APPENDIX E
PUMPING TEST REPORT (TW2-13)

Terraprobe

Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

GREENSVILLE MUNICIPAL WELL FDG01 REPLACEMENT
TW 2-13 PUMPING TEST
HAMILTON, ONTARIO

Prepared For: **City of Hamilton, Public Works Department**
100 King Street West, Level 9
Hamilton, Ontario
L8P 1A2

Attention: Mr. Marco Silverio, Project Manager

File No. T1220561.000
October 4, 2023

Terraprobe Inc.

Greater Toronto
11 Indell Lane
Brampton, Ontario L6T 3Y3
(905) 796-2650 Fax: 796-2250

Hamilton – Niagara
903 Barton Street, Unit 22
Stoney Creek, Ontario L8E
(905) 643-7560 Fax: 643-7559

Central Ontario
220 Bayview Drive, Unit 25
Barrie, Ontario L4N 4Y8
(705) 739-8355 Fax: 739-8369

Northern Ontario
1012 Kelly Lake Rd., Unit 1
Sudbury, Ontario P3E 5P4
(705) 670-0460 Fax: 670-0558

www.terraprobe.ca

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT')

FIGURES:

TABLES:

APPENDICES:

1.0 INTRODUCTION

Terraprobe Inc., an Englobe company (Terraprobe), was retained by the City of Hamilton Public Works Department (City) to conduct a well assessment for a proposed municipal well, TW 2-13. The purpose and scope of the present activities are to further investigate the viability of TW2-13 for use as a municipal supply well and to support the City's efforts for completion of a Municipal Class Environmental Assessment.

There is an ongoing Environmental Assessment (EA) for the proposed upgrade of the Greensville Drinking Water System (DWS). The purpose of this investigation is to investigate the feasibility of replacement of the existing municipal well FDG-01 with a new municipal well and pump station. The City of Hamilton (City) has identified TW2-13 as a viable well for the Greensville DWS. TW2-13 is in Johnson Tew Park located north of Harvest Road between Forest Avenue and Tews Lane. TW 2-13 would serve as a replacement for the existing municipal well FDG01 located along Harvest Road. Under this methodology it is proposed to decommission FDG01 as an alternative to upgrading the existing municipal well and pumping station.

Background testing includes two previous 72-hour pumping tests, three sessions of chemical rehabilitation and ongoing water level and water quality monitoring. Background testing is summarized in the following reports:

- Hydrogeological Assessment Report, Greensville Municipal Well Backup Water Supply, Hamilton, Ontario, prepared by Stantec Consulting Ltd., dated September 2, 2014, file 160900728.

- Enhanced Well Development Results and Recommendations, completed by Lotimer & Associates Inc., dated May 2nd, 2016;

- Additional Enhanced Well Development Results, completed by Lotimer & Associates Inc., dated May 9th, 2016;

- Greensville Backup Water Supply, Hamilton Ontario, City of Hamilton, completed by SNC Lavalin, dated January 30th, 2017.

The present scope of work was based on the results of the above noted previous investigations and the proposed use for TW 2-13, a summary of findings of previous investigations listed above is provided under Section 3.1 below.

2.0 SCOPE OF WORK

To assess the viability of TW2-13 for use as a municipal supply well the following summary of tasks and deliverables is provided:

- ***Perform a Below Grade Well Assessment and Preliminary Step Testing*** – A licensed well contractor will be retained to conduct a below grade well assessment for TW2-13 to indicate the integrity of the well casing and screen prior to installing a pump for further well testing. Following the below-grade well inspection a step pumping test will be completed to confirm the target rate of 90 L/min is achievable without performing chemical rehabilitation. Preliminary well inspection and step testing will implement ground water discharge plans. Based on the results of the below-grade well inspection the requirement for further rehabilitation measures was evaluated.

- ***Prepare a Public Summary of Activity*** – A letter will be prepared for review of the City of Hamilton providing a summary of testing including timelines and provide contact information to project managers from both Englobe and City of Hamilton.

- ***Initiate Well Monitoring and Testing Plan*** – A private well survey will be completed to determine locations of private wells and interviews with property owners to determine construction details and operational history for private wells in operation in the vicinity of TW2-13. A monitoring plan will be determined based on the results of the private well survey and the established network of monitoring wells established for the existing FDG01. It is expected that well monitoring will be conducted both continuously using dedicated pressure transducers (data loggers) and manually at regular intervals throughout testing. Well testing will include both baseline water quality sampling completion prior to well testing and confirmatory sampling completed upon completion of well testing. We are of the understanding that the City of Hamilton Laboratories would be used for all ground water analysis completed under the project scope.

- ***Complete Detailed Ground Water and Surface Water Sampling Plan*** – A ground water monitoring plan will include the test well TW2-13 in addition selected private and on-site monitoring wells. Ground water sampling for test well TW2-13 will include full O.Reg. 169/03 sampling for parameters from Schedule 1 through 3. Selected monitoring wells will be sampled for baseline quality and at 24-hour intervals over the duration of long-term testing (four samples) for selected O.Reg. 169/03 parameters including general inorganics, metals, and microbiology.

Surface water sampling will also be completed to assess a similar range of parameters as the ground water sampling regime in addition to Microscopic Particulate Analysis (MPA), F-Specific Coliphage, Photosynthetic Pigment Bearing Algae and Diatoms (PBADs), Pharmaceuticals and Environmental Isotopes. Ground water and surface water sampling will be used to complete a GUDI analysis as discussed under the Terms of Reference.

- ***Completion of Hydrogeological Assessment Report*** – A comprehensive hydrogeological assessment report will be prepared providing the results of testing, sampling, aquifer properties, and impact assessment. The hydrogeological assessment would be completed to meet the requirements for application for a PTTW (Category 3) application. In addition to a hydrogeological assessment report, summary letters will be provided to private well owners included within the private monitoring program if applicable providing results of ground water monitoring for the private well included and results of ground water quality monitoring where applicable.

3.0 BACKGROUND REVIEW AND PHYSICAL SETTING

3.1 Location and Site Description

The test well TW 2-13 is proposed to replace the communal well FDG01 which currently services the Forest Avenue residential subdivision, consisting of approximately 36 residential properties. The existing municipal well FDG01 is located immediately north of Harvest Road, approximately 50 m east of Forest Avenue. TW 2-13 is located within Johnson Tew Park, immediately east of the Forest Ave. residential subdivision. Johnson Tew Park consists of an irregular shaped parcel of land approximately 16.9 ha (41.8 acres) in size as outlined n the attached **Figure 1**. It is proposed to replace FDG01 by installing a new pumping station and utilizing TW 2-13 as a replacement municipal supply well.

Surrounding properties to the west are municipally serviced, and properties to the east and south, including Greensville Elementary School are privately serviced. An aggregate quarry exists immediately north of the subject property, and as was previously reported aggregate extraction operations have ceased for the quarry, with the site used primarily for stockpiling and processing (SNC, 2017).

3.2 Summary of Previous Investigations

Previous investigations were initiated in 2013, conducted by Stantec, to determine a suitable backup well for the existing municipal well FDG01. As part of this investigation a series of three test wells were

completed, TW 1-13, TW 2-13, and TW 3-13 within the area now comprising Johnson Tew Park. Following test well drilling chemical rehabilitation of TW 2-13 commenced in 2015 to improve yield to meet the requirements for replacement of FDG01. Subsequent chemical rehabilitation was completed in 2016 and was successful in improving yields to meet quantity targets for replacement of FDG01. Following chemical rehabilitation, well testing was carried out in 2017 by SNC Lavalin in support of water taking from TW 2-13. The above reports are summarized in the following sections.

3.2.1 Hydrogeological Assessment – Stantec

A hydrogeological assessment was completed by Stantec in 2014 (Hydrogeological Assessment Report, Greensville Municipal Well Backup Water Supply, Hamilton, Ontario. Dated September 2nd, 2014). The purpose of the report was to provide background information pertaining to the site, outline the current demands on the municipal well (FDG01), and determine the suitability of completed test wells to meet the demands identified for FDG01. A well performance test and constant rate pumping test for TW1-13 and TW2-13, TW 3-13 was not tested due to identified low yields following completion. The following conclusions were made as part of the Stantec report:

- The report determined that water usage between 2007 and 2013 indicated that the maximum and peak hour water demands on FDG01 were 105,000 L/day and 7,560 L/hr, respectively. Production of FDG01 under the current PTTW is permitted at a maximum water taking of 197,000 L/day and 8,210 L/hr.

- A long-term, combined sustainable well yield of 95,040 L/day (66 L/min) was estimated for simultaneous pumping of TW1-13 and TW2-13. Peak short-term simultaneous pumping rates were estimated at 2,700 L/hr (45 L/min) at TW1-13 and 3,240 L/hr (54 L/min) at TW2-13.

- The extent of pumping influence was determined to be 115 m at each test well and therefore would have no impact on surrounding wells or natural heritage features.

- Water quality results from TW1-13 and TW2-13 were interpreted to have similar results between the two wells. Exceedances were observed to be present for hardness, colour, iron and turbidity. Microscopic particulate analysis (MPA) indicated that the test wells would be at a low risk of being influenced by surface water.

- It was concluded that both test wells TW1-13 and TW2-13 would be considered a viable source of groundwater taking based on limited zone of influence and water quality data.

3.2.2 Enhanced Well Development – Lotimer and Associates Inc.

In an effort to utilize one test well as a replacement well for FDG01, the chemical rehabilitation of TW 2-13 was undertaken to increase yields. An enhanced well development program was completed by Lotimer and Associates Inc. in August 2015 (updated 2016), as reported in the report titled: *Greensville TW2-13 Enhanced Well Development Results and Recommendations, Updated Date May 2nd, 2015*. The purpose of the report was to summarize the results of a downhole video inspection to determine the potential for groundwater flow through fractures in the dolostone and a enhance well by means of chemically expanding existing fractures in the bedrock. The following conclusions and recommendations were made as part of this report:

- The video inspection determined that the casing extends 12.5 meters below ground level (mbgl) and is completed within the dolostone bedrock. At 12.9 mbgl a large horizontal fracture was observed and determined to be the main source of waster production in the well. Additional smaller fractures were observed with depth but were considered to only provide small amounts of water.

- The well was pumped at 55 L/min for 20 minutes where upon completion the drawdown was observed to be 1.22 m from static. The flow rate was increased to 90 L/min and allowed to pump. After 30 minutes the pump lost suction and water was observed to enter the fracture at 12.9 mbgl.

- The well was developed with 100 L of hydrochloric acid solution (29% hydrogen chloride) followed by 100 L of clean water forcing the acid through the existing fractures. The well was then surged with compressed air and the acid solution removed from the well. Throughout the process pH was monitored. Following this the well was pumped for an additional 60 minutes to remove turbidity within the groundwater.

- A step test was completed within the well to determine the success of the well development. Upon completion it was observed that the efficiency of TW2-13 well had improved.

3.2.3 Additional Enhanced Well Development – Lotimer and Associates Inc.

To further improve the well yield of TW 2-13 a second chemical rehabilitation was undertaken for TW 2-13 by Lotimer and Associates Inc. in April 2016, as reported in the report titled: *Greensville TW2-13 Additional Enhanced Well Development Results and Recommendations, dated May 9th, 2016*. The purpose

of the report was to summarize the results of a second enhanced well development and video inspection to determine the if further acidification would improve groundwater yield within TW2-13. The following conclusions and recommendations were made as part of this report:

- The second round of enhanced well development was intended to break the acidification process up into the lower and upper potions of the well followed by a step test to confirm results. It was determined that the lower portion of the well would not benefit significantly from an isolated acid treatment and the entire well was acidified in the same manner as the previous test.

- The well was developed with 160 L of hydrochloric acid solution (29% hydrogen chloride) followed by 200 L of clean water forcing the acid through the existing fractures. The well was then surged with compressed air for 15 hours following which the acid solution removed from the well. Immediately after pumping the well the pH was found to be near 7. Following this the well was pumped for an additional 180 minutes to removed turbidity within the groundwater.

- A step test was completed within the well to determine the success of the well development. Upon completion it was observed that second round of acidification significantly improved the efficiency of TW2-13.

3.2.4 Hydrological Study – SNC Lavalin

Following the chemical rehabilitation of TW 2-13 well yield testing was undertaken by SNC Lavalin in January 2017, as summarized in the report titled: *Hydrogeological Study, Greensville Backup Water Supply, Hamilton, ON, Dated January 30th, 2017*. The purpose of this study was to conduct step testing and a 72-hour pumping test on TW2-13, complete water monitoring and sampling and evaluate the expected long-term yield for the purposes of replacing municipal well FDG01 and to assess for the potential of impacts to the surrounding area.

- Water quality analysis were submitted for all on-site wells (TW1-13, TW2-13, TW3-13 and MW101) as part of the 72-hour pumping test program. The onsite wells exceeded for E. Coli, total coliforms, lead, colour, turbidity, iron, manganese, and hardness. Additional testing for TW2-13 was completed for caffeine, MPA and F-specific coliphage. The caffeine and MPA results returned as non detectable. The F-specific results showed an increase within TW2-13 but fell below the detection limit after 24-hours, slightly increased after 48-hours and dropped after 72-hours.

- Residential water quality was collected prior to and following the pumping test. When compared to ODWS MAC standards residential water quality exceeded for E. Coli and total coliforms.

- It was determined that the long-term yield of TW2-13 was estimated to be 90 L/min (129,600 L/day) according to the available drawdowns in the well and nearby residential wells. The maximum short-term water taking rate would be 259,200 L/day.

- It was recommended to monitor surface water features, including ditches and stormwater ponds as well as surrounding residential wells on a regular basis when TW2-13 begins operating as a municipal well water supply.

3.3 Site Topography and Drainage

Site drainage and topography slopes towards the southern end of the property. Topographic mapping for the site and surrounding area indicates ground surface elevations between 251 to 241 metres above sea level (masl). The topography is generally gently flat lying, sloping south towards Harvest Road which lies approximately 50 m south of the site.

The site is situated within the Middle Spencer Creek sub-watershed. The main branch of Middle Spencer Creek watershed bends towards the south collecting discharge from surrounding tributaries, as well as Westover and West Spencer Creek.

Drainage from the site is primarily directed south/southeast towards Logie's Creek and Tews Falls situated approximately 650 m southeast of TW 2-13. Logie's Creek south of Tews Falls flows through the Spencer Gorge Conservation Area joining with Spencer Creek approximately 1 km southeast of TW 2-13. The Middle Spencer Creek flows south towards Webster's Falls and into Spencer Gorge.

3.4 Regional Geology

The subject site is situated within the physiographic region known as the Norfolk Sand Plain. The area lies between the Flamborough Plain and the Dundas Valley. Based on reviewed geologic mapping (OGS Map 2509, 1986) soils in the vicinity of the site consist primarily of glaciolacustrine deposits consisting of stratified silts and clays with sand. Soils at the subject site are comprised of coarse-textured glaciolacustrine sand and gravel with minor silt and clay soils. Overburden thickness in the area is understood to range from between 5 to 10 m followed by dolostone bedrock.

Shallow bedrock consists of dolostone of the Guelph Formation, which belongs to the Lockport Group. The Guelph formation is the uppermost unit within the Group and is comprised of a brown, medium to thick layers of dolostone. The formation is believed to have a thickness of 9 m. The Guelph Formation is considered to be the primary source of water supply for the site and surrounding privately serviced properties. Bedrock beneath the Guelph Formation consists of the Lockport Group consisting of shale deposits of the Queenston Formation.

3.5 Regional Hydrogeology

The regional hydrogeological conditions were assessed based on a review of the site geological conditions described above and reports previously completed by Stantec (Hydrogeological Assessment Report, Greensville Municipal Well Backup Water Supply, Hamilton, Ontario, Dated September 2nd, 2014) and SNC Lavalin (Hydrogeological Study, Greensville Backup Water Supply, Hamilton, ON, Dated January 30th, 2017). The regional hydrogeology is characterized by the following principal hydrostratigraphic units:

- Overburden. Surficial deposits of coarse sand and gravel with minor silt and clay are identified as the soils for the site and surrounding area. The soils are generally considered to facilitate groundwater recharge and are not considered as a viable source of groundwater for typical residential demand. Water supply wells are typically completed within underlying bedrock deposits.

- Shallow Bedrock. The shallow bedrock aquifer is considered to be a confined to semi confined aquifer consisting of water bearing fractured dolostone of the Guelph Formation. This unit is considered to have sharp contact with the overlying deposits and consists of numerous fractures allowing for the recharge of groundwater. The shallow bedrock aquifer represents the primary water supply aquifer for surrounding land use.

- Deep Bedrock. Deeper bedrock deposits consist of shale bedrock of the Queenston Formation, which is generally considered an aquitard. Groundwater within shale partings is generally of low yield and mineralized in quality. Shallow bedrock deposits are considered suitable for yield and quality, as such, water supply wells generally do not extend into deeper bedrock deposits.

Groundwater for the subject site and surrounding area is considered to flow southeast towards the Niagara Escarpment, and Spencer Gorge. With the pronounced change in topography, the gorge is expected to

receive groundwater baseflow through seeps from the bedrock face of the gorge to surface water features including Logie's and Spencer Creek and influence local groundwater flows.

Groundwater uses reported as reported within Ministry of the Environment Conservation and Parks (MECP) well records for the vicinity (500 m radius) of the site were reviewed. Groundwater wells are primarily used for and residential purposes and are situated east and south of the site, completed within limestone bedrock at depths ranging from 9 m to 30 m. It is understood that properties to the west of the site are municipally serviced by municipal well FDG01, located within the study area approximately 360 m southwest of TW 2-13.

4.0 RESULTS OF PRELIMINARY WELL ASSESSMENT AND STEP TEST

A well assessment and step test preliminary report was completed by Terraprobe in October 2022. The purpose of the preliminary assessment was to conduct a below grade well assessment for TW 2-13 including downhole video inspection and step test to confirm well yield for TW 2-13 and the requirement for further chemical rehabilitation based on the results of down-hole inspection and testing.

4.1 Results of Down-Hole Inspection

The down-hole well inspection was conducted on September 23, 2022, for TW 2-13. The inspection was completed beginning at the completed depth of the well, which was measured at a depth of 21.7 m below grade, moving up, and identified the following water bearing fracture systems. A test pump was installed within the well to drawdown water within the well to confirm elevations of water bearing fractures:

- Small fractures visible at a depth of 18.9 m, expected to produce a low yield of groundwater.
- Small fractures present at a depth of 16.4 m, which are expected to yield higher volumes than those encountered at a greater depth.
- Small fractures were present at a depth of 13.9 m yielding a low rate of groundwater.
- Fractures were present at a depth of 12.9 m which are expected to provide significant flows. The rate of flow from these fractures could not be confirmed due to the test pump obstructing camera views.
- The casing extended above depths of approximately 12 m and was observed to be in good condition.

Results of video inspection were consistent with the results of down-hole inspection completed as part of the Lotimer Inspection completed in August 2015.

4.2 Results of Step Testing

Preliminary testing was performed on October 13, 2022, in which TW 2-13 was pumped at three increasing discharge rates to further evaluate the sustainable yield of the well. Each rate was held constant until a stable water level was reached, rates were determined such that the cumulative rate of pumping did not exceed 50,000 L/day and are summarized as follows:

Summary of Step Pumping Test

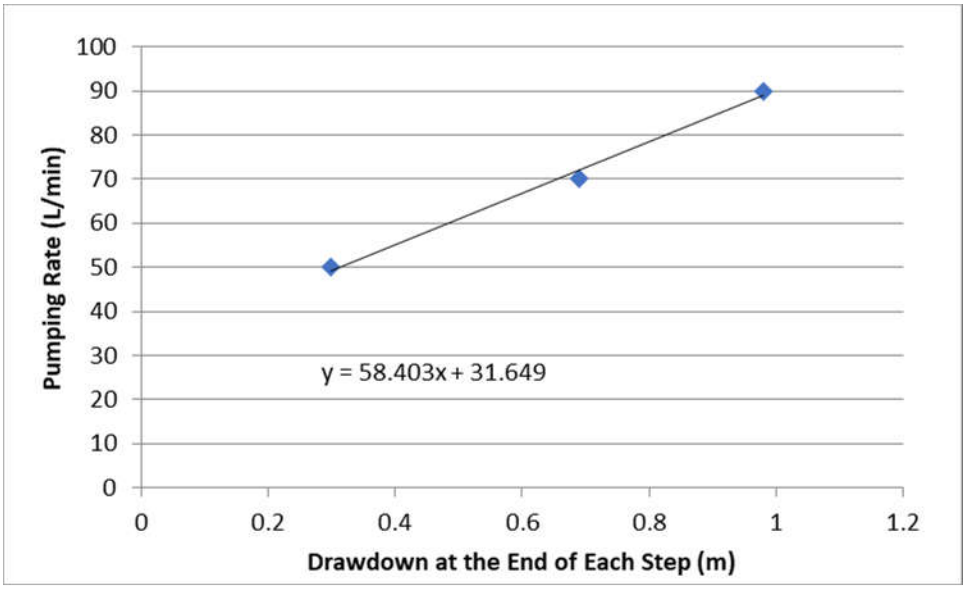
	First Step Rate	Second Step Rate	Third Step Rate
Pumping Rate	50 L/min	70 L/min	90 L/min
Duration	60 minutes	90 minutes	120 minutes
Total Volume Pumped	3,000 L	6,300 L	10,800 L
Static Pumping Water Level	11.8 m	12.2 m	12.5 m
Measured Well Drawdown	0.3 m	0.7 m	1.0 m

Recovery of water levels was observed following completion of the pumping test and 95% recovery of the well was observed within 30 minutes following completion of testing. Water level monitoring results are provided in the attached **Appendix E**.

The total cumulative discharge from testing was approximately 20,100 L. Discharge from the pumping test was discharged approximately 10 m west from TW 2-13 to the grassed field, grading directed runoff to the south, and runoff was observed to infiltrate without significant ponding away from TW 2-13.

4.2.1 Sustainable Yield Calculations

The sustainable capacity of the well was calculated by the linear relationship of the observed drawdown at the end of each completed steps the pumping rate as shown in the graph below:



The slope of the line of best fit represents the specific capacity (discharge per unit drawdown in the well) for the on-site well was approximately 58.4 L/min/m. The specifi capacity is a measure of the efficiency of the test well. The maximum allowable capacity of the well was estimated accoring to the equaition:

$$Q_{max} = SC \times s_{wmax} \times FS$$

Where: Q_{max} is the estimated maximum pumping rate;

SC is the specific capacity of the well;

S_{wmax} is the maximum allowable drawdown in the well; and,

FS is a factor of safety.

The maximum allowable drawdown from the on-site well is estimated from the static water level of 11.5 m below grade and the pump setting approximately 3.0 m from the base of the well (21.8 m) and a 1.0 m submergence above the pump for an available drawdown of 6.3 m. The resulting maximum flow rate accounting for a factor of safety of 0.5 would be 184 L/min or 3.1 L/s.

Based on testing it was determined that TW 2-13 was capable of producing the required yield of 90 L/min without further chemical rehabilitation. Posting to the Environmental Activity and Sector Registry (EASR) was filed based on these results for long term testing to be completed for TW 2-13.

5.0 LONG TERM WELL TESTING

The following sections provide a summary of the work plan carried out as part of the 72-hour testing completed for TW 2-13.

5.1 Results of Private Well Survey

A public summary of monitoring and testing was prepared in conjunction with the City of Hamilton and was distributed to all properties within 500 m of testing understood to utilize private water supply wells. The private well survey was completed on October 23rd, 2022, to request permission to monitor private wells and interview residents regarding the location, construction details and operational history for private wells in operation. Well inspections were scheduled with property owners following completion of the well survey, generally in advance of well testing.

In total 38 properties were visited as part of the well survey. From the well survey letters distributed, 5 residences responded to the well survey. Of the properties from which a response to the well survey had received one well was determined to be inaccessible for the purposes of monitoring and water quality sampling throughout the duration of the pumping test. Private well monitoring was established at the remaining 4 properties. The well survey letter and pumping test notification letter are provided in **Appendix A**. A summary of the survey results is provided in the attached **Table 1**.

5.2 Well Monitoring Program

Based on the results of the well survey, private well monitoring and sampling locations were established prior to the start of well testing where permission was granted by property owners and wells were accessible. A record of manual water level measurements is provided in the attached **Table 2** and **Table 3** with hydrographs showing ground water levels in relation to water levels within TW2-13 are provided within the attached **Appendix B**. The following provides a summary of both on-site and off-site locations monitored as part of the current investigation.

5.2.1 On-Site Monitoring Locations

On-site monitoring locations, within Johnson Tew Park, included three 150 mm diameter wells, TW1-13, TW2-13 and TW3-13, and one 50 mm diameter monitoring well, MW101. The following table provides a summary of the on-site test and monitoring well:

Summary of On-Site Monitoring Locations

Well ID	Approximate Ground Elevation (masl)	Well Depth		Well Screen Details
		(mbgl)	(masl)	
TW1-13	248.92	23.45	225.77	Open Hole (bedrock) 13.72 to 23.15 m depth
TW2-13	243.76	21.67	222.09	Open Hole (bedrock) 12.50 to 21.67 m depth
TW3-13	246.10	26.34	219.76	Open Hole (bedrock) 14.63 to 26.34 m depth
MW101	243.76	10.70	233.06	No. 10 Slot (overburden) 29.0 to 33.5 m depth

Monitoring well MW-101 was previously installed at the site as part of the hydrogeological investigation completed by SNC Lavalin (2016). Monitoring well MW-101 was completed and screened at the base of overburden deposits and is located approximately 5 m north of TW2-13. Test wells TW 1-13, TW 2-13, and TW 3-13 were installed as part of the Stantec hydrogeological investigation (2014), TW 1-13 is situated approximately 150 m north of TW 2-13 and TW 3-13 is located 90 m south of TW 2-13. The above monitoring wells are continuously monitored as part of the City of Hamilton network of monitoring wells, at a monitoring frequency of 10 minutes.

5.2.2 Off-Site Monitoring Locations

Private monitoring well locations were established at locations where permission was granted by the resident and where wells were accessible. Private monitoring wells were included based on the response to the completed private well survey and response received from the provided notification of pumping test distributed one week prior to completion of the pumping test. Well tags and MECP well ID information was not present in the field and could not be confirmed during completed well inspections. Detailed stratigraphy for private monitoring well locations was not known and MECP well records were not correlated to private monitoring locations. Correlation between wells included within the private well monitoring program and the MECP well record database could not be completed due to the degree of error with georeferencing associated with well records.

Based on the well survey data and stratigraphy information within MECP well records it is expected that private wells are completed within the dolostone bedrock. The following table provides details of well locations monitored during the completed well testing:

Summary of Monitoring Well Locations

Monitoring Location	Easting	Northing	Ground Elevation	Depth		Groundwater Level (Dec 12th, 2022)		Distance to TW2-13 (m)
				(mbgl)	(masl)	(mbgl)	(masl)	
63 Tews Lane	582457	4793080	247	28.00	219.00	14.20	232.8	200
3 Medwin Drive	582720	4792675	236	19.00	217.00	6.3	229.7	350
15 Medwin Drive	582521	4792683	241	18.30	222.70	13.21*	227.99	250
609 Harvest Rd	582567	4792673	239	17.10	222.9	10.48	228.52	300

*Water levels taken after testing commenced due to a lack of access to well.

All the above noted monitoring locations were equipped with pressure transducers set to record continuous water levels at 10-minute intervals. This information was supplemented with regular manual water level measurements over the duration of testing. Locations of all on-site and off-site monitoring wells are provided on the attached **Figure 2**. The results of groundwater level monitoring are further discussed in Section 4 below.

5.3 Water Quality Sampling Program and Schedule

Groundwater monitoring was completed for all on-site and off-site wells included within the monitoring program, in addition to surface water sampling at Tews Falls approximately 650 m southeast from TW 2-13. The following table provides a summary of groundwater and surface water sampling locations, the frequency of sampling and parameters sampled over the duration of long-term testing at TW 2-13.

Summary of Water Sampling Program

On-Site Monitoring Wells		
TW 1-13	December 12, 2022 December 15, 2022 January 10, 2023	O.Reg. 169/03 partial sampling, field parameters (daily) As above O.Reg. 169/03 partial sampling with dissolved metals
TW 2-13	December 12, 2022 December 13, 2022 December 14, 2022 December 15, 2022 January 17, 2023	O.Reg. 169/03 partial sampling, caffeine, field parameters (hourly), microscopic particulate analysis (MPA), F-coliphage O.Reg. 169/03 partial sampling As above O.Reg. 169/03 full sampling, caffeine, microcystins, field parameters, age dating, microscopic particulate analysis (MPA), F-coliphage O.Reg. 169/03 partial sampling with dissolved metals
TW 3-13	December 12, 2022 December 15, 2022 January 10, 2023	O.Reg. 169/03 partial sampling, field parameters (daily) As above O.Reg. 169/03 partial sampling with dissolved metals
MW101	December 12, 2022 December 15, 2022 January 10, 2023	O.Reg. 169/03 partial sampling, caffeine, field parameters O.Reg. 169/03 partial sampling, field parameters O.Reg. 169/03 partial sampling with dissolved metals
Off-Site Monitoring Wells		
FDG01	December 15, 2022	O.Reg. 169/03 partial sampling
63 Tews Lane	December 1, 2022 December 15, 2022 May 16, 2023	O.Reg. 169/03 partial sampling As above, with field parameters O.Reg. 169/03 partial sampling
3 Medwin Drive	December 1, 2022	O.Reg. 169/03 partial sampling

	December 15, 2022	As above, with field parameters
15 Medwin Drive	December 12, 2022 December 15, 2022	O.Reg. 169/03 partial sampling As above, field parameters
609 Harvest Road	December 12, 2022 December 15, 2022	O.Reg. 169/03 partial sampling As above, with field parameters
Surface Water Location		
Logie's Creek @ Tews Falls	December 13, 2022 December 15, 2022	O.Reg. 169/03 partial sampling, F-coliphage As Above, with age dating

Sampling for partial parameters of O.Reg. 169/03 included total metals (dissolved metals analysis included where specified), inorganics and organics (partial Schedule 2), and microbiology (Schedule 1). Sampling for full parameters of O.Reg. 169/03 included full Schedule 1 and Schedule 2 sampling, and gross alpha and gross beta particle analysis under Schedule 3. Field parameters were measured in field using a Horiba U 52 sampling unit, office calibrated prior to use. Details regarding the Horiba U 52 sampling unit are provided in **Appendix F**. Field parameter included temperature, pH, oxidation reduction potential, conductivity, turbidity, dissolved oxygen and total dissolved solids. Results of groundwater and surface water sampling are provided in Section 6.6 below.

6.0 SUMMARY OF AQUIFER PERFORMANCE TEST

6.1 Summary of Pumping Test

Well testing occurred between the dates of December 12th and 15th 2022 as summarized below:

Summary of Well Testing

Time Started	December 12th @ 4:30 pm
Available Drawdown at Start of Testing	10.6 m
Pumping Rate	90 L/min (129,600 L/day)
Maximum Observed Drawdown	1.0 m
Available Drawdown at End of Testing	9.6 m
Time Completed	December 15th @ 4:30 pm
Total Test Duration	4,320 mins (72 hours)
Volume Pumped	388,800 L

Total drawdown over the duration of testing was measured at 1.0 m which was calculated to correlate to the use of approximately 15 % of the expected available drawdown available within TW2-13 based on the completed depth of the well (i.e., observed drawdown of 1.0 m divided by total available drawdown of 10.4 m less a 1.0 m pump depth, and having the pump raised 3.0 m from the base of the well).

6.2 Groundwater Discharge

Discharge from the pumping test was directed overland approximately 30 m west of TW2-13 to the western limit of Johnson Tew Park, which sloped south away from TW 2-13. The discharge location was grassed and was inspected regularly throughout pumping to confirm ponding water and erosion was minimized. Groundwater discharge was not observed to impact adjacent properties and infiltrated within shallow soils.

6.3 Summary of Precipitation Events

The table below summarizes the observed precipitation over the duration of testing from the nearest weather station (Hamilton RBG located approximately 6.8 km from the site at the Royal Botanical Gardens):

Summary of Recorded Precipitation during Well Testing

Date	Precipitation (mm)
December 12th	Trace
December 13th	No Precipitation Recorded
December 14th	Trace
December 15th	20.0 mm

Trace rain was recorded in the area December 12th and 14th. A short duration high intensity rainfall event was noted on December 15th, 2022. The rainfall events were not observed and are not expected to have impacted the results of the pumping test given the depth of the test well and that rainfall was not observed to accumulate around the base of TW2-13. There was no accumulated snowpack at the time of testing, snowfall was not recorded over the duration of testing.

6.4 Test Well Recovery

Recovery in the pumping well was monitored following the completion of the pumping test both manually and through installed pressure transducers set to record water levels at 10-minute intervals. Water levels in TW2-13 were observed to have recovered to 95% of the measured static water level prior within 1.5 hours following the completion of the pumping test.

Hydrographs from continuous and manual monitoring of TW 2-13 prior to the start, over the duration of the 72-hour testing, and following completion of testing is provided in the attached **Appendix B** with manual water level measurements in attached **Table 2 and 3**.

6.5 Results of Well Monitoring Program

6.5.1 On-Site Monitoring Wells

On-site water levels were monitored within on-site wells TW1-13, TW3-13 and MW-101. Below is a table summarizing well construction, distance from the pumping well, and observed drawdown during testing:

Summary of On-Site Well Monitoring

Well ID	Distance from Pumping Well (m)	Well Depth (mbgl)	Material Well is Completed Within	Static Water Level Prior to Pumping Test (mbgl)	Available Drawdown (m)	Observed Drawdown (m)
TW1-13	150	23.15	Dolostone	15.32	7.83	0.7
TW3-13	90	26.34	Dolostone	12.63	13.71	0.3
MW-101	5	10.60	Overburden	8.68	14.47	0.01

Impacts to ground water levels were not observed within MW 101. Groundwater fluctuations within TW 1-13 and TW 3-13 were attributed to testing completed at TW2-13, and these locations were used in assessing the drawdown potential for water taking at TW 2-13, further discussed in Section 7.2 below.

6.5.2 Off-Site Monitoring Wells

Off-site monitoring wells were monitored using dedicated pressure transducers set to record water levels at 10-minute intervals. Manual groundwater levels were also collected throughout the duration of testing to verify potential impacts due to water taking and to correlate with continuous monitoring data from each location. The results of off-site well monitoring are further detailed in the following table:

Summary of Off-Site Well Monitoring

Well Location	Distance from Pumping Well (m)	Well Depth (mbgl)	Static Water Level Prior to Pumping Test (mbgl)	Available Drawdown (m)	Observed Drawdown (m)
63 Tews Ln	200	28.0	14.2	13.8	0.5
3 Medwin Dr	400	19.0	6.3	12.7	0.1
15 Medwin Dr	300	18.3	13.0	5.3	0.0
609 Harvest Rd	250	17.1	10.5	6.6	0.0

Impacts to ground water levels were not observed within private wells located at 3 Medwin Drive, 15 Medwin Drive and 609 Harvest Road. Observed groundwater fluctuations at these locations were attributed to residential well use, fluctuations in groundwater were not observed to correlate with groundwater fluctuations observed within TW 2-13.

Groundwater fluctuations within the private wells located at 63 Tews Lane were attributed to testing completed at TW2-13, and this location was used in assessing the drawdown potential for water taking at TW 2-13. Measured drawdown within the private well at 63 Tews Lane accounted for approximately 5 % of available drawdown (assuming a submersible pump located 3.0 m off the base of the well with a 1.0 m submergence). Groundwater changes in the private well at 63 Tews Lane as a result in testing completed for TW 2-13 were not considered significant.

Complaints due to impacts as a result of well testing were not received by Terraprobe or from the MECP over the duration of or following completion of well testing.

6.6 Summary of Water Quality Analysis

The following section provides a summary of water sampling completed as summarized in the table provided in Section 5.3 above.

6.6.1 O.Reg. 169/03 Sampling Results

6.6.1.1 Pumping Well TW 2-13

Groundwater sampling was conducted from the point of discharge from TW2-13 daily beginning at the start of testing on December 12, 2022, to immediately prior to the end of sampling on December 15, 2022. Additional groundwater quality samples were obtained on January 17, 2023, using a submersible pump, for further comparison with sampling completed during testing and to further evaluate total and dissolved metals parameters within groundwater.

Groundwater from TW 2-13 is characterized by high levels of hardness and total dissolved solids including calcium carbonates as a result of the limestone source aquifer. Health related parameters of O.Reg. 169/03 were observed within guideline limits over the duration of testing. Groundwater quality was not observed to degrade with pumping, parameters including turbidity, colour and iron improved with water taking, total metals concentrations and hardness remained consistent. Nitrate was observed to increase from 1.4 mg/L to 3.2 mg/L over the duration of testing but remained well within acceptable limits (health related limit of 10 mg/L), groundwater sampling from TW 2-13 completed on January 17, 2023 indicate nitrate concentrations of 1.36 mg/L. Organic, herbicide, and pesticides within Schedule 2 of O.Reg. 169/03 and gross alpha and gross beta particles within Schedule 3 were not detected within samples collected at the end of testing. A summary of the results of analysis for TW 2-13 for O.Reg. 169/03 parameters is provided in the attached **Table 4**, and certificates of analysis are provided in **Appendix C**.

6.6.1.2 On-Site Monitoring Wells

Groundwater sampling was completed directly from the well using a submersible pump for TW1-13, and TW3-13 and from MW101 using a disposable bailer. Sampling was prior to the start of testing on December 12, 2022, and upon completion of the pumping test on December 15, 2022. Additional sampling was completed on January 10, 2022, for further comparison with sampling completed during testing and to further evaluate total and dissolved metals parameters within groundwater.

Monitoring wells TW 1-13 and TW 3-13 were pumped using a submersible pump to purge standing water prior to sampling on December 12, 2022, and using the same submersible pump on December 15, 2022. Pumping these wells resulted in high levels of turbidity, colour, and total suspended solids. High levels of total suspended solids also resulted in high levels of total metals within the collected samples. Total metals exceedances included aluminium, arsenic, barium, chromium, iron, lead, manganese, and zinc were observed to have elevated suspended sediment loads,

Due to high levels of total metals observed within collected samples these wells were resampled on January 10, 2023 and sampled for both total and dissolved metals to determine metals concentrations dissolved within groundwater. Within the samples collected on January 10, 2022, only total iron concentrations were observed in exceedance of O.Reg. 169/03, dissolved metals were observed within guideline limits.

Groundwater quality within on-site monitoring wells was observed to have high levels of hardness, turbidity, colour, and iron, characteristic of the bedrock aquifer. Coliform bacteria were also detected within on-site monitoring wells. These exceedances are attributed to monitoring wells being used as observation wells and have not been actively pumped. These wells are proposed to form part of the network of monitoring wells in use by the City of Hamilton and are not proposed for water taking.

Organic parameters listed within Schedule 2 of O.Reg. 169/03 were not detected within groundwater sampled from on-site monitoring wells. Groundwater monitoring did not indicate increasing trends over the duration of testing. Nitrate levels within TW 1-13 and TW 3-13 were not detected, and nitrate levels within MW 101 did not exceed 1.1 mg/L. On-site water quality is summarized in the attached **Table 4**. Laboratory certificates of analysis are provided in the attached **Appendix C**.

6.6.2 Surface Water and Off-Site Monitoring Wells

6.6.2.1 Surface Water – Tews Falls

Surface water was collected from Tews Falls December 13th and 15th, 2022 to characterize surface water quality with respected to groundwater sampling conducted as part of the investigation. Surface water sampling was completed along Logie's Creek upstream of Tews Falls approximately 700 m southeast of TW 2-13.

Surface water sampling showed elevated levels of hardness, colour, turbidity and total suspended solids. High concentrations of total suspended solids corresponded with elevated levels of total metals for aluminium, iron, lead and manganese. Surface water was characterized by high levels of both e-coli and total coliform bacteria. A summary of surface water sampling results for O.Reg. 169/03 parameters is provided in the attached **Table 4**, and certificates of analysis are provided in **Appendix C**.

6.6.2.2 Greensville Municipal Well FDG 01

A groundwater sampling was completed for the Greensville municipal well FDG01 on December 15th, 2022 prior to the completion of testing for comparison to sampled groundwater quality for both the

pumping wells and the series on monitoring wells used for the investigation. FGD01 was sampled for Schedule 1 and partial parameters listed within Schedule 2 of O.Reg. 169/03. Groundwater quality results indicated elevated hardness levels representative of the bedrock aquifer of which FDG01 is screened. Health related parameters of sampled O.Reg. 169/03 parameters were all within guideline limits. Bacteria, including e-coli and total coliforms, in addition to sampled organic parameters were not detected within the collected sample. A summary of O.Reg. 169/03 sampling for FDG is provided in **Table 4**, certificates of analysis are provided in **Appendix C**.

6.6.2.3 Private Residential Monitoring Wells

Groundwater samples were collected from residential properties of 3 and 15 Medwin Drive, 63 Tews Lane and 609 Harvest Road. Samples were collected prior to the start of the pumping test on either December 1st or December 12th, 2022, and shortly before the completion of the pumping test on December 15, 2022. Groundwater analysis was completed to assess the potential for changes in groundwater quality with pumping from TW 2-13. Water was collected Groundwater samples were collected directly from the well using a bailer from 63 Tews Lane, and 15 Medwin Drive, or from an outdoor tap which bypasses any treatment 3 Medwin Drive and 609 Harvest Road.

Collected groundwater samples were characterized by high levels of hardness, colour, turbidity, total iron, and total manganese. These parameters are considered representative of the bedrock aquifer. High total iron and manganese concentrations were attributed to the oxidation of the steel well casing since groundwater samples from private residential wells were obtained from untreated source, and water taking fluctuations within private wells is expected to have resulted in heavy oxidation of casing material.

Total coliform bacteria were also detected within collected samples, which was attributed to collection of samples from within the well casing using a bailer, or within the distribution system, and is not considered characteristic of the bedrock supply aquifer. Nitrate concentrations within private water supply wells ranged from non-detect to 1.7 mg/L. Organic parameters included under O.Reg. 169/03 were not detected in completed sampling for private residential wells.

Groundwater sampling completed at 63 Tews Lane indicated high concentrations of total metals including aluminium, arsenic, iron, and manganese. These concentrations of total metals were attributed to be due to sampling methodology using a disposable bailer to obtain a shallow sample directly from the well casing. Resampling was completed at the property May 16, 2023, using a submersible test pump drawing groundwater from above the installed pump to obtain a sample considered representative of groundwater used for the residence. Results of water quality sampling completed on May 16, 2023, indicated all

health-related parameters were within acceptable limits. A summary of all off-site groundwater sampling results is provided in the attached **Table 5**. Laboratory certificates of analysis are provided in the attached **Appendix C**.

6.6.3 Sumary of Groundwater Field Quality Analysis

Field analysis was completed from TW 2-13 (hourly), TW 1-13, TW 3-13 (daily) MW 101 (December 12 and 15) and from private residential monitoring wells (December 15). Field parameters were measured in field using a Horiba U 52 sampling unit, office calibrated prior to use. Field parameter included temperature, pH, oxidation reduction potential, conductivity, turbidity, dissolved oxygen and total dissolved solids. A summary of measured field values are provided in the attached **Table 6**.

Sampled field parameters within TW 2-13 were observed to remain consistent over the duration of monitoring. Field sampled parameters were consistent between monitoring locations and with the results of laboratory analysis. Average field parameter values are summarized in the following table:

Summary of Average Field Sampling Parameters

Location	Temp (ºC)	pH	ORP (mV)	Conductivity (ms/cm)	Turbidity (NTU)	DO (mg/L)	TDS (mg/L)
TW 2-13	5.8	7.2	132	1.1	0	14.1	0.7
TW 1-13	7.8	7.7	78	0.7	29	5.9	0.5
TW 3-13	8.5	7.5	77	2.5	14	3.1	0.5
MW 101	8.4	7.3	45	0.6	61	8.4	0.4
3 Medwin	9.2	7.2	86	1.0	0	6.0	0.6
15 Medwin	13.2	7.1	105	1.0	0	5.1	0.7
609 Harvest	8.2	7.4	121	1.2	0	7.9	0.6
63 Tews	7.0	7.4	111	0.9	9	5.2	0.6

ORP – Oxidation Reduction Potential
DO – Dissolved Oxygen
TDS – Total Dissolved Solids

6.6.4 Summary of Microscopic Particulate Analysis Sampling

Sampling was completed for microscopic particulate analysis (MPA), including coliphages from TW 2-13 following 24, 48, and 72 hours of elapsed pumping, and for coliphages from surface water along Logie's Creek at Tew falls after 24 hours of pumping. Analysis indicated no observable microscopic particulate within obtained groundwater samples and no observable coliphages within surface water at the sampled intervals. Certificates of analysis for completed MPA testing is provided in **Appendix D**.

6.6.5 Summary Age Dating Analysis

Age dating analysis was carried out for TW 2-13, FDG01, and for surface water within Logie's Creek at Tews Falls on December 15, 2022. Age dating testing verified the presence of deuterium (H^2) isotopes

and oxygen O^{18} isotopes. Evaporation and precipitation will deplete levels of O^{18} isotopes, given that they are heavier than O^{16} isotopes. Surface water is expected to have lower concentrations of O^{18} relative to older groundwater sources. Based on the results of sampling surface water was observed to have O^{18} ratios of -8.6% relative to the standard meteoric line and ratios of -10.3 % of O^{18} relative to the standard meteoric line within groundwater. Rations of H^2 were also observed to have variation between surface water and groundwater sources, with surface water ratios for H^2 of -59.1% relative to the standard meteoric line and ratios of -67.5 % of H^2 relative to the standard meteoric line within groundwater. Surface water would be derived by precipitation more so than groundwater sources.

When ratios of H^2 and O^{18} are plotted with the global meteoric line, which describes the global annual average relationship between O^{18} and H^2 isotopes ratios in water both surface and groundwater fall within reasonable limits of the trendline. Based on the completed age dating analysis surface water has a slightly younger age based on the observed ratios of H^2 and O^{18} molecules. Age dating analysis and trendline potting is provided in **Appendix G**.

7.0 DISCUSSION AND ANALYSIS

7.1 Site Hydrogeological Function

The current hydrogeological function of the site was evaluated to assess the potential areas of hydrogeological impact as a result of development of the site. The following conditions were noted:

- Surficial overburden deposits across the site consist of glaciolacustrine deposits comprised of coarse sands and gravel trace silt and clay.

- Surficial deposits overlie dolostone bedrock of the Guelph Formation. Shallow bedrock is characterized to be fractured and will be water bearing. Shallow bedrock of the Guelph Formation is underlain by shale bedrock of the Queenston Formation.

- The Guelph Formation is reported as a brown dolostone. It is expected that water quality within the Guelph Formation will be mineralized with varying concentrations of hardness, carbonate, sodium, iron, and manganese. TW 2-13, along with wells included within the network of monitoring wells used for this investigation are completed within limestone bedrock.

- Within the vicinity of the site the primary water supply aquifer is the dolostone bedrock. Wells in the vicinity of the site are generally completed to a depth of approximately 30 to 60 m.

- Groundwater flow within overburden and within shallow bedrock for the area has been confirmed to the south.

- It is expected that the site functions to provide groundwater recharge for the underlying dolostone bedrock. Areas of groundwater discharge were not observed across the site or for the surrounding vicinity. Groundwater discharge from within bedrock is expected along the face of the Niagara Escarpment south of the site.

- Surface water features in the immediate vicinity include Logie's Creek and Tew Falls. It is expected that overburden in the area generally allows for the recharge of groundwater across the site.

7.2 Drawdown Assessment

Potential drawdown due to water taking was assessed based on the results of pumping. Groundwater levels measurements completed within the pumping and monitoring well network indicated drawdown attributed to the pumping test at monitoring locations TW 1-13, TW 3-13 and 63 Tews Lane. The following summarizes the distance vs. drawdown observed for water taking:

Summary of Distance vs. Drawdown

Location	Distance from Pumping Well (m)	Observed Drawdown (m)
TW 2-13	0	1.0
TW 3-13	90 (south)	0.3
TW 1-13	150 (north)	0.7
63 Tews Lane	200 (northeast)	0.5

Given that TW 2-13 is screened within bedrock drawdown will be dependent on the location and orientation of water bearing fractures. Drawdown with distance from TW 2-13 was not observed to have a direct correlation. Based on the observed drawdown it is expected that fractures trend in a southwest to northeast orientation. The private well at 63 Tews Lane represents the closest private well included within the monitoring program. The remaining private residential wells monitored ranged in distance from 250 m to 400 m east of TW 2-13. Impacts of water taking were not observed within these private residential monitoring wells.

The results of testing at TW 2-13 were analyzed to assess aquifer properties including hydraulic conductivity, transmissivity, and storativity. The aquifer response to both groundwater drawdown and recovery were plotted to assess aquifer properties following a Cooper, Jacob analysis methodology. Drawdown analysis is provided in **Appendix H**, including semi-log plots used in determining storage coefficients based on the following equation:

$$S = 2.25Tt_o/r^2$$

Where: S is the storage coefficient

T is transmissivity (m^2/sec)

t_o is the semi-log intersect where zero drawdown crosses the time axis (min)

r is the radial distance from the pumping well (m)

The following table provides a summary of the results of aquifer analysis:

Summary of Aquifer Properties from Testing (TW 2-13)

Location	Distance from Pumping Well (m)	Hydraulic Conductivity (m/sec)	Transmissivity (m^2/sec)	Storage Coefficient
TW 2-13 (Drawdown)	0	2.3×10^{-4}	2.2×10^{-3}	5.3×10^{-4}
TW 2-13 (Recovery)	0	2.3×10^{-4}	2.1×10^{-3}	5.2×10^{-4}
TW 3-13	90	1.7×10^{-4}	2.3×10^{-3}	2.6×10^{-5}
TW 1-13	150	1.3×10^{-4}	1.2×10^{-3}	7.0×10^{-4}
63 Tews Lane	200	1.1×10^{-4}	1.5×10^{-3}	8.4×10^{-4}
Average Values		**1.7×10^{-4}**	**1.9×10^{-3}**	**5.2×10^{-4}**

Based on the above aquifer long term yield given the assumed 20-year pumping period. The seasonal low groundwater conditions were assumed from the SNC Lavalin investigation at 11.97 m below grade which is considered consistent with the static groundwater level measured at 11.85 m on September 23, 2022, and the average aquifer properties summarized above.

Summary of Long-Term Yield Analysis

Parameters	Unit/Formula		Values
Time (t)	Year		20
	Day		7300
Transmissivity (T)	m^2/sec		1.9×10^{-3}
	m^2/day		164.2
Maximum Available Drawdown (h_o-h)	m		1.68
Radius of Well Screen (r)	m		0.076
Storage Coefficient (s)	Unitless		5.2×10^{-4}
Constant (u)	$u = sr^2/4Tt$	Unitless	5.4×10^{-8}
Well Function of u [W(u)]	-0.5772 – ln(u)	Unitless	16.2
Long-Term Yield (Q_{20}) Theis	$Q_{20} = 4\pi T(h_o\text{-}h)/W(u)$	m^3/day	214
		L/min	149
Long-Term Yield (Q_{20}) Farvolden	$Q_{20} = 0.068T(h_o\text{-}h) \times 0.7$	m^3/day	131
		L/min	91

Given the above analysis it is expected that the target yield for TW 2-13 of 90 L/min is expected to be sustainable over the long-term.

7.3 GUDI Analysis

An assessment was completed for TW 2-13 to assess the potential that TW 2-13 yield groundwater under the direct influence of surface water (GUDI). The assessment was conducted in accordance with the MECP guidance document titled *Terms of Reference for Hydrogeological Studies to Examine Groundwater Sources Potentially Under Direct Influence of Surface Water (MOECC, 2001).* The terms of reference followed a multi criteria approach, with the criteria provided below followed by the completed assessment.

7.3.1 Physical Evidence of Surface Contamination

Physical evidence of surface water contamination in groundwater includes high rates of turbidity, or visible plant or insect matter. Field and laboratory concentrations of turbidity in discharge water remained consistently low. Turbidity was not detected within field sampling completed on a hourly basis over the duration of testing. Laboratory analysis indicated initial concentrations of 6.8 NTU, likely attributed to sediment from the base of the well disturbed with test well installation and the start of testing. Subsequent sampling steadily improved from 0.47 NTU to 0.26 NTU. Physical evidence of surface contamination was not observed during the completion of microscopic particulate analysis. This criterion was not met under the completed GUDI analysis.

7.3.2 Microscopic Particulate Analysis

Microscopic Particulate Analysis (MPA) was carried out after 24 hours, 48 hours and 78 hours of elapsed pumping. Completed MPA analysis did not detect any microscopic particulate within collected samples. Groundwater is considered to not have come in direct contact with sources of microscopic particulate such as surface water. Coliphage was also not detected within groundwater samples collected as part of the MPA analysis. This criterion was not met under the completed GUDI analysis.

7.3.3 Bacterial Contamination of Groundwater

Laboratory analysis of groundwater discharge from TW 2-13 was completed over five sampling events. Bacteria including e-coli and total coliforms were not detected within any of the collected samples. Surface water samples indicated total coliform counts ranging from 1,960 to 3,650 colony forming units (CFU) per 100 mL, with e-coli counts ranging from 10 to 20 CFU per 100 mL. Given the above bacterial sampling results this criterion was not met under the completed GUDI analysis.

7.3.4 Well Characteristics and Groundwater Quality

Test well TW 2-13 was completed as a bedrock well as noted within the well record completed as part of well installation. TW 2-13 is located approximately 600 m northwest of Logie's Creek. Other surface water features include a pond within the former quarry site situated approximately 490 m north of TW 2-13 and the drainage channel (historically known as the railway cut) connecting the quarry pond with Logie's Creek located approximately 450 m northeast of TW 2-13. Surface water is located within 500 m of the pumping well TW 2-13.

Water taking was observed to have negligible impact on the overburden monitoring well MW 101 over the duration of water taking. MW 101 is situated approximately 5 m from the pumping well TW 2-13. Water taking from TW 2-13 is not expected to influence shallow groundwater within overburden deposits or overlying surface water features.

TW 2-13 is cased through overburden deposits with the significant water bearing fracture identified at a depth of approximately 12.9 m below grade. It is expected that the bedrock aquifer can be classified as a confined to semi-confined aquifer with limited surface water interaction. Surface water was not monitored as part of the investigation, however, given the negligible response observed within MW 101 it is expected that water taking will not impact vertical gradients recharging the bedrock aquifer, potentially influencing surface water features.

