2021 Annual Report, Warsaw Road Landfill

Provisional Certificate of Approval No.: A340902

April 25, 2022

Prepared for:
The Corporation of the Township of Douro Dummer

Cambium Reference: 12987-003

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Executive Summary

The Warsaw waste disposal site is on Part of Lot 8, Concession V, in the Township of Douro-Dummer, County of Peterborough. The site is accessed on the west side of Douro 4th Line, 6 km southwest of the community of Warsaw. The Site was closed for operations in 1996. At least 60,399 m³ of waste and daily cover had been place at the site, within an approved waste disposal area of 2.0 ha.

This report presents the results of the 2021 activities that were completed at the Warsaw Waste Disposal Site. The report and activities have been completed and reported on in general conformance with the November 2010 Ministry of the Environment Technical Guidance Document entitled “Monitoring and Reporting for Waste Disposal Sites – Groundwater and Surface Water”. The “Monitoring and Screening Checklist” is provided in. Appendix A.

Groundwater flow in the overburden aquifer is toward the south-southwest. Impacted groundwater is restricted from entering the bedrock aquifer due to upward vertical gradients present south of the waste mound. Shallow groundwater is interpreted to discharge to surface in the wetland areas to the south-southwest of the waste mound.

A weak leachate plume is impacting the groundwater below the waste mound and in the direction of groundwater flow. Of note, non-waste related sources were also influencing the down-gradient water quality. The water quality at the down-gradient monitoring wells were considered stable.

A site-specific trigger mechanism was developed in 2021 in conjunction with the approval to suspend the surface water monitoring program. As such, select sentry monitoring wells were used to monitor for potential impacts to the down-gradient surface water environments. The groundwater trigger was not activated in 2021 and no further action was warranted.

The down-gradient surface water results indicated no negative impacts from historical waste disposal operations.

Landfill gas measurements collected in 2021 reported concentrations less than 2.5% by volume at the property boundaries.

Site inspections completed in conjunction with the monitoring events in 2021 noted that the waste mound was well vegetated with no signs of erosion. No groundwater seeps were observed.

The Township managed the Site in compliance with Ministry Approvals in 2021.

Recommendations were made (and approved by the Ministry of Environment, Conservation and Parks) regarding the ongoing environmental monitoring program of the Warsaw Road Landfill. The approved recommendations included reduction to the scope of the monitoring program and reporting frequencies.

Respectfully submitted,

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1.0 Introduction

The Corporation of the Township of Douro-Dummer (Township) retained Cambium Inc. (Cambium) to complete the 2021 annual monitoring program for the Warsaw Road landfill (Site). The Site operates under Ontario Ministry of the Environment, Conservation and Parks (Ministry) Provisional Certificate of Approval (PC of A) No. A340902, most recently amended on November 21, 1996. In addition, Certificate of Approval (C of A) No. 6601-5YWQBH was issued on May 13, 2004, for operation of a passive landfill gas venting system at the Site (Appendix B).

To aid in the understanding of the history and development of the Site, the following information is included digitally in the report package:

- **Hydrogeological Study, Warsaw Road "South" Landfill Site** (L.R, 1994)
- **Final Site Closure Plan, Township of Douro Warsaw Road (South), Landfill Site** (L.R, 1995a)
- **Groundwater Impact Assessment, Warsaw Road (South) Waste Disposal Site** (L.R, 1995b)
- **Environmental Impact Assessment, Warsaw Road "South" Landfill Site** (L.R, 1995c)
- **Leachate Attenuation Zone Assessment, Warsaw Road (South) Waste Disposal Site** (L.R, 1995d)
- **1995 Annual Monitoring Report, Warsaw Road (South) Landfill Site** (L.R, 1996)

1.1 Site Location

The Site is on Part of Lot 8, Concession V, in the Township of Douro-Dummer, County of Peterborough (Figure 1). The Site is accessed on the west side of Douro 4th Line, 6 km southwest of the community of Warsaw. The Universal Transverse Mercator (UTM) coordinates for the site entrance are Zone 17, 723155 m east, 4918804 m north.

1.2 Site Description

The Site is owned and operated by the Township and began operations as a solid waste natural attenuation landfill around 1971. The Site is in an excavated portion of the Warsaw Esker. The waste footprint approaches (but is still within) the south, east, west, and north-west boundaries of the licenced boundary. Waste has been deposited at an average depth of waste being 6.0 m. The types of materials landfilled included: domestic, commercial, agricultural, non-hazardous solid waste, brush, and construction and demolition materials. The most recent volume of waste landfilled that could be sourced for this report was 60,399 m^3 as of March 1994. Final closure activities were completed in 1996.

The Site is fully fenced and has a locked gate. The Site is in a rural area and is bordered by Country Road 4 and Douro 4th Line to the north and the east, respectively. The Site is forested to the south. Land use to the west of the Site is primarily agricultural.

Site details are included in Embedded Table 1 and a local topography plan is attached as Figure 2. An existing conditions plan is attached as Figure 3.

Embedded Table 1 Site Details

Approved Limit of Waste	2.00 ha
Total Site Area	2.43 ha

1.3 Scope of Work

The scope of the 2021 work program was based on the results of the 2020 monitoring program completed by GHD (GHD, 2021), the requirements outlined in the Ministry PC of A, and included:

- Groundwater elevation monitoring
- Surface water and groundwater sampling and analysis
- Landfill Gas (LFG) monitoring

- Evaluation of groundwater quality against the Ontario Drinking Water Quality Standards (ODWQS) and compliance is assessed using the site-specific trigger mechanism
- Evaluation of surface water quality against the PWQO
- Site Inspection
- Preparation of this annual report

This report presents the results of the 2021 work program and provides an assessment of current landfill impacts on surrounding groundwater and surface water environments. Recommendations for the 2022 monitoring program, based on the 2021 results and assessment, are outlined herein. Furthermore, this report addresses the following Ministry correspondence following their review of the **2020 Annual Monitoring Report, Warsaw Road Landfill Site** (GHD, 2021) and the letter **Request for Review Potential Reductions to the Environmental Monitoring Program – Warsaw Road Landfill** dated August 5, 2021. prepared by Cambium Inc (Appendix C).

- Surface water review comments from Mark Phillips, Surface Water Scientist, Water Resources Unit, Eastern Region dated September 1, 2021.
- Groundwater review comments from Alija Bos, Hydrogeologist, Water Resources Unit, Eastern Region dated October 4, 2021.
- Ministry correspondence ultimately approving changes to the monitoring and reporting programs in a letter dated March 22, 2022.

2.0 Methodology

The 2021 work program was completed to maintain compliance with the PC of A and Ministry requirements. As such, the environmental monitoring work program was completed consistent with **Guidance Manual for Landfill Sites Receiving Municipal Waste** (MOEE, 1993) and **Monitoring and Reporting for Waste Disposal Sites, Groundwater and Surface Water, Technical Guidance Document** (MOE, 2010).

Field tasks were completed following Cambium's Standard Operating Procedures developed from recognized standard procedures such as those listed above and **Guidance on Sampling and Analytical Methods for use at Contaminated Sites in Ontario** (MOEE, 1996). A health and safety program was developed for site-specific conditions and all Cambium personnel working on the project were familiarized and required to follow the identified protocol.

Surface water and groundwater samples were stored in coolers with freezer packs and maintained at less than 10°C during transport to Caduceon Environmental Laboratories (Caduceon) in Kingston, Ontario. Caduceon is accredited by the Canadian Association for Laboratory Accreditation Inc. for specific environmental tests listed in the scope of accreditation. Groundwater and surface water samples were submitted for analysis of the parameters outlined in Table 1.

2.1 Groundwater Monitoring Program

The following tasks were completed as part of the 2021 groundwater monitoring program:

- Prior to sampling, water levels were measured at each monitoring well using an electronic water level tape.
- The purge volume was calculated on-site during each monitoring event using the measured water level, well depth, and the borehole diameter. Each groundwater monitoring well to be sampled was purged of approximately three well bore volumes. For wells with low recovery, at least one saturated borehole volume was purged prior to sampling. Purged water was disposed on-site, down-gradient of each respective well.

- Samples were collected using dedicated polyethylene tubing equipped with inertial-lift foot valves.
- Groundwater samples for metals analysis was field filtered.
- Field measurements were recorded for pH, conductivity, temperature, dissolved oxygen (DO), and oxygen reduction potential (ORP).

Groundwater samples were collected on June 21 and November 10 from the monitoring wells listed below. The only deviation from the monitoring program was that a sample was not collected from monitoring well TW9-2 due to insufficient volumes in the spring and autumn.

Monitoring wells included in the groundwater monitoring program are shown on Figure 3. The UTM coordinates for the monitoring locations are in Table 2. Groundwater results are discussed in Section 4.2. Field data sheets are in Appendix D. Laboratory Certificates of Analysis are in Appendix E. Photographs of each monitoring location are in Appendix F.

- TW2
- TW3-2
- TW4-2
- TW5-2
- TW6-2
- TW7
- TW8-2
- TW9-2

Blind duplicate groundwater samples were collected from TW8-2 in June and TW7 in November as part of the Quality Assurance/Quality Control (QA/QC) program. As these field duplicates equate to at least 10% of the total samples collected, this is an adequate QA/QC program for groundwater. In addition to these samples, the laboratory completes internal QA/QC. The results of the QA/QC program are presented in Section 4.1.

2.2 Residential Well Monitoring Program

Residential well sampling is conducted on a three-year basis next to be completed in 2023. Residential wells identified in the monitoring program include:

- R1
- R2
- R3
- R4

Results from the 2020 residential well sampling are discussed in Section 4.3. Available water well records are in Appendix G.

Residential well locations are included on Figure 2. Field data sheets are in Appendix D and laboratory Certificates of Analysis provided by Caduceon are in Appendix E.

2.3 Surface Water Monitoring Program

The following tasks were completed as part of the 2021 surface water monitoring program:

- Weather conditions prior to and during field events were recorded.
- Surface water samples were collected by immersing the sample container into the water body.
- When sample bottles were prefilled with preservatives, a clean bottle was used to collect and decant the water directly into the sample bottle.
- Surface water samples for mercury analysis were filtered (0.45 µm) by the laboratory.
- Field measurements including pH, conductivity, temperature, DO, and ORP were recorded at each sample location.
- Where possible, depth, width, and flow velocity measurements were collected at each surface water location.

The surface water monitoring program included attempts to collect samples from off-site surface water sample stations DSW06, DSW07, DSW09, DSW11, DSW16, and DSW17 on June 21 and November 10. The following deviations from the monitoring program were noted:

- All monitoring stations were dry during the spring sampling event except for DSW11.
- Station DSW16 was inadvertently missed during the June sampling event due to a misinterpretation of the previously established monitoring program.

- No samples were collected from DSW06 due to insufficient sampling volumes in November.
- No samples were collected from DSW09 due to misinterpretation of the historical figures.

Surface water sampling locations are shown on Figure 2. The UTM coordinates for the monitoring locations are in Embedded Table 2. Surface water results are discussed in Section 4.4. The surface water field data sheets are in Appendix D. Laboratory Certificates of Analysis provided by Caduceon are in Appendix E. Photographs of each surface water sample location are in Appendix F.

Blind duplicate surface water samples were collected from station DSW11 in June and November as part of the QA/QC program. As these field duplicates equate to at least 10% of the total samples obtained, this is an adequate QA/QC program for surface water. The results of the QA/QC program are presented in Section 4.1.

2.4 Landfill Gas Monitoring Program

Landfill gas monitoring was implemented at the Site to assess compliance with Section 4.10 of **Landfill Standards, A Guideline on the Regulatory and Approval Requirements for New and Expanding Landfilling Sites** (MOEE, 1998), which states the concentration of methane gas in the subsurface may not exceed 2.5% by volume at the property boundary.

Landfill gas, specifically methane and carbon dioxide, is derived from the decomposition of organic wastes. Production of LFG from landfilled wastes normally reaches a maximum rate approximately two years after placement and may continue at this rate for many years. The biological decomposition process results in the generation of LFG until some period, likely decades, after the landfilling of that waste ceases. Methane is explosive at volumes of 5% methane by volume to 17% methane by volume (50,000 ppm to 170,000 ppm) in air (Werner Sölken, 2021).

Landfill gas monitoring was conducted on all groundwater monitoring wells, gas probes and the passive gas venting system in conjunction with the spring and autumn sampling events. The gas probes are listed below. Of note, locations GP5 and GP6 are passive landfill gas

vents operated under Ministry Approval No. 6601-5YWQBH. Four additional monitoring events were completed on July 14, August 26, September 17, and December 16 at the following gas probe locations (Figure 3). An RKI Eagle 2 Gas Monitor calibrated for methane, and hydrogen sulfide was used to collect measurements. The LFG monitoring results are in Table 8 and discussed in Section 4.5.

- GP1
- GP2
- GP3
- GP4
- GP5
- GP6

2.5 Site Review and Operations Overview

Site operations were observed during site visits completed in June, and November 2021. During these visits, the items listed below were inspected on accessed areas of the Site and observations were noted in the field file. Site inspection results are presented in Section 5.0.

- Final cover integrity
- Status of monitoring well security
- Condition and layout of access roads, access gates

3.0 Geological and Hydrogeological Context

3.1 Topography and Drainage

The Site is in the Otonabee River tertiary watershed and the Indian River quaternary watershed. Drainage in the watershed is generally directed toward the Indian River which discharges into Rice Lake. Locally, drainage is directed south/southeast of the Site through roadside ditches, and/or intermittent streams within the Indian River/Warsaw South - Provincially Significant Wetland. Drainage eventually discharges into May's Creek which flows east/northeast, eventually discharging to the Indian River, about 4.0 km from the Site.

There are currently six surface water locations in the monitoring program as shown on Figure 2. Apart from surface water station DSW11 and DSW6, all stations can be characterized as low-lying and ponded with intermittent flows of low volume occurring during periods of increased precipitation.

- DSW06 is on a perennial stream, on the north side of a culvert, about 125 m southwest and downgradient of the waste mound.
- DSW07 is about 50 m south and down-gradient of station DSW17. This station is in a wetland environment surrounded by pastureland to the west-southwest.
- DSW09 is about 335 m southwest and downgradient of the waste mound, at a pond surrounded by pastureland. This station is downstream of station DSW06.
- DSW11 is on the west side of Douro 4th Line, at a culvert, and is the closest station to May's Creek. This monitoring station is in a well-defined channel and exhibits flowing conditions for at least part of the year.
- DSW16 is topographically up-gradient of the Site, adjacent Douro 4th Line Road, in a wetland type environment.
- DSW17 is in a roadside ditch along Douro 4th Line about 210 m south and downgradient from the waste mound.

The geospatial coordinates (NAD 83) for the surface water monitoring stations are in Embedded Table 2. Flow and discharge rates measured during the monitoring events are in Appendix D.

Embedded Table 2 Coordinates of Surface Water Stations

Surface Water Station	Northing	Easting
DSW06	4918494	722909
DSW07	4918398	723103
DSW09	4918303	723033
DSW11	4918070	723421
DSW16	4917815	723592
DSW17	4918488	723266

Notes:

1. Zone 17.

3.1.1 Precipitation Data

A review of the 2021 precipitation data for the Peterborough Trent U (Government of Canada, 2021a) in comparison to the average precipitation data for 1981 to 2010 (Government of Canada, 2021b) indicated that the overall precipitation was normal; however, varied from month to month.

In 2021, the wettest months of the year were July and September which had 81% and 94% more precipitation than normal. Conversely, the driest months of the year were May and August. The monthly precipitation, as well as the amount of precipitation during and in the three days prior to the sampling events is summarized in Embedded Table 3. Refer to Appendix D for field sheets and climate data.

Embedded Table 3 Historical and 2021 Precipitation Data

Sampling Date	Average Monthly Precipitation (mm) (1981 – 2010)	2021 Precipitation (mm)	Precipitation During and Prior to Sampling (mm)
June 21	79.9	94.3	9.9
November 10	86.4	49.4	0.0

3.2 Hydrogeology

Based on the assessment completed by GHD and prior consultants, the following summary of the hydrogeology of the Site is provided. The Site is in the physiographic region know as the Peterborough Drumlin Field. This area is characterized by a northeast-southwest trending drumlin feature. The underlying bedrock consists of limestone with minor shale of the Middle Ordovician Trent-Black River Group.

Historically there has been six multi-level groundwater monitors at the Site identified as: TW3, TW4, TW5, TW6, TW8, and TW9. All associated bedrock monitoring wells (identified with -1) have been decommissioned. The current monitoring program is primarily focused on the groundwater quality in the overburden (TW2, TW5-2, TW6-2, TW8-2, and TW9-2) and three monitors (TW3-2, TW4-2, and TW7) screened across the interface of the overburden and bedrock units. Of note, monitoring well TW7 was installed on the top of the southern slope of the waste mound where bedrock contact was about 8.0 m below ground surface (bgs). Borehole records available for the Site indicate that the overburden varies in depth from about 2.10 m bgs (north of the waste mound) to 8.0 m bgs (south of the waste mound) and consists of sandy till, clay, sandy gravel with clay seams, sand, silty sand, sand and gravel, and sandy loam (Appendix G).

Groundwater wells installed in the current monitoring program are described below. Refer to Table 2 for a summary of monitoring well depths and Figure 3 for locations.

- TW2 is screened within a clay, and sandy till units about 60 m southeast of the waste mound. This well is installed adjacent a low-lying wet area.

- TW3-2 is screened within two units: sandy gravel with clay seams, and limestone bedrock. The well is about 150 m southwest of the waste mound.
- TW4-2 is screened within two units: sandy loam and limestone bedrock. The well is about 210 m northwest and upgradient of the waste mound. This monitor is used to assess background water quality for the Site.
- TW5-2 is screened within silt and clay till, and sand and gravel. The well is on the east side of Douro 4th Line, about 60 m southeast of the waste mound.
- TW6-2 is screened within sand with gravel and cobbles about 30 m southwest of the waste mound.
- TW7 is screened within waste, and limestone bedrock on the top of the southern slope of the waste mound. This well is used to characterize Site related impacts.
- TW8-2 is screened in the silty sand about 90 m south of the waste mound.
- TW9-2 is screened in silt, clay, and rocks about 180 m south of the waste mound. This monitor is the farthest down-gradient well and typically exhibits dry conditions.

3.2.1 Well Records

A well record search was completed in 2022 (MECP, 2022). Many well records in the area of the Site were not plotted correctly on the Ministry Water Well Information System (WWIS) mapping. Cambium staff reviewed available information to determine which records corresponded to residents adjacent the Site. The well records outlined below are the suspected records.

- Wells to the north/northwest (up-gradient) of the waste mound ranged from about 8 to 32 m deep. These wells were identified by the Ministry as water well record no's: A140642, 5106499 and 5106962. The shallow well was completed in the sand and gravel whereas the deeper wells were completed in the limestone bedrock. Static water levels ranged from about 4 to 13 m.

- The residential well to the northeast (up-gradient) of the waste mound was about 7 m deep and completed in the clay with a static water level of about 2 m. This well was identified by the Ministry as water well record no. 5112773.
- The residential well to the southeast (down-gradient) of the waste mound was about 9 m deep and completed in the limestone/shale bedrock with a static water level of 2 m. This well was identified by the Ministry as water well record no. 5110691. This well is about 300 m down-gradient of the waste mound.

Given the number of domestic water supply wells surrounding the Site, a residential water quality program is completed, as discussed in Section 4.3.

As per Section 3.3, leachate is not interpreted to migrate into deep bedrock aquifers. Further, leachate is interpreted to discharge to surface water in the areas south and southwest of the Site. The risk of landfill leachate influencing the residential wells outlined herein is considered low, however the existing residential well program is considered reasonable, and should continue as a matter of due diligence.

3.2.2 Groundwater Flow Direction

Groundwater levels measured in the spring and autumn 2021 were used to calculate groundwater elevations and groundwater flow direction summarized in Table 2 and shown on Figure 4 and Figure 5.

The general direction of shallow groundwater flow is to the south-southeast, consistent with historical observations. The average horizontal hydraulic gradients are detailed in Embedded Table 4.

Embedded Table 4 Horizontal Hydraulic Gradients

	Spring	Autumn
Up-gradient of waste mound (South)	0.035 m/m	0.036 m/m
Down-gradient of waste mound (south-southeast)	0.035 m/m	0.034 m/m

3.2.3 Vertical Gradients

As previously mentioned in Section 0, all multi-level bedrock monitors have been decommissioned. As reported in the **"2020 Monitoring Report"** (GHD, 2021), there is a potential for a groundwater to discharge to surface at all monitoring wells except for TW4 (i.e., downward gradient). Of note, historical monitor TW3-1 was a flowing artesian well, further indicating upwards vertical hydraulic gradients at the Site.

The overburden aquifer is interpreted to discharge to surface in the areas south and southwest of the Site.

3.2.4 Hydraulic Conductivity

Embedded Table 5 presents the results of the hydraulic conductivity tests completed at four monitoring wells in 2009 (GHD, 2021). Overall, the highest hydraulic conductivity was at monitoring well TW6-2 at 1.26×10^{-1} cm/s, and the lowest hydraulic conductivity was at TW7 at 1.57×10^{-3} cm/s.

Embedded Table 5 Hydraulic Conductivity at select monitors

Monitor	Test Type	Hydraulic Conductivity (cm/s)	Geometric Mean K (cm/s)	Representative Aquifer
TW2	Rising Head	2.06×10^{-3}	2.06×10^{-3}	Silty Sand
TW5-2	Falling Head Rising Head	9.15×10^{-3} 3.23×10^{-3}	5.43×10^{-3}	Silty Sand
TW6-2	Falling Head Rising Head	1.26×10^{-1} 4.30×10^{-2}	7.37×10^{-2}	Clean Sand Silty Sand, Clean Sand
TW7	Falling Head Rising Head	6.60×10^{-3} 1.57×10^{-3}	3.22×10^{-3}	Silty Sand

3.3 Conceptual Site Model

The following characterization of hydrogeological conditions is based upon the previous annual monitoring report completed by GHD, and other supporting data.

From the waste mound, surface water drainage is generally directed south. To the south, east, and west run off will be directed through roadside ditches, and/or intermittent streams within the Indian River/Warsaw South - Provincially Significant Wetland, until discharging into May's Creek which is a tributary of the Indian River.

The overburden aquifer is the immediate receiver of landfill leachate. Leachate impacted groundwater migrates south-southwest from the waste mound where it discharges to the surface. Vertical gradients to the south of the Site between the overburden and bedrock aquifers restricts leachate from migrating deeper into bedrock aquifer systems. As such, leachate impact to the bedrock aquifer is considered negligible. Based on this conceptual model, the primary receptor of landfill leachate are the wetland areas south-southwest of the Site.

4.0 Results and Discussion

Water quality results from the monitoring program are used to assess the existence, extent, and degree of impacts to the groundwater and surface water environments related to waste disposal site activities at the Site.

To ensure appropriate actions are in place to respond to degradation in surface water or groundwater quality beyond an acceptable level, site-specific trigger levels and contingency measures aid in the assessment of impacts from leachate contamination and help to prevent adverse impacts to the environments surrounding the waste disposal site.

This section presents the results of the 2021 monitoring program.

4.1 Quality Assurance / Quality Control

Results from the analyses completed on the blind duplicate samples obtained as part of the QA/QC program were evaluated. Parameter concentrations were considered significantly different if the relative percent difference (RPD) between the duplicate and the parent samples was greater than 30% when at least one result was greater than five times the reported detection limit (RDL).

The duplicate groundwater and surface water analyses were compared to the originals. Overall, the duplicate samples correlated well with the parent samples and met the data quality objective of 30%. Exceptions were noted:

- Lead and ammonia at surface water station DSW11 in June.
- Total Suspended Solids (TSS) at monitor TW8-2 in June.

Considering the low variation between the parent and duplicate groundwater and surface water samples, the results were interpreted with confidence.

4.2 Groundwater Quality

Groundwater analysis data for 2011 to 2021 are summarized in Table 3 through Table 6.

To assess water quality impacts related to landfill site operations, the analytical results for groundwater samples collected on-site were compared to background water quality and historical data, and site compliance was assessed using the ODWQS (MOE, 2006).

In 2021, approval was granted from the Ministry to suspend the surface water monitoring program. Based on the conceptual site model indicating that groundwater would discharge to surface to the south of the waste mound, select groundwater monitoring wells were used to assess compliance (Appendix C). Furthermore, a trigger mechanism was developed and applied in the 2021 groundwater evaluation. Compliance was assessed using a site specific trigger values derived from historical data, the PWQO (MOEE, 1994b), the Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG) (CCME, 2011), and the British Columbia Approved Water Quality Guidelines (BCG) (BCMOE, 2016).

4.2.1 Background Groundwater Quality

When evaluating the impact of any waste disposal site on a groundwater resource, a reference point or value must be established to assist in determining the magnitude of the impact. In this respect, the quality of the groundwater that is not impacted by the waste disposal site operation (background water quality) should be used for comparison purposes. Given the location of up-gradient monitor TW4-2, the groundwater results for this well represents background water quality at the Site.

Historical water quality indicated that this well has been impacted by road salt de-icing activities along County Road 4 (e.g., elevated conductivity, chloride, sodium, etc.), and agricultural activities (i.e., elevated phosphorous, nitrate, magnesium) in the adjacent fields. The water quality in 2021 remained generally consistent with historical concentrations and continued to represent background conditions for the Site. It is noted that the concentrations of phosphorus reported from TW4-2 was significantly elevated during the 2021 monitoring program, and during the fall 2020 monitoring program, when compared to historical data.

4.2.2 Leachate Characteristics

Monitoring well TW7 was installed at the top of the southern slope of the waste mound. Water quality results have been indicative of the leachate quality as concentrations at this monitoring well have been greater than background chemistry. Significantly elevated concentrations have typically been reported for the leachate indicator parameters (LIP) listed in Embedded Table 6.

Embedded Table 6 Leachate Indicator Parameters

- iron
- potassium
- sodium
- total dissolved solids (TDS)
- chloride
- alkalinity
- total Kjeldahl nitrogen (TKN)
- manganese
- barium
- magnesium
- boron
- total phosphorus

The water quality at TW7 is highly variable; however, no increasing or decreasing trends are apparent. Results in 2021 were consistent with historical observations.

Several parameters outlined as LIPs are also known to be present in the background water quality at elevated concentrations (such as phosphorus and potassium). In addition, some parameters (phosphorus and potassium) are reported at down gradient wells at concentrations greater than those reported from the background monitoring wells and the leachate characterization well (TW7). These data suggest that groundwater influences reported hydraulically down-gradient the waste mound are not directly attributable to waste related sources. Down-gradient influences to water quality are interpreted in consideration of ambient groundwater conditions and other unknown (non-waste related) sources of contamination (see section 4.2.5 for more details).

4.2.3 Down-gradient Groundwater Quality

The following wells monitor the down-gradient water quality: TW2, TW3-2, TW5-2, TW6-2, TW8-2, and TW9-2 (Figure 3).

Monitors TW2 and TW6-2 are the closest down-gradient monitors to the south of the waste mound. The water quality at these monitors suggest site-related impacts as most LIP

concentrations are greater than background chemistry. Furthermore, potassium concentrations at TW6-2 were elevated greater than leachate quality suggesting a non-waste related source.

The water quality at TW2 was highly variable with some LIP concentrations greater than the historical range. The variable water chemistry at TW2 would suggest that seasonal variations were influencing the water chemistry at this monitoring well (i.e., the wetting and drying of organic soils). It should be noted that monitoring well TW2 is the shallowest well in the monitoring program and is installed adjacent a low- lying wet area. Field staff noted that the well casing was constructed of well screen, material making this well susceptible to runoff and other influences. The elevated LIP concentrations (i.e., iron, manganese, alkalinity, conductivity, and TDS) can be at least partially attributed to the non-waste related sources, and well construction.

Conversely, TW6-2 was generally consistent with historical concentrations. It is noted that potassium, calcium, and sulphate are regularly reported from well TW6-2 at concentrations greater than those reported from well TW7 (i.e., the leachate characterization well). As such, water quality influences reported at well TW6-2 may not be wholly due to landfill leachate influences. No increasing or decreasing trends were evident at monitors TW2 and TW6-2.

Monitoring well TW5-2 is off-site and southeast of the waste mound. Historical results suggest similar water quality to background chemistry including elevated concentrations of parameters associated with road de-icing activities. It is evident that a non-waste related source is influencing the water chemistry at this location as concentrations of barium, and phosphorus were elevated greater than leachate quality. The water quality in 2021 remained consistent with historical concentrations, though total phosphorus and magnesium were elevated. The water quality was considered stable with no increasing of decreasing trends.

Monitoring well TW8-2 is directly south of the waste mound. Historically some LIP concentrations (i.e., barium, total phosphorus, alkalinity, and TKN) at this monitor have been reported elevated greater than at the leachate monitor suggesting some non-waste related sources are partially influencing the water chemistry. In 2021, the water quality results were generally consistent with historical results except for TKN and phosphorus in June which were

notably elevated. The concentrations of TKN and phosphorus were reported at TW8-2 at concentrations greater than well TW7 (i.e., the leachate characterization well). As such, water quality influences reported at well TW8-2 may not be wholly due to waste related sources. No increasing or decreasing trends were apparent at this monitor.

Monitoring well TW9-2 is the farthest down-gradient monitor to the south and is off-site. No samples have been collected at this monitor since installation. As such, based on the minor impacts at TW8-2 it is not anticipated that site-related impacts would travel off-site to the south.

Monitoring well TW3-2 is on the southwest property boundary. The water chemistry at this location is variable and has many elevated but generally stable LIP concentrations. It is noted that iron, barium, and boron were reported at concentrations marginally greater than historical ranges during at least one sampling event in 2021. The elevated concentrations were not indicative of changing conditions within the leachate plume but characteristic of the variable water quality at this location. Furthermore, the concentrations of potassium, calcium and sulphate were greater than leachate quality suggesting that a non-waste related source is influencing the chemistry at this location. Nonetheless, the water quality in 2021 was generally consistent with historical results.

Groundwater review comments received in 2021 agreed that the water chemistry at the Site is generally stable. Approval was granted on March 22, 2022, for reductions to the groundwater monitoring program as detailed in Section 4.6.

4.2.4 Volatile Organic Compounds

Volatile Organic Compound (VOC) analysis was completed in the spring and autumn at monitor TW7. All VOC concentrations were less than the reported detection limit in 2021. Refer to Table 4 for VOC results. Ministry approval was granted on March 22, 2022, for the removal of VOCs from the groundwater monitoring program.

4.2.5 Groundwater Compliance Assessment

The Ministry Reasonable Use Concept (MOEE, 1994b) indicates that surface water receiving groundwater through baseflow is a recognized reasonable use of the groundwater. Given that

the groundwater discharges into the wetland areas to the south-southwest, the Site complies with the intent of the Ministry Guideline B-7.

In conjunction with the approval to suspend the surface water monitoring program, a site-specific trigger mechanism was developed to monitor for potential surface water impacts at select down-gradient groundwater wells. Ministry approval was granted on March 22, 2022, and the trigger mechanism is discussed herein.

4.2.5.1 Trigger Locations

Potential impacts to the adjacent surface water system will be monitored by sentry groundwater monitors TW2, TW3-2 and TW8-2 south and down-gradient of the waste mound.

4.2.5.2 Trigger Parameters and Concentrations

The LIPs outlined in Embedded Table 6 are used as the trigger parameters. The trigger criteria were developed as followed:

- The PWQO for iron (MOEE, 1994b)
- The CWQG for chloride (CCME, 2011)
- The BCG for boron (BCMOE, 2016)
- The background concentration for the remaining LIPs (as no PWQO criteria are available). Background concentrations are be defined as the 75th percentile concentrations of the eight most recent sampling events (not including the current sampling year). The background concentration will also be used for comparison if it is greater than an associated PWQO, CWQG, BCG.

4.2.5.3 Trigger Mechanism

The trigger mechanism for the Site includes a three-tier system.

Tier One is monitoring of the landfill related parameters as outlined in the approved monitoring program (Table 1).

Following each sampling event, the water quality will be assessed, and Tier Two will be initiated if both of the following conditions are satisfied:

I. one or more parameter concentrations at one of the sentry wells (TW2, TW3 and TW8-2) are greater than the trigger concentration on three consecutive occasions.

II. One or more parameter concentrations at sentry wells TW2, TW3 and TW8-2 are reported as significantly elevated in compared to historical data during three consecutive sampling events.

Tier Two includes the following steps:

I. Notify the Township of the trigger exceedances.

II. Complete an assessment to determine if the trigger exceedance(s) is causing unacceptable impacts to the receiving watercourse and if the landfill is the primary contributing source to the elevated concentrations. The assessment should consider the need to sample at additional surface water and/or groundwater locations and/or the need for analysis of additional parameters to assess compliance (such as toxicity testing).

III. If the groundwater conditions that triggered Tier Two of the mechanism are interpreted to be a result of landfill leachate influence, and that adverse impacts are expected to the receiving watercourse (which could result in additional testing to assess the potential impacts), then Tier Three of the trigger will be activated.

Tier Three includes the following:

I. Immediately notifying the District Manager of the trigger initiation.

II. Provide the District Manager with the results of the assessment completed as part of Tier Two, including the proposed sampling plan for review and approval, if applicable. This step should be completed within three months of the original trigger exceedance.

III. If assessment or confirmatory testing indicates that adverse impacts are expected and/or evident to the receiving watercourse and are landfill-related, development of a contingency plan that includes an evaluation of remedial options in consultation with the

Township and the Ministry, with discussions to occur within six months of the original trigger exceedance. (Note: at this stage it is unknown what the contingency plan could be. However, the first step will likely be re-implementing the existing surface water sampling program, or a portion thereof. Additional sampling and other remedial options can be determined at a later date, should the surface water program ever be re-instated.).

IV. Implementation of the contingency plan.

Potential contingency plan measures/remedial options include:

- Acquisition of additional buffer lands
- Drainage improvements
- Installation of additional low permeability soil or geotextile capping
- Additional sampling locations

Any recommendation for remedial action should include a time frame for completion of studies and implementation, as well as recommended changes to the monitoring program to assess the effectiveness of the action taken.

4.2.5.4 2021 Compliance Assessment

With the inclusion of the 2021 water quality results, the following LIPs exceeded the trigger criteria for three consecutive events (Table 5).

- TW2: barium, manganese, magnesium, phosphorus, and alkalinity
- TW3-2: barium, iron, manganese, magnesium, phosphorus, potassium, and alkalinity
- TW8-2: barium, manganese, magnesium, potassium, phosphorus, and alkalinity

Although numerous parameters exceeded the trigger criteria for three consecutive events, only barium and iron were reported at concentrations greater than historical ranges from well TW3-2. As previously mentioned in Section 4.2.3, concentrations of barium and iron were only marginally elevated above the historical ranges in 2021. The slight increase in concentrations

were not interpreted to be reflective of a change in the leachate characteristics but indicative of the variable water quality at this location.

The concentrations of phosphorus were reported to be significantly greater than historical concentrations at TW8-2 during three consecutive occasions in 2021 (i.e., during the fall sampling event in 2020 and during both sampling events in 2021).

The concentration of phosphorus reported from well TW8-2 was also greater than that reported from the leachate well during the same time frame. Significant increases in the concentration of phosphorus were also noted at the background water quality station TW4-2 during the same time frame. It is worth nothing that during the November 2021 sampling event the lowest concentration of phosphorus (when comparing TW4-2, TW7 and TW8-2) was reported from TW7. This indicated that the significantly elevated concentrations of phosphorus reported from well TW8-2 were caused from a non-waste related source. As such, Tier II of the trigger mechanism was not activated in 2021 and no further action is warranted. Future monitoring will determine the need for activation of Tier II of the trigger mechanism.

4.3 Residential Water Quality

Residential well samples are collected every three years with the last sample collected in 2020. There are four residential wells in the current monitoring program identified as: R1, R2, R3, and R4. Results from the 2021 sampling event is summarized in Table 6.

Residential well R1 is on the east side of Douro 4th Line, about 335 m southeast, and downgradient of this historical waste mound. Results in 2020 indicated low metals concentrations, a neutral pH, and elevated conductivity. Nitrate and TDS exceeded the ODWQS criteria for at least one monitoring event in 2020.

Residential well R2 is on the east side of Douro 4th Line, about 145 m northeast, and up-gradient of the historical waste mound. Only one sample was collected from this location in 2020. Results indicated low metals concentrations, a neutral pH, and no ODWQS exceedances.

Residential well R3 is on the south side of County Road 4, about 330 m northwest and cross-gradient of the historical waste mound. Results in 2020 indicated a neutral pH, low metal concentrations, and elevated TDS. The only exceedance of the ODWQS criteria was TDS in 2020.

Residential well R4 is on the south side of County Road 4, about 185 m north and up-gradient of the historical waste mound. Results from the November 2020 event suggested the sample was collected post treatment (i.e., water softener) as concentrations of TDS, sodium, conductivity, and chloride were significantly elevated over historical results.

The next residential well sample collection event should be completed in 2023.

4.4 Surface Water Quality

The 2011 to 2021 surface water quality data are included on Table 7. The surface water data have been compared to background water quality and historical data. As per the recent suspension of the surface water monitoring program, the surface water quality data is no longer reviewed to determine compliance of the Site. However, surface water quality is compared herein to the PWQO (MOEE, 1994b) for general reference.

4.4.1 Background Surface Water Quality

Surface water monitoring station DSW16 is topographically up-gradient of the Site and is representative of background conditions. The station is in a wetland environment which exhibits ponded conditions and is adjacent Douro 4th Line Road.

No historical surface water quality data for DSW16 was available at the time of this report. Only one sample was collected from this station in 2021 as it was dry during the June sampling event. Results in 2021 indicated low concentrations of most parameters except for those associated with road de-icing activities (e.g., chloride, hardness, conductivity, etc.). There were no PWQO exceedances in 2021.

4.4.2 Downstream Surface Water Quality

The downstream surface water quality is assessed by the following locations (from closest to farthest from the waste mound):

- DSW06 and DSW09 to the southwest
- DSW17, DSW07, and DSW11 to the south

DSW06 is the closest surface water monitoring station down-gradient of the waste mound. No samples were collected from station DSW06 in 2021 due to dry conditions. Only one data set has been made available historically for this station at the time of this report. Water quality results indicated low concentrations of most parameters except for those associated with road de-icing activities and a PWQO exceedance for phenols.

Station DSW09 is a pond surrounded by pastureland. No samples were collected from this station in 2021 (see Section 2.3). The surface water quality at this location occasionally exceeds the PWQO criteria for copper, iron, total phosphorus, and phenols. The water quality at this station is considered stable with no increasing or decreasing trends.

Station DSW17 is in a roadside ditch adjacent Douro 4th Line Road. The water quality at this station has generally low concentrations of most parameters except those associated with road de-icing activities. Only one sample was collected from this station in 2021 due to dry conditions in June. The water quality in 2021 was consistent with historical concentrations including the PWQO exceedance for phenols and DO (low). The water quality at this station is considered stable with no increasing or decreasing trends.

DSW07 is in a wetland type environment with pastureland to the west and Douro 4th Line to the east. Historical water quality indicated elevated concentrations of parameters associated with wetland environments (e.g., manganese, iron, etc.), road de-icing activities, and the occasional elevated TKN attributed to pastureland. The water quality was consistent with historical concentration ranges in 2021 including the PWQO exceedance for total phosphorus. There are no increasing or decreasing trends apparent at this station.

DSW11 is the farthest down-gradient sampling station. Historical water quality indicated low concentrations of most parameters except for those associated with road de-icing activities. The water quality in 2021 was generally stable with no increasing or decreasing trends. Total phosphorus in June and DO (low) in November where the only parameters to exceed the PWQO criteria.

From the data available at the time of this report, it is evident that down-gradient surface water locations have not been impacted by historical waste disposal operations. Furthermore, given the time since closure it is not anticipated that the water quality with deteriorate in the future.

4.5 Landfill Gas Monitoring

LFG, specifically methane and carbon dioxide, are derived from the decomposition of organic wastes. Production of LFG from landfilled wastes normally reaches a maximum rate about two years after placement and may continue at this rate for many years. The biological decomposition process results in the generation of LFG until some period, likely decades, after the landfilling of that waste ceases.

The 2021 LFG results are included on Table 8 and in Appendix D. Landfill gas measurements for methane, and hydrogen sulphide were collected during the spring and autumn sampling events at all groundwater monitors, gas probes, and passive gas venting system (GP5 and GP6). Four additional monitoring events were completed on July 14, August 26, September 17, and December 16 at the gas probe locations, and passive gas venting system (Figure 5). LFG measurements indicated the following in 2021:

- GP5 had methane concentrations within the lower explosive limit for all monitoring events except June.
- The remaining gas probes had methane concentrations less than the detection limit except for GP3 in November. The measured concentration was slightly above the detection limit.
- Hydrogen sulfide was only detected at GP5 in November and December. The measured concentrations of 0.8 ppm were significantly less than the lower explosive 43,000 ppm (Werner Sölken, 2021)

Given that GP5 is used as a passive gas venting system installed in the waste mound, the measured LFG concentrations were not unexpected. As there were no methane concentrations at the property boundaries greater than 2.5% by volume the Site complied with Section 4.10 of **Landfill Standards, A Guideline on the Regulatory and Approval Requirements for New and Expanding Landfilling Sites** (MOEE, 1998).

Ministry comments received in 2021 supported Cambium's recommendation to reduce the frequency of landfill gas monitoring from six times annually to twice annually (Appendix C). The new monitoring frequency will commence in spring 2022.

4.6 Adequacy of Monitoring Program

Throughout 2021 Cambium, on behalf of the Township, engaged the Ministry in discussion to reduce the environmental monitoring program (Appendix C). As such, approval was granted on March 22, 2022, to suspend the surface water monitoring, reduce the groundwater sampling frequency and parameters analyzed, and reduce the frequency of LFG monitoring as detailed in Embedded Table 7. There were no changes to the residential well monitoring program. Furthermore, approval was granted to reduce the reporting frequency from annually to biennially with the next report to be submitted in March 2024.

Embedded Table 7 Revised Monitoring Program

Location	Task	Frequency	Analytical Parameters
Groundwater			
TW2, TW3-2, TW4-2, TW5-2, TW6-2, TW7, TW8-2, TW9-2 1 QA/QC Duplicate	• Measure groundwater levels • Groundwater sampling • Field measurements (pH, temperature, ORP, conductivity)	Once Annually (Spring)	alkalinity, ammonia, chloride, conductivity, iron, nitrite, nitrate, TKN, pH, total phosphorus, TSS, TDS, sulphate, BOD, COD, phenols, barium, boron, potassium, manganese, magnesium, and sodium, pH, hardness
Gas Probes	• Landfill Gas Measurements	Twice Annually (Spring & Autumn)	CH4 and H2S
Residential Wells			
R1, R2, R3, R4 1 QA/QC Duplicate	• Groundwater sampling • Field measurements (pH, temperature, ORP, conductivity)	Every three years (next in 2023) (Spring & Autumn)	alkalinity, ammonia, arsenic, barium, boron, cadmium, calcium, chloride, chromium, conductivity, copper, iron, lead, magnesium, manganese, mercury, nitrite, nitrate, TKN, pH, total phosphorus, potassium, sodium, TDS, sulphate, zinc, COD, DOC, phenols, hardness Benzene, 1-4-Dichlorobenzene, Dichloromethane, Toluene, Vinyl Chloride

5.0 Site Operations

This section presents a summary of the 2021 site operations.

5.1 Site Access and Security

A lockable gate at the entrance and fencing prohibits access to the Site. Access is only permitted by permission of the Township.

5.2 Final Cover Integrity

A significant amount of time has passed since final closure activities in 1996 allowing for the vegetation cover to become well established. During the 2021 site visits, Cambium field staff noted that the vegetative cover was well established with no leachate seeps or exposed waste observed. As the vegetative cover is now established, the cover integrity is not expected to deteriorate. No post-closure repairs or maintenance was completed by the Township in 2021.

The integrity of the final cover should continue to be inspected in conjunction with the monitoring events and any evidence of erosion or leachate seeps should be addressed immediately.

5.3 Monitoring Well Security

All monitoring wells listed in Table 1 were inspected by Cambium personnel in 2021 for compliance with R.R.O. 1990 Regulation 903 – Wells (Reg.903). All monitoring wells received new padlocks in the autumn. As such, the wells complied with Reg. 903. Refer to Appendix F for photographs of the inspected monitoring wells.

5.4 Compliance with Ministry Approval

The Township managed the Site in compliance with Ministry Approvals in 2021.

6.0 Conclusions and Recommendations

Based on the 2021 monitoring program, Cambium offers the following conclusions regarding the Warsaw Road Landfill.

- Groundwater flow in the overburden aquifer is to the south-southwest.
- Upward vertical gradients to the south of the waste mound restrict leachate from entering the bedrock aquifer. The overburden aquifer is interpreted to discharge to surface in wetland areas south-southwest of the waste mound.
- A weak leachate plum is impacting the groundwater below the waste mound and in the direction of groundwater flow. It is evident that non-waste related sources are also influencing down-gradient water quality. The groundwater quality at the down-gradient monitors was considered stable.
- A site-specific trigger mechanism was developed in 2021 in conjunction with the approval to suspend the surface water monitoring program. As such, select sentry monitoring wells were used to monitor for potential impacts to the down-gradient surface water environments. The groundwater trigger was not activated in 2021 and no further action was warranted.
- Landfill gas measurements collected in 2021 reported concentrations less than 2.5% by volume at the property boundaries.
- Ministry approval was granted for reductions to the environmental monitoring program. Changes include a reduction in groundwater sampling frequency and parameters, reporting frequency from annual to biennial, the suspension of the surface water monitoring program, and a reduction in LFG monitoring frequency.
- The waste mound was observed to be well vegetated with no signs of erosion. Furthermore, no groundwater seeps were noted during any site visits conducted in 2021.
- The Township managed the Site in compliance with Ministry Approvals in 2021.

Based on the results of the 2021 monitoring program, Cambium recommends the following:

- The amended monitoring program should be implemented in 2022 as detailed in Embedded Table 7.
- The next monitoring report should be submitted in March 2024.
- Well TW2 should be upgraded or replaced to ensure a proper seal at ground surface.

7.0 References

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Glossary of Terms

Active Face/Area
The portion of the landfill facility where waste is currently being deposited, spread and/or, compacted prior to the placement of cover material.

Adverse Environmental Impact
Any direct or indirect undesirable effect on the environment resulting from an emission or discharge that is caused or likely to be caused by human activity.

Annual Report
Report documenting the results of water quality, environmental quality, and operations monitoring for the year, or for a period as prescribed in the Certificate of Approval.

Approved Design and Operations Plan
The design of a landfill site and its facilities which have been submitted along with the application documents for which formal Ministry approval has been issued through the Certificate of Approval.

Approved Site or Facility
A landfill site/facility for which there is an existing and current Certificate of Approval.

Aquifer
A geologic unit (soil or rock) that contains sufficient saturated permeable material to yield measurable quantities of water to wells and springs.

Attenuation
Natural process through which the concentrations of landfill generated contaminants are reduced to safe levels.

Borehole
A hole drilled for soil sampling purposes.

Buffer Area
An area of land situated within the peripheral area surrounding an active filling area, but limited in extent to the property boundary, assigned to provide space for remedial measures, contaminant control measures, and for the reduction or elimination of adverse environmental impact caused by migrating contaminants.

Certificate of Approval
The license or permit issued by the Ministry for the operation of a landfill site. Issued to the owner of the site with conditions of compliance stated therein.

Contaminant
A compound, element, or physical parameter, usually resulting from human activity, or found at elevated concentrations that have or may have a harmful effect on public health or the environment.

Contaminant Migration Path
Route by which a contaminant will move from the site into adjacent properties or the natural environment. Usually a route that offers the least resistance to movement.

Contamination Attenuation Zone
The zone beneath the surface, located beyond the landfill site boundary, where contaminants will be naturally attenuated to predetermined levels. Also, see Reasonable Use Policy.

Contingency Plan
A documented plan detailing a co-ordinated course of action to be followed to control and remediate occurrences such as a fire, explosion, or release of contaminants in an uncontrolled manner that could threaten the environment and public health.

Cover Material
Material approved by the Ministry that is used to cover compacted solid waste. Usually, a soil with suitable characteristics for specific end-use.

Site Development Plan and Operations Report
Development and Operations Plan or Report is a document detailing the planned sequence of activities through the landfill site's active life, the control systems, site facilities and monitoring systems that are necessary. This document is required for obtaining a Certificate of Approval.

Design Capacity
The maximum amount of waste that is planned to be disposed of at a landfill site.

Detection Limit
Concentration under which a parameter cannot be quantitatively measured.

EAA or EA Act
Environmental Assessment Act, Revised Statutes of Ontario, 1990. One of the primary acts of legislation intended to protect, conserve, and wisely manage Ontario's environment through regulating planning and development.

Environmental Compliance Approval
The license or permit issued by the Ministry for the operation of a landfill site. Issued to the owner of the site with conditions of compliance stated therein.

EPA
Environmental Protection Act, Revised Status of Ontario, 1990. EPA is another of the primary pieces of Provincial legislation governing the protection of the natural environment of the Province.

Evapotranspiration
The evaporation of all water from soil, snow, ice, vegetation and other surfaces, including the water absorbed by plants, that is released to the atmosphere as vapour.

Fill Area
The area of a landfill site designed and designated for the disposal of waste.

Final Cover
Soil material or soil in combination with synthetic membranes, overlain by vegetation in a planned landscape, placed over a waste cell that has reached the end of its active life.

Groundwater
Subsurface water that occurs beneath the water table in soils and rocks that are fully saturated.

Hydraulic Conductivity
The rate of flow of water through a cross-section under a specific hydraulic gradient. It is a property of the geologic formation and the fluid, in hydrogeologic applications where the fluid is water (Units of m/day or cm/s).

Hydraulic Gradient
The head drop per unit distance in the direction of flow, the driving force for groundwater flow.

Hydrogeology
The study of subsurface waters and related geologic aspects of surface waters.

Impermeable Fill
Soil material that is placed as filling material that is sufficiently cohesive and fine grained to impede and restrict the flow of water through it.

In situ Testing
Testing done on-site, in the field, of material or naturally occurring substances in their original state.

Landfill Gas
Combustible gas (primarily methane and carbon dioxide) generated by the decomposition of organic waste materials.

Landfill Site
A parcel of land where solid waste is disposed of in or on land for the purposes of waste management.

Leachate
Water or other liquid that has been contaminated by dissolved or suspended particles due to contact with solid waste.

Leachate Breakout
Location where leachate comes to the ground surfaces; a seep or spring.

Limit of Filling
The outermost limit at which waste has been disposed of, or approved or proposed for disposal at a landfill.

Ministry
Ontario Ministry of the Environment, Conservation and Parks.

Monitoring
Regular or spontaneous procedures used to methodically inspect and collect data on the performance of a landfill site relating to environmental quality (i.e., air, leachate, gas, ground or surface water, unsaturated soils, etc.).

Monitoring Well
The constructed unit of casing (riser and screen) installed in a borehole.

Multi-Level Monitoring Well
More than one monitoring well installed at a given test well location.

Native Soil
Soil material occurring naturally in the ground at a location.

Natural Attenuation
Where contaminants are reduced to acceptable concentration levels by natural mechanisms (dilution, absorption onto the soil matrix, etc.), biological action, and chemical interaction.

Occupational Health and Safety Act
The primary act of legislation enacted by Ontario Ministry of Labour to regulate and control the safety in the workplace; also Occupational Health and Safety Act, Revised Statutes of Ontario, 1990.

Odour Control
Minimizing or eliminating the nuisance and undesirable impact of objectionable or unpleasant odours arising from waste disposal operations.

Open Burning
Burning any matter whereby the resultant combustion products are emitted directly to the atmosphere without passing through an adequate stack, duct, or chimney.

Operations Plan
A document detailing the waste disposal operations in a planned, and if necessary, a staged manner, that ensure compliance with regulatory provisions concerning the operations of a landfill site.

Operator (Site Operator)/Attendant
The individual or organization who, through ownership or under contract, manages and operates a landfill site for the purpose of waste disposal.

Owner
A person, persons, organization, or municipal authority who own a landfill facility or part of a landfill facility, and in whose name the Certificate of Approval for the site is issued.

Percolation
The movement of infiltrating water through soil.

Permeability
Often used interchangeable with hydraulic conductivity, but not strictly correct. Permeability is a property of the porous media only. Dependent upon media properties that affect flow, diameter, sphericity, roundness, and packing of the grains.

Piezometer
A well that intersects a confined aquifer.

Provisional Certificate of Approval (Provisional C of A)
Same as Certificate of Approval.

Reasonable Use Policy
A policy developed by the Ministry to stipulate limits to the level of groundwater quality impairment that may be permitted to occur at site property boundaries, to allow the reasonable use of adjacent properties or land without adversely affecting public health and the environment.

Recharge Zone
An area where precipitation or surface run-off infiltrates into the ground and then, through natural percolation enters an aquifer.

Recycling
Sorting, collecting or processing waste materials that can be used as a substitute for the raw materials in a process or activity for the production of (the same or other) goods. For example, the "Blue Box" system, in-plant scrap handling, or raw material recovery systems. Recycling is also the marketing of products made from recycled or recycled materials.

Reduction (of waste or component of 3Rs program)
Those actions, practices, or processes that result in the production or generation of less waste.

Remedial Action
Corrective action taken to clean-up or remedy a spill, an uncontrolled discharge of a contaminant, or a breach in a facility or its operations, in order to minimize the consequent threat to public health and the environment.

Representative Sample
A small portion of soil, water, etc. which can be subjected to testing and analysis, that is expected to yield results that will reliably represent the identical characteristics of the source of the material or of a larger body of material.

Reuse (component of 3Rs program)
The use of an item again in its original form, for a similar purpose as originally intended, or to fulfil a different function.

Run-off
The part of precipitation (rainwater, snowmelt) that flows overland and does not infiltrate the surface material (soil or rock).

Saturated Zone
The zone of a subsurface soil where all voids are filled with water.

Sedimentation
The deposition of fine grained soil in an undesirable location, caused by the scouring, erosion and transportation of earth materials by surface run-off.

Sensitive Land Use
A land use where humans or the natural environment may experience an adverse environmental impact.

Settlement
The subsidence of the top surface and underlying waste of a landfill or waste cell as a result of densification under its own weight.

