

PROVIDING MORE



EPCOR Water Services Inc.
Gold Bar Wastewater Treatment Plant
Edmonton, Alberta

2017
Wastewater Treatment Annual Report

SUBMITTED TO:

The Province of Alberta

**Alberta Environment and
Parks (AEP)**

As per requirements of

APPROVAL TO OPERATE NO. 361975-00-00

Feb - 2018

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2017 Overview

The Gold Bar Wastewater Treatment Plant (WWTP) located on the banks of the North Saskatchewan River in Edmonton, Alberta successfully passed the ISO 14001 (Environmental Management System) and OHSAS 18001 (Occupational Health and Safety Management System) surveillance audit for its Integrated Management System. Major capital projects focusing on solids handling improvements and rehabilitation (Screens 7 and 8 upgrades, Bioreactor 6 and Secondary 1 structural rehabilitation, Channel 3 rehabilitation) were completed. There was only one significant wet weather event with inflows to the plant greater than 1200 million litres per day (MLD). The plant received a peak flow of 1551 MLD on August 05.

The Gold Bar WWTP final effluent discharge limits of Approval to Operate 361975-00-00 are summarized in Table 1 and the monitoring requirements are outlined in Table 2. The Gold Bar WWTP Effluent Limit Performance (WELP*) index for 2017 is 22.0% (Figure 1). The 2017 index is higher than the five year running average of 21.2% (Figure 2) impacted primarily by a large number of wet weather events during the months of February, March and April.

Table 1: Approval to Operate 361975-00-00 Limits for Treated Wastewater

Parameter	Limit
Carbonaceous Biochemical Oxygen Demand (5-day) - CBOD ₅	20 mg/L monthly arithmetic mean of daily composite samples
Total Suspended Solids - TSS	20 mg/L monthly arithmetic mean of daily composite samples
Total Phosphorus - TP	1.0 mg/L monthly arithmetic mean of daily composite samples
Total Ammonia - Nitrogen (December 1 to May 31)	10 mg/L monthly arithmetic mean of daily composite samples
Total Ammonia - Nitrogen (June 1 to November 30)	5.0 mg/L monthly arithmetic mean of daily composite samples
<i>Escherichia coli</i> counts	126 counts per 100 mL/monthly geometric mean of daily grab samples
pH	6.5 to 8.5 pH units

* **WELP Index:** The index calculates a percentage value representing the percentage of the discharge limit for each parameter measured in the final effluent. Each value is given equal weighting in the calculation of the index

Table 2: Approval to Operate 361975-00-00 Monitoring Requirements

Parameter	Frequency (Minimum)	Sample Type	Sampling Location
UNTREATED WASTEWATER			
pH	Once per day	Composite	Untreated Wastewater entering the wastewater treatment plant
BOD ₅			
TSS			
Total Phosphorus			
Total Ammonia-Nitrogen			
Volume of Flow	Continuous, recorded daily	Calculated	
TREATED WASTEWATER			
pH	Once per day	Composite	Wastewater treated plant effluent prior to release to the North Saskatchewan River
CBOD ₅			
TSS			
Total Phosphorus			
Total Ammonia-Nitrogen			
Acute Toxicity	Monthly	Grab	
Chronic Toxicity	Quarterly	Grab	
Volume	Continuous, recorded daily	Calculated	
<i>E.coli counts</i>	Once per day	Grab	After ultraviolet (UV) disinfection
EFFLUENT REUSE WATER			
Volume of reuse water	Continuous, recorded daily	Calculated	Reuse water transmission main
WASTEWATER PLANT BYPASS AND UNAUTHORIZED RELEASE			
Release Volume	Continuous during bypass event , recorded daily	Calculated	Primary and Secondary treatment bypass of wastewater at the wastewater treatment plant Unauthorized release point
pH	Any bypass event lasting > 2 hours	Composite	
BOD ₅			
TSS			
Total Phosphorus			
Total Ammonia-Nitrogen			
<i>E.coli counts</i>		Grab	
SLUDGE DISPOSAL			
Sludge Volume	Total Volume	Estimated	Prior to leaving the wastewater treatment plant

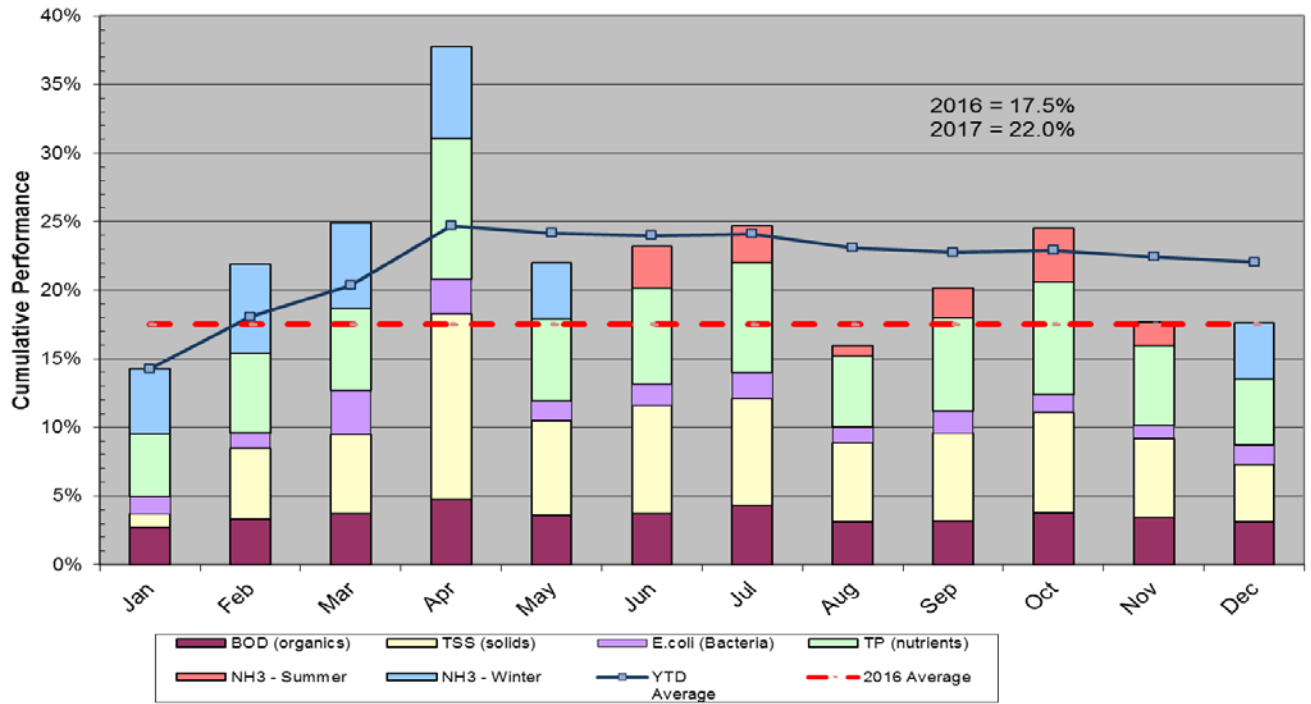


Figure 1: 2017 Monthly Gold Bar WWTP Wastewater Effluent Performance (WELP) Index

