FACT SHEET FOR NPDES PERMIT WA-002465-1
FACILITY NAME: SEA-TAC INTERNATIONAL AIRPORT

DISCHARGE LOCATIONS

Industrial Wastewater (Part I)

RECEIVING WATER	OUTFALL NUMBER	OUTFALL LOCATION
Puget Sound	001	Latitude: 47^0 24’ 07” N Longitude: 122^0 20’ 07” N

Stormwater Associated with Industrial Activities (Part II)

OUTFALL #	OUTFALL LOCATIONS	SAMPLING POINT	RECEIVING WATER
SDE 4	Latitude: 47˚ 26’ 30” N Longitude: 122˚ 17’ 45” W	At the Point of Discharge	DesMoines Creek
SDS1	Latitude: 47˚ 26’ 00” N Longitude: 122˚ 18’ 01” W	At the Point of Discharge	DesMoines Creek
SDS4	Latitude: 47˚ 25’ 33” N Longitude: 122˚ 18’ 15” W	At the Point of Discharge	DesMoines Creek
012 –EY	Latitude: 47˚ 27’ 34” N Longitude: 122˚ 17’ 50” W	At the Point of Discharge	Gilliam Creek via city of Sea-Tac storm drainage system
SDW1-A (Future)	Latitude: 47˚ 27’ 30” N Longitude: 122˚ 19’ 15” W	At the Point of Discharge	Miller Creek
SDW1-B (Future)	Latitude: 47˚ 27’ 15” N Longitude: 122˚ 19’ 15” W	At the Point of Discharge	Miller Creek
SDW2 (Future)	Latitude: 47˚ 27’ 00” N Longitude: 122˚ 19’ 15” W	At the Point of Discharge	Walker Creek
SDN3-A (Future)	Latitude: 47˚ 27’ 45” N Longitude: 122˚ 19’ 15” W	At the Point of Discharge	Miller Creek

OUTFALL #	OUTFALL LOCATIONS	SAMPLING POINT	RECEIVING WATER
004 – SDS2	Latitude: 47˚ 25’ 50” N Longitude: 122˚ 18’ 42” W	At the Point of Discharge	DesMoines Creek via Northwest Pond
005 – SDS3	Latitude: 47˚ 25’ 58” N Longitude: 122˚ 18’ 30” W	At the Point of Discharge	DesMoines Creek via Northwest Pond
010 – SDS7	Latitude: 47˚ 26’ 09” N Longitude: 122˚ 18’ 53” W	At the Point of Discharge	DesMoines Creek via Northwest Pond
014 – SDS6	Latitude: 47˚ 26’ 07” N Longitude: 122˚ 18’ 48” W	At the Point of Discharge	DesMoines Creek via Northwest Pond
015 – SDS5	Latitude: 47˚ 26’ 06” N Longitude: 122˚ 18’ 46” W	At the Point of Discharge	DesMoines Creek via Northwest Pond
006 – SDN1	Latitude: 47˚ 27’ 56” N Longitude: 122˚ 18’ 09” W	At the Point of Discharge	Miller Creek via Lake Reba
007 – SDN2	Latitude: 47˚ 28’ 00” N Longitude: 122˚ 18’ 28” W	At the Point of Discharge	Miller Creek via Lake Reba
008 – SDN3	Latitude: 47˚ 27’ 59” N Longitude: 122˚ 18’ 45” W	At the Point of Discharge	Miller Creek via Lake Reba
011 – SDN4	Latitude: 47˚ 28’ 00” N Longitude: 122˚ 18’ 38” W	At the Point of Discharge	Miller Creek via Lake Reba

<u>Stormwater Associated With Construction Activities</u> (Part III)

EXISTING OUTFALL LOCATION	RECEIVING WATER	SAMPLING POINT
Latitude: 47˚ 25' 45" N Longitude: 122˚ 18' 45" W	Des Moines Creek #5	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˚ 26' 15" N Longitude: 122˚ 17' 45" W	Des Moines Creek #8	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˚ 28' 15" N Longitude: 122˚ 19' 00" W	Miller Creek #14	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˚ 27' 45" N Longitude: 122˚ 19' 15" W	Miller Creek #17	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' 15" W	Miller Creek #19	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' 15" W	Miller Creek #21	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˚ 26' 45" N Longitude: 122˚ 19' 30" W	Walker Creek #23	At the Point of Discharge
Latitude: 47˚ 26' 45" N Longitude: 122˚ 19' 15" W	Walker Creek #24	At the Point of Discharge
FUTURE OUTFALL LOCATION	**RECEIVING WATER**	**SAMPLING POINT**
Latitude: 47˚ 28' 00" N Longitude: 122˚ 17' 45" N	Gilliam Creek #1	At the Point of Discharge
Latitude: 47˚ 27' 45" N Longitude: 122˚ 17' 45" W	Gilliam Creek #2	At the Point of Discharge
Latitude: 47˚ 27' 30" N Longitude: 122˚ 17' 30" W	Gilliam Creek #3	At the Point of Discharge
Latitude: 47˚ 25' 45" N Longitude: 122˚ 19' 00" W	Des Moines Creek #4-F	At the Point of Discharge
Latitude: 47˚ 25' 45" N Longitude: 122˚ 18' 45" W	Des Moines Creek #5-F	At the Point of Discharge
Latitude: 47˚ 25' 30" N Longitude: 122˚ 18' 45" W	Des Moines Creek #6	At the Point of Discharge
Latitude: 47˚ 25' 30" N Longitude: 122˚ 18' 30" W	Des Moines Creek #7-F	At the Point of Discharge
Latitude: 47˚ 26' 15" N Longitude: 122˚ 17' 45" W	Des Moines Creek #8-F	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-F	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˚ 25' 45" N Longitude: 122˚ 18' 15" W	Des Moines Creek #12	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˚ 28' 00" N Longitude: 122˚ 19' 00" W	Miller Creek #15-F	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˚ 27' 45" N Longitude: 122˚ 19' 15" W	Miller Creek #17-F	At the Point of Discharge
Latitude: 47˚ 27' 30" N Longitude: 122˚ 19' 30" W	Miller Creek #18-F	At the Point of Discharge
Latitude: 47˚ 27' 30" N Longitude: 122˚ 19' 15" W	Miller Creek #19-F	At the Point of Discharge
Latitude: 47˚ 27' 15" N Longitude: 122˚ 19' 30" W	Miller Creek #20-F	At the Point of Discharge
Latitude: 47˚ 27' 15" N Longitude: 122˚ 19' 15" W	Miller Creek #21-F	At the Point of Discharge
Latitude: 47˚ 27' 00" N Longitude: 122˚ 19' 30" W	Walker Creek #22-F	At the Point of Discharge
Latitude: 47˚ 26' 45" N Longitude: 122˚ 19' 15" W	Walker Creek #23-F	At the Point of Discharge
Latitude: 47˚ 26' 45" N Longitude: 122˚ 19' 15" W	Walker Creek #24-F	At the Point of Discharge

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STORMWATER DISCHARGES AND CONSTRUCTION RUNOFF

PERMIT ISSUANCE PROCEDURES
(PART I, II, AND III)

PART I, II, AND III.

INTRODUCTION

The federal Clean Water Act (CWA, 1972, and later modifications, 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the CWA is National Pollutant Discharge Elimination System (NPDES) permits program, which is administered by the Environmental Protection Agency (EPA). The EPA has delegated responsibility to administer the NPDES permit program to the state of Washington on the basis of Chapter 90.48 RCW which defines the Department of Ecology's authority and obligations in administering the wastewater discharge permit program.

The regulations adopted by the state include procedures for issuing permits (Chapter 173-220 WAC), water quality criteria for surface and ground waters (Chapters 173-201A and 200 WAC), and sediment management standards (Chapter 173-204 WAC). These regulations require that a permit be issued before discharge of wastewater and stormwater associated with industrial activity to waters of the state is allowed. The regulations also establish the basis for effluent limitations and other requirements which are to be included in the permit. One of the requirements (WAC 173-220-060) for issuing a permit under the NPDES permit program is the preparation of a draft permit and an accompanying fact sheet. Public notice of the availability of the draft permit is required at least thirty (30) days before the permit is issued (WAC 173-220-050). The fact sheet and draft permit are available for review (see <u>Appendix A--Public Involvement</u> of the fact sheet for more detail on the public notice procedures).

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in this review have been corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The fact sheet will not be revised. Comments and the resultant changes to the permit will be summarized in <u>Appendix D--Response to Comments</u>.

This permit is written in three parts. Part I is regulatory requirements for Industrial Wastewater System; Part II is regulatory requirements for non-construction general stormwater runoff; and Part III is construction stormwater runoff and dewatering activities. The general conditions are equally applicable to Parts I, II, and III.

GENERAL INFORMATION	
Applicant	Port of Seattle, Seattle-Tacoma International Airport
Facility Name and Address	Sea-Tac International Airport
Type of Facility	Air-Transportation
SIC Code	4851 (Airfield), 5171 (Bulk Petroleum Storage), 4852 (Transportation by Air, Scheduled), and 7514 (Car Rental)

Description of the Facility

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 de-watering 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.

Stormwater drainage at Sea-Tac Airport is separated into two different collection systems:

A. The Industrial Wastewater System (IWS) collects industrial wastewater which is primarily from rainfall that falls on the terminal, air cargo, deicing areas, hangars, and maintenance areas. Industrial wastewater is water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater, non-contact cooling water, or stormwater associated with industrial activity. Industrial wastewater may result from any process or activity of industry, manufacture, trade or business, and includes, but is not limited to, water used for industrial processes such as pipe integrity pressure testing and vehicle and aircraft wash water; stormwater contaminated with fuel, lubricants, fire fighting foam, cleaning agents and aircraft and ground surface deicing/anti-icing agents; contaminated construction dewatering waters; excess water from ground water well construction and monitoring; and leachate from solid waste facilities. The miniscule amount of deicing/anti-icing fluid, i.e., shear and drip that may fall from the aircraft after they leave the IWS drainage area, may not be considered industrial wastewater. In addition, at the Port’s discretion, construction stormwater, if treatable by the IWTP, may be discharged to the IWS.

B. The Storm Drainage System (SDS) is separated into two collection systems:
   1. Stormwater runoff from the runways, taxiways, building roofs, and public roads;
   2. Stormwater runoff from the construction sites.

There are several outfall drain subbasins without industrial activities. Four on the north end of the airport drain to Miller Creek via the outfall of the Lake Reba Detention Facility. Five on the south end discharge to Des Moines Creek via the outlet of the Northwest Ponds Detention Facility. One on the east side and one on the south discharge directly to Des Moines Creek. One outfall on the east side of the airport joins the Bow Lake outfall prior to daylighting in Des Moines Creek. Two outfalls on the south end of the airport discharge directly to Des Moines Creek. Two discharge to the city of SeaTac storm drains. Two outfalls drain minor areas discharging to the city of SeaTac storm drains. Many of these outfalls and associated receiving waters have commingled stormwater and possibly other discharges from non-Port entities (e.g., the surrounding communities and cities). Four new outfalls are proposed for the Master Plan Update projects. During this permit cycle, the Port may construct temporary stormwater outfalls for construction activities. The NPDES requirements for construction stormwater discharges are covered in a separate section of the permit.

STIA NPDES Permit History

The IWS and Industrial Wastewater Treatment Plant (IWTP) have been covered by an individual NPDES permit since January 2, 1980. The stormwater discharges associated with industrial activity were first added in the 1994 permit. Additional SDS outfalls and construction activities were added in the 1998 permit. There have been major and minor modifications to these permits during the course of each permit cycle.

The current permit became effective March 1, 1998. There was a minor modification to the permit on December 10, 1998, that clearly identified the discharge to the Midway Sewer District; required a study of the structural integrity of the IWS collection system; changed the sampling frequency of monitoring of Outfalls 003 and 007; required reporting of additional monitoring; changed the noncompliance notification of spills to the IWS; clarified language on groundwater discharges; added language on experimental BMPs; and required a hydrogeologic study of the area around the IWTP and lagoons. There was a major modification of the permit on January 25, 1999, that changed the sampling frequency of SDS samples, required sending plan reports and manuals to the Burien Public Library, and allowed discharges to the sanitary sewers. There was another major modification of the permit on May 29, 2001, to cover discharges to Walker Creek and tributaries, Gilliam Creek and tributaries; to add monitoring and reporting requirements for construction stormwater; and add detention and retention impoundment design requirements for construction discharges.

PART I.
DISCHARGES OF INDUSTRIAL WASTEWATER

A. BACKGROUND INFORMATION

Industrial Wastewater System (IWS)

The IWS collects industrial wastewater from two drainage basins: the North Service Basin and the South Service Basin. The IWS North Service Basin includes portions of the airport area between Taxiways A and B and Air Cargo Road, as well as the Weyerhaeuser area on the south side of the airfield. The North Service Basin accounts for approximately 147 acres of the 297-acre IWS contributing area. The IWS South Service Basin includes portions of airport areas east of Runway 16L-34R, west of International Boulevard, north of South 188th Street, and south of the North Satellite. The South Service Basin accounts for approximately 150 acres of the IWS contributing area. The IWS service area is shown in Figure 2: Drainage Basins.

The IWS conveyance system collects and transports industrial wastewater to the IWTP. The conveyance system includes approximately 21 miles of piping, 510 manholes and catch basins, two below-grade vaults in the parking garage, and ten pump stations. Two of the pump stations are associated with the parking garage: one is owned and operated by United Airlines in its fuel farm north of the garage; one is owned and operated by the Olympic Pipeline Company in the Olympic Tank Farm, and two have been installed as BMPs to transfer runoff from ramp and taxiway areas from the storm drainage system to the IWS. Three other pump stations have been built to divert snowmelt water from snow storage areas from the storm drainage system to the IWS. Collectively, five of these pump stations serve as important stormwater BMPs by diverting runoff to the IWS from a total of approximately 61 acres that previously drained to the SDS [46 acres in sub basin SDN2 (Miller Creek), 15 acres in sub basin SDE4, and other areas draining to Des Moines Creek]. The other five IWS pump stations serve simply as lift stations between nodes in the existing IWS conveyance system.

These pump stations are described in Table 1 below:

Table 1. IWS Pump Stations

Location	Drainage Area (ac)	Design Flow	Flow Sources
N. Cargo	35.6	2750	N. Cargo ramps, taxiways A and B (formerly SDS subbasin SDN2)
N. Snowmelt	6.6	750	N. Snowmelt/snow storage area (formerly SDS subbasin SDN2)
N. Satellite	13.8	2150	N. Satellite ramp vicinity (formerly SDS subbasin SDE4)
Central Snowmelt	0.75	750	Central Snowmelt/snow storage area (formerly SDS subbasin SDE4)
South Snowmelt	0.3	750	South Snowmelt/snow storage area)
Parking Garage			Parking Garage
Parking Garage			Parking Garage
UAL Tank Farm			Tank Farm
Olympic Tank Farm			Tank Farm
A Concourse (STEP) Lift Station			Provides IWS lift over STS tunnel

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 five watertight manhole covers in 1997 to prevent flooding in areas that would pose a safety problem or may overflow to the SDS.

The IWTP was originally designed and constructed in 1963/1964 for the purpose of capturing and treating fuel spills. In the last thirty years, its capacity has been enlarged and it now consists of three lagoons and a Dissolved Air Flotation (DAF) plant containing six DAF units. The IWTP is located at the southwest end of the airport, just west of the tunnel under the west airport runway.

The three IWTP lagoons receive the flow from the IWS conveyance system. The purpose of the lagoons is to store flows in excess of treatment capacity. The three lagoons were originally designed to have a combined storage volume of 25.1 million gallons at the maximum normal operating water depth and 29.5 million gallons at the extreme maximum overflow water depth. Lagoon 1 was completed in 1965 and holds approximately 1.6 million gallons at the maximum normal operating water depth. Lagoon 2 was constructed in 1972 and has a capacity of approximately 3.3 million gallons at the maximum normal operating water depth. 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 recently expanded to 76 million gallons and lined.

A continuous rainfall model using National Oceanic and Atmospheric Administration (NOAA) data from 1974 to 1994 showed that the existing lagoon volume is sufficient to prevent an overflow when the IWTP treatment rate is 4 million gallons per day (mgd) assuming that the contributing area remains unchanged. The addition of two new DAF units has increased the IWTP treatment capacity to 8.3 mgd.

Lagoons 1 and 2 are located just north of the IWTP, while Lagoon 3 is located southeast, across South 188th Street. Drainage from the North Service Basin normally flows into Lagoon 2, while drainage from the South Service Basin flows into Lagoon 1. An interconnection pipeline allows diversion of either service basin to either lagoon. Flow may also be diverted to Lagoon 3 by adjusting a valve. Lagoons 1 and 2 supply the IWTP by gravity flow. 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 header. Oil and other petroleum products skimmed off the surface of the lagoons are stored in a tank and removed for off-site disposal.

The IWTP generally operates after periods of significant rainfall. During winter months, operation may be intermittent depending on weather conditions. At temperatures below 35^{o} F, the efficiency of the plant declines significantly. 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. In the summer, IWTP operators may lower flow rates and switch coagulants from aluminum chloride to alum to enhance algae removal. However, some micro-algal blooms may result in elevated concentrations of suspended solids that are unrelated to airport activities and construction.

The IWTP treatment process consists of adding coagulation chemicals to the influent wastewater in a rapid mix chamber, gently mixing the chemicals in a flocculation tank to encapsulate suspended solids and oil droplets, and removing the floc and other oil particles in the DAF units. Air bubbles released into the wastewater in the DAF units attach to the suspended solids and colloidal oil particles, which then float to the surface. This floating material is scraped to a scum beach on one end of the DAF unit for removal. The removed material flows out of the IWTP building in a floor trench to a sludge sump at the east side of the IWTP building. The DAF float is collected in the sludge sump and pumped to two large Baker Tanks and allowed to separate. The water layer is decanted and returned to the IWS lagoons. Settled solids are removed for disposal at a licensed treatment, storage, and disposal facility.

The treated water in the DAF units flows over an outlet weir. Effluent from all of the DAF units is combined and flows first into an effluent manhole, then into an effluent pipeline. The IWTP is equipped with an effluent pH control system to add sodium hydroxide to the effluent manhole when necessary. A small stream of water is pumped from the effluent manhole to a pH analyzer. If the pH is below the set point, an automatic controller activates the sodium hydroxide pump. If the pH is above the set point, the analyzer signals the pump to turn off.

The IWS effluent flows through an 18-inch trunk line, which eventually joins the Midway Sewer District's 30-inch effluent trunk line and discharges through a diffuser into Puget Sound (Outfall 001). The discharge occurs 1,400 feet from shore at a depth of 178 feet. The IWS effluent trunk and marine outfall location is shown in Figure 3.

In February 1995, the Midway Sewer District and the Port entered into a new 30-year agreement 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. Should Midway increase the outfall capacity, the figure of 2,500 gpm may be increased, subject to the Port contributing to the project cost in direct proportion to the additional capacity requested."

The hydraulic capacity of the IWTP is 8.3 mgd. The maximum flow that can be accepted by the existing 18-inch trunk line is 4,900 gpm (7.1 mgd).

The current NPDES permit (dated March 1, 1998 to June 30, 2002) requires the Port to submit an Engineering Report to determine what level of industrial wastewater treatment should be provided to satisfy the requirement of All Known, Available, and Reasonable Methods of Prevention and Treatment (AKART). This report was submitted to the Department in December 1995. Two addenda were submitted in April 1997 and April 2002 to complement this report. The report identified several immediate improvement needs to the IWS collection and treatment system. These projects were separated from the larger AKART Engineering Report and were performed either as maintenance or were approved through the Engineering Report approval process. The Engineering Reports and AKART analysis together with the two addenda were approved by Ecology in May 2002. During the period 1995 - 1998, the Port initiated a number of projects to expand and improve the IWS conveyance and treatment facilities. These projects, described in the 1998 Addendum, increased the IWTP treatment capacity and improved the operation and reliability of the IWS. Construction of these modifications, at an approximate total cost of $12 million, significantly improved the Port's ability to convey, store, and treat the IWS flows and meet the NPDES permit requirements. The Port also implemented several capital programs that routed runoff from ramp and taxiway areas from the SDS to the IWS.

Other improvements to the IWS and IWTP have been undertaken since the 1998 Addendum. Table 2 briefly describes pertinent IWS projects from 1995 until the present.

Table 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.
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.

Table 2: IWS and IWTP Improvements

Improvement	Year(s)	Purpose/Description
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 to any one of the three lagoons.
New IWS influent piping to the lagoons was increased in size from 42-inch concrete pipe to 48-inch polyethylene.	1997	Accommodate 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	Accommodate 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 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 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 mgd from the lift station.
New Onan 350 kW standby generator was installed to provide back-up 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 back-up 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 runoff 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.

