

HUMBER TREATMENT PLANT 2023 Annual Report



April 2, 2024

EXECUTIVE SUMMARY

The Humber Treatment Plant (HTP) is one of four wastewater treatment facilities operated by the City of Toronto. This facility, located at 130 The Queensway, has a rated capacity of 473,000 m³/day or 473 ML/day, and serves an equivalent population of approximately 662,000. Humber Treatment Plant discharges into Lake Ontario and operates under Amended Environmental Compliance Approval No. 9032-ABZNYQ, issued on July 21, 2016.

The average daily flow rate in 2023 was 281.1 ML/day. Influent concentrations of Biochemical Oxygen Demand (BOD), Total Phosphorus (TP) and Total Suspended Solids (TSS) averaged 247.3 mg/L, 5.2 mg/L and 350.1 mg/L, respectively.

Humber Treatment Plant achieved the following effluent quality and loading rates in 2023 in comparison to ECA limits:

Parameter	ECA ¹	2023 Final Effluent
Total Suspended Solids (TSS)	25.0 mg/L	13.9
Carbonaceous Biochemical Oxygen Demand (CBOD ₅)	25.0 mg/L	6.7
Total Phosphorus (TP)	1.0 mg/L	0.6
Escherichia Coli (E. Coli) ²	200 CFU/100mL	34.3
рН	6.0-9.5	6.56
Total Residual Chlorine (TRC) (Dechlorination)	0.02 mg/L	0.006
TP Loading Rate	473.0 kg/day	179.2

¹ Referenced from Condition 6 and 7 of ECA No. 9032-ABZNYQ, issued on July 21, 2016.

² Arithmetic mean of monthly geometric mean data.

The Humber Treatment Plant observed no compliance exceedances in the year 2023.

Sludge generated at the Humber Treatment Plant is transferred to the Ashbridges Bay Treatment Plant via the Mid-Toronto Interceptor (MTI) for further treatment and disposal. During 2023, an average of 3,468 m³/day of waste activated sludge was removed from the system. Of this, 2568 m³/day was thickened and stabilized prior to transfer and 900 m³/day was transferred directly. An average of 71.56 dry tonnes of biosolids and waste activated sludge was transferred per day.

Ferrous chloride consumption for phosphorus removal totalled 377.6 tonnes as iron (Fe). There was no polymer consumption for waste activated sludge (WAS) thickening. Total sodium hypochlorite (12% w/v) consumption for disinfection totalled 3639.5 m³. Sodium Bisulphite (SBS) (38% w/w) consumption for effluent dechlorination totalled 527.9 tonnes.

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There were 17 bypass occurrences in 2023 where each occurrence received preliminary, primary treatment, nutrient removal, as well as disinfection and dechlorination before being blended with fully treated plant effluent and exiting the plant through the plant outfall, upstream of the final effluent sampling point.

The plant continued with various capital projects. Notable projects included: Secondary Treatment Upgrades, Operations Centre Upgrades, Digesters 2 and 3 Upgrades and Repair, HVAC Upgrades, Primary Pumping and Scum Systems Upgrades, Security Upgrades, Gas Compressor Project, Collector Replacement Project, Biofilter Study, Blower Upgrades, Preliminary Treatment Improvements, and Plant Rehabilitation and Services Upgrades. A variety of scheduled, preventative, predictive and reactive maintenance activities was performed, including annual calibration of effluent monitoring equipment.

Total annual consumption of potable water, hydro, and natural gas was 426,381 m³, 48.6 M kWh, and 2.1 M scm, respectively. Direct operating cost for 2023 totalled \$21.8 M. In 2023, the Humber Treatment Plant had a staffing compliment of 62 employees. As of December 31st, 2023, there was 9 health and safety incidents and 11 lost time days due to work related injuries in 2023.



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GLOSSARY OF ABREVIATIONS

AAC	Annual Average Concentration
BOD5	Five-Day Biochemical Oxygen Demand
CBOD5	Five-Day Carbonaceous Biochemical Oxygen Demand
CEU	Continuing Education Units
CFU	Colony Forming Units
DAF	Dissolved Air Flotation
E. Coli	Escherichia Coli
ECA	Environmental Compliance Approval
Fe	Iron
НТР	Humber Treatment Plant
HRT	Hydraulic Retention Time
kg	kilogram
kWh	Kilowatt-hour
MAC	Monthly Average Concentration
MGMD	Monthly Geometric Mean Concentration
m3	Cubic metre
m3 /day	Cubic metre per day
mg/L	Milligrams per litre
mL	Millilitre
ML	Megalitre (million litres)
MECP	Ministry of the Environment, Conservation and Parks
O/S	Out of Service
Q	Flow Rate
RAS	Return Activated Sludge
SBS	Sodium Bisulphite
scm	Standard Cubic Meters
SS	Suspended Solids
TRC	Total Residual Chlorine
ТР	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
% w/v	Percent concentration of components of a solution expressed as weight by volume
% w/w	Percent concentration of components of a solution expressed as weight by weight

Definitions

Bypass: A bypass is defined as a diversion of sewage around one or more-unit processes within the plant with the diverted sewage flows being returned to the plant treatment train upstream of the final effluent sampling location, and discharging to the environment through the plant outfall.

Overflow: An overflow is defined as a discharge to the environment from the plant at a location other than the plant outfall downstream of the final effluent sampling station.

Spill: A spill is defined within the meaning of Part X of the Environmental Protection Act. "Spill", when used in reference to a pollutant, means a discharge,

- a) into the natural environment,
- b) from or out of a structure, vehicle or other container, and
- c) that is abnormal in quality or quantity in light of the discharge.

Abnormal Discharge: A discharge of a pollutant designated by the regulations at a location designated by the regulations shall be deemed to be in a quantity or with a quality abnormal at the location. R.S.O. 1990, c. E.19, s. 91 (2).

$$Loading\left(\frac{kg}{day}\right) = Concentration\left(\frac{mg}{L}\right) \times Flow\left(\frac{ML}{day}\right)$$

Percent Removal (%) = $1 - \frac{Concentration (Final)}{Concentration (Initial)}$

Aeration Loading =
$$\left(\frac{kg \ cBOD}{m^3 \ aeration \ capacity}\right) = \frac{(Q_{Primary \ Effluent} + Q_{RAS}) \times [cBOD_{5}_{primary \ effluent}]}{V_{aeration \ Tanks}}$$

Solids Capture (%) = $\frac{Centrifuge Feed TS - Centrate TSS}{Centrifuge Feed TS} \times 100$



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1 INTRODUCTION

The Humber 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 130 The Queensway, on the border of the old City of Toronto and former City of Etobicoke near the mouth of the Humber River. This area contains an estimated connected population of 662,000¹. The Humber Treatment Plant has a rated capacity of 473,000 m³ per day or 473 ML/day.

Major treatment processes and equipment include screening and grit removal, 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 stabilization by anaerobic digestion. The solids stabilized in these processes are primary (or raw) sludge as well as waste activated sludge thickened using high speed centrifuges. Treated effluent is discharged to Lake Ontario. Sludge (stabilized and non-thickened waste activated sludge) is transferred to the Ashbridges Bay Treatment Plant for disposal via the Mid-Toronto Interceptor (MTI). Numerous auxiliary systems are required for the proper operation of plant processes and include potable water, process water, HVAC, SCADA, electrical power distribution, natural gas, and instrument air. Odour control is achieved by treating air through biofilters and granular activated carbon (GAC) filters located throughout the plant.

The Ministry of the Environment, Conservation and Parks (MECP) has classified the Humber Treatment Plant as a Class IV wastewater treatment facility under Regulation 129/04. The facility operates under Amended Environmental Compliance Approval No. 9032-ABZNYQ (July 21, 2016).

This report is a summary of plant operations and performance in 2023. Highlights of the report include a discussion of effluent quality and summaries of plant operations and maintenance, chemical and utility consumption, capital projects, operational costs and human resources.

¹ Population estimated by sewershed delineation using 2021 census data

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2 PLANT PROCESS OVERVIEW

A description of the plant process is included below. A Plant process flow diagram is available in Appendix A. Additional information regarding the plant process can be found on the City of Toronto website².

