



# **Nitrate Impact Assessment and Water Supply Potential Assessment**

**1891 Reidsville Road  
North Dumfries, Ontario**

**Project 10445**

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# 1. INTRODUCTION

Hydrogeology Consulting Services Inc. (HCS) was retained by Joy Roberts to conduct a nitrate impact assessment and water supply potential assessment for a proposed single-family residential lot severance at 1891 Reidsville Road in North Dumfries, Ontario. The existing lot will be divided into a retained lot with an existing single-family residential dwelling, and a severed lot for the construction of a new single-family dwelling.

The location of the subject property is shown on Drawing 1 in Appendix A.

This assessment has been prepared to address the typical requirements for lot severances privately serviced for water supply and sewage disposal within the Township of North Dumfries.

It is noted a sewage system design will be prepared for the site by a septic design engineer. The septic design report will include evaluation of sewage system design requirements and proposed layout of sewage effluent bed and reserve bed areas.

## 2. STUDY AREA PHYSIOGRAPHY AND GEOLOGY

### 2.1 Site Description

Proposed development of the property consists of severance of a 0.63-hectare parcel from the 5.14-hectare lot, with the existing single-family residential dwelling to remain on the 4.5 ha retained parcel, as shown on Drawing 2 included in Appendix A.

As shown on the appended Drawing 2, the 5.14-ha property consists of a rural residential lot within the Township of North Dumfries. The subject property is bordered by rural residential properties to the north and south, Reidsville Road to the west, and wetland areas to the east and further south. Agricultural fields are located further afield in all directions.

The wetland areas are identified by the Grand River Conservation Authority (GRCA) and the Ontario Ministry of Natural Resources and Forests (MNR), associated with Cedar Creek and its tributaries.

According to GRCA mapping (2026), the subject property slopes generally to the north/northeast, with ground surface elevations ranging from approximately 300.4 meters above sea level (mASL) near the southern boundary to approximately 294.9 mASL near the northern boundary.

## 2.2 Physiography

The property lies within the Waterloo Hills physiographic region (Chapman and Putnam, 2007) which is mainly comprised of well drained sand hills, gravel terraces, and swampy valleys. The subject property is located within the Kame Moraines physiographic landform, consisting of glacial end moraines containing hummocky mounds of irregularly bedded sand and gravel with subordinated till deposited in patches deposited in patches from glacial meltwater (Chapman and Putnam, 2007).

## 2.3 Geology and Hydrogeology

Quaternary Geology mapping (Ontario Geological Survey, 2003) indicates the subject property is underlain by glaciofluvial deposits consisting of river and delta topset facies deposits of sand and gravel, as would be expected for the Kames Moraines region.

The soil grain size analyses from the test pits excavated on the subject property included in Appendix D illustrate generally fine to medium sand deposits (encountered at approximately 0.25 – 0.3 mBGS) underlying topsoil. Test Pit logs are included in Appendix D for reference.

Based on on-site and nearby well records obtained from the MECP Water Well Record (WWR) online database (included in Appendix B), overburden deposits in the area are approximately 44.5 m or more in thickness, generally consisting of interlayered sand, gravel, and clay deposits of varying composition. The well records indicate a shallow granular aquifer at a depth of approximately 3.7 mBGS, and a deep granular aquifer at a depth of approximately 26 mBGS.

Geological cross sections shown on the appended Drawings 5 through 7 illustrate the typical subsurface stratigraphic conditions in the general area of the subject property based on well records from the WWR database. It is important to consider these cross sections are generated using data from well records that are, in some cases, decades old and were not originally prepared to provide detailed stratigraphic information. Additionally, old well records do not have accurate coordinate information; therefore, the MECP WWR database plotted locations (hand-verified where possible based on potentially redacted address information and well driller sketches) have been used to generate the cross sections in the absence of more accurate information.

As shown on Drawings 6 and 7, the subsurface stratigraphy in the vicinity of the subject property generally consists of surficial sandy deposits of varying thickness, underlain by interlayered deposits of clay and sand/gravel of varying composition. No bedrock was encountered in any of the well records.

Paleozoic geology mapping of Southern Ontario (Armstrong and Dodge, 2007) indicates underlying the overburden deposits is the Salina Formation bedrock consisting of dolostone, shale, and gypsum.

### 2.3.1 Grain Size Analysis Results

Test pits were excavated on the subject property at the locations shown on the appended Drawing 2 on March 20, 2026. Soil samples from the two test pits were submitted to FlowSpec Engineering Ltd. for analysis of particle size distribution (grain size). As shown on the grain size analysis graphs included in Appendix C, the near-surface soil samples consist of sand with trace silt and clay. The grain size analysis results were used to estimate soil hydraulic conductivity (K) values by applying the Kaubisch, Breyer, Hazen, and Kozeny-Carman formulae where appropriate based on the limitations of each formula. The hydraulic conductivity estimates are summarized in Table 1 below:

Table 1: Calculated soil hydraulic conductivity values

Soil Sample	Sample Depth (mBGS)	Soil Type	Analysis Method	Hydraulic Conductivity (m/sec)
TP1-26	0.3 – 1.3	Sand, some silt and clay	Breyer	$1.3 \times 10^{-6}$
TP2-26	1.3 – 1.9	Sand, some gravel, trace silt and clay	Hazen	$8.7 \times 10^{-5}$

The hydraulic conductivity value of  $1.3 \times 10^{-6}$  m/sec indicates a moderately low permeability for the native sand (with 26.7% silt and clay) overburden; and the hydraulic conductivity value of  $8.7 \times 10^{-5}$  m/sec indicates a moderate to moderately high permeability for the native sand and gravel underlying topsoil. The range reflects compositional changes across the subject property.

The hydraulic conductivity estimated for TP1-26 is lower than values typically associated with granular sand. This lower conductivity reflects heterogeneity within the overburden materials, specifically the presence of 26.7% of fine particle silt and clay material, and perhaps could be classified as a silty sand vs. a sand.

The hydraulic conductivity estimates from the grain size analyses generally correlate reasonably well with published ranges for major soil types (Freeze and Cherry, 1979).

### 2.3.2 Soil Infiltration Rate and T-Time Calculations

The Toronto Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC) provide a method of assessing soil infiltration rate in the Low Impact Development (LID) Stormwater Management (SWM) Planning and Design Guide (TRCA and CVC, 2010). Following the methodology outlined in Appendix C of the Guide the estimated soil hydraulic conductivity values from Table 1 above were converted into the infiltration rates listed in Table 2 below. Additionally, an estimated soil “T-Time” value based on the Ontario Building Code (OBC) classifications for major soil types is provided.

Table 2: Estimated Soil Infiltration Rates from Hydraulic Conductivity Values

Estimated Hydraulic Conductivity (m/sec)	Estimated Soil Infiltration Rate – <u>Unfactored</u> (mm/hr)	Estimated Soil Infiltration Rate – Factored* (mm/hr)	Estimated Soil T-Time (mins/cm) (OBC)
$1.3 \times 10^{-6}$	53	15.1	17-30
$8.7 \times 10^{-5}$	144	41.1	12-25

\* - Factor of 3.5 applied due to the presence of sand and gravel overburden within 1.5 m of the fine sand soil.