Field testing over the duration of testing indicated an average value of 5.8 ^{o}C, with an average dissolved oxygen content of 14.1 mg/L. Given the ambient temperature of December, the average temperature of groundwater was representative of a groundwater source. Given the above considerations this criterion was not met under the completed GUDI analysis.

Under the above completed GUDI analysis and considering the results of completed age dating, indicating surface water is derived from precipitation and was observed to have a different O^{18} and H^{2} ratio when compared to groundwater, TW 2-13 should not be considered as a GUDI source. Groundwater is expected to be geologically isolated from surface water features.

7.4 Water Taking Impact Analysis

The following sections provide a summary of the potential impacts of water taking to surrounding features including groundwater uses in he vicinity of the site, and natural features. The potential for groundwater quality impacts was assessed based on the completed testing and analysis summarized in the above sections.

7.4.1 Impacts to Private Supply Wells

Given that the test rate is considered sustainable over the long term, the observed drawdown rates within monitoring wells are expected to be representative of potential drawdown over long term water taking. Based on the observed drawdown it is expected that water bearing fractures trend in an south/southwest to north/northeast direction. The present distribution of monitoring wells on site, primarily TW 1-13 and TW 3-13 are expected to function adequately as sentry wells to assess drawdown effects with water taking at TW 2-13 over the long-term.

Water taking from TW 2-13 was considered based on the lowest expected available drawdown based on measured seasonal conditions as part of the ongoing monitoring completed by the City of Hamilton. By maintain a pumping rate suitable to meet demand for the municipal well, but also minimizing the drawdown within the test well, drawdown at a distance from the test well will also be effectively managed. Over the duration of testing drawdown within TW 2-13 was calculated at approximately 15% of available drawdown, with drawdown to the closest monitored private well at 63 Tews Lane amounting to approximately 5% of available drawdown.

Based on the observed drawdown within the pumping well and monitoring wells significant drawdown impacts to private water supply wells in vicinity to TW 2-13 are not expected. The present arrangement of monitoring wells, including TW 1-13 and TW 3-13 is expected to provide adequate coverage for the long-term assessment of drawdown impacts and evaluation of potential well interference claims that may arise from long-term water taking from TW 2-13.

7.4.2 Surface Water Impacts

The potential for long-term impacts to surface water was evaluated based on the criteria used as part of the GUDI analysis summarized in Section 7.3 above. Water taking from within limestone bedrock at the location of TW 2-13 is expected to be geologically isolated from the shallow overburden, based on monitoring results from MW 101 over the duration of testing, and surface water features. The following summarizes the conditions considered as part of the GUDI analysis:

- Physical evidence of surface water contamination
- Microscopic particulate including the presence of coliphages within groundwater
- Bacterial contamination of groundwater
- Construction details of the test well including proximity to surface water, depth, temperature and dissolved oxygen variation, and age dating

The above criteria were not met with regards to monitoring for TW 2-13 over the duration of testing. It is expected that TW 2-13 is geologically isolated from surface water features and water taking will not impact surface water features in the vicinity of TW 2-13.

7.4.3 Impacts on Water Quality

Water quality impacts were evaluated including parameters within O.Reg. 169/03. There was no available record of environmental site assessments completed within the vicinity of the site. Surrounding

properties consist of residential subdivisions, and estate residential properties. Potentially contaminating activities were not noted within the study area. Further, the City of Hamilton has completed well head mapping and risk assessment for the municipal well FDG01 and similar studies have been completed for TW 2-13 should the well be utilized as a municipal source. Under the Clean Water Act, potentially contaminating activities would be restricted from identified well head protection zones for TW 2-13.

8.0 MONITORING AND CONTINGENCY PLANNING

It is expected that the present network of monitoring wells in place for water taking from FDG01 will be maintained and monitored as part of water taking from TW 2-13. Monitoring wells include TW 1-13, TW 3-13, and MW 101. Monitoring for these wells in addition to TW 2-13 are to be monitored on a continuous basis with measurements at a 10-minute interval, consistent with on-going monitoring and other wells included as part of the monitoring well network operated by the City of Hamilton. Monitoring data from these monitoring wells will provide sufficient baseline data and on-going groundwater elevations with which to evaluate potential well interference claims.

Based on completed sampling, potential issues with total suspended solids and associated total metals poses a concern with regards to water quality as observed within on-site monitoring wells TW 1-13 and TW 3-13. Groundwater sampling indicates that high levels of total metals is not characteristic of groundwater quality for TW 2-13, given that adequate separation is maintained from the base of TW 2-13. For the purposes of this investigation, it was assumed that a 3.0 m separation from the base of the well would be maintained. It is expected that ongoing groundwater quality monitoring will be maintained consistent with the current groundwater monitoring program for FDG01. A review of total suspended solids concentrations should be completed to assess the requirements for well maintenance (i.e., flushing sediment from the base of well), or raising the intake such that suspended solids are not disturbed.

Nitrate concentrations within TW 2-13 were observed to increase over the duration of testing from 1.4 mg/L to 3.2 mg/L and decrease to 1.36 mg/L following completion of testing. There is potential for nitrate mobilization with water taking for TW 2-13 likely as a result of surrounding private subsurface sewage disposal. Nitrate concentrations over the duration of testing did not result in health related exceedances of O.Reg. 169/03. Regular groundwater quality monitoring will be required for nitrate to assess fluctuations with water taking.

In the event that TW 2-13 is utilized as a municipal well a record of daily water taking will be maintained by the City of Hamilton, which will be submitted as part of the PTTW Conditions for water taking. This record will also be useful with which to evaluate well interference claims.

In the event of a well interference claim, a temporary water source would be immediately arranged for the impacted property, and an inspection would be scheduled within 24 hours by City staff and a hydrogeologist. The inspection would include a physical inspection of the impacted well and pumping equipment. The inspection results would be reviewed in conjunction with background information

regarding water taking and groundwater monitoring results to make an assessment as to the cause of the well interference.

If well interference is deemed to be the result of water taking from TW 2-13 the impacted well would be replaced to obtain potable groundwater of suitable quality and quantity for residential use, or a connection would be provided to the impacted property to provide municipal water, at cost to the City.

9.0 SUMMARY AND CONCLUSIONS

1. The long-tern yield of TW 2-13 of 90 L/min was assessed to be sustainable over the long term, with a maximum drawdown not expected to exceed 1.0 m. Significant impacts to surrounding private wells are not expected based on the expected drawdown at TW 2-13.

2. Given that TW 2-13 is screened within bedrock drawdown will be dependent on the location and orientation of water bearing fractures. Drawdown with distance from TW 2-13 was not observed to have a direct correlation. Based on the observed drawdown it is expected that fractures trend in a southwest to northeast orientation.

3. Under the above completed GUDI analysis and considering the results of completed age dating, indicating surface water is derived from precipitation and was observed to have a different O^{18} and H^2 ratio when compared to groundwater, TW 2-13 should not be considered as a GUDI source. Groundwater is expected to be geologically isolated from surface water features.

4. It is expected that the present network of monitoring wells in place for water taking from FDG01 will be maintained and monitored as part of water taking from TW 2-13. Monitoring wells include TW 1-13, TW 3-13, and MW 101. Monitoring for these wells in addition to TW 2-13 are to be monitored on a continuous basis.

5. Based on completed sampling potential issues with total suspended solids and associated total metals poses a concern with regards to water quality. Groundwater sampling indicates that high levels of total metals is not characteristic of groundwater quality given that adequate separation is maintained from the base of TW 2-13. For the purposes of this investigation, it was assumed that a 3.0 m separation from the base of the well would be maintained.

6. It is expected that ongoing groundwater quality monitoring will be maintained consistent with the current groundwater monitoring program for FDG01. A review of total suspended solids concentrations should be completed to assess the requirements for well maintenance (i.e., flushing sediment from the base of well), or raising the intake such that suspended solids are not disturbed.

We trust this report meets with your requirements. Should you have any questions regarding the information presented, please do not hesitate to contact our office.

Yours truly,

Terraprobe Inc.

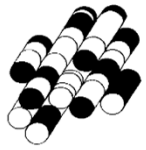
Paul L. Raepple, P.Geo.
Project Manager

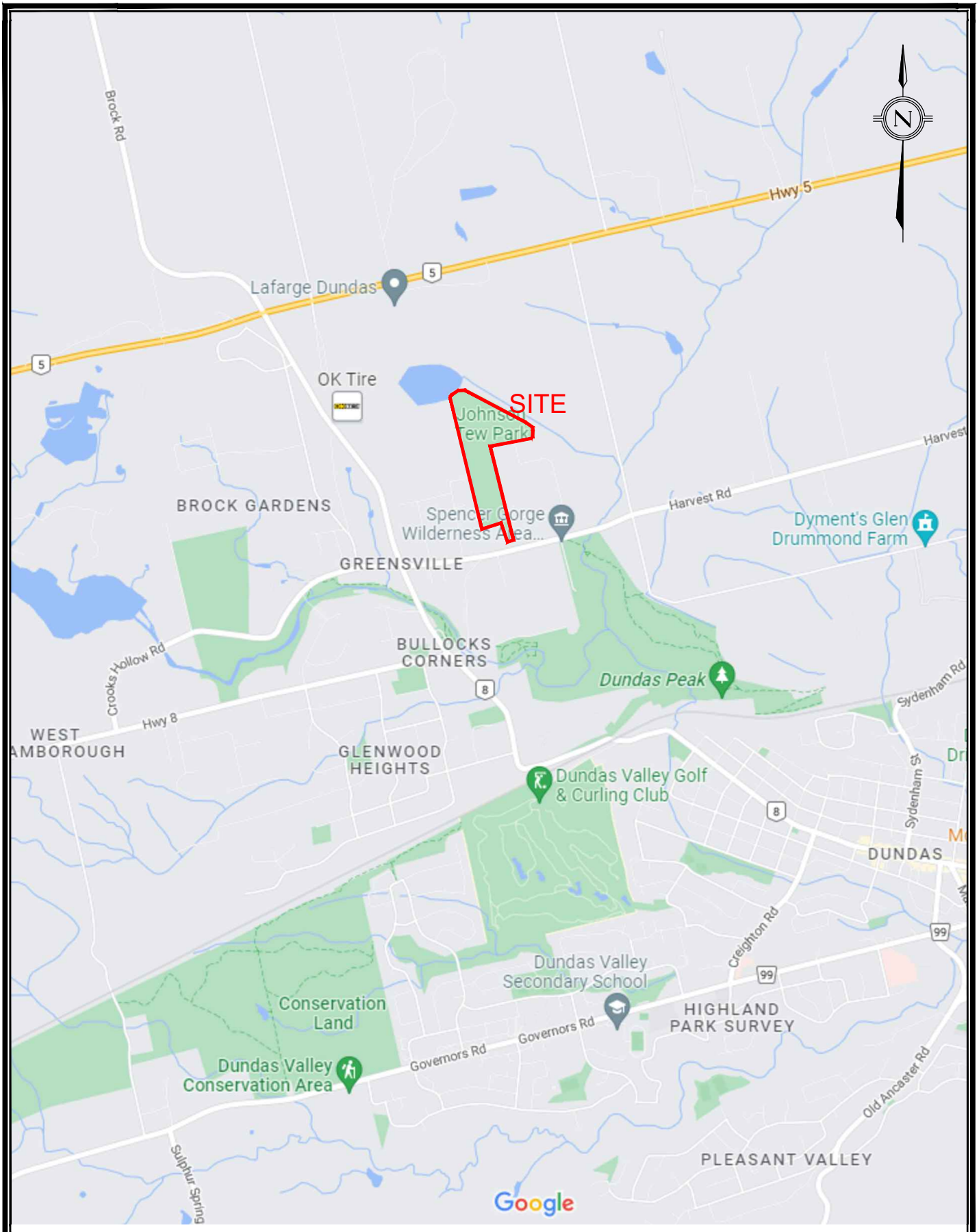
R. Baker Wohayeb, M.A.Sc., P. Eng., QP_{RA}
Principal

Stoney Creek Office

FIGURES

Terraprobe Inc.





Terraprobe
903 Barton Street - Unit 22, Stoney Creek, Ontario, L8E 5R7
Tel: (905) 643-7560, Fax: (905) 643-7559

Title: SITE LOCATION PLAN
Johnson Tew Park, Hamilton, Ontario

File No. 1-22-0561-54

FIGURE : 1

LEGEND

Test/Monitoring Well Location

Pumping Well Location

Terraprobe
903 Barton Street - Unit 22, Stoney Creek, Ontario, L8E 5R7
Tel: (905) 643-7560, Fax: (905) 643-7559

Title: ON-SITE WELL LOCATION PLAN
Johnson Tew Park, Hamilton, Ontario

File No. T1220561.000

FIGURE : 2

TABLES

Terraprobe Inc.

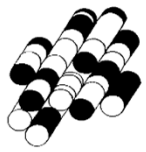


TABLE 1: SUMMARY OF DOOR-TO-DOOR PRIVATE WELL SURVEY
CITY OF HAMILTON PUMPING TEST
JOHNSON TEW PARK, DUNDAS, ONTARIO

ADDRESS	NAME	WELL TYPE	WATER LEVEL (mbgl)	WELL DEPTH (mbgl)	TREATMENT SYSTEMS	WELL USE	WELL DEMAND	COMMENTS
Tews Lane								
1 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
4 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
6 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
12 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
16 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
17 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
20 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
24 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
28 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
32 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
35 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
36 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
39 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
40 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
43 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
44 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
47 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
51 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
55 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
59 Tews Lane	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
63 Tews Lane	Unknown	Driking Water Well	14.94	28	Softner, UV, RO	Residential, landscaping	4 persons	Spoke with property owner, Agreed to participate in well survey, Installed data logger on December 01, 2022, and took water samples, well type- drilled, casing-steel, pump type-unknown, date constructed-2016, water quality-sulphur odour-tank installed, water quantity-no issues, well location-side yard towards back left side from Tews Lane.
Medwin Drive								
1 Medwin Drive	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
2 Medwin Drive	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
3 Medwin Drive	Unknown	Driking Water Well	6.67	18.96	Softner RO	Residential, landscaping, pool, hot tub	5 persons	Agreed to participate in well survey, Installed data logger on December 01, 2022, and took water samples, well type- drilled, casing-steel, pump type-submersible, date constructed-1997, water quality-low level bacteria at times, water quantity-no issues, well location-backyard under wooden washing well structure.
4 Medwin Drive	Unknown	Driking Water Well	None	13.7	Softner UV	Residential	5 persons	Agreed to participate in well survey. However, access to the well cap was not possible. Continuous monitoring of water levels were not obtained. Resident was advised to contact fieldstaff if any noteable changes to water quality or quantity occurred throughout and follwing the puming test.
5 Medwin Drive	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
6 Medwin Drive	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
7 Medwin Drive	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
8 Medwin Drive	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
9 Medwin Drive	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
10 Medwin Drive	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
11 Medwin Drive	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
12 Medwin Drive	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
14 Medwin Drive	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
15 Medwin Drive	Unknown	Driking Water Well	None	None	Waki softner	Residential	5 persons	Agreed to participate in well survey, Installed data logger on December 09, 2022, water samples were obtained December 12, 2022 from an untreated outdoor tap prior to starting pumping test, well type- drilled, casing-steel, pump type-submersible, date constructed-unknown, water quality-minor iron staining, water quantity-no issues, well location-front yard.
16 Medwin Drive	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
Harvest Road								
581 Harvest Road	Unknown	Driking Water Well	None	None	Septic System	Residential	Unknown	No Response. Letter left at residence.
609 Harvest Road (13 Medwin Drive)	Unknown	Driking Water Well	None	None	Septic System	Residential	4	Spoke with property owner, Agreed to participate in well survey, Installed data logger, and took water samples, well type- drilled, casing-steel, well use-residential.

Table 2: Summary of Manual Water Levels - TW2-13
City of Hamilton Municipal Pumping Test
Johnson Tew Park, Dundas, Ontario

MW ID	Ground Surface Elevation (masl)	Well Depth (mbgl)	Well Depth (masl)
TW2-13	243.76	21.67	222.09

12-Dec-22															
17:20		17:40		6:20 PM		19:20		20:20		21:20		22:20		23:20	
mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl
11.34	232.42	11.67	232.09	11.76	232	11.83	231.93	11.86	231.9	11.86	231.9	11.83	231.93	11.86	231.9

13-Dec-22																																										
0:20		1:20		2:20		3:20		4:20		5:20		6:20		7:20		8:20		9:20		10:20		11:20		12:20		13:20		14:20		15:20		16:20		17:20		18:20		19:20		20:20		21:20		22:20		23:20	
mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl
11.83	231.93	11.86	231.9	11.83	231.93	11.83	231.93	11.83	231.93	11.83	231.93	11.83	231.93	11.83	231.93	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.89	11.86	231.9	11.86	231.9	11.86	231.9	11.89	231.87	11.86	231.9	11.86	231.9	11.89	231.87	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9

14-Dec-22																																										
0:20		1:20		2:20		3:20		4:20		5:20		6:20		7:20		8:20		9:20		10:20		11:20		12:20		13:20		14:20		15:20		16:20		17:20		18:20		19:20		20:20		21:20		22:20		23:20	
mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl
11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.89	231.87	11.89	231.87	11.89	231.87	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.89	231.87

15-Dec-22																																	
0:20		1:20		2:20		3:20		4:20		5:20		6:20		7:20		8:20		9:20		10:20		11:20		12:20		13:20		14:20		15:20		16:20		17:20	
mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl
11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.83	231.93	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.86	231.9	11.92	231.84	11.92	231.84	11.89	231.87	11.89	231.87	11.89	231.87	11.89	231.87	11.89	231.97

Table 3: Summary of On-site and Off-site Manual Water Levels
City of Hamilton Municipal Pumping Test
Johnson Tew Park, Dundas, Ontario

Location	Approximate Ground Surface Elevation (masl)	Well Depth		Resident Ground Water Levels																													
		mbgl	masl																														
TW1	248.92	23.15	225.77	12-Dec-22		13-Dec-22				14-Dec-22						15-Dec-22																		
				17:50		9:00		10:50		10:00		11:50		15:30		10:00		14:15		16:40														
				mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl												
				15.32	233.6	15.53	233.39	15.55	233.37	16.03	232.89	15.83	233.09	15.51	233.41	15.52	23.4	15.5	233.42	15.6	233.32												
TW3	246.1	26.34	219.76	12-Dec-22		13-Dec-22								14-Dec-22						15-Dec-22													
				17:50		9:10		10:00 AM		12:00		16:00		10:00		11:40		15:20		10:30		14:00		16:30									
				mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl								
				12.63	232.47	12.77	232.33	12.77	232.33	12.78	232.32	12.78	232.32	12.8	232.3	12.78	232.32	12.81	232.39	12.8	232.3	12.77	232.33	12.77	232.33								
MW101	243.76	23.15	220.61	12-Dec-22		13-Dec-22				14-Dec-22						15-Dec-22																	
				17:30		8:30		10:30 AM		14:30		10:00		12:00		15:30		9:30		14:00		17:00											
				mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl										
				8.68	235.24	8.69	235.23	8.68	235.24	8.69	235.23	8.68	235.24	8.65	235.27	8.69	235.23	8.69	235.23	8.68	235.24	8.69	235.23										
3 Medwin Drive	236	18.97	217.03	01-Dec-22		12-Dec-22				13-Dec-22						14-Dec-22								15-Dec-22						21-Dec-22			
				13:00		12:10		6:20 PM		8:20		11:40		17:10		8:10		11:10		11:40		16:30		8:30		12:30		15:30		11:20			
				mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl		
				6.3	229.7	6.68	229.32	6.32	229.68	6.51	229.49	6.31	229.69	6.33	229.67	6.33	229.67	6.29	229.71	6.38	229.62	6.4	229.6	6.34	229.66	6.32	229.68	6.39	229.61	6.35	229.65		
15 Medwin Drive	241	18.3	222.7	09-Dec-22		12-Dec-22				13-Dec-22				14-Dec-22								15-Dec-22				21-Dec-22					
				17:40		11:10		16:00		11:30		16:40		8:40		10:50		13:30		16:20		8:30		12:30		16:00		21:20					
				mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl				
				13.01	227.99	13.04	227.96	13.41	227.59	13.24	227.76	13.24	227.76	13.39	227.61	13.76	227.24	13.48	227.52	13.83	227.17	13.33	227.67	13.6	227.4	13.05	227.95	13.23	227.77				
609 Harvest Road (13 Medwin Drive)	239	17.07	221.93	01-Dec-22		12-Dec-22				13-Dec-22						14-Dec-22								15-Dec-22						21-Dec-22			
				14:00		11:40		6:10 PM		8:20		11:30		16:50		8:20		10:20		13:30		16:20		8:20		12:30		15:40		11:40			
				mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl		
				10.37	228.63	10.48	228.52	10.19	228.81	10.61	228.39	10.57	228.43	10.47	228.53	10.38	228.62	10.46	228.54	10.46	228.54	10.51	228.49	10.37	228.63	10.4	228.6	10.93	228.07	10.52	228.48		
63 Tews Lane	247	28	219	01-Dec-22		12-Dec-22				13-Dec-22						14-Dec-22								15-Dec-22				21-Dec-22			
				11:10		12:00		18:20		8:10		11:40		17:10		8:10		11:00		13:50		16:40		12:40		15:10		11:10					
				mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl	mbgl	masl				
				14.2	232.8	14.23	232.77	14.48	232.52	14.65	232.35	14.88	232.12	14.64	232.36	14.71	232.29	14.68	232.32	14.66	232.34	14.7	232.3	14.67	232.33	14.67	232.33	14.26	232.74				

Table 4: Summary of On-Site Water Quality Sampling
Pumping Well TW 2-13
Greensville Municipal Well FDG01 Replacement

Client: Hamilton Water		Work Completed By:		Terraprobe Inc. - Stoney Creek		
Attention: Marco Silvario		Project No.:		T1220561.000		
City of Hamilton - Environmental Laboratory		Project Name:		Municipal Well Assessment		
Adddress: 700 Woodward Avenue, Hamilton, Ontario, L8H 6PN		Sampler Initials:		ABC and HP		
Sample ID: TW-2-13						
	ODWS	AO/OG	Units	Analysis		
Date and Time				12-Dec-22	13-Dec-22	14-Dec-22
INORGANICS						
Alkalinity (Total as CaCO3)		30-500	mg/L	292	318.0	320
Ammonia + Ammonium			mg/L	<0.01	<0.01	<0.01
Anion Sum (Calculation)			mg/L	7.6	10.7	11.4
Bicarbonate as Carbonate (Calculation)			mg/L	292	318.0	320
Bromide			mg/L	<1	<1	<1
Cation Sum (Calculation)			mg/L	7.3	10.5	10.8
Chloride		250	mg/L	12.6	95.5	106
Colour (apparent)		5	CU	39	4.0	3
Conductivity			umho/cm	654	970.0	1020
Cyanide - Total	0.2		mg/L	<0.003	<0.003	<0.003
Dissolved Organic Carbon		5	mg/L	1.8	0.9	1.1
Fluoride	1.5		mg/L	0.12	0.2	0.16
Ion Balance (Calculation)			%	1.8	0.6	2.6
Nitrate as N	10		mg/L	1.41	2.9	3.2
Nitrate + Nitrite as N			mg/L	1.41	2.9	3.2
Nitrite as N	1		mg/L	<0.05	<0.05	<0.05
o-Phosphase as P			mg/L	<0.05	<0.05	<0.05
pH		6.5 - 8.5	pH	7.87	7.86	7.87
pH-Saturation			pH	6.96	6.86	6.85
Silica-Reactive			mg/L	14.5	<0.2	15.9
Sulphate			mg/L	44.1	66.5	66.5
Temperature			C	20.9	20.4	20.9
Total Suspended Solids		500	mg/L	3.1	<3	<2
Turbidity		5	NTU	6.83	0.47	0.47
Hardness		80 - 100	mg/L	334	431	436
METALS						
Total Aluminum (Al)		0.1	mg/L	0.106	0.003	<0.002
Total Antimony (Sb)	0.06		mg/L	<0.0001	<0.0001	<0.0001
Total Arsenic (As)	0.01		mg/L	0.0033	0.0003	0.0002
Total Barium (Ba)	1		mg/L	0.0932	0.109	0.109
Total Beryllium (Be)			mg/L	<0.0001	<0.0001	<0.0001
Total Bismuth			mg/L	<0.0001	<0.0001	<0.001
Total Boron (B)	5		mg/L	0.018	0.023	0.023
Total Cadmium (Cd)	0.005		mg/L	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)			mg/L	103	134	134
Total Chromium (Cr)	0.05		mg/L	0.0022	0.0002	0.0002
Total Cobalt (Co)			mg/L	0.0004	<0.0001	<0.0001
Total Copper (Cu)		1	mg/L	0.0015	0.0005	0.0005
Total Iron (Fe)		0.3	mg/L	1.96	0.065	0.042
Total Lead (Pb)	0.01		mg/L	0.0043	0.0001	<0.0001
Total Lithium (Li)			mg/L	0.0068	0.0099	0.0114
Total Magnesium (Mg)			mg/L	18.6	24.1	24.6
Total Manganese (Mn)		0.05	mg/L	0.0339	0.0062	0.0056
Mercury (Hg)	1		ug/L	<0.05	<0.05	<0.05
Total Molybdenum (Mo)			mg/L	0.0004	0.0004	0.0004
Total Nickel (Ni)			mg/L	0.0009	0.0005	0.0005
Total Potassium (K)			mg/L	1.01	1.71	1.81
Total Selenium (Se)	0.05		mg/L	0.0002	0.0002	0.0002
Total Silicon (Si)			mg/L	6.87	7.73	8.06
Total Silver (Ag)			mg/L	<0.0001	<0.0001	<0.0001
Sodium (Na)		20/200	mg/L	12.1	41.5	46.9
Total Strontium (Sr)			mg/L	0.943	1.61	1.68
Total Thallium (Tl)			mg/L	<0.0003	<0.0003	<0.0003
Total Tin (Sn)			mg/L	<0.0001	<0.0001	<0.0001
Total Titanium (Ti)			mg/L	0.0022	0.0004	<0.0004
Total Tungsten (W)			mg/L	0.0003	<0.0001	<0.0001
Total Uranium (U)	20		ug/L	0.615	0.717	0.747
Total Vanadium (V)			mg/L	0.0004	<0.0001	<0.0001
Total Zinc (Zn)		5	mg/L	0.065	0.036	0.035
Total Zirconium (Zr)			mg/L	0.0004	<0.004	<0.0004
NUTRIENTS						
Dissolved Phosphorus (P)			mg/L	0.019	<0.010	<0.010
MICROBIOLOGICAL / ORGANICS						
Escherichia Coli	0		MPN/100mL	0	0	0
Coliform	0		MPN/100mL	0	0	0
1,1-Dichloroethylene	14		ug/L	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	200		ug/L	<0.2	<0.2	<0.2
1,2-Dichloroethane	5		ug/L	<0.2	<0.2	<0.2
1,4-Dichlorobenzene	5		ug/L	<0.2	<0.2	<0.2
Benzene	1		ug/L	<0.2	<0.2	<0.2
Bromodichloromethane			ug/L	<0.2	<0.2	<0.2
Bromoform			ug/L	<0.2	<0.2	<0.2
Carbon Tetrachloride	2		ug/L	<0.2	<0.2	<0.2
Chlorobenzene	80		ug/L	<0.3	<0.3	<0.3
Chloroform			ug/L	<0.2	<0.2	<0.2
Dibromochloromethane			ug/L	<0.2	<0.2	<0.2
Dichloromethane	50		ug/L	<0.5	<0.5	<0.5
Ethylbenzene	140		ug/L	<0.2	<0.2	<0.2
m+p-Xylene			ug/L	<0.4	<0.4	<0.4
o-Xylene			ug/L	<0.2	<0.2	<0.2
Tetrachloroethylene	10		ug/L	<0.2	<0.2	<0.2
Toluene	60		ug/L	<0.2	<0.2	<0.2
Total Trihalomethanes	100		ug/L	<0.4	<0.4	<0.4
Trichloroethylene	5		ug/L	<0.2	<0.2	<0.2
Vinyl Chloride	1		ug/L	<0.2	<0.2	<0.2
Xylene	90		ug/L	<0.5	<0.5	<0.5
Caffeine			ug/L	<0.5	-	-

ODWS - Ontario Drinking Water Standards
AO/OG - Aesthetic Objective/Operational Guidelines
(1) Values reported may be biased low due to overgrowth.

Table 4: Summary of On-Site Water Quality Sampling
Pumping Well TW 2-13
Greensville Municipal Well FDG01 Replacement

Client: Hamilton Water		Work Completed By:	Terraprobe Inc. - Stoney Creek		
Attention: Marco Silvario		Project No.:	T1220561.000		
City of Hamilton		Project Name:	Municipal Well Assessment		
Environmental Laboratory		Sampler Initials:	ABC and HP		
700 Woodward Avenue, Hamilton, Ontario, L8H 6PN					
Sample ID: TW 2-13					
	ODWS	AO/OG	Units	Analysis	
Date and Time				15-Dec-22	17-Jan-23
INORGANICS					
Alkalinity (Total as CaCO3)		30-500	mg/L	311	304
Ammonia + Ammonium			mg/L	<0.01	<0.01
Anion Sum (Calculation)			mg/L	-	7.6
Bicarbonate as Carbonate (Calculation)			mg/L	-	304
Bromide			mg/L	-	<1
Cation Sum (Calculation)			mg/L	-	7.5
Chloride		250	mg/L	107	10.8
Colour (apparent)		5	CU	3	<2
Conductivity			umho/cm	1020	634
Cyanide - Total	0.2		mg/L	<0.003	<0.003
Dissolved Organic Carbon			mg/L	0.6	<0.4
Fluoride	1.5	5	mg/L	0.16	0.12
Ion Balance (Calculation)			%	-	0.7
Nitrate as N	10		mg/L	3.21	1.36
Nitrate + Nitrite as N			mg/L	-	1.36
Nitrite as N	1		mg/L	<0.05	<0.05
o-Phosphase as P			mg/L	-	<0.05
pH		6.5 - 8.5	pH	7.8	7.84
pH-Saturation			pH	-	6.93
Silica-Reactive			mg/L	-	14.2
Sulphate			mg/L	66.3	36.3
Temperature			C	-	19.7
Total Suspended Solids		500	mg/L	-	<2
Turbidity		5	NTU	0.36	0.26
Hardness		80 - 100	mg/L	433	350
TOTAL METALS					
Total Aluminum (Al)		0.1	mg/L	<0.002	<0.002
Total Antimony (Sb)	0.006		mg/L	<0.0001	<0.0001
Total Arsenic (As)	0.01		mg/L	0.0002	0.0002
Total Barium (Ba)	1		mg/L	0.11	0.0917
Total Beryllium (Be)			mg/L	<0.0001	<0.0001
Total Bismuth			mg/L	<0.0001	<0.0001
Total Boron (B)	5		mg/L	0.02	0.015
Total Cadmium (Cd)	0.005		mg/L	<0.0001	<0.0001
Total Calcium (Ca)			mg/L	133	111
Total Chromium (Cr)	0.05		mg/L	0.0002	0.0005
Total Cobalt (Co)			mg/L	<0.0001	<0.0001
Total Copper (Cu)		1	mg/L	0.0006	0.0004
Total Iron (Fe)		0.3	mg/L	0.042	0.007
Total Lead (Pb)	0.01		mg/L	<0.0001	<0.0001
Total Lithium (Li)			mg/L	0.0108	0.007
Total Magnesium (Mg)			mg/L	24.6	17.2
Total Manganese (Mn)		0.05	mg/L	0.0053	0.0016
Mercury (Hg)	1		mg/L	<0.05	<0.05
Total Molybdenum (Mo)			mg/L	0.0004	0.0003
Total Nickel (Ni)			mg/L	0.0005	0.0003
Total Potassium (K)			mg/L	1.79	0.87
Total Selenium (Se)	0.05		mg/L	0.0002	0.0003
Total Silicon (Si)			mg/L	7.89	6.76
Total Silver (Ag)			mg/L	<0.0001	<0.0001
Sodium (Na)		20/200	mg/L	48	10.9
Total Strontium (Sr)			mg/L	1.7	0.611
Total Thallium (Tl)			mg/L	<0.0003	<0.0003
Total Tin (Sn)			mg/L	<0.0001	<0.0001
Total Titanium (Ti)			mg/L	0.0004	0.0007
Total Tungsten (W)			mg/L	<0.0001	<0.0001
Total Uranium (U)	20		mg/L	0.754	0.547
Total Vanadium (V)			mg/L	<0.0001	<0.0001
Total Zinc (Zn)		5	mg/L	0.032	0.036
Total Zirconium (Zr)			mg/L	<0.0004	<0.0004
DISSOLVED METALS					
Dissolved Aluminum (Al)		0.1	mg/L	-	<0.002
Dissolved Antimony (Sb)	0.06		mg/L	-	<0.0001
Dissolved Arsenic (As)	0.01		mg/L	-	0.0002
Dissolved Barium (Ba)	1		mg/L	-	0.0906
Dissolved Beryllium (Be)			mg/L	-	<0.0001
Dissolved Bismuth			mg/L	-	<000001
Dissolved Boron (B)	5		mg/L	-	0.015
Dissolved Cadmium (Cd)	0.005		mg/L	-	<0.0001
Dissolved Calcium (Ca)			mg/L	-	110
Dissolved Chromium (Cr)	0.05		mg/L	-	0.0006
Dissolved Cobalt (Co)			mg/L	-	<0.0001
Dissolved Copper (Cu)		1	mg/L	-	0.0004
Dissolved Iron (Fe)		0.3	mg/L	-	0.078
Dissolved Lead (Pb)	0.01		mg/L	-	<0.0001
Dissolved Lithium (Li)			mg/L	-	0.007
Dissolved Magnesium (Mg)			mg/L	-	17.6
Dissolved Manganese (Mn)		0.05	mg/L	-	0.0017
Mercury (Hg)	1		ug/L	-	<0.05
Dissolved Molybdenum (Mo)			mg/L	-	0.0003
Dissolved Nickel (Ni)			mg/L	-	0.0003
Dissolved Potassium (K)			mg/L	-	0.89
Dissolved Selenium (Se)	0.05		mg/L	-	0.0003
Dissolved Silicon (Si)			mg/L	-	6.65
Dissolved Silver (Ag)			mg/L	-	<0.0001
Dissolved Sodium (Na)		20/200	mg/L	-	11
Dissolved Strontium (Sr)			mg/L	-	0.613
Dissolved Thallium (Tl)			mg/L	-	<0.0003
Dissolved Tin (Sn)			mg/L	-	<0.0001
Dissolved Titanium (Ti)			mg/L	-	0.0007
Dissolved Tungsten (W)			mg/L	-	<0.0001
Dissolved Uranium (U)	20		ug/L	-	0.547
Dissolved Vanadium (V)			mg/L	-	<0.0001
Dissolved Zinc (Zn)		5	mg/L	-	0.036
Dissolved Zirconium (Zr)			mg/L	-	<0.0004
NUTRIENTS					
Total Phosphorous (P)			mg/L	0.018	<0.010
Dissolved Phosphorus (P)			mg/L	<0.010	<0.010
MICROBIOLOGICAL / ORGANICS					
Escherichia Coli	0		MPN/100mL	0	0
Coliform	0		MPN/100mL	0	0
1,1-Dichloroethylene	14		ug/L	<0.2	<0.2
1,2-Dichlorobenzene	200		ug/L	<0.2	<0.2
1,2-Dichloroethane	5		ug/L	<0.2	<0.2
1,4-Dichlorobenzene	5		ug/L	<0.2	<0.2
Benzene	1		ug/L	<0.2	<0.2
Bromodichloromethane			ug/L	<0.2	<0.2
Bromoform			ug/L	<0.2	<0.2
Carbon Tetrachloride	2		ug/L	<0.2	<0.2
Chlorobenzene	80		ug/L	<0.3	<0.3
Chloroform			ug/L	<0.2	<0.2
Dibromochloromethane			ug/L	<0.2	<0.2
Dichloromethane	50		ug/L	<0.5	<0.5
Ethylbenzene	140		ug/L	<0.2	<0.2
m+p-Xylene			ug/L	<0.4	<0.4
o-Xylene			ug/L	<0.2	<0.2
Tetrachloroethylene	10		ug/L	<0.2	<0.2
Toluene	60		ug/L	<0.2	<0.2
Total Trihalomethanes	100		ug/L	<0.4	<0.4
Trichloroethylene	5		ug/L	<0.2	<0.2
Vinyl Chloride	1		ug/L	<0.2	<0.2
Xylene	90		ug/L	<0.5	<0.5
2,3,4,6,-Tetrachlorophenol	100		ug/L	<1	-
2,4,6-Trichlorophenol2,4-D	5		ug/L	<0.2	-
2,4,-Dochlorophenol	900		ug/L	<0.19	-
Alanchlor	5		ug/L	<0.15	-
Atrazine			ug/L	<0.15	-
Atrazine+Desethyl-atrazine	5		ug/L	<0.02	-
Azinephos-methyl	20		ug/L	<0.01	-
Benzo(a)pyrene	0.01		ug/L	<0.01	-
Bromate	10		mg/L	<0.005	-
Bromoxynil	5		ug/L	<0.33	-
Carbaryl	90		ug/L	<0.05	-
Carbofuran	90		ug/L	0.01	-
Chlorate	1		mg/L	0.02	-
Chlorite	1		mg/L	<0.01	-
Chlorpyrifos	90		ug/L	<0.02	-
Desethyl-atrazine			ug/L	<0.01	-
Diazinon	20		ug/L	<0.02	-
Dicamba	120		ug/L	<0.2	-
Diclofop-methyl	9		ug/L	<0.4	-
Dimethoate	20		ug/L	<0.06	-
Dxgate	70		mg/L	<0.002	-
Diuron	150		ug/L	<0.03	-
Glyphosate	280		mg/L	<0.001	-
Gross Alpha			BqL	<0.12	-
Gross Beta			BqL	<0.10	-
Haloacetic Acids	80		ug/L	<5.3	-
Malathion	190		ug/L	<0.02	-
MCPA	0.1		ug/L	<0.12	-
Metolachlor	50		ug/L	<0.01	-
Metribuzin	80		ug/L	<0.020	-
NDMA	0.009		mg/L	<0.0004	-
Nitrilotriacetic Acid	400		mg/L	<0.03	-
Paraquat	10		mg/L	<0.002	-
Total PCBs	3		ug/L	<0204	-
Pentachlorophenol	60		ug/L	<0.15	-
Phorate	20		ug/L	<0.01	-
Picloram	190		ug/L	<1	-
Prometryne	1		ug/L	<0.03	-
Simazine	10		ug/L	<0.01	-
Terbufos	1		ug/L	<0.01	-
Total Toxic Equivalencey			pg/L	4.72	-
Triallate	230		ug/L	<0.01	-
Trifuralin	45		ug/L	<0.02	-
Tritium			BqL	<15	-
Caffiene			ug/L	<0.5	-
Microcystins			ug/L	<0.15	<0.15

ODWS - Ontario Drinking Water Standards
AO/OG - Aesthetic Objective/Operational Guidelines
(t) Values reported may be biased low due to overgrowth.

Table 4: Summary of On-Site Water Quality Sampling
Monitoring Well TW 1-13
Greensville Municipal Well FDG01 Replacement

Client: Hamilton Water		Work Completed By:	Terraprobe Inc. - Stoney Creek			
Attention: Marco Silvario		Project No.:	T1220561.000			
City of Hamilton - Environmental Laboratory		Project Name:	Municipal Well Assessment			
Adddress: 700 Woodward Avenue, Hamilton, Ontario, L8H 6PN		Sampler Initials:	ABC and HP			
Sample ID: TW-1-13						
	ODWS	AO/OG	Units	Analysis		
Date and Time				**12-Dec-22**	**15-Dec-22**	**17-Jan-23**
INORGANICS						
Alkalinity (Total as CaCO3)		30-500	mg/L	286	275	283.0
Ammonia + Ammonium			mg/L	0.05	0.02	0.0
Anion Sum (Calculation)			mg/L	8.2	8.5	8.7
Bicarbonate as Carbonate (Calculation)			mg/L	286	275	283.0
Bromide			mg/L	<1	<1	<1
Cation Sum (Calculation)			mg/L	40.3	161	8.4
Chloride		250	mg/L	8.9	10.6	26.4
Colour (apparent)		5	CU	30200	162000	99.0
Conductivity			umho/cm	652	650	708.0
Cyanide - Total	0.2		mg/L	<0.003	<0.003	<0.003
Dissolved Organic Carbon		5	mg/L	1.6	7.4	0.6
Fluoride	1.5		mg/L	0.24	0.27	0.3
Ion Balance (Calculation)			%	66.3	90	1.8
Nitrate as N	10		mg/L	<0.1	<0.1	<0.1
Nitrate + Nitrite as N			mg/L	<0.2	<0.2	<0.2
Nitrite as N	1		mg/L	<0.05	<0.05	<0.05
o-Phosphase as P			mg/L	<0.05	<0.05	<0.05
pH		6.5 - 8.5	pH	7.46	7.76	7.62
pH-Saturation			pH	6.47	6.36	7.01
Silica-Reactive			mg/L	19.7	15	20.9
Sulphate			mg/L	73.7	75.3	83.6
Temperature			C	20.5	20.5	18.9
Total Suspended Solids		500	mg/L	66.5	10600	15
Turbidity		5	NTU	4580	12800	5.52
Hardness		80 - 100	mg/L	1400	2370	381
TOTAL METALS						
Total Aluminum (Al)		0.1	mg/L	32.5	55.2	0.094
Total Antimony (Sb)	0.006		mg/L	0.0004	0.004	<0.0001
Total Arsenic (As)	0.01		mg/L	0.303	2.97	0.0024
Total Barium (Ba)	1		mg/L	0.382	4.11	0.0546
Total Beryllium (Be)			mg/L	0.0015	0.042	<0.0001
Total Bismuth			mg/L	0.0004	0.0009	<0.0001
Total Boron (B)	5		mg/L	0.046	0.092	0.023
Total Cadmium (Cd)	0.005		mg/L	0.0007	0.0048	<0.0001
Total Calcium (Ca)			mg/L	446	711	107
Total Chromium (Cr)	0.05		mg/L	0.053	0.0811	0.0002
Total Cobalt (Co)			mg/L	0.0304	0.106	0.0001
Total Copper (Cu)		1	mg/L	0.0812	0.268	0.0003
Total Iron (Fe)		0.3	mg/L	217	2940	1.33
Total Lead (Pb)	0.01		mg/L	0.694	2.84	0.0013
Total Lithium (Li)			mg/L	0.0765	0.103	0.0117
Total Magnesium (Mg)			mg/L	70.3	145	27.6
Total Manganese (Mn)		0.05	mg/L	2.76	11.4	0.0314
Mercury (Hg)	1		mg/L	<0.05	<0.05	<0.05
Total Molybdenum (Mo)			mg/L	0.0016	0.0115	0.001
Total Nickel (Ni)			mg/L	0.0661	0.113	0.0002
Total Potassium (K)			mg/L	6.38	13.4	1.29
Total Selenium (Se)	0.05		mg/L	0.0002	0.0008	<0.0001
Total Silicon (Si)			mg/L	52.1	349	9.96
Total Silver (Ag)			mg/L	0.0002	<0.0005	<0.001
Sodium (Na)		20/200	mg/L	8.12	10.9	12.2
Total Strontium (Sr)			mg/L	6.65	22.8	6.46
Total Thallium (Tl)			mg/L	0.0005	<0.002	<0.0003
Total Tin (Sn)			mg/L	0.0008	0.0012	<0.0001
Total Titanium (Ti)			mg/L	0.622	0.808	0.0044
Total Tungsten (W)			mg/L	0.0007	0.0038	<0.0001
Total Uranium (U)	20		mg/L	0.662	3.13	0.207
Total Vanadium (V)			mg/L	0.0693	0.134	0.0002
Total Zinc (Zn)		5	mg/L	0.774	6.65	0.01
Total Zirconium (Zr)			mg/L	0.0153	0.045	<0.0004
DISSOLVED METALS						
Dissolved Aluminum (Al)		0.1	mg/L	-	-	<0.002
Dissolved Antimony (Sb)	0.06		mg/L	-	-	<0.0001
Dissolved Arsenic (As)	0.01		mg/L	-	-	0.0017
Dissolved Barium (Ba)	1		mg/L	-	-	0.0537
Dissolved Beryllium (Be)			mg/L	-	-	<0.0001
Dissolved Bismuth			mg/L	-	-	<0.0001
Dissolved Boron (B)	5		mg/L	-	-	0.023
Dissolved Cadmium (Cd)	0.005		mg/L	-	-	<0.0001
Dissolved Calcium (Ca)			mg/L	-	-	105
Dissolved Chromium (Cr)	0.05		mg/L	-	-	<0.0001
Dissolved Cobalt (Co)			mg/L	-	-	<0.0001
Dissolved Copper (Cu)		1	mg/L	-	-	0.0003
Dissolved Iron (Fe)		0.3	mg/L	-	-	0.57
Dissolved Lead (Pb)	0.01		mg/L	-	-	<0.0001
Dissolved Lithium (Li)			mg/L	-	-	0.0113
Dissolved Magnesium (Mg)			mg/L	-	-	27.2
Dissolved Manganese (Mn)		0.05	mg/L	-	-	0.0216
Mercury (Hg)	1		ug/L	-	-	<0.05
Dissolved Molybdenum (Mo)			mg/L	-	-	0.001
Dissolved Nickel (Ni)			mg/L	-	-	0.0002
Dissolved Potassium (K)			mg/L	-	-	1.25
Dissolved Selenium (Se)	0.05		mg/L	-	-	<0.0001
Dissolved Silicon (Si)			mg/L	-	-	9.73
Dissolved Silver (Ag)			mg/L	-	-	<0.0001
Dissolved Sodium (Na)		20/200	mg/L	-	-	12.3
Dissolved Strontium (Sr)			mg/L	-	-	6.47
Dissolved Thallium (Tl)			mg/L	-	-	<0.0003
Dissolved Tin (Sn)			mg/L	-	-	<0.0001
Dissolved Titanium (Ti)			mg/L	-	-	0.0009
Dissolved Tungsten (W)			mg/L	-	-	<0.0001
Dissolved Uranium (U)	20		ug/L	-	-	0.2
Dissolved Vanadium (V)			mg/L	-	-	<0.0001
Dissolved Zinc (Zn)		5	mg/L	-	-	0.006
Dissolved Zirconium (Zr)			mg/L	-	-	<0.0004
NUTRIENTS						
Total Phosphorous (P)			mg/L	3.88	22.2	<0.010
MICROBIOLOGICAL / ORGANICS						
Escherichia Coli	0		MPN/100mL	0	0	0
Coliform	0		MPN/100mL	0	236	0
1,1-Dichloroethylene	14		ug/L	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	200		ug/L	<0.2	<0.2	<0.2
1,2-Dichloroethane	5		ug/L	<0.2	<0.2	<0.2
1,4-Dichlorobenzene	5		ug/L	<0.2	<0.2	<0.2
Benzene	1		ug/L	<0.2	0.3	<0.2
Bromodichloromethane			ug/L	<0.2	<0.2	<0.2
Bromoform			ug/L	<0.2	<0.2	<0.2
Carbon Tetrachloride	2		ug/L	<.02	<0.2	<0.2
Chlorobenzene	80		ug/L	<0.3	<0.3	<0.3
Chloroform			ug/L	<0.2	<0.2	<0.2
Dibromochloromethane			ug/L	<0.2	<0.2	<0.2
Dichloromethane	50		ug/L	<0.5	<0.5	<0.5
Ethylbenzene	140		ug/L	<0.2	<0.2	<0.2
m+p-Xylene			ug/L	<0.4	<0.4	<0.4
o-Xylene			ug/L	<0.2	0.3	<0.2
Tetrachloroethylene	10		ug/L	<0.2	<0.2	<0.2
Toluene	60		ug/L	3.1	1	<0.2
Total Trihalomethanes	100		ug/L	<0.4	<0.4	<0.4
Trichloroethylene	5		ug/L	<0.2	<0.2	<0.2
Vinyl Chloride	1		ug/L	<0.2	<0.2	<0.2
Xylene	90		ug/L	<0.5	<0.5	<0.5

ODWS - Ontario Drinking Water Standards
AO/OG - Aesthetic Objective/Operational Guidelines
(1) Values reported may be biased low due to overgrowth.

Table 4: Summary of On-Site Water Quality Sampling
Monitoring Well TW 3-13
Greensville Municipal Well FDG01 Replacement

Client: Hamilton Water		Work Completed By:	Terraprobe Inc. - Stoney Creek			
Attention: Marco Silvario		Project No.:	T1220561.000			
City of Hamilton - Environmental Laboratory		Project Name:	Municipal Well Assessment			
Adddress: 700 Woodward Avenue, Hamilton, Ontario, L8H 6PN		Sampler Initials:	ABC and HP			
Sample ID: TW-3-13						
	ODWS	AO/OG	Units	Analysis		
Date and Time				**12-Dec-22**	**15-Dec-22**	**10-Jan-23**
INORGANICS						
Alkalinity (Total as CaCO3)		30-500	mg/L	274	260	262.0
Ammonia + Ammonium			mg/L	0.03	<0.01	<0.01
Anion Sum (Calculation)			mg/L	7.6	7.6	7.5
Bicarbonate as Carbonate (Calculation)			mg/L	274	260	262.0
Bromide			mg/L	<1	<1	<0.2
Cation Sum (Calculation)			mg/L	7.4	7.5	7.3
Chloride		250	mg/L	14.3	13.5	12.9
Colour (apparent)		5	CU	13900	404	40.0
Conductivity			umho/cm	596	633	645.0
Cyanide - Total	0.2		mg/L	<0.003	<0.0003	<0.003
Dissolved Organic Carbon		5	mg/L	1.9	<0.4	<0.4
Fluoride	1.5		mg/L	0.19	0.21	0.3
Ion Balance (Calculation)			%	1.7	0.4	1.7
Nitrate as N	10		mg/L	<0.1	<0.1	<0.02
Nitrate + Nitrite as N			mg/L	<0.2	<0.2	<0.03
Nitrite as N	1		mg/L	<0.05	<0.05	<0.01
o-Phosphase as P			mg/L	<0.05	<0.05	<0.05
pH		6.5 - 8.5	pH	7.58	7.82	7.86
pH-Saturation			pH	7.03	7.06	7.03
Silica-Reactive			mg/L	13.9	15.3	15.6
Sulphate			mg/L	66.1	75.1	72.6
Temperature			C	20.6	20.6	21.2
Total Suspended Solids		500	mg/L	3610	74.5	16
Turbidity		5	NTU	3640	54.8	6.68
Hardness		80 - 100	mg/L	335	339	342
TOTAL METALS						
Total Aluminum (Al)		0.1	mg/L	0.243	0.996	0.097
Total Antimony (Sb)	0.006		mg/L	0.0002	0.0002	<0.0001
Total Arsenic (As)	0.01		mg/L	0.0024	0.0049	0.0007
Total Barium (Ba)	1		mg/L	0.0461	0.0531	0.0508
Total Beryllium (Be)			mg/L	<0.0001	<0.0001	<.00001
Total Bismuth			mg/L	<0.0001	<0.0001	<0.0001
Total Boron (B)	5		mg/L	0.015	0.014	0.015
Total Cadmium (Cd)	0.005		mg/L	0.0003	0.0002	<0.0001
Total Calcium (Ca)			mg/L	95	95	97.4
Total Chromium (Cr)	0.05		mg/L	0.0013	0.0014	0.0001
Total Cobalt (Co)			mg/L	0.0009	0.0007	0.0002
Total Copper (Cu)		1	mg/L	0.0038	0.0038	0.0059
Total Iron (Fe)		0.3	mg/L	7.31	6.05	0.753
Total Lead (Pb)	0.01		mg/L	0.0129	0.0164	0.0038
Total Lithium (Li)			mg/L	0.0098	0.0109	0.0106
Total Magnesium (Mg)			mg/L	23.7	24.6	23.6
Total Manganese (Mn)		0.05	mg/L	0.0665	0.0685	0.0398
Mercury (Hg)	1		mg/L	<0.05	<0.05	<0.05
Total Molybdenum (Mo)			mg/L	0.0009	0.0007	0.0008
Total Nickel (Ni)			mg/L	0.0062	0.002	0.0004
Total Potassium (K)			mg/L	1.21	1.45	1.08
Total Selenium (Se)	0.05		mg/L	0.0005	0.0001	<0.0001
Total Silicon (Si)			mg/L	7.93	9.99	7.85
Total Silver (Ag)			mg/L	<0.0001	<0.0001	<0.0001
Sodium (Na)		20/200	mg/L	7.95	7.94	7.6
Total Strontium (Sr)			mg/L	0.425	0.445	0.95
Total Thallium (Tl)			mg/L	0.0003	<0.0003	<0.0003
Total Tin (Sn)			mg/L	<0.0001	<0.0001	<0.0001
Total Titanium (Ti)			mg/L	0.0072	0.0294	0.0053
Total Tungsten (W)			mg/L	0.0002	0.0002	<0.0001
Total Uranium (U)	20		mg/L	1.11	0.935	0.87
Total Vanadium (V)			mg/L	0.0024	0.0026	0.0003
Total Zinc (Zn)		5	mg/L	0.237	0.146	0.015
Total Zirconium (Zr)			mg/L	0.0007	0.0011	<0.0004
DISSOLVED METALS						
Dissolved Aluminum (Al)		0.1	mg/L	-	-	<0.002
Dissolved Antimony (Sb)	0.06		mg/L	-	-	<0.0001
Dissolved Arsenic (As)	0.01		mg/L	-	-	0.0003
Dissolved Barium (Ba)	1		mg/L	-	-	0.0544
Dissolved Beryllium (Be)			mg/L	-	-	<0.0001
Dissolved Bismuth			mg/L	-	-	<0.0001
Dissolved Boron (B)	5		mg/L	-	-	0.016
Dissolved Cadmium (Cd)	0.005		mg/L	-	-	<0.0001
Dissolved Calcium (Ca)			mg/L	-	-	97.9
Dissolved Chromium (Cr)	0.05		mg/L	-	-	<0.0001
Dissolved Cobalt (Co)			mg/L	-	-	0.0001
Dissolved Copper (Cu)		1	mg/L	-	-	0.0013
Dissolved Iron (Fe)		0.3	mg/L	-	-	0.016
Dissolved Lead (Pb)	0.01		mg/L	-	-	<0.016
Dissolved Lithium (Li)			mg/L	-	-	<0.0001
Dissolved Magnesium (Mg)			mg/L	-	-	0.0108
Dissolved Manganese (Mn)		0.05	mg/L	-	-	23.8
Mercury (Hg)	1		ug/L	-	-	0.0319
Dissolved Molybdenum (Mo)			mg/L	-	-	<0.05
Dissolved Nickel (Ni)			mg/L	-	-	0.003
Dissolved Potassium (K)			mg/L	-	-	1.08
Dissolved Selenium (Se)	0.05		mg/L	-	-	<0.0001
Dissolved Silicon (Si)			mg/L	-	-	7.77
Dissolved Silver (Ag)			mg/L	-	-	<0.0001
Dissolved Sodium (Na)		20/200	mg/L	-	-	7.91
Dissolved Strontium (Sr)			mg/L	-	-	0.985
Dissolved Thallium (Tl)			mg/L	-	-	<0.0003
Dissolved Tin (Sn)			mg/L	-	-	<0.0001
Dissolved Titanium (Ti)			mg/L	-	-	0.0007
Dissolved Tungsten (W)			mg/L	-	-	<0.0001
Dissolved Uranium (U)	20		ug/L	-	-	0.873
Dissolved Vanadium (V)			mg/L	-	-	<0.0001
Dissolved Zinc (Zn)		5	mg/L	-	-	0.013
Dissolved Zirconium (Zr)			mg/L	-	-	<0.0004
NUTRIENTS						
Total Phosphorous (P)			mg/L	0.31	0.063	0.018
Dissolved Phosphorus (P)			mg/L	-	-	<0.018
MICROBIOLOGICAL / ORGANICS						
Escherichia Coli	0		MPN/100mL	0	0	0
Coliform	0		MPN/100mL	1	0	13
1,1-Dichloroethylene	14		ug/L	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	200		ug/L	<0.2	<0.2	<0.2
1,2-Dichloroethane	5		ug/L	<0.2	<0.2	<0.2
1,4-Dichlorobenzene	5		ug/L	<0.2	<0.2	<0.2
Benzene	1		ug/L	<0.2	<0.2	<0.2
Bromodichloromethane			ug/L	<0.2	<0.2	<0.2
Bromoform			ug/L	<0.2	<0.2	<0.2
Carbon Tetrachloride	2		ug/L	<0.2	<0.2	<0.2
Chlorobenzene	80		ug/L	<0.3	<0.2	<0.3
Chloroform			ug/L	<0.2	<0.2	<0.2
Dibromochloromethane			ug/L	<0.2	<0.2	<0.2
Dichloromethane	50		ug/L	<0.5	<0.5	<0.5
Ethylbenzene	140		ug/L	<0.2	<0.2	<0.2
m+p-Xylene			ug/L	<0.4	<0.4	<0.4
o-Xylene			ug/L	<0.2	<0.2	<0.2
Tetrachloroethylene	10		ug/L	<0.2	<0.2	<0.2
Toluene	60		ug/L	<0.2	<0.2	<0.2
Total Trihalomethanes	100		ug/L	<0.4	<0.4	<0.4
Trichloroethylene	5		ug/L	<0.2	<0.2	<0.2
Vinyl Chloride	1		ug/L	<0.2	<0.2	<0.2
Xylene	90		ug/L	<0.5	<0.5	<0.5

ODWS - Ontario Drinking Water Standards
AO/OG - Aesthetic Objective/Operational Guidelines
(1) Values reported may be biased low due to overgrowth.