Table 2: IWS and IWTP Improvements

Improvement	Year(s)	Purpose/Description
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 encircle Lagoons #1 and #2. Wash down hydrants located at intervals around the lagoons. Designed to spray 160 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 Lagoons #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 inspection and repairs	1999 - present	Ongoing inspection, maintenance, and repair of the IWS collection system. Inspection of small-bore piping is completed. Larger diameter piping inspection and repair is ongoing.
BOD analyzer	2000 - present	Online BOD analyzer provides real time BOD data for IWTP effluent. Analyzer installed in 2000, currently undergoing final testing and calibration while collecting data during actual deicing events. Because, deicing activity has been relatively mild since installation of the BOD analyzer the range of analysis has been limited.
Lagoon #3 Expansion	2000 - present	Lagoon cleaned, expanded to approximately 76 million gallons 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. Construction began in 2000, with completion expected in 2002.

Status of Lagoon #3 Upgrade: One project identified in the Engineering Report as key to implementing the AKART recommendation is to clean, enlarge, and line Lagoon #3. The 1998 Addendum proposed to enlarge Lagoon #3 to approximately 47 million gallons. This additional volume was calculated to satisfy storage requirements for projected runoff from a 25-year, 24-hour storm without overflowing the lagoon, based on pumping approximately 4 mgd from the IWTP to King County.

As the preliminary design of the lagoon progressed, an alternative was explored for enlarging the lagoon to the maximum practical storage capacity possible on the existing site. This option would provide additional operational flexibility and accommodate increased runoff from airport expansions. Design criteria and other pertinent documentation regarding Lagoon #3 are presented in the *IWS Lagoon #3 Upgrade Final Design Report* (February 2000).

Design of enlarged Lagoon #3 was completed and the contract bid in 2000. Excavation for the enlarged lagoon began in June 2000. Construction is expected to require three summer seasons, with completion scheduled for the fall of 2002. The completed lagoon now has a total storage capacity of 76 million gallons. This additional storage volume will allow the IWTP to operate at rates between 2 and 3 mgd without overflowing the lagoon. Operating at lower rates will allow flexibility when effluent is pumped to the King County (KC) South Treatment Plant (STP), thus reducing capacity charges and the potential for surcharging downstream sewers.

Proposed AKART Pipeline and Pump Station: The AKART project includes design and 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 AKART alternative identified in the 1995 Engineering Report, with minor modifications.

Project Schedule: Condition S4 of the Port's current NPDES permit states 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." Because the proposed alignment of the AKART force main was originally identified to be along the utility corridor in the western portion of the proposed Third Runway embankment, the actual date for implementing the AKART recommendation was tied to the completion dates for the embankment and utilities associated with the new runway.

Delays in obtaining a CWA Section 401 Certification and Section 404 permit and subsequent appeals have caused embankment construction to fall behind schedule. As a result, AKART implementation will be delayed beyond the 2004 deadline. Although the Third Runway schedule is subject to change and further delays, it is currently estimated that the AKART pipeline and pump station can be completed in 2006, at the earliest. This anticipated completion date allows several months for commissioning and operational testing of the new AKART system before beginning continuous operation in mid-2007. However, the final July 1, 2007, date is irrespective of the Embankment Project completion date.

Limited available capacity in downstream lines, combined with a desire to minimize capacity charges, will affect operation of the IWS, including the AKART pump station and the IWTP. Issues to be considered include maximum treatment, storage, and pumping capacities, hours of operation, variations in seasonal flow and Biochemical Oxygen Demand (BOD) effluent concentration, and system instrumentation/control logic.

When the 1998 Addendum to the Engineering Report was prepared, it was assumed that at least 4 mgd of treated effluent would be released to the KC STP, primarily at night when sanitary flows are lowest. It was intended that flows be released to the STP year-round, depending on weather conditions. It is now known that 4 mgd of additional flow may restrict the capacity of existing downstream sewers during high volume rainfall events.

Since the 1998 Addendum, the volume of enlarged Lagoon #3 was increased to more than 76 million gallons. The increased storage volume at Lagoon #3 will allow operation of the system at lower pumping rates, thus reducing downstream effects and capacity charges. As currently proposed, effluent will be pumped to the KC STP at rates of 2 to 3 mgd. In addition, effluent flows will be partitioned, released either to the KC STP or to the Puget Sound, depending on effluent BOD concentrations.

The IWTP is currently staffed 24 hours per day, seven days per week during the winter months. Operators occasionally work as boiler room staff during dry periods of the year when the plant is not operating. Maintaining the current staffing should be adequate to meet future treatment needs but will be considered further as operational parameters are defined.

Due to equipment limitations, treatment rates at the plant are not infinitely adjustable. The IWTP has a total of six DAF units. The lowest sustainable flow in the IWTP would result from operation of a single DAF unit (DAF #1) at approximately 250 gpm (0.36 mgd). The operation of all six units concurrently at full capacity would result in a highest sustainable flow of approximately 5,800 gpm (8.4 mgd).

The treatment plant peak flow is currently limited by the capacity of the 18-inch line to the Midway Sewer District's outfall. The maximum flow allowed by the Port's NPDES permit is 7.1 mgd (4,900 gpm). It is proposed that the future pump station and force main be designed to allow future expansion up to the treatment plant's maximum capacity, although the system will normally operate at much lower rates.

The IWTP staff can manually adjust flow rates to the DAFs by modulating the influent butterfly valves on each DAF unit. The process is not instantaneous; the new flow rates do not occur until several minutes after they have been programmed. Effluent storage capacity provided by the new pump station's wet well will help to smooth the plant turndown process.

In the past, during extreme storm conditions, temporary controlled releases of water from Lagoon #3 have been necessary in order to prevent the lagoon from overflowing. The lagoon was originally designed for a 25-year, 7-day storm capacity. Recent airport growth and increased surface area have resulted in overloads on the IWS lagoon storage system during especially severe storms and consecutive storm events. As outlined in the IWTP O&M Manual, current emergency procedures involve close monitoring of the water elevation in Lagoon #3 after Lagoons #1 and #2 are full. As Lagoon #3 approaches one foot of freeboard, a drain line to Des Moines Creek is opened and water is released. Samples of the released water are collected for analysis.

The enlarged Lagoon #3 can contain estimated runoff resulting from an isolated 100-year storm. The Lagoon #3 design provides both an overflow spillway and an emergency decant drain drawing from mid-depth of the lagoon. This drain can be used as an alternative to allowing the lagoon to overflow from the spillway. Maintaining the maximum storage volume possible, by keeping lagoon levels as low as practical at all times, will reduce the probability of lagoon overflows. The Port also proposes to maintain the existing connection to the Midway Sewer District's outfall for disposal of low-BOD IWTP effluent. Pumping only high-BOD effluent to the KC STP, combined with releasing as much as possible low-BOD effluent to Puget Sound via the existing outfall, should avoid overflows or releases to Des Moines Creek.

Lagoons #1 and #2 are currently scheduled to be cleaned in August each year. The preferred cleaning method requires removing each lagoon from service for approximately one week prior to the actual cleaning event. This allows the accumulated sludge to desiccate so that the lagoon can be cleaned by a dry method (sweeping). Each of the two lagoons is typically out of service for approximately one additional week for removing the dried solids. Lagoon #3 receives all IWS flows during this downtime. The expanded Lagoon #3 will likely require two to three weeks of downtime for cleaning during the summer. If a large storm event exceeds the capacity of Lagoons #1 and #2 while Lagoon #3 is being cleaned, cleaning operations will have to be interrupted. However, it is unlikely that Lagoon #3 will require annual cleaning.

The new AKART pipeline and appurtenances will require some routine maintenance. It is anticipated, for example, that a number of air/vacuum valves and blow-off stations will be required along the pipeline, in addition to flow monitoring and control devices. These devices typically require routine inspection and repair, as needed.

Ideally, the Port will be able to secure a permanent minimum available capacity in the KC STP and Val Vue Sewer District systems. This will allow continuous discharge at a predetermined minimum flow rate at all times. Higher flow rates may be contingent upon the absence of storm events and the resulting available capacity in the conveyance system. If a storm occurs concurrent with major deicing activities, the IWTP may have to reduce its discharge rate and provide short-term storage for the collected runoff.

Automatic downstream flow monitoring and feedback control may be required to efficiently operate the IWS treatment/pumping systems. The use of downstream flow/capacity analyzers is proposed to determine when sewers are at capacity and flow must be stored or diverted. Several flow monitoring stations are recommended for accurate system control. A magnetic flow meter at the new effluent pump station could track instantaneous flow and totalize flow readings over a period of time. Magnetic meters installed in the Val Vue Sewer District and KC collection systems would allow for feedback to the pump station if sewer capacity is being exceeded. A modulating valve at the Val Vue Sewer District connection point could be tied into the feedback loop to temporarily reduce flow from the pump station if immediate capacity problems occur. Sufficient wet well storage at the new effluent pump station will help reduce surge and equalize flow if downstream capacity problems occur.

The Port proposes to use in-line BOD analyzers to continuously monitor influent and effluent BOD concentrations. This continuous monitoring would allow plant operators to partition effluent flows — discharging effluent with BOD concentrations greater than 250 mg/L to the new effluent pump station and treated water with lower BOD concentrations through the existing outfall to Puget Sound. An in-line effluent BOD analyzer has been installed and is currently being tested at the IWTP. Identical devices have been successfully used in several airports, including Portland, Oregon, and in the United Kingdom at Heathrow, Gatwick, and Manchester. Using the analyzer to monitor influent and effluent BOD could significantly reduce the total amount of effluent conveyed to the KC STP. Transmission would be limited to higher-BOD effluent, typically resulting from airplane and ground surface deicing/anti-icing events. This plan would allow the effective use of the detention capacity of the IWS and substantially increase operational flexibility. By segregating the higher-strength effluent at the source, this plan would conserve the county's conveyance and treatment capacity, as well as energy resources, for higher-BOD wastes requiring secondary treatment.

The proposed plan would require that the Port would continue to operate under an NDPES permit. The volume of flows to the Puget Sound and to the KC STP will depend on weather conditions, volume of aircraft and ground deicing and anti-icing chemicals (primarily glycols and acetates) used and plant operations. Further testing of the BOD analyzer at the IWTP is planned for the year – 2003-04 deicing season. In addition, historical data has been gathered in an effort to model the system for various operating scenarios and discharge limits. Results of this modeling were reported in Addendum #2 to the Engineering Report.

The existing NPDES permit has given the Port until June 30, 2004, to fully implement its AKART. This deadline was based on the schedules proposed in the 1998 Addendum to the Engineering Report. However, delays in related Port projects, primarily the Third Runway embankment, will affect the location, design, and construction of the AKART pipeline and pump station. Therefore, the AKART project completion date per the existing conditions and completion schedules of projects linked to the AKART pipeline has been revised. The current permit requires completion of the AKART pipeline by June 30, 2007, with interim milestones. The final project completion is irrespective of the Third Runway Embankment Project completion date.

The Port must obtain an Industrial Waste Discharge Permit from King County Department of Natural Resources (KCDNR) in order to discharge flows to the STP. Discussions and exchange of information with KC regarding this issue have been ongoing since 1998. In order to issue the permit, KCDNR requires information about the expected quantity and quality of the effluent discharged to the STP. Information has been provided to KCDNR regarding the particular constituents of interest, based on effluent sampling at the IWTP. A sampling and analysis plan was proposed in a letter to KCDNR of February 14, 2001. The letter included a summary of Discharge Monitoring Report (DMR) data from April 1995 through November 2000, as well as Annual Priority Pollutant Scans from December 1994 through December 2000. This data has recently been updated for KCDNR.

Deicing and Anti-icing

Aircraft deicing and anti-icing is mandated by the Federal Aviation Authority (FAA) to ensure public safety. Deicing means removing ice from the surface of aircraft, airfield, or runway. Anti-icing means measures taken to prevent ice accumulation on the surface of the aircraft, airfield, or runway. Deicing and anti-icing are normally conducted during freezing conditions, although MD-80s and 737's require more frequent deicing. Deicing may be conducted at a gate, on a cargo ramp, or occasionally at airline hangar complexes. All aircraft deicing must occur 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.

The application of aircraft deicers is under the control of the individual airlines. Airlines or ground service companies provide deicing/anti-icing services. During the deicing season, the airline or ground service provider submits monthly deicing/anti-icing reports to the Port.

Currently, the FAA authorizes ethylene glycol-based and propylene glycol-based deicing/anti-icing fluids 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 3 summarizes the aircraft deicing/anti-icing fluid usage (as undiluted product) reported by the Port during the previous permit cycle.

Table 3: Annual Aircraft Deicing/Anti-icing Fluid Usage (Gallons)

	Type I EG	Type I PG	Type IV EG	Type IV PG	Type II PG	TOTAL
Period	Gal	Gal	Gal	Gal	Gal	Gal
4/01--3/02	15,137	117,245	-	8,275	-	140,657
4/00--3/01	1,423	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

The Department's Hazardous Waste and Toxics Reduction Program regulates hazardous waste in Washington State through Chapter 173-303 WAC, the Dangerous Waste Regulations. The Department 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 enough 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 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, the Department certified that waste aircraft deicing fluids containing ethylene glycol generated at STIA are not dangerous wastes on October 20, 1995. This certificate was renewed in October 2000.

Deicing fluids are highly biodegradable and when released into surface water will exert BOD. Measuring the BOD of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is used by bacteria as food. BOD is used to estimate the potential reduction of dissolved oxygen in receiving water after an 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. 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. The IWS final effluent limitations include BOD, which will effectively limit the discharge of deicing/anti-icing fluids.

Potassium acetate, calcium magnesium acetate (CMA), and sodium acetate (NAAC) are used to deice and anti-ice the runways, taxiways, and roadways at the airport. Sand is also applied on the roadways and may be used on the runways and ramps under extreme circumstances. The use of glycols on the runways and taxiways was terminated in 1992, and the use of urea was terminated in 1996. Deicing chemicals applied to runways and taxiways discharge to the SDS. Table 4 summarizes the amount of deicing chemicals applied at STIA during the four previous deicing seasons.

Table 4: Annual Ground Deicing/Anti-icing Usage

Year	Potassium Acetate	Calcium Magnesium Acetate	Sodium Acetate
4/98 – 3/99	27,075 gallons	26,000 pounds	3,800 pounds
4/99 – 3/00	10,450 gallons	18,940 pounds	27,865 pounds
4/00 – 3/01	36,306 gallons	4,351 pounds	785 pounds
4/01 – 3/02	367,813 gallons	2,150 pounds	13,423 pounds

Discharges to Midway Sewer District

Rental Car Wash Blowdown

The car rental agencies use a multi-bay, partial closed-loop vehicle washing system located directly northeast of the main parking garage complex. The car wash facility operates 24 hours per day, seven days per week, and washes approximately 3,100 vehicles per day during peak season. It is estimated that about 80 to 90 percent of the wash water is recycled. The remaining 10 to 20 percent is pumped to the IWS. Blowdown discharge is estimated to range from 2,000 gallons per day (gal/day) to 20,000 gal/day.

Currently, the blowdown from the rental car wash is discharged to the IWTP via the IWS. Soaps and detergents containing surfactants used for vehicle washing are not removed by the existing car wash pretreatment facility, nor are these compounds removed by the IWTP. Because soaps and their surfactants are biodegradable, disposal of the rental car wash blowdown to the STP is preferred.

The blowdown streams from the enclosed wash bays will be removed from the IWS and routed to the sanitary. Surface runoff from areas outside the enclosed wash bays will continue to drain to the IWS.

Boiler Blowdown

The STIA boiler room is located on the bottom level of the parking garage. The boiler is used to heat the airport terminal. The blowdown stream from the boiler has been connected to the sanitary sewer since about 1971. The system is operated manually, with blowdown occurring five days per week at rates ranging from 125 to 2,000 gal/day. The boiler waste stream includes surface and 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.

Makeup water to the boilers is drawn from the city of Seattle supply to the airport. The boiler water is not pretreated prior to makeup to the boiler. Boiler additives are injected to control corrosion and scale, and to disperse precipitates.

Cooling Tower Blowdown

The cooling tower blowdown stream was connected to the sanitary sewer in August 1995. Depending on the season, blowdown from the cooling tower may range from about 2,000 to 25,000 gallons of water per day.

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. A new cooling tower was constructed in 1999. The cooling tower was further expanded in the summer of 2002. The new system includes an automatic blowdown feature. The frequency of blowdown is based on conductivity readings.

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 system. Because biocides are consumed by reaction with biological load and diluted by regulating makeup rates, the ultimate concentrations of additives reaching the blowdown are difficult to predict. In any event, the concentrations of such additives in the blowdown will be much lower than the initial concentration.

Port Equipment Wash Rack

The Port is considering installation of a 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. Also, 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 Equipment Wash Rack will range from about 200 to 1,000 gallons per day. The wash rack blowdown is expected to be of a chemical composition similar to that from the rental car wash.

NPDES Permit Status

The current NPDES permit for this facility was issued on February 20, 1998, and modified on May 29, 2001. That permit placed interim effluent limitations on flow, pH, oil & grease, and total suspended solids (TSS) with final numerical effluent limits for flow and pH. The oil & grease, BOD_5, and TSS were to be determined after completion of the AKART Engineering Report.

Wastewater Characterization

The table below described the Industrial Wastewater Effluent Characterization.

Table 5: Industrial Wastewater (IWS Effluent) Characterization

Parameter	Average Concentration	Concentration Range
Monthly Flow Rate[a, b]	4,930 gpm	---
pH	6.8 std. Units	6.1 - 7.7 std. Units
Oil & Grease	3.7mg/L	2.5 - 11.0 mg/L
TSS	12 mg/L	2 - 46 mg/L
BOD (inhib) [b]	116 mg/L	None Detected - 1100 mg/L
BOD (noninhib) [b]	123 mg/L	None Detected - 1100 mg/L
Ammonia	0.04 mg/L	None Detected - 0.27 mg/L
Ethylene Glycol [b]	8.6 mg/L	1 - 82 mg/L
Propylene Glycol [b]	48.5 mg/L	1 - 199 mg/L
Benzene	1.1 µg/L	0.5 - 3 µg/L
Toluene	11.8 µg/L	0.5 – 37 µg/L
Ethylbenzene	4.2 µg/L	0.5 – 13 µg/L
Total Xylenes	36 µg/L	1 - 111 µg/L

WTPH-D	4.6 mg/L	None Detected – 6.6 mg/L
Phenols	0.04 mg/L	None Detected - 0.14 mg/L
Total Recoverable Copper	0.014 mg/L	None Detected - 0.022 mg/L
Total Recoverable Lead	0.067 mg/L	None Detected - 0.162 mg/L
Total Recoverable Zinc	0.086 mg/L	0.078 - 0.1 mg/L

[a] Flow rate based on capacity of existing trunk line to Midway Sewer District outfall.
[b] Weather-dependent parameters. Temperature and precipitation may vary dramatically from year to year. Flow and deicing-related parameters fluctuate with weather conditions.

B. PROPOSED PERMIT LIMITATIONS FOR THE IWS

Federal and state regulations require that effluent limitations set forth in an NPDES permit must be either technology- or water quality-based. Technology-based limitations are based upon the treatment methods available to treat specific pollutants. Technology-based limitations are set by regulation or developed on a case-by-case basis (40 CFR 125.3, and Chapter 173-220 WAC). Water quality-based limitations are based upon compliance 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 (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992). The more stringent of these two limits must be chosen for each of the parameters of concern. Each of these types of limits is described in more detail below.

The limits in this permit are based in part on information received in the application. The effluent constituents in the application were evaluated on a technology- and water quality-basis. The limits necessary to meet the rules and regulations of the state of Washington were determined and included in this permit. Ecology does not develop effluent limits for all pollutants that may be reported on the application as present in the effluent. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and/or do not have a reasonable potential to cause a water quality violation. Effluent limits are not always developed for pollutants that may be in the discharge but not reported as present in the application. In those circumstances, the permit does not authorize discharge of the non-reported pollutants. Effluent discharge conditions may change from the conditions reported in the permit application. If significant changes occur in any constituent, as described in 40 CFR 122.42(a), the Port is required to notify the Department. In that case, the Port may be in violation of the permit until the permit is modified to reflect additional discharge of pollutants.

Design Criteria

In accordance with WAC 173-220-150 (1)(g), flows or waste loadings shall 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 6: Design Standards for the IWTP

Parameter	Design Quantity
Daily Peak Flow[a]	7.1 MGD
IWTP Hydraulic Capacity	8.3 MGD

[a] Reported Daily Peak Flow is limited by the capacity of existing outfall shared with Midway Sewer District. The hydraulic capacity of the IWTP is 8.3 MGD.

Technology-based Limitations

The technology-based effluent limits for the IWTP are based on the AKART analysis conducted by the Port and approved by the Department in May 2002. The AKART analysis is based on capability and appropriateness of the applicable technology for the quantity and quality of the wastewater generated within the Port's STIA IWS drainage area. The Port shall comply with these limits according to the schedule outlined in the NPDES permit.

Surface Water Quality-based Effluent Limitations

In order to protect existing water quality and preserve the designated beneficial uses of Washington's surface waters, WAC 173-201A-060 states that waste discharge permits shall be conditioned such that the discharge will meet established Surface Water Quality Standards. The Washington State Surface Water Quality Standards (Chapter 173-201A WAC) is a state regulation designed to protect the beneficial uses of the surface waters of the state. Surface water quality-based effluent limitations may be based on an individual waste load allocation (WLA) or on a WLA developed during a basin wide total maximum daily loading study (TMDL).

