APPENDIX 5

DESKTOP GEOTECHNICAL & HYDROGEOLOGICAL ASSESSMENT REPORT

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March 18, 2024

To: Andrew McGregor
Senior Planner / Project Manager, EA & Approvals
R.V. Anderson Associates Limited
43 Church Street, Suite 104, St. Catharines ON L2R 7E1

From: Frank C. Liu, P.Eng. & Jason Cole, M.Sc., P.Geo.

Re: **Desktop Geotechnical and Hydrogeological Assessment for Water Storage Facility Sites Carlisle Well**

1. Introduction

Palmer Environmental Consulting Group Inc. (Palmer) was retained by R.V. Anderson Associates Limited (RVA) (the "client") to complete a desktop geotechnical and hydrogeological assessment in support of the proposed Municipal Class Environmental Assessment (EA) and Conceptual Design for the Carlisle Water Storage Facility located in the Town of Carlisle, within the City of Hamilton (the "project" or the "sites") (**Figure 1**).

Based on information from the Client, two (2) potential Water Storage Facility Sites are proposed (**Figure 1).** *Site 1* is Tower Park, located at 42-46 Woodend Drive, Carlisle and *Site 2* is located at 1535 Centre Road, Flamborough.

The purpose of this desktop geotechnical and hydrogeological assessment is to provide a preliminary characterization of regional setting and subsurface conditions for the two sites and to assess the expected soil mechanic properties, assess potential groundwater issues, identify data gaps and to make recommendations for additional, site-specific work, if required.

Based on information from the client and knowledge of the existing water supply system of Carlisle, the proposed storage facility is expected to include:

- Water Storage Building/Structure;
- Access road and vehicle parking; and
- Associated appurtenances, which may include a treatment facility and/or pump house.

It is noted that the Municipal Class Environmental Assessment has not determined the type of storage facility, and both elevated storage tank and underground storage tank are possible options.

2. Methodology and Data Sources

The geotechnical and hydrogeological assessment was conducted through a desktop study based on data available from multiple public sources, and consulting reports provided by the client.

The major source of data for the current study are the well records collected from Ministry of the Environment, Conservation and Parks (MECP) water well dataset (**Figure 1** and **Appendix A**).

Data from other public sources include, but not limited to, Ontario Geological Survey (OGS: physiography, geology and geotechnical boreholes), MECP, municipalities, conservation authorities, and other public agencies. The data was collected, analysed and synthesized to characterize physical and environmental settings of the two proposed sites. The physical and environmental setting will direct site subsurface condition characterization.

3. Summary of Site Soil and Groundwater Conditions

3.1 Stratigraphy

Surficial geology of both Sites was mapped by OGS as Ice-Contact Stratified deposits of gravel and sand, minor till, in the facies of esker, kame, end moraine, ice-marginal delta and subaqueous fan (**Figure 2**). Bedrock under the overburden below both sites was mapped by OGS as Amabel Formation bedrock, which is described a thick-bedded, crinoidal, locally biohermal and locally bituminous dolostone. Solution enhanced fractures and karstic features are known to be present within the Amabel Formation.

Three (3) well records were identified near Site 1 and four (4) well records were identified adjacent to Site 2 (**Appendix A**). Only well record (6807563) had stratigraphic data for Site 1. All of the well records near Site 2 have stratigraphic data, but only well records (6806877 and 6809946) were used for this assessment as they are located closes to the Site. FDC03RR is 700 m east of Site 1. The information from the well log of FDC03RR can be used to predict stratigraphy at Site 1 and Site 2.

Based on the information from the well records identified at the two Sites with reference to information from other sources, the stratigraphy conditions for the two Sites are summarized in **Table 1**. The elevation data was acquired from Conservation Halton and is also shown in **Figure 1**. While expected to be generally accurate, it should be noted that the stratigraphic data from the MECP water well records should be viewed with a degree of uncertainty.

Table 1. Anticipated Stratigraphy for Site 1 and Site 2

Data	Site 1 (WWR #6807563)	Site 2 (WWR #6806877 & #6809946)
Ground Surface Elevation (masl)	271.0 – 276.0 masl	265.0 – 272.0 masl
Stratigraphic Unit and Depth Range (m)	Sand and gravel, trace boulders: 0 – 12.7 m	Sand, some gravel: 0 – 18.3 m
	Limestone: 12.7 – 38.1 m	Limestone: 18.3 – 26.5 m
	Shale: 38.1 – 39.6+ m	Shale: 26.5 – 30.5+ m

3.2 Groundwater

Groundwater information recorded in the well records is related to the groundwater in bedrock supply aquifers. Groundwater table in overburden should be much shallower. Based on observations during drilling the redundant well, FDC03RR, as well as the well log for the sentry well (CM-03-03S/D) located to the east of the two sites (**Appendix A** and **Figure 1**), the groundwater table in the area close to the two Sites should range from 4.0 to 6.0 meters below groundwater surface (mbgs), however a shallower water table may occur seasonally.

3.3 Source Water Protection

The two Sites are situated in the Halton Region Source Protection Area and is subject to the Source Protection Plan of Halton-Hamilton Source Protection Region. The Source Water Protection Plan identifies four main regulatory factors under the *Clean Water Act (2006)* relating to local hydrogeology to consider: Significant Groundwater Recharge Areas (SGRAs), Highly Vulnerable Aquifers (HVAs), and Wellhead Protection Areas (WHPAs), and Intake Protection Zones (IPZs).

A Wellhead Protection Area (WHPA) is the area around the wellhead where land use activities have the potential to affect the quality or quantity of water that flows into the well. These areas are delineated into zones of vulnerability (A, B, C, and D) based on the time of travel of water into the well, and zones around a surface water body influencing a Groundwater Under Direct Influence (GUDI: E, F). Other zones (Q1, and Q2) are defined as the areas where new water takings or reduced recharge could impact the quantity of water available to municipal supply wells. IPZs are the area on water and land surrounding a municipal surface water intake. HVAs are aquifers that are susceptible to contamination as a result of the soil structure/material or due its location near the ground surface. Lastly, SGRAs are areas where recharge is important to maintain the water level in a community drinking water aquifer.

Based on the provincial dataset, Site 1 is located within a WHPA-A with a score of 10 and a SGRA, and the east part of Site 2 is located within a SGRA (**Figure 3**). WHPA-A with a score of 10 indicates that Site 1 is located within 100 m from the existing supply wells, and that surficial contaminants at Site 1 have a higher risk to migrate into the well screen of the nearby supply well(s).

3.4 Natural Heritage

Based on provincial dataset, no natural heritage features were identified within the two Sites. A wetland is identified adjacent to the south boundary of Site 2. The wetland is a not identified as a Provincially Significant Wetland.

The majority of Site 2 is located within the regulation limit for Conservation Halton. Site 1 is outside of the regulation limit for Conservation Halton.

4. Desktop Geotechnical Assessment

4.1 Foundation Considerations

As presented above, the proposed storage facility may include an elevated storage tank or underground storage tank and associated appurtenances. The major lithological units under both Sites are coarse grained sand and gravel underlain by limestone and shale. Based on the structural forms of the proposed development and the site stratigraphy, spreading footings are expected to be feasible for both elevated storage tank and underground storage tank options. The spread footing for the elevated storage tank may take forms of reinforced concrete raft foundation and reinforced concrete ring. The spread footing for the underground storage tank may take forms of reinforced concrete raft. The spread footing for supporting appurtenances may be conventional strip footing.

It should be noted that the spread footings have to be founded in native soil. The depth of fill will be determined through Site-specific borehole drilling completed during later design stages.

Bearing capacity of foundation soil should be determined through borehole drilling and in-situ testing such as Standard Penetration Test (SPT) and soil classification as part of a geotechnical drilling program.

Bearing capacity of foundation soil for appurtenances structures can be determined either with in-situ SPT test and soil classification as part of a geotechnical drilling program, or with in-situ footing soil inspection conducted by Palmer's experienced geotechnical staff during excavation. Footing soil inspection is usually conducted with a steel rod or a penetrometer coupled with soil classification. The experience of the inspector plays a key role in determining the bearing capacity, and the estimated bearing capacity values can only be used to apparently firm foundation soil and appurtenant structures.

Based on information of lithology as recorded in well records within and adjacent to the sites and well logs from the nearby site, for a preliminary foundation design, 70 to 100 KPa bearing capacity of soil under the sites for spread footings can be considered subjected to confirmation by geotechnical inspection that the soil must be native ice-contact deposits and over 1.5 m deep.

The foundation should be founded on firm native mineral soil and with a depth of more than 1.2 m to be below the front line.

In case the thickness of fill is greater than 1.2 m, the fill should be excavated and removed. The space should be backfilled with lean concrete to grade. Lean concrete should be designed to have a compressive strength over 5.0 MPa.