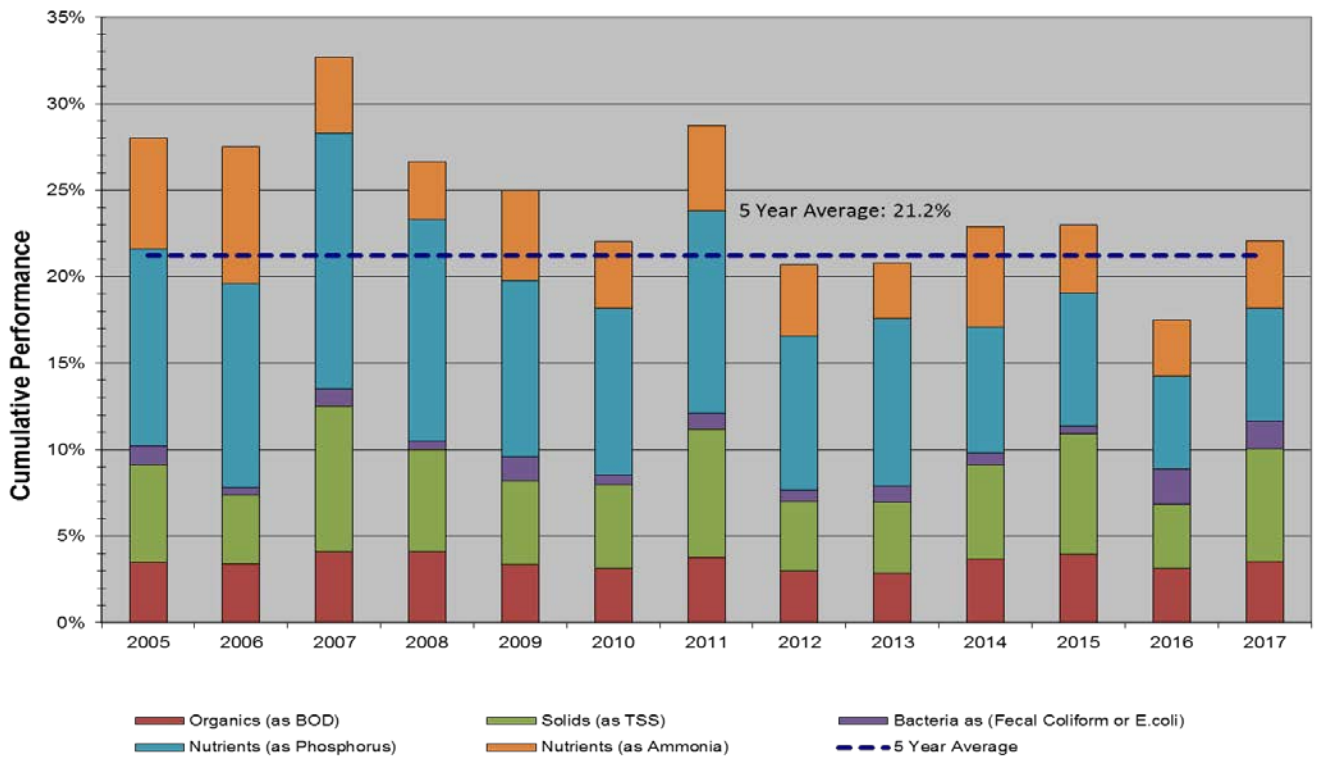


Figure 2: Gold Bar WWTP Wastewater Effluent Performance (WELP Index) 2005-2017

For 2017, all of the monthly limits for Approval to Operate discharge parameters were met (Table 3, Appendix A - Monthly Plant Performance Reports). A total of 101,057 million litres (ML) of wastewater was conveyed to the plant. Secondary treatment and UV disinfection was provided to 93,027 ML (92.1%) of the total influent raw flow with 3,795 ML (3.8%) of reclaimed water provided to industrial customers. A summary of reclaimed water quality in 2017 is provided in Table 4.

Plant Bypass (Secondary and Primary)

- In 2017, Gold Bar WWTP had 64 days of secondary and primary plant bypasses. Total volume of secondary bypass in 2017 was 4235 ML (4.2%). In addition, the total primary bypass volume was 0.3 ML (approximate)

Uncommitted hydraulic reserve capacity (Secondary treatment)

- In 2017, Gold Bar WWTP had total dry weather volume of 96,822 ML. This volume is sum total of Outfall 10 effluent and membrane product water (3795 ML). Outfall 10 effluent also includes wet weather flow that did not result in secondary bypass and any additional wet weather flow that had secondary treatment during plant secondary bypass events
- Average dry weather flow in 2017 was 265 MLD. However, true dry weather flow was lower than 265 MLD and was approximately 256 MLD (This average flow excludes additional flow to the plant during snow melt or rainfall, true dry weather volume was approximately 93,382 ML)
- Based on 310 MLD of average secondary treatment capacity and true dry weather average of 256 MLD, uncommitted hydraulic reserve capacity for secondary treatment, in 2017, was 54 MLD

Summary of 2017 Major Work Program

Major Maintenance includes activities within the Major Work Schedule as well as significant equipment failure and major Preventive Maintenance (PM) work on various plant assets. Major maintenance is classified as having significant impact to Operations, high man-hour efforts, and/or large financial expenditures (capital or expense).

Most maintenance is completed at Gold Bar WWTP using internal work forces; however, when special skills are required to complete maintenance, contract services are utilized to complete specific tasks. Contract services used in 2017 included Tundra Boiler Controls for boiler maintenance, MAP Water & Sewer Services Ltd. for roadwork at Clover Bar Lagoons, and other contractors as required for weed control, tree trimming, asbestos abatement, lifting device certification and overhead crane repair, and EPCOR Energy services for transformer maintenance.

Major maintenance activities during 2017 included clarifier chain replacement on two clarifiers, UV bulb and hydraulic cylinder replacement in two UV disinfection channels, boiler tube replacement in one boiler, and overhaul of two blowers.

Buildings

- Asbestos abatement completed on piping elbows, unit heaters, and ducting within Scum House 3
- Refurbishment of crane in the membrane building and the crane over grit tanks 1, 2, and 3 was completed

Digestion

- Two blend tank sludge pumps were rebuilt. The submersible mixer in Blend Tank 2 was replaced. Both blend tanks were cleaned and inspected.
- Chemical clean of Digester 2 heat exchanger was completed
- Overhaul, electrical calibration, and replacement of recirculation valves was completed for mixing compressors 101, 102, 103, and 104
- Cleaning was completed on boilers 6, 7, and 9

Disinfection

- Bulbs on UV banks 4A, 4B and various burned out lamps and ballasts were replaced
- Replacement of all bulbs and hydraulic cylinders on UV channels 2 and 3 was completed

Fermentation

- Cleaning and inspection was completed on Fermenter 4
- Completed plunger replacement on Fermenter 3 West TPS Pump and VFD replacement on Fermenter 3 East TPS Pump

Lab

- Replaced condensing unit for walk-in cooler for laboratory sample storage.

Lagoons (Clover Bar)

- Road widening and grading completed around lagoons cells 3A and 5, respectively
- New cradle for second hidrostal pump in lagoon cell 2 was fabricated and installed

Membrane Filtration

- Replaced backpulse valve on the membrane backpulse system
- Replaced East product water pump on membrane product water system
- Completed cleaning of membrane contact tanks

Odour Control

- The scrubber tower level transmitter and west bleach injection pump were replaced on the Fermenter scrubber system
- ORP and pH probes were replaced on the East, West, and EPT Scrubber systems

Outfall

- Flow meter for Outfall 30 channel was replace

Pretreatment

- Wash press for Screen 4 was rebuilt
- Overhaul of the two alum mixers in the west primary influent channel was completed
- Hydraulic hoses on CSO Screen System 4 were replaced

Primary Treatment

- Cleaning and inspection of primary clarifiers 7 and 11 were completed. Replacement of conveyor chain was completed in the long and cross collectors of primary clarifiers 8 and 10.
- Scum pump 2 for primary clarifier 5 was rebuilt. Sludge pump 1W was rebuilt for primary clarifier 4.
- Sludge blanket level sensors for primary clarifiers were serviced by HACH Canada.

Secondary Treatment

- Cleaning and inspection of secondary clarifiers 2, 5, 9, and 11 was completed. Replacement of conveyor chain was completed in the long and cross collectors of secondary clarifier 3.
- Ten submersible mixers were replaced in Bioreactor 5. Influent pumps were replaced in Bioreactors 1, 2, and 3.
- Electrical diagnostic testing completed for motors on Blowers 1, 4, 5, and 6. Overhaul completed on Blower 6 motor and Blower 4 motor and blower.

Utilities

- Replaced desiccant in instrument air dryer units
- Completed tube replacement in boiler 2 and ABSA certifications of boilers 2 and 3
- Completed power factor (Doble) testing and dissolved gas analysis on 33 high voltage liquid filled transformers. Visual inspection, exercising, and LSIG trip function testing was also performed on 33 high voltage breakers and related relay apparatus.
- Completed superchlorination and disinfection of potable water system feeding Blower House 2

Sludge/ Supernatant Piping

- Completed construction of an access road to D2 manhole from the parking lot
- Replaced starter contacts on motors at the pump house

Waste Activated Sludge Thickening

- Rebuild of South and Centre TWAS pumps was completed

TABLE 4: 2017 Reclaimed Water Quality.

