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**2025 Biennial Groundwater Monitoring
Report - Elgin Street Well Field (G9)**

The Region of Waterloo



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2025 Biennial Groundwater Monitoring Report - Elgin Street Well Field (G9)

The Region of Waterloo

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R.J. Burnside & Associates Limited

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1.0 Introduction

The Regional Municipality of Waterloo (the Region) is unique in Ontario in that it is the largest urban municipality to rely almost exclusively on groundwater supplies for its drinking-water (Region of Waterloo, 2015). Figure 1 shows the location of municipal well fields within the Region.

Most of the well fields in the Region have a Permit to Take Water (PTTW) issued by the Ministry of Environment, Conservation and Parks (MECP) which require a well field specific biennial report that documents production well pumping volumes and water levels in specific monitoring wells. Since the Elgin Street Well Field was established before the Ontario Water Resource Act, it does not have a PTTW and is referred to as “Grandfathered” (Appendix A). A biennial report similar to other well fields with PTTWs is completed for the Elgin Street Well Field out of due diligence.

This report documents production well pumping volumes and water levels in monitoring wells during 2024 and 2025 at the Elgin Street Wellfield. The location of the Elgin Street Well Field is shown in Figure 1 and the production wells in Cambridge are shown in Figure 2 with the monitoring network for G9 shown in Figure 3. Well records for the production and monitoring wells are found in Appendix B.

1.1 Scope of Work

The Region records water levels on a regular basis within a network of monitoring wells to satisfy the requirements of their Permits to Take Water (PTTW) and to confirm that water taking is sustainable in the long term. The monitoring wells are concentrated near the production wells and are also located in known aquifer recharge areas. The data from these wells and regular measurements of pumping volume obtained from the production wells are used to evaluate the impact of Region pumping on aquifers and potential impacts to private wells, other water takers and the natural environment.

The Region has developed a monitoring program for the Elgin Street Well Field which consists of the following activities:

- Measuring the daily volume pumped from the G9 production well;
- Measuring the water levels in monitoring wells C-ES-OW8-95-ABCDEFGH; and
- Review of precipitation data from the nearest GRCA / Environment Canada weather station.

The monitoring data (pumped volumes and hydrographs) are found in Appendix C with precipitation data in Appendix D. The monitoring program procedures and methodology are included in Appendix E.

2.0 Site Setting

2.1 Well Field Description

The Elgin Street Well Field is located in the southeast part of Cambridge, 1.2 km east of the Grand River (Figure 3). The closest well fields are the Middleton Well Field located to the southwest and Shade's Mills Well Field located to the north (Figure 2). The closest surface water feature to the Elgin Street Well Field is Moffat Creek located southeast of G9 (Figure 3).

2.1.1 Pumping Wells

The single production well (G9) that makes up the Elgin Street Well Field obtains its water from the Guelph Formation. Well records for the production well are found in Appendix B. A summary of the production well construction details is provided in Table 1 below.

Table 1: Production Well Construction Details

Well Name	Year Built	Casing Diameter (mm)	Open Hole Diameter (mm)	Open Hole Interval (mbgs)	Aquifer
G9	1954	300	300	25.4 – 76.5	Guelph / Eramosa

The water taking volumes for the Elgin Street Well Field are summarized in Table 2 below.

Table 2: Annual Water Taking 2024/2025

Well	2024			2025		
	Avg. Daily Water Taking (m ³)	Max Taken per Day (m ³)	Total Volume Pumped (m ³)	Avg. Daily Water Taking (m ³)	Max Taken per Day (m ³)	Total Volume Pumped (m ³)
G9	1,342	1,521	489,707	1,189	1,365	433,822

The Region of Waterloo's SCADA system records total daily water taking volumes including the dates and times of water takings, the rates of pumping, and calculations of the total amounts of water pumped per day for each supply well. The total daily volumes are presented in Appendix C as total monthly volumes. Pumping volumes from the well field ranged from 36,429 m³/month to 44,357 m³/month in 2024, and from 28,738 m³/month to 38,765 m³/month in 2025. In total, 489,707 m³ was produced at this well field in 2024 and 433,822 m³ was produced in 2025. 2025 volumes are similar to 2023 volumes and 2024 volumes are similar to 2022 volumes. (Table C-1).

2.1.2 Monitoring Wells

C-ES-OW8-95-ABCDEFGH is a multilevel monitoring well drilled in 1995 located 630 m southeast of G9 (Figure 3). Construction details for the monitoring well are described in the table below. Well records for the monitoring well are provided in Appendix B.

Table 3: Monitoring Well Construction Details

Monitoring Well ID	Year Built	Screened Depth (mbgs)	Screened Formation	Distance to G9 (m)
C-ES-OW8-95-A	1995	122.53 – 128.63	Cabot Head to Lower Gasport	615
C-ES-OW8-95-B		85.34 – 96.01	Mid to Upper Gasport	
C-ES-OW8-95-C		67.05 – 73.15	Vinemount	
C-ES-OW8-95-D		33.53 – 39.62	Lower Guelph to Reformatory	
C-ES-OW8-95-E		18.90 – 20.42	Guelph to Upper Contact	
C-ES-OW8-95-F		14.02 – 15.54	AFA2 to ATC1	
C-ES-OW8-95-G		3.96 – 7.01	AFA2	

2.2 Regional Geology and Hydrostratigraphy

The following sections provide a brief overview of the regional geology and hydrogeology of the Elgin Street Well Field. The surficial geology based on regional OGS mapping is provided on Figure 4. Representative cross-sections showing the stratigraphy in the vicinity of the Elgin Street Well Field are included as Figures 5, 6 and 7 to visualize the stratigraphy described in this section. The cross-section locations are provided on Figure 3.

The layers displayed were generated from results of the Hydrogeological Characterization and Conceptual Model Tier 3 Assessment Update Project (Aqua Insight et al, 2023) and associated hydrogeological modelling work and may not necessarily match layers identified through borehole log interpretation.

2.2.1 Surficial Geology and Conceptual Hydrostratigraphy

The surficial geology of the Study Area has been mapped and described by Karrow (1987). Along the eastern side of the Grand River and the south side of the Speed River, the surficial geology (Figure 4) largely consists of sand and gravel outwash deposits (Units 7a and 7b on Figure 4) and silty to sandy glacial till deposits.

The thickness of overburden deposits generally range from approximately 5 to 10 m in areas of outwash deposits, however can be up to approximately 30 to 40 m thick in areas of the Paris and Galt moraines to the east of Cambridge. In the vicinity of the Elgin Street Well Field the overburden is 10 to 20 m thick and is thin or absent in the Grand River valley.

The Quaternary Geology of the Cambridge area includes the following units (Stantec, 2011). These units are described in more detail below.

Aquitard ATA2 - Wentworth Till

The Wentworth Till was deposited by the last glacier to advance in the area. It is described as a stony, sandy silt to sand textured till, and is often inter-bedded with sand and gravel. In the Cambridge area, the Wentworth Till is generally less than 10 m thick. Due to the loose, coarse-grained nature of the till, the unit behaves as a leaky aquitard or poor aquifer that is readily recharged from precipitation.

Aquifer AFA2 - Outwash Deposits

The outwash sand and gravel sediments of AFA2 are present within the Grand River Valley and vicinity, however extensive deposits have also been identified underlying the Wentworth Till in the Paris and Galt moraines.

Aquitard ATB1 - Port Stanley Till

The Port Stanley Till is a sandy silt to silty sand till, with occasional stony texture. The Port Stanley Till was deposited by ice advancing from the Erie-Ontario ice lobe. In other parts of the Region, Bajc and Shirota (2007) have also used unit ATB1 to represent Tavistock, Mornington and Upper Maryhill Tills. This unit is generally finer grained than the Wentworth Till and behaves as an aquitard. In the Grand River and Speed River valleys this unit has been largely removed by erosion.

Aquifer AFB1 - Upper Waterloo Moraine Stratified Sediments and Equivalents

Significant thicknesses of aquifer AFB1 are interpreted to occur southeast of the Speed River and west of Puslinch Lake and generally correspond with mapped surficial ice-contact sands and gravels. AFB1 is generally fine sand with some gravel and is often slightly finer grained than unit AFA2, which typically contains greater amounts of gravel. Since AFB1 and AFA2 both behave as aquifers, differentiation of these units is not critical from a hydraulic perspective, although it is necessary to represent AFB1 separately from AFA2 to allow sequential layers for aquifer units both above and below the Port Stanley Till (ATB1), where this situation occurs. Where AFB1 is not present, Port Stanley Till may directly overlie Maryhill Till and Catfish Creek Till (described below), forming a single combined aquitard unit composed of these tills.

Aquitard ATB3 - Lower Maryhill Till

Fine grained till and glaciolacustrine deposits of the Lower Maryhill Till ATB3 generally separate AFB1 from the underlying Catfish Creek Till. The Lower Maryhill Till is described as a dense, dark brown, clayey silt to silty clay till. Aquitard ATB3 can be difficult to distinguish from ATB1 throughout most of the study area due to the similar lithologies of these units. Lotowater (1997) grouped the Port Stanley and Maryhill Tills as a single aquitard hydrostratigraphic unit, which is a reasonable approach where no significant thickness of sand and gravel separate these units.

Aquitard ATC1 – Upper / Main Catfish Creek Till

The Catfish Creek Till was deposited by a major glacial advance from the north to northeast that covered all of southern Ontario. The Catfish Creek Till is a dense, stony, sandy silt to silty sand till with little clay content. Although originally deposited over the entire Cambridge area, erosion, glaciations and meltwater events have removed areas of the Catfish Creek Till and it is now discontinuous. In the Cambridge Area, the thickness of this unit ranges from approximately 5 m in areas east of the Grand River, to approximately 20 m west of the Grand River, and is usually found immediately overlying bedrock and beneath clayey sediments. The hydrogeologic properties of the Catfish Creek Till are variable, ranging from a good aquitard to a poor aquifer, depending on local lithology, degree of compaction, and the presence of overlying aquitard units.

2.2.2 Bedrock Geology and Conceptual Hydrostratigraphy

The stratigraphy discussed below is consistent with the revised stratigraphic framework described by the OGS (Brunton, 2009) and is also used in the Tier 3 Study of the area (Golder, 2011). A brief description (from Stantec, 2013) of each bedrock formation and conceptual hydrostratigraphic units typically present in Cambridge is provided below (from youngest to oldest). The formations present in the vicinity of G9 are shown on the cross sections in Figures 5, 6 and 7.

Guelph Formation

The Guelph Formation is a cream-coloured fossiliferous dolostone that represents an important aquifer in the Cambridge and Guelph area, where it is most often the uppermost bedrock unit. Eramosa Formation

The Upper Eramosa Formation is described by Brunton (2009) as light brown to cream coloured, pseudonodular, thickly bedded and coarsely crystalline dolostone. The formation consists of the Reformatory Quarry Member, and the Vinemount Member.

The Reformatory Quarry Member is susceptible to karstification due to its uniform fine dolomite crystallinity (Brunton, 2009), and also often contains mud-rich and microbial mat-bearing lithofacies. As a result, this unit generally represents a poor aquifer or poor

aquitard. This unit was described as either the Guelph Formation or Eramosa Member in previous studies within the Region.

The Vinemount Member is comprised of thinly bedded, fine crystalline dolostone with shaley beds that give off a distinctive petroliferous odour when broken (Brunton, 2009). This unit represents an aquitard when present within the Cambridge and Guelph areas.

Goat Island Formation

The Goat Island Formation consists of the upper Ancaster Member and lower Niagara Falls Member. The Ancaster Member is a chert rich, finely crystalline dolostone that is medium to ash grey in colour. The Niagara Falls Member is a finely crystalline and cross laminated crinoidal grainstone with small reef mounds. The finely crystalline nature of these Members results in a lower hydraulic conductivity and transmissivity compared to the underlying Gasport Formation (Brunton, 2009). Conceptually, the two members of the Goat Island Formation are treated as a single hydrostratigraphic unit.

Gasport (Amabel) Formation

The Gasport Formation is a cross-bedded crinoidal grainstone-packstone with sequences of reef mound and coquina (shell bed) lithofacies. This unit has commonly been referred to as the Amabel Formation in previous studies in the Region. Upper, middle and lower hydrostratigraphic units of the Gasport have been defined to allow for general representation of the vertical distribution of the more transmissive reef mound and coquina bed lithofacies. Highly transmissive reef mounds, crinoidal grainstones and coquina beds are generally present in the upper and middle portions of the formation, and are largely absent from the lower 10 m to 20 m.

The lower portion of the Gasport Formation has been grouped with the Rochester, Irondequoit, Rockway, and Merriton Formations due to the difficulty in distinguishing the various units from available borehole data and geophysical logs. All four formations, as well as the base of the Gasport Formation, are relatively less permeable than the upper sections of the Gasport Formation.

Cabot Head Formation

The Cabot Head Formation is described as a shale unit that represents a regional aquitard. It is characterized on the geophysical logs as a large spike in gamma readings and a decrease in resistivity.

2.3 Local Geology

Figure 3 displays the Elgin Street Well Field well plan and cross-section locations. Representative cross-sections are included as Figures 5, 6 and 7 to visualize the stratigraphy described in this section.

