Annual Industrial Waste System Stormwater Monitoring Report

Seattle-Tacoma International Airport

For the Period July 1, 2018 through June 30, 2019

September 12, 2019

Prepared by

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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 2018 through June 2019. The IWTP discharges to 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, WA-0024651.

The IWTP also operates under King County (KC) Waste Discharge Permit #7810-03. This permit allows the facility to discharge stormwater with higher concentrations of biochemical oxygen demand (BOD) to the King County South Treatment Plant (KC STP) for further treatment before ultimately discharging to Puget Sound.

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

A total of two hundred and forty-six (246) million gallons (MG) of flow was processed in the IWTP and discharged to either the Outfall 001 or KC STP during the reporting period. The IWTP operated on 168 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 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 twenty (120) MG were processed and discharged through Outfall 001 to Puget Sound over 42 days. The average daily flow to Outfall 001 was 2.85 MG. There were no discharges in August 2018, February 2019, March 2019, April 2019, May 2019, or June 2019. The maximum daily discharge was 4.47 MG on October 31, 2018.

Forty-two (42) effluent samples were collected to characterize the daily discharge for BOD_5 concentration and loading. Concentrations of BOD_5 in IWTP effluent to Outfall 001 ranged from 2.0 milligrams per liter (mg/L) to 51.5 mg/L. Samples taken during the de-icing season (November - March) were well below their respective maximum daily BOD_5 mass limits of 2665 pounds/day. The maximum daily load of BOD_5 discharged was 1,593 pounds, which occurred on December 24, 2018 during the de-icing season. The average monthly BOD_5 load ranged from 66 pounds in September 2018 to 644 pounds in December 2018. The BOD_5 average monthly effluent concentration of 45 mg/L in the de-icing season and 25 mg/L in the non-de-icing season was not exceeded during this reporting period.

Fifteen (15) effluent samples were analyzed for total suspended solids (TSS). TSS concentrations discharged to Outfall 001 ranged from 4.0 mg/L to 16.0 mg/L. All TSS samples were below the maximum daily effluent limit of 33 mg/L. The average monthly effluent limit of 21 mg/L was met.

pH was continuously measured at the IWTP and instantaneous maximum and minimum results were recorded. The plant consistently operated within the permit-required pH range of 6.0 to 9.0. A minimum instantaneous pH of 6.6 and a maximum of 9.3 were measured during this reporting period. The maximum pH of 9.3 was above the 9.0 permit limit, but it occurred for less than 1 hour; therefore, it does not exceed permit benchmarks.

Fifteen (15) grab samples were analyzed for oil and grease. The maximum concentration was 1.67 mg/L. Average daily concentration was 1.17 mg/L. All Oil and Grease samples were well below the maximum daily effluent limit of 15 mg/L.

Two (2) effluent grab and composite samples for water discharged to Outfall 001 were analyzed for priority pollutants. These samples fulfill the priority pollutant dry and wet season sample requirements for the permit renewal application. Results have not yet been qualified and will be reported in the 2020 IWS Annual Report.

Acute and Chronic Toxicity tests were conducted during this reporting period. Results from toxicity tests are required in the final summer and winter of the year before permit renewal. Results have not yet been qualified and will be reported in the 2020 IWS Annual Report.

King County South Treatment Plant Discharges

The high concentration BOD_5-treated wastewater is discharged to the Valley View Sewer District and then conveyed to the KC STP where the wastewater undergoes secondary treatment prior to discharging to Puget Sound. All sample parameters were reported in accordance with Condition S4 of the King County Waste Discharge Permit.

One hundred and twenty-six (126) MG of industrial wastewater flow was processed and routed to the KC STP due to elevated levels of BOD_5. Discharge to KC STP occurred on 132 days. The IWTP discharged to KC STP every month during the reporting period. The maximum daily discharge of 2.17 MG occurred on April 15, 2019. The maximum daily discharge permit limit of 2.3 MG was met.

One hundred and thirty-two (132) effluent composite samples for water discharged to KC STP were analyzed for BOD_5. Concentrations of BOD_5 in effluent to KC STP ranged from 8.3 mg/L to 11,200 mg/L. The KC STP BOD_5 average concentration was 1,914 mg/L. A maximum daily load of 49,149 pounds was discharged on February 27, 2019. All samples met the KC STP maximum daily BOD_5 permit limit load of 60,000 pounds.

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 2018 Key Facts and Figures, STIA handled 432,315 metric tons of air cargo, and 49.8 million passengers. STIA is ranked the eighth-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 I, Special Condition S2.F, to submit an annual 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 current NPDES Permit (No. WA-0024651) became effective on January 1, 2016. This Annual Report focuses on the monitoring results from July 2018 through June 2019.

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 and the King County South Treatment Plant (KC STP) waste discharge permits.

The STIA 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 southern side of the airfield. The IWS South Basin includes the Fuel Farm and Passenger Gate Ramp areas, as well as aircraft hangers. Each drainage basin accounts for approximately half of the 375-acre IWS area. The IWS and storm drainage areas are depicted in Figure 1.