Summary of data developed on the ultrafiltered final effluent (i.e. reclaimed water) samples from January 1 to December 31, 2017 as required under section 4.2.2 (i) and 4.3.1 (j) of the Approval to Operate No. 361975-00-00 (May 29, 2015). All parameters except *E. coli* which were developed on daily 24-hour composite samples of the recycled water. The *E. coli* testing was conducted on discrete samples collected on a daily basis.

Month		FLOW ML	Total Alkalinity (mg CaCO3 /L)	Ammonia (mg N/L)	Biochemical Oxygen Demand (mg/L)	Chemical Oxygen Demand (mg/L)	Chloride (mg Cl/L)	Conductivity (mS/cm)	<i>E. coli</i> (Counts/100 mL)	pH	Total Suspended Solids (mg/L)	Total Organic Carbon (mg/L)	Total Phosphorus (mg P/L)	Total Dissolved Solids (mg/L)	Turbidity (NTU)
January	Avg	9.87	173	0.29	< 2	28	118	1,011	< 1	8.1	< 0.7	10.2	0.10	613	0.17
	Min	8.60	163	0.08	< 2	< 20	97	949	< 1	8.0	< 0.7	9.2	0.07	496	0.12
	Max	10.98	179	1.53	< 2	41	231	1,380	< 1	8.2	0.7	11.1	0.12	809	0.25
February	Avg	9.91	154	0.20	< 2	35	134	1,072	< 1	8.0	< 0.7	10.7	0.12	655	0.15
	Min	7.36	143	0.03	< 2	< 20	89	931	< 1	8.0	< 0.7	9.6	0.08	566	0.12
	Max	11.29	172	0.43	< 2	58	267	1,460	< 1	8.2	< 0.7	11.4	0.23	865	0.22
March	Avg	9.99	156	0.40	< 2	30	128	1,027	< 1	8.0	0.7	10.1	0.10	632	0.15
	Min	9.07	146	0.07	< 2	< 20	85	854	< 1	7.9	< 0.7	9.1	0.06	514	0.10
	Max	10.85	170	2.91	< 2	43	305	1,570	< 1	8.1	0.7	10.7	0.13	938	0.32
April	Avg	8.82	157	1.29	< 2	25	101	1,041	< 1	8.1	< 0.7	9.9	0.06	652	0.16
	Min	6.30	135	0.06	< 2	< 20	81	846	< 1	7.9	< 0.7	7.8	0.04	489	0.11
	Max	12.05	193	4.85	< 2	43	158	1,280	< 1	8.2	< 0.7	11.0	0.10	828	0.21
May	Avg	10.32	171	0.63	< 2	28	88	1,133	< 1	8.1	< 0.7	10.2	0.07	754	0.18
	Min	6.52	162	0.08	< 2	< 20	60	863	< 1	7.9	< 0.7	8.1	0.02	554	0.12
	Max	11.62	184	2.42	< 2	37	105	1,240	< 1	8.2	< 0.7	11.1	0.11	866	0.35
June	Avg	10.46	157	0.12	< 2	28	88	1,076	< 1	8.1	< 0.7	10.2	0.09	698	0.17
	Min	9.06	143	0.03	< 2	< 20	71	901	< 1	8.0	< 0.7	9.4	0.06	571	0.11
	Max	11.65	164	0.44	< 2	38	97	1,210	< 1	8.1	< 0.7	11.8	0.21	800	0.26
July	Avg	11.14	158	0.13	< 2	27	86	992	< 1	8.0	0.7	9.8	0.14	636	0.18
	Min	3.93	148	0.06	< 2	< 20	62	738	< 1	7.9	< 0.7	8.2	0.08	468	0.12
	Max	13.38	172	0.97	< 2	41	99	1,110	< 1	8.1	2.6	10.8	0.65	701	0.75
August	Avg	10.18	157	0.08	< 2	24	82	955	< 1	8.1	0.7	8.8	0.09	614	0.15
	Min	8.84	148	0.02	< 2	< 20	61	788	< 1	8.0	< 0.7	6.3	0.07	505	0.10
	Max	11.31	163	0.24	< 2	35	93	1,080	< 1	8.2	1.0	10.4	0.14	750	0.24
September	Avg	11.13	132	0.24	< 2	24	81	897	< 1	8.1	0.7	9.0	0.12	570	0.17
	Min	10.27	113	0.06	< 2	20	62	746	1	7.9	< 0.7	6.3	0.01	459	0.12
	Max	12.60	146	1.24	< 2	31	94	969	< 1	8.3	0.9	10.2	0.28	643	0.22
October	Avg	10.84	139	0.28	< 2	24	80	918	< 1	8.0	< 0.7	8.6	0.19	559	0.17
	Min	9.45	129	0.06	< 2	20	67	830	< 1	8.0	< 0.7	2.7	0.14	494	0.13
	Max	11.56	145	1.01	< 2	33	87	1,020	< 1	8.2	< 0.7	9.9	0.77	617	0.24
November	Avg	10.84	164	0.11	< 2	24	131	1,028	< 1	8.1	< 0.7	7.2	0.08	612	0.18
	Min	8.20	136	0.05	< 2	20	84	861	< 1	7.9	< 0.7	4.7	0.05	532	0.12
	Max	11.72	185	0.46	< 2	34	341	1,710	< 1	8.2	< 0.7	7.9	0.14	923	0.56
December	Avg	11.23	151	0.29	2	24	101	926	< 1	8.0	< 0.7	7.8	0.08	555	0.22
	Min	10.56	142	0.06	< 2	20	83	804	< 1	7.9	< 0.7	7.0	0.01	472	0.13
	Max	12.25	157	1.74	5	33	148	1,090	< 1	8.2	< 0.7	8.4	0.14	641	0.43
Annual Summary	Avg	10.39	156	0.34	< 2	27	102	1,006	< 1	8.1	0.7	9.4	0.10	629	0.17
	Min	3.93	113	0.02	< 2	< 20	60	738	< 1	7.9	0.7	7.2	0.01	459	0.10
	Max	13.38	193	4.85	5	58	341	1,710	1	8.3	1.0	10.7	0.77	938	0.75

Notes:

- 1) NTU – Nephelometric turbidity units.
- 2) Counts/100mL – Counts per 100 mL of sample.
- 3) ML – Megaliters (1,000,000 liters)

TABLE 5: 2017 Effluent Toxicity

Summary of chronic and acute toxicity testing as outlined in the sections 4.3.1. (i) and 6.1.1. of the Approval to Operate No. 361975-00-00. Both acute and chronic toxicity tests were carried out by contract laboratories in accordance with the Environment Canada Biological Test Methods (Environment Canada 1990 and 1992). The acute testing included 48-hour Rainbow Trout static toxicity, 48-hour static toxicity using *Daphnia magna* and 15-minute Microtox tests using luminescence bacteria. Seven-day *Ceriodaphnia dubia*, Fathead minnows and three-day *P. subcapitata* survival and reproductive impairment tests were used to determine chronic toxicity.

On the sample collected April 6, 2017 mortality was observed in the Fathead Minnows analysis. No further mortality was observed in the following three months of analyses.