2.1 Influent

Wastewater from the Queensway Sanitary Trunk Sewer and Humber Sanitary Trunk Sewer flows to the plant to a common influent channel. A portion of the Humber Treatment Plant sewershed consists of combined sanitary and storm sewers, causing plant influent to be sensitive to wet weather events.

2.2 Preliminary Treatment

Raw wastewater enters the Headworks for grit and screenings removal. Bar screens with 12 mm openings remove rags and debris. Ferrous chloride is applied to the distribution conduits to the Grit system for the first stage of phosphorous removal. Grit is removed in grit vortex chambers and aerated grit channels. The removed grit and screenings are hauled to a sanitary landfill site.

2.3 Primary Treatment

Primary Treatment occurs in the Primary Clarification Tanks, where the flow velocity of the wastewater is reduced to allow heavier solids to settle to the bottom and lighter solids float to the top. There are 11 Primary Clarification Tanks. Sludge collectors in the tanks sweep the settled sludge, called primary or raw sludge, into sludge hoppers. Floating solids called scum are collected from the top of the water and swept into scum hoppers. The primary sludge and scum is then pumped out for further treatment and the wastewater, called primary effluent, continues onto secondary treatment.

2.4 Secondary Treatment

The primary effluent receives secondary treatment through a conventional, suspended biomass activated sludge process in the Aeration Tanks. The mixed liquor consists of primary effluent mixed with return activated sludge (RAS), which is removed from the Final Clarification Tanks and contains micro-organisms that naturally occur in wastewater and facilitate its degradation. In the presence of oxygen, these micro-organisms break down organic material in the wastewater. Air is supplied to the Aeration Tanks through nine electrically driven blowers. There are a total of

² <u>https://www.toronto.ca/services-payments/water-environment/managing-sewage-in-toronto/wastewater-treatment-plants-and-reports/</u>



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eight Aeration Tanks each equipped with fine bubble dome diffusers. Ferrous chloride is applied at the end of the aeration tanks prior to the Final Clarification Tanks for the second and final stage of phosphorous removal.

The mixed liquor from the Aeration Tanks flows to 21 Final Clarification Tanks, where the Activated Sludge is allowed to settle. A controlled quantity of this sludge is returned to the Aeration Tanks as RAS in order to maintain a sufficient biomass concentration. The excess is removed as Waste Activated Sludge (WAS) and thickened using centrifuges.

2.5 Final Effluent

Sodium Hypochlorite is used to disinfect and kill pathogens in the final effluent. Sodium Bisulphite (SBS) is added after disinfection to remove excess chlorine (dechlorinate) from the wastewater; helping to protect the aquatic environment. The final effluent is discharged to Lake Ontario. The plant uses direct measurement of Total Residual Chlorine (TRC), in the final effluent for monitoring and compliance.

2.6 Solids Handling

Primary sludge and scum, from the Primary Clarification Tanks, is first fed into primary anaerobic digesters. Secondary sludge (WAS), from the Secondary Clarification Tanks, is thickened through centrifugation before it is also fed into primary digesters, where it undergoes the same process as primary sludge. Centrifugation reduces the volume of sludge by separating solids from liquid. The Thickening process consists of seven centrifuges. WAS may also be pumped directly to the Ashbridges Bay Treatment Plant via the MTI.

Anaerobic digestion is the biological degradation (stabilization) of organic materials (sludge and scum) in the absence of oxygen – it reduces volume of solids, destroys pathogens and mitigates sludge odour. The process produces digester gas, made up predominantly of methane. This gas is used as a supplementary fuel for plant needs, including process and space heating and the generation of electricity via two cogeneration engines, thereby reducing the plant's operating costs and carbon footprint. The digesters are operated in the mesophilic temperature range (34 – 38° C). The target operating temperature for the digesters is 36° C.

The resulting anaerobically digested sludge (biosolids) is subsequently transferred to the secondary digesters for storage, until it is ultimately transferred to the Ashbridges Bay Treatment Plant via the MTI for further treatment.



3 PROCESS SUMMARY

3.1 Process Parameters

In 2023, the Humber Treatment Plant continued to produce a high-quality effluent. A summary of key final effluent parameters against the ECA objectives and limits are shown in Table 1. Regulated parameters are highlighted. Influent and effluent performance charts are available in Appendix B. Historical performance data is included in Appendix C.

Parameter	cBOD₅ (mg/L)	TSS (mg/L)	TP (mg/L)	Chlorine Residual (mg/L)	e E-Coli al (count/100mL)		рН Мах
January	7.6	15.1	0.5	0.01	45	6.1	7.1
February	10.3	20.4	0.6	0.01	58	6.1	7.1
March	7.6	12.9	0.4	0.00	76	6.1	6.8
April	6.3	12.5	0.4	0.01	32	6.2	7.0
Мау	6.1	11.2	0.5	0.01	17	6.4	7.0
June	8.4	20.4	0.8	0.00	46	6.1	6.8
July	7.1	17.7	0.7	0.01	11	6.3	6.8
August	5.7	12.0	0.8	0.01	12	6.4	6.9
September	5.9	12.3	0.9	0.01	3	6.4	6.8
October	5.3	15.7	0.9	0.01	23	6.1	6.8
November	4.6	8.2	0.5	0.00	10	6.2	6.8
December	5.4	8.7	0.5	0.00	78	6.3	7.0
Annual Average	6.7	13.9	0.6	0.01	35	6.6	
Loading ¹ (kg/d)	1881	3915	179.2	N/A	N/A	N/A	N/A
Removal Efficiency²(%)	97%	96%	88%	N/A	N/A	N/A	N/A
ECA Requirements ^{3, 4,}							
Effluent Objective	ACC: 15.0 mg/L	ACC: 15.0 mg/L	MAC: 0.9 mg/L	MAC: Non- detectable	MGMD: 150 CFU/100 mL	6.5	- 8.5
Effluent Limit	ACC: 25.0 mg/L	ACC: 25.0 mg/L	MAC: 1.0 mg/L	MAC: 0.02 mg/L	MGMD: 200 CFU/100 mL	6.0 - 9.5	
Effluent Loading Limit	-	-	473 kg/day	N/A	N/A	N	/A

¹Loading is calculated based on the flow rates as provided in Table 2.

² CBOD = 0.8 * BOD assumed for removal efficiency calculations

⁴AAC refers to Annual Average Concentration, MAC refers to Monthly Average Concentration, MGMD refers to Monthly Geometric Mean Density, and AAL refers to Annual Average Daily Loading.

³ Referenced from Amended Environmental Compliance Approval No. 9032-ABZNYQ, issued on July 21, 2016.



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Influent and Final effluent concentrations of 11 select heavy metals have been included in Appendix D. Any discharge into City sewers must meet the sewer use By-law limits. Final effluent concentrations are presented to assess the treatment plant's removal capacity.

A summary of the annual averages of process parameters over the past three years are shown in Table 2.

Table 2: Process Summary

Parameter	Units	2023	2022	2021					
Influent Parameters									
Flow ¹	ML/day	281.1	255.6	249.9					
Total Annual Flow	ML	102,591	93,312	91,204					
Total Suspended Solids (TSS)	mg/L	350.1	386.3	366.3					
Biological Oxygen Demand (BOD)	mg/L	247.3	279.4	287.2					
Total Phosphorus (TP)	mg/L	5.2	5.3	5.2					
Preliminary Treatment									
Grit and Screenings	Tonnes/day	2.8	2.8	2.9					
Primary Treatment			•	<u>.</u>					
TSS	mg/l	109.8	105.7	103.6					
cBOD5	mg/L	125.5	151.3	162.8					
Secondary Treatment									
Aeration Loading	kg CBOD⁵/m ^{3.} day	0.38	0.42	0.44					
Mixed Liquor Suspended Solids	mg/L	3321	3734	3405					
Solids Handling									
Primary Sludge Treated	m³/day	2,474	2,241	2,169					
Primary Sludge TS	%	1.9	2.2	2.0					
Primary Sludge TVS	%	70.1	73.6	73.5					
WAS to Thickening	m³/day	2,568	5,609	5,011					
WAS transferred to Ashbridges Bay	DT/day	8	2	4					
Biosolids Transferred to Ashbridges Bay	DT/day	64	70	53					
Biosolids TS	%	1.97	2.27	1.75					
WAS SS	mg/L	8,677	7,839	8,357					
TWAS TS	%	3.4	4.4	3.4					
TWAS TVS	%	78.7	79.2	77.6					
TWAS Treated	m³/day	476	680	674					
Volume to Digestion	m³/day	2950	2,921	2,843					
Digester Hydraulic Retention Time	days	12.8	13.0	13.3					
Organic Loading to Digesters	TVS/m ³ /day	1.5	1.9	1.6					
Digester Gas Volume	m³/day	31,616	31,640	27,750					

¹Flow monitoring is provided by influent flow meters. There are no effluent flow meters due to infrastructure limitations. There is no appreciable difference between influent and effluent flow rates at the Humber Treatment Plant.