Numerical Criteria for the Protection of Aquatic Life

"Numerical" water quality criteria are numerical values set forth in the state of Washington's Water Quality Standards for Surface Waters (Chapter 173-201A WAC). They specify the levels of pollutants allowed in a receiving water while remaining protective of aquatic life. Numerical criteria set forth in the Water Quality Standards are used 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 limitations, they must be used in a permit.

Numerical Criteria for the Protection of Human Health

The U.S. EPA has promulgated 91 numeric water quality criteria for the protection of human health that are applicable to Washington State (EPA, 1992). These criteria are designed to protect humans from cancer and other disease and are primarily applicable to fish and shellfish consumption and drinking water from surface waters.

Narrative Criteria

In addition to numerical criteria, "narrative" water quality criteria (WAC 173-201A-030) limit toxic, radioactive, or deleterious material concentrations below those which have the potential to adversely affect characteristic water uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health. Narrative criteria protect the specific beneficial uses of all fresh (WAC 173-201A-130) and marine (WAC 173-201A-140) waters in the state of Washington.

Antidegradation

The state of Washington's Antidegradation Policy requires that discharges into a receiving water shall not further degrade the existing water quality of the water body. In cases where the natural conditions of a receiving water are of lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. Similarly, when the natural conditions of a receiving water are of higher quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. More information on the State Antidegradation Policy can be obtained by referring to WAC 173-201A-070.

The Department has reviewed existing records and is unable to determine if ambient water quality is either higher or lower than the designated classification criteria given in Chapter 173-201A WAC; therefore, the Department will use the designated classification criteria for this water body in the proposed permit. The discharges authorized by this proposed permit should not cause a loss of beneficial uses.

Critical Conditions

Surface water quality-based limits are derived for the waterbody's critical condition, which represents the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or characteristic water body uses.

Mixing Zones

The Water Quality Standards allow the Department to authorize mixing zones around a point of discharge in establishing surface water quality-based effluent limits. Both "acute" and "chronic" mixing zones may be authorized for pollutants that can have a toxic effect on the aquatic environment near the point of discharge. The concentration of pollutants at the boundary of these mixing zones may not exceed the numerical criteria for that type of zone. Mixing zones can only be authorized for discharges that are receiving AKART and in accordance with other mixing zone requirements of WAC 173-201A-100. The National Toxics Rule (EPA, 1992) allows the chronic mixing zone to be used to meet human health criteria.

Description of the Receiving Water

The facility discharges to the Puget Sound, which is designated as a Class AA receiving water in the vicinity of the outfall. Other nearby point source outfalls include Midway Sewer Districts.

The characteristic uses of Class AA waters include water supply (domestic, industrial, agricultural); stock watering; fish migration; fish and shellfish rearing, spawning and harvesting; wildlife habitat; primary contact recreation; sport fishing; boating and aesthetic enjoyment; commerce and navigation [WAC 173-201A-030(1)]. Water quality of this class shall markedly and uniformly exceed the requirements for all or substantially all uses.

Surface Water Quality Criteria

Applicable criteria are defined in Chapter 173-201A WAC for aquatic biota. In addition, U.S. EPA has promulgated human health criteria for toxic pollutants (EPA, 1992). Criteria applicable to discharge from the IWTP are summarized below:

Fecal Coliforms	14 organisms/100 mL maximum geometric mean; not more than 10% of all samples obtained for calculating the geometric mean shall exceed 43 colonies/l00 mL. The Department of Ecology is in the process of modifying this standard to *E. coli* or *Enterococcus* sp.
Dissolved Oxygen	7.0 mg/L minimum
Temperature	13.0^{o} C maximum or 0.3^{o} C incremental increase above background
pH	7.0 to 8.5 standard units
Turbidity	Less than 5 NTU above background turbidity when the background turbidity is 50 NTU or less, or have more than a 10% increase in turbidity when the background turbidity is more than 50 NTU.
Toxics	No toxics in toxic amounts

Consideration of Surface Water Quality-based Limits for Numeric Criteria

Pollutant concentrations in the proposed discharge exceed water quality criteria with technology-based controls, which the Department has determined to be AKART. A mixing zone is authorized in accordance with the geometric configuration, flow restriction, and other restrictions for mixing zones in Chapter 173-201A WAC and are defined as follows:

The dilution factors of effluent to receiving water that occur within these zones have been determined at the critical condition. The applicable dilution factors, described in detail in Appendix C, are:

	Acute	**Chronic**
Aquatic Life	60.1	470:1
Human Health, Carcinogen		470:1
Human Health, Non-carcinogen		470:1

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 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.

The derivation of surface water quality-based limits also takes into account the variability of the pollutant concentrations in both the effluent and the receiving water.

The impacts of dissolved oxygen deficiency, temperature, pH, fecal coliform, chlorine, ammonia, metals, and other toxics were determined as shown below, using the dilution factors at critical conditions described above.

<u>BOD_5</u>--This discharge with technology-based limitations results in a small amount of BOD loading relative to the large amount of dilution occurring in the receiving water at critical conditions. Technology-based limitations will be protective of dissolved oxygen criteria in the receiving water.

<u>Temperature</u>--Under critical conditions there is no predicted violation of the Water Quality Standards for Surface Waters. Therefore, no effluent limitations for temperature were placed in the proposed permit.

<u>pH</u>--Because of the high buffering capacity of marine water, compliance with the technology-based limits of 6 to 9 standard units will assure compliance with the Water Quality Standards for Surface Waters.

<u>Turbidity</u>--The impact of turbidity was evaluated based on the range of turbidity in the effluent and turbidity of the receiving water. Due to the large degree of dilution, it was determined that the turbidity criteria would not be violated outside the designated mixing zone.

<u>Toxic Pollutants--</u>Federal regulations (40 CFR 122.44) require NPDES permits to contain effluent limits for toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. This process occurs concurrently with the derivation of technology-based effluent limits. Facilities with technology-based effluent limits defined in regulation are not exempted from meeting the Water Quality Standards for Surface Waters or from having surface water quality-based effluent limits. A reasonable potential analysis (see Appendix C) was conducted on parameters that were identified under Table 1 - Wastewater Characterization and for those identified under WAC 173-201A to determine whether or not effluent limitations would be required in this permit.

The determination of the reasonable potential for these parameters to exceed the water quality criteria was evaluated with procedures given in EPA (Appendix C) at the critical condition. The parameters used in the critical condition modeling are as follows: acute dilution factor 60, chronic dilution factor 470.

A determination of reasonable potential resulted in no reasonable potential. However, the permit requires the Permittee to continue sampling and monitoring for these parameters and report them to the Department. This information may result in a permit modification or limits in the next renewal.

Whole Effluent Toxicity

The Water Quality Standards for Surface Waters require that the effluent not cause toxic effects in the receiving waters. Many toxic pollutants cannot be detected by commonly available detection methods. However, toxicity can be measured directly by exposing living organisms to the wastewater in laboratory tests and measuring the response of the organisms. Toxicity tests measure the aggregate toxicity of the whole effluent, and therefore 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 are providing an indication of the potential lethal effect of the effluent to organisms in the receiving environment.

Chronic toxicity tests measure various sub lethal toxic responses such as retarded growth or reduced reproduction. Chronic toxicity tests often involve either a complete life cycle test of an organism with an extremely short life cycle or a partial life cycle test on a critical stage of one of a test organism’s life cycles. Organism survival is also measured in some chronic toxicity tests.

In accordance with WAC 173-205-040, the Port’s effluent has been determined to have the potential to contain toxic chemicals. The proposed permit contains requirements for whole effluent toxicity testing as authorized by RCW 90.48.520 and 40 CFR 122.44 and in accordance with procedures in Chapter 173-205 WAC. The proposed permit requires the Port to conduct toxicity testing for one year in order to characterize both the acute and chronic toxicity of the effluent.

In order to meet permit limits, those portions of the IWTP effluent containing elevated BOD concentrations will be diverted to the KC STP. Diversion of the elevated BOD wastestream will effectively reduce the potential for the toxicity of wastewater being discharged to the Puget Sound. Therefore, acute and chronic WET testing will be required after AKART has been implemented.

If acute or chronic toxicity is measured during effluent characterization at levels that, in accordance with WAC 173-205-050(2)(a), have a reasonable potential to cause receiving water toxicity, then a limit on the acute or chronic toxicity set forth in the permit will become effective. The permit requires the Port to conduct WET testing in order to monitor for compliance with either an acute toxicity limit, a chronic toxicity limit, or both an acute and a chronic toxicity limit. The proposed permit also specifies the procedures the Port must use to come back into compliance if the limits are exceeded.

Accredited WET testing laboratories have the proper WET testing protocols, data requirements, and reporting format. Accredited laboratories are knowledgeable about WET testing and capable of calculating an NOEC, LC_{50}, EC_{50}, IC_{25}, etc. All accredited labs have been provided the most recent version of the Department of Ecology Publication # WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria,* which is referenced in the permit. Any Permittee interested in receiving a copy of this publication may call the Ecology Publications Distribution Center at 360-407-7472 for a copy. Ecology recommends that Permittees send a copy of the acute or chronic toxicity sections(s) of their permits to their laboratory of choice.

When the WET tests during effluent characterization indicate that no reasonable potential exists to cause receiving water toxicity, the Port will not be given WET limits and will only be required to retest the effluent prior to application for permit renewal in order to demonstrate that toxicity has not increased in the effluent.

If the Port makes process or material changes which, in the Department's opinion, results in an increased potential for effluent toxicity, then the Department may require additional effluent characterization in a regulatory order, by permit modification, or in the permit renewal. Toxicity is assumed to have increased if WET testing conducted for submission with a permit application fails to meet the performance standards in WAC 173-205-020, "whole effluent toxicity performance standard." The Port may demonstrate to the Department that changes have not increased effluent toxicity by performing additional WET testing after the time the process or material changes have been made.

In accordance with WAC 173-205-060(5), the proposed permit requires the Port to further characterize effluent toxicity to fish using a WET test method meeting the requirements of WAC 173-205-050(1)(d). WET testing will commence after AKART is implemented. The effluent characterization conducted during the previous permit term used an obsolete fish acute toxicity test, which may not have been as sensitive as a 96-hour acute toxicity test using fish and the most recent EPA methodology. In accordance with WAC 173-205-060(5), the proposed permit requires another effluent characterization for toxicity.

The acute toxicity limit is set relative to the zone of acute criteria exceedance (acute mixing zone) established in accordance with WAC 173-201A-l00. The acute critical effluent concentration (ACEC) is the concentration of effluent existing at the boundary of the acute mixing zone during critical conditions. Because no acute mixing zone has been authorized, the ACEC equals one hundred percent effluent.

Monitoring for compliance with an acute toxicity limit is accomplished by conducting an acute toxicity test using a sample of effluent diluted to equal the ACEC and comparing test organism survival in the ACEC to survival in nontoxic control water. The Port is in compliance with the acute toxicity limit if there is no statistically significant difference in test organism survival between the ACEC and the control.

The chronic toxicity limit is set relative to the mixing zone established in accordance with WAC 173-201A-100. The chronic critical effluent concentration (CCEC) is the concentration of effluent existing at the boundary of the mixing zone during critical conditions. If no mixing zone has been authorized, the CCEC equals one hundred percent effluent.

Monitoring for compliance with a chronic toxicity limit is accomplished by conducting a chronic toxicity test using a sample of effluent diluted to equal the CCEC and comparing test organism response in the CCEC to organism response in nontoxic control water. The Port is in compliance with the chronic toxicity limit if there is no statistically significant difference in test organism response between the CCEC and the control.

Human Health

Washington's Water Quality Standards now include 91 numeric health-based criteria that must be considered in NPDES permits. These criteria were promulgated for the state by the U.S. EPA in its National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992).

The Department has determined that the effluent is likely to have chemicals of concern for human health. The discharger's high priority status is based on knowledge of data or process information indicating regulated chemicals occur in the discharge.

A determination of the discharge's potential to cause an exceedance of the Water Quality Standards was conducted as required by 40 CFR 122.44(d). The reasonable potential determination was evaluated with procedures given in the Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001) and the Department's *Permit Writer's Manual* (Ecology Publication 92-109, July 1994). The determination indicated that the discharge has no reasonable potential to cause a violation of Water Quality Standards, thus an effluent limit is not warranted.

Sediment Quality

The Department has promulgated aquatic sediment standards (Chapter 173-204 WAC) to protect aquatic biota and human health. These standards state that the Department may require Permittees to evaluate the potential for the discharge to cause a violation of applicable standards (WAC 173-204-400).

Under the current and previous NPDES permit, the Port was required to monitor the sediment around the Puget Sound outfall. Both were completed and submitted to Ecology for review and approval.

However, Department has been unable to confirm and approve this report. Therefore, presence of potential for this discharge to cause a violation of Sediment Quality Standards is yet to be determined. If the Department determines in the future that there is a potential for violation of the Sediment Quality Standards, an order will be issued to require the Port to demonstrate that either the point of discharge is not an area of deposition or, if the point of discharge is a depositional area, that there is not an accumulation of toxics in the sediments.

Ground Water Quality Limitations

The Department has promulgated Ground Water Quality Standards (Chapter 173-200 WAC) to protect beneficial uses of ground water. Permits issued by the Department shall be conditioned in such a manner so as not to allow violations of those standards (WAC 173-200-100).

The Port has no discharge of industrial wastewater to ground and therefore no limitations are required based on potential effects to ground water. Construction and non-construction stormwater not associated with industrial activities can be discharged to groundwater.

<u>Comparison of New Effluent Limits With the Existing Permit</u>

1. Interim and Final Effluent Limitations - Industrial Wastewater

INTERIM EFFLUENT LIMITATIONS FOR EXISTING PERMIT: OUTFALL 001		
Parameter	**Average Monthly**	**Maximum Daily**
Flow	---	4,800 gpm[d]
pH	Within the range of 6.0 to 9.0 Standard Units	
Oil and Grease	8 mg/L	15 mg/L
Total Suspended Solids (TSS)	21 mg/L	33 mg/L
FINAL EFFLUENT LIMITATIONS FOR EXISTING PERMIT: OUTFALL 001		
Parameter	**Average Monthly**	**Maximum Daily**
Flow		2,500 gpm
pH	Within the range of 6.0 to 9.0 Standard Units	
Oil and Grease	TBD	TBD
TSS	TBD	TBD
Biochemical Oxygen Demand (BOD_5)	TBD	TBD
THE NEW EFFLUENT LIMITS		
Parameter	**Average Monthly**	**Maximum Daily**
Flow	N/A	8.3 MGD
BOD[a]	30 mg/L	250 mg/L
TSS	21 mg/L	33 mg/L
Oil and Grease	8 mg/L	15 mg/L
pH	Daily minimum is equal to or greater than 6 and the daily maximum is less than 9.	
Toxicity Testing	See Section S3	
[a] BOD_5 limits will be applicable one year after successful implementation and completion of AKART. The sampling and reporting shall begin effective immediately after issuance of this permit, i.e., July 1, 2007.		

<u>Industrial Discharges to the Sanitary Sewer System</u>

Boiler blowdown, cooling tower blowdown, rental car wash blowdown, and equipment wash rack blowdown connect and discharge to the Midway Sewer District sanitary sewer system at separate points. During the period beginning on the date of issuance and lasting through the expiration date of this permit, the Port is authorized to discharge boiler blowdown, cooling tower blowdown, rental car wash blowdown, and equipment wash rack blowdown to the Midway Sewer District sanitary sewer system. Each blowdown wastestream will be sampled separately. Each wastestream will be separately subject to the following limitations:

EXISTING EFFLUENT LIMITATIONS: Industrial Waste Discharges to Sanitary Sewer		
Parameter	**Maximum Average Monthly**	**Daily Maximum Flow**
Flow - GPD		
Boiler Blow Down	500	2,000
Cooling Tower Blow Down	16,000	200,000
Rental Car Wash Blow Down	20,000	20,000
Equipment Wash Rack Blow Down	1,000	1,000
Oil and Grease – mg/L	----	100 mg/L

THE NEW EFFLUENT LIMITATIONS: Sanitary Sewer Discharge		
Parameter	**Maximum Average Monthly**	**Daily Maximum Flow**
Flow - GPD		
Boiler Blow Down	500	2,500
Cooling Tower Blow Down	16,000	250,000
Rental Carwash Blow Down	20,000	25,000
Equipment Wash Rack Blow Down	2,000	2,000
Oil and Grease – mg/L (Cooling Tower, Rental Car Wash, and Equipment Wash Rack)	N/A	100
pH (Cooling Tower, Rental Car Wash, and Equipment Wash Rack)	Daily minimum is equal to or greater than 6, and the daily maximum is less than 9.	

C. MONITORING REQUIREMENTS

Monitoring, recording, and reporting are required (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and the effluent limitations are being achieved.

The monitoring schedule is detailed in the proposed permit under Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring.

Lab Accreditation

The permit requires all monitoring data to be prepared by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, *Accreditation of Environmental Laboratories.*

D. OTHER PERMIT CONDITIONS

Reporting and Recordkeeping

The conditions of S3 are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-220-210).

Non-routine and Unanticipated Discharges

Occasionally, this facility may generate wastewater, which is not characterized in the permit application because it is not a routine discharge and was not anticipated at the time of application. These typically are waters used to pressure-test storage tanks or fire water systems or leaks from drinking water systems. These are typically clean wastewaters but may be contaminated with pollutants. The permit contains an authorization for non-routine and unanticipated discharges. The permit requires a characterization of these wastewaters for pollutants and examination of the opportunities for reuse. Depending on the nature and extent of pollutants in this wastewater and opportunities for reuse, Ecology may authorize a direct discharge via the process wastewater outfall or through a stormwater outfall for clean water, require the wastewater to be placed through the facilities wastewater treatment process, or require the water to be reused.

Effluent Mixing Study

The Department has estimated that the amount of mixing of the discharge within the authorized mixing zone to determine the potential for violations of the Water Quality Standards for Surface Waters (Chapter 173-201A WAC). Mixing will be measured or modeled under conditions specified in the permit to assess whether assumptions made about dilution will protect the receiving water quality outside the allotted dilution zone boundary.

Projects or activities that reduce the quantity or toxicity of the IWS effluent, such as the diversion of high-BOD flows to the KC STP sewage treatment plant, do not constitute a change and thus do not require a new Mixing Zone Study.

Outfall Evaluation

The Port will not be required to conduct an outfall inspection and submit a report detailing the findings of that inspection. Although the Port discharges to the outfall, the outfall is owned and operated by the Midway Sewer District. Inspection of the outfall is the responsibility of the Midway Sewer District.

Treatment System Operating Plan

In accordance with state and federal regulations, the Port is required to take all reasonable steps to properly operate and maintain the treatment system [40 CFR 122.4 1(e)] and WAC 173-220-150 (1)(g). An *Operation and Maintenance Manual* was submitted as required by state regulation for the construction of wastewater treatment facilities (WAC 173-240-150). It has been determined that the implementation of the procedures in the Treatment System Operating Plan is a reasonable measure to ensure compliance with the terms and limitations in the permit.

Compliance Schedule – IWS

The proposed permit under Condition S10, Part I, has required the Permittee to comply with the following Compliance Schedule to comply with the AKART provisions of this permit. The Port of Seattle shall comply with the following schedule to comply with the AKART determination. Once the infrastructure is built, the discharge shall be limited to maximum daily BOD_5 discharge of 250 mg/L with the monthly average of 30 mg/L. These limits are based on best professional judgment of the permit writer. Any discharge in excess of 250 mg/L shall be discharge to the King County South Treatment Plant (Renton) for further processing and discharge to Puget Sound in compliance with the King County NPDES permit.

A.	Design Completion	July 1, 2003
B.	Construction Begins	February 1, 2004
C.	Construction Complete	December 31, 2006
D.	Start Up Testing	January 1, 2007 to June 30, 2007
E.	Compliance Deadline	July 1, 2007

General Conditions

General Conditions are based directly on state and federal law and regulations and have been standardized for all individual industrial NPDES permits issued by the Department.

PART II AND III.
STORMWATER DISCHARGES AND CONSTRUCTION RUNOFF

SUMMARY

This section portion of the Fact Sheet applies to stormwater discharges associated with industrial activity at STIA. The storm drainage system (SDS) at STIA drains about 1.5 square miles of currently permitted drainage area and the 14 corresponding outfalls associated with the airport. Less than one half of this area is impervious, with the remainder being pervious (e.g. landscaped or fallow open spaces). About 17% (165 acres) of this area drains to Miller Creek, where it represents less than 2.5% of Miller Creek's watershed. The remaining permitted outfall drainage area, about 83% of the total, drains to Des Moines Creek representing about 20% of the watershed. Less than 1% of the total area drains to Gilliam Creek via the city of SeaTac drainage system. Other municipalities and urban areas comprise a large fraction of each creek's watershed. Miller Creek and Des Moines Creek flow several river miles southeast to Puget Sound. Gilliam Creek drains to the Green River.

