REPORT

Holbrook Landfill

2025 Water Monitoring Report

Submitted to:

County of Oxford

21 Reeve Street
Woodstock, Ontario N4S 7Y3

Submitted by:

WSP Canada Inc.

55 King Street, Suite 700, St. Catharines, ON
L2R 3H5 Canada

(519) 974-5887

CA0024089.5055-02

February 5, 2026

Distribution List

Pamela Antonio, MPA, BES, Supervisor of Waste Management, County of Oxford

Frank Gross, C.Tech, Senior Manager of Transportation & Waste Services, County of Oxford

Executive Summary

The closed Holbrook Landfill (site) is located on Part of Lots 20 and 21, Concession III near the village of Holbrook in the Township of Norwich. The site is located north of Quaker Street (Norwich Road 3) and is bounded by agricultural land to the east and west, and Long Point Region Conservation Authority (LPRCA) wetlands to the north and south. It is understood that the landfill site originally started accepting waste around 1970, and was assumed by the County of Oxford in 1982. The landfill operated until July 1986, at which time it was capped and seeded as part of the staged development and closure of the site. The closed site is currently operated under Ministry of the Environment, Conservation and Parks (MECP) Amended Environmental Compliance Approval (ECA) No. A070702, dated March 6, 2018. The 2025 annual monitoring program was completed at the site in accordance with ECA requirements.

Groundwater movement in the shallow flow system across most of the site is inferred to be southwesterly towards the on-site creek, while shallow groundwater movement in the western portion of the site (west of the creek) is inferred to flow east towards the creek. However, the shallow flow system groundwater elevations indicate that a mound exists in the fill area, inducing a localized radial flow away from the fill area to the east and southeast. Thus, groundwater flow in the shallow flow system across the majority of the site is inferred to converge on the on-site stream, with a minor component of localized shallow groundwater flow from the fill area toward the east and southeast.

Groundwater movement in the deeper flow system is inferred to be in a generally south to southeasterly direction beneath the site. The horizontal hydraulic gradient across the site is low, with a grade change of less than 1 m from the north to southeast limits of the site.

There may have been some historical landfill impacts in a number of the shallow groundwater flow system wells adjacent to the northeast and particularly to the east and southeast of the landfill; however, most of these have abated such that there was no clear indication of leachate influence in the shallow observation wells at the downgradient property boundaries to the east/southeast at the site during 2025. The shallow groundwater quality complies with Guideline B-7 (as established by the MECP as a mechanism to assess the acceptable level of leachate impacts on the groundwater system), with the exception nitrate at well 44. The nitrate exceedance at well 44 is not likely to be the result of a landfill leachate impact as nitrate has not been detected within the leachate; the concentration is likely the result of agricultural activities that surround this well location.

There was no clear indication of leachate influence in the deeper groundwater flow system at the property boundaries in 2025. The deep groundwater quality complied with Guideline B-7, with the exception of hardness and iron at wells 27, 37R and 38. Concentrations of hardness and iron are interpreted to be naturally elevated in the deep flow system.

None of the groundwater trigger criteria at the site were exceeded during 2025.

Surface water quality in the wetland at the northeast site boundary, and the northern and southeast on-site retention ponds was not measurably affected by the landfill in 2025. Surface water quality at intermediate station C04 along the on-site stream and retention pond P02 in the central part of the site were inferred to be slightly influenced by the landfill. Surface water quality in the on-site stream leaving the site (station C01) has been affected by landfill influences from the upstream portions of the on-site stream, shallow groundwater discharge, and possibly road salting activities. However, the landfill influences in the surface water quality leaving the site are very weak, based

on the monitoring results, with chloride values typically below the Canadian Environmental Quality Guideline (CEQG) water quality guideline for the protection of aquatic life. Surface water quality leaving the site at station C01 complied with the current trigger level boundary criteria in the spring 2025 sampling event.

The fall 2025 sample collected from downstream station C01 exceeded the current trigger level boundary criteria for chloride and un-ionized ammonia; however, these exceedances could not be confirmed due to dry/frozen stream conditions in November/December 2025. Inspections of the site were completed in accordance with the Site Closure Plan, which did not identify evidence that leachate impacts were occurring in the stream. The elevated concentrations observed in the fall 2025 sample from C01 were attributed to stagnant conditions.

No methane was detected during the 2025 monitoring event at any of the landfill gas monitoring probes, located adjacent to the east, northeast, and north of the landfill mound.

Based on the findings of the 2025 monitoring program, it is recommended that the monitoring program outlined within this report be continued at the site in 2026. In addition, the following will be implemented in 2026, based upon discussions with the MECP (as described in Section 2.4):

- As discussed during recent MECP correspondence, a new gas probe should be installed near existing monitor 28R, for completion of landfill gas monitoring. Leachate well 41 should also be incorporated into the landfill gas monitoring program.
- As discussed during recent MECP correspondence, supplemental PFAS sampling should be completed at wells 26R, 45 and 46 in 2026.
- As discussed during recent MECP correspondence, the reference elevation for monitoring wells 26R, 45 and 46 should be re-surveyed in 2026.
- The existing monitoring wells should be reviewed to determine if any further wells should be equipped with packers, to prevent high groundwater conditions from damaging the wells during the winter.

Limitations

This report was prepared by WSP Canada Inc. (WSP) for the account of COUNTY OF OXFORD, in accordance with the professional services agreement. The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects WSP's best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This limitations statement is considered part of this report.

The original of the technology-based document sent herewith has been authenticated and will be retained by WSP for a minimum of ten years. Since the file transmitted is now out of WSP's control and its integrity can no longer be ensured, no guarantee may be given with regards to any modifications made to this document.

Table of Contents

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

1.1 Background

The closed Holbrook Landfill (site) is located on Part of Lots 20 and 21, Concession III near the village of Holbrook in the Township of Norwich. The site is located north of Quaker Street (Norwich Road 3) and is bounded by agricultural land to the east and west, and Long Point Region Conservation Authority (LPRCA) wetlands to the north and south. The general site location is shown on **Figure 1**.

It is understood that the landfill site was originally owned by Ingersoll Sanitation Ltd. and started accepting waste around 1970. The site was subsequently owned and operated by Superior Sanitation Services Inc. before the County of Oxford assumed the site in January 1982. The landfill operated until July 1986, at which time it was capped and seeded as part of the staged development and closure of the site. During County ownership from January 1982 until July 1986, the site received only domestic, commercial, and non-hazardous industrial solid waste.

The site operated under Provisional Certificate of Approval (CofA) No. A070702 issued on March 31, 1983 which permitted landfilling at the site until June 30, 1984. It is understood that the County subsequently obtained an extension of the CofA from June 1984, until the site was closed in 1986. A copy of the site CofA (Waste) is provided in **Appendix A**.

The County purchased the property to the east of the landfill for use as a buffer zone on August 15, 1990.

Following closure of the site, the County monitored the groundwater and surface water quality at the site, while the Ministry of the Environment, Conservation and Parks (MECP) monitored off-site domestic wells in the area. The monitoring data since closure was reviewed by Charlesworth & Associates in 1996 and a revised monitoring program was recommended. The MECP approved the revised monitoring program for the site, which has been undertaken by the County on an annual basis. The groundwater and surface water monitoring locations are shown on the Site Plan, **Figure 2**.

On September 8, 2016, the site CofA (Waste) was updated by the MECP to Amended Environmental Compliance Approval (ECA) No. A070702. The new approval incorporated the County owned buffer lands to the east of the landfill into a Contaminant Attenuation Zone (CAZ). As part of the new ECA, a closure plan was submitted to the MECP, which included a trigger mechanism and contingency plan as well as a new monitoring program. The closure plan was accepted by the MECP in Notice No. 1 of the ECA, dated March 6, 2018.

WSP Canada Inc. (WSP) was retained by the County to complete the 2025 annual monitoring program at the site.

1.2 Supplemental Investigations

1.2.1 Well Network Upgrade Program 2013-2015

In 2012, GENIVAR (now called WSP) completed a site survey, well network inspection and hydrogeological assessment work program at the site (GENIVAR, 2013). The work program followed the recommendations provided in the 2010 Water Monitoring Report as well as the MECP review of the 2009 Water Monitoring Report, as outlined in their letter dated April 4, 2011.

Additional borehole logs, historic groundwater elevation data and geological cross-sections from this program have been incorporated into this report.

Based on the results of the well inspection and hydrogeological assessment program, it was recommended that the monitoring network at the site be upgraded. This work program would include the drilling and installation of new wells, decommissioning and replacement of existing wells and completion of a site survey, among other things. The well network upgrades were completed in a phased approach.

Phase I of the work program was completed in the summer of 2013 and included the decommissioning of well 17, drilling and installation of background wells 39 and 40, and the drilling and installation of leachate well 41. The locations of the installed wells are shown on the Site Plan, **Figure 2**. Wells 39, 40 and 41 were surveyed and incorporated into the annual monitoring program in 2014.

Phase II of the well network upgrade program was completed in the fall of 2014. This work program included the decommissioning of 15 wells, drilling and installation of 9 replacement wells, and installation of a single staff gauge. The locations of the installed wells and staff gauge are shown on the Site Plan, **Figure 2**. The replacement wells and new staff gauge were surveyed and incorporated into the 2015 annual monitoring program.

The remaining phase (Phase III) of the well network upgrade program was completed in the summer of 2015. This work program included the decommissioning of 16 wells, drilling and installation of 12 replacement wells, and the drilling and installation of 3 new monitoring wells. The locations of the installed wells are shown on the Site Plan, **Figure 2**. A full Site survey was completed following this final phase of the work program, in order to calculate groundwater elevations (in metres above sea level) at all the new and replacement monitoring wells. The wells were incorporated into a revised annual monitoring program in 2016, as outlined in Section 2.0.

1.2.2 Supplemental Drilling and Sampling Program 2019

In 2019, a supplemental drilling program was completed at the site to investigate exceedances noted at observation well 26R. Monitoring wells 45 and 46 were installed north of well 26R on August 15 and 16, 2019. The locations of the new wells are shown on the Site Plan (**Figure 2**), and the borehole logs are provided in **Appendix B**. A survey of the reference elevations for the new wells was completed by the County of Oxford. These wells were added to the annual monitoring program for supplemental groundwater elevation and quality information.

1.3 Physical Setting

Topography and Drainage

The elevation of the original ground surface at the site generally decreased in a southwesterly direction from the northeast portion of the site where the refuse was placed, towards a small creek in the southwest portion, then increased towards the western property boundary. Following the closure of the landfill site, the drainage configuration at the site was modified by the capped landfill, which is reportedly the highest elevation on the property, and by the subsequent landscaping which has created a pond in the southwest portion of the site.

The swampy area to the north of the property is part of the headwaters of Otter Creek, which flows in a generally northeasterly direction.

The small creek situated within the site property originates to the northwest of the site and flows in a somewhat southerly direction to the southwestern part of the site before draining into a swampy area south of the road. This area is the headwaters of Branch Creek, which flows in a southeasterly direction away from the area.

Geologic Setting

The description of the site geology provided herein is based on a review of published maps and reports, including findings from other investigations carried out in the general area, and historical intrusive investigations completed at the Holbrook landfill.

Cross-sections depicting the general stratigraphy across the site are provided on **Figure 3 through 6** (Cross-sections A-A′, B-B′, C-C′ and D-D′, respectively). The locations of the cross-sections are shown on **Figure 2**.

The study area is situated within the Mount Elgin Ridges physiographic region of Southern Ontario (Chapman and Putnam, 1984). The ridges generally consist of moraines of brown clay or silty clay till with low areas covered with alluvial silt, sand and gravel.

The Holbrook landfill site is situated within an undrumlinized till plain. Three approximately northeast to southwest trending till moraines occur in the area. The Ingersoll Moraine is found to the west of the village of Holbrook and the St. Thomas Moraine occurs northeast and southwest of the landfill site. Additionally, the Norwich moraine occurs south of Newark and extends in a northeasterly direction to the north of Norwich. Several northwest to southeast trending drumlins occur immediately north of the village of Holbrook and represent the southeasterly extent of a large drumlin field which lies to the northwest.

The surficial deposits in the area are generally related to ice moving in a northwesterly direction out of the Erie basin. The soil generally consists of a clay loam of the Huron series with a silt loam of the Honeywood series occurring in the vicinity of the northern boundary of the site (Soil Survey of Oxford County, 1961).

Glaciofluvial outwash deposits occur in the northern part of the property (Barnett, 1976 and Cowan, 1975). These deposits consist primarily of sand, gravelly sand, and sandy gravel.

In the southern part of the property the surficial deposits are principally the Port Stanley Till, which is a silty to silty clay till and represents a glacial advance during the Port Bruce Stadial. The Port Stanley Till occurs at the surface of the Ingersoll, St. Thomas, and Norwich Moraines.

A bog deposit occurs adjacent to and south of the southern boundary of the property.

A large area of glaciolacustrine, shallow water, fine to medium and silty fine sand occurs to the northeast and east of the site. Glaciofluvial outwash sand and ice-contact stratified drift consisting primarily of sand were deposited to the northwest.

As noted above, the surficial overburden at the Site consists of a glaciofluvial outwash deposit (Upper Sand and Gravel Unit) in the northern area, and the Port Stanley Till (Upper Clayey Silt Unit) in the south. Beneath these uppermost soils is a clayey silt unit, which may or may not contain gravel (Lower Clayey Silt Unit) and is variable in thickness. This in turn is underlain by a laterally extensive sand and gravel formation (Lower Sand and Gravel Unit). The Lower Sand and Gravel Unit is reportedly underlain by a relatively thick gravelly silt till formation.

The overburden deposits at the site range from approximately 29 m to 46 m in thickness. In general, the surficial deposits increase in thickness from east to west.

The bedrock underlying the site consists of Middle Devonian limestone and dolostone of the Detroit River Group. None of the intrusive investigations at the site encountered bedrock.

Hydrogeologic Setting

The local geologic units at the site are grouped into four (4) hydrostratigraphic units as summarized below, and as shown in the cross-section **Figures 3, 4, 5 and 6**. Results of historic in-situ hydraulic conductivity testing completed at the site (James F. MacLaren Ltd., 1979 and MacLaren Engineers, 1982) are also provided.

		Calculated Hydraulic Conductivity Results (cm/s)					
Flow System	**Hydrostratigraphy**	**Range**			**Mean**		
Shallow Flow System	Upper Sand and Gravel Unit	$5.6x10^{-1}$	-	$9.0x10^{-6}$	$2.9x10^{-1}$	-	$2.6x10^{-3}$
					coarse sediments		fine sediments
	Upper Clayey Silt Unit	$8.1x10^{-5}$	-	$9.4x10^{-5}$	$8.8x10^{-5}$		
	Lower Clayey Silt Unit (confining / semi-confining layer)	$3.5x10^{-6}$	-	$9.5x10^{-6}$	$6.5x10^{-6}$		
Deep Flow System	Lower Sand and Graven Unit	$3.6x10^{-1}$	-	$7.2x10^{-5}$	$3.6x10^{-1}$	-	$6.1x10^{-5}$
					coarse sediments		fine sediments

Although each hydrostratigraphic unit is identified as part of a groundwater flow system, each flow system has a hydraulic influence on the others. Shallow groundwater flow directions are expected to follow the surface drainage patterns.

The Upper Sand and Gravel Unit and Upper Clayey Silt Unit are considered to represent the shallow groundwater flow system. The Lower Sand and Gravel Unit represents the deeper groundwater flow system at the site.

The Lower Clayey Silt Unit likely forms a confining or semi-confining layer restricting groundwater movement. The unit may be intermittently present as the lateral extent and thickness of the unit is unknown. The Lower Clayey Silt Unit has the capacity to transmit water laterally; however, groundwater movement through this unit is inferred to be slower and predominantly downward, as weak downward vertical hydraulic gradients between the shallow and deep flow systems in the vicinity of the landfill have been reported.

The Upper Sand and Gravel Unit and the Lower Sand and Gravel Unit have the greatest capacity to transmit groundwater. The Upper Clayey Silt Unit and the Lower Clayey Silt Unit consist of finer grained material and groundwater movement through the soils is expected to be slow, based on the hydraulic conductivity results shown above.

2 ANNUAL MONITORING PROGRAM

2.1 Objectives and Scope

The principal objectives of the annual monitoring program at the Holbrook landfill site are as follows:

- To provide documentation of the monitoring program results and findings;
- To assess the current and potential impacts of the landfill site on overburden groundwater quality;
- To assess the current and potential impacts of the landfill site on surface water quality; and
- To provide recommendations on future monitoring and remedial actions, if required.

The monitoring program includes a data collection component, and an analysis and interpretation component. This report documents the data collected as part of the 2025 annual monitoring program activities, and our interpretation of the results. Available historic data are also incorporated into the report.

2.2 Annual Monitoring Program

The 2025 annual program at the site included groundwater and surface water monitoring. The groundwater monitoring program included on-site observation wells and two private domestic wells. In 2025, groundwater level measurements, groundwater sampling of on-site wells and private domestic wells, and surface water sampling were completed by WSP following general monitoring protocols and procedures, provided in **Table 2-1**.

2.2.1 Groundwater – On-Site Observation Wells

The groundwater monitoring program completed in 2025 included the following items:

- Annual groundwater level measurements at thirty (30) observation well locations in May;
- Annual staff gauge measurement at one (1) staff gauge located in Branch Creek;
- Annual groundwater sample collection from twenty (20) observation wells (seventeen (17) on-site groundwater wells, one (1) leachate well and two (2) private domestic well) in May 2025; and
- Additional groundwater level measurements and groundwater sample collection in May 2025 at two wells installed in 2019 (45 and 46).

The 2025 groundwater monitoring network at the site is outlined in the following table.

Monitoring Network	Designation	
	Annual Water Levels	Annual Groundwater Sampling
Shallow Flow System	4R, 5R, 10R, 11R, 13R, 14R, 15A, 16AR, 18R, 19R, 24AR, 26R, 28R, 32R, 33R, 40, 41, 43, 44, 45, 46	11R, 16AR, 19R, 26R, 28R, 32R, 40, 41, 43, 44, 45, 46
Deep Flow System	16R, 21R, 24R, 25R, 27, 31, 35, 37R, 38, 39, 42	21R, 24R, 25R, 27, 37R, 38, 39, 42, D1, D2

Notes: A number of shallow flow system observation wells may be screened across the upper flow system and the shallow confining layer.

Table 2-1: Monitoring Protocols and Procedures

Groundwater Level Measurement	Groundwater/Leachate Sampling	Surface Water Sampling
▪ Monitor integrity is visually inspected (casing, lock, caps, etc.). ▪ Well cap is carefully removed to avoid introducing foreign material into monitor. ▪ A water level is measured using a clean electronic water level meter with a stainless steel probe and graduated cable. ▪ The water level measurement is referenced to a known geodetic elevation on the monitor and checked twice for confirmation. ▪ The water level is recorded in the dedicated project field book and checked against previous reading. ▪ If the water level is significantly greater than historic value, the level in the well is checked again. ▪ The water level depth probe and cable are rinsed with de-ionized water between wells. ▪ Water levels in each monitor are measured and recorded prior to purging.	▪ Each monitoring well is purged prior to sampling in order to remove stagnant water in the monitor and surrounding sand pack. ▪ Purging and sampling is carried out using the dedicated inertial lift pump and high density polyethylene tubing in place within the monitors. ▪ Well volumes are determined in the field based on the water level measurement. At least 3 well volumes are removed for moderate yield wells, or 1 to 2 well volumes for low yield wells (wells that dry out and are slow to recover). The volume of water purged is measured in a graduated container. ▪ Field parameters (pH, conductivity and temperature) are measured using calibrated instruments during purging to ensure that representative formation water is sampled. Purging is considered completed once the pH, conductivity, and temperature have stabilized. ▪ The groundwater sample is collected from the well as soon as there is a sufficient volume of liquid within the well, usually on the same day or on the following day, at the latest. ▪ Samples collected for metals analysis are field filtered using a high capacity in-line 0.45 micron disposable filter. The sample is collected directly from the filter discharge into the sample bottle. ▪ Water samples are collected directly into the laboratory provided bottles with the appropriate preservatives added. Sample bottles are marked, labelled, and sealed in the field. ▪ Samples are stored in coolers packed with ice, and delivered or couriered to the laboratory at the end of each day, under Chain of Custody procedures. ▪ Field notes including date, weather, the sampling data, time, staff, field parameters, visual observations, and number of bottles are marked on the Water Sampling Field Data sheets in the Project Field Book.	▪ Attempts are made to schedule surface water monitoring events to correspond to periods of anticipated flow whenever possible (i.e. 24 hrs after a significant precipitation event). ▪ Surface water samples at each location are collected prior to flow measurement. ▪ Monitoring is completed from downstream to upstream locations to avoid sediment disturbance which may influence sample integrity. ▪ Surface water samples are collected directly into the laboratory provided bottles that do not have preservatives. For bottles with preservatives added, standard grab sampling methods are used and then the water decanted into laboratory provided bottles with the appropriate preservatives. The sample container is pointed upstream and care is taken to avoid particulate and organic matter in the water. ▪ Sample bottles are marked, labelled and sealed in the field. ▪ Samples are stored in ice packed coolers, and delivered or couriered to the laboratory at the end of each day, under Chain of Custody procedures. ▪ Field parameters (pH, conductivity, temperature and dissolved oxygen) are measured from a separate beaker of water using calibrated instruments. ▪ When the flows are adequate, stream flow discharge is estimated based on the cross-sectional area of the stream, and the water velocity. ▪ A cross-sectional profile of the stream is determined by measuring the cross sectional width and depth of the wetted stream at various points. The velocity is estimated by measuring travel time between two profiles across the stream. ▪ Field notes including date, weather, time, sampling data, staff, field parameters, visual observations, and number of bottles are marked on the Water Sampling Field Data sheets in the Project Field Book.

Groundwater samples were submitted to SGS Canada Inc. in Lakefield, Ontario for analysis of the following parameters.

General Parameters			
pH	Conductivity	Hardness	
Major and Minor Ions			
Alkalinity	Chloride	Potassium	Sulphate
Calcium	Magnesium	Sodium	
Nutrients and Organics			
Ammonia	Nitrite	DOC	
Nitrate	TKN		
Dissolved Metals			
Boron	Iron		
Chromium	Manganese		

Select wells (26R, 27, 32R, 37R, 38, 39, 40, 41, 42, 43, 44, 45, and 46) were also analyzed for the volatile organic compounds of vinyl chloride, benzene, and 1,4 dichlorobenzene in May 2025, as per the approved environmental monitoring program.

The groundwater sampling locations are shown on the Site Plan, **Figure 2**. Copies of available borehole logs for the observation wells are provided in **Appendix B**. Monitoring well details are provided in **Table C-1, Appendix C**. It is assumed that the observation well designations and borehole logs are consistent between those used in previous reports (Charlesworth & Associates, 2008 and MacLaren Engineers, 1982).

2.2.2 Groundwater – Private Domestic Well

Since 1997, the County has sampled a private domestic well that is now referred to as the Pearce domestic well (D2), formerly the Roswell domestic well. Of the more than thirty (30) private domestic wells in the vicinity of the site, domestic well D2 was deemed the most likely to exhibit potential influences from landfill leachate, given the inferred flow regimes at the site. The location of domestic well D2 is shown on **Figure 2**.

A second private domestic well was incorporated into the monitoring program in 2024, at the request of the homeowner. This well is referred to as domestic well D1. The location of domestic well D1 is shown on **Figure 2**.

The private domestic well groundwater monitoring program completed in 2025 included annual groundwater sampling at wells D1 and D2 in May. Groundwater samples were submitted to SGS Canada Inc. in Lakefield, Ontario for analysis of the parameters previously noted for the groundwater monitoring program.

2.2.3 Surface Water

Surface water monitoring was completed at the stations listed in the following table. The locations of the surface water monitoring stations are shown on **Figure 2**.

Surface Water Station	Relative Position	Sampling Frequency
C01	The on-site stream, south (downstream) of the landfill where the stream leaves the site property boundary via a culvert beneath Quaker Street. Station C01 is downstream of surface water stations C04 and C06.	Semi-annually (spring and fall)
C06	Collected from a swampy area, northwest (upstream) of the landfill where the on-site stream enters the site property.	
C04	The on-site stream, intermediate station southwest (downstream) of the landfill. Station C04 is downstream of stations C06 and P02.	Annually (spring)
P02	The on-site pond situated adjacent west (downstream) of the landfill. The pond is inferred to be the receiving body for shallow groundwater moving from beneath the landfill. Drainage from P02 enters the on-site stream between sampling points C04 and C06.	
P03	The on-site retention pond situated close to the landfill in the northern portion of the site.	
P01	The on-site retention pond situated in the southeast portion of the site.	
NE1	The swampy area situated in the northeast portion of the site, at the toe of the landfill.	

The semi-annual sample collection was completed on April 29 and October 21, 2025, and the annual sample collection was completed on April 29, with the exception of the sample collection from station C04, which was completed on May 7, 2025 due to low water levels at station C04 during the event completed on April 29. The surface water monitoring protocols and procedures are presented in **Table 2-1**. The surface water samples were submitted to SGS Canada Inc. in Lakefield, Ontario for analysis of the parameters listed below.

General Parameters			
pH	Conductivity	Hardness	
Major and Minor Ions			
Alkalinity	Chloride	Potassium	Sulphate
Calcium	Magnesium	Sodium	
Nutrients and Organics			
Ammonia	Nitrite	Un-ionized Ammonia	
Nitrate			
Dissolved Metals			
Boron	Iron		
Chromium	Manganese		

2.2.4 Landfill Gas

During 2025, landfill gas measurements were completed on an annual basis at standpipes SP3R, SP4R, and SP5. The locations of these standpipes are shown on **Figure 2**. The monitoring included the measurement of methane, carbon dioxide, oxygen, and balance gas concentrations, as well as water levels to determine whether or not the screened interval was partially flooded. Measurements and readings were completed on May 7, 2025.

2.3 Monitoring Well Maintenance and Inspections

In 2025, WSP conducted a monitoring well restoration program at the site. The key purpose of the program was to decommission an existing monitoring well (29), in addition to repairing and adjusting five (5) other monitoring wells. Observation Well 29 was not included in the site's annual compliance monitoring program and had previously been reported as missing.

In May/June 2025, WSP also completed a full condition inspection of all the groundwater observation monitoring wells at the site. The results of this well condition inspection (conducted before repairs were undertaken) are provided in **Appendix B**. The following work program was formulated as a result of this well condition assessment:

- Decommissioning of three (3) piezometers (observation well 29);
- Repairs to five (5) groundwater observation monitoring wells (24R, 24AR, 26R, 27, and 45), including but not limited to re-setting well casings and adjusting well heights; and
- Replacing worn locks, replacing caps, and adding fill/mounding around the base of many groundwater observation monitoring wells, across the site.

A summary of the 2025 monitoring well restoration program is provided in **Appendix B**. As documented within this report, all action items noted within the well condition assessment were completed by September 17, 2025.

2.4 Ministry of Environment, Conservation and Parks Correspondence

A Hydrogeologist from the Technical Support Section of the MECP completed a review of the 2022 Annual Monitoring Report (WSP, 2023) for the Site and provided comments in a Memorandum dated March 15, 2024. On behalf of the County, WSP prepared a letter dated June 17, 2024 in response to the March 2024 MECP comments.

The MECP completed a follow-up visit to the site on May 14, 2025, and submitted an inspection report to the County on May 28, 2025. The County responded to this inspection report on October 6, 2025, addressing the issues raised during the MECP's May 2025 inspection. The MECP reviewed this correspondence and provided additional comments in a Memorandum dated November 7, 2025. Following receipt of the November 2025 Memorandum, the MECP, County and WSP attended a meeting on December 1, 2025, and WSP subsequently prepared a response letter dated December 3, 2025. Copies of the reports, memorandums and letters described above are included in **Appendix A**.

As a result of the MECP correspondence, additional discussion and review has been incorporated into this report, including the inclusion of an additional cross-section figure (Cross-Section D-D', **Figure 6**) and discussion regarding monitoring well maintenance/inspection (**Section 2.3** and **Appendix B**). As discussed in the attached MECP correspondence, the following recommendations are also provided:

- A new gas probe should be installed near existing monitor 28R for completion of landfill gas monitoring. Leachate well 41 will also be incorporated into the landfill gas monitoring program.

- Supplemental per- and polyfluoroalkyl substances (PFAS) sampling should be completed at wells 26R, 45 and 46 in 2026, with discussion related to these results provided in the 2026 Annual Monitoring Report.

- The reference elevation of monitoring wells 26R, 45 and 46 should be re-surveyed in 2026.

- The existing monitoring wells should be reviewed to determine if any further wells should be equipped with packers, to prevent high groundwater conditions from damaging the wells during the winter.

3 GROUNDWATER LEVELS AND FLOW CONDITIONS

Groundwater levels are measured annually in the observation wells at the site prior to the sampling event. The groundwater level elevation data from May 2025 and the available historic water level elevation data for the site are provided in **Table C-2** and graphically in **Figures C-1 through C-15, Appendix C**. A well survey to establish elevation and location was completed in 2012, and groundwater elevations have been calculated from the current and historic water levels measured at the site. New observation wells installed in 2013 were surveyed for location and elevation in 2014, while new and replacement wells installed in 2014/2015 were surveyed for location and elevation in 2015. The two wells installed in August 2019 were surveyed for location and elevation in 2019.

In 2025, groundwater elevations measured in the observation wells were within their respective historic ranges, with the exception of wells 24R, 25R, 26R, 28R, 33R, 37R and 43, where the groundwater elevations in May 2025 were marginally lower than the historical range for each well.

Groundwater level elevations measured in the observation wells decreased from May 2024 to May 2025. Also, as noted historically, flowing conditions were observed in May 2025 at observation wells 26R and 27, meaning that the groundwater pressure was above both the ground surface and the top of the pipe. A temporary extension was added to the top of the pipe in order to obtain a measurable groundwater elevation at these wells during the monitoring event. The May 2025 groundwater elevations at observation wells 19R, 45 and 46 were also at or above ground surface, but were below the top of pipe.

3.1 Groundwater Flow

Observation wells at the site have been grouped into the shallow groundwater flow system, deep groundwater flow system, or confining/semi-confining system.

The groundwater table is located in the Upper Sand and Gravel Unit and the Upper Clayey Silt Unit which represents the shallow flow system. The groundwater table elevations measured in May 2025 and the interpreted shallow water table contours are presented on **Figure 7**. In general, groundwater movement in the shallow flow system across most of the site is inferred to be southwesterly towards the on-site creek, while shallow groundwater movement in the western portion of the site (west of the creek) is inferred to flow east towards the creek. However, the shallow flow system groundwater elevations indicate that a mound exists in the fill area, inducing a localized radial flow away from the fill area to the east and southeast. In addition, groundwater level data from monitors 45 and 46 indicate a component of northward groundwater flow in the vicinity of these monitors.

Hence, over the majority of the site, groundwater flow in the shallow flow system is inferred to converge on the creek, contributing to the flow of the creek. Also, given that the thickness of the Upper Sand and Gravel Unit in the northern part of the site thins toward the creek in the southwest, shallow groundwater below the landfill likely contributes to the creek. Further, the retention pond located in the central portion of the site likely acts as a discharge zone for the shallow groundwater. As such, any leachate influences observed in the shallow flow system across the majority of the site would likely impact the surface water quality. There may be a minor component of localized shallow groundwater flow from the fill area east, north and southeast toward the buffer property.

Based on historic borehole logs, the base of waste was at an elevation of approximately 279 mASL to 280 mASL; though there was an area of deeper waste, approximately 275 mASL, in the west central portion of the fill area (BH22) that was associated with a swampy depression. Previous observation wells in the waste disposal area are no longer present. In order to determine if groundwater (leachate) mounding is present at the site, leachate well 41 was incorporated into the 2014 annual monitoring program. Based on the May 2025 liquid level within well 41 (282.98 mASL), localized perched leachate mounding is likely present at the site. This mounding is attributed to areas of low hydraulic conductivity within the refuse, and has the potential to influence shallow groundwater quality adjacent to the disposal area or result in surface seeps.

Though some shallow flow system observation wells located adjacent to the north and northeast of the landfill are situated hydraulically upgradient of the landfill, it is possible that they have been historically influenced by localized landfill effects and as such, are not considered to be suitable background observation wells. Shallow flow system well 40 is more representative of upgradient conditions, and was incorporated into the 2014 annual monitoring program as a background observation well.

Groundwater elevations measured in the deeper flow system in May 2025 are presented in **Figure 8**. Groundwater flow in the deep flow system is inferred to be in a generally south to southeasterly direction under a very low horizontal hydraulic gradient. As shown on **Figure 8**, the difference in head across most of the site is less than 1 m, although there is a greater head difference of at least 1.8 m between the background wells in the northwest corner of the site and the downgradient wells.

Observation well 39 was installed in 2013 to serve as a background observation well for the deep flow system. However, the groundwater elevation measured in the well did not appear to correspond with the other deep flow system groundwater elevations on site. Well 39 was drilled to a similar depth as nearby deep flow system wells, but a significant layer of clayey silt was not encountered when drilling the borehole for observation well 39. Based on recommendations from the 2014 annual water monitoring report, a deeper observation well (42) was installed in the summer of 2015, which penetrated a confining to semi-confining layer of approximately 6.5 m of clayey silt. Observation well 42 was incorporated into the 2016 monitoring program as a deep flow system background observation well. Similar to observation well 39, the groundwater elevation measured in observation well 42 does not appear to correspond with the other deep flow system groundwater elevations on site, but rather corresponds to the shallow groundwater elevation at this location. It is inferred that the confining/semi-confining unit in the northwestern corner of the site may be discontinuous, as there is little to no difference in groundwater elevation between the shallow and deep flow systems.

As part of a further evaluation into the source of trigger exceedances at monitoring well 26R, shallow observation wells 45 and 46 were installed in August 2019, north of monitoring well 26R. Since first measuring groundwater levels from within boundary monitoring well 26R in 2016, artesian conditions have consistently been observed. Artesian conditions have also been observed at monitoring wells 45 and 46, since their installation. Based on groundwater elevations measured in 2020 through 2025, there appears to be a component of northward groundwater flow in the vicinity of monitoring wells 45 and 46. In 2020 and 2021, the groundwater elevation at boundary monitoring well 26R was higher than at both wells 45 and 46, indicating that groundwater flow from the property boundary was northward, towards to the landfill mound. In 2022, 2023, 2024 and 2025, the groundwater elevation at well 26R was lower than at monitoring well 45, indicating a groundwater divide may be present in this area. Continued monitoring will be required to confirm this conclusion. As recommended by the MECP, an updated survey of the reference elevations at wells 26R, 45 and 46 is also recommended, to confirm the data is accurate.

Groundwater levels in the shallow flow system are generally higher than those in the deeper flow system at corresponding downgradient locations. As such, vertical hydraulic gradients are downward through the less permeable confining/semi-confining unit. The vertical linear velocity of groundwater downward through the confining/semi-confining layer was estimated to be in the order of 0.01 to 1.5 m/yr (MacLaren Engineers, 1982). By comparison, the horizontal linear groundwater velocity in the deeper flow system is estimated to be in the range of 12.7 to 45.7 m/yr (MacLaren Engineers, 1982). As such, the volume of flow through the deeper flow system is considerably greater than the vertical leakage of shallow groundwater downward through the confining/semi-confining unit.

For the purposes of assessing the groundwater quality, the downgradient observation wells were divided into groups based on their location in the inferred flow regimes, which is consistent with the previous reports at the site. This approach facilitates the assessment of groundwater quality within the two flow systems with respect to the inferred groundwater flow regimes and potential leachate impact.

4 GROUNDWATER QUALITY

The available groundwater chemical data for the site from 1979 to 2025 are provided in **Appendix D**. The groundwater chemical results for the shallow flow system and the deeper flow system are provided in **Tables D-1 and D-2**, respectively. The private domestic groundwater chemical results are provided in **Table D-3**. The tables also provide the applicable Ontario Drinking Water Quality Standards (2003, revised June 2006) (ODWQSs). Time versus concentration graphs for chloride, alkalinity, potassium, boron, iron, ammonia, and TKN are presented on **Figures D-1 to D-35, Appendix D**. The 2025 laboratory certificates of analysis are included in **Appendix F**.

The quality assurance/quality control (QA/QC) program for the monitoring program at the site included a field and a laboratory component. Standard field protocols were used to ensure consistency.

Laboratory reports were reviewed as part of the laboratory QA/QC program. Blind duplicate samples were collected from wells D2 and 26R in May 2025. Duplicate samples were similar to the original samples results with the calculated Relative Percent Difference (RPD) within the 20% guideline for acceptability or less than two times the laboratory reported method detection limit (MDL). Acceptable data quality control including laboratory blanks, spiked blanks, laboratory duplicates, and laboratory percent recoveries of analysis indicated that the detected constituent concentrations were accurate and reflected actual groundwater conditions at the time of sample collection and are acceptable for inclusion into the database.

4.1 Leachate Chemistry

Leachate is produced from the infiltration of precipitation through the waste. Processes within the waste degrade the quality of the percolating water to create leachate. The chemical composition of leachate can vary within the waste cells depending on various factors such as refuse composition, age, hydraulic conductivity, residence time, and the leachate flow regime.

There is currently one leachate well (41) in the observation well network, located in the south portion of the landfill, for characterizing the leachate quality. This leachate well has been sampled since 2014. It is noted that older refuse is located in the north portion of the landfill and younger refuse is located in the south portion of landfill (James F. MacLaren Ltd., 1979). As such, it is likely that the leachate strength in the north portion of the landfill is weaker than the leachate strength in the south portion of the landfill.

The 2025 leachate chemistry results are provided in **Table 4-1**. The groundwater chemistry ranges from the background shallow flow system and deeper flow system observations wells, along with the range of representative concentrations for municipal landfills in Ontario, are also summarized.

Table 4-1: 2025 Background Groundwater Chemistry Relative to Landfill Leachate Chemistry

Parameter	Ontario Drinking Water Quality Standards	Parameter Concentrations			
		Leachate (well 41)	2025 Background Range		Typical Landfill Leachate (source)
			Shallow Flow System (well 40)	Deep Flow System (well 39 and 42)	
pH	6.5 - 8.5 OG	7.08	7.99	8.15 - 8.29	6 - 7 (2)
Conductivity	-	1970	717	390 - 706	
Hardness	80 – 100 OG	593	391	186 - 332	400 - 2,000 (2)
Chloride	250 AO	73	20	<1 - 35	20 - 2,500 (2)
Sulphate	500 AO	3	42	<2 - 48	<1 - 300 (2)
Alkalinity	30 – 500 OG	981	353	220 - 284	300 - 2,000 (2)
Calcium	-	172	119	36.4 - 90.4	100 - 1,000 (2)
Magnesium	-	39.8	22.6	23.1 - 25.7	100 - 1,500 (1)
Potassium	-	50.2	0.991	1.22 - 1.70	200 - 1,000 (1)
Sodium	200 AO	48.9	9.72	18.7 - 21.9	200 - 1,200 (2)
Ammonia	-	85.9	0.2	<0.1 - 0.3	5 - 1,000 (2)
TKN	-	83.5	0.6	<0.5	1 - 100 (2)
Nitrate	10.0 MAC	<0.06	<0.06	<0.06	
Nitrite	1.0 MAC	<0.03	<0.03	<0.03	0.1 - 0.50 (2)
DOC	5 AO	26.4	5.7	1.3 - 1.4	
Boron	5.0 IMAC	1.69	0.019	0.028 - 0.051	0.5 - 10 (2)
Chromium	0.05 MAC	<0.003	<0.003	<0.003	<0.01 - 0.5 (2)
Iron	0.3 AO	61.1	4.04	0.21 - 0.43	1 - 1,000 (1)
Manganese	0.05 AO	0.406	0.292	0.010 - 0.133	0.01 - 100 (1)
Vinyl Chloride	1 MAC	0.2	<0.2	<0.2	
Benzene	1 MAC	13.9	<0.5	<0.5	
1,4 Dichlorobenzene	5 MAC 1 AO	13.9	<0.5	<0.5	

Notes: All concentrations in mg/L except pH (unitless), conductivity (µS/cm), and VOCs vinyl chloride, benzene and 1,4-dichlorobenzene (µg/L)

Shading indicates concentration exceeds Ontario Drinking Water Quality Standard.

(1) Typical leachate characteristics data from Freeze & Cherry (1979).

(2) Typical leachate characteristics data from the Ministry of the Environment (1993).

The 2025 leachate quality at the Site was generally below or within the lower portion of the range of representative concentrations for municipal landfills in Ontario (Freeze and Cherry, 1979 and the Ministry of the Environment, 1993). The leachate strength at the site is considered to be very weak, with chloride and sodium concentrations below their respective ODWQSs. Nonetheless, concentrations of most parameters in the leachate well were elevated relative to the background shallow and deep flow system groundwater. In particular, concentrations of chloride, alkalinity, potassium, boron, iron, ammonia, TKN, benzene, 1,4 dichlorobenzene, and historical concentrations of vinyl chloride are notably elevated in the landfill leachate relative to the background groundwater quality, and serve as diagnostic leachate indicator parameters for the site.

The historical laboratory leachate quality data at leachate well 41 is provided in **Table D-1, Appendix D**. Time versus concentration graphs for the leachate indicator parameters of chloride, alkalinity, potassium, boron, iron, ammonia, and TKN are shown on **Figures D-1 through D-7, Appendix D**. Several leachate indicator parameter concentrations have decreased overall since 2016. Parameter concentrations at leachate well 41 in 2025 were generally within their respective historic ranges, with the exception of DOC, which was below the historical range of results from leachate well 41.

4.2 Groundwater Chemistry

Background concentrations for groundwater were established in the 1980s, based on chemical results from upgradient domestic wells. However, the domestic wells used were screened in various aquifer units, and the background concentrations were not representative of either the shallow or deeper groundwater flow system.

During the time when the site was operating, shallow groundwater beneath the fill area was considered to be impacted based on the results from observation well 34, drilled through the refuse and screened in the underlying shallow aquifer. Observation well 34 was reportedly destroyed in 1984. Also, some of the wells adjacent to the northeast and east of the fill area showed evidence of leachate influences, likely from periodic leachate seeps. The reports at the time concluded that any contamination in the shallow flow system had not migrated off-site as the flow system likely discharged to the on-site stream. It is understood that the periodic leachate seeps would have been addressed through the site closure works and are no longer an issue.

Within the deeper flow system, leachate impacts in the groundwater were not observed during the site operation. Observation well 36, screened in the deeper aquifer below the waste, did not show any evidence of leachate influence. The well reportedly became non-functional after 1985; and was destroyed during historic landfilling activities.

Nineteen (19) overburden groundwater observation wells, one (1) leachate observation well, and two (2) private domestic wells were sampled for general inorganic parameters as part of the 2025 monitoring program. Twelve (12) of the overburden groundwater observations wells and one (1) leachate observation well were also sampled for select volatile organic compounds (VOCs). Based on the inferred shallow groundwater flow pattern and measured groundwater elevations, some observation wells located along the north and northeastern landfill boundary may have been situated hydraulically upgradient of the landfill. Given their proximity however, it is possible that they were influenced in the past by localized landfill effects and thus, they are not considered to be representative of background conditions in the shallow flow system. Similarly, there were no observation wells situated hydraulically upgradient of the landfill in the deeper groundwater flow system prior to 2013. Observation wells 39 and 40 were installed in mid-2013 to address these deficiencies and have since been included in the annual monitoring program. Observation well 42 was installed in 2015 and has been included in the annual monitoring program since 2016. These wells are considered to be representative of background conditions, as they are situated hydraulically upgradient of the inferred landfill mound.

4.2.1 Groundwater Quality Comparison

A summary of the 2025 chemical results for the observation wells at the site, along with their respective historical ranges, is provided in **Table 4-2**. For assessment purposes, the observation wells were divided into the following groups based on their location in the inferred groundwater flow regime, as shown below.

Flow System	Observation Wells and Positions Relative to Fill Area	
Shallow Flow System	Background northwest	40
	Adjacent northeast	32R
	Adjacent east	11R
	East	44
	Adjacent west	19R
	Adjacent southeast	28R
	South	26R, 45, & 46
	Southeast	43
Deep Flow System	Background northwest	39 & 42
	Adjacent northeast	24R
	Adjacent east	25R
	East	38
	Adjacent west	21R
	South	27
	Southeast	37R, D1 & D2

Table 4-2: Historic Groundwater Quality Comparison

Observation Well Position Relative to the Landfill	Well	pH		Conductivity		Hardness		Chloride		Sulphate		Alkalinity		Calcium		Magnesium		Potassium		Sodium		Ammonia	
		Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results
Refuse																							
Landfill Mound	41	**6.46** - 7.79	7.08	1800 - 3670	1970	**501 - 685**	**593**	56 - **267**	73	<1.5 - 22.0	3	301 - **1590**	**981**	121 - 199	172	36.2 - 61.3	39.8	40.8 - 132	50.2	41.9 - 151	48.9	72.8 - 195	85.9
Shallow Flow System																							
Background Northwest	40	7.24 - 8.15	7.99	658 - 782	717	**359 - 450**	**391**	16.5 - 29.0	20	34.5 - 51.0	42	328 - 369	353	106 - 142	119	19.7 - 25.3	22.6	0.838 - 1.15	0.991	9.69 - 13.4	9.72	0.16 - 0.3	0.2
Adjacent Northeast	32/32R	7.65 - 8.25	8.05	220 - 648	620	**148 - 351**	**341**	1.0 - 17	14	25.0 - 39.0	29	167 - 336	296	40.9 - 95.4	89.7	11.8 - 28.8	28.3	0.783 - 2.0	0.964	4.0 - 22.5	9.72	<0.02 - 0.06	<0.1
Adjacent East	11/11R	6.88 - 8.20	7.65	290 - 1650	1540	**120 - 825**	**694**	3.9 - 140	99	2.60 - 29.9	4	105 - **827**	**731**	36.4 - 202	167	6.5 - 78.1	67.4	0.75 - 6.33	3.77	3.9 - 71.2	62.0	0.72 - 5.74	1.6
East	44	7.58 - 8.22	7.97	667 - 840	723	**357 - 434**	**372**	12.3 - 20.0	15	37.7 - 61.0	42	262 - 302	275	87.4 - 112	96.5	29.7 - 37.4	31.8	1.15 - 1.39	1.3	5.98 - 7.60	6.85	<0.010 - 0.07	<0.1
Adjacent West	19R	7.43 - 8.27	8.34	385 - 504	435	**190 - 267**	**222**	<1 - 4.19	1	25.5 - 35.0	28	201 - 232	205	39.9 - 64.4	52.3	18.4 - 25.8	22.1	1.12 - 1.65	1.28	11.3 - 27.3	12.8	<0.010 - 0.16	<0.1
West	16AR	7.75 - 8.15	8.22	571 - 692	650	**276 - 355**	**310**	23.3 - 29.0	25	54.5 - 95.0	50	268 - 283	268	59.8 - 84.1	70.9	29.0 - 37.8	32.2	1.19 - 2.38	1.39	21.2 - 26.3	23.5	<0.02 - 0.045	<0.1
Adjacent Southeast	28/28R	7.30 - 8.35	8.31	380 - 662	541	**184 - 382**	**240**	1.6 - 7.0	6	25.9 - 75.0	42	150 - **789**	302	39.0 - 82.9	51.8	21.0 - 40.4	26.8	0.66 - 2.94	1.88	6.6 - 37.1	35.8	0.06 - 0.2	0.1
South	26/26R	7.21 - 8.13	7.95	595 - 2210	963	**339 - 657**	**364**	15.8 - **319**	87	14.8 - 30	29	223 - **739**	374	85.8 - 172	91.2	25.6 - 65.3	33.1	1.10 - 3.20	1.87	8.11 - **208**	70.0	0.042 - 0.11	<0.1
	45	7.90 - 8.32	8.34	324 - 334	345	**143 - 222**	**158**	<1 - 3.00	2	19.4 - 32.0	27	153 - 180	167	33.3 - 60.8	40.2	12.2 - 17.1	14.1	0.784 - 1.62	1.01	19.9 - 28.2	24.0	<0.1 - 0.2	0.1
	46	7.88 - 8.24	8.14	391 - 431	439	**233 - 276**	**247**	<1 - 2.97	2	14.8 - 37.0	25	198 - 245	266	63 - 74.0	65.8	18.4 - 22.3	20.2	0.984 - 1.10	1.01	1.92 - 4.35	2.5	<0.1 - 0.052	<0.1
Southeast	43	7.53 - 8.38	8.36	321 - 456	421	**108 - 144**	**127**	1.35 - 24.0	21	10.6 - 59.0	30	172 - 334	234	22.5 - 31.9	28.6	11.5 - 16.5	13.5	1.12 - 1.78	1.58	22.0 - 63.5	52.8	0.06 - 0.3	0.5
Deep Flow System																							
Background Northwest	39	7.52 - 8.18	8.15	666 - 773	706	**294 - 379**	**332**	33.9 - 44.0	35	41.9 - 55.0	45	275 - 315	284	76.3 - 107	90.4	23.4 - 28.3	25.7	1.45 - 1.83	1.70	19.2 - 23.7	21.9	0.04 - 0.11	<0.1
	42	7.42 - 8.32	8.29	347 - 422	390	**161 - 281**	**186**	0.51 - 2.12	<1	1.45 - 5.69	<2	206 - 269	220	28.2 - 45.8	36.4	20.1 - 29.0	23.1	0.939 - 1.45	1.22	16.0 - 21.8	18.7	0.29 - 2.0	0.3
Adjacent Northeast	24/24R	7.27 - 8.36	8.30	288 - 920	420	**130 - 404**	**213**	0.5 - 65.5	2	13.4 - 41.2	17	141 - 348	209	28.3 - 118	51	14.9 - 26.4	20.9	0.48 - 2.59	0.997	9.06 - 32.4	10.9	0.013 - 0.42	0.4
Adjacent East	25/25R	6.93 - 8.32	8.18	270 - 1518	425	**133 - 500**	**194**	3.1 - 213	10	4.20 - 53.4	5	138 - 500	205	32.4 - 120	49.9	11.0 - 70.5	16.8	0.95 - 15.0	1.38	6.13 - **296**	18.1	0.060 - 0.20	<0.1
East	38	7.30 - 8.32	8.08	290 - 630	554	**173 - 330**	**270**	3.0 - 31.0	24	21.1 - 27.0	24	158 - 280	240	47.5 - 86.8	72.3	13.0 - 27.0	21.8	0.44 - 2.0	1.28	9.92 - 24.5	16.5	0.07 - 0.13	0.1
Adjacent West	21/21R	7.10 - 8.26	8.22	409 - 652	656	**210 - 440**	**315**	5.0 - 40.0	39	5 - 33.2	5	181 - 279	282	50.2 - 95.5	82.6	15.7 - 30.5	26.3	0.40 - 2.31	1.57	8.1 - 27.5	13.6	0.09 - 0.20	0.1
South	27	7.00 - 8.14	8.13	400 - 905	723	**298 - 395**	**347**	10.0 - 62.7	38	29.5 - 42.1	31	236 - 340	300	75.0 - 110	96.6	22.0 - 30.3	25.8	1.23 - 5.32	1.61	12.1 - 33.6	17.2	<0.02 - 0.10	<0.1
Southeast	37/37R	7.10 - 8.32	8.04	394 - 689	664	**252 - 493**	**326**	10.0 - 38.0	33	35.8 - 44.5	36	217 - 290	282	62.9 - 101	88.1	22.9 - 34.6	25.8	<0.02 - 1.75	1.52	7.09 - 14.8	15.0	0.05 - 0.15	<0.1
	D1	8.13	8.05	672	684	**346**	**319**	33	35	34	29	286	293	94.4	86.5	26.8	24.9	1.56	1.48	16.2	15.7	<0.1	<0.1
	D2 *	7.30 - 8.38	8.43	398 - 888	718	<0.50* - **430**	**1.0***	1.0 - 49.0	36	30.0 - 43.0	34	210 - 370	289	0.089* - 122	0.29*	<0.05* - 31.6	0.068*	0.08* - 3.11	0.522*	11.0 - 207	163	<0.010 - 0.12	<0.1

Notes:
- Concentrations are in mg/L with the exception of VOCs which are in µg/L, pH which is in SU, and conductivity which is in µS/cm.
- Bold and shading indicates exceedance of ODWQS.
- Blank indicates there is no Historical data for thie specified parameter.
- Shaded parameters across title row have been identified as diagnostic indicator parameters.
- * Groundwater sample from domestic well D2 is inferred to be softened prior to collection; the results should be viewed with caution.

Table 4-2: Historic Groundwater Quality Comparison

Observation Well Position Relative to the Landfill	Well	TKN		Nitrate		Nitrite		DOC		Boron		Chromium		Iron		Manganese		Vinyl Chloride		Benzene		1,4 Dichlorobenzene	
		Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results	Historical Range	2025 Results
Refuse																							
Landfill Mound	41	70.6 - 212	83.5	<0.06 - <0.50	<0.06	<0.03 - <0.50	<0.03	**27.4 - 146**	**26.4**	1.28 - 4.85	1.69	<0.0050 - 0.011	<0.003	**43.6 - 63.7**	**61.1**	**0.179 - 0.486**	**0.406**	<0.50 - **2.0**	0.2	**<8.00 - 25**	**13.9**	**<4.00 - 71**	**13.9**
Shallow Flow System																							
Background Northwest	40	0.16 - 1.48	0.6	<0.05 - 0.13	<0.06	<0.010 - <0.25	<0.03	**6.3 - 8.06**	**5.7**	0.018 - 0.036	0.019	<0.00050 - 0.005	<0.003	**2.66 - 9.96**	**4.04**	**0.211 - 0.931**	**0.292**	<0.17 - <0.68	<0.2	<0.20 - <0.80	<0.5	<0.20 - <0.50	<0.5
Adjacent Northeast	32/32R	<0.10 - 0.85	<0.5	<0.05 - 0.41	0.07	<0.010 - <0.05	<0.03	1.2 - **6.1**	1.8	0.028 - 0.057	0.047	<0.00050 - <0.003	<0.003	<0.01 - **2.56**	<0.01	0.017 - **0.380**	0.002	<0.17 - <0.50	<0.2	<0.20 - <0.50	<0.5	<0.10 - <0.50	<0.5
Adjacent East	11/11R	2.1 - 6.95	2.9	<0.06 - 0.12	<0.06	<0.03 - <0.25	<0.03	**10.5 - 20.5**	**16.8**	0.199 - 0.264	0.225	<0.00050 - 0.008	<0.003	<0.02 - **8.96**	**1.17**	0.048 - **0.432**	**0.051**	**2.2 - 2.6**		<0.20 - 0.22		<0.10	
East	44	<0.10 - 0.46	<0.5	**15.4 - 27.4**	**16.3**	<0.010 - <0.25	<0.03	0.8 - 3.12	1.1	0.020 - 0.04	0.022	0.00062 - <0.003	<0.003	<0.007 - 0.034	0.02	0.00052 - 0.003	<0.002	<0.17 - <0.50	<0.2	<0.20 - <0.50	<0.5	<0.10 - <0.50	<0.5
Adjacent West	19R	0.19 - 1.80	<0.5	<0.05 - 0.24	0.20	<0.010 - <0.050	<0.03	0.9 - 3.8	1.0	0.032 - 0.061	0.040	<0.00050 - <0.003	<0.003	<0.007 - **0.313**	<0.01	0.00081 - **0.084**	<0.002	<0.17		<0.20		<0.10	
West	16AR	<0.10 - 1.13	<0.5	<0.05 - 0.140	0.12	<0.010 - <0.05	<0.03	1.0 - 2.62	<1.0	0.029 - 0.045	0.034	<0.00050 - <0.003	<0.003	<0.01 - 0.178	0.24	0.0176 - 0.031	0.022	-		-		-	
Adjacent Southeast	28/28R	0.15 - 0.43	0.7	<0.020 - 0.25	0.19	<0.010 - <0.05	<0.03	1.1 - **18.1**	2.6	0.073 - 0.101	0.090	<0.00050 - <0.003	<0.003	<0.01 - **1.66**	0.27	0.0151 - **0.627**	0.027	<0.17		<0.20		<0.10	
South	26/26R	<0.5 - 1.05	<0.5	<0.06 - <0.5	<0.06	<0.03 - <0.5	<0.03	**5.4 - 13.0**	3.4	0.638 - 1.85	0.579	<0.00050 - 0.012	<0.003	0.19 - **2.19**	**1.22**	0.027 - **0.118**	0.027	<0.17 - <0.68	<0.2	<0.20 - <0.80	<0.5	<0.10 - <0.50	<0.5
	45	<0.5 - 0.22	<0.5	<0.020 - 0.17	<0.06	<0.03 - 0.048	<0.03	1.2 - 4.3	1.5	0.100 - 0.133	0.126	<0.00050 - 0.00039	<0.003	0.028 - **0.336**	0.02	0.017 - 0.0375	0.014	<0.2 - <0.50	<0.2	<0.50	<0.5	<0.50	<0.5
	46	<0.5 - 0.60	<0.5	<0.020 - 0.14	<0.06	<0.010 - <0.03	<0.03	1.7 - **6.9**	2.1	0.010 - 0.020	0.014	<0.00050 - 0.0002	<0.003	0.154 - **0.667**	**0.550**	0.0146 - 0.0181	0.018	<0.2 - <0.50	<0.2	<0.50 - <1	<0.5	<0.50 - <1	<0.5
Southeast	43	0.20 - 0.60	0.9	<0.05 - 0.20	0.30	<0.03 - 0.09	0.07	1.6 - 2.9	1.7	0.128 - 0.166	0.148	<0.00050 - <0.003	<0.003	<0.010 - 0.145	**0.32**	0.009 - 0.0123	0.026	<0.17 - <0.68	<0.2	<0.20 - <0.80	<0.5	<0.10 - <0.50	<0.5
Deep Flow System																							
Background Northwest	39	<0.10 - 0.36	<0.5	<0.06 - 0.670	<0.06	<0.03 - 0.054	<0.03	1.2 - 3.65	1.4	0.025 - 0.034	0.028	<0.00050 - 0.004	<0.003	0.183 - **0.71**	**0.43**	**0.131 - 0.182**	**0.133**	<0.17 - <0.50	<0.2	<0.20 - <0.50	<0.5	<0.10 - <0.50	<0.5
	42	0.29 - 2.3	<0.5	<0.020 - 0.031	<0.06	<0.010 - <0.05	<0.03	0.9 - 2.44	1.3	0.048 - 0.063	0.051	<0.00050 - <0.003	<0.003	0.038 - **1.77**	0.21	0.010 - **0.106**	0.010	<0.17 - <0.50	<0.2	<0.20 - <0.50	<0.5	<0.10 - <0.50	<0.5
Adjacent Northeast	24/24R	0.25 - 0.75	0.7	<0.05 - 2.48	<0.06	<0.010 - <0.05	<0.03	2.9 - 4.36	3.8	0.037 - 0.053	0.044	<0.00050 - <0.003	<0.003	<0.01 - **6.10**	**0.59**	<0.00050 - **0.100**	0.014	<0.17		<0.20		<0.10	
Adjacent East	25/25R	0.12 - 0.35	<0.5	<0.020 - 0.22	<0.06	<0.010 - <0.05	<0.03	1.7 - **5.42**	2.1	0.042 - 0.069	0.053	<0.00050 - <0.003	<0.003	<0.01 - **1.90**	**1.07**	0.006 - **0.825**	0.024	<0.17		<0.20		<0.10	
East	38	<0.10 - 0.22	<0.5	<0.020 - <0.06	<0.06	<0.010 - <0.05	<0.03	1.2 - 3.7	1.3	0.036 - 0.068	0.041	<0.00050 - <0.003	<0.003	<0.01 - **3.05**	**0.54**	<0.020 - **0.093**	0.050	<0.17 - 0.2	<0.2	<0.20 - <0.50	<0.5	<0.10 - <0.50	<0.5
Adjacent West	21/21R	0.18 - 0.45	<0.5	<0.020 - <0.06	<0.06	<0.010 - <0.05	<0.03	1.1 - 2.8	1.8	0.046 - 0.067	0.061	<0.00050 - <0.003	<0.003	<0.01 - **1.40**	**1.26**	<0.020 - **0.250**	0.044	<0.17		<0.20		<0.10	
South	27	<0.10 - 0.63	<0.5	<0.020 - <0.25	<0.06	<0.010 - <0.25	<0.03	1.0 - 2.99	1.5	0.069 - 0.266	0.090	<0.00050 - 0.005	<0.003	<0.04 - **1.09**	**0.96**	0.050 - **0.0673**	**0.061**	<0.17 - <0.50	<0.2	<0.20 - <0.50	<0.5	<0.10 - <0.50	<0.5
Southeast	37/37R	<0.10 - 0.37	<0.5	<0.020 - <0.25	<0.06	<0.010 - <0.25	<0.03	0.8 - 2.26	1.3	0.046 - 0.056	0.045	<0.00050 - 0.004	<0.003	0.02 - **3.27**	**0.80**	0.030 - **0.211**	0.042	<0.17 - <0.50	<0.2	<0.20 - <0.50	<0.5	<0.10 - <0.50	<0.5
	D1	<0.5	<0.5	<0.06	<0.06	<0.03	<0.03	1.3	1.3	0.057	0.056	<0.003	<0.003	**2.30**	**3.78**	**0.064**	**0.097**	<0.2		<0.5		<0.5	
	D2 *	<0.05 - 0.50	<0.5	<0.020 - <0.25	<0.06	<0.010 - <0.25	<0.03	1.2 - 3.54	1.4	0.047 - 0.060	0.049	<0.00050 - 0.004	<0.003	<0.01 - **1.89**	0.02	<0.00050 - **0.054**	<0.002	<0.17		<0.20		<0.10	

Notes:
- Concentrations are in mg/L with the exception of VOCs which are in µg/L, pH which is in SU, and conductivity which is in µS/cm.
- Bold and shading indicates exceedance of ODWQS.
- Blank indicates there is no Historical data for thie specified parameter.
- Shaded parameters across title row have been identified as diagnostic indicator parameters.
- * Groundwater sample from domestic well D2 is inferred to be softened prior to collection; the results should be viewed with caution.

Shallow Groundwater Flow System

As observed in **Table 4-2**, the 2025 parameter concentrations in the shallow groundwater observation wells were typically within or below their respective historic concentration ranges for the wells. The following parameters were above the historical range for the specified well and former well, if applicable:

- Well 19R – pH;
- Well 16AR – pH and iron;
- Well 28R – TKN;
- Well 43 – ammonia, TKN, nitrate, iron and manganese; and
- Well 45 – pH and conductivity; and
- Well 46 – conductivity and alkalinity.

The elevated concentrations in replacement wells with respect to the historic range of results at the former wells may be the result of the slight variations in screen depth and location for the replacement monitoring wells.

Time versus concentration graphs for the leachate indicator parameters of chloride, alkalinity, potassium, boron, iron, ammonia, and TKN are shown on **Figures D-8 through D-35, Appendix D**.

Shallow flow system well 40 is representative of upgradient conditions, and was incorporated into the 2014 annual monitoring program as a background observation well. Concentrations of leachate indicator parameters have generally fluctuated with no increasing or decreasing trends, with the exception of a significant iron concentration spike that occurred in May 2017. The iron concentrations since 2017 have returned to the expected historical concentration range. Chloride concentrations may also be marginally increasing with time in well 40.

Over the long-term, concentrations of general parameters and major and minor ions at observation wells 32 and 32R typically increased between the 1980s and mid to late 1990s. Since then however, concentrations have typically fluctuated with no overall pattern. As shown on the concentration versus time graphs for this well, leachate indicator parameter concentrations have fluctuated with no overall increasing trends. Chloride concentrations have generally increased since 2020; however, concentrations still remain relatively low and less than the background concentrations at well 40.

The sampling results for observation wells 11 and 11R, located adjacent to the east, show that concentrations of select general parameters and major and minor ions increased from the late 1970s to late 1980s, decreased until mid-1990s, and typically fluctuated with no overall trend since that time. One exception is alkalinity concentrations, which fluctuated with an overall increase from the late 1990s/early 2000s to 2015. Metals concentrations at well 11 fluctuated over the long term with no overall trend. In 2016, observation well 11 was decommissioned and replaced by observation well 11R. When compared to recent results at former well 11, most parameters at replacement well 11R had appreciably elevated concentrations in 2016-2025. These concentrations indicate a residual landfill influence, directly adjacent to the east of the landfill mound. The higher concentrations at replacement well 11R do not necessarily indicate a change in groundwater conditions at the site, however, continued monitoring at observation well 11R is recommended.

Concentrations of leachate indicator parameters at observation wells 16AR, 19R, 43, 44, 45 and 46 have generally fluctuated with no discernible increasing or decreasing trends. Alkalinity and ammonia concentrations both increased to historical highs at well 43 in 2023. The alkalinity concentration at well 43 returned to pre-2023 concentrations in 2024 and subsequently increased marginally in 2025, but remained below the 2023 concentration. The ammonia concentration at well 43 was lower in 2024 than in 2023, but remained slightly elevated above the pre-2023 results. In 2025, the ammonia concentration at well 43 increased again to a historical high. Concentrations of iron and TKN also increased to historical highs at well 43 in 2025. Continued monitoring is required to assess trends at well 43.

At observation wells 28 and 28R, general parameter, major and minor ion, and metal concentrations have fluctuated over the long term with no overall increasing or decreasing trend. It is noted that there was a discernible increase in the potassium concentrations from 2012 to 2015, although this concentration has decreased from 2016 to 2019 at replacement well 28R and now appears to be stable. The ammonia concentration at well 28R increased to a historical high in 2024, but decreased back to pre-2024 concentrations in 2025. Of note, TKN concentrations increased to a historical high at well 28R in 2025, which will continue to be monitored. It is also noted that the DOC concentration reported in 2024 (18.1 mg/L) was notably higher than the historical results. In 2025, the DOC concentration was notably lower (2.6 mg/L) and was similar to pre-2024 results which suggests that the appreciably elevated concentration from 2024 was an anomaly.

Concentrations of several leachate indicator parameters (chloride, alkalinity, potassium, and iron) displayed increasing concentration trends with time from 1997 to 2012 at observation well 26. The condition of the well was determined to be deteriorating and was decommissioned and replaced with observation well 26R in 2015 to monitor downgradient groundwater conditions in the shallow flow system. This well was incorporated into the monitoring program and sampled in 2016. Parameter concentrations in replacement well 26R have decreased with time. Concentrations of chloride, alkalinity, potassium, boron and iron decreased appreciably between 2022 and 2024 and appear to have stabilized since. Chloride concentrations displayed the most significant concentration increase over time between 2004 and 2016, however they have since decreased back to pre-2005 concentrations and have been lower than the trigger level in 2024 and 2025. In order to further investigate the groundwater conditions in the vicinity of observation well 26R, a supplemental drilling program was completed and two additional wells (45 and 46) were installed in August 2019. Groundwater samples have been collected from monitoring wells 45 and 46 annually since 2019 and submitted to the laboratory for analysis of the annual groundwater parameter package. It is noted that VOCs have not been detected in the samples collected from monitoring wells 45 and 46 since their installation. The parameter concentrations at monitoring wells 45 and 46 are significantly below the concentrations at 26R. In particular, chloride concentrations, which historically exceeded the trigger levels at well 26R, were well below the trigger levels at wells 45 and 46 in 2019 through 2025.

Based on the groundwater elevation and chemistry results at recently installed wells 45 and 46, the elevated concentrations and historical trigger exceedances in property boundary well 26R do not appear to be the result of shallow groundwater migrating from the landfill mound. A component of northward groundwater flow appears to be present within the vicinity of monitoring wells 45 and 46. Meanwhile, key parameter concentrations within monitoring wells 45 and 46 were generally similar or below the concentrations at 26R. Continued additional monitoring of wells 45 and 46 is recommended to confirm this conclusion.

It is suspected that road salting was a contributing factor in the increasing concentrations at well 26R, as both chloride and sodium concentrations were greater at well 26R than within leachate well 41 in 2025, as well as in recent historical results. VOCs have not been detected in the samples collected at well 26R.

Groundwater quality at the adjacent and downgradient observation wells were generally similar to those observed in background well 40. The exceptions, which were discernibly higher than historical background levels (greater than 50% higher), were concentrations of: conductivity, hardness, chloride, alkalinity, magnesium, potassium, sodium, ammonia, TKN, DOC and boron at observation well 11R; chloride, potassium, sodium and boron at observation well 26R; potassium, sodium and boron at observation well 28R; sodium at observation well 16AR; sodium, boron and nitrate at observation well 43; sodium and boron at observation well 45; and nitrate at observation well 44.

In general, the highest parameter concentrations in the shallow groundwater flow system at the site were typically observed in observation well 11R and included elevated concentrations of a number of general parameters and major ions. This was followed by concentrations at 26R. Conversely, parameter concentrations at shallow groundwater wells 16AR, 19R, 28R, 32R, 43, 44, 45 and 46 were typically similar to those observed in the background well.

In summary, there may have been some historical landfill impacts in a number of the shallow groundwater flow system wells adjacent to the northeast, and particularly adjacent to the east of the landfill; however, these impacts have generally abated such that there was no clear indication of leachate influence in the shallow observation wells further downgradient to the east/southeast at the site during 2025. The area adjacent to the east of the landfill, near 11R, should continue to be inspected to confirm that there are no leachate seeps. The elevated parameter concentrations observed at observation well 11R may be landfill related, although most parameter concentrations appear to be decreasing in recent years. Off-site influenced groundwater may be contributing to the elevated concentrations at 26R, as supported by additional monitoring completed at wells 45 and 46. Continued additional monitoring should be undertaken at wells 45 and 46 to confirm this inference. Similar to well 11R, most leachate indicator parameter concentrations at well 26R appear to be decreasing in recent years.

Deep Groundwater Flow System

As observed in **Table 4-2**, the 2025 parameter concentrations in the deeper groundwater observation wells were typically within or below their respective historic concentration ranges for the wells, with some exceptions. The following parameters were above the historic range for the specified well and former well:

- Well 37R – sodium; and
- Well 21R – conductivity and alkalinity.

The elevated concentrations in replacement wells with respect to the historic range of results at the former wells may be the result of the slight variations in screen depth and location for the replacement monitoring wells.

Time versus concentration graphs for the leachate indicator parameters of chloride, alkalinity, potassium, boron, iron, ammonia, and TKN are shown on **Figures D-8 through D-35, Appendix D**.

Deep flow system wells 39 and 42 are representative of upgradient conditions, and were incorporated into the 2014 and 2016 annual monitoring programs, respectively, as background observation wells. Concentrations of leachate indicator parameters have generally fluctuated with no increasing or decreasing trends, although concentrations of ammonia and TKN were elevated above their historical range at background well 42 in 2024. The TKN and ammonia concentrations at background well 42 decreased in 2025, and were similar to pre-2024 results.

It is observed in these graphs that the 2010 through 2025 iron concentrations in deep wells 21/21R, 24/24R, 25/25R, and 38 are marginally to appreciably elevated relative to the historical data in the respective wells. The reason for this trend is not clear, although it is inferred that the change in iron concentrations may be related to a change in laboratory analytical method; as a different laboratory was used after 2010.

The concentration versus time graphs for observation well 24/24R, located adjacent to the northeast, show that leachate indicator concentrations have fluctuated over the long term with no overall increasing or decreasing trends.

At observation well 25/25R, located adjacent to the east of the landfill, concentrations of most parameters fluctuated with an overall increase from 1999 to 2007, followed by an overall decrease from 2007 to 2015, and now appear to be generally stable.

To the east and southeast of the landfill, along the eastern limit of the buffer zone property (CAZ), the concentration versus time graphs for well 37/37R and well 38, show that leachate indicator parameter concentrations have fluctuated over the long term with no overall increasing or decreasing trends. The exceptions are the chloride concentrations, which have increased marginally in both wells since the early 2000s, but are still considered low and are far below the ODWQS. It is noted that chloride concentrations have slightly decreased at wells 37R and 38 since 2022.

To the west of the landfill area, at observation well 21/21R, most parameters have generally fluctuated over the long term with no overall trend, with the exception of iron and chloride concentrations which appear to be increasing over time. Chloride concentrations in the old well 21 fluctuated with an overall increase from 1999 to 2007, followed by an overall decrease from 2008 to 2014. Chloride concentrations in the replacement well 21R increased since sampling began in 2015, although the concentrations appear to have stabilized since 2022. The chloride concentrations at well 21R are still considered low and remain far below the ODWQS. Iron concentrations at 21/21R have increased steadily since 2009.

At observation well 27, located south of the landfill, most parameter concentrations fluctuated with no overall increasing trends prior to 1995. When monitoring of well 27 resumed again in 2012, most constituent concentrations appeared to slightly increase compared to prior to 1995, but concentration trends have remained stable.

Groundwater quality at the adjacent and downgradient observation wells were generally similar to those observed in background wells 39 and 42.

In general, the highest parameter concentrations in the deep groundwater flow system at the site were observed in background well 39 and observation well 27 (located along the southern property boundary). The 2025 parameter concentrations at well 27 do not show clear evidence of an adverse leachate influence, given the chloride concentration of just 38 mg/L and the absence of VOC detections. There is no conclusive evidence of a leachate influence on the deep groundwater quality at well 27 at this time.

Parameter concentrations at well 21/21R situated west of the landfill, and well 37/37R at the southeast corner of the buffer zone property (CAZ) were also marginally elevated relative to the other deeper flow system wells; but typically similar to, or below the parameter concentrations at well 39 in the northwest corner. As discussed previously, recent chloride concentrations in the replacement well 21R may be increasing, but still remain relatively low. Concentrations of other leachate indicators are generally fluctuating within historical ranges. Marginally increasing chloride concentrations had also been observed at observation well 37/37R, but concentrations remain relatively low and well below the ODWQS for chloride. The increasing chloride concentrations may be indicative of the natural fluctuations in the deeper flow system or influences from road salting activities. As such, there is no conclusive evidence of a leachate influence on the deep groundwater quality at wells 21/21R and 37/37R at this time.

In summary, there was no clear evidence of a leachate influence in the deeper groundwater flow system along the northeast portion of the property boundary (well 24R), adjacent east to the landfill mound (well 25R), west of the landfill (well 21R) and south of the landfill (27). Deeper groundwater quality at the east and southeast limits of the buffer zone property (wells 38 and 37R respectively) do not demonstrate a leachate influence.

4.2.2 Domestic Wells

As observed in **Table 4-2**, the 2025 parameter concentrations in domestic well D2 (Pearce) were within their respective historical concentration ranges, with the exception of pH, which was slightly higher than the historical range. The 2025 sample collected from domestic well D1 is the second sample from this location, and as such, inferences are unable to be made with respect to historical concentration ranges. Both domestic wells D1 and D2 are believed to obtain water from the deep flow system.

It is noted that domestic well D2 (Pearce) came under new ownership before the 2015 sampling event, with notable renovations happening at the home. Previous groundwater chemical results (2012-2013, 2016-2024) have strongly suggested that the water was treated (ie. softened) prior to sample collection. This was also the case in the 2025 sample. The May 2025 sample results from domestic well D1 do not suggest that the water was treated (ie. softened) prior to sample collection.

The concentration versus time graphs for well D2 show that parameter concentrations have fluctuated over the long term with no overall increasing or decreasing trends at this location.

Parameter concentrations at domestic groundwater wells D1 and D2 (Pearce) were generally similar to those observed at the other deep flow system wells. Anthropogenic sources, such as road salting, septic beds, home renovations, and/or the well distribution system may be responsible for some of the historically elevated concentrations at domestic well D2. Groundwater quality in the domestic wells does not show evidence of leachate influence, based on a comparison with background shallow groundwater quality.

4.2.3 Trilinear Diagram

The natural variability in the overburden groundwater quality at the Site is illustrated on the trilinear diagram (**Figure 9**) using the May 2025 analytical results. The anion chemical results are presented on the triangular graph in the lower right, while the cation chemical results are presented on the triangular graph in the lower left. The anion and cation results are combined on the diamond shaped graph in the centre. Water with similar chemical signatures will plot together on the tri-linear plot.

Leachate chemistry from the Site is plotted in red on the trilinear plot, for reference purposes. Leachate chemistry from well 41 is bicarbonate enriched and sulphate deficient, with a slightly dominant calcium cation.

The shallow and deep flow system groundwater quality at the Site generally plots together on the trilinear diagram. As shown on **Figure 8**, groundwater is typically enriched with bicarbonate (anion), with a dominant calcium cation. An exception is the groundwater quality at domestic well D2, which is enriched with bicarbonate (anion) and sodium (cation), as a result of the water being treated (ie. softened) prior to sample collection.

The shallow and deep groundwater samples from the site plot consistently together near the left corner of the combined graph, with the exception of well 26R which was influenced by slightly more elevated chloride and sodium concentrations, and domestic well D2 which was influenced by elevated sodium concentrations. However, the water quality at these wells do not exhibit typical leachate quality influences. As mentioned in Section 4.2.1, observation well 26R is suspected to be influenced by road salting, as both chloride and sodium concentrations were greater at well 26R than within leachate well 41. As mentioned in Section 4.2.2, the groundwater quality at domestic well D2 suggests that the water was treated (ie. softened) prior to sample collection. Shallow groundwater in well 43 also plots slightly separate from the other monitors, due to the influence of slightly elevated sodium concentrations.

The leachate chemistry from the Site plots in the same general area as most groundwater wells, near the left corner of the combined graph. Typical municipal leachate would plot toward the lower left-central area of the combined graph. The location of the well 41 chemistry on the combined graph suggests a weak leachate strength.

In summary, the trilinear plot does not provide any indication of a discernible leachate impact to the shallow or deep groundwater flow systems.

4.2.4 Ontario Drinking Water Quality Standards

The following parameters were detected at concentrations exceeding the Ontario Drinking Water Quality Standards (ODWQS) (MECP, June 2003) in samples collected from the shallow flow system and deeper flow system observation wells during 2025.

- Hardness at all wells sampled in 2025;
- Alkalinity at shallow flow system well 11R;
- Nitrate at shallow flow system well 44;
- DOC at shallow flow system wells 11R and 40;
- Iron at shallow flow system wells 11R, 26R, 40, 43 and 46, and at each deep flow system well sampled except for wells 42 and Domestic Well D2; and
- Manganese at shallow flow system wells 11R and 40, and at deep flow system wells 27, 39 and Domestic Well D1.

Most parameters that exceeded the ODWQS within the shallow groundwater flow system and deep groundwater flow system have objectives or guidelines related to the aesthetic quality or operational treatment of the water and are not health related. The exception to this is nitrate, which has a maximum acceptable concentration limit. The nitrate exceedance observed at shallow flow system well 44 is not likely to be the result of a landfill leachate impact as nitrate has not been detected within the leachate, and only in very low concentrations in the shallow groundwater adjacent to the east side of the landfill mound. It is much more likely that this concentration is the result of agricultural activities that surround this well location. A supplemental sample was collected at observation well OW33R in May 2019, in order to better assess the landfill's potential contribution of nitrate on the east side of the site. The nitrate concentration at well OW33R was 0.496 mg/L which is well below the ODWQS of 10.0 mg/L for nitrate, and significantly less than the concentrations observed at well 44 in recent years (15.4 – 27.4 mg/L from 2017-2025). Given that well 33R is directly adjacent to the landfill and the nitrate concentration was low, the elevated nitrate concentration at well 44 is unlikely to be landfill related.

Concentrations of hardness, iron, and manganese observed in the shallow and deep groundwater flow systems, and DOC in the shallow flow system, appear to naturally approach or exceed the ODWQS, since exceedances for these parameters have been observed at background wells. Alkalinity exceedances observed at shallow groundwater well 11/11R may indicate residual landfill influences.

4.2.5 Guideline B-7 Compliance Assessment

Guideline B-7 was established by the MECP as a mechanism to assess the acceptable level of leachate impacts on the groundwater system. Guideline B-7 is applied to groundwater quality at the property boundary, and is intended to protect both existing and potential reasonable uses of the groundwater on adjacent properties. The

Guideline states that, for non-health related parameters, the impact from the landfill should not raise the concentration by more than half the difference between the background concentration and the ODWQS.

Shallow Flow System

Groundwater movement in the shallow flow system across most of the site is inferred to converge on the on-site stream; though the groundwater elevations indicate that a mound exists in the fill area, inducing a localized radial flow away from the fill area to the east and southeast. Hence, there may be a minor component of localized shallow groundwater flow from the fill area east and southeast toward the buffer property.

MECP Guideline B-7 criteria were calculated to assess the significance of the landfill effects on the shallow groundwater flow system along the eastern property boundary. Guideline B-7 is normally applied at the property boundary, and is intended to protect both existing and potential reasonable uses of that groundwater on adjacent properties.

Guideline B-7 criteria were calculated for parameters that have ODWQS. The chemistry results measured in 2025 from shallow background monitoring well 40 were used as the reference concentration for the groundwater flow system.

Table 4-3 provides a comparison of the calculated Guideline B-7 criteria and downgradient wells on Site.

Table 4-3: 2025 Guideline B-7 Compliance - Shallow Flow System

Parameter	Reference Quality	ODWQS	Guideline B-7	Monitoring Well					
				26R	32R	43	44	45*	46*
Hardness	391	80-100	**391 †**	364	341	127	372	158	247
Chloride	20	250	**135**	87	14	21	15	2	2
Sulphate	42	500	**271**	29	29	30	42	27	25
Alkalinity	353	30-500	**427**	374	296	234	275	167	266
Sodium	9.7	200	**105**	70.0	9.72	52.8	6.85	24.0	2.50
Nitrate	<0.06	10.0	**2.52**	<0.06	0.07	0.30	**16.3**	<0.06	<0.06
Nitrite	<0.03	1.0	**0.26**	<0.03	<0.03	0.07	<0.03	<0.03	<0.03
DOC	5.7	5	**5.7 †**	3.4	1.8	1.7	1.1	1.5	2.1
Boron	0.019	5.0	**1.26**	0.579	0.047	0.148	0.022	0.126	0.014
Chromium	<0.003	0.05	**0.014**	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	4.04	0.3	**4.04 †**	1.22	<0.01	0.32	0.02	0.02	0.550
Manganese	0.292	0.05	**0.292 †**	0.027	0.0279	0.026	<0.002	0.014	0.018
Vinyl Chloride (µg/L)	<0.2	1	**0.33**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Benzene (µg/L)	<0.5	1	**0.44**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4 Dichlorobenzene (µg/L)	<0.5	5 MAC	**1.44**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		1 AO	**0.63**						

Notes:
- All concentrations are mg/L unless otherwise noted.
- ODWQS - Ontario Drinking Water Quality Standards (June 2003)
- Shading indicates concentrations exceed Guideline B-7 criteria.
- Reference quality based on 2025 groundwater quality measured from background observation well 40.
- † When the reference concentration is greater than the ODWQS, the reference value is used as the Guideline B-7 Criterion.
- * Wells included for comparison purposes only, as GB-7 is actually assessed at the property boundary.

In summary, concentrations at the landfill property boundary complied with the Guideline B-7 (GB-7) criteria, with the exception of nitrate at well 44.

As discussed previously, the nitrate exceedance observed at well 44 is not likely to be the result of a landfill leachate impact as nitrate has not been detected within the leachate, and only in very low concentrations in the shallow groundwater adjacent to the east side of the landfill mound. Furthermore, other leachate indicator parameters such as chloride, alkalinity, and VOCs are not elevated at well 44. A supplemental sample was collected at observation well OW33R in 2019, in order to better assess the landfill's contribution of nitrate on the east side of the site. The nitrate concentration was found to be low at well 33R (well below ODWQS and GB-7 Criteria), indicating the elevated nitrate concentration at well 44 is unlikely to be landfill related. The nitrate concentration is likely the result of agricultural activities that surround this well location.

Deep Groundwater Flow System

Groundwater flow in the deep flow system is inferred to be in a generally south to southeasterly direction under a low horizontal hydraulic gradient. MECP Guideline B-7 criteria were calculated to assess the significance of the landfill effects on the deep groundwater flow system. Guideline B-7 is applied at the property boundary, and is intended to protect both existing and potential reasonable uses of the groundwater on adjacent properties.

Guideline B-7 criteria were calculated for parameters that have ODWQS. The median chemistry results measured in 2025 from deep background monitoring wells 39 and 42 were used as the reference concentration for the deep flow system.

Table 4-4 provides a comparison of the calculated Guideline B-7 criteria and deep flow system downgradient wells on Site. Guideline B-7 is applied at the property boundary and is applicable to observation wells 27, 37R, and 38.

Table 4-4: 2025 Guideline B-7 Compliance - Deep Flow System

Parameter	Reference Quality	ODWQS	Guideline B-7	Monitoring Well		
				27	37R	38
Hardness	259	80-100	**259 †**	**347**	**326**	**270**
Chloride	18	250	**134**	38	33	24
Sulphate	23	500	**262**	31	36	24
Alkalinity	252	30-500	**376**	300	282	240
Sodium	20.3	200	**110**	17.2	15.0	16.5
Nitrate	<0.06	10.0	**2.52**	<0.06	<0.06	<0.06
Nitrite	<0.03	1.0	**0.26**	<0.03	<0.03	<0.03
DOC	1.4	5	**3.2**	1.5	1.3	1.3
Boron	0.040	5.0	**1.28**	0.09	0.045	0.041
Chromium	<0.003	0.05	**0.014**	<0.003	<0.003	<0.003
Iron	0.32	0.3	**0.32 †**	**0.96**	**0.80**	**0.54**
Manganese	0.072	0.05	**0.072 †**	0.061	0.042	0.050
Vinyl Chloride (µg/L)	<0.20	1	**0.33**	<0.2	<0.2	<0.2
Benzene (µg/L)	<0.50	1	**0.44**	<0.5	<0.5	<0.5
1,4 Dichlorobenzene (µg/L)	<0.50	5 MAC	**1.44**	<0.5	<0.5	<0.5
		1 AO	**0.63**			

Notes:
- All concentrations are mg/L unless otherwise noted.
- ODWQS - Ontario Drinking Water Quality Standards (June 2003)
- Shading indicates concentrations exceed Guideline B-7 criteria.
- Reference quality based on 2025 groundwater quality measured from background observation wells 39 and 42.
- † When the reference concentration is greater than the ODWQS, the reference value is used as the Guideline B-7 Criterion.

In summary, concentrations at the property boundary complied with the Guideline B-7 criteria, with the exception of hardness and iron at wells 27, 37R and 38. As stated in Section 4.2.4., concentrations of hardness and iron appear to be naturally elevated in the deep flow system. The hardness concentrations at observation wells 37R and 38 are actually below the 2025 background results at well 39 and the hardness concentration at well 27 was only slightly higher than the concentrations at well 39. As such, the site is considered to be in compliance at the downgradient property boundaries.

4.2.6 Trigger Mechanism Compliance Assessment

On September 8, 2016, the site CofA (Waste) was updated by the MECP to Amended Environmental Compliance Approval (ECA) No. A070702. The new approval incorporated the County owned buffer lands to the east of the landfill into a Contaminant Attenuation Zone (CAZ). As part of the new ECA, a closure plan was submitted to the MECP on June 28, 2017, which included a trigger mechanism and contingency plan as well as the new monitoring program. The closure plan was accepted by the MECP in Notice No. 1 of the ECA, dated March 6, 2018.

Table 4-5 outlines the current groundwater trigger concentrations and boundary criteria, with 2025 results for the selected boundary wells.

Table 4-5: 2025 Groundwater Trigger Mechanism Compliance Assessment

Parameter	Trigger Level	Monitoring Well					
		Shallow Flow System			Deep Flow System		
		26R	43	44	27	37R	38
Chloride	134	87	21	15	38	33	24
Boron	1.3	0.579	0.148	0.022	0.090	0.045	0.041
Vinyl Chloride (µg/L)	0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Benzene (µg/L)	0.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4 Dichlorobenzene (µg/L)	1.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Notes:
- All concentrations are mg/L unless otherwise noted.
- Shading indicates concentrations exceed proposed trigger boundary criteria.

The property boundary groundwater trigger criteria at the site were not exceeded during 2025.

5 SURFACE WATER QUALITY

The general surface water chemical results from the surface water stations are provided in **Table E-1, Appendix E**. The laboratory certificates of analysis are provided in **Appendix F**. Concentration versus time graphs for conductivity, hardness, alkalinity, calcium, chloride, magnesium, iron, and manganese are presented on **Figures E-1 through E-21**. Surface water samples are collected semi-annually (April and October) from stations C01 and C06, and annually in April from stations C04, P01, P02, P03, and NE1. A sample could not be collected from station C04 during the April monitoring event due to limited water depth at the station; however, a sample from station C04 was successfully collected on May 7, 2025. A sample could not be collected from station P03 during the April 2025 monitoring event, or from station C06 during the October 2025 monitoring event, due to dry conditions at the stations. The surface water station locations are shown on **Figure 2**.

The QA/QC program for the monitoring program at the site included a field and a laboratory component. Standard field protocols were used to ensure consistency.

Laboratory reports were reviewed as part of the laboratory QA/QC program. Blind duplicate samples were collected from surface water station C01 in April and October 2025. The duplicate samples were similar to the original samples results, with the calculated RPD within the 20% guideline for acceptability or less than two times the laboratory reported MDL, with one exception. In April, the electrical conductivity concentration was elevated in the duplicate sample compared to the original sample from C01 (RPD 42%). The laboratory was contacted to review the conductivity results and their review did not identify any errors with the reported concentrations. The conductivity concentrations reported in both the original and duplicate sample were similar to historical results from station C01 and, therefore, the results were considered acceptable for assessment purposes. Acceptable data quality control including laboratory blanks, spiked blanks, laboratory duplicates, and laboratory percent recoveries of analysis indicated that the detected constituent concentrations were accurate and reflected actual surface water conditions at the time of sample collection and are acceptable for inclusion into the database, with the exception of the above-noted conductivity value.

5.1 Surface Water Quality Comparison

I) Wetlands on Northeast Boundary (NE1)

Surface water station NE1 is situated in the wetland area north of the site, associated with the Otter Creek drainage system. Station NE1 is in an area of ponded water situated at the toe of the landfill, which receives runoff from the north and east side slopes of the landfill.

The 2025 chemistry results at surface water station NE1 were generally consistent with historical results, with the exceptions of the potassium, ammonia and boron concentrations, which were higher than their respective historical ranges. It is noted that there are no drainage channels within the low relief (swampy) area northeast of the landfill. Surface water run-off into the swampy area travels overland as sheet flow, usually forming ponds and eventually infiltrating into the soil. As such, stagnant water conditions usually exist at the time of sampling at station NE1. During stagnant conditions, chemical precipitates, evaporation and biological activity serve to change the water quality. Thus, the concentration results at NE1 are likely indicative of the swampy, stagnant conditions in the area, and are not representative of the natural water quality in flowing conditions.

As illustrated in **Figures E-10 to E-12**, alkalinity, hardness, conductivity, calcium, magnesium and calcium concentrations at NE1 fluctuated and increased from 2013 to 2022, decreased notably in 2023 and increased back to 2022 concentrations in 2024. The conductivity concentration at NE1 decreased notably in 2025, while concentrations of alkalinity, hardness and calcium increased marginally in 2025. The remaining parameter concentrations at NE1 have fluctuated over time with no overall long-term increasing or decreasing trends.

Of the parameters tested, only the parameters pH, alkalinity, un-ionized ammonia, boron, chromium, and iron have PWQOs. The 2025 surface water chemistry at station NE1 complied with the PWQOs for the parameters tested, with the exceptions of un-ionized ammonia, boron and iron. Concentrations of un-ionized ammonia and iron exceeded the PWQO at NE1 in 2025 but were within the historical range of results for this sampling location. The concentration of boron at NE1 exceeded the PWQO and the historical range of results; however, it is noted that the historical database of boron results is limited, as boron analysis was added to the monitoring program in 2018.

Based on the monitoring results, surface water quality in the northeast portion of the site was not measurably affected by the landfill site in 2025.

II) On-Site Stream (C01, C04, and C06) and Adjacent Retention Pond (P02)

Surface water station C06 is located in a swampy area near the northwest corner of the site, inferred to be the headwaters of the on-site stream, and represents the upstream surface water quality conditions in the on-site stream. Station C04 is located downstream of C06 in the on-site stream, within the landfill property, while station C01 is located furthest downstream at the southern property boundary. The on-site stream exits the southern portion of the site via a culvert beneath Quaker Street.

Surface water station P02 is located on the retention pond situated in the central portion of the site, adjacent and west of the landfill. The pond receives surface water run-off from the western portion of the fill area, and also shallow groundwater moving from beneath the landfill. Drainage from the retention pond (P02) enters the on-site stream between surface water stations C06 and C04.

The 2025 chemistry results from the stations along the on-site stream and from the retention pond at station P02 were generally within or below their respective historic ranges. The exceptions included concentrations of several parameters (turbidity, chloride, alkalinity, sodium, ammonia, un-ionized ammonia and iron) in the October sample collected from station C01. The October 2025 sample collected from station C01 was collected from low water/stagnant conditions and the results should, therefore, be interpreted with caution. As previously noted, during stagnant conditions, chemical precipitates, evaporation and biological activity serve to change the water quality and are not representative of the natural water quality in flowing conditions. Upstream stations C06 and C04 were dry during the October 2025 sampling event, confirming that flowing conditions were not present along the stream.

The spring 2025 chemistry results from the on-site stream and pond P02 are shown on **Table 5-1** in sequence of the flow direction, downstream from station C06.

Table 5-1: Spring 2025 Surface Water Chemistry - On-Site Stream and Pond P02

Parameter	C06	P02	C04	C01
pH	8.09	8.14	8.34	8.20
Conductivity	579	408	761	457
Hardness	303	348	313	331
Chloride	41	49	59	51
Sulphate	9	26	23	18
Alkalinity	264	316	306	313
Calcium	94.9	97.0	79.5	90.6
Magnesium	16.1	25.8	27.9	25.4
Potassium	1.70	6.46	10.1	8.20
Sodium	21.1	29.4	35.6	33.7
Ammonia	<0.1	3.4	5.5	0.3
Un-ionized Ammonia	<0.001	0.028	0.082	0.002
Nitrate	<0.06	0.35	0.18	1.43
Nitrite	<0.03	<0.03	<0.03	0.040
Boron	0.025	0.221	0.367	0.319
Chromium	<0.003	<0.003	<0.003	<0.003
Iron	0.45	0.23	0.43	0.20
Manganese	0.278	0.126	0.096	0.114

Note: All concentrations in mg/L except pH (unitless) and conductivity (μS/cm).

As observed in **Table 5-1**, parameter concentrations typically increased between stations C06 and C04. The increase is likely related to the quality of surface water discharge from pond P02. Surface water quality concentrations in spring 2025 generally remained similar or decreased between stations C04 and C01, with the exception of nitrate; however, parameter concentrations at downstream station C01 were generally higher or equivalent to those observed at upstream station C06.

A comparison between upstream station C06 and downstream station C01 was not possible for October 2025, as the upstream station C06 was dry during the sampling event and stagnant conditions were present at downstream station C01.

As illustrated in **Figures E-1 to E-9** for stations C01 to C06 and **Figures E-16 to E-18** for pond P02, parameter concentrations have typically fluctuated over the long-term with no overall increasing or decreasing trends; though there are some exceptions. Chloride concentrations at stations C01, C04 and C06 increased between about 1998 and 2002, and have generally fluctuated with no overall trend since that time. As previously noted, concentrations of several parameters were notably elevated in the October 2025 sample collected from station C01, as evident in the concentration versus time graphs for alkalinity, conductivity, chloride, calcium and iron. These elevated concentrations are attributed to stagnant sampling conditions and the samples results should be interpreted with caution. Alkalinity and conductivity concentrations at C04 increased overall from the mid-1990s until approximately 2013 and now appear to have stabilized. Alkalinity, hardness, conductivity, and chloride concentrations at retention pond station P02 fluctuated with an overall increasing trend from the mid-1990s to 2015, but decreased in 2016/2017 and now appear to be fluctuating around this level.

The increasing parameter concentrations observed in retention pond P02 from the mid-1990s to 2015 are likely attributable to landfill influences since the pond is inferred to receive shallow groundwater flow from beneath the landfill. Likewise, the increased chloride concentrations at surface water stations C01 and C04 are likely related, at least in part, to discharge of shallow groundwater from beneath the landfill. Station C06 is located along the western property boundary. It is unlikely that any shallow groundwater from beneath the landfill is reaching the stream at this point. Thus, the increasing chloride levels at C06 may be related to off-site influences, such as road salting along County Road 13. However, monitoring should be continued for confirmation.

Previous reports have suggested that the increasing chloride concentrations observed at downstream station C01 coincided with the increase of chloride concentrations observed at shallow groundwater observation well 26, which is under artesian conditions. Packer systems were installed in shallow observation well 26 and deep observation well 27 (also artesian) in the summer of 2009 to prevent the wells from flowing to the receiving surface water course. An appreciable decrease in chloride concentrations at downstream station C01 was not observed in the sampling results after the packers were installed. As a result of the artesian conditions observed at well 26/26R, shallow groundwater with elevated chloride concentrations (similar to those at 26/26R) may be discharging into the low lying forested area west of well 26/26R and possibly directly into Branch Creek, contributing to the chloride levels.

A comparison of the chloride concentrations at C01, C04, and pond P02 (**Figures E-2, E-5 and E-17, Appendix E**) indicates that they are likely related. Since 1998, chloride levels at C01 have ranged from 29.0 mg/L to 79.8 mg/L with an average of 52.2 mg/L (excluding the October 2025 result), while levels at C04 have ranged from 33.0 mg/L to 63.3 mg/L with an average of 51.7 mg/L. The chloride concentrations at pond P02 have ranged from 10.0 mg/L to 71.0 mg/L with an average of 50.2 mg/L. It is also understood that the area in the vicinity of surface water station C01 (i.e., a culvert) occasionally floods above the road level during the spring freshet and/or periods of high rainfall. As such, flooding and road salting influences may also contribute to the elevated chloride concentrations observed at station C01.

The 2025 concentrations at on-site stream stations C01, C04, and C06 and retention pond station P02 generally complied with the PWQOs, with the following exceptions:

- The unionized ammonia concentrations at stations C01 (October), C04 and P02;
- Boron concentrations at stations C01, C04 and P02; and
- Iron concentrations at stations C01 (October), C04 and C06.

In summary, weak landfill influences are likely observed in the surface water quality in retention pond P02, and in the on-site stream at intermediate station C04. The retention pond and on-site stream are inferred to receive shallow groundwater flow from beneath the landfill. At station C01, landfill influences from the upstream portions of the on-site stream, shallow groundwater discharge, and road salting practices have all likely contributed to the chloride levels at the station.

III) Northern On-Site Retention Pond (P03)

Surface water station P03 is located on the retention pond situated in the northern portion of the site, near the fill area. The pond likely receives surface water run-off from portions of the north and northwest areas of the landfill area.

A sample could not be collected from station P03 in 2025 due to dry conditions at the time of the annual sampling event in April 2025. As illustrated in **Figures E-19 to E-21**, parameter concentrations have fluctuated over the long-term with spikes of elevated concentrations, but with no overall increasing or decreasing trends.

IV) Southeast On-Site Retention Pond (P01)

Surface water station P01 is located on the retention pond situated in the southeast portion of the site. The pond likely receives surface water run-off from portions of the south and southeast areas of the landfill area.

The 2025 chemistry results at retention pond P01 were within or below their respective historical ranges. As illustrated in **Figures E-13 to E-15**, concentrations of most parameters have fluctuated over the long-term with no overall increasing trend. The 2025 surface water concentrations at station P01 complied with the PWQO.

Based on the monitoring results, surface water quality in retention pond P01, in the southeast portion of the site, was not measurably affected by the landfill site in 2025.

5.2 Trigger Mechanism Compliance Assessment

On September 8, 2016, the site CofA (Waste) was updated by the MECP to Amended Environmental Compliance Approval (ECA) No. A070702. The approval incorporated the County owned buffer lands to the east of the landfill into a Contaminant Attenuation Zone (CAZ). As part of the new ECA, a closure plan was submitted to the MECP on June 28, 2017, which included a trigger mechanism and contingency plan as well as the new monitoring program. The closure plan was accepted by the MECP in Notice No. 1 of the ECA, dated March 6, 2018.

Table 5-2 outlines the current surface water trigger concentrations and boundary criteria, with 2025 results for the downstream surface water trigger location (C01).

Table 5-2: 2025 Surface Water Trigger Mechanism Compliance Assessment

Parameter	Trigger Level	Surface Water Station C01	
		Date	
		April 29	October 22
Chloride	120	51	140 ▨
Boron	1.5	0.319	0.340
Un-ionized Ammonia	0.02	0.002	0.024 ▨

Notes: • All concentrations are mg/L unless otherwise noted.
• Shading indicates concentrations exceed proposed trigger criteria.

As shown in **Table 5-2**, concentrations of the trigger parameters were lower than the trigger levels in the April 2025 sample collected from station C01, while concentrations of chloride and un-ionized ammonia exceeded the trigger level in the October 2025 sample collected. As previously noted, the October 2025 sample from station C01 was collected from stagnant conditions and is not considered to be representative of water quality within the stream during flowing conditions. Following receipt of the October 22, 2025 sample results, inspections of the site were completed in accordance with the Site Closure Plan. The inspections did not identify evidence that leachate impacts were occurring in the stream. Several attempts to re-sample station C01 were made in November/December 2025; however, flowing conditions were not observed and, therefore, a confirmatory sample could not be collected. Given that the upstream stations C06 and C04 were dry at the time of the October 2025 sampling event, the elevated concentrations observed are likely attributed to the stagnant sampling conditions and are not attributed to leachate impacts from the Site.

5.3 Summary

Based on the monitoring results, the on-site stream surface water quality demonstrates a weak landfill influence through the central portion of the site (station C04). It should be noted that the landfill influence is marginal, with the 2025 chloride concentration at 59 mg/L.

At the downstream station C01, where the on-site stream leaves the property, surface water quality has demonstrated marginally elevated chloride levels for a number of years. The chloride levels may be attributed to landfill influences from the upstream portions of the on-site stream, from shallow groundwater discharge, and from road salting practices. The concentration of boron exceeded the PWQO at downstream station C01 in spring 2025. As previously noted, the results of the October 2025 sample from station C01 are not considered to be representative of water quality in the flowing stream. Concentrations of un-ionized ammonia, boron and iron exceeded the PWQO at station C01 in October 2025.

Therefore, based on the monitoring results, surface water quality in the on-site stream leaving the site has been affected by landfill influences from the upstream portions of the on-site stream and in the shallow groundwater, and possibly from road salting activities. It is noted however, that the landfill influences in the surface water quality leaving the site are minor at most, as evident by the chloride concentration of 51 mg/L in spring 2025. The Canadian Environmental Quality Guideline (CEQG) for chloride for the protection of aquatic life is 120 mg/L.

The fall 2025 sample collected from downstream station C01 exceeded the trigger level boundary criteria for chloride and un-ionized ammonia; however, these exceedances could not be confirmed due to dry/frozen stream conditions in November/December 2025. The elevated concentrations observed in the fall 2025 sample from C01 are attributed to stagnant conditions.

6 LANDFILL GAS MONITORING RESULTS

Landfill gas concentrations were measured at standpipes SP3R, SP4R, and SP5 on May 7, 2025. These standpipes are located adjacent to the east, northeast, and north of the landfill mound, respectively.

The following table summarizes the landfill gas monitoring results and water levels within the standpipes in 2025. The combustible gas concentrations were measured as a percent of the lower explosive limit (LEL) for methane, and are presented in the following table. The LEL for methane represents 5% gas by volume in air.

Sampling Location	% LEL Methane	% CO_2	% O_2	% Balance Gas	Groundwater Elevation (masl)
SP3R	0.0	0.0	20.9	79.0	280.36
SP4R	0.0	0.0	20.9	79.0	279.47
SP5	0.0	0.0	20.9	79.0	Dry

Methane was not detected at any of the locations, suggesting that landfill gas is not migrating from the site. At SP3R and SP4R, the water level was above the screened portion of the well (flooded); however, the water level elevation was less than 0.5 m below the ground surface. As such, gas migration would be limited in the areas of SP3R and SP4R due to the high-water table condition. Sampling location SP5 was dry during the 2025 monitoring event.

7 2026 MONITORING PROGRAM

The annual monitoring program, as detailed in the ECA, should be continued at the Holbrook Landfill site in 2026. In addition to the ECA required monitoring program, monitoring of observation wells 45 and 46, as well as domestic well D1, should be continued in 2026. The packers placed in shallow and deep groundwater wells 26R and 27 should be maintained to prevent discharge from the flowing wells from reaching the surface water drainage system.

Table 7-1 provides the recommended 2026 environmental monitoring program for the Site.

Table 7-1: 2026 Environmental Monitoring Program

Activity	Location	Sampling Frequency	Analysis / Measurement
Groundwater and Leachate Level Monitoring	**Shallow Flow System**: 4R, 5R, 10R, 11R, 13R, 14R, 15A, 16AR, 18R, 19R, 24AR, 26R, 28R, 32R, 33R, 40, 43, 44, 45, 46, SG1 **Deep Flow System**: 16R, 21R, 24R, 25R, 27, 31, 35, 37R, 38, 39, 42 **Leachate Well**: 41	Annual (May)	Water Level Measurement
Groundwater and Leachate Sampling	**Shallow Flow System**: 11R, 16AR, 19R, 26R, 28R, 32R, 40, 43, 44, 45, 46 **Deep Flow System**: 21R, 24R, 25R, 27, 37R, 38, 39, 42 **Private Wells**: D1, D2 (Pearce) **Leachate Well**: 41	Annual (May)	**Field Parameters**: pH, conductivity, temperature General Parameters: pH, conductivity, hardness **Major and Minor Ions**: alkalinity, calcium, chloride, magnesium, potassium, sodium, sulphate **Nutrients and Organics**: ammonia, nitrate, nitrite, TKN, DOC **Dissolved Metals**: boron, chromium, iron, manganese
	Shallow Flow System: 32R, 26R, 40, 43, 44, 45, 46 **Deep Flow System**: 27, 37R, 38, 39, 42 **Leachate Well**: 41	Annual (May)	**Volatile Organic Compounds**: vinyl chloride, benzene, 1,4 dichlorobenzene
Surface Water Sampling	**Surface Water Station**: C01, C06	Semi-annual (spring and fall)	**Field Parameters**: pH, conductivity, temperature, turbidity **General Parameters**: pH, conductivity, hardness **Major and Minor Ions**: alkalinity, calcium, chloride, magnesium, potassium, sodium, sulphate **Nutrients and Organics**: ammonia, un-ionized ammonia, nitrate, nitrite **Total Metals**: boron, chromium, iron, manganese
	Surface Water Station: C04, P01, P02, P03, NE1	Annual (spring)	

Activity	Location	Sampling Frequency	Analysis / Measurement
Landfill Gas Monitoring	**Standpipes:** SP3R, SP4R, SP5 **Leachate Well:** 41	Annual	Field measurement of methane, carbon dioxide, oxygen, balance gas, pressure, as well as water level

8 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the 2025 monitoring program presented in this report, the following conclusions are provided.

- Groundwater movement in the shallow flow system across most of the site is inferred to be southwesterly towards the on-site creek, while shallow groundwater movement in the western portion of the site (west of the creek) is inferred to flow east towards the creek. However, the shallow flow system groundwater elevations indicate that a mound exists in the fill area, inducing a localized radial flow away from the fill area to the east and southeast. Thus, groundwater flow in the shallow flow system across the majority of the site is inferred to converge on the on-site stream, with a minor component of localized shallow groundwater flow from the fill area toward the east and southeast.
- The retention pond located in the central portion of the site (pond P02) likely receives shallow groundwater inflow from beneath the landfill.
- Groundwater movement in the deeper flow system is inferred to be in a generally south to southeasterly direction beneath the site. The horizontal hydraulic gradient across the site is low, with a grade change of less than 1 m from the north to southeast limits of the site.
- The leachate strength at the site is relatively weak, with chloride and sodium concentrations below their respective Ontario Drinking Water Quality Standards (ODWQSs).
- There may have been some historical landfill impacts in a number of the shallow groundwater flow system wells adjacent to the northeast and particularly to the east and southeast of the landfill; however, most of these have abated such that there was no clear indication of leachate influence in the shallow observation wells at the downgradient property boundaries to the east/southeast at the site during 2025. The shallow groundwater quality complied with Guideline B-7, with the exception of nitrate at well 44. The nitrate exceedance at well 44 is not likely to be the result of a landfill leachate impact as nitrate has not been detected within the leachate, and only in very low concentrations in the shallow groundwater adjacent to the east side of the landfill mound. Furthermore, other leachate indicator parameters such as chloride, alkalinity, and VOCs are not elevated at well 44. The nitrate concentration is likely the result of agricultural activities that surround this well location.
- There was no clear indication of leachate influence in the deeper groundwater flow system at the property boundaries in 2025. The deep groundwater quality complies with Guideline B-7, with the exception of hardness and iron at wells 27, 37R and 38. Concentrations of hardness and iron are interpreted to be naturally elevated in the deep flow system. Thus, the site is considered to be in compliance at the downgradient property boundaries.
- None of the groundwater trigger criteria at the site were exceeded during 2025.

- Surface water quality in the wetland at the northeast site boundary, and the northern and southeast on-site retention ponds was not measurably affected by the landfill in 2025. Surface water quality at intermediate station C04 along the on-site stream and retention pond P02 in the central part of the site were inferred to be slightly influenced by the landfill.
- Surface water quality in the on-site stream leaving the site (station C01) has been affected by landfill influences from the upstream portions of the on-site stream, shallow groundwater discharge, and possibly road salting activities. However, the landfill influences in the surface water quality leaving the site are very weak, based on the monitoring results, with chloride values typically below the CEQG water quality guideline for the protection of aquatic life. Surface water quality leaving the site at station C01 complied with the current trigger level boundary criteria in spring 2025.
- The fall 2025 sample collected from downstream station C01 exceeded the current trigger level boundary criteria for chloride and un-ionized ammonia; however, these exceedances could not be confirmed due to dry/frozen stream conditions in November/December 2025. Inspections of the site were completed in accordance with the Site Closure Plan, which did not identify evidence that leachate impacts were occurring in the stream. The elevated concentrations observed in the fall 2025 sample from C01 were attributed to stagnant conditions.
- Methane was not detected at the landfill gas monitoring probes, located adjacent to the east, northeast, and north of the landfill mound, during the 2025 monitoring event.

Based on the findings of the 2025 monitoring program, the following recommendations will be implemented in 2026:

- Monitoring should be continued at the site in 2026 with the recommended program presented in Section 7.0.
- The landfill slopes should continue to be inspected to confirm that there are no leachate seeps in the area.
- Supplemental groundwater samples should continue to be collected in 2026 at observation wells 45 and 46 to continue to evaluate/verify the source of the previous trigger exceedances at observation well 26R.
- A supplemental groundwater sample should continue to be collected in 2026 at domestic well D1.
- As discussed during recent MECP correspondence, a new gas probe should be installed near existing monitor 28R for completion of landfill gas monitoring. Leachate well 41 should also be incorporated into the landfill gas monitoring program.
- As discussed during recent MECP correspondence, supplemental PFAS sampling should be completed at wells 26R, 45 and 46 in 2026.
- As discussed during recent MECP correspondence, the reference elevation for monitoring wells 26R, 45 and 46 should be re-surveyed in 2026.
- The existing monitoring wells should be reviewed to determine if any further wells should be equipped with packers, to prevent high groundwater conditions from damaging the wells during the winter.

9 REFERENCES

Barnett, P.J. 1982. *Quaternary Geology of the Tillsonburg Area*, Southern Ontario; Ontario Geological Survey, Report 220, 87 p.

Chapman, L.J., and Putnam, D.F. 1984. *The Physiography of Southern Ontario*; Ontario Geological Survey, Special Volume 2, 270 p.

Cowan, N.R. 1975. *Quaternary Geology of the Woodstock Area, Southern Ontario*; Ontario Division of Mines, Geological Report 119, 91 p.

Freeze, R.A. and Cherry, J.A. 1979. *Groundwater*. Prentice-Hall Inc., 604 p.

GENIVAR Inc. 2013. *Site Survey, Well Network Inspection and Hydrogeologic Assessment Work Program*, *Holbrook Landfill Site*.

GENIVAR Inc. 2013. *Monitoring Well Upgrade Program – Phase I Results, Holbrook Landfill Site*.

James F. MacLaren Ltd. 1979. *Report on a Hydrogeological Investigation at the Holbrook Sanitary Landfill Site for Superior Sanitation Services Inc*.

MacLaren Engineers Inc. 1982. *Hydrogeological Investigations. Holbrook Sanitary Landfill Site 1979 – 1982*.

Ministry of the Environment. 1993. *Guidance Manual for Landfill Sites Receiving Municipal Waste*. November 1993.

Ministry of the Environment. 1994. *Water Management Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy*; July 1994. Reprinted February 1999.

Ministry of the Environment, 2004. *Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines*. Revised June 2006.

Terasmae, J., P.F. Karow and A. Dreimanis. 1972. *Quaternary stratigraphy and geomorphology of the eastern Great Lakes region of southern Ontario; field guidebook for excursion A 42*, XXIV International Geological Congress, Montreal. 75 p.

WSP Canada Inc. 2014. *Monitoring Well Upgrade Program – Phase II Results, Holbrook Landfill Site*.

WSP Canada Inc. 2015. *Monitoring Well Upgrade Program – Phase III Results, Holbrook Landfill Site*.

WSP Canada Inc. 2025. *2024 Water Monitoring Report. Holbrook Landfill, County of Oxford*.

Signature Page

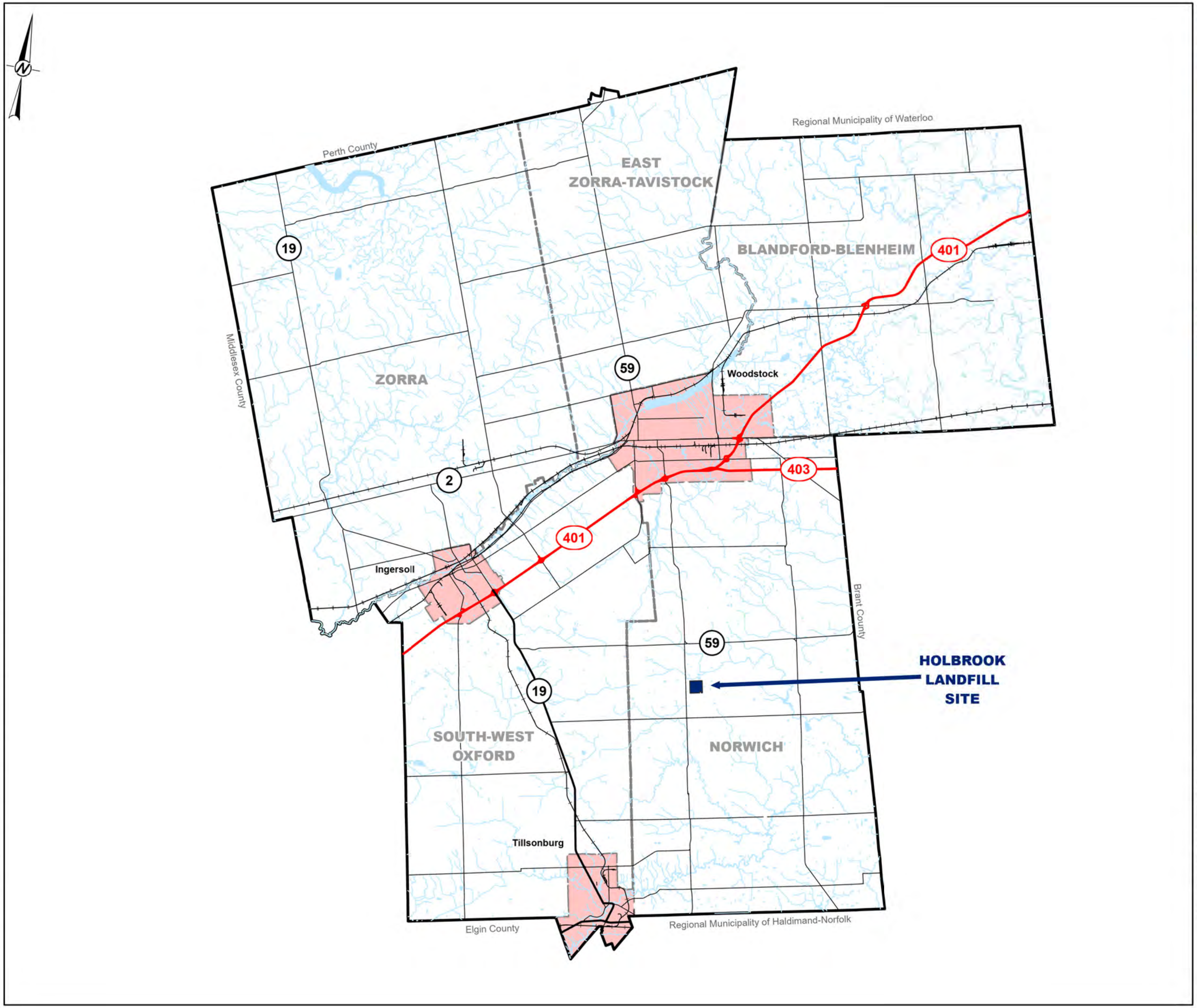
WSP Canada Inc.