NOTE: AEP Reference No. 322851 (03/16/2017) – Failure of Quality Control for *Ceriodaphnia dubia* and Mortality issues in Fathead Minnow

Dates	Qrt	Microtox	<i>Daphnia</i>	Rainbow Trout	<i>Ceriodaphnia</i>		Fathead Minnows		<i>Pseudokirchneriella</i>				
		% of Control	LC ₅₀ % ¹	LC ₅₀ %	LC ₅₀ %	IC ₅₀ % ²	LC ₅₀ %	IC ₅₀ %	IC ₂₅ % ³	NOEL (%) ⁴	LOEL (%) ⁵	TOEL (%) ⁶	Toxic Units (TU) ⁷
11/01/2017	1	>81.8	>100	>100	---	---	---	---	---	---	---	---	---
08/02/2017		>81.8	>100	>100	---	---	---	---	---	---	---	---	---
20/03/2017		>81.8	>100	>100	---	---	---	---	>90.91	<1.42	1.42	n/a	>70.42
06/04/2017	2	---	---	---	>100	>100	10.3	36.1	---	---	---	---	---
11/04/2017		>81.8	>100	>100	---	---	---	---	---	---	---	---	---
09/05/2017		>81.8	>100	>100	>100	>100	>100	>100	>90.91	<1.42	1.42	n/a	>70.42
13/06/2017		>81.8	>100	>100	>100	>100	>100	>100	>90.91	2.841	5.682	4.018	35.20
11/07/2017	3	>81.8	>100	>100	---	---	>100	>100	---	---	---	---	---
21/08/2017		>81.8	>100	>100	---	---	---	---	>90.91	<1.42	1.42	n/a	>70.42
11/09/2017		>81.8	>100	>100	>100	>100	---	---	---	---	---	---	---
10/10/2017	4	>81.8	>100	>100	---	---	---	---	---	---	---	---	---
07/11/2017		>81.8	>100	>100	>100	>100	>100	>100	>90.91	11.364	22.728	10.07	8.8
19/12/2017		>81.8	>100	>100	---	---	---	---	---	---	---	---	---

¹ LC50 - % effluent concentration at which there is a 50% mortality of test organisms; ² IC50 - % effluent concentration at which there is a 50% reduction in growth or reproduction of test organisms; ³ IC25 - % effluent concentration at which there is a 25% reduction in growth or reproduction of test organisms; ⁴ NOEL - the concentration at which there was no observed effect level; ⁵ LOEL - the concentration at which you start seeing the lowest observable effect; ⁶ TOEL - NOEL/LOEL; ⁷ TU - the ratio of the concentration observed divided by the concentration for 50% inhibition.

TABLE 6: 2017 Summary of Gold Bar Wastewater Proficiency Testing

Summary of quality assurance data as required under sections 4.3.1 (m) of the Approval to Operate No. 361975-00-00 (May 29, 2015), and includes the Laboratory z-scores achieved from analyzing proficiency testing (PT) samples for constituents required by the Approval to Operate No. 361975-00-00. The 2017 PT samples were provided by the Canadian Association for Laboratory Accreditation (CALA). A PT scores greater than or equal to 70 or z-scores less than or equal to 3.000 are considered acceptable for CALA PT.

Study	Date	pH		BOD		C-BOD		TSS		NH3-N		TP		E.coli	
		PT Score	Avg. z-score	PT Score	Avg. z-score	PT Score	Avg. z-score	PT Score	Avg. z-score	PT Score	Avg. z-score	PT Score	Avg. z-score	PT Score	Avg. z-score
CALA	Mar-17	96	-0.08	86	0.92	86	0.95	98	0.04	98	-0.09	98	-0.25	83 ^L	-1.13
CALA	Oct-17	97	0.23	95	-0.32	85	-0.98	95	-0.31	94	-0.37	95	0.02	94	-0.35

Notes:

PT Score > 70 acceptable.

VH - Very high bias, H - High bias, L - Low bias, A - Acceptable, Q - Questionable, U - Unsatisfactory

CALA - Canadian Association for Laboratory Accreditation.

pH - pH manual, BOD - 5-day Biochemical Oxygen Demand, C-BOD - 5-day Carbonaceous Biochemical Oxygen Demand, TSS - Total Suspended Solids, NH3-N - Ammonia as Nitrogen, TP - Total Phosphorus.

E.coli - Sample analyzed using membrane filtration (mENDO) method.

TABLE 7: Environmental Release Reports & Administrative Non-Compliances

Date of Occurrence	ESS Incident Number	Location	Incident Description	Type	AEP Reference Number
12/03/2017	ENV-01397	Gold Bar - Outfall No. 30	Gold Bar WWTP had a secondary plant bypass on March 12 between 0500 hrs to 0530 hrs that resulted in a discharge of approx. 1 ML of primary treated wastewater to NSR. Plant influent flow peaked at 540 MLD due to sudden release of stored 6 ML (approx.) of wastewater at one the Real Time Control (RTC) site within the collection system. Sudden release was due to a power failure	Reportable- Uncontrolled Release	322002
06/04/2017	ENV-01419	Gold Bar-Outfall No. 10	Failed/incomplete Chronic Toxicity test from an final effluent sample collected from Outfall No. 10	Reportable- Contravention of Approval	322851
08/05/2017	ENV-01456	Gold Bar - supernatant return pipelines (in Hermitage Park)	Supernatant release from the supernatant pipeline 1 in Hermitage Park between the D2 Chamber and the Distribution Chamber. A rescue crew arrived to assist operators in isolating the pipeline and a vac truck arrived to site to clean up the supernatant spill.	Reportable- Uncontrolled Release	324035
10/05/2017	ENV-01459	Gold Bar - supernatant return pipelines (in Hermitage Park)	Supernatant spill that occurred at the TEM's Diversion Chamber coming from a leak in supernatant pipeline 2 into the chamber	Reportable- Uncontrolled Release	324126

TABLE 8: 2017 List of Certified Wastewater Treatment Operators (as of December 2017)

Name	Title	WWT Certification Level
Grossell, Ken M	Manager, Operations	IV
Schneider, Brian P	WWTP Operator Foreman	IV
Kerr, David A	WWTP HEI Co Ordinator	IV
Graham, Thomas A	WWTP Operator Foreman	IV
Jones, Kira I	WWTP Operator Foreman	IV
Kwan, Tom	WWTP Operator Foreman	IV
Barrett, Jeremy L	WWTP Operator Foreman	III
Espinosa, Diego F	WWTP Operator Foreman	IV
Lekamwasam, Janaka	WWTP Operator Foreman	IV
Li, Bing BL	WWTP Operator	III
Jama, Yusuf	WWTP Operator	III
Ketchum, Glen	WWTP Training Co Ordinator	III
Budden, Curt	WWTP Lead Operator	III
Rindero, Billy	WWTP Operator	III
Hetherington, Clarke	WWTP Operator	III
Hahn, Kevin	WWTP Operator	III
Holden, Derek	WWTP Operator	II
Sontrop Melanie	WWTP Operator	II
Nunes, Michael	WWTP Lead Operator	III
Penner, Jody	WWTP Lead Operator	III
Sanche, Dagny	WWTP Operator	III
Sandouga, Sam	WWTP Lead Operator	III
Baker, Cole	WWTP Operator	II
Diletzoy, Kyle	WWTP Operator	II
Jordan, Bradley	WWTP Operator	II
Nieuwenhuis, Andrew	WWTP Operator	II
Volgensang, Ryan	WWTP Operator	II
Rees, Emma	WWTP Operator	I
Omeragic, Arment	WWTP Operator In Training	

TABLE 9: Summary of 2017 Completed Projects and Planned Major Capital and Rehabilitation Projects

Program	Project/Scope	Completion
Plant Reliability		
	Screens 7, 8 Upgrades	In Service
	Biogas Systems Risk Mitigation	Completed
	Electrical Switchgear Upgrades	Completed
	Standby Generator Upgrade	Dec 2018
	Channel 3 Rehab	Completed
	Bioreactor 6 Structural Rehab	Completed
	Restore Odour Control System Capacity	July 2018
	Operations Center at Mid-Point Entrance	Dec 2020
	EPT Polymer System Upgrades	June 2018
	EPT Ventilation	Dec 2018
	Secondary 1 Structural Rehab	Completed
	Distribution Chamber Rehab	Oct 2018
	Evacuation Alarm Upgrades	Dec 2019
	Boiler Upgrades	Apr 2018
	Digested Sludge Piping Replacement	Aug 2018
	Chain Operated Valve Upgrades	Dec 2018
	LIMS Upgrade	Completed
	Odour Scrubber Reliability Improvements	Dec 2018
Program Work		
	Isolation Upgrades	2017 work completed
	HVAC Rehabilitation	2017 work completed
	Utility Hot Water System Rehabilitation	2017 work completed
	Buildings and Site Rehabilitation	2017 work completed
	Electrical Rehabilitation	2017 work completed
	Instrumentation Rehab and Upgrades	2017 work completed
	Control System Rehab and Improvements	2017 work completed
	Mechanical Rehabilitation	2017 work completed
	Structural Rehabilitation	2017 work completed
	Membrane Rehabilitation	2017 work completed
	Clarifier Chain Rehabilitation	2017 work completed
	Plant Improvements	2017 work completed
	Process Improvements	2017 work completed
	Plant Equipment Upgrades	2017 work completed
	Fleet Replacement	2017 work completed
	Lab Equipment Replacement	2017 work completed
Digester Reliability		
	Digester 3 Upgrades	Dec 2018
	Digester 4 Upgrades	Dec 2019
Clover Bar Improvements		
	Sludge Lines Upgrades	Dec 2019
	Lagoon Supernatant Project (OSTARA)	Ongoing
Special Projects		
	Hydrovac Sanitary Grit Treatment Facility	In Service

Appendices

Main data table with columns for Date, Volume of Flow (ML), and Liquid Stream Quality parameters like pH, TSS, BOD, TP, NH3-N, TKN, NO3-NO2, Chloride, and E. coli. Includes summary rows for Average, Minimum, Maximum, and Geometric Mean.