The IWS manages stormwater associated with industrial activities from airline and maintenance operations as well as wastewater from other airport-related operations. These contaminants consist primarily of spilled fuel, de-icing and anti-icing fluids, detergents, and lubricants. 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 wastewater 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. Although the primary purpose of Lagoon #3 is for collection of low BOD_5 runoff, high BOD_5 runoff during deicing periods may also be stored in Lagoon #3 when Lagoon #1 and #2 reach full capacity. Prior to treatment, the wastewater flows from Lagoons #1 and #2 through mechanical screening devices, which are sized to remove large objects.

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 IWS treatment 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 stored in either of two underground wet wells located adjacent to the treatment plant. Treated water is discharged to Puget Sound from the low BOD_5 wet well and to the Valley View Sewer District from the high BOD_5 wet well. Discharges to the Valley View Sewer District are conveyed to King County's Renton South Wastewater Treatment Plant (KC STP) where they undergo secondary treatment before being discharged to Puget Sound.

The IWTP AKART pump station and pipeline are capable of discharging 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 limits discharges to the treatment plant to 1,600 GPM (2.3 MGD) and 60,000 pounds per day of BOD_5. In addition, the permit reserves King County's and Valley View Sewer District's authority to request that discharges to their system stop as necessary to prevent hydraulic overloading of the sewer conveyance systems or the KC STP.

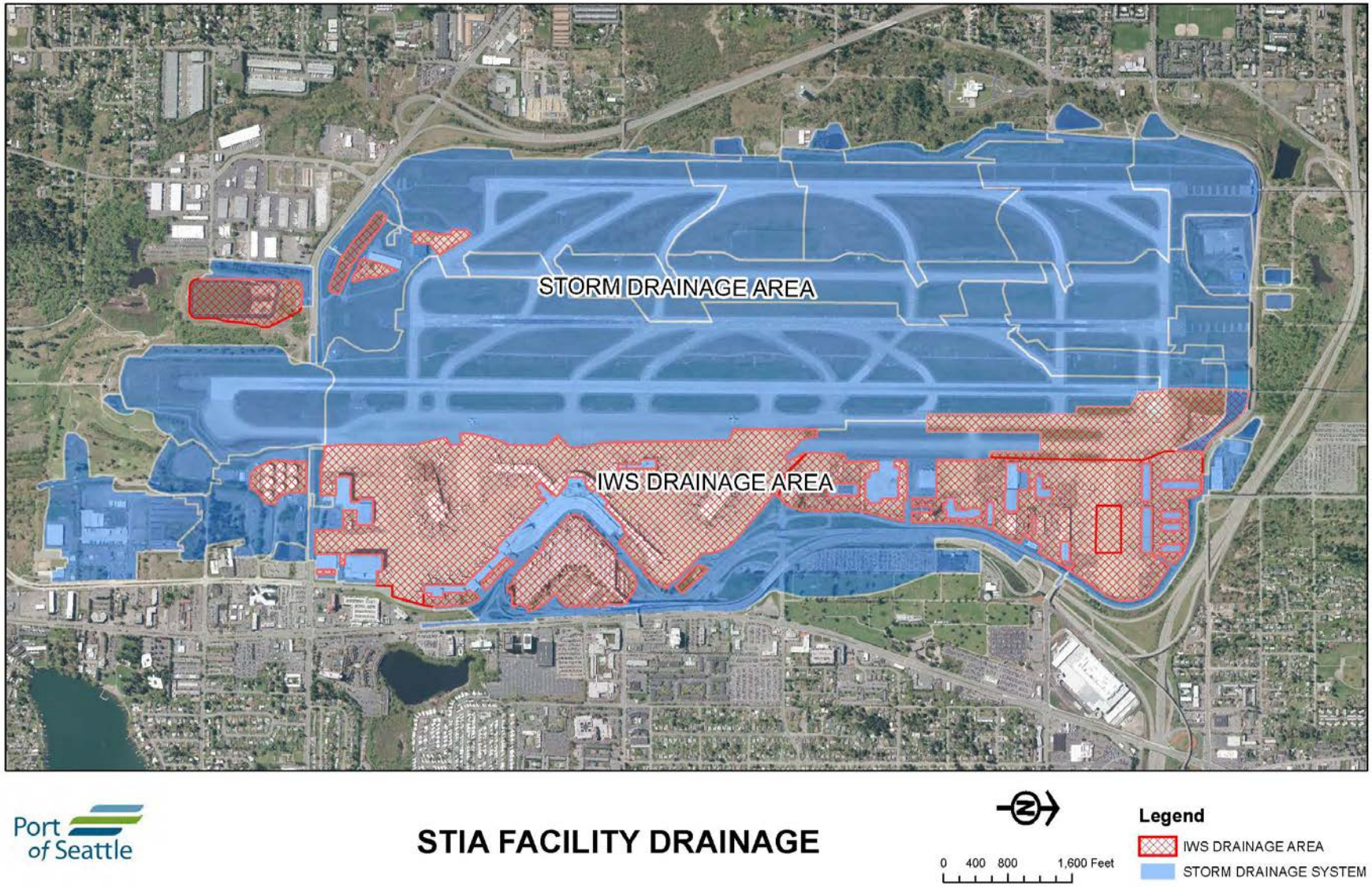


Figure 1. Vicinity Map for the POS Industrial Waste Treatment Plant at Sea-Tac International Airport

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. WA-0024651, Part I, Special Condition S1.A and S2.A
- King County Waste Discharge Permit #7810-03

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.