Table 4: Summary of On-Site Water Quality Sampling
Monitoring Well MW 101
Greensville Municipal Well FDG01 Replacement

Client: Hamilton Water		Work Completed By:	Terraprobe Inc. - Stoney Creek			
Attention: Marco Silvario		Project No.:	T1220561.000			
City of Hamilton - Environmental Laboratory		Project Name:	Municipal Well Assessment			
Address: 700 Woodward Avenue, Hamilton, Ontario, L8H 6PN		Sampler Initials:	ABC and HP			
Sample ID: MW101						
	ODWS	AO/OG	Units	Analysis		
Date and Time				12-Dec-22	15-Dec-22	10-Jan-23
INORGANICS						
Alkalinity (Total as CaCO3)		30-500	mg/L	296	274	276.0
Ammonia + Ammonium			mg/L	<0.01	<0.01	<0.01
Anion Sum (Calculation)			mg/L	6.9	6.6	6.6
Bicarbonate as Carbonate (Calculation)			mg/L	296	274	276.0
Bromide			mg/L	<1	<1	<0.2
Cation Sum (Calculation)			mg/L	22.9	7	6.0
Chloride		250	mg/L	2.5	3.6	2.2
Colour (apparent)		5	CU	4700	616	18.0
Conductivity			umho/cm	554	557	553.0
Cyanide - Total	0.2		mg/L	<0.003	<0.003	<0.003
Dissolved Organic Carbon		5	mg/L	1.9	<0.4	<0.4
Fluoride	1.5		mg/L	0.11	0.11	0.1
Ion Balance (Calculation)			%	53.9	3.2	4.8
Nitrate as N	10		mg/L	1.06	1.08	1.1
Nitrate + Nitrite as N			mg/L	1.06	1.08	1.1
Nitrite as N	1		mg/L	<0.05	<0.5	<0.01
o-Phosphase as P			mg/L	<0.05	<0.05	<0.05
pH		6.5 - 8.5	pH	7.5	7.84	7.94
pH-Saturation			pH	6.63	7.02	7.03
Silica-Reactive			mg/L	5.99	13.8	14.4
Sulphate			mg/L	27.5	26.2	25.3
Temperature			C	20.4	21	21
Total Suspended Solids		500	mg/L	1870	169	<3
Turbidity		5	NTU	874	87.3	2.24
Hardness		80 - 100	mg/L	825	306	286
TOTAL METALS						
Total Aluminum (Al)		0.1	mg/L	31.6	3.74	0.101
Total Antimony (Sb)	0.006		mg/L	0.0004	0.0003	<0.0001
Total Arsenic (As)	0.01		mg/L	0.161	0.0022	0.0002
Total Barium (Ba)	1		mg/L	0.391	0.1	0.0702
Total Beryllium (Be)			mg/L	0.0012	0.0002	<0.0001
Total Bismuth			mg/L	0.0004	<0.0001	<0.0001
Total Boron (B)	5		mg/L	0.032	0.013	0.011
Total Cadmium (Cd)	0.005		mg/L	0.0004	<0.0001	<0.0001
Total Calcium (Ca)			mg/L	259	93.6	88.2
Total Chromium (Cr)	0.05		mg/L	0.066	0.006	0.0015
Total Cobalt (Co)			mg/L	0.0322	0.003	<0.0001
Total Copper (Cu)		1	mg/L	0.0896	0.0085	0.0013
Total Iron (Fe)		0.3	mg/L	64.3	5.61	0.161
Total Lead (Pb)	0.01		mg/L	0.0329	0.0034	<0.0001
Total Lithium (Li)			mg/L	0.0503	0.0102	0.0056
Total Magnesium (Mg)			mg/L	43.4	17.5	15
Total Manganese (Mn)		0.05	mg/L	2.3	0.213	0.0034
Mercury (Hg)	1		mg/L	<0.05	<0.05	<0.05
Total Molybdenum (Mo)			mg/L	0.0023	0.0003	0.0002
Total Nickel (Ni)			mg/L	0.0547	0.0051	0.0002
Total Potassium (K)			mg/L	7.08	2.09	0.93
Total Selenium (Se)	0.05		mg/L	0.0007	0.0004	0.0004
Total Silicon (Si)			mg/L	37.5	13.2	6.8
Total Silver (Ag)			mg/L	0.0002	<0.0001	<0.0001
Sodium (Na)		20/200	mg/L	5.87	4.67	4.41
Total Strontium (Sr)			mg/L	0.52	0.258	0.225
Total Thallium (Tl)			mg/L	0.0005	<0.0003	<0.0003
Total Tin (Sn)			mg/L	0.0031	0.0002	<0.0001
Total Titanium (Ti)			mg/L	1.17	0.103	0.0094
Total Tungsten (W)			mg/L	0.0001	<0.0001	<0.0001
Total Uranium (U)	20		mg/L	0.672	0.368	0.322
Total Vanadium (V)			mg/L	0.0036	0.0071	0.0004
Total Zinc (Zn)		5	mg/L	0.212	0.026	<0.001
Total Zirconium (Zr)			mg/L	0.008	0.001	<0.0004
DISSOLVED METALS						
Dissolved Aluminum (Al)		0.1	mg/L	-	-	0.004
Dissolved Antimony (Sb)	0.06		mg/L	-	-	<0.0001
Dissolved Arsenic (As)	0.01		mg/L	-	-	0.0002
Dissolved Barium (Ba)	1		mg/L	-	-	0.071
Dissolved Beryllium (Be)			mg/L	-	-	<0.0001
Dissolved Bismuth			mg/L	-	-	<0.0001
Dissolved Boron (B)	5		mg/L	-	-	0.011
Dissolved Cadmium (Cd)	0.005		mg/L	-	-	<0.0001
Dissolved Calcium (Ca)			mg/L	-	-	90
Dissolved Chromium (Cr)	0.05		mg/L	-	-	0.0008
Dissolved Cobalt (Co)			mg/L	-	-	<0.0001
Dissolved Copper (Cu)		1	mg/L	-	-	0.0013
Dissolved Iron (Fe)		0.3	mg/L	-	-	<0.003
Dissolved Lead (Pb)	0.01		mg/L	-	-	<0.0001
Dissolved Lithium (Li)			mg/L	-	-	0.0054
Dissolved Magnesium (Mg)			mg/L	-	-	14.8
Dissolved Manganese (Mn)		0.05	mg/L	-	-	0.0008
Mercury (Hg)	1		ug/L	-	-	<0.05
Dissolved Molybdenum (Mo)			mg/L	-	-	0.0002
Dissolved Nickel (Ni)			mg/L	-	-	0.0001
Dissolved Potassium (K)			mg/L	-	-	0.9
Dissolved Selenium (Se)	0.05		mg/L	-	-	0.0004
Dissolved Silicon (Si)			mg/L	-	-	6.75
Dissolved Silver (Ag)			mg/L	-	-	<0.0001
Dissolved Sodium (Na)		20/200	mg/L	-	-	4.36
Dissolved Strontium (Sr)			mg/L	-	-	0.223
Dissolved Thallium (Tl)			mg/L	-	-	<0.0003
Dissolved Tin (Sn)			mg/L	-	-	<0.0001
Dissolved Titanium (Ti)			mg/L	-	-	0.0005
Dissolved Tungsten (W)			mg/L	-	-	<0.0001
Dissolved Uranium (U)	20		ug/L	-	-	0.326
Dissolved Vanadium (V)			mg/L	-	-	0.0002
Dissolved Zinc (Zn)		5	mg/L	-	-	0.001
Dissolved Zirconium (Zr)			mg/L	-	-	<0.0004
NUTRIENTS						
Total Phosphorous (P)			mg/L	1.9	0.161	<0.01
MICROBIOLOGICAL / ORGANICS						
Escherichia Coli	0		MPN/100mL	0	0	0
Coliform	0		MPN/100mL	1	1	0
1,1-Dichloroethylene	14		ug/L	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	200		ug/L	<0.2	<0.2	<0.2
1,2-Dichloroethane	5		ug/L	<0.2	<0.2	<0.2
1,4-Dichlorobenzene	5		ug/L	<0.2	<0.2	<0.2
Benzene	1		ug/L	<0.2	<0.2	<0.2
Bromodichloromethane			ug/L	<0.2	<0.2	<0.2
Bromoform			ug/L	<0.2	<0.2	<0.2
Carbon Tetrachloride	2		ug/L	<0.2	<0.2	<0.2
Chlorobenzene	80		ug/L	<0.3	<0.3	<0.3
Chloroform			ug/L	<0.2	<0.2	<0.2
Dibromochloromethane			ug/L	<0.2	<0.2	<0.2
Dichloromethane	50		ug/L	<0.5	<0.5	<0.5
Ethylbenzene	140		ug/L	<0.2	0.2	<0.2
m+p-Xylene			ug/L	<0.4	1	<0.4
o-Xylene			ug/L	<0.2	0.6	<0.2
Tetrachloroethylene	10		ug/L	<0.2	<0.2	<0.2
Toluene	60		ug/L	<0.2	1	<0.2
Total Trihalomethanes	100		ug/L	<0.4	<0.4	<0.4
Trichloroethylene	5		ug/L	<0.2	<0.2	<0.2
Vinyl Chloride	1		ug/L	<0.2	<0.2	<0.2
Xylene	90		ug/L	<0.5	1.6	<0.5
2,3,4,6,-Tetrachlorophenol	100		ug/L	-	-	-
2,4,6-Trichlorophenol2,4-D	5		ug/L	-	-	-
2,4,-Dochlorophenol	900		ug/L	-	-	-
Alanchlor	5		ug/L	-	-	-
Atrazine			ug/L	-	-	-
Atrazine+Desethyl-atrazine	5		ug/L	-	-	-
Azinephos-methyl	20		ug/L	-	-	-
Benzo(a)pyrene	0.01		ug/L	-	-	-
Bromate	10		mg/L	-	-	-
Bromoxynil	5		ug/L	-	-	-
Carbaryl	90		ug/L	-	-	-
Carbofuran	90		ug/L	-	-	-
Chlorate	1		mg/L	-	-	-
Chlorite	1		mg/L	-	-	-
Chlorpyrifos	90		ug/L	-	-	-
Desethyl-atrazine			ug/L	-	-	-
Diazinon	20		ug/L	-	-	-
Dicamba	120		ug/L	-	-	-
Diclofop-methyl	9		ug/L	-	-	-
Dimethoate	20		ug/L	-	-	-
Diqate	70		mg/L	-	-	-
Diuron	150		ug/L	-	-	-
Glyphosate	280		mg/L	-	-	-
Gross Alpha			Bq/L	-	-	-
Gross Beta			Bq/L	-	-	-
Haloacetic Acids	80		ug/L	-	-	-
Malathion	190		ug/L	-	-	-
MCPA	0.1		ug/L	-	-	-
Metolachlor	50		ug/L	-	-	-
Metribuzin	80		ug/L	-	-	-
NDMA	0.009		mg/L	-	-	-
Nitrilotriacetic Acid	400		mg/L	-	-	-
Paraquat	10		mg/L	-	-	-
Total PCBs	3		ug/L	-	-	-
Pentachlorophenol	60		ug/L	-	-	-
Phorate	20		ug/L	-	-	-
Picloram	190		ug/L	-	-	-
Prometryne	1		ug/L	-	-	-
Simazine	10		ug/L	-	-	-
Terbufos	1		ug/L	-	-	-
Total Toxic Equivalencey			pg/L	-	-	-
Triallate	230		ug/L	-	-	-
Trifuralin	45		ug/L	-	-	-
Tritium			Bq/L	-	-	-
Caffiene			ug/L	<0.5	-	-
Microcystins			ug/L	-	-	-

ODWS - Ontario Drinking Water Standards
AO/OG - Aesthetic Objective/Operational Guidelines
(1) Values reported may be biased low due to overgrowth.

Table 5: Summary of Off-Site Water Quality Municipal Well FDG01
Greensville Municipal Well FDG01 Replacement

Client: Hamilton Water		Work Completed By:	Terraprobe Inc. - Stoney Creek	
Attention: Marco Silvario		Project No.:	T1220561.000	
City of Hamilton - Environmental Laboratory		Project Name:	Municipal Well Assessment	
Adddress: 700 Woodward Avenue, Hamilton, Ontario, L8H 6PN		Sampler Initials:	ABC and HP	
Sample ID: FDG01				
	ODWS	**AO/OG**	**Units**	**Analysis**
Date and Time				**15-Dec-22**
INORGANICS				
Alkalinity (Total as CaCO3)		30-500	mg/L	373
Ammonia + Ammonium			mg/L	<0.01
Anion Sum (Calculation)			mg/L	296
Bicarbonate as Carbonate (Calculation)			mg/L	-
Bromide			mg/L	-
Cation Sum (Calculation)			mg/L	-
Chloride		250	mg/L	-
Colour (apparent)		5	CU	<2
Conductivity			umho/cm	1730
Cyanide - Total	0.2		mg/L	<0.03
Dissolved Organic Carbon		5	mg/L	0.7
Fluoride	1.5		mg/L	0.11
Ion Balance (Calculation)			%	-
Nitrate as N	10		mg/L	7.22
Nitrate + Nitrite as N			mg/L	-
Nitrite as N	1		mg/L	<0.01
o-Phosphase as P			mg/L	-
pH		6.5 - 8.5	pH	7.67
pH-Saturation			pH	-
Silica-Reactive			mg/L	-
Sulphate			mg/L	63.3
Temperature			C	-
Total Suspended Solids		500	mg/L	-
Turbidity		5	NTU	0.12
Hardness		80 - 100	mg/L	511
TOTAL METALS				
Total Aluminum (Al)		0.1	mg/L	<0.002
Total Antimony (Sb)	0.006		mg/L	<0.0001
Total Arsenic (As)	0.01		mg/L	<0.0001
Total Barium (Ba)	1		mg/L	0.167
Total Beryllium (Be)			mg/L	<0.0001
Total Bismuth			mg/L	<0.0001
Total Boron (B)	5		mg/L	0.043
Total Cadmium (Cd)	0.005		mg/L	<0.0001
Total Calcium (Ca)			mg/L	160
Total Chromium (Cr)	0.05		mg/L	0.0002
Total Cobalt (Co)			mg/L	<0.0001
Total Copper (Cu)		1	mg/L	0.0007
Total Iron (Fe)		0.3	mg/L	<0.003
Total Lead (Pb)	0.01		mg/L	<0.0001
Total Lithium (Li)			mg/L	0.0099
Total Magnesium (Mg)			mg/L	27.1
Total Manganese (Mn)		0.05	mg/L	<0.0001
Mercury (Hg)	1		mg/L	<0.05
Total Molybdenum (Mo)			mg/L	0.0002
Total Nickel (Ni)			mg/L	0.0005
Total Potassium (K)			mg/L	2.26
Total Selenium (Se)	0.05		mg/L	0.0003
Total Silicon (Si)			mg/L	6.36
Total Silver (Ag)			mg/L	<0.0001
Sodium (Na)		20/200	mg/L	163
Total Strontium (Sr)			mg/L	1
Total Thallium (Tl)			mg/L	<0.0003
Total Tin (Sn)			mg/L	<0.0001
Total Titanium (Ti)			mg/L	<0.0004
Total Tungsten (W)			mg/L	<0.0001
Total Uranium (U)	20		mg/L	0.708
Total Vanadium (V)			mg/L	<0.0001
Total Zinc (Zn)		5	mg/L	0.007
Total Zirconium (Zr)			mg/L	<0.0004
NUTRIENTS				
Total Phosphorous (P)			mg/L	<0.01
MICROBIOLOGICAL / ORGANICS				
Escherichia Coli	0		MPN/100mL	0
Coliform	0		MPN/100mL	0
1,1-Dichloroethylene	14		ug/L	<0.2
1,2-Dichlorobenzene	200		ug/L	<0.2
1,2-Dichloroethane	5		ug/L	<0.2
1,4-Dichlorobenzene	5		ug/L	<0.2
Benzene	1		ug/L	<0.2
Bromodichloromethane			ug/L	<0.2
Bromoform			ug/L	<0.2
Carbon Tetrachloride	2		ug/L	<0.2
Chlorobenzene	80		ug/L	<0.3
Chloroform			ug/L	0.4
Dibromochloromethane			ug/L	<0.2
Dichloromethane	50		ug/L	<0.5
Ethylbenzene	140		ug/L	<0.2
m+p-Xylene			ug/L	<0.4
o-Xylene			ug/L	<0.2
Tetrachloroethylene	10		ug/L	<0.2
Toluene	60		ug/L	<0.2
Total Trihalomethanes	100		ug/L	0.4
Trichloroethylene	5		ug/L	<0.2
Vinyl Chloride	1		ug/L	<0.2
Xylene	90		ug/L	<0.5

ODWS - Ontario Drinking Water Standards
AO/OG - Aesthetic Objective/Operational Guidelines
(1) Values reported may be biased low due to overgrowth.

Table 5: Summary of Off-Site Water Quality Sampling
Surface Water Monitoring
Greensville Municipal Well FDG01 Replacement

Client: Hamilton Water		Work Completed By:	Terraprobe Inc. - Stoney Creek		
Attention: Marco Silvario		Project No.:	T1220561.000		
City of Hamilton - Environmental Laboratory		Project Name:	Municipal Well Assessment		
Adddress: 700 Woodward Avenue, Hamilton, Ontario, L8H 6PN		Sampler Initials:	ABC and HP		
Sample ID: Tews Falls - Surface Water					
	ODWS	AO/OG	Units	Analysis	
Date and Time				13-Dec-22	15-Dec-22
INORGANICS					
Alkalinity (Total as CaCO3)		30-500	mg/L	183	203
Ammonia + Ammonium			mg/L	0.18	0.12
Anion Sum (Calculation)			mg/L	25.9	21.9
Bicarbonate as Carbonate (Calculation)			mg/L	183	203
Bromide			mg/L	1.1	<1
Cation Sum (Calculation)			mg/L	25.2	25.2
Chloride		250	mg/L	171	167
Colour (apparent)		5	CU	358	2850
Conductivity			umho/cm	2110	1850
Cyanide - Total	0.2		mg/L	<0.003	<0.003
Dissolved Organic Carbon		5	mg/L	2.5	3.6
Fluoride	1.5		mg/L	0.68	0.57
Ion Balance (Calculation)			%	1.3	7.12
Nitrate as N	10		mg/L	2.86	2.06
Nitrate + Nitrite as N			mg/L	2.86	2.06
Nitrite as N	1		mg/L	<0.05	<0.05
o-Phosphase as P			mg/L	<0.05	<0.05
pH		6.5 - 8.5	pH	8.02	7.94
pH-Saturation			pH	6.91	6.88
Silica-Reactive			mg/L	16.5	4.39
Sulphate			mg/L	803	614
Temperature			C	21.7	20.5
Total Suspended Solids		500	mg/L	185	1360
Turbidity		5	NTU	66.4	592
Hardness		80 - 100	mg/L	1040	1010
TOTAL METALS					
Total Aluminum (Al)		0.1	mg/L	0.308	4.14
Total Antimony (Sb)	0.006		mg/L	0.0004	0.0004
Total Arsenic (As)	0.01		mg/L	0.0006	0.003
Total Barium (Ba)	1		mg/L	0.0537	0.0764
Total Beryllium (Be)			mg/L	<0.0001	0.0002
Total Bismuth			mg/L	<0.0001	<0.0001
Total Boron (B)	5		mg/L	0.261	0.194
Total Cadmium (Cd)	0.005		mg/L	0.0002	0.0009
Total Calcium (Ca)			mg/L	268	262
Total Chromium (Cr)	0.05		mg/L	0.0005	0.0058
Total Cobalt (Co)			mg/L	0.0005	0.0046
Total Copper (Cu)		1	mg/L	0.0022	0.0168
Total Iron (Fe)		0.3	mg/L	0.539	7.28
Total Lead (Pb)	0.01		mg/L	0.0122	0.0926
Total Lithium (Li)			mg/L	0.0534	0.0465
Total Magnesium (Mg)			mg/L	89.7	86.3
Total Manganese (Mn)		0.05	mg/L	0.0819	0.906
Mercury (Hg)	1		mg/L	<0.05	0.06
Total Molybdenum (Mo)			mg/L	0.0483	0.0399
Total Nickel (Ni)			mg/L	0.012	0.0258
Total Potassium (K)			mg/L	21.4	18.3
Total Selenium (Se)	0.05		mg/L	0.0004	0.0006
Total Silicon (Si)			mg/L	34.7	8.9
Total Silver (Ag)			mg/L	<0.0001	<0.0001
Sodium (Na)		20/200	mg/L	81.9	81.6
Total Strontium (Sr)			mg/L	9.62	7.43
Total Thallium (Tl)			mg/L	0.0004	0.0006
Total Tin (Sn)			mg/L	<0.0001	0.0006
Total Titanium (Ti)			mg/L	0.0068	0.0789
Total Tungsten (W)			mg/L	<0.0001	<0.0001
Total Uranium (U)	20		mg/L	10.5	7.64
Total Vanadium (V)			mg/L	0.0011	0.0102
Total Zinc (Zn)		5	mg/L	0.267	0.902
Total Zirconium (Zr)			mg/L	<0.0004	0.001
NUTRIENTS					
Total Phosphorous (P)			mg/L	0.04	0.372
MICROBIOLOGICAL / ORGANICS					
Escherichia Coli	0		MPN/100mL	10	20
Coliform	0		MPN/100mL	1960	3650
1,1-Dichloroethylene	14		ug/L	<0.2	<0.2
1,2-Dichlorobenzene	200		ug/L	<0.2	<0.2
1,2-Dichloroethane	5		ug/L	<0.2	<0.2
1,4-Dichlorobenzene	5		ug/L	<0.2	<0.2
Benzene	1		ug/L	<0.2	<0.2
Bromodichloromethane			ug/L	<0.2	<0.2
Bromoform			ug/L	<0.2	<0.2
Carbon Tetrachloride	2		ug/L	<0.2	<0.2
Chlorobenzene	80		ug/L	<0.3	<0.3
Chloroform			ug/L	<0.2	<0.2
Dibromochloromethane			ug/L	<0.5	<0.2
Dichloromethane	50		ug/L	<0.2	<0.5
Ethylbenzene	140		ug/L	<0.4	<0.2
m+p-Xylene			ug/L	<0.2	<0.4
o-Xylene			ug/L	<0.2	<0.2
Tetrachloroethylene	10		ug/L	<0.2	<0.2
Toluene	60		ug/L	<0.2	<0.2
Total Trihalomethanes	100		ug/L	<0.4	<0.4
Trichloroethylene	5		ug/L	<0.2	<0.2
Vinyl Chloride	1		ug/L	<0.2	<0.2
Xylene	90		ug/L	<0.5	<0.5

ODWS - Ontario Drinking Water Standards
AO/OG - Aesthetic Objective/Operational Guidelines
(1) Values reported may be biased low due to overgrowth.

Table 5: Summary of Off-Site Quality Sampling
3 Medwin Drive
Greensville Municipal Well FDG01 Replacement

Client: Hamilton Water		Work Completed By:	Terraprobe Inc. - Stoney Creek		
Attention: Marco Silvario		Project No.:	T1220561.000		
City of Hamilton		Project Name:	Municipal Well Assessment		
Environmental Laboratory		Sampler Initials:	ABC and HP		
700 Woodward Avenue, Hamilton, Ontario, L8H 6PN					
Monitoring Location Address		3 Medwin Drive			
Sample ID		3 Medwin Drive			
	ODWS	AO/OG	Units	Analysis	
Date				1-Dec-22	15-Dec-22
INORGANICS					
Alkalinity (Total as CaCO3)		30-500	mg/L	317	289.0
Ammonia + Ammonium			mg/L	0.01	<0.1
Anion Sum (Calculation)			me/L	10.5	10.0
Bicarbonate as Carbonate (Calculation)			mg/L	317	289.0
Bromide			mg/L	<0.2	<1
Cation Sum (Calculation)			me/L	9.7	9.7
Chloride		250	mg/L	79.9	80.6
Colour (apparent)		5	CU	65	18.0
Conductivity			umho/cm	930	886.0
Cyanide - Total	0.2		mg/L	<.003	<0.003
Dissolved Organic Carbon		5	mg/L	1	0.7
Fluoride	1.5		mg/L	0.28	0.3
Ion Balance (Calculation)			%	4	1.3
Nitrate as N	10		mg/L	1.78	1.6
Nitrate + Nitrite as N			mg/L	1.78	1.61
Nitrite as N	1		mg/L	<0.01	<0.05
o-Phosphase as P			mg/L	<0.05	<0.05
pH		6.5 - 8.5	pH	7.8	7.79
pH-Saturation			pH	6.91	6.95
Silica-Reactive			mg/L	13.2	12.7
Sulphate			mg/L	68.5	70.6
Temperature			C	21.3	20.3
Total Suspended Solids		500	mg/L	22.1	<5
Turbidity		5	NTU	17.4	4.12
Hardness		80-100	mg/L	390	397
METALS					
Total Aluminum (Al)		0.1	mg/L	0.02	0.006
Total Antimony (Sb)	0.06		mg/L	<0.0001	0.0002
Total Arsenic (As)	0.01		mg/L	0.0003	0.0004
Total Barium (Ba)	1		mg/L	0.0693	0.061
Total Beryllium (Be)			mg/L	<0.0001	<0.0001
Total Bismuth			mg/L	<0.0001	<0.0001
Total Boron (B)	5		mg/L	0.025	0.029
Total Cadmium (Cd)	0.005		mg/L	<0.0001	<0.0001
Total Calcium (Ca)			mg/L	113	118
Total Chromium (Cr)	0.05		mg/L	0.0004	0.0002
Total Cobalt (Co)			mg/L	<0.0001	<0.0001
Total Copper (Cu)		1	mg/L	0.0079	0.0034
Total Iron (Fe)		0.3	mg/L	0.813	1.21
Total Lead (Pb)	0.01		mg/L	0.0024	0.0024
Total Lithium (Li)			mg/L	0.0102	0.0117
Total Magnesium (Mg)			mg/L	26.1	24.9
Total Manganese (Mn)		0.05	mg/L	0.0122	0.0239
Mercury (Hg)	1		ug/L	<0.05	<0.05
Total Molybdenum (Mo)			mg/L	0.0012	0.0012
Total Nickel (Ni)			mg/L	0.0019	0.0016
Total Potassium (K)			mg/L	<0.0010	2.08
Total Selenium (Se)	0.05		mg/L	0.0002	0.0003
Total Silicon (Si)			mg/L	6.14	6.38
Total Silver (Ag)			mg/L	<0.0001	<0.0001
Sodium (Na)		20/200	mg/L	40.8	37.9
Total Strontium (Sr)			mg/L	1.56	1.48
Total Thallium (Tl)			mg/L	<0.003	<0.0003
Total Tin (Sn)			mg/L	0.0011	0.0005
Total Titanium (Ti)			mg/L	0.0007	0.0006
Total Tungsten (W)			mg/L	<0.00001	<0.0001
Total Uranium (U)	20		ug/L	1.49	1.42
Total Vanadium (V)			mg/L	0.0001	<0.0001
Total Zinc (Zn)		5	mg/L	0.051	0.043
Total Zirconium (Zr)			mg/L	<0.0004	<0.0004
NUTRIENTS					
Total Phosphorus (P)			mg/L	-	<0.010
MICROBIOLOGICAL / ORGANICS					
Escherichia Coli	0		MPN/100mL	0	0
Coliform	0		MPN/100mL	108	461
1,1-Dichloroethylene	14		ug/L	<0.2	<0.2
1,2-Dichlorobenzene	200		ug/L	<0.2	<0.2
1,2-Dichloroethane	5		ug/L	<0.2	<0.2
1,4-Dichlorobenzene	5		ug/L	<0.2	<0.2
Benzene	1		ug/L	<0.2	<0.2
Bromodichloromethane			ug/L	<0.2	<0.2
Bromoform			ug/L	<0.2	<0.2
Carbon Tetrachloride	2		ug/L	<0.2	<0.2
Chlorobenzene	80		ug/L	<0.3	<0.3
Chloroform			ug/L	<0.02	<0.2
Dibromochloromethane			ug/L	<0.2	<0.2
Dichloromethane	50		ug/L	<0.5	<0.5
Ethylbenzene	140		ug/L	<0.2	<0.2
m+p-Xylene			ug/L	<0.4	<0.4
o-Xylene			ug/L	<0.2	<0.2
Tetrachloroethylene	10		ug/L	<0.2	<0.2
Toluene	60		ug/L	<0.2	<0.2
Total Trihalomethanes	100		ug/L	<0.4	<0.4
Trichloroethylene	5		ug/L	<0.2	<0.2
Vinyl Chloride	1		ug/L	<0.2	<0.2
Xylene	90		ug/L	<0.5	<0.5

ODWS - Ontario Drinking Water Standards
AO/OG - Aesthetic Objective/Operational Guidelines
(1) Values reported may be biased low due to overgrowth.

Table 5: Summary of Off-Site Water Quality Sampling
15 Medwin Drive
Greensville Municipal Well FDG01 Replacement

Client: Hamilton Water		Work Completed By:		Terraprobe Inc. - Stoney Creek	
Attention: Marco Silvario		Project No.:		T1220561.000	
City of Hamilton		Project Name:		Municipal Well Assessment	
Environmental Laboratory		Sampler Initials:		ABC and HP	
700 Woodward Avenue, Hamilton, Ontario, L8H 6PN					
Monitoring Location Address		15 Medwin Drive			
Sample ID		15 Medwin Drive			
	ODWS	**AO/OG**	**Units**	**Analysis**	
Date				**12-Dec-23**	**15-Dec-23**
INORGANICS					
Alkalinity (Total as CaCO3)		30-500	mg/L	303	306
Ammonia + Ammonium			mg/L	<0.01	<0.01
Anion Sum (Calculation)			me/L	11.7	12.1
Bicarbonate as Carbonate (Calculation)			mg/L	303	306
Bromide			mg/L	<1	<1
Cation Sum (Calculation)			me/L	10.9	11.8
Chloride		250	mg/L	104	113
Colour (apparent)		5	CU	4	13
Conductivity			umho/cm	1050	1080
Cyanide - Total	0.2		mg/L	<0.003	<0.003
Dissolved Organic Carbon		5	mg/L	0.8	0.8
Fluoride	1.5		mg/L	0.59	0.58
Ion Balance (Calculation)			%	3.7	1.3
Nitrate as N	10		mg/L	1.23	1.31
Nitrate + Nitrite as N			mg/L	1.23	1.31
Nitrite as N	1		mg/L	<0.05	<0.05
o-Phosphase as P			mg/L	<0.05	<0.05
pH		6.5 - 8.5	pH	7.49	7.56
pH-Saturation			pH	6.88	6.86
Silica-Reactive			mg/L	13.7	13.4
Sulphate			mg/L	109	110
Temperature			C	20.9	20.7
Total Suspended Solids		500	mg/L	<3	4
Turbidity		5	NTU	0.69	2.28
Hardness		80-100	mg/L	463	495
METALS					
Total Aluminum (Al)		0.1	mg/L	0.002	0.01
Total Antimony (Sb)	0.06		mg/L	<0.0001	<0.0001
Total Arsenic (As)	0.01		mg/L	<0.0001	0.0002
Total Barium (Ba)	1		mg/L	0.0714	0.0707
Total Beryllium (Be)			mg/L	<0.0001	<0.0001
Total Bismuth			mg/L	<0.0001	<0.0001
Total Boron (B)	5		mg/L	0.63	0.064
Total Cadmium (Cd)	0.005		mg/L	<0.0001	0.0001
Total Calcium (Ca)			mg/L	134	143
Total Chromium (Cr)	0.05		mg/L	0.0002	0.0007
Total Cobalt (Co)			mg/L	<0.0001	0.0004
Total Copper (Cu)		1	mg/L	0.0213	0.0789
Total Iron (Fe)		0.3	mg/L	0.032	0.358
Total Lead (Pb)	0.01		mg/L	0.0002	0.0018
Total Lithium (Li)			mg/L	0.143	0.0156
Total Magnesium (Mg)			mg/L	31.2	33.6
Total Manganese (Mn)		0.05	ug/L	0.0078	0.0654
Mercury (Hg)	1		mg/L	<0.05	<0.05
Total Molybdenum (Mo)			mg/L	0.0014	0.0012
Total Nickel (Ni)			mg/L	0.0025	0.0075
Total Potassium (K)			mg/L	2.63	2.7
Total Selenium (Se)	0.05		mg/L	<0.0001	<0.0001
Total Silicon (Si)			mg/L	6.27	6.59
Total Silver (Ag)			mg/L	<0.0001	<0.0001
Sodium (Na)		20/200	mg/L	33	37.7
Total Strontium (Sr)			mg/L	4.92	5.17
Total Thallium (Tl)			mg/L	<0.0003	<0.0003
Total Tin (Sn)			mg/L	<0.0001	0.0012
Total Titanium (Ti)			mg/L	<0.0004	0.0007
Total Tungsten (W)			ug/L	0.0002	0.0002
Total Uranium (U)	20		mg/L	2.23	2.39
Total Vanadium (V)			mg/L	0.0001	0.0001
Total Zinc (Zn)		5	mg/L	0.098	0.171
Total Zirconium (Zr)			mg/L	<0.0004	<0.0004
NUTRIENTS					
Total Phosphorus (P)			mg/L	<0.010	<0.010
MICROBIOLOGICAL / ORGANICS					
Escherichia Coli	0		MPN/100mL	0	0
Coliform	0		ug/L	0	16
1,1-Dichloroethylene	14		ug/L	<0.2	<0.2
1,2-Dichlorobenzene	200		ug/L	<0.2	<0.2
1,2-Dichloroethane	5		ug/L	<0.2	<0.2
1,4-Dichlorobenzene	5		ug/L	<0.2	<0.2
Benzene	1		ug/L	<0.2	<0.2
Bromodichloromethane			ug/L	<0.2	<0.2
Bromoform			ug/L	<0.2	<0.2
Carbon Tetrachloride	2		ug/L	<0.2	<0.2
Chlorobenzene	80		ug/L	<0.3	<0.3
Chloroform			ug/L	<0.2	<0.2
Dibromochloromethane			ug/L	<0.2	<0.2
Dichloromethane	50		ug/L	<0.5	<0.5
Ethylbenzene	140		ug/L	<0.2	<0.2
m+p-Xylene			ug/L	<0.4	<0.4
o-Xylene			ug/L	<0.2	<0.2
Tetrachloroethylene	10		ug/L	<0.2	<0.2
Toluene	60		ug/L	<0.2	<0.2
Total Trihalomethanes	100		ug/L	<0.4	<0.4
Trichloroethylene	5		ug/L	<0.2	<0.2
Vinyl Chloride	1		ug/L	<0.2	<0.2
Xylene	90		ug/L	<0.5	<0.5

ODWS - Ontario Drinking Water Standards
AO/OG - Aesthetic Objective/Operational Guidelines
(1) Values reported may be biased low due to overgrowth.

Table 5: Summary of Off-Site Water Quality Samplig
609 Harvest Road
Greensville Muncipal Well FDG01 Replacement

Client: Hamilton Water		Work Completed By:	Terraprobe Inc. - Stoney Creek		
Attention: Marco Silvario		Project No.:	T1220561.000		
City of Hamilton		Project Name:	Municipal Well Assessment		
Environmental Laboratory		Sampler Initials:	ABC and HP		
700 Woodward Avenue, Hamilton, Ontario, L8H 6PN					
Monitoring Location Address		609 Harvest Road (13 Medwin Drive)			
Sample ID		609 Harvest Road			
	ODWS	**AO/OG**	**Units**	**Analysis**	
INORGANICS				**12-Dec-23**	**15-Dec-23**
Alkalinity (Total as CaCO3)		30-500	mg/L	308	302
Ammonia + Ammonium			mg/L	<0.01	<0.01
Anion Sum (Calculation)			me/L	10.1	10.1
Bicarbonate as Carbonate (Calculation)			mg/L	308	302
Bromide			mg/L	<0.2	<1
Cation Sum (Calculation)			me/L	8.8	10
Chloride		250	mg/L	66.5	66.2
Colour (apparent)		5	CU	44	32
Conductivity			umho/cm	895	886
Cyanide - Total	0.2		mg/L	<0.003	<0.003
Dissolved Organic Carbon		5	mg/L	1.2	0.7
Fluoride	1.5		mg/L	0.44	0.48
Ion Balance (Calculation)			%	6.9	0.5
Nitrate as N	10		mg/L	1.34	1.28
Nitrate + Nitrite as N			mg/L	1.34	1.28
Nitrite as N	1		mg/L	<0.01	<0.05
o-Phosphase as P			mg/L	<0.05	<0.05
pH		6.5 - 8.5	pH	7.74	7.72
pH-Saturation			pH	6.94	6.91
Silica-Reactive			mg/L	13	13.2
Sulphate			mg/L	76.9	81.7
Temperature			C	22.3	20.6
Total Suspended Solids		500	mg/L	44.4	19
Turbidity		5	NTU	12.8	6.64
Hardness		80-100	mg/L	3.63	420
METALS					
Total Aluminum (Al)		0.1	mg/L	0.057	0.19
Total Antimony (Sb)	0.06		mg/L	<0.0001	0.0002
Total Arsenic (As)	0.01		mg/L	0.0004	0.001
Total Barium (Ba)	1		mg/L	0.0659	0.0707
Total Beryllium (Be)			mg/L	<0.0001	<0.0001
Total Bismuth			mg/L	<0.0001	<0.0001
Total Boron (B)	5		mg/L	0.36	0.035
Total Cadmium (Cd)	0.005		mg/L	<0.0001	0.0001
Total Calcium (Ca)			mg/L	103	122
Total Chromium (Cr)	0.05		mg/L	0.0009	0.0008
Total Cobalt (Co)			mg/L	0.0012	0.0031
Total Copper (Cu)		1	mg/L	0.005	0.0089
Total Iron (Fe)		0.3	mg/L	1.61	2.65
Total Lead (Pb)	0.01		mg/L	0.0024	0.0064
Total Lithium (Li)			mg/L	0.0114	0.0127
Total Magnesium (Mg)			mg/L	27.4	28
Total Manganese (Mn)		0.05	mg/L	0.0755	0.191
Mercury (Hg)	1		ug/L	<0.05	<0.05
Total Molybdenum (Mo)			mg/L	0.0014	0.0014
Total Nickel (Ni)			mg/L	0.0037	0.0068
Total Potassium (K)			mg/L	2.23	2.27
Total Selenium (Se)	0.05		mg/L	0.0002	0.0003
Total Silicon (Si)			mg/L	5.96	6.99
Total Silver (Ag)			mg/L	<0.0001	<0.0001
Sodium (Na)		20/200	mg/L	26.8	29.8
Total Strontium (Sr)			mg/L	3.88	3.62
Total Thallium (Tl)			mg/L	<0.0003	<0.0003
Total Tin (Sn)			mg/L	0.0039	0.0004
Total Titanium (Ti)			mg/L	0.0016	0.0064
Total Tungsten (W)			mg/L	,0.0001	<0.0001
Total Uranium (U)	20		ug/L	2.02	1.96
Total Vanadium (V)			mg/L	0.0004	0.0009
Total Zinc (Zn)		5	mg/L	0.091	0.134
Total Zirconium (Zr)			mg/L	<0.0004	<0.0004
NUTRIENTS					
Total Phosphorus (P)			mg/L	0.011	0.022
MICROBIOLOGICAL / ORGANICS					
Escherichia Coli	0		MPN/100mL	0	0
Coliform	0		MPN/100mL	9	866
1,1-Dichloroethylene	14		ug/L	<0.2	<0.2
1,2-Dichlorobenzene	200		ug/L	<0.2	<0.2
1,2-Dichloroethane	5		ug/L	<0.2	<0.2
1,4-Dichlorobenzene	5		ug/L	<0.2	<0.2
Benzene	1		ug/L	<0.2	<0.2
Bromodichloromethane			ug/L	<0.2	<0.2
Bromoform			ug/L	<0.2	<0.2
Carbon Tetrachloride	2		ug/L	<0.2	<0.2
Chlorobenzene	80		ug/L	<0.3<0.2	<0.3
Chloroform			ug/L	<0.2	<0.2
Dibromochloromethane			ug/L	<0.2	<0.2
Dichloromethane	50		ug/L	<0.5	<0.5
Ethylbenzene	140		ug/L	<0.2	<0.2
m+p-Xylene			ug/L	<0.4	<0.4
o-Xylene			ug/L	<0.2	<0.2
Tetrachloroethylene	10		ug/L	<0.2	<0.2
Toluene	60		ug/L	<0.2	<0.2
Total Trihalomethanes	100		ug/L	<0.4	<0.4
Trichloroethylene	5		ug/L	<0.2	<0.2
Vinyl Chloride	1		ug/L	<0.2	<0.2
Xylene	90		ug/L	<0.5	<0.5

ODWS - Ontario Drinking Water Standards
AO/OG - Aesthetic Objective/Operational Guidelines
(1) Values reported may be biased low due to overgrowth.

Table 2: Summary of Ground Water Quality Analysis
63 Tews Lane
Hamilton, Ontario

Client: Hamilton Water		Work Completed By:	Terraprobe Inc. - Stoney Creek			
Attention: Marco Silvario		Project No.:	T1220561.000			
City of Hamilton		Project Name:	Municipal Well Assessment			
Environmental Laboratory		Sampler Initials:	ABC and HP			
700 Woodward Avenue, Hamilton, Ontario, L8H 6PN						
Monitoring Location Address		63 Tews Lane				
Sample ID		63 Tews Lane				
	ODWS	AO/OG	Units	Analysis		
Date				1-Dec-22	15-Dec-22	16-May-23
INORGANICS						
Alkalinity (Total as CaCO3)		30-500	mg/L	280	274	269
Ammonia + Ammonium			mg/L	0.03	0.04	0.04
Anion Sum (Calculation)			me/L	9.4	9.2	9
Bicarbonate as Carbonate (Calculation)			mg/L	280	274	269
Bromide			mg/L	<0.2	<1	<0.2
Cation Sum (Calculation)			me/L	8.3	9.1	8.6
Chloride		250	mg/L	40.6	40.5	38.1
Colour (apparent)		5	CU	445	67	26
Conductivity			umho/cm	796	780	775
Cyanide - Total	0.2		mg/L	<0.003	<0.003	<0.003
Dissolved Organic Carbon		5	mg/L	1.1	0.6	0.6
Fluoride	1.5		mg/L	0.31	0.31	0.32
Ion Balance (Calculation)			%	5.8	0.6	2.2
Nitrate as N	10		mg/L	0.02	<0.1	<002
Nitrate + Nitrite as N			mg/L	<0.03	<0.2	<0.03
Nitrite as N	1		mg/L	<0.01	<0.05	<0.01
o-Phosphase as P			mg/L	<0.05	<0.05	<005
pH		6.5 - 8.5	pH	7.82	7.49	7.82
pH-Saturation			pH	7.02	6.98	6.97
Silica-Reactive			mg/L	21.8	21.2	21.5
Sulphate			mg/L	96.5	97	94.2
Temperature			C	21.6	20.3	22.3
Total Suspended Solids		500	mg/L	96	9.7	<1
Turbidity		5	NTU	108	11.2	2.19
Hardness		80-100	mg/L	363	399	386
METALS						
Total Aluminum (Al)		0.1	mg/L	0.063	0.109	<0.002
Total Antimony (Sb)	0.06		mg/L	<0.0001	<0.0001	<0.0001
Total Arsenic (As)	0.01		mg/L	0.004	0.0146	0.0019
Total Barium (Ba)	1		mg/L	0.0544	0.0568	0.529
Total Beryllium (Be)			mg/L	<0.0001	<0.0001	<0.0001
Total Bismuth			mg/L	<0.0001	<0.0001	<0.0001
Total Boron (B)	5		mg/L	0.028	0.027	0.026
Total Cadmium (Cd)	0.005		mg/L	<0.0001	<0.0001	<0.0001
Total Calcium (Ca)			mg/L	96.8	113	109
Total Chromium (Cr)	0.05		mg/L	0.0004	0.0002	<0.0001
Total Cobalt (Co)			mg/L	0.0001	0.0002	<0.0001
Total Copper (Cu)		1	mg/L	0.0011	0.0007	0.0002
Total Iron (Fe)		0.3	mg/L	2.94	6.91	0.83
Total Lead (Pb)	0.01		mg/L	0.0006	0.0012	0.0001
Total Lithium (Li)			mg/L	0.0106	0.012	0.0117
Total Magnesium (Mg)			mg/L	29.6	28.4	27.7
Total Manganese (Mn)		0.05	mg/L	0.0401	0.0586	0.0234
Mercury (Hg)	1		ug/L	<0.05	<0.05	<0.05
Total Molybdenum (Mo)			mg/L	0.0011	0.0011	0.0011
Total Nickel (Ni)			mg/L	0.0009	0.0006	0.0002
Total Potassium (K)			mg/L	1.33	1.28	1.26
Total Selenium (Se)	0.05		mg/L	<0.0001	<0.0001	<0.0001
Total Silicon (Si)			mg/L	9.5	11.9	10.3
Total Silver (Ag)			mg/L	<0.0001	<0.0001	<0.0001
Sodium (Na)		20/200	mg/L	17	15.6	15.6
Total Strontium (Sr)			mg/L	6.79	6.37	6.28
Total Thallium (Tl)			mg/L	<0.0003	<0.0003	<0.0003
Total Tin (Sn)			mg/L	0.0015	0.0004	<0.0001
Total Titanium (Ti)			mg/L	0.0038	0.0046	0.0006
Total Tungsten (W)			mg/L	<0.0001	<0.0001	<0.0001
Total Uranium (U)	20		ug/L	0.151	0.167	0.167
Total Vanadium (V)			mg/L	0.0002	0.0003	<0.0001
Total Zinc (Zn)		5	mg/L	0.006	0.012	0.013
Total Zirconium (Zr)			mg/L	<0.0004	<0.0004	<0.0004
NUTRIENTS						
Total Phosphorus (P)			mg/L	0.011	0.051	<0.010
MICROBIOLOGICAL / ORGANICS						
Escherichia Coli	0		MPN/100mL	0	0	0
Coliform	0		MPN/100mL	9	10	0
1,1-Dichloroethylene	14		ug/L	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	200		ug/L	<0.2	<0.2	<0.2
1,2-Dichloroethane	5		ug/L	<0.2	<0.2	<0.2
1,4-Dichlorobenzene	5		ug/L	<0.2	<0.2	<0.2
Benzene	1		ug/L	<0.2	<0.2	<0.2
Bromodichloromethane			ug/L	<0.2	<0.2	<0.2
Bromoform			ug/L	<0.2	<0.2	<0.2
Carbon Tetrachloride	2		ug/L	<0.2	<0.2	<0.2
Chlorobenzene	80		ug/L	<0.3	<0.3	<0.3
Chloroform			ug/L	<0.2	<0.2	<0.2
Dibromochloromethane			ug/L	<0.2	<0.2	<0.2
Dichloromethane	50		ug/L	<0.5	<0.5	<0.5
Ethylbenzene	140		ug/L	<0.2	<0.2	<0.2
m+p-Xylene			ug/L	<0.4	<0.4	<0.4
o-Xylene			ug/L	<0.2	<0.2	<0.2
Tetrachloroethylene	10		ug/L	<0.2	<0.2	<0.2
Toluene	60		ug/L	<0.2	<0.2	<0.2
Total Trihalomethanes	100		ug/L	<0.4	<0.4	<0.4
Trichloroethylene	5		ug/L	<0.2	<0.2	<0.2
Vinyl Chloride	1		ug/L	<0.2	<0.2	<0.2
Xylene	90		ug/L	<0.5	<0.5	<0.5

ODWS - Ontario Drinking Water Standards
AO/OG - Aesthetic Objective/Operational Guidelines
(1) Values reported may be biased low due to overgrowth.

Table 6: Summary of Field Quality Sampling - TW 2-13
Greensville Municipal Well FDG01 Replacement
Hamilton, Ontario

Date & time	Temperature (°C)	pH	Oxidation Reduction Potential (mV)	Conductivity (ms/cm)	Turbidity (NTU)	Dssolved Oxygen (mg/L)	Total Dissolved Solids (mg/L)
12/13/2022 10:00	9.22	7.25	79	1.03	0	6.89	0.66
12/13/2022 11:00	11.78	7.37	122	0.988	0	11.7	0.631
12/13/2022 12:00	14.03	7.34	124	0.971	0	12.1	0.62
12/13/2022 13:00	11.07	7.24	106	1	0	8.41	0.639
12/13/2022 14:00	11	7.21	111	1.1	0	9.83	0.653
12/13/2022 15:00	7.58	8.06	136	1.07	0	13.65	0.684
12/13/2022 16:00	6.99	7.01	121	1.06	0	13.89	0.68
12/13/2022 17:00	5.62	7.11	121	1.1	0	14.01	0.74
12/13/2022 18:00	4.5	7.13	119	1.13	0	13.65	0.727
12/13/2022 19:00	4.05	7.27	112	1.15	0	13.21	0.733
12/13/2022 20:00	3.74	7.17	122	1.14	0	13.3	0.73
12/13/2022 21:00	-2	7.12	143	1.41	0	13.52	0.901
12/13/2022 22:00	-2.5	7.43	119	1.28	0	15.75	0.814
12/13/2022 23:00	2.55	7.38	142	1.23	0	13.39	0.785
12/14/2022 0:00	3.21	7.14	140	1.18	0	15.63	0.792
12/14/2022 1:00	3.2	7.19	152	1.2	0	11.9	0.752
12/14/2022 2:00	4.98	7.07	165	1.12	0	7.43	0.727
12/14/2022 3:00	3.57	7.2	165	1.16	0	16.78	0.757
12/14/2022 4:00	3.14	7.2	147	1.21	0	21.17	0.772
12/14/2022 5:00	2.85	7.3	159	1.17	0	19.47	0.737
12/14/2022 6:00	1.93	7.26	149	1.21	0	23.9	0.765
12/14/2022 7:00	2.37	7.23	152	1.22	0	21.61	0.72
12/14/2022 8:00	2.24	7.34	153	1.2	0	24.19	0.766
12/14/2022 9:00	3	7.24	162	1.21	0	10.57	0.778
12/14/2022 10:00	3.65	7.29	160	1.2	0	11.48	0.745
12/14/2022 11:00	6.45	7.11	16	1.13	0	11	0.723
12/14/2022 12:00	7.05	7.13	102	1.12	0	12.27	0.718
12/14/2022 13:00	6.73	7.34	117	1.14	0	15.83	0.729
12/14/2022 14:00	7.83	7.17	95	1.11	0	14.03	0.721
12/14/2022 15:00	8.17	7.19	116	1.1	0	14.78	0.704
12/14/2022 16:00	7.46	7.3	129	1.11	0	14.57	0.714
12/14/2022 17:00	7.44	7.31	119	1.1	0	14.64	0.722
12/14/2022 18:00	7.87	7.15	136	1.11	0	14.7	0.76
12/14/2022 19:00	6.6	7.5	125	1.12	0	14.5	0.759
12/14/2022 20:00	5.83	7.15	123	1.18	0	16.42	0.754
12/14/2022 21:00	6.86	7.11	121	1.16	0	15.2	0.746
12/14/2022 22:00	6.39	7.2	139	1.15	0	16.52	0.738
12/14/2022 23:00	6.02	7.14	121	1.1	0	16.3	0.74
12/15/2022 0:00	6.7	7.27	129	1.14	0	15.84	0.731
12/15/2022 1:00	5.94	7.07	125	1.16	0	12.3	0.751
12/15/2022 2:00	6.16	7.18	122	1.14	0	13.26	0.754
12/15/2022 3:00	6.17	7.29	173	1.17	0	11.13	0.745
12/15/2022 4:00	6.38	7.21	175	1.15	0	8.49	0.729
12/15/2022 5:00	6.2	7.31	182	1.18	0	16.61	0.751
12/15/2022 6:00	6.42	7.2	184	1.15	0	7.96	0.731
12/15/2022 7:00	6.24	7.28	171	1.16	0	19.71	0.744
12/15/2022 8:00	6.3	7.2	176	1.15	0	17.71	0.734
12/15/2022 12:00	7.83	6.92	88	1.11	0	8.68	0.708
12/15/2022 13:00	7.61	7.14	121	1.11	0	10.62	0.713
12/15/2022 14:00	7.25	7.22	122	1.12	0	15.04	0.717
Max Value	**14.0**	**8.06**	**184**	**1.41**	**0**	**24.19**	**0.901**
Min Value	**-2.5**	**6.92**	**16**	**0.97**	**0**	**6.89**	**0.62**
Avg Value	**5.8**	**7.23**	**132**	**1.14**	**0**	**14.11**	**0.73**

Table 6: Summary of Field Quality Sampling - Monitoring Wells
Greensville Municipal Well FDG01 Replacement
Hamilton, Ontario

Well ID / Address	Date & time	Temperature (°C)	pH	Oxidation Reduction Potential (mV)	Conductivity (ms/cm)	Turbidity (NTU)	Dssolved Oxygen (mg/L)	Total Dissolved Solids (mg/L)
TW 1-13	12/13/2022 12:00	8.99	7.32	n/a	0.734	n/a	6.81	0.47
	12/14/2022 10:00	7.49	7.4	68	0.771	0	5.85	0.46
	12/15/2022 10:00	7.46	8.95	27	0.696	0	4.78	0.45
	12/15/2022 18:00	7.36	6.94	140	0.7	87.2	6.21	0.448
	TW 1-13 Average	**7.8**	**7.7**	**78.3**	**0.7**	**29.1**	**5.9**	**0.5**
TW 3-13	12/13/2022 12:00	8.23	7.58	n/a	7.58	n/a	3.12	0.497
	12/14/2022 11:00	8.23	7.58	45	0.82	0	5.02	0.525
	12/15/2022 10:00	9.7	7.63	90	0.738	0	3.43	0.472
	12/15/2022 18:00	7.92	7.34	96	0.693	43.1	0.733	0.444
	TW 3-13 Average	**8.5**	**7.5**	**77.0**	**2.5**	**14.4**	**3.1**	**0.5**
MW101	12/12/2023 0:00	8.59	7.45	33	0.669	81.4	8.72	n/a
	12/15/2023 0:00	8.14	7.06	56	0.596	41.1	8.06	0.381
3 Medwin Drive	12/15/2023 15:30	9.16	7.19	86	0.972	0	6.03	0.624
609 Harvest Road	12/15/2023 16:00	8.17	7.36	105	0.98	0	7.88	0.628
15 Medwin Drive	12/15/2023 16:30	13.2	7.08	121	1.18	0	5.06	0.748
63 Tews Lane	12/15/2023 15:00	7.03	7.45	111	0.893	9	5.2	0.571

Private Well Survey and
Wel Testing Notification Letters

APPENDIX A

Terraprobe Inc.