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Influent flow to the Humber Treatment Plant increased by 9.9% in 2023. The influent quality improved slightly – TSS, BOD, TP, and TKN decreased by 9.4%, 11.5%, 1.7%, and 4.5% respectively.

Final effluent annual average concentration for cBOD, TSS, and TP were 6.7 mg/L, 13.9 mg/L, and 0.6 mg/L, respectively, and met the compliance limits specified in Condition 7 of the ECA throughout 2023. The final effluent annual average for e. Coli monthly geometric mean density in 2023 was 34.3 CFU/100 mL. Final effluent pH remained between the range of 6.0 - 9.5 throughout the course of 2023.

The Humber Treatment Plant encountered no chronic operating problems and continued to produce quality effluent through the continued improvement of operations and maintenance of treatment processes.

3.2 Biosolids Management

All sludge generated at the Humber Treatment Plant is transferred to the Ashbridges Bay Treatment Plant for further treatment. The sludge generated (WAS and biosolids) during 2023 averaged 4,143.5 m³/day (71.6 dry tonnes per day). The quantity of sludge generated in 2024 is anticipated to be +/- 5% of the 2023 value. A summary of the digested sludge parameter analysis is included in Appendix E.



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3.3 Chemical Usage

Several chemicals are used during the treatment process at the plant. Table 3 outlines the chemical consumption for the current and previous years. Costs listed are plus applicable taxes. The unit cost for sodium hypochlorite increased substantially in 2023 compared to previous years.

Process		Chemical	2023	2022	2021
	Ferrous Chloride as Fe	Dosage as Fe (mg/L)	3.7	3.8	3.9
Phosphorus		Consumption (tonnes as Fe)	377.6	356.6	353.4
Removal		Cost (\$)	460,700	388,728	385,218
	Sodium Hypochlorite (12% w/v)	Dosage as Cl (mg/L)	4.73	4.49	4.49
Disinfection		Consumption (m3)	3639.5	3139.6	3070.3
		Cost (\$)	3,603,112	636,091	501,076
Dechlorination	Sodium Bisulphite (38 w/w)	Dosage (mg/L)	1.96	3.10	3.26
		Consumption (tonnes)	527.9	760.9	782.6
		Cost (\$)	200,603	193 <i>,</i> 876	169,035

Table 3: Chemical Usage and Chemical Cost Summary

3.4 Bypasses, Overflows, Spills, and Abnormal Discharge Events

3.4.1 Bypasses

There were 17 secondary bypass events in 2023. The total volume of bypass flow was 848.5 ML, or 0.91 % of the annual flow. A bypass is defined as a diversion of sewage around one or more unit processes within the plant with the diverted sewage flows being returned to the plant treatment train upstream of the final effluent sampling location, and discharging to the environment through the plant outfall. All bypass flow received preliminary, primary treatment, nutrient removal, as well as disinfection and dechlorination and exited the plant through the plant outfall upstream of the final effluent sampling point. Each instance was reported to the MECP Spills Action Center and recorded into the plant's monthly report. Secondary bypasses occur due to high wet weather flows that exceed the plant's secondary treatment capacity. Total precipitation in the Toronto area³ was 727.5 mm in 2023, virtually no change from 2022.

³ Adapted from <u>http://climate.weather.gc.ca/historical_data/search_historic_data_e.html</u>, Toronto City Station



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Table 4: Bypass Summary

Date	Start of Event	End of Event	Active Duration ¹ (hr)	Duration (hr)	Volume (m ³)
January 4,2023-January 5, 2023	19:03	1:05	6.0	6.0	72,890
February 9, 2023-February 10, 2023	11:50	1:15	13.4	13.4	65,174
March 17, 2023	11:15	22:22	11.1	11.1	67,795
March 25, 2023	11:45	23:28	11.7	11.7	112,948
April 1, 2023	3:20	14:24	11.1	11.1	41,006
April 5, 2023-April 6, 2023	8:05	0:30	12.4	16.4	101,625
April 22, 2023	12:45	15:20	2.6	2.6	12,894
April 30, 2023	15:32	20:20	4.8	4.8	28,012
May 7, 2023	14:35	18:07	3.5	3.5	37,390
June 12, 2023	9:50	19:40	9.8	9.8	235,572
June 26, 2023	12:38	12:44	0.1	0.1	312
June 27, 2023	17:25	19:50	2.4	2.4	13,421
July 13, 2023	4:47	9:25	3.8	4.6	15,249
July 23, 2023	15:47	17:12	1.4	1.4	3,462
July 27, 2023	3:33	6:10	2.6	2.6	19,203
July 29, 2023	11:20	14:35	3.3	3.3	19,604
September 7, 2023	15:57	16:42	0.80	0.8	1,926

¹ In wet weather the plant may bypass intermittently. The active duration is the period for which the bypass was actively occurring, whereas the duration is the total duration for the event.

3.4.2 Overflows

There were no overflow events at the Humber Treatment Plant in 2023. An overflow is defined as a discharge to the environment from the plant at a location other than the plant outfall or into the plant outfall downstream of the final effluent sampling station.

3.4.3 Spills

There were two spills reported to the MECP in 2023. A third gas leak was reported in Digester #5 in December 2023 but the vast majority of the spill, including emergency repairs, took place in January of 2024. A spill is defined within the meaning of Part X of the Environmental Protection Act.

No	Date	Duration (hr)	Volume (m ³)	Nature of event	Description
1	27-Jan-23	1.50	7,790	Digester Gas	Emergency valve repair (Digester 8)
2	17-Apr-23	1.17	3,755	Digester Gas	Emergency valve repair (Digester 10)

Table 5: Spills



3.4.4 Abnormal Discharge Events

There were two abnormal discharge events at the Humber Treatment Plant in 2023.

The first was a dechlorination interruption, where there were no exceedances to any of the limits specified in the ECA (monthly chlorine residual). The dechlorination dosing pumps failed, and there were delays getting the pumps back in service. During this period, there was intermittent addition of Sodium Bisulphite to the chlorinated effluent.

The second event was over-chlorination of effluent. This also did not result in exceedances to any of the limits specified in the ECA. There was an unplanned release of sodium hypochlorite from the spill containment tank into the outfall. This was a result of a miscommunication of between facility maintenance and the operator in charge. The release resulted in a dramatic spike in the concentration of chlorine residual, to which an adequate dose of sodium bisulphite was not applied.

Table 6: Abnormal Events

Νο	Date			Duration (hr)	Volume (m³)	Nature of event
1	14-Jun-23	5:40	6:35	0.92	11,282	Dechlorination Interruption
2	22-Feb-23	7:00	7:36	0.6	5,697	Over chlorination

3.5 Complaints

The Humber Treatment Plant investigated 2 complaints related to odour and 1 complaint related to noise. The odour complaints were received on October 1st and October 26th. During investigations, the causes of odours were traced and promptly addressed.

Additionally, there was a noise complaint on August 29. The cause of the noise complaint was investigated and discovered; the cause was addressed the following morning.

All complaints were recorded, investigated by Toronto Water Staff, reported to the MECP, and followed up on with the complainant.

A table of correspondence related to complaints can be found in Section 7.6.