*Contact Laboratory for information about the quality assurance associated with the result.

Enhanced Primary Treatment (EPT) Usage table showing Total Bypass, EPT Usage, and % Usage for YTD.

Report Comments

Report Comments table with columns for Date, Comment, and AEP Ref #.

Legend defining abbreviations: RAW (Untreated Influent into the Plant), INF (Untreated wastewater from collection system), INFs (Influent, screened at the Headworks Diversion Structure), PE (Primary Effluent from conventional primaries), PE 30 (Primary Effluent from conventional primaries discharged via Outfall 30), EPT (Enhanced Primary Treatment), EPE (Enhanced Primary Effluent), EPEPS (Enhanced Primary Effluent and Pump Station), FE (Final Effluent from secondary treatment process), FEC (Combined pre-UV disinfection), OUTFALL 10 (UV-disinfected, discharged via OUTFALL 10), OUTFALL 20 (Combined Bypass), OUTFALL 30 (Combined Bypass), MPW (Membrane Product Water), ML (Megalitre), MPN (Most Probable Number), NR (No result), NS (No sample), INS (Insufficient sample).

Signature of Abhishek Bhargava

Signature of Shane Harnish

Abhishek Bhargava (mm/dd/yyyy)
Shane Harnish (mm/dd/yyyy)
Senior Manager, Operations
Senior Manager, Analytical Operations

DATE	Peak Flow (MLD)	Volume of Flow (ML)						Liquid Stream Quality																																																					
		Influent			Effluent			pH@25°C						TSS (mg/L)						BOD ₅ /cBOD ₅ (mg/L)						TP (mg/L)						NH ₃ -N (mg/L)						TKN (mg/L)						NO ₂ +NO ₃ (mg/L)						Chloride (mg/L)						E. coli (Counts/100 mL)					
		RAW	OUTFALL 30		MPW	EPEPS		OUTFALL 10		RAW	OUTFALL 30		EPEPS	OUTFALL 10		RAW	OUTFALL 30		EPEPS	OUTFALL 10		RAW	OUTFALL 30		EPEPS	OUTFALL 10		RAW	OUTFALL 30		EPEPS	OUTFALL 10		RAW	OUTFALL 30		EPEPS	OUTFALL 10		RAW	OUTFALL 30		EPEPS	OUTFALL 10		RAW	OUTFALL 30		EPEPS	OUTFALL 10											
			FEC	FE		FEC	FE	FEC	FE		BOD ₅	cBOD ₅		BOD ₅	cBOD ₅		BOD ₅	cBOD ₅		BOD ₅	cBOD ₅		BOD ₅	cBOD ₅		BOD ₅	cBOD ₅		BOD ₅	cBOD ₅		BOD ₅	cBOD ₅		BOD ₅	cBOD ₅		BOD ₅	cBOD ₅		BOD ₅	cBOD ₅		BOD ₅	cBOD ₅		BOD ₅	cBOD ₅		BOD ₅	cBOD ₅	BOD ₅	cBOD ₅	BOD ₅	cBOD ₅	BOD ₅	cBOD ₅	BOD ₅	cBOD ₅	BOD ₅	cBOD ₅
Wed 01	388.71	244.52	0.00	10.09	0.00	234.43	234.43	7.7		7.5	323			5.3	5.3	319			4	4	8.84			0.28	0.28	53.8			1.39	1.39	68.8			3.39	0.01		9.34	99.9		111							4														
Average	447.53	273.87	12.55	9.99	0.00	251.70	251.70	7.6	7.6	7.5	306	119		5.8	5.8	302	152		4	4	7.55	4.85		0.30	0.30	38.5	33.0		3.12	3.12	59.0	43.2	5.23	0.02	0.29	7.90	124	278	125																						
Minimum	332.65	232.74	0.00	9.07	0.00	221.92	221.92	7.5	7.4	7.4	182	70		4.2	4.2	156	134		3	3	4.98	4.35		0.22	0.22	28.4	25.1		0.16	0.16	43.0	35.5	1.58	< 0.01	0.01	4.50	75.3	75.1	79.7	1.7	1.6				3																
Maximum	830.91	410.26	142.05	10.85	0.00	289.79	289.79	7.8	8.0	7.7	605	226		8.3	8.3	382	202		5	5	10.1	5.60		0.48	0.48	53.8	44.8		5.35	5.35	73.6	50.4	7.51	0.05	1.33	10.6	421	546	311	2.7	2.2				500																
GeoMean	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---													
TOTAL	---	8,502	389	310	0	7,803	7,803	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---														

* contact Laboratory for information about the quality assurance associated with the result

Enhanced Primary Treatment (EPT) Usage					
Total Bypass (hrs)	EPT Usage (hrs)	%	Total Bypass YTD (hrs)	EPT Usage % Usage YTD	
56	56	100%	91	91	100.00%

Report Comments	
1	Outfall 30 - March 12: No auto-sampler available. Tests performed on grab sample.

AEP** Ref #

- | | | | |
|-------|--|------------|--|
| RAW | Untreated Influent into the plant | FEC | Combined pre-UV disinfection (FE+EPEPS) |
| INF | Untreated Wastewater from collection system | OUTFALL 10 | UV-disinfected, discharged via OUTFALL 10 |
| INFs | Influent, screened at the Headworks Diversion Structure | OUTFALL 20 | Combined Bypass (RAW + PE + EPE) |
| PE | Primary Effluent from conventional primaries | OUTFALL 30 | Combined Bypass (INF + INFS + PE30 + EPE) |
| PE 30 | Primary Effluent from conventional primaries discharged via Outfall 30 | MPW | Membrane Product Water (Effluent re-use water) |
| EPT | Enhanced Primary Treatment | ML | Megalitre (1,000,000 Litre) |
| EPE | Enhanced Primary Effluent | MPN | Most Probable Number |
| EPEP | Enhanced Primary Effluent and Pump Station | NR | No Result |
| FE | Final Effluent from secondary treatment process (with biological nutrient removal). Pre-Ultraviolet disinfection | NS | No Sample |
| | | INS | Insufficient Sample |

 4/28/2017
Abhishek Bhargava
 Senior Manager, Operations

 4/28/2017
Shane Harnish
 Senior Manager, Analytical Operations

** AEP - Alberta Environment & Parks

Table with columns: DATE, Peak Flow (MLD), Volume of Flow (ML) (Influent, Effluent), pH@25°C, TSS (mg/L), BOD5/cBOD5 (mg/L), TP (mg/L), NH3-N (mg/L), TKN (mg/L), NOx+NOy (mg/L), Chloride (mg/L), E. coli (Counts/100 mL). Includes summary rows for Average, Minimum, Maximum, GeoMean, and TOTAL.

* contact Laboratory for information about the quality assurance associated with the results

Enhanced Primary Treatment (EPT) Usage table with columns: Total Bypass (hrs), EPT Usage (hrs), %, Total Bypass YTD (hrs), EPT Usage YTD, % Usage YTD.

Report Comments table with columns: Date, Comment.

AEP** Ref # table with columns: Ref #.