4.2 Frost Penetration and Foundation Depth

The frozen depth at the two sites is prescribed as 1.2 m on the Ontario Provincial Standard Drawing (OPSD 3090.101), which is the same as the minimal foundation depth of 1.2 m provided in Table 9.12.2.2 of the Ontario Building Code (2012). The spread footing depth of 1.2 m or more should be adequate to protect the foundation from frost heave. Based on the above site characterization, the overburden soil is not frost heave or adfreezing prone. Consequently, frost heave and adfreezing should not be a significant issue if the foundation is founded to a depth of 1.2 m or more and backfilled with well drained materials.

4.3 Excavation and Groundwater Control

The majority of excavation will go through sand and gravel. Based on the density of soil and classification as observed during drilling the redundant well, a light to medium duty backhoe excavator should be adequate to execute the excavation.

Excavation sequence, cutting slope forms and support system should be implemented in accordance with Regulation 213/91 under the Ontario Occupational Health and Safety Act (OHSA) and Ontario Building Code. For the purpose of Regulation 213/91, the soil to be excavated at the Site can be classified as Type 3. The following lists the major criteria that a support system is required by the regulation for Type 3 soil:

- Excavation is deeper than 1.2 m below grade;
- Cutting walls are not sloped from its bottom with a slope having a minimum gradient of one vertical to one horizontal; and
- There will be workers working close to cutting walls for all excavation.

As presented above, the excavation may extend to deeper than 1.2 mbgs, and there must be workers working in the trench to build foundation. Therefore, supporting system has to be considered if the cutting slope is not to be flattened to one vertical to one horizontal (1:1 slope or 45 degree natural slope).

Excavation should be closely inspected by qualified geotechnical staff. If soil condition exposed is different from findings from boreholes, excavation process and shoring system might have to be modified.

Excavated soil should be stockpiled at least 3 m away from the cutting wall crest if space is available.

Unsupported excavation sequence should be arranged such as to minimize the time of the exposure of cutting slopes to elements and to execute the excavation in dry season if possible. Tarping may be needed during extended period of rainfall to prevent erosion and soaking of the slope. Care should be taken to direct surface water away from the open excavations.

Excess soil should be disposed of according to Ontario Regulation 406/19 under the Ontario Environmental Protection Act and associated guidelines.

As mentioned above, the groundwater table under the two sites should be deeper than 3.0 m. If the excavation depth does not extend deeper than 3.0 m, groundwater seepage into the excavation pit is not anticipated. However, considering the coarse grain size of the overburden soil, perched groundwater seepage during precipitation is anticipated, which will be discussed below.

In case the groundwater is encountered at shallower depth, construction dewatering will have to be considered. Hydrogeological assessment will be recommended for each site to determine if construction dewatering is needed.

4.4 Consolidation and Settlement

Based on available lithological information of overburden soil, the founding soil and the underlying soil are not anticipated to be compressible. Drainage-consolidation due to structure loading (primary settlement) is not anticipated. Initial and secondary settlement due to soil grain re-arrangement caused by structure loading will be determined with in-situ SPT tests and soil classification as part of a geotechnical drilling program recommended below.

4.5 Seismic Considerations

The 2012 Ontario Building Code (OBC 2012) came into effect on January 1, 2014 and contains updated seismic analysis and design methodology. The seismic site classification methodology outlined in the code is based on subsurface conditions within the upper 30 m below grade.

As shown in Table 4.1.8.4A of the OBC, three methods of determining the site class are provided in the code: method 1 based on average shear wave velocity, method 2 based on average standard penetration resistance (N-value), and method 3 based on undrained shear strength. Because no information and data about the shear wave velocity, N-values and undrained shear strength are available, seismic conditions can not be assessed at this stage.

5. Desktop Hydrogeological Assessment

As presented above, Site 1 is located within a WHPA-A, and Site 1 and part of Site 2 are located in a Significant Groundwater Recharge Area (SGRA). Moreover, both sites are located in Carlisle Well Field, and Site 1 contains existing supply wells.

Groundwater levels are anticipated to be deeper than 3.0 m for both sites. If the excavation does not extend deeper than 3.0 m, construction dewatering for groundwater seepage should be minimal. If no construction dewatering for control of groundwater seepage is required, other related issues such as a Permit To Take Water (PTTW), an Environmental Activity and Sector Registry (EASR), impacts to natural heritage and interference with other water users, and dewatering-induced soil settlement would not be expected to occur.

As presented above, the shallow overburden is composed of ice-contact stratified deposits. The stratified deposits are expected to have high horizontal hydraulic conductivity values (K-values) in the range of 10^{-5} m/s. Therefore, a large quantity of transient groundwater seepage during precipitation events is anticipated. The contractor should have a sump pump with adequate capacity in place if the excavation occurs during the wet season to deal with potential perched, transient groundwater seepage and stormwater accumulation. Depending on the excavation depth and the rate of groundwater ingress, active dewatering methods such as well points or eductors may be required. Any construction dewatering in excess of 50,000 L/day is required to be registered on the MECP EASR system. Any construction dewatering in excess of 400,000 L/day requires a Category 3 PTTW from the MECP.

Based on the above preliminary characterization of site subsurface conditions, the hydrogeological conditions are considered to be suitable for shallow subsurface construction of the proposed storage facility and appurtenances. No significant groundwater constraints were identified through the desktop assessment for either Site 1 or Site 2. A Site-specific hydrogeological field program is recommended during later design

stages to confirm water table depth, soil permeability and our interpretation of the low potential for adverse effects.

The following are recommendations for the prevention of potential contamination caused by construction activities within a WHPA and SGRA:

- Appropriate awareness training of field staff on the vulnerability of the existing supply wells;
- Spill management plan has to be formulated to meet construction requirement and pass the review of the Risk Management Officer (RMO) of the City of Hamilton; and
- The construction area should be fenced and marked with clear signage for protection of existing supply wells; and
- The City's staff should inspect the construction site periodically for the purpose of onsite contamination prevention.

6. Conclusion and Recommendations

This desktop geotechnical and hydrogeological assessment was based on regional data, secondary source data and available MECP water well records within and close to the Sites. Through the desktop study, preliminary physical and environmental settings, as well as site conditions are characterized, and a preliminary assessment of geotechnical and hydrogeological conditions was provided.

The results of the geotechnical and hydrogeological assessment shows that soil mechanical properties and groundwater conditions at both Site 1 and Site 2 are considered generally suitable for the proposed water storage facility and appurtenance structures. Significant geotechnical and hydrogeological constraints are not anticipated. Geotechnically, both Site 1 and Site 2 will be appropriate for the proposed development. Hydrogeologically, Site 1 is moderately preferred to Site 2 as groundwater levels under Site 1 are predicted to be deeper, and the possibility of construction dewatering requirement is lower.

The above assessment and discussion were based on desktop studies only and should be verified or confirmed with further investigations, including Site-specific field investigations. The following is the recommended steps:

- Geotechnical and hydrogeological drilling should be conducted for the site selected. The drilling should extend to dense to very dense soils or bedrock expected at approximately 30 m depth. The drilling program should include at least three (3) boreholes outside but adjacent to the footprint of the storge tank. SPT testing, soil sampling and lab testing and classification should be completed. Groundwater monitoring wells should be installed in all boreholes to measure stabilized groundwater levels;
- At least one borehole for each appurtenance structure should be drilled to a depth of 6 m and completed as a groundwater monitoring well. SPT testing, soil sampling and lab testing and classification should be completed; and

- To facilitate soil management during excavation as required by O.Reg. 406/19, an Assessment of Past Uses (AP) is recommended during later design stages.

7. Closure

We trust that the information contained in this assessment meets your requirements. Should you have any questions, please do not hesitate to contact our office. The report is subject to the statement of limitations provided at the end of the report.