As shown in the table above it is important to consider that the LID SWM Planning and Design Guide requires implementation a Safety Correction factor to calculate “Design Infiltration Rates” (e.g. for subdivision soakaway pits and infiltration galleries). The unfactored rate listed in the table is considered reasonable for comparative purposes and for design of sewage effluent leaching beds, while the factored rate would be applicable for design of high volume infiltration facilities.

As a conservative factor of safety, the soil sample from TP1-26 will be considered in the nitrate impact assessment, based on an assumed sand with some silt and clay overburden for the proposed leaching bed.

Soil T-Times should be considered by a septic design engineer when developing leaching bed parameters for the proposed lot.

### 3. PREDICTIVE NITRATE IMPACT ASSESSMENT

The proposed single family residential lot will be privately serviced for water and privately serviced for sewage disposal. The single-family residential sewage system will discharge effluent to the subsurface via a leaching bed. The leaching bed will load residential waste nutrients to the subsurface shallow groundwater system(s). The principal components of the sewage effluent will be nitrate (as nitrogen), ammonia, and phosphorus (total). As ammonia is normally aerobically converted to nitrate in the unsaturated zone, and phosphorous typically reacts with and attaches to soil particles, nitrate is the primary nutrient parameter that percolates downwards to the water table and can impact groundwater. Nitrate can persist in groundwater; however, under anaerobic conditions it is typically converted to nitrogen gas by bacteria in the process of denitrification.

Assessment of the potential impact of a subsurface sewage disposal system is performed based on nitrate loading of the shallow groundwater aquifer, as excessive amounts of nitrate can impact both drinking water (particularly for infants) and surface water (due to eutrophication and plant growth).

The Ontario Drinking Water Quality Standard (ODWQS) for nitrate-N is 10 mg/L, and this is the criteria applied to the predictive nitrate impact assessment.

For the purposes of this assessment, the Ontario Ministry of the Environment and Climate Change (MOECC, now MECP) Technical Guideline for Individual On-Site Sewage Systems Procedure D-5-4 (1996) is applied as follows:

$$C_{PB} = \frac{(SEF \times C_{SEF}) + (GR \times C_{GR}) + (GUF \times C_{GUF})}{(SEF + GR + GUF)}$$

**Variables:**

**C<sub>PB</sub>** = Nitrate concentration in groundwater at the down-gradient property boundary (mg/L as nitrate-N)

**SEF** = Sewage effluent flow (m<sup>3</sup>/yr)

Sewage effluent flows for the existing and proposed single-family residential dwellings (1,000 L/day<sup>1</sup>) have been applied to these calculations.

Existing Residential Dwelling	Proposed Residential Dwelling
= 1,000 L/day x 365 days	= 1,000 L/day x 365 days
= 365,000 L/yr	= 365,000 L/yr

**C<sub>SEF</sub>** = Nitrate concentration of sewage effluent (mg/L)

Sewage effluent nitrate concentration of 40 mg/L for a conventional treatment system, 20 mg/L for a tertiary treatment system, and 12 mg/L for an enhanced tertiary treatment system.

**GR** = Groundwater recharge from infiltrating precipitation (m<sup>3</sup>/yr)

Groundwater Recharge = Infiltration Rate<sup>2</sup> x Site Area<sup>3</sup>

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<sup>1</sup> Sewage flow volume for the 3-bedroom home based on MECP Procedure D-5-4 flow volumes for typical 4-bedroom homes.

<sup>2</sup> Infiltration rate from MOEE Hydrogeological Technical Information Requirements for Land Development Application (1995) Section 4.5 Table 3, assuming a general fine sand soil type across the property.

<sup>3</sup> Site Area is taken as the total lot area, based on methodology outlined in MOEE Procedure D-5-4: Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment.

Lot	Infiltration Rate m/yr	Site Area m <sup>2</sup>	Groundwater Recharge m <sup>3</sup> /yr	Groundwater Recharge L/yr
Proposed 0.63 ha Lot	0.20	6,300	1,260	1,260,000
Retained 4.51 ha Lot	0.20	45,100	9,020	9,020,000

It is noted the entire site area is normally applied to the groundwater recharge calculation. Conceptually, when site-level water balance calculations using the Thornthwaite-Mather method are prepared for a property with no municipal storm sewer connection, runoff from impervious surfaces such as rooftops and driveways is assumed to flow onto adjacent pervious surfaces where, apart from significant rainfall events where the ground becomes completely saturated, it is reasonable to assume it has the opportunity to infiltrate into the ground at the same rate as precipitation falling directly on the pervious surfaces. Site-level water balance calculations prepared by HCS for properties throughout Southern Ontario with no connection to municipal storm sewers have consistently shown an infiltration surplus under post-development conditions based on this methodology – these calculations have been consistently approved by a wide variety of Conservation Authorities and municipalities. Based on this information it is concluded the application of 100% of site area to the groundwater recharge calculation is typically reasonable and appropriate for a property with no connection to municipal storm sewers. It is noted the nitrate impact assessment calculations do not assume the typical surplus of groundwater recharge under post-development conditions as a conservative factor of safety.

**C<sub>GR</sub>** = Nitrate concentration of groundwater recharge (mg/L)  
 0.9 mg/L Nitrate concentration assumed for infiltrating precipitation.

**GUF** = Groundwater underflow (excluded as a conservative factor of safety)

**C<sub>GUF</sub>** = Nitrate concentration of groundwater underflow (excluded as a conservative factor of safety)

Based on the variables described above, predictive nitrate impact calculation results for conventional and tertiary treatment systems are summarized in Table 3 below.

**Table 3: Nitrate Impact Assessment Calculated Results**

	Sewage Effluent Concentration (mg/L)	Total Annual Sewage volume (L/yr)	Nitrate-N Concentration at Downgradient Property Boundary (mg/L)
<b>0.63-ha</b> Proposed Lot (3-BR Home)	40	365,000	<b>9.68</b>
	20	365,000	<b>5.19</b>
	12	365,000	<b>3.39</b>
<b>4.51-ha</b> Retained Lot (3-BR Home)	40	365,000	<b>2.42</b>
	20	365,000	<b>1.64</b>
	12	365,000	<b>1.33</b>

The nitrate impact assessment calculations, which conservatively assume moderate annual precipitation recharge for the sand (with silt and clay) subsurface deposits, show using a conventional treatment system for the proposed and retained lots would result in nitrate-N concentrations at the downgradient lot boundary below the 10 mg/L ODWQS criteria limit.

### 3.1 Assessment of Nitrate Impact Calculations

To minimize the potential for impacts to the shallow overburden soils and overburden aquifers, a conventional sewage effluent treatment system with a maximum design effluent concentration of 40 mg/L for nitrate-N will be required for the sewage effluent disposal system for the proposed lot severance, and for the existing home on the retained lot.

As shown on the attached topographic sketch (McKechnie Surveying Ltd., March 2026) the proposed sewage effluent leaching bed for the proposed lot severance is located outside of the 30 m wetland buffer.

