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PINCHIN

2022 Annual Monitoring Report

McGarry Waste Disposal Site
Township of McGarry, Ontario

Prepared for:

Corporation of the
Township of McGarry
27 Webster Street, P.O. Box 99
Virginiatown, Ontario P0K 1X0

February 27, 2023

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1.0 INTRODUCTION

Pinchin Ltd. (Pinchin) was retained by the Township of McGarry (Client) to conduct the 2022 Annual Monitoring Program for the McGarry Waste Disposal Site (Site) property located east of Virginiatown, Ontario, on the south side of Highway 66 in the Township of McGarry, District of Timiskaming, Ontario.

The purpose of completing the 2022 Annual Monitoring Program was to assess the hydraulic media for contaminants of concern as a compliance requirement under the site-specific Certificate of Approval (CofA) **Number A572402** and the applicable regulatory requirements during 2022. To achieve the reporting objectives of this Site monitoring program, Pinchin carried out groundwater and surface water sampling at the Site in general accordance with the documents referenced within this report.

1.1 Location

The Site is located at Universal Transverse Mercator (UTM) coordinates Zone 17U, 609,800 metres (m) Easting and 5,332,529 m Northing (North American Datum 1983). Landfill coordinates were obtained from Google Earth.

The Site is located approximately 4 kilometres (km) east of Virginiatown, Ontario, along the Quebec and Ontario border. Access to the Site is by a gravel road that extends off Raven Mountain Road, south of Highway 66. The Site location is indicated on Figure 1 (All Figures are provided in Appendix I).

1.1.1 Site Survey and Aerial Photography

At the time of preparation of this report, a cadastral or geodetic survey, or aerial photography of the Site was not available for Pinchin to review. Pinchin completed an elevation survey of the existing well network on May 20, 2017. All elevations referenced within this report are based on local benchmarks established by Pinchin.

1.2 Ownership and Key Personnel

The Site is owned and operated by the Township of McGarry. The 2022 Monitoring Program was completed for the following Representative:

Ms. Sylvie Côté

Township of McGarry

27 Webster Street, PO Box 99

Virginiatown, Ontario P0K 1X0

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The Competent Environmental Practitioner (CEP) for the Site groundwater and surface water monitoring program was Mr. Tim McBride of Pinchin Ltd. Mr. McBride's contact information is provided below:

Mr. Tim McBride, B.Sc., P.Geo., Q.Pesa

Pinchin Ltd.

662 Falconbridge Road, Unit 3

Sudbury, Ontario P3A 4S4

1.3 Description and Development of the Site

This Site was originally approved in 1973 for the use and operation of a 35.0 hectares (ha) landfilling site for the disposal of domestic and commercial wastes. The original Site Design and Operations Plan was prepared by Heathwood Engineering Associated Limited. The most recent approval for the Site was issued August 20, 1980, as Provisional Certificate of Approval (CofA) No. **A572402** (Appendix II).

The August 20, 1980, CofA indicates that the Site is to be operated in accordance with a Site Plan dated February 8, 1977, a Surveyors Certificate prepared by Pit, Blackburn, Ontario Land Surveyors dated July 2, 1974. Neither of these documents have been provided to Pinchin.

On October 29, 1998, MECP issued an Inspection Report that included as an action item, a request that the Township update their Site Plan and their Operational and Maintenance Plan. The inspection report indicated that these requests had been made previously. In 1998 or early 1999, the Township retained Hatch to update their Site Design and Operations Plan. The final Site Design and Operations Plan was issued on August 12, 1999. It is Pinchin's understanding that the Hatch Plan is the current approved D&O Plan for the Site.

In 2014, the MECP conducted a groundwater related review of the 2013 Annual Monitoring Report for the Site, to evaluate on and offsite groundwater impacts, as well as compliance with provincial regulations. The review was summarized in the 2014 Thomas Guo Memo. Mr. Guo indicated that contaminated leachate was migrating off the established attenuation zone (CAZ) for the Site. Based on this interpretation, it was recommended that the Township investigate mitigation measures including expanding the CAZ, with additional downgradient lands and to replace the assumed background monitoring well (MW-1) with a new background monitoring well.

In 2014, a new monitoring well (MW-8) was installed and monitored. The recommendations in the 2014 A&A Annual Monitoring Report were to replace MW-1 with MW-8, as the background well and to continue annual groundwater monitoring:

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- Pinchin was retained in 2015 to complete the 2015 Annual Monitoring Report. Pinchin recommended that:
  - Landfill cover material be inspected and maintained as part of the ongoing monitoring program;
  - Consideration should be given to installing an additional monitoring well northwest of MW7 to confirm or refute the presence of leachate impacts migrating off-Site;
  - An elevation survey be completed for the Site to confirm the groundwater flow direction and help identify the direction of the leachate plume; and
  - Monitoring frequency should be reduced to twice annually in the early spring and late fall.

On January 21, 2016, a Voluntary Abatement Plan was submitted to the Township by Pinchin. This document provided a detailed outline of a three-year plan that was intended to help facilitate the long-term disposal needs of the Township, address MECP concerns and be economically viable. As a result, the work completed has included:

- An Environmental Peer Review and Operations Evaluation in which historical documents were reviewed to identify the Site's groundwater impacts and evaluate compliance with respect to the provincial regulations;
- Completion of the 2016 to 2020 Annual Monitoring Programs and Reports;
- Completion of monitoring well elevation survey;
- A Design and Operations Plan and Waste Capacity Assessment; and
- An updated Voluntary Abatement Plan.

1.4 Site Document Review

Pinchin reviewed the following documents for the Site and are referenced within this document:

- Report entitled "*The Corporation of the Township of McGarry, Virginiatown, Ontario, Operation and Maintenance Manual for McGarry Sanitary Landfill*" prepared for The Corporation of the Township of McGarry by Hatch, dated January 4, 1999 (the 1999 Hatch Operation and Maintenance Manual);

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- Report entitled "*The Corporation of the Township of McGarry, Virginiatown, Ontario, Groundwater Well Installation and Groundwater Testing for McGarry Sanitary Landfill*" prepared for The Corporation of the Township of McGarry by Hatch, dated August 12, 1999 (the 1999 Hatch Groundwater Well Installation and Groundwater Testing Report);
- Report entitled "*The Corporation of the Township of McGarry, Virginiatown, Ontario, Site Design and Operations Plan for McGarry Sanitary Landfill*" prepared for The Corporation of the Township of McGarry by Hatch, dated August 12, 1999 (the 1999 Hatch Design and Operations Plan);
- Memorandum entitled "*The Township of McGarry – McGarry Township Landfill Site, 2013 Annual Monitoring Report, ECA Number: A572402*" issued by Thomas Guo, Regional Hydrogeologist (in-training), Technical Support Section, Northern Region of the MECP to Steven Momy, Senior Environmental Officer, Timmins District Office of the MECP (the 2014 Thomas Guo Memo);
- Report entitled "*2014 Annual Monitoring Report – McGarry Township Landfill*" prepared for the Township of McGarry by A&A Environmental Consultants Inc., dated March 12, 2015 (the 2014 A&A Monitoring Report);
- Report entitled "*2015 Monitoring Report, McGarry Waste Disposal Site, Township of McGarry, Ontario*" prepared for the Township of McGarry by Pinchin, dated March 31, 2016 (the 2015 Pinchin Monitoring Report);
- Report entitled "*2016 Annual Monitoring Report, McGarry Waste Disposal Site, Township of McGarry, Ontario*" prepared for the Township of McGarry by Pinchin, dated February 1, 2017 (the 2016 Pinchin Monitoring Report);
- Report entitled "*Design & Operations Plan, McGarry Waste Disposal Site, Township of McGarry, Ontario*" prepared for the Township of McGarry by Pinchin, dated September 29, 2017 (the 2017 Pinchin D&O Plan);
- Report entitled "*2017 Annual Monitoring Report, McGarry Waste Disposal Site, Township of McGarry, Ontario*" prepared for the Township of McGarry by Pinchin, dated December 14, 2018 (the 2017 Pinchin Monitoring Report);
- Memorandum entitled "*2016 Annual Monitoring Report – McGarry Waste Disposal Site, Township of McGarry, District of Timiskaming*" issued by Melissa Lefrancois, Hydrogeologist, Technical Support of the MECP to Steve Momy, Senior Environmental Officer, Timmins Office of the MECP, dated January 11, 2018 (the 2018 MECP Memo);

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- Report entitled "*2018 Annual Monitoring Report, McGarry Waste Disposal Site, Township of McGarry, Ontario*" prepared for the Township of McGarry by Pinchin, dated February 14, 2019 (the 2018 Pinchin Monitoring Report);
- Report entitled "*2019 Annual Monitoring Report, McGarry Waste Disposal Site, Township of McGarry, Ontario*" prepared for the Township of McGarry by Pinchin, dated January 23, 2020 (the 2019 Pinchin Monitoring Report);
- Report entitled "*2020 Annual Monitoring Report, McGarry Waste Disposal Site, Township of McGarry, Ontario*" prepared for the Township of McGarry by Pinchin, dated February 10, 2021 (the 2020 Pinchin Monitoring Report); and
- Report entitled "*2021 Annual Monitoring Report, McGarry Waste Disposal Site, Township of McGarry, Ontario*" prepared for the Township of McGarry by Pinchin, dated March 22, 2022 (the 2021 Pinchin Monitoring Report).

A copy of these documents can be obtained from the Client. Pinchin has relied on the information available in the previous environmental reports reviewed for the Site as part of this assessment. Information reviewed within this report is referenced in pertinent sections throughout this document.

1.5 Monitoring and Reporting Program Objectives and Requirements

The reporting completed by Pinchin has been generally developed based on the Ontario Ministry of Environment and Climate Change (MECP) document entitled "*Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document*" dated November 2010.

1.6 Assumptions and Limitations

Pinchin has assumed that the information generated from historical investigations is accurate and has been completed in accordance with standard engineering practices and regulations. It should be noted that the historical background information made available to Pinchin, by the Client, was limited to the information provided in the 2014 A&A Monitoring Report and the 1999 Hatch Groundwater Well Installation and Groundwater Testing Report, as well as MECP correspondence.

The scope of the monitoring activities was limited to the parameters listed in the Column 1 (spring groundwater samples), Column 2 (summer and fall groundwater samples), Column 3 (spring surface water samples), and Column 4 (summer and fall surface water samples) of Schedule 5, in the MECP document entitled "*Landfill Standards: A Guideline on the Regulatory and Approval Requirements for New or Expanding Landfilling Sites*" dated January 2012 (MECP Landfill Standards) and was limited to the immediate area surrounding the Site. The investigations were limited solely to the groundwater within the monitoring well installations on-Site and the surface water surrounding the Site. The investigation

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does not constitute an exhaustive investigation of the Site property or adjacent properties for potentially unknown contaminants and/or other unknown sources of environmental impact.

Pinchin's limitation of liability and scope of work is as follows:

- The work performed in this report was carried out in accordance with the Terms and Conditions made part of the contract. The conclusions presented herein are based solely upon the scope of services and time and budgetary limitations described in the contract;
- The report has been prepared in accordance with generally accepted environmental study and/or engineering practices. No other warranties, either expressed or implied, are made as to the professional services provided under the terms of the contract and included in this report;
- The services performed and outlined in this report were based, in part, upon a previously installed monitoring network established by others and approved by the applicable regulatory agencies. Pinchin's opinion cannot be extended to portions of the Site which were unavailable for direct observations, reasonably beyond the control of Pinchin;
- The objective of this report was to assess the water quality conditions at the Site given the context of the contract with respect to existing environmental regulations within the applicable jurisdiction;
- The Site history interpreted herein relies on information supplied by others, such as local, provincial, and federal agencies, as well as Site personnel. No attempt has been made to independently verify the accuracy of such information, unless specifically noted in this report;
- Pinchin's interpretations relating to the landfill-derived leachate plume at the Site are described in this report. Where testing was performed, it was executed in accordance with the contract for these services. It should be noted that other compounds or materials not tested for may be present in the Site environment. The conclusions of this report are based, in part, on the information provided by others. The possibility remains that unexpected environmental conditions may be encountered at the Site in locations not specifically investigated. Should such an event occur, Pinchin must be notified in order that we may determine if modifications to our conclusions are necessary;
- The utilization of Pinchin's services during future monitoring at the Site will allow Pinchin to observe compliance with the conclusions and recommendations contained herein. It will also provide for changes as necessary to suit field conditions as they are encountered; and

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- Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Pinchin accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

2.0 PHYSICAL SETTING

2.1 Geology and Hydrogeology

It was reported in the 1999 Hatch Groundwater Well Installation and Groundwater Testing Report that the Site is located in a sand and gravel pit. The base of the landfill reportedly consisted of silty sand.

Based on Pinchin's review of the 2014 A&A Monitoring Report, the Site is located on the boundary of an esker, which consists of sand and gravel deposits approximately 100 m thick, deposited by glacial meltwater that was flowing beneath or within the glacier. The quaternary geology of the Site is mapped as Cenozoic Glaciolacustrine shallow water deposits of sand with minor gravel. This sand is typically fine to medium grained, although silty and/or coarse layers are commonly encountered.

The topography of the Site gently slopes toward the middle of the Site and westward toward the Milky Creek drainage area. Milky Creek is located approximately 500 m west of the Site. The landfill area is located in the drainage area of a tributary to Milky Creek. Pit development and sand extraction has resulted in a flat, level site for fill placement surrounded by a sand bluff.

Based on Pinchin's review of the boreholes advanced at the Site, the soil consists of medium and silty sand. Borehole logs depicting the soil and construction details for each of the groundwater monitoring wells for the Site are provided in Appendix III.

2.2 Surface Water Features

Milky Creek is located approximately 500 m west of the Site. Surface water drainage from the landfill is inferred to flow to the west and dissipate to ground and is reported to be intermittent with seasonal fluctuations consistent with precipitation events. In addition, there are no Provincially Significant Wetlands identified in the surrounding watershed system.

Based on the 1999 Hatch Operation and Maintenance Manual, surface water run-off at the Site generally flows into the low-lying area in the southwest end of the Site. Based on field observations conducted in 1998, direct off-site surface water drainage into the Milky Creek drainage area was not located. The surface waters that collect in the low-lying area are likely re-infiltrating into the groundwater at the Site.

Based on the 1999 Hatch Design and Operations Plan, a surface water ditch was excavated in the spring of 1999 to drain standing water from the western toe to the west.

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Previous investigations included a surface water sampling location within a ditch in the vicinity of MW3. Surface water quality at this location has regularly exceeded the Provincial Water Quality Objectives (PWQO) for various parameters. The 2014 Thomas Guo Memo recommended that a surface water review was required to assess the source of the elevated contaminants in the surface water.

During the 2016 Monitoring Program, Pinchin completed a surface water evaluation for the Site which included the collection of surface water samples at various locations. Details regarding the 2016 surface water evaluation activities are provided in the 2016 Pinchin Monitoring Report. Pinchin tailored the surface water monitoring program in 2017 to include upstream and downstream locations within Milky Creek, located west of the Site. This design was followed into the 2018-2020 sampling events.

3.0 HISTORICAL DOCUMENT REVIEW

Pinchin reviewed the 1999 Hatch Operation and Maintenance Manual, the 1999 Hatch Groundwater Well Installation and Groundwater Testing Report, the 1999 Hatch Design and Operations Plan, the 2013 Thomas Guo Memo, the 2014 A&A Monitoring Report, the 2015 and 2016 Pinchin Monitoring Reports, the 2017 Pinchin D&O Plan, the 2018 MECP Memo, the 2019 Annual Monitoring Report, and the 2020 Annual Monitoring Report. The following section provides a brief summary of these documents.

The 1999 Hatch Operation and Maintenance Manual

The 1999 Hatch Operation and Maintenance Manual was completed to update the Site Design and Operations Plan for the Site. Based on the population estimates at the time, it was concluded that the Site would be capable of accepting waste for approximately 30 to 35 years. The 1999 Hatch Operation and Maintenance Manual provided background information regarding topography, geology, soil conditions, and climatology. It also provided operation and maintenance procedures to be implemented at the Site.

The 1999 Hatch Groundwater Well Installation and Groundwater Testing Report

The 1999 Hatch Groundwater Well Installation and Groundwater Testing Report was completed in response to the action requirements provided by the MECP in their Inspection Report dated October 26, 1998. The Operation and Maintenance Manual was to include a groundwater monitoring program for the Site.

The 1999 Hatch Groundwater Well Installation and Groundwater Testing Report consisted of the following:

- The installation of four groundwater monitoring wells (MW1 through MW4);
- Measurement of groundwater levels to determine groundwater flow directions;

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- Collection of groundwater samples and submission for chemical testing including metals, anions, and general chemistry parameters. Submission of a sample of leachate impacted groundwater for volatile organic compounds (VOC) analysis;
- Collection of surface water sample of runoff from the Site and submit for chemical testing including metals, anions, and general chemistry parameters; and
- Preparation of a factual report detailing the well installation program and providing sampling methodologies for future samples.

The 1999 Hatch Groundwater Well Installation and Groundwater Testing Report indicated that the Site overburden soils consist of sand with some silty and gravelly zones. Groundwater level measurements indicated that the groundwater flows toward the middle of the Site, from the north and south, and is inferred to flow westward from there towards Milky Creek.

The groundwater quality results indicated that groundwater in the perimeter monitoring wells have not been adversely impacted by the leachate at levels of concern. Furthermore, based on topography and a review of the groundwater level measurements collected at the Site, it was reported that leachate is migrating generally towards the west as it crosses the property boundary. However; no adverse impacts or concerns were identified at downgradient monitoring well MW3.

The 1999 Hatch Design and Operations Plan

The 1999 Hatch Design and Operations Plan was completed to update the Site Design and Operations Plan published for the Site on January 4, 1999. In particular, the report provided a revised site capacity estimate which equated to approximately 19 years. In addition, the 1999 Hatch Design and Operations Plan noted a waste fill area located at the left when entering the Site, which was reportedly used for the disposal of solid waste from the demolition of buildings, as well as residential wastes. In addition, it was noted that a surface water drainage ditch was excavated in the spring of 1999 to drain standing water from the western toe of the landfill.

The 2014 Thomas Guo Memo

The 2014 Thomas Guo Memo consisted of a review of the groundwater related portions of the report prepared by A&A Environmental Consultants Inc., entitled "*2013 Annual Monitoring Report, McGarry Township Landfill, Report #2379 – McGarry*" dated March 20, 2014. The purpose of the 2014 Thomas Guo Memo was to review and evaluate on and off-Site groundwater impacts and compliance with provincial regulations.

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The following is a summary of the recommendations provided in the 2014 Thomas Guo Memo:

- Replace MW1 with a new background well in 2014, located along the south boundary of the property;
- Although the impacted wells are within the established attenuation zone area of the landfill, it does not acknowledge that some wells are located immediately adjacent to the site boundary. The downgradient wells MW2 and MW7 are impacted by leachate. Based on the proximity of these wells to the site boundary, the leachate is migrating beyond the established attenuation zone area of the landfill;
- Based on off-Site leachate impacts, Thomas Guo recommended that the proponent needs to immediately investigate mitigation options. As previously suggested by an MECP hydrogeologist, this could include the acquisition of additional lands downgradient of the current property to bring this Site into compliance with the "reasonable use concept" (RUC) Guideline B-7. It was recommended that the proponent should include a plan for achieving compliance in the next annual monitoring report;
- The consultant is asked to further investigate the elevated contaminant levels found in surface water samples from the site ditch. This could include sediment analysis to investigate the causes of impacts in surface water;
- The monitoring program should be continued to be conducted in the spring, summer, and fall. The monitoring report shall be prepared by a qualified person and submitted to the MECP by March 31, 2015; and
- The monitoring report should include a copy of the active CofA issued by the MECP.

<u>The 2014 A&A Monitoring Report</u>

The 2014 A&A Monitoring Report includes the monitoring results from June 1999 to October 2014 and specifically documents the 2014 monitoring program which consisted of measuring and sampling groundwater from seven previously installed monitoring wells on Site. The 2014 sampling events were conducted in May, August, and October.

The following provides a summary of the 2014 A&A Monitoring Report:

- There was significant fluctuation throughout the monitoring events for the majority of the parameters which was correlated to the amount of rainfall received at the Site prior to each sampling event;

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- High concentrations for most parameters were observed at the leachate well (MW4), but such parameters show a general declining trend in most of the tested parameters in recent years. In addition, the concentrations of these parameters in the boundary wells are much lower and fairly stable indicating that attenuation is taking place within the landfill boundaries;
- In 2014, groundwater quality at all down-gradient and boundary monitoring wells met the RUC for all health-related parameters. Concentrations of arsenic and boron exceeded the RUC at the leachate well (MW4); however, natural attenuation between MW4 and the north and west site boundaries has ensured that the concentrations of these metals are reduced to acceptable levels as groundwater exits the property;
- Background groundwater quality at MW1 shows steady horizontal trends with generally low parameter concentrations, but concentrations of pH, alkalinity, and hardness continue to fall below the Ontario Drinking Water Quality Standards (ODWQS). This was correlated to naturally occurring up-gradient source of organic nitrogen, decaying organic matter, and lack of naturally occurring carbonate minerals;
- Monitoring well MW8 was installed on August 5, 2014, to replace monitoring well MW6 that was observed to be dry on multiple sampling events. Several RUC exceedances occurred in MW8 including organic nitrogen, pH, DOC, aluminum, iron, and manganese;
- Most of the monitoring wells except leachate well MW4 showed levels of pH below the acceptable range of values for the Site and concentrations of organic nitrogen slightly higher that the RUC allowable limits. This was noted to be a reflection of groundwater quality entering the Site, which does not meet the ODWQS for these parameters;
- Previous investigations included the sampling for VOCs during the summer sampling event; however, no VOCs were sampled during the 2014 sampling program;
- Lead, iron, aluminum, and manganese naturally occur in the soil and may be carried over in the sample if the filtering procedure is unsuccessful and if the wells are not sampled at a slow enough rate. Groundwater free of dissolved oxygen tend to dissolve iron and manganese from the geological strata of the aquifer material; however, high levels of iron and manganese observed at the leachate well are more likely due to the influence of landfill leachate. In addition, exceedances of the RUC allowable limit for organic nitrogen are likely the result of impact from leachate and the presence of some local influences;
- The leachate impacted wells are within the established attenuation zone area of the landfill, and present results do not suggest the site is operating outside the originally proposed design objectives as a natural attenuation site; and

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- A surface water sample was collected twice from the ditch located near MW3. Previous investigations noted PWQO exceedances at this location for various metals. It was noted that surface water samples are unfiltered, and the acid preservative used for metals analysis would digest any fine sediment particles present in the sample, which likely accounts for the high metals concentrations.

The following provides a summary of the recommendations made in the 2014 A&A Monitoring Report:

- Previous investigations used monitoring well MW1 as a background well based on the belief that groundwater was flowing to the west. Although MW1 shows low levels for most of the tested parameters, it has also exceeded the ODWS on several sampling occasions. Since groundwater has been established to flow northwest-north, and MW1 is located close to the site boundary northeast of the site, replacing this well with a new well (MW8) is recommended in the future events; and
- It was recommended that the monitoring and sampling program continue to be conducted in spring, summer, and fall.

In summary, the 2014 A&A Monitoring Report noted that the Site is having only a slight impact on downgradient water quality. Although groundwater impairment is evident at the leachate source well MW4, which indicates higher values for conductivity, TDS, and dissolved constituents, the natural attenuation and buffering capacity of the soil has been sufficient to restore the groundwater quality to near background levels at the downgradient boundary.

Furthermore, 2014 A&A Report indicated that the 2014 results suggest that the Site is still operating within the originally proposed design objectives as a natural attenuation site, and additional lands should be acquired in order to provide adequate contaminant attenuation.

The 2015 Pinchin Monitoring Report

The 2015 Pinchin Monitoring Report includes the monitoring results from May, July, and September 2015 and specifically documents the 2015 monitoring program which consisted of measuring and sampling groundwater from seven previously installed monitoring wells on Site, as well as the collection of surface water samples from the "ditch".

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Based on the 2015 results obtained from the existing groundwater monitoring wells, Pinchin did not identify any significant landfill related impacts at the Site. Concentrations of pH, alkalinity, and total hardness observed at downgradient monitoring locations MW2 and MW7 were reported to be likely naturally occurring conditions within the shallow unconfined aquifer on-site. All exceedances of the RUC Guideline B-7 in 2015 were related to operational guidelines associated with drinking water systems set by the ODWQS and were not considered to be significant environmental concern originating from the Site.

In 2015, elevated concentrations of DOC, iron, and manganese observed at the leachate monitoring well MW4 and the newly installed background well MW8 (located southeast of the Site) appeared to be attenuating within close proximity to the Site, as concentrations of such parameters were observed to be below the ODWQS at monitors MW1, MW2, MW3, MW5, and MW7.

In 2015, elevated concentrations of DOC, aluminum, and lead were observed at the surface water sampling location "ditch", during the spring 2015 sampling event. This surface water sampling location is located within the landfill confines. Considering there was no downgradient surface water sampling location established at the Site, it was Pinchin's opinion that there was inconclusive evidence to suggest significant concentrations of landfill related contaminants were being observed at downgradient surface water receptors.

The following provides a summary of the recommendations made in the 2015 Pinchin Monitoring Report:

- The Client should continue to ensure that the current landfill cover material is inspected and maintained as part of the ongoing monitoring program. In the future, any damage to the cover due to weathering or other cause should be rectified;
- Consideration should be given during future monitoring events to installing a monitoring well northwest of MW7 to confirm or refute the presence of leachate impacts migrating off-Site and beyond MW7;
- Based on the soil characteristics of the Site, consideration should be given to installing a deeper monitoring well nested with MW7, in order to assess groundwater quality beneath the shallow aquifer and to determine if a confined aquifer is present at the Site;
- Pinchin recommends completing an elevation survey at the Site to confirm groundwater flow direction. An elevation survey would accurately determine the groundwater flow direction and help identify the direction of the leachate plume;

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- As per the 2013 Thomas Guo Memo, further investigation is required regarding the elevated concentrations of metals observed at the surface water sampling location. Pinchin recommends establishing an up gradient and downgradient surface water sampling locations to identify potential downgradient surface water impacts; and
- It is Pinchin's opinion that the monitoring frequency should be reduced to twice annually (early spring and late fall).

