TORONTO Water

HIGHLAND CREEK WASTEWATER TREATMENT PLANT

2016 Annual Report

March 31, 2017

EXECUTIVE SUMMARY

The Highland Creek Treatment Plant (HCTP) is one of four wastewater treatment facilities operated by the City of Toronto. This facility, located at 51 Beechgrove Drive has a rated capacity of 219,000 m^3 per day and serves an equivalent population of approximately 533,000. The Highland Creek Treatment Plant discharges into Lake Ontario and operates under Environmental Compliance Approval (Sewage) No. 8261-99EP4S, issued on October 28, 2015.

The average daily influent flow rate in 2016 was 161.7 ML/day. Influent concentrations of Biological Oxygen Demand (BOD_5), Total Phosphorus (TP) and Suspended Solids (SS) averaged 242 mg/L, 5.5 mg/L and 244.8 mg/L, respectively.

Highland Creek achieved the following effluent quality in 2016:

	ECA[1]	2016 Final Effluent
Suspended Solids (SS)	25 mg/L	14.6 mg/L
Carbonaceous Biological Oxygen Demand ($CBOD_5$)	25 mg/L	6.7 mg/L
Total Phosphorus (TP)	1 mg/L	0.7 mg/L
Escherichia Coli (*E. Coli*)	200 CFU/100mL[3]	53.2 CFU/100mL[3]
pH	6.0-9.5	6.5
Total Residual Chlorine (Dechlorination)	0.02 mg/L	0.007
SS Loading Rate	5,475 kg/day	2,368 kg/day
$CBOD_5$ Loading Rate	5,475 kg/day	1,077 kg/day
TP Loading Rate	219 kg/day	117 kg/day

[1] Referenced from ECA No. 8261-99EP4S, issued on October 28, 2015.
[2] Geometric Mean
[3]The arithmetic mean of the monthly geometric mean values.

During 2016, the sludge feed flow to the dewatering centrifuges averaged 1,924m^3/day which resulted in 43.1dry tonnes of dewatered solids being genenerated per day.

The plant continued with numerous capital projects. Notable projects included: Biosolids Treatment Upgrades, Headworks and Odour Control Upgrades.

In 2016, polymer consumption for Waste Activated Sludge Thickening and Sludge Dewatering totalled 404 tonnes. Ferrous chloride consumption was 669 tonnes as Fe. Sodium hypochlorite consumption for effluent disinfection totalled 2218 m^3. Sodium Bisulphate (SBS) consumption for effluent dechlorination totalled 433 m^3. Total annual consumption for potable water, hydro, and natural gas was 2,649m^3, 32.7M kWh, and 7.4M m^3, respectively.

The plant operating costs for 2016 totalled $19.6M. In 2016, the Highland Creek Treatment Plant had 67 full time employees on its establishment. There were 25.5 days lost due to work related injuries.

Table of Contents

APPENDICES

APPENDIX A - Glossary of Abbreviations
APPENDIX B – Plant Schematic
APPENDIX C – Performance Charts:

- Influent Flows
- Influent SS & BOD_5 Concentrations
- Influent TKN & Total Phosphorous Concentrations
- Effluent SS & $CBOD_5$ Concentrations
- Effluent Total Phosphorous
- Effluent TKN & Ammonia Concentrations
- Effluent Nitrate + Nitrite Concentrations
- Effluent Total Residual Chlorine
- Effluent *E. Coli*
- Effluent pH
- Effluent Temperature

APPENDIX D – Influent and Effluent Metal Concentrations
APPENDIX E – Analytical Testing Summary
APPENDIX F – Influent Flow Meter Calibration Records
APPENDIX G – Effluent Suspended Solids Action Plan Correspondence

LIST OF TABLES

1. INTRODUCTION

The Highland Creek Treatment Plant is one of four wastewater treatment facilities operated by the City of Toronto under the responsibility of the Wastewater Treatment section of Toronto Water. The facility is located at 51 Beechgrove Drive, south of Lawrence Avenue East and services an area bounded by Steeles Avenue on the north, Victoria Park Avenue on the west, the Rouge River on the east and Lake Ontario on the south. This area contains an estimated connected population of 533,000. The Highland Creek Treatment Plant has a rated capacity of 219,000 m^3 per day.

Major treatment processes include preliminary treatment, primary treatment, secondary treatment, phosphorus removal with ferrous chloride, final effluent disinfection using sodium hypochlorite, and final effluent dechlorination using sodium bisulphite. Solids handling processes include sludge stabilization by anaerobic digestion followed by dewatering using high speed centrifuges. Two multiple hearth incinerators (normally one duty and one standby) are used for the disposal of the dewatered biosolids. Numerous auxiliary systems are required for the proper operation of plant processes and include potable water, process water, HVAC, electrical power distribution, natural gas, and instrument air.

The Ministry of the Environment and Climate Change (MOECC) has classified the Highland Creek Treatment Plant as a Class IV wastewater treatment facility under Regulation 129/04. The facility operates under Environmental Compliance Approval (Sewage) No. 8261-99EP4S, issued on October 28, 2015.

This report is a summary of plant operations and performance in 2016. Highlights of the report include a discussion of effluent quality and summaries of process operations, maintenance, chemical and utility consumption, operational costs and human resources.

2. OPERATIONS

2.1 Influent

Wastewater flows to the plant via a common sewer in which the flows from the Morningside Sanitary Trunk Sewer and Highland Creek Sanitary Trunk Sewer systems join. The plant experienced a 1.90% decrease in the daily average influent flow from 2015 to 2016.

A summary of annual flow and influent parameter concentrations for the past three years is shown in Table 1. A comparison of monthly influent flow rates and characteristics for 2016 is illustrated in Appendix C.

Table 1: Influent Parameters

Parameter	2016	2015	2014
Influent Flow [ML/day]	161.8	164.9	170.6
Total Annual Flow [ML]	59,200	60,208	62,242
Influent SS [mg/L]	244.8	212.1	247.6
Influent BOD_5 [mg/L]	242.2	234.0	232.1
Influent TP [mg/L]	5.5	5.0	4.9

Influent concentrations for eleven (11) select metals have been included in Appendix D and presented against the sewer Bylaw limits for comparison purposes only.

2.2 Preliminary Treatment

Raw wastewater enters the Headworks which provides grit and screenings removal operations. Ferrous chloride is added to the wastewater for phosphorous removal. There are five aerated grit channels (18 m x 4.0 m x 4.0 m), each having a Peak Flow Rate of 104,800 m^3/day, for the removal of grit and inorganic material from the wastewater flow. There are also five climber-type bar screens with bars spaced 1.25 cm apart to remove rags and large pieces of debris from the wastewater. The grit and screenings are hauled to a sanitary landfill site.

The quantity of grit and screenings removed by the aerated grit channels and mechanical bar screens averaged 2.4 tonnes per day in 2016.

2.3 Primary Treatment

The next step in the treatment process is Primary Settling or Clarification where the flow velocity is reduced through the Primary Clarification Tanks allowing the heavier solids in the wastewater to settle to the bottom. Sludge collectors in the tanks sweep the settled sludge (primary sludge or raw sludge) into sludge hoppers located on the bottom of the tank at one end, from where it is pumped for further treatment. There are 12 Primary Clarification Tanks: four rectangular tanks (48.4 m x 28.4 m x 3.7 m) in the New Section (Phase 1 and 4), each having a Peak Flow Rate of 82,470 m^3/day and eight square tanks (18.3 m x 18.3 m x 3.4 m) in the Old Section, each having a Peak Flow Rate of 20,090 m^3/day.

Table 2 contains a summary of key primary treatment effluent parameter concentrations and their respective removal efficiencies in 2016 and 2015.

Table 2: Primary Treatment Effluent Parameters

Parameter	2016	Primary Removal Efficiency	2015	Primary Removal Efficiency
SS [mg/L]	151	37%	171	19%
BOD_5 [mg/L]	178	27%[1]	170	27%[2]

[1] In 2016, Primary Effluent BOD_5 was measured and used to calculate the Primary Removal Efficiency.

[2] In 2015, Primary Removal Efficiency was calculated using Primary Effluent $CBOD_5$ and Influent BOD_5.

2.4 Secondary Treatment

In Secondary Treatment, Return Activated Sludge from the final clarification tanks is mixed with primary effluent and treated through a conventional, suspended biomass activated sludge process which occurs in the Aeration Tanks. The activated sludge is made up of micro-organisms which are a natural part of wastewater. In the presence of oxygen, these micro-organisms break down organic solids in the wastewater. Air is supplied to the Aeration Tanks through 12 electrically driven blowers. There are a total of 16 Aeration Tanks each equipped with ceramic fine bubble dome diffusers[1]: eight rectangular tanks (36.0 m x 17.6 m x 4.57 m) in the Old Section and eight circular tanks (22.86 m in diameter and 9.14 m in depth) in the New Section.

The mixed liquor from the Aeration Tanks flows to large quiescent Final Clarification Tanks where the Activated Sludge is allowed to settle. A controlled quantity of this sludge is returned to the Aeration Tanks in order to maintain a sufficient sludge concentration. The excess is removed as Waste Activated Sludge (WAS) which is thickened by high speed centrifuges. There are 16 Final Clarification Tanks: eight square tanks (18.3 m x 18.3 m x 3.35 m) in the Old Section, each having a Peak Flow rate of 16,050 m^3/day, and eight square tanks (35.0 m x 35.0 m x 3.7 m) in the New Section, each having a Peak Flow Rate of 61,250 m^3/day.

A summary of key aeration basin parameters for 2015 to 2016 are shown in Table 3.

Table 3: Secondary Treatment Process Parameters

Parameter	2016	2015
Aeration Loading [kg $BOD_5/m^3 \cdot d$]	0.54	0.53[2]
Mixed Liquor Suspended Solids [mg/L]	2736	3,243

2.5 Final Effluent Quality, Disinfection & Dechlorination

Sodium Hypochlorite is used to disinfect the final effluent and Sodium Bisulphite is used as the dechlorination agent prior to discharging into Lake Ontario. The plant outfall is equipped with a number of diffusers and extends approximately 1000 m into the lake from the shore.

In 2016, the Highland Creek Treatment Plant continued to produce a high quality effluent which surpassed requirements of the plant's Environmental Compliance Approval (Sewage). The plant also met Federal Government effluent monitoring requirements, including un-ionized ammonia and acute toxicity. A summary of key final effluent parameters for 2015 and 2016 is shown in Table 4. Details of the plant's final effluent characteristics are presented in graphical form in Appendix C.

[1] With exception of the first 2 sections of Aeration Tank 8.

[2] A correction has been made to the 2015 Aeration Loading value. Note that the unit is [kg $CBOD_5/m^3 \cdot d$].

Table 4: Annual Average Final Effluent Parameter Limits and Performance

Parameter	ECA Limit[1]	2016	Removal Efficiency	2015		Removal Efficiency
SS [mg/L]	25	14.6	94%	17.4		92%
$CBOD_5$ [mg/L]	25	6.7	97%[2]	6.2		97%[2]
pH	6-9.5	6.5	-	6.5		-
SS Loading Rate [kg/day]	5,475	2368	-	2877		-
$CBOD_5$ Loading Rate [kg/day]	5,475	1077	-	1025		-
TP Loading Rate [kg/day]	219	117	-	115		-
Total Residual Chlorine [mg/L] (Dechlorination)	0.02	0.007	-	Bisulphite Presence Detected[3]	0.006	-

[1] Referenced from ECA No. 8261-99EP4S, issued on October 28, 2015.
[2] $CBOD_5$ Removal efficiency is calculated by assuming influent $CBOD_5$ = 0.8 x influent BOD_5.
[3] The presence of Bisulphite indicates a Total Residual Chlorine of 0.0 mg/L. This was the case from January – March 2015. Subsequently, the Total Residual Chlorine was measured directly.

Table 5: Monthly Average Final Effluent Parameter Limits and Performance

Parameter	ECA Limit[1]	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
TP [mg/L]	1.0	0.73	0.72	0.59	0.67	0.69	0.83	0.69	0.90	0.68	0.82	0.65	0.73
Escherichia Coli[2] [CFU/100mL]	200	96	6	5	17	61	30	61	35	130	68	88	41

[1] Referenced from ECA No. 8261-99EP4S, issued on October 28, 2015.
[2] Geometric Mean

Table 6: Annual Average Secondary Treatment Effluent Limits, Objectives and Performance Summary

Parameter	ECA Limit	ECA Objective[1]	2016
SS [mg/L]	25.0	15.0	14.6
$CBOD_5$ [mg/L]	25.0	15.0	6.7
TP [mg/L]	1.0	0.9	0.7
TRC [mg/L]	0.02	non-detect	0.007
E. Coli [CFU/100 mL]	200	150	53[2]
pH	6.0-9.5	6.5-8.5	6.5

[1] Referenced from ECA No. 8261-99EP4S, issued on October 28, 2015.
[2] Arithmetic mean of the monthly geometric mean values.

Final effluent concentrations of eleven (11) select heavy metals have been included in Appendix D.

2.6 Bypasses, Spills and Abnormal Events

There were no bypass events to report in 2016.

Two spills of raw sewage from the Headhouse were reported on July 4th and July 15th. The volume was estimated to be less than 1 m^3 and was contained on site. The raw sewage was cleaned up along with the affected areas and equipment. Grit classifier operations and drainage system were modified to prevent similar discharges.

2.7 Solids Handling

Solids handling and disposal at the Highland Creek Treatment Plant treats all primary sludge, thickened waste activated sludge (TWAS) as well as scum from the primary and secondary clarifiers. The treatment is performed in the following process areas: anaerobic digestion, intermediate blending and storage, dewatering, incineration and ash handling.

In 2016, anaerobic digestion of primary sludge and TWAS was not performed to facilitate cleaning and rehabilitation of the digesters. However, the normal process consists of a digester control building and four primary digesters each measuring 33.5 m in diameter and 7.6 m in depth for a volume of 6,500 m^3 each. This process also accomplishes the following:

- Generation of methane gas, which can be used by the plant for process and space heating requirements.
- Reduction in solids volume
- Pathogen destruction
- Sludge odour mitigation

On average, 3,519 m^3/day of WAS was thickened with high speed centrifuges. The WAS contained an average SS concentration of 6,126 mg/L. The TWAS contained an average TS concentration of 3.8%. An average of 1,090 m^3/day of primary sludge was pumped to the sludge storage tanks having an average TS concentration of 2.4% and TVS content of 81.9% of TS.

A summary of the solids handling process from 2014 to 2016 can be seen in Table 7.

Table 7: Solids Handling Process Parameters

Parameter	2016	2015	2014
Primary Sludge Treated [m^3/day]	1,090	1,525	2,150
Primary Sludge TS [%]	2.4	2.8	2.6
Primary Sludge TVS [%]	81.9	81.6	77.9
WAS to Thickening [m^3/day]	3,519	3,110	2,254
TWAS TS (%)	3.83	5.3	5.7
TWAS Treated [m^3/day]	474	323	255
WAS to Co-settling [m^3/day]	-	-	-
WAS SS [mg/L]	6,126	7,358	7,300
Dewatering Centrifuge Feed Flow [m^3/day]	1,924	2,143	2,065
Dewatering Centrifuge Feed TS [%]	2.3	3.0	2.0
Dewatered Solids TS [%]	26.6	22.8	25.0
Dewatered Solids Disposed [dry tonnes per day]	45.1	57.4	38.5

The blend of Primary Sludge and TWAS is conditioned with a polymer and dewatered by centrifugation. In 2016, an average of 1,924 m^3/day of sludge was dewatered, resulting in an average of 45.1 dry tonnes per day of dewatered solids being produced. Average TS of centrifuge feed and dewatered sludge cake were 2.3% and 26.6, respectively. The increase in dewatered solids concentration was attributed to a change of polymer products which improved the overall dewatering process performance.

In 2016 the daily average inflow to the Highland Creek Treatment Plant was 161.8 ML/day. The flow projections for 2017 do not exceed the rated plant capacity of 219 ML/day and are expected to generate a sludge volume that will be +/-5% of the given volume for 2016

2.8 Solids Management

Solids cake that is disposed of on-site is incinerated in one of the two multiple-hearth incinerators. This thermal reduction process produces an ash that is mixed with effluent water from the scrubbers and pumped to one of two ash lagoons. When a lagoon is full, ash is removed and hauled to a landfill site for final disposal. Approximately 3,775 tonnes of ash were removed in 2016.

2.9 Complaints

The Highland Creek Treatment Plant received 4 complaints related to odour. Three of the complaints were logged in June 21st and 22nd. Plant staff addressed the complaints by cleaning and pumping down primary tank sludge hoppers. To address the complaint received on August 17th, plant staff adjusted the head house exhaust fan and took measures to reduce odours from the Phase I final tanks.

In the 2015 Annual Report, there was an error in reporting the number of complaints received by the Highland Creek Treatment Plant staff. In 2015, the plant received 5 odour complaints. All complaints were recorded, investigated by City of Toronto staff and, where possible, action was taken immediately.