Yours truly,

Palmer

Prepared By: Frank C. Liu, P. Eng. & P.Geo.
Senior Hydrogeologist

Reviewed By: Jason Cole, M.Sc., P.Geo.
VP, Principal Hydrogeologist

Statement of Limitations

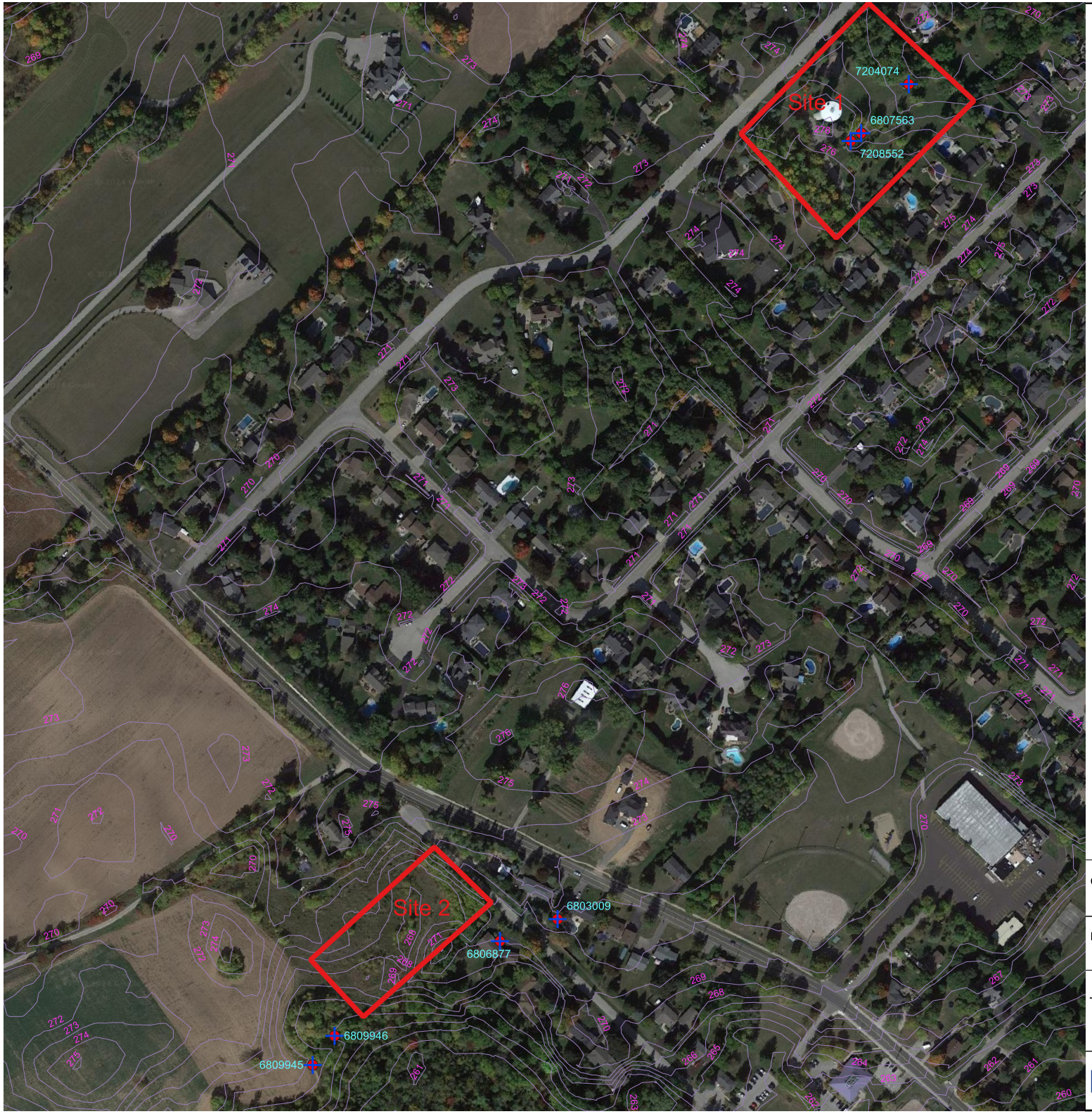
The extent of this study was limited to the specific scope of work for which we were retained and that is described in this report. Palmer has assumed that the information provided by the client or any secondary sources of information are factual and accurate. Palmer accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or negligent acts from relied upon data. Judgment has been used by Palmer in the interpretation of the information provided but subsurface physical and chemical characteristics may differ from regional scale geology mapping and vary between or beyond well/borehole locations given the inherent variability in geological conditions.

Palmer is not a guarantor of the geological or groundwater conditions at the subject site, but warrants only that its work was undertaken and its report prepared in a manner consistent with the level of skill and diligence normally exercised by competent geoscience professionals practicing in the Province of Ontario. Our findings, conclusions and recommendations should be evaluated in light of the limited scope of our work.

The information and opinions expressed in the Report are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT PALMER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS PALMER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belongs to Palmer. Any use which a third party makes of the Report is the sole responsibility of such third party. Palmer accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Palmer's express written permission. Should the project design change following issuance of the Report, Palmer must be provided the opportunity to review and revise the Report in light of such alteration or variation.

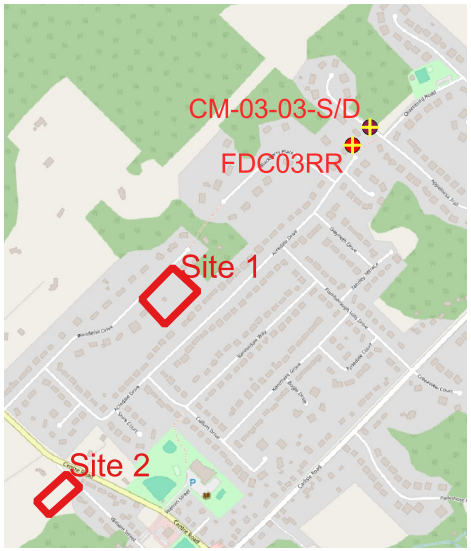
Attachment:
Figure 1. Site Investigation Plan
Figure 2. Surficial Geology
Figure 3. Source Water Protection
Appendix A: Well Records and Well Logs

Figures



LEGEND

- Storage Facility
- Well Record
- Top Contours (1 m)



100 100 m

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Universal Transverse Mercator Projection Zone 17

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Drawn: FL
Checked: JC
Date: Dec 2, 2023

Source Notes:
Basement - Google Satellite Image
Topographical Contours - Conservation Halton

CLIENT
R.V. Anderson Associates Limited

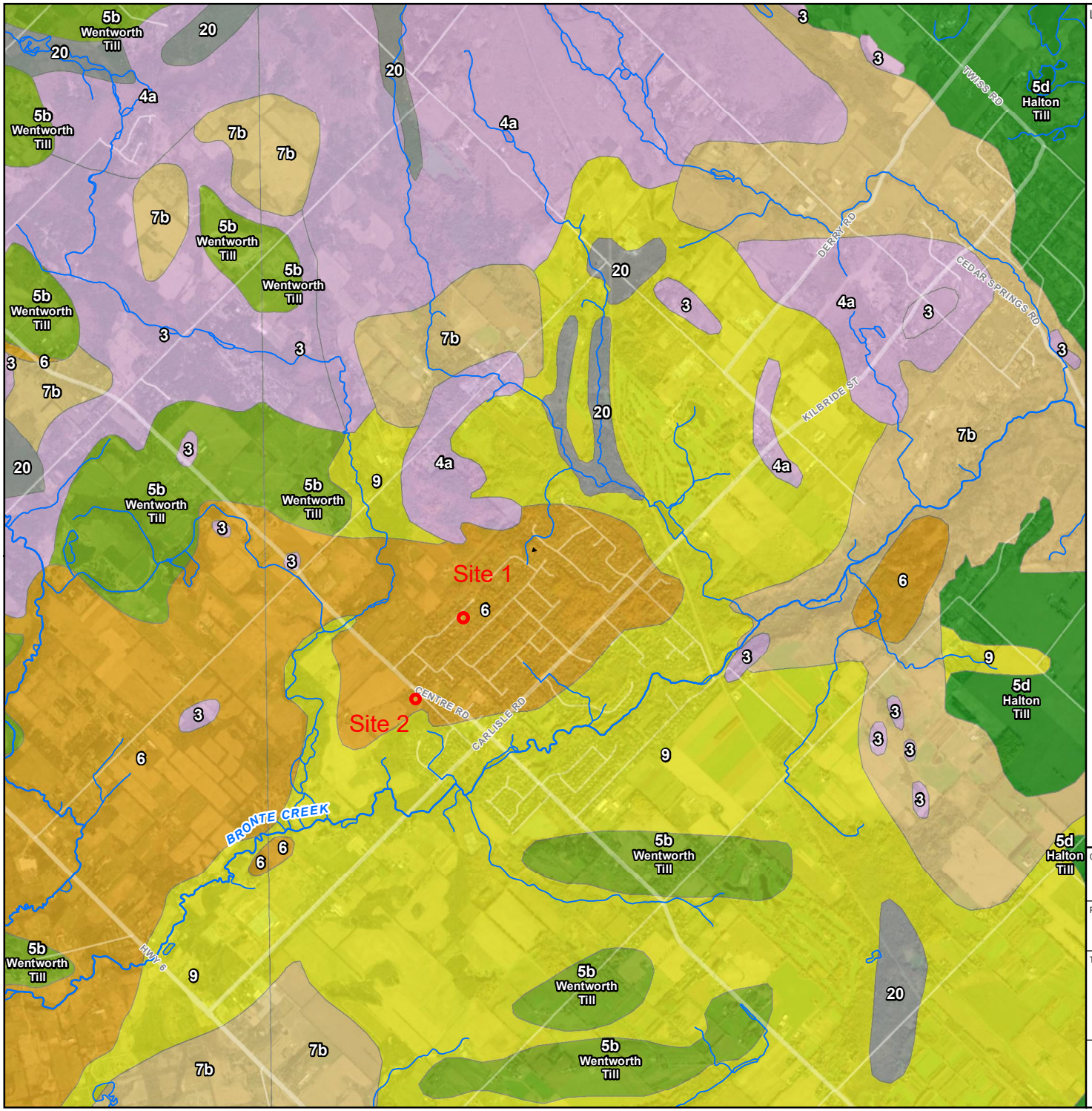
PROJECT
Carlisle Water Storge EA

TITLE
Site Investigation Plan

Palmer PART OF SLR

REF. NO: 2108704

Figure 1



LEGEND

Subject Site

Watercourse[1]