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3.6 Effluent Quality Assurance and Control Measures

Analytical tests to monitor required parameters are performed by the Toronto Water Laboratory which is accredited to ISO/IEC 17025 by Canadian Association for Laboratory Accreditation Inc. Plant operation and performance is monitored by licensed operators as well as by the facility management team. Standard Operation Procedures, emergency plans, equipment preventative and predictive maintenance, and a network of support staff, help ensure a rapid and effective response to issues, and maintain the high quality of the effluent and biosolids. An Integrated Quality Management System emphasizing environmental, and health and safety objectives is also in the early implementation stages across Toronto Water and is expected to further standardize facility operations and improve facility performance.



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4 CAPITAL PROJECTS

Under Toronto Water's capital program, the Humber Treatment Plant commenced or continued with the capital works projects and studies listed in Table 6 in 2023.

Project Name	Project Description	Project Stage (Dec 31, 2023)
South Secondary	Refurbishment of south aeration system including expanded	Construction
Process Upgrades	return activated sludge pumping station, new plant water	
	pumping station, new phosphorus removal system.	
Primary Scum and	Upgrade of north primary treatment sludge and scum systems.	Construction
Sludge Upgrades		
TW Operations	Expansion of the operations centre to meet current and future	Construction
Centre	needs.	
Gas Compressor	Replacement of all gas compressors, refurbishment of gas	Design
Project	compressor building. Replacement of gas compressor electrical distribution	
Biofilter Study	Study regarding replacement and upgrades to Humber biofilters and odour scrubbers	Design
Digester 2&3 Upgrade and Repairs	Upgrades and repairs to Digesters 2 and 3.	Construction
Collector	Refurbishment and replacement of south primary collector	Design
Replacement	equipment	
Project		
Rehabilitation	A comprehensive project to rehabilitate and upgrade plant wide	Design
and Services	process and maintenance support services at the HTP. This will	
Upgrades	include, the plant hot water system, HVAC, digesters, sludge	
	thickening, south primary treatment, headhouse, north grit,	
	new maintenance shop, secondary treatment and other	
	miscellaneous required upgrades.	
Security Upgrades	Various plant wide upgrades to security including replacement	Construction
	of the exterior fence and CCTVs, upgrades to building access	
	control system and security network.	
Preliminary	Upgrades to odour control grit removal systems.	Design
Treatment		
Improvements		
Head House	Operational improvements to Head House conveyors.	Construction
Conveyors		
Modifications		
Blowers Upgrades	Upgrades to air blower system to increase process and cost efficiency.	Design

Table 7: Capital Projects



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5 MAINTENANCE

Staff from the Humber Treatment Plant performed a variety of scheduled, preventative, predictive and reactive maintenance activities on a diverse spectrum of equipment. Equipment availability and reliability ensures operational requirements are achieved.

The annual calibration and maintenance records of flow meters and on-line analysers for regulated parameters was completed in 2023 and found to be within acceptable limits. A summary of effluent monitoring equipment calibration and maintenance performed in 2023 is included in Table 7.

Table 8: Summary of Regulated Monitoring Equipment Calibration and Maintenance

Calibration and/or Maintenance Record	Completion Date
Influent Flow Meter THR-PLT-FIT-2001A - Verification	September 1, 2023
Influent Flow Meter THR-PLT-FIT-2003A – Verification	September 1, 2023
Influent Flow Meter THR-PLT-FIT-1012 – Verification	September 11, 2023
Effluent pH analyzer THR-EPS-AIT-0055 - Calibration	Weekly
Effluent temperature analyzer THR-EPS-TIT-0053 - Verification	Weekly
HACH DR3900 Spectrophotometer THR-ELS-INQ-3900 – Calibration	April 6, 2023
Effluent Autosampler THR-FT-SP-0001 - Calibration	Monthly
Influent Auto sampler THR-PLT-SP-0001 – Calibration	Monthly
Aeration Flow Meter- THR-AER-FIT-0105 - Verification	September 1, 2023
Aeration Flow Meter- THR-AER-FIT-0205 - Verification	September 1, 2023
Aeration Flow Meter- THR-AER-FIT-0305 - Verification	September 1, 2023
Aeration Flow Meter- THR-AER-FIT-0402 - Verification	September 1, 2023
Aeration Flow Meter- THR-AER-FIT-0505 - Verification	September 1, 2023
Aeration Flow Meter- THR-AER-FIT-0602 - Verification	September 1, 2023
Aeration Flow Meter- THR-AER-FIT-0702 - Verification	September 1, 2023
Aeration Flow Meter- THR-AER-FIT-0802 - Verification	September 1, 2023

In 2023, there were a total of 13, 381 work orders completed; refer to Appendix G for a summary of maintenance activities as per Conditions 10(6)(c) of the ECA. None of the maintenance activities undertaken at the plant fell under Limited Operational Flexibility; as a result, no Notices of Modifications were submitted to the Water Supervisor as per Condition 10(6)(j) of the ECA. Regular safety inspections and preventative maintenance was performed on the life safety systems at the plant in 2023.



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6 UTILITIES

A summary of monthly utility consumption for the previous three years at Humber Treatment Plant is provided in Figure 1. Table 8 below summarizes the total cost and average unit cost for water, hydro, and natural gas. Total annual consumption of potable water, hydro, and natural gas was 426,381 m³, 48.6 M kWh, and 2.1 M m³, respectively.



Figure 1: Annual Utility Consumption (Water, Hydro, Gas)

Table 9: Average	Unit and	Total	Utility	Cost
------------------	----------	-------	---------	------

Utility	2023	2022	2021
Water Unit Cost (\$/m ³)	\$4.62	\$4.30	\$4.35
Water Total Cost (\$/year)	\$1.97M	\$0.67M	\$0.69M
Hydro Unit Cost (\$/kWh)	\$0.10	\$0.10	\$0.09
Hydro Total Cost (\$/year)	\$4.88M	\$4.77M	\$4.22M
Natural Gas Unit Cost (\$/m³)	\$0.41	\$0.33	\$0.26
Natural Gas Total Cost (\$/year)	\$0.86M	\$0.81M	\$0.48M



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7 ADMINISTRATION

7.1 Operations and Maintenance Costs

The 2023 plant direct operational costs are broken down into five categories: Salaries and Benefits, Materials and Supplies, New Equipment, Services and Rents, and Inter-Divisional Charges. Materials and Supplies is further segregated into Utilities, Machine & Equipment Parts, Chemicals and Other Materials and Supplies. A breakdown of annual operations and maintenance costs for the past three years is illustrated in Figure 2. Overall, operational costs increased by 28.6% from 2022. Approximately 50% of the operational cost increase was due to an increase in the cost of sodium hypochlorite for disinfection.



Figure 2: Operations and Maintenance Cost Breakdown



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7.2 Human Resources

Plant Staffing at the Humber Treatment Plant in 2023 is shown in Table 9.

Table	10:	Plant	Staffina
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Position	Number of FTE ¹
Plant Manager	1
Senior Engineer	2
Engineer	1
Area Supervisors	4
Electrical & Instrumentation Specialist	1
Plant Technicians	16
Industrial Millwrights	22
Electrical Instrumentation Control Technicians	7
Wastewater Treatment Plant Workers	4
Support Assistant/Materials Management	3
Engineering Technologist	1
Total FTE Positions	62
	•

¹FTE refers to Full Time Equivalent staff. Seasonal staff are considered 0.5 FTE staff.

7.3 Occupational Health & Safety

Continuous efforts are made to ensure a safe working environment at the Humber 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 Humber Treatment Plant are included in Figure 3.

As of December 31, 2023, there was 9 health and safety incidents, and 11 lost time days due to work related injuries.



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Figure 3: Humber Treatment Plant Health & Safety Injury Summary

7.4 Staff Training and Development

The Strategic Planning and Workforce Development unit of Toronto Water facilitates a comprehensive training program for all staff.

Training attended by Humber Treatment Plant operations and skilled trades staff in 2023 includes the list of courses shown in Appendix H. Some of these courses were eligible for Continuing Education Units (CEU's) as specified by the Ontario Water and Wastewater Certification Office. Additional training related to the start-up and commissioning of new equipment/systems installed as part of the capital program was provided as required.

