

January 7, 2025

Project/File: 165630246 - East Oxford PS Septic Review

Carlos Henriquez, P.Eng. – Manager, Capital Projects
Thames Valley District School Board
951 Leathorne Street
London ON, N5Z 3M7

Reference: East Oxford Central Public School Septic System Review

1 Introduction

This letter is prepared to provide information regarding the current state and capacity of the existing on-site sewage system servicing East Oxford Central Public School, per request of the Thames Valley District School Board (TVDSB). The information provided within this letter addresses the forecasted population (2024 – 2043) increase to the school, updated with longer-term estimates provided by the TVDSB in September, to assess its related impact on the existing sanitary system.

2 Site Location

The school property is located at 505767 Old Stage Road, Woodstock, Ontario in the regional municipality of Oxford County. The site is bound by agricultural/open fields to the north, Oxford Road 14 to the east, Old Stage Road to the south, and Old 14 Line to the west.

3 Background and Purpose

The current Class 4 Sewage System was constructed in 1966 and consists of a 28,725 L two-chamber (Chamber 1 = 19,220 L; Chamber 2 = 9,505 L) reinforced concrete septic tank which then distributes flows through a gravity pipe to a field tile bed. The tile bed was upgraded in 1994 to be a raised tile bed and consists of 14 rows of 27 m distribution pipe, spaced 1.6 m apart which results in 378 m of distribution length. The septic tank was noted to remain as-is for the 1994 upgrades. The 1966 Plot Plan drawing (Riddle, Conor, Falls & Irvine Architects) showing the existing septic tank, and the 1994 Septic System Site Plan (K. Smart Associates Limited) showing the upgraded tile bed are both included with this brief as **Attachment 1**.

A previous analysis completed by Stantec on August 9, 2023 (**Attachment 2**) determined that the existing septic system cannot sufficiently handle the extra flows produced as a result of the forecasted population (year 2027) of students and staff, as determined by the Ontario Building Code (OBC) design per capita rates. It should be noted that this analysis was carried out using maximum occupancy populations, as

Reference: East Oxford Central Public School Septic System Review

requested by the Township of Norwich, rather than the population data provided by the TVDSB. This was completed as a conservative analysis assuming all classrooms and portables were at full capacity.

Based on the August 9, 2023 assessment, the anticipated future sewage generation would exceed 10,000 L/day (12,858 L/day for 2027 maximum occupancy), based on OBC design rates, which would typically trigger the need for a new system that would be subject to MECP approval.

Based on this assessment, Stantec proceeded to commence the design for the new septic system, classified as a large subsurface sewage disposal system (LSSDS). This system was intended to include the use of an Ecoflo Biofilter in order to treat the effluent to an enhanced degree to satisfy MECP water quality criteria. However, it was later determined through a hydrogeological assessment completed by WSP (**Attachment 3**) that the site subsurface characteristics are unsuitable for a septic system of this size. MECP Chapter 22 outlines the classification for 'low permeable' environments, in which calculations for the contaminant attenuation zone (CAZ) can be ignored since the low permeability nature of the subsurface creates an environment resistant to flow and contaminant transport. Therefore, if a low permeability environment exists, it is unlikely that high concentration contaminants will travel beyond the property bounds. The results of the hydrogeological assessment determined that the subsurface cannot be classified as 'low permeability', therefore requiring the calculation of the CAZ. The assessment determined that a CAZ of 200,000 m² is required for the attenuation of nitrate-nitrogen at the site. The East Oxford Central Public School site is not sufficiently large enough to accommodate the CAZ required.

Therefore, through discussions with MECP it was decided to limit the proposed septic system upgrade to a maximum design flow of 10,000 L/day, which would fall under the OBC procedures and approval process. This was mostly based on the anticipation that actual per capita rates would be significantly less than design rates and that total actual flows would be less than 10,000 L/day.

As it was anticipated that the actual flows would be less than the OBC design per capita rates, Stantec recommended the installation of a flow meter in the August 9, 2023 letter to record water usage data. A flow meter was installed on September 5, 2023. Stantec has reviewed the available data from September 5, 2023 to June 24, 2024 to determine the actual water usage at the school in order to further evaluate the capacity of the existing septic system and the sewage capacity needs for the site.

4 Topography and Soil Type

WSP Canada Inc. (WSP) completed a geotechnical investigation of the site on March 13, 2024 and the report (WSP, dated April 17, 2024) is included as **Attachment 4** with this report. The surface of the site was found to be generally flat with surveyed ground elevation measured from 286.9 m to 287.7 m (above mean sea level).

The results from the geotechnical investigation determined that the soil in the vicinity of the existing and proposed septic bed ranged from Sandy Silty Clay to Sandy Clayey Silt. The 'T' time of the major strata encountered was estimated based on the grain size and plasticity characteristics of the soil. It was estimated that the 'T' time experienced on site is > 50 min/cm. Therefore, the existing underlying soil is not considered suitable for a conventional Class IV system. The proposed septic bed is designed to be a raised bed to overcome the limitation of the soil characteristics. The design of the proposed septic bed is detailed throughout the subsequent sections of this report.

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5 Bedding Material

Information provided in the 1994 upgrade drawings (**Attachment 1**) indicate that the existing bedding material consists of 19 mm diameter clear washed stone 50 mm above and 150 mm below the 100 mm perforated pipe. Imported sand with a T-time of 6 to 10 min/cm is placed at a minimum of 1000 mm below the clear washed stone until native clay is reached. Imported sand is also placed above the top clear washed stone, followed by 100 mm of topsoil to the top ground surface.

6 System Assessment

The information included in the subsections below is intended to provide an overall assessment of the capacity of the existing septic system based on the requirements of Part 8 of the OBC.

In addition, a review of the available water consumption data has been completed using the data from the flow meter installed on September 5, 2023 at the school site. The available data will be used to further evaluate the capacity of the existing septic system, the sewage capacity needs for the system, and to outline design parameters for a new 10,000 L/d system which would be subject to OBC Part 8.

6.1 Design Flows

6.1.1 OBC Design Capacity

Current and future projected student enrollment numbers were provided up to year 2043 by the TVDSB and are expected to be the most up to date projections for the school. The projections for staff members were not provided, however, estimates for teaching staff were calculated based on O.Reg. 132/12 which has assumed approximately 24.2 students per teacher for the school. The non-teaching staff was estimated based on the 2019 Ontario school statistics found in *2019 Annual Report on Schools: What makes a school?* (People for Education, 2019) which determined that on average each elementary school has 1 office staff per 255 students, 1 principal, 1 full time librarian, and 1 custodian per 198 students.

At the request of Township of Norwich staff, the septic capacity assessments have used maximum occupancy rather than actual or projected enrollment, which assumes each classroom is operating at its maximum capacity. Upon discussion with the TVDSB, based on 2023 enrollment, two portables were required in 2023/2024 to satisfy the enrollment needs. A breakdown of the maximum student occupancy, including portables, is summarized in **Table 111111Table 1111Table 11** below:

Table 111111: Maximum Student Occupancy of School and Portables

Grade	Number of Classes (2023/2024)	Maximum Occupancy (Per Class ¹)	Total Occupancy (School and Portables)	Comments
JK/SK	3	26	78	

Reference: East Oxford Central Public School Septic System Review

1 – 3	4	20	80	
4 – 6	4	28	112	Assumes 2 portables (56 students)
7 – 8	4	26	104	
TOTAL			374	

Note 1: It is noted that class sizes could fluctuate +/- 4 students per classroom, however the values noted are targeted student occupancy per classroom.

Using the 2023/2024 estimations above, the maximum occupancy estimations have been expanded using the projected student enrollment information. As summarized in **Table 2**, a total of six portables are anticipated to be required by year 2032, assuming 26 students per portable (assuming grades 6-8). It is noted that the peak student population is projected to be observed in year 2032, with declining populations between 2032 to 2043. For this reason, year 2032 population projections have been carried forward to represent future growth for the purposes of this assessment.

Table 222222: Future School Populations - Student Enrollment, Teachers, and Non-Teaching Staff

Year	Total Student Enrollment	Students (Max Occupancy)	Teachers	Non Teaching Staff	Total Population (Max. Occ.)	Comments
2023	354	374	15	7	396	2 portables (existing)
2024	360	374	15	7	396	
2025	364	374	15	7	396	
2026	373	374	16	7	397	
2027	393	400	17	7	424	3 portables (26 students each)
2028	408	426	17	8	451	4 portables (26 students each)
2029	419	426	18	8	452	
2030	437	452	18	8	478	5 portables (26 students each)
2031	442	452	19	8	479	
2032	457	478	19	9	506	Peak Population, 6 portables (26 students each)
2033	447	478	19	9	506	
2034	446	478	19	9	506	

Reference: East Oxford Central Public School Septic System Review

Year	Total Student Enrollment	Students (Max Occupancy)	Teachers	Non Teaching Staff	Total Population (Max. Occ.)	Comments
2035-2043	454	478	19	9	506	

For the purposes of the capacity assessment within this document, capacity assessments will be completed for the 2024 maximum occupancy populations, and the 2032 future growth populations (peak population). The assessment also includes the review of the maximum population which could be accommodated by a new 10,000 L/d system designed under OBC.

6.1.2 Design Flow - Actual Flow (Water Use Records)

The OBC per capita flows have typically been shown to be conservative in comparison to known water consumption rates which tend to provide a more realistic estimate of sewage flow. For this reason, in the August 9, 2023 Assessment, Stantec recommended the installation of a flow meter to record actual water consumption data.

Refer to **Attachment 5** for an assessment of the collected data. Based on the data collected from September 5, 2023 to June 24, 2024, the average daily demand for the school was 4,396 L/d. As noted in the August 9, 2023 Assessment (**Attachment 2**), the 2023 school population was estimated at 374 persons (including enrolled students, teachers, and non-teaching staff), this works out to an average sewage generation rate of 11.8 L/person/day.

A reading of 7,400 L/d (calculated to be 19.8 L/person/day) was observed on October 13, 2023 is considered as a representative value for maximum day flow.

Although the average per capita usage was calculated to be 11.8 L/person/day, the sewage generation rate of 19.8 L/person/day was applied to the future population projections to develop design flow estimates. These flows are summarized in **Table 4** below

Table 4: Required Tank Size Based on Water Use (Future Conditions)

Year	Students	Teaching Staff Members	Non-Teaching Staff Members	Total Daily Design Flow (L/d)
2024	374	15	7	7,850
2032	478	19	9	10,019
New System (10,000 L/d)	~500 persons (total population)			10,000

Detailed design calculations are included in **Attachment 6** of this letter.

It is noted that a maximum of approximately 500 persons (inclusive of students, teaching staff, and non-teaching staff) could be accommodated in a new system without exceeding a maximum flow of 10,000 L/d, which would be the maximum flow permissible for a system subject to OBC Part 8 and the Townships approval of the use of measured flow data in lieu of design per capita rates.

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6.2 Review of Current Design Capacity

The existing system tank and distribution tile bed was evaluated to determine the capacity of the components and whether the design flows can be accommodated by the existing infrastructure.

According to OBC section 8.2.2.3, the tank size for non-residential occupancies must be three times the daily sewage generation. Given that the existing tank size is 28,725 L, the maximum design flow that can be satisfied by the tank is 9,575 L/day.

Based on the design flow calculated using OBC rates (**Table 2**), the current tank size is considered insufficient for both existing 2024 and future 2032 populations. While the design flows based on actual water records (**Table 4**) for the existing 2024 population could be accommodated in the existing tank based on the sizing criteria, the 2032 growth projections exceed tank and system capacity.

Section 8.7.3.1.(2) of the OBC stipulates that a leaching bed constructed by means of absorption trenches shall have a total distribution bed length not less than the value determined by:

$$L = \frac{QT}{200}$$

Given that the length of the existing distribution tile bed is 378 m, using the design percolation rate of 10 min/cm (as noted in the 1994 upgrade drawings, **Attachment 1**), the sewage flow that can be accommodated by this bed is 7,560 L/day. Current and future flows calculated using OBC rates (**Table 2**) and using water record data exceed the capacity of the distribution piping.

7 Septic Tank

7.1.1 Septic Tank - OBC Design Flows

Using Section 8.2.2.3 of the OBC and projected design flows, the minimum required working capacity of the septic tank is as follows:

Table 5: Forecasted Required Septic Tank Volumes

Year	Required Volume (L) (Based on OBC Standards)
2024	36,101
2032	46,080

Note: The existing septic tank has a capacity of 28,725 L.

Comparing **Table 5** above with the current 28,725 L septic tank, it is concluded that the existing tank is undersized for 2032 growth projections based on OBC design parameters.

Reference: East Oxford Central Public School Septic System Review

7.1.2 Septic Tank - Actual Flow (Water Use Records)

Based on the sewage generation rate of 19.8 L/person/day, as informed by the water use records (Section 4.2), the required working capacity of the septic tank based on existing and future maximum occupancy populations is as follows:

Table 6: Required Tank Size Based on Water Use

Year	Required Volume (L)
2024	23,549
2032	30,057

Note: The existing septic tank has a capacity of 28,725 L.

Table 6 above shows that the required septic tank volume for future growth projections in year 2032 is greater than the existing tank volume (28,725 L). Therefore, based on water usage rates from the existing flow meter, it can be determined that the tank would have insufficient capacity for the projected maximum occupancy in 2032.

7.2 Distribution Bed

7.2.1 Distribution Bed – OBC

The length of the required distribution bed has been calculated according to OBC section 8.7.3.1.(2) based on existing and future projected flows. The future projected calculations have been carried out using 10 min/cm, based on the recommendation for a future system to be designed as a raised bed system due to impermeable soil conditions onsite. The results are outlined in **Table 7** below.

Table 7: Forecasted Distribution Bed Lengths

Year	Percolation "T" (min/cm)	Length (m)
2024	10	602
2032		768
New System (10,000 L/d)		500

Note: The existing length of distribution piping is 378 m.

These results reiterate the conclusions drawn in **Section 6.2**, which determined that the existing tile bed length is too small to service future maximum occupancy OBC design flows.

7.2.2 Distribution Bed – Water Use

The length of the required distribution bed has also been calculated using the sewage generation rate of 19.8 L/person/day (based on water records), as specified in **Section 6.1.2**. This analysis also used 10 min/cm as the percolation rate. The results are outlined in **Table Table Table** below.

Reference: East Oxford Central Public School Septic System Review

Table 8: Distribution Bed Length Based on Water Usage

Year	Percolation “T” (min/cm)	Length Required (m)
2024	10	392
2032		501
New System (10,000 L/d)		~500

Note: The existing length of distribution piping is 378 m.

These results determined that the existing tile bed is insufficiently sized for future maximum growth conditions (up to year 2032) based on a sewage generation rate of 19.8 L/cap/day (based on water records).

The existing distribution length of 387 m can accommodate a daily flow of 7,560 L/d based on a T of 10 min/cm (as per 1994 upgrade drawings, **Attachment 1**). This equates to a maximum school population of approximately 381 persons (including students, teachers, and non-teaching staff) based on the sewage generation rate of 19.8 L/cap/d.

It is noted that the applied rate of 19.8 L/cap/day is intended to represent a maximum daily flow throughout the year. The average observed flow over the reporting period is significantly lower at 11.8 L/cap/day, which would require a shorter minimum length of 233 m based on the 2023 estimated school population. Based on this information, it is reasonable to suggest that the current system is operating within the upper limits of its design capacity.

It is therefore recommended that a new septic system is recommended to be installed to accommodate future growth.

A new septic system with a capacity of 10,000 L/d, a minimum length of 500 m of distribution piping would be required.

8 Conclusions and Recommendations

Based on a review of available information related to the existing Class 4 Sewage System, including as-built drawings, geotechnical information, and data provided by the TVDSB for estimated population and maximum occupancy projections, the existing septic system is found to be insufficient to meet the forecasted population increase based on the OBC design criteria.

Through previous discussion with MECP, it is noted that, due to the site’s inability to attenuate nitrate-nitrogen, the system would require too large of a contaminant attenuation zone, and the site is not sufficiently large. Therefore, it was determined to restrict the design flow to 10,000 L/d which is the maximum allowable flow for a system subject to OBC Part 8.

Given that the OBC per capita rates are known to be more conservative, a flow meter was installed on September 5, 2023. Based on the available water consumption data, a sewer generation rate of 19.8 L/person/day is more representative of the actual system. However, the use of a reduced sewage generation rate based on observed data is subject to approval by the Township of Norwich. It should be

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noted that Section 22.5.9 of the MECP Design Guidelines for Sewage Works, 2008 does reference the use of actual daily flow data, where available.

Key findings from the capacity assessment of the existing system are summarized below:

- The current septic tank is sufficient to accommodate current 2024 flows based on the observed water consumption data, based on the sewage generation rate of 19.8 L/cap/d. However, in year 2032, the proposed increase in school population exceeds the capacity of the existing tank, based on maximum school occupancy.
- The distribution piping is insufficient to accommodate the current flows based on the observed water consumption data. The existing system can accommodate a maximum of 7,560 L/d only, or approximately 381 persons (including students, teachers, and non-teaching staff) based on the sewage generation rate of 19.8 L/cap/d.

Based on these findings, the TVDSB would like to build a new septic system designed to 10,000 L/d in accordance with the OBC Part 8, modified to account for actual water use data.

A detailed summary of the proposed options is provided in **Table 9**.

Table 9: Summary of Septic System Options

System	Design Criteria	Comments
New 10,000 L/d System, designed per OBC Part 8 with use of measured flow data **Limited Population**	OBC Part 8 for design of septic tank and distribution bed. Use of water records, using max day per capita of 19.8 L/person/day.	Recommended to rebuild a new 10,000 L/d system, consisting of a new septic tank (30,000 L) and new distribution bed (raised) at 500 m in length. The new system would promote more effective and homogeneous treatment, system to including dosing to allow for distribution of flows over longer period of time (i.e., 24 hours versus normal 8 hour distribution for schools). A maximum population of ~500 persons could be accommodated based on the per capita rates derived from water records. TVDSB would continue to monitor flow data.

In addition to the options provided above, the following recommendation are provided:

- At this time, no issues have been reported by TVDSB. However, any signs of septic system failure (i.e., ponding water, backups) must be communicated to the Health Unit and Chief Building Official immediately in order to determine further remedial measures.

Reference: East Oxford Central Public School Septic System Review

We trust that the information provided meets the needs of the Thames Valley District School Board. For any questions or clarifications, please do not hesitate to contact the undersigned.

Regards,

STANTEC CONSULTING LTD.

Simon Jeater C.Tech.

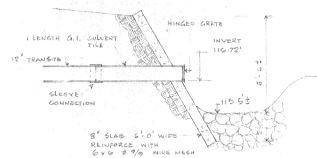
Project Manager

Phone: 519-675-6620

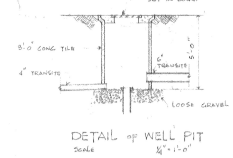
Mobile: (519) 494-0124

simon.jeater@stantec.com

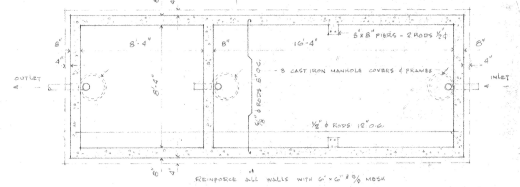
Attachment: Attachment 1: Existing System Drawings
Attachment 2: August 9, 2023 Assessment Letter
Attachment 3: WSP Draft Hydrogeological Assessment (May 28, 2024)
Attachment 4: WSP Draft Geotechnical Assessment (April 17, 2024)
Attachment 5: Water Use Records
Attachment 6: Detailed Design Calculations



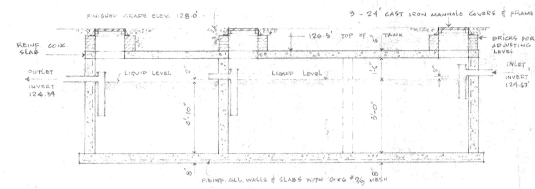
DETAIL OF HEAD WALL
SCALE 8'-1'-0"



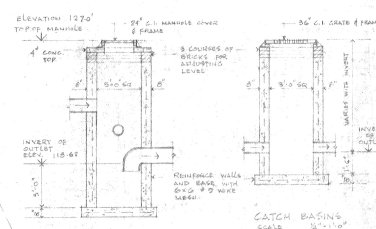
DETAIL OF WELL PIT
SCALE 8'-1'-0"



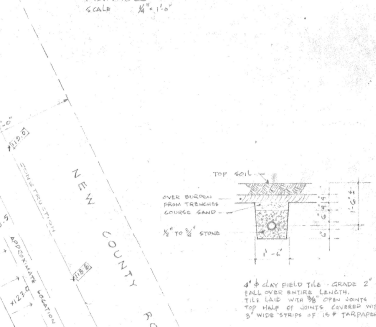
PLAN
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SECTION
SEPTIC TANK DETAILS
SCALE 8'-1'-0"

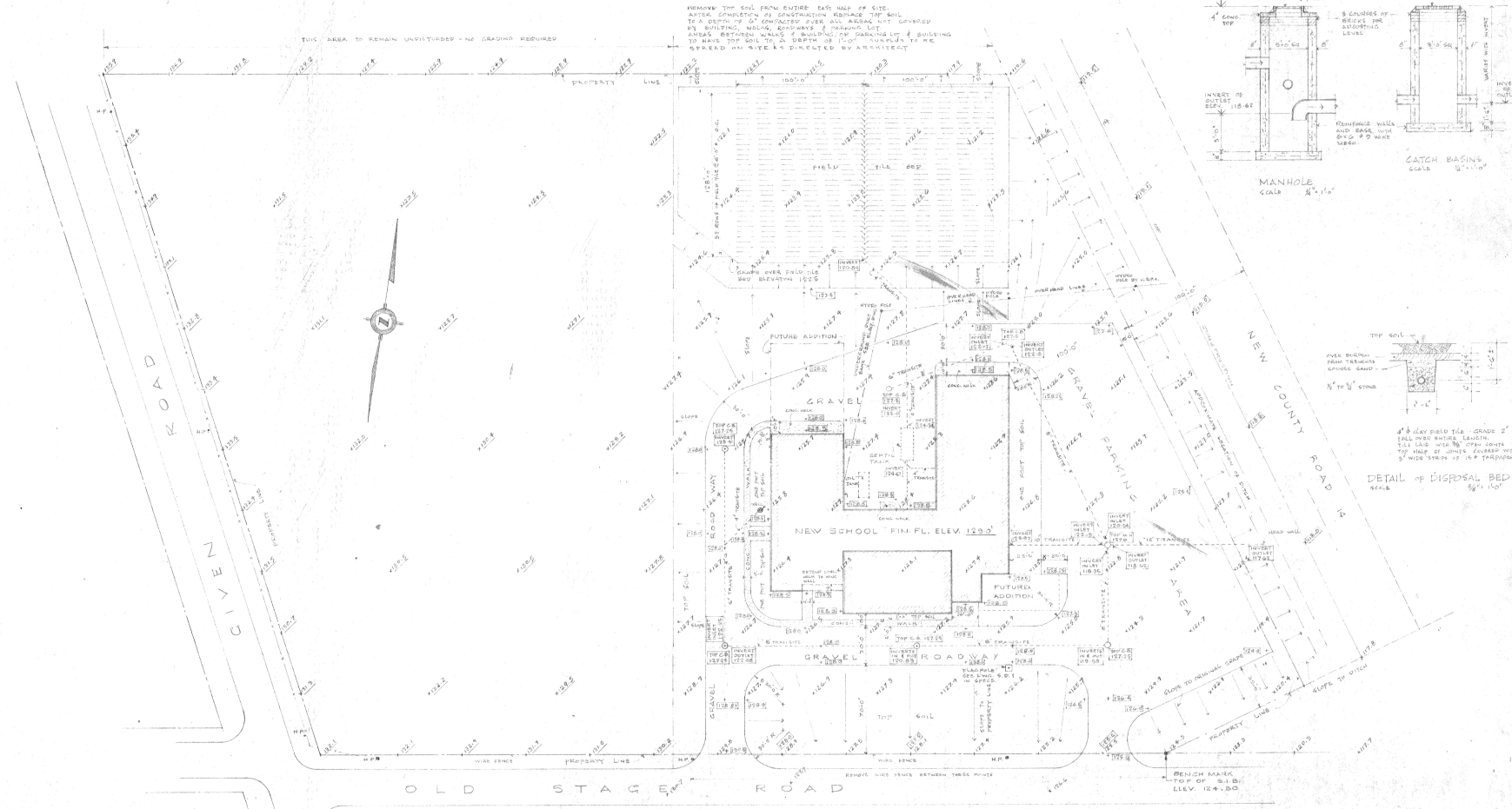


MANHOLE
SCALE 8'-1'-0"

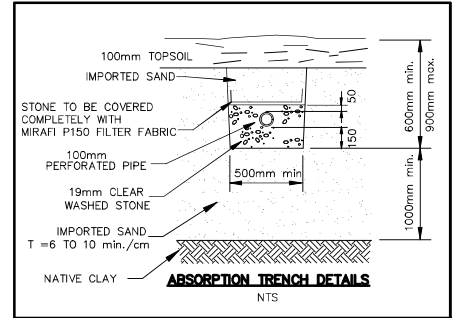
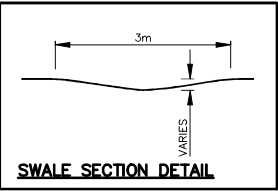
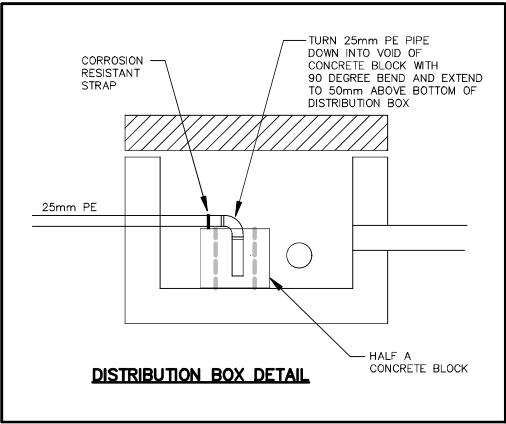
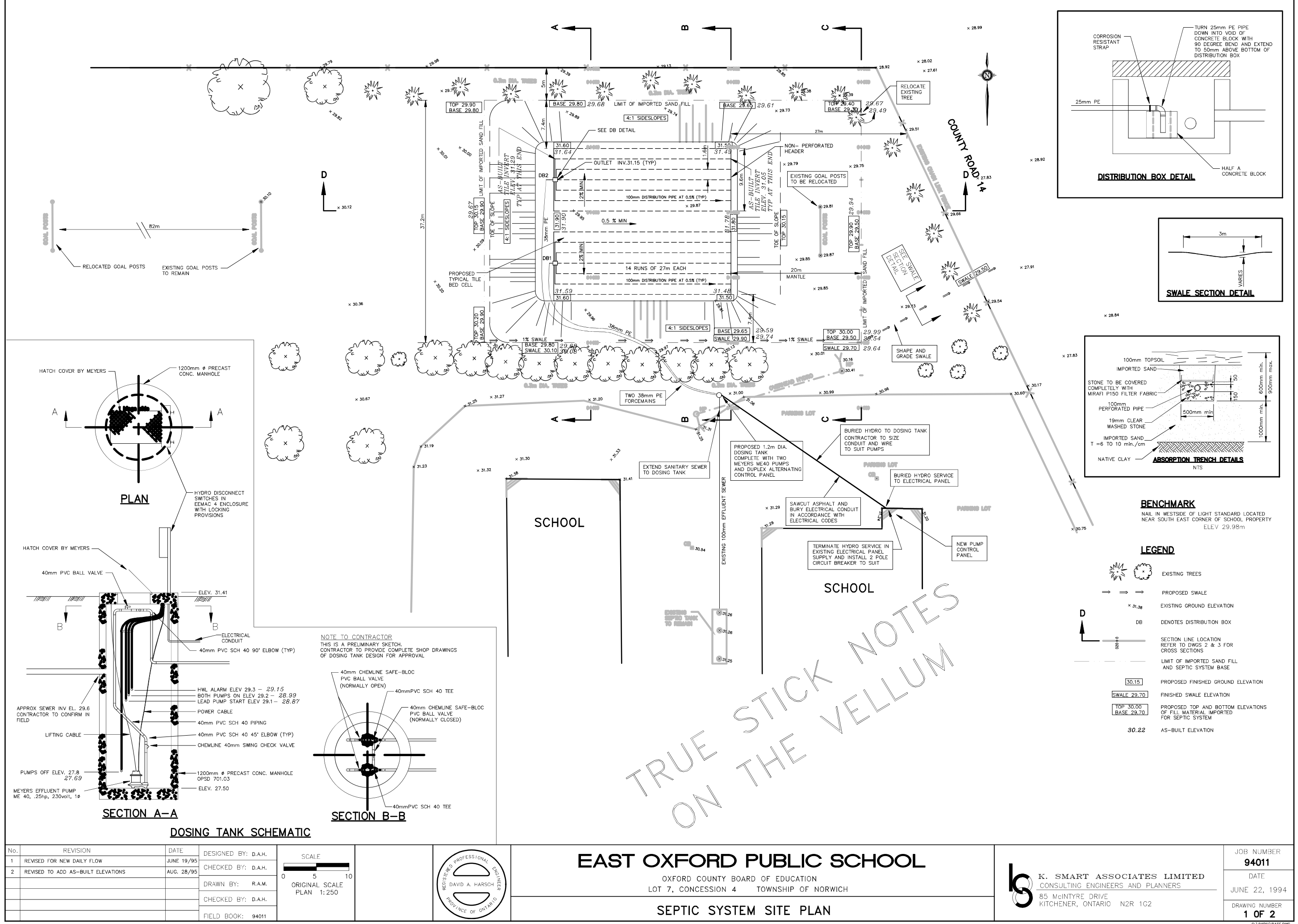


CATCH BASIN
SCALE 8'-1'-0"

DETAIL OF DISPOSAL BED
SCALE 8'-1'-0"

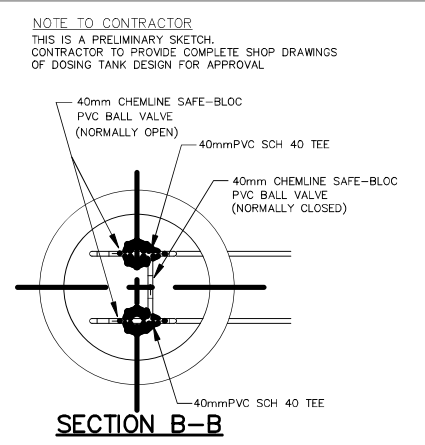
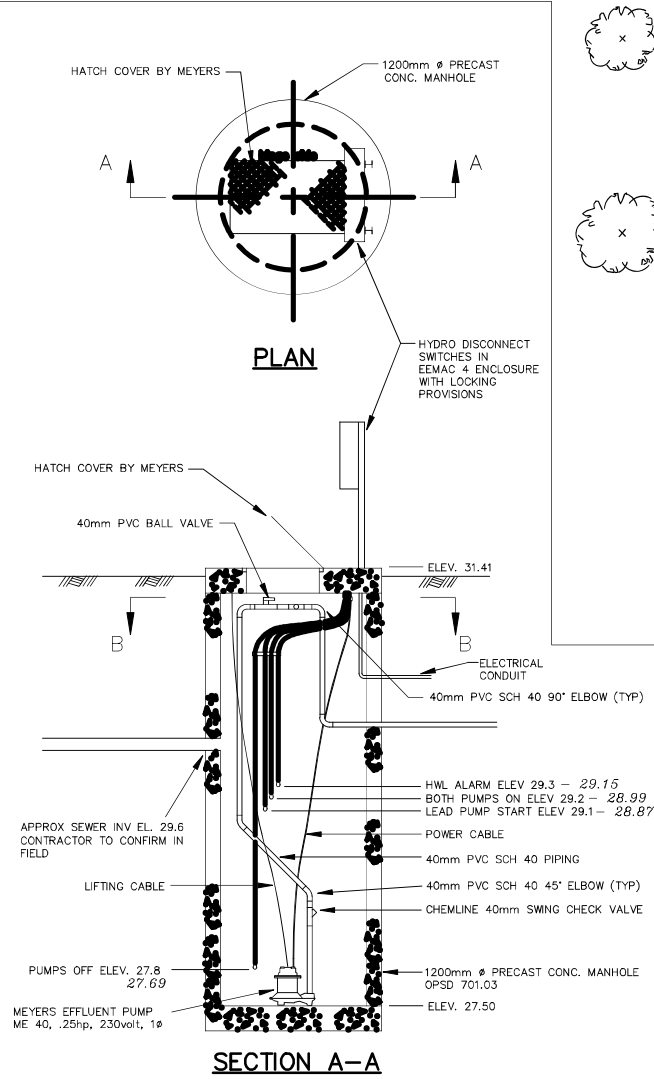


PLOT PLAN
SCALE 1" = 40'-0"



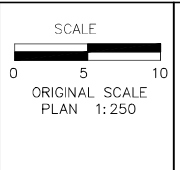
BENCHMARK
NAIL IN WESTSIDE OF LIGHT STANDARD LOCATED NEAR SOUTH EAST CORNER OF SCHOOL PROPERTY
ELEV 29.98m

- LEGEND**
- EXISTING TREES
 - PROPOSED SWALE
 - EXISTING GROUND ELEVATION
 - DB DENOTES DISTRIBUTION BOX
 - SECTION LINE LOCATION REFER TO DWGS 2 & 3 FOR CROSS SECTIONS
 - LIMIT OF IMPORTED SAND FILL AND SEPTIC SYSTEM BASE
 - PROPOSED FINISHED GROUND ELEVATION
 - FINISHED SWALE ELEVATION
 - PROPOSED TOP AND BOTTOM ELEVATIONS OF FILL MATERIAL IMPORTED FOR SEPTIC SYSTEM
 - AS-BUILT ELEVATION



NOTE TO CONTRACTOR
THIS IS A PRELIMINARY SKETCH. CONTRACTOR TO PROVIDE COMPLETE SHOP DRAWINGS OF DOSING TANK DESIGN FOR APPROVAL

No.	REVISION	DATE	DESIGNED BY: D.A.H.
1	REVISED FOR NEW DAILY FLOW	JUNE 19/95	CHECKED BY: D.A.H.
2	REVISED TO ADD AS-BUILT ELEVATIONS	AUG. 28/95	DRAWN BY: R.A.M.
			CHECKED BY: D.A.H.
			FIELD BOOK: 94011



EAST OXFORD PUBLIC SCHOOL
OXFORD COUNTY BOARD OF EDUCATION
LOT 7, CONCESSION 4 TOWNSHIP OF NORWICH
SEPTIC SYSTEM SITE PLAN

K. SMART ASSOCIATES LIMITED
CONSULTING ENGINEERS AND PLANNERS
85 McINTYRE DRIVE
KITCHENER, ONTARIO N2R 1G2

JOB NUMBER
94011

DATE
JUNE 22, 1994

DRAWING NUMBER
1 OF 2

August 9, 2023
File: 165630246

Attention: Thames Valley District School Board
951 Leathome Street
London ON, N5Z 3M7

Dear Julelian Grant,

Reference: East Oxford Central Public School Septic System Review

1 INTRODUCTION

This letter is prepared to provide information regarding the current state and capacity of the existing on-site sewage system servicing East Oxford Central Public School, per request of the Thames Valley District School Board (TVDSB) via email correspondence on June 14, 2023. The information provided within this letter addresses the forecasted population (2023 – 2027) increase to the school, inclusive of both students and staff members, and its related impact on the existing sanitary system. This population increase has included the two additional portable classrooms planned for the school in September 2023.