It is important to note that these calculations have conservatively assumed no dilution effects from groundwater underflow. Conceptually, when sewage effluent percolating vertically downwards through the unsaturated zone reaches the groundwater table, mixing of the sewage effluent with groundwater having a Nitrate-N concentration lower than the sewage effluent would result in dilution of the sewage effluent by the groundwater, and therefore result in a lower Nitrate-N concentration than if the sewage were only diluted by infiltrating precipitation. Quantifying the additional dilution from mixing of the effluent with groundwater would require a detailed site-level investigation to determine the shallow aquifer thickness, flow direction, and rate of groundwater flux beneath the property.

### **3.1.1 Nitrate Impact Assessment and Surface Water Features**

The closest surface water features are wetlands associated with a tributary of Cedar Creek approximately 40 m east of the development envelope within the proposed lot severance. Cedar Creek and its associated wetlands are located farther to the southeast.

While the nitrate impact assessment calculations above prepared using conservative assumptions show Nitrate-N concentrations less than 10 mg/L at the downgradient property boundary with the use of conventional sewage effluent treatment systems for both the retained lot and proposed lot, it is reasonable to conclude further dilution and attenuation of any sewage effluent that may flow beyond the downgradient property boundary will occur between the property boundary and any downgradient surface water features.

As noted in Section 3.1 above, the nitrate impact assessment calculations have excluded the diluting effects of groundwater underflow as a conservative measure. However, during travel beneath and beyond the property limits the dilution of sewage effluent by mixing with groundwater underflow will result in further reductions in the concentration of sewage effluent that flows from the property towards surface water features.

Additionally, the same natural attenuative processes that occur beneath the subject property (i.e. denitrification by bacteria under anoxic conditions at/below the groundwater table; and assimilative consumption of nitrate by plants and microbes) will continue to occur downgradient of the subject property boundary.

As a result, it is concluded no material impacts to surface water features would be expected by the potential lot severance and single-family residential dwelling.

## 4. WATER SUPPLY POTENTIAL ASSESSMENT

Well Records from the Ministry of the Environment, Conservation, and Parks (MECP) Water Well Record (WWR) Database were reviewed to determine the number of supply wells present. As shown on the well records included in Appendix B, sixteen wells are located within an approximate radius of 500 m from the proposed severance according to the MECP WWR Database.

Of these, one well is identified as “not in use”, four wells are abandoned, and one well has no completion details; these wells have been excluded from further consideration.

Of the ten remaining wells, all are identified as domestic supply wells and are completed in overburden at depths between 5.5 and 47.2 mBGS. A copy of the MECP well records is appended for reference, and the well locations are shown on the attached Drawing 4.

Pumping test results were recorded for the ten wells completed in overburden. Pumping test rates for the overburden wells ranged from 15.1 to 151.4 litres per minute (L/min), averaging 72 L/min during pump tests that lasted 1 to 2 hours.

It is noted that some of the wells plotted on the attached Drawing 4 are located in areas where the actual existence of a well is unlikely (they may be associated with nearby properties), and that some properties shown on the aerial imagery do not have a well associated with them; however, the MECP WWR coordinate data has been used in the absence of more reliable information.

Ministry of the Environmental, Conservation, and Parks (MECP) Procedure D-5-5 (Technical Guideline for Private Wells: Water Supply Assessment, 1996) specifies minimum per-person water requirements as 450 L/day, with a peak demand rate of 3.75 L/min per person. Assuming a likely number of persons as the “number of bedrooms plus one” the minimum sustainable pumping rate for a 3-bedroom house shall be 15 L/min.

Within the scope of this desktop study, the information available indicates that a sufficient supply of groundwater should be available to provide for the needs of the proposed single-family dwelling on the severed lot from the overburden aquifer deposits.

Please be advised that this assessment is based on a desktop review of publicly available information. Verification of available water supply and/or water quality, and/or empirical investigation of the potential cumulative impact of groundwater extraction, would require well drilling and a pumping test to be conducted.

## **4.1 Municipal Wellhead Protection Areas and Sensitive Areas**

According to the Ontario Source Protection Information Atlas (OSPPIA) shown on the appended Drawing 3 the subject property is not located within a municipal wellhead protection area (WHPA). The closest WHPA-D (representing up to a 25 year time of travel to a municipal supply well) is located approximately 19.5 m south of the southeast corner of the subject property.

According to the Ontario Source Protection Information Atlas (OSPPIA) mapping, the subject property is located within an Intake Protection Zone 3 (IPZ-3) with a score of 2, a Significant Groundwater Recharge Area (SGRA), and a Highly Vulnerable Aquifer (HVA) area with a score of 6.

The Significant Groundwater Recharge Area (SGRA) designation refers to the ability for precipitation to infiltrate into the ground and recharge underlying aquifers. Based on the stratigraphy encountered in the on-site water supply well (Well No. 6506498), the shallow granular aquifer is located at approximately 4.6 mBGS within the granular sand deposit underlying the topsoil. Given the shallow depth to the aquifer and the absence of a significant low-permeability layer, recharge of the aquifer is expected to occur relatively rapidly.

As the proposed single-family dwelling will discharge runoff from rooftops and impervious surfaces to the adjacent pervious areas where it will have the opportunity to infiltrate, it is reasonable to expect overall site infiltration rates can be maintained after development.

The Highly Vulnerable Aquifer (HVA) designation refers to the potential for contaminants that might spill onto the ground to infiltrate and percolate downwards towards the overburden aquifer due to the lack of a significant low permeability aquitard or barrier protecting the shallow aquifer. Based on the stratigraphy encountered in the on-site water supply well, no significant low-permeability aquitard is present above the shallow aquifer. As such, it is important that measures be taken to prevent any potential contamination at the ground surface.

## **4.2 Door-to-Door Well Survey**

A door-to-door survey of properties within a 500 m radius of the subject property was conducted on March 8<sup>th</sup>, 2026 to determine the locations and construction details of private water supply wells in the area. A copy of the survey was left along with a self-addressed stamped envelope. Seven property received surveys; however, no responses had been received at the time of preparation of this report.

## 5. CLOSURE

This investigation compiled data for the subject property from existing sources and site-specific soils information collected from the subject property to gain an understanding of the subsurface stratigraphy.

Nitrate impact assessment calculations using conservatively assessed values for daily sewage effluent flow and annual recharge demonstrate the proposed lot and retained lot will require the use of conventional treatment with an effluent nitrate-N concentration of 40 mg/L for the sewage effluent disposal systems in order to achieve nitrate-N concentrations at the downgradient property boundaries below the ODWQS criteria limit of 10 mg/L.

Please consider that changes to sewage system design parameters (such as number of bedrooms in the proposed residential dwelling) would require updated nitrate impact assessment calculations.

Within the scope of the desktop-level assessment, the information available indicates that a sufficient supply of groundwater should be available to provide for the needs of a new three-bedroom single-family residential dwelling from the overburden aquifer(s) beneath the property.

We trust that this report satisfies your present requirements, and we thank you for this opportunity to be of service. If you have any questions, or require further hydrogeological consulting services, please feel free to contact me directly.