2.10 Effluent Suspended Solids Compliance – Action Plan Status

The updates to the Action Plan items for the Effluent Suspended Solids Compliance Plan (See Appendix G) are as follows:

2.10.1 Biosolids Master Plan

In May 2011, Toronto's City Council directed that a biosolids Beneficial Use Program with Landfill as a contingency option be implemented for the HCTP which would require the construction of a truck loading facility so that the biosolids generated at the HCTP could be trucked away on a daily basis rather than incinerated on site. Subsequent to Council's consideration of the Biosolids Master Plan (BMP) in May 2011, additional public meetings were held and several local community members expressed their concerns to the City and the Ministry of the Environment and Climate Change (MOECC) regarding Council's final decision.

After consulting with the MOECC in the summer of 2012, a separate process consistent with Class EA requirements was initiated. As such the BMP was closed and a new Schedule B Class Environmental Assessment specifically for the implementation of the proposed HCTP biosolids management undertakings was recommended to Council.

In early 2014, the City retained Consulting services to undertake the new biosolids Class EA work for the HCTP. The City Project Team for this Class EA included staff from Toronto Public Health (TPH) and the Toronto Energy and Environment Division (EED) in addition to Toronto Water (TW) and Engineering & Construction Services (ECS).

The Schedule B Class EA looked at all viable biosolids management options and included a Health Impact Assessment that was overseen by TPH as well as a Cumulative (Air) Impact Assessment that was overseen by the EED. The results of the Cumulative Impact Assessment and the Health Impact

Assessment were used by the project team to assess all biosolids management options and arrive at a preferred biosolids management strategy for the HCTP.

This project continued throughout 2015 and involved extensive consultation with stakeholders including the public and specifically the surrounding community. A project web site was maintained and kept up to date with relevant project information such as minutes of Public Meetings and technical memorandums. In October 2015, the City's Board of Health adopted the report from the MOH on the Health Impact Assessment of Biosolids Management Plan for HCTP.

In May 2016, City Council received the Executive Summary of the Highland Creek Wastewater Treatment Plant Biosolids Schedule B Class Environmental Assessment Study and endorsed the recommendations. The Environmental Study Report was finalized and submitted to the MOECC in June 2016 for the obligatory 30 day public review period in accordance with the requirements of the Environmental Assessment Act. Subsequently, the MOECC received a Part II Order Request and is currently reviewing this request.

2.10.2 Additional Sludge Dewatering Capacity

A capital project for the sludge dewatering centrifuges is in progress. An engineering consultant was selected in 2007 and the design was completed and tendered for construction in late 2013. Construction is ongoing and expected to be completed by 2017.

2.10.3 Biosolids Truck Loading

A conceptual design of a potential future truck loading facility was completed in May 2013. This study is now a reference document for the Class EA for Biosolids Management at the HCTP.

2.10.4 Incineration Operation

In 2007, an engineering consultant was selected to perform the detailed design of the incinerator repairs. A minor repair contract to #1 Incinerator was completed in 2009. The minor repair work for #2 Incinerator is included as part of the Dewatering project noted above in 2.10.2 and is currently ongoing.

3. CAPITAL PROJECTS & STUDIES

Under Toronto Water's capital program , the Hi ghland Creek Treatment Plant commenced or continued with the following projects:

- WAS Thickening and Sludge Blending Upgrades
- Biosolids Treatment Unit Upgrades
- Headworks and Odour Control Upgrades
- Plant Services Improvements
- Miscellaneous Electrical Projects Contract 2
- Process Control Building Upgrades
- RAS Pumping, Aeration and Phosphorus Removal
- Electrical Condition Assessment Project #6
- PLC Platform Migration
- Firm Capacity and Liquid Train Upgrades
- Tunnel Concrete Inspection & Repairs

4. MAINTENANCE

The Highland Creek Treatment Plant maintenance activities in 2016 were distributed between four Work Areas. Staff from these groups performed a variety of scheduled, preventative, predictive and breakdown maintenance on a diverse spectrum of equipment. The main goal of maintenance activities is to ensure equipment availability and reliability to meet plant process operation requirements.

The following is a summary of significant maintenance activities conducted over the past year. These are considered to be maintenance as per Conditions 10(6) (c) & (j) and Condition 11 of the ECA.

4.1 Flow Meter Calibration Record

Calibration records for flow meters are attached in Appendix F.

4.2 Solids Handling (Work Area 1)

Work Area 1 encompasses the solids treatment portion of the plant including sludge digestion, dewatering, and incineration. The following major maintenance was completed in 2016 in this Work Area:

- Overhauled 3 Ash slurry pumps
- Repaired 2 Ash slurry hoppers
- Refurbished #1 and #2 incinerator quencher/scrubber sprays
- Overhauled 1 sludge grinder
- Replaced sections of ash slurry piping and 4 gate valves
- Removed #1 incinerator clinker (H3 and H4)
- Continuous SCADA upgrades for incinerator, sludge feed, and polymer mixing system

4.3 Liquids Handling (Work Area 2)

Work Area 2 encompasses the liquid treatment portion of the plant including grit and screening removal, primary clarification, aeration and secondary clarification, TWAS, phosphorous removal, effluent disinfection and dechlorination. The following major maintenance was completed in 2016 for Work Area 2:

- Structural repairs to Primary Tanks 9, 10, 11 and 12
- Structural repairs to Final Tank 9,10 and 13
- Various primary and final tank sludge and scum collector repairs
- Structural repairs to Grit Channel 2 and 4
- Repairs to Bar Screens 1, 2, 3, 4 and 5
- Repairs to all Turblex blowers
- Rebuild of Ferrous Chloride pumps and Sodium Hypochlorite pumps
- Scum and Return pump repairs
- New dedicated discharge line for West Grit Cyclone

4.4 Plant Services 1 (Work Area 3)

Work Area 3 encompasses various plant support services such as effluent water pumping, instrument air system, buildings and grounds maintenance and building HVAC systems. The following maintenance was completed in 2016 for Work Area 3:

- Plant roadway lighting upgrades
- Forklifts, Scissor lift and Overhead Cranes annual inspections
- Repaired unlicensed vehicles (personnel vehicles for plant use only)
- Disposed of environmental wastes
- Repaired various potholes on all plant roadways
- Continuous improvement of tunnel and outside building lighting
- Replaced sump pumps in various locations
- Inspection and repairs, as required, for all Back Flow Preventers
- Preventative maintenance on Emergency generators (Headhouse & Solids Disposal Building)
- Repaired and replaced heating valves and piping in various location
- Repaired and replaced heating booster pumps in various locations
- Replaced corroded effluent water piping and valves in various locations
- Repaired and replaced heating coils
- Provide for regular vibration data collection
- Changed all oils in old section clarifier drives
- Installed new grease hoppers in #3 and #4 Primary Clarifiers
- Maintained monthly inspections on fire extinguishers
- Maintained monthly inspections on elevators

4.5 Plant Services 2 (Work Area 4)

Work Area 4 encompasses various plant support services such as the digester gas system, boilers, process ventilation, odour control systems and plant fire protection. The following maintenance was completed in 2016 for Work Area 4:

- Serviced 5 boilers and inspected all control systems
- Optimized operations of 4 boiler hot water feed pumps
- Installed new stainless steel effluent water lines in various locations at the plant
- Serviced all 7 ozone generators
- Tested and serviced all plant gas monitoring systems
- Tested and serviced all plant fire hydrants as needed
- Replaced 3 hot water pumps in the plant
- Rebuilt or serviced 6 hot water pumps

5. CHEMICALS AND UTILITIES

5.1 Chemicals

Several chemicals are used for a variety of treatment processes at the plant. Major process chemicals are discussed below and include:

- Polymer (Solids Dewatering and WAS Thickening)
- Ferrous Chloride (Nutrient Removal)
- Sodium Hypochlorite (Disinfection)
- Sodium Bisulphite (Dechlorination)

5.1.1 Polymer for WAS Thickening and Biosolids Dewatering

Polymer is applied to the sludge feed into the dewatering centrifuges as well as the WAS feed into the thickening centrifuges. In 2016, for the dewatering centrifuges the plant switched to an emulsion polymer from a dry polymer. For the thickening centrifuges a dry polymer is used. The total polymer consumption during 2016 was approximately 404,493 kg,

Polymer was purchased at an average cost of $2,390 per tonne, plus applicable taxes.

5.1.2 Ferrous Chloride for Phosphorus Removal

Ferrous chloride is applied to the distribution conduits upstream of the aerated grit channels. Ferrous chloride consumption during 2016 was approximately 669 tonne as Iron (Fe). The average ferrous chloride dosage rate was 11.30 mg/L as Fe during the year.

In 2016, ferrous chloride for nutrient removal was purchased at an average cost of $800 per tonne Fe plus applicable taxes.

5.1.3 Sodium Hypochlorite for Disinfection

Sodium hypochlorite is used for final effluent disinfection. Sodium hypochlorite consumption during 2016 was approximately 2,218 m^3.

Sodium hypochlorite for disinfection was purchased at an average cost of $0.129 per L, plus applicable taxes.

5.1.4 Sodium Bisulphite

Sodium Bisulphite is used as the dechlorination agent. The total quantity of sodium bisulphite consumed in 2016 was approximately 433 m^3.

Sodium Bisulphite was purchased at an average cost of $228 per tonne, plus applicable taxes.

5.2 Utilities

A summary of monthly utility consumption for the previous two years at Highland Creek Treatment Plant is provided in Table 8.

Table 8: Monthly Utility Consumption for 2014 - 2016

Utility	2016	2015	2014
Water [m^3 / month]	221	260	343
Hydro [kWh/ month]	2,723,233	2,948,442	2,867,574
Gas [m^3/ month]	620,240	881,856	665,847

5.2.1 Water

Total potable water consumption was measured to be 1,925 m^3 for the period of January to October. It is estimated that the annual potable water consumption was 2,649 m^3. This is a 15% decrease in consumption from 2015. The total cost for potable water was $6,991. The average unit cost of water was $3.63 per cubic meter.

5.2.2 Hydro

The total electrical energy consumption in 2016 was 32.7M kWh. This is a 7.6% decrease from 2015. The total cost for hydro was $4.7M. The average unit cost of power was $0.14 per kWh.

5.2.3 Natural Gas

The total natural gas consumption in 2016 was 7.44M m^3. This is a 29.7% decrease from 2015. The total cost for natural gas was $1.5M. The average unit cost of natural gas was $0.21 per m^3.

The decrease in natural gas consumption aligns with the ongoing construction project involving the shutdown and refurbishment of one of the incinerators.

6. OPERATIONS AND MAINTENANCE COSTS

The 2016 plant operational costs are broken down into five (5) categories: Salaries & Benefits, Materials & Supplies, New Equipment, Services & Rents and Inter-Divisional Charges. Materials & Supplies is further segregated into Utilities (power, natural gas and water), Machine & Equipment Parts, Chemicals and Other Materials & Supplies. The total cost of plant operation in 2016 was $19.6M. Overall, operational costs increased by 5% from 2015. A breakdown of annual operational costs for the previous two years is shown in Table 9. The 2016 operating costs are also illustrated below in Figure 1.

Table 9: Operations and Maintenance Costs, 2015 - 2016

Operating Cost	2016	2015
Salaries & Benefits	$6,965,168	$6,782,684
Materials & Supplies		
Utilities	$6,281,734	$6,789,922
Machine & Equipment Parts	$369,697	$483,021
Chemicals	$1,926,727	$1,870,827
Other Materials & Supplies	$675,784	$864,655
New Equipment	$51,999	$11,117
Services & Rents	$2,599,204	$885,858
Inter-Divisional Charges	$750,490	$1,030,620[1]
TOTAL PROGRAM COST:	**$19,620,803**	**$18,718,704[1]**

[1]Values incorrectly reported in 2015 have been corrected as shown.

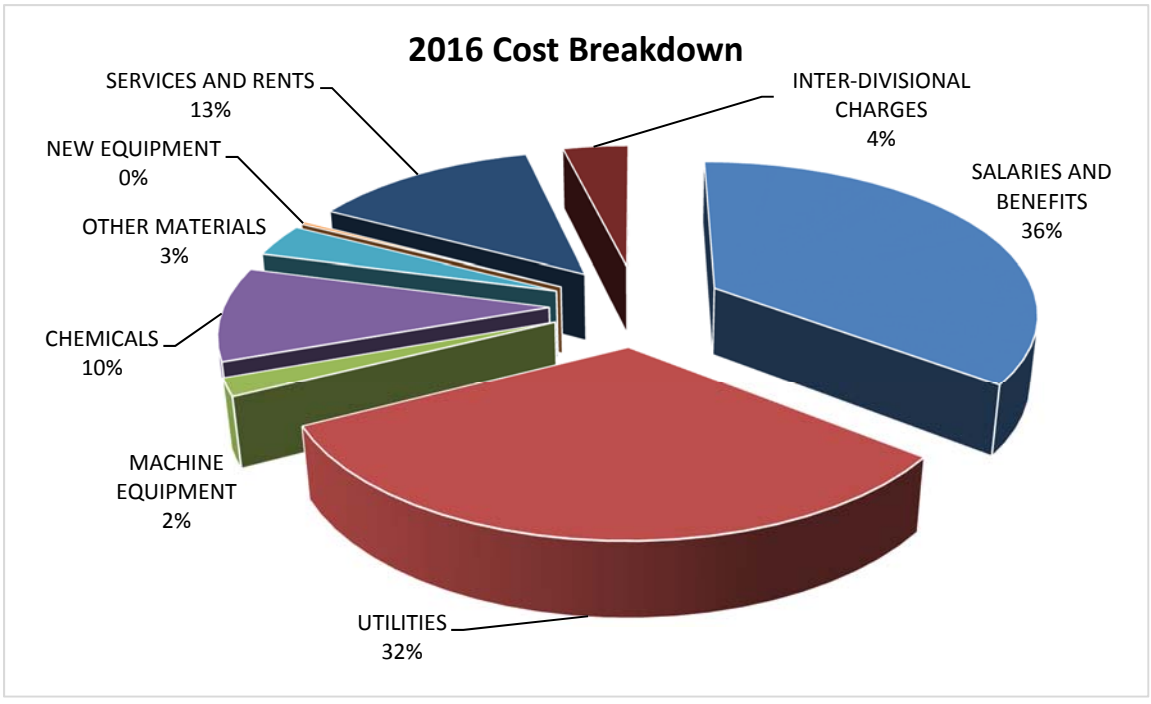


Figure 1: 2016 Highland Creek Treatment Plant Operations and Maintenance Cost Breakdown

7. HUMAN RESOURCES

7.1 Staffing

In 2016, the Highland Creek Treatment Plant had 67 positions on their establishment, several of which were vacant. Plant Staffing excluding vacant positions is shown in Table 10.

Table 10: Plant Staffing

Position Title	Number
Plant Manager	1
Senior Engineer	1
Engineer	1
Area Supervisors	4
Electrical & Instrumentation Specialist	1
Electricians	1
Plant Technicians	27
Industrial Millwrights	16
Electrical Instrumentation Control Technicians	7
Wastewater Treatment Plant Workers	6
Support Assistant	1
Engineering Technologist	1

7.2 Occupational Health & Safety

Continuous efforts are made to ensure a safe working environment at the Highland Creek Treatment Plant. The Joint Health and Safety Committee (JHSC) assists management in resolving issues through regular meetings and monthly workplace inspections.

Plant Health and Safety statistics for the Highland Creek Treatment Plant in 2016 were as follows:

Incident	4
First Aid	1
Medical Aid	1
Lost Time	5
Recurrence	1
Total	**12**

In 2016, total lost days due to work related injuries was 25.5 days.

7.3 Staff Training & Development

The Strategic Planning and Workforce Development unit of Toronto Water facilitates training programs that expand the abilities of the staff, resulting in better service to the public.

All Highland Creek Treatment Plant operations and maintenance staff attended training which was held at various Toronto Water facilities. Courses were eligible for Continuing Education Units (CEU's) from the Ontario Environmental Training Consortium (OETC).

The Highland Creek Treatment Plant offered its operation and maintenance staff the following training courses in 2016:

a) Technical and Health and Safety Training

- Cross Connection Specialist Backflow Tester – Recertification
- Transportation of Dangerous Goods
- Wastewater Laboratory Procedures
- Electrical Safety for Maintenance Staff
- Level "C" CPR Renewal
- Safety in a High Voltage Environment
- Mathematics for Operators: Module 1
- Working at Heights
- Common Wear Items for Plant Machinery
- Confined Space Entry & Rescue Training Awareness
- Backflow Prevention Awareness
- Hot Work Permit System Awareness
- Lock out, Tag out & Test Awareness
- Confined Space Awareness
- Fall Protection Awareness
- Rigging Safety Awareness
- Workplace Hazardous Materials Information System WHMIS (MSDS Interpretation)
- Project Management: Concepts
- Joint Health and Safety Committees – (JHSC) Certification Training Part I – Basic
- Emergency First Aid Level 'A' CPR
- Scaffolding Awareness
- Working with Wastewater
- Conductors
- Mathematics for Operators: Module 2
- Standard First Aid – Level "C" CPR & AED

b) Other Training

- Customer Service Essentials for Administrative Support and Frontline Staff
- Respect in Our Workplace
- Violence in the Workplace

7.4 Utility Operator Certification

Toronto Water has incorporated the requirement of a Class I operating licence into the job profiles of the skilled trades in the Water and Wastewater Treat ment facilities. As part of this initiative, general operational/process training was delivered in order to prepare staff for the certification examination.

