbing construction activity.

During the design phase, environmental staff identify the construction outfall(s) and determine the necessary BMPs. Stormwater associated with construction activities is categorized as: non-chemically treated, batch chemically treated, and continuous flow chemically treated.

<u>Outfall designation</u>

The construction stormwater outfalls are identified by the point of discharge into the receiving water. The outfalls are named with a letter and number code. The letter depicts with basin.

D – Des Moines Creek

M – Miller Creek

W – Walker Creek

G – Gilliam Creek

L – Lake Reba

The number is a chronological number to track multiple outfalls in each basin. The outfall locations are defined by a 15 second latitude and longitude grid box. See Figure H-1.

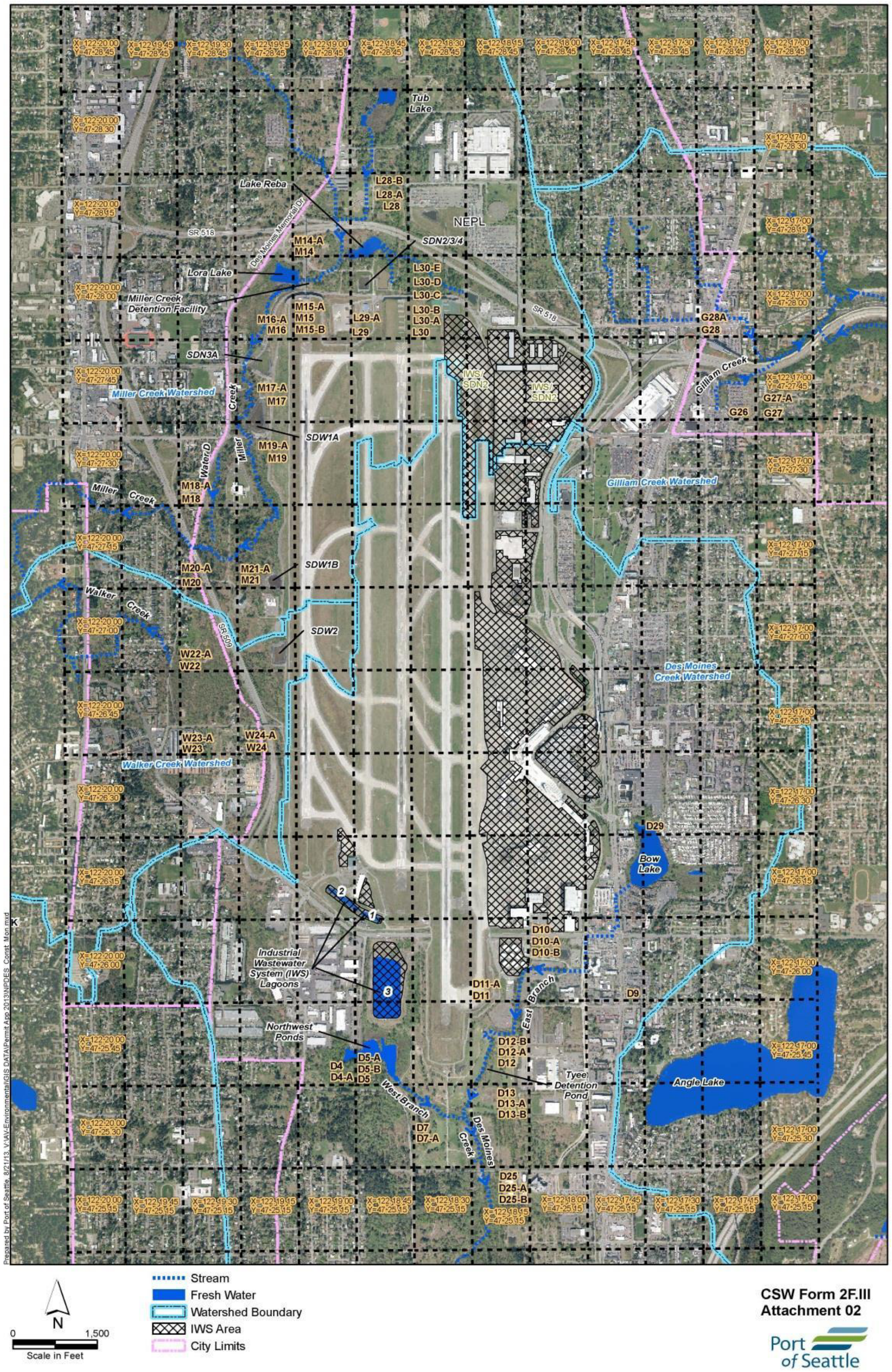
Tub Lake
Lake Reba
L28-B
L28-A
L28
NEPL
SR 518
Des Moines Memorial Dr
M14-A
M14
SDN2/3/4
Lora Lake
L30-E
L30-D
L30-C
L30-B
L30-A
L30
Miller Creek Detention Facility
M15-A
M15
M15-B
M16-A
M16
L29-A
L29
SDN3A
IWS / SDN2
M17-A
M17
Miller Creek Watershed
SDW1A
M19-A
M19
Gilliam Creek
G28A
G28
G27-A
G26
G27
Gilliam Creek Watershed
M18-A
M18
Miller Creek
M20-A
M20
M21-A
M21
SDW1B
Walker Creek
SDW2
W22-A
W22
Des Moines Creek Watershed
W23-A
W23
W24-A
W24
Walker Creek Watershed
D29
Bow Lake
D10
D10-A
D10-B
Industrial Wastewater System (IWS) Lagoons
D11-A
D11
East Branch
D9
Northwest Ponds
D12-B
D12-A
D12
D4
D4-A
D5-A
D5-B
D5
West Branch
Tyee Detention Pond
D13
D13-A
D13-B
Angle Lake
D7
D7-A
Des Moines Creek
D25
D25-A
D25-B
Stream
Fresh Water
Watershed Boundary
IWS Area
City Limits
N
0
1,500
Scale in Feet
CSW Form 2F.III
Attachment 02
Port of Seattle

