Annual Industrial Waste System Stormwater Monitoring Report

Seattle-Tacoma International Airport

For the Period July 1, 2020 through June 30, 2021

September 30, 2021

Prepared by

Aspect Consulting

Port of Seattle

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Executive Summary

This Annual Report summarizes the results of effluent monitoring at the Seattle-Tacoma International Airport (STIA) Industrial Waste Treatment Plant (IWTP) from July 1, 2020 through June 30, 2021. The IWTP discharges to the Puget Sound via Outfall 001 (Outfall 001) as defined in the Port of Seattle's (Port) National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit, WA0024651.

The IWTP also operates under the King County (KC) Waste Discharge Permit No. 7810-05. This permit allows the facility to discharge stormwater with higher concentrations of biochemical oxygen demand (BOD_5) to the King County South Treatment Plant (KC STP) for further treatment before ultimately discharging to the Puget Sound.

As of January 2007, STIA has operated under, final effluent limitations, which includes separate limits for BOD_5 from November through March and April through October. In addition, all known, available and reasonable methods of prevention, control, and treatment (AKART) system for segregating higher BOD_5 concentrations and routing them to the KC STP was finished in November 2006 with final implementation on January 1, 2007.

During the reporting period, a total of three hundred and three (303) million gallons (MG) of stormwater was processed in the IWTP and discharged to either Outfall 001 or KC STP. The IWTP operated on 157 days during the reporting period.

Outfall 001 Discharges

Outfall 001, as referred to in the Airport's NPDES Permit, is the Midway Sewer District's sewage treatment plant discharge point to the Puget Sound. The Midway Sewer District and Port have an operating agreement for joint use of the Midway Sewer District's outfall (Outfall 001). The Port monitors and reports all discharges to Ecology in accordance with Part 1 Special Conditions S1 and S2 of the STIA NPDES permit.

One hundred and fifty-eight (158) MG of stormwater was processed and discharged through Outfall 001 to Puget Sound over 72 days during the reporting period. The daily average flow to Outfall 001 was 2.19 MG. There were no discharges to Outfall 001 in August 2020, March 2021, April 2021, or May 2021. During the reporting period, the maximum daily discharge to Outfall 001 was 4.34 MG and occurred on January 5, 2021.

Seventy-two (72) samples were collected from Outfall 001 effluent to characterize the daily discharge for BOD_5 concentration and to calculate BOD_5 mass-loading. Concentrations of BOD_5 discharged to Outfall 001 ranged from 1.8 milligrams per liter (mg/L) to 37.7 mg/L. The BOD_5 monthly average effluent concentration of 45 mg/L in the de-icing season (November - March) and 25 mg/L in the non-de-icing season (April - October) was not exceeded. All samples collected were well below their respective daily maximum BOD_5 mass-loading limits. The monthly average BOD_5 mass-load ranged from 46 pounds in September 2020 to 680 pounds in January 2021. The daily maximum BOD_5 mass-load discharged to Outfall 001 was 1,218 pounds and occurred during the de-icing season on January 7, 2021.

Twenty-four (24) samples were collected from Outfall 001 effluent and analyzed for total suspended solids (TSS). TSS concentrations discharged to Outfall 001 ranged from 3.0 mg/L to 16.0 mg/L. All TSS samples were below the daily maximum effluent limit of 33 mg/L as well as the monthly average effluent limit of 21 mg/L.

pH was continuously measured at the IWTP and instantaneous maximum and minimum results were recorded. The plant consistently operated within the NPDES permit-required pH range of 6.0 to 9.0. A minimum instantaneous pH of 6.4 and a maximum of 8.9 were measured during this reporting period.

Twenty-four (24) samples were collected from Outfall 001 effluent and analyzed for oil and grease. Over the reporting period, the maximum concentration of oil and grease was 2.58 mg/L and the daily average concentration was 0.96 mg/L. All Oil and Grease samples were well below the daily maximum effluent limit of 15 mg/L.

Section 1: Introduction

Located midway between the cities of Seattle and Tacoma, Washington, the Seattle-Tacoma International Airport (STIA) was built in the 1940s and is owned and operated by the Port of Seattle (Port). According to the Port's 2019 Key Facts and Figures, STIA handled 453,549 metric tons of air cargo, and 51.8 million passengers. STIA is ranked in the top ten busiest U.S. passenger airport and has a regional impact of more than $22.5 billion in business revenue, generating more than 151,400 jobs.

The Port is required by the National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit Part 1, Special Condition S2.F, to submit an Annual IWS Stormwater Monitoring Report for the STIA, Industrial Waste Treatment Plant (IWTP). The annual report is a compilation of data submitted monthly to the Washington State Department of Ecology (Ecology) in the Discharge Monitoring Reports (DMRs).

The NPDES Permit (No. WA0024651) became effective on January 1, 2016 and is valid through the reporting period. The current NPDES Permit was just reissued and is effective as of September 1, 2021 through August 31, 2026. This Annual IWS Stormwater Monitoring Report summarizes the discharge monitoring results from July 2020 through June 2021.

1.1 Industrial Waste System

The primary function of the Port's Industrial Wastewater System (IWS) at STIA is to collect, segregate, treat, and discharge effluent generated from aircraft fueling and maintenance areas in compliance with the Port's NPDES permit (No. WA0024651) and the King County South Treatment Plant (KC STP) waste discharge permit (No. 7810-05).

The STIA IWS collects industrial stormwater from two drainage basins: The North and South Service Basins. The IWS and storm drainage areas are depicted in Figure 1. The IWS North Service Basin includes portions of the airport area between Taxiways A and B and Air Cargo Road, as well as the Paccar area on the southern side of the airfield. The IWS South Basin includes the Fuel Farm and Passenger Gate Ramp areas, as well as aircraft hangers. The North drainage basin accounts for approximately 130-acres and the South drainage basins accounts for approximately 350-acres.

The IWS manages stormwater associated with industrial activities from airline and maintenance operations as well as wastewater from other airport-related operations. These contaminants of concern consist primarily of spilled fuel, detergents, lubricants, and de-icing and anti-icing fluids. The system includes collection and conveyance facilities, high biochemical oxygen demand (BOD_5) runoff segregation, runoff storage, and the IWTP. These facilities along with additional information on all known, available, and reasonable methods of treatment determination (AKART) for IWS, an overview of aircraft de-icing and anti-icing operations of STIA, discharge characterization, stormwater pollution prevention, and the mixing zone study are described below.

