# 2023 Annual Monitoring Report

## Kincardine Waste Management Centre

Municipality of Kincardine

April 30 2024

→ The Power of Commitment

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# 1. Introduction

GHD Ltd. has prepared this 2023 Annual Monitoring Report (Report) on behalf of the Municipality of Kincardine (Municipality) for the Kincardine Waste Management Centre (KWMC or Site) located on Lot 15, Concession V, 437 Sideroad 15 North in the Municipality of Kincardine, Bruce County, Ontario. The Site has historically been referred to as the "Ward 2 Waste Disposal Site". The Site location is shown on Figure 1.1.

This Report covers the monitoring and operations details between January 1 and December 31, 2023 (reporting period).

## 1.1 Site Background

The property was used as a rural dump prior to 1987. The historical operations are detailed in the D&O Report (CRA, 2012) with limited discussion provided in this report.

The Site is currently operating as an approved waste disposal site under Environmental Compliance Approval (ECA) No. A272702. The current ECA, issued on June 1, 2011, revoked all previous certificates and amendments. The ECA approves the updated D&O Report (CRA, 2012). The ECA and previous amendments and notices are provided in Appendix A.

On behalf of the Municipality, GHD applied to the Ministry of Environment, Conservation, and Parks (MECP)[1] in December 2009 to amend the ECA to the updated D&O Report (CRA, 2009, revised 2012). The purpose of the updated design was to optimize the useable design volume and to update the design components to current standards. Since the ECA amendment (issued by the MECP on June 1, 2011), it has governed the Site operations and monitoring/reporting requirements. Construction on the Phase 2 landfill expansion area (Phase 2 area) began shortly after the amended ECA was issued. As per the ECA, a revised D&O Report (CRA, 2012) was prepared that incorporated review comments and responses, as well as the initial "as recorded" drawings for the initial landfill construction phases of the Phase 2 area.

## 1.2 Site Description

The Site is located northeast of the Town of Kincardine, southwest of the hamlet of Armow, on Sideroad 15 North. The land surrounding the Site are either agricultural or vacant land. The total waste disposal area is approximately 5.5 hectares (ha) (13.5 acres) within a total Site area of 40.5 ha (100.1 acres). The Municipality owns buffer lands around the Site, extending beyond the licensed landfill area approximately 355 metres (m) to the north, 655 m to the west, and 455 m to the south. The Site and Municipally-owned buffer lands cover approximately 89.4 ha (220.9 acres).

The Site is located within the Penetangore River watershed. The North Penetangore River flows through the northeast corner of the Site and through the Municipally-owned buffer lands to the north and west. The existing Site conditions showing topographical contours are illustrated on Figure 1.2. A topographic high point exists between the Phase 1 and Phase 2 areas of the landfill. The Phase 2 area (western half of the landfill footprint) slopes to the south or southwesterly direction from the high point at an approximate elevation of 268 metres above mean sea level (m AMSL) near the Site entrance to approximately 255 m AMSL near the southwest corner of the Site. The Phase 1 area (eastern half of the landfill footprint) is relatively smooth and gently sloping, with an approximate elevation drop of 3 m toward the east from the topographic high in the centre of the Site to the top of the bank of the North Penetangore River. The banks of the North Penetangore River to the north and west are steep and drop approximately 15 m from the extent of the landfill area to the edge of the river.

A surface water/shallow groundwater divide exists on Site, which divides surface water runoff and shallow groundwater flow between the Phase 1 and 2 areas. The Phase 1 area drains in north, northwesterly, and westerly

[1] The MECP was referred to as the Ministry of the Environment and Climate Change (MOECC) in 2009 at the time of the application.

directions into the North Penetangore River. The Phase 2 area of the Site primarily drains towards the southwest into a natural drainage corridor, which is located within a wetland area that in turn flows into the North Penetangore River.

## 1.3 Geologic and Hydrogeologic Setting

The Site is located within the Huron Slope physiographic region. The Huron Slope consists of a beveled clay till plain with the twin beaches of glacial Lake Warren and Wyoming Moraine (Chapman and Putnam, 1984).

From the past investigative work completed on Site, two major stratigraphic overburden units have been identified: a shallow silty sand overlying a massive clay and silt till. It has been demonstrated that the Site is underlain continuously by the massive clay and silt till. Typically, the shallow silty sand unit consists of more granular deposits, such as fine to medium grained silty sands. Additionally, a discontinuous brown clayey silt unit is found across portions the Site either within the shallow silty sand or between the shallow silty sand and the massive clay and silt till units.

Regional mapping taken from the Soil Survey of Bruce County, Report No. 16 of the Ontario Soil Survey describe the surficial soils of the area as consisting of sandy loams of the Berrien and Donnybrook series overlying a clay loam of the Perth series. The sandy loams show imperfect to good drainage and belong to the grey-brown Podzolic group, while the clay loam show imperfect drainage and belongs to the same group.

A review of MECP water well records for the surrounding area indicates that the bedrock surface is found at approximately 30 m (100 feet) below ground surface on average. Due to highly variable ground surface, the overburden thickness may vary significantly regionally. The bedrock surface is at an approximate elevation of 210 m AMSL and consists of Middle Devonian Age, Paleozoic rock. The upper portion of the bedrock consists of a buff to brownish grey dolomite of the Detroit River Group. Regionally, bedrock dips southwesterly towards Lake Huron.

There are two relevant groundwater systems in the vicinity of the Site: a shallow groundwater unit and a shallow bedrock aquifer. The two units are separated by the massive clay and silt till aquitard (clay till aquitard unit).

The shallow groundwater flow direction varies regionally and is influenced largely by surface water channels and mimics surface topography. Regionally, the overburden is incised by surface water bodies in deep gullies and channels and shallow groundwater discharges into the surface water channels. This surface water ultimately discharges to the North Penetangore River and Lake Huron.

The massive clay and silt till forms a confining layer separating the shallow groundwater unit from the shallow bedrock aquifer. Due to the lower conductivity observed in the clay and silt till, it is expected that groundwater flow within this unit is largely vertical and very slow. The massive clay and silt till acts as an aquitard.

Regionally, the groundwater in the shallow bedrock aquifer is interpreted to flow to the northwest towards Lake Huron.

## 1.4 MECP Correspondence

Comments on the 2020, 2021, 2022 Annual Monitoring Reports (2021, 2022, and 2023 GHD) have not been received at the time of writing this report.

Most recently, the MECP provided comments on the 2019 Annual Monitoring Report (2020, GHD). Comments were provided in a letter dated July 21, 2020. The MECP reviewer noted the following:

– Upsets to the LTF were not presented in the 2019 Annual Monitoring Report;
– Reductions in volatile organic compound (VOC) sampling for surface water should be proposed but key locations should remain and be monitored for review; and
– The groundwater interceptor could be connected to the LTF.

On behalf of the Municipality, GHD prepared a response to the MECP letter on August 28, 2020. A copy of GHD's response letter (which includes a summary of the comments) is provided in Appendix B. This report has been updated to reflect the recommendations made through correspondence with the MECP.

Prior to the most recent MECP correspondence, the MECP had provided comments on the 2015 Annual Monitoring Report (2016, GHD). Comments were provided in a letter dated June 3, 2016. In the letter, the MECP reviewer states that the Ministry concurs with the report's conclusions and that, overall, the Ministry has no concerns or recommendations, other than continued monitoring and reporting as noted in the annual report.

## 1.5 Report Organization

This Report is organized into the following sections:

- Section 1 Introduction
- Section 2 Site Operations
- Section 3 Leachate Treatment Facility
- Section 4 2023 Monitoring Program
- Section 5 Quality Assurance/Quality Control Program
- Section 6 Environmental Quality Monitoring Results
- Section 7 Groundwater Compliance Assessment
- Section 8 Annual Report Completion Checklist
- Section 9 Conclusions and Recommendations

# 2. Site Operations

During the reporting period, the Site operations were completed in general accordance with the D&O Report (CRA, 2012) and the conditions of the current ECA which includes various inspection and reporting requirements.

## 2.1 Daily Landfill Operations

The daily landfill operations at the Site were conducted by Municipal staff. Daily operations included monitoring the origin of incoming waste, collecting tipping fees, disposing and compacting waste, applying daily cover soil, and segregating recyclable and recoverable waste materials. Site staff was augmented by other Municipal staff on an as-required basis.

The KWMC is the primary landfill for the Municipality of Kincardine. Kincardine's other active landfill, Ward 3 Landfill Site, continues to operate seasonally in spring and summer.

During the reporting period, the KWMC operated Monday to Friday from 9:00 AM to 3:00 PM, and Saturday from 8:00 AM to 12:00 PM.

The waste disposal tipping fee is based on operational cost projections for the Municipal landfill operations and is adjusted by the Municipality, as required. All waste that enters the KWMC is passed over the weigh scale and is tracked by material type. The waste tonnages in 2023 are discussed in the following Sections.

## 2.2 Waste Management Operations

Municipal waste received at the Site during the reporting period are either segregated for recycling/diversion or disposed of at the active disposal area. Waste material segregated for off-Site recycling/diversion is temporarily stockpiled at the Site (see Figure 2.2 for stockpile locations).

### 2.2.1 Waste Recycling

The waste recycling/ diversion for the Municipality consist of a weekly blue box pick-up program and speciality/bulk recycling/diversion at the active landfills. The active landfills also have blue box material segregation areas for public convenience.

Table 2.1 provides a summary of the annual waste diversion for the Municipality. The blue box materials are tracked by Municipal region and the wastes segregated at the landfill are tracked through the weigh scale records. The Municipality has largely provided the tonnages for waste diversion materials but where required, segregated materials have been converted to tonnages based on the conversions noted on the table.

Appendix C contains summaries of the waste received at the Site.

***Blue Box Recyclables***

Blue box recyclables, including fine paper, newspaper, metal cans, plastics, clear glass, coloured glass, and boxboard, are picked up curbside on a bi-weekly basis by Bruce Area Solid Waste Recycling (BASWR). Blue box recyclables are accepted at the Site at no charge and picked up by BASWR as part of the curbside program. Waste disposal carts/bins are used at the KWMC and the Ward 3 Landfill sites for the temporary storage of the blue box materials. During the current reporting period, approximately 972.2 tonnes of blue box materials were diverted from the Municipal landfills.

***E-waste***

E-waste including computers, printers, televisions, etc., are segregated and stockpiled on Site. All E-waste received at the KWMC is temporarily stockpiled in sea-can containers, weighed, and removed by a recycling contractor. During the reporting period, approximately 17.25 tonnes of e-waste was diverted.

***Steel (scrap metals and white goods)***

Steel wastes, including scrap metals, fridges, microwaves, etc., are segregated and stockpiled on Site. During the current reporting period, approximately 166.99 tonnes of steel waste was collected. In addition, 19.80 tonnes or 198 fridges were collected and diverted from the landfill.

***Tires***

Tires are temporarily stockpiled on Site. During the current reporting period, approximately 1,321 units (12.02 tonnes) were diverted from the Municipal landfills.

***Drywall and Shingles***

During the current reporting period, approximately 61.41 tonnes of drywall were diverted from the Kincardine landfills for recycling. Approximately 473.85 tonnes of shingles were sent for recycling.

***Clean Wood and Brush***

Clean wood waste and brush received at the Site is temporarily stockpiled. Once the clean wood waste pile has reached a reasonable size, the clean wood waste is chipped and used on Site for daily cover and landscape purposes. Depending on needs, a small amount of chipped clean wood may be used by the Municipality for off-site landscape needs. Clean wood received at the Ward 3 Landfill Site is incinerated (at the Ward 3 Landfill Site) when the proper conditions and supervision are available. Approximately 266.13 tonnes of unchipped wood were received this year. Approximately 194.82 tonnes of yard waste received.

***Other Materials Diverted and Recycled***

The Municipality continues to look for additional items that can be diverted and recycled. Additional materials recycled during the reporting period included: styrofoam, mattresses, film plastic, bale wrap, light bulbs, propane tanks, bricks and concrete, and batteries. The Municipality also supports a local program that recycles specific items through the TerraCycle Program.

Table 2.1 includes the tonnages of other materials diverted and recycled.

***Municipal Hazardous and Special Waste Collection Programs***

The Municipality continues to undertake special and hazardous waste collection programs. Special waste items included paint, pressurized containers, fire extinguishers, automotive and household batteries, antifreeze, oil filters, oil, flammable organics, pesticides and fertilizers, inorganic acid, alkaline, and oxidizing materials, pharmaceuticals, aerosols, florescent tubes/bulbs, Freon, mercury containing devices, and non-PCB ballasts. Approximately 10.79 tonnes of hazardous and special waste materials were received during 2023.

### 2.2.2 Waste Disposal

Waste disposal operations at the Site during the reporting period were conducted using the area method in accordance with the D&O Report. Daily cover consists of clean fill, low level contaminated fill that is received at the Site during the year, or chipped wood waste. Daily cover is stored at the soil stockpiles on Site or from the Stage 2 cell area of Phase 2. Daily cover for the main travel areas consist of soils with a higher gravel/stone content. The equipment used for landfilling operations included a front-end loader and the landfill compactor.

During 2023 waste disposal occurred within Stage 2B of the Phase 2 area in accordance with the D&O Report. According to Municipal records, a total of 4,144.33 tonnes of waste were accepted at the Site in the reporting year. Adjusting for the waste that was received at the Site and recycled, the actual amount of waste landfilled at the Site was approximately 3,183.98 tonnes.

## 2.3 Site Capacity and Projected Site Life

The D&O Report (CRA, 2012) provides an updated design for the Site including the Phase 2 area. The D&O Report specified a total disposal capacity of 682,503 $m^3$, of which 78,000 $m^3$ of waste had already been landfilled in the Phase 1 area in 2009. The D&O Report estimated an annual fill rate to be between 15,500 and 18,700 $m^3$/yr based on the records available at the time. Based on a compaction rate of 0.70 tonnes/$m^3$ and assuming a 0.5 percent per year increase in population within the Municipality, the projected remaining Site life for the KWMC was estimated to be just over 34 years (closure in 2043).

Detailed topographic surveys of the waste disposal areas are completed at the Site. A year-over-year comparison of the topographic surveys provides an estimate of the landfill volume consumed between surveys.

The constructed base of the landfill Site is provided on Figure 1.2. The following provides a summary of the information used to project future Site life:

| | As of Nov. 2021 | As of Nov. 2022 | As of Dec. 2023 |
|---|---|---|---|
| Stage 1 and Stage 2A/B Consumed | 55,853 $m^3$ | 61,975 $m^3$ | |
| Tonnage Landfilled per year | 2,716 tonnes | 3,616 tonnes | 3,158 tonnes |
| Volume Consumed | 8,268.05 $m^3$ | 6,122.54 $m^3$ | 6,122.54 $m^3$ |
| Annual Bulk Density (tonnage/volume) | 0.33 tonnes/$m^3$ | 0.59 tonnes/$m^3$ | 0.52 tonnes/$m^3$ |
| Average Stage 1 bulk density | 0.58 tonnes/$m^3$ | | |

Table 2.2 provides a waste disposal summary and Site life projections for KWMC. The table assumes that the total waste disposal capacity available for Phase 2 is 604,500 $m^3$. Based on the most recent survey information, the waste tonnages received to-date, the estimated bulk waste density (ranging from 0.33 to 0.74 tonnes/$m^3$), and a 0.5 percent annual increase in waste received at the Site, the KWMC is estimated to have greater than 50 years of Site life remaining. As the Site data and information increases, the confidence in the Site life projection will increase.

## 2.4 Slope Stability Monitoring Program

The periodic monitoring of the installed instrumentation and visual slope inspection was discontinued following the 2022 inspections and topographic survey. The following summarizes the results of the slope stability monitoring program:

– The slope inclinometers have shown little movement over the period of 2012 to 2022. No indications of significant slope movements of the slope along North Penetangore River have been recorded over this period.
– Some movement has been recorded at the survey pin locations over the period of 2012 to 2022, including the loss of survey pins at some locations close to the toe of the river. The river is an active meandering river, and the river banks show signs of erosion and undercutting, which is typical of a meandering river. These minor erosional features are not a significant concern as they are well away from the top of the slope and the landfill features.
– The bare slope at the northeastern corner of the site, west of Sideroad 15N, has not significantly changed over the ten years of monitoring (2013 to 2022). The steepest eroded portion of the slope is located where the river flow bends to the north at SP-6. It is expected that this area will erode over time to a flatter more stable slope. An aerial drone survey for the site was carried out on November 15, 2022. The images generated from this drone survey can be used to monitor slope movements over time. An additional drone survey can be carried out at a later date to make a comparison between the top of slope and determine erosion rates over time. It is recommended that the next drone survey be completed in 2027. A geotechnical engineer should review the erosion rates from the two drone surveys and determine if any additional measures need to be undertaken to stabilize this area.

For reference, Appendix D includes the results of the most recent, 2022, slope stability monitoring program.

The slope stability monitoring program was originally proposed to continue for a five-year period after which the program would be reassessed.

Following the 2022 monitoring program, GHD's geotechnical engineers concluded that the annual monitoring program can be discontinued, as there are no current concerns with the meandering nature of the river, and with the slope inclinometer movements.  This program can be re-instated at a future date if the meandering river becomes a concern.

## 2.5 Stage 2C Construction

Throughout the 2023 summer months and into the fall, Municipal staff worked towards constructing the next phase of the Stage 2 landfill cell. Municipal staff completed excavation and the earthworks portion of the Stage 2C construction and extended the groundwater collection across the eastern boundary of the landfill. The leachate collection systems were also extended from Phase 1 and Phase 2B. Construction on the sidewall of Stage 2C is ongoing and is anticipated to be completed in 2024.

Once construction is complete, it is recommended that the Muncipality prepare and submit a construction report to the MECP which documents the construction efforts for the Stage 2 landfill cell. This document should also be appended to the Site's D&O Plan to ensure that all as-built packages are compiled and accessible.

# 3. Leachate Treatment Facility

Prior to the LTF completion, leachate was collected in the sump at the southwest corner of the Phase 2 area and was pumped into a below-ground storage tank. The leachate was then transported for treatment and disposal to the Bruce Energy Centre Wastewater Treatment Plant (BEC WWTP) or the Ward 1 leachate pump station for transfer to the Kincardine Wastewater Treatment Plant (KWWTP).

The LTF was commissioned between June 28 and October 20, 2016. The LTF operated in accordance with Amended ECA No. 5194-9VTHQ4 until March 15, 2019, when the MECP provided an Amended ECA No. 1731-B9ZKPU

(Amended LTF ECA) that allowed limited operational flexibility. Copies of the LTF's ECAs are provided in Appendix A. Relevant Provincial Officer's Orders, and other correspondence from the MECP is included for reference. All work items from the Provincial Officer's Orders and MECP correspondence has been completed.

The LTF also operates with a Stormwater Contingency and Remedial Action Plan (SWMCRAP). The SMWCRAP identifies a formal monitoring program and remedial actions to be taken in the event of a spill. Both manuals continued to be used during the current reporting period.

# 3.1 Leachate Treatment Facility Performance

The LTF treats the leachate generated and collected by the leachate collection system (LCS). The leachate is transferred from the LCS to the leachate holding tank. The leachate is then transferred by forcemain from the leachate holding tank to the leachate tote in the LTF. The LTF consists of an anoxic/toxic biological nutrient removal process and a secondary clarifier. Effluent from the secondary clarifier is discharged into a manhole directly upstream of SWP-2.

## 3.1.1 Leachate Treatment Facility Flow Rate and Total Volume Treated

The LTF flow rates are selected by the Plant Operator based on the landfill leachate production rates as measured within the leachate collection sump located in the Stage 1 cell of the landfill. The table below presents a summary of average monthly LTF flow rates and the monthly volume treated.

| Month in Operation (2023) | Average Effluent Flow Rate ($m^3$/day) | Influent Volume Treated ($m^3$) |
|---|---|---|
| January | 33.6 | 781.0 |
| February | 40.0 | 754.0 |
| March | 29.5 | 718.5 |
| April | 36.4 | 842.3 |
| May | 18.9 | 588.9 |
| June | 5.9 | 247.4 |
| July | 10.7 | 433.6 |
| August | 14.4 | 463.4 |
| September | 6.8 | 233.0 |
| October | 7.5 | 271.8 |
| November | 11.5 | 374.7 |
| December | 12.2 | 417.0 |

The 2023 monthly average LTF effluent flow rates ranged from 5.9 to 40.0 $m^3$/day (0.06 to 0.40 liter per second (L/s)) in June and February, respectively. The total volume treated during the reporting period was approximately 6,125.6 $m^3$. This is an average of 16.8 $m^3$/day or 31 percent of the designed flow rate of 55 $m^3$/day.

## 3.1.2 Effluent Quality

Effluent from the LTF is required to meet the daily effluent limits and annual average effluent objectives specified in Amended LTF ECA. Exceedance of the criteria is deemed to have occurred when the concentration of an effluent parameter exceeds the effluent limit or the annual average exceeds the effluent objective as listed below:

| Effluent Parameter | Annual Average Effluent Objectives (mg/L) | Daily Effluent Limits (mg/L) |
|---|---|---|
| Biological Oxygen Demand ($BOD_5$) | 10 | 15 |
| Total Suspended Solids (TSS) | 15 | 20 |
| Total Phosphorous (TP) | 0.5 | 0.7 |
| Ammonia ($NH_3$, expressed as nitrogen, N) | 1 | 5 |
| Nitrate | 35 | N/A |

To ensure compliance with the effluent criteria, the Amended LTF ECA requires bi-weekly monitoring of the effluent parameters as specified above. Amended LTF ECA also requires bi-weekly sampling of pH, *E. Coli*, and temperature. Samples are required to be collected from the clarifier discharge pipe. Certain effluent parameters (particularly pH and TSS) may be measured on a more frequent basis in order to assist in the effective operation of the LTF. Annual effluent samples, taken in the spring, are required to be collected and analyzed for VOCs, inorganics, and other organics (chemical oxygen demand [COD], dissolved organic carbon [DOC], and phenols).

In addition to effluent sampling, monthly monitoring of influent quality is required. Influent grab samples are to be analyzed for $BOD_5$, TSS, TP, and total kjeldahl nitrogen (TKN) in accordance with Amended LTF ECA.

The influent and effluent sample results from this reporting period are presented in Table 3.1. Table 3.1 also provides the 2023 annual average concentrations for comparison to effluent objectives. The following sections discuss the monitoring results for each of the effluent limit parameters ($BOD_5$, TSS, TP, ammonia, and nitrate). The following table summarizes the range and average effluent concentrations of each parameter reported during the current reporting year as well as the number of daily effluent limit exceedances and average removal efficiency.

| Parameter | Daily Effluent Limits (mg/L) | 2023 Range (mg/L) | 2023 Average (mg/L) | No. of Daily Effluent Limit exceedances | Average Removal Efficiency (%) |
|---|---|---|---|---|---|
| $BOD_5$ | 15 | 2 – **26** | 4 | 1 | 92% |
| TSS | 20 | 2 – **24** | 8 | 1 | 60% |
| TP | 0.5 | 0.10 – **0.64** | 0.37 | 0 | 83% |
| Ammonia | 5 | 0.1 – **6.2** | 0.8 | 2 | - |
| Nitrate | N/A | 0.08 – 52.70 | 21.12 | 0 | - |

Notes:

**Bold** – results is above the Annual Average Effluent Limit specified in the Amended LTF ECA ($BOD_5$ – 10 mg/L, TSS – 15 mg/L, TP – 0.5 mg/L, Ammonia – 1 mg/L, nitrate – no objective))

**Bold** - annual average above the Annual Average Effluent Objective specified in the Amended LTF ECA ($BOD_5$ – 15 mg/L, TSS – 20 mg/L, TP – 0.7 mg/L, Ammonia – 5 mg/L, nitrate – no objective))

As shown in the table above, there were four samples that exceeded the Daily Effluent Limits for criteria parameters (January 24, July 4, November 28, 2023). The operating measures employed for these occasions are discussed in Section 3.4. The annual average concentrations were less than the Daily Effluent Limits for BOD, TSS, TP, and ammonia.

It is also noted that the removal efficiency for TSS in July 17 was negative (i.e., TSS increased in the effluent). This is associated with an operation condition described below.

## 3.2 Stormwater and Surface Water Monitoring Results

The ECA requires bi-weekly monitoring of nitrate from SW4, located within a tributary of the North Penetangore River located to the west of the Site. The daily effluent limit for nitrate at SW4 is 20.0 mg/L, as specified in ECA No. 1731-B9ZKPU.

The surface water from this reporting period is presented in Table 3.1. Table 3.1 also provides the average concentrations. Nitrate concentrations at SW4 ranged from 0.03 mg/L (July 17, 2023) to 1.56 mg/L (February 13, 2023). All samples collected for nitrate during the reporting period were below the effluent limit of 20 mg/L.

## 3.3 Operating Conditions

During the reporting period, the LTF operated between January 1st and December 31, 2021. The LTF operated in normal operations mode during the reporting period, with the exception of the noted items below.

– January 24, 2023 – Total Suspended Solids Exceedance
– July 4, 2023 – Total Ammonia (as N) Exceedance
– November 28, 2023 – Biochemical Oxygen Demand, and Total Ammonia (as N) Exceedance

As described above, a daily effluent limits has been set in the LTF's ECA. These effluent limits were exceeded on January 24, July 4, and November 28, 2023. After receiving the sample results from the laboratory, Municipal staff took immediate follow-up actions including: testing nitrate levels at the clarifier, increasing raw leachate flow, confirming methanol and phosphorus addition was adequate, visually checking microbe levels, and resampling the effluent.

The effluent was resampled one week after the exceedances were noted (2 weeks after January 24 exceedance) and the results showed that respective exceedances were below effluent limits. No operational issues were identified on January 4 or July 4 during follow-up actions and thus, exceedances may have been erroneous. During the November 28 exceedance it was noted that the blowers tripped due to power outage and not enough air was supplied to the LTF.

No other operating conditions and/or issues were reported for the LTF during the reporting period.

## 3.4 Calibration and Maintenance on Effluent Monitoring Equipment

As reported by the Plant Operator, regular maintenance was performed throughout the operating period of the year. LTF maintenance included replacing the oil on the blowers, cleaning the inline instrumentation sensors, checking sensor calibration, replacing belts on various pumps, and replacing pipes and pumps as required. The Plant Operators log is included in Appendix E.

On June 5, 2023, the influent, recirculation, return active sludge (RAS), waste activated sludge (WAS), and effluent flow meters were verified by Indus Controls.

## 3.5 Sludge Production

Sludge at the LTF is generated from the secondary clarifier. A portion of sludge generated from the secondary clarifier is returned to the aeration basins as RAS on an ongoing basis to support the biological process. Sludge that is produced in excess of that required to support the biological process is wasted to the sludge storage tank as WAS. The WAS is the only sludge produced at the Plant. The WAS is pumped to a sludge holding tank prior to removal and disposal in the KWMC landfill cells.

The sludge was transported by a vacuum truck for disposal within the active landfill cell.

## 3.6 Complaints

GHD is unaware of any complaints made during the current reporting period (i.e., there were no complaints received by Municipal staff members in regard to odour, noise, or other operational aspects of the LTF).

## 3.7 Spills and Abnormal Discharge Events

During the current Reporting Period, two spills from the leachate holding tank were recorded. On January 5, 2023, heavy precipitation and snow melt caused the leachate holding tank to reach its maximum capacity and to overflow onto the ground. Approximately 7.2 $m^3$ of raw leachate was spilled over the course of 12 hours. During this period leachate was being pumped out and hauled off-Site to minimize any extra spillage. Leachate was hauled to the Ward 1 landfill where it was pumped into the leachate collection system which is pumped to Kincardine's wastewater treatment facility. Approximately 105 $m^3$ was transported to the Ward 1 site in January 2023. Following the spill the Municipality collected samples from the raw leachate and from SWP-1 to investigate potential surface water impacts. The results of the analyses are summarized below:

| Parameter (mg/L) | Raw Leachate | SWP-1 Effluent |
|---|---|---|
| $CBOD_5$ | 47 | <2 |
| TSS | 11 | <3 |
| Phosphorus | 2.6 | <0.03 |
| Ammonia + Ammonia (N)) | 130 | 0.2 |
| Nitrite (as N) | <0.3 | <0.03 |
| Nitrate (as N) | <0.06 | 0.16 |

Comparison of the two samples does not show similarities in water quality and does not indicate that SWP-1 was influenced by the spill.

On April 12, 2023, a minor spill was noted at the leachate treatment facility. The spill was due to an air relief valve failure. During the spill less than 1 $m^3$ of leachate was spilled and therefore no additional sampling of the SWP-1 or the raw leachate was undertaken as surface water impacts were assumed to be negligible. Repairs were conducted on the air relief valve by removing debris from the system.

In both instances, the overflow was managed appropriately and reported to the MECP Spills Action Centre (MECP SAC).

# 4. 2023 Water Quality Monitoring Program

Site monitoring is conducted semi-annually and was completed on May 18, 2023, and November 8, 2023 during the current Reporting Period.

The water quality monitoring program includes 33 monitoring wells, 4 mini-piezometers, 6 surface water locations, two on-Site stormwater ponds, the discharge from the groundwater interceptor trench (GWIT).

Table 4.1 provides the specifications for the current monitoring program. Groundwater and surface water sampling locations are shown on Figure 1.2. Environmental monitoring is conducted in accordance with the ECAs that govern the operations of the Site.

A summary of monitoring well completion details is provided in Table 4.2 and the available stratigraphic and instrumentation logs are available in Appendix F. Table 4.3 provides a summary of the monitoring wells that were abandoned as part of the Phase 2 development.

The results of the monitoring program are discussed in detail in Section 5.0 below. The groundwater quality is assessed in terms of evidence of landfill-related water quality impacts. This is accomplished through an assessment of the spatial and temporal trends in groundwater quality across the Site and a comparison of groundwater quality between each location, background locations, and MECP criteria. The MECP criteria listed in the Ontario Drinking Water Standards (ODWS) are used for comparative reference. The groundwater monitoring results are also assessed with respect to the MECP Guideline B-7 “Incorporation of the Reasonable Use Concept into MOEE Groundwater Management Activities” (MOEE, 1994). The discussion with respect to this guideline is present in Section 5.2.4. Surface water quality is assessed with respect to the MECP criteria listed in the Provincial Water Quality Objectives (PWQO) (MOEE, 1999).

As per the updated D&O Report (CRA, 2012), modifications to the monitoring program became necessary as part of the development of the Phase 2 area. To ensure continued comprehensive monitoring of the Site, several replacement monitoring wells and mini-piezometers were installed in 2013. At this time, the monitoring well network, frequency of sampling, and the analytical parameter lists provides more comprehensive monitoring program than is warranted based on the degree of landfill-derived impacts observed in groundwater. Thus, several recommendations for monitoring program reductions have been made throughout this report (summarized in Section 7.2). These recommendations were originally made in the 2014 AMR; however, the recommended changes have not been approved by the MECP as such have not been implemented. It is recommended that the monitoring program continue to be reassessed as the Phase 2 area continues to be developed.

## 4.1 Monitoring Program Deviations

The following provides a summary of the deviations to the monitoring program in 2023:

| Monitoring Location(s) | Monitoring Event | Reason |
|---|---|---|
| OW2-83 | Spring and fall | Blocked |
| OW3-83 | Fall | Not monitored due to field oversight |
| OW4-83 | Spring and fall | Dry in the spring and insufficient volume for sample collection in the fall |
| OW6-83 | Fall | Insufficient volume for sample collection |
| OW7-83 | Spring and fall | Buried; no access |
| OW9-88, OW17-89 | Spring and fall | Dry during both monitoring events |
| OW16-89, OW18-89 | Fall | Insufficient volume for sample collection |
| OW29-07, OW30-07 | Spring | No access; field staff ran into issues with Municipal keys/locks and were unable to cut and replace the locks on either well until the fall event |
| OW36-09 | Spring and fall | Dry in the spring and insufficient volume for sample collection in the fall |
| OW43-09, MP04-13 | Spring and fall | Destroyed |
| MP01-13 through MP03-13 | Spring and fall | Unsafe Access |
| SW5 | Spring | Dry or insufficient flow for sampling |
| LW Holding Tank | Spring | Partial Sample only |

# 5. Quality Assurance/Quality Control Program

A Quality Assurance/Quality Control (QA/QC) Program, which involved the collection of one duplicate groundwater sample and one field blank, was performed as stipulated in the monitoring contract. All analytical data received were validated by a review of the standard quality control criteria including blind split sample analysis and blind field blank analysis. As well, the laboratory QA/QC data were reviewed upon receipt of the lab results. An analytical data assessment for the current reporting period is included in Appendix G.

Results of statistical comparisons between original and field duplicate samples is conducted through calculating the Relative Percent Difference (RPD) following the MOE's Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (MOE, March 9, 2004, amended July 1, 2011). Relative percent difference provides an absolute difference between the original and split or field duplicate samples using the following equation:

$$RPD = \left(\frac{x_1 - x_2}{(x_1 - x_2)/2}\right) x100\%$$

Where:

X1 and X2 are the respective concentrations of analytes from the original and split/duplicate sample

An RPD value that is below 30% is considered the acceptable level for differences; parameters that have an RPD greater than 30% should be considered estimates. For instances where analytes were detected in one sample and not detected in the other, the detection limit was used to calculate the RPD for the non detect. If the detected value was lower than the detection limit of the other sample, an RPD could not be calculated due to uncertainty. Where both the original and split/duplicate sample were below laboratory reporting limits, the RPD could not be calculated due to differing reporting limits.

As shown in Appendix G, manganese and sulfate exceeded 30% during the spring monitoring event. In the fall event, the RPD of phosphorus was above 30 percent. Each parameter should be considered an estimated value for that monitoring event. Many of the parameters analyzed where detected at very low levels in the field blank samples (both spring and fall). These should be considered when discussing water quality results.

These qualifications of these parameters as estimates do not significantly alter the interpretation of the data or affect the conclusions provided in this report. The analytical data are of good quality to be used in assessing the ongoing environmental performance at the Site.

# 6. Environmental Quality Monitoring Results

## 6.1 Groundwater Flow

### 6.1.1 Shallow Groundwater Unit

The shallow groundwater unit is contained primarily within the shallow silty sand. Groundwater elevations measured in spring and fall are summarized in Table 6.1 and groundwater contours for spring and fall are presented on Figures 6.1 and 6.2, respectively. The groundwater flow direction presented on these figures is generally consistent with past monitoring reports.

Groundwater flow illustrated on Figures 6.1 and 6.2 is likely being influenced by the excavation of the new landfill cell. The excavation is likely to create a hydraulic depression in the Phase 2 area. The depression would redirect a portion of groundwater flow in the centre of the Site towards the recently constructed cell. The control of groundwater in the Stage 1 Cell area is discussed further in Section 6.1.2.

While the development in the Phase 2 area has likely created a localized groundwater depression, groundwater flow across the Site within the shallow groundwater unit continues to be in a general semi-radial pattern originating along the eastern boundary, in the vicinity of OW23-98 and OW50-13, and radiating north, south, and west. The groundwater contours continue to indicate the presence of a groundwater flow divide near the northern portion of the Phase 2 area. This flow divide corresponds with the on-Site topographic high. Groundwater to the north of the divide flows in a general north to northwesterly direction toward the North Penetangore River. Groundwater to the south of the divide flows toward the west and southwest toward the wetland located to the south of the Phase 2 area and the North Penetangore River.

Wetlands are present south to southwest of the Phase 2 area. Based on the static shallow groundwater elevations measured at the downgradient extent of the Phase 2 area and the presence of groundwater seeps, it is likely that the shallow groundwater unit discharges into the wetland which in turn drains into the North Penetangore River. It is also likely that shallow groundwater flow north and west also discharges into the North Penetangore River. The North Penetangore River is found at an elevation considerably lower than the static water levels found across the Site, therefore the river acts as a hydraulic barrier into which shallow groundwater is interpreted to discharge.

The horizontal hydraulic gradients were approximately 0.031 to 0.050 m/m in the Phase 1 area and 0.027 to 0.062 m/m in the Phase 2 area for current Reporting Period. These horizontal hydraulic gradients are consistent with previous reporting periods. Hydraulic conductivity for the shallow groundwater unit has been previously reported in the Hydrogeologic Characterization and Design Assessment Report (CRA, 2009) to be approximately $6.4 \times 10^{-4}$ cm/s, with a corresponding estimated groundwater velocity of about 25 to 50 metres/year using an effective porosity of 30 percent.

### 6.1.2 Groundwater Control

In order to control groundwater flow, two GWITs were installed to control groundwater flow into the Phase 2 Area. The first was installed along Sideroad 15 and the second, adjacent to the Phase 2 development. The first GWIT is located west of Sideroad 15 and gravity drains to the southern tributary to the North Penetangore River. It was installed at an elevation ranging from 254 to 258 m AMSL (approximately 2.5 to 3 m below static groundwater elevations). The second GWIT was installed approximately 35 m downgradient, near the southwest corner of Phase 2 development. It was installed approximately 2 to 3 m deeper than the first GWIT and groundwater collected from the second GWIT drains into SWP-1. As noted in Section 2.5, the Municipality extended the second GWIT and groundwater seepage is now being captured across Stage 2C.

Groundwater elevations in monitoring wells OW48-13 and OW49-13 have remained relatively consistent with the elevation of the first GWIT, demonstrating that this GWIT has been effective in lowering the water table along the eastern property boundary in the Phase 2 area. Since construction of the second GWIT in 2018, groundwater seepage stopped along the northern sidewall of the Phase 2 development area. Groundwater flow along the northern cell boundary is controlled.

Groundwater seepage has continued in the northeastern corner of the Stage 2C excavation. To control seepage in this corner, the Municipality extended the clay berm running east to west along the length of the waste within Stage 2. The berm ensures that the waste and any seeping groundwater are kept separate. Seeping groundwater is allowed to flow into an excavated area north of the berm and flow westward along the base of the excavated landfill cell(s). The seeping groundwater flows westward until it encounters a sump which is installed near the western limit of the excavation. Groundwater drains into the sump and is pumped, via submersible pump, to the drainage ditching along the western side of the active landfill area. This ditching flows into SWP-1.

### 6.1.3 Clay Till Aquitard Unit

The massive clay and silt till, known regionally as the St. Joseph's Till, forms an aquitard that separates the shallow groundwater unit and shallow bedrock aquifer. Groundwater level data from the shallow groundwater unit, clay till aquitard unit, and shallow bedrock aquifer indicates that the clay till aquitard unit provides significant hydraulic

separation of the two aquifers. Single well response testing estimated a very low hydraulic conductivity of $8.5 \times 10^{-8}$ cm/sec (CRA, 2009).

Monitoring wells OW46A-13 and OW46B-13 were installed within the clay till aquitard unit and shallow groundwater unit, respectively. During the current Reporting Period, vertical hydraulic gradients of 0.419 m/m and 0.434 m/m (downwards) were calculated using the groundwater elevations measured. The large vertical gradient indicates hydraulic separation between the clay till aquitard and shallow groundwater unit. These results were consistent with the vertical hydraulic gradient estimates historically made at nearby monitoring wells that have since been abandoned.

Based on the stratigraphic information and the very low hydraulic conductivity of the aquitard, it is anticipated that groundwater flow across the clay till aquitard unit will be largely vertical (downwards) but very slow.

### 6.1.4 Shallow Bedrock Aquifer

Underlying the clay till aquitard unit, a confined shallow bedrock aquifer is located within the uppermost weathered portion of the shallow fractured bedrock. Monitoring well OW37-09 and the scale house supply well (not sampled) are the only on-Site locations that extends to the bedrock aquifer.

Hydraulic conductivity for a highly fractured rock, similar to what is present at the Site, is anticipated to range from $10^{-3}$ to $10^{-2}$ cm/sec. Regional information indicates that groundwater in this aquifer unit follows the general slope of the bedrock surface towards Lake Huron to the west-northwest (Ontario Department of Mines, 1962).

Monitoring wells OW46A-13 and OW37-09 were installed in the clay till aquitard and shallow bedrock units respectively. Using the measured water levels from the current Reporting Period, the vertical gradient between the clay till aquitard unit and bedrock aquifer is calculated to be 0.202 and 0.217 m/m downwards. The high vertical gradient indicates that there is a significant hydraulic separation between the clay till aquitard unit and bedrock aquifer.

## 6.2 Water Quality Results

GHD has used six primary leachate indicator parameters (indicator parameters) previously established for the Site to evaluate the effects of the landfill on surrounding water quality, consisting of:

- Alkalinity — Caused by the increased concentrations of carbonate, bicarbonate, and hydroxide ions due to the waste materials
- Ammonia — Landfill leachate is rich in ammonia due to the denitrification of multiple nitrogen sources caused by general reducing conditions of landfilled waste
- Chloride — Formed in part by the degradation of paper products, food wastes, and a major component of salts
- Hardness — Caused by the increased concentrations of calcium and magnesium ions due to the waste materials and more acidic pH breaking down the native lime-rich soils
- Iron — Caused by the oxidation and dissolution of iron materials including iron sulphide minerals and the reduction of ferric ($Fe^{3+}$) iron oxides to ferrous ($Fe^{2+}$) iron oxides (generally from mineral coatings on soil particles in native overburden deposits) during microbial degradation of naturally occurring and anthropogenic organic compounds
- Manganese — Caused by the oxidation of various metallic materials and the breakdown of food wastes as well as from the reduction of naturally occurring manganese oxides similar to iron oxides

It is noted that other analytical parameter concentrations also change in leachate impacted water, but not generally at the high levels of change noted in the above-listed indicator parameters. Secondary parameters, such as conductivity, nitrate, dissolved organic carbon (DOC), are used to supplement the discussion of the key leachate indicator parameters.

The groundwater, leachate, and surface water quality general chemistry and metals analytical results are summarized in Tables 6.2, 6.3, and 6.4, respectively. Field measurements of pH, conductivity, and temperature obtained during

sample collection are also provided in Tables 6.2, 6.3, and 6.4. Volatile organic compound (VOC) results are summarized in Tables 6.5, 6.6, and 6.7 for groundwater, leachate, and surface water quality respectively.

Historical, pre-2017, groundwater and surface water analytical results are provided in Appendix H.

The current laboratory analytical reports are provided in Appendix G. Groundwater and surface water samples were submitted, under chain-of-custody protocol, to SGS Canada Inc. (SGS) in Lakefield, Ontario for chemical analysis.

Alkalinity, hardness, and pH concentrations are given consideration in the evaluation of water quality; however, the ODWS criteria established for these parameters are operational guidelines set for water treatment plant operations and are thus not relevant to landfill water quality evaluations. As such exceedances of ODWS Operational Guidelines for alkalinity, hardness, and pH are not highlighted within the analytical data tables or in the summary tables embedded within the text.