Figure H-1

In order to meet limits, the Port has implemented both chemically treated and non-chemically treated BMPs. Monitoring and reporting requirements have been adjusted for each treatment type to adequately monitor performance.

Non-chemically treated stormwater

Non-chemically treated discharge monitoring is triggered when conventional erosion and sediment control BMPs are utilized to meet water quality standards. Non-chemical treatment discharges are monitored upstream and downstream of the outfall. The upstream monitoring location is approximately five (5) feet upstream of the discharge and the downstream monitoring location is determined by Ecology's RivPlum Model and is no greater than 100 feet downstream or at the nearest accessible point.

The Port conducts instream measurements for pH, turbidity, total petroleum hydrocarbons (TPH), and flow during any storm event greater than 0.5 inches within 24-hour period. Samples for pH and turbidity are collected upstream and downstream of the outfall. The outfall is observed for visual sheen. If sheen is present, then a sample is collected and analyzed.

Chemically treated stormwater

Batch and/or continuous chemical treatment is used to treat runoff in those cases where site specific conditions may limit the ability of traditional erosion and sediment control BMPs to meet water quality standards in the receiving water. Ecology defines chemical treatment methods and requirements in BMP C250, *Western Washington Stormwater Management Manual, Volume II*. Chemical monitoring and treatment is regulated under the Ecology Conditional Use Level Designation, General Use Level Designation and Quality Assurance Prevention Plan (QAPP). In addition, the Port's NPDES permit includes continuous and batch chemical treatment monitoring parameters and frequencies.

Ecology approved technologies are utilized for treatment and a project specific treatment plan defines the treatment discharge rates into the receiving water. Prior to discharge, the effluent is sampled for pH, turbidity and flow. TPH sampling is performed in the detention area.

Pollution prevention plan

The contractor pollution prevention plan (PPP) consists of planning and implementing measures to prevent the pollution of soil and water, control and dispose of pollutants, spill prevention and response. The PPP details the procedures and management practices to properly manage chemicals and waste, spill prevention and response, and fueling practices at the project site and staging area. The plan also includes project contact information and site inspection requirements.

Contractor erosion and sediment control plan

The contractor erosion and sediment control plan (CESCP) consists of planning, installing, inspecting, maintaining and removing temporary erosion and sediment control BMPs to prevent pollution of air and water, controlling and responding to eroded sediment and turbid water. The CESCP includes site specific BMPs, project contact information, map, construction phasing, site monitoring requirements and noncompliance response procedures.

Water quality characterization

Tables H-1, H-2 and H-3 describe the construction effluent characterization discharged into the surrounding fresh water for non-chemically and chemically treated construction stormwater.

Non-chemically treated stormwater

The Port monitored eighty-six (86) 0.5-inch of rain within 24-hour storm events from April 2009 through March 2013. Non-chemically treated stormwater was discharged into Miller Creek, Des Moines Creek, Gilliam Creek, Walker Creek, Lake Reba and Northwest Ponds from nineteen (19) outfalls. Table H-1 provides results from 0.5-inch within 24-hour stormwater events at all non-chemically treated outfalls.