Original is Signed	*Original is Signed*
Rebecca Warrack, P.Eng.	Albert Siertsema, P.Eng., PMP
Project Engineer, Earth & Environment	*Project Engineer, Earth & Environment*

RLW/AMS/ams

https://wsponlinecan.sharepoint.com/sites/ca-ca00240894861/shared documents/06. deliverables/02-holbrook/2025 amr/01-text/holbrook 2025 water monitoring report-f.docx

Figures



KEY MAP

SCALE: 1:3,000,000

LEGEND

—	WATERCOURSE
—+—	RAILWAY
■	HOLBROOK LANDFILL SITE
▭	MUNICIPAL BOUNDARY
▭	WATER BODY

0 2,500 5,000 10,000

1:250,000 METRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. BASE MAP: SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N

CLIENT
COUNTY OF OXFORD

PROJECT
2025 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE, COUNTY OF OXFORD, ON

TITLE
SITE LOCATION MAP

CONSULTANT

YYYY-MM-DD	2025-11-16
DESIGNED	----
PREPARED	VS
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV	FIGURE
CA0024089.5055	0001	0	1

PATH: S:\Clients\County_of_Oxford\Holbrook_Landfill\99_PROJ\CA0024089_5055_Env_Services\40_PROD\0001_AMR_2025\CA0024089_5055-0001-HS-XXXX\CA0024089_5055-0001-HS-XXXX.aprx PRINTED ON: AT: 1:03:01 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

KEY MAP

SCALE: 1:250,000

LEGEND

- ● D-2 DOMESTIC WELL
- SG1 ⌖ STAFF GAUGE
- ● SP3R STANDPIPES
- ⌖ 23 DECOMMISSIONED MONITORING WELL
- ⌖ 21R DEEP AQUIFER MONITORING WELL
- ⌖ 21R HISTORIC MONITORING WELL (ASSUMED LOCATION)
- ⊗ 41 LEACHATE MONITORING WELL
- ⌖ 28R SHALLOW AQUIFER MONITROING WELL
- ▲ P01 SURFACE WATER SAMPLING LOCATION
- ➡ SURFACE WATER FLOW DIRECTION
- ⟷ CROSS SECTION
- ─ WATERCOURSE
- ─ PARCEL BOUNDARY
- ▭ HOLBROOK LANDFILL SITE

0 50 100 200

1:4,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. BASE MAP: VANTOR, SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
4. PARCEL FABRIC, PROPERTY BOUNDARIES PROVIDED BY OXFORD COUNTY, 2011

CLIENT

COUNTY OF OXFORD

PROJECT

2025 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE, COUNTY OF OXFORD, ON

TITLE

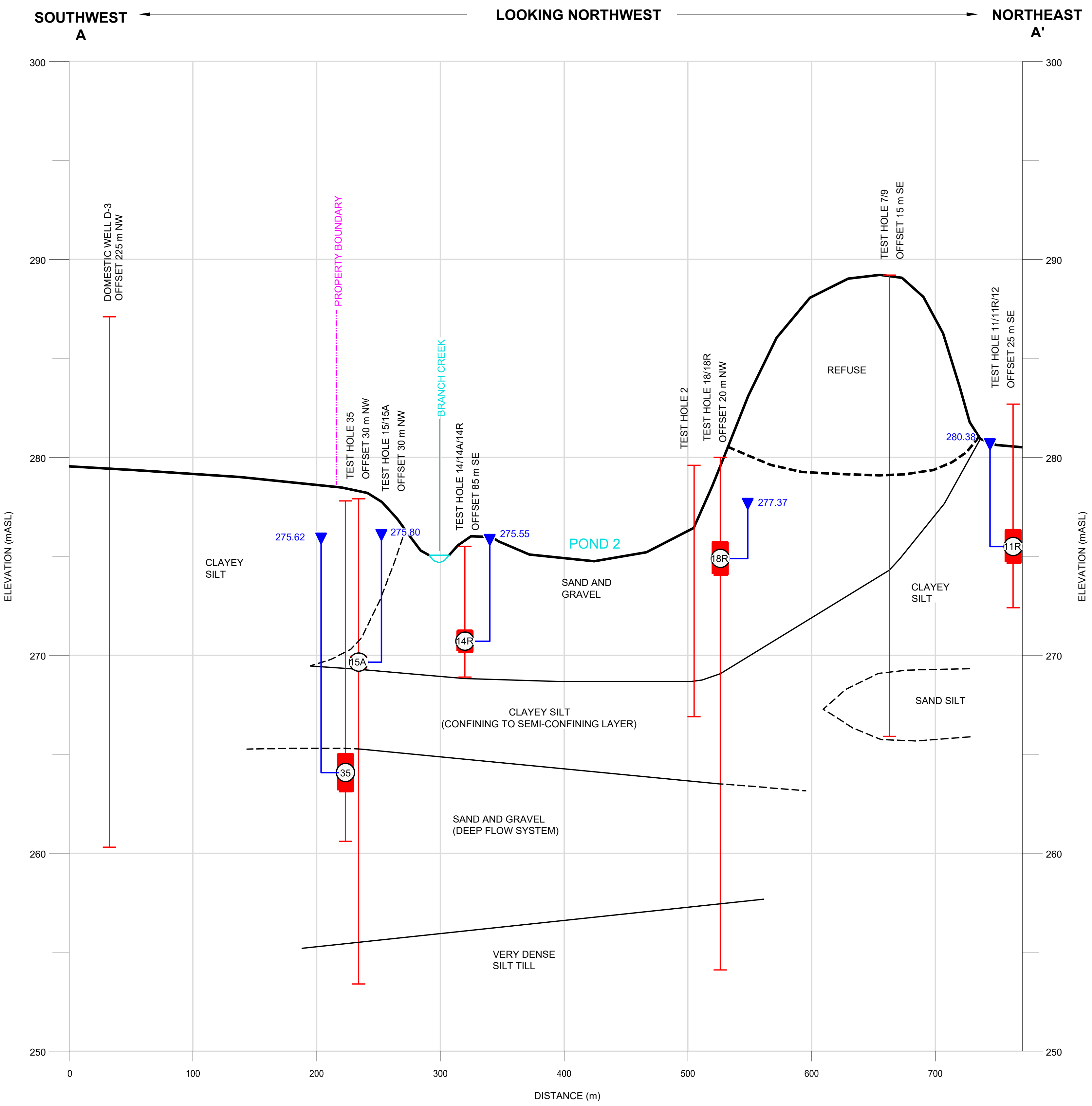
SITE PLAN

CONSULTANT

wsp

YYYY-MM-DD	2025-11-17
DESIGNED	----
PREPARED	VS
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV	FIGURE
CA0024089.5055	0001	0	2

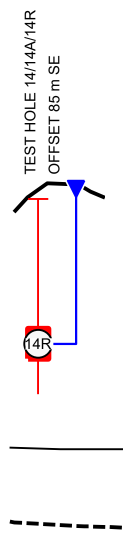


HOR.SCALE 1:4,000 m
VERT. SCALE 1:250 m

A-A'
2

SOUTHWEST TO NORTHEAST CROSS-SECTION A-A'

LEGEND



WELL DESIGNATION

GROUNDWATER ELEVATION (MAY 7, 2025)

GROUND SURFACE

SCREENED INTERVAL

SCREEN DESIGNATION

INFERRED STRATIGRAPHIC CONTACT

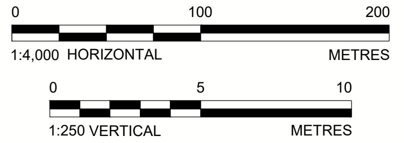
INFERRED ORIGINAL GROUND SURFACE

NOTE(S)

1. GEOLOGICAL SEQUENCES/CONTACTS HAVE BEEN INTERPOLATED AND MAY DIFFER FROM THAT DEPICTED.

REFERENCE(S)

1. GROUND SURFACE TOPOGRAPHY BASED ON INFORMATION PROVIDED IN "HYDROGEOLOGICAL INVESTIGATIONS, HOLBROOK SANITARY LANDFILL SITE, 1979-1982" BY MACLAREN ENGINEERS, OCTOBER 1982.
2. STRATIGRAPHY INTERPRETED FROM BOREHOLES LOGGED BY VARIOUS CONSULTANTS.



CLIENT
COUNTY OF OXFORD

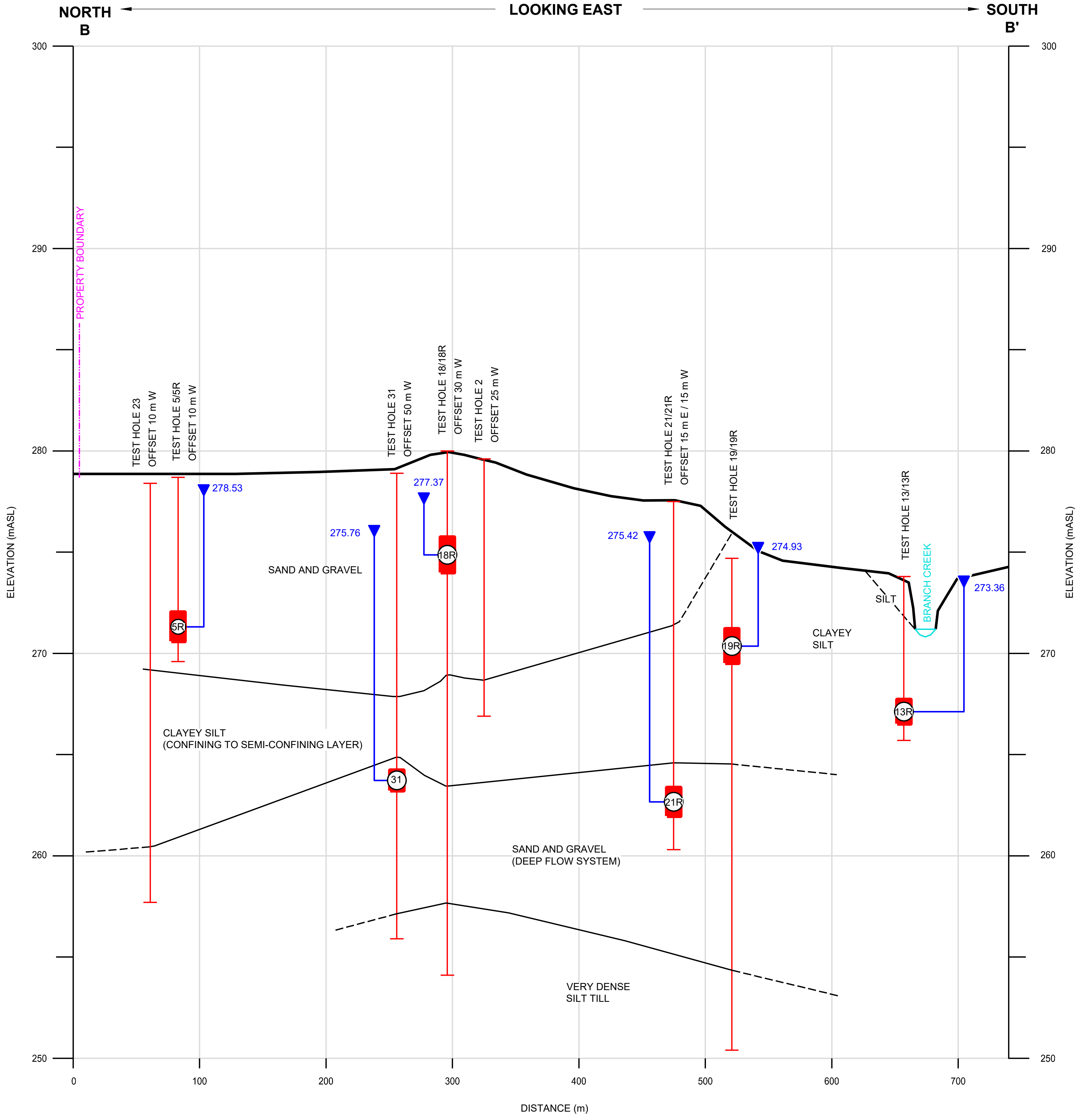
CONSULTANT

YYYY-MM-DD	2025-11-21
DESIGNED	-
PREPARED	INS
REVIEWED	RW
APPROVED	RW

PROJECT
2025 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE
COUNTY OF OXFORD, ONTARIO

TITLE
CROSS SECTION A-A'

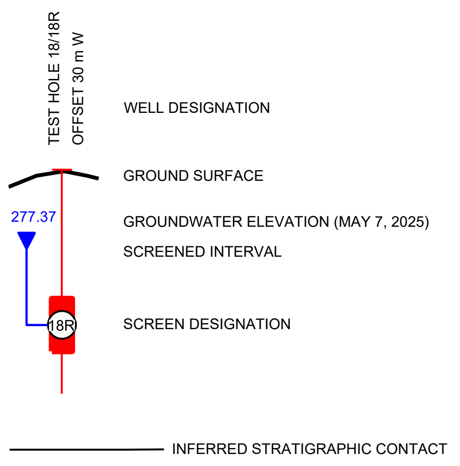
PROJECT NO.	CONTROL	REV.	FIGURE
CA0024089.5055	0001	A	3



HOR.SCALE 1:4,000 m
VERT. SCALE 1:250 m

B-B' 2 NORTH TO SOUTH CROSS-SECTION B-B'

LEGEND

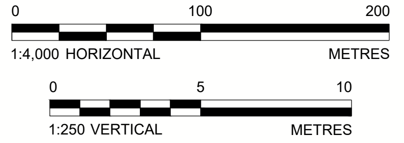


NOTE(S)

1. GEOLOGICAL SEQUENCES/CONTACTS HAVE BEEN INTERPOLATED AND MAY DIFFER FROM THAT DEPICTED.

REFERENCE(S)

1. GROUND SURFACE TOPOGRAPHY BASED ON INFORMATION PROVIDED IN "HYDROGEOLOGICAL INVESTIGATIONS, HOLBROOK SANITARY LANDFILL SITE, 1979-1982" BY MACLAREN ENGINEERS, OCTOBER 1982.
2. STRATIGRAPHY INTERPRETED FROM BOREHOLES LOGGED BY VARIOUS CONSULTANTS.



CLIENT
COUNTY OF OXFORD

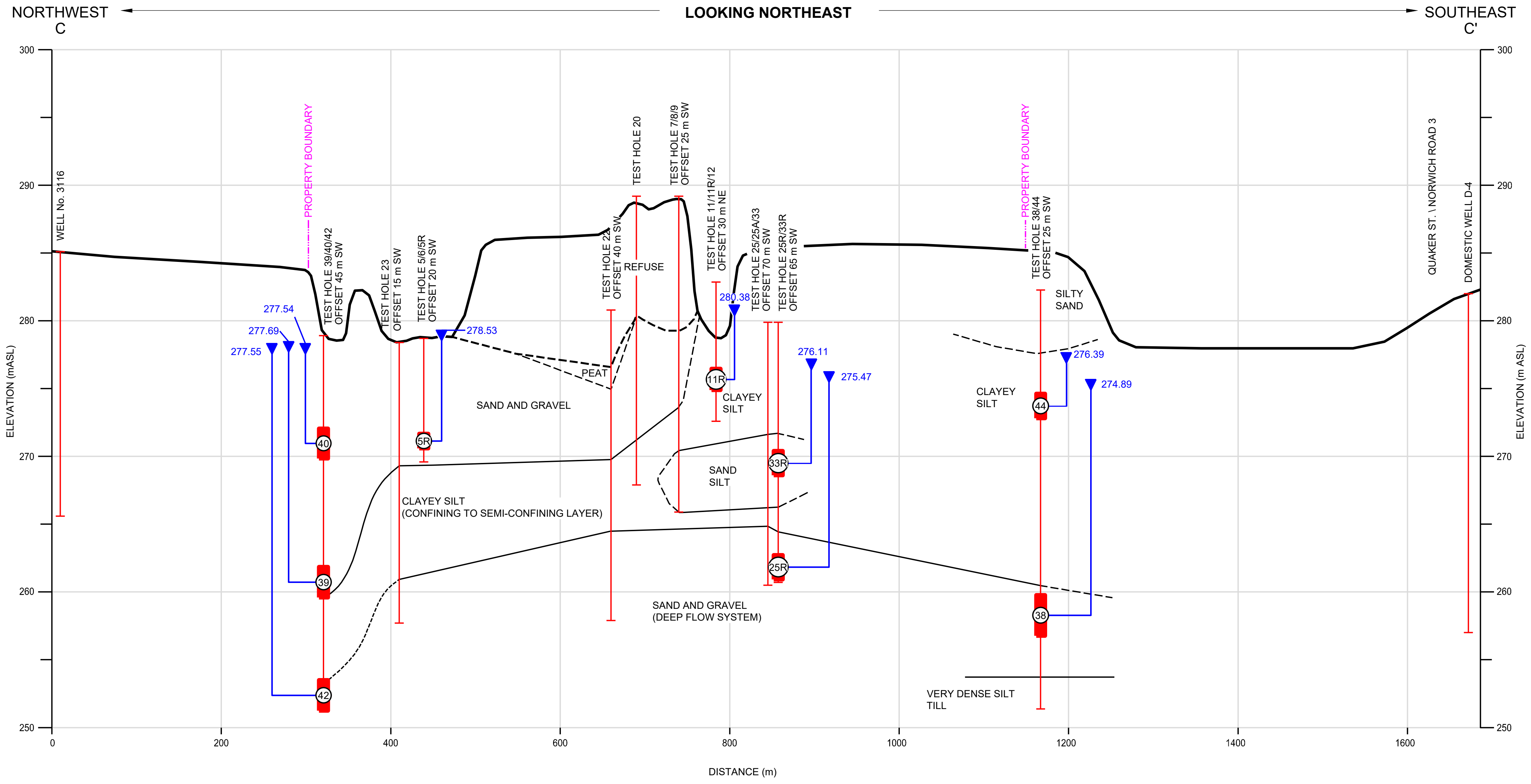
CONSULTANT

YYYY-MM-DD	2025-11-21
DESIGNED	-
PREPARED	INS
REVIEWED	RW
APPROVED	RW

PROJECT
2025 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE
COUNTY OF OXFORD, ONTARIO

TITLE
CROSS SECTION B-B'

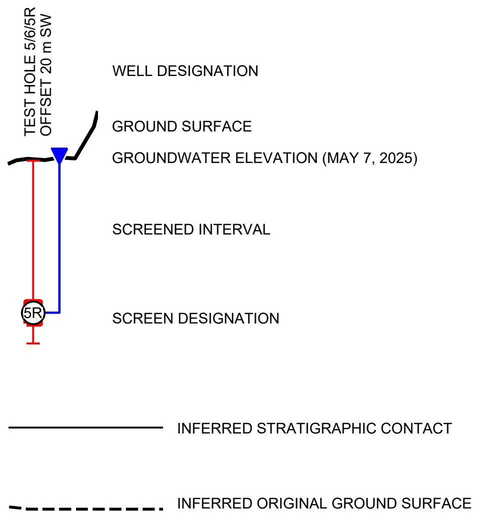
PROJECT NO.	CONTROL	REV.	FIGURE
CA0024089.5055	0001	A	4



HOR.SCALE 1:6,000 m
VERT. SCALE 1:400 m

C-C'
2
NORTHWEST TO SOUTHEAST CROSS-SECTION C-C'

LEGEND

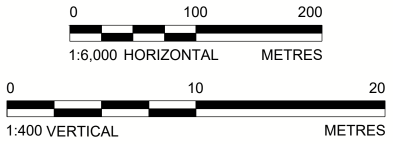


NOTE(S)

1. GEOLOGICAL SEQUENCES/CONTACTS HAVE BEEN INTERPOLATED AND MAY DIFFER FROM THAT DEPICTED.

REFERENCE(S)

1. GROUND SURFACE TOPOGRAPHY BASED ON INFORMATION PROVIDED IN "HYDROGEOLOGICAL INVESTIGATIONS, HOLBROOK SANITARY LANDFILL SITE, 1979-1982" BY MACLAREN ENGINEERS, OCTOBER 1982.
2. STRATIGRAPHY INTERPRETED FROM BOREHOLES LOGGED BY VARIOUS CONSULTANTS.



CLIENT
COUNTY OF OXFORD

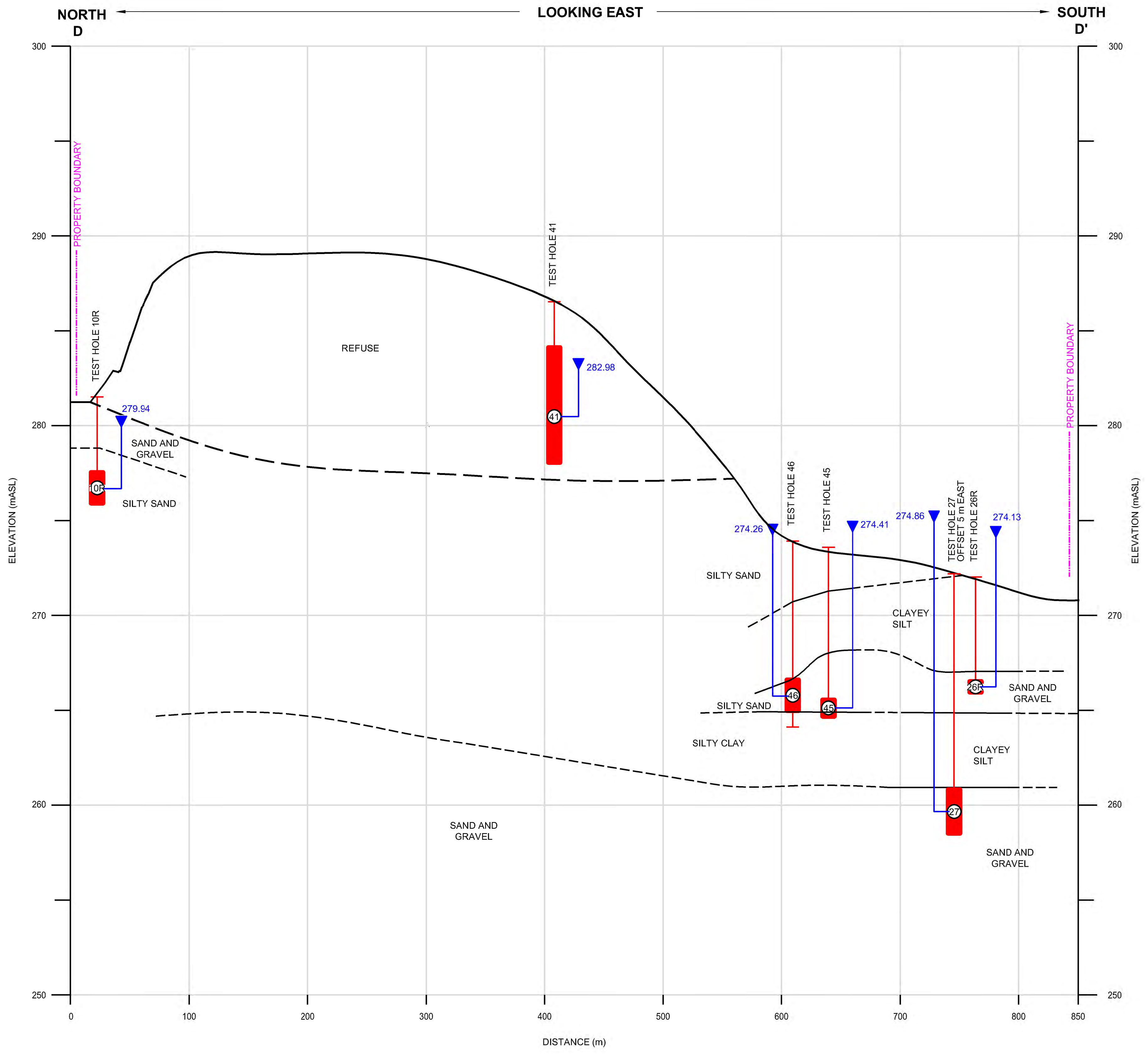
CONSULTANT
wsp

YYYY-MM-DD	2025-11-21
DESIGNED	-
PREPARED	INS
REVIEWED	RW
APPROVED	RW

PROJECT
2025 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE
COUNTY OF OXFORD, ONTARIO

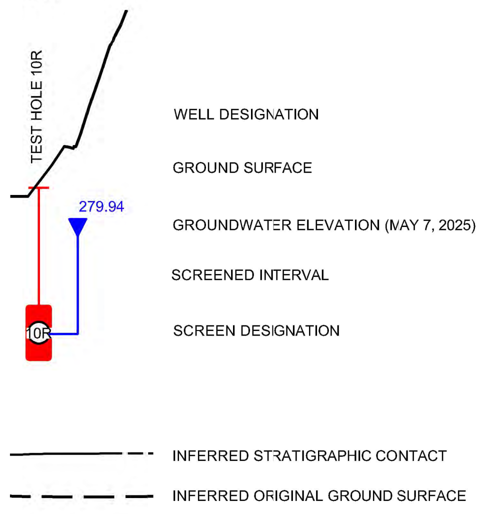
TITLE
CROSS SECTION C-C'

PROJECT NO.	CONTROL	REV.	FIGURE
CA0024089.5055	0001	A	5



HOR.SCALE 1:4,000 m
VERT. SCALE 1:250 m
D-D'
2
NORTH TO SOUTH CROSS-SECTION D-D'

LEGEND

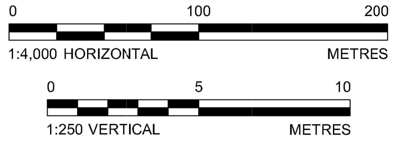


NOTE(S)

1. GEOLOGICAL SEQUENCES/CONTACTS HAVE BEEN INTERPOLATED AND MAY DIFFER FROM THAT DEPICTED.

REFERENCE(S)

1. GROUND SURFACE TOPOGRAPHY BASED ON INFORMATION PROVIDED IN "HYDROGEOLOGICAL INVESTIGATIONS, HOLBROOK SANITARY LANDFILL SITE, 1979-1982." BY MACLAREN ENGINEERS, OCTOBER 1982.
2. STRATIGRAPHY INTERPRETED FROM BOREHOLES LOGGED BY VARIOUS CONSULTANTS.



CLIENT
COUNTY OF OXFORD

CONSULTANT

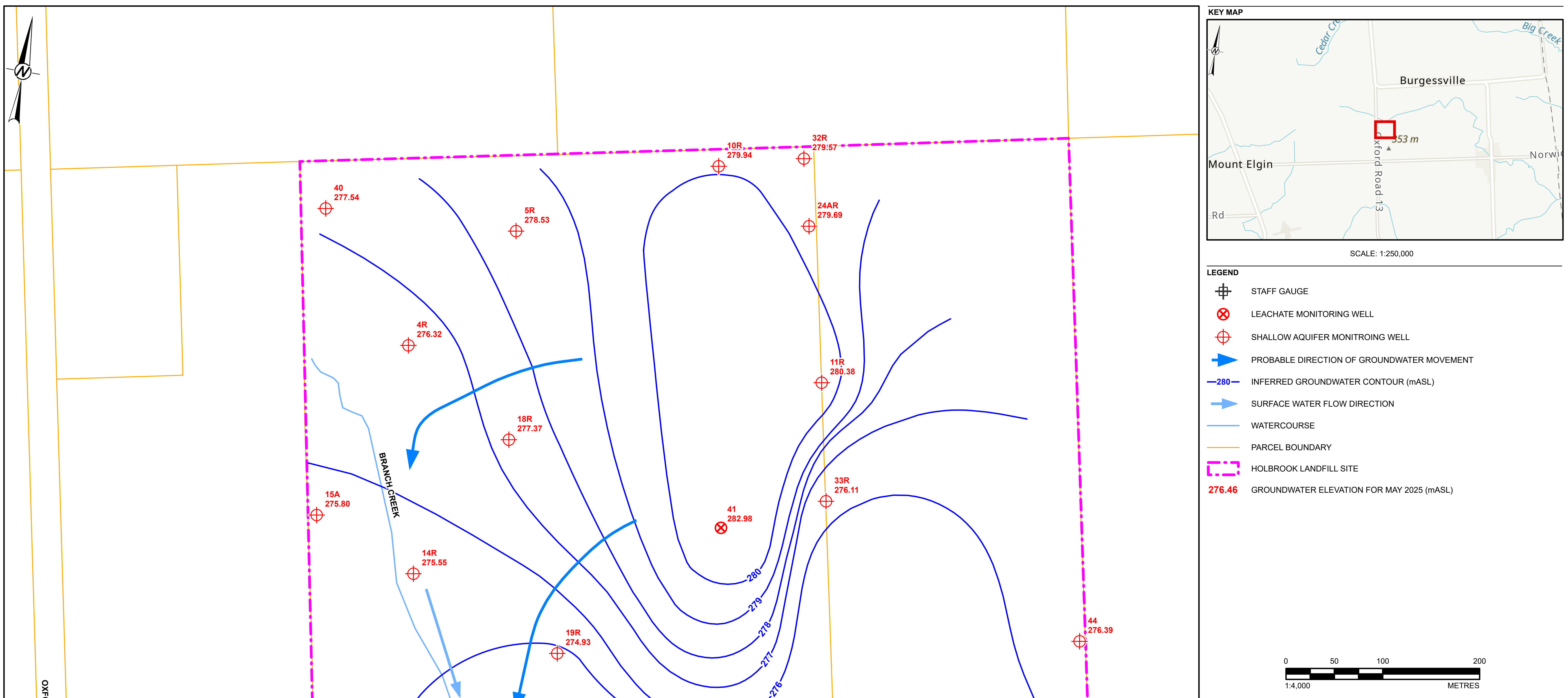
YYYY-MM-DD	2025-11-26
DESIGNED	-
PREPARED	INS
REVIEWED	RW
APPROVED	RW

PROJECT
2025 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE
COUNTY OF OXFORD, ONTARIO

TITLE
CROSS SECTION D-D'

PROJECT NO.	CONTROL	REV.	FIGURE
CA0024089.5055	0001	A	6

Path: \\corp.pbwan.net\CA\CAMIS300\CTX_Data\SIM\Clients\County_of_Oxford\Holbrook_Landfill\99_PROJ\CA0024089_5055_Env_Services\40_PROD\0001_AMR_2025\ | File Name: CA0024089_5055-0001-CW-0006.dwg | Last Edited By: gld_fciuffreda Date: 2025-11-27 Time:3:36:01 PM | Printed By: gld_fciuffreda Date: 2025-11-27 Time:3:36:22 PM



NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. BASE MAP: SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
4. PARCEL FABRIC, PROPERTY BOUNDARIES PROVIDED BY OXFORD COUNTY, 2011

CLIENT
COUNTY OF OXFORD

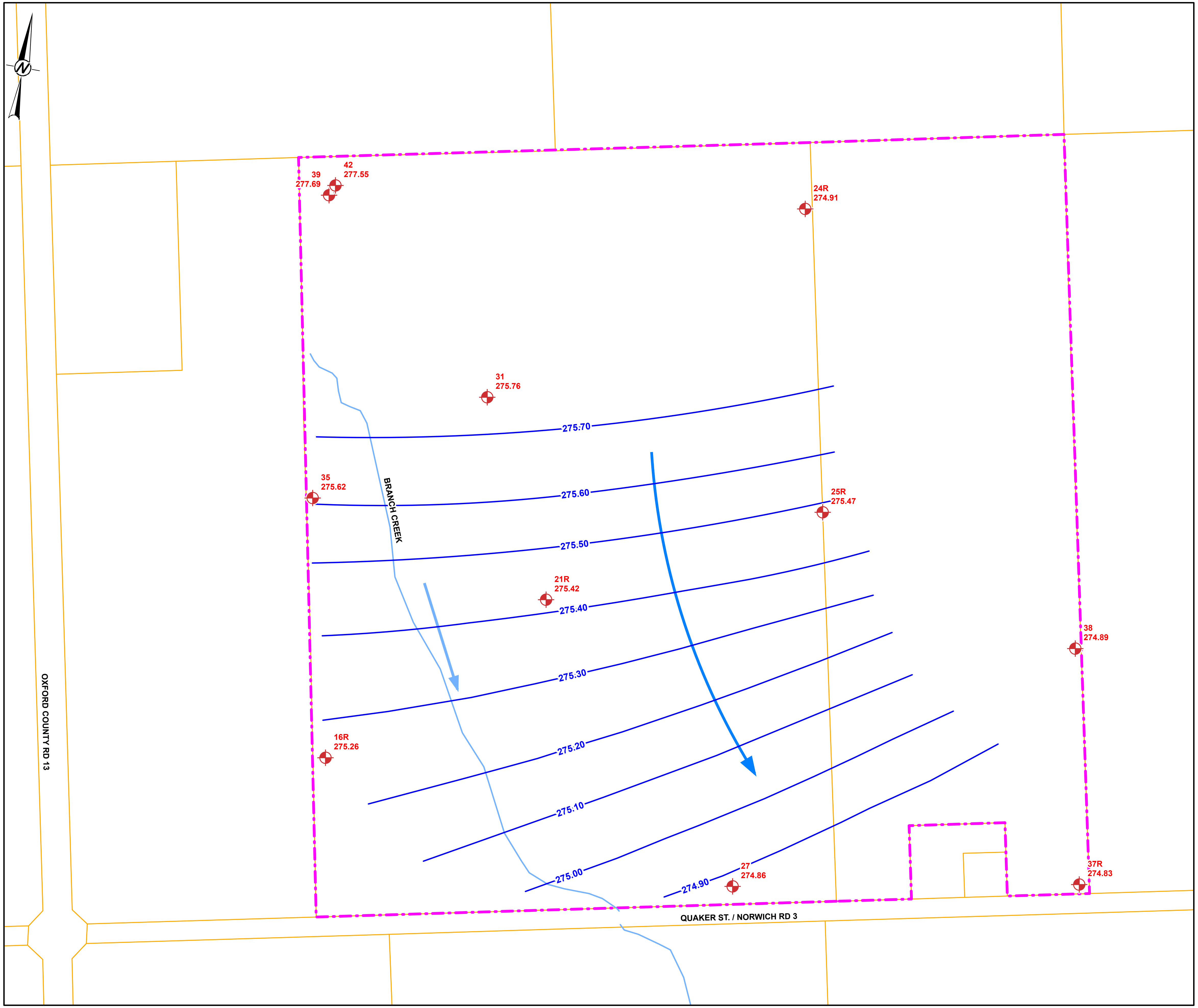
PROJECT
2025 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE, COUNTY OF OXFORD, ON

TITLE
SHALLOW FLOW SYSTEM GROUNDWATER ELEVATIONS (MAY 2025

CONSULTANT

YYYY-MM-DD	2025-11-18
DESIGNED	----
PREPARED	VS
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
CA0024089.5055	0001	0	7



KEY MAP

SCALE: 1:250,000

LEGEND

- ⊕ DEEP AQUIFER MONITORING WELL
- ➡ PROBABLE DIRECTION OF GROUNDWATER MOVEMENT
- —280— INFERRED GROUNDWATER CONTOUR (mASL)
- ➡ SURFACE WATER FLOW DIRECTION
- — WATERCOURSE
- — PARCEL BOUNDARY
- ▭ HOLBROOK LANDFILL SITE
- 276.46 GROUNDWATER ELEVATION FOR MAY 2025 (mASL)

0 50 100 200
1:4,000 METRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. BASE MAP: SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
4. PARCEL FABRIC, PROPERTY BOUNDARIES PROVIDED BY OXFORD COUNTY, 2011

CLIENT
COUNTY OF OXFORD

PROJECT
2025 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE, COUNTY OF OXFORD, ON

TITLE
DEEP FLOW SYSTEM GROUNDWATER ELEVATIONS (MAY 2025)

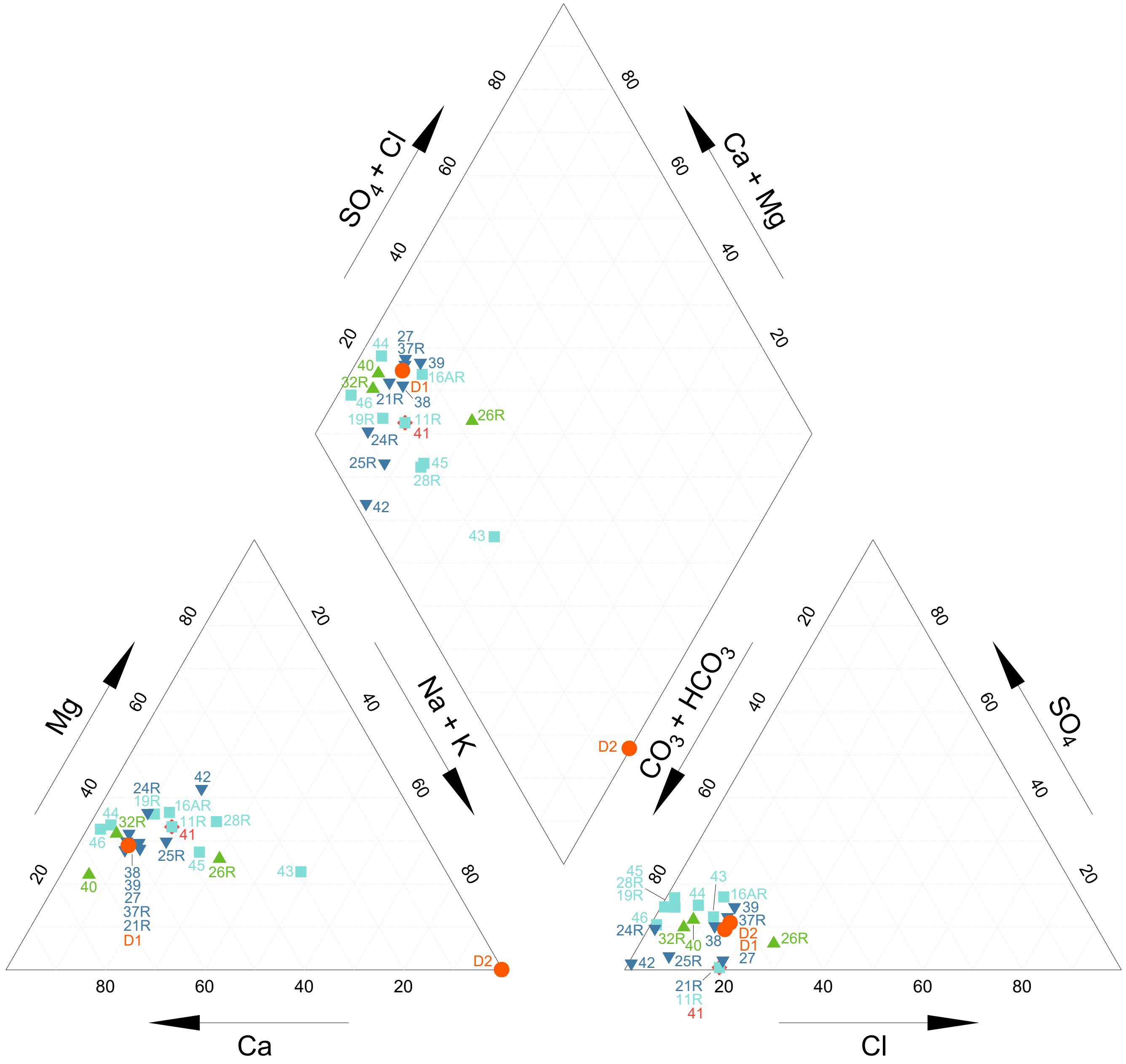
CONSULTANT

YYYY-MM-DD	2025-11-18
DESIGNED	----
PREPARED	VS
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
CA0024089.5055	0001	0	8

PATH: S:\Clients\County_of_Oxford\Holbrook_Landfill\99_PROJ\CA0024089_5055_Env_Services\40_PROD\0001_AMR_2025\CA0024089_5055-0001-HS-XXXX\CA0024089_5055-0001-HS-XXXX.aprx PRINTED ON: AT: 2:08:19 AM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm
0



LEGEND

41 ◆ LEACHATE

40 ▲ SHALLOW FLOW SYSTEM

28R ■ SHALLOW FLOW SYSTEM/
SHALLOW CONFINING LAYER

25R ▼ DEEP FLOW SYSTEM

D2 ● DOMESTIC WELL

CLIENT
THE COUNTY OF OXFORD

CONSULTANT
wsp

YYYY-MM-DD	2026-01-08
DESIGNED	JLD
PREPARED	CS
REVIEWED	RLW
APPROVED	CS

PROJECT
2025 ANNUAL MONITORING REPORT
HOLBROOK LANDFILL SITE
THE COUNTY OF OXFORD, ONTARIO

TITLE
TRILINEAR DIAGRAM - MAY 2025

PROJECT NO.
CA0024089.5055

REV.
A.

FIGURE
9

APPENDIX A

Certificates of Approval and MECP Correspondence

Ontario

Ministry
of the
Environment

Southwestern
Region

985 Adelaide Street South
London, Ontario.
N6E 1V3
(519) 681-3600

February 4, 1983

Mr. D. Pratt
County Engineer
County of Oxford
Box 397
Woodstock, Ontario

Dear Sir:

RE: Holbrook Landfill
Certificate A-07-07-02
Our File M & P 19-03

On January 31, 1983 Mr. J. Stinson, Environmental Officer, inspected the Holbrook landfill site. The site is inspected to determine the operating condition at that time.

The site was well operated with a small dumping face and an ample supply of cover material. A larger fence was constructed around the landfill area to contain the litter.

The site is well run and maintained. If additional information is required please contact this office.

Yours truly,

JFS:jc
4/1/3F

J. F. Janse, P. Eng.
District Officer
Municipal and Private Abatement

of the
Environment
Ontario

Provisional Certificate No.
A 070702

PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE

Under the Environmental Protection Act and the regulations and subject to the limitations thereof, this Provisional Certificate of Approval is issued to:

County of Oxford,
P.O. Box 397,
415 Hunter Street,
Woodstock, Ontario.
N4S 7Y3

for the use and operation of a 10.12 hectare (25 acre) landfilling site within a total site area of 40.5 hectares (100 acres),

all in accordance with the following plans and specifications:

Located:

S.W. 1/4 Lot 20, and S.E. 1/4 Lot 21, Concession 3,
Township of Norwich,
County of Oxford.

which includes the use of the site only for the disposal of the following categories of waste (NOTE: Use of the site for additional categories of wastes requires a new application and amendments to the Provisional Certificate of Approval)

Domestic, commercial and non-hazardous solid industrial wastes.

and subject to the following conditions:

1. The use, operation and closure of the site shall be in accordance with the following documents:
   (1) Report prepared by MacLaren Engineers entitled "County of Oxford, Contingency Plan for Solid Waste Disposal", dated March 1982.
   (2) The terms of the Agreement between the Corporation of the County of Oxford and the Corporation of the Township of Norwich concerning the use, operation and closure of the site dated December 8, 1982.
   (3) Report prepared by MacLaren Engineers entitled "Hydrogeological Investigations - Summary Report - October 1982".

Dated this 31st day of March, 1983.

Director, Section 38
Environmental Protection Act

PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE

The following conditions are additional to the conditions shown on Provisional Certificate of Approval Number A 070702 dated March 31, 1983

(4) Application form signed by D.L. Pratt of the County of Oxford entitled "Application for a Certificate of Approval for a Waste Disposal Site (Landfill)" dated March 15, 1982.

2. Background water quality levels for the site are to be determined to the satisfaction of the Director of the Southwestern Region of the Ministry of the Environment.

3. Upon cessation of waste disposal operations at the site, the site is to be properly closed utilizing at least 2 feet of suitable final cover material, in a manner which establishes properly graded final slopes and to the satisfaction of the Director of the Southwestern Region of the Ministry of the Environment.

4. No waste is to be deposited at the site after June 30, 1984.

5. By June 30, 1983 suitable plans accomodating a minimum 5% slope in all of cell 1 and detailing the staged development and closure of the site are to be submitted to the Director of the Environmental Approvals and Project Engineering Branch and, following its approval, shall be implemented.

6. Where there is a conflict between a provision of documents (1),(3), or (4) listed in condition 1 and a provision of document (2) listed in condition 1, the provision in document (2) shall apply.

7. By June 30, 1983 a suitable surface water control plan is to be submitted to the Director of the Environmental Approvals and Project Engineering Branch and, following its approval, shall be implemented.

Ontario

MINISTRY OF THE ENVIRONMENT

NOTICE

TO:

County of Oxford,
P.O. Box 397,
415 Hunter Street,
Woodstock, Ontrio.
N4S 7Y3

You are hereby notified that Provisional Certificate of Approval No. A 070702 has been issued to you subject to the conditions outlined therein.

The reasons for the imposition of these conditions are as follows:

1. The reason for the imposition of condition no. 1 is to ensure that the use, operation and closure of the site is in accordance with the plans and documentation submitted for approval and approved by the Director of the Environmental Approvals and Project Engineering Branch and is carried out in an orderly and systematic manner and the landfilling operation will be in accordance with the provisions of the Environmental Protection Act and Regulation 309 (R.R. of Ontario 1980) pursuant to that Act. The use, operation and closure of the site without such a condition may create a nuisance or may result in a hazard to the health or safety of any person.

2. The reason for the imposition of condition no. 2 is that defining proper background water quality levels is an integral part of a monitoring program to establish that pollutant attenuation is taking place on site as intended and the use, operation and closure of the site without such a condition may create a nuisance or may result in a hazard to the health or safety of any person.

3. The reason for the imposition of condition no. 3 is to ensure that the site is operated and closed in an aesthetically acceptable manner and to control insects, rodents and infiltration and to ensure that the landfilling operation will be in accordance with the provisions of the Environmental Protection Act and Regulation 309 (R.R. of Ontario 1980) pursuant to that Act. The use, operation and closure of the site without such a condition may create a nuisance or may result in a hazard to the health or safety of any person.

4. The reason for the imposition of condition no. 4 is that the applicant has estimated, based on an anticipated rate of landfilling, that the site should reach its design capacity by June 30, 1984.

5. The reason for the imposition of condition no. 5 is that although a minimum 5% final slope is to be achieved in cell 1 and cell 2 of the site to control infiltration, the design plans and specifications contained in document (1) listed in condition 1 do not provide for a minimum 5% final slope in a portion of cell 1. Suitable plans and specifications are therefore necessary to ensure that the minimum 5% final slope is achieved in all portions of cell 1 and cell 2. The use, operation and closure of the site without such a condition may create a nuisance or may result in a hazard to the health or safety of any person.

6. The reason for the imposition of condition no.6 is to clarify the manner in which the site is to be orderly and systematically used, operated and closed in the event that there is conflict between the provisions of document (2) and the provisions of documents (1),(3) or (4). The use, operation and closure of the site without such a condition may create a nuisance or may result in a hazard to the health or safety of any person.

7. The reason for the imposition of condition no. 7 is that a suitable surface water control plan is an integral part of an operating and development report for a landfilling site which is needed to ensure that the use, operation and closure of the site is carried out in a proper manner and the landfilling operation will be in accordance with the provisions of the Environmental Protection Act and Regulation 309 (R.R. of Ontario 1980) pursuant to that Act. The use, operation and closure of the site without such a condition may create a nuisance or may result in a hazard to the health or safety of any person.

You may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board.

This Notice should be served upon:

The Secretary
Environmental Appeal Board
1 St. Clair Avenue West
5th Floor
Toronto, Ontario M4V 1K7

AND

The Director
Section 38, E.P.A.
Ministry of the Environment
135 St. Clair Ave. W.,
Toronto, Ontario M4V 1P5

Dated at Toronto this 31st day of March, 1983.

Director
Section 38, E.P.A.
Ministry of the Environment

Ontario

Environmental
Appeal Board

1 St. Clair Avenue Wes
Toronto, Ontario
M4V 1K7

FORM OF NOTICE OF APPEAL
EXPLANATORY NOTES

Appeals to the Environmental Appeal Board should be made in the attached form, which is intended to provide the Board and the respondent with specific details regarding the nature of the appeal.

The form has been structured to allow sufficient space for a typical appeal, and two copies of the form are attached in case the appellant wishes to insert the information on the form provided. A third copy is attached for retention by the appellant.

The form is not intended to be restricting or confining and if, in a particular case, it is found that insufficient space is available on the forms provided, the particulars may be attached on additional plain white sheets.

In some cases, appellants may prefer not to use the forms provided by the Board. The Board will accept Notices of Appeal submitted on the appellant's stationery, provided that the required format and particulars as indicated on the Board's form are present.

Ministry
of the
Environment
Ontario

Provisional Certificate No.
A 070702

PROVISIONAL CERT
WASTE DI

HOLBROOK C of A

Under the Environmental Protection A
limitations thereof, this Provisional Certificate of Approval is issued to:

County of Oxford,
P.O. Box 397,
415 Hunter Street,
Woodstock, Ontario.
N4S 7X3

THIS IS A TRUE COPY OF THE
ORIGINAL CERTIFICATE MARKED
on June 28/84.

(Signed)

for the use and operation of a 10.12 hectare (25 acre) landfilling site within a total site area of 10.5 hectares (100 acres)

all in accordance with the following plans and specifications:

Located: S.W. 1/4 Lot 20 and S.E. 1/4 Lot 21, Concession 3,
Township of Norwich,
County of Oxford.

which includes the use of the site only for the disposal of the following categories of waste (NOTE: Use of the site for additional categories of wastes requires a new application and amendments to the Provisional Certificate of Approval) domestic, commercial and non-hazardous solid industrial wastes.

and subject to the following conditions:

1. The use, operation and closure of the site shall be in accordance with the following documents:

   (1) Report prepared by MacLaren Engineers entitled "Support Document for Proposed 1984 Extension to the Holbrook Sanitary Landfill Site" dated April 1984.

   (2) Report prepared by MacLaren Engineers entitled "Additional Hydrogeological Investigations at the Holbrook Sanitary Landfill Site" dated October 1983.

Dated this 28th day of June, 19 84.

Director, Section 38
Environmental Protection Act

Ministry
of the
Environment
Ontario

PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE

The following conditions are additional to the conditions shown on Provisional Certificate of Approval Number A 070702 dated June 28, 1984

(3) The terms of the Agreement between the Corporation of the County of Oxford and the Corporation of the Township of Norwich concerning the use, operation and closure of the site dated May 29, 1984.

(4) Application form signed by D.L. Pratt of the County of Oxford entitled "Application for a Certificate of Approval for a Waste Disposal Site (Landfill)" dated April 10, 1984.

2. By August 31, 1984 a list of erosion control measures suitable to the Director of the Southwestern Region of the Ministry of the Environment (herein after referred to as "The Director") shall be submitted to him.

3. The erosion control measures submitted pursuant to condition no. 2 above shall be implemented in accordance with the approval of The Director.

4. The Site Plan, Figure no. 1 contained in the report entitled "Support Document for Proposed 1984 Extension to the Holbrook Sanitary Landfill Site" dated April, 1984 shall be modified in a manner approved by The Director to provide a minimum slope greater than 5%.

5. Where waste is to be placed on top of existing final cover, the existing final cover material must be removed prior thereto.

6. No waste is to be deposited at the site after June 30, 1986.

7. The surface water sampling program as outlined in Section 2 of the Agreement between the County of Oxford and the Township of Norwich dated May 29, 1984 shall be modified to include analysis for total phosphorus and ammonia in addition to the parameters listed in the Agreement.

Ontario

MINISTRY OF THE ENVIRONMENT

NOTICE

June 28/84.
JB

TO: County of Oxford,
P.O. Box 397,
415 Hunter Street,
Woodstock, Ontario. N4S 7Y3

You are hereby notified that Provisional Certificate of Approval No. A 070702 has been issued to you subject to the conditions outlined therein.

The reasons for the imposition of these conditions are as follows:

1. The reason for the imposition of condition no. 1 is to ensure that the use, operation and closure of the site is in accordance with the plans and documentation submitted for approval and approved by the Director of the Environmental Approvals and Project Engineering Branch and is carried out in an orderly and systematic manner and the landfilling operation will be in accordance with the provisions of the Environmental Protection Act and Regulation 309 (R.R.O. 1980) pursuant to that Act. The use, operation and closure of this site without such a condition may create a nuisance or may result in a hazard to the health or safety of any person.

2. The reason for the imposition of condition nos. 2 and 3 is to ensure that erosion is minimized on the side slopes of the landfilled area and the operation of the site without such condition may create a nuisance.

3. The reason for the imposition of condition no. 4 is to reduce the amount of infiltration that would result in leachate production.

4. The reason for the imposition of condition no. 5 is to promote the downward migration of leachate and to minimize leachate breakouts.

5. The reason for the imposition of condition no. 6 is that the applicant has agreed to not to extend the use of the site after June 30, 1986.

6. The reason for the imposition of condition no. 7 is that the added parameters mentioned therein are significant as indicators of the possible effect of landfills on aquatic life.

You may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board.

This Notice should be served upon:

The Secretary
Environmental Appeal Board
1 St. Clair Avenue West
5th Floor
Toronto, Ontario M4V 1K7

AND

The Director
Section 38, E.P.A.
Ministry of the Environment
135 St. Clair Ave. W.,
Toronto, Ontario M4V 1P5

Dated at Toronto this 28th day of June, 1984.

Director,
Section 38, E.P.A.,
Ministry of the Environment.

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A070702
Issue Date: September 8, 2016

County of Oxford
21 Reeve St Post Office Box No. 1614
Woodstock, Ontario
N4S 7Y3

Site Location: Holbrook Landfill - closed
Part of Lot 20 & 21, Concession 3
Norwich Township, County of Oxford

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act*, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:*

10.12 hectare landfilling site within a total site area of 40.5 hectares.

For the purpose of this environmental compliance approval, the following definitions apply:

"*Approval* " means this Environmental Compliance Approval and any Schedules to it, including the application and supporting documentation listed in Schedule "A";

"Director" means any Ministry employee appointed in writing by the Minister pursuant to section 5 of the EPA as a Director for the purposes of Part II.1 of the EPA;

"*District Manager*" means the District Manager of the local district office of the *Ministry* in which the *Site* is geographically located;

"*EPA* " means *Environmental Protection Act* , R.S.O. 1990, c. E. 19, as amended;

"Ministry" means the Ontario Ministry of the Environment and Climate Change;

"*Owner*" means any person that is responsible for the establishment or operation of the *Site* being approved by this *Approval,* and includes The County of Oxford and its successors and assigns;

"*Regional Director* " means the Regional Director of the local Regional Office of the *Ministry* in which the *Site* is located; and

"Regulation 232" means Ontario Regulation 232/98 (New Landfill Standards) made under the *EPA* , as amended from time to time;

"*Regulation 347* " means Ontario Regulation 347, R.R.O. 1990, made under the EPA, as amended;

"*Regulation 903"* means Regulation 903, R.R.O. 1990, made under the *OWRA,* as amended;

"*Site* " means the entire waste disposal site, including the buffer land at Parts of Lot 20 & 21, Concession 3, Township of Norwich, County of Oxford.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL

Compliance

1 The *Owner* and *Operator* shall ensure compliance with all the conditions of this *Approval* and shall ensure that any person authorized to carry out work on or operate any aspect of the *Site* is notified of this *Approval* and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

2 Any person authorized to carry out work on or operate any aspect of the *Site* shall comply with the conditions of this *Approval* .

In Accordance

3 Except as otherwise provided by this *Approval,* the *Site* shall be designed, developed, built, operated and maintained in accordance with the documentation listed in the attached Schedule “A”.

Interpretation

4 Where there is a conflict between a provision of any document listed in Schedule "A" in this *Approval,* and the conditions of this *Approval,* the conditions in this *Approval* shall take precedence.

5 Where there is a conflict between the application and a provision in any document listed in Schedule "A", the application shall take precedence, unless it is clear that

the purpose of the document was to amend the application and that the *Ministry* approved the amendment.

6 Where there is a conflict between any two documents listed in Schedule "A", the document bearing the most recent date shall take precedence.

7 The conditions of this *Approval* are severable. If any condition of this *Approval,* or the application of any condition of this *Approval* to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this *Approval* shall not be affected thereby.

Other Legal Obligations

8 The issuance of, and compliance with, this *Approval* does not:
  (a) relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement; or
  (b) limit in any way the authority of the *Ministry* to require certain steps be taken or to require the *Owner* and *Operator* to furnish any further information related to compliance with this *Approval* .

Adverse Effect

9 The *Owner* shall take steps to minimize and ameliorate any adverse effect on the natural environment or impairment of water quality resulting from the *Site,* including such accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.

10 Despite an *Owner* or any other person fulfilling any obligations imposed by this *Approval* the person remains responsible for any contravention of any other condition of this *Approval* or any applicable statute, regulation, or other legal requirement resulting from any act or omission that caused the adverse effect to the natural environment or impairment of water quality.

Change of Ownership

11 The *Owner* shall notify the *Director,* in writing, and forward a copy of the notification to the *District Manager,* within 30 days of the occurrence of any changes in the following information:
  (a) the ownership of the *Site;*
  (b) the *Operator* of the *Site;*
  (c) the address of the *Owner or Operator;* and
  (d) the partners, where the *Owner or Operator* is or at any time becomes a partnership and a copy of the most recent declaration filed under the *Business Names Act* , R. S. O. 1990, c. B.17, shall be included in the notification.

12 No portion of this *Site* shall be transferred or encumbered after closing of the *Site* unless the *Director* is notified in advance and sufficient financial assurance is deposited with the *Ministry* to ensure that these conditions will be carried out.

13 In the event of any change in ownership of the *Site,* other than change to a successor municipality, the *Owner* shall notify the successor of and provide the successor with a copy of this *Approval,* and the *Owner* shall provide a copy of the notification to the *District Manager* and the *Director.*

Certificate of Requirement/Registration on Title

<u>Registration on Title Requirement</u>

14 Prior to dealing with the property in any way, the *Owner* shall provide a copy of this *Approval* and any amendments, to any person who will acquire an interest in the property as a result of the dealing.

15 (a) Within sixty (60) calendar days from the date of issuance of this *Approval,* the *Owner* shall submit to the *Director* a completed Certificate of Requirement which shall include:

(i) a plan of survey prepared, signed and sealed by an Ontario Land Surveyor, which shows the area of the *Site* where waste has been or is to be deposited at the *Site;*
(ii) proof of ownership of the *Site;*
(iii) a letter signed by a member of the Law Society of Upper Canada or other qualified legal practitioner acceptable to the *Director,* verifying the legal description provided in the Certificate of Requirement;
(iv) the legal abstract of the property; and
(v) any supporting documents including a registerable description of the *Site.*

(b) Within fifteen (15) calendar days of receiving a Certificate of Requirement authorized by the *Director,* the *Owner* shall:

(i) register the Certificate of Requirement in the appropriate Land Registry Office on the title to the property; and
(ii) submit to the *Director* and *District Manager,* written verification that the Certificate of Requirement has been registered on title.

Registration on Title Requirement - Contaminant Attenuation Zone (CAZ)

16. The Owner shall, within sixty (60) calendar days from the date of issuance of this Approval, submit to the *Director* documents confirming that a contaminant attenuation zone (CAZ) has been established, in either fee simple or by way of a groundwater easement.

17 Within thirty (30) calendar days from the date of establishing a contaminant attenuation zone (CAZ) (overburden and/or bedrock aquifers) in either fee simple or by way of a groundwater easement, the *Owner* shall submit to the *Director* a completed Certificate of Requirement which shall include:

(a) If rights are obtained in fee simple, the *Owner* shall provide:
  (i) documentation evidencing ownership of the CAZ obtained in compliance with *O.Reg. 232/98,* as amended;
  (ii) a completed Certificate of Requirement and supporting documents containing a registerable description of the CAZ; and
  (iii) a letter signed by a member of the Law Society of Upper Canada; or other qualified legal practitioner acceptable to the *Director,* verifying the legal description of the CAZ.

(b) within fifteen (15) calendar days of receiving a Certificate of Requirement signed or authorized by the *Director,* the Owner shall:
  (i) register the Certificate of Requirement in the appropriate Land Registry Office on the title to the property; and
  (ii) submit to the *Director* and the *District Manager,* written verification that the Certificate of Requirement has been registered on title.

(c) If rights are obtained by way of a groundwater easement, the Applicant shall:
  (i) provide a copy of the easement;
  (ii) provide a plan of survey signed and sealed by an Ontario Land Surveyor for the CAZ;
  (ii) submit proof of registration on title of the groundwater easement to the *Director;*

(d) The *Owner* shall not amend or remove or consent to the removal of the easement or CAZ from title without the prior written consent of the *Director.*

2. CLOSURE PLAN

1. By no later than July 15, 2017, the *Owner* shall submit to the *Director* for approval, with copies to the *District Manager,* a detailed *Site* closure plan pertaining to the termination of landfilling operations at this *Site,* post-closure inspection, maintenance and monitoring, and end use. The plan shall include but not be limited to the following information:

(a) a plan showing *Site* appearance after closure;
(b) a description of the proposed end use of the *Site;*

(c) a descriptions of the procedures for closure of the *Site,* including:
  (i) advance notification of the public of the *Landfill* closure;
  (ii) posting of a sign at the *Site* entrance indicating that the *Landfill* is closed and identifying any alternative waste disposal arrangements;
  (iii) completion, inspection and maintenance of the final cover and landscaping;
  (iv) *Site* security;
  (v) removal of unnecessary *Landfill* related structures, buildings and facilities;
  (vi) final construction of any control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas; and
  (vii) a schedule indicating the time period for implementing sub-conditions (i) to (vi) above.

(d) descriptions of the procedures for post-closure care of the *Landfill,* including:
  (i) operation, inspection and maintenance of the control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas;
  (ii) record keeping and reporting; and
  (iii) complaint contact and response procedures;

(e) an assessment of the adequacy of and need to implement the contingency plans for leachate and methane gas; and

(f) an updated estimate of the contaminating life span of the *Site,* based on the results of the monitoring programs to date.

2 The *Site* shall be closed in accordance with the closure plan as approved by the *Director.*

3 The Site is hereby acknowledged to be closed for receipt of waste for disposal since 1986, and no waste management activities shall be carried out at the Site without approval of the Director.

3.0 LANDFILL MONITORING

Compliance

1 The *Site* shall be operated in such a way as to ensure compliance with the following:

(a) Reasonable Use Guideline B-7 for the protection of the groundwater at the *Site;* and

(b) Provincial Water Quality Objectives included in the July 1994 publication entitled *Water Management Policies, Guidelines, Provincial Water Quality Objectives,* as amended from time to time or limits set by the *Regional Director,* for the protection of the surface water at and off the *Site.*

(c) The *Owner* shall submit to the *Director* , Environmental Approvals Branch, Ministry of the Environment and Climate Change an application for approval to amend the *ECA* to address any non-compliance Guideline B-7, including if warranted an application to incorporate a contaminant attenuation zone into the approval, and including a proposed updated *EMP*. The application shall outline the options that were considered for bringing the *Site* into compliance with Guideline B-7 and the rationale for the preferred option, and include all necessary supporting documentation.

2 The *Owner* shall monitor surface water and ground water in accordance with documents in Schedule "A".

Annual Report

3 A written report on the development, operation and monitoring of the *Site,* shall be completed annually (the "Annual Report"). The Annual Report shall be submitted to the *District Manager,* by March 31st of the year following the period being reported upon.

4 The Annual Report shall include but not be limited to the following information:
(a) the results and an interpretive analysis of the results of all leachate, groundwater, surface water and landfill gas monitoring, including an assessment of the need to amend the monitoring programs;
(b) site plans showing the final contours of the *Site* and vegetative cover;
(c) a discussion of any operational problems encountered at the *Site* and corrective action taken;
(d) a report on the status of all monitoring wells and a statement as to compliance with *Regulation 903;*
(e) any other information with respect to the *Site* which the *District Manager* may require from time to time; and
(f) a summary and analysis of all hydraulic and geochemical monitoring results.

Groundwater Wells and Monitors

5 The *Owner* shall ensure that all groundwater monitoring wells which form part of the monitoring program are properly capped, locked and protected from damage.

6 Any groundwater monitoring well included in the on-going monitoring program that are damaged shall be assessed, repaired, replaced or decommissioned by the *Owner,* as required.

(a) The *Owner* shall repair or replace any monitoring well which is destroyed or in any way made to be inoperable for sampling such that no more than one regular sampling event is missed.

(b) All monitoring wells which are no longer required as part of the groundwater monitoring program, and have been approved by the *District*

Manager for abandonment, shall be decommissioned by the *Owner,* as required, in accordance with *Reg. 903,* that will prevent contamination through the abandoned well. A report on the decommissioning of the well shall be included in the Annual Report for the period during which the well was decommissioned.

Changes to the Monitoring Plan

7 The *Owner* may request to make changes to the monitoring program(s) to the *District Manager* in accordance with the recommendations of the annual report. The *Owner* shall make clear reference to the proposed changes in separate letter that shall accompany the annual report.

8 Within fourteen (14) days of receiving the written correspondence from the *District Manager* confirming that the *District Manager* is in agreement with the proposed changes to the environmental monitoring program, the *Owner* shall forward a letter identifying the proposed changes and a copy of the correspondences from the *District Manager* and all other correspondences and responses related to the changes to the monitoring program, to the *Director* requesting the *Approval* be amended to approve the proposed changes to the environmental monitoring plan prior to implementation.

9 In the event any other changes to the environmental monitoring program are proposed outside of the recommendation of the annual report, the *Owner* shall follow current ministry procedures for seeking approval for amending the *Approval.*

Trigger Mechanism and Contingency Plan

10 By no later than July 15, 2017*,* the *Owner* shall submit to the *Director,* for approval, and copies to the *District Manager,* details of a trigger mechanisms plan for surface water and groundwater quality monitoring for the purpose of initiating investigative activities into the cause of increased contaminant concentrations

11\. By no later than July 15, 2017, the *Owner* shall submit to the *Director* for approval, and copies to the *District Manager,* details of a contingency plan to be implemented in the event that the surface water or groundwater quality exceeds any trigger mechanism.

12 In the event of a confirmed exceedance of a site-specific trigger level relating to leachate mounding or groundwater or surface water impacts due to leachate, the *Owner* shall immediately notify the *District Manager,* and an investigation into the cause and the need for implementation of remedial or contingency actions shall be carried out by the *Owner* in accordance with the approved trigger

mechanisms and associated contingency plans.

13 If monitoring results, investigative activities and/or trigger mechanisms indicate the need to implement contingency measures, the *Owner* shall ensure that the following steps are taken:

(a) The *Owner* shall notify the *District Manager,* in writing of the need to implement contingency measures, no later than 30 days after confirmation of the exceedances;
(b) Detailed plans, specifications and descriptions for the design, operation and maintenance of the contingency measures shall be prepared and submitted by the *Owner* to the *District Manager* for approval; and
(c) The contingency measures shall be implemented by the *Owner* upon approval by the *District Manager* .

14 The *Owner* shall ensure that any proposed changes to the site-specific trigger levels for leachate impacts to the surface water or groundwater, are approved in advance by the *Director* via an amendment to this *Approval.*

SCHEDULE "A"

1. Report prepared by Maclaren Engineers entitled " Support Document for Proposed 1984 extension to the Holbrook Sanitary landfill Site" dated April 1984.

2. Report prepared by MacLaren Engineers entitled " Additional Hydrogeological Investigation at the Holbrook Sanitary Landfill Site" dated October 1983.

3. The terms of the Agreement between the Corporation of the County of Oxford and the Corporation of the Township of Norwich concerning the use, operation and closure of the site dated May 29, 1984.

4. Application form signed by D.L. Pratt of the County of Oxford entitled " Application for a Certificate of Approval for a Waste Disposal Site (Landfill) " dated April 10, 1984.

5. Holbrook Landfill County of Oxford - 2012 Water Monitoring Report" prepared by Genivar Inc. dated May 2013

The reasons for the imposition of these terms and conditions are as follows:

GENERAL

- The reason for Conditions 1(1), (2), (4), (5), (6), (7), (8), (9) and (10) is to clarify the legal rights and responsibilities of the *Owner* under this *Approval* .

- The reasons for Condition 1(3) is to ensure that the *Site* is designed, operated, monitored and maintained in accordance with the application and supporting documentation submitted by the *Owner,* and not in a manner which the *Director* has not been asked to consider.

- The reasons for Condition 1(11) are to ensure that the *Site* is operated under the corporate name which appears on the application form submitted for this approval and to ensure that the *Director* is informed of any changes.

- The reasons for Condition 1(12) are to restrict potential transfer or encumbrance of the *Site* without the approval of the *Director* and to ensure that any transfer of encumbrance can be made only on the basis that it will not endanger compliance with this *Approval* .

- The reason for Condition 1(13) is to ensure that the successor is aware of its legal responsibilities.

- The reason for Condition 1(14) and (15) are that the Part II.*1 Director* is an individual with authority pursuant to Section 197 of the Environmental Protection Act to require registration on title and provide any person with an interest in property before dealing with the property in any way to give a copy of the Approval to any person who will acquire an interest in the property as a result of the dealing.

CLOSURE PLAN

- The reasons for Condition 2 are to ensure that final closure of the *Site* is completed in an aesthetically pleasing manner, in accordance with Ministry standards, and to ensure the long-term protection of the health and safety of the public and the environment.

LANDFILL MONITORING

- Condition 3(1) is included to provide the groundwater and surface water limits to prevent water pollution at the *Site.*

- Conditions 3(2) is included to require the Owner to demonstrate that the *Site* is performing as designed and the impacts on the natural environment are acceptable. Regular monitoring allows for the analysis of trends over time and ensures that there is an early warning of potential problems so that any necessary remedial/contingency action can be taken.

- The reasons for Condition (3) and 3(4) are to ensure that regular review of site development, operations and monitoring data is documented and any possible improvements to site design, operations or monitoring programs are identified. An annual report is an important tool used in reviewing site activities and for determining the effectiveness of site design.

- Conditions 3(5), 3(6) and 3(7) are included to ensure the integrity of the groundwater monitoring network so that accurate monitoring results are achieved and the natural environment is protected.

- Reasons for conditions 3(8), 3(9) and 3(10) are included to streamline the approval of the changes to the monitoring plan.

- Reason for conditions 3(11) to 3 (14) inclusive are added to ensure the *Owner* has a plan with an organized set of procedures for identifying and responding to potential issues relating to groundwater and surface water contamination at the *Site's* compliance point.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). A070702 issued on March 31, 1983

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;

6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 8th day of September, 2016

Dale Gable, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

HV/
c: District Manager, MOECC London - District
Field Alert, County of Oxford

COUNTY OF OXFORD
RECEIVED

MAR 13 2018

REFER TO ______________
File/ EDMS: ______________

Ontario
Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

---

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A070702
Notice No. 1
Issue Date: March 6, 2018

County of Oxford
21 Reeve St
Post Office Box, No. 1614
Woodstock, Ontario
N4S 7Y3

Site Location: Holbrook Landfill - closed
Lot 20 & 21, Concession 3
Norwich Township, County of Oxford

You are hereby notified that I have amended Approval No. A070702 issued on September 8, 2016 for the post closure inspection, monitoring and maintenance of 10.2 hectare closed Holbrook Landfill site within a total site area of 62.31 hectares, *as follows:*

Definition of *"Site"* is revised as follows:

"Site" means the entire waste disposal site, including the buffer land and Contaminant Attenuation Zone located at Parts 1 and 2 of Lot 20 & 21, Concession 3, Township of Norwich, County of Oxford.

Conditions 2(1), 3(2), 3(10) and 3(11) are hereby revoked and replaced with the following:

2. CLOSURE PLAN

2. (1) Closure plan dated June 2017 and amended by letter report dated December 8, 2017 prepared by WSP and submitted to Bob Slivar, Senior Environmental Officer, London District Office, Ministry of the Environment and Climate Change, is hereby approved subject to the conditions of this *Approval.*

3.0 LANDFILL MONITORING

3. (2) The *Owner* shall monitor surface water and ground water in accordance with Schedules

"B" and "C".

Trigger Mechanism and Contingency Plan

3. (10) Trigger mechanisms shall be in accordance with Items 6 and 7 in Schedule "A".

3. (11) Contingency plan in the event of a confirmed exceedance of a site-specific trigger level relating to leachate mounding or groundwater or surface water impacts due to leachate shall be in accordance with Items 6 and 7 in Schedule "A".

Conditions 2(2) and 2(3) are added to the *Approval:*

2. (2) No person shall use, operate, establish, alter, enlarge or extend a waste disposal site except under and in accordance with an environmental compliance approval. As such the *Owner/Operator* shall obtain approval from the *Director* through an amendment to this *Approval* prior to any changes to the approved closure plan/facilities within the closed *Site.*

2. (3) Notwithstanding condition 2(1), the *Owner* shall submit to the *Director* for approval for any change to the current "natural open space with restricted public access". Supporting documentation to the application shall contain the following as a minimum:

   (a) Detailed plan showing all the groundwater monitoring wells;
   (b) A detailed site plan showing where any structures or pathways are located;

   (c) Potential dangers related to methane gas is a concern to the *Ministry.* Decomposition of waste and producing methane can continue many years pass the closure of a landfill depending on factors within the landfill that expedite or slow down decomposition of An assessment of methane gas in the landfill as this will help the *Ministry* determine if the site is safe for public use; and
   (d) Consultation with the interested parties (specially residents within 500 m) about the change in landuse and the proposal.

The following items are added to the Schedule "A":

SCHEDULE "A"

6. Report titled "Holbrook Landfill, Closure Plan" dated June 2017 prepared by WSP Canada Inc.

7. Letter report dated December 8, 2017 prepared by Albert Siertsema, P.Eng., Project Engineer, Environment and Dan Mohr, P.Eng., Assistant Vice President Environment, Ontario, submitted to Bob Slivar, Senior Environmental Officer, London District Office, Ministry of the Environment and Climate Change as a response to comments from Technical Support, Ministry of the Environment and Climate Change.

Schedule "B"
Surface Water Monitoring Program

ACTIVITY	LOCATION	SAMPLING FREQUENCY	ANALYSIS / MEASUREMENT
Surface Water Sampling	**Surface Water Station:** C01, C06	Semi-annual (spring and fall)	**Field Parameters:** pH, conductivity, temperature, turbidity **General Parameters:** pH, conductivity, hardness **Major and Minor Ions:** alkalinity, calcium, chloride, magnesium, potassium, sodium, sulphate **Nutrients and Organics:** ammonia, un-ionized ammonia, nitrate, nitrite **Dissolved Metals:** boron, chromium, iron, manganese
	Surface Water Station: C04, P01, P02, P03, NE1	Annual (spring)	**Field Parameters:** pH, conductivity, temperature, turbidity **General Parameters:** pH, conductivity, hardness **Major and Minor Ions:** alkalinity, calcium, chloride, magnesium, potassium, sodium, sulphate **Nutrients and Organics:** ammonia, un-ionized ammonia, nitrate, nitrite **Dissolved Metals:** boron, chromium, iron, manganese

Schedule "C"
Groundwater and Landfill Gas Monitoring Programs

ACTIVITY	LOCATION	SAMPLING FREQUENCY	ANALYSIS / MEASUREMENT
Groundwater and Leachate Level Monitoring	**Shallow Flow System:** 4R, 5R, 10R, 11R, 13R, 14R, 15A, 16AR, 18R, 19R, 24AR, 26R, 28R, 32R, 33R, 39, 40, 43, 44, SG1 **Deep Flow System:** 16R, 21R, 24R, 25R, 27, 31, 35, 37R, 38, 42 **Leachate Well: 41**	Annual (May)	Water Level Measurement
Groundwater and Leachate Sampling	**Shallow Flow System:** 11R, 16AR, 19R, 26R, 28R, 32R, 40, 43, 44 **Deep Flow System:** 21R, 24R, 25R, 27, 37R, 38, 39, 42 **Private Wells:** D2 (Pearce) **Leachate Well: 41**	Annual (May)	**Field Parameters:** pH, conductivity, temperature **General Parameters:** pH, conductivity, hardness **Major and Minor Ions:** alkalinity, calcium, chloride, magnesium, potassium, sodium, sulphate **Nutrients and Organics:** ammonia, nitrate, nitrite, TKN, DOC **Dissolved Metals:** boron, chromium, iron, manganese
	Shallow Flow System: 32R, 26R, 40, 43, 44 **Deep Flow System:** 27, 37R, 38, 39, 42 **Leachate Well: 41**	Annual (May)	**Volatile Organic Compounds:** vinyl chloride, benzene, 1,4 dichlorobenzene
Landfill Gas Monitoring	**Standpipes:** SP3R, SP4R, SP5	Annual	Methane, carbon dioxide, oxygen, balance gas, as well as water level

The reasons for this amendment to the *Approval* are as follows:

- Preamble is amended to clarify the approved total *Site* area which includes Contaminant Attenuation Zone.

- Condition 2(1) was revised to approve the closure plan for the *Site* to ensure the final closure of the *Site* is completed in an aesthetically pleasing manner, in accordance with *Ministry* standards, and to ensure the long-term protection of the health and safety of the public and the environment.

- Condition 3(2) is included to require the *Owner* to demonstrate that the *Site* is performing as designed and the impacts on the natural environment are acceptable. Regular monitoring allows for the analysis of trends over time and ensures that there is an early warning of potential problems so that any necessary remedial/contingency action can be taken. This condition was revised to approve the revised groundwater and surface water monitoring program.

- Conditions 3(10) and 3(11) approved trigger mechanisms and contingency plans proposed for the *Site.* This provides a plan with an organized set of procedures for identifying and responding to potential issues relating to groundwater and surface water contamination at the *Site's* compliance point.

- Conditions 2(2) and 2(3) are added to ensure that the *Site* is designed, operated, monitored and maintained in accordance with the application and supporting documentation submitted by the *Owner,* and not in a manner which the *Director* has not been asked to consider.

This Notice shall constitute part of the approval issued under Approval No. A070702 dated September 8, 2016 as amended.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;

6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

* **Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 6th day of March, 2018

Dale D. Gable

Dale Gable, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

RM/

c: District Manager, MOECC London - District
Dave Vermeeren, Waste Management Supervisor, County of Oxford

June 17, 2024 Project No. CA0024089.4861-02

Heather Mitchell, Senior Environmental Officer
Ministry of the Environment, Conservation and Parks
London District Office
733 Exeter Road
London, ON N6E 1L3

RESPONSE TO MECP COMMENTS
HOLBROOK LANDFILL, 2022 ANNUAL MONITORING REPORT
GROUNDWATER COMMENTS (ECHO REF. 1-188600312)

Dear Ms. Mitchell:

WSP Canada Inc. (WSP) was retained by the County of Oxford (County) to provide environmental engineering consultation services regarding the closed Holbrook Landfill site, located on Part of Lots 20 and 21, Concession III near the village of Holbrook in the Township of Norwich (Site). The Site is a closed landfill which has not accepted waste for landfilling since 1986. The Site is currently operated under Ministry of the Environment, Conservation and Parks (MECP) Amended Environmental Compliance Approval (ECA) No. A070702, dated March 6, 2018.

A Hydrogeologist from the Technical Support Section of the Ministry of Environment, Conservation and Parks (MECP) completed a review of the 2022 Annual Monitoring Report (WSP, 2023) for the Site. The MECP comments were provided to the County on May 16, 2024, in a Memorandum dated March 15, 2024. Please see attached for a copy of this letter. The MECP Senior Environmental Officer for the Site did not request a specific date for a response to these comments, but the County has asked WSP to respond now, in order to resolve and clarify the comments in advance of the next annual monitoring report. This letter has been prepared to address this request. A Site Plan is also appended to this letter for reference.

Response to Comments

The MECP comments from the March 15, 2024 Memorandum are provided below in *italics*, followed by WSP's response to each comment.

Comment 1: *The landfill site may have closed several years ago, however, the leachate chemistry indicates that the site is still geochemically active. Anaerobic conditions are still noted at OW41.*

Response: Noted and agreed.

Comment 2: *The shallow groundwater quality complied with RUG with the exception of hardness, chloride, alkalinity, sodium and DOC at MW26R and hardness and nitrate at MW 44. The deeper groundwater quality complied with RUG with the exception of hardness and iron at all 3 boundary monitoring wells (i.e. MW27, MW37R and MW38). At this time, I do not feel that the exceedances warrant immediate action. Continued monitoring is recommended.*

Response: Agreed.

Comment 3: *I don't really agree with the Consultant's interpretation that the shallow groundwater near MW26R flows north towards MW46. The groundwater chemistry of MW26R is possibly influenced by the nearby road and by the Otter Creek Wetland Complex, however, I believe that it is downgradient of the landfill mound.*

Furthermore, in 2018, I noted that OW27, located next to OW26R, was an older well whose annular space wasn't fully sealed with bentonite. Having monitoring wells from which representative samples of groundwater can be sampled is important especially for boundary wells used for compliance purposes. I suggest that the County consider properly abandoning Well OW27 and constructing a new well.

Response: Please see below for a table showing the historical groundwater elevation data collected from MW26R, MW45 and MW46, since the installation of MW45 and MW46 in August 2019.

	DATE				
WELL	May-20	May-21	May-22	May-23	May-24
MW26R	274.82	274.66	274.35	274.43	274.35
MW45	274.66	274.29	274.47	274.61	274.64
MW46	274.52	274.18	273.97	274.52	274.50

Groundwater level measurements provided in mASL (metres above sea level)

As shown above, groundwater elevations in 2020 and 2021 consistently showed shallow groundwater flowing north from MW26R towards both MW45 and MW46. In 2022, shallow groundwater flow appeared to continue to flow north toward MW46, from both MW45 and MW26R. In 2023 and 2024 (new data), shallow groundwater elevations at MW26R are lower than both MW45 and MW46, but groundwater flow still appears to be flowing from the area of MW45 to the north, towards MW46. Based upon the most recent data, it is possible that MW26R could be considered cross-gradient, but groundwater elevations at MW45 continue to show shallow groundwater flow north, towards MW46 and the landfill mound.

With respect to the discussion regarding monitoring well MW27; it is recognized that the MECP was concerned with the reliability of the well in 2018, based upon the well construction details in the historical borehole log. Based upon the significantly artesian conditions (average hydraulic head of 2.84 m above ground surface since 2013), if the annular space at MW27 created a preferential pathway for groundwater flow, the area in the vicinity of the well would be extremely wet with visible flow coming from around the monitoring well casing. Field conditions in the area of monitoring wells MW26R and MW27 have been noted to be dry during sampling events conducted in May, since the installation and use of groundwater packers within these wells. As such, it is assumed that results from monitoring well MW27 can be considered representative of the deep groundwater flow system. WSP will continue to verify conditions at MW27 during each groundwater monitoring event, should conditions change and the monitoring well require replacement.

Comment 4: *The Consultant should provide at least one additional cross-section for the site. A north-south cross-section that includes MW41, MW46, MW45 and MW26R would be helpful.*

Response: The Annual Water Monitoring Report for the Site already provides three cross-sections for the Site. WSP and the County do not believe that an additional north-south cross-section is necessary, but this will be considered as an addition to the 2024 Annual Water Monitoring Report.

Comment 5: *PFAS – how did the PFAS study inform the contaminant migration at the site?*

Response: The County voluntarily permitted a closed landfill study to be conducted at the Site by student researchers and Environment and Climate Change Canada (ECCC) starting in 2018, that was supported by the MECP. This evolved further into participating in a PFAS sampling program, at the behest of the MECP. It was understood that the intent of the studies and PFAS sampling program was not to find new areas of contamination or inform the contaminant migration at the Site, but it was instead to focus on sampling in areas of known or suspected leachate impact. This data, in turn, was to help the MECP in their formulation of possible future standards for PFAS at landfill sites. As such, the scope of the Annual Water Monitoring Report for the Site did not consider the results of the PFAS testing in its analysis or conclusions on contaminant migration at the Site.

Comment 6: *Landfill gas – The report notes that methane wasn't detected at the 3 gas monitoring locations, however the lack of detection isn't really valid as the screens of 2 of the 3 gas wells were reported to be flooded and the screen of the 3rd gas well was partly. If gas monitoring is going to be useful, then the monitoring needs to be meaningful. What can be done to ameliorate the situation?*

Response: WSP would contend that landfill gas monitoring is not necessary at the Site. This was previously discussed with the MECP during the submission of the closure plan for the Site, revised and completed in June 2017. Nevertheless, landfill gas monitoring was added to the revised monitoring program via the revised Closure Plan, with the intention of terminating in 3 years, should no landfill gas be detected. Of their own volition, the County decided to continue the landfill gas monitoring at the Site, as a due diligence measure moving forward.

It is noted that geological conditions at the Site are not favourable for landfill gas migration, even if landfill gas could reach the boundaries of the Site, due to the generally elevated groundwater levels with the shallow flow system. The elevated groundwater levels often result in flooding the screens of the landfill gas probes, which were installed as shallow as possible to provide the best chance of capturing any landfill gas migration. It is assumed that the current landfill gas probe program will continue to provide sufficient monitoring for possible landfill gas migration moving forward, as it is coupled with water level monitoring. The water level monitoring in the gas probes will prove that either the shallow groundwater elevations are preventing landfill gas movement, or that the shallow groundwater has dropped to within the screens of the landfill gas probes and meaningful landfill gas monitoring is taking place.

Comment 7: *The nitrate exceedance noted at OW44 was further assessed by sampling OW33R. Although both of those wells have low concentration of nitrate, the TKN concentration is not insignificant. The presence of TKN and ammonia is noted at OW11R. Continued monitoring is recommended to assess the potential landfill nitrogen contribution east of the waste mound.*

Response: It is understood that the TKN and ammonia concentrations at monitoring wells MW11R and OW33R are not insignificant, but given the magnitude of the nitrate concentrations at MW44, the nitrate exceedances are not the result of a landfill leachate impact. Monitoring will continue to assess the potential landfill nitrogen contribution to the east of the waste mound.

Comment 8: *The Consultant should continue to use the comprehensive list (e.g. Table 4.3) as the basis of compliance with Reasonable Use while an updated list of trigger parameters is being determined.*

Response: We will continue to use the comprehensive list of parameters in the Guideline B-7 Compliance comparison table within the Annual Water Monitoring Report.

Comment 9: *Artesian/Flowing Conditions – The report notes the presence of artesian conditions at MW26R, MW27, MW45 and MW46. Wells 26R and 27 were reported to have been extended. Packers were reported to have been installed in wells 26R and 27. Based on this information, I have the following specific questions:*

1. *Who extended the casing? Were new well records created?*
2. *Some of the wells were reported to be flowing at the time of construction. That wasn't noted on the well record.*
3. *Some of the wells have been equipped with a flow control device; how was it determined that the well construction could sustain the pressure?*
4. *Some of the flowing wells have reported to have water come up in the casing. How are these wells winterized?*

Response: There are artesian conditions at MW26R, MW27, MW45 and MW46. Packers are utilized in MW26R and MW27, while J-plugs are utilized at MW45 and MW46.

1. The casings for these wells were not extended. During groundwater monitoring events, the groundwater packers (MW26R and MW27) or J-plugs (MW45 and MW46) are removed, and temporary riser extensions are added to the artesian wells. The groundwater levels are then allowed to equilibrate, in order to obtain measurable groundwater elevations at the wells. Please see below for an example of the addition of a temporary riser to MW26R, in May 2024. After measuring the groundwater levels and sampling, the temporary risers are removed and the groundwater packers or J-plugs are re-installed accordingly.

Figure 1 - Addition of Temporary Riser to MW26R

2. The reviewer noted that some of the well records didn't contain information about flowing conditions at the time of construction. All historical groundwater level measurements can be found on Table C-2, in Appendix C of the Annual Water Monitoring Report.

3. The flow control devices at each of these wells have been installed for many years, and have clearly been successful at sustaining the pressure, based upon the field conditions surrounding the wells. Packer systems were installed in MW26 and MW27 in the summer of 2009, to prevent the wells from flowing to the receiving surface water course. A new packer was installed in MW26R, after its installation in the summer of 2015. J-plugs were installed in MW45 and MW46, after their installation in the summer of 2019. When removing and re-installing the packers and J-plugs during the annual monitoring event each year, care is taken to ensure that no leaks are encountered after re-installing the flow control devices.

4. It is unclear as to where it was reported that water has come "up" in the casing of any of these wells. This is not the case. The wells are winterized by utilizing a peristaltic pump or mini-waterra foot valve system to purge any remaining standing water from inside the riser pipe and casing, after the re-installation of the flow control devices.

We trust that this submission is sufficient for your current needs. If you have any questions or comments, please do not hesitate to contact us.

WSP Canada Inc.

Albert Siertsema, P.Eng., PMP
Project Engineer
Earth & Environment

Attachments: Memorandum provided by MECP (dated March 15, 2024), Site Plan

https://wsponlinecan.sharepoint.com/sites/ca-ca00240894861/shared documents/06. deliverables/02-holbrook/mecp response/mecp resp_holbrook landfill.docx

Ministry of the Environment,
Conservation and Parks

733 Exeter Road
London ON N6E 1L3
Tel': 519 873-5000
Fax: 519 873-5020

Ministère de l'Environnement, de la
Protection de la nature et des Parcs

733, rue Exeter
London ON N6E 1L3
Tél.: 519 873-5000
Téléc.: 519 873-5020

March 15th 2024

Memorandum

To: Heather Mitchell, Senior Environmental Officer
Ministry of the Environment, Conservation and Parks, London District Office

From: Helene Pierard, P.Geo, Hydrogeologist
Ministry of the Environment, Conservation and Parks, SWR, Technical Support Section

Re: Holbrook Landfill Site – 2022 Annual Monitoring report
Groundwater Comments (ECHO Ref. 1-188600312)

I reviewed the 2022 Holbrook Landfill Annual Monitoring Report, prepared by WSP Canada Inc. This landfill site is located on lots 20 and 21, Concession III in the Township of Norwich, Oxford County. The site, closed since 1986, operates under ECA No. A070702 most recently updated in 2018.

The purpose of the report is to document the monitoring program results and findings, a requirement under Condition 3.3 of the 2016 ECA. The purpose of my review is to assess the hydrogeological aspects of the report and verify compliance with the Reasonable Use Guideline (B-7). I offer the following comments:

- The landfill site may have closed several years ago, however, the leachate chemistry indicates that the site is still geochemically active. Anaerobic conditions are still noted at OW41.
- The shallow groundwater quality complied with RUG with the exception of hardness, chloride, alkalinity, sodium and DOC at MW 26R and hardness and nitrate at MW 44. The deeper groundwater quality complied with RUG with the exception of hardness and iron at all 3 boundary monitoring wells (i.e. MW27, MW37R and MW38). At this time, I do not feel that the exceedances warrant immediate action. Continued monitoring is recommended.
- I don't really agree with the Consultant's interpretation that the shallow groundwater near MW26R flows north towards MW46. The groundwater chemistry of MW26R is possibly influenced by the nearby road and by the Otter Creek Wetland Complex, however, I believe that it is downgradient of the landfill mound.

  Furthermore, in 2018, I noted that OW27, located next to OW26R, was an older well whose annular space wasn't fully sealed with bentonite. Having monitoring wells from which representative samples of groundwater can be sampled is important especially for boundary wells used for compliance purposes. I suggest that the County consider properly abandoning Well OW27 and constructing a new well.

- The Consultant should provide at least one additional cross-section for the site. A north-south cross-section that includes MW41, MW46, MW45 and MW26R would be helpful.
- PFAS – how did the PFAS study inform the contaminant migration at the site?
- Landfill gas – The report notes that methane wasn't detected at the 3 gas monitoring locations, however the lack of detection isn't really valid as the screens of 2 of the 3 gas wells were reported to be flooded and the screen of the 3rd gas well was partly. If gas monitoring is going to be useful, then the monitoring needs to be meaningful. What can be done to ameliorate the situation?
- The nitrate exceedance noted at OW44 was further assessed by sampling OW33R. Although both of those wells have low concentration of nitrate, the TKN concentration is not insignificant. The presence of TKN and ammonia is noted at OW11R. Continued monitoring is recommended to assess the potential landfill nitrogen contribution east of the waste mound.
- The Consultant should continue to use the comprehensive list (e.g. Table 4.3) as the basis of compliance with Reasonable Use while an updated list of trigger parameters is being determined.
- Artesian/Flowing Conditions - The report notes the presence of artesian conditions at MW26R, MW27, MW45 and MW46. Wells 26R and 27 were reported to have been extended. Packers were reported to have been installed in wells 26R and 27. Based on this information, I have the following specific questions:

    1. Who extended the casing? Were new well records created?
    2. Some of the wells were reported to be flowing at the time of construction. That wasn't noted on the well record.
    3. Some of the wells have been equipped with a flow control device; how was it determined that the well construction could sustain the pressure?
    4. Some of the flowing wells have reported to have water come up in the casing. How are these wells winterized?

Please let me know if you have any questions,

Helene Pierard

STATEMENT OF LIMITATIONS

LEGEND

	PROPERTY LINE (APPROXIMATE)
28R	SHALLOW AQUIFER MONITORING WELL
21R	DEEP AQUIFER MONITORING WELL
41	LEACHATE MONITORING WELL
20	HISTORIC MONITORING WELL (ASSUMED LOCATION)
23	DECOMMISSIONED MONITORING WELL
● SP3R	STANDPIPES
SG1	STAFF GAUGE
D-2 ●	DOMESTIC WELL
▲ P01	SURFACE WATER SAMPLING LOCATION
	SURFACE WATER FLOW DIRECTION
A A'	CROSS-SECTION LOCATION AND DESIGNATION

REFERENCE(S)

PARCEL FABRIC, PROPERTY BOUNDARIES AND ORTHOPHOTO PROVIDED BY OXFORD COUNTY, 2011.

0 100 200

1:4,000 METRES

CLIENT
COUNTY OF OXFORD

CONSULTANT
wsp

YYYY-MM-DD	2024-01
DESIGNED	
PREPARED	NV
REVIEWED	JM/AS
APPROVED	SH

PROJECT
2023 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE
COUNTY OF OXFORD, ONTARIO

TITLE
SITE PLAN

PROJECT NO.	CONTROL	REV.	FIGURE
111-53037-07	0001	A	2

Ministry of the Environment,
Conservation and Parks

Ministère de l'Environnement, de la
Protection de la nature et des Parcs

HOLBROOK LANDFILL- COUNTY OF OXFORD- CLOSED LANDFILL

Physical Address: LOT:20,21, CONCESSION:III,
GEOTOWNSHIP:NORWICH, ,
NORWI, ON

INSPECTION REPORT

Entity: COUNTY OF OXFORD
Inspection Start Date: May 14, 2025
Site Inspection Date: May 14, 2025
Inspection End Date: May 14, 2025
Inspected By: Heather Mitchell
Badge #: 2032

H. Mitchell

(signature)

INTRODUCTION

Purpose

Ontario has a comprehensive legislative and regulatory framework to ensure that wastes are managed in an environmentally safe manner. The Environmental Protection Act (EPA) and accompanying regulations have established a cradle to grave approach which includes the systematic control of collection, storage, transportation, treatment, recovery and disposal of waste.

Once a landfill has reached capacity, final closure of the site must be completed in a manner that ensures the long-term protection of the environment. The post-closure period for a landfill depends on its location, the level of engineering and the type of waste that was historically deposited. The post-closure period may be decades long. For the contaminating life span of the site there are a number of factors that need to be considered including care and maintenance of the final cover and landscaping, gas production as well as monitoring, analysis, and reporting provisions.

To confirm whether the regulated community is complying with the requirements related to closed landfill sites the Province is committed to conducting pro-active inspections of these facilities. As part of this commitment the Ministry of the Environment, Conservation and Parks (MECP) conducted a planned inspection of the Holbrook landfill site as part of the 2025-2026 London District inspection program. The site is located at Part of Lot 20 & 21, Concession 3, Norwich Township, County of Oxford.

Scope

The Closed Landfill inspection consisted of a review of available Ministry files and information including the Closure Plan, correspondence with Pamela Antonio, Waste Supervisor, and the most recent annual monitoring report (2024) in order to assess the operation's compliance with the terms and conditions of Environmental Compliance Approval (ECA) A070702. The onsite portion of the inspection was conducted on May 14, 2025 by London District Environmental Compliance Officer Heather Mitchell and Southwest Region Hydrogeologist Helene Pierard. The purpose of the inspection was to confirm that the closed landfill maintenance and monitoring activities are in compliance with the requirements of the Environmental Protection Act, the Ontario Water Resources Act, O.Reg. 347, O.Reg 903, Environmental Compliance Approval (A070702), and other applicable MECP policies and guidelines. Pamela Antonio and Chris Hotchkiss, Waste Management Foreman, from Oxford County were interviewed onsite during the inspection. The onsite inspection consisted in a review of the monitoring wells that are providing informative data for the landfill influence to the subsurface conditions at the site, surface water features, leachate monitoring well, and overall landfill cap integrity.

Facility Contacts and Dates

Oxford County representatives involved in this inspection were:
- Pamela Antonio, Waste Supervisor: pantonio@oxfordcounty.ca
- Chris Hotchkiss, Waste Management Foreman: chotchkiss@oxfordcounty.ca

The onsite portion of the inspection was conducted on May 14, 2025 by London District Environmental Compliance Officer Heather Mitchell and Southwest Region Hydrogeologist Helene Pierard.

Permissions/Approvals

The Holbrook Landfill operated under Provisional Certificate of Approval (CofA) No. A070702 issued on March 31,1983 which permitted landfilling at the site until June 30, 1984. The County subsequently obtained an extension of the CofA from June 1984, until the site was closed in 1986. Although the Landfill is closed and has not accepted waste since 1986, a Closure Plan was developed as a requirement of the Amended ECA issued on September 8, 2016. The amended ECA No. A070702 also incorporated the County owned buffer lands to the east of the landfill into a Contaminant Attenuation Zone (CAZ). As part of the new ECA, a Closure Plan was submitted to the MECP. The Closure Plan was accepted by the MECP in Notice No. 1 of the ECA, dated March 6, 2018 and included trigger mechanisms and contingency plans as well as a new comprehensive monitoring program.

Background and Compliance

The Site which covers an area of 40.5 ha was originally owned by Ingersoll Sanitation Ltd. and started accepting waste around 1970. The site was subsequently owned and operated by Superior Sanitation Services Inc. before the County of Oxford took over the Site in January 1982. From January 1982 to July 1986 the site received municipal waste (non haz domestic, ICI). In July 1986 the Site was closed, with final cover applied and seeded. A groundwater, surface water, and domestic wells monitoring plan was established and has been continued. On September 8, 2016, an updated ECA was issued to include the requirement to establish a CAZ on title and prepare and submit a closure plan incorporating a trigger mechanism and contingency plan as well as a new environmental monitoring program. The Closure Plan was issued in June 2017 and amended with a letter prepared by WSP on December 8, 2017 to update the Closure Plan based on Ministry comments. On March 6, 2018, the ECA was amended to include updates to the closure plan and landfill monitoring requirements.

NON-COMPLIANCE

This should not be construed as a confirmation of full compliance with all potential applicable legal requirements. These inspection findings are limited to the components and/or activities that were assessed, and the legislative framework(s) that were applied. It remains the responsibility of the owner to ensure compliance with all applicable legislative and regulatory requirements.

If you have any questions related to this inspection, please contact the signed Provincial Officer.

RECOMMENDATIONS

This should not be construed as a confirmation of full conformance with all potential applicable BMPs. These inspection findings are limited to the components and/or activities that were assessed, and the legislative framework(s) that were applied. It remains the responsibility of the owner to ensure compliance with all applicable legislative and regulatory requirements.

If you have any questions related to this inspection, please contact the signed Provincial Officer.

INSPECTION DETAILS

This section includes all questions that were assessed during the inspection.

Ministry Program: WASTE | **Regulated Activity:** Landfills

Question ID	NCL 1	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1);

Question:
Does the Closed landfill site have an Environmental Compliance Approval (ECA)?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

The landfill site is approved under ECA #: A070702 for a 10.12 hectare landfilling site within a total site area of 40.5 hectares at Part of Lot 20 & 21, Concession 3 in Norwich Township, County of Oxford.

Question ID	NCL 2	**Question Type**	Information

Legislative Requirement(s):
Not Applicable

Question:
Is this landfill on Crown land?

Compliance Response(s)/Corrective Action(s)/Observation(s):
No

Question ID	NCL 3	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1); EPA | O. Reg. 232/98 | 3;

Question:
Does the holder of the landfill ECA own the entire site?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

Land registry PIN # 00063-0069 for the site notes the ownership was transferred from Laidlaw Waste Systems (Superior Sanitation Services Inc) to The Corporation of the County of Oxford in 1982. Oxford County still remains in ownership of the site.

Question ID	NCL 4	**Question Type**	Information

Legislative Requirement(s):
Not Applicable

Question:
Does the landfill have a Contaminant Attenuation Zone (CAZ)?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

ECA #: A070702 was amended on September 8, 2016 to incorporate the County owned buffer lands to the east of the landfill into a Contaminant Attenuation Zone (CAZ).

The "Site " in ECA #: A070702 means the entire waste disposal site, including the buffer land at Parts of Lot 20 & 21, Concession 3, Township of Norwich, County of Oxford.

Question ID	NCL 5	**Question Type**	Information

Legislative Requirement(s):
Not Applicable

Question:
Is the CAZ on Crown land?

Compliance Response(s)/Corrective Action(s)/Observation(s):
No

Question ID	NCL 7	**Question Type**	Information

Legislative Requirement(s):
Not Applicable

Question:
Is the CAZ on a public road?

Compliance Response(s)/Corrective Action(s)/Observation(s):
No

Question ID	NCL 9	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1); EPA | O. Reg. 232/98 | 4 | (1);

Question:
Does the holder of the landfill ECA own the property rights for the CAZ?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

Condition 17 of ECA #: A070702 required the Owner to register the Certificate of Requirement for the CAZ at the appropriate Land Registry Office on the title to the property and submit to the Director and District Manager, written verification that the Certificate of Requirement has been registered on title.

On November 04, 2016, the County met the obligation under Condition 17 of ECA #: A070702.

The County purchased property adjacent to the east of the landfill site for use as a buffer zone in 1990.

Land survey plan 41R-9610 shows the Plan # 41R-9394 with PIN # 00063-0069. This represents the Holbrook Landfill, the buffer area and the Contaminant Attenuation Zone (CAZ) that are all owned by Oxford County.

Question ID	NCL 10	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1); EPA | O. Reg. 232/98 | 4 | (3);

Question:
Do the property rights for the CAZ meet the requirements of Reg 232?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

As noted in the previous response, the buffer area and the Contaminant Attenuation Zone (CAZ) lands are all owned by Oxford County.

A portion of the County owned buffer lands to the east is rented to a farmer. The farmer rotates growing various crops on the arable portion of the land. Oxford County staff and their consultant have unimpeded access to the buffer area and CAZ lands to conduct required activities associated with the annual monitoring program for the site.

Question ID	NCL 13	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1);

Question:
Is site access restricted by use of a gate, fence, or physical barrier?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

Condition 2(3) of amended ECA #: A070702 states that the site should remain "natural open space with restricted public access" unless a request is submitted to the Director for approval to change the land use.

Access to the site is restricted by perimeter fencing, gates, and secondary barriers consisting of concrete meter blocks and large tree stumps/roots in an attempt to prevent unauthorized access to the site by ATVs. The additional barriers to the site do not interfere with any site monitoring activities.

The County monitors the integrity of the gate monthly and replaces any broken locks, chains etc. Twice a year, the County walks the site to assess for any repair and maintenance required at the site as well as any signs of trespassing.

In September 2024 in response to trespass concerns at the site, the County installed a number of "No Trespassing" signs around the perimeter of the Holbrook property and posted at the gate as well as placing large tree logs and stumps at various unofficial access points around the perimeter of the property to deter unauthorized access to the site.

The County has included the Holbrook lands within the County Forests and County Lands in the County of Oxford By-law 5854-2016. The by-law permits public access at the Holbrook lands however Condition 2(3) states the current land use is "natural open space with restricted public access". The Holbrook Landfill Closure Plan states "Public access to the site is restricted and the site will remain as passive open space, accessed only for post-closure monitoring and maintenance". As per Condition 2(2) of Amended ECA A070702, any changes to the approved closure plan/facilities within the closed Site must be submitted to the Director through an ECA amendment with the following information:
(a) Detailed plan showing all the groundwater monitoring wells;
(b) A detailed site plan showing where any structures or pathways are located;
(c) Potential dangers related to methane gas is a concern to the Ministry. Decomposition of waste and producing methane can continue many years pass the closure of a landfill depending on factors within the landfill that expedite or slow down decomposition of An assessment of methane gas in the landfill as this will help the Ministry determine if the site is safe for public use; and
(d) Consultation with the interested parties (specially residents within 500 m) about the change in land use and the proposal.

To remain in compliance with the ECA, the County should either update the by-law to reflect the Holbrook landfill site as natural open space with restricted public access for only maintenance and annual monitoring activities or assess the site for passive public access as per the requirements noted above and submit for an amendment to ECA A070702.

Question ID	NCL 16	**Question Type**	Information

Legislative Requirement(s):
Not Applicable

Question:
Is the site required to have a ground water monitoring program in the ECA?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

Condition 3.0 of ECA #: A070702 requires the Owner to ensure complaince with the Reasonable Use Guideline B-7 for the protection of the groundwater at the Site.

Condition 3(2) of amended ECA A070702 requires the Owner to monitor groundwater in accordance with Schedule "C".

Continued monitoring of groundwater will be required until monitoring results indicate that the Site no longer represents a concern to the natural environment or public health and safety.

Question ID	NCL 17	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1);

Question:
Is the landfill implementing the groundwater monitoring program as required by the ECA?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

The post-closure groundwater monitoring program is detailed in Section 4.1 the approved Holbrook Landfill Closure Plan dated June 2017, a letter prepared by WSP on December 8, 2017 to update the Closure Plan based on Ministry comments, and an amendment to ECA A070702.

The County submits the Annual Monitoring Report to the Ministry by March 31st with the required information as detailed in the ECA.

The Ministry is currently reviewing the Holbrook Landfill 2024 Water Monitoring Report, therefore comments related to the data provided in the 2024 Report will be provided at a later date.

Question ID	NCL 18	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1); EPA | O. Reg. 232/98 | 25;

Question:
Are monitoring well samples taken and tested to determine the quality of the groundwater?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

The groundwater monitoring program consists of monitoring potential landfill impacts on the shallow and deep groundwater aquifers. The Closure Plan provides a groundwater trigger mechanism to identify when investigative activities or contingency measures should be initiated as a result of increased contaminant concentrations in the groundwater. The groundwater trigger mechanism includes trigger parameters, boundary criteria, and trigger conditions to determine when the Contingency Plan is to be implemented.

The amendment to ECA 070702 provides the annual groundwater monitoring program details in Schedule C.

The 2024 Water Monitoring Report provides sampling analysis for the current groundwater conditions at the site. The report notes that the shallow groundwater quality complies with Guideline B-7 with the exception of DOC at monitoring well 26R and nitrate at well 44. The report notes that the deep groundwater quality complies with Guideline B-7 with the exception of hardness and iron in wells 27, 37R, and 38 and DOC at well 38. The report notes that none of the groundwater trigger criteria were exceeded at the site in 2024.

Question ID	NCL 19	**Question Type**	Information

Legislative Requirement(s):
Not Applicable

Question:
Are there water quality concerns with the results of the samples that have been tested?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

Observations during the onsite inspection determined that the monitoring wells on the property need maintenance and some of the wells may need to be properly abandoned - plugged and sealed (e.g. OW29) if no longer in use or properly protected with a proper well casing if use will continue. Several protective casings are wobbly lacking a sufficient bentonite seal, and the drainage around the wells need improvement to prevent pooling surface water around the casings.

The Ministry comments on the 2022 Annual Monitoring Report note that some of the wells, particularly by the entrance of the property, had artesian conditions. It was noted that some of the well casings were extended and equipped with packers. There appears to be a gap between the information in the report and the field observations.

Having monitoring wells from which representative samples of groundwater can be relied on to inform decisions is important especially regarding compliance at the property boundary.

Question ID	NCL 20	**Question Type**	Information

Legislative Requirement(s):
Not Applicable

Question:
Is there ongoing abatement to address any concerns of the ministry with the ground water monitoring?

Compliance Response(s)/Corrective Action(s)/Observation(s):
No

Resulting from this inspection, the Ministry recommends that all the monitoring wells on the property are assessed for compliance with the Wells Regulation.

The assessment should be made by a Licensed Well Technician working for a Licensed Well Contractor and that recommendations be made for compliance with the Wells Regulation. It would be helpful if the qualified person (consultant) could conduct the assessment with the Licensed Well Technician as some integrity issues may be suspected based on the groundwater quality data. This annual assessment, recommendations, and plan to address the issues should accompany the photographic inventory of the monitoring wells described in the "Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document – November 2010" and form part of the annual reports prepared by the qualified person going forward.

Pending on the outcome of the assessment, if new wells are proposed to be constructed, the Ministry recommends engaging with the Regional Hydrogeologist to discuss a plan to maximize the meaningfulness of the monitoring (i.e. cover gaps) and minimize duplication.

Question ID	NCL 21	**Question Type**	Information

Legislative Requirement(s):
Not Applicable

Question:
Is the site required to manage leachate by the ECA?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

Condition 2.0 of ECA #: A070702 requires the Owner to submit a Closure Plan for the site that includes a monitoring program for leachate.

Condition 3(2) of amended ECA A070702 requires the Owner to monitor the groundwater for leachate parameters annually in accordance with Schedule "C".

Continued monitoring for leachate will be required until monitoring results indicate that the Site no longer represents a concern to the natural environment or public health and safety.

Question ID	NCL 22	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1);

Question:
Is the landfill implementing the procedures required by the ECA to manage leachate?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

Historical monitoring results of the liquid level within Leachate Well 41 indicate a localized perched leachate mound is present at the site. The Holbrook Landfill Closure report notes that this mounding is attributed to areas of low hydraulic conductivity within the refuse and has potential to influence shallow groundwater quality adjacent to the refuse disposal area or result in surface seeps.

The Holbrook Landfill Closure report notes that the landfill was operated as a natural attenuation site with no passive or active leachate collection which is continued in the post closure phase for this site. To date construction of a leachate control, treatment, or disposal facility is not anticipated. The need to implement any leachate control system would be addressed through exceedances of the groundwater or surface water trigger mechanisms and subsequent actions through the groundwater or surface water contingency plans.

The County submits the Annual Monitoring Report to the Ministry by March 31st with the required information as detailed in the ECA.

The Ministry is currently reviewing the Holbrook Landfill 2024 Water Monitoring Report, therefore comments related to the data provided in the 2024 Report will be provided at a later date.

Question ID	NCL 23	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1); EPA | O. Reg. 232/98 | 26;

Question:
Are samples taken to monitor leachate quality?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

The groundwater sampling parameters for leachate indicators are chloride, boron, and three VOCs (vinyl chloride, benzene, 1,4 dichlorobenzene). The surface water parameters for leachate indicators chloride, boron, unionized ammonia, nitrate and nitrite. The groundwater and surface water trigger mechanisms include trigger parameters, boundary criteria, and trigger conditions to determine when the Contingency Plan is to be implemented.

The amendment to ECA 070702 provides the leachate indicator parameters for the annual groundwater sampling in accordance with Schedule "C" and for the semi-annual and annual surface water sampling in accordance with Schedule "B".

The 2024 Water Monitoring Report provides monitoring results for leachate at the site. The report did note that the leachate elevation in Well 41 was measured to be marginally higher in May 2024 than the historical range for this well, noting that localized leachate mounding is likely present at the site. The report notes that there may have been historical influence of leachate in the shallow groundwater wells adjacent to the northeast, east and southeast of the landfill however most of these have since abated as there is no clear indication of leachate influence in the shallow groundwater wells at the downgradient property boundaries to the east/southeast in 2024. The report notes that the shallow groundwater quality complies with Guideline B-7 with the exception of DOC at monitoring well 26R and nitrate at well 44. The report notes that the deep groundwater quality complies with Guideline B-7 with the exception of hardness and iron in wells 27, 37R, and 38 and DOC at well 38. The report notes that none of the groundwater trigger criteria were exceeded at the site in 2024. The report notes that surface water quality in the wetland at the northeast site boundary and the northern and southeast onsite retention ponds was not measurably affected by the landfill in 2024. The report notes that monitoring results for onsite monitoring station C04 and retention pond P02 were inferred to be slightly influenced by the landfill. The report states that surface water quality in the onsite stream leaving the site (C01) has been affected by landfill influences from the upstream portions of the onsite stream, shallow groundwater discharges and possibly road salting activities. The report notes however that based on the monitoring results, the landfill influences in the surface water quality are very weak, with the surface water leaving the site at C01 complying with the current trigger level boundary criteria.

Question ID	NCL 26	**Question Type**	Information

Legislative Requirement(s):
Not Applicable

Question:
Is the site required to manage landfill gas by the ECA?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

Condition 2.0 of ECA #: A070702 requires the Owner to submit a Closure Plan for the site that includes a monitoring program for landfill gas.

Condition 3(2) of amended ECA A070702 requires the Owner to monitor landfill gas in accordance with Schedule "C".

Continued monitoring for landfill gas will be required until monitoring results indicate that the Site no longer represents a concern to the natural environment or public health and safety.

Question ID	NCL 27	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1);

Question:
Is the site implementing the landfill gas manangement requirements in the ECA?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

The Holbrook Landfill Closure Plan noted that migration of combustible gas is not considered to be a concern due to gas production being beyond its peak and the high water table will restrict the movement of gas. The Ministry did not concur with this opinion and as a result requested gas probes be installed and a gas monitoring program be undertaken. ECA A070702 was amended to include the gas monitoring program, the results of which are included in the annual report.

The County submits the Annual Monitoring Report to the Ministry by March 31st with the required information as detailed in the ECA.

The Ministry is currently reviewing the Holbrook Landfill 2024 Water Monitoring Report, therefore comments related to the data provided in the 2024 Report will be provided at a later date.

Question ID	NCL 28	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1);

Question:
Is landfill gas managed and monitored at this site?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

The County monitors for landfill gas through three standpipes (SP3R, SP4R, SP5) along the north, northeast, and eastern property line between the landfill lands and CAZ. Methane, carbon dioxide, oxygen, balance gas, and water level to determine whether the screened interval is partially flooded are measured annually from each standpipe.

The amendment to ECA 070702 provides the annual landfill gas monitoring program details in Schedule C.

The 2024 Water Monitoring Report provides monitoring results for landfill gas conditions at the site. The report notes that methane gas was not detected at any of the sampling locations, indicating that landfill gas is not migrating away from the site. The screened portion of SP3R and SP4R was completed flooded and the screened portion of SP5 was partially flooded at the time of sampling in May 2024.

Question ID	NCL 29	**Question Type**	Information

Legislative Requirement(s):
Not Applicable

Question:
Are there landfill gas concerns at this site?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

Observations made by the Ministry during the onsite inspection on May 14, 2025 indicated that landfill gas (likely methane) is actively venting from the leachate well (41). Strong landfill gas odours were observed from openings in the well casing indicating the landfill is still actively "digesting" waste in anaerobic conditions.

Question ID	NCL 30	**Question Type**	Information

Legislative Requirement(s):
Not Applicable

Question:
Is there ongoing abatement to address any concerns the ministry has with landfill gas at this site?

Compliance Response(s)/Corrective Action(s)/Observation(s):
No

Resulting from the inspection, the Ministry recommends that the concentration and pressure of landfill gas discharged from Well 41 be measured.

The landfill gas at the site should be managed in a way that prevents any potential hazards.

This information, together with the rest of the landfill gas monitoring program, should inform on the lifecycle of the landfill and on the movement of gas in the subsurface.

Question ID	NCL 31	**Question Type**	Information

Legislative Requirement(s):
Not Applicable

Question:
Is the site required to have a surface water monitoring program by the ECA?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

ECA A070702 requires the site to ensure complaince with the Provincial Water Quality Objectives for the protection of the surface water at and off the Site.

Condition 3(2) of amended ECA A070702 requires the Owner to monitor surface water sampling in accordance with Schedule "B".

Continued monitoring of surface water will be required until monitoring results indicate that the Site no longer represents a concern to the natural environment or public health and safety.

Question ID	NCL 32	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1);

Question:
Is the site implementing the surface water monitoring program as required by the ECA?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

The post-closure surface water monitoring program is detailed in Section 4.2 of the approved Holbrook Landfill Closure Plan dated June 2017, a letter prepared by WSP on December 8, 2017 to update the Closure Plan based on Ministry comments, and an amendment to ECA A070702.

The County submits the Annual Monitoring Report to the Ministry by March 31st with the required information as detailed in the ECA.

The Ministry is currently reviewing the Holbrook Landfill 2024 Water Monitoring Report, therefore comments related to the data provided in the 2024 Report will be provided at a later date.

Question ID	NCL 33	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1); EPA | O. Reg. 232/98 | 24;

Question:
Is the water quality being monitored/sampled for surface water features on-site and for any off-site surface water features that receive a direct discharge from the site?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

Historical monitoring at stations along Otter Creek north of the site indicated there are no landfill influences on the water quality in Otter Creek. As a result, the surface water monitoring program has been revised to focus on sampling locations where surface water impacts are possible, or where necessary for boundary compliance. The Closure Plan provides a surface water trigger mechanism to identify when investigative activities or contingency measures should be initiated as a result of increased contaminant concentrations in the surface water. The surface water trigger mechanism includes trigger parameters, boundary criteria, and trigger conditions to determine when the Contingency Plan is to be implemented.

The amendment to ECA 070702 provides the semi-annual and annual surface water monitoring program details in Schedule B.

The 2024 Water Monitoring Report provides sampling analysis for the current surface water conditions at the site. The report notes that surface water quality in the wetland at the northeast site boundary and the northern and southeast onsite retention ponds was not measurably affected by the landfill in 2024. The report notes that monitoring results for onsite monitoring station C04 and retention pond P02 were inferred to be slightly influenced by the landfill. The report states that surface water quality in the onsite stream leaving the site (C01) has been affected by landfill influences from the upstream portions of the onsite stream, shallow groundwater discharges and possibly road salting activities. The report notes however that based on the monitoring results, the landfill influences in the surface water quality are very weak, with the surface water leaving the site at C01 complying with the current trigger level boundary criteria.

Question ID	NCL 36	**Question Type**	Information

Legislative Requirement(s):
EPA | 27 | (1);

Question:
Has the annual post-closure care report been submitted to MECP or available on site as required by the ECA?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

Condition 3.0 of ECA #: A070702 requires the Owner to submit the Annual Report to the District Manager by March 31st of the year following the period being reported upon.

Oxford County submitted the Holbrook Landfill 2024 Water Monitoring Report to the Ministry on March 28, 2025 and the Report is available on the Oxford County's Waste Management website for public viewing.

Question ID	NCL 37	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1);

Question:
Is scavenging being prevented?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

There was no observed evidence of scavenging due the onsite inspection on May 14, 2025 at the site.

Question ID	NCL 38	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1);

Question:
Has a closure plan been submitted to the MECP?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

Condition 2.0 of ECA #: A070702 required the Owner, by no later than July 15, 2017, to submit a closure plan pertaining to the termination of landfilling operations at this Site, post-closure inspection, maintenance and monitoring, and end use.

Oxford County, through their consultant WSP, prepared the Holbrook Landfill Closure Plan which was submitted with the required information to the Ministry in 2017.

Question ID	NCL 39	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1);

Question:
Has the closure plan been approved by MECP?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

Based on comments received from the Ministry review of the Closure Plan, WSP issued a follow up letter dated December 8, 2017 providing clarification to the groundwater, surface water, and landfill gas monitoring programs for the site. This letter and the modifications to the groundwater, surface water, and landfill gas monitoring plans were incorporated into the amended ECA A070702 Notice 1 issued on March 6, 2018.

Question ID	NCL 40	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1);

Question:
Does the landfill have a procedure in place to address complaints?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

While there is no specific condition within ECA A070702 that requires a complaint procedure, the ECA does dictate the requirements to be included within the landfill closure plan. Complaint contact and response procedures are included in the 2017 Holbrook Landfill Closure Plan. The closure plan states: "A sign will be posted at the entrance of the site providing information to the public to direct complaints to the appropriate County of Oxford representative. Each formal complaint will be recorded by the designated County representative and will be addressed as necessary."

In August 2024, Oxford County developed a Procedure for Addressing Public Complaints at the Waste Management Facility. The County adheres to the processes outlined within the complaint procedure when complaints are received related to both open and closed landfill sites within the County.

Question ID	NCL 41	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1);

Question:
Has the landfill operator addressed the complaints to the satisfaction of the ministry?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

In May 2024, an adjacent resident located at 345091 Quacker Street contacted the Ministry and the County with a number of concerns related to their newly acquired property being located adjacent to the former Holbrook Landfill. The County and the Ministry provided a number of responses to the complainant's inquiries and the County issued a letter, at the complainant's request, detailing the site history, County's roles and responsibilities for the annual monitoring both on and off-site, and ongoing maintenance of the former Holbrook Landfill property and associated CAZ/buffer lands. For clarity the letter also states that "the County as the landfill owner is responsible for any mitigation measures that may be necessary to ensure environmental compliance. In the event of environmental impacts to an adjacent property, the County would notify the property owner to discuss any actions that may be required."

The County documents all public complaints, contact information, and follow up actions taken in a Holbrook Communications Log which was provided for review as part of this inspection.

Question ID	NCL 42	**Question Type**	Information

Legislative Requirement(s):
EPA | 27 | (1);

Question:
Is there an ECA condition requiring financial assurance?

Compliance Response(s)/Corrective Action(s)/Observation(s):
No

Financial assurance is not a requirement for municipally owned landfill sites therefore there is no financial assurance associated with the Holbrook Landfill.

Question ID	NCL 45	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1);

Question:
At the time of inspection, there are no indications of inadequate waste management (no visible leachate seeping, no waste deposited illegally outside the landfill boundary, etc)?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

There was evidence of unauthorized site access through a cut fence in the back of the property and ATV/bicycle activity observed along unofficial trails towards the back of the property during the onsite inspection on May 14, 2025. Sections of these unofficial trails transverse on the landfill cap which has resulted in the integrity of the landfill cap being eroded, exposing some waste debris.

During the inspection, County officials indicated that the back fence would be promptly repaired with "No Trespass" signage reinstalled. Clay cap material would be applied to the areas where the integrity of the cap has been compromised. The County plans to create vegetation berms along the back trails to prevent future passage.

Question ID	NCL 46	**Question Type**	Legislative

Legislative Requirement(s):
EPA | 27 | (1);

Question:
Has the Certificate of Requirement been registered on Title?

Compliance Response(s)/Corrective Action(s)/Observation(s):
Yes

Condition 15 of ECA #: A070702 required the Owner to register the Certificate of Requirement for the landfill property at the appropriate Land Registry Office on the title to the property and submit to the Director and District Manager, written verification that the Certificate of Requirement has been registered on title.

On November 04, 2016, the County met the obligation under Condition 15 of ECA #: A070702.

Question ID	949100	**Question Type**	Legislative

Legislative Requirement(s):
Not Applicable

Question:
Were the inspection questions sufficient to address other identified non-compliance items?