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: Amtest Laboratories of Kirkland, WA; Analytical Resources Inc., of Seattle, WA; and Edge Analytical, Inc. of Burlington, WA. All samples were analyzed by methods defined in Part I, 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			
Continuous flow/pH/TOC	Daily shift logs completed on each monitoring date.	Shift log review within 1 day of monitoring. Data entered into POS 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 Puget Sound [a]			
Continuous flow/pH Daily BOD Weekly TSS/TPH Weekly glycols (Nov.-March only) Year 3 metals/cyanide, priority pollutants (one dry season and one wet season event) [b]	Laboratory report within 10 days of sample date.	Data entry within 15 days of completing data review	Monthly discharge monitoring report (DMR) by the 28th of the following month. Priority pollutant reports submitted within 45 days of the monitoring period. Annual summary report by October 1 following each permit year (July through June).
King County Waste Discharge Permit for Discharge to Valley View Sewer District			
Continuous flow/pH Daily BOD/TSS Monthly metals/ cyanide/TPH	Laboratory report within 10 days of sample date.	Data entry within 15 days of completing data review.	Monthly self-monitoring report by the 15th of the following month

[a] Discharge to Puget Sound occur only when the BOD_5 concentration and mass loading limits specified in Table 1 are met. Discharge must be to the Valley View Sewer District if these conditions are not met.

[b] Year 3 of the 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 Permit) are summarized in Table 2. The renewed permit effective January 1, 2016 recalculated the BOD_5 mass load effluent limits based upon the treatment design flow. The 2016 permit renewal effluent limits are depicted in Table 2.

Table 2. Effluent Limitations: Port of Seattle, IWTP Effluent, Puget Sound Outfall

Parameter	Average Monthly[(a)]	Maximum Daily[(b)]
Flow[(c)]	Report	Report
Oil and Grease	8 mg/L	15 mg/L
BOD_5 November through March	45 mg/L	2,665 lbs/day
BOD_5 April through October	25 mg/L	1,480 lbs/day
TSS	21 mg/L	33 mg/L
pH[(d)]	pH 6 to 9	
Toxicity Testing	As defined in Permit Sections S3.A and S4.A	

Notes:

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

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

(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) 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 for discharges to Puget Sound under the Airport's NPDES Permit and to the KC STP for the period of July 2018 through June 2019. Flow and BOD related results are summarized in this report for samples collected under the King County Waste Discharge permit to provide a complete overview of all discharges from the IWTP.

3.2 Effluent Flow

The amount of water processed in the IWTP is a function of runoff volumes, lagoon inventories, and operations schedules. Table 3 depicts the total daily effluent volume, number of days of operation, and the maximum daily flow discharged to Outfall 001 from the IWTP during plant operations. Days of operation and effluent discharge for each month ranged from 3 to 31 days. A total of 246 MG of IWS runoff was processed during the reporting period. This includes both discharges to Outfall 001 and KC STP. One hundred and twenty (120) MG were discharged to Outfall 001 during the reporting period.

The maximum monthly flow to Outfall 001 was 47.7 MG in December 2018. During December 2018, Outfall 001 average daily flow was 3.40 MG and a maximum daily flow of 4.39 MG. The maximum monthly flow routed to the KC STP was 37.5 MG in April 2019. During April 2019, the KC STP outfall average daily flow was 1.39 MG and a maximum daily flow of 2.17 MG. Figure 2 depicts the monthly total flows from the IWTP to Outfall 001 and to KC STP.