Table 11 summa rizes the status of operator certifi cation at the Highland Creek Treat ment Plant in 2016.

Table 11: Wastewater Treatment Certificates

Class Level	Licensed
Class IV	22
Class III	1
Class II	10
Class I	9
O. I. T.	9
TOTAL	**51**

7.5 MOECC/MOL Correspondence

There were no orders issued by the Ministry of the Environment and Climate Change (MOECC) or the Ministry of Labour (MOL). Notable correspondence with the MOECC in 2016 was as follows:

- Follow up spill reports
- Request for consent to change the point of discharge for odourous air from aeration tanks to accommodate capital work.
- Source testing for CWS – pre-test plan and test report
- Incinerator shut down notifications
- Ontario Sewage Treatment Facility Sludge Survey response
- Municipal Wastewater Profile Information form submission
- EPA S. 20.18 order exempting Highland Creek from plant heating system EASR registration
- Comments on Air ECA amendments

Appendix A

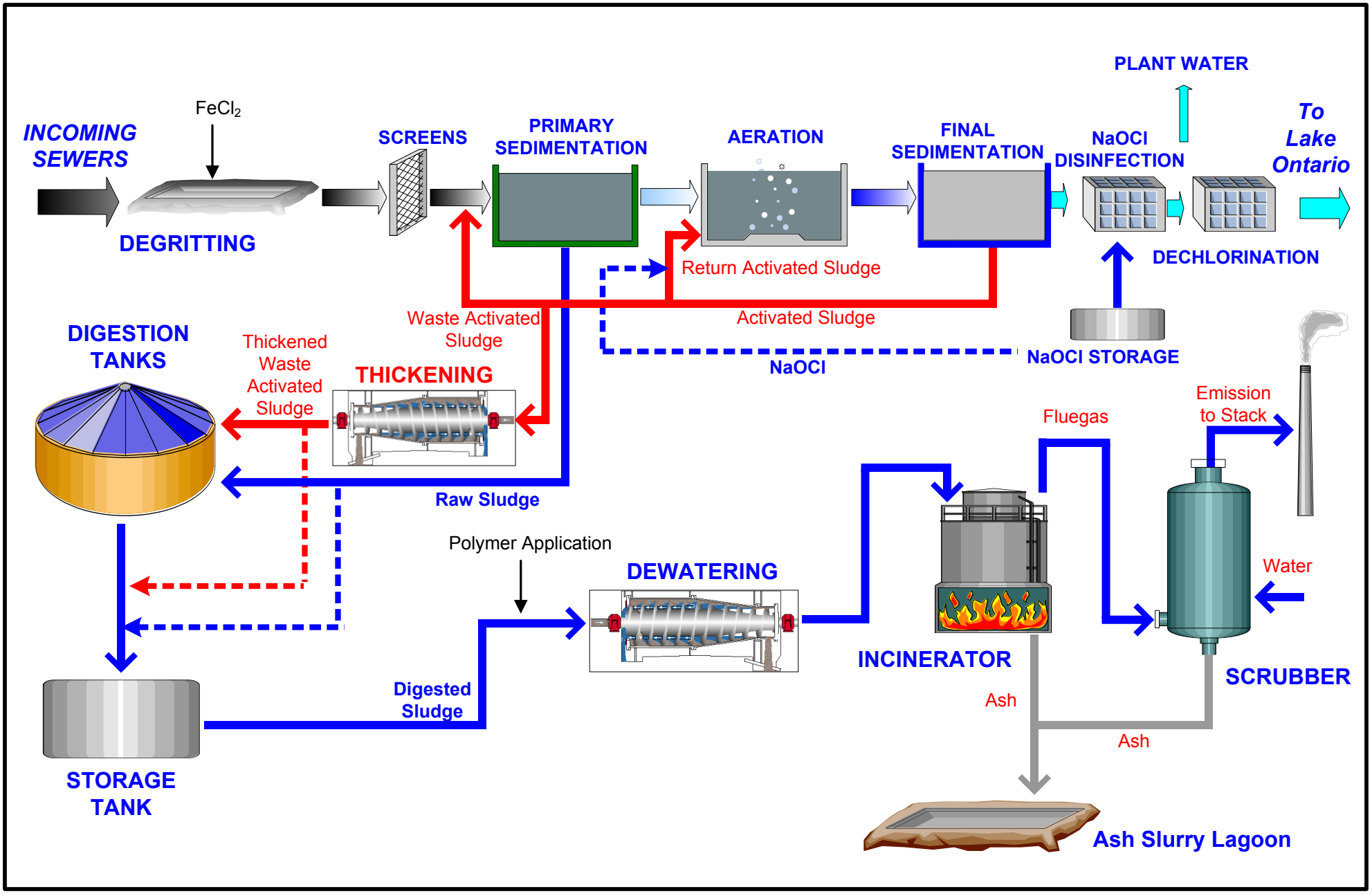
Glossary of Abbreviations

Glossary of Abbreviations

ABTP	Ashbridges Bay Treatment Plant
BOD_5	Five-Day Biological Oxygen Demand (in some instances this may be referred to as BOD)
$CBOD_5$	Five-Day Carbonaceous Biological Oxygen Demand
CEU	Continuing Education Units
CFU	Colony Forming Units
C of A	Certificate of Approval
CPR	Cardiopulmonary Resuscitation
CSO	Combined Sewer Overflow (Tank)
DAF	Air Flotation
D.O.	Dissolved Oxygen
ECA	Environmental Compliance Approval
E. Coli	Escheria Coli
ha	Hectare
HCTP	Highland Creek Treatment Plant
HTP	Humber Treatment Plant
HP	Horsepower
HRT	Hydraulic Retention Time
kg	Kilogram
kg/day	Kilogram per day
kWh	Kilowatt-hour
kWh/month	Kilowatt-hour per month
MWh	Megawatt-hour
m	Metre
m^3	Cubic metre
m^3/month	Cubic metre per month
M	Million
MCC	Motor Control Centre
mA	milliamps
mg/L	Milligrams per litre
mL	Millilitre
ML	Megalitre
ML/day	Megalitre per day
MOECC	Ministry of Environment and Climate Change
No.	Number
P	Presence
MTI	Mid-Toronto Interceptor Forcemain
NTTP	North Toronto Treatment Plant
SBS	Sodium Bisulphite
SCADA	Supervisory Control and Data Acquisition
STS	Sanitary Trunk Sewer
SS	Suspended Solids
TCR	Total Chlorine Residual
TP	Total Phosphorus
TS	Total Solids
TSS	Total Suspended Solids
TVS	Total Volatile Solids
TWAS	Thickened Waste Activated Sludge
µg/L	micrograms per litre
WAS	Waste Activated Sludge

Appendix B

Plant Schematic

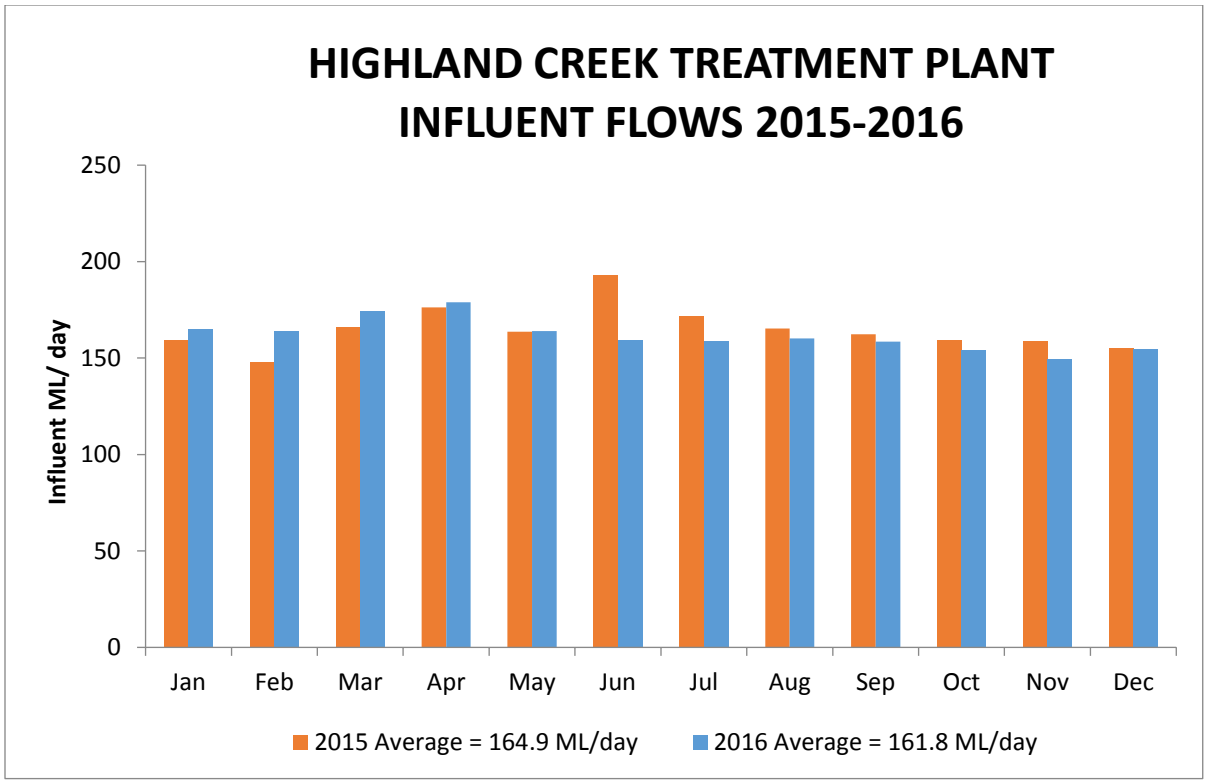


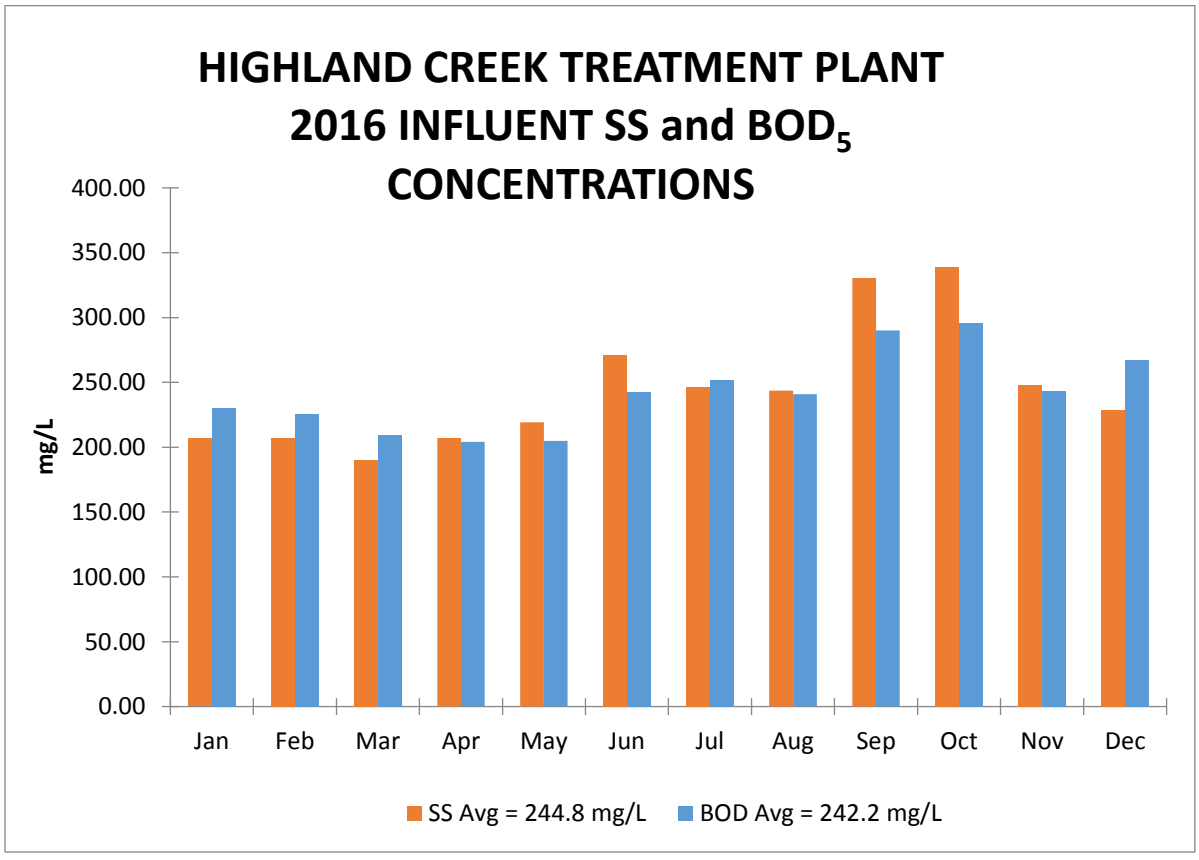
Process Flow Diagram for Highland Creek Wastewater Treatment Plant