## 6.2.1 Groundwater Quality

The following discussion assesses groundwater quality following geographic divisions of the two Phases of the Site. Groundwater quality from each area is discussed in a general upgradient to downgradient fashion. The groundwater monitoring well locations are grouped as follows:

| | |
|---|---|
| **Background/GWIT Monitoring Locations** | OW48-13 and OW49-13 |
| **Leachate** | Phase 2 Area Leachate Holding Tank |
| **Phase 1** | |
| Eastern Boundary | OW18-89, OW22-98, OW23-98, and OW50-13 |
| Northern Boundary | OW2-83, OW3-83, OW4-83, OW8-88, OW19-89, OW24-98, OW29-07, and OW30-07 |
| Western Boundary | OW6-83, OW7-83, OW31-07, OW32-07, and OW33-07 |
| **Phase 2** | |
| Northern Boundary | OW9-88, OW16-89, and OW36-09 |
| Western Boundary | OW20-89, OW43-09, OW46A/B-13, and OW47-13 |
| Southern Boundary | OW17-89, OW27-00, OW28-00, OW25R-13, and OW45-13 |
| **Discharge to North Penetangore River** | |
| Western Portion of the Site | MP01-13, MP02-13, and MP03-13 |
| Northern Portion of the Site | MP04-13 (destroyed) |
| **Bedrock** | OW37-09 |

It should be noted that there are a number of monitoring wells that are used for hydraulic monitoring purposes only (i.e., not sampled).

It should also be noted that a number of monitoring locations have become redundant throughout the evolution of the monitoring program at the Site. GHD has previously recommended that several monitoring wells be removed from the water quality portion of the monitoring program (CRA, 2015). The removal of any monitoring locations has been deferred pending MECP agreement (i.e., the monitoring program has remained unchanged from the previous year).

### 6.2.1.1 Background

Monitoring wells OW18-89 and OW34-09 were historically used to represent background groundwater quality. Both were replaced in 2013. Currently, monitoring wells OW48-13 and OW49-13 represent groundwater quality flowing onto the Site and as such are used to define background water quality.

Concentrations of indicator parameters along with nitrate, TKN, and DOC at OW48-13 and OW49-13 during the current reporting period are compared to the ODWS and summarized in the following table (spring | fall). The historical ranges for indicator parameters reported at OW18-89 between 1989 and 2008 and at OW34-09 between 2009 and 2011 are included for reference.

| Parameter (mg/L) | ODWS | OW18-89 (1989-2008)* | OW34-09 (2009-2011) | OW48-13 | OW49-13 |
|---|---|---|---|---|---|
| Alkalinity | 30 – 500 | 189 – 440 | 325 – 372 | 407 (393) \| 362 | 345 \| 387 |
| Ammonia | - | - | <0.050 – 0.166 | <0.1 (<0.1) \| <0.1 | <0.1 \| <0.1 |
| Chloride | 250 | 1.42 – 17 | 2.8 – 123 | 9 (9) \| 4 | 11 \| 12 |
| Hardness | 80 – 100 | 236 – 455 | 328 – 486 | 372 (416) \| 376 | 379 \| 438 |
| Iron | 0.30 | <0.01 – **1.40** | <0.050 – 0.112 | <0.007 (<0.007) \| 0.019 | <0.007 \| <0.007 |
| Manganese | 0.05 | <0.003 – **0.161** | <0.001 – **0.184** | 0.00067 (0.00042) \| 0.00227 | 0.00023 \| 0.0011 |
| Nitrate | 10 | <0.1 – 0.3 | 0.23 - 1.59 | 1 (1.03) \| 2.83 | 5.89 \| 7.58 |
| TKN | - | 0.08 – 0.63 | <0.15 - 0.24 | <0.5 (<0.5) \| <0.5 | <0.5 \| <0.5 |
| DOC | 5 | 0.7 – **11.4** | <1.0 - 2.9 | 1 (1) \| 1 | 2 \| 1 |

Notes:
**Bold** concentrations indicate exceedances of the ODWS.
Values in parentheses indicate duplicate samples.
* Results from the first sampling in July 1989 are not included due to several anomalous values

The current 5-year median background concentrations (2019-2023) for the key leachate indicator parameters at the background wells, OW48-13 and OW49-13 are presented in the following table.

| Parameter (mg/L) | ODWS | Median Background Concentrations (2019-2023) |
|---|---|---|
| Alkalinity | 30 – 500 | 383 |
| Ammonia | - | 0.1 |
| Chloride | 250 | 10 |
| Hardness | 80 – 100 | 394 |
| Iron | 0.30 | 0.025 |
| Manganese | 0.05 | 0.00219 |
| Nitrate | 10 | 8.74 |
| TKN | - | 0.5 |
| DOC | 5 | 1 |

Note:
**Bold** concentrations indicate exceedances of the ODWS.

The above summary table indicates that background water quality at the Site is characterized by elevated concentrations of hardness and occasionally manganese. This is typical of groundwater in southwestern Ontario. The presence of slightly elevated chloride and nitrate concentrations indicate the presence of upgradient sources of impacts likely related to road-salt use along the adjacent road and agricultural activities on the adjoining properties to the east. Figure 6.3A has historically shown a general seasonal trend in chloride concentrations at OW48-13 with high levels occurring in the spring.

The results from background monitoring wells OW48-13 and OW49-13 have generally shown similar water quality since their installation. Thus, sampling from both wells has created a redundancy. It is recommended that OW49-13 no longer be included in the water quality monitoring program. The well should continue to be maintained for hydraulic monitoring during each monitoring event.

### 6.2.1.2 Leachate

Leachate quality is determined via samples collected from the leachate holding tank located along the western extent of the Stage 1 cell of the Phase 2 area. Leachate sampling began in late 2012 as a stipulation in the Site's updated ECA.

The historical range and concentrations of indicator parameters along with nitrate, TKN, and DOC are summarized in the following table. Note that the leachate hold tank could not be accessed in 2021. Thus, the historical range presented below does not include 2021 data.

| Parameter (mg/L) | Median Background Concentrations | Leachate Holding Tank | |
|---|---|---|---|
| | 2019-2023 | 2012 – 2022* | May 18, 2023 |
| Alkalinity | 383 | 961 – 3070 | 1880 |
| Ammonia | 0.1 | 49 – 215 | 163 |
| Chloride | 10 | 116 – 480 | 350 |
| Hardness | 394 | 797 – 2030 | 1040 |
| Iron | 0.025 | 0.53 – 9.22 | 0.49 |
| Manganese | 0.00219 | 0.724 – 3.45 | 0.751 |
| Nitrate | 8.74 | ND – 2.46 | <0.06 |
| TKN | 0.5 | 50.5 – 308 | 154 |
| DOC | 1 | 30.9 – 981 | 132 |
| Notes:<br>*Does not include 2021 data | | | |

Leachate quality in the Phase 2 area exhibits elevated concentrations of many general chemistry parameters and total metals, typical of moderate to strong leachate. The pattern of elevated parameters in leachate assists in identifying landfill-related water quality impacts in samples collected from monitoring wells. As presented in the above table, alkalinity, ammonia, chloride, hardness, iron manganese, TKN and DOC are all significantly elevated above background levels.

Figure 6.3B illustrates leachate concentrations over time within the Leachate holding Tank. As shown in the figure, concentrations varied significantly during the first four years of sampling. Concentrations have stabilized somewhat during the past six years (2018-2023).

### 6.2.1.3 Phase 1 Area

***Eastern Phase 1 Boundary***

Due to the observed pattern of groundwater flow and historical monitoring results, it is unlikely that off-Site migration of landfill-related impacts along the eastern Site boundary is occurring.

The measured sample concentrations of the selected leachate indicator parameters during the current reporting period at OW50-13, OW18-89, OW22-98, and OW23-98 are compared to the ODWS and summarized in the following table (spring | fall). These wells are located along the east boundary of the Phase 1 area.

| Parameter (mg/L) | ODWS | OW50-13 | OW18-89 | OW22-98 | OW23-98 |
|---|---|---|---|---|---|
| Alkalinity | 30 – 500 | 302 \| 349 | 608 \| - | 249 \| 228 | 589 \| 731 |
| Ammonia | - | <0.1 \| <0.1 | 0.1 \| - | <0.1 \| <0.1 | 0.7 \| 1.3 |
| Chloride | 250 | **270 \| 460** | 4 \| - | 3 \| 4 | <1 \| 4 |
| Hardness | 80 – 100 | 418 \| 426 | 552 \| - | 218 \| 231 | 559 \| 763 |
| Iron | 0.30 | <0.007 \| <0.007 | **10.5** \| - | 0.018 \| 0.034 | 0.1 \| **12.6** |

| Parameter (mg/L) | ODWS | OW50-13 | OW18-89 | OW22-98 | OW23-98 |
|---|---|---|---|---|---|
| Manganese | 0.05 | 0.0028 \| 0.00018 | **1.28** \| **-** | 0.00229 \| 0.00374 | **0.468** \| **1.3** |
| Nitrate | 10 | 1.23 \| 2.89 | 0.08 \| - | 0.18 \| 0.09 | <0.06 \| 0.21 |
| TKN | - | <0.5 \| <0.5 | 0.6 \| - | <0.5 \| <0.5 | 1.7 \| 2 |
| DOC | 5 | 2 \| 2 | 2 \| - | 2 \| 3 | 5 \| 5 |

Note:
**Bold** concentrations indicate exceedances of the ODWS.
- indicate parameter was not analyzed or no information available from the lab; OW18-89 had insufficient volume to sample in the fall 2023

Figures 6.4A and 6.4B illustrates water quality at the eastern Phase 1 boundary monitoring wells. The following observations are drawn from the current indicator parameter concentrations and the concentration versus time plots illustrated:

– From the December 2022 event onwards, samples collected from OW50-13 show record high concentrations of chloride and concentrations are following an increasing trend. Consistent and low concentrations of alkalinity, ammonia, iron, and manganese are observed. Elevated levels and variability of hardness are noted in historical values. Due to the proximity of the well to Sideroad 15N, and in the absence of other elevated indicator parameters, concentrations of chloride are not interpreted to be related to the landfill.
– Sample collected from OW18-89 contains elevated concentrations of several landfill-related indicator parameters (alkalinity, hardness, iron, and manganese). None of the forementioned parameters show increasing trends; however, the results indicate some minor landfill-derived impacts.
– Indicator parameter concentrations at OW22-98 are similar to or less than the median background concentrations and are generally consistent.
– Indicator parameter concentrations at OW23-98 contain elevated concentrations of several indicator parameters (alkalinity, hardness, iron, and manganese). Concentrations of ammonia are demonstrating overall, a slight increasing trend. Concentrations of iron and manganese show some variability, but overall water quality is stable at this location.

Hydraulic monitoring results show that these monitoring wells are generally located in an upgradient location. However, based on the sample chemistry at OW18-89 and OW23-98, landfill-related impacts are still apparent. This is likely due to the close proximity of these wells to the waste footprint. Leachate mounding continues to be the likely cause of cross-gradient or radial migration of impacts along the eastern boundary of the Phase 1 area. Landfill-related impacts along the eastern Phase 1 boundary are expected to be limited in extent due to the natural direction of groundwater flow to the west.

***Northern Phase 1 Boundary***

Monitoring wells OW2-83, OW8-88, OW24-98, and OW30-07 monitor potential downgradient migration near the northern limit of Phase 1. OW8-88 is screened within the clay till aquitard unit however, the sand pack reportedly extends to approximately 10 cm into the overlying shallow silty sand unit. Samples collected from this monitoring well are thus interpreted to represent water quality within the shallow groundwater unit. OW24-98 and OW30-07 are screened in the clay till aquitard unit but have sand packs that potentially extend into the shallow silty sand unit and thus it is interpreted that these wells monitor water quality within the clay till and shallow groundwater unit. Monitoring wells OW3-83, OW4-83, OW19-89, and OW29-07 are located approximately 25 m further downgradient to the north.

The following table summarizes the groundwater analytical results from samples collected during the current reporting period adjacent to the northern corner of the Phase 1 area limit of refuse from OW8-88, OW24-98, and OW2-83 (spring │ fall):

| Parameter (mg/L) | ODWS | OW8-88 | OW24-98 | OW2-83 (2022)* |
|---|---|---|---|---|
| Alkalinity | 30 – 500 | 679 \| - | 381 \| 385 | 492 \| 458 |
| Ammonia | - | 5.7 \| - | 0.1 \| 0.4 | <0.1 \| <0.1 |
| Chloride | 250 | 34 \| - | 38 \| 40 | 4 \| 6 |
| Hardness | 80 – 100 | 628 \| - | 300 \| 300 | 537 \| 594 |
| Iron | 0.30 | 0.055 **\|** - | **2.53** \| **0.453** | 0.193 \| 0.144 |
| Manganese | 0.05 | **1.38 \| -** | **0.145 \| 0.104** | **0.0939 \| 0.101** |

Note:
**Bold** concentrations indicate exceedances of the ODWS.
***** A blockage was noted at OW2-83 resulting in the well not being sampled in 2023, 2022 data is presented
- indicate parameter was not analyzed or monitoring well not sampled; OW8-88 was dry in the fall 2023

Figure 6.5 illustrates water quality at the northern Phase 1 boundary monitoring wells immediately downgradient of the landfill. The following observations are drawn from the current indicator parameter concentrations and the concentration versus time plots illustrated:

– Leachate indicator parameter concentrations in OW8-88 have shown elevated levels. Chloride is following an overall decreasing trend while the other parameters appear to be stable with some seasonal changes.
– Indicator parameter concentrations at OW24-98 remain low with the exception of chloride. Iron concentrations show seasonal fluctuations above background conditions. Overall, chloride levels are decreasing over time.
– Indicator parameter concentrations at OW2-83 have remained only slightly elevated over background levels.

Leachate related water quality issues are interpreted to be minor at OW24-98 and OW2-83. Landfill related impacts are also noted at OW8-88.

The following table summarizes the groundwater analytical results from samples collected during the current reporting period adjacent to the northern corner of the Phase 1 area limit of refuse from OW3-83, OW29-07, OW30-07, OW4-83, and OW19-89 (spring │ fall):

| Parameter (mg/L) | ODWS | OW3-83 | OW29-07 | OW30-07 | OW4-83 (2022)* | OW19-89 |
|---|---|---|---|---|---|---|
| Alkalinity | 30 – 500 | 467 \| - | - \| 394 | - \| 583 | - \| 402 | 311 \| 300 |
| Ammonia | - | <0.1 \| - | - \| <0.1 | - \| <0.1 | - \| <0.1 | <0.1 \| <0.1 |
| Chloride | 250 | 3 \| - | - \| 1 | - \| 42 | - \| 26 | 13 \| 16 |
| Hardness | 80 – 100 | 444 \| - | - \| 356 | - \| 543 | - \| 526 | 260 \| 266 |
| Iron | 0.30 | 0.028 \| - | - \| 0.037 | - \| 0.07 | - \| 0.007 | 0.009 \| 0.026 |
| Manganese | 0.05 | 0.0263 \| - | - \| **0.0136** | - \| **0.113** | - \| 0.0196 | 0.00076 \| 0.00334 |

Note:
**Bold** concentrations indicate exceedances of the ODWS.
***** OW4-83 was not sampled in 2023, 2022 data is presented
- indicate parameter was not analyzed or monitoring well not sampled

Figures 6.6A and 6.6B illustrate water quality at the northern corner, Phase 1 area monitoring wells. The following observations are drawn from the current indicator parameter concentrations and the concentration versus time plots:

– The parameter concentrations in the northern corner of the Phase 1 area (OW3-83, OW29-07, and historically OW7-83) are comparable or only slightly elevated over background levels, except for iron and manganese. This pattern indicates that groundwater in the vicinity of these locations contains low-level leachate-derived impacts.
– Concentrations of leachate indicators are slightly elevated in OW30-07 in comparison to background and OW19-89. This is indicative of moderate landfill derived impacts. Some increasing trends in indicator parameter concentrations have been observed in OW30-07 during recent monitoring events.

The analytical results from OW3-83 and OW29-07 have consistently shown similar water quality and are located in close proximity to one another. Thus, sampling both wells is redundant, and it is recommended that OW29-07 be removed from the water quality monitoring program. OW4-83 has frequently been dry since 2011 and should also be removed from the water quality monitoring program. Both wells should continue to be maintained for hydraulic water level monitoring and/or future use.

***Western Phase 1 Boundary***

Based on the groundwater quality and well construction, it is anticipated that samples from OW7-83 are representative of the shallow groundwater unit. OW7-83 is located approximately 30 m west of the Phase 1 area. OW32-07 is located immediately downgradient of OW7-83 but was installed within the clay till aquitard unit. The borehole log for this location indicates that the shallow silty sand unit is not present at this location.

Monitoring wells OW31-07 and OW6-83 are located near each other and located downgradient of the landfill portion of Phase 1. Groundwater sampled from OW6-83 is representative of the shallow groundwater unit, while OW32-07 is screened within the clay till aquitard unit.

The following table summarizes the groundwater analytical results from samples collected during the current reporting period (spring │ fall) at OW7-83 (using 2018 data), OW32-07 (located along the western Phase 1 boundary), OW31-07, and OW6-83:

| Parameter (mg/L) | ODWS | OW7-83 (2018 results) | OW32-07 | OW31-07 | OW6-83 |
|---|---|---|---|---|---|
| Alkalinity | 30 – 500 | 859 \| 650 | 191 \| 190 | 543 \| 509 | 831 \| - |
| Ammonia | - | 1.47 \| 1.52 | <0.1 \| 0.1 | 0.3 \| 0.4 | 16.1 \| - |
| Chloride | 250 | 159 \| 87.3 | 3 \| 3 | 28 \| 30 | 42 \| - |
| Hardness | 80 – 100 | 520 \| 545 | 137 \| 142 | 502 \| 507 | 755 \| - |
| Iron | 0.30 | **4.22** \| **1.57** | <0.007 \| 0.011 | **0.816** \| **0.885** | **17.8** \| **-** |
| Manganese | 0.05 | **0.341** \| **0.249** | 0.00331 \| 0.0037 | **0.0804** \| **0.0777** | **0.415** \| **-** |

Note:
**Bold** concentrations indicate exceedances of the ODWS.
- indicate parameter was not analyzed or no information available; OW6-83 was dry in the fall 2023

Figure 6.7 illustrates water quality along the western portion of the Phase 1 area at OW7-83 and OW32-07. The following observations are drawn from the current indicator parameter concentrations and the concentration versus time plots illustrated:

– Concentrations of indicator parameters at OW7-83 using results from 2018 are elevated in comparison to background. This indicates that a landfill-related impact is present to the west of the Phase 1 area.
– Concentrations of indicator parameters at OW32-07, located immediate downgradient from OW7-83, are similar to or lower than background. This indicates water quality at this location has not been altered by the landfill.

It should be noted that OW7-83 is located in close proximity to the Phase 1 area as compared to the other monitoring locations included within the western boundary discussion. The presence of stronger landfill-related water quality

impairments at this location is not unexpected. OW7-83 was noted as buried during 2018 and has not been monitored since. Based on the water quality observed at OW32-07, landfill-related water quality impairments are interpreted to be largely attenuated between OW7-83 and OW32-07.

Figure 6.8 illustrates water quality along the western portion of the Phase 1 area at OW6-83 and OW31-07. The following observations are drawn from the current indicator parameter concentrations and the concentration versus time plots illustrated:

– Indicator parameter concentrations are slightly elevated as compared to background levels at OW31-07 indicating landfill derived impact to water quality. Indicator parameter concentrations (alkalinity, chloride, conductivity, hardness, and manganese) at OW31-07 have demonstrated increasing trends indicating a progressive landfill-related water quality influence. Iron concentrations in 2023 have shown a slight decrease.
– Groundwater at OW6-83 is characterized by elevated concentrations of leachate indicator parameters with a moderate degree of landfill-derived impacts. Indicator parameter concentrations at OW6-83 are demonstrating increasing trends. Concentrations of alkalinity, ammonia, chloride, hardness, and iron have shown overall increasing trends since 1993/94.

Monitoring wells OW31-07 and OW6-83 make up a nested location that monitors the shallow groundwater unit and the underlying clay till aquitard unit, respectively. The current analytical results indicate that leachate impacts observed in the shallow silty sand unit have likely begun migrating downwards into the grey silt and clay in the vicinity of OW6-83 and OW31-07. However, impacts at OW31-07 are low, as demonstrated by the lower indicator parameter concentrations observed in samples collected from OW31-07 compared to the sample results for OW6-83.

Monitoring well OW33-07 is located to the west of the southern limit of the Phase 1 area. This well is located within the Phase 2 area but has historically been interpreted to be on the Phase 1 area side of the identified shallow groundwater flow divide and is thus discussed in the context of the Phase 1 area groundwater monitoring. OW33-07 is screened within the shallow groundwater unit. The following summarizes the groundwater analytical results from samples collected during the reporting period (spring │ fall):

| Parameter (mg/L) | ODWS | OW33-07 |
|---|---|---|
| Alkalinity | 30 – 500 | 546 \| 622 |
| Ammonia | - | <0.1 \| 0.3 |
| Chloride | 250 | 14 \| 20 |
| Hardness | 80 – 100 | 777 \| 657 |
| Iron | 0.30 | 0.127 \| **0.86** |
| Manganese | 0.05 | 0.00506 \| **0.192** |
| Note:<br>**Bold** concentrations indicate exceedances of the ODWS.<br>- indicate parameter was not analyzed or no information available | | |

Figure 6.9 illustrates water quality along the southwestern portion of the Phase 1 area at OW33-07. The following observations are drawn from the current indicator parameter concentrations and the concentration versus time plots illustrated:

– Overall, concentrations of the leachate indicator parameters at OW33-07 have been consistent since 2009. Levels are elevated above background which indicates the presence of a mild landfill-related impact in the shallow flow zone at this location. Historical highs of alkalinity, iron and manganese were noted during the fall 2023 sampling event. Further monitoring is required to determine if these trends will continue or are temporary spikes in concentrations.

Historical groundwater flow direction and the minor water quality impairments observed at this location are indicative of impacts associated with landfill activities within the Phase 1 area. With the exception of the most recent fall 2023 results, water quality trends at this location show improvements.

### 6.2.1.4 Phase 2 Area

***Northern Phase 2 Boundary***

The following section describes the groundwater quality in the northern portion of the Phase 2 area. Monitoring well OW16-89 is located along the service access road near the metals stockpile and is screened within the shallow groundwater unit. OW9-88 is located downgradient of the metal stockpiles and the historical disposal area and is screened within the clay silt aquitard. OW9-88 has contained insufficient volumes for sampling since the fall 2012 monitoring event. The April 2012 monitoring data is presented for comparison. OW36-09 is located along the eastern perimeter of the area, which was formerly used for burning wood waste. OW36-09 is screened within the shallow groundwater unit and has contained insufficient volumes for sampling since spring 2020. The following table summarizes groundwater analytical results from samples collected from within the landfill vicinity (spring │ fall):

| Parameter (mg/L) | ODWS | OW9-88 (April 2012) | OW16-89 | OW36-09 (spring 2020 only) |
|---|---|---|---|---|
| Alkalinity | 30 – 500 | 462 | 637 \| - | 1010 \| - |
| Ammonia | - | 0.078 | <0.1 \| - | 0.2 \| - |
| Chloride | 250 | 104 | 74 \| - | 16 \| - |
| Hardness | 80 – 100 | 584 | 664 \| - | 816 \| - |
| Iron | 0.30 | <0.05 | 0.161 \| - | **0.576** \| - |
| Manganese | 0.05 | 0.0028 | **1.4 \| -** | **0.241** \| - |

Note:

**Bold** concentrations indicate exceedances of the ODWS

- indicate parameter was not analyzed or no information available; OW16-89 had insufficient volumes to samples in the fall; OW36-09 has been dry or had insufficient volumes to sample since spring 2020; OW9-88 has had insufficient volumes since spring 2012

Figure 6.10 illustrates water quality along the northern boundary of the Phase 2 area. The following observations are drawn from the current indicator parameter concentrations and the concentration versus time plots illustrated:

– The indicator parameter concentrations in the samples collected from OW16-89 and OW36-09 are elevated in comparison to background levels, indicating moderate landfill-related impacts on groundwater quality in this vicinity.
– Increasing trends in alkalinity had been observed at both OW16-89 and OW36-09. Concentrations in OW16-98 have stabilized during recent years. Decreasing trends in hardness and iron are observed at OW16-98. 2023 sampling results from OW16-98 show increases in these parameters and the fall 2023 sample showed a significant increase in manganese levels.
– Overall historical results from OW36-09 showed moderate landfill derived impacts. Current results from OW16-89 show minor to moderate leachate impacts with many parameters reported at concentrations comparable to OW36-09.

Similar to water quality monitoring along the northern Phase 1 boundary, there is an excess of monitoring points in the area north of the Phase 2. It is recommended that OW9-88 and OW16-89 be removed from the water quality monitoring program but continue to be monitored as part of the hydraulic monitoring program. OW36-09 provides sufficient monitoring north of Phase 2, between the Phase 1 and Phase 2 areas, and provides a worst-case scenario (most degraded water quality) in that area of the Site. OW16-89 should be sampled as a backup if recharge in OW36-09 is insufficient to facilitate sampling.

***Western Phase 2 Boundary***

Monitoring well nest OW46A/B-13 was installed for the purpose of monitoring the shallow groundwater unit and the clay silt aquitard unit along the western Phase 2 boundary. OW46A-13 was screened entirely within the clay silt

aquitard and was installed to replace OW35-09 which was abandoned in 2011. Historical monitoring results for OW35-09 were generally comparable to or below background concentrations, apart from elevated sulphate and DOC concentrations, which were interpreted to be naturally occurring within the clay silt aquitard. The following table summarizes the analytical results from the sample collected during the current reporting period from the replacement well OW46A-13 (spring | fall):

| Parameter (mg/L) | ODWS | OW46A-13 |
|---|---|---|
| Alkalinity | 30 – 500 | 200 \| 207 |
| Ammonia | - | 0.2 \| 0.2 |
| Chloride | 250 | <1 \| <1 |
| Hardness | 80 – 100 | 167 \| 180 |
| Iron | 0.30 | 0.053 \| <0.007 |
| Manganese | 0.05 | 0.0135 \| 0.0125 |
| Note:<br>**Bold** concentrations indicate exceedances of the ODWS.<br>- indicate parameter was not analyzed or no information available | | |

Figure 6.11 illustrates water quality along the western boundary of the Phase 2 area. The following observations are drawn from the current indicator parameter concentrations and the concentration versus time plots illustrated:

– The sample results show relatively consistent concentrations.
– Concentrations of the leachate indicator parameters are comparable to or lower than background groundwater quality demonstrating that there are no landfill derived impacts.

Analytical data from OW46A-13 indicates elevated sulphate concentrations in comparison to background levels. In the absence of elevated indicator parameter concentrations, elevated sulphate levels are interpreted to be due to natural groundwater conditions in the clay till aquitard unit.

To provide additional monitoring of the shallow groundwater unit along the western Phase 2 boundary, monitoring wells OW46B-13 and OW47-13 were installed during the fall of 2013. Monitoring well OW46B-13 is located approximately 50 m downgradient from the Stage 1 cell of the Phase 2 area. OW47-13 was installed along the southern edge of the large gully into which SW6 and numerous groundwater discharge points flow. OW47-13 is located at the apex of the shallow groundwater divide that separates the Phase 1 and Phase 2 areas of the Site. The following table summarizes the groundwater analytical results from samples collected during the current reporting period at OW46B-13 and OW47-13 (spring | fall):

| Parameter (mg/L) | ODWS | OW46B-13 | OW47-13 |
|---|---|---|---|
| Alkalinity | 30 – 500 | 564 \| 574 | 416 \| 370 |
| Ammonia | - | <0.1 \| <0.1 | <0.1 \| <0.1 |
| Chloride | 250 | 34 \| 30 | 7 \| 9 |
| Hardness | 80 – 100 | 638 \| 596 | 440 \| 417 |
| Iron | 0.30 | <0.007 \| <0.007 | 0.02 \| <0.007 |
| Manganese | 0.05 | 0.0111 \| 0.0446 | 0.00305 \| 0.00052 |
| Note:<br>**Bold** concentrations indicate exceedances of the ODWS.<br>- indicate parameter was not analyzed or no information available | | | |

Figure 6.12 illustrates water quality along the western boundary of the Phase 2 area. The following observations are drawn from the current indicator parameter concentrations and the concentration versus time plots illustrated:

– Recent indicator parameter concentrations at OW46B-13 for alkalinity, chloride, hardness, and, manganese are elevated in comparison to background levels, indicating possible minor landfill-related impacts on groundwater quality in this vicinity. Increasing trends of these parameters are present.
– Previous monitoring results indicated alkalinity, hardness, chloride, iron, and manganese at concentrations above background for OW47-13. Decreasing or stable concentrations of each indicator parameter is present. Monitoring results for indicator parameters at OW47-13 are at or slightly below background concentrations in 2023. Current data shows that landfill-derived impacts are not present at this location.

Previous monitoring reports have noted that monitoring well OW20-89, located in the northern corner of the Stage 1 cell, was damaged in the spring of 2012. Access issues related to the development of the Stage 1 cell have prevented repairs to the well and thus groundwater sampling and hydraulic monitoring has not been completed since 2011. Once safe to access, the well should be repaired.

It is recommended that monitoring wells OW20-89 (once accessible and repaired) and OW43-09 be removed from the water quality portion of the monitoring program. The trigger monitoring wells, OW46A/B-13 and OW47-13, provide an adequate representation of water quality and migration of potential migration of landfill impacts in the west of the Phase 2 Area. Both should continue to be maintained and used for water level monitoring.

***Southern Phase 2 Boundary***

Historical monitoring results from the wells located near the southern limit of the Phase 2 area shows water quality similar to background. As per recommendations made in the 2009 AMR (CRA, 2010), OW25-00, OW26-00, and OW27-00 were incorporated into the semi-annual sampling portion of the monitoring program as of the 2010 monitoring period. Monitoring well OW26-00 was abandoned in 2011 prior to the excavation of the Stage 1 cell and OW25-00 was inadvertently destroyed. To ensure adequate monitoring of the southern Phase 2 boundary, an additional two monitoring wells, OW25R-13 and OW45-13, were installed in the fall of 2013.

The following table summarizes the groundwater analytical results for samples collected during the current reporting period at OW25R-13, OW45-13, and OW27-00 (spring | fall):

| Parameter (mg/L) | ODWS | OW25R-13 | OW45-13 | OW27-00 |
|---|---|---|---|---|
| Alkalinity | 30 – 500 | 296 \| 256 (258) | 245 \| 279 | 466 \| 480 |
| Ammonia | - | <0.1 \| 0.1 (0.1) | <0.1 \| <0.1 | 0.1 \| 0.2 |
| Chloride | 250 | 42 \| 32 (32) | 16 \| 48 | 56 \| 58 |
| Hardness | 80 – 100 | 381 \| 297 (300) | 253 \| 318 | 531 \| 498 |
| Iron | 0.30 | 1.03 \| 0.199 (0.154) | <0.007 \| 0.035 | **3.9 \| 2.81** |
| Manganese | 0.05 | 0.113 \| 0.119 (0.111) | 0.00858 \| 0.0881 | **2.84 \| 2.38** |

Notes:
**Bold** concentrations indicate exceedances of the ODWS.
( ) indicates duplicate samples.
- indicate parameter was not analyzed or no information available.

The following observations are drawn from the current indicator parameter concentrations and the concentration versus time plots illustrated on Figure 6.13:

– Concentrations of many of the indicator parameters at OW25R-13 demonstrate stabilizing or decreasing trends with the exception of overall chloride trends. Concentrations of alkalinity, ammonia, and hardness at OW25R-13 are similar or below to background; however, chloride, iron, and manganese are above background.

– Concentrations of chloride and manganese above background at OW45-13. The remaining indicator parameters are at or below background levels.
– Slightly elevated concentrations of alkalinity, chloride, and hardness are detected in samples collected from OW27-00. In addition, manganese and iron are elevated in OW27-00. Ammonia concentrations are similar to background levels.
– Concentrations of chloride are elevated and increasing in each of the southern Phase 2 boundary wells.

The results from OW27-00 indicate water quality has been altered by the landfill. Concentrations trends from OW45-13 indicate some road-salting impacts. Results from OW25R-13 show indication of very minor landfill-derived impacts.

The following table summarizes the groundwater analytical results from the samples collected from monitoring well OW28-00 (spring | fall).

| Parameter (mg/L) | ODWS | OW28-00 |
|---|---|---|
| Alkalinity | 30 – 500 | 248 \| 291 |
| Ammonia | - | <0.1 \| <0.1 |
| Chloride | 250 | 68 \| 160 |
| Hardness | 80 – 100 | 315 \| 389 |
| Iron | 0.30 | 0.036 \| 0.011 |
| Manganese | 0.05 | 0.00207 \| 0.0006 |
| Note:<br>**Bold** concentrations indicate exceedances of the ODWS.<br>- indicate parameter was not analyzed or no information available. | | |

The following observations are drawn from the current indicator parameter concentrations and the concentration versus time plots illustrated on Figure 6.14:

– With the exception of chloride, the indicator parameter concentrations in groundwater samples collected from OW28-00 have generally been comparable to background concentrations since the well was installed.
– Chloride concentrations have been increasing since 2018 to historically high levels in 2023. The cause of this trend is unsure but follows a similar pattern to the other southern boundary wells.
– The historical high in manganese in November 2021 is an erroneous result as all subsequent results have been similar to background and historical concentrations.
– Conductivity is also noted to be following increasing trends during recent monitoring years.

Increasing chloride and conductivity trends at OW28-00 are likely indicative of road-salting impacts. In the absence of other elevated leachate indicator parameters it is unlikely that monitoring well OW28-00 is impacted by the landfill.

***Bedrock***

Monitoring well OW37-09 is screened within the upper fractured portion of the shallow bedrock aquifer. Water quality samples collected from this location are representative of the shallow bedrock aquifer at the Site. The following table summarizes the groundwater analytical results from samples collected during the current reporting period (spring | fall):

| Parameter (mg/L) | ODWS | OW37-09 |
|---|---|---|
| Alkalinity | 30 – 500 | 182 \| 181 |
| Ammonia | - | 0.1 \| 0.2 |

| Parameter (mg/L) | ODWS | OW37-09 |
|---|---|---|
| Chloride | 250 | 15 \| 17 |
| Hardness | 80 – 100 | 393 \| 393 |
| Iron | 0.30 | 0.223 \| 0.217 |
| Manganese | 0.05 | 0.0043 \| 0.00404 |
| Note:<br>**Bold** concentrations indicate exceedances of the ODWS.<br>- indicate parameter was not analyzed or no information available. | | |

The following observations are drawn from the current indicator parameter concentrations and the concentration versus time plots illustrated on Figure 6.15:

– Slightly elevated chloride, iron, and manganese concentrations have been reported in the bedrock well. In the absence of elevated hardness and alkalinity and consistent levels of chloride, the elevated concentrations are not interpreted to be related to the landfill.
– Overall concentration trends have been consistent at this location.

Based on the ongoing monitoring results and the presence of the substantial thickness of low permeability clay till aquitard unit separating the bedrock aquifer from the shallow groundwater unit, the water quality in samples collected from OW37-09 is interpreted to be representative of the natural water quality within the bedrock aquifer, and not the result of landfill-derived impacts.

The bedrock water quality results vary from year to year. Concentrations of ammonia, hardness, and iron appear to be variable from event to event; however, the cause for the change in water quality is unknown. Results continue to demonstrate the absence of landfill related water quality issues.

### 6.2.2 Surface Water Quality

Surface water samples have historically been collected from three locations within the North Penetangore River (SW1, SW2, and SW3). SW4 is located within a tributary of the North Penetangore River located to the south of the Site. This tributary is interpreted to be largely fed by surface water and groundwater discharge from the wetland located to the south of the Phase 2 area.

In 2007, surface water sample locations SW5 and SW6 were added to the monitoring program. These monitoring locations are located west of the landfill footprint. SW5 is located within a small intermittent creek that flows west of monitoring well OW7-83. SW6 is located in a separate intermittent creek that flows to the west of the southern extent of the Phase 1 area. Ultimately, SW6 flows into a deeply incised gully that drains into the North Penetangore River. The locations of the six surface water sampling points are shown on Figure 1.2.

The following table summarizes the surface water analytical results in the North Penetangore River during the current reporting period (spring │ fall):

| Parameter (mg/L) | PWQO | SW1 (upstream) | SW2 (midstream) | SW3 (downstream) |
|---|---|---|---|---|
| Alkalinity | -- | 234 \| 281 | 233 \| 284 | 236 \| 285 |
| Ammonia | -- | <0.1 \| <0.1 | <0.1 \| <0.1 | <0.1 \| <0.1 |
| Chloride | -- | 15 \| 19 | 15 \| 19 | 16 \| 20 |
| Hardness | -- | 300 \| 340 | 303 \| 348 | 305 \| 337 |
| Iron | 0.3 | 0.124 **\| 1.02** | 0.104 \| **0.626** | 0.136 \| **0.797** |

| Parameter (mg/L) | PWQO | SW1 (upstream) | SW2 (midstream) | SW3 (downstream) |
|---|---|---|---|---|
| Manganese | -- | 0.0114 \| 0.02551 | 0.0129 \| 0.0178 | 0.0148 \| 0.01877 |
| Phosphorus | 0.01 – 0.03(a) | 0.018 **\| 0.122** | 0.016 **\| 0.107** | **0.018** \| **0.106** |
| Phenolics | 0.001 | <0.001 \| <0.001 | 0.001 \| <0.001 | <0.001 \| <0.001 |
| DOC | -- | 4 \| 5 | 4 \| 5 | 4 \| 5 |

Notes:

**Bolded** concentrations indicated exceedances of the PWQO.

(a) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

Total Phosphorus is provided in the metals analysis.

– No PWQO for the given parameter.

The following table summarizes the additional on-Site surface water analytical results during the current reporting period (spring │fall):

| Parameter (mg/L) | PWQO | SW4 (tributary) | SW5 (on-Site) | SW6 (on-Site) (2022)* |
|---|---|---|---|---|
| Alkalinity | -- | 323 \| 309 | - \| 372 | 376 \| - |
| Ammonia | -- | <0.1 \| <0.1 | - \| 1.1 | <0.1 \| - |
| Chloride | -- | 42 \| 47 | - \| 37 | 13 \| - |
| Hardness | -- | 350 \| 342 | - \| 1590 | 503 \| - |
| Iron | 0.3 | 0.053 \| 0.06 | **- \| 118** | **0.554** \| - |
| Manganese | -- | 0.0116 \| 0.01652 | - \| 3.58 | 0.039 \| - |
| Phosphorus | 0.01 – 0.03(a) | 0.007 \| 0.005 | - \| **1.85** | **0.03** \| **-** |
| Phenolics | 0.001 | <0.001 \| <0.001 | - \| <0.001 | <0.001 \| **-** |
| DOC | -- | 5 \| 4 | - \| 4 | 3 \| - |

Notes:

**Bolded** concentrations indicated exceedances of the PWQO.

(a) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

Total Phosphorus is provided in the metals analysis

- Sample not taken; SW5 had insufficient flow for sampling

-- No PWQO for the given parameter

* SW6 was not sampled during 2023, 2022 data is presented

The historical monitoring results from samples collected from the North Penetangore River, illustrated on Figure 6.16, have demonstrated relatively consistent water quality since 1983, when monitoring of surface water quality in the river began. A slight increase in chloride and sodium in the upstream location, SW1, has been attributed to road salting activities. As indicated above and in Figure 6.16, surface water quality at upstream monitoring location SW1 is similar to the water quality at downstream monitoring locations SW2 and SW3.

Figure 6.17 presents the current surface water analytical results from the samples collected at SW4, located within the tributary in the wetland to the south of the landfill footprint. Concentrations for SW4 are generally similar to or only slightly elevated above those observed within the North Penetangore River. Concentrations of chloride have shown increasing trends in recent monitoring events. This is more likely related to road-salting in the absence of other increasing trends.

The current analytical surface water quality within the on-Site surface water monitoring locations, SW5 and SW6, illustrated on Figure 6.18, indicates the presence of more elevated indicator parameter concentrations in comparison to surface water quality within the North Penetangore River. Water quality SW5 is generally worse than SW6 with higher concentrations of all landfill indicator parameters. Significant increases in iron and manganese concentrations were observed in 2023. The more elevated concentrations are interpreted to be indicative of a mild to moderate landfill-related influence on surface water quality in these intermittent streams. SW5 water samples were not collected in spring 2023 due to dry conditions. SW6 water samples have not been collected since the spring 2022 event due to dry conditions.

The analytical results for samples collected from the upstream location at SW1 indicate an upstream source of mildly elevated indicator parameters in the North Penetangore River. Analysis of samples collected from the midstream and downstream locations at SW2 and SW3 show similar parameter concentrations indicating that no additional significant contribution to the river is being caused by landfilling activities.

#### 6.2.2.1 Surface Water Quality - Stormwater Management Ponds

As previously mentioned, stormwater management ponds, SWP-1 and SWP-2 were constructed in 2011 and 2012 respectively. Both ponds operate under ECA, No. 1731-B9ZKPU, which is separate from the landfilling ECA for the KWMC. The ECA stipulates that the ponds be sampled three times per year for various general chemistry, total metals, and field parameters.

Samples were collected from both ponds in May, August, and November during the current monitoring period. The following table summarizes the analytical results during the current reporting period (spring │summer | fall):

| Parameter (mg/L) | PWQO | SW1 (upstream) | SWP-1 (Landfill) | SWP-2 (Entrance) |
|---|---|---|---|---|
| Alkalinity | -- | 234 \| 281 | 218 \| 551 \| 415 | 553 \| 223 \| 358 |
| Ammonia | -- | <0.1 \| <0.1 | <0.1 \| <0.1 \| 1.1 | 0.6 \| <0.1 \| 0.2 |
| Chloride | -- | 15 \| 19 | 45 \| 250 \| 78 | 270 \| 50 \| 160 |
| DOC | -- | 4 \| 5 | 8 \| 29 \| 3 | 29 \| 5 \| 14 |
| Hardness | -- | 300 \| 340 | 268 \| 614 \| 488 | 584 \| 257 \| 362 |
| Iron | 0.3 | 0.124 **\| 1.02** | 0.184 \| **0.447 \| 1.59** | 0.175 \| 0.201 \| 0.183 |
| Phenolics | 0.001 | <0.001 **\|** <0.001 | **0.002** \| <0.001 \| <0.001 | **0.002** \| <0.001 \| <0.001 |
| Phosphorus | 0.01 – 0.03 (a) | 0.018 **\| 0.122** | 0.019 \| **0.339** \| 0.025 | **0.198** \| **0.038 \| 0.048** |

Notes:

**Bolded** concentrations indicated exceedances of the PWQO.

(6) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

Total Phosphorus is provided in the metals analysis

\- No PWQO for the given parameter

Figure 6.19 and the summary table above show that concentrations of key leachate indicator parameters are variable but are elevated above background concentrations when comparing SWP-2 and the North Penetangore River. SWP-2 is located near the scale house and away from the landfill. Landfill impacts in the pond are not possible; however, overflows from the LTF and spills from the scale house and public drop-off bins are possible. The pond is typically stagnant and is subject to evaporative conditions where concentrations of indicator parameters will increase during dry periods. Figure 6.19 illustrates variable water quality in the pond with overall consistent trends. It is noted that the spring 2023 sample results show elevated concentrations of many indicator parameters. These may indicate some influence (possibly from the previous LTF overflow); however, concentrations returned to levels comparable to background in the two subsequent samples.