The currently permitted drainage to Miller Creek discharges via four outfalls that, in turn, drain to the Lake Reba Stormwater Facility (LRSF) prior to entering Miller Creek. The STIA drainage to Des Moines Creek discharges via five outfalls that, in turn, drain to the Northwest Ponds facility prior to entering the west branch of the creek. Two other outfalls (SDE4 and SDS1) drain to the east branch of Des Moines Creek along with considerable drainage from the city of SeaTac. These east branch flows receive detention provided by the Tyee detention pond. A single outfall (SDS4) drains directly to Des Moines Creek near the confluence of the east and west branches.

The Comprehensive Stormwater Master Plan (CSMP) contains stormwater management provisions that address future development at STIA, including the Third Runway and other projects of the Master Plan Update (MPU). The CSMP covers flow control and water quality BMPs for the new and retrofitted development.

Both the EPA and Ecology have adopted a presumptive approach with regard to compliance with Water Quality Standards. The presumptive approach means that the Permittee shall implement appropriate best management practices (BMP) and Stormwater Pollution Prevention Plans (SWPPP) as the key strategies to assure compliance with the standards. BMPs in this case are all known available and reasonable technology (AKART). The Port has not completed the AKART analysis for these outfalls; therefore, compliance with Water Quality Standards cannot be assured. However, Ecology has elected to use its best professional judgment to assign appropriate and achievable effluent limits to assure adequate pollution prevention from each outfall. These limits are based on the EPA Stormwater Multi-Sector General Permit for Industrial Activities (MSGP). Therefore, outfalls discharging directly to the receiving water will have to comply with these limits as effluent limits per specified compliance schedule. Outfalls discharging to the regional detention facilities must utilize these limits as specified under MSGP as a design basis to design appropriate BMPs/enhanced BMPs per specified compliance schedule.

A. BACKGROUND INFORMATION

SDS Overview

The SDS consists of over 33 miles of pipes, over one thousand manholes and catch basins, several lift stations and multiple detention facilities. The SDS collects stormwater water runoff from fourteen drainage basins (permitted under existing permit) totaling over 900 acres. The SDS drains principally to Des Moines Creek (about 83%) and Miller Creek (17%), both of which flow several river miles southwest to Puget Sound. Several small areas drain east to a city of SeaTac storm drain system, which in turn drains to Gilliam Creek. The airport has operated a storm drainage system since commissioning in the 1940s with much of the current drainage infrastructure designed and constructed prior to 1969. This Fact Sheet further outlines the SDS below.

The three northernmost basins (SDN1, SDN3, and SDN4) drain to the Lake Reba Stormwater Facility, which in turn drains to Miller Creek just upstream from the Miller Creek Regional Detention Facility (an instream structure). The former SDN2 subbasin no longer drains to Miller Creek because of two IWS pump stations that divert stormwater flows to the IWS. These two pumps are important BMPs that handle flows up to the peak flow rate of the 6-month, 24-hour storm event from the SDN2 subbasin. The SDN1 subbasin is not associated with industrial activities. Collectively, these three outfalls drain about 114 acres of associated STIA area, which represents about 2.5% of the entire Miller Creek Watershed. Future development at STIA will include new drainage to Miller Creek (Third Runway) and to Walker Creek, a major tributary to Miller Creek.

At the south end of the airport, eight SDS subbasins drain to Des Moines Creek. The in-stream Tyee detention facility (live storage only) serves flows from SDE4, SDS1, and other drainage (Port and city of SeaTac). Runoff from subbasins SDS2, SDS3, SDS5, SDS6, and SDS7 (plus city of SeaTac drainage) flows through the Northwest Ponds prior to entering the west branch of Des Moines Creek. The Port is participating with the Des Moines Creek Basin Planning Committee which has proposed an expansion and redevelopment of the NW Ponds to serve as a regional detention facility (RDF). Outfall SDS4 discharges in the vicinity of the confluence of the east and west branches of Des Moines Creek. Collectively, these eight outfalls drain about 800 acres of associated STIA area, which represents about 20% of the Des Moines Creek watershed. There are no industrial activities currently occurring in subbasins SDS1, SDS2, SDS5, and SDS6.

The Port's Engineering Yard and the Taxi Yard outfalls drain east to the city of SeaTac's storm drain system, which in turn discharges to Gilliam Creek, a tributary of the Green River. There are no industrial activities currently occurring in the Taxi Yard.

SDS Subbasins

As outlined above, STIA stormwater discharges through a variety of outfalls and corresponding drainage areas. These areas have changed over the years with the implementation of various capital improvement projects and drainage modifications. Table 3 summarizes the approximate drainage areas associated with each subbasin and corresponding outfall. The corresponding watersheds for the receiving streams are described later in this Fact Sheet.

The NPDES permit refers to outfalls by number; however, the Port refers to subbasins and their outfalls by location names. The Port codes STIA storm drainage subbasin names according to location, for example, "SDS1" means "storm drain south number 1." In addition, the Port identifies all manholes according to an alphanumeric scheme, some of which are referred to in this report. For convenience and consistency, many of these locations were renamed and renumbered in 1999, though physical monitoring locations have not been moved.

STIA stormwater subbasins can be conveniently categorized according to the dominant activities. These categories group subbasins together that have similar land use and other characteristics. These categories include "landside," "airfield," and other non-specific, low-activity areas. Previous reports showed that concentrations of TPH, TSS, and other constituents were different for the landside and airfield categories (POS 1996a, 1997a.). Note that passenger vehicle operations are absent from the airfield drainage subbasins while aircraft operations are absent from the landside subbasins (except for SDE4 where aircraft taxiways comprise about 11% of the total SDE4 drainage area).

Outfalls SDS3, SDS4, SDN3, and SDN4 drain the principal subbasins of the airfield. These four outfalls drain a total of 626 acres (45% impervious) of the Aircraft Movement Area (AMA), which includes the airport runways, taxiways, and other open space of the "airfield." These four airfield subbasins represent approximately 65 percent of the total STIA storm drainage area. Previously an airfield outfall, SDN2 now discharges to the IWS via two pump stations constructed as BMPs in 1997.

Four subbasins (SDE4, SDN1, EY, and TY) compose the 165 acres (about two-thirds impervious) of "landside" areas of the airport, primarily draining public roads, parking, passenger vehicle areas, and rooftops. SDE4 alone comprises about 149 acres, or 90% of this total landside area drainage. Although 11% of the total drainage area of SDE4 drains portions of Taxiways A and B, the "landside" designation is appropriate because roads, parking, and other vehicle areas on the landside of the airport are the predominant impervious areas of SDE4.

Table 7. Nomenclature for Outfalls listed in NPDES Permit Condition S2B

Outfall #	Port Name	General Category	Creek	Proximity to Receiving Water
002	SDE4	Landside	Des Moines	Combines with Bow Lake & city of Sea-Tac flows before daylighting in East Branch
003	SDS1	None	Des Moines	Direct outfall to East Branch
004	SDS2	None	Des Moines	Flows through swale, NW Ponds then into West Branch
005	SDS3	Airfield	Des Moines	Flows through swale, NW Ponds then into West Branch
006	SDN1	Landside	Miller	Flows through drainage system and Lake Reba Stormwater Facility
007	SDN2	Drains to IWS[1]	Miller	Same as for SDN1
008	SDN3	Airfield	Miller	Same as for SDN1
009	SDS4	Airfield	Des Moines	Direct outfall near confluence of East and West Branches
010	SDS7[2]	None	Des Moines	Combines with city of Sea-Tac streets commercial area, via swale & NW Ponds
011	SDN4	Airfield	Miller	Same as for SDN1
012	EY	Landside	Gilliam	Via city of Sea-Tac drains to stream
013	TY	Landside	Gilliam	Via city of Sea-Tac drains to stream
014	SDS6[2]	None	Des Moines	Same as SDS7
015	SDS5[2]	None	Des Moines	Same as SDS7

Table notes:

1. Two pump stations divert all runoff from the former SDN2 subbasin to the IWS. Discharges to SDN2 only occur when rainfall intensity exceeds the 0.20 inches per hour design for these pump stations. These two pump stations were constructed in 1997 as SWPPP BMPs.
2. Outfalls 010, 014, and 015 were previously named “SDW3,” “B” and “D”, respectively.

Several stormwater BMPs undertaken in 1996-97 and 2000 have removed all known ramp areas from SDS1. Prior to these drainage reroutes, the only “industrial activity” in SDS1 was from a total of about 2.5 acres that was associated with aircraft ramp areas near the B-Concourse and South Satellite. Other BMPs have disconnected ramp areas that occasionally drained to SDS1 when intense rainfall surcharged certain structures. As a result, SDS1 now drains only three hangar rooftops (about eight acres), employee parking (about five acres), and no ramp areas. The added employee parking areas for the new Northwest Airlines hangar have detention vaults for the stormwater runoff. In addition, expanded drainage from South 188th Street was added to SDS1 in 1998-99, adding about one acre of offsite (non-Port) area to the total SDS1 area.[1] Four other outfalls (SDS2, SDS5, SDS6 and SDS7) drain a total of about 110 acres of mostly open spaces (about 11% impervious) in the southwestern portion of STIA.

[1] In 1998-99, the city of SeaTac added drainage area to SDS1 through the widening of about 800 linear feet of South 188th Street, adding curb, gutter, piping, and a number of storm drain inlets. This section of roadway previously drained sheetwise off the shoulder to grassed ditches. Prior to these improvements, only one inlet drained a much smaller portion of this public roadway that is outside the Port’s jurisdiction.

Table 8. Summary of SDS Subbasin Drainage Area Estimates

SUBBASIN	PERVIOUS AREA (acres)	IMPERVIOUS AREA (acres)	TOTAL AREA (acres)
SDN-1[(a)]	3.3	10.2	13.5
SDN-2[(b)]	0.0[(b)]	0.0[(b)]	0.0[(b)]
SDN-3	42.9	27.0	69.9
SDN-4	22.6	7.7	30.2
Total Miller Creek	68.8	44.9	113.7
SDE-4[(c)]	51.7	97.4	149.1
SDS-1	1.5	14.4	15.9
SDS-2	12.2	1.0	13.2
SDS-3	238.1	224.3	462.3
SDS-4	42.6	20.8	63.4
SDS-5	30.7	3.2	33.9
SDS-6	48.2	1.4	49.6
SDS-7	7.0	7.0	14.0
Total Des Moines Creek	432.0	369.4	801.4
Engineering Yard	0.3	1.2	1.5
Taxi Yard	0.0	0.8	0.8
Total City of SeaTac Storm Drains	0.3	2.0	2.3
Total - SDS	**501.1**	**416.3**	**917.4**

Table notes:
(a) Additional drainage from Port and non-Port areas enters the SDN1 system below the current monitoring point prior to daylighting at the ultimate outfall upgradient from the LRSF.
(b) Drainage from the 46.7 acres of SDN2 is diverted to the IWS by two pump stations. Flows exceeding peak design rates for these pumps would discharge to SDN2.
(c) Approximately 12.7 acres of former SDE4 in the North Satellite area is diverted to the IWS by two pump stations. Flows exceeding peak design rates for these pumps would discharge to SDE4.

Infrastructure

Tables 9 and 10 below summarize the pump stations and detention facilities that serve the SDS. These assets are maintained on a regular basis as described in the Port's SWPPP. Much of the SDS infrastructure was constructed prior to 1969 and has been updated with stormwater management facilities in the recent past. Each of the pump stations listed in Table 9 functions as a key source control BMP by diverting runoff to the IWS from various drainage areas formerly drained by the SDS. Previous monitoring (per permit requirements) has indicated that the two pump stations, that together serve the entire SDN2 drainage, effectively divert design flows to the IWS. Other elements of the SDS infrastructure include the numerous catch basins, drain inlets, oil-water separators, and the 33 miles of associated piping.

Table 9. Stormwater to IWS Pump Stations

Location	Date Operable	Drainage Area (ac)	Design Flow (gpm)	Drainage Areas
N. Cargo (SDN2)	1997	35.6	2750	N. Cargo ramps, taxiways A and B (formerly SDS subbasin SDN2)
N. Snowmelt (SDN2)	1997	6.6	750	N. Cargo ramps, taxiways A and B (formerly SDS subbasin SDN2)
N. Satellite (SDE4)	1996	13.8	2150	N. Satellite ramp vicinity (formerly SDS subbasin SDE4)
Central Snowmelt (SDE4)	1997	0.75	750	Central snowmelt/snow storage area (formerly SDS subbasin SDE4)
South Snowmelt	1997	0.3	750	South snowmelt/snow storage area

Table 10. Stormwater Detention Facilities Serving STIA SDS and Other Entities

Facility	Creek	Location	Year Built	Drainage Areas	Est. Live Storage (ac-ft)
Lake Reba (LRSF)	Miller	Offline, between SR518 and airfield	1973	SDN1-SDN4, NEPL, SR518, city of SeaTac, MPU	15.8
Miller Cr Detention Facility (MCDF)	Miller	In-stream near LRSF	1992	LRSF, cities of SeaTac, Burien, MPU	68
NEPL vault	Miller	NEPL, west end	1997	NEPL	4.0
Food Service pond A (currently Lufthansa)	Miller	N. end of facility	1989	Roof and parking lot	0.06
Food Service pond B (currently Flying Foods)	Miller	N. end of facility	1987	Roof and parking lot	0.05
S. 160th Parking Lot	Gilliam Creek	S. 160th and SR99	1990	Parking lot (to city of SeaTac drains)	1.3
NW Ponds	Des Moines	West branch of creek	pre-1970	SDS2, SDS3, SDS5, SDS6, SDS7, city of SeaTac, MPU	16.9
Tyee Regional Pond	Des Moines	East branch of creek	1988	SDE4, SDS1, SEPL, city of SeaTac, MPU	18.5
Taxiway vault	Des Moines	Near SDS3 outfall	1998	SDS3 (airfield)	5.5
SEPL ponds	Des Moines	East branch of creek	1985-1986	Parking lots	0.7 total
Parking infiltration (currently Dog Fox)	Des Moines	SDE4	1989	Roof and parking lot (300’ x 30’ infiltration pipes)	0.06
Starling Road	Des Moines	SDS7	1993	Perimeter road and open area	
				Total	**>115 ac-ft**

Description of the Receiving Waters

There are several different receiving waters for STIA stormwater discharges: Miller Creek, Walker Creek, Des Moines Creek, and Gilliam Creek (via city of SeaTac storm drains). The Port's stormwater may be discharged through an enclosed (piped) stormwater drainage system, a stormwater conveyance system such as a roadside ditch, through a detention facility (with wet pool or dry pool), or directly to a creek. Typically, the discharge will indirectly enter waters classified as Class AA with beneficial uses that include water supply, fish/shellfish, wildlife habitat, and recreation. Affected receiving waters include the creeks and do not include the wet pools of the Lake Reba Stormwater Facility, the Northwest Ponds complex, or other constructed stormwater detention facilities that may or may not contain dead storage. In most instances, the stormwater discharges at STIA enter a collection system and commingle with other sources of stormwater before ultimately discharging to the receiving water. In these urbanized locations, the receiving waters are small creeks subject to a significant number of other municipal and industrial stormwater discharges from entities other than the Port (cities of SeaTac, Burien, Des Moines, and Normandy Park, and WSDOT).

Miller Creek

Miller Creek, a perennial watercourse that drains to Puget Sound, has headwaters originating at Arbor, Burien, and Tub Lakes (see Figure 4). STIA contributes drainage to the creek through the Lake Reba Stormwater Management Facility (LRSF). Walker Creek, a tributary to Miller Creek, begins in the wetlands west of the airport and combines with Miller Creek near the mouth at Puget Sound. The Miller Creek watershed encompasses an area of about 8.1 square miles (5,200 acres). The airport covers approximately 0.4 square miles (5 percent) of the Miller Creek watershed. Approximately 114 acres (less than 2.5 percent of the Miller Creek watershed) of the currently permitted drainage areas on airport property drains through four stormwater outfalls included in this permit (Outfalls 006, 007, 008, and 011) that drain through the stormwater system to the LRSF, which in turn discharges to Miller Creek. Miller Creek's watershed includes portions of Normandy Park, and the cities of SeaTac and Burien. Approximately 62 percent of the land use in the Miller Creek Basin is residential, 14 percent is commercial (non-airport), 5 percent is airport, and the remainder is open space (parks, cemeteries, or forest/wetlands).

The Miller Creek watershed is located on a plateau lying between Puget Sound and the Duwamish Valley. Miller Creek flows off the plateau, through a ravine, and toward the southwest. Materials along the sides of the ravine are of glacial origin, primarily non-cohesive, erodible, and sandy till. Underlying these units is a glacio-lacustrine clay. The clay is significantly more erosion resistant then the non-cohesive materials on the walls of the ravine. Bank erosion and landsliding occurs along this ravine, which terminates in an alluvial valley beginning downstream of First Avenue South.

Urbanization has increased flood peaks and volumes along Miller Creek. The increased runoff has been attributed to increases in mass wasting; bank erosion; bed scour; sedimentation; degradation of fish habitat and water quality; and flooding along the stream. Detention of stormwater runoff is the primary recommended mitigation action. The FRSF was constructed by the Port in 1973. The in-stream Miller Creek Regional Detention Facility (where the maximum backwaters may inundate the LRSF) and the 1st Avenue South Regional Detention Facility were constructed by King County in 1992 as partial mitigation of increased flows attributed to watershed development.

Des Moines Creek

The Des Moines Creek watershed covers 5.8 square miles (3,712 acres) near the center of the Seattle-Tacoma metropolitan area, including portions of King County and the cities of Des Moines, Normandy Park, and SeaTac (see Figure 5). Des Moines Creek is approximately 3.5 miles long and flows into Puget Sound at Des Moines Creek Beach Park. The creek originates on a low gradient plateau and descends steeply though a ravine shortly before it empties into Puget Sound.

The watershed contains two major tributaries: the East Fork and West Fork of Des Moines Creek and two major water bodies, Bow Lake and the Northwest Ponds. The East Fork and the West Fork converge on the Tyee Golf Course. The East Fork flows out of Bow Lake, for the first half mile through a series of subsurface pipes, until it surfaces at approximately 26th Avenue South. An in-stream stormwater detention facility with no dead storage (no wet pool), the Tyee Pond was constructed by King County in the East Fork on the Tyee Golf Course in 1989. The West Fork begins below the outlet of the Northwest Ponds (NWP) complex located at the western edge of the Tyee Golf Course. The stormwater runoff from the south end of the airport receives detention in either Tyee Pond or the NWP complex, except for Outfall 009 (SDS4). Outfalls SDS2, SDS3, SDS5, SDS6, and SDS7 discharge to the NWP which in turn discharges to Des Moines Creek. The NWP complex was formed after peat excavation in the 1960s and functions as a detention facility serving multiple stormwater discharges including the Port and city of SeaTac. The Des Moines Creek Basin Planning Committee has proposed to expand the NWP complex as a regional detentions facility.

Most of the upper watershed is heavily urbanized. Sea-Tac Airport constitutes 27 percent of the watershed. Sea-Tac Airport's NPDES-permitted drainage area covers 705 acres that drain to Des Moines Creek through eight existing outfalls described above -- Outfalls SDE4 (002), SDS1 (003), SDS2 (004), SDS3 (005), SDS4 (009), SDS7 (010), SDS6 (014), and SDS7 (015). In addition to watershed development, the construction of a variety of structures (e.g., bridges, buildings, roads, pipelines, and culverts) on and adjacent to the creek has had a substantial effect on stream hydraulics.

Section 303(d) of the CWA requires states to develop a list of water body segments that are not expected to attain water quality standards after implementation of technology-based pollution controls. This list is commonly referred to as the § 303(d) list. These controls include additional point source wastewater treatment as well as enforceable best management practices for impacts associated with nonpoint sources. The § 303(d) list contains all those water bodies for which some additional management activities must be implemented. The 1996 § 303(d) list included Des Moines Creek for fecal coliform contamination. In the Cedar/Green Water Quality Management Area, which includes Des Moines Creek, 43 of the 54 § 303(d) listed water bodies are included in whole or in part due to fecal coliform contamination. The Port has demonstrated through genetic source tracing that fecal coliforms in STIA stormwater are predominantly attributable to animals and birds. The Des Moines Creek Basin Plan indicated that fecal coliform concentrations increased downstream in Des Moines Creek (KCDNR, 1997), with human sources associated with unsewered areas (septic systems). These facts should be addressed in any future Total Maximum Daily Load (TMDL) assessment for the Creek.

The CWA directs that a TMDL be established for all waters on the § 303(d) list. A TMDL is established to assure that the pollution load to a water body does not exceed its assimilative capacity. The Department has listed Des Moines Creek as a high priority waterbody for performing a TMDL for fecal coliforms. In all, there are thirteen high priority TMDL waterbodies in the Cedar/Green Water Quality Management Area. The implementation schedule for these TMDLs has not been established at this time.