The IWTP Improvements Project was completed in the summer of 2006, allowing for monitoring and segregation of IWS runoff based on BOD_5 concentrations. This project was initiated by the AKART determination for the IWS. "High BOD_5" effluent is defined as any water that could cause the IWTP to exceed the monthly daily average concentration or maximum daily load. Final Effluent Limitations are specified in S1.A of the permit. Treated wastewater containing high BOD_5 concentrations is conveyed to the KC STP, while treated wastewater with low BOD_5

concentrations is discharged to Puget Sound via the Midway Sewer District Outfall (Outfall 001). Start-up for this system occurred on November 6, 2006 and was fully implemented on January 1, 2007.

1.1.1 Collection and Segregation

The IWS collects stormwater from flush gutters and catch basins. These structures collect spilled fluids, which are then conveyed to the IWS storage lagoons during precipitation events. Prior to entering the storage lagoons, the wastewater is automatically analyzed, and flow is directed to specific lagoons based upon BOD_5 concentration.

Untreated industrial stormwater is stored in three lagoons. The primary purpose of Lagoons #1 and #2 is for collection of the "first flush" of high BOD_5 influent from the South Aviation and North Aviation areas, respectively. The primary purpose of Lagoon #3 is for collection of low BOD_5 runoff, however, high BOD_5 runoff during deicing periods may also be stored in Lagoon #3 when Lagoons #1 and #2 reach full capacity. Prior to treatment, the stormwater flows from Lagoons #1 and #2 through mechanical screening devices, which are sized to remove large debris.

Water stored in Lagoons #1 and #2 drain by gravity to the IWTP. Water is pumped from Lagoon #3 to the IWTP. Some settling of solids occurs in the lagoons. The lagoons are typically cleaned every other year pending summer weather conditions. Lagoon sediments are analyzed and disposed of as necessary. Detailed descriptions of the IWS storage lagoons and the IWTP process are provided in earlier Engineering Reports and the Fact Sheet of the NPDES permit for STIA.

1.1.2 Conveyance

The IWS conveyance system includes approximately 35 miles of piping, 1,200 manholes and catch basins, two below-grade vaults in the parking garage, and 11 pump stations. These facilities are maintained on a regular basis as described in the Port's Stormwater Pollution Prevention Plan (SWPPP) and the Inspection, Maintenance, and Operation Procedures Manual. Each pump station functions as a key structural source control best management practice (BMP) by diverting runoff to the IWTP from various areas that formerly drained to the Airport's stormwater drainage system (SDS).

1.1.3 Industrial Waste Treatment Plant

The IWTP is located at the southwestern end of the airport, south of Lagoons #1 and #2 and north of 188th Street, just west of the tunnel under the eastern-most airport runway known as 16 Left / 34 Right. The IWTP is designed to remove petroleum hydrocarbons and suspended solids using a dissolved air flotation (DAF) process.

The facility consists of six treatment trains each with flash mix, flocculation, and DAF tanks. The DAF process begins with the addition of coagulation chemicals to the influent water in a flash mix chamber, followed by gentle mixing in a flocculation tank to coagulate suspended solids and oil droplets. The water then flows by gravity to the DAF units. Air bubbles released in the DAF units float the floc particles. Flight scrapers push the float over a scum beach. The skimmed float flows out of the IWTP building in a floor trench to a sludge sump at the eastern side of the IWTP building. The DAF float is collected in the sludge sump and pumped to two decant tanks located east of the IWTP building. The float separates the process-water into water and sludge phases. The water layer is decanted and returned to the IWS lagoons. The decant tanks are cleaned annually. Sludges are analyzed and disposed of as necessary.

Treated industrial wastewater is directed in either of two underground wet wells located adjacent to the treatment plant. Treated water flows into each wet well from the top of the structure and is discharged through a valve near the bottom of the wet well designated as the high BOD_5 wet well or near the surface of the wet well designated low BOD_5 wet well. Treated water is discharged to Puget Sound from the low BOD_5 wet well and to the Valley View Sewer District (VVSD) from the high BOD_5 wet well. Discharges to the VVSD are conveyed to the King County South Wastewater Treatment Plant (KC STP) where they undergo secondary treatment before being discharged to Puget Sound. A schematic diagram of the treatment system is presented in **Figure 2**.

The IWS AKART pump station and pipeline can discharge up to 2,990 GPM (4.3 MGD) to the KC STP. However, the plant hydraulic capacities are effectively limited by either the mass-based effluent or flow limitations. The KC STP Permit mass-based effluent limits allow a maximum BOD_5 hourly load of 2,500 lbs/hr and a daily maximum load of 60,000 lbs/day. The KC STP Permit limits discharges up to 1,915 GPM for 15-minutes within a 24-hour period, a peak instantaneous flow of 1,965 GPM, and a daily maximum discharge volume of 2.76 MG. The KS STP permit reserves King County's and Valley View Sewer District's authority to request that discharges to their system stop as necessary to prevent hydraulic overloading of the sewer conveyance systems or the KC STP.