Surficial Geology[2]

Phanerozoic / Cenozoic / Quaternary / Recent

20: Organic deposits *(peat, muck, marl)*

Phanerozoic / Cenozoic / Quaternary / Pleistocene

9: Coarse-textured glaciolacustrine deposits *(sand, gravel, minor silt and clay)*

7b: Glaciofluvial deposits *(Gravelly deposits)*

6: Ice-contact stratified deposits *(sand and gravel, minor silt, clay and till)*

5b: TillI *(Stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain)*

5d: TillI *(Clay to silt-textured till [derived from glaciolacustrine deposits or shale])*

Phanerozoic / Paleozoic

4a: Bedrock-drift complex in Paleozoic terrain *(Primarily till cover)*

3: Paleozoic bedrock

1. LIO/MNRF
2. Ontario Geological Survey 2010 (Mapped at 1:50,000). Surficial geology of southern Ontario; Ontario Geological Survey. Miscellaneous Release- Data

0 200 400 800 1,200 1,600 2,000

METRES

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Checked: LB
Date: Mar 19, 2023

NORTH

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CLIENT
R.V. Anderson Associates

PROJECT
Carlisle Water Storage EA

TITLE
Surficial Geology

Palmer™

REF. NO. 2108704

Figure 2

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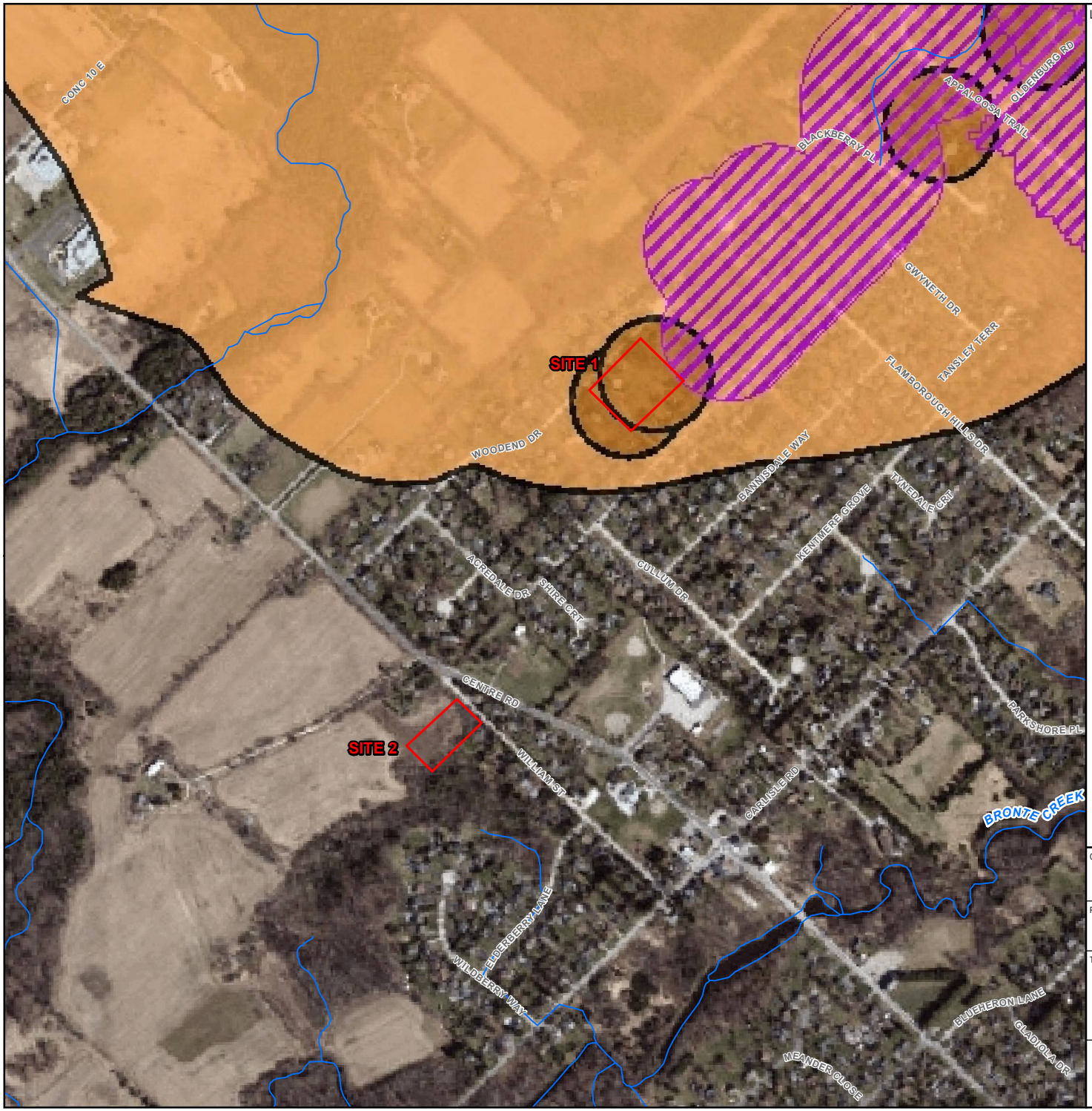

LEGEND

- Subject Site
- Watercourse[1]

Source Water Protection[2]

- Wellhead Protection Area - A
- Wellhead Protection Area - B
- WHPA Groundwater Under Direct Influence (WHPA-E)

1. LIO/MNRF
2. *Source Protection Information Atlas*, MECP © King's Printer for Ontario 2023

0 50 100 200 300 400 500
METRES

North American Datum 1983
Universal Transverse Mercator Projection Zone 17

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CLIENT
R.V. Anderson Associates

PROJECT
Carlisle Water Storage Facility, Hamilton, ON

TITLE
Source Water Protection

Palmer | PART OF SLR

REF. NO. 2108704

Figure 3a

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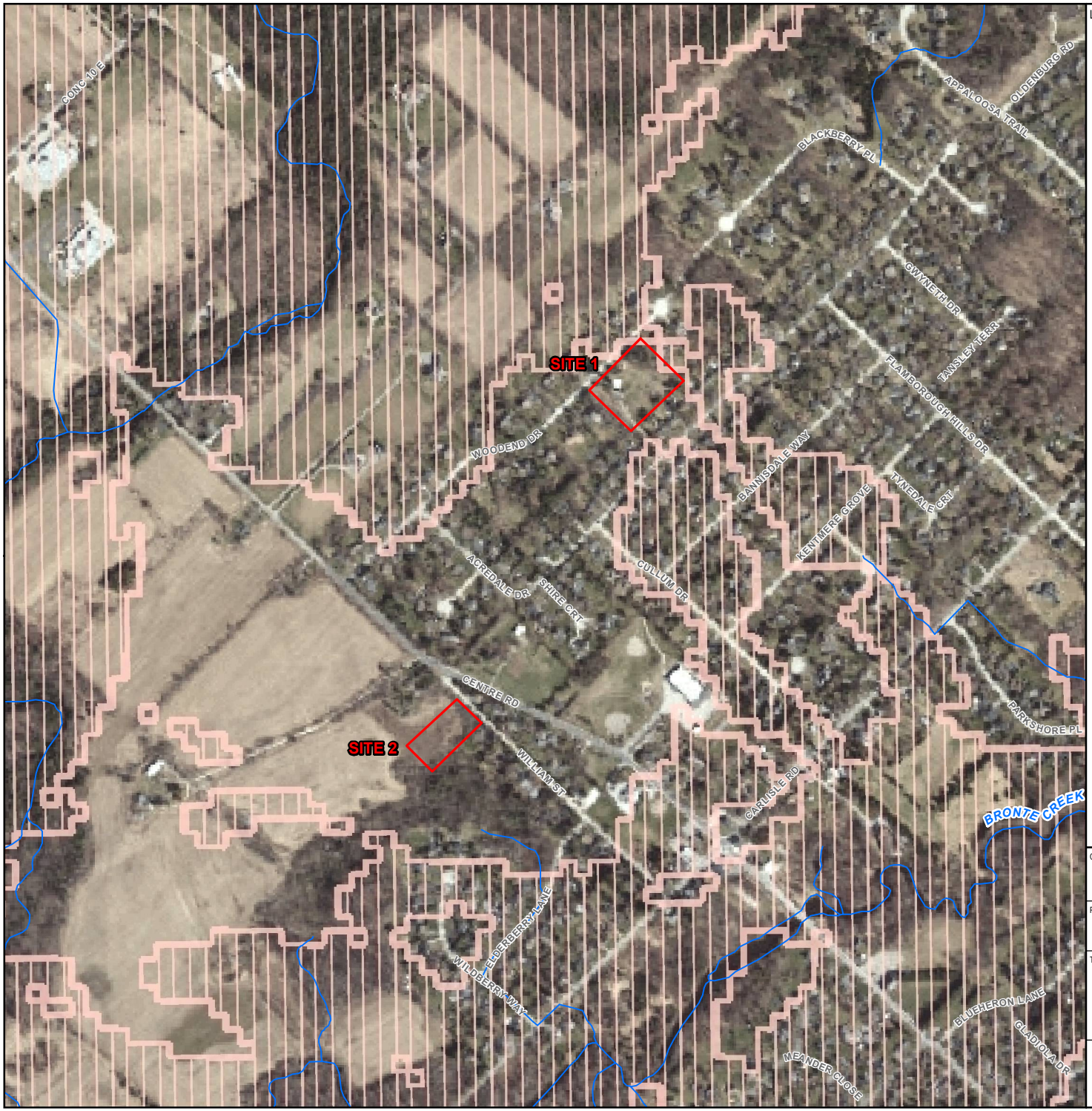