7.5 Utility Operator Certification

Toronto Water trains and provides the required resources to ensure all operators achieve and maintain Class IV certifications. In addition, all skilled trade positions are required to achieve and



maintain a Class I operator's licence. As part of this initiative, general operational/process training was delivered to prepare staff for any certification examination that they need to write. Table 10 summarizes the status of operator certification at the Humber Treatment Plant in 2023.

Table	11:	Wastewater	Treatment	Certificates
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Class Level	Number of Licenses
Class IV	14
Class III	1
Class II	5
Class I	21
0.I.T.	7
Total	48

7.6 MECP Correspondence

There were no orders issued by the Ministry of the Environment, Conservation and Parks.

Table 11 summarizes the correspondence submitted to the MECP for the Humber Treatment Plant. Correspondence related to spills and bypasses can be referenced in Section 3.4.

Table 12: Correspondence submitted to the MECP

Event Date Complaints	Туре	Description	Resolution	Resolution Date
August 29, 2023	Noise	Vacuum truck operating	Vac truck work finished the next day	August 30, 2023
October 1, 2023	Odour	Open lids on south aeration tanks	Lids were closed within the hour of complaint	October 1, 2023
October 26, 2023	Odour	Aeration tank #1 hatches were open	Hatches were closed after an inspection	October 28, 2023



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APPENDIX A – Plant Schematic





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APPENDIX B – Influent and Effluent 2023 Performance Charts









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APPENDIX C – Historical Performance Data

	Units	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
Influent Parameters													
Flow	ML/day	281.07	255.65	249.88	371.45	313.88	286.07	331.70	257.30	269.00	280.50	312.00	287.50
Total Annual Flow	ML	102,591	93,312	91,204	135,952	114,566	104,417	121,062	94,168	98,174	102,364	113,709	105,444
Total Suspended Solids (TSS)	mg/L	350.08	386.33	366.25	308.75	293.26	280.75	301.20	331.00	369.00	356.00	318.00	405.00
Biochemical Oxygen Demand (BOD₅)	mg/L	247.33	279.42	287.17	254.79	247.57	247.83	255.20	299.00	318.00	295.00	238.00	261.00
Total Phosphorus (TP)	mg/L	5.17	5.26	5.23	4.97	5.30	5.24	5.30	5.80	5.80	5.00	4.40	4.90
Total Kjeldahl Nitrogen (TKN)	mg/L	37.25	39.03	41.17	38.14	40.64	40.02	39.80	45.20	42.70	38.40	39.31	43.42
Preliminary Treatment													
Grit and Screenings	tonnes/day	2.75	2.85	2.86	2.78	3.66	4.10	2.10	1.60	2.20	2.10	3.40	1.80
Primary Treatment													
TSS	mg/L	109.83	105.68	103.58	84.72	89.80	95.70	102.00	94.00	97.00	101.00	151.00	148.00
Carbonaceous Biochemical Oxygen Demand (cBOD ₅)	mg/L	125.46	151.30	162.75	157.25	152.12	140.90	118.30	158.00	156.00	138.00	142.00	160.00
Secondary Treatment													
Aeration Loading	kg CBOD₅/ m³.day	0.38	0.42	0.44	0.63	0.52	0.44	0.41	0.38	0.39	0.37	0.40	0.47
Mixed Liquor Suspended Solids	mg/L	3,321.14	3,734.17	3,405.31	3,395.01	3,109.27	2,839.32	2,842.00	2,953.00	2,838.00	2,998.00	2,885.00	2,151.00
Final Effluent													
Final Effluent Daily Average Flow	ML/day	278.67	218.90	248.78	366.49	312.49	284.83	320.59	257.00	268.40	275.50	305.83	288.49
TSS	mg/L	13.93	10.62	10.98	10.43	9.70	11.00	13.00	13.00	11.00	12.00	13.00	15.70
TSS Loading Rate	kg/day	3,915.25	2,712.69	2,742.40	3,869.27	3,042.16	3,157.47	4,322.00	3,341.00	2,952.40	3,306.00	4,050.00	4,523.00
cBOD5	mg/L	6.69	6.25	6.35	5.72	5.36	5.90	6.60	5.70	5.40	4.80	6.00	6.00
cBOD5 Loading Rate	kg/day	1,881.47	1,596.95	1,586.72	2,121.76	1,681.26	1,677.78	2,202.00	1,464.90	1,449.36	1,322.40	1,869.00	1,728.00
ТР	mg/L	0.64	0.65	0.67	0.58	0.44	0.60	0.80	0.70	0.77	0.67	0.65	0.64
TP Loading Rate	kg/day	179.24	165.66	168.04	216.51	139.52	178.00	250.00	180.00	210.00	210.00	202.00	184.00
Escherichia Coli (E. Coli)	CFU/100 mL	34.25	128.17	94.25	54.98	82.91	67.80	72.00	29.00	52.00	30.00	31.00	26.00

APPENDIX C – Historical Performance Data

	Units	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
рН	-	6.56	6.47	6.51	6.66	6.85	7.00	8.00	7.20	7.40	7.00	7.00	7.00
Total Residual Chlorine	mg/L	0.01	0.02	0.01	0.01	0.01	0.01	SBS (P)	SBS (P)	SBS (P)	SBS (P)	-	-
Total Kjeldahl Nitrogen (TKN)	mg/L	2.74	3.37	4.28	2.63	2.65	3.30	3.20	2.66	2.24	2.10	1.95	3.18
Total Ammonia Nitrogen	mg/L	1.21	1.89	3.28	1.07	1.18	1.70	1.60	1.22	1.40	0.85	0.66	0.99
Temperature	degrees Celsius	21.42	21.31	22.07	21.39	20.12	20.00	15.80	17.60	18.90	18.70	20.00	21.00
Solids Handling													
Primary Sludge Treated	m³/day	2,473.77	2,240.55	2,169.36	2,577.29	2,564.37	2,627.10	2,813.00	2,689.00	2,723.00	3,495.00	2,639.00	2,532.00
Primary Sludge Total Solids (TS)	%	1.95	2.16	2.00	1.41	1.49	2.10	1.90	-	-	-	-	-
Primary Sludge Total Volatile Solids (TVS)	%	70.09	73.65	73.45	66.69	69.16	76.70	73.60	-	-	-	-	-
Waste Activated Sludge (WAS) to Thickening	m³/day	2,567.94	5,608.50	5,010.98	3,218.32	5,107.50	3,697.00	3,776.00	3,573.00	3,135.00	3,782.00	2,984.00	3,779.00
WAS SS	mg/L	8,677.28	7,838.56	8,356.65	7,823.97	9,301.79	9,499.00	8,806.00	8,630.00	9,448.00	8,863.00	10,391.00	9,012.00
Thickened WAS (TWAS) TS	%	3.42	4.44	3.39	3.38	3.47	3.70	4.60	4.00	4.20	4.40	5.30	4.70
TWAS VS	%	78.68	79.19	77.60	77.28	76.56	74.90	77.60	75.00	78.60	78.00	79.00	78.70
TWAS Treated	m³/day	476.25	679.99	674.11	545.02	548.63	m3/day	714.00	598.00	350.00	512.00	464.00	726.00
Digested Solids to ABTP	DT/day	63.75	78.67	53.05	60.10	64.57	72.88	80.00	59.00	57.00	64.00	57.00	54.00
WAS to ABTP	DT/day	7.81	1.92	4.28	7.61	2.69	4.90	4.90	5.00	17.00	11.70	5.80	1.70
Digester Gas Generated	10 ³ m ³ /day	31.62	23.43	27.75	22.79	23.85	26.70	26.20	28.10	25.40	24.60	20.30	21.30



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APPENDIX D – Influent and Effluent Metal Concentrations