The 2016 Pinchin Monitoring Report

Based on the results of the 2016 Pinchin Monitoring Report, it was concluded that the historical groundwater quality data observed during previous investigations at MW8 appeared to identify leachate impacted groundwater at this location. This was reportedly likely due to its close proximity to the waste area or a radial groundwater flow pattern at the Site. In addition, groundwater quality south of the Site (MW8) was not assessed during the 2016 monitoring program. As such, Pinchin recommended locating monitoring well MW8 or replacing it in a new location to help delineate potential impacts migrating south of the Site.

Based on Pinchin's review of the analytical data collected in 2016, the observed topography of the area and the proximity of Milky Creek, it was Pinchin's opinion that the leachate plume was likely situated southwest of the Site. Based on the groundwater quality observed at monitoring well MW3, it was Pinchin's opinion that this plume was naturally attenuating within close proximity of the waste area. However, Pinchin recommended that future groundwater elevation measurements are collected to accurately determine the groundwater flow direction and help confirm the direction of the leachate plume.

Based on the 2016 results obtained from the existing groundwater monitoring wells, Pinchin did not identify any significant human health or ecological landfill related impacts northwest of the Site. All exceedances of the RUC Guideline B-7 were related to operational guidelines associated with drinking water systems set by the ODWQS.

Based on Pinchin's review of the existing dataset and regulatory requirements as of the 2016 Pinchin Monitoring Report, Pinchin recommended the following:

- The Client should continue to ensure that the current landfill cover material is inspected and maintained as part of the ongoing monitoring program. In the future, any damage to the cover due to weathering or other cause should be rectified;
- As per the 2013 Thomas Guo Memo, further investigation is required regarding the elevated concentrations of metals observed at the surface water sampling location. Pinchin recommended continuing to sample surface water sampling locations SW1, SW2, and Ditch to identify potential downgradient surface water impacts;

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- Pinchin recommended completing a monitoring well elevation survey in the spring of 2017 to confirm the groundwater flow direction at the Site and ensure the inclusion of monitoring well MW8; and
- It was Pinchin's opinion that the monitoring frequency should remain reduced to twice annually (early spring and late fall).

The 2017 Pinchin D&O Plan

The 2017 Pinchin D&O Plan was written to satisfy the requirements of the Voluntary Abatement Plan issued to the Township on January 21, 2016, to reflect current on-Site operations and to provide direction to guide the future development and operations of the Site. The scope of work included reviewing and updating the 1999 Hatch Design and Operations Plan to meet current regulatory and approval requirements for the design, operation, closure, and post-closure care of the Site.

The 2017 Pinchin D&O Plan also provided an update on the available capacity remaining at the Site. The capacity is dependent upon the limitations of the Site placed by the CofA and applicable provincial statutes and regulations. The primary constraint is the 35.0 ha area for landfilling approved in CofA No. A572402. The conceptual final contour plan for the Site upon closure will include a maximum slope of 4 horizontal to 1 vertical (4:1) and minimum slope of 20 horizontal to 1 vertical (20:1). The volume between the existing contours and the proposed final contours equates to the remaining capacity of the Site. Based on the approved 35.0 ha Site and the annual disposal rate, it was Pinchin's opinion that the Site will not reach capacity for over 75 years; however, it was recommended that an updated D&O Plan is completed every 20 years to re-evaluate the operations, environmental impact, and life expectancy of the Site at that time.

The 2018 MECP Memo

Based on the information provided in the Environmental Peer Review and Operations Evaluation report and the 2015 and 2016 monitoring reports, the following recommendations were provided in the 2018 MECP Memo.

- Continue to ensure that current landfill cover material is inspected and maintained as part of the ongoing monitoring program. Any damage to the cover due to weathering or other causes should be rectified;
- Complete an elevation survey for all sampling events in 2017 to confirm the groundwater flow direction at the site and ensure the inclusion of monitoring well MW8. The groundwater elevations and contours should be illustrated in future monitoring reports; and

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- Update the current regulatory and approval requirements for the design, operation, closure, and post-closure care of the site. Consideration should be given to revise the waste capacity of the site. Consideration should also be given to conduct a waste capacity assessment at the site.

Further, it was recommended that the 2018 annual monitoring should consist of tri-annual sampling, spring, summer, and fall at all groundwater monitoring locations on Site. This is recommended until an appropriate background well, groundwater contour (flow direction), and confirmation of achievable RUC at the property line can be established.

It was also recommended that the Site be reviewed by a MECP surface water specialist as further investigation is required regarding elevated metal concentrations.

The Previous Pinchin Monitoring Reports (2017, 2018, 2019, 2020, and 2021)

Based on Pinchin's review of the analytical data set collected throughout 2017 to 2021, monitoring wells MW1, MW2, MW3, MW5, and MW7 were not being influenced by landfilling activities. It appeared that landfill leachate is naturally attenuating within close proximity of the waste area (MW4) and is not influencing the shallow unconfined groundwater unit in the vicinity of monitoring wells MW1, MW2, MW3, MW5, and MW7. Further investigation is required to confirm or refute the presence of potential landfill leachate migrating south of the Site, in the vicinity of MW8. All exceedances of the RUC Guideline B-7 are related to operation guidelines associated with drinking water systems set by the ODWQS and did not suggest human health or ecological concerns related to landfill impacts. Similarly, based on Pinchin's review of the 2019 surface water analytical data set, it appeared that surface water impacts are not occurring at the downstream surface water receptors.

As part of the previous monitoring reports, Pinchin recommended the following:

- The Client should continue to ensure that the current landfill cover material is inspected and maintained as part of the ongoing monitoring program. In the future, any damage to the cover due to weathering or other cause should be rectified;
- Surface water sampling locations SW1, SW2, Ditch and Pond should continue to be sampled on a tri-annual basis to identify potential downgradient surface water impacts;
- The monitoring frequency should consist of tri-annual sampling, spring (May-June), mid-summer (August-September), and late fall (October-November) at all groundwater monitoring locations on Site. This should continue until the appropriate background well, groundwater contour (flow direction) and confirmation of achievable RUC at the property line can be established; and

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- Groundwater quality south of the Site was assessed during the 2017 to 2021 monitoring programs. During the monitoring events, MW8 was observed to be in good condition and installed/repaired in accordance with O.Reg 903. It is recommended that this monitoring location continue to be sampled during future monitoring events.

4.0 METHODOLOGY

4.1 Scope of Work

The objectives of the monitoring program as requested by the client were provided in Pinchin's proposal entitled "*2022-2024 Annual Monitoring and Reporting – McGarry Landfill*", dated January 7, 2022 (the proposal).

The 2022 Annual Monitoring Report has been developed based on an assessment of the ODWQS, MECP Guideline B-7, PWQO, APV, and CWQG and will meet the minimum reporting requirements specified in the site-specific CofA and MECP Landfill Standards. It should be noted that contrary to previous monitoring programs completed at the Site, the 2017 Monitoring Programs only included two monitoring events completed by Pinchin on May 20 (spring) and November 2 (fall), 2017. It should also be noted that during the 2018 through 2022 monitoring events, all of the groundwater and surface water locations were monitored in the spring, summer, and fall.

The objectives of the current monitoring program as requested by the Client included the following scope of work:

- Mobilization to the Site during the spring, summer, and fall of 2022 and collection of groundwater and surface water samples from the existing well network and surface water monitoring locations;
- Submission of representative spring groundwater samples to an accredited analytical laboratory for analysis of the chemical parameters outlined in Column 1 of Schedule 5 of the MECP Landfill Standards and spring surface water samples to an accredited analytical laboratory for analysis of the chemical parameters outlined in Column 3 of Schedule 5;
- Submission of representative summer and fall groundwater samples to an accredited analytical laboratory for analysis of the chemical parameters outlined in Column 2 of Schedule 5 of the MECP Landfill Standards and summer and fall surface water samples to an accredited analytical laboratory for analysis of the chemical parameters outlined in Column 4 of Schedule 5; and

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- Preparation of a report outlining the 2022 field work completed and the analytical results, an evaluation of the results and any subsequent recommendations.

The investigation methodology was also conducted in general accordance with, and reference is made to the following regulatory and guidance documents:

- MECP document entitled "*Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario*", dated December 1996 (MOE Sampling Guideline);
- MECP document entitled "*Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act*", dated March 9, 2004, amended July 1, 2011 (Analytical Methods);
- Ontario Regulation 169/03 "*Ontario Drinking Water Quality Standards*" under the Safe Drinking Water Act", dated 2002;
- MECP document entitled "*Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines*", dated June 2003 (ODWQS Guideline);
- MECP document entitled "*Incorporation of the Reasonable Use Concept into MOEE Groundwater Management Activities, Guideline B-7 (formerly 15-08)*" (Guideline B-7), dated April 1994;
- MECP document entitled "*Determination of Contaminant Limits and Attenuation Zones, Procedure B-7-1*", (formerly referenced by 15-08);
- Ontario Regulation 903 R.R.O. 1990 "*Wells*", under the Ontario Water Resources Act;
- MECP document entitled "*Water Management Policies Guidelines Provincial Water Quality Objectives*" (PWQO), dated July 1994, revised February 1999;
- MECP document entitled "*Rationale for the Development of Soil and Groundwater Standards for Use at Contaminated Sites in Ontario*" (Table 3.1 - Aquatic Protection Values) dated April 15, 2011; and
- Canadian Council of Ministers of the Environment (CCME) document entitled "*Canadian Environmental Quality Guidelines*" (Water Quality Guidelines for the Protection of Freshwater Aquatic Life) dated 1999.

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4.2 Groundwater Monitoring Well Locations

Eight overburden groundwater monitoring wells (MW1 through MW8) have historically been utilized at the Site, intended to serve as reference points for retrieving water quality across the landfill:

- Monitoring well MW1 was installed in June 1999 and located along the northeast boundary of the Site. MW1 was intended to represent background groundwater quality. Pinchin was successful in obtaining groundwater samples at MW1 during the spring, summer, and fall sampling events;
- Monitoring well MW2 was installed in June 1999 and located along the north boundary of the Site. MW2 was intended to represent upgradient groundwater quality. Pinchin was successful in obtaining groundwater samples at MW2 during the spring, summer, and fall sampling event;
- Monitoring well MW3 was installed in June 1999 and located along the west portion of the Site. MW3 was intended to represent downgradient groundwater quality. Pinchin was successful in obtaining groundwater samples at MW3 during the spring, summer, and fall sampling events;
- Monitoring well MW4 was installed in June 1999 and located centrally within the waste fill area of the Site. MW4 was intended to represent "worst-case" leachate groundwater quality. Pinchin was successful in obtaining groundwater samples at MW4 during the spring, summer, and fall sampling events;
- Monitoring well MW5 was installed on May 22, 2004, and is located within the central-east portion of the Site. MW5 was intended to represent cross-gradient groundwater quality. Pinchin was successful in obtaining groundwater samples at MW5 during the spring, summer, and fall sampling events;
- Monitoring well MW6 was installed on May 22, 2004, and was reportedly located along the south boundary of the Site. MW6 was intended to represent downgradient groundwater quality. During the 2022 spring, summer, and fall sampling events, MW6 was not found and samples were not collected at this location;
- Monitoring well MW7 was installed on May 22, 2004, and is located along the northwest boundary of the Site. MW7 was intended to represent downgradient groundwater quality. Pinchin was successful in obtaining groundwater samples at MW7 during the spring, summer, and fall sampling events; and

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- Monitoring well MW8 was installed on August 5, 2014, and is located along the south boundary of the Site. MW8 was intended to represent background groundwater quality as a replacement monitoring well for MW6 (which was routinely observed to be dry). However, several exceedances of the ODWQS and Guideline B-7 have been quantified at this location, further monitoring is required to determine if MW8 is impacted by landfill leachate migrating south of the Site.

  Pinchin was retained to repair monitoring well MW8 in accordance with O.Reg 903 during the spring 2018 monitoring event. Pinchin was successful in obtaining representative groundwater samples at MW8 during all sampling events.

Surface water and monitoring well locations are identified on Figure 2 (all Figures are provided in Appendix I). Details regarding the groundwater monitoring well locations are provided in Table 1 (all Tables are provided in Appendix IV).

The condition of each of the groundwater monitoring well locations was inspected at the time of each of the 2022 sampling events. All wells were observed to be in compliance with O. Reg. 903, with the exception of MW3 which was found to have its casing sunk and MW4 which was found to have its riser sticking up to a height that prevents the casing lid from closing. In addition, the surficial concrete seal at the base of MW8 appeared to be compromised; however, the underlying bentonite seal remains intact and would serve as an effect barrier to vertical migration or preferential pathway for water infiltration. A photographic log of the monitoring locations is provided in Appendix V.

4.3 Surface Water Monitoring Locations

Milky Creek is located approximately 500 m west of the Site and flows in a southwesterly direction towards Larder River. Based on field observations collected during the 2016 through 2022 monitoring programs, surface water drainage from the Site is expected to flow in a westerly direction towards Milky Creek. It is expected that surface water drainage from the Site, in particular the ponded water observed south of the Site and the ditch area during the spring monitoring event, is intermittent with seasonal fluctuations consistent with precipitation events. Routine monitoring of this ponded surface water and ditch system is required during future monitoring events to confirm this. However, monitoring stagnant water conditions presents challenges with respect to the interpretations of trends as stagnant water is often not representative of the flow system.

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The Site has one historical point for surface water monitoring:

- "Ditch" located along the west portion of the Site, in the vicinity of MW3.

As part of the 2022 Annual Monitoring Program, Pinchin continued the surface water evaluation which included the surface water sampling locations established in 2016. These locations included the upstream (SW1) and downstream (SW2) monitoring locations, as well as the "ditch" and "pond" locations.

The following provides a summary of the surface water sample locations included in the 2022 monitoring program:

- Surface water sample "Ditch" is located in the vicinity of MW3, immediately west of the Site. This sampling location has been monitored during previous investigations and has been included in the 2022 monitoring program;
- Surface water sample "Pond" was located within the central portion of the landfill. This location was observed to be dry during each of the sampling events conducted in 2022;
- Surface water sample "SW1" was collected during the spring, summer, and fall of 2022 sampling events. This surface water sample was located within Milky Creek, approximately 400 m upstream and north of the Site; and
- Surface water sample "SW2" was collected during the spring, summer, and fall of 2022 sampling event. This surface water sample was located within Milky Creek, approximately 700 m downstream and southwest of the Site.

The following table provides a summary of the surface water sampling locations included in the 2022 monitoring program. The locations of the surface water sampling locations are provided in Figure 2. A photographic log of the monitoring locations is provided in Appendix V.

Location	UTM NAD 83	Approximate Proximity to the Waste Area
Ditch	17 U 609,750 m E, 5,332,109 m N	Immediately west of Site.
SW1	17 U 609,654 m E, 5,332,801 m N	Milky Creek, upstream of Site.
SW2	17U 609,850 m E, 5,332,369 m N	Milky Creek, downstream of Site.
Pond	17U 610,083 m E, 5,332,341 m N	Within close proximity to the waste

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4.4 Monitoring Frequency

Groundwater and surface water quality monitoring at the Site was completed on May 25 (spring), August 3 (summer), and September 27 (fall) of 2022. The results of inspection and monitoring are to be reported annually to the MECP by March 31 of the following year.

4.5 Monitoring Parameters

4.5.1 Groundwater Monitoring Parameters

During the spring 2022 monitoring events, groundwater samples were submitted for laboratory analysis of the parameters listed in Column 1 of Schedule 5 of the MECP Landfill Standards. During the summer and fall 2022 monitoring events, groundwater samples were submitted for laboratory analysis of the parameters listed in Column 2 of Schedule 5 of the MECP Landfill Standards. At the time of sample collection, field readings were also measured for the following parameters: temperature, pH, conductivity, oxidation reduction potential (ORP), and dissolved oxygen.

4.5.2 Surface Water Monitoring Parameters

During the spring 2022 monitoring events, surface water samples were submitted for laboratory analysis of the parameters listed in Column 3 of Schedule 5 of the MECP Landfill Standards, whereas summer and fall 2022 monitoring events surface water samples were submitted for laboratory analysis of the parameters listed in Column 4 of Schedule 5. At the time of sample collection, field readings were also measured for the following parameters: temperature, pH, conductivity, ORP, and dissolved oxygen.

4.6 Monitoring Procedures and Methods

4.6.1 Standard Operating Procedures

The following Pinchin Standard Operating Procedures (SOPs) were followed by Pinchin field personnel for each portion of this project:

- Groundwater Sampling SOP; and
- Surface Water Sampling SOP.

All Pinchin monitoring SOPs have been developed in accordance with the MECP Sampling Document and are consistent with standard engineering practices.

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4.6.2 *Groundwater Monitoring Activities*

To perform the groundwater monitoring activities, the following tasks were conducted:

- Pinchin notified the Client prior to field activities and subsequently mobilized staff from the Sudbury office to the Site. The spring, summer, and fall groundwater sampling event occurred on May 25, August 3, and September 27, 2022, respectively;
- Static groundwater levels were collected using a Solinst™ water level tape. Measurements were collected from the top of riser pipe. The meter tape is calibrated in 1.0 mm increments. Reproducibility of the depth measurements is generally within 2.0 mm or less;
- During the monitoring events, groundwater from each monitoring well was purged prior to the collection of the sample, using a moderate-flow sample methodology via high-density polyethylene (HDPE) 3/8" tubing and a Waterra™ inertial foot valve system. The HDPE system was chosen as an approved method to minimize sediment/particulate within each sample and to minimize sample agitation and well trauma in accordance with the MECP Sampling Document. Pinchin purged a minimum of three well volumes to a maximum of six well volumes using the inertial pump system until the well volume column was representative of the surrounding formation. During purging activities, additional groundwater monitoring parameters were collected from each monitoring well using a YSI-556 water quality meter for measurement of field parameters. Sample residual was disposed of onto the ground surface, on-site and up-gradient within the landfill confines;
- Groundwater samples were collected using the HDPE system in accordance with the MECP Sampling Document. Dissolved metals were field-filtered using a dedicated in-line 0.45 micron disposable filter. Upon completion of field sampling and monitoring activities, all samples collected were submitted to the project laboratory, SGS Canada Inc. (SGS) in Lakefield, Ontario. All parameters were analyzed by the project laboratory using MECP approved procedures and are consistent with the analytical methods prescribed in the Analytical Methods document; and
- The groundwater samples collected were analyzed at the project laboratory for the parameters listed in Column 1 of Schedule 5 of the MECP Landfill Standards (spring) and Column 2 of Schedule 5 of the MECP Landfill Standards (summer and fall). Groundwater sample results were compared to the applicable ODWQS as applied in accordance with the ODWQS Guideline document. Groundwater sample results were also compared to the reasonable usage parameters and were assessed using Guideline B-7 to establish

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and determine levels of contaminant discharges to the groundwater formation, which would be considered acceptable by the MECP from naturally attenuating landfill sites, with respect to human consumption and potable considerations.

It should be noted that Pinchin was not retained to perform the groundwater field monitoring activities during previous investigations completed at the Site, specifically the 2015 spring, summer, and fall sampling events.

The 2015 field monitoring activities were completed by A&A. As such, Pinchin has relied on the information made available by A&A to complete the historical data analysis included in the 2015 Annual Monitoring Report and reiterated that information in the subsequent Annual Monitoring Reports.

4.6.3 Surface Water Monitoring Activities

To perform the surface water monitoring activities, the following tasks were conducted:

- Pinchin notified the Client prior to field activities and subsequently mobilized staff from the Sudbury office to the Site. The spring, summer, and fall surface water sampling events coincided with the groundwater monitoring events;
- Care was taken during collection of surface water samples to ensure that a representative sample was collected and that underlying sediments were not disturbed. For the surface water samples only, no filtration was done (in accordance with MECP surface water sampling protocols);
- All field activities at each monitoring location were initiated at down-stream locations working up-stream to avoid sediment disturbance and influencing sample integrity;
- Surface water samples were collected during each sampling event using a direct grab sampling methodology in accordance with the MECP Sampling Document. Upon completion of field sampling and monitoring activities, all samples collected were submitted to SGS. All parameters were analyzed by the project laboratory using MECP approved procedures and are consistent with the analytical methods prescribed in the Analytical Methods document;
- During sampling activities, surface water monitoring field parameters were collected at each surface water monitoring location using a YSI-556 water quality meter; and
- Surface water samples were analyzed during the monitoring events for parameters listed in the Column 3 (spring) of Schedule 5 in the MECP Landfill Standards document and Column 4 (summer and fall) of Schedule 5 in the MECP Landfill Standards document. Sample results were compared to the applicable PWQO, APV, and CWQG criteria.

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4.6.4 *Groundwater and Surface Water Field Measurements*

Subsequent to groundwater depth measurement and during purging activities, additional groundwater monitoring parameters were collected from each monitoring well using a YSI-556 water quality meter for measurement of field parameters. Field parameters at each surface water monitoring location were also collected using the YSI-556. The following field parameters were measured during the 2022 monitoring program:

- *Dissolved Oxygen* (DO) refers to the relative quantity of oxygen molecules which are dissolved or carried within a quantity of water. Oxygen enters water as rooted aquatic plants and algae undergo photosynthesis and as oxygen is transferred across an air and water interface. Oxygen's solubility in water is indirectly correlated with water's temperature, salinity, and pressure.

  DO concentrations have a significant effect on groundwater quality by regulating the valence state of trace of metals and constraining the bacterial metabolism of dissolved organic species;

- *Conductivity* is the measurement of water's capacity to pass an electrical current. It is considered to be a reasonable indicator of ionic activity and dissolved solids concentration levels. It is affected by the presence of inorganic dissolved solids which carry a negative charge such as chloride, nitrate, sulfate, and phosphate anions or a positive charge such as sodium, magnesium, calcium, iron, and aluminum cations. Organic compounds such as oil and phenol do no conduct an electrical current very well and would therefore have low conductivity in water. Conductivity is also directly correlated to the water temperature. Specific conductivity is a measurement of conductivity values which have been compensated to 25°C;

- *pH* is a measure of water's acidic/basic properties on a logarithmic scale from 1 (strongly acidic) to 14 (strongly alkaline or basic). It determines the solubility and biological availability of chemical constituents such as nutrients and heavy metals. For example, in addition to affecting how much and what form of phosphorus is most abundant in the water, pH also determines whether aquatic life and use it. The degree to which heavy metals are soluble determines their toxicity. Metals tend to be more toxic at lower pH values because they are more soluble. Excessively high and low pHs can have serious environmental and health effects. A high pH may cause the release of iron, copper, or lead into potable water, corrosion on water pipes, and water using appliances and reduces the effectiveness of water disinfection with chlorine. Low pH values corrode

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substances such as metals and plastics. Fluctuations in groundwater pH values may be indicative of groundwater contamination;

- *Temperature;* has a dramatic influence on water quality. The rate of chemical reactions is generally correlated to temperature, which in turn affects the biological availability of nutrients within the water. As previously mentioned, oxygen's solubility in water is indirectly correlated with its temperature. Declining concentrations of oxygen within warming water is magnified by aquatic plants increasing metabolism as water temperature increases. Low concentrations of DO weaken aquatic plants resistance to disease, parasites, and other pollutants; and
- *Oxidation-reduction potential* (ORP) characterizes the oxidation-reduction state of the water on a scale from approximately -300mV (strongly reducing) up to +500mV (strongly oxidizing). The primary application of ORP is recording significant changes in the redox potential which is observed when purging a stagnant water column in piezometer and replacing it with "fresh" groundwater.

Field parameter data collected at the groundwater and surface water monitoring locations are provided in Tables 2 through 9 (groundwater) and Tables 11 through 14 (surface water).

4.6.5 Record Keeping and Field Notes

Field notes were collected during the spring, summer, and fall water quality monitoring events and recorded relevant observations including, but not limited to:

- Dates and time of work being completed;
- Instrumentation and instrument condition;
- Calibration methods and results;
- Field parameter measurements;
- Field personnel conducting the investigations;
- Field methods used;
- Sampling location identifications;
- Sampling equipment and condition;
- Sample identification (i.e. type, media, number of containers, etc.);
- Sample preparation methods (i.e. preservatives, filtration, etc.);
- Field QA/QC measurements;
- Field and sample identifiers;

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- Anomalous conditions (i.e. damage to monitoring wells);
- Photographs of monitoring wells and monitoring stations;
- Weather conditions at the time of the monitoring events; and
- Field conditions.

All raw data and field notes are preserved and retained in Pinchin's custody.

4.7 Quality Assurance for Sampling and Analysis

Pinchin uses recognized industry standards, including the Canadian Council of Ministers of the Environment (CCME) *Subsurface Assessment Handbook for Contaminated Sites* and MECP's manual *Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario* for conducting environmental assessments.

For quality assurance, all work is supervised and internally reviewed by senior staff members. As such, various QA/QC protocols were followed during the water quality sampling events to ensure that representative samples were obtained, and that representative analytical data were reported by the laboratory.

Field QA/QC protocols that were employed by Pinchin included the following:

- Clean, labelled, and pre-preserved (when applicable) sample containers were provided by the laboratory;
- Water quality samples were placed in laboratory-supplied sample jars;
- The monitoring wells were purged to remove stagnant water prior to sample collection, so that representative groundwater samples could be obtained. Dedicated purging and sampling equipment was used for monitoring well development, purging, and sampling to minimize the potential for cross-contamination;
- All water quality samples were placed in coolers on ice immediately upon collection with appropriate sample temperatures maintained prior submission to the laboratory;
- Dedicated and disposable Nitrile™ gloves were used for all sample handling;
- All non-dedicated monitoring and sampling equipment (i.e. water level meter and YSI-556) was cleaned before initial use and between uses to minimize the potential for cross-contamination by washing with an Alconox™/potable water mixture followed by a deionized water rinse;
- Field duplicate groundwater samples were collected during the spring, summer, and fall sampling event (1 in 10); and

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- Sample collection and handling procedures were performed in general accordance with the MECP Sampling Guideline.