Industrial Activities

Table 11 outlines the stormwater subbasins, corresponding outfalls, and the industrial activities typically occurring in each subbasin. Drainage from surfaces not associated with industrial activities also occurs, such as from rooftops, employee parking lots, and roadways, as listed in the table. For example, Basin SDE4 includes drainage from International Boulevard, the airport freeway, and numerous building rooftops. Some outfalls do not receive any drainage from surfaces associated with industrial activity (SDN1, SDS-l, SDS2, SDS5, SDS6, and the TY). As described below, many of these outfalls and corresponding monitoring locations also receive drainage from non-Port areas such as from 16th Avenue South (SDS2) and South 188th Street (SDS1 and SDS3). Other non-Port drainage commingles with the Port's stormwater discharges before they ultimately reach receiving waters, especially in the case of Lake Reba.

Table 11. Significant Activities within SDS Subbasins

OUTFALL # BASIN DESIGNATION	RECEIVNG WATER	INDUSTRIAL ACTIVITIES(A)	NON-INDUSTRIAL ACTIVITIES
#006, SDN-1	Miller Creek via LRSF	None	Air Cargo Road, building rooftops, landscape management (SR518, South 154th Street, 24th Avenue So drain to SDN1 below current monitoring station)
#007, SDN-2	Miller Creek via LRSF	Drains to IWS via 2 pump stations - Runway/taxiway deicing/anti-icing, snow storage aircraft service, equipment parking, aircraft taxi (potential contractor staging would be covered under Construction SWPPP)	Perimeter road, open areas
#008, SDN-3	Miller Creek via LRSF	Runway/taxiway deicing/anti-icing, aircraft taxi, takeoff and landings	Perimeter road, open areas
#011, SDN-4	Miller Creek via LRSF	Runway/taxiway deicing/anti-icing, aircraft taxi	Open areas, access road
#002, SDE-4	Des Moines Creek, east tributary	Taxiway deicing/anti-icing, roadway deicing, cargo truck loading/unloading, temporary storage of vehicle engine fluids, fueling of ground vehicles, aircraft taxi, parking of airfield ground vehicles (potential contractor staging would be covered under Construction SWPPP)	Airport freeway, terminal and cargo building rooftops, employee parking, Air Cargo Rd, SR 99, open areas
#003, SDS-1	Des Moines Creek, east tributary	None	Hangar rooftops, employee parking, South 188th St

OUTFALL # BASIN DESIGNATION	RECEIVNG WATER	INDUSTRIAL ACTIVITIES(A)	NON-INDUSTRIAL ACTIVITIES
#004, SDS-2	Des Moines Creek, west tributary	None (potential contractor staging would be covered under Construction SWPPP)	Non-Port employee parking on 16th Ave S, South 188th St, open areas
#005, SDS-3	Des Moines Creek, via NWP	Runway/taxiway deicing/anti-icing, aircraft taxi, takeoff and landings	Open areas
#009, SDS-4	Des Moines Creek, west tributary	Runway/taxiway deicing/anti-icing, aircraft taxi, takeoff and landings	Open areas
#010, SDS-7	Des Moines Creek, via NWP	Occasional aircraft parking, aircraft taxi, potential taxiway deicing/anti-icing	Open areas
#012 Engineering Yard	City of SeaTac storm drain	(Roadway traction sand is stored inside covered structure)	Employee Parking, building rooftop
#013 Taxi Yard	City of SeaTac storm drain	None (car wash covered and drainage routed to sanitary ca. 1996)	Taxi Parking
#014 SDS-6	Des Moines Creek, west tributary	None (potential contractor staging would be covered under Construction SWPPP)	Perimeter road, open areas
#015 SDS-5	Des Moines Creek, west tributary	None (potential contractor staging would be covered under Construction SWPPP)	Perimeter road, open areas, building rooftops

Other Water Quality Authorizations

Because the Port's proposed construction projects will result in the filling of wetlands, the Port must obtain a CWA Section 404 Permit from the U.S. Army Corps of Engineers, which in turn requires the Port to obtain a CWA Section 401 Certification (§ 401 Certification) from the state. The Department issued the Port a § 401 Certification on September 21, 2001. The § 401 Certification certifies that there is reasonable assurance that construction of the Port's construction projects (Third Runway and associated projects) as proposed and conditioned will not impact water quality. The § 401 Certification specifies implementation of a Comprehensive Stormwater Management Plan (CSMP) to address stormwater related water quality impacts of the MPU projects. The Department approved the Port's CSMP (POS 2000a), which addresses not only the new runway and associated projects but also the remainder of the airport site. The CSMP will be incorporated as a baseline in the new NPDES permit. The Department also required the Port to conduct a site specific analysis of relevant Water Quality Standards, such as a water effects ratio (WER) derivation for the applicable streams.

Other aspects of the § 401 Certification include an extensive natural resource mitigation plan addressing impacts to wetlands and required mitigation; a plan for managing impacts to low flows in Des Moines, Miller, and Walker Creeks; and stringent requirements for the importation of fill material. The § 401 Certification was appealed to the Pollution Control Hearings Board (PCHB). A hearing on the appeal was heard by the PCHB in March 2002. The PCHB issued its decision on August 12, 2002, affirming the § 401 Certification but adding 16 new conditions. The PCHB's decision has been appealed by the parties to the initial appeal.

B. STORMWATER MANAGEMENT PROGRAM

Three key elements comprise the Port's Stormwater Management Program for STIA: the Stormwater Pollution Prevention Plan (SWPPP), Comprehensive Stormwater Management Plan (CSMP), and the Stormwater Monitoring Program. The SWPPP describes the overall facility, operations, activities, and corresponding BMPs. The CSMP, discussed above, covers flow control and water quality BMPs for future development and retrofits associated with the Port's MPU, which includes the Third Runway. The Stormwater Monitoring Program covers permit-required monitoring and other supplemental sampling that provides feedback for overall program performance. Together, the NPDES permit monitoring program and the SWPPP are the key tools that the Port uses to manage the airport facility.

Stormwater Pollution Prevention Plan (SWPPP)

The Port has been implementing a SWPPP for stormwater discharges at STIA since 1994 (POS 1995a, 1998a, 2001a). The SWPPP implementation has included many operational and capital improvements to prevent the discharge of contaminants to surface waters. Table 12 summarizes the key stormwater BMPs that the Port has implemented. Typical treatment BMPs employed at STIA include grass swales and filter strips, oil water separators, catch basins, catch basin inserts, and the Lake Reba Stormwater Facility (LRSF). Much of the historic drainage associated with industrial activity (mainly aircraft servicing) has been rerouted to the IWS, which functions as a source-control BMP for the SDS and is in effect also a treatment BMP for the stormwater discharged through the IWS. These principal BMPs along with other various operational source controls constitute the majority of the SWPPP and demonstrate the Port's adaptive management process for stormwater management at STIA.

The Port of Seattle must continuously evaluate its SWPPP program under Part II of this permit to ensure that the outfalls discharging to the regional detention facilities are equipped with appropriate BMPs/enhanced BMPs. The Port is expected to regularly evaluate these outfalls and their respective BMPs and reports to the Department on their progress annually. The permit under Part III, Section S4 (Stormwater Pollution Prevention Plan), contains additional requirements to include arsenic monitoring to ensure compliance with the water quality criteria for this parameter. This additional requirement is to protect the water quality of the receiving water during construction activities from areas that might have received arsenic deposit as a result of Asarco operation in Tacoma.

During the past permit cycles, the Port completed a number of capital improvement projects that diverted drainage from the SDS to the IWS at a cost of more than $800,000. Some of these improvements are the pump stations described above. All aircraft service areas have been completely eliminated from drainage basins SDN2, SDS1, and SDE4. In addition, the Port's maintenance shop yard drainage was rerouted to the IWS, while the vehicle wash at the Taxi Yard was covered and has had associated drainage rerouted to the sanitary sewer.

Table 12. SWPPP BMP Summary

ACTIVITY	BMP	TYPE	STATUS
Aircraft servicing	Restrict to IWS areas or drains blocked	Operational	Ongoing
	Store glycol in IWS areas	Operational	Ongoing
	Confine parking of lavatory waste trucks to IWS	Operational	Ongoing
	Identify and connect problem SDS areas to IWS	Operational	Ongoing
	Restrictions for fueling on taxiway Alpha	Operational	Ongoing
	Monitor certain SDS outfalls during deicing per NPDES permit	Operational	Ongoing
AMA anti-icing/deicing	Minimize chemical use	Operational	Ongoing
	Use CMA/sand mixture for roadways	Operational	Ongoing
Snow storage	Operate pump stations to divert snowmelt to IWS	Operational	Ongoing
Spill control	Implement Spill Plan	Operational	In effect
Construction sites Education/training	Require erosion and sediment control BMPs	Source control	Ongoing
	Attach Erosion and Sediment Control Plans to bid packages	Source control	Ongoing
	Restrict equipment servicing	Source control	Ongoing
	Encourage contractors to use secondary containment	Source control	Ongoing
	Concrete cutting and washout	Source control	Ongoing
	Provide contractor/inspector training	Operational	Ongoing
Erosion of bare ground surfaces in non-construction areas	Implement soil erosion and control BMPs in contractor staging areas	Source control	Ongoing
	Emphasize and enforce contractor responsibility for BMPs in contractor staging areas	Source control	In effect
	Control erosion from temporary soil stockpiles	Source control	In effect
Vehicle washing and maintenance	Prohibit vehicle washing in SDS areas	Source control	Ongoing
	Place signs in key locations	Operational	In effect
	Clean sumps in Taxi Yard annually	Source control	Ongoing
	Sweep Taxi Yard and control litter	Source control	Ongoing
	Maintain catch basin inserts	Source control	Ongoing
	Construct a berm to prevent drainage to SDE4	Source control	Completed
Landscape management	Strive to use environmentally benign chemicals	Operational	In effect
	Follow proper cleaning/disposal procedures	Operational	In effect
	Apply during dry periods	Operational	In effect
	Restrict use near waterways	Operational	In effect
	Incorporate BMPs in contractor specifications	Operational	In effect
	Give priority to biological methods of pest management	Operational	Ongoing
	Apply fertilizer	Operational	Ongoing
	Conduct regular weeding and pruning	Operational	Ongoing
	Follow Ecology guidelines for herbicide application	Operational	Ongoing
	Apply herbicides/pesticides according to instructions	Operational	Ongoing
	De-thatch	Operational	Ongoing
	Trim ivy-covered areas	Operational	Ongoing
	Fertilize shrubs and trees by hand	Operational	Ongoing
	Do not use beauty bark in drainages	Operational	Ongoing
	Maintain stream corridors	Operational	Ongoing
	Prohibit Roundup use within 50 feet of a water body	Operational	Ongoing
	Do not apply pesticides or fertilizer on rainy days	Operational	Ongoing
	Avoid catch basin grates when applying fertilizer or pesticides	Operational	Ongoing
	Infields are mowed and no chemicals or fertilizers used in these areas	Operational	Ongoing
	Follow Japanese Beetle Control protocol	Operational	Ongoing
AOA maintenance	Sweep pavement frequently	Source control	In effect
	Inspect catch basin sumps annually and clean as needed	Source control	Ongoing
	Store and dispose of sediments properly	Operational	In effect
	Hydroblasting of runway skid-mark rubber is self-contained	Operational	Ongoing

ACTIVITY	BMP	TYPE	STATUS
Inappropriate connections and discharges	Inspect outfalls for evidence of illicit connections	Operational	Ongoing
Temporary storage of surplus and used materials	Construct secondary containment for used engine fluids Engineering Yard: Place signs on surplus storage Control entry of surplus materials	Operational	Ongoing
Tenant activities in SDS areas	Monitor and educate tenants	Operational	Ongoing
	Deice aircraft according to procedures	Operational	Ongoing
	Encourage drip pans beneath fueling trucks if leakage is observed	Operational	Ongoing
	Sweep around dumpsters	Operational	Ongoing
	Store liquids in secondary containment	Operational	Ongoing
	Do not store used fluids or hazardous waste in SDS areas	Operational	Ongoing
	Do not maintain vehicles or equipment in SDS areas	Operational	Ongoing
	Inspect catch basin grates	Operational	Ongoing
	Require tenant water pollution control plans	Operations	Ongoing
	Encourage tenant compliance with Port SWPPP	Operations	Ongoing
	Require tenant spill control plans	Source control	In effect
Other Operational BMPs	Designate a SWPPP implementation monitor	Operational	Ongoing
	Conduct regular inspections	Operational	Ongoing
	Assemble Pollution Prevention Team	Operational	Ongoing
	Conduct SDS outfall monitoring	Operational	Ongoing
	Sign catch basins (dump no waste)	Operational	Ongoing
	Establish packing material source control	Operational	Ongoing
	If possible during emergency situations, fire fighting foam is kept from discharging to the SDS	Operational	Ongoing
	Sorbent booms are deployed at most outlets and maintained	Operational	Ongoing
Stormwater Management	Stormwater vaults are in place at the NEPL and at SDS3 to control direct runoff from the airport	Operational	Ongoing
	Stormwater is detained in Lake Reba, Tyee Pond and Northwest Ponds prior to discharge to Miller or Des Moines Creeks	Operational	Ongoing
	Temporary ponds are maintained to control runoff from construction sites		

Table 13. Structural BMPs (Drainage Reroutes)

BMP	STORM DRAIN SYSTEM	DATE COMPLETED	COST (if readily available)
Relocate Hazardous Materials sheds		7/95	$4K
Connect Taxi Yard Wash Pad to sanitary sewer	TY (013)	7/95	$30K
Connect airfield maintenance sediment storage yard to IWS	SDS7 (010)	7/95	na
Connect Loading Dock Dumpster slot drain to sanitary	SDE4 (002)	10/95	$25K
Connect North Satellite to IWS	SDE4 (002)	10/95	$300K
Connect D Concourse to IWS	SDE4 (002)	11/95	N/A
Connect C Concourse ramp area to IWS	SDS3 (005)	11/95	N/A
Seal SDS inlet near Gate C8	SDS3 (005)	12/95	$10K
Seal SDS inlet near Gate B5	SDS3 (005)	12/95	$10K
Connect Port Maintenance Shop Yard to IWS	SDE4 (002)	8/96	N/A
Connect Cargo Area 4 to IWS	SDE4 (002)	8/96	$13K
Connect SDS area between the South Satellite and the NW Hangar to the IWS	SDS1 (003)	8/96	$88K
Connect SDS area between the South Satellite and the B Concourse to the IWS	SDS1 (003)	5/97	$149K
Connect North Cargo Area to IWS via pump station	SDN2 (007)	6/97	$188K
Connect Federal Express loading dock area to IWS	SDN1 (006)	7/97	Tenant Project
Connect food service loading dock drain to sanitary sewer (Lufthansa)	SDN1 (006)	9/97	Tenant
Connect snow storage areas to IWS	SDE4 (008) SDN2 (007)	11/97	N/A
Connect food service compactor area drain to sanitary sewer (Flying Food)	Other	9/98	Tenant
Diversion of 0.6-acre area under S. Satellite Overhang and ramp areas to IWS	SDS1	8/00	$5K-
Diversion of former Delta Hangar parking lot to IWS	Undesignated	1/01	N/A
Plug loading dock drain and divert to IWS	SDN1	9/00	N/A
Diversion of former south ground transportation lot to IWS	SDE4	2002	N/A

Table 13. Other Source Control BMPs

BMP	STORM DRAIN SYSTEM	DATE COMPLETED
Terminate glycol use for ground deicing	All	12/95
Store Chemicals in IWS Area		12/95
Evaluate alternative chemicals for anti-icing and deicing	All	12/95
Store anti-icing chemicals in IWS areas	All	12/95

During and subsequent to snow events of approximately four inches or more, accumulated snow in the ramp and other airfield areas may be moved to a designated snowmelt drainage area. Because some of this snow may have the potential to contain aircraft and/or ground surface deicing agents, the snowmelt drainage areas are designed to prevent the runoff from reaching the SDS. Three of the pump stations described in Table 1 serve these snowmelt areas as important BMPs for the airport.

Stormwater Monitoring Program and Protocols

The Port has implemented a Stormwater Monitoring Program since the NPDES permit was first issued covering stormwater (July 1994). This program covers the required stormwater monitoring (flows and water quality) and other supplemental sampling elected by the Port. The previous NPDES permit required the Port to prepare and submit the *Procedure Manual for Stormwater Monitoring* (POS, 1999x) and 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). Subsequent revisions have been submitted to incorporate reissued permits and permit modifications. Samples taken for DMR reporting under the permit meet the criteria outlined in this manual.

Storm Sampling Procedures and Analytes

The Port's *Procedure Manual for Stormwater Monitoring* (POS 1999a) describes the criteria for sampling storm events and describes all relevant sampling, programming, and handling necessary to comply with requirements of the permit. The permit specifies sampling frequencies and parameters. The Port reports data on DMRs where results from storms and samples meet the representativeness criteria of the manual. In addition to data provided in the DMRs, other results from samples not meeting these criteria or those taken for other purposes have been included in Annual Stormwater Monitoring Reports. Using automatic samplers, the Port generally takes a grab sample, then a flow-weighted composite sample, during rainstorms where the rainstorm is defined in the permit. Each of these samples is analyzed for a different suite of constituents according to the NPDES permit.

C. STORMWATER CHARACTERIZATION

This section of the Fact Sheet summarizes the relevant water quality data associated with STIA stormwater discharges. The historic "outfall" sampling locations discussed above have been used to provide a general characterization of STIA runoff and provide feedback for adaptive management relative to the overall STIA Stormwater Management Program. Table 14 summarizes stormwater data for each of the four principal outfalls over the past four years of sampling conducted under the NPDES permit.

Table 15 summarizes stormwater data for the other ten outfalls that have had less frequent sampling requirements in existing and past permits. These tables summarize data presented in the past four years' Annual Stormwater Monitoring Reports (POS 1998a, 1999a, 2000a, 2001a).

Table 14. Summary of STIA Stormwater Data for Principal Outfalls[a]

Constituent (mg/l)	*SDE4 (002) (DM Crk/landside)*			*SDS3 (005) (DM Crk/airfield)*			*SDN1 (006) (MC/landside)*			*SDN4 (011) MC/(airfield)*		
	med	95th	n	med	95th	n	med	95th	n	med	95th	n
pH	6.8	6.2--8	55	7.3	7.0--7.7	57	6.6	5.5--8.0	49	7.4	6.6--8.4	43
TPH	2	5	39	0.1	0.3	40	1.4	3	45	0.1	0.3	38
Fecal coliforms (MPN/100ml)	220	1600	47	8	374	50	36	1600	48	4	1535	42
TSS	45	135	53	8	69	53	43	192	41	4	69	44
Turbidty (NTU)	27	77	52	7	52	52	27	80	41	5	23	43
BOD_5	6.9	23	54	9.4	40	51	5.2	16	40	5	14	44
E-glycol	1.0	3.2	48	1.0	9	39	<MDL	<MDL	4	<MDL	3	35
P-glycol	1	5.3	48	2.5	83	39	<MDL	<MDL	4	<MDL	4	35
Cu (µg/l)[b]	22	67	54	29	95.4	54	19	56	41	31	64	43
Pb (µg/l)[b]	13	44	54	2	12	54	7	35	41	<MDL	3	44
Zn (µg/l)[b]	116	315	54	38	128	54	191	540	41	20.5	47	44

Table notes:

a. Data summarize overall median ("med"), 95th percentile and number of representative stormwater samples collected per NPDES permit. These outfalls represent over two thirds of the entire permitted SDS drainage area and have been sampled the most frequently, a minimum of once quarterly ("DM"—Des Moines Creek, "MC"—Miller Creek).

b. Total recoverable metals

Table 15. Summary of STIA Stormwater Data for Other Outfalls[a]

Constituent (mg/l)	SDS1 (003)			SDS2 (004)			SDS4 (009)			SDS5 (015)		
	med	95th	n	med	95th	n	med	95th	n	med	95th	n
pH	6.8	5.6--7.6	23	6.9	6.7--7.8	10	7.4	6.8--7.8	23	6.9	6.3--7.6	10
TPH	0.7	1.4	5	0.1	0.3	3	0.1	0.2	4	0.1	0.1	5
Fecal coliforms (MPN/100ml)	105	1600	16	23	696	7	75	1600	16	120	1600	10
TSS	16	74	22	20	59	10	11	42	21	36	56	8
Turbidty (NTU)	13	46	21	20	35	10	6	37	20	20	46	8
BOD_5	12	46	21	4	10	9	5	16	21	3	10	4
E-glycol	<MDL	6	16	na	na	0	<MDL	<MDL	9	na	na	0
P-glycol	<MDL	26	16	na	na	0	<MDL	<MDL	9	na	na	0
Cu[b)]	0.037	0.117	22	0.009	0.010	3	0.023	0.039	21	0.012	0.019	8
Pb[b]	0.009	0.040	22	0.001	0.006	3	0.001	0.005	22	0.001	0.005	8
Zn[b]	0.119	0.287	23	0.064	0.198	3	0.020	0.047	22	0.021	0.092	8

Constituent (mg/l)	SDS6 (014)			SDS7 (010)			SDN3 (008)			EY (012)			TY (013)		
	med	95th	n	med	95th	n	med	95th	n	med	95th	n	med	95th	n
pH	7.1	6.5-7.4	7	7.3	6.3-7.8	11	7.2	6.4-7.7	24	6.2	5.3-7.7	18	6.5	5.6-7.6	19
TPH	0.2	0.2	4	0.1	2.7	7	0.1	0.2	7	1.1	1.6	7	2.4	7.3	9
Fecal coliforms (MPN/100ml)	30	1600	7	2	324	11	14	970	19	na	na	0	na	na	0
TSS	23	75	7	7	70	12	10	25	27	25	124	24	23	73	19
Turbidity (NTU)	35	121	7	4	23	11	11	26	26	42	78	3	8	12	2
BOD_5	2	5	5	5	12	8	3	7	26	24	24	1	na	na	0
E-glycol	na	na	0	na	na	0	<MDL	3.8	14	na	na	0	na	na	0
P-glycol	na	na	0	na	na	0	<MDL	<MDL	14	na	na	0	na	na	0
Cu[b)]	0.013	0.025	7	0.005	0.025	4	0.011	0.036	21	0.020	0.020	1	na	na	1
Pb[(b)]	0.002	0.007	7	0.001	0.001	4	0.001	0.004	21	0.020	0.020	1	na	na	2
Zn[(b)]	0.029	0.099	7	0.008	0.010	4	0.049	0.156	21	0.179	0.179	1	na	na	3

Table notes:

a. Data summarize overall median ("med"), 95^{th} percentile and number representative stormwater samples collected per NPDES permit. These outfalls represent minor portions of the permitted SDS drainage area and have less frequent NPDES permit sampling requirements than the four principal outfalls (a minimum of once annually).

b. Total recoverable metals

General Comparisons With Urban Stormwater Runoff

Relative to typical urban stormwater runoff, STIA discharges are very similar and often contain lower concentrations of the constituents sampled under the NPDES permit. Table 16 summarizes STIA median data for the landside and airfield groups of outfalls and provides a comparison to data collected under comparable circumstances regionally and nationally.