October 13, 2022

Subject: **Public Notice – Test Production Well Pumping Test at Johnson Tew Community Park, Greensville, Ontario**

Dear Resident:

The City of Hamilton (City) is undertaking further well testing for a completed proposed municipal well installed at Johnson Tew Community Park (the Site) in Greensville. The park is located immediately north of the Greensville Public School and consists of an open field. This well testing program intends to test a bedrock well on the Site for suitability to be used as a replacement municipal production well to support the existing Greensville Municipal Well. The current well supplies a reliable source of drinking water to a community of approximately 36 homes located along Harvest Rd., Meldrum Avenue, Forest Avenue, Cedar Avenue, Birch Crescent, and Maple Crescent in Greensville, Ontario.

As part of the project, a pumping test program will be conducted over approximately a three (3) day period during the week of October 24th – 28th. Englobe has been retained to supervise the pumping test contractor and review the data. The results of the pumping test will be documented in a detailed hydrogeological report which will confirm the sustainable pumping rate of the well being tested, the interpreted radius of influence within the bedrock aquifer, and the occurrence of groundwater and/or surface water impacts.

In support of the proposed pumping test, the City has requested that Englobe conduct a water well survey in the area of the Site, which will be used to gather information on private water wells including information on well construction details and history of use. We are also requesting permission to include selected nearby private wells in the monitoring program prior to, during and after the pump test. Participation is not mandatory, and the wells selected will be dependent on interest from the property oner, location (locations adequately spaced), and well accessibility.

If you request to be included and your well is selected for participation in the program, a water level data logger will be installed in the well casing by a licensed well contractor (where required) for the period of the test. The data logger will automatically record water levels throughout the testing period. Staff from Englobe will accompany the well technician during the installation and subsequent removal of the logger and will be on site during the pump test. In addition, our staff will collect water quality samples from the private wells included within the monitoring program before and after the pump test. Results of the water quality sampling and water level monitoring will be reviewed and a letter report with the results will be provided to each resident participating within the monitoring program.

If you are interested in participating in the well monitoring program or have any questions regarding this project, please contact Marco Silverio from the City of Hamilton at (905) 546-2424 ext. 6099 or Paul Raepple

T 905-796-2650 – praepple@Englobe.ca
11 Indell Lane – Brampton, ON – Canada L6T 3Y3
englobecorp.com

of Englobe at (519) 802-0793. To be eligible to participate we would request that you provide notification no later than October 20, 2022. We appreciate your time and cooperation in this matter.

Yours very truly,

Englobe Corp.

Paul L. Raepple, P.Geo.
Senior Project
Manager/Hydrogeologist

Terraprobe

Private Well Survey

PROJECT No.

I.D. No. _____

OWNER _____ ORIGINAL OWNER _____

ADDRESS _____

LOT/CONC./TWP. _____ PHONE _____

DATE

_____

_____

_____

WELL DETAILS

TYPE _____ DIAMETER _____

CASING _____ SCREEN _____

PUMP TYPE & DEPTH _____

WATER TREATMENT _____

DATE CONSTRUCTED _____

DEPTH _____ Meas/Stated

WATER LEVEL _____ b.m.p.

STICK-UP _____ a.g.l.

INSPECTION NOTES :

_____

_____

_____

_____

_____

_____

_____

_____

WELL USE

WELL USE _____

No. OF RESIDENTS _____

WATER QUALITY _____

WATER QUANTITY _____

EVER BOUGHT WATER? _____

WHEN? WHY? _____

PREVIOUS PROBLEMS WITH WELL (WHEN?)

_____

_____

_____

_____

_____

COMMENTS:

_____

_____

_____

_____

WELL CONSTRUCTION

WELL LOCATION / SEPTIC

NOTES:

GEODeTIC ELEVATION: _____

MOE WELL No.: _____

OWNER: _____

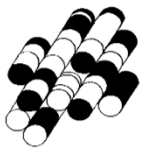
ENGINEER: _____

PERMISSION TO SURVEY WELL: _____

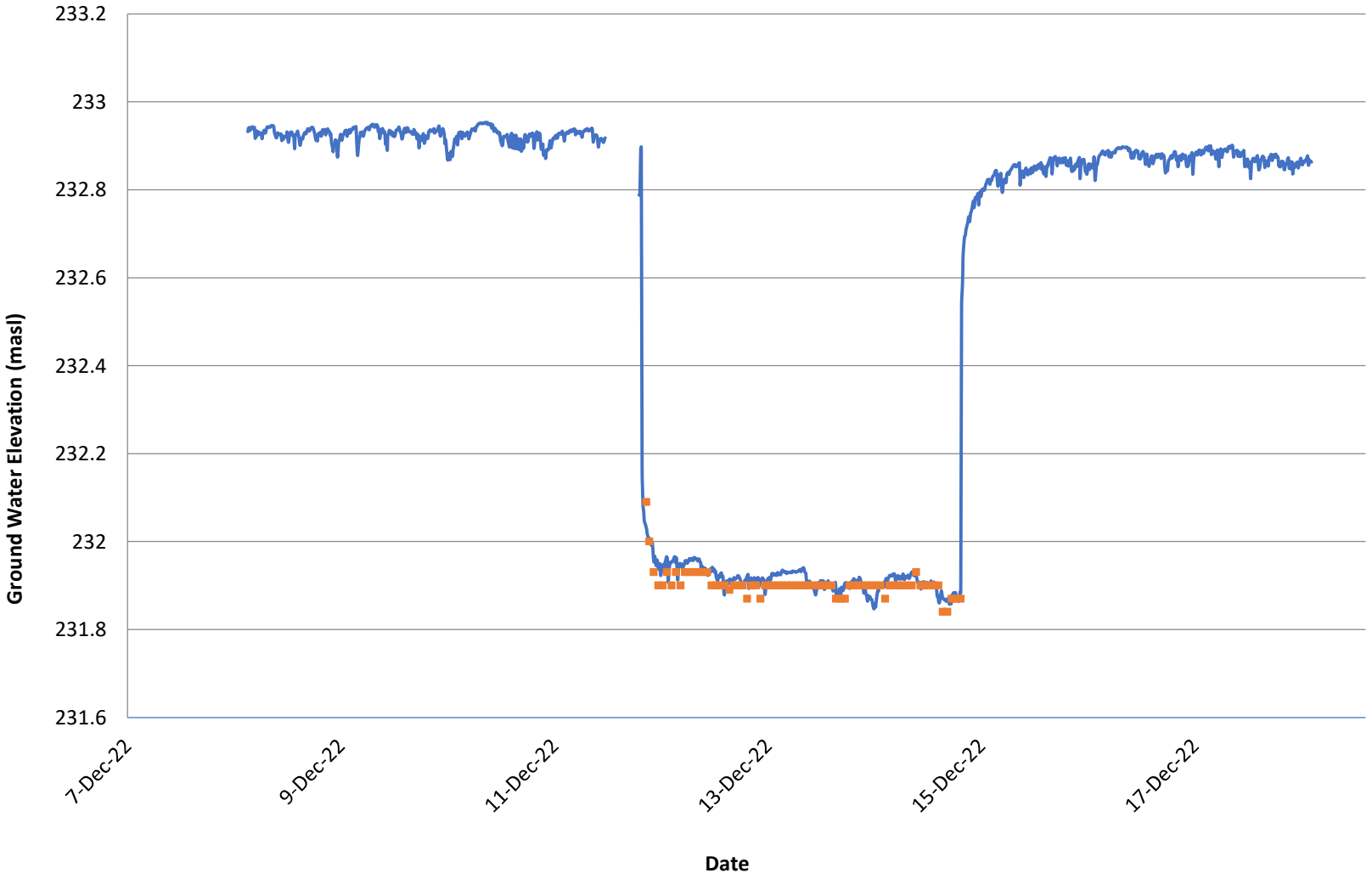
Groundwater Monitoring
Hydrographs

APPENDIX B

Terraprobe Inc.



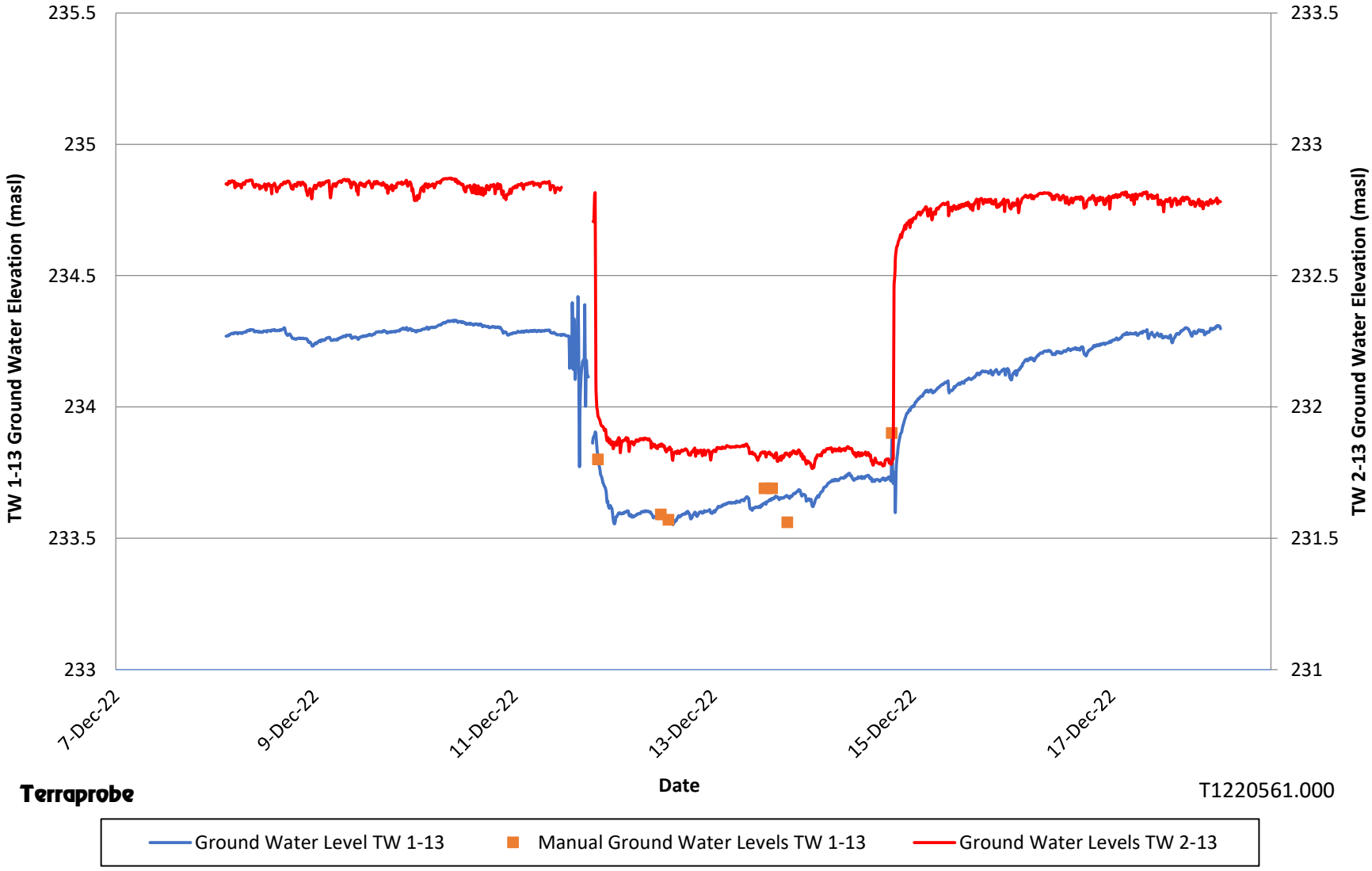
Appendix B: Results of Groundwater Level Monitoring
City of Hamilton - Greensville Municipal Well FDG01 Replacement
Test Well TW 2-13



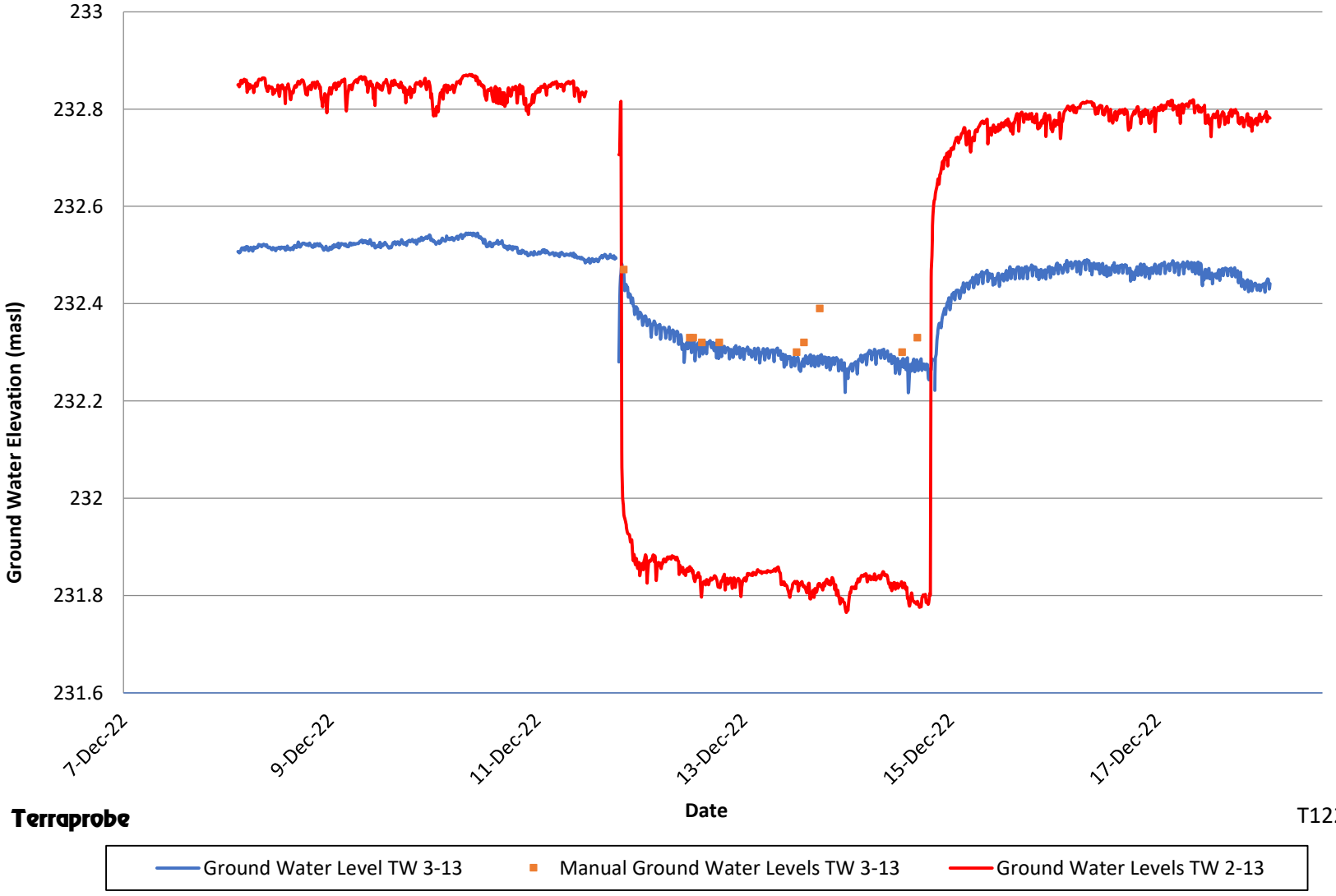
Terraprobe

T1220561.000

Appendix B: Results of Groundwater Level Monitoring
City of Hamilton - Greensville Municipal Well FDG01 Replacement
Test Well TW 1-13



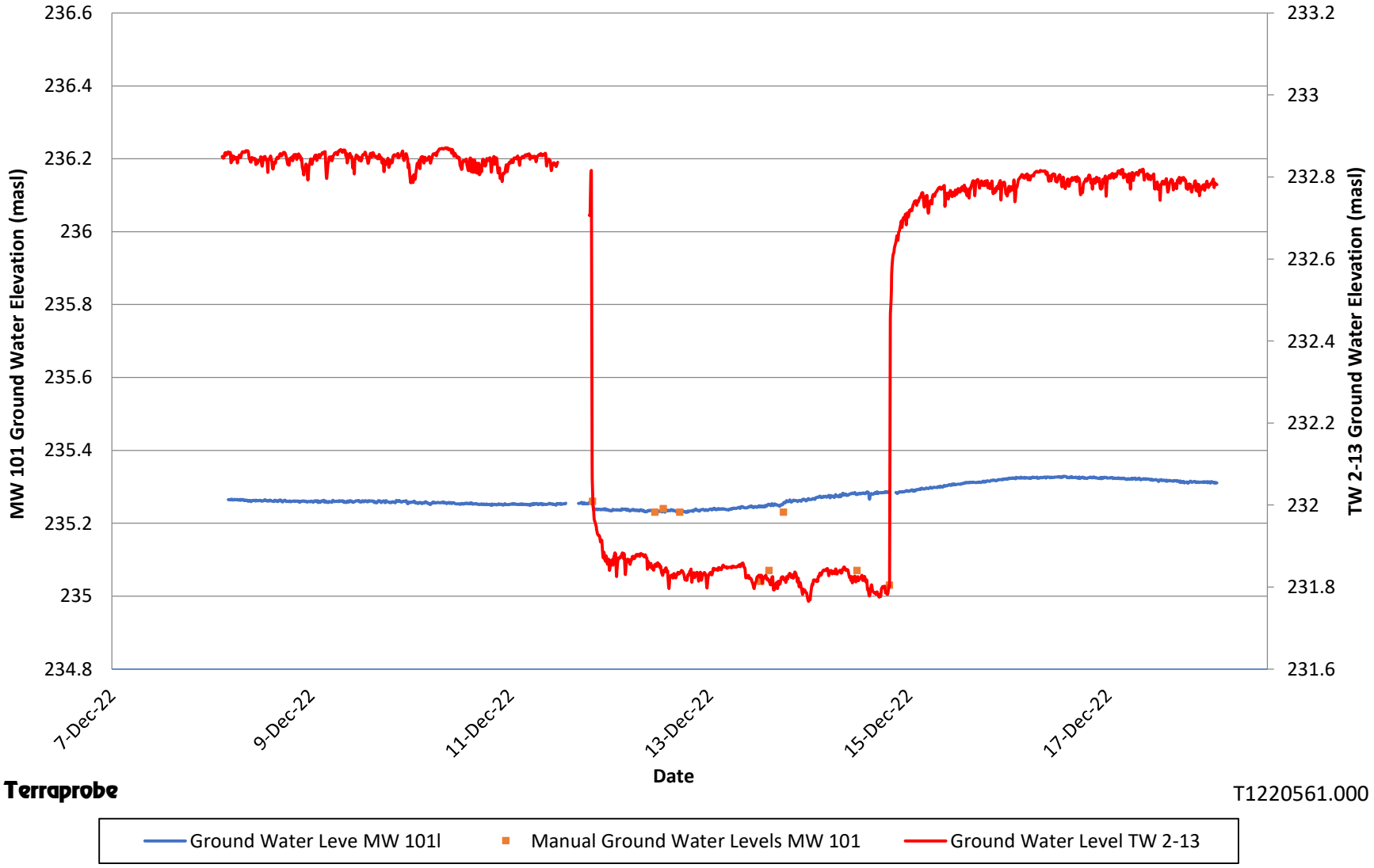
Appendix B: Results of Groundwater Level Monitoring
City of Hamilton - Greenville Municipal Well FDG01 Replacement
Test Well TW 3-13



Terraprobe

T1220561.000

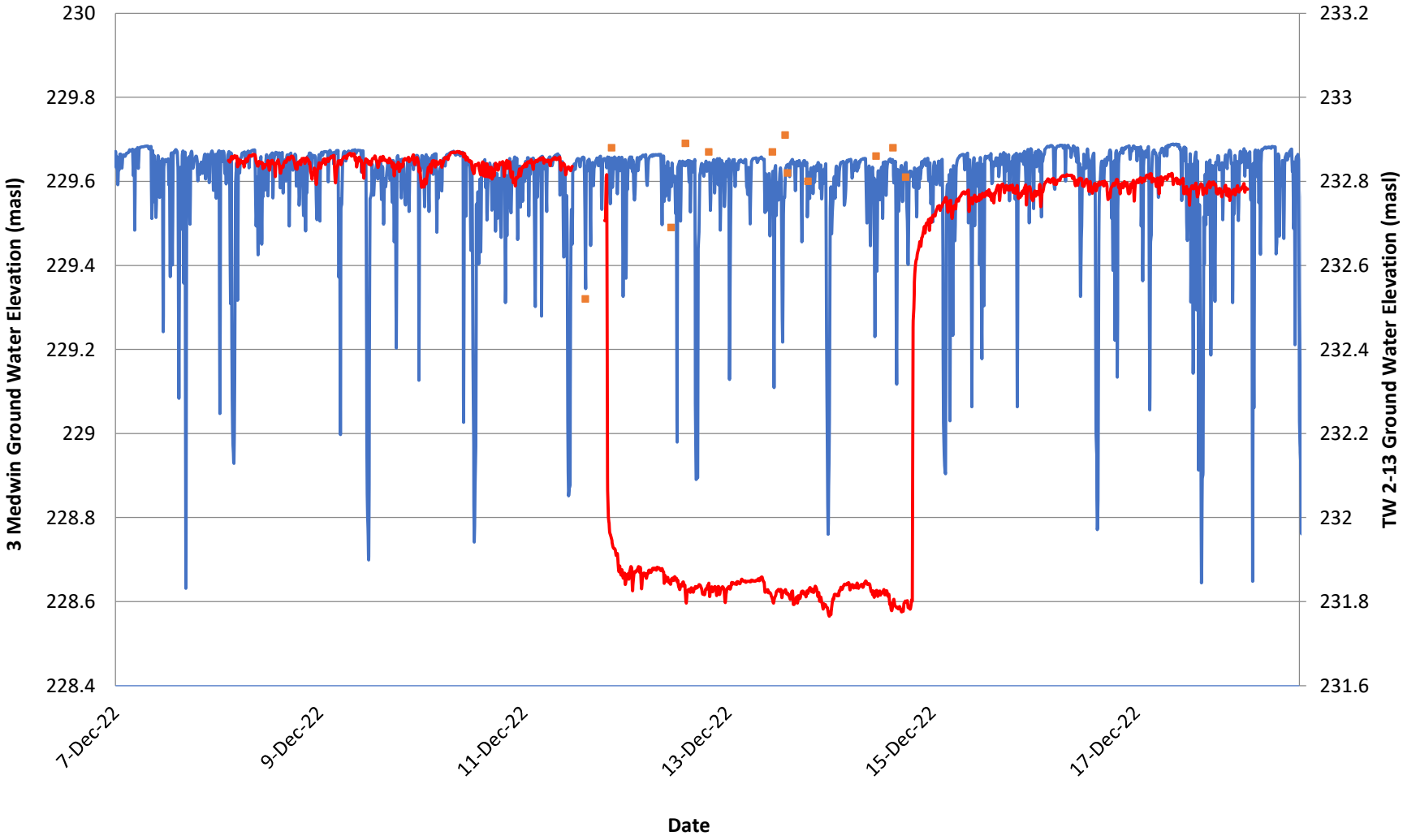
Appendix B: Results of Groundwater Level Monitoring
City of Hamilton - Greensville Municipal Well FDG01 Replacement
Monitoring Well MW 101



Terraprobe

T1220561.000

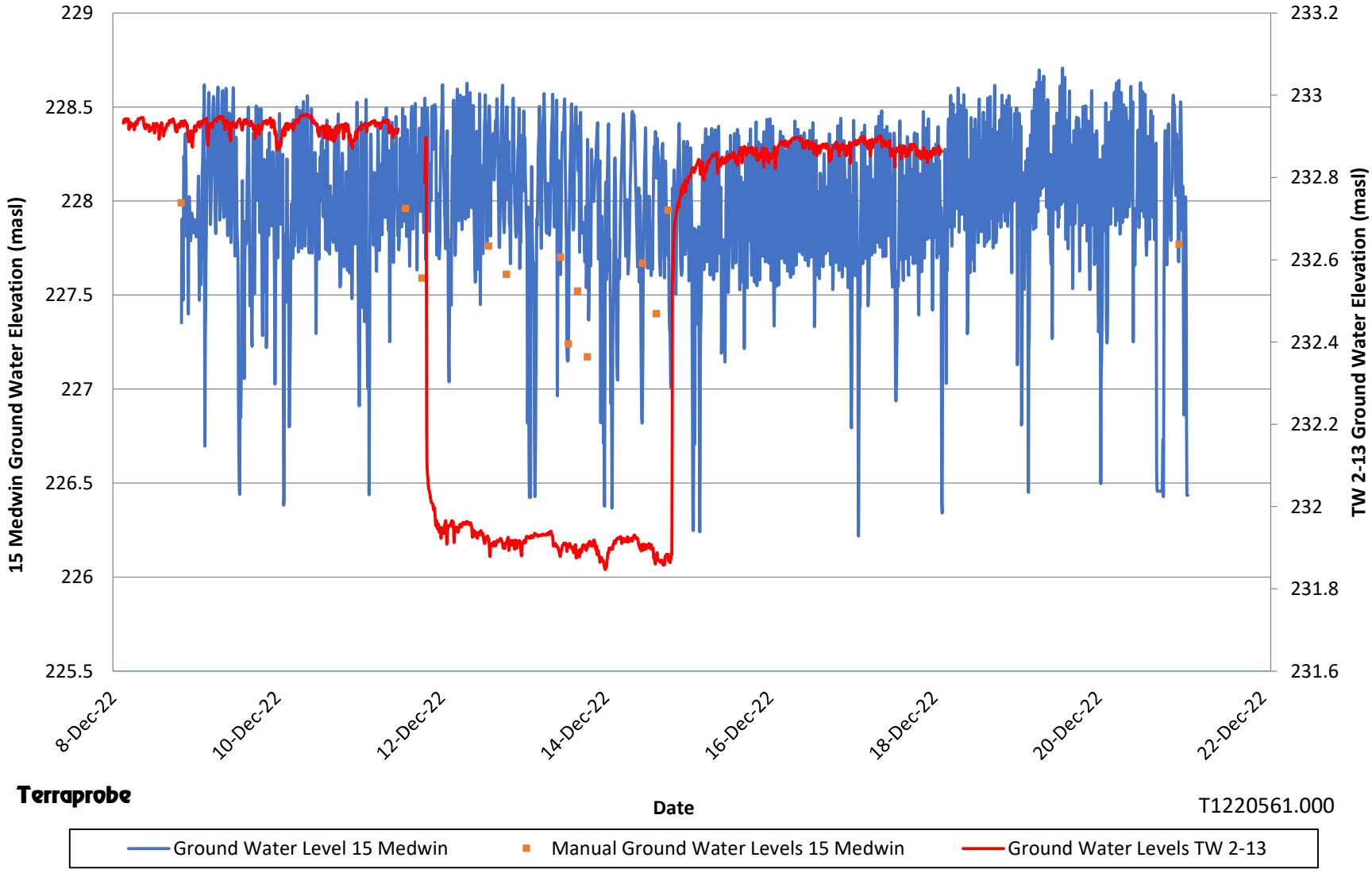
Appendix B: Results of Groundwater Level Monitoring
City of Hamilton - Greensville Municipal Well FDG01 Replacement
3 Medwin Drive, Dundas, Ontario



Terraprobe

T1220561.000

Appendix B: Results of Groundwater Level Monitoring
City of Hamilton - Greensville Municipal Well FDG01 Replacement
15 Medwin Drive, Dundas, Ontario



Terraprobe

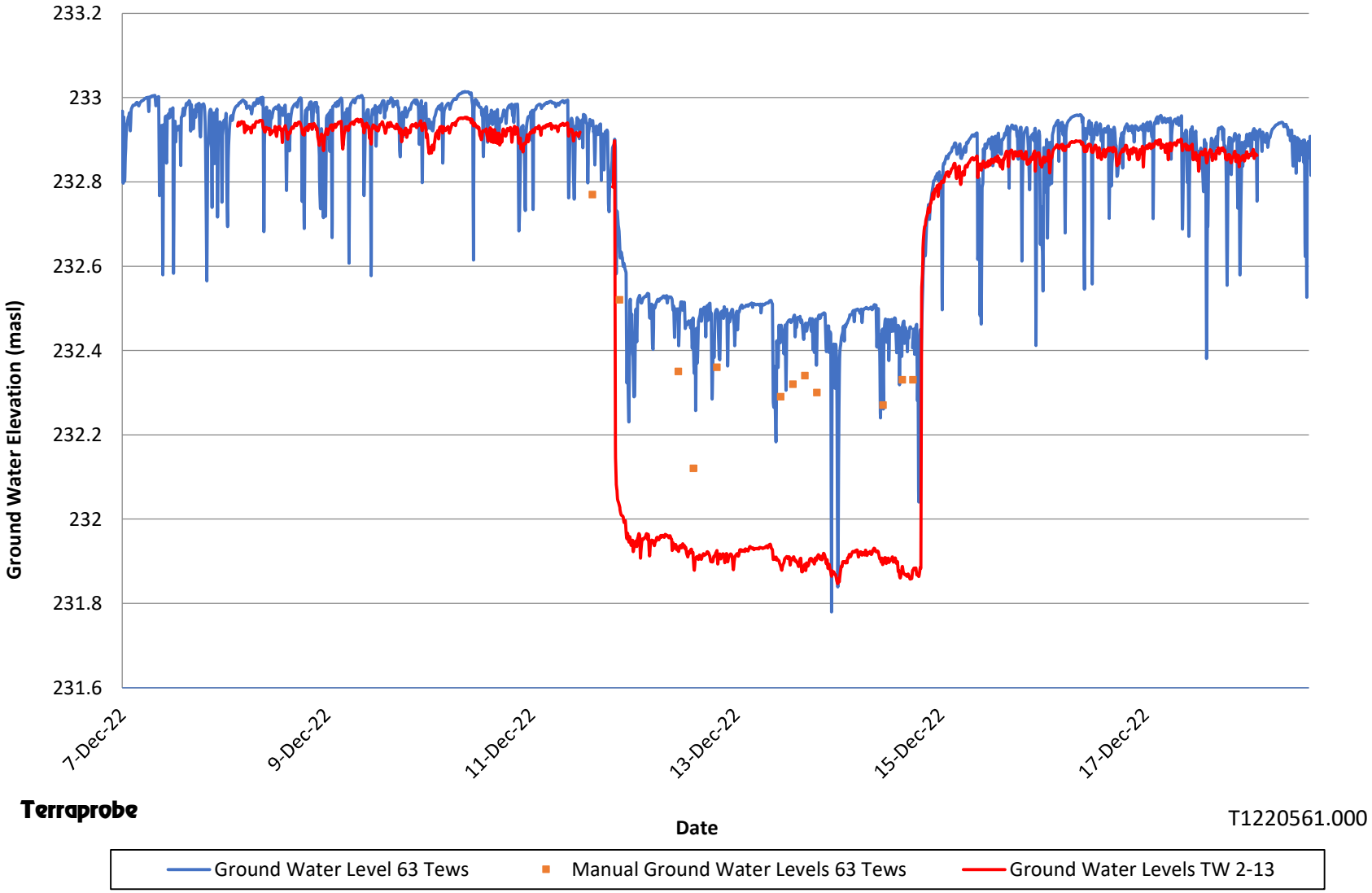
T1220561.000

Appendix B: Results of Groundwater Level Monitoring
City of Hamilton - Greensville Municipal Well FDG01 Replacement
609 Harvest Drive, Dundas, Ontario

Terraprobe

T1220561.000

Appendix B: Results of Groundwater Level Monitoring
City of Hamilton - Greensville Municipal Well FDG01 Replacement
63 Tews Lane, Dundas, Ontario



Terraprobe

T1220561.000

Laboratory Certificates of Analysis
City of Hamilton

APPENDIX C

Terraprobe Inc.

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2022-12-12
Date Submitted: 2022-12-13

Laboratory Work Order Number: 342369

Samples in this work order were analyzed using the following methods:

o-Phosphate Colourimetric	Alk/pH/Cond/Temp PC Titrate	Ammonia Skalar	Anions IC
Bacteria MPN	Caffeine SPE GC/MS	Colour Spectrophotometric	Cyanide Skalar
Fluoride-PC Titrate	LIMS Calculation	Mercury Cold Vapour AA	Metals ICP/MS
Silica Skalar	TOC/DOC Colourimetric	TSS/VSS Gravimetric	Turbidity Turbimeter
Volatile Organics-Purge&Trap/GC/MS			

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.
Results have been compared to the stated specification, without taking into account measurement uncertainty. An asterisk (*) indicates the result has been found to be outside of that specification.
CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.
" † " indicates the analyte is not accredited to ISO/IEC 17025.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.

Final Report Approval by:

Jillian J. Thompson-Anderson
Quality Control Automation Technologist

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02

Hamilton Water

Monitoring Wells - Greensville GW - Pump Test

TW-2-13 2022-12-12 17:00:00 Record 684300

Alkalinity	292	mg/L	2	
Ammonia + Ammonium as N	<0.01	mg/L	0.01	
Anion Sum (Calculation) †	7.6	me/L	0.1	
Bicarbonate as Carbonate (Calculation)	292	mg/L	2	
Bromide	<1	mg/L	1	
Cation Sum (Calculation) †	7.3	me/L	0.1	
Chloride	12.6	mg/L	0.5	
Colour (apparent)	39	CU	2	
Conductivity	654	umhos/cm	4	
Cyanide - Total	<0.003	mg/L	0.003	0.2
Dissolved Organic Carbon	1.8	mg/L	0.4	
Fluoride	0.12	mg/L	0.04	1.5
Ion Balance (Calculation) †	1.8	%	0.1	
Nitrate as N	1.41	mg/L	0.02	10.0
Nitrate+Nitrite as N (Calculation)	1.41	mg/L	0.03	
Nitrite as N	<0.05	mg/L	0.05	1.0
o-Phosphate as P	<0.05	mg/L	0.05	
pH	7.87	pH	0.01	
pH - Saturation (Calculation) †	6.96	pH	0.01	
Silica-Reactive	14.5	mg/L	0.20	
Sulphate	44.1	mg/L	0.5	
Temperature	20.9	C	0.1	
Total Suspended Solids	3.1	mg/L	0.8	
Turbidity	6.83	NTU	0.05	
Aluminum	0.106	mg/L	0.002	
Antimony	<0.0001	mg/L	0.0001	0.006
Arsenic	0.0033	mg/L	0.0001	0.010
Barium	0.0932	mg/L	0.0001	1.0
Beryllium	<0.0001	mg/L	0.0001	
Bismuth	<0.0001	mg/L	0.0001	
Boron	0.018	mg/L	0.010	5.0
Cadmium	<0.0001	mg/L	0.0001	0.005
Calcium	103	mg/L	0.05	
Chromium	0.0022	mg/L	0.0001	0.05
Cobalt	0.0004	mg/L	0.0001	
Copper	0.0015	mg/L	0.0001	
Hardness (Calculation)	334	mg/L	0.3	
Iron	1.96	mg/L	0.003	
Lead	0.0043	mg/L	0.0001	0.010
Lithium	0.0068	mg/L	0.0005	
Magnesium	18.6	mg/L	0.05	
Manganese	0.0339	mg/L	0.0001	
Mercury	<0.05	ug/L	0.05	1
Molybdenum	0.0004	mg/L	0.0001	
Nickel	0.0009	mg/L	0.0001	
Phosphorus Total	0.019	mg/L	0.010	
Potassium	1.01	mg/L	0.05	
Selenium	0.0002	mg/L	0.0001	0.05
Silicon	6.87	mg/L	0.01	
Silver	<0.0001	mg/L	0.0001	
Sodium	12.1	mg/L	0.05	20

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Strontium	0.943	mg/L	0.0005	
Thallium	<0.0003	mg/L	0.0003	
Tin	<0.0001	mg/L	0.0001	
Titanium	0.0022	mg/L	0.0004	
Tungsten	0.0003	mg/L	0.0001	
Uranium	0.615	ug/L	0.002	20
Vanadium	0.0004	mg/L	0.0001	
Zinc	0.065	mg/L	0.001	
Zirconium	<0.0004	mg/L	0.0004	
Escherichia coli	0	MPN/100mL	0	0
Total Coliform	0	MPN/100mL	0	0
1,1-Dichloroethylene	<0.2	ug/L	0.2	14
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200
1,2-Dichloroethane	<0.2	ug/L	0.2	5
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5
Benzene	<0.2	ug/L	0.2	1
Bromodichloromethane	<0.2	ug/L	0.2	
Bromoform	<0.2	ug/L	0.2	
Carbon Tetrachloride	<0.2	ug/L	0.2	2
Chlorobenzene	<0.3	ug/L	0.3	80
Chloroform	<0.2	ug/L	0.2	
Dibromochloromethane	<0.2	ug/L	0.2	
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90
Caffeine †	<0.5	ug/L	0.5	

MW-101 2022-12-12 13:00:00 Record 684301

Alkalinity	296	mg/L	2	
Ammonia + Ammonium as N	<0.01	mg/L	0.01	
Anion Sum (Calculation) †	6.9	me/L	0.1	
Bicarbonate as Carbonate (Calculation)	296	mg/L	2	
Bromide	<1	mg/L	1	
Cation Sum (Calculation) †	22.9	me/L	0.1	
Chloride	2.5	mg/L	0.5	
Colour (apparent)	4700	CU	2	
Conductivity	554	umhos/cm	4	
Cyanide - Total	<0.003	mg/L	0.003	0.2
Dissolved Organic Carbon	1.9	mg/L	0.4	
Fluoride	0.11	mg/L	0.04	1.5
Ion Balance (Calculation) †	53.9	%	0.1	
Nitrate as N	1.06	mg/L	0.02	10.0
Nitrate+Nitrite as N (Calculation)	1.06	mg/L	0.03	
Nitrite as N	<0.05	mg/L	0.05	1.0
o-Phosphate as P	<0.05	mg/L	0.05	
pH	7.50	pH	0.01	
pH - Saturation (Calculation) †	6.63	pH	0.01	
Silica-Reactive	5.99	mg/L	0.20	
Sulphate	27.5	mg/L	0.5	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Temperature	20.4	C	0.1		
Total Suspended Solids	1870	mg/L	0.8		
Turbidity	874	NTU	0.05		
Aluminum	31.6	mg/L	0.002		
Antimony	0.0004	mg/L	0.0001	0.006	
Arsenic	0.0181	mg/L	0.0001	0.010	*
Barium	0.391	mg/L	0.0001	1.0	
Beryllium	0.0012	mg/L	0.0001		
Bismuth	0.0004	mg/L	0.0001		
Boron	0.032	mg/L	0.010	5.0	
Cadmium	0.0004	mg/L	0.0001	0.005	
Calcium	259	mg/L	0.05		
Chromium	0.0560	mg/L	0.0001	0.05	*
Cobalt	0.0322	mg/L	0.0001		
Copper	0.0896	mg/L	0.0001		
Hardness (Calculation)	825	mg/L	0.3		
Iron	64.3	mg/L	0.003		
Lead	0.0329	mg/L	0.0001	0.010	*
Lithium	0.0503	mg/L	0.0005		
Magnesium	43.4	mg/L	0.05		
Manganese	2.30	mg/L	0.0001		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0023	mg/L	0.0001		
Nickel	0.0547	mg/L	0.0001		
Phosphorus Total	1.90	mg/L	0.010		
Potassium	7.08	mg/L	0.05		
Selenium	0.0007	mg/L	0.0001	0.05	
Silicon	37.5	mg/L	0.01		
Silver	0.0002	mg/L	0.0001		
Sodium	5.87	mg/L	0.05	20	
Strontium	0.520	mg/L	0.0005		
Thallium	0.0005	mg/L	0.0003		
Tin	0.0031	mg/L	0.0001		
Titanium	1.17	mg/L	0.0004		
Tungsten	0.0001	mg/L	0.0001		
Uranium	0.672	ug/L	0.002	20	
Vanadium	0.0636	mg/L	0.0001		
Zinc	0.212	mg/L	0.001		
Zirconium	0.0080	mg/L	0.0004		
Escherichia coli	0	MPN/100mL	0	0	
Total Coliform	1	MPN/100mL	0	0	*
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	<0.2	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		
Dichloromethane	<0.5	ug/L	0.5	50	
Ethylbenzene	<0.2	ug/L	0.2	140	
m+p-Xylene	<0.4	ug/L	0.4		
o-Xylene	<0.2	ug/L	0.2		
Tetrachloroethylene	<0.2	ug/L	0.2	10	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90
Caffeine †	<0.5	ug/L	0.5	

Report Comment: The ODWS does not specify a MAC for sodium, however, as per section 18 of the SDWA, sodium results above 20 mg/L on a regulatory sample are prescribed as adverse results with a duty to report as specified in the applicable regulation.

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2022-12-13
Date Submitted: 2022-12-14

Laboratory Work Order Number: 342390

Samples in this work order were analyzed using the following methods:

o-Phosphate Colourimetric	Alk/pH/Cond/Temp PC Titrate	Ammonia Skalar	Anions IC
Bacteria MPN	Colour Spectrophotometric	Cyanide Skalar	Fluoride-PC Titrate
LIMS Calculation	Mercury Cold Vapour AA	Metals ICP/MS	Silica Skalar
TOC/DOC Colourimetric	TSS/VSS Gravimetric	Turbidity Turbimeter	Volatile Organics-Purge&Trap/GC/MS

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.
Results have been compared to the stated specification, without taking into account measurement uncertainty. An asterisk (*) indicates the result has been found to be outside of that specification.
CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.
" † " indicates the analyte is not accredited to ISO/IEC 17025.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.

Final Report Approval by:

Jillian J. Thompson-Anderson
Quality Control Automation Technologist

Hamilton Water

Monitoring Wells - Greensville GW - Pre-Pump Test

Tews Falls 2022-12-13 15:40:00 Record 684378

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Alkalinity	183	mg/L	2		
Ammonia + Ammonium as N	0.18	mg/L	0.01		
Anion Sum (Calculation) †	25.9	me/L	0.1		
Bicarbonate as Carbonate (Calculation)	183	mg/L	2		
Bromide	1.1	mg/L	0.2		
Cation Sum (Calculation) †	25.2	me/L	0.1		
Chloride	171	mg/L	0.5		
Colour (apparent)	358	CU	2		
Conductivity	2110	umhos/cm	4		
Cyanide - Total	<0.003	mg/L	0.003	0.2	
Dissolved Organic Carbon	2.5	mg/L	0.4		
Fluoride	0.68	mg/L	0.04	1.5	
Ion Balance (Calculation) †	1.3	%	0.1		
Nitrate as N	2.86	mg/L	0.02	10.0	
Nitrate+Nitrite as N (Calculation)	2.86	mg/L	0.03		
Nitrite as N	<0.05	mg/L	0.05	1.0	
o-Phosphate as P	<0.05	mg/L	0.05		
pH	8.02	pH	0.01		
pH - Saturation (Calculation) †	6.91	pH	0.01		
Silica-Reactive	16.5	mg/L	0.20		
Sulphate	803	mg/L	0.5		
Temperature	21.7	C	0.1		
Total Suspended Solids	185	mg/L	0.8		
Turbidity	66.4	NTU	0.05		
Aluminum	0.308	mg/L	0.002		
Antimony	0.0004	mg/L	0.0001	0.006	
Arsenic	0.0006	mg/L	0.0001	0.010	
Barium	0.0537	mg/L	0.0001	1.0	
Beryllium	<0.0001	mg/L	0.0001		
Bismuth	<0.0001	mg/L	0.0001		
Boron	0.261	mg/L	0.010	5.0	
Cadmium	0.0002	mg/L	0.0001	0.005	
Calcium	268	mg/L	0.05		
Chromium	0.0005	mg/L	0.0001	0.05	
Cobalt	0.0005	mg/L	0.0001		
Copper	0.0022	mg/L	0.0001		
Hardness (Calculation)	1040	mg/L	0.3		
Iron	0.539	mg/L	0.003		
Lead	0.0122	mg/L	0.0001	0.010	*
Lithium	0.0534	mg/L	0.0005		
Magnesium	89.7	mg/L	0.05		
Manganese	0.0819	mg/L	0.0001		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0483	mg/L	0.0001		
Nickel	0.0120	mg/L	0.0001		
Phosphorus Total	0.040	mg/L	0.010		
Potassium	21.4	mg/L	0.05		
Selenium	0.0004	mg/L	0.0001	0.05	
Silicon	3.47	mg/L	0.01		
Silver	<0.0001	mg/L	0.0001		
Sodium	81.9	mg/L	0.05	20	*

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Strontium	9.62	mg/L	0.0005		
Thallium	0.0004	mg/L	0.0003		
Tin	<0.0001	mg/L	0.0001		
Titanium	0.0068	mg/L	0.0004		
Tungsten	<0.0001	mg/L	0.0001		
Uranium	10.5	ug/L	0.002	20	
Vanadium	0.0011	mg/L	0.0001		
Zinc	0.267	mg/L	0.001		
Zirconium	<0.0004	mg/L	0.0004		
Escherichia coli	10	MPN/100mL	0	0	*
Total Coliform	1960	MPN/100mL	0	0	*
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	<0.2	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		
Dichloromethane	<0.5	ug/L	0.5	50	
Ethylbenzene	<0.2	ug/L	0.2	140	
m+p-Xylene	<0.4	ug/L	0.4		
o-Xylene	<0.2	ug/L	0.2		
Tetrachloroethylene	<0.2	ug/L	0.2	10	
Toluene	<0.2	ug/L	0.2	60	
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100	
Trichloroethylene	<0.2	ug/L	0.2	5	
Vinyl Chloride	<0.2	ug/L	0.2	1	
Xylene (Calculation)	<0.5	ug/L	0.5	90	

Report Comment: The ODWS does not specify a MAC for sodium, however, as per section 18 of the SDWA, sodium results above 20 mg/L on a regulatory sample are prescribed as adverse results with a duty to report as specified in the applicable regulation.

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2022-12-13
Date Submitted: 2022-12-14

Laboratory Work Order Number: 342391

Samples in this work order were analyzed using the following methods:

o-Phosphate Colourimetric	Alk/pH/Cond/Temp PC Titrate	Ammonia Skalar	Anions IC
Bacteria MPN	Colour Spectrophotometric	Cyanide Skalar	Fluoride-PC Titrate
LIMS Calculation	Mercury Cold Vapour AA	Metals ICP/MS	Silica Skalar
TOC/DOC Colourimetric	TSS/VSS Gravimetric	Turbidity Turbimeter	Volatile Organics-Purge&Trap/GC/MS

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.
Results have been compared to the stated specification, without taking into account measurement uncertainty. An asterisk (*) indicates the result has been found to be outside of that specification.
CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.
" † " indicates the analyte is not accredited to ISO/IEC 17025.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.

Final Report Approval by:

Jillian J. Thompson-Anderson
Quality Control Automation Technologist

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Hamilton Water					
Monitoring Wells - Greensville GW - Pump Test					
TW-2-13 2022-12-13 16:15:00 Record 684379					
Alkalinity	318	mg/L	2		
Ammonia + Ammonium as N	<0.01	mg/L	0.01		
Anion Sum (Calculation) †	10.7	me/L	0.1		
Bicarbonate as Carbonate (Calculation)	318	mg/L	2		
Bromide	<1	mg/L	1		
Cation Sum (Calculation) †	10.5	me/L	0.1		
Chloride	95.5	mg/L	0.5		
Colour (apparent)	4	CU	2		
Conductivity	970	umhos/cm	4		
Cyanide - Total	<0.003	mg/L	0.003	0.2	
Dissolved Organic Carbon	0.9	mg/L	0.4		
Fluoride	0.16	mg/L	0.04	1.5	
Ion Balance (Calculation) †	0.6	%	0.1		
Nitrate as N	2.93	mg/L	0.02	10.0	
Nitrate+Nitrite as N (Calculation)	2.93	mg/L	0.03		
Nitrite as N	<0.05	mg/L	0.05	1.0	
o-Phosphate as P	<0.05	mg/L	0.05		
pH	7.86	pH	0.01		
pH - Saturation (Calculation) †	6.86	pH	0.01		
Silica-Reactive	<0.20	mg/L	0.20		
Sulphate	66.5	mg/L	0.5		
Temperature	20.4	C	0.1		
Total Suspended Solids	<3	mg/L	3		
Turbidity	0.47	NTU	0.05		
Aluminum	0.003	mg/L	0.002		
Antimony	<0.0001	mg/L	0.0001	0.006	
Arsenic	0.0003	mg/L	0.0001	0.010	
Barium	0.104	mg/L	0.0001	1.0	
Beryllium	<0.0001	mg/L	0.0001		
Bismuth	<0.0001	mg/L	0.0001		
Boron	0.023	mg/L	0.010	5.0	
Cadmium	<0.0001	mg/L	0.0001	0.005	
Calcium	133	mg/L	0.05		
Chromium	0.0002	mg/L	0.0001	0.05	
Cobalt	<0.0001	mg/L	0.0001		
Copper	0.0005	mg/L	0.0001		
Hardness (Calculation)	431	mg/L	0.3		
Iron	0.065	mg/L	0.003		
Lead	0.0001	mg/L	0.0001	0.010	
Lithium	0.0099	mg/L	0.0005		
Magnesium	24.1	mg/L	0.05		
Manganese	0.0062	mg/L	0.0001		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0004	mg/L	0.0001		
Nickel	0.0005	mg/L	0.0001		
Phosphorus Total	<0.010	mg/L	0.010		
Potassium	1.71	mg/L	0.05		
Selenium	0.0002	mg/L	0.0001	0.05	
Silicon	7.73	mg/L	0.01		
Silver	<0.0001	mg/L	0.0001		
Sodium	41.5	mg/L	0.05	20	*

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Strontium	1.61	mg/L	0.0005	
Thallium	<0.0003	mg/L	0.0003	
Tin	<0.0001	mg/L	0.0001	
Titanium	0.0004	mg/L	0.0004	
Tungsten	<0.0001	mg/L	0.0001	
Uranium	0.717	ug/L	0.002	20
Vanadium	<0.0001	mg/L	0.0001	
Zinc	0.036	mg/L	0.001	
Zirconium	<0.0004	mg/L	0.0004	
Escherichia coli	0	MPN/100mL	0	0
Total Coliform	0	MPN/100mL	0	0
1,1-Dichloroethylene	<0.2	ug/L	0.2	14
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200
1,2-Dichloroethane	<0.2	ug/L	0.2	5
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5
Benzene	<0.2	ug/L	0.2	1
Bromodichloromethane	<0.2	ug/L	0.2	
Bromoform	<0.2	ug/L	0.2	
Carbon Tetrachloride	<0.2	ug/L	0.2	2
Chlorobenzene	<0.3	ug/L	0.3	80
Chloroform	<0.2	ug/L	0.2	
Dibromochloromethane	<0.2	ug/L	0.2	
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90

Report Comment: The ODWS does not specify a MAC for sodium, however, as per section 18 of the SDWA, sodium results above 20 mg/L on a regulatory sample are prescribed as adverse results with a duty to report as specified in the applicable regulation.