Respectfully submitted,



Chris Helmer, B.Sc., P.Geo.  
Senior Hydrogeologist  
MECP Licensed Well Contractor  
[www.hydrog.ca](http://www.hydrog.ca)



encl. Topographic Sketch (McKechnie Surveying Ltd.)

## 6. LIMITATIONS AND USE

This report has been prepared for the exclusive use of the Client indicated in Section 1. Chris F Helmer and Hydrogeology Consulting Services Inc. (HCS) hereby disclaim any liability or responsibility to any person or party, other than the Client, for any loss, damage, expense, fines, or penalties which may arise from the use of any information or recommendations contained in this report by anyone other than the Client.

The conclusions and recommendations provided in this report are not intended as specifications or instructions to contractors. Any use contractors may make of this report, or decisions made based on it, are the responsibility of the contractors. Contractors must accept responsibility for means and methods of construction they select, seek additional information if required, and draw their own conclusions as to how the subsurface conditions may affect them.

In preparing this report Chris F Helmer and HCS have relied in good faith on information provided by individuals and companies noted in this report, and assumes that the information provided is factual and accurate. No responsibility is accepted for any deficiencies, misstatements, or inaccuracies contained in this report as a result of errors, omissions, misinterpretations, or fraudulent acts in the resources referenced, or of persons interviewed or consulted during the preparation of this report.

The report and its complete contents are based on data and information collected during investigations conducted by Chris F Helmer and HCS, and pertains solely to the conditions of the site at the time of the investigation, supplemented by historical information and data as described in this report. It is important to note that the investigation involves sampling of the site at specific locations, and the conclusions in this report are based on the information gathered. Limitations of the data and information include the fact that conditions between and beyond the sampling locations may vary; that the assessment is dependent upon the accuracy of the analytical data generated through sample analysis; and that conditions or contaminants may exist for which no analyses have been conducted. Furthermore, no assurance is made regarding potential changes in site conditions and/or the regulatory regime (standards, guidelines, etc.), subsequent to the time of investigation.

The professional services provided for this project include only the hydrogeological aspects of the subsurface conditions at the site, unless otherwise stated specifically in the report. No other warranty or representation is either expressed or implied, as to the accuracy of the information or recommendations included or intended in this report.

## 7. REFERENCES

Armstrong, D.K. and Dodge, J.E.P. *Paleozoic Geology Map of Southern Ontario*. Ontario Geological Survey.

Chapman, L.J. and Putnam, D.F. 2007. *Physiography of Southern Ontario*. Ontario Geological Survey.

Freeze, R.A. and J.A. Cherry. 1979. *Groundwater*. Englewood Cliffs, New Jersey: Prentice-Hall.

Ontario Ministry of the Environment and Energy. 1995. *Hydrogeological Technical Information Requirements for Land Development Applications*.

## **APPENDIX A: DRAWINGS**

Drawing 1 – Location Plan

Drawing 2 – Site Plan

Drawing 3 – OSPIA Mapping

Drawing 4 – MECP WWRs

Drawing 5 - Stratigraphic Cross Section


Locations

Drawing 6 - Stratigraphic Cross Section A-A'

Drawing 7 - Stratigraphic Cross Section B-B'



**LEGEND**

 Subject Property

imagery from Google Earth © 2026

**Drawing 1 - Location Plan**  
**1891 Reidsville Road, North Dumfries, Ontario**



Drawn: AR  
Date: 08-Apr-26



**LEGEND**

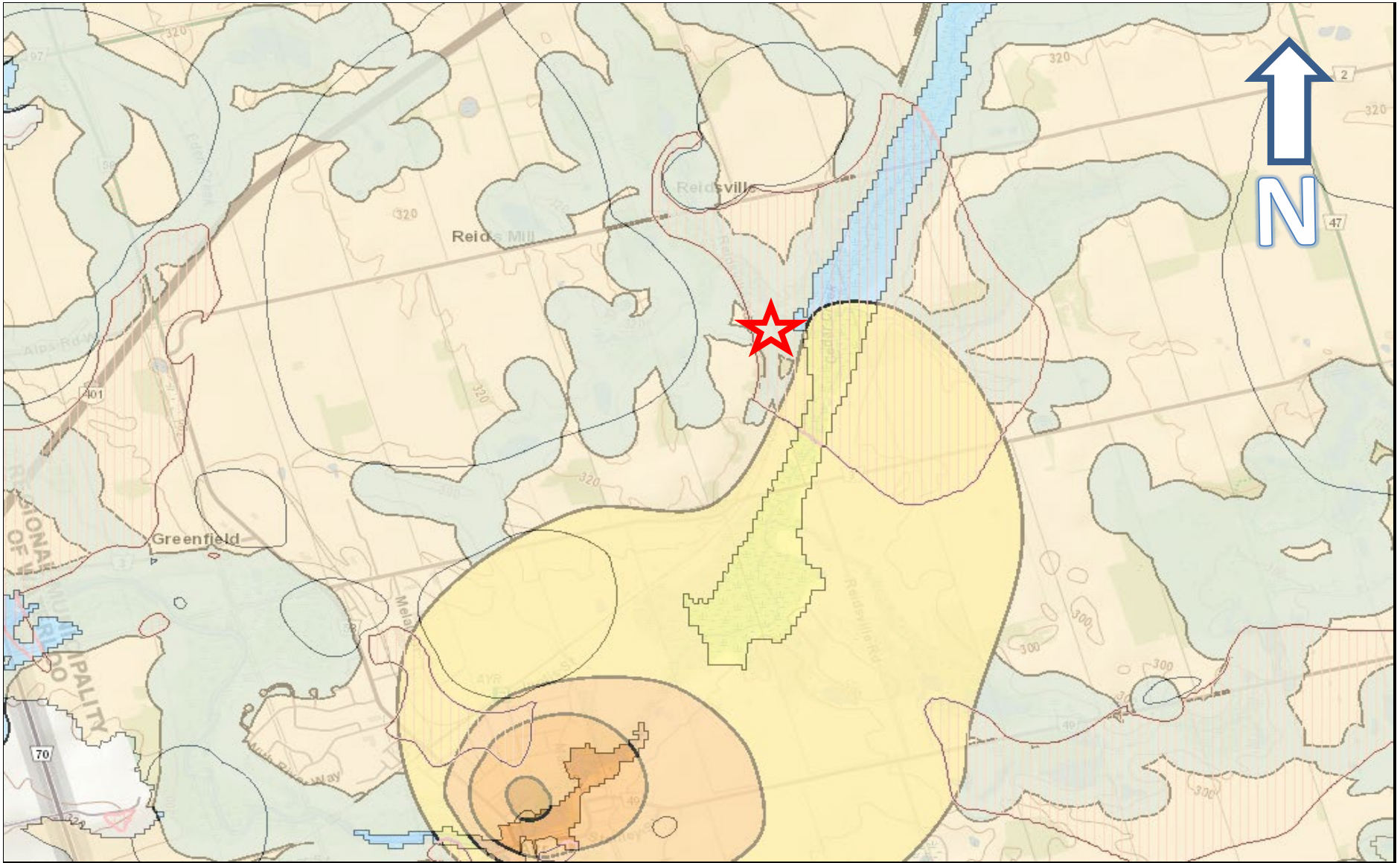
 Test Pit Locatin

imagery from Google Earth © 2026






**Drawing 2 - Site Plan**  
**1891 Reidsville Road, North Dumfries, Ontario**



Drawn: AR  
Date: 08-Apr-26



imagery from OSPIA © 2026

LEGEND	
	Subject Property
	IPZ3 and VSA-SW
	HVA
	SGRA-6
	WPA A, B, C, C1 and VSA-GW/SW