Table 16. Stormwater Quality Comparators[a]

Constituent	Units	Comparative Study Data[(a)]						STIA[(g)]		Bench mark
		NURP 1983	BURP 1984	Metro 1982	Bellevue 1995[(b)]	Highway Runoff[(c)] 1981	Portland NPDES[(d)] 1993	Landside (SDE4, SDN1)	Airfield (SDS3-4, SDN3-4)	
pH	std units		**5.2 - 7.4**		7.2 - 7.8			6.7	7.3	6 -- 9
TPH[(i)]	mg/l				**3.7**		6.5	1.7	0.08	15
F. coliform	mpn per 100 ml	1000 to 21000	*980*		**201**			110	8	na
BOD_5	mg/l	9	***6.6***				20	6.7	6	30[(j)]
TSS	mg/l	100	***50***		82.3	106	119	42.5	7.45	100
Turb	mg/l		19		**29.4**			22	6.2	25[(k)]
glycols	mg/l	*not analyzed in any of these studies*						5**[(h)]**	5**[(h)]**	na
Cu (TR)[(e)]	µg/l	34		20	10.4	43	**40**	24	27	64
Pb (TR)[(e)]	µg/l	144	170	210	**26.3**	466[(c)]	25	11	1	82
Zn (TR)[(e)]	µg/l	160	120	110	**161.4**	638	376	171	32	117
statistic reported →		median	mean[(f)], *median*	mean	log-normal median	mean	median	7-yr median	7-yr median	na

(a) Comparative values used in Annual Reports are in bold. Blank space means no data available, reported, or applicable.
(b) Bellevue, 1995 data are for in-stream stormwater runoff samples from the "Sturtevant Creek, downstream" site.
(c) Highway runoff from an I-5 location in Seattle with 57,000 ADT, 43 to 54 storm samples in 1980-81 (Chui, Mar, and Horner, 1982). Because this study was conducted prior to the phase-out of leaded gasoline, lead results were higher than for other later studies.
(d) City of Portland, 1993 NPDES Part 2 Municipal Application. Median of 10 samples from "I2" "industrial" outfall.
(e) Total recoverable metals. WA State acute standards expressed as total recoverable
(f) For Turb, Cu, Pb, and Zn, BURP 1984 data was mean of grab samples, therefore, Bellevue 1995 data are more representative comparators because they represent median of composite samples, comparable to STIA samples and data for these parameters.
(g) STIA median data cited reflect 37 to 112 samples per parameter for landside group samples, and 90 to 153 samples per parameter for airfield group samples
(h) About 70% of all STIA sample results for glycols have been below detection limits of 5 mg/l (to April 1997) and 2 mg/l (May 1997-June 2002).
(i) TPH data cited for STIA are based on method NWTPH-Dx, all others are based on other methods (e.g. 418.1)
(j) BOD benchmark is for Airport Industrial category and is based on EPA's POTW secondary treatment standard.
(k) Turbidity benchmark is from Ecology draft industrial general stormwater permit and is based on the Department's field experience. The EPA MSGP permit covers suspended material with the TSS parameter benchmark.

Whole Effluent Toxicity

Under the current NPDES permit, the Port characterized whole effluent toxicity (WET) of the four principal stormwater discharges.[2] These discharges from Outfalls SDE4, SDS3, SDN1, and SDN4 represent about two thirds of the total storm drainage area, while representing airfield and landside discharges to Miller and Des Moines Creeks. The Department acknowledged that the other minor outfalls represent substantially equivalent activities and consequent stormwater discharge quality.[3] As required in the permit and the Department's general guidelines, all WET testing was performed on composite samples of stormwater runoff using two aquatic species with acute (lethal) endpoints [*D. pulex* (daphid or waterflea), *P. promelas* (fathead minnow)].

The initial WET characterization conducted in 1998 through 2000 indicated that repeated stormwater discharge samples from three of the outfalls passed Ecology's performance standards for WET (minimum 65% survival in individual samples, WAC 173-205). The Port found that stormwater samples from outfall SDN1 exhibited toxicity that was associated with zinc leaching from metal roofing runoff. As discussed above under sampling locations, none of these samples represent discharges directly to receiving waters. Repeat testing in the fall of 2001 at the same four outfalls indicated stormwater samples from all four outfalls passed the Ecology performance standards. These most recent results were submitted to Ecology as part of the application for renewal of this permit. All WET testing results have been reported to Ecology in individual laboratory testing reports, in summary reports, and in technical articles (POS 1998b, 1999b, 2000b, 2002b, Tobiason et al 2000, 2001). Overall stormwater WET testing results are summarized in Table 17.

[2] See Special Condition S10 and pages 31 and 32 of the corresponding Fact Sheet.
[3] See Special Condition S10: "Alternative outfalls may be substituted with the Department's approval"

Table 17. Overall WET testing results for STIA stormwater

Outfall	Date	Rainfall (in)	Daphnid (*D. pulex*) WET (% survival)	LC50 (% sample)	NOEC (% sample)	LOEC (% sample)	Fathead Minnow (*P. Promeals*) WET (% survival)	LC50 (% sample)	NOEC (% sample)	LOEC (% sample)
SDE4	11/19/98	2.34	90%	>100%	100%	>100%	100%	>100%	100%	>100%
SDE4	1/21/99	0.42	100%	>100%	100%	>100%	98%	>100%	100%	>100%
SDE4	2/23/99	0.56	95%	>100%	100%	>100%	63%	>100%	25%	50%
SDE4	3/24/99	0.28	95%	>100%	100%	>100%	98%	>100%	100%	>100%
SDE4	7/2/99	0.30	100%	>100%	100%	>100%	70%*	>100%	100%	>100%
SDE4	11/12/01	0.44	80%	>100%	100%	>100%	100%	>100%	100%	>100%
SDN4	11/13/98	0.98	75%	100%	>100%	>100%	100%	100%	>100%	>100%
SDN4	1/14/99	1.07	100%	100%	>100%	>100%	100%	100%	>100%	>100%
SDN4	10/31/01	0.61	nr	nr	nr	nr	90%	>100	100%	>100%
SDN4	12/12/01	1.97	100%	>100%	100%	nr	100%	>100	100%	nr
SDS3	11/13/98	0.98	90%	>100%	100%	>100%	98%	>100%	100%	>100%
SDS3	1/14/99	1.07	80%	>100%	100%	>100%	95%	>100%	100%	>100%
SDS3	10/31/01	0.61	nr	nr	nr	nr	88%	>100%	100%	>100
SDS3	12/12/01	1.97	100%	>100%	100%	nr	98%	>100%	100%	nr
SDN1	11/13/98	0.98	80%	>100%	100%	>100%	40%	89%	50%	100%
SDN1	1/14/99	1.07	30%	85.2%	100%	>100%	78%	>100%	100%	>100%
SDN1	3/24/99	0.28	10%	74.%	50%	100%	63%	>100%	50%	100%
SDN1	7/2/99	0.30	nr	nr	nr	nr	33%	88%	50%	100%
SDN1	11/12/01	0.44	80%	>100%	100%	>100%	80%	>100%	100%	>100%
SDN1	12/12/01	1.97	100%	>100%	100%	nr	78%	>100%	100%	nr

Table 18. Stormwater Outfall WET Retest Summary (Oct-Dec 2001)

			daphnid (*D. pulex*)				fathead (*P. promelas*)			
Outfall	Event	Rainfall (in)	WET % survival	LC50 % sample	NOEC % sample	LOEC % sample	WET % survival	LC50 % sample	NOEC % sample	LOEC % sample
SDS3 (005)	12/12/01	1.97	100	>100	100		97.5	>100	100	nr
SDN4 (011)	12/12/01	1.97	100	>100	100		100	>100	100	nr
SDN1 (006)	12/12/01	1.97	100	>100	100		77.5	>100	100	nr
SDS3 (005)	10/31/01	0.61	*Not-representative*				88	>100	100	>100
SDN4 (011)	10/31/01	0.61	*Not-representative*				90	>100	100	>100
SDE4 (002)	11/12/01	0.44	80	>100	100	>100	100	>100	100	>100
SDN1 (006)	11/12/01	0.44	80	>100	100	>100	80	>100	100	>100

Table notes: nr not reported.

Priority Pollutant Metals

According to historic permit requirements, the Port has evaluated the full suite of 13 Priority Pollutant (PP) metals in stormwater discharges (POS 1996; POS 1997a, 1997b; POS 1998). Results from these analyses have conclusively demonstrated that with the exception of copper and zinc, PP metal concentrations in stormwater discharges have been consistently below state Water Quality Standards (WQS). These data are from stormwater samples taken at the outfall locations described earlier in this Fact Sheet and are not from receiving waters. Table 19 shows that of the 13 PP metals analyzed in more than 105 samples collected at the outfalls, only four were detected regularly: arsenic, copper, lead, and zinc. Eight metals were absent or below detection limits in 71% or more of the samples: antimony, beryllium, cadmium, chromium, mercury, silver, selenium, and thallium. Nickel was undetected in more than 50% of 111 samples. The 95th percentile for each of these nine metals was less than 10% of the acute criteria, though the criteria are applied only to receiving waters. Based on these results, in the Port's existing NPDES permit (for the 1998-2002 period), Ecology eliminated monitoring requirements for PP metals with the exception of copper, lead, and zinc. In the preliminary SSA program outlined below, stormwater discharge samples from several NPDES outfalls, Lake Reba and in-stream locations were screened for PP metals in 2001. These results were consistent with previous work showing that metals other than Cu and Zn were absent or below levels of concern.

Table 19. Priority Pollutant Metal Stormwater Monitoring Results (total recoverable metals in µg/L)[1]

Metal	# Samples	Detection Limit[2]	Median	95th Percentile	% Nondetect	Acute WQS[5]
Antimony	125	1, 2, 3	1.5	7.5	82	9000
Arsenic	125	1, 3	1.5	5.1	52	360
Beryllium	125	1, 2	1	6.8	95	130
Cadmium[3]	50	0.2, 0.5	0.25	0.82	70	0.9
Chromium	125	5, 10	5	28	81	612
Copper	312	2	24	83	0.3	5
Lead	312	1, 2	3	34	344	16
Mercury	125	0.1	<0.1	0.93	86	2
Nickel	131	5, 10	5	20	56	483
Selenium	125	1, 3, 10	1.5	3.5	85	20
Silver[3]	9	0.2, 0.3	<0.3	<0.3	100	0.5
Thallium	125	1	<1	2	90	1400
Zinc	312	5	64	360	2	40

1 This table summarizes metal data for all STIA outfalls grouped together. The results must be viewed as an overall summary and not characteristic of any particular outfall. Results are for a 7-year history from July 1994 through June 2001.

2 Multiple detection limits arose during transition between analytical laboratories in 1996 and due to different detection limits used for specific projects.

3 The number of samples for Ag and Cd are less than for other elements because some of the monitoring was performed using detection limits higher than the acute WQS; therefore, this data was excluded from further consideration.

4 In the 1994-1996 Stormwater Receiving Environment Study (SRES) samples, dissolved Pb concentration in in-stream samples (including Lake Reba outfall) was consistently less than the acute WQS (with 13 of 34 samples non-detectable), with an overall maximum of 3.3 µg/L.

5 Water Quality Standards were calculated based on 28 mg/L hardness, which was 10th percentile for receiving water data in existence at the time of the SRES project. Although these WQS are provided for comparison, they do not apply to the stormwater samples taken at the outfalls and do not imply any exceedances of the WQS. The WQS are for receiving waters.

Receiving Water Studies

Several in-stream monitoring studies have been conducted to investigate water quality in Miller and Des Moines Creeks. The Port elected to perform preliminary monitoring in 2001-2002 for the eventual study to be conducted pursuant to the § 401 Certification Condition J2.a. In 1995-1996, the Port conducted the permit-required Stormwater Receiving Environment Study (SRES) in Miller and Des Moines Creeks. The Monitoring Plan for the SRES was submitted to the Department per the 1994 NPDES permit Condition S8, and reviewed and approved by the Department. The SRES project report required by the NPDES permit was submitted to the Department in June 1997. This study was intended to determine the potential water quality effects that STIA discharges could have on the respective receiving waters. The study required concurrent outfall and in-stream sampling during a variety of rainfall events. The study indicated STIA stormwater constituent loading contributions were small or moderate compared with the overall loadings and that the NWP and Lake Reba reduced these loadings considerably. Little to no toxicity was observed in-stream (using the Microtox bioassay), even during deicing events.

Dissolved Oxygen (DO) Studies

Because of the potential for STIA snowmelt and stormwater runoff after runway and taxiway deicing events to affect dissolved oxygen (DO) levels in Miller and Des Moines Creeks, the Port conducted two seasons of extensive monitoring. The first of these "DO Studies" was conducted during the winter of 1998-1999 (Cosmopolitan Engineering Group, 1999). The Department reviewed the report and raised questions that could not be fully evaluated given the scope of the 1999 study (Ecology, 1999). The second study, conducted during the winter of 1999-2000, continued similar work while addressing the Department's comments. These studies are considered an investigative best management practice (BMP) as part of the adaptive management strategy under the Port's NPDES permit for STIA. It is important to note that other entities discharging stormwater to the local streams may also be conducting deicing chemical applications concurrent with the Port (e.g. WSDOT).

As described in Section I of this Fact Sheet, the Port applies three types of deicing chemicals to prevent and/or remove ice on ground surfaces at the airport. These chemical applications on the airfield (runways and taxiways) ensure public safety and comply with FAA requirements. The Port applies liquid potassium acetate (PA), solid sodium acetate (SA), and solid calcium-magnesium acetate (CMA) to the airfield and landside ground surfaces. The use of these deicing chemicals can affect DO in creeks receiving stormwater runoff. To minimize environmental effects of these deicing chemicals, the Port uses a suite of BMPs. Airport operations staff uses temperature sensors in the runway pavement to anticipate chemical applications. The resulting preventive (anti-icing) approach may lead to lower chemical volumes applied than might be needed if ice was allowed to form requiring removal by higher application rates (deicing). In addition, the chemical substitutions implemented prior to 1996 have resulted in a lower potential for water quality effects. The lower BOD acetate-based products replace glycol mixtures and urea [reducing urea-associated ammonia formation (toxicity) potential]. Because snow from the airfield may have the potential to contain aircraft and/or ground surface deicing agents, the three snowmelt areas prevent the runoff from reaching the SDS. Three of the pump stations described in Table 9 serve these snowmelt areas as important BMPs for the airport. Finally, all of the areas where aircraft are serviced, including aircraft deicing/anti-icing fluid [ADAF (glycol)] application areas, drain to the IWS system.

The storm drainage system (SDS) configuration at STIA has two distinct flow regimes that affect transport of deicing chemicals: most of the landside areas (SDE4) drain directly to and rapidly through Des Moines Creek, while most of the airfield areas drain to two ponds (LRSF and NWP) where chemicals may be detained for varying periods prior to being flushed into Miller and Des Moines Creeks.

In general, two factors characterize the potential environmental responses to ground-deicing events: 1) the weather conditions that cause the need for deicing, and 2) the subsequent weather patterns after chemical application. Deicing chemical volumes and application frequency depend on the type of precipitation, e.g. snow or frost, and increase with the severity and duration of subfreezing temperatures, and safety factors. Weather patterns after chemical application, particularly rainfall, determine how fast chemicals are washed off surfaces and transported through drainage systems and receiving waters.

<u>Fecal Coliform Bacteria</u>

The Port began studying fecal coliforms (FC) in SDE4 discharges in 1998 and completed the series of investigations in early 2001 (Herrera, 2001). This work used several special forensic techniques (microbial source tracing or MST) aimed at identifying potential sources of the sporadic elevated FC results. Past Annual Report's have discussed findings that corroborate the most recent and final portion of this investigation. Multiple data over several years using state of the art techniques have demonstrated an absence of sanitary sewer cross connections. This work has also been presented in a technical article (Tobiason et al 2002b).

The most recent analysis found that animals, primarily birds, accounted for more than 90% of the fecal coliforms in samples from several outfalls. During base flow, human sources were not observed at the STIA outfalls and were only observed at the Bow Lake outlet (upstream) station and the Des Moines Creek (downstream) station. These results suggest that human sources of bacteria present in Des Moines Creek during dry periods likely originated from Bow Lake and not STIA outfalls. Only three of the 49 *E. coli* isolates that originated from a human source were unique matches to isolates obtained from aircraft wastewater samples. These three isolates were observed at the airfield outfall (SDS3) and downstream in Des Moines Creek during a single storm event (May 9, 2000). These findings suggest that aircraft wastewater transfer operations may be a transient, minor source of the limited and infrequent human fecal contamination in runoff from the airfield. Aircraft wastewater transfer operations should be reviewed on a regular basis to determine if existing practices are adequately preventing the potential contamination of runoff from STIA.

Several other local and regional studies used this technique and have been able to attribute fecal contamination in surface waters to multiple specific sources, including domestic animals and septage (Trial et al. 1993, King County 1995, Herrera 1999). Ecology recognizes the MST method as "…an excellent method for determining some of the sources of fecal contamination in a watershed" (Sargeant, 1999.)

Using the MST technique, King County (1997) attributed up to 64% of the results in the lower Des Moines Creek basin to unsewered residential areas (leaking septic tanks). In upstream samples taken nearer the airport, human sources comprised 10% or less of the results, while avian and dog sources together represented up to 34%. However, the two rounds of MST analysis in this King County study provided limited statistical power and resulted in 36% to 59% unmatched results, which may also be due to the limited number of "fingerprints" available in the database at that time. Nonetheless, the study indicated that human sources were prevalent in lower basin areas (city of Des Moines) suggesting that aging septic systems should be addressed.

D. PROPOSED PERMIT LIMITATIONS FOR STORMWATER ASSOCIATED WITH INDUSTRIAL AND CONSTRUCTION ACTIVITIES

Federal and state regulations require that effluent limitations set forth in an NPDES permit must be either technology- or water quality-based. Technology-based limitations are based upon the treatment methods available to treat specific pollutants. Technology-based limitations are set by regulation or developed on a case-by-case basis (40 CFR 125.3, and Chapter 173-220 WAC). Water quality-based limitations are based upon compliance 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 (Federal Register, Volume *57,* No. 246, Tuesday, December 22, 1992). The more stringent of these two limits must be chosen for each of the parameters of concern. Each of these types of limits is described in more detail below.

The limits in this permit are based, in part, on information received in the application. The effluent constituents in the application were evaluated on a technology- and water quality-basis. The limits necessary to meet the rules and regulations of the state of Washington were determined and included in this permit. Ecology does not develop effluent limits for all pollutants that may be reported on the application as present in the effluent. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and/or do not have a reasonable potential to cause a water quality violation. Effluent limits are not always developed for pollutants that may be in the discharge but not reported as present in the application. In those circumstances, the permit does not authorize discharge of the non-reported pollutants. Effluent discharge conditions may change from the conditions reported in the permit application. If significant changes occur in any constituent, as described in 40 CFR 122.42(a), the Permittee is required to notify the Department of Ecology. The Permittee may be in violation of the permit until the permit is modified to reflect additional discharge of pollutants.