Compliance Response(s)/Corrective Action(s)/Observation(s):

Weather Conditions:

On May 14, 2025 at 11:00am from Norwich weather data on Ventusky
Temperature: 19°C
Wind speed: 17km/hr
Wind direction: Southeast
Humidity: 80%
Pressure: 1012hPa
Conditions: Overcast

Ontario

Ministry of the Environment, Conservation and Parks

733 Exeter Road
London ON N6E 1L3
Tel': 519 873-5000
Fax: 519 873-5020

Ministère de l'Environnement, de la Protection de la nature et des Parcs

733, rue Exeter
London ON N6E 1L3
Tél.: 519 873-5000
Téléc.: 519 873-5020

November 7th 2025

Memorandum

To: Heather Mitchell, Senior Environmental Officer
Ministry of the Environment, Conservation and Parks, London District Office

From: Helene Pierard, P.Geo, Hydrogeologist
Ministry of the Environment, Conservation and Parks, SWR, Technical Support Section

Re: Holbrook Landfill Site – Groundwater Comments – Follow up of Site Inspection

---

I reviewed the October 6th 2025 letter from the county of Oxford which included a letter dated June 17th 2025 from WSP Canada Inc. (WSP) regarding the 2022 Holbrook Landfill Annual Monitoring Report and our site visit of May 14th 2025. This landfill site is located on lots 20 and 21, Concession III in the Township of Norwich, Oxford County. The site, closed since 1986, operates under ECA No. A070702 most recently updated in 2018.

The purpose of my review is to assess the hydrogeological aspects of the report and verify compliance with the Reasonable Use Guideline (B-7). Based on my review of the response from WSP, some of my comments/concerns remain unresolved. Additional information and resolutions should be provided in the next annual monitoring report (2025 AMR).

- In 2022, the shallow groundwater quality complied with RUG with the exception of hardness, chloride, alkalinity, sodium and DOC at MW 26R and hardness and nitrate at MW 44. The deeper groundwater quality complied with RUG with the exception of hardness and iron at all 3 boundary monitoring wells (i.e. MW27, MW37R and MW38).

  After reviewing the PFAS sampling results, which were present in the leachate as well as in MW26R in concentration greater than 30 mg/L, additional investigative work and/or review of the data should be undertaken. The annual report should incorporate all the analytical data available for the site. The report should also include a workplan and steps that will be taken to address leachate impacted groundwater originating from the site which may be migrating off-site.

- I continue to disagree with the Consultant and believe that MW26R is located downgradient and is impacted by the landfill mound. The PFAS-related information reinforces this point.

The Well Condition Inspection Form for OW27 is misleading. If the wait-and-see approach is considered, the casing of this well must, at the very least, be extended.

Having monitoring wells from which representative samples of groundwater can be sampled is important especially for boundary wells used for compliance purposes.

- I would like the Consultant to provide at least one additional cross-section for the site. This new north-south cross-section must include MW10R, MW41, MW46, MW45 and MW26R.
- Landfill gas – Before conclusions can be drawn about the risk of landfill gas at the site, meaningful data needs to be collected and reviewed. If the 2 of the 3 gas probes aren't giving us meaningful gas information, this program is not working. Useless information does not serve anyone. It would also be helpful to design the gas monitoring in a manner that informs risks relative to the receivers; let's rethink the locations and construction of the gas probes. If gas monitoring is going to be useful, then the monitoring needs to be meaningful. The consultant should prepare a revised gas monitoring plan for ministry review. The plan should also include information collected from OW41.
- Artesian/Flowing Conditions – Artesian conditions have been noted at several well locations (e.g. 19R, 26R, 27, 45 and 46). Most of the artesian wells have been equipped with J-plugs or packers. Most of my concerns remain unaddressed, particularly regarding the appropriateness of shutting-in the wells and winterizing the wells.

  A temporary casing has been reported to be used at MW26R, MW27 and MW45 to measure the height of the water above the top of the casing. We should discuss the storage of the temporary casings.

  I am also following up with the licensed well technician in regards to the casing repairs/extension done at MW27. It would be helpful if a photograph of upgraded well MW27 was provided.

Pease let me know if you have any questions. It might be best to have a meeting to discuss the above.

Helene Pierard

STATEMENT OF LIMITATIONS

The purpose of the preceding review is to provide advice to the Ministry of the Environment, Conservation and Parks regarding subsurface conditions based on a review of the information provided in the above referenced document. The conclusions, opinions and recommendations of the reviewer are based on information provided by others. The Ministry cannot guarantee that the information that has been provided by others is accurate or complete. A lack of specific comment by the reviewer is not to be construed as endorsing the content or views expressed in the reviewed material.

December 3, 2025 Project No. CA0024089.5055-02

Heather Mitchell, Senior Environmental Officer
Ministry of the Environment, Conservation and Parks
London District Office
733 Exeter Road
London, ON N6E 1L3

RESPONSE TO MECP COMMENTS
HOLBROOK LANDFILL
GROUNDWATER COMMENTS – FOLLOW UP OF SITE INSPECTION

Dear Ms. Mitchell:

WSP Canada Inc. (WSP) was retained by the County of Oxford (County) to provide environmental engineering consultation services regarding the closed Holbrook Landfill site, located on Part of Lots 20 and 21, Concession III near the village of Holbrook in the Township of Norwich (Site). The Site is a closed landfill which has not accepted waste for landfilling since 1986. The Site is currently operated under Ministry of the Environment, Conservation and Parks (MECP) Amended Environmental Compliance Approval (ECA) No. A070702, dated March 6, 2018.

A Hydrogeologist from the Technical Support Section of the MECP completed a review of the October 6, 2025 letter from the County, which was comprised as a response to the MECP's site visit on May 14, 2025. The County's October 2025 letter included a response letter prepared by WSP, dated June 17, 2024, regarding MECP technical review comments on the 2022 Holbrook Landfill Annual Monitoring Report (AMR). It is noted that the WSP's response letter was provided to the MECP in June 2024, not June 2025 as referenced in the MECP's memorandum on November 7, 2025.

A meeting was held on December 1, 2025, to discuss the comments. In the November 7, 2025 memorandum and in the meeting, the MECP requested that additional information and resolutions be provided in the next AMR. The County has also requested WSP to create a formal response now, in order to summarize and document the resolutions determined within the meeting. This letter has been prepared to address this request. A Site Plan is also appended to this letter for reference.

Response to Comments

The MECP comments from the November 7, 2025 Memorandum are provided below in *italics*, followed by WSP's response and/or resolutions to each comment.

Comment 1: *The purpose of my review is to assess the hydrogeological aspects of the report and verify compliance with the Reasonable Use Guideline (B-7). Based on my review of the response from WSP, some of my comments/concerns remain unresolved. Additional information and resolutions should be provided in the next annual monitoring report (2025 AMR).*

Response: Noted, and we will add additional information to the 2025 AMR accordingly.

Comment 2: *After reviewing the PFAS sampling results, which were present in the leachate as well as in MW26R in concentration greater than 30mg/L, additional investigative work and/or review of the data should be undertaken. The annual report should incorporate all the analytical data available for the site. The report should also include a workplan and steps that will be taken to address leachate impacted groundwater originating from the site which may be migrating off-site.*

Response: Within the meeting on December 1, 2025, WSP gave a brief overview of the former PFAS sampling program completed at the Site, as noted in WSP's previous response (WSP, June 2024).

The objective for per- and polyfluoroalkyl substances (PFAS) in drinking water represents a precautionary group-based approach. The objective value of 30 ng/L (for the sum total of 25 specific PFAS) was established to reduce exposure to PFAS in drinking water (Health Canada, August 2024).

When the PFAS results were collected (voluntarily) from select groundwater monitoring wells at the Site in 2021, 2022 and 2023, this objective was not yet formulated. Samples have not been collected for PFAS at the Site since that time. It is agreed that the sum total of the specific PFAS included in this objective was greater than 30 ng/L in both the leachate at MW41 and the groundwater at MW26R.

Further discussion occurred within the meeting regarding the assertion that MW26R is located downgradient and is currently impacted by the landfill mound. An additional north-south cross-section of the Site was prepared for the meeting, and was presented for discussion. Recent groundwater flow data within monitoring wells MW26R, MW45 and MW46 was also discussed. Based upon the most recent data, it is possible that MW26R could be considered cross-gradient, but groundwater elevations at MW45 continue to show shallow groundwater flow north, towards MW46 and the landfill mound. The MECP recommended that an updated survey be considered for the wells, to ensure the data is accurate.

Regardless of the noted groundwater flow data, recent concentrations have shown a marked decrease for a number of parameters at MW26R. Please see below for a summary of compliance with the Reasonable Use Guideline (B-7) for 2025, along with historical data since 2020. Parameter concentrations in 2025 complied with the Reasonable Use Guideline (B-7) at MW26R. This data will be presented in the 2025 AMR.

Parameter	Reference Quality (2025)	ODWQS	Guideline B-7 (2025)	Monitoring Well 26R					
				2025	2024	2023	2022	2021	2020
Hardness	391	80-100	**391 †**	364	389	412	609	657	601
Chloride	20	250	**135**	87	70	150	240	260	265
Sulphate	42	500	**271**	29	30	26	24	21	14.8
Alkalinity	353	30-500	**427**	374	387	451	586	601	658
Sodium	9.7	200	**105**	70.0	76.5	101	186	183	182
Nitrate	<0.06	10.0	**2.52**	<0.06	<0.06	<0.06	<0.06	<0.06	<0.10
Nitrite	<0.03	1.0	**0.26**	<0.03	<0.03	<0.03	<0.03	<0.03	<0.050
DOC	5.7	5	**5.7 †**	3.4	9.0	5.4	8.2	9.8	10.6
Boron	0.019	5.0	**1.26**	0.579	0.638	0.770	1.27	1.41	1.73
Chromium	<0.003	0.05	**0.014**	<0.003	<0.003	0.00035	0.00057	0.00053	<0.0050
Iron	4.04	0.3	**4.04 †**	1.22	1.23	1.46	1.96	2.19	2.06
Manganese	0.292	0.05	**0.292 †**	0.027	0.027	0.0334	0.0394	0.045	0.0406
Vinyl Chloride (µg/L)	<0.2	1	**0.33**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5
Benzene (µg/L)	<0.5	1	**0.44**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4 Dichlorobenzene (µg/L)	<0.5	5 MAC 1 AO	**1.44** **0.63**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Notes:
- All concentrations are mg/L unless otherwise noted.
- ODWQS - Ontario Drinking Water Quality Standards (June 2003)
- Shading indicates concentrations exceed Guideline B-7 criteria.
- Reference quality based on 2025 groundwater quality measured from background observation well 40.
- † When the reference concentration is greater than the ODWQS, the reference value is used as the Guideline B-7 Criterion.

It is possible that groundwater quality in the vicinity of MW26R was previously impacted by historical landfilling activities, but it currently appears that previous impacts have decreased to a point where all concentrations met the Reasonable Use Guideline (B-7) Criterion in 2025.

The County agreed to complete a new supplementary sampling event for PFAS compounds at MW26R, MW45 and MW46, considering the significant change in other indicator parameter concentrations since the 2023 PFAS sampling event. This supplemental PFAS sampling event will be completed in 2026, with the results being reported in the 2026 AMR.

Comment 3: *I continue to disagree with the Consultant and believe that MW26R is located downgradient and is impacted by the landfill mound. The PFAS-related information reinforces this point.*

Response: Please see our summary/response to Comment 2, above.

Comment 4: *The Well Condition Inspection Form for OW27 is misleading. If the wait-and-see approach is considered, the casing must, at the very least, be extended.*

Response: The well condition inspection form for OW27 was completed in June 2025, prior to repairs/extension of the well in August 2025. In the meeting, WSP provided updated pictures of the well after the well's protective casing was raised by a licensed drilling contractor.

The MECP noted they contacted the licensed drilling contractor and requested that a separate well record/tag be submitted for this repair, as opposed to the cluster well record/tag previously submitted.

Comment 5: *Having monitoring wells from which representative samples of groundwater can be sampled is important especially for boundary wells used for compliance purposes.*

Response: Agreed.

Comment 6: *I would like the Consultant to provide at least one additional cross-section for the site. This new north-south cross-section must include MW10R, MW41, MW46, MW45 and MW26R.*

Response: Please see attached for this additional cross-section. As noted in the meeting, MW26R, MW45 and MW46 are each screened at a similar elevation within the overburden. It is noted that the stratigraphy between borehole locations, as shown on the cross-sections, is highly inferred and difficult to interpolate, particularly under the waste mound, as historical information is generally unavailable. Intrusive investigations have not been considered to fill this data gap, as they would be detrimental to the integrity of the waste containment, creating possible conduits for leachate migration.

Comment 7: *Landfill gas – Before conclusions can be drawn about the risk of landfill gas at the site, meaningful data needs to be collected and reviewed. If 2 of the 3 gas probes aren't giving us meaningful gas information, this program is not working. Useless information does not serve anyone. It would also be helpful to design the gas monitoring in a manner that informs risks relative to receivers; let's rethink the locations and construction of the gas probes. If gas monitoring is going to be useful, then the monitoring needs to be meaningful. The consultant should prepare a revised gas monitoring plan for ministry review. The plan should also include information collected from OW41.*

Response: Within the meeting on December 1, 2025, WSP gave a brief overview of the current landfill gas monitoring program completed at the Site and the historical reasoning for the inclusion of these gas probes, as outlined in WSP's previous response (WSP, June 2024).

As discussed, geological conditions at the Site are not favourable for landfill gas migration, even if landfill gas could reach the boundaries of the Site, due to the generally elevated groundwater levels with the shallow flow system. The elevated groundwater levels often result in flooding the screens of the landfill gas probes, which were installed as shallow as possible to provide the best chance of capturing any landfill gas migration.

The County is open to revising the landfill gas monitoring program. Two potential receivers are located to the southeast of the Site, at domestic well sampling locations D-1 and D-2. As discussed within the meeting, it would be prudent to install a shallow gas probe (approximately 3 m in depth) in the area of OW28R, which could provide landfill gas information in relation to these receivers. At OW28R, the average groundwater elevation over the last ten years is 275.12 mASL, which is 2.60 m below the ground surface. As such, a 3 m deep gas probe installed with a 2 m long screen should be representative of gas migration through the shallow overburden in this area of the Site.

Landfill gas monitoring will also be conducted at leachate well OW41 moving forward, in order to monitor the lifecycle of the landfill and the potential for landfill gas movement. This has already been enacted and planned for 2026. A new cap with a spigot was added to leachate well OW41 during the well restoration program completed in the summer of 2025, in order to measure the concentrations and pressure of landfill gas within the well.

Comment 8: *Artesian/Flowing Conditions – Artesian conditions have been noted at several well locations (eg. 19R, 26R, 27, 45 and 46). Most of the artesian wells have been equipped with J-plugs or packers. Most of my concerns remain unaddressed, particularly regarding the appropriateness of shutting-in the wells and winterizing the wells.*

Response: As discussed in the meeting, there was a simple miscommunication between the MECP and WSP. Packers are used in all the highly artesian wells at the Site, whereas J-plugs are only used in wells that intermittently have water levels that are close to ground surface.

It is agreed that J-plugs are inappropriate for use in monitoring wells with groundwater levels and pressures well above the ground surface, as packers need to be used to shut-in the groundwater flow and winterize.

Comment 9: *A temporary casing has been reported to be used at MW26R, MW27 and MW45 to measure the height of the water above the top of the casing. We should discuss the storage of the temporary casings.*

Response: As described in the meeting, translucent PVC riser pipes are temporarily added to the top of the PVC riser of the well, during the collection of groundwater elevations. After a groundwater elevation is collected at an artesian well, the temporary translucent PVC riser pipe is removed. The temporary extension pipes are brought back to our WSP office and stored there until the next monitoring event. It is also noted that these temporary extension pipes are dedicated to their specific groundwater monitoring well and are not used for any other wells, to avoid any possible cross contamination.

Comment 10: *I am following up with the licensed well technician in regards to the casing repairs/extension done at MW27. It would be helpful if a photograph of the upgraded well MW27 was provided.*

Response: As shown in the meeting, please see below for pictures of MW27 after the extension was completed to the PVC riser pipe, and the existing protective casing was raised accordingly. The first picture shows the lid of the protective casing open, displaying the installed groundwater packer within the riser pipe. The second picture shows the lid of the casing closed.

We trust that this submission is sufficient for your current needs. If you have any questions or comments, please do not hesitate to contact us.

WSP Canada Inc.

Albert Siertsema, P.Eng., PMP
Project Engineer
Earth & Environment

Attachments: Memorandum provided by MECP (dated November 7, 2025)
Site Plan
Cross Section D-D'

KEY MAP

SCALE: 1:250,000

LEGEND

● D-2	DOMESTIC WELL
SG1 ⌖	STAFF GAUGE
● SP3R	STANDPIPES
⌖ 23	DECOMMISSIONED MONITORING WELL
⌖ 21R	DEEP AQUIFER MONITORING WELL
⌖ 21R	HISTORIC MONITORING WELL (ASSUMED LOCATION)
⊗ 41	LEACHATE MONITORING WELL
⌖ 28R	SHALLOW AQUIFER MONITROING WELL
▲ P01	SURFACE WATER SAMPLING LOCATION
➡	SURFACE WATER FLOW DIRECTION
⟷	CROSS SECTION
—	WATERCOURSE
—	PARCEL BOUNDARY
▭	HOLBROOK LANDFILL SITE

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. BASE MAP: VANTOR, SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
4. PARCEL FABRIC, PROPERTY BOUNDARIES PROVIDED BY OXFORD COUNTY, 2011

CLIENT
COUNTY OF OXFORD

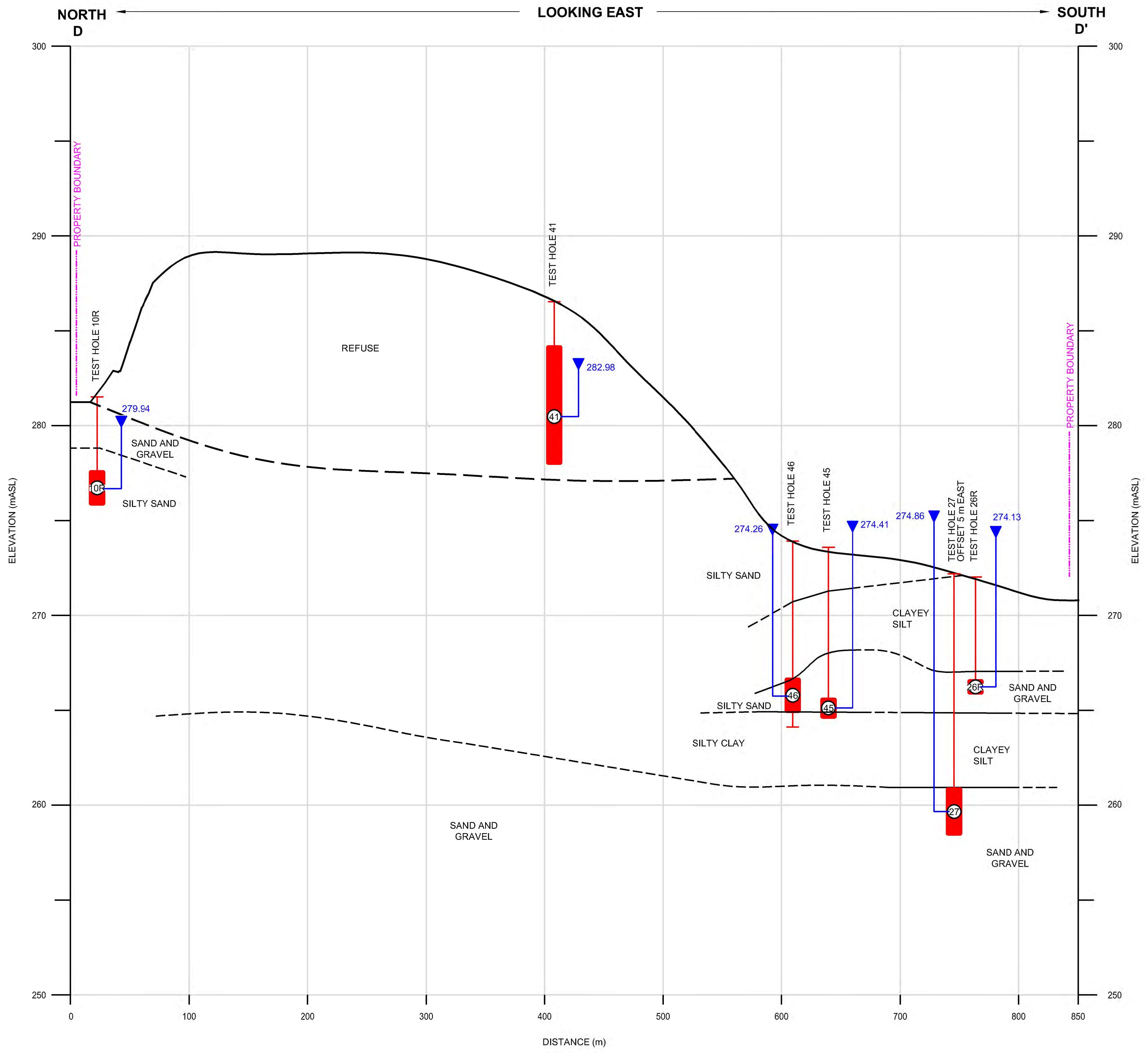
PROJECT
2025 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE, COUNTY OF OXFORD, ON

TITLE
SITE PLAN

CONSULTANT
wsp

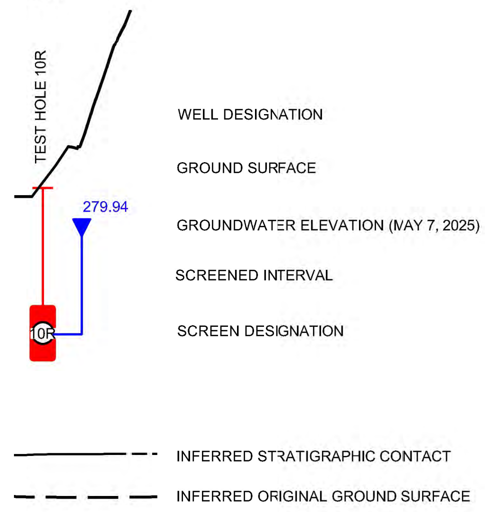
YYYY-MM-DD	2025-11-17
DESIGNED	----
PREPARED	VS
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV	FIGURE
CA0024089.5055	0001	0	2



HOR.SCALE 1:4,000 m
VERT. SCALE 1:250 m
D-D'
2
NORTH TO SOUTH CROSS-SECTION D-D'

LEGEND

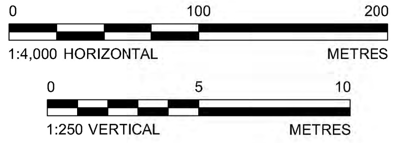


NOTE(S)

1. GEOLOGICAL SEQUENCES/CONTACTS HAVE BEEN INTERPOLATED AND MAY DIFFER FROM THAT DEPICTED.

REFERENCE(S)

1. GROUND SURFACE TOPOGRAPHY BASED ON INFORMATION PROVIDED IN "HYDROGEOLOGICAL INVESTIGATIONS, HOLBROOK SANITARY LANDFILL SITE, 1979-1982" BY MACLAREN ENGINEERS, OCTOBER 1982.
2. STRATIGRAPHY INTERPRETED FROM BOREHOLES LOGGED BY VARIOUS CONSULTANTS.



DRAFT

CLIENT
COUNTY OF OXFORD

CONSULTANT

YYYY-MM-DD	2025-11-26
DESIGNED	-
PREPARED	INS
REVIEWED	RW
APPROVED	RW

PROJECT
2025 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE
COUNTY OF OXFORD, ONTARIO

TITLE
CROSS SECTION D-D'

PROJECT NO.	CONTROL	REV.	FIGURE
CA0024089.5055	0001	A	6

APPENDIX B

Borehole Logs and 2025 Well Condition Inspection Forms

GEOLOGICAL LOG

TEST HOLE No. 2

SHEET 1 OF 1

EL (m) / DEPTH (m)	DESCRIPTION	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
279.6	GROUND SURFACE		1.37 m		
0.0		CLAY			
	Yellowish grey loose very fine sandy silt		1	SS	9
			2	SS	6
275.9 3.7	Grey compact layered silty fine to medium gravelly very fine to coarse sand		3	SS	10
		BACKFILL	4	SS	20
			5	SS	13
	Grey interlayered compact fine sand and medium to coarse sand near base	AND	6	SS	14
268.6 11.0	Grey clayey silt (grey silty sand with some clay from above)		7	SS	15
		CAVE	8	SS	17
266.9 12.7	End of Hole				

NOTES

DATE DRILLED 1 May 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 2.5
(m below ground surface)

STATIC WATER LEVEL 2.9 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 276.7 Static Water Elevation (m GSD) (26 JUNE 1979) *

╪ Piezometer

MacLaren

MacLAREN
ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

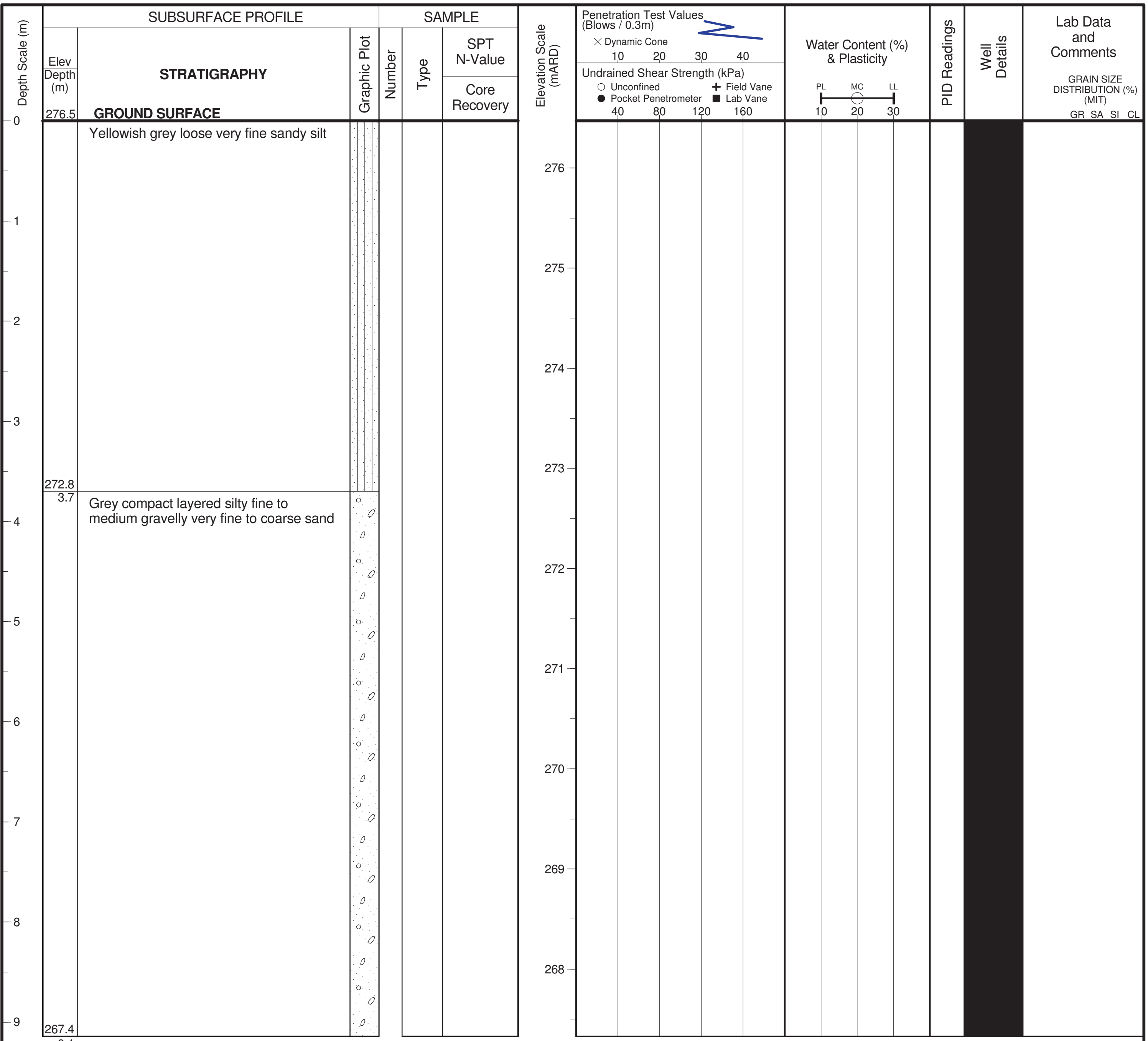
PROJECT NO. 11602-5

LOG OF BOREHOLE 2 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/30
supervisor | MEQ
reviewer | AMS



Elev Depth (m)	STRATIGRAPHY
276.5	**GROUND SURFACE**
	Yellowish grey loose very fine sandy silt
272.8 3.7	Grey compact layered silty fine to medium gravelly very fine to coarse sand
267.4 9.1	**END OF BOREHOLE**

Stratigraphy inferred from original borehole log for BH2 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

GEOLOGICAL LOG

TEST HOLE No. 4

SHEET 1 OF 1

SCALE (ft)(m)	EL (m) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	279.0	GROUND SURFACE		0.99 m			
	0.0 275.0	Brown fine gravelly clayey silt		CLAY CAVE AND BACKFILL	1 2	SS SS	6 14
	4.0 272.4	Brown interlayered fine sandy silt to silty fine sand and fine to medium sand overlying dense fine gravelly very fine to very coarse sand near base			3 4	SS SS	-- 31
	6.6	End of Hole					

NOTES

DATE DRILLED 1 May 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 3.8
(m below ground surface)

STATIC WATER LEVEL 2.4 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 276.6 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 4 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/24
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value / Core Recovery
0	279.3	**GROUND SURFACE**				
		Brown fine gravelly clayey silt				
4	275.3 4.0	Brown interlayered fine sandy silt to silty fine sand and fine to medium sand overlying dense fine gravelly very fine to very coarse sand near base				
6	273.2 6.1	**END OF BOREHOLE**				

Elevation Scale (mARD): 279, 278, 277, 276, 275, 274

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined ✚ Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Stratigraphy inferred from original borehole log for BH4 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

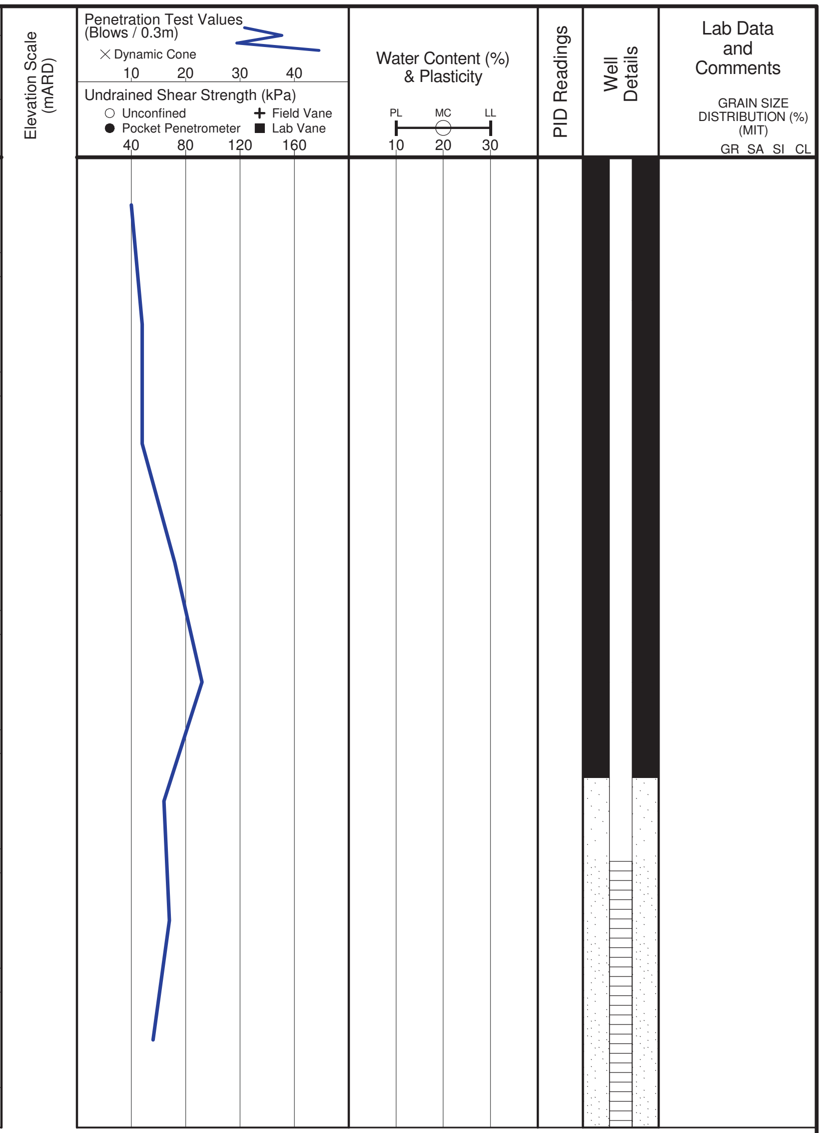
LOG OF BOREHOLE 4R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
position |

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

project no. | 111-53037-00 132-00
date started | 2014/09/24
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	SAMPLE Number	Type	SPT N-Value / Core Recovery
		GROUND SURFACE			
0		Brown **TOPSOIL** and organics, some roots, some clayey silt, dry, loose.	1	SS	10
1	0.6	Orangey brown to brown fine **SAND AND GRAVEL**, some silt, moist to wet, compact.	2	SS	12
2		Some roots and cobbles, red brown silty sand.	3	SS	12
			4	SS	18
3			5	SS	23
4	3.8	Grey brown coarse **SAND AND GRAVEL**, trace fine sand, trace silt, saturated, compact.	6	SS	16
5			7	SS	17
6			8	SS	14
	6.2	**END OF BOREHOLE**			



GEOLOGICAL LOG

TEST HOLE No. 5

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	278.7	GROUND SURFACE			1.03	m	
	0.0				CLAY		
1 5 - 2		Brown compact medium gravelly very fine to very coarse sand with layers of medium sand			1	SS	10
10 - 3					2	SS	14
4 15 - 5	273.2			CAVE AND BACKFILL	3	SS	19
20 - 6	5.5 271.8	Brown compact fine sandy silt and very fine sand			4	SS	20
7 25 - 8	6.9 269.6	Brown dense fine gravelly coarse to very coarse sand			5	SS	38
9 30	9.1	End of Hole					
10 35 - 11 40 - 12 13 45 - 14 15 50							

NOTES

DATE DRILLED 1 May 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 1.0
(m below ground surface)

STATIC WATER LEVEL 1.0 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 277.7 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 5 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/23
supervisor | MEQ
reviewer | AMS

Depth Scale (m)

SUBSURFACE PROFILE

SAMPLE: Number | Type | SPT N-Value | Core Recovery

Elevation Scale (mARD)

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Elev Depth (m)	STRATIGRAPHY
279.2	**GROUND SURFACE**
	Brown compact medium gravelly very fine to very coarse sand with layers of medium sand
273.7 5.5	Brown compact fine sandy silt and very fine sand
272.3 6.9	Brown dense fine gravelly coarse to very coarse sand
271.1 8.1	**END OF BOREHOLE**

Depth Scale (m): 0 1 2 3 4 5 6 7 8

Elevation Scale (mARD): 279 278 277 276 275 274 273 272

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH5 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 5R

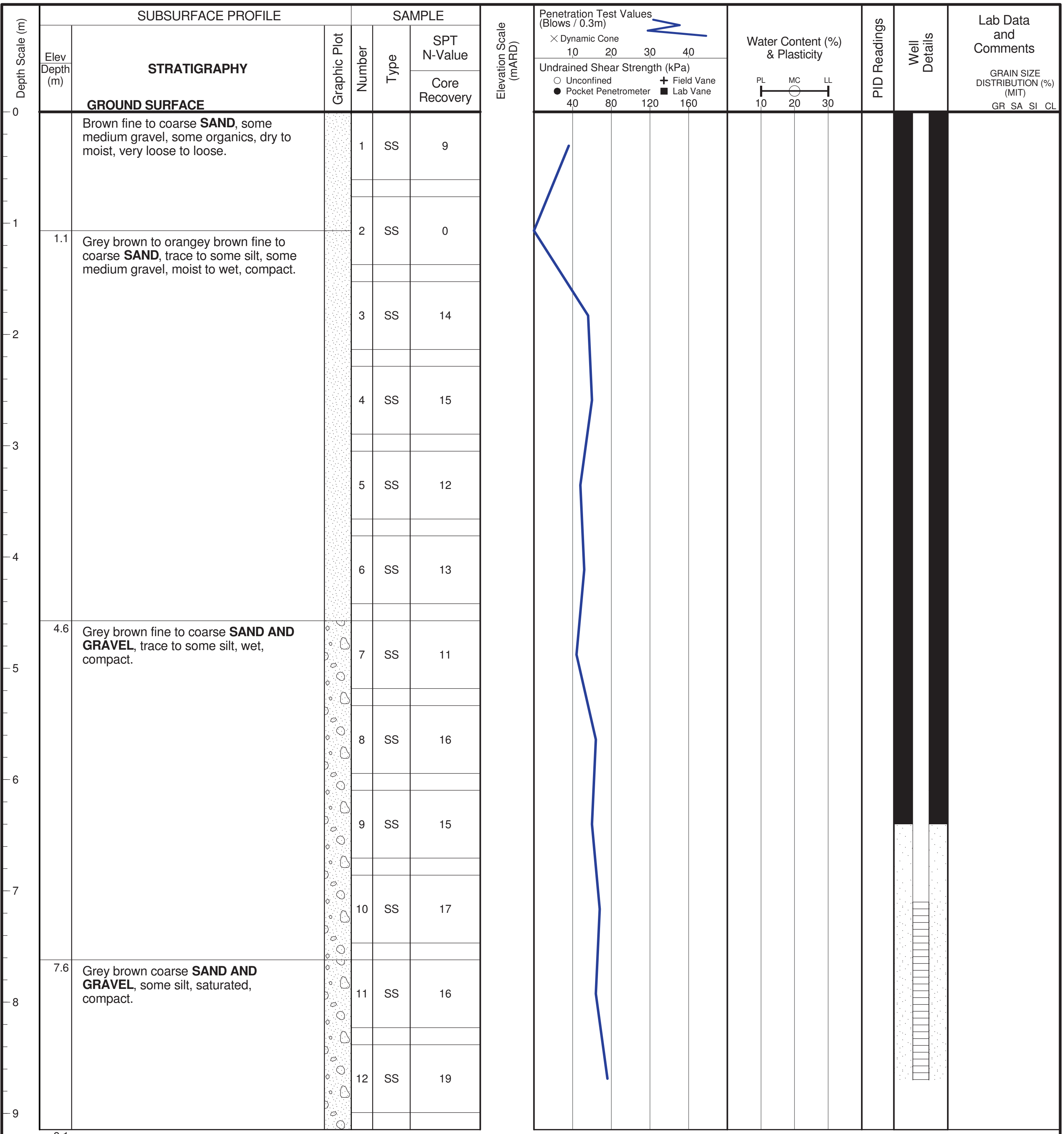
project | Holbrook Landfill Site
project no. | 111-53037-00 132-00
client | Oxford County
rig type | CME 75, track-mounted
date started | 2014/09/24
location | Holbrook, ON
method | Hollow stem augers, 215 mm dia.
supervisor | MEQ
position |
coring | *n/a*
reviewer | AMS

SUBSURFACE PROFILE

Elev Depth (m)	STRATIGRAPHY
0	**GROUND SURFACE**
0	Brown fine to coarse **SAND**, some medium gravel, some organics, dry to moist, very loose to loose.
1.1	Grey brown to orangey brown fine to coarse **SAND**, trace to some silt, some medium gravel, moist to wet, compact.
4.6	Grey brown fine to coarse **SAND AND GRAVEL**, trace to some silt, wet, compact.
7.6	Grey brown coarse **SAND AND GRAVEL**, some silt, saturated, compact.
9.1	**END OF BOREHOLE**

SAMPLE

Number	Type	SPT N-Value	Core Recovery
1	SS	9	
2	SS	0	
3	SS	14	
4	SS	15	
5	SS	12	
6	SS	13	
7	SS	11	
8	SS	16	
9	SS	15	
10	SS	17	
11	SS	16	
12	SS	19	

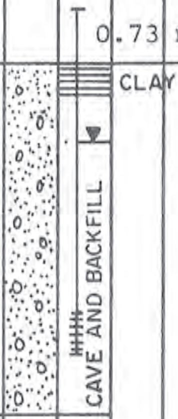


GEOLOGICAL LOG

TEST HOLE No. 6

SHEET 1 OF 1

SCALE (ft) (m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	278.7	GROUND SURFACE			0.73 m		
	0.0	Brown compact medium gravelly very fine to very coarse sand with layers of medium sand			CLAY		
	274.1 4.6	End of Hole					



NOTES

DATE DRILLED 1 May 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 1.0
(m below ground surface)

STATIC WATER LEVEL 1.0 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 277.7 Static Water Elevation (mGSD) (26 JUNE 1979) *

╪ Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 6 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/23
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	Graphic Plot	SAMPLE Number	Type	SPT N-Value Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	279.2	**GROUND SURFACE**										
		Brown compact to medium gravelly very fine to very coarse sand with layers of medium sand					279					
1							278					
2							277					
3							276					
	275.5 3.7											

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH6 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

GEOLOGICAL LOG

TEST HOLE No. 10

SHEET 1 OF 1

SCALE (ft)(m)	EL (m) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	280.0	GROUND SURFACE		0.95 m			
				CLAY			
	0.0	Brown compact fine to medium sand with fine gravel layers			1	SS	23
	277.7 2.3	Brown loose silty very fine sand		CAVE AND BACKFILL	2	SS	9
					3	SS	6
	275.0 5.0	End of Hole					

(ft) 5 10 15 20 25 30 35 40 45 50

(m) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

NOTES

DATE DRILLED 3 May 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 0.8
(m below ground surface)

STATIC WATER LEVEL 0.9 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS - SPLIT SPOON
WA - WASH

▽ 279.2 Static Water Elevation (m GSD) (26 JUNE 1979) *

╪ Piezometer

MacLaren

MacLAREN
ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 10 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/09
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 Undrained Shear Strength (kPa) ○ Unconfined ✚ Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	281.6	**GROUND SURFACE**										
		Brown compact fine to medium sand with fine gravel layers					281					
1							280					
2	279.3 2.3	Brown loose silty very fine sand					279					
3	278.3 3.4											

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH10 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

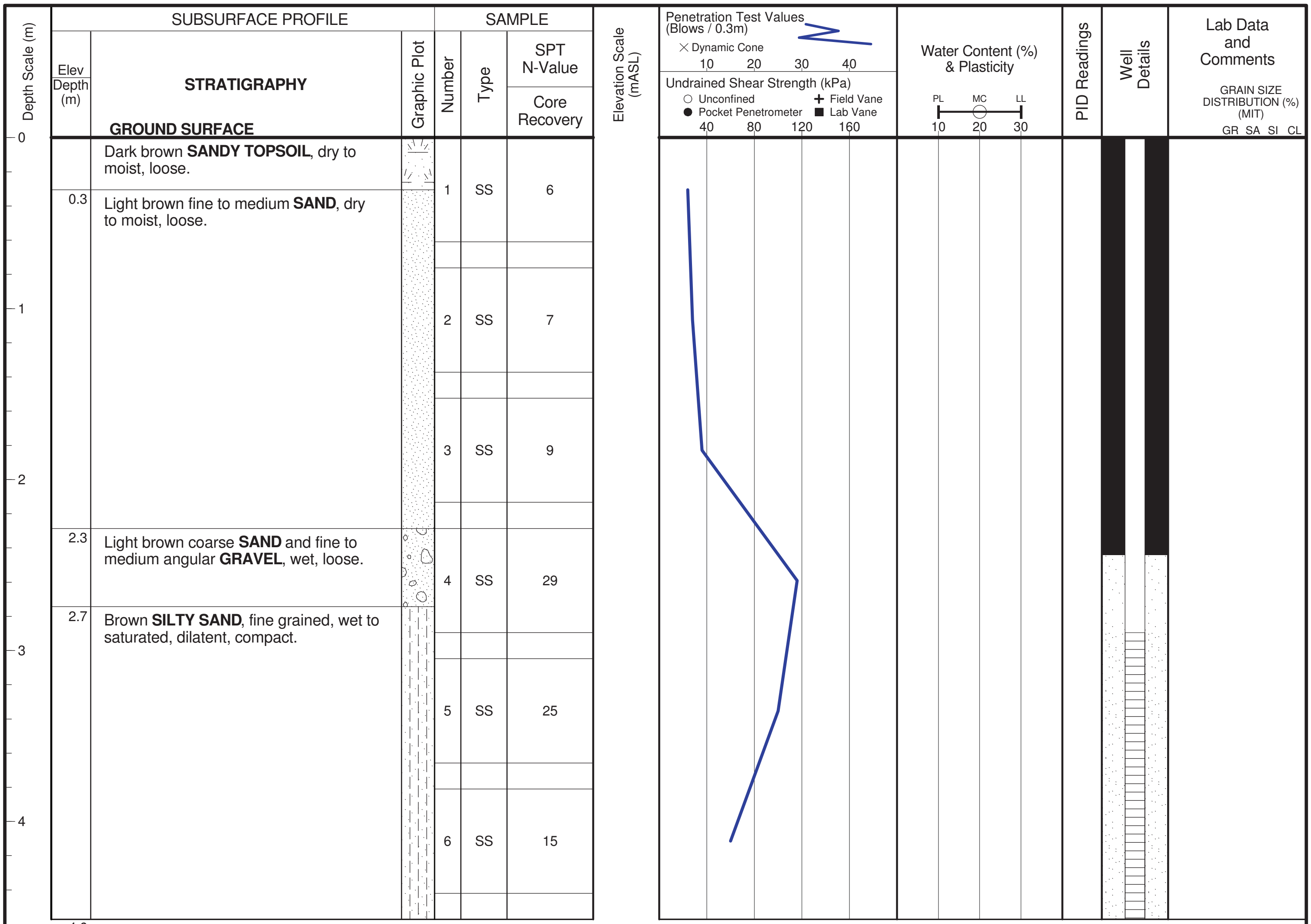
LOG OF BOREHOLE 10R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/09
supervisor | MEQ
reviewer | AMS

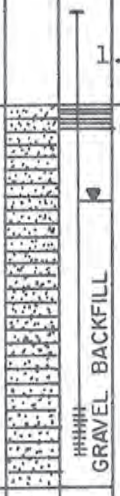
Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery
	GROUND SURFACE			
	Dark brown **SANDY TOPSOIL**, dry to moist, loose.	1	SS	6
0.3	Light brown fine to medium **SAND**, dry to moist, loose.	2	SS	7
		3	SS	9
2.3	Light brown coarse **SAND** and fine to medium angular **GRAVEL**, wet, loose.	4	SS	29
2.7	Brown **SILTY SAND**, fine grained, wet to saturated, dilatent, compact.	5	SS	25
		6	SS	15
4.6	**END OF BOREHOLE**			



library: genivar - library.glb report: gen log v1 file: bhlogs.gpj

GEOLOGICAL LOG

EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
				1.28	m	
280.5	GROUND SURFACE					
0.0	Brown clayey very fine sandy silt			CLAY		
				1	SS	9
			GRAVEL BACKFILL	2	SS	16
275.5				3	SS	16
5.0	End of Hole					



TEST HOLE No. 11

SHEET 1 OF 1

NOTES

DATE DRILLED 3 May 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 1.2 (m below ground surface)

STATIC WATER LEVEL 1.3 * (m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 279.1 Static Water Elevation (m GSD) (26 JUNE 1979) *

╪ Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 11 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/15
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	Graphic Plot	SAMPLE Number	Type	SPT N-Value Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	280.8	**GROUND SURFACE**										
		Brown clayey very fine sandy silt										
1							280					
2							279					
3							278					
4							277					
	276.3 4.5											

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH11 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 11R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

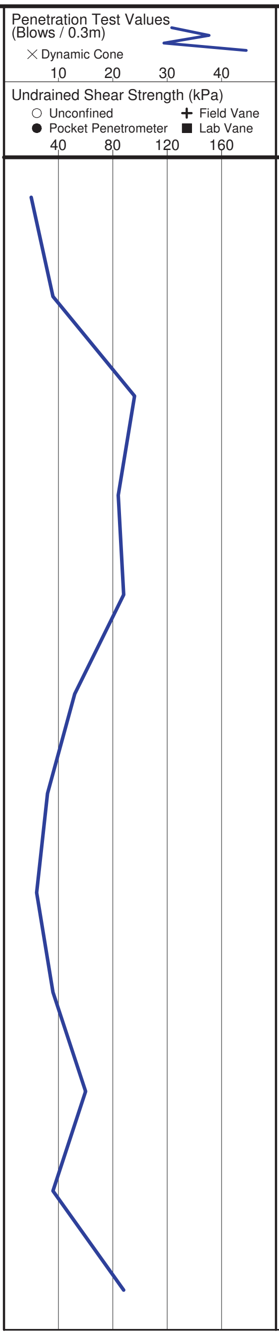
rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/24
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	SUBSURFACE PROFILE: STRATIGRAPHY	SAMPLE: Number	SAMPLE: Type	SAMPLE: SPT N-Value / Core Recovery
	GROUND SURFACE			
	Dark brown **TOPSOIL**, some fine silty sand, rootlets, moist, loose.	1	SS	5
0.3	Reddish brown fine to medium **SAND**, trace gravel, dry to moist, loose, compact below 1.5 m.	2	SS	9
		3	SS	24
		4	SS	21
3.1	Reddish brown fine **SAND**, trace to some silt, trace fine gravel, wet, compact.	5	SS	22
		6	SS	13
4.6	Reddish brown **SANDY SILT**, trace clay, wet, stiff.	7	SS	8
5.3	Grey-brown **CLAYEY SILT**, some fine to medium sand, APL to WTPL, stiff.	8	SS	6
		9	SS	9
6.9	Grey-brown **SANDY SILT**, trace clay, trace fine to medium gravel, wet, compact.	10	SS	15
		11	SS	9
8.4	Grey **CLAYEY SILT**, some gravel, trace sand, DTPL, very stiff.	12	SS	22
9.0	**END OF BOREHOLE**			

Depth Scale (m)

Elevation Scale (mASL)



Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

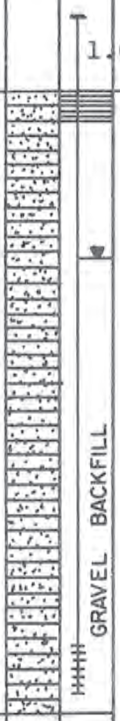
Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

GEOLOGICAL LOG

TEST HOLE No. 12

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	280.5	GROUND SURFACE		1.01 m			
	0.0	Brown clayey very fine sandy silt		CLAY GRAVEL BACKFILL			
20 / 6					1	SS	--
25 / 8					2	SS	20
	272.4 8.1	End of Hole					



NOTES

DATE DRILLED 3 May 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 1.2
(m below ground surface)

STATIC WATER LEVEL 2.2 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 278.3 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

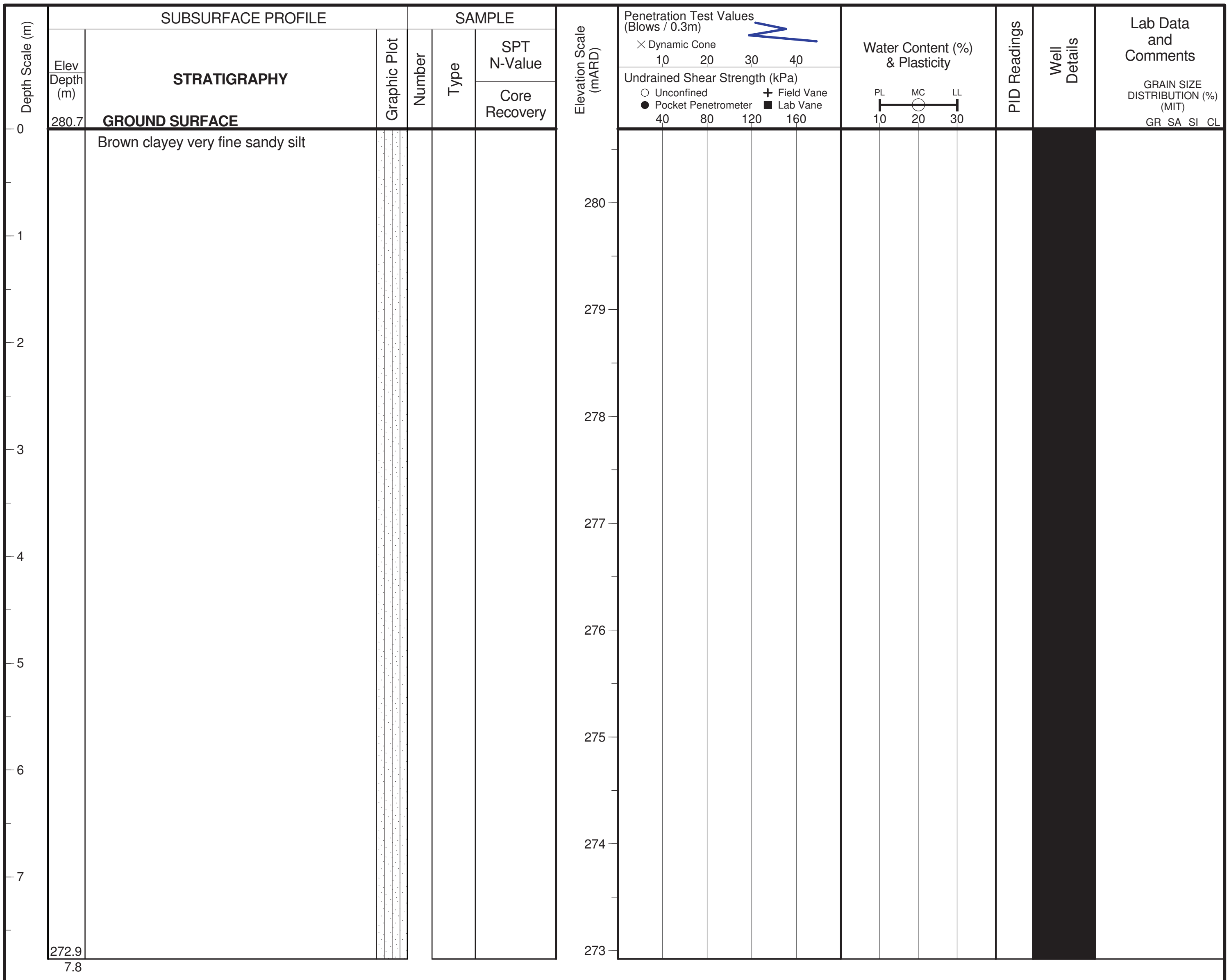
PROJECT NO. 11602-5

LOG OF BOREHOLE 12 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/16
supervisor | MEQ
reviewer | AMS



END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH12 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpi

GEOLOGICAL LOG

TEST HOLE No. 13

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	273.8	GROUND SURFACE		0.88 m			
	0.0	Brown mottled silt near surface overlying Brown compact silty very fine sand			CLAY		
5 / 1					1	SS	24
2	271.7 2.1						
10 / 3		Grey/brown fine gravelly very fine sandy clayey silt			2	SS	15
15 / 4 / 5					3	SS	18
20 / 6					4	SS	16
25 / 7					5	SS	15
8	265.7 8.1						
30 / 9 / 10 / 35 / 11 / 12 / 40 / 13 / 45 / 14 / 15 / 50							

NOTES

DATE DRILLED 13 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND -
(m below ground surface)

STATIC WATER LEVEL 2.2 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 271.6 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

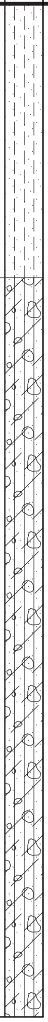
G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 13 Decommissioning

project	Holbrook Landfill Site				
client	Oxford County	**rig type**	CME 75, track-mounted	**date started**	2014/09/25
location	Holbrook, ON	**method**	Hollow stem augers, 215 mm dia.	**supervisor**	MEQ
project no.	*111-53037-00 132-00*	**coring**	*n/a*	**reviewer**	AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE: STRATIGRAPHY	Graphic Plot	SAMPLE: Number	Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40; Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	274.1	**GROUND SURFACE**										
		Brown mottled silt near surface overlying brown compact silty very fine sand.					274					
1							273					
2	272.0 2.1	Grey/brown fine gravelly very fine sandy clayey silt					272					
3							271					
4							270					
5							269					
6							268					
7							267					
	266.3 7.8											



END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH13 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpi

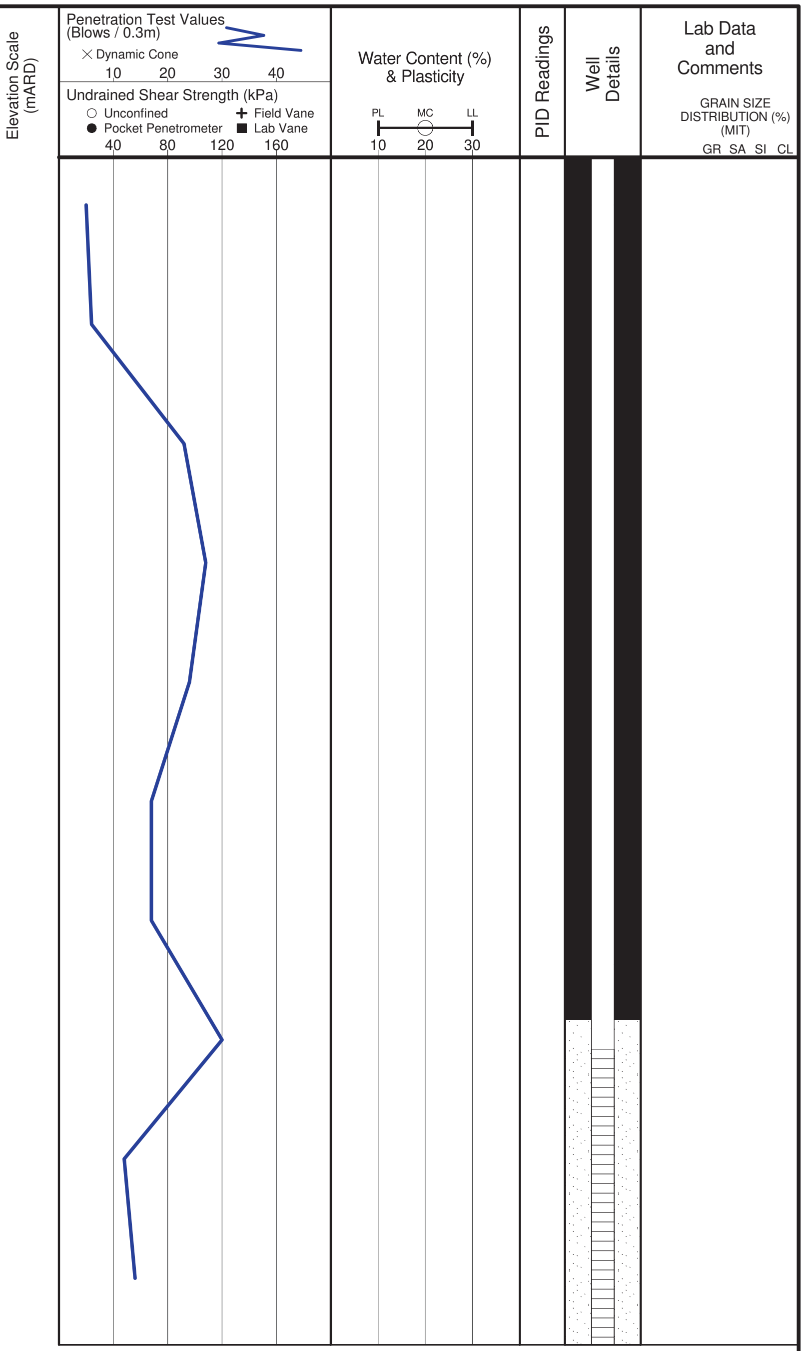
LOG OF BOREHOLE 13R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
position |

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

project no. | 111-53037-00 132-00
date started | 2014/09/25
supervisor | SCL
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery
		GROUND SURFACE			
0		Orangey brown **SILTY SAND**, trace rootlets and roots, some fine to coarse sand, trace gravel, moist, loose.	1	SS	5
1			2	SS	6
	1.5	Orangey brown fine to medium **SAND**, some silt, some rounded gravel, moist to wet, compact.	3	SS	23
2			4	SS	27
3		Increasing presence of coarse gravel and cobbles at 3 m.	5	SS	24
	3.8	Orangey brown **SANDY SILT**, becoming grey brown below 5 m, trace fine rounded gravel, dilatent, APL, very stiff.	6	SS	17
5			7	SS	17
			8	SS	30
6	6.1	Grey **SILT**, some clay, trace to some fine sand, trace rounded gravel, weakly dilatent, APL to WTPL, stiff.	9	SS	12
7			10	SS	14
	7.6	**END OF BOREHOLE**			



GEOLOGICAL LOG

TEST HOLE No. 14

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	275.5	GROUND SURFACE		1.23 m			
1 5	0.0 273.7	Grey gravelly clayey fine sandy silt overlying grey compact silty fine sand			CLAY 1	SS	16
2 10 3	1.8 271.5	Grey fine gravelly clayey very fine to fine sandy silt			2	SS	9
4 15 5 20 6	4.0 268.9	Grey dense interlayered fine, medium and coarse sand, sandy gravel and gravelly sand. (Grey silty very fine sand at base).			3 4	SS SS	40 42
7 25 8 30 9 10 35 11 40 12 13 45 14 15 50	6.6	End of Hole					

NOTES

DATE DRILLED 13 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 0.8
(m below ground surface)

STATIC WATER LEVEL +0.7 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 276.2 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 14 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/17
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE: STRATIGRAPHY
	275.9	**GROUND SURFACE**
0		Grey gravelly clayey fine sandy silt overlying grey compact silty fine sand
1	274.3 1.6	Grey fine gravelly clayey very fine to fine sandy silt
2, 3, 4	271.9 4.0	Grey dense interlayered fine, medium and coarse sand, sandy gravel and gravelly sand. (Grey silty very fine sand at base).
	270.9 5.0	**END OF BOREHOLE**

SAMPLE: Graphic Plot | Number | Type | SPT N-Value / Core Recovery

Elevation Scale (mARD): 275, 274, 273, 272, 271

Penetration Test Values (Blows / 0.3m): × Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): ○ Unconfined, + Field Vane, ● Pocket Penetrometer, ■ Lab Vane 40 80 120 160

Water Content (%) & Plasticity: PL MC LL 10 20 30

PID Readings

Well Details

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Stratigraphy inferred from original borehole log for BH14 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

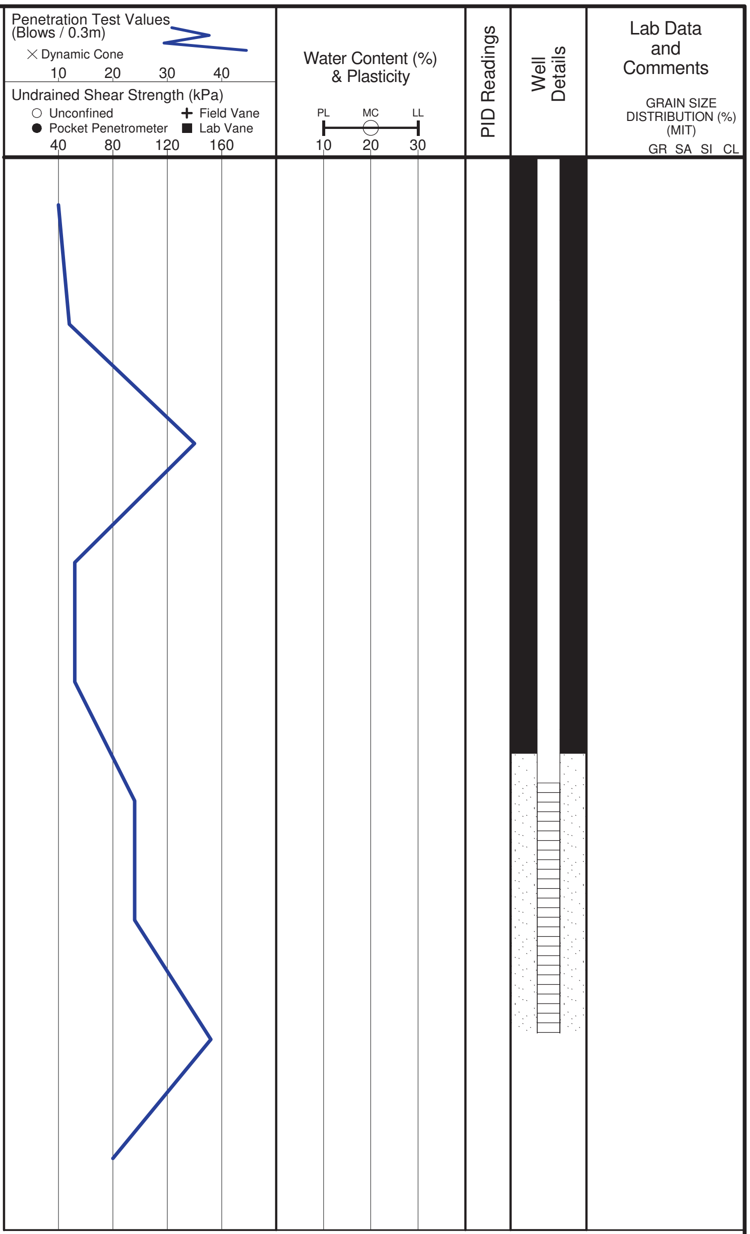
LOG OF BOREHOLE 14R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
position |

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

project no. | 111-53037-00 132-00
date started | 2014/09/17
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	SAMPLE Number	Type	SPT N-Value Core Recovery
	GROUND SURFACE			
	Brown grey **CLAYEY SILT**, with orange striations, some sandy silt, trace medium gravel, trace organics, DTPL to APL, firm.	1	SS	10
		2	SS	12
1.5	Brown grey fine **SILTY SAND**, some medium gravel, wet, loose to compact.	3	SS	35
2.6	Grey **CLAYEY SILT**, trace fine gravel, trace sand, APL to WTPL, firm.	4	SS	13
		5	SS	13
3.8	Grey medium to coarse **SAND AND GRAVEL**, some sandy silt, trace clay, saturated, compact to dense.	6	SS	24
	Increasing presence of coarse gravel and cobbles at 5 m.	7	SS	24
		8	SS	38
		9	SS	20
6.9	**END OF BOREHOLE**			



Depth Scale (m): 0 1 2 3 4 5 6

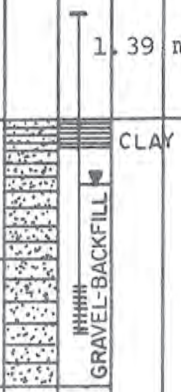
Elevation Scale (mARD)

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpi

GEOLOGICAL LOG

TEST HOLE No. 14A

SHEET 1 OF 1



SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	275.5	GROUND SURFACE					
1 5	0.0 273.7	Grey gravelly clayey fine sandy silt overlying grey compact silty fine sand					
2 3 10	1.8 272.1	Grey fine gravelly clayey very fine to fine sandy silt					
4 15 5 6 20 7 25 8 9 30 10 35 11 12 40 13 45 14 15 50	3.4	End of Hole					

NOTES

DATE DRILLED 13 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 0.8
(m below ground surface)

STATIC WATER LEVEL 0.8 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 274.7 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 14A Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/17
supervisor | MEQ
reviewer | AMS

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined ✚ Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value Core Recovery	Elevation Scale (mARD)	PID Readings	Well Details
	275.9	**GROUND SURFACE**							
0		Grey gravelly clayey fine sandy silt overlying grey compact silty fine sand							
1							275		
	274.1 1.8	Grey fine gravelly clayey very fine to fine sandy silt							
2							274		
	273.2 2.7	**END OF BOREHOLE**							

Stratigraphy inferred from original borehole log for BH14A (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

GEOLOGICAL LOG

TEST HOLE No. 15

SHEET 1 OF 1

EL (mGSD) / DEPTH (m)	DESCRIPTION	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
277.9	GROUND SURFACE	1.18 m			
0.0	Brown gravelly clayey silt	CLAY			
			1	SS	6
			2	SS	32
			3	SS	19
			4	SS	24
271.2 6.7	Brown compact interlayered silty fine sand, fine to medium sand and very fine sandy silt	GRAVEL BACKFILL	5	SS	11
270.3 7.6	Brown gravelly clayey silt		6	SS	4
			7	SS	92
		CLAY	8	SS	39
265.1 12.8	Brown compact to dense fine to very coarse sandy fine to medium gravel (minor silt)		9	SS	--
			10	SS	35
			11	SS	22
			12	SS	--
		CAVE	13	SS	--
255.0 22.9	Brown very dense gravelly silt till		14	SS	70+
253.4 24.5	End of Hole				

NOTES

DATE DRILLED 13 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND —
(m below ground surface)

STATIC WATER LEVEL 1.6 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 276.3 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 15 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/22
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Water Content (%) & Plasticity	PID Readings	Well Details	Lab Data and Comments
278.3	**GROUND SURFACE**								
	Brown gravelly clayey silt								
271.6 6.7	Brown to compact interlayered silty fine sand, fine to medium sand and very fine sandy silt								
270.7 7.6	Brown gravelly clayey silt								
265.5 12.8	Brown compact to dense fine to very coarse sandy fine to medium gravel (minor silt)								
262.3 16.0	**END OF BOREHOLE**								

Stratigraphy inferred from original borehole log for BH15 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

GEOLOGICAL LOG

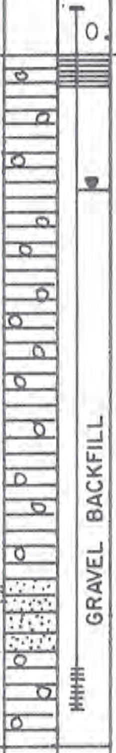
TEST HOLE No. 15A

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	278.1	GROUND SURFACE					
	0.0	Brown gravelly clayey silt			CLAYEY SILT		
	271.2 6.9	Brown compact interlayered silty fine sand, fine to medium sand and very fine sandy silt					
	270.3 7.8	Brown gravelly clayey silt					
	269.0 9.1	End of Hole					

SCALE (ft): 5 10 15 20 25 30 35 40 45 50

SCALE (m): 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15



NOTES

DATE DRILLED 14 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND --
(m below ground surface)

STATIC WATER LEVEL 1.8 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 276.3 Static Water Elevation (m GSD) (26 JUNE 1979)*

╪ Piezometer

MacLaren

MacLAREN
ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

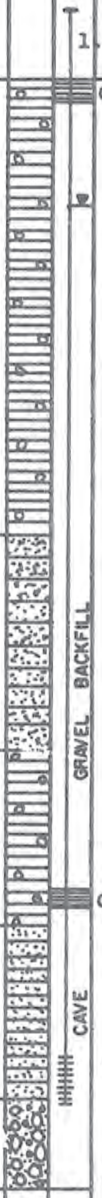
PROJECT NO. 11602-5

GEOLOGICAL LOG

TEST HOLE No. 16

SHEET 1 OF 1

EL (mGSD) / DEPTH (m)	DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
277.8	GROUND SURFACE	1.17 m		
0.0	Brown gravelly clayey silt			
		1	SS	32
		2	SS	15
	(Brown fine sandy gravel layer at ~ 4.6 m BGS)	3	SS	12
		4	SS	14
270.8 / 7.0	Brown very loose to compact very fine sandy silt	5	SS	13
		6	SS	3
267.4 / 10.4	Brown gravelly clayey silt	7	SS	23
		8	SS	40
264.7 / 13.1	Brown very loose to compact silty very fine to fine sand	9	SS	3
		10	SS	21
262.0 / 15.8	Brown dense medium to coarse sand, fine to coarse sandy, fine to medium gravel	11	SS	24+
260.6 / 17.2	End of Hole			



NOTES

DATE DRILLED 14 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND --
(m below ground surface)

STATIC WATER LEVEL 2.0 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER
Trow

SAMPLE TYPE

SS- SPLIT SPOON
WA- WASH

▽ 275.9 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren
MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G. M. P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 16 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/18
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE | SAMPLE | Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 | Undrained Shear Strength (kPa) ○ Unconfined ✚ Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160 | Water Content (%) & Plasticity PL MC LL 10 20 30 | PID Readings | Well Details | Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)
0	278.2	**GROUND SURFACE**					278
		Brown gravelly clayey silt (Brown fine sandy gravel layer at ~ 4.6 m BGS)					
7	271.2 7.0	Brown very loose to compact very fine sandy silt					271
10	267.8 10.4	Brown gravelly clayey silt					268
13	265.1 13.1	Brown very loose to compact silty very fine to fine sand					265
15	262.4 15.8	**END OF BOREHOLE**					263

Stratigraphy inferred from original borehole log for BH16 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

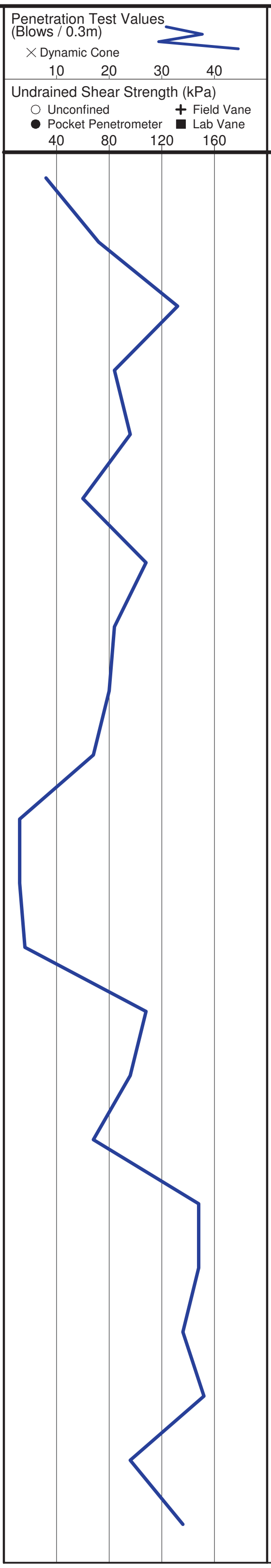
LOG OF BOREHOLE 16R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
position |

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

project no. | 111-53037-00 132-00
date started | 2014/09/19
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	SAMPLE Number	Type	SPT N-Value
	GROUND SURFACE			
	Brown **CLAYEY SILT**, some fine to medium gravel, trace sand, DTPL, stiff to very stiff. Abundant rootlets to 0.8 m depth.	1	SS	8
		2	SS	18
		3	SS	33
2.3	Brown to grey **CLAYEY SILT**, some orange striations, trace fine sand, trace gravel, DTPL, stiff to very stiff.	4	SS	21
		5	SS	24
		6	SS	15
4.9	Grey brown fine **SILTY GRAVEL AND SAND**, trace to some cobbles, wet, compact.	7	SS	27
		8	SS	21
6.0	Grey **CLAYEY SILT**, trace fine silty sand, APL, stiff.	9	SS	20
		10	SS	17
7.8	Grey fine **SANDY SILT**, trace clayey silt, trace fine gravel and coarse sand, WTPL, soft.	11	SS	3
		12	SS	3
		13	SS	4
10.0	Grey **SANDY SILT TILL**, some medium gravel, some fine to coarse sand seams, APL, stiff to very stiff.	14	SS	27
	Reddish brown from 11.0 m to 11.5 m depth.	15	SS	24
		16	SS	17
		17	SS	37
	150mm thick coarse gravelly sand seam at 12.9 m depth.	18	SS	37
13.7	Grey fine **SAND**, some silt, trace fine gravel, wet, compact.	19	SS	34
		20	SS	38
		21	SS	24
	300mm thick coarse gravel seam at 16.5m depth.	22	SS	34
16.8	**END OF BOREHOLE**			



Elevation Scale (mARD)

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

GEOLOGICAL LOG

TEST HOLE No. 16A

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	277.8	GROUND SURFACE		1.38 m			
	0.0	Brown gravelly clayey silt (Brown fine sandy gravel layer at ~ 4.6 m BGS)		CLAY CAVE AND GRAVEL BACKFILL			
	270.8 7.0	Brown very loose to compact very fine sandy silt					
	268.7 9.1	End of Hole					

SCALE (ft): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50
SCALE (m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

NOTES

DATE DRILLED 14 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND --
(m below ground surface)

STATIC WATER LEVEL 1.8*
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE
SS-SPLIT SPOON
WA-WASH

▽ 276.0 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

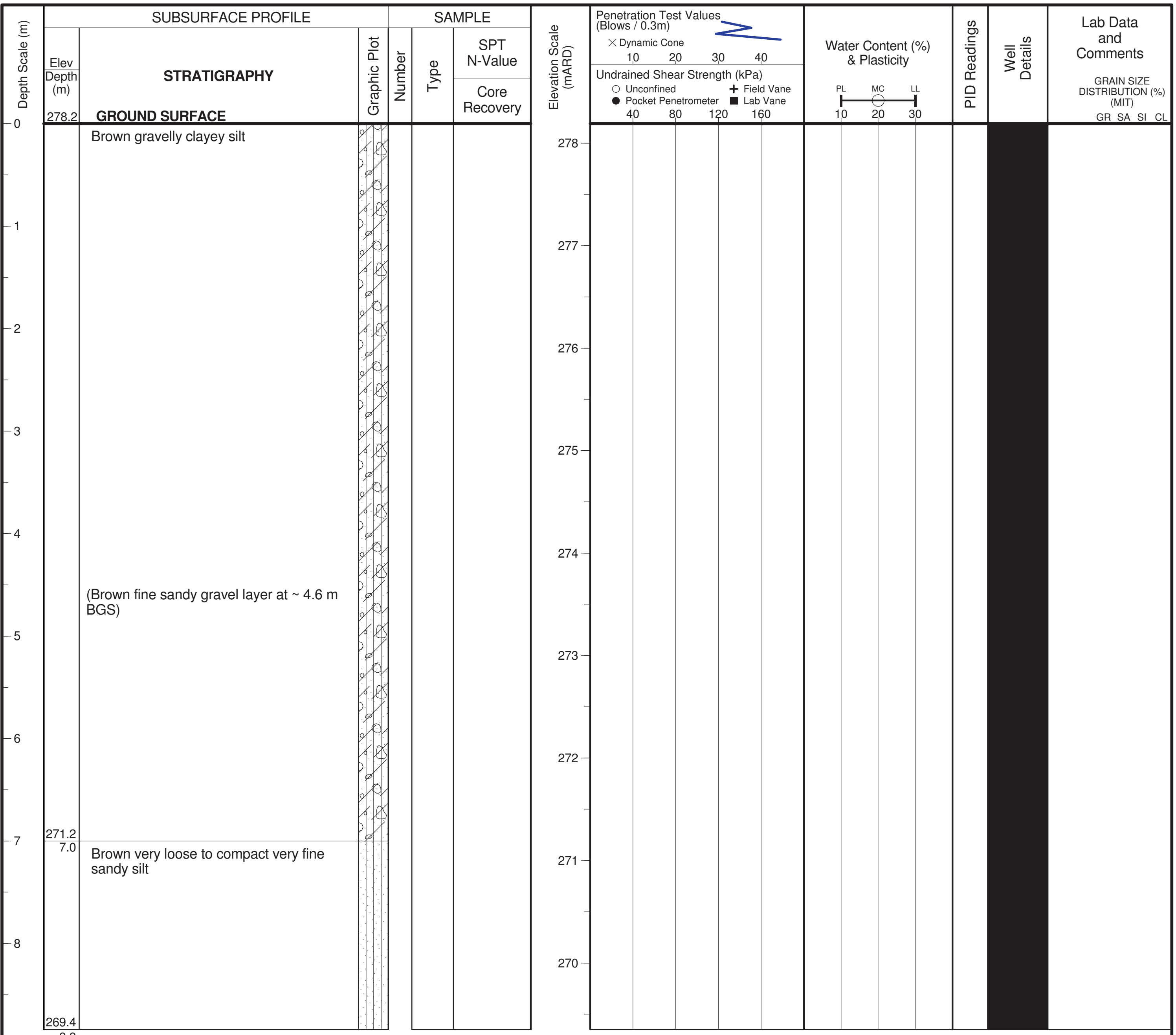
PROJECT NO. 11602-5

LOG OF BOREHOLE 16A Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/18
supervisor | MEQ
reviewer | AMS



Elev Depth (m)	STRATIGRAPHY
278.2	**GROUND SURFACE**
	Brown gravelly clayey silt
	(Brown fine sandy gravel layer at ~ 4.6 m BGS)
271.2 7.0	Brown very loose to compact very fine sandy silt
269.4 8.8	

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH16A (MacLaren Engineers Inc., 1979).

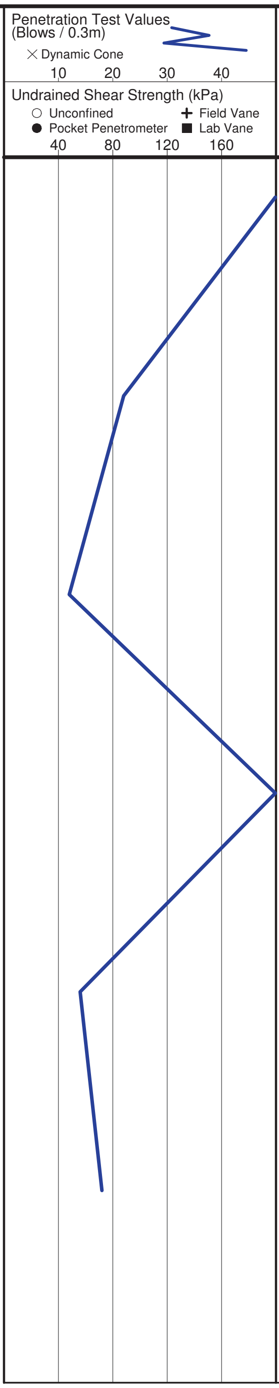
Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 16AR

project | Holbrook Landfill Site
project no. | 111-53037-00 132-00
client | Oxford County
rig type | CME 75, track-mounted
date started | 2014/09/22
location | Holbrook, ON
method | Hollow stem augers, 215 mm dia.
supervisor | MEQ
position |
coring | *n/a*
reviewer | AMS

Depth Scale (m)	SUBSURFACE PROFILE		SAMPLE			
	Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value	Core Recovery
0		GROUND SURFACE				
0		Brown **CLAYEY SILT**, some fine to medium gravel, trace sand, DTPL, stiff to very stiff. Abundant rootlets to 0.8 m depth.	1	SS	55	
2			2	SS	22	
	2.3	Brown to grey **CLAYEY SILT**, some orange striations, trace fine sand, trace gravel, DTPL, stiff to very stiff.				
3			3	SS	12	
5			4	SS	58	
5	4.9	Grey brown fine **SILTY GRAVEL AND SAND**, trace to some cobbles, wet, compact.				
6	6.0	Grey **CLAYEY SILT**, trace fine silty sand, APL, stiff.	5	SS	14	
8	7.8	Grey fine **SANDY SILT**, trace clayey silt, trace fine gravel and coarse sand, WTPL, soft.	6	SS	18	
	9.4	**END OF BOREHOLE** Stratigraphy inferred from adjacent borehole 16.				

Elevation Scale (mARD)



Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

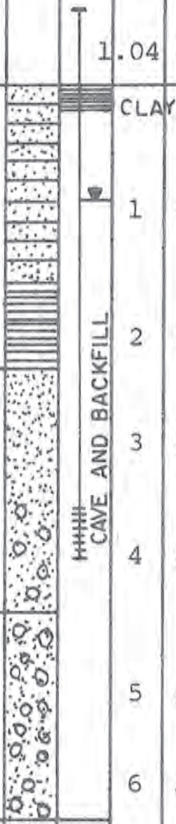
GEOLOGICAL LOG

TEST HOLE No. 17

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	278.6	GROUND SURFACE			
	0.0	Yellowish brown loose very fine sandy silt overlying brown clayey silt	1 2	SS SS	6 7
	274.9 3.7	Brown interlayered compact fine to medium and medium to coarse sand overlying brown gravelly medium to coarse sand	3 4	SS SS	10 5
	271.7 6.9	Brown fine to coarse sandy fine to medium gravel overlying fine to coarse sand near base	5 6	SS AU	-- --
	269.0 9.6	End of Hole			

Scale (ft): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50
Scale (m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15



NOTES

DATE DRILLED 29 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND 1.2
(m below ground surface)

STATIC WATER LEVEL 1.5 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 277.1 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

BOREHOLE NO. BH17 DECOMMISSIONING

PAGE 1 of 1

PROJECT NAME: HOLBROOK LANDFILL

PROJECT NO.: 111-53037-00 132-00

CLIENT: COUNTY OF OXFORD

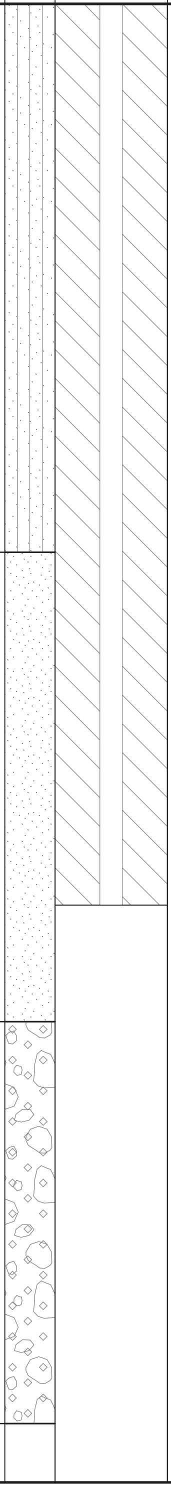
DATE COMPLETED: Jul 18, 2013

BOREHOLE TYPE: HOLLOW STEM AUGER

SUPERVISOR: TJB

GROUND ELEVATION: 278.6 mASL

REVIEWER: RFK



DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 WP WL	REMARKS
0.0	YELLOWISH BROWN LOOSE VERY FINE SANDY SILT OVERLYING BROWN CLAYEY SILT								STRATIGRAPHY INFERRED FROM ORIGINAL BOREHOLE LOG FOR BH17 (MacLaren Engineers Inc., 1979)
3.7	BROWN INTERLAYERED COMPACT FINE TO MEDIUM AND MEDIUM TO COARSE SAND OVERLYING BROWN GRAVELLY MEDIUM TO COARSE SAND								ORIGINAL BOREHOLE CAVED AND WAS BACKFILLED TO 6 m DEPTH BEFORE WELL INSTALLATION.
6.9	BROWN FINE TO COARSE SANDY FINE TO MEDIUM GRAVEL OVERLYING FINE TO COARSE SAND NEAR BASE								
9.6	END OF ORIGINAL BOREHOLE								

GEOLOGICAL LOG

TEST HOLE No. 18

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	280.0	T.H. 18B 0.6 m T.H. 18C 0.43 m GROUND SURFACE			T.H. 18A 0.86 m T.H. 18 0.99 m		
1	0.0	BROWN COMPACT SILTY V. FINE SAND			BACKFILL		
					CLAY		
5 / 2		(CLAYEY FROM 0 - 1.1 m; MINOR CLAY & SOME F. GRAVEL AT 1.5 m)			1	SS	14
					BACKFILL		
10 / 3		277.39			2	SS	9
4	276.0 4.0	GREY V. LOOSE V.FINE - FINE SAND WITH SOME SILT			3	SS	0
15 / 5 / 20 / 6	274.8 5.2	GREY COMPACT C. SAND & F. GRAVEL (SOME SILT - M. SAND MATRIX & M. GRAVEL)			4.	SS	48
7 / 25 / 8					5	SS	25
30 / 9 / 10		COARSE SANDY F. GRAVELLY MED. SAND AT 9.1 m (SOME V.F. - FINE SAND MATRIX & M. GRAVEL)			6	SS	11
35					7	SS	29
11 / 12 / 40	269.2 10.8	DK. GREY COMPACT CLAYEY SILT (MINOR V.F. SAND & OCCAS. C. SAND, F. GRAVEL)			8	SS	20
13 / 45 / 14 / 15		INTERLAYERED WITH ≤5 mm LAYERS OF GREY SILTY V. FINE SAND AT 13.5 m			9	SS	13
50 / 16		F.- MED. GRAVELLY CLAYEY SILT AT 15 m			10	SS	42
55 / 17	263.7 16.3			CAVE	11	SS	—
18 / 60 / 19		GREY V. DENSE SAND & GRAVEL (BOTH VARIABLE IN SIZE FROM FINE - COARSE)			12	SS	100
65 / 20 / 21 / 70		GREY C. SANDY F. GRAVELLY MED. SAND AT 16.8 m			13	SS	59
22 / 75 / 23 / 24 / 80	257.7 22.3	DK. GREY V. DENSE V. STONY SILT TILL (MINOR V. FINE SAND)			14	SS	150 +
25 / 85					15	SS	150 +
26 / 27 / 90	254.1 25.9	END OF HOLE					

NOTES

DATE DRILLED 10,11,14 Sept 81

TYPE OF RIG CME 55

DRILLING METHOD HOLLOW STEM AUGERS

DEPTH WATER FOUND ~ 1.5
(m below ground surface)
STATIC WATER LEVEL 2.6 *
(m below ground surface)

PIPE DIAMETER* 51,13(mm)
LENGTH OF PIEZOMETER 15.3 (m)
TYPE OF PIEZOMETER SLOTTED & FIBERGLASS WRAPPED

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽277.39 Static Water Elevation (m GSD) (23 Sept 81)

Piezometer

T.H. No.	Static Water Elevation (m GSD)
* 18	277.39
18A	Blocked
18B	277.59
18C	276.10

MacLaren

MACLAREN ENGINEERS PLANNERS & SCIENTISTS INC

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 18 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/16
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)
0	279.8	**GROUND SURFACE**					
		Brown compact silty very fine sand (Clayey from 0 - 1.1 m, minor clay and some fine gravel at 1.5 m)					279
1							
2							278
3							277
							276
4	275.8 4.0	Grey very loose very fine - fine sand with some silt					
5							275
	274.6 5.2	Grey compact coarse sand and fine gravel (some silt to medium sand matrix and medium gravel)					
	274.2 5.6	**END OF BOREHOLE**					

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined ✚ Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH18 (MacLaren Engineers Inc., 1981).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

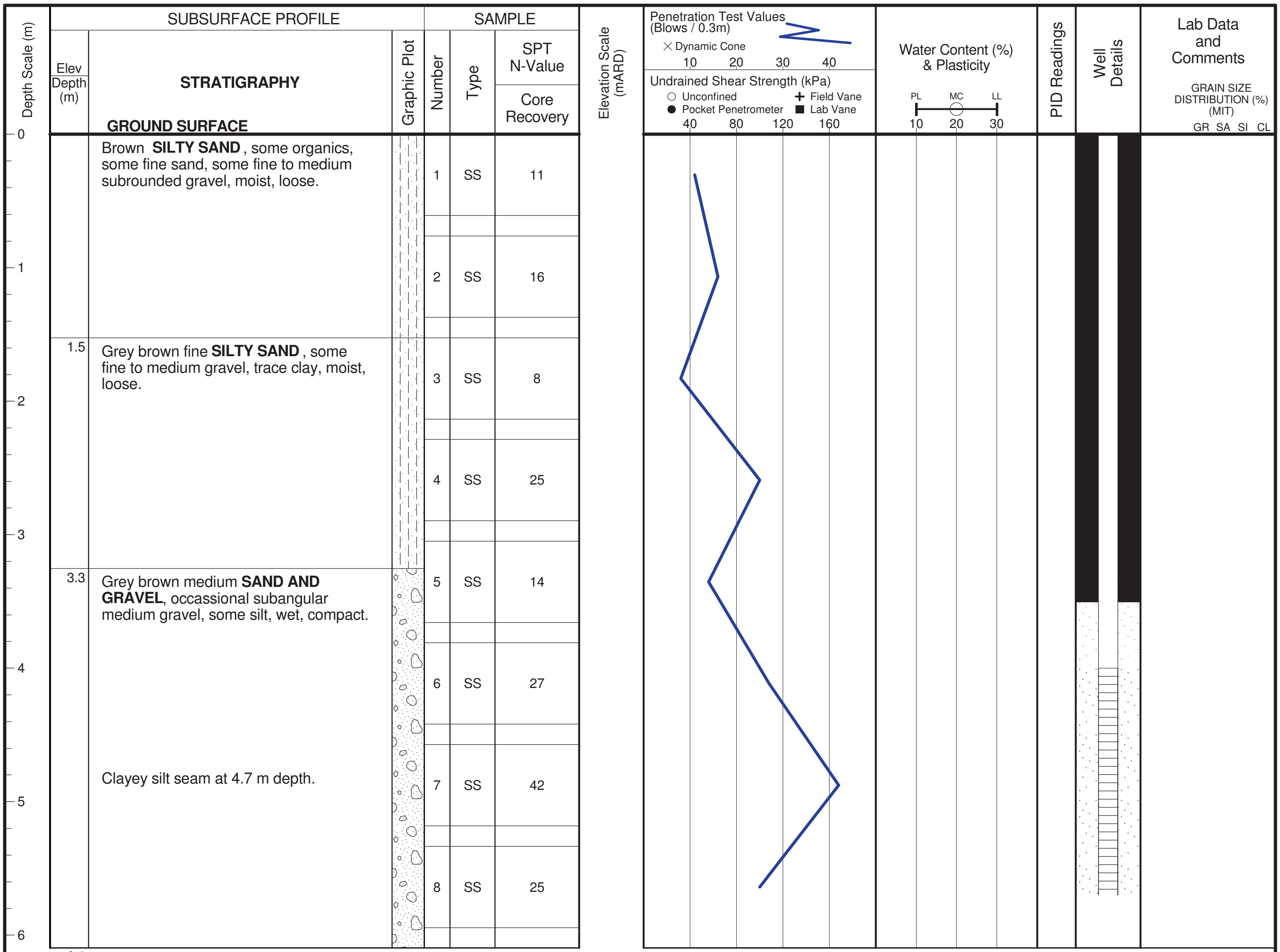
LOG OF BOREHOLE 18R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
position |

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

project no. | 111-53037-00 132-00
date started | 2014/09/16
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery
	GROUND SURFACE			
	Brown **SILTY SAND**, some organics, some fine sand, some fine to medium subrounded gravel, moist, loose.	1	SS	11
		2	SS	16
1.5	Grey brown fine **SILTY SAND**, some fine to medium gravel, trace clay, moist, loose.	3	SS	8
		4	SS	25
3.3	Grey brown medium **SAND AND GRAVEL**, occassional subangular medium gravel, some silt, wet, compact.	5	SS	14
		6	SS	27
	Clayey silt seam at 4.7 m depth.	7	SS	42
		8	SS	25
6.1	**END OF BOREHOLE**			



GEOLOGICAL LOG

TEST HOLE No. 19

SHEET 1 OF 1

T.H. 19A 0.94 m
T.H.19B 0.91 m
T.H. 19 0.97 m

SCALE (ft): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90
SCALE (m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27

EL (mGSD) / DEPTH (m)	DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
274.7	GROUND SURFACE			
0.0	BROWN COMPACT SL. CLAYEY SILT (SOME F. GRAVEL)	BACKFILL		
		CLAY		
		1	SS	24
		BACKFILL		
		2	SS	13
		GRAVEL		
		3	SS	14
269.2				
5.5	GREY COMPACT INTERLAYERED CLAYEY SILT & SILTY V. FINE - FINE SAND	4	SS	16
	(CLAYEY SILT CONTAINS THIN LAYERS OF SILTY V.FINE SAND)	5	SS	29
266.2				
8.5	GREY DENSE V.F. GRAVELLY CLAYEY SILT (MINOR SAND)	6	SS	39
		CLAY		
264.6				
10.1	GREY DENSE INTERLAYERED SAND AND GRAVEL	7	SS	79 +
		8	SS	48
	(GENERALLY F. GRAVELLY MED. & COARSE SAND, F. - MED. GRAVEL)	9	SS	28
		10	SS	43
257.0				
17.7	GREY COMPACT TO DENSE V. SILTY V. FINE SAND (SOME CLAYEY SILT INTERBEDS)	11	SS	43
		12	SS	25
254.0				
20.7	DK. GREY V. DENSE V. STONY SILT TILL	13	SS	76 +
	(LAYER OF GREY V. SILTY V. FINE SAND AT 23 m)	14	SS	137
		15	SS	181
250.0				
24.3	END OF HOLE			

NOTES

DATE DRILLED 14 - 16 Sept 81
TYPE OF RIG CME 55
DRILLING METHOD HOLLOW STEM AUGERS
DEPTH WATER FOUND ~ 5.5 (m below ground surface)
STATIC WATER LEVEL +0.85 * (m below ground surface)
PIPE DIAMETER 51.13 (mm)
LENGTH OF PIEZOMETER 1.5,1.6 m
TYPE OF PIEZOMETER SLOTTED & FIBERGLASS WRAPPED

SAMPLE TYPE
SS-SPLIT SPOON
WA-WASH

275.55 Static Water Elevation (m GSD) (23 Sept 81)

Piezometer

T.H. NO.	Static Water Elevation (m GSD)
* 19	275.55
19A	275.65+
19B	275.61+

MacLaren

MACLAREN ENGINEERS PLANNERS & SCIENTISTS INC

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 19 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/26
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE: STRATIGRAPHY	Graphic Plot	SAMPLE: Number	SAMPLE: Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 / Undrained Shear Strength (kPa) ○ Unconfined ✚ Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	275.0	**GROUND SURFACE**										
		Brown compact sl. clayey silt (some fine gravel)	▨								■	
1							274					
2							273					
3							272					
4							271					
5							270					
	269.8 5.2											

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH19 (MacLaren Engineers Inc., 1981).

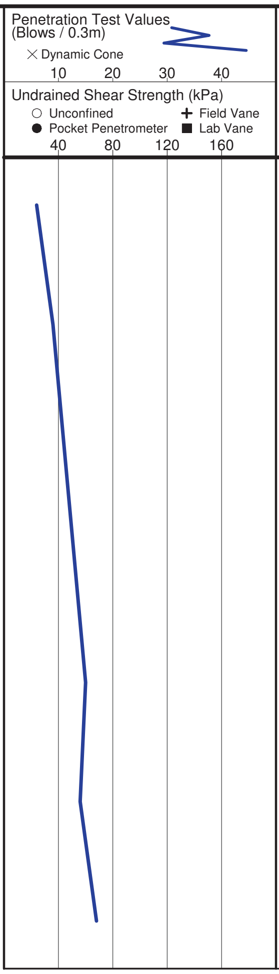
Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 19R

project | Holbrook Landfill Site
project no. | 111-53037-00 132-00
client | Oxford County
rig type | CME 75, track-mounted
date started | 2014/09/26
location | Holbrook, ON
method | Hollow stem augers, 215 mm dia.
supervisor | SCL
position |
coring | *n/a*
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery
0		**GROUND SURFACE**			
		Dark brown **SILTY SAND TO SANDY SILT**, trace to some organics and rootlets, trace clay, moist, loose.	1	SS	6
1	0.8	Orangey brown to grey brown **CLAYEY SILT**, trace to some fine gravel, trace cobble, APL, stiff.	2	SS	9
			3	SS	
2		Becoming grey below 2 m depth.			
			4	SS	13
3			5	SS	15
4			6	SS	14
5			7	SS	17
	5.2	**END OF BOREHOLE**			

Elevation Scale (mARD)



Water Content (%) & Plasticity

PL MC LL

10 20 30

PID Readings

Lab Data and Comments

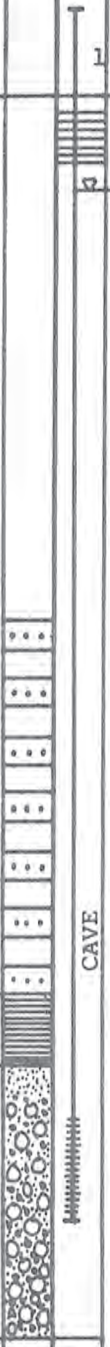
GRAIN SIZE DISTRIBUTION (%) (MIT)

GR SA SI CL

GEOLOGICAL LOG

TEST HOLE No. 21

SHEET 1 OF 1



EL (mGSD) / DEPTH (m)	DESCRIPTION	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
277.5	**GROUND SURFACE**	1.05 m			
0.0	BROWN SL. CLAYEY SILT (GRAVELLY FROM 2 - 6 m) OVERLYING GREY COMPACT INTERLAYERED CLAYEY SILT (OCCAS. GRAVEL) & SILTY V. FINE SAND OF VARIABLE THICKNESS	BACKFILL CLAY			
			1	SS	22
			2	SS	23
	(SILTY V.FINE TO FINE SAND WITH SOME MED. SAND AT 10.7 & 12.2 m)	CAVE	3	SS	7
265.0			4	SS	37
12.5	GREY DENSE V. GRAVELLY CLAYEY SILT				
264.1 13.4	GREY DENSE GRANULAR MED.-COARSE SAND OVERLYING F.-MED. SANDY GRAVEL WHICH CONTAINS SOME SILT & V.F. SAND		5	SS	44
260.3			6	SS	66
17.2	END OF HOLE				

SCALE (ft)(m): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70 ft; 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21 m

NOTES

DATE DRILLED 13 - 16 Oct./81

TYPE OF RIG CME 55

DRILLING METHOD Hollow Stem Augers, Casing

DEPTH WATER FOUND ~ 2.4 (m below ground surface)

STATIC WATER LEVEL 1.3 (m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1.2 (m)

TYPE OF PIEZOMETER SLOTTED AND FIBREGLASS WRAPPED

SAMPLE TYPE

SS-SPLIT SPOON

WA-WASH

▽ 276.22 Static Water Elevation (m GSD) (26 Oct./81)

Piezometer

MacLaren

MacLAREN ENGINEERS PLANNERS & SCIENTISTS INC

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 21 Decommissioning

project | Holbrook Landfill Site

client | Oxford County **rig type |** Acker Soil-Max, track-mounted **date started |** 2015/07/20

location | Holbrook, ON **method |** Hollow stem augers, 215 mm dia. **supervisor |** MEQ

project no. | *111-53037-00 132-02* **coring |** *n/a* **reviewer |** AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	Graphic Plot	SAMPLE Number	SAMPLE Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 / Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	277.8	**GROUND SURFACE**										
		Brown clayey silt (gravelly from 2 - 6 m) overlying grey compact interlayered clayey silt (occassional gravel) & silty very fine sand of variable thickness					277					
		(Silty very fine to fine sand with some medium sand at 10.7 & 12.2 m)										
	265.3 12.5	Grey dense very gravelly clayey silt										
	264.4 13.4	Grey dense granular medium to coarse sand overlying fine to medium sandy gravel which contains some silt & very fine sand										
	262.3 15.5	**END OF BOREHOLE**										

Depth Scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

Elevation Scale (mARD): 277, 276, 275, 274, 273, 272, 271, 270, 269, 268, 267, 266, 265, 264, 263

Stratigraphy inferred from original borehole log for BH21 (MacLaren Engineers Inc., 1981).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 21R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
position |

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

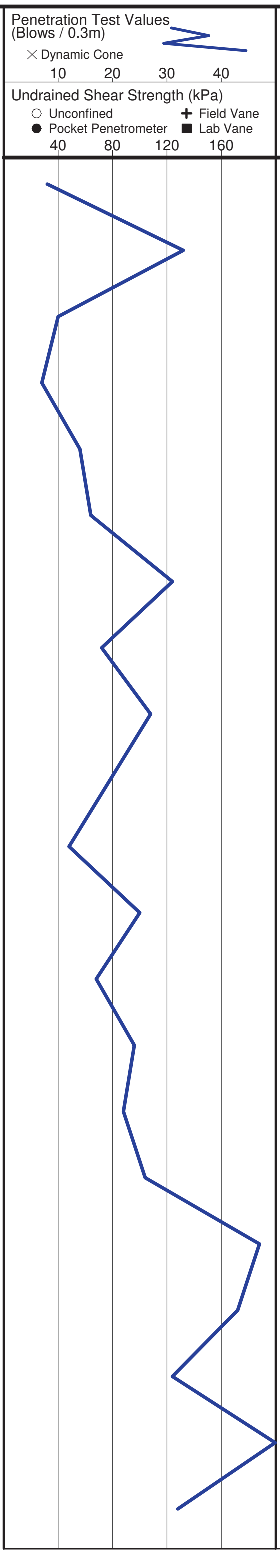
project no. | 111-53037-00 132-00
date started | 2014/09/29
supervisor | SCL
reviewer | AMS

SUBSURFACE PROFILE

Elev Depth (m)	STRATIGRAPHY
0	**GROUND SURFACE**
	Dark orangey brown **SILTY SAND**, trace rootlets, trace gravel, moist, loose to compact.
1.5	Orangey brown **SANDY SILT**, some thin interlayered red brown fine to medium sand, trace clay, APL becoming WTPL, firm to stiff.
3.4	Orangey brown fine to coarse **SILTY SAND AND GRAVEL**, saturated, compact to dense. Becoming siltier below 7.5 m depth.
8.2	Grey **CLAYEY SILT**, some fine rounded and subangular gravel, some fine sand, WTPL, stiff to very stiff.
10.7	Grey **SANDY SILT** with interlayered compact grey fine to coarse sand, trace clay, saturated, compact.
12.2	Grey **SANDY GRAVEL**, fine to medium gravel, saturated, dense to very loose.
16.0	**END OF BOREHOLE**

SAMPLE

Number	Type	SPT N-Value	Lab Data and Comments
1	SS	8	
2	SS	33	
3	SS	10	
4	SS	7	
5	SS	14	
6	SS	16	
7	SS	31	
8	SS	18	
9	SS	27	
10	SS		SS10 - no sample due to cobble/boulder
11	SS	12	
12	SS	25	
13	SS	17	
14	SS	24	
15	SS	22	
16	SS	26	
17	SS	47	
18	SS	43	
19	SS	31	
20	SS	58	
21	SS	32	



Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Depth Scale (m): 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Elevation Scale (mARD)

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpj

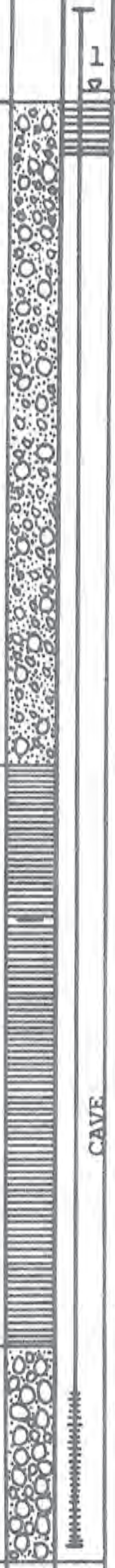
Sheet No. 1 of 1

GEOLOGICAL LOG

TEST HOLE No. 23

SHEET 1 OF 1

SCALE (ft) 5 10 15 20 25 30 35 40 45 50 55 60 65 70
(m) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21



EL (mGSD) / DEPTH (m)	DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
278.4	GROUND SURFACE			
0.0	GREY COARSE SAND AND GRAVEL (SOME SILT AND FINE SAND)	1	SS	28
		2	SS	39
269.0		3	SS	20
9.4	GREY COMPACT CLAYEY SILT	4	SS	26
	GREY V. DENSE GRAVELLY CLAYEY SILT	5	SS	187+
		6	SS	166
		7	SS	204
		8	SS	63
260.7 17.7	GREY COARSE SANDY GRAVEL	9	SS	190
257.7 20.7	END OF HOLE			

NOTES

DATE DRILLED 22,23 Oct./81

TYPE OF RIG CME 55

DRILLING METHOD HOLLOW STEM AUGERS

DEPTH WATER FOUND --
(m below ground surface)

STATIC WATER LEVEL +0.2
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 2.1 (m)

TYPE OF PIEZOMETER SLOTTED AND NYLON SCREEN WRAPPED

SAMPLE TYPE

SS-SPLIT SPOON

WA-WASH

278.66 ▽ Static Water Elevation (m GSD) (26 Oct./81)

Piezometer

MacLaren

MacLAREN ENGINEERS PLANNERS & SCIENTISTS INC

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 23 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/09
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE

Elev (m)	Depth (m)	STRATIGRAPHY
278.9		**GROUND SURFACE**
		Grey coarse sand and gravel (some silt and fine sand)
269.5	9.4	Grey compacy clayey silt
267.4	11.5	Grey very dense gravelly clayey silt
261.2	17.7	Grey coarse sandy gravel
258.5	20.4	**END OF BOREHOLE**

Column headings: Depth Scale (m); SAMPLE: Number, Type, SPT N-Value, Core Recovery; Elevation Scale (mARD); Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40; Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160; Water Content (%) & Plasticity PL MC LL 10 20 30; PID Readings; Well Details; Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Stratigraphy inferred from original borehole log for BH23 (MacLaren Engineers Inc., 1981).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpi

GEOLOGICAL LOG

TEST HOLE No. 24

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	279.2	GROUND SURFACE		0.56 m			
	0.0 275.3	Brown compact fine to coarse sand with trace gravel			1 2	SS SS	20 18
	3.9 266.0	Brown clayey silt; some fine to coarse sand layers several centimeters thick; trace gravel ≈ 8.0 - 8.5 m = fine silty sand with trace gravel			3 4 5 6 7 8	SS SS SS SS SS SS	9 7 18 9 15 32
	13.2 264.6	Brown loose fine sand ?			9	SS	6
	14.6 263.0	Brown interlayered fine sand and clay			10	SS	103
	16.2 260.0	Brown silt with fine sand layers (trace of gravel appears near contact with gravel layer)			11 12	SS SS	49 70
	19.2 256.3	Dense sandy gravel (sand generally medium to coarse grained)			13 14	SS SS	52 37
	22.9	END OF HOLE					

NOTES

DATE DRILLED 11 Feb./82

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~1 (m below ground surface)

STATIC WATER LEVEL 4.0 (m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1 (m)

TYPE OF PIEZOMETER Slotted ABS pipe and Nitex nylon screen wrapped

SAMPLE TYPE

SS - SPLIT SPOON

WA - WASH

▽ 275.97 Static Water Elevation (m GSD) (18 February 1982)

Piezometer

MacLaren

MacLAREN ENGINEERS, PLANNERS & SCIENTISTS

TEST HOLE RECORD

11602-5

LOG OF BOREHOLE 24 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/13
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)
	279.7	**GROUND SURFACE**					
0		Brown compact fine to coarse sand with trace gravel					279
4	275.8 3.9	Brown clayey silt; some fine to coarse sand layers several centimeters thick; trace gravel ~8.0 - 8.5 m = fine silty sand with trace gravel					276
13	266.5 13.2	Brown loose fine sand					266
15	265.1 14.6	Brown interlayered fine sand and clay					265
16	263.5 16.2	Brown silt with fine sand layers (trace of gravel appears near contact with gravel layer)					263
19	260.5 19.2	Dense sandy gravel (sand generally medium to coarse grained)					260
	259.3 20.4	**END OF BOREHOLE**					

Depth Scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Elevation Scale (mARD): 279, 278, 277, 276, 275, 274, 273, 272, 271, 270, 269, 268, 267, 266, 265, 264, 263, 262, 261, 260

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Stratigraphy inferred from original borehole log for BH24 (MacLaren Engineers Inc., 1982).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

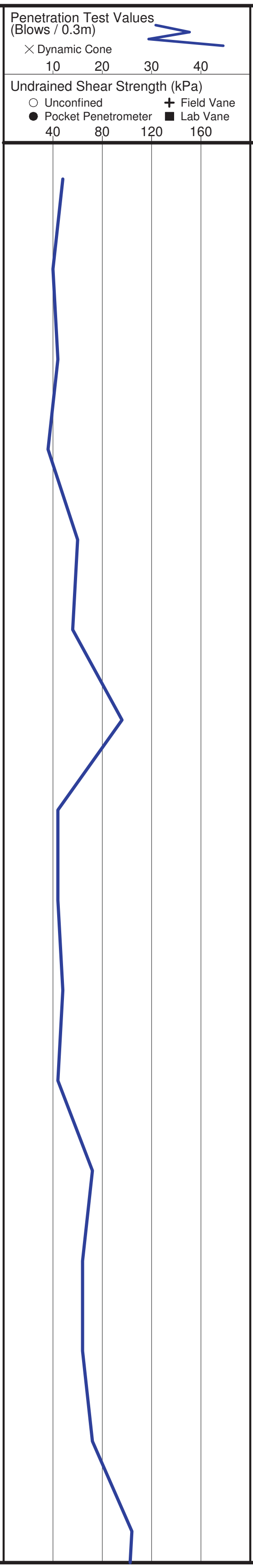
LOG OF BOREHOLE 24R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/14
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE		SAMPLE			Elevation Scale (mASL)	Water Content (%) & Plasticity	PID Readings	Well Details	Lab Data and Comments
Elev Depth (m)	STRATIGRAPHY GROUND SURFACE	Number	Type	SPT N-Value / Core Recovery					
	Brown fine to medium **SILTY SAND**, some fine gravel, trace organics, moist, compact.	1	SS	12					
	Black clayey organic peat layer at 1.2 m depth.	2	SS	10					
1.4	Grey fine to medium **SAND**, some silt, trace fine gravel, wet, compact.	3	SS	11					
		4	SS	9					
		5	SS	15					
		6	SS	14					
		7	SS	24					
4.9	Grey **CLAYEY SILT**, trace fine sand, APL to WTPL, stiff.	8	SS	11					
		9	SS	11					
		10	SS	12					
	Fine gravel seams at 7.6 m depth.	11	SS	11					
		12	SS	18					
9.1	Grey **SILTY SAND**, trace clay, wet, compact.	13	SS	16					
9.9	Grey **CLAYEY SILT**, trace medium sand, trace fine gravel, APL to WTPL, very stiff.	14	SS	16					
		15	SS	18					
		16	SS	26					



Water Content (%) & Plasticity: PL MC LL, 10 20 30

GRAIN SIZE DISTRIBUTION (%) (MIT): GR SA SI CL

(continued next page)

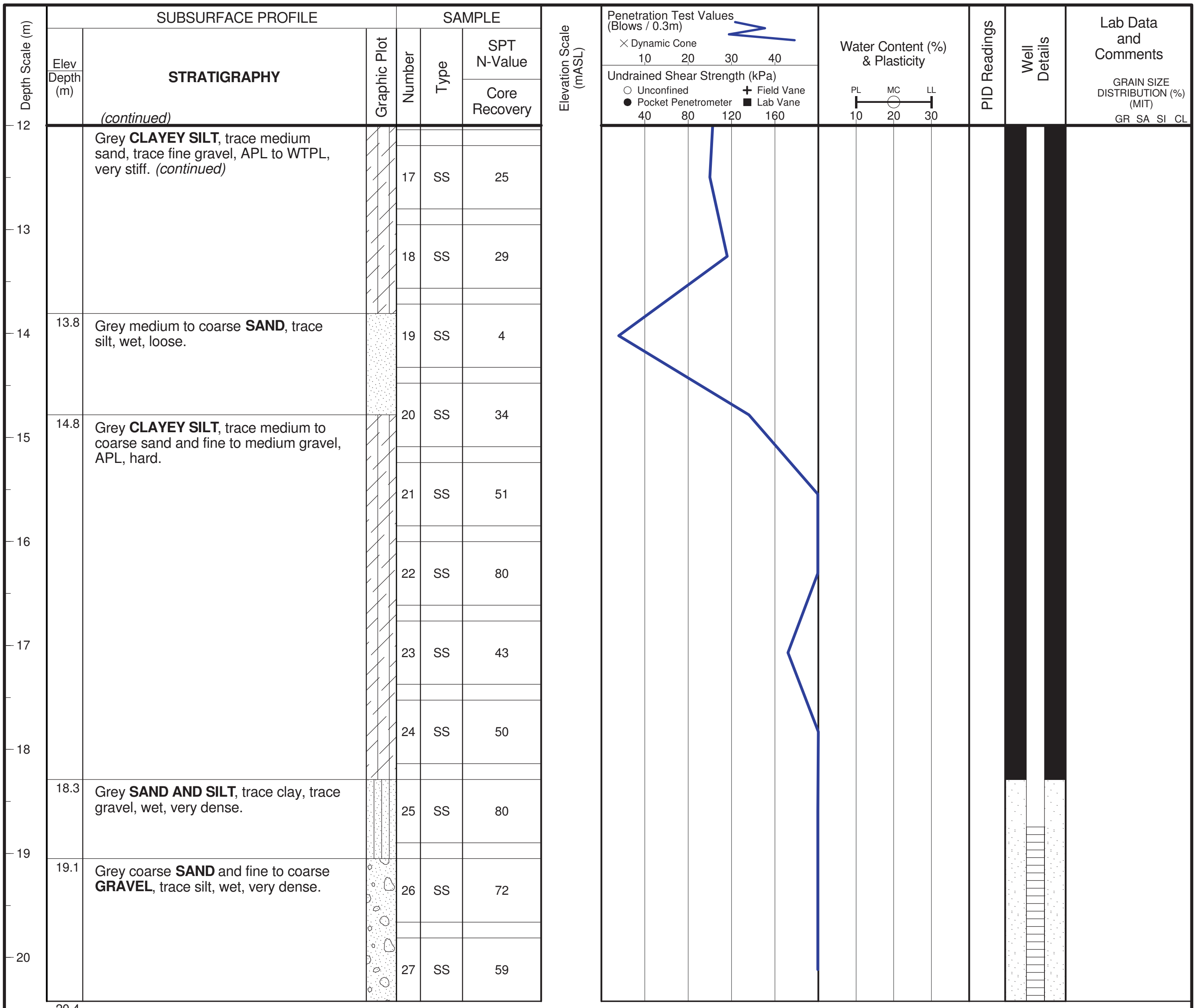
LOG OF BOREHOLE 24R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/14
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value
	(continued) Grey **CLAYEY SILT**, trace medium sand, trace fine gravel, APL to WTPL, very stiff. *(continued)*	17	SS	25
		18	SS	29
13.8	Grey medium to coarse **SAND**, trace silt, wet, loose.	19	SS	4
14.8	Grey **CLAYEY SILT**, trace medium to coarse sand and fine to medium gravel, APL, hard.	20	SS	34
		21	SS	51
		22	SS	80
		23	SS	43
		24	SS	50
18.3	Grey **SAND AND SILT**, trace clay, trace gravel, wet, very dense.	25	SS	80
19.1	Grey coarse **SAND** and fine to coarse **GRAVEL**, trace silt, wet, very dense.	26	SS	72
		27	SS	59
20.4	**END OF BOREHOLE**			



GEOLOGICAL LOG

TEST HOLE No. 24A

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	279.2	GROUND SURFACE			1.08 m		
5 10 15 20 25 30 35 40 45 50	0.0	Fine coarse brown sand with some gravel					
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	275.3 3.9	Brown clayey silt with trace of gravel					
	274.6 4.6	END OF HOLE					

NOTES

DATE DRILLED 11 Feb./82

TYPE OF RIG CME 75

DRILLING METHOD Hollow stem augers

DEPTH WATER FOUND ~1
(m below ground surface)

STATIC WATER LEVEL 0.5
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1 (m)

TYPE OF PIEZOMETER Slotted ABS pipe and Nitex nylon screen wrapped

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 278.73 Static Water Elevation (m GSD) (18 February 1982)

Piezometer

MacLaren

MacLAREN ENGINEERS, PLANNERS & SCIENTISTS

TEST HOLE RECORD

E.H.R.