Site Capacity
The maximum amount of waste that is planned to be disposed (design capacity) or that has been disposed of at a landfill site.

Site Closure
The planned and approved cessation or termination of landfilling activities at a landfill site upon reaching its site capacity.

Site Life
The period from its inception through active period of waste disposal, to the time when a landfill site reaches its' site capacity, when it ceases to receive any further waste, including and up to closure.

Solid Waste
Any waste matter that cannot be characterized by its physical properties as a liquid waste product.

Solid Waste Disposal Site or Facility
A site or facility such as a landfill site where solid waste is disposed of.

Source Separation
The separation of various wastes at their point of generation for the purposes of recycling or further processing.

Standpipe
A monitoring well that intersects the water table aquifer.

Storm water
Run-off that occurs as a direct result of a storm event or thaw.

Storm water Detention
Control of storm water by the construction of impoundments of structures for the purpose of regulating storm water flows during high intensity rainfall events that would otherwise transport excessive amounts of sediment, cause soil erosion or cause flooding.

Stratigraphy
The geologic sub-structuring, usually layered with different distribution, deposition and age.

Surface Run-off (Drainage)
See Run-off.

Surface Water
Water that occurs at the earth's surface (ponds, streams, rivers, lakes, oceans).

Sub-Soil
Soil horizons below the topsoil.

Test hole
A hole drilled for soil sampling purposes.

Topsoil
The uppermost layer of the soil containing appreciable organic materials in mineral soils. Adequate fertility to support plant growth.

Unsaturated Zone
The zone (also vadose zone) in a porous sub-soil, where the voids are not completely water-filled, but contain some air-filled voids. Limited above by the land surface and below by the water table.

Vector
A disease carrier and transmitter; usually an insect or rodent.

VOC
Volatile organic compounds are those compounds that will readily volatilize (convert from liquid to gas phase) at conditions normally found in the environment.

Waste
Ashes, garbage, refuse, domestic waste, industrial waste, or municipal refuse and other used products as are designated or interpreted by the provisions of the Environmental Protection Act.

Waste Disposal Site (Facility)
Any land or land covered by water upon, into, in or through which, or building or structure in which, waste is deposited or processed and any machinery or equipment or operation required for the treatment or disposal of waste.

Waste Management System
All facilities, equipment and operations for the complete management of waste, including the collection, handling, transportation, storage, processing and disposal thereof, and may include one or more waste disposal sites.

Water Table
The water level attained in a monitoring well, which screens the surficial unconfined aquifer.

Water Balance
Amounts of water to various components in a system so that water entering the system equals the amount of water contained within and discharged out of a system.

Water Level
The level of water in a well.

Well Casing
The pipe that is used to construct a well.

Well Screen
A filtering device used to keep sediment from entering a well.

Wetlands
Areas where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrolytic vegetation, and which have soils indicative of wet conditions.

Abbreviations

RFP	Request For Proposal	**ha**	hectare
Ministry	Ontario Ministry of the Environment, Conservation and Parks	**tonne**	metric ton
MNRF	Ontario Ministry of Natural Resources and Forestry	**t**	metric tonne
ECA	Environmental Compliance Approval	**µS**	microSiemens
EPA	Environmental Protection Act	**ODWQS**	Ontario Drinking Water Quality Standards
EAA	Environmental Assessment Act	**PC of A**	Provisional Certificate of Approval
MW	monitoring well	**PWQO**	Provincial Water Quality Objectives
masl	metres above sea level	**TOC**	Total Organic Carbon
pg	picogram	**VOC**	Volatile Organic Compound
ng	nanogram	**BTU**	British Thermal Unit
µg	microgram	**°C**	temperature in degrees Celsius
g	gram	**N/A**	not available
kg	kilogram	**%**	percent
L	Litre	**cfm**	cubic feet per minute
mg/L	milligrams per litre	**ppmdv**	part per million by dry volume
mm	millimetre	**ppmv**	part per million by volume
m	metre	**ppm**	part per million
km	kilometre	**min**	minimum
m^3	cubic metre	**max**	maximum
m^2	square metre		

Standard Limitations

Limited Warranty

In performing work on behalf of a client, Cambium relies on its client to provide instructions on the scope of its retainer and, on that basis, Cambium determines the precise nature of the work to be performed. Cambium undertakes all work in accordance with applicable accepted industry practices and standards. Unless required under local laws, other than as expressly stated herein, no other warranties or conditions, either expressed or implied, are made regarding the services, work or reports provided.

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Appended Figures

Fully accessible appended figures are available upon request.

2021 ANNUAL REPORT
WARSAW ROAD LANDFILL

THE CORPORATION OF THE
TOWNSHIP OF DOURO - DUMMER
Part of Lot 8, Concession 5
Warsaw, Ontario

LEGEND

- Highway
- Major Road
- Railroad
- Watercourse
- Water Area
- Provincial Park
- Wooded Area
- Built Up Area
- Lower Tier Municipality

Notes:
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
- Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.

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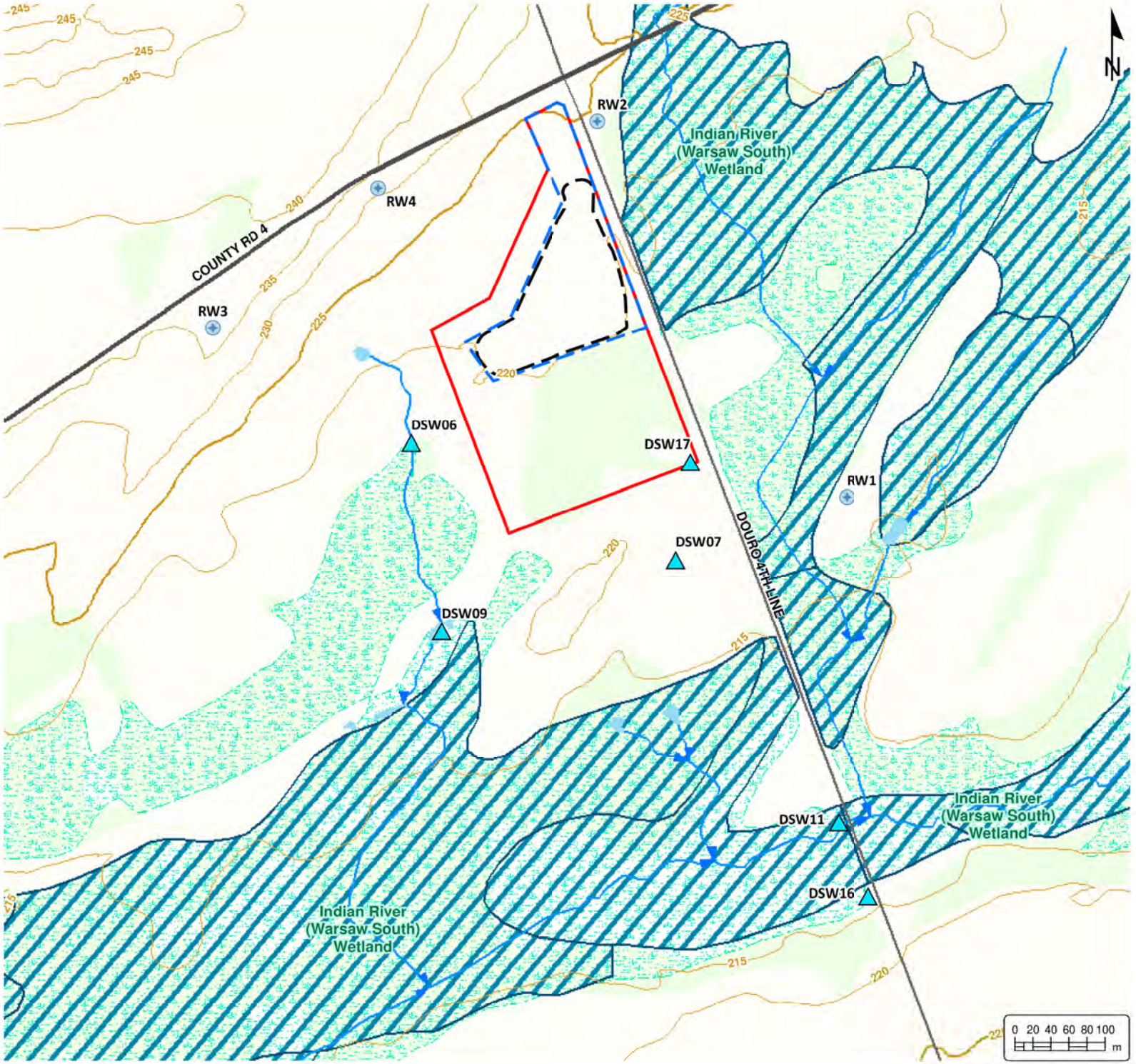
REGIONAL LOCATION PLAN

Project No.:	12987-003	Date:	March 2022
		Rev.:	
Scale:	1:300,000	Projection:	NAD 1983 UTM Zone 17N
Created by:	TLC	Checked by:	CM
Figure:	1		

O:\GIS\MXDs\12900-12999\12987-003 TDD - Warsaw Road\2022-01-05 FIG 1 - Regional Location Plan.mxd



2021 ANNUAL REPORT
WARSAW ROAD LANDFILL

THE CORPORATION OF THE
TOWNSHIP OF DOURO - DUMMER
Part of Lot 8, Concession 5
Warsaw, Ontario

LEGEND

- Residential Well
- Surface Water Location
- Major Road
- Minor Road
- Watercourse, Permanent
- Contour 5m Interval (Major)
- Contour 5m Interval (Minor)
- Unevaluated Wetlands
- Provincially Significant Wetlands
- Water Area
- Wooded Area
- Licensed Boundary (approximate)
- Waste Footprint (approximate)
- Site (approximate)

Notes:
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
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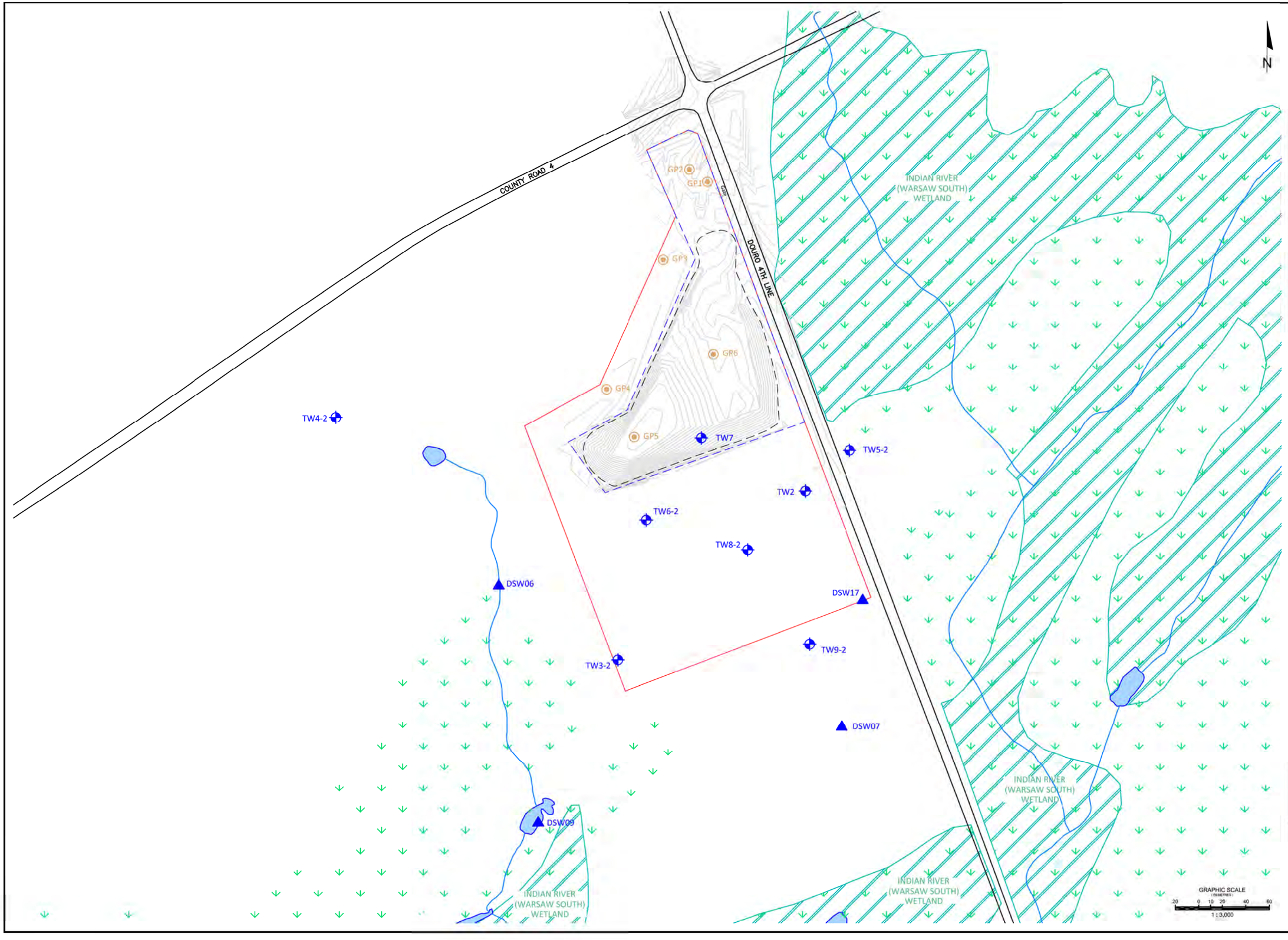
LOCAL TOPOGRAPHY PLAN

Project No.:	Date:	March 2022
12987-003	Rev.:	
Scale: 1:6,000	Projection:	NAD 1983 UTM Zone 17N
Created by: TLC	Checked by: CM	Figure: 2

O:\GIS\MXDs\12900-12999\12987-003 TDD - Warsaw Road\2022-01-05 Fig 2 - Local Topography Plan.mxd

2021 ANNUAL REPORT
WARSAW ROAD LANDFILL
THE CORPORATION OF THE TOWNSHIP OF DOURO-DUMMER
PART OF LOT 8, CONCESSION 5
WARSAW, ONTARIO



LEGEND

- Gas Probe
- Surface Water Location
- Test Well
- Site (approximate)
- Licensed Boundary (approximate)
- Waste Footprint (approximate)
- Topographic Contour
- Watercourse
- Water Area
- Unevaluated Wetland
- Provincially Significant Wetland

Notes:
1. Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.

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EXISTING CONDITIONS

Project No.: 12987-003	Date: March 2022	
	Rev.:	
Horizontal Scale: 1:3,000	Projection: UTM Zone 17N	
Drawn By: TLC	Checked By: CM	Figure: 3

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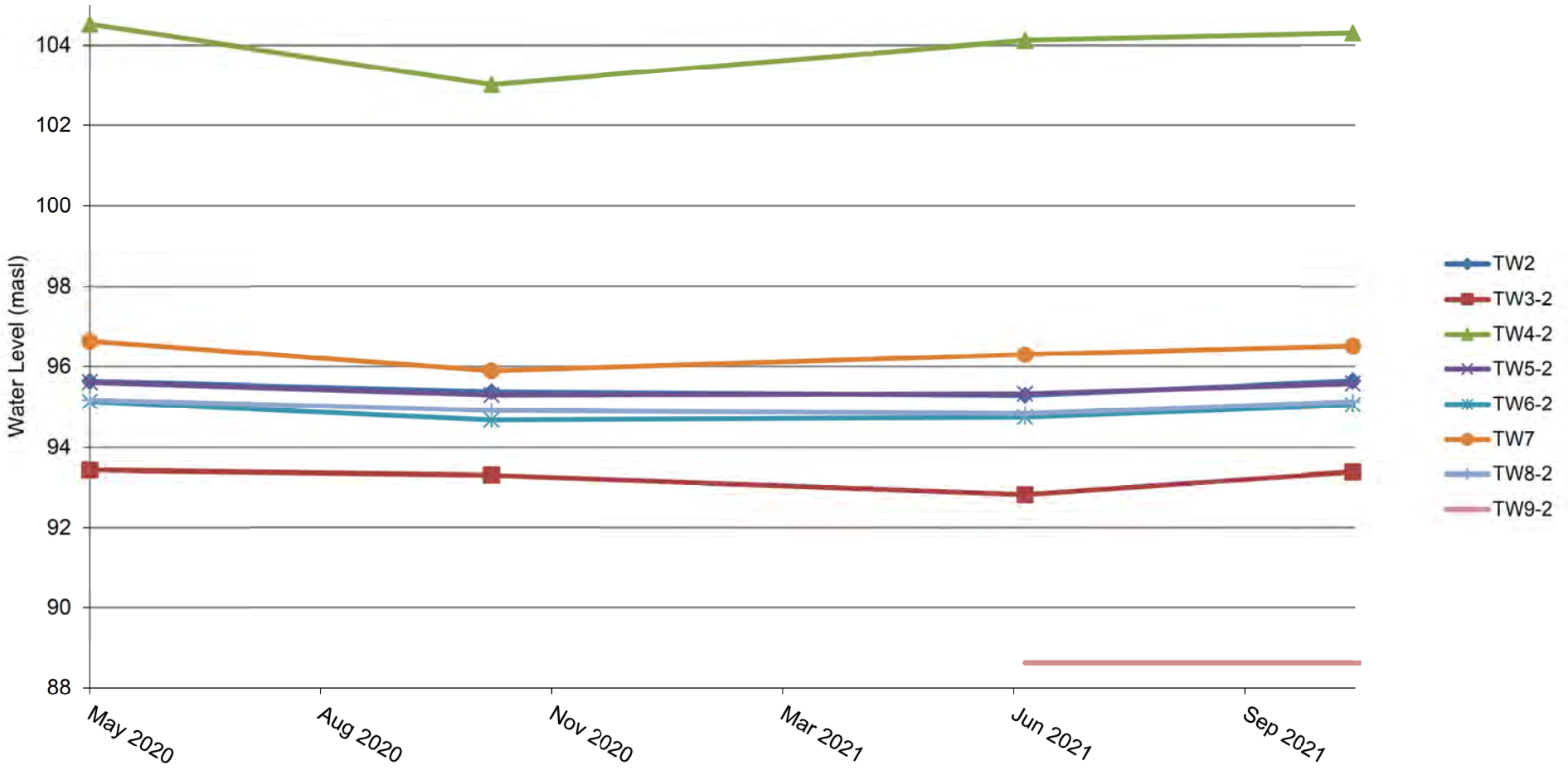

Groundwater Elevations

2021 Annual Report, Warsaw Road Landfill
Part of Lot 8, Concession 5, Warsaw
The Corporation of the Township of Douro-Dummer

Figure:	**4**
Date:	14-Apr-22
Project Manager:	Cameron Macdougall
Project No.:	12987-003

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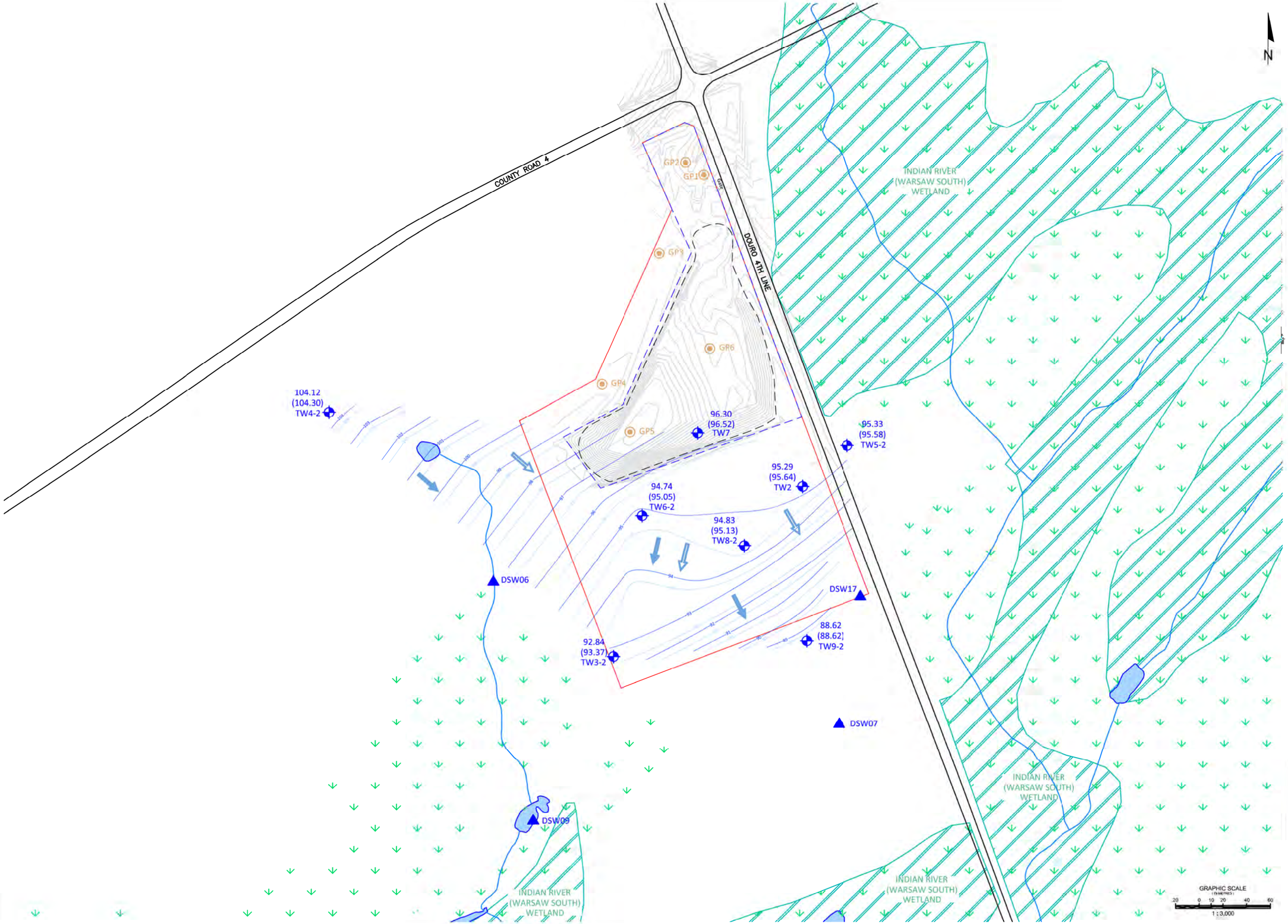
2021 ANNUAL REPORT
WARSAW ROAD LANDFILL
THE CORPORATION OF THE TOWNSHIP OF DOURO-DUMMER
PART OF LOT 8, CONCESSION 5
WARSAW, ONTARIO



LEGEND

- Gas Probe
- Surface Water Location
- Test Well
- 94.83 Groundwater Elevation June 21, 2021
- (95.13) Groundwater Elevation November 10, 2021
- Groundwater Contour June 21, 2021
- Groundwater Contour November 10, 2021
- Site (approximate)
- Licensed Boundary (approximate)
- Waste Footprint (approximate)
- Topographic Contour
- Watercourse
- Water Area
- Unevaluated Wetland
- Provincially Significant Wetland
- Groundwater Flow Direction June 21, 2021
- Groundwater Flow Direction November 10, 2021

Notes:
1. Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.

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GROUNDWATER CONFIGURATION

Project No.: 12987-003	Date: March 2022	
	Rev.:	
Horizontal Scale: 1:3,000	Projection: UTM Zone 17N	
Drawn By: TLC	Checked By: CM	Figure: 5

P:\12800 to 12999\12987-003 TDD - Warsaw Road\Graphics\Drawings\CAD\2022-02-02 Warsaw AMR.dwg

Appended Tables

Fully accessible appended tables are available upon request.

Table Notes

RDL - reported detection limit for the current year

ODWQS - Ontario Drinking Water Quality Standards, O.Reg. 169/03

PWQO - Water Management, Policies, Guidelines, Provincial Water Quality Objectives (MOEE, 1994b)

PWQO for cadmium, copper, and lead depends on hardness

"-" Parameter not analyzed or measured

Table 1 Groundwater and Surface Water Monitoring Program

Location	Task	Frequency	Analytical Parameters
Groundwater			
TW2, TW3-2, TW4-2, TW5-2, TW6-2, TW7, TW8-2, TW9-2 1 QA/QC Duplicate	• Measure groundwater levels • Groundwater sampling • Field measurements (pH, temperature, ORP, conductivity)	Twice Annually (Spring & Autumn)	alkalinity, ammonia, arsenic, barium, boron, cadmium, calcium, chloride, chromium, conductivity, copper, iron, lead, magnesium, manganese, mercury, nitrite, nitrate, TKN, pH, total phosphorus, TSS, TDS, sulphate, potassium, sodium, zinc, BOD, COD, phenols, hardness
TW7	• VOCs	Twice Annually (Spring & Autumn)	See List Below
All Wells and Gas Probes	• Landfill Gas Measurements	Twice Annually (Spring & Autumn)	CH4 and H2S *Gas Probes to be measured during the spring and autumn, in addition to four other occasions.
Residential Wells			
R1, R2, R3, R4 1 QA/QC Duplicate	• Groundwater sampling • Field measurements (pH, temperature, ORP, conductivity)	Every three years (next in 2023) (Spring & Autumn)	alkalinity, ammonia, arsenic, barium, boron, cadmium, calcium, chloride, chromium, conductivity, copper, iron, lead, magnesium, manganese, mercury, nitrite, nitrate, TKN, pH, total phosphorus, potassium, sodium, TDS, sulphate, zinc, COD, DOC, phenols, hardness Benzene, 1-4- Dichlorobenzene, Dichloromethane, Toluene, Vinyl Chloride
Surface Water			
DSW06, DSW07, DSW09, DSW11, DSW16, DSW17 1 QA/QC Duplicate	• Surface water sampling • Flow estimates • Field measurements (pH, temperature, conductivity, ORP, dissolved oxygen)	Twice Annually (Spring & Autumn)	alkalinity, ammonia, arsenic, barium, boron, cadmium, chloride, chromium, conductivity, copper, iron, lead, dissolved mercury, nitrite, nitrate, TKN, pH, total phosphorus, TSS, TDS, sulphate, zinc, BOD, COD, phenols, hardness, unionized ammonia (field)

**Dissolved mercury to be lab filtered with a 0.45 micron filter for all surface water samples.*

VOCs to be analyzed

Bromodichloromethane
Bromoform
Dibromochloromethane
Bromomethane
Carbon tetrachloride
Chloroethane
Chloroform
Chloromethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethylene
1,2-Dichloropropane
trans-1,2-Dichloroethene
cis-1,2-Dichloroethene
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Ethylenedibromide
Dichloromethane
Monochlorobenzene
Styrene
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Trichloroethylene
Vinyl Chloride
Trichlorofluoromethane
1,1,1-Trichloroethane
1,1,2-Trichloroethane
1,1,1,2-Tetrachloroethane

Table 2: Groundwater Elevations

Monitor	UTM Zone 17	Top of Casing Elevation (m)	Ground Elevation (m)	Measured Stick-Up (m)	Well Depth (m)	Screened Unit	Well Diameter (mm)	Water Level Elevation (mASL)			
								12-May-20	02-Nov-20	21-Jun-21	11-Nov-21
TW2	4918579, 723219	97.08	95.78	1.30	2.27	Clay, Sandy Till	38.1	95.63	95.38	95.29	95.64
TW3-2	*4918437, 723059*	94.83	93.54	1.29	4.46	Sandy Gravel with Clay Seams, Limestone Bedrock	38.1	*93.42*	*93.29*	*92.81*	*93.37*
TW4-2	4918644, 722818	105.99	104.98	1.01	5.47	Sandy Loam, Fractured Limestone Bedrock	50.8	104.52	103.02	104.12	104.30
TW5-2	*4918615, 723256*	96.63	95.98	0.65	7.73	Silt and Clay Till, Sand and Gravel	50.8	*95.61*	*95.30*	*95.33*	*95.58*
TW6-2	4918556, 723082	97.66	96.90	0.76	4.67	Sand with Gravel and Cobbles	50.8	95.13	94.67	94.74	95.05
TW7	*4918626, 723130*	100.68	100.33	0.35	8.39	Fractured Limestone Bedrock, Waste	50.8	*96.64*	*95.89*	*96.30*	*96.52*
TW8-2	*4918531, 723169*	97.16	96.36	0.80	7.84	Silty Sand	50.8	*95.17*	*94.91*	*94.83*	*95.13*
TW9-2	-	96.38	95.14	1.24	7.95	Silt , Clay, Rocks	50.8	-	-	*88.62*	*88.62*

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Table 3: Groundwater Quality

	Unit	RDL	ODWQS	TW2 2011-10-28	TW2 2012-05-09	TW2 2013-05-28	TW2 2013-10-29	TW2 2014-06-05	TW2 2014-11-03	TW2 2015-05-14	TW2 2015-11-02	TW2 2016-05-17
Metals												
Arsenic (Filtered)	µg/L	0.1	**25**	0.6	-	-	0.6	0.8	0.7	0.7	1.1	0.9
Barium (Filtered)	µg/L	0.01	**1000**	127	116	131	146	147	150	116	158	138
Boron (Filtered)	µg/L	0.2	**5000**	28	19.5	13.2	21.5	29.8	19.4	35.9	22.2	21
Calcium (Filtered)	µg/L	10		132,000	145,000	121,000	158,000	150,000	147,000	126,000	126,000	162,000
Cadmium (Filtered)	µg/L	0.003	**5**	0.012	-	-	0.039	0.018	0.004	0.011	0.052	0.009
Chloride	µg/L	200	**250000**	99,000	68,000	85,000	180,000	74,000	110,000	77,000	100,000	59,000
Chromium (III+VI) (Filtered)	µg/L	0.03	**50**	<0.5	-	-	4.6	2.12	0.83	0.28	1.21	0.52
Copper (Filtered)	µg/L	0.02	**1000**	0.7	-	-	4.8	1.27	1.67	1.51	1.83	0.45
Iron (Filtered)	µg/L	2	**300**	**690**	**1230**	**1610**	150	**1210**	**5780**	**1570**	**1400**	**1390**
Lead (Filtered)	µg/L	0.01	**10**	0.07	-	-	0.47	0.1	0.58	0.22	0.09	<0.01
Manganese (Filtered)	µg/L	0.01	**50**	**206**	-	**347**	28.5	**246**	**264**	**271**	**140**	**361**
Magnesium (Filtered)	µg/L	1		8810	9010	7360	7800	9400	8700	7930	8880	8210
Mercury (Filtered)	µg/L	0.01	**1**	-	-	-	-	-	-	<0.01	<0.01	<10
Phosphorus (Filtered)	µg/L	10		-	-	-	-	-	-	<30	<30	30
Potassium (Filtered)	µg/L	2		1040	-	-	476	1370	1890	958	1030	800
Sodium (Filtered)	µg/L	10	**200000**	43,800	35,400	36,900	45,900	45,600	35,000	36,000	55,400	33,000
Zinc (Filtered)	µg/L	2	**5000**	<2	-	-	5	9	6	7	8	3
Inorganics												
Alkalinity (as CaCO3)	mg/L	2	**500**	329	347	329	228	430	423	394	281	383
Hardness (as CaCO3) (Filtered)	mg/L	1	**500**	-	-	-	-	-	-	-	-	-
Solids - Total Dissolved (TDS)	mg/L	3	**500**	**531**	476	**609**	**654**	**529**	**737**	**583**	**540**	**577**
Oxygen Demand - Chemical (COD)	mg/L	5		<8	32	30	39	<8	43	35	27	37
Solids - Total Suspended (TSS)	mg/L	2		6700	-	-	-	-	-	16,400	<2	<2
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	**6**	**12.3**	**9.7**	**12.6**	**12.5**	**14.2**	**14.2**	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		6	-	-	-	-	-	22	<4	<4
Phenols (4AAP)	mg/L	0.001		-	-	-	-	-	-	0.01	<0.002	0.001
Sulphate	mg/L	0.2	**500**	14	8.3	92	54	5.8	17	<1	13	12
Ammonia	mg/L	0.01		0.1	<0.1	0.2	<0.1	0.1	0.1	<0.1	<0.1	<0.1
Nitrate (as N)	mg/L	0.05	**10**	0.79	0.05	<0.06	<0.06	0.13	0.09	<0.06	<0.06	0.11
Nitrite (as N)	mg/L	0.03	**1**	-	-	-	-	-	-	<0.03	<0.03	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		-	-	-	-	-	-	0.8	<0.5	0.6
Conductivity (lab)	µS/cm	1		931	842	962	1070	984	1080	922	943	914
pH (Lab)	-	0.05	**6.5-8.5**	7.81	7.63	8.02	8.18	8.22	8.05	8.1	8.05	8.38
Field												
DO (Field)	mg/L			-	-	-	-	-	-	-	-	-
Redox Potential (Field)	mV			-	-	-	-	-	-	-	-	-
Temp (Field)	°C			-	-	-	-	-	-	-	-	-
Conductivity (field)	µS/cm			-	-	-	-	-	-	-	-	-
pH (Field)	-		**6.5-8.5**	-	-	-	-	-	-	-	-	-

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Table 3: Groundwater Quality

	Unit	RDL	ODWQS	TW2 2018-06-04	TW2 2018-10-05	TW2 2019-05-31	TW2 2019-10-25	TW2 2020-05-12	TW2 2020-11-02	TW2 2021-06-21	TW2 2021-11-10
Metals											
Arsenic (Filtered)	µg/L	0.1	**25**	<0.2	0.3	0.7	0.5	0.4	0.2	0.3	0.4
Barium (Filtered)	µg/L	0.01	**1000**	149	104	139	145	97.1	106	150	147
Boron (Filtered)	µg/L	0.2	**5000**	49	18	15	16	16	13	21	12
Calcium (Filtered)	µg/L	10		141,000	120,000	166,000	175,000	131,000	126,000	186,000	201,000
Cadmium (Filtered)	µg/L	0.003	**5**	<0.003	<0.003	0.014	0.021	0.011	0.033	<0.015	<0.015
Chloride	µg/L	200	**250000**	150,000	150,000	99,000	210,000	71,000	83,000	147,000	156,000
Chromium (III+VI) (Filtered)	µg/L	0.03	**50**	0.34	0.18	0.25	0.24	0.25	0.24	<1	<1
Copper (Filtered)	µg/L	0.02	**1000**	0.84	2.04	0.4	2.7	1.3	1.6	0.9	1.3
Iron (Filtered)	µg/L	2	**300**	<7	109	**1500**	**605**	**718**	30	111	**462**
Lead (Filtered)	µg/L	0.01	**10**	0.02	<0.01	0.03	0.05	0.05	0.09	<0.04	0.18
Manganese (Filtered)	µg/L	0.01	**50**	0.2	18.6	**550**	**88.7**	**338**	**78.3**	**334**	**717**
Magnesium (Filtered)	µg/L	1		8040	5250	8980	8030	6940	5940	9440	9790
Mercury (Filtered)	µg/L	0.01	**1**	<0.01	<10	<10	<10	<10	<10	<0.02	<0.02
Phosphorus (Filtered)	µg/L	10		<30	60	740	<30	920	2820	150	2600
Potassium (Filtered)	µg/L	2		1370	362	840	560	482	633	500	300
Sodium (Filtered)	µg/L	10	**200000**	62,900	36,800	48,900	68,800	43,200	42,300	72,100	71,800
Zinc (Filtered)	µg/L	2	**5000**	4	4	4	3	<2	5	<5	<5
Inorganics											
Alkalinity (as CaCO3)	mg/L	2	**500**	283	162	407	249	313	**502**	376	428
Hardness (as CaCO3) (Filtered)	mg/L	1	**500**	-	-	-	-	-	-	**504**	**543**
Solids - Total Dissolved (TDS)	mg/L	3	**500**	**617**	**594**	**611**	**871**	466	**554**	**602**	**699**
Oxygen Demand - Chemical (COD)	mg/L	5		11	39	37	34	15	31	36	306
Solids - Total Suspended (TSS)	mg/L	2		<2	3	1770	2	533	2470	263	3800
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	-	-	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		9	16	4	<4	<4	<4	<3	3
Phenols (4AAP)	mg/L	0.001		<0.001	0.005	0.001	0.005	0.002	0.003	<0.002	<0.001
Sulphate	mg/L	0.2	**500**	9	39	<2	40	<2	22	8	1
Ammonia	mg/L	0.01		<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.08	0.17
Nitrate (as N)	mg/L	0.05	**10**	0.29	0.12	<0.06	<0.06	<0.06	0.13	<0.05	<0.05
Nitrite (as N)	mg/L	0.03	**1**	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		<0.5	0.6	<0.5	0.6	<0.5	<0.5	0.7	4.4
Conductivity (lab)	µS/cm	1		985	855	933	1160	764	892	1120	1290
pH (Lab)	-	0.05	**6.5-8.5**	8.11	8	7.41	7.72	7.67	7.9	7.83	7.79
Field											
DO (Field)	mg/L			-	-	-	-	7.11	10.7	9.21	5.31
Redox Potential (Field)	mV			-	-	200	195	256	52	174	105
Temp (Field)	°C			-	-	9.7	11.1	7.2	6.8	14.5	8.8
Conductivity (field)	µS/cm			-	-	738	915	682	547	1131	535
pH (Field)	-		**6.5-8.5**	-	-	7.55	**6.29**	7.64	7.9	7.36	7.11

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Table 3: Groundwater Quality

	Unit	RDL	ODWQS	TW3-2 2011-10-28	TW3-2 2012-05-09	TW3-2 2012-10-23	TW3-2 2013-05-28	TW3-2 2013-10-29	TW3-2 2014-06-05	TW3-2 2014-11-03	TW3-2 2015-05-14	TW3-2 2015-11-02	TW3-2 2016-05-17
Metals													
Arsenic (Filtered)	µg/L	0.1	**25**	1	-	-	-	0.9	0.8	0.8	0.7	1.6	0.7
Barium (Filtered)	µg/L	0.01	**1000**	115	95.5	111	104	124	98.2	116	115	130	96.9
Boron (Filtered)	µg/L	0.2	**5000**	116	64.8	93.8	85.8	119	101	131	78.9	127	84
Calcium (Filtered)	µg/L	10		135,000	116,000	127,000	114,000	141,000	120,000	136,000	148,000	140,000	139,000
Cadmium (Filtered)	µg/L	0.003	**5**	0.022	-	-	-	0.004	0.016	<0.003	0.005	<0.003	0.004
Chloride	µg/L	200	**250000**	60,000	61,000	67,000	63,000	73,000	66,000	76,000	87,000	83,000	84,000
Chromium (III+VI) (Filtered)	µg/L	0.03	**50**	0.8	-	-	-	3.4	2.06	0.72	0.18	1.27	0.4
Copper (Filtered)	µg/L	0.02	**1000**	0.6	-	-	-	3.3	0.72	0.89	0.64	1.45	0.82
Iron (Filtered)	µg/L	2	**300**	**877**	**871**	**811**	**977**	**798**	**802**	**878**	**1130**	**1580**	**962**
Lead (Filtered)	µg/L	0.01	**10**	0.08	-	-	-	0.17	0.06	0.1	0.1	0.06	0.03
Manganese (Filtered)	µg/L	0.01	**50**	**423**	-	-	**391**	**415**	**258**	**301**	**322**	**369**	**347**
Magnesium (Filtered)	µg/L	1		10,600	9260	10,400	8790	10,200	8990	10,200	11,800	11,500	8900
Mercury (Filtered)	µg/L	0.01	**1**	-	-	-	-	-	-	-	<0.01	0.06	**10**
Phosphorus (Filtered)	µg/L	10		-	-	-	-	-	-	-	<30	<30	30
Potassium (Filtered)	µg/L	2		7230	-	-	-	7620	6820	7870	6120	6970	5690
Sodium (Filtered)	µg/L	10	**200000**	53,500	48,500	57,600	47,300	56,000	50,900	54,000	55,500	61,800	44,900
Zinc (Filtered)	µg/L	2	**5000**	4	-	-	-	<2	3	<2	7	18	3
Inorganics													
Alkalinity (as CaCO3)	mg/L	2	**500**	424	344	383	321	328	364	426	436	407	347
Hardness (as CaCO3) (Filtered)	mg/L	1	**500**	-	-	-	-	-	-	-	-	-	-
Solids - Total Dissolved (TDS)	mg/L	3	**500**	**537**	486	**546**	**517**	**629**	477	**589**	**571**	**617**	**523**
Oxygen Demand - Chemical (COD)	mg/L	5		37	25	33	29	31	29	43	25	42	24
Solids - Total Suspended (TSS)	mg/L	2		89	-	-	-	-	-	-	2	<2	<2
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	**16.9**	**14.9**	**11.9**	**11.3**	**12.9**	**10.1**	**15**	**12**	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	-	-	-	-	-	-	<4	<4	<4
Phenols (4AAP)	mg/L	0.001		-	-	-	-	-	-	-	0.008	0.003	0.001
Sulphate	mg/L	0.2	**500**	1.6	0.8	4.5	27	29	6.8	5.1	<1	1	<1
Ammonia	mg/L	0.01		0.2	<0.1	0.2	<0.1	0.2	0.3	<0.1	<0.1	0.2	<0.1
Nitrate (as N)	mg/L	0.05	**10**	<0.05	<0.05	0.92	<0.06	<0.06	0.09	<0.06	<0.06	<0.06	0.27
Nitrite (as N)	mg/L	0.03	**1**	-	-	-	-	-	-	-	<0.03	<0.03	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		-	-	-	-	-	-	-	0.6	0.9	<0.5
Conductivity (lab)	µS/cm	1		972	862	959	890	959	861	979	1030	1060	942
pH (Lab)	-	0.05	**6.5-8.5**	7.58	7.75	8.04	8	8.05	8.22	8.04	8.07	7.89	8.32
Field													
DO (Field)	mg/L			-	-	-	-	-	-	-	-	-	-
Redox Potential (Field)	mV			-	-	-	-	-	-	-	-	-	-
Temp (Field)	°C			-	-	-	-	-	-	-	-	-	-
Conductivity (field)	µS/cm			-	-	-	-	-	-	-	-	-	-
pH (Field)	-		**6.5-8.5**	-	-	-	-	-	-	-	-	-	-

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Table 3: Groundwater Quality

	Unit	RDL	ODWQS	TW3-2 2016-10-28	TW3-2 2018-06-04	TW3-2 2018-10-05	TW3-2 2019-05-31	TW3-2 2019-10-25	TW3-2 2020-05-12	TW3-2 2020-11-02	TW3-2 2021-06-21	TW3-2 2021-11-10
Metals												
Arsenic (Filtered)	µg/L	0.1	**25**	0.7	0.4	0.5	0.6	0.8	0.7	0.7	0.9	1
Barium (Filtered)	µg/L	0.01	**1000**	104	93.1	124	113	122	107	117	128	141
Boron (Filtered)	µg/L	0.2	**5000**	110	105	95	99	140	103	91	144	166
Calcium (Filtered)	µg/L	10		154,000	154,000	149,000	148,000	164,000	146,000	155,000	159,000	175,000
Cadmium (Filtered)	µg/L	0.003	**5**	0.011	<0.003	0.008	0.005	0.014	<0.003	0.016	<0.015	0.027
Chloride	µg/L	200	**250000**	93,000	84,000	120,000	87,000	100,000	96,000	85,000	97,100	104,000
Chromium (III+VI) (Filtered)	µg/L	0.03	**50**	0.55	0.29	0.29	0.27	0.35	0.3	0.38	<1	<1
Copper (Filtered)	µg/L	0.02	**1000**	0.61	0.27	1.41	0.5	1.4	0.5	1	0.5	5.9
Iron (Filtered)	µg/L	2	**300**	**1070**	40	**572**	**1210**	**1080**	**1360**	**1000**	**1670**	**2160**
Lead (Filtered)	µg/L	0.01	**10**	0.11	<0.01	0.05	0.05	0.1	0.05	0.08	0.04	1.23
Manganese (Filtered)	µg/L	0.01	**50**	**335**	**249**	**233**	**277**	**282**	**298**	**278**	**283**	**329**
Magnesium (Filtered)	µg/L	1		10,400	9420	9130	9530	11,500	10,400	9880	11,500	11,700
Mercury (Filtered)	µg/L	0.01	**1**	<0.01	<0.01	<10	<10	<10	<10	<10	<0.02	<0.02
Phosphorus (Filtered)	µg/L	10		<30	<30	60	230	<30	110	110	260	70
Potassium (Filtered)	µg/L	2		6360	6700	6900	5980	6740	5890	6300	6800	6900
Sodium (Filtered)	µg/L	10	**200000**	55,600	43,800	46,000	42,900	53,400	48,100	49,000	59,300	59,200
Zinc (Filtered)	µg/L	2	**5000**	5	<2	4	9	4	<2	3	<5	<5
Inorganics												
Alkalinity (as CaCO3)	mg/L	2	**500**	418	362	393	366	382	341	400	366	395
Hardness (as CaCO3) (Filtered)	mg/L	1	**500**	-	-	-	-	-	-	-	445	486
Solids - Total Dissolved (TDS)	mg/L	3	**500**	**634**	**531**	**629**	**563**	**654**	**551**	**623**	**513**	**597**
Oxygen Demand - Chemical (COD)	mg/L	5		27	28	30	24	30	19	26	48	44
Solids - Total Suspended (TSS)	mg/L	2		<2	<2	6	150	-	674	475	238	1480
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	-	-	-	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	<4	<4	<4	<4	<4	<4	<3	<3
Phenols (4AAP)	mg/L	0.001		0.001	<0.001	0.001	<0.001	<0.001	0.002	<0.001	<0.002	<0.001
Sulphate	mg/L	0.2	**500**	9	5	18	23	26	7	13	16	19
Ammonia	mg/L	0.01		0.2	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.2	0.23
Nitrate (as N)	mg/L	0.05	**10**	<0.06	0.29	<0.06	0.08	<0.06	<0.06	<0.06	0.07	<0.05
Nitrite (as N)	mg/L	0.03	**1**	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.8	<0.5	<0.5	<0.5	-	<0.5	<0.5	0.8	0.3
Conductivity (lab)	µS/cm	1		1020	921	1100	962	1040	876	1020	963	1110
pH (Lab)	-	0.05	**6.5-8.5**	7.7	8.04	7.83	7.3	7.79	7.39	7.74	7.59	7.68
Field												
DO (Field)	mg/L			-	-	-	-	-	3.55	6.5	1.59	7.07
Redox Potential (Field)	mV			-	-	-	70	177	128	42	155	101
Temp (Field)	°C			-	-	-	8.5	11.2	7.7	8.1	15.5	11.5
Conductivity (field)	µS/cm			-	-	-	692	774	806	627	975	169
pH (Field)	-		**6.5-8.5**	-	-	-	7.26	6.84	7.44	7.92	7.02	6.99

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Table 3: Groundwater Quality

	Unit	RDL	ODWQS	TW4-2 2011-10-25	TW4-2 2012-05-09	TW4-2 2012-10-23	TW4-2 2013-05-28	TW4-2 2013-10-29	TW4-2 2014-06-05	TW4-2 2014-11-03	TW4-2 2015-05-14	TW4-2 2015-11-02	TW4-2 2016-05-17
Metals													
Arsenic (Filtered)	µg/L	0.1	**25**	0.4	-	-	-	0.2	0.3	<0.2	<0.2	0.7	<0.2
Barium (Filtered)	µg/L	0.01	**1000**	47.4	36	44.2	40.8	43.4	45.8	48.1	37	55.6	42.2
Boron (Filtered)	µg/L	0.2	**5000**	8	9.8	14.4	7	14.6	13.6	12.4	26.5	14.4	13
Calcium (Filtered)	µg/L	10		136,000	107,000	121,000	105,000	124,000	124,000	131,000	110,000	128,000	123,000
Cadmium (Filtered)	µg/L	0.003	**5**	0.003	-	-	-	<0.003	0.025	<0.003	0.047	<0.003	<0.003
Chloride	µg/L	200	**250000**	81,000	44,000	78,000	81,000	76,000	110,000	120,000	72,000	120,000	87,000
Chromium (III+VI) (Filtered)	µg/L	0.03	**50**	1	-	-	-	3.1	0.57	0.53	0.09	1.14	0.47
Copper (Filtered)	µg/L	0.02	**1000**	1	-	-	-	1.9	1.94	0.66	0.93	1.05	0.33
Iron (Filtered)	µg/L	2	**300**	232	<3	<3	<3	4	4	4	28	**433**	8
Lead (Filtered)	µg/L	0.01	**10**	0.75	-	-	-	<0.02	0.17	0.02	0.05	0.05	<0.01
Manganese (Filtered)	µg/L	0.01	**50**	18.7	-	-	0.2	0.33	0.76	1.85	0.64	3.58	<0.01
Magnesium (Filtered)	µg/L	1		4170	3530	3950	3400	3930	3930	4250	3620	4590	3410
Mercury (Filtered)	µg/L	0.01	**1**	-	-	-	-	-	-	-	<0.01	0.02	**10**
Phosphorus (Filtered)	µg/L	10		-	-	-	-	-	-	-	-	-	<30
Potassium (Filtered)	µg/L	2		763	-	-	-	647	663	697	552	686	627
Sodium (Filtered)	µg/L	10	**200000**	36,500	32,500	35,300	37,300	36,400	50,700	45,000	35,100	51,600	49,400
Zinc (Filtered)	µg/L	2	**5000**	3	-	-	-	<2	<2	<2	4	5	<2
Inorganics													
Alkalinity (as CaCO3)	mg/L	2	**500**	264	270	265	244	255	279	280	275	282	258
Hardness (as CaCO3) (Filtered)	mg/L	1	**500**	-	-	-	-	-	-	-	-	-	-
Solids - Total Dissolved (TDS)	mg/L	3	**500**	469	409	463	440	417	491	**543**	397	**609**	454
Oxygen Demand - Chemical (COD)	mg/L	5		<8	13	<8	9	10	<8	13	<8	12	<8
Solids - Total Suspended (TSS)	mg/L	2		427	-	-	-	-	-	-	-	-	<2
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	2.2	**7**	<1	1.5	1.7	1.4	2.3	2.4	1.5	-
Oxygen Demand - Biological (BOD)	mg/L	2		<2	-	-	-	-	-	-	-	-	<4
Phenols (4AAP)	mg/L	0.001		-	-	-	-	-	-	-	-	-	<0.001
Sulphate	mg/L	0.2	**500**	8.7	7.1	10	7.3	8.6	7.5	8.6	7	8	8
Ammonia	mg/L	0.01		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrate (as N)	mg/L	0.05	**10**	4.2	2.65	2.07	1.72	2.48	1.56	1.73	1.28	1.88	1.17
Nitrite (as N)	mg/L	0.03	**1**	-	-	-	-	-	-	-	-	-	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		-	-	-	-	-	-	-	-	-	<0.5
Conductivity (lab)	µS/cm	1		813	660	794	771	742	863	897	744	965	812
pH (Lab)	-	0.05	**6.5-8.5**	7.81	7.71	8.01	8.08	8.18	8.18	8.02	8.14	7.99	8.23
Field													
DO (Field)	mg/L			-	-	-	-	-	-	-	-	-	-
Redox Potential (Field)	mV			-	-	-	-	-	-	-	-	-	-
Temp (Field)	°C			-	-	-	-	-	-	-	-	-	-
Conductivity (field)	µS/cm			-	-	-	-	-	-	-	-	-	-
pH (Field)	-		**6.5-8.5**	-	-	-	-	-	-	-	-	-	-

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Table 3: Groundwater Quality

	Unit	RDL	ODWQS	TW4-2 2016-10-28	TW4-2 2018-06-04	TW4-2 2018-10-05	TW4-2 2019-05-31	TW4-2 2019-10-25	TW4-2 2020-05-12	TW4-2 2020-11-02	TW4-2 2021-06-21	TW4-2 2021-11-10
Metals												
Arsenic (Filtered)	µg/L	0.1	**25**	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	<0.1	<0.1
Barium (Filtered)	µg/L	0.01	**1000**	42.2	39	54.7	50.3	58.2	40	47.1	48	46
Boron (Filtered)	µg/L	0.2	**5000**	19	19	12	10	14	16	10	9	10
Calcium (Filtered)	µg/L	10		127,000	129,000	133,000	126,000	152,000	110,000	118,000	130,000	127,000
Cadmium (Filtered)	µg/L	0.003	**5**	<0.003	0.01	<0.003	0.005	0.337	0.004	0.007	<0.015	<0.015
Chloride	µg/L	200	**250000**	85,000	92,000	120,000	130,000	160,000	84,000	69,000	78,200	75,900
Chromium (III+VI) (Filtered)	µg/L	0.03	**50**	0.37	0.8	0.14	0.99	0.27	0.37	0.23	<1	<1
Copper (Filtered)	µg/L	0.02	**1000**	0.35	0.71	0.28	0.6	0.5	0.5	0.8	0.5	0.4
Iron (Filtered)	µg/L	2	**300**	<7	<7	<7	21	11	7	13	<5	49
Lead (Filtered)	µg/L	0.01	**10**	0.02	0.02	<0.01	<0.01	0.13	<0.01	0.07	<0.02	0.12
Manganese (Filtered)	µg/L	0.01	**50**	0.14	0.13	0.15	0.12	0.65	0.12	0.55	<1	3
Magnesium (Filtered)	µg/L	1		3940	3680	3850	3780	4920	3320	3560	4160	3950
Mercury (Filtered)	µg/L	0.01	**1**	<0.01	<0.01	<10	<10	<10	<10	<10	<0.02	<0.02
Phosphorus (Filtered)	µg/L	10		<30	<30	60	<30	<30	<30	220	400	260
Potassium (Filtered)	µg/L	2		569	613	610	521	687	504	526	500	500
Sodium (Filtered)	µg/L	10	**200000**	42,000	51,100	46,900	52,200	62,900	53,800	40,600	54,100	42,900
Zinc (Filtered)	µg/L	2	**5000**	2	<2	2	3	4	<2	<2	<5	<5
Inorganics												
Alkalinity (as CaCO3)	mg/L	2	**500**	289	266	274	276	283	253	338	284	280
Hardness (as CaCO3) (Filtered)	mg/L	1	**500**	-	-	-	-	-	-	-	342	334
Solids - Total Dissolved (TDS)	mg/L	3	**500**	486	449	**620**	**529**	**686**	437	411	408	417
Oxygen Demand - Chemical (COD)	mg/L	5		<8	<8	<8	<8	<8	9	<8	16	9
Solids - Total Suspended (TSS)	mg/L	2		632	<2	3	140	<2	17	461	368	268
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	-	-	-	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	<4	<4	<4	<4	<4	<4	<3	<3
Phenols (4AAP)	mg/L	0.001		0.002	<0.001	<0.001	<0.001	0.002	0.003	<0.001	<0.002	<0.001
Sulphate	mg/L	0.2	**500**	8	6	12	6	8	5	8	7	6
Ammonia	mg/L	0.01		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.07
Nitrate (as N)	mg/L	0.05	**10**	1.72	1.26	2.54	1.35	2.5	1.16	1.92	1.48	0.8
Nitrite (as N)	mg/L	0.03	**1**	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.4	0.4
Conductivity (lab)	µS/cm	1		828	798	962	878	1060	725	794	778	794
pH (Lab)	-	0.05	**6.5-8.5**	7.75	8.14	7.93	8.02	7.89	7.83	7.73	7.69	7.84
Field												
DO (Field)	mg/L			-	-	-	-	-	9.11	10.1	6.74	6.97
Redox Potential (Field)	mV			-	-	-	34	172	268	171	144	86
Temp (Field)	°C			-	-	-	9.5	11.1	8.8	8.8	13.8	12.5
Conductivity (field)	µS/cm			-	-	-	664	780	690	498	786	344
pH (Field)	-		**6.5-8.5**	-	-	-	7.71	7.14	7.37	8.49	7.19	7.08