This permit under Part II contains numeric limits for outfalls discharging directly to the receiving water. These limits are based on the EPA recently developed MSGP and are assumed to be water quality-based limits based on water hardness of 100 mg/L as CaCO3. Under Part III, this permit contains combination of water quality and technology-based effluent limits to ensure protection of water quality criteria. The permit requires stormwater discharges to comply with Water Quality Standards and implement all known, available, and reasonable treatment (AKART) in the form of best management practices for their industrial and construction activities.

In case of construction activities, the effluent limits are based on in-stream sampling and WAC 173-201 A, the water quality criteria for turbidity (in case of non-chemical treatment) and pH, and AKART for turbidity in case of chemical treatment based on per batch basis, and for oil and grease. The permit also contains water quality-based effluent limits for arsenic to ensure construction activities within the Port's boundaries relevant to the permit that had received deposition from Asarco operations in Tacoma will not cause water quality violations.

Technology-based Limitations

The permit includes a narrative requirement to implement all BMPs for stormwater management that are typically applicable to a similar facility and construction site. The applicable BMPs are defined by the Department's *Stormwater Management Manual for Western Washington*. The Port will be using its CSMP for future development and BMP retrofits. New facilities in western Washington are now required to use the *Stormwater Management Manual for Western Washington.*

Surface Water Quality Limitations

Numerical Criteria for the Protection of Aquatic Life

"Numerical" water quality criteria are numerical values set forth in the state of Washington's Water Quality Standards (WQS) for Surface Waters (Chapter 173-201A WAC). They specify the generic levels of pollutants allowed in a receiving water while remaining protective of aquatic life. Numerical criteria set forth in the Water Quality Standards are used along with chemical and physical data for the wastewater (stormwater) and receiving water to determine if a discharge is complying with Water Quality Standards.

Numerical Criteria for the Protection of Human Health

The U.S. EPA has promulgated 91 numeric water quality criteria for the protection of human health that are applicable to Washington State (EPA, 1992). These criteria are designed to protect humans from cancer and other diseases and are primarily applicable to fish and shellfish consumption and drinking water from surface waters. Because most human health-based criteria are based on lifetime exposures, direct comparisons with transient stormwater concentrations may often be inappropriate. This and the high variation in stormwater pollutant concentrations, both between storms and during a single storm, make the application of human health criteria to stormwater particularly problematic. Ecology has therefore placed permit emphasis on implementing BMPs to limit contamination of stormwater. Source control BMPs are expected to eliminate/minimize the potential contamination of stormwater and to protect human health. However, if stormwater monitoring for representative parameters raises questions about the success of the BMP approach, Ecology will have to evaluate how human health criteria could be numerically applied to stormwater discharges.

Narrative Criteria

In addition to numerical criteria, “narrative” water quality criteria (WAC 173-201A-030) limit toxic, radioactive, or deleterious material to concentrations below those that have the potential to adversely affect characteristic water uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health. Narrative criteria protect the specific beneficial uses of all fresh (WAC 173-201A-130) and marine (WAC 173-201A-140) waters in the state of Washington. BMPs are required in the permit to eliminate/minimize the contamination of stormwater and protect beneficial uses of waters of the state.

Antidegradation

The state of Washington’s Antidegradation Policy requires that discharges into a receiving water shall not further degrade the existing water quality of the water body. In cases where the natural conditions of a receiving water are of lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. Similarly, when the natural conditions of a receiving water are of higher quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. More information on the Washington State Antidegradation Policy can be obtained by referring to WAC 173-201A-070.

The Department has reviewed existing records and is unable to determine if ambient water quality is either higher or lower than the designated classification criteria given in Chapter 173-201A WAC; therefore, the Department will use the designated classification criteria for this water body in the proposed permit. The discharges authorized by this proposed permit should not cause a loss of beneficial uses.

Critical Conditions

Surface water quality-based limits are derived for the waterbody’s critical condition, which represents the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or characteristic waterbody uses. The factors include the flow and background level of toxic substances in the receiving water and the flow and concentration of toxic substances in the discharge. The inherent variability of storm events and stormwater discharges adds complexity to defining critical conditions. Storm events are naturally occurring and affect the characteristics of both the stormwater discharge and the receiving waterbody. They vary in intensity and duration and can be isolated events or part of a storm event pattern. All these factors affect flows and water quality.

Acute Toxicity

Acute conditions are changes in the physical, chemical, or biologic environment that are expected or demonstrated to result in injury or death to an organism as a result of short-term exposure to the substance or detrimental environmental condition. The acute standards for metals are one-hour concentrations not to be exceeded more than once every three (3) years. The most likely critical stormwater conditions for acute toxicity would be a high intensity short duration storm event that occurs after a long period of no rain. This results in low flows in the receiving water and a high potential for pollutants that stormwater can mobilize. The critical condition for acute toxicity is most likely to occur during a summertime storm event.

Sublethal Toxicity

Toxic metals are common in stormwater and their concentrations can vary considerably. There are many sources of these metals, but road and parking lot runoff are the biggest sources. The following list focuses on those metals which are present in SEATAC Airport stormwater and have known effects to either important regional fish species or proposed test organisms:

Average copper concentrations (total and dissolved) in various stormwater studies in North America ranged from 6.5 to 150 µg/L (Makepeace et al, 1995). A study in Vancouver, BC found an average total copper concentration near 240 µg/L in industrial and commercial areas with a maximum single sample concentration near 500 µg/L (Hall et al, 1988). A study of stormwater in Birmingham, AL found average dissolved copper concentrations as high as 250 µg/L from the worst area while average total copper in the same area was 290 µg/L (Pitt et al, 1995). Monitoring of 14 stormwater outfalls from SEATAC International Airport during the period of July 1, 2001, through June 30, 2002, found total recoverable copper concentrations that ranged from 1 µg/L to 366 µg/L with a median of 24 µg/L (Tobiason, 2002).

Average zinc concentrations (total and dissolved) in various stormwater studies in North America ranged from 16.6 to 580 µg/L (Makepeace et al, 1995). A study in Vancouver, BC found an average total zinc concentration near 1400 µg/L in commercial and residential areas with a maximum single sample concentration near 5400 µg/L (Hall et al, 1988). A study of stormwater in Birmingham, AL found average dissolved zinc concentrations as high as 220 µg/L from the worst area while average total zinc in the same area was 250 µg/L (Pitt et al, 1995). Monitoring of 14 stormwater outfalls from SEATAC International Airport during the period of July 1, 2001, through June 30, 2002, found total recoverable zinc concentrations that ranged from 2 µg/L to 1030 µg/L with a median of 64 µg/L (Tobiason, 2002).

Average lead concentrations (total and dissolved) in various stormwater studies in North America ranged from 20.9 to 1558 µg/L (Makepeace et al, 1995). A study in Vancouver, BC found an average total lead concentration near 1000 µg/L in commercial and residential areas with a maximum single sample concentration near 4100 µg/L (Hall et al, 1988). A study of stormwater in Birmingham, AL found average dissolved lead concentrations as high as 2.6 µg/L from the worst area while average total lead in the same area was 105 µg/L (Pitt et al, 1995). Monitoring of 14 stormwater outfalls from SEATAC International Airport during the period of July 1, 2001, through June 30, 2002, found total recoverable lead concentrations that ranged from 1 µg/L to 104 µg/L with a median of 2 µg/L (Tobiason, 2002).

Aircraft and runway deicers are other common stormwater contaminants with the potential for toxicity from airports. The main ingredient of a deicer formulation is either ethylene or propylene glycol. Other ingredients may include tolyltriazoles, corrosion inhibitors, surfactants, binding polymers, urea, potassium acetate, potassium formate, or sodium formate (Corsi, 2001). Monitoring of 14 stormwater outfalls from SEATAC International Airport during the period of July 1, 2001, through June 30, 2002, found ethylene glycol concentrations that ranged from 1000 µg/L to 260,000 µg/L with a median of 2500 µg/L and found propylene glycol concentrations that ranged from 1000 µg/L to 355,000 µg/L with a median of 2500 µg/L. Close to 80% of the samples (n = 219) had no detectable glycols (Tobiason, 2002). These values are an order of magnitude lower than the glycol concentrations measured in 1993 in a study at the Baltimore-Washington International Airport (Fisher et al, 1995).

Effects to Fish of Common Stormwater Pollutants - Copper is a ubiquitous stormwater pollutant and may be the worst-case toxic metal for adverse effects to salmonid health. The 96-hour LC50 for yearling coho salmon exposed to dissolved copper is in the range of 60 – 74 µg/L. Dissolved copper concentrations at or above 10 µg/L have been shown to reduce yearling coho feeding, growth, general health, and the ability to survive moving into seawater (Lorz et al, 1977).

Juvenile Chinook salmon exposed to dissolved copper concentrations at or above 50 µg/L for 1 hour or to dissolved copper concentrations at or above 25 µg/L for 4 hours lost a significant number of olfactory receptors resulting in a reduction in the ability to smell. Such a loss would reduce the ability to find prey, avoid predators, and return to the natal stream for spawning. A similar effect on the ability to smell might explain the impairment of coho migration in the study referenced above. Juvenile Chinook salmon exposed to 44 µg/L of dissolved copper quickly lost the ability to smell and avoid further copper exposure. Juvenile Chinook salmon without previous copper exposure actively avoid dissolved copper concentrations as low as 4 µg/L. After acclimation to 2 µg/L of dissolved copper, juvenile Chinook salmon no longer avoided dissolved copper at 4 µg/L. Juvenile rainbow trout were much less sensitive than Chinook to olfactory impairment from copper exposure in the same study (Hansen et al, 1999).

Steelhead salmon embryos, alevins, and fry intermittently exposed to copper for 4.5 hours each day for 78 days exhibited greater impairment than other steelhead salmon of the same age continuously exposed to the same concentrations indicating that water quality criteria based on continuous exposures may be inadequately protective for intermittent exposures to contaminants in runoff from rain events (Seim et al, 1984) Fingerling rainbow trout exposed to dissolved copper concentrations of 10 µg/L for 24 hours showed greatly increased mortalities from a common viral salmon pathogen (IHN) compared to rainbow trout receiving a virus exposure but no copper and rainbow trout receiving a copper exposure but no virus (Hetrick et al, 1979).

Pillard (1995) measured the toxicity to fathead minnows of a propylene glycol type I deicer as a 48-hour LC50 of 790,000 µg/L (96-hour LC50 = 710,000 µg/L), a 7-day LC50 of 270,000 µg/L, and an NOEC for growth of 98,000 µg/L. The toxicity to daphnids in the same study of a propylene glycol type I deicer was a 48-hour LC50 of 1,020,000 µg/L, a 7-day LC50 of 660,000 µg/L, and an NOEC for reproduction of 600,000 µg/L. The study found the toxicity of an ethylene glycol type I deicer, of pure propylene glycol, and of pure ethylene glycol to all be an order of magnitude or more lower than the propylene glycol type I deicer. The toxicity thresholds for the pure propylene or ethylene glycols were much higher than the highest concentrations of these compounds found in the monitoring of 14 stormwater outfalls from SEATAC International Airport during the period of July 1, 2001, through June 30, 2002 (Tobiason, 2002). Majewski et al (1978) found no mortalities in rainbow trout exposed for 24 hours to 5,000,000 µg/L propylene glycol although an increase in ventilation rate was found at 3,850,000 µg/L.

Polycyclic aromatic hydrocarbons (PAHs) are another class of compounds that are ubiquitous in urban runoff. PAHs are persistent, bioaccumulative, and often toxic. The most serious consequences known from PAH exposure to fish are to the early life stages. Weathered PAH concentrations in water as low as 1.0 ppb produced significant mortalities in pink salmon in laboratory exposures (Heintz, 1999).

Biological Monitoring - The best single toxicity test for stormwater monitoring is daphnid acute testing. Daphnids are known to be among the most sensitive of test organisms to metals and pesticides (Hall et al, 1988 and Werner et al, 2000). A typical 48-hour LC50 for daphnids exposed to copper sulfate will typically be in the range of 8.2 - 17.5 µg/L with statistically significant differences in survival as low as 5 µg/L (WA State, 2002) indicating that daphnid acute testing will provide protection for salmonids against the adverse effects of copper discussed above. Daphnid acute tests are widely available and relatively inexpensive. EPA has developed toxicity identification procedures for daphnids which have successfully identified unknown toxicants in stormwater (Anderson et al, 1991, Werner et al, 2000, and de Vlaming et al, 2000). For these reasons, daphnid acute testing is becoming a standard approach for urban runoff with examples such as a study of urban runoff toxicity around Vancouver, BC (Hall et al, 1988), an evaluation of the effectiveness of an urban runoff treatment marsh in Fremont, CA (Katznelson, 1995), and identification of toxicants entering San Francisco Bay in urban runoff (Anderson, 1991). Because the *Ceriodaphnia* in the 7-day chronic test must be generously fed in order to reproduce and the food can bind dissolved copper, the test is often less sensitive to copper than the 48-hour acute daphnid test which has no feeding. Because fish are more sensitive to type I deicer formulations than daphnids (Pillard, 1995), the rainbow trout 96-hour acute toxicity test is also needed on samples collected from stormwater discharges draining areas where deicers are applied.

Environment Canada has developed toxicity tests to protect early life stages of salmonids (McLeay et al, 1998). One of these, the rainbow trout embryo test, is the best available test for assessing the suitability of streams adjacent to the SEATAC airport for coho salmon spawning and will be sensitive to PAHs. Because this test is not at this time valid under WAC 173-205-050(1)(d), it cannot be used in a permit to characterize stormwater discharges. Adverse effects found by the test will be investigated further by the Permittee. Since other sources contribute stormwater to adjacent streams, adverse effects caused by receiving water samples might not be related to SEATAC Airport runoff. It is important to see if local streams have healthy coho spawning habitat and to determine as much as possible if SEATAC Airport activities or some other source are contributing to any impairment. The benthic index of biotic integrity (B-IBI) monitoring required in the permit is a similar type of instream assessment and will quantify habitat impairment from SEATAC Airport and other sources. Benthic organisms are important as food for salmon fry.

<u>Mixing Zones</u>

The Water Quality Standards allow the Department to authorize mixing zones around a point of discharge in establishing surface water quality-based effluent limits. Both “acute” and “chronic” mixing zones may be authorized for pollutants that can have a toxic effect on the aquatic environment near the point of discharge. The concentration of pollutants at the boundary of these mixing zones may not exceed the numerical criteria for that type of zone. Mixing zones can only be authorized for discharges that are receiving AKART and in accordance with other mixing zone requirements of WAC 173-201 A-100.

When authorized, mixing zones define the point of compliance of water quality-based criteria in the receiving waterbody. The potential mixing zone is defined in WAC 173-201A-110 in terms of linear dimensions and volume of the receiving water. The actual mixing zone is defined in relation to the point of discharge and how the discharge mixes with the receiving water. Only the discharge plume can be considered as part of the actual mixing zone. In order to determine actual compliance with water quality-based criteria in the receiving water, one would have to sample within the discharge plume at the edge of the allotted mixing zone. Without a visual marker in the discharge, such as a dye, it is virtually impossible to sample the receiving water for compliance with precision. Typically, a mixing zone dye study or modeling is used to establish the amount of mixing a discharge will receive in the allotted mixing zone. This mixing is expressed as a dilution factor. For specific pollutants, the background level of the pollutant in the receiving water also factors into determining the available dilution. These factors become part of a calculation used to set a discharge limit that must be met at the point of discharge (or as close to a point of discharge as practical). All of these considerations are very site-specific and difficult to determine for stormwater discharges.

This permit does not authorize the application of a mixing zone for stormwater at this time. To be eligible, the Port must have applied all appropriate BMPs for stormwater management at its site and allowable mixing must not result in loss of beneficial uses in the receiving water. A discharge that is not causing or contributing to a water quality violation will typically not cause a loss of beneficial uses.

A mixing zone will not be allowed for pollutants of concern in waters listed in Washington State pursuant to Section 303(d) of the Clean Water Act for either new or existing permit coverage. These waters have been listed because of measurements in the waterbody that exceed water quality-based standards. Where background in the receiving water is at or above water quality standards at the point of discharge, there is no available dilution and therefore a mixing zone is not applicable. Waters subject to a total maximum daily load determination (TMDL) also have requirements that may preclude a mixing zone. The discharge of stormwater to these waters must be consistent with the TMDL determination.

E. SURFACE WATER QUALITY CRITERIA

Applicable criteria are defined in Chapter 173-201A WAC for aquatic biota. In addition, U.S. EPA has promulgated human health criteria for toxic pollutants (EPA, 1992). The standard criteria that apply to Class AA waters are listed below:

Fecal Coliforms	Fresh water - 100 organisms/100 mL maximum geometric mean Marine water - 14 organisms/100 mL maximum geometric mean
Dissolved Oxygen	Fresh water - 8 mg/L minimum Marine water - 6 mg/L minimum
Temperature	Fresh water - 18 degrees Celsius due to human activities Marine water - 16 degrees Celsius due to human activities
pH	Fresh water 6.5 to 8.5 standard units Marine water -7.0 to 8.5 standard units
Turbidity	Less than 5 NTU above background when background is 50 NTU or less, or have no more that a 10% increase if background exceeds 50 NTU
Toxics	No toxics in toxic amounts

F. CONSIDERATION OF SURFACE WATER QUALITY-BASED LIMITS FOR NUMERIC CRITERIA

Water quality-based limits for numeric criteria are included in the proposed permit for outfalls discharging directly to the receiving water. A permit generally does not automatically set limits and require monitoring for all criteria. Instead, there is typically a review of wastewater data to determine the parameters of concern and, either through direct sampling or comparison to data of similar facilities, limits and monitoring are established for discharge of pollutants that have a reasonable potential to violate Water Quality Standards. Determining reasonable potential includes a statistical determination of the maximum concentration of the pollutant likely to occur in the discharge, factoring in available dilution if a mixing zone is granted, and accounting for receiving water background levels for the pollutant. Some criteria are dependent on additional site-specific conditions, for example, hardness of the discharge/receiving water is necessary to calculate the criteria for many metals. These site specific considerations are not easily applicable in case of stormwater runoff; therefore, this permit is using hardness of 100 mg/L, but puts more emphasis on implementation of BMPs to limit contamination of stormwater. Source control BMPs and treatment BMPs as necessary are expected to prevent water quality violations. This permit does apply limits as appropriate for outfalls discharging directly to the receiving water.

Although the proposed permit does not include specific water quality-based numeric limits for all discharges, it does include a narrative requirement to comply with Water Quality Standards. If site-specific analysis reveals that stormwater discharges are violating Water Quality Standards, enforcement action may be taken.

Historical Data Reported Under the Existing NPDES Permit and Their Comparison with Benchmark Criteria

The existing NPDES permit does not contain effluent limits for stormwater discharges associated with industrial activity. The permit has always required an adaptive management strategy consisting of visual inspections, quantitative runoff sampling, and BMPs in combination with the SWPPP. The permit required the quantitative sampling to be reported to the Department on periodic DMRs. In addition, WET testing was required in the existing permit. These data and other studies conducted by the Port have demonstrated successful adaptive management in reducing certain constituents as outlined in prior sections of this Fact Sheet.

Other stormwater management work in progress is aimed at further constituent reductions through monitoring and BMPs while deriving appropriate site specific standards for certain metals. The § 401 Certification (Condition J2.a) requires the Site Specific Water Quality Assessment (SSA) study, which will derive site specific standards for copper and zinc based on translators, water effect ratios, and other factors for pertinent receiving waters, with the aim of developing appropriate, protective limits for the corresponding STIA stormwater. Ecology and EPA acknowledge the potential need for development of site specific standards and have promulgated relevant guidance and regulations that results in standards that are as protective of the default Water Quality Standards (WQS).

The proposed benchmarks for quantitative monitoring are intended to provide objective feedback relating to overall SWPPP and BMP performance. These benchmarks listed in Table 16 are consistent with the EPA's MSGP (Federal Register Vol. 60, No. 189, September 29, 1995, pp 50824-50825, and FR Vol. 65, No. 210, October 30, 2000 pp 64766-64767). Table 20 summarizes the history of benchmark attainment for STIA stormwater discharges for the past permit cycle.

Table 20. Summary of Historical Benchmark Attainment for STIA Stormwater

Constituent	Benchmarks (mg/l)	landside		airfield		landside		airfield	
		SDE4 (002)	*n*	*SDS3 (005)*	*n*	*SDN (006)*	*n*	*SDN4 (011)*	*n*
pH	6--9	100%	55	100%	57	100%	49	100%	43
TPH	15	100%	39	100%	40	100%	45	100%	38
TSS	100	93%	53	96%	53	79%	41	98%	44
BOD_5	30	100%	54	93%	51	100%	40	100%	44
Cu (TR)	63.6	95%	54	82%	54	98%	41	95%	43
Pb (TR)	81.6	100%	54	100%	54	100%	41	100%	44
Zn (TR)[1]	117	51%	54	94%	54	17%	41	100%	44

Table notes:

n = number of samples represented in past permit cycle

[1] The Port is investigating appropriate BMPs for sources of zinc in SDE4 and SDN1.