Table H-1: Non-Chemically Treated Outfalls 4/1/2009 - 3/31/13

Parameter	Unit	Effluent Limit	Average	Minimum	Maximum	Number Samples	Exceedances
Monthly Flow Rate	MGD	Report	1.37	0.10	43.0	383	Report
pH	S.U.	6.5-8.5	NA	5.79	8.47	383	24[1]
Oil & Grease (TPH)	Visual	No Sheen or less 5mg/L	No Sheen	No Sheen	No Sheen	383	0
Turbidity - Variance between downstream & upstream	NTU	5 NTU	12.2	0	68.3	383	23[2]

Notes:

1. Two of the 24 pH exceedances were related to construction activity. The remaining occurrences were likely related to basin-wide effects of low pH rainwater on the receiving waters.
2. Five of the 23 exceedances were related to construction activities.

Batch chemically treated stormwater

During this period the Port discharged batch treated stormwater utilizing Chitosan Enhanced Sand Filtration into Gilliam Creek from two (2) outfalls. Batch CESF discharges monitoring results from both outfalls are summarized in Table H-2. All batch CESF discharges complied with effluent limitations.

Table H-2: Batch Chemically Treated Outfalls 4/1/09 - 3/31/13							
Parameter	**Unit**	**Limit**	**Average**	**Minimum**	**Maximum**	**Number Samples**	**Exceedances**
Daily Flow Rate[1]	Gallons	Report	18,900	5,800	33,200	3	0
pH	S.U.	6.5 – 8.5	NA	6.7	8.38	3	0
Oil & Grease (TPH)	Visual	No Sheen or less 5mg/L	No Sheen	No Sheen	No Sheen	3	0
Turbidity	NTU	5 NTU	3.2	2.7	4.2	3	0

[1] Flow based upon number of batch discharges.

Continuous chemically treated stormwater

During this period the Port discharged CESF treated stormwater into Gilliam and Des Moines Creeks from three (3) outfalls. Continuous CESF discharges monitoring results from all outfalls are shown Table H-3. All continuous CESF discharges complied with effluent limitations. The continuous CESF is monitored every 15 minutes for all parameters except oil and grease. Oil and Grease is monitored 4 times per operating period.

Table H-3: Continuously Chemically Treated Outfalls 4/1/09 – 3/31/13							
Parameter	**Unit**	**Limit**	**Average**	**Minimum**	**Maximum**	**Number Days**	**Exceedances**
Daily Flow Rate	Gallons	Report	195,128	8,356	861,597	379	0
pH	S.U.	6.5-8.5	NA	6.5	8.5	379	0
Oil & Grease (TPH)	Visual	No Sheen or less 5mg/L	No Sheen	No Sheen	No Sheen	379	0
Turbidity	NTU	5 NTU	3.3	0.7	4.7	379	0

Appendix I--Response to Comments

Ecology received four comments from the Port of Seattle on Port of Seattle – Sea Tac International Airport Draft NPDES Permit WA-0024651:

Item 1: Page 8, Table S1-1 IWS Flow Effluent Limits, Oil and Grease TPH-D Parameter

Requested Change: Change Oil and Grease sampling method to NWTPH-Dx.

Supporting Rationale: The NWTPH-Dx sampling method is the historical sampling method utilized and is referenced in Table S2-1 IWTP Monitoring Schedule.

Response: The sampling method has been changed.

Item 2: Page 13, S2.F Annual Sanitary Sewer Monitoring Summary Report

Requested Change: Add the Annual Industrial Wastewater System Monitoring Summary Report to Section S2.F.

Supporting Rationale: The Port believes the Annual Industrial Wastewater System Monitoring Summary Report was inadvertently removed as a submittal requirement.

Response: The Annual Sanitary Sewer Monitoring Summary Report has been included as a submittal requirement.

Item 3: Page 29-30, 2S2.1 Table 2S1-2 Effluent Limits for Industrial Stormwater Common to All Outfalls and 2S2.A Priority Pollutant Monitoring for Permit Application

Requested Change: There are different priority pollutant sampling frequencies noted in Table 2S1-2 Effluent Limits for Industrial Stormwater Common to All Outfalls and 2S2.A Priority Pollutant Monitoring. Please clarify the sampling frequency is 2/year in year 3 of permit or 1/year.

Response: The sampling frequency for priority pollutant sampling is 2/year in year 3 of the permit.

Item 4: Page 57, 3S1 Table 2 Effluent Limits pH parameter

Requested Change: Add the pH non-treatment parameter and effluent limit with footnote f. Remove footnote f from pH treatment effluent limit.

Supporting Rationale: The non-treatment pH parameter and effluent limit is missing. Footnote f refers to the in-stream non-treatment construction monitoring.

Response: The non-treatment pH parameter and effluent limit with footnote f has been included.