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Table 3: Groundwater Quality

	Unit	RDL	ODWQS	TW5-2 2011-10-25	TW5-2 2012-05-09	TW5-2 2012-10-23	TW5-2 2013-05-28	TW5-2 2013-10-29	TW5-2 2014-06-05	TW5-2 2014-11-03	TW5-2 2015-05-14	TW5-2 2015-11-02	TW5-2 2016-05-17
Metals													
Arsenic (Filtered)	µg/L	0.1	**25**	0.4	-	-	-	0.4	0.3	0.2	<0.2	0.7	<0.2
Barium (Filtered)	µg/L	0.01	**1000**	129	136	137	150	142	151	134	151	147	157
Boron (Filtered)	µg/L	0.2	**5000**	15	18	20.7	14.9	18.9	21.5	16.9	25.1	20.2	20
Calcium (Filtered)	µg/L	10		113,000	115,000	115,000	115,000	122,000	128,000	112,000	140,000	108,000	138,000
Cadmium (Filtered)	µg/L	0.003	**5**	<0.003	-	-	-	<0.003	0.007	<0.003	0.005	<0.003	0.007
Chloride	µg/L	200	**250000**	61,000	95,000	89,000	110,000	91,000	140,000	82,000	130,000	72,000	130,000
Chromium (III+VI) (Filtered)	µg/L	0.03	**50**	0.7	-	-	-	3.5	1.46	0.42	<0.03	0.93	0.28
Copper (Filtered)	µg/L	0.02	**1000**	1.8	-	-	-	2.9	1.62	1.73	1.93	1.44	1.08
Iron (Filtered)	µg/L	2	**300**	51	<3	<3	36	<3	4	2	53	**454**	67
Lead (Filtered)	µg/L	0.01	**10**	0.19	-	-	-	0.02	0.06	0.03	0.02	0.03	<0.01
Manganese (Filtered)	µg/L	0.01	**50**	36.5	-	-	5.23	1.02	2.02	1.53	0.32	**125**	0.35
Magnesium (Filtered)	µg/L	1		7250	7710	7580	7680	7830	8420	7450	9540	7710	7960
Mercury (Filtered)	µg/L	0.01	**1**	-	-	-	-	-	-	-	<0.01	0.21	<10
Phosphorus (Filtered)	µg/L	10		-	-	-	-	-	-	-	<30	<30	30
Potassium (Filtered)	µg/L	2		1410	-	-	-	1390	1530	1440	1430	1320	1410
Sodium (Filtered)	µg/L	10	**200000**	41,800	49,700	48,000	42,900	41,500	55,000	47,300	57,000	50,300	58,300
Zinc (Filtered)	µg/L	2	**5000**	4	-	-	-	<2	3	2	6	3	2
Inorganics													
Alkalinity (as CaCO3)	mg/L	2	**500**	301	287	291	249	272	288	303	303	301	260
Hardness (as CaCO3) (Filtered)	mg/L	1	**500**	-	-	-	-	-	-	-	-	-	-
Solids - Total Dissolved (TDS)	mg/L	3	**500**	423	460	466	**540**	434	**563**	434	**543**	486	**566**
Oxygen Demand - Chemical (COD)	mg/L	5		<8	15	10	10	<8	<8	19	<8	15	12
Solids - Total Suspended (TSS)	mg/L	2		112	-	-	-	-	-	-	44	<2	<2
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	2.6	**5.9**	3	2.6	4.7	2.6	4.6	**5.2**	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<2	-	-	-	-	-	-	<4	<4	<4
Phenols (4AAP)	mg/L	0.001		-	-	-	-	-	-	-	0.006	<0.002	0.001
Sulphate	mg/L	0.2	**500**	7.5	9.6	9.2	9.4	18	11	16	13	11	9
Ammonia	mg/L	0.01		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrate (as N)	mg/L	0.05	**10**	<0.05	0.46	0.32	0.57	0.17	0.78	0.17	0.37	0.13	0.4
Nitrite (as N)	mg/L	0.03	**1**	-	-	-	-	-	-	-	<0.03	<0.03	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		-	-	-	-	-	-	-	<0.5	<0.5	<0.5
Conductivity (lab)	µS/cm	1		674	840	826	904	821	950	811	932	835	990
pH (Lab)	-	0.05	**6.5-8.5**	7.61	7.78	8.05	7.98	8.05	8.12	8.09	8.15	7.99	8.18
Field													
DO (Field)	mg/L			-	-	-	-	-	-	-	-	-	-
Redox Potential (Field)	mV			-	-	-	-	-	-	-	-	-	-
Temp (Field)	°C			-	-	-	-	-	-	-	-	-	-
Conductivity (field)	µS/cm			-	-	-	-	-	-	-	-	-	-
pH (Field)	-		**6.5-8.5**	-	-	-	-	-	-	-	-	-	-

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Table 3: Groundwater Quality

	Unit	RDL	ODWQS	TW5-2 2016-10-28	TW5-2 2018-06-04	TW5-2 2018-10-05	TW5-2 2019-05-31	TW5-2 2019-10-25	TW5-2 2020-05-12	TW5-2 2020-11-02	TW5-2 2021-06-21	TW5-2 2021-11-10
Metals												
Arsenic (Filtered)	µg/L	0.1	**25**	<0.2	0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	0.1
Barium (Filtered)	µg/L	0.01	**1000**	128	114	164	166	151	147	148	168	150
Boron (Filtered)	µg/L	0.2	**5000**	23	25	17	16	22	21	16	21	21
Calcium (Filtered)	µg/L	10		120,000	161,000	117,000	131,000	128,000	123,000	120,000	137,000	123,000
Cadmium (Filtered)	µg/L	0.003	**5**	<0.003	0.006	<0.003	<0.003	<0.003	<0.003	<0.003	<0.015	<0.015
Chloride	µg/L	200	**250000**	81,000	77,000	120,000	160,000	130,000	140,000	87,000	140,000	107,000
Chromium (III+VI) (Filtered)	µg/L	0.03	**50**	0.27	0.26	0.11	0.15	0.1	0.23	0.2	<1	<1
Copper (Filtered)	µg/L	0.02	**1000**	1.27	0.87	1.37	0.8	1	1.1	1.4	1.2	1.5
Iron (Filtered)	µg/L	2	**300**	16	**417**	<7	<7	9	<7	<7	<5	61
Lead (Filtered)	µg/L	0.01	**10**	0.03	0.03	<0.01	<0.01	<0.01	0.02	0.11	<0.02	0.11
Manganese (Filtered)	µg/L	0.01	**50**	3.81	**393**	4.92	0.05	2.48	0.11	0.52	1	13
Magnesium (Filtered)	µg/L	1		7600	6700	6290	7850	8020	8010	7020	9160	7890
Mercury (Filtered)	µg/L	0.01	**1**	<0.01	0.04	<10	<10	<10	<10	<10	<0.02	<0.02
Phosphorus (Filtered)	µg/L	10		<30	<30	80	190	<30	400	140	490	800
Potassium (Filtered)	µg/L	2		1170	971	1230	1200	1400	1270	1250	1400	1300
Sodium (Filtered)	µg/L	10	**200000**	47,700	36,800	48,700	57,600	64,800	70,000	57,800	78,800	65,200
Zinc (Filtered)	µg/L	2	**5000**	4	3	3	<2	<2	3	2	<5	<5
Inorganics												
Alkalinity (as CaCO3)	mg/L	2	**500**	318	374	336	**2340**	289	306	309	296	288
Hardness (as CaCO3) (Filtered)	mg/L	1	**500**	-	-	-	-	-	-	-	380	340
Solids - Total Dissolved (TDS)	mg/L	3	**500**	491	**551**	460	**571**	**529**	**509**	**537**	**515**	484
Oxygen Demand - Chemical (COD)	mg/L	5		<8	38	14	<8	<8	8	10	11	60
Solids - Total Suspended (TSS)	mg/L	2		<2	<2	202	22	<2	296	75	278	1290
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	-	-	-	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	<4	<4	<4	<4	<4	<4	<3	<3
Phenols (4AAP)	mg/L	0.001		0.002	0.001	<0.001	0.002	<0.001	0.002	<0.001	<0.002	<0.001
Sulphate	mg/L	0.2	**500**	11	<2	14	8	14	9	13	10	13
Ammonia	mg/L	0.01		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.06	0.06
Nitrate (as N)	mg/L	0.05	**10**	0.11	<0.06	0.26	0.31	0.24	0.23	0.12	0.48	0.4
Nitrite (as N)	mg/L	0.03	**1**	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.3	0.6
Conductivity (lab)	µS/cm	1		844	894	870	1010	953	876	896	968	912
pH (Lab)	-	0.05	**6.5-8.5**	7.81	8.08	7.55	8.05	7.88	7.53	7.89	7.67	7.98
Field												
DO (Field)	mg/L			-	-	-	-	-	5.25	4.52	6.93	3.32
Redox Potential (Field)	mV			-	-	-	98	200	258	-31	176	106
Temp (Field)	°C			-	-	-	8.4	11	7.7	8.1	11.5	10.2
Conductivity (field)	µS/cm			-	-	-	725	688	806	583	980	391
pH (Field)	-		**6.5-8.5**	-	-	-	7.71	**5.98**	7.68	7.76	7.34	7.2

Table 3: Groundwater Quality

	Unit	RDL	ODWQS	TW6-2 2011-10-28	TW6-2 2012-05-09	TW6-2 2012-10-23	TW6-2 2013-05-28	TW6-2 2013-10-29	TW6-2 2014-06-05	TW6-2 2014-11-03	TW6-2 2015-05-14	TW6-2 2015-11-02	TW6-2 2016-05-17
Metals													
Arsenic (Filtered)	µg/L	0.1	**25**	0.3	-	-	-	0.5	0.3	0.3	<0.2	0.9	0.2
Barium (Filtered)	µg/L	0.01	**1000**	112	94.5	102	91.7	146	99.9	126	101	142	102
Boron (Filtered)	µg/L	0.2	**5000**	45	44.8	62.8	52.3	66.3	70.7	48	49.8	53.4	67
Calcium (Filtered)	µg/L	10		137,000	133,000	122,000	122,000	154,000	139,000	148,000	145,000	148,000	149,000
Cadmium (Filtered)	µg/L	0.003	**5**	0.009	-	-	-	<0.003	0.012	0.006	0.013	0.003	0.007
Chloride	µg/L	200	**250000**	53,000	51,000	74,000	47,000	88,000	50,000	100,000	76,000	120,000	72,000
Chromium (III+VI) (Filtered)	µg/L	0.03	**50**	<0.5	-	-	-	2.6	2.06	0.57	0.03	1.15	0.29
Copper (Filtered)	µg/L	0.02	**1000**	2.8	-	-	-	4.2	2.23	2.19	2.26	2.32	1.74
Iron (Filtered)	µg/L	2	**300**	<3	4	37	10	17	3	17	56	**494**	74
Lead (Filtered)	µg/L	0.01	**10**	0.05	-	-	-	0.09	0.02	0.04	0.01	0.03	<0.01
Manganese (Filtered)	µg/L	0.01	**50**	**223**	-	-	6.96	**132**	41.44	**76.5**	**132**	**209**	**184**
Magnesium (Filtered)	µg/L	1		8010	6790	7140	6190	8920	7160	9150	7210	9130	6510
Mercury (Filtered)	µg/L	0.01	**1**	-	-	-	-	-	-	-	<0.01	<0.01	**10**
Phosphorus (Filtered)	µg/L	10		-	-	-	-	-	-	-	<30	<30	<30
Potassium (Filtered)	µg/L	2		8290	-	-	-	8130	7240	9090	5450	7250	5830
Sodium (Filtered)	µg/L	10	**200000**	47,100	42,900	56,000	30,800	53,300	33,000	45,900	44,700	62,800	32,700
Zinc (Filtered)	µg/L	2	**5000**	3	-	-	-	<2	3	<2	6	3	2
Inorganics													
Alkalinity (as CaCO3)	mg/L	2	**500**	383	356	348	316	369	374	396	397	394	300
Hardness (as CaCO3) (Filtered)	mg/L	1	**500**	-	-	-	-	-	-	-	-	-	-
Solids - Total Dissolved (TDS)	mg/L	3	**500**	500	463	**503**	449	**560**	454	**591**	**520**	**697**	**549**
Oxygen Demand - Chemical (COD)	mg/L	5		8	9	<8	<8	<8	<8	13	9	<8	17
Solids - Total Suspended (TSS)	mg/L	2		17	-	-	-	-	-	-	<2	<2	<2
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	3.2	**8.2**	2.1	2.6	3.6	2.5	3.5	4.5	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	-	-	-	-	-	-	<4	<4	<4
Phenols (4AAP)	mg/L	0.001		-	-	-	-	-	-	-	0.007	<0.002	0.002
Sulphate	mg/L	0.2	**500**	6.7	6.9	5.6	8.4	3.3	9.5	6	11	5	6
Ammonia	mg/L	0.01		0.9	0.3	0.4	<0.1	0.6	0.2	0.6	0.2	0.6	0.3
Nitrate (as N)	mg/L	0.05	**10**	0.61	0.09	1.7	0.55	0.65	0.35	0.82	0.08	0.45	<0.06
Nitrite (as N)	mg/L	0.03	**1**	-	-	-	-	-	-	-	<0.03	<0.03	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		-	-	-	-	-	-	-	<0.5	0.8	0.5
Conductivity (lab)	µS/cm	1		905	837	920	818	972	855	990	937	1150	846
pH (Lab)	-	0.05	**6.5-8.5**	7.73	7.61	8.03	7.86	7.9	8.09	7.91	8.01	7.71	8.18
Field													
DO (Field)	mg/L			-	-	-	-	-	-	-	-	-	-
Redox Potential (Field)	mV			-	-	-	-	-	-	-	-	-	-
Temp (Field)	°C			-	-	-	-	-	-	-	-	-	-
Conductivity (field)	µS/cm			-	-	-	-	-	-	-	-	-	-
pH (Field)	-		**6.5-8.5**	-	-	-	-	-	-	-	-	-	-

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Table 3: Groundwater Quality

	Unit	RDL	ODWQS	TW6-2 2016-10-28	TW6-2 2018-06-04	TW6-2 2018-10-05	TW6-2 2019-05-31	TW6-2 2019-10-25	TW6-2 2020-05-12	TW6-2 2020-11-02	TW6-2 2021-06-21	TW6-2 2021-11-10
Metals												
Arsenic (Filtered)	µg/L	0.1	**25**	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	<0.1	<0.1
Barium (Filtered)	µg/L	0.01	**1000**	127	93.6	156	109	145	98.3	118	124	139
Boron (Filtered)	µg/L	0.2	**5000**	89	71	64	55	65	51	58	73	49
Calcium (Filtered)	µg/L	10		160,000	151,000	162,000	148,000	171,000	140,000	135,000	160,000	160,000
Cadmium (Filtered)	µg/L	0.003	**5**	<0.003	0.007	<0.003	0.004	0.016	0.009	0.012	<0.015	<0.015
Chloride	µg/L	200	**250000**	130,000	75,000	160,000	76,000	160,000	78,000	86,000	73,900	74,700
Chromium (III+VI) (Filtered)	µg/L	0.03	**50**	0.37	0.53	0.12	0.15	0.12	0.14	0.13	<1	<1
Copper (Filtered)	µg/L	0.02	**1000**	1.43	1.52	1.76	1.4	1.8	1.9	1.9	1.5	1.9
Iron (Filtered)	µg/L	2	**300**	201	8	<7	<7	29	7	<7	16	155
Lead (Filtered)	µg/L	0.01	**10**	0.03	<0.01	0.11	<0.01	0.06	<0.01	0.09	<0.02	0.03
Manganese (Filtered)	µg/L	0.01	**50**	**125**	48.4	12	12.2	**79.6**	46.9	30.1	36	**180**
Magnesium (Filtered)	µg/L	1		8590	6570	8220	6700	9890	7020	7160	8250	8300
Mercury (Filtered)	µg/L	0.01	**1**	<0.01	<0.01	**10**	<10	<10	<10	<10	<0.02	<0.02
Phosphorus (Filtered)	µg/L	10		<30	<30	60	<30	<30	<30	40	110	30
Potassium (Filtered)	µg/L	2		8230	7060	8340	5670	8690	6050	7020	6700	6900
Sodium (Filtered)	µg/L	10	**200000**	58,200	33,700	54,800	31,300	70,500	39,700	56,000	57,200	61,000
Zinc (Filtered)	µg/L	2	**5000**	3	<2	4	2	4	2	4	<5	<5
Inorganics												
Alkalinity (as CaCO3)	mg/L	2	**500**	380	346	361	386	360	333	418	386	407
Hardness (as CaCO3) (Filtered)	mg/L	1	**500**	-	-	-	-	-	-	-	434	434
Solids - Total Dissolved (TDS)	mg/L	3	**500**	**637**	**506**	**714**	**509**	**663**	471	**580**	491	**546**
Oxygen Demand - Chemical (COD)	mg/L	5		<8	<8	14	<8	<8	<8	<8	12	10
Solids - Total Suspended (TSS)	mg/L	2		<2	4	<2	931	2	25	31	7	32
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	-	-	-	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	<4	<4	<4	<4	<4	<4	<3	<3
Phenols (4AAP)	mg/L	0.001		0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001
Sulphate	mg/L	0.2	**500**	4	5	5	10	<2	7	<2	5	6
Ammonia	mg/L	0.01		1	0.3	0.3	<0.1	1	0.2	0.8	0.22	0.64
Nitrate (as N)	mg/L	0.05	**10**	1.06	0.17	2.21	0.1	1.14	0.23	1.49	0.39	0.45
Nitrite (as N)	mg/L	0.03	**1**	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.09	<0.05	<0.05
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.9	<0.5	<0.5	<0.5	1.2	<0.5	1.5	0.5	0.9
Conductivity (lab)	µS/cm	1		1110	875	1180	917	1160	802	1040	924	1020
pH (Lab)	-	0.05	**6.5-8.5**	7.66	8.01	7.8	7.91	7.37	7.36	7.73	7.52	7.74
Field												
DO (Field)	mg/L			-	-	-	-	-	3.89	6.01	6.2	3.17
Redox Potential (Field)	mV			-	-	-	119	178	130	225	143	101
Temp (Field)	°C			-	-	-	9	22	9.1	8.6	15.3	12.3
Conductivity (field)	µS/cm			-	-	-	686	839	761	618	936	441
pH (Field)	-		**6.5-8.5**	-	-	-	7.45	6.76	7.55	7.92	6.97	6.77

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Table 3: Groundwater Quality

	Unit	RDL	ODWQS	TW7 2011-10-25	TW7 2012-05-09	TW7 2012-10-23	TW7 2013-05-28	TW7 2013-10-29	TW7 2014-06-05	TW7 2014-11-03	TW7 2015-05-14	TW7 2015-11-02	TW7 2016-05-17
Metals													
Arsenic (Filtered)	µg/L	0.1	**25**	0.8	-	-	-	0.6	0.3	0.3	0.2	0.9	0.6
Barium (Filtered)	µg/L	0.01	**1000**	124	103	115	73	98.4	111	83.7	86.7	99.7	88.9
Boron (Filtered)	µg/L	0.2	**5000**	129	111	96.5	150	170	159	150	135	162	134
Calcium (Filtered)	µg/L	10		114,000	111,000	111,000	100,000	115,000	114,000	107,000	110,000	105,000	128,000
Cadmium (Filtered)	µg/L	0.003	**5**	0.066	-	-	-	<0.003	<0.003	<0.003	0.008	<0.003	0.022
Chloride	µg/L	200	**250000**	82,000	81,000	79,000	89,000	91,000	97,000	120,000	120,000	100,000	110,000
Chromium (III+VI) (Filtered)	µg/L	0.03	**50**	0.9	-	-	-	3.9	1.61	0.48	<0.03	1.15	0.34
Copper (Filtered)	µg/L	0.02	**1000**	0.8	-	-	-	2.1	1.01	0.62	0.57	1.31	0.47
Iron (Filtered)	µg/L	2	**300**	**2330**	**915**	**1940**	**535**	**1440**	11	**1250**	**1040**	**1650**	**1770**
Lead (Filtered)	µg/L	0.01	**10**	0.02	-	-	-	0.03	0.03	0.03	0.06	0.05	<0.01
Manganese (Filtered)	µg/L	0.01	**50**	**953**	-	-	**281**	**356**	9.76	**241**	**361**	**286**	**1160**
Magnesium (Filtered)	µg/L	1		14,300	15,200	12,600	19,000	21,600	19,800	21,300	22,100	22,500	17,200
Mercury (Filtered)	µg/L	0.01	**1**	-	-	-	-	-	-	-	<0.01	<0.01	**20**
Phosphorus (Filtered)	µg/L	10		-	-	-	-	-	-	-	-	-	<30
Potassium (Filtered)	µg/L	2		4880	-	-	-	4360	4610	4270	3790	3900	4110
Sodium (Filtered)	µg/L	10	**200000**	52,000	54,300	55,000	39,900	44,200	49,300	45,200	46,600	50,400	48,500
Zinc (Filtered)	µg/L	2	**5000**	6	-	-	-	3	3	<2	4	6	4
Inorganics													
Alkalinity (as CaCO3)	mg/L	2	**500**	316	349	336	309	321	346	338	363	345	333
Hardness (as CaCO3) (Filtered)	mg/L	1	**500**	-	-	-	-	-	-	-	-	-	-
Solids - Total Dissolved (TDS)	mg/L	3	**500**	463	483	474	489	**531**	491	**540**	**506**	**557**	**560**
Oxygen Demand - Chemical (COD)	mg/L	5		<8	15	10	11	<8	<8	12	<8	14	17
Solids - Total Suspended (TSS)	mg/L	2		3	-	-	-	-	-	-	-	-	10
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	3.3	**8.3**	1.8	2.9	3.2	2.7	3	3.3	2.2	-
Oxygen Demand - Biological (BOD)	mg/L	2		<2	-	-	-	-	-	-	-	-	<4
Phenols (4AAP)	mg/L	0.001		-	-	-	-	-	-	-	-	-	0.001
Sulphate	mg/L	0.2	**500**	2.5	3	3.6	5.1	4.3	3.2	2.2	<10	3	<1
Ammonia	mg/L	0.01		0.4	0.2	0.5	0.1	0.4	<0.1	0.2	<0.1	0.2	0.5
Nitrate (as N)	mg/L	0.05	**10**	<0.05	0.11	0.07	0.16	<0.06	0.28	<0.06	0.07	<0.06	0.11
Nitrite (as N)	mg/L	0.03	**1**	-	-	-	-	-	-	-	-	-	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		-	-	-	-	-	-	-	-	-	0.8
Conductivity (lab)	µS/cm	1		867	860	897	899	895	890	936	1000	992	970
pH (Lab)	-	0.05	**6.5-8.5**	7.87	7.71	8.1	8.04	8	8.19	8.02	8.1	7.93	8.34
Field													
DO (Field)	mg/L			-	-	-	-	-	-	-	-	-	-
Redox Potential (Field)	mV			-	-	-	-	-	-	-	-	-	-
Temp (Field)	°C			-	-	-	-	-	-	-	-	-	-
Conductivity (field)	µS/cm			-	-	-	-	-	-	-	-	-	-
pH (Field)	-		**6.5-8.5**	-	-	-	-	-	-	-	-	-	-

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Table 3: Groundwater Quality

	Unit	RDL	ODWQS	TW7 2016-10-28	TW7 2018-06-04	TW7 2018-10-05	TW7 2019-05-31	TW7 2019-10-25	TW7 2020-05-12	TW7 2020-11-02	TW7 2021-06-21	TW7 2021-11-10
Metals												
Arsenic (Filtered)	µg/L	0.1	**25**	0.3	0.4	<0.2	0.6	0.9	<0.2	<0.2	1	1
Barium (Filtered)	µg/L	0.01	**1000**	150	113	111	105	139	74.3	104	168	132
Boron (Filtered)	µg/L	0.2	**5000**	106	95	110	128	99	148	73	82	71
Calcium (Filtered)	µg/L	10		132,000	141,000	123,000	173,000	145,000	127,000	123,000	139,000	128,000
Cadmium (Filtered)	µg/L	0.003	**5**	<0.003	<0.003	<0.003	0.073	<0.003	0.009	0.009	<0.015	0.016
Chloride	µg/L	200	**250000**	110,000	130,000	130,000	130,000	140,000	140,000	85,000	111,000	112,000
Chromium (III+VI) (Filtered)	µg/L	0.03	**50**	0.26	1.03	0.1	1.17	0.19	0.15	0.19	<1	<1
Copper (Filtered)	µg/L	0.02	**1000**	0.17	0.1	1.37	2.4	0.3	1.4	0.8	0.2	0.2
Iron (Filtered)	µg/L	2	**300**	**2440**	**321**	26	**2030**	**4130**	23	66	**4720**	**4950**
Lead (Filtered)	µg/L	0.01	**10**	0.03	<0.01	0.07	**10.74**	0.05	0.04	0.09	0.02	0.04
Manganese (Filtered)	µg/L	0.01	**50**	**770**	**1510**	7.43	**587**	**1270**	17.1	**263**	**1440**	**1490**
Magnesium (Filtered)	µg/L	1		15,900	9990	14,900	20,200	13,400	23,800	13,000	10,200	7990
Mercury (Filtered)	µg/L	0.01	**1**	<0.01	0.02	<10	<10	<10	<10	<10	<0.02	<0.02
Phosphorus (Filtered)	µg/L	10		<30	<30	60	420	40	580	410	490	180
Potassium (Filtered)	µg/L	2		3770	4900	4290	4340	4630	3740	3990	4800	4300
Sodium (Filtered)	µg/L	10	**200000**	54,000	54,700	43,800	48,000	63,600	50,400	53,500	75,600	70,800
Zinc (Filtered)	µg/L	2	**5000**	3	<2	5	32	2	4	4	<5	<5
Inorganics												
Alkalinity (as CaCO3)	mg/L	2	**500**	359	349	338	332	331	354	469	354	326
Hardness (as CaCO3) (Filtered)	mg/L	1	**500**	-	-	-	-	-	-	-	389	353
Solids - Total Dissolved (TDS)	mg/L	3	**500**	**569**	**583**	**566**	**571**	**597**	**560**	**543**	**509**	**521**
Oxygen Demand - Chemical (COD)	mg/L	5		<8	<8	9	<8	9	10	8	31	21
Solids - Total Suspended (TSS)	mg/L	2		11	5	34	50	7	1600	1420	1130	1330
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	-	-	-	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	<4	<4	<4	<4	<4	<4	<3	<3
Phenols (4AAP)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	0.004	0.001	<0.001	<0.002	<0.001
Sulphate	mg/L	0.2	**500**	2	4	<2	2	<2	3	<2	2	<1
Ammonia	mg/L	0.01		0.8	0.7	0.6	0.5	0.8	0.4	0.9	0.93	1.1
Nitrate (as N)	mg/L	0.05	**10**	<0.06	0.06	0.16	0.21	<0.06	0.11	0.07	0.54	<0.05
Nitrite (as N)	mg/L	0.03	**1**	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		1.5	0.5	0.7	<0.5	0.9	0.6	1	1.4	1.5
Conductivity (lab)	µS/cm	1		989	978	940	1040	1030	914	941	957	977
pH (Lab)	-	0.05	**6.5-8.5**	7.8	8.11	7.52	7.83	7.81	7.81	7.77	7.69	7.86
Field												
DO (Field)	mg/L			-	-	-	-	-	4.47	5.2	7.13	11.01
Redox Potential (Field)	mV			-	-	-	150	2	149	58	190	121
Temp (Field)	°C			-	-	-	9.8	11.2	9.9	8	12.5	10.6
Conductivity (field)	µS/cm			-	-	-	784	734	820	578	980	423
pH (Field)	-		**6.5-8.5**	-	-	-	7.78	6.77	7.72	7.7	7.16	7.18

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Table 3: Groundwater Quality

	Unit	RDL	ODWQS	TW8-2 2011-10-28	TW8-2 2012-05-09	TW8-2 2012-10-23	TW8-2 2013-10-29	TW8-2 2014-05-28	TW8-2 2014-06-05	TW8-2 2014-11-03	TW8-2 2015-05-14	TW8-2 2015-11-02	TW8-2 2016-05-17
Metals													
Arsenic (Filtered)	µg/L	0.1	**25**	0.3	-	-	0.5	-	0.3	0.3	<0.2	0.7	<0.2
Barium (Filtered)	µg/L	0.01	**1000**	190	206	197	225	212	202	199	212	222	216
Boron (Filtered)	µg/L	0.2	**5000**	23	27.6	28.4	29.2	24.6	30.8	25.7	42.9	29.5	33
Calcium (Filtered)	µg/L	10		119,000	125,000	121,000	121,000	113,000	128,000	120,000	121,000	113,000	143,000
Cadmium (Filtered)	µg/L	0.003	**5**	0.012	-	-	<0.003	-	<0.003	<0.003	0.004	<0.003	<0.003
Chloride	µg/L	200	**250000**	100,000	63,000	110,000	110,000	120,000	110,000	110,000	120,000	100,000	120,000
Chromium (III+VI) (Filtered)	µg/L	0.03	**50**	<0.5	-	-	3.5	-	1.64	0.43	<0.03	1.15	0.33
Copper (Filtered)	µg/L	0.02	**1000**	1.7	-	-	2.7	-	0.75	0.6	0.75	1.1	0.29
Iron (Filtered)	µg/L	2	**300**	70	17	**431**	**360**	**414**	138	281	78	**984**	156
Lead (Filtered)	µg/L	0.01	**10**	0.12	-	-	<0.02	-	0.07	0.02	0.02	0.01	<0.01
Manganese (Filtered)	µg/L	0.01	**50**	19.4	-	-	23.4	14	17.36	13.3	22.1	14.6	30.2
Magnesium (Filtered)	µg/L	1		9710	10,800	10,400	10,100	9930	11,000	10,300	10,800	10,900	10,400
Mercury (Filtered)	µg/L	0.01	**1**	-	-	-	-	-	-	-	<0.01	<0.01	**10**
Phosphorus (Filtered)	µg/L	10		-	-	-	-	-	-	-	<30	<30	<30
Potassium (Filtered)	µg/L	2		1870	-	-	1910	-	2080	2030	1760	1790	1830
Sodium (Filtered)	µg/L	10	**200000**	50,600	57,600	56,600	53,400	50,100	55,900	58,000	59,800	62,500	57,700
Zinc (Filtered)	µg/L	2	**5000**	8	-	-	<2	-	<2	<2	3	3	<2
Inorganics													
Alkalinity (as CaCO3)	mg/L	2	**500**	305	305	299	284	284	320	318	328	316	271
Hardness (as CaCO3) (Filtered)	mg/L	1	**500**	-	-	-	-	-	-	-	-	-	-
Solids - Total Dissolved (TDS)	mg/L	3	**500**	500	497	494	**697**	**517**	494	**517**	**511**	**560**	**591**
Oxygen Demand - Chemical (COD)	mg/L	5		<8	<8	9	<8	8	92	11	<8	9	9
Solids - Total Suspended (TSS)	mg/L	2		767	-	-	-	-	-	-	2250	2	<2
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	2.3	**7.8**	<1	2.6	2	1.8	2.4	2.8	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	-	-	-	-	-	-	<4	<4	<4
Phenols (4AAP)	mg/L	0.001		-	-	-	-	-	-	-	0.005	<0.002	0.001
Sulphate	mg/L	0.2	**500**	18	8.7	16	16	16	15	15	15	13	13
Ammonia	mg/L	0.01		0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrate (as N)	mg/L	0.05	**10**	0.32	<0.05	<0.05	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Nitrite (as N)	mg/L	0.03	**1**	-	-	-	-	-	-	-	<0.03	<0.03	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		-	-	-	-	-	-	-	<0.5	<0.5	<0.5
Conductivity (lab)	µS/cm	1		941	898	927	893	941	925	920	916	979	967
pH (Lab)	-	0.05	**6.5-8.5**	7.72	7.61	8.06	8.14	8.03	8.16	8.07	8.07	7.9	8.12
Field													
DO (Field)	mg/L			-	-	-	-	-	-	-	-	-	-
Redox Potential (Field)	mV			-	-	-	-	-	-	-	-	-	-
Temp (Field)	°C			-	-	-	-	-	-	-	-	-	-
Conductivity (field)	µS/cm			-	-	-	-	-	-	-	-	-	-
pH (Field)	-		**6.5-8.5**	-	-	-	-	-	-	-	-	-	-

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Table 3: Groundwater Quality

	Unit	RDL	ODWQS	TW8-2 2016-10-28	TW8-2 2018-06-04	TW8-2 2018-10-05	TW8-2 2019-10-25	TW8-2 2020-05-12	TW8-2 2020-11-02	TW8-2 2021-06-21	TW8-2 2021-11-10
Metals											
Arsenic (Filtered)	µg/L	0.1	**25**	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	<0.1	0.1
Barium (Filtered)	µg/L	0.01	**1000**	196	205	228	210	217	210	228	218
Boron (Filtered)	µg/L	0.2	**5000**	31	28	23	27	27	25	26	26
Calcium (Filtered)	µg/L	10		136,000	139,000	129,000	134,000	131,000	130,000	143,000	137,000
Cadmium (Filtered)	µg/L	0.003	**5**	<0.003	0.004	<0.003	<0.003	0.011	<0.003	<0.015	<0.015
Chloride	µg/L	200	**250000**	120,000	120,000	120,000	140,000	140,000	99,000	132,000	131,000
Chromium (III+VI) (Filtered)	µg/L	0.03	**50**	0.28	1.16	0.04	0.15	0.15	0.27	<1	<1
Copper (Filtered)	µg/L	0.02	**1000**	0.38	0.25	1.4	0.5	0.5	0.5	0.4	0.5
Iron (Filtered)	µg/L	2	**300**	**570**	<7	203	100	284	**2910**	244	**521**
Lead (Filtered)	µg/L	0.01	**10**	0.03	<0.01	<0.01	0.02	0.01	0.07	<0.02	0.25
Manganese (Filtered)	µg/L	0.01	**50**	14.8	**60.23**	19.7	25.9	**56.9**	23.2	48	29
Magnesium (Filtered)	µg/L	1		10,700	10,700	9040	11,100	11,100	9750	12,100	11,000
Mercury (Filtered)	µg/L	0.01	**1**	<0.01	<0.01	<10	<10	<10	<10	<0.02	<0.02
Phosphorus (Filtered)	µg/L	10		<30	<30	60	<30	<30	470	15,300	2220
Potassium (Filtered)	µg/L	2		1620	1770	1640	1690	1690	1640	1800	1700
Sodium (Filtered)	µg/L	10	**200000**	58,600	56,200	50,300	62,000	65,300	56,000	73,100	68,100
Zinc (Filtered)	µg/L	2	**5000**	2	<2	4	<2	<2	2	<5	<5
Inorganics											
Alkalinity (as CaCO3)	mg/L	2	**500**	336	315	320	309	323	**1180**	323	292
Hardness (as CaCO3) (Filtered)	mg/L	1	**500**	-	-	-	-	-	-	407	388
Solids - Total Dissolved (TDS)	mg/L	3	**500**	**594**	**566**	**560**	**566**	**571**	**571**	**526**	**533**
Oxygen Demand - Chemical (COD)	mg/L	5		<8	<8	<8	<8	54	<8	178	54
Solids - Total Suspended (TSS)	mg/L	2		<2	2	2	2	13,200	7460	37,000	7750
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	-	-	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	<4	<4	<4	12	<4	<3	<3
Phenols (4AAP)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.002	<0.001
Sulphate	mg/L	0.2	**500**	14	15	14	13	12	13	14	13
Ammonia	mg/L	0.01		<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.15	0.17
Nitrate (as N)	mg/L	0.05	**10**	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.06	<0.05
Nitrite (as N)	mg/L	0.03	**1**	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	0.06
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	4.2	0.5
Conductivity (lab)	µS/cm	1		993	981	1010	997	925	978	987	999
pH (Lab)	-	0.05	**6.5-8.5**	7.79	8.13	7.94	7.95	7.74	7.73	7.71	7.78
Field											
DO (Field)	mg/L			-	-	-	-	6.07	4.3	5.27	8.73
Redox Potential (Field)	mV			-	-	-	185	252	-35	167	102
Temp (Field)	°C			-	-	-	10.5	6.9	7.7	9.7	9.3
Conductivity (field)	µS/cm			-	-	-	727	826	599	994	428
pH (Field)	-		**6.5-8.5**	-	-	-	6.54	7.6	8.02	7.41	7.49

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Table 4: Groundwater Quality - VOCs

	Unit	RDL	ODWQS	TW7 2011-10-25	TW7 2012-05-09	TW7 2012-10-23	TW7 2013-05-28	TW7 2013-10-29	TW7 2014-06-05	TW7 2014-11-03	TW7 2015-05-14	TW7 2015-11-02	TW7 2016-05-17
BTEX													
Benzene	ug/L	0.5	**1**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	ug/L	0.5	**60**	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	ug/L	0.5	**140**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylene (m & p)	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylene (o)	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylene Total	ug/L	0.5	**90**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
VOCs													
Bromodichloromethane	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromoform	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromomethane	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon tetrachloride	ug/L	0.2	**2**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	ug/L	0.5	**80**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroethane	µg/L	3		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloromethane	µg/L	2		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Dibromochloromethane	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromoethylene, 1,2-trans-	ug/L			-	-	-	-	-	-	-	-	-	<0.5
Dichlorobenzene, 1,2-	ug/L	0.5	**200**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorobenzene, 1,3-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorobenzene, 1,4-	ug/L	0.5	**5**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloroethane, 1,1-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloroethane, 1,2-	ug/L	0.5	**5**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloroethylene, 1,1-	ug/L	0.5	**14**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloroethylene,1,2-trans-	µg/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
Dichloroethylene, 1,2-cis-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloropropane, 1,2-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloropropene, 1,3-cis-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloropropene, 1,3-trans-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloropropene, 1,3-(cis+trans)	µg/L	0.5		-	-	-	-	-	-	-	-	-	-
Ethylene dibromide	ug/L	0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Methylene chloride	ug/L	0.5	**50**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Styrene	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethane, 1,1,2,2-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethane, 1,1,1,2-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/L	0.5	**10**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethane, 1,1,1-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethane, 1,1,2-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	ug/L	0.5	**5**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	µg/L	5		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Vinyl chloride	ug/L	0.2	**1**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Table 4: Groundwater Quality - VOCs

	Unit	RDL	ODWQS	TW7 2016-10-28	TW7 2018-06-04	TW7 2018-10-05	TW7 2019-10-25	TW7 2020-05-12	TW7 2020-11-02	TW7 2021-06-21	TW7 2021-11-10
BTEX											
Benzene	ug/L	0.5	**1**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
Toluene	ug/L	0.5	**60**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
Ethylbenzene	ug/L	0.5	**140**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
Xylene (m & p)	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
Xylene (o)	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
Xylene Total	ug/L	0.5	**90**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
VOCs											
Bromodichloromethane	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2
Bromoform	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<5
Bromomethane	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon tetrachloride	ug/L	0.2	**2**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	ug/L	0.5	**80**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
Chloroform	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1
Chloroethane	µg/L	3		<5	<5	<5	<5	<5	<5	<3	<3
Chloromethane	µg/L	2		<5	<5	<5	<5	<5	<5	<2	<2
Dibromochloromethane	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2
Dibromoethylene, 1,2-trans-	ug/L			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
Dichlorobenzene, 1,2-	ug/L	0.5	**200**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorobenzene, 1,3-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorobenzene, 1,4-	ug/L	0.5	**5**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloroethane, 1,1-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloroethane, 1,2-	ug/L	0.5	**5**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloroethylene, 1,1-	ug/L	0.5	**14**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloroethylene,1,2-trans-	µg/L	0.5		-	-	-	-	-	-	<0.5	<0.5
Dichloroethylene, 1,2-cis-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloropropane, 1,2-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloropropene, 1,3-cis-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5
Dichloropropene, 1,3-trans-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloropropene, 1,3-(cis+trans)	µg/L	0.5		-	-	-	-	-	-	<0.5	<0.5
Ethylene dibromide	ug/L	0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Methylene chloride	ug/L	0.5	**50**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<5
Styrene	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethane, 1,1,2,2-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethane, 1,1,1,2-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	ug/L	0.5	**10**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethane, 1,1,1-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethane, 1,1,2-	ug/L	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	ug/L	0.5	**5**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	µg/L	5		<5	<5	<5	<5	<5	<5	<5	<5
Vinyl chloride	ug/L	0.2	**1**	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Table 5: Groundwater Quality - Trigger Assessment

	Unit	RDL	GW Trigger	TW2 2011-10-28	TW2 2012-05-09	TW2 2013-05-28	TW2 2013-10-29	TW2 2014-06-05	TW2 2014-11-03	TW2 2015-05-14	TW2 2015-11-02	TW2 2016-05-17
Metals												
Arsenic (Filtered)	µg/L	0.1		0.6	-	-	0.6	0.8	0.7	0.7	1.1	0.9
Barium (Filtered)	µg/L	0.01	**52**	**127**	**116**	**131**	**146**	**147**	**150**	**116**	**158**	**138**
Boron (Filtered)	µg/L	0.2	**1500**	28	19.5	13.2	21.5	29.8	19.4	35.9	22.2	21
Calcium (Filtered)	µg/L	10		132,000	145,000	121,000	158,000	150,000	147,000	126,000	126,000	162,000
Cadmium (Filtered)	µg/L	0.003		0.012	-	-	0.039	0.018	0.004	0.011	0.052	0.009
Chloride	µg/L	200	**137500**	99,000	68,000	85,000	**180,000**	74,000	110,000	77,000	100,000	59,000
Chromium (III+VI) (Filtered)	µg/L	0.03		<0.5	-	-	4.6	2.12	0.83	0.28	1.21	0.52
Copper (Filtered)	µg/L	0.02		0.7	-	-	4.8	1.27	1.67	1.51	1.83	0.45
Iron (Filtered)	µg/L	2	**300**	**690**	**1230**	**1610**	150	**1210**	**5780**	**1570**	**1400**	**1390**
Lead (Filtered)	µg/L	0.01		0.07	-	-	0.47	0.1	0.58	0.22	0.09	<0.01
Manganese (Filtered)	µg/L	0.01	**0.58**	**206**	-	**347**	**28.5**	**246**	**264**	**271**	**140**	**361**
Magnesium (Filtered)	µg/L	1	**4185**	**8810**	**9010**	**7360**	**7800**	**9400**	**8700**	**7930**	**8380**	**8210**
Mercury (Filtered)	µg/L	0.01		-	-	-	-	-	-	<0.01	<0.01	<10
Phosphorus (Filtered)	µg/L	10	**30**	-	-	-	-	-	-	<30	<30	30
Potassium (Filtered)	µg/L	2	**642**	**1040**	-	-	476	**1370**	**1890**	**958**	**1030**	**800**
Sodium (Filtered)	µg/L	10	**56075**	43,800	35,400	36,900	45,900	45,600	35,000	36,000	55,400	33,000
Zinc (Filtered)	µg/L	2		<2	-	-	5	9	6	7	8	3
Inorganics												
Alkalinity (as CaCO3)	mg/L	2	**285**	**329**	**347**	**329**	228	**430**	**423**	**394**	281	**383**
Hardness (as CaCO3) (Filtered)	mg/L	1		-	-	-	-	-	-	-	-	-
Solids - Total Dissolved (TDS)	mg/L	3	**568**	531	476	**609**	**654**	529	**737**	**583**	540	**577**
Oxygen Demand - Chemical (COD)	mg/L	5		<8	32	30	39	<8	43	35	27	37
Solids - Total Suspended (TSS)	mg/L	2		6700	-	-	-	-	-	16,400	<2	<2
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1		6	12.3	9.7	12.6	12.5	14.2	14.2	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		6	-	-	-	-	-	22	<4	<4
Phenols (4AAP)	mg/L	0.001		-	-	-	-	-	-	0.01	<0.002	0.001
Sulphate	mg/L	0.2		14	8.3	92	54	5.8	17	<1	13	12
Ammonia	mg/L	0.01		0.1	<0.1	0.2	<0.1	0.1	0.1	<0.1	<0.1	<0.1
Nitrate (as N)	mg/L	0.05		0.79	0.05	<0.06	<0.06	0.13	0.09	<0.06	<0.06	0.11
Nitrite (as N)	mg/L	0.03		-	-	-	-	-	-	<0.03	<0.03	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	**0.5**	-	-	-	-	-	-	**0.8**	<0.5	**0.6**
Conductivity (lab)	µS/cm	1		931	842	962	1070	984	1080	922	943	914
pH (Lab)	-	0.05		7.81	7.63	8.02	8.18	8.22	8.05	8.1	8.05	8.38
Field												
DO (Field)	mg/L			-	-	-	-	-	-	-	-	-
Redox Potential (Field)	mV			-	-	-	-	-	-	-	-	-
Temp (Field)	°C			-	-	-	-	-	-	-	-	-
Conductivity (field)	µS/cm			-	-	-	-	-	-	-	-	-
pH (Field)	-			-	-	-	-	-	-	-	-	-

CAMBIUM

Table 5: Groundwater Quality - Trigger Assessment

	Unit	RDL	GW Trigger	TW2 2018-06-04	TW2 2018-10-05	TW2 2019-05-31	TW2 2019-10-25	TW2 2020-05-12	TW2 2020-11-02	TW2 2021-06-21	TW2 2021-11-10
Metals											
Arsenic (Filtered)	µg/L	0.1		<0.2	0.3	0.7	0.5	0.4	0.2	0.3	0.4
Barium (Filtered)	µg/L	0.01	52	149	104	139	145	97.1	106	150	147
Boron (Filtered)	µg/L	0.2	1500	49	18	15	16	16	13	21	12
Calcium (Filtered)	µg/L	10		141,000	120,000	166,000	175,000	131,000	126,000	186,000	201,000
Cadmium (Filtered)	µg/L	0.003		<0.003	<0.003	0.014	0.021	0.011	0.033	<0.015	<0.015
Chloride	µg/L	200	137500	150,000	150,000	99,000	210,000	71,000	83,000	147,000	156,000
Chromium (III+VI) (Filtered)	µg/L	0.03		0.34	0.18	0.25	0.24	0.25	0.24	<1	<1
Copper (Filtered)	µg/L	0.02		0.84	2.04	0.4	2.7	1.3	1.6	0.9	1.3
Iron (Filtered)	µg/L	2	300	<7	109	1500	605	718	30	111	462
Lead (Filtered)	µg/L	0.01		0.02	<0.01	0.03	0.05	0.05	0.09	<0.04	0.18
Manganese (Filtered)	µg/L	0.01	0.58	0.2	18.6	550	88.7	338	78.3	334	717
Magnesium (Filtered)	µg/L	1	4185	8040	5250	8980	8030	6940	5940	9440	9790
Mercury (Filtered)	µg/L	0.01		<0.01	<10	<10	<10	<10	<10	<0.02	<0.02
Phosphorus (Filtered)	µg/L	10	30	<30	60	740	<30	920	2820	150	2600
Potassium (Filtered)	µg/L	2	642	1370	362	840	560	482	633	500	300
Sodium (Filtered)	µg/L	10	56075	62,900	36,800	48,900	68,800	43,200	42,300	72,100	71,800
Zinc (Filtered)	µg/L	2		4	4	4	3	<2	5	<5	<5
Inorganics											
Alkalinity (as CaCO3)	mg/L	2	285	283	162	407	249	313	502	376	428
Hardness (as CaCO3) (Filtered)	mg/L	1		-	-	-	-	-	-	504	543
Solids - Total Dissolved (TDS)	mg/L	3	568	617	594	611	871	466	554	602	699
Oxygen Demand - Chemical (COD)	mg/L	5		11	39	37	34	15	31	36	306
Solids - Total Suspended (TSS)	mg/L	2		<2	3	1770	2	533	2470	263	3800
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1		-	-	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		9	16	4	<4	<4	<4	<3	3
Phenols (4AAP)	mg/L	0.001		<0.001	0.005	0.001	0.005	0.002	0.003	<0.002	<0.001
Sulphate	mg/L	0.2		9	39	<2	40	<2	22	8	1
Ammonia	mg/L	0.01		<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.08	0.17
Nitrate (as N)	mg/L	0.05		0.29	0.12	<0.06	<0.06	<0.06	0.13	<0.05	<0.05
Nitrite (as N)	mg/L	0.03		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	0.5	<0.5	0.6	<0.5	0.6	<0.5	<0.5	0.7	4.4
Conductivity (lab)	µS/cm	1		985	855	933	1160	764	892	1120	1290
pH (Lab)	-	0.05		8.11	8	7.41	7.72	7.67	7.9	7.83	7.79
Field											
DO (Field)	mg/L			-	-	-	-	7.11	10.7	9.21	5.31
Redox Potential (Field)	mV			-	-	200	195	256	52	174	105
Temp (Field)	°C			-	-	9.7	11.1	7.2	6.8	14.5	8.8
Conductivity (field)	µS/cm			-	-	738	915	682	547	1131	535
pH (Field)	-			-	-	7.55	6.29	7.64	7.9	7.36	7.11

CAMBIUM

Table 5: Groundwater Quality - Trigger Assessment

	Unit	RDL	GW Trigger	TW3-2 2011-10-28	TW3-2 2012-05-09	TW3-2 2012-10-23	TW3-2 2013-05-28	TW3-2 2013-10-29	TW3-2 2014-06-05	TW3-2 2014-11-03	TW3-2 2015-05-14	TW3-2 2015-11-02	TW3-2 2016-05-17
Metals													
Arsenic (Filtered)	µg/L	0.1		1	-	-	-	0.9	0.8	0.8	0.7	1.6	0.7
Barium (Filtered)	µg/L	0.01	52	**115**	**95.5**	**111**	**104**	**124**	**98.2**	**116**	**115**	**130**	**96.9**
Boron (Filtered)	µg/L	0.2	1500	116	64.8	93.8	85.8	119	101	131	78.9	127	84
Calcium (Filtered)	µg/L	10		135,000	116,000	127,000	114,000	141,000	120,000	136,000	148,000	140,000	139,000
Cadmium (Filtered)	µg/L	0.003		0.022	-	-	-	0.004	0.016	<0.003	0.005	<0.003	0.004
Chloride	µg/L	200	137500	60,000	61,000	67,000	63,000	73,000	66,000	76,000	87,000	83,000	84,000
Chromium (III+VI) (Filtered)	µg/L	0.03		0.8	-	-	-	3.4	2.06	0.72	0.18	1.27	0.4
Copper (Filtered)	µg/L	0.02		0.6	-	-	-	3.3	0.72	0.89	0.64	1.45	0.82
Iron (Filtered)	µg/L	2	300	**877**	**871**	**811**	**977**	**798**	**802**	**878**	**1130**	**1580**	**962**
Lead (Filtered)	µg/L	0.01		0.08	-	-	-	0.17	0.06	0.1	0.1	0.06	0.03
Manganese (Filtered)	µg/L	0.01	0.58	**423**	-	-	**391**	**415**	**258**	**301**	**322**	**369**	**347**
Magnesium (Filtered)	µg/L	1	4185	**10,600**	**9260**	**10,400**	**8790**	**10,200**	**8990**	**10,200**	**11,800**	**11,500**	**8900**
Mercury (Filtered)	µg/L	0.01		-	-	-	-	-	-	-	<0.01	0.06	10
Phosphorus (Filtered)	µg/L	10	30	-	-	-	-	-	-	-	<30	<30	30
Potassium (Filtered)	µg/L	2	642	**7230**	-	-	-	**7620**	**6820**	**7870**	**6120**	**6970**	**5690**
Sodium (Filtered)	µg/L	10	56075	53,500	48,500	**57,600**	47,300	56,000	50,900	54,000	55,500	**61,800**	44,900
Zinc (Filtered)	µg/L	2		4	-	-	-	<2	3	<2	7	18	3
Inorganics													
Alkalinity (as CaCO3)	mg/L	2	285	**424**	**344**	**383**	**321**	**328**	**364**	**426**	**436**	**407**	**347**
Hardness (as CaCO3) (Filtered)	mg/L	1		-	-	-	-	-	-	-	-	-	-
Solids - Total Dissolved (TDS)	mg/L	3	568	537	486	546	517	**629**	477	**589**	**571**	**617**	523
Oxygen Demand - Chemical (COD)	mg/L	5		37	25	33	29	31	29	43	25	42	24
Solids - Total Suspended (TSS)	mg/L	2		89	-	-	-	-	-	-	2	<2	<2
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1		13.9	14.9	11.9	11.3	12.9	10.1	15	12	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	-	-	-	-	-	-	<4	<4	<4
Phenols (4AAP)	mg/L	0.001		-	-	-	-	-	-	-	0.008	0.003	0.001
Sulphate	mg/L	0.2		1.6	0.8	4.5	27	29	6.8	5.1	<1	1	<1
Ammonia	mg/L	0.01		0.2	<0.1	0.2	<0.1	0.2	0.3	<0.1	<0.1	0.2	<0.1
Nitrate (as N)	mg/L	0.05		<0.05	<0.05	0.92	<0.06	<0.06	0.09	<0.06	<0.06	<0.06	0.27
Nitrite (as N)	mg/L	0.03		-	-	-	-	-	-	-	<0.03	<0.03	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	0.5	-	-	-	-	-	-	-	**0.6**	**0.9**	<0.5
Conductivity (lab)	µS/cm	1		972	862	959	890	959	861	979	1030	1060	942
pH (Lab)	-	0.05		7.58	7.75	8.04	8	8.05	8.22	8.04	8.07	7.89	8.32
Field													
DO (Field)	mg/L			-	-	-	-	-	-	-	-	-	-
Redox Potential (Field)	mV			-	-	-	-	-	-	-	-	-	-
Temp (Field)	°C			-	-	-	-	-	-	-	-	-	-
Conductivity (field)	µS/cm			-	-	-	-	-	-	-	-	-	-
pH (Field)	-			-	-	-	-	-	-	-	-	-	-