This letter is not intended to provide a complete review of each individual component of the existing sanitary system in order to provide a complete review of each individual component of the existing sanitary system in order to confirm its compliance with the current design standards of the Ontario Building Code (OBC) (O.Reg. 332/12). Rather, the purpose of this letter is to provide a high-level assessment of whether the current system can adequately treat sewage generated by the school for current and future population demands based on assumed per capita rates and soil conditions.

2 SITE LOCATION

The school property is located at 505767 Old Stage Road, Woodstock Ontario in the regional municipality of Oxford County. The site is bound by agricultural/open fields to the north, Oxford Road 14 to the east, Old Stage Road to the south, and Old 14 Line to the west.

3 BACKGROUND

The current Class 4 Sewage System was constructed in 1966 and consists of a 28,725 L two-chamber (Chamber 1 = 19,220 L; Chamber 2 = 9,505 L) reinforced concrete septic tank which then distributes flows through a gravity pipe to a field tile bed. The tile bed was upgraded in 1994 to be a raised tile bed and consists of 14 rows of 27 m distribution pipe, spaced 1.6 m apart which results in 378 m of distribution length. The septic tank was noted to remain as-is for the 1994 upgrades. The 1966 Plot Plan drawing (Riddle, Conor, Falls & Irvine Architects) showing the existing septic tank, and the 1994 Septic System Site Plan (K. Smart Associates Limited) showing the upgraded tile bed are both included with this brief as Attachment 1.

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4 TOPOGRAPHY AND SOIL TYPE

Based on the topographic information on the 1966 Plot Plan drawing, the site is generally sloped to the north-east.

Golder Associates Ltd. (Golder) conducted a geotechnical investigation of the site in March 2017 to support parking lot upgrades of the school (Attachment 2). This investigation involved drilling of five boreholes for the purpose of assessing subsurface conditions (soil, seepage, and groundwater). All five boreholes were drilled in the vicinity of the school parking lot/asphalt area, in which the closest borehole is approximately 60 m from the septic distribution bed. While the boreholes were a significant distance from the septic bed, they all revealed that the native soil of the site is silty clay, which is inferred to be either M.L. or O.L. classification.

5 PERCOLATION RATE

The soils on site have not been tested to determine the in-situ percolation ("T") time. However, the 1994 septic bed upgrades noted the use of imported sand with a percolation T-time of 6 to 10 min/cm for infiltration below 19 mm clear washed stone surrounding the perforated pipe. Since this is the most up-to-date information available, 10 min/cm will be used for the purpose of this assessment.

6 GROUNDWATER

Through the geotechnical investigation conducted by Golder (March 2017), five boreholes were drilled to a depth of 1.5 m, and it was found that the majority of the boreholes were dry upon drilling, meaning the water table elevation was not confirmed.

The 1994 upgrades resulted in the construction of a raised tile bed which offers approximately 1150 mm separation between the invert of the perforated pipe and the native clay. Although groundwater elevations were not provided on the 1994 plans, it can be inferred that the water table is located below the native clay and therefore, sufficient groundwater separation has been provided.

7 BEDDING MATERIAL

Information provided in the 1994 upgrade drawings (Attachment 1) indicate that the existing bedding material consists of 19 mm diameter clear washed stone 50 mm above and 150 mm below the 100 mm perforated pipe. Imported sand with a T-time of 6 to 10 min/cm is placed at a minimum of 1000 mm below the clear washed stone until native clay is reached. Imported sand is also placed above the top clear washed stone, followed by 100 mm of topsoil to the top ground surface.

8 SYSTEM ASSESSMENT

The information included in the subsections below is intended to provide the TVDSB with an overall assessment of the capacity of the existing septic system based on the requirements of Part 8 of the OBC.

Reference: East Oxford Central Public School Septic System Review

8.1 DESIGN FLOW

In order to determine whether the existing system has the capacity to accommodate future sewage flows, the theoretical design flow was calculated for each year from 2023 to 2027 based on student enrollment and staff projections. It is assumed that '2023' refers to the upcoming 2023 – 2024 school year and not the current enrollment. Student enrollment numbers were provided via email correspondence on June 14, 2023 and are the most up to date projections for the school. The projections for staff members were not provided, however, were estimated for teaching staff based on O.Reg. 132/12 which has assumed approximately 24.2 students per teacher for the school. The non-teaching staff was estimated based on the 2019 annual report published by People for Education which determined that on average each elementary school has 1 office staff per 255 students, 1 principal, 1 full time librarian, and 1 custodian per 198 students. The projected student enrollment and staff population is tabulated below.

Table 1: Projected Student and Staff Population

Year	Students	Staff (Teaching)	Staff (Non-Teaching)
2023	353	15	6
2024	356	15	6
2025	366	15	6
2026	366	15	6
2027	383	16	6

The assessment was carried out on a maximum occupancy basis. Meaning the calculations were carried out assuming each classroom was operating at its maximum capacity. Upon discussion with the TVDSB, based on 2023 enrollment, two portables are required to satisfy the enrollment needs. A breakdown of the maximum student occupancy, including two portables, is summarized in Table 2 below:

Table 2: Maximum Student Occupancy of School and Portables

Grade	Number of Classes (2023/2024)	Maximum Occupancy (Per Class ¹)	Total Occupancy (School and Portables)	Comments
JK/SK	3	26	78	
1 – 3	4	20	80	
4 – 6	4	28	112	Assumes 2 portables (56 students)
7 – 8	4	26	104	
TOTAL			374	

Note 1: It is noted that class sizes could fluctuate +/- 4 students per classroom, however the values noted are targeted student occupancy per classroom.

The maximum classroom capacity reported in Table 2 above provide sufficient classroom space for the projected student enrollment up to and including 2026, which is 366 students (Table 1). In order to accommodate the projected student enrollment population of 383 students in 2027, an additional portable is required which increases the maximum occupancy of this year to 402, assuming 28 students per portable (value provided by TVDSB). The design flow assuming maximum occupancy is detailed below.

Reference: East Oxford Central Public School Septic System Review

Based upon section 8.2.1.3 (2) and Table 8.2.1.3 B. of the OBC, the design flow, Q, is calculated as:

$$Q_{design} = Q_{student} + Q_{teaching\ staff} + Q_{non-teaching\ staff}$$

$$Q_{design} = \left(30 \left(\frac{L}{person\ day} \right) * student\ population \right) + \left(30 \left(\frac{L}{person\ day} \right) * teaching\ staff\ population \right) + \left(50 \left(\frac{L}{person\ day} \right) * student\ population \right)$$

The future projected design flows are summarized below in Table 3.

Table 3: Projected Maximum Occupancy Design Flow

Year	Enrollment (students)	Teaching Staff Members	Non-Teaching Staff Members	Total Daily Design Flow (L/d)
2023	374	15	6	11,984
2024	374	15	6	11,984
2025	374	15	6	11,984
2026	374	15	6	11,984
2027	402	17	6	12,858

Detailed design calculations are included in Attachment 3 of this letter.

It should also be noted that the projected flows for 2023 and beyond are expected to be >10,000 L/d, meaning, should a new septic system be required for the site, the submission will be required to follow the MECP approval process.

8.2 CURRENT DESIGN CAPACITY

The existing system tank and distribution tile bed was evaluated to determine the capacity of the components and what design flows can be accommodated by the existing infrastructure.

According to OBC section 8.2.2.3, the tank size for non-residential occupancies must be three times the daily sewage generation. Given that the existing tank size is 28,725 L, the maximum design flow that can be satisfied by the tank is 9,575 L/day. Comparing this to the projected design flows in Table 3, it shows that the overall tank size is currently undersized to satisfy design flows for future maximum occupancy.

Section 8.7.3.1.(2) of the OBC stipulates that a leaching bed constructed by means of absorption trenches shall have a total distribution bed length not less than the value determined by:

$$L = \frac{QT}{200}$$

Reference: East Oxford Central Public School Septic System Review

Given that the length of the existing distribution tile bed is 378 m, assuming a percolation rate of 10 min/cm, the sewage flow that can be accommodated by this bed is 7,560 L/day. Therefore, the existing septic tank and tile bed are both undersized to satisfy future maximum occupancy design flows, calculated using OBC per capita rates (Table 3).

8.3 SEPTIC TANK

8.3.1 OBC Design Flows

Using section 8.2.2.3 of the OBC and projected design flows, the minimum required working capacity of the septic tank is as follows:

Table 4: Forecasted Required Septic Tank Volumes

Year	Required Volume (L)
2023	35,951
2024	35,951
2025	35,951
2026	35,951
2027	38,575

Note: The existing septic tank has a capacity of 28,725 L.

Comparing Table 4 above with the current 28,725 L septic tank, it is concluded that the existing tank is undersized for all future conditions from 2023 – 2027.

Section 8.2.2.3 (3) of the OBC determined that the first compartment of the tank must be at least 1.3 times the daily design sanitary sewage flow and each subsequent compartment must be at least 50% of the first compartment. Using this sizing criteria, the minimum sizes of the existing and future compartments for the septic tank are tabulated below:

Table 5: Forecasted Required Chamber Volumes

Year	Chamber 1 (L)	Chamber 2 (L)
2023	15,579	7,789
2024	15,579	7,789
2025	15,579	7,789
2026	15,579	7,789
2027	16,716	8,358

Note: The existing chamber volumes for Chamber 1 and Chamber 2 are 19,221 L and 9,505 L respectively.

Table 5 above shows that the existing chamber sizes meet the minimum criteria and are sized sufficiently for future growth. While the individual chambers meet minimum criteria, the overall tank is undersized, meaning, a larger tank is required to meet the future needs of the school.

Reference: East Oxford Central Public School Septic System Review

8.3.2 Anticipated Actual Flow (Water Use Records)

The OBC per capita flows have typically been shown to be conservative in comparison to known water consumption rates which tend to provide a more realistic estimate of sewage flow. As a private well system, there is no readily available water use information related to the site, and therefore a corresponding per capita flow rate based on previous use versus populations cannot be determined. However, information for similar rural and urban schools that have required previous construction or rehabilitation of on-site septic systems was available and reviewed in order to determine a potential range in per capita flow rates. Refer to Attachment 4 for a summary of information related to these sites. Based on the information provided, the average per capita demand for the four sites was 13.44 L/cap/d with a maximum per capita rate of 17.32 L/cap/d. With regards to the maximum rate, it should be noted that the higher flow at that particular school was due to increased daily flushing requirements for the site in accordance with O.Reg. 243/07 *Schools, Private Schools and Day Nurseries* of the Safe Drinking Water Act (SDWA). To be conservative, a sewage generation rate of 17.32 L/cap/day will be assumed as the per capita rate of East Oxford Central Public School.

Therefore, based on the assumed per capita rate, the required working capacity of the septic tank based on existing and current populations is as follows:

Table 6: Required Tank Size Based on Water Use

Year	Required Volume (L)
2023	20,548
2024	20,548
2025	20,548
2026	20,548
2027	22,063

Note: The existing septic tank has a capacity of 28,725 L.

Table 6 above shows that the required volume for years 2023 – 2027 is less than the existing tank volume (28,725 L). Therefore, based on water usage rates from similar school sites, it can be determined that the tank should have sufficient capacity for the projected maximum occupancy of the next 5 years.

The TVDSB has not reported any performance issues of the septic tank, to date. This supports the notion that the tank is likely appropriately sized based on expected water usage. However, a flow meter should be installed at the school in order to confirm actual daily flows and verify that the flows generated are less than OBC per capita rates.

8.4 DISTRIBUTION BED

8.4.1 Distribution Bed – OBC

The length of the required distribution bed has been calculated according to OBC section 8.7.3.1.(2) based on existing and future projected flows. The future projected calculations have been carried out using 10 min/cm, since this is the value reported for the imported sand beneath the tile bed as per the 1994 Septic System Site Plan (K. Smart Associates Limited). The results are outlined in Table 7 below.

Reference: East Oxford Central Public School Septic System Review

Table 7: Forecasted Distribution Bed Lengths

Year	Percolation "T" (min/cm)	Length (m)
2023	10	599
2024		599
2025		599
2026		599
2027		643

Note: The existing length of distribution piping is 378 m.

These results reiterate the conclusions drawn in Section 8.2, which determined that the existing tile bed length is too small to service future maximum occupancy OBC design flows.

8.4.2 Distribution Bed – Water Use

The length of the required distribution bed has also been calculated using the per capita water usage rate specified in Section 8.3.2. This analysis also used 10 min/cm as the percolation rate. The results are outlined in Table 8 below.

Table 8: Distribution Bed Length Based on Water Usage

Year	Percolation "T" (min/cm)	Length (m)
2023	10	342
2024		342
2025		342
2026		342
2027		368

Note: The existing length of distribution piping is 378 m.

These results determined that the existing tile bed is sufficiently sized for future maximum capacity conditions (2023 – 2027) under the assumption that the actual water usage of the school is around 17.32 L/cap/day. In order to confirm that this assumption is accurate, it is recommended to install a flow meter to confirm the daily per capita flows on site in order to confirm if the bed has been appropriately sized.

9 CLEARANCES

9.1 CLEARANCES - TREATMENT UNIT

OBC section 8.2.1.6 (1) outlines required clearance distances for a Class 4 or 5 treatment unit that must be maintained on site. Table 9 below compares the actual to required clearance distance of the treatment unit and shows that the existing location of the septic tank sufficiently meets the OBC required clearance distances.

Reference: East Oxford Central Public School Septic System Review

Table 9: Clearance Distances of Treatment Unit

Object	Required Clearance	Actual Clearance
Structure	1.5	~7 m
Well	15	>15
Lake	15	>15
Pond	15	>15
Reservoir	15	>15
River	15	>15
Spring	15	>15
Stream	15	>15
Property Line	3	~ 70 m

9.2 CLEARANCES - DISTRIBUTION BED

OBC section 8.2.1.6 (2) outlines the required distances for the distribution piping in a conventional septic system. Table 10 below compares the actual to required clearance distance of the tile bed and shows that the location of the tile bed meets all minimum required clearances.

Table 10: Clearance Distances of Distribution Bed

Object	Required Clearance	Actual Clearance
Structure	1.5	~27 m
Well with a water tight casing to a depth of at least 6 m	15	>15
Any other well	30	>30
Lake	15	>15
Pond	15	>15
Reservoir	15	>15
River	15	>15
Spring not used as a source of potable water	15	>15
Stream	15	>15
Property Line	3	~ 10 m

10 CONCLUSIONS AND RECOMMENDATIONS

Based on a review of available information related to the existing Class 4 Sewage System, including as-built drawings, geotechnical information, and data provided by the TVDSB for estimated population and maximum occupancy projections, the existing septic system is found to be insufficient to meet the forecasted population increase based on the OBC design criteria. However, the existing septic system was found to be sufficient based on expected water usage (assuming an approximate sewage usage of 17.32 L/cap/day). Given that the OBC per capita rates are known to be more conservative, it is likely that the actual sewage usage is less than the projected flows based on the OBC. Therefore, calculating the capacity of the system based on an expected water usage basis is more representative of the actual system.

Reference: East Oxford Central Public School Septic System Review

Additionally, since no issues have been reported by TVDSB, it is assumed that the septic tank is currently sufficiently sized for the actual sewage generation at East Oxford Central Public School.

The following recommendations are provided for future work:

- Continue operating the existing septic system as is. Any signs of septic system failure (i.e., ponding water, backups) must be communicated to the Health Unit and Chief Building Official immediately in order to determine further remedial measures.
- TVDSB to install a flow monitoring device in order to record the actual water usage. This is to confirm that actual water usage is reasonably close to the assumed water usage. These water records should be shared with Stantec so the analysis calculations can be updated to ensure the tank can operate sufficiently with the measured usage.
- Should the water records determine that the tank and/or distribution bed size is insufficient, TVDSB should plan upgrades to the existing septic system. Based on the OBC calculations documented in this report, the sewage generation rates for future population will exceed 10,000 L/d, meaning approval for a new tank would fall under MECP rather than OBC. For this reason, if a new tank is required, it should be planned sufficiently in advance to account for the time required to proceed through MECP approval.

We trust that the information provided meets the needs of the Thames Valley District School Board. For any questions or clarifications, please do not hesitate to contact the undersigned.

Regards,

Stantec Consulting Ltd.



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Attachment: Attachment 1: Existing System Drawings
Attachment 2: Golder March 2017 Geotechnical Investigation
Attachment 3: Design Calculations
Attachment 4: Water Use Records

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ATTACHMENTS

**Omitted
(August 9, 2023 Report)**



DRAFT

May 28, 2024

Project No. CA0021057.5477

Mr. Arran Jeater, Senior Engineering Technologist

Stantec Consulting Ltd.
400-1305 Riverbend Road
London, ON, N6K 0J5

**HYDROGEOLOGICAL ASSESSMENT
EAST OXFORD PUBLIC SCHOOL PROPOSED SEPTIC BED
WOODSTOCK, ONTARIO**

Dear Mr. Jeater,

This summary letter presents the results of the Hydrogeological Assessment carried out to support the design of the new septic bed at East Oxford Public School (EOPS), located at 505767 Old Stage Road in Woodstock, Ontario (the "Site"). (Figure 1).

As described in WSP Proposal 2023CA135477 (issued January 11, 2024), the hydrogeological assessment scope of work includes:

- Compilation and review of existing Site data on local hydrogeological conditions and groundwater quality monitoring results in the area around the proposed septic system.
- Summary of findings from groundwater level measurements, single well response testing, infiltration testing, and monitoring well sampling, including laboratory analysis.
- Discussion of the results of in relation to septic considerations, including a reasonable use compliance criteria assessment (in accordance with MECP Policy Procedure B-7-1).
- Develop an impact assessment of the proposed sewage disposal system with respect to nearby surface water and groundwater receptors identified, and existing source water protection literature.
- Recommendations related to hydrogeology based on our findings.

Background Information

WSP (formerly Golder Associates Ltd. (Golder) previously carried out subsurface investigations at the Site, the results of which are provided in the following reports:

- Golder Report No. 1773481-R01 titled "Geotechnical Investigation, Thames Valley District School Board 2017 Project, Parking Lot Upgrades, London, Ontario" dated March 2017.

- WSP Technical Memorandum No. CA0010895.0572-Rev0 titled “Guelph Permeameter Testing Results, East Oxford Public School, 505767 Old Stage Road, Woodstock, Ontario”, dated November 17, 2023.
- WSP Report No. CA0021057.5477-1000-R01 titled, “Geotechnical Exploration and Testing Program, East Oxford Public School Proposed Septic Bed, Woodstock, Ontario” dated April 17, 2024.

Site Setting

The Site consists of a public-school property located in a rural area near Woodstock, Ontario. The new septic system expansion is proposed to be located in an area within the northwest portion of the EOPS property and consists of a generally flat, grassed field. Surveyed ground surface elevations at the Site range from 286.9 to 287.7 metres (m) above mean sea level (amsl).

The Quaternary Geology of the region surrounding the site consists of glacially derived Port Stanley Till (Ontario Geological Survey, 2000¹), which is comprised of a silt to sandy silt matrix that becomes silt to silty clay near Lake Erie with moderate to low clast content. The bedrock geology in the area is of the Upper Silurian period consisting of variably laminated, mottled and/or argillaceous dolostone of the Bass Islands Formation which is found at varying depths below the overburden. Drift thickness in the area is reported to range between 29.3 to 34.5 m (Gao et al, 2006)². According to the MNRF Natural Heritage Areas Mapping Tool, no provincially significant wetlands are observed on the Site with the nearest Marsh being approximately 190 m northeast of the proposed new septic bed. The closest surface water feature to the Site is an unnamed stream, which is approximately 224 m northeastwards and flows southerly towards Kenny Creek.

Figure 1 shows the groundwater elevation at selected boreholes in m amsl in the vicinity of the septic system upgrade. Based on topography and supplemented by groundwater elevation measurements at the Site, it is inferred that surface water and shallow subsurface groundwater flow in the immediate vicinity of the proposed septic system is toward the northeast.

Subsurface Conditions

Borehole Stratigraphy

Six boreholes (BH-101 to BH-106) were advanced on March 13, 2024 to final depths of about 3.7 to 5.9 m below ground surface (bgs). or to about elevations 281.81 to 284.15 m amsl. The general soil conditions observed at the site consisted of 0.61 to 0.76 m of topsoil followed by interbedded layers of sandy clayey silt, sandy silty clay, silty sand and gravelly silty sand deposits. None of the boreholes encountered any bedrock. Details of the monitoring well installations are provided on the corresponding Record of Borehole sheets in Appendix A.

Monitoring Wells

Four of the six boreholes (BH-103, BH-104, BH-105 and BH-106) were completed as monitoring wells (designated as MW-103, MW-104, MW-105 and MW-106) with well screens installed predominantly within sandy clayey silt. The monitoring wells were constructed with 1.5-metre long, 50-millimetre diameter, slot 10 polyvinyl

¹ Ontario Geological Survey 2000. *Quaternary geology, seamless coverage of the Province of Ontario*; Ontario Geological Survey, Data Set 14---Revised.

² Gao, C., Shirota, J., Kelly, R. I., Brunton, F.R., van Haaften, S. 2006. *Bedrock topography and overburden thickness mapping, southern Ontario*; Ontario Geological Survey, Miscellaneous Release--Data 207

chloride (PVC) well screens threaded to PVC riser pipes. A sand pack consisting of commercially available silica sand was used in the borehole annulus surrounding the well screen. The annulus above the sand pack was filled with bentonite to about ground surface. Monitoring wells were completed with flush mount casings. The monitoring wells were developed using new polyethylene tubing equipped with a Waterra inertial foot valve and surge block. Two of the monitoring wells (MW-103 and MW-106) were lower yield wells where purging occurred while collecting field parameters (pH, conductivity and temperature) until they went dry.

Groundwater Quality

Groundwater samples were collected from the monitoring wells on May 2, 2024. The samples were placed in a cooler with ice and submitted with a chain-of-custody to the Bureau Veritas (BV) depot in London to be sent to the BV Mississauga laboratory for chemical analysis of a general suite of parameters. Results of the analytical testing are presented in Table II (following the text of this report). A copy of the laboratory certificate of analysis is provided in Appendix B.

Groundwater Levels and Flow Direction

Groundwater levels were measured periodically in April and May 2024. Water levels were found to range between 285.9 m amsl and 287.0 m amsl. Water level data can be found in Table I following the text of this report. As mentioned previously, the inferred shallow groundwater flow direction at the Site is northeastward, following a weak horizontal gradient (Figure 1).

Single Well Response Testing

Single-well response tests were conducted at monitoring wells MW-103, MW-104, MW-105 and MW-106 to estimate the hydraulic conductivity ("K") of the cohesive deposits in this area. As summarized in Table C1 in Appendix C, falling head and rising head tests were completed. The water level dataset collected during the single-well response tests was analyzed using the AQTESOLV software package. Hydraulic conductivity values for each test were estimated using the Bouwer Rice³ analytical solution. The results of the hydraulic conductivity testing are presented in Appendix C. Hydraulic conductivity values ranged between 2.0×10^{-9} metres per second (m/s) and 2.0×10^{-5} m/s with variability depending on the screened interval material of the monitoring well.

Infiltration Testing

Guelph Permeameter (GP) testing was performed in two locations within the west yard of the Site. Appropriate testing locations were determined in conjunction with Stantec and our understanding of the proposed and existing raised septic bed.

Soil Conditions

Prior to GP testing soil conditions were assessed and recorded during the manual augering of boreholes. Boreholes were advanced using a 100-millimetre (mm) diameter hand auger and subsurface soil conditions were logged for texture, colour, estimated grain size in the field. The results of the borehole auguring including locations, descriptions, and depths in meters below ground surface (m bgs) are provided below in Table 1.

³³³ Bouwer, H., and R.C. Rice, 1976. *A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells*, *Water Resources Research*, vol. 12, no. 3, pp. 423-428.

Table 1: Borehole Information and Soil Descriptions

Borehole	Depth (m bgs)	Soil Description
GP-105 (TP1) (529313.9 E, 4772145.5 N) East of goal post approximately 40 to 50 m of existing septic bed	0.00 - 0.58	TOPSOIL – sandy SILT, some clay dark brown, moist
	0.58 - 0.73	Sandy clayey SILT, trace organics and gravel, light brown, moist
GP-106 (TP2) (529283.9 E, 4772144.3 N) Approximately 60 to 70 m east of existing septic bed	0.00 - 0.50	TOPSOIL – sandy SILT, some clay, dark brown, moist
	0.50 - 0.64	Sandy clayey SILT, light brown, moist

In summary, soils at locations GP-105 and GP-106 were generally fine and partially cohesive (i.e., sandy clayey silt). These results are similar to those previously reported.

Method and Results

GP testing was completed to determine the in-situ field saturated hydraulic conductivity (K_{fs}) in the existing cohesive soils. Tests were completed using a Guelph Permeameter (Model 2800 by Soil Moisture Equipment Corp.) by augering to the appropriate testing depth, preparing the borehole per manufacturers instructions, saturating the hole and then performing tests with varying parameters. Depending on the hydraulic conductivity of the existing soils testing methods were adjusted appropriately, such as alternating between use of a dual or single reservoir. Hydraulic head values in both tests were 0.25 m.

The results of the tests considered the reservoir cross-sectional area, the hydraulic head height, borehole radius, soil structure category, and the steady state rate of water level change measured on the device. A summary of K_{fs} values, infiltration rates (uncorrected and corrected in accordance with applicable guidelines) and percolation time is provided in Table 2.

Table 2: Field Saturated Hydraulic Conductivity Values, K_{fs}

Location	K_{fs} (m/s)	Estimated Infiltration Rate ¹ (mm/hr)	Correction Factor ²	Estimated Design Infiltration Rate (mm/hr) ²	Estimated Percolation Time, T^1 (min/cm)
GP1*	1.4×10^{-6}	52	2.5	21	12
GP2*	7.4×10^{-9}	<5	-	<5	>50
GP3*	5.9×10^{-6}	59	2.5	24	10
GP4*	2.4×10^{-8}	<5	-	<5	>50
GP-105	N/A	N/A	N/A	N/A	N/A

Location	K_{fs} (m/s)	Estimated Infiltration Rate ¹ (mm/hr)	Correction Factor ²	Estimated Design Infiltration Rate (mm/hr) ²	Estimated Percolation Time, T ¹ (min/cm)
GP1*	1.4×10^{-6}	52	2.5	21	12
GP2*	7.4×10^{-9}	<5	-	<5	>50
GP-106	4.6×10^{-8}	20.3	2.5	8.1	>50

Notes:

m/s – meters per second, mm/hr – millimeters per hour, min/cm – minutes per centimeter, correction factor is unitless.

“*” – Previous GP results performed onsite and presented in WSP Technical Memorandum No. CA0010895.0572-Rev0

1 – based on the approximate relationship between hydraulic conductivity, infiltration rate and percolation time, per Table C2 from Toronto Region Conservation Authority, *Stormwater Management Criteria*, (August 2012), Version 1.0. (“TRCA SMC”).

2 – based on correction factor in accordance with Table C3 from TRCA SMC.

Infiltration test results for the GP-105 location were inconclusive as they reported only a slight decrease in water level (1.4 cm) over time (80 min), which produced a negative steady state rate of water level change that could not be used to accurately calculate infiltration rate and percolation time. This result is due to the presence of very low hydraulic conductivity soils at the Site. The GP-106 test produced a result of 4.6×10^{-8} m/s which corresponds to results from previous test performed on Site, specifically areas with finer soils that had an average K_{fs} value of 1.6×10^{-8} m/s in addition to higher estimated percolation times, >50 min/cm (GP2 and GP4). Areas of non-cohesive soils associated with the test locations of GP1 and GP3, reported an average K_{fs} value of 3.6×10^{-6} m/s and lower percolation times, 10 to 12min/cm.