Figure 1. Vicinity Map for the POS IWTP at STIA

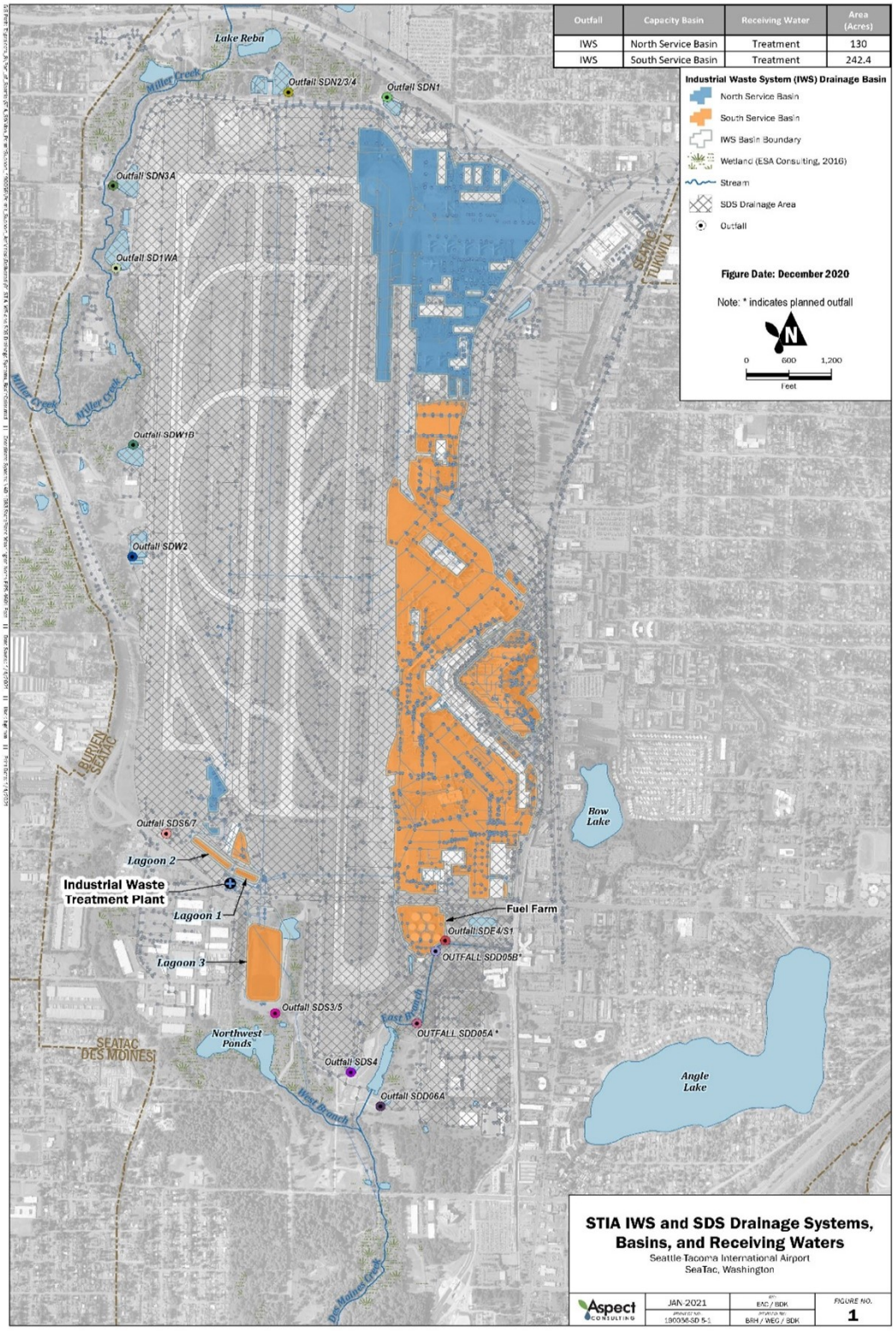
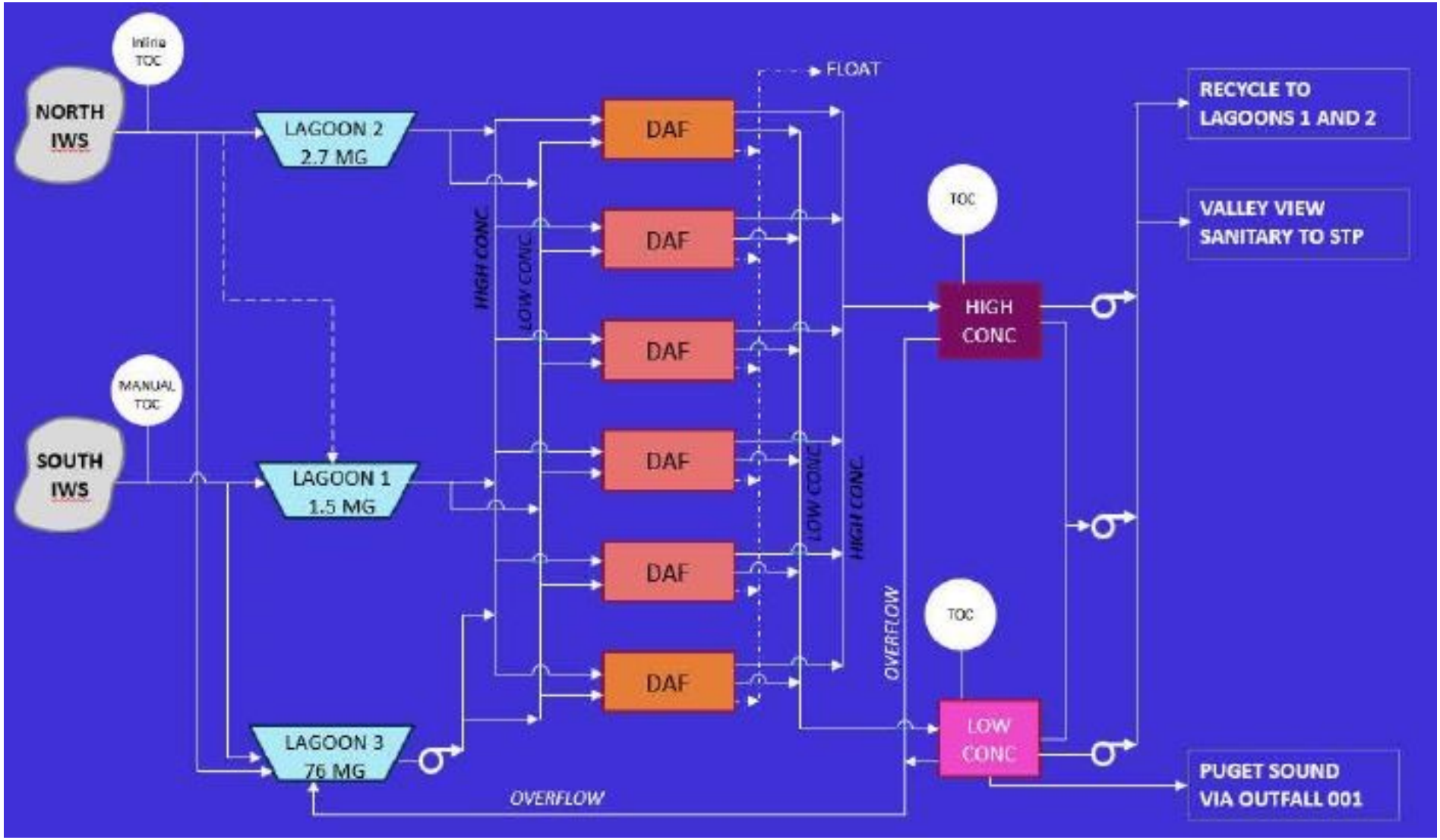


Figure 2. Schematic Diagram of the Port's IWTP at STIA.