Figure 2. IWTP Effluent Flow

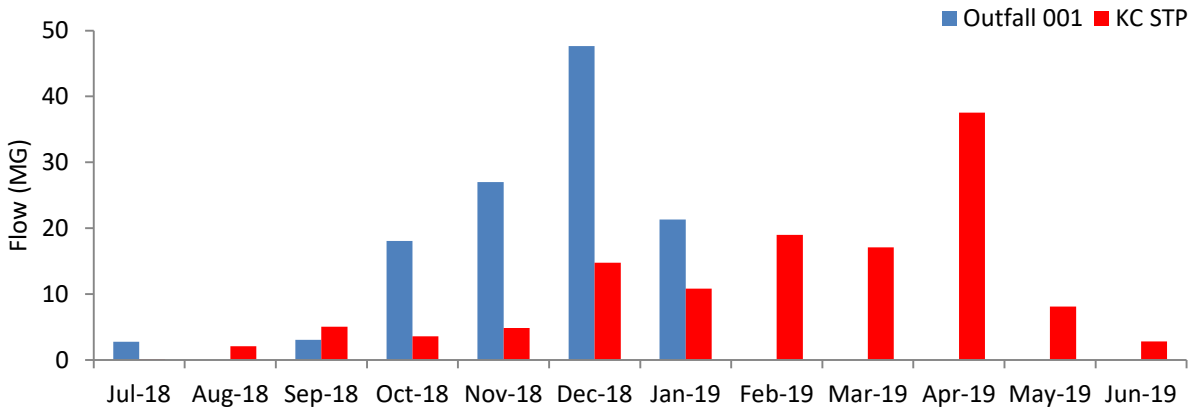


Table 3. Total Daily Effluent Flow Volume to Outfall 001

Date	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19
	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)
1					3.184	4.31						
2					2.231	2.767						
3					2.224	3.004						
4					2.3	2.897						
5												
6												
7												
8												
9												
10							3.146					
11							3.974					
12	1.652											
13	1.087											
14												
15							2.679					
16				2.818								
17				2.959		4.32						
18			0.577	0.903		4.354						
19			1.236			4.394						
20			1.227		1.975	3.003						
21						2.527						
22						1.95						
23						3.44	2.268					
24						3.71	2.87					
25							1.352					
26												
27					4.296							
28					2.842							
29				2.505	3.593		2.741					
30				4.421	4.373	4.353	2.304					
31				4.471		2.633						
Monthly Volume (MG)	**2.74**	**-**	**3.04**	**18.08**	**27.02**	**47.66**	**21.33**	**-**	**-**	**-**	**-**	**-**
Num Days Operation	**2**	**0**	**3**	**6**	**9**	**14**	**8**	**0**	**0**	**0**	**0**	**0**
Avg Daily Flow (MGD)	**1.37**	**-**	**1.01**	**3.01**	**3.00**	**3.40**	**2.67**	**-**	**-**	**-**	**-**	**-**
Max Daily Flow (MGD)	**1.65**	**-**	**1.24**	**4.47**	**4.37**	**4.39**	**3.97**	**-**	**-**	**-**	**-**	**-**

3.3 Effluent Quality

Analytical results for all permit-required monitoring samples are reported in Appendix A. Data results are discussed in the following sections. Line charts and graphs are presented for the parameters sampled daily and weekly. In the provided graphical plots, concentrations of non-detected analytes are presented as one-half the laboratory practical quantitation limit.

3.3.1 Biochemical Oxygen Demand (BOD_5)

One hundred and seventy-four (174) effluent composite samples were analyzed for BOD_5, for discharges to both Outfall 001 and KC STP. Table 4 summarizes the BOD_5 concentration and load discharged to Outfall 001. Figures 3 through 6 depict various BOD_5 concentrations and loadings from Outfall 001 from this reporting period. Figure 7 and 8 describe BOD_5 concentrations and loading to the KC STP outfall.

BOD_5 Concentration

The average monthly BOD_5 concentration discharged to Outfall 001 ranged from 8.40 mg/L in September 2018 to 51.5 mg/L in December 2018. The maximum daily concentration discharged to Outfall 001 was 51.5 mg/L on December 24, 2018.

The maximum daily concentration discharged to KC STP was 11,200 mg/L on February 12, 2019.

BOD_5 Loading

The average monthly BOD_5 load discharged to Outfall 001 ranged from 66 pounds in September 2018 to 644 pounds in December 2018. The maximum daily pounds per day discharged to Outfall 001 was 1,593 pounds. A total of 17,227 pounds of BOD_5 was discharged to Outfall 001 during this reporting period.

The maximum daily pounds per day discharged to KC STP was 49,149 pounds. A total of 1,547,952 pounds of BOD_5 was discharged to KC STP during this reporting period.

Table 4. Outfall 001 Biological Oxygen Demand Results

Date	Jul-18		Aug-18		Sep-18		Oct-18		Nov-18		Dec-18		Jan-18		Feb-18		Mar-18		Apr-18		May-18		Jun-18	
	Conc mg/L	Load lb/day	Conc mg/L	Load lb/day	Conc mg/L	Load lb/day	Conc mg/L	Load lb/day	Conc mg/L	Load lb/day	Conc mg/L	Load lb/day	Conc mg/L	Load lb/day	Conc mg/L	Load lb/day	Conc mg/L	Load lb/day	Conc mg/L	Load lb/day	Conc mg/L	Load lb/day	Conc mg/L	Load lb/day
1																								
1									2.9	77	12.1	435												
2									5.5	102	20.7	478												
3									9.7	180	25.6	641												
4									6.7	129	25.8	623												
5																								
6																								
7																								
8																								
9																								
10													32.5	853										
11													28.6	948										
12	10.1	139																						
13	9.4	85																						
14																								
15													19.1	427										
16							2.0	47																
17							3.5	86			23.3	839												
18					8.4	40	3.3	25			25.2	915												
19					7.4	76					11.8	432												
20					8.0	82			24.4	402	11.2	281												
21											10.2	215												
22											8.7	141												
23											21.0	602	25.0	473										
24											51.5	1593	28.0	670										