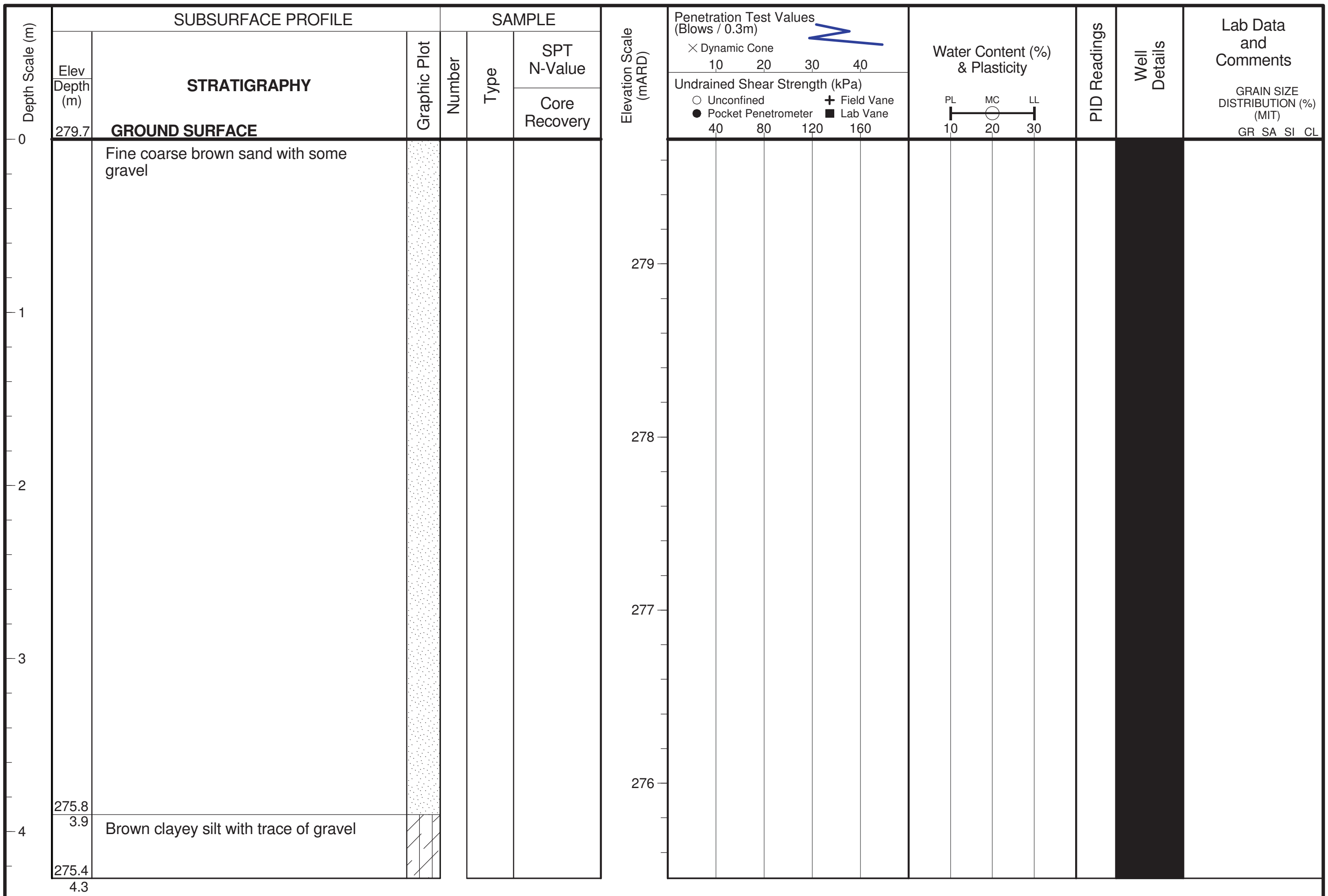
PROJECT NO. 11602-5

LOG OF BOREHOLE 24A Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/13
supervisor | MEQ
reviewer | AMS



Elev Depth (m)	STRATIGRAPHY
279.7	**GROUND SURFACE**
	Fine coarse brown sand with some gravel
275.8 3.9	Brown clayey silt with trace of gravel
275.4 4.3	

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH24A (MacLaren Engineers Inc., 1982).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 24AR

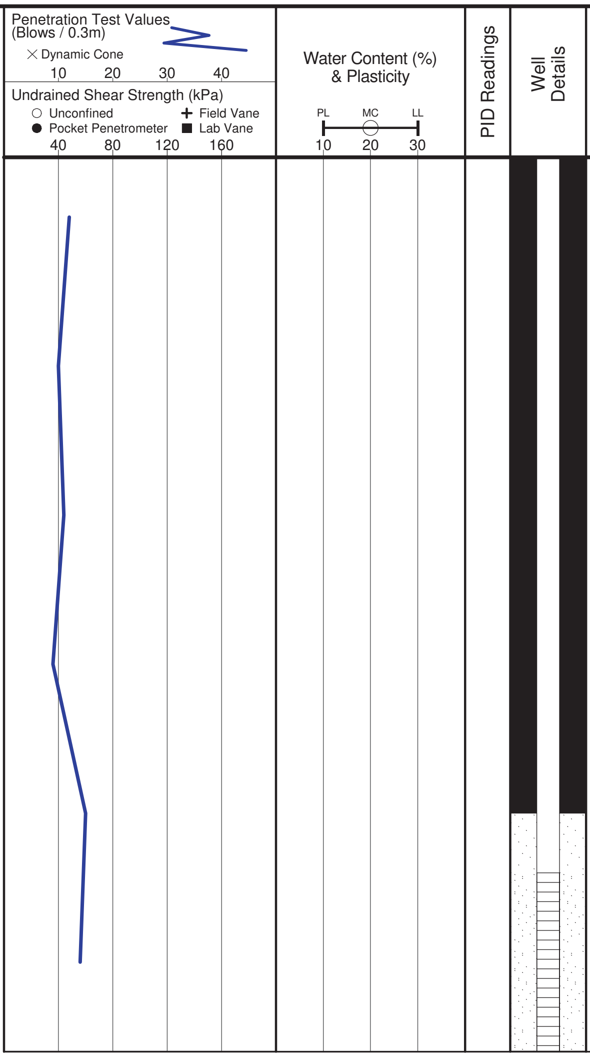
project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/13
supervisor | SM
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value / Core Recovery
0		**GROUND SURFACE**				
		Brown fine to medium **SILTY SAND**, some fine gravel, trace organics, moist, compact.		1	SS	12
1		Black clayey organic peat layer at 1.2 m depth.		2	SS	10
	1.4	Grey fine to medium **SAND**, some silt, trace fine gravel, wet, compact.		3	SS	11
2				4	SS	9
3				5	SS	15
4				6	SS	14
	4.6	**END OF BOREHOLE**				

Stratigraphy inferred from adjacent borehole 24R.



Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)

GR SA SI CL

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpj

GEOLOGICAL LOG

TEST HOLE No. 25

SHEET 1 OF 1

SCALE (ft) (m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	279.9	GROUND SURFACE		0.61 m			
	0.0	Brown compact medium to coarse sand					
	278.2				1	SS	15
	1.7	Brown clayey silt with trace of sand and gravel			2	SS	14
					3	SS	23
					4	SS	18
					5	SS	23
	271.4						
	8.5	Brown sandy silt with some thin layers of fine sand and a trace of gravel			6	SS	13
					7	SS	7
	267.4				8	SS	18
	12.5	Brown silty clay with some gravel			9	SS	25
	265.3						
	14.6	Brown gravelly silt with a trace of clay			10	SS	97
	264.0						
	15.9	Brown sand and gravel			11	SS	48
	260.5				12	SS	-
	19.4	END OF HOLE					

NOTES

DATE DRILLED 12 Feb./82

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND Surface
(m below ground surface)

STATIC WATER LEVEL 3.8
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1 (m)

TYPE OF PIEZOMETER Slotted ABS pipe and fibreglass wrapped

SAMPLE TYPE

SS-SPLIT SPOON

WA-WASH

▽ 276.07 Static Water Elevation (m GSD) (18 February 1982)

Piezometer

MacLaren

MacLAREN ENGINEERS, PLANNERS & SCIENTISTS

TEST HOLE RECORD

E.H.R.

PROJECT NO. 11602-5

LOG OF BOREHOLE 25 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/17
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	SAMPLE Number	Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) ✕ Dynamic Cone 10 20 30 40; Undrained Shear Strength (kPa) ○ Unconfined ✚ Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	280.4	**GROUND SURFACE**									
0		Brown compact medium to coarse sand				280					
1						279					
2	278.7 1.7	Brown clayey silt with trace of sand and gravel				278					
3–8						277–272					
9	271.9 8.5	Brown sandy silt with some thin layers of fine sand and a trace of gravel				271					
10–12						270–268					
13	267.9 12.5	Brown silty clay with some gravel				267					
15	265.8 14.6	Brown gravelly silt with a trace of clay				265					
16	264.5 15.9	Brown sand and gravel				264					
17–19						263–262					
	261.2 19.2	**END OF BOREHOLE**									

Stratigraphy inferred from original borehole log for BH25 (MacLaren Engineers Inc., 1982).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

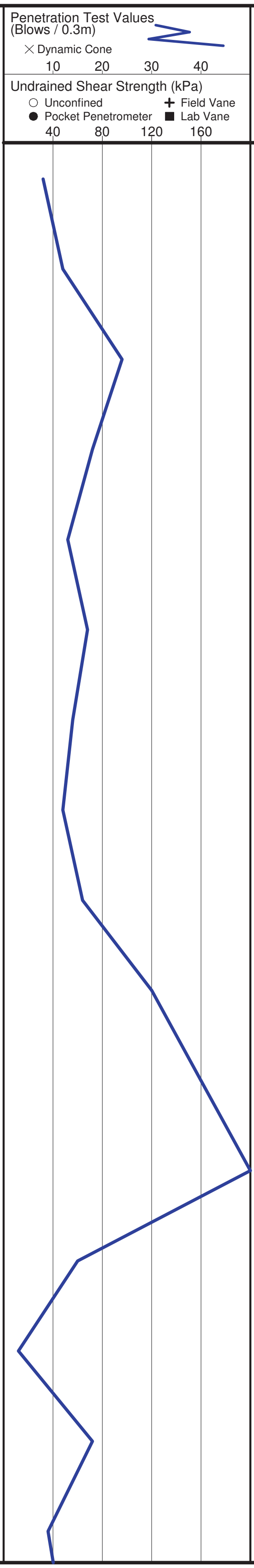
LOG OF BOREHOLE 25R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/22
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value
0	**GROUND SURFACE** Dark brown **TOPSOIL**, some fine sand, rootlets, moist, loose.	1	SS	8
0.6	Reddish brown **CLAYEY SILT**, some fine to medium sand, trace clay, trace rootlets, moist, compact.	2	SS	12
		3	SS	24
2.3	Grey-brown **CLAYEY SILT**, trace fine to coarse sand, trace gravel, DTPL to APL, stiff to very stiff.	4	SS	18
		5	SS	13
		6	SS	17
		7	SS	14
		8	SS	12
		9	SS	16
		10	SS	30
		11	SS	40
		12	SS	50
9.3	Grey-brown fine **SILTY SAND**, trace clay, trace fine gravel, wet to saturated, compact.	13	SS	15
		14	SS	3
		15	SS	18
		16	SS	9



Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

(continued next page)

Sheet No. 1 of 2

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpj

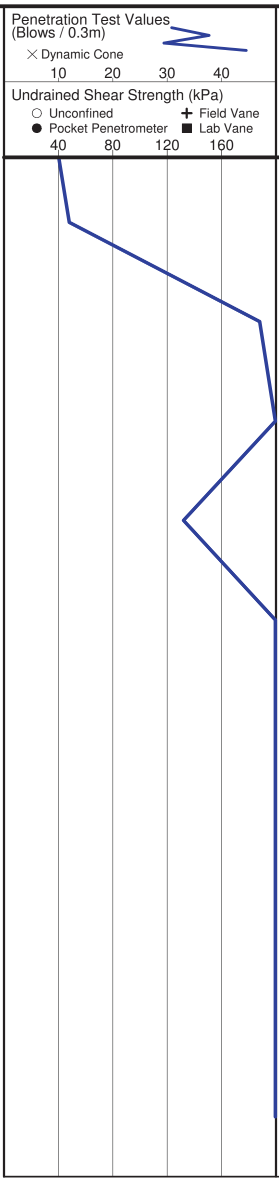
LOG OF BOREHOLE 25R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/22
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value
	(continued) Grey-brown fine **SILTY SAND**, trace clay, trace fine gravel, wet to saturated, compact. Rapidly dilatent below 12.2 m. *(continued)*	17	SS	12
13.0	Light grey **CLAYEY SILT AND GRAVEL**, some fine to coarse sand, DTPL, stiff.	18	SS	47
		19	SS	74
14.2	Grey-brown **SAND AND GRAVEL**, some silt, trace clay, saturated, compact.	20	SS	33
15.2	Grey-brown **CLAYEY SILT**, some gravel, some fine to coarse sand, APL, stiff to very stiff.	21	SS	81
		22	SS	88
		23	SS	63
		24	SS	53
18.0	Grey **SAND AND GRAVEL**, trace silt, wet, hard.	25	SS	83
		26	SS	85
19.8	**END OF BOREHOLE**			



GEOLOGICAL LOG

TEST HOLE No. 25A

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	279.9	GROUND SURFACE			0.98 m		
1 5	0.0 278.2	Brown compact medium to coarse sand	▨	▽			
2 3 10 4	1.7 275.3	Brown compact clayey silt slightly calcareous with trace of sand and gravel	▤	╪			
15 5 6 20 7 25 8 9 30 10 35 11 12 40 13 45 14 15 50	4.6	END OF HOLE					

NOTES

DATE DRILLED 12 Feb./82

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND Surface
(m below ground surface)

STATIC WATER LEVEL 0.2
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1 (m)

TYPE OF PIEZOMETER Slotted ABS pipe and fibreglass wrapped

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 279.85 Static Water Elevation (m GSD) (19 February 1982)

╪ Piezometer

MacLaren

MacLAREN
ENGINEERS, PLANNERS
& SCIENTISTS

TEST HOLE RECORD | E.H.R. | PROJECT NO. 11602-5

LOG OF BOREHOLE 25A Decommissioning

project | Holbrook Landfill Site

client | Oxford County

location | Holbrook, ON

project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted

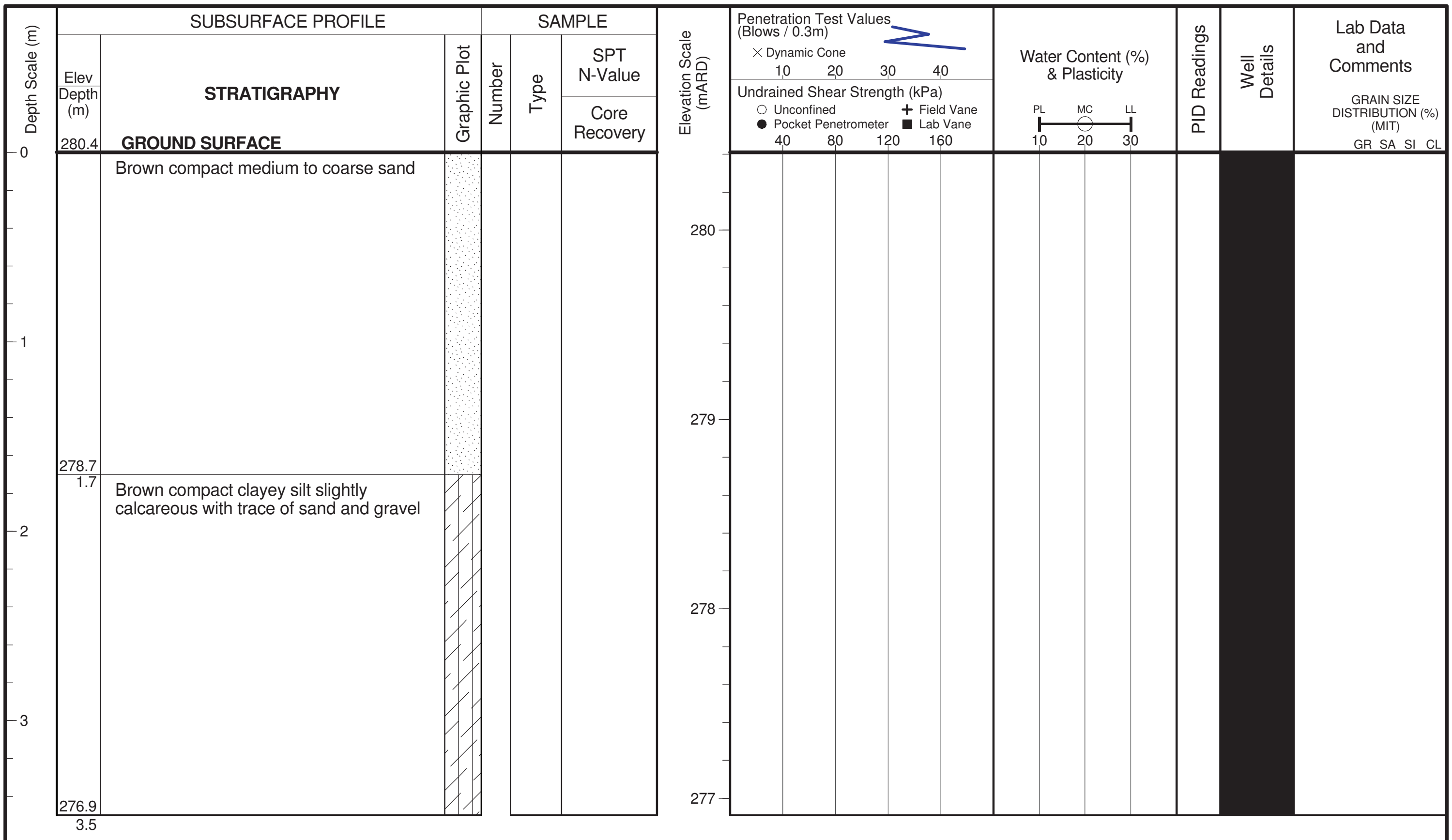
method | Hollow stem augers, 215 mm dia.

coring | *n/a*

date started | 2015/07/16

supervisor | MEQ

reviewer | AMS



Elev Depth (m)	STRATIGRAPHY
280.4	**GROUND SURFACE**
	Brown compact medium to coarse sand
278.7 1.7	Brown compact clayey silt slightly calcareous with trace of sand and gravel
276.9 3.5	**END OF BOREHOLE**

Stratigraphy inferred from original borehole log for BH25A (MacLaren Engineers Inc., 1982).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

GEOLOGICAL LOG

TEST HOLE No. 26

SHEET 1 OF 1

EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
271.8	GROUND SURFACE					
0.0	Red brown to brown inter-layered clayey and silty fine sand with minor gravel			1	ss	8
				2	ss	58
269.6 2.1	Red brown to grey clayey silt, minor gravel			3	ss	24
				4	ss	15
268.1 3.7	Fine-medium gravel; minor coarse sand; coarse gravel; minor silt, changing gradually to predominantly coarse gravel			5	ss	14
				6	ss	19
				7	ss	21
				8	ss	19
265.2 6.6	END OF HOLE					

SCALE (ft) 5 10 15 20 25 30 35 40 45 50
SCALE (m) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

NOTES

DATE DRILLED Jan. 14,16, 1983

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND 3.7
(m below ground surface)

STATIC WATER LEVEL
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1.8 (m)

TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ Static Water Elevation (m GSD)

≡ Piezometer

MacLaren

MacLAREN
ENGINEERS INC.

TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

LOG OF BOREHOLE 26 Decommissioning

project | Holbrook Landfill Site

client | Oxford County

location | Holbrook, ON

project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted

method | Hollow stem augers, 215 mm dia.

coring | *n/a*

date started | 2015/08/06

supervisor | MEQ

reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)
0	272.1	**GROUND SURFACE**				272
		Red brown to brown interlayered clayey and silty fine sand with minor gravel				
1						271
2	270.0 2.1	Red brown to grey clayey silt, minor gravel				270
3						269
	268.4 3.7	Fine-medium gravel; minor coarse sand; coarse gravel; minor silt, changing gradually to predominantly coarse gravel				
4						268
	267.6 4.5	**END OF BOREHOLE**				

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined ✛ Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH26 (MacLaren Engineers Inc., 1983).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 26R

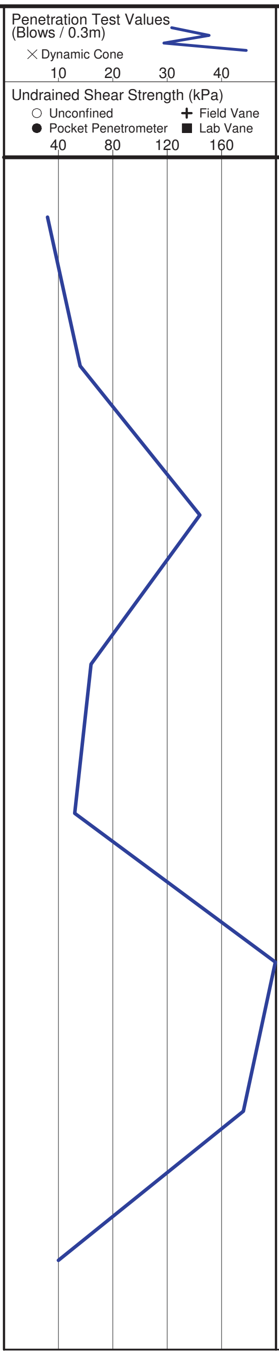
project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/08/07
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery
	GROUND SURFACE			
0	Brown **CLAYEY SILT**, some fine to coarse sand and subrounded gravel, trace roots, APL, firm.	1	SS	8
0.8	Reddish brown **CLAYEY SILT**, some fine to coarse sand, some fine to coarse subrounded gravel, APL, stiff to very stiff.	2	SS	14
		3	SS	36
2.3	Grey **CLAYEY SILT**, trace fine to coarse sand, trace to some fine to coarse gravel, APL, stiff to very stiff.	4	SS	16
		5	SS	13
		6	SS	51
		7	SS	44
5.3	Grey-brown coarse **SAND** and fine to coarse **GRAVEL**, some silt, saturated, loose.	8	SS	10
6.1	**END OF BOREHOLE**			

Elevation Scale (mASL)



Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

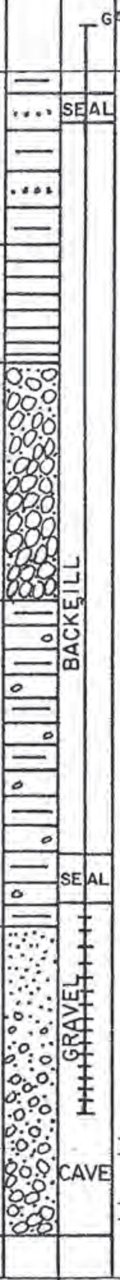
Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

GEOLOGICAL LOG

TEST HOLE No. 27

SHEET 1 OF 1

EL (mGSD) / DEPTH (m)	DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
271.7	GROUND SURFACE			
0.0 269.6	Red brown to brown interlayered clayey silt and silty fine sand with minor gravel			
2.1 268.0	Red brown to grey clayey silt, minor gravel			
3.7 265.0	Fine-medium gravel; minor coarse sand, coarse gravel and silt; changing gradually to predominantly coarse gravel			
6.7	Dense grey clayey silt; minor fine-coarse sand, fine-coarse gravel, predominantly gravel layer at 8.5-9 m	1	ss	42
		2	ss	55
		3	ss	52
		4	ss	37
		5	ss	46
260.7		6	ss	48
11.0	Light brown silty fine-coarse sand changing gradually to grey fine to coarse gravel with minor sand	7	ss	5
		8	ss	34
		9	ss	14
		10	ss	18
256.7		11	ss	2
15.0	END OF HOLE			



NOTES

DATE DRILLED Jan. 21,24, 1983

TYPE OF RIG CME 75

DRILLING METHOD Casing & Tricone

DEPTH WATER FOUND 3.7,11.0
(m below ground surface)
STATIC WATER LEVEL
(m below ground surface)

PIPE DIAMETER 51 (mm)
LENGTH OF PIEZOMETER 2.4 (m)
TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE
SS-SPLIT SPOON
WA-WASH

▽ Static Water Elevation (m GSD)

Piezometer

MacLaren
MacLAREN ENGINEERS INC.

TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

GEOLOGICAL LOG

TEST HOLE No. 28

SHEET 1 OF 1

EL (mGSD) / DEPTH (m)	DESCRIPTION	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
277.4	GROUND SURFACE	0.80m			
0.0	Brown fine sand, minor silt and coarse gravel	BACKFILL SEAL	1 2 3	ss ss ss	8 19 31
275.3 2.1	Brown to dark brown compact-dense clayey silt, minor fine-coarse gravel	▽ BACKFILL SEAL GRAVEL	4 5 6 7 8 9 10	ss ss ss ss ss ss ss	43 20 23 21 45 77 80
270.0 7.5	Light brown loose silty fine sand	╪	11 12	ss ss	 18
267.8		CAVE	13	ss	42
9.6	END OF HOLE				

NOTES

DATE DRILLED Jan. 17, 1983

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 2.7 (m below ground surface)

STATIC WATER LEVEL 2.49 (m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1.5 (m)

TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE

SS-SPLIT SPOON

WA-WASH

▽ 274.94 Static Water Elevation (m GSD) (05 April 1983)

╪ Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

LOG OF BOREHOLE 28 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*
rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*
date started | 2015/07/20
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE | SAMPLE

Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value / Core Recovery
277.7	**GROUND SURFACE**				
	Brown fine sand, minor silt and coarse gravel				
275.6 2.1	Brown to dark brown compact to dense clayey silt, minor fine to coarse gravel				
270.2 7.5	Light brown loose silty fine sand				
268.6 9.1	**END OF BOREHOLE**				

Depth Scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

Elevation Scale (mARD): 277, 276, 275, 274, 273, 272, 271, 270, 269

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40
Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Stratigraphy inferred from original borehole log for BH28 (MacLaren Engineers Inc., 1983).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

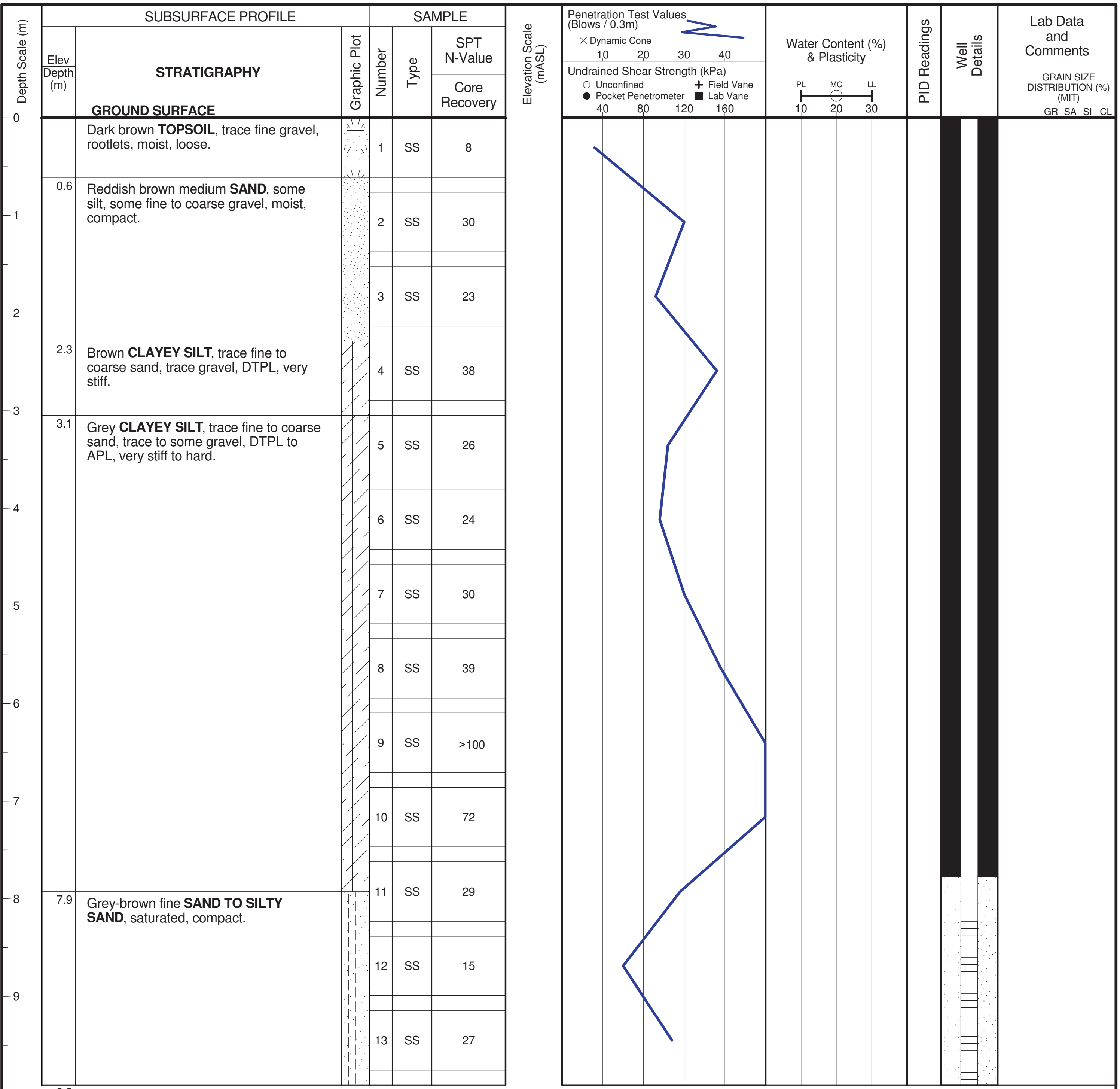
LOG OF BOREHOLE 28R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/21
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	SAMPLE Number	Type	SPT N-Value / Core Recovery
		GROUND SURFACE			
0		Dark brown **TOPSOIL**, trace fine gravel, rootlets, moist, loose.	1	SS	8
	0.6	Reddish brown medium **SAND**, some silt, some fine to coarse gravel, moist, compact.	2	SS	30
			3	SS	23
	2.3	Brown **CLAYEY SILT**, trace fine to coarse sand, trace gravel, DTPL, very stiff.	4	SS	38
	3.1	Grey **CLAYEY SILT**, trace fine to coarse sand, trace to some gravel, DTPL to APL, very stiff to hard.	5	SS	26
			6	SS	24
			7	SS	30
			8	SS	39
			9	SS	>100
			10	SS	72
	7.9	Grey-brown fine **SAND TO SILTY SAND**, saturated, compact.	11	SS	29
			12	SS	15
			13	SS	27
	9.9	**END OF BOREHOLE**			



library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpj

GEOLOGICAL LOG

TEST HOLE No. 30

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	278.9	GROUND SURFACE		1.44 m			
1 5 2	0.0	Light brown fine-coarse sand, minor fine-coarse gravel, minor silt		▽ BACKFILL	1 2 3	ss ss ss	6 11 35
10 3 4	276.8 2.1	Grey clayey silt, minor fine-coarse sand, fine-coarse gravel		BACKFILL SEAL	4 5 6	ss ss ss	18 29 20
15 5 6 20 7 25 8 9 30 10 35 11	274.5 4.4	Grey fine-coarse sand, fine gravel; minor silt, minor medium-coarse gravel		BACKFILL GRAVEL	7 8 9	ss ss ss	12 25 38
12 40 13 45 14 15 50	267.8 11.1	END OF HOLE					

NOTES

DATE DRILLED Jan. 18,19, 1983

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND 2.4
(m below ground surface)

STATIC WATER LEVEL 1.41
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 3.0 (m)

TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 277.51 Static Water Elevation (m GSD) (05 April 1983)

╪ Piezometer

MacLaren

MacLAREN
ENGINEERS INC.

TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

LOG OF BOREHOLE 30 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/25
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE: STRATIGRAPHY	SAMPLE: Number	Type	SPT N-Value / Core Recovery
0	279.1	**GROUND SURFACE**			
0		Light brown fine-coarse sand, minor fine-coarse gravel, minor silt			
2	277.0 2.1	Grey clayey silt, minor fine-coarse sand, fine-coarse gravel			
4	274.7 4.4	Grey fine-coarse sand, fine gravel, minor silt, minor medium-coarse gravel			
11	268.1 11.0	**END OF BOREHOLE**			

Depth Scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

Elevation Scale (mARD): 279, 278, 277, 276, 275, 274, 273, 272, 271, 270, 269

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH30 (MacLaren Engineers Inc., 1983).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

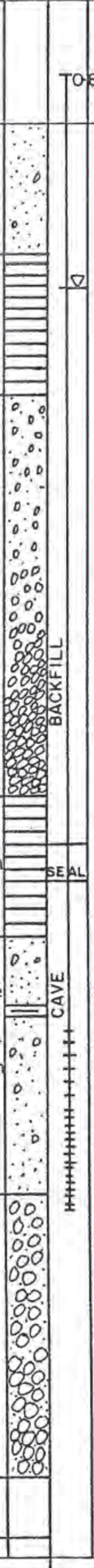
library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

GEOLOGICAL LOG

TEST HOLE No. 31

SHEET 1 OF 1

EL (mGSD) / DEPTH (m)	DESCRIPTION
278.9	GROUND SURFACE
0.0 – 276.8 / 2.1	Light brown fine-coarse sand, minor fine-coarse gravel, minor silt
2.1 – 274.5 / 4.4	Grey clayey silt, minor fine-coarse sand, fine-coarse gravel
4.4 – 267.9 / 11.0	Light brown-grey silty fine-coarse sand, fine-coarse gravel gradually becoming predominantly grey coarse gravel
11.0 – 265.6 / 13.3	Grey clayey silt, minor fine-coarse gravel at 11.0m minor silty fine sand at 13.0 m
13.3 – 261.3 / 17.5	Light brown-grey silty fine sand, minor coarse gravel, medium-coarse sand, significant silt at 14.5m, medium to coarse sand at 16.8 m
17.5 – 256.8 / 22.1	Fine-coarse gravel with medium sand; minor silt
22.1 – 255.9 / 23.0	Dense grey sandy till
23.0	END OF HOLE



SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
1	SS	16
2	SS	44
3	SS	17
4	SS	18
5	SS	9
6	SS	20
7	SS	13
8	SS	51
9	SS	68
10	SS	29
11	SS	46
12	SS	68
13	SS	
14	SS	63
15	SS	64
16	SS	76
17	SS	176

SCALE (ft) (m): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75 / 1–23

NOTES

DATE DRILLED Jan. 25,26, 1983 Feb. 03, 1983

TYPE OF RIG CME 75

DRILLING METHOD Solid Stem Augers Casing and Tricone

DEPTH WATER FOUND ________
(m below ground surface)

STATIC WATER LEVEL 2.63
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 3.0 (m)

TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE

SS- SPLIT SPOON

WA- WASH

▽ 276.25 Static Water Elevation (05 April 1983)

╪ Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

DJR

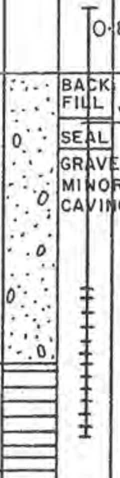
PROJECT NO. 11602-2

GEOLOGICAL LOG

TEST HOLE No. 32

SHEET 1 OF 1

EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
279.6	GROUND SURFACE		0.89m			
0.0	Light brown fine-medium sand, minor fine-coarse gravel, sandy clayey silt layer at 2.5 m		BACKFILL	1	ss	7
			SEAL	2	ss	14
			GRAVEL MINOR CAVING	3	ss	28
				4	ss	18
				5	ss	8
276.0 3.7	Grey loose clayey silt			6	ss	8
				7	ss	5
274.6 5.1	END OF HOLE					



SCALE (ft)(m)
- 5 ft, 10 ft, 15 ft, 20 ft, 25 ft, 30 ft, 35 ft, 40 ft, 45 ft, 50 ft
- 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 m

NOTES

DATE DRILLED Jan. 19, 1983

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 0.6 (m below ground surface)

STATIC WATER LEVEL 0.65 (m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1.8 (m)

TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE

SS-SPLIT SPOON

WA-WASH

∇278.96 Static Water Elevation (m GSD) (05 April 1983)

‡ Piezometer

MacLaren

MACLAREN ENGINEERS INC.

TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

LOG OF BOREHOLE 32 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/10
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE | SAMPLE

Penetration Test Values (Blows / 0.3m) — × Dynamic Cone — 10 20 30 40

Undrained Shear Strength (kPa) — ○ Unconfined ✚ Field Vane ● Pocket Penetrometer ■ Lab Vane — 40 80 120 160

Water Content (%) & Plasticity — PL MC LL — 10 20 30

Lab Data and Comments — GRAIN SIZE DISTRIBUTION (%) (MIT) — GR SA SI CL

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)	PID Readings	Well Details
	280.1	**GROUND SURFACE**							
0		Light brown fine to medium sand, minor fine to coarse gravel, sandy clayey silt layer at 2.5 m					280		
1							279		
2							278		
3							277		
	276.4 3.7	Grey loose clayey silt							
4							276		
	275.5 4.6	**END OF BOREHOLE**							

Stratigraphy inferred from original borehole log for BH32 (MacLaren Engineers Inc., 1983).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

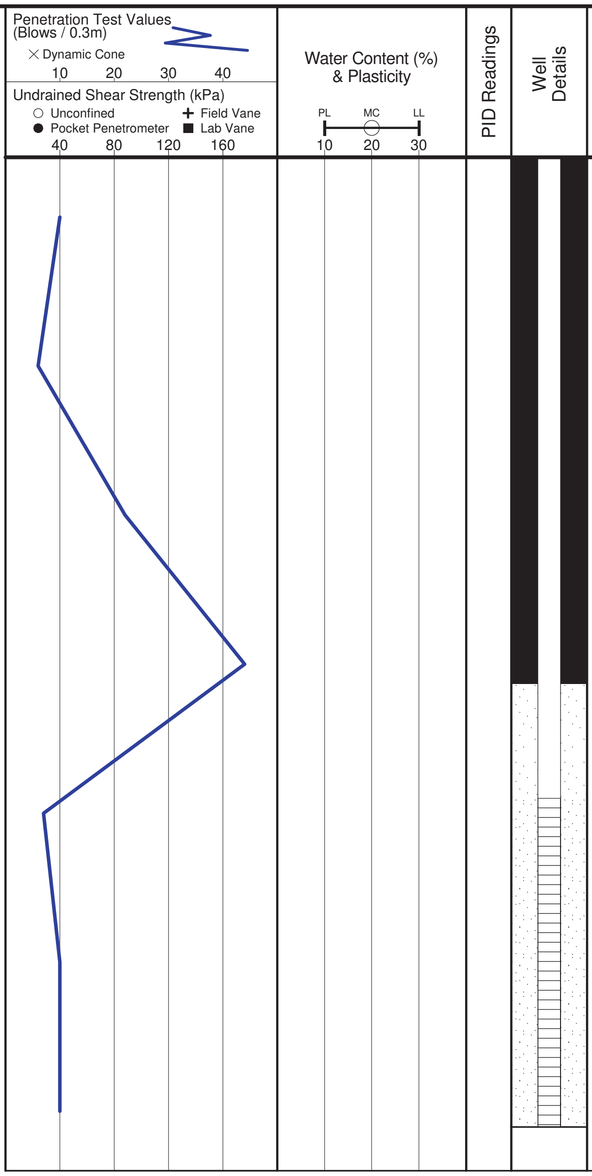
LOG OF BOREHOLE 32R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/10
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	Sample Number	Type	SPT N-Value / Core Recovery
0		**GROUND SURFACE**			
		Dark brown **TOPSOIL AND ORGANICS**, some fine gravel, dry, loose.	1	SS	10
	0.6	Brown fine to coarse **SAND**, trace silt, wet, loose, weakly dilatant.			
1			2	SS	6
	1.5	Brown fine to coarse **SAND**, some medium gravel, trace to some silt, wet, compact to dense.	3	SS	22
2					
			4	SS	44
3					
	3.4	Grey **SANDY SILT**, trace clay, wet, compact.	5	SS	7
4			6	SS	10
	4.6	Grey **SILT**, trace clay, some fine sand, APL, firm.	7	SS	10
5					
	5.2	**END OF BOREHOLE**			



Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)

GR SA SI CL

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpj

Sheet No. 1 of 1

GEOLOGICAL LOG

TEST HOLE No. 33

SHEET 1 OF 1.

EL (mGSD) / DEPTH (m)	DESCRIPTION	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
279.9	GROUND SURFACE	0·76m			
0.0	Black-grey clayey silt, minor medium gravel	BACKFILL SEAL	1	ss	7
			2	ss	5
276.5 3.4	Loose brown silty fine sand	▽	3	ss	9
275.0 4.9	Brown-grey clayey silt; minor fine-coarse gravel, minor sand		4	ss	22
		CAVE	5	ss	39
		SEAL	6	ss	12
270.8 9.1	Brown silty fine sand	CAVE	7	ss	11
			8	ss	12
268.0 11.9	Brown clayey silt		9	ss	37
267.2 12.7	END OF HOLE				

NOTES

DATE DRILLED Jan. 19, 1983

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND
(m below ground surface)

STATIC WATER LEVEL 3.12
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1.8 (m)

TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽276.54 Static Water Elevation (m GSD) (05 April 1983)

Piezometer

MacLaren

MacLAREN
ENGINEERS INC.

TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

LOG OF BOREHOLE 33 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/16
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE: STRATIGRAPHY	Graphic Plot	SAMPLE: Number	SAMPLE: Type	SAMPLE: SPT N-Value / Core Recovery	Elevation Scale (mARD)
	280.2	**GROUND SURFACE**					
0		Black-grey clayey silt, minor medium gravel					280
3.4	276.8 3.4	Loose brown silty fine sand					277
4.9	275.3 4.9	Brown-grey clayey silt; minor fine to coarse gravel, minor sand					275
9.1	271.1 9.1	Brown silty fine sand					271
11.9	268.3 11.9	Brown clayey silt					
12.1	268.1 12.1	**END OF BOREHOLE**					

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40
Undrained Shear Strength (kPa)
○ Unconfined ✚ Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH33 (MacLaren Engineers Inc., 1983).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpi

LOG OF BOREHOLE 33R

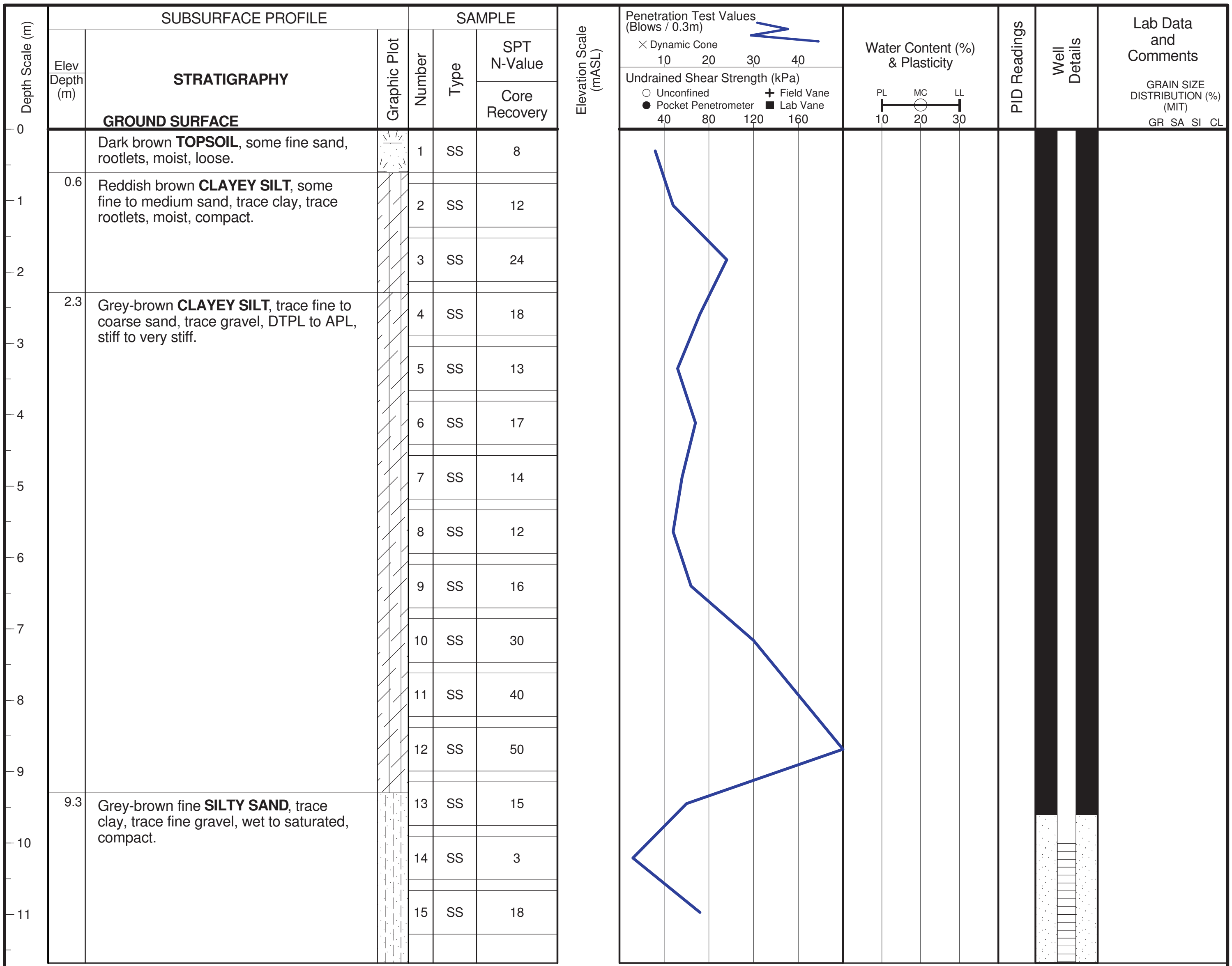
project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/23
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE		SAMPLE		
Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value Core Recovery
	GROUND SURFACE			
	Dark brown **TOPSOIL**, some fine sand, rootlets, moist, loose.	1	SS	8
0.6	Reddish brown **CLAYEY SILT**, some fine to medium sand, trace clay, trace rootlets, moist, compact.	2	SS	12
		3	SS	24
2.3	Grey-brown **CLAYEY SILT**, trace fine to coarse sand, trace gravel, DTPL to APL, stiff to very stiff.	4	SS	18
		5	SS	13
		6	SS	17
		7	SS	14
		8	SS	12
		9	SS	16
		10	SS	30
		11	SS	40
		12	SS	50
9.3	Grey-brown fine **SILTY SAND**, trace clay, trace fine gravel, wet to saturated, compact.	13	SS	15
		14	SS	3
		15	SS	18
11.7	**END OF BOREHOLE**			

Stratigraphy inferred from adjacent borehole 25R.

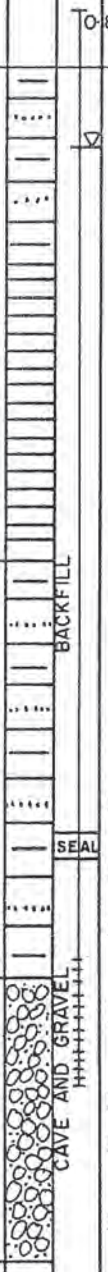


GEOLOGICAL LOG

TEST HOLE No. 35

SHEET 1 OF 1

EL (mGSD) DEPTH (m)	DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
277.8	GROUND SURFACE			
0.0	Grey clayey silt, minor gravel interlayered with silty fine sand at 0.3 m	1	ss	3
		2	ss	47
		3	ss	30
		4	ss	28
270.7		5	ss	9
7.1	Brown-grey clayey silt with fine-coarse gravel interlayered with thin horizons of fine-coarse sand	6	ss	27
		7	ss	17
		8	ss	11
		9	ss	73
		10	ss	58
		11	ss	34
264.7		12	ss	54
13.1	Grey fine-coarse gravel with sand and minor silt	13	ss	27
		14	ss	32
		15	ss	33
260.6		16	ss	25
17.2	END OF HOLE			



NOTES

DATE DRILLED Jan.26,27, 1983

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers, Casing and Tricone

DEPTH WATER FOUND ______ (m below ground surface)

STATIC WATER LEVEL 1.21 (m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1.8 (m)

TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE

SS- SPLIT SPOON
WA- WASH
AU- AUGER

▽276.60 Static Water Elevation (mGSD) (05 April 1983)

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

GEOLOGICAL LOG

TEST HOLE No. 37

SHEET 1 OF 1

NOTES

DATE DRILLED Feb. 11,14,15 1983

TYPE OF RIG CME 75

DRILLING METHOD Solid Stem Auger, Casing, Tricone

DEPTH WATER FOUND 4.6 (m below ground surface)

STATIC WATER LEVEL ________ (m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 3.0 (m)

TYPE OF PIEZOMETER Slotted and Nitex screen wrapped

SAMPLE TYPE

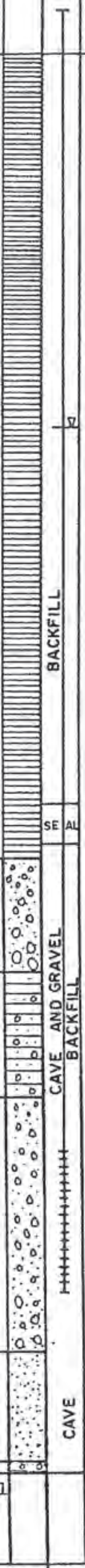
SS-SPLIT SPOON

WA-WASH

AU-AUGER

▽ Static Water Elevation (m GSD) 275.39 m

Piezometer



EL (mGSD) / DEPTH (m)	DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
274.76	GROUND SURFACE	1.72 m		
0.0 259.98	Grey brown clayey silt, minor fine to coarse gravel, layer of silty fine sand at 4.6 m, trace minor fine to coarse sand from 10.6 - 12 m.		SS SS SS SS SS SS SS SS SS	18 18 30 32 38 47 55 31 39
14.8 257.84	Fine gravel, some fine to coarse sand and medium to coarse gravel, minor silt		SS SS	26 134
16.9 255.55	Brown grey clayey silt, minor fine to medium sand, fine to coarse gravel		SS	64
19.2 250.99	Fine to medium gravel, some coarse gravel, minor fine to coarse sand, minor silt		SS SS SS	21 11 7
23.8 249.00	Brown silty fine to coarse sand, minor fine to coarse gravel		SS	73
25.8 248.79	Very dense hard clay till, minor fine to medium gravel sand, silt		SS	600
26.0	END OF HOLE			

TEST HOLE RECORD

DJR

MacLaren

MacLAREN ENGINEERS INC.

PROJECT NO. 11602-2

LOG OF BOREHOLE 37 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/08/04
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE: Depth Scale (m) | Elev Depth (m) | STRATIGRAPHY | Graphic Plot
SAMPLE: Number | Type | SPT N-Value | Core Recovery
Elevation Scale (mARD)
Penetration Test Values (Blows / 0.3m) — × Dynamic Cone — 10 20 30 40
Undrained Shear Strength (kPa) — ○ Unconfined ✚ Field Vane ● Pocket Penetrometer ■ Lab Vane — 40 80 120 160
Water Content (%) & Plasticity — PL MC LL — 10 20 30
PID Readings
Well Details
Lab Data and Comments — GRAIN SIZE DISTRIBUTION (%) (MIT) — GR SA SI CL

Elev Depth (m)	STRATIGRAPHY
275.0	**GROUND SURFACE**
	Grey brown clayey silt, minor fine to coarse gravel, layer of silty fine sand at 4.6 m, trace minor fine to coarse sand from 10.6 - 12 m
260.2 14.8	Fine gravel, some fine to coarse sand and medium to coarse gravel, minor silt
258.1 16.9	Brown grey clayey silt, minor fine to medium sand, fine to coarse gravel
255.8 19.2	Fine to medium gravel, some coarse gravel, minor fine to coarse sand, minor silt
252.3 22.7	**END OF BOREHOLE**

Depth Scale (m)	Elevation Scale (mARD)
0	
1	274
2	273
3	272
4	271
5	270
6	269
7	268
8	267
9	266
10	265
11	264
12	263
13	262
14	261
15	260
16	259
17	258
18	257
19	256
20	255
21	254
22	253

Stratigraphy inferred from original borehole log for BH37 (MacLaren Engineers Inc., 1983).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 37R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

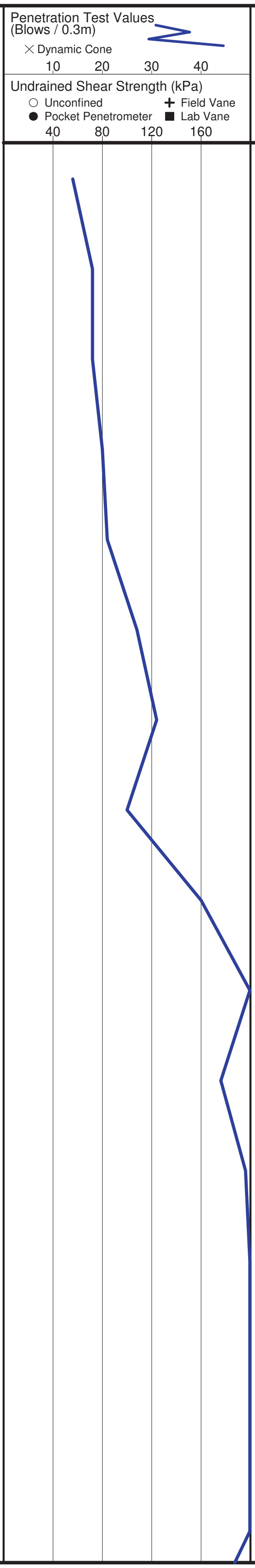
date started | 2015/08/05
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE

Elev Depth (m)	STRATIGRAPHY
	GROUND SURFACE
0	Dark brown **SANDY TOPSOIL**, rootlets, dry, compact.
0.5	Brown coarse **SILTY SAND TO SANDLY SILT**, some fine to medium gravel, trace clay, trace organics, moist, compact.
1.5	Reddish brown **CLAYEY SILT**, some sand, trace fine gravel, APL, very stiff.
2.7	Grey **CLAYEY SILT**, some fine to coarse sand to silty sand layers up to 10 cm, trace fine gravel, APL, very stiff to hard.
7.6	Grey **CLAYEY SILT**, trace fine sand and gravel, DTPL to APL, hard.

SAMPLE

Number	Type	SPT N-Value
1	SS	14
2	SS	18
3	SS	18
4	SS	20
5	SS	21
6	SS	27
7	SS	31
8	SS	25
9	SS	40
10	SS	78
11	SS	44
12	SS	49
13	SS	52
14	SS	52
15	SS	66
16	SS	51



Depth Scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

Elevation Scale (mASL)

Water Content (%) & Plasticity: PL MC LL 10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

(continued next page)

LOG OF BOREHOLE 37R

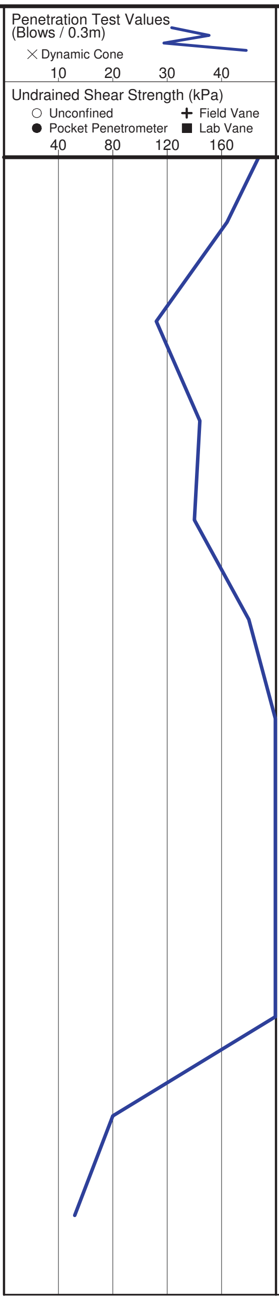
project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/08/05
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY *(continued)*	Number	Type	SPT N-Value / Core Recovery
12		Grey **CLAYEY SILT**, trace fine sand and gravel, DTPL to APL, hard. *(continued)*	17	SS	41
13	13.0	Grey-brown **SANDY SILT**, trace clay, WTPL, very stiff to hard.	18	SS	28
14			19	SS	36
15			20	SS	35
	15.2	Grey coarse **SAND** and fine to medium **GRAVEL**, trace silt, wet, dense to very dense.	21	SS	45
16			22	SS	69
	16.8	Grey **CLAYEY SILT**, some fine to coarse gravel, WTPL, hard.	23	SS	77
17			24	SS	73
18			25	SS	93
19	18.9	Grey coarse **GRAVELLY SAND**, trace silt, wet, compact.	26	SS	20
20			27	SS	13
	20.7	**END OF BOREHOLE**			

Elevation Scale (mASL)



Water Content (%) & Plasticity	PID Readings	Well Details	Lab Data and Comments
PL MC LL 10 20 30			GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

GEOLOGICAL LOG

TEST HOLE No. 38

SHEET 1 OF 1

SCALE (ft): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105

SCALE (m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32

EL (mGSD)	DEPTH (m)	DESCRIPTION	PIEZOMETER
282.27		GROUND SURFACE	1.33 m
	0.0	Red brown silty fine to medium sand, fine to coarse gravel Red brown clayey silt, minor fine to coarse gravel	BACKFILL
278.92	3.4	Light brown uniform fine sand	BACKFILL
277.57	4.7	Red brown to grey clayey silt, minor fine to coarse gravel, minor layer of silty fine to coarse sand at 7.6 m formation becoming more dense at 10.7 m	BACKFILL SEAL
267.77	14.5	Brown-grey brown clayey silt, minor fine to coarse gravel interlayered with brown silty fine sand and sandy silt Grey clayey silt, fine to coarse sand, fine to coarse gravel	CAVE
260.27	21.9	Grey fine to coarse gravel medium to coarse sand	CAVE
253.77	28.5	Grey very dense sandy clayey silt till	CAVE
251.33	30.9	END OF HOLE	

SAMPLE TYPE	BLOWS/0.3m
SS	25
SS	21
SS	26
SS	19
SS	17
SS	37
SS	63
SS	106
SS	113
SS	23
SS	92
SS	26
SS	57
SS	104
SS	34
SS	17
SS	17
SS	51
SS	250
SS	220

NOTES

DATE DRILLED Feb. 15,16,17 1983

TYPE OF RIG CME 75

DRILLING METHOD Solid Stem Augers, Casing and Tricone

DEPTH WATER FOUND ______ (m below ground surface)

STATIC WATER LEVEL ______ (m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 3.0 (m)

TYPE OF PIEZOMETER Slotted and Nitex screen wrapped

SAMPLE TYPE

SS-SPLIT SPOON

WA-WASH

AU-AUGER

▽ Static Water Elevation (m GSD) 275.45 m

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

DJR

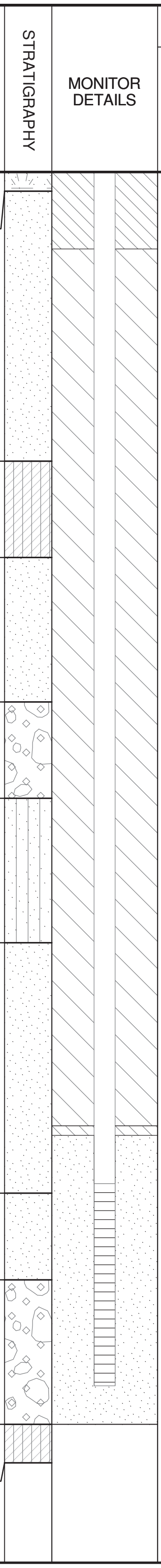
PROJECT NO. 11602-2

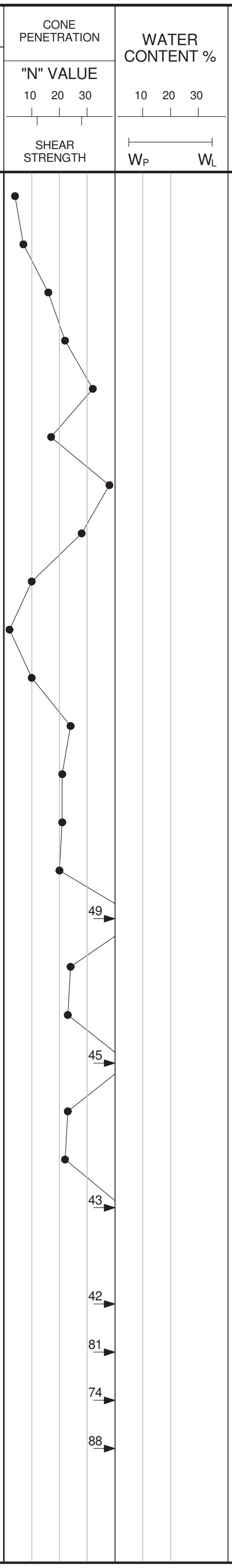
BOREHOLE NO. BH39

PAGE 1 of 1

PROJECT NAME: HOLBROOK LANDFILL
PROJECT NO.: 111-53037-00 132-00
CLIENT: COUNTY OF OXFORD
DATE COMPLETED: Jul 18, 2013
BOREHOLE TYPE: 210 mm HOLLOW STEM AUGER
SUPERVISOR: TJB
GROUND ELEVATION: TO BE DETERMINED
REVIEWER: KJF

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	RQD (%)	REMARKS
0.3	TOPSOIL: DARK BROWN TOPSOIL, SOME ORGANICS, WET, LOOSE.	SS1	4		7		
	SAND: GREY-BROWN MEDIUM TO FINE GRAINED SAND, TRACE TO SOME SILT, SOME MEDIUM TO COARSE GRAVEL BELOW 3.0 m, TRACE SILT, SATURATED, COMPACT.	SS2	7		37		1 cm THICK ORGANIC LAYER AT 1.0 m DEPTH
		SS3	16		33		
		SS4	22		37		
		SS5	32		60		
		SS6	17		10		
4.6	CLAYEY SILT: GREY-BROWN CLAYEY SILT, TRACE GRAVEL, WTPL, STIFF.	SS7	38		2		
		SS8	28		3		
6.1	SAND: GREY-BROWN FINE GRAINED SAND, TRACE SILT, WET TO SATURATED, VERY LOOSE TO LOOSE.	SS9	10		47		
		SS10	2		0		POOR RECOVERY IN SPOON
		SS11	10		50		
8.4	SAND AND GRAVEL: GREY-BROWN FINE TO MEDIUM GRAVEL AND FINE GRAINED SAND, TRACE TO SOME SILT, WET TO SATURATED, COMPACT.	SS12	24		20		
		SS13	21		47		
9.9	SILTY SAND : GREY-BROWN SILTY FINE SAND, WET, COMPACT TO DENSE.	SS14	21		60		
		SS15	20		67		
		SS16	49		70		
12.2	SAND: GREY-BROWN COARSE GRAINED SAND, SOME FINE TO MEDIUM GRAVEL, TRACE SILT, SATURATED, COMPACT.	SS17	24		27		
		SS18	23		33		
		SS19	45		3		
		SS20	23		43		
		SS21	22		53		
16.2	SAND: GREY-BROWN MEDIUM TO FINE GRAINED SAND, TRACE SILT, WET, DENSE.	SS22	43		40		
		SS23	50		20		
17.5	SAND AND GRAVEL: GREY-BROWN MEDIUM TO COARSE GRAINED SAND AND MEDIUM GRAVEL, TRACE CLAYEY SILT, TRACE FINE SAND, WET TO SATURATED, COMPACT.	SS24	42		40		
		SS25	81		27		
		SS26	74		43		
19.8	SILTY CLAY: GREY SILTY CLAY, TRACE GRAVEL, APL TO WTPL, VERY DENSE.	SS27	88		40		
20.4	BOREHOLE TERMINATED AT 20.4 m DEPTH IN SILTY CLAY.						

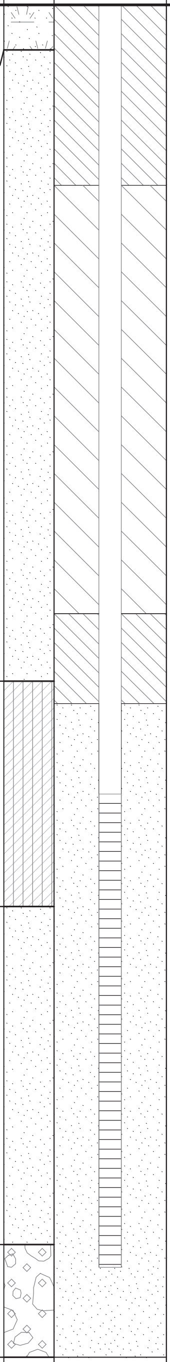




BOREHOLE NO. BH40

PAGE 1 of 1

PROJECT NAME: HOLBROOK LANDFILL
PROJECT NO.: 111-53037-00 132-00
CLIENT: COUNTY OF OXFORD
DATE COMPLETED: Jul 22, 2013
BOREHOLE TYPE: 210 mm HOLLOW STEM AUGER
SUPERVISOR: TJB
GROUND ELEVATION: TO BE DETERMINED
REVIEWER: KJF



DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 SHEAR STRENGTH	WATER CONTENT % 10 20 30 WP WL	REMARKS
0.0	TOPSOIL: DARK BROWN TOPSOIL, SOME ORGANICS, WET, LOOSE.										STRATIGRAPHY BASED ON ADJACENT DEEP BOREHOLE 39.
0.3	SAND: GREY-BROWN MEDIUM TO FINE GRAINED SAND, TRACE TO SOME SILT, SOME MEDIUM TO COARSE GRAVEL BELOW 3.0 m, TRACE SILT, SATURATED, COMPACT.										
1.0											1 cm THICK ORGANIC LAYER AT 1.0 m DEPTH
4.6	CLAYEY SILT: GREY-BROWN CLAYEY SILT, TRACE GRAVEL, WTPL, STIFF.										
6.1	SAND: GREY-BROWN FINE GRAINED SAND, TRACE SILT, WET TO SATURATED, VERY LOOSE TO LOOSE.										
											POOR RECOVERY IN SPOON
8.4	SAND AND GRAVEL: GREY-BROWN FINE TO MEDIUM GRAVEL AND FINE GRAINED SAND, TRACE TO SOME SILT, WET TO SATURATED, COMPACT.										
9.1	BOREHOLE TERMINATED AT 9.1 m DEPTH IN SAND AND GRAVEL.										
10.0											

GENIVAR GEOLOGIC B/W (METRIC) HOLBROOK.GPJ JAGGER HIMS BASIC.GDT 9/6/13

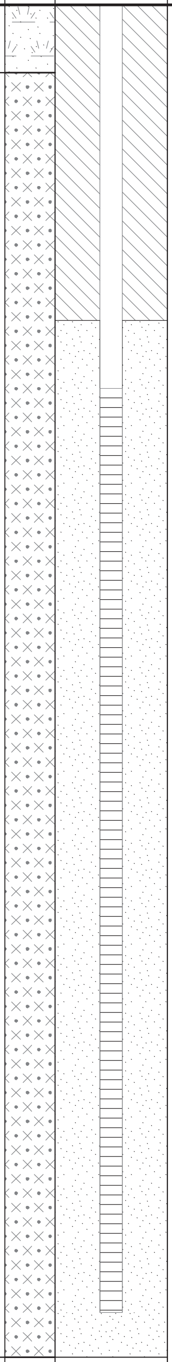
GENIVAR

BOREHOLE NO. BH41

PAGE 1 of 1

PROJECT NAME: HOLBROOK LANDFILL
PROJECT NO.: 111-53037-00 132-00
CLIENT: COUNTY OF OXFORD
DATE COMPLETED: Jul 22, 2013
BOREHOLE TYPE: 210 mm HOLLOW STEM AUGER
SUPERVISOR: TJB
GROUND ELEVATION: TO BE DETERMINED
REVIEWER: RFK

DEPTH (m)		STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE					CONE PENETRATION "N" VALUE 10 20 30 SHEAR STRENGTH	WATER CONTENT % 10 20 30 WP WL	REMARKS
					TYPE	N VALUE	% WATER	% RECOVERY	RQD (%)			
0.0		TOPSOIL AND CLAY CAP										
	0.5	WASTE										
1.0												
		WASTE BECOMING WET										
2.0												
3.0		WASTE BECOMING SATURATED										
4.0												
5.0												
6.0												
7.0												
8.0												
9.0												
	9.1	BOREHOLE TERMINATED AT 9.1 m DEPTH IN WASTE.										
10.0												



LOG OF BOREHOLE 42

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/07
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE | SAMPLE | Elevation Scale (mASL) | Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40; Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160 | Water Content (%) & Plasticity PL MC LL 10 20 30 | PID Readings | Well Details | Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value / Core Recovery
0		**GROUND SURFACE**				
		Dark brown **TOPSOIL**, some organics, wet, loose.				
	0.3	Grey-brown medium to fine grained **SAND**, trace to some silt, some medium to coarse gravel below 3.0 m, trace silt, saturated, compact.				
	4.6	Grey-brown **CLAYEY SILT**, trace gravel, WTPL, stiff.				
	6.1	Grey-brown fine grained **SAND**, trace silt, wet to saturated, very loose to loose.				
	8.4	Grey-brown fine to medium **GRAVEL** and fine grained **SAND**, trace to some silt, wet to saturated, compact.				
	9.9	Grey-brown **SILTY FINE SAND**, wet, compact to dense.				
	12.2	Grey-brown coarse grained **SAND**, some fine to medium gravel, trace silt, saturated, compact.				
15						

(continued next page)

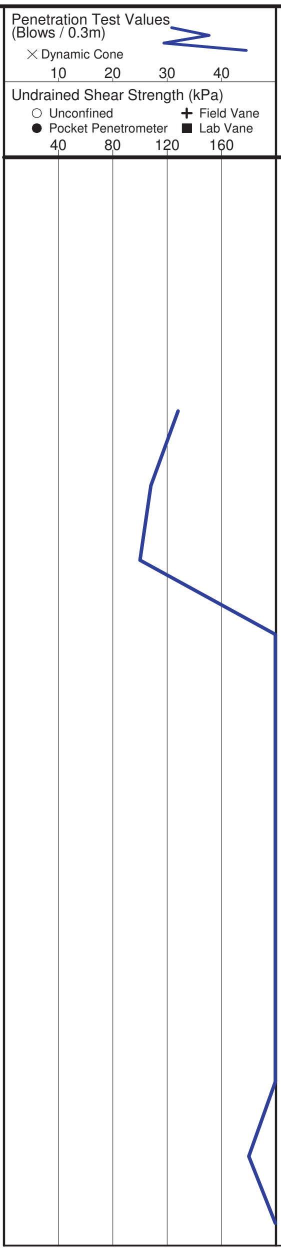
LOG OF BOREHOLE 42

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/07
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	STRATIGRAPHY *(continued)*	Number	Type	SPT N-Value
16.2	Grey-brown medium to fine grained **SAND**, trace silt, wet, dense.			
17.5	Grey-brown medium to coarse grained **SAND** and medium **GRAVEL**, trace clayey silt, trace fine sand, wet to saturated, compact.	1	SS	32
19.1	Grey **CLAYEY SILT**, trace gravel, APL, very stiff.	2	SS	27
		3	SS	25
20.4	Grey **CLAYEY SILT**, trace fine to coarse sand, increasing sand content with depth, DTPL to APL, hard.	4	SS	>100
		5	SS	>100
		6	SS	>100
		7	SS	>100
		8	SS	96
		9	SS	>100
		10	SS	>100
25.9	Grey medium to coarse grained **SAND**, trace silt, wet, dense to very dense.	11	SS	45
		12	SS	80
27.1	**END OF BOREHOLE** Stratigraphy to 18.3 m depth inferred from adjacent BH39.			



Water Content (%) & Plasticity: PL MC LL 10 20 30

PID Readings

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Depth Scale (m): 16 17 18 19 20 21 22 23 24 25 26 27

Elevation Scale (mASL)

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpj

LOG OF BOREHOLE 43

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

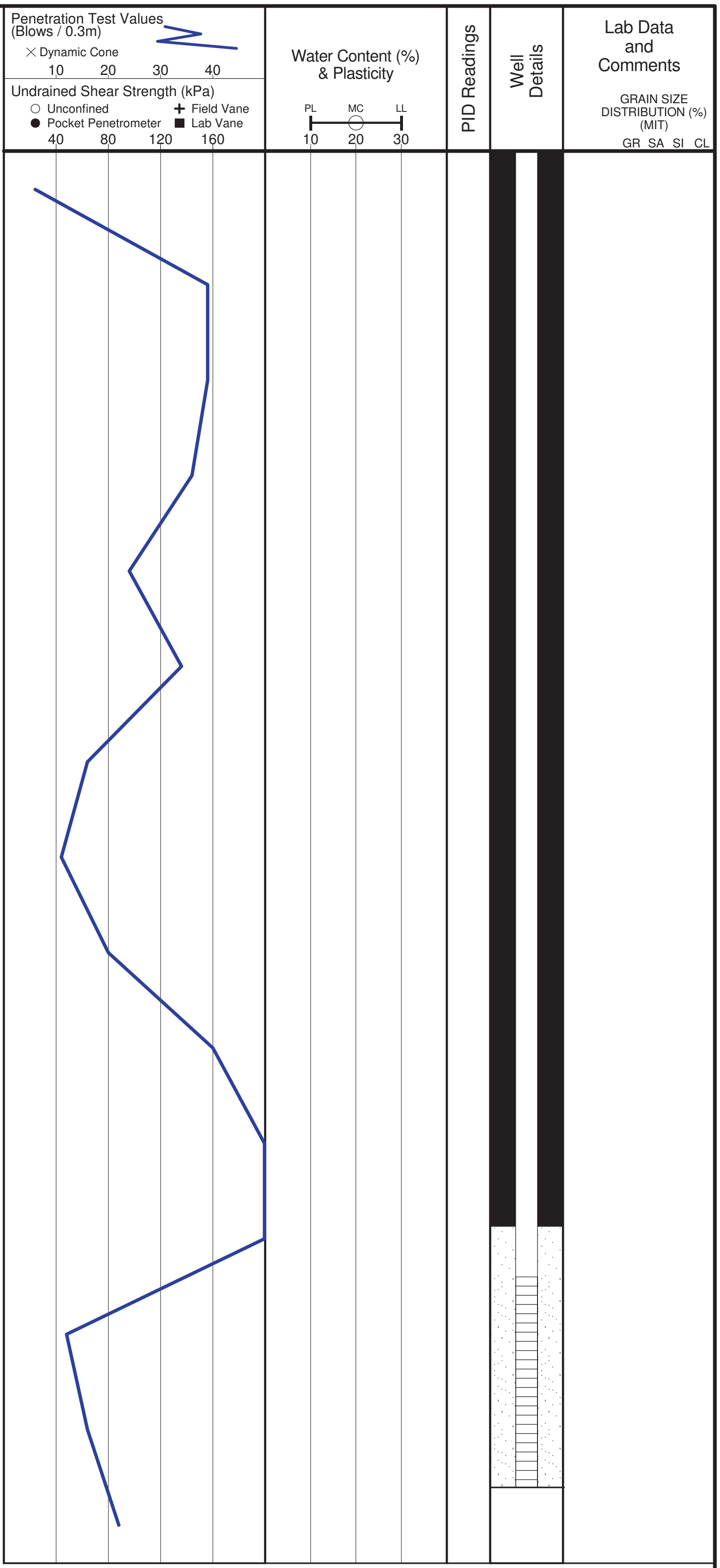
date started | 2015/07/21
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE

Elev Depth (m)	STRATIGRAPHY
	GROUND SURFACE
0	Brown **SANDY TOPSOIL AND ORGANICS**, dry, loose.
0.5	Reddish brown **CLAYEY SILT**, trace fine sand, DTPL, hard.
3.4	Brown fine **SANDY SILT**, moist to wet, compact.
3.8	Grey **CLAYEY SILT**, some fine to coarse sand, some gravel, APL, stiff to hard.
6.7	Grey **CLAYEY SILT**, trace gravel, DTPL, hard.
9.0	Grey-brown **SILTY SAND**, trace fine gravel, saturated, compact.
11.3	**END OF BOREHOLE**

SAMPLE

Number	Type	SPT N-Value
1	SS	6
2	SS	39
3	SS	39
4	SS	36
5	SS	24
6	SS	34
7	SS	16
8	SS	11
9	SS	20
10	SS	40
11	SS	51
12	SS	52
13	SS	12
14	SS	16
15	SS	22



LOG OF BOREHOLE 44

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

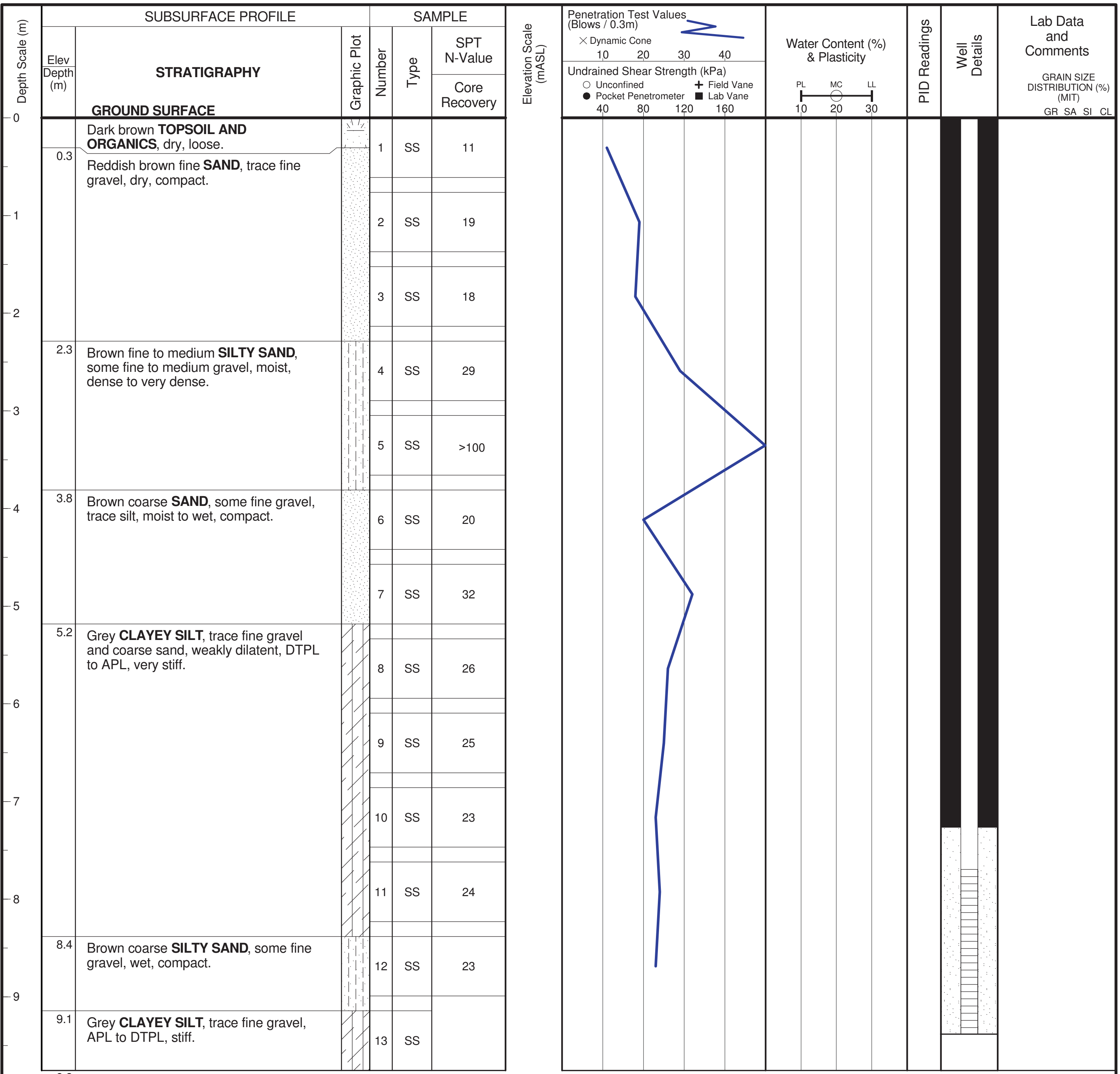
date started | 2015/08/04
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE

Elev Depth (m)	STRATIGRAPHY
	GROUND SURFACE
0	Dark brown **TOPSOIL AND ORGANICS**, dry, loose.
0.3	Reddish brown fine **SAND**, trace fine gravel, dry, compact.
2.3	Brown fine to medium **SILTY SAND**, some fine to medium gravel, moist, dense to very dense.
3.8	Brown coarse **SAND**, some fine gravel, trace silt, moist to wet, compact.
5.2	Grey **CLAYEY SILT**, trace fine gravel and coarse sand, weakly dilatent, DTPL to APL, very stiff.
8.4	Brown coarse **SILTY SAND**, some fine gravel, wet, compact.
9.1	Grey **CLAYEY SILT**, trace fine gravel, APL to DTPL, stiff.
9.8	**END OF BOREHOLE**

SAMPLE

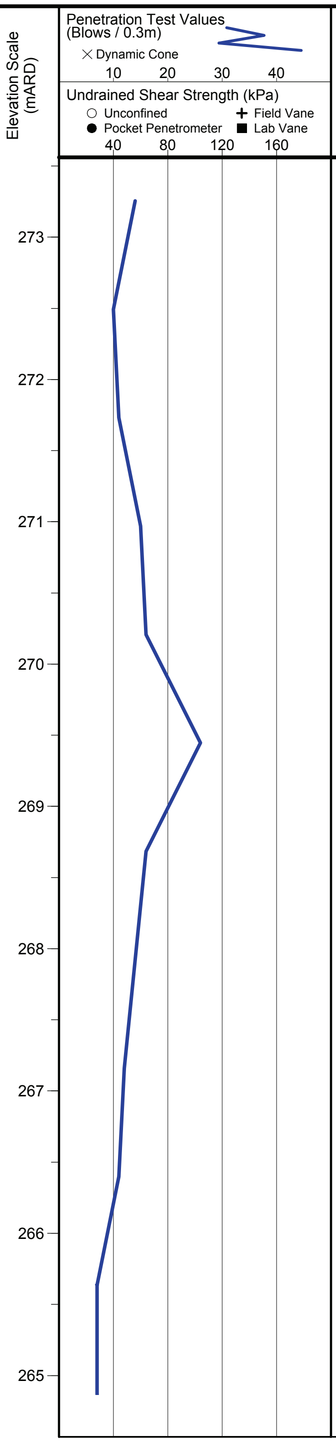
Number	Type	SPT N-Value
1	SS	11
2	SS	19
3	SS	18
4	SS	29
5	SS	>100
6	SS	20
7	SS	32
8	SS	26
9	SS	25
10	SS	23
11	SS	24
12	SS	23
13	SS	



LOG OF BOREHOLE BH45

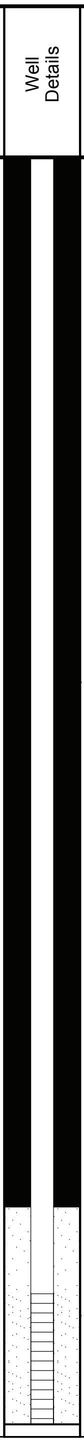
project no. | 111-53037-03
project | Holbrook Landfill Site
client | County of Oxford
location | Holbrook, Ontario
rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*
date started | 2019/08/15
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE – STRATIGRAPHY	SAMPLE – Number	SAMPLE – Type	SAMPLE – SPT N-Value / Core Recovery
	273.6	**GROUND SURFACE**			
0		Light brown **SANDY SILT**, some fine to coarse gravel, some organics and topsoil, trace clay, dry to moist, loose.	1	SS	14
1			2	SS	10
	272.4 1.2	Reddish-brown medium to coarse **SILTY SAND**, trace coarse gravel, trace clay, moist, loose.	3	SS	11
2	271.3 2.3	Reddish-brown **CLAYEY SILT**, some fine sand, some fine to medium gravel, APL, stiff.	4	SS	15
3	270.7 2.9	Grey **CLAYEY SILT**, trace to some subangular gravel, trace fine to coarse sand, occasional cobble, APL, stiff to very stiff.	5	SS	16
4			6	SS	26
			7	SS	16
5	268.6 5.0	Grey medium to coarse **SILTY SAND**, some fine to coarse gravel, wet, loose to compact.	8	SS	14
6	268.0 5.6	Grey **CLAYEY SILT**, trace fine to coarse sand, APL, stiff to very stiff.	9	SS	12
7	267.0 6.6	Grey-brown fine to medium **SILTY SAND**, saturated, loose to compact.	10	SS	11
8			11	SS	7
			12	SS	7
	264.6 9.0	**END OF BOREHOLE**			



Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings



Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

LOG OF BOREHOLE BH46

project no. | 111-53037-03

project | Holbrook Landfill Site

client | County of Oxford

location | Holbrook, Ontario

rig type | CME 75, track-mounted

method | Hollow stem augers, 215 mm dia.

coring | *n/a*

date started | 2019/08/15

supervisor | MEQ

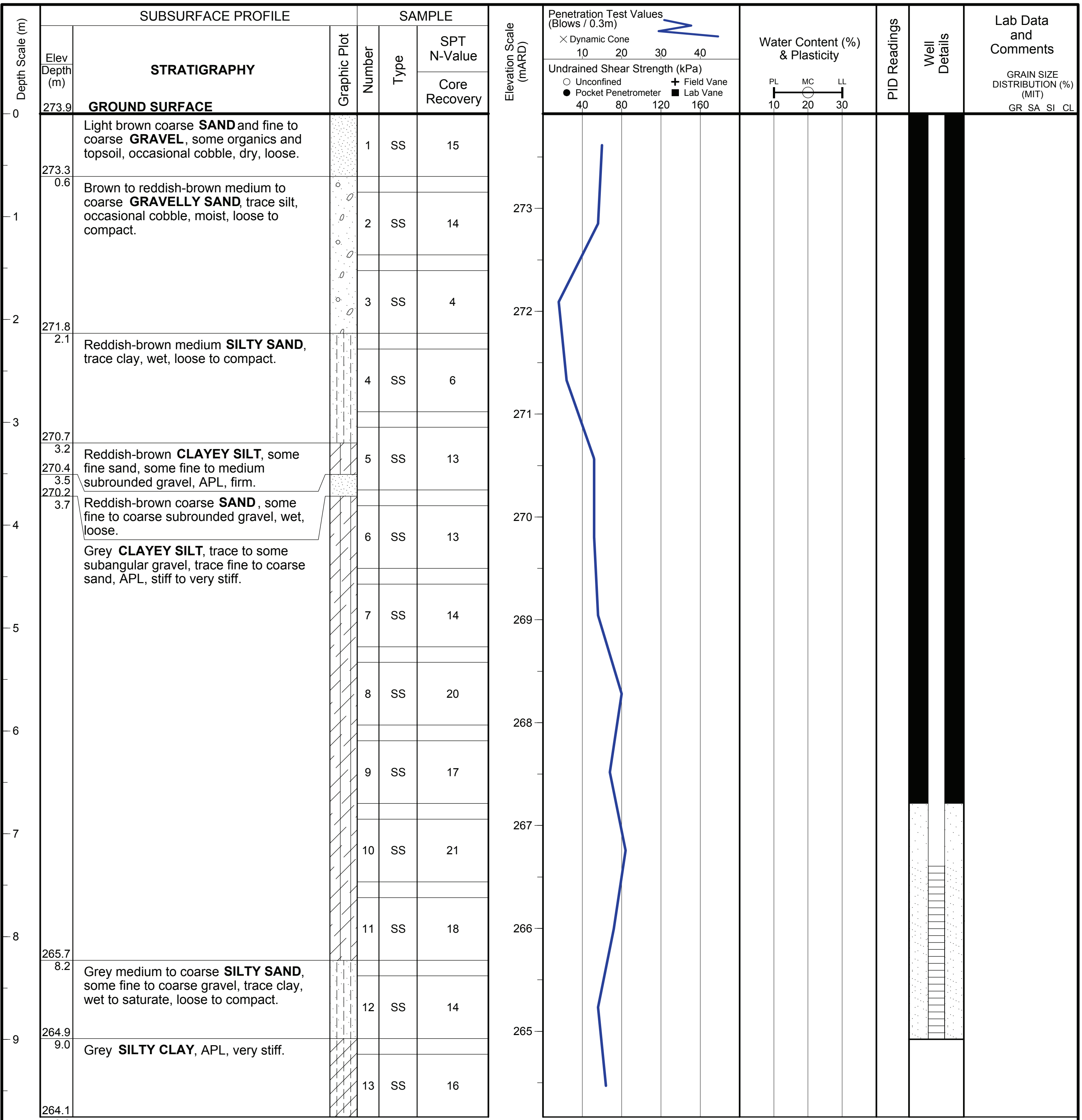
reviewer | AMS

SUBSURFACE PROFILE

Elev Depth (m)	STRATIGRAPHY
273.9	**GROUND SURFACE**
	Light brown coarse **SAND** and fine to coarse **GRAVEL**, some organics and topsoil, occasional cobble, dry, loose.
273.3 0.6	Brown to reddish-brown medium to coarse **GRAVELLY SAND**, trace silt, occasional cobble, moist, loose to compact.
271.8 2.1	Reddish-brown medium **SILTY SAND**, trace clay, wet, loose to compact.
270.7 3.2	Reddish-brown **CLAYEY SILT**, some fine sand, some fine to medium subrounded gravel, APL, firm.
270.4 3.5	Reddish-brown coarse **SAND**, some fine to coarse subrounded gravel, wet, loose.
270.2 3.7	Grey **CLAYEY SILT**, trace to some subangular gravel, trace fine to coarse sand, APL, stiff to very stiff.
265.7 8.2	Grey medium to coarse **SILTY SAND**, some fine to coarse gravel, trace clay, wet to saturate, loose to compact.
264.9 9.0	Grey **SILTY CLAY**, APL, very stiff.
264.1 9.8	**END OF BOREHOLE**

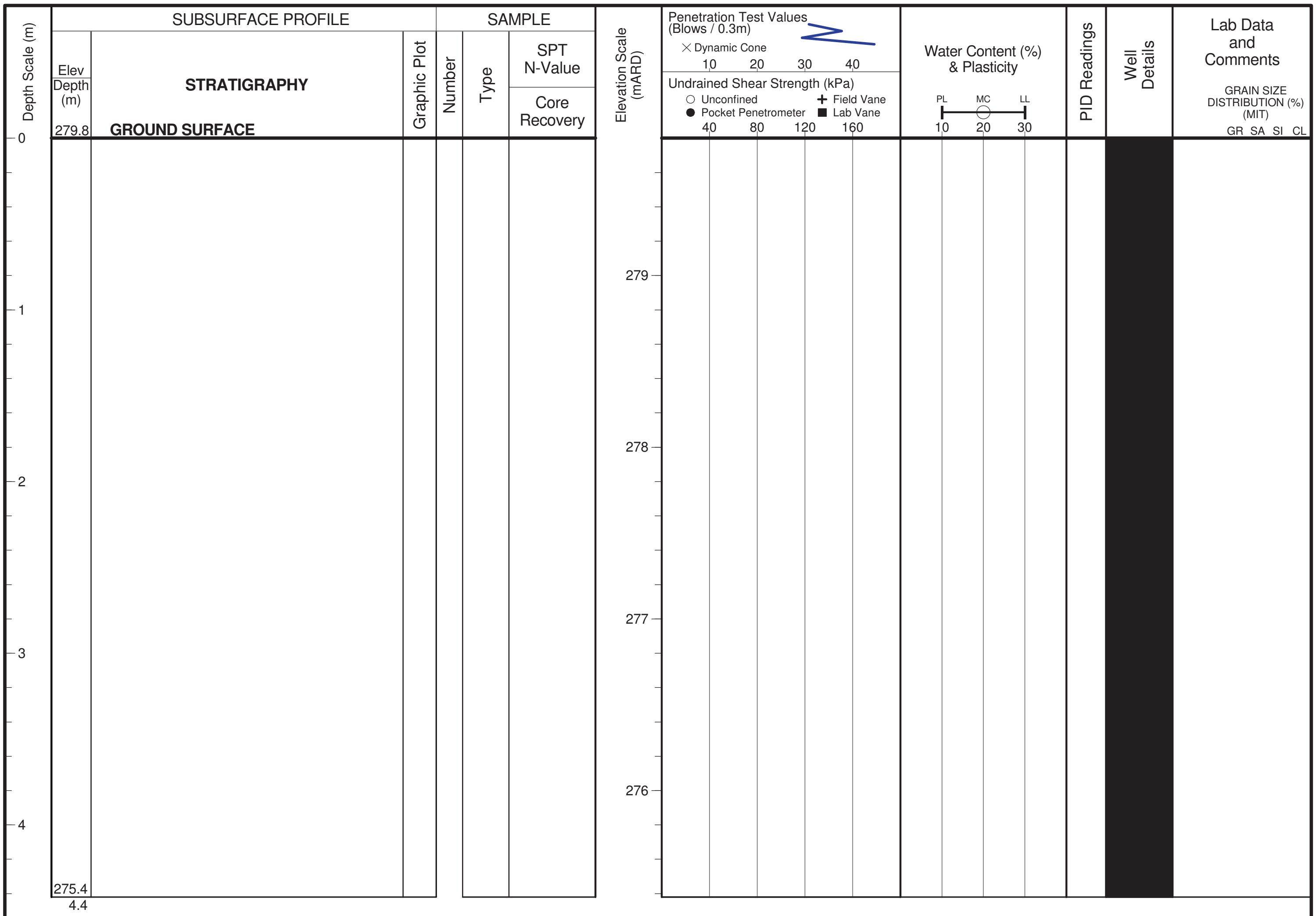
SAMPLE

Number	Type	SPT N-Value / Core Recovery
1	SS	15
2	SS	14
3	SS	4
4	SS	6
5	SS	13
6	SS	13
7	SS	14
8	SS	20
9	SS	17
10	SS	21
11	SS	18
12	SS	14
13	SS	16



LOG OF BOREHOLE 104 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*
rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*
date started | 2014/09/17
supervisor | MEQ
reviewer | AMS



END OF BOREHOLE

No original borehole log information available.

LOG OF BOREHOLE 301 Decommissioning

project | Holbrook Landfill Site

client | Oxford County

location | Holbrook, ON

project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted

method | Hollow stem augers, 215 mm dia.

coring | *n/a*

date started | 2014/09/26

supervisor | MEQ

reviewer | AMS

Depth Scale (m)	SUBSURFACE PROFILE			SAMPLE			Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
	Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value Core Recovery						
0	278.1	**GROUND SURFACE**										
							278					
1							277					
2							276					
3							275					
4							274					
	273.3 4.8	**END OF BOREHOLE** No original borehole log information available.										

LOG OF BOREHOLE SP3 Decommissioning

WSP

project | Holbrook Landfill Site

client | Oxford County

location | Holbrook, ON

project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted

method | Hollow stem augers, 215 mm dia.

coring | *n/a*

date started | 2015/07/22

supervisor | MEQ

reviewer | AMS

Depth Scale (m)	SUBSURFACE PROFILE			SAMPLE			Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
	Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value Core Recovery						
0	280.4	**GROUND SURFACE**										
							280					
1												
	279.2 1.2	**END OF BOREHOLE** No original borehole log information available.										

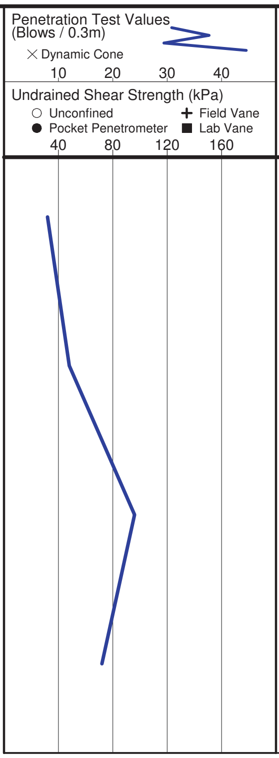
LOG OF BOREHOLE SP3R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/24
supervisor | MEQ
reviewer | AMS

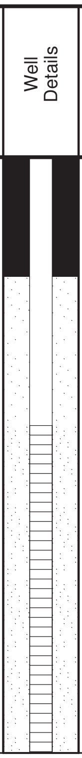
Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY GROUND SURFACE	Number	Type	SPT N-Value / Core Recovery
0		Dark brown **TOPSOIL**, some fine sand, rootlets, moist, loose.	1	SS	8
	0.6	Reddish brown **CLAYEY SILT**, some fine to medium sand, trace clay, trace rootlets, moist, compact.	2	SS	12
1					
			3	SS	24
2					
	2.3	Grey-brown **CLAYEY SILT**, trace fine to coarse sand, trace gravel, DTPL to APL, stiff to very stiff.	4	SS	18
3	3.1	**END OF BOREHOLE** Stratigraphy inferred from adjacent borehole 25R.			



Elevation Scale (mASL)

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings



Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

LOG OF BOREHOLE SP4 Decommissioning

project | Holbrook Landfill Site

client | Oxford County **rig type |** Acker Soil-Max, track-mounted **date started |** 2015/07/10

location | Holbrook, ON **method |** Hollow stem augers, 215 mm dia. **supervisor |** MEQ

project no. | *111-53037-00 132-02* **coring |** *n/a* **reviewer |** AMS

Depth Scale (m)	SUBSURFACE PROFILE			SAMPLE			Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 Undrained Shear Strength (kPa) ○ Unconfined ✚ Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
	Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value Core Recovery						
	279.6	GROUND SURFACE										
0												
							279					
1												
							278					
	277.7 1.9											

END OF BOREHOLE

No original borehole log information available.

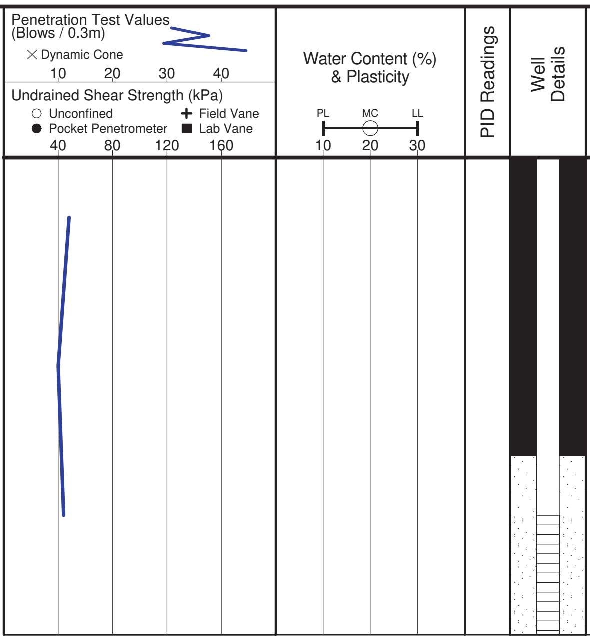
LOG OF BOREHOLE SP4R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/13
supervisor | SM
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery
0		GROUND SURFACE			
		Brown fine to medium **SILTY SAND**, some fine gravel, trace organics, moist, compact. Black clayey organic peat layer at 1.2 m depth.	1	SS	12
1			2	SS	10
	1.4	Grey fine to medium **SAND**, some silt, trace fine gravel, wet, compact.	3	SS	11
2					
	2.4	**END OF BOREHOLE** Stratigraphy inferred from adjacent borehole 24R.			



Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

October 6, 2025 Project No. CA0024089.5055

Pamela Antonio
Supervisor of Waste Management
County of Oxford
21 Reeve Street
Woodstock, ON N4S 7Y3

HOLBROOK LANDFILL, COUNTY OF OXFORD
2025 MONITORING WELL RESTORATION PROGRAM

We are pleased to forward the results of the monitoring well restoration program conducted at the Holbrook Landfill, County of Oxford (Site).

1.0 BACKGROUND

The key purpose of the program was to decommission an existing monitoring well (29), in addition to repairing and adjusting five (5) other monitoring wells.

Observation Well 29 consisted of three 13 mm diameter PVC piezometers installed to depths of approximately 1.5 m, 2.25 m, and 3.1 m below ground surface. This well was not included in the site’s annual compliance monitoring program and had previously been reported as missing. During a recent Ministry of the Environment, Conservation and Parks (MECP) inspection conducted on-site on May 14, 2025, the three piezometers were located. The MECP inspector recommended that these piezometers be properly abandoned, plugged and sealed, if no longer in use.

In May/June 2025, WSP also completed a full condition inspection of all the groundwater observation monitoring wells at the Site. The results of this well condition inspection (conducted before repairs were undertaken), is attached. The work program described below (in Section 2) was formulated as a result of this well condition assessment. As documented within this report, all action items noted within the well condition assessment were completed by September 17, 2025.

2.0 WORK PROGRAM SUMMARY

The work program at the Site consisted of the following items:

- Decommissioning of three (3) piezometers (observation well 29);
- Repairs to five (5) groundwater observation monitoring wells (24R, 24AR, 26R, 27, and 45), including but not limited to re-setting well casings and adjusting well heights; and
- Replacing worn locks, replacing caps, and adding fill/mounding around the base of many groundwater observation monitoring wells, across the Site.

The decommissioning and repairs to specific monitoring wells were completed by Direct Environmental Drilling Inc. (Direct), a Licensed Well Contractor and subcontractor to the County. This work was completed on September 16, 2025. A rubber track-mounted drill rig (Geoprobe 7822DT) equipped with hollow stem augers (4 ¼ inch ID) was used for drilling activities. Drill cuttings were contained onsite in the vicinity of the borehole locations. WSP staff was on-Site to oversee the activities. Direct also completed a full assessment of all monitoring wells while on-site with WSP; any recommendations for compliance with well regulations were completed immediately, on September 16, 2025.

WSP replaced worn locks at several monitoring wells in May/June 2025, and replaced the cap on monitoring well 41. Oxford County operations staff also added fill to the base of many monitoring wells in July/August 2025, ensuring that the soil around the base of each well was mounded and would sufficiently drain any surface water away from the base of the wells.

3.0 DECOMMISSIONING OF WELL 29

No protective casing was previously installed at this location. The entire riser pipes and well screens were successfully removed, and the piezometers were overdrilled to a depth of approximately 6.1 meters. The borehole annulus was subsequently filled with bentonite pellets to ground surface, in accordance with O. Reg. 903.

4.0 WELL RESTORATION ACTIVITIES

4.1 Completed by Driller

WSP previously assessed Wells 24R, 24AR, 26R, 27, and 45 in May/June 2025. These wells were found to have some integrity deficiencies that required a licensed well technician, in accordance with O.Reg. 903.

Monitoring wells 24R, 24AR, and 26R were found to have poor seal integrity at the base of the wells, along with loose casings. The drillers reset and resealed the protective steel casings with bentonite pellets, just below the ground surface at the base of the wells. The casings were then reinstalled at the surface, and concrete was used to hold the protective casing in place.

The casing around the riser pipe of monitoring well 27 had settled over the years and, as such, required repair. As the well was close to surface grade, it could become susceptible to surface water; access was also becoming challenging. As such, monitoring well 27 required both riser and casing height adjustments. The drillers were able to recover the existing protective metal casing that had settled below the ground surface. Approximately 39 cm of additional 51 mm (2-inch) PVC riser pipe was then added, after resetting the existing casing to an acceptable height.

At monitoring well 45, a 2-inch 7-foot stainless steel mechanical packer was installed, as the well is periodically artesian and groundwater would occasionally flow over the top of the riser pipe. The packer was installed inside the 2-inch well, limiting the upward flow and preventing uncontrolled discharge.

4.2 Completed by WSP and the County

In addition to the monitoring well restoration activities completed by the driller, the County and WSP also completed some minor maintenance at several locations across the Site.

WSP replaced worn or faulty locks at four (4) locations. WSP also added a new cap with a spigot to monitoring well 41 (leachate well), in order to measure the concentrations and pressure of landfill gas within the well during future monitoring events (as recommended by the MECP in their previous inspection).

Oxford County staff added fill to the base of most of the monitoring wells on-Site (30 locations). This was completed to ensure that the mounded soil at the base of each well would have a sufficient slope, and adequately shed water away from the base of the wells. Oxford County staff also removed debris surrounding some of the monitoring wells on-site (4 locations). This was completed to ensure safe and unrestricted access to the monitoring well locations.

We trust that this letter has sufficient information for your review. Please contact us if you have any questions or concerns.

Prepared by:

WSP Canada Inc.

Marcel Quenneville, Ept.
Environmental Technician
Earth & Environment

Reviewed by:

Albert Siertsema, P.Eng., PMP
Project Engineer
Earth & Environment

MEQ/AMS/ams

Attachments: Holbrook Closed Landfill – Well Condition Inspection Forms
Borehole Log – 29 (Decom)
MECP Well Record – submitted by Direct Environmental Drilling Inc.

https://wsponlinecan.sharepoint.com/sites/ca-ca00240894861/shared documents/05. technical/02-holbrook/well inventory and condition/2025/drilling/holbrook landfill - well restoration program 2025.docx

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 4R
Year Installed: 2014
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			119.5 cm
Measurements - Front Rim of Casing to Top of Riser			-2.5 cm (below front rim)
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 5R
Year Installed: 2014
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			128.5 cm
Measurements - Front Rim of Casing to Top of Riser			1 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility:	Holbrook	**Well Name:**	10R
Evaluator:	Marcel Quenneville	**Year Installed:**	2015
Evaluation Date:	June 11, 2025	**Oxford Asset rating:**	Good

	Yes	**No**	**Comments**
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			96.5 cm
Measurements - Front Rim of Casing to Top of Riser			3.5 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)	Yes		Solid
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Mounding required at base to prevent ponding.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 11R
Year Installed: 2015
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			109 cm
Measurements - Front Rim of Casing to Top of Riser			2 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)	Yes		Solid
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Mounding required at base to prevent ponding.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025
Well Name: 13R
Year Installed: 2014
Oxford Asset rating: Excellent

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			110.5 cm
Measurements - Front Rim of Casing to Top of Riser			-1.5 cm (below front rim)
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)	Yes		Solid
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Mounding required at base to prevent ponding.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 14R
Year Installed: 2014
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			99 cm
Measurements - Front Rim of Casing to Top of Riser			-2.5 cm (below front rim)
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)	Yes		Solid
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Mounding required at base to prevent ponding.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 15A
Year Installed: 1979
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			98.5 cm
Measurements - Front Rim of Casing to Top of Riser			-3 cm (below front rim)
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Minor rusting.

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 16R
Year Installed: 2014
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			123.5 cm
Measurements - Front Rim of Casing to Top of Riser			11.5 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 16AR
Year Installed: 2014
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			114 cm
Measurements - Front Rim of Casing to Top of Riser			6.5 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 18R
Year Installed: 2014
Oxford Asset rating: Excellent

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			123 cm
Measurements - Front Rim of Casing to Top of Riser			1 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		Lock was replaced
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)	Yes		Solid
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?	Yes		
Is well free of standing or ponded water?	Yes		

Other Comments:

Lock replaced.

Actions to be Taken:

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 19R
Year Installed: 2014
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			117.5 cm
Measurements - Front Rim of Casing to Top of Riser			3.5 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Minor loose casing.

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 21R
Year Installed: 2014
Oxford Asset rating: Good

	Yes	**No**	**Comments**
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			113 cm
Measurements - Front Rim of Casing to Top of Riser			3.5 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?	Yes		
Is well free of standing or ponded water?	Yes		

Other Comments:

Minor loose casing, minor rust.

Actions to be Taken:

Add fill around casing and compact, to solidify casing.

Photos:

Well Condition Inspection Form

Facility:	Holbrook	**Well Name:**	24R
Evaluator:	Marcel Quenneville	**Year Installed:**	2015
Evaluation Date:	June 12, 2025	**Oxford Asset rating:**	Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			107 cm
Measurements - Front Rim of Casing to Top of Riser			20.2 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Recommmend driller to re-seal and re-set the casing. After this, add fill around casing and compact. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook

Evaluator: Marcel Quenneville

Evaluation Date: June 12, 2025

Well Name: 24AR

Year Installed: 2015

Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			115.5 cm
Measurements - Front Rim of Casing to Top of Riser			1.5 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Somewhat loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook

Evaluator: Marcel Quenneville

Evaluation Date: June 12, 2025

Well Name: 25R

Year Installed: 2015

Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			119.5 cm
Measurements - Front Rim of Casing to Top of Riser			2 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 26R
Year Installed: 2015
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			72 cm
Measurements - Front Rim of Casing to Top of Riser			15 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)	Yes		Somewhat loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Rusting.

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 27
Year Installed: 1983
Oxford Asset rating: Excellent

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			25 cm
Measurements - Front Rim of Casing to Top of Riser			8.2 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)	Yes		Solid
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Rusting.

Actions to be Taken:

Mounding required at base to prevent ponding.

Photos:

Well Condition Inspection Form

Facility:	Holbrook	**Well Name:**	28R
Evaluator:	Marcel Quenneville	**Year Installed:**	2015
Evaluation Date:	June 12, 2025	**Oxford Asset rating:**	Good

	Yes	**No**	**Comments**
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			100.7 cm
Measurements - Front Rim of Casing to Top of Riser			1 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 31
Year Installed: 1983
Oxford Asset rating: Excellent

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			92.7 cm
Measurements - Front Rim of Casing to Top of Riser			2.5 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)	Yes		Solid
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?	Yes		
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Photos:

Well Condition Inspection Form

Facility: OCWMF
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 32R
Year Installed: 2015
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			110 cm
Measurements - Front Rim of Casing to Top of Riser			1 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 11, 2025

Well Name: 33R
Year Installed: 2015
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			114 cm
Measurements - Front Rim of Casing to Top of Riser			-2 cm (below front rim)
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025
Well Name: 35
Year Installed: 1983
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			91 cm
Measurements - Front Rim of Casing to Top of Riser			4 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook

Evaluator: Marcel Quenneville

Evaluation Date: June 12, 2025

Well Name: 37R

Year Installed: 2015

Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			119.5 cm
Measurements - Front Rim of Casing to Top of Riser			-0.8 cm (below front rim)
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Minor rust.

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 38
Year Installed: 1983
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			117 cm
Measurements - Front Rim of Casing to Top of Riser			1.5 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		Replaced
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Minor rust, and replaced lock.

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025
Well Name: 39
Year Installed: 2013
Oxford Asset rating: Excellent

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			51.5 cm
Measurements - Front Rim of Casing to Top of Riser			8 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)	Yes		Solid
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?	Yes		
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Remove fallen tree/debris from around the well.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 40
Year Installed: 2013
Oxford Asset rating: Excellent

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			61 cm
Measurements - Front Rim of Casing to Top of Riser			-3 cm (below front rim)
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)	Yes		Solid
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?	Yes		
Is well free of standing or ponded water?	Yes		

Other Comments:

Casing shifted from fallen tree; no damage to PVC riser pipe inside.

Actions to be Taken:

Remove fallen tree/debris from around the well.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 41
Year Installed: 2013
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			129 cm
Measurements - Front Rim of Casing to Top of Riser			18 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Somewhat loose
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Rusting. Requires a new PVC cap to prevent venting.

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing. Need to add a cap with a spigot (for measuring gas pressure and concentrations).

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 42
Year Installed: 2015
Oxford Asset rating: Excellent

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			52 cm
Measurements - Front Rim of Casing to Top of Riser			15.8 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)	Yes		Solid
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?	Yes		
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Remove fallen tree/debris from around the well.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025
Well Name: 43
Year Installed: 2015
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			109.5 cm
Measurements - Front Rim of Casing to Top of Riser			2.5 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook

Evaluator: Marcel Quenneville

Evaluation Date: June 12, 2025

Well Name: 44

Year Installed: 2015

Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			115 cm
Measurements - Front Rim of Casing to Top of Riser			2.3 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Minor rust.

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility:	Holbrook	**Well Name:**	45
Evaluator:	Marcel Quenneville	**Year Installed:**	2019
Evaluation Date:	June 12, 2025	**Oxford Asset rating:**	Excellent

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			93.5 cm
Measurements - Front Rim of Casing to Top of Riser			3 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)	Yes		Solid
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Requires packer for artesian conditions. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: 46
Year Installed: 2019
Oxford Asset rating: Excellent

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			100 cm
Measurements - Front Rim of Casing to Top of Riser			7.7 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)	Yes		Solid
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Mounding required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025

Well Name: SP3R
Year Installed: 2015
Oxford Asset rating: Excellent

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			117 cm
Measurements - Front Rim of Casing to Top of Riser			1.5 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)	Yes		Solid
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Mounding required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025
Well Name: SP4R
Year Installed: 2015
Oxford Asset rating: Good

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			113.5 cm
Measurements - Front Rim of Casing to Top of Riser			1.5 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)		No	Loose
Surface seal free of cracks?		No	
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Loose casing, minor rusting.

Actions to be Taken:

Add fill around casing and compact, to solidify casing. Mounding also required around casing.

Photos:

Well Condition Inspection Form

Facility: Holbrook
Evaluator: Marcel Quenneville
Evaluation Date: June 12, 2025
Well Name: SP5
Year Installed: ?
Oxford Asset rating: Excellent

	Yes	No	Comments
Is the well shown appropriately on a facility map	Yes		
Is a well marker present and attached?	Yes		
Measurements - Ground Surface to Top of Casing			56 cm
Measurements - Front Rim of Casing to Top of Riser			3.8 cm
Is the well labeled on the inside?	Yes		
Is the well labeled on the outside?	Yes		
Casing Condition			Good
Pipe Condition			Good
Is the well locked? Lock Condition	Yes		
Hinge Condition			Good
Is the casing secure (attempt to move along two perpendicular axis)	Yes		Solid
Surface seal free of cracks?	Yes		
Surface seal sloped to prevent ponding around well?		No	
Is well free of standing or ponded water?	Yes		

Other Comments:

Actions to be Taken:

Mounding required around casing.

Photos:

LOG OF BOREHOLE 29 (DECOMMISSIONING)

PROJECT: Holbrook Closed Landfill
CLIENT: County of Oxford
PROJECT LOCATION: Holbrook, ON
DATUM:
BH LOCATION:

Method: Geoprobe, Direct Push
Diameter: 50 mm
Date: Sep-16-2025

REF. NO.: CA0024089.5055
ENCL NO.:
ORIGINATED BY MEQ
COMPILED BY CS
CHECKED BY AMS

SOIL PROFILE			SAMPLES					DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE & Sensitivity ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT w LIQUID LIMIT W_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m^3)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION Ground Surface	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION					
0.00	Brown **SAND**, fine, minor silt and coarse gravel.					■						
2.10	Brown **CLAYEY SILT**, minor fine-coarse gravel.					■						
3.11	This stratigraphy is inferred from the original borehole log for Test Hole No. 29 (MacLaren Engineers Inc., 1983).											

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES $+^3, \times^3$: Numbers refer to Sensitivity

○ ^{8}=3% Strain at Failure

Ministry of the Environment,
Conservation and Parks

Well Record - Regulation 903

Ontario Water Resources Act

General Instructions and Explanations for completing a Well Record

A completed electronic Well Record Form must be delivered to the well purchaser and the owner of the land on which the well is situated within 14 days after the date on which the well's structural stage is complete. The electronic Well Record must also be forwarded within 30 days after the date on which the well's structural stage is complete to the ministry through email to the following email address: WellRecordSubmission@ontario.ca

False and Misleading Information

Subsection 98(2) of the *Ontario Water Resources Act*, R.S.O. 1990 c. O. 40, states that:

"No person shall orally, in writing or electronically, give or submit false or misleading information in any statement, document or data, to any provincial officer, the Minister, the Ministry or the Agency, any employee in or agent of the Ministry or the Agency, or any person involved in carrying out a program of the Ministry or the Agency in respect of any matter related to this Act or the regulations."

Further, subsection 98(3) of the Act states that:

"No person shall include false or misleading information in any document or data required to be created, stored or submitted under this Act."

Measurements

All measurements must be recorded in the specified unit, metric or imperial by checking off the applicable box on the top of the form. You must use the checked unit consistently throughout the well record. Measurements must be reported to 1/10th of a metre if the unit is a metre. All measurements of depth must be referenced to ground surface.

Well Owner's Information

A "well owner" means the owner of land upon which a well is situated and includes a tenant or lessee of the land and a well purchaser. If the "well owner" is an individual, record the owner's last name and first name or if the "well owner" is a business, government or other organization, record the name in the "organization" area.

Well Location

Street Number/Name and City/town/Village must be provided, if available.

Geographic Township, Concession and Lot must be reported if the well is located in an area where such information exists.

UTM Coordinates must be recorded each time a Well Record is completed. Click the button [Test UTM in Map] to use the UTM Coordinates to plot the location to Google map. This allows verification of the UTM Coordinates. This will also automatically populate the County/District.

Municipal Plan and Sublet Number may be provided, if available.

Overburden and Bedrock Materials

For each formation encountered during construction, choose words from the lists that best describe the formation on the basis of general colour, most common material, other materials, and general description of the formation.

General Colours are White, Yellow, Grey, Brown, Blue, Red, Green and Black.

Examples of Materials are: Fill, Silt, Top Soil, Coarse Sand, Slate, Muck, Gravel, Limestone, Dolomite, Quartzite, Peat, Stones, Fine Sand, Shale, Granite, Clay, Boulders, Medium Sand, Sandstone, and Greenstone.

Some definitions are as follows:

- Clay: Composed of very fine particles. Forms dense hard lumps or clods when dry and a very elastic putty-like mass when wet. It can be rolled between fingers to form a long, flexible ribbon.
- Silt: Grain size, midway between sand and clay. It may form clods which, when broken, feel soft and floury. When moist, it will form a cast that can be handled freely without breaking. Rolled between thumb and finger, it will not "ribbon" but will give a broken appearance.

Disponible en français

- Sand: Grains are loose and granular and may be seen and felt readily. Squeezed in the hand when dry, it falls apart when the pressure is released. Squeezed when moist, it will form a cast that will crumble when touched. Should be listed as fine sand, medium sand or coarse sand.
- Gravel: Rock fragments greater than 0.3 cm in diameter.

Examples of General Descriptions are Loose, Cemented, Previously Dug or Bored, Porous, Layered, Previously Drilled, Dense, Soft, Wood Fragments, Packed, Hard.

Abandonment

To report abandonment of a well, check off the applicable box in Type on the top of the form. Details of abandonment must be recorded in the Abandonment and Sealing Section. Additional comments may be entered in the comments box under the Information section.

Annular Space

Record all material placed in the annular space around the single casing or around the permanent outer casing. If the well is a telescoped well [i.e., a well with an outer casing and inner casing(s)] or if the well is a multi-level nested test hole, report the depth from, depth to, material and volume placed for the annular space between two different sized casings or between the inner casing(s) and the side of the well in the “Comments” area of this electronic well record form.

Method of Construction

If the equipment used to construct the well is not on the list, check “Other (specify)” and record the type of equipment, check each equipment that applies.

Well Use

If the well’s use is not provided on the list, check “Other (specify)” and record the use of the well. If the well has multiple uses, check each use that applies.

Status of Well

If the well’s status is not provided on the list, check “Other (specify)” and record the use of the well. If the well has multiple statuses, check each use that applies.

Construction Record – Casing and Open Hole

Use negative values to report the top of casing above ground surface. For example, if the top of the casing is 0.4 metres above the ground surface and the bottom of the casing 6.0 metres below the ground surface, record the casing “Depth From” as -0.4.

If the top of casing is located below the ground surface (e.g., if a test hole is constructed and the top of casing is located below the ground surface in a flush mounted well vault), report the top of the casing from below ground surface. For example, if the top of the casing is 0.1 metres below the ground surface and the bottom of the casing is 6 metres below the ground surface, record the casing “Depth From” as 0.1.

Note: If a drive shoe is used, the shoe is considered casing and it must be reported if the shoe has a different inside diameter thickness.

If a portion of the well was created an open hole, record the location of the open hole on a separate row, including the diameter and the depth (top and bottom of open hole) from the ground surface.

Construction Record – Well Screen

A “well screen” means perforated pipe or tubing, unsealed concrete tiles or other material installed in a well to filter out particulate matter and form the water intake zone. Therefore, the length of a well screen includes any slotted or perforated area and unsealed area of pipe or tiles.

Water Details

- if groundwater was located, record the depth from the ground surface to the location of the groundwater resource, and
- record if the groundwater quality is “Untested,” “Fresh” (i.e., not salty), or “Other (specify).” If “Other (specify)” is recorded, use the “Other (specify)” dropdown list toselect the type of groundwater (e.g., salty, blackish water, yellowish water, mineralized, etc.).