Section 2: Sampling Objectives, Locations and Methods

The goal of this monitoring program is to characterize the flow and water quality of effluent from the IWTP for compliance with the following permits:

- NPDES Permit No. WA0024651, Part 1, Special Condition S1.A and S2.A

Program components include:

- Continuous monitoring of effluent discharge rates to operate the treatment plant in accordance with permit requirements
- Continuous monitoring of water quality of the effluent for selected parameters using in-line meters to ensure permit compliance
- Collection and analysis of effluent samples in accordance with permit requirements
- Quality control measures to obtain reliable and consistent data
- Report data in accordance with permit requirements

This section provides an overview of the monitoring requirements for discharges to Puget Sound and the Valley View Sewer District. A complete description of the monitoring program is contained in the Quality Assurance Program Plan, Seattle Tacoma International Airport Industrial Waste Treatment Plant Discharge Monitoring Program, September 2011, Amended January 2021.

2.1 Influent and Effluent Measurements

Daily grab samples of influent are analyzed for turbidity and pH In-line meters are used to continuously monitor flow, pH, and TOC of the IWTP effluent. These data are used for IWTP operations to determine where to store influent, how to treat influent, and where to discharge effluent. In addition, effluent flow data are used to quantify discharge volumes and constituent loads for compliance with permit requirements.

2.2 Effluent Sampling

Composite and grab sampling techniques are used to collect effluent samples on a daily, weekly, quarterly, or permit-cycle frequency depending on the parameter, as required by the discharge permits. The collected samples are analyzed for pH, turbidity, and total residual chlorine by the sampling personnel, and for the remaining water quality parameters by contract laboratories.

2.3 IWTP Analytes

All sampling and analytical methods used to meet the monitoring requirements follow the Guidelines Establishing Test Procedures for the Analysis of Pollutants contained in 40 CFR Part 136 and the *Standard Methods for the Examination of Water and Wastewater*. A summary of sample parameters and associated sampling frequency and type is provided in **Table 1**.

Samples were submitted with chains-of-custody for analysis at Ecology-accredited laboratories: Analytical Resources Inc., of Seattle, WA. All samples were analyzed by methods defined in Part 1, Special Condition S2 and Appendix A of the permit.

2.4 Schedule

Methods and procedures are implemented in compliance with Part I Condition S2 (Monitoring Requirements) and S3 (Reporting and Record Keeping Requirements) of the Airport's NPDES permit. Sampling for this program occurs at a varied frequency depending on the discharge location and analytical parameter. Data reporting for this program occurs monthly in accordance with the permit requirements. The schedule for sample collection, laboratory analysis, data review and management, and data reporting is summarized in **Table 1**.

Table 1. Industrial Wastewater Treatment Plant Effluent Monitoring Requirements

Sample Collection	Reporting	Data Review/Management	Data Reporting
Treatment System Operations			
Influent: Daily, turbidity/pH Effluent: Continuous, flow/pH/TOC Daily, TOC	Daily shift logs completed on each monitoring date.	Shift log review within 1 day of monitoring. Effluent data entered into POS operator spreadsheet within 1 day of monitoring.	Effluent flow and pH data are reported for permit compliance as specified below.
Ecology NPDES Permit for Discharge to Outfall 001 [a]			
Effluent: Continuous, flow/pH Daily, BOD Weekly [b], TSS/TPH Weekly [b], propylene glycol (Nov.- March only) Year 3, priority pollutants (one dry season and one wet season event) [c]	Laboratory report within 10 days of sample date.	Data entry within 15 days of receiving Level 2A Data Review	Monthly discharge monitoring report (DMR) by the 28th of the following month. Priority pollutant reports submitted 180 days prior to permit expiration. Annual summary report by October 1 following each permit year (July through June).

[a] Discharge to Outfall 001 may occur only when the BOD_5 concentration and mass loading limits specified in **Table 2** are met.

[b] One week is defined as Sunday to Saturday.

[c] Year 3 of the 2016 NPDES permit is January 2018 through December 2018. Dry season is April through October and wet season is November through March.

2.5 NPDES Permit Final Effluent Limits

Final Effluent Limits (excerpted from the NPDES Permit No. WA0024651) are summarized in **Table 2.**

Table 2. Effluent Limitations for Discharges to Outfall 001

Parameter	Average Monthly [a]	Maximum Daily [b]
Flow [c]	Report – MGD	Report – MGD
Oil and Grease [d]	8 mg/L	15 mg/L
BOD_5 November through March	45 mg/L	Report – mg/L 2,665 lbs/day
BOD_5 April through October	25 mg/L	Report – mg/L 1,480 lbs/day
Total Suspended Solids	21 mg/L	33 mg/L
pH [e]	Daily minimum is equal to or greater than 6, the daily maximum is less than 9	

[a] The average monthly effluent limitations are based on the arithmetic mean of the samples taken during the month.

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

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

[d] Oil and grease analyzed by the NWTPH-Dx method as an approved alternative

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

Section 3: Results

3.1 General

This report presents the results of IWTP effluent monitoring program for discharges to Puget Sound under the Airport's NPDES Permit No. WA0024651.

3.2 Effluent Flow

The amount of water processed in the IWTP is a function of runoff volumes, lagoon inventories, and operations schedules. A total of three hundred and three (303) MG of stormwater runoff was processed during the reporting period, this includes both discharges to Outfall 001 and KC STP. **Figure 3** depicts the monthly total effluent volume discharged to Outfall 001 and to KC STP from the IWTP.