There are few continuously cored boreholes near the Elgin Street wellfield and as a result, the overburden geology has not been well characterized. At G9, the overburden is about 20 m thick. At C-ES-OW8-95, sand and gravel and silt of AFA2 was encountered at surface to a depth of 4.5 m. Gravel and boulders and sand and silt of AFB1 extended from 4.5 m to 18.0 mbgs. The model for the Cambridge area (Matrix, 2015) had insufficient data to allow for the overburden to be reliably characterized so the cross sections show the overburden as till and stratified deposits (ATB3, AFB3, ATC1, AFC1 and ATC2).

2.3.1 Bedrock Geology

The production well G9 is completed as an open hole across the Guelph and Eramosa Formations. The Guelph formation is interpreted to be 20 m thick at G9. The well was completed at the top of the Eramosa Formation-Vinemount Member after encountering about 30 m of the Eramosa Formation-Reformatory Quarry Member.

Based on the borehole log for C-ES-OW8-95, the Guelph formation was identified from 18 mbgs to 38.1 mbgs, the Eramosa Formation-Reformatory Quarry Member from 38.1 m to 67.1 mbgs, the Eramosa Formation-Vinemount Member from 67.1 m to 74.7 mbgs, the Gasport Formation from about 74.7 mbgs to 125 mbgs, and the Cabot Head formation from 125 mbgs to the end of the borehole at 140.5 mbgs.

3.0 2024 / 2025 Results

3.1 Precipitation

Longer term precipitation trends can have an impact on water levels in the supply aquifer. To assess the potential influence, monthly precipitation is plotted for comparison to water levels and pumping and presented in Appendix C.

Since variations in precipitation totals can occur throughout the Region due to localized events, monthly precipitation data from the GRCA and Environment Canada station located closest to the production wells are used. The closest GRCA weather station relative to the Elgin Street well field is the Shades Mills Dam station located 2.4 km from the well field. The closest Environment Canada station is Waterloo International Airport (WIA) located about 13.8 km west / northwest from the well field. The locations of the meteorological stations are shown on Figure 1. Annual precipitation data from the past 10 years for all stations are compared with long term averages in Table D.1, Appendix D. Monthly precipitation data for the past 10 years at Shades Mills Dam are shown on Figure D.1, Appendix D. At the Shades Mills Dam station, the long-term average was calculated from when measurements started until the end of 2025. The Roseville and Region of Waterloo International Airport (WIA) has "Climate Normals" calculated by Environment Canada for 1981 to 2010.

Annual 2024 / 2025 precipitation data for the GRCA and Environment Canada meteorological station closest to the Shades Mills well field are presented in Table 4

below. In 2024 WIA was missing 6 days of data and 6 days in 2025. As a result, the precipitation totals may be under reported at this location.

Table 4: Summary of Precipitation Data

Station	2024 Precipitation (mm)	2024 Deviation (mm)	Long- Term Average (mm)	2025 Precipitation (mm)	2025 Deviation (mm)
Region of Waterloo International Airport ⁽¹⁾	874	+23	851 ^(A)	723	-128
Shades Mills Dam ⁽²⁾	976	+67	909 ^(B)	895	-14
Sources: Environment Canada (1), GRCA (2) ^A 1981 to 2010 Normal ^B Average annual precipitation since monitoring began to the end of 2025					

Water levels typically follow a seasonal trend with highest levels occurring in the spring with the depth and water content of the snowpack having a significant influence on water levels. Lowest levels occurring in July / August. Widespread synoptic rainfall events can also result in Region-wide water level responses. Summer thunderstorms tend to be short lived and occur over a smaller area resulting in short term, localized water level rises not typically seen in the monitoring wells.

The 2024 total precipitation at Shades Mills station was 976 mm, which is 67 mm above the long-term average, indicating 2024 was wetter-than-average at the well field A similar above long-term average trend is noted at the WIA station. The March 1 GRCA snow survey indicated a snowpack across the Region that was low compared to normal. In 2025, the total precipitation was 895 mm, which is 14 mm below the long-term average. Similarly, the total precipitation at the WIA station was 128 mm below the long-term average, indicating 2025 was a drier than average year. However, WIA was missing 12 days of data in 2024 / 2025 and as a result, precipitation totals may be under reported. The snow survey conducted by the GRCA on March 15, 2025, showed that the stations in the Region had a high to very high measured snow water equivalent.

3.2 Monitoring Results

Hydrographs showing the results of water level monitoring over the past 10 years are provided in Appendix C. The method used to collect the water levels (manual or electronic) is indicated on the graphs in Appendix C.

C-ES-OW8-95-ABCDEFGF

The nearest observation well C-ES-OW8-95 is located about 615 m southeast of G9 and has screens at seven intervals. Water levels in screens B and F are recorded using dataloggers and Screens A, C, D, E and G are collected by monthly manual readings.

Water levels in all screens in 2024 / 2025 are within typical historical ranges. Water levels in screens B, C and D show a direct response to pumping at G9 with recovery of water levels of up to 2.5 m when G9 is shut down (e.g. January to April 2023). Water levels in the A screen suggest that it is impacted by changes to long-term pumping volumes but not short-term pumping variations. Water levels are stable in 2024 / 2025. The B screen, which is monitored electronically, shows an almost 1 m rise in July 2025 when pumping of G9 is reduced.

Water levels in screens E, F and G do not show direct responses to pumping at G9. In screens E and F, water levels do not typically vary by more than 0.5 m. In screen G the water level shows a strong seasonal trend with a typical yearly range of about 1 m. Screens E and F also show seasonal trends that are more subdued.

4.0 Impact Assessment

4.1 Well Interference

The Elgin Street Well Field is located in a municipally serviced area. When a well interference complaint is received, the Region has a Well Interference Policy in place. A copy of the policy is presented in Appendix F of the 2019 Biennial Groundwater Monitoring Report – Multiple Well Fields (Burnside, 2020). There were no well interference complaints related to pumping of G9 received in 2024 and 2025.

Other groundwater takings registered in the MECP PTTW database within 2 km of the wellfield are mapped on Figure 3 and summarized below in Table 5.

Table 5: PTTWs in Vicinity of Elgin Street Well Field

Permit Number	Permit Holder	Purpose	Source - Max Liters per Day	Distance from G9	Expiry Date
0168-AW8S7T	Dana Canada Corporation	Remediation	PW1 – 213,000 PW2 – 115,000 PW3 – 38,000	1.2 km	02/28/2028
3823-C4WJJE	Region of Waterloo	Remediation	950,400	2.0 km	07/31/2031

These takings are not anticipated to be impacted by / or to impact the Elgin Street Well Field.

4.2 Aquifer Response to Pumping and Precipitation

Water levels in the overburden (AFB1 and AFA2) were monitored using monitoring well screens F and G. Based on monitoring results, the water levels in the overburden

showed no response to pumping. Seasonal fluctuations in the overburden (most pronounced in Screen G) are observed with the highest and lowest levels observed in spring and late summer / fall, respectively. The correlation of individual precipitation events with groundwater levels is difficult due to several reasons including but not limited to hydraulic conductivity, well depth, precipitation intensity and ground cover conditions.

Water levels in the bedrock formations (Cabot Head, Gasport, Eramosa and Lower and Upper Guelph) were monitored using monitoring well screens A, B, C, D and E, respectively. Based on monitoring results, the water levels in the Gasport Aquifer, Eramosa Formation and lower portion of the Guelph Formation (Screens B, C and D) indicate a clear response to pumping at G9, which show drawdowns of up to 3 m. Water levels in the Cabot Head Formation (Screen A) also show a response to pumping but only to longer term changes in pumping rates. There is no response to pumping observed in the E screen within the upper portion of the Guelph Formation.

Although water levels in several of the screened intervals at OW8-95 respond to changes in pumping, there is no evidence of any long- term adverse impacts.

5.0 Conclusions

Impacts from pumping the municipal wells at the Elgin Street Well Field were evaluated through implementation of the Groundwater Monitoring Program. Based on the information contained in the report, Burnside offers the following conclusions:

- The Elgin Street Well Field is a grandfather well under the Ontario Water Resources Act and does not have a PTTW;
- There were no reported well interference complaints arising from water taking at the Elgin Street well field in 2024 and 2025; and
- At current pumping rates there are no adverse impacts on the aquifer.

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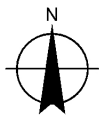
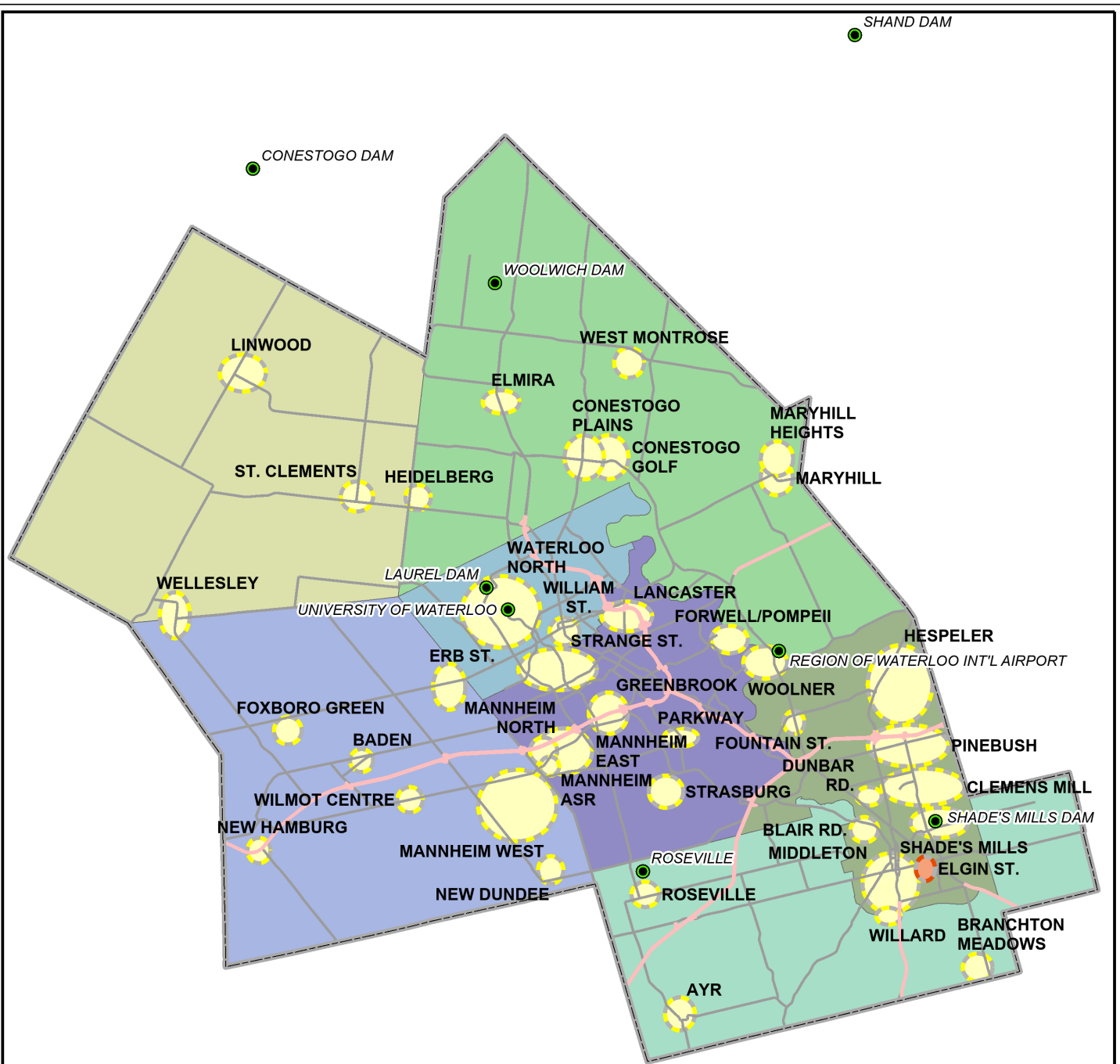


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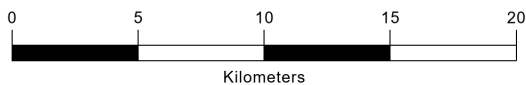
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Figures



Data Source:
Region of Waterloo; Includes material © 2012 of the Queen's
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- | | |
|-------------------------------|-------------------------------------|
| Well Field Location | Township of North Dumfries |
| Well Fields | Township of Wellesley |
| Regional Municipal Boundaries | Township of Wilmot |
| City of Cambridge | Township of Woolwich |
| City of Kitchener | Meteorological Monitoring Locations |
| City of Waterloo | |