“Reasonable Use” Compliance Criteria

The MECP Procedure B-7-1 describes guidance for determining the “reasonable use” of groundwater on property adjacent to a waste disposal site, and for determining acceptable groundwater contaminant levels. The “default” “reasonable use” of groundwater is as a drinking water source. For drinking water impact, the critical contaminant is designated as nitrate (MOE Design Guidelines for Sewage Works, 2008).

Existing Water Wells

MECP Water Well Information System

WSP queried the MECP Water Well Information System in April 2024 to determine the presence of water supply wells within a 500 m radius from around the Site, specifically the existing septic system. Figure 2 provides the results of the query, indicating that 11 wells are reported to be present including the school’s water supply well (ID #4701173) which is located directly on Site. Details of the wells are summarized below.

Table 3: Summary of MECP WWIS Records for 500-m Radius from Site

Well ID #	Date Drilled	Depth (m)	“Kind of Water”	Reported Usage	Approximate distance from Septic Site (m), Direction
4701172	08/25/1965	38.1	Fresh	Water supply	165, NE
4701173	12/02/1965	32.3	Fresh	Water Supply- school	95, SE

Well ID #	Date Drilled	Depth (m)	"Kind of Water"	Reported Usage	Approximate distance from Septic Site (m), Direction
4701174	04/24/1967	35.1	Fresh	Water supply	214, NW
4702823	06/12/1969	30.5	Fresh	Water supply	330, E
4702825	07/22/1969	36.6	Fresh	Water supply	214, SW
4703863	03/20/1974	16.2	Fresh	Water supply	206, N
4705985	01/16/1987	14.3	Fresh	Water supply	201, NE
7145231	04/06/2010	36.6	Fresh	Water supply	232, SW
7184525	07/04/2012	31.4	Untested	Water Supply	175, E
4708376	8/29/2001	33.5	Fresh, minerals	Water Supply	400, NE
4708623	11/25/2002	51.8	Fresh, minerals	Water Supply	400, NE

It is noted that all wells are substantially deeper than the encountered upper few meters of the sandy silty clay, and typically extend into deeper sand and gravel units, and/or bedrock.

Door-to-Door Well Survey

To assess the status and current usage of any wells adjacent to the Site, a door-to-door survey was completed on May 2, 2024. Six residences were provided with a well survey notification and authorization form, as well as a self-directed questionnaire. To date, three residents have contacted WSP by mail indicating they have wells adjacent to the Site. Two well owners stated they would be willing to participate in monitoring program, if deemed necessary. Both owners have two wells each on their properties but only one well is currently in use at each location. It is assumed that the residents are owners of wells #4701172, #4703863, and #4705985. Further respondents and survey results will be provided to Stantec as they are received.

Reasonable Use Calculations

Where the "reasonable use" of groundwater on property adjacent is drinking water, which is inferred for the Site, the maximum concentration (C_M) of a contaminant acceptable in the groundwater beneath an adjacent property is calculated according to the formula:

$$C_M = C_B + x (C_R - C_B)$$

Where C_B is the background concentration of the contaminant (at this Site, represented by results from MW-103, MW-104, MW-105 and MW-106, which are located in the northeast portion of the Site); C_R is a water quality standard and x is a "reasonable use" constant (x is equal to 0.5 for non-health related Ontario Drinking Water Standard (ODWS) parameters and 0.25 for health related ODWS parameters). If the C_B of a designated contaminant is in exceedance of the ODWS, C_M is set at the background concentration, as required by Guideline B-7.

It is assumed that the effluent will be domestic sewage (i.e., there will be no component of industrial effluent within the system at the Site).

Background groundwater concentrations (C_B) for the designated contaminants are based on analytical results from the 2024 sampling. It is assumed that existing septic tank usage have impacted groundwater quality to some extent. The C_B value for nitrate is determined as the average result for MW-103, MW-104, MW-105 and MW-106, which provides a value of 0.41 mg/L for C_B . As mentioned above and in accordance with MECP (2008), for groundwater impact, the critical contaminant is designated as nitrate and the ODWS for nitrate of 10 mg/L is established as C_R .

The C_M for nitrate in the context of drinking water as a reasonable use adjacent to the Site is then:

$$C_M = 0.41 + 0.25(10 - 0.41) = 2.8 \text{ mg/L}$$

Contaminant Attenuation Zone (CAZ) Estimation

In addition to the determination of Reasonable Use of groundwater on the adjacent property, Impact Assessment Reports on Large Subsurface Sewage Disposal Systems are to also include the description of the expected lateral, vertical and longitudinal configuration of the plume.

MECP Procedure B-7-1 describes procedures for the establishment of a contaminant attenuation zone (CAZ). Per Ontario Regulation 232/98, a CAZ is a three-dimensional zone adjacent to, and downgradient of, the contaminant source and is intended to be used for the attenuation of contaminants from the source to levels that will not have an unacceptable impact beyond the boundary of the zone.

Assessment of contaminant attenuation considered the designated "reasonable use" to be a drinking water source adjacent to the Site. The first step is to identify and delineate the groundwater "catchment" downgradient of the septic system that could be impacted by effluent discharge. While groundwater contours indicates that shallow groundwater flow within the sandy silty clay will be northeastwards following a very weak gradient, a typical flow pattern that emerges from septic systems is radial flow in all directions immediately surrounding the system.

The size of a Site's CAZ required for sufficient contamination attenuation is typically estimated using a predictive dilution model. For this model, dilution from infiltrating precipitation is assumed to be the only mechanism for attenuation of the designated contaminants. Environment Canada data between 1981 and 2010 for the London International Airport station was used to establish an average annual precipitation rate of 1012 mm and an annual evapotranspiration of 495 mm based on the Thornthwaite Mather Method. Based on this data, an average annual moisture surplus of 516 mm is designated for the Site. It has been assumed that this entire moisture surplus is available for infiltration within the CAZ.

The contaminant concentration at the Site boundary (C_T) was derived from the total mass loading of contaminants in input waters (M_T) divided by the total volume of the input waters (V_T):

$$C_T = M_T / V_T$$

V_T is equal to the total volume of infiltrating precipitation (V_B) and the total volume of generated leachate from the waste fill area (V_L).

M_T is equal to the total mass of contaminant in both the background groundwater (M_B) and the leachate (M_L):

$$M_B = C_B \times V_B$$

$$M_L = C_L \times V_L$$

Where C_B and C_L are the contaminant concentrations in background groundwater and leachate respectively. An estimated source concentration (C_L) of 40 mg/L nitrate-nitrogen (and thus, ammonia) is generally considered acceptable for domestic sewage.

Based on Section 22.7 of MECP's Large Subsurface Sewage Disposal Systems guideline, and Part 8, Division B of the Building Code (O. Reg. 350/06) made under the Building Code Act, 1992, the average sewage flow per student in a school usage setting is 30 Litres per day (L/day) for students and 50 L/day for staff members. Considering the school's predicted expansion and school staff members, including other persons using the building, a reasonable approximation of 500 persons using the septic system can be made. Therefore, 500 individuals using the septic system with a conservative rate of 30 L/day per student (estimated 360 students) and 50 L/day for estimated 140 staff members yields a total daily sewage design flow of approximately 17,800 L/day, this is established as V_L . V_B is based on infiltrating precipitation downgradient of the septic field. An average annual moisture surplus of 516 mm has been designated for the Site.

Nitrate-nitrogen was considered in the predictive dilution model and the CAZ size was estimated using an irregularly shaped polygon that emanates radially from the septic bed but is predominantly to the northeast.

Table 4 summarizes the estimated size required for the CAZ and the concentrations of the designated contaminants at the CAZ boundary.

Table 4: Predicted CAZ Size and Contaminant Concentration at CAZ Boundary using Dilution Model

Parameter	C_M	CAZ	C_T
	mg/L	m ²	mg/L
Nitrate-nitrogen	2.8	100,000	4.8
Nitrate-nitrogen	2.8	200,000	2.8

Nitrate-nitrogen is predicted to have a high initial concentration ($C_L = 40$ mg/L). The ODWS for nitrates is health-related, so the maximum "reasonable use" concentration is low ($C_M = 2.8$ mg/L); this has led to a relatively large CAZ size (200,000 m²).

Impact Assessment Discussion

Based on the dilution predictive model, a CAZ of up to 200,000 m² may be required to attenuate nitrate-nitrogen to a value approaching the Reasonable Use maximum concentration. Generally, nitrates are expected to behave conservatively in the subsurface. Other attenuation mechanisms (such as adsorption and chemical reactions) may contribute to attenuation, but dilution would be expected to be the main contributor in downgradient attenuation.

A 200,000 m² CAZ would extend radially, but predominantly northward from the septic system. As shown in Figure 1, the lateral flow direction could be interpreted to be from the southwest to the northeast.

There are two domestic water wells, MECP Well ID#4705985 (BH#10303893) and ID#4703863 (BH#10301817) that have total depths of 14.4 m and 16.2 m respectively, which are located within a 500 m radius of the proposed new septic system. It is uncertain that these wells are currently in use as they were both drilled prior to 1987 and appear to have ambiguous geographic coordinates within the database. The remaining nine well records indicate that all other water supply wells (domestic, municipal and livestock) are obtaining water from the deeper overburden or formational contact aquifers (with depths greater than 30.5 m bgs).

It is recommended that a groundwater quality monitoring program be established when the septic system is constructed and operated. The program should include the existing monitoring wells located on Site near the proposed septic bed and potentially the domestic water well on the school property (MECP Well ID #4701173 (BH ID# 10299147). The wells should be routinely monitored (i.e., at least once annually) with representative groundwater samples submitted for standard water quality analysis (including nitrate, nitrite and total ammonia). Field measurements of pH, temperature and conductivity are also recommended. Monitoring results should be assessed to determine impacts from the septic effluent. Due to the very low K values, the soil constituents observed, and our assessment, it is anticipated that the Site lithology is suitable to attenuate nitrate levels for both drinking water wells and surface water adjacent to the Site.

Study Limitations

WSP Canada Inc. ("WSP") prepared this report solely for the use of the intended recipient. This technical report is intended to be used in its entirety. No excerpts may be taken to be representative of the findings in the assessment.

The conclusions presented in this report are based on work performed by trained, professional and technical staff, in accordance with their reasonable interpretation of current and accepted engineering and scientific practices at the time the work was performed. The content and opinions contained in the present report are based on the observations and/or information available to WSP at the time of preparation, using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by WSP and other engineering/scientific practitioners working under similar conditions, and subject to the same time, financial and physical constraints applicable to this project.

References

Ministry of the Environment, Conservation and Parks (2021). Procedure B-7-1: Determination of Contaminant Limits and Attenuation Zones.

Ministry of the Environment, Conservation and Parks, Design Guidelines for Sewage Works, 2008.

Respectfully submitted,

WSP Canada Inc.

DRAFT

DRAFT

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Geoscientist
CNB/STH

Steve Hales, P.Geo.
Lead Hydrogeologist

CC: Arran Jeater, Stantec Consulting Ltd

Attachments: Table I – Summary of Groundwater Levels
Table II – Summary of Groundwater Quality
Figure 1 – Location Plan and Groundwater Contours
Figure 2 – MECP Water Well records for a 500-m Radius from Site
Appendix A – Record of Boreholes
Appendix B – Laboratory Certificate of Analysis
Appendix C – Results of Hydraulic Testing

Tables

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TABLE I

SUMMARY OF GROUNDWATER LEVELS

East Oxford Public School Proposed Septic Bed
Stantec Consulting Ltd.
505767 Old Stage Road
Woodstock, Ontario

MONITORING STATION	GROUND SURFACE ELEVATION (m amsl)	TOP OF PIPE ELEVATION (m amsl)	DRILLING DATE	Installation	GROUNDWATER ELEVATION (m amsl)	
					<u>Encountered</u>	<u>Apr. 25, 2024</u> <u>02-May-24</u>
BH-101	287.75	-	13-Mar-24	Borehole	DRY	-
BH-102	287.79	-	13-Mar-24	Borehole	285.76	-
MW-103	287.80	287.71	13-Mar-24	Monitoring Well	DRY	286.94
MW-104	287.81	287.72	13-Mar-24	Monitoring Well	287.05	286.73
MW-105	286.88	286.74	13-Mar-24	Monitoring Well	286.12	286.19
MW-106	286.95	286.86	13-Mar-24	Monitoring Well	285.43	285.89

NOTES:

1. For installation details, see Record of Borehole sheets.
2. For borehole locations, see Location Plan, Figure 1.
3. "-" Not applicable or not measured.
4. "mbgs" indicates metres below ground surface.
5. Table to be read in conjunction with accompanying report.

Prepared By: CNB
Checked By: DB

SUMMARY OF GROUNDWATER QUALITY

East Oxford Public School Septic Bed
Stantec Consulting Ltd.
505767 Old Stage Road
Woodstock, Ontario

			MW-103	MW-104	MW-105	MW-106	STANDARDS ⁽¹⁾ City of London Storm Sewer Discharge WM-16	STANDARDS ⁽²⁾ Oxford County By-law 6270	STANDARDS ⁽³⁾ PWQO
			02-May-24	02-May-24	02-May-24	02-May-24			
PARAMETER	UNITS	RDL	CONCENTRATION						
Calculated Parameters									
Total Animal/Vegetable Oil and Grease	mg/L	0.50	<0.50	<0.50	<0.50	<0.50	15	-	-
Inorganics									
Total BOD	mg/L	2	<2	<2	<2	<2	15.00	25.00	-
Total Chlorine	mg/L	0.1*	<0.1	<0.1	<0.1	-	1.0	1.0	0.002
Fluoride (F-)	mg/L	0.10	0.17	<0.10	<0.10	<0.10	2.0	2.0	-
pH	pH	-	7.74	7.58	7.64	7.55	6.0 - 10.5	6.0 - 9.0	6.5 -8.5
Phenols-4AAP	mg/L	0.0010	0.0013	<0.0010	<0.0010	0.0013	0.02	-	0.001
Total Suspended Solids	mg/L	10 - 1200*	7,700	1,400	1,200	510	15	15	-
Dissolved Sulphate (SO4)	mg/L	1.0	15.0	3.30	2.40	220.0	1,500	1,500	-
Total Cyanide (CN)	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	0.1	0.1	-
Dissolved Chloride (Cl-)	mg/L	1.0	2.8	3.5	5.9	51.0	1,500	1,500	-
Petroleum Hydrocarbons									
Total Oil & Grease	mg/L	0.50	<0.50	<0.50	<0.50	<0.50	-	-	-
Total Oil & Grease Mineral/Synthetic	mg/L	0.50	<0.50	<0.50	<0.50	<0.50	15	-	-
Inorganics									
Total Ammonia-N	mg/L	0.050	<0.050	<0.050	<0.050	0.07	-	-	-
Total Kjeldahl Nitrogen (TKN)	mg/L	0.10 - 0.20	0.81	0.36	0.50	0.58	-	-	-
Nitrite (N)	mg/L	0.010	<0.010	<0.010	<0.010	0.02	-	-	-
Nitrate (N)	mg/L	0.10	0.97	<0.10	<0.10	0.58	-	-	-
Nitrate + Nitrite (N)	mg/L	0.10	0.97	<0.10	<0.10	0.60	-	-	-
Metals									
Total Mercury (Hg)	mg/L	0.00010 - 0.0015*	<0.0015	<0.00010	<0.00010	<0.00010	0.001	0.001	-
Total Aluminum (Al)	µg/L	49	43,000	55,000	45,000	25,000	1,000	1,000	75
Total Antimony (Sb)	µg/L	5.0	<5.0	<5.0	<5.0	<5.0	-	-	20
Total Arsenic (As)	µg/L	10	12	17	18	<10	200	200	5 - 100 ⁴
Total Barium (Ba)	µg/L	20	460	470	490	330	100	-	-
Total Beryllium (Be)	µg/L	4.0	<4.0	<4.0	<4.0	<4.0	1,000	-	1,100
Total Bismuth (Bi)	µg/L	10	<10	<10	<10	<10	-	-	-
Total Boron (B)	µg/L	100	160	<100	<100	<100	-	-	200
Total Cadmium (Cd)	µg/L	0.90*	<0.90	<0.90	<0.90	<0.90	8	1	0.2
Total Calcium (Ca)	µg/L	2,000	310,000	330,000	330,000	370,000	-	-	-
Total Chromium (Cr)	µg/L	50	54	70	62	<50	200	200	-
Total Cobalt (Co)	µg/L	5.0*	26	34	29	18	-	-	0.9
Total Copper (Cu)	µg/L	9*	70	100	130	57	40	40	5
Total Iron (Fe)	µg/L	1000*	59,000	81,000	69,000	38,000	1,000	1,000	300
Total Lead (Pb)	µg/L	5.0	39	42	31	31	120	50	5
Total Lithium (Li)	µg/L	50	59	86	76	<50	-	-	-
Total Magnesium (Mg)	µg/L	500	66,000	70,000	63,000	82,000	-	-	-
Total Manganese (Mn)	µg/L	20	1,900	2,100	1,700	1,700	1,000	-	-
Total Molybdenum (Mo)	µg/L	5.0	<5.0	<5.0	<5.0	<5.0	-	-	40
Total Nickel (Ni)	µg/L	10	54	76	66	39	80	50	25
Total Phosphorus (P)	µg/L	1000*	1,700	2,000	1,600	1,400	400	400	-
Total Potassium (K)	µg/L	2,000	13,000	17,000	16,000	12,000	-	-	-
Total Selenium (Se)	µg/L	20	<20	<20	<20	<20	200	200	100
Total Silicon (Si)	µg/L	500	59,000	79,000	66,000	40,000	-	-	-
Total Silver (Ag)	µg/L	0.90	<0.90	<0.90	<0.90	<0.90	120	120	0.1
Total Sodium (Na)	µg/L	1,000	13,000	7,500	8,600	19,000	-	-	-
Total Strontium (Sr)	µg/L	10	560	610	640	720	-	-	-
Total Tellurium (Te)	µg/L	10	<10	<10	<10	<10	-	-	-
Total Thallium (Tl)	µg/L	0.50*	0.6	0.8	0.7	<0.50	-	-	0.3
Total Tin (Sn)	µg/L	10	<10	<10	<10	<10	1,000	1,000	-
Total Titanium (Ti)	µg/L	50	940	1,500	1,300	630	-	-	-
Total Tungsten (W)	µg/L	10	<10	<10	<10	<10	-	-	30
Total Uranium (U)	µg/L	1.0	3.3	2.5	2.6	5.9	-	-	5
Total Vanadium (V)	µg/L	5.0	81	100	83	54	-	-	6
Total Zinc (Zn)	µg/L	50*	220	270	250	150	50	50	20-30 ⁴
Total Zirconium (Zr)	µg/L	10*	<10	<10	<10	<10	-	-	4

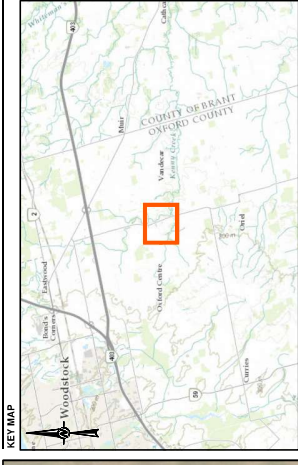
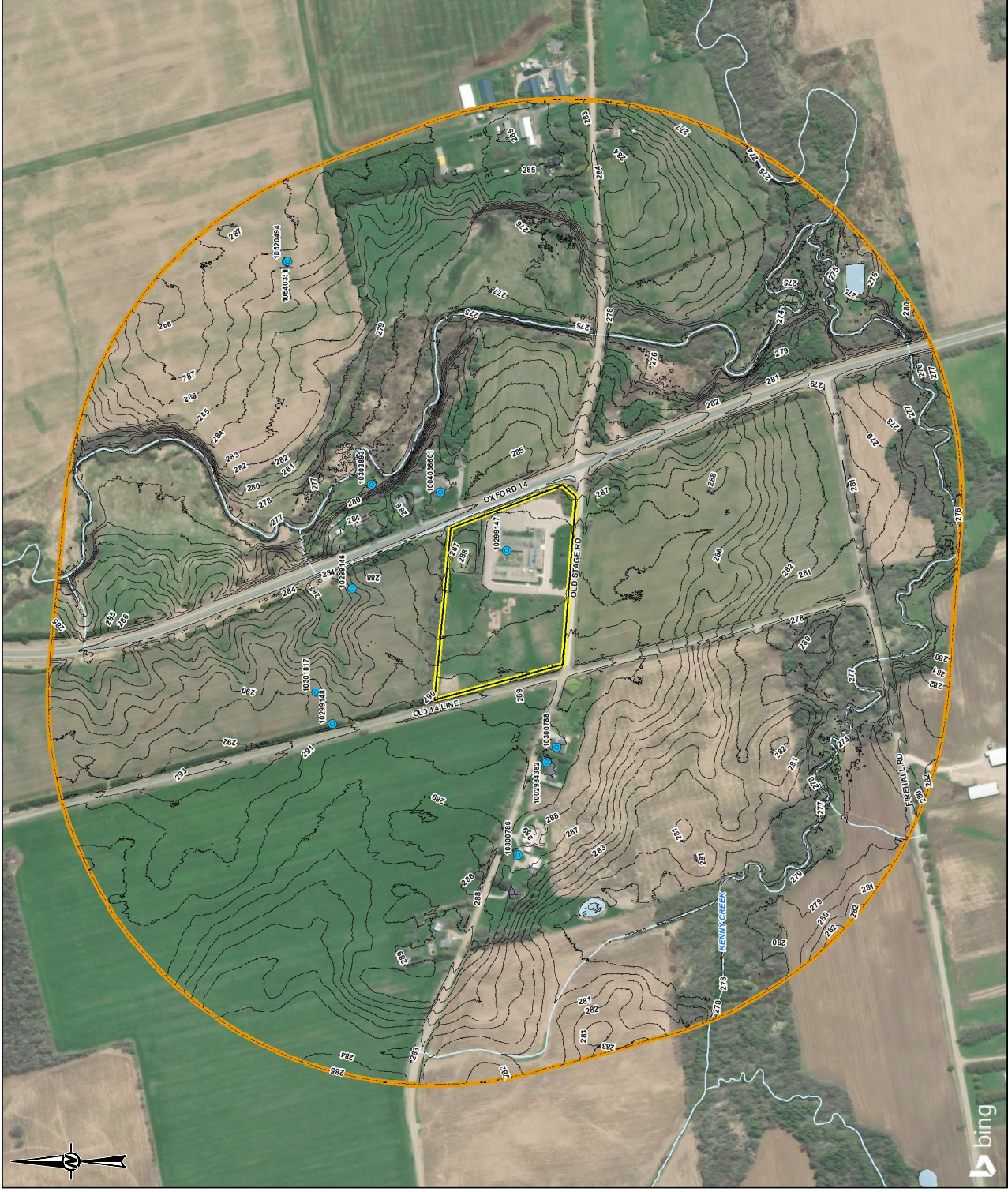
Notes:

- City of London Storm Sewer Use By-Law (London Waste Discharge WM-16, March 29, 2010).
- County of Oxford By-Law - Schedule "E" Storm Sewers
- Provincial Water Quality Objectives (PWQO) of the Ministry of the Environment, July 1994.
- Bold** indicates exceedance of London Storm Sewer.
- Italics* indicates exceedance of Oxford By-Law.
- Underlined indicates exceedance of PWQO.
- "*" indicates RDL exceeds criteria.
- "-" Not applicable or not measured.
- "1" both an PWQO and interim PWQO exist
- Table to be read in conjunction with accompanying report.

Prepared By: CNB
Checked By: DB

Figures

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- LEGEND**
- MECP WATERWELL LOCATIONS
 - CONTOUR (1M INTERVAL)
 - WATERCOURSE
 - WATERBODY
 - SITE BOUNDARY
 - 500M STUDY AREA

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NOTES

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCES

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3. COORDINATE SYSTEM: NAD 83 UTM ZONE 17N

CLIENT

THAMES VALLEY DISTRICT SCHOOL BOARD

PROJECT

EAST OXFORD PUBLIC SCHOOL SEPTIC BED,
WOODSTOCK, ONTARIO

TITLE

MECP WATER WELL LOCATION PLAN

CONSULTANT	YYYY-MM-DD	2024-05-07
DESIGNED	---	---
PREPARED	GU	---
REVIEWED	---	---
APPROVED	---	---

PROJECT NO. CA0021057.5477

CONTROL REV. A

FIGURE 2

APPENDIX A

Record of Boreholes

DRAFT

PROJECT: CA00221057.5477

LOCATION: N 4772107.26; E 529391.15

RECORD OF BOREHOLE: BH-101

SHEET 1 OF 1

BORING DATE: March 13, 2024

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DRILL RIG: Track-Mounted Diedrich D50 Turbo

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m												
								SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT							
								20	40	60	80	nat V. rem V.	+ ⊕	Q - U -	● ○			10 ⁻⁶	10 ⁻⁵
								20	40	60	80								
0		GROUND SURFACE		287.75															
	Power Auger 152 mm Diam. (Hollow Stem)	FILL - gravelly SAND, trace silt; brown; moist, compact		0.00	1	SS	18												
		(ML) sandy CLAYEY SILT, some gravel; brown; moist, stiff to very stiff		287.14															
				0.61															
1					2	SS	16												
2					3	SS	20												
						4	SS	23											
3		- grey																	
					5	SS	14												
		(CL) sandy SILTY CLAY, some gravel; grey; stiff		284.09															
				3.66															
4					6	SS	10												
5					7	SS	12												
		- sand lens at 5.49 m																	
		- lens with increased gravel content at 5.79 m		281.81															
				5.94															
6		END OF BOREHOLE																	
		Note(s): 1. Borehole dry upon completion of drilling.																	
7																			
8																			
9																			
10																			

DEPTH SCALE

1 : 50



LOGGED: DB

CHECKED:

PROJECT: CA00221057.5477
LOCATION: N 4772124.72; E 529344.64

RECORD OF BOREHOLE: BH-102

SHEET 1 OF 1
DATUM: Geodetic

BORING DATE: March 13, 2024

DRILL RIG: Track-Mounted Diedrich D50 Turbo

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa		WATER CONTENT PERCENT						
								20	40	60	80	10 ⁻⁶	10 ⁻⁵			10 ⁻⁴
0	Solid stem Auger 152 mm Diam., (Hollow Stem)	GROUND SURFACE		287.79 0.00												
1		TOPSOIL - sandy SILT, trace clay, trace organics; dark brown; moist, loose			1	SS	6									
		(CL) sandy SILTY CLAY, trace gravel; mottled brown; moist, firm to stiff		287.03 0.76		2	SS	19								
2				3	SS	7										
3		(ML) sandy CLAYEY SILT, some gravel; brown; moist, stiff to very stiff		285.50 2.29		4	SS	16								
				5	SS	17										
4	(CL) SILTY CLAY, some sand, trace gravel; grey; wet, stiff		284.13 3.66													
				6	SS	14										
5		END OF BOREHOLE		283.37 4.42												
6		Note(s): 1. Groundwater encountered at depths of 2.03 m and 4.37 m during drilling on March 13, 2024.														
7																
8																
9																
10																

DEPTH SCALE

1 : 50



LOGGED: BN/RN

CHECKED:

PROJECT: CA00221057.5477
LOCATION: N 4772123.69; E 529302.29

RECORD OF BOREHOLE: MW-103

SHEET 1 OF 1
DATUM: Geodetic

BORING DATE: March 13, 2024

DRILL RIG: Track-Mounted Diedrich D50 Turbo

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
								SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80						
									20	40	60	80					
0		GROUND SURFACE		287.80													
		TOPSOIL - sandy CLAYEY SILT, trace organics; dark brown; moist, loose		0.00	1	SS	5										Flush Mount Casing
		(SM) SILTY SAND; brown; moist, compact		287.04													Bentonite
1		(ML) sandy CLAYEY SILT, trace to some gravel; brown; moist, stiff		0.76	2	SS	12										
				0.84													
		- some small sand lenses from 1.52 m to 2.13 m			3	SS	15										Silica sand
2																	

DEPTH SCALE

1 : 50



LOGGED: BN/RN

CHECKED:

PROJECT: CA00221057.5477
LOCATION: N 4772148.91; E 529269.49

RECORD OF BOREHOLE: MW-104

SHEET 1 OF 1
DATUM: Geodetic

BORING DATE: March 13, 2024

DRILL RIG: Track-Mounted Diedrich D50 Turbo

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
								SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80						
0		GROUND SURFACE		287.81													
	Power Auger 152 mm Diam. (Hollow Stem)	TOPSOIL - SILTY SAND, trace gravel; dark brown; moist loose		0.00	1	SS	5										
				287.20													
		(SM) SILTY SAND; brown; wet, very loose		0.61	2A	SS	3										
1					2B												
					286.29												
		(CL) sandy SILTY CLAY, some gravel; brown; moist, stiff to very stiff		1.52	3	SS	11										
2																	
					4	SS	14										
3																	
		- grey			5	SS	21										
				284.15													
				3.66													
4		END OF BOREHOLE															
		Note(s):															
		1. Groundwater encountered at depth of 0.76 m during drilling on March 13, 2024.															
5																	
6																	
7																	
8																	
9																	
10																	

DEPTH SCALE

1 : 50



LOGGED: BN/RN

CHECKED:

PROJECT: CA00221057.5477
LOCATION: N 4772163.88; E 529304.32

RECORD OF BOREHOLE: MW-105

SHEET 1 OF 1
DATUM: Geodetic

BORING DATE: March 13, 2024

DRILL RIG: Track-Mounted Diedrich D50 Turbo

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION			
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m												
								SHEAR STRENGTH Cu, kPa		nat V. + rem V. ⊕		Q - ● U - ○		WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴			10 ⁻³	Wp	W
								20	40	60	80								
0		GROUND SURFACE		286.88															
	Power Auger 152 mm Diam. (Hollow Stem)	TOPSOIL - sandy SILT, trace organics; dark brown; moist		0.00	1	SS	5												
		(CL) SILTY CLAY, some sand; brown; wet		0.76	2A	SS	5												
1																			
		(CH) CLAY, some gravel; brown; moist, firm to very stiff		1.07	2B														
2					3	SS	16												
					4	SS	18												
3																			
		- grey			5	SS	18												
				283.22															
				3.66															
4		END OF BOREHOLE																	
		Note(s):																	
		1. Groundwater encountered at depth of 0.76 m during drilling on March 13, 2024.																	
5																			
6																			
7																			
8																			
9																			
10																			

DEPTH SCALE

1 : 50



LOGGED: BN/RN

CHECKED:

PROJECT: CA00221057.5477
LOCATION: N 4772143.03; E 529331.54

RECORD OF BOREHOLE: MW-106

SHEET 1 OF 1
DATUM: Geodetic

BORING DATE: March 13, 2024

DRILL RIG: Track-Mounted Diedrich D50 Turbo

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	RESISTANCE				CONDUCTIVITY					
								SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ U - ○		WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴			10 ⁻³
								20	40	60	80	20	40	60	80		
0		GROUND SURFACE		286.95													
	Power Auger 152 mm Diam. (Hollow Stem)	TOPSOIL - sandy SILT, trace organics; dark brown; moist		0.00	1	SS	7										
1		(CL) sandy SILTY CLAY, some gravel; brown; moist, stiff		286.19 0.76	2	SS	8										
2		(ML) sandy CLAYEY SILT, some gravel; brown; moist, stiff to very stiff		285.43 1.52	3	SS	13										

DEPTH SCALE

1 : 50



LOGGED: BN/RN

CHECKED:

APPENDIX B

Laboratory Certificate of Analysis

DRAFT



Your Project #: CA0021057.5477
Site Location: EAST OXFORD PS
Your C.O.C. #: C#989033-01-01

Attention: Candace Bocking

WSP Canada Inc.
309 Exeter Rd
Unit 1
London, ON
CANADA N6L 1C1

Report Date: 2024/05/17
Report #: R8153094
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C4D3464

Received: 2024/05/03, 09:37

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Biochemical Oxygen Demand (BOD)	4	2024/05/05	2024/05/10	CAM SOP-00427	SM 24 5210B m
Total Residual Chlorine	3	2024/05/06	2024/05/06	CAM SOP 00425	SM 24 4500-CL G m
Chloride by Automated Colourimetry	4	N/A	2024/05/08	CAM SOP-00463	SM 24 4500-CL E m
Total Cyanide	1	2024/05/06	2024/05/06	CAM SOP-00457	OMOE E3015 5 m
Total Cyanide	3	2024/05/07	2024/05/07	CAM SOP-00457	OMOE E3015 5 m
Fluoride	4	2024/05/06	2024/05/06	CAM SOP-00449	SM 24 4500-F C m
Mercury in Water by CVAA	1	2024/05/07	2024/05/07	CAM SOP-00453	EPA 7470A m
Mercury in Water by CVAA	3	2024/05/08	2024/05/08	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by ICPMS	4	2024/05/07	2024/05/07	CAM SOP-00447	EPA 6020B m
Total Ammonia-N	4	N/A	2024/05/07	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (1)	4	N/A	2024/05/07	CAM SOP-00440	SM 24 4500-NO3I/NO2B
Animal and Vegetable Oil and Grease	4	N/A	2024/05/05	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	4	2024/05/05	2024/05/05	CAM SOP-00326	EPA1664B m,SM5520B m
Phenols (4AAP)	4	N/A	2024/05/16	CAM SOP-00444	OMOE E3179 m
pH	4	2024/05/06	2024/05/06	CAM SOP-00413	SM 24th-4500H+ B
Sulphate by Automated Turbidimetry	4	N/A	2024/05/08	CAM SOP-00464	SM 24 4500-SO42- E m
Total Kjeldahl Nitrogen in Water	2	2024/05/06	2024/05/07	CAM SOP-00938	OMOE E3516 m
Total Kjeldahl Nitrogen in Water	2	2024/05/06	2024/05/08	CAM SOP-00938	OMOE E3516 m
Mineral/Synthetic O & G (TPH Heavy Oil) (2)	4	2024/05/05	2024/05/05	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	4	2024/05/06	2024/05/07	CAM SOP-00428	SM 24 2540D m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, EPA, APHA or the Quebec Ministry of Environment.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.