** AEP - Alberta Environment & Parks

- RAW Untreated Influent into the plant
INF Untreated Wastewater from collection system
INFs Influent, screened at the Headworks Diversion Structure
PE Primary Effluent from conventional primaries
PE 30 Primary Effluent from conventional primaries discharged via Outfall 30
EPT Enhanced Primary Treatment
EPE Enhanced Primary Effluent
EPEPS Enhanced Primary Effluent and Pump Station
FE Final Effluent from secondary treatment process (with biological nutrient removal)
FEC Combined pre-UV disinfection (FE+EPEPS)
OUTFALL 10 UV-disinfected, discharged via OUTFALL 10
OUTFALL 20 Combined Bypass (RAW + PE + EPE)
OUTFALL 30 Combined Bypass (INF + INFs + PE30 + EPE)
MPW Membrane Product Water (Effluent re-use water)
ML Megalitre (1,000,000 Litre)
MPN Most Probable Number
NR No Result
NS No Sample
INS Insufficient Sample

Signatures and names: Arunesh Bhargava, Senior Manager, Operations; Shane Harnish, Senior Manager, Analytical Operations.

Main data table with columns for DATE, Peak Flow (MLD), Volume of Flow (ML), Liquid Stream Quality (pH, TSS, BOD, TP, NH3-N, TKN, Chloride, E. coli), and various outfall parameters.

* contact Laboratory for information about the quality assurance associated with the results

Enhanced Primary Treatment (EPT) Usage summary table with columns: Total Bypass (hrs), EPT Usage (hrs), %, Total Bypass YTD (hrs), EPT Usage YTD, % Usage YTD.

Report Comments table with columns: ID, Description of comment.

AEP** Ref # table with columns: Ref #, Description.

- RAW Untreated Influent into the plant
INF Untreated Wastewater from collection system
INFs Influent, screened at the Headworks Diversion Structure
PE Primary Effluent from conventional primaries
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MPW Membrane Product Water (Effluent re-use water)
ML Megalitre (1,000,000 Litre)
MPN Most Probable Number
NR No Result
NS No Sample
INS Insufficient Sample

Abhishek Bhargava
Senior Manager, Operations
Shane Harnish
Senior Manager, Analytical Operations



Gold Bar Wastewater Treatment Plant
 10977 50 Street
 Edmonton AB T6A 2E9
 Canada
epcor.com

**Approval 361975-00-00
 Gold Bar Waste Water Treatment Plant Operations Monthly Summary**

2017

SENIOR MANAGER, OPERATIONS MANAGER, OPERATIONS	<ul style="list-style-type: none"> • ABHISHEK BHARGAVA • KEN GROSSELL (LEVEL IV)
LEVEL IV OPERATORS	<ul style="list-style-type: none"> • DAVID KERR • TOM GRAHAM • BRIAN SCHNEIDER • KIRA JONES • TOM KWAN • DIEGO ESPINOSA

January

- 0 Secondary Bypass Events
- EPT 9 & 10 O/S for repair/inspection
- Blower 5 commissioned – back to Operations
- Permanent chlorine gas detectors installed membrane facility
- Boiler 4 available (1 & 2 O/S)
- U.V. Channel 1 & 2 washed (troubleshooting high ecoli outfall 10)

February

- 4 Secondary Bypass Events – Feb 15th, 16th, 17th and 19th (Total volume: 272 ML)
- 1 Diversion structure (main plant bypass) Feb 19th – (Total volume: 0.28 ML)
- Flow equalization project started
- Feb 16th – security incident – north gate vandalized
- Outfall 30 flow meter not registering
- U.V. channel limit set to 130 ML for flow equalization

March

- 7 Secondary Bypass events March 15th, 16th, 17th, 18th, 19th, 25th and 26th (Total volume: 389 ML)
- Flow equalization testing ongoing
- Dig 2 heat exchanger inspected – scheduled for acid clean early April
- Sec 8 O/S for flight repair
- Outfall 30 new flow meter failed/ using flowdar again

April

- 14 Secondary bypass events – Apr 7th, 10th, 13th, 14th, 15th, 16th, 18th, 19th, 21st, 22nd, 23rd, 24th, 25th and 30th (Total volume: 1187 ML)
- Bio 6 back in operation
- Acid clean dig 2 heat exchanger
- Blower 6 motor out for inspection
- Influent channel 3/grit tank 6 & 7/screens 7 & 8/ west primary influent channel/EPT 9 & 10 back in operation

May

- 7 Secondary bypass events – May 1st, 10th, 13th, 15th, 16th, 24th and 25th (Total volume: 659 ML)
- Winter mode trial on bio's 2,3,4,5,6 & 8
- Sec 1 O/S for structural rehab.
- Influent channel 2 O/S for inspection/back in service May 31st.
- Sludge to farmland started May 12th
- Supernatant line 1 leak detected – using line 2
- Main plant bypass May 24th-25th
- Primary 5 & 6 O/S for inspection
- Ferm 4 O/S – inspection in June

June

- 8 Secondary bypass events – June 2nd, 9th, 10th, 14th, 16th, 20th, 27th and 28th (Total volume: 350 ML)
- Primary 5 & 6 back in service.
- BNR back in summer mode
- Blend tank #1 O/S for cleaning/inspection
- Fermenter 4 O/S for cleaning/inspection
- EPT scrubber blower failed – off line 6 hrs.
- Dig 4 O/S – prepare for thinning.
- Outfall 30 flow meter failure

July

- 8 Secondary bypass events – July 1st, 13th, 20th, 23rd, 24th, 27th and 29th (Total volume: 378 ML)
- Primary 5 & 6 back in service after inspection
- Thinning primary 7 & 8 to get ready for inspection
- Membrane shutdown July 19th
- Thinning dig 4 – complete July 21st
- Blower 6 back in service
- Blower 4 O/S for inspection/cleaning
- South blend tank cleaned/in-service
- North blend tank O/S for cleaning

August

- 7 Secondary Bypass Events – Aug 1st, 4th, 5th, 7th, 13th, 18th and 24th (Total volume: 352 ML)
- Fermenter 4 back in service after inspection
- Dig 4 complete, purged and pumped out
- Primary 7 O/S for inspection, primary 8 O/S for chain replacement
- North blend tank back in service after cleaning
- Membrane plant off line for 6 hrs due to loss of contact tank level and product water flow meter, ESS – BI 02223

September

- 6 Secondary Bypass Events – Sept 13th, 14th, 19th, 20th, 21st & 22nd (Total volume: 441 ML)
- Dig 4 cleaning complete
- EPT 11/12 O/S for tank covers/inspection
- Sec 5/9 O/S for Maintenance chain inspection
- Sec 11 O/S for Membrane drain line tie in to 4th pass channel
- Boiler 4 started for plant heating

October

- 3 Secondary Bypass Event – Oct 1st, 17th and 31st (Total volume: 155 ML)
- EPT poly system O/S Oct 3rd for projects
- EPT 11 & 12 O/S for projects
- Scrubber upgrades started
- U.V. outage Oct 18th for approx. 8 hours
- Boiler 4 back to Operations running locally

November

- 1 Secondary Bypass Event – Nov 1st (Total volume: 52 ML)
- Screens 4/5/6 & primary 5/6 back in service – capacity back to 950ML

- West scrubber shutdown upgrade complete
- Boiler $\frac{3}{4}$ now running on local
- Sec 3 back in service after new chain installed
- Secondary alum system off line for projects

December

- 0 Secondary Bypass Events
- Influent channel 2 O/S, grit tanks 4& 5 O/S for inspection
- Boiler 5 back to operations/ boiler house 1 back in remote
- Caustic storage tanks O/S for relining – using caustic totes
- New boi gas flow meters installed
- Sec 2 O/S for chain repair
- Flow equalization started