Map Title

2025 GROUNDWATER MONITORING REPORT - ELGIN STREET WELL FIELD

WELL FIELD LOCATION MAP

Client

REGION OF WATERLOO

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Scale

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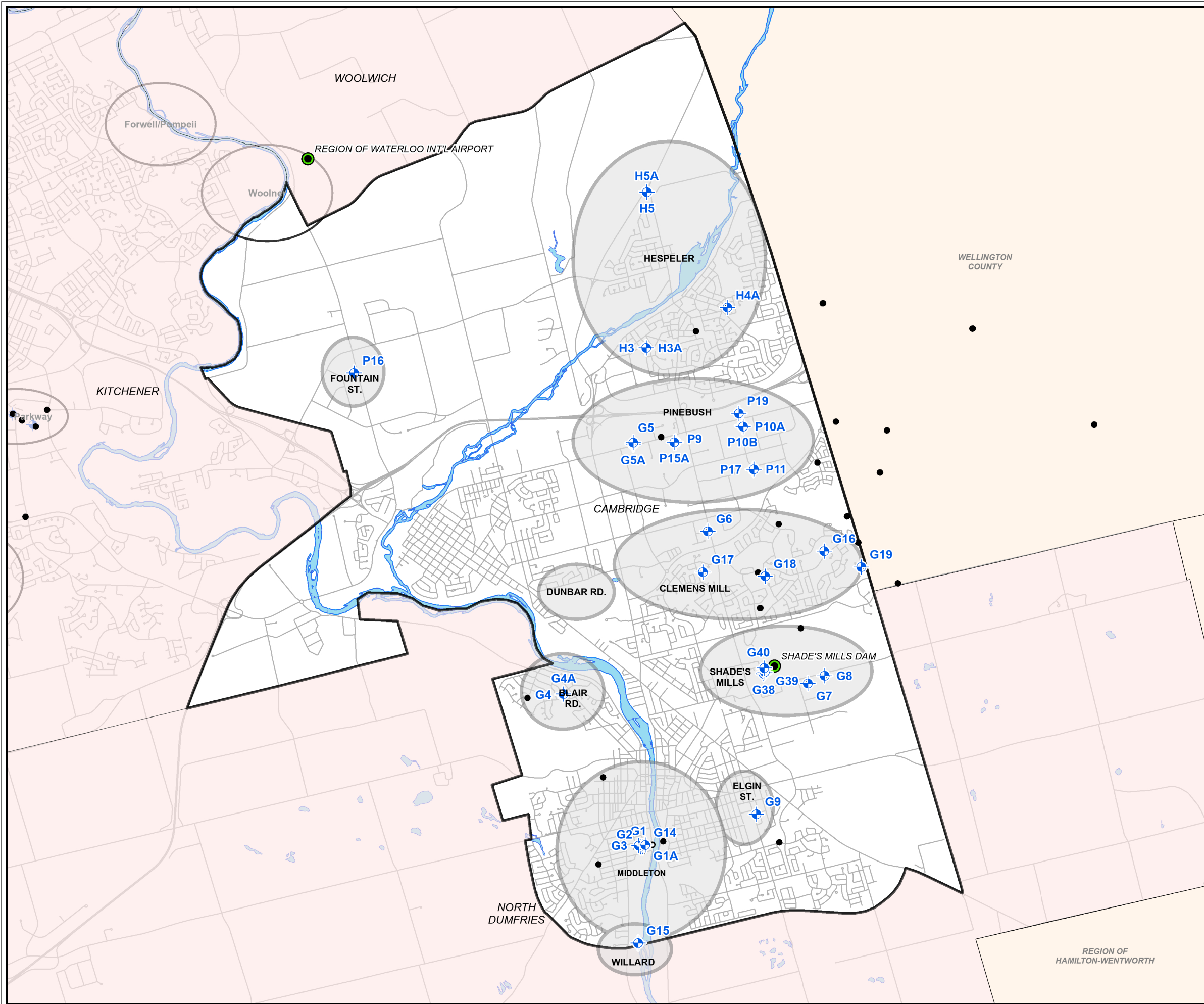
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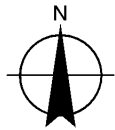
LEGEND

- Meteorological Monitoring Locations
- Production Well Location
- Monitoring Well Location
- Well Fields
- Cambridge Municipal Boundary

Sources:

1. Ministry of Natural Resources, © Queen's Printer for Ontario
2. Natural Resources Canada © Her Majesty the Queen in Right of Canada.

Datum: North American 1983 CSRS
Coord. System: NAD 1983 CSRS UTM Zone 17N



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REGION OF WATERLOO

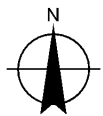
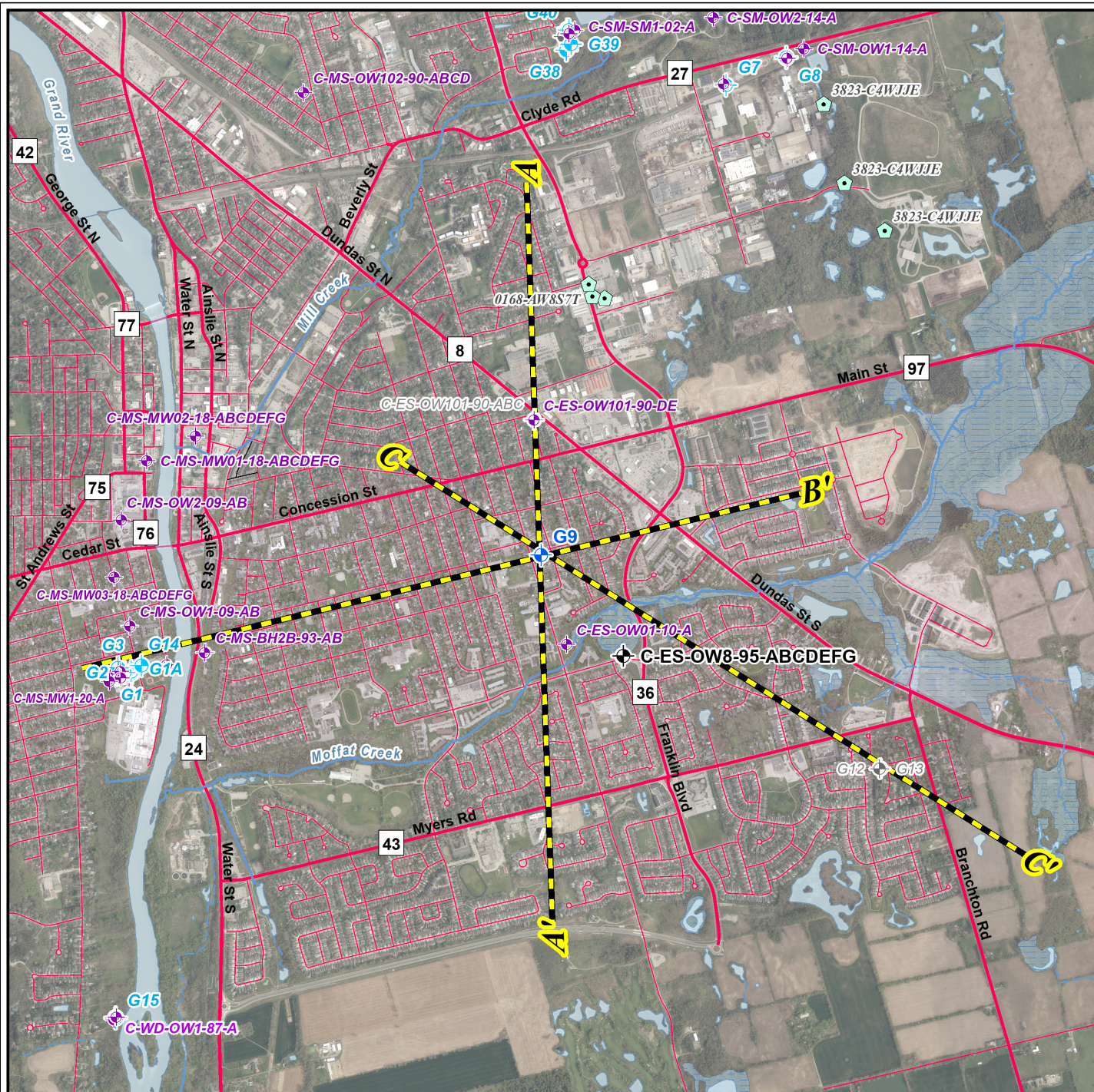
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**2025 GROUNDWATER MONITORING
REPORT - ELGIN STREET WELL FIELD**
**CAMBRIDGE WELL FIELDS AND
MONITORING NETWORK**

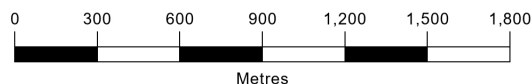
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Data Source:
Region of Waterloo GIS Data; Background 2020 Air Photo;
ArcGIS Image Service Region of Waterloo; Ministry of
Natural Resources, © Queen's Printer for Ontario; Natural
Resources Canada © Her Majesty the Queen in Right of
Canada.



- PTTW Monitoring Well Location
- Nearby Monitoring Well Location
- Nearby Production Well Location

- Decommissioned Production Well Location
- Additional MECP PTTW Locations**
- Groundwater
- Cross Section Orientation

- Intermittent Creek
- Creek
- Waterbody
- Provincially Significant Wetland (MNR)
- Provincial Highway

- Regional Road
- Local Road
- Private / Other Road



Map Title

2025 GROUNDWATER MONITORING REPORT - ELGIN STREET WELL FIELD

WELL LOCATION MAP

Client

REGION OF WATERLOO

Drawn

HN

Scale

1:27,500

Checked

SQ

Date

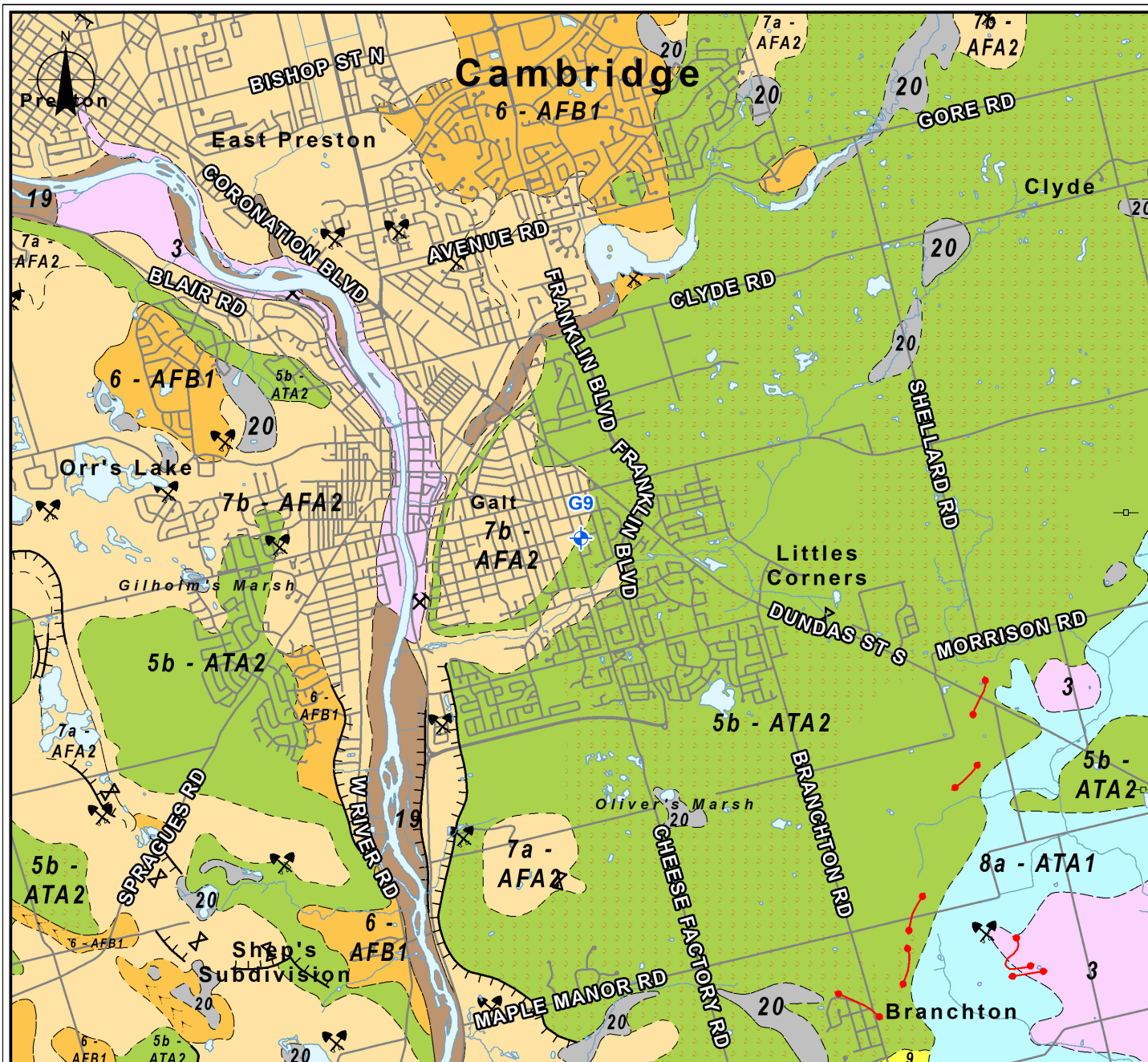
March 2026

Project No.