25													28.8	325										
26																								
27									13.2	473														
28									18.3	434														
29							8.8	184	11.2	336			25.6	585										
30							4.6	170	11.0	401	29.2	1060	19.0	365										
31							2.6	97			34.6	760												
Total		**224**		**-**		**199**		**609**		**2533**		**9017**		**4645**		**-**		**-**		**-**		**-**		**-**
Num Days Operation		**2**		**0**		**3**		**6**		**9**		**14**		**8**		**0**		**0**		**0**		**0**		**0**
Avg Monthly	**9.75**	**112**	**-**	**-**	**7.9**	**66**	**4.1**	**101**	**11.4**	**281**	**22.2**	**644**	**25.8**	**581**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Max Daily	**10.1**	**139**	**-**	**-**	**8.4**	**82**	**8.8**	**184**	**24.4**	**473**	**51.5**	**1593**	**32.5**	**948**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

BOD_5 Results Summary – Outfall 001

Figure 3. Outfall 001 Average Monthly BOD Concentration

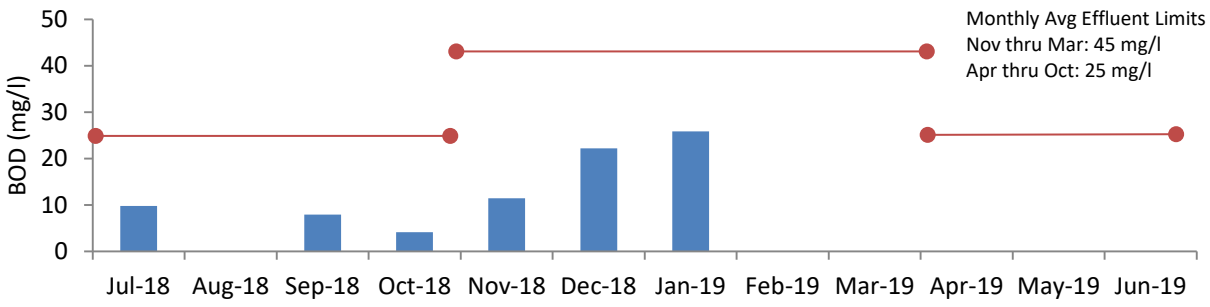


Figure 4. Outfall 001 Maximum Daily BOD Concentration

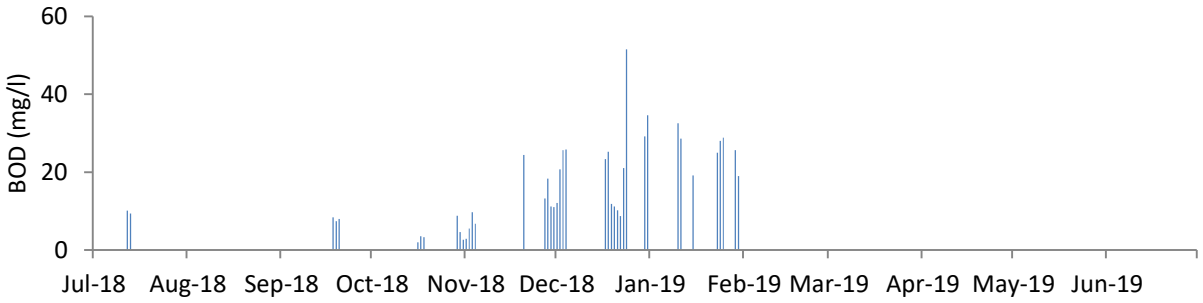


Figure 5. Outfall 001 Average Monthly BOD Load

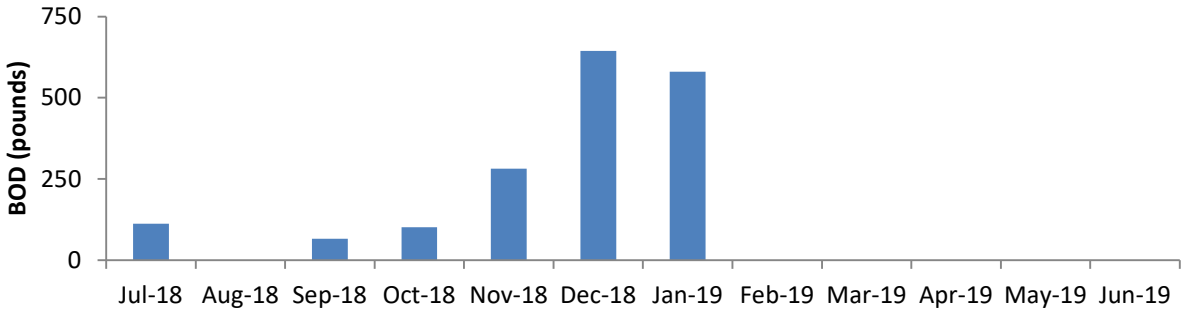
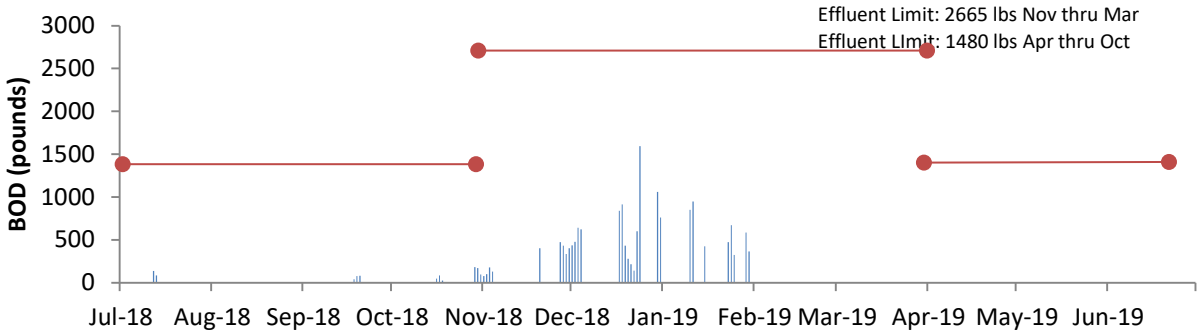


Figure 6. Outfall 001 Maximum Daily BOD Load



BOD Results Summary – KC STP Outfall

Figure 7. KC STP Maximum Daily BOD Concentration

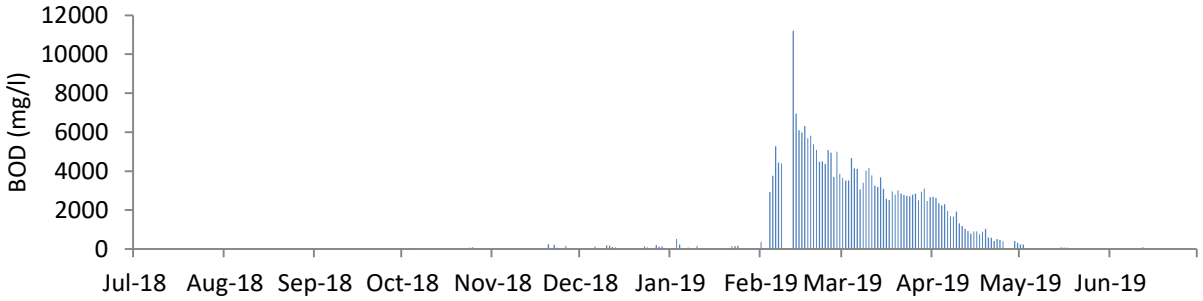
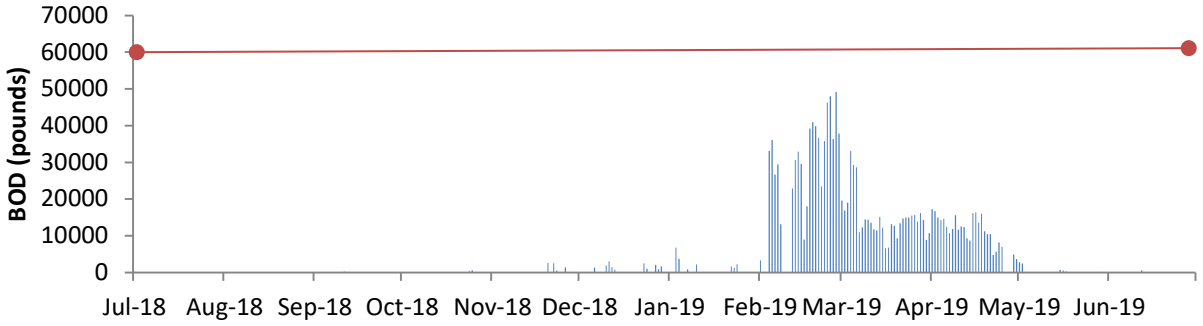