A comparison of SW1 and SWP-1 typically show similar water quality. The summer sample collected from SWP-1 was collected after the Municipality dredged the pond as part of the Stage 2C construction works. Differing water quality is interpreted to be related to that work and not landfill derived impacts.

Continued sampling at both locations is required for water quality trend analysis; however, water quality impacts may be present in SWP-2.

#### 6.2.2.2 Surface Water Quality – Groundwater Discharge

As discussed previously, the two GWITs were built to control groundwater seepage into the Phase 2, Cell 1 area. Groundwater from the GWITs ultimately flow into the tributary located to the south of the landfill footprint (which is represented by SW4) and subsequently into the North Penetangore River. Therefore, water samples collected from the original GWIT are compared to the PWQOs. The second GWIT drains into SWP-1, which ultimately drains into the tributary and the North Penetangore River. The discharge point from the second GWIT into SWP-1 is at an elevation below the water surface, thus sampling is not practical.

Table 6.4 provides a summary of the analytical results from the original GWIT. The following table summarizes the analytical results during the current reporting period.

| Parameter (mg/L) | PWQO | GWIT |
|---|---|---|
| Alkalinity | -- | 370 \| 241 |
| Ammonia | -- | <0.1 \| <0.1 |
| Chloride | -- | 44 \| 31 |
| Hardness | -- | 419 \| 271 |
| Iron | 0.3 | 0.05 \| 0.097 |
| Manganese | -- | 0.00188 \| 0.01 |
| Notes:<br>**Bolded** concentrations indicated exceedances of the PWQO.<br>-- No PWQO for the given parameter | | |

Figure 6.20 illustrates the concentrations of leachate indicator parameters at SW4 and the GWIT. While indicator parameter concentrations in the GWIT are variable, they are generally comparable to SW4.

As discussed above, concentrations at SW4 are generally similar to or only slightly elevated above those observed within the North Penetangore River and there is little to no difference between SW3 and SW2 (upstream and downstream of the confluence with the tributary that SW4 is in). Thus, the discharge of the GWIT is not having a significant influence on SW4 tributary and no influence on the North Penetangore River.

It is also important to note that the LTF also discharges into the wetland upstream of SW4. Thus, SW4 represents water quality after the LTF and GWIT. Similar water quality at SW3 and SW2 shows that neither discharge is having a significant influence on surface water quality in the N. Penetangore River.

### 6.2.3 Volatile Organic Compounds

The leachate holding tank is sampled for VOCs annually at the KWMC while groundwater and surface water is sampled for VOCs once every 2 years (See Table 4.1 for a listing of the groundwater locations currently included). A summary of the leachate, groundwater, and surface water VOC analytical results are provided in Tables 6.5, 6.6, and 6.7.

### 6.2.3.1 Leachate - Volatile Organic Compounds

As part of the Site's ECA, leachate samples are collected and analyzed for VOCs on an annual basis during the spring monitoring event. In 2023, leachate VOC sampling was missed due to oversight. A summary of the VOC analytical results for the samples collected between 2012 and 2022 is provided in Table 5.6. Samples were analyzed for select VOC parameters only.

The following table summarizes the VOC detections made in the leachate samples collected between 2013 and 2022, the 2022 data is also presented in lieu of missing 2023 data:

| Parameter (µg/L) | ODWS | Leachate Holding Tank | |
|---|---|---|---|
| | | 2013 - 2022 | July 3, 2022 |
| 1,4-Dichlorobenzene | 5/1 (MAC/AO) | <0.50 – 0.68 | <20 |
| Benzene | 1 (MAC) | 1.28 – 3.6 (<10*) | <20 |
| Methylene Chloride | 50 (MAC) | <0.5 – 10.7 (<100*) | <20 |
| Toluene | 60/24 (MAC/AO) | 3.5 - 435 | <20 |
| Vinyl Chloride | 1 (MAC) | <0.2 – 2.20 | <8 |

Notes:
**Bold** concentrations indicate exceedances of the ODWS.
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e., colour, taste, smell).
- parameter was not included in the sample analysis
(*) – detection limits in 2013 were raised due to dilution

Concentrations of VOCs are interpreted to be within normal ranges for moderate strength leachate derived from residential waste.

### 6.2.3.2 Groundwater and Surface Water - Volatile Organic Compounds

Most recently, VOCs analysis on groundwater and surface water samples was completed in 2022. The next VOC sampling/analysis should be completed in 2024.

As shown in Tables 5.7 and 5.8, all VOCs in 2022 were below their laboratory reporting limit in groundwater and surface water with the following exceptions:

OW6-83 - benzene

OW48-13 – toluene

Past VOC results have shown low level BTEX (benzene, toluene, ethylbenzene, and xylene) detections.

VOC samples are collected in groundwater biennially and the next samples will be collected in 2024. The current and historical VOC results show that VOC impacts to groundwater are very minor and are limited to the immediate vicinity of the landfill footprint. Thus, it is recommended that VOC analysis be completed only at the wells located in the immediate vicinity of the landfill footprint. It is recommended that additional VOC sampling be completed at downgradient monitoring wells if increasing trends of concentrations is observed in the wells found adjacent to the landfill footprint (e.g., OW7-83).

It is recommended that the next VOC sampling event in 2024 include the following locations:

– North of Phase 1 – OW24-98 and OW8-88
– West of Phase 1 – OW6-83, OW7-83, OW31-07, and OW32-07
– Central portion of the Site - OW16-89, and OW33-07
– West of Phase 2 – OW46B-13 and OW47-13
– South of Phase 2 – OW25R-13

Please note that the VOC monitoring program will continue as is (i.e., the changes recommended above will not be implemented) until the Municipality and/or GHD receive approval from the MECP.

## 6.3 Landfill Gas Monitoring

Landfill gas monitoring is not currently completed at the KWMC. The closest buildings that are at risk of landfill gas hazards are located within the Material Recovery Centre. Between the landfill and the Material Recovery Centre is a wetland area that contains a stream with a base flow. The potential for landfill gas to migrate past this hydraulic boundary is low. Based on the distance to the buildings and the barrier created by the wetland, it is unlikely that lateral landfill gas migration would occur to the buildings. Therefore, landfill gas monitoring is not recommended at this time.

# 7. Groundwater Compliance Assessment

### 7.1.1 Reasonable Use Criteria Assessment

MECP Guideline B-7, entitled *Incorporation of the Reasonable Use Concept into the MOEE Groundwater Management Activities*, regulates the allowable effects, which a landfill site can have on groundwater in the surrounding environment (MOEE, 1994). The Reasonable Use Concept (RUC) maximum concentration of a particular contaminant that is acceptable in the groundwater beneath the adjacent property (to the Site) is calculated in accordance with the following relationship as outlined in related Guideline B-7-1 (*Determination of Contaminant Limits and Attenuation Zones)*:

$$MABC = Cb + x(Cr - Cb)$$

Where:

MABC = Maximum Acceptable Boundary Concentration acceptable in groundwater on adjacent property (the term Cm, maximum acceptable concentration, is used in Guideline B-7-1)

Cb = background concentration of a particular groundwater contaminant before it has been affected by human activity

Cr = maximum allowable concentration in groundwater as per Ontario's water management guideline deemed appropriate for reasonable use at the site in question; for this Site, this is the ODWS of the particular contaminant

x = 0.25 for health related parameters, 0.5 for non-health related and other parameters

Therefore, the allowable concentrations for groundwater leaving a site determined through the MABC calculation are site-specific. Guideline B-7 also states that if background water quality is higher than ODWS guidelines where the water may be used for consumption, the landowner or user is responsible to ensure water quality is not impacted beyond what is already present.

OW48-13 and OW49-13 represent background groundwater quality flowing on to the Site. Both locations were installed in 2013. The 2019 to 2023 data has been used to calculate 5-year, median background concentrations. It is recommended that the MABC values be updated every 3 to 5 years to account for natural fluctuations in the background groundwater conditions (to be updated in 2028).

MABC values have also not been determined for Operational Guidelines parameters (alkalinity, hardness, and pH) as well as temperature as the ODWS limits apply more specifically to water treatment facilities and not groundwater sampled from monitoring wells. Applicable MABC values have been included in Table 7.1.

The monitoring wells located along the northern boundary of the Phase 1 area of the Site provide downgradient monitoring locations. While not specifically along the property boundary, these wells represent groundwater conditions closest to the northern boundary. Monitoring wells OW2-83, OW3-83, OW4-83, OW29-07, OW19-89, and OW30-07 will be used in the RUC assessment. It should be noted that the downgradient receptor of concern for the western and southern areas of the Site are surface water receptors and thus this RUC assessment has been completed for the northern wells only. The following section addresses the implications of groundwater to surface water discharge to the surface water features to the north and west.

Parameters whose concentrations exceeded the MABC (see Table 7.1) along the northern property boundary wells during the reporting period are listed below:

***Northern Property Boundary Wells***

– OW2-83 – well was blocked and not sampled
– OW3-83 – none in fall (insufficient volume for sampling in spring)
– OW4-83 – insufficient volume for sampling
– OW19-89 – none (spring and fall)
– OW29-07 – none in fall (insufficient volume for sampling in spring)
– OW30-07 – manganese (fall) (insufficient volume for sampling in spring)

Upgradient water entering the Site is slightly impacted by agricultural activities as demonstrated by the slightly elevated nitrate, manganese, and chloride (OW48-13 and OW49-13). While some impacts in the downgradient wells are attributable to the landfill, elevated chloride, manganese, and nitrate concentrations are, at least partially, due to natural groundwater conditions and upgradient sources.

It should also be noted that the exceedances of the MABC are relatively minor and that the northern property boundary monitoring wells are located at least 50 m upgradient of the northern property boundary. It is anticipated that additional attenuation of landfill-related groundwater quality impacts will occur over this distance.

### 7.1.2 Trigger Level Program

As previously mentioned, Condition 10.3 of the KWMC's ECA states that a trigger level monitoring program is required to ensure timely detection and action in the event that landfill derived impacts to groundwater may affect off-Site groundwater quality.

The following locations are utilized for groundwater trigger well locations:

| Locations | Area |
|---|---|
| OW45-13 | South of Phase 2 |
| OW28-00 | Southwest of Phase 2 |
| OW46A/B-13 | West of Phase 2 |
| OW47-13 | West of Phase 2 |
| OW32-07 | West of Phase 1 |
| OW3-83 | North of Phase 1 |

The downgradient receptors for potential groundwater quality impacts are the North Penetangore River to the north and west and the on-Site wetland to the south. Groundwater compliance at the Site will be evaluated through the comparison of water quality data to the PWQOs. The PWQOs represent concentrations that are protective of freshwater aquatic life and are thus appropriate assessment criteria for groundwater that will ultimately discharge to surface water. The Municipality owns the land between the waste disposal footprint and the North Penetangore River. There are no drinking water wells located downgradient of the Site, or between the landfill footprint and the point of discharge to surface water.

The proposed trigger wells are located up to 100 m upgradient of the receiving water bodies. As such, there will be additional attenuation of landfill constituents between the trigger wells and the receiving water bodies. For this reason, the use of PWQOs as the trigger levels is considered conservative and appropriate. The proposed trigger level program includes the parameters summarized in the following table and as well as make up part of the Site's groundwater monitoring program. Applicable trigger levels are compared to 2023 samples in Table 7.2.

| Parameter | Trigger Level (mg/L) |
|---|---|
| Iron | 0.3 |
| Phosphorus | 0.02 |
| Unionized Ammonia | 0.02 |
| pH | 6.5 – 8.5 (std. units) |
| Phenolics | 0.005 |

The trigger level monitoring program will consist of a three-tiered approach. Each of the Tiers is described in detail in the following paragraphs.

***Tier I – Routine Monitoring***

Groundwater monitoring is conducted semi-annually at the Site for a comprehensive list of analytical parameters. The regular long-term monitoring program for the Site forms part of the Tier I monitoring and trigger levels will be established for selected leachate-indicator parameters based on the current understanding of the nature of landfill-related groundwater quality impacts at the Site. Trigger wells will be established in consideration of the updated configuration of the landfill footprint and downgradient receptors. It is anticipated that additional monitoring well installations may need to be completed to ensure a proper trigger well network is maintained for the Site.

Trigger levels will be established in relation to the selected compliance criteria for the Site, which for shallow groundwater are both the PWQOs and Reasonable Use Concept (RUC) (to the north of the landfilled area only).

***Tier II – Confirmation Monitoring***

If during a single semi-annual monitoring event, two or more trigger parameter concentrations exceed the established Tier I trigger concentrations at a single trigger location, the Tier II Confirmation Monitoring program will be implemented. The Tier II confirmation monitoring program consists of collecting water quality samples in duplicate from the location exhibiting the Tier I exceedance during the next scheduled monitoring event to confirm the Tier I exceedance of the two or more trigger parameters. If the duplicate samples indicate that Tier I trigger concentrations are not being exceeded then Tier I monitoring will resume. If the Tier I exceedance is confirmed, then the next step in the Tier II Confirmation Monitoring program will be to evaluate the degree, nature, and potential source(s) of trigger level impact identified in Tier I. The implications of the exceedances in terms of compliance with PWQOs and RUC, as well as the potential for downgradient off-Site impacts will be given consideration in the evaluation.

The comparison of the observed water quality to both generic criteria and the applicable regulatory compliance framework will be utilized as indicators of the timing and urgency of response. The comparison will also include parameter trend analyses over time and the contributions of sources of impact other than the landfill. If the Tier II Confirmation Monitoring program and subsequent evaluation indicate that the Site is out of Compliance or that significant surface water impairment is likely, then remedial measures will be required to be implemented.

***Tier III – Compliance Monitoring***

The Tier III Compliance Monitoring is a program designed to assess the effectiveness of the remedial measures implemented. The Tier III Compliance Monitoring program details would be determined in conjunction with the development and implementation of the preferred remedial measure. The compliance performance monitoring parameters, locations and monitoring frequency would be determined at the time of implementation of remedial measures.

### 7.1.3 Trigger Level Assessment

The following table summarizes the results of the Trigger Level Program sampling undertaken during the reporting period:

| Location ID | Sampling Tier 2023 | Trigger Level Exceedances | | Sampling Tier 2024 |
|---|---|---|---|---|
| | | Spring 2023 | Fall 2023 | |
| OW45-13 | I | - | - | I |
| OW28-00 | I | - | - | I |
| OW46A-13 | I | - | - | I |
| OW46B-13 | I | - | - | I |
| OW47-13 | I | - | - | I |
| OW32-07 | I | - | phosphorus | I |
| OW3-83 | I | phosphorus | - | I |

A Tier I trigger exceedance was noted for phosphorus at OW3-83 and OW32-07 in the spring and fall 2023 samples, respectively. There were no trigger exceedances for any other parameters and thus Tier II is not required. Historically phosphorus exceedances are noted at the two wells. As mentioned above upgradient water quality is slightly impacted by agricultural activities.

Tier I monitoring is recommended for 2024.

### 7.1.4 Groundwater Quality Upgradient of the North Penetangore River

As discussed in Section 1.3, the overburden is incised by surface water bodies in deep gullies and channels. These deep gullies and channels create hydraulic boundaries into which, shallow groundwater discharges. In terms of the KWMC, a large portion of the landfilled area is bound by the North Penetangore River, as well as a wetland to the south. Shallow groundwater within the silty sand unit is interpreted to largely discharge into the North Penetangore River and the wetland to the south.

Because shallow groundwater is believed to be discharging to surface in the vicinity of the wetland and the North Penetangore River, the analytical results of those waters should be compared to the Provincial Water Quality Objectives. *"… the PWQO are numerical and narrative criteria which serve as chemical and physical indicators representing a satisfactory level for surface waters (i.e., lakes and rivers) and, where it discharges to the surface, the groundwater of the Province."* The following section discusses water quality results in relation to the PWQO for wells in closest proximity to the point of discharge to surface water. In order to provide a more accurate representation of groundwater discharging to surface, four mini-piezometers were installed at shallow depths, adjacent to the river, at various points downgradient of the Phase 1 and 2 areas of the Site. Each of the mini-piezometers were hand driven to depths ranging from 1.07 to 1.25 mBGS. The following section discusses the groundwater sample results from the mini-piezometers and how they relate to surface water quality.

While the mini-piezometers provide the best representation of groundwater with the potential to discharge directly into the North Penetangore River, the shallow monitoring wells surrounding the landfill represent groundwater with the potential to discharge to ground surface and, via overland flow, enter the various gullies and channels and ultimately flow into the river. Thus, the monitoring wells that best represent groundwater that maybe discharging and flowing overland into the river are included in the discussion below.

In 2023 mini-piezometers were not sampled due to field staff being unable to safely access locations with the necessary field equipment to facilitate sample collection.

It should be noted that MP4-13 was destroyed after the fall 2017 monitoring event. Water quality upgradient of the mini-piezometer and in the North Penetangore River downgradient show little evidence of landfill related impacts reaching the river. Thus, no replacement piezometer is recommended at this time.

The following monitoring wells are completed within the shallow groundwater unit and are representative of groundwater that may potentially reach the North Penetangore River and southern wetland area: OW6-83 and OW7-83 (western Phase 1 boundary), OW2-83, OW3-83, OW4-83, OW19-89 (northern Phase 1 boundary), OW27-00, OW28-00 (southern Phase 2 boundary), and OW46B-13 and OW47-13 (western Phase 2 boundary).

Table 7.3 summarizes the 2023 groundwater analytical results, in comparison to the existing PWQOs. Background groundwater and surface water results from OW48-13, OW49-13, and SW1 are also provided for comparison purposes.

As indicated in Table 7.3, comparison of groundwater sample results to PWQOs indicates exceedances of iron, and phosphorus are common when comparing shallow groundwater quality to the PWQOs. Historical monitoring results have reported concentrations of dissolved phosphorus, field and lab pH levels above their PWQOs as well.

***Western Phase 1 Area***

As previously discussed, analytical results from OW6-83 are elevated well above background concentrations indicating the presence of landfill-related impacts. Concentrations decrease considerably when comparing further downgradient location OW19-89, to monitoring wells closer to the landfill footprint. This indicates that significant attenuation is occurring prior to groundwater reaching the North Penetangore River. In 2022 the mini-piezometers, MP3-13 (and formerly MP04-13), located alongside the North Penetangore River in the western and northern portions of the Phase 1 area, demonstrated groundwater quality that is generally comparable to background groundwater and surface water quality.

***Western Phase 2 Area***

Monitoring wells OW46B-13 and OW47-13 and mini-piezometers MP01-13 and MP02-13 provide the best representation of shallow groundwater quality along the western boundary of the Phase 2 area.

The current monitoring results from OW46B-13 and OW47-13 indicate water quality that is comparable or improved when compared to SW1. Results from OW47-13 indicate the presence of minor landfill-related impacts that are likely discharging and/or flowing overland into the North Penetangore River. Historical samples from MP01-13 and MP02-13 are generally comparable to those reported at SW1.

Shallow groundwater discharging into the North Penetangore River along the northern and western boundaries of Phase 1 and western boundary of Phase 2 enter the river between the upstream monitor SW1 and the mid-stream monitor, SW2. Concentrations of indicator parameters in both surface water monitoring locations are generally similar (both currently and historically). This demonstrates that the influx of any impacted groundwater, namely in the vicinity of MP01-13, MP02-13, and OW47-13, is not having a measurable effect on surface water quality.

***Southern Phase 2 Area***

Monitoring wells OW27-00 and OW28-00 provide the best representation of groundwater that may be discharging into the wetlands to the south of the Phase 2 area. Elevated concentrations of iron, manganese, and DOC have been reported in samples collected from OW27-00. This indicates the possibility of slight landfill-derived impacts at this location which may be discharging to the nearby creek. Groundwater quality in OW28-00 has been, in general, improved when compared to SW1 and as such is not interpreted to cause any negative impacts to the surface water in the wetland area to the south of the Phase 2 area.

Shallow groundwater discharging into the wetland area south of Phase 2 drains into a small tributary which flows into the North Penetangore River. The mouth of the tributary drains into the North Penetangore River in the vicinity of the eastern Property boundary upstream of surface water monitor SW3 and downstream of SW2. Water quality in the intermittent stream is monitored at SW4. As discussed in Section 6.2.2, the differences in water quality between the upstream and downstream surface water monitors SW2 and SW3 are negligible and thus the discharge of the tributary, represented by SW4, is not having a measurable effect on water quality within the North Penetangore River.

# 8. Annual Report Completion Checklist

Appendix D of the document entitled “Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water, Technical Guidance Document” (MOECC, November 2010) includes a monitoring and screening checklist which is intended to provide the MECP with a quick reference for Site information and relevant monitoring results for the monitoring period. A completed checklist is provided in Appendix I of this report. As there is still some uncertainty regarding the nature of the declaration included in the checklist, the checklist has not been signed, but has been completed, as possible, and is included for reference.

# 9. Conclusions and Recommendations

## 9.1 Conclusions

Based on the operational information and the water quality results presented in this report, the following conclusions are provided:

***Site Operation and Development***

– No major operational problems were identified at the Site during the current reporting period. GHD is unaware of any formal complaints made in 2023.
– Waste deposition continued within Stage 2B cell of the Phase 2 area.
– Construction of the Stage 2C cell began during the summer months of 2023 and is expected to be complete in 2024. Earthworks were completed in 2023 as were the connections to the groundwater control and leachate collections systems. Completion of the eastern sidewall and use of the cell is anticipated to occur in 2024.
– The current monitoring frequency and analytical parameter list is more than adequate. A number of reductions are recommended.
– Site Operations were completed in accordance with the D&O Plan approved for the Site. The Municipality has operated the Site in accordance with the Conditions of the Provisional ECA No. A272702, and with the inspection and reporting requirements of the Conditions.
– In 2023, a total of 4,144.33 tonnes of waste were accepted at the Site. Adjusting for the waste that was received but diverted, the actual amount that was deposited at the Site was approximately 3,183.98 tonnes.
– Based on the most recent survey information, the waste tonnages received to date, the five-year estimated bulk waste density (0.58 tonnes/$m^3$), and a 0.5 percent increase in year-to-year waste volumes being received, it is estimated that the Site have greater than 50 years of life remaining.
– The landfill expansion has not had an effect on the stability of the existing riverbank slope; however, the riverbed continues its meandering pattern, which could cause further localized riverbank/ slope erosion.

***Leachate Treatment Facility***

– The analytical results from surface water monitoring location SW4 indicate that there were no negative impacts on the tributary. Thus, there will be no negative impacts on the North Penetangore River related to the discharge of treated effluent.
– There were no complaints during the current reporting period.
– Two spills occurred at the leachate treatment facility during the reporting period (January 5, and April 12). A total of 7.3 $m^3$ of leachate was spilled during the events. In both instances, the overflow was managed appropriately and reported to the SAC. During the January 5 spill, additional sampling conducted showed that the leachate spill did not affect the surrounding surface water.

***Groundwater Flow***

- The geologic units identified on Site can be grouped into three main hydrogeologic units: a shallow groundwater unit, a clay till aquitard unit, and a shallow bedrock aquifer.
- Groundwater flow in the shallow groundwater unit occurs in a general semi-radial pattern originating along the eastern property boundary and radiating outwards towards the north, west, and south.
- A groundwater flow divide corresponding with a topographic high point and the general division between Phase 1 and 2 exists. Flow in the Phase 1 area is in general north to northwesterly direction toward the North Penetangore River. Shallow groundwater flow in the Phase 2 area is toward the west and southwest toward the wetland located to the south of Phase 2 and the North Penetangore River.
- A significant portion of groundwater is discharging from the shallow groundwater unit to the North Penetangore River in the north and west, while in the southern portion of the Site groundwater is interpreted to be discharging to surface, flowing into a wetland area, eventually discharging into the North Penetangore River.
- Based on the stratigraphic information and the low hydraulic conductivity of the aquitard (CRA, 2009), it is anticipated that groundwater flow across the aquitard is vertically downward and very slow.
- Regional information indicates that groundwater in the bedrock unit follows the general slope of the highly fractured and weathered bedrock surface towards Lake Huron to the west-northwest.

***Groundwater Quality***

- Leachate quality determined via samples collected from the leachate holding tank located along the western extent of the Phase 2 area, shows elevated concentrations of numerous general chemistry and total metals parameters, and demonstrates typical moderate to strong leachate within the Stage 1 cell.
- The analytical results for samples collected from monitoring wells completed within the shallow groundwater unit surrounding the Phase 1 area indicate that moderate landfill derived impacts are present immediately downgradient; however, significant leachate impacts have not reached the area north of Phase 1 in the vicinity of OW3-83, OW29-07, and OW30-07.
- The analytical results from samples collected from monitoring wells within the Phase 2 area indicate landfill-derived impacts to groundwater quality due to the historical disposal, and to a lesser extent possibly landfilling within Phase 1 and road salt.
- The analytical results from samples collected from monitoring well OW46B-13 located to the west of the Phase 2 area and instrumented in the shallow groundwater unit indicated an increasing trend of minor landfill-related groundwater impacts.
- There is some indication of worsening water quality to the west of the Phase 2 area expansion.
- Some trends of improving groundwater quality are noted in the northeastern portion of the Phase 1 area.
- Indicator parameter concentrations in the samples collected from the monitoring wells completed within the massive silt and clay till were generally at or just above background concentrations. Elevated concentrations of sulphate and DOC are believed to be naturally occurring. Increasing trends were noted at OW30-07 and OW31-07 for indicator parameters. Mild landfill impact is present in the silt and clay till.
- Water quality results at monitoring location OW37-09 are interpreted to be representative of natural water quality within the bedrock aquifer and not the result of landfill-derived impacts. Similarly, water quality results at monitoring well locations OW46A-13 are interpreted to be representative of natural water quality within the silt and clay till aquitard unit (St. Joseph's Till) and do not indicate landfill-derived impacts.
- The RUC evaluation indicates that off-Site environmental compliance with respect to groundwater quality is very likely based on the available data. The monitoring wells utilized in the RUC evaluation are located a minimum of 50 m upgradient of the northern Site limit and additional attenuation of the mild landfill-derived impacts observed is anticipated to occur prior to flowing off-Site.
- All trigger monitoring locations were in compliance with the TLP criteria.

***Surface Water Quality***

- The results of the surface water quality of the upstream location at SW1 indicate upstream sources of iron, phosphorus, and phenolics in the North Penetangore River.
- Mild landfill-related impacts are present within the on-Site surface water monitoring locations (SW5 and SW6).
- Water quality within the tributary in the wetland to the south of the landfill footprint (SW4) is similar to that observed within the North Penetangore River.
- The midstream and downstream locations (SW2 and SW3) show very similar parameter concentrations to those reported upstream, indicating no measurable contribution of impacts to the river is being caused by the landfill.
- Water quality in on-Site ponds SWP-1 and SWP-2 shows some elevated concentrations which indicate water quality alteration. Alterations at SWP-2 may be a combination of evaporative conditions and stagnant water and impacts related to LTF overflows or spills at the scale house and drop off bins. No landfill derived impacts are interpreted at SWP-1.
- Water quality in the GWIT is unlikely to have a significant detrimental effect on the surface water in the creek/tributary to the south of the landfill footprint or the North Penetangore River.

## 9.2 Recommendations

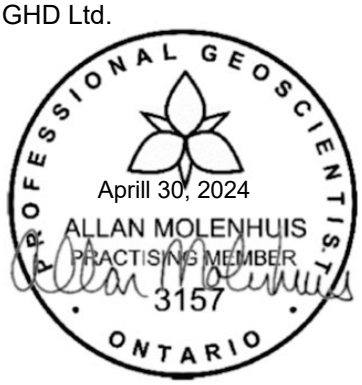
Based on the conclusions and information presented, the following recommendations are provided:

1. In 2024, hydraulic monitoring should continue across the Site; however, the number of locations included in the water quality sampling should be reduced. It is recommended that the following monitoring wells be removed from the water quality monitoring program:
    a. North of Phase 1 - OW4-89 and OW29-07
    b. East of Phase 2 (background) - OW17-89, OW49-13
    c. Central Portion of the Site (North of Phase 2) - OW16-89, OW9-88
    d. West of Phase 2 - OW20-89, and OW43-09
2. Continue to sample groundwater monitoring locations for analysis of VOC parameters once every two years during the fall monitoring event at a reduced list of monitoring locations. VOCs were analysed in 2022, thus, the next VOC groundwater sampling event will take place in 2024. VOC sampling at the Leachate Holding Tank should continue on an annual basis.
    a. VOC sampling should be discontinued at each of the surface water monitoring locations except for both stormwater management ponds (SWP-1 and SWP-2).
    b. VOC sampling should be limited to the following:
        – North of Phase 1 – OW24-98 and OW8-88
        – West of Phase 1 – OW6-83, OW7-83, OW31-07, and OW32-07
        – Central portion of the Site - OW16-89, and OW33-07
        – West of Phase 2 – OW46B-13 and OW47-13
        – South of Phase 2 – OW25R-14
3. SWP-1 and SWP-2 should continue to be sampled three times per year (between April 1st and November 30th) in accordance with the ECA. Samples should be collected following significant rainfall events.
4. Tier I sampling should continue in 2023 at all locations.
5. It is recommended that the Municipality continue to sample the LTF influent and effluent as specified in the ECA. Surface water quality at SW4 should continue to be sampled throughout 2024.
6. Regularly scheduled maintenance should also continue at the LTF throughout 2024 and, where appropriate, equipment should be calibrated as per the manufacturer's specifications.

7. Continue to conduct the regular Site inspection program during the 2024 reporting period to maintain adequate Site conditions.
8. Waste disposal operations should continue to follow the “Design and Operations Plan” (CRA, 2009).
9. It is recommended that the monitoring program for the Site continue to be re-assessed in conjunction with the development of additional Stages of the Phase 2 area.

All of Which is Respectfully Submitted,

GHD Ltd.





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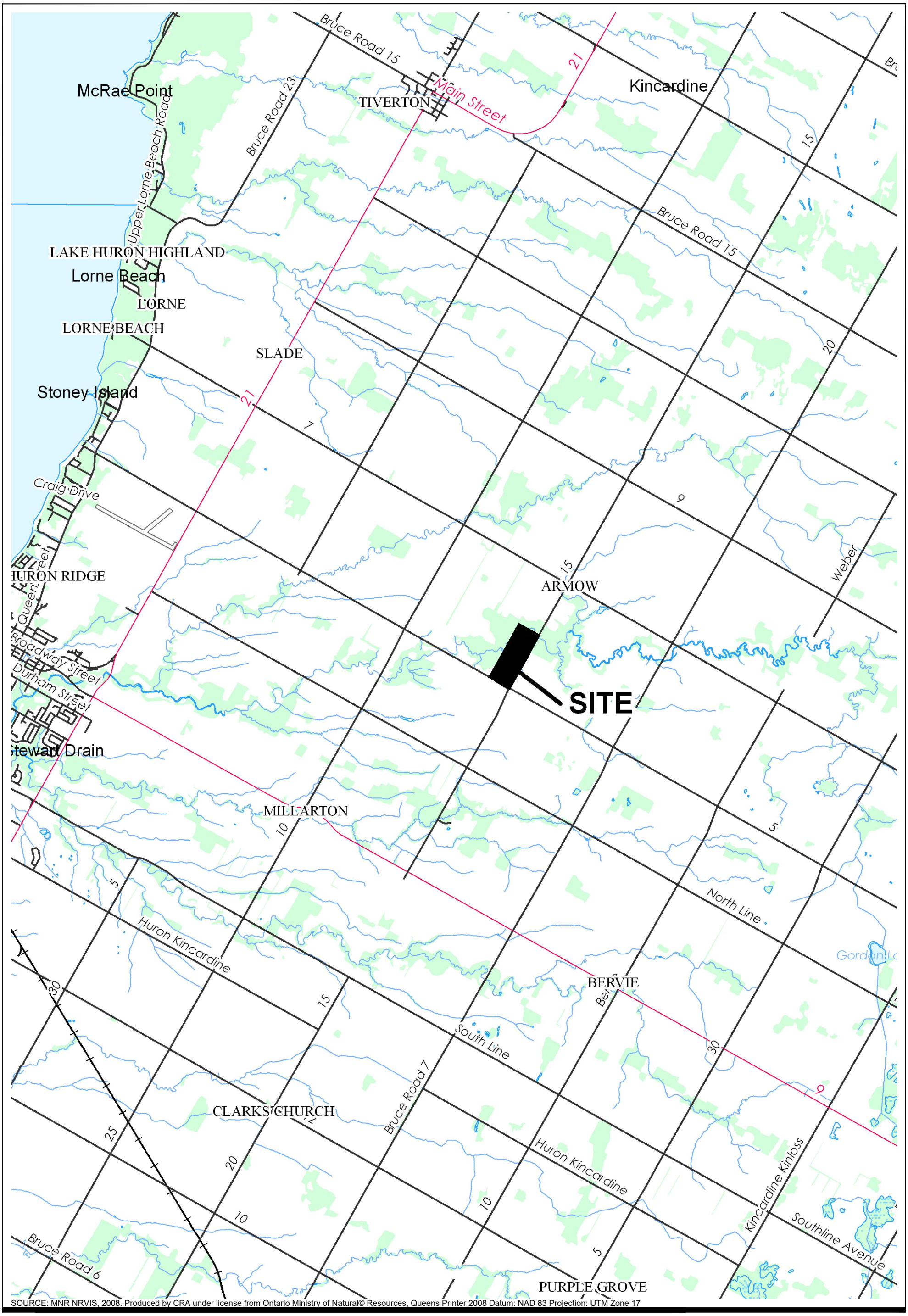
# Figures

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**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**
**2023 ANNUAL MONITORING REPORT**

Project No. **4074**
Date **March 2024**

**SITE LOCATION**

**figure 1.1**

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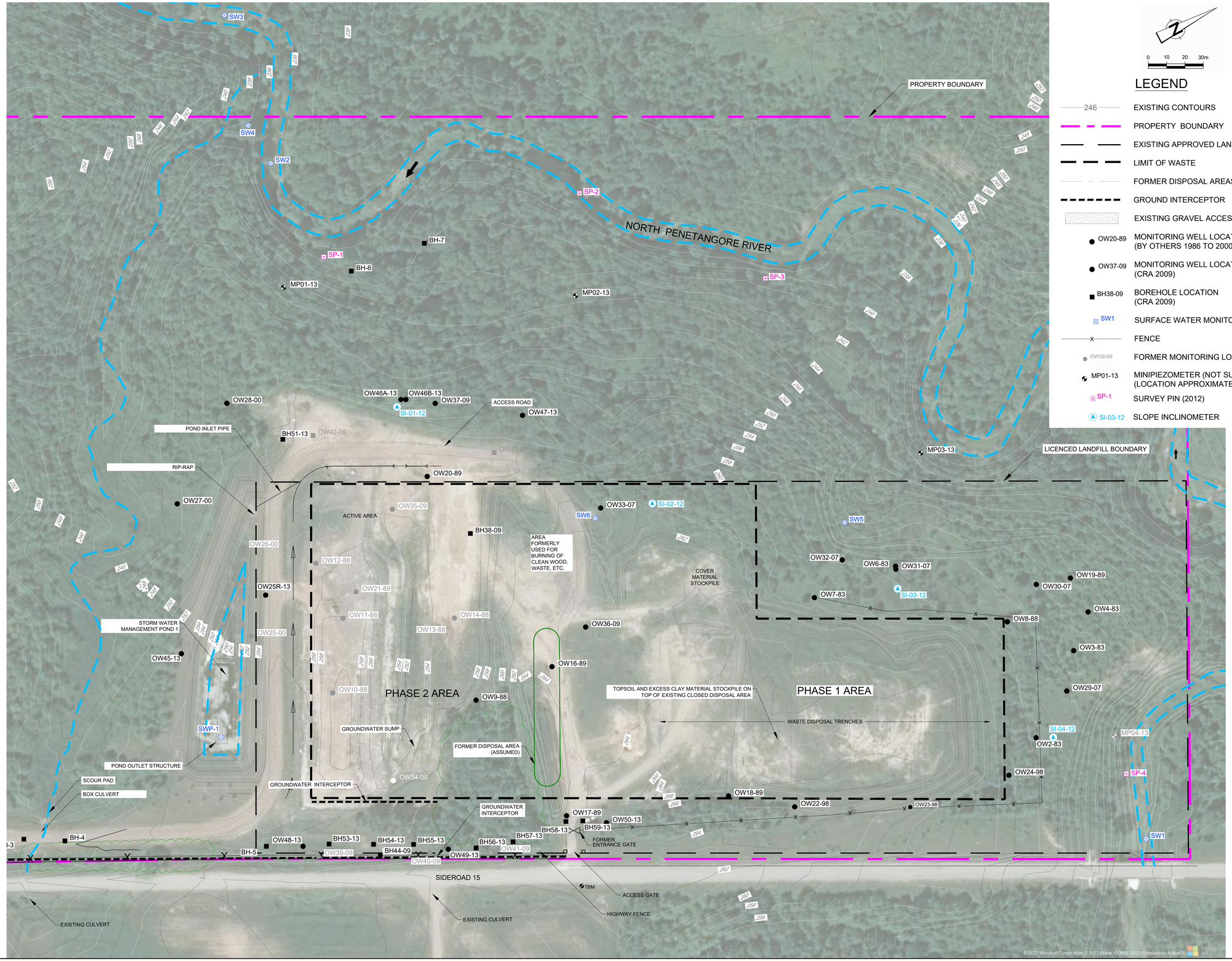


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## LEGEND

- 246 — EXISTING CONTOURS
- PROPERTY BOUNDARY
- EXISTING APPROVED LANDFILL BOUNDARY
- LIMIT OF WASTE
- FORMER DISPOSAL AREAS
- GROUND INTERCEPTOR
- EXISTING GRAVEL ACCESS ROADWAY
- OW20-89 — MONITORING WELL LOCATION (BY OTHERS 1986 TO 2000)
- OW37-09 — MONITORING WELL LOCATION (CRA 2009)
- BH38-09 — BOREHOLE LOCATION (CRA 2009)
- SW1 — SURFACE WATER MONITORING LOCATION
- FENCE
- OW39-09 — FORMER MONITORING LOCATION
- MP01-13 — MINIPIEZOMETER (NOT SURVEYED, (LOCATION APPROXIMATE)
- SP-1 — SURVEY PIN (2012)
- SI-03-12 — SLOPE INCLINOMETER

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GHD TOPOGRAPHIC SURVEY DECEMBER 4, 2017, OBM-MNR NRVIS, 2008, NAD 83 UTM ZONE 17

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| Author | S.HOLLAND | Designer | A. MOLEHUIS |
| Drafting Check | K. DHALIWAL | Design Check | B. KEMPEL |
| Project Manager | J. YARDLEY | Project Director | |

Client
**MUNICIPALITY OF KINCARDINE WASTE MANAGEMENT CENTRE**

Project
# 2023 ANNUAL MONITORING REPORT

| Date | Scale |
|---|---|
| MARCH 2024 | 1:1000 |

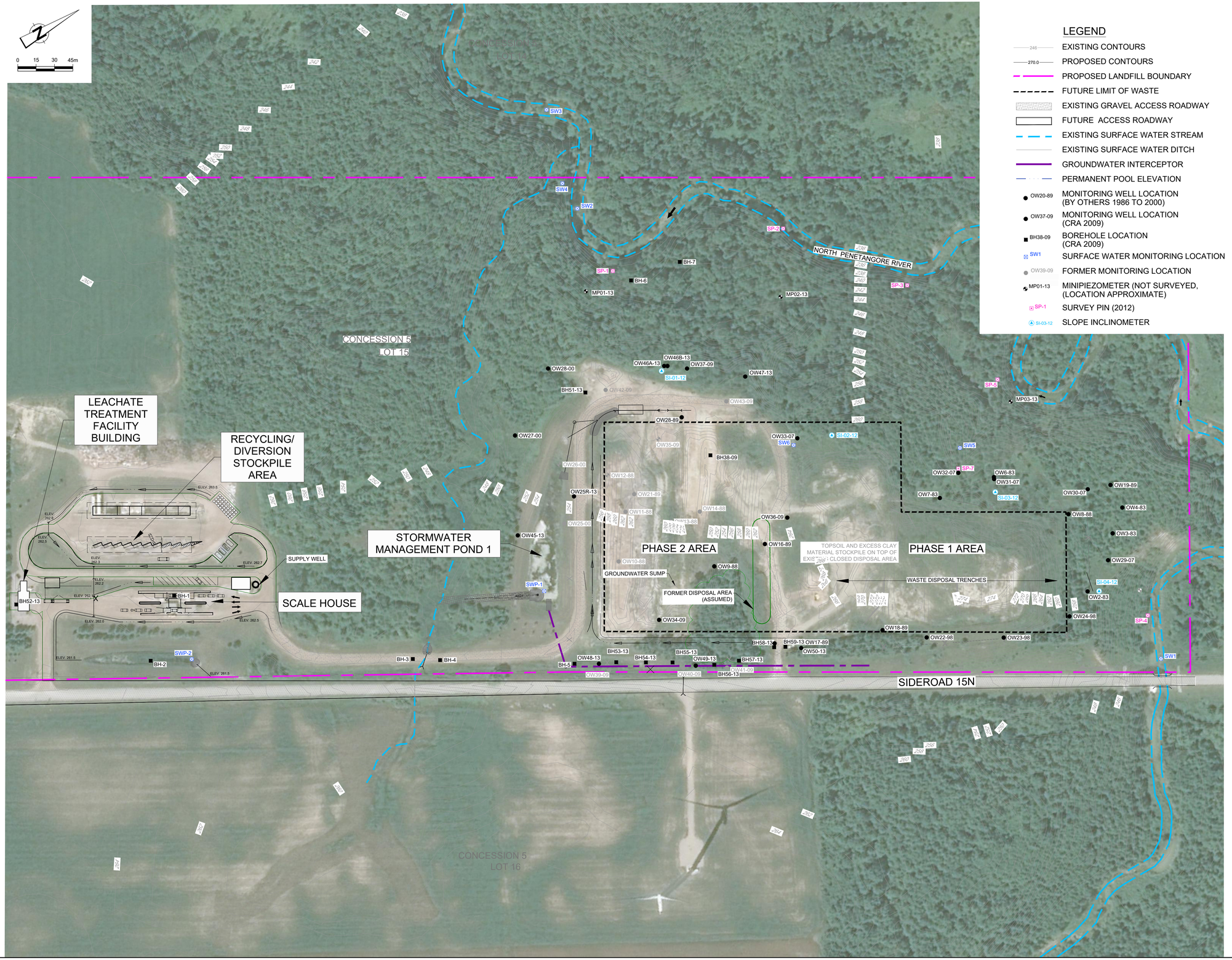
Project No.
**04074**

Title
## EXISTING SITE CONDITIONS

Size
**ANSI D**

Sheet No.
**FIGURE 1.2**

Plot Date: 11 March 2024 - 11:25 AM Plotted By: Ian Robertson Path and Filename: N:\CA\Waterloo\Projects\662\04074\Digital_Design\ACAD\Figures\RPT122\04074-GHD-00-00-RPT-EN-D102_WA-122.dwg