Table 5: Groundwater Quality - Trigger Assessment

	Unit	RDL	GW Trigger	TW3-2 2016-10-28	TW3-2 2018-06-04	TW3-2 2018-10-05	TW3-2 2019-05-31	TW3-2 2019-10-25	TW3-2 2020-05-12	TW3-2 2020-11-02	TW3-2 2021-06-21	TW3-2 2021-11-10
Metals												
Arsenic (Filtered)	µg/L	0.1		0.7	0.4	0.5	0.6	0.8	0.7	0.7	0.9	1
Barium (Filtered)	µg/L	0.01	52	104	93.1	124	113	122	107	117	128	141
Boron (Filtered)	µg/L	0.2	1500	110	105	95	99	140	103	91	144	166
Calcium (Filtered)	µg/L	10		154,000	154,000	149,000	148,000	164,000	146,000	155,000	159,000	175,000
Cadmium (Filtered)	µg/L	0.003		0.011	<0.003	0.008	0.005	0.014	<0.003	0.016	<0.015	0.027
Chloride	µg/L	200	137500	93,000	84,000	120,000	87,000	100,000	96,000	85,000	97,100	104,000
Chromium (III+VI) (Filtered)	µg/L	0.03		0.55	0.29	0.29	0.27	0.35	0.3	0.38	<1	<1
Copper (Filtered)	µg/L	0.02		0.61	0.27	1.41	0.5	1.4	0.5	1	0.5	5.9
Iron (Filtered)	µg/L	2	300	1070	40	572	1210	1080	1360	1000	1670	2160
Lead (Filtered)	µg/L	0.01		0.11	<0.01	0.05	0.05	0.1	0.05	0.08	0.04	1.23
Manganese (Filtered)	µg/L	0.01	0.58	335	249	233	277	282	298	278	283	329
Magnesium (Filtered)	µg/L	1	4185	10,400	9420	9130	9530	11,500	10,400	9880	11,500	11,700
Mercury (Filtered)	µg/L	0.01		<0.01	<0.01	<10	<10	<10	<10	<10	<0.02	<0.02
Phosphorus (Filtered)	µg/L	10	30	<30	<30	60	230	<30	110	110	260	70
Potassium (Filtered)	µg/L	2	642	6360	6700	6900	5980	6740	5890	6300	6800	6900
Sodium (Filtered)	µg/L	10	56075	55,600	43,800	46,000	42,900	53,400	48,100	49,000	59,300	59,200
Zinc (Filtered)	µg/L	2		5	<2	4	9	4	<2	3	<5	<5
Inorganics												
Alkalinity (as CaCO3)	mg/L	2	285	418	362	393	366	382	341	400	366	395
Hardness (as CaCO3) (Filtered)	mg/L	1		-	-	-	-	-	-	-	445	486
Solids - Total Dissolved (TDS)	mg/L	3	568	634	531	629	563	654	551	623	513	597
Oxygen Demand - Chemical (COD)	mg/L	5		27	28	30	24	30	19	26	48	44
Solids - Total Suspended (TSS)	mg/L	2		<2	<2	6	150	-	674	475	238	1480
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1		-	-	-	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	<4	<4	<4	<4	<4	<4	<3	<3
Phenols (4AAP)	mg/L	0.001		0.001	<0.001	0.001	<0.001	<0.001	0.002	<0.001	<0.002	<0.001
Sulphate	mg/L	0.2		9	5	18	23	26	7	13	16	19
Ammonia	mg/L	0.01		0.2	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.2	0.23
Nitrate (as N)	mg/L	0.05		<0.06	0.29	<0.06	0.08	<0.06	<0.06	<0.06	0.07	<0.05
Nitrite (as N)	mg/L	0.03		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	0.5	0.8	<0.5	<0.5	<0.5	-	<0.5	<0.5	0.8	0.3
Conductivity (lab)	µS/cm	1		1020	921	1100	962	1040	876	1020	963	1110
pH (Lab)	-	0.05		7.7	8.04	7.83	7.3	7.79	7.39	7.74	7.59	7.68
Field												
DO (Field)	mg/L			-	-	-	-	-	3.55	6.5	1.59	7.07
Redox Potential (Field)	mV			-	-	-	70	177	128	42	155	101
Temp (Field)	°C			-	-	-	8.5	11.2	7.7	8.1	15.5	11.5
Conductivity (field)	µS/cm			-	-	-	692	774	806	627	975	169
pH (Field)	-			-	-	-	7.26	6.84	7.44	7.92	7.02	6.99

Table 5: Groundwater Quality - Trigger Assessment

	Unit	RDL	GW Trigger	TW8-2 2011-10-28	TW8-2 2012-05-09	TW8-2 2012-10-23	TW8-2 2013-10-29	TW8-2 2014-05-28	TW8-2 2014-06-05	TW8-2 2014-11-03	TW8-2 2015-05-14	TW8-2 2015-11-02	TW8-2 2016-05-17
Metals													
Arsenic (Filtered)	µg/L	0.1		0.3	-	-	0.5	-	0.3	0.3	<0.2	0.7	<0.2
Barium (Filtered)	µg/L	0.01	52	190	206	197	225	212	202	199	212	222	216
Boron (Filtered)	µg/L	0.2	1500	23	27.6	28.4	29.2	24.6	30.8	25.7	42.9	29.5	33
Calcium (Filtered)	µg/L	10		119,000	125,000	121,000	121,000	113,000	128,000	120,000	121,000	113,000	143,000
Cadmium (Filtered)	µg/L	0.003		0.012	-	-	<0.003	-	<0.003	<0.003	0.004	<0.003	<0.003
Chloride	µg/L	200	137500	100,000	63,000	110,000	110,000	120,000	110,000	110,000	120,000	100,000	120,000
Chromium (III+VI) (Filtered)	µg/L	0.03		<0.5	-	-	3.5	-	1.64	0.43	<0.03	1.15	0.33
Copper (Filtered)	µg/L	0.02		1.7	-	-	2.7	-	0.75	0.6	0.75	1.1	0.29
Iron (Filtered)	µg/L	2	300	70	17	431	360	414	138	281	78	984	156
Lead (Filtered)	µg/L	0.01		0.12	-	-	<0.02	-	0.07	0.02	0.02	0.01	<0.01
Manganese (Filtered)	µg/L	0.01	0.58	19.4	-	-	23.4	14	17.36	13.3	22.1	14.6	30.2
Magnesium (Filtered)	µg/L	1	4185	9710	10,800	10,400	10,100	9930	11,000	10,300	10,800	10,900	10,400
Mercury (Filtered)	µg/L	0.01		-	-	-	-	-	-	-	<0.01	<0.01	10
Phosphorus (Filtered)	µg/L	10	30	-	-	-	-	-	-	-	<30	<30	<30
Potassium (Filtered)	µg/L	2	642	1870	-	-	1910	-	2080	2030	1760	1790	1830
Sodium (Filtered)	µg/L	10	56075	50,600	57,600	56,600	53,400	50,100	55,900	58,000	59,800	62,500	57,700
Zinc (Filtered)	µg/L	2		8	-	-	<2	-	<2	<2	3	3	<2
Inorganics													
Alkalinity (as CaCO3)	mg/L	2	285	305	305	299	284	284	320	318	328	316	271
Hardness (as CaCO3) (Filtered)	mg/L	1		-	-	-	-	-	-	-	-	-	-
Solids - Total Dissolved (TDS)	mg/L	3	568	500	497	494	697	517	494	517	511	560	591
Oxygen Demand - Chemical (COD)	mg/L	5		<8	<8	9	<8	8	92	11	<8	9	9
Solids - Total Suspended (TSS)	mg/L	2		767	-	-	-	-	-	-	2250	2	<2
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1		2.3	7.8	<1	2.6	2	1.8	2.4	2.8	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	-	-	-	-	-	-	<4	<4	<4
Phenols (4AAP)	mg/L	0.001		-	-	-	-	-	-	-	0.005	<0.002	0.001
Sulphate	mg/L	0.2		18	8.7	16	16	16	15	15	15	13	13
Ammonia	mg/L	0.01		0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrate (as N)	mg/L	0.05		0.32	<0.05	<0.05	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Nitrite (as N)	mg/L	0.03		-	-	-	-	-	-	-	<0.03	<0.03	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	0.5	-	-	-	-	-	-	-	<0.5	<0.5	<0.5
Conductivity (lab)	µS/cm	1		941	898	927	893	941	925	920	916	979	967
pH (Lab)	-	0.05		7.72	7.61	8.06	8.14	8.03	8.16	8.07	8.07	7.9	8.12
Field													
DO (Field)	mg/L			-	-	-	-	-	-	-	-	-	-
Redox Potential (Field)	mV			-	-	-	-	-	-	-	-	-	-
Temp (Field)	°C			-	-	-	-	-	-	-	-	-	-
Conductivity (field)	µS/cm			-	-	-	-	-	-	-	-	-	-
pH (Field)	-			-	-	-	-	-	-	-	-	-	-

Table 5: Groundwater Quality - Trigger Assessment

	Unit	RDL	GW Trigger	TW8-2 2016-10-28	TW8-2 2018-06-04	TW8-2 2018-10-05	TW8-2 2019-10-25	TW8-2 2020-05-12	TW8-2 2020-11-02	TW8-2 2021-06-21	TW8-2 2021-11-10
Metals											
Arsenic (Filtered)	µg/L	0.1		<0.2	<0.2	<0.2	<0.2	<0.2	0.5	<0.1	0.1
Barium (Filtered)	µg/L	0.01	52	196	205	228	210	217	210	228	218
Boron (Filtered)	µg/L	0.2	1500	31	28	23	27	27	25	26	26
Calcium (Filtered)	µg/L	10		136,000	139,000	129,000	134,000	131,000	130,000	143,000	137,000
Cadmium (Filtered)	µg/L	0.003		<0.003	0.004	<0.003	<0.003	0.011	<0.003	<0.015	<0.015
Chloride	µg/L	200	137500	120,000	120,000	120,000	140,000	140,000	99,000	132,000	131,000
Chromium (III+VI) (Filtered)	µg/L	0.03		0.28	1.16	0.04	0.15	0.15	0.27	<1	<1
Copper (Filtered)	µg/L	0.02		0.38	0.25	1.4	0.5	0.5	0.5	0.4	0.5
Iron (Filtered)	µg/L	2	300	570	<7	203	100	284	2910	244	521
Lead (Filtered)	µg/L	0.01		0.03	<0.01	<0.01	0.02	0.01	0.07	<0.02	0.25
Manganese (Filtered)	µg/L	0.01	0.58	14.8	60.23	19.7	25.9	56.9	23.2	48	29
Magnesium (Filtered)	µg/L	1	4185	10,700	10,700	9040	11,100	11,100	9750	12,100	11,000
Mercury (Filtered)	µg/L	0.01		<0.01	<0.01	<10	<10	<10	<10	<0.02	<0.02
Phosphorus (Filtered)	µg/L	10	30	<30	<30	60	<30	<30	470	15,300	2220
Potassium (Filtered)	µg/L	2	642	1820	1770	1640	1690	1690	1640	1800	1700
Sodium (Filtered)	µg/L	10	56075	58,600	56,200	50,300	62,000	65,300	56,000	73,100	68,100
Zinc (Filtered)	µg/L	2		2	<2	4	<2	<2	2	<5	<5
Inorganics											
Alkalinity (as CaCO3)	mg/L	2	285	336	315	320	309	323	1180	323	292
Hardness (as CaCO3) (Filtered)	mg/L	1		-	-	-	-	-	-	407	388
Solids - Total Dissolved (TDS)	mg/L	3	568	594	566	560	566	571	571	526	533
Oxygen Demand - Chemical (COD)	mg/L	5		<8	<8	<8	<8	54	<8	178	54
Solids - Total Suspended (TSS)	mg/L	2		<2	2	2	2	13,200	7460	37,000	7750
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1		-	-	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	<4	<4	<4	12	<4	<3	<3
Phenols (4AAP)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.002	<0.001
Sulphate	mg/L	0.2		14	15	14	13	12	13	14	13
Ammonia	mg/L	0.01		<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.15	0.17
Nitrate (as N)	mg/L	0.05		<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.06	<0.05
Nitrite (as N)	mg/L	0.03		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	0.06
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	4.2	0.5
Conductivity (lab)	µS/cm	1		993	981	1010	997	925	978	987	999
pH (Lab)	-	0.05		7.79	8.13	7.94	7.95	7.74	7.73	7.71	7.78
Field											
DO (Field)	mg/L			-	-	-	-	6.07	4.3	5.27	8.73
Redox Potential (Field)	mV			-	-	-	185	252	-35	167	102
Temp (Field)	°C			-	-	-	10.5	6.9	7.7	9.7	9.3
Conductivity (field)	µS/cm			-	-	-	727	826	599	994	428
pH (Field)	-			-	-	-	6.54	7.6	8.02	7.41	7.49

Table 6: Residential Well Quality

	Unit	RDL	ODWQS	R1 2011-10-25	R1 2014-06-05	R1 2014-11-03	R1 2020-05-12	R1 2020-11-02	R1 2020-12-01	R2 2011-10-25	R2 2014-06-05	R2 2014-11-03	R2 2020-05-12
Metals													
Arsenic	µg/L	0.2	**25**	0.5	0.4	0.3	<0.2	<0.2	<0.2	0.5	0.3	0.4	<0.2
Barium	µg/L	0.02	**1000**	215	148	200	168	48.6	48.6	88.2	50.6	90.9	44.8
Boron	µg/L	0.2	**5000**	29	26.2	27.6	29	65	65	29	15.7	27.7	11
Calcium	µg/L	20		154,000	155,000	155,000	177,000	42,600	42,600	165,000	91,100	157,000	105,000
Cadmium	µg/L	0.003	**5**	0.004	0.004	0.005	0.006	<0.003	<0.003	<0.003	<0.003	<0.003	0.009
Chloride	µg/L	200	**250000**	53,000	40,000	47,000	55,000	57,000	57,000	80,000	98,000	130,000	72,000
Chromium (III+VI)	µg/L	0.03	**50**	0.8	1.92	0.49	0.09	0.12	0.12	0.9	1.28	0.54	0.22
Copper	µg/L	0.02	**1000**	11.4	26	34	57.2	22	22	**1190**	66.6	138	63.7
Iron	µg/L	2	**300**	<3	2	<2	<7	<7	<7	<3	<2	6	21
Lead	µg/L	0.01	**10**	0.12	0.1	0.14	0.21	0.25	0.25	8.56	1.15	1.5	1.59
Manganese	µg/L	0.01	**50**	**63.5**	23.39	**55.3**	23.1	19.4	19.4	0.9	0.3	1.29	0.3
Magnesium	µg/L	1		18,700	17,400	17,700	19,300	5260	5260	6520	3560	6440	4050
Mercury	µg/L		**1**	-	-	-	<10	<0.01	<10	-	-	-	<10
Phosphorus total (P2O5)	µg/L			-	-	-	<30	<30	<30	-	-	-	<30
Potassium	µg/L	2		21,100	19,000	21,800	21,600	8480	8480	2080	1750	2250	1060
Sodium	µg/L	10	**200000**	20,300	16,200	17,100	14,600	175,000	175,000	47,100	60,600	70,200	42,700
Zinc	µg/L	2	**5000**	3	4	5	11	6	6	91	42	120	27
Inorganics													
Alkalinity (as CaCO3)	mg/L	2	**500**	332	350	359	348	345	345	372	285	394	243
Solids - Total Dissolved (TDS)	mg/L	30	**500**	**634**	**591**	**669**	**669**	**591**	**591**	**603**	451	**680**	391
Oxygen Demand - Chemical (COD)	mg/L	8		<8	9	9	14	10	10	18	<8	11	<8
Solids - Total Suspended (TSS)	mg/L	2		<2	-	-	<2	<2	<2	<2	-	-	2
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	3.8	**5.8**	4.4	-	-	-	2.1	1.9	2.2	-
Oxygen Demand - Biological (BOD)	mg/L	2		<2	-	-	<4	<4	<4	<2	-	-	<4
Phenols (4AAP)	mg/L			-	-	-	0.002	<0.001	<0.001	-	-	-	0.002
Sulphate	mg/L	0.2	**500**	55	62	60	75	85	85	7.8	7.3	8.9	5
Ammonia	mg/L	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrate (as N)	mg/L	0.05	**10**	**12.2**	**13**	**14.6**	**10.2**	5.35	5.35	3.76	0.71	3.49	0.61
Nitrite (as N)	mg/L		**1**	-	-	-	0.06	0.27	0.27	-	-	-	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L			-	-	-	<0.5	<0.5	<0.5	-	-	-	<0.5
Conductivity (lab)	µS/cm	2		1010	975	1010	951	1000	1000	1060	827	1130	663
pH (Lab)	-	0.05	**6.5-8.5**	7.74	8.08	7.86	7.4	7.67	7.67	7.56	8.23	7.83	7.89
Field													
DO (Field)	mg/L			-	-	-	7.52	7.2	-	-	-	-	8.13
Redox Potential (Field)	mV			-	-	-	123	185	-	-	-	-	139
Temp (Field)	°C			-	-	-	9.9	5.1	-	-	-	-	9.4
Conductivity (field)	µS/cm			-	-	-	920	985	-	-	-	-	638
pH (Field)	-		**6.5-8.5**	-	-	-	7.15	7.72	-	-	-	-	7.42

Table 6: Residential Well Quality

	Unit	RDL	ODWQS	R3 2011-10-25	R3 2014-06-05	R3 2014-11-03	R3 2020-05-12	R3 2020-11-02	R4 2011-10-25	R4 2014-06-05	R4 2014-11-03	R4 2020-05-12	R4 2020-11-02
Metals													
Arsenic	µg/L	0.2	**25**	0.3	<0.2	<0.2	<0.2	<0.2	5.5	<0.2	0.3	<0.2	<0.2
Barium	µg/L	0.02	**1000**	45.9	40.9	51.9	33.8	2.35	100	29	71.3	36.6	196
Boron	µg/L	0.2	**5000**	9	10.9	11.5	10	9	311	23.4	52.5	41	130
Calcium	µg/L	20		134,000	120,000	135,000	115,000	5370	145,000	75,200	177,000	67,200	304,000
Cadmium	µg/L	0.003	**5**	<0.003	<0.003	<0.003	0.004	0.009	0.007	<0.003	<0.003	0.004	0.022
Chloride	µg/L	200	**250000**	81,000	98,000	130,000	79,000	95,000	**380,000**	26,000	190,000	34,000	**830,000**
Chromium (III+VI)	µg/L	0.03	**50**	0.8	1.34	0.57	0.26	0.91	4.4	1.12	0.67	0.17	0.44
Copper	µg/L	0.02	**1000**	12.8	18.9	8.54	41.1	202	24.5	26.9	35.6	30.9	30
Iron	µg/L	2	**300**	124	57	18	7	212	18	8	13	8	67
Lead	µg/L	0.01	**10**	0.73	0.9	0.6	1.83	**19.1**	0.4	0.1	0.14	0.23	0.54
Manganese	µg/L	0.01	**50**	9.4	2.24	2.85	0.38	11	5	0.47	0.53	0.22	32.8
Magnesium	µg/L	1		4290	3750	4470	3440	175	19,600	3080	7790	3550	31,100
Mercury	µg/L		**1**	-	-	-	<10	<10	-	-	-	<10	<10
Phosphorus total (P2O5)	µg/L			-	-	-	<30	<30	-	-	-	<30	40
Potassium	µg/L	2		800	627	751	521	208	6800	782	1670	887	5470
Sodium	µg/L	10	**200000**	36,300	48,100	47,300	50,800	187,000	195,000	46,900	52,700	49,000	**246,000**
Zinc	µg/L	2	**5000**	7	10	3	13	95	14	20	22	31	38
Inorganics													
Alkalinity (as CaCO3)	mg/L	2	**500**	279	283	278	255	303	294	257	332	232	198
Solids - Total Dissolved (TDS)	mg/L	30	**500**	480	471	**543**	423	**520**	**954**	323	**823**	323	**1740**
Oxygen Demand - Chemical (COD)	mg/L	8		<8	<8	8	12	<8	<8	<8	<8	<8	<8
Solids - Total Suspended (TSS)	mg/L	2		<2	-	-	2	3	<2	-	-	<2	4
Organic Carbon - Dissolved (DOC) (Filtered)	mg/L	1	**5**	1.2	2.2	2.1	-	-	1.8	1.6	2.3	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<2	-	-	<4	<4	<2	-	-	<4	<4
Phenols (4AAP)	mg/L			-	-	-	0.002	<0.001	-	-	-	<0.001	0.018
Sulphate	mg/L	0.2	**500**	9	7.4	9.4	6	9	6.1	6.1	11	4	4
Ammonia	mg/L	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1
Nitrate (as N)	mg/L	0.05	**10**	4.19	1.38	1.82	1.28	3.26	0.54	0.7	1.33	0.3	0.16
Nitrite (as N)	mg/L		**1**	-	-	-	<0.03	<0.03	-	-	-	<0.03	<0.3
Total Kjeldahl Nitrogen (TKN)	mg/L			-	-	-	<0.5	<0.5	-	-	-	<0.5	<0.5
Conductivity (lab)	µS/cm	2		727	830	930	723	940	1470	561	1170	522	3170
pH (Lab)	-	0.05	**6.5-8.5**	7.74	8.16	7.87	7.65	7.67	7.46	8.31	7.86	7.86	7.6
Field													
DO (Field)	mg/L			-	-	-	6.43	6.44	-	-	-	4.79	11.46
Redox Potential (Field)	mV			-	-	-	264	147	-	-	-	263	215
Temp (Field)	°C			-	-	-	9.3	4.5	-	-	-	10	4.4
Conductivity (field)	µS/cm			-	-	-	686	698	-	-	-	543	2058
pH (Field)	-		**6.5-8.5**	-	-	-	7.47	8.23	-	-	-	7.58	8

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Table 7: Surface Water Quality

	Unit	RDL	PWQO	DSW06 2020-05-12	DSW07 2011-10-25	DSW07 2012-05-09	DSW07 2013-05-28	DSW07 2013-10-29	DSW07 2014-06-05	DSW07 2014-11-03	DSW07 2015-05-14	DSW07 2015-11-02	DSW07 2016-05-16
Metals													
Arsenic	µg/L	0.1	**5**	<0.2	-	-	-	1.2	0.6	0.4	0.3	1	0.5
Barium	µg/L	0.02		38.9	-	-	-	40	155	122	109	174	43.9
Boron	µg/L	0.2	**200**	13	-	-	-	157	81.2	48.4	58.9	84.3	86
Calcium	µg/L	10		115,000	-	-	-	-	-	-	105,000	117,000	104,000
Cadmium	µg/L	0.003	**0.1|0.5**	0.012	-	-	-	<0.003	0.009	<0.003	<0.003	0.02	0.003
Chloride	µg/L	200		58,000	58,000	59,000	61,000	80,000	48,000	62,000	67,000	65,000	89,000
Chromium (III+VI)	µg/L	0.03	**8.9**	0.21	-	-	-	<0.5	0.16	0.13	0.26	0.69	0.4
Copper	µg/L	0.02	**1|5**	1.3	-	-	-	4.5	0.61	0.54	0.48	3.67	0.83
Iron	µg/L	2	**300**	52	**1390**	70	120	41	**725**	282	**304**	**998**	67
Lead	µg/L	0.01	**1|3|5**	0.07	-	-	-	<0.02	0.11	0.04	0.05	0.84	0.1
Manganese	µg/L	0.01		10.3	-	-	-	-	784	565	184	1260	31.7
Magnesium	µg/L	1		4150	-	-	-	-	-	-	8580	9370	8950
Mercury (Filtered)	µg/L	0.01	**0.2**	<10	-	-	-	-	-	-	<0.01	<0.01	**20**
Phosphorus total (P2O5)	µg/L	3	**30**	22	**260**	<30	<30	<30	**120**	**100**	**156**	**200**	<30
Potassium	µg/L	3		2320	-	-	-	-	-	-	7460	10,900	7400
Sodium	µg/L	10		31,200	-	-	-	-	-	-	34,700	40,600	51,000
Zinc	µg/L	1	**20**	3	-	-	-	2	<2	<2	2	**29**	7
Inorganics													
Alkalinity (as CaCO3)	mg/L	2		255	330	278	318	351	323	360	313	362	242
Hardness (as CaCO3)	mg/L	1		-	-	-	-	-	-	-	-	-	-
Solids - Total Dissolved (TDS)	mg/L	3		349	531	406	529	554	434	506	429	531	454
Oxygen Demand - Chemical (COD)	mg/L	5		20	72	50	57	48	43	26	27	45	41
Solids - Total Suspended (TSS)	mg/L	2		11	34	23	2	4	9	8	16	96	44
Organic Carbon - Dissolved (DCC)	mg/L	1		-	-	-	-	-	-	-	10.8	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	2	<4	<4	<4	<4	<4	<4	24	13
Phenols (4AAP)	mg/L	0.001	**0.001**	**0.002**	<0.001	**0.035**	<0.001	<0.001	<0.001	<0.001	**0.002**	0.001	0.001
Sulphate	mg/L	0.2		<2	2.2	<0.2	0.6	18	4.6	6.8	<1	7	<1
Ammonia, Unionized (Field)	mg/L	0.01	**0.02**	-	-	-	-	-	-	-	-	-	-
Ammonia	mg/L	0.01		<0.1	0.2	0.1	<0.1	<0.1	0.3	0.4	<0.1	1.3	<0.1
Nitrate (as N)	mg/L	0.05		<0.06	<0.05	0.07	<0.06	<0.06	0.09	<0.06	<0.06	0.66	0.44
Nitrite (as N)	mg/L	0.03		<0.03	<0.06	<0.06	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		<0.5	1.1	<0.5	0.8	1.2	0.9	1	1.1	2.6	1
Conductivity (lab)	µS/cm	1		672	712	685	833	886	734	849	735	887	766
pH (Lab)	-	0.05	**6.5-8.5**	8.29	7.78	8.11	8.16	8.33	8.31	8.02	7.99	7.59	8.47
Field													
DO (Field)	mg/L		**5**	7.22	-	-	-	-	-	-	-	-	-
Redox Potential (Field)	mV			264	-	-	-	-	-	-	-	-	-
Temp (Field)	°C			7.5	-	-	-	-	-	-	-	-	-
Conductivity (field)	µS/cm			522	-	-	-	-	-	-	-	-	-
pH (Field)	-		**6.5-8.5**	7.73	-	-	-	-	-	-	-	-	-

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Table 7: Surface Water Quality

	Unit	RDL	PWQO	DSW07 2018-06-04	DSW07 2018-10-05	DSW07 2019-05-31	DSW07 2020-05-12	DSW07 2021-11-10	DSW09 2011-10-25	DSW09 2012-05-09	DSW09 2013-05-28	DSW09 2013-10-29
Metals												
Arsenic	µg/L	0.1	**5**	0.5	0.8	<0.2	0.4	0.6	-	-	-	0.9
Barium	µg/L	0.02		139	299	76.4	45.5	84	-	-	-	106
Boron	µg/L	0.2	**200**	87	33	51	75	22	-	-	-	56.6
Calcium	µg/L	10		148,000	110,000	109,000	117,000	-	-	-	-	-
Cadmium	µg/L	0.003	**0.1|0.5**	<0.003	0.014	<0.003	0.007	0.015	-	-	-	0.008
Chloride	µg/L	200		60,000	77,000	64,000	86,000	37,500	31,000	51,000	49,000	60,000
Chromium (III+VI)	µg/L	0.03	**8.9**	0.3	0.78	<0.08	0.15	<1	-	-	-	<0.5
Copper	µg/L	0.02	**1|5**	0.17	4.69	0.3	0.5	1.1	-	-	-	3.8
Iron	µg/L	2	**300**	**1370**	**990**	30	25	167	52	**614**	**748**	**1070**
Lead	µg/L	0.01	**1|3|5**	0.09	0.97	<0.01	<0.01	0.21	-	-	-	0.06
Manganese	µg/L	0.01		1070	1580	26.6	17.7	-	-	-	-	-
Magnesium	µg/L	1		9260	10,000	6290	8090	-	-	-	-	-
Mercury (Filtered)	µg/L	0.01	**0.2**	<10	<10	<10	<10	<0.02	-	-	-	-
Phosphorus total (P2O5)	µg/L	3	**30**	**40**	**470**	<3	**103**	**280**	**70**	**100**	**70**	**500**
Potassium	µg/L	3		11,200	45,300	3750	8390	-	-	-	-	-
Sodium	µg/L	10		35,000	30,700	28,400	47,800	-	-	-	-	-
Zinc	µg/L	1	**20**	<2	10	<2	4	<5	-	-	-	4
Inorganics												
Alkalinity (as CaCO3)	mg/L	2		339	304	282	239	417	200	322	269	379
Hardness (as CaCO3)	mg/L	1		-	-	-	-	413	-	-	-	-
Solids - Total Dissolved (TDS)	mg/L	3		451	543	423	466	442	294	457	449	509
Oxygen Demand - Chemical (COD)	mg/L	5		37	81	<8	29	81	12	62	22	41
Solids - Total Suspended (TSS)	mg/L	2		9	278	<2	56	34	<2	26	7	60
Organic Carbon - Dissolved (DOC)	mg/L	1		-	-	-	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		8	18	<4	<4	<3	<2	12	<4	9
Phenols (4AAP)	mg/L	0.001	**0.001**	**0.004**	**0.008**	<0.001	**0.003**	<0.001	**0.009**	**0.045**	<0.001	**0.002**
Sulphate	mg/L	0.2		<2	43	6	<2	4	3.9	2.4	13	7.8
Ammonia, Unionized (Field)	mg/L	0.01	**0.02**	-	-	-	-	<0.01	-	-	-	-
Ammonia	mg/L	0.01		<0.1	5.6	<0.1	<0.1	0.09	<0.1	0.1	0.1	0.4
Nitrate (as N)	mg/L	0.05		<0.06	<0.06	<0.06	<0.06	<0.05	<0.05	<0.05	<0.06	0.15
Nitrite (as N)	mg/L	0.03		<0.03	<0.03	<0.03	<0.03	<0.05	<0.06	<0.06	<0.03	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.6	8.7	<0.5	0.7	3.9	<0.5	1	0.6	1.5
Conductivity (lab)	µS/cm	1		797	859	702	794	839	515	757	729	879
pH (Lab)	-	0.05	**6.5-8.5**	8.08	7.56	8.24	8.28	8.06	8.36	7.78	7.99	8.26
Field												
DO (Field)	mg/L		**5**	-	-	9.3	7.52	9.42	-	-	-	-
Redox Potential (Field)	mV			-	-	139	123	131	-	-	-	-
Temp (Field)	°C			-	-	12.8	6.9	4.7	-	-	-	-
Conductivity (field)	µS/cm			-	-	561	656	374	-	-	-	-
pH (Field)	-		**6.5-8.5**	-	-	7.97	7.74	7.62	-	-	-	-

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Table 7: Surface Water Quality

	Unit	RDL	PWQO	DSW09 2014-06-05	DSW09 2014-11-03	DSW09 2015-05-14	DSW09 2015-11-02	DSW09 2016-05-16	DSW09 2018-06-04	DSW09 2019-05-31	DSW09 2020-05-12	DSW09 2020-11-02
Metals												
Arsenic	µg/L	0.1	**5**	1	1.3	0.6	0.9	0.4	0.6	0.5	0.3	0.6
Barium	µg/L	0.02		55.5	49.1	42.4	34	89.5	55.4	79.8	97.6	35.8
Boron	µg/L	0.2	**200**	133	93.1	88	121	52	148	73	57	10
Calcium	µg/L	10		-	-	106,000	83,400	113,000	121,000	115,000	120,000	109,000
Cadmium	µg/L	0.003	**0.1|0.5**	0.007	<0.003	0.008	0.026	0.007	0.006	0.021	0.007	0.011
Chloride	µg/L	200		70,000	75,000	95,000	64,000	56,000	60,000	64,000	65,000	68,000
Chromium (III+VI)	µg/L	0.03	**8.9**	0.22	0.41	0.04	0.41	0.65	0.2	0.19	0.14	0.3
Copper	µg/L	0.02	**1|5**	0.35	0.41	0.74	1.18	1.07	0.64	2.5	0.9	1.6
Iron	µg/L	2	**300**	134	67	147	**318**	263	229	**988**	300	**400**
Lead	µg/L	0.01	**1|3|5**	0.02	0.02	0.1	0.22	0.13	0.17	0.2	0.06	0.13
Manganese	µg/L	0.01		39.1	33	61.1	26.3	88.4	307	1290	534	826
Magnesium	µg/L	1		-	-	8660	7420	9330	7940	9380	9000	10,700
Mercury (Filtered)	µg/L	0.01	**0.2**	-	-	<0.01	<0.01	<10	**10**	<10	<10	<10
Phosphorus total (P2O5)	µg/L	3	**30**	<30	<30	**77**	<30	**40**	**40**	**398**	**68**	**933**
Potassium	µg/L	3		-	-	7960	10,200	3830	7010	10,200	9260	40,300
Sodium	µg/L	10		-	-	44,900	41,000	34,600	36,400	31,000	35,800	34,300
Zinc	µg/L	1	**20**	<2	<2	4	**34**	4	6	9	4	3
Inorganics												
Alkalinity (as CaCO3)	mg/L	2		370	391	313	227	269	263	239	297	234
Hardness (as CaCO3)	mg/L	1		-	-	-	-	-	-	-	-	-
Solids - Total Dissolved (TDS)	mg/L	3		480	571	546	431	434	409	511	440	620
Oxygen Demand - Chemical (COD)	mg/L	5		69	60	46	52	22	68	53	20	75
Solids - Total Suspended (TSS)	mg/L	2		22	<2	11	15	6	11	23	<2	56
Organic Carbon - Dissolved (DOC)	mg/L	1		-	-	18.1	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	<4	5	6	5	10	13	<4	13
Phenols (4AAP)	mg/L	0.001	**0.001**	<0.001	<0.001	0.001	0.001	0.001	**0.007**	**0.009**	**0.008**	**0.003**
Sulphate	mg/L	0.2		<0.2	<0.2	<1	<1	2	<2	<2	<2	30
Ammonia, Unionized (Field)	mg/L	0.01	**0.02**	-	-	-	-	-	-	-	-	-
Ammonia	mg/L	0.01		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.6	<0.1	11.6
Nitrate (as N)	mg/L	0.05		0.23	<0.06	<0.06	1.93	<0.06	<0.06	0.08	<0.06	<0.06
Nitrite (as N)	mg/L	0.03		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		1	0.8	0.8	1.2	0.8	0.8	1.5	1	14.7
Conductivity (lab)	µS/cm	1		867	911	841	702	701	659	770	762	1020
pH (Lab)	-	0.05	**6.5-8.5**	8.27	8.35	8.3	8	8.32	8.14	8.48	8.16	7.58
Field												
DO (Field)	mg/L		**5**	-	-	-	-	-	-	7.4	8.13	11.46
Redox Potential (Field)	mV			-	-	-	-	-	-	160	139	215
Temp (Field)	°C			-	-	-	-	-	-	14.5	10.1	4.4
Conductivity (field)	µS/cm			-	-	-	-	-	-	698	672	533
pH (Field)	-		**6.5-8.5**	-	-	-	-	-	-	7.61	7.74	8.15

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Table 7: Surface Water Quality

	Unit	RDL	PWQO	DSW11 2011-10-25	DSW11 2012-05-09	DSW11 2012-10-23	DSW11 2013-05-28	DSW11 2013-10-29	DSW11 2014-06-05	DSW11 2014-11-03	DSW11 2015-05-14	DSW11 2015-11-02	DSW11 2016-05-16
Metals													
Arsenic	µg/L	0.1	**5**	-	-	-	-	0.7	0.7	0.4	0.3	0.5	0.3
Barium	µg/L	0.02		-	-	-	-	65.9	39.5	34.2	36	25.2	35.3
Boron	µg/L	0.2	**200**	-	-	-	-	32.1	15.8	11.1	15.7	15.6	17
Calcium	µg/L	10		-	-	-	-	-	-	-	86,700	80,100	94,500
Cadmium	µg/L	0.003	**0.1|0.5**	-	-	-	-	0.003	0.075	<0.003	0.005	0.032	<0.003
Chloride	µg/L	200		35,000	31,000	140,000	31,000	93,000	37,000	44,000	42,000	40,000	40,000
Chromium (III+VI)	µg/L	0.03	**8.9**	-	-	-	-	<0.5	0.2	0.19	<0.03	0.44	0.38
Copper	µg/L	0.02	**1|5**	-	-	-	-	**6.3**	0.42	0.22	0.22	1.06	0.81
Iron	µg/L	2	**300**	28	39	**374**	50	51	140	27	58	**582**	41
Lead	µg/L	0.01	**1|3|5**	-	-	-	-	0.15	0.1	0.02	0.05	0.14	0.03
Manganese	µg/L	0.01		-	-	-	-	-	39.9	7.8	28.4	8.62	7.9
Magnesium	µg/L	1		-	-	-	-	-	-	-	3570	3690	4110
Mercury (Filtered)	µg/L	0.01	**0.2**	-	-	-	-	-	-	-	<0.01	<0.01	<10
Phosphorus total (P2O5)	µg/L	3	**30**	**80**	<30	**40**	<30	**60**	<30	<30	11	<30	<30
Potassium	µg/L	3		-	-	-	-	-	-	-	720	1540	551
Sodium	µg/L	10		-	-	-	-	-	-	-	19,900	22,700	21,500
Zinc	µg/L	1	**20**	-	-	-	-	7	9	<2	3	5	4
Inorganics													
Alkalinity (as CaCO3)	mg/L	2		212	198	222	198	217	246	250	244	193	227
Hardness (as CaCO3)	mg/L	1		-	-	-	-	-	-	-	-	-	-
Solids - Total Dissolved (TDS)	mg/L	3		340	311	626	346	466	340	383	360	340	340
Oxygen Demand - Chemical (COD)	mg/L	5		31	31	57	38	55	50	45	36	36	31
Solids - Total Suspended (TSS)	mg/L	2		<2	<2	3	5	6	2	<2	<2	<2	<2
Organic Carbon - Dissolved (DOC)	mg/L	1		-	-	-	-	-	-	-	14.4	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<2	<4	6	<4	<4	<4	<4	<4	5	<4
Phenols (4AAP)	mg/L	0.001	**0.001**	0.001	**0.031**	**0.007**	<0.001	<0.001	<0.001	<0.001	0.001	0.001	<0.001
Sulphate	mg/L	0.2		2.2	0.6	53	2.4	64	0.7	0.7	<1	1	<1
Ammonia, Unionized (Field)	mg/L	0.01	**0.02**	-	-	-	-	-	-	-	-	-	-
Ammonia	mg/L	0.01		0.1	<0.1	0.2	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrate (as N)	mg/L	0.05		<0.05	<0.05	<0.05	<0.06	<0.06	<0.06	0.08	<0.06	0.08	<0.06
Nitrite (as N)	mg/L	0.03		<0.06	<0.06	<0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		<0.5	<0.5	1.3	0.6	1.4	0.6	0.7	0.7	0.7	0.6
Conductivity (lab)	µS/cm	1		550	483	965	522	816	571	579	579	532	558
pH (Lab)	-	0.05	**6.5-8.5**	7.98	7.96	8.04	8.06	8.23	8.19	7.99	8.05	8.09	8.37
Field													
DO (Field)	mg/L		**5**	-	-	-	-	-	-	-	-	-	-
Redox Potential (Field)	mV			-	-	-	-	-	-	-	-	-	-
Temp (Field)	°C			-	-	-	-	-	-	-	-	-	-
Conductivity (field)	µS/cm			-	-	-	-	-	-	-	-	-	-
pH (Field)	-		**6.5-8.5**	-	-	-	-	-	-	-	-	-	-

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Table 7: Surface Water Quality

	Unit	RDL	PWQO	DSW11 2016-10-28	DSW11 2018-06-04	DSW11 2018-10-05	DSW11 2019-05-31	DSW11 2019-10-25	DSW11 2020-05-12	DSW11 2020-11-02	DSW11 2021-06-21	DSW11 2021-11-10
Metals												
Arsenic	µg/L	0.1	**5**	0.7	0.4	0.6	0.3	0.5	0.2	0.8	0.5	0.3
Barium	µg/L	0.02		50.9	40	43.5	30.4	42.1	28.6	38.7	50	30
Boron	µg/L	0.2	**200**	28	27	11	17	17	13	16	23	13
Calcium	µg/L	10		171,000	103,000	106,000	89,400	112,000	93,000	114,000	-	-
Cadmium	µg/L	0.003	**0.1|0.5**	0.006	<0.003	<0.003	<0.003	<0.003	0.003	0.008	<0.015	<0.015
Chloride	µg/L	200		190,000	36,000	160,000	36,000	64,000	41,000	140,000	64,200	44,900
Chromium (III+VI)	µg/L	0.03	**8.9**	0.4	0.11	0.12	<0.08	0.15	0.15	0.43	<1	<1
Copper	µg/L	0.02	**1|5**	2.1	0.2	1.54	0.2	0.5	0.4	1.7	0.2	0.2
Iron	µg/L	2	**300**	223	**319**	267	30	47	24	150	189	52
Lead	µg/L	0.01	**1|3|5**	0.26	0.06	0.06	<0.01	<0.01	<0.01	0.2	0.14	<0.02
Manganese	µg/L	0.01		111	86.7	142	5.65	12.9	7.63	90.8	-	-
Magnesium	µg/L	1		6640	3500	3730	3550	4400	3570	4660	-	-
Mercury (Filtered)	µg/L	0.01	**0.2**	<10	<10	<10	<10	<10	<10	<10	<0.02	<0.02
Phosphorus total (P2O5)	µg/L	3	**30**	<30	<30	**90**	13	17	11	**33**	**100**	10
Potassium	µg/L	3		2050	569	1380	937	2290	1020	1260	-	-
Sodium	µg/L	10		86,400	22,200	63,500	19,200	27,200	21,900	74,900	-	-
Zinc	µg/L	1	**20**	10	<2	5	<2	3	3	10	13	15
Inorganics												
Alkalinity (as CaCO3)	mg/L	2		289	229	188	237	250	216	373	287	272
Hardness (as CaCO3)	mg/L	1		-	-	-	-	-	-	-	319	291
Solids - Total Dissolved (TDS)	mg/L	3		783	309	643	346	440	309	526	372	327
Oxygen Demand - Chemical (COD)	mg/L	5		56	51	62	29	52	27	47	63	33
Solids - Total Suspended (TSS)	mg/L	2		9	2	8	27	<2	<2	3	7	<3
Organic Carbon - Dissolved (DOC)	mg/L	1		-	-	-	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	<4	7	<4	<4	<4	<4	<3	<3
Phenols (4AAP)	mg/L	0.001	**0.001**	<0.001	**0.005**	**0.007**	**0.002**	**0.003**	<0.001	<0.001	<0.001	<0.001
Sulphate	mg/L	0.2		39	<2	30	<2	<2	<2	23	1	2
Ammonia, Unionized (Field)	mg/L	0.01	**0.02**	-	-	-	-	-	-	-	<0.01	<0.01
Ammonia	mg/L	0.01		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.07	0.03
Nitrate (as N)	mg/L	0.05		0.08	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.11	<0.05
Nitrite (as N)	mg/L	0.03		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		1	0.6	1	<0.5	0.8	<0.5	0.7	1.1	0.5
Conductivity (lab)	µS/cm	1		1160	530	949	529	678	545	947	717	629
pH (Lab)	-	0.05	**6.5-8.5**	7.76	8.14	7.92	8.35	7.94	8.05	8.05	7.87	8.07
Field												
DO (Field)	mg/L		**5**	-	-	-	5.6	5.93	6.43	6.44	7.78	**3.85**
Redox Potential (Field)	mV			-	-	-	153	224	264	147	131	197
Temp (Field)	°C			-	-	-	15	8.6	7.3	4.5	25.8	5
Conductivity (field)	µS/cm			-	-	-	460	522	445	565	747	293
pH (Field)	-		**6.5-8.5**	-	-	-	7.76	**5.8**	7.71	**8.61**	7.27	7.01

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Table 7: Surface Water Quality

	Unit	RDL	PWQO	DSW16 2021-11-10	DSW17 2011-10-25	DSW17 2012-05-09	DSW17 2013-05-28	DSW17 2013-10-29	DSW17 2014-06-05	DSW17 2014-11-03
Metals										
Arsenic	µg/L	0.1	**5**	0.2	-	-	-	0.6	0.6	0.8
Barium	µg/L	0.02		27	-	-	-	31	93.5	98.6
Boron	µg/L	0.2	**200**	11	-	-	-	13.2	50.8	36.2
Calcium	µg/L	10		-	-	-	-	-	-	-
Cadmium	µg/L	0.003	**0.1|0.5**	<0.015	-	-	-	<0.003	0.017	<0.003
Chloride	µg/L	200		38,800	61,000	82,000	63,000	44,000	91,000	88,000
Chromium (III+VI)	µg/L	0.03	**8.9**	<1	-	-	-	<0.5	0.22	0.28
Copper	µg/L	0.02	**1|5**	0.3	-	-	-	4.4	0.64	0.98
Iron	µg/L	2	**300**	47	126	120	126	27	206	196
Lead	µg/L	0.01	**1|3|5**	<0.02	-	-	-	<0.02	0.13	0.12
Manganese	µg/L	0.01		-	-	-	-	-	30	59.4
Magnesium	µg/L	1		-	-	-	-	-	-	-
Mercury (Filtered)	µg/L	0.01	**0.2**	<0.02	-	-	-	-	-	-
Phosphorus total (P2O5)	µg/L	3	**30**	30	**40**	30	<30	<30	<30	**40**
Potassium	µg/L	3		-	-	-	-	-	-	-
Sodium	µg/L	10		-	-	-	-	-	-	-
Zinc	µg/L	1	**20**	17	-	-	-	3	<2	<2
Inorganics										
Alkalinity (as CaCO3)	mg/L	2		299	269	260	238	233	324	371
Hardness (as CaCO3)	mg/L	1		287	-	-	-	-	-	-
Solids - Total Dissolved (TDS)	mg/L	3		341	406	397	409	349	509	583
Oxygen Demand - Chemical (COD)	mg/L	5		18	31	39	45	50	57	53
Solids - Total Suspended (TSS)	mg/L	2		7	7	2	5	3	5	50
Organic Carbon - Dissolved (DOC)	mg/L	1		-	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<3	<2	<4	<4	<4	<4	4
Phenols (4AAP)	mg/L	0.001	**0.001**	<0.001	**0.002**	**0.012**	<0.001	<0.001	<0.001	<0.001
Sulphate	mg/L	0.2		4	5.3	1.2	6.2	7.2	2	4.2
Ammonia, Unionized (Field)	mg/L	0.01	**0.02**	<0.01	-	-	-	-	-	-
Ammonia	mg/L	0.01		0.02	0.2	<0.1	<0.1	<0.1	<0.1	0.1
Nitrate (as N)	mg/L	0.05		<0.05	<0.05	<0.05	<0.06	<0.06	<0.06	0.13
Nitrite (as N)	mg/L	0.03		<0.05	<0.06	<0.06	<0.03	<0.03	<0.03	<0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.4	<0.5	<0.5	0.7	0.9	1	0.9
Conductivity (lab)	µS/cm	1		657	633	733	698	582	857	914
pH (Lab)	-	0.05	**6.5-8.5**	8.09	7.86	7.84	8.12	8.18	8.24	7.99
Field										
DO (Field)	mg/L		**5**	6.85	-	-	-	-	-	-
Redox Potential (Field)	mV			157	-	-	-	-	-	-
Temp (Field)	°C			3.2	-	-	-	-	-	-
Conductivity (field)	µS/cm			300	-	-	-	-	-	-
pH (Field)	-		**6.5-8.5**	7.42	-	-	-	-	-	-

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Table 7: Surface Water Quality

	Unit	RDL	PWQO	DSW17 2015-05-14	DSW17 2015-11-02	DSW17 2016-05-16	DSW17 2018-06-04	DSW17 2019-05-31	DSW17 2020-05-12	DSW17 2021-11-10
Metals										
Arsenic	µg/L	0.1	**5**	0.4	0.6	0.3	0.6	0.4	0.3	0.3
Barium	µg/L	0.02		93.4	63.1	94.2	103	89.1	82.8	89
Boron	µg/L	0.2	**200**	40.8	40.3	44	73	66	71	50
Calcium	µg/L	10		113,000	76,500	140,000	135,000	131,000	127,000	-
Cadmium	µg/L	0.003	**0.1|0.5**	0.011	0.283	0.003	0.017	0.01	0.008	<0.015
Chloride	µg/L	200		110,000	75,000	110,000	90,000	100,000	93,000	107,000
Chromium (III+VI)	µg/L	0.03	**8.9**	<0.03	0.58	0.44	0.42	0.13	0.22	<1
Copper	µg/L	0.02	**1|5**	1.28	**6.19**	0.49	1.17	0.6	0.8	0.4
Iron	µg/L	2	**300**	265	**331**	56	**598**	86	49	57
Lead	µg/L	0.01	**1|3|5**	0.18	0.62	0.06	0.47	0.06	<0.01	0.04
Manganese	µg/L	0.01		54.7	50.4	20.1	150	78.4	23.1	-
Magnesium	µg/L	1		8050	5520	9000	7560	8200	9110	-
Mercury (Filtered)	µg/L	0.01	**0.2**	<0.01	<0.01	<10	**10**	<10	<10	<0.02
Phosphorus total (P2O5)	µg/L	3	**30**	26	**60**	<30	<30	**35**	**35**	30
Potassium	µg/L	3		4120	7840	4010	4990	5180	7240	-
Sodium	µg/L	10		48,800	40,600	57,800	54,600	58,700	56,200	-
Zinc	µg/L	1	**20**	4	16	3	6	3	4	13
Inorganics										
Alkalinity (as CaCO3)	mg/L	2		325	187	317	305	324	320	383
Hardness (as CaCO3)	mg/L	1		-	-	-	-	-	-	369
Solids - Total Dissolved (TDS)	mg/L	3		543	409	580	506	534	529	530
Oxygen Demand - Chemical (COD)	mg/L	5		41	56	28	50	34	35	35
Solids - Total Suspended (TSS)	mg/L	2		4	48	6	26	5	6	30
Organic Carbon - Dissolved (DOC)	mg/L	1		17.2	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	mg/L	2		<4	7	<4	<4	<4	7	<3
Phenols (4AAP)	mg/L	0.001	**0.001**	**0.002**	<0.001	0.001	**0.005**	**0.007**	**0.005**	**0.002**
Sulphate	mg/L	0.2		<1	19	<1	<2	<2	<2	1
Ammonia, Unionized (Field)	mg/L	0.01	**0.02**	-	-	-	-	-	-	<0.01
Ammonia	mg/L	0.01		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.03
Nitrate (as N)	mg/L	0.05		<0.06	0.08	0.13	<0.06	<0.06	<0.06	<0.05
Nitrite (as N)	mg/L	0.03		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.9	1.1	0.6	<0.5	<0.5	0.7	0.8
Conductivity (lab)	µS/cm	1		837	655	965	829	881	894	993
pH (Lab)	-	0.05	**6.5-8.5**	8.02	7.68	8.2	8.05	8.35	8.15	8.02
Field										
DO (Field)	mg/L		**5**	-	-	-	-	6.67	**4.79**	**3.35**
Redox Potential (Field)	mV			-	-	-	-	36	263	153
Temp (Field)	°C			-	-	-	-	14	6.9	4.7
Conductivity (field)	µS/cm			-	-	-	-	731	728	433
pH (Field)	-		**6.5-8.5**	-	-	-	-	7.89	7.55	7.37

Table 8: Landfill Gas Measurements

Well ID		TW2	TW3-2	TW4-2	TW5-2	TW6-2	TW7	TW8-2	TW9-2	GP1	GP2	GP3	GP4	GP5	GP6
Top of Screen Elevation (m)		96.03	93.52	103.72	90.42	94.51	93.81	90.84	89.95	-	-	-	-	-	-
Water Elevation (mASL)		95.51	93.36	103.77	95.46	94.90	96.27	95.04	-	-	-	-	-	-	-
Screen Saturated		no	no	yes	yes	yes	yes	yes	-	no	no	no	no	unknown	unknown
Percent Methane by Volume	21-Jun-21	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.35	<0.05
	14-Jul-21	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	5	<0.05
	26-Aug-21	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	15	<0.05
	17-Sep-21	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	13	<0.05
	11-Nov-21	-	-	-	-	-	-	-	-	<0.05	<0.05	0.055	<0.05	11	<0.05
	16-Dec-21	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	5.5	<0.05
Hydrogen Sulfide (ppm)	21-Jun-21	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	14-Jul-21	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	26-Aug-21	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	17-Sep-21	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	11-Nov-21	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.8	<0.1
	16-Dec-21	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.8	<0.1

Appendix A

Monitoring and Screening Checklist

Fully accessible appended items are available upon request.