Figure 3. IWTP Total Monthly Effluent Flow

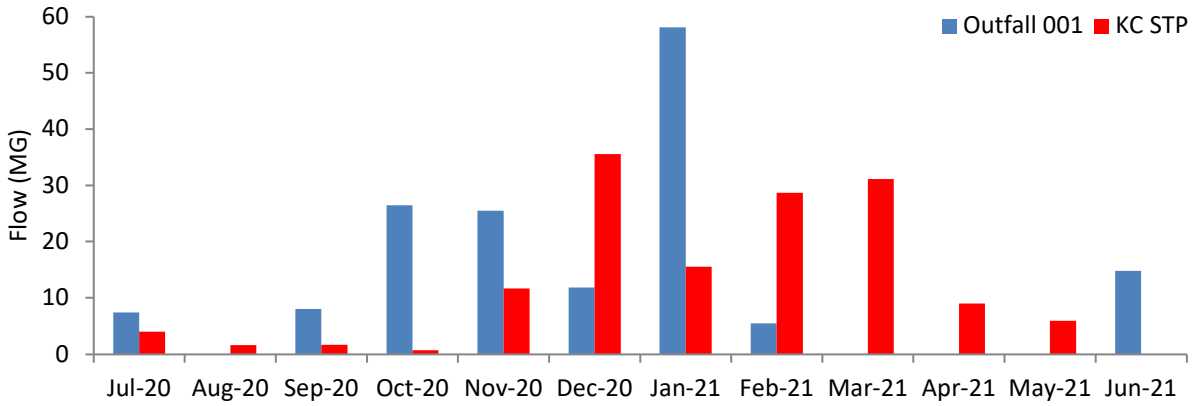


Table 3 depicts the Total Daily Effluent Volume discharged to Outfall 001, as well as the calculated total volume, average, and maximum flows per month. One hundred and fifty-eight (158) MG of stormwater were discharged to Outfall 001 during the reporting period. The monthly maximum flow to Outfall 001 was 58 MG in January 2021. The daily maximum flow to Outfall 001 was 4.34 MG and occurred on January 5, 2021. The IWTP discharged to Outfall 001, 72 days during the reporting period with a daily average flow of 2.19 MG when operating.

Table 3. Total Daily Effluent Flow Volume to Outfall 001

Date	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21
	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)
1	1.576			1.285								
2								1.72				
3							1.316	2.764				
4							3.704	1.003				
5				1.069	2.658		4.344					
6				1.516	1.21		4.306					
7	0.953						4.282					
8	1.573			1.516			4.274					
9	1.621			1.245			4.253					0.789
10	1.207					3.291	1.766					1.415
11					1.432							
12				1.272			2.007					
13				1.397			3.314					
14				1.522	2.225		4.134					
15					2.222		4.146					1.594
16				1.296	2.222		4.123					1.456
17					2.359		4.116					
18					3.51	2.652	4.109					
19				2.179	4.02	2.62	3.884					
20				2.683	1.131							
21				4.198		3.264						1.459
22				2.884								1.645
23												1.649
24			1.193									1.655
25			1.35									
26					2.5							
27			1.53									
28	0.47		1.293	1.18								1.398
29			1.28	1.215								1.162
30			1.361									0.583
31												
Monthly Volume (MG)	7.40	-	8.01	26.46	25.49	11.83	58.08	5.49	-	-	-	14.81
Operating Days per Month	6	0	6	15	11	4	16	3	0	0	0	11
Daily Average Flow (MGD)	1.23	-	1.33	1.76	2.32	2.96	3.63	1.83	-	-	-	1.35
Daily Maximum Flow (MGD)	1.62	-	1.53	4.20	4.02	3.29	4.34	2.76	-	-	-	1.66

3.3 Effluent Quality

Analytical results for all permit-required monitoring samples from Outfall 001 are reported in Appendix A. Results are discussed in the following sections. Line charts and graphs are presented for the parameters sampled daily, weekly, and monthly. In the provided graphical plots and tables for discharges to Outfall 001, concentrations of non-detected analytes are presented as:

- For reporting single values:
    - Method detection limit (for values reported below detection) is presented with a less than (<) sign in tables.
- For reporting average concentrations:
    - Half the detection value (for values reported below detection) is used if the laboratory detected the parameter in another sample for the monthly reporting period.
    - Zero (for values reported below detection) is used if the laboratory did not detect the parameter in another sample for the monthly reporting period.
- For reporting mass-loading:
    - Half the method detection limit (for values reported below detection) is used to calculate mass-loading of parameters. Mass is presented with a less than (<) sign in tables.

3.3.1 Biochemical Oxygen Demand (BOD_5)

Seventy-two (72) effluent samples were analyzed for BOD_5, for discharges to Outfall 001. **Table 4** summarizes the BOD_5 sample concentrations and mass-loading discharged to Outfall 001. **Figures 4** and **7** depict monthly average BOD_5 concentrations and daily maximum BOD_5 mass-loadings from Outfall 001 during this reporting period. **Figures 5** and **6** depict daily maximum BOD_5 concentration and average monthly BOD_5 Mass-Load.

BOD_5 Concentration

The monthly average BOD_5 concentration discharged to Outfall 001 ranged from 4.1 mg/L in September 2020 to 26.1 mg/L in December 2020. The daily maximum concentration discharged to Outfall 001 was 37.7 mg/L on October 28, 2020. All BOD_5 samples collected from discharges to Outfall 001, during this reporting period, were below NPDES permit limits.

BOD_5 Mass-Loading

The BOD_5 monthly average mass-load discharged to Outfall 001 ranged from 46 pounds in September 2020 to 680 pounds in January 2021. The daily maximum BOD_5 mass-load discharged to Outfall 001 was 1,218 pounds on January 7, 2021. A total of 20,439 pounds of BOD_5 was discharged to Outfall 001 during this reporting period. All BOD_5 mass-loading in discharges to Outfall 001, during this reporting period, were below NPDES permit limits.

Table 4. Outfall 001 Biological Oxygen Demand Results

Date	Jul-20		Aug-20		Sep-20		Oct-20		Nov-20		Dec-20		Jan-21		Feb-21		Mar-21		Apr-21		May-21		Jun-21	
	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day
1	7.5	99					4.8	51																
2															15.8	227								
3													27.8	305	15.2	350								
4													28.2	871	15.0	125								
5							5.3	47	11.3	250			31.6	1,145										
6							3.1	39	8.9	90			27.8	998										
7	6.9	55											34.1	1,218										
8	3.8	50					4.6	58					32.3	1,151										
9	3.2	43					4.6	48					31.9	1,131									4.4	29
10	3.7	37									11.3	250	35.5	523									4.2	50
11									9.6	115	8.9	90												
12							8.4	89					18.8	315										
13							4.1	48					11.8	326										
14							2.9	37	11.7	217			14.4	496										
15									14.3	265			15.7	543									4.7	62
16							2.3	25	22.0	408	9.6	115	15.2	523									4.2	51
17									21.2	417			14.9	511										
18									19.3	565			12.8	439										
19							1.9	35	20.8	697	11.7	217	12.0	389										
20							1.8	40	23.9	225	14.3	265												
21							2.3	81			22.0	408											3.5	43
22							6.8	164			21.2	417											2.5	34
23											19.3	565											3.5	48
24					4.3	43					20.8	697											3.7	51
25					3.5	39					23.9	225												
26									16.6	347														
27					2.8	36																		

Date	Jul-20		Aug-20		Sep-20		Oct-20		Nov-20		Dec-20		Jan-21		Feb-21		Mar-21		Apr-21		May-21		Jun-21	
	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day	Conc mg/L	Mass-Load lbs/day
28	11.2	44			3.2	35	37.7	371															5.8*	68*
29					6.1	65	31.5	319															8.4	81
30					4.9	56																	10.4	51
31											16.6	347												
Monthly BOD_5 Mass-Load	328		-		273		1,451		3,596		2,545		10,885		703		-		-		-		568	
Operating Days per Month	6		0		6		15		11		4		16		3		0		0		0		11	
Monthly Average	6.1	55	-	-	4.1	46	8.1	97	16.3	327	26.1	636	22.8	680	15.3	234	-	-	-	-	-	-	5.0	52
Monthly Maximum per Day	11.2	99	-	-	6.1	65	37.7	371	23.9	697	30.6	743	35.5	1,218	15.8	350	-	-	-	-	-	-	10.4	81

* A Hold-Time exceedance occurred due to excessive heat in the laboratory.