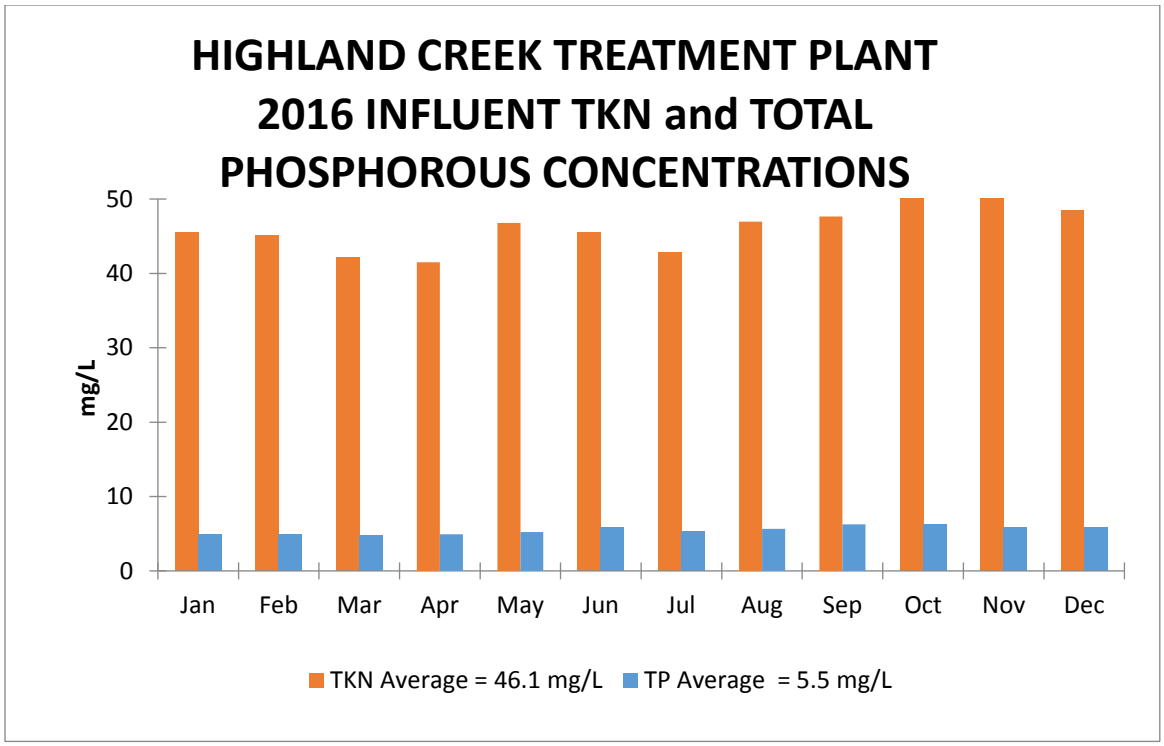
Appendix C

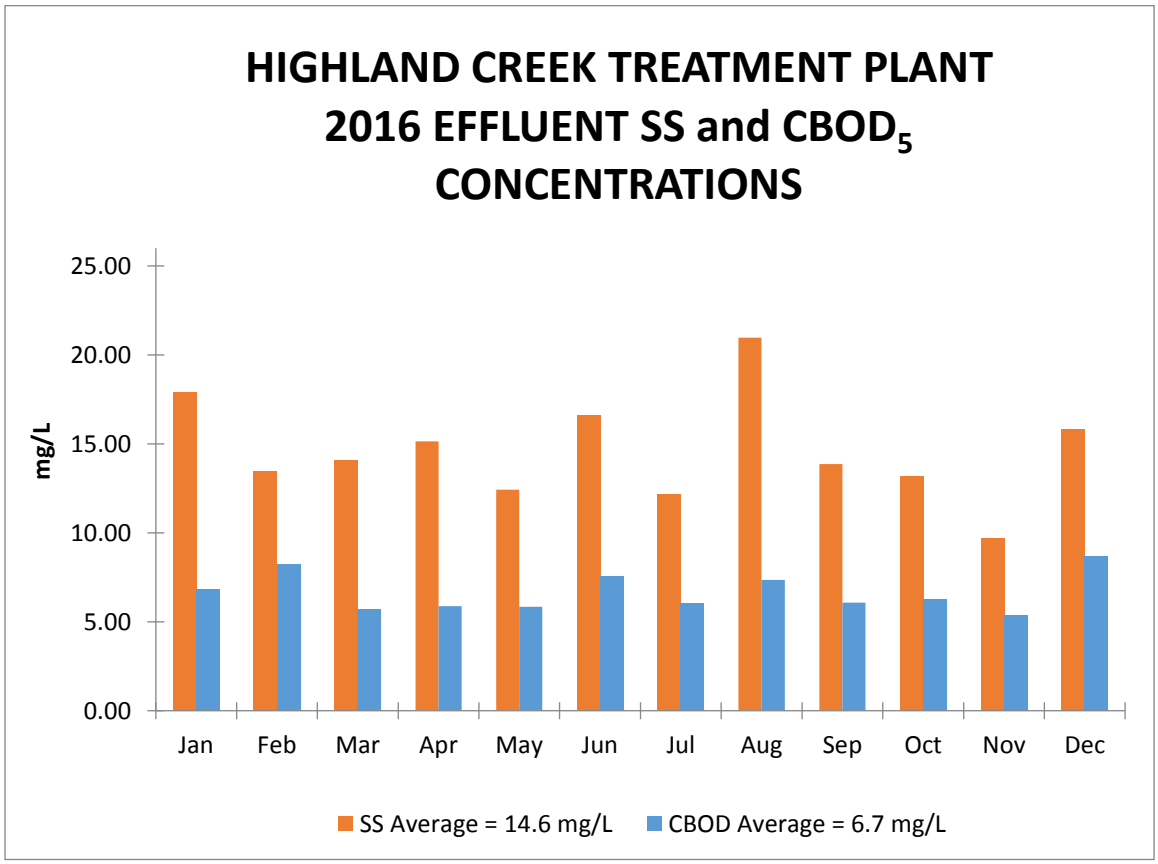
Performance Charts

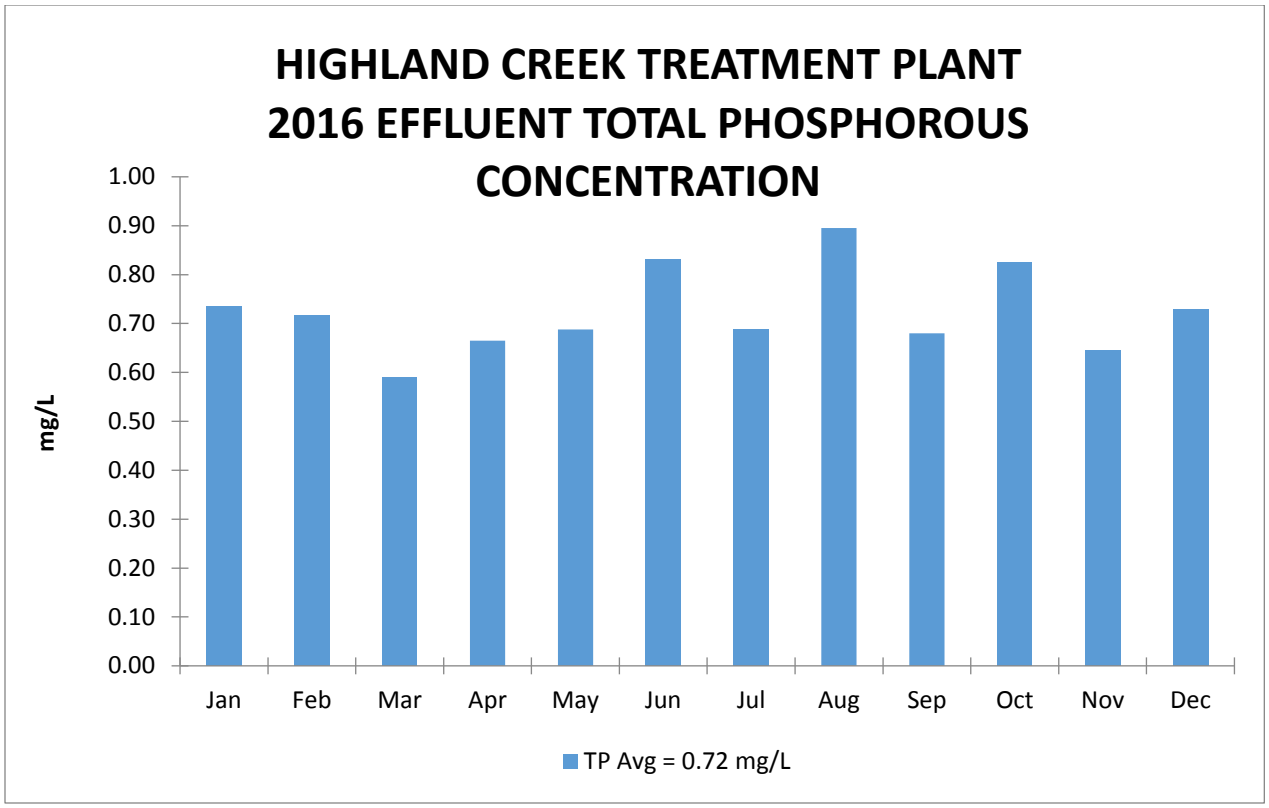
- Influent Flows
- Influent SS & BOD_5 Concentrations
- Influent TKN & Total Phosphorous Concentrations
- Effluent SS & $CBOD_5$ Concentrations
- Effluent Total Phosphorous
- Effluent TKN & Ammonia Concentrations
- Effluent Nitrate + Nitrite Concentrations
- Effluent Total Residual Chlorine
- Effluent *E. Coli*
- Effluent pH
- Effluent Temperature

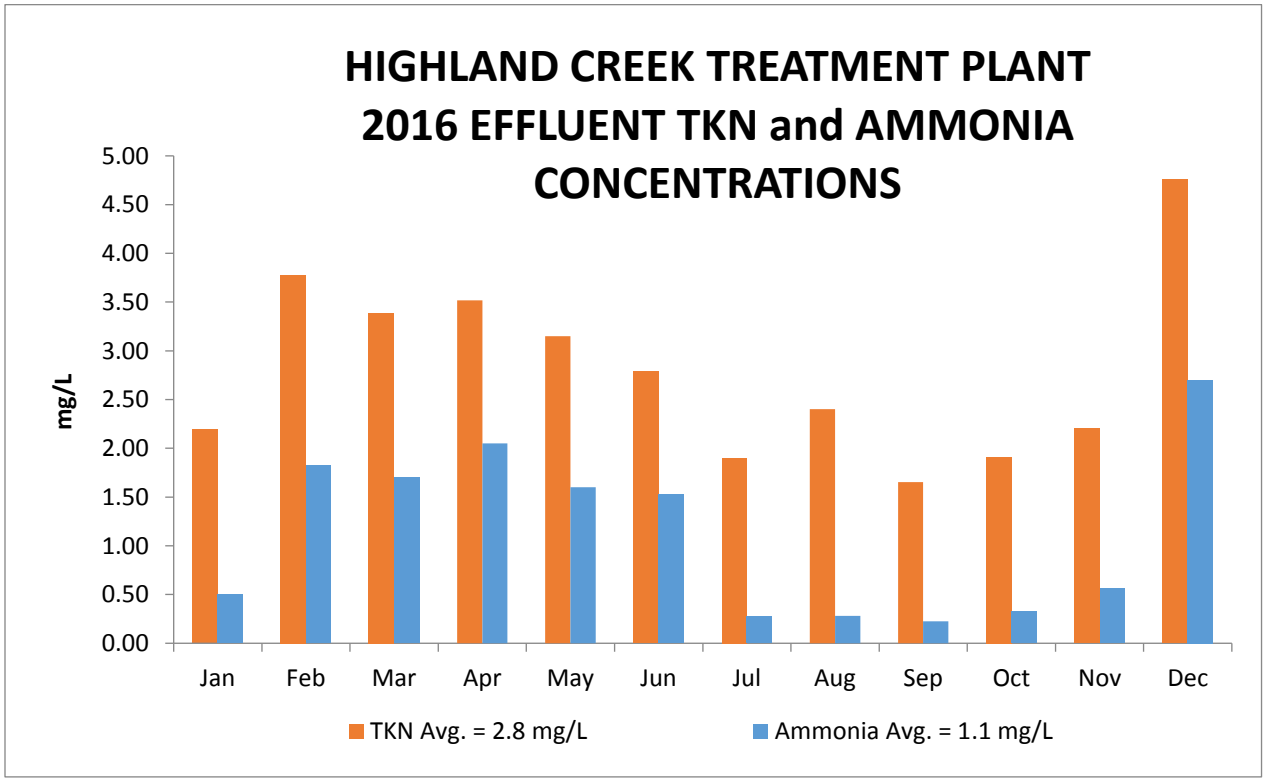

HIGHLAND CREEK TREATMENT PLANT
INFLUENT FLOWS 2015-2016
Influent ML/ day
250
200
150
100
50
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2015 Average = 164.9 ML/day
2016 Average = 161.8 ML/day

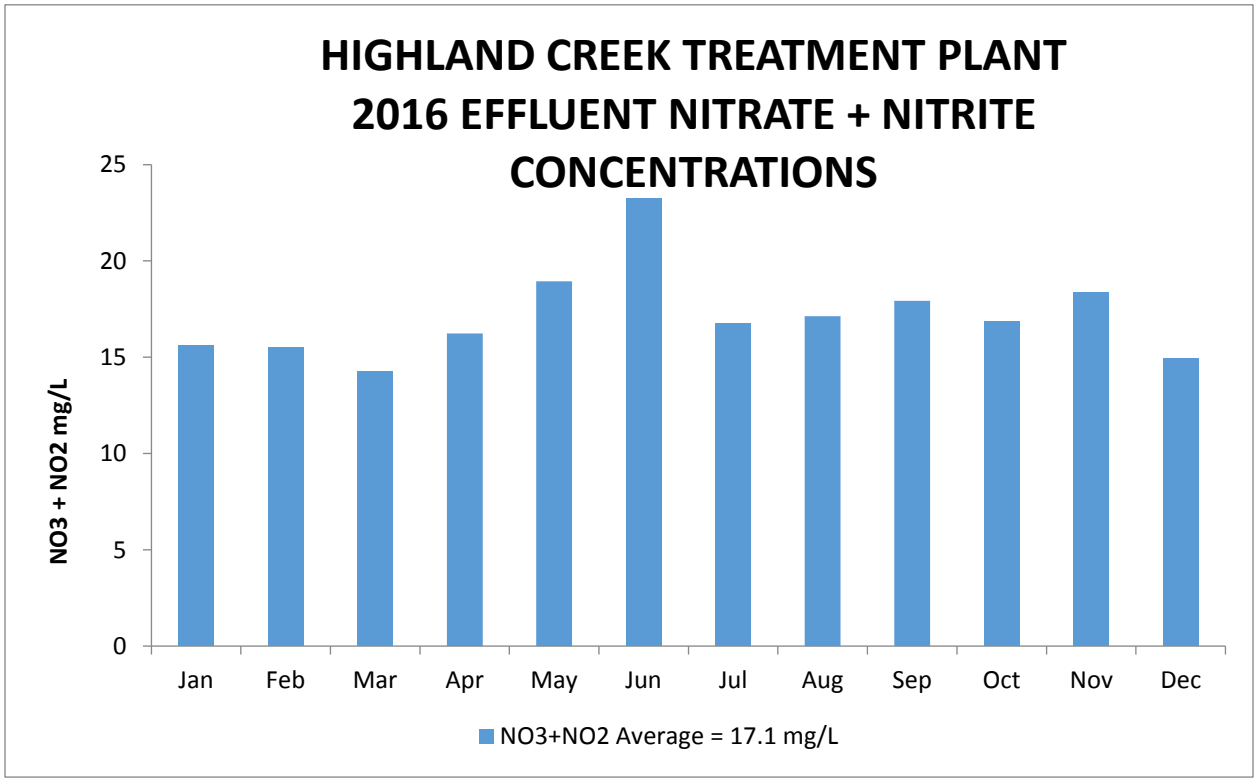

HIGHLAND CREEK TREATMENT PLANT
2016 INFLUENT SS and BOD5
CONCENTRATIONS
mg/L
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
SS Avg = 244.8 mg/L
BOD Avg = 242.2 mg/L

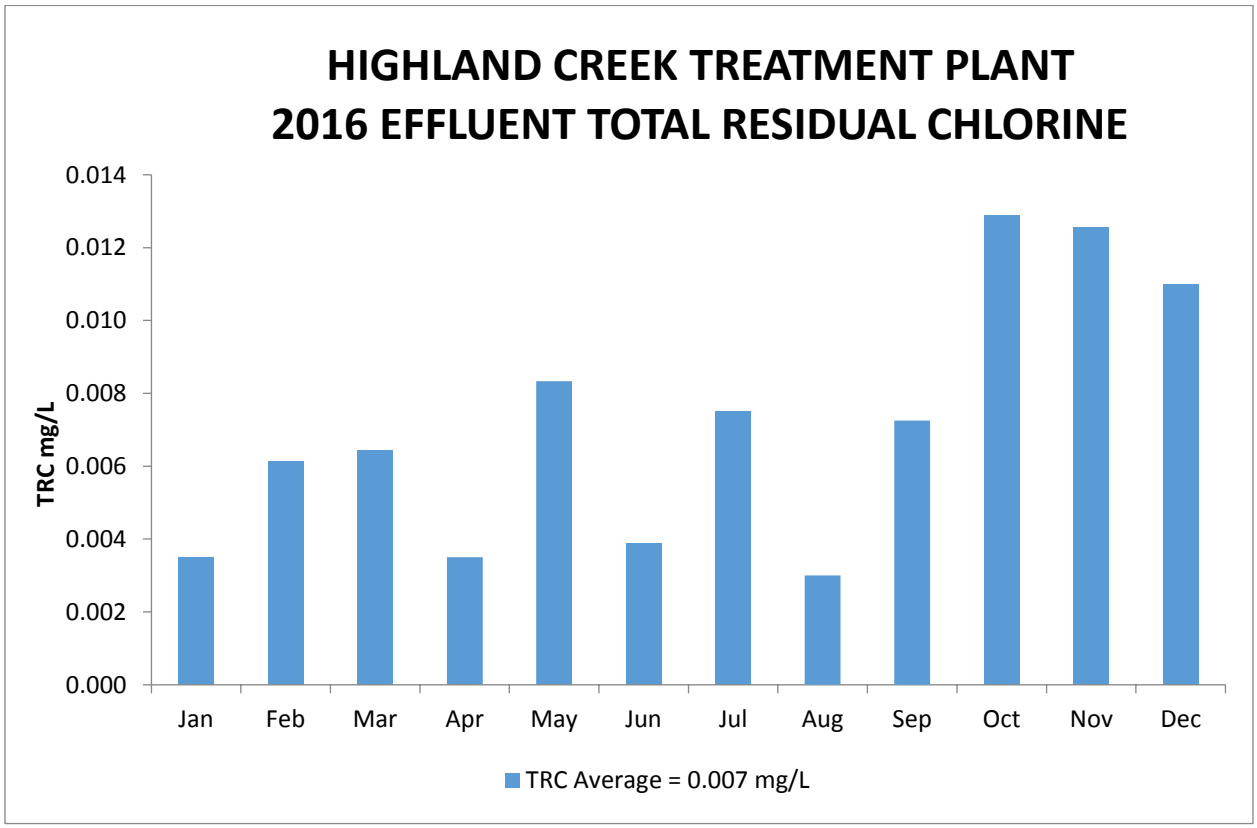

HIGHLAND CREEK TREATMENT PLANT
2016 INFLUENT TKN and TOTAL PHOSPHOROUS CONCENTRATIONS
mg/L
50
40
30
20
10
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
TKN Average = 46.1 mg/L
TP Average = 5.5 mg/L