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	Warsaw Road Landfill
Location (e.g. street address, lot, concession)	Part of Lot 8, Concession 5, Warsaw
GPS Location (taken within the property boundary at front gate/ front entry)	Zone 17, 723155 m east, 4918804 m north
Municipality	Township of Douro-Dummer
Client and/or Site Owner	The Corporations of the Township of Douro-Dummer
Monitoring Period (Year)	2021
This Monitoring Report is being submitted under the following:	
Environmental Compliance Approval (ECA) Number (formerly "Certificate of Approval" (C of A)) :	A340902
Director's Order No.:	
Provincial Officer's Order No.:	

Other:			
Report Submission Frequency	◉ **Annual** ○ **Other**	Specify (Type Here):	
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*	
Maximum Approved Fill Rate		*Units*	
Total Waste Received within Monitoring Period (Year)		*Units*	
Total Waste Received within Monitoring Period (Year) *Describe the methodology used to determine this quantity*			
Estimated Remaining Capacity		*Units*	
Estimated Remaining Capacity *Describe the methodology used to determine this quantity*			
Estimated Remaining Capacity *Date Last Determined*	Select Date		
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)*	1971	**Current ECA Issue Date**	21-Nov-1996
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:		Closure Plan Date October 31, 1995	
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**
		Select Date
		Select Date

		Select Date
		Select Date

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**
		Select Date
		Select Date
		Select Date
		Select 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	
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	Refer to Sections 4.2 and 4.3 of the 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	Refer to Section 4.2.5 of the Annual Report. No additional actions needed to address trigger exceedances.	

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.

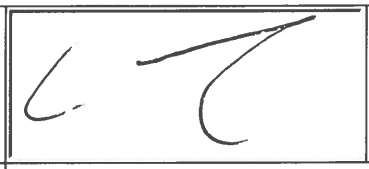
If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature and will be rectified for the next monitoring/reporting period. Where this is not the case, the circumstances 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:

Select Date

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

◉ **No changes to the monitoring program are recommended**	As outlined in the report, the Ministry approved reductions to the monitoring program in 2021. The reduced monitoring program commenced in 2022. See Section 4.6 of report.
○ **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:	Cameron MacDougall, P. Geo.
Seal:	Add Image 

Signature:		**Date:**	25-Apr-2022
CEP Contact Information:	Cameron MacDougall, P. Geo.		
Company:	Cambium Inc.		
Address:	194 Sophia St Peterborough, Ontario K9H 1E5		
Telephone No.:	705-742-7900 x 212	Fax No. :	705-742-7907
E-mail Address:	cameron.macdougall@cambium-inc.com		
Co-signers for additional expertise provided:			
Signature:		**Date:**	Select Date
Signature:		**Date:**	Select 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)	unevaluated wetlands unnamed perennial stream the Indian River (Warsaw South Wetland) Provincially Significant Wetland

Surface Water Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date
		Select Date
		Select Date
		Select Date
		Select 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	

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:

Distance(s)	

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**	
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**
DSW16/DSW09	Missed during the spring monitoring event due to misinterpretation of the 2020 AMR completed by GHD.	21-Jun-2021
DSW09	Missed during the autumn sampling event due to a misinterpretation of the historical figures provided.	10-Nov-2021
		Select Date
		Select 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.

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
total phosphorus DO (low) phenols	PWQO	Refer to Table 7
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**	

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**	Refer to Section 4.4 of the Annual Report.
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	
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.

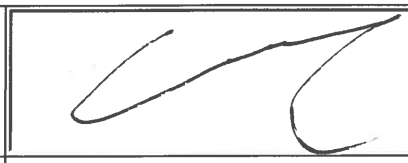
If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature or will be rectified for future monitoring events. Where this is not the case, the circumstances concerning the 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:

Select Date

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

◉ **No Changes to the monitoring program are recommended**	As outlined in the report, the Ministry approved reductions to the monitoring program in 2021. The reduced monitoring program commenced in 2022 (the reduced monitoring program suspended surface water sampling). See Section 4.6 of report.
○ **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	
Relevant Discipline	Physical Geography
Date:	25 Apr-2022
CEP Contact Information:	Cameron MacDougall, P. Geo.
Company:	Cambium Inc.
Address:	194 Sophia St Peterborough, Ontario K9H 1E5
Telephone No.:	(705) 742-7900 x212
Fax No. :	(705) 742-7907
E-mail Address:	cameron.macdougall@cambium-inc.com

Save As **Print Form**

Appendix B

Ministry Approvals

Fully accessible appended items are available upon request.

Ministry of the Environment
Ontario

Provisional Certificate No. A 340902

Road file

PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE

Under The Environmental Protection Act, 1971 and the regulations and subject to the limitations thereof, this Provisional Certificate of Approval is issued to:

Township of Douro
Douro, Ontario
K0L 1S0

for the use and operation of a 2 hectare (5 acre) landfilling site

all in accordance with the following plans and specifications:

1. Application and supporting information
2. Site Plan entitled "Warsaw Road Landfill, Lot 8, Concession 5, Township of Douro".
   Located: S.E. corner Lot 8, Concession 5
   Township of Douro
   County of Peterborough

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 "other" (limited to brush, dead trees and scrap metal) wastes.

and subject to the following conditions:

1. No operation shall be carried out at the site after sixty days from this condition becoming enforceable unless this Certificate including the reasons for this condition has been registered by the applicant as an instrument in the appropriate Land Registry Office against title to the site and a duplicate registered copy thereof has been returned by the applicant to the Director.

2. A suitably designed 6 foot high earth berm is to be constructed along the northern boundary of the landfilling site.

THIS IS A TRUE COPY OF THE ORIGINAL CERTIFICATE MAILED

ON SEP 23 1980

(Signed)

Dated this 17th day of September, 1980.

Director, Section 39,
The Environmental Protection Act, 1971

TO: The Township of Douro
Douro, Ontario
K0L 1S0

Pete

You are hereby notified that the terms and conditions of Provisional Certificate of Approval No. A 340902, *dated* September 17, 1980, is hereby amended as follows:

The Provisional Certificate of Approval No. A 340902 is amended by the addition of the following conditions:

3. Within six (6) months of the date of imposition of this condition a detailed survey of the surface area of the site covered by waste materials, as well as the depth of waste thereon, be completed and submitted to the Director for review.

4. Within twelve (12) months of the date of imposition of this condition a detailed hydrogeologic report as per Appendix VII, "Approvals Requirements and Process, Part 1 - Landfills", of the Ministry of the Environment and Energy Approvals Branch document entitled "Guide for Applying for Certificates of Approval, Waste Disposal Sites (Landfill, Transfer or Processing)", dated September 1992, is to be submitted to the Director for review and approval.

5. Based on the results of conditions 3 and 4, if the site is found to be out of compliance then the Municipality shall:

   i. Immediately apply for an emergency certificate of approval; or,

   ii. If the Municipality wishes to close the site, they shall submit a Closure Plan to the Director for approval.

6. If the Municipality plans to continue to operate the site as a waste disposal site then the Municipality shall submit to the Director, for approval, a detailed Operation and Development Plan as per Appendix VII, "Approvals Requirements and Process, Part 1 - Landfills", of the Ministry of the Environment and Energy Approvals Branch document entitled "Guide for Applying for Certificates of Approval, Waste Disposal Sites (Landfill, Transfer or Processing)", dated September 1992, within eighteen (18) months of the imposition of this condition.

The reasons for this amendment are as follows:

1. The reason for condition 3 is to ensure that the existing waste disposal site is in compliance with the original application and supporting documentation for a waste disposal site dated April 25, 1972.

2. The reason for condition 4 is to determine the existing hydrogeologic conditions at the site and to estimate the impacts from waste disposal on the ground and surface water on the site and along the property boundaries.

3. The reason for condition 5 is to ensure that the Municipality will operate the site in accordance with this certificate and this Ministry's regulations and policies and that potential operational and environmental problems are identified and the necessary remedial measures may be implemented.

4. The reason for condition 6 is to ensure that the waste disposal site's operation and development will be performed in such a way as to minimize any impact which is likely to cause impairment to the quality of the environment.

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. Section 142 of the Environmental Protection Act, R.S.O. 1990 c. E-19, provides that the Notice requiring the hearing shall state:

1. *The portions of the approval or each term or condition in the 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 <u>each</u> portion appealed.*

In addition to these legal requirements the Notice should also include:

3. *The name of the appellant;*
4. *The address of the appellant;*
5. *The Certificate of Approval number;*
6. *The date of the Certificate of Approval;*
7. *The name of the Director;*
8. *The municipality within which the waste disposal site is located;*

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

This Notice must be served upon:

The Secretary,
Environmental Appeal Board,
112 St. Clair Avenue West,
Suite 502,
Toronto, Ontario,
M4V 1N3

AND

The Director,
Section 39, Environmental Protection Act,
Ministry of the Environment,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

DATED AT TORONTO this 24th *day of* August, 1993.

THIS IS A TRUE COPY OF
THE ORIGINAL NOTICE
SIGNED BY

P. DEANGELIS, P. ENG.

MAILED ON Aug 25/93
BY _____

APPROVALS BRANCH
3rd Floor
Tel. (416) 440-3544
Fax (416) 440-6973

Peggy DWF

August 24, 1993

The Township of Douro
Douro, Ontario
K0L 1S0

Attention: Clerk Administrator

Re: Notice of Amendment
Provisional Certificate of Approval No. A 340902 - Township of Douro Waste Disposal Site

Enclosed is a copy of the Notice of Amendment for the above mentioned Provisional Certificate of Approval. The Notice provides for the addition of conditions 3, 4, 5, and 6.

Please note that all other terms and conditions as outlined in the original Certificate of Approval remain unchanged.

I trust this document is adequate. If you have any questions, please feel free to contact Mr. J. Kaasalainen at (416) 440-7032.

Yours truly,

A. Dominski, P.Eng., Acting Supervisor
Waste Sites & Systems Approvals Unit
Industrial Approvals Section

Encl.
JAK/am
c.c.: Bryan Ward, Director, MOEE Southeastern Region
Joseph Olajos, MOEE Peterborough District Office

APPROVALS BRANCH
3rd Floor
Tel. (416) 440-3544
Fax (416) 440-6973

August 24, 1993

The Township of Douro
Douro, Ontario
K0L 1S0

Attention: Clerk Administrator

Re: Notice of Amendment
Provisional Certificate of Approval No. A 340902 - Township of Douro Waste Disposal Site

Enclosed is a copy of the Notice of Amendment for the above mentioned Provisional Certificate of Approval. The Notice provides for the addition of conditions 3, 4, 5, and 6.

Please note that all other terms and conditions as outlined in the original Certificate of Approval remain unchanged.

I trust this document is adequate. If you have any questions, please feel free to contact Mr. J. Kaasalainen at (416) 440-7032.

Yours truly,

ORIGINAL SIGNED BY
A. Dominski

A. Dominski, P.Eng., Acting Supervisor
Waste Sites & Systems Approvals Unit
Industrial Approvals Section

Encl.
JAK/am
c.c.: Bryan Ward, Director, MOEE Southeastern Region
Joseph Olajos, MOEE Peterborough District Office

TO: The Township of Douro
Douro, Ontario
K0L 1S0

You are hereby notified that the terms and conditions of Provisional Certificate of Approval No. A 340902, *dated* September 17, 1980, is hereby amended as follows:

The Provisional Certificate of Approval No. A 340902 is amended by the addition of the following conditions:

3. Within six (6) months of the date of imposition of this condition a detailed survey of the surface area of the site covered by waste materials, as well as the depth of waste thereon, be completed and submitted to the Director for review.

4. Within twelve (12) months of the date of imposition of this condition a detailed hydrogeologic report as per Appendix VII, "Approvals Requirements and Process, Part 1 - Landfills", of the Ministry of the Environment and Energy Approvals Branch document entitled "Guide for Applying for Certificates of Approval, Waste Disposal Sites (Landfill, Transfer or Processing)", dated September 1992, is to be submitted to the Director for review and approval.

5. Based on the results of conditions 3 and 4, if the site is found to be out of compliance then the Municipality shall:

   i. Immediately apply for an emergency certificate of approval; or,

   ii. If the Municipality wishes to close the site, they shall submit a Closure Plan to the Director for approval.

6. If the Municipality plans to continue to operate the site as a waste disposal site then the Municipality shall submit to the Director, for approval, a detailed Operation and Development Plan as per Appendix VII, "Approvals Requirements and Process, Part 1 - Landfills", of the Ministry of the Environment and Energy Approvals Branch document entitled "Guide for Applying for Certificates of Approval, Waste Disposal Sites (Landfill, Transfer or Processing)", dated September 1992, within eighteen (18) months of the imposition of this condition.

The reasons for this amendment are as follows:

1. The reason for condition 3 is to ensure that the existing waste disposal site is in compliance with the original application and supporting documentation for a waste disposal site dated April 25, 1972.

2. The reason for condition 4 is to determine the existing hydrogeologic conditions at the site and to estimate the impacts from waste disposal on the ground and surface water on the site and along the property boundaries.

3. The reason for condition 5 is to ensure that the Municipality will operate the site in accordance with this certificate and this Ministry's regulations and policies and that potential operational and environmental problems are identified and the necessary remedial measures may be implemented.

4. The reason for condition 6 is to ensure that the waste disposal site's operation and development will be performed in such a way as to minimize any impact which is likely to cause impairment to the quality of the environment.

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. Section 142 of the Environmental Protection Act, R.S.O. 1990 c. E-19, provides that the Notice requiring the hearing shall state:

1. *The portions of the approval or each term or condition in the 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 <u>each</u> portion appealed.*

In addition to these legal requirements the Notice should also include:

3. *The name of the appellant;*
4. *The address of the appellant;*
5. *The Certificate of Approval number;*
6. *The date of the Certificate of Approval;*
7. *The name of the Director;*
8. *The municipality within which the waste disposal site is located;*

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

This Notice must be served upon:

The Secretary,
Environmental Appeal Board,
112 St. Clair Avenue West,
Suite 502,
Toronto, Ontario,
M4V 1N3

AND

The Director,
Section 39, Environmental Protection Act,
Ministry of the Environment,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

DATED AT TORONTO this 24th *day of* August, 1993.

THIS IS A TRUE COPY OF
THE ORIGINAL NOTICE
SIGNED BY

P. DEANGELIS, P. ENG.

MAILED ON Aug 25 | 93
BY ____

Joe B Hopkirk

APPROVALS BRANCH
3rd Floor
Tel. (416) 440-3544
Fax (416) 440-6973

September 30, 1994

Clerk Administrator
The Township of Douro
General Delivery
Douro, Ontario
K0L 1S0

Dear Sir/Madam:

Re: Notice of Amendment - Emergency Approval
Provisional Certificate of Approval No. A 340902
Township of Douro Waste Disposal Site

Enclosed is a copy of the Notice of Amendment for the above mentioned Provisional Certificate of Approval. The Notice provides for the continued use and operation of the waste disposal site until March 30, 1996, under Section 31, Emergency Approval, of the Environmental Protection Act.

Please note that all other terms and conditions as outlined in the original Certificate of Approval and all subsequent Notices remain unchanged.

I trust this document is adequate. If you have any questions, please feel free to contact Mr. J. Kaasalainen at (416) 440-7032.

Yours truly,

ORIGINAL SIGNED BY
A. Dominski

A. Dominski, P.Eng., Acting Supervisor
Waste Sites & Systems Approvals Unit
Industrial Approvals Section

Encl.
JAK/es
c.c.: Bryan Ward, Director, MOEE Eastern Region
Jacques Bourque, MOEE Peterborough District Office

Ontario

Ministry of Environment and Energy

Ministère de l'Environnement et de l'Énergie

TO: The Township of Douro
Douro, Ontario
K0L 1S0

You are hereby notified that the terms and conditions of Provisional Certificate of Approval No. A 340902, *dated* September 17, 1980, *and all subsequent Notices are hereby amended as follows:*

1. The Notice dated August 23, 1994 allowing for the continued use and operation of this waste disposal site under Section 31, Emergency Approval, of the Environmental Protection Act is amended by revoking condition 7 and replacing it with the following condition:

   7. Waste can be disposed of at the site until March 30, 1996, in accordance with the following plans and specifications:

      i. The Application for a Certificate of Approval for a Waste Disposal Site (Landfill) and supporting documentation dated August 18, 1994.

      ii. The document entitled "The Corporation of the Township of Douro, Warsaw Road Waste Disposal Site, Provisional Certificate of Approval No. A 340902, Interim Site Development Plan and Operations Report", dated August 1994, by the Greer Galloway Group Incorporated.

      iii. Addendum No. 1, dated September 29, 1994, to the "Interim Site Development Plan and Operations Report" by the Greer Galloway Group Inc., dated August 1994.

In addition, the following conditions are included as part of this approval:

11. The Township shall undertake all necessary efforts to acquire or gain permanent control of a minimum 30 metre attenuation/buffer zone along the south, east, and west edges of the site, as mentioned in document (ii) above.

12. By June 30, 1995, the Township shall submit for the Director's review an assessment of potential and existing impacts to surface water and groundwater resulting from the operation of the waste disposal site and the assessment shall be comprised of:

    a. a surface water drainage and monitoring plan for the site including upstream or off-stream surface water monitoring station(s) for evaluating the background surface water quality;

    b. expansion of the surface water monitoring program by including a sampling station at a permanently flowing location on May Creek downstream from the waste disposal site to determine the impact of the waste disposal site on the water course and to include ambient water temperature as a sampling parameter;

    c. a groundwater impact assessment based on the Ministry's Policy 15-08, "The Incorporation of the Reasonable Use Concept into the Groundwater Management Activities of the Ministry of the Environment and Energy", which shall include the following:

        i. the installation of a minimum of one up gradient nested groundwater monitor with one piezometer in each of the upper and lower aquifers for evaluating the background groundwater quality; and,

        ii. the installation of additional nested groundwater monitors in order to determine the vertical and horizontal extent of the contaminant plume and to determine whether or not the site is in compliance with the Ministry's Reasonable Use Policy (Policy 15-08) at the property boundary or the proposed attenuation zone boundary.

    These new proposed groundwater monitors shall be incorporated into the monitoring program.

13. A work plan shall be submitted to the Director, Eastern Region, Ontario Ministry of the Environment and Energy, by November 14, 1994 with regards to the scheduling of the installation of the new groundwater monitoring wells as discussed in Condition 12(c).

14. By November 14, 1994, The Township shall submit to the Director for approval contingency plans to address contaminant migration of leachate related parameters at the site/attenuation zone boundary for both surface water and groundwater which do not comply with the Ministry of the Environment and Energy's Reasonable Use objectives for groundwater and/or with the Provincial Water Quality Objectives for surface water.

15. If for any reason(s) the Township fails to establish the attenuation zone as per condition 11 by June 30, 1995, then a detailed plan of mitigation measures to address off-site contaminant migration for both surface and groundwater which do not comply with the Ministry of the Environment and Energy's Reasonable Use objectives for groundwater and/or with the Provincial Water Quality Objectives for surface water shall be submitted to the Director for approval by September 30, 1995.

16. If the continued interim use of the site is required at the end of this emergency period then an application for an interim expansion pursuant to Section 30 of the Environmental Protection Act shall be submitted to the Director for approval by June 30, 1995.

17. If closure of the site is required at the end of this emergency period then a Closure Plan as per Appendix VII, "Approvals Requirements and Process, Section 2, Closure of a Landfill Site" of the Ministry of the Environment and Energy Approvals Branch document entitled "Guide for Applying for Certificates of Approval, Waste Disposal Sites (Landfills, Transfer or Processing)", dated September 1992 shall be submitted to the Director for approval by June 30, 1995.

18. If closure of the site is required at the end of this emergency period then final cover shall be constructed to a final grade of between 5 and 25 percent as per Ministry of the Environment and Energy guidelines.

The reason for this amendment is that an emergency situation with respect to waste disposal exists for the Township of Douro. The continued use of the site is to allow sufficient time for the Township to determine, evaluate, and implement alternative solutions for alleviating the emergency situation.

The conditions added to this certificate are to ensure that the waste disposal site is operated in an environmentally safe manner.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990 c. E-19, 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. Section 142 of the Environmental Protection Act, as amended provides that the Notice requiring a hearing shall state:

1. *The portions of the approval or each term or condition in the 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 <u>each</u> portion appealed.*

In addition to these legal requirements the Notice should also include:

3. *The name of the appellant;*
4. *The address of the appellant;*
5. *The Certificate of Approval number;*
6. *The date of the Certificate of Approval;*
7. *The name of the Director;*
8. *The municipality within which the waste disposal site is located;*

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

This Notice must be served upon:

The Secretary,
Environmental Appeal Board,
112 St. Clair Avenue West,
Suite 502,
Toronto, Ontario,
M4V 1N3

AND

The Director,
Section 39, Environmental Protection Act,
Ministry of Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

DATED AT TORONTO this 30th *day of* September, 1994.

THIS IS A TRUE COPY OF
THE ORIGINAL NOTICE
SIGNED BY

W. Ng, P. ENG.

MAILED ON Oct 3/94

BY _____

WM 08 .01
Douro

Bf / file

APPROVALS BRANCH
3rd Floor
Tel. (416) 440-3544
Fax (416) 440-6973

August 23, 1994

Clerk Administrator
The Township of Douro
General Delivery
Douro, Ontario
K0L 1S0

Dear Sir/Madam:

Re: Notice of Amendment - Emergency Approval
Provisional Certificate of Approval No. A 340902
Township of Douro Waste Disposal Site

Enclosed is a copy of the Notice of Amendment for the above mentioned Provisional Certificate of Approval. The Notice provides for the continued use and operation of the waste disposal site until September 30, 1994, under Section 31, Emergency Approval, of the Environmental Protection Act.

Please note that all other terms and conditions as outlined in the original Certificate of Approval and all subsequent Notices remain unchanged.

I trust this document is adequate. If you have any questions, please feel free to contact Mr. J. Kaasalainen at (416) 440-7032.

Yours truly,

ORIGINAL SIGNED BY
A. Dominski

A. Dominski, P.Eng., Acting Supervisor
Waste Sites & Systems Approvals Unit
Industrial Approvals Section

Encl.
JAK/es
c.c.: Bryan Ward, Director, MOEE Southeastern Region
Jacques Bourque, MOEE Peterborough District Office

Ministry of Environment and Energy
Ministère de l'Environnement et de l'Énergie
Ontario

TO: The Township of Douro
Douro, Ontario
K0L 1S0

You are hereby notified that the terms and conditions of Provisional Certificate of Approval No. A 340902, *dated* September 17, 1980, *and all subsequent Notices are hereby amended as follows:*

1. The Notice dated April 26, 1994 allowing for the continued use and operation of this waste disposal site under Section 31, Emergency Approval, of the Environmental Protection Act is amended by revoking condition 7 and replacing it with the following condition:

   7. Waste can be disposed of at the site until September 30, 1994, in accordance with the above plans and specifications.

The reason for this amendment is that an emergency situation with respect to the waste disposal site exists for the Township of Douro. This continuation of the emergency approval is to allow sufficient time for the Ministry to review the Township's application and supporting documentation for an Emergency Approval.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990 c. E-19, 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. Section 142 of the Environmental Protection Act, as amended provides that the Notice requiring a hearing shall state:

1. *The portions of the approval or each term or condition in the 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 <u>each</u> portion appealed.*

In addition to these legal requirements the Notice should also include:

3. *The name of the appellant;*
4. *The address of the appellant;*
5. *The Certificate of Approval number;*
6. *The date of the Certificate of Approval;*
7. *The name of the Director;*
8. *The municipality within which the waste disposal site is located;*

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

This Notice must be served upon:

The Secretary,
Environmental Appeal Board,
112 St. Clair Avenue West,
Suite 502,
Toronto, Ontario,
M4V 1N3

AND

The Director,
Section 39, Environmental Protection Act,
Ministry of Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

DATED AT TORONTO this 23rd *day of* August, 1994.

THIS IS A TRUE COPY OF
THE ORIGINAL NOTICE
SIGNED BY

W. Ng, P. ENG.

MAILED ON 24th August 94

BY M.M.

file WA1-08-01

APPROVALS BRANCH
3rd Floor
Tel. (416) 440-3544
Fax (416) 440-6973

April 26, 1994

Clerk Administrator
The Township of Douro
General Delivery
Douro, Ontario
K0L 1S0

Dear Sir/Madam:

Re: Notice of Amendment - Emergency Approval
Provisional Certificate of Approval No. A 340902 - Township of Douro Waste Disposal Site

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Enclosed is a copy of the Notice of Amendment for the above mentioned Provisional Certificate of Approval. The Notice provides for the continued use and operation of the waste disposal site until August 19, 1994, under Section 31, Emergency Approval, of the Environmental Protection Act.

Please note that all other terms and conditions as outlined in the original Certificate of Approval and all subsequent Notices remain unchanged.

I trust this document is adequate. If you have any questions, please feel free to contact Mr. J. Kaasalainen at (416) 440-7032.

Yours truly,

ORIGINAL SIGNED BY
A. Dominski

A. Dominski, P.Eng., Acting Supervisor
Waste Sites & Systems Approvals Unit
Industrial Approvals Section

Encl.
JAK/es
c.c.: Bryan Ward, Director, MOEE Southeastern Region
Jacques Bourque, MOEE Peterborough District Office

Ontario

Ministry of Environment and Energy

Ministère de l'Environnement et de l'Énergie

NOTICE
Page 1 of 2

TO: The Township of Douro
Douro, Ontario
K0L 1S0

You are hereby notified that the terms and conditions of Provisional Certificate of Approval No. A 340902, *dated* September 17, 1980, *and all subsequent Notices are hereby amended for the continued use and operation of this waste disposal site under Section 31, Emergency Approval, of the Environmental Protection Act in accordance with the following plans and specifications:*

i. The Application for a Certificate of Approval for a Waste Disposal Site (Landfill) and supporting information dated March 30, 1994.

ii. The letter dated April 11, 1994, from Mr. Wade Stogran of Lakefield Research to Mr. John Kaasalainen of the Ministry of the Environment and Energy, Approvals Branch, specifying the location of waste placement and disposal procedures.

iii. The letter dated April 19, 1994, from Mr. Wade Stogran of Lakefield Research to Mr. John Kaasalainen of the Ministry of the Environment and Energy, Approvals Branch, specifying the hours of operation for the landfill site.

In addition, the following conditions are to be implemented as part of this approval:

7. Waste can be disposed of at the site until August 19, 1994, in accordance with the above plans and specifications.

8. If closure of the site is required at the end of this emergency period then a Closure Plan as per Appendix VII, "Approvals Requirements and Process, Section 2, Closure of a Landfill Site" of the Ministry of the Environment and Energy Approvals Branch document entitled "Guide for Applying for Certificates of Approval, Waste Disposal Sites (Landfill, Transfer or Processing)", dated September 1992, shall be submitted to the Director for approval.

9. If the continued interim use of the site is required at the end of this emergency period then an application for an Emergency Certificate of Approval as per Appendix VII, "Approvals Requirements and Process, Section 12, Emergency Certificates of Approval" of the Ministry of the Environment and Energy Approvals Branch document entitled "Guide for Applying for Certificates of Approval, Waste Disposal Sites (Landfill, Transfer or Processing)", dated September 1992, shall be submitted by August 19, 1994, to the Director for approval.

The reason for this amendment is that an emergency situation with respect to the waste disposal site exists for the Township of Douro. This emergency approval is to allow sufficient time for the Township to determine, evaluate, and implement alternative solutions for alleviating the emergency situation.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990 c. E-19, 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. Section 142 of the Environmental Protection Act, as amended provides that the Notice requiring a hearing shall state:

1. *The portions of the approval or each term or condition in the 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 <u>each</u> portion appealed.*

In addition to these legal requirements the Notice should also include:

3. *The name of the appellant;*
4. *The address of the appellant;*
5. *The Certificate of Approval number;*
6. *The date of the Certificate of Approval;*
7. *The name of the Director;*
8. *The municipality within which the waste disposal site is located;*

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

This Notice must be served upon:

The Secretary,
Environmental Appeal Board,
112 St. Clair Avenue West,
Suite 502,
Toronto, Ontario,
M4V 1N3

<u>AND</u>

The Director,
Section 39, Environmental Protection Act,
Ministry of Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

DATED AT TORONTO this 26th *day of* April, 1994.

THIS IS A TRUE COPY OF
THE ORIGINAL CERTIFICATE
SIGNED BY

P. DeANGELIS, P.ENG.

MAILED ON April 28/94

BY _____

WM 08 01
DOURO
WARSAW ROAD

(1) Bruce
(2) SOL
(3) file:

APPROVALS BRANCH
3rd Floor
Tel. (416) 440-3544
Fax (416) 440-6973

August 31, 1995

Clerk Administrator
The Township of Douro
General Delivery
Douro, Ontario
K0L 1S0

Dear Sir/Madam:

Re: Notice of Amendment - Emergency Approval
Provisional Certificate of Approval No. A 340902
Township of Douro Waste Disposal Site

Enclosed is a copy of the Notice of Amendment for the above mentioned Provisional Certificate of Approval. The Notice provides for changes to the dates outlined in Conditions 15, 16, and 17 of the Notice of Amendment dated September 30, 1995. In addition, it should be noted that the Ministry may not approve additional extensions if these deadlines can not be met.

Please note that all other terms and conditions as outlined in the original Certificate of Approval and all subsequent Notices remain unchanged.

I trust this document is adequate. If you have any questions, please feel free to contact Mr. J. Kaasalainen at (416) 440-7032.

Sincerely,

ORIGINAL SIGNED BY
A. Dominski

A. Dominski, P.Eng., Supervisor
Waste Unit

Encl.
JAK/es
cc:
Bryan Ward, Director, MOEE Southeastern Region
Richard Raeburn-Gibson, MOEE Peterborough District Office

TO: The Township of Douro
Douro, Ontario
K0L 1S0

You are hereby notified that the terms and conditions of Provisional Certificate of Approval No. A 340902, *dated* September 17, 1980, *and all subsequent Notices are hereby amended as follows:*

1. The Notices dated September 30, 1994 and June 29, 1995 allowing for the continued use and operation of this waste disposal site under Section 31, Emergency Approval, of the Environmental Protection Act are amended as follows:

   a. Condition 15 is amended by changing the date for establishing an attenuation zone from "August 31, 1995" to "September 31, 1995" and by changing the date of submission of a mitigation plan to the Director from "September 31, 1995" to "October 31, 1995".

   b. Condition 16 is amended by changing the date for submission to the Director of an application for the continued interim use of the site from "August 31, 1995" to "October 31, 1995".

   c. Condition 17 is amended by changing the date for submission of a Closure Plan for the site to the Director from "August 31, 1995" to "October 31, 1995".

The reason for these amendments is to allow for sufficient time for the Township to complete their studies and submit the information to the Ministry.

2. Definitions:

For the purpose of this Provisional Certificate of Approval:

a. "Director" means one or more of the persons who from time to time are so designated for the purpose of Section 39 of the Environmental Protection Act (EPA).

b. "Regional Director" means the Director of Eastern Region, Ministry of the Environment and Energy.

The reason for the definitions is to define the specific meaning of terms used within this certificate of approval.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990 c. E-19, 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. Section 142 of the Environmental Protection Act, as amended provides that the Notice requiring a hearing shall state:

1. *The portions of the approval or each term or condition in the 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 <u>each</u> portion appealed.*

In addition to these legal requirements the Notice should also include:

3. *The name of the appellant;*
4. *The address of the appellant;*
5. *The Certificate of Approval number;*
6. *The date of the Certificate of Approval;*
7. *The name of the Director;*
8. *The municipality within which the waste disposal site is located;*

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

This Notice must be served upon:

The Secretary,
Environmental Appeal Board,
112 St. Clair Avenue West,
Suite 502,
Toronto, Ontario,
M4V 1N3

<u>AND</u>

The Director,
Section 39, Environmental Protection Act,
Ministry of Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

DATED AT TORONTO this 31st *day of* August, 1995.

THIS IS A TRUE COPY OF
THE ORIGINAL NOTICE
SIGNED BY

A. DOMINSKI, P. ENG.

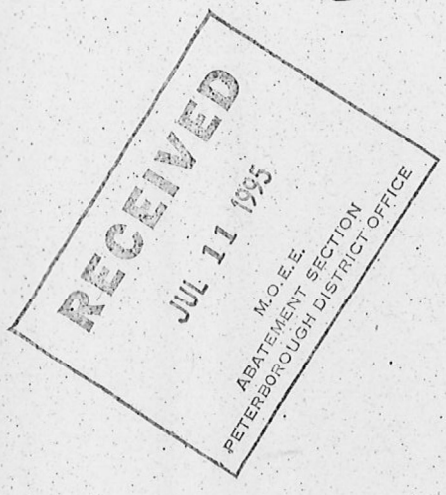
MAILED ON Sept. 1/95

BY _____

07/12/95 WM 08 01

(1) (2) (3) (5) file

APPROVALS BRANCH
3rd Floor
Tel. (416) 440-3544
Fax (416) 440-6973



June 29, 1995

Clerk Administrator
The Township of Douro
General Delivery
Douro, Ontario
K0L 1S0

Dear Sir/Madam:

Re: Notice of Amendment - Emergency Approval
Provisional Certificate of Approval No. A 340902
Township of Douro Waste Disposal Site

Enclosed is a copy of the Notice of Amendment for the above mentioned Provisional Certificate of Approval. The Notice provides for changes to the dates outlined in Conditions 15, 16, and 17 of the Notice of Amendment dated September 30, 1995.

Please note that all other terms and conditions as outlined in the original Certificate of Approval and all subsequent Notices remain unchanged.

I trust this document is adequate. If you have any questions, please feel free to contact Mr. J. Kaasalainen at (416) 440-7032.

Yours truly,

ORIGINAL SIGNED BY
A. Dominski

A. Dominski, P.Eng., Supervisor
Waste Unit

Encl.
JAK/es

cc:
Bryan Ward, Director - MOEE Eastern Region
Richard Raeburn-Gibson - MOEE Peterborough District Office

TO: The Township of Douro
Douro, Ontario
K0L 1S0

You are hereby notified that the terms and conditions of Provisional Certificate of Approval No. A 340902, *dated* September 17, 1980, *and all subsequent Notices are hereby amended as follows:*

1. The Notice dated September 30, 1994 allowing for the continued use and operation of this waste disposal site under Section 31, Emergency Approval, of the Environmental Protection Act is amended as follows:

   a. Condition 15 is amended by changing the date from "June 30, 1995" to "August 31, 1995".

   b. Condition 16 is amended by changing the date for submission to the Director of an application for the continued interim use of the site from "June 30, 1995" to "August 31, 1995".

   c. Condition 17 is amended by changing the date for submission of a Closure Plan for the site to the Director from "June 30, 1995" to "August 31, 1995".

   The reason for these amendments is to allow for sufficient time for the Township to complete their studies and submit the information to the Ministry.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990 c. E-19, 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. Section 142 of the Environmental Protection Act, as amended provides that the Notice requiring a hearing shall state:

1. *The portions of the approval or each term or condition in the 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 <u>each</u> portion appealed.*

In addition to these legal requirements the Notice should also include:

3. *The name of the appellant;*
4. *The address of the appellant;*
5. *The Certificate of Approval number;*
6. *The date of the Certificate of Approval;*
7. *The name of the Director;*
8. *The municipality within which the waste disposal site is located;*

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

This Notice must be served upon:

The Secretary,
Environmental Appeal Board,
112 St. Clair Avenue West,
Suite 502,
Toronto, Ontario,
M4V 1N3

AND

The Director,
Section 39, Environmental Protection Act,
Ministry of Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

DATED AT TORONTO this 29th *day of* June, 1995.

THIS IS A TRUE COPY OF
THE ORIGINAL NOTICE
SIGNED BY

A. DOMINSKI, P. ENG.

MAILED ON July 5/95

BY _____

WM08 01 Doc
#340902

APPROVALS BRANCH
Tel. (416) 440-3544
Fax (416) 440-6973

15 November 1996

Clerk Administrator
The Township of Douro
General Delivery
Douro, Ontario
K0L 1S0

Dear Sir/Madam:

Re: Notice of Amendment
Provisional Certificate of Approval No. A 340902
Township of Douro Waste Disposal Site

Enclosed is a copy of the Notice of Amendment for the above mentioned Provisional Certificate of Approval. This Notice provides for changes to Condition 20 and the revocation of Condition 22(b) of the Notice of Amendment dated May 22, 1996.

Please note that all other terms and conditions as outlined in the original Certificate of Approval and all subsequent Notices remain unchanged.

If you have any questions, please feel free to contact Mr. J. Kaasalainen of this office at (416) 440-7032.

Sincerely,

ORIGINAL SIGNED BY
A. Dominski

A. Dominski, P.Eng., Supervisor
Waste Unit

Encl.
JAK/es

cc:
Bryan Ward, Director, MOEE Southeastern Region
Richard Raeburn-Gibson, MOEE Peterborough District Office

The Township of Douro
Douro, Ontario
K0L 1S0

You are hereby notified that the terms and conditions of Provisional Certificate of Approval No. A 340902 *dated* September 17, 1980, *and all subsequent Notices are hereby amended as follows:*

1. The Notice dated May 22, 1996 is amended as follows:

   a. Condition 20 is revoked and replaced by the following:

      20. A detailed surface water contingency plan complete with appropriate trigger levels shall be submitted to the Regional Director for approval by December 31, 1996. This contingency plan shall be done in consultation with the Ministry's Regional Office.

   b. Condition 22(b) is revoked.

The reasons for these amendments are as follows:

1. Condition 20 is amended to allow for sufficient time for the Township to complete their studies and submit the information to the Ministry.

2. Condition 22(b) is revoked since the requirement for an early warning multi-level monitoring well between the waste disposal site and Residential Well No. 2 was found to be not required.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990 c. E-19, 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. Section 142 of the Environmental Protection Act, as amended provides that the Notice requiring a hearing shall state:

1. *The portions of the approval or each term or condition in the 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 <u>each</u> portion appealed.*

In addition to these legal requirements the Notice should also include:

3. *The name of the appellant;*
4. *The address of the appellant;*
5. *The Certificate of Approval number;*
6. *The date of the Certificate of Approval;*
7. *The name of the Director;*
8. *The municipality within which the waste disposal site is located;*

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

This Notice must be served upon:

The Secretary,
Environmental Appeal Board,
112 St. Clair Avenue West,
Suite 502,
Toronto, Ontario,
M4V 1N3

AND

The Director,
Section 39, Environmental Protection Act,
Ministry of Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

DATED AT TORONTO this 15th *day of* November, 1996.

THIS IS A TRUE COPY OF
THE ORIGINAL NOTICE
SIGNED BY

A. DOMINSKI P. ENG.

MAILED ON Nov. 18/96

BY 18

APPROVALS BRANCH
3rd Floor
Tel. (416) 440-3544
Fax (416) 440-6973

May 22, 1996

Clerk Administrator
The Township of Douro
General Delivery
Douro, Ontario
K0L 1S0

Dear Sir/Madam:

Re: Notice of Amendment - Site Closure
Provisional Certificate of Approval No. A 340902
Township of Douro Waste Disposal Site

Enclosed is a copy of the Notice of Amendment for the above mentioned Provisional Certificate of Approval. The Notice provides for closure of this waste disposal site. In addition, it should be noted that Conditions 19 and 20 of this Notice require additional information with respect to the Surface Water Monitoring program and contingency plans. As such, for your assistance a copy of the Ministry's document entitled "MOEE Eastern Region - Surface Water Unit, Interim Guidance Document for the Development of Waste Disposal Site Contingency Plan Trigger for Surface Water" dated May 01, 1995 is attached.

Please note that all other terms and conditions as outlined in the original Certificate of Approval and all subsequent Notices remain unchanged.

I trust this document is adequate. If you have any questions, please feel free to contact Mr. J. Kaasalainen at (416) 440-7032.

Sincerely,

ORIGINAL SIGNED BY
A. Dominski

A. Dominski, P.Eng., Supervisor
Waste Unit

Encl.
JAK/es
cc: Brian Ward, Director, MOEE Southeastern Region
Richard Raeburn-Gibson, MOEE Peterborough District Office

TO: The Township of Douro
Douro, Ontario
K0L 1S0

You are hereby notified that the terms and conditions of Provisional Certificate of Approval No. A 340902, *dated September 17, 1980, and all subsequent Notices are hereby amended as follows:*

The waste disposal site shall be closed in accordance with the following documents:

i. The document entitled "Leachate Attenuation Zone Assessment, Warsaw Road (South) Waste Disposal Site, Part of Lot 8, Concession V, Township of Douro, County of Peterborough, Certificate of Approval No. A 340902" dated September 29, 1995 by Lakefield Research Limited.

ii. The document entitled "Final Site Closure Plan, Township of Douro Warsaw Road (South) Landfill Site" dated October 1995 by Lakefield Research Limited.

In addition, the following conditions are added as part of this approval:

Surface Water

19. The Surface Water Monitoring program shall be revised to include the following information:

    a. identification of significant surface watercourses which are to be monitored for compliance;
    b. the establishment of monitoring locations at natural marsh/wetland surface waters; and
    c. the establishment and rationale for locating compliance location stations.

    This work shall be done in consultation with the Ministry's Regional Office.

20. A detailed surface water contingency plan complete with appropriate trigger levels shall be submitted to the Regional Director for approval within 120 days of the issuance of this Notice. This contingency plan shall be done in consultation with the Ministry's Regional Office.

Contaminant Attenuation Zone/Buffer Lands

21. a. The Township shall undertake all necessary efforts to acquire or gain access agreements for the contaminant attenuation zone as described in document (i) above. Written documentation of the progress the Township is making in this regard shall be provided to the Regional Director on a monthly basis.

b. Within 120 days of acquiring or gaining access agreements for the contaminant attenuation zone the Township shall have a legal survey conducted of these lands, including all buffer lands, and have this Certificate registered as an Instrument in the appropriate Land Registry Office against the title of those lands. A duplicate registered copy of the Instrument shall be submitted to the Director.

Groundwater

22. a. Within three (3) months of obtaining control and/or access agreements for the contaminant attenuation zone, a multi-level monitoring well shall be constructed close to the new down-gradient property/attenuation zone boundary.

b. Within three (3) months of the issuance of this Notice, an early warning multi-level monitoring well shall be installed between the waste disposal site and the residential well No. 2 as described in the document entitled "Environmental Impact Assessment, Warsaw Road "South" Landfill Site, Township of Douro" dated April 1995 by Lakefield Research Limited.

These new proposed groundwater monitors shall be incorporated into the monitoring program and the groundwater contingency plans.

23. The Groundwater Monitoring program shall be revised as follows:

a. total organic carbon shall be added to the list of parameters to be tested for;
b. a volatile organic compound scan shall be performed on samples from Monitor TW7; and
c. the sampling frequency shall be revised to mid-April and late August/early September and shall include **all** multi-level monitoring wells.

24. The Township shall notify, in writing, the Regional Director of the abandonment of monitor TW 8 and the upgrade or abandonment of monitor TW3-1.

Landfill Gas

25. The landfill gas monitoring/contingency plan shall be revised as follows:

    a. If an exceedance of the landfill gas trigger level occurs during any one of the sampling events, then two additional confirmatory sampling events shall be conducted within 60 days of the initial exceedance sampling event.

    b. One additional gas probe shall be installed along the eastern property/buffer zone boundary. This gas probe shall be incorporated into the monitoring program and the landfill gas contingency plans.

The reason for this amendment is to ensure that the site is closed in an environmentally safe manner.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990 c. E-19, 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. Section 142 of the Environmental Protection Act, as amended provides that the Notice requiring a hearing shall state:

1. *The portions of the approval or each term or condition in the 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 <u>each</u> portion appealed.*

In addition to these legal requirements the Notice should also include:

3. *The name of the appellant;*
4. *The address of the appellant;*
5. *The Certificate of Approval number;*
6. *The date of the Certificate of Approval;*
7. *The name of the Director;*
8. *The municipality within which the waste disposal site is located;*

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

This Notice must be served upon:

The Secretary,
Environmental Appeal Board,
112 St. Clair Avenue West,
Suite 502,
Toronto, Ontario,
M4V 1N3

AND

The Director,
Section 39, Environmental Protection Act,
Ministry of Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

DATED AT TORONTO this 22nd *day of* May, 1996.

THIS IS A TRUE COPY OF
THE ORIGINAL NOTICE
SIGNED BY

A. DOMINSKI P. ENG.

MAILED ON May 24/96

BY _____

Ministry of the Environment / Ministère de l'Environnement

Ontario

CERTIFICATE OF APPROVAL
AIR
NUMBER 6601-5YWQBH

The Corporation of the Township of Douro-Dummer
PO Box 92
Warsaw, Ontario
K0L 3A0

Site Location: Warsaw Road Landfill,
Lot 8, Concession 5, Douro Ward
Douro-Dummer Township, County of Peterborough

You have applied in accordance with Section 9 of the Environmental Protection Act for approval of:

- a passive landfill gas venting system serving a municipal landfill, consisting of two (2) vents, each having a diameter of 0.05 metre, extending 3.0 metres above grade;

all in accordance with the application and all supporting information dated August 21, 2003, signed by D. Clifford.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, 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 approval or each term or condition in the 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.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 9, *Environmental Protection Act*
Ministry of Environment and Energy
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted works are approved under Section 9 of the Environmental Protection Act.

DATED AT TORONTO this 13th day of May, 2004

Neil Parrish, P.Eng.
Director
Section 9, *Environmental Protection Act*

QN/
c: District Manager, MOE Peterborough
Linda Elliott, SGS Lakefield Research Limited

Appendix C

Correspondence

Fully accessible appended items are available upon request.

CAMBIUM

Environmental

Geotechnical

Building Sciences

Construction Quality Verification

Telephone
(866) 217.7900
(705) 742.7900

Facsimile
(705) 742.7907

Website
cambium-inc.com

Mailing Address
P.O. Box 325,
Peterborough, Ontario
Canada, K9J 6Z3

Locations
Peterborough
Kingston
Barrie
Oshawa
Calgary

Laboratory
Peterborough

Professional Engineers Ontario

APGO

August 5, 2021

Ministry of the Environment, Conservation and Parks
Peterborough District Office
300 Water Street, 2nd Floor
Peterborough, Ontario
K9J 3C7

Attn: David Bradley
District Manager

Re: Request for Review of Potential Reductions to Environmental Monitoring Program – Warsaw Road Landfill
Township of Douro-Dummer
Provisional Certificate of Approval No.: A340902
Cambium Reference: 12987-003

Dear Mr. Bradley,

The Corporation of the Township of Douro-Dummer (Township) retained Cambium Inc. (Cambium) in 2021 to complete environmental monitoring services at the Warsaw Road Closed Landfill (Site). Other consultants completed the environmental monitoring at the Site prior to 2021.

Cambium reviewed historical data and determined that reductions to the current environmental monitoring programs are appropriate. Cambium, on behalf of the Township, is requesting that the Ministry of the Environment, Conservation and Parks (Ministry) review of the proposed reductions and provide comments as needed.

BACKGROUND

The Site is on Part of Lot 8, Concession V, in the Township of Douro-Dummer. The Site is on the south side of County Road 4, 6 km southwest of the community of Warsaw.

The Site consists of an approved waste disposal area of 2.0 ha within a total Site area of 2.43 ha. The Site was operated by the Township as a solid waste natural attenuation landfill until closure in 1996.

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The Site operates under Provisional Certificate of Approval (PC of A) No.: A340902. In addition, Certificate of Approval (C of A) No.: 6601-5YWQBH was issued for operation of a passive landfill gas venting system at the Site.

EXISTING CONDITIONS

Cambium reviewed the findings of the 2020 Annual Report[1], and several earlier annual reports, to determine if the established monitoring program is appropriate for the Site. In general, previous monitoring programs indicate the following:

- Minimal influences of landfill leachate detected within the shallow groundwater on-site.
- Influences to surface water were minimal to negligible. There is an established trigger mechanism for surface water that is based on 8 consecutive samples that report a trigger parameter at a concentration greater than the established criteria. The last time a trigger parameter was reported at a concentration in excess of the criteria was in 2018 (for two consecutive events). As such the trigger mechanism hasn't been activated in recent years, and no contingency actions have been required.
- The landfill does not appear to influence adjacent residential wells.
- Landfill gas readings are stable.

The current environmental monitoring program includes collecting groundwater and surface water samples twice annually. Residential well samples are collected every third year. Groundwater samples from the monitoring wells are analyzed for the parameter outlined in Column 3, Schedule 5 of the Landfill Standards[2] (in addition to Column 1 metals). Samples collected from the residential wells are analyzed for the parameters outlined in Column 1, Schedule 5 of the Landfill Standards. In addition, volatile organic compounds (VOCs) are analyzed at well

[1] GHD, *2020 Groundwater Monitoring Report, Warsaw Road Landfill Site*, 2021
[2] Ministry of Environment, Landfill Standards: A guideline on the regulatory and approval requirements for new or expanding landfill sites, 2012

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TW7 during both sampling events. Surface water samples are analyzed for those parameters outlined in Column 3, Schedule 5 of the Landfill Standards.

Landfill gas is measured six times annually.

It is Cambium's opinion that sufficient data has been collected for groundwater, surface water and landfill gas to indicate that stable concentration ranges have been established. Furthermore, given the age of waste, it is not expected that conditions will degrade in the future.

PROPOSED AMENDMENTS TO ESTABLISHED MONITORING PROGRAM

Cambium proposes the following amendments to the established environmental monitoring programs.

Groundwater and surface water monitoring frequencies be reduced to once annually (to be completed in the spring). The residential well sampling program should remain unchanged (and occur once every 3rd year).

The groundwater monitoring wells and residential wells should be analyzed for those parameters outlined in Column 4, Schedule 5 of the Landfill Standards (in addition to manganese and hardness). VOCs should no longer be analyzed a well TW7.

The surface water samples should be analyzed for those parameters outlined in Column 4, Schedule 5 of the Landfill Standards (in addition to manganese and hardness).

Landfill gas measurements should be reduced to twice annually.

Cambium also recommends that the reporting frequency be reduced from once annually to once every two years.

CLOSING

We are requesting the Ministry review the proposed reductions to the established environmental monitoring program at the Site and provide comment as needed. If you have any questions or comments, please do not hesitate to contact the undersigned at 705-742-7900 ext. 212.

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APGO

August 5, 2021

Best regards,

Cambium Inc.

Cameron MacDougall, P.Geo.
Project Coordinator

CM/map

Copies: Mr. Jake Condon, Manager of Public Works, Township of Douro-Dummer

P:\12900 to 12999\12987-003 Township of Douro-Dummer - WDS Monitoring - Warsaw Road\Correspondence\Letters\2021-08-05 LTR Proposed Amendments to Warsaw Road WDS Monitoring Program.docx

Ministry of the Environment, Conservation and Parks
Eastern Region
1259 Gardiners Road, Unit 3
Kingston ON K7P 3J6
Phone: 613.549.4000
or 1.800.267.0974

Ministère de l'Environnement, de la Protection de la nature et des Parcs
Région de l'Est
1259, rue Gardiners, unité 3
Kingston (Ontario) K7P 3J6
Tél: 613 549-4000
ou 1 800 267-0974

Ontario

M E M O R A N D U M

September 1, 2021

TO: Gary Muloin
Senior Environmental Officer,
Peterborough District Office
Eastern Region, MECP

FROM: Mark Phillips
Surface Water Scientist,
Water Resource Unit,
Eastern Region, MECP

RE: 2020 Annual Monitoring Report
Warsaw Road Waste Disposal Site
Certificate of Approval # A340902
Pt Lot 8, Concession V, Township of Douro-Dummer
ECHO #: 1-64662138

I have reviewed the GHD report "2020 Groundwater Monitoring Report (dated March 23, 2021), as well as the Cambium "Request for Review of Potential Reductions to Environmental Monitoring Program – Warsaw Road Landfill" (Cambium, August 5, 2021) from a surface water impact perspective, and I have the following comments.

Background

The most recent review for this site was a Memorandum (December 10, 2014) on the 2013 Annual Monitoring Report (AMR).

The WDS includes a 2 hectare fill area within a larger 2.43 hectare licensed area. The site was operated as a landfill by the Township for approximately 25 years before it was closed in 1996.

The Warsaw WDS is bounded to the south and east by a low-lying area that is wet at ground surface during most of the year. Agricultural pasture land borders the northern and western boundaries of the site. The Provincially Significant Indian River/Warsaw South Wetland surrounds the site. Drainage from the site flows to the south-southeast towards the wetland. Shallow groundwater is described as flowing in a south-easterly direction. The Groundwater Unit has confirmed that leachate impacted groundwater is expected to discharge to the wetlands located downgradient of the WDS.

The surface water sampling program involves sampling at 5 locations, twice annually, for chloride, conductivity, iron, manganese, as well a pH, temperature, and dissolved oxygen. These parameters are the basis for the trigger mechanism and are used to determine if the landfill is impacting on surface waters.

DSW6, DSW7, and DSW9 are located down-gradient from the landfill within the Wetland. DSW17 is located down-gradient from the landfill within the roadside ditch. DSW11 is located a substantial distance south of the WDS on a small creek.

The measured parameters are to be compared to the Provincial Water Quality Objectives (MOE, 1994) (PWQO), as well as background water quality.

Comments/Recommendations

A review of the surface water sampling data does not indicate that down-gradient surface water impacts are occurring at this time.

The consultants are recommending that surface water monitoring be reduced to once per year (spring) and that annual reporting be reduced to once every two years. Sampled parameters are to include Column 4, Schedule 5 (landfill Standards) as well as manganese and hardness.

In my last Memorandum I noted the following "In his Memorandum dated December 29, 2008; Mr. Shawn Kinney, Hydrogeologist, MOECC indicated that the "potential does not exist for surface water impacts to occur (at that time) from leachate impacted groundwater. If the Groundwater Unit is satisfied that there are suitably located groundwater monitors to act as sentry wells, that could provide advanced warning of impending surface water impacts, then it may be possible to suspend the surface water sampling program." This suggestion may still be valid. I recommend that the groundwater unit provide an updated opinion on this matter.

The surface water trigger mechanism is not acceptable and should comprise leachate related parameters and all sampling locations (except background). Trigger concentrations should be based on the 75% concentration at the background stations and/or the Provincial Water Quality Objectives/Canadian Water Quality Guidelines.

Conclusions

I recommend an assessment of the surface water monitoring program be undertaken to assess if there is still a need to continue monitoring surface water at this site. At the very least, a consolidation of the surface water monitoring program, including a re-vamped trigger mechanism would seem appropriate. The proposed changes (requested by Cambium) could be incorporated into the revised Surface Water Monitoring Program.

Please contact me if you have any questions regarding the above comments.