**Drawing 3 - Ontario Source Protection Information Atlas Mapping  
1891 Reidsville Road, North Dumfries, Ontario**



Drawn:	AR
Date:	08-Apr-26



LEGEND	
	Subject Property
	Supply Well

imagery from Google Earth Pro © 2026

**Drawing 4 - MECP WWRs**  
**1891 Reidsville Road, North Dumfries, Ontario**






Drawn:	AR
Date:	08-Apr-26



imagery from Google Earth © 2026

**LEGEND**

- 2800369 Well Record Number
-  Water Well Record Location
-  Cross Section Line
-  Subject Property

**Drawing 5 - Stratigraphic Cross Section Locations**

**1891 Reidsville Road, North Dumfries, Ontario**



Drawn: AR  
Date: 8-Apr-2026

**Drawing 6**  
**1891 Reidsville Road, North Dumfries, Ontario**  
**Stratigraphic Cross Section A-A'**

A  
NE

A'  
SW

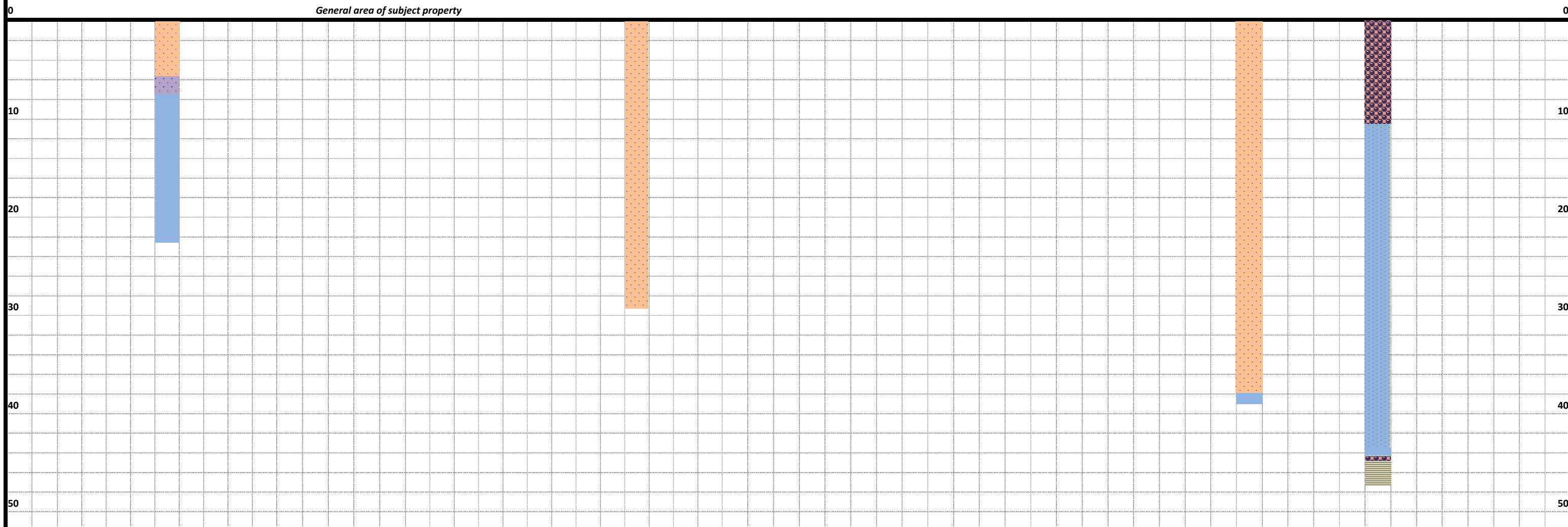
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WWR #6503719

WWR #6506364

WWR #6504707

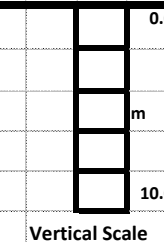
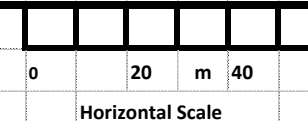
General area of subject property



DEPTH (mBGS)

**LEGEND**

	Silt		silty sand		Sand
	clay		clay till		hardpan
	limestone/dolostone		Unknown material		
	sand and gravel		gravel		



**It is important to note MECP WWRs are plotted based on their locations in the MECP WWR database. It is likely some wells are not plotted in their correct locations due to the age of well records and lack of detailed geographic information available.**