HA0464020

Figure No.

3



Data Source:
 1. Ontario Geological Survey 2003, Surficial Geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 128.
 2. Region of Waterloo GIS

- | | | | | | |
|--|---|---|--|---|--|
| <ul style="list-style-type: none"> RMOW Supply Well Watercourse Waterbody | <ul style="list-style-type: none"> 5b: Stone-poor, carbonate-derived silty to sandy till (ATA2/ATB1 - Aquitard) 6: Ice-contact stratified deposits (AFB1 - Aquifer) | <ul style="list-style-type: none"> 7a: Glaciofluvial deposits: Sandy deposits (AFA2 - Aquifer) 7b: Glaciofluvial deposits: Gravelly deposits (AFA2 - Aquifer) | <ul style="list-style-type: none"> 8a: Fine-textured glaciolacustrine deposits: Massive-well laminated (ATA1) 9: Coarse-textured glaciolacustrine deposits 19: Modern alluvial deposits 20: Organic deposits | <ul style="list-style-type: none"> Quarry (Point) Sand and Gravel Pit Beach Esker: Direction of Flow Known Ice-Contact Slope Terrace Delta, glaciolacustrine | <ul style="list-style-type: none"> Drumlin or drumlinoid ridges (point) Sample Location Hummocky Topography Unit Contact Boundary |
|--|---|---|--|---|--|



2025 GROUNDWATER MONITORING REPORT - ELGIN STREET WELL FIELD

SURFICIAL GEOLOGY

Client

REGION OF WATERLOO

Drawn

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Scale

1:60,000

Checked

SQ

Date

February 2026

Project No.

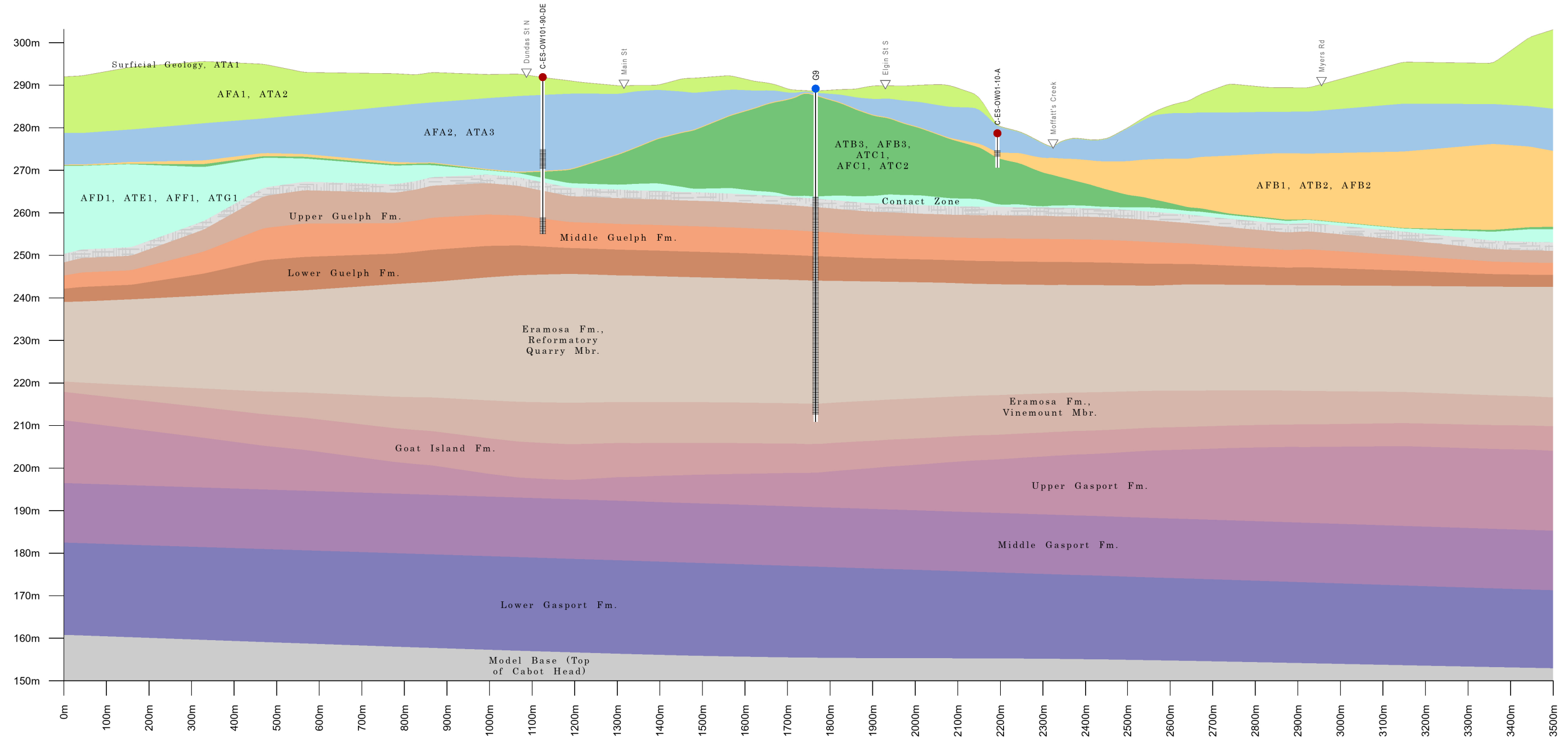
HA0464020

Figure No.

4

A

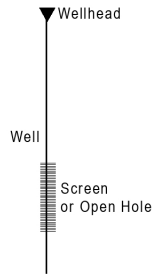
A'



Wells
● Production Well (Active) ● Monitoring Well

Cambridge Model 2026

Surficial Geology, Whittlesey Clay (ATA1)	Upper Waterloo Moraine Stratified Sediments & Equivalents (AFB1), Middle Maryhill Till & Equivalents (ATB2), Middle Waterloo Moraine Stratified Sediments & Equivalents (AFB2)	Pre-Catfish Creek Coarse-Grained Glaciofluvial/ Lacustrine Deposits (AFD1), Canning Drift: Till & Fine Textured Glaciolacustrine Deposits (ATE1), Pre-Canning Coarse-Textured Glaciofluvial/ Glaciolacustrine Deposits (AFF1), Pre-Canning Coarse-Textured Till (ATG1)	Bedrock: Upper Guelph Fm.	Bedrock: Eramosa Fm., Vinemount Mbr.	Bedrock: Middle Gasport Fm.
Whittlesey Sand (AFA1), Wentworth Till (ATA2)	Lower Maryhill Till & stratified Equivalents (ATB3), Lower Waterloo Moraine Stratified Sediments or Catfish Creek Till Outwash (AFB3), Upper / Main Catfish Creek Till (ATC1), Middle Catfish Creek Stratified Deposits (AFC1), Lower Catfish Creek Till (ATC2)	Weathered Bedrock	Bedrock: Middle Guelph Fm.	Bedrock: Goat Island Fm.	Model Base (Top of Cabot Head)
Grand River Valley Outwash Deposits (AFA2), Fine Grain Deposits in the Grand River Valley (ATA3)			Bedrock: Lower Guelph Fm.	Bedrock: Lower Gasport Fm.	
			Bedrock: Eramosa Fm., Reformatory Quarry Mbr.	Bedrock: Upper Gasport Fm.	



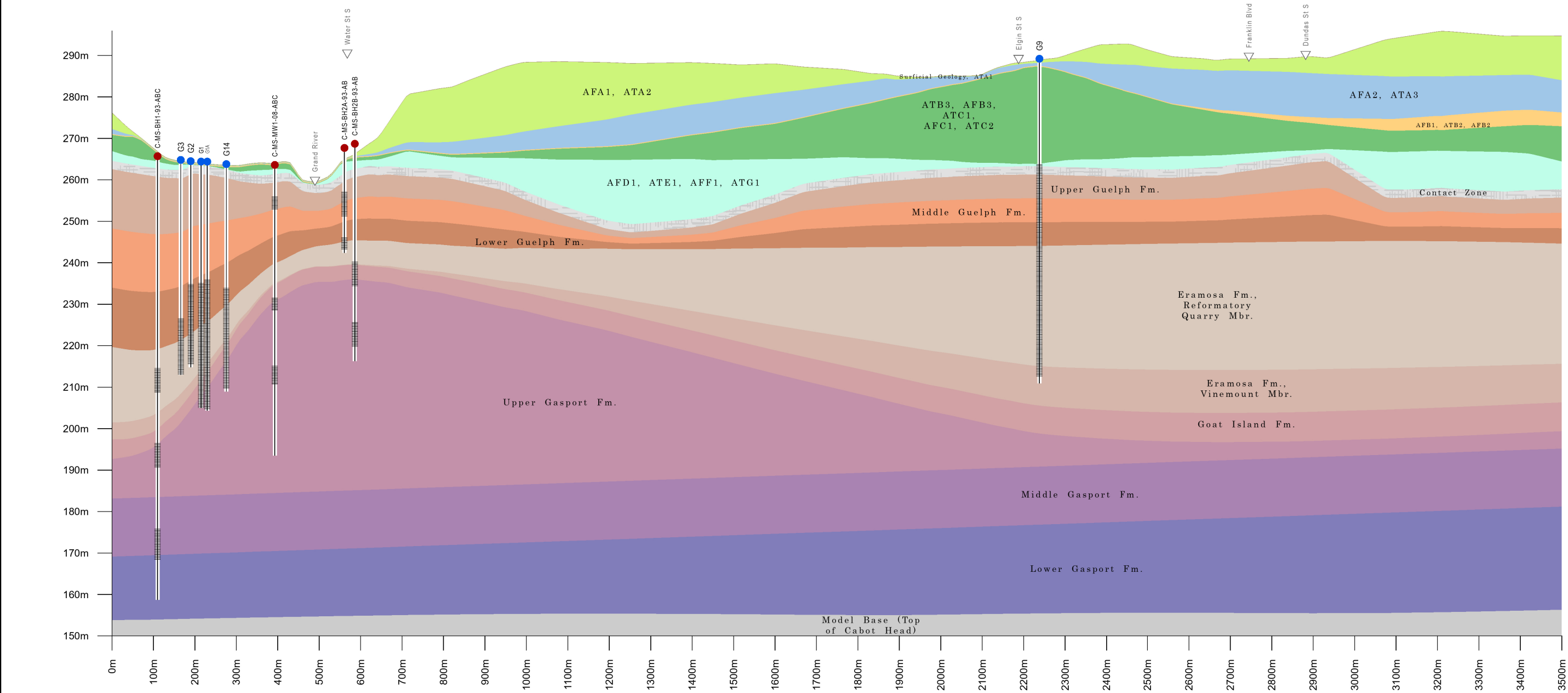


Client
REGION OF WATERLOO

Figure Title GEOLOGIC CROSS SECTION REGION OF WATERLOO Elgin Street Cross Section A - A'			
Drawn PS	Checked DH	Date 2026/06/01	Figure No. 5
Horizontal Scale 1:10,000		Project No.	
Vertical Ex.:10x		HA046402	

B

B'



Wells

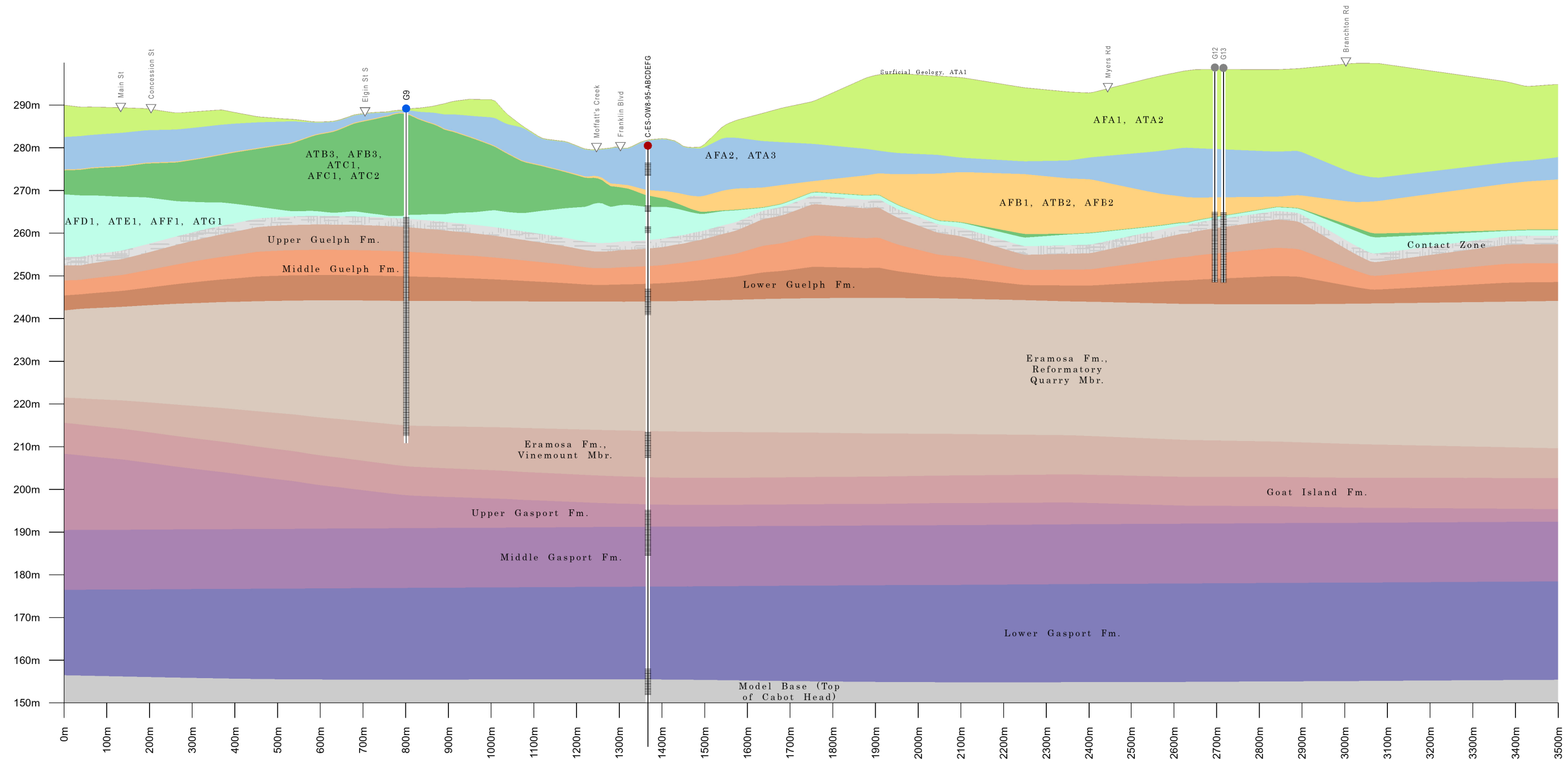
● Production Well (Active) ● Monitoring Well