Your Project #: CA0021057.5477
Site Location: EAST OXFORD PS
Your C.O.C. #: C#989033-01-01

Attention: Candace Bocking

WSP Canada Inc.
309 Exeter Rd
Unit 1
London, ON
CANADA N6L 1C1

Report Date: 2024/05/17
Report #: R8153094
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C4D3464

Received: 2024/05/03, 09:37

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

(2) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Encryption Key

Christine Gripton
Senior Project Manager
17 May 2024 12:29:57

Please direct all questions regarding this Certificate of Analysis to:

Christine Gripton, Senior Project Manager
Email: Christine.Gripton@bureauveritas.com
Phone# (519)652-9444

=====

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.



BUREAU
VERITAS

Bureau Veritas Job #: C4D3464
Report Date: 2024/05/17

WSP Canada Inc.
Client Project #: CA0021057.5477
Site Location: EAST OXFORD PS
Sampler Initials: DB

LONDON STORM SEWER BYLAW (WM-16)

Bureau Veritas ID		ZBR897			ZBR897		
Sampling Date		2024/05/02 15:20			2024/05/02 15:20		
COC Number		C#989033-01-01			C#989033-01-01		
	UNITS	MW103	RDL	QC Batch	MW103 Lab-Dup	RDL	QC Batch
Calculated Parameters							
Total Animal/Vegetable Oil and Grease	mg/L	<0.50	0.50	9374273			
Inorganics							
Total BOD	mg/L	<2	2	9374694			
Total Chlorine	mg/L	<0.1	0.1	9375481	<0.1	0.1	9375481
Fluoride (F-)	mg/L	0.17	0.10	9374947			
pH	pH	7.74		9374905			
Total Suspended Solids	mg/L	7700	100	9375085			
Dissolved Sulphate (SO4)	mg/L	15	1.0	9375385			
Total Cyanide (CN)	mg/L	<0.0050	0.0050	9377013			
Dissolved Chloride (Cl-)	mg/L	2.8	1.0	9375383			
Petroleum Hydrocarbons							
Total Oil & Grease	mg/L	<0.50	0.50	9374544			
Total Oil & Grease Mineral/Synthetic	mg/L	<0.50	0.50	9374545			
Metals							
Mercury (Hg)	mg/L	<0.0015	0.0015	9377551			
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate							



BUREAU
VERITAS

Bureau Veritas Job #: C4D3464
Report Date: 2024/05/17

WSP Canada Inc.
Client Project #: CA0021057.5477
Site Location: EAST OXFORD PS
Sampler Initials: DB

LONDON STORM SEWER BYLAW (WM-16)

Bureau Veritas ID		ZBR898			ZBR898		
Sampling Date		2024/05/02 16:01			2024/05/02 16:01		
COC Number		C#989033-01-01			C#989033-01-01		
	UNITS	MW104	RDL	QC Batch	MW104 Lab-Dup	RDL	QC Batch
Calculated Parameters							
Total Animal/Vegetable Oil and Grease	mg/L	<0.50	0.50	9374273			
Inorganics							
Total BOD	mg/L	<2	2	9374694			
Total Chlorine	mg/L	<0.1	0.1	9375481			
Fluoride (F-)	mg/L	<0.10	0.10	9374947	<0.10	0.10	9374947
pH	pH	7.58		9374905	7.56		9374905
Total Suspended Solids	mg/L	1400	20	9375085			
Dissolved Sulphate (SO ₄)	mg/L	3.3	1.0	9375385			
Total Cyanide (CN)	mg/L	<0.0050	0.0050	9377013			
Dissolved Chloride (Cl-)	mg/L	3.5	1.0	9375383			
Petroleum Hydrocarbons							
Total Oil & Grease	mg/L	<0.50	0.50	9374547			
Total Oil & Grease Mineral/Synthetic	mg/L	<0.50	0.50	9374555			
Metals							
Mercury (Hg)	mg/L	<0.00010	0.00010	9379830			
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate							



BUREAU
VERITAS

Bureau Veritas Job #: C4D3464

Report Date: 2024/05/17

WSP Canada Inc.

Client Project #: CA0021057.5477

Site Location: EAST OXFORD PS

Sampler Initials: DB

LONDON STORM SEWER BYLAW (WM-16)

Bureau Veritas ID		ZBR899			ZBR900		
Sampling Date		2024/05/02 16:42			2024/05/02 17:10		
COC Number		C#989033-01-01			C#989033-01-01		
	UNITS	MW105	RDL	QC Batch	MW106	RDL	QC Batch
Calculated Parameters							
Total Animal/Vegetable Oil and Grease	mg/L	<0.50	0.50	9374273	<0.50	0.50	9374273
Inorganics							
Total BOD	mg/L	<2	2	9374694	<2	2	9374694
Total Chlorine	mg/L	<0.1	0.1	9375481			
Fluoride (F-)	mg/L	<0.10	0.10	9374947	<0.10	0.10	9374947
pH	pH	7.64		9374905	7.55		9374905
Total Suspended Solids	mg/L	1200	25	9375085	510	10	9375085
Dissolved Sulphate (SO4)	mg/L	2.4	1.0	9375385	220	1.0	9375385
Total Cyanide (CN)	mg/L	<0.0050	0.0050	9377013	<0.0050	0.0050	9376272
Dissolved Chloride (Cl-)	mg/L	5.9	1.0	9375383	51	1.0	9375383
Petroleum Hydrocarbons							
Total Oil & Grease	mg/L	<0.50	0.50	9374547	<0.50	0.50	9374547
Total Oil & Grease Mineral/Synthetic	mg/L	<0.50	0.50	9374555	<0.50	0.50	9374555
Metals							
Mercury (Hg)	mg/L	<0.00010	0.00010	9379830	<0.00010	0.00010	9379830
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							

Bureau Veritas ID		ZBR900		
Sampling Date		2024/05/02 17:10		
COC Number		C#989033-01-01		
	UNITS	MW106 Lab-Dup	RDL	QC Batch
Inorganics				
Total Cyanide (CN)	mg/L	<0.0050	0.0050	9376272
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				
Lab-Dup = Laboratory Initiated Duplicate				



BUREAU
VERITAS

Bureau Veritas Job #: C4D3464

Report Date: 2024/05/17

WSP Canada Inc.

Client Project #: CA0021057.5477

Site Location: EAST OXFORD PS

Sampler Initials: DB

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		ZBR897		ZBR898			ZBR898		
Sampling Date		2024/05/02 15:20		2024/05/02 16:01			2024/05/02 16:01		
COC Number		C#989033-01-01		C#989033-01-01			C#989033-01-01		
	UNITS	MW103	RDL	MW104	RDL	QC Batch	MW104 Lab-Dup	RDL	QC Batch
Inorganics									
Total Ammonia-N	mg/L	<0.050	0.050	<0.050	0.050	9376276			
Total Kjeldahl Nitrogen (TKN)	mg/L	0.81	0.20	0.36	0.10	9376151			
Phenols-4AAP	mg/L	0.0013	0.0010	<0.0010	0.0010	9397555			
Nitrite (N)	mg/L	<0.010	0.010	<0.010	0.010	9375251	<0.010	0.010	9375251
Nitrate (N)	mg/L	0.97	0.10	<0.10	0.10	9375251	<0.10	0.10	9375251
Nitrate + Nitrite (N)	mg/L	0.97	0.10	<0.10	0.10	9375251	<0.10	0.10	9375251
RDL = Reportable Detection Limit									
QC Batch = Quality Control Batch									
Lab-Dup = Laboratory Initiated Duplicate									

Bureau Veritas ID		ZBR899		ZBR900		
Sampling Date		2024/05/02 16:42		2024/05/02 17:10		
COC Number		C#989033-01-01		C#989033-01-01		
	UNITS	MW105	RDL	MW106	RDL	QC Batch
Inorganics						
Total Ammonia-N	mg/L	<0.050	0.050	0.066	0.050	9376276
Total Kjeldahl Nitrogen (TKN)	mg/L	0.50	0.10	0.58	0.20	9376151
Phenols-4AAP	mg/L	<0.0010	0.0010	0.0013	0.0010	9397555
Nitrite (N)	mg/L	<0.010	0.010	0.019	0.010	9375251
Nitrate (N)	mg/L	<0.10	0.10	0.58	0.10	9375251
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	0.60	0.10	9375251
RDL = Reportable Detection Limit						
QC Batch = Quality Control Batch						



BUREAU
VERITAS

Bureau Veritas Job #: C4D3464

Report Date: 2024/05/17

WSP Canada Inc.

Client Project #: CA0021057.5477

Site Location: EAST OXFORD PS

Sampler Initials: DB

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		ZBR897	ZBR898	ZBR899	ZBR900		
Sampling Date		2024/05/02 15:20	2024/05/02 16:01	2024/05/02 16:42	2024/05/02 17:10		
COC Number		C#989033-01-01	C#989033-01-01	C#989033-01-01	C#989033-01-01		
	UNITS	MW103	MW104	MW105	MW106	RDL	QC Batch
Metals							
Total Aluminum (Al)	ug/L	43000	55000	45000	25000	49	9377289
Total Antimony (Sb)	ug/L	<5.0	<5.0	<5.0	<5.0	5.0	9377289
Total Arsenic (As)	ug/L	12	17	18	<10	10	9377289
Total Barium (Ba)	ug/L	460	470	490	330	20	9377289
Total Beryllium (Be)	ug/L	<4.0	<4.0	<4.0	<4.0	4.0	9377289
Total Bismuth (Bi)	ug/L	<10	<10	<10	<10	10	9377289
Total Boron (B)	ug/L	160	<100	<100	<100	100	9377289
Total Cadmium (Cd)	ug/L	<0.90	<0.90	<0.90	<0.90	0.90	9377289
Total Calcium (Ca)	ug/L	310000	330000	330000	370000	2000	9377289
Total Chromium (Cr)	ug/L	54	70	62	<50	50	9377289
Total Cobalt (Co)	ug/L	26	34	29	18	5.0	9377289
Total Copper (Cu)	ug/L	70	100	130	57	9.0	9377289
Total Iron (Fe)	ug/L	59000	81000	69000	38000	1000	9377289
Total Lead (Pb)	ug/L	39	42	31	31	5.0	9377289
Total Lithium (Li)	ug/L	59	86	76	<50	50	9377289
Total Magnesium (Mg)	ug/L	66000	70000	63000	82000	500	9377289
Total Manganese (Mn)	ug/L	1900	2100	1700	1700	20	9377289
Total Molybdenum (Mo)	ug/L	<5.0	<5.0	<5.0	<5.0	5.0	9377289
Total Nickel (Ni)	ug/L	54	76	66	39	10	9377289
Total Phosphorus (P)	ug/L	1700	2000	1600	1400	1000	9377289
Total Potassium (K)	ug/L	13000	17000	16000	12000	2000	9377289
Total Selenium (Se)	ug/L	<20	<20	<20	<20	20	9377289
Total Silicon (Si)	ug/L	59000	79000	66000	40000	500	9377289
Total Silver (Ag)	ug/L	<0.90	<0.90	<0.90	<0.90	0.90	9377289
Total Sodium (Na)	ug/L	13000	7500	8600	19000	1000	9377289
Total Strontium (Sr)	ug/L	560	610	640	720	10	9377289
Total Tellurium (Te)	ug/L	<10	<10	<10	<10	10	9377289
Total Thallium (Tl)	ug/L	0.63	0.79	0.66	<0.50	0.50	9377289
Total Tin (Sn)	ug/L	<10	<10	<10	<10	10	9377289
Total Titanium (Ti)	ug/L	940	1500	1300	630	50	9377289
Total Tungsten (W)	ug/L	<10	<10	<10	<10	10	9377289
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							



BUREAU
VERITAS

Bureau Veritas Job #: C4D3464

Report Date: 2024/05/17

WSP Canada Inc.

Client Project #: CA0021057.5477

Site Location: EAST OXFORD PS

Sampler Initials: DB

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		ZBR897	ZBR898	ZBR899	ZBR900		
Sampling Date		2024/05/02 15:20	2024/05/02 16:01	2024/05/02 16:42	2024/05/02 17:10		
COC Number		C#989033-01-01	C#989033-01-01	C#989033-01-01	C#989033-01-01		
	UNITS	MW103	MW104	MW105	MW106	RDL	QC Batch
Total Uranium (U)	ug/L	3.3	2.5	2.6	5.9	1.0	9377289
Total Vanadium (V)	ug/L	81	100	83	54	5.0	9377289
Total Zinc (Zn)	ug/L	220	270	250	150	50	9377289
Total Zirconium (Zr)	ug/L	<10	<10	<10	<10	10	9377289
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							



BUREAU
VERITAS

Bureau Veritas Job #: C4D3464

Report Date: 2024/05/17

WSP Canada Inc.

Client Project #: CA0021057.5477

Site Location: EAST OXFORD PS

Sampler Initials: DB

TEST SUMMARY

Bureau Veritas ID: ZBR897
Sample ID: MW103
Matrix: Water

Collected: 2024/05/02
Shipped:
Received: 2024/05/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	9374694	2024/05/05	2024/05/10	Frank Zhang
Total Residual Chlorine	SPEC	9375481	2024/05/06	2024/05/06	Taslina Aktar
Chloride by Automated Colourimetry	SKAL	9375383	N/A	2024/05/08	Massarat Jan
Total Cyanide	SKAL/CN	9377013	2024/05/07	2024/05/07	Prgya Panchal
Fluoride	ISE	9374947	2024/05/06	2024/05/06	Surinder Rai
Mercury in Water by CVAA	CV/AA	9377551	2024/05/07	2024/05/07	Gagandeep Rai
Total Metals Analysis by ICPMS	ICP/MS	9377289	2024/05/07	2024/05/07	Azita Fazaeli
Total Ammonia-N	LACH/NH4	9376276	N/A	2024/05/07	Yogesh Patel
Nitrate & Nitrite as Nitrogen in Water	LACH	9375251	N/A	2024/05/07	Jinal Chavda
Animal and Vegetable Oil and Grease	BAL	9374273	N/A	2024/05/05	Automated Statchk
Total Oil and Grease	BAL	9374544	2024/05/05	2024/05/05	Navneet Singh
Phenols (4AAP)	TECH/PHEN	9397555	N/A	2024/05/16	Chandra Nandlal
pH	AT	9374905	2024/05/06	2024/05/06	Surinder Rai
Sulphate by Automated Turbidimetry	SKAL	9375385	N/A	2024/05/08	Massarat Jan
Total Kjeldahl Nitrogen in Water	SKAL	9376151	2024/05/06	2024/05/08	Rajni Tyagi
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	9374545	2024/05/05	2024/05/05	Navneet Singh
Total Suspended Solids	BAL	9375085	2024/05/06	2024/05/07	Razieh Tabesh

Bureau Veritas ID: ZBR897 Dup
Sample ID: MW103
Matrix: Water

Collected: 2024/05/02
Shipped:
Received: 2024/05/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Residual Chlorine	SPEC	9375481	2024/05/06	2024/05/06	Taslina Aktar

Bureau Veritas ID: ZBR898
Sample ID: MW104
Matrix: Water

Collected: 2024/05/02
Shipped:
Received: 2024/05/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	9374694	2024/05/05	2024/05/10	Frank Zhang
Total Residual Chlorine	SPEC	9375481	2024/05/06	2024/05/06	Taslina Aktar
Chloride by Automated Colourimetry	SKAL	9375383	N/A	2024/05/08	Massarat Jan
Total Cyanide	SKAL/CN	9377013	2024/05/07	2024/05/07	Prgya Panchal
Fluoride	ISE	9374947	2024/05/06	2024/05/06	Surinder Rai
Mercury in Water by CVAA	CV/AA	9379830	2024/05/08	2024/05/08	Gagandeep Rai
Total Metals Analysis by ICPMS	ICP/MS	9377289	2024/05/07	2024/05/07	Azita Fazaeli
Total Ammonia-N	LACH/NH4	9376276	N/A	2024/05/07	Yogesh Patel
Nitrate & Nitrite as Nitrogen in Water	LACH	9375251	N/A	2024/05/07	Jinal Chavda
Animal and Vegetable Oil and Grease	BAL	9374273	N/A	2024/05/05	Automated Statchk
Total Oil and Grease	BAL	9374547	2024/05/05	2024/05/05	Akshdeep Singh
Phenols (4AAP)	TECH/PHEN	9397555	N/A	2024/05/16	Chandra Nandlal
pH	AT	9374905	2024/05/06	2024/05/06	Surinder Rai
Sulphate by Automated Turbidimetry	SKAL	9375385	N/A	2024/05/08	Massarat Jan



BUREAU
VERITAS

Bureau Veritas Job #: C4D3464

Report Date: 2024/05/17

WSP Canada Inc.

Client Project #: CA0021057.5477

Site Location: EAST OXFORD PS

Sampler Initials: DB

TEST SUMMARY

Bureau Veritas ID: ZBR898
Sample ID: MW104
Matrix: Water

Collected: 2024/05/02
Shipped:
Received: 2024/05/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Kjeldahl Nitrogen in Water	SKAL	9376151	2024/05/06	2024/05/07	Rajni Tyagi
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	9374555	2024/05/05	2024/05/05	Akshdeep Singh
Total Suspended Solids	BAL	9375085	2024/05/06	2024/05/07	Razieh Tabesh

Bureau Veritas ID: ZBR898 Dup
Sample ID: MW104
Matrix: Water

Collected: 2024/05/02
Shipped:
Received: 2024/05/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Fluoride	ISE	9374947	2024/05/06	2024/05/06	Surinder Rai
Nitrate & Nitrite as Nitrogen in Water	LACH	9375251	N/A	2024/05/07	Jinal Chavda
pH	AT	9374905	2024/05/06	2024/05/06	Surinder Rai

Bureau Veritas ID: ZBR899
Sample ID: MW105
Matrix: Water

Collected: 2024/05/02
Shipped:
Received: 2024/05/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	9374694	2024/05/05	2024/05/10	Frank Zhang
Total Residual Chlorine	SPEC	9375481	2024/05/06	2024/05/06	Taslina Aktar
Chloride by Automated Colourimetry	SKAL	9375383	N/A	2024/05/08	Massarat Jan
Total Cyanide	SKAL/CN	9377013	2024/05/07	2024/05/07	Prgya Panchal
Fluoride	ISE	9374947	2024/05/06	2024/05/06	Surinder Rai
Mercury in Water by CVAA	CV/AA	9379830	2024/05/08	2024/05/08	Gagandeep Rai
Total Metals Analysis by ICPMS	ICP/MS	9377289	2024/05/07	2024/05/07	Azita Fazaeli
Total Ammonia-N	LACH/NH4	9376276	N/A	2024/05/07	Yogesh Patel
Nitrate & Nitrite as Nitrogen in Water	LACH	9375251	N/A	2024/05/07	Jinal Chavda
Animal and Vegetable Oil and Grease	BAL	9374273	N/A	2024/05/05	Automated Statchk
Total Oil and Grease	BAL	9374547	2024/05/05	2024/05/05	Akshdeep Singh
Phenols (4AAP)	TECH/PHEN	9397555	N/A	2024/05/16	Chandra Nandlal
pH	AT	9374905	2024/05/06	2024/05/06	Surinder Rai
Sulphate by Automated Turbidimetry	SKAL	9375385	N/A	2024/05/08	Massarat Jan
Total Kjeldahl Nitrogen in Water	SKAL	9376151	2024/05/06	2024/05/07	Rajni Tyagi
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	9374555	2024/05/05	2024/05/05	Akshdeep Singh
Total Suspended Solids	BAL	9375085	2024/05/06	2024/05/07	Razieh Tabesh

Bureau Veritas ID: ZBR900
Sample ID: MW106
Matrix: Water

Collected: 2024/05/02
Shipped:
Received: 2024/05/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	9374694	2024/05/05	2024/05/10	Frank Zhang
Chloride by Automated Colourimetry	SKAL	9375383	N/A	2024/05/08	Massarat Jan
Total Cyanide	SKAL/CN	9376272	2024/05/06	2024/05/06	Chloe Pollock



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VERITAS

Bureau Veritas Job #: C4D3464

Report Date: 2024/05/17

WSP Canada Inc.

Client Project #: CA0021057.5477

Site Location: EAST OXFORD PS

Sampler Initials: DB

TEST SUMMARY

Bureau Veritas ID: ZBR900
Sample ID: MW106
Matrix: Water

Collected: 2024/05/02
Shipped:
Received: 2024/05/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Fluoride	ISE	9374947	2024/05/06	2024/05/06	Surinder Rai
Mercury in Water by CVAA	CV/AA	9379830	2024/05/08	2024/05/08	Gagandeep Rai
Total Metals Analysis by ICPMS	ICP/MS	9377289	2024/05/07	2024/05/07	Azita Fazaeli
Total Ammonia-N	LACH/NH4	9376276	N/A	2024/05/07	Yogesh Patel
Nitrate & Nitrite as Nitrogen in Water	LACH	9375251	N/A	2024/05/07	Jinal Chavda
Animal and Vegetable Oil and Grease	BAL	9374273	N/A	2024/05/05	Automated Statchk
Total Oil and Grease	BAL	9374547	2024/05/05	2024/05/05	Akshdeep Singh
Phenols (4AAP)	TECH/PHEN	9397555	N/A	2024/05/16	Chandra Nandlal
pH	AT	9374905	2024/05/06	2024/05/06	Surinder Rai
Sulphate by Automated Turbidimetry	SKAL	9375385	N/A	2024/05/08	Massarat Jan
Total Kjeldahl Nitrogen in Water	SKAL	9376151	2024/05/06	2024/05/08	Rajni Tyagi
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	9374555	2024/05/05	2024/05/05	Akshdeep Singh
Total Suspended Solids	BAL	9375085	2024/05/06	2024/05/07	Razieh Tabesh

Bureau Veritas ID: ZBR900 Dup
Sample ID: MW106
Matrix: Water

Collected: 2024/05/02
Shipped:
Received: 2024/05/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Cyanide	SKAL/CN	9376272	2024/05/06	2024/05/06	Chloe Pollock



GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.3°C
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Revised report (2024/05/17): Includes results for Phenol analysis.

Metal Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Sample ZBR897 [MW103] : Mercury Analysis: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

Results relate only to the items tested.



Bureau Veritas Job #: C4D3464
Report Date: 2024/05/17

QUALITY ASSURANCE REPORT

WSP Canada Inc.
Client Project #: CA0021057.5477
Site Location: EAST OXFORD PS
Sampler Initials: DB

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9374544	Total Oil & Grease	2024/05/05			98	80 - 110	<0.50	mg/L	0.25	25		
9374545	Total Oil & Grease Mineral/Synthetic	2024/05/05			96	65 - 130	<0.50	mg/L	0.52	25		
9374547	Total Oil & Grease	2024/05/05			99	80 - 110	<0.50	mg/L	0.51	25		
9374555	Total Oil & Grease Mineral/Synthetic	2024/05/05			97	65 - 130	<0.50	mg/L	1.0	25		
9374694	Total BOD	2024/05/10					<2	mg/L	0.73	30	96	80 - 120
9374905	pH	2024/05/06			103	98 - 103			0.27	N/A		
9374947	Fluoride (F-)	2024/05/06	101	80 - 120	108	80 - 120	<0.10	mg/L	NC	20		
9375085	Total Suspended Solids	2024/05/07			95	80 - 120	<10	mg/L	NC	20		
9375251	Nitrate (N)	2024/05/07	109	80 - 120	97	80 - 120	<0.10	mg/L	NC	20		
9375251	Nitrite (N)	2024/05/07	115	80 - 120	102	80 - 120	<0.010	mg/L	NC	20		
9375383	Dissolved Chloride (Cl-)	2024/05/08	NC	80 - 120	101	80 - 120	<1.0	mg/L	0.53	20		
9375385	Dissolved Sulphate (SO4)	2024/05/08	NC	75 - 125	96	80 - 120	<1.0	mg/L	1.3	20		
9375481	Total Chlorine	2024/05/06	105	85 - 115	97	85 - 115	<0.1	mg/L	NC	25		
9376151	Total Kjeldahl Nitrogen (TKN)	2024/05/07	108	80 - 120	104	80 - 120	<0.10	mg/L	2.1	20	111	80 - 120
9376272	Total Cyanide (CN)	2024/05/06	103	80 - 120	104	80 - 120	<0.0050	mg/L	NC	20		
9376276	Total Ammonia-N	2024/05/07	94	75 - 125	97	80 - 120	<0.050	mg/L	NC	20		
9377013	Total Cyanide (CN)	2024/05/07	105	80 - 120	107	80 - 120	<0.0050	mg/L	NC	20		
9377289	Total Aluminum (Al)	2024/05/08	NC (1)	80 - 120	96	80 - 120	<4.9	ug/L	7.0	20		
9377289	Total Antimony (Sb)	2024/05/07	NC (1)	80 - 120	107	80 - 120	<0.50	ug/L				
9377289	Total Arsenic (As)	2024/05/07	NC (1)	80 - 120	101	80 - 120	<1.0	ug/L				
9377289	Total Barium (Ba)	2024/05/07	NC (1)	80 - 120	98	80 - 120	<2.0	ug/L				
9377289	Total Beryllium (Be)	2024/05/07	NC (1)	80 - 120	99	80 - 120	<0.40	ug/L				
9377289	Total Bismuth (Bi)	2024/05/07	NC (1)	80 - 120	96	80 - 120	<1.0	ug/L				
9377289	Total Boron (B)	2024/05/07	NC (1)	80 - 120	100	80 - 120	<10	ug/L				
9377289	Total Cadmium (Cd)	2024/05/08	NC (1)	80 - 120	102	80 - 120	<0.090	ug/L	3.6	20		
9377289	Total Calcium (Ca)	2024/05/07	NC (1)	80 - 120	94	80 - 120	<200	ug/L				
9377289	Total Chromium (Cr)	2024/05/08	NC (1)	80 - 120	94	80 - 120	<5.0	ug/L	NC	20		
9377289	Total Cobalt (Co)	2024/05/07	NC (1)	80 - 120	95	80 - 120	<0.50	ug/L				
9377289	Total Copper (Cu)	2024/05/08	NC (1)	80 - 120	97	80 - 120	<0.90	ug/L	5.5	20		
9377289	Total Iron (Fe)	2024/05/08	NC (1)	80 - 120	98	80 - 120	<100	ug/L	NC	20		
9377289	Total Lead (Pb)	2024/05/08	NC (1)	80 - 120	100	80 - 120	<0.50	ug/L	NC	20		



Bureau Veritas Job #: C4D3464
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QUALITY ASSURANCE REPORT(CONT'D)

WSP Canada Inc.
Client Project #: CA0021057.5477
Site Location: EAST OXFORD PS
Sampler Initials: DB

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9377289	Total Lithium (Li)	2024/05/07	NC (1)	80 - 120	104	80 - 120	<5.0	ug/L				
9377289	Total Magnesium (Mg)	2024/05/07	NC (1)	80 - 120	95	80 - 120	<50	ug/L				
9377289	Total Manganese (Mn)	2024/05/07	NC (1)	80 - 120	96	80 - 120	<2.0	ug/L				
9377289	Total Molybdenum (Mo)	2024/05/07	NC (1)	80 - 120	101	80 - 120	<0.50	ug/L				
9377289	Total Nickel (Ni)	2024/05/08	NC (1)	80 - 120	95	80 - 120	<1.0	ug/L	2.0	20		
9377289	Total Phosphorus (P)	2024/05/07	NC (1)	80 - 120	97	80 - 120	<100	ug/L				
9377289	Total Potassium (K)	2024/05/07	NC (1)	80 - 120	97	80 - 120	<200	ug/L				
9377289	Total Selenium (Se)	2024/05/07	NC (1)	80 - 120	106	80 - 120	<2.0	ug/L				
9377289	Total Silicon (Si)	2024/05/07	NC (1)	80 - 120	95	80 - 120	<50	ug/L				
9377289	Total Silver (Ag)	2024/05/07	NC (1)	80 - 120	98	80 - 120	<0.090	ug/L				
9377289	Total Sodium (Na)	2024/05/07	NC (1)	80 - 120	99	80 - 120	<100	ug/L				
9377289	Total Strontium (Sr)	2024/05/07	NC (1)	80 - 120	96	80 - 120	<1.0	ug/L				
9377289	Total Tellurium (Te)	2024/05/07	NC (1)	80 - 120	105	80 - 120	<1.0	ug/L				
9377289	Total Thallium (Tl)	2024/05/07	NC (1)	80 - 120	101	80 - 120	<0.050	ug/L				
9377289	Total Tin (Sn)	2024/05/07	NC (1)	80 - 120	102	80 - 120	<1.0	ug/L				
9377289	Total Titanium (Ti)	2024/05/07	NC (1)	80 - 120	94	80 - 120	<5.0	ug/L				
9377289	Total Tungsten (W)	2024/05/07	NC (1)	80 - 120	104	80 - 120	<1.0	ug/L				
9377289	Total Uranium (U)	2024/05/07	NC (1)	80 - 120	100	80 - 120	<0.10	ug/L				
9377289	Total Vanadium (V)	2024/05/07	NC (1)	80 - 120	96	80 - 120	<0.50	ug/L				
9377289	Total Zinc (Zn)	2024/05/08	NC (1)	80 - 120	102	80 - 120	<5.0	ug/L	NC	20		
9377289	Total Zirconium (Zr)	2024/05/07	NC (1)	80 - 120	101	80 - 120	<1.0	ug/L				
9377551	Mercury (Hg)	2024/05/07	93	75 - 125	96	80 - 120	<0.00010	mg/L	NC	20		
9379830	Mercury (Hg)	2024/05/08	97	75 - 125	96	80 - 120	<0.00010	mg/L	NC	20		



QUALITY ASSURANCE REPORT(CONT'D)

WSP Canada Inc.
Client Project #: CA0021057.5477
Site Location: EAST OXFORD PS
Sampler Initials: DB

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9397555	Phenols-4AAP	2024/05/16	106	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times \text{RDL}$).