LEGEND

Subject Site

Watercourse[1]

Source Water Protection[2]

Highly Vulnerable Aquifer

1. LIO/MNRF
2. *Source Protection Information Atlas*, MECP © King's Printer for Ontario 2023

0 50 100 200 300 400 500

METRES

North American Datum 1983
Universal Transverse Mercator Projection Zone 17

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CLIENT

R.V. Anderson Associates

PROJECT

Carlisle Water Storage Facility, Hamilton, ON

TITLE

Source Water Protection

Palmer | PART OF SLR

REF. NO. 2108704-2b-1

Figure 3b

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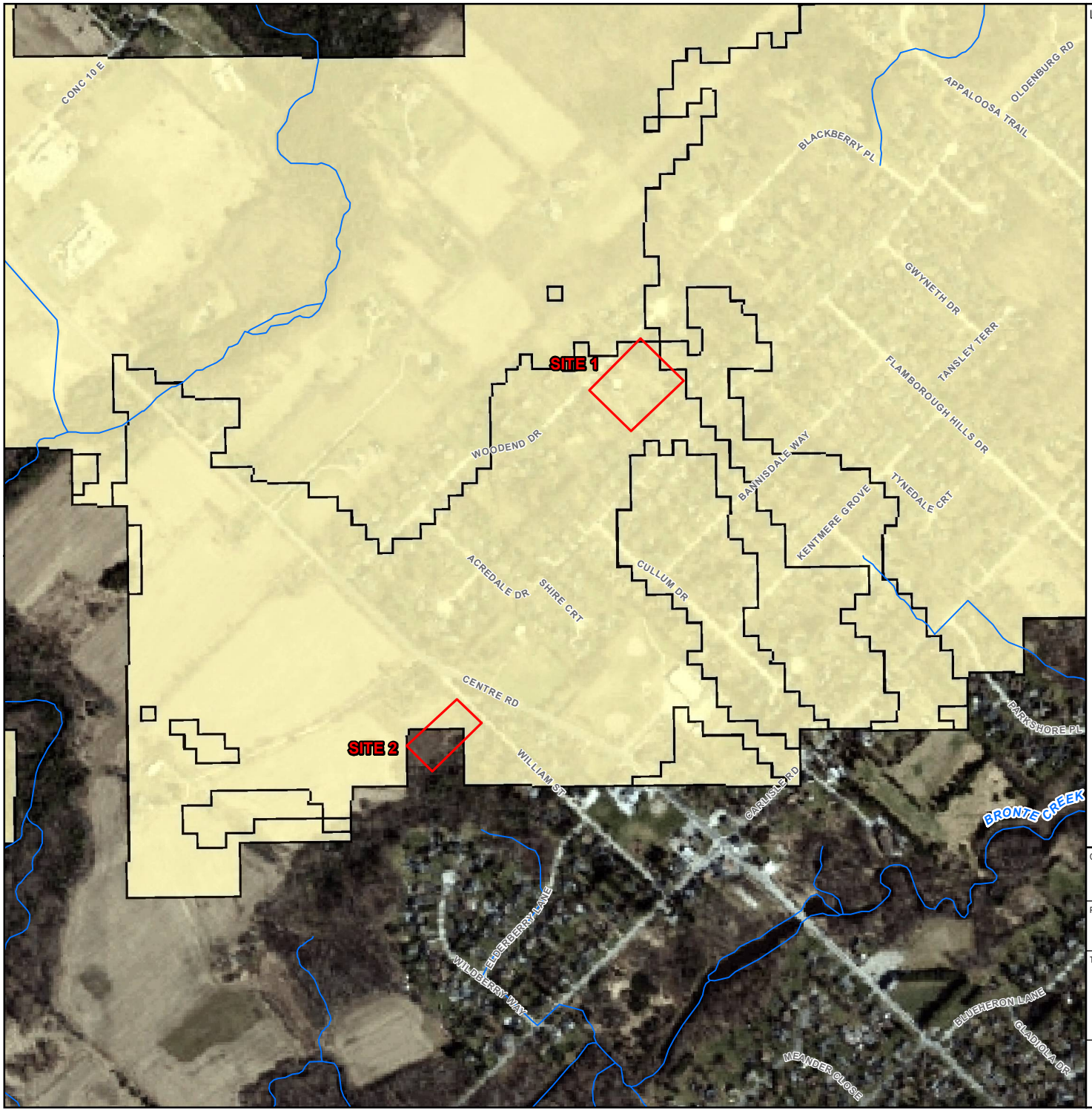

LEGEND

Subject Site

Watercourse[1]

Source Water Protection[2]

Significant Groundwater Recharge Area

Score - N/A

1. LIO/MNRF
2. *Source Protection Information Atlas*, MECP © King's Printer for Ontario 2023

0 50 100 200 300 400 500

METRES

North American Datum 1983
Universal Transverse Mercator Projection Zone 17

Scale: 1:10,000
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Checked: FL
Date: Dec 1, 2023

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R.V. Anderson Associates

PROJECT

Carlisle Water Storage Facility, Hamilton, ON

TITLE

Source Water Protection

Palmer | PART OF SLR

REF. NO. 2108704-2c-1

Figure 3c

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Appendix A

MECP Water Well Records

Well Logs (FDC03RR, CM-03-03S/D

The Ontario Water Resources Commission Act

WATER WELL RECORD

30M/5e

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11

6807563 | MUNICIP. 68005 | CON. CON. 09

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Wentworth	East Flamboro	9	006

[redacted] oke Conc Blks Aldershot Ont.

DATE COMPLETED: DAY 27 MO. ~~Aug~~ 08 YR. 70

[redacted] 05680 | RC. 4 | ELEVATION 0900 | RC. 5 | BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
Brown	Sand	Boulders		0	15
Brown	Sand	Gravelly		15	41½
Brown	Limestone			41½	80
Grey	Limestone			80	84
Brown	Limestone			84	97
White	Limestone			97	114
Grey	Limestone			114	125
Blue	Shale			125	130

APL

31 | 0015609/3 | 0042609/1 | 0080615 | 0084215 | 0097615 | 0114115 | 1

32 | 0125315 | 0130317

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0051	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
6¼ 06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	~~42~~ 0042
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		42	0130
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER

PUMPING RATE: 0025 GPM.

DURATION OF PUMPING: 01 HOURS 00 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
038 FEET	041 FEET	040 FEET	041 FEET	041 FEET	041 FEET

WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

IF FLOWING, GIVE RATE: GPM.

PUMP INTAKE SET AT: FEET

WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

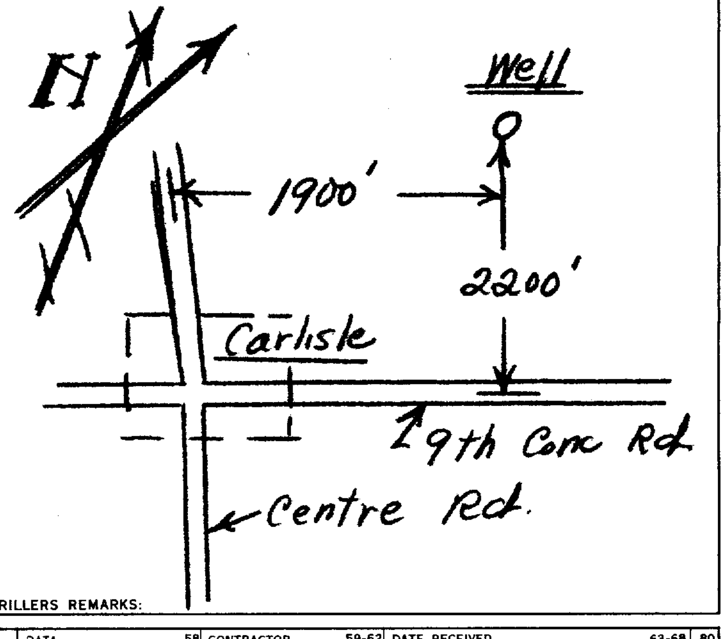
RECOMMENDED PUMP SETTING: 120 FEET

RECOMMENDED PUMPING RATE: ~~25~~ GPM.