Cambridge Model 2026

Surficial Geology, Whittlesey Clay (ATA1) Whittlesey Sand (AFA1), Wentworth Till (ATA2) Grand River Valley Outwash Deposits (AFA2), Fine Grain Deposits in the Grand River Valley (ATA3)	Upper Waterloo Moraine Stratified Sediments & Equivalents (AFB1), Middle Maryhill Till & Equivalents (ATB2), Middle Waterloo Moraine Stratified Sediments & Equivalents (AFB2) Lower Maryhill Till & stratified Equivalents (ATB3), Lower Waterloo Moraine Stratified Sediments or Catfish Creek Till Outwash (AFB3), Upper / Main Catfish Creek Till (ATC1), Middle Catfish Creek Stratified Deposits (AFC1), Lower Catfish Creek Till (ATC2)	Pre-Catfish Creek Coarse-Grained Glaciofluvial/ Lacustrine Deposits (AFD1), Canning Drift: Till & Fine Textured Glaciolacustrine Deposits (ATE1), Pre-Canning Coarse-Textured Glaciofluvial/ Glaciolacustrine Deposits (AFF1), Pre-Canning Coarse-Textured Till (ATG1) Weathered Bedrock	Bedrock: Upper Guelph Fm. Bedrock: Middle Guelph Fm. Bedrock: Lower Guelph Fm. Bedrock: Eramosa Fm., Reformatory Quarry Mbr.	Bedrock: Eramosa Fm., Vinemount Mbr. Bedrock: Goat Island Fm. Bedrock: Lower Gasport Fm. Bedrock: Upper Gasport Fm.	Bedrock: Middle Gasport Fm. Model Base (Top of Cabot Head)	Wellhead Well Screen or Open Hole	 Client REGION OF WATERLOO	Figure Title GEOLOGIC CROSS SECTION REGION OF WATERLOO Elgin Street Cross Section B - B'	Drawn PS Horizontal Scale 1:10,000 Vertical Ex.:10x	Checked DH Project No. HA046402	Date 2026/06/01	Figure No. 6
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C

C'

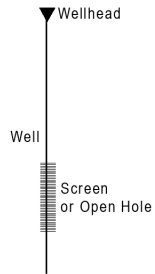


Wells

- Production Well (Active)
- Production Well (Decommissioned)
- Monitoring Well

Cambridge Model 2026

Surficial Geology, Whittlesey Clay (ATA1)	Upper Waterloo Moraine Stratified Sediments & Equivalents (AFB1), Middle Maryhill Till & Equivalents (ATB2), Middle Waterloo Moraine Stratified Sediments & Equivalents (AFB2)	Pre-Catfish Creek Coarse-Grained Glaciofluvial/Lacustrine Deposits (AFD1), Canning Drift: Till & Fine Textured Glaciolacustrine Deposits (ATE1), Pre-Canning Coarse-Textured Glaciofluvial/Glaciolacustrine Deposits (AFF1), Pre-Canning Coarse-Textured Till (ATG1)	Bedrock: Upper Guelph Fm.	Bedrock: Eramosa Fm., Vinemount Mbr.	Bedrock: Middle Gasport Fm.
Whittlesey Sand (AFA1), Wentworth Till (ATA2)	Lower Maryhill Till & stratified Equivalents (ATB3), Lower Waterloo Moraine Stratified Sediments or Catfish Creek Till Outwash (AFB3), Upper / Main Catfish Creek Till (ATC1), Middle Catfish Creek Stratified Deposits (AFC1), Lower Catfish Creek Till (ATC2)	Weathered Bedrock	Bedrock: Middle Guelph Fm.	Bedrock: Goat Island Fm.	Model Base (Top of Cabot Head)
Grand River Valley Outwash Deposits (AFA2), Fine Grain Deposits in the Grand River Valley (ATA3)			Bedrock: Lower Guelph Fm.	Bedrock: Lower Gasport Fm.	
			Bedrock: Eramosa Fm., Reformatory Quarry Mbr.	Bedrock: Upper Gasport Fm.	



Client
REGION OF WATERLOO

Figure Title
**GEOLOGIC CROSS SECTION
REGION OF WATERLOO**
Elgin Street
Cross Section C - C'

Drawn	Checked	Date	Figure No. 7
PS	DH	2026/06/01	
Horizontal Scale 1:10,000		Project No. HA046402	



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Appendix A

Permit To Take Water

Elgin Street Well Field – G9

PTTW not required since well installed prior to Ontario Water Resources Act

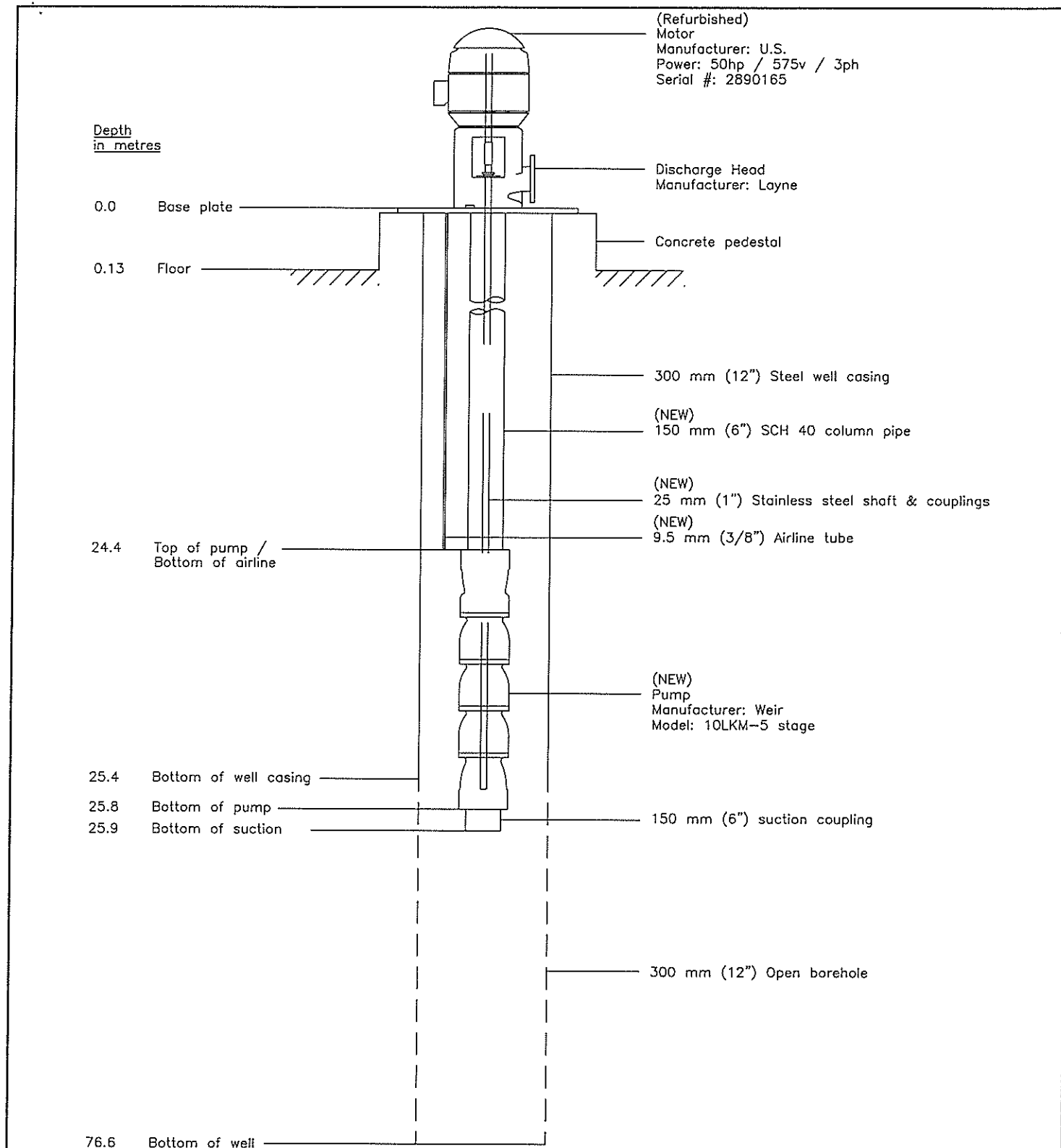


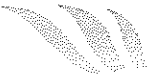
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Appendix B

Well Records



 Lotowater CONSULTING & ENGINEERING			CLIENT Regional Municipality of Waterloo		
			TITLE Well G9 Pump Installation Drawing		
PROJECT No. 006-240			G:\Lotowater Projects\006 Region of Waterloo\240 G9 Pump Repair and Replacement\Pump Installation.dwg		
DESIGN			REVISION No. 2012/10/16	SCALE N.T.S.	FIGURE 1
DRAWN	EH	2012/10/16			
CHECKED					

Well Material

Outer Casing	12" x 82'-8"
Inner Casing	None
Screen	None
Plug	None
Gravel	None

Pump

No. 27979	Setting BP-MB	100'
No. Stages 6	Length Bowl	5'-6"
Bowl 10" RKHC	Size & Lgth. Suction	6" x 10'
Head TF 618	Size Column	7" x 2" x 1 3/16"

Materials or setting details other than standard:
 Pump design capacity: 500IGM @ 222
 TOP

Motor

Make	US	Phase	3
Shaft	VHS	Cycles	60
H. P.	50	Volts	550
R. P. M.	1800	Amps.	
Type	CFU	Base	
Frame	405-4	Serial	997398

Special Equipment

Well G-9

B. P. referred to original Ground Level +1'-4"
 Started FEB 11, 1954 Clear Depth 253'-6"
 Preliminary Test 3/10/54 Length Air Line 100'
 Final Test ~~NONE~~ ^{ON 2-24-54} Static Level 32'-6"
 Guarantee NONE Pumping Level 88'
 Pressure Capacity 775 I.G.P.
 Driller: R. STROH. 4/1/54
 Installer: W RILEY 8/26/54

INTERNATIONAL WATER SUPPLY LTD.