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Bar is 25mm on original size sheet
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SOURCE:

ALL STAGES LIDAR SURVEY BY GHD, DATED NOVEMBER 15, 2022, NAD 83 UTM ZONE 17.
FILE NAME: (V-TOPO-WARD 2-2023 EXISTING CONDITIONS FOR STAGE 2C CELL CONSTRUCTION REVISED 03-15-2023)

| No. | Issue | Checked | Approved | Date |
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| NO. - | | - | | - |
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| | | | |
|---|---|---|---|
| Author | S.HOLLAND | Designer | A. MOLEHUIS |
| Drafting Check | M. WOLFER | Design Check | B. KEMPEL |
| Project Manager | A. MOLEHUIS | Project Director | |

Client
**MUNICIPALITY OF KINCARDINE WASTE MANAGEMENT CENTRE**

Project
**2023 ANNUAL MONITORING REPORT**

| Date | Scale |
|---|---|
| MARCH 2024 | 1:1150 |

Project No.
**04074**

Title
**EXPANDED SITE PLAN**

Size
ANSI D

Sheet No.
**FIGURE 2.2**


0 10 20 30m

## LEGEND

- EXISTING CONTOURS
- PROPERTY BOUNDARY
- EXISTING APPROVED LANDFILL BOUNDARY
- LIMIT OF WASTE
- FORMER DISPOSAL AREAS
- GROUNDWATER INTERCEPTOR
- EXISTING GRAVEL ACCESS ROADWAY
- OW20-89 — MONITORING WELL LOCATION (BY OTHERS 1986 TO 2000)
- OW37-09 — MONITORING WELL LOCATION (CRA 2009)
- BH38-09 — BOREHOLE LOCATION (CRA 2009)
- FENCE
- GROUNDWATER FLOW DIRECTION
- 258 — SHALLOW GROUND WATER CONTOURS
- * — GROUND WATER ELEVATIONS NOT USED TO CREATE CONTOURS
- MP01-13 — MINIPIEZOMETER (NOT SURVEYED, LOCATION APPROXIMATE)
- SP-1 — SURVEY PIN
- OW34-09 — ABANDONED/DESTROYED MONITORING WELL LOCATION
- SI-03-12 — SLOPE INCLINOMETER

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SOURCE:

ALL STAGES LIDAR SURVEY BY GHD, DATED NOVEMBER 15, 2022, NAD 83 UTM ZONE 17.
FILE NAME: (V-TOPO-WARD 2-2023 EXISTING CONDITIONS FOR STAGE 2C CELL CONSTRUCTION REVISED 03-15-2023)

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| No. | Issue | Checked | Approved | Date |
|---|---|---|---|---|

| | | | |
|---|---|---|---|
| Author | **S.HOLLAND** | Designer | **A. MOLEHUIS** |
| Drafting Check | **M. WOLFER** | Design Check | **B. KEMPEL** |
| Project Manager | **A. MOLEHUIS** | Project Director | |

Client
**MUNICIPALITY OF KINCARDINE WASTE MANAGEMENT CENTRE**

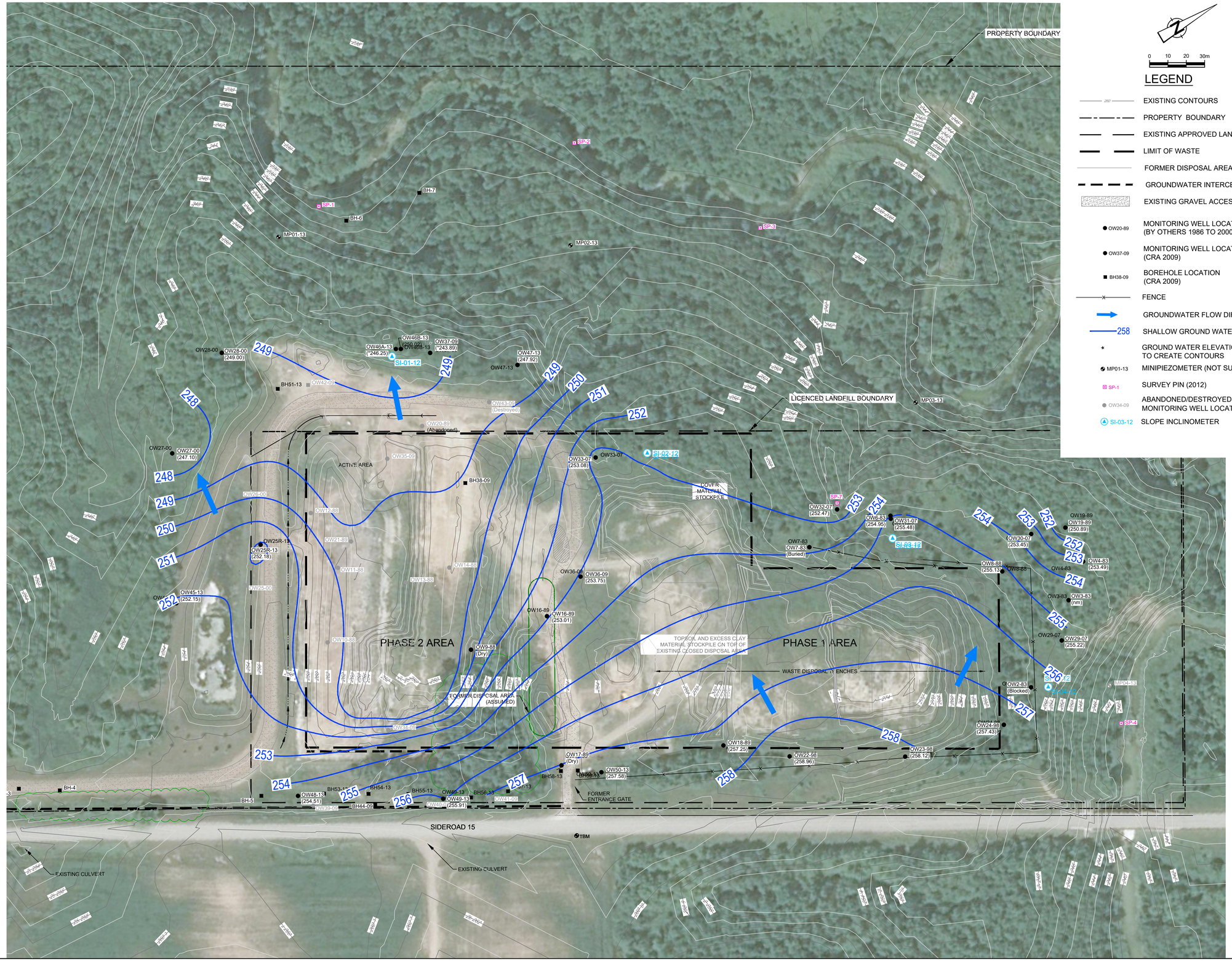
Project
**2023 ANNUAL MONITORING REPORT**

| | |
|---|---|
| Date **MARCH 2024** | Scale **1:1000** |
| Project No. **04074** | |

Title
**SHALLOW AQUIFER UNIT CONTOURS MAY 18, 2023**

Size **ANSI D**

Sheet No
**FIGURE 6.1**




0 10 20 30m

## LEGEND

- EXISTING CONTOURS
- PROPERTY BOUNDARY
- EXISTING APPROVED LANDFILL BOUNDARY
- LIMIT OF WASTE
- FORMER DISPOSAL AREAS
- GROUNDWATER INTERCEPTOR
- EXISTING GRAVEL ACCESS ROADWAY
- OW20-89 — MONITORING WELL LOCATION (BY OTHERS 1986 TO 2000)
- OW37-09 — MONITORING WELL LOCATION (CRA 2009)
- BH38-09 — BOREHOLE LOCATION (CRA 2009)
- FENCE
- GROUNDWATER FLOW DIRECTION
- 258 — SHALLOW GROUND WATER CONTOURS
- * — GROUND WATER ELEVATIONS NOT USED TO CREATE CONTOURS
- MP01-13 — MINIPIEZOMETER (NOT SURVEYED,
- SP-1 — SURVEY PIN (2012)
- OW34-09 — ABANDONED/DESTROYED MONITORING WELL LOCATION
- SI-03-12 — SLOPE INCLINOMETER

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SOURCE:

ALL STAGES LIDAR SURVEY BY GHD, DATED NOVEMBER 15, 2022, NAD 83 UTM ZONE 17.
FILE NAME: (V-TOPO-WARD 2-2023 EXISTING CONDITIONS FOR STAGE 2C CELL CONSTRUCTION REVISED 03-15-2023)

| No. | Issue | Checked | Approved | Date |
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| NO. - | | - | | - |
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| | | | |
|---|---|---|---|
| Author | S.HOLLAND | Designer | A. MOLEHUIS |
| Drafting Check | M. WOLFER | Design Check | B. KEMPEL |
| Project Manager | A. MOLEHUIS | Project Director | |

Client
**MUNICIPALITY OF KINCARDINE WASTE MANAGEMENT CENTRE**

Project
**2023 ANNUAL MONITORING REPORT**

| Date | Scale |
|---|---|
| MARCH 2024 | 1:1000 |

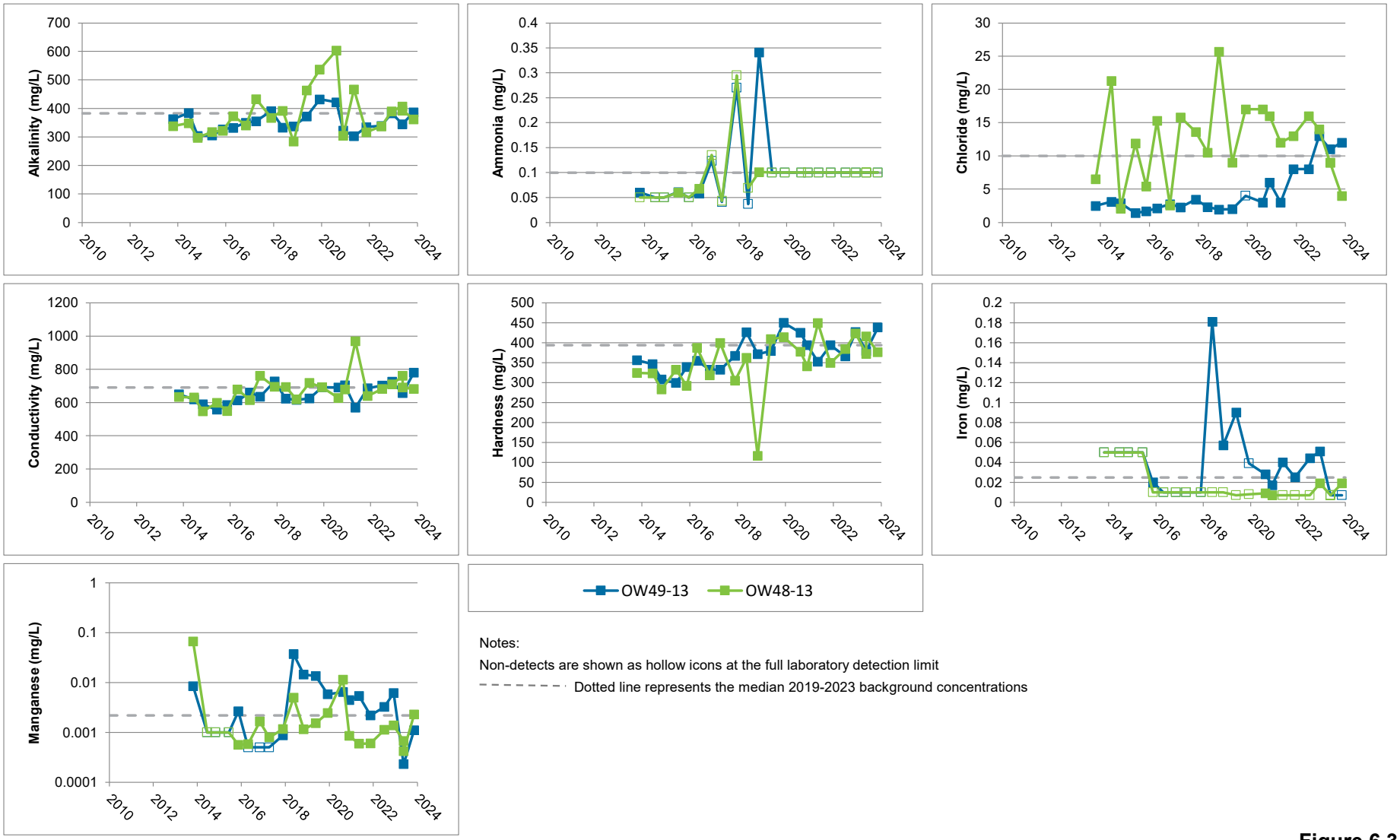
Project No.
04074

Title
**SHALLOW AQUIFER UNIT CONTOURS NOVEMBER 8, 2023**

Size
ANSI D

Sheet No.
**FIGURE 6.2**

Plot Date: 12 April 2024 - 9:50 AM Plotted By: Peter McLean Path and Filename: N:\CA\Waterloo\Projects\662\004074\Digital_Design\ACAD\Figures\RPT122\004074-GHD-00-00-RPT-EN-D105_WA-122.dwg




Notes:

Non-detects are shown as hollow icons at the full laboratory detection limit

Dotted line represents the median 2019-2023 background concentrations

**Figure 6.3A**
**Background Locations**
**OW48-13 and OW49-13 - Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

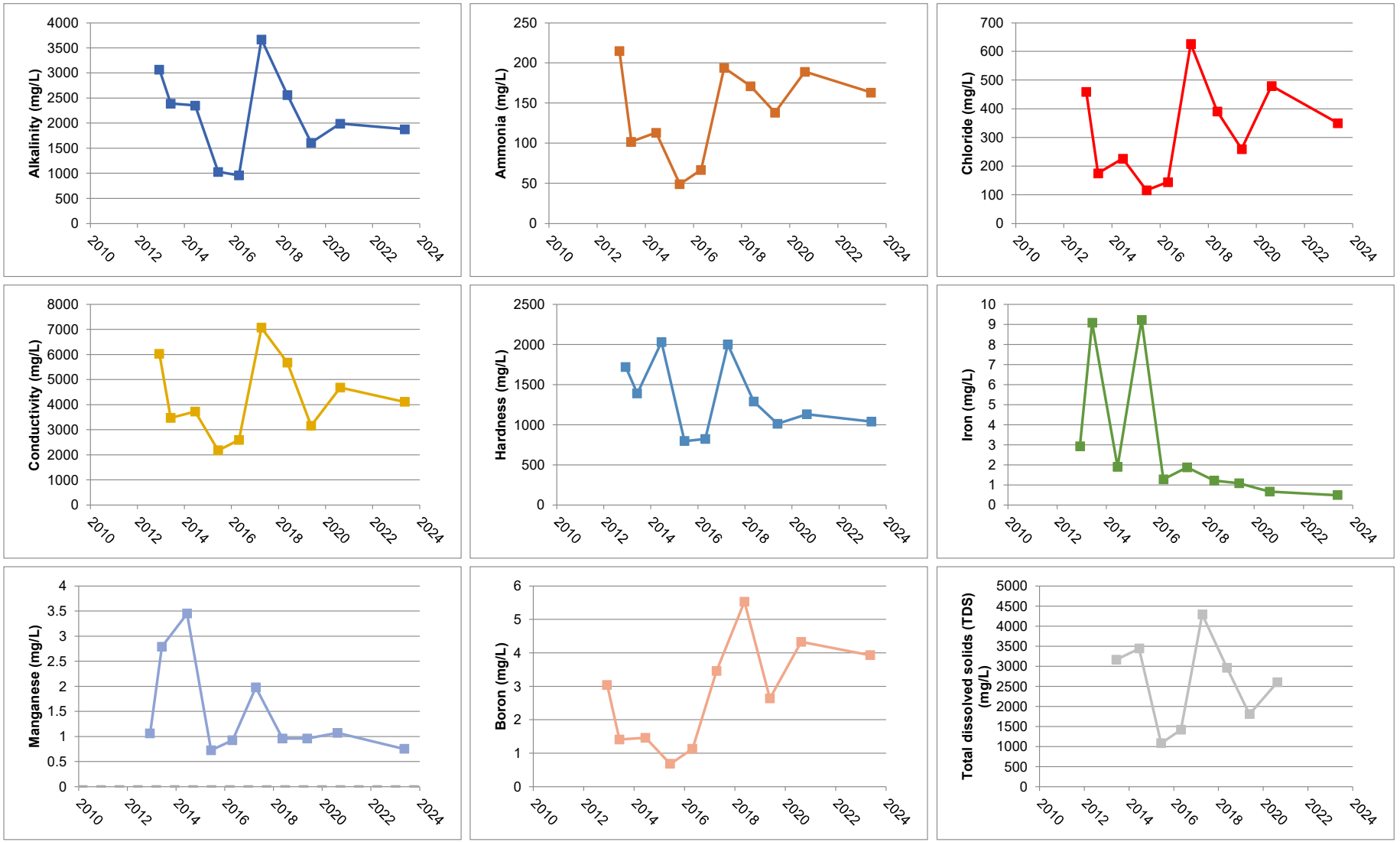
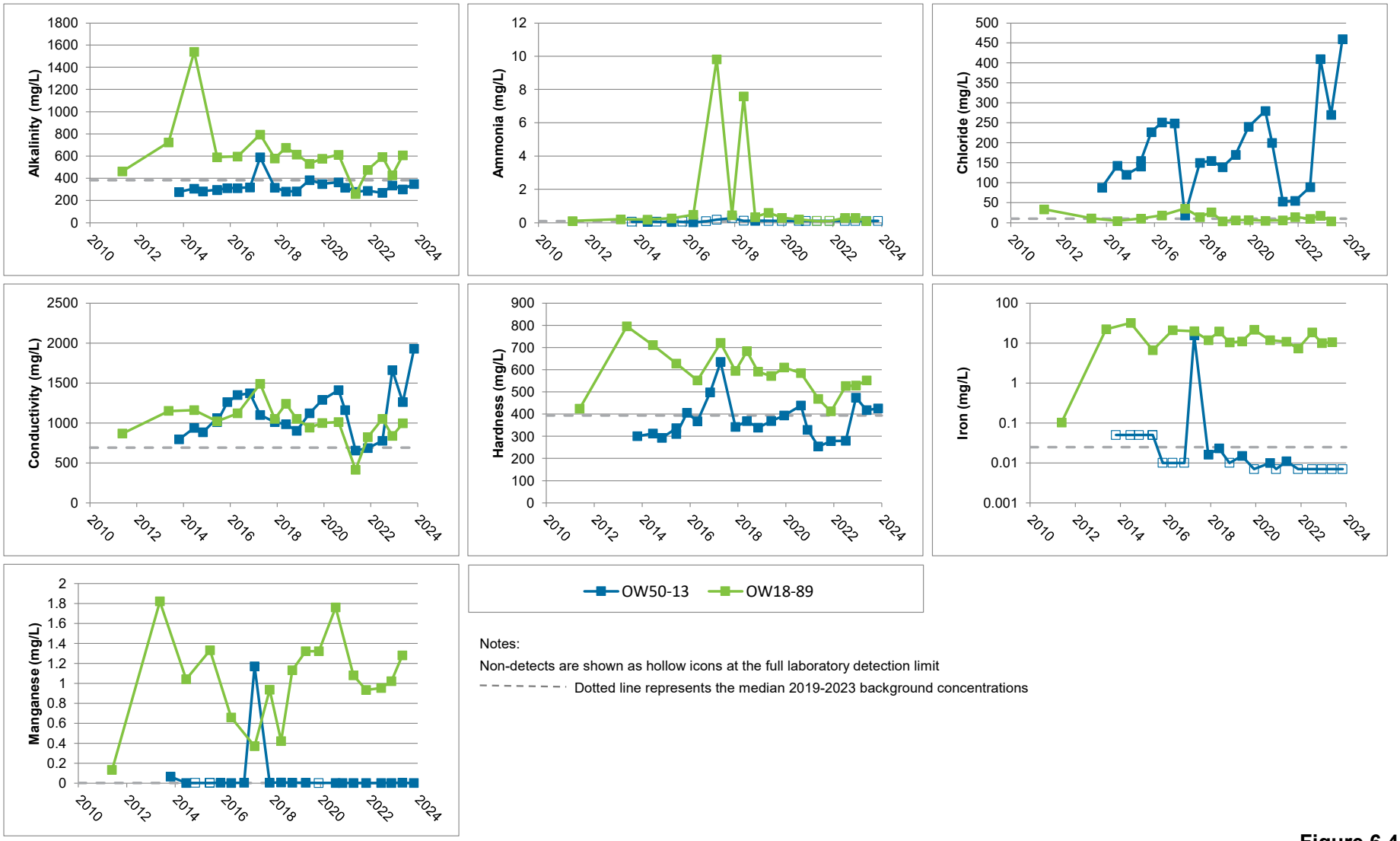



**Figure 6.3B**
**Leachate Holding Tank**
**Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

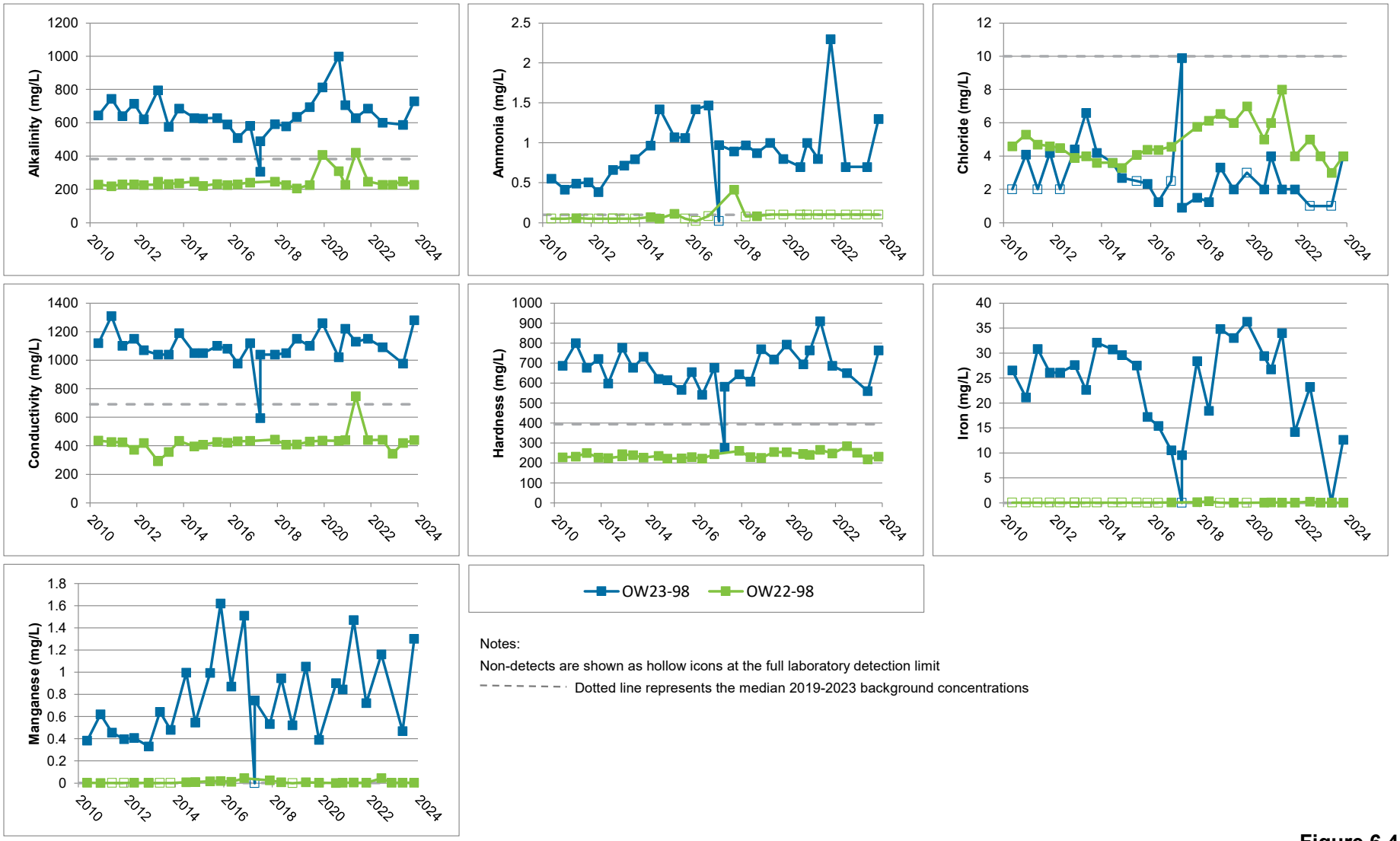



Notes:

Non-detects are shown as hollow icons at the full laboratory detection limit

Dotted line represents the median 2019-2023 background concentrations

**Figure 6.4A**
**Phase 1 Eastern Boundary**
**OW18-89 and OW50-13 - Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

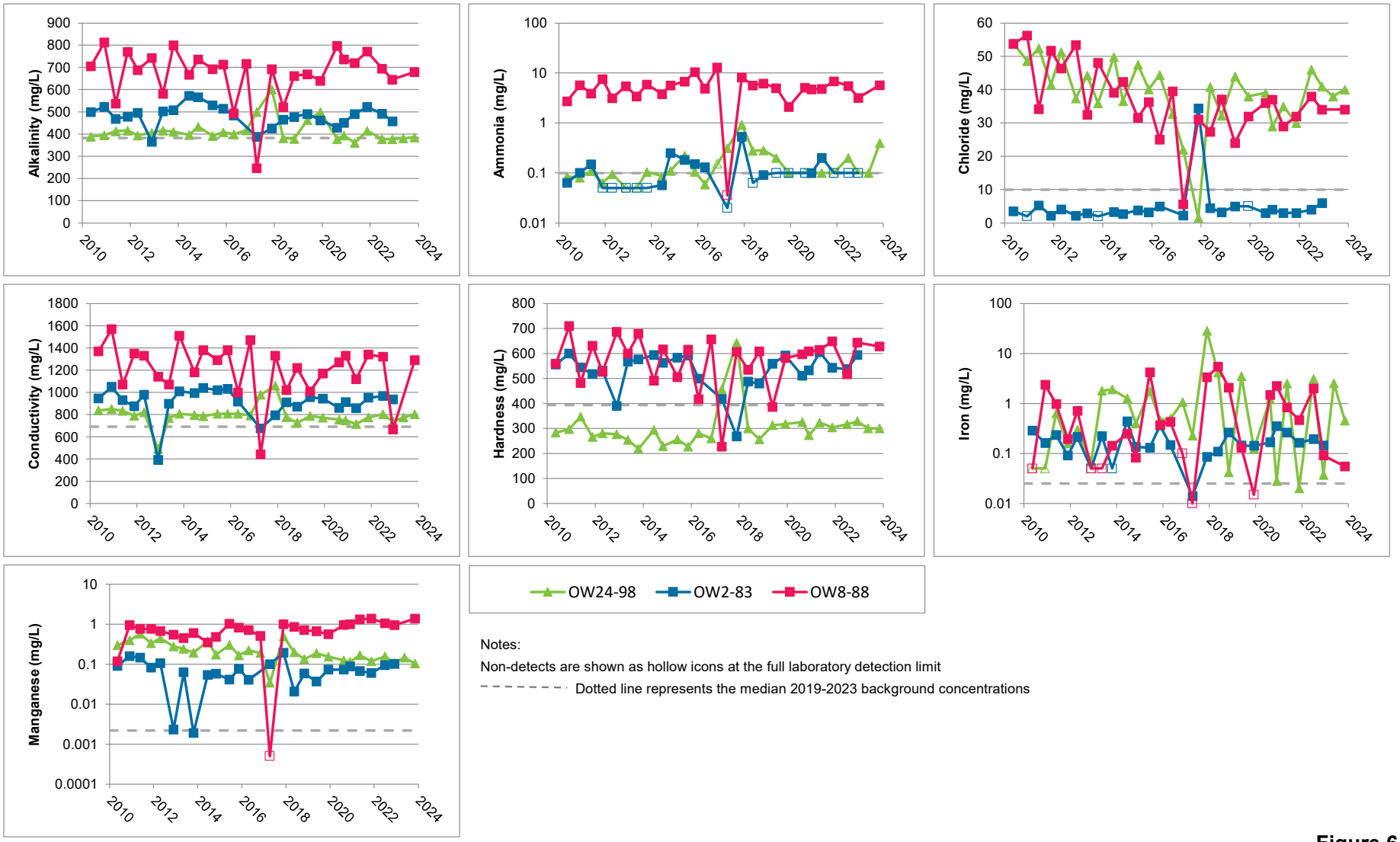



Notes:

Non-detects are shown as hollow icons at the full laboratory detection limit

Dotted line represents the median 2019-2023 background concentrations

**Figure 6.4B**
**Phase 1 Northern Boundary**
**OW22-98 and OW23-98 - Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

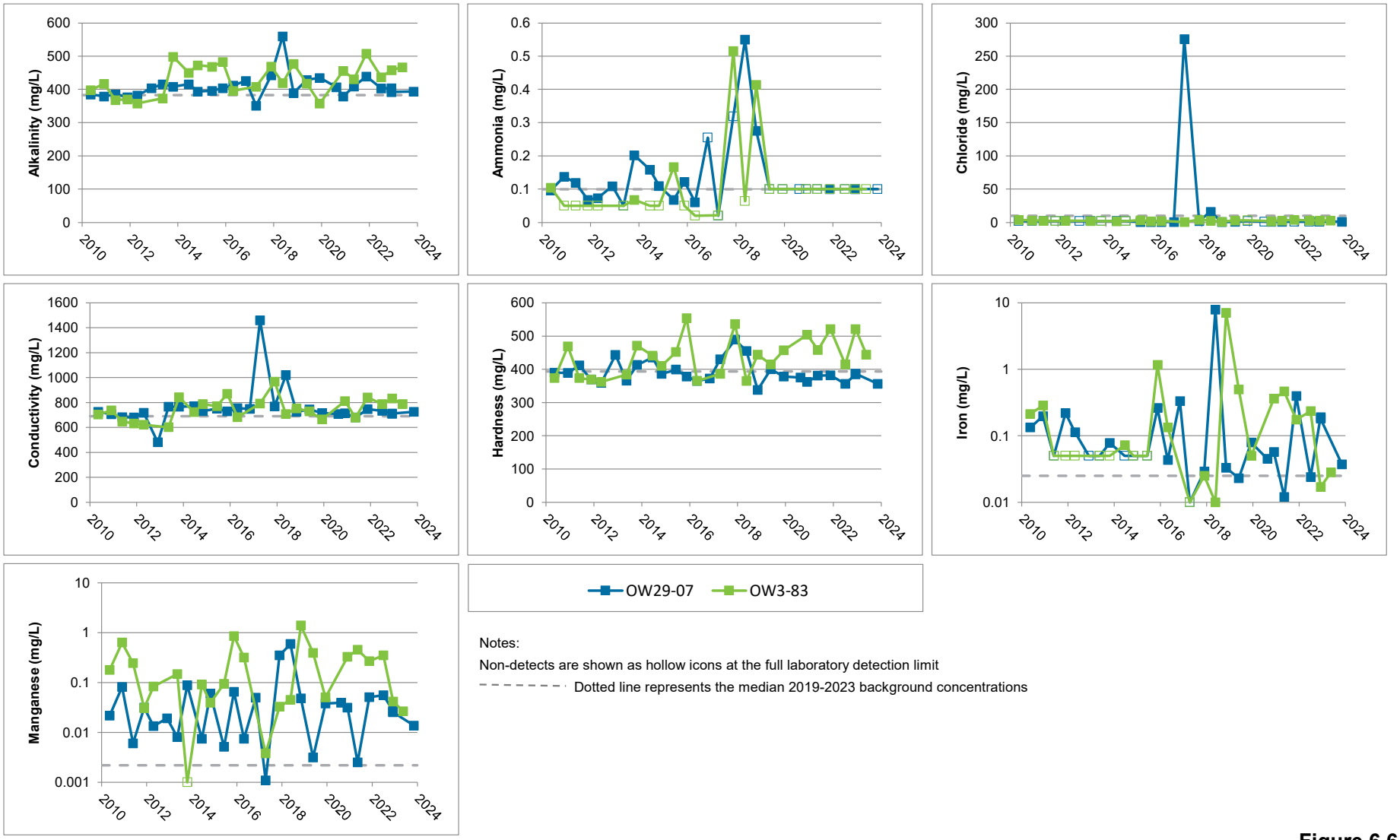



Notes:

Non-detects are shown as hollow icons at the full laboratory detection limit

Dotted line represents the median 2019-2023 background concentrations

**Figure 6.5**
**Phase 1 Northern Boundary**
**OW2-83, OW24-98, and OW8-88 - Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

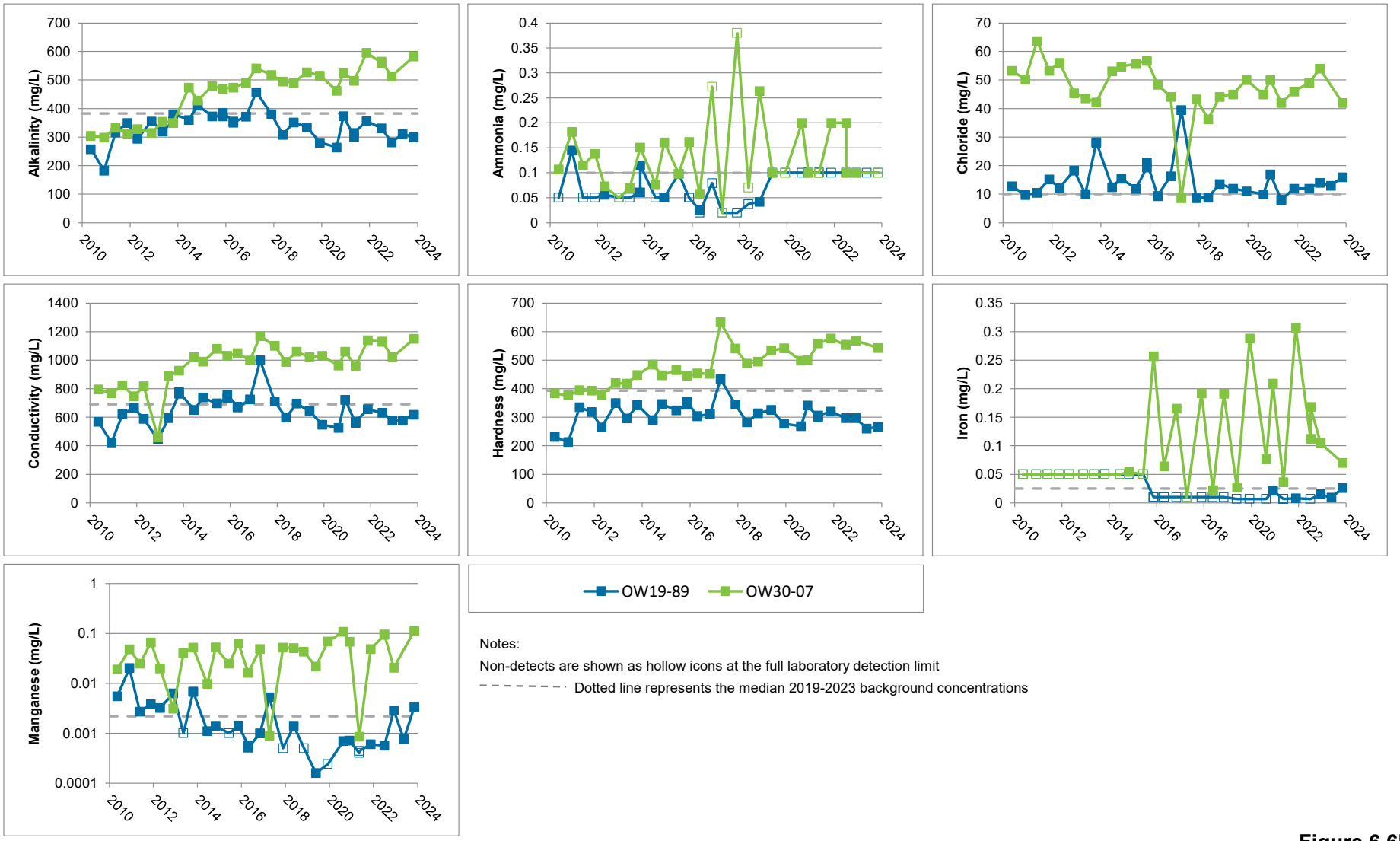



Notes:

Non-detects are shown as hollow icons at the full laboratory detection limit

Dotted line represents the median 2019-2023 background concentrations

**Figure 6.6A**
**Phase 1 Northern Boundary**
**OW29-07 and OW3-83 - Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

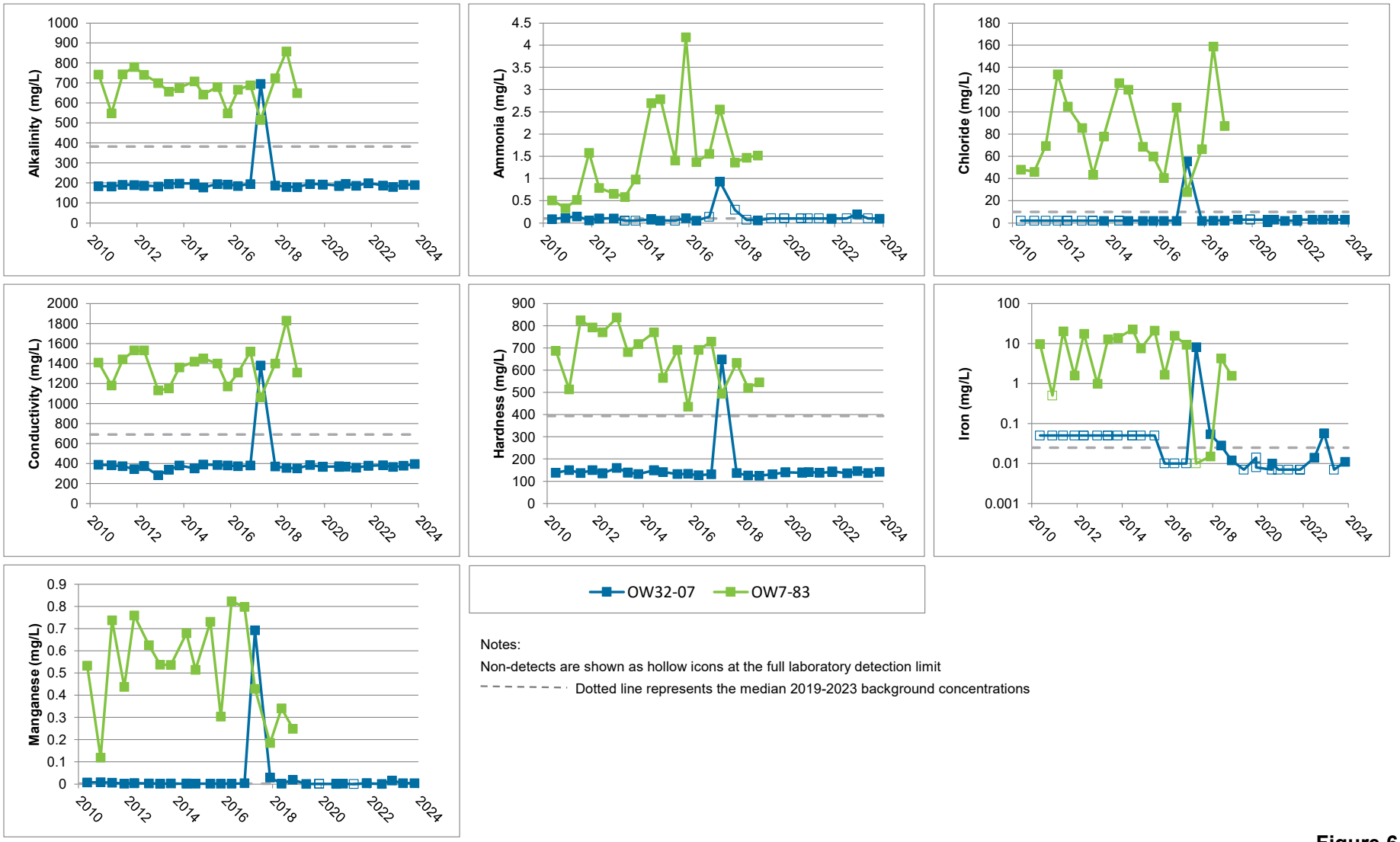



Notes:

Non-detects are shown as hollow icons at the full laboratory detection limit

Dotted line represents the median 2019-2023 background concentrations

**Figure 6.6B**
**Phase 1 Northern Boundary**
**OW19-89 and OW30-07 - Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**




Notes:

Non-detects are shown as hollow icons at the full laboratory detection limit

Dotted line represents the median 2019-2023 background concentrations

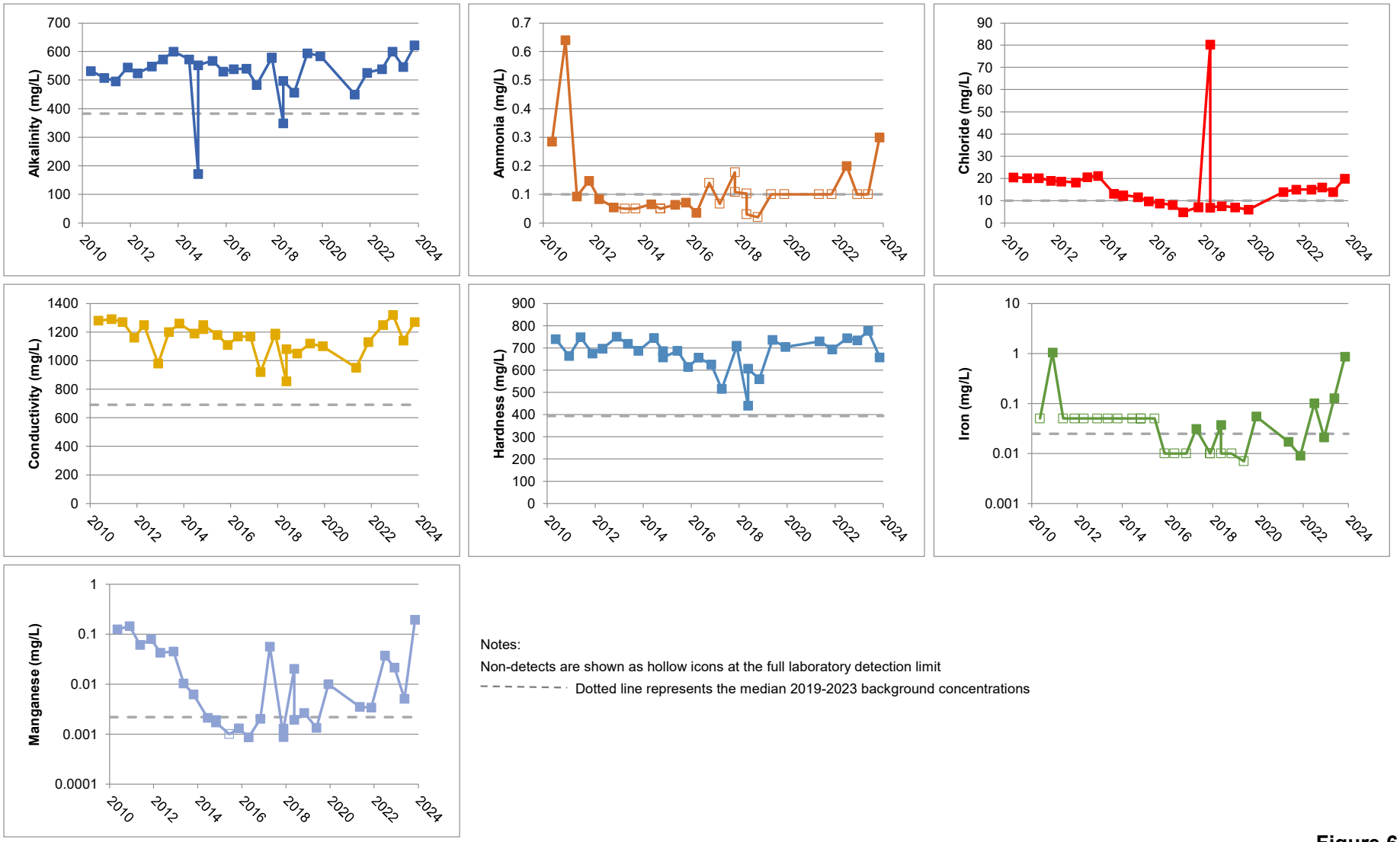
**Figure 6.7**
**Phase 1 Western Boundary**
**OW32-07 and OW7-83 - Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**


Notes:

Non-detects are shown as hollow icons at the full laboratory detection limit

Dotted line represents the median 2019-2023 background concentrations

**Figure 6.8**
**Phase 1 Western Boundary**
**OW31-07, and OW6-83 - Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

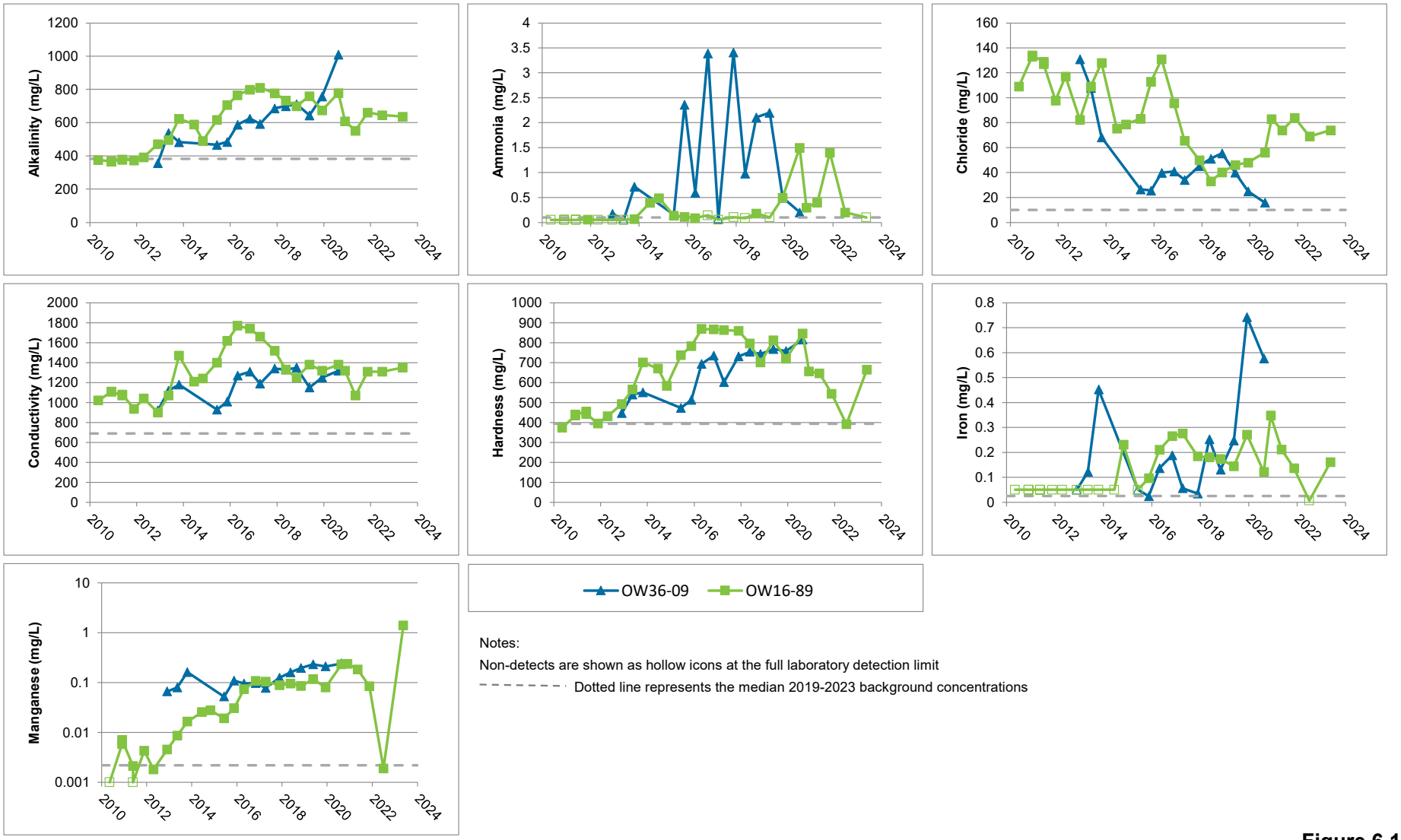



Notes:

Non-detects are shown as hollow icons at the full laboratory detection limit

Dotted line represents the median 2019-2023 background concentrations

**Figure 6.9**
**Phase 1 Southwestern Boundary**
**OW33-07 - Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

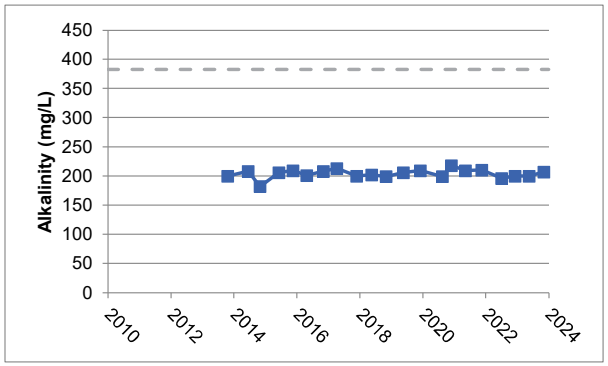


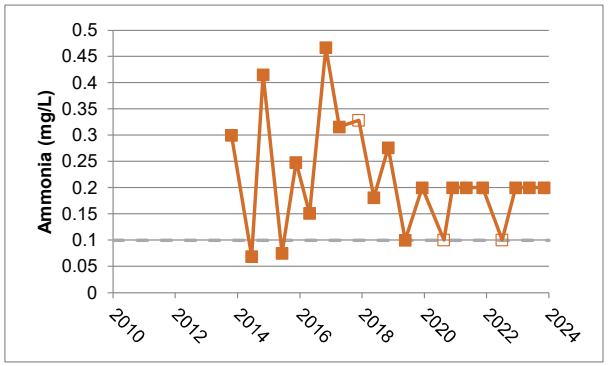

Notes:

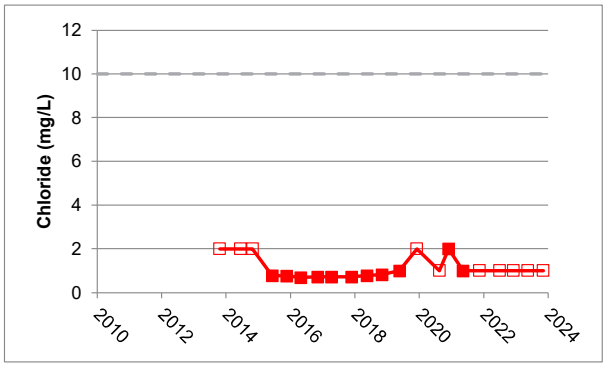
Non-detects are shown as hollow icons at the full laboratory detection limit

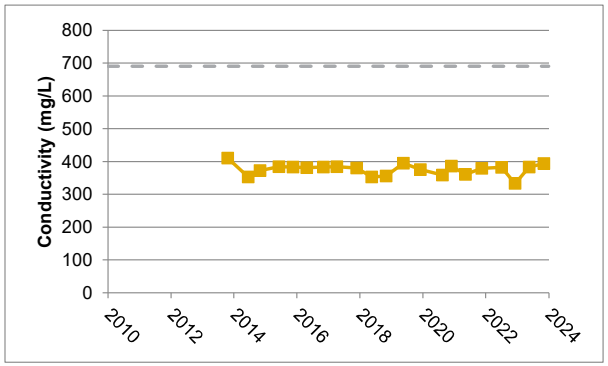
Dotted line represents the median 2019-2023 background concentrations

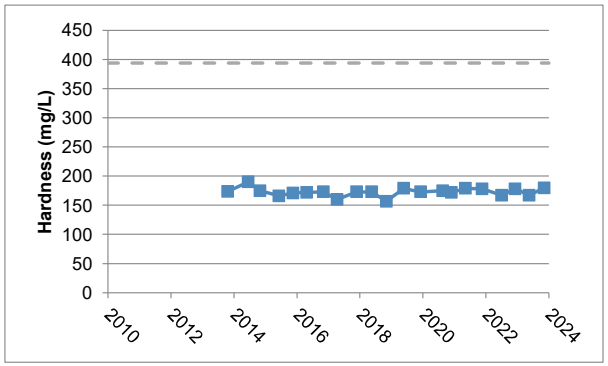
**Figure 6.10**
**Phase 2 Northern Boundary**
**OW16-89, and OW36-09 - Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

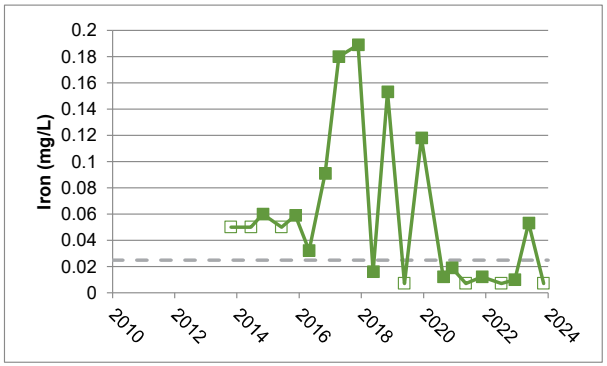


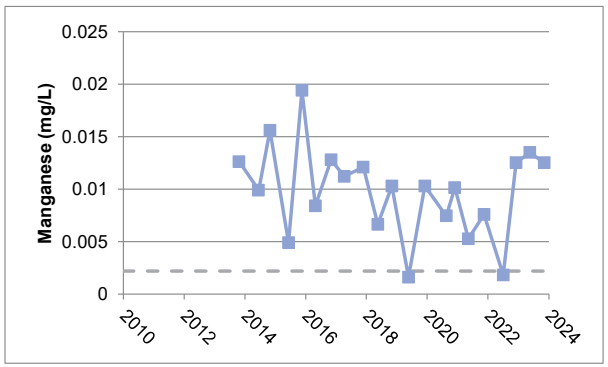



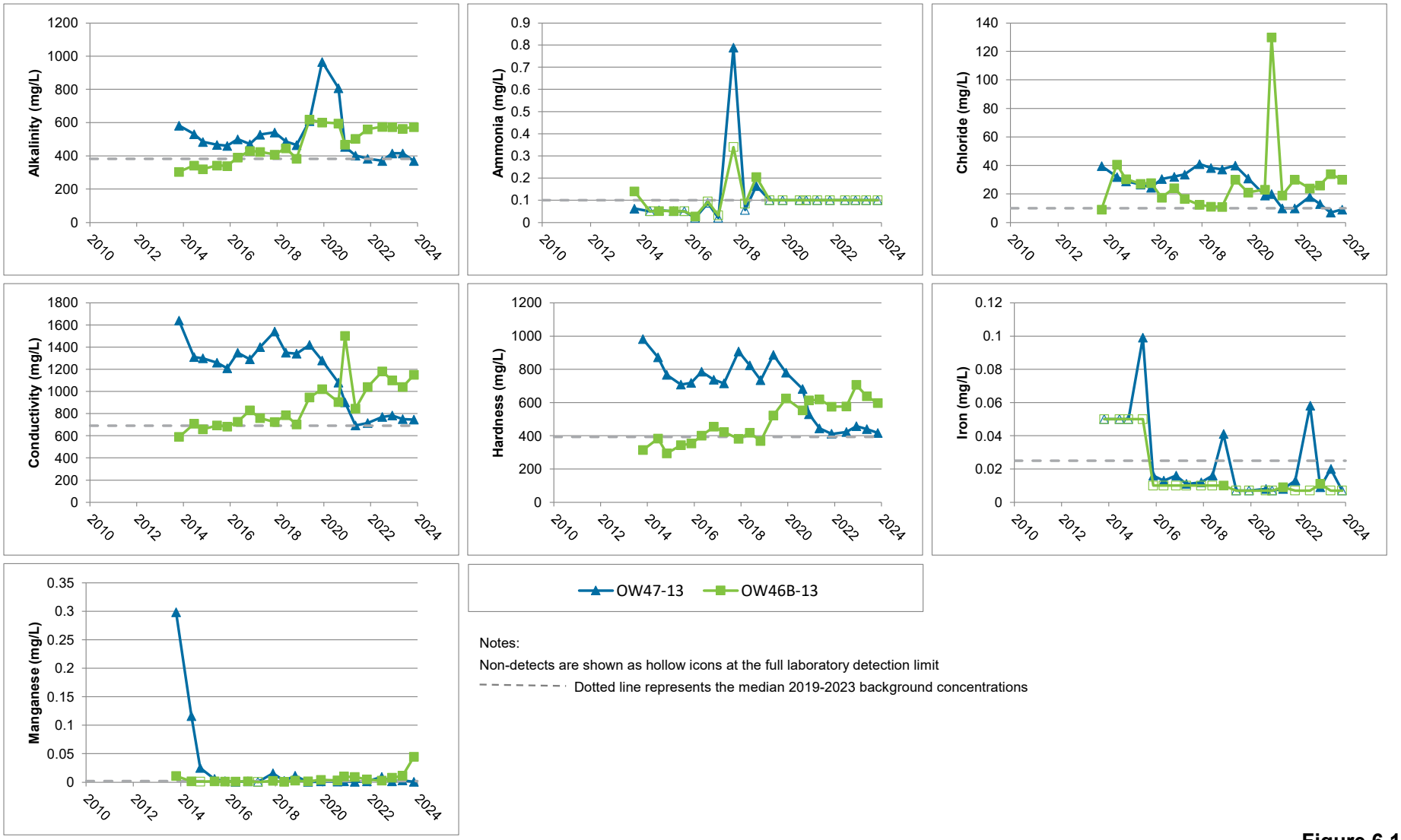




Notes:

Non-detects are shown as hollow icons at the full laboratory detection limit

Dotted line represents the median 2019-2023 background concentrations

**Figure 6.11**
**Phase 2 Western Boundary**
**OW46A-13 - Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

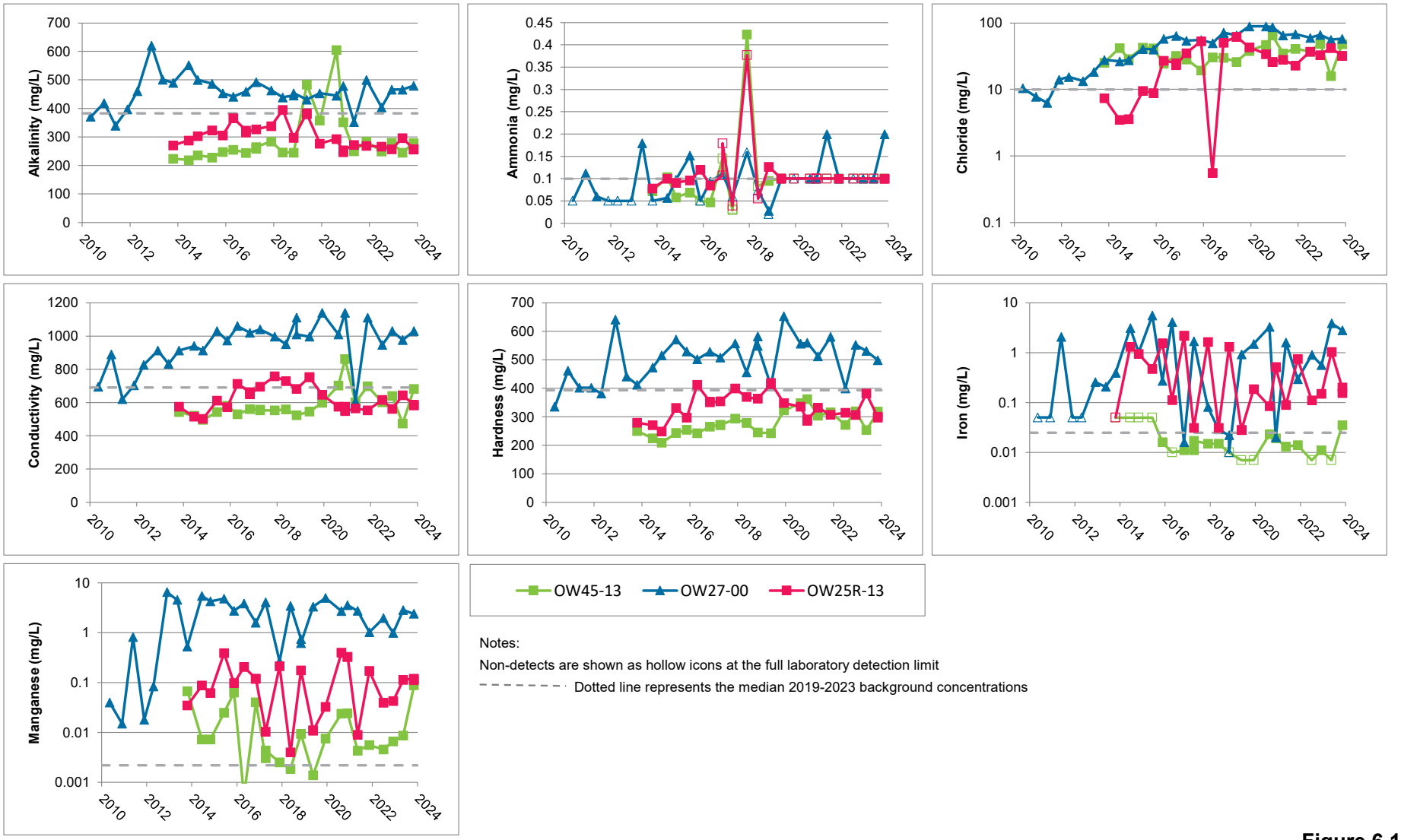



Notes:

Non-detects are shown as hollow icons at the full laboratory detection limit

Dotted line represents the median 2019-2023 background concentrations

**Figure 6.12**
**Phase 2 Western Boundary**
**OW46B-13, and OW47-13 - Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

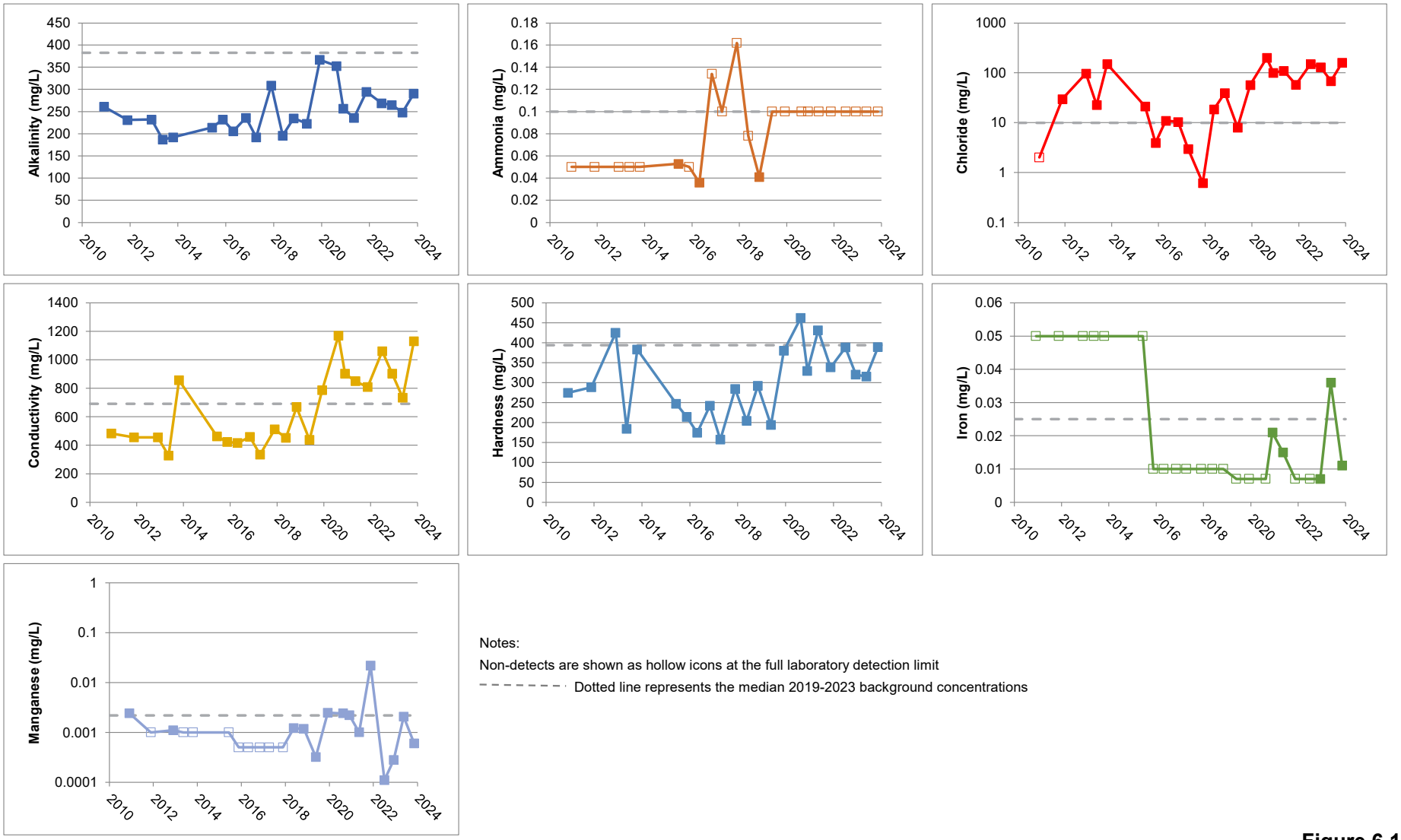



Notes:

Non-detects are shown as hollow icons at the full laboratory detection limit

Dotted line represents the median 2019-2023 background concentrations

**Figure 6.13**
**Phase 2 Southern Boundary**
**OW25R-13, OW27-00, and OW45-13 - Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

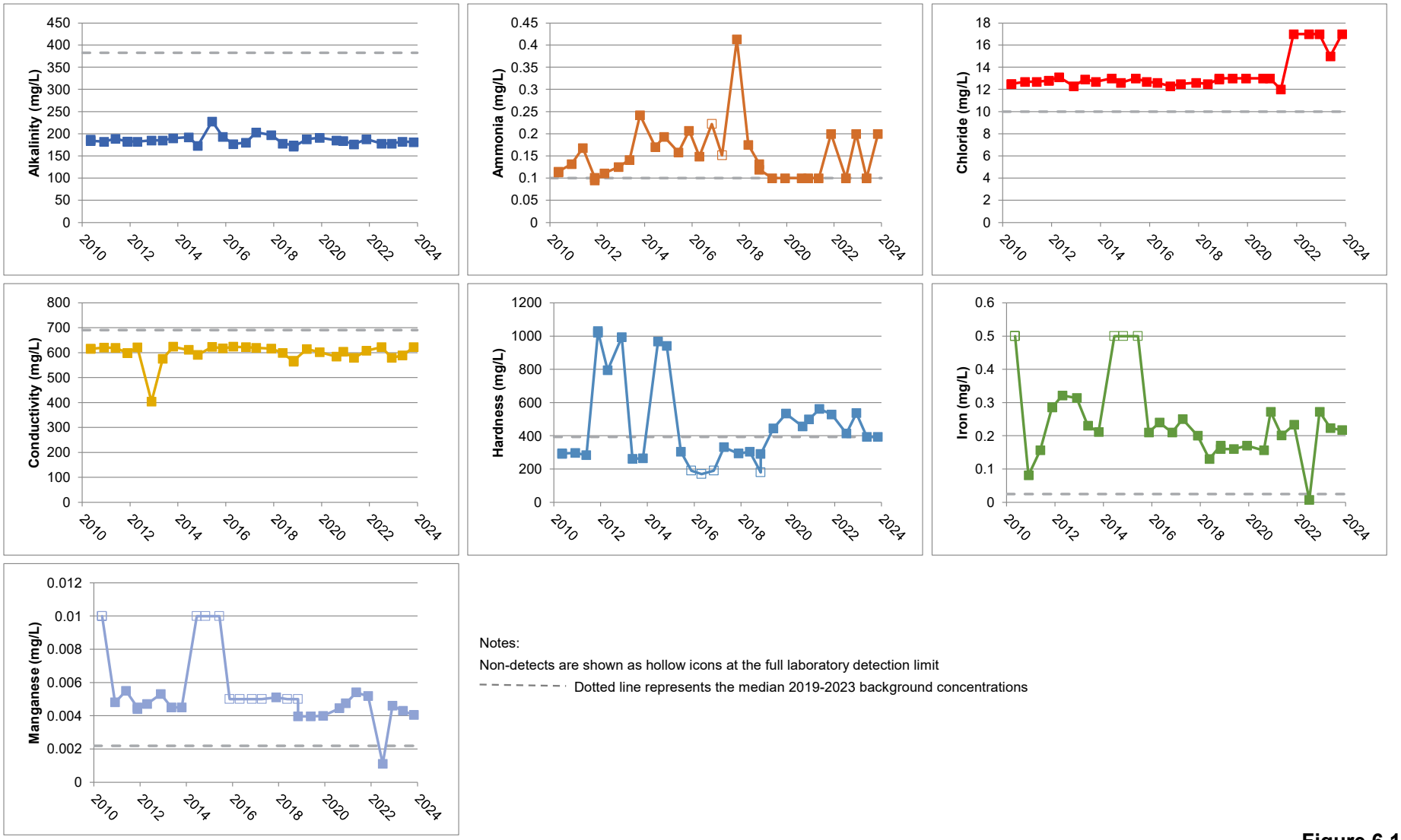



Notes:

Non-detects are shown as hollow icons at the full laboratory detection limit

Dotted line represents the median 2019-2023 background concentrations

**Figure 6.14**
**Phase 2 Southern Boundary**
**OW28-00 - Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

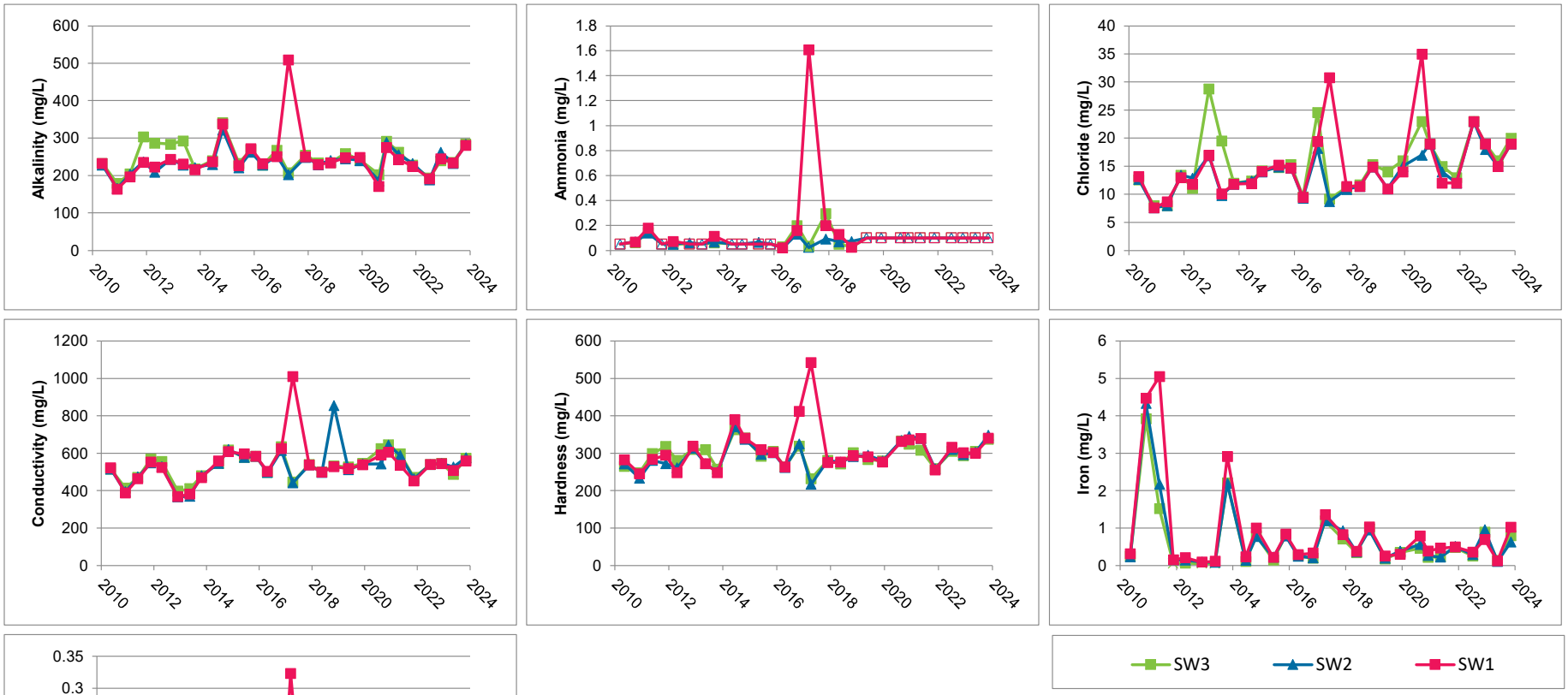



Notes:

Non-detects are shown as hollow icons at the full laboratory detection limit

Dotted line represents the median 2019-2023 background concentrations

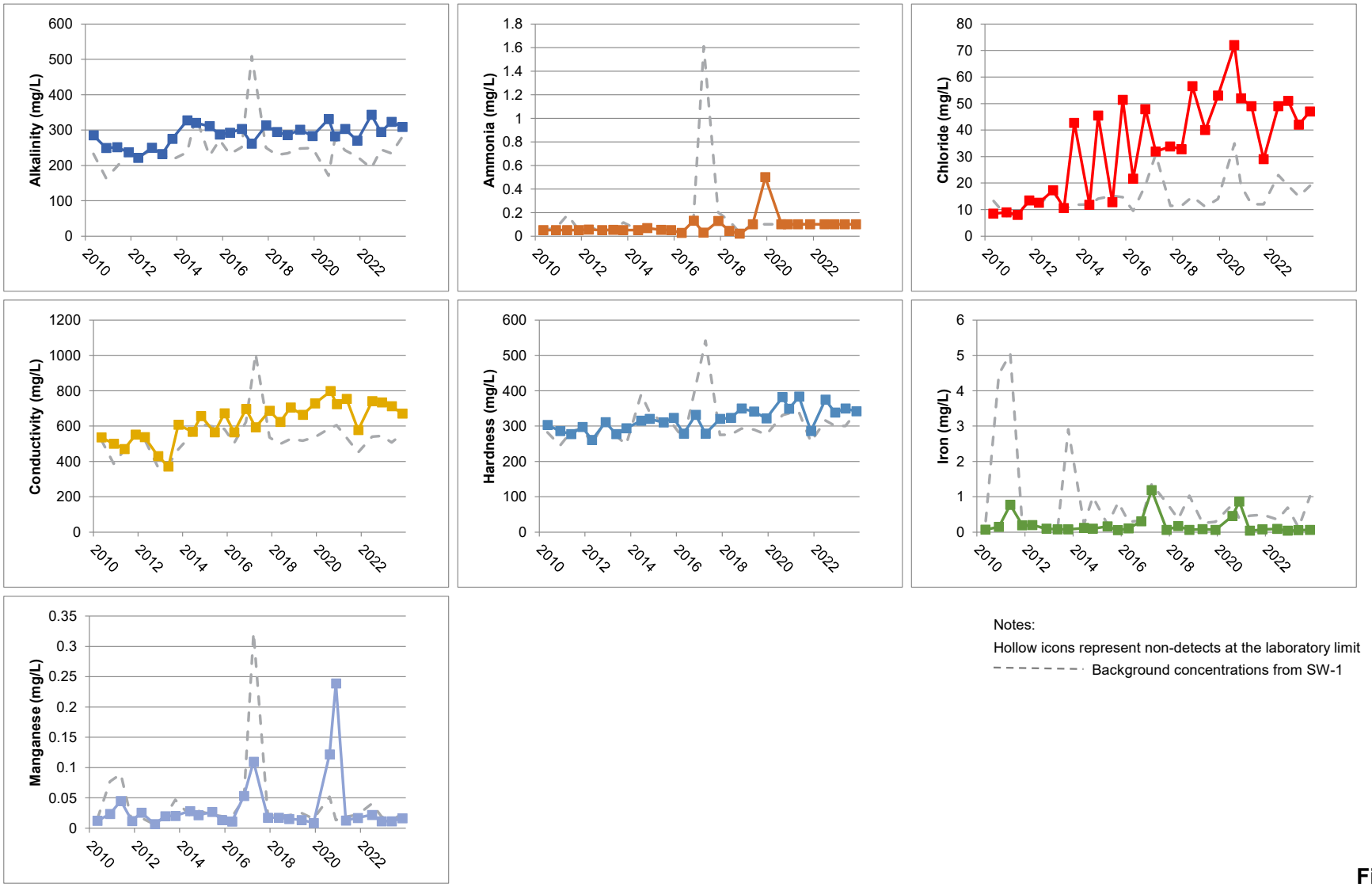
**Figure 6.15**
**Bedrock Water Quality**
**OW37-09 - Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**




Notes:

Hollow icons represent non-detects at the laboratory limit

**Figure 6.16**
**North Penetangore River**
**Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

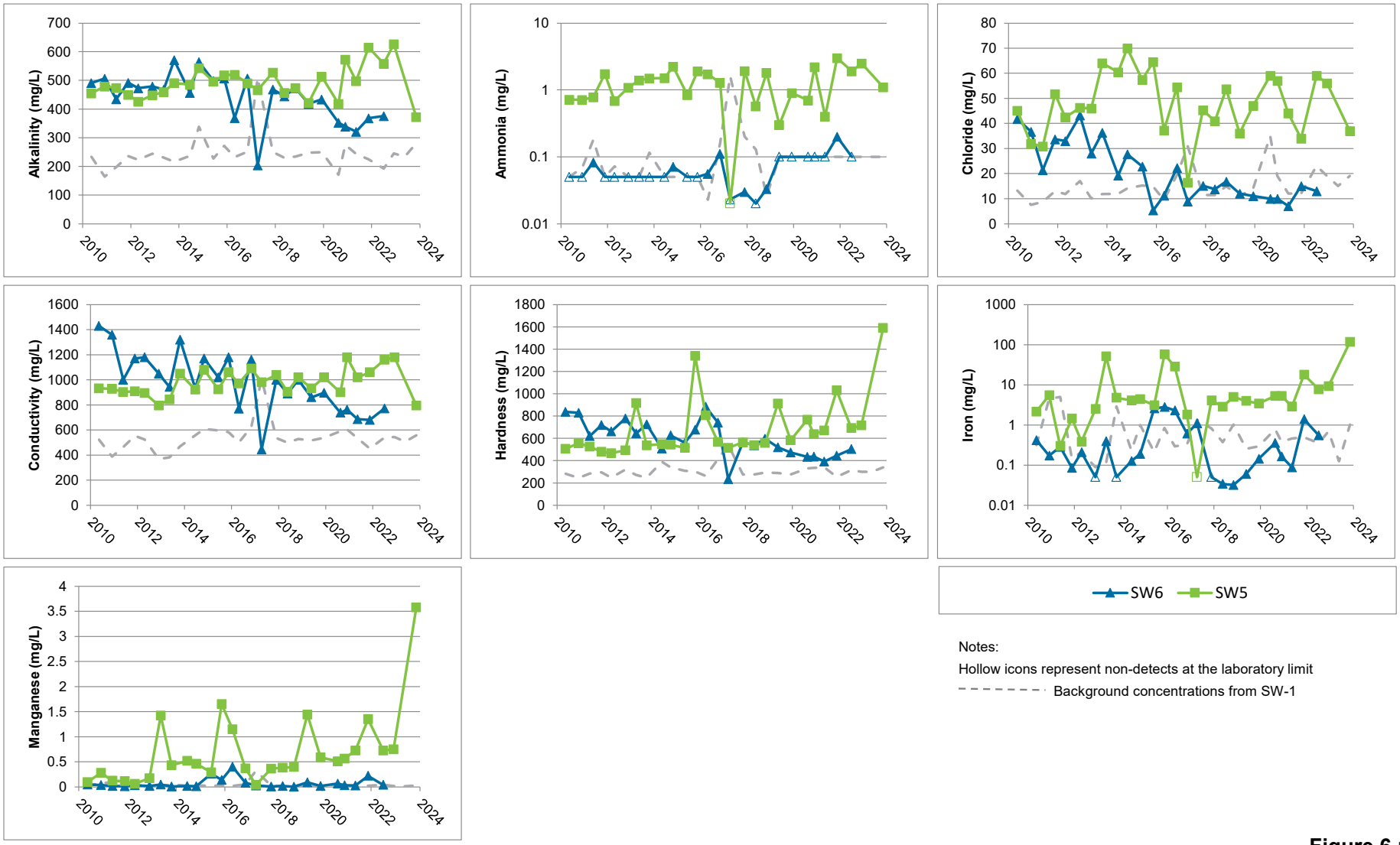



Notes:

Hollow icons represent non-detects at the laboratory limit

Background concentrations from SW-1

**Figure 6.17**
**SW4**
**Concentration Versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

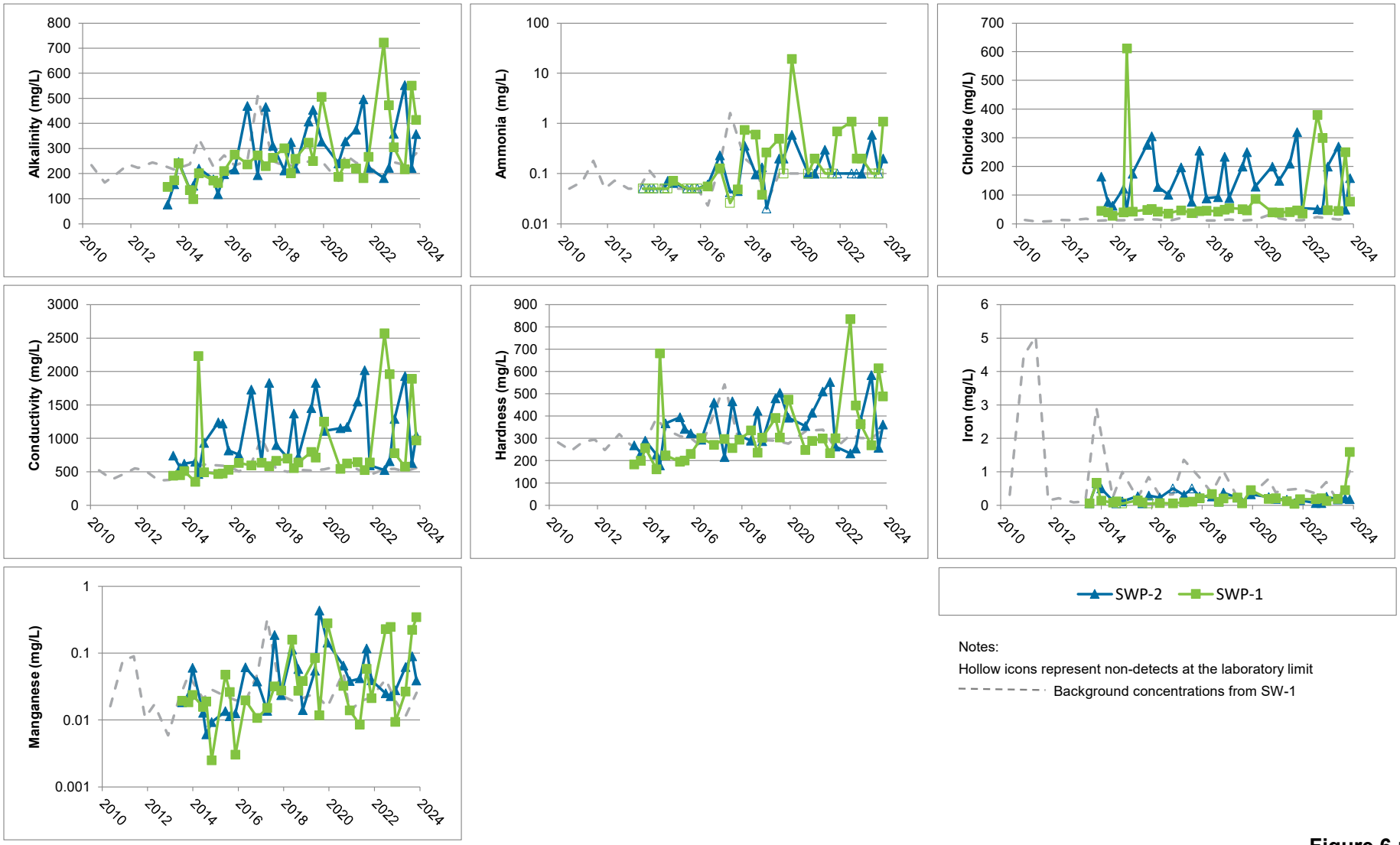



Notes:

Hollow icons represent non-detects at the laboratory limit

Background concentrations from SW-1

**Figure 6.18**
**SW5 and SW6**
**Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**




Notes:
Hollow icons represent non-detects at the laboratory limit
Background concentrations from SW-1

**Figure 6.19**
**Stormwater Management Pond**
**Water Quality Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

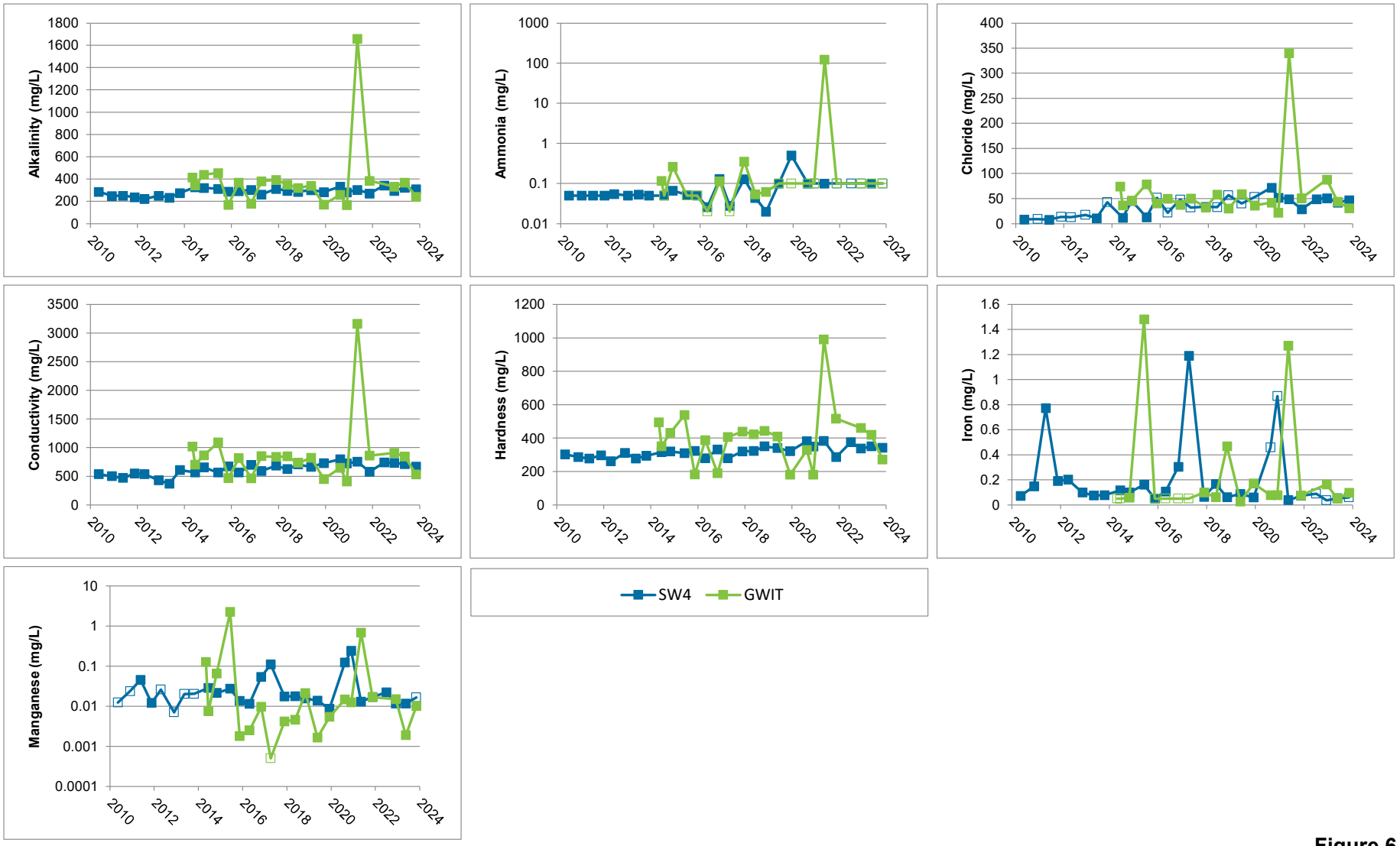



**Figure 6.20**
**Groundwater Interceptor**
**Concentration versus Time**
**2023 Annual Monitoring Report - Kincardine Waste Management Centre**
**Municipality of Kincardine, Ontario**

# Tables

**Table 2.1**

**Waste Diversion Summary**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

**Blue Box (Curbside Pickup) Summary**

| Item | KWMC tonnes | Source | BASWR Summary | | Conversion Factors | |
|---|---|---|---|---|---|---|
| Aluminum | - | BASWR Annual Summary | - | tons | 0.9072 | tons to tonnes |
| Boxboard | - | BASWR Annual Summary | - | tons | 0.9072 | tons to tonnes |
| Cardboard | - | BASWR Annual Summary | - | tons | 0.9072 | tons to tonnes |
| HDPE Plastic | - | BASWR Annual Summary | - | tons | 0.9072 | tons to tonnes |
| Mixed Glass | - | BASWR Annual Summary | - | tons | 0.9072 | tons to tonnes |
| Newspaper | - | BASWR Annual Summary | - | tons | 0.9072 | tons to tonnes |
| PET Plastic | - | BASWR Annual Summary | - | tons | 0.9072 | tons to tonnes |
| Steel Cans | - | BASWR Annual Summary | - | tons | 0.9072 | tons to tonnes |
| White Paper | - | BASWR Annual Summary | - | tons | 0.9072 | tons to tonnes |
| **Subtotals** | | | | tons | 0.9072 | tons to tonnes |

**Waste Diverted at Waste Disposal Facility**

| Item | KWMC tonnes | Source | Records | | Conversion Factors | |
|---|---|---|---|---|---|---|
| Bale Wrap | 15.27 | Landfill Records | 15.27 | tonnes | | |
| Batteries | 1.57 | Landfill Records | 1.57 | tonnes | | |
| BBQ/Propane Tanks | 0.02 | Landfill Records | 48 | units | 0.00045 | lbs to tonnes (20lb cylinders - 37 lbs)) |
| Brick and Concrete | 94.94 | Landfill Records | 94.94 | tonnes | | |
| CRD | 0.00 | Landfill Records | 0 | tonnes | | |
| Drywall | 61.41 | Landfill Records | 61.41 | tonnes | | |
| E-Waste | 17.25 | Landfill Records | 17.25 | tonnes | | |
| Film Plastic | 6.53 | Landfill Records | 6.53 | tonnes | | |
| Foam Packaging | 0.00 | Landfill Records | 0 | tonnes | | |
| Light Bulbs | 556.60 | Landfill Records | 5566 | units | 0.0002 | grams to tonnes (500 grams/bulb) |
| Mattresses | 33.18 | Landfill Records | 976 | units | 0.034 | 34 kg per mattress or 0.034 tonnes per mattress |
| MHSW | 10.79 | Landfill Records | 10.79 | tonnes | | |
| Misc | 0.00 | Landfill Records | 0 | tonnes | | |
| Scrap metal | 166.99 | Landfill Records | 166.99 | tonnes | | |
| Shingles | 473.85 | Landfill Records | 473.85 | tonnes | | |
| Styrofoam | 3.09 | Landfill Records | 3.09 | tonnes | | |
| Textile | 10.51 | Landfill Records | 10.51 | tonnes | | |
| Tires | 12.02 | Landfill Records | 1321 | units | 0.0091 | 9.1 kg/tire |
| White Goods | 19.80 | Landfill Records | 198 | units | 0.1 | Assume 100 kilograms/unit (fridges) and 0.001 kg to tonnes |
| Wood | 266.13 | Landfill Records | 266.13 | tonnes | | |
| Yard Waste | 120.57 | Landfill Records | 120.57 | tonnes | | |
| Yard Waste (Bulky) | 74.25 | Landfill Records | 74.25 | tonnes | | |
| **Total** | **1944.78** | | | | | |

**Waste Recycled by Municipality Support Programs**

| Item | Kg | Source | TerraCycle Program | | Conversion Factors | |
|---|---|---|---|---|---|---|
| Printer Cartridges | - | TerraCycle Program | - | units | 0.04 | kg/unit |
| Babybel packaging | - | TerraCycle Program | - | lbs | 0.453 | lbs to kg |
| Chip bags | - | TerraCycle Program | - | units | 0.007 | kg/unit |
| Cigarette butts | - | TerraCycle Program | - | lbs | 0.453 | lbs to kg |
| Coffee Bags | - | TerraCycle Program | - | units | 0.025 | kg/unit |
| Diaper Packages | - | TerraCycle Program | - | units | 0.69 | kg/unit |
| Electronics | - | TerraCycle Program | - | units | 0.200 | kg/unit |
| Juice Pouches | - | TerraCycle Program | - | units | 0.006 | kg/unit |
| Love Child Packages | - | TerraCycle Program | - | units | 0.026 | kg/unit |
| Lunchable Trays | - | TerraCycle Program | - | units | 0.01 | kg/unit |
| Milk Bags | - | TerraCycle Program | - | units | 0.003 | kg/unit |
| Pens | - | TerraCycle Program | - | units | 0.02 | kg/unit |
| Personal hygiene products | - | TerraCycle Program | - | units | 0.004 | kg/unit |
| Pet food bags | - | TerraCycle Program | - | units | 0.004 | kg/unit |
| Snack Pouches | - | TerraCycle Program | - | units | 0.003 | kg/unit |
| Snack Trays | - | TerraCycle Program | - | units | 0.025 | kg/unit |
| T-Discs | - | TerraCycle Program | - | units | 0.016 | kg/unit |
| Toner | - | TerraCycle Program | - | units | 1.814 | kg/unit |
| **Total** | **0.00** | | | | | |

0 tonnes

**Wastes Used by Municipality at Landfill**

| Item | Tonnes | Source | Landfill Records | | Conversion Factors | |
|---|---|---|---|---|---|---|
| Clean Wood - Chipped | 241.43 | Landfill Records | 266 | tons | 907.185 | tons to kg |
| **Total** | **241.43** | | | | 200 | $kg/m^3$ (chipped wood) |
| | | | | | chipped wood is 25 % volume of unchipped wood | |

| Total Recycled Materials | Total Waste Received at Landfill | Waste Placed in Disposal Cell | Diversion Rate |
|---|---|---|---|
| **2,186.21 Tonnes** | **4,144.33 Tonnes** | **3,183.98 Tonnes** | **52.8%** |

**Table 2.2**

**Projected Site Life**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Year | Annual Tonnage (tonnes) | Annual Waste Density (tonnes/cu.m.) | Annual Waste Volume Placed (cu.m.) | Cumulative Volume Consumed (cu.m.) |
|---|---|---|---|---|
| 2012 | 3,553 | 0.60 | 5,965 | 5,965 |
| 2013 | 3,998 | 0.60 | 6,712 | 12,677 |
| 2014 | 4,599 | 0.60 | 7,721 | 20,398 |
| 2015 | 3,707 | 0.60 | 6,224 | 26,622 |
| 2016 | 2,448 | 0.60 | 4,109 | 30,731 |
| 2017 | 3,087 | 0.67 | 4,594 | 35,325 |
| 2018 | 2,742 | 0.45 | 6,143 | 41,468 |
| 2019 | 4,546 | 0.74 | 6,151 | 47,619 |
| 2020 | 3,215 | 0.73 | 4,376 | 51,995 |
| 2021 | 2,716 | 0.33 | 8,268 | 60,263 |
| 2022 | 3,616 | 0.59 | 6,123 | 66,386 |
| 2023 | 3,184 | 0.52 | 6,123 | 72,508 |
| **5-year Est. Projected** | **3,455** | **0.58** | | |
| 2024 | 3,473 | 0.58 | 5,961 | 78,469 |
| 2025 | 3,490 | 0.58 | 5,991 | 84,460 |
| 2026 | 3,508 | 0.58 | 6,021 | 90,480 |
| 2027 | 3,525 | 0.58 | 6,051 | 96,531 |
| 2028 | 3,543 | 0.58 | 6,081 | 102,612 |
| 2029 | 3,560 | 0.58 | 6,111 | 108,724 |
| 2030 | 3,578 | 0.58 | 6,142 | 114,866 |
| 2031 | 3,596 | 0.58 | 6,173 | 121,038 |
| 2032 | 3,614 | 0.58 | 6,204 | 127,242 |
| 2033 | 3,632 | 0.58 | 6,235 | 133,476 |
| 2034 | 3,650 | 0.58 | 6,266 | 139,742 |
| 2035 | 3,669 | 0.58 | 6,297 | 146,039 |
| 2036 | 3,687 | 0.58 | 6,329 | 152,368 |
| 2037 | 3,705 | 0.58 | 6,360 | 158,728 |
| 2038 | 3,724 | 0.58 | 6,392 | 165,120 |
| 2039 | 3,742 | 0.58 | 6,424 | 171,544 |
| 2040 | 3,761 | 0.58 | 6,456 | 178,000 |
| 2041 | 3,780 | 0.58 | 6,488 | 184,489 |
| 2042 | 3,799 | 0.58 | 6,521 | 191,009 |
| 2043 | 3,818 | 0.58 | 6,553 | 197,563 |
| 2044 | 3,837 | 0.58 | 6,586 | 204,149 |
| 2045 | 3,856 | 0.58 | 6,619 | 210,768 |
| 2046 | 3,875 | 0.58 | 6,652 | 217,420 |
| 2047 | 3,895 | 0.58 | 6,685 | 224,106 |
| 2048 | 3,914 | 0.58 | 6,719 | 230,825 |
| 2048 | 3,934 | 0.58 | 6,752 | 237,577 |
| 2049 | 3,954 | 0.58 | 6,786 | 244,363 |
| 2050 | 3,973 | 0.58 | 6,820 | 251,184 |
| 2051 | 3,993 | 0.58 | 6,854 | 258,038 |
| 2052 | 4,013 | 0.58 | 6,889 | 264,926 |
| 2053 | 4,033 | 0.58 | 6,923 | 271,849 |
| 2054 | 4,053 | 0.58 | 6,958 | 278,807 |
| 2055 | 4,074 | 0.58 | 6,992 | 285,799 |
| 2056 | 4,094 | 0.58 | 7,027 | 292,827 |
| 2057 | 4,114 | 0.58 | 7,063 | 299,889 |
| 2058 | 4,135 | 0.58 | 7,098 | 306,987 |
| 2059 | 4,156 | 0.58 | 7,133 | 314,120 |
| 2060 | 4,176 | 0.58 | 7,169 | 321,289 |

**Table 2.2**

**Projected Site Life**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Year | Annual Tonnage (tonnes) | Annual Waste Density (tonnes/cu.m.) | Annual Waste Volume Placed (cu.m.) | Cumulative Volume Consumed (cu.m.) |
|---|---|---|---|---|
| 2061 | 4,197 | 0.58 | 7,205 | 328,494 |
| 2062 | 4,218 | 0.58 | 7,241 | 335,735 |
| 2063 | 4,239 | 0.58 | 7,277 | 343,012 |
| 2064 | 4,261 | 0.58 | 7,313 | 350,326 |
| 2065 | 4,282 | 0.58 | 7,350 | 357,676 |
| 2066 | 4,303 | 0.58 | 7,387 | 365,062 |
| 2067 | 4,325 | 0.58 | 7,424 | 372,486 |
| 2068 | 4,347 | 0.58 | 7,461 | 379,947 |
| 2069 | 4,368 | 0.58 | 7,498 | 387,445 |
| 2070 | 4,390 | 0.58 | 7,536 | 394,980 |
| 2071 | 4,412 | 0.58 | 7,573 | 402,554 |
| 2072 | 4,434 | 0.58 | 7,611 | 410,165 |
| 2073 | 4,456 | 0.58 | 7,649 | 417,814 |
| 2074 | 4,479 | 0.58 | 7,687 | 425,502 |
| 2075 | 4,501 | 0.58 | 7,726 | 433,227 |
| 2076 | 4,523 | 0.58 | 7,765 | 440,992 |
| 2077 | 4,546 | 0.58 | 7,803 | 448,795 |
| 2078 | 4,569 | 0.58 | 7,842 | 456,638 |
| 2079 | 4,592 | 0.58 | 7,882 | 464,519 |
| 2080 | 4,615 | 0.58 | 7,921 | 472,440 |
| 2081 | 4,638 | 0.58 | 7,961 | 480,401 |
| 2082 | 4,661 | 0.58 | 8,000 | 488,401 |
| 2083 | 4,684 | 0.58 | 8,040 | 496,441 |
| 2084 | 4,708 | 0.58 | 8,081 | 504,522 |
| 2085 | 4,731 | 0.58 | 8,121 | 512,643 |
| 2086 | 4,755 | 0.58 | 8,162 | 520,805 |
| 2087 | 4,779 | 0.58 | 8,202 | 529,007 |
| 2088 | 4,802 | 0.58 | 8,243 | 537,250 |
| 2089 | 4,826 | 0.58 | 8,285 | 545,535 |
| 2090 | 4,851 | 0.58 | 8,326 | 553,861 |
| 2091 | 4,875 | 0.58 | 8,368 | 562,229 |
| 2092 | 4,899 | 0.58 | 8,410 | 570,638 |
| 2093 | 4,924 | 0.58 | 8,452 | 579,090 |
| 2094 | 4,948 | 0.58 | 8,494 | 587,584 |
| 2095 | 4,973 | 0.58 | 8,536 | 596,120 |
| 2096 | 4,998 | 0.58 | 8,579 | 604,699 |

Notes:

1. Phase 2 capacity is estimated to be 604,500 $m^3$
2. Future waste disposal based on a 5 year waste density average
3. Waste volumes for 2012-2016 are calculated by applying a weighted average (based on actual tonnages) to volumes determined by comparison of the 2017/2016 survey to the as-constructed cell base survey.

**Table 3.1**

**Leachate Treatment Facility - Influent Effluent Sampling Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| | FINAL EFFLUENT | | | | | | | | | SURFACE WATER | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Effluent Clarifier | | | | | | | | | SW4 | Pond |
| Date | CBOD5 mg/L | TSS mg/L | Total P mg/L | Nitrite (as N) mg/L | Nitrate (as N) mg/L | Ammonia+ Ammonium (N) mg/L | E-Coli Per 100ml | pH | Temper-ature C | Nitrate N mg/L | Nitrate N mg/L |
| Jan 10 | 4 | 11 | 0.48 | 6.66 | 14.70 | 0.3 | 2 | 7.30 | 16.0 | 1.03 | -- |
| Jan 24 | 6 | **24** | 0.38 | 1.56 | 18.40 | 0.1 | 100 | 7.30 | 15.6 | 1.17 | -- |
| Feb 6 | 5 | 11 | 0.18 | 2.58 | 12.30 | **2.8** | 12 | 7.60 | 16.1 | 1.02 | 4.66 |
| Feb 13 | 6 | 12 | 0.31 | 3.08 | 11.60 | **3.5** | 134 | 7.50 | 18.5 | 1.56 | 2.24 |
| Feb 21 | 3 | 6 | 0.40 | 0.51 | 18.30 | 0.2 | 12 | 7.40 | 17.4 | 1.32 | -- |
| Mar 7 | 2 | 10 | 0.35 | 0.30 | 19.00 | 0.1 | 48 | 7.70 | 17.5 | 1.31 | -- |
| Mar 22 | 4 | 7 | 0.36 | 2.98 | 11.50 | 0.4 | 58 | 7.60 | 18.5 | 1.52 | -- |
| Apr 4 | 2 | 6 | 0.14 | 0.58 | 13.00 | 0.1 | 24 | 7.60 | 18.4 | 0.97 | -- |
| Apr 18 | 6 | **16** | **0.53** | 6.87 | **49.00** | 0.3 | 460 | 7.70 | 19.9 | 0.49 | -- |
| May 2 | 3 | 6 | 0.49 | 0.08 | 20.80 | 0.1 | 10 | 7.80 | 21.7 | 0.45 | -- |
| May 16 | 2 | 6 | **0.52** | 0.3 | 22.80 | 0.1 | 6 | 7.60 | 24.8 | 0.12 | -- |
| May 30 | 2 | 6 | 0.39 | 0.06 | 15.30 | 0.2 | 6 | 7.40 | 30.1 | 0.10 | -- |
| June 6 | 2 | 4 | 0.35 | 0.04 | 18.60 | 0.1 | 6 | 7.40 | 25.4 | -- | -- |
| June 13 | 2 | 8 | **0.64** | 0.04 | 9.81 | 0.2 | 2 | 7.80 | 23.9 | 0.08 | -- |
| June 20 | 2 | 7 | **0.55** | 0.03 | 12.40 | 0.1 | 4 | 8.00 | 27.0 | -- | -- |
| June 27 | 2 | 6 | 0.47 | 0.04 | 23.20 | 0.2 | 2 | 8.10 | 28.50 | 0.08 | -- |
| July 4 | 2 | 4 | 0.34 | 0.31 | 20.50 | **5.6** | 18 | 7.90 | 28.2 | -- | -- |
| July 11 | 2 | 2 | 0.26 | 0.03 | 27.70 | 0.1 | 2 | 8.00 | 28.2 | 0.10 | -- |
| July 17 | 2 | 14 | 0.45 | 0.03 | 25.20 | 0.1 | 6 | 8.00 | 26.9 | 0.03 | -- |
| July 25 | 2 | 8 | 0.48 | 0.03 | 34.40 | 0.2 | 14 | 8.10 | 29.00 | 0.08 | -- |
| Aug 8 | 2 | 6 | 0.38 | 0.03 | **39.8** | 0.1 | 6 | 8.00 | 27.3 | 0.06 | -- |
| Aug 22 | 2 | 2 | 0.29 | 0.30 | **45.30** | 0.1 | 2 | 8.20 | 27.4 | 0.07 | -- |
| Sept 5 | 2 | 3 | 0.26 | 0.03 | **52.70** | 0.1 | 2 | 8.10 | 23.2 | 0.09 | -- |
| Sept 19 | **11** | 5 | 0.28 | 0.30 | 26.60 | 0.2 | -- | 8.10 | 29.0 | 0.06 | -- |
| Sept 22 | -- | -- | -- | -- | -- | -- | 2 | 8.40 | 26.0 | -- | -- |
| Oct 3 | 2 | 6 | 0.37 | 0.11 | 20.60 | 0.3 | 6 | 8.40 | 26.3 | 0.07 | -- |
| Oct 19 | 2 | 5 | 0.30 | 0.09 | 23.10 | 0.3 | 400 | 7.70 | 21.0 | 0.06 | -- |
| Oct 31 | 2 | 12 | 0.42 | 0.18 | **37.30** | 0.3 | 62 | 7.80 | 18.4 | 0.36 | -- |
| Nov 14 | 2 | 3 | 0.36 | 0.06 | 16.50 | 0.2 | 20 | 7.60 | 22.7 | 0.30 | -- |
| Nov 28 | **26** | **17** | 0.41 | 0.04 | 0.08 | **6.2** | 460 | 7.70 | 20.0 | 0.44 | -- |
| Dec 5 | 4 | 9 | 0.20 | 0.24 | 0.20 | 1.0 | -- | 7.90 | 22.4 | -- | 0.27 |
| Dec 12 | 2 | 12 | 0.26 | 0.70 | 8.21 | 0.7 | 340 | 7.80 | 20.4 | 0.53 | -- |
| Dec 27 | 2 | 4 | 0.10 | 0.97 | 6.91 | **1.7** | 114 | 7.40 | 25.1 | 0.46 | -- |
| ECA Limits | 15.0 | 20.0 | 0.7 | N/A | N/A | 5.0 | N/A | | | 20.00 | 20.00 |
| Annual Average | 4 | 8 | 0.37 | 0.91 | 21.12 | 0.8 | 75 | 7.78 | 23.1 | 0.5 | 2.39 |
| ECA Objectives | 10.0 | 15.0 | 0.50 | N/A | 35.00 | 1.00 | N/A | | | N/A | N/A |

Notes:

| | |
|---|---|
| -- | Parameter not analyzed / no information |
| **Bold** | Parameter exceeds the Annual Average Effluent Objective |
| **36.0** | Parameter exceeds the Daily Effluent Limit |
| | Parameter not detected above method detection limit shown |

**Table 4.1**

**Monitoring Locations**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Location | Hydraulic Monitoring | Field pH, Conductivity, Temperature | Field Dissolved Oxygen | Laboratory Test Parameters | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | General Chemistry[1] | Dissolved Metals[2] | Total Metals[2] | Total Phosphorus | VOCs[3] |
| **Groundwater Monitoring Wells** | | | | | | | | |
| (33 locations) | | | | | | | | |
| OW2-83 | √ | √ | | √ | √ | | | o |
| OW3-83 | √ | √ | | √ | √ | | | o |
| OW4-83 | √ | √ | | √ | √ | | | |
| OW6-83 | √ | √ | | √ | √ | | | o |
| OW7-83 | √ | √ | | √ | √ | | | o |
| OW8-88 | √ | √ | | √ | √ | | | o |
| OW9-88 | √ | √ | | √ | √ | | | o |
| OW16-89 | √ | √ | | √ | √ | | | o |
| OW17-89 | √ | | | | | | | |
| OW18-89 | √ | √ | | √ | √ | | | |
| OW19-89 | √ | √ | | √ | √ | | | |
| OW20-89 | √ | | | | | | | |
| OW22-98 | √ | √ | | √ | √ | | | |
| OW23-98 | √ | √ | | √ | √ | | | |
| OW24-98 | √ | √ | | √ | √ | | | o |
| OW25R-13 | √ | √ | | √ | √ | | | o |
| OW27-00 | √ | √ | | √ | √ | | | |
| OW28-00 | √ | √ | | √ | √ | | | |
| OW29-07 | √ | √ | | √ | √ | | | o |
| OW30-07 | √ | √ | | √ | √ | | | o |
| OW31-07 | √ | √ | | √ | √ | | | o |
| OW32-07 | √ | √ | | √ | √ | | | o |
| OW33-07 | √ | √ | | √ | √ | | | o |
| OW36-09 | √ | √ | | √ | √ | | | |
| OW37-09 | √ | √ | | √ | √ | | | |
| OW43-09 | √ | | | | | | | |
| OW45-13 | √ | √ | | √ | √ | | | o |
| OW46A-13 | √ | √ | | √ | √ | | | o |

**Table 4.1**

**Monitoring Locations**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Location | Hydraulic Monitoring | Field pH, Conductivity, Temperature | Field Dissolved Oxygen | Laboratory Test Parameters | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | General Chemistry[1] | Dissolved Metals[2] | Total Metals[2] | Total Phosphorus | VOCs[3] |
| **Groundwater Monitoring Wells (cont'd)** | | | | | | | | |
| OW46B-13 | √ | √ | | √ | √ | | | o |
| OW47-13 | √ | √ | | √ | √ | | | o |
| OW48-13 | √ | √ | | √ | √ | | | o |
| OW49-13 | √ | √ | | √ | √ | | | o |
| OW50-13 | √ | √ | | √ | √ | | | o |
| Field Blank | | | | √ | √ | | | |
| Field Duplicate | | | | √ | √ | | | |
| **Surface Water Monitoring** | | | | | | | | |
| (8 locations) | | | | | | | | |
| SW1 | | √ | √ | √ | | √ | √ | o |
| SW2 | | √ | √ | √ | | √ | √ | o |
| SW3 | | √ | √ | √ | | √ | √ | o |
| SW4 | | √ | √ | √ | | √ | √ | o |
| SW5 | | √ | √ | √ | | √ | √ | o |
| SW6 | | √ | √ | √ | | √ | √ | o |
| SWP Entrance | | ● | ● | ● | | ● | ● | o |
| SWP Landfill | | ● | ● | ● | | ● | ● | o |
| **Groundwater Collector** | | | | | | | | |
| (1 location ea.) | | | | | | | | |
| GW Interceptor | | √ | √ | √ | | √ | √ | o |
| **Leachate** | | | | | | | | |
| (1 location) | | | | | | | | |
| Leachate Holding Tank | | ***X*** | ***X*** | ***X*** | | ***X*** | ***X*** | ***X*** |

**Table 4.1**

**Monitoring Locations**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Location | Hydraulic Monitoring | Field pH, Conductivity, Temperature | Field Dissolved Oxygen | Laboratory Test Parameters | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | General Chemistry[1] | Dissolved Metals[2] | Total Metals[2] | Total Phosphorus | VOCs[3] |
| **Mini-piezometers** | | | | | | | | |
| (4 locations) | | | | | | | | |
| MP1 | | √ | √ | √ | | √ | √ | o |
| MP2 | | √ | √ | √ | | √ | √ | o |
| MP3 | | √ | √ | √ | | √ | √ | o |
| MP4 | | √ | √ | √ | | √ | √ | o |

Notes:

(1) General chemistry parameters - alkalinity, conductivity, hardness, pH, DOC, ammonia, TKN, total phenols, chloride, nitrite, nitrate, sulphate. Leachate samples are to include BOD, COD, TDS, and TSS.

(2) Metals - calcium, iron, magnesium, manganese, phosphorus, potassium, sodium (dissolved metals field filtered) an expanded list of metals is analyzed for leachate including the above and arsenic, barium, boron, cadmium copper, lead, mercury, and zinc.

(3) VOCs once every two years (fall) starting in 2014 - next event in 2022

***X*** Samples to be collected annually (fall only) with the exception of the leachate holding tank (to be collected in the spring)

√ Samples to be collected semi-annually (spring and fall)

● Samples to be collected three times per year

o VOC samples to be collected once every two years (fall)

**Table 4.2**

**Monitoring Well Completion Details**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Monitoring Well Location | Ground Surface Elevation (mAMSL) | Reference Elevation (mAMSL) | Screened Interval (mAMSL) | | Geologic Material |
|---|---|---|---|---|---|
| OW2-83 [1] | 256.70 | 257.13 | - | - | - |
| OW3-83 | 256.86 | 257.88 | - | - | - |
| OW4-83 | 254.45 | 255.49 | - | - | - |
| OW6-83 | 255.80 | 256.66 | - | - | - |
| OW7-83 | 257.76 | 258.40 | - | - | - |
| OW8-88 | 255.77 | 256.53 | 253.70 | 252.78 | Brn. Clayey Silt Till |
| OW9-88 | 258.13 | 259.01 | 257.50 | 256.00 | Brn. Clayey Silt Till |
| OW10-88 [1] [2] | 252.85 | 253.88 | 252.35 | 250.85 | Brn. Clayey Silt Till |
| OW11-88 [1] [2] | 252.05 | 252.71 | 251.55 | 250.85 | Brn. Clayey Silt Till |
| OW12-88 [1] [2] | 250.05 | 250.73 | 249.55 | 248.70 | Brn. Clayey Silt Till |
| OW13-88 [1] [2] | 254.97 | 255.87 | 254.47 | 253.37 | Silty Sand Aquifer |
| OW14-88 [3] | 256.66 | 257.70 | 256.14 | 254.64 | Silty Sand Aquifer |
| OW15-88 [1][3] | 258.32 | 258.73 | 257.82 | 256.22 | Silty Sand Aquifer |
| OW16-89 | 263.66 | 264.63 | 254.73 | 251.48 | Silty Sand Aquifer |
| OW18-89 | 265.52 | 264.66 | 259.58 | 257.98 | Silty Sand Aquifer |
| OW19-89 | 252.79 | 253.71 | 242.19 | 238.94 | Brn. Clayey Silt Till |
| OW20-89 | 257.64 | 258.40 | 251.39 | 249.89 | Silty Sand Aquifer |
| OW21-89 | 252.84 | 253.74 | 244.74 | 243.24 | Brn. Clayey Silt Till |
| OW22-98 [1] | 265.41 | 266.38 | 257.61 | 256.21 | Silty Sand Aquifer |
| OW23-98 | 263.36 | 264.08 | 258.17 | 256.67 | Silty Sand Aquifer |
| OW24-98 | 258.62 | 259.50 | 255.81 | 254.41 | Brn. Clayey Silt Till |
| OW25-00 [3] | 255.09 | 255.85 | 250.05 | 247.55 | Silty Sand Aquifer |
| OW25R-13 | 255.21 | 256.00 | 249.57 | 248.05 | Massive Grey Silty Clay Till |
| OW26-00 [2] | 248.22 | 249.22 | 245.95 | 244.45 | Massive Grey Silty Clay Till |
| OW27-00 | 246.88 | 247.78 | 246.11 | 245.36 | Silty Sand Aquifer |
| OW28-00 | 249.96 | 250.78 | 248.47 | 246.92 | Silty Sand Aquifer |
| OW29-07 | 255.50 | 256.27 | 248.70 | 247.20 | Massive Grey Silty Clay Till |
| OW30-07 | 254.19 | 255.06 | 248.10 | 246.60 | Massive Grey Silty Clay Till |
| OW31-07 | 256.00 | 256.89 | 250.55 | 249.05 | Massive Grey Silty Clay Till |
| OW32-07 | 253.99 | 254.77 | 250.55 | 249.05 | Massive Grey Silty Clay Till |
| OW33-07 | 258.45 | 259.27 | 253.00 | 251.50 | Silty Sand Aquifer |
| OW34-09 [2] | 258.31 | 258.99 | 252.72 | 251.04 | Silty Sand Aquifer |
| OW35-09 [2] | 254.49 | 255.20 | 244.11 | 242.59 | Massive Grey Silty Clay Till |
| OW36-09 | 262.90 | 263.75 | 253.95 | 252.42 | Silty Sand Aquifer |
| OW37-09 | 252.03 | 252.90 | 229.42 | 226.37 | Bedrock |
| OW39-09 [2] | 257.44 | 258.33 | 254.39 | 252.87 | Silty Sand Aquifer |
| OW40-09 [2] | 260.29 | 261.02 | 255.72 | 254.19 | Silty Sand Aquifer |
| OW41-09 [2] | 261.98 | 262.80 | 256.80 | 255.27 | Silty Sand Aquifer |
| OW42-09 [3] | 252.30 | 253.12 | 249.25 | 247.73 | Silty Sand Aquifer |
| OW43-09 | 255.91 | 256.69 | 249.81 | 248.29 | Silty Sand Aquifer |
| OW45-13 | 254.62 | 255.25 | 251.88 | 250.35 | Silty Sand Aquifer |
| OW46A-13 | 251.76 | 252.62 | 241.09 | 238.04 | Massive Grey Silty Clay Till |
| OW46B-13 | 251.77 | 252.63 | 249.33 | 247.81 | Silty Sand Aquifer |
| OW47-13 | 254.24 | 255.08 | 246.92 | 245.40 | Silty Sand Aquifer |
| OW48-13 | 257.49 | 258.33 | 254.14 | 252.61 | Silty Sand Aquifer |
| OW49-13 | 260.66 | 261.50 | 256.09 | 254.56 | Silty Sand Aquifer |
| OW50-13 | 264.66 | 265.35 | 254.91 | 251.86 | Silty Sand Aquifer |
| MP01-13 | ns | ns | 0.56 mBGS | 1.17 mBGS | - |
| MP02-13 | ns | ns | 0.64 mBGS | 1.25 mBGS | - |
| MP03-13 | ns | ns | 0.46 mBGS | 1.07 mBGS | - |
| MP04-13 | ns | ns | 0.46 mBGS | 1.07 mBGS | - |

Notes:

[1] Elevation data was obtained from the 2008 Annual Monitoring Report (Pryde, 2008).
The remaining data was surveyed by GHD in April 2009.

[2] Monitoring locations have been abandoned/excavated (mid-2011) as part of the landfill expansion program.

[3] Monitoring well was reportedly destroyed.

mBGS - metres below ground surface.
mAMSL - metres Above Mean Sea Level.
- No Information available.
- Not surveyed.

**Table 4.3**

**Well Abandonment Record**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Location | Well Condition/Status | Well Depth (m BGS) | Excavation/Overdrill Depth (m BGS) | Notes |
|---|---|---|---|---|
| **Groundwater Monitoring Wells** | | | | |
| OW10-88 | Abandoned - excavated | 2.00 | 4.85 | Well removed via the excavation of Stage 1 Cell of Phase 2 (2011) |
| OW11-88 | Abandoned - excavated | 1.20 | 4.05 | Well removed via the excavation of Stage 1 Cell of Phase 2 (2011) |
| OW12-88 | Abandoned - overdrilled | 1.35 | 1.97 | Well was overdrilled and backfilled with bentonite grout (2011) |
| OW13-88 | Abandoned - excavated | 1.60 | 6.97 | Well removed via the excavation of Stage 1 Cell of Phase 2 (2011) |
| OW14-88 | Destroyed | 2.02 | - | Well could not be located - presumed destroyed |
| OW15-88 | Destroyed | 2.10 | - | Well could not be located - presumed destroyed |
| OW21-89 | Abandoned - overdrilled | 9.60 | 9.60 | Well was overdrilled and backfilled with bentonite grout (2011) |
| OW25-00 | Destroyed | 7.54 | - | Well destroyed - could not be located (replaced by OW25R-13) |
| OW26-00 | Abandoned - overdrilled | 3.77 | 3.90 | Well was overdrilled and backfilled with bentonite grout (2011) |
| OW34-09 | Abandoned - excavated | 7.27 | 10.31 | Well removed via the excavation of Stage 1 Cell of Phase 2 (2011) |
| OW35-09 | Abandoned - overdrilled | 11.90 | 13.33 | Well was overdrilled and backfilled with bentonite grout (2011) |
| OW39-09 | Abandoned - overdrilled | 4.57 | 4.57 | Well was overdrilled and backfilled with bentonite grout (2011) |
| OW40-09 | Abandoned - overdrilled | 6.10 | 6.09 | Well was overdrilled and backfilled with bentonite grout (2011) |
| OW41-09 | Abandoned - overdrilled | 6.71 | 7.16 | Well was overdrilled and backfilled with bentonite grout (2011) |
| OW42-09 | Destroyed | 4.57 | - | Well could not be located - presumed destroyed |
| OW43-09 | Destroyed | 7.62 | - | Well could not be located - presumed destroyed |
| MP4 | Destroyed | 1.07 | - | Well could not be located - presumed destroyed |

Note:

m BGS - metres below ground surface

**Table 6.1**

**Summary Of Groundwater Elevations**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Monitoring Location | Ground Surface Elevation (mAMSL) | Reference Elevation (mAMSL) | 10-Apr-17 (mAMSL) | 24-Nov-17 (mAMSL) | 18-May-18 (mAMSL) | 3-Nov-18 (mAMSL) | 22-May-19 (mAMSL) | 6-Dec-19 (mAMSL) | 17-Aug-20 (mAMSL) | 28-Nov-20 (mAMSL) | 10-May-21 (mAMSL) | 16-Nov-21 (mAMSL) | 2-Jul-22 (mAMSL) | 6-Dec-22 (mAMSL) | 18-May-23 (mAMSL) | 8-Nov-23 (mAMSL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OW2-83 [1] | 256.70 | 257.13 | 256.16 | 256.16 | 256.02 | 255.35 | 255.91 | 256.03 | 255.10 | 255.65 | Blocked | 256.21 | Blocked | Blocked | Blocked | Blocked |
| OW3-83 | 256.86 | 257.88 | 256.88 | Dry | 256.72 | Dry | 256.67 | 256.65 | 255.88 | 256.65 | 256.60 | 257.58 | 256.54 | nr | 255.28 | nm |
| OW4-83 | 254.45 | 255.49 | Dry | Dry | Dry | Dry | Dry | 253.90 | Dry | Dry | 253.33 | 254.42 | Dry | 254.02 | Dry | 253.49 |
| OW6-83 | 255.80 | 256.66 | 255.87 | 255.87 | 255.89 | 255.90 | 255.94 | 255.91 | 255.89 | 255.92 | 255.87 | 255.93 | 255.87 | nr | 255.86 | 254.95 |
| OW7-83 | 257.76 | 258.40 | 257.64 | 257.64 | 257.86 | 257.60 | buried | buried | buried | buried | buried | buried | buried | buried | buried | buried |
| OW8-88 | 255.77 | 256.53 | 255.75 | 255.75 | 255.47 | 255.29 | 255.51 | 255.46 | 254.71 | 255.31 | 255.30 | 255.81 | 254.55 | 255.61 | 255.10 | 255.13 |
| OW9-88 | 258.13 | 259.01 | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry |
| OW16-89 | 263.66 | 264.63 | 256.34 | 256.16 | 256.79 | 256.12 | 255.81 | 254.53 | 254.30 | 254.10 | 254.24 | 253.83 | 253.19 | 252.87 | 253.20 | 253.01 |
| OW17-89 | 263.77 | - | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry |
| OW18-89 | 265.52 | 264.66 | - | 257.42 | 258.38 | 257.27 | 258.45 | 257.34 | 257.29 | 257.05 | 257.66 | 257.28 | 257.70 | 257.40 | 257.92 | 257.25 |
| OW19-89 | 252.79 | 253.71 | 249.22 | 249.67 | 249.82 | 251.13 | 250.14 | 251.11 | 243.81 | 250.46 | 250.14 | 251.12 | 249.35 | 250.51 | 250.05 | 250.89 |
| OW22-98 [1] | 265.41 | 266.38 | - | 260.67 | 260.03 | 258.97 | 260.16 | 259.06 | 259.01 | 258.77 | 259.38 | 259.02 | 259.39 | 259.17 | 259.81 | 258.96 |
| OW23-98 | 263.36 | 264.08 | 258.37 | 258.37 | 258.89 | 258.09 | 258.95 | 257.22 | 258.12 | 258.02 | 258.44 | 258.38 | 258.31 | 258.29 | 258.55 | 258.12 |
| OW24-98 | 258.62 | 259.50 | - | - | 258.02 | 257.44 | 258.27 | 257.73 | 257.23 | 257.55 | 257.81 | 258.02 | 257.59 | 257.93 | 257.97 | 257.43 |
| OW25R-13 | 255.21 | 256.00 | 252.14 | 251.95 | 252.16 | 251.54 | 252.31 | 251.91 | 251.60 | 251.58 | 251.96 | 252.12 | 251.81 | 252.11 | 252.40 | 252.18 |
| OW27-00 | 246.88 | 247.78 | 246.98 | 247.01 | 246.98 | 247.04 | 246.98 | 247.04 | 246.98 | 247.06 | 247.05 | 247.09 | 247.06 | 247.07 | 247.08 | 247.10 |
| OW28-00 | 249.96 | 250.78 | 249.47 | - | 249.28 | 248.91 | 249.22 | 249.08 | 248.59 | 249.17 | 249.01 | 249.88 | 248.28 | 249.20 | 248.92 | 249.00 |
| OW29-07 | 255.50 | 256.27 | 253.96 | 253.96 | 253.59 | 253.84 | 253.83 | 253.13 | 252.69 | 254.22 | 254.28 | 255.10 | 253.73 | 255.20 | na | 255.22 |
| OW30-07 | 254.19 | 255.06 | 253.20 | 253.20 | 252.92 | 252.62 | 252.67 | 251.20 | 250.91 | 252.02 | 252.42 | 252.89 | 252.10 | 252.43 | na | 253.45 |
| OW31-07 | 256.00 | 256.89 | 255.67 | 255.67 | 255.60 | 255.70 | 255.62 | 255.62 | 255.67 | 255.52 | 255.59 | 255.70 | 255.69 | 255.51 | 255.58 | 255.48 |
| OW32-07 | 253.99 | 254.77 | 252.53 | 252.53 | 252.16 | 252.54 | 252.27 | 252.50 | 252.52 | 252.55 | 252.27 | 251.90 | 252.44 | 252.59 | 252.17 | 252.47 |
| OW33-07 | 258.45 | 259.27 | - | 254.64 | 255.54 | 253.86 | 254.88 | 253.78 | No access | 252.90 | 253.96 | 253.56 | 253.64 | 253.36 | 254.63 | 253.08 |
| OW36-09 | 262.90 | 263.75 | 256.35 | 256.14 | 256.83 | 256.16 | 255.90 | 254.91 | 254.62 | 254.36 | 254.49 | 254.12 | Dry | Dry | Dry | 253.75 |
| OW37-09 | 252.03 | 252.90 | 244.56 | 244.48 | 244.45 | 244.29 | 244.46 | 244.30 | 243.17 | 244.21 | 244.30 | 244.40 | 243.81 | 243.91 | 244.03 | 243.89 |
| OW43-09 | 255.91 | 256.69 | 253.40 | - | gone/destroyed | gone/destroyed | gone/destroyed | gone/destroyed | gone/destroyed | gone/destroyed | gone/destroyed | gone/destroyed | gone/destroyed | gone/destroyed | gone/destroyed | gone/destroyed |
| OW45-13 | 254.62 | 255.25 | 252.25 | 252.15 | 252.05 | 252.06 | 252.05 | 252.10 | 252.01 | 252.09 | 252.03 | 252.34 | 251.94 | 252.16 | 252.08 | 252.15 |
| OW46A-13 | 251.76 | 252.62 | 246.98 | 246.70 | 247.03 | 246.39 | 246.94 | 246.44 | 246.04 | 245.81 | 246.50 | 246.63 | 246.10 | 246.34 | 246.57 | 246.25 |
| OW46B-13 | 251.77 | 252.63 | 251.00 | 250.47 | 251.02 | 249.97 | 250.82 | 250.13 | 249.43 | 249.80 | 250.20 | 250.89 | 249.78 | 250.26 | 250.47 | 250.02 |
| OW47-13 | 254.24 | 255.08 | 249.22 | 249.06 | 249.36 | 249.05 | 248.93 | 248.15 | 248.19 | 247.91 | 248.66 | 248.12 | 248.44 | 248.05 | 248.72 | 247.92 |
| OW48-13 | 257.49 | 258.33 | 255.01 | 254.95 | 255.03 | 254.90 | 255.00 | 254.82 | 254.61 | 254.56 | 254.87 | 254.92 | 253.89 | 254.88 | 254.99 | 254.51 |
| OW49-13 | 260.66 | 261.50 | 256.64 | 256.53 | 256.67 | 256.42 | 256.66 | 256.34 | 256.28 | 256.10 | 256.56 | 256.27 | 256.48 | 256.17 | 256.60 | 255.91 |
| OW50-13 | 264.66 | 265.35 | 258.00 | 258.00 | 258.95 | 258.11 | 258.91 | 257.88 | 257.92 | 257.62 | 258.16 | 257.63 | 258.16 | 257.70 | 258.44 | 257.58 |
| MP01-13 | ns | ns | - | 1.2 mBTOR | 1.05 mBTOR | 1.13 mBTOR | 1.09 mBTOR | 1.27 mBTOR | 1.40 mBTOR | 1.20 mBTOR | 1.1 mBTOR | 1.12 mBTOR | 1.1 mBTOR | na | na | na |
| MP02-13 | ns | ns | - | 1.02 mBTOR | 0.92 mBTOR | 0.91 mBTOR | 0.82 mBTOR | 1.10 mBTOR | 1.38 mBTOR | 0.90 mBTOR | 0.91 mBTOR | 0.75 mBTOR | 0.91 mBTOR | na | na | na |
| MP03-13 | ns | ns | - | 1.72 mBTOR | 0.58 mBTOR | 0.81 mBTOR | 0.51 mBTOR | 1.01 mBTOR | 1.18 mBTOR | 0.97 mBTOR | 0.87 mBTOR | 0.90 mBTOR | 0.87 mBTOR | na | na | na |
| MP04-13 | ns | ns | - | 1.19 mBTOR | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed |

Notes:

[1] Elevation data was obtained from the 2008 Annual Monitoring Report (Pryde, 2008). The remaining data was surveyed by GHD in April 2009.
mBTOR - metres below top of riser
mAMSL - metres Above Mean Sea Level.
- No Information available.
na No access.
ns Not surveyed.
nr - Not recorded

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | MP01-13 | MP01-13 | MP01-13 | MP01-13 | MP01-13 | MP01-13 | MP01-13 | MP01-13 | MP01-13 | MP01-13 | MP01-13 | MP02-13 | MP02-13 | MP02-13 | MP02-13 | MP02-13 | MP02-13 | MP02-13 | MP02-13 | MP02-13 | MP03-13 | MP03-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | GW(MP)-WARD2-041017-001 | GW(MP)-WARD2-112417-003 | GW(MP)-WARD2-051818-001 | GW(MP)-WARD2-110318-001 | GW-WARD2-19-002 MINI-PIEZOMETER | GW-WARD2-19-001 MINI-PIEZOMETER | GW-WARD 2-19-023 | MP1 | GW-WARD 2-001 MINI-PIEZOMETER | GW/MP WARD 2 001 | GW-WARD 2-031 | GW(MP)-WARD2-041017-002 | GW(MP)-WARD2-112417-004 | GW(MP)-WARD2-051818-002 | GW(MP)-WARD2-110318-002 | GW-WARD2-19-003 MINI-PIEZOMETER | GW-WARD2-19-002 MINI-PIEZOMETER | GW-WARD 2-19-027 | MP2 | GW-WARD 2-002 MINI-PIEZOMETER | GW/MP WARD 2 002 | GW-WARD 2-030 | GW(MP)-WARD2-041017-003 | GW(MP)-WARD2-112417-001 |
| Sample Date: | | ODWS [1] | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/18/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/3/2022 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/18/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/3/2022 | 4/10/2017 | 11/24/2017 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 141 | 125 | 125 | 127 | 155 | 172 | 158 | 146 | 130 | 130 | 105 | 94 | 90.8 | 102 | 78.7 | 110 | 104 | 110 | 104 | 128 | 100 | 119 | 86.5 | 75.4 |
| Iron (dissolved) | mg/L | 0.30 (AO) | **0.55** | <0.1 | **0.87** | <0.1 | **0.322** | <0.03 | 0.255 | 0.012 | 0.209 | **0.825** | **0.786** | 0.022 | 0.147 | **3.89** | 0.098 | **4** | <0.033 | **1.39** | 0.08 | **0.882** | 0.082 | **0.959** | **0.429** | 0.081 |
| Magnesium (dissolved) | mg/L | -- | 50.8 | 47 | 46.1 | 43.9 | 43 | 40.4 | 41.6 | 37.3 | 34.6 | 30.9 | 32 | 57.4 | 57.8 | 60.1 | 53 | 58.8 | 48.9 | 52 | 51.5 | 63.4 | 51.1 | 63 | 36.1 | 37.7 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | **0.375** | **0.0829** | **0.239** | **0.0646** | **0.229** | **0.318** | **0.214** | 0.0227 | **0.205** | **0.238** | **0.222** | **0.534** | **0.366** | **0.539** | **0.289** | **0.647** | **0.595** | **0.62** | **0.104** | **0.795** | **0.158** | **0.624** | **0.22** | **0.133** |
| Molybdenum (dissolved) | mg/L | -- | - | 0.00103 | 0.0009 | - | - | - | - | - | - | - | - | - | 0.00314 | 0.00245 | - | - | - | - | - | - | - | - | - | 0.00239 |
| Phosphorus (dissolved) | mg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | 0.031 | 0.018 | 0.049 | <0.003 | 0.04 | 0.076 | 0.118 | <0.05 | <0.05 | <0.05 | <0.05 | 0.026 | 0.019 | 0.165 | 0.061 | 0.042 | 0.016 | 0.013 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | -- | 1.01 | 1.48 | 1.45 | 1.13 | 1.23 | 1.07 | 1.55 | 1.45 | 1.46 | 1.6 | 1.48 | 6.41 | 6.81 | 6.15 | 6.51 | 6.54 | 6.96 | 7.15 | 7.09 | 7.68 | 6.97 | 8.2 | 3.64 | 4.12 |
| Sodium (dissolved) | mg/L | 200 (AO) | 7.4 | 8.4 | 8.84 | 9.78 | 10.3 | 10.7 | 13.8 | 11.5 | 11.3 | 10.7 | 13 | 14.2 | 15.2 | 12.8 | 12.5 | 11.7 | 11.7 | 12.2 | 12 | 12.8 | 10.1 | 11.8 | 33.6 | 37.3 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 401 | 419 | 366 | 379 | 395 | 384 | 391 | 364 | 343 | 241 | 244 | 487 | 476 | 478 | 444 | 429 | 427 | 376 | 453 | 454 | 463 | - | 384 | 415 |
| Ammonia-N | mg/L | -- | 0.214 | <0.058 | 0.225 | 0.077 | <0.1 | 0.2 | 0.2 | <0.1 | 0.2 | 0.2 | 0.3 | 0.167 | 0.459 | 0.527 | 0.037 | 0.4 | 0.5 | 2.2 | 0.2 | 0.3 | <0.1 | 1.1 | 0.073 | <0.098 |
| Chloride | mg/L | 250 (AO) | 23.4 | 25.2 | 26.1 | 34 | 38 | 37 | 41 | 40 | 37 | 23 | 35 | 14.3 | 13.5 | 13.2 | 12.8 | 13 | 13 | 11 | 11 | 9 | 7 | - | 24 | 27 |
| Conductivity | uS/cm | -- | 913 | 860 | 760 | 765 | 796 | 797 | 754 | 811 | 764 | 499 | 537 | 905 | 872 | 831 | 787 | 780 | 786 | 742 | 923 | 909 | 843 | - | 756 | 810 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | **5.2** | **6.5** | **7.5** | **7.32** | 5 | 5 | **8** | 5 | **6** | **6** | **7** | **7.9** | **8.7** | **8.9** | **15.4** | **8** | **9** | **11** | **9** | **8** | **10** | - | **5.1** | **7** |
| Hardness | mg/L | 80-100 (OG) | 561 | 505 | 503 | 499 | 565 | 596 | 565 | 519 | 468 | 451 | 394 | 471 | 465 | 501 | 415 | 516 | 460 | 489 | 471 | 582 | 461 | 556 | 365 | 344 |
| Nitrate (as N) | mg/L | 10 | 0.1 | 0.041 | 0.045 | 0.026 | <0.06 | <0.06 | <0.06 | 0.06 | 0.19 | 0.93 | 1.04 | 0.203 | 0.088 | 0.062 | 0.046 | 0.11 | 0.36 | 0.22 | 1.34 | 1.47 | 0.5 | - | 0.02 | 0.102 |
| Nitrite (as N) | mg/L | 1 | 0.027 | <0.01 | <0.01 | <0.01 | 0.04 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.081 | <0.01 | 0.062 | <0.01 | 0.09 | <0.03 | 0.14 | <0.03 | <0.03 | <0.03 | - | <0.01 | <0.01 |
| pH | s.u. | 6.5-8.5 (OG) | 7.82 | 8.07 | 7.69 | 7.38 | 7.34 | 8.01 | 8 | 8.3 | 8.05 | 7.72 | 8.08 | 7.96 | 8.1 | 8.17 | 7.54 | 8.08 | 7.76 | 7.82 | 8.24 | 8.11 | 8.07 | - | 8.14 | 8.2 |
| Phenolics (total) | mg/L | -- | 0.0013 | <0.001 | <0.0042 | <0.0027 | 0.003 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.001 | <0.0027 | <0.0012 | <0.0023 | <0.002 | <0.002 | 0.005 | <0.002 | <0.002 | <0.002 | - | 0.0012 | 0.0064 |
| Sulfate | mg/L | 500 (AO) | 89.7 | 56.8 | 46.8 | 31.1 | 21 | 16 | 21 | 15 | 12 | 8 | 12 | 39.9 | 32.3 | 29.5 | 24 | 22 | 32 | 60 | 61 | 48 | 42 | - | 22.4 | 21.1 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | 0.73 | 0.99 | 1.13 | 5.1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.99 | 1.41 | 1.54 | 0.64 | <0.5 | <0.5 | 2.2 | <0.5 | 0.7 | <0.5 | 1.8 | <0.15 | 1.99 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | - | - | 394 | - | - | - | - | - | - | - | NM | - | - | 480 | 970 | - | - | - | - | - | - | NM | - | - |
| pH, field | s.u. | 6.5-8.5 (OG) | NM | NM | 7.55 | NM | NM | NM | NM | NM | NM | NM | NM | NM | NM | 7.62 | 7.69 | NM | NM | NM | NM | NM | NM | NM | NM | NM |
| Temperature, field | Deg C | 15 (AO) | - | - | **16.08** | - | - | - | - | - | - | - | NM | - | - | 13.54 | 7.77 | - | - | - | - | - | - | NM | - | - |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

OG Operation Guideline (water treatment and distribution).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
R Rejected.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | MP03-13 | MP03-13 | MP03-13 | MP03-13 | MP03-13 | MP03-13 | MP03-13 | MP03-13 | MP03-13 | MP04-13 | MP04-13 | MP04-13 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW(MP)-WARD2-051818-003 | GW(MP)-WARD2-110318-003 | GW-WARD2-19-001 MINI-PIEZOMETER | GW-WARD2-19-003 MINI-PIEZOMETER | GW-WARD 2-_19-017 | MP3 | GW-WARD 2-003 MINI-PIEZOMETER | GW/MP WARD 2 003 | GW-WARD 2-032 | GW(MP)-WARD2-041017-004 | GW(MP)-WARD2-112417-002 | GW-WARD2-112417-022 | GW-WARD2-041017-023 | GW-WARD2-112417-025 | GW-WARD2-051818-014 | GW-WARD2-110318-032 | GW-WARD2-19-014 | GW-WARD2-19-008 | GW-WARD 2-_19-011 | OW2-83 | GW-WARD 2-014 | GW-WARD2-016 | GW-WARD 2-007 | GW-WARD2-1222-020 |
| **Sample Date:** | | *ODWS* [1] | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/18/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/3/2022 | 4/10/2017 | 11/24/2017 | 11/24/2017 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/17/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/2/2022 | 12/6/2022 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 14.9 | - | 69.2 | 85.8 | 85 | 89.2 | 91.6 | 88.3 | 85.5 | 72.8 | 61.2 | 70.5 | 115 | 61.1 | 134 | 130 | 157 | 171 | 143 | 151 | 177 | 153 | 150 | 168 |
| Iron (dissolved) | mg/L | 0.30 (AO) | 0.1 | - | **0.506** | **0.923** | **0.529** | 0.023 | 0.235 | 0.011 | 0.179 | 0.104 | 0.028 | 0.073 | 0.014 | 0.085 | 0.109 | 0.262 | 0.145 | 0.142 | 0.167 | **0.351** | 0.262 | 0.163 | 0.193 | 0.144 |
| Magnesium (dissolved) | mg/L | -- | 3.65 | - | 22.1 | 29.3 | 33.2 | 34.1 | 36.4 | 37.3 | 37.3 | 47.6 | 52.7 | 51.3 | 31.7 | 27.9 | 37.1 | 37.8 | 40.4 | 40 | 37.5 | 37.8 | 39.8 | 39 | 39.6 | 42.3 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | **0.0654** | - | **0.183** | **0.241** | **0.226** | **0.163** | **0.212** | 0.0377 | **0.18** | 0.035 | 0.0151 | 0.0474 | **0.0989** | **0.193** | 0.0205 | **0.058** | 0.0365 | **0.0725** | **0.0733** | **0.08692** | **0.0666** | **0.0601** | **0.09394** | **0.101** |
| Molybdenum (dissolved) | mg/L | -- | 0.000585 | - | - | - | - | - | - | - | - | - | 0.00113 | 0.00311 | - | 0.00496 | 0.000613 | - | - | - | - | - | - | - | - | - |
| Phosphorus (dissolved) | mg/L | -- | <0.05 | - | 0.075 | 0.121 | 0.047 | 0.006 | 0.023 | 0.006 | 0.017 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.533 | 0.122 | 0.054 | 0.096 | 0.043 | <0.003 | 0.019 | 0.088 | 0.112 | 0.005 |
| Potassium (dissolved) | mg/L | -- | 0.97 | - | 2.54 | 3.75 | 4.32 | 3.69 | 3.81 | 4.23 | 4.16 | 1.84 | 2.17 | 2.12 | 1.02 | 1.68 | 4.24 | 0.843 | 0.682 | 1.15 | 0.843 | 0.655 | 0.714 | 1.19 | 1.14 | 0.779 |
| Sodium (dissolved) | mg/L | 200 (AO) | 3.59 | - | 23.8 | 31.8 | 37 | 37 | 37.5 | 40.9 | 39.3 | 16.8 | 14 | 26.8 | 5.76 | 77.5 | 6.99 | 7.52 | 6.95 | 7.28 | 7.27 | 7.19 | 7.38 | 7.49 | 7.66 | 7.84 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 167 | 304 | 106 | 326 | 380 | 374 | 348 | 423 | 361 | 227 | 287 | 395 | 389 | 426 | 466 | 478 | 491 | 462 | 429 | 451 | 491 | 522 | 492 | 458 |
| Ammonia-N | mg/L | -- | <0.143 | 0.201 | 0.1 | 0.2 | 0.1 | <0.1 | 0.1 | <0.1 | 0.1 | 0.132 | <0.888 | <0.286 | <0.02 | 0.535 | <0.063 | 0.092 | <0.1 | <0.1 | <0.1 | 0.1 | 0.2 | <0.1 | <0.1 | <0.1 |
| Chloride | mg/L | 250 (AO) | 15.3 | 19.9 | 5 | 25 | 23 | 28 | 24 | 26 | 23 | 3.27 | 4.23 | 0.55 | 2.31 | 34.4 | 4.48 | 3.21 | 5 | <5 | 3 | 4 | 3 | 3 | 4 | 6 |
| Conductivity | uS/cm | -- | 329 | <3 | 217 | 677 | 745 | 788 | 699 | 796 | 714 | 277 | 600 | 757 | 675 | 793 | 911 | 870 | 957 | 943 | 860 | 912 | 857 | 951 | 967 | 937 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | 3.6 | **7.29** | 1 | 5 | 5 | 4 | 5 | 4 | 4 | 1.1 | **13.6** | <1 | 1.6 | 4.8 | 2.1 | <4.01 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Hardness | mg/L | 80-100 (OG) | 52 | - | 264 | 335 | 349 | 363 | 378 | 374 | 367 | 378 | 370 | 387 | 418 | 268 | 488 | 480 | 559 | 592 | 511 | 532 | 605 | 543 | 537 | 594 |
| Nitrate (as N) | mg/L | 10 | 0.128 | <0.02 | 0.64 | 0.11 | 0.4 | <0.06 | <0.06 | <0.06 | 0.1 | 0.045 | 0.041 | <0.02 | <0.02 | <0.02 | 0.454 | 0.033 | <0.06 | 1.25 | 0.13 | <0.06 | <0.06 | 0.58 | 0.72 | 0.18 |
| Nitrite (as N) | mg/L | 1 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 (OG) | 7.94 | 5.83 | 7.4 | 7.96 | 8.05 | 8.2 | 8.44 | 8.28 | 8.07 | 8.53 | 8.33 | 8.08 | 7.62 | 8.15 | 7.67 | 7.02 | 7.81 | 7.64 | 7.87 | 7.76 | 7.71 | 7.9 | 8 | 7.66 |
| Phenolics (total) | mg/L | -- | <0.0159 | <0.0028 | 0.004 | <0.004 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.0015 | <0.004 | <0.001 | 0.0012 | <0.001 | <0.0077 | <0.005 | <0.002 | <0.002 | 0.003 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Sulfate | mg/L | 500 (AO) | 10.7 | 12.4 | 3 | 23 | 24 | 22 | 17 | 21 | 21 | 88.9 | 96.5 | 42.1 | 4.37 | <0.3 | 58.4 | 56.5 | 73 | 77 | 64 | 69 | 55 | 54 | 59 | 55 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | 1.62 | 1.46 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 2.4 | 3.4 | 0.33 | <0.15 | 2.3 | 0.27 | 0.75 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 107 | - | 184 | - | - | - | - | - | NM | - | - | 636 | 660 | 660 | 517 | 1000 | 1410 | 1440 | 943 | 900 | 1000 | 812 | 921 | 1190 |
| pH, field | s.u. | 6.5-8.5 (OG) | 7.35 | NM | 7.65 | NM | NM | NM | NM | NM | NM | NM | NM | 7.6 | 7.49 | 7.49 | 6.86 | 6.66 | 7.14 | 6.57 | 6.96 | 6.72 | 6.68 | 7.5 | 7.03 | 7.55 |
| Temperature, field | Deg C | 15 (AO) | 9.63 | - | 8.21 | - | - | - | - | - | NM | - | - | 9.7 | 7.3 | 7.3 | 8.82 | 9.89 | 6.72 | 6.61 | 14.9 | 7.95 | 7.26 | 8.67 | 11.8 | 8.64 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

| | |
|---|---|
| OG | Operation Guideline (water treatment and distribution). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| -- | No guideline. |
| < | Parameter detected below the laboratory method detection limit. |
| R | Rejected. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW4-83 | OW4-83 | OW4-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-041017-024 | GW-WARD2-112417-023 | GW-WARD2-051818-008 | GW-WARD2-110318-026 | GW-WARD2-19-012 | GW-WARD2-19-032 | OW3-83 | GW-WARD 2-006 | GW-WARD2-004 | GW-WARD 2-010 | GW-WARD2-1222-019 | OW3-83 | GW-WARD2-19-010 | GW-WARD2-007 | GW-WARD2-1222-027 | GW-WARD2-041017-019 | GW-WARD2-112417-019 | GW-WARD2-051818-002 | GW-WARD2-110318-030 | GW-WARD2-19-026 | GW-WARD2-19-002 | GW-WARD 2-_19-003 | OW6-83 | GW-WARD 2-001 |
| **Sample Date:** | | *ODWS* [1] | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/2/2022 | 12/6/2022 | 5/18/2023 | 12/6/2019 | 11/16/2021 | 12/5/2022 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/17/2020 | 11/28/2020 | 5/10/2021 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 68.7 | 146 | 94.9 | 121 | 116 | 130 | 143 | 129 | 149 | 113 | 144 | 122 | 121 | 142 | 116 | 27.4 | 189 | 97.6 | 165 | 179 | 200 | 203 | 190 | 204 |
| Iron (dissolved) | mg/L | 0.30 (AO) | <0.01 | 0.025 | 0.01 | **7.07** | **0.498** | 0.05 | **0.362** | **0.463** | 0.175 | 0.234 | 0.017 | 0.028 | <0.023 | <0.007 | 0.007 | <0.01 | **2.83** | **1.67** | **4.08** | **11.5** | **14.6** | **18** | **1.68** | **15.6** |
| Magnesium (dissolved) | mg/L | -- | 52.1 | 41.6 | 31.2 | 34.8 | 30.6 | 32 | 35.6 | 32.7 | 36.2 | 32 | 39 | 33.5 | 32.7 | 38.4 | 33 | 15.1 | 76.2 | 54 | 60.5 | 60 | 62.5 | 65.2 | 61.4 | 64 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | 0.00379 | 0.0326 | 0.045 | **1.39** | **0.392** | **0.0502** | **0.326** | **0.455** | **0.268** | **0.351** | 0.0413 | 0.0263 | 0.0273 | 0.00015 | 0.0196 | 0.00117 | **0.274** | **0.0539** | **0.498** | **0.349** | **0.458** | **0.528** | **0.436** | **0.371** |
| Molybdenum (dissolved) | mg/L | -- | - | 0.00056 | 0.000067 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.000164 | 0.00199 | - | - | - | - | - | - |
| Phosphorus (dissolved) | mg/L | -- | <0.05 | 1.27 | <0.05 | 1.52 | 0.023 | 0.023 | 0.015 | 0.035 | <0.003 | 0.014 | 0.025 | 0.023 | 0.152 | 0.068 | <0.003 | <0.05 | <0.05 | <0.05 | <0.05 | 0.024 | 0.044 | 0.101 | 0.004 | 0.045 |
| Potassium (dissolved) | mg/L | -- | 1.98 | 21.8 | 1.01 | 5.44 | 0.994 | 0.773 | 0.847 | 1.15 | 0.939 | 1.03 | 0.918 | 0.706 | 3.19 | 2.45 | 1.92 | 0.952 | 29.4 | 1.96 | 17.2 | 14.5 | 15.6 | 14.6 | 14.5 | 15 |
| Sodium (dissolved) | mg/L | 200 (AO) | 26 | 7.28 | 6.37 | 6.08 | 5.69 | 5.32 | 5.44 | 5.84 | 6.33 | 5.8 | 6.27 | 5.5 | 23.7 | 21.4 | 22 | 33.5 | 33.3 | 41.9 | 24.1 | 20.8 | 23.7 | 26.5 | 28 | 32 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 408 | 469 | 419 | 477 | 418 | 358 | 456 | 431 | 508 | 437 | 458 | 467 | 434 | 558 | 402 | 197 | 842 | 486 | 730 | 742 | 786 | 749 | 773 | 711 |
| Ammonia-N | mg/L | -- | <0.021 | 0.516 | <0.064 | 0.414 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.023 | 10.9 | 0.348 | 8.93 | 8.6 | 7.5 | 8 | 7.4 | 7.4 |
| Chloride | mg/L | 250 (AO) | 0.63 | 3.95 | 2.65 | 1.06 | 3 | <3 | 2 | 3 | 4 | 3 | 3 | 3 | 26 | 22 | 26 | 2.04 | 31.7 | 23.7 | 28.6 | 29 | 25 | 39 | 55 | 34 |
| Conductivity | uS/cm | -- | 791 | 968 | 707 | 752 | 730 | 665 | 811 | 679 | 840 | 788 | 833 | 788 | 791 | 965 | 526 | 374 | 1510 | 939 | 1340 | 1320 | 1370 | 1380 | 1510 | 1210 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | 1 | 2.2 | 1.6 | <5.55 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 3 | 4 | 2 | <1 | **8.6** | 3.8 | **11.3** | 1 | **6** | **8** | **9** | <1 |
| Hardness | mg/L | 80-100 (OG) | 386 | 536 | 365 | 444 | 415 | 457 | 504 | 458 | 521 | 415 | 521 | 444 | 436 | 512 | 426 | 130 | 785 | 466 | 661 | 695 | 756 | 776 | 727 | 772 |
| Nitrate (as N) | mg/L | 10 | 0.074 | 0.08 | 0.048 | 0.039 | <0.06 | <0.06 | 0.18 | <0.06 | 1.45 | 0.1 | <0.06 | <0.06 | 0.09 | 0.17 | <0.06 | 0.113 | <0.1 | <0.02 | 0.039 | <0.06 | 0.96 | 0.13 | <0.06 | 1.74 |
| Nitrite (as N) | mg/L | 1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.01 | <0.05 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 (OG) | 7.87 | 7.83 | 7.75 | 6.91 | 7.6 | 7.54 | 7.6 | 7.94 | 8.03 | 8.06 | 7.72 | 7.76 | 7.79 | 8.08 | 7.81 | 8.12 | 7.55 | 7.97 | 6.72 | 6.88 | 7.22 | 7.53 | 7.24 | 7.48 |
| Phenolics (total) | mg/L | -- | 0.002 | <0.001 | <0.0042 | 0.053 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.0015 | <0.0026 | <0.0086 | <0.0097 | 0.006 | <0.002 | <0.002 | <0.002 | <0.002 |
| Sulfate | mg/L | 500 (AO) | 62.5 | 63.2 | 2.36 | 2.11 | 3 | 5 | 4 | 3 | 3 | 4 | 10 | 4 | 14 | 9 | 9 | 14.3 | <1.5 | 3.51 | 3.12 | 10 | 7 | 4 | 5 | 6 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | <0.15 | 0.58 | 0.17 | 6.1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.17 | 11.5 | 0.73 | 10.1 | 8.2 | 9.3 | 7.6 | 7.9 | 9.1 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 674 | 6.74 | 416 | 1020 | 1200 | 789 | 873 | 879 | 828 | 762 | 1030 | 737 | 939 | - | 1040 | 1570 | 1570 | 1480 | 1590 | 1740 | 640 | 1460 | 1470 | 1570 |
| pH, field | s.u. | 6.5-8.5 (OG) | 7.46 | 7.46 | 6.95 | 6.54 | 7.33 | 6.7 | 6.8 | 6.62 | 6.89 | 6.96 | 7.27 | 7.12 | 7.12 | NM | 7.6 | 7.58 | 7.58 | 6.5 | 6.4 | 6.91 | 7 | 6.67 | 6.57 | 6.3 |
| Temperature, field | Deg C | 15 (AO) | 8.6 | 8.6 | 9.8 | 9.27 | 7.19 | 6.07 | 8.33 | 7.14 | 9.53 | 11.8 | 7.23 | 12.7 | 6 | - | 5.42 | 7.9 | 7.9 | 9.85 | 9.25 | 8.7 | 6.14 | **17.8** | 7.67 | 7.5 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

| | |
|---|---|
| OG | Operation Guideline (water treatment and distribution). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| -- | No guideline. |
| < | Parameter detected below the laboratory method detection limit. |
| R | Rejected. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW16-89 | OW16-89 | OW16-89 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-005 | GW-WARD 2-014 | GW-WARD2-1222-004 | OW6-83 | GW-WARD2-041017-017 | GW-WARD2-112417-017 | GW-WARD2-051818-017 | GW-WARD2-110318-015 | GW-WARD2-041017-020 | GW-WARD2-112417-020 | GW-WARD2-051818-010 | GW-WARD2-110318-021 | GW-WARD2-19-016 | GW-WARD2-19-003 | GW-WARD 2-_19-004 | OW8-88 | GW-WARD 2-005 | GW-WARD2-002 | GW-WARD 2-008 | GW-WARD2-1222-031 | OW8-88 | GW-WARD2-041017-032 | GW-WARD2-112417-009 | GW-WARD2-051818-023 |
| **Sample Date:** | | *ODWS* [1] | 11/16/2021 | 7/2/2022 | 12/6/2022 | 5/18/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/17/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/2/2022 | 12/5/2022 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 185 | 185 | 203 | 191 | 114 | 166 | 115 | 113 | 55 | 130 | 105 | 135 | 93.1 | 140 | 144 | 140 | 149 | 154 | 121 | 155 | 148 | 222 | 219 | 208 |
| Iron (dissolved) | mg/L | 0.30 (AO) | 8.63 | 16.3 | 15.7 | 17.8 | <0.01 | 0.015 | 4.22 | 1.57 | <0.01 | 3.35 | 5.44 | 2.08 | 0.131 | <0.015 | 1.48 | 2.23 | 0.828 | 0.466 | 1.99 | 0.091 | 0.055 | 0.276 | 0.184 | 0.18 |
| Magnesium (dissolved) | mg/L | -- | 61.8 | 62.4 | 72 | 67.2 | 51.2 | 52.8 | 56.5 | 63.9 | 21.8 | 68.3 | 65.9 | 65.9 | 37.3 | 56.2 | 57.5 | 63 | 58.8 | 64 | 52.1 | 62.3 | 62.7 | 75.1 | 75.7 | 67 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | 0.349 | 0.348 | 0.38 | 0.415 | 0.429 | 0.185 | 0.341 | 0.249 | <0.0005 | 0.998 | 0.852 | 0.706 | 0.66 | 0.557 | 0.947 | 1 | 1.31 | 1.38 | 1.05 | 0.945 | 1.38 | 0.104 | 0.0883 | 0.0948 |
| Molybdenum (dissolved) | mg/L | -- | - | - | - | - | - | 0.000248 | 0.000393 | - | - | <0.0005 | 0.000534 | - | - | - | - | - | - | - | - | - | - | - | <0.00005 | <0.00005 |
| Phosphorus (dissolved) | mg/L | -- | 0.018 | 0.068 | 0.05 | 0.066 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 2.94 | 0.151 | 1.18 | 0.071 | 0.061 | 0.384 | 0.188 | 0.045 | 0.06 | 0.553 | 0.066 | 0.008 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | -- | 15.6 | 20.5 | 28.9 | 17.7 | 31.6 | 3.12 | 3.17 | 2.48 | 0.746 | 46 | 39.3 | 47.3 | 27.2 | 40.3 | 40.3 | 41.5 | 35.7 | 40.2 | 34.4 | 38.4 | 36.8 | 1.58 | 1.48 | 1.3 |
| Sodium (dissolved) | mg/L | 200 (AO) | 25 | 31.2 | 38.9 | 32.7 | 35 | 33.5 | 51.7 | 59.1 | 3.74 | 44.2 | 44.4 | 45.3 | 23.6 | 36.3 | 37.3 | 42.5 | 36.6 | 40.3 | 31.9 | 36.6 | 38.4 | 38.7 | 41 | 30.3 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 800 | 764 | 796 | 831 | 516 | 725 | 859 | 650 | 247 | 693 | 521 | 662 | 670 | 640 | 797 | 737 | 720 | 772 | 695 | 645 | 679 | 811 | 777 | 734 |
| Ammonia-N | mg/L | -- | 9.7 | 9.8 | 9.2 | 16.1 | 2.56 | 1.36 | 1.47 | 1.52 | <0.036 | 8.16 | 5.62 | 6.14 | 5 | 2.1 | 5.1 | 4.7 | 4.8 | 6.8 | 5.5 | 3.2 | 5.7 | <0.054 | <0.105 | <0.085 |
| Chloride | mg/L | 250 (AO) | 32 | 43 | 49 | 42 | 27.9 | 66.5 | 159 | 87.3 | 5.66 | 31.1 | 27.4 | 37.1 | 24 | 32 | 36 | 37 | 29 | 32 | 38 | 34 | 34 | 65.5 | 49.9 | 33 |
| Conductivity | uS/cm | -- | 1400 | 1450 | 1520 | 1450 | 1060 | 1400 | 1830 | 1310 | 442 | 1330 | 1020 | 1220 | 1010 | 1170 | 1270 | 1330 | 1120 | 1340 | 1320 | 666 | 1290 | 1660 | 1520 | 1330 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | 4 | 8 | 8 | 11 | 5.6 | 8.3 | 15.5 | 13.1 | <1 | 8.8 | 7 | 10.5 | 6 | 5 | 7 | 6 | 17 | 2 | 8 | 5 | 9 | 4.6 | 4.7 | 3.4 |
| Hardness | mg/L | 80-100 (OG) | 716 | 719 | 803 | 755 | 494 | 633 | 520 | 545 | 227 | 607 | 534 | 609 | 386 | 582 | 597 | 609 | 614 | 649 | 517 | 644 | 628 | 863 | 860 | 796 |
| Nitrate (as N) | mg/L | 10 | 0.08 | 1.55 | 0.14 | 0.13 | 0.707 | <0.1 | <0.1 | 0.087 | 0.024 | 0.12 | 0.361 | 3.25 | 0.32 | 14.6 | 4.7 | 0.16 | <0.06 | <0.06 | <0.06 | 0.25 | 0.46 | <0.1 | <0.1 | <0.1 |
| Nitrite (as N) | mg/L | 1 | <0.03 | <0.03 | <0.03 | <0.03 | 0.108 | <0.05 | <0.05 | <0.01 | <0.01 | <0.05 | 0.03 | 0.028 | 0.2 | 0.35 | 0.46 | 0.09 | <0.03 | <0.03 | <0.03 | <0.03 | 0.09 | <0.05 | <0.05 | <0.05 |
| pH | s.u. | 6.5-8.5 (OG) | 7.81 | 7.86 | 7.44 | 7.39 | 7.5 | 7.63 | 7.14 | 6.76 | 8.02 | 7.68 | 7.6 | 7.06 | 7.38 | 7.45 | 7.69 | 7.6 | 7.67 | 7.97 | 8.01 | 7.82 | 7.68 | 7.16 | 7.41 | 7.37 |
| Phenolics (total) | mg/L | -- | 0.002 | 0.003 | 0.003 | <0.002 | 0.0023 | <0.0013 | <0.005 | <0.0055 | 0.0012 | <0.0014 | <0.0102 | <0.0106 | 0.004 | <0.002 | 0.039 | <0.002 | <0.002 | <0.002 | 0.031 | <0.002 | <0.002 | 0.0018 | <0.001 | <0.0102 |
| Sulfate | mg/L | 500 (AO) | 6 | 8 | <2 | 11 | 7.3 | 15.1 | 22.8 | 17.5 | 8.34 | 1.9 | 4.43 | 2.24 | 5 | 3 | 6 | <2 | <2 | 2 | <2 | 4 | 6 | 61.5 | 59.4 | 31 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | 10.3 | 9.9 | 10.5 | 16.2 | 4.09 | 3.3 | 3.17 | 2.4 | 0.63 | 13.3 | 7.73 | 9.9 | 5 | 2.7 | 5.8 | 7.1 | 7.5 | 7.3 | 11 | 6.2 | 8.6 | 0.5 | 0.36 | 0.35 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 1320 | NM | 1880 | 1240 | 1490 | 1490 | 2020 | 1530 | 1400 | 1400 | 591 | 1470 | 981 | 1520 | 1340 | 1310 | 1400 | 1190 | 1200 | 1580 | 1470 | 1600 | 1540 | 781 |
| pH, field | s.u. | 6.5-8.5 (OG) | 6.66 | NM | 6.45 | 7.18 | 7.67 | 7.67 | 6.43 | 6.44 | 7.52 | 7.52 | 6.84 | 6.69 | 7.15 | 7.22 | 6.72 | 6.76 | 6.35 | 6.91 | 6.86 | 7.42 | 6.57 | 6.59 | 7.71 | 6.42 |
| Temperature, field | Deg C | 15 (AO) | 9.65 | NM | 6.39 | 15.02 | 7.7 | 7.7 | 8.6 | 9.08 | 8 | 8 | 9.19 | 10.04 | 8.25 | 5.37 | 15.8 | 8.15 | 7.4 | 8.82 | 12.7 | 5.71 | 7.71 | 10.7 | 9.6 | 11.07 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

| | |
|---|---|
| OG | Operation Guideline (water treatment and distribution). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| -- | No guideline. |
| < | Parameter detected below the laboratory method detection limit. |
| R | Rejected. |
| NM | Not Measured. |
| 36.0 | Parameter exceeds the ODWS. |