The ALS laboratory has an established QA/QC program and is a member of the Canadian Association for Laboratory Accreditation (CALA) and is accredited by the Standards Council of Canada (SCC) for specified environmental analyses.

ALS's internal laboratory QA/QC consisted of the analysis of laboratory duplicate, method blank, matrix spike and spiked blank samples, an evaluation of relative percent difference calculations for laboratory duplicate samples, and an evaluation of surrogate recoveries for the method blank, matrix spike and spiked blank samples.

4.8 Data Quality Evaluation

In order to provide confidence in the data obtained, a comprehensive QA/QC component was included in the monitoring program. The QA/QC procedures developed for this monitoring program are prepared in accordance with MECP Sampling Document, and in most cases, exceed the minimum requirements.

Water quality samples collected by Pinchin were generated in accordance with acceptable procedures. No analytical hold times were exceeded for samples submitted for analyses and sample temperatures upon receipt at the project laboratory were below 10° Celsius.

Relative per cent difference (RPD) values (the absolute difference between two values divided by the average value and expressed as a per cent) were calculated between the parent sample and the field duplicate as part of the QA/QC program. RPD results of sample and duplicate analyses that are less than 50 percent indicate an acceptable level of analytical uncertainty. RPD values calculated for measured analyte concentrations for sample and duplicate pairs that exceed 50 per cent generally warrant discussion because they may indicate the presence of elevated analytical uncertainty and a potential for making interpretive errors based on the analysis results. Use of calculated RPD values to assess analytical uncertainty when using measured analyte concentrations for sample and sample duplicate pairs is not appropriate when either measured analyte concentration is within a multiple of 5 of the method detection limit (a value designated as the practical quantification limit (PQL)), where analytical uncertainty is typically elevated.

All field instrumentation calibration checks were completed by Pinchin field staff members prior to use on-Site. All field operations conducted by Pinchin field staff members were completed using standard equipment decontamination and sampling procedures, and no deviations from the sampling plan were noted.

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5.0 ASSESSMENT, INTERPRETATION, AND DISCUSSION

5.1 Groundwater Quality Monitoring

5.1.1 The Ontario Drinking Water Quality Standards (ODWQS)

Through the establishment of the ODWQS, the province of Ontario has determined legally enforceable standards on contaminants in drinking water. The standards are designed to protect public health by restricting the quality of specific contaminants in drinking water. Three categories of contaminates are regulated under the Ontario Regulation 169/03 Drinking Water Standards:

- Microbiological – Originating from human and animals waste, coliforms, and bacteria are common in the environment. Most are harmless; however, their presence may be indicative of other harmful bacteria in the water. Under the ODWQS, Escherichia coli ("E. Coli"), fecal coliforms and total coliforms must be non-detectable in drinking water;
- Chemical – ODWQS regulates maximum quantities of organic and inorganic chemicals allowed in drinking water. Industrial discharges or agricultural runoff are not necessarily removed by drinking water treatment. Consuming water exhibiting a greater concentration of these chemicals than the ODWQS may cause serious health problems; and
- Radiation – Natural and artificial radio nuclides are also regulated in the ODWQS. Standards are expressed as maximum allowable concentrations in becquerels per litre ("Bq/L"). Radiological contaminants include radio nuclides, such as radium 228, which are caused from the erosion of naturally occurring deposits, or artificial radio nuclides, such as tritium, released into the water by nuclear power plants. Radiological contaminants do not naturally occur within the study area, and the disposal of radiological waste was not suspected in the Nellie Lake WDS and as a result radiation was not monitored for this study.

The ODWQS Guideline Document is the MECP technical guidance document which provides guidance on applicability of the ODWQS and also provides applicable interim guidelines where legal standards are absent. Both the ODWQS and the Guideline B-7 were used in assessing the groundwater results obtained during the 2022 monitoring program.

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5.1.2 *The Reasonable Use Criteria Assessment (RUC)*

Guideline B-7, the "reasonable use concept" (RUC) approach, is the MECP's groundwater management strategy for mitigating the effect of contamination on properties adjacent to its source.

It establishes procedures for determining the reasonable use of groundwater on a property adjacent to sources of contaminates and establishes limits on the discharge of contaminants from facilities which dispose of waste into the shallow subsurface.

The application of "reasonable use" is outlined in Procedure B-7-1 "Determination of Contaminant Limits and Attenuation Zones." The procedure determines the maximum concentration (Cm) of a particular contaminant that would be acceptable in the groundwater beneath an adjacent property and is calculated in accordance with the relationship:

$$C_m = C_b + x(C_r - C_b)$$

C_b – This is the background concentration of the particular groundwater contaminant in consideration before it has been affected by human activities. From this it is possible to calculate the extent of human activities impact on contaminant levels.

C_r – In accordance with the Ontario Water Management Guideline, this is the maximum concentration of a particular contaminant that should be present in the groundwater. This value is dependent on property's use of the groundwater as outlined in B-7. It also allows for the total amount of contamination. Pinchin conservatively assumes that the reasonable use of the groundwater on-site is potentially for potable drinking water purposes.

x – As determined by the MECP, this constant determines the extent which the contamination has on the groundwater's use. For drinking water x is 0.5 for non-health related parameters or 0.25 for health related parameters. For other reasonable uses it is 0.5.

Contamination concentrations which exceed C_m may have an appreciable effect on the use of an adjacent property, and as such the Site should be managed in a manner to minimize environmental damage, or the operation should be modified. It is acceptable to modify the operation of the disposal site to meet the specified limits. However, if these limits are exceeded, all waste disposals, except for that done in conjunction with a reasonable plan for closure or with remedial activities, should be terminated until the specified limits have been met, or until monitoring data indicate that these limits will be met. Determination of the replacement of contaminated water supplies and the abatement of the contaminate plume must be made on a case-by-case basis in accordance with "Resolution of Groundwater Quality Interference Problems," Guideline B-9. For the purpose of evaluating compliance with respect to the RUC, Pinchin has compared the calculated C_m values versus the applicable downgradient compliance

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monitoring wells (MW3, MW5, MW7, and MW8) as these monitors are located downgradient of the waste areas and closest to the property boundaries.

Groundwater analytical results obtained from each monitoring well (MW1 through MW5, MW7, and MW8) during the 2022 monitoring program were compared to both Guideline B-7 and the ODWQS. The analytical results and the applicable criteria are presented in Tables 2 through 9. A summary of groundwater analytical results and the Guideline B-7 Criteria is presented in Table 10. Copies of the laboratory analytical reports are presented in Appendix VI.

5.2 Groundwater Results

The following discussion of parameters documents the groundwater quality in comparison to the calculated RUC as per Guideline B-7. To implement Guideline B-7, groundwater samples collected from monitoring wells located closest to the property boundaries of the Site (MW3, MW5, MW7, and MW8) are applicable. Given the recent interpretation of the groundwater flow within the unconfined aquifer, MW5 is currently representative of the groundwater quality at the downgradient property boundary and should be considered the compliance trigger well.

Previous investigations have indicated that groundwater quality observed at MW1, located along the northeast boundary of the Site, is representative of background conditions. However, the 2014 A&A Monitoring Report concluded the following:

> *"The monitoring well MW-1 was used as the background well by HATCH (the previous consultant) in 1999. Their selection was based on their belief that the groundwater was flowing toward the west. Although, this well shows low levels for most of the tested parameters, it has also exceeded the ODWS on several sampling occasions. Since it has been established that the groundwater is flowing northwest-north and MW-1 is located close to the site boundary northeast of the site, replacing this well with a new installed well (MW-8) is recommended in the future events"*

Based on the results of the 2013 monitoring events, the 2014 Thomas Guo Memo recommended that since it has been established that the groundwater is flowing north-northwest and MW1 is located close to the Site boundary, replacing this well with a new background well is recommended. In addition, the 2014 Thomas Guo Memo concurred with the recommendation to replace MW1 with a new background well in 2014. It was noted that the new monitoring well should be located along the south boundary of the property.

Monitoring well MW8 was installed along the south property boundary in August 2014. Based on Pinchin's review of the historical groundwater quality data observed at MW8, elevated concentrations of DOC, aluminum, iron, and manganese were found to exceed the ODWQS during the 2015 sampling

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events. Furthermore, groundwater quality observed at MW8 during the 2017 monitoring program exhibited elevated concentrations of TDS, alkalinity, and DOC, as well as depressed pH when compared to MW1. During the 2018 and 2019 sampling events, low levels of alkalinity and pH similar to background concentrations, as well as slightly elevated DOC and nitrate concentrations were observed.

Based on groundwater contouring and the associated inferred groundwater flow direction, as depicted in Figures 3, 4, and 5, the use of MW8 located south of the waste deposits is not appropriate for utilization within the Guideline B-7 calculations to derive the Site-specific discharge criteria.

As a result of the information provided above, it is Pinchin's opinion that groundwater quality observed at MW1 continues to reflect unimpacted groundwater quality and therefore has been allocated as the "best case" background monitor at this time. Pinchin has calculated the maximum off-Site acceptable contaminant concentration (C_m) using the groundwater quality observed at MW1. The groundwater quality results observed at MW1 obtained since May 2015 were used as background concentration criteria (C_b) to calculate the maximum off-Site acceptable contaminant concentration (C_m).

The analytical data for each well in comparison to the applicable regulatory criteria is provided in Tables 2 through 9. An evaluation of the RUC criteria in comparison to the downgradient compliance wells is provided in Table 10. Copies of the laboratory analytical reports are presented in Appendix VI. The following is a breakdown of the water quality observed the monitoring well locations with comparison to the background quality and leachate being produced on-Site.

5.2.1 Background Water Quality Evaluation

Monitoring Well MW1

Monitoring well MW1 was installed on June 1, 1999, and is located along the northeast boundary of the Site. During the 2022 monitoring program, concentrations of concentrations of alkalinity during each of the sampling were observed below the acceptable range specified by the ODWQS. The exceedance of alkalinity at the background monitoring well precludes it as an effective landfill indicator parameter within the Guideline B-7 evaluation.

Monitoring Well MW2

Monitoring well MW2 was installed on June 1, 1999, and located along the northwest boundary of the Site. During the 2022 monitoring program, concentrations of alkalinity (low - all events) were observed below the acceptable range specified by the ODWQS.

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5.2.2 *Leachate Source Quality Evaluation*

Monitoring Well MW4

Monitoring well MW4 was installed on June 1, 1999, and located centrally within the waste fill area of the Site. During the 2022 monitoring program, concentrations of TDS (all events), DOC (all events), sodium (summer), alkalinity (high - all events), arsenic (spring), iron (all events), and manganese (spring and fall) were found to exceed the ODWQS, indicating a measurable impact from the landfill leachate. As a result, the water quality at this location is interpreted to be representative of the leachate source quality.

5.2.3 *Cross Gradient Water Quality Evaluation*

Monitoring Well MW3

Monitoring well MW3 was installed on June 1, 1999, and located along the west portion of the Site. Based on the inferred groundwater flow direction and the location of MW3 in relation to the property boundary, this monitoring location has been designated as a compliance well for assessing the RUC.

During the 2022 monitoring program, all parameters analyzed for at MW3 met the applicable ODWQS criteria with the exception of alkalinity (low - all events) and manganese (spring) that were observed outside the range specified by the ODWQS. In addition to pH (spring), concentrations of TDS (spring), alkalinity (low – all events), and manganese (spring and fall) exceeded the Guideline B-7 Criteria.

Alkalinity and manganese are either aesthetic objectives or operational guidelines set by the ODWQS and are not considered to be a significant human health or environmental concern originating from the Site. Historical concentrations of manganese at this location show considerable variation throughout the dataset and should be confirmed during future monitoring events.

Monitoring Well MW6

Monitoring well MW6 was installed on May 22, 2004, and is located along the south boundary of the Site. During the 2022 sampling events, MW6 could not be located and was assumed to be flooded. Similar to the 2016-2021 efforts groundwater samples were not collected at this location during the 2022 monitoring program.

Monitoring Well MW7

Monitoring well MW7 was installed on May 22, 2004, and is located along the northwest boundary of the Site. During the 2022 monitoring program, all parameters analyzed for at MW7 satisfied the ODWQS with the exception of alkalinity (low – all events) and manganese (spring and fall) which were observed to exceed the values specified by the ODWQS. Manganese also exceeded the Guideline B-7 Criteria.

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Alkalinity and manganese are either aesthetic objectives or operational guidelines set by the ODWQS and are not considered to be a significant human health or environmental concern originating from the Site.

Monitoring Well MW8

Monitoring well MW8 was installed on August 5, 2014, and repaired by Pinchin during the spring 2018 monitoring event. MW8 is located along the south boundary of the Site and at the time was intended to represent background groundwater quality as a replacement monitoring well for MW6 (which was routinely observed to be dry). During the 2022 monitoring program, concentrations of pH (all events), and alkalinity (low - all events) did not meet the ODWQS or Guideline B-7 Criteria. In addition, DOC (spring and fall) exceeded the Guideline B-7 Criteria.

5.2.4 Trigger Well Water Quality Evaluation

Monitoring Well MW5

Monitoring well MW5 was installed on May 22, 2004, and is located within the central-east portion of the Site and is most representative of the groundwater quality at the downgradient property boundary. During the 2022 monitoring program, all parameters analyzed for at MW5 satisfied the ODWQS with the exception of alkalinity that was observed to be below the range specified by the ODWQS (similar to background). Concentrations of alkalinity (low – all events) did not satisfy the Guideline B-7 criteria during the spring, summer, and fall monitoring events of 2022.

Alkalinity is an operational guideline set by the ODWQS and is not considered to be a significant human health or environmental concern originating from the Site. Low concentrations of alkalinity at this monitoring well location are consistent with the historical monitoring records.

In general, the groundwater quality concentrations within the monitoring well network for the Site appear to be stable and consistent with the historical monitoring record. Based on the current groundwater monitoring well network configuration, Pinchin has not identified any significant human health or ecological impacts originating from the landfill at the Site. The concentrations of nitrate, which exceeded the Guideline B-7 values in 2020 at monitoring well MW3 were observed to be below the Guideline B-7 values in 2021 and 2022 and were confirmed to be anomalous based on these subsequent sampling results. In summary, it is inferred that the Site is continuing to effectively operate as designed, as a natural attenuation type facility, with any landfill derived groundwater impacts attenuated to acceptable levels prior to the downgradient property boundaries.

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5.3 Groundwater Field Measurement Results

On May 25, August 3, and September 27, 2022, Pinchin collected groundwater monitoring parameters from each of the well locations using a YSI-556 water quality meter for measurement of field parameters. The field parameter measurements are provided in Tables 2 through 9.

A review of the field parameters for the project identified no significant concerns in the water quality during the monitoring events. The water quality at the Site monitoring locations did not change significantly between each of the monitoring locations, and the measured field parameters were within the normal variability associated with shallow groundwater monitoring systems, with the exception of MW4 which was observed to have higher conductivity measurements in summer and fall events, which is an indicator of stagnant anaerobic conditions and possibly impact from leachate generated from the landfill.

5.4 Surface Water Quality Monitoring

5.4.1 The Provincial Water Quality Objectives (PWQO)

The PWQO are numerical and narrative criteria which serve as chemical and physical indicators representing satisfactory levels for surface water and groundwater where it discharges to the surface. The PWQO are levels which are protective of the water quality for all forms of aquatic life during their indefinite exposures to the water. The PWQO levels include protection for anthropogenic recreational water uses where there is a high potential of exposure and are based on public health and aesthetic considerations.

In general, the PWQO stated that the surface water quality of a water body shall be "free from contaminating levels of substances and materials attributable to human activities which in themselves, or in combination with other factors can: settle to form objectionable deposits; float as debris or scum or oil or other matter to form nuisances; product objectionable colour, odour, taste, or turbidity; injure, are toxic to, or produce adverse physiological or behavioural responses in humans, animals, or plants; or enhance the production of undesirable aquatic life or result in the dominance of nuisance species".

5.4.2 Aquatic Protection Values (APV)

Under Ontario Regulation 153/04, the MECP have developed APVs to protect aquatic organisms exposed to contaminants from migration of contaminated groundwater to surface water. Protection of aquatic biota from migration of contaminants by overland flow is provided by a Site being designated an environmentally sensitive area if the property includes or is adjacent to a water body or includes land that is within 30 m of a water body.

APVs are designed to provide a scientifically defensible and reasonably conservative level of protection for most aquatic organisms from the migration of contaminated groundwater to surface water resources.

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5.4.3 *Canadian Water Quality Guidelines (CWQG)*

The CWQG were developed by the Canadian Council of Resources and Environment, to provide basic scientific information about the effects of water quality parameters on uses in order to assess water quality issues and concerns and to establish water quality objectives for specific sites. The guidelines contain recommendations for chemical, physical, radiological, and biological parameters necessary to protect and enhance designated uses of water. They apply only to inland surface waters and groundwater and not to estuarine and marine waterbodies. The rationale for each parameter is included to assist in the development of water quality objectives to suit local water conditions.

5.5 Surface Water Results

During the 2022 monitoring program, Pinchin collected surface water samples from the monitoring locations described in Section 4.3. A summary of water quality monitoring data relative to the regulatory standards is presented in the attached Tables 11 through 14. Copies of the laboratory analytical reports are presented in Appendix VI. Based on the limited data set available for review, a full review of historical datasets and temporal trend analysis charts could not be prepared or evaluated. It should be noted that sample location "pond" was not sampled during the 2022 monitoring period as the location were observed to be consistently dry.

A review of the 2022 analytical dataset identified the following exceedances:

Surface Water Station "Ditch"

Surface water sampling station "ditch" is located immediately west of Site. During the 2022 monitoring period, pH (summer and fall events), phosphorus (all events), and iron (all events) did not satisfy the PWQO. In addition, pH (summer and fall events) was observed to be below the levels outlined within the PWQO and APV and cadmium (spring event) was observed to be below the CWQG.

Surface Water Station SW1

Surface water sampling station SW1 located within Milky Creek is situated upstream of the Site and is inferred to be representative of background surface water conditions. During the 2022 monitoring period, phosphorus (summer event), phenols (all events), and iron (all events) exceeded the PWQO. In addition, pH (all events) was observed to be below the levels outlined within the PWQO and APV and cadmium (spring event) was observed to be below the CWQG.

Surface Water Station SW2

Surface water sampling station SW2, located within Milky Creek, is situated downstream of the Site and represents a potential receptor of landfill leachate originating at the Site. During the 2022 monitoring period concentrations of pH (low – fall event), phenols (summer and fall events), total phosphorus

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(summer event), and iron (all events) were observed to exceed the PWQO. In addition, pH and iron (summer event) exceeded the APV and cadmium (spring event) exceeded the CWQG.

It is Pinchin's opinion that low pH concentrations and elevated iron, phenols, and total phosphorus concentrations are likely naturally occurring elements within the watershed system and are not landfill related impacts. Based on Pinchin's review of the surface water analytical data set, it appears that surface water impacts are not occurring at the downstream surface water receptors; however, the surface water analytical dataset is considered to be too small (due to seasonal dry conditions, etc.) to identify any significant trends at this time.

5.6 Surface Water Field Measurement Results

Pinchin collected surface water monitoring parameters from each surface water monitoring location using a YSI-556 water quality meter for real-time in-situ measurement of field parameters. The field parameter measurements are provided in Tables 11 through 14.

A review of the field parameters for the project identified no significant concerns in the water quality during the monitoring event. The quality at the surface water monitoring locations did not change significantly between each of the monitoring locations.

5.7 Groundwater Flow Interpretation

Based on the 2014 A&A Monitoring Report, historical groundwater flow was reportedly in a northwest-north direction towards the lowlands of Milky Creek. As such, it has historically been interpreted that the leachate plume originating from the waste area would migrate towards monitoring wells MW2 and MW7, which are located northwest and west of the Site, respectively.

However, based on Pinchin's review of the analytical data provided for these monitoring wells, it is Pinchin's opinion that the groundwater quality in this vicinity represent groundwater that is not being influenced by landfilling activities at this time. Furthermore, historical groundwater quality south of the waste area represented by available analytical data collected from monitoring well MW8 appears to be indicative of anthropogenic impacts. It should be noted however that additional sampling at this location is recommended to confirm this, as the dataset is considered too small to identify significant trends at this time.

Based on the relative elevation survey of the monitoring well network on May 20, 2017, and the depth to groundwater measurements collected during the 2018 through 2022 monitoring events, the groundwater flow has been interpreted to be in a radial pattern appearing to converge towards monitoring well MW5. Based on groundwater elevations collected during the spring, summer, and fall monitoring events, the

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groundwater flow vector appears to be towards the low-lying area in the vicinity of MW5. The spring, summer, and fall 2022 groundwater contours have been provided in Figures 3, 4, and 5, respectively.

5.8 Leachate Characterization

A review of the 2022 groundwater quality data set indicates leachate impacts observed at monitoring well MW4 characterized by elevated levels of alkalinity, TDS, DOC, sodium, conductivity, iron, and manganese which is consistent with previous investigations. These results are expected at this location considering the close proximity of MW4 to the waste area. It is Pinchin's opinion that groundwater quality observed at this location is considered to be worst-case "source" landfill leachate that can be used to identify leachate constituents.

A review of the 2022 groundwater quality data set for monitoring wells MW1, MW2, MW3, MW5, MW7, and MW8 identified low concentrations of pH and alkalinity, often below the acceptable range as specified in the ODWQS. Alkalinity and pH are operating guidelines for drinking water systems specified by the ODWQS and are not considered an environmental concern. It is Pinchin's opinion that low concentrations of pH and alkalinity are likely naturally occurring conditions within the unconfined groundwater unit.

During the 2022 sampling events, Guideline B-7 exceedances were quantified for pH at MW3 (fall event) and MW8 (all events), DOC at MW8 (spring and fall events), alkalinity at MW3, MW5, and MW8 (all events), and manganese at MW3 (spring event), MW7 (spring and fall events), and MW8 (fall event).

Based on Pinchin's review of the analytical data set collected to date, monitoring wells MW1, MW2, MW3, MW5, and MW7 are not being influenced by landfilling activities at this time. It appears that landfill leachate is naturally attenuating within close proximity of the waste area (MW4) and is not influencing the shallow unconfined groundwater unit in the vicinity of monitoring wells MW1, MW2, MW3, MW5, and MW7. Further investigation is required to confirm or refute the presence of potential landfill leachate migrating south of the Site, in the vicinity of MW8, although this seems unlikely given observed groundwater elevations, flow direction, and distance from the waste deposits.

5.9 Contamination Attenuation Zone

A Contaminant Attenuation Zone (CAZ) has not been established for the Site. Future investigations should involve the development of a CAZ for this Site.

5.10 Adequacy of the Monitoring Program

Based on Pinchin's review of the current and historical groundwater and surface water data, it is Pinchin's opinion that annual monitoring should consist of tri-annual sampling conducted in the spring (May-June), mid-summer (August-September) and late fall (October-November) at all groundwater monitoring

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locations on Site. This should continue until the appropriate background well, groundwater contour (flow direction), and confirmation of achievable RUC at the property line can be established. Further, it is recommended that the monitoring well network be further evaluated for adequacy and determine if there is a need to establish additional monitoring wells and/or decommission existing monitoring wells.

5.11 Monitoring Well Network Efficiency

Pinchin concludes that the current groundwater monitoring network is considered adequate for evaluating the shallow groundwater quality north (MW1 and MW2), northwest (MW7), southwest (MW3) and directly east (MW5) of the Site. In addition, Pinchin concludes that monitoring well MW4 is representative of "worst case" landfill leachate and is adequate in representing leachate being sourced from the Site.

Following the repair of monitoring location MW8 groundwater quality south of the Site was assessed. During the monitoring events, MW8 was observed to be in good condition and installed/repaired in accordance with O.Reg 903.

5.11.1 Background Monitoring Well Efficiency

It is Pinchin's opinion that monitoring well MW1 is currently the most representative background water quality at this time, given the inferred groundwater flow direction and quantified groundwater concentrations.

5.12 Supplemental Monitoring: Sediment, Benthic and/or Toxicity Monitoring

No supplemental monitoring was completed as part of the 2022 monitoring program completed by Pinchin.

5.13 Assessment of the Need for Implementation of Contingency Measures

There are currently no set trigger levels designed for the Site. At this time, Pinchin does not recommend any need or implementation for contingency measures.

5.14 Waste Disposal Site Gas Impacts

At this time no evidence has been documented to suggest that methane gas generation from the Site is a significant concern.

5.15 Effectiveness of Engineered Controls

With the exception of the intermittent landfill cover, there are no operational engineered controls in effect at the Site. The Client should continue to maintain the integrity of the landfill cover as per the Design and Operations Plan. Annual monitoring and inspections should continue to be completed to ensure regular

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maintenance is occurring on an as needed basis. At the time of the monitoring event no significant damage or concerns were noted.

5.16 Controls System Monitoring

Environmental control systems are designed, constructed, and utilized at some waste disposal sites to reduce or increase an environmental variable to an acceptable level, or to maintain an environmental variable within an acceptable range, in order to prevent a negative environmental outcome. Certain environmental control systems, such as a leachate collection system or a methane gas collection system, can provide the basis for operator intervention to bring about or maintain a desired condition to operate the landfill. The Site does not currently operate any control systems; therefore, no control system monitoring was completed as part of the 2022 monitoring program.

5.17 QA/QC Results

In order to provide confidence in the data obtained, a comprehensive QA/QC component was included in the monitoring program. The QA/QC procedures developed for this monitoring program are prepared in accordance with MECP Sampling Document, and in most cases exceed the minimum requirements.

Water quality samples collected by Pinchin were generated in accordance with acceptable procedures. No analytical hold times were exceeded for samples submitted for analyses and sample temperatures upon receipt at the project laboratory were below 10° Celsius.