008.3 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE 07

1 ☐ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☒ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: G.J. Wallis | LICENCE NUMBER: 5417

ADDRESS: RR#2, Stoney Creek

NAME OF DRILLER OR BORER: Same | LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: George J Wallis | SUBMISSION DATE: DAY 28 MO. 12 YR. 70

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 5417 | DATE RECEIVED: 160970

DATE OF INSPECTION: | INSPECTOR: 7

REMARKS: CSS.SS

P

WI

OWRC COPY

Ontario — Ministry of the Environment

Well Tag No. (Print Below) A131386 — Tag#: A131386 — 7204074

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
CITY OF HAMILTON			

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
120 KING ST. W.	HAMILTON	ONT	L8P4V2	9055462424

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
ACREDALE DR.	EAST FLAMBOROUGH	06	09

County/District/Municipality	City/Town/Village	Province	Postal Code
WENTWORTH	CARLISLE	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	17	582447	4805928		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
		RE: WELL FDC02	CONVERT EXISTING 10" CASING TO		
			12" BARREL PITLESS ADAPTER		
			WITH VERMIN PROOF LID		

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, *specify*

Well Use

☒ Public ☐ Commercial ☐ Not used ☐ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
12	STEEL	.385	+2.5	7.7

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☐ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☒ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, *specify* ☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth (m/ft) From	To	Diameter (cm/in)
☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*			
☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*			
☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*			

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

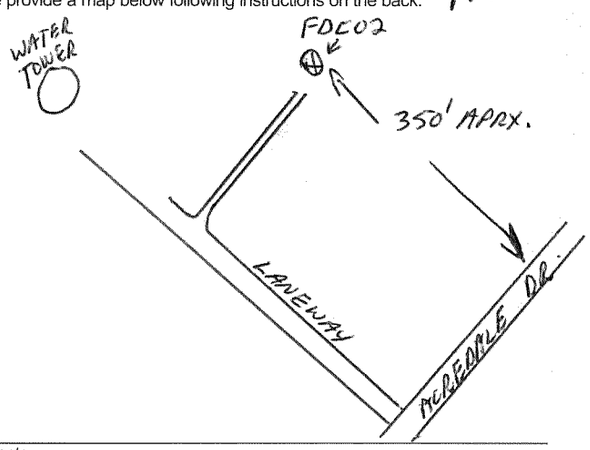
Well production *(l/min / GPM)*

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

PUMP BY W.D.HOPPER

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
W. D. Hopper and Sons Ltd.	2604

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
RR#2, #32 Harpurhey Rd.	Seaforth	Ont.	N0K1W0	wdhopper@tcc.on.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
5195221737	PAUL HOPPER	2577		21/06/2013

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☐ No NO		12/06/2013

Ministry Use Only

Audit No. Z 151351

Received JUL 02 2013

Ministry's Copy

Ontario Ministry of the Environment

Well Tag No. A131355 **Tag#: A131355** 7208552

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
CITY OF HAMILTON			

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
120 KING ST. W.	HAMILTON	ONT	L8P4V2	9055462424

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
ACREDALE DR.	EAST FLAMBOROUGH	06	09

County/District/Municipality	City/Town/Village	Province	Postal Code
WENTWORTH	CARLISLE	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	582407	4805895		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
			PACK AND SEAL EXISTING BEDROCK		
			OVERDRILL EXISTING 6" CASING	0	41
			REMOVE PACK & SEAL THEN FLUSH		
			BEDROCK	41	128
			HEAVY DUTY DRIVE SHOE INSTALL		
			ON END OF CASING		

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
6	41	NEET CEMENT	400GA

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☒ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 70

Pumping rate (l/min / GPM): 168US

Duration of pumping: 8 hrs + ___ min

Final water level end of pumping (m/ft): 43.73

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 70

Recommended pump rate (l/min / GPM): 168

Well production (l/min / GPM): 168

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	41		
1	43.27	1	41.89
2	43.30	2	41.83
3	43.30	3	41.76
4	43.33	4	41.76
5	43.34	5	41.73
10	43.40	10	41.63
15	43.40	15	
20	43.43	20	
25		25	
30	43.43	30	
40	43.43	40	
50	43.43	50	
60	43.47	60	

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) rc ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, specify

Well Use

☒ Public ☐ Commercial ☐ Not used ☐ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6.2	STEEL	.219	+3	41

Status of Well

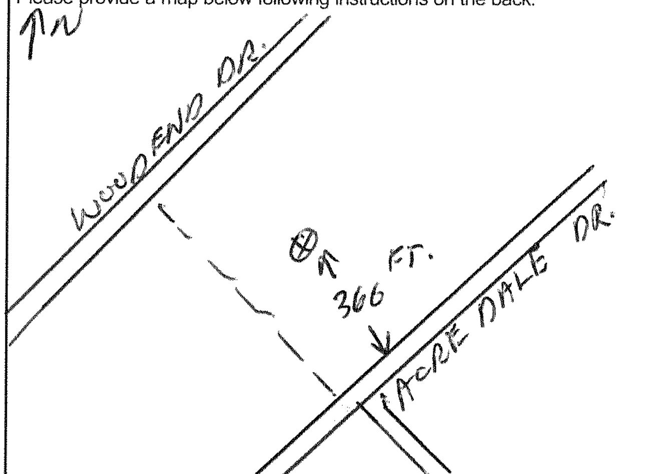
☐ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☒ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

Map of Well Location

Please provide a map below following instructions on the back.



Water Details

Water found at Depth (m/ft) Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify

Water found at Depth (m/ft) Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify

Water found at Depth (m/ft) Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	41	13

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
W. D. Hopper and Sons Ltd.	2604

Business Address (Street Number/Name)	Municipality
RR#2, #32 Harpurhey Rd.	Seaforth

Province	Postal Code	Business E-mail Address
Ont.	N0K1W0	wdhopper@tcc.on.ca

Bus.Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5195221737	ALLAN HOPPER

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
2576	[signature]	12/08/2013

Comments:

WELL# FDC01,PUMP & PITLESS, W.D.HOPPER, MEASURED FROM TOC

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☒ No	12/08/2013	01/08/2013

Ministry Use Only

Audit No. Z151373

Received OCT 0 1 2013

0506E (2007/12) Ministry's Copy

Con IX
Lot 8

30m/5e

J.B.

UTM 17 Z 5821120 E

4 R 4805070 N

Elev. 6480885

Basin 24

CODED

6806877

3 9

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District: Wentworth | Township, Village, Town or City: E Flamboro

Con. 9 IX | Lot 7 8 | Date completed: 12 (day) Nov (month) 68 (year)

Owner [redacted] (print in block letters) | Address: RR1 ~~Waterdown~~ Carlisle

[redacted]

Casing and Screen Record

Inside diameter of casing	6 1/4
Total length of casing	~~[illegible]~~ 66
Type of screen	—
Length of screen	—
Depth to top of screen	—
Diameter of finished hole	6 1/4

Pumping Test

Static level	29
Test-pumping rate	15 G.P.M.
Pumping level	60
Duration of test pumping	1 hr
Water clear or cloudy at end of test	clear
Recommended pumping rate	10 G.P.M.
with pump setting of	60 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Stony clay fill	0	8	67	fresh
Sandy clay some gravel	8	35		
dirty sand	35	60		
clay hardpan	60	66		
Bed Rock	66	68		

For what purpose(s) is the water to be used? D
house

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm: W Parkham

Address: RR2 Ancaster

Licence Number: 2794

Name of Driller or Borer: W Parkham

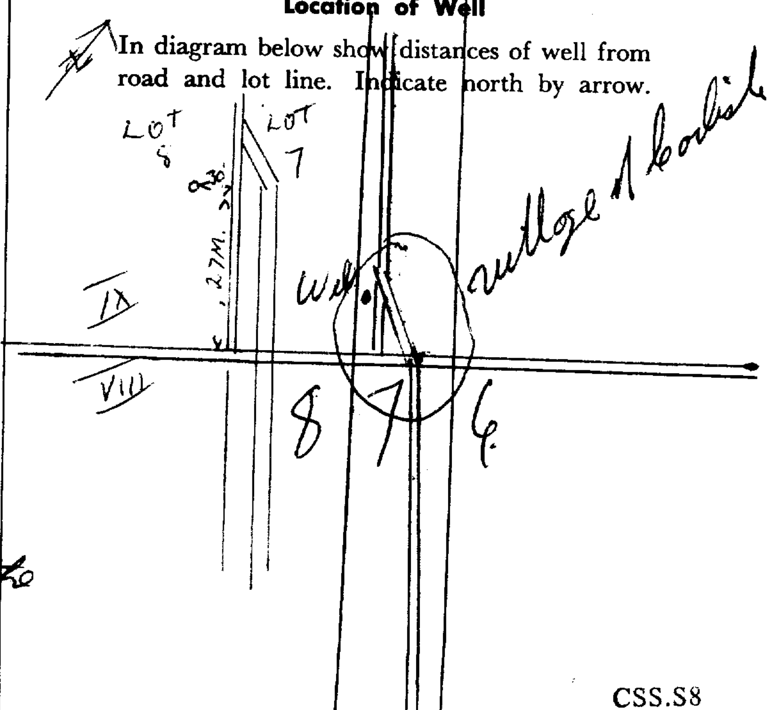
Address: RR2 Ancaster

Date: Nov 12/68

Wesley Parkham
(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7

OWRC COPY

Large new house across the Road from a duplex

CSS.S8

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

80 M/15e

14/19 — 1. PRINT ONLY IN SPACES PROVIDED 2. CHECK ☒ CORRECT BOX WHERE APPLICABLE — (11) 6809946 — MUNICIP 68005 — CON. CGN 09