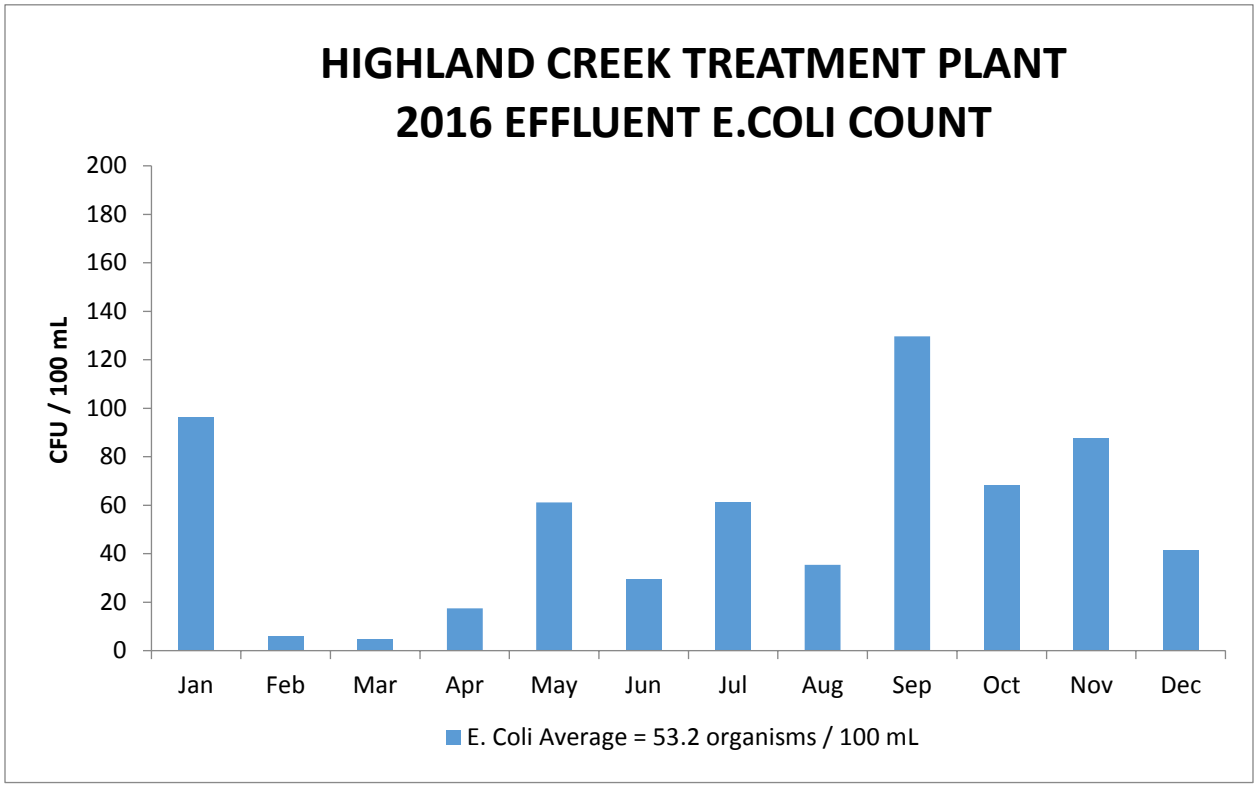

HIGHLAND CREEK TREATMENT PLANT
2016 EFFLUENT SS and CBOD5 CONCENTRATIONS
mg/L
25.00
20.00
15.00
10.00
5.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
SS Average = 14.6 mg/L
CBOD Average = 6.7 mg/L

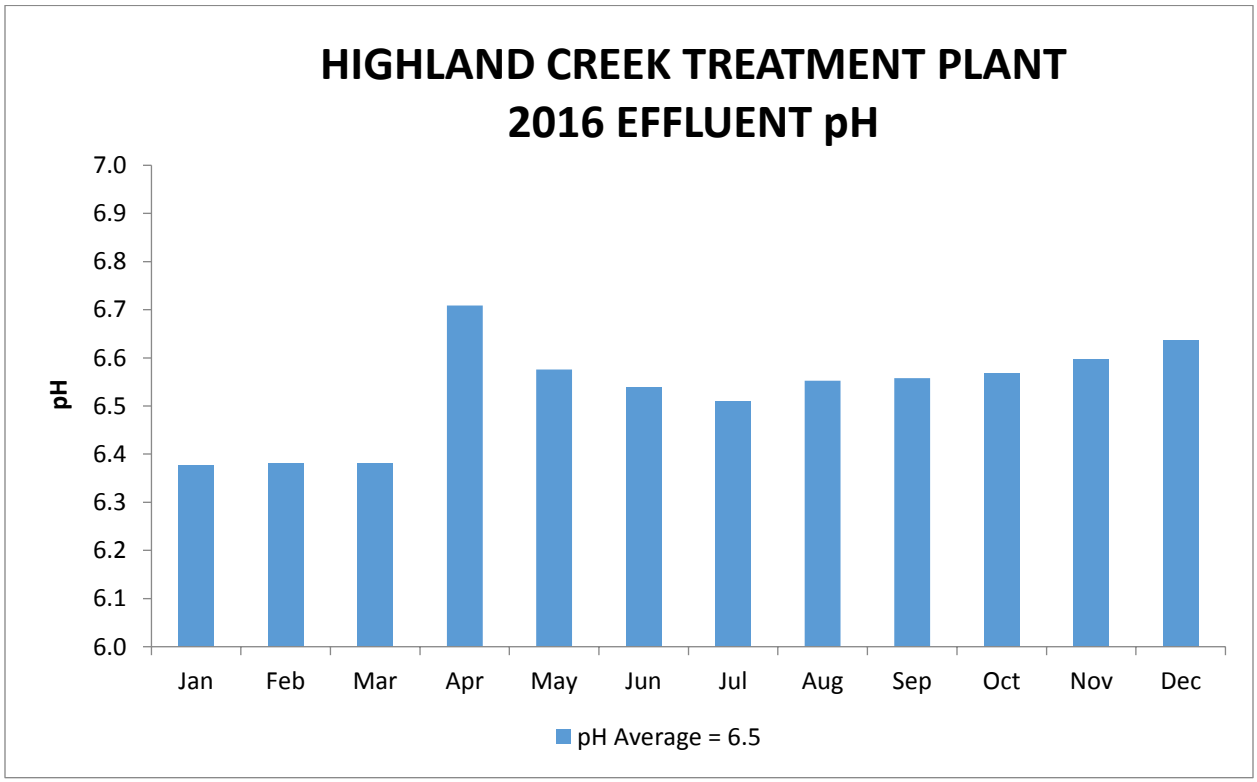

HIGHLAND CREEK TREATMENT PLANT
2016 EFFLUENT TOTAL PHOSPHOROUS CONCENTRATION
mg/L
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
TP Avg = 0.72 mg/L

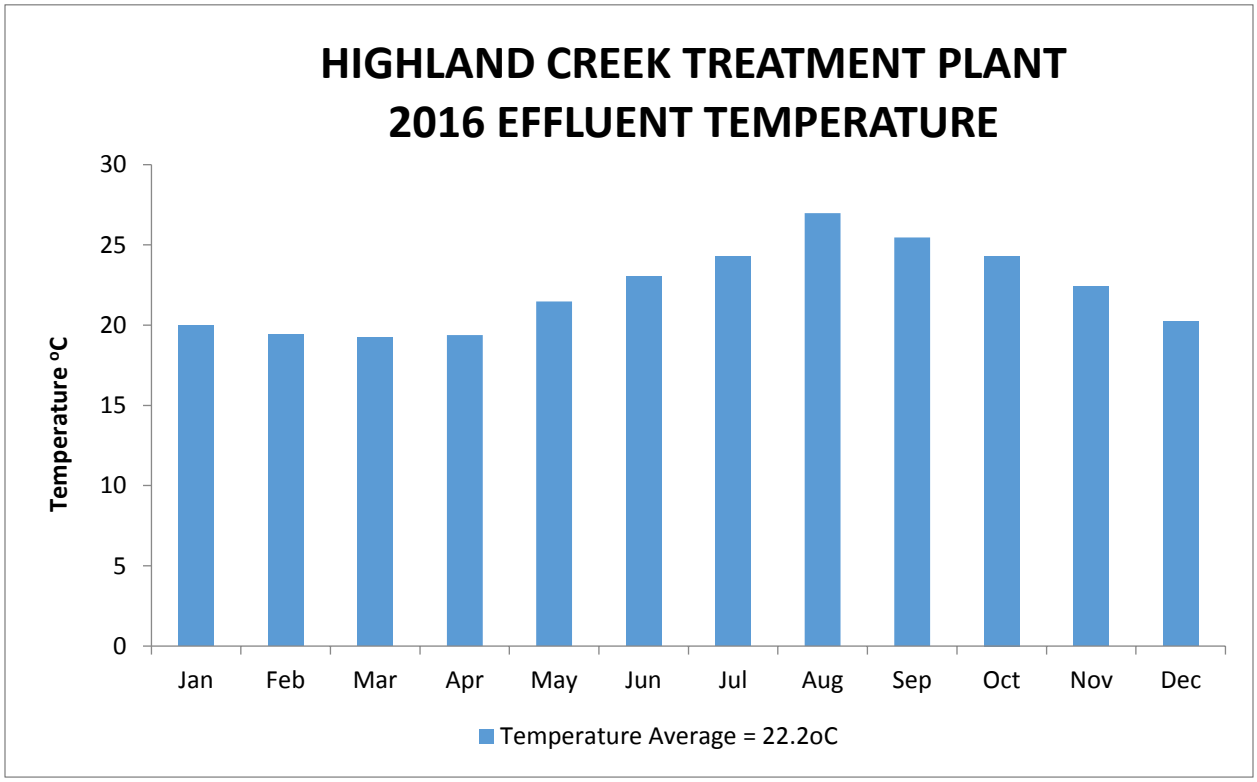

HIGHLAND CREEK TREATMENT PLANT
2016 EFFLUENT TKN and AMMONIA CONCENTRATIONS
mg/L
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
TKN Avg. = 2.8 mg/L
Ammonia Avg. = 1.1 mg/L


HIGHLAND CREEK TREATMENT PLANT
2016 EFFLUENT NITRATE + NITRITE CONCENTRATIONS
NO3 + NO2 mg/L
25
20
15
10
5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
NO3+NO2 Average = 17.1 mg/L


HIGHLAND CREEK TREATMENT PLANT
2016 EFFLUENT TOTAL RESIDUAL CHLORINE
TRC mg/L
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
TRC Average = 0.007 mg/L


HIGHLAND CREEK TREATMENT PLANT
2016 EFFLUENT E.COLI COUNT
CFU / 100 mL
200
180
160
140
120
100
80
60
40
20
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
E. Coli Average = 53.2 organisms / 100 mL


HIGHLAND CREEK TREATMENT PLANT
2016 EFFLUENT pH
pH
7.0
6.9
6.8
6.7
6.6
6.5
6.4
6.3
6.2
6.1
6.0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
pH Average = 6.5


HIGHLAND CREEK TREATMENT PLANT
2016 EFFLUENT TEMPERATURE
Temperature °C
30
25
20
15
10
5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Temperature Average = 22.2oC

Appendix D

Influent & Effluent Metal Concentrations

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

Tel: 416-392-2894
Fax: 416-397-0342

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: January 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Highland Creek Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0216	mg/L	0.0400	
	Iron	1.59	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0675	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00594	mg/L	0.0800	
	Zinc	0.0373	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.0324	mg/L	4.0000	
	Copper	0.102	mg/L	2.0000	
	Iron	0.843	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0621	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.00567	mg/L	2.0000	
	Zinc	0.173	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 25-Feb-2016 /

Approved By: TP Chief Chemist /

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

Tel: 416-392-2894
Fax: 416-397-0342

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: February 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Highland Creek Treatment Plant					
FINAL EFFLUENT	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0211	mg/L	0.0400	
	Iron	1.34	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0765	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00608	mg/L	0.0800	
	Zinc	0.0388	mg/L	0.0400	
INFLUENT	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00605	mg/L	4.0000	
	Copper	0.104	mg/L	2.0000	
	Iron	0.677	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0660	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.00649	mg/L	2.0000	
	Zinc	0.127	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 18-Mar-2016 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

Tel: 416-392-2894
Fax: 416-397-0342

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: March 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Highland Creek Treatment Plant					
Monthly Metals at Dee - FINAL EFFLUENT Lab Basement	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0193	mg/L	0.0400	
	Iron	1.28	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0820	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00730	mg/L	0.0800	
	Zinc	0.0370	mg/L	0.0400	
Monthly Metals at Dee. - INFLUENT	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00582	mg/L	4.0000	
	Copper	0.0895	mg/L	2.0000	
	Iron	0.575	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0633	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.00676	mg/L	2.0000	
	Zinc	0.116	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 03-May-2016 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

Tel: 416-392-2894
Fax: 416-397-0342

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: April 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Highland Creek Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0211	mg/L	0.0400	
	Iron	1.37	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0827	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00576	mg/L	0.0800	
	Zinc	0.0347	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00448	mg/L	4.0000	
	Copper	0.0983	mg/L	2.0000	
	Iron	0.771	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0640	mg/L	5.0000	
	Mercury	0.00008200	mg/L	0.0100	
	Nickel	0.00562	mg/L	2.0000	
	Zinc	0.118	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 16-May-2016 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

Tel: 416-392-2894
Fax: 416-397-0342

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: May 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Highland Creek Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0208	mg/L	0.0400	
	Iron	1.04	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0664	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00593	mg/L	0.0800	
	Zinc	0.0334	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00538	mg/L	4.0000	
	Copper	0.111	mg/L	2.0000	
	Iron	0.728	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0652	mg/L	5.0000	
	Mercury	0.00007700	mg/L	0.0100	
	Nickel	0.00687	mg/L	2.0000	
	Zinc	0.137	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 29-Jun-2016 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

Tel: 416-392-2894
Fax: 416-397-0342

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: June 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Highland Creek Treatment Plant					
FINAL EFFLUENT- Monthly Metals at Dee	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0225	mg/L	0.0400	
	Iron	1.23	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0683	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00644	mg/L	0.0800	
	Zinc	0.0374	mg/L	0.0400	
INFLUENT- Monthy Metals at Dee	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00851	mg/L	4.0000	
	Copper	0.123	mg/L	2.0000	
	Iron	1.16	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0730	mg/L	5.0000	
	Mercury	0.0001040	mg/L	0.0100	
	Nickel	0.00661	mg/L	2.0000	
	Zinc	0.165	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 29-Jul-2016 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

Tel: 416-392-2894
Fax: 416-397-0342

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: July 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Highland Creek Treatment Plant					
FINAL EFFLUENT - Monthly @ Dee.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0179	mg/L	0.0400	
	Iron	0.913	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0835	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00652	mg/L	0.0800	
	Zinc	0.0382	mg/L	0.0400	
INFLUENT - Monthly @ Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00747	mg/L	4.0000	
	Copper	0.125	mg/L	2.0000	
	Iron	1.08	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0683	mg/L	5.0000	
	Mercury	0.0001000	mg/L	0.0100	
	Nickel	0.00767	mg/L	2.0000	
	Zinc	0.173	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 30-Aug-2016 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

Tel: 416-392-2894
Fax: 416-397-0342

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: August 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Highland Creek Treatment Plant					
FINAL EFFLUENT - Monthly Meatls @ Dee.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0190	mg/L	0.0400	
	Iron	1.67	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0720	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00966	mg/L	0.0800	
	Zinc	0.0367	mg/L	0.0400	
INFLUENT - Monthly Meatls @ Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00810	mg/L	4.0000	
	Copper	0.121	mg/L	2.0000	
	Iron	0.889	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0643	mg/L	5.0000	
	Mercury	0.0001000	mg/L	0.0100	
	Nickel	0.0115	mg/L	2.0000	
	Zinc	0.168	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 03-Oct-2016 /

Approved By: TP Chief Chemist /

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

Tel: 416-392-2894 #
Fax: 416-397-0342 #

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: September 2016 (

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES /
Highland Creek Treatment Plant					
FINAL EFFLUENT - Monthly Metals at Dee.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0148	mg/L	0.0400	
	Iron	1.01	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0702	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.0116	mg/L	0.0800	
	Zinc	0.0398	mg/L	0.0400	
INFLUENT - Monthly Metals at Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00806	mg/L	4.0000	
	Copper	0.129	mg/L	2.0000	
	Iron	1.23	mg/L		
	Lead	0.00547	mg/L	1.0000	
	Manganese	0.0714	mg/L	5.0000	
	Mercury	0.0001400	mg/L	0.0100	
	Nickel	0.00688	mg/L	2.0000	
	Zinc	0.175	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 31-Oct-2016 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

Tel: 416-392-2894
Fax: 416-397-0342

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: October 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Highland Creek Treatment Plant					
EFFLUENT Monthly Metals	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0118	mg/L	0.0400	
	Iron	0.883	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0693	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00627	mg/L	0.0800	
	Zinc	0.0323	mg/L	0.0400	
INFLUENT Montly Metals	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00773	mg/L	4.0000	
	Copper	0.134	mg/L	2.0000	
	Iron	2.29	mg/L		
	Lead	0.00570	mg/L	1.0000	
	Manganese	0.0740	mg/L	5.0000	
	Mercury	0.00007800	mg/L	0.0100	
	Nickel	0.00705	mg/L	2.0000	
	Zinc	0.177	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 01-Dec-2016 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