Groundwater duplicate sample pair were collected from the Site during each of the spring, summer, and fall sampling events. Each sample and duplicate pair were submitted for laboratory analysis of the full suite of analytical parameters.

When compared to concentrations reported in the original samples, duplicate water quality data reported that all parameters were within an acceptable range with respect to relative percent difference (i.e. the industry standard of less than 50%).

The analytical laboratory employed to perform the laboratory analyses (SGS) is accredited by the Standards Council of Canada/Canadian Association for Laboratory Accreditation in accordance with ISO/IEC 17025:1999 – "*General Requirements for the Competence of Testing and Calibration Laboratories*" for the tested parameters and has met the standards for proficiency testing developed by the Standards Council of Canada for parameters set out in the Soil, Ground Water and Sediment Standards.

Sample analysis dates provided on the laboratory analytical reports issued by SGS indicate that all sample analyses were performed within the required sample/extract hold times, as indicated by the dates presented in columns for each sample parameter on the analytical report. The laboratory minimum

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detection limits were reported to be at or lower than the required MECP reporting detection limits for the parameters analyzed. A comparison of the internal laboratory duplicate samples indicates that all samples and the respective duplicates are within acceptable limits.

Upon review of the QA/QC results for spring, summer, and fall sampling programs, Pinchin has not identified any significant concerns that would warrant the invalidation of any of the field or laboratory data; therefore, considers the data generated as part of this program to be reliable.

6.0 CONCLUSIONS

Based on the work completed, the following is a summary of the activities and findings of the 2022 water quality monitoring program:

- Groundwater and surface water samples were collected from the existing monitoring well network on May 25, August 3, and September 27, 2022;
- Based on depth to groundwater measurements collected during the 2022 monitoring events and the previously conducted survey during the 2017 through 2020 sampling events the groundwater flow has been interpreted to be in a radial pattern, appearing to converge towards monitoring well MW5, located within the low-lying, central portion of the Site;
- Based on site-specific information, the groundwater quality was assessed based on the ODWQS and Guideline B-7. Surface water quality was assessed versus the PWQO, APV and CWQG;
- Leachate impacts were observed at monitoring well MW4, characterized by elevated levels of alkalinity, TDS, DOC, conductivity, sodium, iron, and manganese. These results are expected at this location considering the close proximity of MW4 to the waste area. It is Pinchin's opinion that groundwater quality observed at this location is considered to be worst-case "source" landfill leachate that can be used to identify leachate constituents;
- Groundwater quality observed at monitoring wells MW1, MW2, MW3, MW5, and MW7 is characterized by low concentrations of pH and alkalinity, often below the acceptable range as specified in the ODWQS. Alkalinity and pH are operating guidelines for drinking water systems specified by the ODWQS and are not considered an environmental concern at this time. It is Pinchin's opinion that low concentrations of pH and alkalinity are likely naturally occurring conditions within the unconfined groundwater unit and not indicative of a landfill derived impact;

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- All reported concentrations in the downgradient groundwater monitors (MW3, MW5, MW7, and MW8) submitted for analysis satisfied the applicable Guideline B-7 criteria for all parameters analyzed with the exception the following:
  - Groundwater samples collected at monitoring location MW3 had concentrations of pH (fall), alkalinity (all events), and manganese (spring) that did not satisfy the Guideline B-7 criteria;
  - Groundwater samples collected at monitoring location MW5 had concentrations of alkalinity that did not satisfy the Guideline B-7 criteria during all 2022 monitoring events;
  - Groundwater samples collected at monitoring location MW7 had concentrations of manganese (summer and fall) that exceeded the Guideline B-7 criteria; and
  - Groundwater samples collected at monitoring location MW8 had concentrations of pH (all events), alkalinity (all events), DOC (spring and fall), and manganese (fall) that exceeded Guideline B-7 criteria.
- In summary, it is inferred that the Site is continuing to effectively operate as designed, as a natural attenuation type facility, with any landfill derived groundwater impacts attenuated to acceptable levels prior to the downgradient property boundaries;
- All reported surface water samples submitted for analysis satisfied the applicable standards for the parameters analyzed with the exception of the following:
  - Exceedances of the PWQO at surface water station Ditch included pH (low – summer and fall events), phosphorus (all events), phenols (summer and fall events), and iron (all events). pH (summer event) was observed to be below the PWQO and APV and cadmium (spring event) was above the CWQG;
  - Exceedances of the PWQO at surface water station SW1 included pH (low – all events), phosphorus (summer event), phenols (fall event), and iron (all events). In addition, pH did not satisfy the APV (all events) while cadmium exceeded the CWQG (spring event);
  - Exceedances of the PWQO at surface water station SW2 included pH (low – fall event), phosphorus (summer event), phenols (summer and fall event), and iron (spring and fall event. Exceedances of PWQO and APV included iron (all events) and pH (fall event). In addition, cadmium exceeded the CWQG (spring event);

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- It is Pinchin's opinion that low pH concentrations and elevated iron, phenols, and total phosphorous concentrations within the surface water samples are likely naturally occurring elements within the watershed system.

Based on Pinchin's review of the analytical data set collected to date, monitoring wells MW1, MW2, MW3, MW5, and MW7 are not being influenced by landfilling activities at this time. It appears that landfill leachate is naturally attenuating within close proximity of the waste area (MW4) and is not influencing the shallow unconfined groundwater unit in the vicinity of monitoring wells MW1, MW2, MW3, MW5, and MW7. Further investigation is required to confirm or refute the presence of potential landfill leachate migrating south of the Site, in the vicinity of MW8.

Based on the 2022 results obtained from the existing groundwater monitoring wells, Pinchin has not identified any significant human health or ecological landfill related impacts northwest of the Site. All exceedances of the RUC Guideline B-7 are related to operational guidelines associated with drinking water systems set by the ODWQS.

Similarly, based on Pinchin's review of the surface water analytical data set, it appears that surface water impacts are not occurring at the downstream surface water receptors.

7.0 RECOMMENDATIONS

Based on a review of the existing dataset and regulatory requirements to date, Pinchin recommends the following:

- The Client should continue to ensure that the current landfill cover material is inspected and maintained as part of the ongoing monitoring program. In the future, any damage to the cover due to weathering or other cause should be rectified;
- Pinchin recommends continuing to sample surface water sampling locations SW1, SW2, Ditch and Pond on a tri-annual basis to identify potential downgradient surface water impacts;
- It is Pinchin's opinion that the monitoring frequency should continue to consist of tri-annual sampling, spring (May-June), mid-summer (August-September), and late fall (October-November) at all groundwater and surface water monitoring locations on Site. This should continue until the appropriate background well, groundwater contour (flow direction) and confirmation of achievable RUC at the property line can be established;
- The analysis of volatile organic compounds (VOC's) in the groundwater samples during the spring monitoring events can be removed from the program (with the exception of the source well) as these parameters have been consistently quantified as non-detectable at

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all locations including the source well, MW4, and the well casings for monitoring wells MW3 and MW4 should be modified to allow for closing and locking to ensure the contaminants do not enter the well.

8.0 MONITORING AND SCREENING CHECKLIST

In accordance with the MECP Landfill Standards, the Monitoring and Screening Checklist for the Site completed by the Pinchin CEP is completed and provided in Appendix VII.

9.0 DISCLAIMER

This Monitoring Report was performed for the Township of McGarry (Client) in order to investigate the environmental condition of the groundwater and surface water at the McGarry Waste Disposal Site (Site). The term recognized environmental condition means the presence or likely presence of any hazardous substance on a property under conditions that indicate an existing release, past release, or a material threat of a release of a hazardous substance into structures on the property or into the ground, groundwater, or surface water of the property. This Monitoring Report does not quantify the extent of the extent of the current and/or recognized environmental condition or the cost of any remediation.

Conclusions derived are specific to the immediate area of study and cannot be extrapolated extensively away from sample locations. Samples have been analyzed for a limited number of contaminants that are expected to be present at the Site, and the absence of information relating to a specific contaminant does not indicate that it is not present.

No environmental site assessment can wholly eliminate uncertainty regarding the potential for recognized environmental conditions on a property. Performance of this Monitoring Report to the standards established by Pinchin is intended to reduce, but not eliminate uncertainty regarding the potential for recognized environmental conditions on the Site and recognizes reasonable limits on time and cost.

This Monitoring Report was performed in general compliance with currently acceptable practices for environmental site investigations and specific Client requests, as applicable to this Site.

This report was prepared for the exclusive use of the Client, subject to the conditions and limitations contained within the duly authorized work plan. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third parties. If additional parties require reliance on this report, written authorization from Pinchin will be required. Pinchin disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed. Furthermore, this report should not be construed as legal advice.

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Pinchin will not be responsible for any consequential or indirect damages. Pinchin will only be held liable for damages resulting from the negligence of Pinchin. Pinchin will not be liable for any losses or damage if the Client has failed, within a period of two years following the date upon which the claim is discovered within the meaning of the Limitations Act, 2002 (Ontario) to commence legal proceedings against Pinchin to recover such losses or damage.

Pinchin makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and these interpretations may change over time.

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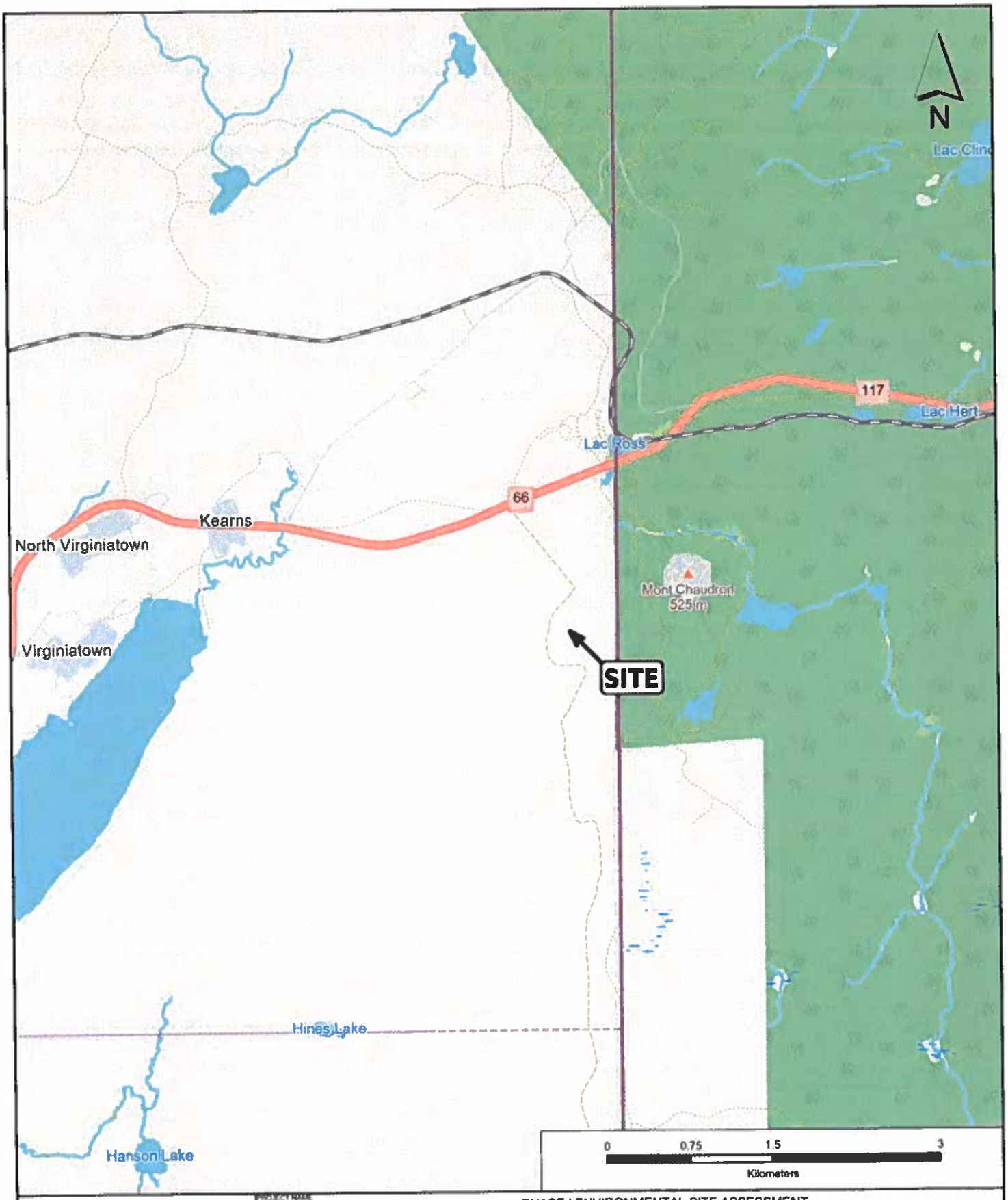
APPENDIX I

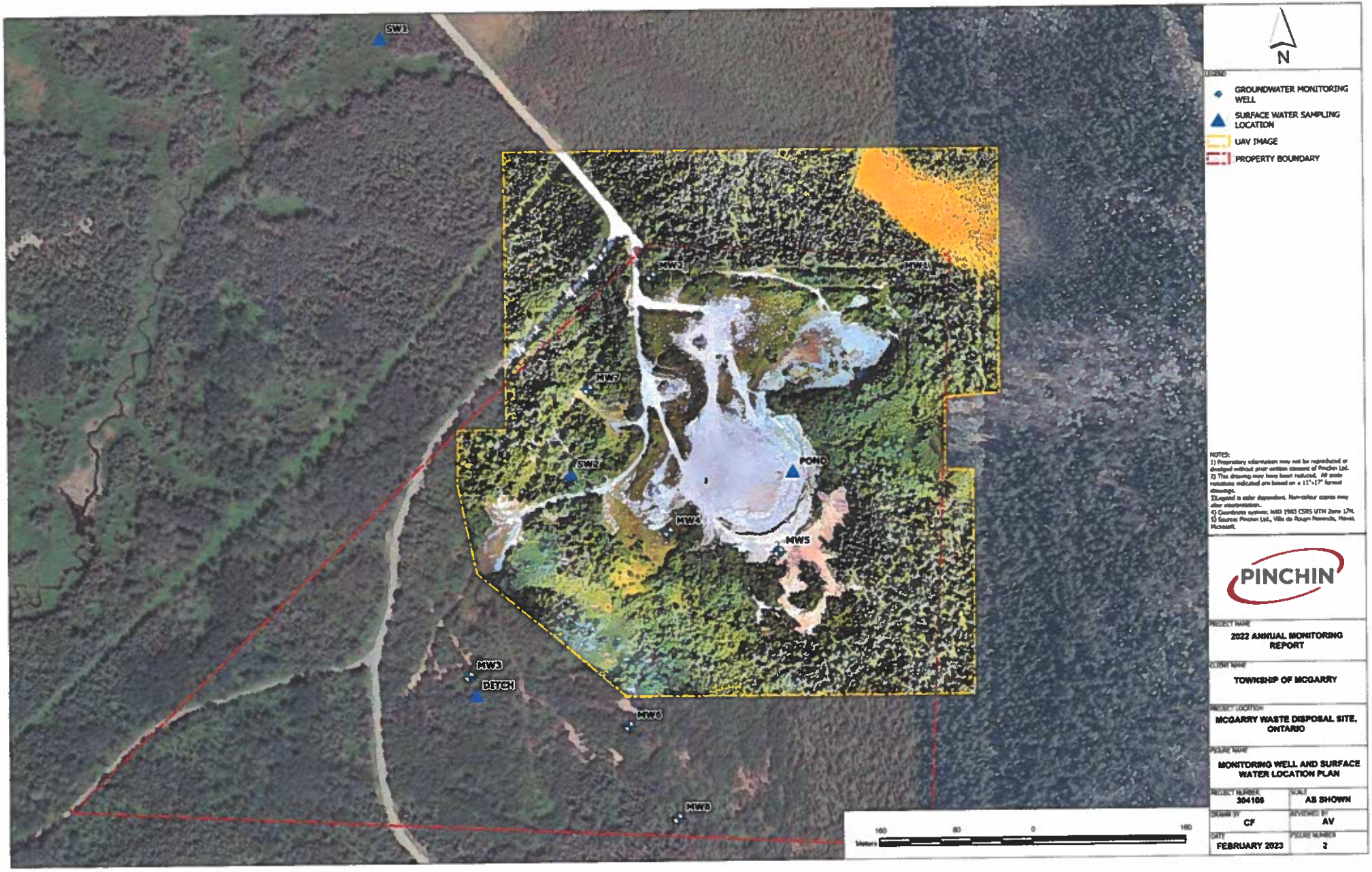
Figures



PINCHIN

PROJECT NAME	PHASE I ENVIRONMENTAL SITE ASSESSMENT
CLIENT NAME	THE CORPORATION OF THE TOWNSHIP OF MCGARRY
PROJECT LOCATION	MCGARRY LANDFILL, VIRGINIATOWN, ONTARIO
FIGURE NAME	KEY MAP
FIGURE NUMBER	1

PROJECT NUMBER	SCALE	DRAWN BY	REVIEWED BY	DATE
304108	AS SHOWN	CRF	AV	FEBRUARY 2023



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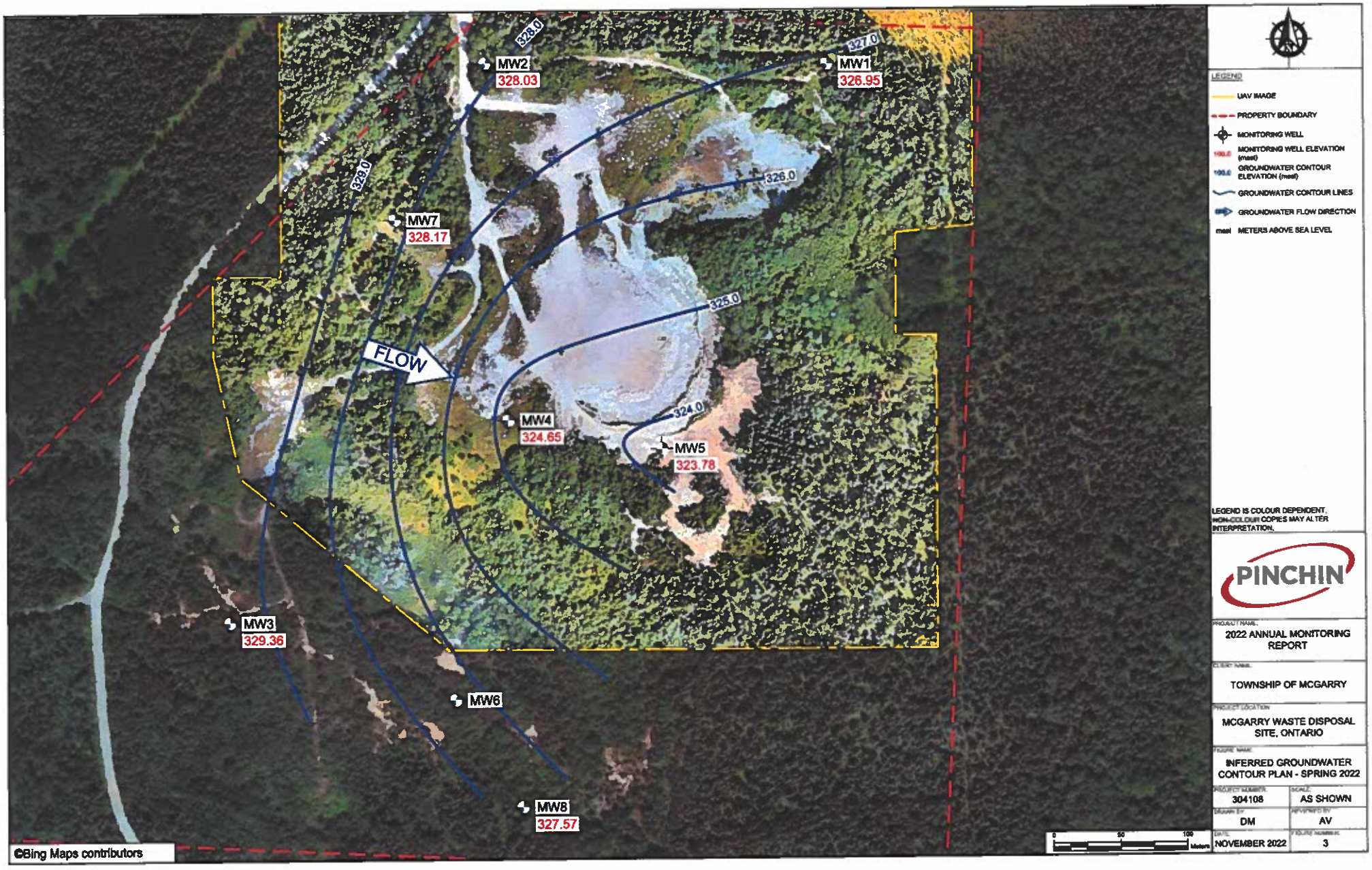
PROJECT NAME
2022 ANNUAL MONITORING REPORT