LONDON, CANADA
WATER SUPPLY CONTRACTORS

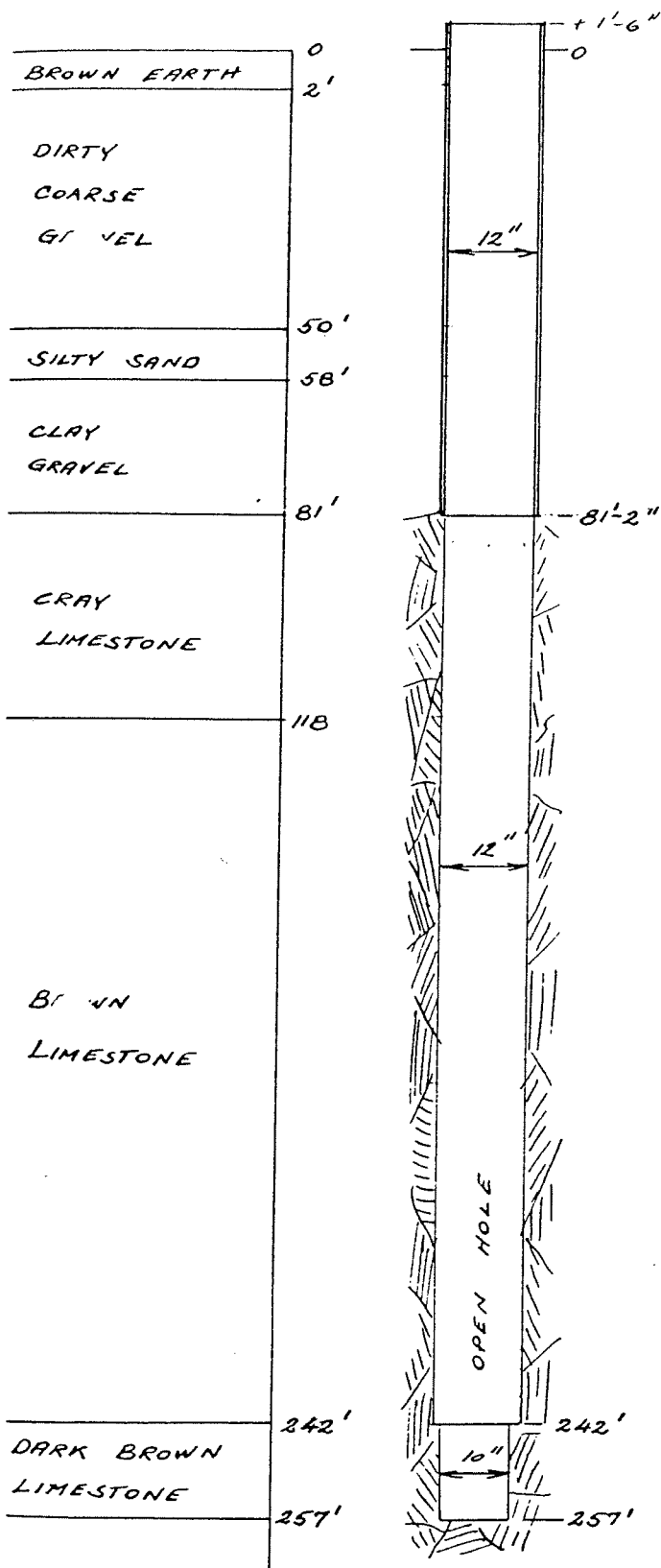
PUC GALT ONTARIO.

DRAWN BY *CHL*

APPROVED BY

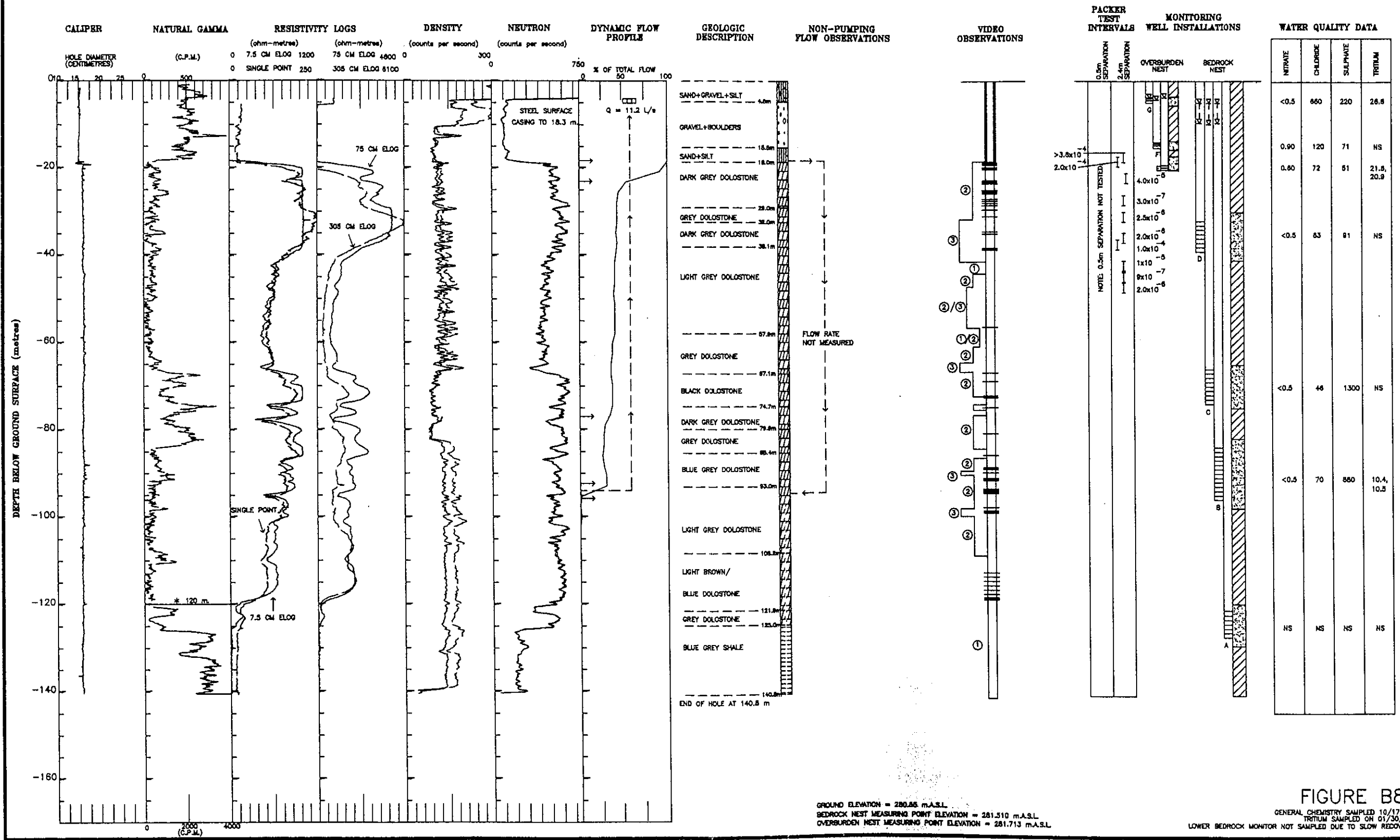
WELL NO. 5 (Test Hole #2/54) ELGIN ST.

Ref DV



93282 (10/20/95)

TEST HOLE/MONITORING WELL OW8/95 MOFFAT CREEK





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Appendix C

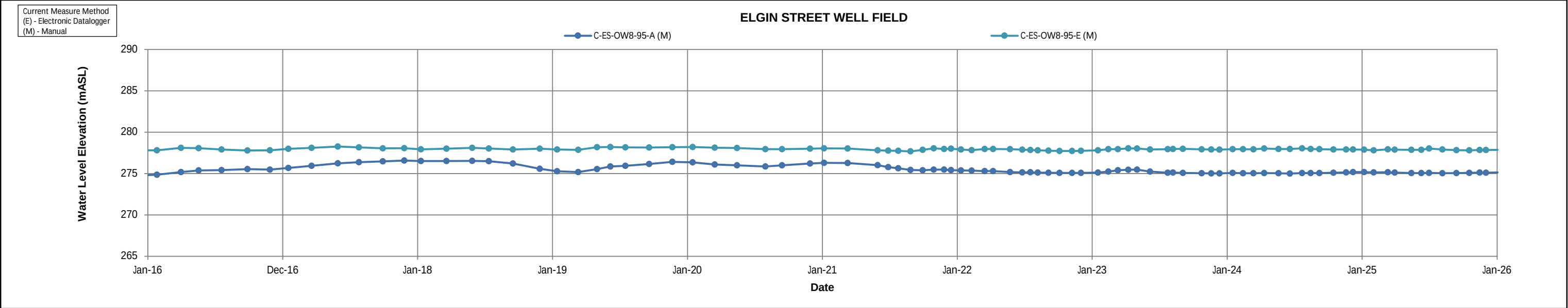
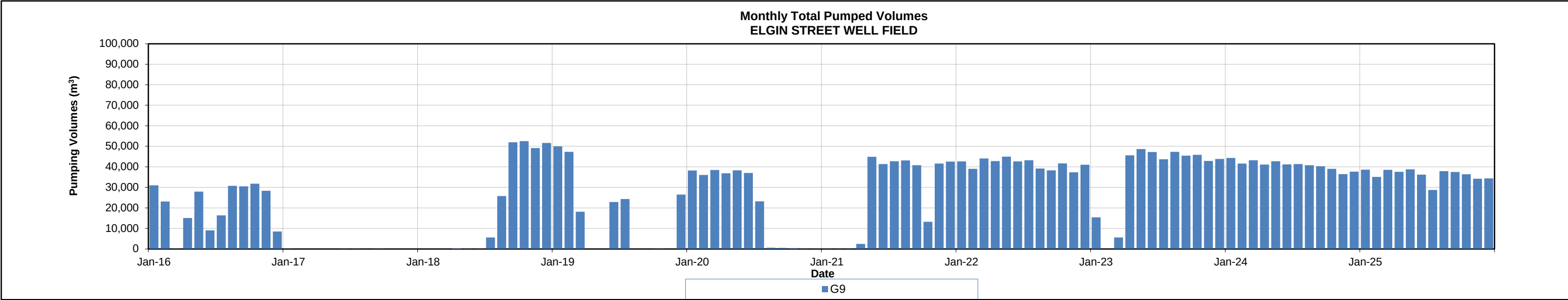
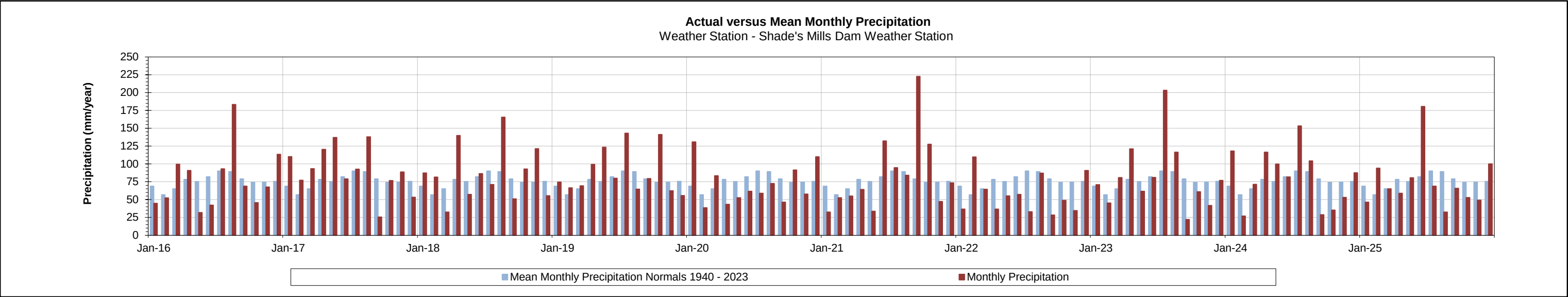
Monitoring Data (Pumped Volumes and Hydrographs)