Tel: 416-392-2894
Fax: 416-397-0342

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: November 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Highland Creek Treatment Plant					
FINAL EFFLUENT	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0133	mg/L	0.0400	
	Iron	0.760	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0724	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00627	mg/L	0.0800	
	Zinc	0.0447	mg/L	0.0400	
INFLUENT	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00815	mg/L	4.0000	
	Copper	0.128	mg/L	2.0000	
	Iron	1.30	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0733	mg/L	5.0000	
	Mercury	0.0002240	mg/L	0.0100	
	Nickel	0.00650	mg/L	2.0000	
	Zinc	0.167	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 04-Jan-2017 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

Tel: 416-392-2894
Fax: 416-397-0342

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: December 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Highland Creek Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0150	mg/L	0.0400	
	Iron	1.13	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0789	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00560	mg/L	0.0800	
	Zinc	0.0346	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00496	mg/L	4.0000	
	Copper	0.103	mg/L	2.0000	
	Iron	1.85	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0680	mg/L	5.0000	
	Mercury	0.00008300	mg/L	0.0100	
	Nickel	0.00567	mg/L	2.0000	
	Zinc	0.118	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 16-Jan-2017 /

Approved By: TP Chief Chemist /

Appendix E

Analytical Testing Summary

Toronto Water Laboratory LIMS Sample and Result Counts From: 01/01/2016 To: 12/31/2016
Client Number of Samples
Highland Creek Treatment Plant 9885

	ALK pH DS COND	BOD_5	$CBOD_5$	Chlorine	COD	ECOLI	Ferric Chloride	IONS	Iron	Mercury	METALS	NH3(as N)	Orthophosphate	P	pH_15	SPGR	TKN(as N)	Total Solids	Toxicity	TS	TSS	Un-Ionized NH3 (as N)	Total
AERATION TANK 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	0	99
AERATION TANK 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104	0	104
AERATION TANK 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97	0	97
AERATION TANK 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	100
AERATION TANK 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	100
AERATION TANK 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	100
AERATION TANK 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	100
AERATION TANK 1E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94	0	94
AERATION TANK 1W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94	0	94
AERATION TANK 2E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94	0	94
AERATION TANK 2W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94	0	94
AERATION TANK 3E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	0	99
AERATION TANK 3W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	101	0	101
AERATION TANK 4E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	101	0	101
AERATION TANK 4W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	0	99
AERATION TANK 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	106	0	106
AERATION TANK 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104	0	104
AERATION TANK 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	106	0	106
AERATION TANK 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	106	0	106
AERATION TANK 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	103	0	103
CUSTOM SAMPLE POINT	6	6	0	0	0	9	0	0	0	0	0	1	0	6	0	0	1	0	0	26	31	0	86
DEWATERING BLENDED SLUDGE FEED	0	0	0	0	0	0	0	10	0	3	10	1	0	0	0	0	0	0	0	674	0	0	698
DEWATERING CAKE # 310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	14
DEWATERING CAKE # 313	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
DEWATERING CAKE # 314	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	30
DEWATERING CAKE # 413	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	658	0	0	658
DEWATERING CAKE # 414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	635	0	0	635
DEWATERING CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
DEWATERING CENTRATE # 310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	7
DEWATERING CENTRATE # 314	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	13
DEWATERING CENTRATE # 413	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	349	0	349
DEWATERING CENTRATE # 414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	336	0	336
FINAL EFFLUENT	156	1	359	3	51	101	0	496	0	12	108	61	52	360	46	0	52	0	24	0	399	34	2,315
HCTP FE SAMPLE	0	0	0	0	0	0	48	0	2	0	23	0	0	0	0	8	0	0	0	0	0	0	81
INFLUENT	309	361	0	0	0	0	0	0	0	12	108	52	2	362	0	0	52	0	0	0	374	0	1,632
POLYMER DEWATERING MIXING TANK 1.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4
POLYMER DEWATERING MIXING TANK 2.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74	0	0	74
POLYMER DEWATERING MIXING TANK 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71	0	0	71
POLYMER THICKENING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	77	0	0	77
POLYMER THICKENING NEAT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	78	0	0	78
PRIMARY EFFLUENT 1	132	43	0	0	44	0	0	0	0	0	0	0	44	9	0	0	0	0	0	0	93	0	365
PRIMARY EFFLUENT 11-12	309	101	1	0	101	0	0	0	0	0	0	0	103	0	0	0	0	0	0	0	368	0	983
PRIMARY EFFLUENT 2	132	44	0	0	44	0	0	0	0	0	0	0	44	9	0	0	0	0	0	0	94	0	367
PRIMARY EFFLUENT 3	147	49	0	0	49	0	0	0	0	0	0	0	49	9	0	0	0	0	0	0	102	0	405
PRIMARY EFFLUENT 4	150	50	0	0	50	0	0	0	0	0	0	0	50	9	0	0	0	0	0	0	105	0	414
PRIMARY EFFLUENT 5	156	52	0	0	52	0	0	0	0	0	0	0	52	11	0	0	0	0	0	0	107	0	430
PRIMARY EFFLUENT 6	156	52	0	0	52	0	0	0	0	0	0	0	52	11	0	0	0	0	0	0	107	0	430
PRIMARY EFFLUENT 7	156	52	0	0	51	0	0	0	0	0	0	0	52	10	0	0	0	0	0	0	107	0	428
PRIMARY EFFLUENT 8	153	51	0	0	51	0	0	0	0	0	0	0	51	10	0	0	0	0	0	0	106	0	422
PRIMARY EFFLUENT 9-10	309	101	2	0	103	0	0	0	0	0	0	0	103	0	0	0	0	0	0	0	368	0	986
RAW SLUDGE 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	167	0	0	169
RAW SLUDGE 11-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	185	0	0	189
RAW SLUDGE 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	171	0	0	173
RAW SLUDGE 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	146	0	0	148
RAW SLUDGE 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	148	0	0	150
RAW SLUDGE 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	199	2	0	204
RAW SLUDGE 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	201	2	0	206
RAW SLUDGE 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	193	2	0	198
RAW SLUDGE 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	193	2	0	198
RAW SLUDGE 9-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	172	0	0	174
RETURN SLUDGE 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	88	0	90
RETURN SLUDGE 13-16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97	0	97
RETURN SLUDGE 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	89	0	89
RETURN SLUDGE 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	0	99
RETURN SLUDGE 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	0	99
RETURN SLUDGE 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	101	0	101
RETURN SLUDGE 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	101	0	101
RETURN SLUDGE 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	0	99
RETURN SLUDGE 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	0	99
RETURN SLUDGE 9-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	97	0	99
WAS FEED from VAULT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	189	0	189
WAS THICKENING - CENTRIFUGE #1 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	148	0	148
WAS THICKENING - CENTRIFUGE #1 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	269	0	0	269
WAS THICKENING - CENTRIFUGE #2 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
WAS THICKENING - CENTRIFUGE #3 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0	29
WAS THICKENING - CENTRIFUGE #3 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	50
WAS THICKENING - CENTRIFUGE #4 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	10
WAS THICKENING - CENTRIFUGE #4 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	0	19
WAS THICKENING - CENTRIFUGE #5 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	0	60
WAS THICKENING - CENTRIFUGE #5 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	113	0	0	113
WAS THICKENING - CENTRIFUGE #6 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	165	0	165
WAS THICKENING - CENTRIFUGE #6 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	310	0	0	310
Total	**2,271**	**963**	**362**	**3**	**648**	**110**	**48**	**506**	**2**	**27**	**249**	**115**	**654**	**806**	**46**	**8**	**105**	**26**	**24**	**4,885**	**6,646**	**34**	**18,538**

Ions include: Cl, SO4, NO3, NO2, Br, Ca, Mg, Na, K
Metals by ICP include: Cd, Cr, Cu, Ni, Pb, Zn, Al, Mn, Fe, B
Volatlie Total Solids (VS) are done on 80% of Total Solids
Volatile Suspend Solids (VSS) are done on 2% of the Total Suspended Solids samples.

Toronto Water Laboratory &
545 Commissioners Street, !
Toronto,Ontario, M4M 1A5 !

Tel: 416-392-2894 !
Fax: 416-397-0342 !

TORONTO WATER LABORATORY

Sampling Point: THC01 INFLUENT &

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	40.30	304.00	269.51	mg/L	<1.6
Conductivity	936.00	1,510.00	1,127.41	µS/cm	<1.5
pH	5.80	7.70	7.43	SU	<0.10

Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	2.00	550.00	232.86	mg/L	<2

Group: METALS	Minimum	Maximum	Average	Units	Reporting Limit
Arsenic	0.010000	0.01000	0.01000	mg/L	<0.01
Cadmium	0.004000	0.00400	0.00400	mg/L	<0.004
Chromium	0.004500	0.03240	0.00979	mg/L	<0.004
Copper	0.089500	0.12500	0.10923	mg/L	<0.004
Iron	0.575000	1.16000	0.84038	mg/L	<0.02
Lead	0.005000	0.00500	0.00500	mg/L	<0.005
Manganese	0.062100	0.07300	0.06578	mg/L	<0.004
Nickel	0.005600	0.01150	0.00716	mg/L	<0.005
Zinc	0.116000	0.17300	0.14713	mg/L	<0.02

Group: Mercury	Minimum	Maximum	Average	Units	Reporting Limit
Mercury	0.000100	0.00010	0.00010	mg/L	<0.00003

Group: NH3(as N)	Minimum	Maximum	Average	Units	Reporting Limit
Ammonia(as N)	24.00	45.00	32.11	mg/L	<0.05

Group: P	Minimum	Maximum	Average	Units	Reporting Limit
Phosphorus (HACH)	0.95	9.20	5.31	mg/L	<0.08

Group: TKN(as N)	Minimum	Maximum	Average	Units	Reporting Limit
Total Kjeldahl Nitrogen	31.20	57.90	44.63	mg/L	<0.2

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	24.00	692.00	235.72	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC03 PRIMARY EFFLUENT 9-10

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	196.00	294.00	245.45	mg/L	<1.6
Conductivity	897.00	1,800.00	1,148.05	µS/cm	<1.5
pH	7.10	7.70	7.47	SU	<0.10

Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	81.00	295.00	162.79	mg/L	<2

Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	99.00	214.00	156.50	mg/L	

Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	73.00	645.00	355.83	mg/L	<10

Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	1.70	8.60	4.60	mg/L	<0.5

Printed on: 02/22/2017

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	52.00	2,460.00	144.40	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC04 PRIMARY EFFLUENT 11-12

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	215.00	285.00	249.20	mg/L	<1.6
Conductivity	966.00	1,690.00	1,144.91	µS/cm	<1.5
pH	7.10	7.70	7.42	SU	<0.10
Group: BOD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Biochemical Oxygen Demand (BOD)	76.00	410.00	184.96	mg/L	<2
Group: CBOD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Carbonaceous Biochemical Oxygen Demand	544.00	544.00	544.00	mg/L	
Group: COD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Chemical Oxygen Demand	73.00	710.00	402.21	mg/L	<10
Group: Orthophosphate	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Orthophosphate	0.50	16.00	5.08	mg/L	<0.5
Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	60.00	472.00	176.83	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC05 FINAL EFFLUENT

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	78.80	139.00	106.09	mg/L	<1.6
Conductivity	880.00	1,320.00	1,019.44	µS/cm	<1.5
pH	7.50	7.90	7.68	SU	<0.10
Group: BOD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Biochemical Oxygen Demand (BOD)	8.00	8.00	8.00	mg/L	<2
Group: CBOD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Carbonaceous Biochemical Oxygen Demand	2.00	28.00	6.56	mg/L	
Group: COD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Chemical Oxygen Demand	24.00	260.00	56.50	mg/L	<10
Group: Chlorine	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Residual Chlorine	0.90	0.90	0.90	mg/L	<0.01
Group: ECOLI	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
EColi	0.00	1,800.00	131.48	CFU/100 mL	
Group: IONS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Bromide	0.100000	2.75000	2.41806	mg/L	<0.1
Calcium	33.500000	129.00000	83.99722	mg/L	<0.2
Chloride	86.600000	243.00000	142.79444	mg/L	<0.2
Hardness (Calculation)	176.000000	423.00000	270.61111	mg/L	<1
Magnesium	6.330000	24.40000	14.33139	mg/L	<0.1
Nitrate(as N)	9.920000	35.60000	16.60056	mg/L	<0.01
Nitrite(as N)	0.055000	3.46000	0.57406	mg/L	<0.002
Potassium	6.250000	24.60000	11.75028	mg/L	<0.05
Sodium	52.300000	180.00000	101.87778	mg/L	<0.4
Sulfate	30.500000	93.70000	52.59722	mg/L	<0.2
Group: METALS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**

Arsenic	0.010000	0.01000	0.01000	mg/L	<0.01
Cadmium	0.004000	0.00400	0.00400	mg/L	<0.004
Chromium	0.004000	0.00400	0.00400	mg/L	<0.004
Copper	0.017900	0.02250	0.02041	mg/L	<0.004
Iron	0.913000	1.67000	1.30413	mg/L	<0.02
Lead	0.005000	0.00500	0.00500	mg/L	<0.005
Manganese	0.066400	0.08350	0.07486	mg/L	<0.004
Nickel	0.005800	0.00970	0.00670	mg/L	<0.005
Zinc	0.033400	0.03880	0.03669	mg/L	<0.02
Group: Mercury	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Mercury	0.000100	0.00010	0.00010	mg/L	<0.00003
Group: NH3(as N)	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Ammonia(as N)	0.20	2.80	1.05	mg/L	<0.05
Group: Orthophosphate	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Orthophosphate	0.56	2.30	1.09	mg/L	<0.5
Group: P	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Phosphorus (HACH)	0.35	2.00	0.72	mg/L	<0.08
Group: TKN(as N)	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Kjeldahl Nitrogen	1.51	4.25	2.86	mg/L	<0.2
Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	2.00	55.00	15.28	mg/L	<2
Volatile Suspended Solids				%	
Group: Toxicity	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
96h_ Mortality	0.00	0.00	0.00		
96h_LC50	100.00	100.00	100.00	%	
Un-ionized Ammonia	0.00	0.00	0.00	mg/L	
Group: Un-ionized NH3(as N)	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Ammonia(as N)Un-ionized (Calculation)	0.00	0.03	0.01	mg/L	<0.001
Group: pH_15	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
pH_15C	7.20	7.70	7.39	SU	

Sampling Point: THC08 — RAW SLUDGE 9-10

Group: TS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Solids	0.16	8.40	2.53	%	
Volatile Total Solids	62.50	89.30	81.88	%	
Group: Total Solids	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Solids	1.90	3.91	2.91	%	

Sampling Point: THC09 — RAW SLUDGE 11-12

Group: TS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Solids	0.20	10.50	2.48	%	
Volatile Total Solids	33.30	93.80	80.97	%	
Group: Total Solids	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Solids	1.91	2.35	2.05	%	

Sampling Point: THC10 — DEWATERING BLENDED SLUDGE FEED

Group: IONS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Bromide	0.550000	0.55000	0.55000	mg/L	<0.1

Calcium	173.000000	173.00000	173.00000	mg/L	<0.2
Chloride	180.000000	180.00000	180.00000	mg/L	<0.2
Hardness (Calculation)	579.000000	579.00000	579.00000	mg/L	<1
Magnesium	35.600000	35.60000	35.60000	mg/L	<0.1
Nitrate(as N)	0.150000	0.15000	0.15000	mg/L	<0.01
Nitrite(as N)	1.800000	1.80000	1.80000	mg/L	<0.002
Potassium	49.000000	49.00000	49.00000	mg/L	<0.05
Sodium	124.000000	124.00000	124.00000	mg/L	<0.4
Sulfate	13.000000	13.00000	13.00000	mg/L	<0.2
Group: METALS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Arsenic	0.057400	0.05740	0.05740	mg/L	<0.01
Cadmium	0.008000	0.00800	0.00800	mg/L	<0.004
Chromium	1.360000	1.36000	1.36000	mg/L	<0.004
Cobalt	0.055600	0.05560	0.05560	mg/L	<0.004
Copper	12.600000	12.60000	12.60000	mg/L	<0.004
Lead	0.273000	0.27300	0.27300	mg/L	<0.005
Molybdenum	0.143000	0.14300	0.14300	mg/L	<0.01
Nickel	0.376000	0.37600	0.37600	mg/L	<0.005
Selenium	0.020000	0.02000	0.02000	mg/L	<0.01
Zinc	11.000000	11.00000	11.00000	mg/L	<0.02
Group: Mercury	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Mercury	0.004200	0.00910	0.00680	mg/L	<0.00003
Group: NH3(as N)	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Ammonia(as N)	65.00	65.00	65.00	mg/L	<0.05
Group: TS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Solids	0.60	4.43	2.42	%	
Volatile Total Solids	62.50	89.20	79.15	%	

Sampling Point: THC100 PRIMARY EFFLUENT 8

Group: ALK pH DS COND	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Alkalinity	228.00	308.00	268.81	mg/L	<1.6
Conductivity	1,080.00	1,390.00	1,223.24	µS/cm	<1.5
pH	7.00	7.60	7.35	SU	<0.10
Group: BOD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Biochemical Oxygen Demand (BOD)	92.00	228.00	162.14	mg/L	<2
Group: COD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Chemical Oxygen Demand	140.00	485.00	353.65	mg/L	<10
Group: Orthophosphate	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Orthophosphate	2.70	11.00	5.59	mg/L	<0.5
Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	44.00	168.00	100.81	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC101 RAW SLUDGE 1