CLIENT NAME
TOWNSHIP OF MCGARRY

PROJECT LOCATION
MCGARRY WASTE DISPOSAL SITE, ONTARIO

FIGURE NAME
MONITORING WELL AND SURFACE WATER LOCATION PLAN

PROJECT NUMBER	SCALE
304108	AS SHOWN
DRAWN BY	REVIEWED BY
CF	AV
DATE	FIGURE NUMBER
FEBRUARY 2023	2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327.0
MW2
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MW1
326.95
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326.0
MW7
328.17
325.0
FLOW
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324.0
MW5
323.78
MW3
329.36
MW6
MW8
327.57
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LEGEND
UAV IMAGE
PROPERTY BOUNDARY
MONITORING WELL
MONITORING WELL ELEVATION (masl)
GROUNDWATER CONTOUR ELEVATION (masl)
GROUNDWATER CONTOUR LINES
GROUNDWATER FLOW DIRECTION
masl METERS ABOVE SEA LEVEL
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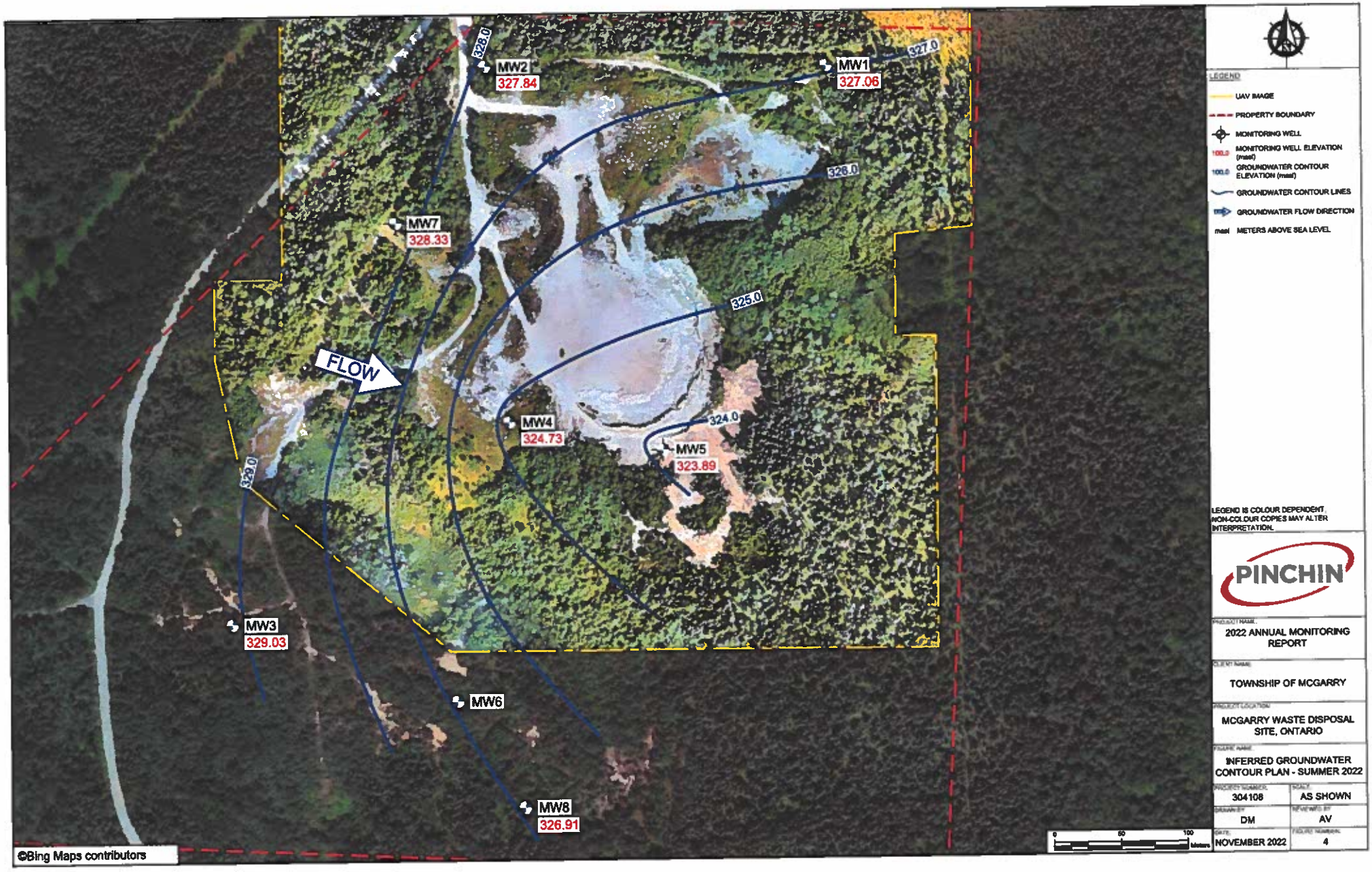
PROJECT NAME:
2022 ANNUAL MONITORING REPORT
CLIENT NAME:
TOWNSHIP OF MCGARRY
PROJECT LOCATION:
MCGARRY WASTE DISPOSAL SITE, ONTARIO
FIGURE NAME:
INFERRED GROUNDWATER CONTOUR PLAN - SPRING 2022
PROJECT NUMBER: 304108
SCALE: AS SHOWN
DRAWN BY: DM
APPROVED BY: AV
DATE: NOVEMBER 2022
FIGURE NUMBER: 3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MW2
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MW3
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MW4
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MW5
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MW6
MW7
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MW8
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327.0
328.0
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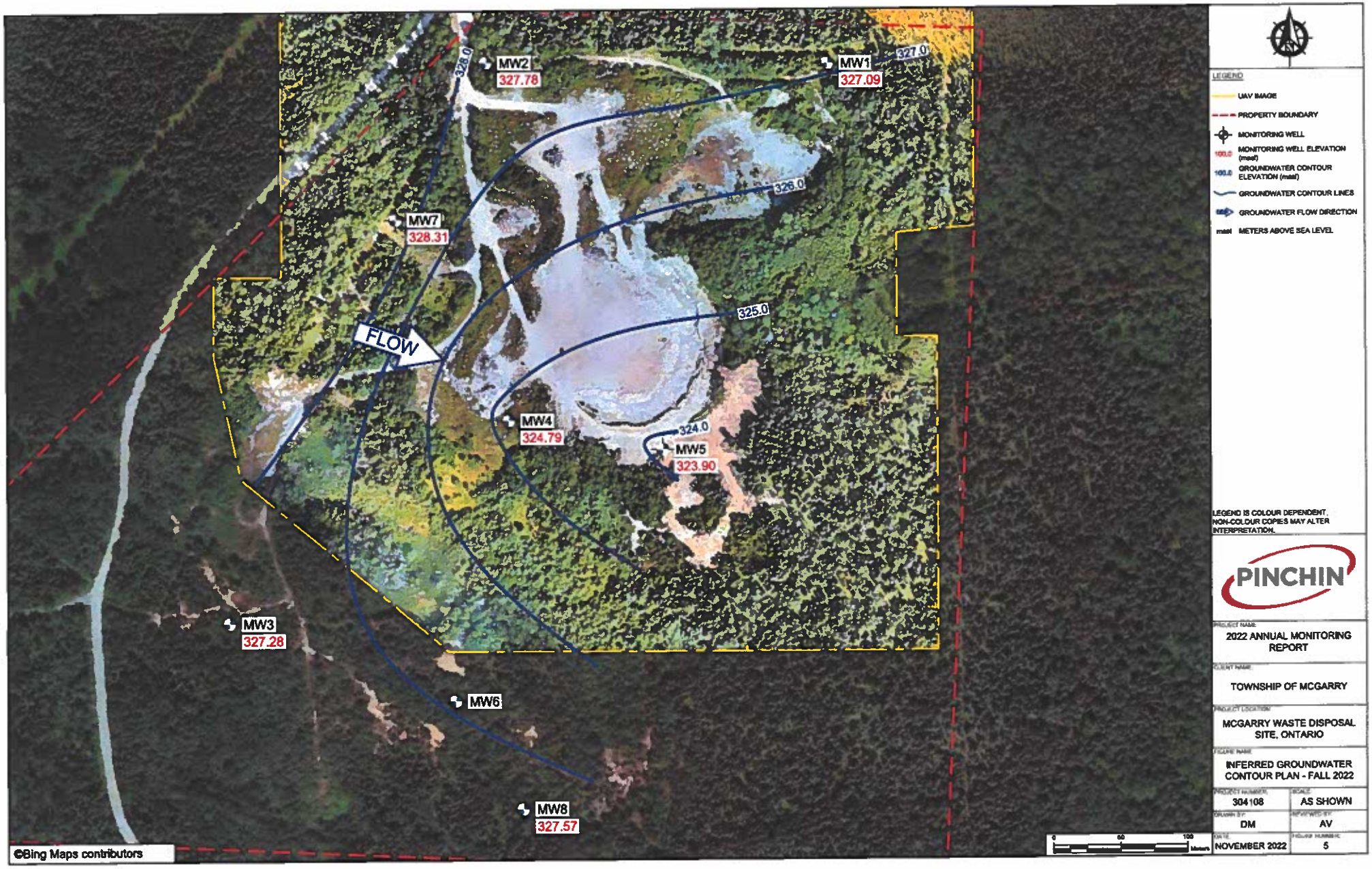
325.0
324.0
FLOW
©Bing Maps contributors
LEGEND
UAV IMAGE
PROPERTY BOUNDARY
MONITORING WELL
MONITORING WELL ELEVATION (masl)
GROUNDWATER CONTOUR ELEVATION (masl)
GROUNDWATER CONTOUR LINES
GROUNDWATER FLOW DIRECTION
masl METERS ABOVE SEA LEVEL
LEGEND IS COLOUR DEPENDENT. NON-COLOUR COPIES MAY ALTER INTERPRETATION.
PINCHIN
2022 ANNUAL MONITORING REPORT
TOWNSHIP OF MCGARRY
MCGARRY WASTE DISPOSAL SITE, ONTARIO
INFERRED GROUNDWATER CONTOUR PLAN - SUMMER 2022
304108
AS SHOWN
DM
AV
NOVEMBER 2022
4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MW3
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MW6
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MW8
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326.0
325.0
324.0
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FLOW
©Bing Maps contributors
LEGEND
UAV IMAGE
PROPERTY BOUNDARY
MONITORING WELL
MONITORING WELL ELEVATION (masl)
GROUNDWATER CONTOUR ELEVATION (masl)
GROUNDWATER CONTOUR LINES
GROUNDWATER FLOW DIRECTION
masl METERS ABOVE SEA LEVEL
LEGEND IS COLOUR DEPENDENT. NON-COLOUR COPIES MAY ALTER INTERPRETATION.
PINCHIN
PROJECT NAME
2022 ANNUAL MONITORING REPORT
CLIENT NAME
TOWNSHIP OF MCGARRY
PROJECT LOCATION
MCGARRY WASTE DISPOSAL SITE, ONTARIO
FIGURE NAME
INFERRED GROUNDWATER CONTOUR PLAN - FALL 2022
PROJECT NUMBER
304108
SCALE
AS SHOWN
DRAWN BY
DM
APPROVED BY
AV
DATE
NOVEMBER 2022
FIGURE NUMBER
5

APPENDIX II

Certificate of Approval

Ministry of the Environment
Ontario

Provisional Certificate No. A 572402

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:

The Corporation of the Township of McGarry
P.O. Box 99
Virginiatown, Ontario

for the use and operation of a 35 hectare landfilling site

all in accordance with the following plans and specifications: the Site Plan dated Feb.8, 1977, the "Surveyors Certificate" prepared by Pit, Blackburn, Ontario Land Surveyor dated July 2,1974 and "McGarry Sanitary Landfill Site" operating program and drawings #7012-1 and 7012-2 prepared by Heathwood Engineering Associates Limited.

Located: South Part of Sand-Gravel Reserve
File 126090, Mining Claim L 40808
Township of McGarry, District of Timiskaming

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 and commercial wastes

and subject to the following conditions:

Dated this 20th day of August, 1980.

Director, Section 39,
The Environmental Protection Act, 1971

APPENDIX III

Borehole Logs

MONITORING WELL LOG MW-1

SHEET 1 of 1

PROJECT No: 1010146 | DATE: April 2004 | EASTING:

SITE: McGarry Landfill | LOGGED BY: HATCH | NORTHING:

CLIENT: McGarry Township | CONTRACTOR: HATCH | ELEVATION: 317.986

WATER LEVEL	WELL DEPTH (m)	WELL	LEGEND	DEPTH (m)	DESCRIPTION	ODOUR	PID (ppmv)	SAMPLE LABEL	DEPTH (m)
					Ground Surface				
				0	Silty Sand to fine Sand (Loose, Brown) Moist, occasional silt and coarse sand seams	No odour		Sa1	
				1					
				2		No odour		Sa2	
				3		No odour		Sa3	
				4					
				5	Silty Sand to fine Sand(Very loose, Grey) Wet, occasional silt and coarse sand seams	No odour		Sa4	
				6					
				7					
				8					
				9					

NOTES

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater
Static Groundwater Level

Reviewed By: | FILE

MONITORING WELL LOG MW-2

PROJECT No: 1010146 | DATE: April 2004 | EASTING:

SITE: McGarry Landfill | LOGGED BY: HATCH | NORTHING:

CLIENT: McGarry Township | CONTRACTOR: HATCH | ELEVATION: 318.641

WATER LEVEL	WELL DEPTH (m)	WELL	LEGEND	DEPTH (m)	DESCRIPTION	ODOUR	PID (ppmv)	SAMPLE LABEL	DEPTH (m)
				0	Ground Surface				
					Compact Sand with trace of silt Cmpact, brown sand with trace to some silt becoming grey at 0.15 mbgs. Moist becoming wet at 0.15 mbgs.	No odour		Sa1	
				2	**Very loose Sand with trace of silt** Very loose, grey sand with trace to some silt becoming silty sand to sandy silt. Wet, occasional silt and coarse sand seams	No odour		Sa2	
				3		No odour		Sa3	
				5	**Very loose Silty Sand to fine Sand** Very loose, grey silty sand to fine sand with some silt. Wet				

NOTES

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater
Static Groundwater Level

Reviewed By: | FILE

MONITORING WELL LOG MW-3

SHEET 1 of 1

PROJECT No: 1010146	DATE: April 2004	EASTING:
SITE: McGarry Landfill	LOGGED BY: HATCH	NORTHING:
CLIENT: McGarry Township	CONTRACTOR: HATCH	ELEVATION: 316.310

WATER LEVEL	WELL DEPTH (m)	WELL	LEGEND	DEPTH (m)	DESCRIPTION	ODOUR	PID (ppmv)	SAMPLE LABEL	DEPTH (m)
				0	Ground Surface				
					Compact Sand Compact, brown sand with trace to some silt becoming grey at 0.3 mbgs. Moist with silty zones.	No odour		Sa1	
				2	**Loose Sand** Loose, grey fine sand with trace to some silt becoming silty sand to sandy silt. Wet, occasional silt and coarse sand seams.	No odour		Sa2	
				3		No odour		Sa3	
				4	**Very loose fine Sand** Very loose, grey fine sand with some silt. Wet.				

NOTES

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater
Static Groundwater Level

	Reviewed By:	FILE

MONITORING WELL LOG MW-4

PROJECT No: 1010146 | DATE: April 2004 | EASTING:

SITE: McGarry Landfill | LOGGED BY: HATCH | NORTHING:

CLIENT: McGarry Township | CONTRACTOR: HATCH | ELEVATION: 320.106

WATER LEVEL	WELL DEPTH (m)	WELL	LEGEND	DEPTH (m)	DESCRIPTION	ODOUR	PID (ppmv)	SAMPLE LABEL	DEPTH (m)
				0	**Ground Surface**				
					Waste and Sand cover material Drillied to 3.05 mbgs through waste and sand cover material. Auger cuttings indicate 0.63 mof dray sand cover with pieces of waste, over waste mixed with sand including plastic, bags. oil bottles, cloth, metal, etc.				
				3	**Dense Sand** Dense, brown and grey sand mixed with pieces of waste material. Moist, black fibrous material recovered on the shoe of the sampler.Drill rig stalled at about 3.7 mbgs due to steel cable wrapped around augers.	Moderate to stronge landfill type odours		Sa1	
				4.6	**Dense Sand** Dense, grey sand becomming silty sand below about 5 mbgs. Moistbecoming wet at about 5 mbgs, occasional silt and coarse sand seams.	Moderate landfill odours		Sa2	
				6	**Loose Sand** Loose, grey fine sand to silt sand. Wet, occasional silt and coarse sand seams.	Slight odour		Sa3	
				7.6					
				9					

NOTES

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater
Static Groundwater Level

Reviewed By: | FILE

Project No: A0048-McGarry *Location: McGarry Landfill Site*

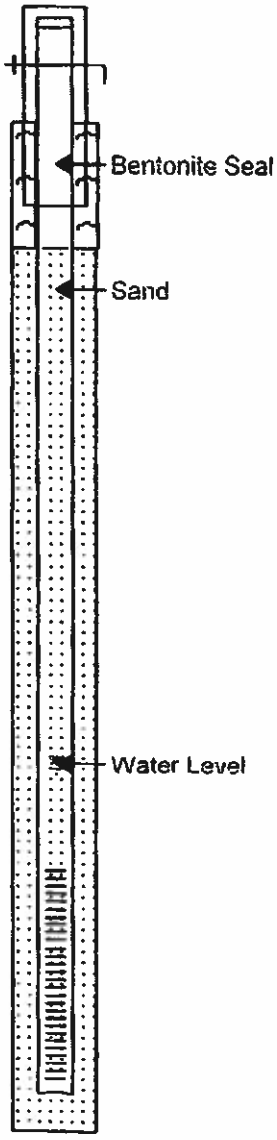
Project: Installtion of 3 Monitoring Wells

A&A ENVIRONMENTAL SERVICES INC.

Consultants in Soil, Water & Air Quality

Log of Borehole: BH-1 (MW-5)

SUBSURFACE PROFILE				SAMPLE			
Depth (ft / m)	Symbol	Description	Elev.	Number	Type	Recovery	Well Completion Details
		Ground Surface	0				
		Sand, light brown, medium grained, moist	-2				
		Sand, light brown, medium grained, saturated	-4				
		Sand, light brown, medium grained, wet	-6				
		Sand, light brown, medium grained, moist	-8				
		Sand, light brown, medium grained, wet	-20				
		Sand, brown, medium grained, saturated	-22				
		Sand/Gravel, brown, saturated	-24				
		End of Borehole					



Drill Method: Hollow Stem Auger

Drill Date: May 22, 2004

Hole Size: 6in

Datum:

Checked by: Dr. G. Duncan

Project No: A0048-McGarry *Location: McGarry Landfill Site*

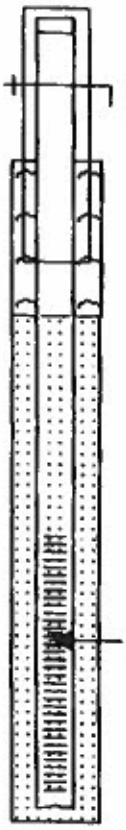
Project: Installtion of 3 Monitoring Wells

A&A ENVIRONMENTAL SERVICES INC.

Consultants in Soil, Water & Air Quality

Log of Borehole: BH-2 (MW-6)

SUBSURFACE PROFILE				SAMPLE			
Depth (ft / m)	Symbol	Description	Elev.	Number	Type	Recovery	Well Completion Details
		Ground Surface	0				
		Sand, light brown, medium fine, wet	-8				
		Sand, light brown, fine, saturated	-18				Water Level
		End of Borehole					



Drill Method: Hollow Stem Auger

Drill Date: May 22, 2004

Hole Size: 6in

Datum:

Checked by: Dr. G. Duncan

Project No: A0048-McGarry *Location: McGarry Landfill Site*

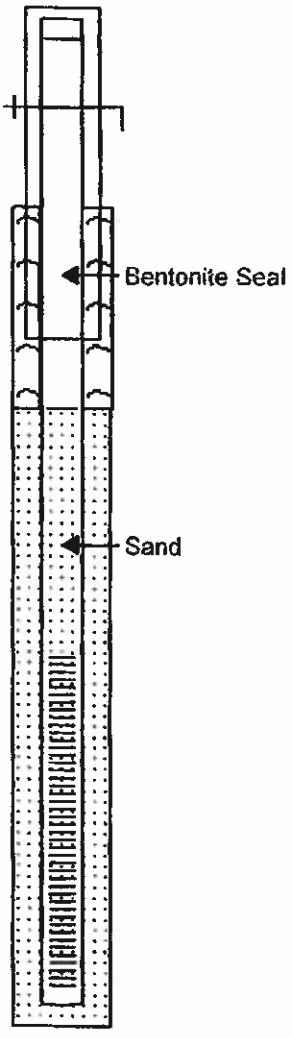
Project: Installtion of 3 Monitoring Wells

A&A ENVIRONMENTAL SERVICES INC.

Consultants in Soil, Water & Air Quality

Log of Borehole: BH-3 (MW-7)

SUBSURFACE PROFILE				SAMPLE			Well Completion Details
Depth	Symbol	Description	Elev.	Number	Type	Recovery	
ft / m		Ground Surface	0				
		Sand,light brown, medium fine, moist	-2				
		Sand, brown, coarse, moist	-8				
		Sand, brown, medium fine, moist	-12				
		End of Borehole					



Drill Method: Hollow Stem Auger

Drill Date: May 22, 2004

Hole Size: 6in

Datum:

Checked by: Dr. G. Duncan

Project No: 2551

Project: Landfill Monitoring Program

Client: McGarry Township

Location: South landfill Area

Log of Borehole: MW-8

Engineer: P. Crawford

SUBSURFACE PROFILE				SAMPLE			VOC Concentration ppm (125, 250, 375) / %LEL (10 20 30 40 50 60 70 80 90)	Well Completion Details
Depth (ft / m)	Symbol	Description	Elev.	Number	Type	Recovery		
0 / 0		Ground Surface	0					
0 – 3 / 0 – 1		**Sand** Light brown fine sand. Dry, no odour.	-2	1				
3 – 7 / 1 – 2		**Coarse Sand** Medium to light brown coarse sand. Moist, no odour.	-8	2, 3, 4				
7 – 16 / 2 – 5		**Sand** Medium to light brown fine sand. Moist to saturated, no odour.	-16	5, 6, 7, 8				
16 / 5		End of Borehole						

Drill Method: Conventional

Drill Date: Aug. 5, 2014

Hole Size: 4"

A & A Environmental Consultants Inc.
16 Young Street
Woodstock, ON N4S 3L4
www.aaenvironmental.ca

Checked by: A. Rasoul

APPENDIX IV

Summary Tables

PINCHIN

TABLE 1
Groundwater Monitoring Location Data
McGarry Waste Disposal Site
Township of McGarry, Ontario

Well Number	Date (dd/mmm/yy)	Ground Surface Elevation (mREL)*	TOC Elevation (mREL)	Height of TOC from Ground Surface (m)	NAPL Level Measurement from TOC (m)	Water Level Measurement from TOC (m)	Total Well Depth from TOC - Field (m)	Depth to Groundwater (mbgs)	NAPL Thickness (m)	Calculated Water Level Elevation (mREL)	Methane Detection Reading (ppm)	UTM Coordinates (Field)			Comments
												Zone	Easting (m)	Northing (m)	
MW1	26-May-16	98.9	99.82	0.92	ND	2.563	5.355	1.64	ND	97.26	0	17 U	610192	5332545	Brown, cloudy, lots of sediment.
	25-Oct-16	98.9	99.82	0.92	ND	3.161	5.44	2.24	ND	96.66	0				Brown, cloudy, lots of sediment.
	20-May-17	328.994	329.947	0.95	ND	2.64	5.19	1.69	ND	327.31	0				Well is in good condition.
	2-Nov-17	328.994	329.947	0.95	ND	3.18	5.12	2.23	ND	326.77	0				Brownish, cloudy, good recovery, no odours (duplicate).
	23-May-18	328.994	329.947	0.95	ND	3.72	5.14	2.77	ND	326.23	0				Brownish with sand, no odour.
	3-Aug-18	328.994	329.947	0.95	ND	3.44	5.41	2.49	ND	326.51	0				Brown, no odour.
	4-Oct-18	328.994	329.947	0.95	ND	3.42	5.55	2.47	ND	326.53	0				Cloudy, no odour.
	9-May-19	328.994	329.947	0.95	ND	2.71	5.55	1.76	ND	327.24	0				Light brown, silty, no odour.
	25-Jul-19	328.994	329.947	0.95	ND	2.27	5.41	1.32	ND	327.68	0				Silty, no odour.
	23-Sep-19	328.994	329.947	0.95	ND	2.71	5.99	1.76	ND	327.24	0				Silty, no odour, good recovery.
	11-Jun-20	328.994	329.947	0.95	ND	2.64	5.83	1.69	ND	327.31	0				Light brown, silty, no odour.
	25-Aug-20	328.994	329.947	0.95	ND	3.1	5.78	2.15	ND	326.85	0				Silty, no odour.
	20-Oct-20	328.994	329.947	0.95	ND	2.96	5.84	2.01	ND	326.99	0				Silty, no odour, good recovery.
	3-Jun-21	328.994	329.947	0.95	ND	3.72	6.07	2.77	ND	326.23	0				Silty, no odour, good recovery.
	5-Aug-21	328.994	329.947	0.95	ND	3.53	5.83	2.58	ND	326.42	0				Silty, no odour, good recovery.
	14-Oct-21	328.994	329.947	0.95	ND	3.73	6	2.78	ND	326.22	0				Silty, no odour, good recovery.
	25-May-22	328.994	329.947	0.98	ND	3	6.06	2.02	ND	326.95	0				Silty, no odour, good recovery.
	3-Aug-22	328.994	329.947	0.95	ND	2.89	6.11	1.94	ND	327.06	0				Silty, no odour, good recovery.
	27-Sep-22	328.994	329.947	0.97	ND	2.86	6.06	1.89	ND	327.09	0				Silty, no odour, good recovery.
MW2	26-May-16	99.46	100.31	0.85	ND	2.412	4.325	1.56	ND	97.90	0	17 U	609936	5332547	Brown, cloudy, lots of sediment.
	25-Oct-16	99.46	100.31	0.85	ND	3.325	4.442	2.47	ND	96.99	0				Brown, cloudy, lots of sediment.
	20-May-17	329.783	330.64	0.86	ND	2.36	4.38	1.50	ND	328.28	0				Slightly brown, no odours.
	2-Nov-17	329.783	330.64	0.86	ND	3.37	4.51	2.51	ND	327.27	0				Brownish, sandy, no odours.
	23-May-18	329.783	330.64	0.86	ND	3.37	4.72	2.51	ND	327.27	0				Brown with sand, no odour.
	3-Aug-18	329.783	330.64	0.86	ND	3.41	4.701	2.55	ND	327.23	0				Brown, no odour.
	4-Oct-18	329.783	330.64	0.86	ND	3.36	4.9	2.50	ND	327.28	0				Cloudy, no odour.
	9-May-19	329.783	330.64	0.86	ND	2.03	4.9	1.17	ND	328.61	0				Dark grey, silty, no odour.
	25-Jul-19	329.783	330.64	0.86	ND	2.64	4.7	1.78	ND	328.00	0				Silty, no odour.
	23-Sep-19	329.783	330.64	0.86	ND	3.05	4.81	2.19	ND	327.59	0				Silty, no odour, good recovery.
	11-Jun-20	329.783	330.64	0.86	ND	2.39	4.61	1.53	ND	328.25	0				Dark grey, silty, no odour.
	25-Aug-20	329.783	330.64	0.86	ND	3.14	4.79	2.28	ND	327.50	0				Silty, no odour.
	20-Oct-20	329.783	330.64	0.86	ND	2.97	4.79	2.11	ND	327.67	0				Silty, no odour, good recovery.
	3-Jun-21	329.783	330.64	0.86	ND	3.3	4.8	2.44	ND	327.34	0				Silty, no odour.
	5-Aug-21	329.783	330.64	0.86	ND	3.21	5.02	2.35	ND	327.43	0				Cloudy, no odour, purged dry.
	14-Oct-21	329.783	330.64	0.86	ND	3.47	5.01	2.61	ND	327.17	0				Cloudy, no odour, good recovery.
	25-May-22	329.783	330.64	0.83	ND	2.61	5	1.78	ND	328.03	0				Silty, no odour.
	3-Aug-22	329.783	330.64	0.84	ND	2.8	5.01	1.96	ND	327.84	0				Cloudy, no odour, purged dry.
	27-Sep-22	329.783	330.64	0.84	ND	2.86	5	2.02	ND	327.78	0				Silty, no odour, good recovery.