2017 Summary of Notifications to Alberta Environment & Parks		
Date	Summary of Notifications	AEP Reference Number
March 15	AEP was notified of 0.5 hour UV outage on March 30, 2017. The planned outage of the UV was to transfer the load from one transformer over to the other redundant transformer in preparation for connecting the Grit Recovery facility into Substation 1	322002
May 8	AEP was notified of a spill in Hermitage Park on Line 1 which was returning supernatant at the time	324035
May 10	AEP was notified of a spill at the TEM's Diversion Chamber coming from Line 2 into the chamber	324126
June 20	AEP was notified of two 1 hour UV outages planned for June 27 and 28, 2017. The planned outage of the UV was to test the autotransfer switch between the two main feeders for the plant	325944
July 20	AEP was notified of a half an hour UV outage planned for July 20 th at 11:30AM. The planned outage of the UV was to check for issues in Substation 2 after losing the Hardisty Power feed to the plant on July 18 th	327272
July 20	AEP was notified of a half an hour UV outage planned for July 21 st at 12:00PM. The planned outage of the UV was to switch back to the Hardisty Power feeder	327294
September 13	AEP was notified of a reduction in total hydraulic capacity in the plant due to capital construction that took Primary 7 and 8, and EPT 11 and 12 out of service	329672
September 21	AEP was notified of an eight hour UV outage planned for October 19 th at 12:00AM. The planned outage was for replacement of 480V breakers that control the UV lamp system	329949
October 12	AEP was notified of a 5 day East Scrubber outage planned to start October 16 th at 7AM and finishing October 20 th at 4PM	330693
October 20	AEP was notified of a 5 day Fermenter Scrubber outage planned to start October 23 rd at 4AM and finishing October 27 th at 4PM	331006
October 31	AEP was notified of a 5 day West Scrubber outage planned to start October 30 th at 7AM and finishing November 3 rd at 4PM	331385
November 2	AEP was notified of the Channel 2 isolation starting November 6 th at 7AM which reduces the hydraulic capacity to 650MLD. UPDATE – Nov 28 th updated Alberta Environment that the hydraulic capacity is back up to 1000MLD	331477
November 28	AEP was notified of a 5 day East Scrubber outage planned to start December 4 th at 7AM and finishing December 8 th at 4PM	332243

2017 Secondary Alum Usage (kg as delivered solution 48.5%)

	January	February	March	April	May	June	July	August	September	October	November	December
1	0	0	0	0	0	29	0	0	0	0	0	0
2	0	0	0	0	0	12499	0	0	0	0	0	0
3	0	0	0	0	0	267	0	258	0	0	10971	0
4	0	0	0	0	0	0	0	0	0	0	39508	0
5	0	0	0	0	0	422	0	0	0	0	17740	0
6	0	0	0	0	100	1246	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	215	0	0	0	0	0
10	0	31	500	0	0	0	1146	0	0	0	0	0
11	0	640	674	0	0	0	18	0	0	0	0	0
12	0	0	440	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	115	0	0	0	0
15	0	0	0	1217	42	0	0	0	0	0	0	0
16	0	0	0	297	93	0	0	0	0	3759	0	0
17	0	0	0	0	0	0	0	0	0	8264	0	0
18	980	0	0	0	0	0	0	0	0	0	0	0
19	0	1320	0	773	0	0	0	0	0	0	0	0
20	0	130	584	4763	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	367	5356	0	0	0	0	0
23	0	0	0	0	0	0	0	0	896	0	0	0
24	0	0	513	0	0	0	0	0	0	0	0	0
25	0	0	0	0	2263	0	0	0	0	0	0	0
26	0	0	0	0	358	0	0	0	0	0	0	0
27	0	1213	0	458	0	0	0	0	0	0	0	0
28	0	0	0	4	0	0	0	0	0	0	0	0
29	0		0	0	0	7	0	0	0	0	0	0
30	102		0	0	0	0	0	0	142	0	0	0
31	0		0		0		0	0		0		0
Total (kg)	1,082	3,334	2,710	7,512	2,856	14,838	6,735	372	1,038	12,023	68,219	0

2017 EPT Alum Usage (kg as delivered solution 48.5%)

	January	February	March	April	May	June	July	August	September	October	November	December
1	0	0	0	0	3736	0	4455	7963	0	2866	4902	0
2	0	0	0	0	0	20150	0	0	0	13023	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	8571	0	0	0	0
5	0	0	0	0	0	0	0	16622	0	0	0	0
6	0	0	0	0	0	0	0	2237	0	0	0	0
7	0	0	0	0	0	0	0	3124	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	8379	0	0	0	0	15553	0
10	0	0	0	211	0	10131	0	0	0	0	217	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	11965	31293	0	6227	4230	20350	0	0	0
14	0	0	0	30753	0	12769	1390	5212	10224	0	0	0
15	0	0	0	16563	11422	2389	0	0	0	0	0	0
16	0	0	0	9987	2630	4823	0	0	0	0	0	0
17	0	0	0	1081	0	724	0	0	0	2445	0	0
18	0	0	0	18813	0	0	0	877	0	0	0	0
19	0	0	0	4108	0	0	0	6771	16845	0	0	0
20	0	0	0	0	0	9534	5234	0	6761	0	0	0
21	0	0	0	2374	0	2588	6618	0	32869	0	0	0
22	0	0	0	11278	0	0	0	0	4506	0	0	0
23	0	0	0	15707	0	0	5946	0	0	0	0	0
24	0	0	0	29382	29356	0	29943	6971	0	0	0	0
25	0	0	0	24507	21159	0	2255	1171	0	0	0	0
26	0	0	0	6683	0	0	0	0	0	0	0	0
27	0	0	0	0	0	10377	931	0	0	0	0	0
28	0	0	0	0	0	14296	2929	0	0	0	0	0
29	0		0	0	0	2133	4709	0	0	0	0	0
30	0		0	8997	0	0	0	0	0	0	0	0
31	0		0		0		0	0		12474		0
Total (kg)	0	0	0	192,409	99,595	98,294	70,637	63,750	91,555	30,809	20,672	0

2017 EPT Polymer Usage (kg)

	January	February	March	April	May	June	July	August	September	October	November	December
1	0	0	0	0	1	0	2	3	0	10	0	0
2	0	0	0	0	0	8	0	0	0	44	0	0
3	0	0	0	0	0	0	0	0	0	2	0	0
4	0	0	0	0	0	0	0	3	0	0	0	0
5	0	0	0	0	0	0	0	6	0	0	0	0
6	0	0	0	0	0	0	0	1	0	0	0	0
7	0	0	0	0	0	0	0	1	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	3	0	0	0	0	0	0
10	0	0	0	0	0	4	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	5	12	0	2	2	101	0	0	0
14	0	0	0	12	0	5	1	2	46	0	0	0
15	0	0	0	6	4	0	0	0	0	0	0	0
16	0	0	0	4	1	2	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	7	0	0	0	0	0	0	0	0
19	0	0	0	2	0	0	0	0	84	0	0	0
20	0	0	0	0	0	4	2	0	23	0	0	0
21	0	0	0	1	0	1	2	0	110	0	0	0
22	0	0	0	4	0	0	0	0	15	0	0	0
23	0	0	0	6	0	0	2	0	0	0	0	0
24	0	0	0	11	11	0	11	13	0	0	0	0
25	0	0	0	9	8	0	0	0	0	0	0	0
26	0	0	0	3	0	0	0	0	0	0	0	0
27	0	0	0	0	0	4	0	0	0	0	0	0
28	0	0	0	0	0	5	1	0	0	0	0	0
29	0		0	0	0	0	2	0	0	0	0	0
30	0		0	3	0	0	0	0	0	0	0	0
31	0		0		0		0	0		0		0
Total (kg)	0	0	0	73	37	35	25	31	379	55	0	0

2017 DAF Polymer Usage (kg)

	January	February	March	April	May	June	July	August	September	October	November	December
1	24	35	33	30	31	26	26	28	31	31	23	35
2	24	36	33	31	27	24	28	28	33	29	22	34
3	30	37	33	28	28	26	27	27	27	24	21	32
4	30	39	33	31	25	29	25	26	29	26	22	31
5	40	39	33	29	31	27	24	25	74	14	22	33
6	40	39	28	31	30	23	24	25	29	31	22	33
7	38	37	26	26	31	22	24	25	33	31	22	31
8	39	37	25	24	31	23	26	23	32	29	22	29
9	38	37	25	27	30	22	24	25	33	28	23	30
10	36	37	22	27	21	20	27	25	33	26	22	31
11	34	35	23	24	28	21	23	26	27	26	23	30
12	30	39	24	21	29	22	28	25	26	27	26	32
13	31	39	26	28	27	23	24	25	24	25	28	30
14	33	47	30	26	25	24	22	25	24	25	29	15
15	33	47	30	27	25	25	25	27	30	26	29	30
16	31	51	29	28	24	26	30	28	27	25	29	30
17	33	52	29	27	26	25	30	25	23	26	29	29
18	35	53	30	33	24	25	27	25	25	25	30	31
19	36	53	29	28	23	13	23	23	26	25	30	32
20	36	61	31	24	23	28	30	23	26	26	23	33
21	33	61	26	22	21	28	26	22	28	25	22	35
22	33	56	27	23	23	30	37	23	26	24	26	32
23	33	49	30	22	24	31	30	25	24	23	31	31
24	33	48	32	17	23	31	29	21	30	24	33	32
25	33	44	36	8	22	32	29	19	28	27	31	34
26	32	43	33	13	22	33	30	30	30	27	33	31
27	31	43	35	36	29	29	32	25	28	25	30	29
28	31	41	30	47	30	25	31	28	27	26	33	27
29	31		29	33	30	30	28	22	25	24	34	26
30	32		22	35	28	30	29	18	24	22	34	28
31	32		30		27		28	25		24		28
Total (kg)	1,028	1,235	904	806	819	775	847	769	880	793	804	944