Check off “Gas” if natural gas was encountered during well construction.

Note: Natural gas encounters need to be immediately reported to the ministry at 1-800-268-6060, well purchaser and the owner of the land.

Results of Well Yield Testing

Check off “Pumping Discontinued” if pumping was discontinued before 1 hour of continuous pumping. Explain the reason why pumping was discontinued or in some cases not performed (e.g., the well went dry, impossible to install pump in small diameter well, static water level from test hole or dewatering well was obtained and is reported instead of completing a yield test etc.).

Note: Equipment breakdown is not an acceptable reason for checking off “Pumping Discontinued” on the well record form. If groundwater in the well is flowing out of the well, provide the rate of flow, and check off “Flowing Well” (i.e., static water level above the ground surface).

In the “Results of Well Yield Testing” section of the well record form, record:

- the depth to the intake of the pump,
- the rate of pumping and duration of pumping period during the yield test,
- the final water level when pumping stops,
- water level measurements made during pumping (drawdown) and recovery. All water level measurements must be referenced from below the ground surface for each time interval specified in the drawdown and recovery boxes.

If the water level measurements remain the same over a period of time, continue to measure and report the same water level measurement for the remaining pumping or recovery time intervals.

If pumping continuously for at least 1 hour, but the design of the well does not allow for water level measurements (e.g., driven point well), the person constructing the well is not required to report drawdown or recovery water level measurements.

Map of Well Location

In the “Map of Well Location” section of the well record form, click the map area to attach a map of the well location. The map must show sufficient information to locate the well, including:

- a mark on the map showing the well,
- a scale on the map, and
- where available, the name of the structure, street or surface water body nearest to the well.

Note: More than one map can be added to the well record form by clicking on “Add Map (+)” to add an additional map.

Information

Record any additional information (e.g., observations, tests, additional licensed well technicians who worked on the well, additional annular space details for a telescoped well or a multi-level nested test hole, reasons for not providing a well owner information package) in the comments area.

Declaration

Check the declaration statement to confirm that the person constructing the well agrees with the following statement: “I hereby confirm that I am the person who constructed the well and I hereby confirm that the information on the form is correct and accurate”.

Validate

Click the validate button. If there is no missing information, you will be asked to enter the well tag again to make sure the well tag is entered correctly (only enter the numeric portion of the tag number). The audit number will then be changed from “**incomplete**” to an assigned audit number. The signature field will then be available. Click on “signature” to enter the well technician’s electronic signature. For instructions on how to create an electronic signature, please visit the Adobe Digital IDs website using the following link: https://helpx.adobe.com/acrobat/using/digital-ids.html

Ontario Ministry of the Environment, Conservation and Parks

Well Record - Regulation 903

Ontario Water Resources Act

Notice of Collection of Personal Information

Personal information contained on this form is collected pursuant to sections 35-50 and 75(2) of the *Ontario Water Resources Act* and section 16.3 of the Wells Regulation. This information will be used for the purpose of maintaining a public record of wells in Ontario. This form and the information contained on the form will be stored in the Ministry's well record database and made publicly available. Questions about this collection should be directed to the Water Well Customer Service Representative at the Wells Help Desk, 125 Resources Road, Toronto Ontario M9P 3V6, at 1-888-396-9355 or wellshelpdesk@ontario.ca.

Fields marked with an asterisk (*) are mandatory.

Well Tag Number *
No Tag on Well

Type *

☐ Construction ☑ Abandonment

Measurement recorded in: *

☑ Metric ☐ Imperial

1. Well Owner's Information

Last Name and First Name, or Organization is mandatory. *

Last Name Antonio	First Name Pamela
Organization Oxford County	Email Address

Current Address

Unit Number	Street Number * 21	Street Name * Reeve Street	City/Town/Village Woodstock
Country Oxford	Province Ontario	Postal Code N4S 7Y3	Telephone Number 519-539-9800

2. Well Location

Address of Well Location

Unit Number	Street Number * 345071	Street Name * Quaker Street	Township
Lot	Concession	County/District/Municipality Oxford	
City/Town Norwich		Province Ontario	Postal Code

UTM Coordinates	Zone *	Easting *	Northing *		Municipal Plan and Sublot Number
NAD 83	17	525996	4759938	Test UTM in Map	

Other

3. Abandonment and Sealing

Well Depth 3.1 (m)

Provide information of well (e.g. construction date, original contractor). **Do not** enter private information
Nest Well with 3 13mm piezometers installed in 1 borehole location. No protective casing.

Original Owner

General Description	Depth From (m)	Depth To (m)
13mm Piezometer	0	1.5
13mm Piezometer	0	2.25
13mm Piezometer	0	3.1

4. Annular Space

Depth From (m)	Depth To (m)	Type of Sealant Used (Material and Type)	Volume Placed (cubic metres)
0	6.1	Hydrated 3/8 Bentonite Chips	0.211

5. Method of Construction

☐ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Diamond

☐ Jetting ☐ Driving ☐ Digging ☐ Rotary (Air) ☑ Augering ☐ Direct Push

☐ Other (specify)

6. Well Use

☐ Public
☐ Domestic
☐ Livestock
☐ Irrigation
☐ Other (specify)

☐ Industrial
☐ Commercial
☐ Municipal
☑ Test Hole

☐ Cooling & Air Conditioning
☐ Not Used
☐ Monitoring
☐ Dewatering

7. Status of Well

☐ Water Supply
☐ Recharge Well
☐ Alteration (Construction)
☑ Abandoned, other (specify) No Longer Using
☐ Other (specify)

☐ Replacement Well
☐ Dewatering Well
☐ Abandoned, Insufficient Supply

☐ Test Hole
☐ Observation and/or Monitoring Hole
☐ Abandoned, Poor Water Quality

8. Construction Record - Casing (use negative number(s) to indicate depth above ground surface)

Inside Diameter (cm)	Open Hole **or** Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness	Depth From (m)	Depth To (m)

9. Construction Record - Screen

Outside Diameter (cm)	Material (Plastic, Galvanized, Steel)	Slot Number	Depth From (m)	Depth To (m)

10. Water Details

Water found at Depth (m) ☐ Gas Kind of water ☐ Fresh ☐ Untested ☐ Other

11. Hole Diameter

Depth From (m)	Depth To (m)	Diameter (cm)
0	6.1	21

12. Results of Well Yield Testing

☐ Pumping Discontinued

Explain

If flowing give rate

☐ Flowing (L/min)

Draw down

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

Recovery

Time (min)	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (m)													

After test of well yield, water was

☐ Clear and sand free ☐ Other (specify)

Pump intake set at (m)	Pumping rate (L/min)	Duration of pumping hrs + min	Final water level end of pumping (m)	Disinfected? ☐ Yes ☐ No

Recommended pump depth (m)	Recommended pump rate (L/min)	Well production (L/min)

13. Map of Well Location *

Map 1. Please Click the map area below to import an image file to use as the map. ☐ Make map area bigger

14. Information

Well owner's information package delivered
☐ Yes ☑ No

Date Package Delivered (yyyy/mm/dd)

Date Work Completed (yyyy/mm/dd) *
2025/09/16

Comments
Consultant: WSP Canada Inc.
Removed all 3 13mm piezometers from the well location. Overdrilled the well location to a depth of 6.1mbgs with 4.25" (ID) HSA and sealed with hydrated 3/8 bentonite chips.

15. Well Contractor and Well Technician Information

Business Name of Well Contractor *
Direct Environmental Drilling Inc.

Well Contractor's License Number *
7320

Business Address

Unit Number

Street Number
25

Street Name *
Artisans Crescent

City/Town/Village *
London

Province
Ontario

Postal Code *
N5V 5E9

Business Telephone Number
519-868-0175

Business Email Address
aarmstrong@directenvironmentaldrilling.com

Last Name of Well Technician *
Armstrong

First Name of Well Technician *
Andrew

Well Technician's License Number *
3446

16. Declaration *

☑ I hereby confirm that I am the person who constructed the well and I hereby confirm that the information on the form is correct and accurate.

Last Name
Armstrong

First Name
Andrew

Email Address
ded.andrew@gmail.com

Signature
Andrew Armstrong
Digitally signed by Andrew Armstrong
Date: 2025.09.17 08:35:28 -04'00'

Date Submitted (yyyy/mm/dd)
2025/09/17

17. Ministry Use Only

Audit Number
42OH 697E

Ontario Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. (Place Sticker and/or Print Below)
NO TAG

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name: PAMELA
Last Name/Organization: ANTONIO "OXFORD COUNTY"
E-mail Address:
☐ Well Constructed by Well Owner
Mailing Address (Street Number/Name): 21 REEVE STREET
Municipality: WOODSTOCK
Province: ON
Postal Code: N4S7V3
Telephone No. (inc. area code): 5195399000

Well Location

Address of Well Location (Street Number/Name): 345071 QUAKER STREET
Township: -
Lot: -
Concession: -
County/District/Municipality: OXFORD
City/Town/Village: NORWICH
Province: **Ontario**
Postal Code:
UTM Coordinates Zone: NAD 8 3 17
Easting: 528983
Northing: 4759747
Municipal Plan and Sublot Number:
Other:

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To

* ADDED 0.39M OF THE 50mm PVC RISER PIPE TO EXISTING WELL AND RAISED PROTECTIVE CASING. *

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To

Status of Well

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

Construction Record - Screen

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

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify
If pumping discontinued, give reason:
Pump intake set at (m/ft)
Pumping rate (l/min / GPM)
Duration of pumping ___ hrs + ___ min
Final water level end of pumping (m/ft)
If flowing give rate (l/min/GPM)
Recommended pump depth (m/ft)
Recommended pump rate (l/min/GPM)
Well production (l/min/GPM)
Disinfected? ☐ Yes ☐ No

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

Map of Well Location

Please provide a map below following instructions on the back.

ATTACHED MAP
"MW 2"

Water Details

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

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)

Well Contractor and Well Technician Information

Business Name of Well Contractor: DIRECT ENVIRONMENTAL DRILLING
Well Contractor's Licence No.: 7320
Business Address (Street Number/Name): 25 ARTISANS CRES.
Municipality: LONDON.
Province: ON
Postal Code: N5V5E9
Business E-mail Address: aarmstrong@directenvironmentaldrilling.com
Bus. Telephone No. (inc. area code): 5196580175
Name of Well Technician (Last Name, First Name): ARMSTRONG ANDREW.
Well Technician's Licence No.: 3446
Signature of Technician and/or Contractor:
Date Submitted: 20230917

Comments:

Well owner's information package delivered: ☐ Yes ☑ No
Date Package Delivered:
Date Work Completed: 20230916

Ministry Use Only
Audit No. Z453148

0506E (2023/08) © King's Printer for Ontario, 2023

Ministry's Copy

APPENDIX C

Groundwater Elevation Data

Table C-1: Monitoring Well Details
Holbrook Landfill Site

Observation Well	Installation Date	Ground Surface Elevation (m ASL) (1)	Measuring Point Elevation (1) (m ASL)	Stickup (m)	Riser Inside Diameter (mm)	Screen Length (m)	Screened Interval (m bgs)	Screened Interval (m ASL)	Well Depth (mbTOP)	Flow System (2)	Well Condition Status
2	01-May-79	276.47	277.57	1.10	51	0.50	8.64 - 9.14	270.96 - 270.46	10.51	SFS	Decommissioned in 2014
4	01-May-79	279.32	280.34	1.02	51	0.50	5.60 - 6.10	273.40 - 272.90	7.09	SFS	Decommissioned in 2014
4R	24-Sep-14	278.91	280.12	1.21	51	1.67	4.55 - 6.22	274.36 - 272.69	7.43	SFS	✓
5	01-May-79	279.15	280.12	0.97	51	0.50	7.60 - 8.10	271.10 - 270.60	9.13	SFS	Decommissioned in 2014
5R	24-Sep-14	279.26	280.46	1.20	51	1.68	7.06 - 8.74	272.20 - 270.52	9.94	SFS	✓
6	01-May-79	279.15	279.78	0.63	51	0.50	3.16 - 3.66	275.54 - 275.04	4.39	SFS	Decommissioned in 2014
10	03-May-79	281.63	282.48	0.85	51	0.50	2.85 - 3.35	277.15 - 276.65	4.30	SFS	Decommissioned in 2015
10R	09-Jul-15	281.52	282.55	1.04	51	1.67	2.90 - 4.57	278.62 - 276.95	5.61	SFS	✓
11	03-May-79	280.79	281.99	1.20	51	0.50	4.00 - 4.50	276.50 - 276.00	5.78	SFS	Decommissioned in 2015
11R	24-Jul-15	283.02	284.11	1.09	51	1.67	6.71 - 8.38	276.31 - 274.64	9.47	SFS/SCL	✓
12	03-May-79	280.69	281.85	1.16	51	0.50	7.27 - 7.77	273.23 - 272.73	8.78	SFS/SCL	Decommissioned in 2015
13	13-Jun-79	274.08	274.89	0.81	51	0.50	7.27 - 7.77	266.53 - 266.03	8.65	SFS/SCL	Decommissioned in 2014
13R	25-Sep-14	274.16	275.26	1.10	51	1.67	5.92 - 7.59	268.24 - 266.57	8.69	SFS/SCL	✓
14	13-Jun-79	275.85	277.40	1.55	51	0.50	4.50 - 5.00	271.00 - 270.50	6.23	SFS	Decommissioned in 2014
14R	17-Sep-14	275.69	276.65	0.97	51	1.68	3.96 - 5.64	271.73 - 270.05	6.61	SFS	✓
14A	13-Jun-79	275.94	277.47	1.53	51	0.50	2.24 - 2.74	273.26 - 272.76	4.13	SFS	Decommissioned in 2014
15	13-Jun-79	278.29	279.30	1.01	51	0.50	15.50 - 16.00	262.40 - 261.90	17.18	DFS	Decommissioned in 2014
15A	14-Jun-79	278.31	279.28	0.97	51	0.50	8.00 - 8.50	270.10 - 269.60	9.13	SFS/SCL	✓
16	14-Jun-79	278.19	279.24	1.05	51	0.50	15.35 - 15.85	262.45 - 261.95	17.02	DFS	Decommissioned in 2014
16R	19-Sep-14	277.98	279.23	1.26	51	1.67	14.05 - 15.72	263.93 - 262.26	16.98	DFS	✓
16A	14-Jun-79	278.19	279.50	1.31	51	0.50	8.34 - 8.84	269.46 - 268.96	10.22	SFS/SCL	Decommissioned in 2014
16AR	22-Sep-14	278.14	279.29	1.15	51	1.67	7.75 - 9.42	270.39 - 268.72	10.57	SFS/SCL	✓
17	29-Jun-79	278.84	279.43	0.59	51	0.50	5.60 - 6.10	273.00 - 272.50	7.14	SFS/SCL	Decommissioned in 2013
18	14-Sep-81	279.78	281.31	1.53	51	1.50	4.14 - 5.64	275.86 - 274.36	6.63	SFS/SCL	Decommissioned in 2014
18R	16-Sep-14	279.57	280.76	1.19	51	1.68	4.04 - 5.72	275.53 - 273.85	6.91	SFS	✓
19	14-Sep-81	274.95	276.05	1.10	51	1.50	3.68 - 5.18	271.02 - 269.52	6.15	SFS/SCL	Decommissioned in 2014
19R	26-Sep-14	274.89	276.11	1.21	51	1.65	3.58 - 5.23	271.31 - 269.66	6.44	SFS/SCL	✓
21	16-Oct-81	277.78	278.86	1.08	51	1.20	14.34 - 15.54	263.16 - 261.96	16.59	DFS	Decommissioned in 2015
21R	29-Sep-14	277.75	278.90	1.15	51	1.70	14.15 - 15.85	263.60 - 261.90	17.00	DFS	✓
23	23-Oct-81	278.94	280.15	1.21	51	2.10	18.32 - 20.42	260.08 - 257.98	21.54	DFS	Decommissioned in 2015
24	11-Feb-82	279.73	280.35	0.62	51	1.00	19.42 - 20.42	259.78 - 258.78	20.98	DFS	Decommissioned in 2015
24R	15-Jul-15	280.25	281.00	0.74	51	1.67	18.75 - 20.42	261.50 - 259.83	21.16	DFS	✓
24A	11-Feb-82	279.72	280.84	1.12	51	1.00	3.27 - 4.27	275.93 - 274.93	5.35	SCL	Decommissioned in 2015
24AR	13-Jul-15	279.95	281.11	1.15	51	0.91	3.66 - 4.57	276.29 - 275.38	5.72	SFS	✓
25	12-Feb-82	280.42	280.84	0.42	51	1.00	18.20 - 19.20	261.70 - 260.70	19.81	DFS	Decommissioned in 2015
25R	23-Jul-15	280.72	281.83	1.10	51	1.68	17.98 - 19.66	262.74 - 261.06	20.76	DFS	✓
25A	12-Feb-82	280.41	281.30	0.89	51	1.00	2.50 - 3.50	277.40 - 276.40	4.48	SFS/SCL	Decommissioned in 2015
26	16-Jan-83	272.07	272.21	0.14	51	1.80	2.70 - 4.50	269.10 - 267.30	4.50	SFS	Decommissioned in 2015
26R	07-Aug-15	272.03	272.91	0.88	51	0.61	5.49 - 6.10	266.54 - 265.93	6.98	SFS	Artesian
27	24-Jan-83	272.20	272.75	0.55	51	2.40	10.86 - 13.26	260.84 - 258.44	14.31	DFS	Artesian

Notes: · All elevations in metres above sea level

· (1) Elevations based on 2012 well network survey, with the exception of wells 4R, 5R, 10R, 11R, 13R, 14R, 15A, 16R, 16AR, 18R, 19R, 21R, 24R, 24AR, 25R, 26R, 27, 28R, 32R, 31, 33R, 35, 37R, 38, 39, 40, 41, 42, 43, 44, SP3R, SP4R, and SP5 which were surveyed in 2015.

· (2) Flow system estimated based on borehole log interpretation.

· SFS - Shallow Flow System

· SFS/SCL - Shallow Flow System / Shallow Confining Layer (possibly screened between two units)

· DFS - Deep Flow System

· ✓ Surface seal in good condition and well is capped.

Table C-1: Monitoring Well Details
Holbrook Landfill Site

Observation Well	Installation Date	Ground Surface Elevation (m ASL) (1)	Measuring Point Elevation (1) (m ASL)	Stickup (m)	Riser Inside Diameter (mm)	Screen Length (m)	Screened Interval		Well Depth (mbTOP)	Flow System (2)	Well Condition Status
							(m bgs)	(m ASL)			
28	17-Jan-83	277.65	278.52	0.87	51	1.50	7.64 - 9.14	269.76 - 268.26	9.94	SFS/SCL	Decommissioned in 2015
28R	21-Jul-15	277.72	278.78	1.06	51	1.68	8.23 - 9.91	269.49 - 267.81	10.97	SFS/SCL	✓
30	19-Jan-83	279.10	280.63	1.53	51	3.00	8.00 - 11.00	270.90 - 267.90	12.44	SFS/SCL	Decommissioned in 2014
31	03-Feb-83	279.14	280.06	0.92	51	3.00	14.68 - 17.68	264.22 - 261.22	18.49	DFS	✓
32	19-Jan-83	280.08	280.26	0.18	51	1.80	2.77 - 4.57	276.83 - 275.03	5.46	SFS	Decommissioned in 2015
32R	10-Jul-15	280.12	281.09	0.96	51	1.67	3.28 - 4.95	276.84 - 275.17	5.91	SFS	✓
33	19-Jan-83	280.23	280.78	0.55	51	1.80	10.30 - 12.10	269.60 - 267.80	12.86	SFS/SCL	Decommissioned in 2015
33R	23-Jul-15	280.67	281.85	1.18	51	1.67	10.01 - 11.68	270.66 - 268.99	12.86	SFS/SCL	✓
35	27-Jan-83	278.11	279.03	0.81	51	1.80	12.83 - 14.63	264.97 - 263.17	15.47	DFS	✓
37	15-Jan-83	274.97	276.41	1.44	51	3.00	19.71 - 22.71	255.05 - 252.05	24.43	DFS	Decommissioned in 2015
37R	06-Aug-15	275.15	276.24	1.09	51	1.68	19.05 - 20.73	256.10 - 254.42	21.82	DFS	✓
38	17-Feb-83	282.52	283.66	1.14	51	3.00	22.50 - 25.50	259.77 - 256.77	26.83	DFS	✓
39	18-Jul-13	278.03	278.94	0.91	51	3.05	16.00 - 19.05	262.12 - 259.07	19.84	DFS	✓
40	22-Jul-13	277.95	279.14	1.19	51	3.05	5.33 - 8.38	272.65 - 269.60	9.25	SFS	✓
41	22-Jul-13	286.53	287.50	0.97	51	6.10	2.59 - 8.69	284.14 - 278.04	9.55	LEACHATE	✓
42	08-Jul-15	278.02	279.05	1.03	51	1.68	25.37 - 27.05	252.65 - 250.97	28.08	DFS	✓
43	21-Jul-15	280.62	281.66	1.04	51	1.68	8.99 - 10.67	271.63 269.95	11.71	SFS/SCL	✓
44	04-Aug-15	282.26	283.36	1.10	51	1.67	7.70 - 9.37	274.56 - 272.89	10.47	SFS/SCL	✓
45	16-Aug-19	273.56	274.56	1.00	51	0.91	7.99 - 8.90	265.57 264.66	9.90	SFS/SCL	✓
46	15-Aug-19	273.92	274.88	0.96	51	1.67	7.29 - 8.96	266.63 - 264.96	9.92	SFS/SCL	✓
SP3		280.38	280.73	0.35	32					SFS	Decommissioned in 2015
SP3R	24-Jul-15	280.75	281.81	1.06	51	1.68	1.37 - 3.05	279.38 - 277.70	4.11	SFS	✓
SP4		279.57	279.82	0.25	32					SFS	Decommissioned in 2015
SP4R	13-Jul-15	279.93	280.86	0.93	51	0.61	1.83 - 2.44	278.10 - 277.49	3.37	SFS	✓
SP5		281.64	282.30	0.66	32				2.83	SFS	✓
104		279.80	281.91	2.11	51					SFS	Decommissioned in 2014
301		278.12	279.31	1.19	51					SFS	Decommissioned in 2014

Notes:
- All elevations in metres above sea level
- (1) Elevations based on 2012 well network survey, with the exception of wells 4R, 5R, 10R, 11R, 13R, 14R, 15A, 16R, 16AR, 18R, 19R, 21R, 24R, 24AR, 25R, 26R, 27, 28R, 32R, 31, 33R, 35, 37R, 38, 39, 40, 41, 42, 43, 44, SP3R, SP4R, and SP5 which were surveyed in 2015.
- (2) Flow system estimated based on borehole log interpretation.

- SFS - Shallow Flow System
- SFS/SCL - Shallow Flow System / Shallow Confining Layer (possibly screened between two units)
- DFS - Deep Flow System
- ✓ Surface seal in good condition and well is capped.

Table C-2: Groundwater Level Elevations
Holbrook Landfill Site

Well Number	Measuring Point Elevation	Ground Elevation	May-79	Jun-79	Oct-79	Mar-80	May-80	Sep-80	Feb-81	Oct-81	Oct-81	Jan-82	Jan-82	Jan-82	Feb-82	Feb-82	Apr-82
2	277.57	276.47	277.00	276.70	276.60	276.90	277.00	276.60	276.70			277.10		276.89		276.80	277.24
4	280.34	279.32	277.10	276.60	276.50	276.80	277.00	276.50	276.60		276.94	276.90		276.73		276.64	277.03
4R	280.12	278.91															
5	280.12	279.15	278.10	277.70	277.30	278.00	278.10	277.50	277.60		278.02	278.02		277.90		277.78	278.37
5R	280.46	279.26															
6	279.78	279.15	278.10	277.70	277.30	278.00	278.10	277.60	277.60		278.02	278.01		277.88		277.75	278.39
10	282.48	281.63	279.60	279.20	278.90	279.40	279.30	278.80	279.00		279.33	279.28		279.16		279.07	279.51
10R	282.55	281.52															
11	281.99	280.79	279.70	279.10	279.80	279.70	279.60	279.60	279.60		279.55	279.50		279.01		279.56	279.00
11R	284.11	283.02															
12	281.85	280.69	278.60	278.30	278.00	278.40	278.70	278.30	278.20		278.45	278.43		278.36		278.30	278.81
13	274.89	274.08		271.60	272.90	272.90	273.00	272.50	272.70		273.20	273.37		273.24		273.15	273.39
13R	275.26	274.16															
14	277.40	275.85		276.20	276.10	276.30	276.50	276.10	frozen		276.54	frozen		frozen		frozen	276.70
14R	276.65	275.69															
14A	277.47	275.94															
15	279.30	278.29		276.30	276.10	276.40	276.60	276.10	276.20	276.48	276.64	276.57	276.48	276.44	276.37	276.38	276.75
15A	279.28	278.31		276.30	276.20	276.40	276.60	276.10	276.20		276.60	276.54		276.40		276.31	276.64
16	279.24	278.19		275.90	275.70	276.00	276.20	275.70	275.80	276.08	276.25	276.19	276.11	276.05	275.95	275.95	276.31
16R	279.23	277.98															
16A	279.50	278.19		276.00	276.00	276.10	276.40	275.90	276.10		276.43	276.34		276.23		276.13	276.50
16AR	279.29	278.14															
17	279.43	278.84		277.10		277.20	277.40	276.80	277.00		277.40	277.33		277.17		277.07	277.52
18	281.31	279.78									277.56	277.42		277.21		277.13	277.60
18R	280.76	279.57															
19	276.05	274.95										frozen		frozen		frozen	
19R	276.11	274.89															
21	278.86	277.78									276.22	276.17	276.08	276.03	275.95	275.95	276.34
21R	278.90	277.75															
23	280.15	278.94									278.66	276.13	276.01	276.04	275.93	275.94	276.48
24	280.35	279.73													275.97	275.97	276.35
24R	280.35	279.73															
24A	280.84	279.72														278.73	278.92
24AR	281.11	279.95															
25	280.84	280.42													276.22	276.07	276.26
25R	281.83	280.72															
25A	281.30	280.41														279.85	279.49
26	272.21	272.07															

Notes: · All elevations in metres above sea level.
· Blank indicates data not available.
· 2001 through 2011 water level evelvations calculated using 2012 survey data.
· (1) Data based on field measurements during 2012 well network survey.

Table C-2: Groundwater Level Elevations
Holbrook Landfill Site

Well Number	Measuring Point Elevation	Ground Elevation	May-79	Jun-79	Oct-79	Mar-80	May-80	Sep-80	Feb-81	Oct-81	Oct-81	Jan-82	Jan-82	Jan-82	Feb-82	Feb-82	Apr-82
26R	272.91	272.03															
27	272.75	272.20															
28	278.52	277.65															
28R	278.78	277.72															
30	280.63	279.10															
31	280.06	279.14															
32	280.26	280.08															
32R	281.09	280.12															
33	280.78	280.23															
33R	281.85	280.67															
35	279.03	278.11															
37	276.41	274.97															
37R	276.24	275.15															
38	283.66	282.52															
39	278.94	278.03															
40	279.14	277.95															
41	287.50	286.53															
42	279.05	278.02															
43	281.66	280.62															
44	283.36	282.26															
45	274.56	273.56															
46	274.88	273.92															
SP3	280.73	280.38															
SP3R	281.81	280.75															
SP4	279.82	279.57															
SP4R	280.86	279.93															
SP5	282.30	281.64															
104	281.91 (1)	279.80															
301	279.31	278.12															
SG1	273.41	272.49															

Notes: · All elevations in metres above sea level.
· Blank indicates data not available.
· 2001 through 2011 water level evelvations calculated using 2012 survey data.
· (1) Data based on field measurements during 2012 well network survey.

Table C-2: Groundwater Level Elevations
Holbrook Landfill Site

Well Number	Measuring Point Elevation	Ground Elevation	Jun-82	Aug-82	Mar-83	Apr-83	Jun-83	Aug-83	Dec-83	Jun-01	Jun-02	Jun-03	Jun-04	Jun-05	Jun-06	May-07	Jun-08
2	277.57	276.47	277.14	276.62	277.17	277.09	277.07	277.13	276.57	275.60	273.52	275.61	275.68	275.64	275.70	275.63	275.67
4	280.34	279.32	276.90	276.44	276.93	276.89	276.92	277.27	276.65	276.05	276.18	276.11	276.74	276.19	276.19	276.07	276.05
4R	280.12	278.91															
5	280.12	279.15	278.07	277.48	278.21	278.20		278.46		278.90	278.94	278.96	278.92	278.90	278.86	278.77	278.90
5R	280.46	279.26															
6	279.78	279.15	278.09	277.41	278.23	278.23	278.29	278.44	277.83	277.82	277.82	278.08	278.81	278.32	278.28	278.02	278.19
10	282.48	281.63	279.28	278.78	279.33	279.31	279.27	279.56	279.51	279.68	280.26	279.83	280.15	279.77	279.72	279.65	279.71
10R	282.55	281.52															
11	281.99	280.79		277.98	279.79	279.88		277.54	279.83	280.23	280.51	280.32	280.20	280.11	280.48	279.70	280.30
11R	284.11	283.02															
12	281.85	280.69	278.64	277.53		278.57		278.45		278.63	278.75	278.57	279.17	278.91	278.83	278.75	278.84
13	274.89	274.08	273.37	272.80		273.44											
13R	275.26	274.16															
14	277.40	275.85	276.47	276.02		276.50		276.61		275.42	275.45	275.41	275.67	275.42	275.40	275.36	275.32
14R	276.65	275.69															
14A	277.47	275.94				275.18		275.19		275.47	275.47	275.56	275.35	275.23	275.69	275.96	275.32
15	279.30	278.29	276.60	276.17		276.59		276.73		275.48	275.53	275.46	275.79	275.52	275.51	275.45	275.44
15A	279.28	278.31	276.54	276.07	276.59	276.55	276.57	276.68	276.06	275.74	275.77	275.73	276.02	275.75	275.77	275.68	275.69
16	279.24	278.19	276.21	275.70	276.24	276.20	276.17	276.27	275.81	275.26	275.30	275.21	275.56	275.25	275.27	275.21	275.18
16R	279.23	277.98															
16A	279.50	278.19	276.37	275.81		276.48		276.48		275.66	275.68	275.60	275.71	275.65	275.70	275.58	275.50
16AR	279.29	278.14															
17	279.43	278.84	277.32	276.81		277.37		277.58								276.54	276.56
18	281.31	279.78	277.44	276.93		277.43		277.42		276.06	276.06	276.12	276.33	276.13	276.17	276.09	276.13
18R	280.76	279.57															
19	276.05	274.95		275.21		flowing		flowing		274.92	274.94	274.90	275.13	274.88	274.99	274.85	275.05
19R	276.11	274.89															
21	278.86	277.78	276.22	275.69	276.09	276.20	276.19	276.30	275.90	275.43	275.47	275.37	275.75	275.44	275.44	275.35	275.34
21R	278.90	277.75															
23	280.15	278.94	276.24	275.71	276.24	276.20	276.20		275.87	275.47	275.52	275.38	275.77	275.46	275.43	275.39	275.33
24	280.35	279.73	276.24	275.73	276.26	276.23	276.24	276.33	275.90	275.53	276.96	275.45	275.83	275.53	275.50	275.44	275.42
24R	280.35	279.73															
24A	280.84	279.72	278.90	278.52	278.98	278.93	278.81	279.13	279.17	279.30	279.56	279.33	279.61	279.26	278.88	279.14	279.24
24AR	281.11	279.95															
25	280.84	280.42	276.23	275.71	276.22	279.19	276.12	276.28	275.85	275.41	275.49	275.38	275.76	275.46	275.45	275.38	275.35
25R	281.83	280.72															
25A	281.30	280.41	279.60	279.54		279.66	279.53	279.70	279.76	280.03	280.08	280.13	280.14	280.10	280.14	280.07	280.16
26	272.21	272.07				flowing	275.40	276.33	274.84	flowing	flowing	flowing	flowing	flowing	flowing	flowing	flowing

Notes: · All elevations in metres above sea level.
· Blank indicates data not available.
· 2001 through 2011 water level evelvations calculated using 2012 survey data.
· (1) Data based on field measurements during 2012 well network survey.

Table C-2: Groundwater Level Elevations
Holbrook Landfill Site

Well Number	Measuring Point Elevation	Ground Elevation	Jun-82	Aug-82	Mar-83	Apr-83	Jun-83	Aug-83	Dec-83	Jun-01	Jun-02	Jun-03	Jun-04	Jun-05	Jun-06	May-07	Jun-08
26R	272.91	272.03															
27	272.75	272.20				flowing	275.03	276.16	274.46	flowing	flowing	flowing	flowing	flowing	flowing	flowing	flowing
28	278.52	277.65			275.09	274.94	275.52	274.89	274.38	274.61	274.72	274.43	275.12	274.67	274.64	274.53	274.53
28R	278.78	277.72															
30	280.63	279.10				277.51	277.26	277.41	275.33	275.94	275.96	275.96	276.07	276.01	276.01	275.98	276.02
31	280.06	279.14				276.25	276.24	276.34	275.95	275.45	275.48	275.38	275.76	275.46	275.48	275.42	275.41
32	280.26	280.08				278.96	278.89	279.13	279.15	279.09	279.56	279.59	279.78	279.56	279.53	279.46	279.49
32R	281.09	280.12															
33	280.78	280.23			276.56	276.54	276.59	276.55	276.45	276.03	276.03	275.96	276.40	276.04	276.51	275.97	275.95
33R	281.85	280.67															
35	279.03	278.11				276.00	276.63	276.72	276.07	275.45	275.49	275.43	275.76	275.48	275.49	275.42	275.41
37	276.41	274.97				275.39	275.32	275.37	275.23	274.96	274.98	274.75	275.31	274.90	274.88	274.78	274.75
37R	276.24	275.15															
38	283.66	282.52				275.46	275.44	275.47	275.33	270.49	270.51	274.86	275.38	274.96	274.97	274.90	274.85
39	278.94	278.03															
40	279.14	277.95															
41	287.50	286.53															
42	279.05	278.02															
43	281.66	280.62															
44	283.36	282.26															
45	274.56	273.56															
46	274.88	273.92															
SP3	280.73	280.38								280.61	280.63	280.53	280.58	280.50	280.50	280.40	280.58
SP3R	281.81	280.75															
SP4	279.82	279.57								278.26	279.34	278.29	279.34	278.41	279.65	279.08	279.15
SP4R	280.86	279.93															
SP5	282.30	281.64								dry	278.51	279.98	280.24	279.85	279.85	279.95	279.77
104	281.91 (1)	279.80			280.06	280.06	279.42	279.40									
301	279.31	278.12				277.35	276.64	275.73									
SG1	273.41	272.49															

Notes: · All elevations in metres above sea level.
· Blank indicates data not available.
· 2001 through 2011 water level evelvations calculated using 2012 survey data.
· (1) Data based on field measurements during 2012 well network survey.

Table C-2: Groundwater Level Elevations
Holbrook Landfill Site

Well Number	Measuring Point Elevation	Ground Elevation	Jun-09	May-10	Jun-11	May-12	May-13	May-14	May-15	May-16	May-17	May-18	May-19	May-20	May-21	May-22	May-23
2	277.57	276.47	275.73	275.71	275.74	275.69	275.76	275.81	(2)								
4	280.34	279.32	276.36	276.24	276.48	276.03	276.39	276.39	(2)								
4R	280.12	278.91							276.16	276.43	277.14	276.84	277.06	276.66	276.26	276.34	276.41
5	280.12	279.15	278.99	278.98	278.97	278.89	278.98	278.07	(2)								
5R	280.46	279.26							278.11	278.55	278.93	279.01	279.07	278.88	278.20	278.77	278.86
6	279.78	279.15	279.78	278.17	278.67	277.92	278.70	278.73	(2)								
10	282.48	281.63	279.88	279.76	279.99	279.48	280.03	279.58	279.63	(2)							
10R	282.55	281.52								279.86	280.37	280.26	280.33	280.07	279.71	279.97	280.03
11	281.99	280.79	280.17	280.49	280.08	279.58	280.02	280.15	279.59	(2)							
11R	284.11	283.02								280.34	280.69	280.60	280.61	280.41	280.12	280.41	280.49
12	281.85	280.69	279.04	278.66	279.21	278.71	279.01	279.03	278.61	(2)							
13	274.89	274.08		273.11	272.86	272.67	272.89	272.82	(2)								
13R	275.26	274.16							273.42	273.59	274.06	273.96	274.14	273.89	273.65	273.63	273.24
14	277.40	275.85	275.45	275.39	275.49	275.36	275.43	275.51	(2)								
14R	276.65	275.69							275.47	275.68	276.05	275.94	275.97	275.81	275.63	275.73	275.79
14A	277.47	275.94	275.61	275.72	273.50	275.17	275.01	275.31	(2)								
15	279.30	278.29	274.60	275.53	275.67	275.47	275.62	275.69	(2)								
15A	279.28	278.31	275.85	275.78	275.90	275.68	275.82	275.89	275.69	275.91	276.33	276.20	276.24	276.06	275.85	275.97	276.05
16	279.24	278.19	275.35	275.26	275.41	275.17	275.37	275.46	(2)								
16R	279.23	277.98							275.22	275.43	275.82	275.70	275.77	275.56	275.33	275.48	275.53
16A	279.50	278.19	275.71	275.70	275.78	275.53	275.76	275.90	(2)								
16AR	279.29	278.14							275.64	275.89	276.26	276.15	276.23	276.03	275.80	275.94	276.00
17	279.43	278.84	276.90	276.73	277.01	<277.07	<277.63	(2)									
18	281.31	279.78	276.29	276.24	276.37	276.14	276.42	276.51	(2)								
18R	280.76	279.57							276.07	276.43	277.31	276.92	278.13	277.64	277.44	277.32	277.59
19	276.05	274.95	274.96	274.95	275.38	274.95	275.31	275.26	(2)								
19R	276.11	274.89							274.82	274.86	275.23	275.13	275.29	275.04	274.82	275.18	275.06
21	278.86	277.78	275.53	275.44	275.58	275.28	275.53	275.62	275.28	(2)							
21R	278.90	277.75							275.33	275.55	275.94	275.81	275.92	275.69	275.43	275.63	275.66
23	280.15	278.94	275.55	275.45	275.64	275.33	275.57	275.63	275.33	(2)							
24	280.35	279.73	275.62	275.53	275.68	275.37	275.62	275.71	275.37	(2)							
24R	280.35	279.73								275.05	275.44	275.31	275.41	275.19	274.93	275.13	275.17
24A	280.84	279.72	279.58	279.57	279.62	279.06	279.60	279.68	279.10	(2)							
24AR	281.11	279.95								279.35	279.81	279.79	279.77	279.64	279.39	279.59	279.71
25	280.84	280.42	275.64	275.45	275.60	275.31	275.54	275.37	(2)	(2)							
25R	281.83	280.72								275.63	276.02	275.90	275.97	275.85	275.53	275.69	275.74
25A	281.30	280.41	280.16	280.20	280.18	280.09	280.17	280.03	280.07	(2)							
26	272.21	272.07	flowing	flowing	flowing	flowing	275.09	275.22	275.06	(2)							

Notes: · All elevations in metres above sea level.

· Blank indicates data not available.

· 2001 through 2011 water level evelvations calculated using 2012 survey data.

· (1) Data based on field measurements during 2012 well network survey.

· (2) Well decommissioned.

Table C-2: Groundwater Level Elevations
Holbrook Landfill Site

Well Number	Measuring Point Elevation	Ground Elevation	Jun-09	May-10	Jun-11	May-12	May-13	May-14	May-15	May-16	May-17	May-18	May-19	May-20	May-21	May-22	May-23
26R	272.91	272.03								275.18	276.01	275.51	275.19	274.82	274.66	274.35	274.43
27	272.75	272.20	flowing	flowing	flowing	flowing	274.99	275.13	275.14	275.03	275.45	275.17	275.45	274.71	274.08	275.09	275.19
28	278.52	277.65	274.88	274.67	275.08	274.51	274.91	274.99	274.36	(2)							
28R	278.78	277.72								275.55	275.30	275.21	275.30	275.05	274.95	274.99	275.05
30	280.63	279.10	276.09	276.18	276.13	276.04	276.15	276.18	(2)								
31	280.06	279.14	275.60	275.53	275.67	275.41	275.66	275.73	275.58	275.82	276.17	276.06	276.16	275.96	275.74	275.81	275.97
32	280.26	280.08	279.65	279.56	279.70	279.28	279.71	279.77	279.43	(2)							
32R	281.09	280.12								279.52	279.81	279.78	279.78	279.67	279.44	279.59	279.62
33	280.78	280.23	275.98	276.00	276.26	275.93	276.18	276.22	275.88	(2)							
33R	281.85	280.67								276.22	276.55	276.48	276.57	276.28	276.20	276.31	276.35
35	279.03	278.11	275.57	275.50	275.63	275.44	275.59	275.66	275.55	275.76	276.16	276.03	276.09	275.90	275.70	275.82	275.89
37	276.41	274.97	275.01	274.97	275.01	274.55	274.95	275.07	275.22	(2)							
37R	276.24	275.15								274.99	275.40	275.19	275.38	275.15	275.04	275.08	275.04
38	283.66	282.52	275.12	274.99	275.10	274.65	275.05	275.50	274.82	275.04	275.46	275.26	275.43	275.23	275.16	275.12	275.18
39	278.94	278.03						278.02	277.43	277.67	278.47	278.18	278.44	277.94	277.51	277.94	278.06
40	279.14	277.95						277.65	277.36	277.65	278.44	278.11	278.36	278.16	277.44	277.84	277.96
41	287.50	286.53						283.29	282.58	283.33	283.68	283.73	283.65	283.45	283.38	283.25	283.37
42	279.05	278.02								277.64	278.20	278.00	278.17	277.78	277.45	277.79	277.86
43	281.66	280.62								275.09	275.47	275.38	275.52	275.31	275.26	275.15	275.29
44	283.36	282.26								276.68	276.90	276.92	277.21	276.42	276.37	276.38	276.54
45	274.56	273.56												274.66	274.29	274.47	274.61
46	274.88	273.92												274.52	274.18	273.97	274.52
SP3	280.73	280.38	280.73	280.71	280.12	280.09	280.08	280.13	280.12	(2)							
SP3R	281.81	280.75								280.25	280.50	280.48	280.49	280.46	280.44	280.48	280.37
SP4	279.82	279.57	279.42	279.42	279.46	279.03	279.46	279.51	279.04	(2)							
SP4R	280.86	279.93								279.10	279.56	279.54	279.56	279.42	279.16	279.34	279.49
SP5	282.30	281.64	280.55	279.68	279.51	279.54	280.13	279.59	279.64	279.97	279.55	279.52	279.58	279.60	279.48	279.58	279.50
104	281.91 $^{(1)}$	279.80							(2)								
301	279.31	278.12				275.83			(2)								
SG1	273.41	272.49							272.67	272.61	272.67	272.63	272.64	272.61	272.62	272.66	272.71

Notes: · All elevations in metres above sea level.

· Blank indicates data not available.

· 2001 through 2011 water level evelvations calculated using 2012 survey data.

· (1) Data based on field measurements during 2012 well network survey.

· (2) Well decommissioned.

Table C-2: Groundwater Level Elevations
Holbrook Landfill Site

Well Number	Measuring Point Elevation	Ground Elevation	May-24	May-25
2	277.57	276.47		
4	280.34	279.32		
4R	280.12	278.91	276.52	276.32
5	280.12	279.15		
5R	280.46	279.26	278.78	278.53
6	279.78	279.15		
10	282.48	281.63		
10R	282.55	281.52	280.00	279.94
11	281.99	280.79		
11R	284.11	283.02	280.45	280.38
12	281.85	280.69		
13	274.89	274.08		
13R	275.26	274.16	273.37	273.36
14	277.40	275.85		
14R	276.65	275.69	275.63	275.55
14A	277.47	275.94		
15	279.30	278.29		
15A	279.28	278.31	275.89	275.80
16	279.24	278.19		
16R	279.23	277.98	275.40	275.26
16A	279.50	278.19		
16AR	279.29	278.14	275.85	275.73
17	279.43	278.84		
18	281.31	279.78		
18R	280.76	279.57	277.55	277.37
19	276.05	274.95		
19R	276.11	274.89	275.04	274.93
21	278.86	277.78		
21R	278.90	277.75	275.53	275.42
23	280.15	278.94		
24	280.35	279.73		
24R	280.35	279.73	275.04	274.91
24A	280.84	279.72		
24AR	281.11	279.95	279.80	279.69
25	280.84	280.42		
25R	281.83	280.72	275.62	275.47
25A	281.30	280.41		
26	272.21	272.07		

Notes: · All elevations in metres above sea level.
· Blank indicates data not available.
· 2001 through 2011 water level evelvations calculated using 2012 survey data.
· (1) Data based on field measurements during 2012 well network survey.
· (2) Well decommissioned.

Table C-2: Groundwater Level Elevations
Holbrook Landfill Site

Well Number	Measuring Point Elevation	Ground Elevation	May-24	May-25
26R	272.91	272.03	274.35	274.13
27	272.75	272.20	274.97	274.86
28	278.52	277.65		
28R	278.78	277.72	275.04	274.79
30	280.63	279.10		
31	280.06	279.14	275.89	275.76
32	280.26	280.08		
32R	281.09	280.12	279.63	279.57
33	280.78	280.23		
33R	281.85	280.67	276.24	276.11
35	279.03	278.11	275.72	275.62
37	276.41	274.97		
37R	276.24	275.15	275.03	274.83
38	283.66	282.52	275.07	274.89
39	278.94	278.03	277.88	277.69
40	279.14	277.95	277.79	277.54
41	287.50	286.53	283.78	282.98
42	279.05	278.02	277.72	277.55
43	281.66	280.62	275.17	274.69
44	283.36	282.26	276.43	276.39
45	274.56	273.56	274.64	274.41
46	274.88	273.92	274.50	274.26
SP3	280.73	280.38		
SP3R	281.81	280.75	280.42	280.36
SP4	279.82	279.57		
SP4R	280.86	279.93	279.58	279.47
SP5	282.30	281.64	279.51	dry
104	281.91 (1)	279.80		
301	279.31	278.12		
SG1	273.41	272.49	272.69	272.61

Notes: · All elevations in metres above sea level.
· Blank indicates data not available.
· 2001 through 2011 water level evelvations calculated using 2012 survey data.
· (1) Data based on field measurements during 2012 well network survey.
· (2) Well decommissioned.

Figure C-1
Groundwater Hydrograph - Adjacent Northeast
Holbrook Landfill Site - Shallow Aquifer

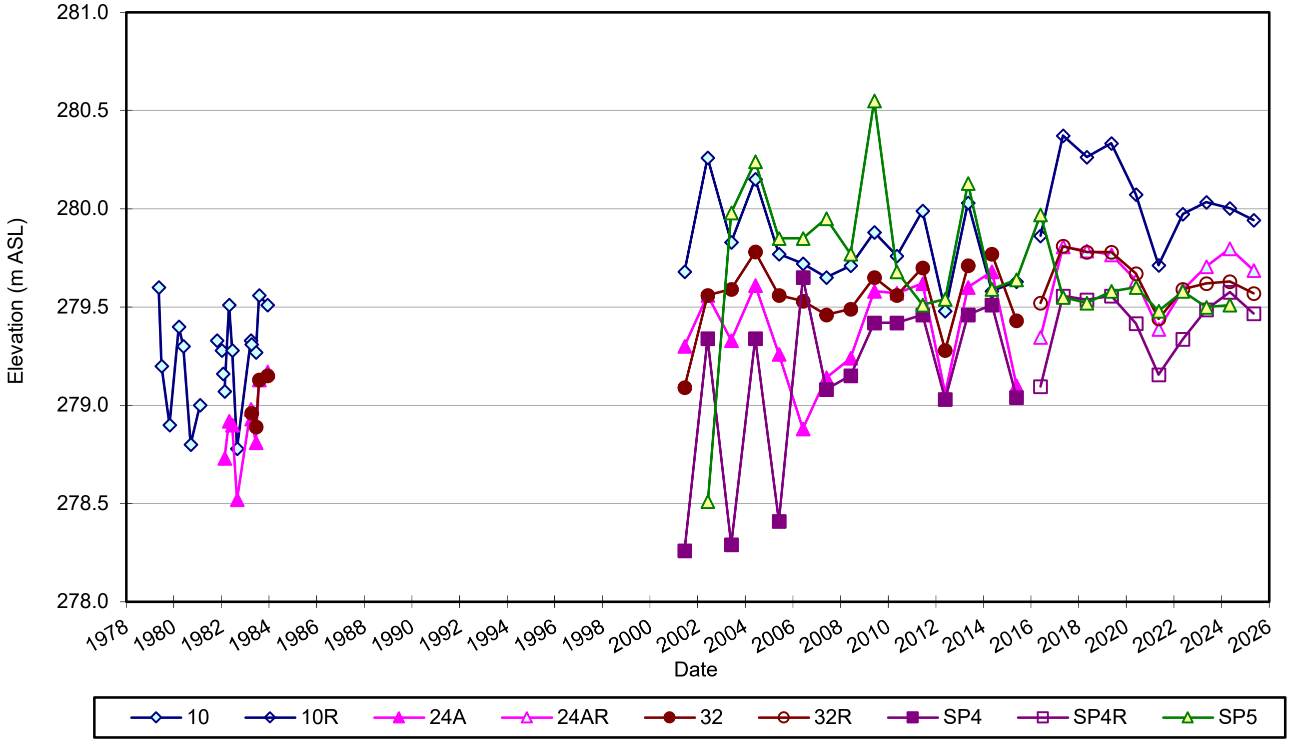


Figure C-2
Groundwater Hydrograph - Adjacent East
Holbrook Landfill Site - Shallow Aquifer

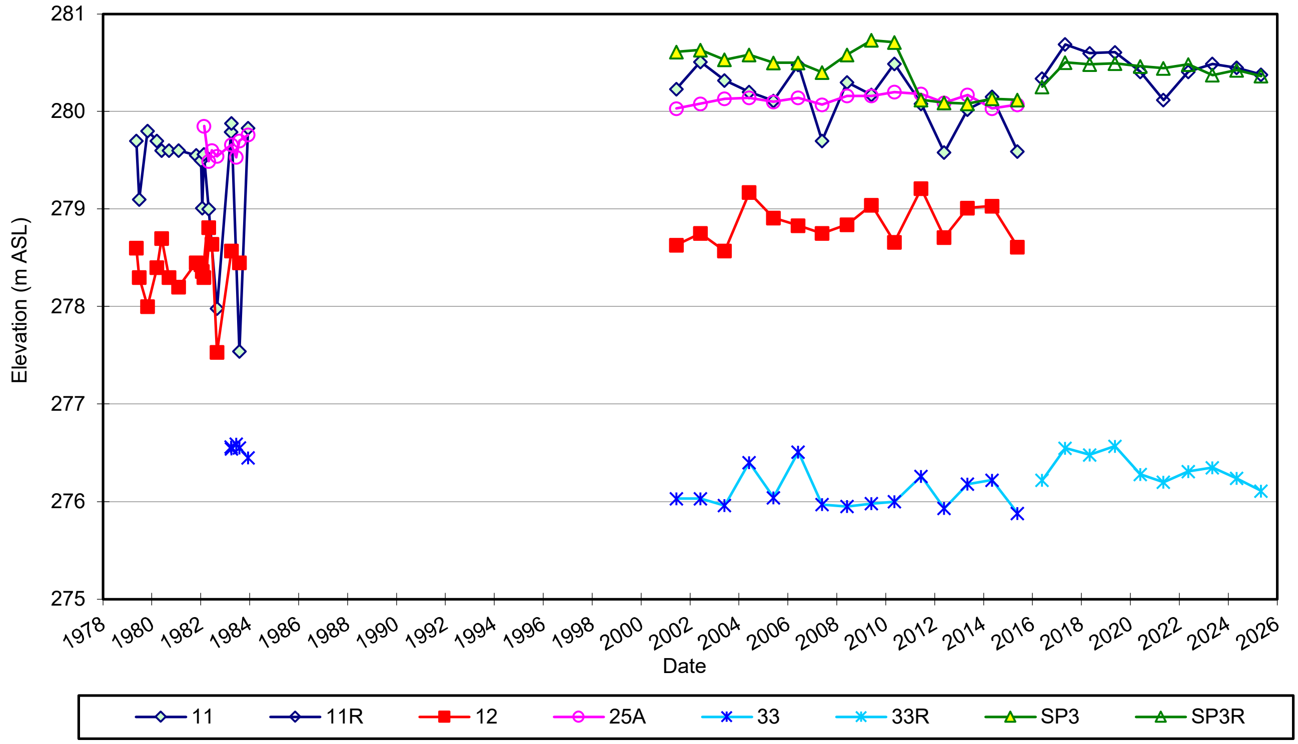


Figure C-3
Groundwater Hydrograph - Adjacent Southeast
Holbrook Landfill Site - Shallow Aquifer

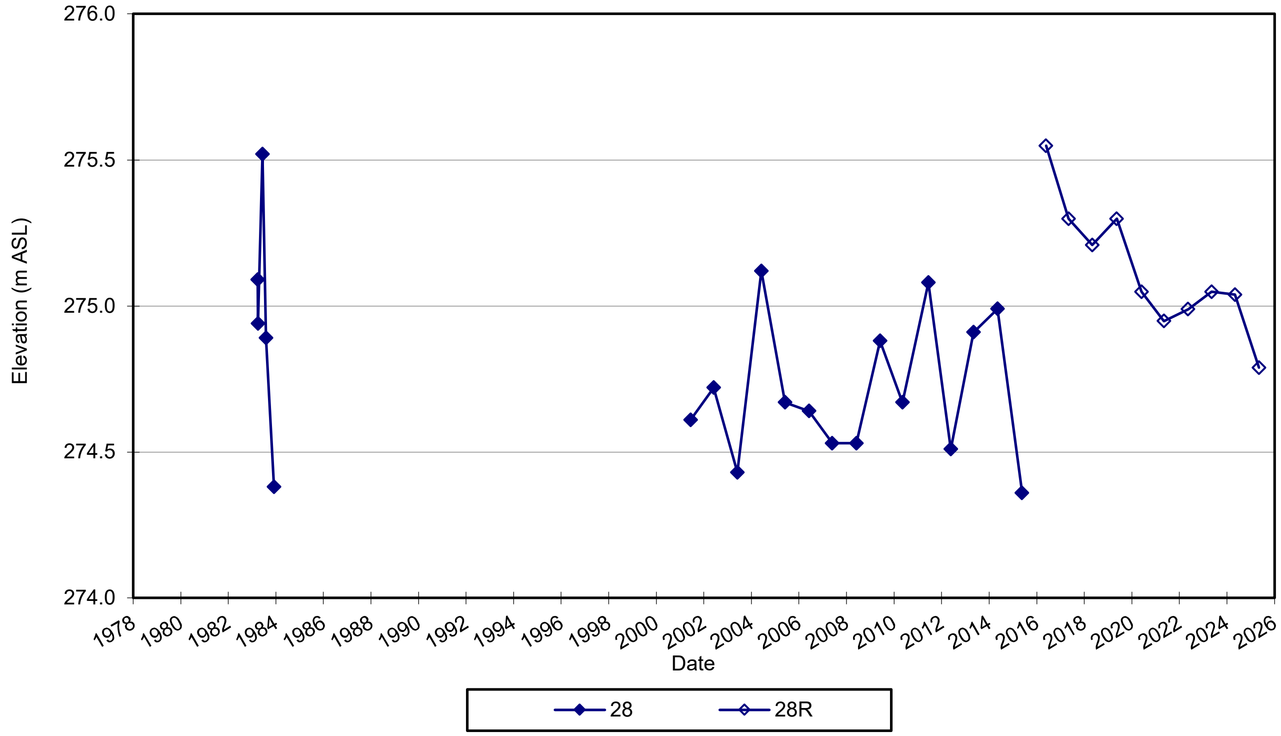


Figure C-4
Groundwater Hydrograph - Downgradient South & Cross-Gradient Southeast
Holbrook Landfill Site - Shallow Aquifer

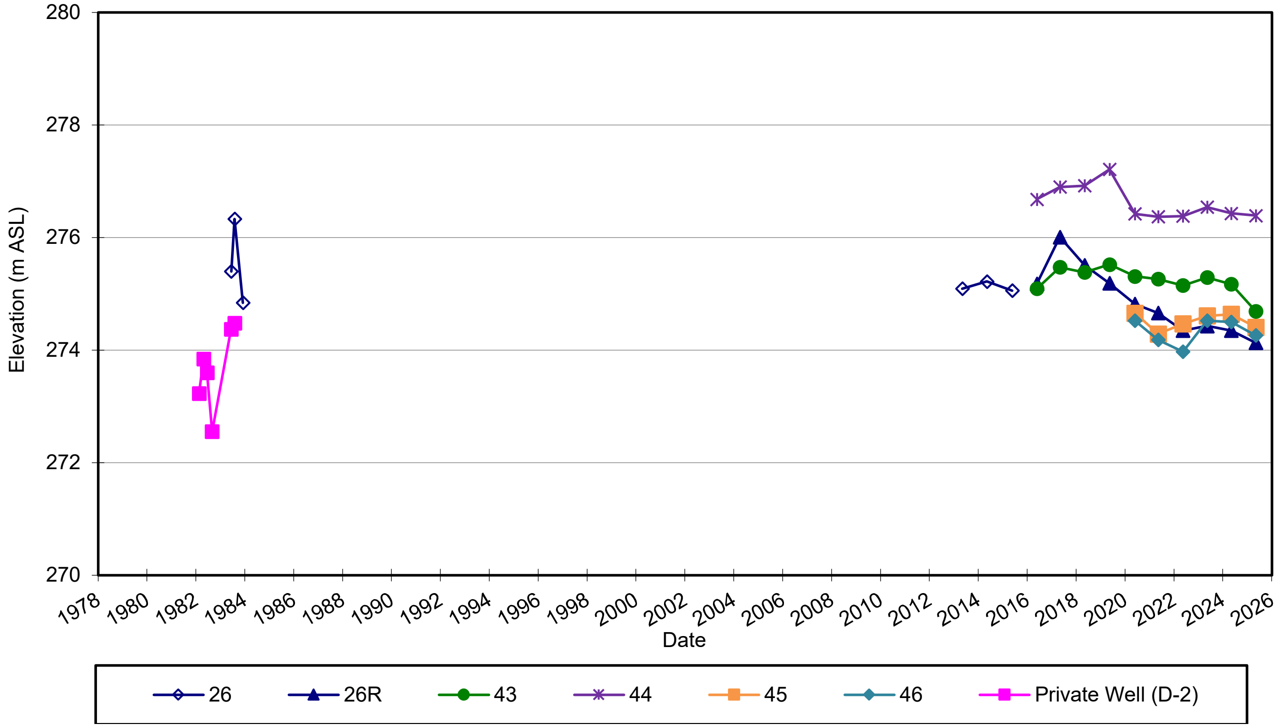


Figure C-5
Groundwater Hydrograph - Adjacent Northwest
Holbrook Landfill Site - Shallow Aquifer

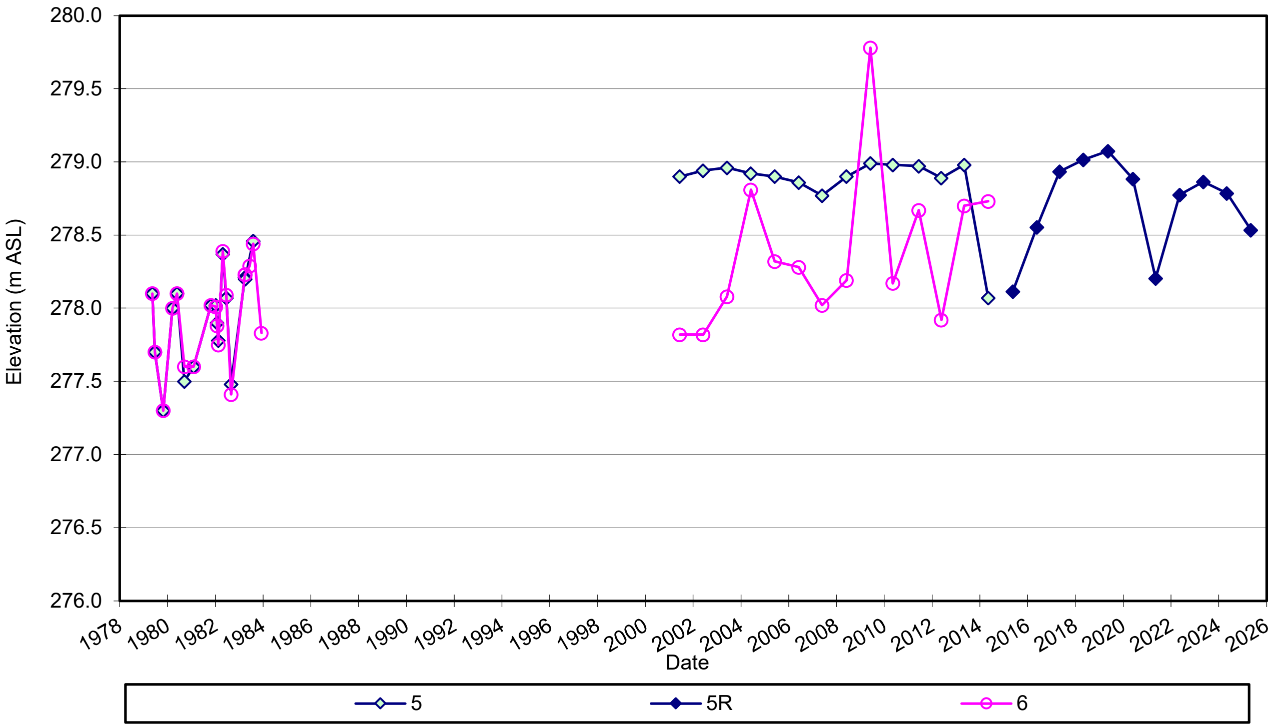


Figure C-6
Groundwater Hydrograph - Downgradient West
Holbrook Landfill Site - Shallow Aquifer

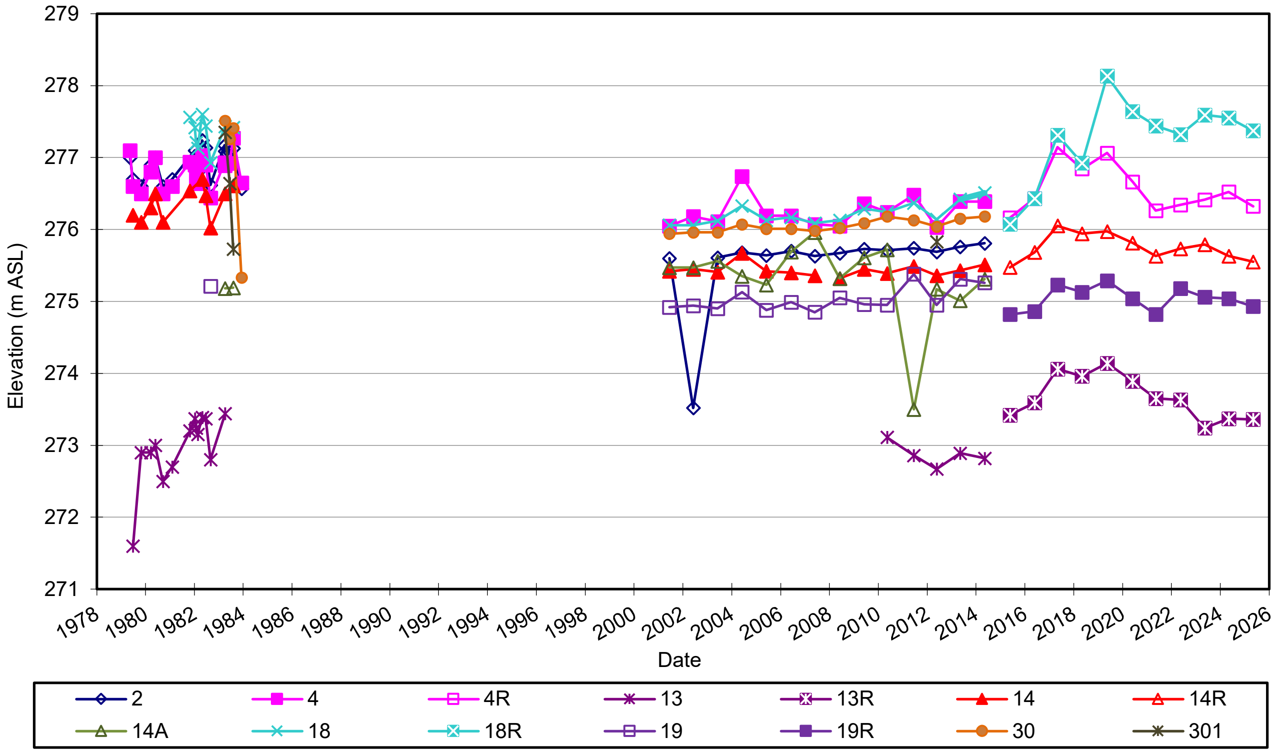


Figure C-7
Groundwater Hydrograph - Cross-Gradient/Upgradient West
Holbrook Landfill Site - Shallow Aquifer

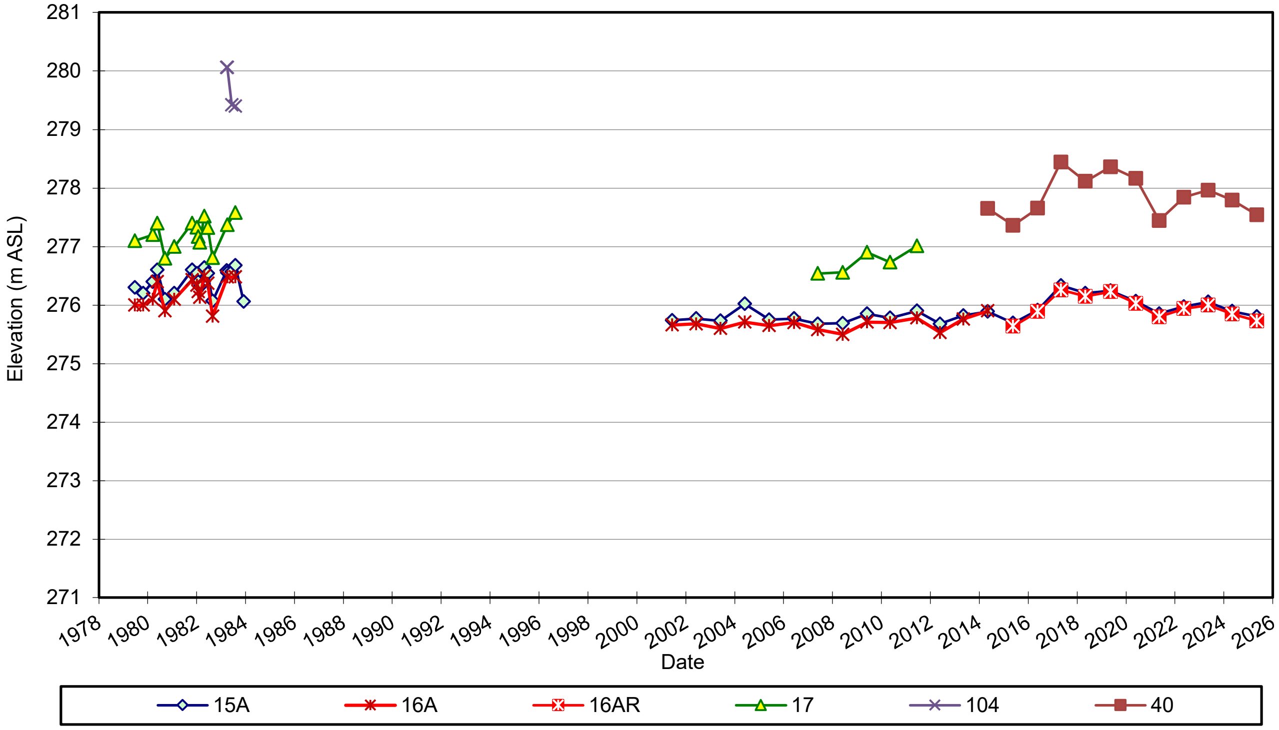


Figure C-8
Groundwater Hydrograph - Landfill Mound
Holbrook Landfill Site - Refuse

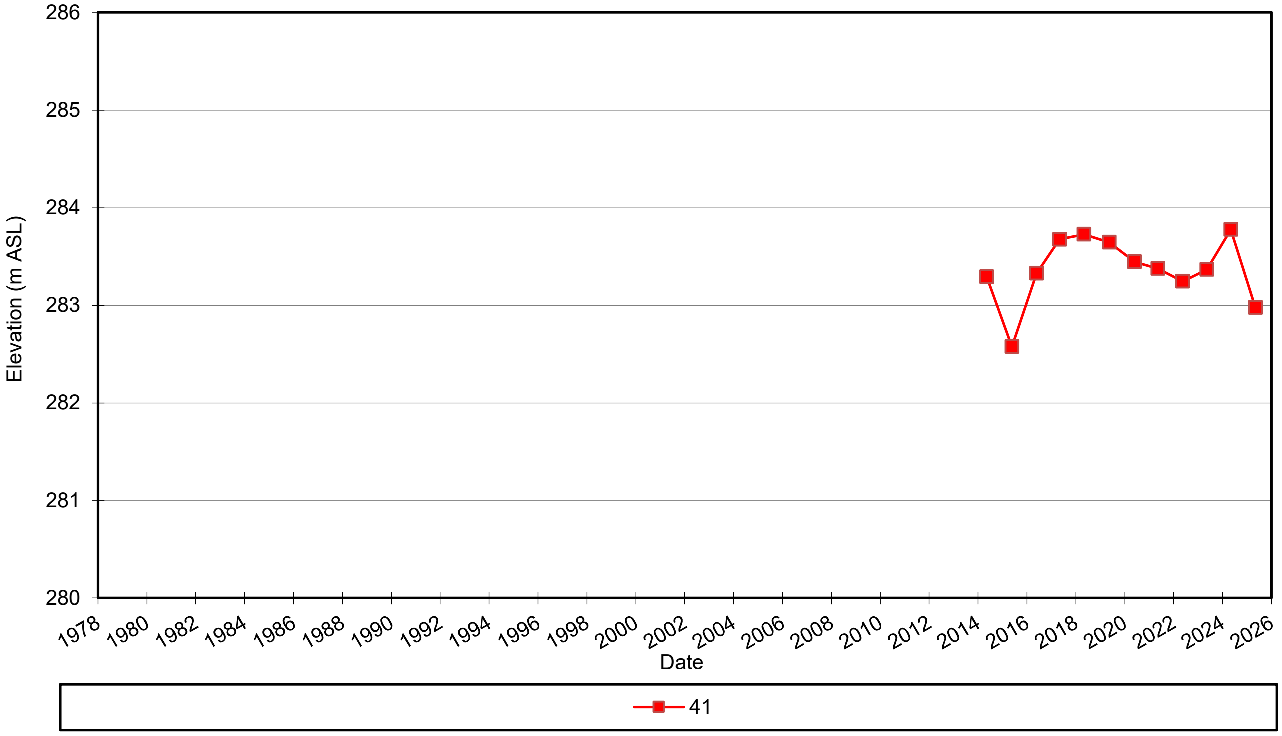


Figure C-9
Groundwater Hydrograph - Adjacent Northeast
Holbrook Landfill Site - Deep Aquifer

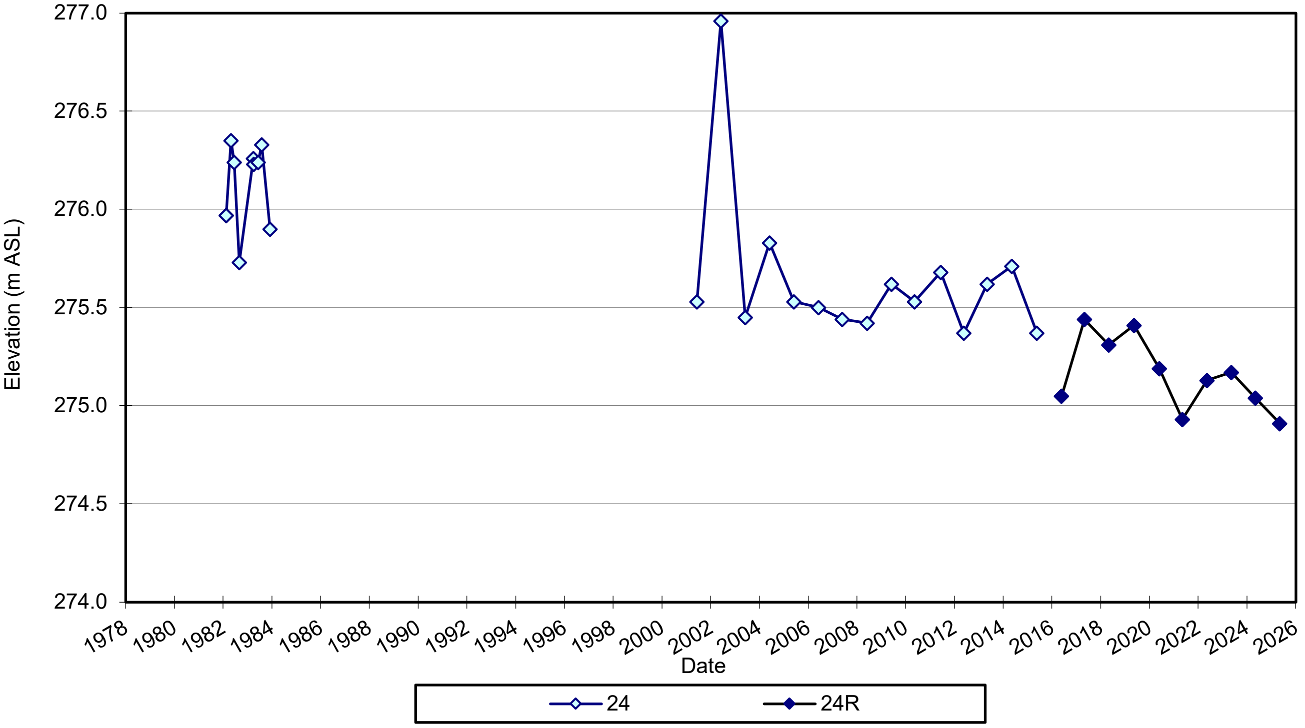


Figure C-10
Groundwater Hydrograph - Adjacent East
Holbrook Landfill Site - Deep Aquifer

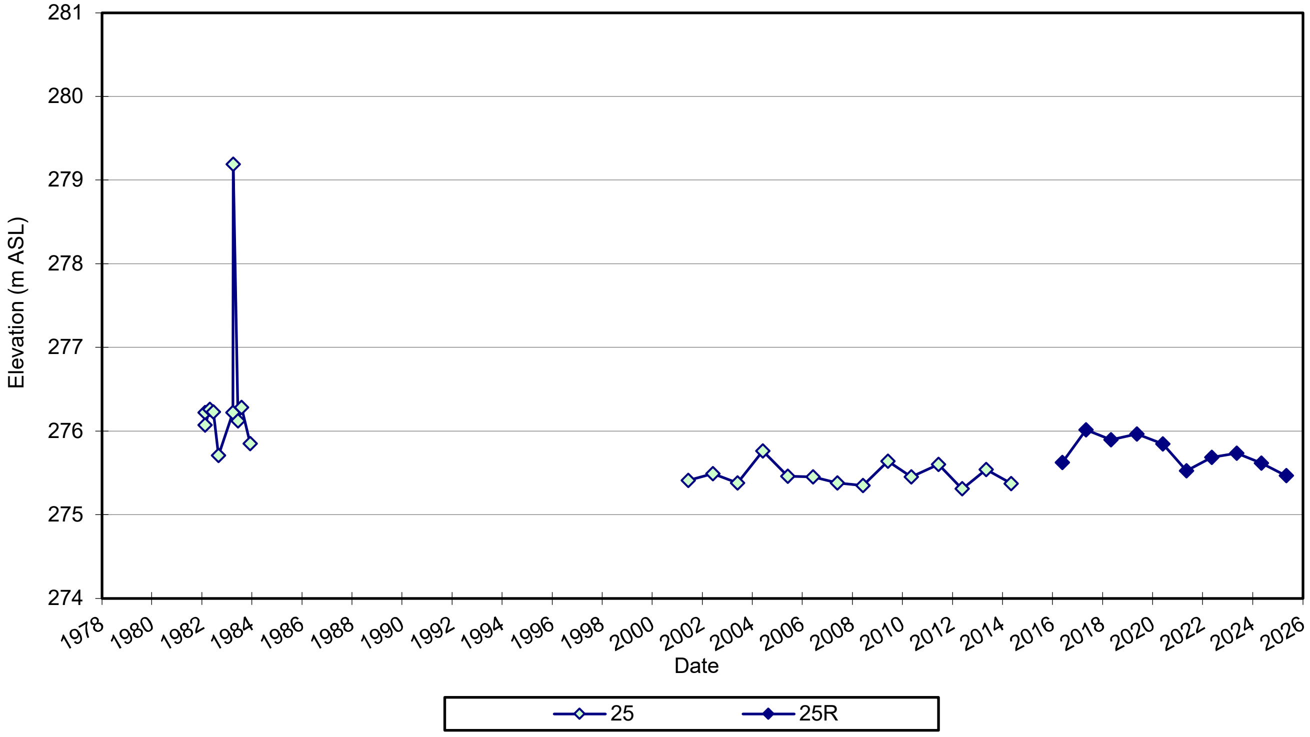


Figure C-11
Groundwater Hydrograph - Adjacent West
Holbrook Landfill Site - Deep Aquifer

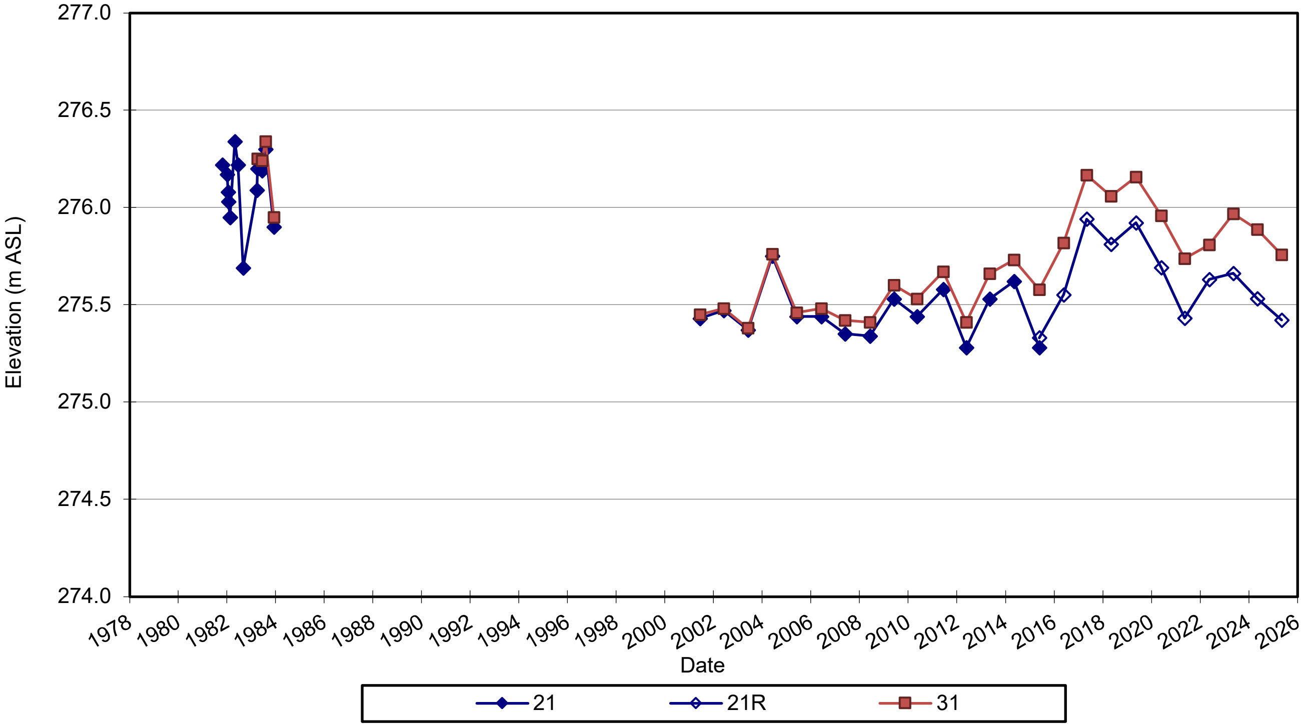


Figure C-12
Groundwater Hydrograph - Downgradient South
Holbrook Landfill Site - Deep Aquifer

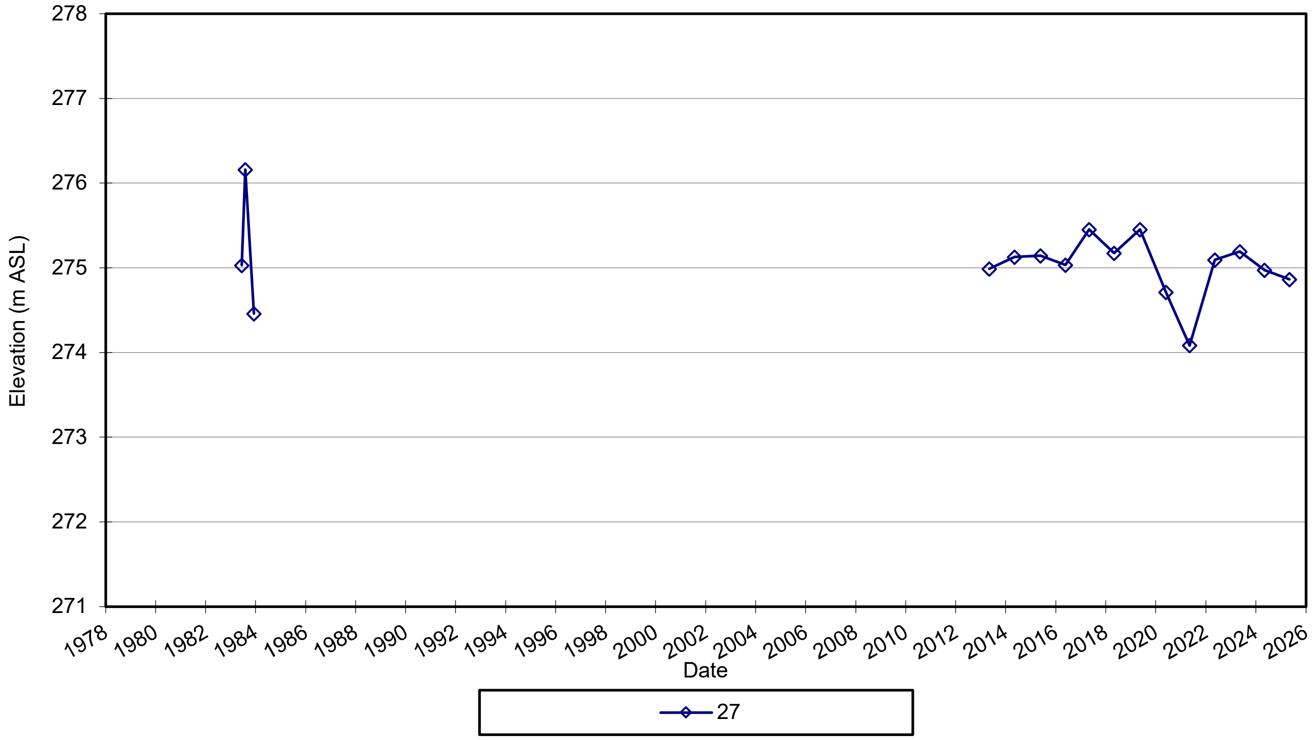


Figure C-13
Groundwater Hydrograph - Downgradient Southeast
Holbrook Landfill Site - Deep Aquifer

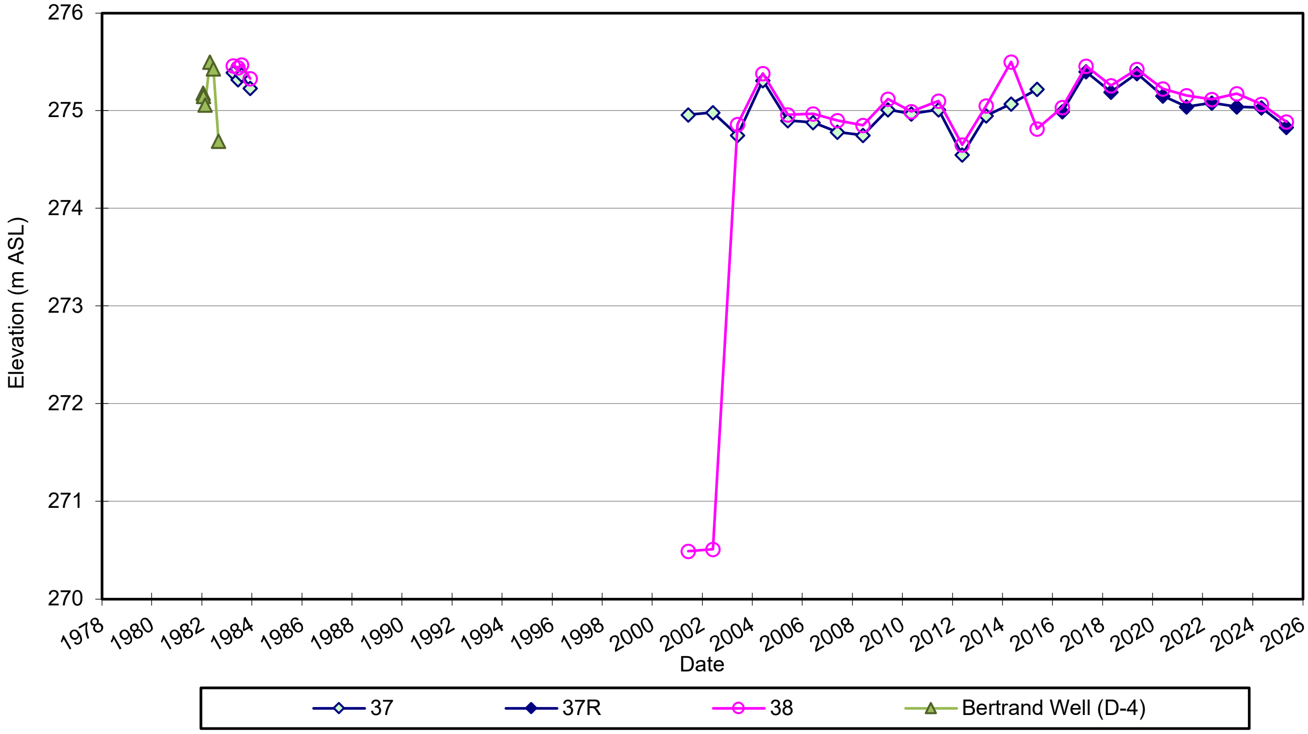


Figure C-14
Groundwater Hydrograph - Adjacent Northwest
Holbrook Landfill Site - Deep Aquifer

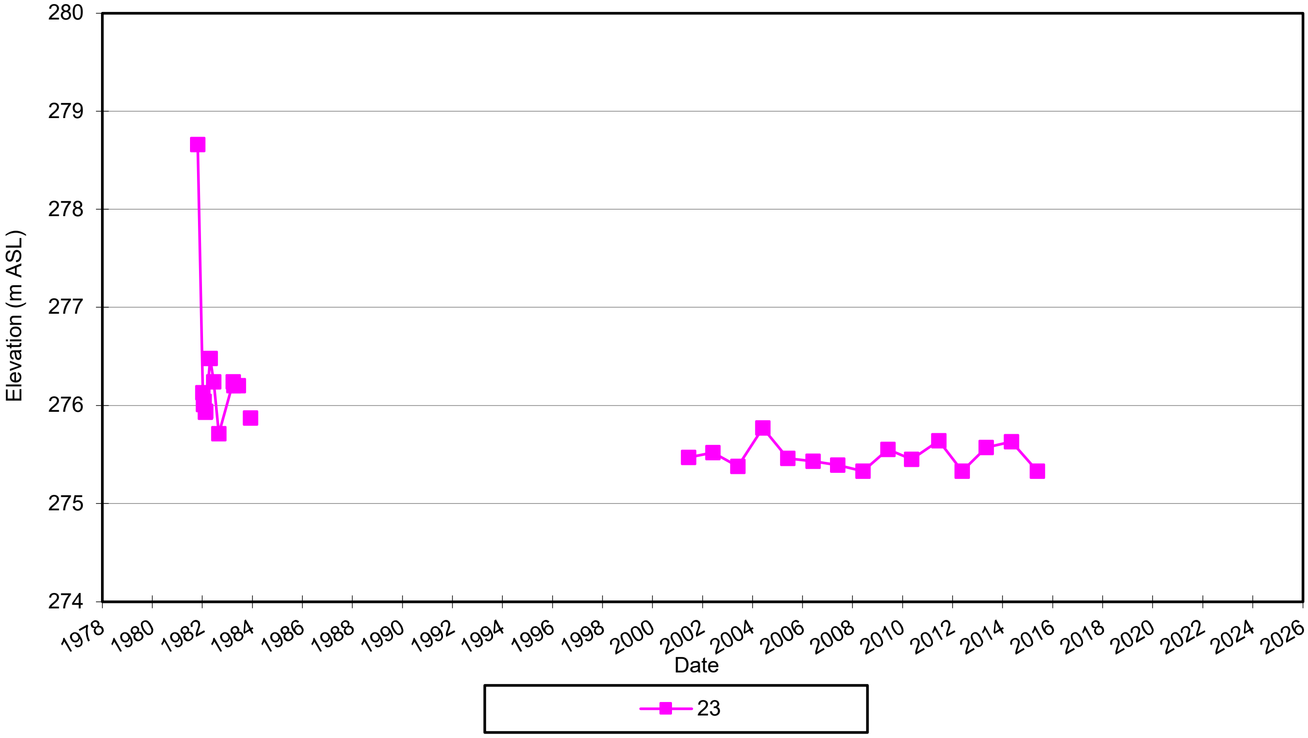
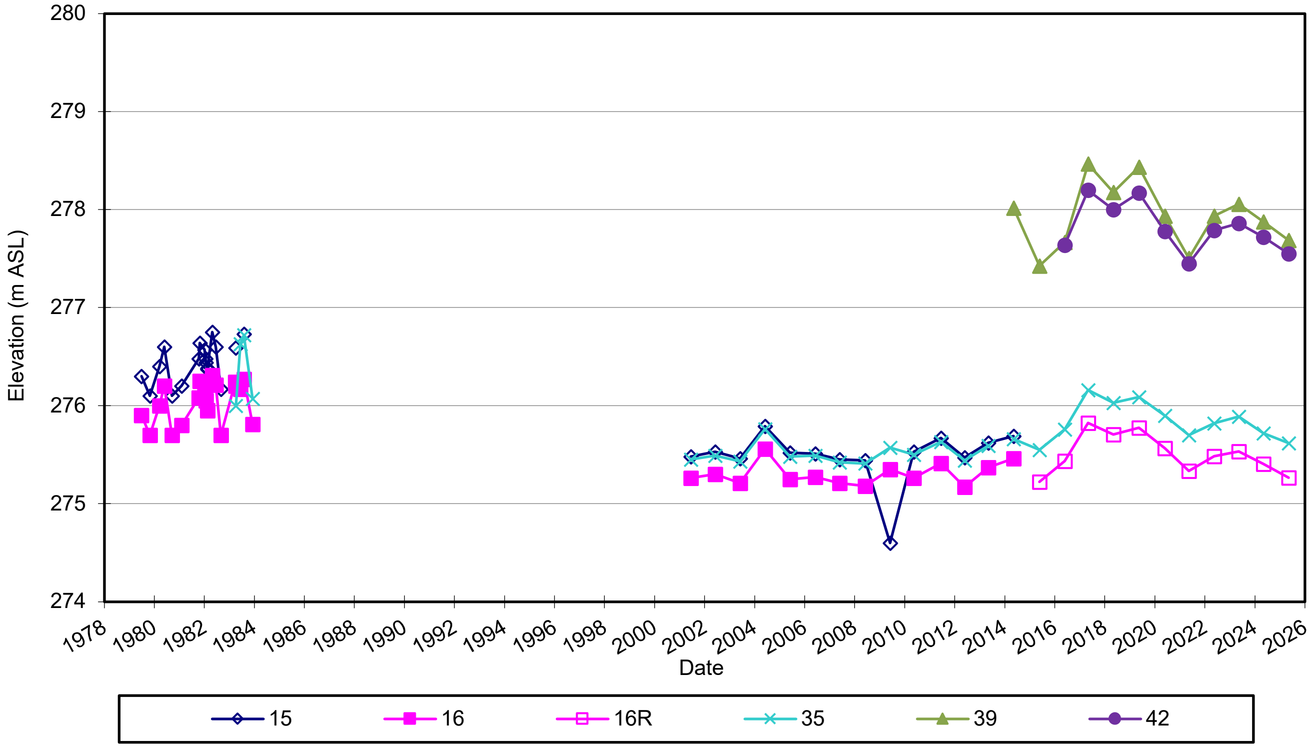


Figure C-15
Groundwater Hydrograph - Cross-Gradient West
Holbrook Landfill Site - Deep Aquifer



APPENDIX D

Groundwater Chemistry

Notation	***Description***		
	all units in mg/L unless otherwise noted	EC	Electrical Conductivity
mg/L	milligrams per Litre	TKN	Total Kjeldahl Nitrogen
µg/L	micrograms per Litre	DOC	Dissolved Organic Carbon
SU	Scientific Units	T	Temperature
µS/cm	microSiemens per centimetre		
ºC	degrees Celsius		
ODWQS	Ontario Drinking Water Quality Standards (June 2003)		
MAC	Maximum Acceptable Concentration		
IMAC	Interim Maximum Acceptable Concentration		
AO	Aesthetic objective		
OG	Operational Guideline		
nc	no OWDWS criteria		
em	equipment malfunction - field parameter data not available		
DRY	sampling location dry at the time of sampling		
- or blank	parameter not analysed during sampling event		
< value	parameter not detected above associated laboratory reported detection limit		
*	estimated / anomalous value - result interpreted with caution or considered questionable		

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
11	16-May-79				7.9	290		5.0		105				
	27-Jun-79				7.9	310	168	3.9		150				
	30-Oct-79				7.6	670	348	9.5			79.5	36.2		
	20-Mar-80				7.7	630	335	13.5			77.5	34.4		
	27-May-80				8.2	432	225	10.0			52.5	22.8		
	18-Sep-80				7.5	630	334	11.5			76.0	35.0		
	6-Feb-81				7.7	690	367	17.5			83.0	38.8		
	28-Jan-82				7.7	600	396	12.0		260				
	29-Apr-82				7.5	620	396	14.0						
	2-Sep-82				7.8	640	340	13.5			80.5	33.6		
	30-Mar-83				7.3	610	390	19.0						
	13-Jun-83				7.3	390	456	26.0						
	14-Sep-83				7.3	700	424	24.0						
	7-Dec-83				7.7	730	570	25.0						
	1-May-84				7.2	920	504	33.0						
	6-Nov-84				6.9	1040	615	27.0		308	139	65.0		
	30-Apr-85				7.31	875	445	27.5		284	105	44.4		
	21-Oct-85				7.58	1020	519	27.0		156	125	50.0		
	30-Apr-86				7.23	434	270	14.5		208	67.5	24.6		
	14-Oct-86				7.31	805	420	18.0		324	102.0	40.0		
	20-Apr-87				7.33	845	452	20.5			110	43.0		
	6-Oct-87				7.43	750	373	17.8		349	92.9	34.2		
	10-May-88				7.29	1040	591	24.8		355	148	53.7		
	12-Oct-88				7.20	1040	671	29.0		556	163	64.0		
	23-Jan-89				7.07	1296	669	35.3		473	162	63.6		
	30-Oct-89				7.21	1320	712	29.0		546	176	66.0		
	7-May-90				7.46	1011	556	21.6		442	139	50.0		
	29-Oct-90				7.76	1030	542	19.5		503	140	46.6		

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
11	16-May-79												
	27-Jun-79					7.8			0.04				
	30-Oct-79								0.62				
	20-Mar-80								0.89				
	27-May-80								0.15				
	18-Sep-80								0.03				
	6-Feb-81								0.01				
	28-Jan-82					2.3			0.02				
	29-Apr-82					1.7							
	2-Sep-82					2.9							
	30-Mar-83					2.1							
	13-Jun-83					1.7							
	14-Sep-83					1.4							
	7-Dec-83					2.1							
	1-May-84					1.5							
	6-Nov-84					1.1			0.18				
	30-Apr-85					3.0			0.80				
	21-Oct-85					2.5			0.80				
	30-Apr-86					4.6			0.64				
	14-Oct-86					2.8			0.66				
	20-Apr-87					3.2			0.01				
	6-Oct-87					3.7			0.20				
	10-May-88					3.1			0.94				
	12-Oct-88					9.0			0.06				
	23-Jan-89								0.41				
	30-Oct-89					2.4			0.96				
	7-May-90								0.65				
	29-Oct-90					4.6			0.09				

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
11	6-May-91				7.44	949	488	20.6		462	122	44.4		
cont'd	26-May-92				7.36	843	454	17.3		376	118	38.5		
	6-Oct-92				7.55	745	398	15.0		332	104	33.7		
	3-May-93				7.26	897	438	12.0		465	107	41.1		
	26-Oct-93				7.26	991	502	14.4		487	128	44.0		
	25-Apr-94				7.70	877	474	11.6		432	123	39.8		
	25-Oct-94				7.38	782	416	11.0		359	112	32.7		
	16-May-95				7.37	820	440	9.9		355	114	37.5		
	15-Jun-97				7.60	714	415	7.6		386	112	32.9	2.40	7.8
	15-Jun-98				7.36	760	487	8.0		210	137	35.1	3.14	7.87
	15-Jun-99				7.27	885	527	13.0		308	154	34.7	3.27	9.35
	15-Jun-00				7.86	930	537	8.0		440	153	37.7	1.38	14.9
	15-Jun-01				7.32	993	547	10.0		565	160	35.7	0.75	17.5
	15-Jun-02				7.12	844	427	10.0		438	124	28.4	2.06	7.16
	15-Jun-03				7.34	868	509	15.0		450	147	34.5	1.40	11.2
	15-Jun-04				7.65	927	448	9.0		491	125	33.1	1.28	19.8
	15-Jun-05				8.05	796	575	9.9		517	160	40.2	2.5	9.5
	15-Jun-06				7.24	854	510	9.0		450	148	33.8	2.0	7.3
	29-May-07				6.88	933	390	6.0		530	118	22.9	3.0	6.3
	5-Jun-08				7.45	973	120	8.0		450	36.4	6.5	2.0	3.9
	4-Jun-09				7.38	889	305	5.4		477	91.5	18.7	2.7	4.44
	13-May-10	7.10	620	8.0	7.62	970	664	5.06		600	198	41.2	2.53	6.77
	15-Jun-11	7.33	776	11.8	7.81	922	579	5.14		565	175	34.5	2.31	5.88
	23-May-12	6.97	788	11.1	7.73	957	557	5.82		549	163	36.4	2.28	5.86
	9-May-13	2.34	1163	9.5	7.99	1060	634	16.7		502	186	41.1	2.22	7.06
	9-May-14	7.31	1079	8.2	7.92	1000	478	13.3		501	130	37.2	1.99	7.68
	27-May-15	6.98	573	14.3	7.60	997	448	9.53	29.9	522	121	35.5	2.00	8.02
	25-May-16	7.00	1062	11.9	8.10	1440	664	76.4	7.34	735	163	62.5	4.92	45.1
	1-Nov-16	7.26	1415	12.2	7.78	1450	-	78.4	4.65	758	163	60.3	4.24	43.4

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
11	6-May-91								0.19				
cont'd	26-May-92					4.1			0.41				
	6-Oct-92					5.0			0.14				
	3-May-93					3.3			0.85				
	26-Oct-93					4.2			0.08				
	25-Apr-94					3.6			1.03				
	25-Oct-94					3.7			0.29				
	16-May-95					3.8			0.64				
	15-Jun-97								0.15	0.110			
	15-Jun-98								1.17	0.170			
	15-Jun-99								0.08	0.180			
	15-Jun-00								1.29	0.410			
	15-Jun-01								<0.02	0.180			
	15-Jun-02								0.26	0.180			
	15-Jun-03								0.19	0.210			
	15-Jun-04								0.03	0.060			
	15-Jun-05								<0.05	0.058			
	15-Jun-06								0.06	0.161			
	29-May-07								0.27	0.203			
	5-Jun-08								1.74	0.048			
	4-Jun-09								0.273	0.094			
	13-May-10								0.216	0.178			
	15-Jun-11								0.291	0.148			
	23-May-12								0.550	0.227			
	9-May-13								0.636	0.313			
	9-May-14								1.30	0.432			
	27-May-15								0.169	0.078			
	25-May-16								7.68	0.086			
	1-Nov-16	0.72	2.56	<0.25	<0.25	12.9	0.203	<0.003	6.36	0.068	2.2	<0.20	<0.10

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
11R	4-May-17	7.31	1590	8.08	7.93	1650	724	85.7	4.32	776	178	67.9	5.67	53.9
	10-May-18	7.09	1350	10.23	7.74	1540	700	104	3.12	827	172	65.8	6.33	58.1
	17-May-19	7.24	1380	10.73	6.94	1430	825	102	3.4	753	202	78.1	5.62	60.5
	12-May-20	7.46	1300	9.61	7.19	1530	777	100	2.6	715	185	76.8	3.58	59.6
	12-May-21	7.21	1620	10.1	7.98	1550	761	120	4	715	194	66.8	3.09	54.7
	17-May-22	7.21	1450	10.2	7.76	1540	806	140	5	767	197	76.2	4.80	71.2
	15-May-23	7.07	1200	14.9	7.85	1630	689	96	3	762	170	64.2	2.96	54.0
	7-May-24	6.91	1490	9.9	7.51	1490	778	87	4	770	188	75.1	3.75	64.7
	7-May-25	6.77	1620	9.5	7.65	1540	694	99	4	731	167	67.4	3.77	62.0
16AR	10-May-18	7.87	557	9.43	7.84	605	276	23.3	54.5	277	59.8	30.7	2.38	23.3
	16-May-19	7.86	506	9.95	7.99	571	305	24.2	59.0	268	68.6	32.5	1.64	22.1
	11-May-20	7.90	577	8.10	7.75	635	297	23.8	56.4	273	67.7	31.0	1.30	22.2
	12-May-21	7.70	683	10.5	8.15	619	319	27	86	244	72.9	33.3	1.42	24.4
	16-May-22	7.94	661	11.2	8.13	659	365	29	95	283	84.1	37.8	1.43	26.3
	15-May-23	7.42	494	14.9	7.99	692	287	26	68	273	66.9	29.0	1.19	21.2
	6-May-24	7.74	560	13.4	8.10	606	324	25	73	275	72.2	34.9	1.32	21.5
	7-May-25	7.47	740	12.9	8.22	650	310	25	50	268	70.9	32.2	1.39	23.5
19R	1-Nov-16	8.33	494	11.5	8.01	466		4.19	26.6	223	39.9	18.4	1.65	27.3
	4-May-17	8.34	459	8.46	8.27	504	190	2.64	27.8	230	40.9	21.3	1.57	20.5
	10-May-18	8.28	447	9.65	7.43	432	191	1.96	27.7	232	41.1	21.4	1.42	17.2
	16-May-19	8.04	359	9.17	7.87	385	210	1.76	26.0	214	47.2	22.3	1.31	15.5
	11-May-20	8.15	389	7.74	7.98	424	207	1.55	25.5	213	48.7	20.6	1.29	13.8
	11-May-21	8.05	442	9.8	8.27	432	245	2	30	205	61.0	22.6	1.44	14.4
	16-May-22	8.35	430	12.0	8.15	428	267	2	35	214	64.4	25.8	1.37	16.3
	15-May-23	7.95	363	11.9	8.15	446	211	<1	27	201	51.5	20.0	1.12	11.3
	6-May-24	7.94	393	9.4	8.10	433	233	<1	28	204	54.9	23.3	1.27	13.3
	7-May-25	7.69	480	11.5	8.34	435	222	1	28	205	52.3	22.1	1.28	12.8

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
11R	4-May-17	5.00	6.29	<0.25	<0.25	10.5	0.264	<0.003	8.70	0.072	2.6	0.22	<0.10
	10-May-18	5.74	6.95	<0.25	<0.25	19.7	0.272	0.008	7.81	0.063			
	17-May-19	3.96	5.08	<0.10	<0.050	20.5	0.258	0.00284	8.96	0.130			
	12-May-20	1.13	2.38	<0.10	<0.050	17.3	0.215	<0.00050	1.56	0.062			
	12-May-21	3.3	4.6	0.12	<0.03	16.9	0.204	0.00042	2.67	0.059			
	17-May-22	2.6	4.0	<0.06	<0.03	19.0	0.243	0.00051	3.99	0.060			
	15-May-23	1.4	2.1	<0.06	<0.03	17.1	0.199	0.00046	1.26	0.058			
	7-May-24	1.5	2.3	<0.06	<0.03	18.5	0.232	<0.003	1.89	0.055			
	7-May-25	1.6	2.9	<0.06	<0.03	16.8	0.225	<0.003	1.17	0.051			
16AR	10-May-18	<0.02	<0.10	<0.05	<0.05	1.3	0.045	<0.003	<0.010	0.026			
	16-May-19	0.045	0.36	0.073	<0.010	1.81	0.037	<0.00050	0.178	0.0311			
	11-May-20	0.046	1.13	0.087	<0.010	2.62	0.032	<0.00050	0.013	0.0176			
	12-May-21	<0.1	<0.5	0.09	<0.03	1.1	0.040	0.00013	0.03	0.0240			
	16-May-22	<0.1	<0.5	0.14	<0.03	1.3	0.038	0.00009	0.047	0.0217			
	15-May-23	<0.1	<0.5	0.08	<0.03	1.0	0.029	0.00013	0.008	0.0176			
	6-May-24	<0.1	<0.5	0.10	<0.03	1.9	0.033	<0.003	0.03	0.019			
	7-May-25	<0.1	<0.5	0.12	<0.03	<1.0	0.034	<0.003	0.24	0.022			
19R	1-Nov-16	0.12	0.34	0.06	<0.05	1.9	0.061	<0.003	0.313	0.084	<0.17	<0.20	<0.10
	4-May-17	0.16	0.88	<0.05	<0.05	2.8	0.053	<0.003	<0.010	0.009	<0.17	<0.20	<0.10
	10-May-18	<0.02	0.19	0.13	<0.05	0.9	0.044	<0.003	<0.010	0.003			
	16-May-19	<0.010	1.8	0.105	<0.010	1.72	0.041	<0.00050	0.020	0.00272			
	11-May-20	0.034	0.19	0.223	<0.010	1.83	0.039	<0.00050	0.067	0.00081			
	11-May-21	<0.1	<0.5	0.23	<0.03	3.6	0.050	0.00017	<0.007	0.00020			
	16-May-22	<0.1	<0.5	0.24	<0.03	1.1	0.052	0.00019	<0.007	0.00010			
	15-May-23	<0.1	<0.5	0.22	<0.03	1.4	0.032	0.00027	0.019	0.00201			
	6-May-24	<0.1	<0.5	0.20	<0.03	3.8	0.040	<0.003	<0.01	<0.002			
	7-May-25	<0.1	<0.5	0.20	<0.03	1.0	0.040	<0.003	<0.01	<0.002			

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
26	15-Jun-97				8.04	606	343	15.8		276	93.3	26.8	1.1	8.6
	15-Jun-98				7.97	595	339	17.0		268	93.7	25.6	1.45	8.11
	15-Jun-99				7.97	729	400	46.0		223	107	32.3	1.43	27.6
	15-Jun-00				8.10	760	388	45.0		360	101	32.9	1.56	29.7
	15-Jun-01				7.64	821	442	51.0		357	117	36.5	1.36	30.8
	15-Jun-02				7.54	916	451	71.0		384	115	39.8	1.39	33.2
	15-Jun-03				7.59		501	85.0		419	129	43.5	1.35	36.6
	15-Jun-04				7.54	1110	503	30.0		261	129	44.0	1.64	63.9
	15-Jun-05				8.13	1360	568	192		468	160	49.3	2.1	80.0
	15-Jun-06				7.21	1540	610	237		470	155	54.3	2.0	93.5
	29-May-07				7.24	1600	580	235		510	143	54.0	2.0	120
	5-Jun-08				7.69	1730	570	260		550	145	51.5	2.0	126
	4-Jun-09				7.60	1810	599	242		555	148	55.9	2.7	149
26R	13-May-10	7.11	1650	10.2	7.81	1680	346	300		594	85.8	31.9	1.33	80.5
	15-Jun-11	7.35	1458	9.5	7.81	1650	639	300		581	158	59.3	3.05	171
	23-May-12	7.95	1465	10.0	7.81	1790	648	294		600	161	59.7	2.70	174
	1-Nov-16	7.40	1820	14.6	7.95	2030		319	17.3	705	133	65.3	3.20	208
	4-May-17	7.27	2050	8.79	8.08	2210	578	302	18.0	739	134	59.1	2.78	208
	11-May-18	6.99	1710	10.25	7.99	1840	580	286	17.1	702	136	58.4	2.75	202
	16-May-19	7.31	1470	11.43	7.41	1750	607	278	16.7	652	142	61.0	2.61	192
	11-May-20	7.15	1710	8.83	7.29	1770	601	265	14.8	658	151	54.1	2.51	182
	11-May-21	7.32	1823	9.2	8.08	1790	657	260	21	601	172	55.4	2.95	183
	17-May-22	7.35	1552	9.0	7.88	1590	609	240	24	586	150	56.9	2.52	186
	15-May-23	6.94	1030	11.9	7.91	1320	412	150	26	451	103	37.3	1.87	101
	7-May-24	7.39	905	9.1	7.94	996	389	70	30	387	96.8	35.7	1.88	76.5
	7-May-25	7.30	1030	11.5	7.95	963	364	87	29	374	91.2	33.1	1.87	70.0

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
26	15-Jun-97								0.38	0.060			
	15-Jun-98								0.19	0.060			
	15-Jun-99								0.48	0.030			
	15-Jun-00								0.61	0.030			
	15-Jun-01								0.58	0.040			
	15-Jun-02								0.67	0.040			
	15-Jun-03								0.77	0.050			
	15-Jun-04								0.92	0.060			
	15-Jun-05								1.40	0.078			
	15-Jun-06								1.15	0.078			
	29-May-07								0.25	0.118			
	5-Jun-08								0.64	0.096			
	4-Jun-09								1.59	0.090			
26R	13-May-10								1.92	0.089			
	15-Jun-11								1.85	0.089			
	23-May-12								1.79	0.083			
	1-Nov-16	0.06	0.88	<0.25	<0.25	11.1	1.80	<0.003	2.16	0.050	<0.17	<0.20	<0.10
	4-May-17	0.11	1.05	<0.5	<0.5	13.0	1.85	<0.003	2.14	0.041	<0.17	<0.20	<0.10
	11-May-18	0.07	0.85	<0.5	<0.5	12.1	1.80	0.012	2.03	0.042	<0.68	<0.80	<0.40
	16-May-19	0.042	0.89	<0.10	<0.050	10.9	1.71	<0.0050	2.03	0.0409	<0.50	<0.50	<0.50
	11-May-20	0.048	0.86	<0.10	<0.050	10.6	1.73	<0.0050	2.06	0.0406	<0.50	<0.50	<0.50
	11-May-21	<0.1	0.6	<0.06	<0.03	9.8	1.41	0.00053	2.19	0.045	<0.2	<0.5	<0.5
	17-May-22	<0.1	<0.5	<0.06	<0.03	8.2	1.27	0.00057	1.96	0.039	<0.2	<0.5	<0.5
	15-May-23	<0.1	<0.5	<0.06	<0.03	5.4	0.77	0.00035	1.46	0.033	<0.2	<0.5	<0.5
	7-May-24	<0.1	<0.5	<0.06	<0.03	9.0	0.638	<0.003	1.23	0.027	<0.2	<0.5	<0.5
	7-May-25	<0.1	<0.5	<0.06	<0.03	3.4	0.579	<0.003	1.22	0.027	<0.2	<0.5	<0.5

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
28	5-Apr-83				7.8	390	216	5.0		211	50.0	25.0		
	13-Jun-83				7.5	390	252	2.0		234	54.0	27.0		
	13-Sep-83				7.6	400	220	2.0						
	8-Dec-83				7.5	420	270	5.0						
	1-May-84				7.5	510	258	2.0						
	5-Nov-84				7.3	510	258	2.0		224	54.0	30.0		
	29-Apr-85				7.79	560	242	3.5		243	47.5	30.0		
	21-Oct-85				8.05	510	224	3.0		233	43.5	28.0		
	30-Apr-86				7.77	424	257	3.5		258	49.0	32.6		
	14-Oct-86				7.68	455	211	2.5		212	40.5	26.6		
	20-Apr-87				7.61	520	238	2.5		237	45.0	30.4		
	6-Oct-87				7.84	458	246	1.6		230	48.4	30.4		
	10-May-88				7.70	520	270	2.9		156	53.0	33.4		
	12-Oct-88				7.70	380	184	3.0		150	39.0	21.0		
	30-Oct-89				7.73	501	237	3.8		235	45.6	29.9		
	7-May-90				7.84	546	266	6.4		244	51.1	33.6		
	29-Oct-90				7.73	495	227	4.1		235	45.6	27.5		
	6-May-91				7.76	469	221	3.6		225	45.2	26.2		
	4-Nov-91				7.94	435	207	2.7		195	41.1	25.2		
	26-May-92				7.66	457	227	2.3		215	45.0	27.8		
	6-Oct-92				7.83	551	295	5.9		255	58.9	35.9		
	3-May-93				7.69	553	280	3.5		789	55.0	35.4		
	26-Oct-93				7.79	535	260	2.7		292	51.3	31.9		
	25-Apr-94				7.81	542	282	3.5		275	57.4	33.5		
	25-Oct-94				7.88	523	262	4.0		264	54.9	30.4		
	16-May-95				7.94	529	274	3.1		255	56.7	32.2		
	15-Jun-97					382	210	1.8		185	47.2		1.4	6.6
	15-Jun-98					420	219	3.0		214	48.8		2.10	6.80

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
28	5-Apr-83					13.4			0.35				
	13-Jun-83					6.5			0.57				
	13-Sep-83					3.2							
	8-Dec-83					1.8							
	1-May-84					1.5							
	5-Nov-84					0.6			<0.04				
	29-Apr-85					2.6			1.66				
	21-Oct-85					1.5			0.01				
	30-Apr-86					3.9			0.03				
	14-Oct-86					1.3			0.04				
	20-Apr-87					2.4			0.02				
	6-Oct-87					1.6			0.03				
	10-May-88					1.2			0.03				
	12-Oct-88					1.2			<.05				
	30-Oct-89					1.1			<0.01				
	7-May-90					0.8			<0.01				
	29-Oct-90					1.2			1.60				
	6-May-91								0.01				
	4-Nov-91					2.0			0.15				
	26-May-92					1.7			<0.01				
	6-Oct-92					3.6			0.14				
	3-May-93					1.0			0.13				
	26-Oct-93					1.3			0.21				
	25-Apr-94					2.3			0.02				
	25-Oct-94					1.4			<0.01				
	16-May-95					1.3			0.04				
	15-Jun-97								<0.02	0.050			
	15-Jun-98								0.17	0.330			

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
28	15-Jun-99					497	232	3.0		240	51.5		2.01	8.62
cont'd	15-Jun-00					539	257	3.0		265	55.7		1.21	23.7
	15-Jun-01					582	347	3.0		301	78.1		0.81	14.5
	15-Jun-02					581	327	3.0		292	68.8		1.73	9.0
	15-Jun-03					662	382	5.0		308	80.7		1.18	13.1
	15-Jun-04					580	272	6.0		311	58.8		0.66	16.7
	15-Jun-05					529	334	3.23		261	71.2		1.9	11.0
	15-Jun-06					544	350	4.0		270	82.9		2.0	8.8
	29-May-07				7.35	597	300	4.0		290	64.2	35.1	2.0	10.7
	5-Jun-08				7.93	569	310	4.0		270	70.5	31.9	2.0	9.6
	4-Jun-09				7.98	588	309	2.7		297	68.2	33.7	1.9	8.24
	13-May-10	7.74	480	9.2	8.05	568	354	2.68		320	75.3	40.4	2.01	10.9
	15-Jun-11	8.03	451	10.7	8.11	516	287	2.44		272	60.1	33.2	1.90	12.1
	23-May-12	7.41	451	11.4	8.07	521	271	3.32		275	55.9	32.0	1.75	13.4
	9-May-13	7.92	613	9.7	8.23	581	302	3.16		262	61.5	36.1	1.95	13.8
	9-May-14	7.70	623	9.4	7.89	589	296	2.98		267	61.4	34.6	2.58	12.5
	27-May-15	7.95	380	14.6	8.00	593	282	3.49	31.0	280	59.6	32.3	2.94	12.1
28R	25-May-16	7.63	408	13.5	8.17	533	219	6.10	37.8	263	44.7	26.1	2.49	25.0
	1-Nov-16	8.39	535	12.0	8.05	541		4.50	30.7	272	46.2	24.5	2.00	25.6
	4-May-17	8.15	325	9.82	8.29	567	221	2.75	31.1	270	44.8	26.4	2.33	28.4
	10-May-18	7.85	313	9.76	8.01	517	222	3.06	32.6	284	45.6	26.3	2.04	28.2
	16-May-19	7.60	221	10.45	8.04	467	234	2.48	29.9	268	48.1	27.7	1.45	25.8
	12-May-20	8.19	406	9.15	7.95	516	242	2.51	25.9	270	51.0	27.8	1.72	23.9
	12-May-21	8.03	475	9.9	8.00	480	232	3	67	239	51.4	25.1	1.47	22.3
	17-May-22	8.03	277	10.2	8.24	525	281	7	75	281	62.8	30.2	1.69	37.1
	15-May-23	7.93	324	10.9	8.35	592	213	6	66	274	47.8	22.8	1.55	36.1
	7-May-24	7.80	286	10.8	8.25	500	255	4	46	259	54.9	28.6	1.56	26.3
	7-May-25	7.69	600	11.6	8.31	541	240	6	42	302	51.8	26.8	1.88	35.8

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC 1 AO*
28	15-Jun-99								0.09	0.110			
cont'd	15-Jun-00								0.02	0.170			
	15-Jun-01								<0.02	0.100			
	15-Jun-02								0.06	0.100			
	15-Jun-03								0.11	0.070			
	15-Jun-04								0.02	0.190			
	15-Jun-05								<0.05	<0.02			
	15-Jun-06								0.06	0.627			
	29-May-07								<0.05	0.009			
	5-Jun-08								<0.05	0.572			
	4-Jun-09								<0.050	0.012			
	13-May-10								0.042	0.133			
	15-Jun-11								0.080	0.141			
	23-May-12								0.060	0.086			
	9-May-13								0.080	0.092			
	9-May-14								0.225	0.113			
	27-May-15								0.015	0.156			
28R	25-May-16								<0.010	0.023			
	1-Nov-16	0.11	0.25	<0.05	<0.05	2.9	0.074	<0.003	<0.010	0.023	<0.17	<0.20	<0.10
	4-May-17	0.10	0.33	<0.05	<0.05	1.6	0.09	<0.003	0.167	0.021	<0.17	<0.20	<0.10
	10-May-18	0.06	0.15	0.09	<0.05	1.1	0.08	<0.003	<0.010	0.018			
	16-May-19	0.16	51.9*	<0.020	<0.010	1.75	0.084	<0.00050	0.255	0.0194			
	12-May-20	0.10	0.43	<0.020	<0.010	1.96	0.073	<0.00050	0.055	0.0177			
	12-May-21	0.10	<0.5	<0.06	<0.03	2.0	0.085	0.00018	0.27	0.019			
	17-May-22	<0.1	<0.5	0.18	<0.03	2.2	0.089	0.00019	0.119	0.0194			
	15-May-23	0.1	<0.5	0.25	<0.03	1.6	0.101	0.00011	0.030	0.0151			
	7-May-24	0.2	<0.5	<0.06	<0.03	18.1	0.088	<0.003	0.37	0.018			
	7-May-25	0.1	0.7	0.19	<0.03	2.6	0.090	<0.003	0.27	0.027			