Parameter Units	Arsenic mg/L	Cadmium mg/L	Chromium mg/L	Cobalt mg/L	Copper mg/L	lron mg/L	Lead mg/L	Manganese mg/L	Mercury mg/L	Nickel mg/L	Zinc mg/L
January	*0.005	*0.002	0.00714	*0.002	0.0678	0.912	*0.0025	0.0472	*0.00005	0.0163	0.0928
February	*0.005	*0.002	0.0051	*0.002	0.0847	1.08	0.00519	0.0639	*0.00005	0.00797	0.115
March	*0.005	*0.002	0.00642	*0.002	0.079	1.08	*0.0025	0.0673	0.000143	0.00902	0.113
April	*0.005	*0.002	0.00937	*0.002	0.102	2.81	0.0050	0.107	0.000247	0.0104	0.145
May	*0.005	*0.002	0.00719	*0.002	0.109	1.75	*0.0025	0.0846	*0.00005	0.00936	0.146
June	*0.005	*0.002	*0.002	*0.002	0.0823	1.14	*0.0025	0.0758	*0.00005	0.00769	0.123
July	*0.005	*0.002	*0.002	*0.002	0.0823	1.14	*0.0025	0.0758	*0.00005	0.00769	0.123
August	*0.005	*0.002	0.00817	*0.002	0.0914	1.22	*0.0025	0.0674	0.000106	0.00984	0.176
September	*0.005	*0.002	0.00651	*0.002	0.115	1.07	*0.0025	0.0674	*0.00005	0.0105	0.165
October	*0.005	*0.002	0.00567	*0.002	0.089	1.06	*0.0025	0.0584	*0.00005	0.00773	0.131
November	*0.005	*0.002	0.00699	*0.002	0.0896	1.09	*0.0025	0.0628	0.000116	0.0102	0.126
December	*0.005	*0.002	0.00632	*0.002	0.0858	1.26	*0.0025	0.0593	*0.00005	0.00991	0.131
Annual Average	0.005	0.002	0.006	0.002	0.090	1.301	0.0029	0.070	0.00008	0.0097	0.132

Influent (Daily Composite tested once/month for metals)

Data in red with an asterisk prefix is half the MDL

Parameter Units	Arsenic mg/L	Cadmium mg/L	Chromium mg/L	Cobalt mg/L	Copper mg/L	lron mg/L	Lead mg/L	Manganese mg/L	Mercury mg/L	Nickel mg/L	Zinc mg/L
January	*0.005	*0.002	0.00468	*0.002	0.0148	0.623	*0.0025	0.0335	*0.00005	0.00625	0.0375
February	*0.005	*0.002	*0.002	*0.002	0.0122	0.765	*0.0025	0.0329	*0.00005	0.00534	0.033
March	*0.005	*0.002	*0.002	*0.002	0.0121	0.431	*0.0025	0.0359	*0.00005	0.00528	0.0348
April	*0.005	*0.002	*0.002	*0.002	0.0109	0.373	*0.0025	0.0332	*0.00005	0.00502	0.0381
May	*0.005	*0.002	*0.002	*0.002	0.00985	0.356	*0.0025	0.0304	*0.00005	*0.0050	0.0318
June	*0.005	*0.002	*0.002	*0.002	0.0124	0.485	*0.0025	0.0342	*0.00005	0.00512	0.0336
July	*0.005	*0.002	*0.002	*0.002	0.0124	0.485	*0.0025	0.0342	*0.00005	0.00512	0.0336
August	*0.005	*0.002	*0.002	*0.002	0.00957	0.321	*0.0025	0.0324	*0.00005	0.00579	0.0343
September	*0.005	*0.002	*0.002	*0.002	0.0108	0.374	*0.0025	0.0321	*0.00005	0.00645	0.0316
October	*0.005	*0.002	*0.002	*0.002	0.0106	0.377	*0.0025	0.0273	*0.00005	0.00551	0.0314
November	*0.005	*0.002	*0.002	*0.002	0.0102	0.283	*0.0025	0.023	*0.00005	0.00687	0.0319
December	*0.005	*0.002	*0.002	*0.002	0.0111	0.251	*0.0025	0.0269	*0.00005	0.00616	0.0314
Annual Average	0.005	0.002	0.002	0.002	0.0114	0.4270	0.0025	0.03133	0.00005	0.0057	0.0336

Final Effuent (Daily Composite tested once/month for metals)

Data in red with an asterisk prefix is half the MDL



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APPENDIX E – Digested Sludge Analysis

	Arsenic	Cadmium	Cobolt	Chromium	Copper	Mercury	Molybdenum	Nickel	Lead	Selenium	Zinc
Limit ¹	170	34	340	2800	1700	11	94	420	1100	34	4200
January											
February	8.40	3.36	3.4	49.1	528	0.11	8.40	30.8	30.8	8.4	535
March											
April											
Мау	3.13	0.91	7.10	41.3	547	1.75	7.62	30.3	32.7	1.9	555
June											
July											
August	1.91	0.20	5.0	36.6	417	0.16	7.32	23.6	21.1	1.7	480
September											
October											
November	2.4	0.5	6.2	50.7	518	0.6	9.2	30.4	40.8	1.9	541
December											
Annual											
Average	3.966	1.24	5.42	44.422	502.309	0.650	8.133	28.761	31.378	3.46	527.68

¹As per MOECC regulations for sludge utilization on agricultural lands. All sludge from HTP received further treatment at Ashbridges Bay Treatment Plant

All values are expressed in terms of mg metal / kg digested sludge dry weight



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APPENDIX F – Maintenance Activities

Solids Handling (Work Area 1)

Work Area 1 includes WAS thickening centrifuges, anaerobic digesters and gas collection, compression, and burner systems. A total of 3,186 work orders were closed in this work area in 2023. The following maintenance on major structures, equipment, apparatus, mechanism, or thing forming the Works was completed by Work Area 1 in 2023:

• Monthly activities

- Valve exercises
 - Centrate pump valves
 - Centrifuge feed pump and flushing water valves
 - Digester scum feed valves
 - Digester sampling valves
 - Digester sludge recirculation valves
 - MTI Line isolation valves
 - TWAS Transfer Pump valves
 - Waste gas burner pressure regulating valves
- o Scum Tanks and hoppers, chute and paddle cleaning
- o Inspections
 - Sealing oil reservoir tank
 - Standby gas compressor inspection and operational testing
 - Portable eyewashes, fire extinguishers and first aid kits

• Quarterly activities

- Scum tanks and hoppers cleaning
- Inspections
 - Waste gas burners
 - TWAS transfer pumps
 - MTI transfer pumps
 - Centrate transfer pump
 - Centrifuge feed pumps
 - Sludge recirculating pump
 - Hot water recirculating pump
 - Digester gas compressor and accumulator
- Centrifuge motor bearing vibrational analysis

• Bi-annual activities

- Centrate pump valve exercises
- o Digester flame arrestors and gas stack valve cleaning
- Lubrication
 - Sludge transfer and recirculation pumps bearings
 - MTI transfer pump bearings
 - Digester gas booster compressor bearings
 - Actuator valve stems
 - TWAS transfer pump motor

- MTI transfer pump motor and bearings
- Inspections:
 - Digester dome valves
 - Digester gas stack valves and flame arrestors
 - Natural gas pilot pressure regulating valve
 - Digester valves
 - Waste gas burners

• Annual activities

- Valve Exercises
 - Scum Tank, hopper and pump valves
 - Sludge flowmeter valves
 - Centrifuge isolation valves
 - Waste gas header isolation valves (including lubrication)
 - Waste gas burner valves
 - Digester routing and sample valves (including lubrication)
 - Scum valves (including inspection)
 - TWAS feed valves (including lubrication)
 - Digester discharge valves (including inspection)
 - Condensate and sediment tank valves (including inspection)
- \circ Cleaning
 - Condensate and sediment tanks (including inspection)
 - Digester Gas burner regulating valves (including calibration)
- Inspections/maintenance:
 - Centrate pump valve isolation exercise and drive sheaves
 - Digester gas compressors and boosters (including lubrication)
 - Standby gas compressor
 - Centrifuge flushing valves and flexible chute connections
 - Centrifuge feed pumps isolation and flushing valve exercises.
 - Sludge recirculation and transfer pumps and valves
 - Coffin box valves (including lubrication)
 - WAS storage tank mixers
 - Backflow preventers
 - MTI transfer pumps
 - TWAS pumps