Effluent Limits and Benchmarks

There are no effluent limits proposed by this permit for outfalls mentioned in Part II of the permit (stormwater discharges associated with industrial activity) to the Lake Reba and Northwest Pond Regional Detention Facilities. However, this permit applies benchmarks for pH, copper, lead, zinc, oil & grease, ammonia, nitrate/nitrites, and turbidity to those discharges. These benchmarks were adopted by the EPA in the Federal Register, Volume 65, Number 210, October 30, 2000, Final Reissuance of National Pollutant Discharge Elimination System (NPDES) Storm Water Multi-Sector General Permit (MSGP) for Industrial Activities. The benchmarks adopted indicate discharges with low risk of violating Water Quality Standards. The benchmarks are not the Water Quality Standards. Discharges that comply with these numbers have high likelihood of complying with the Water Quality Standards. The benchmarks will be reevaluated based on the compliance schedules for submittals of the various studies required by this permit. There are effluent limits proposed by this permit for outfalls identified in Part II of this permit that directly discharge to the receiving water. These limits are applied to pH, copper, lead, zinc, oil and grease, ammonia, nitrate/nitrites, and turbidity. The effluent limits are identical to the benchmarks as promulgated by EPA, MSGP. They are water quality-based limits based on receiving water hardness of 100 mg/L for heavy metals.

Table 21. Proposed Benchmarks for Stormwater Discharges Associated with Industrial Activity

Parameter	Benchmark Values	Basis
pH	In the range of 6 to 9 standard units	USEPA MSGP
TSS	100 mg/l	USEPA MSGP
Copper	63.6 µg/L	USEPA MSGP
Lead	81.6 µg/L	USEPA MSGP
Zinc	117 µg/L	USEPA MSGP
Oil and Grease (NWTPH-Dx)	15 mg/L	USEPA MSGP
Ammonia	19 mg/L	USEPA MSGP
Nitrates/Nitrites as N	0.68 mg/L	USEPA MSGP

Whole Effluent Toxicity

The Water Quality Standards for Surface Waters require that discharges not cause toxic effects in the receiving waters. Many toxic pollutants cannot be detected by commonly available detection methods. However, toxicity can be measured directly by exposing living organisms to the discharge water in laboratory tests and measuring the response of the organisms. Toxicity tests measure the aggregate toxicity of the whole effluent, and, therefore, this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity, and other WET tests measure chronic toxicity. The existing permit required the Port to conduct WET characterization testing in the previous permit cycle. The latest WET test results met performance standards at all of the four outfalls tested.

Acute toxicity tests measure mortality as the significant response to the toxicity of the effluent. Dischargers who monitor their wastewater with acute toxicity tests are providing an indication of the potential lethal effect of the effluent to organisms in the receiving environment.

Accredited WET testing laboratories have the proper WET testing protocols, data requirements, and reporting format. Accredited laboratories are knowledgeable about WET testing and capable of calculating an NOEC, LC_{50}, EC_{50}, IC_{25}, etc. All accredited labs have been provided the most recent version of the Department of Ecology Publication # WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria,* which is referenced in the permit. Any Permittee interested in receiving a copy of this publication may call the Ecology Publications Distribution Center at (360) 407-7472 for a copy. Ecology recommends that Permittees send a copy of the acute or chronic toxicity section(s) of their permits to their laboratory of choice.

Human Health

Washington's Water Quality Standards now include 91 numeric health-based criteria that must be considered in NPDES permits. These criteria were promulgated for the state by the U.S. EPA in its National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992).

The Port's stormwater discharges associated with industrial activities at STIA are not likely to contain chemicals of concern based on existing data or knowledge. The discharges will be re-evaluated for impacts to human health at the next permit reissuance and after the Department receives the required reports.

Sediment Quality

The Department has promulgated aquatic sediment standards (Chapter 173-204 WAC) to protect aquatic biota and human health. These standards state that the Department may require permittees to evaluate the potential for the discharge to cause a violation of applicable standards (WAC 173-204-400). The permit requires BMPs to limit contamination of stormwater. Source control BMPs are expected to eliminate/minimize the potential contamination of stormwater and comply with aquatic sediment standards. However, if stormwater monitoring for representative parameters raises questions about the success of the BMP approach, Ecology will consider additional permit requirements in the future to assure compliance with sediment standards.

Ground Water Quality Limitations

The Department has promulgated Ground Water Quality Standards (Chapter 173-200 WAC) to protect beneficial uses of ground water. NPDES permits issued by the Department shall be conditioned in such a manner so as not to allow violations of those standards (WAC 173-200-100). This permit requires BMPs to limit contamination of stormwater. Source control BMPs are expected to eliminate/minimize the potential contamination of stormwater and to protect ground water. However, if stormwater monitoring for representative parameters raises questions about the success of the BMP approach, Ecology will consider additional permit requirements and possible limits to protect ground water.

G. MONITORING REQUIREMENTS

Monitoring, recording, and reporting are required (WAC 173-220-210 and 40 CFR 122.41) to verify that the SWPPP and BMPs are effective.

The stormwater monitoring schedule is detailed in the proposed permit under Condition S.1, Part II and III. Specified monitoring frequencies take into account the quantity and variability of the discharge, the associated industrial activities, past data history, significance of pollutants, and cost of monitoring.

Stormwater must be sampled according to the instructions below. If a Permittee is unable to sample according to any of these criteria, it must submit an explanation with the monitoring report that includes the variance and the reason why. Sampling of stormwater will be conducted as follows:

- Grab and composite samples for respective parameters. The parameters' oil and grease (by TPH method NWTPH-Dx), pH and bacteria (fecal coliform and turbidity or other appropriate parameter as discussed below) should only be analyzed in grab samples. The remaining parameters should be analyzed only in flow-weighted composite samples (metals, BOD, glycols, TSS) so that results reflect event-mean concentrations (EMCs). The grab samples shall be taken for all relevant parameters for flow characterization to establish design criteria for the BMPs.
- All samples will be taken as close to the point of discharge as reasonably practical.
- The storm event sampled must be at least 0.1 inches of rain in a 24-hours period.
- The storm event sampled must be preceded by at least 24 hours of no discharge.

Lab Accreditation

The permit requires all monitoring data to be prepared by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, *Accreditation of Environmental Laboratories.*

H. OTHER PERMIT CONDITIONS

Reporting and Recordkeeping

The reporting and recordkeeping requirements are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control of discharge of pollution (WAC 173-220-210). Discharge monitoring reports must be submitted to Ecology every quarter even if there was no discharge or if monitoring was suspended based on consistent attainment of benchmark values. This will assure that the Department's records are maintained and demonstrate compliance with monitoring requirements by the facility.

Compliance With Water Quality Standards

The proposed permit requires compliance with Water Quality Standards through implementation of BMPs, the SWPPP and associated monitoring and inspections. The Port must install appropriate BMPs and, if necessary, enhanced BMPs to manage stormwater so that its stormwater discharge will not cause or contribute to a violation of Water Quality Standards in waters of the state. Ecology recognizes the difficulty stormwater presents to easily determine when a discharge is causing a receiving water quality violation. The Department also recognizes the challenges associated with designing stormwater management for storm events that vary in duration, intensity, and volume. The issue focuses on providing reasonable assurance of environmental protection within the context of what is reasonably achievable. The proposed permit has included the following provisions to address this issue:

- All known available and reasonable treatment (AKART)
- Monitoring and analysis
- Mixing zones
- Zero dilution for 303(d) listed waters
- Stormwater Management Manual (SWMM) minimum technical requirements for treatment

The Port is required to implement all BMPs identified in its SWPPP. Operational and structural source control BMPs must be in place, operational, and maintained. Treatment BMPs are also required for industrial activities that unavoidably lead to significant stormwater contamination. The Department's *Stormwater Management Manual for Western Washington* identifies BMPs source control and treatment BMPs that limit the exposure of pollutants to stormwater. Implementation of these BMPs is presumed to typically result in discharges of stormwater that will not violate Water Quality Standards. If the prescribed BMPs fail to be protective, the Port is required to add additional BMPs to achieve compliance. Monitoring and analysis were included to provide an indication of when water quality violations may be a concern and additional BMPs are required. Final consideration of a water quality violation will consider available dilution, if a mixing zone is granted, except for parameters of concern in waters listed according to Section 303(d) of the Clean Water Act. Application of these provisions is expected to provide protection of waters of the state that is reasonably achievable.

The Department's *Stormwater Management Manual for Western Washington* is the current standard for minimum technical requirements addressing water quality of stormwater through treatment BMPs for facilities in western Washington. Under the *Stormwater Management Manual for Western Washington*, the design basis for volume-based treatment systems is the 6-month, 24-hour storm event. For flow rate-based treatment systems, the design basis is the flow rate at, or below which, 91% of the runoff volume, as estimated by an approved continuous runoff model, will be effectively treated. This design storm was derived to assure that stormwater treatment facilities were sized to treat 91% of the stormwater. Treatment systems must be fully functional for all storm events that do not exceed the design storm. Treatment systems that fail to fully treat stormwater during storms that exceed the water quality design storm may not be in violation of the permit provisions. Failure of source control BMPs will be considered a violation of permit provisions even when the storm exceeds the water quality design storm.

Operation and Maintenance

The Port must properly operate and maintain all BMPs for stormwater management. However, Ecology recognizes that circumstances can develop that require bypassing the stormwater management systems. Condition S4.A, in Part II of the permit, includes bypass procedures, identifying when it may be authorized and the Port's responsibility to inform the Department.

Stormwater Pollution Prevention Plan (SWPPP)

The SWPPP is the plan for and the action of managing 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 be retained on-site or within reasonable access to the site and available for review by Ecology. The SWPPP must identify potential sources of stormwater contamination from industrial activities and how those sources of contamination are managed to prevent or minimize contamination of stormwater. If contamination of stormwater is unavoidable, the SWPPP will quantify the environmental risk and determine if treatment of the stormwater is necessary to prevent a violation of Water Quality Standards and loss of beneficial uses in waters of the state. The SWPPP must be a "living" document that is under consistent review and revised, as necessary, to assure that stormwater discharges are not resulting in degradation of the state's waters. Pollution prevention is not a one-time effort but requires constant vigilance and full participation if it is to be effective. Like maintaining safety at the site, the SWPPP will only be successful when it becomes part of the way all employees at the site do business.

Best Management Practices (BMPs) are the action items identified in the SWPPP to manage 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 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. In the proposed permit, BMPs are categorized as operational source control, structural source control, and treatment BMPs. The Permittee is required to implement operational and source control BMPs. Treatment BMPs are required when operational and source control BMPs are not sufficient to assure compliance with Water Quality Standards.

Ecology released the *Stormwater Management Manual for Western Washington* (SWMM) in September 2001. Therefore, the Port is required to apply BMPs from the new manual if its stormwater discharge is failing to achieve compliance with Water Quality Standards or where redevelopment at the site fits the manual definition.

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 to 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 best management practices. Prohibitions might include eliminating field 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 very cost-effective way to control pollutants and protect the environment. The SWPPP must identify all the operational BMPs and how they are implemented. For example, it will not be sufficient to simply say that employees will be trained. The SWPPP must identify what that training will consist of, when that training will take place, and who is responsible to assure that employee training happens. Chapter 2 of Volume 4 in the *Stormwater Management Manual for Western Washington* provides a detailed list of operational source control measures that apply to virtually all industrial activities. The chapter provides the required best management practices for each major category listed in the permit. It includes "recommended additional... BMPs" for good housekeeping, preventative maintenance, and spill prevention and cleanup. The recommended BMPs are not required but may be necessary to achieve discharge compliance with Water Quality Standards.

Structural Source Control BMPs include physical, structural, or mechanical devices or facilities intended to prevent pollutants from entering stormwater. A few examples of source control BMPs are 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 are likely to include a capital investment but are cost effective compared to cleaning up pollutants after they have entered stormwater. Structural source control BMPs are also identified in Chapter 2 of Volume 4 in the *Stormwater Management Manual for Western Washington.* Some of the control measures are specific to an industrial group such as "Commercial Composting" while others apply to general industrial activities such as "Mobil Fueling of Vehicles and Heavy Equipment."

The previous BMPs are designed to prevent pollutants from entering stormwater to begin with. However, even with a very aggressive and successful program, stormwater may still require treatment to achieve discharge compliance with Water Quality Standards. **Treatment BMPs** are intended to remove pollutants from stormwater. A few examples of treatment BMPs are detention ponds, oil/water separators, biofiltration, and constructed wetlands[4]. Volume 5 of the *Stormwater Management Manual for Western Washington* provides information on treatment BMPs including guidance on selecting appropriate treatment BMPs. All facilities are encouraged to review Chapter 5 of the *Stormwater Management Manual for Western Washington* and implement appropriate treatment BMPs. Facilities that are unable to achieve discharge compliance through source control BMPs are required to implement appropriate treatment BMPs. If treatment BMPs are not required, the facility must still include in its SWPPP a description of how it arrived at that conclusion.

[4] Developing a constructed wetland can be an effective way to treat stormwater. However, wetlands constructed for treatment of stormwater are not eligible for use as compensatory mitigation for authorized impacts to regulated wetland systems.

The Department recognizes the need to include specific BMP requirements for stormwater runoff quantity control to protect beneficial water uses, including fish habitat. These are referred to as **Flow Control BMPs**. New facilities and existing facilities undergoing redevelopment are required to implement the requirements for peak runoff rate and volume control identified by Volume 1 of the *Stormwater Management Manual for Western Washington* as applicable to their development. Chapter 3 of Volume 3 lists BMPs to accomplish rate and volume control. Existing facilities should also review the requirements of Volume 1 (Minimum Technical Requirements) and Chapter 3 of Volume 3. Although not required to implement these BMPs, controlling rate and volume of stormwater discharge is very important to 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.

Compliance Schedule

This permit contains Compliance Schedules in Section S.9 (Part II) to ensure appropriate source control and technology and BMPs establishment to ensure eventual compliance with the water quality criteria. Compliance Schedules provide:

1. Based on monitoring conducted under Section S.1.B (Part II), the Port of Seattle shall identify outfalls with potentially contaminated runoff to the Miller and the Des Moines Creeks and shall submit an engineering report for AKART analysis in accordance with the Chapter 173-240 WAC, to the Department for review and approval.
2. The Port of Seattle shall implement and shall install appropriate BMPs, where necessary, to meet the applicable effluent limits for specific outfalls specified under Part II of the permit.
3. The Port of Seattle shall implement and shall install appropriate BMPs and enhanced BMPs, where necessary, to ensure outfalls discharging to the regional detention facilities are designed and sized appropriately. The Port shall use the benchmark criteria as the design basis to size the BMPs.
4. The Port of Seattle shall finalize the site specific study as required under Condition J.2 of the 401 Certification and to complete the necessary retrofit prior to 50% completion of the new proposed impervious areas.

Solid Waste Plan

RCW 90.48.080 requires appropriate disposal of any organic or inorganic waste. This includes any wastes that are collected as a result of stormwater treatment. Maintenance of stormwater treatment facilities must include appropriate disposal of collected wastes. They must not be allowed to re-suspend and discharge. The plan for appropriate collection and disposal of solid waste must be included in the Stormwater Pollution Prevention Plan.

General Conditions

General Conditions are based directly on state and federal law and regulations and have been standardized for all individual industrial NPDES permits issued by the Department.

PERMIT ISSUANCE PROCEDURES (PART I, II, III)

PERMIT MODIFICATIONS

The Department may modify this permit to impose numerical limitations, if necessary, to meet Water Quality Standards for Surface Waters, Sediment Quality Standards, or Water Quality Standards for Ground Waters, based on new information obtained from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

The Department may also modify this permit as a result of new or amended state or federal regulations.

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to control toxics, protect human health, aquatic life, and the beneficial uses of waters of the state of Washington. The Department proposes that this proposed permit be issued for five (5) years.

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APPENDIX A – PUBLIC INVOLVEMENT INFORMATION

The Department has tentatively determined to reissue a permit to the applicant listed on page one of this fact sheet. The permit contains conditions and effluent limitations which are described in the rest of this fact sheet.

Public Notice of Application (PNOA) was published on September 3, 2002, and September 10, 2002, in the *Seattle Times* to inform the public that an application had been submitted and to invite comment on the reissuance of this permit.

The Department will publish a Public Notice of Draft (PNOD) on (date) in (name of publication) to inform the public that a draft permit and fact sheet are available for review. Interested persons are invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents are available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the regional office listed below. Written comments should be mailed to:

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

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the thirty (30)-day comment period to the address above. The request for a hearing shall indicate the interest of the party and reasons why the hearing is warranted. The Department will hold a hearing if it determines there is a significant public interest in the draft permit (WAC 173-220-090). Public notice regarding any hearing will be circulated at least thirty (30) days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing (WAC 173-220-100).

Comments should reference specific text followed by proposed modification or concern when possible. Comments may address technical issues, accuracy and completeness of information, the scope of the facility's proposed coverage, adequacy of environmental protection, permit conditions, or any other concern that would result from issuance of this permit.

The Department will consider all comments received within thirty (30) days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Department's response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Department by telephone, (425) 649-7227, or by writing to the address listed above.

This permit and fact sheet were written and compiled by Ed Abbasi.

APPENDIX B – GLOSSARY

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

AKART--An acronym for "all known, available, and reasonable methods of treatment."

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.

Average Monthly Discharge Limitation--The average of the measured values obtained over a calendar month's time.

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.

BOD_5--Determining the 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 BOD_5 is used in modeling to measure the reduction of dissolved oxygen in a receiving water 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 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.

Chlorine--Chlorine is 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.

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 to accomplish the purpose of a Compliance Inspection - Without Sampling and 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. Additional sampling may be conducted.

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.

Dilution Factor--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, e.g., a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Engineering Report--A document which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall 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 period of time as is feasible.

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 storm water and, also, leachate from solid waste facilities.

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 Limitation--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.

Method Detection Level (MDL)--The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

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 area of the authorized mixing zone is specified in a facility's permit and follows 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. A pH of 7 is defined as neutral and large variations above or below this value are considered harmful to most aquatic life.

Quantitation Level (QL)--A calculated value five times the MDL (method detection level).

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).

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 storm water drainage system into a defined surface water body or a constructed infiltration facility.

Technology-based Effluent Limit--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

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 limitations 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 on the concentration of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into a receiving water.

APPENDIX C – 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 on the Department's homepage at http://www.ecy.wa.gov.

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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)

CALCULATIONS

Parameter	Metal Criteria Translator as decimal (Acute)	Metal Criteria Translator as decimal (Chronic)	Ambient Concentration (metals as dissolved) ug/L	State Water Quality Standard: Acute ug/L	State Water Quality Standard: Chronic ug/L	Max concentration at edge of... Acute Mixing Zone ug/L	Max concentration at edge of... Chronic Mixing Zone ug/L	LIMIT REQ'D?	Effluent percentile value	Pn	Max effluent conc. measured (metals as total recoverable) ug/L	Coeff Variation CV	s	# of samples n	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor	COMMENTS
COPPER	0.83	0.83		4.80	3.10	1.45	0.19	NO	0.95	0.368	35.00	0.60	0.55	3	3.00	60.00	470.00	
LEAD	0.951	0.95		210.00	8.10	0.43	0.05	NO	0.95	0.368	9.00	0.60	0.55	3	3.00	60.00	470.00	
ZINC	0.946	0.946		90.00	81.00	5.20	0.66	NO	0.95	0.368	110.00	0.60	0.55	3	3.00	60.00	470.00	
Ammonia				233	35	11.13	1.42	NO	0.95	0.978	820.00	0.60	0.55	135	0.81	60.00	470.00	
Phenols				5800.00	1000.00	1.49	0.19	NO	0.95	0.978	110.00	0.60	0.55	135	0.81	60.00	470.00	
Ethylbenzene				430.00	1000.00	0.22	0.03	NO	0.95	0.978	16.00	0.60	0.55	135	0.81	60.00	470.00	
Benzene				5100.00	700.0000	36.65	4.68	NO	0.95	0.978	2700.00	0.60	0.55	135	0.81	60.00	470.00	
Toluene				6300.00	5000.00	203.61	25.99	NO	0.95	0.978	15000.00	0.60	0.55	135	0.81	60.00	470.00	
Total Xylene								NO								60.00	470.00	
Ethylene Glycol								NO	0.95	0.978		0.60	0.55	135	0.81	60.00	470.00	
Propylene Glycol								NO	0.95	0.978		0.60	0.55	135	0.81	60.00	470.00	

Ethylene Glycol	Unspecified under WAC 173-201-A
Propylene Glycol	Unspecified under WAC 173-201-A
TOTAL XYLENE -	Unspecified under WAC 173-201-A

Phenols	Under WAC 173-201-A No Chronic criteria specified
Ethylbenzene	Under WAC 173-201-A No Chronic criteria specified

The existing NPDES permit required the Port of Seattle to monitor for priority pollutants on an annual basis.
It defined the priority pollutants as Semivolitile (organic acid extractables and organic base nutral extractables), volatile organic analysis, and total recoverable copper, lead and zinc

APPENDIX H - RESPONSE TO COMMENTS

(TO BE ADDED AFTER MAY 17, 2002)