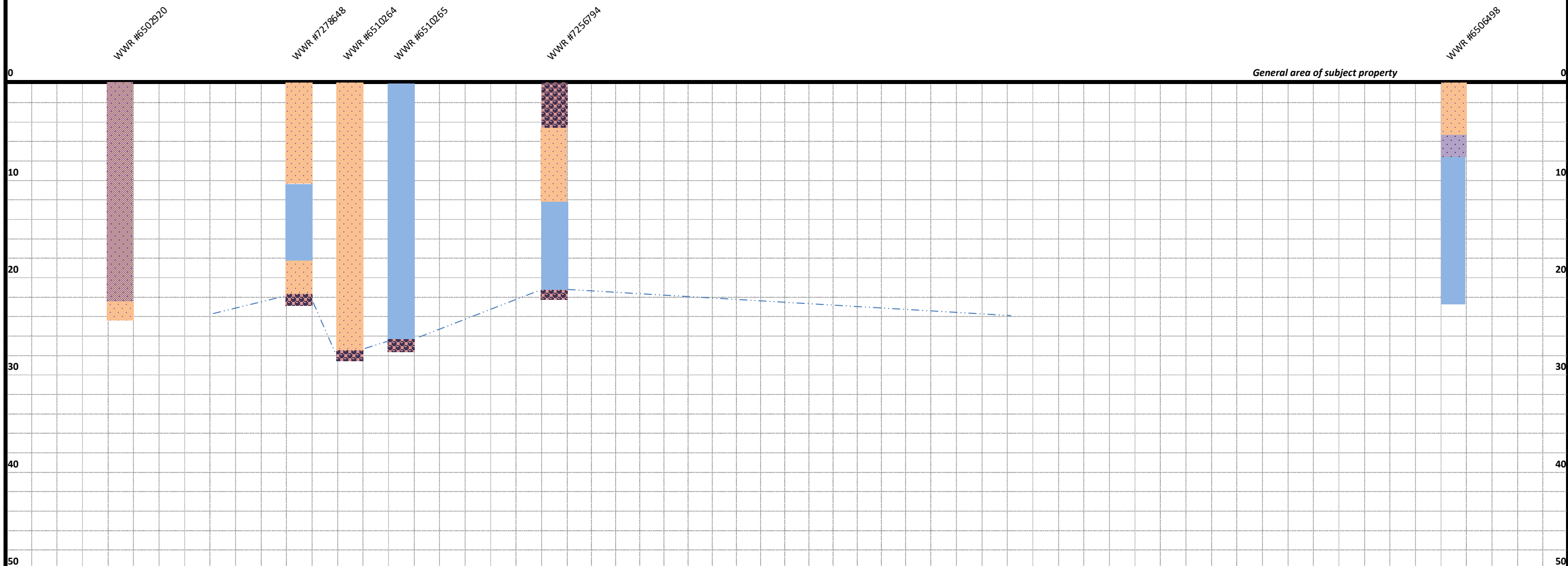


Drawn	AR
Date	2026-04-08

**Drawing 7**  
**1891 Reidsville Road, North Dumfries, Ontario**  
**Stratigraphic Cross Section B-B'**

**B**  
NW

**B'**  
SE

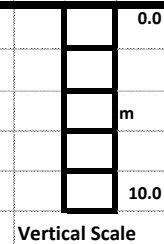
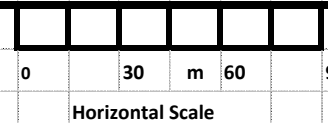


DEPTH (mBGS)

LEGEND		
	Silt	
	clay	
	limestone/dolostone	
	sand and gravel	
	Sand	



It is important to note MECP WWRs are plotted based on their locations in the MECP WWR database. It is likely some wells are not plotted in their correct locations due to the age of well records and lack of detailed geographic information available.



Drawn	AR
Date	2026-04-08



## **APPENDIX B: MECP WATER WELL RECORDS AND WELL SURVEYS**

# Water Well Records

Wednesday, April 8, 2026

11:55:18 AM

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
NORTH DUMFRIES TOWNS	17 545953 4796046 W	2022/12 7343						7450780 (Z405248) A357523 P	
NORTH DUMFRIES TOWNS	17 545996 4796054 W	2023/07 7343						7460487 (Z415820) A P	
NORTH DUMFRIES TOWNS 09 031	17 545531 4796154 W	2006/01 2663				DO		6510723 (Z41572) A	
NORTH DUMFRIES TOWNS 09 031	17 545555 4796137 W	2005/09 2663	6.25	FR 0093	/83/30/1:	DO		6510264 (Z29010) A017812	BLCK LOAM 0002 BRWN SAND CLAY 0090 GRVL 0093
NORTH DUMFRIES TOWNS 09 031	17 545555 4796136 W	2005/09 2663	6.25	0090	/7/30/1:	DO		6510265 (Z29009) A017811	LOAM 0002 BRWN CLAY SAND GRVL 0086 GRVL 0090
NORTH DUMFRIES TOWNS CON 09 030	17 545590 4796280 W	2017/10 7492	36	0012	12/12/10/1:	DO		7301489 (Z274368) A201373	BRWN LOAM 0001 BRWN SAND PCKD 0002 BRWN GRVL LOOS 0009 BRWN SAND STNS LOOS 0018
NORTH DUMFRIES TOWNS CON 09 030	17 545759 4795603 W	1973/03 5469	5	FR 0086	60/81/4/:	DO	0089 4	6503779 ( )	PRDG 0006 BRWN SAND 0080 BRWN SAND 0096
NORTH DUMFRIES TOWNS CON 09 030	17 545848 4795799 W	1988/10 4207	6 5	FR 0015	/17/5/1:0	DO		6506498 (37023)	BLCK LOAM 0002 BRWN SAND GRVL 0018 GREY SILT CLAY 0025 GREY CLAY 0075
NORTH DUMFRIES TOWNS CON 09 030	17 545839 4795383 W	1988/07 4207	6 5	FR 0121	35/128/7/1:0	DO	0121	6506364 (37202)	BRWN FSND SILT 0020 GREY FSND SILT 0110 GREY SAND GRVL 0125 GREY CLAY 0128
NORTH DUMFRIES TOWNS CON 09 031	17 545545 4796137 W	2016/12 7557	6.11 5.11 5.11	FR 0075	-2/10/20/1:	DO		7278648 (Z247056) A193163	BRWN LOAM 0002 BRWN SAND GRVL 0035 BLDR 0037 BRWN CLAY 0060 BRWN SAND 0072 BRWN GRVL 0075
NORTH DUMFRIES TOWNS CON 09 031	17 545557 4796072 W	2015/10 7557	6.05 5.11	FR 0073	-5/10/25/2:0			7256794 (Z218796) A193158	BRWN LOAM 0002 BRWN GRVL SAND 0015 BRWN SAND CLAY 0040 BRWN CLAY 0070 BRWN GRVL SAND 0073
NORTH DUMFRIES TOWNS CON 09 031	17 545555 4796135 W	2016/12 7557			///:	DO		7278649 (Z247057) A	
NORTH DUMFRIES TOWNS CON 09 031	17 545545 4796137 W	2020/04 7557	8.05 6.11 5.11	UT 0095	0/6/20/:			7367520 (Z319812) A193163	0070 BRWN GRVL 0095
NORTH DUMFRIES TOWNS CON 09 031	17 545523 4796262 W	1993/09 3518	6	FR 0091		NU		6507554 (133637)	BRWN SAND STNS CLAY 0013 GREY SAND SILT STNS 0040 GREY CLAY SILT LYRD 0065 GREY SAND STNS LOOS 0085 BRWN STNS SAND LOOS 0091
NORTH DUMFRIES TOWNS CON 09 031	17 545714 4795373 W	1977/09 4208	6	FR 0155	70/150/40/1:0	DO		6504707 ( )	GREY GRVL 0035 GREY CLAY SAND GRVL 0144 GREY CLAY 0145 GREY GRVL 0146 UNKN 0155

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
NORTH DUMFRIES TOWNS CON 09 031	17 545556 4796067 W	2015/10 7557			///:			7256793 (2218797) A	

Notes:

UTM:  $\emptyset$ TM in Zone, Easting, Northing and Datum is NAD83; L: UTM estimated from Centroid of Lot; W: UTM not from Lot Centroid  
DATE CNTR:  $\emptyset$ ate Work Completed and  $\emptyset$ Well Contractor Licence Number  
CASING DIA:  $\emptyset$ asing diameter in inches  
WATER:  $\emptyset$ nit of Depth in Fee. See Table 4 for Meaning of Code

PUMP TEST: Static Water Level in Feet / Water Level After Pumping in Feet /  $\emptyset$ ump Test Rate in GPM / Pump Test Duration in Hour : Minutes  
WELL USE: See Table 3 for Meaning of Code  
SCREEN:  $\emptyset$ creen Depth and Length in feet  
WELL:  $\emptyset$ WEL ( AUDIT # ) Well Tag .  $\emptyset$ : Abandonment; P: Partial Data Entry Only  
FORMATION: See Table 1 and 2 for Meaning of Code