Figure 8. KC STP Maximum Daily BOD Load



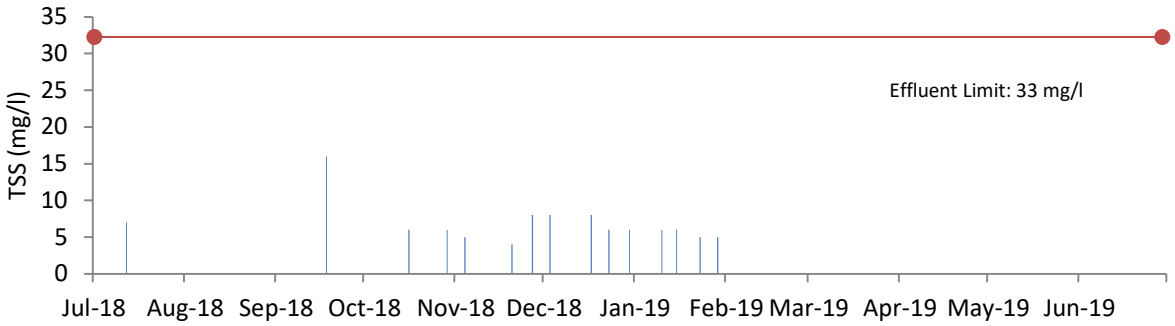
BOD_5 Mass Load Summary – AKART Implementation

Since AKART implementation, the IWTP has processed 10,032,512 pounds of BOD_5 from the 001 and KC STP outfalls. A total of 9,772,454 pounds of BOD_5 (97.4%) were segregated and sent to King County for treatment.

3.3.2 Total Suspended Solids (TSS)

A total of fifteen (15) samples were collected from Outfall 001 for TSS by EPA Method 160.2. TSS analytical results for discharge to Outfall 001 ranged from 4.00 mg/L to 16.0 mg/L. All TSS samples were well below the maximum daily effluent limit of 33 mg/L. The monthly average effluent limit of 21 mg/L was met. Figure 9 depicts the TSS values for this reporting period.

Figure 9. Maximum Daily Total Suspended Solids Concentration



3.3.3 Glycols

Twelve (12) effluent composite sample were collected 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 from November through March. The daily concentration for propylene glycol discharged to Outfall 001 ranged from non-detect to 19.5 mg/L.

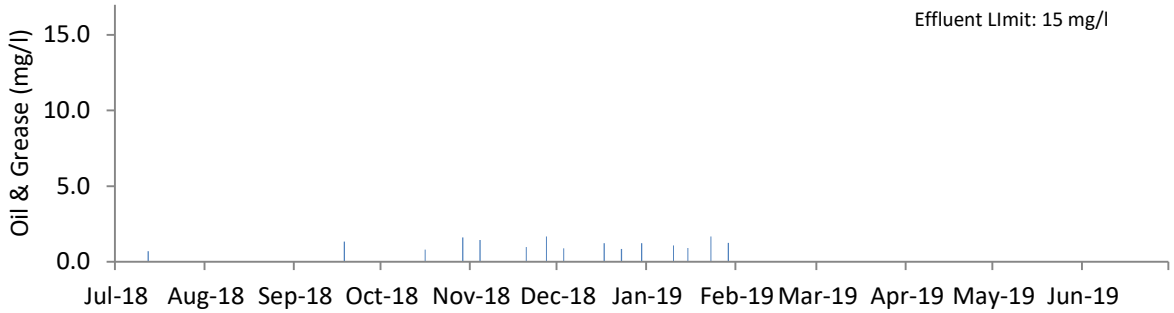
3.3.4 pH

Continuous pH metering is performed during discharge. The minimum instantaneous measurement was 6.6 and the maximum measurement was 9.3. The maximum pH of 9.3 was above the 9.0 permit limit, but it occurred for less than 1 hour; therefore, it does not exceed permit benchmarks. All stormwater discharged to Outfall 001 was within the permitted range throughout the reporting period.

3.3.5 Oil and Grease

Fifteen (15) grab samples of discharge to Outfall 001 were collected and submitted for oil and grease analysis. 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 maximum concentration during the 2018-2019 reporting period was 1.67 mg/L. As noted in Figure 10, all Oil and Grease samples were well below the maximum daily effluent limit of 15 mg/L.

Figure 10. Maximum Daily Oil & Grease Concentration



3.3.6 Priority Pollutants

Priority pollutant sampling is conducted once in the wet season and once in the dry season during year three of the permit (January 2018 – December 2018). Priority pollutant dry season sampling was conducted on April 18th and 19th, 2018. Priority pollutant wet season sampling was conducted on December 18th, 2018. These samples fulfill the priority pollutant dry and wet season sample requirements for the permit renewal application. Results have not yet been qualified and will be reported in the 2020 IWS Annual Report

3.3.7 Toxicity Testing

Acute and Chronic toxicity testing was conducted on July 2nd, 2019. This sample fulfills the "last summer prior to permit submittal" sample. The winter toxicity testing sample will occur later in the year. Results have not yet been qualified and will be reported in the 2020 IWS Annual Report.

Section 4: Conclusions

This report summarized results of effluent sampling at the STIA IWTP from July 2018 through June 2019. Results of both NPDES permit-required monitoring were presented. Results were presented for flow, oil and grease, BOD_5, TSS, glycol, and pH. Results for analysis performed under compliance with King County Industrial Waste Discharge Permit have also been included with this report to provide comparison information for BOD_5 that has been removed from receiving waters because of the implementation of AKART.