(1) Matrix Spike not calculated. Original sample and matrix spike sample were analyzed at a dilution, due to high target analytes, or sample matrix interference



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Bureau Veritas Job #: C4D3464
Report Date: 2024/05/17

WSP Canada Inc.
Client Project #: CA0021057.5477
Site Location: EAST OXFORD PS
Sampler Initials: DB

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Anastassia Hamanov, Scientific Specialist

Cristina Carriere, Senior Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

APPENDIX C

Results of Hydraulic Testing

DRAFT

TABLE C-1

SUMMARY OF HYDRAULIC TESTING

East Oxford Public School Septic Bed
 Stantec Consulting Ltd.
 505767 Old Stage Road
Woodstock, Ontario

BOREHOLE	Screened Interval Material	TEST NO.	TEST TYPE	HYDRAULIC CONDUCTIVITY¹ (m/s)
MW-103	sandy SILTY CLAY	FH1	Falling Head	1.72E-07
MW-104	SILTY SAND	FH1	Falling Head	1.47E-05
MW-104	SILTY SAND	FH2	Falling Head	1.46E-05
MW-104	SILTY SAND	FH3	Falling Head	1.43E-05
MW-104	SILTY SAND	RH1	Rising Head	1.45E-05
MW-104	SILTY SAND	RH2	Rising Head	1.49E-05
MW-104	SILTY SAND	RH3	Rising Head	1.53E-05
MW-105	Top soil - silty clay contact	FH1	Falling Head	1.83E-05
MW-105	Top soil - silty clay contact	FH2	Falling Head	1.48E-05
MW-105	Top soil - silty clay contact	FH3	Falling Head	1.62E-05
MW-105	Top soil - silty clay contact	RH1	Rising Head	1.95E-05
MW-105	Top soil - silty clay contact	RH2	Rising Head	1.99E-05
MW-105	Top soil - silty clay contact	RH3	Rising Head	1.88E-05
MW-106	CLAYEY SILT	FH1	Falling Head	1.98E-09

NOTES:

1. Hydraulic conductivity results provided in metres per second (m/s).
2. Test data were screened; suitable displacement curves were analysed for inclusion in this table.
3. Table to be read in conjunction with accompanying text.

Prepared By: CNB

Checked By: DB

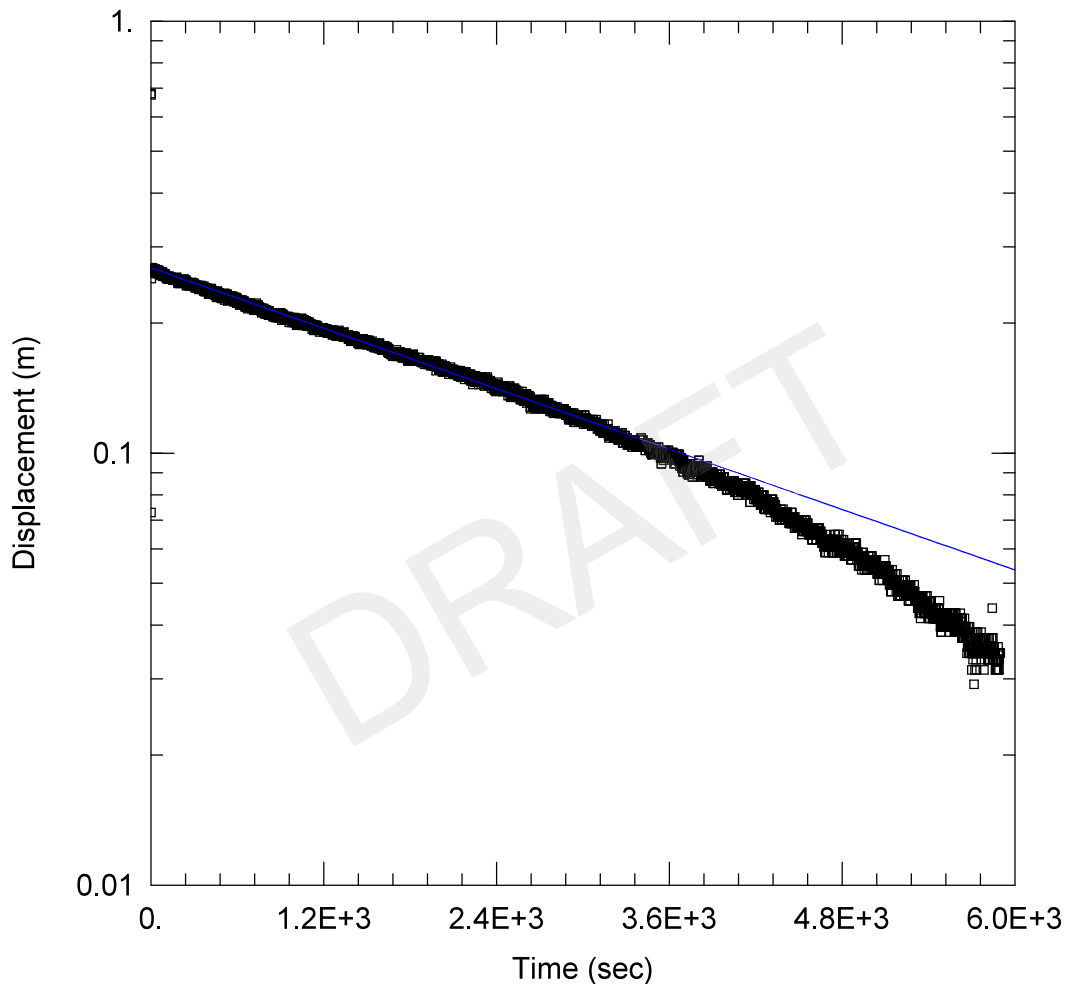
MW-103_FH1

Prepared By:
WSP Canada Inc.

Prepared For:
Stantec Consulting Ltd.

Project:
CA0021057.5477

Location:
East Oxford



Data Set: C:\Users\CACB079095\OneDrive - WSP O365\Desktop\Aqt&AQUIFER DATA\3_FH1.aqt
Date: 05/06/24 Time: 11:23:31

Saturated Thickness: 2.39 Anisotropy Ratio (K_z/K_r): 1.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
 $K = 1.721E-7$ m/sec $y_0 = 0.2685$ m

WELL DATA (MW-103)

Initial Displacement: 0.68 m
Static Water Column Height: 2.39 m
Total Well Penetration Depth: 2.13 m
Screen Length: 1.5 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.32

MW-104_FH1

Prepared By:

WSP Canada Inc.

Prepared For:

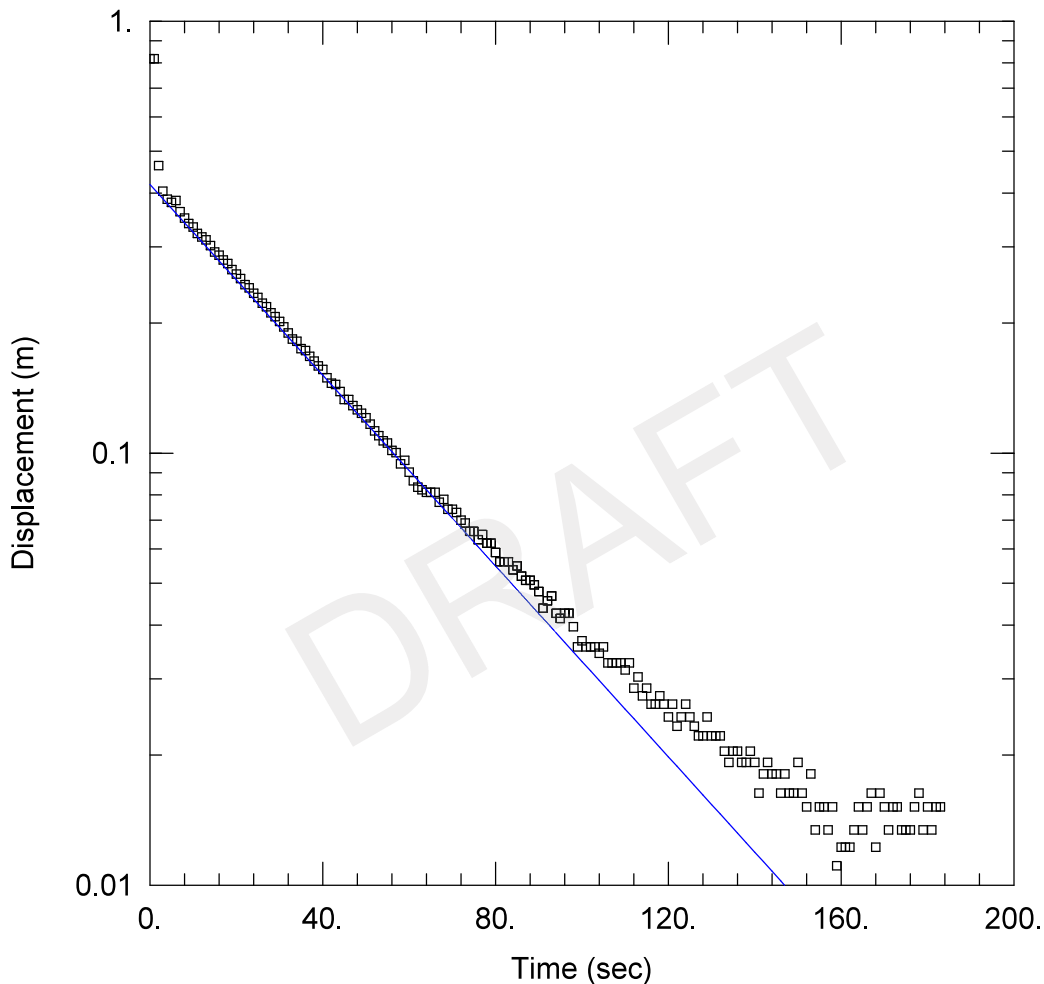
Stantec Consulting Ltd.

Project:

CA0021057.5477

Location:

East Oxford



Data Set:

Date: 05/06/24

Time: 11:33:02

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 1.469E-5 m/sec y0 = 0.4184 m

AQUIFER DATA

Saturated Thickness: 2.08 Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-104)

Initial Displacement: 0.819 m

Static Water Column Height: 2.08 m

Total Well Penetration Depth: 1.55 m

Screen Length: 1.55 m

Casing Radius: 0.025 m

Well Radius: 0.025 m

Gravel Pack Porosity: 0.32

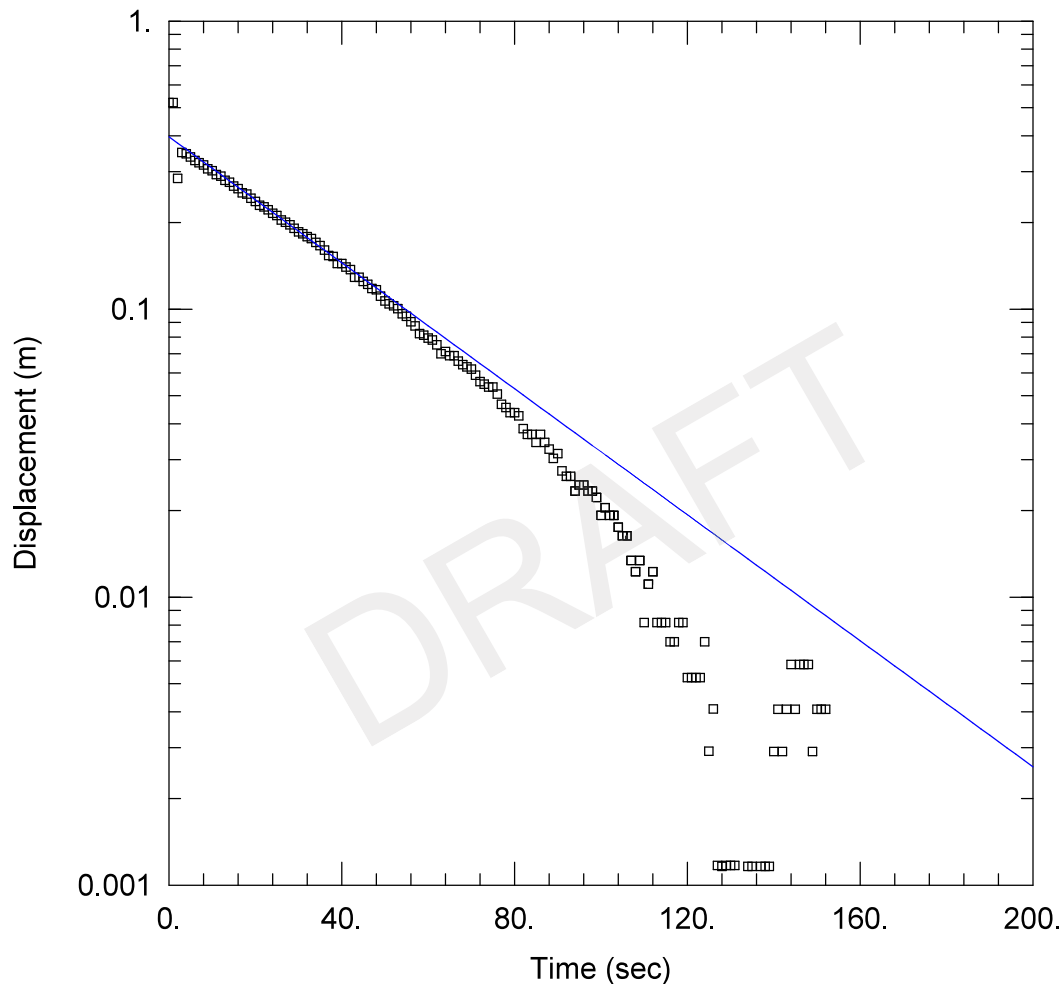
MW-104_FH2

Prepared By:
WSP Canada Inc.

Prepared For:
Stantec Consulting Ltd.

Project:
CA0021057.5477

Location:
East Oxford



Data Set: C:\Users\CACB079095\OneDrive - WSP O365\Desktop\Aqt\AQUIFER DATA\4_FH2.aqt
Date: 05/06/24 Time: 11:42:03

Saturated Thickness: 2.08 Anisotropy Ratio (K_z/K_r): 1.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
 $K = 1.455E-5$ m/sec $y_0 = 0.3966$ m

WELL DATA (MW-104)

Initial Displacement: 0.5215 m
Static Water Column Height: 2.08 m
Total Well Penetration Depth: 1.55 m
Screen Length: 1.55 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.32

MW-104_FH3

Prepared By:

WSP Canada Inc.

Prepared For:

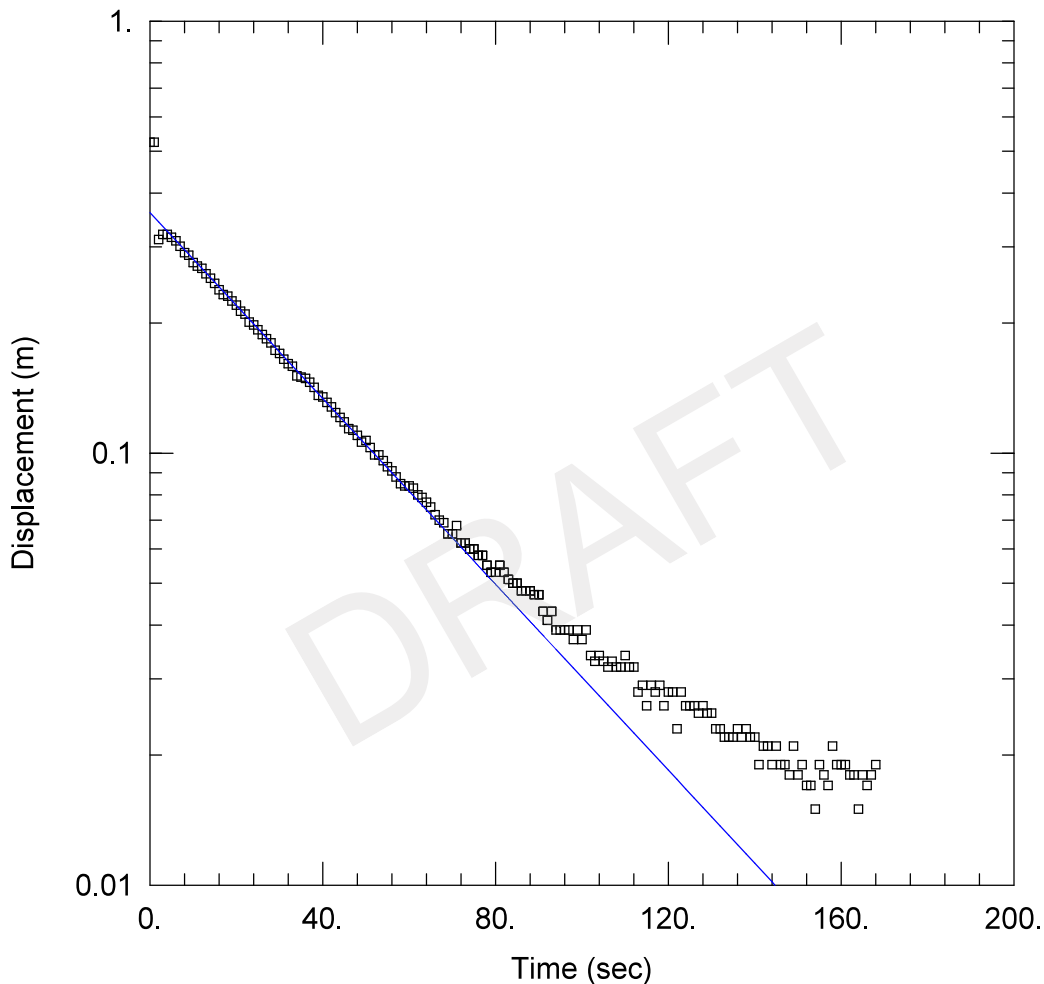
Stantec Consulting Ltd.

Project:

CA0021057.5477

Location:

East Oxford



Data Set: C:\Users\CACB079095\OneDrive - WSP O365\Desktop\Aqt\AQUIFER DATA\4_FH3.aqt

Date: 05/06/24

Time: 14:35:14

Saturated Thickness: 2.08 Anisotropy Ratio (K_z/K_r): 1.

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 1.431\text{E-}5$ m/sec $y_0 = 0.3604$ m

WELL DATA (MW-104)

Initial Displacement: 0.5244 m

Static Water Column Height: 2.08 m

Total Well Penetration Depth: 1.55 m

Screen Length: 1.55 m

Casing Radius: 0.025 m

Well Radius: 0.025 m

Gravel Pack Porosity: 0.32

MW-104_RH1

Prepared By:

WSP Canada Inc.

Prepared For:

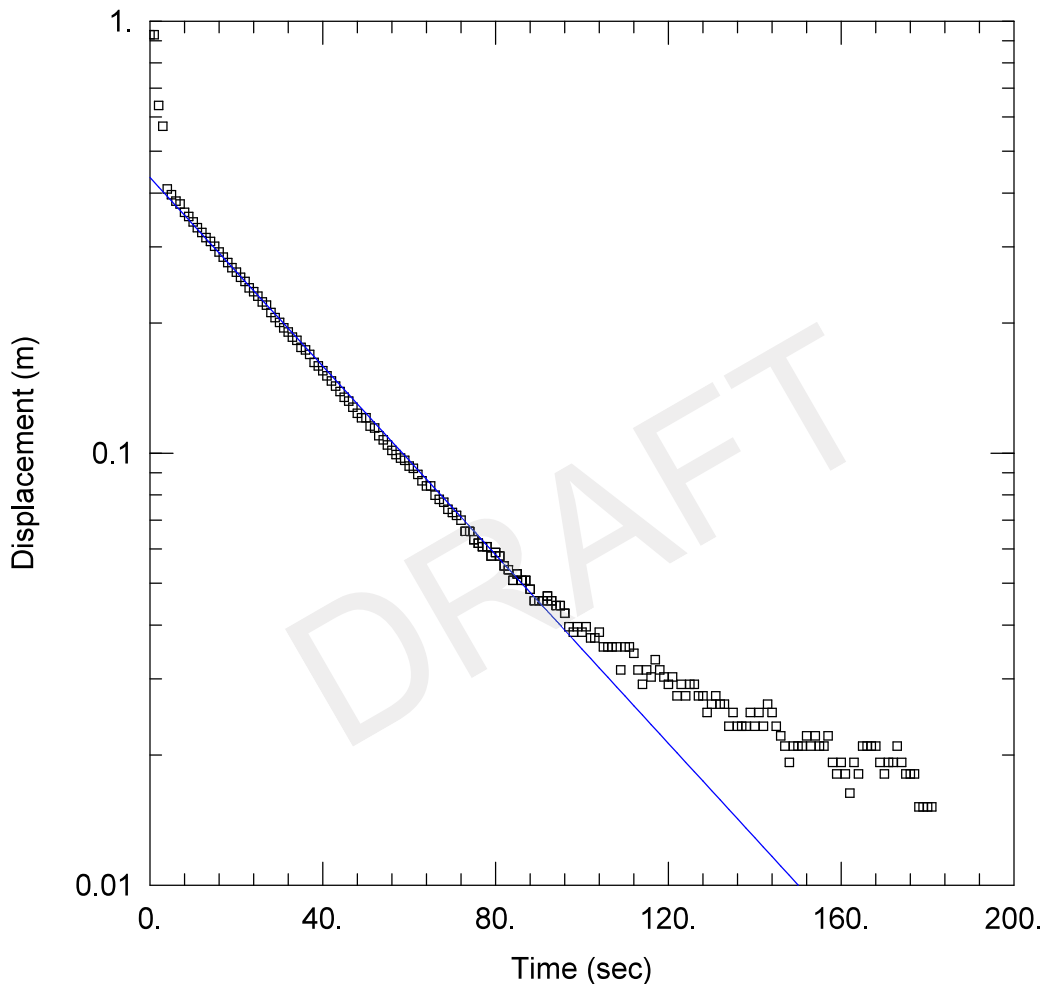
Stantec Consulting Ltd.

Project:

CA0021057.5477

Location:

East Oxford



Data Set: C:\Users\CACB079095\OneDrive - WSP O365\Desktop\Aqt\AQUIFER DATA\4_RH1.aqt

Date: 05/06/24

Time: 11:38:45

Saturated Thickness: 2.08 Anisotropy Ratio (K_z/K_r): 1.

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 1.452E-5$ m/sec $y_0 = 0.4343$ m

WELL DATA (MW-104)

Initial Displacement: 0.9298 m

Static Water Column Height: 2.08 m

Total Well Penetration Depth: 1.55 m

Screen Length: 1.55 m

Casing Radius: 0.025 m

Well Radius: 0.025 m

Gravel Pack Porosity: 0.32

MW-104_RH2

Prepared By:

WSP Canada Inc.

Prepared For:

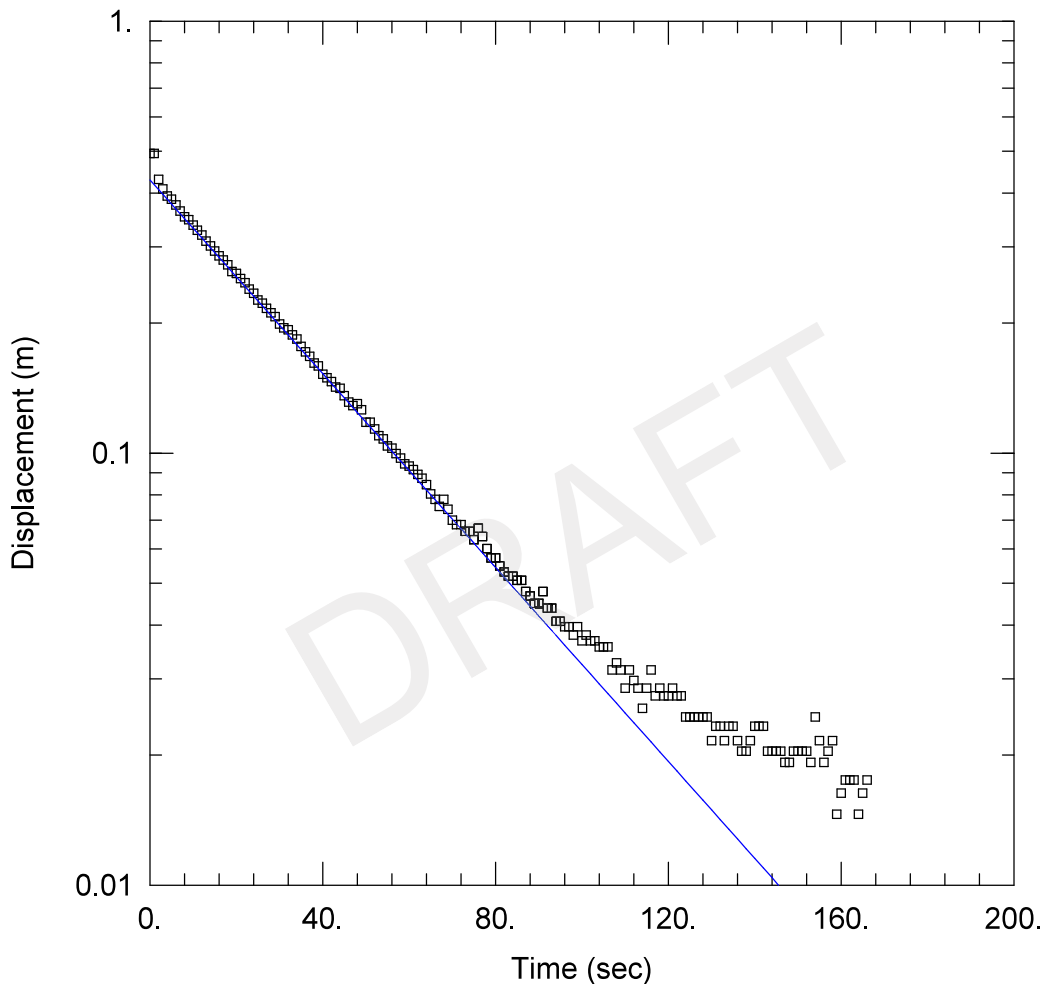
Stantec Consulting Ltd.

Project:

CA0021057.5477

Location:

East Oxford



Data Set: C:\Users\CACB079095\OneDrive - WSP O365\Desktop\Aqt&AQUIFER DATA\4_RH2.aqt

Date: 05/06/24

Time: 11:46:25

Saturated Thickness: 2.08 Anisotropy Ratio (K_z/K_r): 1.

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 1.492E-5$ m/sec $y_0 = 0.429$ m

WELL DATA (MW-104)

Initial Displacement: 0.4941 m

Static Water Column Height: 2.08 m

Total Well Penetration Depth: 1.55 m

Screen Length: 1.55 m

Casing Radius: 0.025 m

Well Radius: 0.025 m

Gravel Pack Porosity: 0.32

MW-104_RH3

Prepared By:

WSP Canada Inc.

Prepared For:

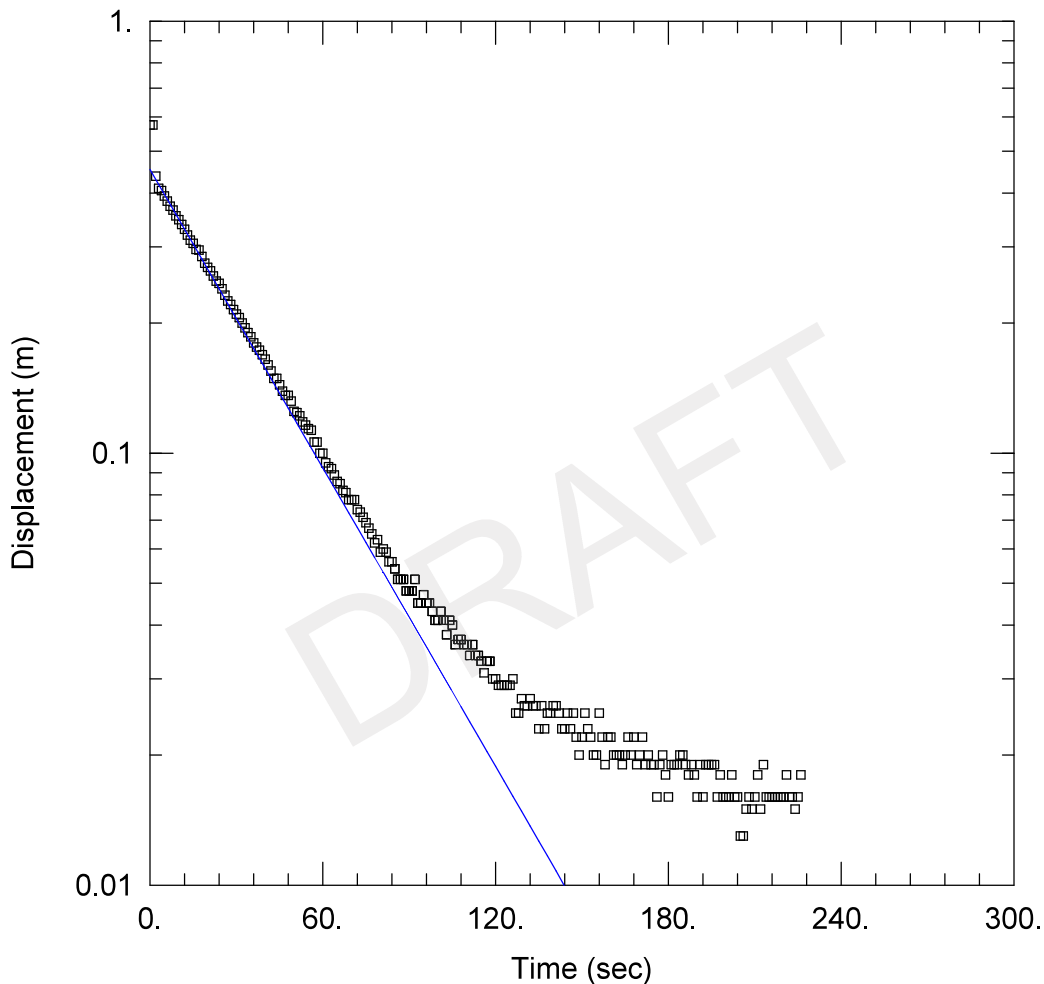
Stantec Consulting Ltd.

Project:

CA0021057.5477

Location:

East Oxford



Data Set: C:\Users\CACB079095\OneDrive - WSP O365\Desktop\Aqt&AQUIFER DATA\4_RH3.aqt

Date: 05/06/24

Time: 11:55:38

Saturated Thickness: 2.08 Anisotropy Ratio (K_z/K_r): 1.

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 1.532E-5$ m/sec $y_0 = 0.4534$ m

WELL DATA (MW-104)

Initial Displacement: 0.5752 m

Static Water Column Height: 2.08 m

Total Well Penetration Depth: 1.55 m

Screen Length: 1.55 m

Casing Radius: 0.025 m

Well Radius: 0.025 m

Gravel Pack Porosity: 0.32

MW-105_FH1

Prepared By:

WSP Canada Inc.