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC	LOT
Hamilton-Wentworth	E. Flamboro	9	008

[redacted] isle, Ontario — Registered A Member of ONTARIO 386392 LTD. — DATE COMPLETED DAY 24 MO May YR 79

UTM 05000 — RC 4 — ELEVATION 0860 — RC 4 — BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
	Top Soil			0	1
M. Brown	Clay	Stones		1	10
D. Brown	Clay Sand	Stones		10	20
D. Brown	Clay Sand	Gravels		20	40
M. Brown	Sand	Gravels		40	52
		Gravels		52	55
Brown	Clay Sand	Gravels		55	60
M. Gray	Rock			60	70
D. Gray	Rock			70	87
Blue	Shales			87	96
Red	Shales			96	100
		T.W. 1			

(31) 0001 02 | 0010605128 | 0020605128 | 0040605281 | 0052428111 | 0055 1 1

(32) 0060605281 | 0070212781 | 0087212651 | 0096317 | 0100717

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0083-85	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

(51) CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
08"	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.250	0	0062
08"	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		62	0100
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE — DEPTH TO TOP OF SCREEN FEET

(61) PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)

(71) PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER — PUMPING RATE: 0040 GPM — DURATION OF PUMPING: 04 HOURS 00 MINS

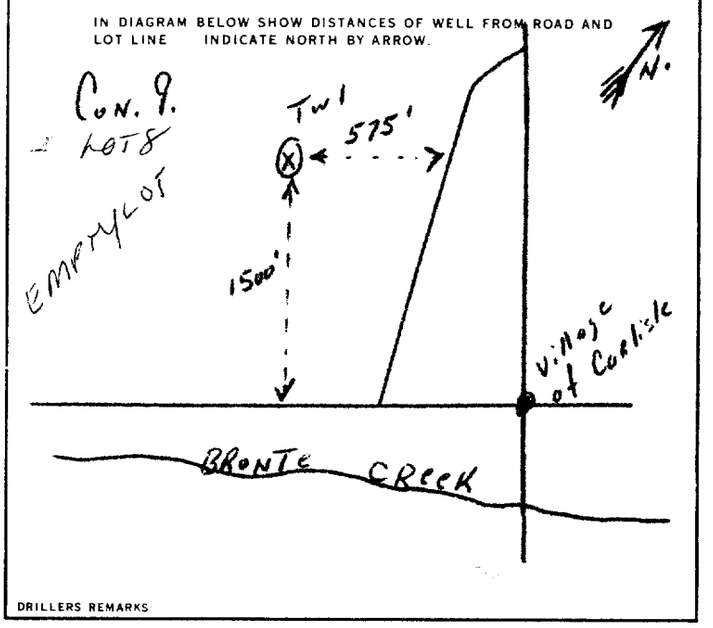
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY			
-bb	Flowing 004 FEET	15 MINUTES FEET	30 MINUTES FEET	45 MINUTES FEET	60 MINUTES 001 FEET Flow

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
0001 GPM	FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	040 FEET	0040 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

FINAL STATUS OF WELL (84): 1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE (55-56) 05: 1 ☐ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☒ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING (57): 1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Graham Well Drilling Ltd. — LICENCE NUMBER: 2336

ADDRESS: Guelph, Ontario

NAME OF DRILLER OR BORER: Jim Hawkins 22 W — LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: K Graham — SUBMISSION DATE: DAY 30 MO. May YR. 79

OFFICE USE ONLY

DATA SOURCE 1 — CONTRACTOR 2336 — DATE RECEIVED 010679

DATE OF INSPECTION — INSPECTOR — May 6/80 JW

REMARKS

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506—4—77

30m/5e

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

15/79

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 6809945 MUNICIP. 68005 CON. CGN 09

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Wentworth Hamilton	E. Flamboro	9	008 8

[redacted] isle, Ontario REGISTERED ONT #386392

DATE COMPLETED 05 DAY 24 MO May YR 79

UTM [illegible] 004980 RC 4 ELEVATION 0860 RC 4 BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
	Top soil			0	1
n. Brown	Clay	Stones		1	10
D. Brown	Clay Sand	Stones		10	20
D. Brown	Clay Sand	Gravels		20	40
M. Brown	Clay Sand	Gravels		40	60
M/ Br. Gray	Rock			60	73
D. Gray	Rock			73	87
Blue	Shales			87	95
Red	Shales			95	100
		T.W. 2			

31 0001 02 00106051 2 00206052812 00606052811 00736128 00872126 5 1

32 00953 17 01007 17 8" Shoe

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0061	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
0083	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
08"	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.250	0	0061
08"	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		61	0100
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER

PUMPING RATE: 0040 GPM

DURATION OF PUMPING: 24 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY			
-06 FLOW FEET	004 FEET	15 MINUTES FEET	30 MINUTES FEET	45 MINUTES FEET	60 MINUTES 001 FLOW FEET

IF FLOWING, GIVE RATE: 0001 GPM

PUMP INTAKE SET AT: FEET

WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

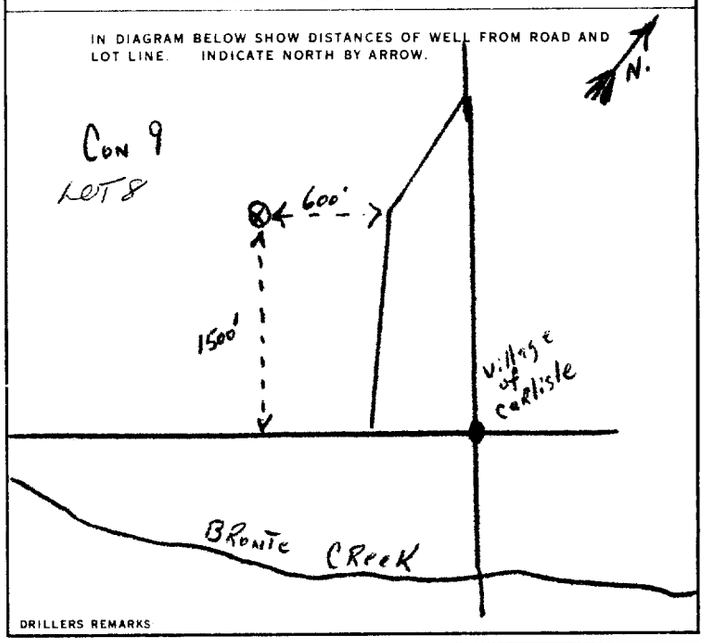
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

RECOMMENDED PUMP SETTING: 040 FEET

RECOMMENDED PUMPING RATE: 0040 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

FINAL STATUS OF WELL 54: 1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 55-56: 05 — 1 ☐ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☒ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING 57: 1 — 1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Graham Well Drilling Ltd. LICENCE NUMBER: 2336

ADDRESS: Guelph, Ontario

NAME OF DRILLER OR BORER: Jim Hawkins 22W LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: R Graham SUBMISSION DATE: DAY 30 MO May YR 79

OFFICE USE ONLY

DATA SOURCE 58: 1 CONTRACTOR 59-62: 2336 DATE RECEIVED 63-68: 010679

DATE OF INSPECTION: INSPECTOR: 17 May 6/80

REMARKS:

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506—4—77

6803009

UTM Z E

R N

Elev. R 0882

Basin Con 14 Lot 7

The Ontario Water Resources Commission Act, 1957

GROUND WATER BRANCH
No. 68
MAY 25 1959
ONTARIO WATER RESOURCES COMMISSION

3009

WATER WELL RECORD

County or District Wentworth — Township, Village, Town or City E Flamboro

Con. 9 Lot 7 — Date completed 1 (day) May (month) 59 (year)

[redacted] — Address Carlisle P.O.

Casing and Screen Record

Inside diameter of casing 6

Total length of casing ~~28~~ 68

Type of screen none

Length of screen

Depth to top of screen

Diameter of finished hole 6

Pumping Test

Static level 37

Test-pumping rate 20 G.P.M.