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
32	5-Apr-83				7.7	300	176			167	48.0	16.0		
	14-Jun-83				7.5	270	148			168	41.0	14.0		
	19-Aug-83				7.9	310								
	13-Sep-83				7.6	320	182							
	7-Dec-83				7.7	220	232							
	1-May-84				7.5	380	200							
	6-Nov-84				7.4	420	212			182	57.0	17.0		
	30-Apr-85				7.85	427	210	1.5		204	54.5	17.8		
	21-Oct-85				7.95	434	212	1.5			58.0	16.2		
	30-Apr-86				7.77	314	201	1.0		195	52.5	17.0		
	14-Oct-86				7.69	403	204	1.0		195	54.5	16.4		
	20-Apr-87				7.65	398	207	1.5		194	54.0	17.4		
	6-Oct-87				7.82	382	223	2.7		200	59.8	17.9		
	10-May-88				7.74	390	217	1.1		177	59.4	16.6		
	12-Oct-88				7.80	370	185	4.0		194	51.0	14.0		
	30-Oct-89				7.73	432	217	6.7		205	59.8	16.4		
	7-May-90				7.86	419	212	4.1		202	55.9	17.5		
	29-Oct-90				7.77	465	223	8.7		221	61.3	17.0		
	6-May-91				7.90	413	199	3.7		204	52.3	16.6		
	4-Nov-91				7.86	496	238	12.5		227	62.4	20.0		
	26-May-92				7.76	455	236	6.7		216	61.4	20.0		
	6-Oct-92				7.84	475	252	9.6		213	67.0	20.5		
	3-May-93				7.75	440	222	6.3		228	58.0	18.6		
	26-Oct-93				7.88	509	250	11.7		252	67.0	20.1		
	25-Apr-94				8.05	451	242	7.4		235	64.3	19.7		
	25-Oct-94				7.89	498	246	8.8		237	65.6	19.9		
	16-May-95				7.86	472	240	7.5		250	62.9	20.0		
	15-Jun-97				8.17	437	235	5.3		191	59.3	21.1	0.70	7.40

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

		Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
32	5-Apr-83					1.1			0.23				
	14-Jun-83					1.2			0.65				
	19-Aug-83												
	13-Sep-83					0.6							
	7-Dec-83					1.3							
	1-May-84					0.9							
	6-Nov-84					0.3			<0.04				
	30-Apr-85					1.3			2.56				
	21-Oct-85					3.7			0.18				
	30-Apr-86					2.5			0.01				
	14-Oct-86					1.3			0.02				
	20-Apr-87					2.3			0.03				
	6-Oct-87					2.0			0.01				
	10-May-88					1.2			0.03				
	12-Oct-88					1.4			<.05				
	30-Oct-89					1.3			0.01				
	7-May-90					0.6			0.01				
	29-Oct-90					1.3			0.02				
	6-May-91								0.09				
	4-Nov-91					2.5			0.10				
	26-May-92					2.1			<0.01				
	6-Oct-92					2.2			0.05				
	3-May-93					1.2			0.08				
	26-Oct-93					2.7			0.01				
	25-Apr-94					2.4			0.03				
	25-Oct-94					4.3			0.21				
	16-May-95					1.8			0.13				
	15-Jun-97								0.02	0.110			

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
32	15-Jun-98				8.06	439	275	8.0		208	75.1	21.2	1.13	7.17
cont'd	15-Jun-99				7.57	530	311	8.0		228	83.4	24.9	0.84	8.46
	15-Jun-00				8.07	515	267	7.0		240	70.7	22.0	0.53	19.7
	15-Jun-01				7.80	518	312	7.0		250	83.4	25.1	0.42	22.5
	15-Jun-02				7.60	472	244	6.0		233	63.9	20.7	0.86	6.15
	15-Jun-03				7.84	509	288	7.0		264	75.6	24.1	0.38	9.15
	15-Jun-04				7.89	460	225	7.0		234	56.6	19.8	0.36	15.9
	15-Jun-05				8.25	433	256	6.8		216	66.8	21.6	0.8	8.3
	15-Jun-06				7.72	455	290	8.0		250	79.4	22.8	<1	6.7
	29-May-07				7.30	458	200	6.0		230	54.3	15.9	1.0	6.8
	5-Jun-08				7.99	457	150	7.0		230	40.9	11.8	2.0	6.3
	4-Jun-09				7.99	492	157	6.8		243	43.1	11.9	1.8	4.0
	13-May-10	8.08	430	7.8	7.86	536	335	10.6		274	88.6	27.6	0.98	7.72
	15-Jun-11	8.13	427	10.5	8.08	511	291	9.32		270	76.7	24.2	1.09	7.34
	23-May-12	6.66	430	9.0	7.93	543	291	9.39		266	76.4	24.3	1.11	7.35
	9-May-13	7.80	592	8.9	8.16	562	301	8.63		244	78.5	25.6	0.94	7.64
	9-May-14	7.99	569	7.0	8.13	527	273	8.15		231	69.9	23.9	0.94	7.36
	27-May-15	7.51	343	15.3	8.04	548	252	9.37	27.4	252	63.6	22.6	0.98	8.39
32R	25-May-16	7.80	235	11.3	8.09	558	274	10.9	33.2	271	70.5	23.7	1.01	7.9
	1-Nov-16	8.23	630	12.5	8.07	582		10.6	29.8	278	78	23.3	1.27	7.98
	4-May-17	7.92	535	7.27	8.19	598	275	8.74	31.3	271	70.5	24.1	1.22	8.13
	11-May-18	7.72	477	7.42	7.92	507	270	8.42	29.1	271	69.7	23.4	1.17	7.93
	16-May-19	8.10	421	10.02	7.87	508	293	9.87	37.1	284	76.4	24.9	0.808	7.80
	12-May-20	7.94	462	7.40	7.65	542	275	8.82	25.0	235	71.7	23.4	0.783	7.97
	11-May-21	7.75	620	7.7	8.14	519	351	14	39	245	95.4	27.5	0.920	8.47
	16-May-22	7.73	573	8.8	8.08	582	335	15	33	291	87.0	28.8	0.816	9.88
	15-May-23	8.08	541	9.2	8.10	648	303	17	30	336	80.2	25.0	0.837	8.80
	6-May-24	7.60	551	9.2	8.05	609	330	16	28	292	85.6	28.2	0.908	9.53
	7-May-25	7.28	710	10.1	8.05	620	341	14	29	296	89.7	28.3	0.964	9.72

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
32	15-Jun-98								0.07	0.380			
cont'd	15-Jun-99								0.10	0.020			
	15-Jun-00								<0.02	0.060			
	15-Jun-01								<0.02	0.120			
	15-Jun-02								0.12	0.070			
	15-Jun-03								0.10	0.050			
	15-Jun-04								0.04	0.050			
	15-Jun-05								0.09	0.033			
	15-Jun-06								0.97	0.083			
	29-May-07								0.17	0.073			
	5-Jun-08								0.06	0.040			
	4-Jun-09								<0.050	0.039			
	13-May-10								0.579	0.057			
	15-Jun-11								0.366	0.058			
	23-May-12								0.400	0.053			
	9-May-13								0.429	0.050			
	9-May-14								0.353	0.049			
	27-May-15								<0.010	0.032			
32R	25-May-16								0.267	0.04			
	1-Nov-16	<0.02	0.12	<0.05	<0.05	1.6	0.043	<0.003	0.099	0.049	<0.17	<0.20	<0.10
	4-May-17	0.04	0.28	0.06	<0.05	1.6	0.029	<0.003	0.156	0.036	<0.17	<0.20	<0.10
	11-May-18	0.04	<0.10	0.11	<0.05	1.2	0.032	<0.003	0.130	0.041	<0.17	<0.20	<0.10
	16-May-19	0.06	124*	<0.020	<0.010	1.99	0.030	<0.00050	0.170	0.0391	<0.50	<0.50	<0.50
	12-May-20	0.064	0.85	0.024	<0.010	2.43	0.028	<0.00050	0.258	0.0446	<0.50	<0.50	<0.50
	11-May-21	<0.1	<0.5	0.08	<0.03	2.7	0.043	0.0001	0.747	0.0389	<0.2	<0.5	<0.5
	16-May-22	<0.1	<0.5	0.41	<0.03	1.6	0.057	0.00009	0.082	0.0871	<0.2	<0.5	<0.5
	15-May-23	<0.1	<0.5	0.07	<0.03	1.9	0.040	0.00012	0.254	0.0212	<0.2	<0.5	<0.5
	6-May-24	<0.1	<0.5	<0.06	<0.03	6.1	0.042	<0.003	0.080	0.017	<0.2	<0.5	<0.5
	7-May-25	<0.1	<0.5	0.07	<0.03	1.8	0.047	<0.003	<0.01	0.002	<0.2	<0.5	<0.5

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
33R	16-May-19	8.35	381	11.19	8.02	437	195	3.76	29.4	244	50.1	16.9	4.24	30.7
40	9-May-14	7.18	786	9.5	8.05	728	381	16.5		348	113	24.0	1.15	10.7
	27-May-15	6.99	476	10.7	7.90	734	365	17.8	37.5	341	110	22.0	0.89	12.0
	24-May-16	7.22	556	10.2	8.07	722	384	16.7	41	349	115	23.5	0.97	11
	1-Nov-16	7.66	711	9.9	7.88	714		22.2	40.1	328	106	20.1	0.99	10.7
	4-May-17	7.45	719	9.07	8.15	782	364	18.8	38.4	346	109	22.3	1.13	11.1
	10-May-18	7.25	642	9.86	7.86	692	359	18.2	34.5	369	108	21.6	0.96	11.2
	16-May-19	7.45	589	10.11	7.24	658	385	20.3	37.8	345	116	23.4	0.951	11.3
	11-May-20	7.94	462	7.40	7.29	707	368	19.7	40.7	333	113	21.2	0.919	10.5
	11-May-21	7.50	758	8.7	8.15	722	450	20	45	337	142	23.2	1.02	10.4
	16-May-22	7.35	718	9.8	7.95	699	431	29	51	338	131	25.3	0.995	13.4
	15-May-23	7.54	637	9.9	7.86	767	359	23	43	351	111	19.7	0.838	9.69
	6-May-24	7.18	702	9.0	8.02	683	392	22	47	344	119	23.4	1.02	12.0
	7-May-25	6.87	810	10.6	7.99	717	391	20	42	353	119	22.6	0.991	9.72
41	9-May-14	6.41	2980	11.9	7.66	2590	501	166		1110	121	48.3	84.7	103
	27-May-15	6.81	1954	15.3	7.41	2840	614	167	2	1240	145	61.1	110	123
	25-May-16	6.75	2930	13.3	7.79	2600	587	156	1.8	1190	150	51.7	84.9	97.6
	1-Nov-16	6.80	3430	15.7	7.58	3670		267	3.8	1590	134	61.3	132	151
	4-May-17	6.76	2820	14.50	7.57	2210	569	83.3	2.61	1060	158	42.3	55.8	62.5
	10-May-18	6.60	2100	13.93	7.49	1870	546	66.9	3.5	1010	155	38.6	50.2	55.1
	16-May-19	6.38	1760	10.19	6.46	1840	633	75.2	<3.0	820	178	45.6	54.2	54.1
	12-May-20	6.52	1950	9.23	6.48	2160	626	74.0	<1.5	301	178	44.2	58.7	58.6
	12-May-21	6.77	2050	10.2	7.63	2160	685	80	22	1030	199	45.9	66.5	63.3
	17-May-22	6.92	2100	10.3	7.30	2010	663	72	7	1040	190	45.7	61.4	59.4
	15-May-23	6.87	2090	10.8	7.09	1970	568	60	6	948	168	36.2	40.8	41.9
	6-May-24	6.69	1760	16.4	7.11	1800	640	56	6	973	187	42.2	53.8	50.2
	7-May-25	6.98	1992	14.7	7.08	1970	593	73	3	981	172	39.8	50.2	48.9

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC 1 AO*
33R	16-May-19	0.085	2.44	0.496	<0.010	3.53	0.062	<0.00050	0.368	0.0279			
40	9-May-14								3.80	0.268			
	27-May-15								2.99	0.249			
	24-May-16								3.15	0.211			
	1-Nov-16	0.19	0.57	<0.25	<0.25	6.6	0.022	<0.003	2.96	0.212	<0.17	<0.20	<0.10
	4-May-17	0.16	0.65	<0.05	<0.05	7.3	0.024	0.005	9.96	0.931	<0.17	<0.20	<0.10
	10-May-18	0.20	0.60	<0.25	<0.25	6.8	0.020	0.004	2.79	0.219	<0.68	<0.80	<0.40
	16-May-19	0.224	1.48	<0.020	<0.010	7.06	0.019	<0.00050	2.80	0.225	<0.50	<0.50	<0.50
	11-May-20	0.187	0.79	0.021	<0.010	8.06	0.019	<0.00050	2.85	0.218	<0.50	<0.50	<0.50
	11-May-21	0.3	<0.5	<0.06	<0.03	6.8	0.036	0.00029	3.19	0.242	<0.2	<0.5	<0.5
	16-May-22	0.2	<0.5	0.08	<0.03	5.8	0.024	0.00045	2.94	0.238	<0.2	<0.5	<0.5
	15-May-23	0.2	<0.5	<0.06	<0.03	6.3	0.019	0.00033	2.66	0.22	<0.2	<0.5	<0.5
	6-May-24	0.3	<0.5	<0.06	<0.03	7.5	0.018	<0.003	3.20	0.235	<0.2	<0.5	<0.5
	7-May-25	0.2	0.6	<0.06	<0.03	5.7	0.019	<0.003	4.04	0.292	<0.2	<0.5	<0.5
41	9-May-14								54.7	0.361			
	27-May-15								49.2	0.278			
	25-May-16								63.7	0.328			
	1-Nov-16	195	212	<0.5	<0.5	75.7	4.85	0.006	43.6	0.179	0.90	25	71
	4-May-17	87.0	86.5	<0.25	<0.25	35.0	1.70	0.004	60.5	0.436	1.2	19	21
	10-May-18	75.0	84.3	<0.5	<0.5	30.4	1.71	0.011	55.7	0.484	<6.80	<8.00	<4.00
	16-May-19	72.8	89.5	<0.20	<0.10	27.4	1.94	<0.0050	59.4	0.486	<0.50	17.5	14.5
	12-May-20	99.2	92.8	<0.10	<0.050	31.9	1.63	<0.0050	59.3	0.448	<0.50	15.4	12.1
	12-May-21	99.1	95.8	<0.06	<0.03	146	1.90	0.00306	60.6	0.391	0.5	18.8	17.9
	17-May-22	89.9	98.9	<0.06	<0.03	28.4	1.75	0.00247	59.4	0.392	0.4	15.5	15.9
	15-May-23	76.1	70.6	<0.06	<0.3	41.0	1.28	0.0029	55.9	0.483	2.0	12.2	13.3
	6-May-24	84.8	84.2	<0.06	<0.3	28.0	1.48	<0.003	59.7	0.416	0.5	11.5	11.3
	7-May-25	85.9	83.5	<0.06	<0.03	26.4	1.69	<0.003	61.1	0.406	0.2	13.9	13.9

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
43	25-May-16	8.03	225	11.7	8.11	348	125	2.57	16.2	175	23.4	16.2	1.67	23.1
	4-May-17	8.41	338	9.40	7.53	365	127	1.35	10.6	174	23.6	16.5	1.73	22.0
	11-May-18	8.38	285	9.90	7.71	331	122	2.53	12.4	184	22.5	16.1	1.78	23.9
	17-May-19	8.03	287	10.75	8.25	321	130	5.61	17.4	183	26.0	15.8	1.12	29.4
	12-May-20	8.59	356	10.36	8.13	421	117	14.6	25.2	202	23.9	13.9	1.29	49.0
	12-May-21	7.93	210	11.5	8.24	394	110	16	59	172	23.5	12.5	1.2	49.4
	17-May-22	8.20	177	13.0	8.18	418	144	24	34	187	31.9	15.5	1.27	63.5
	15-May-23	8.15	192	12.8	8.19	456	108	8	35	334	24.2	11.5	1.26	49.1
	7-May-24	8.38	321	10.9	8.38	337	134	10	20	195	29.1	15.0	1.35	41.6
	7-May-25	8.27	400	10.0	8.36	421	127	21	30	234	28.6	13.5	1.58	52.8
44	24-May-16	7.40	617	11.3	8.11	800	362	13.9	46.0	269	87.4	34.8	1.35	6.58
	5-May-17	7.81	788	9.00	8.22	840	385	12.3	45.8	262	96.0	35.3	1.37	6.21
	11-May-18	7.66	713	9.12	7.93	738	384	12.5	41.6	286	96.9	34.4	1.32	6.23
	17-May-19	7.78	626	10.63	7.62	708	395	13.8	42.0	274	98.7	35.9	1.26	6.35
	12-May-20	7.83	661	9.24	7.58	762	384	13.6	37.7	302	98.4	33.6	1.27	6.29
	12-May-21	7.89	750	10.3	7.98	667	342	16	61	229	86.8	30.5	1.39	7.22
	17-May-22	7.77	736	11.1	7.99	735	434	20	50	280	112	37.4	1.28	7.60
	15-May-23	7.35	617	11.6	7.98	701	357	17	43	289	94.1	29.7	1.15	5.98
	7-May-24	7.73	627	12.4	7.95	681	387	16	46	271	98.8	34.2	1.25	6.83
	7-May-25	7.33	780	9.5	7.97	723	372	15	42	275	96.5	31.8	1.3	6.85
45	28-Aug-19	8.20	310	13.89	8.24	385	146	3.23	36.1	171	34.0	14.8	2.27	32.5
	12-May-20	8.50	290	9.13	7.90	334	143	1.14	19.4	157	33.3	14.6	1.62	28.2
	11-May-21	8.15	350	8.8	8.24	328	184	<1	25	153	50.1	14.3	1.05	24.6
	16-May-22	8.10	338	10.9	8.23	324	222	3	32	162	41.6	17.1	0.963	28.0
	15-May-23	7.59	272	15.4	8.32	334	149	<1	21	162	39.8	12.2	0.784	19.9
	7-May-24	8.19	312	9.3	8.31	311	175	<1	25	180	45.8	14.6	0.937	24.7
	7-May-25	7.93	370	13.5	8.34	345	158	2	27	167	40.2	14.1	1.01	24.0

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
43	25-May-16								0.039	0.010			
	4-May-17	0.06	0.36	<0.05	<0.05	2.2	0.153	<0.003	<0.010	0.009	<0.17	<0.20	<0.10
	11-May-18	0.14	0.20	<0.05	<0.05	2.0	0.14	<0.003	0.027	0.010	<0.68	<0.80	<0.40
	17-May-19	0.085	2.37 *	0.088	0.030	2.42	0.133	<0.00050	0.034	0.00864	<0.50	<0.50	<0.50
	12-May-20	0.063	0.20	0.151	0.022	2.51	0.166	<0.00050	0.145	0.01230	<0.50	<0.50	<0.50
	12-May-21	0.1	0.6	0.20	0.08	1.6	0.162	0.00012	0.01	<0.002	<0.2	<0.5	<0.5
	17-May-22	<0.1	<0.5	0.11	<0.03	1.7	0.145	0.00015	<0.007	0.00340	<0.2	<0.5	<0.5
	15-May-23	0.3	<0.5	<0.06	0.09	2.9	0.128	0.00009	0.018	0.0122	<0.2	<0.5	<0.5
	7-May-24	0.2	<0.5	<0.06	<0.03	1.9	0.141	<0.003	0.06	0.011	<0.2	<0.5	<0.5
	7-May-25	0.5	0.9	0.30	0.07	1.7	0.148	<0.003	0.32	0.026	<0.2	<0.5	<0.5
44	24-May-16								<0.010	0.003			
	5-May-17	0.07	<0.10	27.4	<0.25	1.9	0.04	<0.003	<0.010	<0.002	<0.17	<0.20	<0.10
	11-May-18	<0.02	<0.10	27.4	<0.25	0.8	0.03	0.003	<0.010	<0.002	<0.17	<0.20	<0.10
	17-May-19	<0.010	0.46	24.1	<0.010	3.12	0.023	0.00078	0.010	0.00086	<0.50	<0.50	<0.50
	12-May-20	0.016	<0.15	20.7	<0.010	2.17	0.022	0.00092	0.034	0.00124	<0.50	<0.50	<0.50
	12-May-21	<0.1	<0.5	15.4	<0.03	1.2	0.032	0.00040	0.01	<0.002	<0.2	<0.5	<0.5
	17-May-22	<0.1	<0.5	19.1	<0.03	1.0	0.022	0.00078	0.007	0.00081	<0.2	<0.5	<0.5
	15-May-23	<0.1	<0.5	19.3	<0.03	1.3	0.020	0.00062	<0.007	0.00052	<0.2	<0.5	<0.5
	7-May-24	<0.1	<0.5	17.0	<0.03	1.2	0.023	<0.003	<0.01	<0.002	<0.2	<0.5	<0.5
	7-May-25	<0.1	<0.5	16.3	<0.03	1.1	0.022	<0.003	0.02	<0.002	<0.2	<0.5	<0.5
45	28-Aug-19	0.137	18.4	<0.020	<0.010	2.48	0.127	<0.00050	0.020	0.0378	<0.50	<0.50	<0.50
	12-May-20	0.131	0.22	<0.020	0.048	4.30	0.133	<0.00050	0.050	0.0293	<0.50	<0.50	<0.50
	11-May-21	<0.1	<0.5	0.11	<0.03	1.8	0.118	0.00015	0.049	0.0193	<0.2	<0.5	<0.5
	16-May-22	0.1	<0.5	0.17	<0.03	1.2	0.133	0.00039	0.336	0.0375	<0.2	<0.5	<0.5
	15-May-23	0.2	<0.5	0.07	0.04	2.4	0.100	0.00012	0.028	0.0175	<0.2	<0.5	<0.5
	7-May-24	0.2	<0.5	<0.06	<0.03	1.6	0.127	<0.003	0.03	0.017	<0.2	<0.5	<0.5
	7-May-25	0.1	<0.5	<0.06	<0.03	1.5	0.126	<0.003	0.02	0.014	<0.2	<0.5	<0.5

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
46	28-Aug-19	8.01	208	12.95	7.99	471	245	4.55	24.9	236	62.2	21.9	2.01	15.9
	12-May-20	8.25	330	9.43	7.88	430	247	2.97	14.8	222	63.4	21.4	1.10	4.35
	11-May-21	8.18	385	10.4	8.20	391	262	2	33	198	71.4	20.3	1.02	2.36
	16-May-22	8.04	451	13.0	8.24	431	276	1	37	230	106	22.3	1.04	2.18
	15-May-23	8.09	376	13.1	8.22	430	233	<1	25	245	63.0	18.4	1.02	1.92
	6-May-24	7.90	210	15.8	8.21	413	253	<1	23	232	66.8	20.9	0.984	2.26
	7-May-25	7.48	550	11.7	8.14	439	247	2	25	266	65.8	20.2	1.01	2.5

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
46	28-Aug-19	0.072	9.3	<0.020	<0.010	5.62	0.016	<0.00050	0.509	0.0199	<0.50	<0.50	<0.50
	12-May-20	0.052	0.56	<0.020	<0.010	2.59	0.013	<0.00050	0.667	0.0181	<0.50	<0.50	<0.50
	11-May-21	<0.1	<0.5	<0.06	<0.03	3.1	0.015	0.00014	0.562	0.0177	<0.4	<1	<1
	16-May-22	<0.1	0.6	0.14	<0.03	2.1	0.020	0.0002	0.386	0.0156	<0.2	<0.5	<0.5
	15-May-23	<0.1	<0.5	<0.06	<0.03	6.9	0.010	0.00015	0.154	0.0146	<0.2	<0.5	<0.5
	6-May-24	<0.1	<0.5	<0.06	<0.03	1.7	0.015	<0.003	0.480	0.016	<0.2	<0.5	<0.5
	7-May-25	<0.1	<0.5	<0.06	<0.03	2.1	0.014	<0.003	0.550	0.018	<0.2	<0.5	<0.5

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
21	27-Oct-81				7.7	510		10.0						
	29-Oct-81				8.0	510		8.0						
	28-Jan-82				7.9	490	304	5.0		240				
	29-Apr-82				7.1	445	340	8.0						
	2-Sep-82				7.7	550	283	9.5			76.0	22.6		
	30-Mar-83				7.5	450	276	8.0						
	14-Jun-83				7.4	490	280	7.0						
	14-Sep-83				7.3	480	278	9.0						
	8-Dec-83				7.4	480	440	11.0						
	30-Apr-84				7.3	570	298	9.0						
	5-Nov-84				7.1	550	296	8.0		231	79.0	24.0		
	29-Apr-85				7.87	575	267	10.0		246	70.0	22.4		
	21-Oct-85				7.94	555	271	10.0		261	71.0	22.8		
	30-Apr-86				7.72	460	284	14.0		261	77.0	22.2		
	14-Oct-86				7.66	580	286	13.5		255	76.5	23.0		
	20-Apr-87				7.76	540	260	12.5			67.0	22.4		
	6-Oct-87				7.72	495	259	9.4		223	69.3	20.8		
	10-May-88				7.70	510	265	10.5		190	71.2	21.2		
	12-Oct-88				7.60	510	263	14.0		242	69.0	22.0		
	30-Oct-89				7.71	555	276	14.7		260	73.2	22.5		
	7-May-90				7.93	534	279	13.8		251	73.9	22.9		
	29-Oct-90				7.60	532	254	13.3		243	69.0	19.8		
	6-May-91				7.74	517	251	11.8		241	68.6	19.0		
	26-May-92				7.56	428	210	9.2		196	57.3	16.3		
	6-Oct-92				7.51	409	214	9.4		181	59.6	15.7		
	3-May-93				7.57	459	220	10.7		221	60.3	16.9		
	26-Oct-93				7.41	453	227	12.7		230	63.3	16.7		

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
21	27-Oct-81												
	29-Oct-81												
	28-Jan-82					2.1			<0.02				
	29-Apr-82					9.3							
	2-Sep-82					3.2							
	30-Mar-83					1.3							
	14-Jun-83					1.3							
	14-Sep-83					1.1							
	8-Dec-83					1.8							
	30-Apr-84					0.9							
	5-Nov-84					1.2			0.04				
	29-Apr-85					1.6			1.06				
	21-Oct-85					3.6			<0.01				
	30-Apr-86					2.4			0.07				
	14-Oct-86					2.3			<0.01				
	20-Apr-87					2.6			0.12				
	6-Oct-87					2.4			0.01				
	10-May-88					1.6			0.02				
	12-Oct-88					2.7			<.05				
	30-Oct-89					1.5			0.02				
	7-May-90					1.1			0.02				
	29-Oct-90					6.0			0.45				
	6-May-91								0.02				
	26-May-92					2.0			<0.01				
	6-Oct-92					2.5			0.02				
	3-May-93					1.6			0.02				
	26-Oct-93					2.5			0.04				

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Field Parameters			General Parameters			Major and Minor Ions						
Well	Date	pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
21	25-Apr-94				7.84	499	257	11.4		246	70.0	19.9		
cont'd	25-Oct-94				7.61	491	240	11.4		231	65.3	18.6		
	16-May-95				7.64	502	257	11.1		257	69.9	19.9		
	15-Jun-97				8.10	555	316	13.5		253	85.2	25.0	1.20	
	15-Jun-98				7.58	441	250	10.0		200	69.7	18.5	2.31	
	15-Jun-99				7.84	498	294	12.0		200	84.0	20.5	1.81	
	15-Jun-00				8.20	517	275	12.0		248	75.1	21.3	0.56	
	15-Jun-01				7.70	514	300	13.0		231	82.1	23.1	0.45	
	15-Jun-02				7.64	559	294	15.0		257	78.2	24.0	1.41	
	15-Jun-03				7.78	536	298	16.0		265	80.3	23.7	1.57	
	15-Jun-04				7.84	565	271	17.0		262	71.6	22.3	0.40	
	15-Jun-05				8.19	542	308	17.4		253	83.7	24.1	1.9	
	15-Jun-06				7.53	526	320	20.0		260	92.6	22.2	2.0	
	29-May-07				7.24	544	260	17.0		260	68.6	21.9	2.0	8.1
	5-Jun-08				7.90	594	290	29.0		270	77.8	23.6	2.0	10.2
	4-Jun-09				7.95	566	282	18.3		248	76.6	22.1	1.9	8.12
	14-May-10	7.72	580	10.9	7.96	579	347	28.6		270	95.5	26.4	1.59	10.0
	15-Jun-11	7.89	468	11.1	8.06	562	312	27.0		261	86.7	23.1	1.48	10.0
	23-May-12	7.31	485	11.0	7.85	592	304	25.9		265	84.2	22.8	1.55	10.2
	9-May-13	7.71	650	9.5	8.14	601	324	25.4		237	88.2	25.1	1.59	10.7
	9-May-14	7.71	650	9.5	8.11	606	303	24.7		252	81.5	24.1	1.66	10.7
21R	25-May-16	7.52	408	11.9	8.26	536	210	20.1	33.2	237	50.2	20.6	1.92	27.5
	1-Nov-16	8.07	637	10.2	8.14	547		22.8	24.9	240	60.0	20.5	1.60	19.1
	4-May-17	7.94	555	9.96	8.22	602	238	23.4	27.4	253	59.4	21.7	1.61	23.0
	10-May-18	7.61	504	11.10	7.83	541	236	22.1	24.1	269	59.4	21.2	1.70	25.1
	16-May-19	7.73	477	10.28	7.70	517	268	25.3	20.9	261	67.4	24.2	1.51	21.9
	11-May-20	7.85	513	9.00	7.78	556	260	26.3	15.0	262	66.5	22.8	1.59	17.4

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
21	25-Apr-94					2.2			0.01				
cont'd	25-Oct-94					1.9			0.33				
	16-May-95					1.6			0.03				
	15-Jun-97								<0.02	0.250			
	15-Jun-98								<0.02	<0.02			
	15-Jun-99								0.04	0.090			
	15-Jun-00								<0.02	0.030			
	15-Jun-01								<0.02	<0.02			
	15-Jun-02								<0.02	<0.02			
	15-Jun-03								<0.02	<0.02			
	15-Jun-04								<0.02	<0.02			
	15-Jun-05								0.06	<0.02			
	15-Jun-06								<0.05	0.009			
	29-May-07								<0.05	0.003			
	5-Jun-08								<0.05	0.147			
	4-Jun-09								<0.050	0.004			
	14-May-10								0.852	0.135			
	15-Jun-11								0.601	0.110			
	23-May-12								0.280	0.093			
	9-May-13								0.591	0.122			
	9-May-14								0.532	0.200			
21R	25-May-16								0.645	0.024			
	1-Nov-16	0.15	0.38	<0.05	<0.05	1.4	0.046	<0.003	0.814	0.032	<0.17	<0.20	<0.10
	4-May-17	0.20	0.34	<0.05	<0.05	1.1	0.047	<0.003	0.752	0.035	<0.17	<0.20	<0.10
	10-May-18	0.09	0.34	<0.05	<0.05	1.4	0.049	<0.003	0.741	0.036			
	16-May-19	0.093	0.45	<0.020	<0.010	1.97	0.050	0.00054	0.933	0.0382			
	11-May-20	0.105	0.18	<0.020	<0.010	2.36	0.046	<0.00050	0.905	0.0302			

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
21R	11-May-21	7.66	630	9.8	8.22	609	312	36	14	266	83.6	25.2	1.63	15.0
cont'd	17-May-22	7.88	609	10.1	8.06	593	353	40	8	279	91.2	30.5	1.57	15.4
	15-May-23	7.91	530	11.5	8.13	652	294	38	6	265	78.1	24.2	1.37	10.7
	6-May-24	7.72	563	11.8	8.01	635	331	37	5	278	85.2	28.7	1.63	13.2
	7-May-25	7.31	710	11.2	8.22	656	315	39	5	282	82.6	26.3	1.57	13.6
24	19-Feb-82				8.1	430	215	15.0		180				
	29-Apr-82				7.8	345	212	2.0						
	30-Apr-82				8.1	377	182	1.6						
	4-May-82				8.1	372	177	1.5			36.0	21.0		
	2-Sep-82				7.3	372	179	0.5			37.5	20.8		
	30-Mar-83				7.7	340	196							
	13-Jun-83				7.7	860	200							
	13-Sep-83				7.7	350	188	1.0						
	7-Dec-83				7.7	330	235							
	1-May-84				7.7	390	188	1.0						
	6-Nov-84				7.4	385	172			188	39.0	18.0		
	30-Apr-85				7.27	920	404	65.5		348	118	26.4		
	21-Oct-85				8.02	382	182			218	40.0	19.8		
	30-Apr-86				7.75	304	167	2.0		204	37.5	17.8		
	15-Oct-86				7.40	350	188			206	44.0	19.0		
	20-Apr-87				7.61	383	177	1.0		206	38.5	19.6		
	6-Oct-87				7.69	371	185	1.4		202	40.1	20.6		
	10-May-88				7.46	348	152	4.3		141	34.6	15.9		
	12-Oct-88				7.40	340	137	4.0		174	30.0	15.0		
	30-Oct-89				7.47	366	143	3.5		197	31.7	15.5		
	7-May-90				7.64	369	149	3.3		198	34.2	15.3		
	29-Oct-90				7.45	366	143	3.0		196	32.4	15.0		
	6-May-91				7.53	357	146	1.3		195	32.5	15.6		

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
21R	11-May-21	0.1	<0.5	<0.06	<0.03	1.7	0.066	0.00008	1.08	0.0449			
cont'd	17-May-22	0.1	<0.5	<0.06	<0.03	1.6	0.052	0.00016	1.28	0.0416			
	15-May-23	<0.1	<0.5	<0.06	<0.03	2.1	0.067	0.00013	1.19	0.0354			
	6-May-24	0.1	<0.5	<0.06	<0.03	2.8	0.061	<0.003	1.40	0.038			
	7-May-25	0.1	<0.5	<0.06	<0.03	1.8	0.061	<0.003	1.26	0.044			
24	19-Feb-82					230			<0.05				
	29-Apr-82					14.0							
	30-Apr-82					14.3							
	4-May-82												
	2-Sep-82					8.9							
	30-Mar-83					8.8							
	13-Jun-83					3.3							
	13-Sep-83					4.1							
	7-Dec-83					3.2							
	1-May-84					5.4							
	6-Nov-84					2.6			<0.04				
	30-Apr-85					3.8			6.10				
	21-Oct-85					3.5			0.02				
	30-Apr-86					5.3			0.03				
	15-Oct-86					3.6			0.03				
	20-Apr-87					4.2			0.05				
	6-Oct-87					4.1			0.05				
	10-May-88					4.3			0.04				
	12-Oct-88					4.1			<.05				
	30-Oct-89					3.7			0.06				
	7-May-90					3.6			0.05				
	29-Oct-90					4.4			0.17				
	6-May-91								0.31				

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Field Parameters			General Parameters			Major and Minor Ions						
Well	Date	pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
24	4-Nov-91				7.95	390	176	1.1		197	37.3	20.0		
cont'd	26-May-92				7.67	394	189	0.5		214	41.0	20.9		
	6-Oct-92				7.79	391	202	0.9		199	44.7	21.9		
	3-May-93				7.75	379	171	1.6		216	37.8	18.6		
	26-Oct-93				7.96	383	181	2.2		226	41.6	18.8		
	25-Apr-94				7.65	342	147	2.4		190	34.3	14.9		
	25-Oct-94				7.98	401	186	1.2		219	40.3	20.6		
	16-May-95				7.97	390	192	1.2		214	42.9	20.6		
	15-Jun-97				8.09	369	187	2.1		202	42.4	19.8	1.20	13.4
	15-Jun-98				8.00	333	175	2.0		178	40.4	18.0	2.13	12.7
	15-Jun-99				8.16	382	203	1.0		199	46.9	20.8	0.99	11.3
	15-Jun-00				8.24	382	184	1.0		205	40.9	19.9	0.58	16.3
	15-Jun-01				7.96	373	221	1.0		201	51.2	22.5	0.48	15.0
	15-Jun-02				7.77	382	193	1.0		209	41.6	21.7	0.84	11.9
	15-Jun-03				7.89	383	203	1.0		213	44.9	22.0	0.78	12.8
	15-Jun-04				7.97	401	178	2.0		212	38.6	19.8	0.62	13.9
	15-Jun-05				8.36	384	207	1.7		211	45.7	22.5	1.1	13.0
	15-Jun-06				7.79	288	130	3.0		170	28.3	15.2	2.0	15.4
	29-May-07				7.60	375	230	2.0		200	57.8	20.5	2.0	11.2
	5-Jun-08				8.07	391	190	<2		200	44.8	20.0	2.0	12.6
	4-Jun-09				8.08	385	199	<2.0		207	46.2	20.3	1.8	11.0
	13-May-10	7.94	290	8.9	8.05	368	216	1.29		208	48.9	22.9	1.05	11.4
	15-Jun-11	8.03	315	10.6	8.16	364	195	1.39		204	43.9	20.7	1.00	10.9
	23-May-12	7.42	323	9.7	7.97	387	192	2.15		207	43.1	20.5	0.96	10.9
	23-May-12	7.42	323	9.7	8.05	390	194	2.1		207	43.5	20.7	1.0	10.9
	9-May-13	7.90	417	9.1	8.31	424	201	1.68		205	44.7	21.6	1.07	11.1

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
24	4-Nov-91					3.6			0.01				
cont'd	26-May-92					3.2			<0.01				
	6-Oct-92					3.6			0.07				
	3-May-93					3.6			0.03				
	26-Oct-93					3.8			0.45				
	25-Apr-94					4.6			0.26				
	25-Oct-94					3.2			0.02				
	16-May-95					3.9			0.04				
	15-Jun-97								0.30	0.100			
	15-Jun-98								0.15	0.020			
	15-Jun-99								0.13	0.030			
	15-Jun-00								0.15	0.020			
	15-Jun-01								0.12	0.020			
	15-Jun-02								0.40	0.020			
	15-Jun-03								0.40	0.020			
	15-Jun-04								0.30	0.020			
	15-Jun-05								0.06	0.022			
	15-Jun-06								<0.05	0.033			
	29-May-07								0.27	0.077			
	5-Jun-08								<0.05	0.021			
	4-Jun-09								0.371	0.027			
	13-May-10								0.622	0.019			
	15-Jun-11								0.595	0.014			
	23-May-12								0.510	0.013			
	23-May-12								0.54	0.013			
	9-May-13								0.584	0.017			

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
24	9-May-14	7.73	422	9.2	8.23	396	192	1.78		197	42.1	21.0	1.03	10.9
cont'd	27-May-15	7.29	260	11.3	8.14	404	193	1.84	13.4	203	44.3	19.9	0.92	11.1
24R	25-May-16	7.77	401	12.3	7.68	500	184	10.8	41.2	220	35.3	23.2	2.59	32.4
	1-Nov-16	8.50	418	10.2	8.02	415	-	2.92	18.2	207	38.3	20.0	1.63	15.3
	4-May-17	8.10	417	8.67	8.31	460	186	2.64	14.2	209	38.8	21.7	1.87	12.4
	11-May-18	7.93	360	9.05	7.79	396	188	1.59	15.4	222	40.8	20.9	1.26	11.1
	16-May-19	7.52	335	9.68	7.97	366	205	1.58	14.1	215	46.5	21.7	1.07	11.2
	12-May-20	7.98	365	9.07	7.90	418	206	1.91	14.7	206	47.4	21.2	1.16	11.0
	11-May-21	7.77	432	8.8	8.29	410	238	2	12	208	59.5	21.8	1.18	11.5
	16-May-22	7.85	420	9.2	8.18	406	246	2	17	218	59.8	23.6	1.06	12.4
	15-May-23	8.25	356	9.9	8.25	461	199	<1	15	202	49.7	18.2	0.869	9.06
	6-May-24	7.88	382	9.0	8.21	386	225	1	16	221	53.6	22.1	1.04	11.0
	7-May-25	7.65	420	9.7	8.30	420	213	2	17	209	51	20.9	0.997	10.9
25	19-Feb-82				8.1	510	243	21.0		190				
	29-Apr-82				7.5	580	372	26.0						
	30-Apr-82				7.9	623	326	26.8						
	4-May-82				7.9	602	281	33.0			61.0	31.2		
	2-Sep-82				7.8	600	311	25.0			70.5	70.5		
	30-Mar-83				7.5	490	300	18.0						
	13-Jun-83				7.2	490	288	17.0						
	13-Sep-83				7.5	520	302	21.0						
	13-Dec-83				7.2	560	326	21.0						
	1-May-84				7.4	600	310	20.0						
	6-Nov-84				7.1	590	297	18.0		230	71.0	29.0		
	30-Apr-85				7.74	540	265	19.5		238	59.5	28.2		
	21-Oct-85				7.91	520	252	17.5		240	57.5	26.2		
	30-Apr-86				7.15	399	227	15.0		227	50.5	24.4		
	15-Oct-86				7.40	465	231	13.0		226	53.0	24.0		

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
24	9-May-14								0.574	0.015			
cont'd	27-May-15								0.551	0.016			
24R	25-May-16								0.042	0.011			
	1-Nov-16	0.19	0.48	<0.05	<0.05	2.9	0.051	<0.003	0.17	0.012	<0.17	<0.20	<0.10
	4-May-17	0.42	0.59	<0.05	<0.05	3.3	0.046	<0.003	0.33	0.014	<0.17	<0.20	<0.10
	11-May-18	0.32	0.39	<0.05	<0.05	3.1	0.053	<0.003	0.368	0.014			
	16-May-19	0.333	0.75	0.031	<0.010	3.85	0.045	<0.00050	0.459	0.0148			
	12-May-20	0.013	0.25	0.296	<0.010	4.36	0.045	<0.00050	<0.010	<0.00050			
	11-May-21	0.4	<0.5	2.48	<0.03	3.7	0.043	<0.00008	0.567	0.0168			
	16-May-22	0.4	<0.5	<0.06	0.03	3.2	0.044	0.00025	0.512	0.0158			
	15-May-23	0.4	<0.5	<0.06	<0.03	3.6	0.037	0.00014	0.515	0.0162			
	6-May-24	0.4	<0.5	<0.06	<0.03	4.0	0.044	<0.003	0.54	0.016			
	7-May-25	0.4	0.7	<0.06	<0.03	3.8	0.044	<0.003	0.59	0.014			
25	19-Feb-82					100			<0.05				
	29-Apr-82					2.7							
	30-Apr-82					1.5							
	4-May-82												
	2-Sep-82					4.0							
	30-Mar-83					0.6							
	13-Jun-83					1.3							
	13-Sep-83					1.3							
	13-Dec-83					1.1							
	1-May-84					0.6							
	6-Nov-84					0.7			0.11				
	30-Apr-85					1.7			0.58				
	21-Oct-85					3.5			0.27				
	30-Apr-86					2.2			0.20				
	15-Oct-86					1.6			0.05				

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
25	20-Apr-87				7.63	438	211	10.5		214	46.5	23.0		
cont'd	6-Oct-87				7.84	433	239	7.6		216	54.0	25.3		
	10-May-88				7.59	434	226	8.3		180	51.7	23.4		
	12-Oct-88				7.60	430	199	10.0		207	45.0	21.0		
	30-Oct-89				7.66	432	205	6.0		218	48.2	20.4		
	7-May-90				8.02	445	211	5.3		231	49.7	21.0		
	29-Oct-90				7.56	377	171	6.9		188	40.9	16.6		
	6-May-91				7.50	389	186	5.9		200	43.7	18.6		
	4-Nov-91				7.48	343	155	6.5		154	35.3	16.2		
	26-May-92				7.40	356	174	6.2		182	40.5	17.7		
	6-Oct-92				7.70	443	230	4.9		221	55.8	22.0		
	3-May-93				7.79	430	206	4.8		233	51.0	19.0		
	26-Oct-93				7.77	414	194	4.5		234	49.0	17.3		
	25-Apr-94				7.44	283	133	4.4		143	32.4	12.5		
	25-Oct-94				8.00	433	211	3.6		228	53.2	18.9		
	16-May-95				7.37	286	138	4.0		150	34.5	12.6		
	15-Jun-97				8.18	402	208	3.1		188	52.6	18.5	2.0	11.1
	15-Jun-98				8.16	370	197	4.0		200	50.6	17.1	2.33	9.76
	15-Jun-99				7.65	270	147	4.0		138	40.7	11.0	2.05	6.13
	15-Jun-00				8.13	442	222	7.0		225	59.1	18.1	1.06	25.3
	15-Jun-01				7.47	514	294	10.0		256	83.4	20.8	0.95	20.0
	15-Jun-02				7.15	537	279	14.0		264	76.1	21.5	2.09	12.6
	15-Jun-03				7.38	785	355	63.0		335	96.7	27.6	6.27	35.5
	15-Jun-04				7.26	634	253	37.0		299	69.0	19.6	2.62	296
	15-Jun-05				7.95	949	393	91.4		363	110	32.9	1.1	62.0
	15-Jun-06				6.99	687	370	53.0		300	109	23.4	5.0	29.3
	29-May-07				6.93	1518	500	213		500	120	47.9	15.0	88.0

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
25	20-Apr-87					2.4			0.01				
cont'd	6-Oct-87					1.9			0.01				
	10-May-88					1.4			0.09				
	12-Oct-88					1.5			<0.05				
	30-Oct-89					1.1			0.06				
	7-May-90					0.7			0.01				
	29-Oct-90					2.3			0.54				
	6-May-91								0.08				
	4-Nov-91					3.1			0.10				
	26-May-92					2.0			<0.01				
	6-Oct-92					1.3			0.03				
	3-May-93					1.3			0.01				
	26-Oct-93					2.3			0.43				
	25-Apr-94					2.6			0.01				
	25-Oct-94					1.1			0.01				
	16-May-95					2.5			0.02				
	15-Jun-97								0.02	0.100			
	15-Jun-98								0.14	0.090			
	15-Jun-99								0.07	0.060			
	15-Jun-00								0.28	0.130			
	15-Jun-01								0.30	0.160			
	15-Jun-02								0.15	0.100			
	15-Jun-03								0.20	0.360			
	15-Jun-04								0.02	0.190			
	15-Jun-05								<0.05	0.150			
	15-Jun-06								0.12	0.165			
	29-May-07								0.07	0.825			

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
25	5-Jun-08				7.49	1040	370	107		390	95.4	31.9	11.0	60.8
cont'd	4-Jun-09				7.40	835	341	59.3		345	92.4	26.9	7.4	42.2
	13-May-10	7.47	540	10.0	8.00	547	314	28.1		261	85.3	24.5	2.44	15.4
	15-Jun-11	7.49	500	11.9	8.02	541	278	27.3		252	75.5	21.8	2.15	14.6
	23-May-12	6.93	520	12.0	7.87	616	290	34.5		269	77.3	23.5	3.89	22.0
	9-May-13	7.21	732	9.3	8.22	702	325	38.0		286	88.4	25.4	2.68	20.1
	9-May-14	6.92	1890	11.5	8.14	789	327	72.1		276	83.0	29.1	2.47	37.8
	27-May-15	7.02	2208	14.1	7.60 *	3640 *	910 *	571 *	2.8 *	1210 *	183 *	110 *	35.5 *	353 *
25R	25-May-16	7.70	331	12.5	7.97	418	172	7.00	12.7	212	41.7	16.4	1.62	16.5
	1-Nov-16	8.40	398	12.8	7.70	392	-	5.37	8.48	195	39.9	15.9	1.65	15.5
	4-May-17	8.02	404	10.53	8.10	444	184	6.60	8.31	212	45.1	17.3	1.55	12.6
	10-May-18	7.75	359	11.98	7.89	415	188	8.86	8.46	224	46.9	17.3	1.38	12.1
	17-May-19	7.88	353	12.49	7.86	408	218	12.8	10.0	218	56.1	19.0	1.31	12.5
	12-May-20	8.17	357	10.33	7.93	405	160	8.69	4.20	219	35.9	17.1	1.64	27.2
	12-May-21	7.83	444	12.0	8.32	427	206	13	9	206	53.8	17.4	1.30	13.1
	17-May-22	7..80	437	12.8	8.04	415	232	15	7	213	60.1	20.0	1.41	19.3
	15-May-23	7.76	359	13.4	8.24	457	182	12	6	198	48.1	15.1	1.17	14.6
	7-May-24	7.88	398	12.1	8.07	433	221	13	8	209	56.9	19.2	1.27	14.0
	7-May-25	7.91	480	11.2	8.18	425	194	10	5	205	49.9	16.8	1.38	18.1
27	5-Apr-83				7.2	500	318	10.0		265	89.0	26.0		
	15-Jun-83				7.3	550	312	12.0		258	75.0	22.0		
	4-Aug-83				7.3	400		13.0						
	19-Aug-83				7.7	545		12.0						
	3-Sep-83													
	13-Sep-83				7.3	550	328	12.0						
	7-Dec-83				7.3	510	344	13.0						
	30-Apr-84				7.3	630	342	13.0						
	5-Nov-84				7.1	630	335	12.0		257	93.0	25.0		

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
25	5-Jun-08								<0.05	0.244			
cont'd	4-Jun-09								<0.050	0.184			
	13-May-10								1.90	0.074			
	15-Jun-11								1.78	0.053			
	23-May-12								1.71	0.068			
	9-May-13								1.79	0.110			
	9-May-14								1.39	0.082			
	27-May-15								15.6 *	1.58 *			
25R	25-May-16								0.384	0.026			
	1-Nov-16	0.18	0.18	<0.05	<0.05	1.9	0.069	<0.003	0.394	0.025	<0.17	<0.20	<0.10
	4-May-17	0.19	0.35	<0.05	<0.05	1.9	0.061	<0.003	0.350	0.025	<0.17	<0.20	<0.10
	10-May-18	0.12	0.12	<0.05	<0.05	1.8	0.057	<0.003	0.474	0.026			
	17-May-19	0.147	0.32	<0.020	<0.010	2.25	0.047	<0.00050	0.563	0.0258			
	12-May-20	0.060	<0.15	<0.020	<0.010	5.42	0.068	<0.00050	0.182	0.00549			
	12-May-21	0.2	<0.5	0.22	<0.03	2.3	0.057	0.00013	0.70	0.026			
	17-May-22	0.1	<0.5	<0.06	<0.03	2.2	0.061	0.00024	0.875	0.0246			
	15-May-23	<0.1	<0.5	<0.06	<0.03	2.5	0.042	0.00015	0.796	0.0278			
	7-May-24	0.2	<0.5	<0.06	<0.03	1.7	0.049	<0.003	0.78	0.028			
	7-May-25	<0.1	<0.5	<0.06	<0.03	2.1	0.053	<0.003	1.07	0.024			
27	5-Apr-83					0.3			0.64				
	15-Jun-83					0.8			0.73				
	4-Aug-83												
	19-Aug-83												
	3-Sep-83												
	13-Sep-83					0.5							
	7-Dec-83					1.0							
	30-Apr-84					0.7							
	5-Nov-84					0.4			<0.04				

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
27	29-Apr-85				7.56	650	333	14.5		272	91.5	25.2		
cont'd	21-Oct-85				7.76	620	338	14.5		266	92.0	26.2		
	30-Apr-86				7.53	484	323	15.5		272	89.0	24.4		
	15-Oct-86				7.00	620	329	12.0		278	92.0	24.0		
	20-Apr-87				7.43	635	318	15.5		275	87.0	24.4		
	6-Oct-87				7.65	615	357	15.5		283	98.3	27.0		
	10-May-88				7.52	645	358	19.1		236	99.7	26.5		
	12-Oct-88				7.60	610	326	20.0		272	91.0	24.0		
	30-Oct-89				7.62	646	335	19.7		288	92.8	25.0		
	7-May-90				7.84	631	324	19.1		285	88.7	24.7		
	29-Oct-90				7.85	643	327	19.4		286	91.1	24.1		
	6-May-91				7.66	624	330	17.9		281	91.6	24.5		
	4-Nov-91				7.75	644	298	19.5		274	77.6	25.3		
	26-May-92				7.58	642	330	17.8		268	88.7	26.3		
	6-Oct-92				7.70	645	348	19.9		273	94.1	27.3		
	3-May-93				7.54	632	311	17.9		297	83.4	24.8		
	26-Oct-93				7.71		299	20.2		309	80.0	24.1		
	25-Apr-94				7.85	644	339	18.2		304	92.9	25.8		
	25-Oct-94				7.71	644	335	18.3		271	92.4	25.2		
	16-May-95				7.57	628	318	17.2		273	85.5	25.2		
	24-Oct-12	7.35	568	9.5	8.14	620	341	37.2		285	93.7	26.1	1.27	14.4
	9-May-13	7.45	907	9.6	8.31	843	384	58.3		307	104	30.3	1.45	29.3
	9-May-14	7.63	659	9.5	8.08	778	360	49.5		301	96.7	28.7	1.40	24.0
	9-May-14	-	-	-	8.15	773	355	48.6		289	95.0	28.7	1.41	24.2
	27-May-15	7.72	410	12.5	7.97	684	308	35.2	40.8	272	83.1	24.3	1.31	12.5
	24-May-16	7.81	630	12.5	8.08	756	362	51.3	42.1	306	99.9	27.4	5.32	22.5
	1-Nov-16	8.22	736	13.1	7.87	677		38.9	38.1	278	89.1	22.7	1.23	12.1

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
27	29-Apr-85					0.8			0.76				
cont'd	21-Oct-85					1.2			0.62				
	30-Apr-86					1.9			0.62				
	15-Oct-86					1.3			0.83				
	20-Apr-87					2.0			0.68				
	6-Oct-87					1.5			0.61				
	10-May-88					1.1			0.71				
	12-Oct-88					0.5			0.57				
	30-Oct-89					0.9			0.63				
	7-May-90					0.6			0.65				
	29-Oct-90					1.1			0.79				
	6-May-91								0.72				
	4-Nov-91					1.5			0.59				
	26-May-92					1.4			0.43				
	6-Oct-92					1.2			0.53				
	3-May-93					0.8			0.65				
	26-Oct-93					2.4			0.71				
	25-Apr-94					1.8			0.80				
	25-Oct-94					1.0			0.75				
	16-May-95					1.2			0.81				
	24-Oct-12								0.87	0.057			
	9-May-13								1.09	0.063			
	9-May-14								1.01	0.063			
	9-May-14								1.03	0.064			
	27-May-15								0.78	0.063			
	24-May-16								0.925	0.054			
	1-Nov-16	<0.02	<0.10	<0.25	<0.25	1.0	0.099	<0.003	0.718	0.050	<0.17	<0.20	<0.10

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
27	4-May-17	7.51	767	9.42	7.93	905	359	62.7	35.9	331	96.1	29.0	1.51	33.6
cont'd	11-May-18	7.34	698	11.35	7.79	761	350	55.0	31.8	340	95.8	26.8	1.40	28.6
	16-May-19	7.58	565	10.87	7.55	625	352	39.4	32.3	289	96.6	27.0	1.37	14.7
	11-May-20	7.97	676	8.98	7.67	659	329	38.3	29.5	293	93.4	23.2	1.35	13.9
	12-May-21	7.55	700	11.0	8.07	686	361	41	34	284	104	24.4	1.42	15.1
	17-May-22	7.55	713	9.8	8.05	688	395	41	36	305	110	29.1	1.50	18.7
	15-May-23	7.33	599	12.8	8.08	745	320	38	31	310	91.3	22.4	1.28	14.2
	7-May-24	7.49	650	10.5	7.93	645	351	36	32	290	97.2	26.4	1.48	17.0
	7-May-25	7.36	770	10.4	8.13	723	347	38	31	300	96.6	25.8	1.61	17.2
37	5-Apr-83				7.8	480	304	10.0		247	81.0	26.0		
	15-Jun-83				7.3	545	292	12.0		260	71.0	24.0		
	4-Aug-83				7.3	410		12.0						
	15-Aug-83													
	19-Aug-83				7.6	530		13.0						
	3-Sep-83													
	14-Sep-83				7.3	540	326	13.0						
	8-Dec-83				7.3	525	335	15.0						
	30-Apr-84				7.3	610	332	13.0						
	5-Nov-84				7.2	630	329	11.0		254	89.0	26.0		
	29-Apr-85				7.70	655	303	14.0		271	78.0	26.2		
	21-Oct-85				7.80	630	324	14.0		290	85.5	26.8		
	30-Apr-86				7.89	394	252	17.0		247	63.0	23.0		
	15-Oct-86				7.10	610	319	13.0		276	85.0	26.0		
	16-Oct-86													
	20-Apr-87				7.50	640	325	17.0		273	85.5	27.0		
	10-May-88				7.65	640	346	16.7		271	92.3	28.0		
	12-Oct-88				7.80	560	298	18.0		254	78.0	25.0		
	30-Oct-89				7.74	617	316	17.6		277	84.4	25.6		

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
27	4-May-17	0.10	0.26	<0.05	<0.05	2.4	0.225	<0.003	1.01	0.058	<0.17	<0.20	<0.10
cont'd	11-May-18	0.04	0.10	<0.25	<0.25	1.9	0.266	0.005	1.01	0.065	<0.17	<0.20	<0.10
	16-May-19	0.034	0.63	<0.020	<0.010	1.74	0.087	<0.00050	0.920	0.0586	<0.50	<0.50	<0.50
	11-May-20	0.044	<0.15	<0.020	<0.010	2.99	0.083	<0.00050	0.833	0.0564	<0.50	<0.50	<0.50
	12-May-21	<0.1	<0.5	<0.06	<0.03	1.2	0.084	0.00012	0.92	0.062	<0.2	<0.5	<0.5
	17-May-22	<0.1	<0.5	<0.06	<0.03	1.4	0.084	0.0001	1.00	0.0639	<0.2	<0.5	<0.5
	15-May-23	<0.1	<0.5	<0.06	<0.03	1.3	0.069	0.00013	0.926	0.0673	<0.2	<0.5	<0.5
	7-May-24	<0.1	<0.5	<0.06	<0.03	1.6	0.096	<0.003	0.91	0.059	<0.2	<0.5	<0.5
	7-May-25	<0.1	<0.5	<0.06	<0.03	1.5	0.090	<0.003	0.96	0.061	<0.2	<0.5	<0.5
37	5-Apr-83					10.6			0.10				
	15-Jun-83					1.9			0.21				
	4-Aug-83												
	15-Aug-83												
	19-Aug-83												
	3-Sep-83												
	14-Sep-83					0.6							
	8-Dec-83					1.2							
	30-Apr-84					0.6							
	5-Nov-84					0.5			<0.04				
	29-Apr-85					1.0			0.68				
	21-Oct-85					4.9			0.11				
	30-Apr-86					3.6			0.13				
	15-Oct-86					1.3			0.24				
	16-Oct-86								0.24				
	20-Apr-87					2.6			0.26				
	10-May-88					2.4			0.15				
	12-Oct-88					1.8			0.34				
	30-Oct-89					0.8			0.37				

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
37	7-May-90				7.85	615	325	17.5		271	87.8	25.6		
cont'd	29-Oct-90				7.75	611	298	16.9		276	80.1	23.7		
	6-May-91				7.80	552	280	15.3		268	62.9	25.9		
	26-May-92				7.74	613	318	16.3		261	81.9	27.4		
	6-Oct-92				7.78	619	318	21.3		264	80.2	28.5		
	3-May-93				7.56	615	315	16.9		283	83.3	25.8		
	26-Oct-93				7.68	616	291	19.7		283	68.6	28.9		
	25-Apr-94				7.99	597	320	14.7		285	85.3	26.0		
	25-Oct-94				7.79	631	326	13.8		273	86.2	26.7		
	16-May-95				7.77	599	295	14.9		235	75.4	25.8		
	15-Jun-97				7.96	586	328	12.0		263	85.4	27.8	1.0	7.5
	15-Jun-98				8.02	542	306	12.0		260	80.9	25.3	1.24	7.09
	15-Jun-99				7.72	546	320	14.0		264	84.6	26.4	1.58	7.46
	15-Jun-00				8.14	535	281	10.0		280	74.1	23.2	0.32	8.48
	15-Jun-01				7.84	567	330	11.0		254	88.8	26.2	<0.02	13.8
	15-Jun-02				7.64	560	300	11.0		260	77.9	25.5	0.92	7.42
	15-Jun-03				7.79	533	303	11.0		268	80.3	25.0	0.87	7.56
	15-Jun-04				7.84	557	283	12.0		266	73.2	24.3	0.80	10.2
	15-Jun-05				8.24	523	317	12.1		278	83.5	26.3	1.2	9.2
	15-Jun-06				7.70	520	310	12.0		260	85.1	22.9	1.0	7.5
	29-May-07				7.48	553	270	13.0		270	68.8	23.0	1.0	7.9
	5-Jun-08				7.98	574	290	15.0		270	77.3	23.9	1.0	10.2
	4-Jun-09				8.03	589	327	15.9		265	88.3	25.9	1.5	8.9
	14-May-10	7.76	550	11.2	8.00	544	335	18.7		272	89.7	27.0	1.26	9.27
	15-Jun-11	7.89	468	11.3	8.10	538	295	20.6		264	78.7	23.8	1.22	9.25
	23-May-12	7.49	477	11.5	8.08	575	294	20.4		264	78.5	23.8	1.20	9.34
	9-May-13	7.80	674	9.8	8.32	640	323	21.7		257	85.9	26.4	1.28	10.2

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
37	7-May-90					0.5			0.57				
cont'd	29-Oct-90					1.4			0.46				
	6-May-91								0.43				
	26-May-92					1.5			0.16				
	6-Oct-92					1.1			0.65				
	3-May-93					0.8			0.13				
	26-Oct-93					1.0			0.42				
	25-Apr-94					1.6			0.12				
	25-Oct-94					1.6			0.27				
	16-May-95					1.3			0.19				
	15-Jun-97								0.25	0.030			
	15-Jun-98								0.30	0.040			
	15-Jun-99								0.02	0.040			
	15-Jun-00								0.32	0.040			
	15-Jun-01								0.18	0.040			
	15-Jun-02								0.48	0.040			
	15-Jun-03								0.40	0.040			
	15-Jun-04								0.62	0.030			
	15-Jun-05								0.20	0.036			
	15-Jun-06								0.33	0.037			
	29-May-07								0.52	0.045			
	5-Jun-08								<0.05	0.045			
	4-Jun-09								0.427	0.049			
	14-May-10								0.571	0.039			
	15-Jun-11								0.606	0.040			
	23-May-12								0.490	0.031			
	9-May-13								0.604	0.041			

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Field Parameters			General Parameters			Major and Minor Ions						
Well	Date	pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
37	9-May-14	7.61	658	10.0	8.14	612	310	22.8		250	81.8	25.7	1.22	9.92
cont'd	27-May-15	7.85	402	13.4	8.04	617	278	25.1	39.2	253	72.3	23.7	1.22	10.5
37R	24-May-16	7.33	491	11.2	8.15	611	317	24.9	44.5	265	83.9	26.0	1.54	11.3
	5-May-17	7.83	623	9.40	8.19	615	304	29.2	42.6	217	80.5	24.9	1.30	10.8
	11-May-18	7.68	556	10.25	7.94	605	306	28.4	39.3	280	81.3	24.9	1.31	11.1
	17-May-19	7.63	509	10.90	7.74	576	493	30.1	40.3	268	140*	34.6	1.75	11.4
	12-May-20	7.83	566	9.12	7.77	649	320	32.2	35.8	286	85.7	25.7	1.37	11.8
	12-May-21	7.78	690	10.1	8.05	596	316	35	41	238	87.1	24	1.29	12.0
	17-May-22	7.81	648	11.2	8.05	624	375	38	41	277	101	29.6	1.39	14.8
	15-May-23	7.41	546	11.6	7.90	689	307	34	36	267	85.2	22.9	1.23	12.0
	7-May-24	7.66	598	10.5	8.02	608	328	33	37	273	88.0	26.3	1.40	13.9
	7-May-25	7.23	730	10.1	8.04	664	326	33	36	282	88.1	25.8	1.52	15.0
38	5-Apr-83				7.5	500	314	12.0		266	83.0	27.0		
	15-Jun-83				7.3	540	284	12.0		270	59.0	24.0		
	4-Aug-83				7.6	290		15.0						
	15-Aug-83													
	19-Aug-83				7.7	540		13.0						
	3-Sep-83													
	14-Sep-83				7.3	530	318	11.0						
	19-Oct-83													
	8-Dec-83				7.5	520	330	15.0						
	30-Apr-84				7.4	590	314	13.0						
	5-Nov-84				7.3	600	318	12.0		250	86.0	25.0		
	29-Apr-85				7.70	630	302	14.5		263	78.5	25.6		
	21-Oct-85				7.87	600	306	14.0		280	80.5	25.4		
	30-Apr-86				7.62	493	315	15.5		267	83.5	25.8		
	15-Oct-86				7.30	355	173	8.0		164	48.0	13.0		
	16-Oct-86													

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
37	9-May-14								0.591	0.040			
cont'd	27-May-15								0.550	0.042			
37R	24-May-16								0.597	0.033			
	5-May-17	0.15	0.20	<0.25	<0.25	0.8	0.052	<0.003	0.660	0.039	<0.17	<0.20	<0.10
	11-May-18	0.05	<0.10	<0.05	<0.05	1.0	0.056	0.004	0.660	0.041	<0.17	<0.20	<0.10
	17-May-19	0.062	0.37	0.022	<0.010	2.26	0.048	0.0031	3.27	0.211	<0.50	<0.50	<0.50
	12-May-20	0.061	0.18	<0.020	<0.010	2.11	0.048	<0.00050	0.718	0.0427	<0.50	<0.50	<0.50
	12-May-21	<0.1	<0.5	<0.06	<0.03	<1.0	0.056	0.00009	0.72	0.041	<0.2	<0.5	<0.5
	17-May-22	<0.1	<0.5	<0.06	<0.03	1.1	0.047	<0.00008	0.816	0.0455	<0.2	<0.5	<0.5
	15-May-23	<0.1	<0.5	<0.06	<0.03	1.5	0.046	0.00011	0.738	0.0434	<0.2	<0.5	<0.5
	7-May-24	0.1	<0.5	<0.06	<0.03	1.4	0.047	<0.003	0.70	0.040	<0.2	<0.5	<0.5
	7-May-25	<0.1	<0.5	<0.06	<0.03	1.3	0.045	<0.003	0.80	0.042	<0.2	<0.5	<0.5
38	5-Apr-83					0.8			0.27				
	15-Jun-83					1.5			0.19				
	4-Aug-83												
	15-Aug-83												
	19-Aug-83												
	3-Sep-83												
	14-Sep-83					0.5							
	19-Oct-83												
	8-Dec-83					1.1							
	30-Apr-84					0.7							
	5-Nov-84					0.3			<0.04				
	29-Apr-85					1.0			3.05				
	21-Oct-85					3.7			0.22				
	30-Apr-86					1.8			0.21				
	15-Oct-86					3.3			0.03				
	16-Oct-86								0.01				

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions							
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
38	20-Apr-87				7.45	377	180	9.5		175	47.5	14.8		
cont'd	10-May-88				7.53	430	227	10.9		158	61.3	17.9		
	12-Oct-88				7.60	410	203	14.0		200	55.0	16.0		
	30-Oct-89				7.77	525	257	14.5		254	65.4	22.7		
	7-May-90				7.81	528	271	14.4		256	68.8	24.1		
	29-Oct-90				7.83	527	252	14.5		251	64.5	22.1		
	6-May-91				7.88	515	254	13.5		256	64.4	22.6		
	26-May-92				7.70	507	241	6.9		242	66.6	21.7		
	6-Oct-92				7.80	506	259	8.1		229	68.5	21.3		
	3-May-93				7.66	491	242	6.5		248	64.2	19.8		
	26-Oct-93				7.75	482	240	7.3		252	59.4	22.1		
	25-Apr-94				8.00	480	249	5.5		245	66.3	20.1		
	25-Oct-94				7.91	486	243	5.7		235	64.1	20.0		
	16-May-95				7.84	465	239	5.0		232	63.6	19.5		
	15-Jun-97				8.06	453	232	3.5		215	60.8	19.5	1.0	10.4
	15-Jun-98				7.99	413	231	4.0		210	61.7	18.8	1.38	9.92
	15-Jun-99				8.03	414	262	4.0		196	74.9	18.3	1.05	10.5
	15-Jun-00				8.30	415	217	3.0		210	57.7	17.7	0.59	24.5
	15-Jun-01				7.92	426	237	3.0		208	64.0	18.7	0.44	17.2
	15-Jun-02				7.74	430	217	4.0		217	56.8	18.3	0.99	11.0
	15-Jun-03				7.90	433	221	5.0		228	59.0	17.9	0.57	12.0
	15-Jun-04				7.99	450	215	6.0		228	56.9	17.8	0.54	16.8
	15-Jun-05				8.31	455	234	7.0		232	62.8	18.7	1.1	13.0
	15-Jun-06				7.75	416	220	8.0		220	61.7	17.2	<1	10.8
	29-May-07				7.59	447	300	7.0		230	86.8	19.7	1.0	12.3
	5-Jun-08				8.01	471	240	9.0		220	65.3	18.8	2.0	15.1
	4-Jun-09				8.09	473	240	8.6		227	66.2	18.0	1.2	12.1

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
38	20-Apr-87					4.1			0.07				
cont'd	10-May-88					3.0			0.02				
	12-Oct-88					2.2			<.05				
	30-Oct-89					1.1			0.15				
	7-May-90					1.5			0.04				
	29-Oct-90					1.6			0.02				
	6-May-91								<0.01				
	26-May-92					1.8			<0.01				
	6-Oct-92					1.5			0.60				
	3-May-93					0.7			0.02				
	26-Oct-93					2.5			0.41				
	25-Apr-94					2.1			<0.01				
	25-Oct-94					1.5			0.30				
	16-May-95					1.3			0.01				
	15-Jun-97								<0.02	0.050			
	15-Jun-98								<0.02	<0.02			
	15-Jun-99								0.03	0.060			
	15-Jun-00								<0.02	0.040			
	15-Jun-01								<0.02	0.050			
	15-Jun-02								<0.02	0.040			
	15-Jun-03								0.05	0.050			
	15-Jun-04								<0.02	0.050			
	15-Jun-05								0.07	0.056			
	15-Jun-06								0.08	0.076			
	29-May-07								<0.05	0.093			
	5-Jun-08								0.18	0.042			
	4-Jun-09								<0.050	0.051			

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions							
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
38	13-May-10	7.94	390	9.4	8.00	445	258	11.1		224	69.7	20.5	1.13	12.3
cont'd	15-Jun-11	7.54	389	10.7	8.26	442	231	11.9		219	62.0	18.5	1.05	12.2
	15-Jun-11	7.54	389	10.7	8.13	429	228	11.1		218	61.4	18.2	1.1	11.8
	23-May-12	7.61	393	11.2	8.08	465	239	11.9		228	64.1	19.1	1.07	12.5
	9-May-13	7.88	541	9.8	8.32	500	248	12.7		212	65.7	20.5	1.14	12.8
	9-May-13	7.88	541	9.8	8.34	515	249	12.8		223	66.5	20.1	1.09	12.7
	9-May-14	7.89	525	10.3	8.09	493	237	13.3		216	62.9	19.5	1.04	12.4
	27-May-15	7.89	329	15.4	8.10	493	228	13.6	22.2	219	60.5	18.6	1.06	13.0
	24-May-16	7.62	405	11.1	8.15	497	245	16.2	25.6	230	64.8	20.1	1.13	13.9
	5-May-17	7.91	517	9.19	8.18	562	237	18.7	23.1	237	62.7	19.6	1.10	13.1
	11-May-18	7.80	481	9.00	7.91	514	242	20.8	23.0	260	64.7	19.6	1.08	13.6
	17-May-19	7.63	443	10.49	7.81	502	259	23.3	22.6	240	68.9	21.2	1.10	14.4
	12-May-20	8.00	474	9.72	7.80	551	264	23.0	21.1	234	70.4	21.3	1.15	14.9
	12-May-21	7.85	520	11.7	8.08	553	260	27	24	237	71.2	19.9	1.10	14.5
	17-May-22	7.51	573	11.3	7.98	542	310	31	27	252	83.1	24.8	1.20	18.4
	15-May-23	7.56	482	12.3	8.09	601	262	28	24	230	71.7	20.1	1.06	14.8
	7-May-24	7.88	515	11.3	7.93	518	277	25	23	240	73.8	22.5	1.24	16.9
	7-May-25	7.42	620	9.9	8.08	554	270	24	24	240	72.3	21.8	1.28	16.5
39	9-May-14	7.73	770	9.8	8.10	722	336	37.3		280	90.2	27.0	1.83	21.7
	27-May-15	7.41	463	12.0	8.01	716	294	37.8	45.1	281	76.3	25.2	1.73	21.8
	24-May-16	7.62	405	11.1	8.14	711	340	36.1	47.7	300	90.3	27.8	1.70	23.1
	1-Nov-16	7.94	711	9.8	8.06	703		39.8	44.7	289	86.8	23.5	1.55	20.0
	4-May-17	7.90	705	9.08	8.18	773	326	36.8	44.5	312	87.7	25.9	1.64	21.2
	10-May-18	7.45	635	9.95	7.93	680	324	33.9	41.9	315	88.5	25.0	1.65	21.0
	16-May-19	7.58	593	10.10	7.52	666	354	38.5	45.2	307	98.0	26.7	1.62	21.8
	11-May-20	7.71	643	7.78	7.67	703	331	37.2	44.2	303	93.1	24.0	1.61	20.3
	11-May-21	7.10	730	8.9	8.16	684	374	38	50	275	107	25.7	1.82	21.7

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
38	13-May-10								0.499	0.042			
cont'd	15-Jun-11								0.529	0.041			
	15-Jun-11								0.55	0.042			
	23-May-12								0.450	0.038			
	9-May-13								0.555	0.049			
	9-May-13								0.530	0.044			
	9-May-14								0.579	0.043			
	27-May-15								0.439	0.042			
	24-May-16								0.456	0.039			
	5-May-17	0.13	0.22	<0.05	<0.05	1.3	0.048	<0.003	0.464	0.042	<0.17	<0.20	<0.10
	11-May-18	0.07	<0.10	<0.05	<0.05	1.2	0.048	<0.003	0.494	0.046	<0.17	<0.20	<0.10
	17-May-19	0.089	<0.15	<0.020	<0.010	2.10	0.043	<0.00050	0.554	0.0442	<0.50	<0.50	<0.50
	12-May-20	0.089	<0.15	<0.020	<0.010	2.37	0.044	<0.00050	0.592	0.0473	<0.50	<0.50	<0.50
	12-May-21	<0.1	<0.5	<0.06	<0.03	1.3	0.068	<0.00008	0.56	0.047	<0.2	<0.5	<0.5
	17-May-22	<0.1	<0.5	<0.06	<0.03	1.8	0.05	0.00010	0.634	0.0503	0.2	<0.5	<0.5
	15-May-23	0.1	<0.5	<0.06	<0.03	1.9	0.036	0.00011	0.494	0.0518	0.2	<0.5	<0.5
	7-May-24	<0.1	<0.5	<0.06	<0.03	3.7	0.042	<0.003	0.51	0.051	<0.2	<0.5	<0.5
	7-May-25	0.1	<0.5	<0.06	<0.03	1.3	0.041	<0.003	0.54	0.050	<0.2	<0.5	<0.5
39	9-May-14								0.183	0.156			
	27-May-15								0.236	0.182			
	24-May-16								0.259	0.133			
	1-Nov-16	0.04	<0.10	<0.25	<0.25	1.2	0.025	<0.003	0.271	0.131	<0.17	<0.20	<0.10
	4-May-17	0.11	0.36	0.14	<0.05	1.2	0.026	<0.003	0.268	0.145	<0.17	<0.20	<0.10
	10-May-18	0.05	0.27	<0.25	<0.25	1.2	0.026	0.004	0.249	0.143	<0.17	<0.20	<0.10
	16-May-19	0.082	0.36	0.494	0.054	3.65	0.029	<0.00050	0.195	0.149	<0.50	<0.50	<0.50
	11-May-20	0.057	0.33	0.67	0.048	2.00	0.027	<0.00050	0.239	0.16	<0.50	<0.50	<0.50
	11-May-21	<0.1	<0.5	0.39	0.04	2.0	0.034	0.00008	0.316	0.165	<0.2	<0.5	<0.5

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Field Parameters			General Parameters			Major and Minor Ions						
Well	Date	pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
39	16-May-22	7.29	704	9.9	8.08	710	379	44	55	300	105	28.3	1.62	23.7
cont'd	15-May-23	7.84	609	10.2	8.18	743	319	37	47	280	89.4	23.4	1.45	19.2
	6-May-24	7.48	646	8.9	7.99	703	348	35	48	283	94.3	27.3	1.65	22.5
	7-May-25	7.30	760	10.3	8.15	706	332	35	45	284	90.4	25.7	1.70	21.9
42	24-May-16	7.73	770	9.8	8.20	394	177	2.12	5.50	217	31.3	24.0	1.45	21.3
	1-Nov-16	8.59	425	10.1	7.92	389		1.09	3.64	211	29.2	20.6	1.17	18.3
	4-May-17	8.38	387	8.91	8.21	422	163	0.60	5.69	217	28.2	22.6	1.19	18.8
	10-May-18	8.13	382	9.13	7.42	379	161	0.81	4.20	228	28.2	21.9	1.18	18.7
	16-May-19	8.06	314	10.25	8.06	347	281	0.51	1.61	220	64.6*	29.0	1.33	18.0
	11-May-20	8.37	361	8.00	8.02	379	173	0.57	1.45	269	34.4	21.1	1.06	18.0
	11-May-21	7.60	400	9.1	8.22	386	198	<1	2	213	42.3	22.5	1.21	19.2
	16-May-22	7.52	398	10.7	8.21	381	221	<1	2	221	45.8	26.0	1.16	21.8
	15-May-23	8.06	338	10.4	8.32	404	174	<1	<2	206	36.4	20.1	0.939	16.0
	6-May-24	7.90	359	9.1	8.17	384	195	<1	2	211	39.1	23.6	1.12	19.2
	7-May-25	7.80	430	10.9	8.29	390	186	<1	<2	220	36.4	23.1	1.22	18.7

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
39	16-May-22	<0.1	<0.5	0.26	0.04	1.2	0.034	0.00016	0.398	0.141	<0.2	<0.5	<0.5
cont'd	15-May-23	<0.1	<0.5	0.14	<0.03	1.7	0.025	0.00012	0.439	0.141	<0.2	<0.5	<0.5
	6-May-24	0.1	<0.5	<0.06	<0.03	1.8	0.026	<0.003	0.71	0.131	<0.2	<0.5	<0.5
	7-May-25	<0.1	<0.5	<0.06	<0.03	1.4	0.028	<0.003	0.43	0.133	<0.2	<0.5	<0.5
42	24-May-16								0.038	0.011			
	1-Nov-16	0.34	0.32	<0.05	<0.05	1.2	0.051	<0.003	0.070	0.012	<0.17	<0.20	<0.10
	4-May-17	0.42	0.51	<0.05	<0.05	0.9	0.056	<0.003	0.059	0.010	<0.17	<0.20	<0.10
	10-May-18	0.29	0.29	<0.05	<0.05	1.2	0.063	<0.003	0.088	0.011	<0.17	<0.20	<0.10
	16-May-19	0.307	1.09	<0.020	<0.010	2.44	0.053	0.00218	1.77	0.106	<0.50	<0.50	<0.50
	11-May-20	0.301	0.49	0.031	<0.010	1.92	0.052	<0.00050	0.173	0.010	<0.50	<0.50	<0.50
	11-May-21	0.4	<0.5	<0.06	<0.03	1.5	0.048	0.00017	0.177	0.011	<0.2	<0.5	<0.5
	16-May-22	0.4	<0.5	<0.06	<0.03	1.1	0.052	<0.00008	0.180	0.0107	<0.2	<0.5	<0.5
	15-May-23	0.4	<0.5	<0.06	<0.03	1.4	0.048	0.00009	0.119	0.0112	<0.2	<0.5	<0.5
	6-May-24	2.0	2.3	<0.06	<0.03	1.8	0.063	<0.003	0.19	0.010	<0.2	<0.5	<0.5
	7-May-25	0.3	<0.5	<0.06	<0.03	1.3	0.051	<0.003	0.21	0.010	<0.2	<0.5	<0.5

Note: refer to notation page for groundwater notation details

Table D-3: Groundwater Chemical Results - Private Wells

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
D1	6-May-24	7.63	576	15.3	8.13	672	346	33	34	286	94.4	26.8	1.56	16.2
	15-May-25				8.05	684	319	35	29	293	86.5	24.9	1.48	15.7
D2	27-Feb-79				8.33	515	220	15.0			53.5	21.0	1.1	24.0
(Roswell)	16-Jul-79				7.35		208	10.5		210	49.0	20.8	0.95	21.4
	24-Apr-80				7.82	790	356	39.5		288	97.0	27.6	1.85	31.8
	30-Sep-80				7.83	585	256	16.5		244	65.0	22.6	1.2	26.2
	17-Jun-81				7.84	615	284	26.0		243	75.0	23.4		28.5
	14-May-82				7.75	587	256	24.5		237	67.0	21.4	1.0	29.0
	13-Jul-82				7.60	525	226	15.0		224	57.5	20.0		
	15-Jun-97				8.04	636	294	27.9		279	77.7	24.4	1.80	36.1
	15-Jun-99				7.44	709	326	35.0		300	88.9	25.2	1.92	37.4
	15-Jun-00				8.36	770	336	47.0		320	95.3	23.8	3.11	42.7
	15-Jun-01				7.74	625	320	23.0		257	85.2	26.1	1.36	32.2
	15-Jun-02				7.90	398	200	1.0		216	42.9	22.5	1.05	12.4
	15-Jun-03				7.74	666	323	32.0		304	84.9	26.9	1.32	32.4
	15-Jun-04				7.81	854	347	37.0		364	101.0	23.0	1.92	51.5
	15-Jun-05				8.27	668	321	28.7		295	83.7	27.0	1.5	34.0
	15-Jun-06				7.30	749	360	42.0		330	101.0	26.3	2.0	35.7
	29-May-07				7.41	888	430	44.0		370	122.0	31.6	2.0	41.4
	5-Jun-08				7.87	853	360	39.0		340	99.2	27.4	2.0	37.2
	4-Jun-09				7.99	665	292	24.0		275	76.7	24.5	1.5	33.5
	14-May-10	7.75	610	20.1	8.09	541	280	20.5		242	72.4	24.1	1.36	25.9
	23-May-12	8.48	547	15.0	8.23	663	<10	24.8		274	0.07	<0.05	0.16	163
	15-May-13	7.64	-	18.6	8.02	653	<10	28.7		243	0.99	0.41	0.61	149
D2	27-May-15	7.64	421	17.1	8.17	641	306	29.1	42.0	259	82.3	24.3	1.24	11.0
(Pearce)	25-May-16	8.32	519	11.3	8.38	698	1.7	34.2	43.0	285	0.48	0.11	0.43	152
	9-May-17	8.25	750	8.90	8.17	756	4.4	31.8	38.5	286	1.05	0.42	1.01	150
	11-May-18	7.50	667	16.80	8.14	684	1.0	30.8	33.1	305	0.29	0.06	1.30	160

Note: refer to notation page for groundwater notation details

Table D-3: Groundwater Chemical Results - Private Wells

		Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
D1	6-May-24	<0.1	<0.5	<0.06	<0.03	1.3	0.057	<0.003	2.3	0.064	<0.2	<0.5	<0.5
	15-May-25	<0.1	<0.5	<0.06	<0.03	1.3	0.056	<0.003	3.78	0.097			
D2	27-Feb-79								0.08				
(Roswell)	16-Jul-79								0.09				
	24-Apr-80								0.14	0.020			
	30-Sep-80								0.08	0.020			
	17-Jun-81								0.01	0.007			
	14-May-82								0.08				
	13-Jul-82								0.04				
	15-Jun-97								<0.02	<0.01			
	15-Jun-99								0.04	<0.02			
	15-Jun-00								0.09	<0.02			
	15-Jun-01								<0.02	<0.02			
	15-Jun-02								0.51	<0.02			
	15-Jun-03								0.02	<0.02			
	15-Jun-04								<0.02	<0.02			
	15-Jun-05								0.09	0.004			
	15-Jun-06								<0.05	0.002			
	29-May-07								<0.05	0.025			
	5-Jun-08								<0.05	0.002			
	4-Jun-09								<0.050	0.0036			
	14-May-10								<0.010	<0.002			
	23-May-12								<0.01	0.002			
	15-May-13								0.033	0.006			
D2	27-May-15								1.89	0.054			
(Pearce)	25-May-16								<0.010	<0.002			
	9-May-17	0.12	<0.05	<0.25	<0.25	1.7	0.051	<0.003	<0.010	<0.002	<0.17	<0.20	<0.10
	11-May-18	<0.02	<0.10	<0.25	<0.25	1.4	0.060	0.004	<0.010	0.005			

Note: refer to notation page for groundwater notation details

Table D-3: Groundwater Chemical Results - Private Wells

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
D2	17-May-19	8.14	549	14.70	8.17	641	<0.50	35.4	32.5	285	0.134	<0.050	0.17	159
(Pearce)	12-May-20	8.46	604	12.73	8.15	702	<0.50	34.4	30.0	279	0.089	<0.050	0.08	168
cont'd	12-May-21	8.38	730	15.9	8.19	689	2.2	37	35	278	0.50	0.236	0.824	160
	17-May-22	8.20	720	16.5	8.22	697	1.0	49	40	294	0.28	0.083	0.116	207
	15-May-23	8.12	610	15.8	8.21	753	1.7	48	33	274	0.47	0.123	0.478	146
	6-May-24	7.93	621	15.3	8.15	776	1.4	35	37	280	0.42	0.093	0.441	176
	7-May-25	8.03	780	12.9	8.43	718	1.0	36	34	289	0.29	0.068	0.522	163

Note: refer to notation page for groundwater notation details

Table D-3: Groundwater Chemical Results - Private Wells

		Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
D2	17-May-19	<0.010	<0.15	<0.020	<0.010	2.19	0.053	<0.00050	<0.010	<0.00050			
(Pearce)	12-May-20	<0.010	0.25	<0.020	<0.010	3.54	0.052	<0.00050	0.017	<0.00050			
cont'd	12-May-21	<0.1	0.5	<0.06	<0.03	1.2	0.051	0.00033	0.09	<0.002			
	17-May-22	<0.1	<0.5	<0.06	<0.03	1.1	0.053	0.00012	0.025	0.00035			
	15-May-23	<0.1	<0.5	<0.06	<0.03	1.5	0.047	0.00015	0.021	0.00061			
	6-May-24	<0.1	<0.5	<0.06	<0.03	2.0	0.050	<0.003	0.04	<0.002			
	7-May-25	<0.1	<0.5	<0.06	<0.03	1.4	0.049	<0.003	0.02	<0.002			