**1. Core Material and Descriptive terms**

Code	Description	Code	Description	Code	Description	Code	Description	Code	Description
BLDR	BOULDERS	FCRD	FRACTURED	IRFM	IRON FORMATION	PORS	POROUS	SOFT	SOFT
BSLT	BASALT	FGRD	FINE-GRAINED	LIMY	LIMY	PRDG	PREVIOUSLY DUG	SPST	SOAPSTONE
CGRD	COARSE-GRAINED	FGVL	FINE GRAVEL	LMSN	LIMESTONE	PRDR	PREV. DRILLED	STKY	STICKY
CGVL	COARSE GRAVEL	FILL	FILL	LOAM	TOPSOIL	QRTZ	QUARTZITE	STNS	STONES
CHRT	CHERT	FLDS	FELDSPAR	LOOS	LOOSE	QSND	QUICKSAND	STNY	STONEY
CLAY	CLAY	FLNT	FLINT	LTCL	LIGHT-COLOURED	QTZ	QUARTZ	THIK	THICK
CLN	CLEAN	FOSS	FOSILIFEROUS	LYRD	LAYERED	ROCK	ROCK	THIN	THIN
CLYD	CLAYEY	FSND	FINE SAND	MARL	MARL	SAND	SAND	TILL	TILL
CMTD	CEMENTED	GNIS	GNEISS	MGRD	MEDIUM-GRAINED	SHLE	SHALE	UNKN	UNKNOWN TYPE
CONG	CONGLOMERATE	GRNT	GRANITE	MGVL	MEDIUM GRAVEL	SHLY	SHALY	VERY	VERY
CRYS	CRYSTALLINE	GRSN	GREENSTONE	MRBL	MARBLE	SHRP	SHARP	WBRG	WATER-BEARING
CSND	COARSE SAND	GRVL	GRAVEL	MSND	MEDIUM SAND	SHST	SCHIST	WDFR	WOOD FRAGMENTS
DKCL	DARK-COLOURED	GRWK	GREYWACKE	MUCK	MUCK	SILT	SILT	WTHD	WEATHERED
DLMT	DOLOMITE	GVLY	GRAVELLY	OBDN	OVERBURDEN	SLTE	SLATE		
DNSE	DENSE	GYPS	GYPSUM	PCKD	PACKED	SLTY	SILTY		
DRTY	DIRTY	HARD	HARD	PEAT	PEAT	SNDS	SANDSTONE		
DRY	DRY	HPAN	HARDPAN	PGVL	PEA GRAVEL	SNDY	SANDYOAPSTONE		

**2. Core Color**

Code	Description
WHIT	WHITE
GREY	GREY
BLUE	BLUE
GREN	GREEN
YLLW	YELLOW
BRWN	BROWN
RED	RED
BLCK	BLACK
BLGY	BLUE-GREY

**3. Well Use**

Code	Description	Code	Description
DO	Domestic	OT	Other
ST	Livestock	TH	Test Hole
IR	Irrigation	DE	Dewatering
IN	Industrial	MO	Monitoring
CO	Commercial	MT	Monitoring TestHole
MN	Municipal		
PS	Public		
AC	Cooling And A/C		
NU	Not Used		

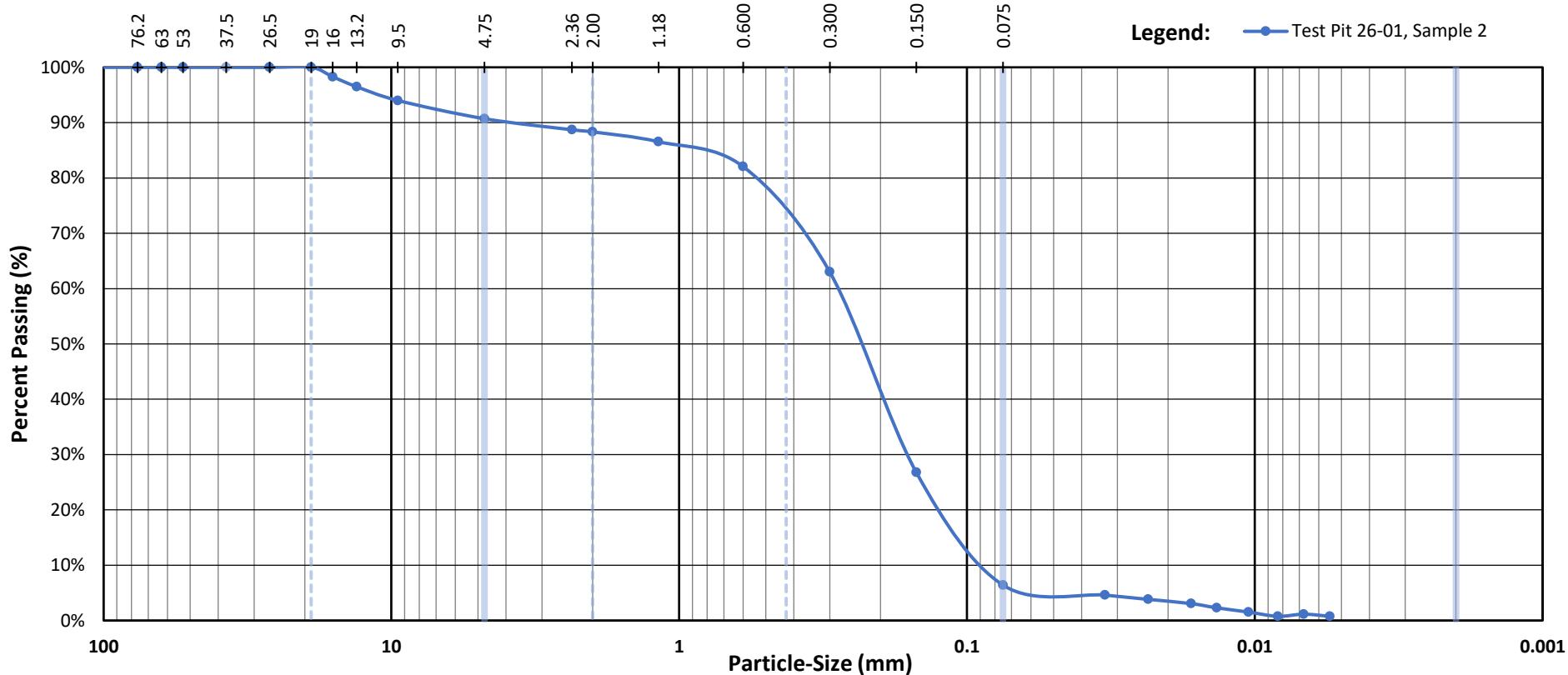
**4. Water Detail**

Code	Description	Code	Description
FR	Fresh	GS	Gas
SA	Salty	IR	Iron
SU	Sulphur		
MN	Mineral		
UK	Unknown		

## **APPENDIX C: GRAIN SIZE ANALYSIS GRAPHS**

## Unified Soil Classification System

<b>Gravel</b>		<b>Sand</b>			<b>Silt and Clay</b>	
Coarse	Fine	Coarse	Medium	Fine		