BOD_5 Results Summary – Outfall 001

Figure 4. Outfall 001 Monthly Average BOD_5 Concentration

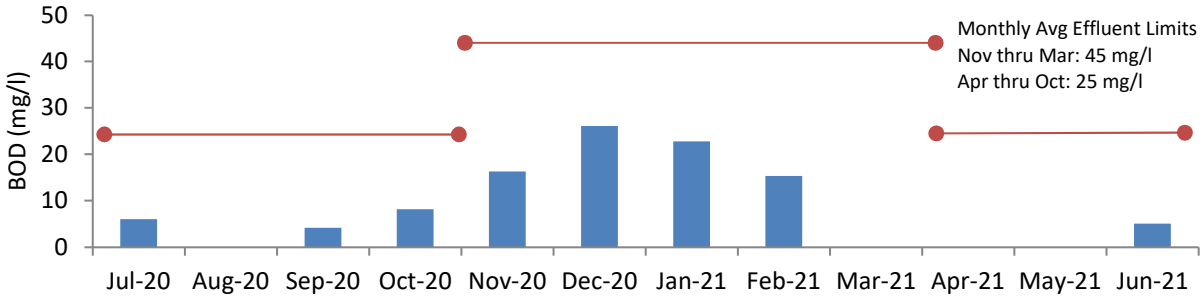


Figure 5. Outfall 001 Daily Maximum BOD_5 Concentration

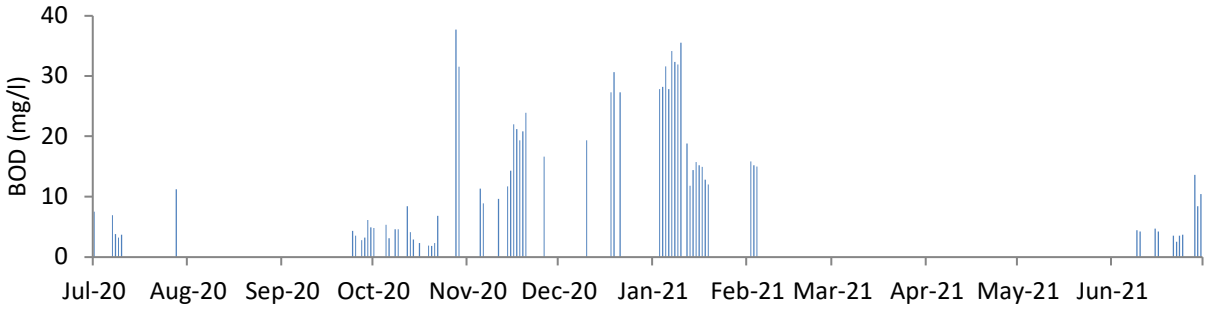


Figure 6. Outfall 001 Average Monthly BOD_5 Mass-Load

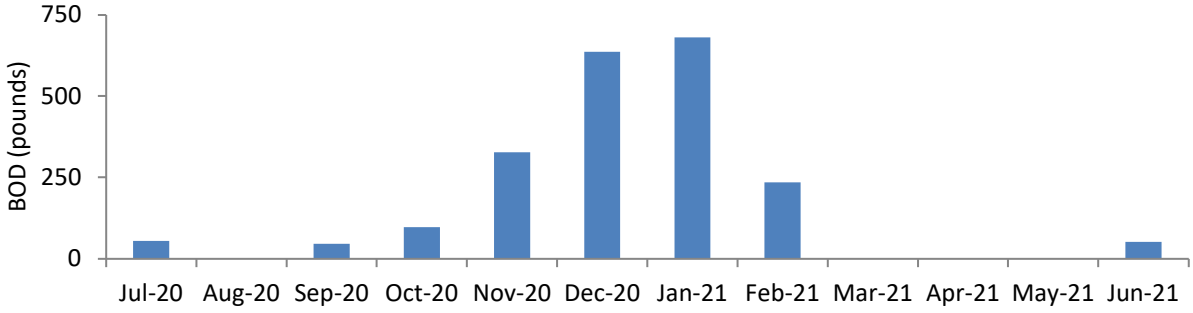
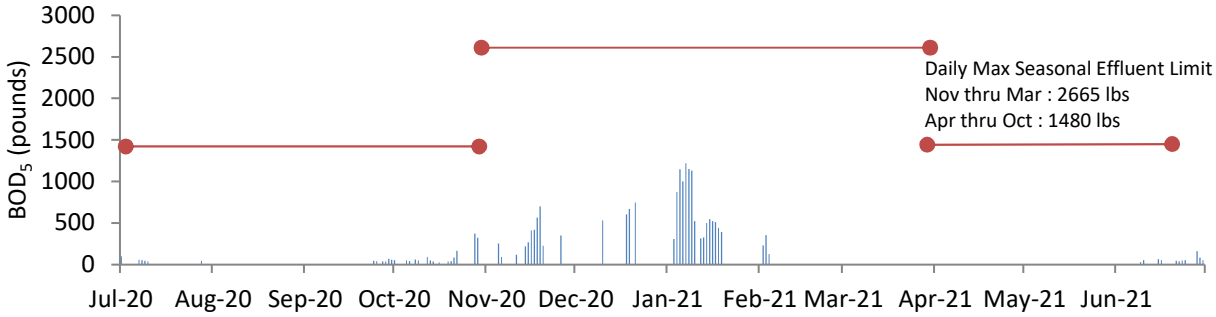