Original to be Signed

Mark Phillips

ec: J. Mahoney, (A)Tech. Support Manager, MECP
V. Castro, (A)WRU Supervisor, MECP
C. Redmond, Peterborough District Supervisor, MECP
Groundwater Unit Files
ECHO

Ministry of the Environment, Conservation and Parks
Eastern Region
1259 Gardiners Road, Unit 3
Kingston ON K7P 3J6
Phone: 613.549.4000
or 1.800.267.0974

Ministère de l'Environnement, de la Protection de la nature et des Parcs
Région de l'Est
1259, rue Gardiners, unité 3
Kingston (Ontario) K7P 3J6
Tél: 613 549-4000
ou 1 800 267-0974

Ontario

M E M O R A N D U M

October 4, 2021

TO: Gary Muloin
Senior Environmental Officer
Peterborough District Office
Eastern Region

FROM: Alija Bos
Hydrogeologist
Water Resources Unit
Technical Support Section
Eastern Region

RE: *Warsaw Road Closed Waste Disposal Site A340902*
Lot 8, Concession 5, Geographic Township of Douro
Township of Douro-Dummer
2020 Annual Environmental Monitoring Report - ECHO 1-64662170

As requested, I have reviewed the following document entitled:

- "*2020 Annual Monitoring Report Warsaw Road Landfill Site, PC of A No. A340902*" dated March 23, 2021 prepared by GHD.

- *Request for Review of Potential Reductions to Environmental Monitoring Program – Warsaw Road Landfill Township of Douro-Dummer Provisional Certificate of Approval No.: A340902, dated August 5th 2021. Prepared by Cambium.*

Based upon the information provided in the document above, I submit the following comments for your consideration.

Summary

- On behalf of the site owner, Township of Douro-Dummer, Cambium Inc. has submitted a letter to the District requesting changes to the environmental monitoring program at the Closed Warsaw Road WDS.

- Elevated Phosphorus and Phenols have been noted in downgradient monitoring wells. These trends should be assessed in future reports.

- Surface water sampling was conducted. No exceedances triggering a contingency measure occurred in the downgradient surface water monitoring locations.

- Changes to the current monitoring program are proposed and justified in the text below.

Environmental Compliance Approval

The Warsaw Road Waste Disposal Site operates under Certificate of Approval A340902. The site was licensed for the use and operation of a 2.0 hectare landfill site within a total site area of 2.43 hectares. The naturally attenuating landfill site underwent final closure in 1996.

Topography and Drainage

The consultant describes the physiographic region as the Peterborough Drumlin Field (GHD). This region is characterized by relatively northeast-southwest trending drumlin features. Bedrock underlying the site consists of limestone, with the minor shale of the Middle Ordovician Trenton-Black River Group.

Surface drainage at the site is generally southwest towards a tributary of June's Creek which eventually outlets into the Indian River situated approximately 3.5km southeast of the site.

Geological and Hydrogeological Conditions

Groundwater flow direction at the site is interpreted to be south.

Based on the available well records the geology is described as:
• Sandy loam, silty sand and sandy gravel: up to 4 metres
• Bedrock: Limestone with minor shale

Overburden in the eastern edge of the site differs from this general condition and is comprised of clay till. The clay till material in the south-eastern portion probably functions as an aquitard and may be a confining layer in the vicinity of TW9. The underlying limestone bedrock is also an aquifer which appears to recharge upwards in the southern part of the site.

The primary pathway of leachate migration from the waste disposal site is the shallow overburden and fractured bedrock aquifer.

Groundwater Monitoring

The groundwater monitoring network consists of eight (8) monitors locations, designated as TW 4 (located up-gradient, northwest of the landfill); TW 7 (located at the southerly refuse perimeter); TW 3, TW 2, TW 6, TW 8 and TW 9 (located within the

down-gradient attenuation zone); and TW 5 (located on the east side Douro Fourth Line). Monitor TW 9 has routinely been dry or contains too little water for sampling.

Residential wells RW-1, RW-2, RW-3 and RW-4 are included in the sampling program every three (3) years including the 2020 monitoring program.

Based on the data, the pattern of shallow groundwater movement appears to be in a southwesterly direction. This is from the fill area southward towards monitor TW3-2.

Background Groundwater Quality

The general chemistry results for the groundwater monitors are contained in section 5.2 of the 2020 report. The tables present historical groundwater quality data.

It is noted that the Phosphorus levels were elevated in all wells including the background well in the fall. Phenolics were elevated in virtually all wells including the background well in the spring and one well in the fall. These parameters should be monitored for trends in the future. TW4-2 is a representative background monitor.

Leachate Quality

Monitoring well TW-7 is completed within the waste fill area.
The historical data indicate the parameter concentrations at this location are elevated above the TDS and Phosphorus objectives (ODWS or PWQO) in the spring. TW-7 also exceeded ODWS for TDS, Iron, Manganese and Phosphorus (PWQO) in the fall. This location was also sampled for VOCs during both events and reported values below their respective detection limits.

Downgradient Groundwater Quality

Water quality effects from the landfill consist of leachate impacts identified by elevated Iron and Manganese. Phosphorus appears to be elevated at all locations. This should be monitored as the groundwater likely discharges to a surface water feature 350m downgradient of the fill area in the vicinity of the site.
Leachate influences are noted in monitors immediately downgradient of the waste (TW3-2, TW2). TW8-2 also showed very elevated levels of iron in the fall. TW8-2 is immediately downgradient of TW7 and the waste area.

Residential Monitoring Wells

Concentrations for select parameters, including TDS in wells R-1, R-3, R-4, and Sodium in R-4 exceeded Ontario Drinking Water Standards (ODWS). TDS is 3.5x the ODWS at the residence R-4. R-1 showed minor exceedances of Nitrates in the spring sample, but not the fall. This well is noted to be in a field with cattle and has historically shown elevated nitrates. I do not note any evidence of leachate-impacted residential wells related to the landfill based on this data.

Landfill Gas Monitoring

Landfill gas monitoring was conducted at six gas probe that have been installed within and adjacent to the buried refuse area. Methane gas was detected in GP5 for all sampling periods.

Surface Water Monitoring

The surface water stations are monitored, and trigger mechanisms are in place with Chloride, Conductivity, Iron and Manganese limits. These parameters are summarized in Tables 5.4 and 5.5 in the GHD report. No parameter has exceeded the trigger value for 8 consecutive periods. Therefore, the contingency plan has not been triggered.

Proposed Amendments to Established Monitoring Program

The Corporation of the Township of Douro-Dummer (Township) retained Cambium in 2021 to complete environmental monitoring services at the Site. Cambium reviewed the historical data and determined that reductions to the current environmental monitoring programs are appropriate.

Cambium proposed the following changes, and my comments are provided in bold text:

Groundwater and surface water monitoring frequencies be reduced to once annually (to be completed in the spring). **I agree with this. Fall sampling has often been hindered by dry surface water locations. Given that surface water trigger mechanisms are in place, this data serves as a priority. Fall monitoring well samples have historically shown more ODWQS exceedances, however they are all generally within the same historic range.**

The residential well sampling program should remain unchanged (and occur once every 3rd year). **I agree with this.**

The groundwater monitoring wells and residential wells should be analyzed for those parameters outlined in Column 4, Schedule 5 of the Landfill Standards (in addition to manganese and hardness). VOCs should no longer be analyzed a well TW7. **I agree with this. No elevated VOCs have been noted in recent years and the removal of them from the monitoring program is acceptable.**

The surface water samples should be analyzed for those parameters outlined in Column 4, Schedule 5 of the Landfill Standards (in addition to manganese and hardness). **MECP surface water reviewer to comment on any of the changes to these monitoring conditions.**

Landfill gas measurements should be reduced to twice annually. **I agree with this. The current requirement of monitoring six times annually is excessive given the site has been closed for over 20 years.**

Cambium also recommends that the reporting frequency be reduced from once annually to once every two years. **This is acceptable.**

Alija Bos

P.Geo., Hydrogeologist

ec: Sarah Baxter, Surface Water Specialist
Courtney Redmond, Peterborough District Supervisor
V. Castro, Water Resources Unit Supervisor
J. Mahoney, Technical Support Section Manager

c: GW File 01 03 PB PD Warsaw WDS
AB / ECHO# 1-64662170

Mike Pion

From: Cameron MacDougall
Sent: October 20, 2021 2:40 PM
To: Mulcin, Gary (MECP)
Cc: Stephanie Reeder; Phillips, Mark (MECP); Jake Condon
Subject: RE: MECP Surface Water Comments - Warsaw Road Closed WDS, ECA # A340902
Attachments: 2021-10-04 Warsaw WDS - 2020 GW Comments.pdf

Hi Gary,
Please see below our response to Mark Philips' letter dated Sept 1, 2021 regarding proposed reductions of the environmental monitoring program at the Warsaw Road Waste Disposal Site. The letter indicated that surface water monitoring at the Site may not be necessary and that the need for continued monitoring of surface water should be assessed. Please review this response with Mark (cc'd herein) and feel free to reach out to me if you have any questions. Thanks for your help.

A review of the historical surface water quality data that is available to us (i.e., 2014, 2016, 2019 and 2020) indicates that sustained PWQO criteria exceedances were noted for total phosphorus and/or phenol at several sampling stations. Sporadic PWQO exceedances of chloride and iron have been reported in the past. Groundwater is interpreted to discharge to surface water in the area of the Site. The background monitoring well (TW4-2) has reported concentrations of total phosphorus and phenol at concentrations greater than PWQO criteria in the past, therefore the PWQO exceedances reported in the surface water on-site are considered to be at least partially due to background conditions in groundwater (and not solely from landfill leachate influence).
These data indicate that the Warsaw Road Waste Disposal Site is not significantly influencing the receiving surface water system. Suspending the surface water monitoring program is considered appropriate. The Site has also been closed since 1996, therefore significant degradation of surface water quality (derived from landfill leachate) is not expected.

The groundwater reviewer (Alija Bos) agreed with Cambium's recommendation that the groundwater quality monitoring program be reduced to once annually, and that groundwater samples be analyzed for the parameters outlined in Column 4, Schedule 5 of the Landfill standards (letter attached). To monitor for potential surface water impacts in the future (derived form landfill leachate), Cambium is proposing the following trigger:

Trigger – Sentry Well Locations
Under the proposed trigger mechanism the surface water sampling program will be suspended and groundwater sampling will occur from all on-site wells once annually (and groundwater quality will be analyzed against those parameters outlined in Column 4, Schedule 5 of the Landfill standards). Potential impacts to the adjacent surface water system will be monitored by groundwater sampling from sentry wells as groundwater is interpreted to discharge to surface water in the areas south of the waste mound. The most appropriate sentry wells are interpreted to be TW-2, TW3-2 and TW8-2.

Trigger Parameters and Concentrations
The surface-water trigger criteria are comprised of the leachate indicator parameters (LIPs) outlined in Embedded Table 2.

Chloride	Iron	Manganese	Magnesium
Potassium	Sodium	TDS	

Total phosphorus and phenol are not included as trigger parameters as they are already present in background water quality and in the receiving surface water systems at concentrations greater than PWQO criteria.

The trigger criteria are:

- The PWQO criteria for iron
- The CWQG for chloride
- The background concentration for the remaining LIPs (as no PWQO criteria are available). Background concentrations are be defined as the 75th percentile concentrations of the eight most recent sampling events (not including the current sampling year). The background concentration will also be used for comparison if it is greater than an associated PWQO or CWQG guideline.

Trigger Mechanism

The trigger mechanism for the Site includes a three-tier system.

Tier One is monitoring of the landfill related parameters as outlined in the approved monitoring program. Following each sampling event, the water quality will be assessed and Tier Two will be initiated if:

i) one or more parameter concentrations at one of the sentry wells (TW-2, TW-3 and TW8-2) are greater than the trigger concentration on three consecutive occasions. (Note: several of the LIPs noted in the above table already satisfy this condition, as such a second condition is listed below which must also be satisfied in order to initiate Tier Two).

ii) One or more parameter concentrations at sentry wells TW-2, TW-3 and TW8-2 are reported as significantly elevated in compared to historical data during three consecutive sampling events.

Tier Two includes the following steps:

1. Notify the Township of the trigger exceedances.
2. Complete an assessment to determine if the trigger exceedance(s) is causing unacceptable impacts to the receiving watercourse and if the landfill is the primary contributing source to the elevated concentrations. The assessment should consider the need to sample at additional surface water and/or groundwater locations and/or the need for analysis of additional parameters to assess compliance (such as toxicity testing).
3. If the groundwater conditions that triggered Tier Two of the mechanism are interpreted to be a result of landfill leachate influence, and that adverse impacts are expected to the receiving watercourse (which could result in additional testing to assess the potential impacts), then Tier Three of the trigger will be activated.

Tier Three includes the following:

1. Immediately notify the District Manager of the trigger initiation.
2. Provide the District Manager with the results of the assessment completed as part of Tier Two, including the proposed sampling plan for review and approval, if applicable. This step should be completed within three months of the original trigger exceedance.
3. If assessment or confirmatory testing indicates that adverse impacts are expected and/or evident to the receiving watercourse and are landfill-related, development of a contingency plan that includes an evaluation of remedial options in consultation with the Township and the Ministry, with discussions to occur within six months of the original trigger exceedance. (Note: at this stage it is unknown what the contingency plan could be. However, the first step will likely be re-implementing the existing surface water sampling program, or a portion thereof. Additional sampling and other remedial options can be determined at a later date, should the surface water program ever be re-instated.).
4. Implementation of the contingency plan.

   Potential contingency plan measures/remedial options (should they ever be required).
   - Acquisition of additional buffer lands
   - Drainage improvements

- Installation of additional low permeability soil or geotextile capping
- Additional sampling locations

Any recommendation for remedial action should include a time frame for completion of studies and implementation, as well as recommended changes to the monitoring program to assess the effectiveness of the action taken.

From: Muloin, Gary (MECP) <Gary.Muloin@ontario.ca>
Sent: September 1, 2021 2:39 PM
To: Jake Condon <Jakec@dourodummer.on.ca>
Cc: Cameron MacDougall <Cameron.MacDougall@cambium-inc.com>; Stephanie Reeder <stephanie.reeder@cambium-inc.com>; Phillips, Mark (MECP) <Mark.E.Phillips@ontario.ca>
Subject: MECP Surface Water Comments - Warsaw Road Closed WDS, ECA # A340902

Good day

Please see attached a memo detailing surface water comments produced by ministry regional water resources staff. These comments are based upon a request from Cambium Inc. to amend the environmental monitoring/reporting requirements for the site as well as a review of the 2020 annual monitoring report for the facility (produced by GHD).

Groundwater comments for this facility will be provided as soon as they are available.

If you have any questions, comments or concerns related to the attached, please don't hesitate to write back.

Best regards,

Gary

Gary Muloin (he/him), H.BSc., CET, EP
Provincial Officer
Ministry of the Environment, Conservation and Parks – Peterborough District
300 Water Street, Robinson Place, 2nd Floor, South Tower
Peterborough, ON K9J 3C7
Phone: 705-927-7811
Fax: 705-755-4321
E-mail: gary.muloin@ontario.ca

Mike Pion

From: Muloin, Gary (MECP) <Gary.Muloin@ontario.ca>
Sent: March 1, 2022 2:00 PM
To: Cameron MacDougall; Stephanie Reeder; Jake Condon
Cc: Phillips, Mark (MECP); Bos, Alija (MECP)
Subject: MECP Technical Support Section Comments - Warsaw Road Closed WDS, ECA # A340902

Hello Cameron, Stephanie & Jake

Staff from the ministry's regional technical support section have reviewed your submission (e-mail chain below) concerning proposed changes to the environmental monitoring program at the Closed Warsaw Waste Disposal Site. Based upon the review by MECP water resources staff, I can offer you the following:

Comment #1 – the proposed approach to utilize sentry wells is acceptable. Note that results from TW6-2 should continue to be monitored for increasing trends. The effluent flow direction will likely cause TW8-2 to be the most impacted location and any triggers should be observed at that location.

Comment #2 - MECP staff are satisfied with continued monitoring of phenolics as indicated. If increasing trends pose a risk to surface water features, the ministry will consider the need to isomer specific analysis at that time.

Comment #3 – MECP staff concur with this proposed definition/determination.

Please let me know if you have any questions, comments or concerns related to the above.

Thanks

Gary Muloin

From: Cameron MacDougall <Cameron.MacDougall@cambium-inc.com>
Sent: February 2, 2022 9:53 AM
To: Bos, Alija (MECP) <Alija.Bos@ontario.ca>
Cc: Phillips, Mark (MECP) <Mark.E.Phillips@ontario.ca>; Stephanie Reeder <stephanie.reeder@cambium-inc.com>; Muloin, Gary (MECP) <Gary.Muloin@ontario.ca>; Cambium Admin <file@cambium-inc.com>
Subject: RE: Warsaw Road Closed WDS, ECA # A340902 (12987-003)

Hi Alija, I hope all is well.
I have reviewed your questions and provided responses below in green. Please feel free to contact me if you would like to discuss further.
Thanks.

1. *Mark noted TW-2, TW-3, TW8-2 have been proposed as SW trigger locations (sentry wells). We note that TW6-2 is located closer to the landfill than TW3. We propose to include it in place of TW-3.*

   The proposed monitoring program includes all wells in the annual sampling regime, however only wells TW-2, TW3-2 and TW8-2 will be assigned as the trigger assessment wells (ie., the sentry wells). These wells are located furthest down-gradient from the waste mound (and closest to receiving

surface water features). As such these three wells are considered the most appropriate to act as sentry wells for the surface water trigger.

In general, shallow groundwater flow across the Site is south to south-east. As such well TW6-2 is hydraulically up-gradient from both TW3-2 and TW8-2. Maintaining the sentry wells as described above (TW-2, TW-3 and TW8-2) will account for natural mitigation between TW6-2 and TW3-2/TW8-2, while also providing the most accurate representation of groundwater quality migrating off-site. Therefore we recommend that sentry well locations remain as TW-2, TW3-2 and TW8-2.

2. *Mark also noted phenolics as a potential trigger parameter. I note they are elevated in the background wells already -the background well showing 3 ug/L in 2020 I think it might be worth breaking out the individual phenolics for analyses and comparison to PWQOs. I also note that phenolics appear to be showing more exceedances in 2020 than previous years. There are isomer specific PWQOs for individual phenolics which should be used.*

   Phenolics have been reported in background water quality and throughout some of the wells installed in the waste mound at similar concentrations. The dataset we have access to indicates that the highest concentration of phenols we have at TW4-2 is 0.003 mg/L, whereas the highest onsite concentrations of phenols were reported at TW2 and TW7 at 0.005 mg/L and 0.004 mg/L, respectively (which is very similar to background concentrations). Elevated concentrations of phenolics were reported at some SWs greater than GW (for example at DSW9 at 0.003 mg/L to 0.009 in 2020 and DSW17 at 0.007 mg/L and 0.005 mg/L in 2019/2020), however these were sporadic occurrences. Most previous sampling events reported concentrations of phenols at concentrations less than detectable limits or similar to background groundwater concentrations. Many of the surface water sampling stations are regularly reported as dry and/or ponded which can influence the quality of the water sample collected. Further, most if not all of the surface water stations are located in areas that collect runoff from the greater general region, and not solely runoff from the Site. As such variations in water quality have multiple potential sources other than the landfill (and as noted above, phenolics are present in the background conditions).

   The landfill has been closed since 1996 (26 years ago). Some variations in surface water quality are expected, and are mostly attributed to natural conditions and not worsening conditions of the waste mound. Further segregating phenols into specific is isomer analysis is considered excessive for this site at this time. Phenolics are still included in the Col 4 Sched 5 parameter list proposed for the annual groundwater monitoring, as such we can continue to review the onsite information, but including phenolics as a trigger parameter is considered unreliable assessment tool.

3. *I would also like "significantly elevated" to be better defined.*

   Significantly elevated would be concentrations elevated greater than historical ranges, and upon judgement of a qualified professional.

From: Bos, Alija (MECP) <Alija.Bos@ontario.ca>
Sent: December 29, 2021 12:21 PM
To: Cameron MacDougall <Cameron.MacDougall@cambium-inc.com>
Cc: Phillips, Mark (MECP) <Mark.E.Phillips@ontario.ca>; Stephanie Reeder <stephanie.reeder@cambium-inc.com>;

Muloin, Gary (MECP) <Gary.Muloin@ontario.ca>
Subject: Warsaw Road Closed WDS, ECA # A340902

Hi Cameron,

Just following up on your email to Gary regarding the Warsaw file. Mark and I discussed the proposed modifications.

1. Mark noted TW-2, TW-3, TW8-2 have been proposed as SW trigger locations (sentry wells). We note that TW6-2 is located closer to the landfill than TW3. We propose to include it in place of TW-3.

2. Mark also noted phenolics as a potential trigger parameter. I note they are elevated in the background wells already -the background well showing 3 ug/L in 2020 I think it might be worth breaking out the individual phenolics for analyses and comparison to PWQOs. I also note that phenolics appear to be showing more exceedances in 2020 than previous years. There are isomer specific PWQOs for individual phenolics which should be used.

3. I would also like "significantly elevated" to be better defined.

Let us know if you would like to discuss further.

Alija Bos, B.Sc., P.Geo.

Hydrogeologist

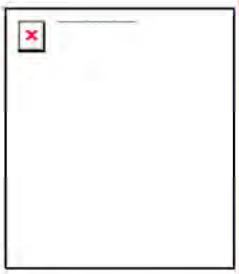
Ministry of the Environment, Conservation and Parks

Eastern Region

1259 Gardiners Road, Unit 3, Kingston ON K7P 3J6

Cell : 613.484.7908

Email: alija.bos@ontario.ca



Cameron MacDougall, P.Geo.
Project Manager
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Cambium is Celebrating 15 Years of Guiding Great Outcomes!
Since 2006, our team has worked diligently to bring the insights needed for good decisions and collective success. We are grateful for what has been and is yet to come!

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March 21, 2022

Ministry of the Environment, Conservation and Parks
Peterborough District Office
300 Water Street, 2nd Floor
Peterborough, Ontario
K9J 3C7

Attn: Gary Muloin
Senior Environmental Officer

Re: Summary of Reduced Environmental Monitoring Program – Warsaw Road Landfill
Township of Douro-Dummer
Provisional Certificate of Approval No.: A340902
Cambium Reference: 12987-003

Dear Mr. Muloin,

The Corporation of the Township of Douro-Dummer (Township) retained Cambium Inc. (Cambium) in 2021 to complete environmental monitoring services at the Warsaw Road Closed Landfill (Site).

Cambium reviewed historical groundwater and surface water quality data of the Site and determined that reductions to the current environmental monitoring programs were appropriate. A letter[1] summarizing the proposed reductions was sent to the Ministry of Environment, Conservation and Parks (Ministry) in the summer of 2021. The Ministry's groundwater and surface water reviewers provided separate responses [2,3] to Cambium's proposed reduction letter. In summary, the Ministry's review staff agreed that the monitoring program can be reduced, however the existing surface water trigger mechanism was not deemed

[1] Cambium Inc. (August 5, 2021), Re: Request for Review of Potential Reductions to Environmental Monitoring Program – Warsaw Road Landfill Township of Douro-Dummer Provisional Certificate of Approval No.: A340902 Cambium Reference: 12987-003
[2] Ministry of Environment, Conservation and Parks (September 1, 2021), Re: 2020 Annual Monitoring Report, Warsaw Road Waste Disposal Site, Certificate of Approval # A34902, Pt Lot 8, Concession V, Township of Douro-Dummer, ECHO#: 1-64662138
[3] Ministry of Environment, Conservation and Parks (October 4, 2021), Re: Warsaw Road Closed Waste Disposal Site A340902, Lot 8, Concession 5, Geographic Township of Douro, Township of Douro-Dummer, 2020 Annual Environmental Monitoring Report – ECHO 1-64662170

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acceptable and should be re-developed. Cambium drafted an email to Ministry staff dated October 20, 2021[4] that outlined potential surface water trigger mechanism. The Ministry reviewed the proposed surface water trigger and provided responses and requested clarification in late 2021 and early 2022[5,6,7]. The specific communications between Cambium and the Ministry will be included in the 2021 Annual Monitoring Report for the Site. Ultimately, a surface water trigger mechanism (and reduced monitoring program) was agreed upon by Cambium and the Ministry. The agreed upon monitoring program and surface water trigger mechanism are described in the following sections.

Note: Cambium began the environmental monitoring program at the Site in spring of 2021. Since that time historical data has been compiled and reviewed. Upon further review of available information it is considered prudent to expand the list of Leachate Indicator Parameters (LIPs) initially referenced in the proposed surface water trigger mechanism. The suggested LIPs are outlined in the table below (and include the previously suggested LIPs, and the newly included LIPs).

Reduced Monitoring Program

As per recent communications with the Ministry the surface water sampling program at the Site can cease (beginning in the spring of 2022). Groundwater sampling from all wells will be reduced to once annual (commencing in the spring of 2022). The residential well sampling program should remain unchanged (and occur once every 3rd year). Groundwater samples will be analyzed for those parameters listed in Column 4, Schedule 5 of the Landfill Standards[8] in addition to manganese, magnesium, potassium, sodium, barium and boron. Landfill gas

[4] Cambium Inc. (October 20, 2021), Re: MECP surface Water Comments – Warsaw Road Closed WDS ECA, # A340902
[5] Ministry of Environment, Conservation and Parks (December 29, 2021), Warsaw Road Closed WDS, ECA # A34090
[6] Cambium Inc. (February 2, 2022), RE: Warsaw Road Closed WDS, ECA # A340902 (12987-003)
[7] Ministry of Environment, Conservation and Parks (March 1, 2022), MECP Technical Support Section Comments - Warsaw Road Closed WDS, ECA # A340902
[8] Ministry of Environment (January 2012), Landfill Standards: A Guideline on the Regulatory and Approval Requirements for New or Expanding Landfill Sites

measurements will occur twice annually from the six gas probes only (commencing in the spring of 2022). The reporting frequency will be reduced to once every two years.

Surface Water Trigger Mechanism

Trigger – Sentry Well Locations

Under the reduced monitoring program surface water sampling will be suspended and groundwater sampling will occur from all on-site wells once annually. Potential impacts to the adjacent surface water system will be monitored by groundwater sampling from sentry wells as groundwater is interpreted to discharge to surface water in the areas south and southwest of the waste mound. Sentry wells were determined to be TW-2, TW3-2 and TW8-2. Site plans are attached to this letter.

Trigger Parameters and Concentrations

The surface-water trigger criteria are comprised of the leachate indicator parameters (LIPs) outlined in the table below

Chloride	Iron	Manganese	Magnesium
Potassium	Sodium	TDS	
Barium*	Boron*	Total Phosphorus*	Alkalinity*
TKN*			

*Notes: * LIPs added after final discussion with Ministry*

The trigger criteria are:

- The PWQO[9] criteria for iron
- The CWQG[10] for chloride
- The BCG[11] for boron

[9] Ministry of Environment and Energy (1994), Water Management: Policies, Guidelines, Provinicial Water Quality Objectives
[10] Canadian Council of Ministers of the Environment (2011), Canadian Water Quality Guidelines for the Protection of Aquatic Life
[11] British Columbia Ministry of Environment (2016), British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildelife & Agriculture

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- The background concentration for the remaining LIPs (as no PWQO criteria are available). Background concentrations are be defined as the 75th percentile concentrations of the eight most recent sampling events (not including the current sampling year). The background concentration will also be used for comparison if it is greater than an associated PWQO, CWQG, BCG as was the case for chloride in 2021.

Trigger Mechanism

The trigger mechanism for the Site includes a three-tier system.

Tier One

Tier One is monitoring of the landfill related parameters as outlined in the approved monitoring program. Following each sampling event, the water quality will be assessed, and Tier Two will be initiated if both of the following conditions are satisfied:

i. one or more parameter concentrations at one of the sentry wells (TW-2, TW-3 and TW8-2) are greater than the trigger concentration on three consecutive occasions.

ii. One or more parameter concentrations at sentry wells TW-2, TW-3 and TW8-2 are reported as significantly elevated in compared to historical data during three consecutive sampling events.

Tier Two

Tier Two includes the following steps:

i. Notify the Township of the trigger exceedances.

ii. Complete an assessment to determine if the trigger exceedance(s) is causing unacceptable impacts to the receiving watercourse and if the landfill is the primary contributing source to the elevated concentrations. The assessment should consider the need to sample at additional surface water and/or groundwater locations and/or the need for analysis of additional parameters to assess compliance (such as toxicity testing).

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iii. If the groundwater conditions that triggered Tier Two of the mechanism are interpreted to be a result of landfill leachate influence, and that adverse impacts are expected to the receiving watercourse (which could result in additional testing to assess the potential impacts), then Tier Three of the trigger will be activated.

Tier Three

Tier Three includes the following:

i. Immediately notify the District Manager of the trigger initiation.

ii. Provide the District Manager with the results of the assessment completed as part of Tier Two, including the proposed sampling plan for review and approval, if applicable. This step should be completed within three months of the original trigger exceedance.

iii. If assessment or confirmatory testing indicates that adverse impacts are expected and/or evident to the receiving watercourse and are landfill-related, development of a contingency plan that includes an evaluation of remedial options in consultation with the Township and the Ministry, with discussions to occur within six months of the original trigger exceedance. (Note: at this stage it is unknown what the contingency plan could be. However, the first step will likely be re-implementing the existing surface water sampling program, or a portion thereof. Additional sampling and other remedial options can be determined at a later date, should the surface water program ever be re-instated.).

Potential contingency plan measures/remedial options (should they ever be required).

- Acquisition of additional buffer lands
- Drainage improvements
- Installation of additional low permeability soil or geotextile capping
- Additional sampling locations

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March 21, 2022

Any recommendation for remedial action should include a time frame for completion of studies and implementation, as well as recommended changes to the monitoring program to assess the effectiveness of the action taken.

Closing

We hope this document clearly summarizes the agreed upon changes to the environmental monitoring program and the trigger mechanism at the Site. Please contact the undersigned at 705-742-7900 for clarification.

Best regards,

Cambium Inc.

Cameron MacDougall, P.Geo.
Project Manager

CJM

Encl. *Figure 1. Regional Location Plan*
Figure 2. Local Topography Plan
Figure 3. Existing Conditions

Copies:

P:\12900 to 12999\12987-003 TDD - Warsaw Road\Correspondence\Letters\2022-03-17 LTR Monitoring Program Changes - Warsaw Road WDS.docx

2021 ANNUAL REPORT
WARSAW ROAD LANDFILL

THE CORPORATION OF THE
TOWNSHIP OF DOURO - DUMMER
County Road 4 and Douro 4th Line
Warsaw, Ontario

LEGEND

- Highway
- Major Road
- Railroad
- Watercourse
- Water Area
- Provincial Park
- Wooded Area
- Built Up Area
- Lower Tier Municipality

Notes:
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
- Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.

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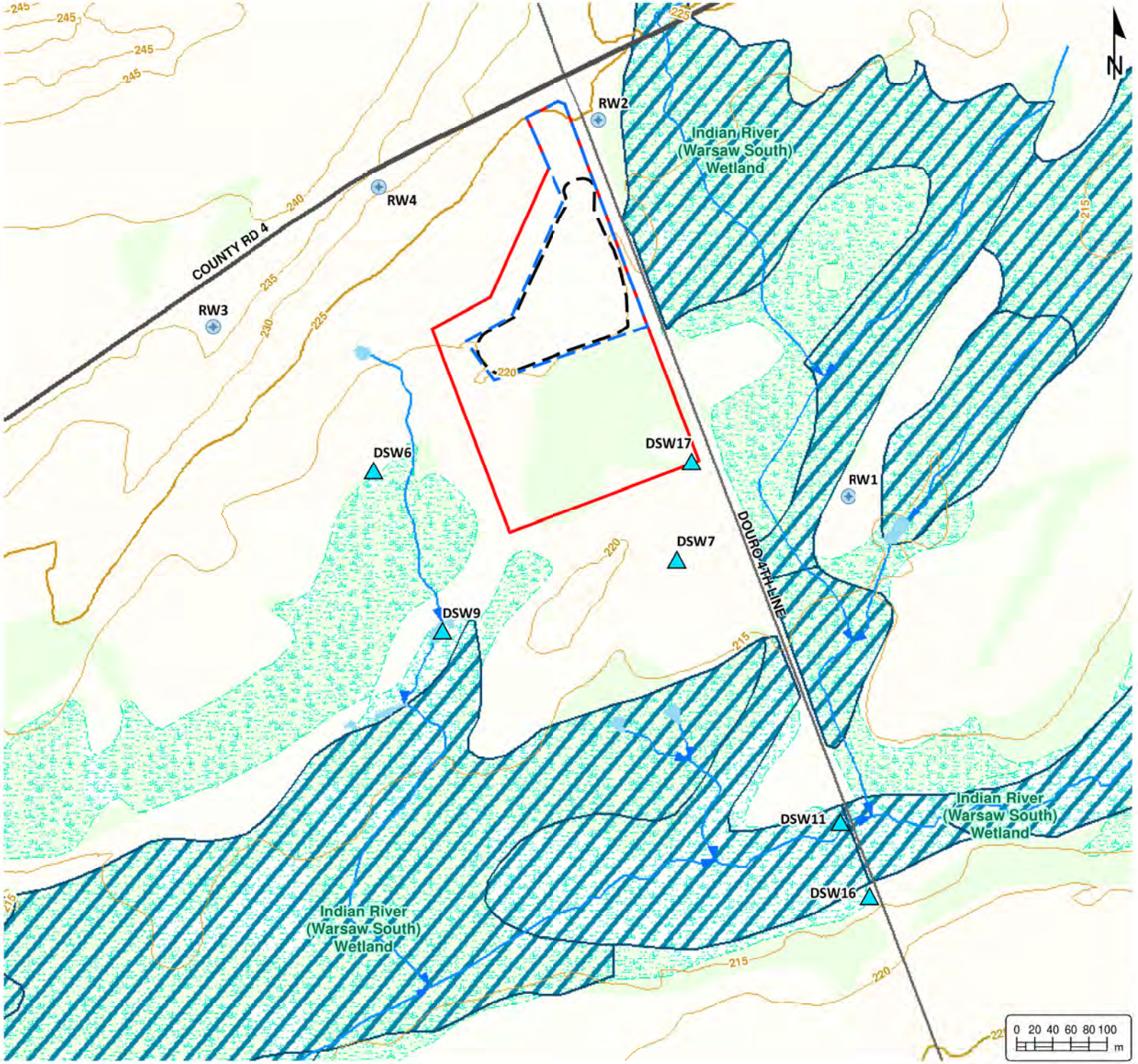
REGIONAL LOCATION PLAN

Project No.: 12987-003		Date: March 2022	
		Rev.:	
Scale: 1:300,000		Projection: NAD 1983 UTM Zone 17N	
Created by: TLC	Checked by: CM	Figure: 1	

O:\GIS\MXDs\12900-12999\12987-003 TDD - Warsaw Road\2022-01-05 FIG 1 - Regional Location Plan.mxd



2021 ANNUAL REPORT
WARSAW ROAD LANDFILL

THE CORPORATION OF THE TOWNSHIP OF DOURO - DUMMER

County Road 4 and Douro 4th Line
Warsaw, Ontario

LEGEND

- Residential Well
- Surface Water Location
- Major Road
- Minor Road
- Watercourse, Permanent
- Contour 5m Interval (Major)
- Contour 5m Interval (Minor)
- Unevaluated Wetlands
- Provincially Significant Wetlands
- Water Area
- Wooded Area
- Licensed Boundary (approximate)
- Waste Footprint (approximate)
- Site (approximate)

Notes:
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
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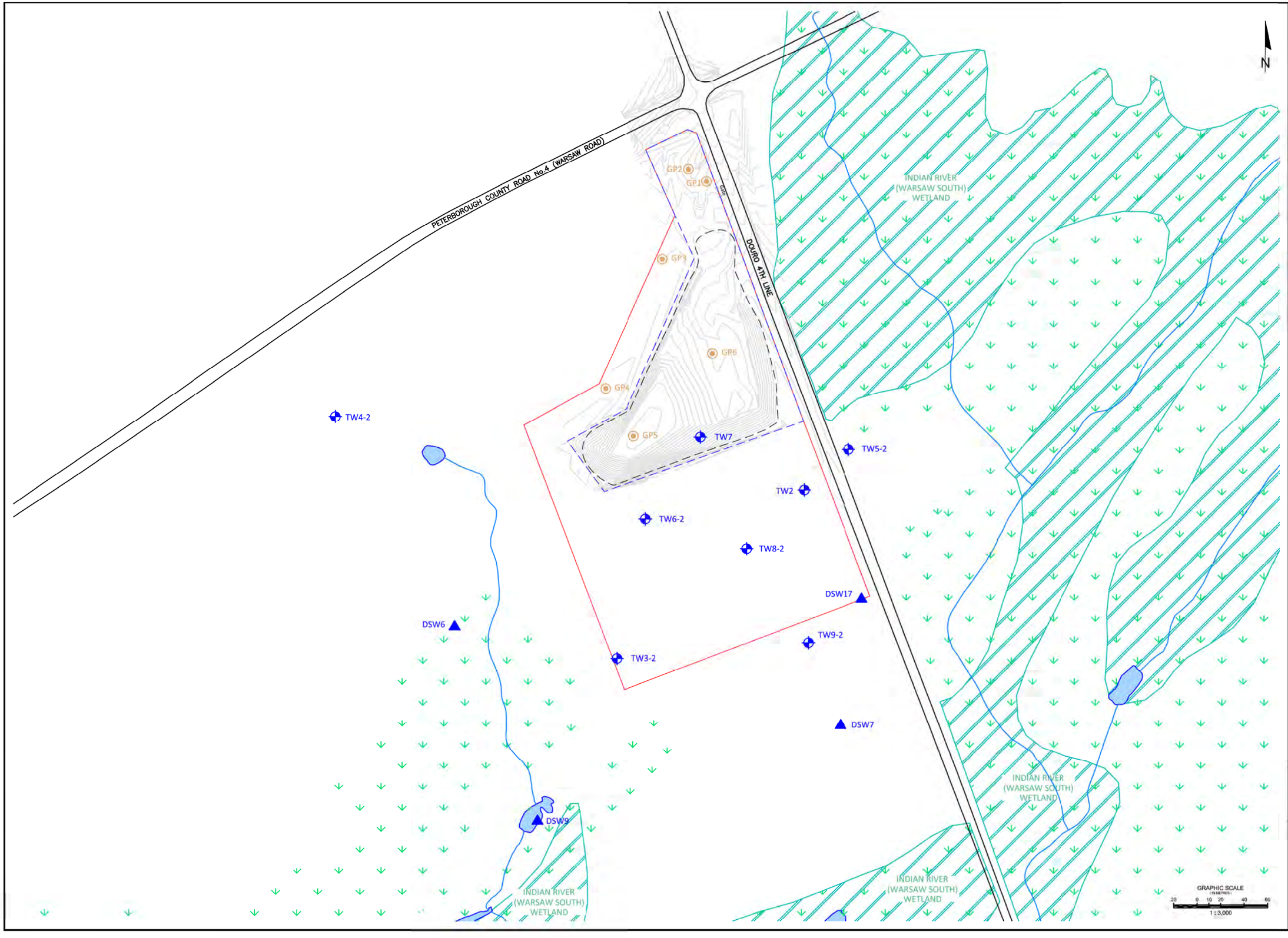
LOCAL TOPOGRAPHY PLAN

Project No.:	Date:	
12987-003	March 2022	
Scale:	Rev.:	
1:6,000	Projection: NAD 1983 UTM Zone 17N	
Created by: TLC	Checked by: CM	Figure: 2

O:\GIS\MXDs\12900-12999\12987-003 TDD - Warsaw Road\2022-01-05 Fig 2 - Local Topography Plan.mxd

2021 ANNUAL REPORT
WARSAW ROAD LANDFILL
THE CORPORATION OF THE TOWNSHIP OF DOURO-DUMMER

COUNTY ROAD 4 AND DOURO 4th LINE
WARSAW, ONTARIO



LEGEND

- Gas Probe
- Surface Water Location
- Test Well
- Site (approximate)
- Licensed Boundary (approximate)
- Waste Footprint (approximate)
- Topographic Contour
- Watercourse
- Water Area
- Unevaluated Wetland
- Provincially Significant Wetland

Notes:
1. Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.

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EXISTING CONDITIONS

Project No.: 12987-003	Date: March 2022 Rev.:	
Horizontal Scale: 1:3,000	Projection: UTM Zone 17N	
Drawn By: TLC	Checked By: CM	Figure: 3

P:\12900 to 12999\12987-003 TDD - Warsaw Road\Graphics\Drawings\CAD\2022-02-02 Warsaw AMR.dwg

Ministry of the Environment, Conservation and Parks
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Ministère de l'Environnement, de la Protection de la nature et des Parcs
Région de l'Est
Bureau du district de Peterborough
300, rue Water
2e étage, Tour Sud
Peterborough (Ontario) K9J 3C7
Tél: 705 755-4300 ou
1 800 558-0595

Ontario

March 22, 2022

The Corporation of the Township of Douro-Dummer
894 South Street
Warsaw, Ontario, K0L 3A0

Dear Elana Arthurs, CAO:

Re: Environmental Monitoring Changes at Closed Warsaw Waste Disposal Site, Environmental Compliance Approval # A340902
Lot 8, Concession 5, Township of Douro-Dummer (Douro)

This will follow-up the correspondence submitted to this office by Cambium Inc. (dated March 21, 2022), detailing changes to the surface water and groundwater monitoring and reporting program at the closed Warsaw Waste Disposal Site.

Ministry staff have previously reviewed and commented upon the above-noted changes to the environmental monitoring program at the site. This letter shall serve as an acknowledgement that this office accepts the environmental monitoring changes and reporting frequency for the closed Warsaw Waste Disposal Site as established by your consultant in the correspondence dated March 21, 2022.

Should you have any questions with regards to this letter, please contact me directly at 705-927-7811 or by e-mail at gary.muloin@ontario.ca.

Regards,

Gary Muloin

Gary Muloin
Provincial Officer
Peterborough District Office
Ministry of the Environment, Conservation & Parks

File SI PB DD CO5 610 – Lot 8, Concession 5, Douro Ward
c: Mr. Cameron MacDougall, P.Geo., Cambium Inc., P.O. Box 325, Peterborough, ON K9J 6Z3
Mr. Jake Condon, Township of Douro-Dummer

Appendix D

Field Sheets and Climate Data

Fully accessible appended items are available upon request.

LOCATION: Warsaw Road WDS DATE: June 21, 2021 WEATHER (SAMPLE DAY): 18°C Sun and Rain 26°

PROJECT NUMBER: 12987-003 SAMPLED BY: M. Pion and R. Doyle WEATHER (PREVIOUS DAY): 29°C Sun

FIELD SHEET – GROUNDWATER DEVELOPMENT & SAMPLING

Sample Location	Water Level	B.H. Depth (m)	B.H. Dia. (mm)	Stick – Up (m)	Purge Volumes (L)		Temp (°C)	pH (units)	Cond. (µS/cm)	DO (mg/L)	ORP (mV)	CH4 (% lel)	H2S (ppm)	Observations				
					Needed	Actual								Clarity	Colour	Odour	Sheen	Other
TW2	1.79	2.27	38.1	1.30	1.25	1.25	14.5	7.36	1131	9.21	174	<1	<0.1	Cloudy	Grey	Swampy	None	O2: 17.9 % vol CO2: 0.0 % vol
TW3-2	2.02	4.46	38.1	1.29	11	11	15.5	7.02	975	1.59	155	<1	<0.1	Cloudy	Brown	None	None	O2: 20.9 % vol CO2 0.0 % vol
TW4-2	1.87	5.47	50.8	1.01	21	21	13.8	7.19	786	6.74	144	<1	<0.1	Cloudy	Brown	None	None	O2: 20.9 % vol CO2 0.0 % vol
TW5-2	1.30	7.73	50.8	0.65	38	Dry x1 17	11.5	7.34	980	6.93	176	<1	<0.1	Cloudy	Grey	None	None	O2: 18.3 % vol CO2 0.0 % vol
TW6-2	2.92	4.67	50.8	0.76	10	10	15.3	6.97	936	6.20	143	<1	<0.1	Clear	None	None	None	O2: 20.9 % vol CO2 0.0 % vol
TW7	4.38	8.39	50.8	0.35	24	Dry x1 8	12.5	7.16	980	7.13	190	<1	<0.1	Opaque	Grey	None	None	O2: 17.8 % vol CO2 0.0 % vol
TW8-2	2.33	7.84	50.8	0.80	33	Dry x1 15	9.7	7.41	994	5.27	167	<1	<0.1	Opaque	Brown	None	None	O2: 16.0 % vol CO2 0.0 % vol QA/QC
TW9-2	7.76	7.95	50.8	1.24	-	-	-	-	-	-	-	<1	<0.1	-	-	-	-	O2: 20.9 %vol CO2: 0.0 % vol Insufficient volumes

LOCATION: Warsaw Road WDS

DATE: November 10, 2021

WEATHER (SAMPLE DAY): -2°C Sun 12°C

PROJECT NUMBER: 12987-003

SAMPLED BY: N. Morin, M. Pion and W. Verduyn

WEATHER (PREVIOUS DAY): 10°C Sun

FIELD SHEET – GROUNDWATER DEVELOPMENT & SAMPLING

Sample Location	Water Level	B.H. Depth (m)	B.H. Dia. (mm)	Stick – Up (m)	Purge Volumes (L)		Temp (°C)	pH (units)	Cond. (µS/cm)	DO (mg/L)	ORP (mV)	CH4 (% lel)	H2S (ppm)	Observations				
					Needed	Actual								Clarity	Colour	Odour	Sheen	Other
TW2	1.44	2.27	38.1	1.30	2.75	Dry x 1 1	8.8	7.11	535	5.31	105	<1	<0.1	Opaque	Brown	Swampy	None	O2: 20.9 % vol CO2: 0.0 % vol
TW3-2	1.46	4.46	38.1	1.29	11	Dry x 1 4	11.5	6.99	169	7.07	101	<1	<0.1	Opaque	Grey	None	None	O2: 20.9 % vol CO2: 0.0 % vol
TW4-2	1.69	5.47	50.8	1.01	24	24	12.5	7.08	344	6.97	86	<1	<0.1	Cloudy	Grey	None	None	O2: 20.9 % vol CO2: 0.0 % vol
TW5-2	1.05	7.73	50.8	0.65	41	Dry x 1 21	10.2	7.20	391	3.32	106	<1	<0.1	Opaque	Grey	None	None	O2: 20.9 % vol CO2: 0.0 % vol
TW6-2	2.61	4.67	50.8	0.76	13	Dry x 1 5	12.3	6.77	441	3.17	101	<1	<0.1	Clear	None	None	None	O2: 20.6 % vol CO2: 0.0 % vol
TW7	4.16	8.39	50.8	0.35	26	26	10.6	7.18	423	11.01	121	<1	<0.1	Opaque	Grey	None	None	O2: 20.9 % vol CO2: 0.2 % vol QA/QC
TW8-2	2.03	7.84	50.8	0.80	36	Dry x 1 26	9.3	7.49	428	8.73	102	<1	<0.1	Opaque	Grey	None	None	O2: 20.9 % vol CO2: 0.0 % vol
TW9-2	7.76	7.95	50.8	1.24	-	-	-	-	-	-	-	<1	<0.1	-	-	-	-	O2: 20.9 % vol CO2: 0.0 % vol Insufficient Volumes

LOCATION: Warsaw Road WDS DATE: June 21, 2021 WEATHER (SAMPLE DAY): 18°C Sun and Rain 26°C

PROJECT NUMBER: 12987-003 SAMPLED BY: M. Pion and R. Doyle WEATHER (PREVIOUS DAY): 29°C Sun

FIELD SHEET – SURFACE WATER SAMPLING

Sample Location	Depth (m)	Width (m)	Velocity (m/s)	Discharge (m^3/s)	Temp (°C)	pH (units)	Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Observations				
										Clarity	Colour	Odour	Sheen	Other
DSW06	-	-	-	-	-	-	-	-	-	-	-	-	-	Dry
DSW07	-	-	-	-	-	-	-	-	-	-	-	-	-	Dry
DSW09	-	-	-	-	-	-	-	-	-	-	-	-	-	Dry
DSW11	0.35	Ponded – No Observable Flow			25.8	7.78	727	7.47	131	Clear	None	None	None	QA/QC
DSW16	-	-	-	-	-	-	-	-	-	-	-	-	-	Dry
DSW17	-	-	-	-	-	-	-	-	-	-	-	-	-	Dry

LOCATION: Warsaw Road WDS

DATE: November 10, 2021

WEATHER (SAMPLE DAY): -2°C Sun 12°C

PROJECT NUMBER: 12987-003

SAMPLED BY: N. Morin, M. Pion and W. Verduyn

WEATHER (PREVIOUS DAY): 10°C Sun

FIELD SHEET – SURFACE WATER SAMPLING

Sample Location	Depth (m)	Width (m)	Velocity (m/s)	Discharge (m^3/s)	Temp (°C)	pH (units)	Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Observations				
										Clarity	Colour	Odour	Sheen	Other
DSW06	0.01	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient Volume
DSW07	0.04	Ponded - No Observable Flow			4.7	7.62	374	9.42	131	Clear	Yellow	Swampy	None	
DSW09	-	-	-	-	-	-	-	-	-	-	-	-	-	Dry
DSW11	0.81	1.25	0.10	0.101	5.0	7.01	293	3.85	197	Clear	Yellow	None	None	QA/QC
DSW16	0.08	Ponded - No Observable Flow			3.2	7.42	300	6.85	157	Clear	None	None	None	
DSW17	0.08	Ponded - No Observable Flow			4.7	7.37	433	3.35	153	Clear	None	None	None	

LOCATION: Warsaw Road WDS DATE: June 21, 2021 WEATHER (SAMPLE DAY): 18°C Sun and Rain 26°C

PROJECT NUMBER: 12987-003 SAMPLED BY: M. Pion and R. Doyle BAROMETRIC PRESSURE: ↑ 99.7 kPa

FIELD SHEET – Landfill Gas Monitoring

Sample Location	Water Level	B.H. Depth (m)	B.H. Dia. (mm)	Stick – Up (m)	Purge Volumes (L)		CH4 (% lel)		H2S (ppm)		O2 (% vol)	CO2 (% vol)	Observations				
					Needed	Actual	Peak	Stable	Peak	Stable			Clarity	Colour	Odour	Sheen	Other
GP1	-	3.30	50.8	1.14	-	-	<1	<1	<0.1	<0.1	18.9	0.0	-	-	-	-	Dry
GP2	-	3.06	50.8	1.06	-	-	<1	<1	<0.1	<0.1	18.1	0.9	-	-	-	-	Dry
GP3	-	2.35	50.8	1.19	-	-	<1	<1	<0.1	<0.1	17.3	1.7	-	-	-	-	Dry
GP4	-	-	-	1.17	-	-	<1	<1	<0.1	<0.1	18.0	0.1	-	-	-	-	Unable to get gas probe cap off
GP5	-	-	-	-	-	-	7	-	<0.1	-	0.3	2.0	-	-	-	-	Landfill Gas Vent Went into alarm
GP6	-	-	-	-	-	-	<1	<1	<0.1	<0.1	20.9	0.0	-	-	-	-	Landfill Gas Vent

Notes: Due to alarms no stable readings recorded at GP5

LOCATION: Warsaw Road WDS DATE: July 14, 2021 WEATHER (SAMPLE DAY): 19°C Sun 27°C

PROJECT NUMBER: 12987-003 SAMPLED BY: M. Pion BAROMETRIC PRESSURE: ↑ 101.8 kPa

FIELD SHEET – Landfill Gas Monitoring

Sample Location	Water Level	B.H. Depth (m)	B.H. Dia. (mm)	Stick – Up (m)	Purge Volumes (L)		CH4 (% vol)		H2S (ppm)		O2 (% vol)	CO2 (%vol)	Observations				
					Needed	Actual	Peak	Stable	Peak	Stable			Clarity	Colour	Odour	Sheen	Other
GP1	-	3.30	50.8	1.14	-	-	<0.01	<0.01	<0.1	<0.1	18.9	10000	-	-	-	-	Dry
GP2	-	3.06	50.8	1.06	-	-	<0.01	<0.01	<0.1	<0.1	19.5	10000	-	-	-	-	Dry
GP3	-	2.35	50.8	1.19	-	-	<0.01	<0.01	<0.1	<0.1	17.6	10000	-	-	-	-	Dry
GP4	-	-	-	1.17	-	-	<0.01	<0.01	<0.1	<0.1	20.1	5550	-	-	-	-	Unable to get gas probe cap off
GP5	-	-	-	-	-	-	5	-	<0.1	-	17.4	10000	-	-	-	-	Landfill Gas Vent Went into alarm
GP6	-	-	-	-	-	-	<0.01	<0.01	<0.1	<0.1	20.9	400	-	-	-	-	Landfill Gas Vent

Notes: Due to alarms no stable readings recorded at GP5

LOCATION: Warsaw Road WDS DATE: August 26, 2021 WEATHER (SAMPLE DAY): 19°C Sun 30°C

PROJECT NUMBER: 12987-003 SAMPLED BY: M. Pion BAROMETRIC PRESSURE: ↑ 101.8 kPa

FIELD SHEET – Landfill Gas Monitoring

Sample Location	Water Level	B.H. Depth (m)	B.H. Dia. (mm)	Stick – Up (m)	Purge Volumes (L)		CH4 (% lel)		H2S (ppm)		O2 (% vol)	CO2 (% vol)	Observations				
					Needed	Actual	Peak	Stable	Peak	Stable			Clarity	Colour	Odour	Sheen	Other
GP1	-	3.30	50.8	1.14	-	-	<0.01	<0.01	<0.1	<0.1	20.1	0.8	-	-	-	-	Dry
GP2	-	3.06	50.8	1.06	-	-	<0.01	<0.01	<0.1	<0.1	20.4	0.7	-	-	-	-	Dry
GP3	-	2.35	50.8	1.19	-	-	<0.01	<0.01	<0.1	<0.1	19.7	1.3	-	-	-	-	Dry
GP4	-	-	-	1.17	-	-	<0.01	<0.01	<0.1	<0.1	20.7	0.3	-	-	-	-	Unable to get gas probe cap off
GP5	-	-	-	-	-	-	15% vol	-	<0.1	-	15.3	5.1	-	-	-	-	Landfill Gas Vent Went into alarm
GP6	-	-	-	-	-	-	<0.01	<0.01	<0.1	<0.1	20.7	0.2	-	-	-	-	Landfill Gas Vent