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2022-12-14
Date Submitted: 2022-12-15

Laboratory Work Order Number: 342403

Samples in this work order were analyzed using the following methods:

o-Phosphate Colourimetric	Alk/pH/Cond/Temp PC Titrate	Ammonia Skalar	Anions IC
Bacteria MPN	Colour Spectrophotometric	Cyanide Skalar	Fluoride-PC Titrate
LIMS Calculation	Mercury Cold Vapour AA	Metals ICP/MS	Silica Skalar
TOC/DOC Colourimetric	TSS/VSS Gravimetric	Turbidity Turbimeter	Volatile Organics-Purge&Trap/GC/MS

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.
Results have been compared to the stated specification, without taking into account measurement uncertainty. An asterisk (*) indicates the result has been found to be outside of that specification.
CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.
" † " indicates the analyte is not accredited to ISO/IEC 17025.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.

Final Report Approval by:

Jillian J. Thompson-Anderson
Quality Control Automation Technologist

ODWS (Amnd O.Reg.457/16) Jan2020 02

Hamilton Water

Monitoring Wells - Greensville GW - Pump Test

TW-2-13 2022-12-14 16:00:00 Record 684422

Analyte	Result	Units	MDL		
Alkalinity	320	mg/L	2		
Ammonia + Ammonium as N	<0.01	mg/L	0.01		
Anion Sum (Calculation) †	11.4	me/L	0.1		
Bicarbonate as Carbonate (Calculation)	320	mg/L	2		
Bromide	<1	mg/L	1		
Cation Sum (Calculation) †	10.8	me/L	0.1		
Chloride	106	mg/L	0.5		
Colour (apparent)	3	CU	2		
Conductivity	1020	umhos/cm	4		
Cyanide - Total	<0.003	mg/L	0.003	0.2	
Dissolved Organic Carbon	1.1	mg/L	0.4		
Fluoride	0.16	mg/L	0.04	1.5	
Ion Balance (Calculation) †	2.6	%	0.1		
Nitrate as N	3.20	mg/L	0.02	10.0	
Nitrate+Nitrite as N (Calculation)	3.20	mg/L	0.03		
Nitrite as N	<0.05	mg/L	0.05	1.0	
o-Phosphate as P	<0.05	mg/L	0.05		
pH	7.87	pH	0.01		
pH - Saturation (Calculation) †	6.85	pH	0.01		
Silica-Reactive	15.9	mg/L	0.20		
Sulphate	66.5	mg/L	0.5		
Temperature	20.9	C	0.1		
Total Suspended Solids	<2	mg/L	2		
Turbidity	0.47	NTU	0.05		
Aluminum	<0.002	mg/L	0.002		
Antimony	<0.0001	mg/L	0.0001	0.006	
Arsenic	0.0002	mg/L	0.0001	0.010	
Barium	0.109	mg/L	0.0001	1.0	
Beryllium	<0.0001	mg/L	0.0001		
Bismuth	<0.0001	mg/L	0.0001		
Boron	0.023	mg/L	0.010	5.0	
Cadmium	<0.0001	mg/L	0.0001	0.005	
Calcium	134	mg/L	0.05		
Chromium	0.0002	mg/L	0.0001	0.05	
Cobalt	<0.0001	mg/L	0.0001		
Copper	0.0005	mg/L	0.0001		
Hardness (Calculation)	436	mg/L	0.3		
Iron	0.042	mg/L	0.003		
Lead	<0.0001	mg/L	0.0001	0.010	
Lithium	0.0114	mg/L	0.0005		
Magnesium	24.6	mg/L	0.05		
Manganese	0.0056	mg/L	0.0001		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0004	mg/L	0.0001		
Nickel	0.0005	mg/L	0.0001		
Phosphorus Total	<0.010	mg/L	0.010		
Potassium	1.81	mg/L	0.05		
Selenium	0.0002	mg/L	0.0001	0.05	
Silicon	8.06	mg/L	0.01		
Silver	<0.0001	mg/L	0.0001		
Sodium	46.9	mg/L	0.05	20	*

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Strontium	1.68	mg/L	0.0005	
Thallium	<0.0003	mg/L	0.0003	
Tin	<0.0001	mg/L	0.0001	
Titanium	<0.0004	mg/L	0.0004	
Tungsten	<0.0001	mg/L	0.0001	
Uranium	0.747	ug/L	0.002	20
Vanadium	<0.0001	mg/L	0.0001	
Zinc	0.035	mg/L	0.001	
Zirconium	<0.0004	mg/L	0.0004	
Escherichia coli	0	MPN/100mL	0	0
Total Coliform	0	MPN/100mL	0	0
1,1-Dichloroethylene	<0.2	ug/L	0.2	14
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200
1,2-Dichloroethane	<0.2	ug/L	0.2	5
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5
Benzene	<0.2	ug/L	0.2	1
Bromodichloromethane	<0.2	ug/L	0.2	
Bromoform	<0.2	ug/L	0.2	
Carbon Tetrachloride	<0.2	ug/L	0.2	2
Chlorobenzene	<0.3	ug/L	0.3	80
Chloroform	<0.2	ug/L	0.2	
Dibromochloromethane	<0.2	ug/L	0.2	
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90

Report Comment: The ODWS does not specify a MAC for sodium, however, as per section 18 of the SDWA, sodium results above 20 mg/L on a regulatory sample are prescribed as adverse results with a duty to report as specified in the applicable regulation.

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2022-12-15
Date Submitted: 2022-12-15

Laboratory Work Order Number: 342408

Samples in this work order were analyzed using the following methods:

Alk/pH/Cond/Temp PC Titrate	Ammonia Skalar	Anions IC	Bacteria MPN
Colour Spectrophotometric	Cyanide Skalar	Fluoride-PC Titrate	LIMS Calculation
Mercury Cold Vapour AA	Metals ICP/MS	TOC/DOC Colourimetric	Turbidity Turbimeter
Volatile Organics-Purge&Trap/GC/MS			

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.
Results have been compared to the stated specification, without taking into account measurement uncertainty. An asterisk (*) indicates the result has been found to be outside of that specification.
CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.

Final Report Approval by:

Mira Bogle
Environmental Compliance Technologist

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Hamilton Water					
Monitoring Wells - Greensville GW - Pump Test					
WELL:FDG01(GREENSVILLE WELL SUPPLY) 2022-12-15 09:30:00 Record 684440					
Alkalinity	373	mg/L	2		
Ammonia + Ammonium as N	<0.01	mg/L	0.01		
Chloride	298	mg/L	0.5		
Colour (apparent)	<2	CU	2		
Conductivity	1730	umhos/cm	4		
Cyanide - Total	<0.003	mg/L	0.003	0.2	
Dissolved Organic Carbon	0.7	mg/L	0.4		
Fluoride	0.11	mg/L	0.04	1.5	
Nitrate as N	7.22	mg/L	0.02	10.0	
Nitrite as N	<0.01	mg/L	0.01	1.0	
pH	7.67	pH	0.01		
Sulphate	63.3	mg/L	0.5		
Total Organic Carbon	1.0	mg/L	0.4		
Turbidity	0.12	NTU	0.05		
Aluminum	<0.002	mg/L	0.002		
Antimony	<0.0001	mg/L	0.0001	0.006	
Arsenic	<0.0001	mg/L	0.0001	0.010	
Barium	0.167	mg/L	0.0001	1.0	
Beryllium	<0.0001	mg/L	0.0001		
Bismuth	<0.0001	mg/L	0.0001		
Boron	0.043	mg/L	0.010	5.0	
Cadmium	<0.0001	mg/L	0.0001	0.005	
Calcium	160	mg/L	0.05		
Chromium	0.0002	mg/L	0.0001	0.05	
Cobalt	<0.0001	mg/L	0.0001		
Copper	0.0007	mg/L	0.0001		
Hardness (Calculation)	511	mg/L	0.3		
Iron	<0.003	mg/L	0.003		
Lead	<0.0001	mg/L	0.0001	0.010	
Lithium	0.0099	mg/L	0.0005		
Magnesium	27.1	mg/L	0.05		
Manganese	<0.0001	mg/L	0.0001		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0002	mg/L	0.0001		
Nickel	0.0005	mg/L	0.0001		
Phosphorus Total	<0.010	mg/L	0.010		
Potassium	2.26	mg/L	0.05		
Selenium	0.0003	mg/L	0.0001	0.05	
Silicon	6.36	mg/L	0.01		
Silver	<0.0001	mg/L	0.0001		
Sodium	163	mg/L	0.05	20	*
Strontium	1.00	mg/L	0.0005		
Thallium	<0.0003	mg/L	0.0003		
Tin	<0.0001	mg/L	0.0001		
Titanium	<0.0004	mg/L	0.0004		
Tungsten	<0.0001	mg/L	0.0001		
Uranium	0.708	ug/L	0.002	20	
Vanadium	<0.0001	mg/L	0.0001		
Zinc	0.007	mg/L	0.001		
Zirconium	<0.0004	mg/L	0.0004		
Escherichia coli	0	MPN/100mL	0	0	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Total Coliform	0	MPN/100mL	0	0
1,1-Dichloroethylene	<0.2	ug/L	0.2	14
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200
1,2-Dichloroethane	<0.2	ug/L	0.2	5
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5
Benzene	<0.2	ug/L	0.2	1
Bromodichloromethane	<0.2	ug/L	0.2	
Bromoform	<0.2	ug/L	0.2	
Carbon Tetrachloride	<0.2	ug/L	0.2	2
Chlorobenzene	<0.3	ug/L	0.3	80
Chloroform	0.4	ug/L	0.2	
Dibromochloromethane	<0.2	ug/L	0.2	
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90

Report Comment: The ODWS does not specify a MAC for sodium, however, as per section 18 of the SDWA, sodium results above 20 mg/L on a regulatory sample are prescribed as adverse results with a duty to report as specified in the applicable regulation.

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2022-12-15
Date Submitted: 2022-12-15

Laboratory Work Order Number: 342410

Samples in this work order were analyzed using the following methods:

Microcystin ADDA

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.

CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.

Final Report Approval by:

Jillian J. Thompson-Anderson
Quality Control Automation Technologist

Analyte	Result	Units	MDL

Hamilton Water

Monitoring Wells - Greensville GW - Pump Test

WELL:FDG01(GREENSVILLE WELL SUPPLY) 2022-12-15 09:30:00 Record 684442

Microcystins	<0.15	ug/L	0.15

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2022-12-15
Date Submitted: 2022-12-15

Laboratory Work Order Number: 342413

Samples in this work order were analyzed using the following methods:

o-Phosphate Colourimetric	Alk/pH/Cond/Temp PC Titrate	Ammonia Skalar	Anions IC
Bacteria MPN	Colour Spectrophotometric	Cyanide Skalar	Fluoride-PC Titrate
LIMS Calculation	Mercury Cold Vapour AA	Metals ICP/MS	Silica Skalar
TOC/DOC Colourimetric	TSS/VSS Gravimetric	Turbidity Turbimeter	Volatile Organics-Purge&Trap/GC/MS

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.
Results have been compared to the stated specification, without taking into account measurement uncertainty. An asterisk (*) indicates the result has been found to be outside of that specification.
CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.
" † " indicates the analyte is not accredited to ISO/IEC 17025.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.
The Certificate of Analysis shall not be reproduced except in full without approval of CHEL.

Final Report Approval by:

Jillian J. Thompson-Anderson
Quality Control Automation Technologist

Hamilton Water

Monitoring Wells - Greensville GW - Post Pump Test

Surface Water 2022-12-15 10:20:00 Record 684450

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Alkalinity	203	mg/L	2		
Ammonia + Ammonium as N	0.12	mg/L	0.01		
Anion Sum (Calculation) †	21.9	me/L	0.1		
Bicarbonate as Carbonate (Calculation)	203	mg/L	2		
Bromide	<1	mg/L	1		
Cation Sum (Calculation) †	25.2	me/L	0.1		
Chloride	167	mg/L	0.5		
Colour (apparent)	2850	CU	2		
Conductivity	1850	umhos/cm	4		
Cyanide - Total	<0.003	mg/L	0.003	0.2	
Dissolved Organic Carbon	3.6	mg/L	0.4		
Fluoride	0.57	mg/L	0.04	1.5	
Ion Balance (Calculation) †	7.1	%	0.1		
Nitrate as N	2.06	mg/L	0.02	10.0	
Nitrate+Nitrite as N (Calculation)	2.06	mg/L	0.03		
Nitrite as N	<0.05	mg/L	0.05	1.0	
o-Phosphate as P	<0.05	mg/L	0.05		
pH	7.94	pH	0.01		
pH - Saturation (Calculation) †	6.88	pH	0.01		
Silica-Reactive	4.39	mg/L	0.20		
Sulphate	614	mg/L	0.5		
Temperature	20.5	C	0.1		
Total Suspended Solids	1360	mg/L	0.8		
Turbidity	592	NTU	0.05		
Aluminum	4.14	mg/L	0.002		
Antimony	0.0004	mg/L	0.0001	0.006	
Arsenic	0.0030	mg/L	0.0001	0.010	
Barium	0.0764	mg/L	0.0001	1.0	
Beryllium	0.0002	mg/L	0.0001		
Bismuth	<0.0001	mg/L	0.0001		
Boron	0.194	mg/L	0.010	5.0	
Cadmium	0.0009	mg/L	0.0001	0.005	
Calcium	262	mg/L	0.05		
Chromium	0.0058	mg/L	0.0001	0.05	
Cobalt	0.0046	mg/L	0.0001		
Copper	0.0168	mg/L	0.0001		
Hardness (Calculation)	1010	mg/L	0.3		
Iron	7.28	mg/L	0.003		
Lead	0.0926	mg/L	0.0001	0.010	*
Lithium	0.0465	mg/L	0.0005		
Magnesium	86.3	mg/L	0.05		
Manganese	0.906	mg/L	0.0001		
Mercury	0.06	ug/L	0.05	1	
Molybdenum	0.0399	mg/L	0.0001		
Nickel	0.0258	mg/L	0.0001		
Phosphorus Total	0.372	mg/L	0.010		
Potassium	18.3	mg/L	0.05		
Selenium	0.0006	mg/L	0.0001	0.05	
Silicon	8.90	mg/L	0.01		
Silver	<0.0001	mg/L	0.0001		
Sodium	81.6	mg/L	0.05	20	*

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Strontium	7.43	mg/L	0.0005		
Thallium	0.0006	mg/L	0.0003		
Tin	0.0006	mg/L	0.0001		
Titanium	0.0789	mg/L	0.0004		
Tungsten	<0.0001	mg/L	0.0001		
Uranium	7.64	ug/L	0.002	20	
Vanadium	0.0102	mg/L	0.0001		
Zinc	0.902	mg/L	0.001		
Zirconium	0.0010	mg/L	0.0004		
Escherichia coli	20	MPN/100mL	0	0	*
Total Coliform	3650	MPN/100mL	0	0	*
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	<0.2	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		
Dichloromethane	<0.5	ug/L	0.5	50	
Ethylbenzene	<0.2	ug/L	0.2	140	
m+p-Xylene	<0.4	ug/L	0.4		
o-Xylene	<0.2	ug/L	0.2		
Tetrachloroethylene	<0.2	ug/L	0.2	10	
Toluene	<0.2	ug/L	0.2	60	
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100	
Trichloroethylene	<0.2	ug/L	0.2	5	
Vinyl Chloride	<0.2	ug/L	0.2	1	
Xylene (Calculation)	<0.5	ug/L	0.5	90	

Report Comment: The ODWS does not specify a MAC for sodium, however, as per section 18 of the SDWA, sodium results above 20 mg/L on a regulatory sample are prescribed as adverse results with a duty to report as specified in the applicable regulation.

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2022-12-15
Date Submitted: 2022-12-16

Laboratory Work Order Number: 342426

Samples in this work order were analyzed using the following methods:

o-Phosphate Colourimetric	Alk/pH/Cond/Temp PC Titrate	Ammonia Skalar	Anions IC
Bacteria MPN	Colour Spectrophotometric	Cyanide Skalar	Fluoride-PC Titrate
LIMS Calculation	Mercury Cold Vapour AA	Metals ICP/MS	Silica Skalar
TOC/DOC Colourimetric	TSS/VSS Gravimetric	Turbidity Turbimeter	Volatile Organics-Purge&Trap/GC/MS

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.
Results have been compared to the stated specification, without taking into account measurement uncertainty. An asterisk (*) indicates the result has been found to be outside of that specification.
CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.
" † " indicates the analyte is not accredited to ISO/IEC 17025.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.
The Certificate of Analysis shall not be reproduced except in full without approval of CHEL.

Final Report Approval by:

Jillian J. Thompson-Anderson
Quality Control Automation Technologist

ODWS (Amnd O.Reg.457/16) Jan2020 02

Hamilton Water

Monitoring Wells - Greensville GW - Post Pump Test

3 Medwin Dr 2022-12-15 15:45:00 Record 684471

Analyte	Result	Units	MDL		
Alkalinity	289	mg/L	2		
Ammonia + Ammonium as N	<0.01	mg/L	0.01		
Anion Sum (Calculation) †	10.0	me/L	0.1		
Bicarbonate as Carbonate (Calculation)	289	mg/L	2		
Bromide	<1	mg/L	1		
Cation Sum (Calculation) †	9.7	me/L	0.1		
Chloride	80.6	mg/L	0.5		
Colour (apparent)	18	CU	2		
Conductivity	886	umhos/cm	4		
Cyanide - Total	<0.003	mg/L	0.003	0.2	
Dissolved Organic Carbon	0.7	mg/L	0.4		
Fluoride	0.27	mg/L	0.04	1.5	
Ion Balance (Calculation) †	1.3	%	0.1		
Nitrate as N	1.61	mg/L	0.02	10.0	
Nitrate+Nitrite as N (Calculation)	1.61	mg/L	0.03		
Nitrite as N	<0.05	mg/L	0.05	1.0	
o-Phosphate as P	<0.05	mg/L	0.05		
pH	7.79	pH	0.01		
pH - Saturation (Calculation) †	6.95	pH	0.01		
Silica-Reactive	12.7	mg/L	0.20		
Sulphate	70.6	mg/L	0.5		
Temperature	20.3	C	0.1		
Total Suspended Solids	<5	mg/L	5		
Turbidity	4.12	NTU	0.05		
Aluminum	0.006	mg/L	0.002		
Antimony	0.0002	mg/L	0.0001	0.006	
Arsenic	0.0004	mg/L	0.0001	0.010	
Barium	0.0610	mg/L	0.0001	1.0	
Beryllium	<0.0001	mg/L	0.0001		
Bismuth	<0.0001	mg/L	0.0001		
Boron	0.029	mg/L	0.010	5.0	
Cadmium	<0.0001	mg/L	0.0001	0.005	
Calcium	118	mg/L	0.05		
Chromium	0.0002	mg/L	0.0001	0.05	
Cobalt	<0.0001	mg/L	0.0001		
Copper	0.0034	mg/L	0.0001		
Hardness (Calculation)	397	mg/L	0.3		
Iron	1.21	mg/L	0.003		
Lead	0.0024	mg/L	0.0001	0.010	
Lithium	0.0117	mg/L	0.0005		
Magnesium	24.9	mg/L	0.05		
Manganese	0.0239	mg/L	0.0001		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0012	mg/L	0.0001		
Nickel	0.0016	mg/L	0.0001		
Phosphorus Total	<0.010	mg/L	0.010		
Potassium	2.08	mg/L	0.05		
Selenium	0.0003	mg/L	0.0001	0.05	
Silicon	6.38	mg/L	0.01		
Silver	<0.0001	mg/L	0.0001		
Sodium	37.9	mg/L	0.05	20	*

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Strontium	1.48	mg/L	0.0005		
Thallium	<0.0003	mg/L	0.0003		
Tin	0.0005	mg/L	0.0001		
Titanium	0.0006	mg/L	0.0004		
Tungsten	<0.0001	mg/L	0.0001		
Uranium	1.42	ug/L	0.002	20	
Vanadium	<0.0001	mg/L	0.0001		
Zinc	0.043	mg/L	0.001		
Zirconium	<0.0004	mg/L	0.0004		
Escherichia coli	0	MPN/100mL	0	0	
Total Coliform	461	MPN/100mL	0	0	*
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	<0.2	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		
Dichloromethane	<0.5	ug/L	0.5	50	
Ethylbenzene	<0.2	ug/L	0.2	140	
m+p-Xylene	<0.4	ug/L	0.4		
o-Xylene	<0.2	ug/L	0.2		
Tetrachloroethylene	<0.2	ug/L	0.2	10	
Toluene	<0.2	ug/L	0.2	60	
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100	
Trichloroethylene	<0.2	ug/L	0.2	5	
Vinyl Chloride	<0.2	ug/L	0.2	1	
Xylene (Calculation)	<0.5	ug/L	0.5	90	

15 Medwin Dr 2022-12-15 16:15:00 Record 684472

Alkalinity	306	mg/L	2		
Ammonia + Ammonium as N	<0.01	mg/L	0.01		
Anion Sum (Calculation) †	12.1	me/L	0.1		
Bicarbonate as Carbonate (Calculation)	306	mg/L	2		
Bromide	<1	mg/L	1		
Cation Sum (Calculation) †	11.8	me/L	0.1		
Chloride	113	mg/L	0.5		
Colour (apparent)	13	CU	2		
Conductivity	1080	umhos/cm	4		
Cyanide - Total	<0.003	mg/L	0.003	0.2	
Dissolved Organic Carbon	0.8	mg/L	0.4		
Fluoride	0.58	mg/L	0.04	1.5	
Ion Balance (Calculation) †	1.3	%	0.1		
Nitrate as N	1.31	mg/L	0.02	10.0	
Nitrate+Nitrite as N (Calculation)	1.31	mg/L	0.03		
Nitrite as N	<0.05	mg/L	0.05	1.0	
o-Phosphate as P	<0.05	mg/L	0.05		
pH	7.56	pH	0.01		
pH - Saturation (Calculation) †	6.86	pH	0.01		
Silica-Reactive	13.4	mg/L	0.20		
Sulphate	110	mg/L	0.5		
Temperature	20.7	C	0.1		

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Total Suspended Solids	4.0	mg/L	0.8		
Turbidity	2.28	NTU	0.05		
Aluminum	0.010	mg/L	0.002		
Antimony	<0.0001	mg/L	0.0001	0.006	
Arsenic	0.0002	mg/L	0.0001	0.010	
Barium	0.0707	mg/L	0.0001	1.0	
Beryllium	<0.0001	mg/L	0.0001		
Bismuth	<0.0001	mg/L	0.0001		
Boron	0.064	mg/L	0.010	5.0	
Cadmium	0.0001	mg/L	0.0001	0.005	
Calcium	143	mg/L	0.05		
Chromium	0.0007	mg/L	0.0001	0.05	
Cobalt	0.0004	mg/L	0.0001		
Copper	0.0789	mg/L	0.0001		
Hardness (Calculation)	495	mg/L	0.3		
Iron	0.358	mg/L	0.003		
Lead	0.0018	mg/L	0.0001	0.010	
Lithium	0.0156	mg/L	0.0005		
Magnesium	33.6	mg/L	0.05		
Manganese	0.0654	mg/L	0.0001		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0012	mg/L	0.0001		
Nickel	0.0075	mg/L	0.0001		
Phosphorus Total	<0.010	mg/L	0.010		
Potassium	2.70	mg/L	0.05		
Selenium	<0.0001	mg/L	0.0001	0.05	
Silicon	6.59	mg/L	0.01		
Silver	<0.0001	mg/L	0.0001		
Sodium	37.7	mg/L	0.05	20	*
Strontium	5.17	mg/L	0.0005		
Thallium	<0.0003	mg/L	0.0003		
Tin	0.0012	mg/L	0.0001		
Titanium	0.0007	mg/L	0.0004		
Tungsten	0.0002	mg/L	0.0001		
Uranium	2.39	ug/L	0.002	20	
Vanadium	0.0001	mg/L	0.0001		
Zinc	0.171	mg/L	0.001		
Zirconium	<0.0004	mg/L	0.0004		
Escherichia coli	0	MPN/100mL	0	0	
Total Coliform	16	MPN/100mL	0	0	*
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	<0.2	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		
Dichloromethane	<0.5	ug/L	0.5	50	
Ethylbenzene	<0.2	ug/L	0.2	140	
m+p-Xylene	<0.4	ug/L	0.4		
o-Xylene	<0.2	ug/L	0.2		
Tetrachloroethylene	<0.2	ug/L	0.2	10	
Toluene	<0.2	ug/L	0.2	60	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90
609 Harvest Rd 2022-12-15 16:00:00 Record 684473				
Alkalinity	302	mg/L	2	
Ammonia + Ammonium as N	<0.01	mg/L	0.01	
Anion Sum (Calculation) †	10.1	me/L	0.1	
Bicarbonate as Carbonate (Calculation)	302	mg/L	2	
Bromide	<1	mg/L	1	
Cation Sum (Calculation) †	10.0	me/L	0.1	
Chloride	66.2	mg/L	0.5	
Colour (apparent)	32	CU	2	
Conductivity	886	umhos/cm	4	
Cyanide - Total	<0.003	mg/L	0.003	0.2
Dissolved Organic Carbon	0.7	mg/L	0.4	
Fluoride	0.48	mg/L	0.04	1.5
Ion Balance (Calculation) †	0.5	%	0.1	
Nitrate as N	1.28	mg/L	0.02	10.0
Nitrate+Nitrite as N (Calculation)	1.28	mg/L	0.03	
Nitrite as N	<0.05	mg/L	0.05	1.0
o-Phosphate as P	<0.05	mg/L	0.05	
pH	7.72	pH	0.01	
pH - Saturation (Calculation) †	6.91	pH	0.01	
Silica-Reactive	13.2	mg/L	0.20	
Sulphate	81.7	mg/L	0.5	
Temperature	20.6	C	0.1	
Total Suspended Solids	19.0	mg/L	0.8	
Turbidity	6.64	NTU	0.05	
Aluminum	0.190	mg/L	0.002	
Antimony	0.0002	mg/L	0.0001	0.006
Arsenic	0.0010	mg/L	0.0001	0.010
Barium	0.0707	mg/L	0.0001	1.0
Beryllium	<0.0001	mg/L	0.0001	
Bismuth	<0.0001	mg/L	0.0001	
Boron	0.035	mg/L	0.010	5.0
Cadmium	0.0001	mg/L	0.0001	0.005
Calcium	122	mg/L	0.05	
Chromium	0.0008	mg/L	0.0001	0.05
Cobalt	0.0031	mg/L	0.0001	
Copper	0.0089	mg/L	0.0001	
Hardness (Calculation)	420	mg/L	0.3	
Iron	2.65	mg/L	0.003	
Lead	0.0064	mg/L	0.0001	0.010
Lithium	0.0127	mg/L	0.0005	
Magnesium	28.0	mg/L	0.05	
Manganese	0.191	mg/L	0.0001	
Mercury	<0.05	ug/L	0.05	1
Molybdenum	0.0014	mg/L	0.0001	
Nickel	0.0068	mg/L	0.0001	
Phosphorus Total	0.022	mg/L	0.010	
Potassium	2.27	mg/L	0.05	
Selenium	0.0003	mg/L	0.0001	0.05
Silicon	6.99	mg/L	0.01	
Silver	<0.0001	mg/L	0.0001	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Sodium	29.8	mg/L	0.05	20	*
Strontium	3.62	mg/L	0.0005		
Thallium	<0.0003	mg/L	0.0003		
Tin	0.0004	mg/L	0.0001		
Titanium	0.0064	mg/L	0.0004		
Tungsten	<0.0001	mg/L	0.0001		
Uranium	1.96	ug/L	0.002	20	
Vanadium	0.0009	mg/L	0.0001		
Zinc	0.134	mg/L	0.001		
Zirconium	<0.0004	mg/L	0.0004		
Escherichia coli	0	MPN/100mL	0	0	
Total Coliform	866	MPN/100mL	0	0	*
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	<0.2	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		
Dichloromethane	<0.5	ug/L	0.5	50	
Ethylbenzene	<0.2	ug/L	0.2	140	
m+p-Xylene	<0.4	ug/L	0.4		
o-Xylene	<0.2	ug/L	0.2		
Tetrachloroethylene	<0.2	ug/L	0.2	10	
Toluene	<0.2	ug/L	0.2	60	
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100	
Trichloroethylene	<0.2	ug/L	0.2	5	
Vinyl Chloride	<0.2	ug/L	0.2	1	
Xylene (Calculation)	<0.5	ug/L	0.5	90	

63 Tews Ln 2022-12-15 15:30:00 Record 684475

Alkalinity	274	mg/L	2		
Ammonia + Ammonium as N	0.04	mg/L	0.01		
Anion Sum (Calculation) †	9.2	me/L	0.1		
Bicarbonate as Carbonate (Calculation)	274	mg/L	2		
Bromide	<1	mg/L	1		
Cation Sum (Calculation) †	9.1	me/L	0.1		
Chloride	40.5	mg/L	0.5		
Colour (apparent)	67	CU	2		
Conductivity	780	umhos/cm	4		
Cyanide - Total	<0.003	mg/L	0.003	0.2	
Dissolved Organic Carbon	0.6	mg/L	0.4		
Fluoride	0.31	mg/L	0.04	1.5	
Ion Balance (Calculation) †	0.6	%	0.1		
Nitrate as N	<0.1	mg/L	0.1	10.0	
Nitrate+Nitrite as N (Calculation)	<0.2	mg/L	0.2		
Nitrite as N	<0.05	mg/L	0.05	1.0	
o-Phosphate as P	<0.05	mg/L	0.05		
pH	7.49	pH	0.01		
pH - Saturation (Calculation) †	6.98	pH	0.01		
Silica-Reactive	21.2	mg/L	0.20		
Sulphate	97.0	mg/L	0.5		

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Temperature	20.3	C	0.1		
Total Suspended Solids	9.7	mg/L	0.8		
Turbidity	11.2	NTU	0.05		
Aluminum	0.109	mg/L	0.002		
Antimony	<0.0001	mg/L	0.0001	0.006	
Arsenic	0.0146	mg/L	0.0001	0.010	*
Barium	0.0568	mg/L	0.0001	1.0	
Beryllium	<0.0001	mg/L	0.0001		
Bismuth	<0.0001	mg/L	0.0001		
Boron	0.027	mg/L	0.010	5.0	
Cadmium	<0.0001	mg/L	0.0001	0.005	
Calcium	113	mg/L	0.05		
Chromium	0.0002	mg/L	0.0001	0.05	
Cobalt	0.0002	mg/L	0.0001		
Copper	0.0007	mg/L	0.0001		
Hardness (Calculation)	399	mg/L	0.3		
Iron	6.91	mg/L	0.003		
Lead	0.0012	mg/L	0.0001	0.010	
Lithium	0.0120	mg/L	0.0005		
Magnesium	28.4	mg/L	0.05		
Manganese	0.0586	mg/L	0.0001		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0011	mg/L	0.0001		
Nickel	0.0006	mg/L	0.0001		
Phosphorus Total	0.051	mg/L	0.010		
Potassium	1.28	mg/L	0.05		
Selenium	<0.0001	mg/L	0.0001	0.05	
Silicon	11.9	mg/L	0.01		
Silver	<0.0001	mg/L	0.0001		
Sodium	15.6	mg/L	0.05	20	
Strontium	6.37	mg/L	0.0005		
Thallium	<0.0003	mg/L	0.0003		
Tin	0.0004	mg/L	0.0001		
Titanium	0.0046	mg/L	0.0004		
Tungsten	<0.0001	mg/L	0.0001		
Uranium	0.167	ug/L	0.002	20	
Vanadium	0.0003	mg/L	0.0001		
Zinc	0.012	mg/L	0.001		
Zirconium	<0.0004	mg/L	0.0004		
Escherichia coli	0	MPN/100mL	0	0	
Total Coliform	10	MPN/100mL	0	0	*
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	<0.2	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		
Dichloromethane	<0.5	ug/L	0.5	50	
Ethylbenzene	<0.2	ug/L	0.2	140	
m+p-Xylene	<0.4	ug/L	0.4		
o-Xylene	<0.2	ug/L	0.2		
Tetrachloroethylene	<0.2	ug/L	0.2	10	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90
Travel Blank 2022-12-15 Record 684474				
Dissolved Organic Carbon	<0.4	mg/L	0.4	
1,1-Dichloroethylene	<0.2	ug/L	0.2	14
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200
1,2-Dichloroethane	<0.2	ug/L	0.2	5
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5
Benzene	<0.2	ug/L	0.2	1
Bromodichloromethane	<0.2	ug/L	0.2	
Bromoform	<0.2	ug/L	0.2	
Carbon Tetrachloride	<0.2	ug/L	0.2	2
Chlorobenzene	<0.3	ug/L	0.3	80
Chloroform	<0.2	ug/L	0.2	
Dibromochloromethane	<0.2	ug/L	0.2	
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90

Report Comment: The ODWS does not specify a MAC for sodium, however, as per section 18 of the SDWA, sodium results above 20 mg/L on a regulatory sample are prescribed as adverse results with a duty to report as specified in the applicable regulation.

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2022-12-15
Date Submitted: 2022-12-16

Laboratory Work Order Number: 342427

Samples in this work order were analyzed using the following methods:

o-Phosphate Colourimetric	Alk/pH/Cond/Temp PC Titrate	Ammonia Skalar	Anions IC
Bacteria MPN	Colour Spectrophotometric	Cyanide Skalar	Fluoride-PC Titrate
LIMS Calculation	Mercury Cold Vapour AA	Metals ICP/MS	Silica Skalar
TOC/DOC Colourimetric	TSS/VSS Gravimetric	Turbidity Turbimeter	Volatile Organics-Purge&Trap/GC/MS

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.
Results have been compared to the stated specification, without taking into account measurement uncertainty. An asterisk (*) indicates the result has been found to be outside of that specification.
CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.
" † " indicates the analyte is not accredited to ISO/IEC 17025.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.

Final Report Approval by:

Jillian J. Thompson-Anderson
Quality Control Automation Technologist

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Hamilton Water					
Monitoring Wells - Greensville GW - Post Pump Test					
TW-1-13 2022-12-15 17:20:00 Record 684476					
Alkalinity	275	mg/L	2		
Ammonia + Ammonium as N	0.02	mg/L	0.01		
Anion Sum (Calculation) †	8.5	me/L	0.1		
Bicarbonate as Carbonate (Calculation)	275	mg/L	2		
Bromide	<1	mg/L	1		
Cation Sum (Calculation) †	161	me/L	0.1		
Chloride	10.6	mg/L	0.5		
Colour (apparent)	162000	CU	2		
Conductivity	650	umhos/cm	4		
Cyanide - Total	<0.003	mg/L	0.003	0.2	
Dissolved Organic Carbon	7.4	mg/L	0.4		
Fluoride	0.27	mg/L	0.04	1.5	
Ion Balance (Calculation) †	90.0	%	0.1		
Nitrate as N	<0.1	mg/L	0.1	10.0	
Nitrate+Nitrite as N (Calculation)	<0.2	mg/L	0.2		
Nitrite as N	<0.05	mg/L	0.05	1.0	
o-Phosphate as P	<0.05	mg/L	0.05		
pH	7.76	pH	0.01		
pH - Saturation (Calculation) †	6.36	pH	0.01		
Silica-Reactive	15.0	mg/L	0.20		
Sulphate	75.3	mg/L	0.5		
Temperature	20.5	C	0.1		
Total Suspended Solids	10600	mg/L	0.8		
Turbidity	12800	NTU	0.05		
Aluminum	55.2	mg/L	0.01		
Antimony	0.0040	mg/L	0.0005	0.006	
Arsenic	2.97	mg/L	0.0005	0.010	*
Barium	4.11	mg/L	0.0005	1.0	*
Beryllium	0.0042	mg/L	0.0005		
Bismuth	0.0009	mg/L	0.0005		
Boron	0.092	mg/L	0.050	5.0	
Cadmium	0.0048	mg/L	0.0005	0.005	
Calcium	711	mg/L	0.2		
Chromium	0.0811	mg/L	0.0005	0.05	*
Cobalt	0.106	mg/L	0.0005		
Copper	0.267	mg/L	0.0005		
Hardness (Calculation)	2370	mg/L	1		
Iron	2940	mg/L	0.2		
Lead	2.84	mg/L	0.0005	0.010	*
Lithium	0.103	mg/L	0.002		
Magnesium	145	mg/L	0.2		
Manganese	11.4	mg/L	0.0005		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0115	mg/L	0.0005		
Nickel	0.113	mg/L	0.0005		
Phosphorus Total	22.2	mg/L	0.050		
Potassium	13.4	mg/L	0.2		
Selenium	0.0008	mg/L	0.0005	0.05	
Silicon	349	mg/L	0.05		
Silver	<0.0005	mg/L	0.0005		
Sodium	10.9	mg/L	0.2	20	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Strontium	22.8	mg/L	0.002		
Thallium	<0.002	mg/L	0.002		
Tin	0.0012	mg/L	0.0005		
Titanium	0.808	mg/L	0.002		
Tungsten	0.0038	mg/L	0.0005		
Uranium	3.13	ug/L	0.01	20	
Vanadium	0.134	mg/L	0.0005		
Zinc	6.65	mg/L	0.005		
Zirconium	0.045	mg/L	0.002		
Escherichia coli	0	MPN/100mL	0	0	
Total Coliform	236	MPN/100mL	0	0	*
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	0.3	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		
Dichloromethane	<0.5	ug/L	0.5	50	
Ethylbenzene	<0.2	ug/L	0.2	140	
m+p-Xylene	<0.4	ug/L	0.4		
o-Xylene	0.3	ug/L	0.2		
Tetrachloroethylene	<0.2	ug/L	0.2	10	
Toluene	1.0	ug/L	0.2	60	
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100	
Trichloroethylene	<0.2	ug/L	0.2	5	
Vinyl Chloride	<0.2	ug/L	0.2	1	
Xylene (Calculation)	<0.5	ug/L	0.5	90	

Note: ICP-Metals, MDLs elevated due to matrix.

TW-3-13 2022-12-15 17:40:00 Record 684477

Alkalinity	260	mg/L	2		
Ammonia + Ammonium as N	<0.01	mg/L	0.01		
Anion Sum (Calculation) †	7.6	me/L	0.1		
Bicarbonate as Carbonate (Calculation)	260	mg/L	2		
Bromide	<1	mg/L	1		
Cation Sum (Calculation) †	7.5	me/L	0.1		
Chloride	13.5	mg/L	0.5		
Colour (apparent)	404	CU	2		
Conductivity	633	umhos/cm	4		
Cyanide - Total	<0.003	mg/L	0.003	0.2	
Dissolved Organic Carbon	<0.4	mg/L	0.4		
Fluoride	0.21	mg/L	0.04	1.5	
Ion Balance (Calculation) †	0.4	%	0.1		
Nitrate as N	<0.1	mg/L	0.1	10.0	
Nitrate+Nitrite as N (Calculation)	<0.2	mg/L	0.2		
Nitrite as N	<0.05	mg/L	0.05	1.0	
o-Phosphate as P	<0.05	mg/L	0.05		
pH	7.82	pH	0.01		
pH - Saturation (Calculation) †	7.06	pH	0.01		
Silica-Reactive	15.3	mg/L	0.20		
Sulphate	75.1	mg/L	0.5		
Temperature	20.6	C	0.1		

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Total Suspended Solids	74.5	mg/L	0.8		
Turbidity	54.8	NTU	0.05		
Aluminum	0.996	mg/L	0.002		
Antimony	0.0002	mg/L	0.0001	0.006	
Arsenic	0.0049	mg/L	0.0001	0.010	
Barium	0.0531	mg/L	0.0001	1.0	
Beryllium	<0.0001	mg/L	0.0001		
Bismuth	<0.0001	mg/L	0.0001		
Boron	0.014	mg/L	0.010	5.0	
Cadmium	0.0002	mg/L	0.0001	0.005	
Calcium	95.0	mg/L	0.05		
Chromium	0.0014	mg/L	0.0001	0.05	
Cobalt	0.0007	mg/L	0.0001		
Copper	0.0038	mg/L	0.0001		
Hardness (Calculation)	339	mg/L	0.3		
Iron	6.05	mg/L	0.003		
Lead	0.0164	mg/L	0.0001	0.010	*
Lithium	0.0109	mg/L	0.0005		
Magnesium	24.6	mg/L	0.05		
Manganese	0.0685	mg/L	0.0001		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0007	mg/L	0.0001		
Nickel	0.0020	mg/L	0.0001		
Phosphorus Total	0.063	mg/L	0.010		
Potassium	1.45	mg/L	0.05		
Selenium	0.0001	mg/L	0.0001	0.05	
Silicon	9.99	mg/L	0.01		
Silver	<0.0001	mg/L	0.0001		
Sodium	7.94	mg/L	0.05	20	
Strontium	0.445	mg/L	0.0005		
Thallium	<0.0003	mg/L	0.0003		
Tin	<0.0001	mg/L	0.0001		
Titanium	0.0294	mg/L	0.0004		
Tungsten	0.0002	mg/L	0.0001		
Uranium	0.935	ug/L	0.002	20	
Vanadium	0.0026	mg/L	0.0001		
Zinc	0.146	mg/L	0.001		
Zirconium	0.0011	mg/L	0.0004		
Escherichia coli	0	MPN/100mL	0	0	
Total Coliform	0	MPN/100mL	0	0	
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	<0.2	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		
Dichloromethane	<0.5	ug/L	0.5	50	
Ethylbenzene	<0.2	ug/L	0.2	140	
m+p-Xylene	<0.4	ug/L	0.4		
o-Xylene	<0.2	ug/L	0.2		
Tetrachloroethylene	<0.2	ug/L	0.2	10	
Toluene	<0.2	ug/L	0.2	60	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90
MW-101 2022-12-15 17:00:00 Record 684478				
Alkalinity	274	mg/L	2	
Ammonia + Ammonium as N	<0.01	mg/L	0.01	
Anion Sum (Calculation) †	6.6	me/L	0.1	
Bicarbonate as Carbonate (Calculation)	274	mg/L	2	
Bromide	<1	mg/L	1	
Cation Sum (Calculation) †	7.0	me/L	0.1	
Chloride	3.6	mg/L	0.5	
Colour (apparent)	616	CU	2	
Conductivity	557	umhos/cm	4	
Cyanide - Total	<0.003	mg/L	0.003	0.2
Dissolved Organic Carbon	<0.4	mg/L	0.4	
Fluoride	0.11	mg/L	0.04	1.5
Ion Balance (Calculation) †	3.2	%	0.1	
Nitrate as N	1.08	mg/L	0.02	10.0
Nitrate+Nitrite as N (Calculation)	1.08	mg/L	0.03	
Nitrite as N	<0.05	mg/L	0.05	1.0
o-Phosphate as P	<0.05	mg/L	0.05	
pH	7.84	pH	0.01	
pH - Saturation (Calculation) †	7.02	pH	0.01	
Silica-Reactive	13.8	mg/L	0.20	
Sulphate	26.2	mg/L	0.5	
Temperature	21.0	C	0.1	
Total Suspended Solids	169	mg/L	0.8	
Turbidity	87.3	NTU	0.05	
Aluminum	3.74	mg/L	0.002	
Antimony	0.0003	mg/L	0.0001	0.006
Arsenic	0.0022	mg/L	0.0001	0.010
Barium	0.100	mg/L	0.0001	1.0
Beryllium	0.0002	mg/L	0.0001	
Bismuth	<0.0001	mg/L	0.0001	
Boron	0.013	mg/L	0.010	5.0
Cadmium	<0.0001	mg/L	0.0001	0.005
Calcium	93.6	mg/L	0.05	
Chromium	0.0060	mg/L	0.0001	0.05
Cobalt	0.0030	mg/L	0.0001	
Copper	0.0085	mg/L	0.0001	
Hardness (Calculation)	306	mg/L	0.3	
Iron	5.81	mg/L	0.003	
Lead	0.0034	mg/L	0.0001	0.010
Lithium	0.0102	mg/L	0.0005	
Magnesium	17.5	mg/L	0.05	
Manganese	0.213	mg/L	0.0001	
Mercury	<0.05	ug/L	0.05	1
Molybdenum	0.0003	mg/L	0.0001	
Nickel	0.0051	mg/L	0.0001	
Phosphorus Total	0.161	mg/L	0.010	
Potassium	2.09	mg/L	0.05	
Selenium	0.0004	mg/L	0.0001	0.05
Silicon	13.2	mg/L	0.01	
Silver	<0.0001	mg/L	0.0001	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Sodium	4.67	mg/L	0.05	20	
Strontium	0.258	mg/L	0.0005		
Thallium	<0.0003	mg/L	0.0003		
Tin	0.0002	mg/L	0.0001		
Titanium	0.103	mg/L	0.0004		
Tungsten	<0.0001	mg/L	0.0001		
Uranium	0.368	ug/L	0.002	20	
Vanadium	0.0071	mg/L	0.0001		
Zinc	0.026	mg/L	0.001		
Zirconium	0.0010	mg/L	0.0004		
Escherichia coli	0	MPN/100mL	0	0	
Total Coliform	1	MPN/100mL	0	0	*
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	<0.2	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		
Dichloromethane	<0.5	ug/L	0.5	50	
Ethylbenzene	0.2	ug/L	0.2	140	
m+p-Xylene	1.0	ug/L	0.4		
o-Xylene	0.6	ug/L	0.2		
Tetrachloroethylene	<0.2	ug/L	0.2	10	
Toluene	1.0	ug/L	0.2	60	
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100	
Trichloroethylene	<0.2	ug/L	0.2	5	
Vinyl Chloride	<0.2	ug/L	0.2	1	
Xylene (Calculation)	1.6	ug/L	0.5	90	

Report Comment: The ODWS does not specify a MAC for sodium, however, as per section 18 of the SDWA, sodium results above 20 mg/L on a regulatory sample are prescribed as adverse results with a duty to report as specified in the applicable regulation.

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2022-12-15
Date Submitted: 2022-12-16

Laboratory Work Order Number: 342428

Samples in this work order were analyzed using the following methods:

Alk/pH/Cond/Temp PC Titrate	Ammonia Skalar	Anions IC	Bacteria MPN
Caffeine SPE GC/MS	Colour Spectrophotometric	Cyanide Skalar	Fluoride-PC Titrate
LIMS Calculation	Mercury Cold Vapour AA	Metals ICP/MS	Subcontract
TOC/DOC Colourimetric	Turbidity Turbimeter	Volatile Organics-Purge&Trap/GC/MS	

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.
Results have been compared to the stated specification, without taking into account measurement uncertainty. An asterisk (*) indicates the result has been found to be outside of that specification.
CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.
The Certificate of Analysis shall not be reproduced except in full without approval of CHEL.

Final Report Approval by:

Jillian J. Thompson-Anderson
Quality Control Automation Technologist

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Hamilton Water					
Monitoring Wells - Greensville GW - Pump Test					
TW-2-13 2022-12-15 16:36:00 Record 684479					
Alkalinity	311	mg/L	2		
Ammonia + Ammonium as N	<0.01	mg/L	0.01		
Chloride	107	mg/L	0.5		
Colour (apparent)	3	CU	2		
Conductivity	1020	umhos/cm	4		
Cyanide - Total	<0.003	mg/L	0.003	0.2	
Dissolved Organic Carbon	0.6	mg/L	0.4		
Fluoride	0.16	mg/L	0.04	1.5	
Nitrate as N	3.21	mg/L	0.02	10.0	
Nitrite as N	<0.05	mg/L	0.05	1.0	
pH	7.80	pH	0.01		
Sulphate	66.3	mg/L	0.5		
Total Organic Carbon	0.8	mg/L	0.4		
Turbidity	0.36	NTU	0.05		
Aluminum	<0.002	mg/L	0.002		
Antimony	<0.0001	mg/L	0.0001	0.006	
Arsenic	0.0002	mg/L	0.0001	0.010	
Barium	0.110	mg/L	0.0001	1.0	
Beryllium	<0.0001	mg/L	0.0001		
Bismuth	<0.0001	mg/L	0.0001		
Boron	0.020	mg/L	0.010	5.0	
Cadmium	<0.0001	mg/L	0.0001	0.005	
Calcium	133	mg/L	0.05		
Chromium	0.0002	mg/L	0.0001	0.05	
Cobalt	<0.0001	mg/L	0.0001		
Copper	0.0006	mg/L	0.0001		
Hardness (Calculation)	433	mg/L	0.3		
Iron	0.042	mg/L	0.003		
Lead	<0.0001	mg/L	0.0001	0.010	
Lithium	0.0108	mg/L	0.0005		
Magnesium	24.6	mg/L	0.05		
Manganese	0.0053	mg/L	0.0001		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0004	mg/L	0.0001		
Nickel	0.0005	mg/L	0.0001		
Phosphorus Total	<0.010	mg/L	0.010		
Potassium	1.79	mg/L	0.05		
Selenium	0.0002	mg/L	0.0001	0.05	
Silicon	7.98	mg/L	0.01		
Silver	<0.0001	mg/L	0.0001		
Sodium	48.0	mg/L	0.05	20	*
Strontium	1.70	mg/L	0.0005		
Thallium	<0.0003	mg/L	0.0003		
Tin	<0.0001	mg/L	0.0001		
Titanium	0.0004	mg/L	0.0004		
Tungsten	<0.0001	mg/L	0.0001		
Uranium	0.754	ug/L	0.002	20	
Vanadium	<0.0001	mg/L	0.0001		
Zinc	0.032	mg/L	0.001		
Zirconium	<0.0004	mg/L	0.0004		
Escherichia coli	0	MPN/100mL	0	0	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Total Coliform	0	MPN/100mL	0	0
1,1-Dichloroethylene	<0.2	ug/L	0.2	14
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200
1,2-Dichloroethane	<0.2	ug/L	0.2	5
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5
Benzene	<0.2	ug/L	0.2	1
Bromodichloromethane	<0.2	ug/L	0.2	
Bromoform	<0.2	ug/L	0.2	
Carbon Tetrachloride	<0.2	ug/L	0.2	2
Chlorobenzene	<0.3	ug/L	0.3	80
Chloroform	<0.2	ug/L	0.2	
Dibromochloromethane	<0.2	ug/L	0.2	
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90
2,3,4,6-Tetrachlorophenol (Subcontract)	<1	ug/L	1	100
2,4,6-Trichlorophenol (Subcontract)	<0.2	ug/L	0.2	5
2,4-D (Subcontract)	<0.19	ug/L	0.19	100
2,4-Dichlorophenol (Subcontract)	<0.15	ug/L	0.15	900
Alachlor (Subcontract)	<0.02	ug/L	0.02	5
Atrazine (Subcontract)	<0.01	ug/L	0.01	
Atrazine + Desethyl-atrazine (Subcontract)	<0.01	ug/L	0.01	5
Azinphos-methyl (Subcontract)	<0.05	ug/L	0.05	20
Benzo[a]pyrene (Subcontract)	<0.01	ug/L	0.01	0.01
Bromate (Subcontract)	<0.005	mg/L	0.005	10
Bromoxynil (Subcontract)	<0.33	ug/L	0.33	5
Carbaryl (Subcontract)	<0.05	ug/L	0.05	90
Carbofuran (Subcontract)	<0.01	ug/L	0.01	90
Chlorate (Subcontract)	0.02	mg/L	0.01	1.0
Chlorite (Subcontract)	<0.01	mg/L	0.01	1.0
Chlorpyrifos (Dursban) (Subcontract)	<0.02	ug/L	0.02	90
Desethyl-atrazine (Subcontract)	<0.01	ug/L	0.01	
Diazinon (Subcontract)	<0.02	ug/L	0.02	20
Dicamba (Subcontract)	<0.20	ug/L	0.20	120
Diclofop-methyl (Subcontract)	<0.40	ug/L	0.40	9
Dimethoate (Subcontract)	<0.06	ug/L	0.06	20
Diquat (Subcontract)	<0.002	mg/L	0.001	70
Diuron (Subcontract)	<0.03	ug/L	0.03	150
Glyphosate (Subcontract)	<0.001	mg/L	0.001	280
Gross Alpha (Subcontract)	<0.12	Bq/L	0.12	
Gross Beta (Subcontract)	<0.10	Bq/L	0.10	
Haloacetic Acids (Subcontract)	<5.3	ug/L	5.3	80
Malathion (Subcontract)	<0.02	ug/L	0.02	190
MCPA (Subcontract)	<0.12	ug/L	0.12	0.1
Metolachlor (Subcontract)	<0.01	ug/L	0.01	50
Metribuzin (Sencor) (Subcontract)	<0.02	ug/L	0.02	80
NDMA (Subcontract)	<0.0004	mg/L	0.0004	0.009
Nitrilotriacetic Acid (Subcontract)	<0.03	mg/L	0.03	400
Paraquat (Subcontract)	<0.002	mg/L	0.001	10
PCBsTotal (Subcontract)	< 0.04	ug/L	0.04	3.0

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Pentachlorophenol (Subcontract)	<0.15	ug/L	0.15	60
Phorate (Subcontract)	<0.01	ug/L	0.01	2
Picloram (Subcontract)	<1	ug/L	1	190
Prometryne (Subcontract)	<0.03	ug/L	0.03	1
Simazine (Subcontract)	<0.01	ug/L	0.01	10
Terbufos (Subcontract)	<0.01	ug/L	0.01	1
Total Toxic Equivalency (Subcontract)	4.72	pg/L	4.72	
Triallate (Subcontract)	<0.01	ug/L	0.01	230
Trifluralin (Subcontract)	<0.02	ug/L	0.02	45
Tritium (Subcontract)	<15	Bq/L	15	
Caffeine	<0.5	ug/L	0.5	

Report Comment: The ODWS does not specify a MAC for sodium, however, as per section 18 of the SDWA, sodium results above 20 mg/L on a regulatory sample are prescribed as adverse results with a duty to report as specified in the applicable regulation.

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2022-12-15
Date Submitted: 2022-12-16

Laboratory Work Order Number: 342429

Samples in this work order were analyzed using the following methods:

Microcystin ADDA

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.

CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.

Final Report Approval by:

Jillian J. Thompson-Anderson
Quality Control Automation Technologist

Analyte	Result	Units	MDL

Hamilton Water

Monitoring Wells - Greensville GW - Pump Test

TW-2-13 2022-12-15 16:36:00 Record 684480

Analyte	Result	Units	MDL
Microcystins	<0.15	ug/L	0.15

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2023-01-10
Date Submitted: 2023-01-10

Laboratory Work Order Number: 342635

Samples in this work order were analyzed using the following methods:

o-Phosphate Colourimetric	Alk/pH/Cond/Temp PC Titrate	Ammonia Skalar	Anions IC
Bacteria MPN	Colour Spectrophotometric	Cyanide Skalar	Fluoride-PC Titrate
LIMS Calculation	Mercury Cold Vapour AA	Metals ICP/MS	Silica Skalar
TOC/DOC Colourimetric	TSS/VSS Gravimetric	Turbidity Turbimeter	Volatile Organics-Purge&Trap/GC/MS

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.
Results have been compared to the stated specification, without taking into account measurement uncertainty. An asterisk (*) indicates the result has been found to be outside of that specification.
CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.
" † " indicates the analyte is not accredited to ISO/IEC 17025.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.