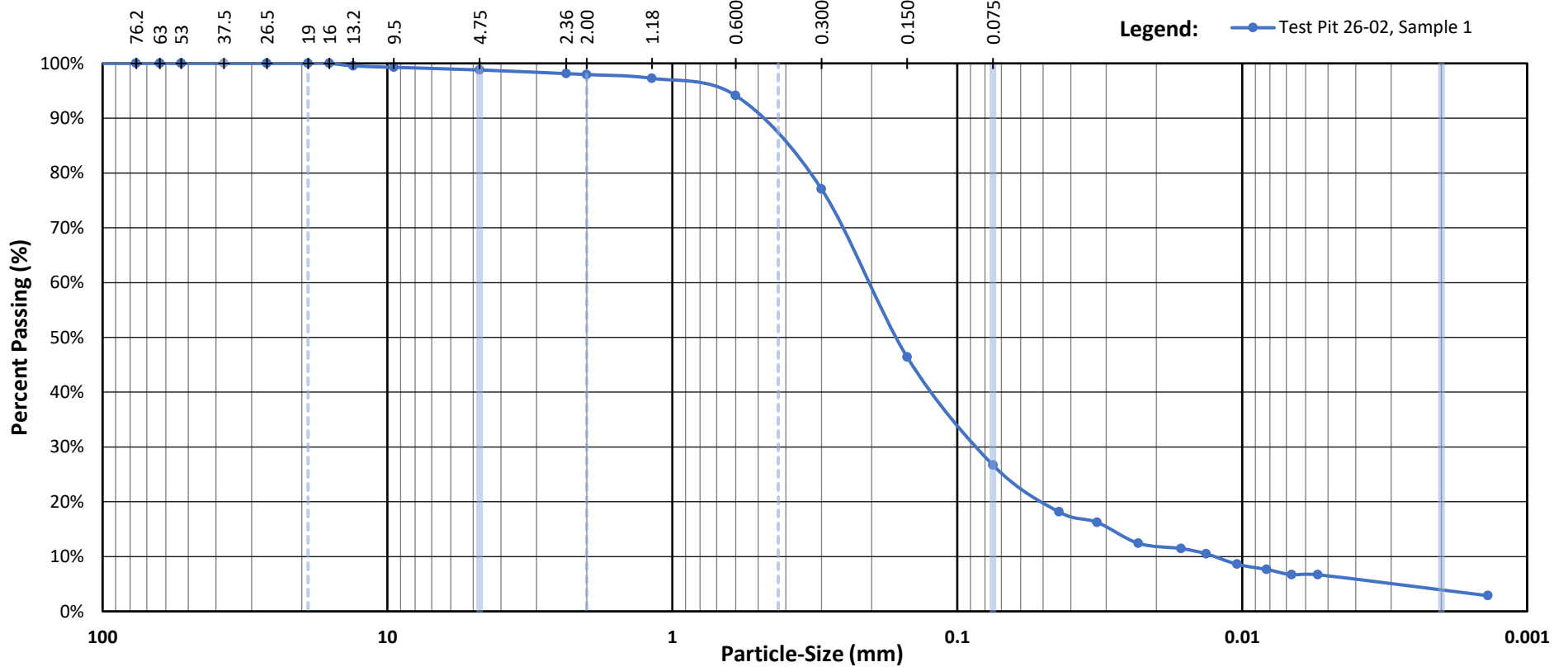


Test Pit No.	Sample No.	Depth (m)	D <sub>60</sub>	D <sub>10</sub>	C <sub>u</sub>	% Gravel	% Sand	% Silt and Clay
26-01	2	1.3 - 1.9				9.3%	84.3%	6.4%

	Client: Hydrogeology Consulting Services	<b>Particle-Size Distribution Curve</b>
	Project: Laboratory Analysis	
	Location: 1891 Reidsville Road Township of North Dumfries	File Number: 01138-1

## Unified Soil Classification System

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	



Test Pit No.	Sample No.	Depth (m)	D <sub>60</sub>	D <sub>10</sub>	C <sub>u</sub>	% Gravel	% Sand	% Silt and Clay
26-02	1	0.3 - 1.3				1.2%	72.1%	26.7%

	Client: Hydrogeology Consulting Services	<b>Particle-Size Distribution Curve</b>
	Project: Laboratory Analysis	
	Location: 1891 Reidsville Road Township of North Dumfries	File Number: 01138-1



## **APPENDIX D: TEST PIT LOGS**

TP 1-26 to TP 2-26



<b>PROJECT NUMBER</b> 10445	<b>CONTRACTOR</b> Dal Hastings Haulage & Excavating Inc.	<b>DRILLING DATE</b> 20 March 2026
<b>ADDRESS</b> 1891 Reidsville Road, North Dumfries, Ontario		<b>CONDITIONS IN PIT</b> Wet
<b>METHOD</b> Mini-excavator E32		<b>GPS LOCATION</b> 17N 545724 4795733 +- 6m

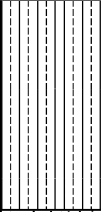
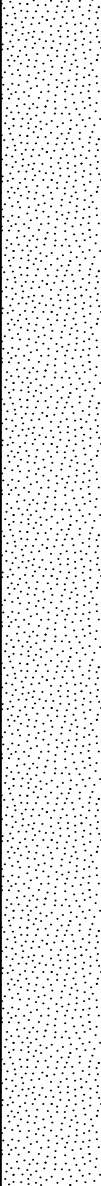
<b>COMMENTS</b> N/A	<b>LOGGED BY</b> Adrian Rudy
	<b>CHECKED BY</b> Chris Helmer

Depth (m)	Major Unit	Graphic Log	Material Description	Moisture
0.1	TOPSOIL (ORGANIC)		Surface: Grass lawn. Topsoil, dark brown, moist.	Moist
0.2				
0.3	SANDY		Brown. Fine sand, some silt, trace gravel. Moist.	
0.4				
0.5				
0.6				
0.7				
0.8				
0.9				
1				
1.1				
1.2				
1.3			Brown becomes grey at 1.60m. Sand (fine to medium), trace gravel, silt, and cobble. Moist, Becoming wet at 1.65m.	
1.4				
1.5				
1.6				
1.7				Wet
1.8				



<b>PROJECT NUMBER</b> 10445	<b>CONTRACTOR</b> Dal Hastings Haulage & Excavating Inc.	<b>DRILLING DATE</b> 20 March 2026
<b>ADDRESS</b> 1891 Reidsville Road, North Dumfries, Ontario		<b>CONDITIONS IN PIT</b> Wet
<b>METHOD</b> Mini-excavator E32		<b>GPS LOCATION</b> 17N 545741 4795731 +- 6m

<b>COMMENTS</b> N/A	<b>LOGGED BY</b> Adrian Rudy
	<b>CHECKED BY</b> Chris Helmer

Depth (m)	Major Unit	Graphic Log	Material Description	Moisture
0.1	TOPSOIL (ORGANIC)		Surface: Grass lawn. Topsoil, dark brown, moist.	Moist
0.2				
0.3	SANDY		Brown. Fine Sand, some silt, trace gravel. Moist.	
0.4				
0.5				
0.6				
0.7				
0.8				
0.9				
1				
1.1				
1.2				
1.3			Grey. Sand (Fine to medium), trace gravel, silt, and cobble. Moist, becoming wet at 1.45m.	
1.4				
1.5				Wet
1.6				
1.7				
1.8				
1.9				