Note: refer to notation page for groundwater notation details

FIGURE D-1
TIME-CONCENTRATION GRAPH - CHLORIDE
HOLBROOK LANDFILL - LEACHATE

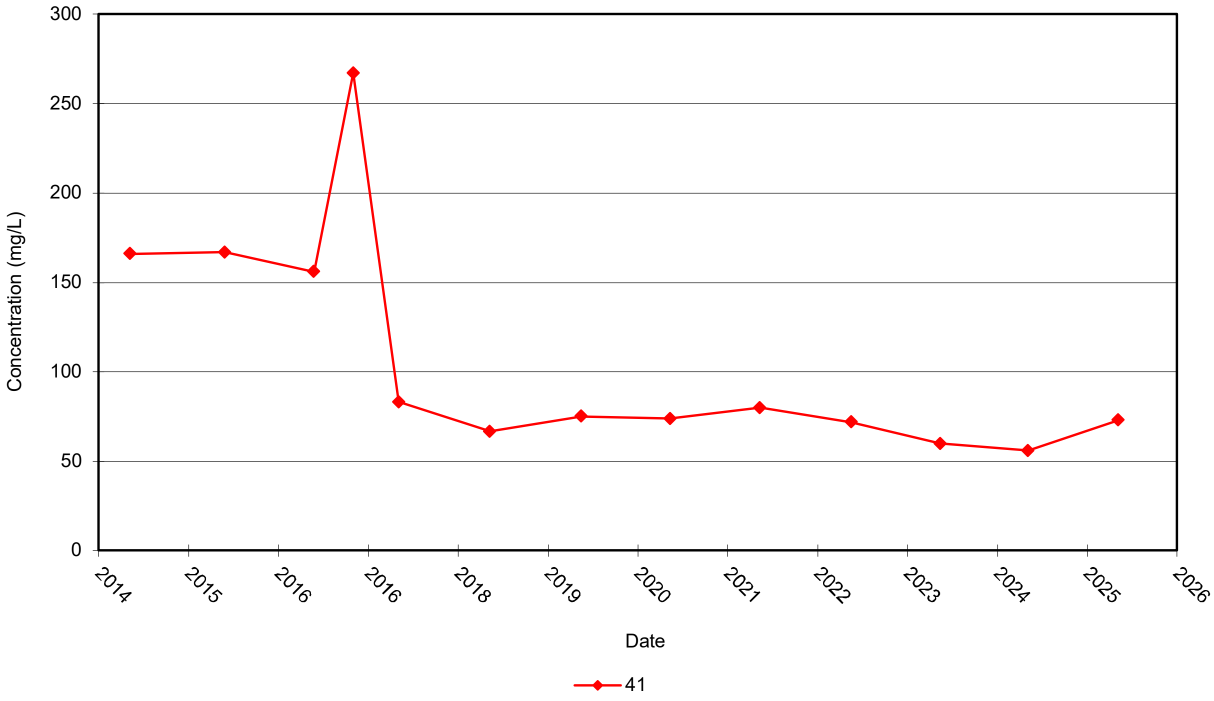


FIGURE D-2
TIME-CONCENTRATION GRAPH - ALKALINITY
HOLBROOK LANDFILL - LEACHATE

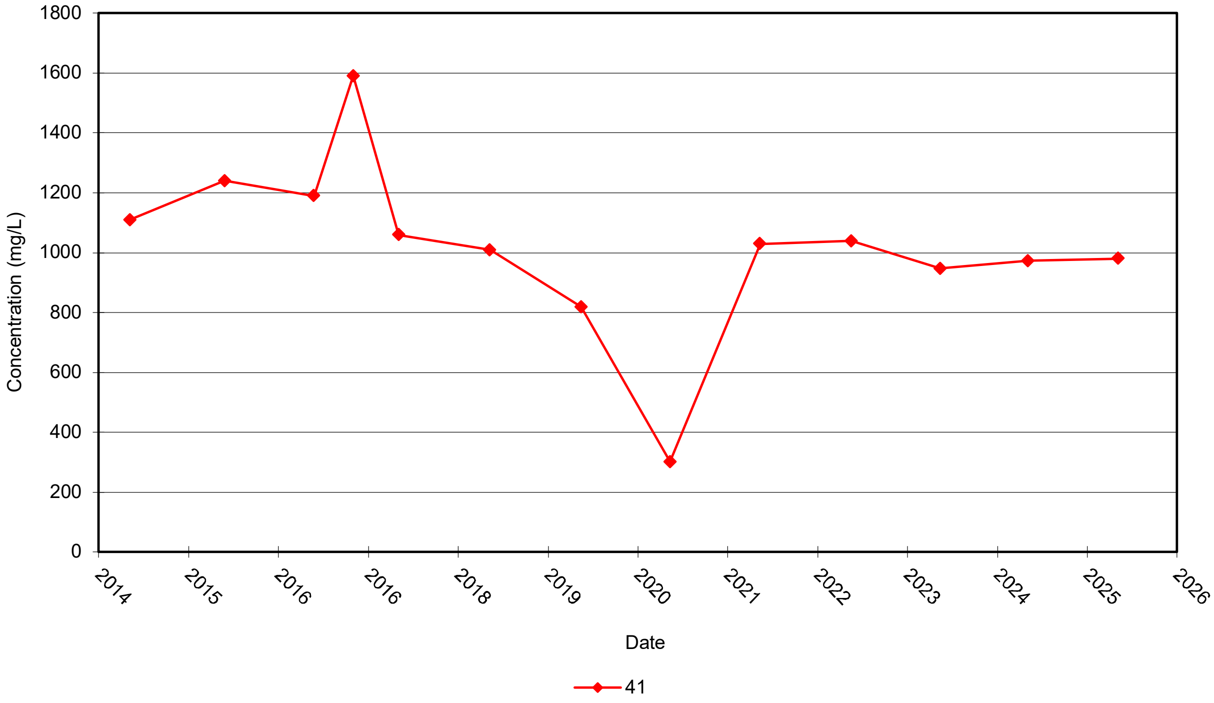


FIGURE D-3
TIME-CONCENTRATION GRAPH - POTASSIUM
HOLBROOK LANDFILL - LEACHATE

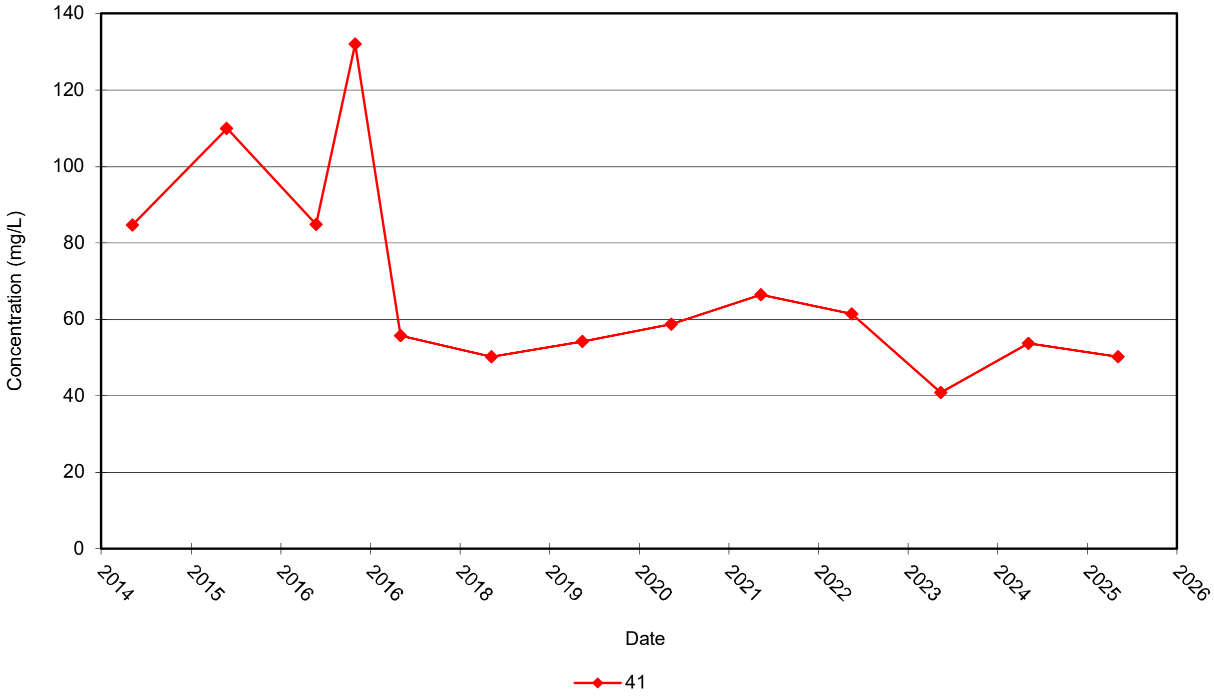


FIGURE D-4
TIME-CONCENTRATION GRAPH - BORON
HOLBROOK LANDFILL - LEACHATE

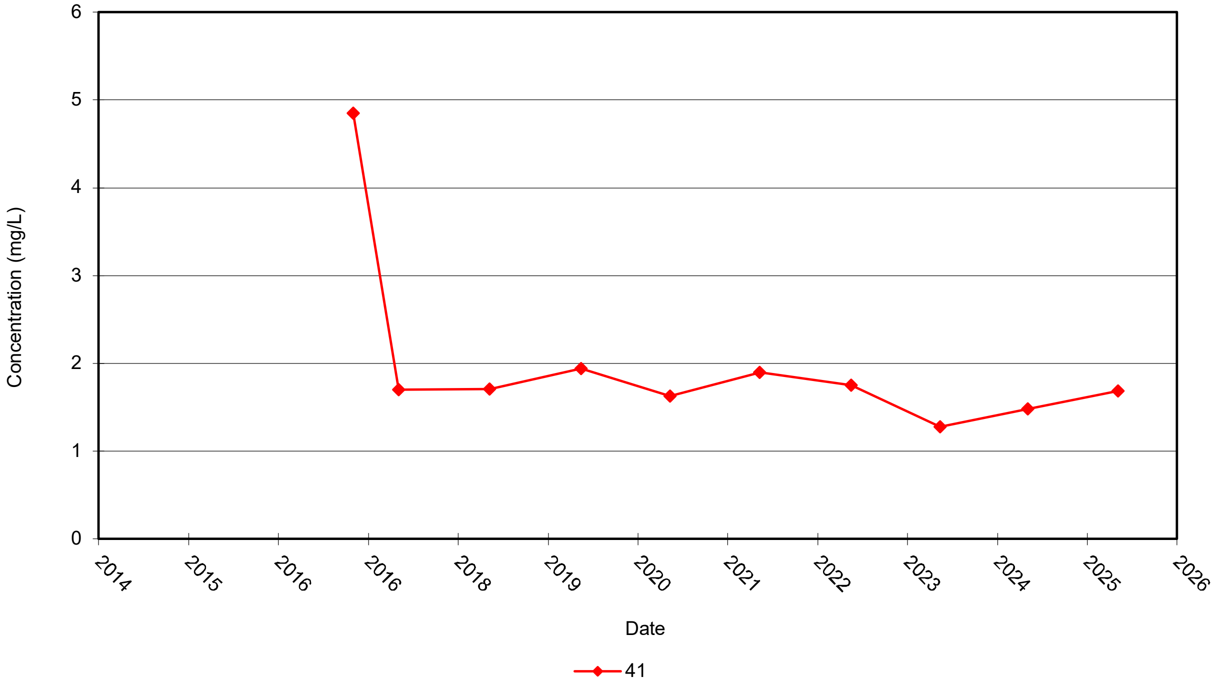


FIGURE D-5
TIME-CONCENTRATION GRAPH - IRON
HOLBROOK LANDFILL - LEACHATE

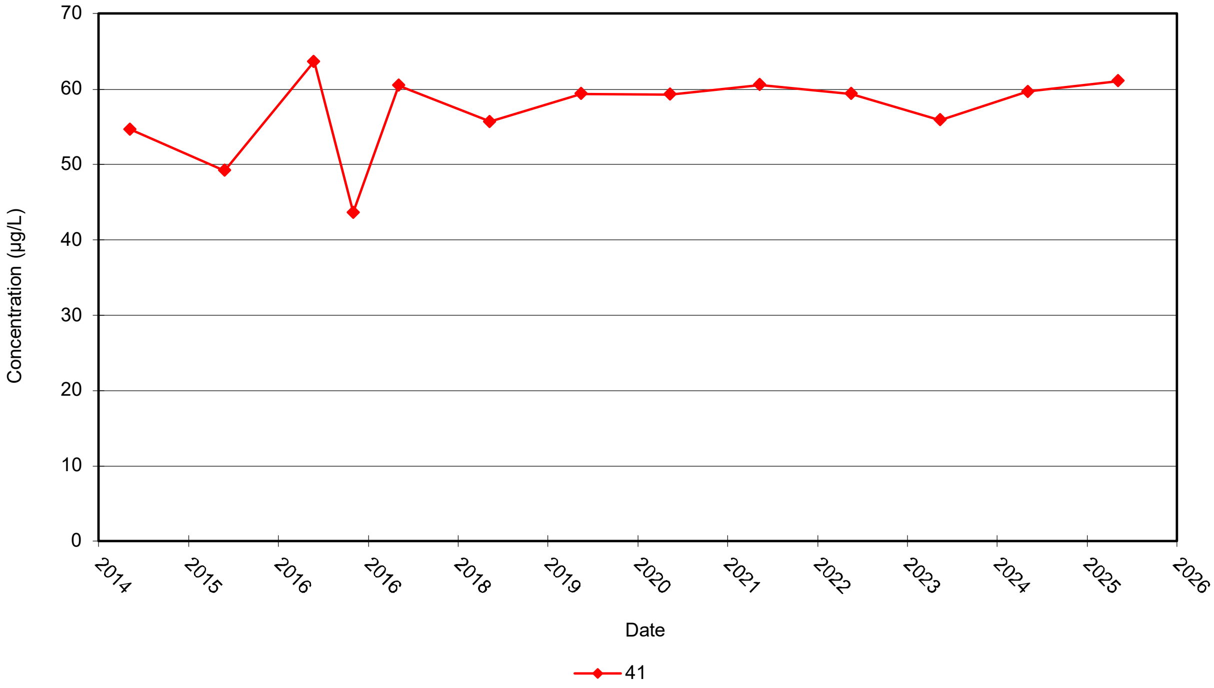


FIGURE D-6
TIME-CONCENTRATION GRAPH - AMMONIA
HOLBROOK LANDFILL - LEACHATE

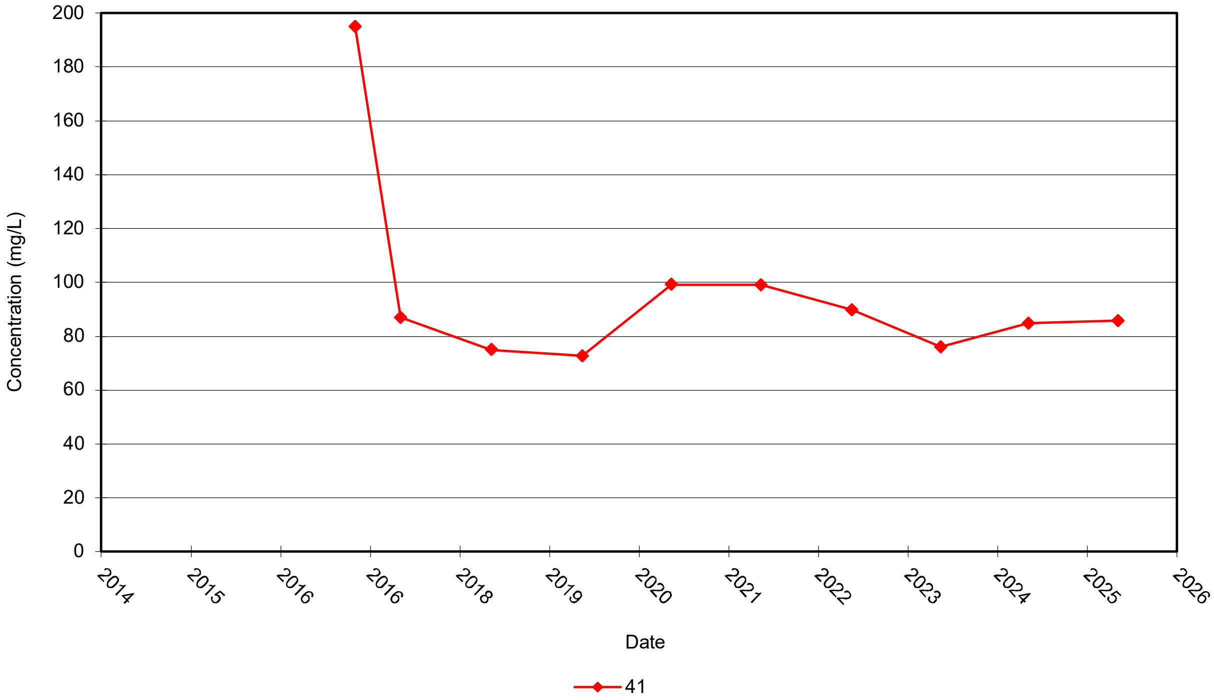


FIGURE D-7
TIME-CONCENTRATION GRAPH - TKN
HOLBROOK LANDFILL - LEACHATE

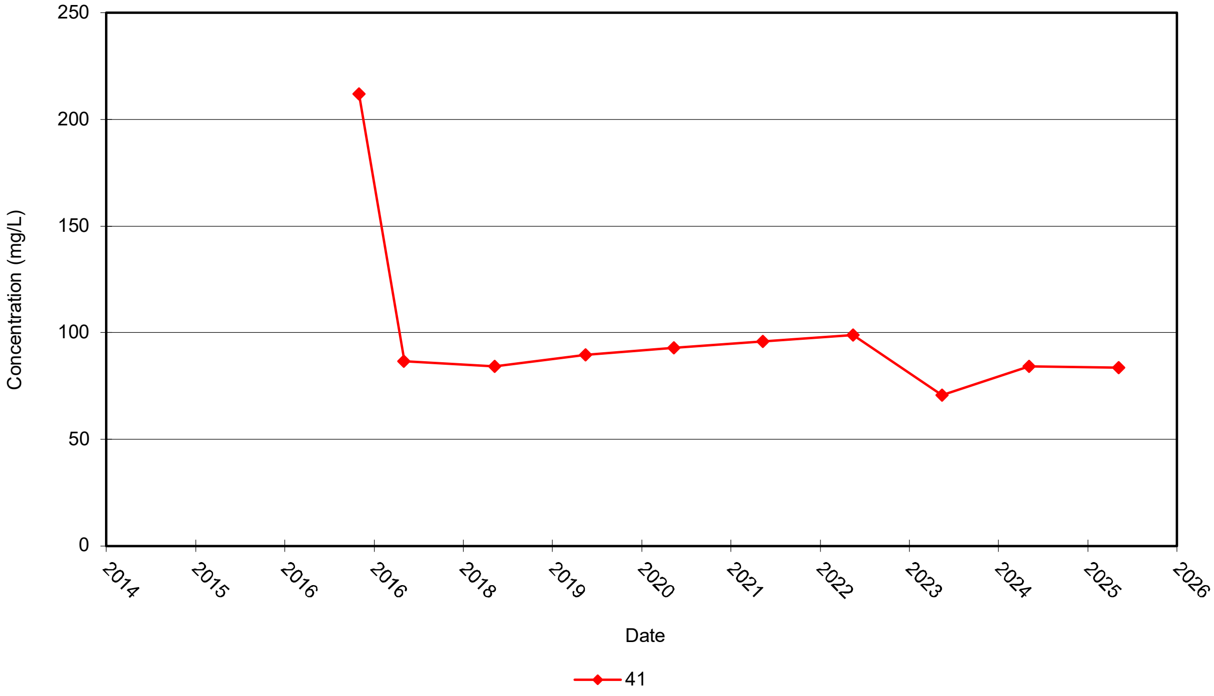


FIGURE D-8
TIME-CONCENTRATION GRAPH - CHLORIDE
HOLBROOK LANDFILL - NORTH SIDE

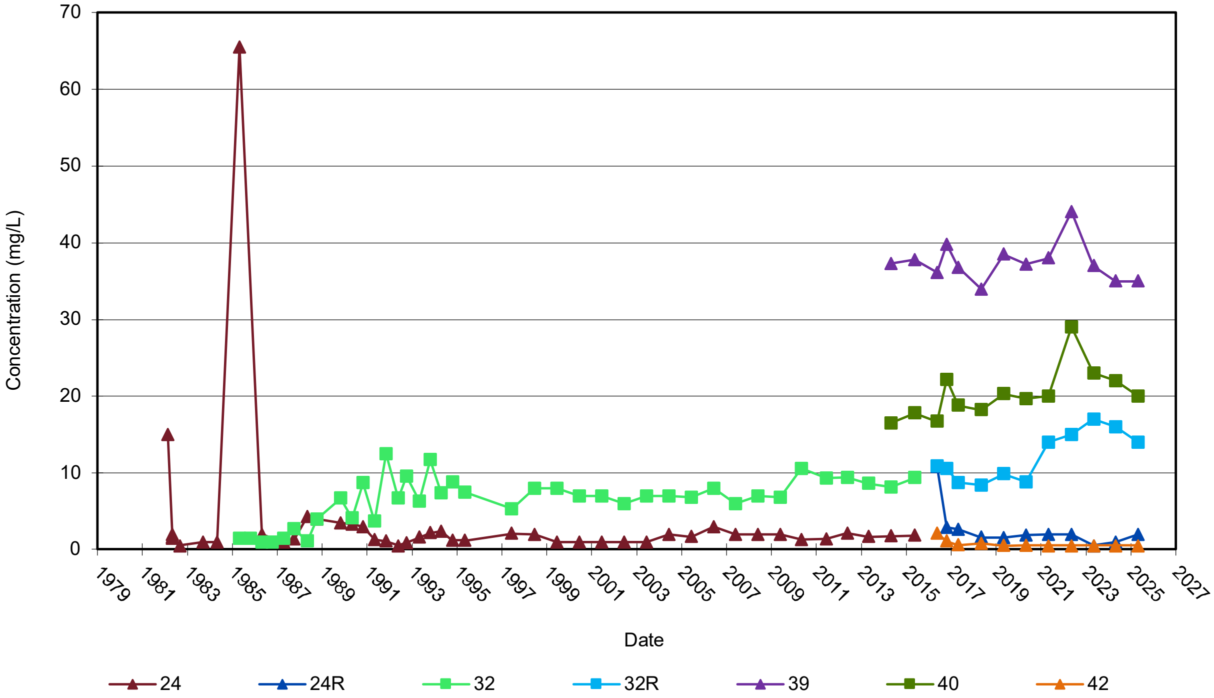


FIGURE D-9
TIME-CONCENTRATION GRAPH - CHLORIDE
HOLBROOK LANDFILL - SOUTH SIDE

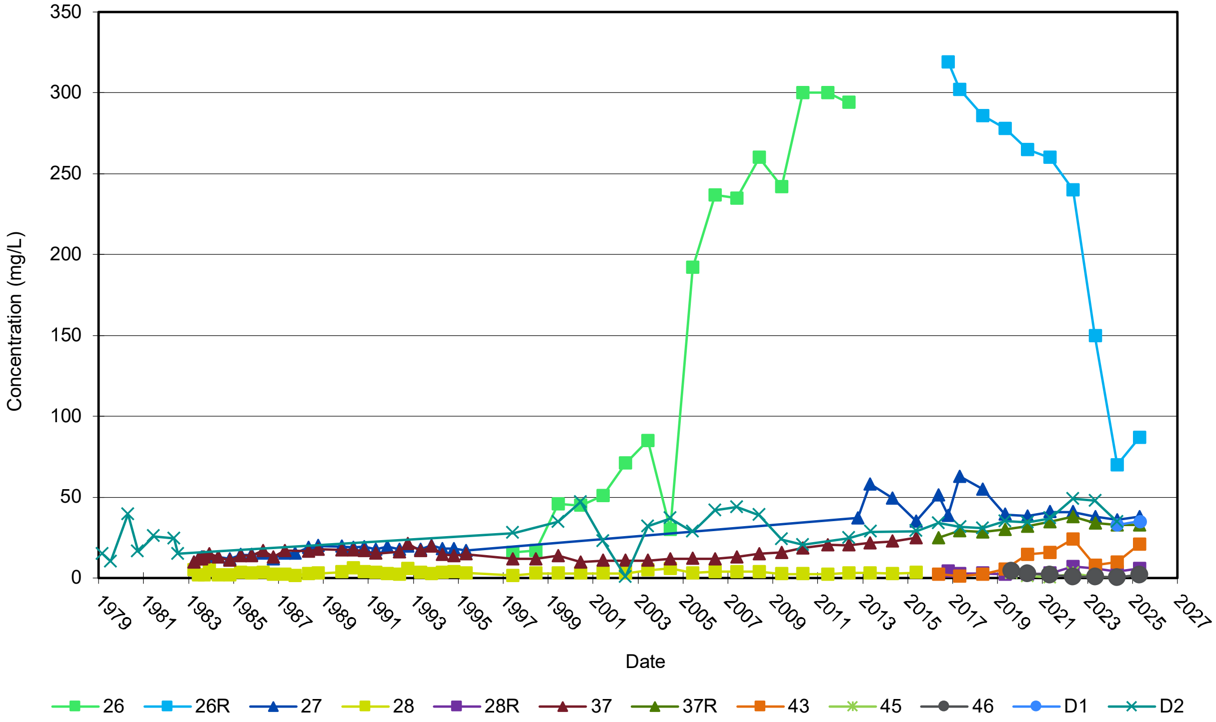


FIGURE D-10
TIME-CONCENTRATION GRAPH - CHLORIDE
HOLBROOK LANDFILL - EAST SIDE

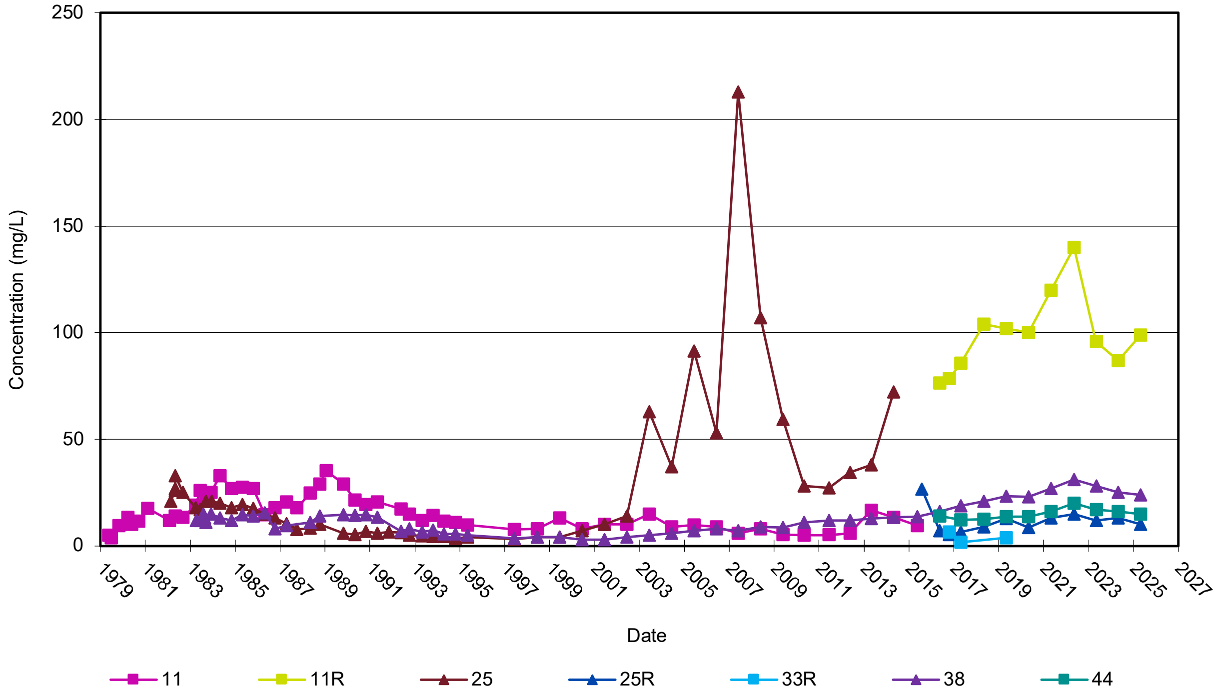


FIGURE D-11
TIME-CONCENTRATION GRAPH - CHLORIDE
HOLBROOK LANDFILL - WEST SIDE

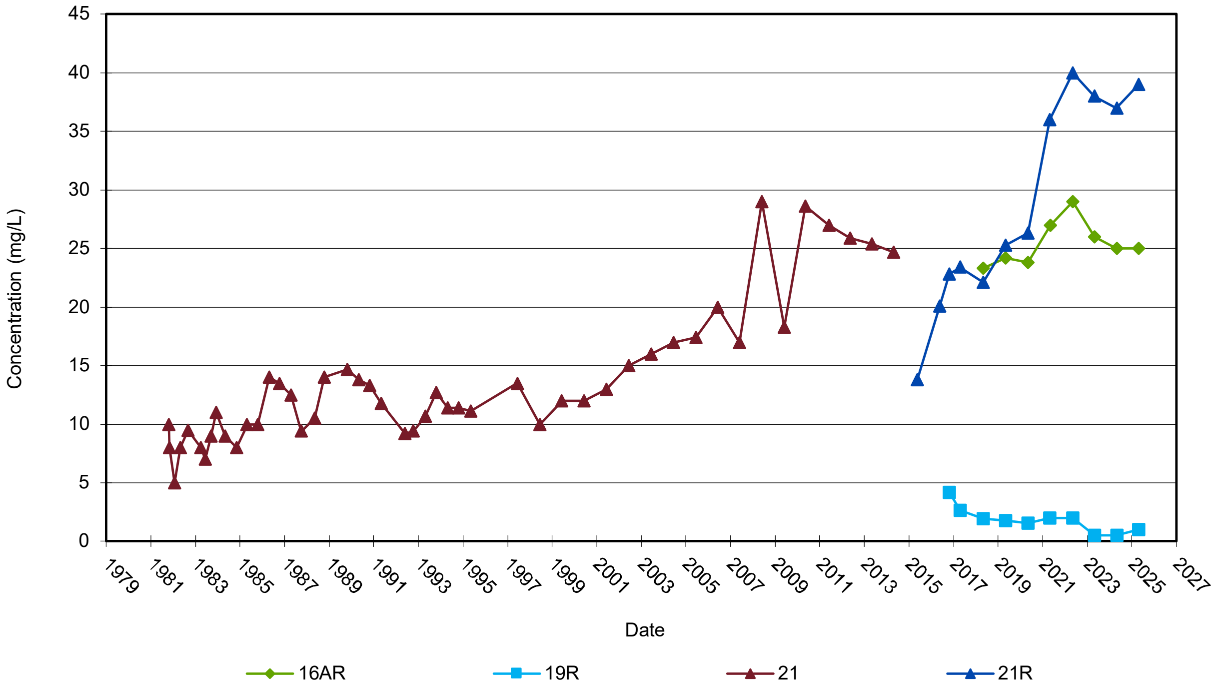


FIGURE D-12
TIME-CONCENTRATION GRAPH - ALKALINITY
HOLBROOK LANDFILL - NORTH SIDE

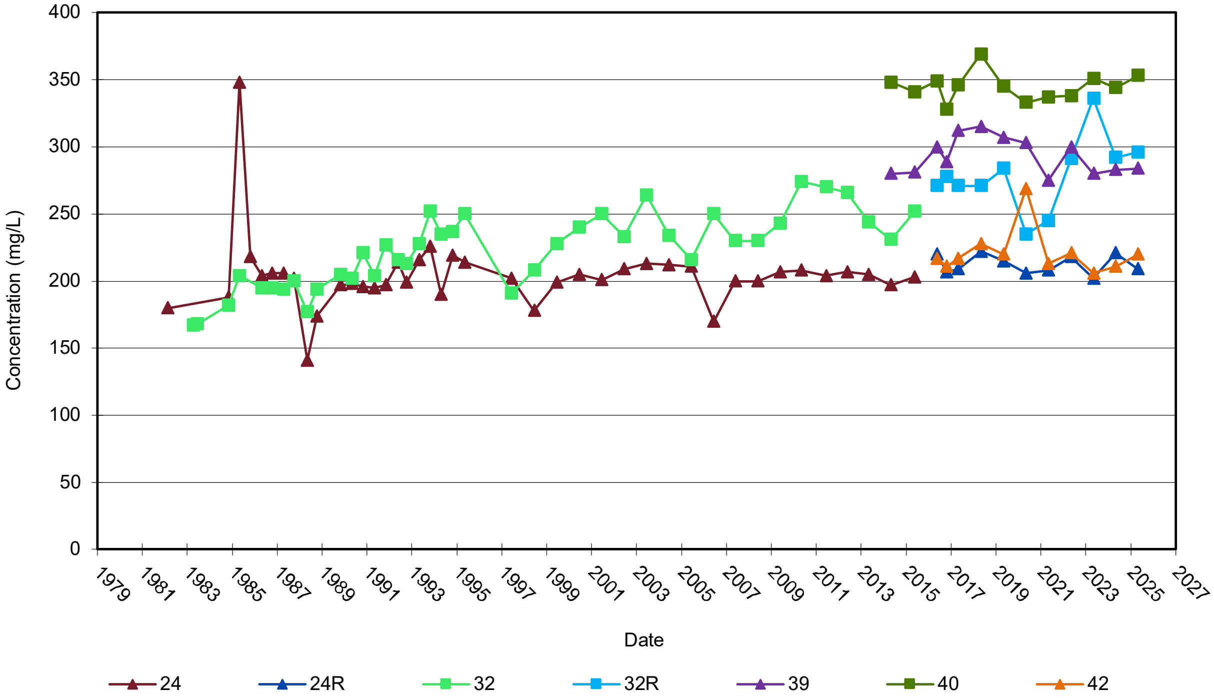


FIGURE D-13
TIME-CONCENTRATION GRAPH - ALKALINITY
HOLBROOK LANDFILL - SOUTH SIDE

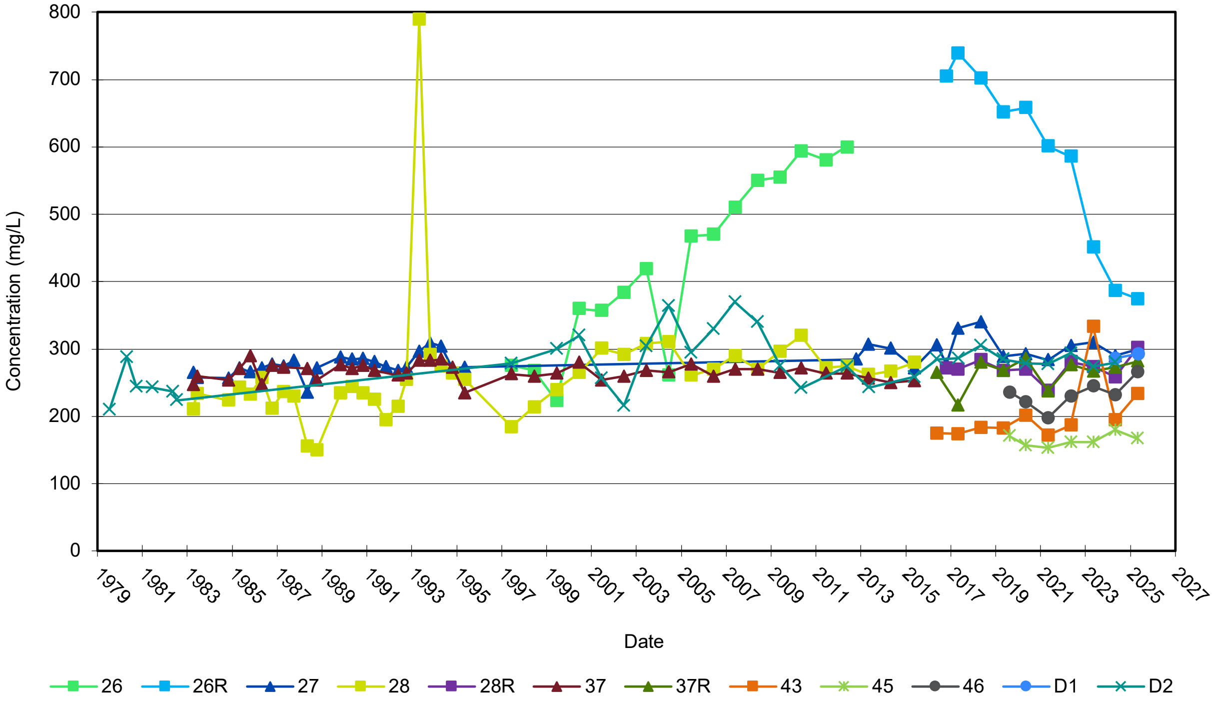


FIGURE D-14
TIME-CONCENTRATION GRAPH - ALKALINITY
HOLBROOK LANDFILL - EAST SIDE

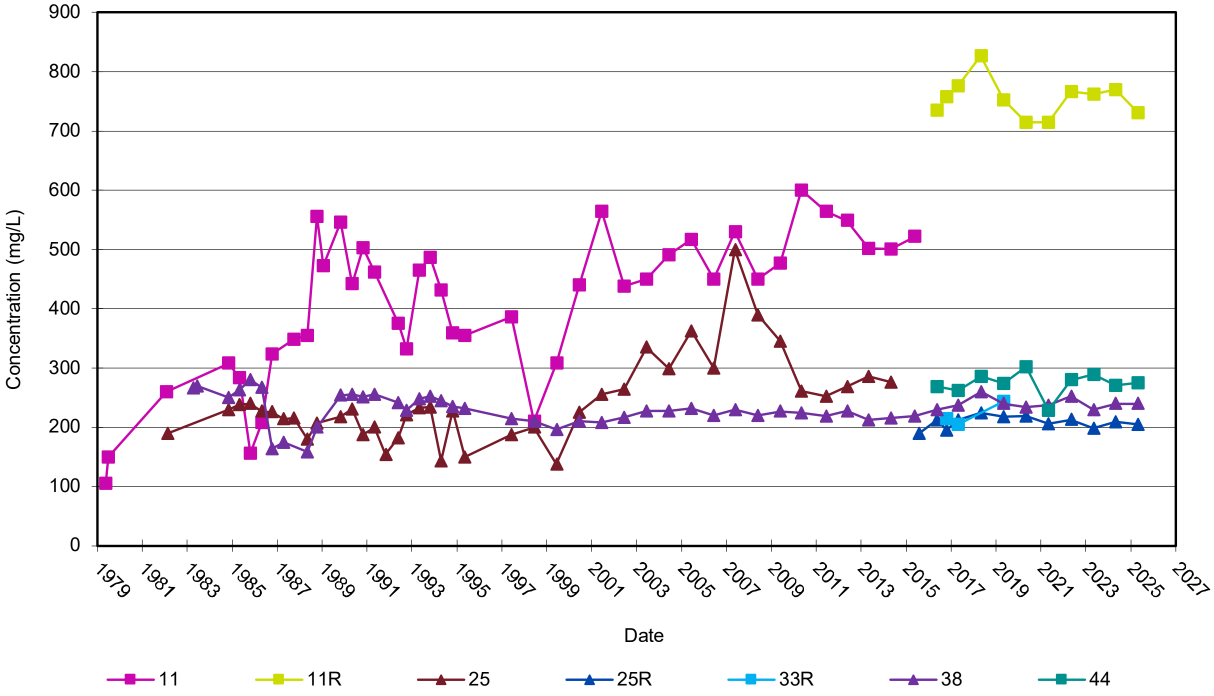


FIGURE D-15
TIME-CONCENTRATION GRAPH - ALKALINITY
HOLBROOK LANDFILL - WEST SIDE

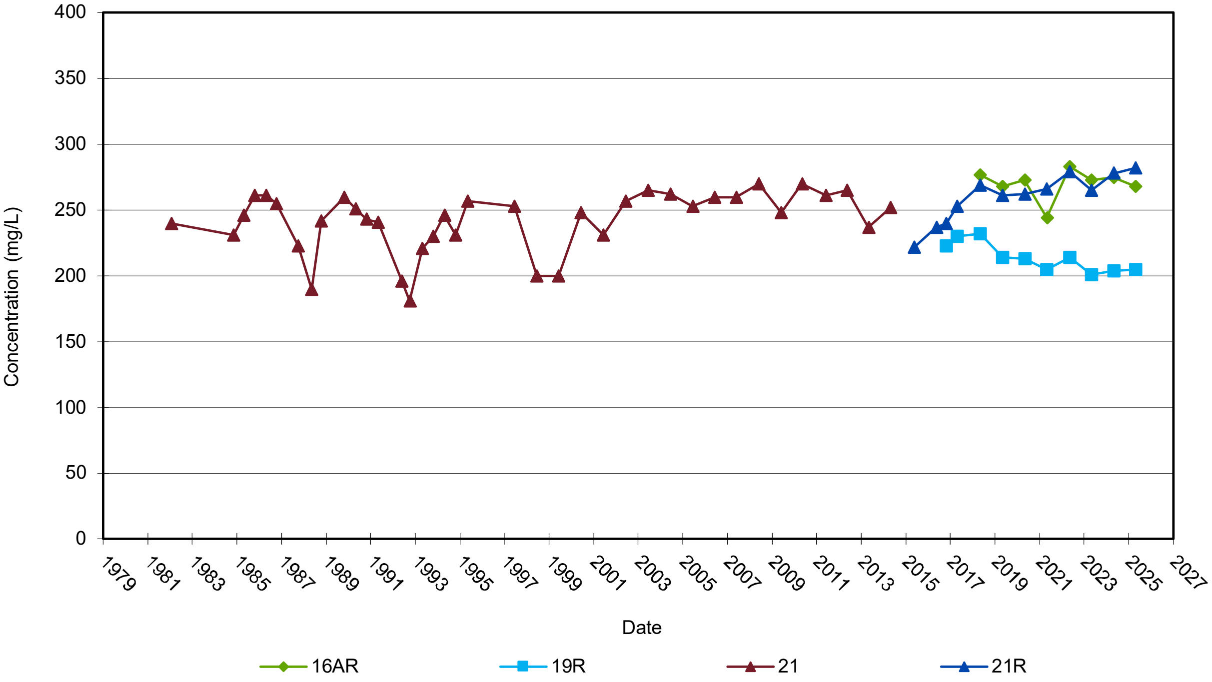


FIGURE D-16
TIME-CONCENTRATION GRAPH - POTASSIUM
HOLBROOK LANDFILL - NORTH SIDE

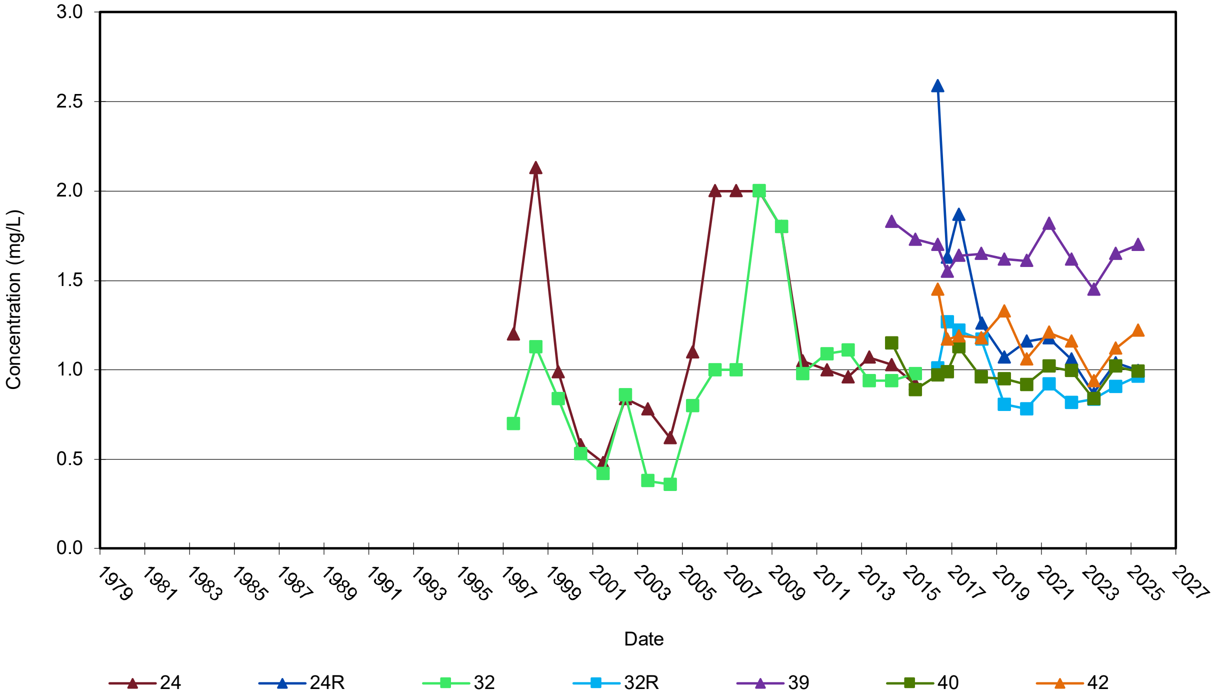


FIGURE D-17
TIME-CONCENTRATION GRAPH - POTASSIUM
HOLBROOK LANDFILL - SOUTH SIDE

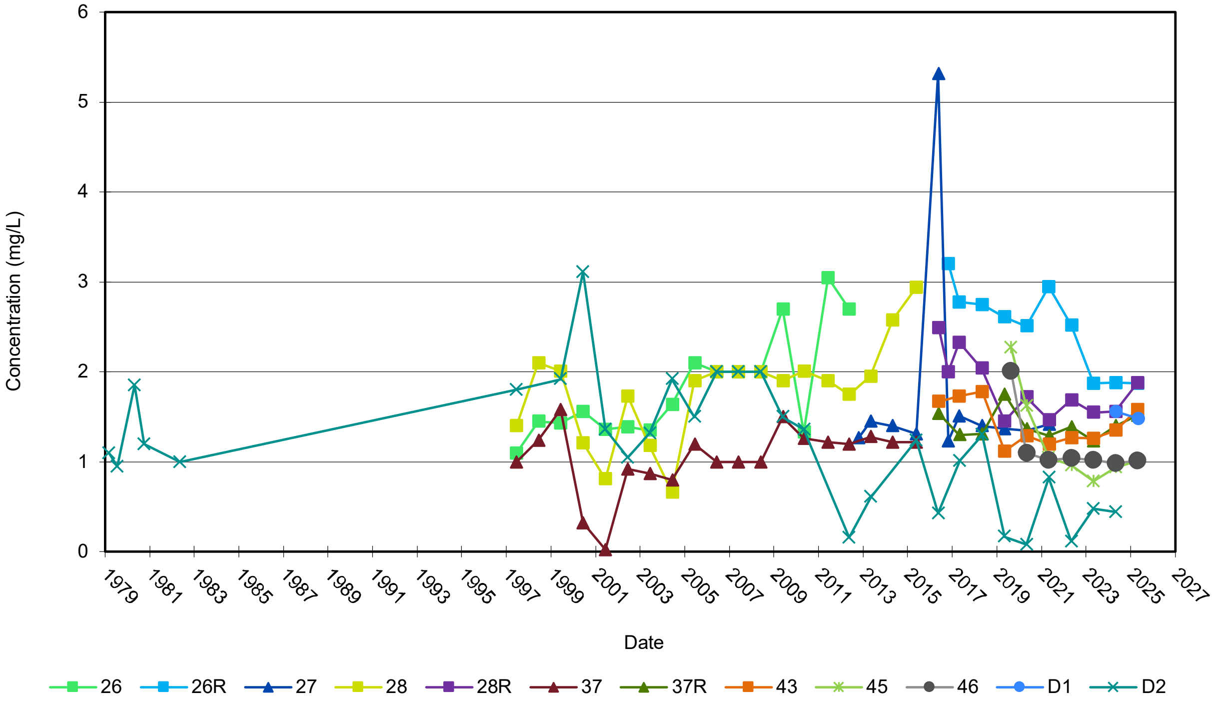


FIGURE D-18
TIME-CONCENTRATION GRAPH - POTASSIUM
HOLBROOK LANDFILL - EAST SIDE

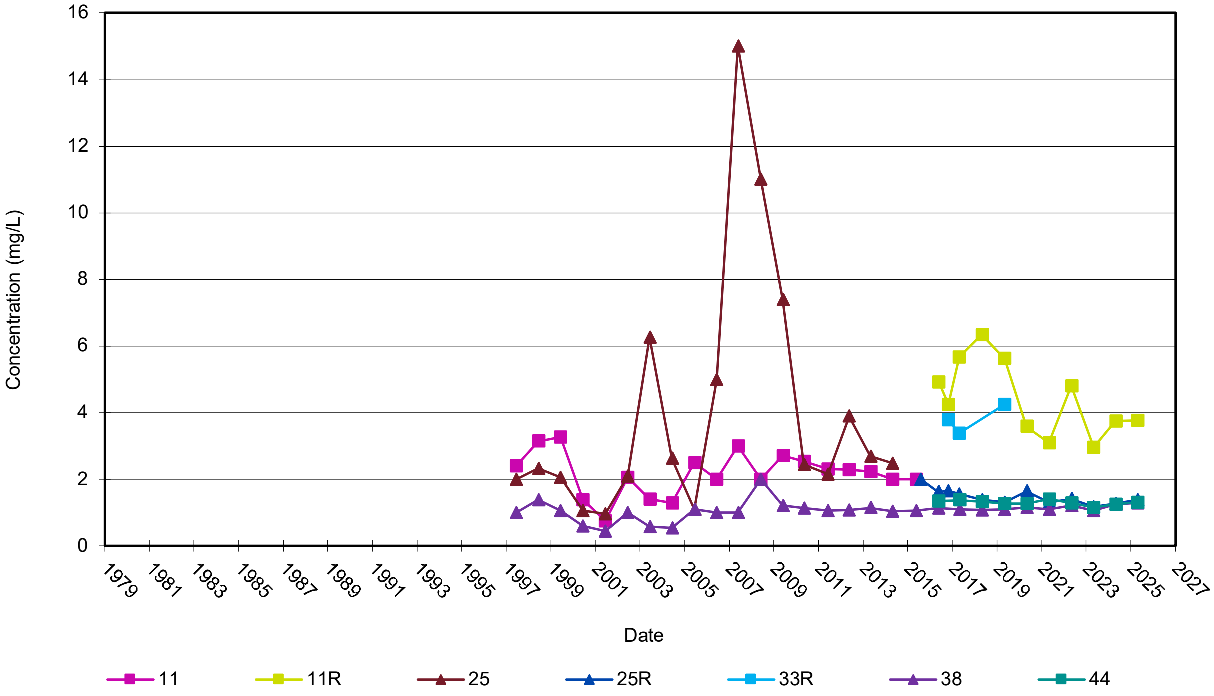


FIGURE D-19
TIME-CONCENTRATION GRAPH - POTASSIUM
HOLBROOK LANDFILL - WEST SIDE

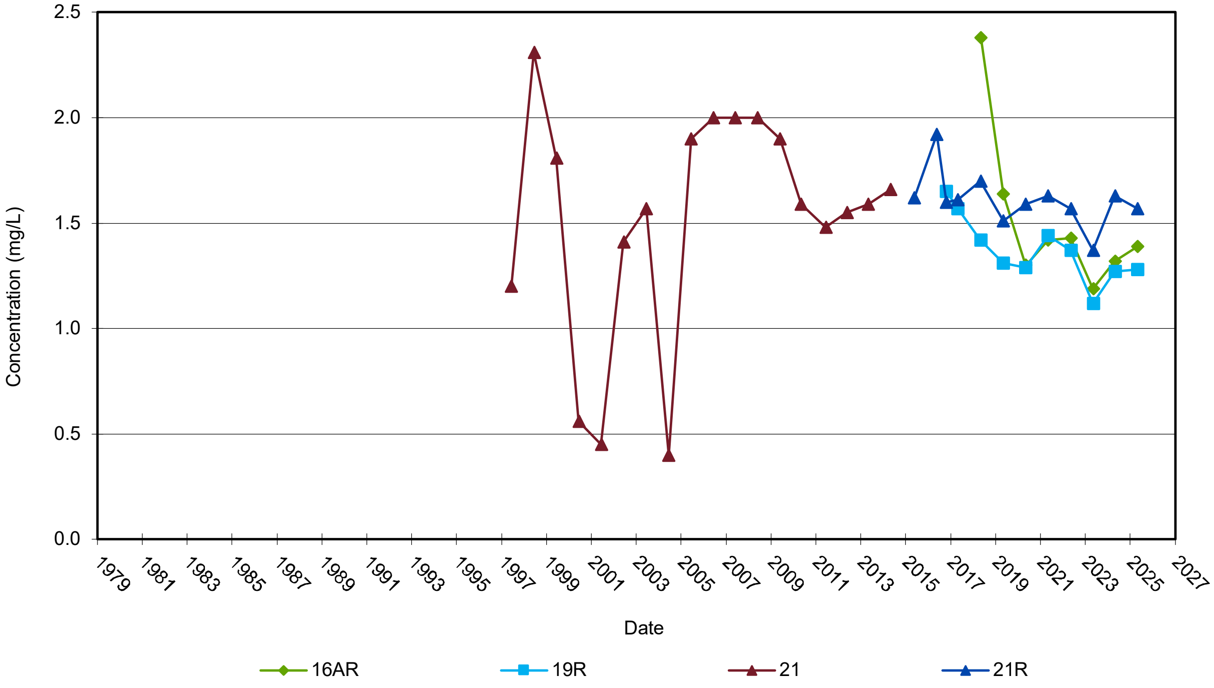


FIGURE D-20
TIME-CONCENTRATION GRAPH - BORON
HOLBROOK LANDFILL - NORTH SIDE

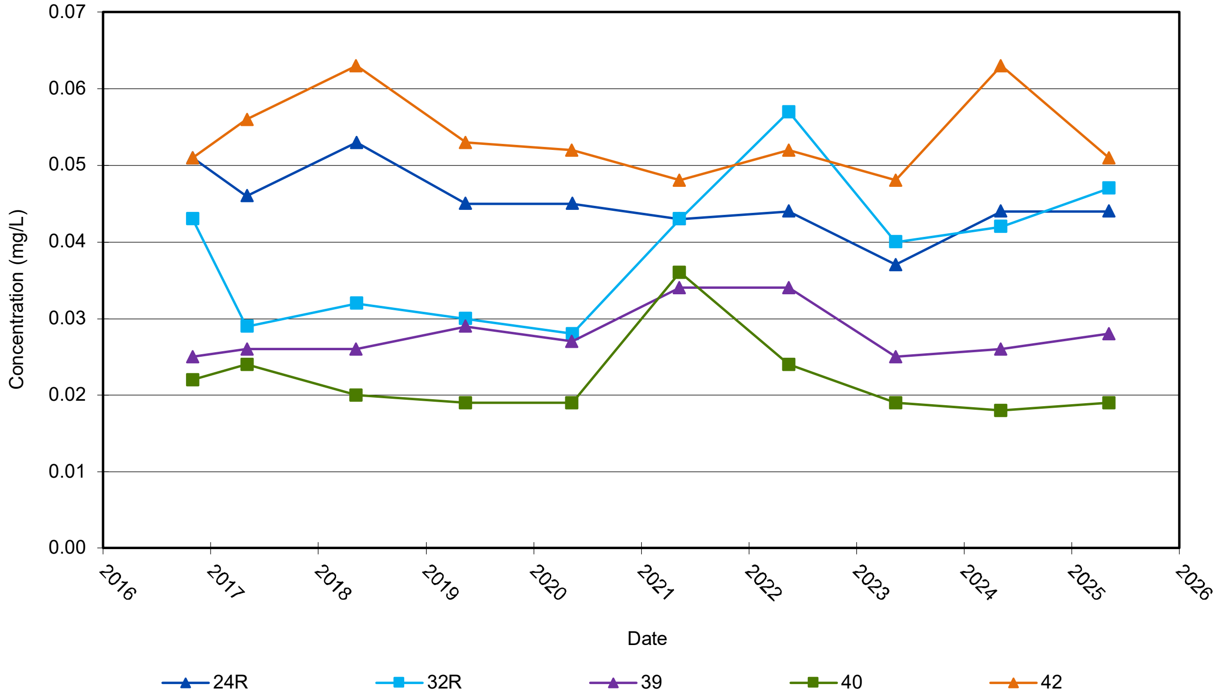


FIGURE D-21
TIME-CONCENTRATION GRAPH - BORON
HOLBROOK LANDFILL - SOUTH SIDE

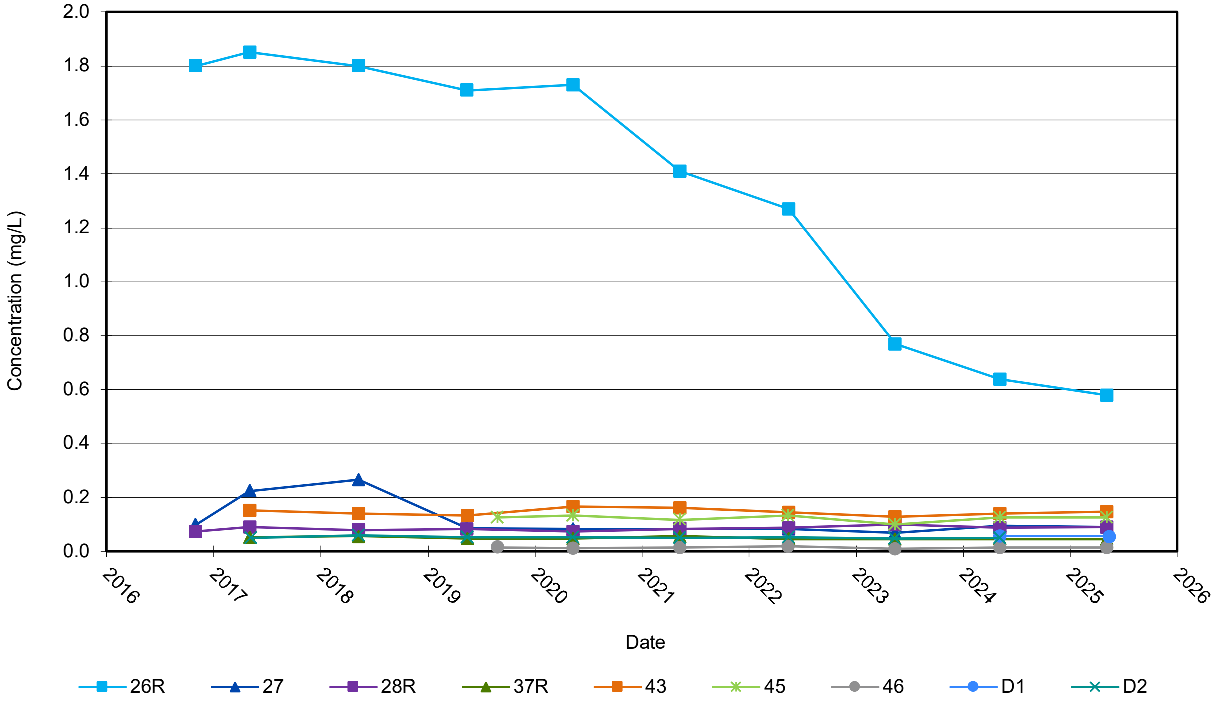


FIGURE D-22
TIME-CONCENTRATION GRAPH - BORON
HOLBROOK LANDFILL - EAST SIDE

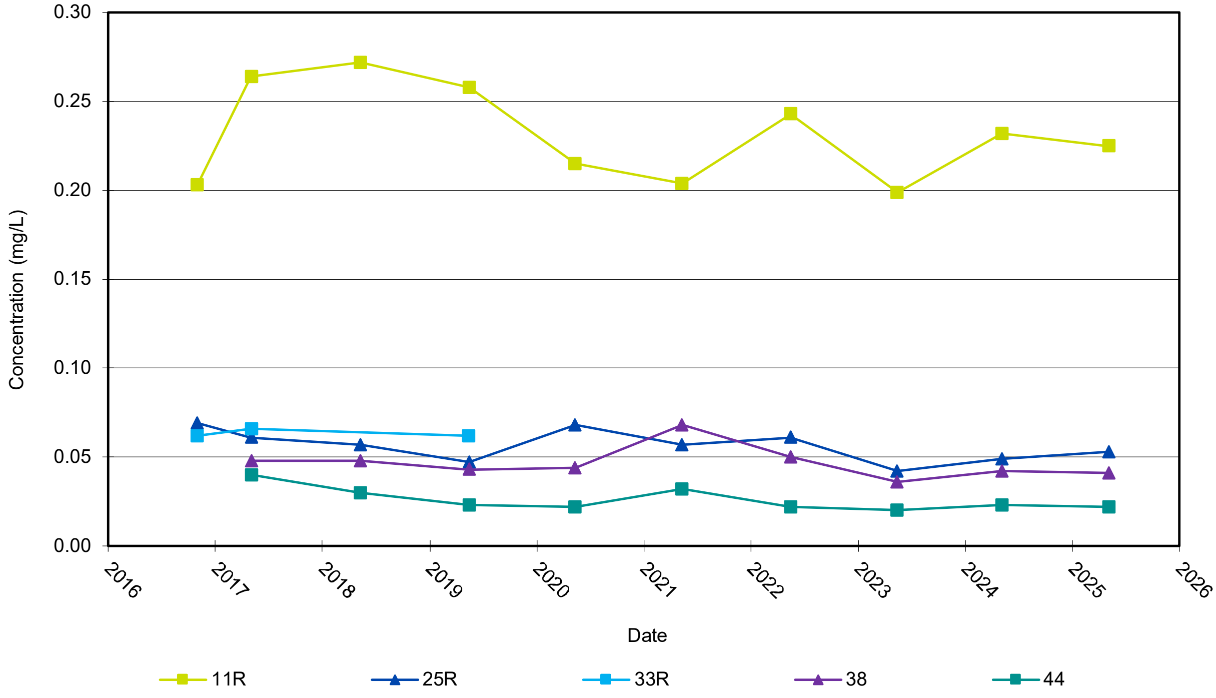


FIGURE D-23
TIME-CONCENTRATION GRAPH - BORON
HOLBROOK LANDFILL - WEST SIDE

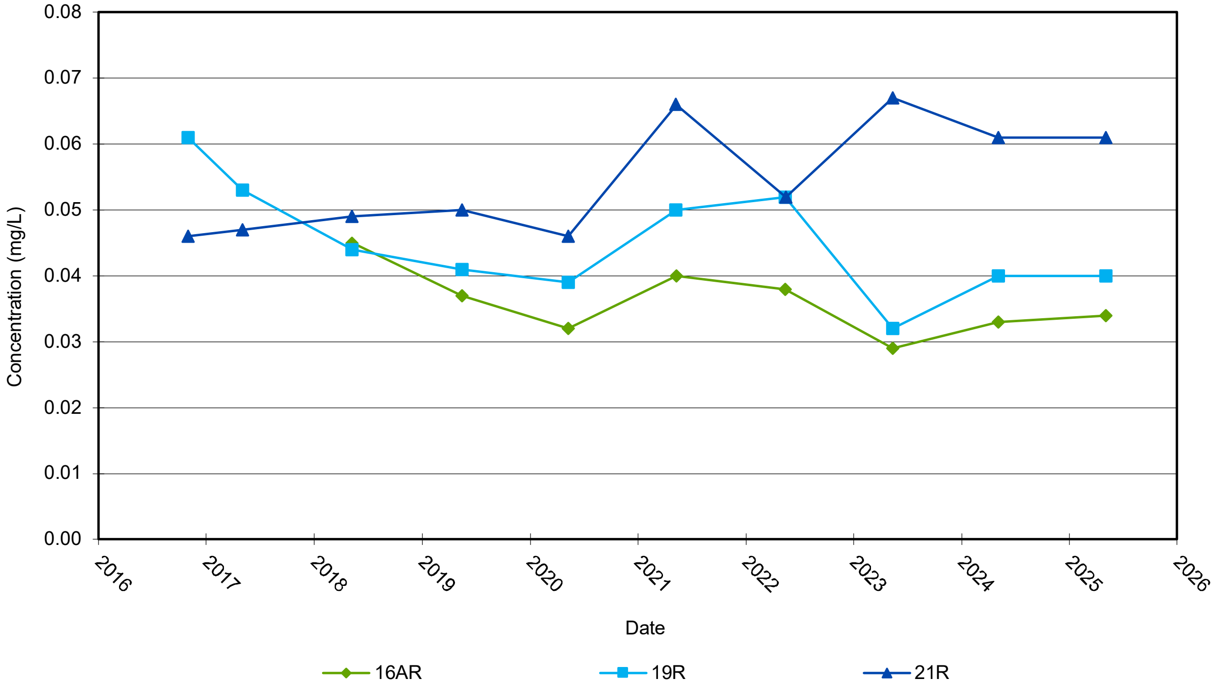


FIGURE D-24
TIME-CONCENTRATION GRAPH - IRON
HOLBROOK LANDFILL - NORTH SIDE

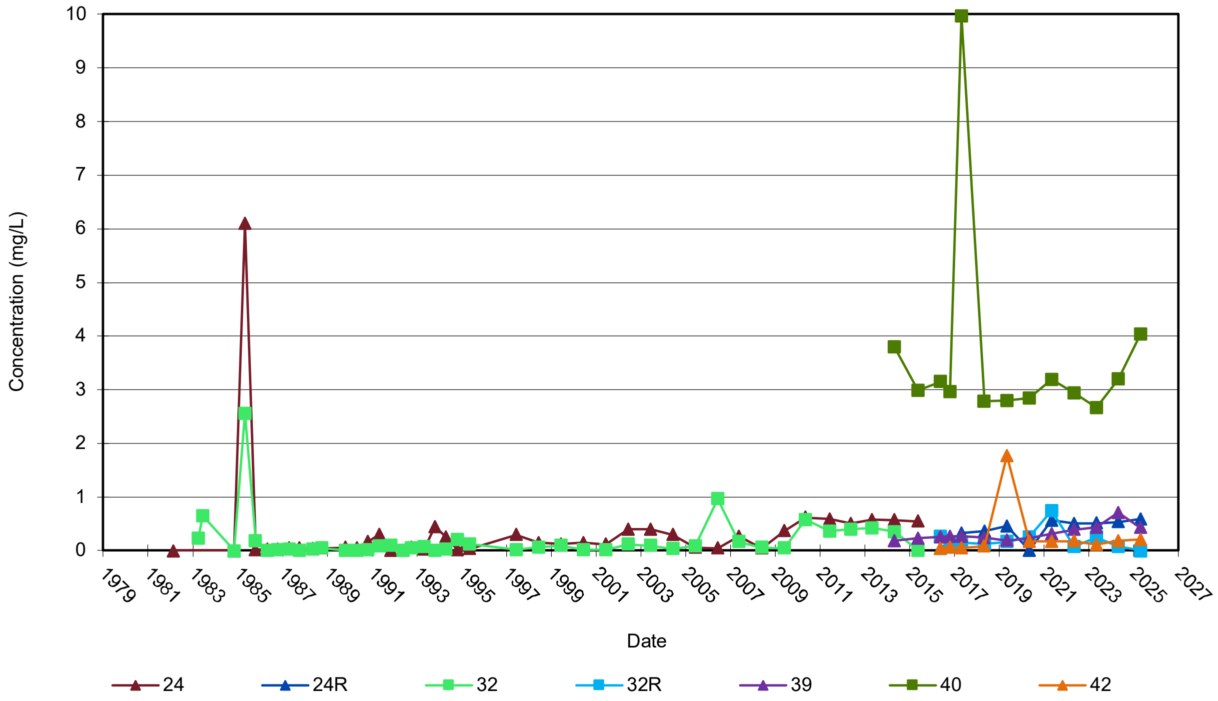


FIGURE D-25
TIME-CONCENTRATION GRAPH - IRON
HOLBROOK LANDFILL - SOUTH SIDE

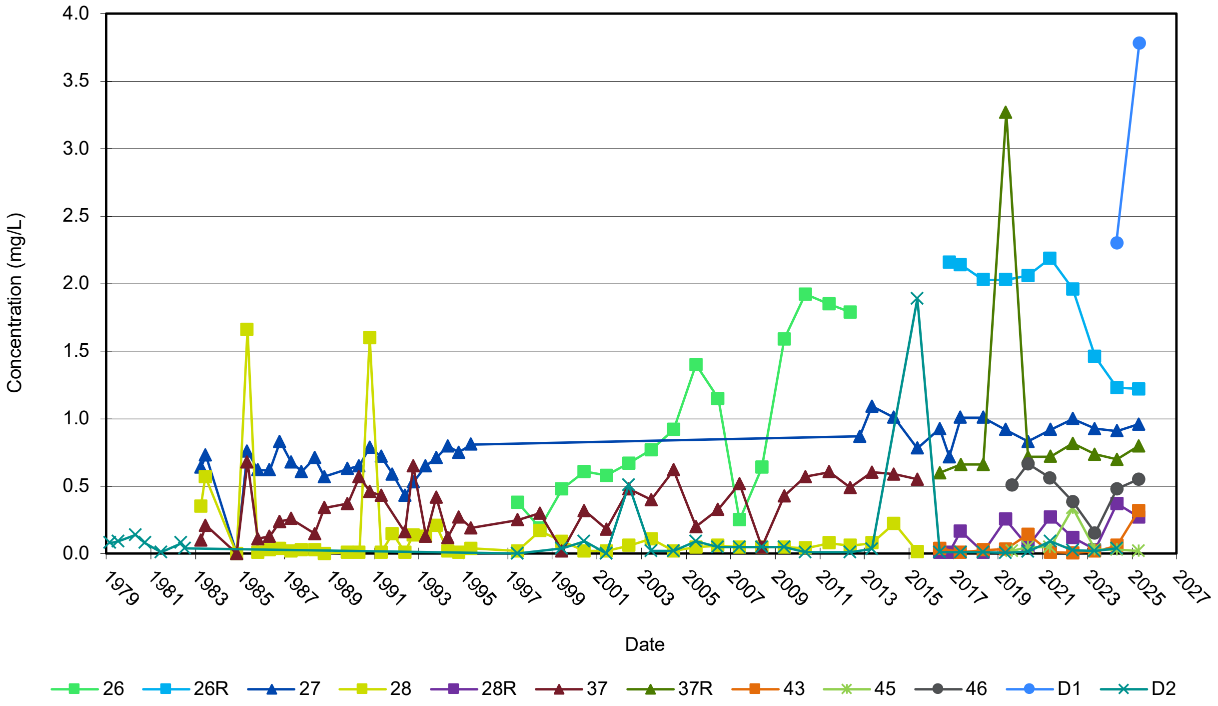


FIGURE D-26
TIME-CONCENTRATION GRAPH - IRON
HOLBROOK LANDFILL - EAST SIDE

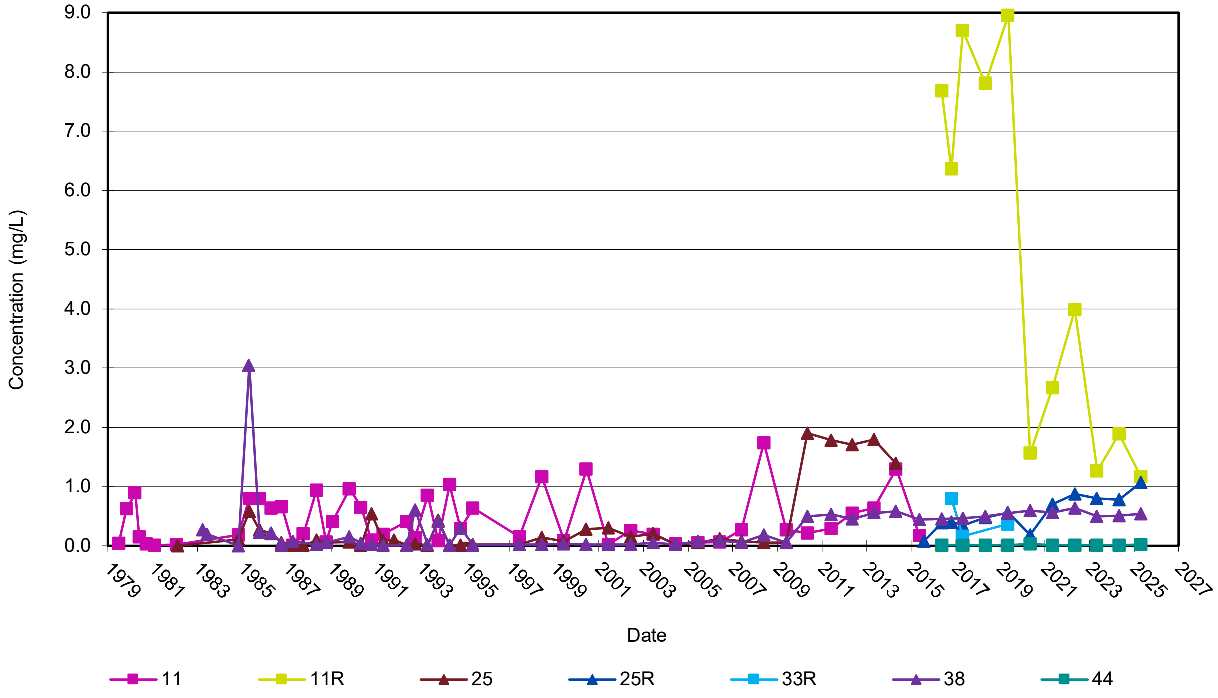


FIGURE D-27
TIME-CONCENTRATION GRAPH - IRON
HOLBROOK LANDFILL - WEST SIDE

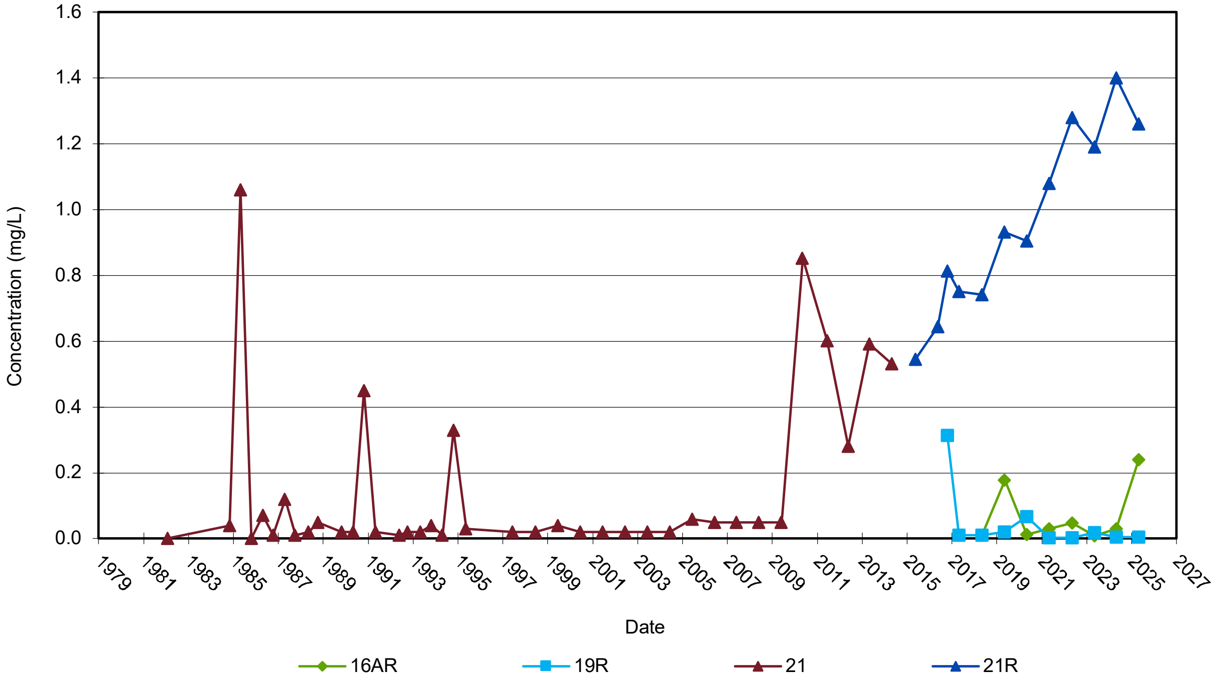


FIGURE D-28
TIME-CONCENTRATION GRAPH - AMMONIA
HOLBROOK LANDFILL - NORTH SIDE

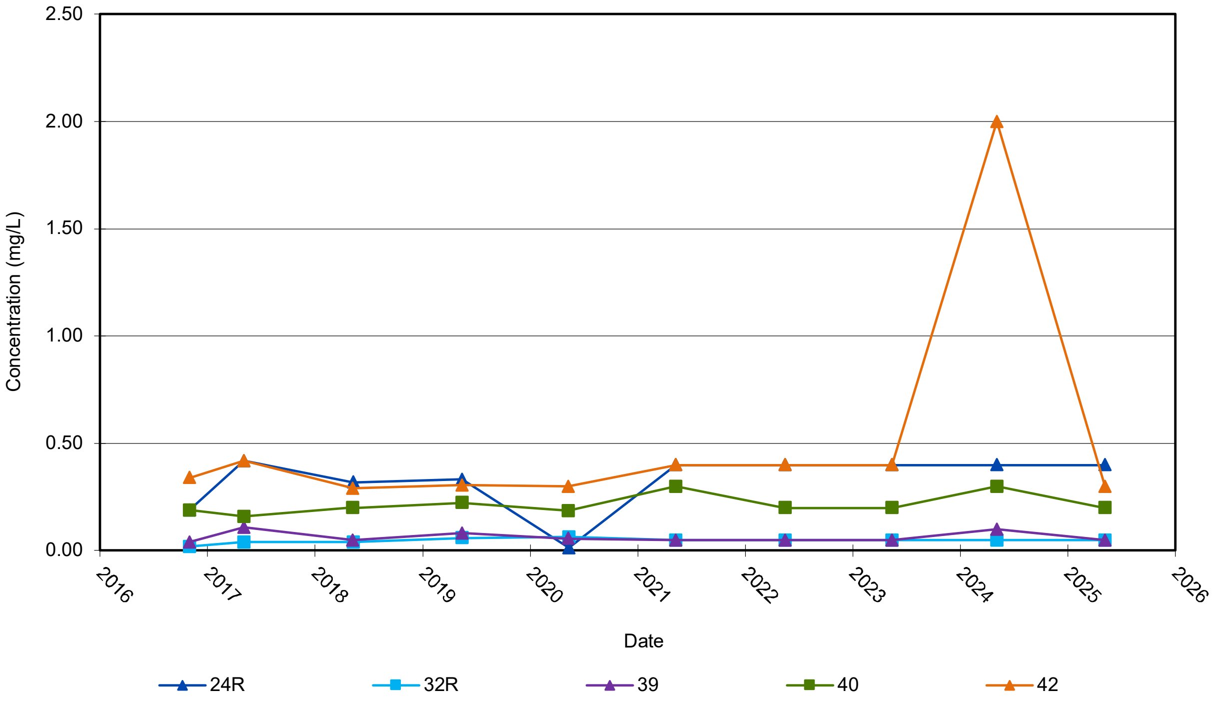


FIGURE D-29
TIME-CONCENTRATION GRAPH - AMMONIA
HOLBROOK LANDFILL - SOUTH SIDE

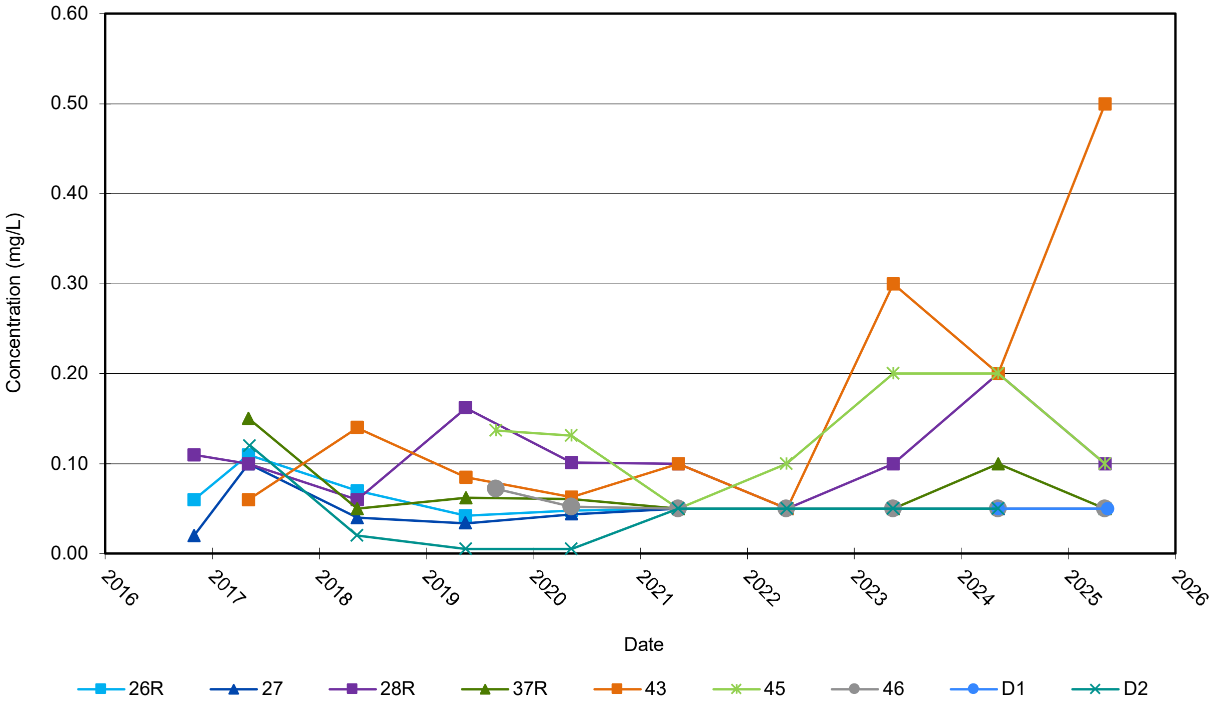


FIGURE D-30
TIME-CONCENTRATION GRAPH - AMMONIA
HOLBROOK LANDFILL - EAST SIDE

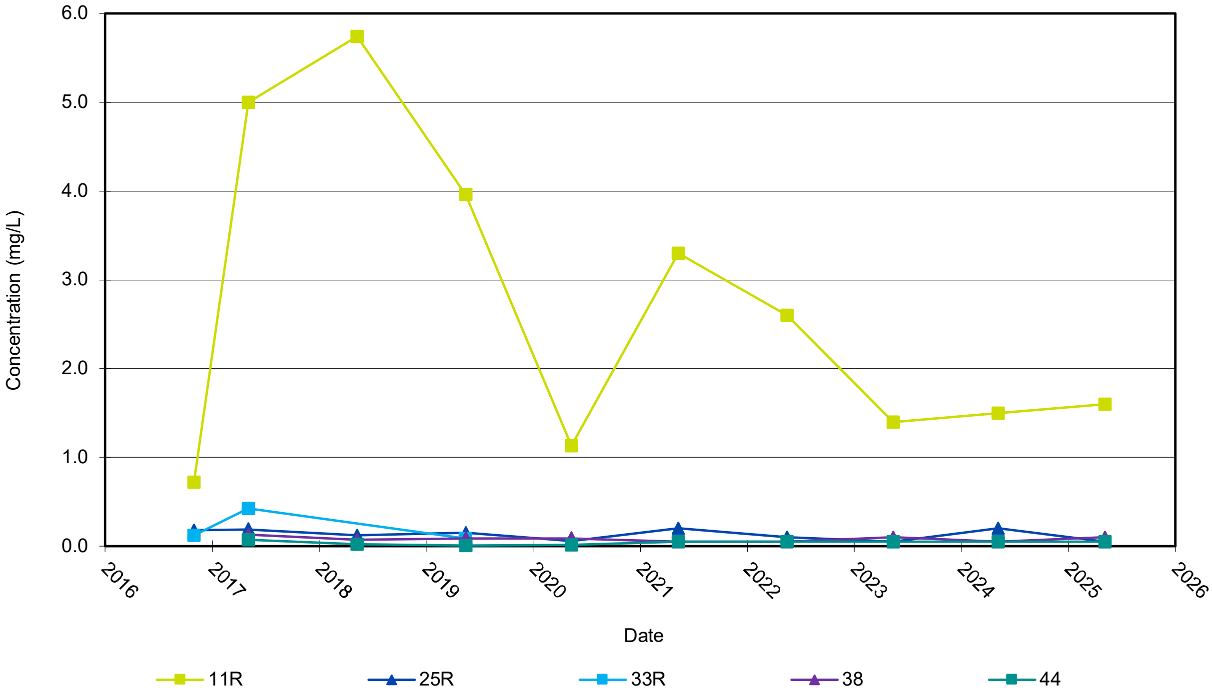


FIGURE D-31
TIME-CONCENTRATION GRAPH - AMMONIA
HOLBROOK LANDFILL - WEST SIDE

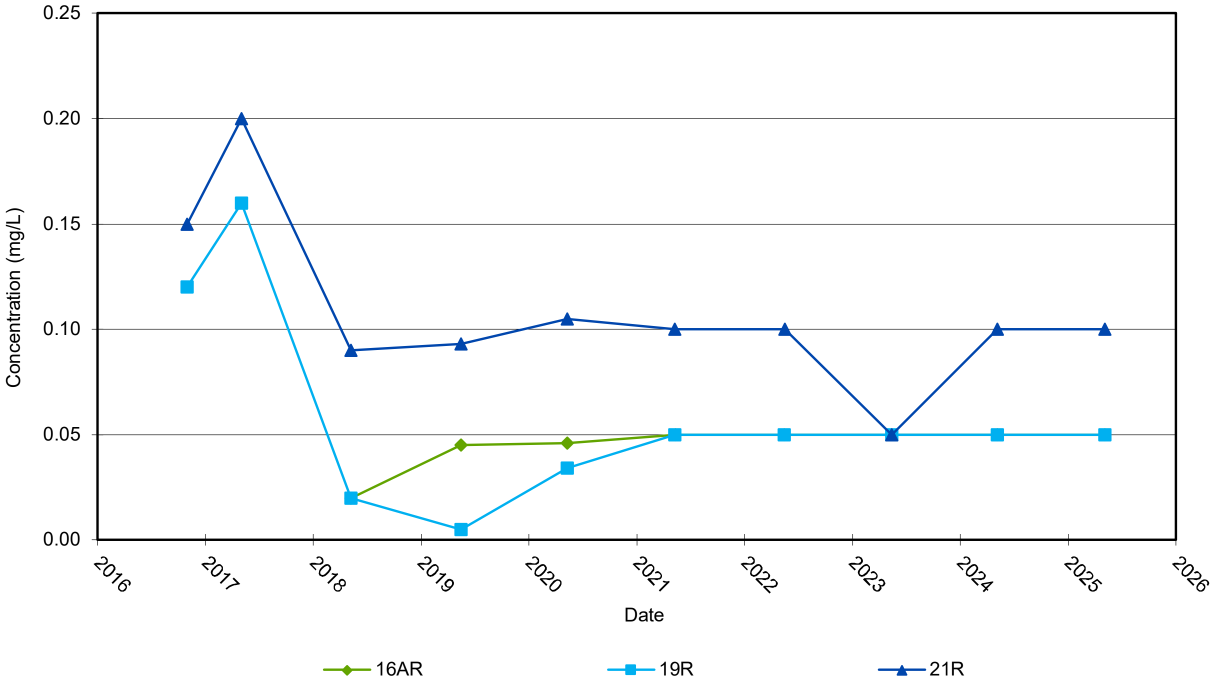


FIGURE D-32
TIME-CONCENTRATION GRAPH - TKN
HOLBROOK LANDFILL - NORTH SIDE

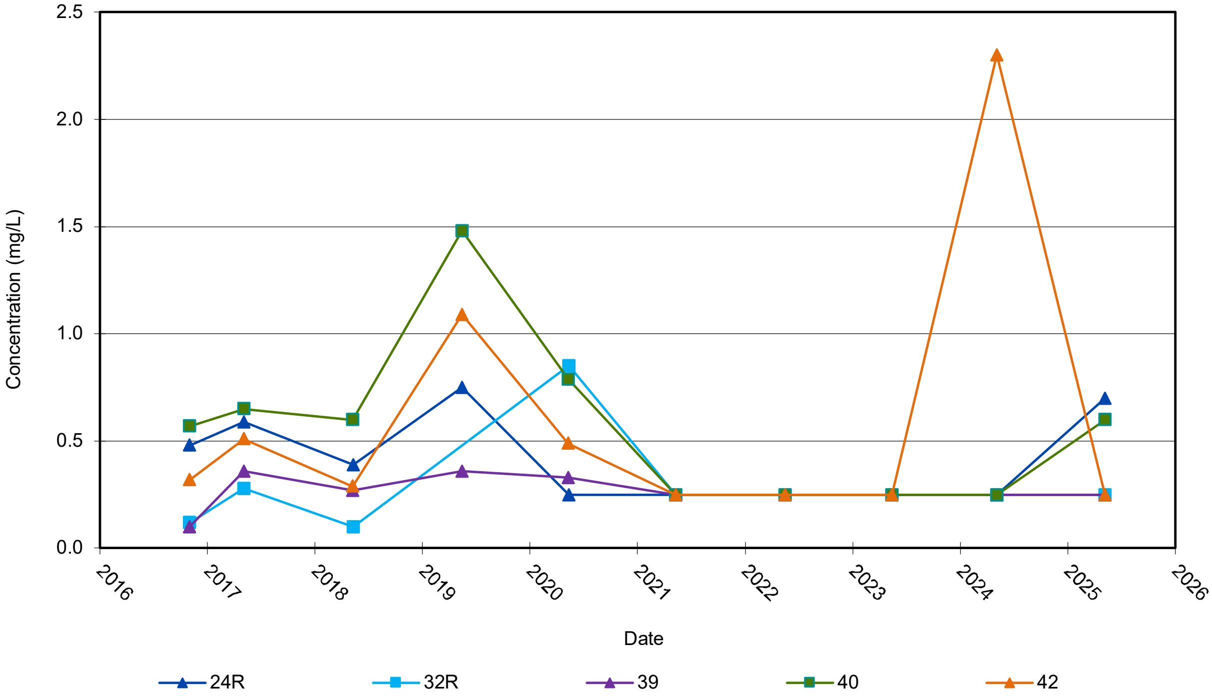


FIGURE D-33
TIME-CONCENTRATION GRAPH - TKN
HOLBROOK LANDFILL - SOUTH SIDE

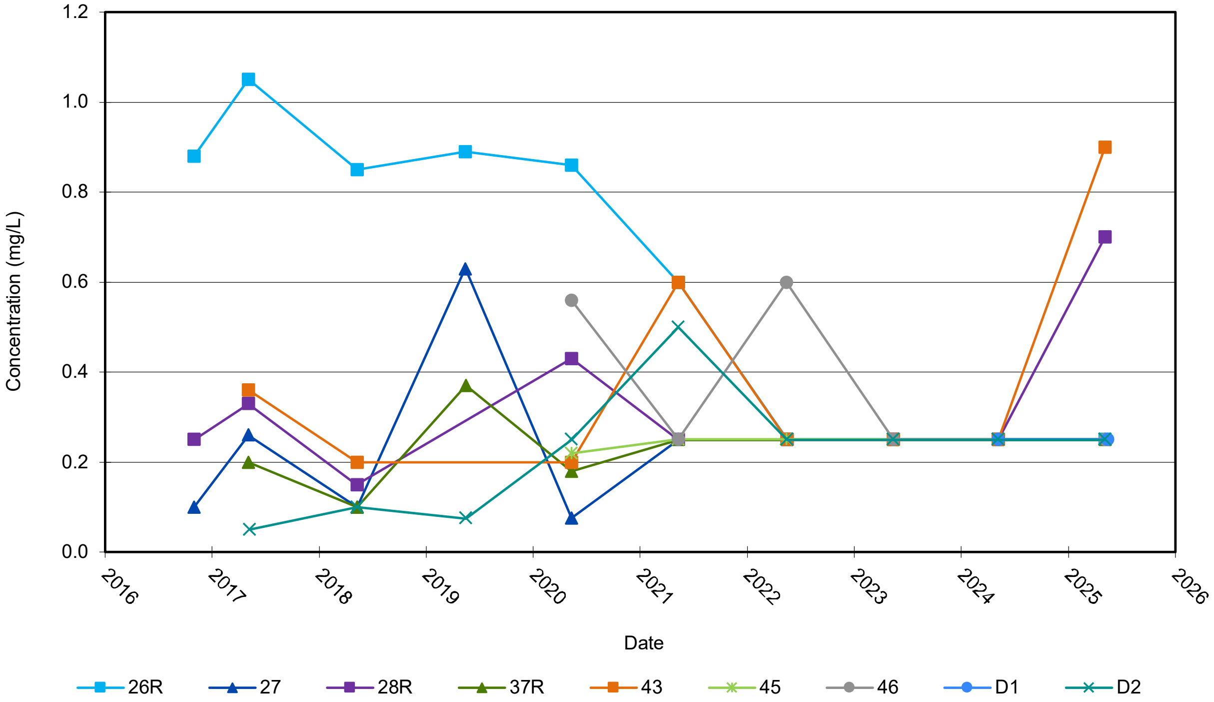


FIGURE D-34
TIME-CONCENTRATION GRAPH - TKN
HOLBROOK LANDFILL - EAST SIDE

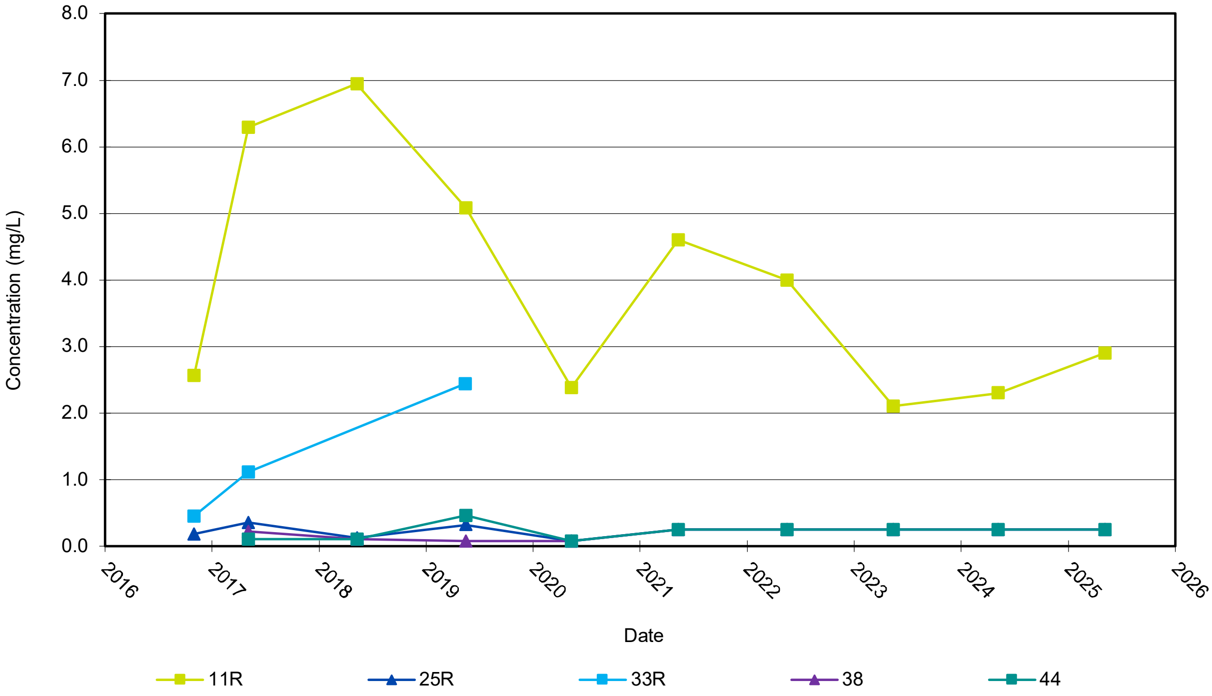
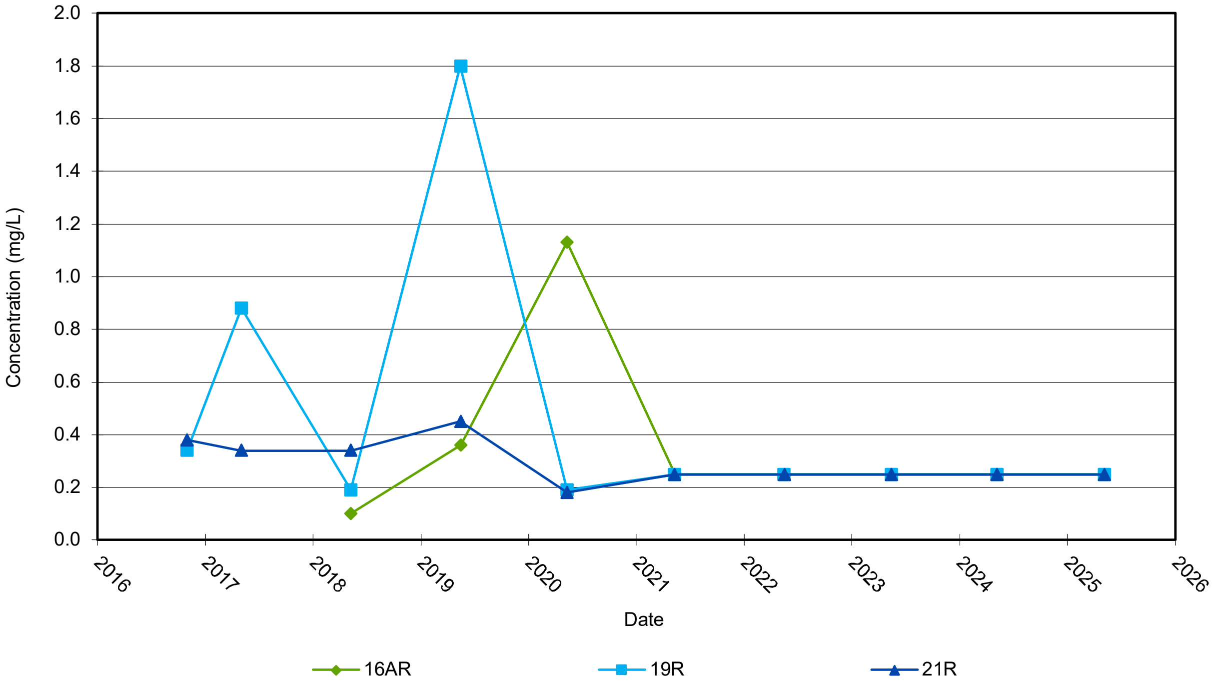


FIGURE D-35
TIME-CONCENTRATION GRAPH - TKN
HOLBROOK LANDFILL - WEST SIDE



APPENDIX E

Surface Water Chemistry

Notation	***Description***		
	all units in mg/L unless otherwise noted	EC	Electrical Conductivity
mg/L	milligrams per Litre	ºC	degrees Celsius
µg/L	micrograms per Litre	µS/cm	microSiemens per centimetre
SU	Scientific Units	T	Temperature
PWQO	Provincial Water Quality Objectives (July 1994)		
i	interim PWQO		
nc	no PWQO criteria		
a	**alkalinity** should not decrease by more than 25% of the natural concentration: calculated on an event specific basis from background station CO6 when sampled		
em	equipment malfunction - field parameter data not available		
DRY	sampling location dry at the time of sampling		
- or blank	parameter not analysed during sampling event		
< value	parameter not detected above associated laboratory reported detection limit		
*	estimated value / result interpreted with caution or considered questionable		

Table E-1: Surface Water Chemical Results

		Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
Well	Date	pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO1	30-Mar-83					7.30	380	222	12.0														
	18-Apr-83					7.30	380	222	12.0														
	15-Jun-83					7.30	620	324	2.0														
	20-Jul-83					7.45	670	356	21.0		328	108.0	20.8										
	13-Sep-83					7.20	580	328	26.0														
	14-Nov-83					8.24	640	342	21.8		305	95.0	25.5									0.39	
	8-Dec-83					7.30	510	316	19.0														
	30-Apr-84					7.30	600	318	18.0														
	15-Jun-84					7.94	720	342	22.0		331	96.0	24.8									0.42	
	8-Aug-84					7.92	553	288	17.8		251	83.0	19.5									0.22	
	10-Aug-84					7.48	700	346	23.5		336	100.0	23.4									0.65	
	18-Sep-84					7.65	660	348	21.5		315	99.5	24.0									0.32	
	18-Dec-84					7.88	618	309	22.0		293	86.0	22.8									0.20	
	24-Jun-85					7.77	660	321	22.0		317	89.0	23.8									0.30	
	7-Oct-85					7.57	710	338	18.5		300	97.0	23.2									1.45	
	18-Dec-85					7.51	690	346	22.0		290	98.0	24.4									0.80	
	12-Mar-86					7.46	468	228	18.5		200	68.0	14.0									0.84	
	10-Jun-86					7.81	635	314	20.5		302	90.0	21.6									0.44	
	18-Sep-86					7.60	615	291	23.5		260	80.0	22.0									0.24	
	15-Dec-86					7.56	625	311	21.5		274	85.5	23.6									0.74	
	6-Mar-87					7.81	630	321	20.5		275	90.5	23.0									0.20	
	12-Jun-87					7.61	660	316	25.0		304	86.0	24.4									0.65	
	14-Sep-87					7.52	615	303	28.0			82.0	23.8									0.60	
	14-Dec-87					7.60	595	288	22.8		234	81.6	20.4									0.26	
	7-Mar-88					7.36	625	314	19.9		273	88.1	22.6									0.54	
	6-Sep-88					7.49	550	258	24.0		243	66.2	22.5									0.38	
	12-Dec-88					7.31	733	373	26.0		314	102.0	28.5									0.25	

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO1	14-Mar-89					7.66	610	288	20.7		260	80.3	21.2									0.24	
cont'd	14-Mar-89					7.66	610	288	20.7		260	80.3	21.2									0.24	
	13-Jun-89					7.52	498	232	22.0			57.9	21.1									0.38	
	11-Sep-89					7.42	559	311	28.2		256	85.0	24.0									2.40	
	11-Dec-89					7.65	667	335	26.8		280	89.3	27.2									0.61	
	5-Mar-90					7.39	598	291	20.5		272	83.3	20.1									0.41	
	21-Jun-90					7.92	508	252	24.0		231	63.1	22.9									0.23	
	17-Sep-90					7.43	531	273	26.0		237	73.3	21.9									0.44	
	2-Dec-90					8.24	568	272	21.0		246	74.2	21.1									0.06	
	11-Mar-91					7.77	619	307	23.0		271	87.3	21.6									0.09	
	17-Jun-91					7.69	493	213	28.3		201	48.6	22.3									0.54	
	9-Sep-91					7.62	494	218	28.4		183	48.0	23.8									0.58	
	3-Dec-91					7.81	515	253	20.3		221	69.3	19.4									0.09	
	24-Mar-92					7.61	618	303	23.3		273	82.1	23.8									0.26	
	16-Jun-92					7.78	486	223	29.7		166	44.2	27.4									0.75	
	15-Sep-92					7.74	511	244	24.2		212	59.3	23.3									0.53	
	7-Dec-92					7.75	632	349	23.3		285	99.3	24.4									0.44	
	23-Mar-93					7.82	629	338	22.4		272	96.5	23.6									0.47	
	15-Jun-93					7.69	446	204	25.0		198	46.3	21.3									0.56	
	7-Sep-93					7.61	533	274	30.5		227	65.4	26.9									0.76	
	7-Dec-93					8.44	621	325	22.9		243	89.1	24.7									0.19	
	21-Mar-94					7.59	667	373	24.1		296	105.0	26.6									0.28	
	21-Jun-94					7.68	522	253	31.3		248	58.0	26.3									0.98	
	6-Dec-94					7.83	618	321	21.8		268	85.8	25.9									0.19	
	28-Mar-95					7.83	613	316	25.5		252	86.7	24.2									0.21	
	26-Jun-95					7.70	529	251	31.0		208	61.5	23.6									0.64	
	16-May-97					8.42	611	307	27.1		268	84.3	23.4									0.22	0.030

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

		Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
Well	Date	pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO1	16-Oct-97					8.05	630	383	33.0		270	112.0	25.0									0.12	0.040
cont'd	16-Dec-97					7.71	588	253	32.0		238	63.2	23.2									0.66	0.130
	16-May-98					8.40	583	281	33.0		276	74.1	23.2									0.37	0.100
	16-Oct-98					8.15	869	325	51.0		236	81.2	29.7									0.36	0.110
	16-Dec-98					8.33	594	273	44.0		216	65.0	27.0									1.72	0.370
	16-May-99					7.90	670	344	32.0		270	97.4	24.4									0.16	0.070
	16-Jul-99					8.04	561	278	40.0		232	65.6	27.7									1.19	0.370
	16-Oct-99					7.87	888	325	48.0		220	84.3	27.8									1.36	0.180
	16-Dec-99					7.75	666	396	61.9		102	113.0	27.7									2.04	0.720
	16-May-00					7.95	595	329	29.0		262	94.5	22.6									0.16	0.050
	16-Jul-00					7.57	592	317	30.0		260	87.4	24.1									1.08	0.530
	16-Oct-00					7.88	637	335	40.0		261	87.2	28.4									0.26	0.070
	16-Dec-00					7.81	610	352	34.0		281	100.0	24.8									0.50	0.240
	16-May-01					7.69	643	341	37.0		276	96.6	24.3									0.08	0.020
	16-Jul-01					8.24	591	311	45.0		227	78.7	27.8									0.32	0.090
	16-Oct-01					8.05	624	337	43.0		265	85.8	29.7									0.21	0.090
	16-May-02					7.98	717	384	43.0		303	106.0	29.0									0.29	0.090
	16-Jul-02					8.42	667	297	48.0		277	75.1	26.6									0.68	0.410
	16-Oct-02					7.97	713	368	57.0		276	98.1	30.0									1.68	0.410
	16-May-03					8.06	634	288	46.0		233	80.2	21.4									0.27	0.130
	16-Jul-03					7.81	628	344	49.0		254	87.7	30.4									2.73	0.980
	16-Dec-03					7.74	629	316	56.0		266	84.7	25.4									0.63	0.240
	16-May-04					7.96	652	327	50.0		242	87.2	29.1									1.61	0.310
	16-Jul-04					7.68	641	332	49.0		268	85.4	28.8									1.01	0.360
	16-Oct-04					8.15	657	338	48.0		262	90.0	27.6									0.24	0.034
	16-Dec-04					8.12	682	310	57.0		236	73.7	30.6									1.42	0.300
	16-May-05					8.20	700	321	47.4		279	88.4	24.4									0.20	0.043

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO1	16-Jul-05					8.16	646	335	56.9		245	73.8	36.5									2.10	0.540
cont'd	16-Oct-05					8.19	632	330	46.0		235	94.0	24.0									0.53	0.240
	16-Dec-05					8.05	702	267	55.0		253	67.6	23.8									0.46	0.099
	16-May-06					7.83	636	340	45.0		280	89.1	27.4									0.48	0.650
	16-Jul-06					7.75	619	320	57.0		250	78.6	29.6									1.02	0.264
	16-Oct-06					7.60	628	330	42.0		280	99.7	19.6									0.80	0.170
	16-Dec-06					7.60	607	260	60.0		280	63.9	23.4									0.70	0.170
	19-Apr-07					7.77	750	350	49.0		310	91.7	28.8									0.29	0.053
	28-Jun-07					7.68	624	320	61.0		210	64.2	37.6									3.97	0.748
	22-Nov-07					8.09	747	300	79.0		220	81.8	23.9									0.29	0.042
	15-Apr-08					8.10	687	320	50.0		270	84.0	26.0									0.13	0.020
	28-Jun-08					8.00	656	280	58.0		250	65.0	29.0									0.92	0.590
	11-Aug-08					8.00	620	290	45.0		270	77.0	24.0									2.80	2.320
	16-Apr-09					8.03	722	321	52.0		289	93.8	21.1									0.12	0.020
	1-May-09					8.06	554	279	32.7		240	82.9	17.5									0.38	0.059
	1-Oct-09					8.04	672	381	52.0		247	97.3	33.6									1.41	0.422
	1-Dec-09					8.14	762	386	49.2		308	106.0	29.4									1.60	0.336
	15-Mar-10	7.80	610	2.3		8.11	637	298	40.9		261	83.8	21.5									0.20	0.092
	10-May-10	7.92	670	15.2		8.40	572	312	47.3		274	82.7	25.7									0.25	0.059
	14-Jul-10	7.17	540	26		7.69	650	266	59.8		252	61.5	27.4									1.02	0.353
	4-Oct-10	7.65	780	12.1		8.12	666	317	57.1		286	83.9	26.0									0.37	0.160
	11-Apr-11	8.03	645	13.7		8.37	731	329	53.2		288	93.0	23.4									0.07	0.032
	15-Jun-11	7.49	601	20.2		8.10	642	314	46.7		294	86.1	24.1									0.70	0.460
	6-Aug-11	7.32	615	23.3		8.05	589	232	75.4		208	49.3	26.5									0.40	0.140
	24-Oct-11	6.77	525	9.7		7.92	543	272	45.3		242	77.1	19.3									0.18	0.058
	8-Mar-12	7.61	589	6.1		8.26	715	282	50.1		279	78.5	20.9									0.11	0.031
	23-May-12	7.35	551	23.1		8.05	651	253	66.1		251	54.8	28.3									0.47	0.094

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

		Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
Well	Date	pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO1	13-Aug-12	6.98	558	21.3		7.94	603	232	69.6		207	44.1	29.6									0.67	0.236
cont'd	24-Oct-12	6.76	600	11.9		8.24	692	303	68.5		283	74.4	28.4									0.56	0.183
	9-Apr-13	8.32	826	5.8		8.03	754	293	45.8		298	82.7	20.9									0.20	0.069
	9-May-13	7.94	855	23.6		8.39	828	301	58.6		316	74.2	28.2									0.44	0.149
	7-Aug-13	8.10	707	23		7.48	703	236	66.5		240	52.4	25.5									0.17	0.063
	31-Oct-13	8.18	647	11.2		8.25	595	271	35.7		234	76.9	19.3									0.25	0.044
	28-Mar-14	7.99	807	2		8.05	641	294	43.1		281	81.7	21.8									0.21	0.144
	9-May-14	7.71	724	20.1		8.00	693	299	45.1		265	80.8	23.5									0.30	0.118
	12-Aug-14	8.23	668	21.8		8.09	658	244	53.4		249	56.8	24.9									0.451	0.204
	20-Oct-14	7.90	700	11.2		7.96	799	341	51.1		316	91.6	27.3									0.22	0.061
	6-Apr-15	6.00	610	4.4		7.97	731	322	47.7		307	89.8	23.8									0.15	0.070
	28-May-15	7.56	494	26.3		8.21	740	275	63.4		275	66.5	26.5									0.37	0.201
	26-Aug-15	8.02	720	19.8		8.40	746	268	69.5		262	60.0	28.8									0.75	0.545
	29-Oct-15	7.76	740	8.8		8.17	727	297	60.8		252	79.7	23.9									0.15	0.047
	10-Mar-16	7.76	550	7.6		7.72	695	285	48.1		275	80.1	20.6									0.08	0.089
	25-May-16	7.94	556	13.9		8.20	773	277	69.1		297	67.3	26.5									0.42	0.180
	18-Aug-16	7.52	641	21.6		8.17	873	316	72.8		251	78.1	29.3									0.32	0.127
	17-Oct-16	7.28	1310	17.2		8.10	1290	556	78.4		316	161	37.4									2.66	1.92
	1-Nov-16	7.52	1112	7.10		8.03	1120		79.8	216	308	143	31.8	5.85	40.5	0.23	0.001	<0.25	<0.25	0.573	<0.003	1.12	0.445
	7-Mar-17	7.72	652	3.19		8.19	644	239	43.5		237	66.3	17.8									0.092	0.012
	4-May-17	7.94	700	8.75		8.31	755	290	44.6	17.8	294	81.5	20.9	6.16	27.4	0.21	0.003	1.59	<0.10	0.292	<0.003	<0.010	0.023
	2-Aug-17	7.87	633	20.93		8.18	761	297	66.1		305	72.4	28.2									0.34	0.178
	17-Oct-17	7.11	619	12.49		8.04	766	309	71.8		304	79.9	26.6									0.644	0.395
	2-Apr-18	7.96	707	5.90	8.3	8.01	667	289	55.2	23.5	286	80.1	21.6	7.28	29.9	0.66	0.008	2.79	<0.10	0.325	<0.003	0.027	0.020
	18-Oct-18	8.05	712	6.41	25.2	8.12	743	320	62.1	10.9	348	84.6	26.3	7.92	34.7	0.42	0.006	0.51	<0.10	0.262	<0.003	0.63	0.393
	15-Apr-19	7.78	591	3.91	0.0	7.99	580	256	36.0	14.0	248	72.2	18.4	6.03	24.2	0.203	0.001	2.13	0.017	0.198	0.0019	0.118	0.016
	8-Oct-19	7.99	620	12.29	8.0	7.77	715	306	59.1	13.7	298	72.4	30.4	8.36	38.7	0.281	0.006	0.486	0.020	0.310	<0.0050	0.34	0.189

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO1	8-Apr-20	7.75	614	9.52	2.0	8.23	692	308	48.1	14.1	297	83.5	24.1	8.00	31.2	0.142	0.001	2.12	0.03	0.307	<0.00050	0.099	0.0284
cont'd	15-Oct-20	7.96	624	13.72	2.0	8.10	752	334	60.7	5.99	320	86.3	28.9	7.61	36.8	0.849	0.019	0.103	0.044	0.350	<0.0050	1.62	0.760
	12-Apr-21	7.74	624	14.13	1.0	8.07	677	319	49	15	269	91.4	22.1	8.98	31.8	0.2	0.003	1.03	<0.03	0.397	0.00053	0.15	0.055
	7-Oct-21	7.65	638	17.42	2.0	7.96	728	322	52	12	300	89.1	24.1	7.93	29.2	0.5	0.007	0.35	0.030	0.301	0.00022	0.58	0.511
	6-Apr-22	7.79	664	6.66	9.5	8.02	678	341	54	22	284	95.3	25.2	8.48	33.6	0.5	0.004	2.13	<0.03	0.332	<0.00008	0.12	0.0590
	18-Oct-22	7.84	691	9.24	5.0	8.26	737	296	61	22	274	70.8	28.9	10.6	40.7	0.8	0.010	0.57	<0.03	0.359	<0.00008	0.55	0.276
	3-Apr-23	7.68	656	6.08	17.4	8.09	584	261	43	19	211	77.2	16.7	6.22	23.8	1.04	0.007	5.88	<0.03	0.184	0.00015	0.276	0.0119
	12-Oct-23	7.27	632	12.04	25.2	8.01	711	273	57	19	271	68.5	24.7	8.83	33.4	1.5	0.006	0.68	0.050	0.292	<0.003	0.36	0.132
	18-Mar-24	7.69	692	2.67	2.3	8.26	699	318	56	18	290	88.1	23.8	7.98	29.2	0.6	0.003	2.12	<0.03	0.234	0.00033	0.11	0.0375
	16-Oct-24	7.60	629	9.41	0.0	8.34	748	295	54	15	298	73.0	27.3	8.84	36.5	0.6	0.004	0.24	<0.03	0.232	<0.003	0.48	0.242
	29-Apr-25	7.67	690	6.13	13.1	8.20	457	331	51	18	313	90.6	25.4	8.20	33.7	0.3	0.002	1.43	0.040	0.319	<0.003	0.2	0.114
	21-Oct-25	7.70	1220	12.91	246	8.00	1110	421	140	14	405	122	28.5	6.40	77.0	2.1	0.024	<0.06	<0.03	0.340	<0.003	8.97	1.04
CO4	20-Mar-80					7.70	490	253	16.0			74.5	16.2									1.34	
	27-May-80					8.00	690	353	25.0			100.0	25.0									0.21	
	17-Sep-80					7.80	745	376	30.5			105.0	27.6									0.08	
	25-Sep-81					7.60	625		26.0														
	2-Oct-81					7.40	595	330	26.0														
	3-Oct-81						635		23.0														
	2-Feb-82					8.00	640	388	25.0		305											0.02	
	4-May-82					7.90	480	344	20.0														
	2-Sep-82					8.00	780	397	32.0			112.0	28.4										
	3-Sep-82					8.00	780	397	32.0			112.0	28.4										
	30-Mar-83					7.80	460	294	16.0														
	18-Apr-83					7.80	460	294	16.0														
	15-Jun-83					7.80	700	400															
	20-Jul-83					7.84	620	329	37.0		302	92.0	24.0										
	14-Sep-83					7.70	610	364	20.0														
	8-Dec-83					7.70	350	200	16.0														

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO4	12-Dec-83					7.70	350	200	16.0														
cont'd	30-Apr-84					7.70	670	354	20.0														
	18-Sep-84					7.91	720	212	23.0		356	41.0	26.6									8.15	
	24-Jun-85					7.82	690	329	22.5		310	89.5	25.6									0.30	
	18-Dec-85					7.50	735	374	22.5		308	105.0	25.2									0.10	
	18-Sep-86					8.12	560	256	22.5		212	65.5	22.4									0.21	
	6-Mar-87					7.84	635	324	19.5		275	91.5	23.0									0.26	
	14-Sep-87					7.53	550	265	27.0			63.0	26.2									0.84	
	7-Mar-88					7.66	695	368	21.8		294	104.4	26.0									0.19	
	12-Dec-88					7.07	1144	748	22.7		457	233.5	40.0									10.40	
	5-Mar-90					7.72	701	347	25.6		318	99.6	23.8									0.01	
	21-Jun-90					7.76	485	234	25.0		199	54.3	23.8									0.96	
	2-Dec-90					8.58	604	280	22.1		264	74.4	22.8									0.13	
	11-Mar-91					7.89	623	303	23.7		270	87.3	20.6									0.22	
	9-Sep-91					7.84	454	198	28.6		150	39.0	24.4									0.60	
	24-Mar-92					7.94	666	328	29.0		209	87.7	26.3									0.18	
	16-Jun-92					8.08	462	213	30.7		145	38.6	28.2									0.38	
	7-Dec-92					7.97	682	343	27.5		302	96.4	24.8									0.13	
	23-Mar-93					7.77	679	370	22.0		306	104.0	26.3									0.26	
	7-Sep-93					7.86	486	234	28.4		188	51.2	25.7									0.44	
	21-Mar-94					7.55	699	381	25.0		306	108.0	26.6									0.26	
	21-Jun-94					7.84	511	240	32.6		219	51.8	26.8									0.77	
	6-Dec-94					8.09	636	304	28.6		230	77.4	26.1									0.18	
	28-Mar-95					8.08	664	306	31.7		231	86.7	26.6									0.34	
	15-Jun-97					8.27	552	324	28.0		268	86.5	26.3									0.30	0.060
	15-Jun-98					8.05	601	298	33.0		275	78.1	25.1									0.41	0.230

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO4	15-Jun-99					8.10	677	348	41.0		300	95.2	26.8									0.42	0.070
cont'd	15-Jun-00					8.22	635	371	42.0		236	102.0	28.2									0.44	0.130
	15-Jun-01					7.76	669	353	42.0		289	99.9	25.2									0.40	0.080
	15-Jun-02					8.05	749	392	47.0		317	108.0	29.6									0.48	0.210
	15-Jun-03					8.11	748	370	53.0		295	94.7	32.4									0.68	0.110
	15-Jun-04					8.12	721	337	52.1		294	89.7	26.7									0.70	0.102
	15-Jun-05					8.20	738	335	51.9		298	91.7	25.8									0.40	0.090
	15-Jun-06					7.90	693	340	53.0		290	87.9	30.1									1.10	0.279
	19-Apr-07					7.85	790	380	52.0		330	101.0	30.3									0.56	0.072
	15-Apr-08					8.10	740	350	49.0		310	92.0	29.0									0.47	0.040
	16-Apr-09					8.18	747	316	61.2		306	89.1	22.8									0.52	0.071
	10-May-10	8.16	680	14.8		8.17	530	306	54.3		280	77.9	27.1									0.40	0.058
	11-Apr-11	7.95	723	14.8		8.32	791	345	55.9		322	97.4	24.8									0.35	0.060
	8-Mar-12	7.79	632	7.0		8.34	776	312	50.0		329	87.6	22.7									0.31	0.041
	9-Apr-13	8.39	924	8.7		8.13	879	328	56.8		349	92.4	23.6									0.47	0.110
	28-Mar-14	7.98	896	2.7		8.15	822	329	48.2		339	92.2	23.9									0.20	0.209
	6-Apr-15	7.68	655	8.0		8.15	788	339	52.3		338	94.8	24.9									0.42	0.116
	10-Mar-16	7.50	640	9.6		8.20	859	332	63.3		337	92.3	24.7									0.08	0.042
	7-Mar-17	7.88	782	5.95		8.24	778	283	48.9		306	78.1	21.3									0.422	0.166
	2-Apr-18	8.12	819	8.81	10.7	8.09	765	315	58.1	24.8	338	85.5	24.7	9.49	35.2	5.54	0.121	0.96	<0.25	0.421	<0.003	0.172	0.045
	15-Apr-19	7.97	725	5.78	0.0	8.02	718	304	47.9	21.7	297	83.3	23.4	7.96	30.0	4.20	0.051	0.841	0.019	0.317	<0.00050	0.263	0.0577
	8-Apr-20	7.95	682	11.17	10.1	8.26	768	332	54.1	18.5	328	88.3	27.0	9.37	35.4	4.73	0.084	0.748	0.034	0.374	<0.00050	0.309	0.0593
	12-Apr-21	7.89	683	16.33	1.0	8.11	737	320	52	30	285	86.9	25.0	9.95	33.4	5.3	0.121	0.43	0.04	0.417	0.00045	0.34	0.103
	6-Apr-22	8.36	766	9.42	17.7	8.27	803	382	62	25	338	107	28.2	9.79	38.1	6.2	0.242	0.78	<0.03	0.389	0.00040	0.29	0.0776
	3-Apr-23	7.71	654	6.83	24.9	8.16	626	288	50	24	243	82.9	19.7	8.53	28.3	4.80	0.035	1.83	<0.03	0.287	0.00275	2.66	0.0445
	18-Mar-24	7.73	791	4.72	2.7	8.25	797	335	58	23	354	93.4	24.7	8.77	31.8	5.7	0.037	0.26	<0.03	0.272	0.00039	0.43	0.058
	7-May-25	8.04	817	6.31	18.3	8.34	761	313	59	23	306	79.5	27.9	10.1	35.6	5.5	0.082	0.18	<0.03	0.367	<0.003	0.43	0.096

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

		Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
Well	Date	pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO6	20-Jul-83					7.27	660	294	16.0		308	87.5	18.2										
	15-Jun-84					7.21	340	175	2.0		158	52.0	11.0									3.00	
	18-Dec-85					7.45	705	287	14.5		308	85.5	17.8									33.80	
	12-Mar-86					7.13	432	202	17.5		175	61.5	11.6									7.80	
	14-Dec-87					7.59	650	328	16.7		79	102.8	17.2									0.12	
	7-Dec-93					4.50	586	300	13.4		111	92.5	16.8									0.45	
	15-Jun-97																						
	15-Jun-98																						
	15-Jun-99					7.69	617	348	15.0		237	107.0	19.6									0.71	0.120
	15-Jun-00					7.95	488	280	18.0		200	87.3	15.0									0.29	0.040
	15-Jun-01					7.72	545	297	38.0		242	92.9	15.9									0.07	0.020
	15-Jun-02					7.93	586	322	39.0		239	100.0	17.6									0.26	0.060
	15-Jun-03					7.86	622	321	49.0		220	97.6	18.7									0.18	0.080
	15-Jun-04					7.92	491	257	30.7		221	87.2	15.2									0.17	0.022
	15-Jun-05					8.15	518	241	29.9		213	74.8	13.1									<0.1	<0.005
	15-Jun-06					7.72	482	290	30.0		230	89.8	16.6									0.23	0.029
	19-Apr-07					7.58	572	290	35.0		250	86.6	16.9									0.18	0.018
	15-Apr-08					8.00	487	230	38.0		180	69.0	14.0									0.10	
	16-Apr-09					7.87	593	266	54.7		232	87.0	11.9									0.12	0.007
	10-May-10	7.55	590	12.4		8.31	657	338	26.7		289	105.0	18.3									3.00	0.323
	11-Apr-11	7.75	511	11.5		8.23	571	255	48.1		214	80.2	13.2									<0.01	0.003
	11-Apr-11	7.75	511	11.5		8.29	575	247	48.4		207	78.1	12.6									<0.01	0.003
	8-Mar-12	7.57	414	4.7		8.21	514	214	30.2		210	66.9	11.5									0.01	0.005
	9-Apr-13	8.25	541	4.9		7.77	480	196	27.1		194	61.5	10.3									<0.01	<0.002
	28-Mar-14	7.96	605	0.4		8.11	548	238	32.7		229	72.9	13.5									0.21	0.058
	6-Apr-15	8.03	412	5.0		7.91	523	253	33.2		222	78.9	13.5									<0.01	0.008
	10-Mar-16	7.56	355	8.0		7.96	465	233	19.6		207	72.3	12.7									<0.01	0.005

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

		Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
Well	Date	pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO6	7-Mar-17	7.67	556	4.89		8.01	559	204	58.1		171	63.2	11.2									0.013	0.010
cont'd	4-May-17	8.15	625	8.53		8.32	657	249	47.2	11.9	243	77.6	13.4	1.21	24.1	0.12	0.003	0.20	<0.10	0.015	<0.003	<0.010	0.008
	2-Apr-18	7.43	566	8.25	12.3	7.85	508	234	44.6	15.9	208	72.9	12.6	1.23	18.2	<0.02	<0.001	1.00	<0.10	0.018	<0.003	<0.010	0.002
	18-Oct-18	D	R	Y																			
	15-Apr-19	7.84	521	3.92	0.0	7.80	509	226	45.9	8.25	201	68.4	13.3	1.49	25.1	0.049	<0.001	1.12	0.015	0.011	<0.00050	0.225	0.0149
	8-Oct-19	D	R	Y																			
	8-Apr-20	7.97	567	8.75	2.0	8.07	604	274	45.4	7.52	259	82.8	16.2	1.47	26.4	0.027	<0.001	0.192	<0.010	0.014	<0.00050	0.078	0.0114
	15-Oct-20	D	R	Y																			
	12-Apr-21	7.64	511	13.84	0.0	8.05	549	280	30	14	237	89.5	13.9	1.82	13.2	<0.1	<0.001	0.11	<0.03	0.026	0.00041	0.11	0.0334
	7-Oct-21	7.55	662	10.37	22.8	8.05	754	382	41	<2	342	122	18.8	2.19	22.6	<0.1	<0.001	0.76	<0.03	0.034	0.00072	0.60	0.243
	6-Apr-22	7.69	558	6.86	10.4	8.13	592	298	52	15	253	91.5	16.9	1.27	27.8	<0.1	<0.001	0.22	<0.03	0.040	0.00032	0.05	0.0342
	18-Oct-22	D	R	Y																			
	3-Apr-23	7.48	573	5.13	7.6	8.00	491	220	52	20	176	68.9	11.6	1.88	23	0.04	<0.001	4.57	0.04	0.023	0.00013	0.245	0.00576
	12-Oct-23	D	R	Y																			
	18-Mar-24	7.66	620	2.97	8.0	8.20	619	288	47	12	262	89.1	15.8	1.27	22.8	<0.1	<0.001	<0.06	<0.03	0.013	0.00066	0.37	0.0751
	16-Oct-24	D	R	Y																			
	29-Apr-25	7.58	587	6.75	9.0	8.09	579	303	41	9	264	94.9	16.1	1.70	21.1	<0.1	<0.001	<0.06	<0.03	0.025	<0.003	0.45	0.278
	21-Oct-25	D	R	Y																			
NE1	20-Jul-83					7.44	330	169	4.5		156	54.0	8.2										
	18-Sep-84					8.00	425	163	24.0		153	53.0	7.4									<0.04	
	24-Jun-85					7.64	510	167	31.5		210	44.5	13.6									1.10	
	18-Dec-85					7.57	580	242	22.0		236	79.5	10.6									0.60	
	18-Sep-86					8.30	227	96	5.0		89	31.5	4.2									1.85	
	6-Mar-87					8.03	309	142	7.0		128	46.5	6.2									0.44	
	7-Mar-88					7.65	254	128	4.3		89	42.5	5.2									2.30	
	12-Dec-88					7.28	506	230	13.6		211	75.8	9.9									0.50	
	5-Mar-90					7.05	241	120	2.9		105	41.5	4.0									0.09	
	21-Jun-90					8.12	553	266	15.2		283	87.9	11.2									1.14	

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

		Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
Well	Date	pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
NE1	2-Dec-90					8.20	605	260	22.4		261	86.2	10.9									0.05	
cont'd	11-Mar-91					6.68	646	32	0.9		25	10.4	1.5									0.06	
	24-Mar-92					7.39	336	165	9.7		105	52.4	8.3									0.02	
	16-Jun-92					7.75	699	316	20.1		329	98.9	16.6									1.14	
	7-Dec-92					7.30	425	208	9.3		212	68.9	8.6									0.40	
	23-Mar-93					6.80	1047	507	21.8		513	170.0	19.8									30.60	
	21-Mar-94					7.12	234	117	4.9		109	40.8	3.6									0.11	
	21-Jun-94					7.62	604	287	15.1		245	93.9	12.8									2.23	
	28-Mar-95					7.44	367	181	7.4		173	60.3	7.3									0.15	
	15-Jun-97					8.31	565	314	13.0		321	103.0	13.7									0.28	0.030
	15-Jun-98					7.60	639	344	18.0		278	112.0	18.0									1.41	0.440
	15-Jun-99					8.17	798	413	26.0		346	140.0	26.0									0.18	<0.02
	15-Jun-00					7.64	703	428	15.0		300	144.0	15.0									0.55	0.080
	15-Jun-01					7.21	437	256	7.0		224	86.1	7.0									0.22	0.030
	15-Jun-02					7.72	795	399	28.0		385	130.0	28.0									0.56	0.250
	15-Jun-03					7.72	659	361	23.0		311	118.0	23.0									0.35	0.270
	15-Jun-04					7.97	657	357	21.2		337	102.0	21.2									0.92	0.034
	15-Jun-05					8.16	730	318	33.4		334	99.3	33.4									0.10	0.029
	15-Jun-06					7.55	637	370	14.0		340	121.0	14.0									0.78	0.053
	19-Apr-07					7.25	642	340	13.0		320	110.0	16.1									0.34	0.023
	15-Apr-08					7.60	380	210	4.0		180	67.0	10.0									0.09	0.010
	16-Apr-09					7.63	717	341	19.0		350	115.0	13.0									0.21	0.014
	10-May-10	7.69	630	11.8		8.02	599	308	25.9		314	98.0	15.4									0.66	0.082
	11-Apr-11	7.78	421	13.1		8.15	491	241	14.7		221	81.2	9.35									0.01	0.028
	8-Mar-12	7.84	126	6.7		7.84	258	113	5.18		123	38.1	4.22									0.12	0.069
	9-Apr-13	8.29	227	5.6		7.75	240	104	5.09		112	34.2	4.40									0.02	0.048
	28-Mar-14	7.97	378	1.8		7.90	306	150	4.76		153	47.9	7.30									0.38	0.196
	6-Apr-15	8.30	220	10		7.69	260	120	8.30		115	38.9	5.48									<0.01	0.048
	10-Mar-16	7.71	267	8.9		7.77	399	152	21.7		156	47.9	7.88									<0.01	0.035
	7-Mar-17	7.52	593	5.3		8.05	585	237	14.3		255	77.9	10.2									<0.010	0.088

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
NE1	2-Apr-18	7.64	465	9.56	8.5	7.89	429	232	4.29	8.75	239	77.3	9.40	2.50	2.82	0.40	0.003	0.88	<0.10	0.046	<0.003	0.016	0.069
cont'd	15-Apr-19	8.16	585	5.18	0.0	7.55	480	244	6.75	5.33	237	79.7	10.9	3.81	5.74	1.67	0.030	3.53	0.035	0.054	<0.00050	0.071	0.00734
	8-Apr-20	8.09	493	9.35	2.8	7.85	618	323	6.29	5.50	326	106	14.0	3.60	5.35	1.91	0.041	2.50	0.069	0.060	<0.00050	0.039	0.0233
	12-Apr-21	7.67	590	14.82	2.0	8.02	639	318	30	4	296	104	13.9	10.1	17.3	1.2	0.015	<0.06	<0.03	0.143	0.00031	0.73	0.103
	6-Apr-22	8.11	607	8.77	17.0	7.73	656	391	7	5	371	132	14.8	4.35	4.58	2.4	0.051	0.32	<0.03	0.077	0.00029	0.33	0.0566
	3-Apr-23	6.71	453	5.41	20.9	7.79	279	178	3	8	162	60.0	6.82	1.88	1.93	0.07	<0.001	0.65	<0.03	0.026	0.00024	0.353	0.0145
	18-Mar-24	7.21	715	4.1	3.6	7.83	723	375	10	10	388	127	14.1	5.82	5.03	2.6	0.005	1.03	< 0.03	0.081	0.00028	0.36	0.0444
	29-Apr-25	7.71	473	7.12	16.1	8.02	443	423	20	5	418	140	18.0	15.1	14.4	6.4	0.048	0.33	0.05	0.229	<0.003	0.41	0.104
PO1	18-Sep-84					8.30	365	179	9.0		133	52.0	12.0									<0.04	
	24-Jun-85					8.21	350	150	14.0		146	29.5	18.4									2.00	
	18-Dec-85					7.47	715	338	27.5		283	96.5	23.4									0.46	
	18-Sep-86					8.26	279	122	7.5		113	33.0	9.6									0.18	
	6-Mar-87					7.87	454	233	7.5		208	66.5	16.2									0.78	
	14-Sep-87					9.00	262	116	3.5			21.5	15.0									0.46	
	7-Mar-88					7.71	192	97	4.1		72	30.9	4.8									0.80	
	12-Dec-88					7.77	538	255	10.8		231	72.6	17.9									0.37	
	13-Jun-89					8.20	429	187	23.0			36.3	23.4									0.14	
	11-Sep-89					7.78	335	191	10.3		142	46.0	18.4									1.75	
	5-Mar-90					7.66	471	235	10.6		203	66.5	16.6									0.38	
	21-Jun-90					8.32	405	207	8.9		182	56.4	15.9									1.05	
	2-Dec-90					8.56	436	212	11.6		195	60.9	14.4									0.24	
	11-Mar-91					7.58	378	186	6.7		169	55.6	11.4									0.63	
	9-Sep-91					7.64	359	163	7.1		155	41.4	14.5									0.73	
	24-Mar-92					8.18	408	208	7.8		178	57.7	15.5									0.22	
	16-Jun-92					8.78	259	132	6.4		95	22.2	18.6									2.35	
	7-Dec-92					8.20	427	226	4.5		216	61.2	17.8									0.35	
	23-Mar-93					7.33	336	134	11.7		133	42.9	6.5									3.46	
	7-Sep-93					7.73	343	169	7.9		155	35.1	19.8									1.87	

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
PO1	21-Mar-94					7.36	339	175	6.3		148	53.2	10.3									1.94	
cont'd	21-Jun-94					7.50	312	156	2.4		156	36.5	15.8									<0.01	
	6-Dec-94					7.98	310	157	4.8		147	38.7	14.7									1.36	
	28-Mar-95					8.69	261	136	2.6		121	30.6	14.5									0.62	
	15-Jun-97					8.45	350	195	8.2		182	50.8	16.6									1.01	0.170
	15-Jun-98					8.42	323	189	10.0		168	45.1	18.6									1.91	0.100
	15-Jun-99					8.21	410	217	6.0		178	81.2	15.5									0.29	0.030
	15-Jun-00					8.28	532	316	18.0		210	92.9	20.4									0.11	0.040
	15-Jun-01					7.88	524	256	21.0		246	72.4	18.2									0.29	0.060
	15-Jun-02					8.06	560	284	18.0		259	79.2	21.0									0.57	0.040
	15-Jun-03					8.05	560	315	21.0		227	88.3	22.9									0.07	0.020
	15-Jun-04					8.01	432	222	18.9		181	57.0	18.7									0.31	0.061
	15-Jun-05					8.15	496	231	16.2		190	63.0	17.9									0.22	0.070
	15-Jun-06					7.97	414	210	24.0		180	50.6	21.4									0.58	0.056
	19-Apr-07					8.13	378	180	13.0		170	39.4	20.1									0.30	0.013
	15-Apr-08					8.20	443	200	16.0		180	51.0	18.0									0.16	0.010
	16-Apr-09					8.16	478	197	26.9		197	53.0	15.6									0.10	0.009
	10-May-10	8.36	390	14.7		8.34	534	208	12.7		258	51.1	19.6									0.30	0.029
	11-Apr-11	8.12	450	17.7		8.39	491	226	13.0		223	65.6	15.1									0.06	0.020
	8-Mar-12	7.93	416	7.1		8.34	592	234	24.8		261	66.5	16.4									0.14	0.012
	9-Apr-13	8.46	471	8.4		8.00	421	192	5.72		199	53.3	14.2									0.07	0.011
	28-Mar-14	8.41	215	1.9		8.02	237	115	1.26		120	37.7	5.03									0.08	0.004
	6-Apr-15	6.50	420	7.4		7.91	488	268	4.21		254	83.0	14.8									0.06	0.025
	10-Mar-16	7.64	540	10.1		8.05	522	238	14.9		237	70.8	14.8									<0.01	0.018
	7-Mar-17	7.76	457	5.2		8.19	459	208	6.35		212	63.5	12.1									0.123	0.021
	2-Apr-18	8.07	495	6.33	9.9	8.08	455	222	14.1	9.18	232	63.8	15.3	6.92	10.5	0.21	0.003	1.87	<0.10	0.118	<0.003	0.104	0.010
	15-Apr-19	7.85	476	6.5	5.0	7.76	422	186	9.45	4.16	212	56.5	10.9	3.17	3.45	0.078	0.001	1.25	0.016	0.038	<0.00050	0.208	0.0183

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
PO1	8-Apr-20	8.12	421	11.55	10.4	8.22	472	238	11.4	6.85	235	65.6	17.9	7.57	9.71	0.061	0.002	1.78	0.036	0.135	<0.00050	0.216	0.0318
cont'd	12-Apr-21	8.12	363	16.03	0.0	8.12	366	326	9	8	175	88.5	25.6	10.5	34.3	<0.1	<0.004	0.72	<0.03	0.45	0.00036	0.34	0.102
	6-Apr-22	8.26	431	9.62	16.5	8.2	456	249	10	8	234	71.5	17.1	4.37	6.11	<0.1	<0.003	0.34	<0.03	0.085	0.00017	0.17	0.0201
	3-Apr-23	7.65	440	5.28	30.0	8.02	330	215	12	6	208	65.3	12.6	4.49	5.04	0.06	<0.001	1.33	<0.03	0.076	0.00154	1.45	0.0376
	18-Mar-24	7.72	443	3.8	2.5	8.12	422	218	12	6	212	63.8	14.2	4.65	6.16	<0.1	<0.001	0.56	<0.03	0.071	0.00024	0.08	0.0105
	29-Apr-25	8.05	492	6.55	5.5	8.26	217	184	6	7	173	46.5	16.6	3.28	4.47	<0.1	<0.002	0.08	<0.03	0.049	<0.003	0.24	0.0250
PO2	15-Jun-84					7.67	780	369	24.5		331	104.0	26.4									0.18	
	18-Dec-84					7.73	670	251	21.0		271	59.0	25.0									0.48	
	7-Oct-85					8.02	605	275	20.5		218	70.5	24.0									0.10	
	12-Mar-86					8.12	120	39	6.0		40	12.5	1.8									2.52	
	10-Jun-86					7.97	670	328	23.0		282	89.0	25.6									0.19	
	15-Dec-86					7.37	640	302	20.5		285	83.0	23.0									0.17	
	12-Jun-87					7.91	615	284	26.0		252	69.0	27.0									0.45	
	14-Dec-87					8.04	645	319	22.4		263	89.6	23.1									0.25	
	6-Sep-88					7.94	505	234	24.0		198	54.9	23.6									0.18	
	14-Mar-89					7.54	680	321	23.3		290	89.1	23.9									0.23	
	11-Dec-89					7.86	689	349	24.8		297	95.3	27.0									0.07	
	11-Jun-90					8.52	453	216	25.2		173	46.3	24.3									0.21	
	17-Sep-90					7.98	474	213	25.7		183	47.9	22.6									0.13	
	17-Jun-91					8.20	440	181	27.6		160	34.7	22.9									0.16	
	3-Dec-91					8.17	571	279	26.1		229	71.2	24.6									0.16	
	15-Sep-92					8.16	487	228	26.7		188	52.3	23.6									0.20	
	15-Jun-93					8.27	390	173	25.6		152	32.7	22.1									0.20	
	7-Dec-93					8.09	605	338	26.0		222	91.2	26.8									0.20	
	26-Jun-95					8.27	468	209	32.0		170	41.9	25.2									0.20	
	15-Jun-97					8.34	567	327	29.2		269	87.8	26.2									0.41	0.110
	15-Jun-98					8.28	599	300	34.0		256	79.3	24.8									0.42	0.210
	15-Jun-99					8.03	712	364	40.0		313	99.9	27.7									0.38	0.100

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

		Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
Well	Date	pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
PO2	15-Jun-00					8.61	377	203	10.0		174	48.9	19.6									0.54	0.040
cont'd	15-Jun-01					7.67	678	376	44.0		292	107.0	26.5									0.42	0.090
	15-Jun-02					8.01	770	387	48.0		321	107.0	29.0									0.45	0.200
	15-Jun-03					8.13	731	389	50.0		286	103.0	31.9									0.90	0.090
	15-Jun-04					7.89	521	321	27.2		289	94.7	18.7									0.51	0.100
	15-Jun-05					8.10	745	333	49.9		301	91.4	25.5									0.40	0.090
	15-Jun-06					7.59	481	310	22.0		240	97.0	17.5									0.59	0.115
	19-Apr-07					7.84	777	380	52.0		330	102.0	31.3									0.55	0.061
	15-Apr-08					8.10	741	360	49.0		310	95.0	30.0									0.42	0.050
	16-Apr-09					8.20	763	305	57.4		296	85.8	22.1									0.34	0.014
	10-May-10	7.88	760	18.1		8.25	374	327	51.6		195	87.4	26.5									0.29	0.067
	11-Apr-11	7.70	780	14.4		8.27	863	363	64.1		343	102	26.4									0.22	0.055
	8-Mar-12	7.58	8.28	8		8.37	861	325	65.3		348	89.1	25.0									0.44	0.050
	9-Apr-13	8.42	928	8.9		8.05	885	333	58.3		349	93.7	24.0									0.54	0.149
	28-Mar-14	7.63	948	2.6		8.10	876	342	55.8		365	94.9	25.4									0.32	0.233
	28-Mar-14	7.63	948	2.6		8.15	882	341	54.6		366	95.0	25.2									0.37	0.219
	6-Apr-15	7.30	720	9.1		7.93	898	372	65.4		372	102	28.4									0.91	0.127
	10-Mar-16	7.52	519	10.4		8.12	691	321	35.8		308	97.5	18.8									<0.01	0.084
	7-Mar-17	7.84	844	6.98		8.21	819	282	56.4		322	75.7	22.5									0.170	0.023
	2-Apr-18	8.13	784	7.88	26.2	8.06	795	323	60.2	23.8	357	86.5	25.9	10.5	37.4	8.47	0.176	0.29	<0.25	0.453	<0.003	0.210	0.023
	15-Apr-19	7.60	807	6.40	0.0	7.90	774	319	57.0	18.8	335	84.6	26.1	9.56	36.9	6.93	0.038	0.414	0.017	0.386	0.00150	0.375	0.0556
	8-Apr-20	7.92	715	11.81	2.0	8.18	795	334	57.2	17.2	341	87.1	28.2	10.3	37.5	6.56	0.115	0.256	0.014	0.383	<0.00050	0.472	0.0844
	12-Apr-21	7.77	736	17.66	2.0	8.13	799	316	63	20	306	83.0	26.3	11.8	37.9	7.5	0.144	0.27	<0.03	0.435	0.00035	0.36	0.104
	6-Apr-22	7.56	889	8.51	15.6	8.10	864	402	71	26	373	110	31.0	12.3	45.5	9.7	0.058	0.32	<0.03	0.443	0.00023	0.56	0.0833
	3-Apr-23	7.34	714	5.94	68.7	8.00	632	256	53	19	260	73.6	17.5	9.31	28.5	5.55	0.016	2.28	0.040	0.235	0.00338	3.93	0.135
	18-Mar-24	7.57	794	4.99	13.0	8.20	767	327	56	25	318	91.4	24.0	8.29	30.2	5.5	0.025	0.19	<0.03	0.253	0.00036	0.56	0.0898
	29-Apr-25	7.75	746	7.21	14.5	8.14	408	348	49	26	316	97.0	25.8	6.46	29.4	3.4	0.028	0.35	<0.03	0.221	<0.003	0.23	0.1260

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

		Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
Well	Date	pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
PO3	15-Jun-84					7.57	495	209	21.5		198	63.0	12.6									1.30	
	18-Dec-84					7.64	730	297	55.0		181	87.0	19.2									0.35	
	12-Mar-86					7.54	423	132	30.0		122	41.0	7.2									4.70	
	15-Dec-86					7.52	273	136	12.0		106	45.0	5.6									0.68	
	14-Dec-87					8.01	328	150	12.6		101	49.9	6.1									1.18	
	6-Sep-88					7.78	680	162	8.3		87	52.6	7.3									22.8	
	14-Mar-89					7.60	208	94	5.8		65	30.5	4.2									1.02	
	3-Dec-91					7.64	468	204	24.7		175	63.5	11.0									0.63	
	15-Sep-92					7.68	412	197	6.1		199	63.9	9.1									1.60	
	7-Dec-92					8.02	631	307	24.3		246	96.9	15.8									0.20	
	15-Jun-00					8.23	635	358	43.0		234	98.4	27.3									0.37	0.110
	15-Jun-04					7.91	531	331	7.2		302	106.0	18.7									0.27	0.062
	15-Jun-05					8.21	597	330	6.8		307	102.0	18.4									<0.1	0.042
	15-Jun-06					7.84	512	350	10.0		300	103.0	21.4									0.31	0.086
	19-Apr-07					7.72	548	300	7.0		300	87.4	19.2									0.26	0.018
	15-Apr-08					8.10	493	250	10.0		240	76.0	15.0									0.15	0.020
	16-Apr-09					8.12	637	327	19.0		315	101.0	18.1									0.068	0.023
	11-Apr-11	7.86	397	14.9		8.31	448	207	11.1		208	64.6	11.1									<0.01	0.006
	8-Mar-12	8.16	97	2.5		8.10	264	95	10.9		110	28.9	5.6									0.016	0.004
	7-Mar-17	8.04	525	4.68		8.14	543	200	17.4		233	62.3	10.8									0.053	0.003
	2-Apr-18	7.90	686	8.97	13.4	8.00	575	244	27.8	6.56	274	75.7	13.3	13.4	21.3	1.92	0.026	3.50	<0.10	0.417	<0.003	<0.010	0.002
	15-Apr-19	7.99	558	2.87	0.0	7.85	531	233	19.3	3.12	258	70.9	13.7	14.0	18.5	2.95	0.030	2.71	0.017	0.368	<0.00050	0.053	0.00629
	8-Apr-20	8.13	583	9.54	2.4	8.11	657	337	14.8	17.6	329	102	20.2	12.4	14.9	0.176	0.004	1.98	0.032	0.525	<0.00050	0.113	0.0242
	12-Apr-21	D	R	Y																			
	6-Apr-22	7.94	555	8.01	12.0	8.09	593	369	9	34	301	111	22.2	6.92	5.72	<0.1	<0.001	<0.06	<0.03	0.389	0.00035	0.02	0.00215
	3-Apr-23	7.22	341	5.60	9.9	7.93	252	138	10	8	138	43.4	7.23	8.55	7.28	0.60	0.001	1.30	<0.03	0.190	0.00046	0.698	0.0240
	18-Mar-24	7.63	518	3.61	3.1	8.07	480	202	24	10	241	61.8	11.5	12.9	14.2	0.9	0.004	2.81	0.04	0.360	0.00034	0.08	0.00282
	29-Apr-25	D	R	Y																			

Note: refer to notation page for surface water notation details

Figure E-1
Concentration Versus Time - Surface Water Station CO1
Holbrook Landfill Site - Surface Water

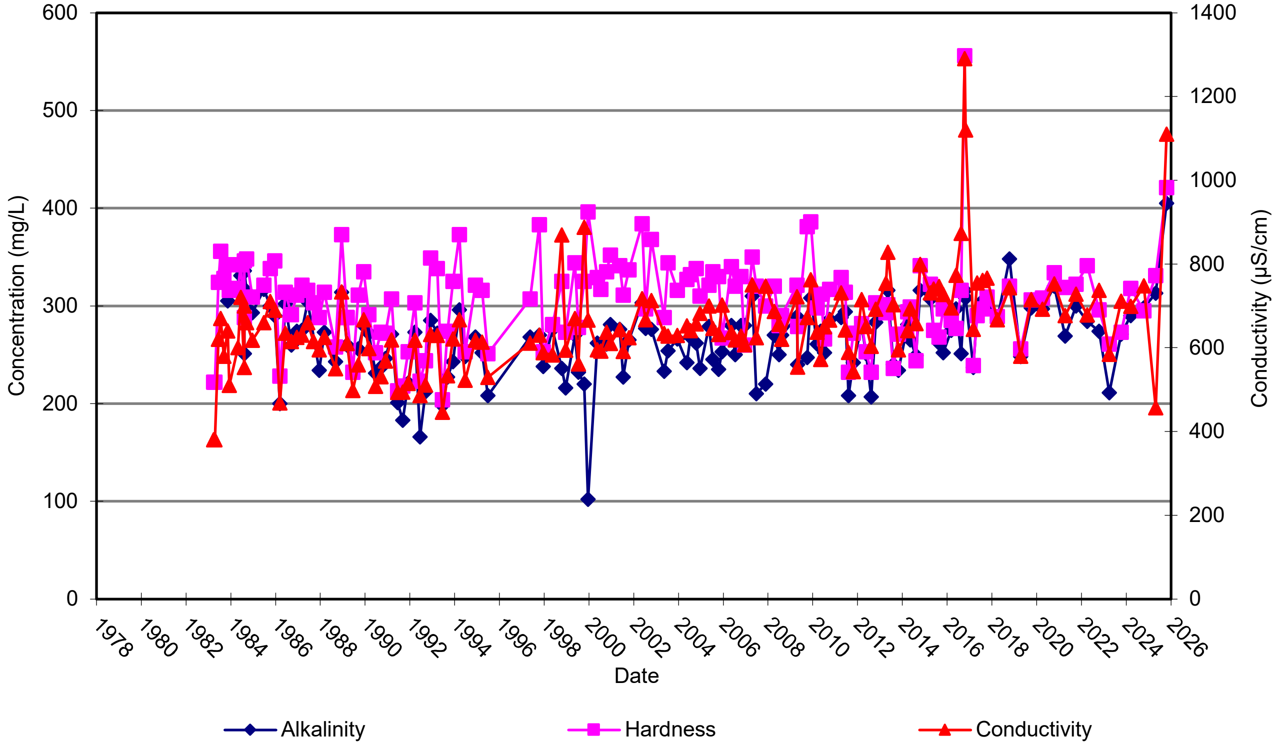


Figure E-2
Concentration Versus Time - Surface Water Station CO1
Holbrook Landfill Site - Surface Water