Liquid Primary Treatment (Work Area 2)

Work Area 2 encompasses preliminary treatment processes including influent bar screens, aerated grit chambers, vortex grit chambers, and primary clarifiers. A total of 2,544 work orders were closed in this work area in 2023. The following maintenance on major structures, equipment, apparatus, mechanism, or thing forming the Works was completed by Work Area 2 in 2023:

- Bi-weekly inspection and lubrication of bar screen switch and bushings
- Monthly activities
 - North Plant bridge lubrication
 - o Inspections
 - Grit blowers air inlet and inverter filters (including replacement)
 - Scum transfer pump
 - Vortex slewing gear (including lubrication)
 - Portable eyewashes, fire extinguishers and first aid kits
 - AED and SCBA
 - 2 month bar screen pillow block lubrication
 - 2 month plant wide SCBA training exercise
- Quarterly activities
 - Grit pump pinch valves inspection
 - Bar screen carriage drive chains lubrication
 - Ultrasonic testing of vortex pumps, grit pumps and scum pumps
 - Vibrational testing of sludge pumps and vortex blowers

• Bi-annual activities

- Valve exercises
 - Grit channel sluice gates (including lubrication)
 - Primary sluice gates (including lubrication)
 - Vortex sluice gates (including lubrication)
- \circ Inspection
 - Ultrasonic testing of vortex pumps
 - Bar screen conveyers and compactors
 - Grit and screenings conveyors
 - Conveyor and scum collector gear box oil analysis
 - Grit de-watering pump
 - Classifiers and cyclones
 - Vortex pumps
 - Primary scum pump (including lubrication)
 - Sludge transfer pump seal water line
 - Ladders
- Scum collector cleaning and lubrication
- o Preliminary treatment bypass valve stem lubrication

• Annual activities

- Sludge pumps and header isolation valve exercises
- Scum and sludge long and cross collector gearbox lubrication check
- Inspections
 - Primary collector drives
 - Primary cross collector gear box lubrication
 - North primary bridges
 - Sludge transfer pumps (and valve exercise).
 - Backflow preventer
 - Grit tank conveyor
 - Primary sluice gate inlet and actuator (including lubrication)

Support Services (Work Area 3)

Work Area 3 includes support services around the plant, process air blowers, and the electrical system. A total of 4,218 work orders were closed in this work area in 2023. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 2 in 2023:

- Weekly activities
 - o Inspections
 - Emergency generator
 - Dechlorination analyzers
 - Chlorine analyzer probe check (including cleaning)
 - Monitor of air compressor motor temperature
 - Biweekly verification of boiler low level trip circuits

• Monthly activities

- Inspections
 - Boiler exhaust valve actuator (visual)
 - Screen channel level alarms
 - Air dryers and receivers
 - Blower and blower air inlet filters
 - Substation
 - Plant wide emergency lighting
 - Sprinkler system alarm and fire water valves
 - Control room paging modulator alarm system
 - Portable eyewashes, fire extinguishers and first aid kits
- o Cleanings
 - Bio-filter beds (Summer months)
 - Venturi ports
 - Chlorine analyzer probe (including calibration)
- Repositioning of cogeneration engine crankshaft
- Test and verify emergency generator on load
- Elevator guide door cleaning and testing
- Quarterly activities
 - Inspections
 - 600 V MCC room
 - Gallery cooling water pumps
 - Waste gas burners
 - Phosphorus removal system pumps
 - Glycol pumps
 - Primary loop hot water pumps and PRVs
 - o Glycol pump gland filter replacement
 - Vibrational testing of hot water recirculation pump motor bearings
- Bi-annual activities

- o Inspections
 - Dechlorination pump VFD drives, cabinets and fans
 - Plant wide supply and exhaust fans (including cleaning)
 - Electrical and mechanical generators
 - Chilled water pumps and skid
 - Control panels
 - WAS and sludge pumps (including motor bearing lubrication)
 - Sludge thickening scrubbers
 - Air compressor (including cleaning)
 - Gallery Air curtain
 - Glycol skids
 - Pneumatic positioner air filters
 - WAS pump and motor (including bearing lubrication)
 - Plant wide air handling unit and HVAC (including maintenance)
- Calibrations/Verifications
 - Temperature transmitters
 - pH, DO analyzers
 - Raw sludge densitometer (including cleaning)
 - Hazardous gas detectors, alarms and portable gas meters
 - Control valves and actuators
 - Blower discharge and bypass valves
 - Blower axial trip alarms
- Lubrication of hot water recirculation pumps
- Digester gas compressor building ventilation fan testing
- Testing of the blower motor bearings and auxiliary oil pump.

• Annual activities

- o Inspections
 - Gas compressor flow, pressure and temperature circuits
 - Heat tracing on sodium bisulphate piping and waste gas burners
 - Waste gas burner instrumentation
 - Glycol pressure relief valve and skid
 - RAS and WAS pump motor and VFD
 - Sludge recirculation pumps and instrumentation
 - Digester gas boosters and instrumentation
 - Hot water recirculation pumps
 - Centrifuge electrical and instrumentation checks
- Calibrations/Verifications
 - Digester pump discharge and seal oil water switches
 - Digester PLC, RPU functionality testing
 - Primary collector shutdown torque switch
 - RAS, WAS, primary sludge and waste gas burner flow meters
 - Effluent sampling pump flow transmitter
 - Scum transfer pump control panel and instrumentation
 - Digester floating cover sensor
 - TWAS and WAS storage level transmitter sensors

- Final effluent disinfection transmitters
- Palace pier level switches
- Sludge recirculation pumps and instrumentation
- Bar screen rake drive motor emergency shutdown circuit
- Digester dome and tank instrumentation
- Maintenance/cleaning
 - Plant wide wall and roof mounted exhaust fans
 - TWAS pump motor (including calibration
 - Centrate pump motor and pressure switches
- o Electrical and instrumentation checks of centrifuges and gas compressor

Liquid Secondary Treatment (Work Area 4)

Work Area 4 encompasses secondary treatment processes including aeration, phosphorus removal and final clarification. A total of 3, 078 work orders were closed in this work area in 2023. The following maintenance on major structures, equipment, apparatus, mechanism, or thing forming the Works was completed by Work Area 2 in 2023:

- Monthly activities
 - Inspections
 - Effluent sampling pumps
 - Portable eyewashes, fire extinguishers and first aid kits
 - WAS and RAS pumps
 - Plant water backwash air regulator seat
 - Sodium Hypochlorite tanks (detection holes and stave joints)
 - Final clarifying tanks scum collector mechanisms
 - Air driers and receivers
 - Filtered plant water pumps, piping and isolation valves
 - o Sodium hypochlorite sump drain valve exercises
- Quarterly activities
 - Cleaning of sodium hypochlorite dosing pump inlet strainer
 - o Inspections
 - Air driers and receivers
 - Plant water sump pump
 - Plant water filter cell trash basket
 - trainer brushes and blades on dechlorination discharge line
 - Effluent discharge mixers lubricant level
 - \circ $\;$ Lubrication of filtered plant water pumps and motors $\;$
 - o Vibrational testing
 - RAS, WAS and filtered plant water pumps
 - Aeration blowers and cogeneration burner fans (including oil analysis)
- Bi-annual activities
 - Scum pump lubrication, hopper flushing water solenoid verification and seal inspection
 - o Inspections
 - Sodium hypochlorite control valve
 - Scum and sludge collector gearbox oil level
 - Final clarifying tanks drainage pumps
 - Chlorine analyzer sample line
 - Air compressor (including cleaning)
 - o Scum tank cleaning and trough flushing
 - o Testing of sodium bisulphate containment area level switch
 - Verification/calibration of chlorine gas analyzer
- Annual activities
 - o Lubricate and exercise filtered plant water pump isolation valves
 - Lubrication of final clarifying tanks inlet gate valve stem and inspect actuator oil level
 - o Inspections
 - Backflow preventers
 - Replacement of process air regulator diaphragm



2023 ANNUAL REPORT

Training attended by Humber Treatment Plant operations and skilled trades staff in 2023 includes the list of courses below.