The AKART system has been in place for 12.5 years. It is proving to be very effective in reducing discharge of pollutants to Puget Sound. For this reporting period, 1,547,952 pounds of BOD_5 out of the total processed 1,565,179 pounds (98.9 %) were segregated and sent to King County for treatment. Since the implementation of AKART on January 1, 2007, a total of 10,032,512 pounds of BOD_5 were processed through the IWTP and 9,772,454 pounds were segregated and sent to KC STP for treatment.

Effluent concentrations of BOD_5, TSS, oil and grease, and glycols to Outfall 001 have been significantly reduced via diversion to KC STP. The stormwater discharged to Outfall 001 met effluent limitations throughout the reporting period for BOD, TSS, glycols, pH, and oil and grease.

The BOD_5 discharges to Outfall 001 never exceeded 60% of the daily mass limit during de-icing season (November through March). The highest daily BOD_5 load occurred during the de-icing season at 1,593 pounds and the maximum daily effluent limit during that period is 2,665 pounds.

Section 5: References

Gresham Smith and Partners. February 2019. Port of Seattle Seattle-Tacoma International Airport Industrial Waste System Waste Water Treatment Plant Operation & Maintenance Manual.

Herrera. September 2011, amended 2018. Quality Assurance Program Plan, Seattle Tacoma International Airport, Industrial Waste Treatment Plant Discharge Monitoring Program.

Port of Seattle; Sea-Tac Airport Website; http://www.portseattle.org/seatac/; 2016 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.

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Appendix A: Outfall 001 Analytical Results

Appendix A. Outfall 001 Analytical Results

Date	Flow	BOD Concentration	BOD Mass	pH Min	pH Max	Propylene Glycol	TSS	Oil & Grease
	MGD	mg/l	pounds	S.U.	S.U.	mg/l	mg/l	mg/l
7/12/2018	1.65	10.1	139	8.4	9.0		7.00	0.69
7/13/2018	1.09	9.4	85	8.6	9.3			
9/18/2018	0.58	8.4	40	6.7	7.9		16.00	1.33
9/19/2018	1.24	7.4	76	6.7	7.0			
9/20/2018	1.23	8.0	82	6.7	6.9			
10/16/2018	2.82	2.0	47	7.6	8.0		6.00	0.80
10/17/2018	2.96	3.5	86	7.7	8.0			
10/18/2018	0.90	3.3	25	7.6	7.8			
10/29/2018	2.51	8.8	184	6.8	6.9		6.00	1.60
10/30/2018	4.42	4.6	170	6.8	7.0			
10/31/2018	4.47	2.6	97	6.9	7.4			
11/1/2018	3.18	2.9	77	6.9	7.2	5.0		
11/2/2018	2.23	5.5	102	7.1	7.2			
11/3/2018	2.22	9.7	180	7.0	7.2			
11/4/2018	2.30	6.7	129	7.1	7.4	5.0	5.00	1.43
11/20/2018	1.98	24.4	402	7.9	8.2	14.9	4.00	0.97
11/27/2018	4.30	13.2	473	6.7	7.1	5.0	8.00	1.67
11/28/2018	2.84	18.3	434	6.6	6.8			
11/29/2018	3.59	11.2	336	6.6	7.6			
11/30/2018	4.37	11.0	401	6.6	6.7			
12/1/2018	4.31	12.1	435	6.6	6.9			
12/2/2018	2.77	20.7	478	6.8	6.8			
12/3/2018	3.00	25.6	641	6.8	7.0	14.9	8.00	0.88
12/4/2018	2.90	25.8	623	7.0	7.3			
12/17/2018	4.32	23.3	839	7.1	7.2	11.7	8.00	1.22
12/18/2018	4.35	25.2	915	6.9	7.2			
12/19/2018	4.39	11.8	432	6.9	7.0			
12/20/2018	3.00	11.2	281	6.9	7.1			
12/21/2018	2.53	10.2	215	7.0	7.1			
12/22/2018	1.95	8.7	141	7.0	7.2			
12/23/2018	3.44	21.0	602	6.9	7.2	5.0	6.00	0.84
12/24/2018	3.71	51.5	1593	6.6	7.1			
12/30/2018	4.35	29.2	1060	6.9	7.1	5.0	6.00	1.23
12/31/2018	2.63	34.6	760	6.9	7.4			
1/10/2019	3.15	32.5	853	6.8	7.3	19.5	6.00	1.07
1/11/2019	3.97	28.6	948	7.1	7.2			
1/15/2019	2.68	19.1	427	7.5	7.8	13.0	6.00	0.90
1/23/2019	2.27	25.0	473	6.8	7.0	16.5	5.00	1.67
1/24/2019	2.87	28.0	670	6.9	7.0			
1/25/2019	1.35	28.8	325	6.9	7.0			
1/29/2019	2.74	25.6	585	7.3	7.4	11.3	5.00	1.25
1/30/2019	2.30	19.0	365	7.3	7.7			

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