Notes: Due to alarms no stable readings recorded at GP5

LOCATION: Warsaw Road WDS DATE: September 17, 2021 WEATHER (SAMPLE DAY): 8°C Overcast 22°C

PROJECT NUMBER: 12987-003 SAMPLED BY: N. Morin BAROMETRIC PRESSURE: ↑ 102.3 kPa

FIELD SHEET – Landfill Gas Monitoring

Sample Location	Water Level	B.H. Depth (m)	B.H. Dia. (mm)	Stick – Up (m)	Purge Volumes (L)		CH4 (% lel)		H2S (ppm)		O2 (% vol)	CO2 (% vol)	Observations				
					Needed	Actual	Peak	Stable	Peak	Stable			Clarity	Colour	Odour	Sheen	Other
GP1	-	3.30	50.8	1.14	-	-	<0.01	<0.01	<0.1	<0.1	20.2	0.4	-	-	-	-	Dry
GP2	-	3.06	50.8	1.06	-	-	<0.01	<0.01	<0.1	<0.1	19.0	0.7	-	-	-	-	Dry
GP3	-	2.35	50.8	1.19	-	-	<0.01	<0.01	<0.1	<0.1	17.8	1.3	-	-	-	-	Dry
GP4	-	-	-	1.17	-	-	<0.01	<0.01	<0.1	<0.1	18.4	0.7	-	-	-	-	Unable to get gas probe cap off
GP5	-	-	-	-	-	-	13% vol	-	<0.1	-	17.9	1.1	-	-	-	-	Landfill Gas Vent Went into alarm
GP6	-	-	-	-	-	-	<0.01	<0.01	<0.1	<0.1	18.4	0.0	-	-	-	-	Landfill Gas Vent

Notes: Due to alarms no stable readings recorded at GP5

LOCATION: Warsaw Road WDS

DATE: November 10, 2021

WEATHER (SAMPLE DAY): -2°C Sun 10°C

PROJECT NUMBER: 12987-003

SAMPLED BY: N. Morin, M. Pion and W. Verduyn

BAROMETRIC PRESSURE: ↑ 102.2 kPa

FIELD SHEET – Landfill Gas Monitoring

Sample Location	Water Level	B.H. Depth (m)	B.H. Dia. (mm)	Stick – Up (m)	Purge Volumes (L)		CH4 (% lel)		H2S (ppm)		O2 (% vol)	CO2 (% vol)	Observations				
					Needed	Actual	Peak	Stable	Peak	Stable			Clarity	Colour	Odour	Sheen	Other
GP1	-	3.30	50.8	1.14	-	-	<0.01	<0.01	<0.1	<0.1	20.9	0.0	-	-	-	-	Dry
GP2	-	3.06	50.8	1.06	-	-	<0.01	<0.01	<0.1	<0.1	20.9	0.5	-	-	-	-	Dry
GP3	-	2.35	50.8	1.19	-	-	1.1	<0.01	<0.1	<0.1	20.9	0.7	-	-	-	-	Dry
GP4	-	-	-	1.17	-	-	<0.01	<0.01	<0.1	<0.1	20.9	0.0	-	-	-	-	Unable to get gas probe cap off
GP5	-	-	-	-	-	-	11% vol	-	0.8	-	17.4	0.4	-	-	-	-	Landfill Gas Vent Went into alarm
GP6	-	-	-	-	-	-	<0.01	<0.01	<0.1	<0.1	20.9	0.0	-	-	-	-	Landfill Gas Vent

Notes: Due to alarms no stable readings recorded at GP5

LOCATION: Warsaw Road WDS DATE: December 16, 2021 WEATHER (SAMPLE DAY): 8°C Sun and Cloud 13°C

PROJECT NUMBER: 12987-003 SAMPLED BY: N. Morin BAROMETRIC PRESSURE: ↓100.4 kPa

FIELD SHEET – Landfill Gas Monitoring

Sample Location	Water Level	B.H. Depth (m)	B.H. Dia. (mm)	Stick – Up (m)	Purge Volumes (L)		CH4 (% lel)		H2S (ppm)		O2 (% vol)	CO2 (% vol)	Observations				
					Needed	Actual	Peak	Stable	Peak	Stable			Clarity	Colour	Odour	Sheen	Other
GP1	2.79	3.30	50.8	1.14	-	-	<0.01	<0.01	<0.1	<0.1	19.3	0.4	-	-	-	-	
GP2	2.97	3.06	50.8	1.06	-	-	<0.01	<0.01	<0.1	<0.1	19.2	0.2	-	-	-	-	
GP3	2.10	2.35	50.8	1.19	-	-	<0.01	<0.01	<0.1	<0.1	19.2	0.1	-	-	-	-	
GP4	-	-	-	1.17	-	-	<0.01	<0.01	<0.1	<0.1	19.1	0.0	-	-	-	-	Unable to get gas probe cap off
GP5	-	-	-	-	-	-	5.5% vol	-	0.8	-	15.8	1.1	-	-	-	-	Landfill Gas Vent Went into alarm
GP6	-	-	-	-	-	-	<0.01	<0.01	<0.1	<0.1	19.2	0.0	-	-	-	-	Landfill Gas Vent

Notes: Due to alarms no stable readings recorded at GP5

Daily Data Report for June 2021

PETERBOROUGH TRENT U
ONTARIO
Current Station Operator: ECCC - MSC

Latitude:	44°21'00.000" N	**Longitude:**	78°18'00.000" W	**Elevation:**	216.00 m
Climate ID:	6166456	**WMO ID:**	71672	**TC ID:**	TPQ

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01	25.6	8.2	16.9	1.1	0.0			0.2		25	35
02	25.9	5.8	15.8	2.2	0.0			0.5			
03	22.0	12.3	17.2	0.8	0.0			8.8			
04	26.3	10.9	18.6	0.0	0.6			4.2			
05	31.5	12.8	22.2	0.0	4.2			0.0		26	35
06	32.8	16.0	24.4	0.0	6.4			0.0		21	35
07	30.1	14.2	22.1	0.0	4.1			0.0		22	31
08	28.5	20.8	24.7	0.0	6.7			0.9			
09	31.3	12.9	22.1	0.0	4.1			0.0			
10	M	M	M	M	M			M		M	M
11	24.0	14.6	19.3	0.0	1.3			0.2			
12	28.3	11.6	19.9	0.0	1.9			0.0			
13	28.9	11.2	20.0	0.0	2.0			0.0			
14	22.6	13.0	17.8	0.2	0.0			1.1			
15	24.1	11.2	17.7	0.3	0.0			2.6			
16	22.1	8.4	15.3	2.7	0.0			0.0		26	33
17	26.3	6.9	16.6	1.4	0.0			0.0			
18	22.8	10.8	16.8	1.2	0.0			7.4		21	40
19	28.1	12.5	20.3	0.0	2.3			0.0		25	33
20	28.3	11.5	19.9	0.0	1.9			0.0			
21	29.8	12.4	21.1	0.0	3.1			2.5		31	46
22	19.2	5.7	12.5	5.5	0.0			0.0		25	31
23	23.8	3.9	13.8	4.2	0.0			0.2			
24	27.3	10.0	18.7	0.0	0.7			0.0		13	37
25	23.9	18.0	21.0	0.0	3.0			10.9			
26	25.7	17.4	21.5	0.0	3.5			16.6		19	40
27	30.2	21.7	26.0	0.0	8.0			4.3		22	38
28	31.3	18.2	24.8	0.0	6.8			0.2			
29	28.0	18.1	23.0	0.0	5.0			33.7			
30	27.6	16.4	22.0	0.0	4.0			0.0		26	36
Sum				19.6^	69.6^			94.3^			

Daily Data Report for November 2021

PETERBOROUGH TRENT U
ONTARIO
Current Station Operator: ECCC - MSC

Latitude:	44°21'00.000" N	**Longitude:**	78°18'00.000" W	**Elevation:**	216.00 m
Climate ID:	6166456	**WMO ID:**	71672	**TC ID:**	TPQ

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01	M	M	M	M	M			M		M	M
02	8.1	-2.2	3.0	15.0	0.0			0.7			
03	7.4	-5.1	1.2	16.8	0.0			0.0			
04	5.8	-5.6	0.1	17.9	0.0			0.0			
05	8.8	-6.0	1.4	16.6	0.0			0.2	2		
06	10.9	-5.3	2.8	15.2	0.0			0.0			
07	16.1	-3.6	6.3	11.7	0.0			0.0			
08	16.5	-1.9	7.3	10.7	0.0			0.0			
09	13.4	2.5	8.0	10.0	0.0			0.0	1		
10	12.6	-2.5	5.1	12.9	0.0			0.0			
11	10.9	-3.1	3.9	14.1	0.0			0.0		7	35
12	12.4	1.7	7.1	10.9	0.0			8.5		21	33
13	7.4	1.4	4.4	13.6	0.0			0.8	0	22	34
14	5.0	0.1	2.5	15.5	0.0			8.5			
15	4.4	-3.0	0.7	17.3	0.0			1.1	1		
16	4.6	-4.1	0.2	17.8	0.0			0.2			
17	14.9	-4.0	5.5	12.5	0.0			5.3		23	35
18	14.8	0.6	7.7	10.3	0.0			0.5	1	25	39
19	4.1	-6.0	-1.0	19.0	0.0			2.9	3		
20	4.8	-5.9	-0.5	18.5	0.0			0.7			
21	8.4	-1.8	3.3	14.7	0.0			4.6		25	40
22	4.9	-7.0	-1.1	19.1	0.0			5.5		24	37
23	0.0	-12.3	-6.1	24.1	0.0			0.0			
24	5.9	-11.2	-2.6	20.6	0.0			0.0	1		
25	5.6	2.8	4.2	13.8	0.0			2.8	0		
26	3.7	-6.5	-1.4	19.4	0.0			0.2		30	37
27	-0.1	-7.9	-4.0	22.0	0.0			0.2			
28	-3.0	-10.3	-6.6	24.6	0.0			3.9			
29	-2.0	-14.0	-8.0	26.0	0.0			0.2	0		
30	1.3	-5.7	-2.2	20.2	0.0			2.6	0		
Sum				480.8^	0.0^			49.4^			

Appendix E

Laboratory Certificate of Analysis

Fully accessible appended items are available upon request.

CADUCEON™ ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G103642

REPORT No. B21-19379 (i)

Rev. 1

Report To:

Cambium Environmental
194 Sophia St.,
Peterborough ON K9H 1E5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 23-Jun-21
DATE REPORTED: 28-Jul-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Warsaw Road Landfills
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		TW7	TW5-2	TW2	GW_QAQC
			Sample I.D.		B21-19379-1	B21-19379-2	B21-19379-3	B21-19379-4
			Date Collected		21-Jun-21	21-Jun-21	21-Jun-21	21-Jun-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	24-Jun-21/O	354	296	376	324
Conductivity @25°C	µmho/cm	1	SM 2510B	24-Jun-21/O	957	968	1120	989
pH @25°C	pH Units		SM 4500H	24-Jun-21/O	7.69	7.67	7.83	7.68
Total Dissolved Solids	mg/L	3	SM 2540D	25-Jun-21/O	509	515	602	527
Total Suspended Solids	mg/L	3	SM2540D	24-Jun-21/K	1130	278	263	16400
BOD(5 day)	mg/L	3	SM 5210B	24-Jun-21/K	< 3	< 3	< 3	< 3
COD	mg/L	5	SM5220C	24-Jun-21/K	31	11	36	176
Phenolics	mg/L	0.002	MOEE 3179	25-Jun-21/K	< 0.002	< 0.002	< 0.002	< 0.002
Chloride	mg/L	0.5	SM4110C	25-Jun-21/O	111	140	147	131
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	24-Jun-21/K	0.93	0.06	0.08	0.15
Sulphate	mg/L	1	SM4110C	25-Jun-21/O	2	10	8	14
Nitrite (N)	mg/L	0.05	SM4110C	25-Jun-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	25-Jun-21/O	0.54	0.48	< 0.05	0.06
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	28-Jun-21/K	1.4	0.3	0.7	4.6
Mercury	mg/L	0.00002	SM 3112 B	25-Jun-21/O	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Hardness (as CaCO3)	mg/L	1	SM 3120	24-Jun-21/O	389	380	504	413
Arsenic	mg/L	0.0001	EPA 200.8	28-Jun-21/O	0.0010	< 0.0001	0.0003	0.0001
Barium	mg/L	0.001	SM 3120	24-Jun-21/O	0.168	0.168	0.150	0.231
Boron	mg/L	0.005	SM 3120	24-Jun-21/O	0.082	0.021	0.021	0.026
Cadmium	mg/L	).000015	EPA 200.8	28-Jun-21/O	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Calcium	mg/L	0.02	SM 3120	24-Jun-21/O	139	137	186	145
Chromium	mg/L	0.001	EPA 200.8	28-Jun-21/O	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	0.0001	EPA 200.8	28-Jun-21/O	0.0002	0.0012	0.0009	0.0004
Iron	mg/L	0.005	SM 3120	24-Jun-21/O	4.72	< 0.005	0.111	0.241
Lead	mg/L	0.00002	EPA 200.8	28-Jun-21/O	0.00002	< 0.00002	< 0.00004	< 0.00002
Magnesium	mg/L	0.02	SM 3120	24-Jun-21/O	10.2	9.16	9.44	12.2
Manganese	mg/L	0.001	SM 3120	24-Jun-21/O	1.44	0.001	0.334	0.049

R.L. = Reporting Limit
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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Michelle Dubien
Lab Manager

CADUCEON™ ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G103642

REPORT No. B21-19379 (i)

Rev. 1

Report To:

Cambium Environmental
194 Sophia St.,
Peterborough ON K9H 1E5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 23-Jun-21
DATE REPORTED: 28-Jul-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Warsaw Road Landfills
P.O. NUMBER: 12987-003
WATERWORKS NO.

	Client I.D.				TW7	TW5-2	TW2	GW_QAQC
	Sample I.D.				B21-19379-1	B21-19379-2	B21-19379-3	B21-19379-4
	Date Collected				21-Jun-21	21-Jun-21	21-Jun-21	21-Jun-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Phosphorus-Total	mg/L	0.01	E3199A.1	28-Jun-21/K	0.49	0.49	0.15	16.6
Potassium	mg/L	0.1	SM 3120	24-Jun-21/O	4.8	1.4	0.5	1.8
Sodium	mg/L	0.2	SM 3120	24-Jun-21/O	75.6	78.8	72.1	73.6
Zinc	mg/L	0.005	SM 3120	24-Jun-21/O	< 0.005	< 0.005	< 0.005	< 0.005

1 Revised to provide corrected results for TP, sample #8

Michelle Dubien
Lab Manager

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Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 23-Jun-21
DATE REPORTED: 28-Jul-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Warsaw Road Landfills
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		TW3-2	TW6-2	TW4-2	TW8-2
			Sample I.D.		B21-19379-5	B21-19379-6	B21-19379-7	B21-19379-8
			Date Collected		21-Jun-21	21-Jun-21	21-Jun-21	21-Jun-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	24-Jun-21/O	366	386	284	323
Conductivity @25°C	µmho/cm	1	SM 2510B	24-Jun-21/O	963	924	778	987
pH @25°C	pH Units		SM 4500H	24-Jun-21/O	7.59	7.52	7.69	7.71
Total Dissolved Solids	mg/L	3	SM 2540D	25-Jun-21/O	513	491	408	526
Total Suspended Solids	mg/L	3	SM2540D	24-Jun-21/K	238	7	368	37000
BOD(5 day)	mg/L	3	SM 5210B	24-Jun-21/K	< 3	< 3	< 3	< 3
COD	mg/L	5	SM5220C	24-Jun-21/K	48	12	16	178
Phenolics	mg/L	0.002	MOEE 3179	25-Jun-21/K	< 0.002	< 0.002	< 0.002	< 0.002
Chloride	mg/L	0.5	SM4110C	25-Jun-21/O	97.1	73.9	78.2	132
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	24-Jun-21/K	0.20	0.22	0.10	0.15
Sulphate	mg/L	1	SM4110C	25-Jun-21/O	16	5	7	14
Nitrite (N)	mg/L	0.05	SM4110C	25-Jun-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	25-Jun-21/O	0.07	0.39	1.48	0.06
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	28-Jun-21/K	0.8	0.5	0.4	4.2
Mercury	mg/L	0.00002	SM 3112 B	25-Jun-21/O	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Hardness (as CaCO3)	mg/L	1	SM 3120	24-Jun-21/O	445	434	342	407
Arsenic	mg/L	0.0001	EPA 200.8	28-Jun-21/O	0.0009	< 0.0001	< 0.0001	< 0.0001
Barium	mg/L	0.001	SM 3120	24-Jun-21/O	0.128	0.124	0.048	0.228
Boron	mg/L	0.005	SM 3120	24-Jun-21/O	0.144	0.073	0.009	0.026
Cadmium	mg/L	).000015	EPA 200.8	28-Jun-21/O	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Calcium	mg/L	0.02	SM 3120	24-Jun-21/O	159	160	130	143
Chromium	mg/L	0.001	EPA 200.8	28-Jun-21/O	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	0.0001	EPA 200.8	28-Jun-21/O	0.0005	0.0015	0.0005	0.0004
Iron	mg/L	0.005	SM 3120	24-Jun-21/O	1.67	0.016	< 0.005	0.244
Lead	mg/L	0.00002	EPA 200.8	28-Jun-21/O	0.00004	< 0.00002	< 0.00002	< 0.00002
Magnesium	mg/L	0.02	SM 3120	24-Jun-21/O	11.5	8.25	4.16	12.1
Manganese	mg/L	0.001	SM 3120	24-Jun-21/O	0.283	0.036	< 0.001	0.048

M. Dubien

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Michelle Dubien
Lab Manager

CADUCEON™ ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G103642

REPORT No. B21-19379 (i)

Rev. 1

Report To:

Cambium Environmental
194 Sophia St.,
Peterborough ON K9H 1E5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 23-Jun-21
DATE REPORTED: 28-Jul-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Warsaw Road Landfills
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		TW3-2	TW6-2	TW4-2	TW8-2
			Sample I.D.		B21-19379-5	B21-19379-6	B21-19379-7	B21-19379-8
			Date Collected		21-Jun-21	21-Jun-21	21-Jun-21	21-Jun-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Phosphorus-Total	mg/L	0.01	E3199A.1	28-Jun-21/K	0.26	0.11	0.40	15.3
Potassium	mg/L	0.1	SM 3120	24-Jun-21/O	6.8	6.7	0.5	1.8
Sodium	mg/L	0.2	SM 3120	24-Jun-21/O	59.3	57.2	54.1	73.1
Zinc	mg/L	0.005	SM 3120	24-Jun-21/O	< 0.005	< 0.005	< 0.005	< 0.005

1 Revised to provide corrected results for TP, sample #8

Michelle Dubien
Lab Manager

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G103642

REPORT No. B21-19379 (ii)

Rev. 1

Report To:

Cambium Environmental
194 Sophia St.,
Peterborough ON K9H 1E5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 23-Jun-21
DATE REPORTED: 28-Jul-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Warsaw Road Landfills
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		TW7			
			Sample I.D.		B21-19379-1			
			Date Collected		21-Jun-21			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Bromodichloromethane	µg/L	2	EPA 8260	24-Jun-21/R	< 2			
Bromoform	µg/L	5	EPA 8260	24-Jun-21/R	< 5			
Bromomethane	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Carbon Tetrachloride	µg/L	0.2	EPA 8260	24-Jun-21/R	< 0.2			
Chloroethane	µg/L	3	EPA 8260	24-Jun-21/R	< 3			
Chloroform	µg/L	1	EPA 8260	24-Jun-21/R	< 1			
Chloromethane	µg/L	2	EPA 8260	24-Jun-21/R	< 2			
Dibromochloromethane	µg/L	2	EPA 8260	24-Jun-21/R	< 2			
Dibromoethane,1,2- (Ethylene Dibromide)	µg/L	0.2	EPA 8260	24-Jun-21/R	< 0.2			
Dichlorobenzene,1,2-	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Dichlorobenzene,1,3-	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Dichlorobenzene,1,4-	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Dichloroethane,1,1-	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Dichloroethane,1,2-	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Dichloroethylene,1,1-	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Dichloroethene, cis-1,2-	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Dichloroethene, trans-1,2-	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Dichloromethane (Methylene Chloride)	µg/L	5	EPA 8260	24-Jun-21/R	< 5			
Dichloropropane,1,2-	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Dichloropropene 1,3- cis+trans	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Dichloropropene, trans-1,3-	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Dichloropropene, cis-1,3-	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Monochlorobenzene (Chlorobenzene)	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Styrene	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			

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Michelle Dubien
Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G103642

REPORT No. B21-19379 (ii)

Rev. 1

Report To:

Cambium Environmental
194 Sophia St.,
Peterborough ON K9H 1E5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 23-Jun-21
DATE REPORTED: 28-Jul-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Warsaw Road Landfills
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		TW7			
			Sample I.D.		B21-19379-1			
			Date Collected		21-Jun-21			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Tetrachloroethane,1,1,1,2-	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Tetrachloroethane,1,1,2,2-	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Tetrachloroethylene	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Trichloroethane,1,1,1-	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Trichloroethane,1,1,2-	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Trichloroethylene	µg/L	0.5	EPA 8260	24-Jun-21/R	< 0.5			
Trichlorofluoromethane	µg/L	5	EPA 8260	24-Jun-21/R	< 5			
Vinyl Chloride	µg/L	0.2	EPA 8260	24-Jun-21/R	< 0.2			

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Michelle Dubien
Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G103641

REPORT No. B21-19382

Rev. 1

Report To:

Cambium Environmental
194 Sophia St.,
Peterborough ON K9H 1E5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 23-Jun-21
DATE REPORTED: 20-Jan-22
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Warsaw Road Landfill
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		DSW11	SW_QAQC		
			Sample I.D.		B21-19382-1	B21-19382-2		
			Date Collected		21-Jun-21	21-Jun-21		
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	24-Jun-21/O	287	289		
Conductivity @25°C	µmho/cm	1	SM 2510B	24-Jun-21/O	717	719		
pH @25°C	pH Units		SM 4500H	24-Jun-21/O	7.87	7.94		
Total Dissolved Solids	mg/L	3	SM 2540D	25-Jun-21/O	372	374		
Total Suspended Solids	mg/L	3	SM2540D	25-Jun-21/K	7	7		
BOD(5 day)	mg/L	3	SM 5210B	24-Jun-21/K	< 3	< 3		
COD	mg/L	5	SM5220C	24-Jun-21/K	63	62		
Phenolics	mg/L	0.001	MOEE 3179	25-Jun-21/K	< 0.001	< 0.001		
Chloride	mg/L	0.5	SM4110C	25-Jun-21/O	64.2	68.7		
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	24-Jun-21/K	0.07	0.02		
Ammonia (N)-unionized	mg/L	0.01	CALC	24-Jun-21/K	< 0.01	< 0.01		
Sulphate	mg/L	1	SM4110C	25-Jun-21/O	1	1		
Nitrite (N)	mg/L	0.05	SM4110C	25-Jun-21/O	< 0.05	< 0.05		
Nitrate (N)	mg/L	0.05	SM4110C	25-Jun-21/O	0.11	0.17		
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	28-Jun-21/K	1.1	1.1		
Mercury	mg/L	0.00002	SM 3112 B	28-Jun-21/O	< 0.00002	< 0.00002		
Hardness (as CaCO3)	mg/L	1	SM 3120	24-Jun-21/O	319	330		
Arsenic	mg/L	0.0001	EPA 200.8	25-Jun-21/O	0.0005	0.0005		
Barium	mg/L	0.001	SM 3120	24-Jun-21/O	0.050	0.051		
Boron	mg/L	0.005	SM 3120	24-Jun-21/O	0.023	0.024		
Cadmium	mg/L	0.000015	EPA 200.8	25-Jun-21/O	< 0.000015	< 0.000015		
Chromium	mg/L	0.001	EPA 200.8	25-Jun-21/O	< 0.001	< 0.001		
Copper	mg/L	0.0001	EPA 200.8	25-Jun-21/O	0.0002	0.0001		
Iron	mg/L	0.005	SM 3120	24-Jun-21/O	0.189	0.193		
Lead	mg/L	0.00002	EPA 200.8	25-Jun-21/O	0.00014	0.00004		
Phosphorus-Total	mg/L	0.01	E3199A.1	28-Jun-21/K	0.10	0.09		
Zinc	mg/L	0.005	SM 3120	24-Jun-21/O	0.013	0.013		

R.L. = Reporting Limit
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Michelle Dubien
Lab Manager

CADUCEON™ ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G103641

REPORT No. B21-19382

Rev. 1

Report To:

Cambium Environmental
194 Sophia St.,
Peterborough ON K9H 1E5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 23-Jun-21
DATE REPORTED: 20-Jan-22
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Warsaw Road Landfill
P.O. NUMBER: 12987-003
WATERWORKS NO.

	Client I.D.	DSW11	SW_QAQC		
	Sample I.D.	B21-19382-1	B21-19382-2		
	Date Collected	21-Jun-21	21-Jun-21		
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed	

1. Revised to include U-NH3

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Michelle Dubien
Lab Manager

CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G100968

REPORT No. B21-37305 (i)

Report To:

Cambium Environmental
194 Sophia St.,
Peterborough ON K9H 1E5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 12-Nov-21
DATE REPORTED: 14-Dec-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Warsaw Road Landfills
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		TW7	GW_QAQC	TW5-2	TW2
			Sample I.D.		B21-37305-1	B21-37305-2	B21-37305-3	B21-37305-4
			Date Collected		10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	30-Nov-21/O	326	331	288	428
Conductivity @25°C	µmho/cm	1	SM 2510B	30-Nov-21/O	977	978	912	1290
pH @25°C	pH Units		SM 4500H	30-Nov-21/O	7.86	7.91	7.98	7.79
Total Dissolved Solids	mg/L	3	SM 2540D	01-Dec-21/O	521	521	484	699
Total Suspended Solids	mg/L	3	SM2540D	15-Nov-21/K	1330	1480	1290	3800
BOD(5 day)	mg/L	3	SM 5210B	12-Nov-21/K	< 3	< 3	< 3	3
COD	mg/L	5	SM5220C	25-Nov-21/K	21	22	60	306
Phenolics	mg/L	0.002	MOEE 3179	19-Nov-21/K	< 0.002	< 0.002	< 0.002	< 0.002
Chloride	mg/L	0.5	SM4110C	20-Nov-21/O	112	114	107	156
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	25-Nov-21/K	1.10	1.12	0.06	0.17
Sulphate	mg/L	1	SM4110C	20-Nov-21/O	< 1	< 1	13	1
Nitrite (N)	mg/L	0.05	SM4110C	20-Nov-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	20-Nov-21/O	< 0.05	< 0.05	0.40	< 0.05
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	08-Dec-21/K	1.5	1.5	0.6	4.4
Mercury	mg/L	0.00002	SM 3112 B	17-Nov-21/O	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Hardness (as CaCO3)	mg/L	1	SM 3120	18-Nov-21/O	353	351	340	543
Arsenic	mg/L	0.0001	EPA 200.8	01-Dec-21/O	0.0010	0.0010	0.0001	0.0004
Barium	mg/L	0.001	SM 3120	18-Nov-21/O	0.132	0.132	0.150	0.147
Boron	mg/L	0.005	SM 3120	18-Nov-21/O	0.071	0.072	0.021	0.012
Cadmium	mg/L	0.000015	EPA 200.8	01-Dec-21/O	0.000016	< 0.000015	< 0.000015	< 0.000015
Calcium	mg/L	0.02	SM 3120	18-Nov-21/O	128	127	123	201
Chromium	mg/L	0.001	EPA 200.8	01-Dec-21/O	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	0.0001	EPA 200.8	01-Dec-21/O	0.0002	< 0.0001	0.0015	0.0013
Iron	mg/L	0.005	SM 3120	18-Nov-21/O	4.95	4.94	0.061	0.462
Lead	mg/L	0.00002	EPA 200.8	01-Dec-21/O	0.00004	0.00003	0.00011	0.00018
Magnesium	mg/L	0.02	SM 3120	18-Nov-21/O	7.99	8.04	7.89	9.79
Manganese	mg/L	0.001	SM 3120	18-Nov-21/O	1.49	1.48	0.013	0.717

M. Dubien

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Michelle Dubien
Lab Manager

CADUCEON™ ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G100968

REPORT No. B21-37305 (i)

Report To:

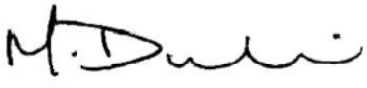
Cambium Environmental
194 Sophia St.,
Peterborough ON K9H 1E5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 12-Nov-21
DATE REPORTED: 14-Dec-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Warsaw Road Landfills
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		TW7	GW_QAQC	TW5-2	TW2
			Sample I.D.		B21-37305-1	B21-37305-2	B21-37305-3	B21-37305-4
			Date Collected		10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Phosphorus-Total	mg/L	0.01	E3199A.1	08-Dec-21/K	0.18	0.17	0.80	2.60
Potassium	mg/L	0.1	SM 3120	18-Nov-21/O	4.3	4.4	1.3	0.3
Sodium	mg/L	0.2	SM 3120	18-Nov-21/O	70.8	71.8	65.2	71.8
Zinc	mg/L	0.005	SM 3120	18-Nov-21/O	< 0.005	< 0.005	< 0.005	< 0.005



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Michelle Dubien
Lab Manager

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DATE RECEIVED: 12-Nov-21
DATE REPORTED: 14-Dec-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Warsaw Road Landfills
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		TW8-2	TW6-2	TW3-2	TW4-2
			Sample I.D.		B21-37305-5	B21-37305-6	B21-37305-7	B21-37305-8
			Date Collected		10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	30-Nov-21/O	292	407	395	280
Conductivity @25°C	µmho/cm	1	SM 2510B	30-Nov-21/O	999	1020	1110	794
pH @25°C	pH Units		SM 4500H	30-Nov-21/O	7.78	7.74	7.68	7.84
Total Dissolved Solids	mg/L	3	SM 2540D	01-Dec-21/O	533	546	597	417
Total Suspended Solids	mg/L	3	SM2540D	15-Nov-21/K	7750	32	1480	268
BOD(5 day)	mg/L	3	SM 5210B	12-Nov-21/K	< 3	< 3	< 3	< 3
COD	mg/L	5	SM5220C	25-Nov-21/K	54	10	44	9
Phenolics	mg/L	0.002	MOEE 3179	19-Nov-21/K	< 0.002	< 0.002	< 0.002	< 0.002
Chloride	mg/L	0.5	SM4110C	20-Nov-21/O	131	74.7	104	75.9
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	25-Nov-21/K	0.17	0.64	0.23	0.07
Sulphate	mg/L	1	SM4110C	20-Nov-21/O	13	6	19	6
Nitrite (N)	mg/L	0.05	SM4110C	20-Nov-21/O	0.06	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	20-Nov-21/O	< 0.05	0.45	< 0.05	0.80
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	08-Dec-21/K	0.5	0.9	0.3	0.4
Mercury	mg/L	0.00002	SM 3112 B	17-Nov-21/O	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Hardness (as CaCO3)	mg/L	1	SM 3120	18-Nov-21/O	388	434	486	334
Arsenic	mg/L	0.0001	EPA 200.8	01-Dec-21/O	0.0001	< 0.0001	0.0010	< 0.0001
Barium	mg/L	0.001	SM 3120	18-Nov-21/O	0.218	0.139	0.141	0.046
Boron	mg/L	0.005	SM 3120	18-Nov-21/O	0.026	0.049	0.166	0.010
Cadmium	mg/L	).000015	EPA 200.8	01-Dec-21/O	< 0.000015	< 0.000015	0.000027	< 0.000015
Calcium	mg/L	0.02	SM 3120	18-Nov-21/O	137	160	175	127
Chromium	mg/L	0.001	EPA 200.8	01-Dec-21/O	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	0.0001	EPA 200.8	01-Dec-21/O	0.0005	0.0019	0.0059	0.0004
Iron	mg/L	0.005	SM 3120	18-Nov-21/O	0.521	0.155	2.16	0.049
Lead	mg/L	0.00002	EPA 200.8	01-Dec-21/O	0.00025	0.00003	0.00123	0.00012
Magnesium	mg/L	0.02	SM 3120	18-Nov-21/O	11.0	8.30	11.7	3.95
Manganese	mg/L	0.001	SM 3120	18-Nov-21/O	0.029	0.180	0.329	0.003

M. Dubien

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Michelle Dubien
Lab Manager

CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G100968

REPORT No. B21-37305 (i)

Report To:

Cambium Environmental
194 Sophia St.,
Peterborough ON K9H 1E5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 12-Nov-21
DATE REPORTED: 14-Dec-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Warsaw Road Landfills
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		TW8-2	TW6-2	TW3-2	TW4-2
			Sample I.D.		B21-37305-5	B21-37305-6	B21-37305-7	B21-37305-8
			Date Collected		10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Phosphorus-Total	mg/L	0.01	E3199A.1	08-Dec-21/K	2.22	0.03	0.07	0.26
Potassium	mg/L	0.1	SM 3120	18-Nov-21/O	1.7	6.9	6.9	0.5
Sodium	mg/L	0.2	SM 3120	18-Nov-21/O	68.1	61.0	59.2	42.9
Zinc	mg/L	0.005	SM 3120	18-Nov-21/O	< 0.005	< 0.005	< 0.005	< 0.005

Michelle Dubien
Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G100968

REPORT No. B21-37305 (ii)

Report To:

Cambium Environmental
194 Sophia St.,
Peterborough ON K9H 1E5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 12-Nov-21
DATE REPORTED: 14-Dec-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Warsaw Road Landfills
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		TW7			
			Sample I.D.		B21-37305-1			
			Date Collected		10-Nov-21			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Bromodichloromethane	µg/L	2	EPA 8260	19-Nov-21/R	< 2			
Bromoform	µg/L	5	EPA 8260	19-Nov-21/R	< 5			
Bromomethane	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Carbon Tetrachloride	µg/L	0.2	EPA 8260	19-Nov-21/R	< 0.2			
Chloroethane	µg/L	3	EPA 8260	19-Nov-21/R	< 3			
Chloroform	µg/L	1	EPA 8260	19-Nov-21/R	< 1			
Chloromethane	µg/L	2	EPA 8260	19-Nov-21/R	< 2			
Dibromochloromethane	µg/L	2	EPA 8260	19-Nov-21/R	< 2			
Dibromoethane,1,2- (Ethylene Dibromide)	µg/L	0.2	EPA 8260	19-Nov-21/R	< 0.2			
Dichlorobenzene,1,2-	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Dichlorobenzene,1,3-	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Dichlorobenzene,1,4-	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Dichloroethane,1,1-	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Dichloroethane,1,2-	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Dichloroethylene,1,1-	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Dichloroethene, cis-1,2-	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Dichloroethene, trans-1,2-	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Dichloromethane (Methylene Chloride)	µg/L	5	EPA 8260	19-Nov-21/R	< 5			
Dichloropropane,1,2-	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Dichloropropene 1,3- cis+trans	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Dichloropropene, trans-1,3-	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Dichloropropene, cis-1,3-	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Monochlorobenzene (Chlorobenzene)	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Styrene	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			

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Michelle Dubien
Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G100968 **REPORT No. B21-37305 (ii)**

Report To:

Cambium Environmental
194 Sophia St.,
Peterborough ON K9H 1E5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 12-Nov-21
DATE REPORTED: 14-Dec-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Warsaw Road Landfills
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		TW7			
			Sample I.D.		B21-37305-1			
			Date Collected		10-Nov-21			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Tetrachloroethane,1,1,1,2-	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Tetrachloroethane,1,1,2,2-	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Tetrachloroethylene	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Trichloroethane,1,1,1-	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Trichloroethane,1,1,2-	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Trichloroethylene	µg/L	0.5	EPA 8260	19-Nov-21/R	< 0.5			
Trichlorofluoromethane	µg/L	5	EPA 8260	19-Nov-21/R	< 5			
Vinyl Chloride	µg/L	0.2	EPA 8260	19-Nov-21/R	< 0.2			

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Final Report

C.O.C.: G100967

REPORT No. B21-37300

Rev. 1

Report To:

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194 Sophia St.,
Peterborough ON K9H 1E5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 12-Nov-21
DATE REPORTED: 24-Jan-22
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Warsaw WDS
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		DSW11	SW_QAQC	DSW16	DSW17
			Sample I.D.		B21-37300-1	B21-37300-2	B21-37300-3	B21-37300-4
			Date Collected		10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	30-Nov-21/O	272	276	299	383
Conductivity @25°C	µmho/cm	1	SM 2510B	30-Nov-21/O	629	627	657	993
pH @25°C	pH Units		SM 4500H	30-Nov-21/O	8.07	8.08	8.09	8.02
Total Dissolved Solids	mg/L	3	SM 2540D	01-Dec-21/O	327	325	341	530
Total Suspended Solids	mg/L	3	SM2540D	15-Nov-21/K	< 3	< 3	7	30
BOD(5 day)	mg/L	3	SM 5210B	12-Nov-21/K	< 3	< 3	< 3	< 3
COD	mg/L	5	SM5220C	25-Nov-21/K	33	36	18	35
Phenolics	mg/L	0.001	MOEE 3179	19-Nov-21/K	< 0.001	< 0.001	< 0.001	0.002
Chloride	mg/L	0.5	SM4110C	20-Nov-21/O	44.9	42.8	38.8	107
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	25-Nov-21/K	0.03	0.03	0.02	0.03
Ammonia (N)-unionized	mg/L	0.01	CALC	25-Nov-21/K	< 0.01	< 0.01	< 0.01	< 0.01
Sulphate	mg/L	1	SM4110C	20-Nov-21/O	2	2	4	1
Nitrite (N)	mg/L	0.05	SM4110C	20-Nov-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	20-Nov-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	08-Dec-21/K	0.5	0.5	0.4	0.8
Mercury	mg/L	0.00002	SM 3112 B	16-Nov-21/O	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Hardness (as CaCO3)	mg/L	1	SM 3120	17-Nov-21/O	291	299	287	369
Arsenic	mg/L	0.0001	EPA 200.8	25-Nov-21/O	0.0003	0.0003	0.0002	0.0003
Barium	mg/L	0.001	SM 3120	17-Nov-21/O	0.030	0.030	0.027	0.089
Boron	mg/L	0.005	SM 3120	17-Nov-21/O	0.013	0.013	0.011	0.050
Cadmium	mg/L	0.000015	EPA 200.8	25-Nov-21/O	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Chromium	mg/L	0.001	EPA 200.8	25-Nov-21/O	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	0.0001	EPA 200.8	25-Nov-21/O	0.0002	0.0002	0.0003	0.0004
Iron	mg/L	0.005	SM 3120	17-Nov-21/O	0.052	0.053	0.047	0.057
Lead	mg/L	0.00002	EPA 200.8	25-Nov-21/O	< 0.00002	< 0.00002	< 0.00002	0.00004
Phosphorus-Total	mg/L	0.01	E3199A.1	08-Dec-21/K	0.01	< 0.01	0.03	0.03
Zinc	mg/L	0.005	SM 3120	17-Nov-21/O	0.015	0.010	0.017	0.013

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Michelle Dubien
Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G100967

REPORT No. B21-37300

Rev. 1

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194 Sophia St.,
Peterborough ON K9H 1E5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 12-Nov-21
DATE REPORTED: 24-Jan-22
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Warsaw WDS
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		DSW11	SW_QAQC	DSW16	DSW17
			Sample I.D.		B21-37300-1	B21-37300-2	B21-37300-3	B21-37300-4
			Date Collected		10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				

1. Revised to include U-NH3

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DATE RECEIVED: 12-Nov-21
DATE REPORTED: 24-Jan-22
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Warsaw WDS
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		DSW7			
			Sample I.D.		B21-37300-5			
			Date Collected		10-Nov-21			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	30-Nov-21/O	417			
Conductivity @25°C	µmho/cm	1	SM 2510B	30-Nov-21/O	839			
pH @25°C	pH Units		SM 4500H	30-Nov-21/O	8.06			
Total Dissolved Solids	mg/L	3	SM 2540D	01-Dec-21/O	442			
Total Suspended Solids	mg/L	3	SM2540D	15-Nov-21/K	34			
BOD(5 day)	mg/L	3	SM 5210B	12-Nov-21/K	< 3			
COD	mg/L	5	SM5220C	25-Nov-21/K	81			
Phenolics	mg/L	0.001	MOEE 3179	19-Nov-21/K	< 0.001			
Chloride	mg/L	0.5	SM4110C	20-Nov-21/O	37.5			
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	25-Nov-21/K	0.09			
Ammonia (N)-unionized	mg/L	0.01	CALC	25-Nov-21/K	< 0.01			
Sulphate	mg/L	1	SM4110C	20-Nov-21/O	4			
Nitrite (N)	mg/L	0.05	SM4110C	20-Nov-21/O	< 0.05			
Nitrate (N)	mg/L	0.05	SM4110C	20-Nov-21/O	< 0.05			
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	08-Dec-21/K	3.9			
Mercury	mg/L	0.00002	SM 3112 B	16-Nov-21/O	< 0.00002			
Hardness (as CaCO3)	mg/L	1	SM 3120	17-Nov-21/O	413			
Arsenic	mg/L	0.0001	EPA 200.8	25-Nov-21/O	0.0006			
Barium	mg/L	0.001	SM 3120	17-Nov-21/O	0.084			
Boron	mg/L	0.005	SM 3120	17-Nov-21/O	0.022			
Cadmium	mg/L	0.000015	EPA 200.8	25-Nov-21/O	0.000015			
Chromium	mg/L	0.001	EPA 200.8	25-Nov-21/O	< 0.001			
Copper	mg/L	0.0001	EPA 200.8	25-Nov-21/O	0.0011			
Iron	mg/L	0.005	SM 3120	17-Nov-21/O	0.167			
Lead	mg/L	0.00002	EPA 200.8	25-Nov-21/O	0.00021			
Phosphorus-Total	mg/L	0.01	E3199A.1	08-Dec-21/K	0.28			
Zinc	mg/L	0.005	SM 3120	17-Nov-21/O	< 0.005			

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Michelle Dubien
Lab Manager

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ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G100967

REPORT No. B21-37300

Rev. 1

Report To:

Cambium Environmental
194 Sophia St.,
Peterborough ON K9H 1E5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 12-Nov-21
DATE REPORTED: 24-Jan-22
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Warsaw WDS
P.O. NUMBER: 12987-003
WATERWORKS NO.

			Client I.D.		DSW7			
			Sample I.D.		B21-37300-5			
			Date Collected		10-Nov-21			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				

1. Revised to include U-NH3

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Michelle Dubien
Lab Manager

Appendix F

Photographs

Fully accessible appended items are available upon request.

Photograph 1: Monitor TW2, June 2021

Photograph 2: Monitor TW3-2, June 2021

Photograph 3: Monitor TW4-2, November 2021

Photograph 4: Monitor TW5-2, November 2021

Photograph 5: Monitor TW6-2, November 2021

Photograph 6: Monitor TW7, November 2021

Photograph 7: Monitors TW8-1 (right, abandoned) and TW8-2, November 2021

Photograph 8: Monitors TW9-1 (right, abandoned) and TW9-2, November 2021

Photograph 9: Dry - Surface water station DSW06, June 2021

Photograph 10: Insufficient volumes - Surface water station DSW06, November 2021

Photograph 11: Dry - Surface water station DSW07, June 2021

Photograph 12: Surface water station DSW07, November 2021

Photograph 13: Dry - Surface water station DSW09, June 2021

Photograph 14: Dry - Surface water station DSW09, November 2021

Photograph 15: Surface water station DSW11, June 2021

Photograph 16: Surface water station DSW11, November 2021

Photograph 17: Surface water station DSW16, November 2021

Photograph 18: Surface water station DSW16, November 2021

Photograph 19: Dry - Surface water station DSW17, June 2021

Photograph 20: Surface water station DSW17, November 2021

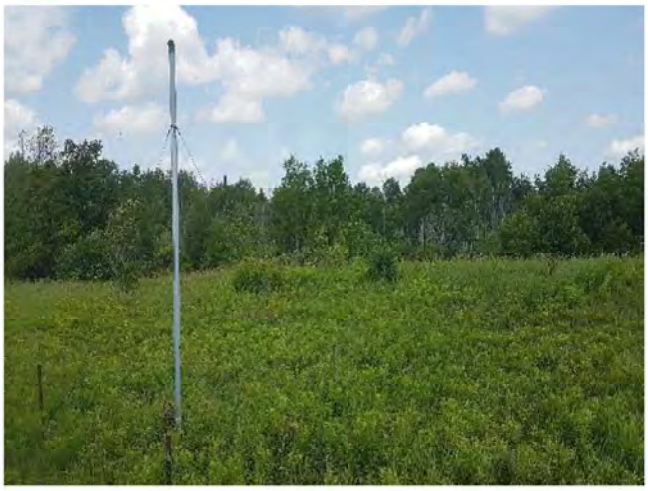
Photograph 21: Gas Probe GP1, June 2021

Photograph 22: Gas Probe GP2, August 2021

Photograph 23: Gas Probe GP3, July 2021

Photograph 24: Gas Probe GP4, June 2021

Photograph 25: Gas Probe GP5, August 2021



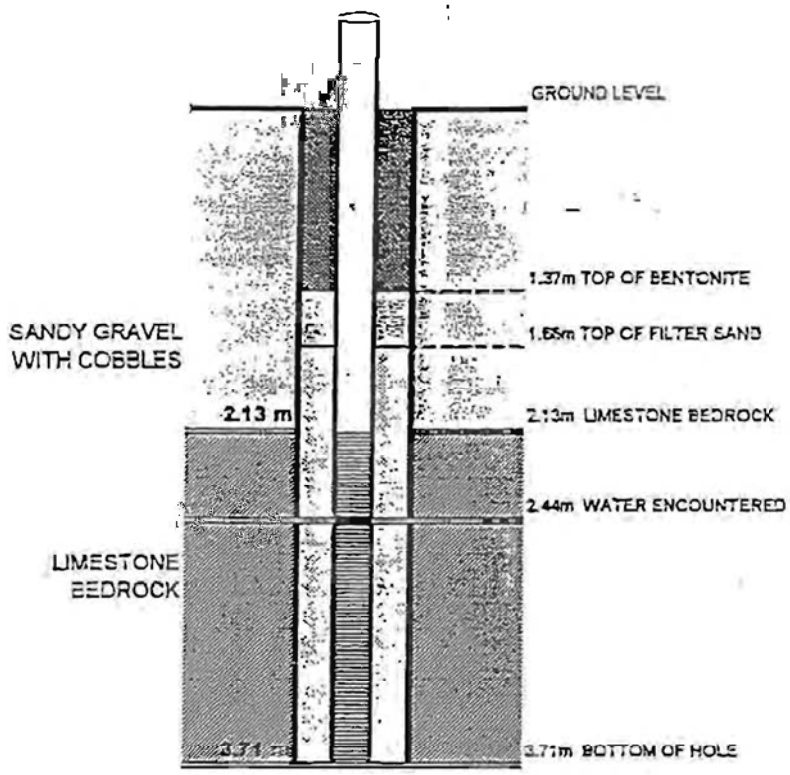
Photograph 26: Gas Probe GP6, August 2021

Appendix G

Borehole Logs

Fully accessible appended items are available upon request.