Prepared For:

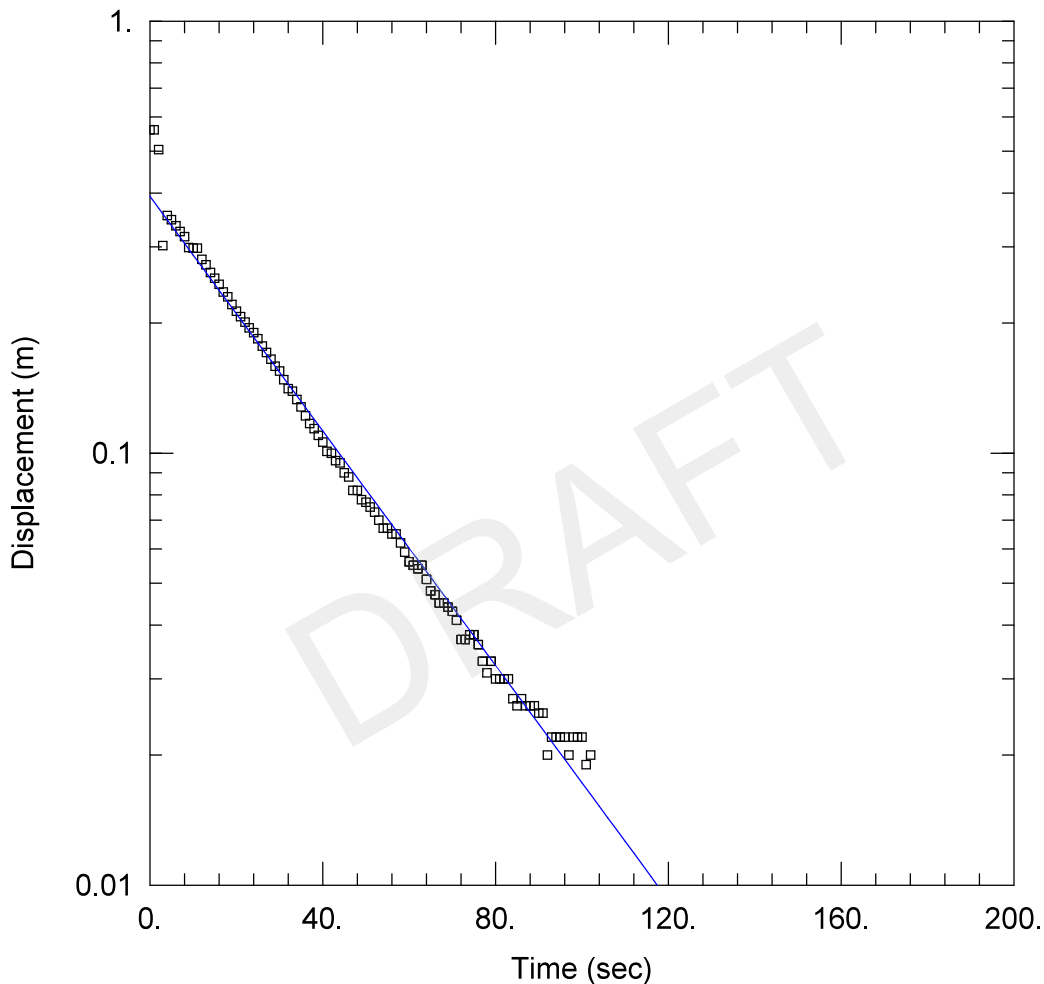
Stantec Consulting Ltd.

Project:

CA0021057.5477

Location:

East Oxford



Data Set: C:\Users\CACB079095\OneDrive - WSP O365\Desktop\Aqt\AQUIFER DATA\5_FH1.aqt

Date: 05/06/24

Time: 14:47:45

Saturated Thickness: 2.51 Anisotropy Ratio (K_z/K_r): 1.

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 1.831E-5$ m/sec $y_0 = 0.3927$ m

WELL DATA (MW-105)

Initial Displacement: 0.56 m

Static Water Column Height: 2.51 m

Total Well Penetration Depth: 1.76 m

Screen Length: 1.55 m

Casing Radius: 0.025 m

Well Radius: 0.025 m

Gravel Pack Porosity: 0.32

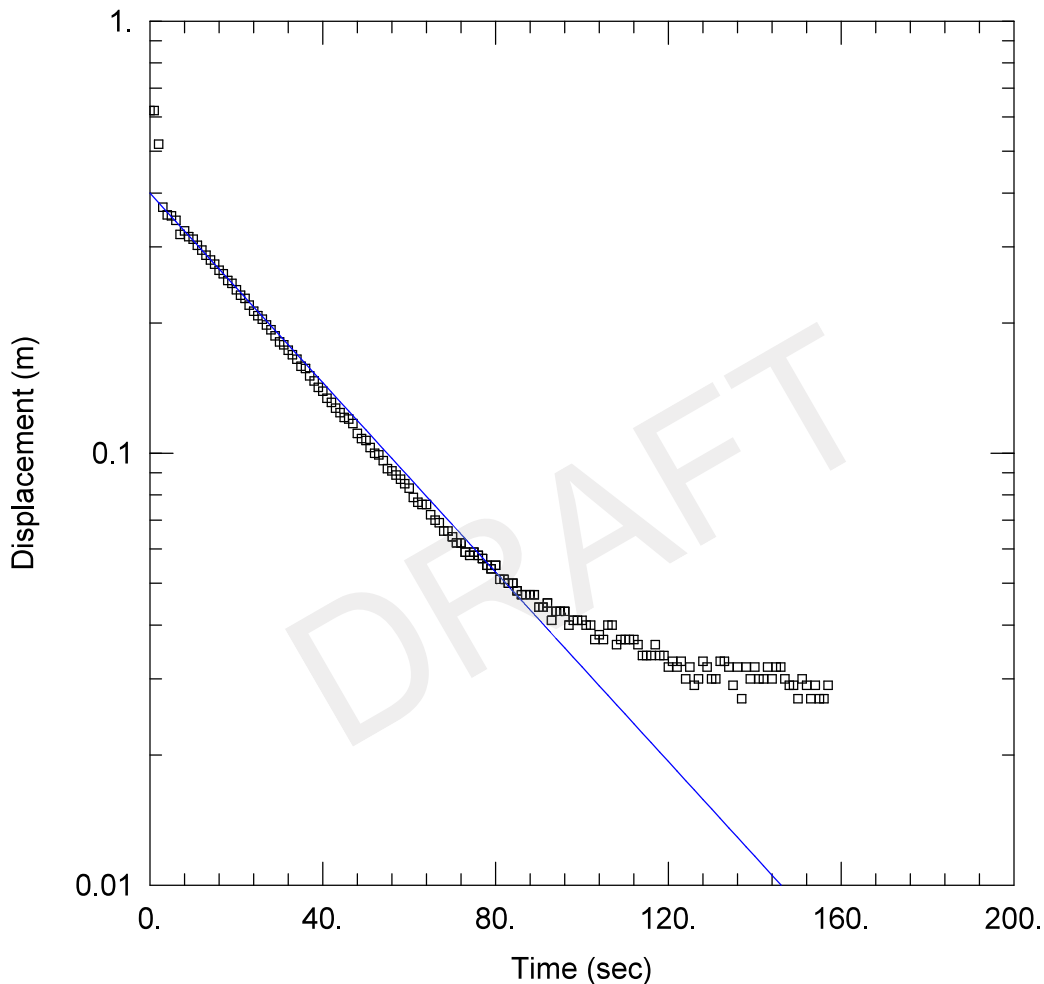
MW-105_FH2

Prepared By:
WSP Canada Inc.

Prepared For:
Stantec Consulting Ltd.

Project:
CA0021057.5477

Location:
East Oxford



Data Set: C:\Users\CACB079095\OneDrive - WSP O365\Desktop\Aqt&AQUIFER DATA\5_FH2.aqt
Date: 05/06/24 Time: 14:52:57

Saturated Thickness: 2.51 Anisotropy Ratio (K_z/K_r): 1.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

$K = 1.479E-5$ m/sec $y_0 = 0.3995$ m

WELL DATA (MW-105)

Initial Displacement: 0.621 m
Static Water Column Height: 2.51 m
Total Well Penetration Depth: 1.76 m
Screen Length: 1.55 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.32

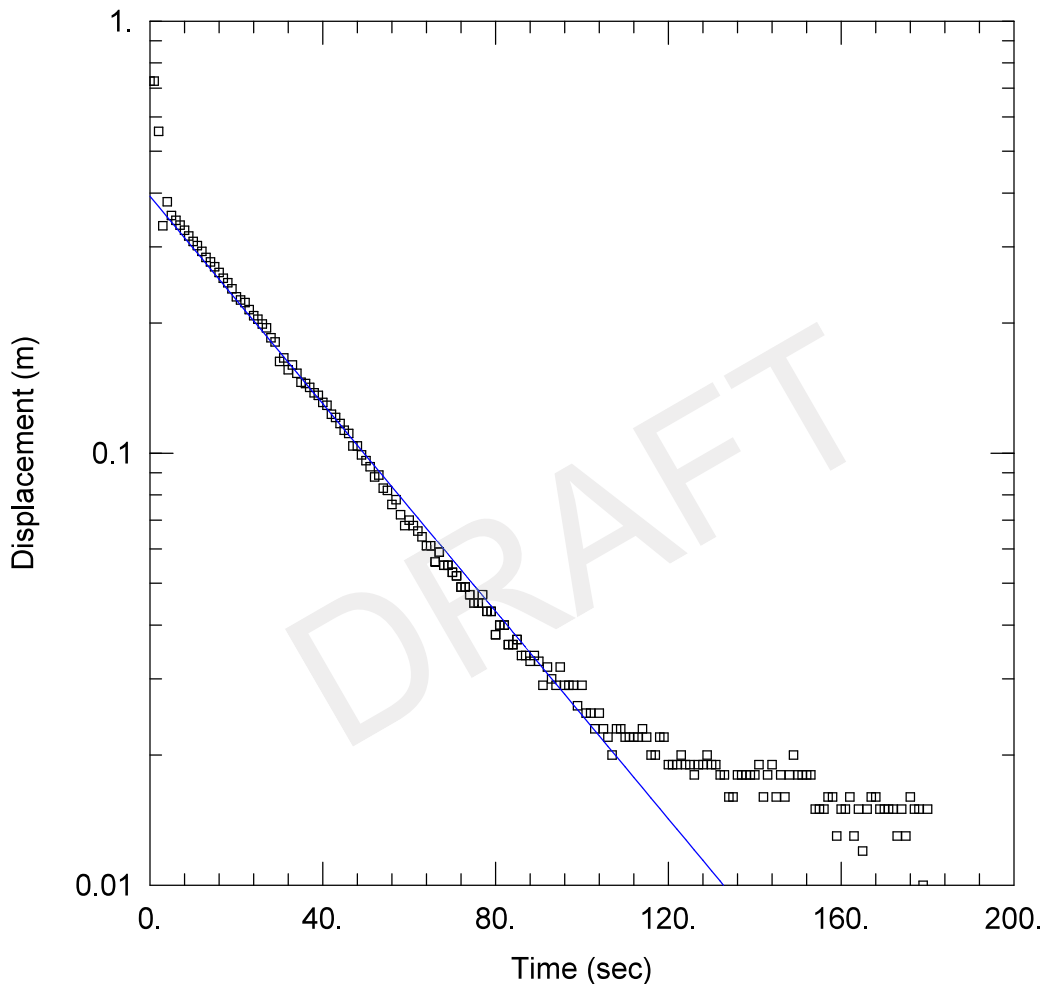
MW-105_FH3

Prepared By:
WSP Canada Inc.

Prepared For:
Stantec Consulting Ltd.

Project:
CA0021057.5477

Location:
East Oxford



Data Set: C:\Users\CACB079095\OneDrive - WSP O365\Desktop\Aqt\AQUIFER DATA\5_FH3.aqt
Date: 05/06/24 Time: 14:52:40

Saturated Thickness: 2.51 Anisotropy Ratio (K_z/K_r): 1.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
 $K = 1.621E-5$ m/sec $y_0 = 0.3932$ m

WELL DATA (MW-105)

Initial Displacement: 0.726 m
Static Water Column Height: 2.51 m
Total Well Penetration Depth: 1.76 m
Screen Length: 1.55 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.32

MW-105_RH1

Prepared By:

WSP Canada Inc.

Prepared For:

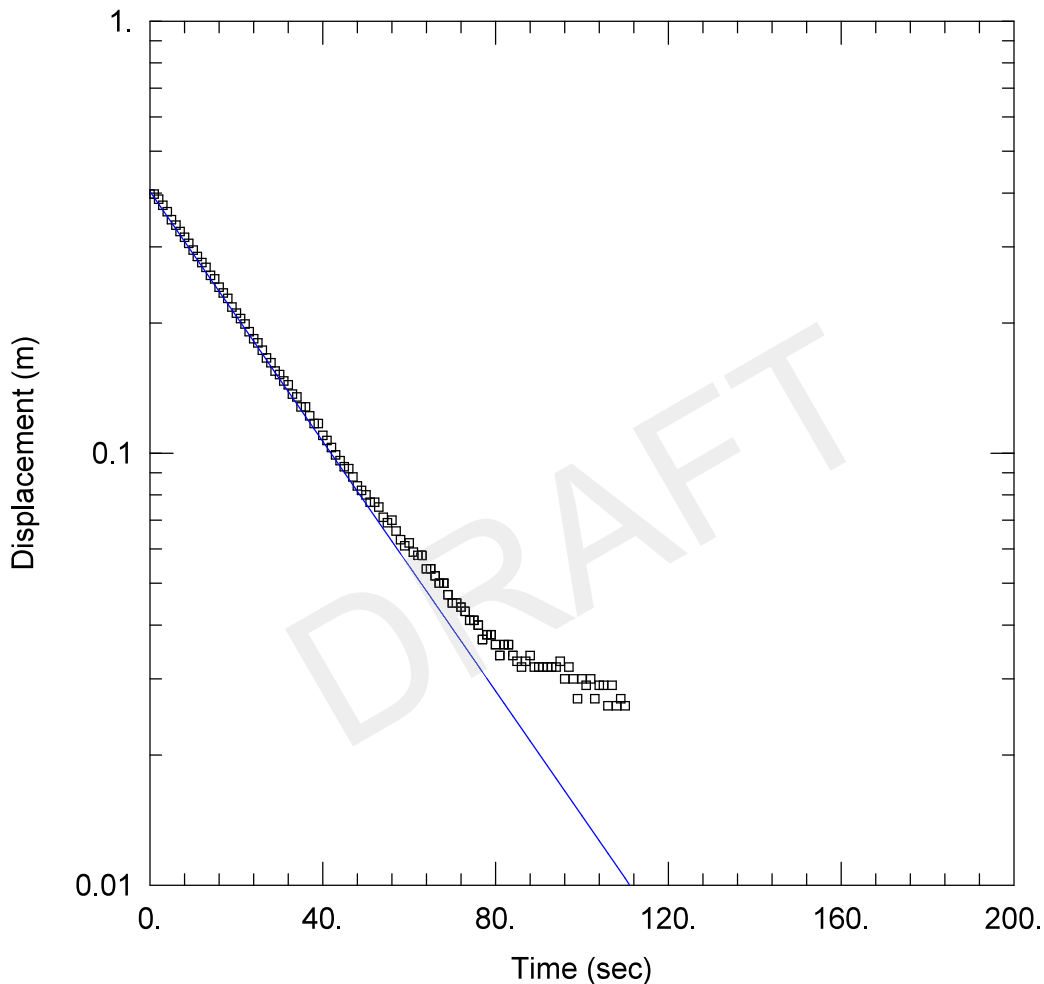
Stantec Consulting Ltd.

Project:

CA0021057.5477

Location:

East Oxford



Data Set: C:\Users\CACB079095\OneDrive - WSP O365\Desktop\Aqt&AQUIFER DATA\5_RH1.aqt

Date: 05/06/24

Time: 14:56:55

Saturated Thickness: 2.51 Anisotropy Ratio (K_z/K_r): 1.

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 1.95E-5$ m/sec $y_0 = 0.4031$ m

WELL DATA (MW-105)

Initial Displacement: 0.398 m

Static Water Column Height: 2.51 m

Total Well Penetration Depth: 1.76 m

Screen Length: 1.55 m

Casing Radius: 0.025 m

Well Radius: 0.025 m

Gravel Pack Porosity: 0.32

MW-105_RH2

Prepared By:

WSP Canada Inc.

Prepared For:

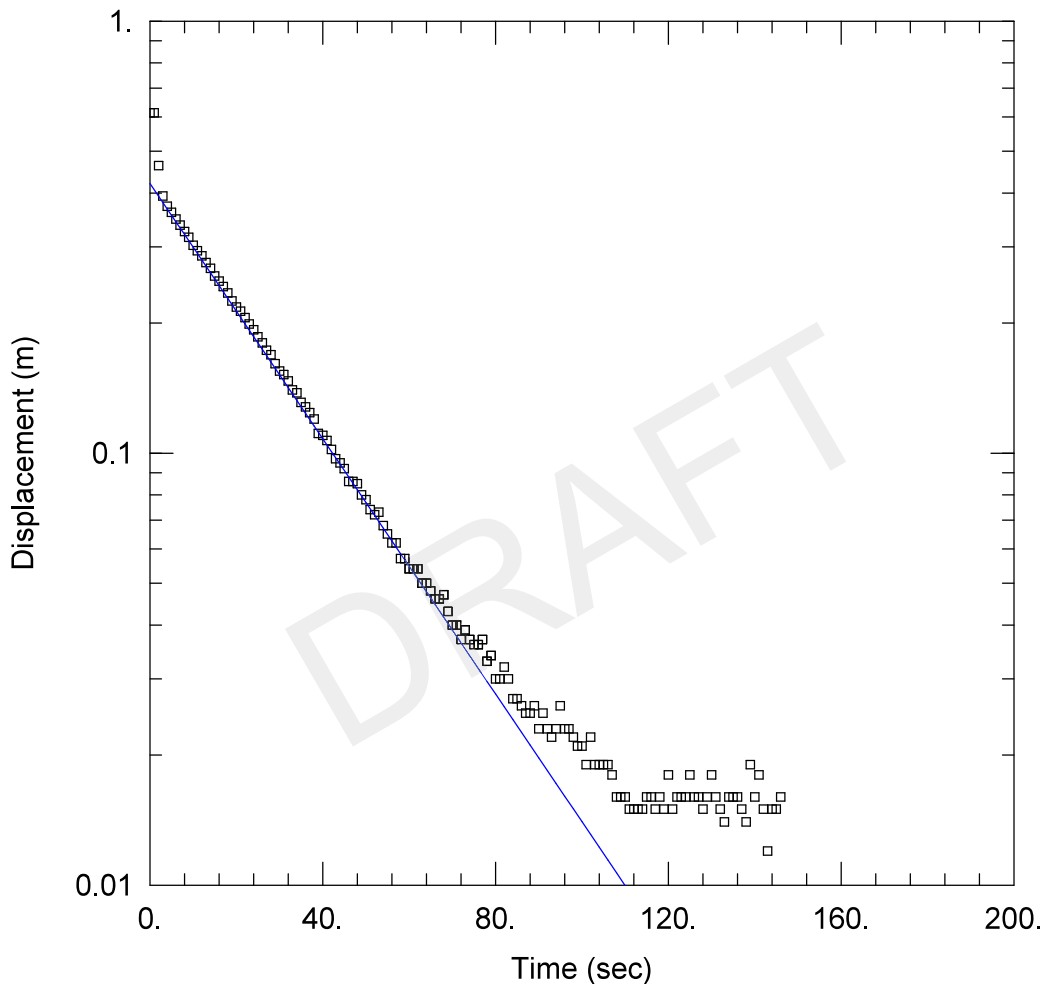
Stantec Consulting Ltd.

Project:

CA0021057.5477

Location:

East Oxford



Data Set: C:\Users\CACB079095\OneDrive - WSP O365\Desktop\Aqt\AQUIFER DATA\5_RH2.aqt

Date: 05/06/24

Time: 14:51:49

Saturated Thickness: 2.51 Anisotropy Ratio (K_z/K_r): 1.

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 1.993E-5$ m/sec $y_0 = 0.4209$ m

WELL DATA (MW-105)

Initial Displacement: 0.613 m

Static Water Column Height: 2.51 m

Total Well Penetration Depth: 1.76 m

Screen Length: 1.55 m

Casing Radius: 0.025 m

Well Radius: 0.025 m

Gravel Pack Porosity: 0.32

MW-105_RH3

Prepared By:

WSP Canada Inc.

Prepared For:

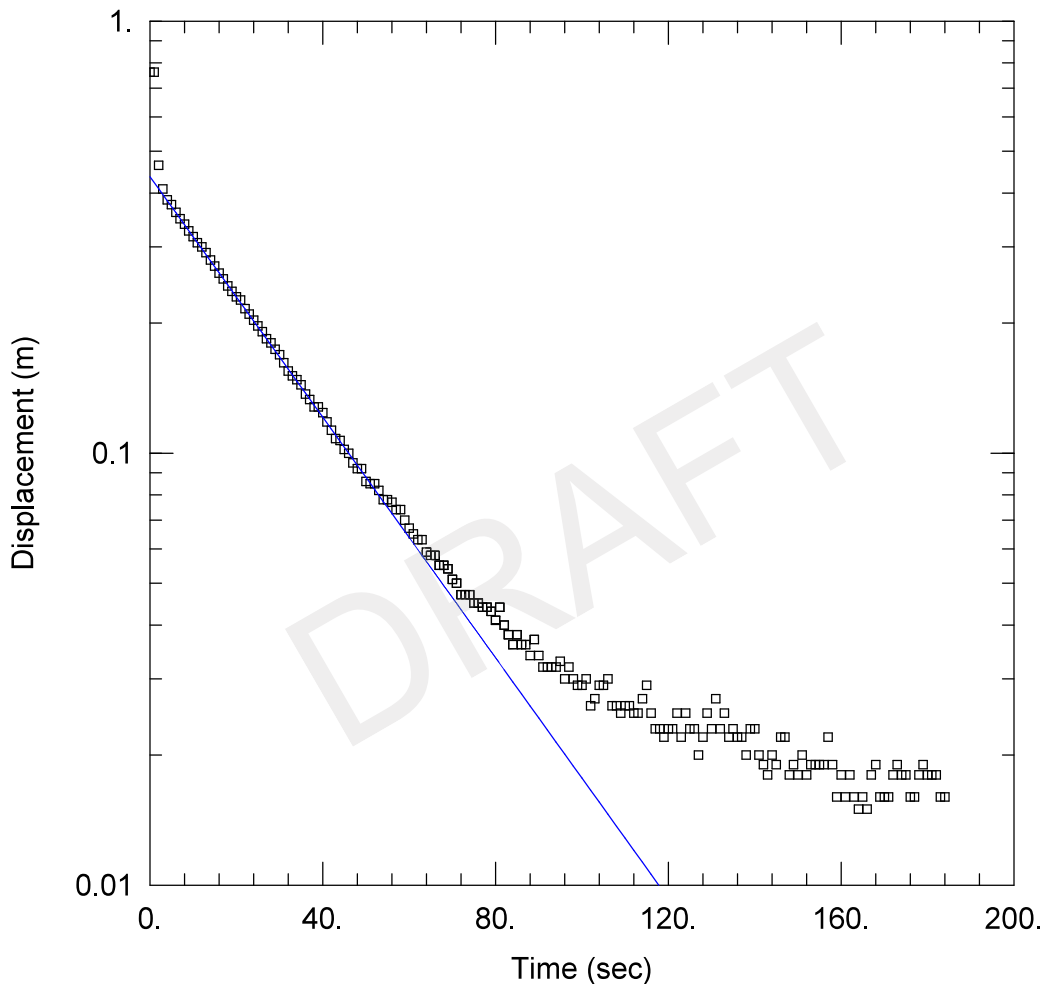
Stantec Consulting Ltd.

Project:

CA0021057.5477

Location:

East Oxford



Data Set: C:\Users\CACB079095\OneDrive - WSP O365\Desktop\Aqt&AQUIFER DATA\5_RH3.aqt

Date: 05/06/24

Time: 14:50:10

Saturated Thickness: 2.51 Anisotropy Ratio (K_z/K_r): 1.

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 1.879E-5$ m/sec $y_0 = 0.4365$ m

WELL DATA (MW-105)

Initial Displacement: 0.762 m

Static Water Column Height: 2.51 m

Total Well Penetration Depth: 1.76 m

Screen Length: 1.55 m

Casing Radius: 0.025 m

Well Radius: 0.025 m

Gravel Pack Porosity: 0.32

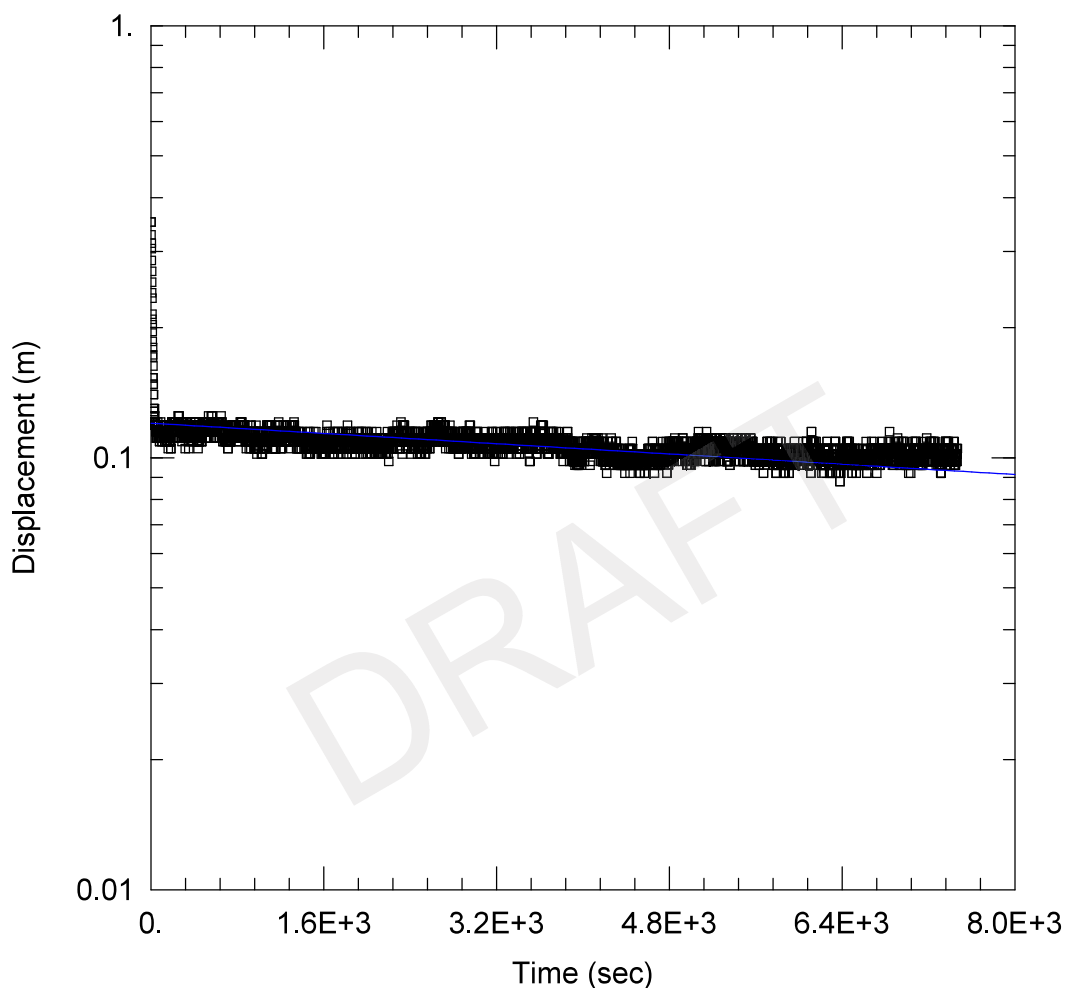
MW-106_FH1

Prepared By:
WSP Canada Inc.

Prepared For:
Stantec Consulting Ltd.

Project:
CA0021057.5477

Location:
East Oxford



Data Set: C:\...MW-106_FH1.aqt
Date: 05/23/24 Time: 20:36:51

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 1.976E-8 m/sec y0 = 0.1202 m

AQUIFER DATA

Saturated Thickness: 2.09 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-106)

Initial Displacement: 0.351 m
Static Water Column Height: 2.09 m
Total Well Penetration Depth: 1.55 m
Screen Length: 1.55 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.32

DRAFT



wsp.com



April 17, 2024

Project No. CA0021057.5477

Mr. Arran Jeater, Senior Engineering Technologist

Stantec Consulting Ltd.
400-1305 Riverbend Road
London, ON N6K 0J5

**GEOTECHNICAL EXPLORATION AND TESTING PROGRAM
EAST OXFORD PUBLIC SCHOOL PROPOSED SEPTIC BED
WOODSTOCK, ONTARIO**

Mr. Jeater,

This draft summary letter presents the results of the geotechnical exploration and testing program carried out to support the design of the new septic bed at East Oxford Public School, located at 505767 Old Stage Road in Woodstock, Ontario (the Site).

The purpose of the geotechnical exploration was to evaluate the subsurface soil and groundwater conditions at the site and to provide geotechnical engineering guidance for the geotechnical design aspects of the project. The location of the site is shown on the Key Plan, Figure 1.

Authorization to proceed with the exploration program in accordance with our proposal, 2023CA135477, dated January 11, 2024, was provided by Stantec Consulting Ltd. (Stantec) on January 19, 2024.

This letter should be read in conjunction with the attached document "Important Information and Limitations of This Report", which comprises an integral component hereof. The reader's attention is specifically drawn to this material, as it is essential for the proper use and interpretation of the information presented and discussed herein.

Background Information

WSP Canada Inc. (WSP, formerly Golder Associates Ltd. (Golder)) previously carried out a geotechnical exploration at the Site. The results of the exploration are provided in the following report:

Golder Report No. 1773481-R01 titled "Geotechnical Investigation, Thames Valley District School Board 2017 Projects, Parking Lot Upgrades, London, Ontario" dated March 2017.

Site Description

The Site is located northwest of the main structure of the East Oxford Public School and consists of a generally flat, grassed field. At the time of the exploration, surveyed ground surface elevations at the borehole locations ranged from about 286.9 to 287.8 metres (m).

Based on the Ontario Division of Mines Map 2281 titled "Quaternary Geology, Woodstock, Southern Ontario" the predominant soils are comprised of Port Stanley Till. Based on the Ontario Geological Survey map titled "Surficial Geology of Southern Ontario" the surficial soils in the area of the Site consist of clay to silt textured till.

Procedure

The field work for the geotechnical exploration was carried out on March 13, 2024, during which time six (6) boreholes labelled BH-101, BH-102 and MW-103 to MW-106. The boreholes were advanced to depths of about 3.7 to 5.9 m or to about elevations 281.81 to 284.15 m. The locations of the boreholes advanced within the site are shown on the Location Plan, Figure 1. The boreholes were drilled using track-mounted drilling equipment supplied and operated by a specialist drilling contractor licensed by the Ministry of Environment, Conservation and Parks (MECP). Standard penetration testing (SPT) and sampling was carried out in the boreholes at suitable intervals of depth using 35 millimetre (mm) inside diameter split spoon sampling equipment in general accordance with ASTM - D1586. All of the samples obtained were placed in sealed plastic sample bags and transported to our laboratory for further examination and geotechnical laboratory testing. The results of the laboratory testing are provided on the Record of Borehole sheets and on Figures 2 and 3.

Groundwater seepage conditions were observed in the boreholes during drilling and the encountered groundwater levels are shown on the corresponding Record of Borehole sheets. Following completion of drilling and logging, monitoring wells were installed in boreholes MW-103 to MW-106 to measure groundwater levels. Following completion of drilling and logging, the boreholes were backfilled in accordance with the requirements of the Revised Regulations of Ontario (R.R.O.) 1990, Ontario Regulation (O.Reg.) 903 (as amended) of the Ontario Water Resources Act. Members of our engineering staff designated the borehole locations in the field, obtained underground utility locates, monitored the drilling, logged the boreholes, and cared for the samples obtained. The ground surface elevations at the borehole locations were surveyed by WSP and referenced to a geodetic datum.