Group: TS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Solids	0.29	4.90	2.56	%	
Volatile Total Solids	60.00	91.70	81.93	%	
Group: Total Solids	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Solids	0.76	0.95	0.86	%	

Sampling Point: THC102 RAW SLUDGE 2

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.32	6.03	2.60	%	
Volatile Total Solids	66.70	88.50	82.97	%	

Group: Total Solids	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.75	0.86	0.81	%	

Sampling Point: THC103 RAW SLUDGE 3

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.20	5.90	2.90	%	
Volatile Total Solids	57.10	88.90	81.56	%	

Group: Total Solids	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.83	0.87	0.85	%	

Sampling Point: THC104 RAW SLUDGE 4

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.20	5.30	2.69	%	
Volatile Total Solids	62.50	86.84	81.42	%	

Group: Total Solids	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.88	1.01	0.95	%	

Sampling Point: THC105 RAW SLUDGE 5

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.10	6.00	2.25	%	
Volatile Total Solids	50.00	93.30	81.12	%	

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	6,220.00	6,220.00	6,220.00	mg/L	<2
Volatile Suspended Solids	74.40	74.40	74.40	%	

Group: Total Solids	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.01	2.12	1.60	%	

Sampling Point: THC106 RAW SLUDGE 6

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.20	7.00	2.80	%	
Volatile Total Solids	57.10	87.20	80.99	%	

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,560.00	2,560.00	2,560.00	mg/L	<2
Volatile Suspended Solids	77.00	77.00	77.00	%	

Group: Total Solids	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.21	2.41	1.87	%	

Sampling Point: THC107 RAW SLUDGE 7

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.19	4.50	2.20	%	
Volatile Total Solids	50.00	88.90	81.27	%	

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit

Total Suspended Solids	4,250.00	4,250.00	4,250.00	mg/L	<2
Volatile Suspended Solids	76.00	76.00	76.00	%	

Group: Total Solids	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Solids	0.91	2.23	1.59	%	

Sampling Point: THC108 RAW SLUDGE 8

Group: TS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Solids	0.20	4.40	1.85	%	
Volatile Total Solids	60.00	90.00	81.10	%	

Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	3,840.00	3,840.00	3,840.00	mg/L	<2
Volatile Suspended Solids	77.10	77.10	77.10	%	

Group: Total Solids	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Solids	0.82	2.18	1.47	%	

Sampling Point: THC109 DEWATERING CAKE # 413

Group: TS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Solids	19.90	38.50	26.86	%	
Volatile Total Solids	70.60	86.80	81.60	%	

Sampling Point: THC110 DEWATERING CENTRATE # 413

Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	270.00	10,110.00	998.28	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC111 DEWATERING CAKE # 414

Group: TS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Solids	18.06	63.83	27.04	%	
Volatile Total Solids	73.30	93.20	81.71	%	

Sampling Point: THC112 DEWATERING CENTRATE # 414

Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	220.00	27,340.00	1,053.43	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC13 AERATION TANK 1E

Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	1,480.00	2,750.00	2,036.22	mg/L	<2
Volatile Suspended Solids	75.00	85.00	78.76	%	

Sampling Point: THC14 AERATION TANK 1W

Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	1,420.00	2,650.00	1,916.49	mg/L	<2
Volatile Suspended Solids	75.00	86.60	79.02	%	

Sampling Point: THC15 AERATION TANK 2E

Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**

Total Suspended Solids	1,340.00	2,470.00	1,884.86	mg/L	<2
Volatile Suspended Solids	75.60	85.10	79.06	%	

Sampling Point: THC16 AERATION TANK 2W

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,260.00	2,400.00	1,844.59	mg/L	<2
Volatile Suspended Solids	74.90	86.60	79.06	%	

Sampling Point: THC17 AERATION TANK 3E

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,217.00	3,510.00	2,266.33	mg/L	<2
Volatile Suspended Solids	73.60	85.20	77.87	%	

Sampling Point: THC18 AERATION TANK 3W

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,590.00	3,410.00	2,278.72	mg/L	<2
Volatile Suspended Solids	74.50	84.60	78.20	%	

Sampling Point: THC19 AERATION TANK 4E

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	470.00	3,710.00	2,126.92	mg/L	<2
Volatile Suspended Solids	74.90	87.20	79.69	%	

Sampling Point: THC20 AERATION TANK 4W

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	500.00	3,810.00	2,222.05	mg/L	<2
Volatile Suspended Solids	74.70	92.00	78.93	%	

Sampling Point: THC21 AERATION TANK 5

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,580.00	4,310.00	2,916.05	mg/L	<2
Volatile Suspended Solids	74.50	83.30	77.81	%	

Sampling Point: THC22 AERATION TANK 6

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,440.00	4,860.00	1,914.47	mg/L	<2
Volatile Suspended Solids	72.60	88.50	79.15	%	

Sampling Point: THC23 AERATION TANK 7

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,520.00	4,960.00	2,339.49	mg/L	<2
Volatile Suspended Solids	74.50	84.90	78.79	%	

Sampling Point: THC24 AERATION TANK 8

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,540.00	5,190.00	2,138.72	mg/L	<2
Volatile Suspended Solids	72.80	86.00	78.18	%	

Sampling Point: THC25 AERATION TANK 9

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,800.00	5,000.00	3,297.30	mg/L	<2
Volatile Suspended Solids	73.30	82.90	77.33	%	

Sampling Point: THC26 AERATION TANK 10

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,910.00	5,030.00	3,480.54	mg/L	<2
Volatile Suspended Solids	70.20	83.40	77.32	%	

Sampling Point: THC27 AERATION TANK 11

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,460.00	4,750.00	3,890.27	mg/L	<2
Volatile Suspended Solids	72.90	83.00	77.12	%	

Sampling Point: THC28 AERATION TANK 12

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,330.00	5,470.00	4,023.82	mg/L	<2
Volatile Suspended Solids	73.30	80.70	77.04	%	

Sampling Point: THC29 AERATION TANK 13

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,780.00	4,990.00	3,368.97	mg/L	<2
Volatile Suspended Solids	73.20	89.80	79.25	%	

Sampling Point: THC30 AERATION TANK 14

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,850.00	6,230.00	3,864.62	mg/L	<2
Volatile Suspended Solids	74.70	89.80	79.31	%	

Sampling Point: THC31 AERATION TANK 15

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,830.00	4,540.00	3,240.51	mg/L	<2
Volatile Suspended Solids	74.00	89.60	79.62	%	

Sampling Point: THC32 AERATION TANK 16

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,270.00	4,630.00	3,541.03	mg/L	<2
Volatile Suspended Solids	72.20	88.30	79.44	%	

Sampling Point: THC38 HCTP FE SAMPLE

Group: Ferric Chloride	Minimum	Maximum	Average	Units	Reporting Limit
Absolute Difference	0.00	0.01	0.01		
Bill of Lading #	82,351,914.00	82,442,260.00	82,399,657.25		
Specific Gravity	1.21	1.31	1.26		
Supplier Specific Gravity	1.20	1.31	1.26		

Group: METALS	Minimum	Maximum	Average	Units	Reporting Limit
Iron	133,000.000000	144,000.00000	138,500.00000	mg/L	<0.02 !

Group: SPGR	Minimum	Maximum	Average	Units	Reporting Limit
Specific Gravity	1.27	1.27	1.27		

Sampling Point: THC39 RETURN SLUDGE 1

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	3.17	3.17	3.17	%	
Volatile Total Solids	82.72	82.72	82.72	%	

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,340.00	7,430.00	3,850.00	mg/L	<2
Volatile Suspended Solids	75.90	80.80	77.63	%	

Sampling Point: THC40 RETURN SLUDGE 3

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	164.00	8,710.00	4,280.10	mg/L	<2
Volatile Suspended Solids	73.50	82.00	77.03	%	

Sampling Point: THC41 RETURN SLUDGE 5

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,500.00	9,630.00	5,975.41	mg/L	<2
Volatile Suspended Solids	74.50	80.90	76.46	%	

Sampling Point: THC42 RETURN SLUDGE 7

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,490.00	6,770.00	4,480.00	mg/L	<2
Volatile Suspended Solids	75.30	79.80	77.54	%	

Sampling Point: THC43 RETURN SLUDGE 9-12

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	4.30	4.30	4.30	%	
Volatile Total Solids	84.70	84.70	84.70	%	

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	5,900.00	11,710.00	8,538.42	mg/L	<2
Volatile Suspended Solids	73.50	85.30	76.30	%	

Sampling Point: THC44 RETURN SLUDGE 13-16

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	4,730.00	11,040.00	8,358.46	mg/L	<2
Volatile Suspended Solids	73.20	80.40	78.13	%	

Sampling Point: THC49 RETURN SLUDGE 2

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,330.00	6,750.00	3,845.28	mg/L	<2
Volatile Suspended Solids	75.80	80.70	77.73	%	

Sampling Point: THC50 RETURN SLUDGE 4

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,140.00	8,240.00	4,558.97	mg/L	<2
Volatile Suspended Solids	70.20	82.30	77.51	%	

Sampling Point: THC51 RETURN SLUDGE 6

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,540.00	6,760.00	3,801.35	mg/L	<2
Volatile Suspended Solids	73.70	80.70	77.94	%	

Sampling Point: THC52 RETURN SLUDGE 8

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,750.00	6,580.00	4,202.22	mg/L	<2
Volatile Suspended Solids	75.10	80.30	77.07	%	

Sampling Point: THC56 POLYMER DEWATERING MIXING TANK 1.

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.55	0.61	0.59	%	

Sampling Point: THC57 POLYMER DEWATERING MIXING TANK 2.

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.32	0.81	0.50	%	

Sampling Point: THC58 POLYMER DEWATERING MIXING TANK 3

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.43	1.80	0.53	%	

Sampling Point: THC62 DEWATERING CAKE # 314

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	24.20	30.80	27.23	%	
Volatile Total Solids	73.80	82.56	79.04	%	

Sampling Point: THC63 DEWATERING CENTRATE # 314

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	520.00	7,110.00	2,090.77	mg/L	<2

Sampling Point: THC65 WAS THICKENING - CENTRIFUGE #1 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	180.00	9,890.00	1,216.60	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC66 WAS THICKENING - CENTRIFUGE #1 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.50	6.30	3.88	%	
Volatile Total Solids	70.43	83.50	74.55	%	

Sampling Point: THC69 WAS THICKENING - CENTRIFUGE #2 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit

Total Solids	3.60	3.60	3.60	%
Volatile Total Solids	79.07	79.07	79.07	%

Sampling Point: THC71 — WAS THICKENING - CENTRIFUGE #3 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	170.00	12,400.00	1,935.00	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC72 — WAS THICKENING - CENTRIFUGE #3 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.00	7.20	5.03	%	
Volatile Total Solids	71.20	75.80	73.65	%	

Sampling Point: THC74 — WAS THICKENING - CENTRIFUGE #4 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	300.00	4,070.00	1,379.00	mg/L	<2

Sampling Point: THC75 — WAS THICKENING - CENTRIFUGE #4 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	2.80	6.00	4.55	%	
Volatile Total Solids	73.13	75.80	74.53	%	

Sampling Point: THC77 — WAS THICKENING - CENTRIFUGE #5 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	14.00	5,330.00	869.52	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC78 — WAS THICKENING - CENTRIFUGE #5 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.80	6.50	3.91	%	
Volatile Total Solids	72.40	76.90	74.33	%	

Sampling Point: THC80 — WAS THICKENING - CENTRIFUGE #6 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	50.00	11,830.00	1,041.64	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC81 — WAS THICKENING - CENTRIFUGE #6 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.70	7.10	3.87	%	
Volatile Total Solids	62.70	77.53	74.23	%	

Sampling Point: THC84 — DEWATERING CAKE # 310

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	25.90	29.00	27.40	%	
Volatile Total Solids	75.60	82.20	79.47	%	

Sampling Point: THC85 DEWATERING CENTRATE # 310

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	230.00	970.00	604.29	mg/L	<2

Sampling Point: THC88 DEWATERING CAKE # 313

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	26.53	26.53	26.53	%	
Volatile Total Solids	82.35	82.35	82.35	%	

Sampling Point: THC90 WAS FEED from VAULT

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	300.00	8,200.00	6,331.80	mg/L	<2
Volatile Suspended Solids	74.60	96.70	77.37	%	

Sampling Point: THC91 POLYMER THICKENING

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.08	1.13	0.22	%	

Sampling Point: THC92 POLYMER THICKENING NEAT

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.18	2.16	1.02	%	

Sampling Point: THC93 PRIMARY EFFLUENT 1

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	236.00	293.00	269.30	mg/L	<1.6
Conductivity	976.00	1,440.00	1,198.27	µS/cm	<1.5
pH	7.10	7.70	7.42	SU	<0.10
Group: BOD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Biochemical Oxygen Demand (BOD)	79.00	237.00	164.81	mg/L	<2
Group: COD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Chemical Oxygen Demand	58.00	495.00	315.35	mg/L	<10
Group: Orthophosphate	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Orthophosphate	2.80	11.00	6.10	mg/L	<0.5
Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	64.00	148.00	107.59	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC94 PRIMARY EFFLUENT 2

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	234.00	300.00	274.05	mg/L	<1.6
Conductivity	965.00	1,500.00	1,221.49	µS/cm	<1.5
pH	7.00	7.70	7.40	SU	<0.10
Group: BOD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Biochemical Oxygen Demand (BOD)	87.00	228.00	166.63	mg/L	<2
Group: COD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Chemical Oxygen Demand	60.00	520.00	347.30	mg/L	<10

Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	2.90	11.00	6.30	mg/L	<0.5

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	60.00	152.00	109.80	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC95 PRIMARY EFFLUENT 3

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	236.00	299.00	272.81	mg/L	<1.6
Conductivity	968.00	1,490.00	1,221.06	µS/cm	<1.5
pH	6.80	7.80	7.41	SU	<0.10

Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	86.00	255.00	167.95	mg/L	<2

Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	58.00	485.00	339.67	mg/L	<10

Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	2.10	11.00	6.18	mg/L	<0.5

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	56.00	184.00	107.15	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC96 PRIMARY EFFLUENT 4

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	241.00	297.00	270.27	mg/L	<1.6
Conductivity	986.00	1,460.00	1,210.70	µS/cm	<1.5
pH	7.20	7.70	7.41	SU	<0.10

Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	31.00	256.00	157.76	mg/L	<2

Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	59.00	510.00	343.51	mg/L	<10

Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	2.60	11.00	6.09	mg/L	<0.5

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	32.00	152.00	104.16	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC97 PRIMARY EFFLUENT 5

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	246.00	313.00	277.53	mg/L	<1.6
Conductivity	1,090.00	1,420.00	1,249.47	µS/cm	<1.5
pH	7.00	7.70	7.38	SU	<0.10

Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	85.00	263.00	154.50	mg/L	<2

Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	50.00	475.00	350.79	mg/L	<10

Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	2.70	11.00	5.79	mg/L	<0.5

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit

Total Suspended Solids	32.00	184.00	102.26	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC98 PRIMARY EFFLUENT 6

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	247.00	310.00	275.89	mg/L	<1.6
Conductivity	1,090.00	1,410.00	1,241.84	µS/cm	<1.5
pH	7.00	7.70	7.37	SU	<0.10

Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	75.00	227.00	155.05	mg/L	<2

Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	155.00	495.00	346.58	mg/L	<10

Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	2.60	24.00	6.09	mg/L	<0.5

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	16.00	168.00	100.91	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC99 PRIMARY EFFLUENT 7

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	245.00	311.00	272.03	mg/L	<1.6
Conductivity	1,090.00	1,390.00	1,227.63	µS/cm	<1.5
pH	7.00	7.70	7.36	SU	<0.10

Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	71.00	247.00	156.26	mg/L	<2

Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	175.00	540.00	343.16	mg/L	<10

Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	2.60	17.00	5.87	mg/L	<0.5

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	32.00	164.00	100.81	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THR88 WAS THICKENING - CENTRIFUGE #6 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,800.00	3,740.00	3,270.00	mg/L	<2

Note: Averages are based on raw data !

Note: Minimum values are normally reported as < the reporting limit for that parameter. !

Note: Average is calculated for ECOLI, if Geometric Mean is required ask the lab for a separate data file.