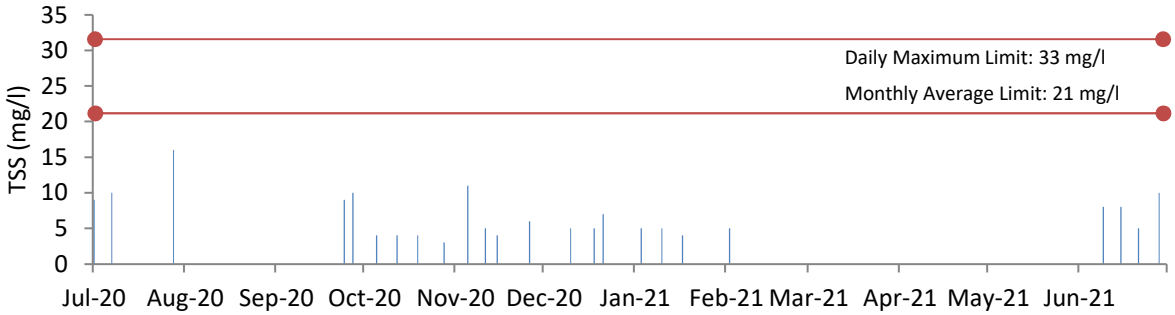
Figure 7. Outfall 001 Daily Maximum BOD_5 Mass-Load



3.3.2 Total Suspended Solids (TSS)

A total of twenty-four (24) samples were collected from Outfall 001 for TSS analysis. TSS results for discharges to Outfall 001 ranged from 3.0 mg/L to 16.0 mg/L. All TSS samples were well below the NPDES daily maximum effluent limit of 33 mg/L and the monthly average effluent limit of 21 mg/L. **Figure 8** depicts the Outfall 001 Daily Maximum TSS concentrations for the reporting period.

Figure 8. Outfall 001 Daily Maximum TSS Concentration



3.3.3 Glycols

Eleven (11) effluent samples were collected from discharges to Outfall 001 and analyzed for propylene-glycol using a modified technique of EPA Method 8015. There is no established effluent limit for glycol; however monthly reporting is required on DMR's during the de-icing season from November through March. The daily concentration for propylene-glycol discharged to Outfall 001 during the reporting period ranged from non-detect to 20.4 mg/L.

3.3.4 pH

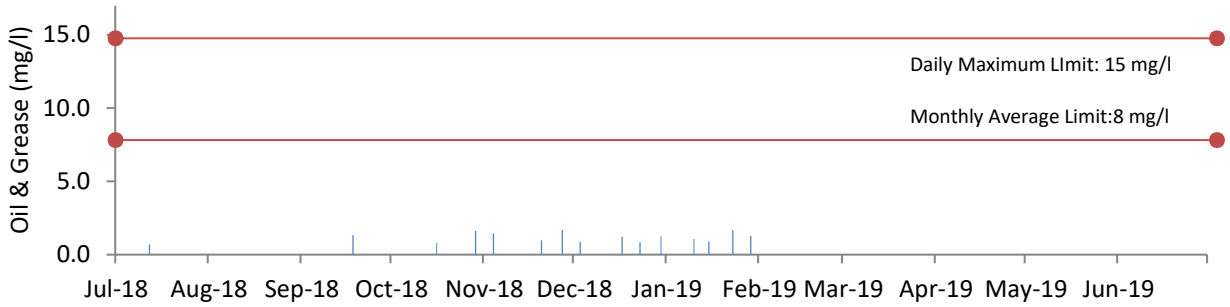
Continuous pH metering is performed during discharge Outfall 001. For Outfall 001 discharges the minimum instantaneous pH measurement was 6.4 and the maximum pH measurement was 8.9. All stormwater discharged to Outfall 001 was within the NPDES permitted range throughout the reporting period.

Continuous pH metering is performed during discharge to KC STP. For KC STP discharges the minimum instantaneous pH measurement was 5.9 and the maximum pH measurement was 10.5. All stormwater discharged to KC STP was within the King County Waste Discharge permit range throughout the reporting period.

3.3.5 Oil and Grease

Twenty-four (24) samples were collected and submitted for oil and grease analysis of discharge to Outfall 001. The oil and grease samples were analyzed by method NW-TPH-Dx which has a lower detection limit and more accurately characterizes potential contaminants related to jet fuel. The daily maximum concentration collected of oil and grease, during the 2020-2021 reporting period, was 2.58 mg/L. As noted in **Figure 9**, all Oil and Grease samples were well below the daily maximum effluent limit of 15 mg/L and the monthly average effluent limit of 8 mg/l.

Figure 9. Outfall 001 Daily Maximum Oil & Grease Concentration



3.3.6 Priority Pollutants

Priority pollutant sampling was not conducted during this reporting period. Results of past reporting periods have been reported to Ecology as part of the permit renewal process.

3.3.7 Toxicity Testing

Acute and Chronic toxicity testing was not conducted during this reporting period. Results of past reporting periods have been reported to Ecology as part of the permit renewal process.

Section 4: Conclusions

This report summarized results of effluent sampling at the STIA IWTP from July 2020 through June 2021. Results of permit required monitoring were presented for both NPDES Permit (No. WA0024651) and King County Waste Discharge Permit (No. 7810-05). Results were presented for flow, BOD_5, TSS, propylene-glycol, pH, and oil and grease.

The AKART system has been in place for 14.5 years. It is proving to be very effective in reducing discharge of pollutants to Puget Sound. For this reporting period, 676,864 pounds of BOD_5 out of the total processed 697,303 pounds (97.1%) were segregated and sent to King County for treatment. Since the implementation of AKART on January 1, 2007, a total of 11,051,394 pounds of BOD_5 were processed through the IWTP and 10,748,762 pounds were segregated and sent to KC STP for treatment.

Stormwater pollutants to Outfall 001 have been significantly reduced via diversion to KC STP. The stormwater discharged to Outfall 001 met NPDES effluent limitations throughout the reporting period for all parameters measured.

Section 5: References

Kennedy/Jenks Consultants. April 2012. Port of Seattle Seattle-Tacoma International Airport Industrial Waste System Waste Water Treatment Plant Operation & Maintenance Manual.

Aspect Consulting. January 2021. Quality Assurance Program Plan, Seattle Tacoma International Airport, Industrial Waste Treatment Plant Discharge Monitoring Program.

Port of Seattle; Sea-Tac Airport Website; https://www.portseattle.org/page/airport-statistics; 2019 Airport Activity Report.

Washington State Department of Ecology. National Pollutant Discharge Elimination System Waste Discharge Permit WA-0024651, Port of Seattle. Effective Date: 1 January 2016.