TW - 1 DOURO LANDFILL SOUTH SITE



LIMESTONE BEDROCK

SANDY GRAVEL WITH COBBLES

BENTONITE HOLE PLUG

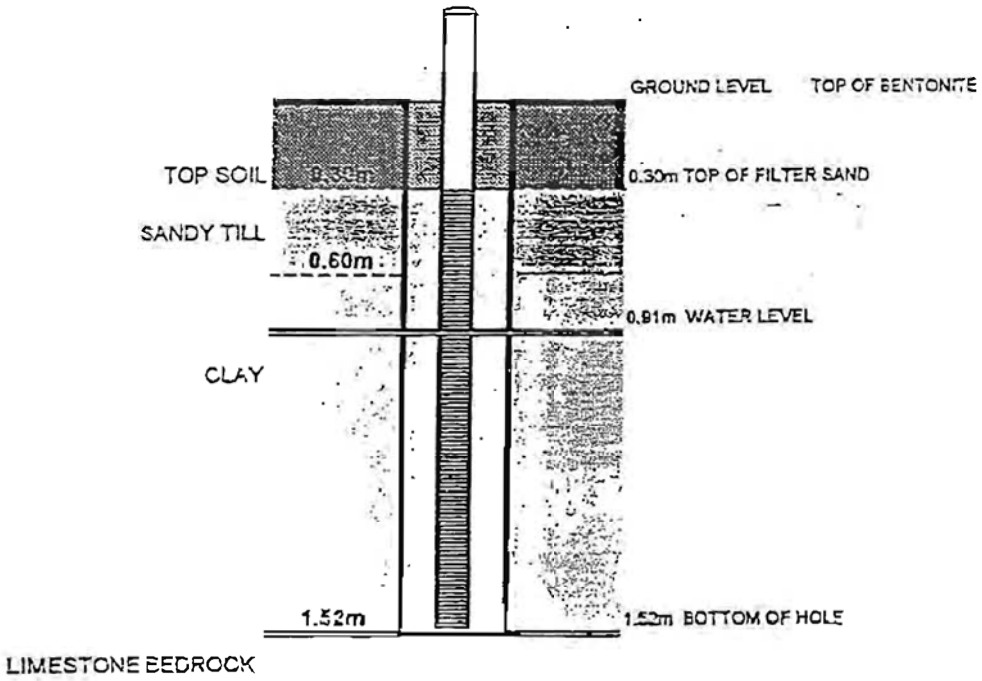
FILTER SAND

NATURAL BACKFILL

ENVIRONMENTAL SERVICES
LAKEFIELD, ONTARIO
K0L 2H0, (705) 652-2020

LAKEFIELD RESEARCH LIMITED

TW - 2 DOURO LANDFILL SOUTH SITE



STRATIGRAPHY LEGEND

- TOP SOIL
- SANDY TILL
- CLAY

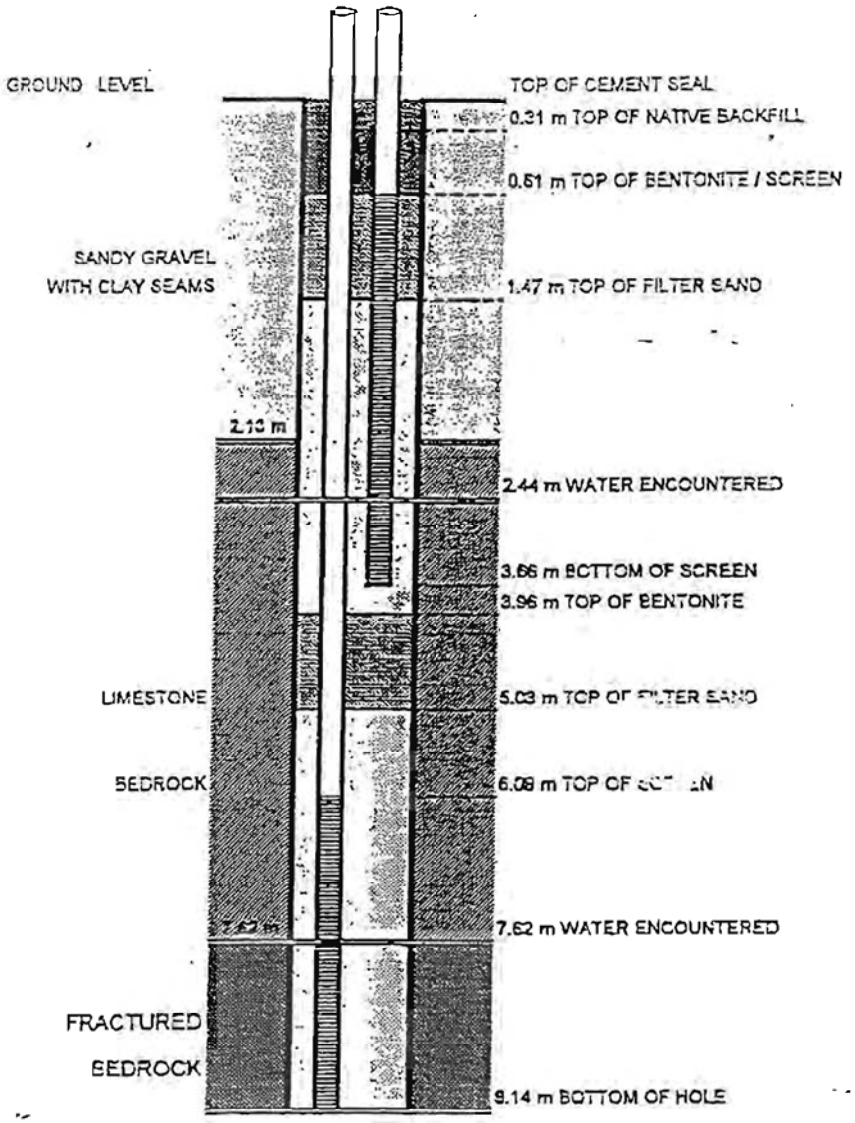
BORE HOLE LEGEND

- SCREEN
- BENTONITE HOLE PLUG
- FILTER SAND

ENVIRONMENTAL SERVICES
LAKEFIELD, ONTARIO
K0L 2H0, (705) 652-2020

LAKEFIELD RESEARCH LIMITED

TW - 3 DOURO LANDFILL SOUTH SITE



STRATIGRAPHY LEGEND

- SANDY GRAVEL WITH CLAY SEAMS
- LIMESTONE BEDROCK
- FRACTURED LIMESTONE BEDROCK

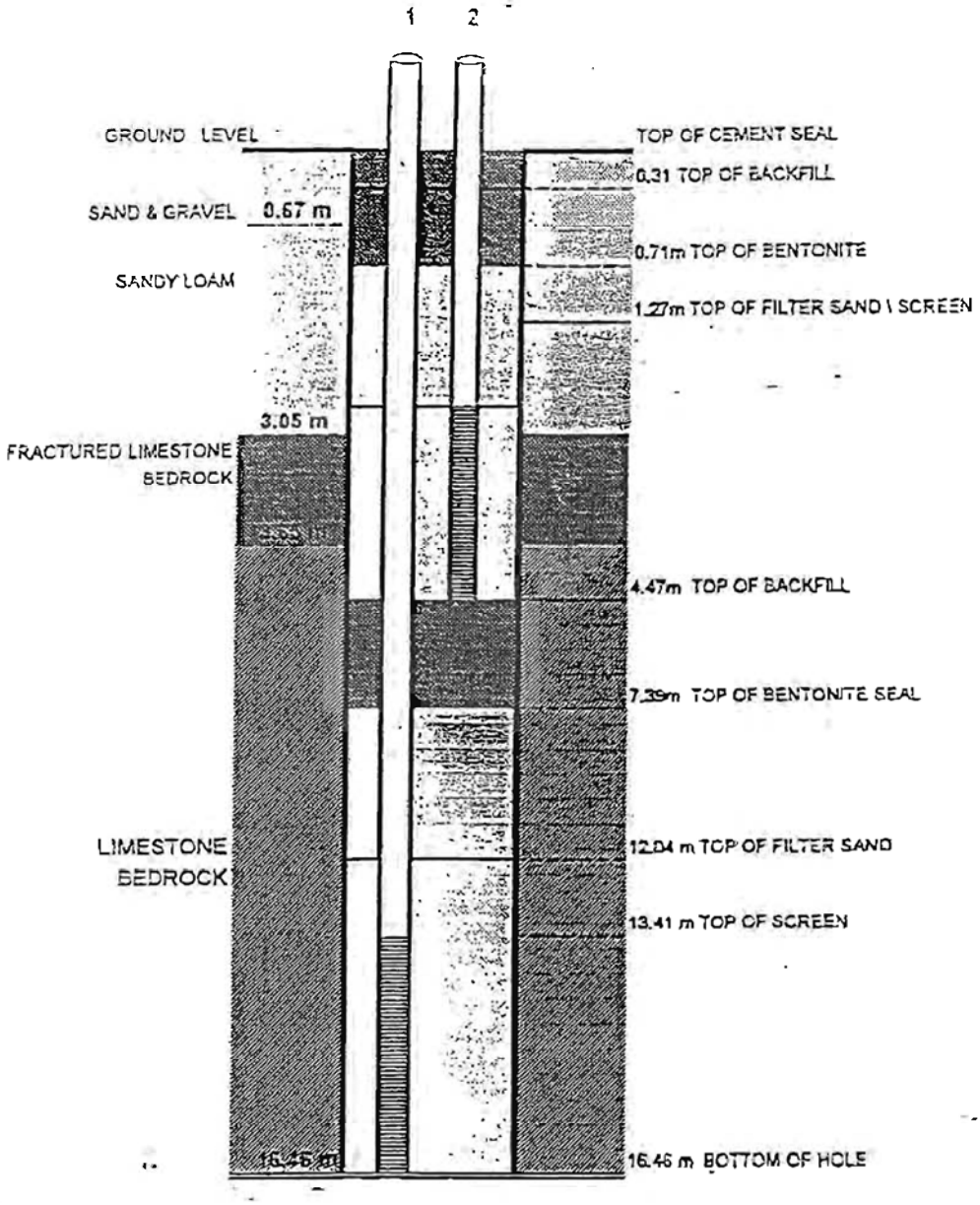
BORE HOLE LEGEND

- CEMENT SEAL
- NATURAL BACKFILL
- BENTONITE HOLE PLUG
- FILTER SAND

ENVIRONMENTAL SERVICES
LAKEFIELD, ONTARIO
K0L 2H0, (705) 652-2020

LAKEFIELD RESEARCH LIMITED

94TW - 4 DOURO LANDFILL SOUTH SITE



STRATIGRAPHY LEGEND

- SAND AND GRAVEL
- SANDY LOAM
- FRACTUERED LIMESTONE BEDROCK
- LIMESTONE BEDROCK

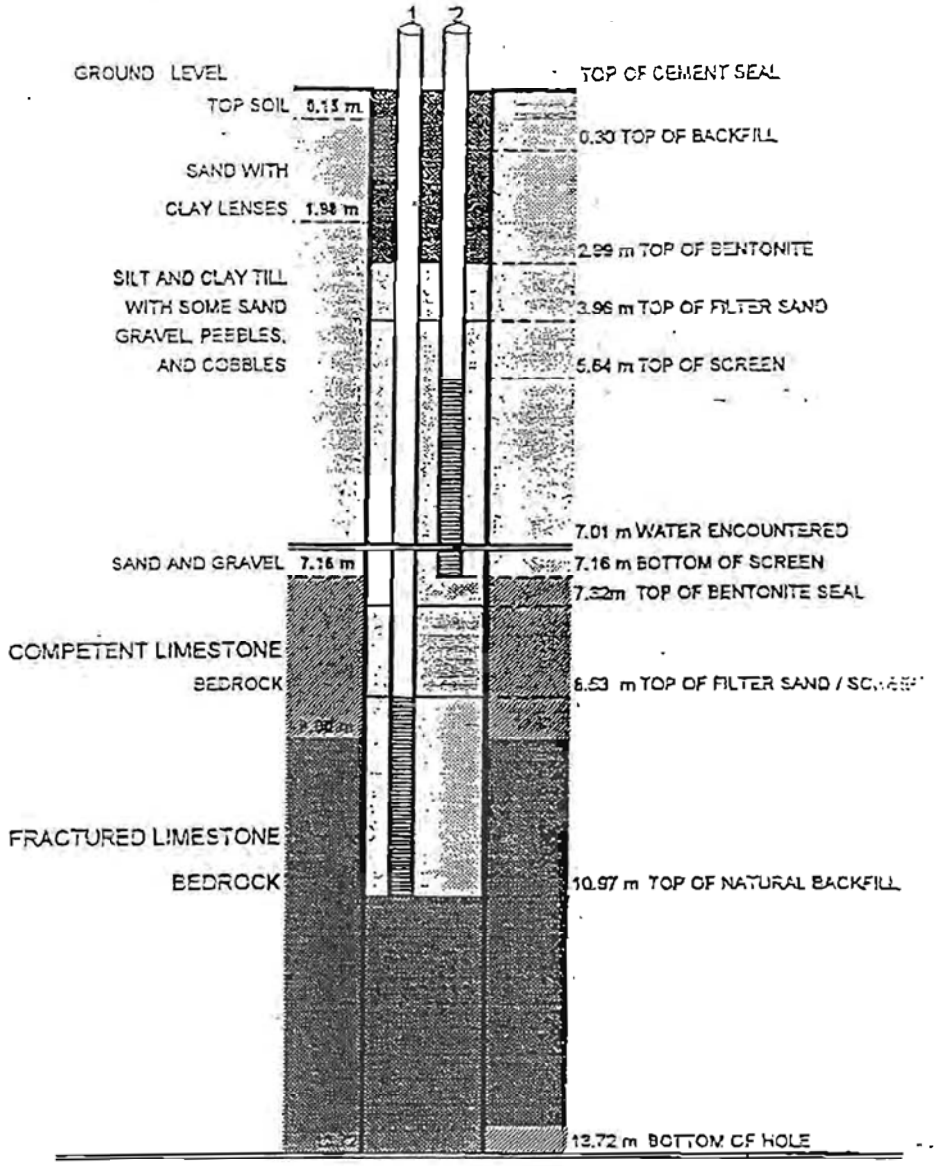
BOREHOLE LEGEND

- CEMENT SEAL
- NATURAL BACKFILL
- BENTONITE HOLE PLUG
- FILTER SAND

ENVIRONMENTAL SERVICES
LAKEFIELD, ONTARIO
K0L 2H0, (705) 652-2020

LAKEFIELD RESEARCH LIMITED

94TW - 5 DOURO LANDFILL SOUTH SITE



STRATIGRAPHY LEGEND

- TOP SOIL
- SILT .....COBBLES
- SAND AND GRAVEL
- COMPETENT LIMESTONE BEDROCK
- FRACTURED LIMESTONE BEDROCK

BORE HOLE LEGEND

- CEMENT SEAL
- NATURAL BACKFILL
- BENTONITE HOLE PLUG
- FILTER SAND

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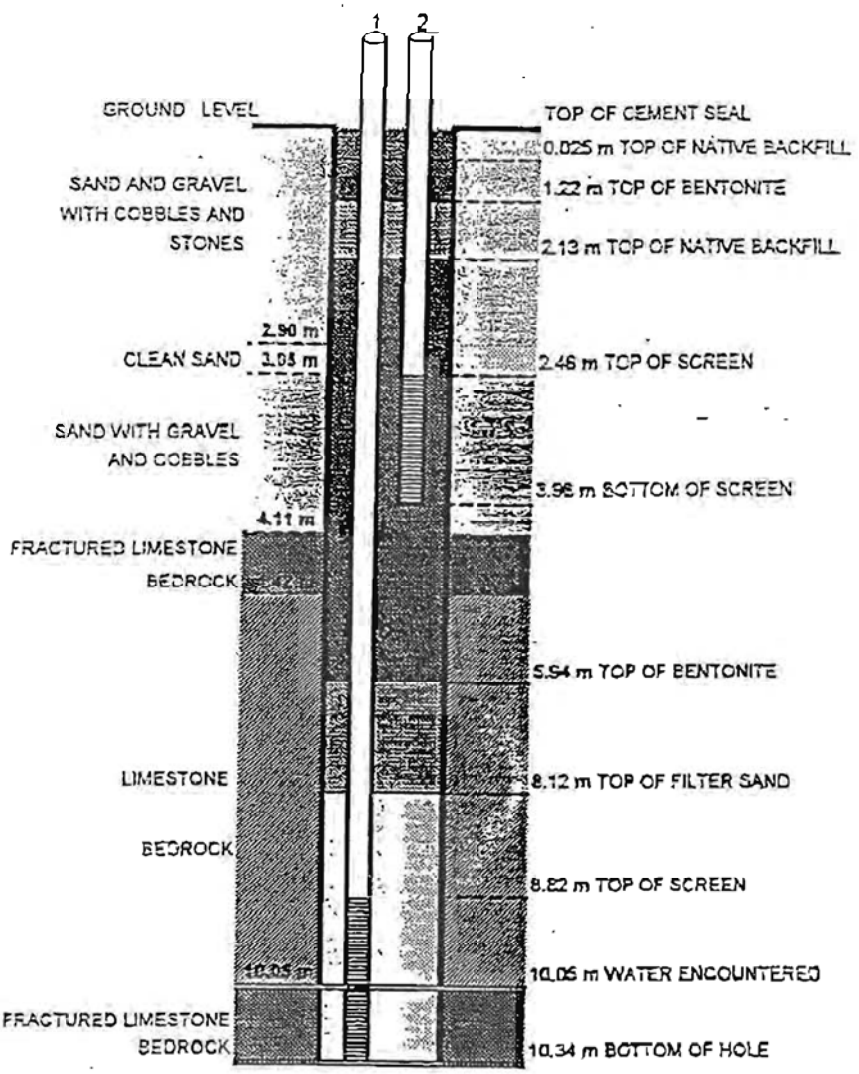
94TW - 6 DOURO LANDFILL SOUTH SITE



STRATIGRAPHY LEGEND

- SAND AND GRAVEL ..... STONES
- CLEAN SAND
- SAND WITH GRAVEL AND COBBLES
- LIMESTONE BEDROCK
- FRACTURED LIMESTONE BEDROCK

BORE HOLE LEGEND

- CEMENT SEAL
- NATURAL BACKFILL
- BENTONITE HOLE PLUG
- FILTER SAND

ENVIRONMENTAL SERVICES
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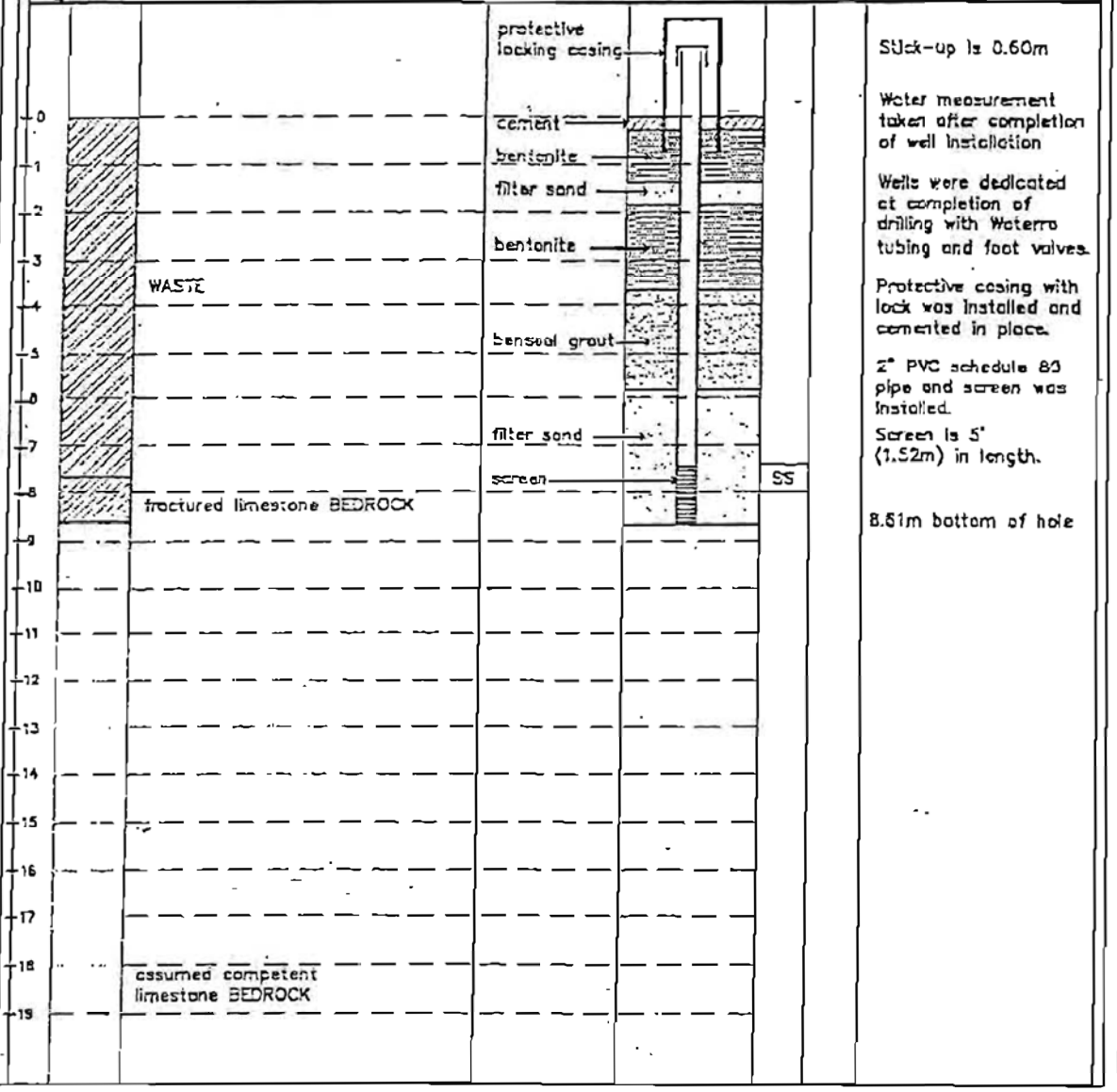
K0L 2H0, (705) 652-2020

LAKEFIELD RESEARCH LIMITED

BOREHOLE LOG # TW 7

PROJECT NAME	LOGGED BY
DOURO SOUTH LANDFILL SITE	D. BUCHOLTZ

DRILLING METHOD	PROJECT No	DATE DRILLED	GROUND ELEV.	SCALE
HOLLOW STEM AUGERS	7777-079	AUG 16, 1995	100.35	1:125

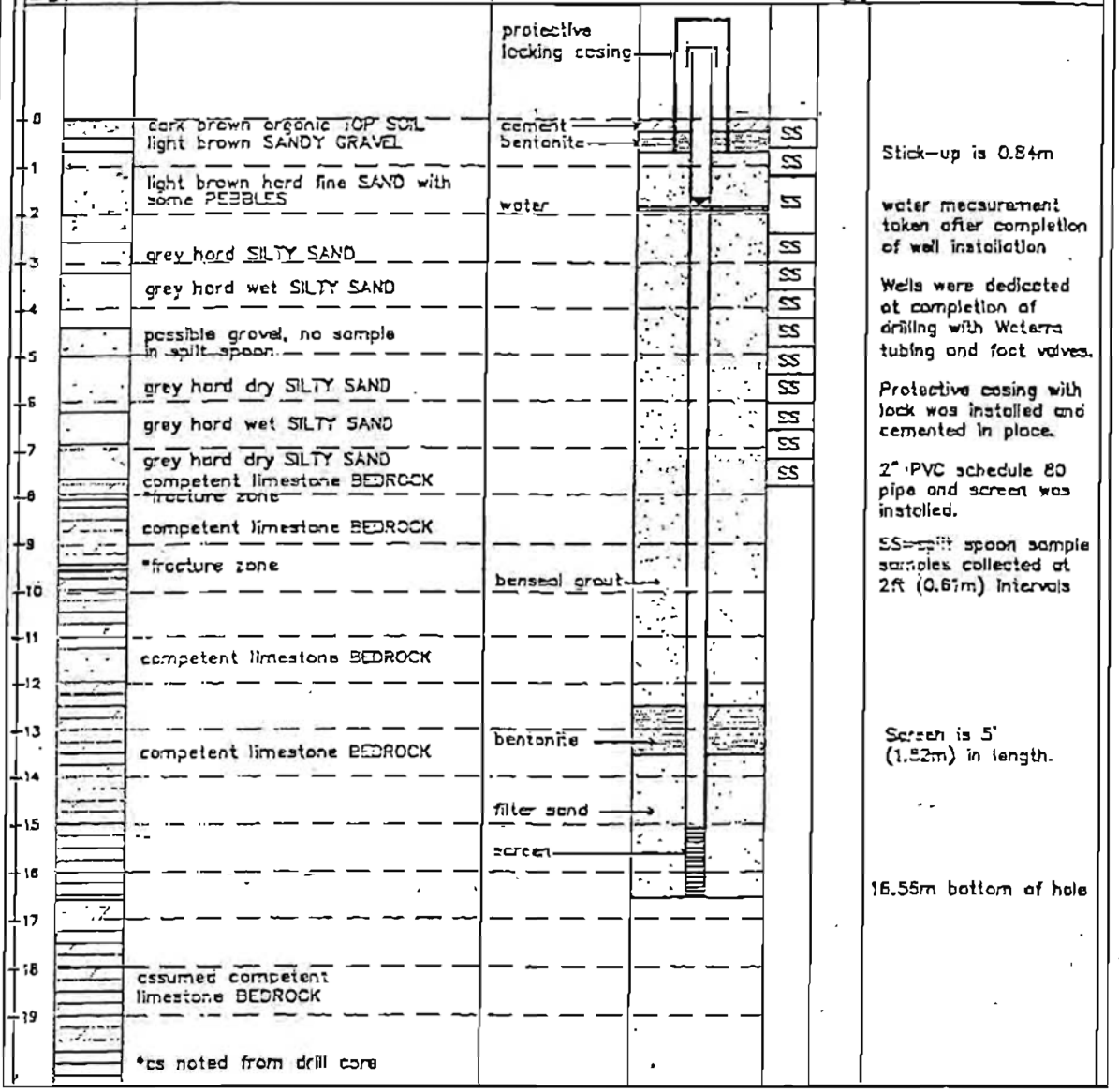


LAKEFIELD RESEARCH

ENVIRONMENTAL SERVICES
LAKEFIELD, ONTARIO
K0L 2H0, (705) 652-2020

LAKEFIELD RESEARCH LIMITED

BOREHOLE LOG # TW 8-1	PROJECT NAME: DOURO SOUTH LANDFILL SITE		LOGGED BY: D. BUCHOLTZ	
DRILLING METHOD: HOLLOW STEM AUGERS	PROJECT No: 7777-079	DATE DRILLED: AUG 16, 1995	GROUND ELEV.: 96.30	SCALE: 1:125



LAKEFIELD RESEARCH

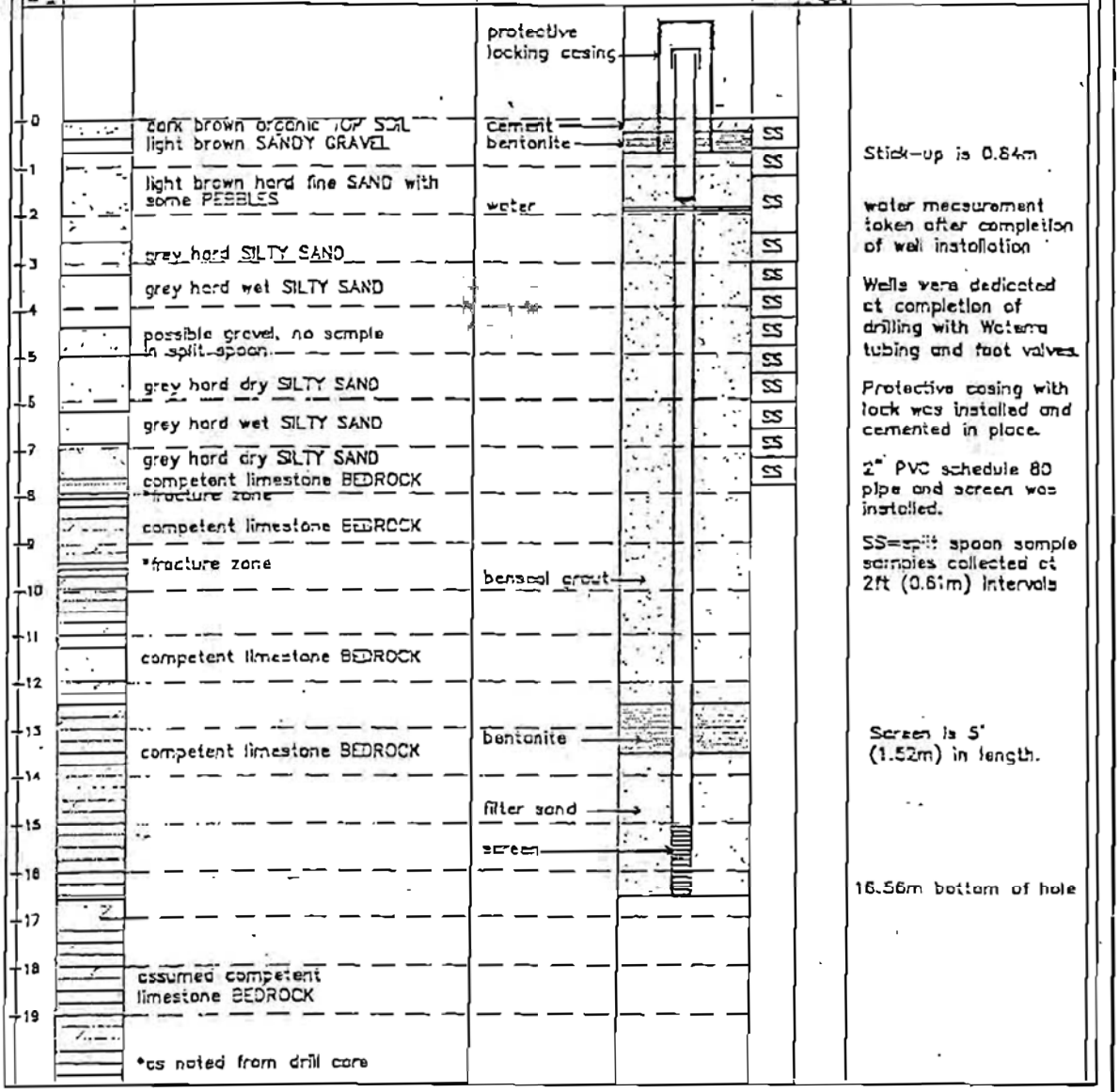
ENVIRONMENTAL SERVICES
LAKEFIELD, ONTARIO
K0L 2H0, (705) 652-2020

LAKEFIELD RESEARCH LIMITED

BOREHOLE LOG # TW 8-1

PROJECT NAME	LOGGED BY
DOURO SOUTH LANDFILL SITE	D. BUCHOLTZ

DRILLING METHOD	PROJECT No	DATE DRILLED	GROUND ELEV.	SCALE
HOLLOW STEM AUGERS	7777-079	AUG 16, 1995	96.30	1:125



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LAKEFIELD, ONTARIO
K0L 2H0, (705) 652-2020

LAKEFIELD RESEARCH LIMITED

BOREHOLE LOG

TW 8-2

PROJECT NAME	LOGGED BY
DOURO SOUTH LANDFILL SITE	D. BUCHOLTZ

DRILLING METHOD	PROJECT No	DATE DRILLED	GROUND ELEV.	SCALE
HOLLOW STEM AUGERS	7777-079	AUG 16, 1995	95.29	1:125

DEPTH METERS	STRAT-IGRAPHY	STRATIGRAPHIC DESCRIPTION	CONSTRUCTION DETAILS	SAMPLE TYPE	SAMPLE N VALUE	COMMENTS
0		dark brown organic TOP SOIL light brown SANDY GRAVEL	protective locking casing cement bentonite			Stick-up is 0.85m Water measurement taken after completion of well installation Wells were dedicated at completion of drilling with Waterra tubing and foot valves. Protective casing with lock was installed and cemented in place. 2" PVC schedule 80 pipe and screen was installed. Screen is 5' (1.52m) in length. 7.61m bottom of hole
1		light brown hard fine SAND with some PEBBLES				
2						
3		grey hard SILTY SAND				
4		grey hard wet SILTY SAND	benseal grout			
5		possible gravel, no sample in split-spoon	bentonite			
6		grey hard dry SILTY SAND				
7		grey hard wet SILTY SAND grey hard dry SILTY SAND	screen filter sand			
8		competent limestone BEDROCK *fracture zone				
9		competent limestone BEDROCK				
10		*fracture zone				
11						
12						
13						
14		competent limestone BEDROCK (from TW 8-1 well log data)				
15						
16						
17						
18		assumed competent limestone BEDROCK				
19						

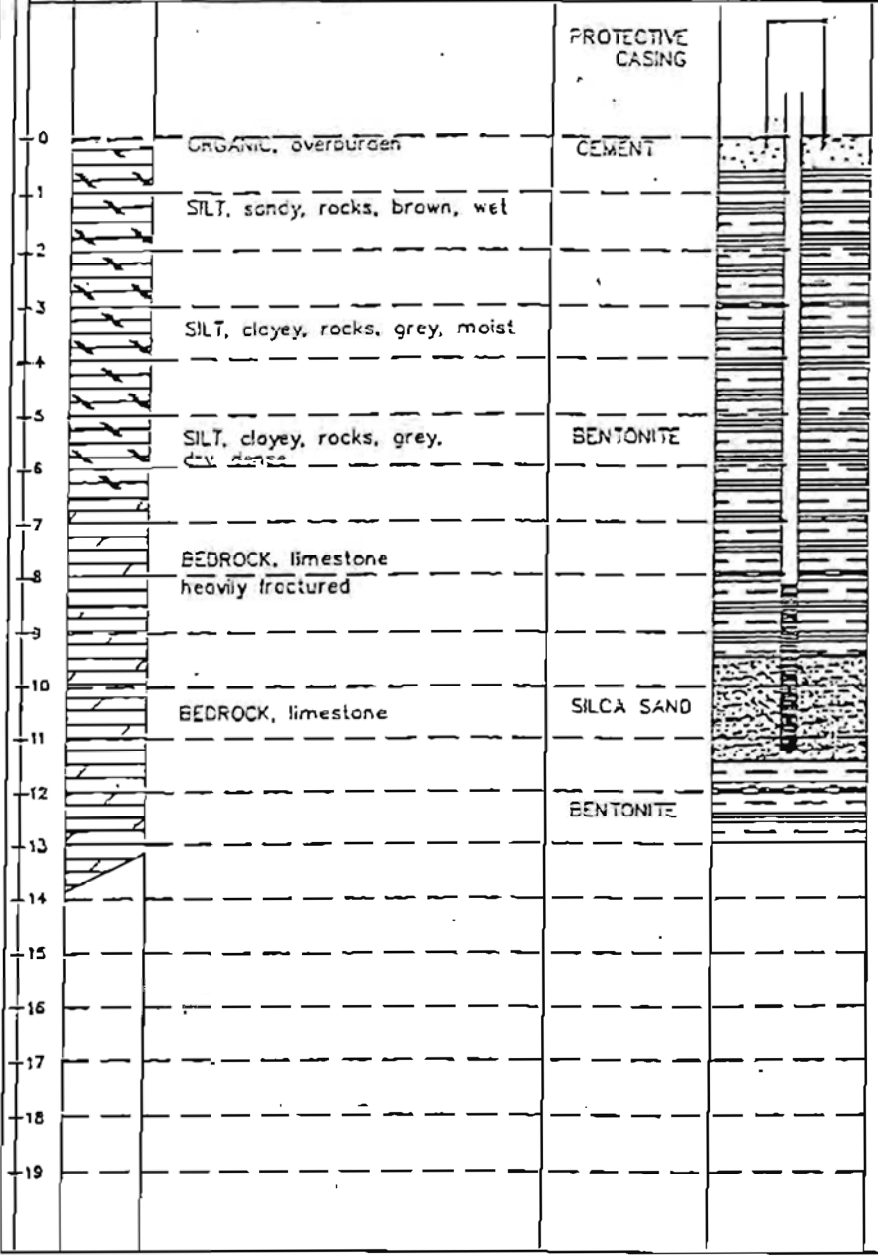
* as note from drill core

LAKEFIELD RESEARCH

ENVIRONMENTAL SERVICES
LAKEFIELD, ONTARIO
K0L 2H0, (705) 652-2020

LAKEFIELD RESEARCH LIMITED

BOREHOLE LOG	SITE BH9-1	PROJECT NAME: TOWNSHIP OF DOURO, WARSAW ROAD LANDFILL	LOGGED BY: D. BUCHOLTZ, LAKEFIELD RESEARCH LIMITED
DRILLING METHOD: HOLLOW STEM AUGER		PROJECT No: 7777-369	DATE DRILLED: AUGUST 20, 1997
GROUND ELEV.: N/A	SCALE: NTS		



Drilling commenced 08:00hrs, Aug 20/97

Well instrumented with dedicated inertia pump upon completion.

TW9-1 has 50MM PVC Schedule 40 riser pipe and 1.52m No.10 slotted screen

Water was encountered @ 10.85m (35.6ft) below grade.

Bottom of hole at 11.34m (37.2ft) below grade.

LAKEFIELD RESEARCH LIMITED
ENVIRONMENTAL SERVICES

185 CONCESSION STREET
LAKEFIELD, ONTARIO, CANADA

21, 1st AVENUE
SCHUMACHER, ONTARIO, CANADA

BOREHOLE LOG BH9-2

PROJECT NAME	LOGGED BY
TOWNSHIP OF DOURO WARSAW ROAD LANDFILL	D. BUCHOLTZ LAKEFIELD RESEARCH LIMITED

DRILLING METHOD	PROJECT No	DATE DRILLED	GROUND ELEV.	SCALE
HOLLOW STEM AUGER	7777-369	AUGUST 20, 1997	N/A	NTS

DEPTH METERS	STRAT-IGRAPHY	STRATIGRAPHIC DESCRIPTION	CONSTRUCTION DETAILS	SAMPLE TYPE	SAMPLE N VALUE	COMMENTS
0		ORGANIC, overburden	PROTECTIVE CASING			Drilling commenced 08:00hrs, Aug 20/97
1		SILT, sandy, rocks, brown, wet	CEMENT			Well instrumented with dedicated inertia pump upon completion.
2			BENTONITE			TW9-2 has 50MM PVC Schedule 40 riser pipe and 1.52m No.10 slotted screen
3		SILT, clayey, rocks, grey, moist				
4			SILCA SAND			Water was encountered @ 3.00m (9.8ft) below grade.
5		SILT, clayey, rocks, grey, dry dense				
6						Bottom of hole at 6.91m (22.67ft) below grade.
7			BENTONITE			
8		BEDROCK, limestone heavily fractured				
9						
10		BEDROCK, limestone				
11						
12						
13						
14						
15						
16						
17						
18						
19						

LAKEFIELD RESEARCH LIMITED
ENVIRONMENTAL SERVICES

185 CONCESSION STREET
LAKEFIELD, ONTARIO, CANADA

21, 1st AVENUE
SCHUMACHER, ONTARIO, CANADA

Ministry of Environment and Energy, Ontario

WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

Warsaw Road

County or District	Township/Borough/City/Town/Village	Con.	Lot
PETERBOROUGH	DOURO	5	8
Owner's surname: TOWNSHIP OF DOURO	Address: DOURO ONT.	Date: 24 05 97	

LOG OF OVERBURDEN AND BEDROCK MATERIALS

General colour	Most common material	Other materials	General description	Depth - feet From	To
NOTE: WELL ABANDONMENT					
TW3-1 NORMALLY A FLOWING WELL					
WAS NOT FLOWING AT TIME OF					
ABANDONMENT.					
SOUTH LAND FILL.					

CASING & OPEN HOLE RECORD

Inside diam. inches	Material	Wall thickness inches	Depth - feet From	To
2"		L.H. NO		

SCREEN

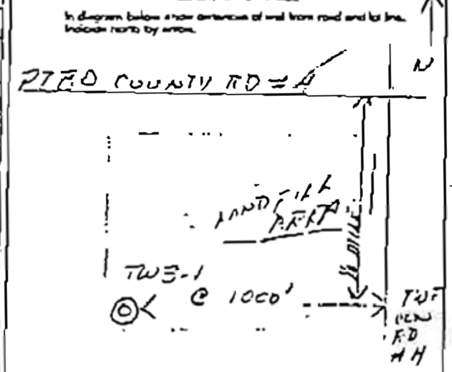
Slot No.	Diameter	Length
	2"	
Material and type: P.V.C		

PLUGGING & SEALING RECORD

Depth set at - feet From	To	Material and type
3	130'	BENTONITE

LOCATION OF WELL

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



FINAL STATUS OF WELL

WATER USE

METHOD OF CONSTRUCTION

171309

Name of Well Contractor	Well Contractor's Licence No.
TRIAQUA DRILLING	6778
Address: RR # 2 LAKEFIELD ONT	
Name of Well Technician: PATRICK O'BRIEN	Well Technician's Licence No.: T2455
Signature of Technician/Contractor	Submission date: 24 05 97

MINISTRY USE ONLY

ENVIRONMENTAL SERVICES
LAKEFIELD, ONTARIO
K0L 2H0, (705) 652-2020

LAKEFIELD RESEARCH LIMITED

Ontario Ministry of the Environment and Energy

WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

'Watson Road

County or District	Township/Borough/City/Town/Village	Con	Lot
PETER PAPOUCH	DOURO	5	8
Owner's surname / First name	Address	Date	
TOWNSHIP OF DOURO	DOURO ONT.	24 08 97	

LOG OF OVERBURDEN AND BEDROCK MATERIALS

General colour	Most common material	Other materials	General description	Depth - feet From	To
NOTE	WELL	ABANDONMENT.			
	TW A-1				
	SOUTH LAND FILL.				

CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness	Depth - feet From	To
2"		SCH 40		

SCREEN

Slot no.	Diameter	Length
	2"	
Material and type: P.V.C.		

PLUGGING & SEALING RECORD

Depth set at - feet From	To	Material and type
+3	154	BENTONITE.

LOCATION OF WELL

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

PTBO COUNTY RD #4

1200.'

350'

TWA-1 LAND FILL

TWP ROAD #4

N.

171313

FINAL STATUS OF WELL — Abandonment

WATER USE

METHOD OF CONSTRUCTION

Name of Well Contractor	Well Contractor's Licence No.
TRIAQUA DRILLING	6773
Address: RR#2 LAKEFIELD ONT.	
Name of Well Technician: PATRICK O'BRIEN	Well Technician's Licence No.: T2655
Signature of Technician/Contractor	Submission date: 24 08 97

MINISTRY USE ONLY

1. OWNER'S COPY

ENVIRONMENTAL SERVICES
LAKEFIELD, ONTARIO
K0L 2H0, (705) 652-2020

LAKEFIELD RESEARCH LIMITED

Ministry of the Environment and Energy — Ontario

WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

Warsaw Road

County or District	Township/Borough/City/Town/Village	Con.	Lot
PETERBOROUGH	DOURO	5	8
Owner's surname / First name: TOWNSHIP OF DOURO	Address: DOURO ONT		Date completed: 24 08 97

LOG OF OVERBURDEN AND BEDROCK MATERIALS

NOTE: WELL ABANDONMENT
TW 8-1
SOUTH LANDFILL

WATER RECORD

CASING & OPEN HOLE RECORD

SCREEN

PLUGGING & SEALING RECORD

+3 KHB BENTONITE

PUMPING TEST

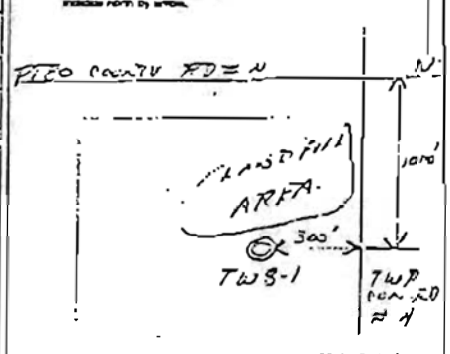
FINAL STATUS OF WELL

WATER USE

METHOD OF CONSTRUCTION

LOCATION OF WELL

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



171314

Name of Well Contractor: TRIAQUA DRILLING	Well Contractor's Licence No.: 6778
Address: RR # 2 LAKEFIELD ONT	
Name of Well Technician: PATRICK O'BRIEN	Well Technician's Licence No.: T 2155
Signature	Date: 29 08 97

MINISTRY USE ONLY

1 - OWNER'S COPY

ENVIRONMENTAL SERVICES
LAKEFIELD, ONTARIO
K0L 2H0, (705) 652-2020

LAKEFIELD RESEARCH LIMITED

Appendix H

Ministry Well Records

Fully accessible appended items are available upon request.

3108 .

Ministry of the Environment

Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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

(11) 5110691 MUNICIP 51007 CON CON 04

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
[redacted]	DOURO.	CON 4	007

DATE COMPLETED: DAY 28 MO 07 YR 82

DUNLOP

(21) [redacted] /18300 RC 5 ELEVATION 0725 RC 5 BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BLACK		TOP SOIL		0	1
GREY	CLAY + STONES.			1	24
GREY	LIMESTONE SHALE			24	28
GREY	LIMESTONE			28.	30.

(31) 0001802 | 00242051 2 | 0028215 17 | 0030215

32

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
28-30 0028	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

(51) CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 1/4 06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	0030.
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

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

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN
	FEET

(61) PLUGGING & SEALING RECORD

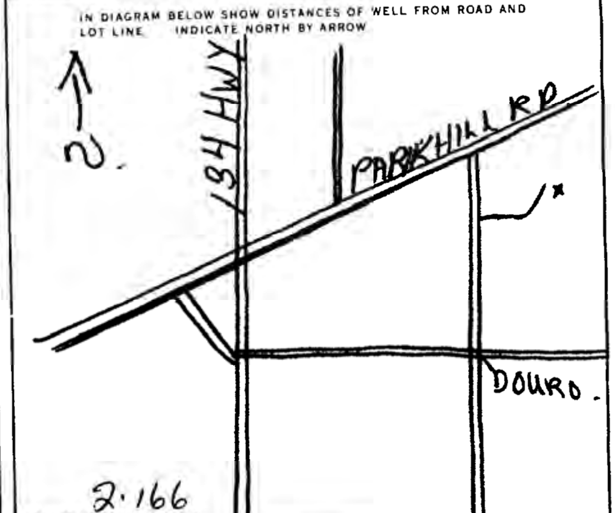
DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

(71) PUMPING TEST

PUMPING TEST METHOD	1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE	0004 GPM
DURATION OF PUMPING	02 HOURS 30 MINS
	1 ☒ PUMPING 2 ☐ RECOVERY
STATIC LEVEL	006 FEET
WATER LEVEL END OF PUMPING	20 FEET
WATER LEVELS DURING: 15 MINUTES	20 FEET
30 MINUTES	20 FEET
45 MINUTES	20 FEET
60 MINUTES	20 FEET
IF FLOWING, GIVE RATE	GPM
PUMP INTAKE SET AT	28 FEET
WATER AT END OF TEST	1 ☒ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE	☒ SHALLOW ☐ DEEP
RECOMMENDED PUMP SETTING	028 FEET
RECOMMENDED PUMPING RATE	0004 GPM

LOCATION OF WELL

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



2.166

DRILLERS REMARKS

FINAL STATUS OF WELL 1	1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED
WATER USE 12	1 ☒ DOMESTIC 2 ☒ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED
METHOD OF DRILLING 1	1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR	Tate Well Drilling
LICENCE NUMBER	4923
ADDRESS	RR#2 Ptbo. Ont
NAME OF DRILLER OR BORER	Dave Tate
LICENCE NUMBER	4923
SIGNATURE OF CONTRACTOR	
SUBMISSION DATE	DAY ___ MO ___ YR ___

OFFICE USE ONLY

DATA SOURCE	1
CONTRACTOR	4923
DATE RECEIVED	09 03 83
DATE OF INSPECTION	
INSPECTOR	
REMARKS	

CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506—4—77

Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*

Tag#: A140642

Well Record

Regulation 903 Ontario Water Resources Act

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
923 County Road 4	Douro	8	5
County/District/Municipality	**City/Town/Village**	**Province**	**Postal Code**
Peterborough	Douro	Ontario	K0L 2H0
UTM Coordinates Zone / Easting / Northing	**Municipal Plan and Sublot Number**	**Other**	
NAD 83 17 722669 4918545			

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Black			Topsoil	0	1.5'
Brown	Silt	Gravel & Stones	Dense	1.5	13'
Brown	Gravel	Sand.	Loose	13'	25'

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
36"	Concrete	4"	0	25'

Construction Record - Screen

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

Status of Well

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

Water Details

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

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)

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) 27 GPM

Duration of pumping 1 hrs + 0 min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

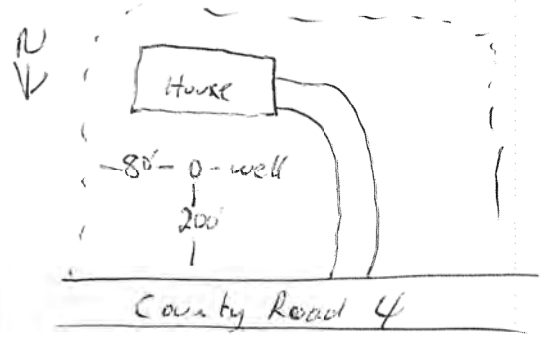
Well production (l/min / GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1	13'6"	1	19'3"	
2	13'11"	2	19'3"	
3	14'1"	3	19'3"	
4	14'3"	4	19'5"	
5	14'5"	5	19'3"	
10	15'3"	10	19'1"	
15	16'	15	19'	
20	16'7"	20	18'11"	
25	17'3"	25	18'11"	
30	17'8"	30	18'9"	
40	18'5"	40	18'8"	
50	18'11"	50	18'6"	
60	19'3	60	18'5"	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Leahy Excavation Inc.	6513
Business Address (Street Number/Name)	**Municipality**
2187 Keene Rd.	Otonabee
Province	**Postal Code**	**Business E-mail Address**
Ont.	K9J 6Z1	leahyexcavation@rogers.com
Bus. Telephone No. (inc. area code)	**Name of Well Technician (Last Name, First Name)**
705 742 4765	Leahy, Paul
Well Technician's Licence No.	**Signature of Technician and/or Contractor**	**Date Submitted**
1992	[signature]	2014 08 06

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☑ No		2014 07 20

Ministry Use Only

Audit No. Z 161446

AUG 13 2014

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act
WATER WELL RECORD

Ontario   31 D/8E

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11 | 5106962 | MUNICIP. 51007 | CON. CON | 05

COUNTY OR ~~DISTRICT~~	TOWNSHIP	CON., ~~BLOCK, TRACT, SURVEY, ETC.~~	LOT
Peterborough	Douro	5 V	008

[redacted] R. 10, Peterborough, Ont. — DATE COMPLETED: DAY 11 MO. 04 YR. 74

[redacted] 18153 | RC. 4 | ELEVATION 0775 | RC. 5 | BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
			Drilled Well	0	67
Grey	Limestone		Medium hard	67	105

Deepened old well - Drilled 38'

OWRC C-V

31 | 0067 2 | 0105215
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0028-105	☒ FRESH

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
6	☒ STEEL			0067
06			67	105
06	☒ OPEN HOLE			0105

SCREEN: SIZE(S) OF OPENING (SLOT NO.) / DIAMETER (INCHES) / LENGTH (FEET) / MATERIAL AND TYPE / DEPTH TO TOP OF SCREEN (FEET)

61 PLUGGING & SEALING RECORD

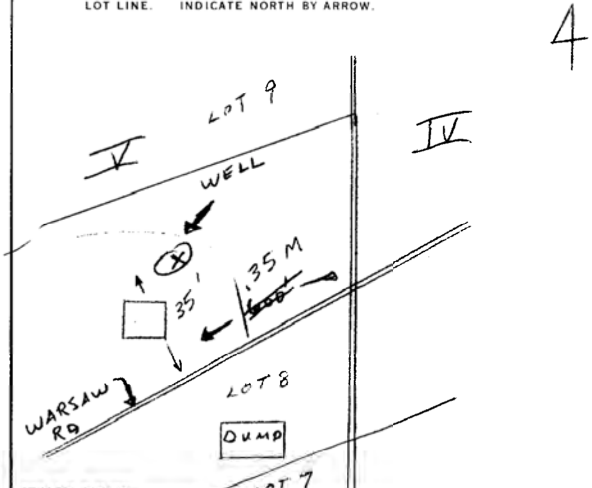
DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

- PUMPING TEST METHOD: ☒ PUMP ☐ BAILER
- PUMPING RATE: ½ qt. 0000 GPM
- DURATION OF PUMPING: 02 HOURS 00 MINS
- STATIC LEVEL: 012 FEET
- WATER LEVEL END OF PUMPING: 100 FEET
- WATER LEVELS DURING: ☐ PUMPING ☒ RECOVERY
- 15 MINUTES: 098 FEET
- 30 MINUTES: 095 FEET
- 45 MINUTES: 091 FEET
- 60 MINUTES: 088 FEET
- IF FLOWING, GIVE RATE: -- GPM
- PUMP INTAKE SET AT: 102 FEET
- WATER AT END OF TEST: ☒ CLEAR ☐ CLOUDY
- RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
- RECOMMENDED PUMP SETTING: 102 FEET
- RECOMMENDED PUMPING RATE: 0000 ½ Qt. GPM
- 000.0 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL 2218

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



DRILLERS REMARKS:

FINAL STATUS OF WELL: ☒ WATER SUPPLY ☐ OBSERVATION WELL ☐ TEST HOLE ☐ RECHARGE WELL ☐ ABANDONED, INSUFFICIENT SUPPLY ☐ ABANDONED, POOR QUALITY ☐ UNFINISHED

WATER USE 01: ☒ DOMESTIC ☐ STOCK ☐ IRRIGATION ☐ INDUSTRIAL ☐ OTHER ☐ COMMERCIAL ☐ MUNICIPAL ☐ PUBLIC SUPPLY ☐ COOLING OR AIR CONDITIONING ☐ NOT USED

METHOD OF DRILLING: ☒ CABLE TOOL ☐ ROTARY (CONVENTIONAL) ☐ ROTARY (REVERSE) ☐ ROTARY (AIR) ☐ AIR PERCUSSION ☐ BORING ☐ DIAMOND ☐ JETTING ☐ DRIVING

CONTRACTOR

- NAME OF WELL CONTRACTOR: Faulkner Well Drilling Co.Ltd — LICENCE NUMBER 2104
- ADDRESS: 789 Erskine Ave., Peterborough, Ont.
- NAME OF DRILLER OR BORER: Herb Lang
- SIGNATURE OF CONTRACTOR: N. N. Faulkner — SUBMISSION DATE: DAY 11 MO. 4 YR. 74

OFFICE USE ONLY

- DATA SOURCE: 1
- CONTRACTOR: 2104
- DATE RECEIVED: 0307 74
- DATE OF INSPECTION: May 14/75
- INSPECTOR: J.B.
- REMARKS:
- P
- WI

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FORM 7 07-091

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

Ontario

31 D/8E

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

(11) 5106499 | MUNICIP. 51007 | CON. CON 05

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
PETERBORO	DOURO	Con. V	008

[redacted] CLONSILLA RD. PETERBORO — DATE COMPLETED: DAY 05 MO SEPT YR 23

[redacted] 18650 | RC 4 | ELEVATION 0775 | RC 5 | BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
GREY	CLAY			0	8
GREY	SHALE			8	12
GREY	LIMESTONE			12	101

(31) 0008205 | 0012217 | 0101215

(32)

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0100	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

(51) CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
06 / 6¼	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	0013
06 / 6¼	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		13	0101
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN: SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET | MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

(61) PLUGGING & SEALING RECORD

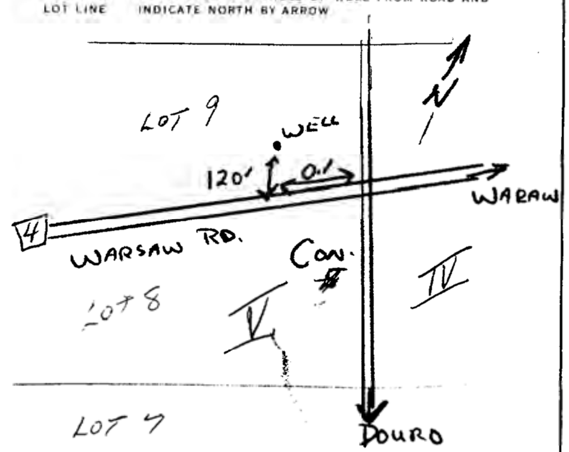
DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)

(71) PUMPING TEST

PUMPING TEST METHOD	1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE	0005 GPM
DURATION OF PUMPING	02 HOURS 30 MINS
STATIC LEVEL	042 FEET
WATER LEVEL END OF PUMPING	092 FEET
WATER LEVELS DURING	1 ☐ PUMPING 2 ☒ RECOVERY
15 MINUTES	050 FEET
30 MINUTES	042 FEET
45 MINUTES	042 FEET
60 MINUTES	042 FEET
IF FLOWING GIVE RATE	GPM
PUMP INTAKE SET AT	96 FEET
WATER AT END OF TEST	1 ☒ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE	☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING	096 FEET
RECOMMENDED PUMPING RATE	0005 GPM
50-53	000.1

LOCATION OF WELL 2218

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



DRILLERS REMARKS:

FINAL STATUS OF WELL	1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED
WATER USE 01	1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED
METHOD OF DRILLING	1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR	ANTON URBAN
LICENCE NUMBER	5102
ADDRESS	RR#10 PETERBORO
NAME OF DRILLER OR BORER	HEINZ URBAN
LICENCE NUMBER	
SIGNATURE OF CONTRACTOR	Anton Urban
SUBMISSION DATE	DAY 5 MO SEPT YR 23

OFFICE USE ONLY

DATA SOURCE	1
CONTRACTOR	5102
DATE RECEIVED	180913
DATE OF INSPECTION	May 20/75
INSPECTOR	
REMARKS	P WD

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FORM 7 07-091

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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

11 5112773

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON. BLOCK, TRACT, SURVEY, ETC.	LOT
Peterborough	Douro	4	8

OWNER (SURNAME FIRST) [redacted]

ADDRESS: R. R. # 2, Indian River, Ont. K0L 2B0

DATE COMPLETED: DAY 2 MO 12 YR 87

21 ZONE EASTING NORTHING E. EVATION BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
black	topsoil			0	1
grey	clay			1	16
blue	clay			16	24
4					

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
24	2 SALTY

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
36"	2 GALVANIZED	2 1/2"	+1	24

SCREEN

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

MATERIAL AND TYPE: washed stone

DEPTH TO TOP OF SCREEN: 6 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
0	7 1/2	cement

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☒ PUMP 2 ☐ BAILER	7 GPM	HOURS 5 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
7' 4" FEET	6" 2" FEET	1 ☐ PUMPING 2 ☐ RECOVERY	FEET	FEET	FEET	FEET

IF FLOWING GIVE RATE: GPM

PUMP INTAKE SET AT: FEET

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

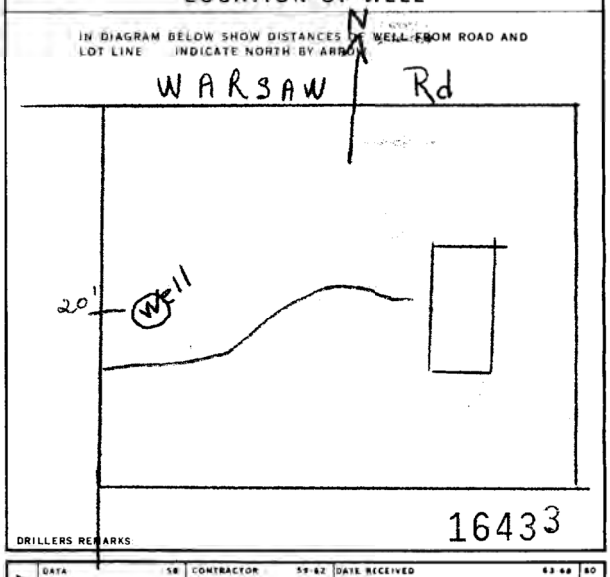
RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP

RECOMMENDED PUMP SETTING: FEET

RECOMMENDED PUMPING RATE: GPM

LOCATION OF WELL

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



DRILLERS REMARKS: 16433

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED 9 ☐ DEWATERING

WATER USE

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

METHOD OF CONSTRUCTION

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

CONTRACTOR

NAME OF WELL CONTRACTOR: Allan Fallis Excavating Co.

WELL CONTRACTOR'S LICENCE NUMBER: 2129

ADDRESS: R. R. # 11, Peterborough K9J 6Y3.

NAME OF WELL TECHNICIAN: Jeff Fallis

WELL TECHNICIAN'S LICENCE NUMBER: T-0451

SIGNATURE OF TECHNICIAN/CONTRACTOR: Jeff Fallis

SUBMISSION DATE: DAY 12 MO. 12 YR. 87

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR | DATE RECEIVED: DEC 23 1987

DATE OF INSPECTION | INSPECTOR

REMARKS

CSS.ES

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