Appendix F

Influent Flow Meter Calibration Records

Highland Creek Treatment Plant
Inflow measurement
Calibration Report

Date: 03/12/2016
Type: Parshall Flume , Ultrasonic Flow Transd.
Location: Phase 1 Primary 9-10
Instrument No. PRM-FIT-5112
Temperature Compensation : Yes
Exponential Factor: U = 1.587

Maximum Head : 58.67
Range: 0-1600 litres /sec
Output : 4-20 mA
Throat size : 5 Feet (152.4 c.m)
Blanking Distance: 60.87 cm
Overall Distance : 119.787cm

Rarnge	Head	Cal.Output		Actual (local		Actual
%	cm	mA	L/sec	mA	L/sec	Remote
						m3/sec
0	0	4.01	0	4.03	4	0
8.25	12.19	5.32	132	5.6	165	0.17
22.44	22.86	7.59	359	7.91	396	0.4
32.57	28.96	9.21	521	9.65	561	0.56
60.38	42.88	13.66	966	14.08	1011	1.0
98.13	57.91	19.7	1570	20.03	1591	1.6
100	58.67	20	1600	20.73	1613	1.61

	Make	Model
Aux.. Equipment Used :	Target Transducer	XRS-5C SIEMENS MILTRONICS
	Milltronics Programmer	OCM-3

General comments: Parshall Flume cleaned and inspected, check zero readings, still have flow of 26 litres per seconds due to Gate leakage

Checked By : Lam Chu and Peter Wang

Highland Creek Treatment Plant
Inflow measurement
Calibration Report

Date: 04/29/2016
Type: Parshall Flume , Ultrasonic Flow Transd.
Location: Phase 4 Primary 11-12
Instrument No. PRM-FIT-5142
Temperature Compensation : Yes
Exponential Factor: U = 1.607

Maximum Head : 43.43
Range: 0-1600 litres /sec
Output : 4-20 mA
Throat size : 8 Feet
Blanking Distance: 76.11 cm
Overall Distance : 120 cm

Ramge	Head	Cal.Output		Actual (local)		Actual
%	cm	mA	L/sec	mA	L/sec	Remote m3/sec
0	0	4	0	4.03	0	0
8.13	9.14	5.3	130	5.5	141	0.14
16.188	13.72	6.5	250	6.35	243	0.24
21.875	16.76	7.5	350	7.57	356	0.36
31.875	21.34	9.1	510	9.23	522	0.52
61.25	32.00	13.8	980	13.81	982	0.98
95.625	42.68	19.3	1530	19.88	1576	1.58
100	43.43	20	1600	20.13	1608	1.6

	Make	Model
Aux.. Equipment Used :	Target Transducer	XRS-5C SIEMENS MILTRONICS
	Milltronics Programmer	OCM-3

General comments: Parshall Flume cleaned and inspected, check zero readings, still have flow of 35 litres per seconds due to Gate Leakage.

Checked By : Lam Chu and Peter Wang

Highland Creek Treatment Plant
Inflow measurement
Calibration Report

Date: 05/17/2016
Type: Parshall Flume , Ultrasonic Flow Transd.
Location: Old Plant, Primary 5-8
Instrument No. PRM-FIT-5002
Temperature Compensation : Yes
Exponential Factor: U = 1.550

Maximum Head : 79.43 cm
Range: 0-1000 litres /sec
Output : 4-20 mA
Throat size : 2 Feet
Blanking Distance: 57.07 cm
Overall Distance : 136.5cm

From wall	Rarnge %	Head cm	Cal.Output mA	L/sec	Actual (local) mA	L/sec	Actual Remote m3/sec
53 6/8"	0	0	4	0	4	0	0
45 7/8"	11	19.81	5.76	110	5.63	103	0.1
41 6/8"	22	30.48	7.52	220	7.35	214	0.21
38"	34	39.62	9.44	340	9.23	330	0.33
30 2/8"	64	59.57	14.24	640	13.72	613	0.61
29 6/8"	66	60.96	14.56	660	14.30	634	0.63
22 3/8"	100	79.43	20	1000	19.58	975	0.98

	Make	Model
Aux.. Equipment Used :	Target Transducer	XRS-5C SIEMENS MILTRONICS
	Milltronics Programmer	OCM-3

General comments: Zero Flow at meter reading is 21/sec due to Gate Leakage

Checked By : Lam Chu and Frank Gao

Highland Creek Treatment Plant
Inflow measurement
Calibration Report

Date: 05/17/2016
Type: Parshall Flume , Ultrasonic Flow Transd.
Location: Old Plant, Primary 5-8
Instrument No. PRM-FIT-5003
Temperature Compensation : Yes
Exponential Factor: U = 1.550

Maximum Head : 79.43 cm
Range: 0-1000 litres /sec
Output : 4-20 mA
Throat size : 2 Feet
Blanking Distance: 57.07 cm
Overall Distance : 136.5cm

From wall	Rarnge %	Head cm	Cal.Output mA	L/sec	Actual (local) mA	L/sec	Actual Remote m3/sec
53 6/8"	0	0	4	0	4	0	0
45 7/8"	11	19.81	5.76	110	6.11	126	0.13
41 6/8"	22	30.48	7.52	220	7.69	231	0.23
38"	34	39.62	9.44	340	9.53	350	0.35
30 2/8"	64	59.57	14.24	640	14.33	645	0.65
29 6/8"	66	60.96	14.56	660	14.68	674	0.67
22 3/8"	100	79.43	20	1000	20.06	1007	1.0

	Make	Model
Aux.. Equipment Used :	Target Transducer	XRS-5C SIEMENS MILTRONICS
	Milltronics Programmer	OCM-3

General comments: Zero Flow at meter reading is 13/sec due to Gate Leakage

Checked By : Lam Chu and Frank Gao

Highland Creek Treatment Plant
Inflow measurement
Calibration Report

Date: 10/15/2016
Type: Parshall Flume , Ultrasonic Flow Transd.
Location: Old Plant, Primary 5-8
Instrument No. PRM-FIT-5002
Temperature Compensation : Yes
Exponential Factor: U = 1.550

Maximum Head : 79.43 cm
Range: 0-1000 litres /sec
Output : 4-20 mA
Throat size : 2 Feet
Blanking Distance: 57.07 cm
Overall Distance : 136.5cm

From wall	Rarnge %	Head cm	Cal.Output mA	L/sec	Actual (local) mA	L/sec	Actual Remote m3/sec
53 6/8"	0	0	4	0	4	0	0
45 7/8"	11	19.81	5.76	110	5.77	110	0.11
41 6/8"	22	30.48	7.52	220	7.5	219	0.22
38"	34	39.62	9.44	340	9.4	336	0.34
30 2/8"	64	59.57	14.24	640	14.22	638	0.64
29 6/8"	66	60.96	14.56	660	14.57	661	0.66
22 3/8"	100	79.43	20	1000	19.53	963	0.96

	Make	Model
Aux.. Equipment Used :	Target Transducer	XRS-5C SIEMENS MILTRONICS
	Milltronics Programmer	OCM-3

General comments: Zero Flow at meter reading is 15/sec due to Gate Leakage

Checked By : Lam Chu and Frank Gao

Highland Creek Treatment Plant
Inflow measurement
Calibration Report

Date: 10/15/2016
Type: Parshall Flume , Ultrasonic Flow Transd.
Location: Old Plant, Primary 5-8
Instrument No. PRM-FIT-5003
Temperature Compensation : Yes
Exponential Factor: U = 1.550

Maximum Head : 79.43 cm
Range: 0-1000 litres /sec
Output : 4-20 mA
Throat size : 2 Feet
Blanking Distance: 57.07 cm
Overall Distance : 136.5cm

From wall	Rarnge %	Head cm	Cal.Output mA	L/sec	Actual (local) mA	L/sec	Actual Remote m3/sec
53 6/8"	0	0	4	0	4	0	0
45 7/8"	11	19.81	5.76	110	5.8	114	0.11
41 6/8"	22	30.48	7.52	220	7.55	223	0.22
38"	34	39.62	9.44	340	9.21	325	0.33
30 2/8"	64	59.57	14.24	640	14.16	633	0.63
29 6/8"	66	60.96	14.56	660	14.55	658	0.66
22 3/8"	100	79.43	20	1000	20.01	998	1.0

	Make	Model
Aux.. Equipment Used :	Target Transducer	XRS-5C SIEMENS MILTRONICS
	Milltronics Programmer	OCM-3

General comments: Zero Flow at meter reading is 18/sec due to Gate Leakage

Checked By : Lam Chu and Frank Gao

Highland Creek Treatment Plant
Inflow measurement
Calibration Report

Date: 12/17/2016
Type: Parshall Flume , Ultrasonic Flow Transd.
Location: Phase 1 Primary 9-10
Instrument No. PRM-FIT-5112
Temperature Compensation : Yes
Exponential Factor: U = 1.587

Maximum Head : 58.67
Range: 0-1600 litres /sec
Output : 4-20 mA
Throat size : 5 Feet (152.4 c.m)
Blanking Distance: 60.87 cm
Overall Distance : 119.787cm

Rarnge	Head	Cal.Output		Actual (local		Actual
%	cm	mA	L/sec	mA	L/sec	Remote
						m3/sec
0	0	4.01	0	4.03	4	0
8.25	12.19	5.32	132	5.36	135	0.14
22.44	22.86	7.59	359	7.64	365	0.37
32.57	28.96	9.21	521	9.87	531	0.53
60.38	42.88	13.66	966	14.03	989	0.99
98.13	57.91	19.7	1570	19.83	1588	1.59
100	58.67	20	1600	20.05	1608	1.61

	Make	Model
Aux.. Equipment Used :	Target Transducer	XRS-5C SIEMENS MILTRONICS
	Milltronics Programmer	OCM-3

General comments: Parshall Flume cleaned and inspected, check zero readings, still have flow of 36 litres per seconds due to Gate leakage

Checked By : Lam Chu and Frank Gao

Appendix G

Effluent Suspended Solids Action Plan

Correspondence

TORONTO

Toronto Water
Wastewater Treatment

Martin Shigeishi, P. Eng
Plant Manager
Highland Creek Treatment Plant
Tel: 416 392-4762
Fax: 416 392-2362
mshigeis@toronto.ca

April 20th, 2005

Mr. Raymond Valentine
Senior Environmental Officer
Ministry of the Environment
Central Region
Toronto District Office
5775 Yonge Street
8th Floor
Toronto, Ontario
M2M 4J1

RE: Highland Creek Treatment Plant - Effluent Suspended Solids Compliance

Dear Mr. Valentine:

Further to the discussions that occurred last year, this report outlines the cause and identifies the projects that have been initiated to help achieve continuous compliance with respect to the effluent suspended solids concentration at the Highland Creek Treatment Plant. For 2004, the annual average daily concentration and loading rate of effluent suspended solids at the Highland Creek Treatment Plant were 29 mg/L and 4721 kg/day respectively.

Root Cause

The solids inventory in the plant had been high in the month of December 2003. However, this situation was being managed and by the end of December, solids concentrations were returning to normal levels. Unfortunately the adverse weather conditions that occurred throughout the month of January 2004 caused some of the clarifier mechanisms in the Final Settling Tanks to freeze periodically and fail. Despite the ongoing physical efforts to manually break the ice that was forming on the clarifier surfaces, poor solids capture resulted. Compounding this situation was the fact that the Sludge Disposal Building was shut down for three consecutive days from January 14th to 16th inclusive, which caused the solids inventory to increase once again. Other operational problems in the Sludge Disposal Building, mainly related to aging dewatering and incineration equipment, occurred on February 17th to 19th, March 10th, April 26th, May 19th, August 12th, November 22nd and December 21st and 22nd. Together, these process interruptions resulted in lost throughput totaling approximately 395 dry tonnes. During these times, this sludge remained in our primary clarifiers and overloaded the secondary treatment. Consequently, the characteristics of the mixed liquor varied and the final effluent quality was prone to periods of poor settling.

Action Plan

There are a number of actions presently in place, both long term and short term, to help achieve continuous compliance with respect to the effluent suspended solids concentration in the future. These include the following:

1. **Biosolids & Residuals Master Plan (BRMP)**
   The preferred plant strategy to manage the Highland Creek Treatment Plant biosolids is to continue with the on-site incineration and replace the existing multiple hearth incinerators with fluidized bed units. The implementation plan, as outlined in the City of Toronto Biosolids & Residuals Master Plan Executive Summary (September 2004), was to initiate the design and construction in 2005, with completion within 4 to 6 years. The 30-day public review period for this master plan, required under the Class Environmental Assessment Master Planning process, was scheduled to close on September 16th, 2004 but has been extended to late in 2005. Until the public review is complete, the BRMP cannot be brought to the Works Committee of City Council for approval and the implementation cannot begin.

2. **Additional Sludge Dewatering Capacity**
   Our Capital Budget presently includes approved funding to install two (2) new dewatering centrifuges in the Sludge Disposal Building. The technical specification for these units has been completed and they will be purchased in 2005. A separate installation contract will be tendered early in 2006 and completed in early 2007.

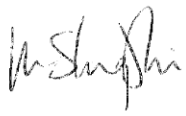
3. **Waste Activated Sludge Thickening Improvements**
   Our Capital Budget presently includes approved funding to install Waste Activated Sludge (WAS) thickening centrifuges in place of the decommissioned Dissolved Air Flotation Tanks. Despite study recommendations received from a consulting engineer to continue co-settling the WAS in the primary clarifiers and optimize performance, we believe that separate handling of the WAS will improve plant performance in a more consistent manner. Modifications and other preparatory work in the existing building will begin this year along with the development of the technical specifications for the thickening centrifuges. The centrifuge units will then be purchased in 2006. A separate installation contract will be tendered early in 2007 and completed in 2008. In the meantime, we will continue to co-settle in the primary clarifiers and optimize the performance where possible.

4. **Optimization of Anaerobic Digestion Tanks**
   The four new anaerobic digestion tanks are in service and the commissioning activities are nearly complete. We will be monitoring the operation closely in order to optimize the process performance and determine whether the solids reduction is having a positive impact on our ability to effectively manage the sludge disposal given the current incineration and dewatering equipment.

5. **Incineration Operation**
   Normally, one incinerator is in service while the other unit is out of service for maintenance. Where possible, our strategy to help reduce high sludge inventory has been to extend the overlapping run times when one unit is being taken out of service and the other is being brought into service. This strategy of increasing the throughput is limited however, given the age and condition of the incinerators and related ancillary equipment. We are not always able to achieve extended periods of overlapping operation due to maintenance requirements.

If you require any additional information, please call me at (416) 392-4762.

Yours truly,



M. Shigeishi, P. Eng
Plant Manager
Highland Creek Treatment Plant

cc. L. Di Gironimo, Director – Wastewater Treatment

Ontario

Ministry of the Environment
Central Region
Toronto District Office

Ministère de l'Environnement
Région du Centre
Bureau de district de Toronto

5775 Yonge St.
8th Floor
Toronto, Ontario
M2M 4J1

Tel. (416) 326-6700
Fax (416) 325-6346

5775, rue Yonge
8e étage
Toronto (Ontario)
M2M 4J1

June 13, 2005

Toronto Works & Emergency Services
Toronto Water - Wastewater Treatment
Highland Creek Treatment Plant
51 Beechgrove Drive
Toronto, Ontario M1E 3Z3

Attention: Mr. Martin Shigeishi, P. Eng.
Plant Manager

Dear Mr. Shigeishi:

Re: Highland Creek Treatment Plant - Effluent Suspended Solids Compliance

Thank you for your letter of April 20, 2005, identifying the causes of, and the Action Plan to deal with, the exceedence of the suspended solids limit for 2004 in the plant effluent.

The annual average final effluent suspended solids limit of 25 mg/l in Certificate of Approval No.1477-595KKC, was exceeded by an annual average for 2004 of 29 mg/l.

This constitutes a contravention of Section 53(5) of the Ontario Water Resources Act, which states,

> No person shall use or operate sewage works for which an approval is required under subsection (1) unless the required approval has been granted and complied with.

It is the Ministry's intention to enshrine the City's Action Plan in a voluntary compliance program. In consideration that the time horizons for the items in the Action Plan are in terms of years, it is therefore required that copies of:

a) your April 20, 2005 letter to me,

b) this letter to you, and

.../2

c) annual progress reports on each item in the Action Plan be bound in future Annual Reports for the Highland Creek Treatment Plant, until all the action items have been completed.

The items identified in the Action Plan are:

1. **Biosolids and Residuals Master Plan (BRMP)**
   Continuation of on-site incineration and replacement of the existing multiple hearth incinerators with fluidized bed units, as proposed in the Biosolids and Residuals Master Plan, and to be ratified by City Council.

2. **Additional Sludge Dewatering Capacity**
   Purchase and installation of two (2) new dewatering centrifuges in the Sludge Disposal Building.

3. **Waste Activated Sludge Thickening Improvements**
   Building modifications, purchase, and installation of Waste Activated Sludge thickening centrifuges.

4. **Optimization of Anaerobic Digestion Tanks**
   Completion of commissioning of the new anaerobic digestion tanks, and optimization of process performance.

5. **Incineration Operation**
   Extension of overlapping of run times for the existing incinerators, as far as practicable. (Reported as a percentage of the year when overlapping occurred)

I look forward to receiving your letter of acknowledgment and intention to comply with the terms of this voluntary compliance program, by June 30, 2005.

Thank you for your attention to this matter.

Yours truly,

R. Valentine

Ray Valentine
Senior Environmental Officer

cc. K.Willson - MOE, TDO