King County Waste Discharge Permit No. 7810-04, Port of Seattle. Effective Date: 21 July 2016

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Appendix A: Outfall 001 Analytical Results

Appendix A. Outfall 001 Analytical Results

Date	Flow	BOD_5	BOD_5	pH Min	pH Max	Propylene-Glycol	TSS	NWTPH-Dx
	MGD	mg/l	pounds	S.U.	S.U.	mg/l	mg/l	mg/l
7/1/2020	1.58	7.5	99	7.4	7.6		9.00	1.12
7/7/2020	0.95	6.9	55	7.4	7.8		< 10.00 [a]	< 0.65
7/8/2020	1.57	3.8	50	7.5	8.4			
7/9/2020	1.62	3.2	43	7.7	8.3			
7/10/2020	1.21	3.7	37	7.7	8.3			
7/28/2020	0.47	11.2	44	7.8	8.4		16.00	2.58
9/24/2020	1.19	4.3	43	7.2	7.3		< 9.00 [a]	1.79
9/25/2020	1.35	3.5	39	7.1	7.3			
9/27/2020	1.53	2.8	36	7.1	7.2		< 10.00 [a]	0.94
9/28/2020	1.29	3.2	35	7.2	7.3			
9/29/2020	1.28	6.1	65	7.5	7.9			
9/30/2020	1.36	4.9	56	7.4	7.6			
10/1/2020	1.29	4.8	51	7.5	7.7			
10/5/2020	1.07	5.3	47	7.3	7.4		4.00	0.77
10/6/2020	1.52	3.1	39	7.5	7.6			
10/8/2020	1.52	4.6	58	7.5	7.8			
10/9/2020	1.25	4.6	48	7.7	7.8			
10/12/2020	1.27	8.4	89	7.6	7.8		4.00	0.74
10/13/2020	1.40	4.1	48	7.2	7.3			
10/14/2020	1.52	2.9	37	6.9	7.1			
10/16/2020	1.30	2.3	25	7.0	7.3			
10/19/2020	2.18	1.9	35	7.1	7.2		4.00	0.54
10/20/2020	2.68	1.8	40	7.2	7.4			
10/21/2020	4.20	2.3	81	7.3	7.5			
10/22/2020	2.88	6.8	164	7.4	7.8			
10/28/2020	1.18	37.7	371	7.6	7.8		3.00	0.65
10/29/2020	1.22	31.5	319	7.6	7.8			
11/5/2020	2.66	11.3	250	7.0	7.3	0.0 [b]	11.00	1.24
11/6/2020	1.21	8.9	90	7.0	7.1			
11/11/2020	1.43	9.6	115	7.0	7.6	0. 0 [b]	5.00	0.71
11/14/2020	2.23	11.7	217	6.8	7.0			
11/15/2020	2.22	14.3	265	6.8	7.0	0. 0 [b]	4.00	0.51
11/16/2020	2.22	22.0	408	6.9	7.1			
11/17/2020	2.36	21.2	417	6.9	7.2			
11/18/2020	3.51	19.3	565	6.9	7.1			

Date	Flow	BOD_5	BOD_5	pH Min	pH Max	Propylene-Glycol	TSS	NWTPH-Dx
	MGD	mg/l	pounds	S.U.	S.U.	mg/l	mg/l	mg/l
11/19/2020	4.02	20.8	697	6.9	7.2			
11/20/2020	1.13	23.9	225	7.1	7.1			
11/26/2020	2.50	16.6	347	7.2	7.5	0. 0 [b]	6.00	0.56
12/10/2020	3.29	19.3	530	7.0	7.1	10.6	5.00	0.90
12/18/2020	2.65	27.3	604	7.1	7.2	14.1	5.00	0.68
12/19/2020	2.62	30.6	669	7.0	7.2			
12/21/2020	3.26	27.3	743	6.6	7.0	17.5	7.00	0.78
1/3/2021	1.32	27.8	305	6.4	6.7	19.0	5.00	0.89
1/4/2021	3.70	28.2	871	6.5	6.7			
1/5/2021	4.34	31.6	1,145	6.6	6.8			
1/6/2021	4.31	27.8	998	6.6	6.8			
1/7/2021	4.28	34.1	1,218	6.7	6.8			
1/8/2021	4.27	32.3	1,151	6.7	6.9			
1/9/2021	4.25	31.9	1,131	6.7	7.0			
1/10/2021	1.77	35.5	523	6.8	6.9	20.4	5.00	0.62
1/12/2021	2.01	18.8	315	6.5	6.7			
1/13/2021	3.31	11.8	326	6.5	7.5			
1/14/2021	4.13	14.4	496	6.5	6.7			
1/15/2021	4.15	15.7	543	6.6	6.7			
1/16/2021	4.12	15.2	523	6.6	6.7			
1/17/2021	4.12	14.9	511	6.7	6.8	< 5.0 [c]	4.00	0.67
1/18/2021	4.11	12.8	439	6.7	6.9			
1/19/2021	3.88	12.0	389	6.8	7.1			
2/2/2021	1.72	15.8	227	6.6	6.9	< 10.0 [a]	5.00	1.21
2/3/2021	2.76	15.2	350	6.6	6.8			
2/4/2021	1.00	15.0	125	6.6	6.7			
6/9/2021	0.79	4.4	29	7.4	7.5		8.00	1.81
6/10/2021	1.42	4.2	50	7.3	7.8			
6/15/2021	1.59	4.7	62	7.4	7.6		8.00	1.14
6/16/2021	1.46	4.2	51	7.3	7.7			
6/21/2021	1.46	3.5	43	7.1	8.7		5.00	0.72
6/22/2021	1.65	2.5	34	7.5	8.8			
6/23/2021	1.65	3.5	48	8.1	8.7			
6/24/2021	1.66	3.7	51	8.9	8.9			
6/28/2021	1.40	5.8[d]	68 [d]	7.4	8.3		10.00	0.78
6/29/2021	1.16	8.4	81	7.4	7.6			
6/30/2021	0.58	10.4	51	7.2	8.0			

[a] Method detection limit (for values reported below detection) is used if only a single sample was taken during the monthly reporting period and is presented with a less than (<) sign.

[b] Zero (for values reported below detection) is used if the laboratory did not detect the parameter in another sample for the monthly reporting period.

[C] Half the detection value (for values reported below detection) is used if the laboratory detected the parameter in another sample for the monthly reporting period and is presented with a less than (<) sign.

[d] A Hold-Time exceedance occurred due to excessive heat in the laboratory.