Pumping level 45

Duration of test pumping 1 hr

Water clear or cloudy at end of test clear

Recommended pumping rate ~~20~~ 3 G.P.M.

with pumping level of ~~60~~ 40'

Well Log

Overburden and Bedrock Record	From ft.	To ft.
Sandy loam	0	35
Silty loam	35	65
Sand	65	~~67~~
Rock	~~67~~	72

Water Record

Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, sulphur)
71	~~3~~ 4	fresh

For what purpose(s) is the water to be used?

house

Is well on upland, in valley, or on hillside? hillside

Drilling Firm Wesley Parkinson

Address Smithville

Licence Number 49

Name of Driller Wesley Parkinson

Address Smithville

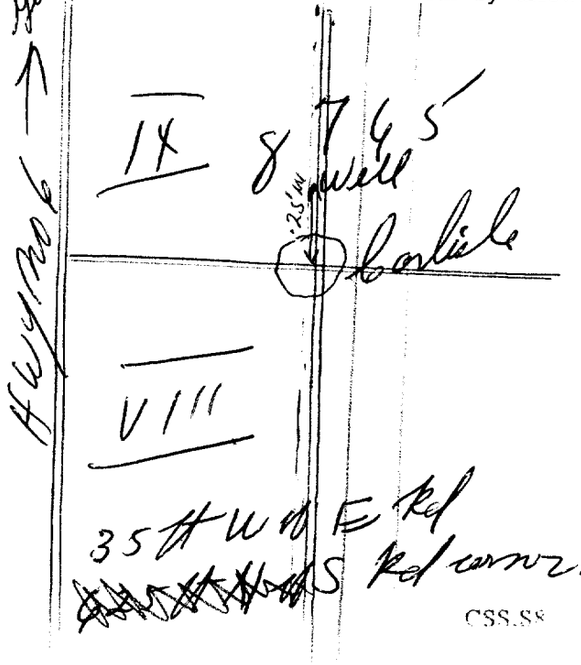
Date May 22/59

Wesley Parkinson

(Signature of Licensed Drilling Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 5
15M-58-4149

CSS.58

Well Log FDC03RR

PROJECT: Carlisle Redundant Well

CLIENT: R.V. Anderson Associates Limited

PROJECT LOCATION: 84 Acredale Drive Carlisle, ON

DATUM: Geodetic

BH LOCATION:

Method: Cased rotary-percussion drilling

Diameter: 400 mm

Date: Apr-17-2023 to Apr-20-2023

REF. NO.: 2108704

ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
273.0	Ground Surface						
0.0	**FILL:** sandy gravel to gravelly sand, trace clay, subrounded dolostone and sandstone gravel (<30 mm), brown, wet to moist, no stain and no odor. a few rootlets and anthropogenic debris.		1	GR			
269.2			2	GR			
3.8	**SANDY GRAVEL TO GRAVELLY SAND:** trace clay, subrounded to subangular dolostone, limestone and sandstonegravel (10 to 35 mm), brown, damp to dry at top, no stain and no odor. --- clean water was used as drilling fluid.		3	GR			
			4	GR			
			5	GR			
			6	GR			
261.9			7	GR			
11.1	**SANDY GRAVEL:** subrounded to subangular dolostone and precambrian rock gavel (<30 mm), greyish brown, no stain and no odor.		8	GR			
258.5			9	GR			
14.5	**DOLOSTONE:** fine-crystallized, slightly weathered at upper part, a few vugs and solution holes, geyish white.		10	GR			
255.5			11	GR			
17.5	**LIMESTONE:** fine-crystallized, grey. ---fractures.		12	GR			
252.4			13	GR			
20.6	**LIMESTONE and DOLOSTONE:** interlayered limestone and dolostone, fine-crystallized, Vuggy and fossiliferous locally, a few fractures, light grey. --- fractures.		14	GR			
			15	GR			
			16	GR			
	--- abundant vugs and fossils (25 to 27 mbgs).		17	GR			
			18	GR			
244.1							
28.9	**LIMESTONE:** fine-crystallized, thinly bedded, with siltstone interlayers at lower part, grey.		19	GR			
			20	GR			
240.5							
240.0	**SHALE:** calcareous shale with siltstone interlayers, greenish grey.		21	GR			
33.0	**END OF BOREHOLE**		22	GR			

Notes:
Grab samples of cuttings were taken with fine mesh strainer. Loss of fine materials is anticipated.
The well log was based on cutting classfication and records of construction.

Bentonite Seal

Cement Grout

W. L. 262.5 m
May 01, 2023

Open Hole

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Shallow/ Single Installation 1st 2nd Deep/Dual Installation 1st 2nd

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ε=3% Strain at Failure

CM-03-03d

BOREHOLE LOG

Logged By:	Reviewed By	Sheet Number:	Test Pit Number:
H. Sangam	Draft	1 of 2	CM-03-03

Drilling Company:	Drilling Equipment:	Drilling Method:	Start Date:	End Date:
Lantech Drilling Services	CME-75	SSA and HQ-Core	27 Mar 03	28 Mar 03

Final Hole Depth (m):	Final Well Depth (m):	Hole Diameter (m):	Well Diameter (m):	Pipe Stickup (m):
27.4	27.37	0.1	0.1	0.50

Ground Elevation (m):	TOC Elevation (m):	Depth to Water BTOC (m):	Depth to Water BGS (m):	Groundwater Elevation (m):
n.a.	Not Surveyed	5.60	5.10	n.a.

Sample Type Legend:

SS Split Spoon Sample; AU Auger Sample
PS Pionjar Sample; VA Vane Test Interval
GR Grab Sample; SP Standard Penetration Test
RX Core Sample; SH Shelby Tube Sample

Borehole Location Description/Notes:

Northing: 4808434
Easting: 563016 Zone 17T

Sample Type, No., and Interval	Blow Counts (blows/6 cm)	N-Value	Sample Recovery	Elevation (m) / Depth (m)	Depth Scale (m)	Material	Stratigraphic Description	Well Materials	Well Construction Details
SS-1		n.a.		0.10	1		TOPSOIL-FILL Brown, some gravel and clay		Backfill
SS-2		n.a.		3.05	4		Brown, layered, some gravel		
SS-3		n.a.		5.79	6		Brown, layered, some clay, damp		
RX-4		n.a.		5.94	7		BOULDER -White grey -Water intermitently turning brown and milky white -granite at about 6.24 m to 6.47 m		Bentonite Seal 0.20 m Steel Casing
RX-5		n.a.			8				
RX-6		n.a.			9				
RX-7		n.a.		9.19	10		-Fractured with with occasional -brown soil material in fractures (washed out) by drilling fluid		
RX-8		n.a.		10.97	11		BEDROCK - DOLOSTONE -grey -fractures at about every 0.15 m		
RX-9		n.a.			12				
RX-10		n.a.		12.19			-completely fractured -gravel like cuttings		
RX-11		n.a.		12.95	13		-open fractures -filling soil washed out -highly fractured -gravel like cuttings		
RX-12		n.a.		13.44					
RX-13		n.a.		13.67	14		-fractures with filing soil wash out -dissolution cavities		

SNC-LAVALIN
Engineers & Constructors

Project Name: Hamilton Groundwater Study
Project Location: Ontario

Project Number: 331256

TEST-PIT-NEW CIRCLE.GPJ HAMILTON.GDT 4/8/03

BOREHOLE LOG

Logged By:	Reviewed By:	Sheet Number:	Test Pit Number:
H. Sangam	Draft	2 of 2	CM-03-03

Sample Type Legend:

SS Split Spoon Sample
PS Piezjer Sample
GR Grab Sample
RX Core Sample
AU Auger Sample
VA Vane Test Interval
SP Standard Penetration Test
SH Shelby Tube Sample

Borehole Location Description/Notes:

Northing: 4806434
Easting: 583016 Zone 17T

Sample Type, No., and Interval	Blow Counts (#/0.5 cm)	N-Value	Sample Recovery	Elevation (m) / Depth (m)	Depth Scale (m)	Material	Stratigraphic Description	Well Materials	Well Construction Details
				15.24	16		-fractured, open fractures -abundant dissolution cavities		
RX-1		n.s.							
				17.22	17		-highly fractured -angular gravel like cuttings		
RX-1		n.s.			18				
				18.57	19		-micropores -rough core		
RX-1		n.s.		19.76	20		-highly fractured -gravel like cuttings		0.10 m Diameter Open Hole from 13.72 mbgs to 27.37 mbgs
RX-1		n.s.		21.13	21		-micropores -rough core surface		
RX-1		n.s.		22.60	22		-Intact rock, no factures -smooth core surface		
RX-1		n.s.			23				
RX-1		n.s.			24				
				24.33			SHALE -dark grey, very stiff -plastic clay seams starting at about 25.5 mbgs -clay seams at every 0.1 to 0.20 m -becoming greenish with depth		
RX-2		n.s.			25				
RX-2		n.s.			26				
					27				
				27.37			End of Borehole		

SNC·LAVALIN
Engineers & Constructors

Project Name: Hamilton Groundwater Study
Project Location: Carlisle

Project Number: 331256

TEST-PIT-NEW CARLISLE.GPJ FASHDWA1.GDT 8/8/03