TABLE C-1
WELL FIELD WATER PRODUCTION SUMMARY
REGION OF WATERLOO - 2025 GROUNDWATER MONITORING REPORT

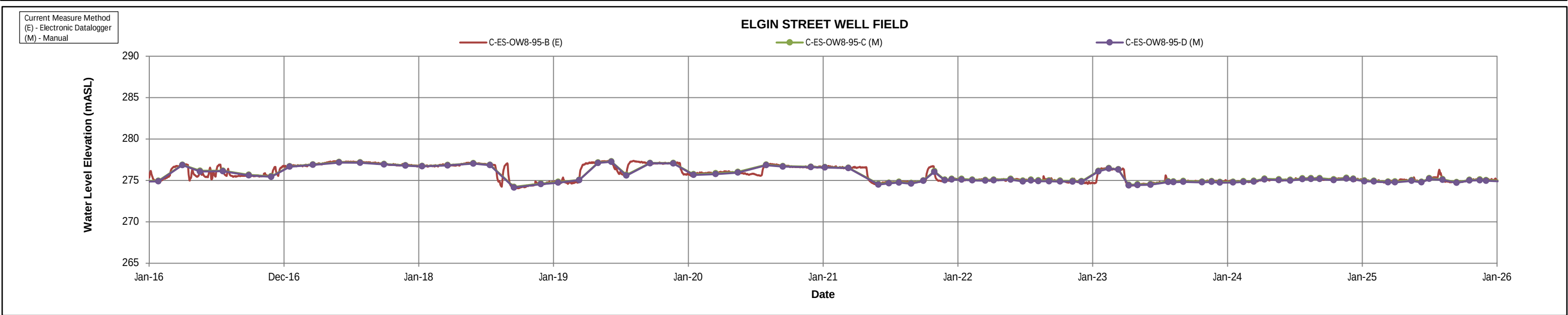
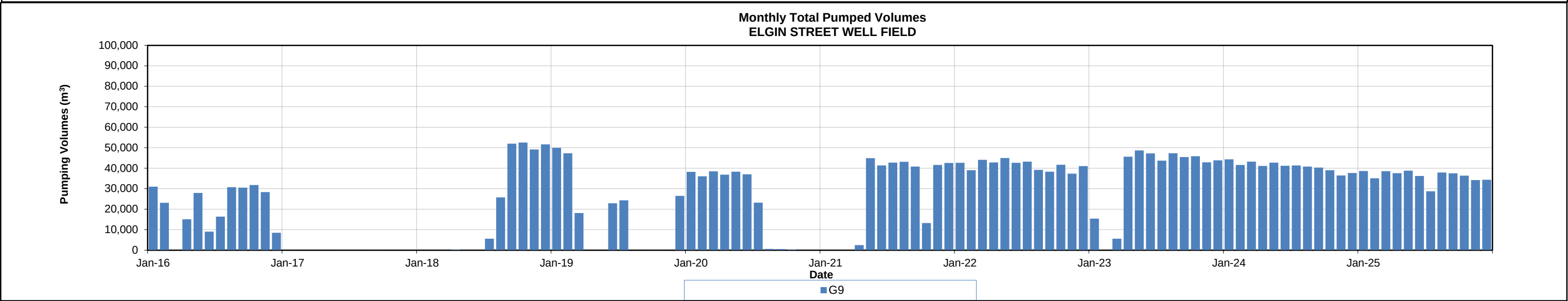
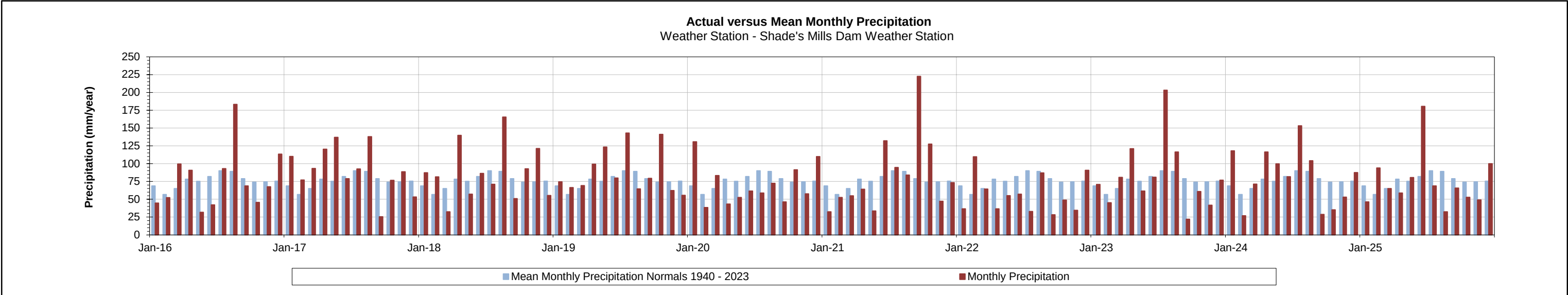
Well Field	Major or Minor Supply	Production Well Name	Status	Permit to Take Water Details			2021 Production Summary			2022 Production Summary			2023 Production Summary			2024 Production Summary			2025 Production Summary		
				MOE Permit Number	Permitted Capacity (total m ³ /year)*	Permitted Rate (L/s)*	Total Production Well Volume (total m3/year)	Average Daily Rate (m3/day)	Average Rate (L/s)	Total Production Well Volume (total m3/year)	Average Daily Rate (m3/day)	Average Rate (L/s)	Total Production Well Volume (total m3/year)	Average Daily Rate (m3/day)	Average Rate (L/s)	Total Production Well Volume (total m3/year)	Average Daily Rate (m3/day)	Average Rate (L/s)	Total Production Well Volume (total m3/year)	Average Daily Rate (m3/day)	Average Rate (L/s)
Elgin Street	Major	G9	Supply	not required - well installed prior to Ontario Water Resources Act	N/A	N/A	312,653 312,653	857 857	9.9 9.9	496,773 496,773	1,361 1,361	15.8 15.8	431,460 431,460	1,182 1,182	13.7 13.7	489,707 489,707	1,342 1,342	15.5 15.5	433,822 433,822	1,189 1,189	13.8 13.8

Notes:
- = no applicable data
n/a = data not available
* = rates and volumes based on permitted L/day

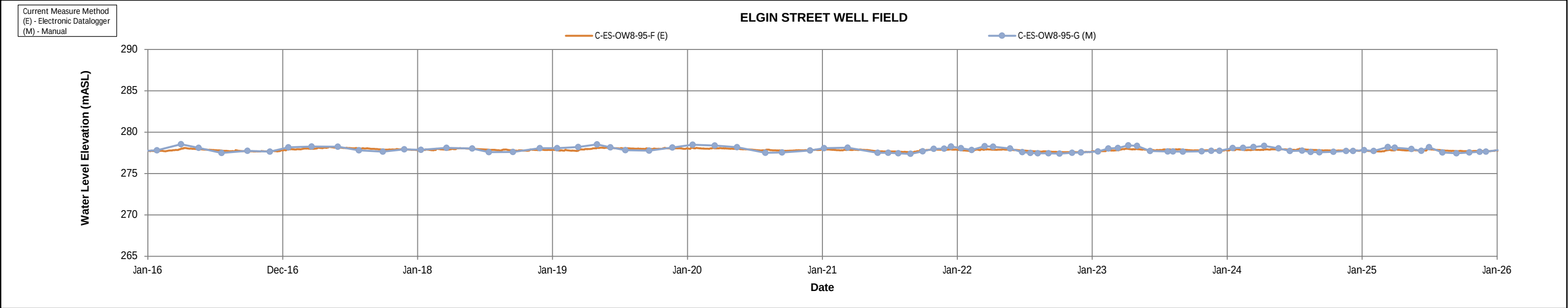
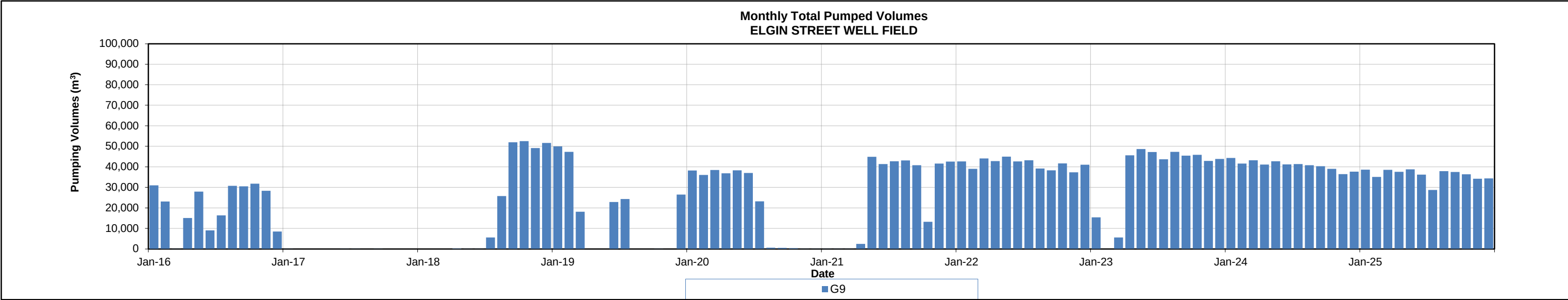
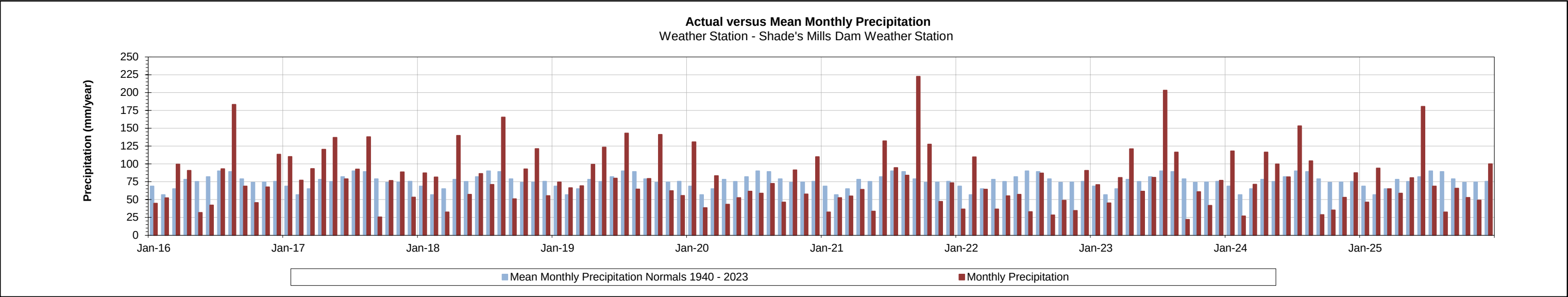
REGION OF WATERLOO
2025 GROUNDWATER MONITORING REPORT -
ELGIN STREET



REGION OF WATERLOO
2025 GROUNDWATER MONITORING REPORT -
ELGIN STREET



REGION OF WATERLOO
2025 GROUNDWATER MONITORING REPORT -
ELGIN STREET





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Appendix D

Precipitation Data

Table D-1
Precipitation Variation from Average
Region of Waterloo - 2025 Groundwater Monitoring Report

Year	Kitchener/Waterloo Weather Station Established 1966		
	Annual Precipitation (mm)	30-yr NORMAL Precipitation 1981-2010 (mm)	Difference (mm)
2016	748	851	-103
2017	818	851	-33
2018	749	851	-102
2019	695	851	-156
2020	689	851	-162
2021	772	851	-79
2022	438	851	-413
2023	813	851	-38
2024	874	851	23
2025	723	851	-128

Year	University of Waterloo Station Established 1988		
	Annual Precipitation (mm)	Average Precipitation 1998-2024 (mm)	Difference (mm)
2016	891	871	20
2017	989	871	118
2018	950	871	79
2019	923	871	52
2020	953	871	82
2021	1022	871	151
2022	578	871	-293
2023	959	871	88
2024	763	871	-108
2025	943	871	72

Year	Shand Dam Established 1939		
	Annual Precipitation (mm)	Average Precipitation 1940-2025 (mm)	Difference (mm)
2016	976	926	50
2017	1093	926	167
2018	849	926	-77
2019	1081	926	155
2020	1017	926	91
2021	876	926	-50
2022	798	926	-128
2023	1015	926	89
2024	994	926	68
2025	995	926	69

Year	Conestogo Dam Established 1961		
	Annual Precipitation (mm)	Average Precipitation 1961-2025 (mm)	Difference (mm)
2016	983	990	-7
2017	1210	990	220
2018	962	990	-28
2019	992	990	2
2020	1021	990	31
2021	975	990	-15
2022	907	990	-83
2023	1053	990	63
2024	972	990	-18
2025	1025	990	35

Year	Woolwich Dam Established 1960		
	Annual Precipitation (mm)	Average Precipitation 1960-2025 (mm)	Difference (mm)
2016	844	835	9
2017	986	835	151
2018	869	835	34
2019	824	835	-11
2020	862	835	27
2021	649	835	-186
2022	668	835	-167
2023	859	835	24
2024	793	835	-42
2025	732	835	-103

Year	Shade's Mills Dam Established 1960		
	Annual Precipitation (mm)	Average Precipitation 1960-2025 (mm)	Difference (mm)
2016	934	909	24
2017	1092	909	183
2018	1042	909	133
2019	1059	909	150
2020	848	909	-62
2021	1020	909	111
2022	682	909	-227
2023	982	909	73
2024	976	909	67
2025	895	909	-14

Year	Laurel Dam Established 1960		
	Annual Precipitation (mm)	Average Precipitation 1960-2025 (mm)	Difference (mm)
2016	985	938	47
2017	1062	938	124
2018	1071	938	133
2019	940	938	2
2020	938	938	0
2021	1027	938	89
2022	689	938	-249
2023	921	938	-17
2024	907	938	-31
2025	894	938	-44