Final Report Approval by:

Jillian J. Thompson-Anderson
Quality Control Automation Technologist

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02

Hamilton Water

Monitoring Wells - Greensville GW - Additional Sam

TW-3-13 2023-01-10 12:25:00 Record 686533

Alkalinity	262	mg/L	2	
Ammonia + Ammonium as N	<0.01	mg/L	0.01	
Anion Sum (Calculation) †	7.5	me/L	0.1	
Bicarbonate as Carbonate (Calculation)	262	mg/L	2	
Bromide	<0.2	mg/L	0.2	
Cation Sum (Calculation) †	7.3	me/L	0.1	
Chloride	12.9	mg/L	0.5	
Colour (apparent)	40	CU	2	
Conductivity	645	umhos/cm	4	
Cyanide - Total	<0.003	mg/L	0.003	0.2
Dissolved Organic Carbon	<0.4	mg/L	0.4	
Fluoride	0.26	mg/L	0.04	1.5
Ion Balance (Calculation) †	1.7	%	0.1	
Nitrate as N	<0.02	mg/L	0.02	10.0
Nitrate+Nitrite as N (Calculation)	<0.03	mg/L	0.03	
Nitrite as N	<0.01	mg/L	0.01	1.0
o-Phosphate as P	<0.05	mg/L	0.05	
pH	7.86	pH	0.01	
pH - Saturation (Calculation) †	7.03	pH	0.01	
Silica-Reactive	15.6	mg/L	0.20	
Sulphate	72.6	mg/L	0.5	
Temperature	21.2	C	0.1	
Total Suspended Solids	16.0	mg/L	0.8	
Turbidity	6.68	NTU	0.05	
Aluminum	0.097	mg/L	0.002	
Antimony	<0.0001	mg/L	0.0001	0.006
Arsenic	0.0007	mg/L	0.0001	0.010
Barium	0.0508	mg/L	0.0001	1.0
Beryllium	<0.0001	mg/L	0.0001	
Bismuth	<0.0001	mg/L	0.0001	
Boron	0.015	mg/L	0.010	5.0
Cadmium	<0.0001	mg/L	0.0001	0.005
Calcium	97.4	mg/L	0.05	
Chromium	0.0001	mg/L	0.0001	0.05
Cobalt	0.0002	mg/L	0.0001	
Copper	0.0059	mg/L	0.0001	
Dissolved Aluminum	<0.002	mg/L	0.002	
Dissolved Antimony	<0.0001	mg/L	0.0001	
Dissolved Arsenic	0.0003	mg/L	0.0001	
Dissolved Barium	0.0544	mg/L	0.0001	
Dissolved Beryllium	<0.0001	mg/L	0.0001	
Dissolved Bismuth	<0.0001	mg/L	0.0001	
Dissolved Boron	0.016	mg/L	0.010	
Dissolved Cadmium	<0.0001	mg/L	0.0001	
Dissolved Calcium	97.9	mg/L	0.05	
Dissolved Chromium	<0.0001	mg/L	0.0001	
Dissolved Cobalt	0.0001	mg/L	0.0001	
Dissolved Copper	0.0013	mg/L	0.0001	
Dissolved Iron	0.016	mg/L	0.003	
Dissolved Lead	<0.0001	mg/L	0.0001	
Dissolved Lithium	0.0108	mg/L	0.0005	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Dissolved Magnesium	23.8	mg/L	0.05		
Dissolved Manganese	0.0319	mg/L	0.0001		
Dissolved Mercury	<0.05	ug/L	0.05		
Dissolved Molybdenum	0.0008	mg/L	0.0001		
Dissolved Nickel	0.0003	mg/L	0.0001		
Dissolved Potassium	1.08	mg/L	0.05		
Dissolved Selenium	<0.0001	mg/L	0.0001		
Dissolved Silicon	7.77	mg/L	0.01		
Dissolved Silver	<0.0001	mg/L	0.0001		
Dissolved Sodium	7.91	mg/L	0.05		
Dissolved Strontium	0.985	mg/L	0.0005		
Dissolved Thallium	<0.0003	mg/L	0.0003		
Dissolved Tin	<0.0001	mg/L	0.0001		
Dissolved Titanium	0.0007	mg/L	0.0004		
Dissolved Tungsten	<0.0001	mg/L	0.0001		
Dissolved Uranium	0.873	ug/L	0.002		
Dissolved Vanadium	<0.0001	mg/L	0.0001		
Dissolved Zinc	0.013	mg/L	0.001		
Dissolved Zirconium	<0.0004	mg/L	0.0004		
Hardness (Calculation)	342	mg/L	0.7		
Iron	0.753	mg/L	0.003		
Lead	0.0038	mg/L	0.0001	0.010	
Lithium	0.0106	mg/L	0.0005		
Magnesium	23.6	mg/L	0.05		
Manganese	0.0398	mg/L	0.0001		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0008	mg/L	0.0001		
Nickel	0.0004	mg/L	0.0001		
Phosphorus Dissolved Total	<0.010	mg/L	0.010		
Phosphorus Total	0.018	mg/L	0.010		
Potassium	1.08	mg/L	0.05		
Selenium	<0.0001	mg/L	0.0001	0.05	
Silicon	7.85	mg/L	0.01		
Silver	<0.0001	mg/L	0.0001		
Sodium	7.60	mg/L	0.05	20	
Strontium	0.950	mg/L	0.0005		
Thallium	<0.0003	mg/L	0.0003		
Tin	<0.0001	mg/L	0.0001		
Titanium	0.0053	mg/L	0.0004		
Tungsten	<0.0001	mg/L	0.0001		
Uranium	0.870	ug/L	0.002	20	
Vanadium	0.0003	mg/L	0.0001		
Zinc	0.015	mg/L	0.001		
Zirconium	<0.0004	mg/L	0.0004		
Escherichia coli	0	MPN/100mL	0	0	
Total Coliform	13	MPN/100mL	0	0	*
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	<0.2	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90
MW-101 2023-01-10 15:25:00 Record 686534				
Alkalinity	276	mg/L	2	
Ammonia + Ammonium as N	<0.01	mg/L	0.01	
Anion Sum (Calculation) †	6.6	me/L	0.1	
Bicarbonate as Carbonate (Calculation)	276	mg/L	2	
Bromide	<0.2	mg/L	0.2	
Cation Sum (Calculation) †	6.0	me/L	0.1	
Chloride	2.2	mg/L	0.5	
Colour (apparent)	18	CU	2	
Conductivity	553	umhos/cm	4	
Cyanide - Total	<0.003	mg/L	0.003	0.2
Dissolved Organic Carbon	<0.4	mg/L	0.4	
Fluoride	0.12	mg/L	0.04	1.5
Ion Balance (Calculation) †	4.8	%	0.1	
Nitrate as N	1.14	mg/L	0.02	10.0
Nitrate+Nitrite as N (Calculation)	1.14	mg/L	0.03	
Nitrite as N	<0.01	mg/L	0.01	1.0
o-Phosphate as P	<0.05	mg/L	0.05	
pH	7.94	pH	0.01	
pH - Saturation (Calculation) †	7.03	pH	0.01	
Silica-Reactive	14.4	mg/L	0.20	
Sulphate	25.3	mg/L	0.5	
Temperature	21.0	C	0.1	
Total Suspended Solids	<3	mg/L	3	
Turbidity	2.24	NTU	0.05	
Aluminum	0.101	mg/L	0.002	
Antimony	<0.0001	mg/L	0.0001	0.006
Arsenic	0.0002	mg/L	0.0001	0.010
Barium	0.0702	mg/L	0.0001	1.0
Beryllium	<0.0001	mg/L	0.0001	
Bismuth	<0.0001	mg/L	0.0001	
Boron	0.011	mg/L	0.010	5.0
Cadmium	<0.0001	mg/L	0.0001	0.005
Calcium	88.2	mg/L	0.05	
Chromium	0.0015	mg/L	0.0001	0.05
Cobalt	<0.0001	mg/L	0.0001	
Copper	0.0013	mg/L	0.0001	
Dissolved Aluminum	0.004	mg/L	0.002	
Dissolved Antimony	<0.0001	mg/L	0.0001	
Dissolved Arsenic	0.0002	mg/L	0.0001	
Dissolved Barium	0.0710	mg/L	0.0001	
Dissolved Beryllium	<0.0001	mg/L	0.0001	
Dissolved Bismuth	<0.0001	mg/L	0.0001	
Dissolved Boron	0.011	mg/L	0.010	
Dissolved Cadmium	<0.0001	mg/L	0.0001	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Dissolved Calcium	90.0	mg/L	0.05	
Dissolved Chromium	0.0008	mg/L	0.0001	
Dissolved Cobalt	<0.0001	mg/L	0.0001	
Dissolved Copper	0.0013	mg/L	0.0001	
Dissolved Iron	<0.003	mg/L	0.003	
Dissolved Lead	<0.0001	mg/L	0.0001	
Dissolved Lithium	0.0054	mg/L	0.0005	
Dissolved Magnesium	14.8	mg/L	0.05	
Dissolved Manganese	0.0008	mg/L	0.0001	
Dissolved Mercury	<0.05	ug/L	0.05	
Dissolved Molybdenum	0.0002	mg/L	0.0001	
Dissolved Nickel	0.0001	mg/L	0.0001	
Dissolved Potassium	0.90	mg/L	0.05	
Dissolved Selenium	0.0004	mg/L	0.0001	
Dissolved Silicon	6.76	mg/L	0.01	
Dissolved Silver	<0.0001	mg/L	0.0001	
Dissolved Sodium	4.36	mg/L	0.05	
Dissolved Strontium	0.223	mg/L	0.0005	
Dissolved Thallium	<0.0003	mg/L	0.0003	
Dissolved Tin	<0.0001	mg/L	0.0001	
Dissolved Titanium	0.0005	mg/L	0.0004	
Dissolved Tungsten	<0.0001	mg/L	0.0001	
Dissolved Uranium	0.328	ug/L	0.002	
Dissolved Vanadium	0.0002	mg/L	0.0001	
Dissolved Zinc	0.001	mg/L	0.001	
Dissolved Zirconium	<0.0004	mg/L	0.0004	
Hardness (Calculation)	286	mg/L	0.7	
Iron	0.161	mg/L	0.003	
Lead	<0.0001	mg/L	0.0001	0.010
Lithium	0.0056	mg/L	0.0005	
Magnesium	15.0	mg/L	0.05	
Manganese	0.0034	mg/L	0.0001	
Mercury	<0.05	ug/L	0.05	1
Molybdenum	0.0002	mg/L	0.0001	
Nickel	0.0002	mg/L	0.0001	
Phosphorus Dissolved Total	<0.010	mg/L	0.010	
Phosphorus Total	<0.010	mg/L	0.010	
Potassium	0.93	mg/L	0.05	
Selenium	0.0004	mg/L	0.0001	0.05
Silicon	6.80	mg/L	0.01	
Silver	<0.0001	mg/L	0.0001	
Sodium	4.41	mg/L	0.05	20
Strontium	0.225	mg/L	0.0005	
Thallium	<0.0003	mg/L	0.0003	
Tin	<0.0001	mg/L	0.0001	
Titanium	0.0094	mg/L	0.0004	
Tungsten	<0.0001	mg/L	0.0001	
Uranium	0.322	ug/L	0.002	20
Vanadium	0.0004	mg/L	0.0001	
Zinc	<0.001	mg/L	0.001	
Zirconium	<0.0004	mg/L	0.0004	
Escherichia coli	0	MPN/100mL	0	0
Total Coliform	0	MPN/100mL	0	0
1,1-Dichloroethylene	<0.2	ug/L	0.2	14
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200
1,2-Dichloroethane	<0.2	ug/L	0.2	5
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Benzene	<0.2	ug/L	0.2	1
Bromodichloromethane	<0.2	ug/L	0.2	
Bromoform	<0.2	ug/L	0.2	
Carbon Tetrachloride	<0.2	ug/L	0.2	2
Chlorobenzene	<0.3	ug/L	0.3	80
Chloroform	<0.2	ug/L	0.2	
Dibromochloromethane	<0.2	ug/L	0.2	
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90

Travel Blank 2023-01-10 Record 686535

1,1-Dichloroethylene	<0.2	ug/L	0.2	14
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200
1,2-Dichloroethane	<0.2	ug/L	0.2	5
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5
Benzene	<0.2	ug/L	0.2	1
Bromodichloromethane	<0.2	ug/L	0.2	
Bromoform	<0.2	ug/L	0.2	
Carbon Tetrachloride	<0.2	ug/L	0.2	2
Chlorobenzene	<0.3	ug/L	0.3	80
Chloroform	<0.2	ug/L	0.2	
Dibromochloromethane	<0.2	ug/L	0.2	
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90

Report Comment: The ODWS does not specify a MAC for sodium, however, as per section 18 of the SDWA, sodium results above 20 mg/L on a regulatory sample are prescribed as adverse results with a duty to report as specified in the applicable regulation.

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2023-01-17
Date Submitted: 2023-01-17

Laboratory Work Order Number: 342769

Samples in this work order were analyzed using the following methods:

o-Phosphate Colourimetric	Alk/pH/Cond/Temp PC Titrate	Ammonia Skalar	Anions IC
Bacteria MPN	Colour Spectrophotometric	Cyanide Skalar	Fluoride-PC Titrate
LIMS Calculation	Mercury Cold Vapour AA	Metals ICP/MS	Silica Skalar
TOC/DOC Colourimetric	TSS/VSS Gravimetric	Turbidity Turbimeter	Volatile Organics-Purge&Trap/GC/MS

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.
Results have been compared to the stated specification, without taking into account measurement uncertainty. An asterisk (*) indicates the result has been found to be outside of that specification.
CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.
" † " indicates the analyte is not accredited to ISO/IEC 17025.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.
The Certificate of Analysis shall not be reproduced except in full without approval of CHEL.

Final Report Approval by:

Jillian J. Thompson-Anderson
Quality Control Automation Technologist

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02

Hamilton Water

Monitoring Wells - Greensville GW - Additional Sam

TW-1-13 2023-01-17 13:50:00 Record 688640

Alkalinity	283	mg/L	2	
Ammonia + Ammonium as N	0.04	mg/L	0.01	
Anion Sum (Calculation) †	8.7	me/L	0.1	
Bicarbonate as Carbonate (Calculation)	283	mg/L	2	
Bromide	<1	mg/L	1	
Cation Sum (Calculation) †	8.4	me/L	0.1	
Chloride	26.4	mg/L	0.5	
Colour (apparent)	99	CU	2	
Conductivity	708	umhos/cm	4	
Cyanide - Total	<0.003	mg/L	0.003	0.2
Dissolved Organic Carbon	0.6	mg/L	0.4	
Fluoride	0.32	mg/L	0.04	1.5
Ion Balance (Calculation) †	1.8	%	0.1	
Nitrate as N	<0.1	mg/L	0.1	10.0
Nitrate+Nitrite as N (Calculation)	<0.2	mg/L	0.2	
Nitrite as N	<0.05	mg/L	0.05	1.0
o-Phosphate as P	<0.05	mg/L	0.05	
pH	7.62	pH	0.01	
pH - Saturation (Calculation) †	7.01	pH	0.01	
Silica-Reactive	20.9	mg/L	0.20	
Sulphate	83.6	mg/L	0.5	
Temperature	18.9	C	0.1	
Total Suspended Solids	15.0	mg/L	0.8	
Turbidity	5.52	NTU	0.05	
Aluminum	0.094	mg/L	0.002	
Antimony	<0.0001	mg/L	0.0001	0.006
Arsenic	0.0024	mg/L	0.0001	0.010
Barium	0.0546	mg/L	0.0001	1.0
Beryllium	<0.0001	mg/L	0.0001	
Bismuth	<0.0001	mg/L	0.0001	
Boron	0.023	mg/L	0.010	5.0
Cadmium	<0.0001	mg/L	0.0001	0.005
Calcium	107	mg/L	0.05	
Chromium	0.0002	mg/L	0.0001	0.05
Cobalt	0.0001	mg/L	0.0001	
Copper	0.0003	mg/L	0.0001	
Dissolved Aluminum	<0.002	mg/L	0.002	
Dissolved Antimony	<0.0001	mg/L	0.0001	
Dissolved Arsenic	0.0017	mg/L	0.0001	
Dissolved Barium	0.0537	mg/L	0.0001	
Dissolved Beryllium	<0.0001	mg/L	0.0001	
Dissolved Bismuth	<0.0001	mg/L	0.0001	
Dissolved Boron	0.023	mg/L	0.010	
Dissolved Cadmium	<0.0001	mg/L	0.0001	
Dissolved Calcium	105	mg/L	0.05	
Dissolved Chromium	<0.0001	mg/L	0.0001	
Dissolved Cobalt	<0.0001	mg/L	0.0001	
Dissolved Copper	0.0003	mg/L	0.0001	
Dissolved Iron	0.570	mg/L	0.003	
Dissolved Lead	<0.0001	mg/L	0.0001	
Dissolved Lithium	0.0113	mg/L	0.0005	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Dissolved Magnesium	27.2	mg/L	0.05	
Dissolved Manganese	0.0216	mg/L	0.0001	
Dissolved Mercury	<0.05	ug/L	0.05	
Dissolved Molybdenum	0.0010	mg/L	0.0001	
Dissolved Nickel	0.0002	mg/L	0.0001	
Dissolved Potassium	1.25	mg/L	0.05	
Dissolved Selenium	<0.0001	mg/L	0.0001	
Dissolved Silicon	9.73	mg/L	0.01	
Dissolved Silver	<0.0001	mg/L	0.0001	
Dissolved Sodium	12.3	mg/L	0.05	
Dissolved Strontium	6.47	mg/L	0.0005	
Dissolved Thallium	<0.0003	mg/L	0.0003	
Dissolved Tin	<0.0001	mg/L	0.0001	
Dissolved Titanium	0.0009	mg/L	0.0004	
Dissolved Tungsten	<0.0001	mg/L	0.0001	
Dissolved Uranium	0.200	ug/L	0.002	
Dissolved Vanadium	<0.0001	mg/L	0.0001	
Dissolved Zinc	0.006	mg/L	0.001	
Dissolved Zirconium	<0.0004	mg/L	0.0004	
Hardness (Calculation)	381	mg/L	0.7	
Iron	1.33	mg/L	0.003	
Lead	0.0013	mg/L	0.0001	0.010
Lithium	0.0117	mg/L	0.0005	
Magnesium	27.6	mg/L	0.05	
Manganese	0.0314	mg/L	0.0001	
Mercury	<0.05	ug/L	0.05	1
Molybdenum	0.0010	mg/L	0.0001	
Nickel	0.0002	mg/L	0.0001	
Phosphorus Dissolved Total	<0.010	mg/L	0.010	
Phosphorus Total	0.018	mg/L	0.010	
Potassium	1.29	mg/L	0.05	
Selenium	<0.0001	mg/L	0.0001	0.05
Silicon	9.96	mg/L	0.01	
Silver	<0.0001	mg/L	0.0001	
Sodium	12.2	mg/L	0.05	20
Strontium	6.46	mg/L	0.0005	
Thallium	<0.0003	mg/L	0.0003	
Tin	<0.0001	mg/L	0.0001	
Titanium	0.0044	mg/L	0.0004	
Tungsten	<0.0001	mg/L	0.0001	
Uranium	0.207	ug/L	0.002	20
Vanadium	0.0002	mg/L	0.0001	
Zinc	0.010	mg/L	0.001	
Zirconium	<0.0004	mg/L	0.0004	
Escherichia coli	0	MPN/100mL	0	0
Total Coliform	0	MPN/100mL	0	0
1,1-Dichloroethylene	<0.2	ug/L	0.2	14
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200
1,2-Dichloroethane	<0.2	ug/L	0.2	5
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5
Benzene	<0.2	ug/L	0.2	1
Bromodichloromethane	<0.2	ug/L	0.2	
Bromoform	<0.2	ug/L	0.2	
Carbon Tetrachloride	<0.2	ug/L	0.2	2
Chlorobenzene	<0.3	ug/L	0.3	80
Chloroform	<0.2	ug/L	0.2	
Dibromochloromethane	<0.2	ug/L	0.2	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90
TW-2-13 2023-01-17 12:00:00 Record 688641				
Alkalinity	304	mg/L	2	
Ammonia + Ammonium as N	<0.01	mg/L	0.01	
Anion Sum (Calculation) †	7.6	me/L	0.1	
Bicarbonate as Carbonate (Calculation)	304	mg/L	2	
Bromide	<1	mg/L	1	
Cation Sum (Calculation) †	7.5	me/L	0.1	
Chloride	10.8	mg/L	0.5	
Colour (apparent)	<2	CU	2	
Conductivity	634	umhos/cm	4	
Cyanide - Total	<0.003	mg/L	0.003	0.2
Dissolved Organic Carbon	<0.4	mg/L	0.4	
Fluoride	0.12	mg/L	0.04	1.5
Ion Balance (Calculation) †	0.7	%	0.1	
Nitrate as N	1.36	mg/L	0.02	10.0
Nitrate+Nitrite as N (Calculation)	1.36	mg/L	0.03	
Nitrite as N	<0.05	mg/L	0.05	1.0
o-Phosphate as P	<0.05	mg/L	0.05	
pH	7.84	pH	0.01	
pH - Saturation (Calculation) †	6.93	pH	0.01	
Silica-Reactive	14.2	mg/L	0.20	
Sulphate	36.3	mg/L	0.5	
Temperature	19.7	C	0.1	
Total Suspended Solids	<2	mg/L	2	
Turbidity	0.26	NTU	0.05	
Aluminum	<0.002	mg/L	0.002	
Antimony	<0.0001	mg/L	0.0001	0.006
Arsenic	0.0002	mg/L	0.0001	0.010
Barium	0.0906	mg/L	0.0001	1.0
Beryllium	<0.0001	mg/L	0.0001	
Bismuth	<0.0001	mg/L	0.0001	
Boron	0.015	mg/L	0.010	5.0
Cadmium	<0.0001	mg/L	0.0001	0.005
Calcium	110	mg/L	0.05	
Chromium	0.0006	mg/L	0.0001	0.05
Cobalt	<0.0001	mg/L	0.0001	
Copper	0.0004	mg/L	0.0001	
Dissolved Aluminum	<0.002	mg/L	0.002	
Dissolved Antimony	<0.0001	mg/L	0.0001	
Dissolved Arsenic	0.0002	mg/L	0.0001	
Dissolved Barium	0.0917	mg/L	0.0001	
Dissolved Beryllium	<0.0001	mg/L	0.0001	
Dissolved Bismuth	<0.0001	mg/L	0.0001	
Dissolved Boron	0.015	mg/L	0.010	
Dissolved Cadmium	<0.0001	mg/L	0.0001	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Dissolved Calcium	111	mg/L	0.05	
Dissolved Chromium	0.0005	mg/L	0.0001	
Dissolved Cobalt	<0.0001	mg/L	0.0001	
Dissolved Copper	0.0004	mg/L	0.0001	
Dissolved Iron	0.007	mg/L	0.003	
Dissolved Lead	<0.0001	mg/L	0.0001	
Dissolved Lithium	0.0070	mg/L	0.0005	
Dissolved Magnesium	17.2	mg/L	0.05	
Dissolved Manganese	0.0016	mg/L	0.0001	
Dissolved Mercury	<0.05	ug/L	0.05	
Dissolved Molybdenum	0.0003	mg/L	0.0001	
Dissolved Nickel	0.0003	mg/L	0.0001	
Dissolved Potassium	0.87	mg/L	0.05	
Dissolved Selenium	0.0003	mg/L	0.0001	
Dissolved Silicon	6.76	mg/L	0.01	
Dissolved Silver	<0.0001	mg/L	0.0001	
Dissolved Sodium	10.9	mg/L	0.05	
Dissolved Strontium	0.611	mg/L	0.0005	
Dissolved Thallium	<0.0003	mg/L	0.0003	
Dissolved Tin	<0.0001	mg/L	0.0001	
Dissolved Titanium	0.0007	mg/L	0.0004	
Dissolved Tungsten	<0.0001	mg/L	0.0001	
Dissolved Uranium	0.547	ug/L	0.002	
Dissolved Vanadium	<0.0001	mg/L	0.0001	
Dissolved Zinc	0.036	mg/L	0.001	
Dissolved Zirconium	<0.0004	mg/L	0.0004	
Hardness (Calculation)	350	mg/L	0.7	
Iron	0.078	mg/L	0.003	
Lead	<0.0001	mg/L	0.0001	0.010
Lithium	0.0070	mg/L	0.0005	
Magnesium	17.6	mg/L	0.05	
Manganese	0.0017	mg/L	0.0001	
Mercury	<0.05	ug/L	0.05	1
Molybdenum	0.0003	mg/L	0.0001	
Nickel	0.0003	mg/L	0.0001	
Phosphorus Dissolved Total	<0.010	mg/L	0.010	
Phosphorus Total	<0.010	mg/L	0.010	
Potassium	0.89	mg/L	0.05	
Selenium	0.0003	mg/L	0.0001	0.05
Silicon	6.65	mg/L	0.01	
Silver	<0.0001	mg/L	0.0001	
Sodium	11.0	mg/L	0.05	20
Strontium	0.613	mg/L	0.0005	
Thallium	<0.0003	mg/L	0.0003	
Tin	<0.0001	mg/L	0.0001	
Titanium	0.0007	mg/L	0.0004	
Tungsten	<0.0001	mg/L	0.0001	
Uranium	0.547	ug/L	0.002	20
Vanadium	<0.0001	mg/L	0.0001	
Zinc	0.036	mg/L	0.001	
Zirconium	<0.0004	mg/L	0.0004	
Escherichia coli	0	MPN/100mL	0	0
Total Coliform	0	MPN/100mL	0	0
1,1-Dichloroethylene	<0.2	ug/L	0.2	14
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200
1,2-Dichloroethane	<0.2	ug/L	0.2	5
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Benzene	<0.2	ug/L	0.2	1
Bromodichloromethane	<0.2	ug/L	0.2	
Bromoform	<0.2	ug/L	0.2	
Carbon Tetrachloride	<0.2	ug/L	0.2	2
Chlorobenzene	<0.3	ug/L	0.3	80
Chloroform	<0.2	ug/L	0.2	
Dibromochloromethane	<0.2	ug/L	0.2	
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90

Travel Blank 2023-01-17 Record 688650

1,1-Dichloroethylene	<0.2	ug/L	0.2	14
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200
1,2-Dichloroethane	<0.2	ug/L	0.2	5
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5
Benzene	<0.2	ug/L	0.2	1
Bromodichloromethane	<0.2	ug/L	0.2	
Bromoform	<0.2	ug/L	0.2	
Carbon Tetrachloride	<0.2	ug/L	0.2	2
Chlorobenzene	<0.3	ug/L	0.3	80
Chloroform	<0.2	ug/L	0.2	
Dibromochloromethane	<0.2	ug/L	0.2	
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90

Report Comment: The ODWS does not specify a MAC for sodium, however, as per section 18 of the SDWA, sodium results above 20 mg/L on a regulatory sample are prescribed as adverse results with a duty to report as specified in the applicable regulation.

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2022-12-01
Date Submitted: 2022-12-01

Laboratory Work Order Number: 342245

Samples in this work order were analyzed using the following methods:

o-Phosphate Colourimetric	Alk/pH/Cond/Temp PC Titrate	Ammonia Skalar	Anions IC
Bacteria MPN	Colour Spectrophotometric	Cyanide Skalar	Fluoride-PC Titrate
LIMS Calculation	Mercury Cold Vapour AA	Metals ICP/MS	Silica Skalar
TOC/DOC Colourimetric	TSS/VSS Gravimetric	Turbidity Turbimeter	Volatile Organics-Purge&Trap/GC/MS

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.
Results have been compared to the stated specification, without taking into account measurement uncertainty. An asterisk (*) indicates the result has been found to be outside of that specification.
CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.
" † " indicates the analyte is not accredited to ISO/IEC 17025.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.

Final Report Approval by:

Mira Bogle
Environmental Compliance Technologist

Hamilton Water

Monitoring Wells - Greensville GW - Pre-Pump Test

3 Medwin Dr 2022-12-01 12:00:00 Record 683444

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Alkalinity	317	mg/L	2		
Ammonia + Ammonium as N	0.01	mg/L	0.01		
Anion Sum (Calculation) †	10.5	me/L	0.1		
Bicarbonate as Carbonate (Calculation)	317	mg/L	2		
Bromide	<0.2	mg/L	0.2		
Cation Sum (Calculation) †	9.7	me/L	0.1		
Chloride	79.9	mg/L	0.5		
Colour (apparent)	65	CU	2		
Conductivity	930	umhos/cm	4		
Cyanide - Total	<0.003	mg/L	0.003	0.2	
Dissolved Organic Carbon	1.0	mg/L	0.4		
Fluoride	0.28	mg/L	0.04	1.5	
Ion Balance (Calculation) †	4.0	%	0.1		
Nitrate as N	1.78	mg/L	0.02	10.0	
Nitrate+Nitrite as N (Calculation)	1.78	mg/L	0.03		
Nitrite as N	<0.01	mg/L	0.01	1.0	
o-Phosphate as P	<0.05	mg/L	0.05		
pH	7.80	pH	0.01		
pH - Saturation (Calculation) †	6.91	pH	0.01		
Silica-Reactive	13.2	mg/L	0.20		
Sulphate	68.5	mg/L	0.5		
Temperature	21.3	C	0.1		
Total Suspended Solids	22.1	mg/L	0.8		
Turbidity	17.4	NTU	0.05		
Aluminum	0.020	mg/L	0.002		
Antimony	<0.0001	mg/L	0.0001	0.006	
Arsenic	0.0003	mg/L	0.0001	0.010	
Barium	0.0693	mg/L	0.0001	1.0	
Beryllium	<0.0001	mg/L	0.0001		
Bismuth	<0.0001	mg/L	0.0001		
Boron	0.025	mg/L	0.010	5.0	
Cadmium	<0.0001	mg/L	0.0001	0.005	
Calcium	113	mg/L	0.05		
Chromium	0.0004	mg/L	0.0001	0.05	
Cobalt	<0.0001	mg/L	0.0001		
Copper	0.0079	mg/L	0.0001		
Hardness (Calculation)	390	mg/L	0.3		
Iron	0.813	mg/L	0.003		
Lead	0.0024	mg/L	0.0001	0.010	
Lithium	0.0102	mg/L	0.0005		
Magnesium	26.1	mg/L	0.05		
Manganese	0.0122	mg/L	0.0001		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0012	mg/L	0.0001		
Nickel	0.0019	mg/L	0.0001		
Phosphorus Total	<0.010	mg/L	0.010		
Potassium	2.27	mg/L	0.05		
Selenium	0.0002	mg/L	0.0001	0.05	
Silicon	6.14	mg/L	0.01		
Silver	<0.0001	mg/L	0.0001		
Sodium	40.8	mg/L	0.05	20	*

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Strontium	1.56	mg/L	0.0005		
Thallium	<0.0003	mg/L	0.0003		
Tin	0.0011	mg/L	0.0001		
Titanium	0.0007	mg/L	0.0004		
Tungsten	<0.0001	mg/L	0.0001		
Uranium	1.49	ug/L	0.002	20	
Vanadium	0.0001	mg/L	0.0001		
Zinc	0.051	mg/L	0.001		
Zirconium	<0.0004	mg/L	0.0004		
Escherichia coli	0	MPN/100mL	0	0	
Total Coliform	108	MPN/100mL	0	0	*
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	<0.2	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		
Dichloromethane	<0.5	ug/L	0.5	50	
Ethylbenzene	<0.2	ug/L	0.2	140	
m+p-Xylene	<0.4	ug/L	0.4		
o-Xylene	<0.2	ug/L	0.2		
Tetrachloroethylene	<0.2	ug/L	0.2	10	
Toluene	<0.2	ug/L	0.2	60	
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100	
Trichloroethylene	<0.2	ug/L	0.2	5	
Vinyl Chloride	<0.2	ug/L	0.2	1	
Xylene (Calculation)	<0.5	ug/L	0.5	90	

63 Tews Ln 2022-12-01 14:30:00 Record 683445

Alkalinity	280	mg/L	2		
Ammonia + Ammonium as N	0.03	mg/L	0.01		
Anion Sum (Calculation) †	9.4	me/L	0.1		
Bicarbonate as Carbonate (Calculation)	280	mg/L	2		
Bromide	<0.2	mg/L	0.2		
Cation Sum (Calculation) †	8.3	me/L	0.1		
Chloride	40.6	mg/L	0.5		
Colour (apparent)	445	CU	2		
Conductivity	796	umhos/cm	4		
Cyanide - Total	<0.003	mg/L	0.003	0.2	
Dissolved Organic Carbon	1.1	mg/L	0.4		
Fluoride	0.31	mg/L	0.04	1.5	
Ion Balance (Calculation) †	5.8	%	0.1		
Nitrate as N	0.02	mg/L	0.02	10.0	
Nitrate+Nitrite as N (Calculation)	<0.03	mg/L	0.03		
Nitrite as N	<0.01	mg/L	0.01	1.0	
o-Phosphate as P	<0.05	mg/L	0.05		
pH	7.82	pH	0.01		
pH - Saturation (Calculation) †	7.02	pH	0.01		
Silica-Reactive	21.8	mg/L	0.20		
Sulphate	96.5	mg/L	0.5		
Temperature	21.6	C	0.1		

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Total Suspended Solids	96.0	mg/L	0.8		
Turbidity	108	NTU	0.05		
Aluminum	0.063	mg/L	0.002		
Antimony	<0.0001	mg/L	0.0001	0.006	
Arsenic	0.0040	mg/L	0.0001	0.010	
Barium	0.0544	mg/L	0.0001	1.0	
Beryllium	<0.0001	mg/L	0.0001		
Bismuth	<0.0001	mg/L	0.0001		
Boron	0.028	mg/L	0.010	5.0	
Cadmium	<0.0001	mg/L	0.0001	0.005	
Calcium	96.8	mg/L	0.05		
Chromium	0.0004	mg/L	0.0001	0.05	
Cobalt	0.0001	mg/L	0.0001		
Copper	0.0011	mg/L	0.0001		
Hardness (Calculation)	363	mg/L	0.3		
Iron	2.94	mg/L	0.003		
Lead	0.0006	mg/L	0.0001	0.010	
Lithium	0.0106	mg/L	0.0005		
Magnesium	29.5	mg/L	0.05		
Manganese	0.0401	mg/L	0.0001		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0011	mg/L	0.0001		
Nickel	0.0009	mg/L	0.0001		
Phosphorus Total	0.011	mg/L	0.010		
Potassium	1.33	mg/L	0.05		
Selenium	<0.0001	mg/L	0.0001	0.05	
Silicon	9.50	mg/L	0.01		
Silver	<0.0001	mg/L	0.0001		
Sodium	17.0	mg/L	0.05	20	
Strontium	6.79	mg/L	0.0005		
Thallium	<0.0003	mg/L	0.0003		
Tin	0.0015	mg/L	0.0001		
Titanium	0.0038	mg/L	0.0004		
Tungsten	<0.0001	mg/L	0.0001		
Uranium	0.151	ug/L	0.002	20	
Vanadium	0.0002	mg/L	0.0001		
Zinc	0.006	mg/L	0.001		
Zirconium	<0.0004	mg/L	0.0004		
Escherichia coli	0	MPN/100mL	0	0	
Total Coliform	9	MPN/100mL	0	0	*
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	<0.2	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		
Dichloromethane	<0.5	ug/L	0.5	50	
Ethylbenzene	<0.2	ug/L	0.2	140	
m+p-Xylene	<0.4	ug/L	0.4		
o-Xylene	<0.2	ug/L	0.2		
Tetrachloroethylene	<0.2	ug/L	0.2	10	
Toluene	<0.2	ug/L	0.2	60	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90
609 Harvest Rd 2022-12-01 13:00:00 Record 683446				
Alkalinity	308	mg/L	2	
Ammonia + Ammonium as N	<0.01	mg/L	0.01	
Anion Sum (Calculation) †	10.1	me/L	0.1	
Bicarbonate as Carbonate (Calculation)	308	mg/L	2	
Bromide	<0.2	mg/L	0.2	
Cation Sum (Calculation) †	8.8	me/L	0.1	
Chloride	66.5	mg/L	0.5	
Colour (apparent)	44	CU	2	
Conductivity	895	umhos/cm	4	
Cyanide - Total	<0.003	mg/L	0.003	0.2
Dissolved Organic Carbon	1.2	mg/L	0.4	
Fluoride	0.44	mg/L	0.04	1.5
Ion Balance (Calculation) †	6.9	%	0.1	
Nitrate as N	1.34	mg/L	0.02	10.0
Nitrate+Nitrite as N (Calculation)	1.34	mg/L	0.03	
Nitrite as N	<0.01	mg/L	0.01	1.0
o-Phosphate as P	<0.05	mg/L	0.05	
pH	7.74	pH	0.01	
pH - Saturation (Calculation) †	6.94	pH	0.01	
Silica-Reactive	13.0	mg/L	0.20	
Sulphate	76.9	mg/L	0.5	
Temperature	22.3	C	0.1	
Total Suspended Solids	44.4	mg/L	0.8	
Turbidity	12.8	NTU	0.05	
Aluminum	0.057	mg/L	0.002	
Antimony	<0.0001	mg/L	0.0001	0.006
Arsenic	0.0004	mg/L	0.0001	0.010
Barium	0.0659	mg/L	0.0001	1.0
Beryllium	<0.0001	mg/L	0.0001	
Bismuth	<0.0001	mg/L	0.0001	
Boron	0.036	mg/L	0.010	5.0
Cadmium	<0.0001	mg/L	0.0001	0.005
Calcium	103	mg/L	0.05	
Chromium	0.0009	mg/L	0.0001	0.05
Cobalt	0.0012	mg/L	0.0001	
Copper	0.0050	mg/L	0.0001	
Hardness (Calculation)	370	mg/L	0.3	
Iron	1.61	mg/L	0.003	
Lead	0.0024	mg/L	0.0001	0.010
Lithium	0.0114	mg/L	0.0005	
Magnesium	27.4	mg/L	0.05	
Manganese	0.0755	mg/L	0.0001	
Mercury	<0.05	ug/L	0.05	1
Molybdenum	0.0014	mg/L	0.0001	
Nickel	0.0037	mg/L	0.0001	
Phosphorus Total	<0.010	mg/L	0.010	
Potassium	2.23	mg/L	0.05	
Selenium	0.0002	mg/L	0.0001	0.05
Silicon	5.96	mg/L	0.01	
Silver	<0.0001	mg/L	0.0001	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Sodium	26.8	mg/L	0.05	20	*
Strontium	3.88	mg/L	0.0005		
Thallium	<0.0003	mg/L	0.0003		
Tin	0.0039	mg/L	0.0001		
Titanium	0.0016	mg/L	0.0004		
Tungsten	<0.0001	mg/L	0.0001		
Uranium	2.02	ug/L	0.002	20	
Vanadium	0.0004	mg/L	0.0001		
Zinc	0.091	mg/L	0.001		
Zirconium	<0.0004	mg/L	0.0004		
Escherichia coli	0	MPN/100mL	0	0	
Total Coliform	276	MPN/100mL	0	0	*
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	<0.2	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		
Dichloromethane	<0.5	ug/L	0.5	50	
Ethylbenzene	<0.2	ug/L	0.2	140	
m+p-Xylene	<0.4	ug/L	0.4		
o-Xylene	<0.2	ug/L	0.2		
Tetrachloroethylene	<0.2	ug/L	0.2	10	
Toluene	<0.2	ug/L	0.2	60	
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100	
Trichloroethylene	<0.2	ug/L	0.2	5	
Vinyl Chloride	<0.2	ug/L	0.2	1	
Xylene (Calculation)	<0.5	ug/L	0.5	90	
Travel Blank 2022-12-01 Record 683447					
Dissolved Organic Carbon	<0.4	mg/L	0.4		
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	<0.2	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		
Dichloromethane	<0.5	ug/L	0.5	50	
Ethylbenzene	<0.2	ug/L	0.2	140	
m+p-Xylene	<0.4	ug/L	0.4		
o-Xylene	<0.2	ug/L	0.2		
Tetrachloroethylene	<0.2	ug/L	0.2	10	
Toluene	<0.2	ug/L	0.2	60	
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100	
Trichloroethylene	<0.2	ug/L	0.2	5	
Vinyl Chloride	<0.2	ug/L	0.2	1	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Xylene (Calculation)	<0.5	ug/L	0.5	90

Report Comment: The ODWS does not specify a MAC for sodium, however, as per section 18 of the SDWA, sodium results above 20 mg/L on a regulatory sample are prescribed as adverse results with a duty to report as specified in the applicable regulation.

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2022-12-12
Date Submitted: 2022-12-13

Laboratory Work Order Number: 342367

Samples in this work order were analyzed using the following methods:

o-Phosphate Colourimetric	Alk/pH/Cond/Temp PC Titrate	Ammonia Skalar	Anions IC
Bacteria MPN	Colour Spectrophotometric	Cyanide Skalar	Fluoride-PC Titrate
LIMS Calculation	Mercury Cold Vapour AA	Metals ICP/MS	Silica Skalar
TOC/DOC Colourimetric	TSS/VSS Gravimetric	Turbidity Turbimeter	Volatile Organics-Purge&Trap/GC/MS

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.
Results have been compared to the stated specification, without taking into account measurement uncertainty. An asterisk (*) indicates the result has been found to be outside of that specification.
CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.
" † " indicates the analyte is not accredited to ISO/IEC 17025.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.

Final Report Approval by:

Jillian J. Thompson-Anderson
Quality Control Automation Technologist

ODWS (Amnd O.Reg.457/16) Jan2020 02

Hamilton Water

Monitoring Wells - Greensville GW - Pre-Pump Test

TW-1-13 2022-12-12 15:00:00 Record 684296

Analyte	Result	Units	MDL		
Alkalinity	286	mg/L	2		
Ammonia + Ammonium as N	0.05	mg/L	0.01		
Anion Sum (Calculation) †	8.2	me/L	0.1		
Bicarbonate as Carbonate (Calculation)	286	mg/L	2		
Bromide	<1	mg/L	1		
Cation Sum (Calculation) †	40.3	me/L	0.1		
Chloride	8.9	mg/L	0.5		
Colour (apparent)	30200	CU	2		
Conductivity	652	umhos/cm	4		
Cyanide - Total	<0.003	mg/L	0.003	0.2	
Dissolved Organic Carbon	1.6	mg/L	0.4		
Fluoride	0.24	mg/L	0.04	1.5	
Ion Balance (Calculation) †	66.3	%	0.1		
Nitrate as N	<0.1	mg/L	0.1	10.0	
Nitrate+Nitrite as N (Calculation)	<0.2	mg/L	0.2		
Nitrite as N	<0.05	mg/L	0.05	1.0	
o-Phosphate as P	<0.05	mg/L	0.05		
pH	7.46	pH	0.01		
pH - Saturation (Calculation) †	6.47	pH	0.01		
Silica-Reactive	19.7	mg/L	0.20		
Sulphate	73.7	mg/L	0.5		
Temperature	20.5	C	0.1		
Total Suspended Solids	6650	mg/L	0.8		
Turbidity	4580	NTU	0.05		
Aluminum	32.5	mg/L	0.002		
Antimony	0.0004	mg/L	0.0001	0.006	
Arsenic	0.303	mg/L	0.0001	0.010	*
Barium	0.382	mg/L	0.0001	1.0	
Beryllium	0.0015	mg/L	0.0001		
Bismuth	0.0004	mg/L	0.0001		
Boron	0.046	mg/L	0.010	5.0	
Cadmium	0.0007	mg/L	0.0001	0.005	
Calcium	446	mg/L	0.5		
Chromium	0.0530	mg/L	0.0001	0.05	*
Cobalt	0.0304	mg/L	0.0001		
Copper	0.0812	mg/L	0.0001		
Hardness (Calculation)	1400	mg/L	2		
Iron	217	mg/L	0.03		
Lead	0.694	mg/L	0.0001	0.010	*
Lithium	0.0765	mg/L	0.0005		
Magnesium	70.3	mg/L	0.05		
Manganese	2.76	mg/L	0.0001		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0016	mg/L	0.0001		
Nickel	0.0661	mg/L	0.0001		
Phosphorus Total	3.88	mg/L	0.010		
Potassium	6.38	mg/L	0.05		
Selenium	0.0002	mg/L	0.0001	0.05	
Silicon	52.1	mg/L	0.01		
Silver	0.0002	mg/L	0.0001		
Sodium	8.12	mg/L	0.05	20	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Strontium	6.65	mg/L	0.0005	
Thallium	0.0005	mg/L	0.0003	
Tin	0.0008	mg/L	0.0001	
Titanium	0.622	mg/L	0.0004	
Tungsten	0.0007	mg/L	0.0001	
Uranium	0.662	ug/L	0.002	20
Vanadium	0.0693	mg/L	0.0001	
Zinc	0.774	mg/L	0.001	
Zirconium	0.0153	mg/L	0.0004	
Escherichia coli	0	MPN/100mL	0	0
Total Coliform	0	MPN/100mL	0	0
1,1-Dichloroethylene	<0.2	ug/L	0.2	14
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200
1,2-Dichloroethane	<0.2	ug/L	0.2	5
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5
Benzene	<0.2	ug/L	0.2	1
Bromodichloromethane	<0.2	ug/L	0.2	
Bromoform	<0.2	ug/L	0.2	
Carbon Tetrachloride	<0.2	ug/L	0.2	2
Chlorobenzene	<0.3	ug/L	0.3	80
Chloroform	<0.2	ug/L	0.2	
Dibromochloromethane	<0.2	ug/L	0.2	
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	3.1	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90

TW-3-13 2022-12-12 15:30:00 Record 684297

Alkalinity	274	mg/L	2	
Ammonia + Ammonium as N	0.03	mg/L	0.01	
Anion Sum (Calculation) †	7.6	me/L	0.1	
Bicarbonate as Carbonate (Calculation)	274	mg/L	2	
Bromide	<1	mg/L	1	
Cation Sum (Calculation) †	7.4	me/L	0.1	
Chloride	14.3	mg/L	0.5	
Colour (apparent)	13900	CU	2	
Conductivity	596	umhos/cm	4	
Cyanide - Total	<0.003	mg/L	0.003	0.2
Dissolved Organic Carbon	1.9	mg/L	0.4	
Fluoride	0.19	mg/L	0.04	1.5
Ion Balance (Calculation) †	1.7	%	0.1	
Nitrate as N	<0.1	mg/L	0.1	10.0
Nitrate+Nitrite as N (Calculation)	<0.2	mg/L	0.2	
Nitrite as N	<0.05	mg/L	0.05	1.0
o-Phosphate as P	<0.05	mg/L	0.05	
pH	7.58	pH	0.01	
pH - Saturation (Calculation) †	7.03	pH	0.01	
Silica-Reactive	13.9	mg/L	0.20	
Sulphate	66.1	mg/L	0.5	
Temperature	20.6	C	0.1	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02	
Total Suspended Solids	3610	mg/L	0.8		
Turbidity	3640	NTU	0.05		
Aluminum	0.243	mg/L	0.002		
Antimony	0.0002	mg/L	0.0001	0.006	
Arsenic	0.0024	mg/L	0.0001	0.010	
Barium	0.0461	mg/L	0.0001	1.0	
Beryllium	<0.0001	mg/L	0.0001		
Bismuth	<0.0001	mg/L	0.0001		
Boron	0.015	mg/L	0.010	5.0	
Cadmium	0.0003	mg/L	0.0001	0.005	
Calcium	95.0	mg/L	0.05		
Chromium	0.0013	mg/L	0.0001	0.05	
Cobalt	0.0009	mg/L	0.0001		
Copper	0.0038	mg/L	0.0001		
Hardness (Calculation)	335	mg/L	0.3		
Iron	7.31	mg/L	0.003		
Lead	0.0129	mg/L	0.0001	0.010	*
Lithium	0.0098	mg/L	0.0005		
Magnesium	23.7	mg/L	0.05		
Manganese	0.0665	mg/L	0.0001		
Mercury	<0.05	ug/L	0.05	1	
Molybdenum	0.0009	mg/L	0.0001		
Nickel	0.0062	mg/L	0.0001		
Phosphorus Total	0.031	mg/L	0.010		
Potassium	1.21	mg/L	0.05		
Selenium	0.0005	mg/L	0.0001	0.05	
Silicon	7.93	mg/L	0.01		
Silver	<0.0001	mg/L	0.0001		
Sodium	7.95	mg/L	0.05	20	
Strontium	0.425	mg/L	0.0005		
Thallium	0.0003	mg/L	0.0003		
Tin	<0.0001	mg/L	0.0001		
Titanium	0.0072	mg/L	0.0004		
Tungsten	0.0002	mg/L	0.0001		
Uranium	1.11	ug/L	0.002	20	
Vanadium	0.0024	mg/L	0.0001		
Zinc	0.237	mg/L	0.001		
Zirconium	0.0007	mg/L	0.0004		
Escherichia coli	0	MPN/100mL	0	0	
Total Coliform	1	MPN/100mL	0	0	*
1,1-Dichloroethylene	<0.2	ug/L	0.2	14	
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200	
1,2-Dichloroethane	<0.2	ug/L	0.2	5	
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5	
Benzene	<0.2	ug/L	0.2	1	
Bromodichloromethane	<0.2	ug/L	0.2		
Bromoform	<0.2	ug/L	0.2		
Carbon Tetrachloride	<0.2	ug/L	0.2	2	
Chlorobenzene	<0.3	ug/L	0.3	80	
Chloroform	<0.2	ug/L	0.2		
Dibromochloromethane	<0.2	ug/L	0.2		
Dichloromethane	<0.5	ug/L	0.5	50	
Ethylbenzene	<0.2	ug/L	0.2	140	
m+p-Xylene	<0.4	ug/L	0.4		
o-Xylene	<0.2	ug/L	0.2		
Tetrachloroethylene	<0.2	ug/L	0.2	10	
Toluene	<0.2	ug/L	0.2	60	

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90
Travel Blank 2022-12-12 Record 684298				
Dissolved Organic Carbon	<0.4	mg/L	0.4	
1,1-Dichloroethylene	<0.2	ug/L	0.2	14
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200
1,2-Dichloroethane	<0.2	ug/L	0.2	5
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5
Benzene	<0.2	ug/L	0.2	1
Bromodichloromethane	<0.2	ug/L	0.2	
Bromoform	<0.2	ug/L	0.2	
Carbon Tetrachloride	<0.2	ug/L	0.2	2
Chlorobenzene	<0.3	ug/L	0.3	80
Chloroform	<0.2	ug/L	0.2	
Dibromochloromethane	<0.2	ug/L	0.2	
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90

Report Comment: The ODWS does not specify a MAC for sodium, however, as per section 18 of the SDWA, sodium results above 20 mg/L on a regulatory sample are prescribed as adverse results with a duty to report as specified in the applicable regulation.

Certificate of Analysis

City of Hamilton
Environmental Laboratory
700 Woodward Avenue, Hamilton, ON L8H 6P4
P. (905) 546-2424 F. (905)545-0234

CLIENT INFORMATION

Client Name: HAMILTON WATER
Attention: CARMEN VEGA

Address: 100 KING STREET WEST, LEVEL 9
HAMILTON
L8P 1A2

LABORATORY INFORMATION

Sample Date: 2023-05-16
Date Submitted: 2023-05-16

Laboratory Work Order Number: 343966

Samples in this work order were analyzed using the following methods:

o-Phosphate Colourimetric	Alk/pH/Cond/Temp PC Titrate	Ammonia Skalar	Anions IC
Bacteria MPN	Colour Spectrophotometric	Cyanide Skalar	Fluoride-PC Titrate
LIMS Calculation	Mercury Cold Vapour AA	Metals ICP/MS	Silica Skalar
TOC/DOC Colourimetric	TSS/VSS Gravimetric	Turbidity Turbimeter	Volatile Organics-Purge&Trap/GC/MS

NOTES:
'<' = less than the Method Detection Limit (MDL), 'IS' = Insufficient Sample, '>' = greater than the reported result.
Results have been compared to the stated specification, without taking into account measurement uncertainty. An asterisk (*) indicates the result has been found to be outside of that specification.
CHEL is accredited by CALA to ISO/IEC 17025 for specific parameters on its scope of accreditation.
" † " indicates the analyte is not accredited to ISO/IEC 17025.

Methods used by the City of Hamilton's Environmental Laboratory (CHEL) are based upon or modified from those found in published reference methods. Specific information on the methods used and equations used for calculated analytes are available upon request.
All analytical work performed at the CHEL is done according to accepted quality assurance and quality control procedures. Quality and other related data as well as uncertainty values are available upon request.

The results on this Certificate of Analysis relate only to the sample as received and analyzed.
Field data provided by the customer is identified as such and can affect the validity of CHEL's results.