Subsurface Conditions

The subsurface soil and groundwater conditions encountered during the exploration program are shown on the attached Record of Borehole sheets and are summarized in the discussion below. The subsurface conditions have been simplified in terms of major strata for the purposes of geotechnical evaluation and design. The soil boundaries indicated have been inferred from non-continuous sampling, visual assessment and observations of drilling and sampling resistance. Accordingly, the boundaries typically represent transitions from one soil type to another rather than exact planes of geological change. Further, the subsurface conditions are established only at the borehole locations and may vary between and beyond those locations.

Where the presence of topsoil is noted, the topsoil was classified based solely on visual and textural evidence. Accordingly, materials classified as topsoil herein cannot necessarily be relied upon for the support and growth of vegetation without supplemental soil fertility analyses.

Asphalt

Asphalt was encountered at the ground surface in borehole BH-101 and was determined to be approximately 90 mm thick.

Topsoil

Surficial topsoil was encountered at the ground surface in all boreholes except BH-101 and ranged in thickness from about 610 to 760 mm with an average thickness of about 730 mm. SPT N¹ values recorded within the topsoil ranged from 5 to 7 blows per 0.3 m of penetration and samples of the topsoil had water contents of about 19 to 26 per cent.

Fill

Fill material comprised of gravelly sand was encountered beneath the asphalt in borehole BH-101 and was approximately 520 mm thick. An SPT N value of 18 blows per 0.3 m of penetration was recorded with the gravelly sand fill. A sample of the fill material had a water content of about 5 per cent.

Sandy Clayey Silt

Sandy clayey silt was encountered beneath the fill materials in borehole BH-101, the sandy silty clay in boreholes BH-102 and MW-106 and beneath the silty sand in borehole MW-103. Borehole MW-103 was terminated within the sandy clayey silt after exploring the stratum for about 2.8 m. Where fully penetrated the sandy clayey silt was about 1.4 to 3.1 m thick with an average thickness of about 2.1 m. SPT N values measured within the sandy clayey silt ranged from 12 to 25 blows per 0.3 m of penetration. Samples of the sandy clayey silt had water contents of about 11 to 19 per cent. Grain size distribution curves for samples of the sandy clayey silt are provided on Figure 2. An Atterberg limits determination was conducted on a sample of the sandy clayey silt, which a liquid limit of about 17 per cent, a plastic limit of about 12 per cent, and a plasticity index of about 5 per cent. The results of the Atterberg limit testing, as shown on Figure 3, indicated that the sandy clayey silt is of low plasticity. Although not specifically encountered in the boreholes, cobbles and boulders should be expected within the sandy clayey silt as the soil has been inferred as glacially derived.

Sandy Silty Clay

Sandy silty clay was encountered beneath the sandy clayey silt in borehole BH-101, beneath the topsoil in boreholes BH-102, MW-105 and MW-106 and beneath the silty sand in borehole MW-104. Boreholes BH-101, MW-104 and MW-105 were terminated within the sandy silty clay after exploring the deposit for 2.3 to 2.9 m. Where fully penetrated, the sandy silty clay was about 0.8 to 1.5 m thick. SPT N values measured within the sandy silty clay ranged from 3 to 21 blows per 0.3 m of penetration. Samples of the sandy silty clay had water contents of about 11 to 20 per cent. Grain size distribution curves for samples of the sandy silty clay are provided on Figure 2. Although not specifically encountered in the boreholes, cobbles and boulders should be expected within the sandy silty clay as the soil has been inferred as glacially derived.

¹ The SPT N value is defined as the number of blows required by a 63.5 kilogram hammer dropped from a height of 760 mm to drive a split spoon sampler a distance of 300 mm into the soil after having first penetrated 150 mm.

Silty Sand and Gravelly Silty Sand

Silty sand was encountered beneath the topsoil in boreholes MW-103 and MW-104. The silty sand was about 80 to 300 mm thick, with an average thickness of about 190 mm. SPT N values recorded within the silty sand ranged from 3 to 12 blows per 0.3 m of penetration. A sample of the silty sand had a water content of about 19 per cent.

Gravelly silty sand was encountered beneath the sandy clayey silt in borehole MW-106. Borehole MW-106 was terminated within the gravelly silty sand after penetrating the layer for about 0.3 m. An SPT N value of 25 blows per 0.3 m of penetration was recorded within the gravelly silty sand.

Groundwater Conditions

Perched water, groundwater and seepage conditions were observed in the boreholes and monitoring wells as shown on the Record of Borehole sheets. Perched water and/or groundwater was encountered in all of the boreholes except BH-101 and MW-103 during drilling. Monitoring wells were installed in boreholes MW-103 to MW-106 to permit subsequent groundwater level measurements. A summary of the encountered groundwater levels are provided in the table below. Measured groundwater levels will be added to the final report as the data becomes available.

Borehole	Date Drilled	Ground Surface Elevation (m)	Groundwater Elevation (m)
			Encountered During Drilling
BH-101	March 13, 2024	287.75	Not Encountered
BH-102		287.79	2.03 (perched), 4.37 (groundwater)
MW-103		287.80	Not Encountered
MW-104		287.81	0.76 (perched)
MW-105		286.88	0.76 (perched)
MW-106		286.95	1.52 (perched)

Note: Groundwater and seepage levels should be expected to fluctuate seasonally and in response to significant precipitation events.

Discussion

This section of the report provides recommendations based on our interpretation of the factual information obtained during the exploration and is intended for the guidance of the design engineer. Where comments are made on construction, they are provided only to highlight those aspects which could affect the design of the project. Those requiring information on aspects of construction should make their own independent interpretation of the factual information provided as it may affect equipment selection, proposed construction methods, costs and scheduling.

Based on the information provided, the existing septic beds at the site are to be replaced. No design information has been provided for the existing septic beds; therefore, the following comments are general and preliminary in nature.

Assessment of “T” times

The estimated percolation time, ‘T’ time, for the major strata encountered in the boreholes was evaluated based on grain size and plasticity characteristics from selected samples obtained during the exploration and are summarized in the table below:

Material	‘T’ time (min/cm)
Sandy Silty Clay	>50
Sandy Clayey Silt	>50

Based on the results of the estimated percolation times and as per Section 8 in the Ontario Building Code, it is anticipated that a raised bed will be required.

Excavations

All excavations should be conducted in accordance with all current Occupational Health and Safety Act (OHSA) provisions, and in particular, OSHA Regulation 213/91, which specifically addresses Construction Projects. Based on the current OHSA criteria and the results of the boreholes, the native sandy silty clay and sandy clayey silt would be classified as Type 2 soils. The fill, silty sand, and gravelly silty sand would be classified as Type 3 soils above the groundwater table and Type 4 soils below the groundwater table.

It is considered that the septic beds replacement can be carried out using conventional open cut trenches and/or properly designed trench liner boxes. All unsupported excavations should be carried out in accordance with the current OHSA requirements. For OHSA compliance, unsupported excavations in Type 2 soils should be sloped to within a maximum of 1.2 metres above the base with sidewall with slopes inclined no steeper than a gradient of one horizontal to one vertical. For Type 3 soils, unsupported excavations should be constructed with sidewall slopes inclined no steeper than a gradient of one horizontal to one vertical extending upward from the base of the excavation. For Type 4 soils, unsupported excavations should be constructed with sidewall slopes inclined no steeper than a gradient of three horizontal to one vertical extending upward from the base of the excavation.

All construction debris and/or cobbles/boulders larger than 150 millimetres in diameter should be removed from the excavation side slopes for worker safety. During construction, the excavations and exposed soil conditions should be observed and an opinion as to the appropriate OHSA soil type category provided at that time.

Care will be required to ensure that adequate support is provided for any existing utilities located within the zone of influence of the excavation as defined by a line drawn upwards and outwards from the base of the excavation at an inclination of 1 horizontal to 1 vertical.

Should a trench liner box be used to reduce the lateral extent of the excavation, it should be noted that the box only provides protection for the workmen once in place. The liner box does not restrict movement of the excavation walls. Any voids between the excavation wall and the trench liner box should be filled immediately to address the potential for loss of ground and support for adjacent buried utilities, pavements and the like. Further, it is suggested that the trench excavation be carried out in short sections with the support system installed immediately upon completion of excavation.

Care should be taken to direct all surface water away from open excavations. Depending on the timing of construction, seasonal variation potentially resulting in groundwater levels higher than those encountered during the exploration should be expected.

Based on the subsurface conditions encountered in the boreholes, perched water above the lower permeable cohesive deposits and relatively minor groundwater seepage should be anticipated for excavations in the sandy silty clay and clayey sandy silt. It is considered that adequate groundwater control may be achieved by pumping from properly constructed sumps located in the base of the excavation, if necessary, and a Permit To Take Water (PTTW) and/or registration for an Environmental Activity and Sector Registry (EASR) is not anticipated to be required. Further commentary on dewatering will be provided within the Hydrogeological assessment reported under a separate cover.

Bedding

Bedding for the new septic beds should consist of properly graded material consistent with the size, type and class of pipe and current Ontario Building Code (OBC) requirements. If clear/crushed stone is used for bedding, it is imperative that the bedding be provided with a continuous, non-woven geotextile surround. The geotextile is required to prevent migration of fine-grained materials into the bedding which could result in loss of support for the pipes and/or post construction loss of ground resulting in excessive settlements at the ground surface. All bedding materials should be placed in loose lifts not exceeding 300 millimetres in thickness and uniformly compacted to at least 95 per cent of standard Proctor maximum dry density. Should a trench liner box be utilized, care should be taken to ensure that the compacted pipe bedding is not disturbed when the liner box is moved.

Trench Backfill

The excavated materials will consist of topsoil, fill, silty sand, sandy silty clay, and sandy clayey silt. Provided that all deleterious materials are wasted together with any fill, organic or excessively wet materials, the remaining drier portions of the excavated materials are considered geotechnically suitable for use as trench backfill provided that some post construction settlements can be tolerated. Care will be required to separate the different soils being excavated if reuse is being considered. Should there be any shortfall in backfill, or if settlements cannot be tolerated, imported Granular B Type I, or Select Subgrade Material (SSM) should be used as backfill. Care will be required to ensure that sufficient effort is put into placement and compaction of the trench backfill in order to limit settlement, especially if a trench liner box is used. The general trench backfill should be placed in maximum 300-millimetre-thick loose lifts and uniformly compacted to at least 95 per cent of SPMDD. Cobbles and boulders exceeding a nominal diameter of 150 millimetres should not be used in the backfill.

Geotechnical Inspections and Testing

A regular program of geotechnical inspections and materials testing should be carried out during construction to confirm that the conditions being encountered are consistent with the results of the boreholes, that the intent of the design recommendations provided is being met and that the various project and material specifications are being consistently achieved.

Closure

The factual data, interpretation and recommendations presented in this report pertain to specific project site as described in the report and are not applicable to any other project or site location. If the project is modified in concept, location or elevation, or if the project is not initiated within eighteen months of the date of the report, WSP should be given an opportunity to confirm that the recommendations are still valid.

We trust that this draft summary letter provides sufficient information for your present requirements. Should any point require further clarification, or when we can be of additional assistance, please contact this office.

Respectfully Submitted,
WSP Canada Inc.

DRAFT

DRAFT

Jordan A. Kiss, MEng, P.Eng
Geotechnical Engineer

Daniel R.P. Babcock, P.Eng.
Lead Geotechnical Engineer

JAK/DB/lw

Attachments: Important Information and Limitations on this Report
Method of Soil Classification
Abbreviations and Terms Used on Records of Boreholes and Test Pits
List of Symbols
Records of Boreholes
Figure 1: Location Plan
Figure 2: Grain Size Distribution – (CL-ML) sandy clayey Silt to sandy silty Clay
Figure 3: Plasticity Chart

[https://wsponlinecan.sharepoint.com/sites/ca-ca00210575477/shared documents/06. deliverables/task 1000-geo/ca0021057.5477-1000-r01 draft east oxford ps_17april2024.docx](https://wsponlinecan.sharepoint.com/sites/ca-ca00210575477/shared%20documents/06.%20deliverables/task%201000-geo/ca0021057.5477-1000-r01%20draft%20east%20oxford%20ps_17april2024.docx)



IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: WSP Canada Inc. (WSP) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to WSP by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. WSP cannot be responsible for use of this report, or portions thereof, unless WSP is requested to review and, if necessary, revise the report.

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The report is of a summary nature and is not intended to stand alone without reference to the instructions given to WSP by the Client, communications between WSP and the Client, and to any other reports prepared by WSP for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. WSP can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Ground Water Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, WSP does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that WSP interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: WSP will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of WSP's report. WSP should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of WSP's report.

During construction, WSP should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of WSP's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in WSP's report. Adequate field review, observation and testing during construction are necessary for WSP to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, WSP's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that WSP be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that WSP be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. WSP takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

DRAFT

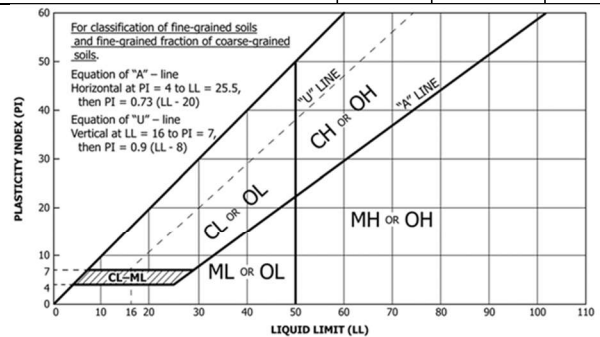
METHOD OF SOIL CLASSIFICATION

The WSP Canada Soil Classification¹ System is based on the Unified Soil Classification System (USCS) (after ASTM D2487)

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$C_u = \frac{D_{60}}{D_{10}}$	$C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$	Organic Content ^{6,9}	USCS Group Symbol ^{3,5,7}	Primary Group Name ²						
INORGANIC (Organic Content <30% by mass)	COARSE-GRAINED SOILS (>50% by mass is larger than 0.075 mm)	GRAVELS (>50% by mass of coarse fraction is larger than 4.75 mm)	Clean Gravels with <5% fines ³ (by mass)	Well Graded	≥4 (and)	≥1 to ≤3	≤30%	GW	Well-graded GRAVEL ^{4,6}						
				Poorly Graded	<4 (and/or)	<1 or >3		GP	Poorly graded GRAVEL ^{4,6}						
			Gravels with >12% fines ³ (by mass)	Below A Line	n/a			GM	SILTY GRAVEL ^{4,6}						
				Above A Line	n/a			GC	CLAYEY GRAVEL ^{4,5,6}						
		SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	Clean Sands with <5% fines ⁷ (by mass)	Well Graded	≥6 (and)	≥1 to ≤3		SW	Well-graded SAND ^{6,8}						
				Poorly Graded	<6 (and/or)	<1 or >3		SP	Poorly graded SAND ^{6,8}						
			Sands with >12% fines ⁷ (by mass)	Below A Line	n/a			SM	SILTY SAND ^{6,8}						
				Above A Line	n/a			SC	CLAYEY SAND ^{5,6,8}						
			Organic or Inorganic	Soil Group	Type of Soil	Laboratory Tests		Field Indicators					Organic Content ^{8,10}	USCS Group Symbol ^A	Primary Group Name ^A
			INORGANIC (Organic Content <30% by mass)	FINE-GRAINED SOILS (≥50% by mass is smaller than 0.075 mm)	SILTS (Nonplastic or PL and LL plot below A-Line on Plasticity Chart below) ^C	Liquid Limit		Rapid	None to Low	Dull to None	3 to >6	Low/can't roll 3 mm	<15%	ML	SILT ^H
<50 ^D	None to Slow	Low to Medium				Dull to Slight	3 to 6	Low	15% to 30%	OL	ORGANIC SILT				
Liquid Limit	None to V.Slow	Low to Medium				Slight	3 to 6	Low to Medium	<15%	MH	ELASTIC SILT ^H				
≥50 ^D	None	Medium to High				Dull to Slight	1 to 3	Low to Medium	15% to <30%	OH	ORGANIC SILT				
CLAYS (PI and LL plot above A-Line on Plasticity Chart below) ^A	Liquid Limit	None to Medium Slow			Medium to High	Slight to Shiny	1 to 3	Medium	<15%	CL	LEAN CLAY ^{A,E,F,G,H}				
	<50 ^D	None to V.Slow			Medium to High	Slight to Shiny	1 to 3	Medium	15% to <30%	OL	ORGANIC CLAY ^{E,F,G}				
	Liquid Limit	None			High to V.High	Shiny	<1	High	<15%	CH	FAT CLAY ^{E,F,G,H}				
	≥50 ^D	None			High	Shiny	<1 to 1	High	15% to <30%	OH	ORGANIC CLAY ^{E,F,G}				
	HIGHLY ORGANIC SOILS (Organic Content >30% by mass)	Peat and mineral soil mixtures			Relatively lightweight, possibly spongy. Some water may squeeze from sample. Some shrinkage may occur on air drying. Sand fraction may be visible. Low to high dilatancy. Thread weak near plastic limit. Low to medium dry strength.					30% to <75%	PT	SILTY PEAT, SANDY PEAT			
		Predominantly peat, may contain some mineral soil, fibrous or amorphous peat			Lightweight, spongy. Much water squeezes from sample. Shrinks considerably on air drying (i.e., very high water content). Plant structure identifiable to altered.					75% to 100%		PEAT			

Coarse-Grained Soil Note(s):

- Based on the material passing the 75 mm sieve.
- If field sample contains or drilling observations indicate cobbles or boulders or both, add, "with cobbles" or "with cobbles and boulders". Include notes on the depth(s) encountered, and sizes if possible.
- Gravels with 5% to 12% fines require dual symbols:
(GW-GM) Well-graded GRAVEL with silt,
(GW-GC) Well-graded GRAVEL with clay,
(GP-GM) Poorly graded GRAVEL with silt,
(GP-GC) Poorly graded GRAVEL with clay.
- If soil contains $\geq 15\%$ sand, add "with sand" to Group Name.
- If fines classify as CL-ML, use dual symbol (GC-GM) or (SC-SM) for Group Symbol.
- If the soil has an organic content (OC) $15\% \leq OC < 30\%$ the prefix "Organic" should be added before the Group Name. If the soil has an organic content $3\% \leq OC < 15\%$ add "with organic fines" to Group Name. If the soil contains $> 0\%$ to $\leq 3\%$ organics, the descriptor "trace organics" may be added.
- Sands with 5% to 12% fines require dual symbols:
(SW-SM) Well-graded SAND with silt,
(SW-SC) Well-graded SAND with clay,
(SP-SM) Poorly graded SAND with silt,
(SP-SC) Poorly graded SAND with clay.
- If soil contains $\geq 15\%$ gravel, add "with gravel" to Group Name.



Fine-Grained Soil Note(s):

- If Atterberg limits plot above the A-line but in the 'hatched' area on the plasticity chart, soil is a (CL-ML) SILTY CLAY.
- If the soil contains $> 0\%$ to $\leq 3\%$ organics, the descriptor "trace organics" may be added.
- If fine-grained materials are nonplastic (i.e., a plastic limit (PL) cannot be measured), soil is a (ML) SILT.
- If soil has a liquid limit (LL) $> 30\%$ to $< 50\%$, the term 'medium plasticity' may be included in the description, but the Group Name/Symbol is not changed.
- If soil contains 15% to $< 30\%$ +No.200, add "with sand" or "with gravel".
- If soil contains $\geq 30\%$ +No.200 mainly sand, add "Sandy" to Group Name.
- If soil contains $\geq 30\%$ +No.200 mainly gravel, add "Gravelly" to Group Name.
- If the soil has an organic content (OC) $3\% \leq OC < 15\%$ add "with organic fines" to Group Name.

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

GRADATIONAL COMPONENT TERMS

% (by mass)	Term
≤ 5	Use "trace"
> 5 to ≤ 12	Use "few"
> 12 to <30	Use "little"
≥ 30 to <50	Use "some"
≥ 50	Use "mostly"

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.). Values reported are as recorded in the field and are uncorrected.

Cone Penetration Test (CPT)

An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm² pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); Nd:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure

PM: Sampler advanced by manual pressure

WH: Sampler advanced by static weight of hammer

WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DD	Diamond Drilling
DO or DP	Seamless open ended, driven, pushed tube sampler, or geoprobe macro-core – note size
DS	Denison type sample
FS	Foil Sample
GS	Grab Sample
MC	Modified California Samples – note sample diameter and hammer weight
MS	Modified Shelby (for frozen soil)
RC	Rock core
SC	Soil core
SS	Split-spoon sampler (50 mm OD); larger sizes use MC
ST	Slotted tube
TO	Thin-walled, open – note size (Shelby tube)
TP	Thin-walled, piston – note size (Shelby tube)
WS	Wash sample

SOIL TESTS

w	water content
PL, w _p	plastic limit
LL, w _L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test ¹
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement ¹
D _R	relative density (specific gravity, G _s)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO ₄	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
Y	unit weight

1. Tests anisotropically consolidated prior to shear are shown as CAD, CAU.

NON-COHESIVE (COHESIONLESS) SOILS

Compactness²

Term	SPT 'N' (blows/0.3m) ¹
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

1. SPT 'N' in general accordance with ASTM D1586, uncorrected for the effects of overburden pressure.

2. Definition of compactness terms are based on SPT 'N' ranges as provided in Terzaghi, Peck and Mesri (1996). Many factors affect the recorded SPT 'N' value, including hammer efficiency (which may be greater than 60% in automatic trip hammers), overburden pressure, groundwater conditions, and grain size. As such, the recorded SPT 'N' value(s) should be considered only an approximate guide to the soil compactness. These factors need to be considered when evaluating the results, and the stated compactness terms should not be relied upon for design or construction.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

COHESIVE SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N' ^{1,2} (blows/0.3m)
Very Soft	<12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

1. SPT 'N' in general accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.

2. SPT 'N' values should be considered ONLY an approximate guide to consistency; for sensitive clays (e.g., Champlain Sea clays), the N-value approximation for consistency terms does NOT apply. Rely on direct measurement of undrained shear strength or other manual observations.

Water Content

Term	Description
w < PL	Material is estimated to be drier than the Plastic Limit.
w ~ PL	Material is estimated to be close to the Plastic Limit.
w > PL	Material is estimated to be wetter than the Plastic Limit.

LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
$\ln x$	natural logarithm of x
$\log_{10}$	x or $\log x$, logarithm of x to base 10
g	acceleration due to gravity
t	time

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta \sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
ν	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

(a) Index Properties (continued)

w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index $= (w_l - w_p)$
NP	nonplastic
w_s	shrinkage limit
I_L	liquidity index $= (w - w_p) / I_p$
I_C	consistency index $= (w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index $= (e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
C_v	coefficient of consolidation (vertical direction)
C_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio $= \sigma'_p / \sigma'_{vo}$

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction $= \tan \delta$
c'	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p'	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

* Density symbol is ρ . Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

Notes: 1
2

$$\tau = c' + \sigma' \tan \phi'$$

$$\text{shear strength} = (\text{compressive strength})/2$$

PROJECT: CA00221057.5477

LOCATION: N 4772107.26; E 529391.15

RECORD OF BOREHOLE: BH-101

SHEET 1 OF 1

BORING DATE: March 13, 2024

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DRILL RIG: Track-Mounted Diedrich D50 Turbo

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ ⊗ ⊙ ⊖		WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴			10 ⁻³
0	Power Auger 152 mm Diam. (Hollow Stem)	GROUND SURFACE		287.75													
		ASPHALT		0.00													
		FILL - gravelly SAND, trace silt; brown; moist, compact		0.09	1	SS	18										
		(ML) sandy CLAYEY SILT, some gravel; brown; moist, stiff to very stiff		287.14													
				0.61													
1					2	SS	16										
					3	SS	20										
2																	
					4	SS	23										
			- grey		5	SS	14										
			(CL) sandy SILTY CLAY, some gravel; grey; stiff		284.09												
				3.66													
4				6	SS	10											
				7	SS	12											
5																	
		- sand lens at 5.49 m		8	SS	13											
		- lens with increased gravel content at 5.79 m		281.81													
				5.94													
6		END OF BOREHOLE															
		Note(s): 1. Borehole dry upon completion of drilling.															
7																	
8																	
9																	
10																	

DEPTH SCALE

1 : 50



LOGGED: DB

CHECKED: JAK

GTA-BHS 001 S:\CLIENTS\THAMES VALLEY DISTRICT SCHOOL BOARD\EAST OXFORD PUBLIC SCHOOL\02 DATA\GINT\EAST OXFORD PS.GPJ GAL-MIS.GDT 4/17/24

PROJECT: CA00221057.5477
LOCATION: N 4772124.72; E 529344.64

RECORD OF BOREHOLE: BH-102

SHEET 1 OF 1
DATUM: Geodetic

BORING DATE: March 13, 2024

DRILL RIG: Track-Mounted Diedrich D50 Turbo

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa		nat V. rem V.		WATER CONTENT PERCENT						
								+	Q -	U -	Wp	W	VM					
		GROUND SURFACE		287.79 0.00				20	40	60	80		10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³		
0	Solid stem Auger 152 mm Diam. (Hollow Stem)	TOPSOIL - sandy SILT, trace clay, trace organics; dark brown; moist, loose			1	SS	6											
1		(CL) sandy SILTY CLAY, trace gravel; mottled brown; moist, firm to very stiff		287.03 0.76		2	SS	19										
2						3	SS	7										
		(ML) sandy CLAYEY SILT, some gravel; brown; moist, very stiff		285.50 2.29		4	SS	16										
3																		
					5	SS	17											
4		(CL) SILTY CLAY, some sand, trace gravel; grey; wet, stiff		284.13 3.66														
					6	SS	14											
		END OF BOREHOLE		283.37 4.42														
5		Note(s): 1. Groundwater encountered at depths of 2.03 m and 4.37 m during drilling on March 13, 2024.																
6																		
7																		
8																		
9																		
10																		

DEPTH SCALE

1 : 50



LOGGED: DB

CHECKED: JAK

PROJECT: CA00221057.5477
LOCATION: N 4772123.69; E 529302.29

RECORD OF BOREHOLE: MW-103

SHEET 1 OF 1
DATUM: Geodetic

BORING DATE: March 13, 2024

DRILL RIG: Track-Mounted Diedrich D50 Turbo

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa		nat V. rem V.	+ ⊕	Q- U- ● ○	WATER CONTENT PERCENT			
								20	40	60	80	10 ⁻⁶	10 ⁻⁵			10 ⁻⁴
0		GROUND SURFACE		287.80												
	Power Auger 152 mm Diam. (Hollow Stem)	TOPSOIL - sandy CLAYEY SILT, trace organics; dark brown; moist, loose		0.00	1	SS	5									
				287.04												
		(SM) SILTY SAND; brown; moist, compact		0.76												
1		(ML) sandy CLAYEY SILT, trace to some gravel; brown; moist, stiff to very stiff		0.84	2	SS	12									
		- some small sand lenses from 1.52 m to 2.13 m														
					3	SS	15									
2																
					4	SS	12									
3																
					5	SS	19									
		END OF BOREHOLE		284.14												
4				3.66												
5																
6																
7																
8																
9																
10																

DEPTH SCALE

1 : 50



LOGGED: DB

CHECKED: JAK

GTA-BHS 001 S:\CLIENTS\THAMES VALLEY DISTRICT SCHOOL BOARD\EAST OXFORD PUBLIC SCHOOL\02 DATA\GINT\EAST OXFORD PS.GPJ GAL-MIS.GDT 4/17/24

PROJECT: CA00221057.5477
LOCATION: N 4772148.91; E 529269.49

RECORD OF BOREHOLE: MW-104

SHEET 1 OF 1
DATUM: Geodetic

BORING DATE: March 13, 2024

DRILL RIG: Track-Mounted Diedrich D50 Turbo

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
								SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ U - ⊙		WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴			10 ⁻³
								20	40	60	80						
0		GROUND SURFACE		287.81													
	Power Auger 152 mm Diam. (Hollow Stem)	TOPSOIL - SILTY SAND, trace gravel; dark brown; moist, loose		0.00	1	SS	5								Flush Mount Casing		
				287.20											Bentonite		
		(SM) SILTY SAND; brown; wet, very loose		0.61	2A												
1		(CL) sandy SILTY CLAY, some gravel; brown; moist, soft to very stiff		286.90		SS	3								MH		
				0.91	2B										Silica sand		
2					3	SS	11										
					4	SS	14								50 mm Diam. PVC #10 Slot Screen		
3																	
		- grey			5	SS	21										
				284.15													
				3.66													
4		END OF BOREHOLE															
		Note(s):															
		1. Groundwater encountered at depth of 0.76 m during drilling on March 13, 2024.															
5																	
6																	
7																	
8																	
9																	
10																	

DEPTH SCALE

1 : 50



LOGGED: DB

CHECKED: JAK

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PROJECT: CA00221057.5477
LOCATION: N 4772163.88; E 529304.32

RECORD OF BOREHOLE: MW-105

SHEET 1 OF 1
DATUM: Geodetic

BORING DATE: March 13, 2024

DRILL RIG: Track-Mounted Diedrich D50 Turbo

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa		nat V. rem V.	+ - Q - U -	● ○	WATER CONTENT PERCENT			
								20	40	60	80	20	40	60		
0	Power Auger 152 mm Diam. (Hollow Stem)	GROUND SURFACE		286.88 0.00												
		TOPSOIL - sandy SILT, trace organics; dark brown; moist, loose			1	SS	5									
		(CL) sandy SILTY CLAY, some gravel; brown; moist, firm to very stiff - grey		286.12 0.76												
1					2A	SS	5									
					2B											
					3	SS	16									
2																
					4	SS	18									
3					5	SS	18									
					283.22 3.66											
4				END OF BOREHOLE												
		Note(s): 1. Groundwater encountered at depth of 0.76 m during drilling on March 13, 2024.														
5																
6																
7																
8																
9																
10																

DEPTH SCALE

1 : 50



LOGGED: DB
CHECKED: JAK

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PROJECT: CA00221057.5477
LOCATION: N 4772143.03; E 529331.54

RECORD OF BOREHOLE: MW-106

SHEET 1 OF 1
DATUM: Geodetic

BORING DATE: March 13, 2024

DRILL RIG: Track-Mounted Diedrich D50 Turbo

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa		nat V. rem V.		Q - U -				WATER CONTENT PERCENT	
								20	40	60	80	10 ⁻⁶	10 ⁻⁵			10 ⁻⁴	10 ⁻³
0		GROUND SURFACE		286.95													
	Power Auger 152 mm Diam. (Hollow Stem)	TOPSOIL - sandy SILT, trace organics; dark brown; moist, loose		0.00	1	SS	7								Flush Mount Casing		
1		(CL) sandy SILTY CLAY, some gravel; brown; moist, stiff		286.19	2	SS	8								Bentonite		
				0.76													
2		(ML) sandy CLAYEY SILT, some gravel; brown; moist, stiff to very stiff		285.43	3	SS	13								Silica sand		
				1.52													
3																	
					4	SS	21										
					5	SS	25										
		(SM) gravelly SILTY SAND, some clay, trace gravel; brown; moist, compact		283.55											MH		
				3.40													
				283.29													
				3.66													
4		END OF BOREHOLE															
		Note(s):															
		1. Groundwater encountered at depth of 1.52 m during drilling on March 13, 2024.															
5																	
6																	
7																	
8																	
9																	
10																	

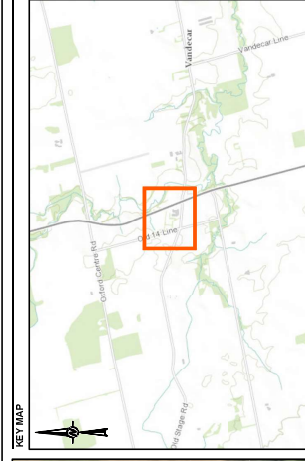
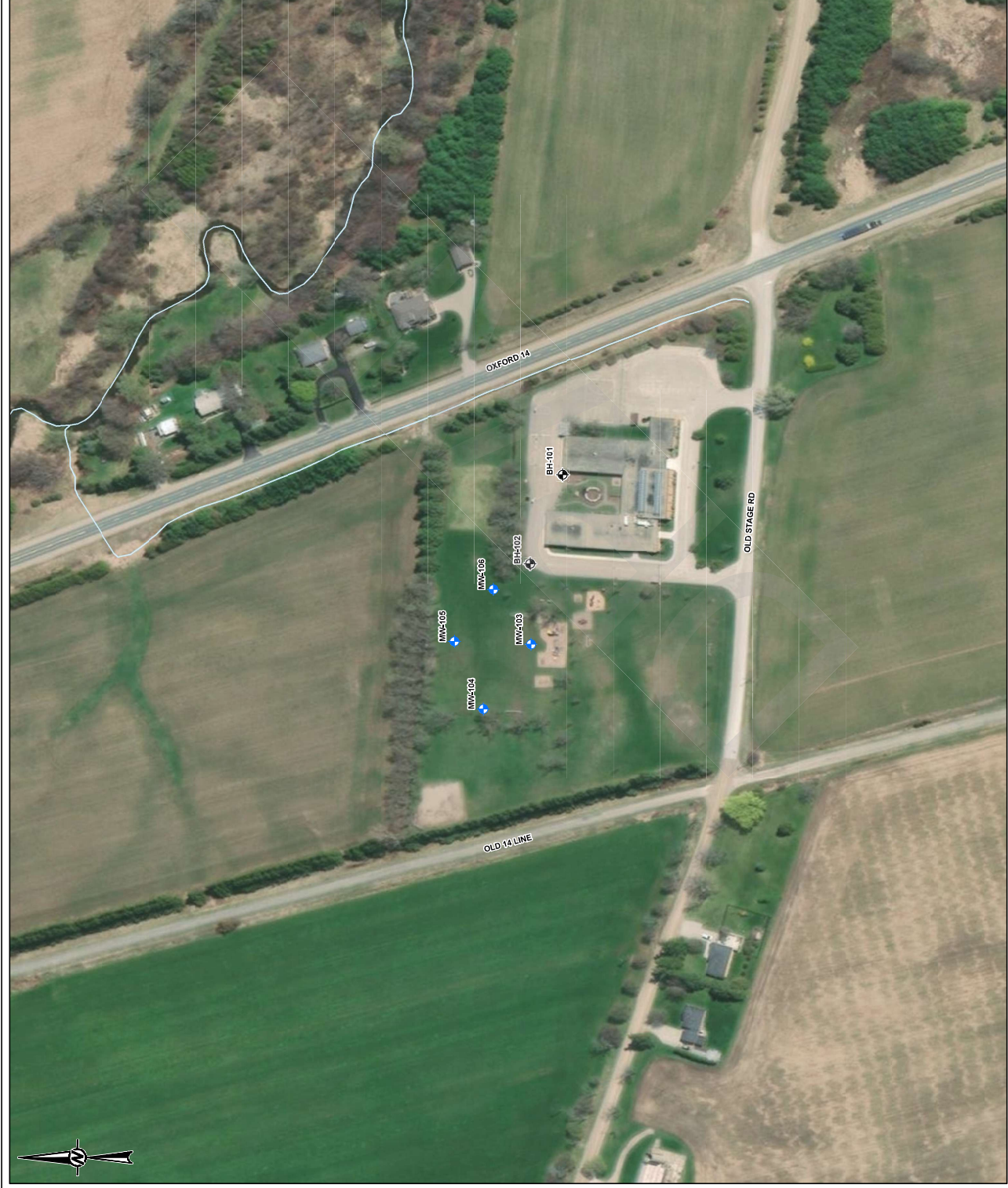
DEPTH SCALE

1 : 50



LOGGED: DB
CHECKED: JAK

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SCALE 1:50,000

LEGEND



BOREHOLE

 MONITORING WELL

WATERCOURSE

DRAFT



NOTE(S)

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCES

REFERENCES

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CLIENT

THAMES VALLEY DISTRICT SCHOOL BOARD

PROJECT:

PROJECT
EAST OXFORD PUBLIC SCHOOL SEPTIC BED.