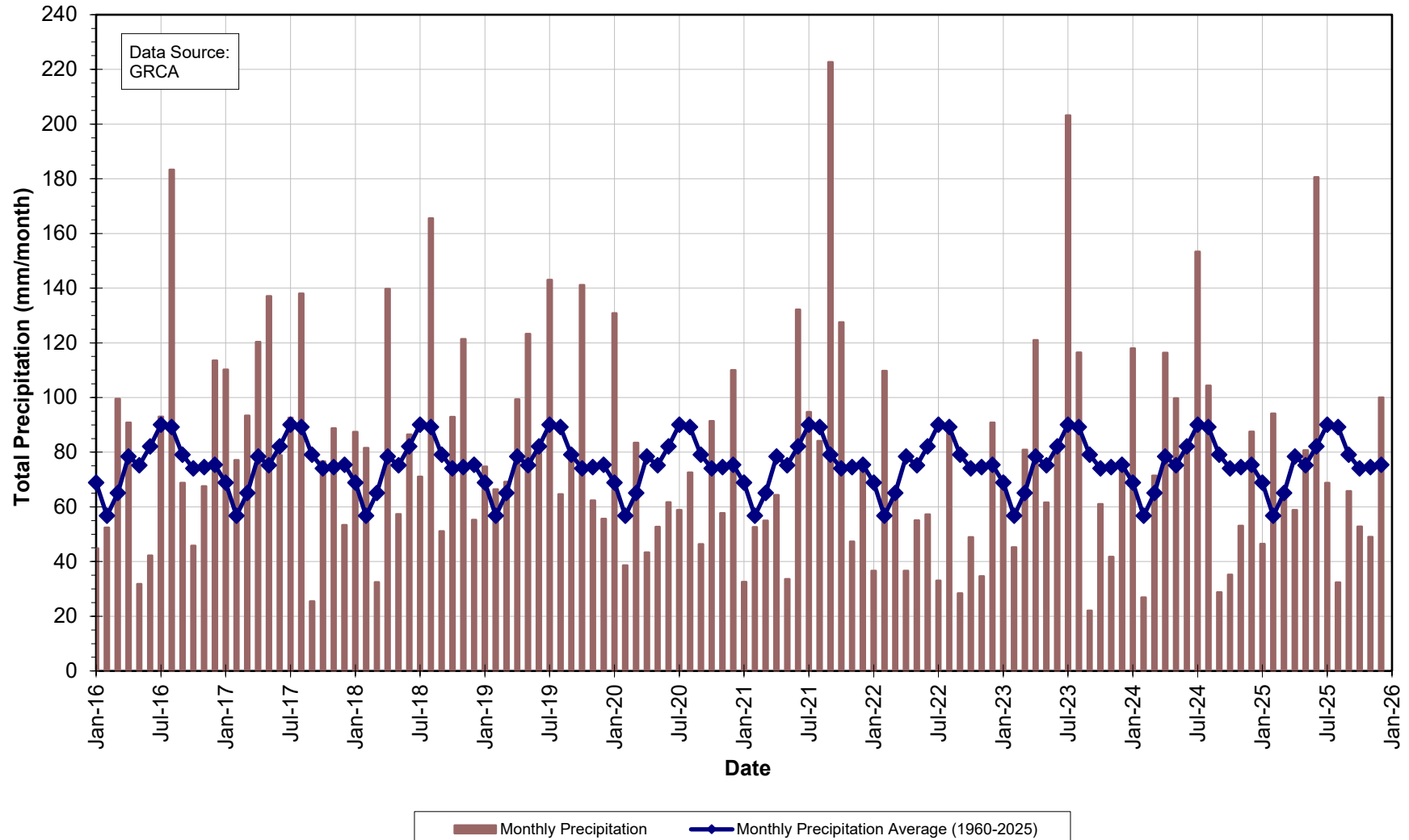
Year	Roseville Weather Station Established 1972		
	Annual Precipitation (mm)	30-yr NORMAL Precipitation 1981-2010 (mm)	Difference (mm)
2016	899	919	-20
2017	882	919	-37
2018	905	919	-14
2019	957	919	38
2020	817	919	-102
2021	832	919	-87
2022	637	919	-282
2023	945	919	26
2024	856	919	-63
2025	786	919	-133

NOTES:

WIA station data is not subject to review by the National Climate Archives, therefore, undergoes very limited quality checking.
 GRCA Dam stations data is not reviewed extensively and undergoes limited quality checking.

Region of Waterloo – 2025 Groundwater Monitoring Report

Figure D.1
Shade's Mills Dam
Monthly Precipitation





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Appendix E

Monitoring Program Overview

GROUNDWATER LEVEL MONITORING PROGRAM PROCEDURES

E.1 Overview

The Region of Waterloo (Region) collects water level measurements at specific monitoring wells to ensure sustainable long-term water supply and to meet monitoring and reporting requirements for the Region's water-taking permits. The goal of the program is to manage and protect the Region's groundwater supply and to assess the potential impact of municipal pumping on the groundwater and surface water resources in the Region. The ongoing collection and assessment of groundwater level data is integral to assess any changes to the water resources that may occur due to pumping.

E.1.1 Production Well Pumping and Water Levels

In 2023 the Region managed approximately 132 production wells with status defined as:

- Commissioned – Active wells
- New Not-Commissioned – Well are inactive or locked out until future demand or repairs/maintenance of other wells requires activating them

The well fields are referred to as Urban (Kitchener, Waterloo, and Cambridge) and Rural (North Dumfries, Woolwich, Wilmot, and Wellesley). Well fields in Kitchener, Waterloo, and Cambridge are referred to as the Integrated Urban System (IUS).

The Region's active production wells are monitored through the Region's SCADA (Supervisory Control and Data Acquisition) system, which reads and records the volume pumped on a daily basis. A few wells do not have their own meter but are combined with other nearby well(s) in the well field and the combined flow is divided into a record for each source. Water level measurements are obtained from the production wells where required. All manual measurements are obtained using either an air line or a water level tape.

E.1.2 Monitoring Wells and Surface Water levels

Water levels are measured at monitoring wells and at some surface water features. The objective of this monitoring is to collect data to ensure that the Region's water taking has minimal impact on the environment and on private water takers.

Water levels in the Region's monitoring wells are measured either electronically or manually. Most of the wells that are monitored electronically use datalogger equipment manufactured by *In-Situ Inc.*® LevelTROLLs® and RuggedTROLLs®, as well as, by *Van Essen Instruments (formerly Schlumberger Water Services)* Mini-Divers®, Micro-Divers®, and TD-Divers®; or by *Solinst*® Levelloggers®. The datalogger pressure sensor models used may be either vented (gauged) or non-vented (absolute) for *In-Situ Inc.*®; whereas, for *Van Essen Instruments* and for *Solinst*®, non-vented (absolute) models are used. Barometric dataloggers by each manufacturer suspended in select well locations are also used with the non-vented (absolute) models to provide the required barometric pressure compensation necessary in producing the water level data. Manual monitoring is done using a *Solinst*® and/or *Heron Instruments Inc.* electronic water level meter with both visual and audio indicators.

The electronically monitored wells are typically measured every hour, with increased frequency as required. At the hourly frequency, the following trends can be distinguished in an individual monitoring well:

- Seasonal climate trends;
- Water level changes in the aquifer that is being pumped;
- Water level changes in aquifers connected to the pumped aquifer; and
- Individual precipitation events in unconfined aquifers.

The manually monitored wells are measured once per month. At this frequency only the first three responses listed above can be distinguished.

E.1.3 Climatological Data

To evaluate the reaction of water levels to changes in climatic conditions, precipitation data are monitored at various locations throughout the Region. Within the Region of Waterloo, climate data is collected by Environment Canada at the Region of Waterloo International Airport (WIA) and the Roseville weather station, by the Grand River Conservation Authority (GRCA) at various Dam locations and by the University of Waterloo at a weather station located on the north campus.

E.2 Groundwater Level Collection Protocols

E.2.1 Groundwater Level Monitoring Network Summary Well Checklist

A well checklist and data entry spreadsheet are prepared of all the measuring points where water levels will be collected on a monthly basis. The checklist and spreadsheet are organized by well field so wells in close proximity are grouped together and indicates whether locations are measured with electronic dataloggers or manual measurements only. Once a well is visited, data is entered in the spreadsheet and the well is checked off the list; thus, the checklist and spreadsheet provides an obvious indication that work is unfinished if a location is unchecked and has no data.

E.2.2 Well Inspection

Upon visiting a well for the first time, the well/casing/equipment details are noted, photos taken, and GPS coordinates are recorded in a field book and/or in the monthly data entry spreadsheet. Well/casing/equipment details includes: location, access, condition, materials, diameters, casing security, surface seal condition, requiring repair or not, well/casing stickup measurements from ground level, well total depth, and the type of datalogger and/or sampling equipment installed. Any notable deficiencies, concerns, problems, or changes in the well condition are recorded in a field book and/or in the monthly data entry spreadsheet, as well as, photos are taken. Also, any observed activities taking place around or near the well that are worth noting are recorded in a field book and/or in the monthly data entry spreadsheet.

E.2.3 Monitoring Well Manual Water Level Measurement Procedure

- Unlock well casing and open well casing lid.
- Remove well cap (if present).
- Use an Electronic Water Level meter and lower the probe down the well until the meter beeps to indicate the probe has encountered water.
- The probe is raised up until the beep of the meter stops, indicating the probe is now above the water.
- Then the probe is slowly lowered down until the probe just contacts the water level surface causing the meter to beep.
- At this point the depth (in meters) is read off the water level meter tape from the measuring point of the well (in most cases is the top of the casing or pipe) and this provides the water level depth below the measuring point.
- The date, time, and water level depth measured is recorded in a field book and/or in the monthly data entry spreadsheet.
- This procedure is repeated for each of the well screens inside the well casing.

- Replace well caps.
- Close well casing lid and lock well casing.

E.2.4 Downloading of Water Levels from Electronic Dataloggers Procedure

For Non-Vented (Absolute) Datalogger Models:

In-Situ Inc.® LevelTROLLs® and RuggedTROLLs®, *Van Essen Instruments* Divers®, and *Solinst*® Leveloggers®

- Prior to downloading data from the datalogger, a manual water level is measured in each well screen containing a datalogger.
- The datalogger is pulled out of the well, unthreaded from the cap that is attached to a wire cable and connected to (or placed in) the corresponding datalogger communication device. The communication device is connected to a laptop/tablet PC or a RuggedReader® Handheld PC and the associated datalogger software is started.
- Water level data stored in the datalogger is subsequently downloaded and viewed using the datalogger software and saved on the hard drive/memory.
- Note: downloading data from the datalogger does not automatically stop the datalogger from recording.
- The status of the datalogger is viewed and checked for correct operation and to confirm that the datalogger is hanging in the well water within its operating range.
- Select datalogger details such as the battery level and free/used memory are recorded in a field book and/or in the monthly data entry spreadsheet.
- If the datalogger does not require restarting to free up memory or to change the sample rate, then the datalogger is removed from the communication device and is threaded back onto its cap and lowered back down the well on the wire cable.
- If the datalogger does require restarting to free up memory or to change the sample rate, then the datalogger is stopped, reprogrammed, and restarted using the datalogger software and, as a result, erases the previous data stored in memory on the datalogger.
- This procedure is repeated for each datalogger within each of the well screens inside the well casing.
- After all the non-vented (absolute) dataloggers have been downloaded then the Barometric dataloggers are downloaded following the same procedure as above.

For Vented (Gauged) Datalogger Models:*In-Situ Inc.*® LevelTROLLs®

- Prior to downloading data from the datalogger, a manual water level is measured in each well screen containing a datalogger.
- The desiccant tube is disconnected from the datalogger cable.
- The datalogger cable is connected to a communication cable device that is connected to a laptop/tablet PC or a RuggedReader® Handheld PC and the datalogger software is started.
- Water level data stored in the datalogger is subsequently downloaded and viewed using the datalogger software and saved on the hard drive/memory.
- Note: downloading data from the datalogger does not automatically stop the datalogger from recording.
- The status of the datalogger is viewed and checked for correct operation and to confirm that the datalogger is hanging in the well water within its operating range.
- Select datalogger details such as the battery level, free/used memory, and desiccant condition (colour) are recorded in a field book and/or in the monthly data entry spreadsheet.
- The desiccant tube condition is checked and replaced if necessary.
- If the datalogger does not require restarting to free up memory or to change the sample rate, then the communication cable device is disconnected from the datalogger cable and the desiccant tube is reconnected.
- If the datalogger does require restarting to free up memory or to change the sample rate, then the datalogger is stopped, reprogrammed, and restarted using the datalogger software and, as a result, erases the previous data stored in memory on the datalogger.
- This procedure is repeated for each datalogger within each of the well screens inside the well casing.

E.2.5 Data Entry and Processing into the Burnside MS ACCESS/SQL® Database

- All field data collected (i.e. date, time, manual water level depth measured, comments) and recorded for each well screen and datalogger in a field book is entered into the monthly data entry spreadsheet, unless already entered in the field using a laptop/tablet PC.
- The monthly data entry spreadsheet is checked and reviewed prior to importing the data into a database table using Burnside Water Level Data Tools software. Manual water level depth values are converted into water level elevation values using the software during this import process.
- Any associated well notes, comments, and datalogger details are entered into a database table under the appropriate well and screen.

- Water level data from the dataloggers downloaded to a laptop/tablet PC or a RuggedReader® Handheld PC are transferred to Burnside file folder network upon returning to the office.
- These datalogger water level data files are subsequently read and the data is imported into a database table using Burnside Water Level Data Tools software.
- Using Burnside Water Level Data Tools software, the datalogger water level data are reviewed and processed (as described below) resulting in corrected water level depth values and corrected water level elevation values that are stored in a database table.
- *For Non-Vented (Absolute) Datalogger Models:*
Datalogger water level data is first barometric pressure compensated using selected Barometric datalogger data, then a manual water level depth value measured at the time of the most recent download is applied and used to convert the barometric compensated water level data into corrected water level depth values, which are converted into water level elevation values that are appended to a database table.
- *For Vented (Gauged) Datalogger Models:*
A manual water level depth value measured at the time of the most recent download is applied to the datalogger water level data to convert the water level data into corrected water level depth values, which are converted into water level elevation values that are appended to a database table.
- Temperature data recorded by the dataloggers are also imported into a database table.
- Hydrographs are subsequently created for each well and screen from the water level elevation data in the database for review and presentation. If there are some data points that are erroneous, then these data points are marked as non-reportable (invalid) within the database and/or are removed resulting in them not being plotted on the hydrographs.
- An updated data file is provided to the Region on a quarterly basis for upload into their eWRAS EQUIS database.