Final Report Approval by:

Jillian J. Thompson-Anderson
Quality Control Automation Technologist

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02

Hamilton Water

Monitoring Wells - Greensville GW - Post Pump Test

63 Tews Ln 2023-05-16 11:31:00 Record 695093

Alkalinity	269	mg/L	2	
Ammonia + Ammonium as N	0.04	mg/L	0.01	
Anion Sum (Calculation) †	9.0	me/L	0.1	
Bicarbonate as Carbonate (Calculation)	269	mg/L	2	
Bromide	<0.2	mg/L	0.2	
Cation Sum (Calculation) †	8.6	me/L	0.1	
Chloride	38.1	mg/L	0.5	
Colour (apparent)	26	CU	2	
Conductivity	775	umhos/cm	4	
Cyanide - Total	<0.003	mg/L	0.003	0.2
Dissolved Organic Carbon	0.6	mg/L	0.4	
Fluoride	0.32	mg/L	0.04	1.5
Ion Balance (Calculation) †	2.2	%	0.1	
Nitrate as N	<0.02	mg/L	0.02	10.0
Nitrate+Nitrite as N (Calculation)	<0.03	mg/L	0.03	
Nitrite as N	<0.01	mg/L	0.01	1.0
o-Phosphate as P	<0.05	mg/L	0.05	
pH	7.82	pH	0.01	
pH - Saturation (Calculation) †	6.97	pH	0.01	
Silica-Reactive	21.5	mg/L	0.20	
Sulphate	94.2	mg/L	0.5	
Temperature	22.3	C	0.1	
Total Suspended Solids	<1	mg/L	1	
Turbidity	2.19	NTU	0.05	
Aluminum	<0.002	mg/L	0.002	
Antimony	<0.0001	mg/L	0.0001	0.006
Arsenic	0.0019	mg/L	0.0001	0.010
Barium	0.0529	mg/L	0.0001	1.0
Beryllium	<0.0001	mg/L	0.0001	
Bismuth	<0.0001	mg/L	0.0001	
Boron	0.026	mg/L	0.010	5.0
Cadmium	<0.0001	mg/L	0.0001	0.005
Calcium	109	mg/L	0.05	
Chromium	<0.0001	mg/L	0.0001	0.05
Cobalt	<0.0001	mg/L	0.0001	
Copper	0.0002	mg/L	0.0001	
Hardness (Calculation)	386	mg/L	0.3	
Iron	0.830	mg/L	0.003	
Lead	0.0001	mg/L	0.0001	0.010
Lithium	0.0117	mg/L	0.0005	
Magnesium	27.7	mg/L	0.05	
Manganese	0.0234	mg/L	0.0001	
Mercury	<0.05	ug/L	0.05	1
Molybdenum	0.0011	mg/L	0.0001	
Nickel	0.0002	mg/L	0.0001	
Phosphorus Total	<0.010	mg/L	0.010	
Potassium	1.26	mg/L	0.05	
Selenium	<0.0001	mg/L	0.0001	0.05
Silicon	10.3	mg/L	0.01	
Silver	<0.0001	mg/L	0.0001	
Sodium	15.6	mg/L	0.05	20

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02
Strontium	6.28	mg/L	0.0005	
Thallium	<0.0003	mg/L	0.0003	
Tin	<0.0001	mg/L	0.0001	
Titanium	0.0006	mg/L	0.0001	
Tungsten	<0.0001	mg/L	0.0001	
Uranium	0.167	ug/L	0.002	20
Vanadium	<0.0001	mg/L	0.0001	
Zinc	0.013	mg/L	0.001	
Zirconium	<0.0004	mg/L	0.0004	
Escherichia coli	0	MPN/100mL	0	0
Total Coliform	0	MPN/100mL	0	0
1,1-Dichloroethylene	<0.2	ug/L	0.2	14
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200
1,2-Dichloroethane	<0.2	ug/L	0.2	5
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5
Benzene	<0.2	ug/L	0.2	1
Bromodichloromethane	<0.2	ug/L	0.2	
Bromoform	<0.2	ug/L	0.2	
Carbon Tetrachloride	<0.2	ug/L	0.2	2
Chlorobenzene	<0.3	ug/L	0.3	80
Chloroform	<0.2	ug/L	0.2	
Dibromochloromethane	<0.2	ug/L	0.2	
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90
Travel Blank 2023-05-16 Record 695094				
1,1-Dichloroethylene	<0.2	ug/L	0.2	14
1,2-Dichlorobenzene	<0.2	ug/L	0.2	200
1,2-Dichloroethane	<0.2	ug/L	0.2	5
1,4-Dichlorobenzene	<0.2	ug/L	0.2	5
Benzene	<0.2	ug/L	0.2	1
Bromodichloromethane	<0.2	ug/L	0.2	
Bromoform	<0.2	ug/L	0.2	
Carbon Tetrachloride	<0.2	ug/L	0.2	2
Chlorobenzene	<0.3	ug/L	0.3	80
Chloroform	<0.2	ug/L	0.2	
Dibromochloromethane	<0.2	ug/L	0.2	
Dichloromethane	<0.5	ug/L	0.5	50
Ethylbenzene	<0.2	ug/L	0.2	140
m+p-Xylene	<0.4	ug/L	0.4	
o-Xylene	<0.2	ug/L	0.2	
Tetrachloroethylene	<0.2	ug/L	0.2	10
Toluene	<0.2	ug/L	0.2	60
Total Trihalomethanes (Calculation)	<0.4	ug/L	0.4	100
Trichloroethylene	<0.2	ug/L	0.2	5
Vinyl Chloride	<0.2	ug/L	0.2	1
Xylene (Calculation)	<0.5	ug/L	0.5	90

Analyte	Result	Units	MDL	ODWS (Amnd O.Reg.457/16) Jan2020 02

Report Comment: The ODWS does not specify a MAC for sodium, however, as per section 18 of the SDWA, sodium results above 20 mg/L on a regulatory sample are prescribed as adverse results with a duty to report as specified in the applicable regulation.

Laboratory Certificates of Analysis
York Region Laboratory

APPENDIX D

Terraprobe Inc.

York-Durham Regional Environmental Laboratory
901 McKay Road
Pickering, ON L1W 3A3
Phone (905)686-0041 Fax (905)686-0664

LABORATORY ANALYSIS REPORT

Work Order #: 98457 **Work ID:** REL22-5371

Project Description: Johnson Tews Park 72hr Pump Test TW-2-13
Client: City of Hamilton
Profile: Non-regulated Water Sampling
Sampled By: Marco Silverio
Sample Count: 3

Report To: Marco Silverio
City of Hamilton
100 King St. West
Level 9
Hamilton,
marco.silverio@hamilton.ca

Authorized by: Sarah Ostler, Acting Laboratory Supervisor

Workorder Summary

Workorder Comments

Cryptosporidium and Giardia Internal Control – Percent Recovery: Cryptosporidium, 75%; Giardia, 73%.
Microscopic Particulate Analysis - Parameter results have been adjusted to reflect 100L of the original sample volume.

Analysis Results Comments

9845701 (TW-2-13) - Filtered Volume

Value provided by client.

Task Comments

9845701 - 4439555 - MBI/69858

The bioindicators Giardia, Cryptosporidium, Diatoms, Other Algae, Rotifers, Insect/Larvae and Plant Debris (Chlorophyll containing), were calculated to have a relative risk factor of 0 (not significant). According to the USEPA Consensus method (1992, EPA910/9-92-029) the relative risk score of surface water contamination is 0 – Low Risk.

Analytical Results

Parameter	Results	Units	MDL	RDL	DF	Limit	Prepared	Analyzed	C
Lab ID: 9845701	**Sample ID:** TW-2-13		**Criteria:** Cryptosporidium & Giardia					**Date Received:** 12/14/2022	
Matrix: Water	**Location:** MPA Envirochek - HV							**Date Collected:** 12/13/2022	
Type: Ground Water	**Description:**								
CRYPTOSPORIDIUM / GIARDIA (RELM-9)									
Filtered Volume	**333**	L					12/15/2022	12/17/2022	
Cryptosporidium oocysts	0	n/a	1	1	1	0	12/15/2022	12/17/2022	
Giardia cysts	0	n/a	1	1	1	0	12/15/2022	12/17/2022	
PHYTOPLANKTON (RELM-15)									
Algae 2-7um	0	n/a		3.6	1		12/19/2022	12/19/2022	
Algae 7-15um	0	n/a		3.6	1		12/19/2022	12/19/2022	
Algae >15um	0	n/a		3.6	1		12/19/2022	12/19/2022	
Amoebae	0	n/a		3.6	1		12/19/2022	12/19/2022	
Crustaceans, Parts	0	n/a		3.6	1		12/19/2022	12/19/2022	
Diatoms	0	n/a		3.6	1		12/19/2022	12/19/2022	
Filtered Volume	**333**	L					12/19/2022	12/19/2022	*

Legend: MDL = Method Detection Limit; RDL = Reporting Detection Limit; MU = Measurement Uncertainty; < or ND = Less Than or Non-detect; ^ = Result outside limit; Limit = MAC; DF = Dilution Factor; OG = Operational Guideline; AO = Aesthetic Objective; HC = Health Canada; C = Comment; * = Comment Present

York-Durham Regional Environmental Laboratory
901 McKay Road
Pickering, ON L1W 3A3
Phone (905)686-0041 Fax (905)686-0664

LABORATORY ANALYSIS REPORT

Work Order #: 98457 **Work ID:** REL22-5371

Analytical Results

Parameter	Results	Units	MDL	RDL	DF	Limit	Prepared	Analyzed	C
Gastrotrichs	0	n/a		3.6	1		12/19/2022	12/19/2022	
Insects, Parts	0	n/a		3.6	1		12/19/2022	12/19/2022	
Invertebrate eggs	0	n/a		3.6	1		12/19/2022	12/19/2022	
Nematodes, eggs	0	n/a		3.6	1		12/19/2022	12/19/2022	
Pollen	0	n/a		3.6	1		12/19/2022	12/19/2022	
Protozoa	0	n/a		3.6	1		12/19/2022	12/19/2022	
Rotifers, eggs	0	n/a		3.6	1		12/19/2022	12/19/2022	
Spores	0	n/a		3.6	1		12/19/2022	12/19/2022	
Tardigrades	0	n/a		3.6	1		12/19/2022	12/19/2022	
Vegetative debris	0	n/a		3.6	1		12/19/2022	12/19/2022	

Lab ID: 9845702 **Sample ID:** TW-2-13 **Criteria:** N/A **Date Received:** 12/14/2022
Matrix: Water **Location:** F - Coliphage **Date Collected:** 12/13/2022
Type: Ground Water **Description:** Bed Rock Well

COLIPHAGES (RELM-16)

Male-Spec. Coliphage DNA+RNA	0	PFU/100mL	1	1	1		12/14/2022	12/15/2022	
Male-Spec. Coliphage RNA	0	PFU/100mL	1	1	1		12/14/2022	12/15/2022	

Lab ID: 9845703 **Sample ID:** Surface Water **Criteria:** N/A **Date Received:** 12/14/2022
Matrix: Water **Location:** F - Coliphage **Date Collected:** 12/13/2022
Type: Surface Water **Description:**

COLIPHAGES (RELM-16)

Male-Spec. Coliphage DNA+RNA	0	PFU/100mL	1	1	1		12/14/2022	12/15/2022	
Male-Spec. Coliphage RNA	0	PFU/100mL	1	1	1		12/14/2022	12/15/2022	

Legend: MDL = Method Detection Limit; RDL = Reporting Detection Limit; MU = Measurement Uncertainty; < or ND = Less Than or Non-detect; ^ = Result outside limit; Limit = MAC; DF = Dilution Factor; OG = Operational Guideline; AO = Aesthetic Objective; HC = Health Canada; C = Comment; * = Comment Present

York-Durham Regional Environmental Laboratory

901 McKay Road
Pickering, ON L1W 3A3
Phone (905)686-0041 Fax (905)686-0664

LABORATORY ANALYSIS REPORT

Work Order #: 98457 **Work ID:** REL22-5371

York Region

York-Durham
Regional Environmental Laboratory
901 McKay Road, Pickering ON L1W 3A3 Toll Free: 1-877-551-8877 Local: 905-686-0041
Fax: 905-686-0664 Email: rel@durham.ca Web: www.durham.ca

REL22-5371

Page 1 of

Non-regulated Water, Wastewater,Biosolid,Soil
Chain of Custody Form

Client Information		Invoice To (leave blank if same as Client)		Report to (email address)	
Company Name:	City of Hamilton	Company:		1)	marco.silveiro@hamilton.ca
Facility Name:	Hamilton Water / Watershed Management			2)	praepple@Terraprobe.ca
Facility Address:	100 King St. West Level 9	Quote #:		3)	
Facility Contact:	Marco Silveiro	PO #:		4)	
Email:	marco.silveiro@hamilton.ca	Tel: (905)546 2424 ext 6099		5)	

Project Information (if applicable)
Description: Johnson Tews Park 72h Pump Test TW-2-13

Standard Turnaround Time (TAT) is 10 business days ☐ *RUSH *Rush TAT requires lab approval in advance. Surcharge will apply.

Sample(s) Information

Lab ID (lab use only)	Field ID	Location/Description/Comment(s)	Matrix	Type	Collection mm-dd-yy	Collection HH:MM	Test Group(s)	Container Type	Container Sent	Container Rec'd	Chlorine Free	Chlorine Total	Apply Criteria (Y/N) (*1)
01	TW-2-13	MPA Envirocheck -HV		~~SW~~ GW	12-13-22	16:15	NBCGMPA	Cartridge		1			
02	TW-2-13	F. Coliphage - BED ROCK WELL		GW	12-13-22	16:10	F- Coliphage MBCPF	Bottles		2			
03	Surface water	F. Coliphage		~~GW~~ SW	12-13-22	15:41	F-Coliphage NBCPF	Bottles		2			
		*SEE LINE FOR ATTACHED EMAIL											
					Dec 14/2022 RK								

Sampled By: MARCO SILVEIRO Tel: (905)546 2424 ext 6099

Relinquished By (Print/Sign): MARCO SILVEIRO Date/Time: December 13, 2022 17:46

(1) Select One Applicable Criteria — Provide Municipality / City / Description
☐ Sanitary Sewer Use By-law
☐ Storm Sewer Use By-law
☐ New Water Main
☒ Other — Groundwater Well Pump Test

LABORATORY USE ONLY

Delivery Method: Courier ☑ Drop Off ☐ YDREL Pickup ☐
Sorted by: Labelled by:
Checked by: Proofed by:
WO #: 98457

98457

'ved Date/Time:
'ved By: SK
nents:

DEC 14 2022 12:47

Incomplete COC Temp - 15.2°C

REL-COC-NONREG-NOV-2019-REV-1

Legend: MDL = Method Detection Limit; RDL = Reporting Detection Limit; MU = Measurement Uncertainty; < or ND = Less Than or Non-detect; ^ = Result outside limit; Limit = MAC; DF = Dilution Factor; OG = Operational Guideline; AO = Aesthetic Objective; HC = Health Canada; C = Comment; * = Comment Present

York-Durham Regional Environmental Laboratory
901 McKay Road
Pickering, ON L1W 3A3
Phone (905)686-0041 Fax (905)686-0664

LABORATORY ANALYSIS REPORT

Work Order #: 98496 **Work ID:** REL22-5157

Project Description: 72hr Pump test of Bedrock well TW-2-13
Client: City of Hamilton
Profile: Non-regulated Water Sampling
Sampled By: Marco Silverio
Sample Count: 2

Report To: Marco Silverio
City of Hamilton
100 King St. West
Level 9
Hamilton,
marco.silverio@hamilton.ca

Authorized by: Sarah Ostler, Acting Laboratory Supervisor

Workorder Summary

Workorder Comments

Cryptosporidium and Giardia Internal Control – Percent Recovery: Cryptosporidium, 75%; Giardia, 73%.
Microscopic Particulate Analysis - Parameter results have been adjusted to reflect 100L of the original sample volume.

Analysis Results Comments

9849601 (TW-2-13) - Filtered Volume

Value provided by client.

Task Comments

9849601 - 4441443 - MBI/69858

The bioindicators Giardia, Cryptosporidium, Diatoms, Other Algae, Rotifers, Insect/Larvae and Plant Debris (Chlorophyll containing), were calculated to have a relative risk factor of 0 (not significant). According to the USEPA Consensus method (1992, EPA910/9-92-029) the relative risk score of surface water contamination is 0 – Low Risk.

Analytical Results

Parameter	Results	Units	MDL	RDL	DF	Limit	Prepared	Analyzed	C
Lab ID: 9849601	**Sample ID:**	TW-2-13	**Criteria:**	Cryptosporidium & Giardia				**Date Received:**	12/15/2022
Matrix: Water	**Location:**	TW-2-13 Well						**Date Collected:**	12/14/2022
Type: Ground Water	**Description:**	Crypto/Giardia MPA (48hr)							
CRYPTOSPORIDIUM / GIARDIA (RELM-9)									
Filtered Volume	**361**	L					12/15/2022	12/17/2022	
Cryptosporidium oocysts	0	n/a	1	1	1	0	12/15/2022	12/17/2022	
Giardia cysts	0	n/a	1	1	1	0	12/15/2022	12/17/2022	
PHYTOPLANKTON (RELM-15)									
Algae 2-7um	0	n/a		3.3	1		12/19/2022	12/19/2022	
Algae 7-15um	0	n/a		3.3	1		12/19/2022	12/19/2022	
Algae >15um	0	n/a		3.3	1		12/19/2022	12/19/2022	
Amoebae	0	n/a		3.3	1		12/19/2022	12/19/2022	
Crustaceans, Parts	0	n/a		3.3	1		12/19/2022	12/19/2022	
Diatoms	0	n/a		3.3	1		12/19/2022	12/19/2022	
Filtered Volume	361	L					12/19/2022	12/19/2022	*

Legend: MDL = Method Detection Limit; RDL = Reporting Detection Limit; MU = Measurement Uncertainty; < or ND = Less Than or Non-detect; ^ = Result outside limit; Limit = MAC; DF = Dilution Factor; OG = Operational Guideline; AO = Aesthetic Objective; HC = Health Canada; C = Comment; * = Comment Present

York-Durham Regional Environmental Laboratory
901 McKay Road
Pickering, ON L1W 3A3
Phone (905)686-0041 Fax (905)686-0664

LABORATORY ANALYSIS REPORT

Work Order #: 98496 **Work ID:** REL22-5157

Analytical Results

Parameter	Results	Units	MDL	RDL	DF	Limit	Prepared	Analyzed	C
Gastrotrichs	0	n/a		3.3	1		12/19/2022	12/19/2022	
Insects, Parts	0	n/a		3.3	1		12/19/2022	12/19/2022	
Invertebrate eggs	0	n/a		3.3	1		12/19/2022	12/19/2022	
Nematodes, eggs	0	n/a		3.3	1		12/19/2022	12/19/2022	
Pollen	0	n/a		3.3	1		12/19/2022	12/19/2022	
Protozoa	0	n/a		3.3	1		12/19/2022	12/19/2022	
Rotifers, eggs	0	n/a		3.3	1		12/19/2022	12/19/2022	
Spores	0	n/a		3.3	1		12/19/2022	12/19/2022	
Tardigrades	0	n/a		3.3	1		12/19/2022	12/19/2022	
Vegetative debris	0	n/a		3.3	1		12/19/2022	12/19/2022	

Lab ID: 9849602 **Sample ID:** TW-2-13 **Criteria:** N/A **Date Received:** 12/15/2022
Matrix: Water **Location:** TW-2-13 Well **Date Collected:** 12/14/2022
Type: Ground Water **Description:** F-Coliphage 48hr

COLIPHAGES (RELM-16)

Male-Spec. Coliphage DNA+RNA	0	PFU/100mL	1	1	1		12/16/2022	12/17/2022	
Male-Spec. Coliphage RNA	0	PFU/100mL	1	1	1		12/16/2022	12/17/2022	

Legend: MDL = Method Detection Limit; RDL = Reporting Detection Limit; MU = Measurement Uncertainty; < or ND = Less Than or Non-detect; ^ = Result outside limit; Limit = MAC; DF = Dilution Factor; OG = Operational Guideline; AO = Aesthetic Objective; HC = Health Canada; C = Comment; * = Comment Present

York-Durham Regional Environmental Laboratory

901 McKay Road
Pickering, ON L1W 3A3
Phone (905)686-0041 Fax (905)686-0664

LABORATORY ANALYSIS REPORT

Work Order #: 98496 **Work ID:** REL22-5157

York Region / York-Durham Regional Environmental Laboratory
901 McKay Road, Pickering ON L1W 3A3 Toll Free: 1-877-551-8877 Local: 905-686-0041
Fax: 905-686-0664 Email: rel@durham.ca Web: www.durham.ca

REL22-5157

Page 1 of

Non-regulated Water, Wastewater,Biosolid,Soil
Chain of Custody Form

Client Information	Invoice To (leave blank if same as Client)	Report to (email address)
Company Name: City of Hamilton	Company:	1) marco.silverio@hamilton.ca
Facility Name: Hamilton Water - Watershed Management		2) praipple@tenpolve.ca
Facility Address: 100 King ST. West Level 9	Quote #:	3)
Facility Contact: Marco Silverio	PO #:	4)
Email: marco.silverio@hamilton.ca Tel: (905) 546 2424 ext. 6098		5)

Project Information (if applicable)
Description: 72h pump test of backup well TW-2-13

Standard Turnaround Time (TAT) is 10 business days ☐ *RUSH *Rush TAT requires lab approval in advance. Surcharge will apply.

Sample(s) Information

Lab ID (lab use only)	Field ID	Location/Description/Comment(s)	Matrix	Type	Collection mm-dd-yy	Collection HH:MM	Test Group(s)	Container Type	Container Sent	Container Rec'd	Chlorine Free	Chlorine Total	Apply Criteria (Y/N) (*1)
01	TW-2-13	TW-2-13 Well - Crypto/Giardia (HPA (48h)	WA	GW	12-14-22	15:47	MBCGHPA	Cartridge	1	1			
02	TW-2-13	TW-2-13 Well - E-Coli/Image (48h)	WA	GW	12-14-22	15:50	MBC PF	Bottles	2	2			

Sampled By: Marco Silverio Tel: (905) 546 2424 ext. 6098

Relinquished By (Print/Sign): MARCO SILVERIO Date/Time: December 14, 2022 17:36

(1) Select One Applicable Criteria — Provide Municipality / City / Description
☐ Sanitary Sewer Use By-law
☐ Storm Sewer Use By-law
☐ New Water Main
☒ Other Groundwater Well Pumps at John Lewis Park in Hamilton

LABORATORY USE ONLY
Delivery Method: Courier ☑ Drop Off ☐ YDREL Pickup ☐
Sorted by: Labelled by:
Checked by: Proofed by: WO #: 98496

98496

Date/Time:
By:
nts:

DEC 15 2022 10:53

Temp 10.4°C

REL-COC-NONREG-NOV-2019-REV-1

Legend: MDL = Method Detection Limit; RDL = Reporting Detection Limit; MU = Measurement Uncertainty; < or ND = Less Than or Non-detect; ^ = Result outside limit; Limit = MAC; DF = Dilution Factor; OG = Operational Guideline; AO = Aesthetic Objective; HC = Health Canada; C = Comment; * = Comment Present

York-Durham Regional Environmental Laboratory
901 McKay Road
Pickering, ON L1W 3A3
Phone (905)686-0041 Fax (905)686-0664

LABORATORY ANALYSIS REPORT

Work Order #: 98574 **Work ID:** REL22-5159

Project Description: 72hr Pump Test of Bedrock Well TW-2-13
Client: City of Hamilton
Profile: Non-regulated Water Sampling
Sampled By: Marco Silverio
Sample Count: 2

Report To: Marco Silverio
City of Hamilton
100 King St. West
Level 9
Hamilton,
marco.silverio@hamilton.ca

Authorized by: Sarah Ostler, Acting Laboratory Supervisor

Workorder Summary

Workorder Comments

Cryptosporidium and Giardia Internal Control – Percent Recovery: Cryptosporidium, 75%; Giardia, 73%.
Microscopic Particulate Analysis - Parameter results have been adjusted to reflect 100L of the original sample volume.

Analysis Results Comments

9857401 (TW-2-13) - Filtered Volume

Value provided by client.

Task Comments

9857401 - 4443805 - MBI/69858

The bioindicators Giardia, Cryptosporidium, Diatoms, Other Algae, Rotifers, Insect/Larvae and Plant Debris (Chlorophyll containing), were calculated to have a relative risk factor of 0 (not significant). According to the USEPA Consensus method (1992, EPA910/9-92-029) the relative risk score of surface water contamination is 0 – Low Risk.

Analytical Results

Parameter	Results	Units	MDL	RDL	DF	Limit	Prepared	Analyzed	C
Lab ID: 9857401	**Sample ID:**	TW-2-13	**Criteria:**	Cryptosporidium & Giardia				**Date Received:**	12/16/2022
Matrix: Water	**Location:**	TW-2-13 Well						**Date Collected:**	12/15/2022
Type: Ground Water	**Description:**	Crypto/Giardia/ MPA 72 hr							
CRYPTOSPORIDIUM / GIARDIA (RELM-9)									
Filtered Volume	**317**	L					12/16/2022	12/17/2022	
Cryptosporidium oocysts	0	n/a	1	1	1	0	12/16/2022	12/17/2022	
Giardia cysts	0	n/a	1	1	1	0	12/16/2022	12/17/2022	
PHYTOPLANKTON (RELM-15)									
Algae 2-7um	0	n/a		3.8	1		12/19/2022	12/19/2022	
Algae 7-15um	0	n/a		3.8	1		12/19/2022	12/19/2022	
Algae >15um	0	n/a		3.8	1		12/19/2022	12/19/2022	
Amoebae	0	n/a		3.8	1		12/19/2022	12/19/2022	
Crustaceans, Parts	0	n/a		3.8	1		12/19/2022	12/19/2022	
Diatoms	0	n/a		3.8	1		12/19/2022	12/19/2022	
Filtered Volume	**317**	L					12/19/2022	12/19/2022	*

Legend: MDL = Method Detection Limit; RDL = Reporting Detection Limit; MU = Measurement Uncertainty; < or ND = Less Than or Non-detect; ^ = Result outside limit; Limit = MAC; DF = Dilution Factor; OG = Operational Guideline; AO = Aesthetic Objective; HC = Health Canada; C = Comment; * = Comment Present

York-Durham Regional Environmental Laboratory
901 McKay Road
Pickering, ON L1W 3A3
Phone (905)686-0041 Fax (905)686-0664

LABORATORY ANALYSIS REPORT

Work Order #: 98574 **Work ID:** REL22-5159

Analytical Results

Parameter	Results	Units	MDL	RDL	DF	Limit	Prepared	Analyzed	C
Gastrotrichs	0	n/a		3.8	1		12/19/2022	12/19/2022	
Insects, Parts	0	n/a		3.8	1		12/19/2022	12/19/2022	
Invertebrate eggs	0	n/a		3.8	1		12/19/2022	12/19/2022	
Nematodes, eggs	0	n/a		3.8	1		12/19/2022	12/19/2022	
Pollen	0	n/a		3.8	1		12/19/2022	12/19/2022	
Protozoa	0	n/a		3.8	1		12/19/2022	12/19/2022	
Rotifers, eggs	0	n/a		3.8	1		12/19/2022	12/19/2022	
Spores	0	n/a		3.8	1		12/19/2022	12/19/2022	
Tardigrades	0	n/a		3.8	1		12/19/2022	12/19/2022	
Vegetative debris	0	n/a		3.8	1		12/19/2022	12/19/2022	

Lab ID: 9857402 **Sample ID:** TW-2-13 **Criteria:** N/A **Date Received:** 12/16/2022
Matrix: Water **Location:** TW-2-13 Well **Date Collected:** 12/15/2022
Type: Ground Water **Description:** F.Coliphage 72 hr

COLIPHAGES (RELM-16)

Male-Spec. Coliphage DNA+RNA	0	PFU/100mL	1	1	1		12/16/2022	12/17/2022	
Male-Spec. Coliphage RNA	0	PFU/100mL	1	1	1		12/16/2022	12/17/2022	

Legend: MDL = Method Detection Limit; RDL = Reporting Detection Limit; MU = Measurement Uncertainty; < or ND = Less Than or Non-detect; ^ = Result outside limit; Limit = MAC; DF = Dilution Factor; OG = Operational Guideline; AO = Aesthetic Objective; HC = Health Canada; C = Comment; * = Comment Present

York-Durham Regional Environmental Laboratory

901 McKay Road
Pickering, ON L1W 3A3
Phone (905)686-0041 Fax (905)686-0664

LABORATORY ANALYSIS REPORT

Work Order #: 98574 **Work ID:** REL22-5159

York Region | York-Durham Regional Environmental Laboratory
901 McKay Road, Pickering ON L1W 3A3 Toll Free: 1-877-551-8877 Local: 905-686-0041
Fax: 905-686-0664 Email: rel@durham.ca Web: www.durham.ca

REL22-5159

Page 1 of

Non-regulated Water, Wastewater,Biosolid,Soil
Chain of Custody Form

Client Information	Invoice To (leave blank if same as Client)	Report to (email address)
Company Name: City of Hamilton	Company:	1) marco.silverio@hamilton.ca
Facility Name: Hamilton Water - Watershed Management		2) pwapple@torontolake.ca
Facility Address: 100 King St. West Level 9	Quote #:	3)
Facility Contact: Marco Silverio	PO #:	4)
Email: marco.silverio@hamilton.ca Tel: (905) 546-2424 ext. 6098		5)

Project Information (if applicable)
Description: 72h Pump Test of Setback well TW-2-13

Standard Turnaround Time (TAT) is 10 business days ☐ *RUSH *Rush TAT requires lab approval in advance. Surcharge will apply.

Sample(s) Information

Lab ID (lab use only)	Field ID	Location/Description/Comment(s)	Matrix	Type	Collection mm-dd-yy	Collection HH:MM	Test Group(s)	Container Type	Container Sent	Container Rec'd	Chlorine Free	Chlorine Total	Apply Criteria (Y/N) (*1)
01	TW-2-13	TW-2-13 Well - Cryto/Giardia/HPA (72h)	WA	GW	12-15-22	16:43	HBCG HPA	Cartridge	1	1			
02	TW-2-13	TW-2-13 well - E. Coli/Phage (72h)	WA	GW	12-15-22	16:36	HBCPF	Bottle	2	2			

Sampled By: Marco Silverio Tel: (905) 546-2424 ext. 6098

Relinquished By (Print/Sign): MARCO SILVERIO Date/Time: December 15, 2022 18:22

(1) Select One Applicable Criteria — Provide Municipality / City / Description
☐ Sanitary Sewer Use By-law
☐ Storm Sewer Use By-law
☐ New Water Main
☒ Other — Groundwater well pump test at Johnson Tews Park in Hamilton

LABORATORY USE ONLY
Delivery Method: Courier ☑ Drop Off ☐ YDREL Pickup ☐
Sorted by: Labelled by:
Checked by: Proofed by: WO #: 98574
98574
ed Date/Time:
ed By:
DEC 16 2022 9:18
Temp 16.6°C

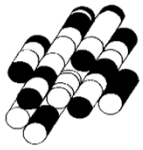
REL-COC-NONREG-NOV-2019-REV-1

Legend: MDL = Method Detection Limit; RDL = Reporting Detection Limit; MU = Measurement Uncertainty; < or ND = Less Than or Non-detect; ^ = Result outside limit; Limit = MAC; DF = Dilution Factor; OG = Operational Guideline; AO = Aesthetic Objective; HC = Health Canada; C = Comment; * = Comment Present

Results of Step Testing

APPENDIX E

Terraprobe Inc.



Terraprobe

Consulting Geotechnical & Environmental Engineering
Construction Materials Engineering, Inspection & Testing

PUMPING TEST

Project:	Johnson Tew Park, Hamilton	**Water Level:**	11.52	**Well Dia:**	150 mm
File/Report No:	7-22-0561-54	**Well Depth:**	21.84	**Screen Length:**	Open
Date/Time:	10/13/2022	**Stick Up:**	1.01	**Water Temp:**	
Inspector:	HP	**Weather:**	10	**Well No:**	TW-2-13

Time	Elapsed Time (sec)	Depth to Water Level (mbgl)	Drawdown (m)	Comments
10/13/2022 10:15	0	11.52	0.00	50 L/min
	30	11.70	0.18	Pump Test
	60	11.70	0.18	
	90	11.73	0.21	
	120	11.73	0.21	
	150	11.73	0.21	
	180	11.73	0.21	
	210	11.73	0.21	
	240	11.73	0.21	
	270	11.75	0.23	
	300	11.75	0.23	
	420	11.77	0.25	
	600	11.77	0.25	
	900	11.77	0.25	
	1800	11.79	0.27	
	2700	11.82	0.30	
60 mins	3600	11.80	0.28	

Terraprobe

Consulting Geotechnical & Environmental Engineering
Construction Materials Engineering, Inspection & Testing

PUMPING TEST

Project:	Johnson Tew Park, Hamilton	**Water Level:**	11.52	**Well Dia:**	150 mm
File/Report No:	7-22-0561-54	**Well Depth:**	21.84	**Screen Length:**	Open
Date/Time:	10/13/2022	**Stick Up:**	1.01	**Water Temp:**	
Inspector:	HP	**Weather:**	10	**Well No:**	TW-2-13

Time	Elapsed Time (sec)	Depth to Water Level (mbgl)	Drawdown (m)	Comments
10/13/2022 0:00	30	12.04	0.52	70 L/min
	60	12.09	0.57	Pump Test
	90	12.12	0.60	
	120	12.13	0.61	
	150	12.13	0.61	
	180	12.14	0.62	
	210	12.14	0.62	
	240	12.15	0.63	
	270	12.15	0.63	
	300	12.16	0.64	
	420	12.17	0.65	
	600	12.17	0.65	
	900	12.18	0.66	
	1800	12.19	0.67	
	2700	12.19	0.67	
	3600	12.21	0.69	
	4500	12.20	0.68	
90 mins	5400	12.21	0.69	

Terraprobe

Consulting Geotechnical & Environmental Engineering
Construction Materials Engineering, Inspection & Testing

PUMPING TEST

Project:	Johnson Tew Park, Hamilton	**Water Level:**	11.52	**Well Dia:**	150 mm
File/Report No:	7-22-0561-54	**Well Depth:**	21.84	**Screen Length:**	Open
Date/Time:	10/13/2022	**Stick Up:**	1.01	**Water Temp:**	
Inspector:	HP	**Weather:**	10	**Well No:**	TW-2-13

Time	Elapsed Time (sec)	Depth to Water Level (mbgl)	Drawdown (m)	Comments
10/13/2022 0:00	30	12.43	0.91	90 L/min
	60	12.48	0.96	Pump Test
	90	12.48	0.96	
	120	12.49	0.97	
	150	12.49	0.97	
	180	12.50	0.98	
	210	12.50	0.98	
	240	12.50	0.98	
	270	12.50	0.98	
	300	12.50	0.98	
	420	12.49	0.97	
	600	12.48	0.96	
	900	12.48	0.96	
	1800	12.48	0.96	
	2700	12.49	0.97	
	3600	12.49	0.97	
	4500	12.49	0.97	
	5400	12.50	0.98	
	6300	12.50	0.98	
120 mins	7200	12.50	0.98	

Terraprobe

Consulting Geotechnical & Environmental Engineering
Construction Materials Engineering, Inspection & Testing

PUMPING TEST

Project:	Johnson Tew Park, Hamilton	**Water Level:**	11.52	**Well Dia:**	150 mm
File/Report No:	7-22-0561-54	**Well Depth:**	21.84	**Screen Length:**	Open
Date/Time:	10/13/2022	**Stick Up:**	1.01	**Water Temp:**	
Inspector:	HP	**Weather:**	10	**Well No:**	

Time	Elapsed Time (sec)	Depth to Water Level (mbgl)	Recovery (m)	% Recovery
2/28/2020 14:00:00 PM	0	12.5	0	0
	30	12.22	0.28	29
	60	12.17	0.33	34
	90	12.15	0.35	36
	120	12.13	0.37	38
	150	12.12	0.38	39
	180	12.10	0.4	41
	210	12.09	0.41	42
	240	12.08	0.42	43
	270	12.07	0.43	44
	300	12.06	0.44	45
	420	12.04	0.46	47
	600	12.02	0.48	49
	900	11.99	0.51	52
	1800	11.98	0.52	53
	2700	11.96	0.54	55

Horiba U 52 Product Specifications

APPENDIX F

Terraprobe Inc.

U-50 Series Specifications

		U-51	U-52	U-52G	U-53	U-53G	U-54	U-54G
Sensor Probe	Measurement temperature	-10 to 55℃						
	Maximum sensor diameter	Approx. 96 mm						
	Probe length	Approx. 340 mm						
	Cable length	Standard: 2 m, option: 10, 30 m						
	Mass	Approx. 1,800 g (Approx. 3.97 lbs)						
	Automatic calibration (uses pH4)	●		●		●		●
	Turbidity wiper	—	—	—	●	●	—	—
	Measurement depth	Max. 30 m						
	Liquid contact part material (liquid end material)	PPS, glass, SUS316L, SUS304, FKM, PEEK,Q, titanium, FEP membrane, POM						
	Water resistance	JIS protection level 8						
Control Unit	Outer dimensions	115 (W) x 66 (D) x 283 (H) mm						
	Mass	Approx. 800 g (Approx. 1.76 lbs)						
	LCD	320 x 240 liquid crystal display with backlight (black and white)						
	Data memory	10,000						
	Communication	USB						
	Battery	C batteries x 4						
	Water resistance	JIS protection level 7 (when sensor cable is fitted)						
	Battery Life	Approx. 70 hours (without backlight)			Approx. 500 measurements		Approx. 70 hours (without backlight)	
	Storage temperature	-10 to 60℃						
	Ambient temperature	-5 to 45℃						
pH ●Two-point calibration ●Automatic temperature	Measurement principle	Glass electrode method						
	Range	pH0 to 14						
	Resolution	0.01pH						
	Repeatability	±0.05pH						
	Accuracy	±0.1pH						
Oxidation Reduction Potential (ORP)	Measurement principle	Platinum electrode method						
	Range	-2000 mV to +2000 mV						
	Resolution	1 mV						
	Repeatability	±5 mV						
	Accuracy	±15 mV						
Dissolved Oxygen (DO) ●Salinity conversion (0 to 70 PPT/automatic) ●Automatic temperature compensation	Measurement principle	Polarographic method						
	Range	0 to 50.0 mg/L						
	Resolution	0.01 mg/L						
	Repeatability	±0.1 mg/L						
	Accuracy	0 to 20 mg/L: ±0.2 mg/L 20 to 50 mg/L: ±0.5 mg/L						
Conductivity (COND) ●Auto range ●Automatic temperature conversion (25℃)	Measurement principle	4 AC electrode method						
	Range	0 to 10 S/m (0 to 100 mS/cm)						
	Resolution	0.000 to 0.999 mS/cm: 0.001 mS/cm 1.00 to 9.99 mS/cm: 0.01 mS/cm 10.0 to 99.9 mS/cm: 0.1 mS/cm 0.0 to 99.9 mS/m: 0.1 mS/m 0.100 to 0.999 S/m: 0.001 S/m 1.00 to 9.99 S/m : 0.01 S/m						
	Repeatability	±0.05% F.S.						
	Accuracy	*±1% F.S. (Median of two-point calibration)						
Salinity	Measurement principle	Conductivity conversion						
	Range	0 to 70 PPT (permillage)						
	Resolution	0.1 PPT						
	Repeatability	±1 PPT						
	Accuracy	±3 PPT						
Total Dissolved Solid (TDS) ●Conversion factor setting	Measurement principle	Conductivity conversion						
	Range	0 to 100 g/L						
	Resolution	0.1% F.S.						
	Repeatability	±2 g/L						
	Accuracy	±5 g/L						
Seawater specific gravity ●Display σ_t, σ_0, σ_{15}	Measurement principle	Conductivity conversion						
	Range	0 to 50 σ_t						
	Resolution	0.1 σ_t						
	Repeatability	±2 σ_t						
	Accuracy	±5 σ_t						
Temperature	Measurement principle	Thermistor method						
	Range	-10 to 55℃						
	Resolution	0.01℃						
	Repeatability	*±0.10℃ (at calibration point)						
	Accuracy	JIS class B platinum thermometer sensor (±0.3+0.005 | t |)						
Turbidity (TURB)	Measurement principle	—	LED light source and 30° scattering method		Tungsten lamp source and 90° scattering method		LED light source and 90° scattering method	
	Range		0 to 800 NTU		0 to 1000 NTU		0 to 1000 NTU	
	Resolution		0 to 99.9 NTU: 0.1 NTU 100 to 800 NTU: 1 NTU		0 to 9.99 NTU: 0.01 NTU 10 to 99.9 NTU: 0.1 NTU 100 to 1000 NTU: 1 NTU		0 to 0.99 NTU: 0.01 NTU 1 to 99.9 NTU: 0.1 NTU 100 to 1000 NTU: 1 NTU	
	Repeatability		*±5% (Reading) or ± 0.5 NTU whichever is greater		±3% (Reading) or ±0.1 NTU whichever is greater		±5% (Reading) or ± 0.5 NTU whichever is greater	
	Accuracy		±5% (Reading) or ±1 NTU whichever is greater		0 to 10 NTU: ±0.5 NTU 10 to 1000 NTU: 3% (Reading) or ±1 NTU whichever is greater		±5% (Reading) or ±1 NTU whichever is greater	
Water depth	Measurement principle	—	—	Pressure method			Pressure method, only 10m and 30m product	
	Range			0 to 30 m				
	Resolution			0.05 m				
	Repeatability			±1% F.S.				
	Accuracy			±0.3 m				
GPS	12 channel parallel	—	—	●	—	●	—	●

Note:
* Battery life based on continuous operation using alkaline C dry batteries when the monitor temperature is over 20℃ and the backlight OFF.
* Accuracy is measured by calibrating 4 points for turbidity and electrical conductivity and 2 points for all other measurements against standard solution.
* Repeatability is measured by the ability to reproduce the results against the standard solution (at 25℃ normal pressure condition).

Summary of Age Dating Analysis

APPENDIX G

Terraprobe Inc.

Client: Silverio/City of Hamilton

Project: Pump Test TW-2-13

ISO# 2023013
Location: C2
3 for 18O, 2H

Environmental Isotope Lab
2023-01-10

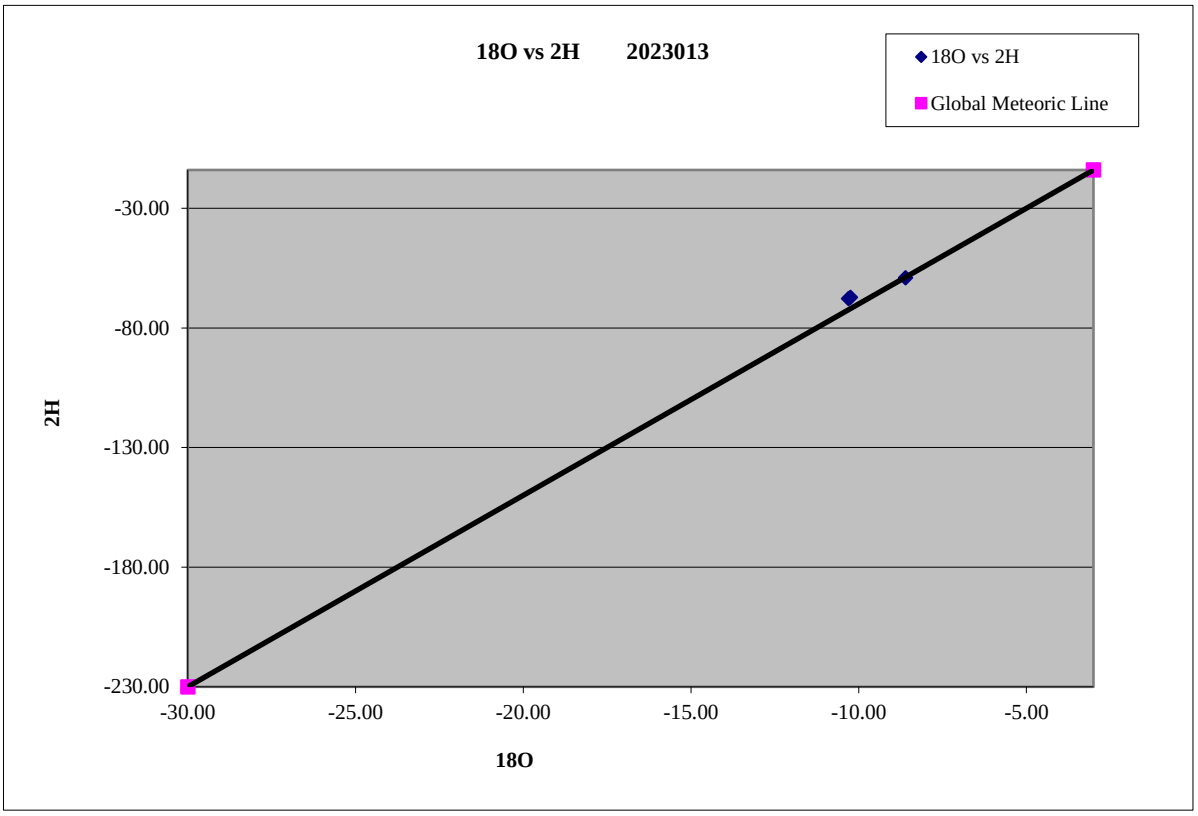
#	Sample	Date	Lab#	$\delta^{18}O$	Result	Repeat	$\delta^{2}H$	Result	Repeat		pH	EC	AZD
				H_2O	VSMOW ± 0.2‰		H_2O	VSMOW ± 0.8‰				mS/cm	
1	FDG01	15/12/2022 (9:40)	495544	X	-10.25	-10.14	X	-67.21	-67.44	100mlx2	7.16	1.83	
2	Surface Water	15/12/2022 (10:10)	495545	X	-8.61		X	-59.09		100mlx2	7.51	2.00	
3	TW-2-13	15/12/2022 (16:35)	495546	X	-10.30	-10.27	X	-67.69	-67.90	100mlx2	7.22	1.12	

ENVIRONMENTAL ISOTOPE LABORATORY

Silverio 2023013

-10.25	-10.14	-67.21	-67.44
-8.61		-59.09	
-10.30	-10.27	-67.69	-67.90

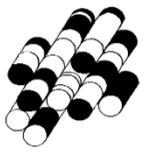
-3.00 -14
-30.00 -230



Drawdown Analysis

APPENDIX H

Terraprobe Inc.



WELL ID: Greensville TW 2-13 - Drawdown

Local ID: Greensville, Hamilton, Ontario
Date: ########
Time: 0:00

INPUT

Construction:		
Casing dia. (d_c)	0.15	Meter
Annulus dia. (d_w)	0.15	Meter
Screen Length (L)	8.84	Meter
Depths to:		
water level (DTW)	10.85	Meter
Top of Aquifer	11.9	Meter
Base of Aquifer	21.3	Meter
Annular Fill:		
across screen --	Open Hole	
above screen --	Bentonite	
Aquifer Material --	Reef Limestone	
FLOW RATE	90	liters/min

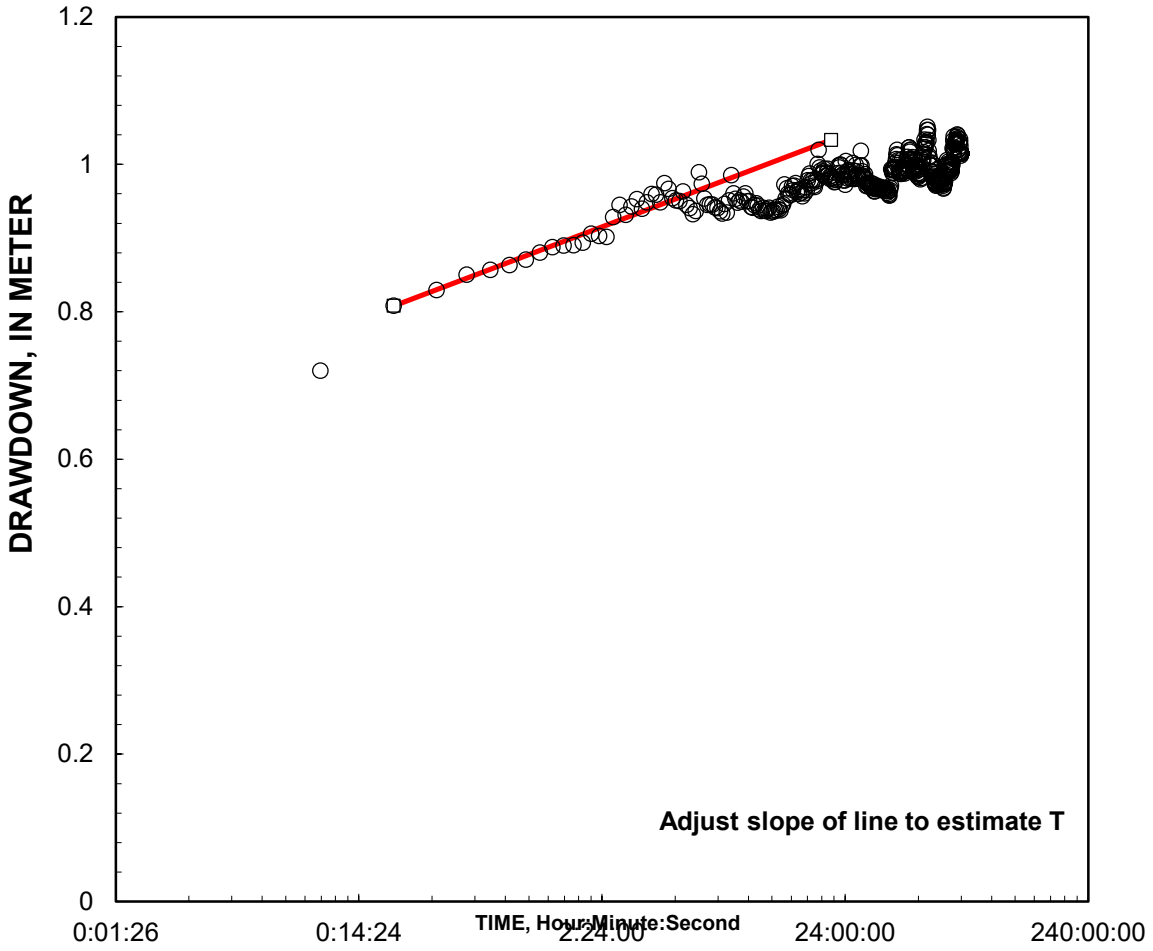
COMPUTED

Aquifer thickness = 9.4 Meter

Slope = 0.038114 Meter/log10

Input is consistent.

K = 0.00023 Meter/Second
T = 0.0022 Meter²/Second



REMARKS: Cooper-Jacob analysis of single-well aquifer test

Reduced Data

Entry	Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1	1/0/00 0:00:00	232.90	51	1/1/00 9:20:00	231.93
2	1/0/00 0:40:00	232.05	52	1/1/00 10:00:00	231.93
3	1/0/00 1:20:00	232.02	53	1/1/00 10:40:00	231.93
4	1/0/00 2:00:00	232.00	54	1/1/00 11:20:00	231.93
5	1/0/00 2:40:00	231.97	55	1/1/00 12:00:00	231.93
6	1/0/00 3:20:00	231.95	56	1/1/00 12:40:00	231.93
7	1/0/00 4:00:00	231.94	57	1/1/00 13:20:00	231.91
8	1/0/00 4:40:00	231.94	58	1/1/00 14:00:00	231.90
9	1/0/00 5:20:00	231.95	59	1/1/00 14:40:00	231.90
10	1/0/00 6:00:00	231.91	60	1/1/00 15:20:00	231.89
11	1/0/00 6:40:00	231.95	61	1/1/00 16:00:00	231.91
12	1/0/00 7:20:00	231.96	62	1/1/00 16:40:00	231.91
13	1/0/00 8:00:00	231.95	63	1/1/00 17:20:00	231.90
14	1/0/00 8:40:00	231.95	64	1/1/00 18:00:00	231.91
15	1/0/00 9:20:00	231.94	65	1/1/00 18:40:00	231.90
16	1/0/00 10:00:00	231.96	66	1/1/00 19:20:00	231.90
17	1/0/00 10:40:00	231.96	67	1/1/00 20:00:00	231.88
18	1/0/00 11:20:00	231.96	68	1/1/00 20:40:00	231.89
19	1/0/00 12:00:00	231.96	69	1/1/00 21:20:00	231.89
20	1/0/00 12:40:00	231.96	70	1/1/00 22:00:00	231.90
21	1/0/00 13:20:00	231.95	71	1/1/00 22:40:00	231.90
22	1/0/00 14:00:00	231.94	72	1/1/00 23:20:00	231.90
23	1/0/00 14:40:00	231.93	73	1/2/00 0:00:00	231.91
24	1/0/00 15:20:00	231.93	74	1/2/00 0:40:00	231.90
25	1/0/00 16:00:00	231.94	75	1/2/00 1:20:00	231.91
26	1/0/00 16:40:00	231.93	76	1/2/00 2:00:00	231.88
27	1/0/00 17:20:00	231.92	77	1/2/00 2:40:00	231.87
28	1/0/00 18:00:00	231.93	78	1/2/00 3:20:00	231.88
29	1/0/00 18:40:00	231.88	79	1/2/00 4:00:00	231.86
30	1/0/00 19:20:00	231.91	80	1/2/00 4:40:00	231.85
31	1/0/00 20:00:00	231.91	81	1/2/00 5:20:00	231.89
32	1/0/00 20:40:00	231.92	82	1/2/00 6:00:00	231.90
33	1/0/00 21:20:00	231.92	83	1/2/00 6:40:00	231.91
34	1/0/00 22:00:00	231.92	84	1/2/00 7:20:00	231.91
35	1/0/00 22:40:00	231.90	85	1/2/00 8:00:00	231.92
36	1/0/00 23:20:00	231.91	86	1/2/00 8:40:00	231.93
37	1/1/00 0:00:00	231.93	87	1/2/00 9:20:00	231.92
38	1/1/00 0:40:00	231.92	88	1/2/00 10:00:00	231.91
39	1/1/00 1:20:00	231.92	89	1/2/00 10:40:00	231.92
40	1/1/00 2:00:00	231.91	90	1/2/00 11:20:00	231.92
41	1/1/00 2:40:00	231.91	91	1/2/00 12:00:00	231.92
42	1/1/00 3:20:00	231.92	92	1/2/00 12:40:00	231.93
43	1/1/00 4:00:00	231.90	93	1/2/00 13:20:00	231.92
44	1/1/00 4:40:00	231.92	94	1/2/00 14:00:00	231.91
45	1/1/00 5:20:00	231.93	95	1/2/00 14:40:00	231.91
46	1/1/00 6:00:00	231.93	96	1/2/00 15:20:00	231.91
47	1/1/00 6:40:00	231.93	97	1/2/00 16:00:00	231.90
48	1/1/00 7:20:00	231.93	98	1/2/00 16:40:00	231.90
49	1/1/00 8:00:00	231.93	99	1/2/00 17:20:00	231.90
50	1/1/00 8:40:00	231.93	100	1/2/00 18:00:00	231.90

WELL ID: Greensville TW 2-13 - Recovery

Local ID: Greensville, Hamilton, Ontario
Date: ########
Time: 0:00

INPUT

Construction:		
Casing dia. (d_c)	0.15	Meter
Annulus dia. (d_w)	0.15	Meter
Screen Length (L)	8.84	Meter
Depths to:		
water level (DTW)	10.58	Meter
Top of Aquifer	11.9	Meter
Base of Aquifer	21.3	Meter
Annular Fill:		
across screen --	Open Hole	
above screen --	Bentonite	
Aquifer Material --	Reef Limestone	
FLOW RATE	90	liters/min

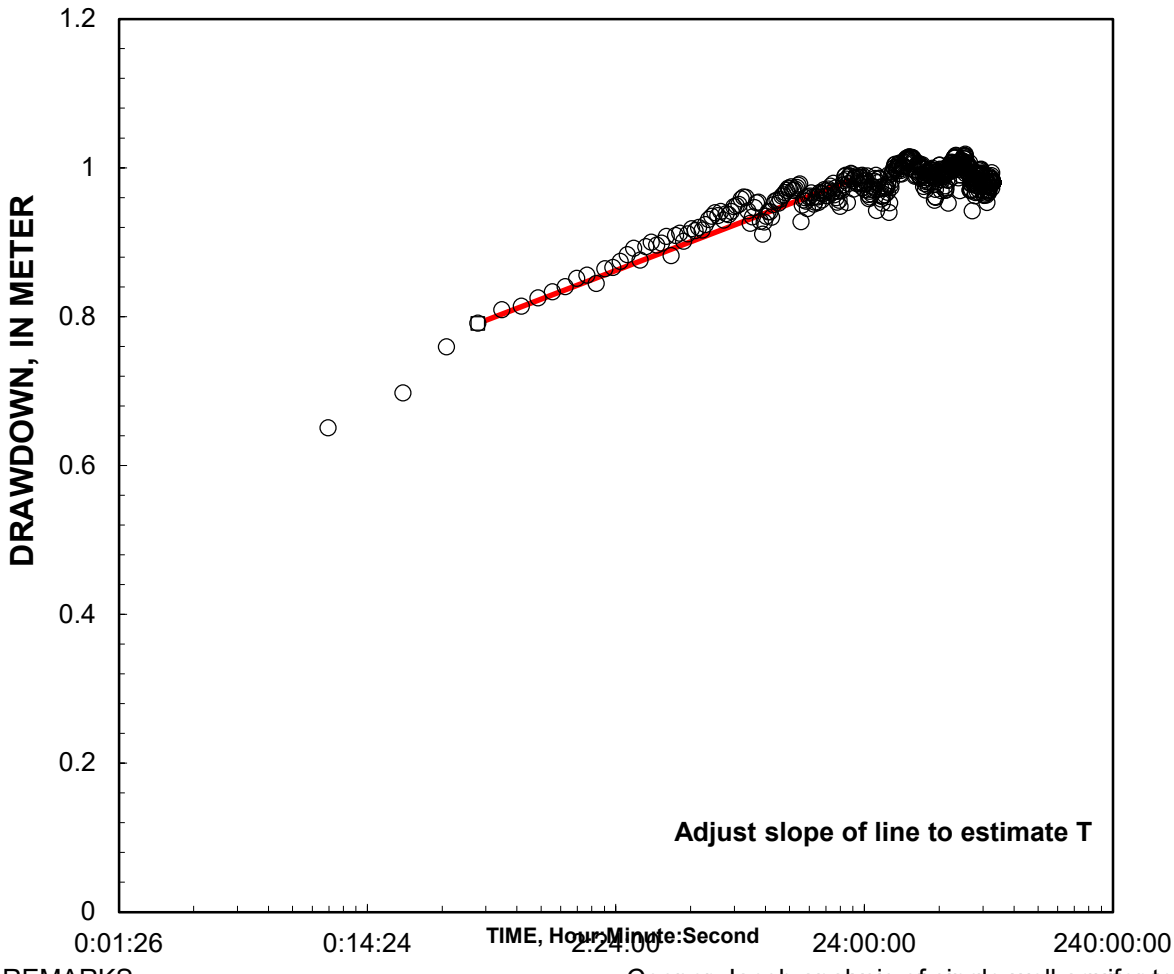
COMPUTED

Aquifer thickness = 9.4 Meter

Slope = 0.039046 Meter/log10

Input is consistent.