2017 Scrubber Caustic Usage (kg as delivered 50% sodium hydroxide solution)

	January	February	March	April	May	June	July	August	September	October	November	December
1	344	193	113	40	35	117	126	171	175	239	82	105
2	344	193	113	40	35	117	126	171	175	239	82	105
3	344	193	113	40	35	117	126	171	175	239	82	105
4	344	193	113	40	35	117	126	171	175	239	82	105
5	344	193	113	40	35	117	126	171	175	239	82	105
6	344	193	113	40	35	117	126	171	175	239	82	105
7	344	193	113	40	35	117	126	171	175	239	82	105
8	344	193	113	40	35	117	126	171	175	239	82	105
9	344	193	113	40	35	117	126	171	175	239	82	105
10	344	193	113	40	35	117	126	171	175	239	82	105
11	344	193	113	40	35	117	126	171	175	239	82	105
12	344	193	113	40	35	117	126	171	175	239	82	105
13	344	193	113	40	35	117	126	171	175	239	82	105
14	344	193	113	40	35	117	126	171	175	239	82	105
15	344	193	113	40	35	117	126	171	175	239	82	105
16	344	193	113	40	35	117	126	171	175	239	82	105
17	344	193	113	40	35	117	126	171	175	239	82	105
18	344	193	113	40	35	117	126	171	175	239	82	105
19	344	193	113	40	35	117	126	171	175	239	82	105
20	344	193	113	40	35	117	126	171	175	239	82	105
21	344	193	113	40	35	117	126	171	175	239	82	105
22	344	193	113	40	35	117	126	171	175	239	82	105
23	344	193	113	40	35	117	126	171	175	239	82	105
24	344	193	113	40	35	117	126	171	175	239	82	105
25	344	193	113	40	35	117	126	171	175	239	82	105
26	344	193	113	40	35	117	126	171	175	239	82	105
27	344	193	113	40	35	117	126	171	175	239	82	105
28	344	193	113	40	35	117	126	171	175	239	82	105
29	344		113	40	35	117	126	171	175	239	82	105
30	344		113	40	35	117	126	171	175	239	82	105
31	344		113		35		126	171		239		105
Total (kg)	10,655	5,414	3,500	1,200	1,100	3,500	3,900	5,300	5,257	7,400	2,472	3,255

2017 Scrubber Bleach Usage (L as delivered 16% sodium hypochlorite solution)

	January	February	March	April	May	June	July	August	September	October	November	December
1	1545	1079	311	1631	800	2102	2520	1281	1081	1192	552	579
2	2787	2311	1837	1212	897	1142	1293	2133	1432	1505	746	871
3	1625	1292	1289	2026	1667	1707	1977	1498	2390	1497	1067	587
4	3009	740	1563	548	898	1010	1182	2271	1578	2455	1419	602
5	1459	1201	1723	887	839	1927	591	1228	1625	2152	1336	1001
6	1492	2330	1041	913	1555	992	1415	2013	1387	1070	1287	129
7	1538	954	1120	2337	1017	2240	1940	922	689	1241	1281	982
8	2508	857	2428	904	968	1094	1252	1007	1463	2021	1644	1006
9	1465	1802	1047	906	1603	1477	1441	2494	3076	2078	1001	1053
10	1073	905	1503	804	1706	1590	839	898	1824	1307	635	1673
11	1159	1018	983	1318	1472	1114	1258	959	2868	1492	832	3505
12	1398	2042	1189	614	1977	1439	2696	2186	1191	760	795	1577
13	2127	1530	782	2265	1576	2021	1640	1191	2640	2526	872	1032
14	4401	1442	2007	864	1087	960	2143	1928	1169	1069	923	968
15	2723	1042	910	791	1745	1940	958	1507	2212	1111	893	1074
16	2479	1403	763	840	1016	1452	1155	2660	1655	2194	977	1204
17	1160	1127	1213	894	1687	1558	739	794	1440	1488	949	886
18	2237	730	2244	975	2134	1055	2551	2647	2418	1124	867	954
19	1240	1632	751	862	1117	1264	999	1421	1718	2605	818	2113
20	290	1125	1957	1706	1066	1599	999	2129	2984	926	903	1560
21	1245	843	911	848	2154	2398	2102	1722	1442	759	1033	999
22	1286	2779	824	773	1021	1349	1853	1565	1338	923	873	1562
23	2391	2540	925	782	1212	1601	1148	2317	1869	811	835	1206
24	921	2177	2045	6	2051	1056	1824	1354	1799	765	602	2021
25	1437	617	903	1677	1125	1177	1155	2217	2308	814	694	1648
26	1950	623	1372	812	1433	1388	1258	1390	444	875	1008	1011
27	1079	546	755	866	957	1298	2776	1748	1673	963	858	1041
28	1719	1885	730	860	1836	1504	1199	1138	1641	1408	834	974
29	1111		2290	847	1068	2094	1185	1318	1973	1392	972	1992
30	613		758	1602	1551	1542	1448	1728	2082	964	694	765
31	1287		525		179		2027	2373		174		929
Total (L)	52,755	38,574	38,697	32,370	41,413	45,089	47,560	52,036	53,408	41,660	28,200	37,504

2017 Membrane Bleach Usage (L as delivered 16% sodium hypochlorite solution)

	January	February	March	April	May	June	July	August	September	October	November	December
1	433	551	505	511	254	468	395	446	531	526	430	575
2	473	588	497	420	202	401	326	497	477	475	285	497
3	409	521	509	390	230	461	482	401	481	556	480	586
4	587	489	510	557	175	420	305	447	515	647	417	492
5	564	482	489	584	232	476	492	461	597	550	459	563
6	674	551	515	292	386	545	658	356	489	596	484	331
7	482	544	336	462	284	593	533	295	560	560	488	527
8	391	535	449	298	361	521	509	447	484	572	500	248
9	413	573	423	220	467	508	519	536	496	535	547	225
10	479	503	465	357	552	398	483	492	521	498	465	191
11	378	465	456	430	279	399	614	518	524	502	539	274
12	338	473	447	380	527	516	594	397	489	510	514	263
13	371	510	412	415	535	504	502	387	542	516	480	534
14	392	462	532	246	481	479	463	488	473	341	505	526
15	309	428	464	105	481	478	460	453	499	313	281	281
16	367	410	465	101	425	347	505	526	438	507	527	318
17	420	327	447	147	371	294	515	463	366	429	544	813
18	516	360	517	152	413	332	498	471	428	420	579	304
19	537	361	456	112	337	339	245	389	477	370	517	558
20	502	346	423	247	272	351	487	472	348	180	446	407
21	477	374	317	114	362	291	403	326	301	202	572	596
22	501	470	395	102	380	296	420	352	427	273	484	460
23	471	503	354	105	477	329	425	414	460	192	303	372
24	507	472	451	109	566	334	449	375	455	814	494	544
25	497	410	296	255	363	344	494	401	538	216	518	385
26	535	414	468	106	265	409	420	385	513	151	411	247
27	518	442	367	100	270	297	447	368	497	803	349	281
28	583	482	366	130	349	282	455	381	576	218	554	326
29	477		500	203	296	319	450	484	488	173	534	353
30	521		424	264	451	346	476	461	491	320	576	443
31	585		418		459		421	465		758		312
Total (L)	14,704	13,046	13,673	7,914	11,500	12,078	14,446	13,353	14,482	13,723	14,282	12,832