WOOD

TITLE

LOCAT

CONSULTANT

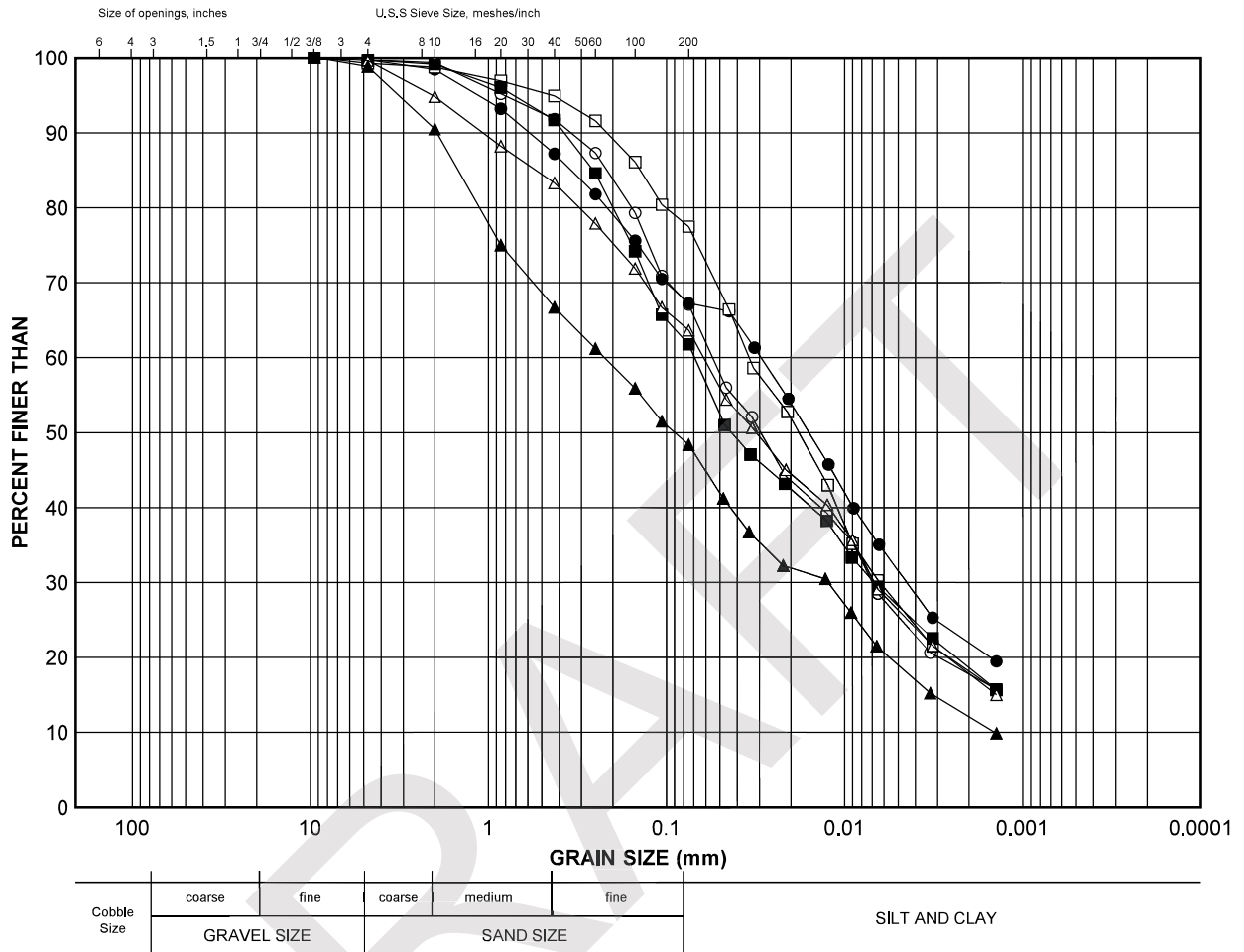
2024-04-02
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PROJECT NO.

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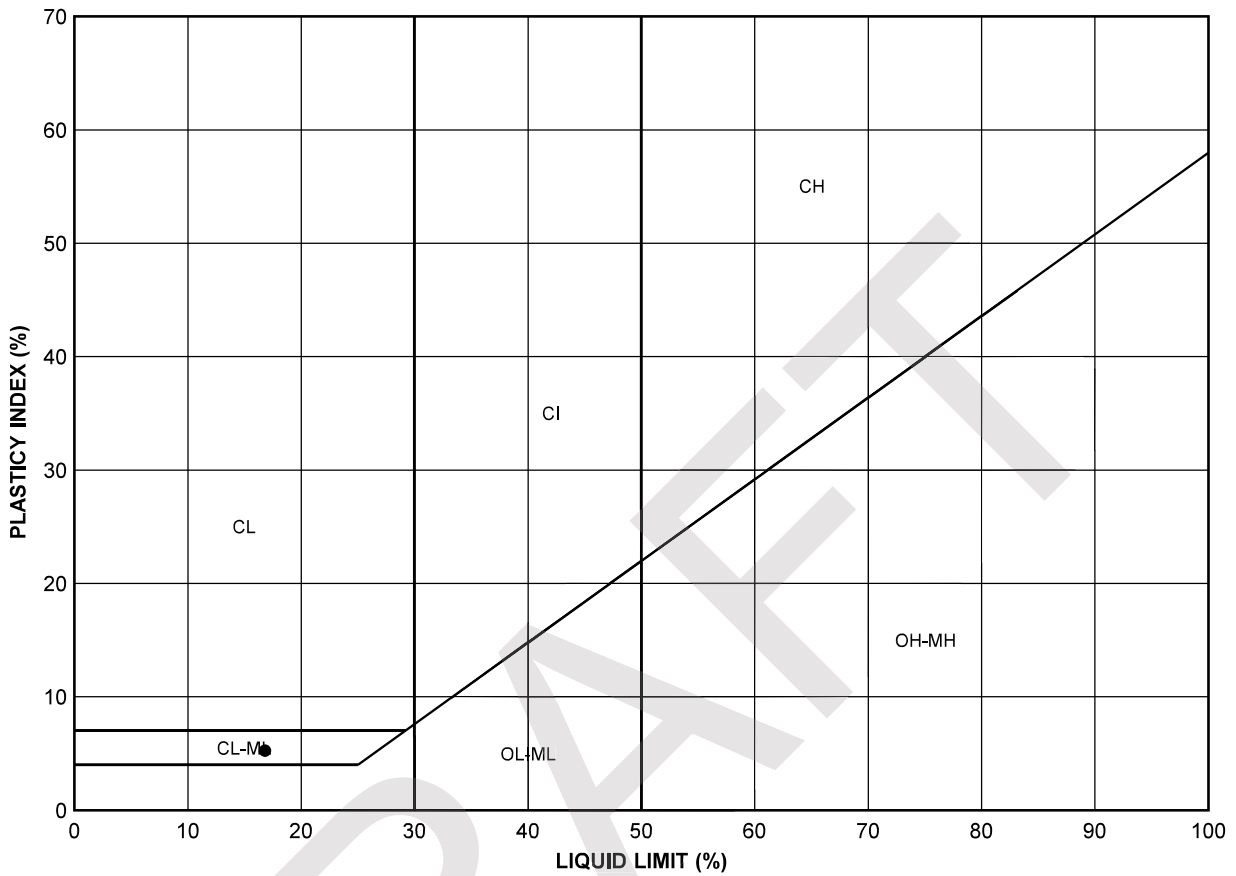
FIGURE 1



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
○	101	5	284.4
●	102	3	286.0
□	103	4	285.2
■	104	2B	287.0
△	105	3	285.1
▲	106	5	283.7

PROJECT				GEOTECHNICAL EXPLORATION EAST OXFORD PUBLIC SCHOOL PROPOSED SEPTIC BED WOODSTOCK, ONTARIO							
TITLE				GRAIN SIZE DISTRIBUTION (ML-CL) sandy clayey SILT to sandy silty CLAY							
		PROJECT No.		CA0021057,5477		FILE No.		CA0021047,5477			
		DRAWN		JAK		2024-04-16		SCALE		N/A	
		CHECK						REV.		0	
				FIGURE 2							



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	101	5	284.4

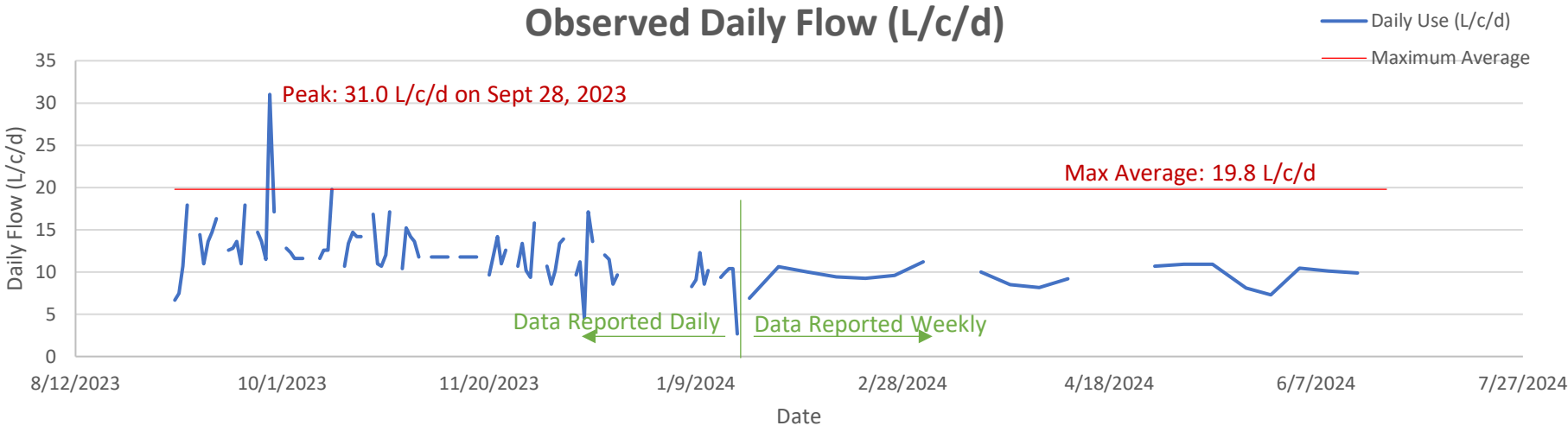
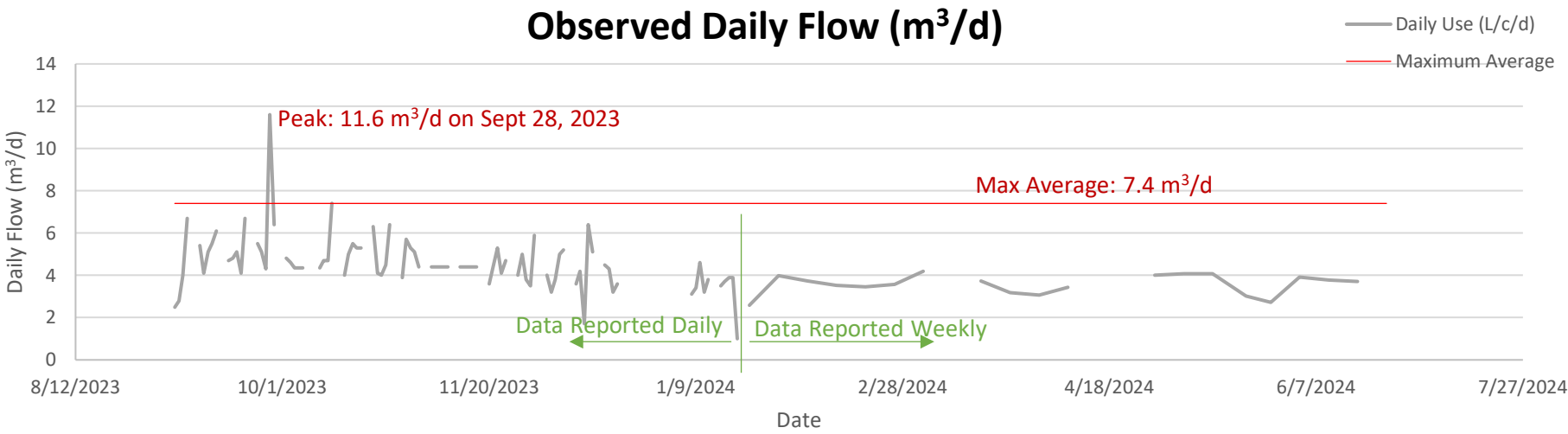
PROJECT		GEOTECHNICAL EXPLORATION EAST OXFORD PUBLIC SCHOOL PROPOSED SEPTIC BED WOODSTOCK, ONTARIO			
TITLE					
PLASTICITY CHART					
		PROJECT No.		CA0021047.5477	
		DRAWN		JAK	
		CHECK		2024-04-16	
		FILE No.		CA0021047.5477.xdgm, Figure 3	
		SCALE		N/A	
				REV. 0	
		FIGURE 3			

Total Flow	791.3	m ³
Total Days	180	days
Total Population (2024)	374	persons

	Flow (L/d)	Flow (L/c/d)	comments
Daily Average	4396.1	11.8	
Representative Max	7400	19.8	September 28, 2023 peak omitted.
Max .day recorded	11600	31.0	Recorded September 28, 2023

Note: 36 weeks of active school from Sept 5, 2023 to June 24, 2024. This equates to approximately 180 school days.

Year	Students	Teaching Staff	Non-Teaching Staff	Total Population	L/c/d rate	Daily Flow (m ³ /d)	Daily Flow (L/d)
2023 (Actual Projection)	353	15	6	374	19.8	7.4	7400
2023 (Max Occupancy)	374	15	6	395	19.8	7.8	7816
2027 (Max Occupancy)	402	17	6	425	19.8	8.4	8409
Maximum (10,000 L/d)	-	-	-	500	19.8	9.9	9893



165630246: 2023 TVDSB MSA Assignments
 East Oxford Central Public School Sewage System Review
 Water Usage 2023 - Raw Data

Daily Reading Date	Accumulative meter reading (m ³)	Weekly Use (m3)	Daily Use (m3)	Total Est Population (students + staff)	Daily Use (L/c/d)
5-Sep	6		2.5	374	6.7
6-Sep	8.5		2.8	374	7.5
7-Sep	11.3		4	374	10.7
8-Sep	15.3		6.7	374	17.9
weekend					
11-Sep	22		5.4	374	14.4
12-Sep	27.4		4.1	374	11.0
13-Sep	31.5		5.1	374	13.6
14-Sep	36.6		5.5	374	14.7
15-Sep	42.1		6.1	374	16.3
weekend					
18-Sep	48.2		4.7	374	12.6
19-Sep	52.9		4.8	374	12.8
20-Sep	57.7		5.1	374	13.6
21-Sep	62.8		4.1	374	11.0
22-Sep	66.9		6.7	374	17.9
weekend					
25-Sep	73.6		5.5	374	14.7
26-Sep	79.1		5.1	374	13.6
27-Sep	84.2		4.3	374	11.5
28-Sep	88.5		11.6	374	31.0
29-Sep	100.1		6.4	374	17.1
weekend					
2-Oct	106.5		4.8	374	12.8
3-Oct	111.3		4.6	374	12.3
4-Oct	115.9		4.35	374	11.6
5-Oct	no reading		4.35	374	11.6
6-Oct	no reading		4.35	374	11.6
weekend					
10-Oct	no reading		4.35	374	11.6
11-Oct	133.3		4.7	374	12.6
12-Oct	no reading		4.7	374	12.6
13-Oct	142.7		7.4	374	19.8
weekend					
16-Oct	150.1		4	374	10.7
17-Oct	154.1		5	374	13.4
18-Oct	159.1		5.5	374	14.7
19-Oct	164.6		5.3	374	14.2
20-Oct	169.9		5.3	374	14.2
weekend					
23-Oct	175.2		6.3	374	16.8
24-Oct	181.5		4.1	374	11.0
25-Oct	185.6		4	374	10.7
26-Oct	189.6		4.5	374	12.0
27-Oct	194.1		6.4	374	17.1
weekend					
30-Oct	200.5		3.9	374	10.4
31-Oct	204.4		5.7	374	15.2
1-Nov	210.1		5.3	374	14.2
2-Nov	215.4		5.1	374	13.6
3-Nov	220.5		4.4	374	11.8
weekend					
6-Nov	no reading		4.4	374	11.8

165630246: 2023 TVDSB MSA Assignments
 East Oxford Central Public School Sewage System Review
 Water Usage 2023 - Raw Data

Daily Reading Date	Accumulative meter reading (m ³)	Weekly Use (m3)	Daily Use (m3)	Total Est Population (students + staff)	Daily Use (L/c/d)
7-Nov	no reading		4.4	374	11.8
8-Nov	no reading		4.4	374	11.8
9-Nov	no reading		4.4	374	11.8
10-Nov	no reading		4.4	374	11.8
weekend					
13-Nov	no reading		4.4	374	11.8
14-Nov	no reading		4.4	374	11.8
15-Nov	no reading		4.4	374	11.8
16-Nov	no reading		4.4	374	11.8
17-Nov	no reading		4.4	374	11.8
weekend					
20-Nov	269.1		3.6	374	9.6
21-Nov	272.7		4.4	374	11.8
22-Nov	277.1		5.3	374	14.2
23-Nov	282.4		4.1	374	11.0
24-Nov	286.5		4.7	374	12.6
weekend					
27-Nov	291.2		4	374	10.7
28-Nov	295.2		5	374	13.4
29-Nov	300.2		3.8	374	10.2
30-Nov	304		3.5	374	9.4
1-Dec	307.5		5.9	374	15.8
weekend					
4-Dec	313.4		4	374	10.7
5-Dec	317.4		3.2	374	8.6
6-Dec	320.6		3.8	374	10.2
7-Dec	324.4		5	374	13.4
8-Dec	329.4		5.2	374	13.9
weekend					
11-Dec	334.6		3.6	374	9.6
12-Dec	338.2		4.2	374	11.2
13-Dec	342.4		1.7	374	4.5
14-Dec	344.1		6.4	374	17.1
15-Dec	350.5		5.1	374	13.6
weekend					
18-Dec	355.6		4.5	374	12.0
19-Dec	360.1		4.3	374	11.5
20-Dec	364.4		3.2	374	8.6
21-Dec	367.6		3.6	374	9.6
22-Dec	371.2				
Christmas Break					
8-Jan	387.5		3.1	374	8.3
9-Jan	390.6		3.4	374	9.1
10-Jan	394		4.6	374	12.3
11-Jan	398.6		3.2	374	8.6
12-Jan	401.8		3.8	374	10.2
weekend					
15-Jan	405.6		3.5	374	9.4
16-Jan	409.1		3.7	374	9.9
17-Jan	412.8		3.9	374	10.4
18-Jan	416.7		3.9	374	10.4
19-Jan	420.6		1	374	2.7
weekend					

165630246: 2023 TVDSB MSA Assignments
 East Oxford Central Public School Sewage System Review
 Water Usage 2023 - Raw Data

Daily Reading	Accumulative meter reading (m ³)	Weekly Use (m3)	Daily Use (m3)	Total Est Population (students + staff)	Daily Use (L/c/d)
22-Jan	421.6	12.9	2.58	374	6.9
29-Jan	434.5	19.9	3.98	374	10.6
5-Feb	454.4	18.7	3.74	374	10.0
12-Feb	473.1	17.6	3.52	374	9.4
19-Feb	490.7	13.8	3.45	374	9.2
26-Feb	504.5	17.9	3.58	374	9.6
3/4/2024	522.4	21	4.2	374	11.2
March Break	11-Mar				
18-Mar	543.4	18.7	3.74	374	10.0
25-Mar	562.1	15.9	3.18	374	8.5
1-Apr	578	15.3	3.06	374	8.2
8-Apr	593.3	51.5	3.43	374	9.2
15-Apr	no reading				
22-Apr	no reading				
29-Apr	644.8	20	4.00	374	10.7
6-May	664.8	20.4	4.08	374	10.9
13-May	685.2	20.4	4.08	374	10.9
21-May	705.6	15.1	3.02	374	8.1
27-May	720.7	13.6	2.72	374	7.3
3-Jun	734.3	19.6	3.92	374	10.5
10-Jun	753.9	18.9	3.78	374	10.1
17-Jun	772.8	18.5	3.70	374	9.9
24-Jun	791.3		7.4		

Table 1: 2023/2024 School Year - Maximum Occupancy Population

	Number of Classes (23/24)	Average Number of Students	Total
JK/SK	3	26	78
Grade 1-3	4	20	80
Grade 4-6	4	28	112
Grade 7-8	4	26	104
Total School Student Population			374

Note: Table above was provided via email by Cassandra Harms (c.harms@tvdsb.ca) on August 1, 2023. These values represent the estimated max. capacity enrollment for the 2023/2024 school year.

Table 2: Future School Populations - Student Enrollment, Teachers, and Non-Teaching Staff

Year	Total Student Enrollment	Students (Max Occupancy)	Teachers	Non Teaching Staff	Total Population (Max. Occ.)	Comments
2023	354	374	15	7	396	**includes 2 existing portables (56 students)
2024	360	374	15	7	396	
2025	364	374	15	7	396	
2026	373	374	16	7	397	
2027	393	400	17	7	424	Assumes addition of a third portable, 26 students (grade 6-8) in a portable.
2028	408	426	17	8	451	Assumes addition of a fourth portable, 26 students (grade 6-8) in a portable.
2029	419	426	18	8	452	
2030	437	452	18	8	478	Assumes addition of a fifth portable, 26 students (grade 6-8) in a portable.
2031	442	452	19	8	479	
2032	457	478	19	9	506	Peak population*** Assumes addition of a sixth portable, 26 students (grade 6-8) in a portable.
2033	447	478	19	9	506	
2034	446	478	19	9	506	
2035	454	478	19	9	506	
2036	449	478	19	9	506	
2037	449	478	19	9	506	
2038	449	478	19	9	506	
2039	449	478	19	9	506	
2040	449	478	19	9	506	
2041	449	478	19	9	506	
2042	449	478	19	9	506	
2043	449	478	19	9	506	

Notes:

1. The projections for staff members were estimated for teaching staff based on O.Reg. 132/12 which has assumed approximately 24.2 students per teacher for the school.
2. The non-teaching staff was estimated based on the 2019 annual report published by People for Education which determined that on average each elementary school has 1 office staff per 255 students, 1 principal, 1 full time librarian, and 1 custodian per 198 students.

EAST OXFORD CENTRAL PUBLIC SCHOOL
FUTURE SEPTIC SYSTEM ANALYSIS - WATER USAGE
(Based on Maximum Occupancy Student Populations, and Observed Water Consumption Rates)

Population Forecasting:

Year	Maximum Student Occupancy ¹	Design Flow (students) (L/d)	Staff Members (Teaching) ²	Staff Members (Non-Teaching) ²	Design Flow (staff) (L/d)	Total Design Flow (L/d)
2024	374	7,405	15	7	445	7,850
2032	478	9,464	19	9	554	10,019
New System (10,000 L/d)	500	9,900			0	10,000

Table 8.2.1.3.B. of the OBC:

	Water usage ³	
Student + Teacher	19.8	L/person/day
Non-Teaching Employee	19.8	L/person/day

Current Design Flow

Based on Distribution Length:

Length of distribution piping (m):	378
T (percolation rate) (min/cm):	10
Design Flow (L/d):	7,560.00

Based on Tank Size:

Tank Size (L):	28,725.10
Peaking Factor:	3
Design Flow (L/d):	9,575.03

Working Capacity:

Peaking Factor ⁴	3
-----------------------------	---

Year	Volume (L)
2024	23,549
2032	30,056
New System (10,000 L/d)	30,000

Chambers:

Year	2024	2032	New System (10,000 L/d)
Chamber 1 (1.3x) daily flow (L) ⁴	10,205	13,024	13,000
Chamber 2 (50% of Chamber 1) (L) ⁴	5,102	6,512	6,500

Existing Chambers	Check	Calculation (2023)	Status
Chamber 1	19,220.61 > 1.3 x daily flow	10,204.74	OK
Chamber 2	9,504.50 ~ 50% chamber 1	0.49	OK
Total	28,725.10 3*design flow	23,549.40	OK

Length of Weeping Tile Distribution Piping:

Year	T (Percolation) (min/cm)	Length (L= QT/200) ^{5,6} (m)	> Existing? (Y/N)	Number of runs (max length 30 m per run)
2024	10	392	Y	13.1
2032	10	501	Y	16.7
New System (10,000 L/d)	10	500	Y	16.7

NOTES:

- 1) Maximum student occupancy is determined from the classroom and potable capacities that satisfy the projected student enrollment values. The population in 2027 triggers the need for an additional portable, therefore an additional 28 students are added for the maximum occupancy.
2) Assuming staff based on O.Reg 132/12 and 2019 Ontario Classroom Statistics

- 3) Water usage based on flow meter records at East Oxford PS (see attachment 5)

- 4) Section 8.2.2.3 of the OBC

- 5) Section 8.7.3.1.(2) of the OBC
6) Total length of existing tile bed: 378 (m)

EAST OXFORD CENTRAL PUBLIC SCHOOL
FUTURE SEPTIC SYSTEM ANALYSIS
(Based on Maximum Occupancy Student Populations, OBC Sewage Rates)

Population Forecasting:

Year	Maximum Student Occupancy ¹	Design Flow (students) (L/d)	Staff Members (Teaching) ²	Staff Members (Non-Teaching) ²	Design Flow (staff) (L/d)	Total Design Flow (L/d)
2024	374	11,220	15	7	814	12,034
2032	478	14,340	19	9	1,020	15,360
New System (10,000 L/d)	333	9,990			0	10,000

Table 8.2.1.3.B. of the OBC:

	Water usage ³	
Student + Teacher	30	L/person/day
Non-Teaching Employee	50	L/person/day

Current Design Flow

Based on Distribution Length:

Length of distribution piping (m):	378
T (percolation rate) (min/cm):	10
Design Flow (L/d):	7,560.00

Based on Tank Size:

Tank Size (L):	28,725.10
Peaking Factor:	3
Design Flow (L/d):	9,575.03

Working Capacity:

Peaking Factor ⁴	3
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Year	Volume (L)
2024	36,101
2032	46,080
New System (10,000 L/d)	30,000

Chambers:

Year	2024	2032	New System (10,000 L/d)
Chamber 1 (1.3x) daily flow (L) ⁴	15,644	19,968	13,000
Chamber 2 (50% of Chamber 1) (L) ⁴	7,822	9,984	6,500

Existing Chambers	Check	Calculation (2023)	Status
Chamber 1	19,220.61 > 1.3 x daily flow	15,643.73	OK
Chamber 2	9,504.50 ~ 50% chamber 1	0.49	OK
Total	28,725.10 3*design flow	36,100.91	NO

Length of Weeping Tile Distribution Piping:

Year	T (Percolation) (min/cm)	Length (L= QT/200) ^{5,6} (m)	> Existing? (Y/N)	Number of runs (max length 30 m per run)
2024	10	602	Y	20.1
2032	10	768	Y	25.6
New System (10,000 L/d)	10	500	Y	16.7

NOTES:

- 1) Maximum student occupancy is determined from the classroom and potable capacities that satisfy the projected student enrollment values. The population in 2027 triggers the need for an additional portable, therefore an additional 28 students are added for the maximum occupancy.
2) Assuming staff based on O.Reg 132/12 and 2019 Ontario Classroom Statistics

- 3) Water usage rates per OBC Table 8.2.1.3. B

- 4) Section 8.2.2.3 of the OBC

- 5) Section 8.7.3.1.(2) of the OBC

- 6) Total length of existing tile bed: 378 (m)