K = 0.00023 Meter/Second
T = 0.0021 Meter²/Second



REMARKS: Cooper-Jacob analysis of single-well aquifer test

Recovery Data

Reduced Data

Entry	Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1	1/0/00 0:00:00	231.88	51	1/1/00 9:20:00	232.88
2	1/0/00 0:40:00	232.67	52	1/1/00 10:00:00	232.88
3	1/0/00 1:20:00	232.72	53	1/1/00 10:40:00	232.88
4	1/0/00 2:00:00	232.73	54	1/1/00 11:20:00	232.89
5	1/0/00 2:40:00	232.77	55	1/1/00 12:00:00	232.90
6	1/0/00 3:20:00	232.78	56	1/1/00 12:40:00	232.90
7	1/0/00 4:00:00	232.77	57	1/1/00 13:20:00	232.90
8	1/0/00 4:40:00	232.79	58	1/1/00 14:00:00	232.89
9	1/0/00 5:20:00	232.80	59	1/1/00 14:40:00	232.88
10	1/0/00 6:00:00	232.82	60	1/1/00 15:20:00	232.89
11	1/0/00 6:40:00	232.82	61	1/1/00 16:00:00	232.87
12	1/0/00 7:20:00	232.83	62	1/1/00 16:40:00	232.88
13	1/0/00 8:00:00	232.84	63	1/1/00 17:20:00	232.87
14	1/0/00 8:40:00	232.83	64	1/1/00 18:00:00	232.86
15	1/0/00 9:20:00	232.79	65	1/1/00 18:40:00	232.87
16	1/0/00 10:00:00	232.82	66	1/1/00 19:20:00	232.86
17	1/0/00 10:40:00	232.84	67	1/1/00 20:00:00	232.88
18	1/0/00 11:20:00	232.85	68	1/1/00 20:40:00	232.88
19	1/0/00 12:00:00	232.86	69	1/1/00 21:20:00	232.87
20	1/0/00 12:40:00	232.85	70	1/1/00 22:00:00	232.84
21	1/0/00 13:20:00	232.81	71	1/1/00 22:40:00	232.86
22	1/0/00 14:00:00	232.84	72	1/1/00 23:20:00	232.88
23	1/0/00 14:40:00	232.85	73	1/2/00 0:00:00	232.89
24	1/0/00 15:20:00	232.84	74	1/2/00 0:40:00	232.88
25	1/0/00 16:00:00	232.85	75	1/2/00 1:20:00	232.88
26	1/0/00 16:40:00	232.85	76	1/2/00 2:00:00	232.88
27	1/0/00 17:20:00	232.85	77	1/2/00 2:40:00	232.86
28	1/0/00 18:00:00	232.86	78	1/2/00 3:20:00	232.88
29	1/0/00 18:40:00	232.84	79	1/2/00 4:00:00	232.89
30	1/0/00 19:20:00	232.85	80	1/2/00 4:40:00	232.88
31	1/0/00 20:00:00	232.87	81	1/2/00 5:20:00	232.88
32	1/0/00 20:40:00	232.86	82	1/2/00 6:00:00	232.88
33	1/0/00 21:20:00	232.87	83	1/2/00 6:40:00	232.89
34	1/0/00 22:00:00	232.87	84	1/2/00 7:20:00	232.90
35	1/0/00 22:40:00	232.87	85	1/2/00 8:00:00	232.90
36	1/0/00 23:20:00	232.86	86	1/2/00 8:40:00	232.89
37	1/1/00 0:00:00	232.87	87	1/2/00 9:20:00	232.87
38	1/1/00 0:40:00	232.87	88	1/2/00 10:00:00	232.85
39	1/1/00 1:20:00	232.84	89	1/2/00 10:40:00	232.87
40	1/1/00 2:00:00	232.86	90	1/2/00 11:20:00	232.89
41	1/1/00 2:40:00	232.87	91	1/2/00 12:00:00	232.89
42	1/1/00 3:20:00	232.87	92	1/2/00 12:40:00	232.90
43	1/1/00 4:00:00	232.84	93	1/2/00 13:20:00	232.88
44	1/1/00 4:40:00	232.86	94	1/2/00 14:00:00	232.89
45	1/1/00 5:20:00	232.86	95	1/2/00 14:40:00	232.88
46	1/1/00 6:00:00	232.87	96	1/2/00 15:20:00	232.89
47	1/1/00 6:40:00	232.86	97	1/2/00 16:00:00	232.85
48	1/1/00 7:20:00	232.88	98	1/2/00 16:40:00	232.85
49	1/1/00 8:00:00	232.89	99	1/2/00 17:20:00	232.86
50	1/1/00 8:40:00	232.89	100	1/2/00 18:00:00	232.87

WELL ID: Greensville TW 1-13 - Recovery

Local ID: Greensville, Hamilton, Ontario
Date: ########
Time: 0:00

INPUT

Construction:		
Casing dia. (d_c)	0.15	Meter
Annulus dia. (d_w)	0.15	Meter
Screen Length (L)	8.84	Meter
Depths to:		
water level (DTW)	14.8	Meter
Top of Aquifer	11.9	Meter
Base of Aquifer	24.3	Meter
Annular Fill:		
across screen --	Open Hole	
above screen --	Bentonite	
Aquifer Material --	Reef Limestone	
FLOW RATE	90	liters/min

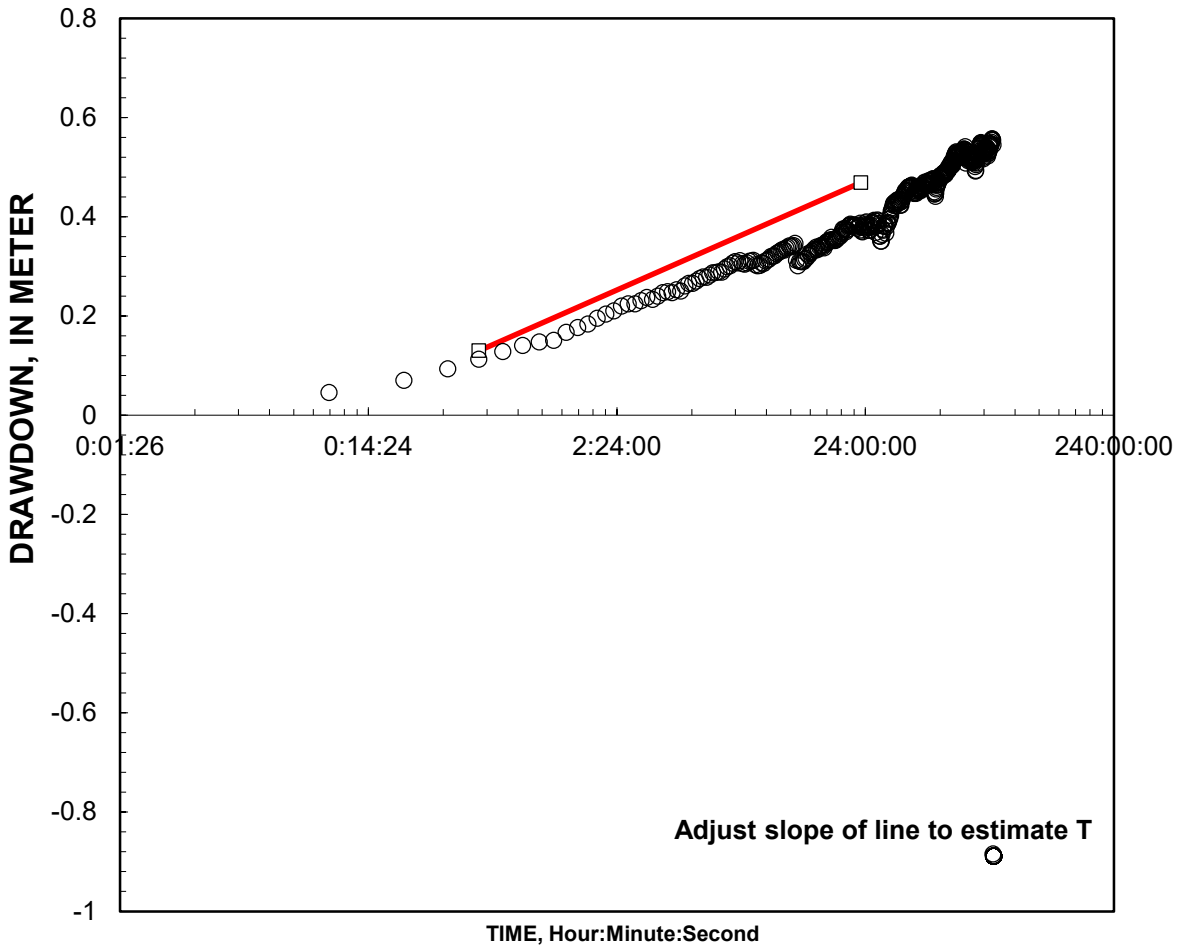
COMPUTED

Aquifer thickness = 9.5 Meter

Slope = 0.067191 Meter/log10

Input is consistent.

K = 0.00013 Meter/Second
T = 0.0012 Meter²/Second



REMARKS: Cooper-Jacob analysis of single-well aquifer test

Recovery Data

Reduced Data

Entry	Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1	1/0/00 0:00:00	233.75	51	1/1/00 9:20:00	234.18
2	1/0/00 0:40:00	233.87	52	1/1/00 10:00:00	234.19
3	1/0/00 1:20:00	233.90	53	1/1/00 10:40:00	234.20
4	1/0/00 2:00:00	233.95	54	1/1/00 11:20:00	234.21
5	1/0/00 2:40:00	233.98	55	1/1/00 12:00:00	234.21
6	1/0/00 3:20:00	233.99	56	1/1/00 12:40:00	234.22
7	1/0/00 4:00:00	234.00	57	1/1/00 13:20:00	234.21
8	1/0/00 4:40:00	234.02	58	1/1/00 14:00:00	234.20
9	1/0/00 5:20:00	234.03	59	1/1/00 14:40:00	234.21
10	1/0/00 6:00:00	234.04	60	1/1/00 15:20:00	234.21
11	1/0/00 6:40:00	234.05	61	1/1/00 16:00:00	234.21
12	1/0/00 7:20:00	234.06	62	1/1/00 16:40:00	234.21
13	1/0/00 8:00:00	234.06	63	1/1/00 17:20:00	234.22
14	1/0/00 8:40:00	234.06	64	1/1/00 18:00:00	234.22
15	1/0/00 9:20:00	234.06	65	1/1/00 18:40:00	234.22
16	1/0/00 10:00:00	234.07	66	1/1/00 19:20:00	234.23
17	1/0/00 10:40:00	234.08	67	1/1/00 20:00:00	234.22
18	1/0/00 11:20:00	234.09	68	1/1/00 20:40:00	234.23
19	1/0/00 12:00:00	234.09	69	1/1/00 21:20:00	234.20
20	1/0/00 12:40:00	234.07	70	1/1/00 22:00:00	234.20
21	1/0/00 13:20:00	234.06	71	1/1/00 22:40:00	234.22
22	1/0/00 14:00:00	234.08	72	1/1/00 23:20:00	234.22
23	1/0/00 14:40:00	234.08	73	1/2/00 0:00:00	234.23
24	1/0/00 15:20:00	234.09	74	1/2/00 0:40:00	234.24
25	1/0/00 16:00:00	234.09	75	1/2/00 1:20:00	234.24
26	1/0/00 16:40:00	234.10	76	1/2/00 2:00:00	234.24
27	1/0/00 17:20:00	234.11	77	1/2/00 2:40:00	234.24
28	1/0/00 18:00:00	234.11	78	1/2/00 3:20:00	234.25
29	1/0/00 18:40:00	234.11	79	1/2/00 4:00:00	234.25
30	1/0/00 19:20:00	234.12	80	1/2/00 4:40:00	234.26
31	1/0/00 20:00:00	234.12	81	1/2/00 5:20:00	234.26
32	1/0/00 20:40:00	234.13	82	1/2/00 6:00:00	234.26
33	1/0/00 21:20:00	234.13	83	1/2/00 6:40:00	234.27
34	1/0/00 22:00:00	234.13	84	1/2/00 7:20:00	234.28
35	1/0/00 22:40:00	234.14	85	1/2/00 8:00:00	234.28
36	1/0/00 23:20:00	234.12	86	1/2/00 8:40:00	234.28
37	1/1/00 0:00:00	234.14	87	1/2/00 9:20:00	234.28
38	1/1/00 0:40:00	234.13	88	1/2/00 10:00:00	234.27
39	1/1/00 1:20:00	234.13	89	1/2/00 10:40:00	234.28
40	1/1/00 2:00:00	234.15	90	1/2/00 11:20:00	234.28
41	1/1/00 2:40:00	234.14	91	1/2/00 12:00:00	234.29
42	1/1/00 3:20:00	234.11	92	1/2/00 12:40:00	234.27
43	1/1/00 4:00:00	234.12	93	1/2/00 13:20:00	234.28
44	1/1/00 4:40:00	234.14	94	1/2/00 14:00:00	234.27
45	1/1/00 5:20:00	234.14	95	1/2/00 14:40:00	234.28
46	1/1/00 6:00:00	234.15	96	1/2/00 15:20:00	234.27
47	1/1/00 6:40:00	234.17	97	1/2/00 16:00:00	234.27
48	1/1/00 7:20:00	234.18	98	1/2/00 16:40:00	234.27
49	1/1/00 8:00:00	234.18	99	1/2/00 17:20:00	234.26
50	1/1/00 8:40:00	234.18	100	1/2/00 18:00:00	234.27

WELL ID: Greensville TW 3-13 - Drawdown

Local ID: Greensville, Hamilton, Ontario
Date: ########
Time: 0:00

INPUT

Construction:		
Casing dia. (d_c)	0.15	Meter
Annulus dia. (d_w)	0.15	Meter
Screen Length (L)	8.84	Meter
Depths to:		
water level (DTW)	12.6	Meter
Top of Aquifer	11.9	Meter
Base of Aquifer	26.3	Meter
Annular Fill:		
across screen --	Open Hole	
above screen --	Bentonite	
Aquifer Material --	Reef Limestone	
FLOW RATE	90	liters/min

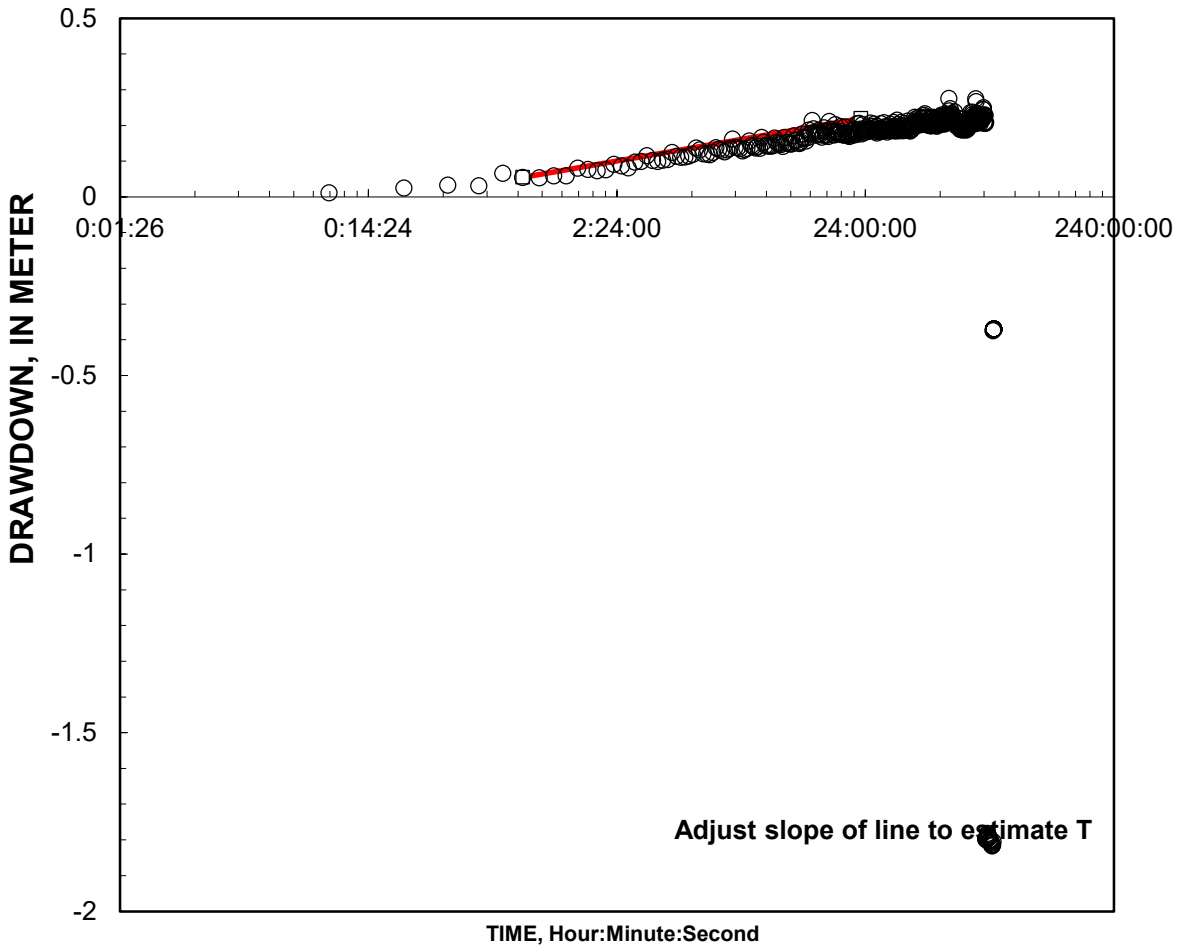
COMPUTED

Aquifer thickness = 14 Meter

Slope = 0.036932 Meter/log10

Input is consistent.

K = 0.00017 Meter/Second
T = 0.0023 Meter²/Second



REMARKS: Cooper-Jacob analysis of single-well aquifer test

Recovery Data

Reduced Data

Entry	Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1	1/0/00 0:00:00	232.49	51	1/1/00 9:20:00	232.28
2	1/0/00 0:40:00	232.46	52	1/1/00 10:00:00	232.31
3	1/0/00 1:20:00	232.43	53	1/1/00 10:40:00	232.30
4	1/0/00 2:00:00	232.42	54	1/1/00 11:20:00	232.30
5	1/0/00 2:40:00	232.41	55	1/1/00 12:00:00	232.31
6	1/0/00 3:20:00	232.39	56	1/1/00 12:40:00	232.30
7	1/0/00 4:00:00	232.37	57	1/1/00 13:20:00	232.29
8	1/0/00 4:40:00	232.38	58	1/1/00 14:00:00	232.28
9	1/0/00 5:20:00	232.37	59	1/1/00 14:40:00	232.29
10	1/0/00 6:00:00	232.36	60	1/1/00 15:20:00	232.29
11	1/0/00 6:40:00	232.36	61	1/1/00 16:00:00	232.29
12	1/0/00 7:20:00	232.36	62	1/1/00 16:40:00	232.29
13	1/0/00 8:00:00	232.36	63	1/1/00 17:20:00	232.26
14	1/0/00 8:40:00	232.36	64	1/1/00 18:00:00	232.28
15	1/0/00 9:20:00	232.34	65	1/1/00 18:40:00	232.28
16	1/0/00 10:00:00	232.35	66	1/1/00 19:20:00	232.28
17	1/0/00 10:40:00	232.34	67	1/1/00 20:00:00	232.29
18	1/0/00 11:20:00	232.33	68	1/1/00 20:40:00	232.29
19	1/0/00 12:00:00	232.35	69	1/1/00 21:20:00	232.29
20	1/0/00 12:40:00	232.34	70	1/1/00 22:00:00	232.28
21	1/0/00 13:20:00	232.32	71	1/1/00 22:40:00	232.28
22	1/0/00 14:00:00	232.33	72	1/1/00 23:20:00	232.29
23	1/0/00 14:40:00	232.28	73	1/2/00 0:00:00	232.29
24	1/0/00 15:20:00	232.32	74	1/2/00 0:40:00	232.27
25	1/0/00 16:00:00	232.33	75	1/2/00 1:20:00	232.29
26	1/0/00 16:40:00	232.32	76	1/2/00 2:00:00	232.29
27	1/0/00 17:20:00	232.30	77	1/2/00 2:40:00	232.27
28	1/0/00 18:00:00	232.32	78	1/2/00 3:20:00	232.26
29	1/0/00 18:40:00	232.32	79	1/2/00 4:00:00	232.22
30	1/0/00 19:20:00	232.32	80	1/2/00 4:40:00	232.25
31	1/0/00 20:00:00	232.32	81	1/2/00 5:20:00	232.27
32	1/0/00 20:40:00	232.32	82	1/2/00 6:00:00	232.28
33	1/0/00 21:20:00	232.32	83	1/2/00 6:40:00	232.28
34	1/0/00 22:00:00	232.32	84	1/2/00 7:20:00	232.29
35	1/0/00 22:40:00	232.29	85	1/2/00 8:00:00	232.28
36	1/0/00 23:20:00	232.29	86	1/2/00 8:40:00	232.29
37	1/1/00 0:00:00	232.31	87	1/2/00 9:20:00	232.30
38	1/1/00 0:40:00	232.31	88	1/2/00 10:00:00	232.30
39	1/1/00 1:20:00	232.30	89	1/2/00 10:40:00	232.30
40	1/1/00 2:00:00	232.29	90	1/2/00 11:20:00	232.29
41	1/1/00 2:40:00	232.31	91	1/2/00 12:00:00	232.30
42	1/1/00 3:20:00	232.31	92	1/2/00 12:40:00	232.30
43	1/1/00 4:00:00	232.31	93	1/2/00 13:20:00	232.29
44	1/1/00 4:40:00	232.30	94	1/2/00 14:00:00	232.29
45	1/1/00 5:20:00	232.31	95	1/2/00 14:40:00	232.30
46	1/1/00 6:00:00	232.30	96	1/2/00 15:20:00	232.29
47	1/1/00 6:40:00	232.30	97	1/2/00 16:00:00	232.27
48	1/1/00 7:20:00	232.30	98	1/2/00 16:40:00	232.26
49	1/1/00 8:00:00	232.30	99	1/2/00 17:20:00	232.28
50	1/1/00 8:40:00	232.30	100	1/2/00 18:00:00	232.28

WELL ID: 63 Tews Lane - Recovery

Local ID: Greensville, Hamilton, Ontario
Date: ########
Time: 0:00

INPUT

Construction:		
Casing dia. (d_c)	0.15	Meter
Annulus dia. (d_w)	0.15	Meter
Screen Length (L)	16	Meter
Depths to:		
water level (DTW)	14.2	Meter
Top of Aquifer	11.9	Meter
Base of Aquifer	28	Meter
Annular Fill:		
across screen --	Open Hole	
above screen --	Bentonite	
Aquifer Material --	Reef Limestone	
FLOW RATE	90	liters/min

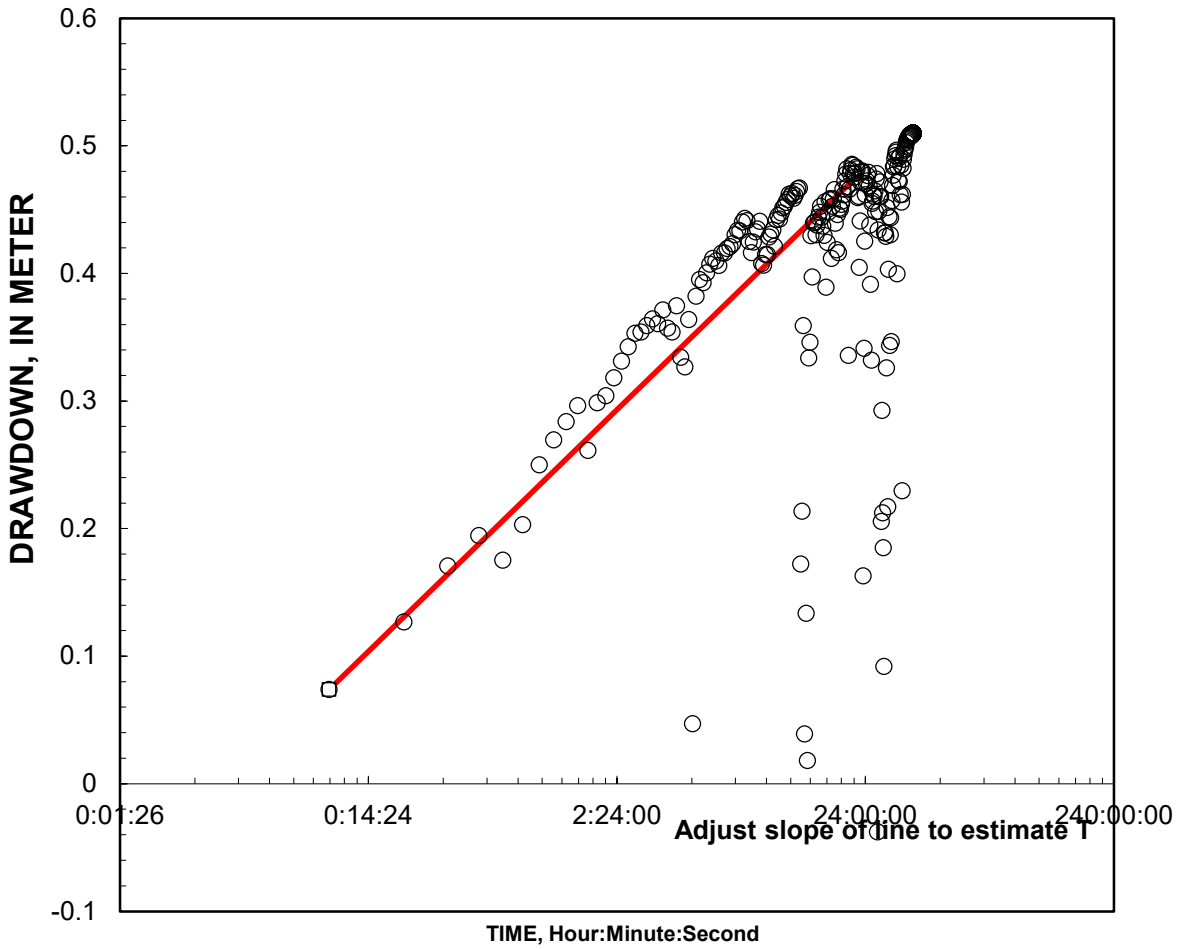
COMPUTED

Aquifer thickness = 14 Meter

Slope = 0.057745 Meter/log10

Input is consistent.

K = 0.00011 Meter/Second
T = 0.0015 Meter²/Second

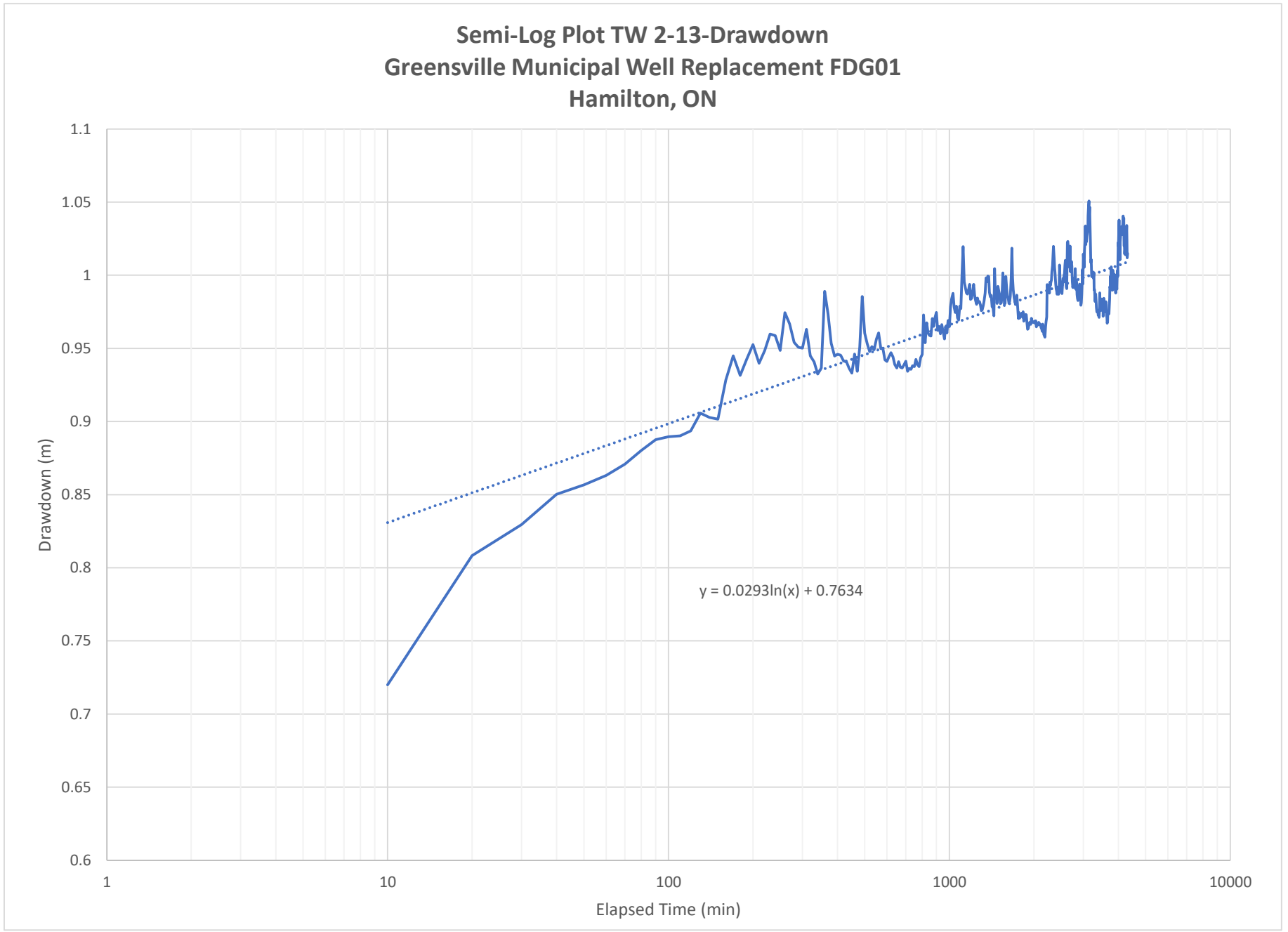


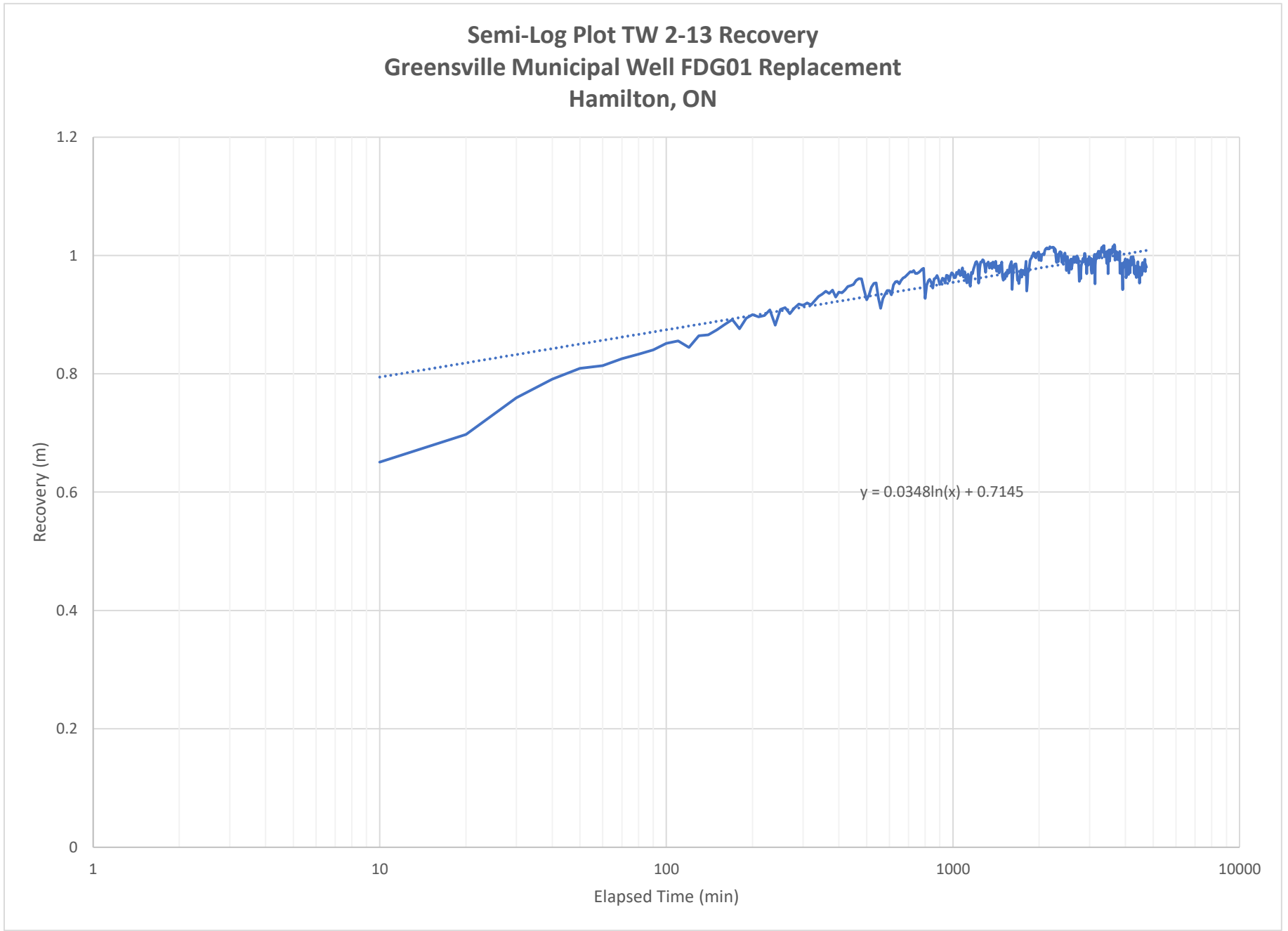
REMARKS: Cooper-Jacob analysis of single-well aquifer test

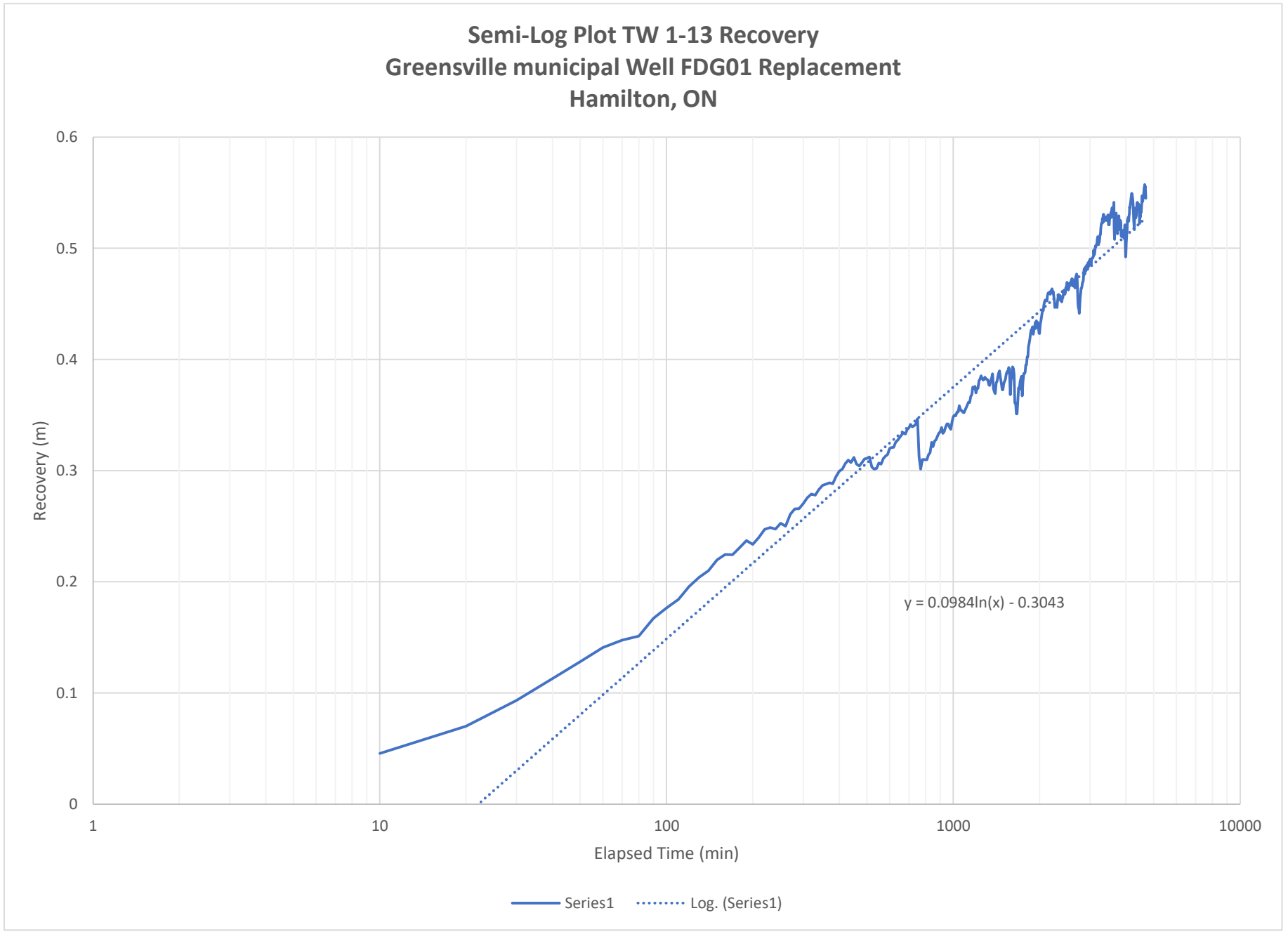
Recovery Data

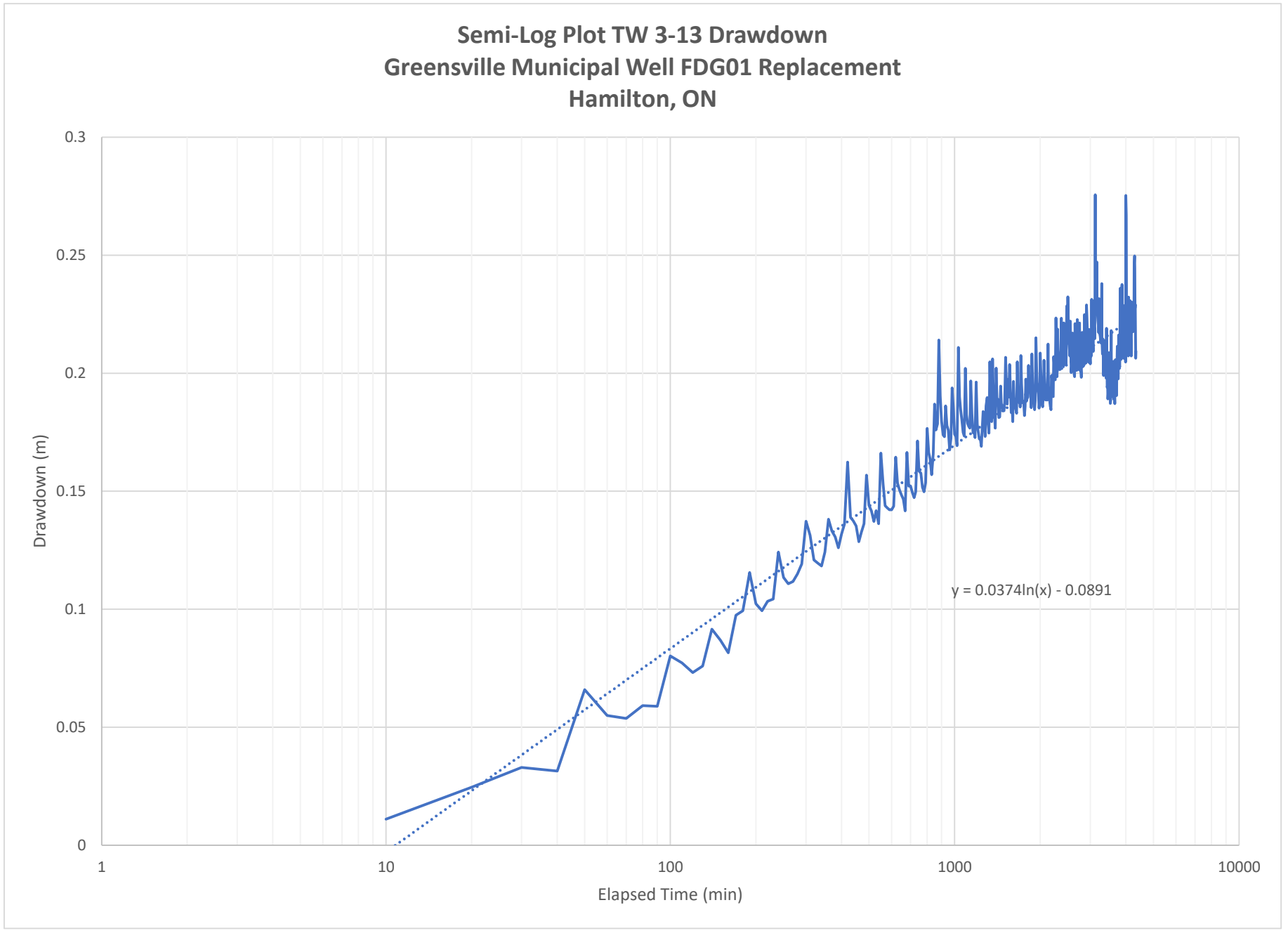
Reduced Data

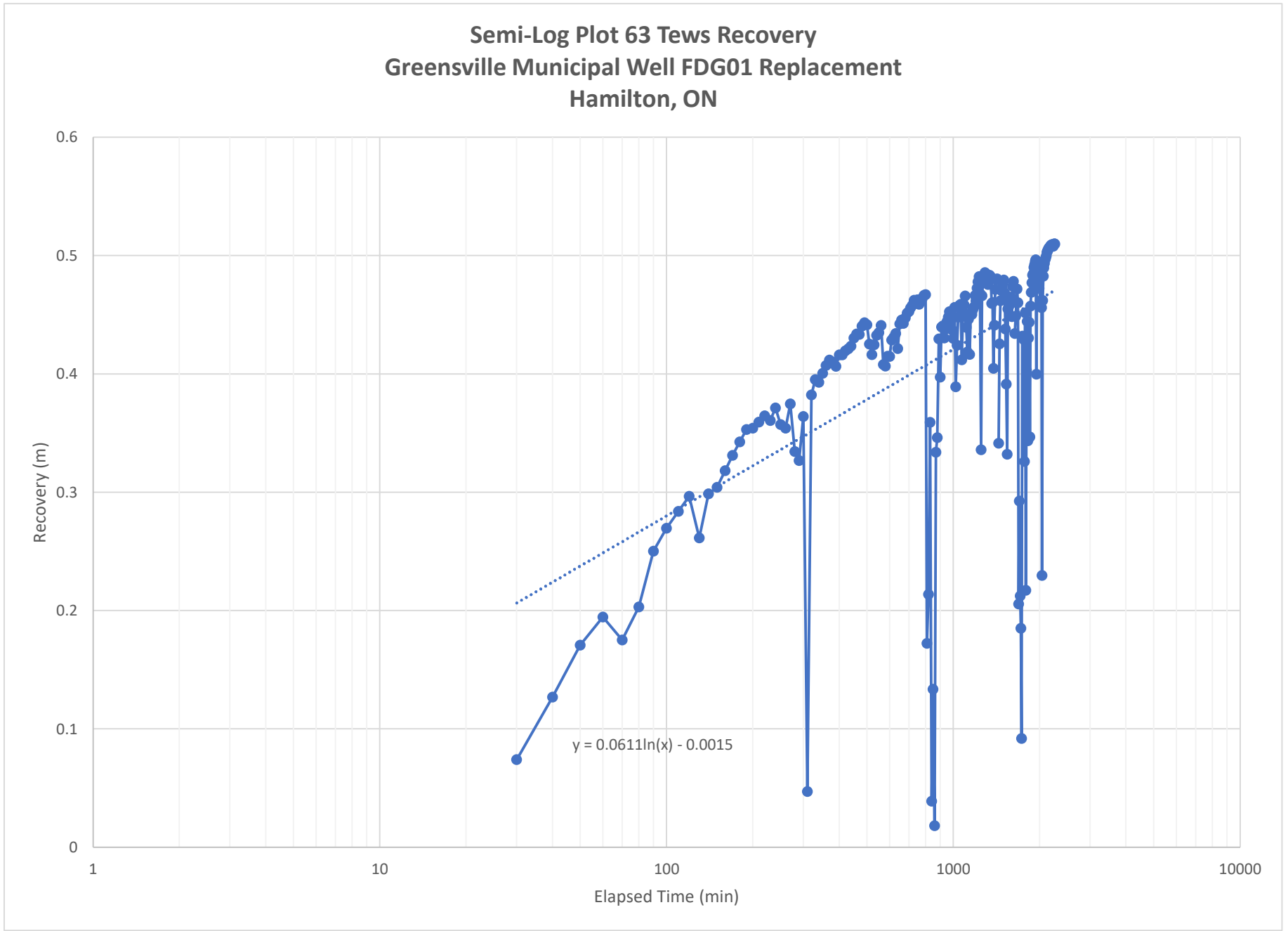
Entry	Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1	1/0/00 0:00:00	232.45	51	1/0/00 16:40:00	232.84
2	1/0/00 0:20:00	232.58	52	1/0/00 17:00:00	232.90
3	1/0/00 0:40:00	232.64	53	1/0/00 17:20:00	232.91
4	1/0/00 1:00:00	232.65	54	1/0/00 17:40:00	232.90
5	1/0/00 1:20:00	232.72	55	1/0/00 18:00:00	232.92
6	1/0/00 1:40:00	232.75	56	1/0/00 18:20:00	232.87
7	1/0/00 2:00:00	232.75	57	1/0/00 18:40:00	232.87
8	1/0/00 2:20:00	232.77	58	1/0/00 19:00:00	232.90
9	1/0/00 2:40:00	232.79	59	1/0/00 19:20:00	232.91
10	1/0/00 3:00:00	232.80	60	1/0/00 19:40:00	232.91
11	1/0/00 3:20:00	232.81	61	1/0/00 20:00:00	232.93
12	1/0/00 3:40:00	232.82	62	1/0/00 20:20:00	232.92
13	1/0/00 4:00:00	232.80	63	1/0/00 20:40:00	232.92
14	1/0/00 4:20:00	232.78	64	1/0/00 21:00:00	232.93
15	1/0/00 4:40:00	232.81	65	1/0/00 21:20:00	232.93
16	1/0/00 5:00:00	232.83	66	1/0/00 21:40:00	232.93
17	1/0/00 5:20:00	232.84	67	1/0/00 22:00:00	232.93
18	1/0/00 5:40:00	232.86	68	1/0/00 22:20:00	232.91
19	1/0/00 6:00:00	232.86	69	1/0/00 22:40:00	232.85
20	1/0/00 6:20:00	232.87	70	1/0/00 23:00:00	232.92
21	1/0/00 6:40:00	232.87	71	1/0/00 23:20:00	232.93
22	1/0/00 7:00:00	232.87	72	1/0/00 23:40:00	232.79
23	1/0/00 7:20:00	232.88	73	1/1/00 0:00:00	232.91
24	1/0/00 7:40:00	232.89	74	1/1/00 0:20:00	232.92
25	1/0/00 8:00:00	232.89	75	1/1/00 0:40:00	232.93
26	1/0/00 8:20:00	232.87	76	1/1/00 1:00:00	232.89
27	1/0/00 8:40:00	232.88	77	1/1/00 1:20:00	232.78
28	1/0/00 9:00:00	232.89	78	1/1/00 1:40:00	232.91
29	1/0/00 9:20:00	232.86	79	1/1/00 2:00:00	232.91
30	1/0/00 9:40:00	232.86	80	1/1/00 2:20:00	232.90
31	1/0/00 10:00:00	232.88	81	1/1/00 2:40:00	232.93
32	1/0/00 10:20:00	232.87	82	1/1/00 3:00:00	232.88
33	1/0/00 10:40:00	232.90	83	1/1/00 3:20:00	232.91
34	1/0/00 11:00:00	232.90	84	1/1/00 3:40:00	232.91
35	1/0/00 11:20:00	232.90	85	1/1/00 4:00:00	232.74
36	1/0/00 11:40:00	232.91	86	1/1/00 4:20:00	232.63
37	1/0/00 12:00:00	232.91	87	1/1/00 4:40:00	232.88
38	1/0/00 12:20:00	232.91	88	1/1/00 5:00:00	232.88
39	1/0/00 12:40:00	232.91	89	1/1/00 5:20:00	232.90
40	1/0/00 13:00:00	232.92	90	1/1/00 5:40:00	232.85
41	1/0/00 13:20:00	232.66	91	1/1/00 6:00:00	232.79
42	1/0/00 13:40:00	232.49	92	1/1/00 6:20:00	232.89
43	1/0/00 14:00:00	232.47	93	1/1/00 6:40:00	232.91
44	1/0/00 14:20:00	232.80	94	1/1/00 7:00:00	232.93
45	1/0/00 14:40:00	232.85	95	1/1/00 7:20:00	232.93
46	1/0/00 15:00:00	232.89	96	1/1/00 7:40:00	232.94
47	1/0/00 15:20:00	232.89	97	1/1/00 8:00:00	232.95
48	1/0/00 15:40:00	232.90	98	1/1/00 8:20:00	232.93
49	1/0/00 16:00:00	232.89	99	1/1/00 8:40:00	232.94
50	1/0/00 16:20:00	232.88	100	1/1/00 9:00:00	232.94


Semi-Log Plot TW 2-13-Drawdown
Greensville Municipal Well Replacement FDG01
Hamilton, ON
Drawdown (m)
1.1
1.05
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
y = 0.0293ln(x) + 0.7634
1
10
100
1000
10000
Elapsed Time (min)


Semi-Log Plot TW 2-13 Recovery
Greensville Municipal Well FDG01 Replacement
Hamilton, ON
Recovery (m)
1.2
1
0.8
0.6
0.4
0.2
0
y = 0.0348ln(x) + 0.7145
1
10
100
1000
10000
Elapsed Time (min)


Semi-Log Plot TW 1-13 Recovery
Greensville municipal Well FDG01 Replacement
Hamilton, ON
0.6
0.5
0.4
0.3
0.2
0.1
0
Recovery (m)
y = 0.0984ln(x) - 0.3043
1
10
100
1000
10000
Elapsed Time (min)
Series1
Log. (Series1)


Semi-Log Plot TW 3-13 Drawdown
Greensville Municipal Well FDG01 Replacement
Hamilton, ON
0.3
0.25
0.2
0.15
0.1
0.05
0
Drawdown (m)
y = 0.0374ln(x) - 0.0891
1
10
100
1000
10000
Elapsed Time (min)


Semi-Log Plot 63 Tews Recovery
Greensville Municipal Well FDG01 Replacement
Hamilton, ON
Recovery (m)
0.6
0.5
0.4
0.3
0.2
0.1
0
y = 0.0611ln(x) - 0.0015
1
10
100
1000
10000
Elapsed Time (min)