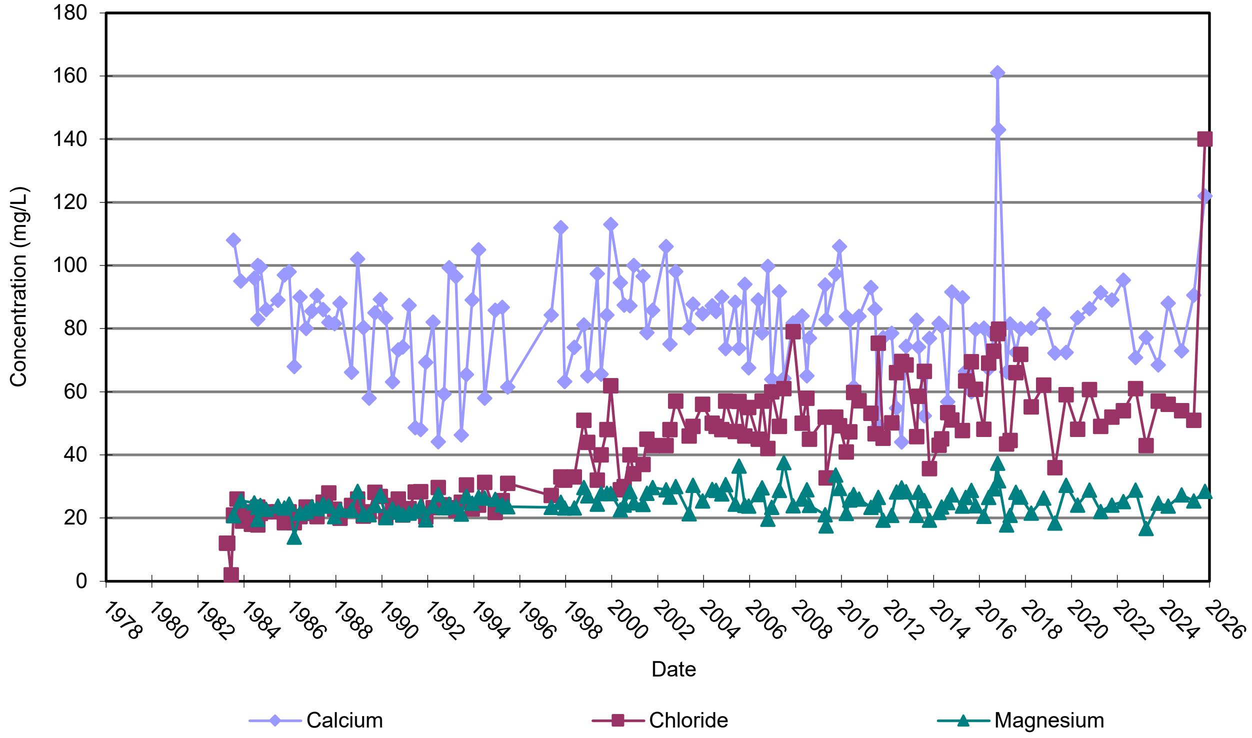


Figure E-3
Concentration Versus Time - Surface Water Station CO1
Holbrook Landfill Site - Surface Water

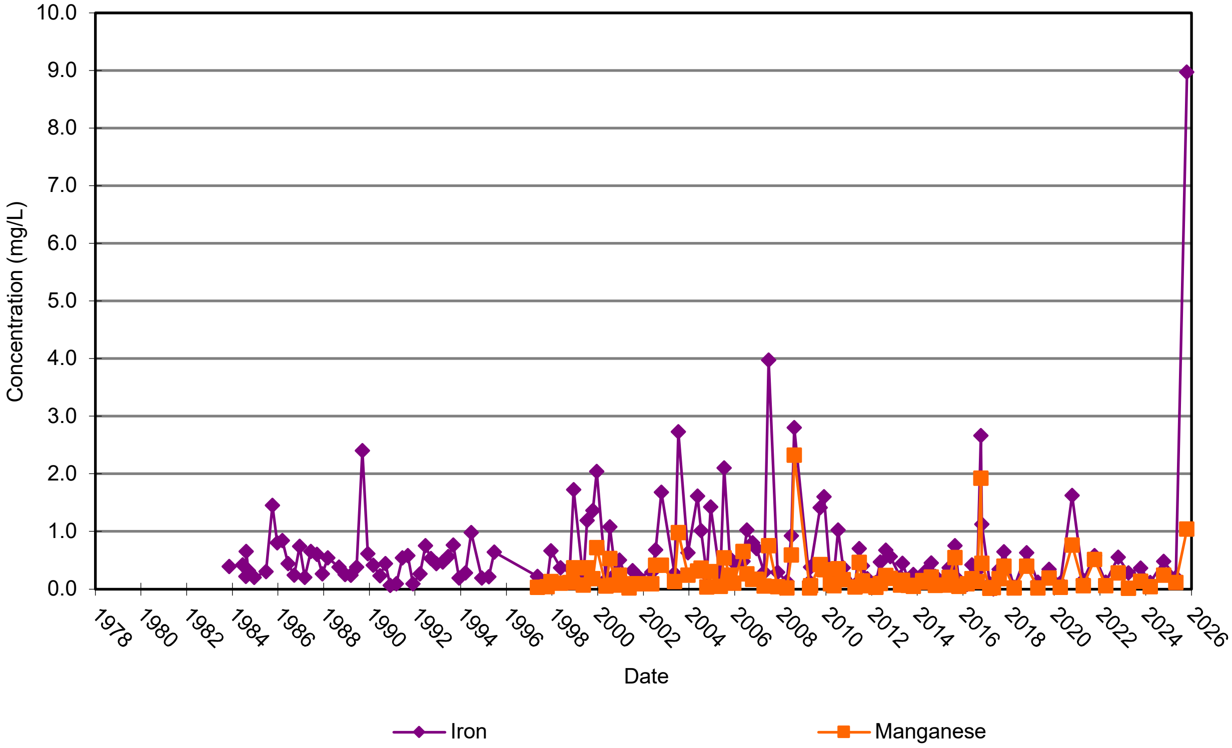


Figure E-4
Concentration Versus Time - Surface Water Station CO4
Holbrook Landfill Site - Surface Water

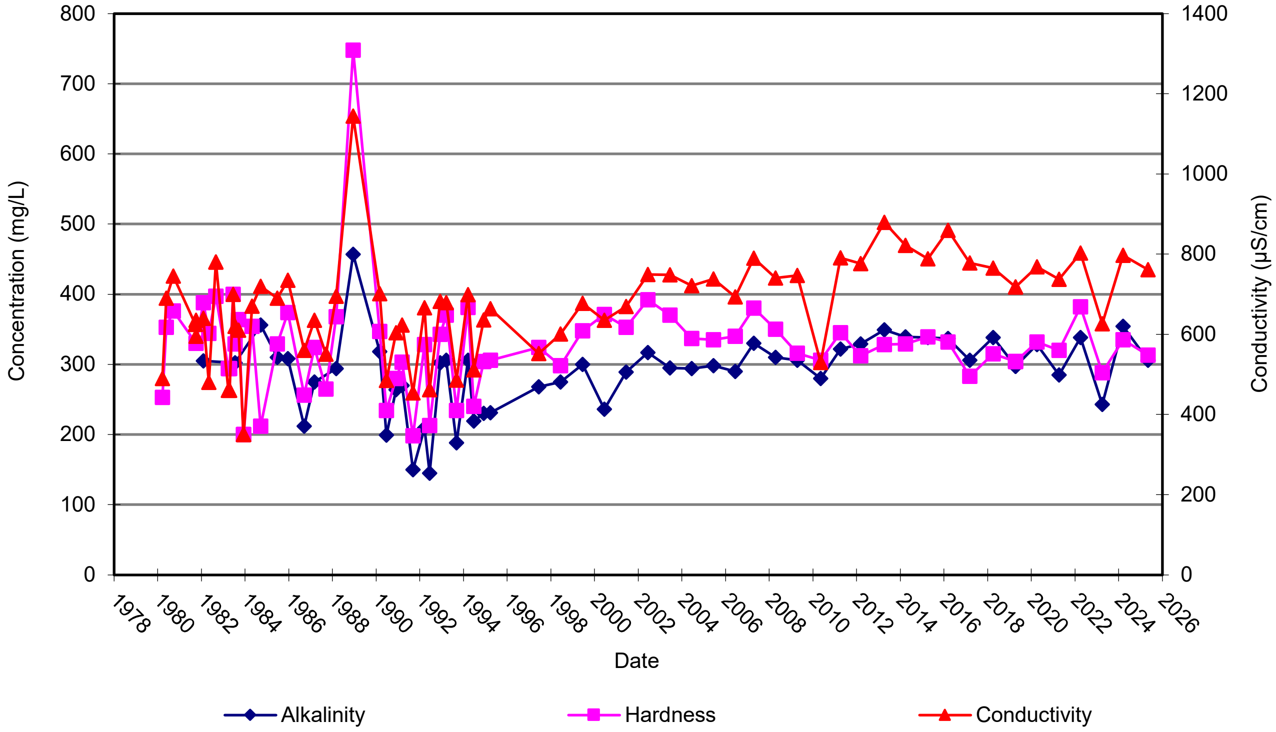


Figure E-5
Concentration Versus Time - Surface Water Station CO4
Holbrook Landfill Site - Surface Water

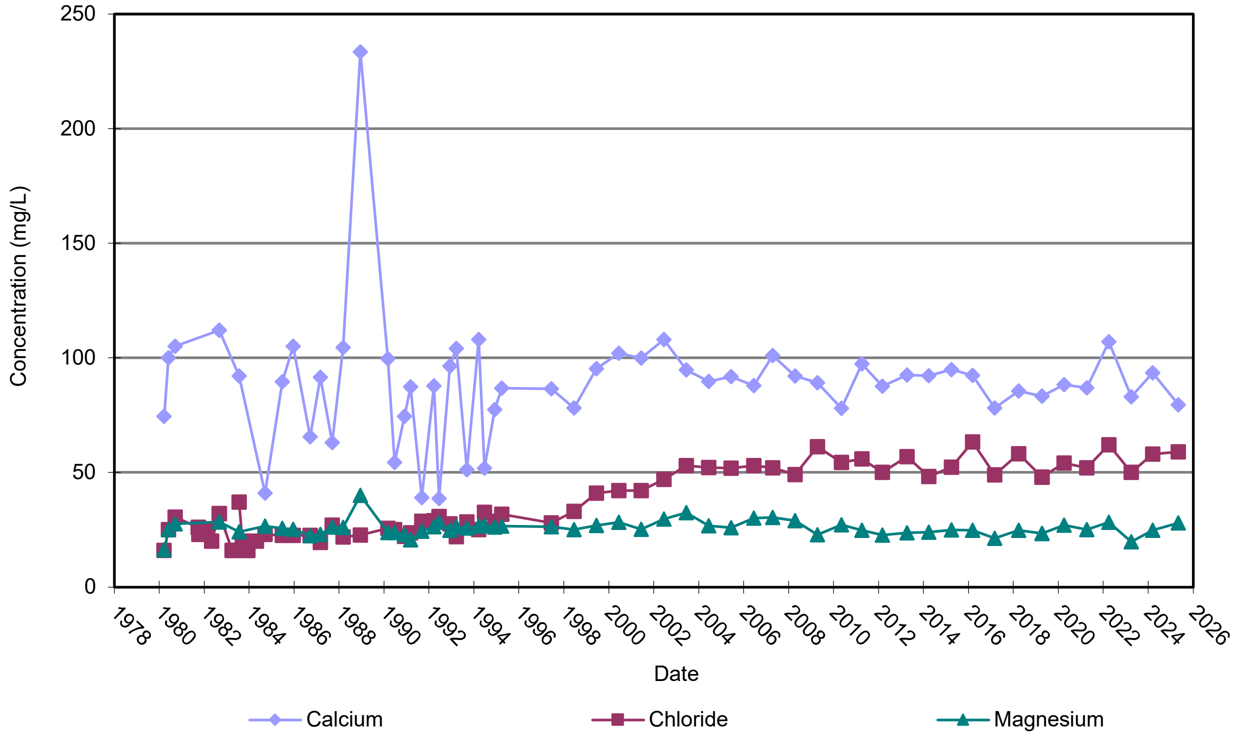


Figure E-6
Concentration Versus Time - Surface Water Station CO4
Holbrook Landfill Site - Surface Water

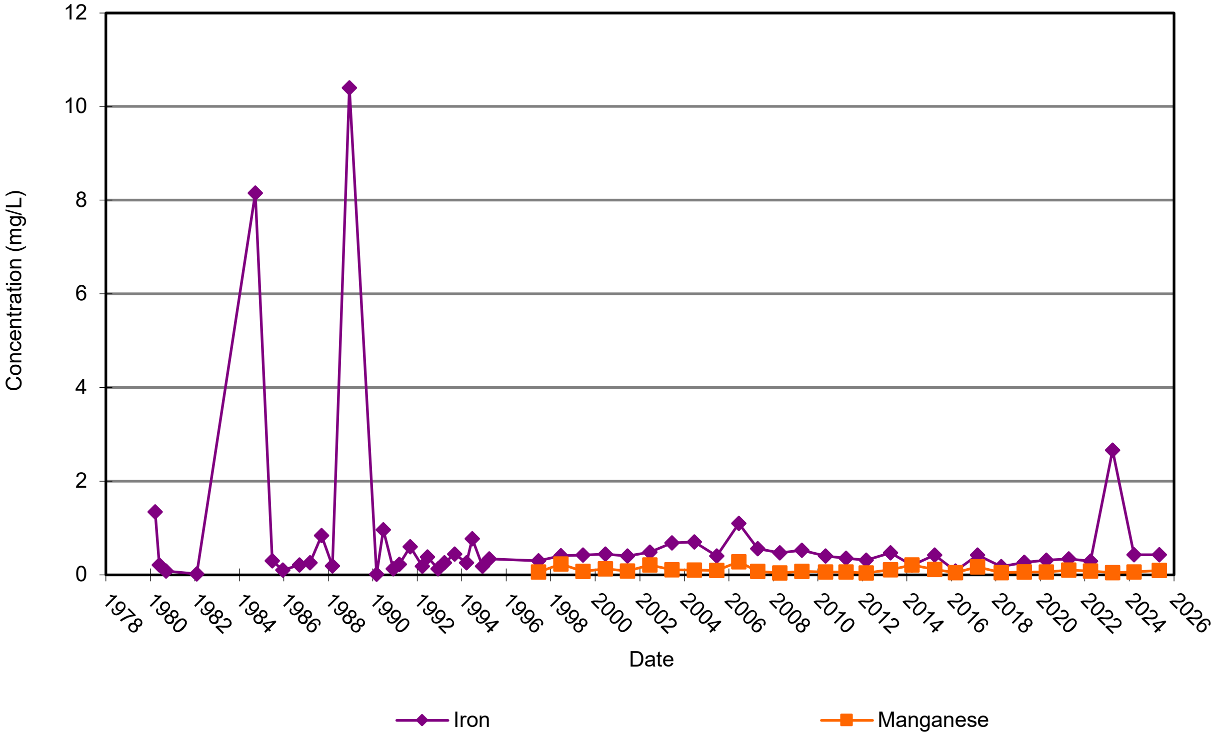


Figure E-7
Concentration Versus Time - Surface Water Station CO6
Holbrook Landfill Site - Surface Water

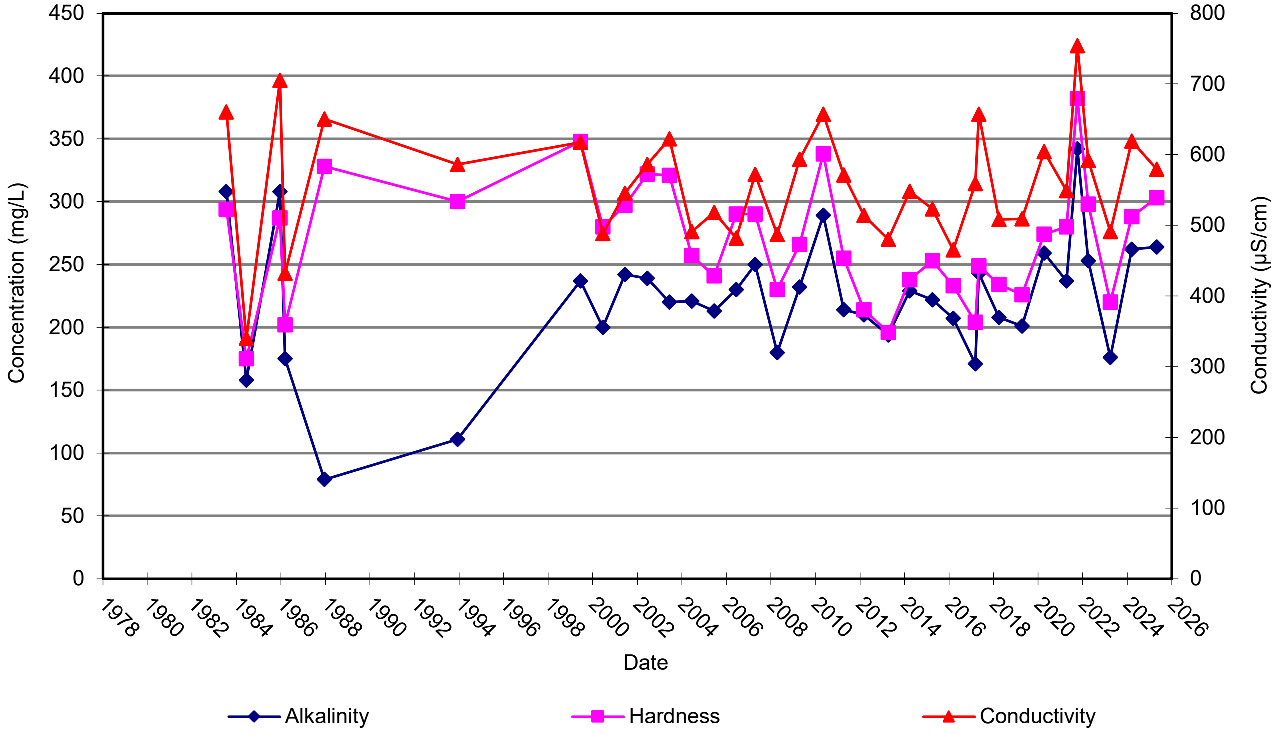


Figure E-8
Concentration Versus Time - Surface Water Station CO6
Holbrook Landfill Site - Surface Water

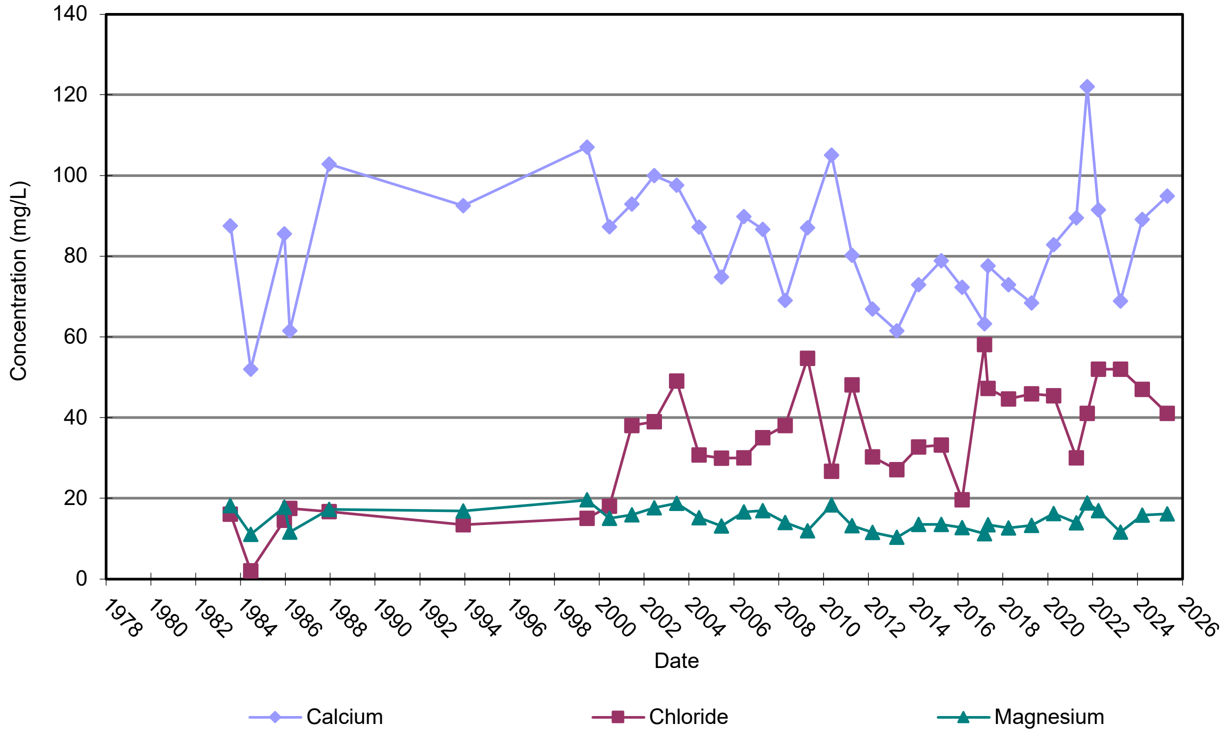


Figure E-9
Concentration Versus Time - Surface Water Station CO6
Holbrook Landfill Site - Surface Water

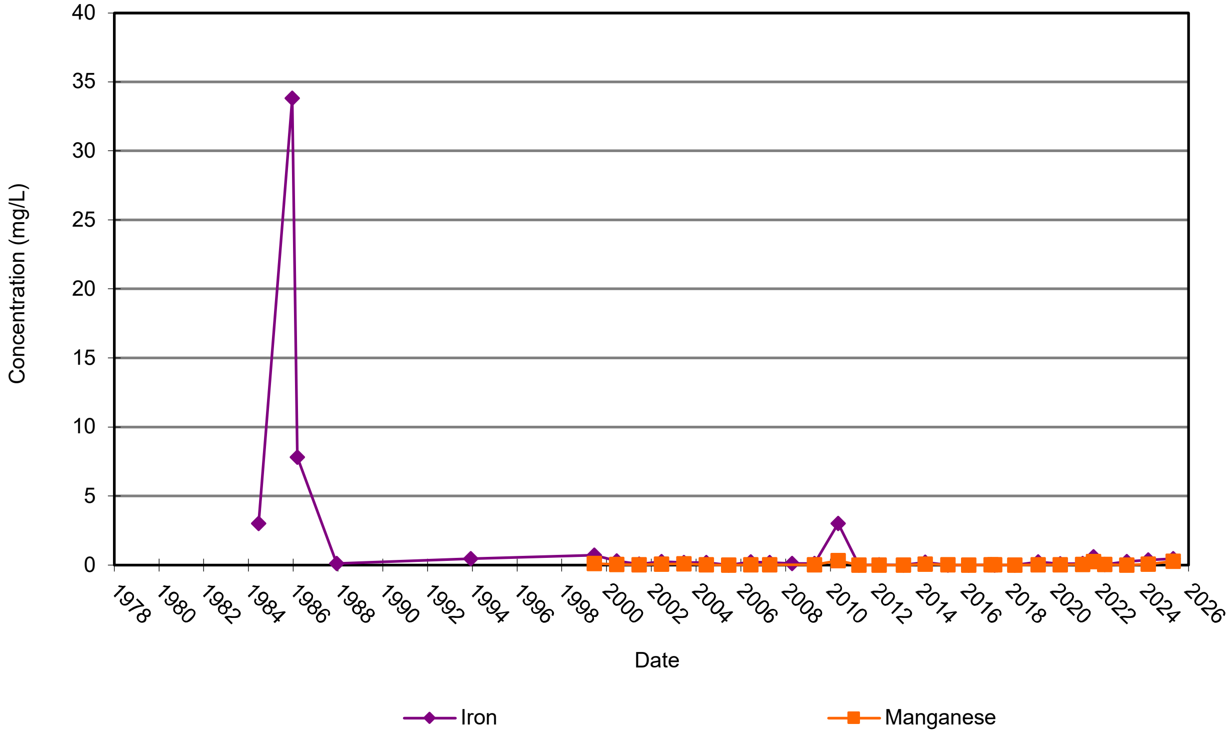


Figure E-10
Concentration Versus Time - Surface Water Station NE1
Holbrook Landfill Site - Surface Water

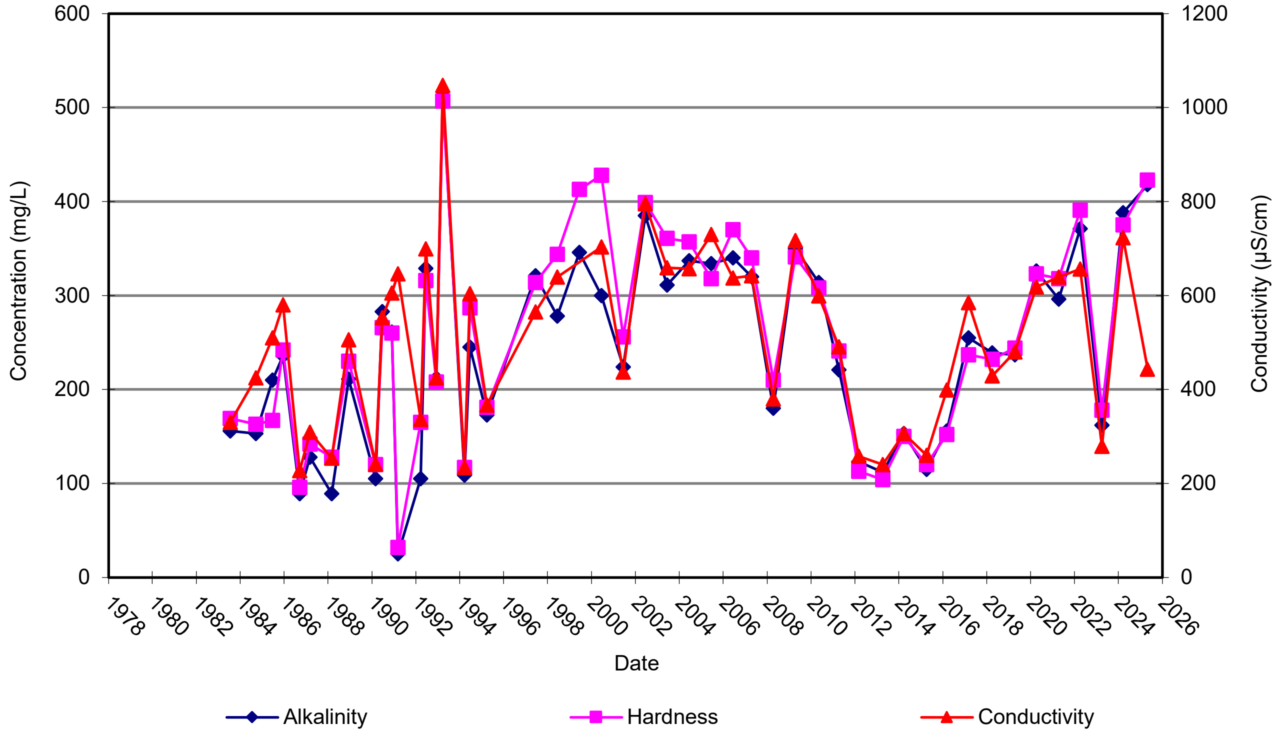


Figure E-11
Concentration Versus Time - Surface Water Station NE1
Holbrook Landfill Site - Surface Water

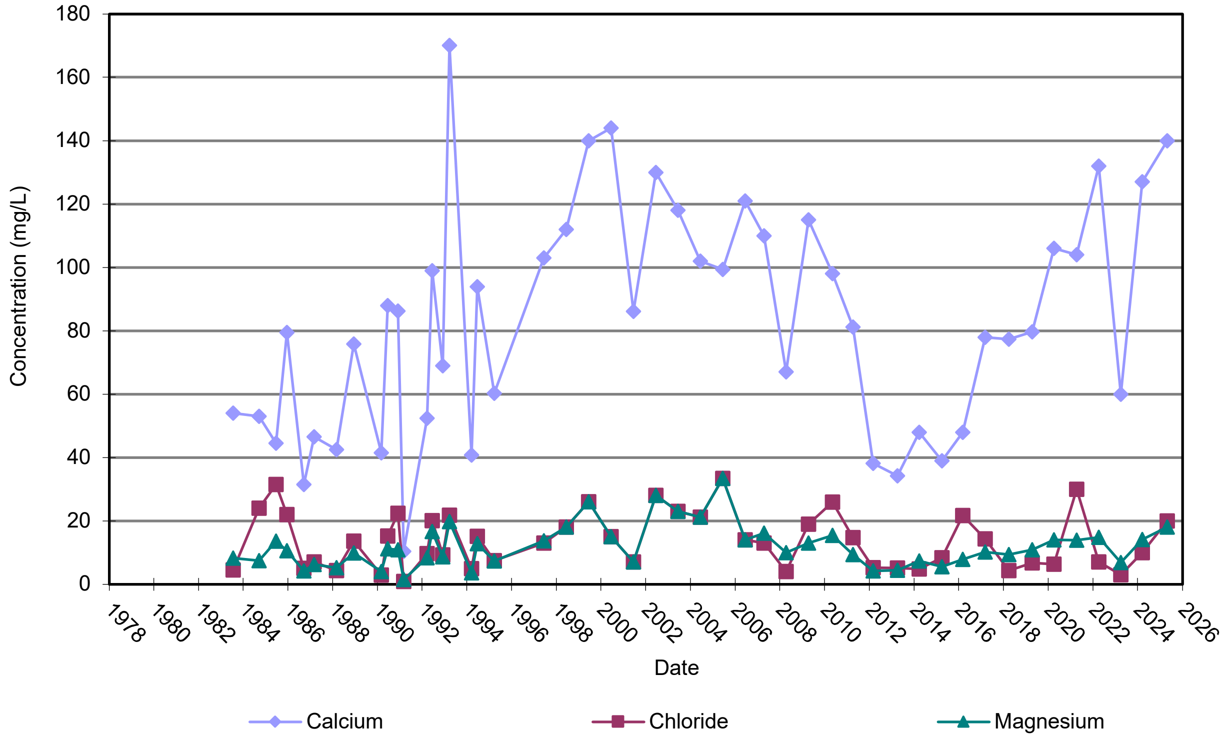


Figure E-12
Concentration Versus Time - Surface Water Station NE1
Holbrook Landfill Site - Surface Water

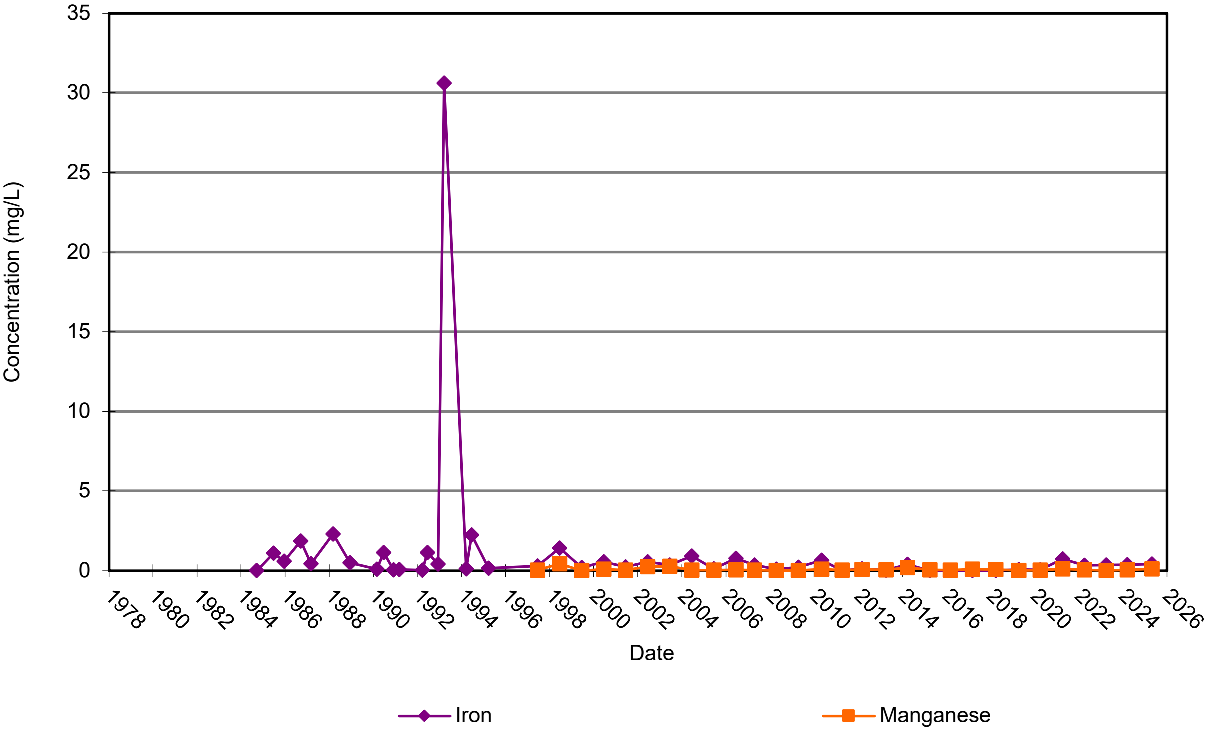


Figure E-13
Concentration Versus Time - Surface Water Station PO1
Holbrook Landfill Site - Surface Water

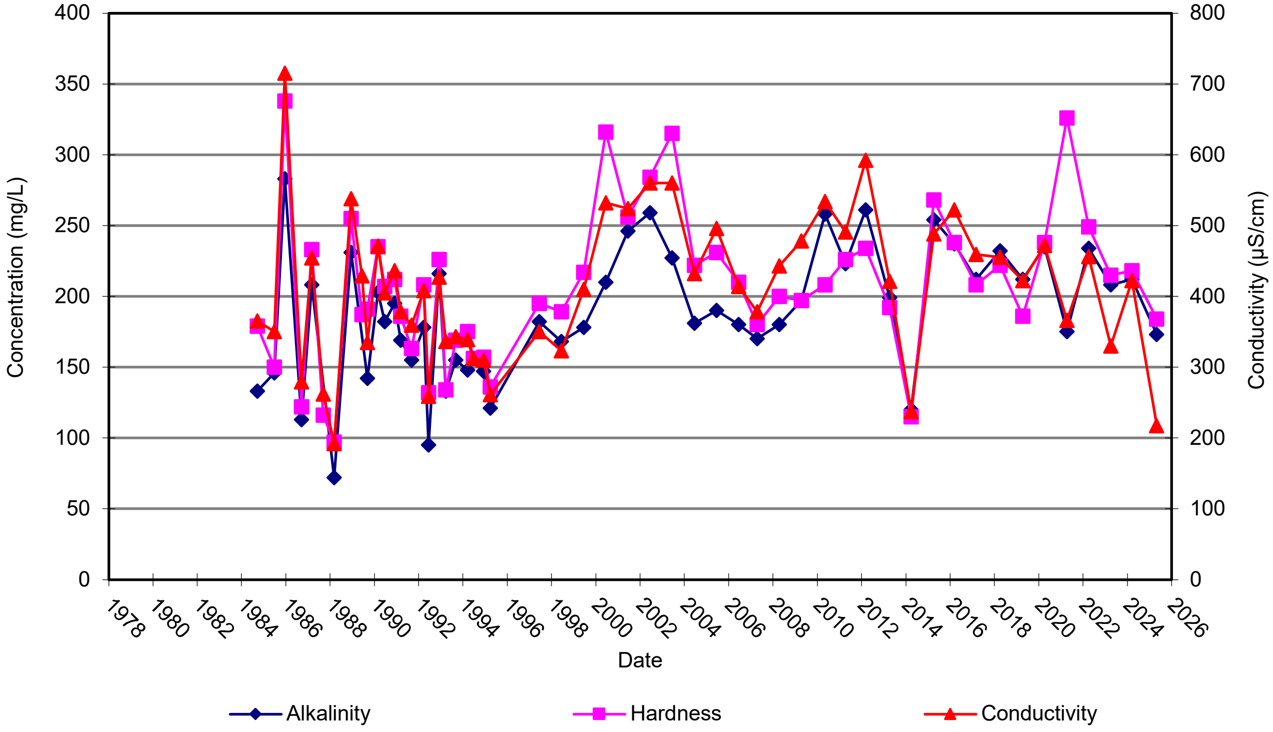


Figure E-14
Concentration Versus Time - Surface Water Station PO1
Holbrook Landfill Site - Surface Water

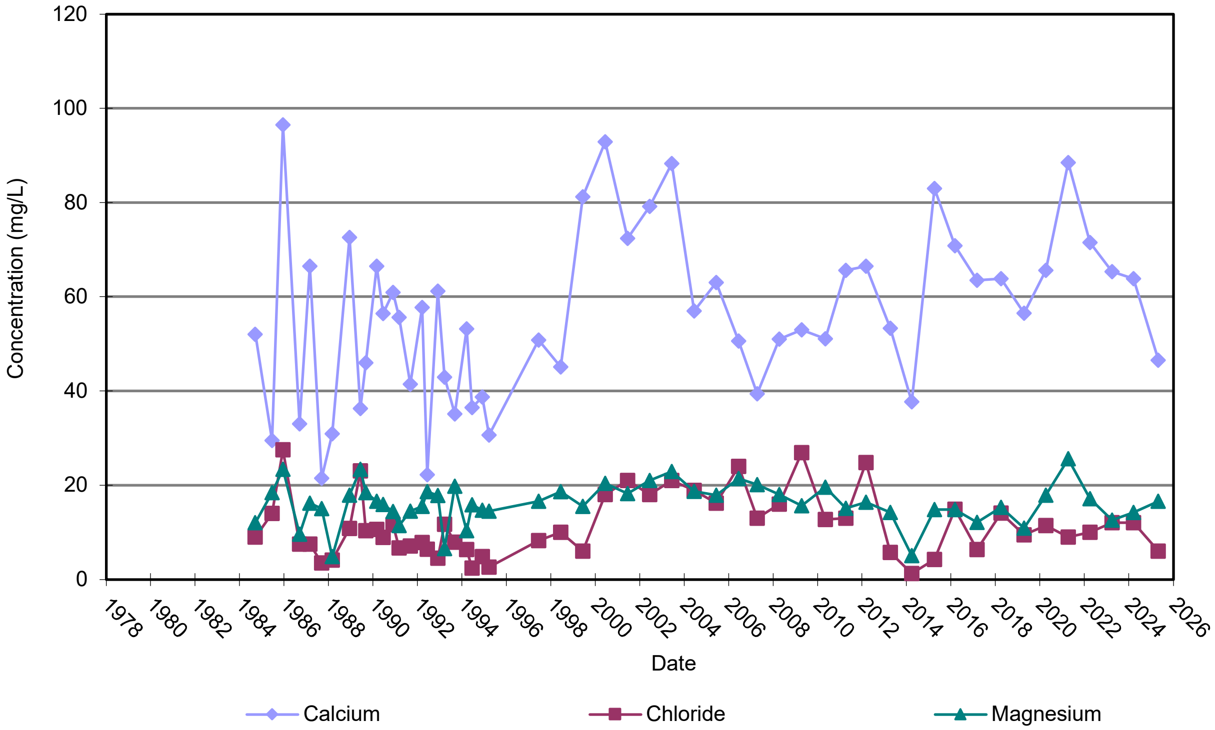


Figure E-15
Concentration Versus Time - Surface Water Station PO1
Holbrook Landfill Site - Surface Water

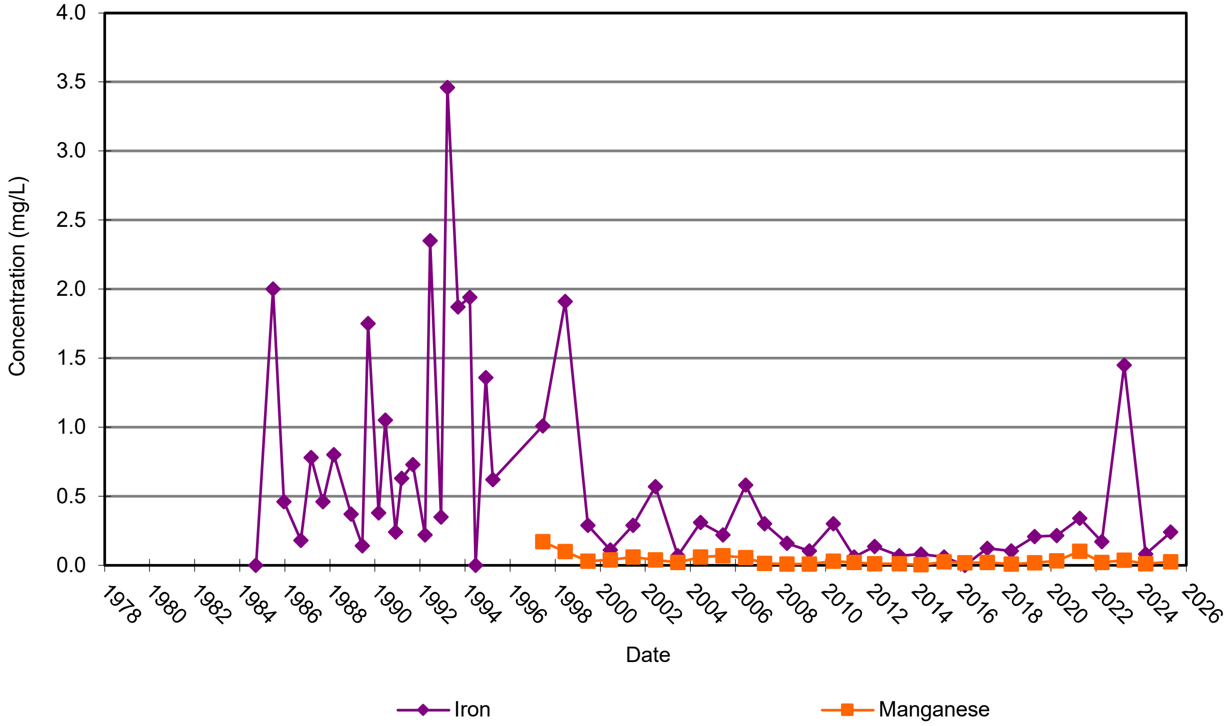


Figure E-16
Concentration Versus Time - Surface Water Station PO2
Holbrook Landfill Site - Surface Water

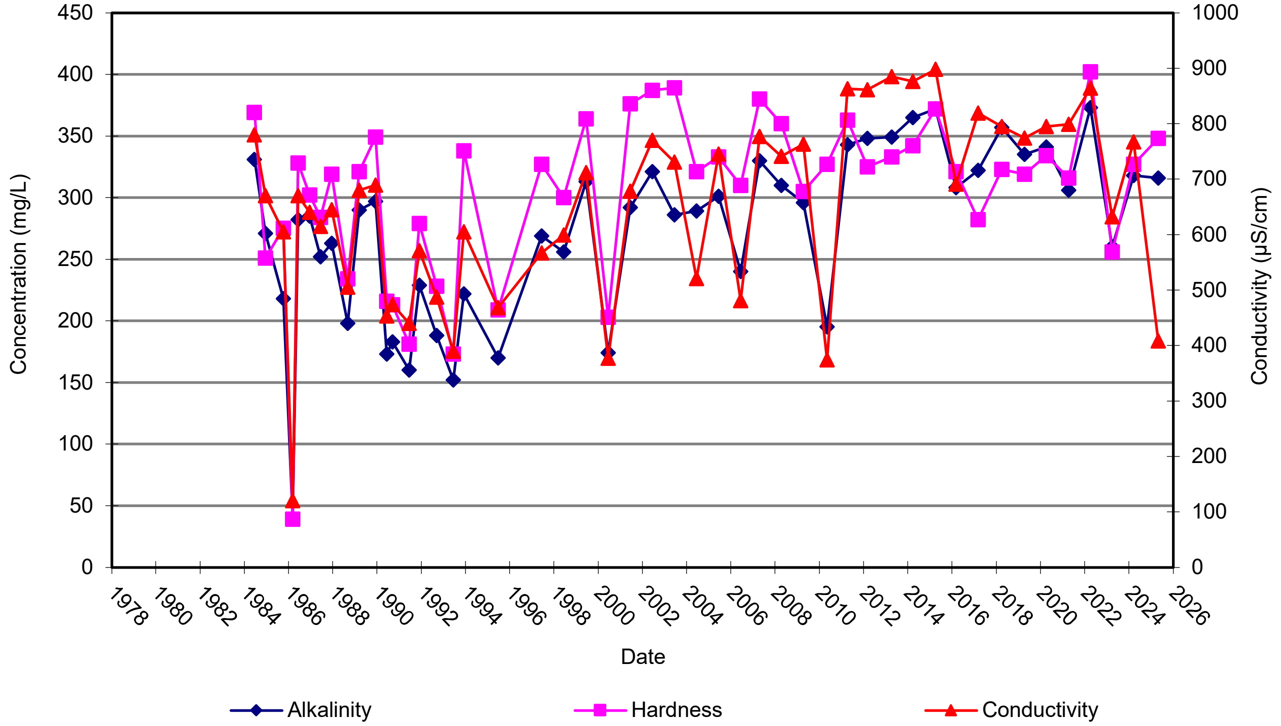


Figure E-17
Concentration Versus Time - Surface Water Station PO2
Holbrook Landfill Site - Surface Water

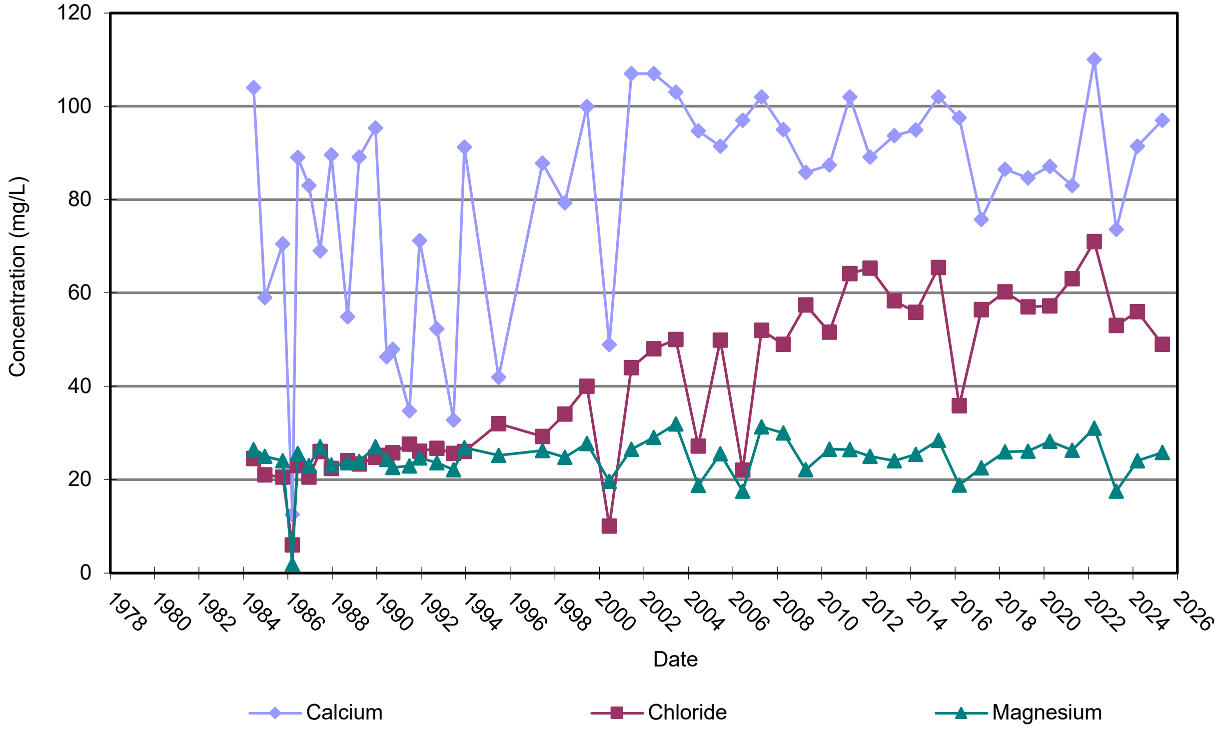


Figure E-18
Concentration Versus Time - Surface Water Station PO2
Holbrook Landfill Site - Surface Water

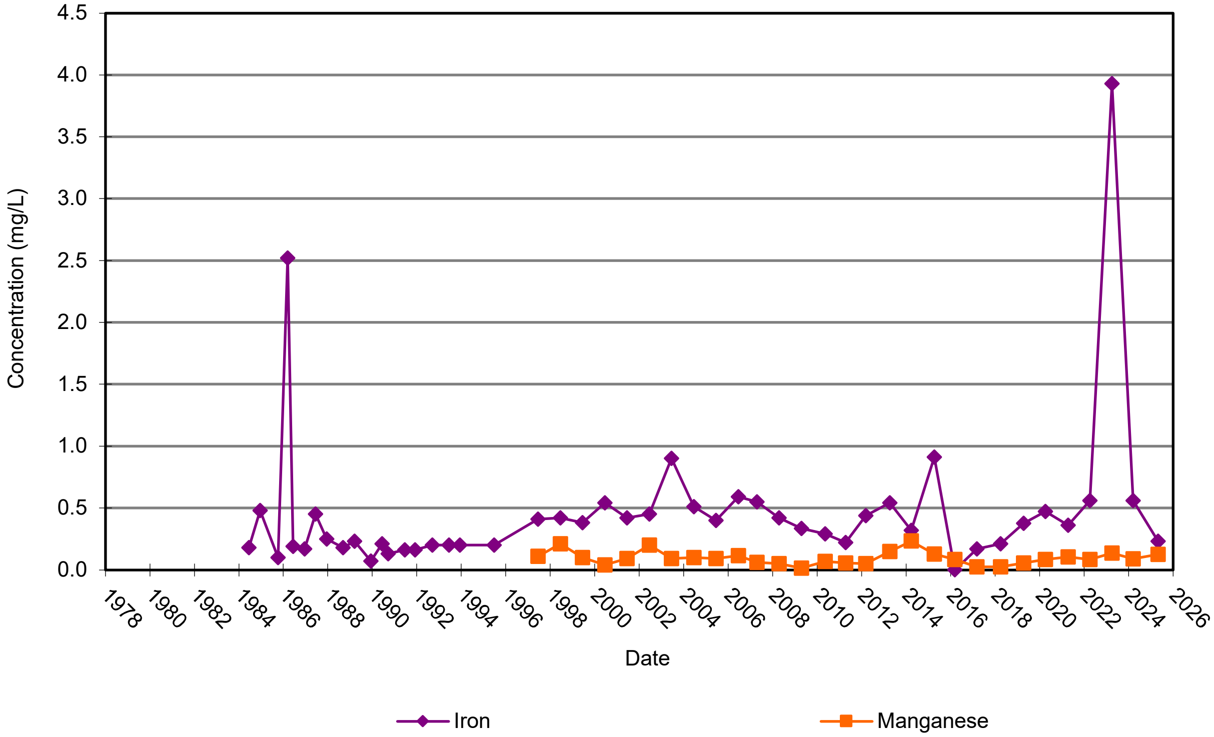


Figure E-19
Concentration Versus Time - Surface Water Station PO3
Holbrook Landfill Site - Surface Water

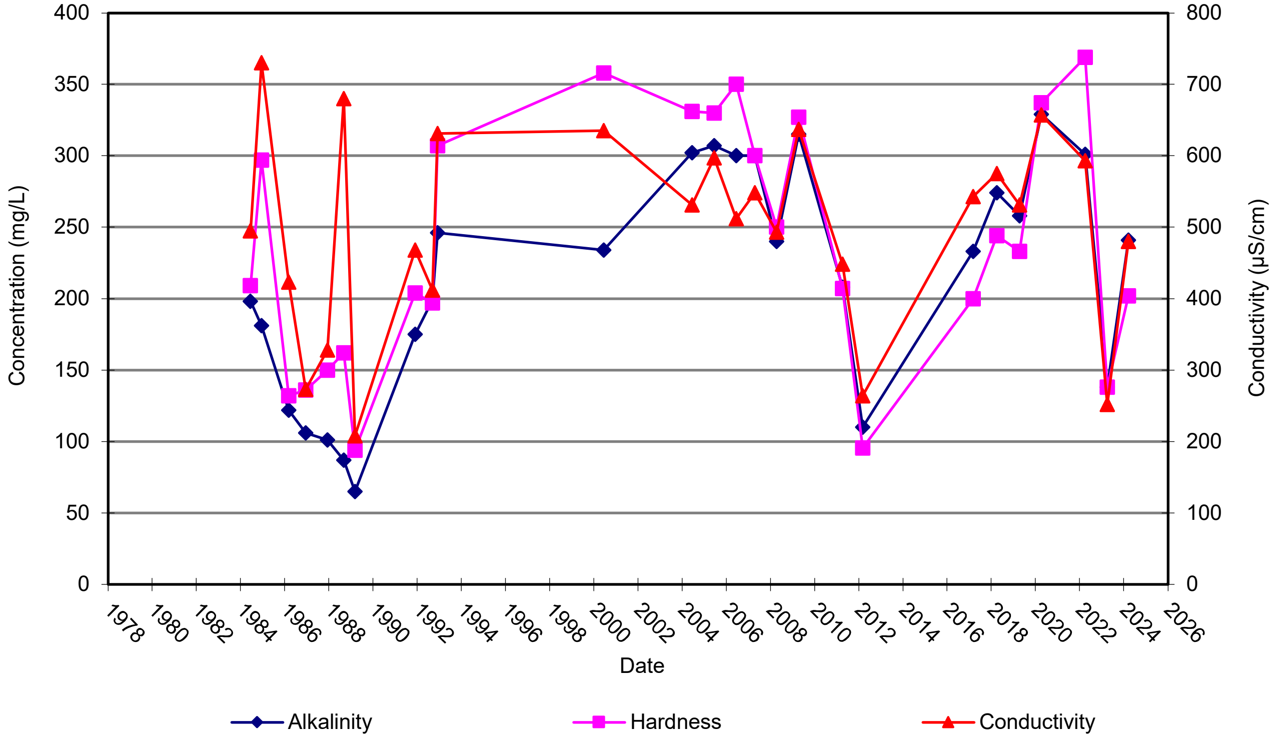


Figure E-20
Concentration Versus Time - Surface Water Station PO3
Holbrook Landfill Site - Surface Water

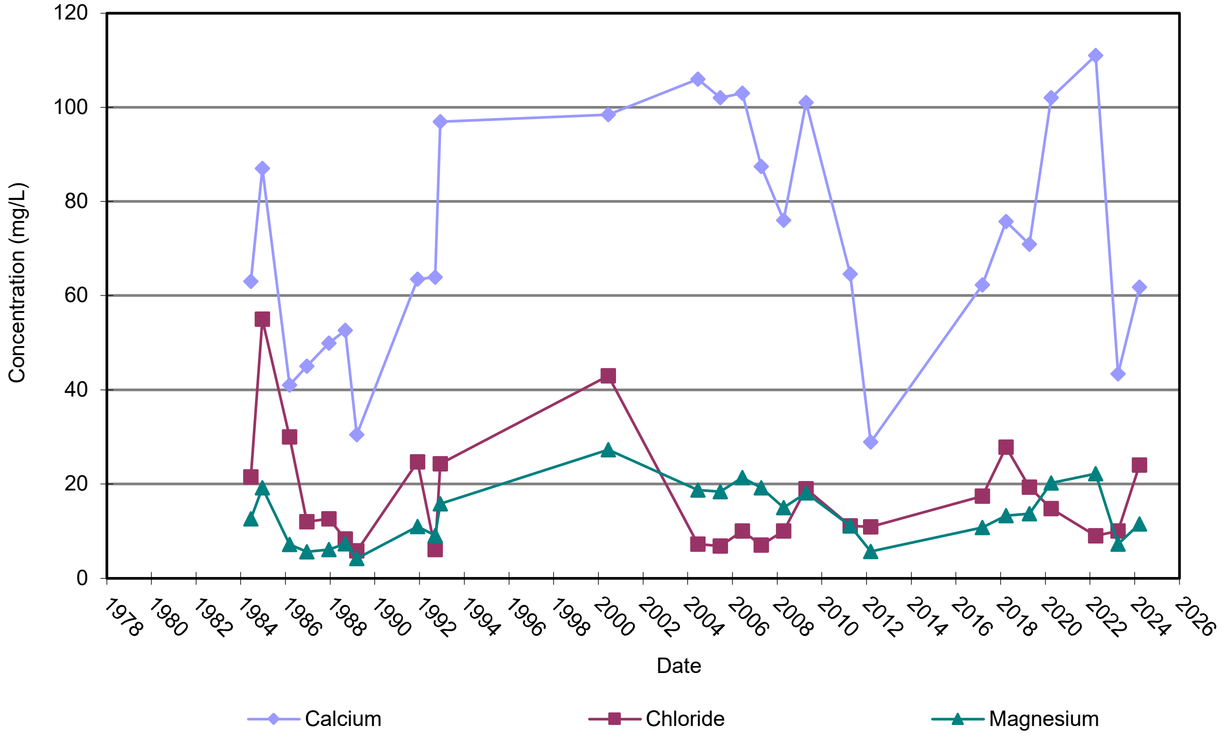
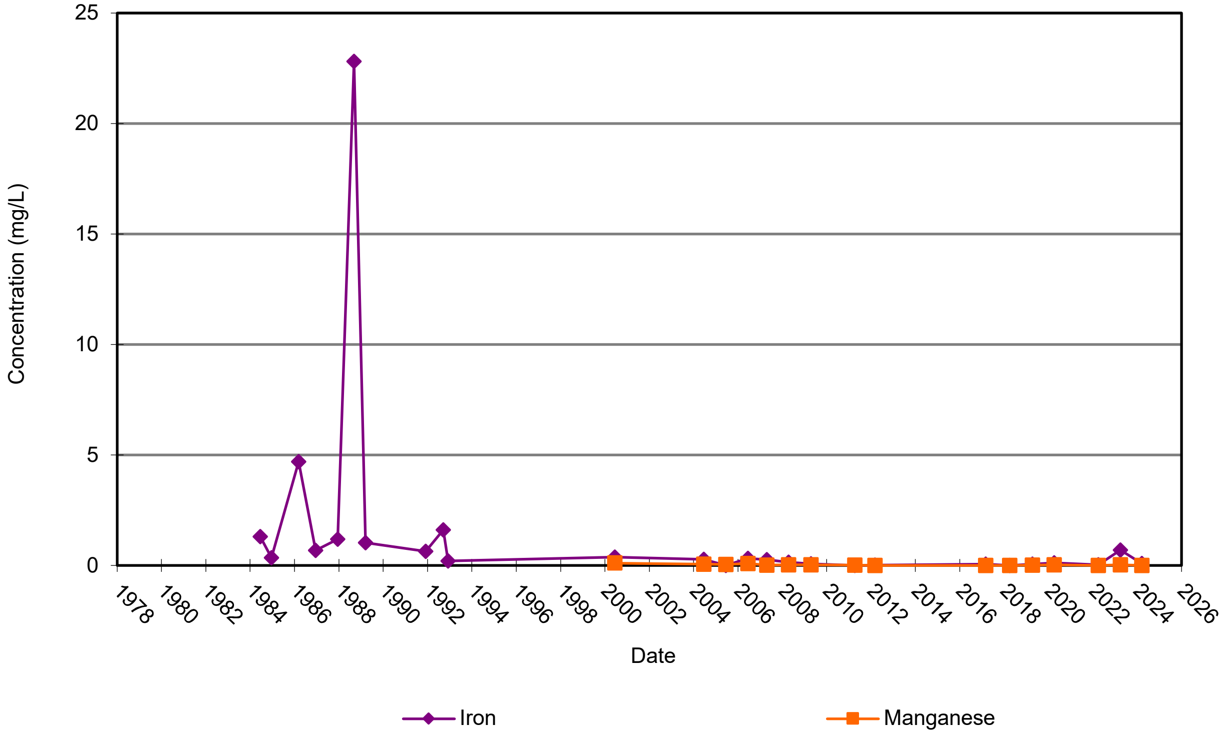


Figure E-21
Concentration Versus Time - Surface Water Station PO3
Holbrook Landfill Site - Surface Water



APPENDIX F

Laboratory Certificates of Analysis

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : C.A0024089.5055-02,
Holbrook Landfill Site SW

06-May-2025

WSP Canada Inc.
Attn : Albert Siertsema

55 King Street, Suite 700, St. Catharines
Canada, L2R 3H5
Phone: 905-687-1771 x 240, Fax:

Date Rec. : 29 April 2025
LR Report: **CA40293-APR25**
Reference: CA0024089.5055-02, Albert Siertsema

Copy: 1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Completed Date**	**4: Analysis Completed Time**	**5: RL**	**6: Client Limits**	**7: PWQO**
Sample Date & Time							
Temp Upon Receipt [°C]	***	***	***	***	***	***	***
pH [No unit]	30-Apr-25	12:51	01-May-25	11:42	0.05		
Conductivity [uS/cm]	30-Apr-25	12:51	01-May-25	11:42	2	---	---
Alkalinity [mg/L as CaCO3]	30-Apr-25	12:51	01-May-25	11:42	2	---	---
Cl [mg/L]	01-May-25	17:44	05-May-25	19:59	1	---	---
SO4 [mg/L]	01-May-25	17:44	05-May-25	19:59	2	---	---
NO3 [as N mg/L]	02-May-25	14:56	06-May-25	15:47	0.06	---	---
NO2 [as N mg/L]	02-May-25	14:31	06-May-25	15:47	0.03	---	---
NH3+NH4 [as N mg/L]	30-Apr-25	19:14	02-May-25	14:59	0.1	---	---
Ca (tot) [mg/L]	01-May-25	09:58	02-May-25	09:39	---	---	---
Mg (tot) [mg/L]	01-May-25	09:58	02-May-25	09:39	---	---	---
Na (tot) [mg/L]	01-May-25	09:58	02-May-25	09:39	---	---	---
K (tot) [mg/L]	01-May-25	09:58	02-May-25	09:39	---	---	---
Hardness [mg/L as CaCO3]	01-May-25	09:58	02-May-25	09:39	---	---	---
B (tot) [mg/L]	01-May-25	09:58	02-May-25	09:39	0.002	---	0.2
Cr (tot) [mg/L]	01-May-25	09:58	02-May-25	09:39	0.003	0.003	0.001
Fe (tot) [mg/L]	01-May-25	09:58	02-May-25	09:39	---	0.01	0.3
Mn (tot) [mg/L]	01-May-25	09:58	02-May-25	09:39	0.002	0.002	---

Analysis	**8: NE1**	**9: CO6**	**10: PO2**	**11: PO1**	**12: CO1**
Sample Date & Time	29-Apr-25 10:00	29-Apr-25 10:30	29-Apr-25 11:00	29-Apr-25 11:30	29-Apr-25 12:00
Temp Upon Receipt [°C]	***	***	***	***	***
pH [No unit]	8.02	8.09	8.14	8.26	8.20
Conductivity [uS/cm]	443	579	408	217	457
Alkalinity [mg/L as CaCO3]	418	264	316	173	313

Analysis	**8: NE1**	**9: CO6**	**10: PO2**	**11: PO1**	**12: CO1**
Cl [mg/L]	20	41	49	6	51
SO4 [mg/L]	5	9	26	7	18
NO3 [as N mg/L]	0.33	<0.06	0.35	0.08	1.43
NO2 [as N mg/L]	0.05	< 0.03	< 0.03	< 0.03	0.04
NH3+NH4 [as N mg/L]	6.4	< 0.1	3.4	< 0.1	0.3
Ca (tot) [mg/L]	140	94.9	97.0	46.5	90.6
Mg (tot) [mg/L]	18.0	16.1	25.8	16.6	25.4
Na (tot) [mg/L]	14.4	21.1	29.4	4.47	33.7
K (tot) [mg/L]	15.1	1.70	6.46	3.28	8.20
Hardness [mg/L as CaCO3]	423	303	348	184	331
B (tot) [mg/L]	0.229*	0.025	0.221*	0.049	0.319*
Cr (tot) [mg/L]	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Fe (tot) [mg/L]	0.41*	0.45*	0.23	0.24	0.20
Mn (tot) [mg/L]	0.104	0.278	0.126	0.025	0.114

Analysis	**13: SW Dup**
Sample Date & Time	29-Apr-25 12:00
Temp Upon Receipt [°C]	***
pH [No unit]	8.28
Conductivity [uS/cm]	699
Alkalinity [mg/L as CaCO3]	315
Cl [mg/L]	51
SO4 [mg/L]	17
NO3 [as N mg/L]	1.45
NO2 [as N mg/L]	0.05
NH3+NH4 [as N mg/L]	0.3
Ca (tot) [mg/L]	91.7
Mg (tot) [mg/L]	25.5
Na (tot) [mg/L]	34.4
K (tot) [mg/L]	8.38
Hardness [mg/L as CaCO3]	334
B (tot) [mg/L]	0.323*
Cr (tot) [mg/L]	< 0.003
Fe (tot) [mg/L]	0.21
Mn (tot) [mg/L]	0.116

Temperature of Sample upon Receipt: 17 degrees C

Method Descriptions

Parameter	Description	SGS Method Code	PALA
Alkalinity	Alkalinity by Titration	ME-CA-[ENV]EWL-LAK-AN-006	N

OnLine LIMS

0004102357

Parameter	Description	SGS Method Code	PALA
Ammonia+Ammonium (N)	NH3+NH4 by Skalar - solution	ME-CA-[ENV]SFA-LAK-AN-007	N
Boron (total)	B by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
Calcium (total)	Ca by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
Chloride	Chloride by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026	N
Chromium (total)	Cr by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
Conductivity	Conductivity by Conductivity Meter	ME-CA-[ENV]EWL-LAK-AN-006	Y
Hardness	Hardness (CaCO3) by ICP-MS	ME-CA-[ENV]SPE-LAK-AN-006	N
Iron (total)	Fe by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
Magnesium (total)	Mg by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
Manganese (total)	Mn by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
Nitrate (as N)	Nitrate by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026	N
Nitrite (as N)	Nitrite by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026	N
pH	pH - solution	ME-CA-[ENV]EWL-LAK-AN-006	Y
Potassium (total)	K by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	N
Sodium (total)	Na by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
Sulphate	Sulphate by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026	N

Accreditation Descriptions

PALA:

SGS Canada Industries & Environment conforms to the requirements of ISO/IEC 17025:2005 for specific tests as listed on their scope of accreditation found at https://www.ceaeq.gouv.qc.ca/documents/publications/listes.htm#labo_accr. Analytes and SGS Method Codes marked with a “Y” in the “PALA” column in the table denote ISO/IEC17025:2005 accreditation

Maarit Wolfe, Hon.B.Sc
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0004102357

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0673-APR25													
Alkalinity	2	mg/L as Ca	< 2			0	20	100	80	120	NA		
Ammonia by SFA - QCBatchID: SKA0009-MAY25													
Ammonia+Ammonium (N)	0.1	as N mg/L	<0.1			3	10	101	90	110	100	75	125
Ammonia by SFA - QCBatchID: SKA0023-MAY25													
Ammonia+Ammonium (N)	0.1	as N mg/L	<0.1			1	10	97	90	110	97	75	125
Anions by discrete analyzer - QCBatchID: DIO5001-MAY25													
Sulphate	2	mg/L	<2			2	20	94	80	120	96	75	125
Anions by discrete analyzer - QCBatchID: DIO8002-MAY25													
Chloride	1	mg/L	<1			1	20	97	80	120	79	75	125
Nitrite (as N)	0.03	mg/L	< 0.03			ND	20	105	80	120	107	75	125
Sulphate	2	mg/L	<2			2	20	106	80	120	86	75	125
Anions by discrete analyzer - QCBatchID: DIO8004-MAY25													
Chloride	1	mg/L	<1			ND	20	93	80	120	100	75	125
Nitrite (as N)	0.03	mg/L	< 0.03			ND	20	107	80	120	103	75	125
Anions by discrete analyzer - QCBatchID: DIO8006-MAY25													
Sulphate	2	mg/L	<2			ND	20	106	80	120	102	75	125
Conductivity - QCBatchID: EWL0673-APR25													
Conductivity	2	uS/cm	< 2			5	20	99	90	110	NA		
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0327-APR25													
Boron (total)	0.002	mg/L	<0.002			1	20	96	90	110	96	70	130
Calcium (total)	0.01	mg/L	<0.01			2	20	97	90	110	107	70	130
Chromium (total)	0.003	mg/L	<0.00008			9	20	97	90	110	102	70	130
Iron (total)	0.01	mg/L	<0.007			0	20	96	90	110	100	70	130
Magnesium (total)	0.001	mg/L	<0.001			0	20	94	90	110	95	70	130
Manganese (total)	0.002	mg/L	<0.00001			0	20	98	90	110	97	70	130
Potassium (total)	0.009	mg/L	<0.009			1	20	95	90	110	106	70	130
Sodium (total)	0.01	mg/L	<0.01			1	20	92	90	110	95	70	130
pH - QCBatchID: EWL0673-APR25													
pH	0.05	No unit	NA			0		100			NA		

OnLine LIMS

0004102357

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : C.A0024089.5055-03,
Holbrook Landfill Site SW

16-May-2025

WSP Canada Inc.
Attn : Albert Siertsema

55 King Street, Suite 700, St. Catharines
Canada, L2R 3H5
Phone: 905-687-1771 x 240, Fax:

Date Rec. : 09 May 2025
LR Report: **CA14310-MAY25**
Reference: CA0024089.5055-03, Albert Siertsema

Copy: 1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	3: Analysis Completed Date	5: RL	6: Client Limits	7: PWQO	8: CO4
Sample Date & Time						07-May-25 13:50
Temp Upon Receipt [°C]	***	***	***	***	***	***
pH [No unit]	10-May-25	13-May-25	0.05			8.34
Conductivity [uS/cm]	10-May-25	13-May-25	2	---	---	761
Alkalinity [mg/L as CaCO3]	10-May-25	13-May-25	2	---	---	306
Cl [mg/L]	16-May-25	16-May-25	1	---	---	59
SO4 [mg/L]	16-May-25	16-May-25	2	---	---	23
NO3 [as N mg/L]	14-May-25	14-May-25	0.06	---	---	0.18
NO2 [as N mg/L]	14-May-25	14-May-25	0.03	---	---	< 0.03
NH3+NH4 [as N mg/L]	13-May-25	14-May-25	0.1	---	---	5.5
Ca (tot) [mg/L]	12-May-25	13-May-25	---	---	---	79.5
Mg (tot) [mg/L]	12-May-25	13-May-25	---	---	---	27.9
Na (tot) [mg/L]	12-May-25	13-May-25	---	---	---	35.6
K (tot) [mg/L]	12-May-25	13-May-25	---	---	---	10.1
Hardness [mg/L as CaCO3]	12-May-25	13-May-25	---	---	---	313
B (tot) [mg/L]	12-May-25	13-May-25	0.002	---	0.2	0.367*
Cr (tot) [mg/L]	12-May-25	13-May-25	0.003	0.003	0.001	< 0.003
Fe (tot) [mg/L]	12-May-25	13-May-25	---	0.01	0.3	0.43*
Mn (tot) [mg/L]	12-May-25	13-May-25	0.002	0.002	---	0.096

Temperature of Sample upon Receipt: 16 degrees C

Method Descriptions

Parameter	Description	SGS Method Code	PALA
Alkalinity	Alkalinity by Titration	ME-CA-[ENV]EWL-LAK-AN-006	N
Ammonia+Ammonium (N)	NH3+NH4 by Skalar - solution	ME-CA-[ENV]SFA-LAK-AN-007	N
Boron (total)	B by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
Calcium (total)	Ca by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y

Parameter	Description	SGS Method Code	PALA
Chloride	Chloride by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026	N
Chromium (total)	Cr by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
Conductivity	Conductivity by Conductivity Meter	ME-CA-[ENV]EWL-LAK-AN-006	Y
Hardness	Hardness (CaCO3) by ICP-MS	ME-CA-[ENV]SPE-LAK-AN-006	N
Iron (total)	Fe by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
Magnesium (total)	Mg by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
Manganese (total)	Mn by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
Nitrate (as N)	Nitrate by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001	N
Nitrite (as N)	Nitrite by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001	N
pH	pH - solution	ME-CA-[ENV]EWL-LAK-AN-006	Y
Potassium (total)	K by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	N
Sodium (total)	Na by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
Sulphate	Sulphate by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026	N

Accreditation Descriptions

PALA:
SGS Canada Industries & Environment conforms to the requirements of ISO/IEC 17025:2005 for specific tests as listed on their scope of accreditation found at https://www.ceaeq.gouv.qc.ca/documents/publications/listes.htm#labo_accr. Analytes and SGS Method Codes marked with a “Y” in the “PALA” column in the table denote ISO/IEC17025:2005 accreditation

Jill Campbell

Jill Campbell, B.Sc.,GISAS
Project Specialist,
Environment, Health & Safety

Quality Control Report

Inorganic Analysis

Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0242-MAY25													
Alkalinity	2	mg/L as Ca	< 2			1	20	100	80	120	NA		
Ammonia by SFA - QCBatchID: SKA0128-MAY25													
Ammonia+Ammonium (N)	0.1	as N mg/L	<0.1			ND	10	97	90	110	94	75	125
Anions by discrete analyzer - QCBatchID: DIO5017-MAY25													
Chloride	1	mg/L	<1			2	20	102	80	120	103	75	125
Sulphate	2	mg/L	<2			2	20	100	80	120	93	75	125
Anions by IC - QCBatchID: DIO0306-MAY25													
Nitrate (as N)	0.06	mg/L	<0.06			ND	20	103	90	110	106	75	125
Nitrite (as N)	0.03	mg/L	<0.03			ND	20	100	90	110	105	75	125
Conductivity - QCBatchID: EWL0242-MAY25													
Conductivity	2	uS/cm	4			3	20	103	90	110	NA		
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0100-MAY25													
Boron (total)	0.002	mg/L	<0.002			2	20	99	90	110	101	70	130
Calcium (total)	0.01	mg/L	<0.01			2	20	101	90	110	105	70	130
Chromium (total)	0.003	mg/L	<0.00008			ND	20	101	90	110	106	70	130
Iron (total)	0.01	mg/L	<0.007			0	20	100	90	110	100	70	130
Magnesium (total)	0.001	mg/L	<0.001			4	20	98	90	110	104	70	130
Manganese (total)	0.002	mg/L	<0.00001			3	20	100	90	110	100	70	130
Potassium (total)	0.009	mg/L	<0.009			6	20	99	90	110	100	70	130
Sodium (total)	0.01	mg/L	<0.01			3	20	97	90	110	104	70	130
pH - QCBatchID: EWL0242-MAY25													
pH	0.05	No unit	NA			0		100			NA		

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : C.A0024089.5055-02, Holbrook Landfill Site GW Monitoring Wells

28-May-2025

WSP Canada Inc.
Attn : Albert Siertsema

55 King Street, Suite 700, St. Catharines
Canada, L2R 3H5
Phone: 905-687-1771 x 240, Fax:

Date Rec. : 21 May 2025
LR Report: **CA15075-MAY25**
Reference: CA0024089.5055-02, Albert Siertsema

Copy: 1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Completed Date**	**4: Analysis Completed Time**	**5: RL**	**6: Client Limits**	**7: D1**
Sample Date & Time							15-May-25 15:30
Temp Upon Receipt [°C]	***	***	***	***	***	***	***
pH [No unit]	21-May-25	15:30	22-May-25	10:57	0.05	---	8.05
Conductivity [uS/cm]	21-May-25	15:30	22-May-25	10:57	2	---	684
Alkalinity [mg/L as CaCO3]	21-May-25	15:30	22-May-25	10:57	2	---	293
DOC [mg/L]	21-May-25	14:48	23-May-25	08:39	1.0	---	1.3
Cl [mg/L]	28-May-25	15:20	28-May-25	16:17	1	---	35
SO4 [mg/L]	28-May-25	15:19	28-May-25	16:17	2	---	29
TKN [as N mg/L]	21-May-25	17:24	26-May-25	10:31	0.5	---	< 0.5
NO2 [as N mg/L]	21-May-25	23:48	22-May-25	14:35	0.03	---	< 0.03
NO3 [as N mg/L]	21-May-25	23:48	22-May-25	14:35	0.06	---	< 0.06
NO2+NO3 [as N mg/L]	21-May-25	23:48	22-May-25	14:35	0.06	---	<0.06
NH3+NH4 [as N mg/L]	21-May-25	20:42	22-May-25	11:37	0.1	---	< 0.1
Ca (diss) [mg/L]	22-May-25	10:15	23-May-25	14:26	0.01	---	86.5
Mg (diss) [mg/L]	22-May-25	10:15	23-May-25	14:26	0.001	---	24.9
Na (diss) [mg/L]	22-May-25	10:15	23-May-25	14:26	0.01	---	15.7
K (diss) [mg/L]	22-May-25	10:15	23-May-25	14:26	0.009	---	1.48
Hardness [mg/L as CaCO3]	22-May-25	10:15	23-May-25	14:26	0.05	---	319
B (diss) [mg/L]	22-May-25	10:15	23-May-25	14:26	0.002	---	0.056
Cr (diss) [mg/L]	22-May-25	10:15	23-May-25	14:26	0.003	0.003	< 0.003
Fe (diss) [mg/L]	22-May-25	10:15	23-May-25	14:26	0.01	0.01	3.78
Mn (diss) [mg/L]	22-May-25	10:15	23-May-25	14:26	0.002	0.002	0.097

Temperature of Sample upon Receipt: 4 degrees C

Method Descriptions

Parameter	Description	SGS Method Code	PALA
Alkalinity	Alkalinity by Titration	ME-CA-[ENV]EWL-LAK-AN-006	N

Parameter	Description	SGS Method Code	PALA
Ammonia+Ammonium (N)	NH3+NH4 by Skalar - solution	ME-CA-[ENV]SFA-LAK-AN-007	N
Boron (dissolved)	B by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	Y
Calcium (dissolved)	Ca by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	Y
Chloride	Chloride by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026	N
Chromium (dissolved)	Cr by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	Y
Conductivity	Conductivity by Conductivity Meter	ME-CA-[ENV]EWL-LAK-AN-006	Y
Dissolved Organic Carbon	DOC by Combustion/Oxidation	ME-CA-[ENV]EWL-LAK-AN-023	N
Hardness (dissolved)	Hardness (CaCO3) by ICP-MS dissolved	ME-CA-[ENV]SPE-LAK-AN-006	N
Iron (dissolved)	Fe by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	Y
Magnesium (dissolved)	Mg by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	Y
Manganese (dissolved)	Mn by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	Y
Nitrate (as N)	Nitrate by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001	N
Nitrate + Nitrite (as N)	Total Nitrate/Nitrite by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001	Y
Nitrite (as N)	Nitrite by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001	N
pH	pH - solution	ME-CA-[ENV]EWL-LAK-AN-006	Y
Potassium (dissolved)	K by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	N
Sodium (dissolved)	Na by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	Y
Sulphate	Sulphate by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026	N
Total Kjeldahl Nitrogen	Tot. kjeldahl Nitrogen by Skalar	ME-CA-[ENV]SFA-LAK-AN-002	N

Accreditation Descriptions

PALA:

SGS Canada Industries & Environment conforms to the requirements of ISO/IEC 17025:2005 for specific tests as listed on their scope of accreditation found at https://www.ceaeq.gouv.qc.ca/documents/publications/listes.htm#labo_accr. Analytes and SGS Method Codes marked with a “Y” in the “PALA” column in the table denote ISO/IEC17025:2005 accreditation

Brad Moore Hon. B.Sc
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0004128022

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0485-MAY25													
Alkalinity	2	mg/L as Ca	< 2			0	20	102	80	120	NA		
Ammonia by SFA - QCBatchID: SKA0199-MAY25													
Ammonia+Ammonium (N)	0.1	as N mg/L	<0.1			ND	10	97	90	110	99	75	125
Anions by discrete analyzer - QCBatchID: DIO8049-MAY25													
Chloride	1	mg/L	<1			ND	20	98	80	120	101	75	125
Sulphate	2	mg/L	<2			1	20	100	80	120	112	75	125
Anions by IC - QCBatchID: DIO0490-MAY25													
Nitrate (as N)	0.06	mg/L	<0.06			0	20	100	90	110	102	75	125
Nitrite (as N)	0.03	mg/L	<0.03			ND	20	97	90	110	102	75	125
Carbon by Combustion/Oxidation - QCBatchID: EWL0484-MAY25													
Dissolved Organic Carbon	1.0	mg/L	<1.0			0	20	100	90	110	93	75	125
Conductivity - QCBatchID: EWL0485-MAY25													
Conductivity	2	uS/cm	< 2			3	20	100	90	110	NA		
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0212-MAY25													
Boron (dissolved)	0.002	mg/L	<0.002			18	20	103	90	110	94	70	130
Calcium (dissolved)	0.01	mg/L	<0.01			7	20	100	90	110	97	70	130
Chromium (dissolved)	0.003	mg/L	<0.00008			ND	20	99	90	110	111	70	130
Iron (dissolved)	0.01	mg/L	<0.007			17	20	103	90	110	125	70	130
Magnesium (dissolved)	0.001	mg/L	<0.001			1	20	101	90	110	76	70	130
Manganese (dissolved)	0.002	mg/L	<0.00001			12	20	102	90	110	97	70	130
Potassium (dissolved)	0.009	mg/L	<0.009			3	20	102	90	110	100	70	130
Sodium (dissolved)	0.01	mg/L	<0.01			ND	20	100	90	110	89	70	130
pH - QCBatchID: EWL0485-MAY25													
pH	0.05	No unit	NA			0		100			NA		
Total Nitrogen - QCBatchID: SKA0220-MAY25													
Total Kjeldahl Nitrogen	0.5	as N mg/L	<0.5			8	10	105	90	110	93	75	125

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : C.A0024089.5055-03,
Holbrook Landfill Site GW

16-May-2025

WSP Canada Inc.
Attn : Albert Siertsema

55 King Street, Suite 700, St. Catharines
Canada, L2R 3H5
Phone: 905-687-1771 x 240, Fax:

Date Rec. : 09 May 2025
LR Report: **CA15283-MAY25**
Reference: CA0024089.5055-03, Albert Siertsema

Copy: 1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: RL	6: Client Limits	7: 40
Sample Date & Time							07-May-25 11:30
Temp Upon Receipt [°C]	***	***	***	***	***	***	***
pH [No unit]	10-May-25	11:41	13-May-25	08:09	0.05	---	7.99
Conductivity [uS/cm]	10-May-25	11:41	13-May-25	08:09	2	---	717
Alkalinity [mg/L as CaCO3]	10-May-25	11:41	13-May-25	08:09	2	---	353
DOC [mg/L]	14-May-25	14:53	16-May-25	14:48	1.0	---	5.7*
Cl [mg/L]	15-May-25	13:43	16-May-25	08:48	1	---	20
SO4 [mg/L]	15-May-25	13:41	16-May-25	08:48	2	---	42
TKN [as N mg/L]	13-May-25	09:39	15-May-25	15:45	0.5	---	0.6
NO2 [as N mg/L]	14-May-25	01:56	15-May-25	13:54	0.03	---	< 0.03
NO3 [as N mg/L]	14-May-25	01:56	14-May-25	15:57	0.06	---	< 0.06
NO2+NO3 [as N mg/L]	14-May-25	01:56	15-May-25	13:54	0.06	---	< 0.06
NH3+NH4 [as N mg/L]	13-May-25	16:43	15-May-25	14:38	0.1	---	0.2
Ca (diss) [mg/L]	12-May-25	11:36	14-May-25	08:29	0.01	---	119
Mg (diss) [mg/L]	12-May-25	11:36	14-May-25	08:29	0.001	---	22.6
Na (diss) [mg/L]	12-May-25	11:36	14-May-25	08:29	0.01	---	9.72
K (diss) [mg/L]	12-May-25	11:36	14-May-25	08:29	0.009	---	0.991
Hardness [mg/L as CaCO3]	12-May-25	11:36	14-May-25	08:29	0.05	---	391*
B (diss) [mg/L]	12-May-25	11:36	14-May-25	08:29	0.002	---	0.019
Cr (diss) [mg/L]	12-May-25	11:36	14-May-25	08:29	0.003	0.003	< 0.003
Fe (diss) [mg/L]	12-May-25	11:36	14-May-25	08:29	0.01	0.01	4.04*
Mn (diss) [mg/L]	12-May-25	11:36	14-May-25	08:29	0.002	0.002	0.292*
Vinyl Chloride [mg/L]	12-May-25	14:55	13-May-25	09:53	0.0002	---	< 0.0002
Benzene [mg/L]	12-May-25	14:55	13-May-25	09:53	0.0005	---	< 0.0005
1,4-Dichlorobenzene [mg/L]	12-May-25	14:55	13-May-25	09:53	0.0005	---	< 0.0005

Analysis	**8: 42**	**9: 45**	**10: 28R**	**11: 46**	**12: 32R**
Sample Date & Time	07-May-25 12:00	07-May-25 15:30	07-May-25 15:00	07-May-25 14:00	07-May-25 10:45
Temp Upon Receipt [°C]	***	***	***	***	***
pH [No unit]	8.29	8.34	8.31	8.14	8.05
Conductivity [uS/cm]	390	345	541	439	620
Alkalinity [mg/L as CaCO3]	220	167	302	266	296
DOC [mg/L]	1.3	1.5	2.6	2.1	1.8
Cl [mg/L]	< 1	2	6	2	14
SO4 [mg/L]	< 2	27	42	25	29
TKN [as N mg/L]	< 0.5	< 0.5	0.7	< 0.5	< 0.5
NO2 [as N mg/L]	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
NO3 [as N mg/L]	< 0.06	< 0.06	0.19	< 0.06	0.07
NO2+NO3 [as N mg/L]	< 0.06	< 0.06	0.19	< 0.06	0.07
NH3+NH4 [as N mg/L]	0.3	0.1	0.1	< 0.1	< 0.1
Ca (diss) [mg/L]	36.4	40.2	51.8	65.8	89.7
Mg (diss) [mg/L]	23.1	14.1	26.8	20.2	28.3
Na (diss) [mg/L]	18.7	24.0*	35.8*	2.50	9.72
K (diss) [mg/L]	1.22	1.01	1.88	1.01	0.964
Hardness [mg/L as CaCO3]	186*	158*	240*	247*	341*
B (diss) [mg/L]	0.051	0.126	0.090	0.014	0.047
Cr (diss) [mg/L]	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Fe (diss) [mg/L]	0.21	0.02	0.27	0.55*	< 0.01
Mn (diss) [mg/L]	0.010	0.014	0.027	0.018	0.002
Vinyl Chloride [mg/L]	< 0.0002	< 0.0002	---	< 0.0002	< 0.0002
Benzene [mg/L]	< 0.0005	< 0.0005	---	< 0.0005	< 0.0005
1,4-Dichlorobenzene [mg/L]	< 0.0005	< 0.0005	---	< 0.0005	< 0.0005

Analysis	**13: 27**	**14: 39**	**15: 19R**	**16: 41**	**17: 16AR**
Sample Date & Time	07-May-25 16:00	07-May-25 11:45	07-May-25 13:45	07-May-25 14:00	07-May-25 12:30
Temp Upon Receipt [°C]	***	***	***	***	***
pH [No unit]	8.13	8.15	8.34	7.08	8.22
Conductivity [uS/cm]	723	706	435	1970	650
Alkalinity [mg/L as CaCO3]	300	284	205	981*	268
DOC [mg/L]	1.5	1.4	1.0	26.4*	< 1.0
Cl [mg/L]	38	35	1	73	25
SO4 [mg/L]	31	45	28	3	50
TKN [as N mg/L]	< 0.5	< 0.5	< 0.5	83.5	< 0.5
NO2 [as N mg/L]	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
NO3 [as N mg/L]	< 0.06	< 0.06	0.20	< 0.06	0.12
NO2+NO3 [as N mg/L]	< 0.06	< 0.06	0.20	< 0.06	0.12
NH3+NH4 [as N mg/L]	< 0.1	< 0.1	< 0.1	85.9	< 0.1
Ca (diss) [mg/L]	96.6	90.4	52.3	172	70.9
Mg (diss) [mg/L]	25.8	25.7	22.1	39.8	32.2

Analysis	**13:** **27**	**14:** **39**	**15:** **19R**	**16:** **41**	**17:** **16AR**
Na (diss) [mg/L]	17.2	21.9*	12.8	48.9*	23.5*
K (diss) [mg/L]	1.61	1.70	1.28	50.2	1.39
Hardness [mg/L as CaCO3]	347*	332*	222*	593*	310*
B (diss) [mg/L]	0.090	0.028	0.040	1.69	0.034
Cr (diss) [mg/L]	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Fe (diss) [mg/L]	0.96*	0.43*	< 0.01	61.1*	0.24
Mn (diss) [mg/L]	0.061*	0.133*	< 0.002	0.406*	0.022
Vinyl Chloride [mg/L]	< 0.0002	< 0.0002	---	0.0002	---
Benzene [mg/L]	< 0.0005	< 0.0005	---	0.0139	---
1,4-Dichlorobenzene [mg/L]	< 0.0005	< 0.0005	---	0.0139	---

Analysis	**18:** **24R**	**19:** **21R**	**20:** **Trip Blank**	**21:** **26R**	**22:** **11R**
Sample Date & Time	07-May-25 10:45	07-May-25 13:30	07-May-25	07-May-25 16:30	07-May-25 10:45
Temp Upon Receipt [°C]	***	***	***	***	***
pH [No unit]	8.30	8.22	---	7.95	7.65
Conductivity [uS/cm]	420	656	---	963	1540
Alkalinity [mg/L as CaCO3]	209	282	---	374	731*
DOC [mg/L]	3.8	1.8	---	3.4	16.8*
Cl [mg/L]	2	39	---	87	99
SO4 [mg/L]	17	5	---	29	4
TKN [as N mg/L]	0.7	< 0.5	---	< 0.5	2.9
NO2 [as N mg/L]	< 0.03	< 0.03	---	< 0.03	< 0.03
NO3 [as N mg/L]	< 0.06	< 0.06	---	< 0.06	< 0.06
NO2+NO3 [as N mg/L]	< 0.06	< 0.06	---	< 0.06	< 0.06
NH3+NH4 [as N mg/L]	0.4	0.1	---	< 0.1	1.6
Ca (diss) [mg/L]	51.0	82.6	---	91.2	167
Mg (diss) [mg/L]	20.9	26.3	---	33.1	67.4
Na (diss) [mg/L]	10.9	13.6	---	70.0*	62.0*
K (diss) [mg/L]	0.997	1.57	---	1.87	3.77
Hardness [mg/L as CaCO3]	213*	315*	---	364*	694*
B (diss) [mg/L]	0.044	0.061	---	0.579	0.225
Cr (diss) [mg/L]	< 0.003	< 0.003	---	< 0.003	< 0.003
Fe (diss) [mg/L]	0.59*	1.26*	---	1.22*	1.17*
Mn (diss) [mg/L]	0.014	0.044	---	0.027	0.051*
Vinyl Chloride [mg/L]	---	---	< 0.0002	< 0.0002	---
Benzene [mg/L]	---	---	< 0.0005	< 0.0005	---
1,4-Dichlorobenzene [mg/L]	---	---	< 0.0005	< 0.0005	---

Analysis	**23: GWDUP 2**	**24: D2**	**25: 38**	**26: 44**	**27: 37R**
Sample Date & Time	07-May-25	07-May-25 11:30	07-May-25 10:00	07-May-25 09:45	07-May-25 09:30
Temp Upon Receipt [°C]	***	***	***	***	***
pH [No unit]	8.21	8.43	8.08	7.97	8.04
Conductivity [uS/cm]	720	718	554	723	664
Alkalinity [mg/L as CaCO3]	288	289	240	275	282
DOC [mg/L]	1.2	1.4	1.3	1.1	1.3
Cl [mg/L]	34	36	24	15	33
SO4 [mg/L]	34	34	24	42	36
TKN [as N mg/L]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
NO2 [as N mg/L]	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
NO3 [as N mg/L]	< 0.06	< 0.06	< 0.06	16.3*	< 0.06
NO2+NO3 [as N mg/L]	< 0.06	< 0.06	< 0.06	16.3	< 0.06
NH3+NH4 [as N mg/L]	< 0.1	< 0.1	0.1	< 0.1	< 0.1
Ca (diss) [mg/L]	0.32	0.29	72.3	96.5	88.1
Mg (diss) [mg/L]	0.073	0.068	21.8	31.8	25.8
Na (diss) [mg/L]	166*	163*	16.5	6.85	15.0
K (diss) [mg/L]	0.527	0.522	1.28	1.30	1.52
Hardness [mg/L as CaCO3]	1.09	1.00	270*	372*	326*
B (diss) [mg/L]	0.050	0.049	0.041	0.022	0.045
Cr (diss) [mg/L]	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Fe (diss) [mg/L]	0.02	0.02	0.54*	0.02	0.80*
Mn (diss) [mg/L]	< 0.002	< 0.002	0.050	< 0.002	0.042
Vinyl Chloride [mg/L]	---	---	< 0.0002	< 0.0002	< 0.0002
Benzene [mg/L]	---	---	< 0.0005	< 0.0005	< 0.0005
1,4-Dichlorobenzene [mg/L]	---	---	< 0.0005	< 0.0005	< 0.0005

Analysis	**28: 25R**	**29: 43**	**30: GWDUP1**
Sample Date & Time	07-May-25 11:10	07-May-25 10:20	07-May-25
Temp Upon Receipt [°C]	***	***	***
pH [No unit]	8.18	8.36	8.00
Conductivity [uS/cm]	425	421	972
Alkalinity [mg/L as CaCO3]	205	234	376
DOC [mg/L]	2.1	1.7	3.2
Cl [mg/L]	10	21	84
SO4 [mg/L]	5	30	28
TKN [as N mg/L]	< 0.5	0.9	< 0.5
NO2 [as N mg/L]	< 0.03	0.07	< 0.03
NO3 [as N mg/L]	< 0.06	0.30	< 0.06
NO2+NO3 [as N mg/L]	< 0.06	0.37	< 0.06
NH3+NH4 [as N mg/L]	< 0.1	0.5	< 0.1
Ca (diss) [mg/L]	49.9	28.6	90.8
Mg (diss) [mg/L]	16.8	13.5	33.7

Analysis	28: 25R	29: 43	30: GWDUP1
Na (diss) [mg/L]	18.1	52.8*	72.3*
K (diss) [mg/L]	1.38	1.58	1.86
Hardness [mg/L as CaCO3]	194*	127*	366*
B (diss) [mg/L]	0.053	0.148	0.572
Cr (diss) [mg/L]	< 0.003	< 0.003	< 0.003
Fe (diss) [mg/L]	1.07*	0.32*	1.22*
Mn (diss) [mg/L]	0.024	0.026	0.027
Vinyl Chloride [mg/L]	---	< 0.0002	---
Benzene [mg/L]	---	< 0.0005	---
1,4-Dichlorobenzene [mg/L]	---	< 0.0005	---

Temperature of Sample upon Receipt: 14 degrees C

Raised RL for tag#26 NO2 due to sample matrix

Method Descriptions

Parameter	Description	SGS Method Code	PALA
1,4-Dichlorobenzene	VOC wtr	ME-CA-[ENV]GC-LAK-AN-004	N
Alkalinity	Alkalinity by Titration	ME-CA-[ENV]EWL-LAK-AN-006	N
Ammonia+Ammonium (N)	NH3+NH4 by Skalar - solution	ME-CA-[ENV]SFA-LAK-AN-007	N
Benzene	VOC wtr - BTEX	ME-CA-[ENV]GC-LAK-AN-004	N
Boron (dissolved)	B by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	Y
Calcium (dissolved)	Ca by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	Y
Chloride	Chloride by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026	N
Chromium (dissolved)	Cr by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	Y
Conductivity	Conductivity by Conductivity Meter	ME-CA-[ENV]EWL-LAK-AN-006	Y
Dissolved Organic Carbon	DOC by Combustion/Oxidation	ME-CA-[ENV]EWL-LAK-AN-023	N
Hardness (dissolved)	Hardness (CaCO3) by ICP-MS dissolved	ME-CA-[ENV]SPE-LAK-AN-006	N
Iron (dissolved)	Fe by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	Y
Magnesium (dissolved)	Mg by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	Y
Manganese (dissolved)	Mn by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	Y
Nitrate (as N)	Nitrate by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001	N
Nitrate + Nitrite (as N)	Total Nitrate/Nitrite by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001	Y
Nitrite (as N)	Nitrite by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001	N
pH	pH - solution	ME-CA-[ENV]EWL-LAK-AN-006	Y
Potassium (dissolved)	K by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	N
Sodium (dissolved)	Na by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006	Y
Sulphate	Sulphate by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026	N
Total Kjeldahl Nitrogen	Tot. kjeldahl Nitrogen by Skalar	ME-CA-[ENV]SFA-LAK-AN-002	N
Vinyl Chloride	VOC wtr	ME-CA-[ENV]GC-LAK-AN-004	N

Accreditation Descriptions

PALA:
SGS Canada Industries & Environment conforms to the requirements of ISO/IEC 17025:2005 for specific tests as listed on their scope of accreditation found at https://www.ceaeq.gouv.qc.ca/documents/publications/listes.htm#labo_accr. Analytes and SGS Method Codes marked with a “Y” in the “PALA” column in the table denote ISO/IEC17025:2005 accreditation

Maarit Wolfe, Hon.B.Sc
Project Specialist,
Environment, Health & Safety

Quality Control Report

Organic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Volatile Organics - QCBatchID: GCM0148-MAY25													
1,4-Dichlorobenzene	0.0005	mg/L	<0.0005			ND	30	94	60	130	103	50	140
Benzene	0.0005	mg/L	<0.0005			ND	30	94	60	130	103	50	140
Vinyl Chloride	0.0002	mg/L	<0.0002			ND	30	101	50	140	110	50	140
Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0242-MAY25													
Alkalinity	2	mg/L as Ca	< 2			1	20	100	80	120	NA		
Ammonia by SFA - QCBatchID: SKA0128-MAY25													
Ammonia+Ammonium (N)	0.1	as N mg/L	<0.1			ND	10	97	90	110	94	75	125
Ammonia by SFA - QCBatchID: SKA0150-MAY25													
Ammonia+Ammonium (N)	0.1	as N mg/L	<0.1			0	10	100	90	110	98	75	125
Anions by discrete analyzer - QCBatchID: DIO5016-MAY25													
Chloride	1	mg/L	<1			1	20	98	80	120	100	75	125
Sulphate	2	mg/L	<2			ND	20	100	80	120	102	75	125
Anions by IC - QCBatchID: DIO0301-MAY25													
Nitrate (as N)	0.06	mg/L	<0.06			ND	20	103	90	110	106	75	125
Nitrate + Nitrite (as N)	0.06	mg/L	<0.06			NA		NA			NA		
Nitrite (as N)	0.03	mg/L	<0.03			ND	20	100	90	110	104	75	125
Anions by IC - QCBatchID: DIO0302-MAY25													
Nitrate (as N)	0.06	mg/L	<0.06			0	20	102	90	110	105	75	125
Nitrate + Nitrite (as N)	0.06	mg/L	<0.06			NA		NA			NA		
Nitrite (as N)	0.03	mg/L	<0.03			ND	20	99	90	110	103	75	125
Anions by IC - QCBatchID: DIO0306-MAY25													
Nitrate (as N)	0.06	mg/L	<0.06			ND	20	103	90	110	106	75	125
Nitrate + Nitrite (as N)	0.06	mg/L	<0.06			NA		NA			NA		
Nitrite (as N)	0.03	mg/L	<0.03			ND	20	100	90	110	105	75	125
Carbon by Combustion/Oxidation - QCBatchID: EWL0348-MAY25													
Dissolved Organic Carbon	1.0	mg/L	<1.0			0	20	96	90	110	102	75	125
Carbon by Combustion/Oxidation - QCBatchID: EWL0349-MAY25													
Dissolved Organic Carbon	1.0	mg/L	<1.0			3	20	102	90	110	99	75	125
Carbon by Combustion/Oxidation - QCBatchID: EWL0385-MAY25													
Dissolved Organic Carbon	1.0	mg/L	<1.0			0	20	100	90	110	98	75	125

Inorganic Analysis

Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Carbon by Combustion/Oxidation - QCBatchID: EWL0386-MAY25													
Dissolved Organic Carbon	1.0	mg/L	<1.0			ND	20	100	90	110	101	75	125
Conductivity - QCBatchID: EWL0242-MAY25													
Conductivity	2	uS/cm	4			3	20	103	90	110	NA		
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0103-MAY25													
Boron (dissolved)	0.002	mg/L	<0.002			1	20	98	90	110	94	70	130
Calcium (dissolved)	0.01	mg/L	<0.01			2	20	101	90	110	96	70	130
Chromium (dissolved)	0.003	mg/L	<0.00008			ND	20	101	90	110	102	70	130
Iron (dissolved)	0.01	mg/L	<0.007			ND	20	100	90	110	100	70	130
Magnesium (dissolved)	0.001	mg/L	<0.001			0	20	102	90	110	102	70	130
Manganese (dissolved)	0.002	mg/L	<0.00001			18	20	100	90	110	97	70	130
Potassium (dissolved)	0.009	mg/L	<0.009			1	20	105	90	110	92	70	130
Sodium (dissolved)	0.01	mg/L	<0.01			0	20	99	90	110	76	70	130
pH - QCBatchID: EWL0242-MAY25													
pH	0.05	No unit	NA			0		100			NA		
Total Nitrogen - QCBatchID: SKA0126-MAY25													
Total Kjeldahl Nitrogen	0.5	as N mg/L	<0.5			4	10	96	90	110	102	75	125
Total Nitrogen - QCBatchID: SKA0151-MAY25													
Total Kjeldahl Nitrogen	0.5	as N mg/L	<0.5			1	10	98	90	110	98	75	125

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : C.A0024089.5055-02,
Holbrook Landfill

30-October-2025

WSP Canada Inc.
Attn : Albert Siertsema

55 King Street, Suite 700, St. Catharines
Canada, L2R 3H5
Phone: 905-687-1771 x 240, Fax:

Date Rec. : 22 October 2025
LR Report: **CA40206-OCT25**
Reference: CA0024089.5055-02,
P118924CA001, Albert
Siertsema

Copy: 1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: RL	6: Client Limits	7: PWQO	8: COI	9: SWDUP
Sample Date & Time								21-Oct-25 13:00	21-Oct-25
Temp Upon Receipt [°C]	***	***	***	***	***	***	***	***	***
pH [No unit]	23-Oct-25	15:36	24-Oct-25	15:01	0.05			8.00	8.10
Conductivity [uS/cm]	23-Oct-25	15:36	24-Oct-25	15:02	2	---	---	1110	1120
Alkalinity [mg/L as CaCO3]	23-Oct-25	15:36	24-Oct-25	15:02	2	---	---	405	405
Cl [mg/L]	27-Oct-25	15:42	28-Oct-25	14:34	1	---	---	140	140
SO4 [mg/L]	27-Oct-25	15:40	28-Oct-25	14:34	2	---	---	14	14
NO3 [as N mg/L]	27-Oct-25	11:17	27-Oct-25	17:20	0.06	---	---	< 0.06	< 0.06
NO2 [as N mg/L]	27-Oct-25	10:52	27-Oct-25	17:20	0.03	---	---	< 0.03	< 0.03
Nitrates [as N mg/L]	27-Oct-25	11:17	27-Oct-25	17:20	0.06			< 0.06	< 0.06
NH3+NH4 [as N mg/L]	23-Oct-25	20:11	24-Oct-25	11:31	0.1	---	---	2.1	2.1
Ca (tot) [mg/L]	28-Oct-25	12:56	29-Oct-25	14:50	---	---	---	122	119
Mg (tot) [mg/L]	28-Oct-25	12:56	29-Oct-25	14:50	---	---	---	28.5	27.8
Na (tot) [mg/L]	28-Oct-25	12:56	29-Oct-25	14:50	---	---	---	77.0	74.6
K (tot) [mg/L]	28-Oct-25	12:56	29-Oct-25	14:50	---	---	---	6.40	6.68
Hardness [mg/L as CaCO3]	28-Oct-25	12:56	29-Oct-25	14:50	---	---	---	421	412
B (tot) [mg/L]	28-Oct-25	12:56	29-Oct-25	14:50	0.002	---	0.2	0.340	0.346
Cr (tot) [mg/L]	28-Oct-25	12:56	29-Oct-25	14:50	0.003	0.003	0.001	< 0.003	< 0.003
Fe (tot) [mg/L]	28-Oct-25	12:56	29-Oct-25	14:50	---	0.01	0.3	8.97	9.26
Mn (tot) [mg/L]	28-Oct-25	12:56	29-Oct-25	14:50	0.002	0.002	---	1.04	1.13

`Temperature of Sample upon Receipt: 10 degrees C`

Method Descriptions

Units	Description	SGS Method Code	PALA
mg/L as CaCO3	Alkalinity by Titration	ME-CA-[ENV]EWL-LAK-AN-006	N
as N mg/L	NH3+NH4 by Skalar - solution	ME-CA-[ENV]SFA-LAK-AN-007	N
mg/L	B by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
mg/L	Ca by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
mg/L	Chloride by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026	N
mg/L	Cr by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
uS/cm	Conductivity by Conductivity Meter	ME-CA-[ENV]EWL-LAK-AN-006	Y
mg/L as CaCO3	Hardness (CaCO3) by ICP-MS	ME-CA-[ENV]SPE-LAK-AN-006	N
mg/L	Fe by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y

OnLine LIMS

Units	Description	SGS Method Code	PALA
mg/L	Mg by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
mg/L	Mn by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
mg/L	Nitrate by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026	N
mg/L	Total Nitrate/Nitrite by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026	N
mg/L	Nitrite by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026	N
No unit	pH - solution	ME-CA-[ENV]EWL-LAK-AN-006	Y
mg/L	K by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	N
mg/L	Na by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006	Y
mg/L	Sulphate by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026	N

Accreditation Descriptions

PALA:
SGS Canada Industries & Environment conforms to the requirements of ISO/IEC 17025:2005 for specific tests as listed on their scope of accreditation found at https://www.ceaeq.gouv.qc.ca/documents/publications/listes.htm#labo_accr. Analytes and SGS Method Codes marked with a “Y” in the “PALA” column in the table denote ISO/IEC17025:2005 accreditation

Brad Moore Hon. B.Sc
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0004310863

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0565-OCT25													
Alkalinity	2	mg/L as Ca	< 2			1	20	109	80	120	NA		
Ammonia by SFA - QCBatchID: SKA0212-OCT25													
Ammonia+Ammonium (N)	0.1	as N mg/L	<0.1			ND	10	99	90	110	103	75	125
Anions by discrete analyzer - QCBatchID: DIO8040-OCT25													
Nitrate + Nitrite (as N)	0.06	mg/L	< 0.06			1	20	107	80	120	101	75	125
Nitrite (as N)	0.03	mg/L	< 0.03			1	20	98	80	120	100	75	125
Anions by discrete analyzer - QCBatchID: DIO8041-OCT25													
Chloride	1	mg/L	<1			ND	20	91	70	130	96	70	130
Sulphate	2	mg/L	<2			ND	20	99	80	120	101	75	125
Conductivity - QCBatchID: EWL0565-OCT25													
Conductivity	2	uS/cm	< 2			0	10	98	90	110	NA		
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0287-OCT25													
Boron (total)	0.002	mg/L	<0.002			9	20	94	90	110	96	70	130
Calcium (total)	0.01	mg/L	<0.01			12	20	97	90	110	101	70	130
Chromium (total)	0.003	mg/L	<0.00008			10	20	100	90	110	97	70	130
Iron (total)	0.01	mg/L	<0.007			0	20	102	90	110	125	70	130
Magnesium (total)	0.001	mg/L	<0.001			0	20	98	90	110	103	70	130
Manganese (total)	0.002	mg/L	<0.00001			14	20	101	90	110	104	70	130
Potassium (total)	0.009	mg/L	<0.009			14	20	97	90	110	103	70	130
Sodium (total)	0.01	mg/L	<0.01			4	20	100	90	110	104	70	130
pH - QCBatchID: EWL0565-OCT25													
pH	0.05	No unit	NA			0		100			NA		

APPENDIX G

Monitoring and Screening Checklist

Appendix D-Monitoring and Screening Checklist
General Information and Instructions

General Information: The checklist is to be completed, and submitted with the Monitoring Report.
Instructions: A complete checklist consists of:
(a) a completed and signed checklist, including any additional pages of information which can be attached as needed to provide further details where indicated.
(b) completed contact information for the Competent Environmental Practitioner (CEP)
(c) self-declaration that CEP(s) meet(s) the qualifications as set out below and in Section 1.2 of the Technical Guidance Document.

Definition of Groundwater CEP:
For groundwater, the CEP must have expertise in hydrogeology and meet one of the following:
(a) the person holds a licence, limited licence or temporary licence under the *Professional Engineers Act*; or
(b) the person holds a certificate of registration under the *Professional Geoscientists Act, 2000* and is a practicing member, temporary, member or limited member of the Association of Professional Geoscientists of Ontario. O. Reg. 66/08, s. 2..
Definition of Surface water CEP:
A CEP for surface water assessments is a scientist, professional engineer or professional geoscientist as described in (a) and (b) above with demonstrated experience and post-secondary education, either a diploma or degree, in hydrology, aquatic ecology, limnology, aquatic biology, physical geography with specialization in surface water, and/or water resource management.

The type of scientific work that a CEP performs must be consistent with that person's education and experience. If an individual has appropriate training and credentials in both groundwater and surface water and is responsible for both areas of expertise, the CEP may then complete and validate both sections of the checklist.

Monitoring Report and Site Information

Waste Disposal Site (WDS) Name	Holbrook Landfill Site
Location (e.g. street address, lot, concession)	Part of Lots 20 and 21, Concession III, Township of Norwich
GPS Location (taken within the property boundary at front gate/ front entry)	NAD 83, Zone 17, N 4759736 E 525949
Municipality	Township of Norwich
Client and/or Site Owner	County of Oxford
Monitoring Period (Year)	2025
This Monitoring Report is being submitted under the following:	
Environmental Compliance Approval (ECA) Number (formerly "Certificate of Approval" (C of A)) :	Amended ECA No. A070702 - dated September 8, 2016 Notice No. 1 - dated March 6, 2018
Director's Order No.:	
Provincial Officer's Order No.:	

Other:			
Report Submission Frequency	● **Annual** ○ **Other**		
The site is: **(Operation Status)**		○ **Open** ○ **Inactive** ● **Closed**	
Is there an active waste transfer station at the site?		○ **Yes** ● **No**	
Does this WDS have a Closure Plan?		○ **Not yet submitted** ○ **Submitted and under review** ● **Submitted and approved**	
Total Approved Capacity		*Units*	Tonnes
Maximum Approved Fill Rate		*Units*	
Total Waste Received within Monitoring Period (Year)		*Units*	Tonnes
Total Waste Received within Monitoring Period (Year) *Describe the methodology used to determine this quantity*			
Estimated Remaining Capacity		*Units*	Cubic Metres
Estimated Remaining Capacity *Describe the methodology used to determine this quantity*			
Estimated Remaining Capacity *Date Last Determined*			
Non-Hazardous Approved Waste Types	☐ Domestic ☐ Industrial, Commercial & Institutional (IC&I) ☐ Source Separated Organics (Green Bin) ☐ Tires	☐ Contaminated Soil ☐ Wood Waste ☐ Blue Box Material ☐ Processed Organics ☐ Leaf and Yard Waste	☐ Food Processing/Preparation Operations Waste ☐ Hauled Sewage Other:
Subject Waste Approved Waste Classes: Hazardous & Liquid Industrial *(separate waste classes by comma)*			

Year Site Opened *(enter the Calendar Year only)*	1970	**Current** **ECA Issue Date**	9/8/2016

Is your Site required to submit Financial Assurance?	○ **Yes** ● **No**
Describe how your WDS is designed.	● Natural Attenuation only ○ Fully engineered Facility ○ Partially engineered Facility
Does your Site have an approved Contaminant Attenuation Zone?	● **Yes** ○ **No**
If closed, specify ECA, control or authorizing document closure date:	Select Date
Has the nature of the operations at the site changed during this monitoring period?	○ **Yes** ● **No**
If yes, provide details:	

Have any measurements been taken since the last reporting period that indicate landfill gas volumes have exceeded the MOE limits for subsurface or adjacent buildings? (i.e. exceeded the LEL for methane)	○ Yes ● No

Groundwater WDS Verification:

Based on all available information about the site and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The monitoring program continues to effectively characterize site conditions and any groundwater discharges from the site. All monitoring wells are confirmed to be in good condition and are secure:	● **Yes** ○ **No**	
2) All groundwater, leachate and landfill gas sampling and monitoring for the monitoring period being reported on was successfully completed as required by ECA or other relevant authorizing/ control document(s):	● **Yes** ○ **No** ○ **Not Applicable**	If no, list exceptions below or attach information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**
All groundwater sampling and monitoring was successfully completed as required.		

3) a) Some or all groundwater, leachate and landfill gas sampling and monitoring requirements have been established or defined outside of a ministry ECA, authorizing, or control document.

○ **Yes**
● **No**
○ **Not Applicable**

b) If yes, the sampling and monitoring identified under 3(a) for the monitoring period being reported on was successfully completed in accordance with established protocols, frequencies, locations, and parameters developed as per the Technical Guidance Document:

○ **Yes**
○ **No**
● **Not Applicable**

If no, list exceptions below or attach additional information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**

4) All field work for groundwater investigations was done in accordance with Standard Operating Procedures (SOP) as established/outlined per the Technical Guidance Document (including internal/external QA/QC requirements) (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	● **Yes** ○ **No**	Field work for groundwater monitoring was completed in accordance with standard operating procedures. The field QA/QC program included blind duplicate field duplicates; however, travel spiked blanks were not part of the field QA/QC program. The laboratory QA/QC control program was extensive and included method blanks, duplicates, spiked blanks, matrix spikes, and surrogate recovery.

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

5) The site has an adequate buffer, Contaminant Attenuation Zone (CAZ) and/or contingency plan in place. Design and operational measures, including the size and configuration of any CAZ, are adequate to prevent potential human health impacts and impairment of the environment.	● **Yes** ○ **No**	
6) The site meets compliance and assessment criteria.	○ **Yes** ● **No**	Please see Sections 4.2.4, 4.2.5, and 4.2.6 of the 2025 Water Monitoring Report.
7) The site continues to perform as anticipated. There have been no unusual trends/changes in measured leachate and groundwater levels or concentrations.	● **Yes** ○ **No**	

1) Is one or more of the following risk reduction practices in place at the site: *(a)* There is minimal reliance on natural attenuation of leachate due to the presence of an effective waste liner and active leachate collection/ treatment; or *(b)* There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or *(c)* The site meets the following two conditions (typically achieved after 15 years or longer of site operation): *i.*The site has developed stable leachate mound(s) and stable leachate plume geometry/ concentrations; and *ii.*Seasonal and annual water levels and water quality fluctuations are well understood.	● Yes ○ No	Note which practice(s):	☐ (a) ☐ (b) ☒ (c)
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	○ Yes ● No ○ Not Applicable	Please see Section 4.2.6 of the 2025 Water Monitoring Report.	

Groundwater CEP Declaration:

I am a licensed professional Engineer or a registered professional geoscientist in Ontario with expertise in hydrogeology, as defined in Appendix D under Instructions. Where additional expertise was needed to evaluate the site monitoring data, I have relied on individuals who I believe to be experts in the relevant discipline, who have co-signed the compliance monitoring report or monitoring program status report, and who have provided evidence to me of their credentials.

I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended), and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories,* or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature and will be rectified for the next monitoring/reporting period. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

● **No changes to the monitoring program are recommended** ○ **The following change(s) to the monitoring program is/are recommended:**	
● **No Changes to site design and operation are recommended** ○ **The following change(s) to the site design and operation is/are recommended:**	
Name:	Albert Siertsema
Seal:	*Original is Signed and Sealed*

Signature:	*Original is Signed*	**Date:**	5-Feb-2026
CEP Contact Information:	Albert Siertsema		
Company:	WSP Canada Inc.		
Address:	1821 Provincial Rd, Suite 100, Windsor, ON N8W 5V7		
Telephone No.:	519-383-0366	Fax No. :	
E-mail Address:	albert.siertsema@wsp.com		
Co-signers for additional expertise provided:			
Signature:		**Date:**	
Signature:		**Date:**	

Surface Water WDS Verification:

Provide the name of surface water body/bodies potentially receiving the WDS effluent and the approximate distance to the waterbody (including the nearest surface water body/bodies to the site):

Name (s)	Branch Creek

Distance(s)	Crosses Site, +/- 150 m from the fill area

Based on all available information and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The current surface water monitoring program continues to effectively characterize the surface water conditions, and includes data that relates upstream/background and downstream receiving water conditions:	● **Yes** ○ **No**	If no, identify issues (Type Here):
2) All surface water sampling for the monitoring period being reported was successfully completed in accordance with the ECA or relevant authorizing/control document(s) (if applicable):	● **Yes** ○ **No** ○ **Not applicable**	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date

3) a) Some or all surface water sampling and monitoring program requirements for the monitoring period have been established outside of a ministry ECA or authorizing/control document.	○ **Yes** ● **No** ○ **Not Applicable**	
b) If yes, all surface water sampling and monitoring identified under 3 (a) was successfully completed in accordance with the established program from the site, including sampling protocols, frequencies, locations and parameters) as developed per the Technical Guidance Document:	○ **Yes** ○ **No** ● **Not Applicable**	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date

4) All field work for surface water investigations was done in accordance with SOP, including internal/external QA/QC requirements, as established/outlined as per the Technical Guidance Document, MOE 2010, or as amended. (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	● **Yes** ○ **No**	Field work for groundwater monitoring was completed in accordance with standard operating procedures. The field QA/QC program included blind duplicate field duplicates; however, travel spiked blanks were not part of the field QA/QC program. The laboratory QA/QC control program was extensive and included method blanks, duplicates, spiked blanks, matrix spikes, and surrogate recovery.

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

5) The receiving water body meets surface water-related compliance criteria and assessment criteria: i.e., there are no exceedances of criteria, based on MOE legislation, regulations, Water Management Policies, Guidelines and Provincial Water Quality Objectives and other assessment criteria (e.g., CWQGs, APVs), as noted in Table A or Table B in the Technical Guidance Document (Section 4.6):	○ **Yes** ● **No**

If no, list parameters that exceed criteria outlined above and the amount/percentage of the exceedance as per the table on the following page or provide details in an attachment:

Parameter	Compliance or Assessment Criteria or Background	Amount by which Compliance or Assessment Criteria or Background Exceeded
e.g. Nickel	e.g. ECA limit, PWQO, background	e.g. X% above PWQO
Please refer to Section 5.0 of the 2025 Water Monitoring Report		
6) In my opinion, any exceedances listed in Question 5 are the result of non-WDS related influences (such as background, road salting, sampling site conditions)?	○ **Yes** ● **No**	Weak landfill influences are likely observed in the surface water quality in retention pond P02, and in the on-site stream at intermediate station C04. The retention pond and the on-site stream are inferred to receive shallow groundwater flow from beneath the landfill. At station C01, which monitors surface water quality leaving the site, landfill influences from upstream portions of the on-site stream, shallow groundwater discharge, and possibly road salting practices have likely affected the surface water quality at the station. The elevated concentrations observed at station C01 in fall 2025 are attributed to sampling site conditions (stagnant).

7) All monitoring program surface water parameter concentrations fall within a stable or decreasing trend. The site is not characterized by historical ranges of concentrations above assessment and compliance criteria.	● **Yes** ○ **No**	
8) For the monitoring program parameters, does the water quality in the groundwater zones adjacent to surface water receivers exceed assessment or compliance criteria (e.g. , PWQOs, CWQGs, or toxicity values for aquatic biota (APVs)):	● Yes ○ No ○ Not Known ○ Not Applicable	The retention pond and on-site stream are inferred to receive shallow groundwater flow from beneath the landfill. As such, weak leachate impacts are observed in the on-site stream.
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	○ **Yes** ● **No** ○ **Not Applicable**	

Surface Water CEP Declaration:

I, the undersigned hereby declare that I am a Competent Environmental Practitioner as defined in Appendix D under Instructions, holding the necessary level of experience and education to design surface water monitoring and sampling programs, conduct appropriate surface water investigations and interpret the related data as it pertains to the site for this monitoring period.

I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended) and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories,* or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature or will be rectified for future monitoring events. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

● **No Changes to the monitoring program are recommended** ○ **The following change(s) to the monitoring program is/are recommended:**	
● **No changes to the site design and operation are recommended** ○ **The following change(s) to the site design and operation is/ are recommended:**	

CEP Signature	*Original is Signed*
Relevant Discipline	Geological Engineer
Date:	5-Feb-2026
CEP Contact Information:	Albert Siertsema
Company:	WSP Canada Inc.
Address:	1821 Provincial Rd, Suite 100, Windsor, ON N8W 5V7
Telephone No.:	519-383-0366
Fax No. :	
E-mail Address:	albert.siertsema@wsp.com

Save As **Print Form**

wsp.com