PINCHIN

TABLE 1
Groundwater Monitoring Location Data
McGarry Waste Disposal Site
Township of McGarry, Ontario

Well Number	Date (dd/mmm/yy)	Ground Surface Elevation (mREL)*	TOC Elevation (mREL)	Height of TOC from Ground Surface (m)	NAPL Level Measurement from TOC (m)	Water Level Measurement from TOC (m)	Total Well Depth from TOC - Field (m)	Depth to Groundwater (mbgs)	NAPL Thickness (m)	Calculated Water Level Elevation (mREL)	Methane Detection Reading (ppm)	UTM Coordinates (Field)			Comments
												Zone	Easting (m)	Northing (m)	
MW3	26-May-16	97.7	97.9	0.20	ND	0.557	5.316	0.36	ND	97.34	0	17 U	609743	5332128	Brownish yellow, cloudy.
	25-Oct-16	97.7	97.9	0.20	ND	1.565	5.298	1.37	ND	96.34	0				Brownish yellow, cloudy.
	20-May-17	330.088	330.218	0.13	ND	0.5	5.17	0.37	ND	329.72	0				Slightly brown, no odour.
	2-Nov-17	330.088	330.218	0.13	ND	1.62	5.2	1.49	ND	328.60	0				Clearish brown, lots of water, no odours.
	23-May-18	330.088	330.218	0.13	ND	0.25	5.7	0.12	ND	329.97	0				Brown, odour.
	3-Aug-18	330.088	330.218	0.13	ND	1.81	5.26	1.68	ND	328.41	0				Clear, no odour.
	4-Oct-18	330.088	330.218	0.13	ND	1.79	5.2	1.66	ND	328.43	0				Clear, no odour.
	9-May-19	330.088	330.218	0.13	ND	-	-	-	-	-	-				Well not accessable. No sample.
	25-Jul-19	330.088	330.218	0.13	ND	0.35	5.2	0.22	ND	329.87	-				Clear, no odour.
	23-Sep-19	330.088	330.218	0.13	ND	0.9	5.16	0.77	ND	329.32	-				Clear, no odour.
	11-Jun-20	330.088	330.218	0.13	ND	0.67	5.03	0.54	ND	329.55	-				Well not accessable. No sample.
	25-Aug-20	330.088	330.218	0.13	ND	1.42	5.17	1.29	ND	328.80	-				Clear, no odour.
	20-Oct-20	330.088	330.218	0.13	ND	1.26	5.24	1.13	ND	328.96	-				Clear, no odour.
	3-Jun-21	330.088	330.218	0.13	ND	2.53	5.24	2.40	ND	327.69	-				Clear, no odour.
	5-Aug-21	330.088	330.218	0.13	ND	1.76	5.18	1.63	ND	328.46	-				Clear, no odour, good recovery
	14-Oct-21	330.088	330.218	0.13	ND	2.03	5.23	1.90	ND	328.19	-				Cloudy, no odour, casing sunk
	25-May-22	330.088	330.218	0.12	ND	0.86	5.17	0.74	ND	329.36	-				Clear, no odour. Casing sunk
	3-Aug-22	330.088	330.218	0.10	ND	1.19	5.19	1.09	ND	329.03	-				Clear, no odour, good recovery
	27-Sep-22	330.088	330.218	0.13	ND	2.94	5.22	2.81	ND	327.28	-				Cloudy, no odour, casing sunk
MW4	26-May-16	100.76	101.64	0.88	ND	4.507	8.008	3.63	ND	97.13	0	17 U	609952	5332279	Dark brown slightly cloudy.
	25-Oct-16	100.76	101.64	0.88	ND	5.273	8.221	4.39	ND	96.37	0				Dark brown slightly cloudy.
	20-May-17	328.811	329.694	0.88	ND	4.63	8.11	3.75	ND	325.06	0				Clear, appears impacted, odours.
	2-Nov-17	328.811	329.694	0.88	ND	5.39	8.03	4.51	ND	324.30	0				Odours, cloudy, appears impacted.
	23-May-18	328.811	329.694	0.88	ND	5.22	8.02	4.34	ND	324.47	0				Brown, cloudy with odour, duplicate.
	3-Aug-18	328.811	329.694	0.88	ND	5.5	8.08	4.62	ND	324.19	0				Cloudy, strong odour.
	4-Oct-18	328.811	329.694	0.88	ND	5.54	8.1	4.66	ND	324.15	0				Clear, no odour.
	9-May-19	328.811	329.694	0.88	ND	4.29	7.97	3.41	ND	325.40	0				Clear, strong leachate odours.
	25-Jul-19	328.811	329.694	0.88	ND	4.04	7.95	3.16	ND	325.65	0				Clear, odour
	23-Sep-19	328.811	329.694	0.88	ND	4.63	7.97	3.75	ND	325.06	0				Clear, odour
	11-Jun-20	328.811	329.694	0.88	ND	4.56	8.06	3.68	ND	325.13	0				Clear, strong leachate odours.
	25-Aug-20	328.811	329.694	0.88	ND	5.09	8.04	4.21	ND	324.60	0				Clear, odour
	20-Oct-20	328.811	329.694	0.88	ND	5.12	8.07	4.24	ND	324.57	0				Clear, odour
	3-Jun-21	328.811	329.694	0.88	ND	5.57	8.07	4.69	ND	324.12	0				Clear, no odour.
	5-Aug-21	328.811	329.694	0.88	ND	5.52	8.18	4.64	ND	324.17	0				Clear, odour, good recovery
	14-Oct-21	328.811	329.694	0.88	ND	5.75	8.02	4.87	ND	323.94	0				Clear, no odour, purged dry.
	25-May-22	328.811	329.694	0.89	ND	5.04	8.13	4.15	ND	324.65	0				Clear, no odour.
	3-Aug-22	328.811	329.694	0.92	ND	4.96	8.01	4.04	ND	324.73	0				Clear, odour, good recovery
	27-Sep-22	328.811	329.694	0.90	ND	4.9	8.05	4.00	ND	324.79	0				Clear, odourous, good recovery.

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TABLE 1
Groundwater Monitoring Location Data
McGarry Waste Disposal Site
Township of McGarry, Ontario

Well Number	Date (dd/mmm/yy)	Ground Surface Elevation (mREL)*	TOC Elevation (mREL)	Height of TOC from Ground Surface (m)	NAPL Level Measurement from TOC (m)	Water Level Measurement from TOC (m)	Total Well Depth from TOC - Field (m)	Depth to Groundwater (mbgs)	NAPL Thickness (m)	Calculated Water Level Elevation (mREL)	Methane Detection Reading (ppm)	UTM Coordinates (Field)			Comments
												Zone	Easting (m)	Northing (m)	
MW5	26-May-16	101.87	102.52	0.65	ND	5.445	8.265	4.80	ND	97.08	0	17 U	610067	5332257	Clear.
	25-Oct-16	101.87	102.52	0.65	ND	6.25	7.976	5.60	ND	96.27	0				Clear.
	20-May-17	329.057	329.747	0.69	ND	5.53	8.19	4.84	ND	324.22	0				Clear, no odour.
	2-Nov-17	329.057	329.747	0.69	ND	6.21	8.245	5.52	ND	323.54	0				Clear, no odours.
	23-May-18	329.057	329.747	0.69	ND	6.03	8.39	5.34	ND	323.72	0				Clear, no odour.
	3-Aug-18	329.057	329.747	0.69	ND	6.38	8.29	5.69	ND	323.37	0				Cloudy, odour.
	4-Oct-18	329.057	329.747	0.69	ND	6.46	8.29	5.77	ND	323.29	0				Clear, no odour.
	9-May-19	329.057	329.747	0.69	ND	5.53	8.2	4.84	ND	324.22	0				Clear, no odour.
	25-Jul-19	329.057	329.747	0.69	ND	4.95	8.22	4.26	ND	324.80	0				Clear, no odour.
	23-Sep-19	329.057	329.747	0.69	ND	5.55	8.25	4.86	ND	324.20	0				Clear, no odour, purged dry.
	11-Jun-20	329.057	329.747	0.69	ND	5.62	8.25	4.93	ND	324.13	0				Clear, no odour.
	25-Aug-20	329.057	329.747	0.69	ND	5.99	8.27	5.30	ND	323.76	0				Clear, no odour.
	20-Oct-20	329.057	329.747	0.69	ND	6.07	8.28	5.38	ND	323.68	0				Clear, no odour, purged dry.
	3-Jun-21	329.057	329.747	0.69	ND	6.51	8.15	5.82	ND	323.24	0				Clear, no odour, purged dry
	5-Aug-21	329.057	329.747	0.69	ND	6.41	8.15	5.72	ND	323.34	0				Clear, no odour, purged dry.
	14-Oct-21	329.057	329.747	0.69	ND	6.65	8.23	5.96	ND	323.10	0				Clear, no odour, purged dry.
	25-May-22	329.057	329.747	0.77	ND	5.97	8.17	5.20	ND	323.78	0				Clear, no odour, purged dry.
	3-Aug-22	329.057	329.747	0.72	ND	5.86	8.32	5.14	ND	323.89	0				Clear, no odour, purged dry.
	27-Sep-22	329.057	329.747	0.70	ND	5.85	8.15	5.15	ND	323.90	0				Clear, no odour, purged dry.
MW6	26-May-16	99.4	99.97	0.57	-	-	-	-	-	-	-	17 U	609912.2	5332069.92	Unable to locate.
	25-Oct-16	99.4	99.97	0.57	-	-	-	-	-	-	-				Unable to locate.
	20-May-17	-	-	-	-	-	-	-	-	-	-				Unable to locate.
	2-Nov-17	-	-	-	-		-	-	-	-	-				Unable to locate.
	23-May-18	-	-	-	-	-	-	-	-	-	-				Unable to locate.
	3-Aug-18	-	-	-	-	-	-	-	-	-	-				Unable to locate.
	4-Oct-18	-	-	-	-	-	-	-	-	-	-				Unable to locate.
	9-May-19	-	-	-	-	-	-	-	-	-	-				Unable to locate.
	25-Jul-19	-	-	-	-	-	-	-	-	-	-				Unable to locate.
	23-Sep-19	-	-	-	-	-	-	-	-	-	-				Unable to locate.
	11-Jun-20	-	-	-	-	-	-	-	-	-	-				Unable to locate.
	25-Aug-20	-	-	-	-	-	-	-	-	-	-				Unable to locate.
	20-Oct-20	-	-	-	-	-	-	-	-	-	-				Unable to locate.
	3-Jun-21	-	-	-	-	-	-	-	-	-	-				Unable to locate.
	5-Aug-21														Unable to locate.
	14-Oct-21														Unable to locate.
	25-May-22	-	-	-	-	-	-	-	-	-	-				Unable to locate.
	3-Aug-22														Unable to locate.
	27-Sep-22														Unable to locate.

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TABLE 1
Groundwater Monitoring Location Data
McGarry Waste Disposal Site
Township of McGarry, Ontario

Well Number	Date (dd/mmm/yy)	Ground Surface Elevation (mREL)*	TOC Elevation (mREL)	Height of TOC from Ground Surface (m)	NAPL Level Measurement from TOC (m)	Water Level Measurement from TOC (m)	Total Well Depth from TOC - Field (m)	Depth to Groundwater (mbgs)	NAPL Thickness (m)	Calculated Water Level Elevation (mREL)	Methane Detection Reading (ppm)	UTM Coordinates (Field)			Comments
												Zone	Easting (m)	Northing (m)	
MW7	26-May-16	97.06	97.8	0.74	ND	0.839	3.52	0.10	ND	96.96	0	17 U	609868	5332430	Clear.
	25-Oct-16	97.06	97.8	0.74	ND	1.966	3.467	1.23	ND	95.83	0				Clear.
	20-May-17	328.736	329.526	0.79	ND	1.03	3.5	0.24	ND	328.50	0				Clear, no odour.
	2-Nov-17	328.736	329.526	0.79	ND	1.64	3.075	0.85	ND	327.89	0				Slip cap removed, clear, good well, no odours.
	23-May-18	328.736	329.526	0.79	ND	1.37	3.54	0.58	ND	328.16	0				Clear, no odour.
	3-Aug-18	328.736	329.526	0.79	ND	1.73	3.56	0.94	ND	327.80	0				Clear, no odour.
	4-Oct-18	328.736	329.526	0.79	ND	1.79	3.12	1.00	ND	327.74	0				-
	9-May-19	328.736	329.526	0.79	ND	0.87	3.08	0.08	ND	328.66	0				Clear water, no odour. Duplicate.
	25-Jul-19	328.736	329.526	-	ND	-	-	-	-	-	-				Submerged, no sample
	23-Sep-19	328.736	329.526	0.71	ND	0.91	3.02	0.20	ND	328.62	0				Clear , no odour.
	11-Jun-20	328.736	329.526	0.79	ND	0.93	2.7	0.14	ND	328.60	0				Clear water, no odour. Duplicate.
	25-Aug-20	328.736	329.526	-	ND	1.27	3.08	-	-	-	-				Submerged, no sample
	20-Oct-20	328.736	329.526	0.71	ND	1.42	3.11	0.71	ND	328.11	0				Clear , no odour.
	3-Jun-21	328.736	329.526	0.71	ND	1.82	3.57	1.11	ND	327.71	0				Clear , no odour, purged dry
	5-Aug-21	328.736	329.526	0.71	ND	1.82	3.2	1.11	ND	327.71	0				Clear, no odour, purged dry.
	14-Oct-21	328.736	329.526	0.71	ND	2	3.2	1.29	ND	327.53	0				Clear, no odour, good recovery
	25-May-22	328.736	329.526	0.80	ND	1.36	3.24	0.56	ND	328.17	0				Clear , no odour
	3-Aug-22	328.736	329.526	0.77	ND	1.2	3.11	0.43	ND	328.33	0				Clear, no odour, purged dry.
	27-Sep-22	328.736	329.526	0.80	ND	1.22	3.13	0.42	ND	328.31	0				Clear, odourous, good recovery
MW8	26-May-16	-	-	-	-	-	-	-	-	-	-	17 U	609962	5331988	Unable to locate.
	25-Oct-16	-	-	-	-	-	-	-	-	-	-				Unable to locate.
	20-May-17	328.619	328.77	0.15	ND	0.24	3.11	0.09	ND	328.53	0				Strong sewage odour, no protective casing.
	2-Nov-17	328.619	328.77	0.15	ND	0.14	3.10	-0.01	ND	328.63	0				Organic odours, cloudy, good recharge, no protective casing.
	23-May-18	328.619	328.77	0.15	ND	2.26	3.71	2.11	ND	326.51	0				Brown, slight odour.
	3-Aug-18	328.619	328.77	0.15	ND	2.26	3.76	2.11	ND	326.51	0				Cloudy, very strong odour, duplicate.
	4-Oct-18	328.619	328.77	0.15	ND	2.46	3.80	2.31	ND	326.31	0				Clear, no odour.
	9-May-19	328.619	328.77	0.15	ND	0.84	3.75	0.69	ND	327.93	0				Light brown, some silt, no odour.
	25-Jul-19	328.619	328.77	0.15	ND	1.83	3.74	1.68	ND	326.94	0				Cloudy, no odour.
	23-Sep-19	328.619	328.77	0.68	ND	2.59	3.73	1.91	ND	326.18	0				Clear, no odour.
	11-Jun-20	328.619	328.77	0.15	ND	-	-	-	-	-	-				No sample
	25-Aug-20	328.619	328.77	0.15	ND	2.71	3.79	2.56	ND	326.06	0				Cloudy, no odour.
	20-Oct-20	328.619	328.77	0.68	ND	1.00	3.70	0.32	ND	327.77	0				Clear, no odour.
	3-Jun-21	328.619	328.77	0.68	ND	2.34	3.78	1.66	ND	326.43	0				Clear/Orange, no odour.
	5-Aug-21	328.619	328.77	0.68	ND	2.27	3.78	1.59	ND	326.50	0				Clear, no odour, purged dry.
	14-Oct-21	328.619	328.77	0.68	ND	2.76	3.78	2.08	ND	326.01	0				Clearn no odour, poor recovery
	25-May-22	328.619	328.77	0.85	ND	1.20	3.72	0.35	ND	327.57	0				Clear, no odour. Purged dry
	3-Aug-22	328.619	328.77	0.85	ND	1.86	3.74	1.01	ND	326.91	0				Clear, no odour, purged dry.
	27-Sep-22	328.619	328.77	0.86	ND	1.20	3.79	0.34	ND	327.57	0				Clear, odourous, good recovery

Notes:
mREL - Indicates Groundwater Elevation (metres) Relative to Site Benchmark
NAPL - Non Aqueous Phase Liquid
ND - Not Detected
mbgs - metres below ground surface
TOC - Top of Casing
NT- Not Tested
*All elevations are measured relative to an assumed benchmark which was re-established in May 2017

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TABLE 2
Groundwater Quality Results - MW1
McGarry Waste Disposal Site
Township of McGarry, Ontario

Parameter	Units	RDL	Sample Collection Date (dd-mmm-yy)																								ODWQS
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Benzene	µg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Methylene Chloride	µg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Toluene	µg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vinyl Chloride	µg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1,4-Dichlorobenzene	µg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
pH	pH Units	NA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BOD	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Electrical Conductivity	uS/cm	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total Dissolved Solids	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total Suspended Solids	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Alkalinity (as CaCO3)	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total Hardness (as CaCO3)	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Fluoride	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Chloride	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nitrate as N	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nitrite as N	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bromide	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sulphate	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ortho phosphate as P	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ammonia as N	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total Kjeldahl Nitrogen	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Chemical Oxygen Demand	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dissolved Organic Carbon	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Phenols	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Calcium	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Magnesium	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sodium	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Potassium	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tannins and Lignins	mg phenol/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Aluminum	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Antimony	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Arsenic	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Barium	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Beryllium	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Boron	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cadmium	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Chromium	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cobalt	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Copper	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Iron	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Lead	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Manganese	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mercury	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Molybdenum	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nickel	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Selenium	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Silver	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Strontium	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Thallium	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Titanium	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vanadium	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Zinc	mg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Field Measurements																									
Temperature	C	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-
pH	pH Units	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-
Conductivity	uS/cm	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-
Oxidation Reduction Potential	mV	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-
Dissolved Oxygen	mg/L	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-

Notes:
[illegible]

TABLE 3
Groundwater Quality Results - MW2
McGarry Waste Disposal Site
Township of McGarry, Ontario

Sample Designation: MW2 — Sample Collection Date (dd-mmm-yy)

Parameter	Units	RDL	27-May-15	23-Jul-15	16-Sep-15	18-May-16	26-Oct-16	26-May-17	5/26/2017 (Dup)	2-Nov-17	22-May-18	3-Aug-18
Benzene	µg/L	0.2	-	<0.20	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	-
Methylene Chloride	µg/L	0.3	-	<0.30	-	-	<0.30	<0.30	<0.30	<0.30	<0.30	-
Toluene	µg/L	0.2	-	<0.20	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	-
Vinyl Chloride	µg/L	0.17	-	<0.17	-	-	<0.17	<0.17	<0.17	<0.17	<0.17	-
1,4-Dichlorobenzene	µg/L	0.1	-	<0.10	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	-
pH	pH Units	NA	6.29	6.73	7.02	6.43	6.89	6.64	6.63	6.52	6.30	6.02
BOD	mg/L	5	-	-	-	-	-	<5	<5	<5	<5	<5
Electrical Conductivity	uS/cm	2	16	25	47	38	46	14	14	46	34	46
Total Dissolved Solids	mg/L	20	<20	73	76	38	66	888	1220	74	408	84
Total Suspended Solids	mg/L	10	-	-	-	-	-	267000	861000	66100	46400	22800
Alkalinity (as CaCO3)	mg/L	5	6	9	13	6	32	7	6	32	36	17
Total Hardness (as CaCO3)	mg/L	0.5	4.6	8	14.8	-	-	-	-	-	-	-
Fluoride	mg/L	0.05	<0.05	<0.05	<0.05	-	-	-	-	-	-	-
Chloride	mg/L	0.1	0.33	1.37	3.37	0.40	1.82	0.33	0.31	1.06	0.88	1.43
Nitrate as N	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	0.08	<0.05	<0.05	<0.05
Nitrite as N	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-
Bromide	mg/L	0.05	<0.05	<0.05	<0.05	-	-	-	-	-	-	-
Sulphate	mg/L	0.1	6.04	8.9	2.83	1.11	2.97	1.64	0.90	2.48	1.8	2.09
Ortho phosphate as P	mg/L	0.1	<0.10	<0.10	<0.10	-	-	-	-	-	-	-
Ammonia as N	mg/L	0.02	<0.02	<0.02	0.04	0.06	<0.02	0.12	0.16	0.03	0.05	<0.03
Total Kjeldahl Nitrogen	mg/L	0.1	<0.10	0.29	0.42	0.13	0.14	0.51	0.45	0.10	<0.10	-
Chemical Oxygen Demand	mg/L	5	<5	46	<5	<5	<5	8	6	<5	<5	<5
Dissolved Organic Carbon	mg/L	0.5	<0.5	1.1	0.8	0.8	0.8	0.3	0.5	1.7	2.2	6.8
Phenols	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Calcium	mg/L	0.05	1.36	2.37	4.46	0.94	4.17	0.81	0.89	3.83	0.63	3.58
Magnesium	mg/L	0.05	0.28	0.61	0.86	0.28	0.94	0.14	0.14	0.52	0.29	8.9
Sodium	mg/L	0.05	1.32	1.31	2.83	1.06	3.36	1.27	1.34	3.86	0.81	0.49
Potassium	mg/L	0.05	0.46	0.57	0.65	0.37	0.75	0.39	0.34	0.61	0.63	-
Tannins and Lignins	mg phenol/L	0.1	0.2	0.2	<0.1	-	-	-	-	-	-	-
Aluminum	mg/L	0.004	0.014	0.009	0.013	-	-	-	-	-	-	-
Antimony	mg/L	0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
Arsenic	mg/L	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-
Barium	mg/L	0.002	<0.002	<0.002	0.003	0.007	0.007	0.003	0.006	0.003	<0.002	0.004
Beryllium	mg/L	0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-
Boron	mg/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	<0.010	<0.010	<0.010
Cadmium	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-
Chromium	mg/L	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-
Cobalt	mg/L	0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-
Copper	mg/L	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-
Iron	mg/L	0.01	<0.010	<0.010	<0.010	0.114	0.139	0.188	0.317	<0.010	<0.010	<0.010
Lead	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	-
Manganese	mg/L	0.002	<0.002	<0.002	0.004	0.002	0.007	0.007	0.009	0.009	<0.002	-
Mercury	mg/L	0.0001	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0002	-
Molybdenum	mg/L	0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
Nickel	mg/L	0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
Selenium	mg/L	0.004	<0.004	<0.004	<0.004	-	-	-	-	-	-	-
Silver	mg/L	0.002	<0.002	<0.002	0.19	-	-	-	-	-	-	-
Strontium	mg/L	0.005	0.01	0.021	<0.002	-	-	-	-	-	-	-
Thallium	mg/L	0.005	<0.005	<0.005	0.004	-	-	-	-	-	-	-
Titanium	mg/L	0.002	<0.002	<0.002	<0.005	-	-	-	-	-	-	-
Vanadium	mg/L	0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
Zinc	mg/L	0.005	<0.005	<0.005	<0.002	0.011	<0.005	<0.005	0.006	<0.005	<0.005	-
Field Measurements												
Temperature	C	-	-	-	-	3.39	6.56	3.63	3.63	8.7	8.19	11.9
pH	pH Units	-	-	-	-	5.94	6.42	6.47	6.47	7.14	5.56	6.29
Conductivity	uS/cm	-	-	-	-	41	-	9	8	26	33	33
Oxidation Reduction Potential	mV	-	-	-	-	86.9	246.5	101.6	101.6	267	129.6	140
Dissolved Oxygen	mg/L	-	-	-	-	12.6	4.94	16.82	15.82	7.88	11.91	17.2

Parameter	4-Oct-18	9-May-19	23-Jul-19	23-Sep-19	11-Jun-20	25-Aug-20	20-Oct-20	3-Jun-21	5-Aug-21	21-Oct-21	26-May-22	3-Aug-22	27-Sep-22	ODWQS
Benzene	-	<0.50	-	-	<0.50	-	-	<0.5	-	-	<0.5	<0.5	-	1
Methylene Chloride	-	<2.0	-	-	-	-	-	<0.5	-	-	<0.5	-	-	50
Toluene	-	<0.50	-	-	<0.50	-	-	<0.5	-	-	<0.5	<0.5	-	60
Vinyl Chloride	-	<0.50	-	-	<0.50	-	-	<0.2	-	-	<0.2	<0.2	-	1
1,4-Dichlorobenzene	-	<0.50	-	-	<0.50	-	-	<0.5	-	-	<0.5	<0.5	-	5
pH	6.61	6.21	6.16	6.13	6.17	6.17	6.05	6.89	6.64	6.08	6.63	6.62	6.82	(6.5-8.5)
BOD	<5	<3.0	<3.0	<3.0	<3.3	<3.0	<3.0	<4	<4	<4	<4	<4	<4	
Electrical Conductivity	52	13.4	21.4	25.5	15.8	46.9	56.7	57	60	61	29	52	61	
Total Dissolved Solids	129	463	249	204	201	66	46	66	66	73	365	66	66	500
Total Suspended Solids	29300	68800	10400	16600	22600	7430	8830	80700	3630	3290	12100	12600	10400	
Alkalinity (as CaCO3)	16	<60	<10	11	8.3	39	22	36	27	23	12	22	25	(30-500)
Total Hardness (as CaCO3)	-	-	-	-	-	-	-	-	-	-	-	-	-	(80-100)
Fluoride	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5
Chloride	2.86	<0.50	<0.30	<0.50	<0.60	1.34	1.33	1	1	<1	4	6	6	250
Nitrate as N	<0.05	<0.020	0.024	0.043	<0.020	<0.020	0.022	<0.06	<0.06	<0.03	0.06	<0.06	<0.06	10
Nitrite as N	-	<0.010	<0.010	-	<0.010	-	-	<0.03	<0.03	0.02	<0.03	-	-	1
Bromide	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sulphate	2.96	1.93	3.90	0.77	0.83	1.23	1.88	4	3	4	41	12	7	500
Ortho phosphate as P	-	-	-	-	-	-	-	-	-	-	3.88	-	-	
Ammonia as N	3.24	0.014	0.078	0.013	0.026	<0.010	<0.010	<0.04	<0.04	0.08	0.08	<0.04	<0.04	
Total Kjeldahl Nitrogen	-	<15	<1.5	-	<0.15	-	-	<0.06	4		<0.06	-	-	
Chemical Oxygen Demand	<5	94	131	30	160	60	30	<8	<8	<8	10	<8	<8	
Dissolved Organic Carbon	4.7	3.78	1.8	1.8	1.11	1.87	1.80	<1	1	2	2	1	2	5
Phenols	-	<0.0010	<0.0010	-	0.0001			<0.002	-	-	<0.002	-	-	
Calcium	4.23	0.448	1.46	1.04	1.36	3.40	3.73	5.06	6.0	6.04	2.21	4.40	4.89	
Magnesium	1.02	0.159	0.360	0.471	0.36	0.681	1.02	1.31	1.20	1.30	0.873	0.801	1.20	
Sodium	6	2.10	2.10	2.64	1.36	4.1	0.80	4.83	4.08	0.34	2.84	3.88	3.77	20 (200)
Potassium	-	0.348	0.348	-	0.348	-	-	0.41	-	-	0.414	-	-	
Tannins and Lignins	-	-	-	-	-	-	-	-	-	-	-	-	-	
Aluminum	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
Antimony	-	-	-	-	-	-	-	-	-	-	-	-	-	0.006
Arsenic	-	-	<0.00010	-	0.00018	-	-	0.0002	-	-	<0.0002	-	-	0.01
Barium	0.004	-	0.00122	0.00147	0.0041	0.00181	0.00194	0.00234	0.00211	0.00223	0.00097	0.0107	0.00172	1
Beryllium	-	-	-	-	-	-	-	-	-	-	-	-	-	
Boron	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	0.01	0.003	0.029	0.007	<0.002	0.002	5
Cadmium	-	-	<0.000019	-	0.0000066	-	-	-	-	-	0.000063	-	-	0.005
Chromium	-	-	<0.00066	-	0.00051	-	-	0.00066	-	-	0.00023	-	-	0.05
Cobalt	-	-	-	-	-	-	-	-	-	-	-	-	-	
Copper	-	-	0.00436	-	-	-	-	0.0088	-	-	<0.0002	-	-	1
Iron	<0.010	-	0.03	0.019	0.152	-	0.026	0.07	0.03	0.026	<0.007	0.014	0.044	0.3
Lead	-	-	0.000113	-	0.000133	-	-	<0.00009	-	-	<0.00009	-	-	0.01
Manganese	-	0.00204	0.00256	-	0.00576	-	-	0.00566	0.00616	0.00799	0.00199	-	0.00140	0.05
Mercury	-	<0.000010	-	-	<0.0000069	-	-	<0.00001	-	-	<0.00001	-	-	0.001
Molybdenum	-	-	-	-	-	-	-	-	-	-	-	-	-	
Nickel	-	-	-	-	-	-	-	-	-	-	-	-	-	
Selenium	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01
Silver	-	-	-	-	-	-	-	-	-	-	-	-	-	
Strontium	-	-	-	-	-	-	-	-	-	-	-	-	-	
Thallium	-	-	-	-	-	-	-	-	-	-	-	-	-	
Titanium	-	-	-	-	-	-	-	-	-	-	-	-	-	
Vanadium	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zinc	-	-	0.0023	-	0.0021	-	-	0.003	-	-	<0.002	-	-	5
Field Measurements														
Temperature	8.89	2.4	13	6.1	6.3	10	7.8	15.1	12.1	11.8	9.3	11.3	9	-
pH	6.43	6.46	6.47	6.1	6.80	6.06	6.63	6.12	6.63	6.22	6.06	6.16	6.32	-
Conductivity	26	6.8	19	22.1	21	33.3	31	46.7	47.6	46	0.041	46	38	-
Oxidation Reduction Potential	-114.4	164.5	215.6	29	117.7	266.3	171.8	303	97.3	86.9	74.9	113.1	101.4	-
Dissolved Oxygen	86.2	14.91	7.85	4.68	6.39	6.06	7.11	9.21	5.33	72.7	7.96	7.84	6.94	-

Notes:
Ontario Drinking Water Quality Standards: Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act, dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2006.
500.0 — Exceeds ODWQS Standard
RDL — Reportable Detection Limit
NA — Not Applicable - Ontario standard on the parameter is based on operational guidelines (OG) as defined in Operational Guidelines for [illegible] in the Procedure for Disinfection of Drinking Water in Ontario.
Units — All Units in mg/L Unless Otherwise Noted.