- Electrical, Heat Trace, Oil/Water, Transfer Switch, HVAC, Gas Detection Training
- FUNDAMENTALS OF LADDER SAFETY AWARENESS (CEU)
- PREVENTING STRUCK -BY/CONTACT INJURIES (August 2023 Mandatory Tailgate)
- RIGGING SAFETY AWARENESS (2022-2024)
- SCAFFOLD SAFETY TRAINING (2023-2025)
- Situational Awareness- Toronto Water Mandatory Tailgate February 2023
- STANDARD FIRST AID LEVEL 'C' CPR & AED 2 Day (FAST Rescue)
- Toronto Water Emergency Plan Awareness (Mandatory Tailgate May 2023)
- TRENCHING and EXCAVATION AWARENESS (CEU) -2024
- WORKING AT HEIGHTS (2022-2024)
- SCADA Cybersecurity Training
- CONFINED SPACE ENTRY AND RESCUE 2 DAY (CEU)
- OPERATIONAL IMPERATIVES (RM-58-CT) CEU
- Crossfeed+Drain Pump Training
- South Secondary HVAC System
- Introduction to Indigenous Learning
- Electrical, Heat Trace, Oil/Water, Transfer Switch, HVAC, Gas Detection Training
- Building Automation Systems Training
- Oil Water Separator Training
- MSA Gas Detection System Training
- Choose Your Own Adventure: Curse of the Mummy's Data
- The Curse of the Mummy's Data Assessment
- Choose Your Own Adventure: Deep Space Danger
- Deep Space Danger Assessment
- Choose Your Own Adventure: League of Cyberheroes
- The League of Cyberheroes Assessment
- Choose Your Own Adventure: Plunge Into Peril
- Plunge into Peril Assessment
- 2022 Cyber Awareness Refresher Training Curriculum
- NUTRIENT REMOVAL SYSTEM (CEU)
- RESPECT IN OUR WORKPLACE
- WORKPLACE VIOLENCE LEGISLATION & POLICY REVIEW
- WWT INTEGRATED QUALITY MANAGEMENT SYSTEM TRAINING
- PROCESS OPTIMIZATION ENERGY MANAGEMENT & eRIS REFRESHER
- Just the Facts: Data Destruction
- Just the Facts: Insider Threats
- Just the Facts: Travel Security
- Executive Cyber Security Awareness Program Curriculum
- Hybrid Work Fire Safety Review
- SEWAGE WORKS AND SURFACE WATER SPILL RESPONSE
- WORKING AT HEIGHTS REFRESHER (CEU) 2022-2024

- WATER SYSTEM REPAIRS:INTRODUCTION TO OXY-ACETYLENE CUTTING AND STICK WELDING -2 DAY (CEU)
- Protecting Privacy on the Job
- The Toronto Public Service By-law eLearning
- Accessibility 101
- Human Rights 101
- Worker Health and Safety Awareness in 4 Steps
- Password Security Brief
- Just the Facts: Phishing
- TRANSPORTATION OF DANGEROUS GOODS (2021-2023)
- Just the Facts: Social Engineering
- Just the Facts: Malware
- Just the Facts: Working Remotely
- General Cyber Security Awareness Program Curriculum
- Business Email Compromise
- OneNote for Microsoft 365 Virtual Instructor Led Training (VILT)
- Getting More Productive with Outlook Virtual Instructor Led Training (VILT)
- Excel M365: Tips & Tricks Virtual Instructor Led Training (VILT)
- Getting Started with Outlook Mobile Virtual Instructor Led Training (VILT)
- City Benefit and Pension Seminars
- MATHEMATICS FOR OPERATORS: MODULE 1 (CEU)
- MATHEMATICS FOR OPERATORS: MODULE 2 (CEU)
- ACTIVATED SLUDGE
- ASBESTOS AWARENESS (CEU)
- Wastewater Treatment Exam Prep Set #1
- Wastewater Treatment Exam Prep Set #2
- Wastewater Treatment Exam Prep Set #3
- TORONTO WATER ORIENTATION
- IN-SERVICE HEALTH & SAFETY ORIENTATION
- INCIDENT REPORTING
- AIR PURIFYING RESPIRATORS (2023) CEU
- MOULD AWARENESS (CEU) -2025
- DESIGNATED SUBSTANCES AWARENESS (CEU)-2025
- OIT Exam In All 4 Disciplines (Water Treatment, Water Distribution, Wastewater Treatment, and Wastewater Collection).
- MMR SELF-CONTAINED BREATHING APPARATUS (CEU) -(2022-2024)
- WHMIS 2015 eLearning Module
- TRANSPORTATION OF DANGEROUS GOODS FOR TORONTO WATER STAFF eLEARNING (2022-2025)
- TRAFFIC CONTROL ROADWAY WORK (CEU) 2025
- FALL PROTECTION IN AN INDUSTRIAL WORK SETTING (CEU)
- G Permit Vehicle Operator Orientation
- Health and Safety Orientation Training Program Part B
- Human Rights 101 Tailgate Session Materials

- Managing Labour Relations: An Introduction Part 1
- AVANTIS SUPERVISOR MODULES: EMERGENCY WORK ORDER PROGRESS
- What Coaching Is and Isn't
- When Does an Employee Need Coaching?
- Recognize the Different Coaching Styles
- AVANTIS SUPERVISOR MODULES: WORK REQUEST TO WORK ORDER PART 1 APPROVAL PROCESS
- Leadership: Practical Leadership Skills
- Lead with Compassion
- Brain Bites Empathy: The Key to Active Listening
- Emotional Intelligence: Developing Empathy
- Allow Your People to Bring Their Humanity to Work: What Leaders Can Do to Improve Employee Engagement
- The Elements of Every Great Coaching Conversation
- How to Overcome The Most Common Coaching Challenges
- Use Questions When Coaching Employees
- Improve Your Delegation Through Coaching
- AVANTIS SUPERVISOR MODULES: WORK ORDER MATERIAL ACQUISITION
- How to Conduct Workplace Investigations (Toronto Water)
- Virtual TPS New Employee Orientation (NEO)
- New Employee Orientation: Technology Onboarding Virtual Instructor Led Training (VILT)
- Supervisor Health and Safety Awareness in 5 Steps
- INDUSTRIAL MAINTENANCE TECHNICIAN (IMT) E & M CERTIFICATION (2021-2024)
- Bike Helmets 101
- Bike Handling
- Bike Traffic Skills
- On The Road: City of Toronto Bicycle Safety videos and quiz
- Can-Bike Quiz
- CONFINED SPACE AWARENESS 1/2 DAY (CEU)
- Respiratory Protection- Air Purifying Respirators Condensed Version
- Human Rights and Workplace Harassment Essentials for Management
- Indigenous Awareness Training: Truth and Reconciliation
- Attendance Management Program Training for City of Toronto Management
- COVID-19 Vaccination: Understanding the Benefits and Risks
- ABTP Tailgate Psychosocial Program, Risk Assessments & Mental Health in our Work place
- ELECTRICAL SAFETY FOR DISTRICT OPERATIONS & MAINTENANCE OPERATORS (CEU)
- HOT WORK PERMIT SYSTEM AWARENESS
- ARC FLASH FOR NON-QUALIFIED PERSONS (CEU)
- ABTP Kenaidan- Sludge Pumps, HEX, HWR pumps, Hydronic Heating System Digester 9-12
- ABTP 2023 08 Reporting
- Joint Health and Safety Committees (JHSC) Certification Training Part I Basic

- Joint Health and Safety Committees (JHSC) Certification Training Part II Workplace Specific Hazard Training
- Agile Project Management Overview
- Endress+Hauser Technology Symposium
- SAP Ariba: Module and Dashboard Navigation
- SAP Ariba Client Division: Sourcing Request
- CONFLICT RESOLUTION & NEGOTIATION SKILLS
- Confronting Anti-Black Racism Training -Half day
- TRAFFIC CONTROL & TRAFFIC CONTROL PERSON (2022-2024)
- Part 1: Getting Started with eRIS
- Part 2: e-Logbooks
- Lockout, Tag Out and Test Awareness