TABLE 4
Groundwater Quality Results - MW3
McGarry Waste Disposal Site
Township of McGarry, Ontario

Parameter	Units	RDL	Sample Designation																	ODWQS
			Sample Collection Date (dd/mm/yy)																	
			MW3																	
			23-May-18	3-Aug-18	4-Oct-18	3-May-19	25-Jul-19	23-Sep-19	11-Jun-20	25-Aug-20	20-Oct-20	18/09/2020 (Dup)	3-Jun-21	5-Aug-21	21-Oct-21	21-Oct-21 (DUP)	25-May-22	3-Aug-22	27-Sep-22	
Benzene	µg/L	0.2	<0.20	-	-		-	-	<0.50	-	-	-	< 0.5	-	-	-	< 0.5	< 0.5	-	1
Methylene Chloride	µg/L	0.3	<0.30	-	-		-	-	-	-	-	-	< 0.5	-	-	-	< 0.5	-	-	50
Toluene	µg/L	0.2	<0.20	-	-		-	-	<0.50	-	-	-	< 0.5	-	-	-	< 0.5	< 0.5	-	60
Vinyl Chloride	µg/L	0.17	<0.17	-	-		-	-	<0.50	-	-	-	< 0.2	-	-	-	< 0.2	< 0.2	-	1
1,4-Dichlorobenzene	µg/L	0.1	<0.10	-	-		-	-	<0.50	-	-	-	< 0.5	-	-	-	< 0.5	< 0.5	-	5
pH	pH Units	NA	8.96	8.38	8.3		8.69	8.89	8.79	8.89	8.96	8.96	6.57	6.33	6.36	6.52	8.96	6.82	8.50	(6.5-8.5)
BOD	mg/L	5	<5	<5	<5		<2.0	<3.0	<2.0	<3.0	<3.0	<3.0	< 4	< 4	< 4	< 4	< 4	< 4	< 4	-
Electrical Conductivity	uS/cm	2	21	22	21		21.4	23.4	53.8	57.5	41.7	41.2	41	28	36	28	33	24	24	-
Total Dissolved Solids	mg/L	20	20	<20	24		27	34	41	44	28	31	< 30	43	31	< 30	< 30	< 30	< 30	500
Total Suspended Solids	mg/L	10	2380	1290	580		2610	1280	32.1	175	902	214	175	964	79	111	516	322	798	-
Alkalinity (as CaCO3)	mg/L	5	6	8	<5		<10	<10	13.2	11	12	12	14	10	12	11	12	7	6	(30-500)
Total Hardness (as CaCO3)	mg/L	0.5	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	(80-100)
Fluoride	mg/L	0.06	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	1.5
Chloride	mg/L	0.1	0.47	0.24	0.27		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	< 1	< 1	< 1	< 1	< 1	< 1	< 1	250
Nitrate as N	mg/L	0.05	0.16	0.14	0.16		0.147	0.152	2.57	3.16	1.13	1.14	0.33	0.25	< 0.03	< 0.03	0.61	0.49	0.57	10
Nitrite as N	mg/L	0.05	<0.05	-	-		<0.010	-	<0.010	-	-	-	< 0.03	<0.03	0.29	0.36	< 0.03	-	-	1
Bromide	mg/L	0.05					-	-	-	-	-	-					-	-	-	-
Sulphate	mg/L	0.1	2.99	2.23	2.44		2.11	2.04	0.96	1	1.38	1.35	< 2	2	< 2	2	2	< 2	2	500
Ortho phosphate as P	mg/L	0.1	-	-	-		-	-	-	-	-	-	-	-	-	-	0.14	-	-	-
Ammonia as N	mg/L	0.02	<0.02	<0.02	0.08		<0.010	<0.010	<0.010	0.017	<0.010	0.011	< 0.04	<0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	-
Total Kjeldahl Nitrogen	mg/L	0.1	<0.10	-	-		0.23		0.26	-	-	-	< 0.05	-	-	-	< 0.05	-	-	-
Chemical Oxygen Demand	mg/L	5	<5	<5	<5		27	20	<10	<10	<10	<10	< 8	<8	< 8	< 8	< 8	< 8	< 8	-
Dissolved Organic Carbon	mg/L	0.5	0.8	1.8	1.5		3.77	1.32	1.87	2.67	2.33	2.52	2	1	1	3	1	2	2	5
Phenols	mg/L	0.001	<0.001	-	-		0.0055		<0.0010	-	-	-	< 0.002	-	-	-	< 0.002	-	-	-
Calcium	mg/L	0.05	1.71	1.87	1.8		2.28	2.09	4.85	5.02	3.96	3.82	3.87	3.18	3.05	2.93	3.15	2.18	2.09	-
Magnesium	mg/L	0.05	0.39	0.39	0.36		0.438	0.442	1.23	1.19	1.01	0.991	0.71	0.595	0.845	0.817	0.851	0.368	0.360	-
Sodium	mg/L	0.05	0.84	1.2	1		0.82	1.03	1.8	2.38	2.02	1.95	1.5	1.27	1.48	1.43	1.24	1.21	0.92	20 (200)
Potassium	mg/L	0.05	0.46	-	-		0.628	-	0.827	-	-	-	0.851	-	-	-	0.842	-	-	-
Tannins and Lignins	mg phenol/L	0.1	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum	mg/L	0.004	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
Antimony	mg/L	0.003	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	0.006
Arsenic	mg/L	0.003	<0.003	-	-		<0.00010	-	0.00011	-	-	-	< 0.0002	-	-	-	< 0.0002	-	-	0.01
Barium	mg/L	0.002	0.006	0.009	0.012		0.00974	0.00984	0.019	0.0235	0.0174	0.0174	0.0157	0.0157	0.0158	0.0159	0.0189	0.0216	0.0194	1
Beryllium	mg/L	0.001	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron	mg/L	0.01	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.027	0.003	0.010	0.010	0.009	0.003	0.003	5
Cadmium	mg/L	0.002	<0.002	-	-		<0.000010	-	0.000012	-	-	-	-	-	-	-	0.000007	-	-	0.005
Chromium	mg/L	0.003	<0.003	-	-		<0.00050	-	<0.00050	-	-	-	0.00035	-	-	-	0.00048	-	-	0.05
Cobalt	mg/L	0.001	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	0.003	<0.003	-	-		0.0003	-	-	-	-	-	0.0011	-	-	-	0.001	-	-	1
Iron	mg/L	0.01	<0.010	<0.010	<0.010		0.013	0.013	<0.010	-	<0.010	<0.010	0.02	<0.007	< 0.007	0.010	< 0.007	0.026	0.033	0.3
Lead	mg/L	0.002	<0.001	-	-		<0.000050	-	0.000053	-	-	-	< 0.00009	-	-	-	< 0.00009	-	-	0.01
Manganese	mg/L	0.002	0.007	-	-		0.00748	-	0.0095	-	-	-	0.0233	0.0329	0.0368	0.0369	0.169	-	0.0231	0.05
Mercury	mg/L	0.0001	<0.0002	-	-		-	-	<0.0000050	-	-	-	< 0.00001	-	-	-	< 0.00001	-	-	0.001
Molybdenum	mg/L	0.002	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.003	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.004	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	0.01
Silver	mg/L	0.002	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium	mg/L	0.005	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium	mg/L	0.002	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.002	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	0.005	<0.005	-	-		<0.0010	-	0.002	-	-	-	0.003	-	-	-	< 0.002	-	-	5
Field Measurements																				
Temperature	C	-	8.58	11.29	9.19	-	9.3	11.4	8.1	10.8	8.78	-	6.2	12.8	11.7	-	5.1	11	10.2	-
pH	pH Units	-	5.42	5.47	5.39	-	6.47	5.23	6.04	4.76	5.34	-	5.3	4.91	5.3	-	5.18	5.45	4.8	-
Conductivity	uS/cm	-	14	18	17	-	16.4	20.7	56.1	43.4	27	-	23	26.4	28	-	0.046	25.9	18.2	-
Oxidation Reduction Potential	mV	-	111	206.4	-86	-	127.4	181.8	343.7	343.8	288.7	-	239.9	131.8	172.2	-	178.1	130.9	274.8	-
Dissolved Oxygen	mg/L	-	15.09	6.59	61.1	-	8.32	8.24	8.07	2.49	9.75	-	6.8	7.59	33.5	-	8.13	4.87	3.12	-

Notes:
Ontario Drinking Water Quality Standards* Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2003, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.
BOLD Exceeds ODWQS Standard
RDL Reportable Detection Limit

NA Not Applicable - Criteria contained on the parameter is based on operational guidelines (OG) as defined as Operational Guidelines for filtration processes are performance criteria in the Procedure for Distribution of Drinking Water in Ontario.
Units All Units in mg/L Unless Otherwise Noted.

TABLE 5
Groundwater Quality Results - MW4
McCarry Waste Disposal Site
Township of McCarry, Ontario

Parameter	Units	RDL	Sample Designation																				ODWQS
			Sample Collection Date (dd/mm/yy)																				
			MW4																				
			23-May-18	23-May-19	3-Aug-19	4-Oct-19	9-Nov-19	23-Jul-19	23-Sep-19	23-Sep-19 (Dup)	11-Jun-20	29-Aug-20	9/23/2020 (Dup)	20-Oct-20	3-Jun-21	9-Aug-21	21-Oct-21	25-May-22	25-May-22 (dup)	3-Aug-22	30-Aug-22 (dup)	27-Sep-22	27-Sep-22 (DUP)	
Benzene	µg/L	0.2	<0.80	<0.80	-	-	<0.50	-	-	-	<0.50	-	-	-	< 0.5	-	-	< 0.5	< 0.5	< 0.5	< 0.5	-	-	1
Methylene Chloride	µg/L	0.5	<1.20	<1.20	-	-	<2.0	-	-	-	<0.50	-	-	-	< 0.5	-	-	< 0.5	< 0.5	< 0.5	< 0.5	-	-	50
Toluene	µg/L	0.2	<0.80	<0.80	-	-	<0.50	-	-	-	<0.50	-	-	-	< 0.5	-	-	< 0.5	< 0.5	< 0.5	< 0.5	-	-	60
Vinyl Chloride	µg/L	0.17	<0.68	<0.68	-	-	<0.50	-	-	-	<0.50	-	-	-	< 0.2	-	-	< 0.2	< 0.2	< 0.2	< 0.2	-	-	1
1,4-Dichlorobenzene	µg/L	0.5	<0.68	<0.68	-	-	<0.50	-	-	-	<0.50	-	-	-	< 0.5	-	-	< 0.5	< 0.5	< 0.5	< 0.5	-	-	5
pH	pH Units	NA	7.84	7.7	7.44	7.47	6.53	8.71	8.71	8.81	8.74	8.75	8.74	8.7	7.84	7.31	7.84	7.84	7.37	7.32	7.39	7.47	7.44	(6.5-8.5)
BOD	mg/L	5	<5	<5	<5	<5	5.1	<3.0	5	<3.0	<7.5	<3.0	3.9	3.1	< 4	5	< 4	< 4	6	< 4	< 4	< 4	< 4	-
Electrical Conductivity	uS/cm	2	1260	1290	1430	1320	1440	950	1150	1140	1290	1290	1290	1300	1340	1240	1300	1540	1610	1410	1400	1290	1270	-
Total Dissolved Solids	mg/L	20	840	860	950	880	971	705	764	734	738	870	865	911	892	848	874	1050	1100	1040	984	886	846	500
Total Suspended Solids	mg/L	10	220	224	181	174	112	87.7	130	130	111	122	116	105	146	131	146	128	122	130	78	77	104	-
Alkalinity (as CaCO3)	mg/L	5	769	775	868	868	868	438	867	861	873	861	874	811	884	848	839	868	911	899	883	842	848	(30-500)
Total Hardness (as CaCO3)	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(80-100)
Fluoride	mg/L	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5
Chloride	mg/L	0.1	6.77	8.28	4.82	5.05	4	2.66	2.81	2.81	3.1	2.6	2.8	<2.5	2	2	-	4	3	3	4	2	2	250
Nitrate as N	mg/L	0.06	<0.25	<0.25	<0.25	<0.25	<0.10	<0.020	0.046	0.021	<0.10	<0.10	<0.10	<0.10	0.83	<0.06	-	< 0.06	< 0.06	< 0.06	< 0.06	0.57	< 0.06	10
Nitrite as N	mg/L	0.06	<0.25	<0.25	-	-	<0.060	<0.010	-	-	<0.060	-	-	-	< 0.03	<0.03	-	< 0.03	< 0.03	-	-	-	-	1
Nitrite as N	mg/L	0.06			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromide	mg/L	0.05																-	-	-	-	-	-	-
Sulphate	mg/L	0.1	97.7	98.4	173	126	305	194	194	197	348	189	183	143	116	219	-	400	409	310	310	160	156	500
Ortho phosphate as P	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.87	0.06	-	-	-	-	-
Ammonia as N	mg/L	0.02	3.43	3.44	2.83	4.36	3.81	1.84	2.39	2.76	1.83	2.84	4.18	3.34	2.91	3.09	-	3.67	3.83	2.49	2.43	2.05	1.94	-
Ammonia as N	mg/L	0.02									2.46				3.57		-	4	4.18	-	-	-	-	-
Total Kjeldahl Nitrogen	mg/L	0.1	4.4	3.88	-	-	4.7	3.26																
Chemical Oxygen Demand	mg/L	5	36	43	42	36	79	70	70	66	48	53	50	48	35	41	39	46	38	33	29	34	34	-
Dissolved Organic Carbon	mg/L	0.5	10.1	10.3	9.9	8.7	10.8	10.3	13.5	13.9	1.37	8.6	12.1	13.2	10	9	9	10	10	9	8	9	9	5
Phenols	mg/L	0.001	0.002	0.002	-	-	0.0012	0.0051			0.0015				0.0003			0.004	0.005	-	-	-	-	-
Calcium	mg/L	0.05	203	206	219	229	237	186	199	200	224	207	226	230	201	258	208	334	311	237	239	219	211	-
Magnesium	mg/L	0.05	29.4	29.3	36.2	31.8	46	19.4	26.8	27.3	32.8	29.2	31.4	31.2	29.5	28.9	27.1	37.8	33.4	36.1	36.8	30.9	31.4	-
Sodium	mg/L	0.05	16.2	14.2	33	16.7	34.4	9.81	15.6	16.7	17.8	14.3	18.3	14.1	13.2	11.6	10.8	16.7	14.8	28.6	26.8	19.4	19.3	20 (200)
Potassium	mg/L	0.05	19.2	19.8	-	-	16.1	7.67	-	-	11.8	-	-	-	17.8	-	-	19	17.4	-	-	-	-	-
Tannins and Lignins	mg phenols/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
Aluminum	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.008
Antimony	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01
Arsenic	mg/L	0.003	1.54	1.56	-	-	-	0.108	-	-	0.455	-	-	-	0.15	-	-	0.279	0.275	-	-	-	-	-
Barium	mg/L	0.002	0.126	0.124	0.136	0.196	-	0.0755	0.0627	0.0629	0.0803	0.104	0.117	0.115	0.138	0.139	0.157	0.119	0.115	0.0728	0.0709	0.0874	0.0951	1
Beryllium	mg/L	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron	mg/L	0.01	4.01	3.84	4.84	3.72	-	2.3	2.81	2.78	3.41	3.13	3.37	2.98	3.27	2.75	2.75	3.88	3.38	3.03	3.10	3.08	3.06	5
Cadmium	mg/L	0.002	<0.002	<0.002	-	-	-	0.000099	-	-	<0.000008	-	-	-	-	-	-	< 0.000003	0.000005	-	-	-	-	0.005
Chromium	mg/L	0.003	0.006	0.007	-	-	-	<0.0050	-	-	<0.0050	-	-	-	0.00074	-	-	0.00112	0.00166	-	-	-	-	0.05
Cobalt	mg/L	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	0.001	<0.003	<0.003	-	-	-	0.0038	-	-	-	-	-	-	0.0003	-	-	0.0007	< 0.0002	-	-	-	-	1
Iron	mg/L	0.01	62.0	78.5	62.8	84.1	-	46.3	63.8	63.9	69.8	-	-	74.8	57.3	68.8	67.1	91.3	84.8	64.4	39.8	38.8	37.3	0.3
Lead	mg/L	0.002	<0.001	<0.001	-	-	-	0.00038	-	-	0.00151	-	-	-	< 0.00009	-	-	0.00013	0.00012	-	-	-	-	0.01
Manganese	mg/L	0.002	2.89	3.05	-	-	2.69	2.06	-	-	3.16	-	-	-	4	3.66	3.81	6.1	5.76	-	-	3.01	2.96	0.05
Mercury	mg/L	0.0001	<0.0002	<0.0002	-	-	<0.000010	-	-	-	<0.0000050	-	-	-	< 0.00001	-	-	< 0.00001	< 0.00001	-	-	-	-	0.001
Molybdenum	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01
Selenium	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium	mg/L	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Zinc	mg/L	0.005	<0.005	<0.005	-	-	-	0.027	-	-	0.025	-	-	-	0.006	-	-	0.062	0.006	-	-	-	-	5
Field Measurements																								
Temperature	C	-	7.24	7.24	10.18	8.44	8.8	10.8	8.4	-	6.8	10.2	-	7.43	6.81	11.1	10.3	-	14.5	-	8.2	-	-	-
pH	pH Units	-	8.44	8.44	8.41	8.37	8.58	7.33	8.88	-	8.41	8.3	-	8.42	8.81	8.36	8.47	-	8.86	-	8.12	-	-	-
Conductivity	uS/cm	-	1045	1045	1128	903.5	886	825	864	-	1416	1052	-	837	1211	1388	1.56	-	1238	-	801	-	-	-
Oxidation Reduction Potential	mV	-	-77.8	-77.8	-72.8	-134	230	-33.7	-54.1	-	212.5	64.8	-	8	-15.7	-60.8	64.4	-16.5	-66.7	-	-8.3	-	-	-
Dissolved Oxygen	mg/L	-	3.84	3.84	2.68	80.7	14.01	2.17	1.8	-	1.7	1.8	-	7.12	2.01	0.97	11.1	2.41	-	1.32	-	2.38	-	-

Notes:
Ontario Drinking Water Quality Standards" Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2003, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2006.
Exceeds ODWQS Standard
RDL Reportable Detection Limit
NA Not Applicable - Criteria contained on the parameter is based on operational guidelines (OG) as outlined in Operational Guidelines for filtration processes are performance criteria in the Procedure for Disinfection of Drinking Water in Ontario.
Units All Units in mg/L Unless Otherwise Noted.

TABLE 6
Groundwater Quality Results - MW5
McGarry Waste Disposal Site
Township of McGarry, Ontario

Parameter	Units	RDL	Sample Designation																ODWQS
			Sample Collection Date (dd/mm/yy)																
			MW5																
			23-May-19	3-Aug-19	4-Oct-19	9-May-19	25-Jul-19	25-Jul-19 (Dup)	23-Sep-19	11-Jun-20	25-Aug-20	28-Oct-20	June-03-2021	5-Aug-21	5-Aug-21 (DUP)	21-Oct-21	25-May-22	3-Aug-22	27-Sep-22	
Benzene	µg/L	0.2	<0.20	-	-	<0.50	-	-	-	<0.50	-	-	< 0.5	-	-	-	< 0.5	<0.5	-	1
Methylene Chloride	µg/L	0.3	<0.30	-	-	<2.0	-	-	-		-	-	< 0.5	-	-	-	< 0.5	-	-	50
Toluene	µg/L	0.2	<0.20	-	-	<0.50	-	-	-	<0.50	-	-	< 0.5	-	-	-	< 0.5	<0.5	-	80
Vinyl Chloride	µg/L	0.17	<0.17	-	-	<0.50	-	-	-	<0.50	-	-	< 0.2	-	-	-	< 0.2	<0.2	-	1
1,4-Dichlorobenzene	µg/L	0.1	<0.10	-	-	<0.50	-	-	-	<0.50	-	-	< 0.5	-	-	-	< 0.5	<0.5	-	5
pH	pH Units	NA	6.62	6.36	6.39	6.86	6.81	6.76	6.86	6.86	7.01	6.99	6.89	7.12	6.98	7.33	7.33	7.1	7.08	(6.5-8.5)
BOD	mg/L	5	<5	<5	<5	<3.0	<2.0	<2.0	<3.0	<2.0	<3.0	<3.0	< 4	<4	< 4	< 4	< 4	<4	< 4	-
Electrical Conductivity	uS/cm	2	41	45	46	49.8	39.9	40.8	42.4	39	39.8	42.4	36	35	34	42	41	39	39	-
Total Suspended Solids	mg/L	10	32	20	36	40	39	38	42	27	29	27	< 30	78	71	56	< 30	<30	34	-
Total Dissolved Solids	mg/L	20	141	96	59	77.2	21.6	12.5	44.8	64.3	73.2	76.9	60	48	48	37	61	34	59	500
Alkalinity (as CaCO3)	mg/L	5	29	19	16	18	12	12	11	13.1	<10	11	12	11	11	17	14	16	19	(30-500)
Total Hardness (as CaCO3)	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(80-100)
Fluoride	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5
Chloride	mg/L	0.1	0.33	0.3	0.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	< 1	<1	< 1	< 1	< 1	<1	< 1	250
Nitrate as N	mg/L	0.05	<0.05	0.25	<0.05	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.18	<0.06	< 0.03	< 0.03	< 0.06	<0.06	< 0.06	10
Nitrite as N	mg/L	0.05	<0.05	-	-	<0.010	<0.010	<0.010	-	<0.010	-	-	< 0.03	<0.03	< 0.06	< 0.06	< 0.03	-	-	1
Bromide	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphate	mg/L	0.1	5.54	5.97	5.02	6.11	7.4	7.51	7.01	4.55	7.18	6.73	5	5	4	4	5	6	7	500
Ortho phosphate as P	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 0.03	-	-	-
Ammonia as N	mg/L	0.02	<0.02	<0.02	0.08	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	< 0.04	<0.04	-	< 0.04	< 0.04	<0.04	< 0.04	-
Total Kjeldahl Nitrogen	mg/L	0.1	<0.10	-	-	<0.15	<0.15	<0.15	-	<0.15	-	-	< 0.05	-	-	-	< 0.05	-	-	-
Chemical Oxygen Demand	mg/L	5	<5	<5	<5	<10	<10	<10	17	<10	<10	11	< 8	<8	< 8	< 8	< 8	<8	< 8	-
Dissolved Organic Carbon	mg/L	0.5	0.7	1.5	1.5	3.76	2.52	1.85	3.12	1.7	1.51	2.22	1	1	1	2	< 1	1	1	5
Phenols	mg/L	0.001	<0.001	-	-	<0.0010	0.0015	0.0013	-	<0.0010	-	-	< 0.002	-	-	-	< 0.002	-	-	-
Calcium	mg/L	0.05	4.18	5.19	5.83	6.83	5.4	5.26	4.92	5.06	4.42	4.81	5.18	4.53	4.81	4.67	6.34	4.71	4.44	-
Magnesium	mg/L	0.05	0.89	0.97	1.06	1.06	0.82	0.843	0.8	0.818	0.797	0.909	0.804	0.706	0.724	0.786	0.969	0.67	0.783	-
Sodium	mg/L	0.05	0.99	1.06	1.1	1.21	0.92	0.93	1.06	1.02	0.99	1.24	1.12	0.99	0.97	1.110	1.29	1.11	0.980	20 (200)
Potassium	mg/L	0.05	0.21	-	-	0.281	0.198	0.204	-	0.233	-	-	0.299	-	-	-	0.384	-	-	-
Tannins and Lignins	mg phenol/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
Antimony	mg/L	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.006
Arsenic	mg/L	0.003	<0.003	-	-	-	<0.00010	<0.00010	-	<0.00010	-	-	< 0.0002	-	-	-	< 0.0002	-	-	0.01
Barium	mg/L	0.002	<0.002	<0.002	0.003	-	0.00039	0.00068	0.00064	0.00043	0.00078	0.00054	0.00087	0.00078	0.00062	0.00122	0.00559	0.00874	0.00438	1
Beryllium	mg/L	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron	mg/L	0.01	0.036	0.071	0.048	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	0.005	0.004	0.027	0.004	0.004	0.006	5
Cadmium	mg/L	0.002	<0.002	-	-	-	<0.000010	<0.000010	-	<0.000050	-	-	-	-	-	-	< 0.000003	-	-	0.005
Chromium	mg/L	0.003	0.003	-	-	-	0.00314	0.00288	-	0.00335	-	-	0.00418	-	-	-	0.00428	-	-	0.05
Cobalt	mg/L	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	0.003	<0.003	-	-	-	0.00039	0.00125	-	-	-	-	0.001	-	-	-	0.0007	-	-	1
Iron	mg/L	0.01	<0.010	<0.010	<0.010	-	0.012	0.01	0.015	<0.010	-	<0.010	0.08	0.12	0.142	0.236	0.09	-	0.101	0.3
Lead	mg/L	0.002	<0.001	-	-	-	<0.000050	0.000088	-	<0.000050	-	-	< 0.00009	-	-	-	< 0.00008	-	-	0.01
Manganese	mg/L	0.002	<0.002	-	-	0.00052	<0.00050	<0.00050	-	<0.00050	-	-	0.00544	0.00827	0.0087	0.0116	0.0035	-	0.0034	0.05
Mercury	mg/L	0.0001	<0.0002	-	-	<0.000010	-	-	-	<0.0000050	-	-	< 0.00001	-	-	-	< 0.00001	-	-	0.001
Molybdenum	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01
Silver	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium	mg/L	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	0.005	-	-	-	< 0.002	-	-	5
Zinc	mg/L	0.005	<0.005	-	-	-	<0.0010	0.0029	-	<0.0010	-	-	-	-	-	-	-	-	-	-
Field Measurements																				
Temperature	C	-	8.56	8.18	6.24	4	11.8	-	8	8.2	9.2	4.15	11.2	10.2	-	9.9	9.7	8.5	7.5	-
pH	pH Units	-	8.04	8.85	5.58	6.98	7.47	-	7.84	5.58	5.7	7.42	5.58	7.37	-	7.36	7.56	5.03	5.4	-
Conductivity	uS/cm	-	21	34	30	44.9	35.9	-	30	39.3	28	24	27.5	30.6	-	30	0.061	34.3	27.6	-
Oxidation Reduction Potential	mV	-	81.1	24	-77.7	82.4	136.3	-	197.9	372.1	331	-17.4	314.1	-67.4	-	-42.7	-53.3	185.1	243.4	-
Dissolved Oxygen	mg/L	-	11.46	16.95	98.7	9.73	11.88	-	10.77	7.87	10.65	19.25	7.86	10.43	-	8.89	8.05	11.81	5.56	-

Notes:
Ontario Drinking Water Quality Standards* Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.
BOLD Exceeds ODWQS Standard
RDL Reportable Detection Limit
NA Not Applicable - Criteria evaluated on the parameter is based on operational guidelines (OG) as defined as Operational Guidelines for filtration processes are performance criteria in the Procedure for Disinfection of Drinking Water in Ontario.
Units All Units in mg/L Unless Otherwise Noted.

TABLE 7
Groundwater Quality Results - MW6
McGarry Waste Disposal Site
Township of McGarry, Ontario

Parameter	Units	RDL	Sample Designation / Sample Collection Date (dd/mm/yyyy): MW6																				ODWQS
			27-May-15	29-Jul-15	30-Sep-15	18-May-16	25-Oct-16	30-May-17	7-Nov-17	23-May-18	3-Aug-18	4-Oct-18	9-May-19	25-Jul-19	23-Aug-19	11-Jun-20	25-Aug-20	30-Oct-20	3-Jun-21	25-May-22	3-Aug-22	27-Sep-22	
			DRY	DRY	DRY	Could not locate due to flooding.	Could not locate due to flooding.	Could not locate due to flooding.	Could not locate due to flooding.	Could not locate due to flooding.	Could not locate due to flooding.	Could not locate due to flooding.	Could not locate due to flooding.	Could not locate due to flooding.	Could not locate due to flooding.	Could not locate due to flooding.	Could not locate due to flooding.	Could not locate due to flooding.	Could not locate due to flooding.	Could not locate due to flooding.	Could not locate due to flooding.	Could not locate due to flooding.	
Benzene	µg/L	0.20																					1
Methylene Chloride	µg/L	0.30																					50
Toluene	µg/L	0.20																					60
Vinyl Chloride	µg/L	0.17																					1
1,4-Dichlorobenzene	µg/L	0.10																					5
pH	pH Units	NA																					(6.5-8.5)
BOD	mg/L	1																					-
Electrical Conductivity	uS/cm	2																					-
Total Suspended Solids	mg/L	10																					-
Total Dissolved Solids	mg/L	20																					500
Alkalinity (as CaCO3)	mg/L	5																					(30-500)
Total Hardness (as CaCO3)	mg/L	0.5																					(80-100)
Fluoride	mg/L	0.05																					1.5
Chloride	mg/L	0.1																					250
Nitrate as N	mg/L	0.05																					10
Nitrite as N	mg/L	0.05																					1
Bromide	mg/L	0.05																					
Sulphate	mg/L	0.1																					500
Ortho phosphate as P	mg/L	0.1																					
Ammonia as N	mg/L	0.02																					
Total Kjeldahl Nitrogen	mg/L	0.1																					
Chemical Oxygen Demand	mg/L	5																					
Dissolved Organic Carbon	mg/L	0.5																					5
Phenols	mg/L	0.001																					
Calcium	mg/L	0.05																					
Magnesium	mg/L	0.05																					
Sodium	mg/L	0.05																					20 (200)
Potassium	mg/L	0.05																					
Tannins and Lignins	mg phenol/L	0.1																					
Aluminum	mg/L	0.004																					0.1
Antimony	mg/L	0.005																					0.006
Arsenic	mg/L	0.003																					0.01
Barium	mg/L	0.002																					1
Beryllium	mg/L	0.001																					
Boron	mg/L	0.01																					5
Cadmium	mg/L	0.002																					0.005
Chromium	mg/L	0.003																					0.05
Cobalt	mg/L	0.001																					
Copper	mg/L	0.002																					1
Iron	mg/L	0.01																					0.3
Lead	mg/L	0.002																					0.01
Manganese	mg/L	0.002																					0.05
Mercury	mg/L	0.0001																					0.001
Molybdenum	mg/L	0.002																					
Nickel	mg/L	0.002																					
Selenium	mg/L	0.004																					[illegible]
Silver	mg/L	0.002																					
Strontium	mg/L	0.005																					
Thallium	mg/L	0.005																					
Titanium	mg/L	0.002																					
Vanadium	mg/L	0.002																					
Zinc	mg/L	0.005																					5
Field Measurements																							
Temperature	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	pH Units	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conductivity	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oxidation Reduction Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
Ontario Drinking Water Quality Standard: Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act, dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2006.
BOLD: Exceeds ODWQS Standard
RDL: Reportable Detection Limit
NA: Not Applicable - Criteria indicated on the parameter is based on operational guidelines (OG) as defined on Operational Guidelines for filtration processes are performance criteria in the Procedure for Disinfection of Drinking Water in Ontario.
Units: All Units in mg/L Unless Otherwise Noted.

TABLE 8
Groundwater Quality Results - MW7
McGarry Waste Disposal Site
Township of McGarry, Ontario

Parameter	Units	RDL	Sample Designation																			ODWQS
			Sample Collection Date (dd/mm/yy)																			
			MW7																			
			23-May-18	3-Aug-18	4-Oct-18	8-May-19	5/8/2019 (Dup)	25-Jul-19	23-Sep-19	11-Jun-20	23-Sep-20	28-Oct-20	3-Jun-21	3-Aug-21	21-Oct-21	23-May-22	3-Aug-22	27-Sep-22	
Benzene	µg/L	0.2	<0.20	-	-	<0.50	<0.50	Submerged, no sample.	-	<0.50	-	-	< 0.5	-	-	< 0.5	< 0.5	-	1
Methylene Chloride	µg/L	0.3	<0.30	-	-	<2.0	<2.0		-	-	-	-	< 0.5	-	-	< 0.5	-	-	50
Toluene	µg/L	0.2	<0.20	-	-	<0.50	<0.50		-	-	-	-	< 0.5	-	-	< 0.5	< 0.5	-	60
Vinyl Chloride	µg/L	0.17	<0.17	-	-	<0.50	<0.50		-	-	-	-	< 0.5	-	-	< 0.5	< 0.5	-	1
1,4-Dichlorobenzene	µg/L	0.1	<0.10	-	-	<0.50	<0.50		-	<0.50	-	-	< 0.2	-	-	< 0.2	< 0.2	-	5
pH	pH Units	NA	8.83	8.93	6.78	6.72	6.68		-	<0.50	-	-	< 0.5	-	-	< 0.5	< 0.5	7.15	(6.5-8.5)
BOD	mg/L	5	<5	<5	<5	<2.0	2.2		-	<0.50	-	-	< 0.5	7.3	7.00	7.56	7.20	-	-
Electrical Conductivity	uS/cm	2	81	45	62	52	53.5		-	<0.50	-	-	< 0.2	-	< 4	< 4	< 4	< 4	-
Total Suspended Solids	mg/L	10	50	30	48	40	38		-	<0.50	-	-	< 0.5	7.18	92	53	49	46	-
Total Dissolved Solids	mg/L	20	27	30	27	22.1	22.1		7.07	6.75	8.64	8.79	<3.0	< 4	4	< 30	31	43	500
Alkalinity (as CaCO3)	mg/L	5	43	30	28	28	28		<3.0	<2.0	<3.0	<3.0	103	70	77	12	8	9	(30-500)
Total Hardness (as CaCO3)	mg/L	0.5	-	-	-	-	-		59.7	58.4	62.7	103	58	< 30	17	28	22	25	(80-100)
Fluoride	mg/L	0.06	1.11	0.24	0.32	<0.50	0.53		56	21	35	58	5.9	9	74	-	-	-	1.5
Chloride	mg/L	0.1	<0.05	<0.05	<0.05	<0.020	0.031		2.9	<3.0	9.6	5.9	61	34	39	-	-	-	250
Nitrate as N	mg/L	0.05	<0.05	-	-	<0.010	<0.010		31	27.7	31	61	-	-	-	-	-	< 1	10
Nitrite as N	mg/L	0.05	-	-	-	-	-		-	-	-	-	-	-	-	< 1	< 1	< 0.06	1
Bromide	mg/L	0.1	3.75	0.7	0.7	0.93	2.42		-	-	-	-	< 1	< 1	< 1	< 0.06	< 0.06	-	
Sulphate	mg/L	0.1	-	-	-	-	-		<0.50	<0.50	<0.50	<0.50	< 1	<0.06	< 0.03	< 0.03	-	-	500
Ortho phosphate as P	mg/L	0.02	<0.02	<0.02	0.06	<0.010	0.021		0.021	<0.020	<0.020	<0.020	< 0.06	<0.03	< 0.06	< 0.03	-	-	
Ammonia as N	mg/L	0.1	<0.10	-	-	<0.15	0.3		-	<0.010	-	-	-	-	-	-	-	-	
Total Kjeldahl Nitrogen	mg/L	0.1	<5	<5	<5	15	12		0.47	2.74	0.79	<0.30	< 2	<2	< 2	3	< 2	< 2	
Chemical Oxygen Demand	mg/L	5	0.9	1.8	1.7	5.88	2.38		-	-	-	-	-	-	-	< 0.03	-	-	
Dissolved Organic Carbon	mg/L	0.6	<0.001	-	-	<0.0010	<0.0010		<0.010	<0.010	<0.010	<0.010	< 0.04	<0.04	< 0.04	< 0.04	< 0.04	< 0.04	
Phenols	mg/L	0.001	9.78	6.43	9.17	7.82	7.73		-	-	-	-	-	-	-	< 0.06	-	-	
Calcium	mg/L	0.05	1.83	0.87	1.36	1.22	1.16		1.31	0.17	<10	<10	0.06	< 8	< 8	< 8	< 8	< 8	
Magnesium	mg/L	0.05	1.29	0.72	0.89	1.07	1.01		-	<10	-	-	< 8	1	2	1	1	2	5
Sodium	mg/L	0.05	<0.05	-	-	<0.050	<0.050		14	1.82	1.73	2.45	1	-	-	< 0.002	-	-	
Potassium	mg phenol/L	0.1	-	-	-	-	-		-	<0.0010	-	-	< 0.002	12.6	12.5	8.64	7.83	7.4	
Tannins and Lignins	mg/L	3.004	-	-	-	-	-		9.06	8.83	9.08	15.8	1.89	1.8	12.7	1.13	0.770	0.85	
Aluminum	mg/L	0.003	-	-	-	-	-		-	-	-	-	-	-	2.22	0.76	0.76	0.48	20 (200)
Antimony	mg/L	0.003	<0.003	-	-	-	-		1.05	1.17	1.11	2.37	0.91	0.67	0.96	0.041	-	-	
Arsenic	mg/L	0.002	0.003	<0.002	0.005	-	-		0.54	0.901	0.67	0.9	0.049	-	-	-	-	-	
Barium	mg/L	0.001	-	-	-	-	-		-	<0.050	-	-	-	-	-	-	-	-	0.1
Beryllium	mg/L	0.01	0.021	0.018	0.016	-	-		-	-	-	-	-	-	-	-	-	-	0.006
Boron	mg/L	0.002	<0.002	-	-	-	-		-	-	-	-	-	-	-	-	-	-	0.01
Cadmium	mg/L	0.003	<0.003	-	-	-	-		-	-	-	-	-	-	-	< 0.0002	-	-	1
Chromium	mg/L	0.001	-	-	-	-	-		-	-	-	-	0.0006	-	-	0.0099	0.00633	0.00636	-
Cobalt	mg/L	0.003	<0.003	<0.010	<0.010	-	-		-	<0.00010	-	-	0.00299	0.00381	0.00240	-	-	-	5
Copper	mg/L	0.01	<0.010	-	-	-	-		0.002	0.00128	0.00225	0.00277	-	-	-	0.008	0.047	0.004	0.005
Iron	mg/L	0.002	<0.001	-	-	0.0133	0.0112		-	-	-	-	0.01	0.004	0.023	0.000014	-	-	0.05
Lead	mg/L	0.002	<0.002	-	-	<0.000010	<0.000010		<0.010	<0.010	<0.010	<0.010	-	-	-	0.00028	-	-	1
Manganese	mg/L	0.0001	<0.0002	-	-	-	-		-	<0.0000050	-	-	0.00063	-	-	-	-	-	
Mercury	mg/L	0.002	-	-	-	-	-		-	0.00073	-	-	-	-	-	0.0007	-	-	0.3
Molybdenum	mg/L	0.003	-	-	-	-	-		-	-	-	-	0.0018	0.067	0.015	0.008	0.075	0.049	0.01
Nickel	mg/L	0.004	-	-	-	-	-		-	-	-	-	0.513	-	-	< 0.00009	-	-	0.01
Selenium	mg/L	0.002	-	-	-	-	-		0.07	<0.010	-	0.014	< 0.00008	0.879	0.998	0.0005	-	0.278	0.06
Silver	mg/L	0.006	-	-	-	-	-		-	<0.000050	-	-	0.138	-	-	< 0.00001	-	-	0.001
Strontium	mg/L	0.006	-	-	-	-	-		-	0.00169	-	-	< 0.00001	-	-	-	-	-	0.01
Thallium	mg/L	0.002	-	-	-	-	-		-	<0.0000050	-	-	-	-	-	-	-	-	
Titanium	mg/L	0.002	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	
Vanadium	mg/L	0.005	<0.005	-	-	-	-		-	-	-	-	-	-	-	-	-	-	
Zinc			-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	
Field Measurements			-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	
Temperature	C	-	10.21	13.3	9.96	3.1	-	-	-	-	-	-	-	-	-	-	-	-	
pH	pH Units	-	5.81	5.57	6.85	6.52	-	-	-	11	7.3	11.8	8.1	11	14.8	10.8	12.5	12.2	10.8	-
Conductivity	uS/cm	-	1	33	64	30.8	-	-	-	6.18	6.96	5.89	-	8.34	5.73	6.47	5.9	-53.7	6.1	-
Oxidation Reduction Potential	mV	-	102.7	17.09	-150.5	282.2	-	-	-	47.2	88.7	50.9	64	63.7	86.2	61	0.065	47.4	38.1	-
Dissolved Oxygen	mg/L	-	4.43	4.93	51	8.89	-	-	-	38.4	308	36.6	1870	194.5	118.1	86.2	76.1	-53.7	44.2	-
									-	2.96	4.86	2.89	8.77	7.22	8.56	18.4	3.13	4.9	4.89	-

Notes:
Ontario Drinking Water Quality Standards: Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.
BOLD: Exceeds ODWQS Standard
RDL: Reportable Detection Limit
NA: Not Applicable - Criteria entered as the parameter is based on operational guidelines (OG) as defined as Operational Guidelines for filtration processes are performance criteria in the Procedure for Disinfection of Drinking Water in Ontario.
Units: All Units in mg/L Unless Otherwise Noted.

TABLE 9
Groundwater Quality Results - MW8
McGarry Waste Disposal Site
Township of McGarry, Ontario

Parameter	Sample Designation																ODWQS
	Sample Collection Date (dd/mm/yy)																
	MW8																
	23-May-18	3-Aug-18	3-Aug-18 (dup)	4-Oct-18	4-Oct-18 (dup)	8-May-19	25-Jul-19	23-Sep-19	11-Jun-20	25-Aug-20	28-Oct-20	3-Jun-21	5-Aug-21	31-Oct-21	25-May-22	3-Aug-22	27-Sep-22	
Benzene	<0.20	-	-	-	-	<0.50	-	-				< 0.5			< 0.5	< 0.5	-	1
Methylene Chloride	<0.30	-	-	-	-	<2.0	-	-				< 0.5			< 0.5	-	-	50
Toluene	<0.20	-	-	-	-	<0.50	-	-				< 0.5			< 0.5	< 0.5	-	60
Vinyl Chloride	<0.17	-	-	-	-	<0.50	-	-				< 0.2			< 0.2	< 0.2	-	1
1,4-Dichlorobenzene	<0.10	-	-	-	-	<0.50	-	-				< 0.5			< 0.5	< 0.5	-	5
pH	8.82	8.67	8.46	8.46	8.17	8.48	8.3	8.27		8.34	8.84	8.78	8.81	8.37	8.31	8.82	8.34	(6.5-8.5)
BOD	<5	<5	<5	<5	<5	<2.0	<2.0	<3.0		<3.0	<3.0	< 4	<4	< 4	< 4	< 4	< 4	-
Electrical Conductivity	20	40	50	23	22	35.2	18.3	21.1		20.4	31.1	19	16	44	21	19	33	-
Total Suspended Solids	1100	4350	706	28	29	1480	26	36		20	25	< 30	91	55	49	< 30	< 30	-
Total Dissolved Solids	44	46	<20	200	188	39	126	107		153	145	135	<30	< 30	372	159	184	500
Alkalinity (as CaCO3)	<5	6	8	<5	<5	<10	<10	<10		<10	<10	< 2	<2	6	3	6	< 2	(30-500)
Total Hardness (as CaCO3)	-	-	-	-	-	-	-	-							-	-	-	(80-100)
Fluoride	-	-	-	-	-	-	-	-							-	-	-	1.5
Chloride	0.51	0.37	0.41	0.32	0.33	<0.50	<0.50	<0.50		<0.50	0.59	< 1	<1	< 1	< 1	< 1	< 1	250
Nitrate as N	0.18	0.38	0.31	0.91	0.81	0.832	0.383	0.759		0.672	0.547	0.86	0.76	< 0.03	0.57	0.42	1.95	10
Nitrite as N	<0.05	-	-	-	-	<0.010	<0.010					< 0.03	<0.03	0.06	< 0.03	-	-	1
Bromide	-	-	-	-	-	-	-	-							-	-	-	-
Sulphate	3.82	5.5	4.84	3.33	3.49	7.46	3.82	3.46		3.78	5.32	3	3	4	4	3	5	500
Ortho phosphate as P	-	-	-	-	-	-	-	-							< 0.03	-	-	-
Ammonia as N	0.10	0.80	3.99	0.08	0.08	0.02	<0.010	0.02		<0.010	<0.010	< 0.04	<0.04	< 0.04	< 0.04	< 0.04	< 0.04	-
Total Kjeldahl Nitrogen	0.33	-	-	-	-	0.28	0.33					< 0.05			0.1	-	-	-
Chemical Oxygen Demand	27	25	88	<5	<5	136	17	26		26	50	< 8	9	19	12	< 8	< 8	-
Dissolved Organic Carbon	8.9	8.7	14.2	2.8	2.5	4.16	3.15	3.18		3.32	8.23	3	3	3	4	3	4	5
Phenols	0.001	-	-	-	-	<0.0010	0.0014					< 0.002			< 0.002	-	-	-
Calcium	0.71	0.32	0.4	1.38	1.34	0.874	1.08	1.2		0.948	0.928	1.34	1.15	1.11	0.88	1.34	1.59	-
Magnesium	0.15	0.06	<0.05	0.41	0.42	0.31	0.31	0.38	No sample.	0.34	0.37	0.40	0.33	0.360	0.30	0.323	0.482	-
Sodium	2.21	8.15	10.20	1.53	1.27	3.43	0.98	1.23		2.30	4.81	1.08	1.17	1.44	2.30	1.02	1.92	20 (200)
Potassium	<0.05	-	-	-	-	0.07	<0.050	-				0.24			0.04	-	-	-
Tannins and Lignins	-	-	-	-	-	-	-	-							-	-	-	-
Aluminum	-	-	-	-	-	-	-	-							-	-	-	0.1
Antimony	-	-	-	-	-	-	-	-							-	-	-	0.006
Arsenic	<0.003	-	-	-	-	-	0.0002	-				< 0.0002			0.0002	-	-	0.01
Barium	0.01	<0.002	<0.002	0.01	0.01	-	0.01	0.01		0.01	0.01	0.01	0.01	0.00982	0.02	0.0149	0.02060	1
Beryllium	-	-	-	-	-	-	-	-				-	-	-	-	-	-	-
Boron	0.01	0.01	<0.010	<0.010	<0.010	-	<0.010	<0.010		<0.010	0.01	0.004	0.004	0.012	0.005	0.012	0.004	5
Cadmium	<0.002	-	-	-	-	-	0.00002	-							0.00001	-	-	0.005
Chromium	<0.003	-	-	-	-	-	0.00062	-				0.00039			0.00088	-	-	0.05
Cobalt	-	-	-	-	-	-	-	-							-	-	-	-
Copper	<0.003	-	-	-	-	-	0.00083	-				0.00180			0.00080	-	-	1
Iron	0.07	0.25	0.23	<0.010	<0.010	-	0.04	0.04		0.12	0.04	0.03	0.016	0.06	0.053	0.026	0.3
Lead	<0.001	-	-	-	-	-	0.0001	-				0.0001			< 0.00008	-	-	0.01
Manganese	0.013	-	-	-	-	0.0147	0.0157	-				0.0177	0.0168	0.0158	0.0126	-	0.0275	0.05
Mercury	<0.0002	-	-	-	-	<0.000010	-	-				< 0.00001			< 0.00001	-	-	0.001
Molybdenum	-	-	-	-	-	-	-	-							-	-	-	-
Nickel	-	-	-	-	-	-	-	-							-	-	-	0.01
Selenium	-	-	-	-	-	-	-	-							-	-	-	-
Silver	-	-	-	-	-	-	-	-							-	-	-	-
Strontium	-	-	-	-	-	-	-	-							-	-	-	-
Thallium	-	-	-	-	-	-	-	-							-	-	-	-
Titanium	-	-	-	-	-	-	-	-							-	-	-	-
Vanadium	-	-	-	-	-	-	0.0017	-				0.0090			< 0.002	-	-	5
Zinc	<0.005	-	-	-	-	-		-										
Field Measurements																		
Temperature	5.14	11.15	11.15	6.63	6.63	1	10.4	11.5	-	10.8	7.43	8.1	14.1	10.1	6.9	12.1	11.4	-
pH	6.23	5.1	5.1	4.54	4.54	5.41	6.5	4.73	-	4.9	5.86	4.82	4.88	5.71	5.86	5.36	6.04	-
Conductivity	67	25	26	17	17	16	15.6	16.6	-	21.3	21	13.4	8.4	17	0.043	25	31.8	-
Oxidation Reduction Potential	34.6	116.7	116.7	-66.2	-66.2	226.6	236.9	179.6	-	286.7	226.1	309.5	125.1	160.9	145.5	141.3	231.3	-
Dissolved Oxygen	11.09	14.82	14.82	93.1	93.1	15.02	9.38	7.02	-	8.45	16.11	10.65	7.41	33.3	8.54	8.59	5.45	-

Notes:
Ontario Drinking Water Quality Standards: Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2003, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.
ODWQS: Exceeds ODWQS Standard
RDL: Reportable Detection Limit
NA: Not Applicable - Criteria outlined on the parameter is based on operational guidelines (OG) as defined as Operational Guidelines for filtration processes are performance criteria in the Procedure for Disinfection of Drinking Water in Ontario.
Units: All Units in mg/L Unless Otherwise Noted.