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW18-89 | OW18-89 | OW18-89 | OW18-89 | OW18-89 | OW18-89 | OW18-89 | OW18-89 | OW18-89 | OW18-89 | OW19-89 | OW19-89 | OW19-89 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-110318-018 | GW-WARD2-19-004 | GW-WARD2-19-009 | GW-WARD 2-_19-030 | OW16-89 | GW-WARD 2-028 | GW-WARD2-029 | GW-WARD 2-027 | OW16-89 | GW-WARD2-041017-015 | GW-WARD2-112417-005 | GW-WARD2-051818-003 | GW-WARD2-110318-006 | GW-WARD2-19-019 | GW-WARD2-19-017 | GW-WARD 2-_19-012 | GW-WARD 2-020 | GW-WARD2-014 | GW-WARD 2-003 | GW-WARD2-1222-009 | OW18-89 | GW-WARD2-041017-001 | GW-WARD2-112417-001 | GW-WARD2-051818-011 |
| **Sample Date:** | | *ODWS* [1] | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/18/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/3/2022 | 5/18/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/17/2020 | 5/10/2021 | 11/16/2021 | 7/2/2022 | 12/5/2022 | 5/18/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 184 | 219 | 186 | 231 | 181 | 180 | 142 | 64.4 | 177 | 171 | 163 | 168 | 164 | 160 | 171 | 164 | 144 | 129 | 158 | 161 | 168 | 85.3 | 77.4 | 63.2 |
| Iron (dissolved) | mg/L | 0.30 (AO) | 0.173 | 0.144 | 0.271 | 0.122 | 0.348 | 0.211 | 0.136 | <0.007 | 0.161 | 19.8 | 11.8 | 19.6 | 10.4 | 11 | 21.6 | 11.8 | 10.9 | 7.36 | 18.6 | 9.96 | 10.5 | <0.01 | <0.01 | <0.01 |
| Magnesium (dissolved) | mg/L | -- | 58.9 | 64.5 | 62.1 | 65.1 | 49.6 | 48 | 46.2 | 55.8 | 53.7 | 71.7 | 45.7 | 64.4 | 43.9 | 41.8 | 44.5 | 42.9 | 26.2 | 21.9 | 32.2 | 31.1 | 31.9 | 53.7 | 37 | 30.1 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | 0.0846 | 0.116 | 0.0796 | 0.23 | 0.237 | 0.182 | 0.0843 | 0.00188 | 1.4 | 0.37 | 0.935 | 0.421 | 1.13 | 1.32 | 1.32 | 1.76 | 1.08 | 0.933 | 0.953 | 1.02 | 1.28 | 0.00524 | <0.0005 | 0.00141 |
| Molybdenum (dissolved) | mg/L | -- | - | - | - | - | - | - | - | - | - | - | 0.000057 | 0.000068 | - | - | - | - | - | - | - | - | - | - | 0.000212 | 0.000262 |
| Phosphorus (dissolved) | mg/L | -- | <0.05 | 0.006 | 0.071 | 0.108 | 0.076 | 0.096 | 0.807 | 0.122 | 0.237 | <0.05 | <0.05 | 0.163 | <0.05 | <0.003 | 0.006 | 0.007 | 0.004 | <0.003 | <0.003 | 0.011 | 0.003 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | -- | 1.14 | 1.29 | 1.74 | 1.95 | 1.29 | 1.44 | 13 | 1.99 | 1.51 | 15.6 | 1.51 | 15.8 | 1.58 | 1.52 | 1.08 | 1.07 | 1.12 | 0.944 | 1.15 | 1.01 | 0.887 | 2.24 | 13.5 | 13 |
| Sodium (dissolved) | mg/L | 200 (AO) | 27 | 25.3 | 30.7 | 44.5 | 45 | 45.2 | 42.8 | 42.1 | 34.1 | 32.7 | 8.14 | 24.1 | 6 | 6.4 | 4.82 | 5.66 | 22.3 | 25 | 16.3 | 8.2 | 3.1 | 54.9 | 20.9 | 15.2 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 700 | 759 | 675 | 779 | 609 | 552 | 662 | 646 | 637 | 795 | 579 | 676 | 615 | 532 | 578 | 612 | 259 | 476 | 594 | 429 | 608 | 458 | 381 | 308 |
| Ammonia-N | mg/L | -- | 0.179 | <0.1 | 0.5 | 1.5 | 0.3 | 0.4 | 1.4 | 0.2 | <0.1 | 9.82 | 0.457 | 7.59 | 0.339 | 0.6 | 0.3 | 0.2 | <0.1 | <0.1 | 0.3 | 0.3 | 0.1 | <0.02 | <0.02 | <0.037 |
| Chloride | mg/L | 250 (AO) | 40.3 | 46 | 48 | 56 | 83 | 74 | 84 | 69 | 74 | 35.7 | 14.1 | 26.2 | 4.01 | 6 | 7 | 5 | 6 | 14 | 10 | 18 | 4 | 39.5 | 8.62 | 8.8 |
| Conductivity | uS/cm | -- | 1250 | 1380 | 1320 | 1380 | 1320 | 1070 | 1310 | 1310 | 1350 | 1490 | 1050 | 1240 | 1050 | 941 | 1000 | 1010 | 414 | 822 | 1050 | 838 | 996 | 1000 | 710 | 598 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | 6.47 | 12 | 4 | 4 | 2 | 2 | 5 | 2 | 8 | 8.1 | 3.2 | 7.4 | 7.21 | 11 | 4 | 3 | 5 | 2 | 6 | 2 | 2 | 2.5 | 1.6 | 1.8 |
| Hardness | mg/L | 80-100 (OG) | 701 | 812 | 719 | 846 | 656 | 646 | 544 | 391 | 664 | 721 | 595 | 683 | 591 | 571 | 610 | 585 | 468 | 412 | 527 | 529 | 552 | 434 | 345 | 282 |
| Nitrate (as N) | mg/L | 10 | <0.02 | <0.06 | 0.47 | 0.58 | 0.06 | <0.06 | 0.91 | 1.29 | 0.08 | 0.24 | <0.02 | 0.3 | <0.02 | <0.06 | 0.09 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | 0.08 | 0.039 | 0.032 | 0.241 |
| Nitrite (as N) | mg/L | 1 | <0.01 | <0.03 | <0.03 | 0.56 | <0.03 | <0.03 | 0.05 | <0.03 | <0.03 | <0.05 | <0.01 | <0.05 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.01 | <0.01 | <0.01 |
| pH | s.u. | 6.5-8.5 (OG) | 6.69 | 7.41 | 7.44 | 7.33 | 7.49 | 7.31 | 7.87 | 7.24 | 7.74 | 7.05 | 7.35 | 7.36 | 6.53 | 7.26 | 6.94 | 7.48 | 8.06 | 7.85 | 7.63 | 7.78 | 7.41 | 7.7 | 7.79 | 8.1 |
| Phenolics (total) | mg/L | -- | <0.0057 | <0.002 | <0.002 | <0.002 | <0.002 | 0.002 | <0.002 | <0.002 | <0.002 | 0.0038 | <0.001 | <0.0067 | <0.0051 | 0.005 | <0.005 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.0022 | <0.001 | <0.001 |
| Sulfate | mg/L | 500 (AO) | 30.4 | 29 | 34 | 39 | 22 | 18 | 27 | 24 | 35 | 14.4 | 1.66 | 3.1 | 3.52 | 2 | <2 | 7 | <2 | <20 | <2 | <2 | <2 | 43.9 | 13.6 | 13.9 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | 0.33 | <0.5 | 0.5 | 1.9 | <0.5 | <0.5 | 1.6 | 0.7 | <0.5 | 13.3 | 1.02 | 9.49 | 1.55 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 1.1 | 0.6 | 0.6 | 0.44 | 0.32 | <0.15 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 1540 | 1850 | 1690 | 1480 | 1160 | - | 1200 | 1210 | 1310 | - | 970 | 605 | 1180 | 961 | 1100 | 970 | 971 | 773 | 1170 | 1190 | 942 | 623 | 623 | 367 |
| pH, field | s.u. | 6.5-8.5 (OG) | 6.69 | 6.84 | 7.09 | 6.62 | 6.89 | NM | 6.7 | 7.02 | 6.89 | NM | 7.62 | 6.56 | 6.45 | 6.97 | 7 | 6.49 | 6.28 | 6.6 | 6.91 | 7.54 | 6.83 | 7.6 | 7.6 | 7.25 |
| Temperature, field | Deg C | 15 (AO) | 9.42 | 10.71 | 7.79 | 11.8 | 8.37 | - | 9.52 | 13.4 | 11.49 | - | 7.7 | 8.89 | 9.35 | 8.19 | 8.71 | 11.4 | 8.7 | 9.69 | 11.9 | 7.4 | 11.99 | 8.1 | 8.1 | 8.98 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

OG Operation Guideline (water treatment and distribution).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
R Rejected.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-110318-002 | GW-WARD2-19-015 | GW-WARD2-19-021 | GW-WARD 2-_19-006 | OW19-89 | GW-WARD 2-004 | GW-WARD 2-010 | GW-WARD2-001 | GW-WARD 2-004 | GW-WARD2-1222-026 | OW19-89 | OW19-89 | GW-WARD2-112417-004 | GW-WARD2-051818-016 | GW-WARD2-110318-011 | GW-WARD2-19-009 | GW-WARD2-19-018 | GW-WARD 2-_19-010 | OW22-98 | GW-WARD 2-021 | GW-WARD2-012 | GW-WARD 2-013 | GW-WARD2-1222-010 | OW22-98 |
| **Sample Date:** | | *ODWS* [1] | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/17/2020 | 11/28/2020 | 5/10/2021 | 5/10/2021 Duplicate | 11/16/2021 | 7/2/2022 | 12/5/2022 | 5/18/2023 | 11/8/2023 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/17/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/2/2022 | 12/5/2022 | 5/18/2023 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 69.7 | 75.8 | 65.5 | 61.9 | 80.6 | 70.1 | 72.5 | 75.2 | 67.4 | 68.6 | 59 | 61.9 | 63.3 | 55.7 | 55.1 | 65 | 63.1 | 58.7 | 61.4 | 66.7 | 62.7 | 68.5 | 63.9 | 53.4 |
| Iron (dissolved) | mg/L | 0.30 (AO) | <0.01 | <0.007 | <0.007 | <0.007 | 0.021 | <0.007 | <0.007 | 0.008 | <0.007 | 0.015 | 0.009 | 0.026 | 0.114 | 0.299 | <0.01 | 0.009 | <0.021 | 0.015 | 0.079 | 0.029 | 0.03 | 0.239 | 0.019 | 0.018 |
| Magnesium (dissolved) | mg/L | -- | 34.1 | 33.1 | 27.5 | 27.7 | 33.9 | 30 | 30.4 | 32.1 | 31.3 | 30.5 | 27.4 | 27.1 | 24.8 | 21.9 | 21.3 | 22.6 | 23.3 | 23.8 | 21 | 24.1 | 22 | 27.4 | 22.3 | 20.7 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | <0.0005 | 0.00016 | <0.00024 | 0.00069 | 0.00071 | <0.0004 | <0.00044 | 0.0006 | 0.00056 | 0.00287 | 0.00076 | 0.00334 | 0.025 | 0.00725 | <0.0005 | 0.00703 | 0.00264 | 0.00148 | 0.00324 | 0.0041 | 0.00354 | 0.0439 | 0.00263 | 0.00229 |
| Molybdenum (dissolved) | mg/L | -- | - | - | - | - | - | - | - | - | - | - | - | - | 0.000399 | 0.000289 | - | - | - | - | - | - | - | - | - | - |
| Phosphorus (dissolved) | mg/L | -- | <0.05 | <0.003 | <0.003 | 0.006 | <0.003 | <0.003 | 0.007 | <0.003 | <0.003 | 0.026 | 0.016 | 1.28 | <0.05 | <0.05 | <0.05 | <0.003 | 0.016 | 0.027 | 0.016 | 0.009 | <0.003 | 0.129 | <0.003 | 0.006 |
| Potassium (dissolved) | mg/L | -- | 11.6 | 14.1 | 12.4 | 12.4 | 11.7 | 13 | 13.4 | 10.9 | 11.7 | 11.7 | 10.8 | 9.96 | 0.74 | 0.853 | 0.699 | 0.715 | 2.9 | 2.48 | 2.1 | 0.896 | 0.754 | 1.66 | 0.722 | 0.737 |
| Sodium (dissolved) | mg/L | 200 (AO) | 29.1 | 15.8 | 14.3 | 13.7 | 23.9 | 15.5 | 15.8 | 19.5 | 15.4 | 17.8 | 13.2 | 21.6 | 4.09 | 3.82 | 3.85 | 4.07 | 4.15 | 4.94 | 5.21 | 4.77 | 4.43 | 5.17 | 4.53 | 4.07 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 352 | 335 | 281 | 264 | 374 | 301 | 315 | 356 | 331 | 282 | 311 | 300 | 248 | 227 | 206 | 227 | 409 | 310 | 228 | 422 | 248 | 228 | 229 | 249 |
| Ammonia-N | mg/L | -- | 0.042 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.415 | <0.076 | 0.082 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Chloride | mg/L | 250 (AO) | 13.6 | 12 | 11 | 10 | 17 | 8 | 8 | 12 | 12 | 14 | 13 | 16 | 5.76 | 6.14 | 6.55 | 6 | 7 | 5 | 6 | 8 | 4 | 5 | 4 | 3 |
| Conductivity | uS/cm | -- | 696 | 643 | 547 | 526 | 721 | 561 | 570 | 656 | 632 | 576 | 577 | 618 | 443 | 408 | 409 | 429 | 437 | 435 | 440 | 748 | 440 | 441 | 345 | 420 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | <2.79 | <1 | 2 | 1 | 1 | 2 | 2 | 1 | <1 | 2 | 2 | 2 | 1.3 | R | <1.99 | <1 | 1 | <1 | <1 | <1 | 2 | <1 | 1 | 2 |
| Hardness | mg/L | 80-100 (OG) | 314 | 326 | 277 | 269 | 341 | 299 | 306 | 320 | 297 | 297 | 260 | 266 | 260 | 229 | 225 | 255 | 253 | 245 | 240 | 266 | 247 | 284 | 251 | 218 |
| Nitrate (as N) | mg/L | 10 | 0.101 | 0.13 | <0.06 | 0.34 | 0.09 | 0.06 | 0.07 | 0.09 | 0.15 | 0.21 | <0.06 | 0.23 | 0.032 | 0.027 | 0.059 | <0.06 | <0.06 | 0.14 | 0.14 | <0.06 | <0.06 | <0.06 | <0.06 | 0.18 |
| Nitrite (as N) | mg/L | 1 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 (OG) | 7.41 | 8.12 | 7.79 | 8.28 | 7.87 | 8.16 | 8.05 | 8.05 | 8.19 | 8.05 | 8.08 | 7.88 | 8.14 | 8.09 | 7.81 | 8.17 | 7.85 | 8.06 | 8.21 | 7.19 | 8.15 | 8.22 | 8.22 | 8.21 |
| Phenolics (total) | mg/L | -- | <0.003 | <0.002 | <0.002 | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.001 | <0.0158 | <0.0035 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Sulfate | mg/L | 500 (AO) | 16.4 | 14 | 14 | 15 | 20 | 10 | 10 | 18 | 12 | 15 | 11 | 17 | 8.98 | 8.56 | 8.93 | 8 | 8 | 11 | 9 | <2 | 8 | 8 | 10 | 7 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | <0.15 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.9 | 1.6 | 0.58 | 2.1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 863 | 1110 | 774 | 608 | 873 | 753 | 753 | 708 | 948 | 864 | 590 | 851 | 1140 | 273 | 565 | 462 | 619 | 512 | 579 | 575 | 646 | 592 | 652 | 411 |
| pH, field | s.u. | 6.5-8.5 (OG) | 6.91 | 7.45 | 7.33 | 7.42 | 7.08 | 6.88 | 6.88 | 7.2 | 7.5 | 7.2 | 7.53 | 7.98 | 7.61 | 7.28 | 6.93 | 7.35 | 7.38 | 7.02 | 7.03 | 6.6 | 6.96 | 7.13 | 7.71 | 7.96 |
| Temperature, field | Deg C | 15 (AO) | 8.09 | 7.98 | 7.16 | 10.5 | 7.65 | 7.5 | 7.5 | 8.73 | 10.4 | 5.54 | 9.8 | 5.17 | 8.6 | 10.11 | 9.7 | 9.54 | 8.89 | 12.2 | 9.37 | 9.3 | 10.16 | 11.6 | 5.15 | 11.87 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

OG Operation Guideline (water treatment and distribution).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
R Rejected.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW22-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | OW22-98 | GW-WARD2-041017-002 | GW-WARD2-041017-003 | GW-WARD2-112417-003 | GW-WARD2-051818-015 | GW-WARD2-110318-003 | GW-WARD2-19-013 | GW-WARD2-19-033 | GW-WARD 2-_19-018 | OW23-98 | GW-WARD 2-007 | GW-WARD2-013 | GW-WARD 2-012 | OW23-98 | OW23-98 | GW-WARD2-041017-014 | GW-WARD2-112417-002 | GW-WARD2-051818-012 | GW-WARD2-110318-031 | GW-WARD2-19-020 | GW-WARD2-19-014 | GW-WARD 2-_19-009 | OW24-98 | GW-WARD 2-011 |
| **Sample Date:** | | *ODWS* [1] | 11/8/2023 | 4/10/2017 | 4/10/2017 Duplicate | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/18/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/2/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/17/2020 | 11/28/2020 | 5/10/2021 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 56 | 62.2 | 162 | 185 | 176 | 216 | 215 | 233 | 201 | 217 | 276 | 195 | 191 | 168 | 213 | 92 | 183 | 69.1 | 59.8 | 77.7 | 78.4 | 77.1 | 66.1 | 77.2 |
| Iron (dissolved) | mg/L | 0.30 (AO) | 0.034 | <0.01 | **9.53** | **28.4** | **18.4** | **34.8** | **33** | **36.3** | **29.4** | **26.7** | **34** | **14.2** | **23.2** | 0.1 | **12.6** | 0.226 | **28.5** | **4.16** | 0.042 | **3.52** | 0.124 | **1.21** | 0.028 | **2.49** |
| Magnesium (dissolved) | mg/L | -- | 22.1 | 29.1 | 42.5 | 44 | 40.9 | 56.1 | 44.2 | 51.7 | 46.4 | 53.4 | 53.8 | 48.4 | 42.3 | 34 | 56.3 | 55 | 45.6 | 30.9 | 26 | 29 | 29.7 | 32.3 | 26.1 | 31.8 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | 0.00374 | <0.0005 | **0.746** | **0.532** | **0.944** | **0.521** | **1.05** | **0.39** | **0.9** | **0.844** | **1.47** | **0.722** | **1.16** | **0.468** | **1.3** | 0.034 | **0.492** | **0.197** | **0.134** | **0.188** | **0.153** | **0.124** | **0.114** | **0.168** |
| Molybdenum (dissolved) | mg/L | -- | - | - | - | 0.000188 | 0.000149 | - | - | - | - | - | - | - | - | - | - | - | <0.0005 | 0.00598 | - | - | - | - | - | - |
| Phosphorus (dissolved) | mg/L | -- | <0.003 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.003 | <0.003 | <0.003 | <0.003 | 0.006 | 0.054 | <0.003 | 0.005 | 0.067 | <0.05 | <0.5 | <0.05 | <0.05 | 0.037 | 0.019 | 0.229 | 0.034 | 0.02 |
| Potassium (dissolved) | mg/L | -- | 0.634 | 11.5 | 1.27 | 0.872 | 0.803 | 1.1 | 0.779 | 0.924 | 0.812 | 0.969 | 0.93 | 1.81 | 0.71 | 0.876 | 1.58 | 1.91 | 0.82 | 1.03 | 1.54 | 1.07 | 1.6 | 8.68 | 3.56 | 2.29 |
| Sodium (dissolved) | mg/L | 200 (AO) | 4.15 | 14.4 | 3.33 | 3.47 | 3.55 | 8.49 | 3.55 | 5.21 | 3.57 | 6.62 | 4.16 | 3.67 | 3.44 | 3.54 | 8.68 | 46 | <5 | 68.1 | 75.6 | 58.3 | 64.2 | 69.5 | 69.4 | 61.3 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 228 | 308 | 490 | 593 | 579 | 636 | 695 | 814 | 1000 | 707 | 629 | 686 | 602 | 589 | 731 | 499 | 601 | 382 | 379 | 463 | 500 | 378 | 394 | 361 |
| Ammonia-N | mg/L | -- | <0.1 | <0.02 | 0.973 | 0.893 | 0.969 | 0.872 | 1 | 0.8 | 0.7 | 1 | 0.8 | 2.3 | 0.7 | 0.7 | 1.3 | 0.314 | 0.925 | 0.278 | 0.285 | 0.2 | 0.1 | <0.1 | <0.1 | 0.1 |
| Chloride | mg/L | 250 (AO) | 4 | 9.89 | 0.91 | 1.51 | 1.24 | 3.32 | 2 | <3 | 2 | 4 | 2 | 2 | <1 | <1 | 4 | 22 | 1.53 | 40.8 | 32.2 | 44 | 38 | 39 | 29 | 35 |
| Conductivity | uS/cm | -- | 440 | 593 | 1040 | 1040 | 1050 | 1150 | 1100 | 1260 | 1020 | 1220 | 1130 | 1150 | 1090 | 976 | 1280 | 979 | 1060 | 777 | 727 | 787 | 772 | 754 | 747 | 714 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | 3 | 1.5 | 2.5 | 3.3 | 3.7 | **8.1** | **11** | 3 | 3 | 5 | **8** | 5 | 2 | 5 | 5 | 4.1 | 3.3 | 3.9 | **5.89** | 3 | 4 | 4 | 4 | 4 |
| Hardness | mg/L | 80-100 (OG) | 231 | 275 | 581 | 643 | 607 | 769 | 718 | 793 | 694 | 763 | 910 | 686 | 650 | 559 | 763 | 456 | 643 | 300 | 256 | 313 | 318 | 326 | 273 | 324 |
| Nitrate (as N) | mg/L | 10 | 0.09 | 0.046 | <0.02 | <0.02 | <0.02 | 0.045 | <0.06 | 0.22 | <0.06 | 0.23 | <0.06 | 0.79 | <0.06 | <0.06 | 0.21 | <0.02 | <0.02 | <0.02 | 0.077 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 |
| Nitrite (as N) | mg/L | 1 | <0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.04 | <0.03 | <0.03 | <0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.03 | 0.04 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 (OG) | 7.97 | 7.78 | 6.97 | 7.51 | 7.43 | 6.55 | 7.1 | 6.78 | 6.88 | 7.22 | 7.36 | 7.77 | 7.74 | 7.23 | 7.34 | 7.66 | 7.34 | 8.01 | 7.62 | 7.71 | 8.03 | 8.07 | 8.09 | 8.25 |
| Phenolics (total) | mg/L | -- | <0.002 | 0.0017 | 0.0019 | <0.001 | <0.0055 | <0.0068 | <0.002 | <0.002 | <0.002 | 0.006 | <0.002 | 0.029 | <0.002 | <0.002 | <0.002 | 0.0021 | <0.001 | <0.007 | <0.0045 | 0.004 | <0.002 | <0.002 | <0.002 | <0.002 |
| Sulfate | mg/L | 500 (AO) | 9 | 14.7 | 37.1 | 17.2 | 30.3 | 56.2 | 67 | 75 | 41 | 53 | 120 | 32 | 39 | 26 | 51 | 2.95 | 17.1 | <0.3 | <0.3 | <2 | <2 | <2 | <2 | <2 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | <0.5 | 0.2 | 1.72 | 1.6 | 1.93 | 1.6 | 0.8 | 0.8 | <0.5 | <0.5 | 1.2 | 2.5 | 0.7 | 1.7 | 2 | 0.65 | 3.1 | 1.04 | 1.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 457 | 1140 | 1140 | 1140 | 687 | 1440 | 1650 | 1570 | 1160 | 1270 | 1340 | 1180 | 772 | 926 | 1360 | - | 860 | 471 | 887 | 1270 | 970 | 849 | 844 | 916 |
| pH, field | s.u. | 6.5-8.5 (OG) | 8 | 7.61 | 7.61 | 7.61 | 6.84 | 6.21 | 6.83 | 6.73 | 6.45 | 6.34 | 6.14 | 6.6 | 7.27 | 6.85 | 6.79 | NM | 7.6 | 7.12 | 7.27 | 7.8 | 7.04 | 7.26 | 7.31 | 6.95 |
| Temperature, field | Deg C | 15 (AO) | 6.75 | 9.4 | 9.4 | 9.5 | 8.96 | 9.93 | 8.11 | 9.52 | 13.5 | 10.18 | 8.7 | 10.75 | 12.3 | 13.04 | 7.89 | - | 8.9 | 7.83 | 10.38 | 7.23 | 7.4 | 13.1 | 9.45 | 7.7 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

| | |
|---|---|
| OG | Operation Guideline (water treatment and distribution). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| -- | No guideline. |
| < | Parameter detected below the laboratory method detection limit. |
| R | Rejected. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW27-00 | OW27-00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-015 | GW-WARD 2-011 | GW-WARD2-1222-015 | OW24-98 | OW24-98 | GW-WARD2-041017-028 | GW-WARD2-112417-028 | GW-WARD2-051818-005 | GW-WARD2-110318-016 | GW-WARD2-19-002 | GW-WARD2-19-005 | GW-WARD2-19-019 | GW-WARD 2-_19-021 | DUP | OW25R-13 | GW-WARD 2-018 | GW-WARD2-023 | GW-WARD 2-020 | GW-WARD2-1222-022 | OW25R-13 | OW25R-13 | Field Duplicate | GW-WARD2-041017-008 | GW-WARD2-112417-006 |
| **Sample Date:** | | *ODWS* [1] | 11/16/2021 | 7/2/2022 | 12/5/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 5/22/2019 Duplicate | 12/6/2019 | 8/18/2020 | 11/28/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/3/2022 | 12/6/2022 | 5/18/2023 | 11/8/2023 | 11/8/2023 Duplicate | 4/10/2017 | 11/24/2017 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 73.3 | 71.7 | 78.2 | 71.1 | 66.8 | 85.1 | 89.8 | 64.7 | 86.9 | 102 | 103 | 84.3 | 79.6 | 69.6 | 67.2 | 80.3 | 73.5 | 72.9 | 70.9 | 93.5 | 68.7 | 67.9 | 123 | 131 |
| Iron (dissolved) | mg/L | 0.30 (AO) | 0.02 | 3.11 | 0.037 | 2.53 | 0.453 | 0.031 | 1.63 | 0.031 | 1.31 | 0.028 | 0.028 | 0.185 | 0.084 | 0.516 | 0.506 | 0.089 | 0.742 | 0.11 | 0.149 | 1.03 | 0.199 | 0.154 | 1.7 | 0.081 |
| Magnesium (dissolved) | mg/L | -- | 29.4 | 33.6 | 32.6 | 29.9 | 32.4 | 34.3 | 42.5 | 50.3 | 35.4 | 38.7 | 39.1 | 33.5 | 33.1 | 28.6 | 28.8 | 31.9 | 30.1 | 32 | 31.2 | 35.8 | 30.5 | 31.7 | 49 | 55.8 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | 0.118 | 0.155 | 0.108 | 0.145 | 0.104 | 0.0103 | 0.211 | 0.00395 | 0.175 | 0.011 | 0.0108 | 0.0325 | 0.394 | 0.328 | 0.324 | 0.00886 | 0.171 | 0.0393 | 0.0425 | 0.113 | 0.119 | 0.111 | 4.07 | 0.265 |
| Molybdenum (dissolved) | mg/L | -- | - | - | - | - | - | - | 0.00114 | 0.00351 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.000119 |
| Phosphorus (dissolved) | mg/L | -- | 0.018 | 0.034 | 0.018 | 0.036 | 0.533 | <0.05 | <0.05 | <0.05 | <0.05 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | 0.005 | <0.003 | <0.003 | 0.034 | 0.099 | 0.009 | 0.015 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | -- | 1.98 | 3.08 | 1.99 | 0.96 | 1.46 | 1.66 | 1.71 | 2.09 | 1.47 | 1.46 | 1.46 | 1.44 | 1.44 | 1.35 | 1.32 | 1.41 | 1.4 | 1.23 | 1.38 | 1.37 | 1.25 | 1.28 | 0.226 | 0.316 |
| Sodium (dissolved) | mg/L | 200 (AO) | 67.6 | 59.7 | 63.3 | 49.3 | 59.9 | 5.85 | 7.26 | 29.4 | 9.87 | 11 | 11.3 | 9 | 9.4 | 8.48 | 8.51 | 9.2 | 8.57 | 9.92 | 9.3 | 9.47 | 8.79 | 9.2 | 7.69 | 11.6 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 415 | 378 | 378 | 381 | 385 | 327 | 338 | 395 | 297 | 383 | 380 | 277 | 293 | 254 | 247 | 272 | 269 | 266 | 257 | 296 | 256 | 258 | 493 | 464 |
| Ammonia-N | mg/L | -- | <0.1 | 0.2 | <0.1 | 0.1 | 0.4 | <0.039 | <0.377 | <0.055 | 0.127 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 | 0.1 | 0.1 | <0.06 | <0.159 |
| Chloride | mg/L | 250 (AO) | 30 | 46 | 41 | 38 | 40 | 35.2 | 53.3 | 0.56 | 50.7 | 62 | 62 | 43 | 34 | 26 | 26 | 28 | 23 | 37 | 33 | 42 | 32 | 32 | 54 | 55.6 |
| Conductivity | uS/cm | -- | 774 | 802 | 738 | 774 | 802 | 695 | 758 | 728 | 682 | 753 | 752 | 646 | 575 | 574 | 549 | 565 | 553 | 616 | 562 | 643 | 586 | 582 | 1040 | 996 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | 7 | 3 | 4 | 4 | 4 | 1 | <1 | 1 | <2.98 | 2 | 1 | 2 | <1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 4 | 4.3 |
| Hardness | mg/L | 80-100 (OG) | 304 | 317 | 329 | 300 | 300 | 354 | 399 | 369 | 363 | 415 | 419 | 348 | 335 | 291 | 286 | 332 | 307 | 314 | 306 | 381 | 297 | 300 | 508 | 557 |
| Nitrate (as N) | mg/L | 10 | <0.06 | <0.06 | <0.06 | <0.06 | 0.06 | <0.02 | <0.02 | 0.056 | <0.02 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | 0.06 | <0.06 | <0.06 | <0.06 | <0.06 | 0.08 | 0.07 | <0.02 | <0.02 |
| Nitrite (as N) | mg/L | 1 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.01 | <0.01 |
| pH | s.u. | 6.5-8.5 (OG) | 8.16 | 8.17 | 8.15 | 8.09 | 7.92 | 7.85 | 8.04 | 8 | 7.47 | 7.52 | 7.48 | 7.92 | 8.05 | 8.24 | 8.04 | 8.14 | 8.13 | 8.18 | 7.92 | 8 | 7.89 | 7.98 | 7.45 | 7.91 |
| Phenolics (total) | mg/L | -- | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.002 | <0.001 | <0.0052 | <0.0028 | 0.009 | 0.005 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.002 | <0.001 |
| Sulfate | mg/L | 500 (AO) | <2 | <2 | <2 | <2 | 3 | 14.4 | 12.1 | 36.6 | 13.6 | 15 | 15 | 14 | 19 | 16 | 15 | 18 | 19 | 25 | 25 | 20 | 23 | 26 | 44.3 | 44.6 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | <0.5 | 0.7 | <0.5 | 0.9 | 0.9 | 0.35 | 0.67 | 0.18 | 0.25 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.8 | 0.7 | 0.44 | 0.45 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 796 | 861 | 927 | 895 | 934 | 662 | 645 | 519 | 865 | 759 | 759 | 791 | 680 | 682 | 682 | 728 | 609 | 589 | 756 | 634 | 588 | 588 | 759 | 100 |
| pH, field | s.u. | 6.5-8.5 (OG) | 7.24 | 7.36 | 7.41 | 6.79 | 7.94 | 7.41 | 7.68 | 7.02 | 7.02 | 7.42 | 7.42 | 7.3 | 7.29 | 7.24 | 7.24 | 6.86 | 7.25 | 7.74 | 7.58 | 7.64 | 7.84 | 7.84 | 7.38 | 7.59 |
| Temperature, field | Deg C | 15 (AO) | 9.96 | 11.3 | 5.03 | 11.07 | 6.78 | 9.2 | 11.2 | 9.29 | 11.81 | 9.08 | 9.08 | 9.47 | 12.9 | 8.53 | 8.53 | 9.6 | 11.72 | 12.9 | 9.73 | 10.06 | 10.14 | 10.14 | 7.7 | 7.9 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

| | |
|---|---|
| OG | Operation Guideline (water treatment and distribution). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| -- | No guideline. |
| < | Parameter detected below the laboratory method detection limit. |
| R | Rejected. |
| NM | Not Measured. |
| 36.0 | Parameter exceeds the ODWS. |

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW28-00 | OW28-00 | OW28-00 | OW28-00 | OW28-00 | OW28-00 | OW28-00 | OW28-00 | OW28-00 | OW28-00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | GW-WARD2-051818-031 | GW-WARD2-110318-001 | GW-WARD2-110318-009 | GW-WARD2-19-022 | GW-WARD2-19-007 | GW-WARD 2-_19-020 | OW27-00 | GW-WARD 2-022 | GW-WARD2-021 | GW-WARD 2-024 | GW-WARD2-1222-017 | OW27-00 | OW27-00 | GW-WARD2-041017-004 | GW-WARD2-112417-007 | GW-WARD2-051818-021 | GW-WARD2-110318-010 | GW-WARD2-19-025 | GW-WARD2-19-012 | GW-WARD 2-_19-022 | OW28-00 | GW-WARD 2-027 | GW-WARD2-024 | GW-WARD 2-019 |
| Sample Date: | | *ODWS* [1] | 5/18/2018 | 11/3/2018 | 11/3/2018 Duplicate | 5/22/2019 | 12/6/2019 | 8/18/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/3/2022 | 12/6/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/18/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/3/2022 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 108 | 139 | 131 | 106 | 170 | 139 | 142 | 136 | 146 | 101 | 137 | 134 | 120 | 48.1 | 88.6 | 63.4 | 90.2 | 62.2 | 124 | 154 | 106 | 131 | 108 | 111 |
| Iron (dissolved) | mg/L | 0.30 (AO) | 0.029 | 0.022 | <0.01 | **0.921** | **1.5** | **3.3** | 0.02 | **1.6** | 0.294 | **0.901** | **0.564** | **3.9** | **2.81** | <0.01 | <0.01 | <0.01 | <0.01 | <0.007 | <0.007 | <0.007 | 0.021 | 0.015 | <0.007 | <0.007 |
| Magnesium (dissolved) | mg/L | -- | 45.4 | 57.1 | 53.7 | 34.5 | 55.8 | 51 | 50.2 | 41.8 | 52.3 | 35.4 | 50.8 | 47.9 | 48.2 | 8.98 | 15.1 | 11.1 | 16.3 | 9.47 | 17.2 | 18.8 | 15.4 | 25.6 | 16.6 | 27.1 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | **3.42** | **0.745** | **0.615** | **3.32** | **4.96** | **2.7** | **3.53** | **2.72** | **1.02** | **1.96** | **0.98** | **2.84** | **2.38** | <0.0005 | <0.0005 | 0.00121 | 0.00118 | 0.00032 | 0.00248 | 0.0024 | 0.0022 | 0.001 | 0.0219 | 0.00011 |
| Molybdenum (dissolved) | mg/L | -- | 0.000125 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.000143 | 0.000139 | - | - | - | - | - | - | - | - |
| Phosphorus (dissolved) | mg/L | -- | <0.05 | <0.05 | <0.05 | <0.003 | 0.004 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | 0.004 | <0.003 | <0.05 | <0.05 | <0.05 | <0.05 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 |
| Potassium (dissolved) | mg/L | -- | 0.272 | 0.35 | 0.335 | 0.201 | 0.527 | 0.443 | 0.385 | 0.389 | 0.521 | 0.614 | 0.492 | 0.443 | 0.385 | 0.534 | 0.788 | 1 | 1.25 | 0.783 | 1.69 | 2.21 | 2.41 | 2.9 | 6.22 | 2.74 |
| Sodium (dissolved) | mg/L | 200 (AO) | 10.8 | 15.3 | 14.9 | 10 | 23.7 | 27.8 | 34.9 | 31.4 | 39.8 | 30.4 | 37.4 | 33.9 | 32.7 | 1.08 | 1.36 | 12.4 | 40 | 10.5 | 33.3 | 92.9 | 66.7 | 42.3 | 42.8 | 66.8 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 439 | 446 | 453 | 431 | 453 | 445 | 479 | 353 | 500 | 404 | 466 | 466 | 480 | 192 | 309 | 196 | 235 | 223 | 367 | 353 | 257 | 236 | 295 | 269 |
| Ammonia-N | mg/L | -- | <0.073 | 0.028 | <0.02 | <0.1 | <0.1 | 0.1 | 0.1 | 0.2 | 0.1 | <0.1 | 0.1 | 0.1 | 0.2 | <0.1 | <0.162 | <0.078 | 0.041 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Chloride | mg/L | 250 (AO) | 49.6 | 71 | 71.2 | 65 | 89 | 89 | 87 | 65 | 68 | 60 | 66 | 56 | 58 | 2.97 | 0.62 | 18.5 | 39.3 | 8 | 57 | 200 | 100 | 110 | 58 | 150 |
| Conductivity | uS/cm | -- | 951 | 1110 | 1010 | 996 | 1140 | 1010 | 1140 | 607 | 1110 | 946 | 1030 | 976 | 1030 | 334 | 512 | 452 | 668 | 438 | 787 | 1170 | 903 | 849 | 809 | 1060 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | 3.8 | **6.56** | **7.2** | 4 | **6** | **6** | **6** | **6** | **6** | 4 | 5 | **6** | **6** | <1 | 1.3 | R | <2.71 | <1 | 2 | 2 | 2 | 2 | 4 | 2 |
| Hardness | mg/L | 80-100 (OG) | 456 | 582 | 549 | 408 | 653 | 556 | 560 | 512 | 580 | 399 | 552 | 531 | 498 | 157 | 284 | 204 | 292 | 194 | 380 | 462 | 329 | 431 | 338 | 388 |
| Nitrate (as N) | mg/L | 10 | <0.02 | <0.02 | <0.02 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | 0.07 | <0.06 | <0.06 | <0.06 | <0.02 | <0.02 | 0.025 | 0.403 | 0.22 | 0.08 | 0.5 | 0.72 | 1.07 | 0.18 | 1.37 |
| Nitrite (as N) | mg/L | 1 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 (OG) | 7.8 | 7.14 | 7.17 | 7.53 | 7.62 | 7.65 | 7.76 | 7.86 | 7.99 | 8.07 | 7.78 | 7.71 | 7.78 | 7.92 | 8 | 8.06 | 7.57 | 7.56 | 7.78 | 7.65 | 7.84 | 7.85 | 8 | 8.16 |
| Phenolics (total) | mg/L | -- | <0.0067 | <0.0017 | <0.0019 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.0019 | <0.001 | <0.0113 | <0.0064 | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Sulfate | mg/L | 500 (AO) | 58.6 | 66 | 66.8 | 56 | 79 | 67 | 47 | 55 | 41 | 33 | 23 | 31 | 12 | 1.69 | 0.77 | 13.7 | 79.6 | 26 | 61 | 89 | 62 | 61 | 49 | 92 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | 0.33 | 0.4 | 0.38 | <0.5 | <0.5 | <0.5 | <0.5 | 0.6 | <0.5 | 0.6 | <0.5 | 0.7 | 0.8 | <1.5 | <1.5 | 0.54 | <1.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 592 | 1160 | 1160 | 959 | 1390 | 960 | 1040 | 1210 | 1030 | 670 | NM | - | 1030 | 306 | 642 | 268 | 861 | 406 | 936 | 1060 | 900 | 1040 | 760 | 886 |
| pH, field | s.u. | 6.5-8.5 (OG) | 6.83 | 6.92 | 6.92 | 7.25 | 6.96 | 7.02 | 6.92 | 6.71 | 6.96 | 7.66 | NM | - | 7.35 | 7.78 | 7.6 | 7.16 | 7.14 | 7.61 | 7.29 | 7.14 | 7 | 6.86 | 7.02 | 7.65 |
| Temperature, field | Deg C | 15 (AO) | 10.18 | 9.58 | 9.58 | 9.57 | 5.8 | **16.8** | 7.68 | 9.2 | 9.35 | 14.9 | NM | - | 8.86 | 5.9 | 10.2 | 9.32 | 10.06 | 6.87 | 5.89 | 13.9 | 8.18 | 8.1 | 9.45 | 11.9 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

OG Operation Guideline (water treatment and distribution).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
R Rejected.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW28-00 | OW28-00 | OW28-00 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-1222-008 | OW28-00 | OW28-00 | GW-WARD2-041017-022 | GW-WARD2-112417-024 | GW-WARD2-051818-004 | GW-WARD2-110318-022 | GW-WARD2-19-010 | GW-WARD2-19-015 | GW-WARD 2-_19-007 | OW29-07 | GW-WARD 2-013 | GW-WARD2-003 | GW-WARD 2-005 | GW-WARD2-1222-012 | FD GW-WARD2-1222-13 | OW29-07 | GW-WARD2-041017-021 | GW-WARD2-112417-021 | GW-WARD2-051818-009 | GW-WARD2-110318-025 | GW-WARD2-19-001 | GW-WARD2-19-020 | GW-WARD 2-_19-001 |
| **Sample Date:** | | *ODWS* [1] | 12/6/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/17/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/2/2022 | 12/5/2022 | 12/5/2022 Duplicate | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/17/2020 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 96.9 | 90.8 | 114 | 133 | 133 | 132 | 60.1 | 77.5 | 74.6 | 72.4 | 70.3 | 75 | 75 | 69 | 79.3 | 78 | 68.8 | 148 | 98.7 | 91.8 | 97.8 | 112 | 118 | 106 |
| Iron (dissolved) | mg/L | 0.30 (AO) | 0.007 | 0.036 | 0.011 | <0.01 | 0.029 | **7.9** | 0.033 | 0.023 | 0.079 | 0.045 | 0.057 | 0.012 | **0.397** | 0.024 | 0.19 | 0.181 | 0.037 | <0.01 | 0.192 | 0.022 | 0.191 | 0.027 | 0.288 | 0.077 |
| Magnesium (dissolved) | mg/L | -- | 18.9 | 21.4 | 25.6 | 23.9 | 38.2 | 30.4 | 45.6 | 50.1 | 46.5 | 47.2 | 45.2 | 47.1 | 47.3 | 44.5 | 45.5 | 46.8 | 44.8 | 64 | 71.4 | 62.9 | 61 | 61.6 | 59.9 | 56.8 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | 0.00028 | 0.00207 | 0.0006 | 0.00109 | **0.35** | **0.592** | 0.0481 | 0.00312 | 0.0378 | 0.039 | 0.03111 | 0.0025 | **0.0508** | **0.0555** | 0.0267 | 0.0252 | 0.0136 | 0.00089 | **0.052** | **0.0509** | 0.0426 | 0.0216 | **0.0687** | **0.108** |
| Molybdenum (dissolved) | mg/L | -- | - | - | - | - | 0.000127 | 0.000065 | - | - | - | - | - | - | - | - | - | - | - | - | 0.00313 | 0.00214 | - | - | - | - |
| Phosphorus (dissolved) | mg/L | -- | <0.003 | 0.004 | <0.003 | <0.05 | <0.05 | <0.05 | <0.05 | 0.005 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | 0.103 | <0.05 | <0.05 | <0.05 | <0.05 | 0.007 | 0.006 | <0.003 |
| Potassium (dissolved) | mg/L | -- | 6.33 | 3.04 | 4.05 | 1.52 | 2.55 | 1.37 | 2 | 1.98 | 1.83 | 1.72 | 1.75 | 1.83 | 1.74 | 1.51 | 1.61 | 1.64 | 1.38 | 9.39 | 2.86 | 3.27 | 2.94 | 3.96 | 4.16 | 3.33 |
| Sodium (dissolved) | mg/L | 200 (AO) | 68.7 | 53.8 | 87.9 | 118 | 5.87 | 17.6 | 28.8 | 35.3 | 28.7 | 27.6 | 25.9 | 32.8 | 30.3 | 30.9 | 30.6 | 31.3 | 24.6 | 8.77 | 60.7 | 45.7 | 43.3 | 43.9 | 41.8 | 40.4 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 265 | 248 | 291 | 351 | 443 | 560 | 389 | 429 | 435 | 407 | 379 | 409 | 439 | 403 | 404 | 392 | 394 | 541 | 518 | 495 | 490 | 528 | 516 | 463 |
| Ammonia-N | mg/L | -- | <0.1 | <0.1 | <0.1 | <0.02 | <0.319 | 0.55 | 0.276 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.02 | <0.38 | <0.07 | 0.264 | 0.1 | <0.1 | 0.2 |
| Chloride | mg/L | 250 (AO) | 130 | 68 | 160 | **276** | 2.26 | 16.3 | 0.62 | 1 | <2 | <1 | 1 | 1 | <1 | <1 | <1 | <1 | 1 | 8.6 | 43.3 | 36.3 | 44.1 | 45 | 50 | 45 |
| Conductivity | uS/cm | -- | 902 | 734 | 1130 | 1460 | 768 | 1020 | 726 | 744 | 716 | 707 | 713 | 681 | 746 | 734 | 710 | 712 | 726 | 1170 | 1100 | 988 | 1060 | 1020 | 1030 | 962 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | 3 | 2 | 3 | <1 | 1.6 | 3.3 | <2.91 | 1 | 2 | <1 | 1 | <1 | <1 | <1 | <1 | 1 | <1 | 1.7 | 3.7 | 3.5 | **6.13** | 4 | 3 | 2 |
| Hardness | mg/L | 80-100 (OG) | 320 | 315 | 389 | 430 | 489 | 455 | 338 | 400 | 378 | 375 | 362 | 381 | 382 | 356 | 385 | 387 | 356 | 633 | 541 | 488 | 495 | 534 | 542 | 498 |
| Nitrate (as N) | mg/L | 10 | 2.25 | 1.81 | 7.39 | 2.45 | <0.02 | <0.02 | <0.02 | 0.06 | <0.06 | <0.06 | <0.06 | 0.07 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | 0.68 | <0.1 | 0.028 | <0.02 | <0.06 | <0.06 | <0.06 |
| Nitrite (as N) | mg/L | 1 | <0.03 | <0.03 | <0.03 | <0.05 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.05 | <0.05 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 (OG) | 7.79 | 8.05 | 7.79 | 7.76 | 7.84 | 7.19 | 7.51 | 7.68 | 7.98 | 7.94 | 8.03 | 8.16 | 8.12 | 8.16 | 7.98 | 7.86 | 7.88 | 7.67 | 7.92 | 7.89 | 7.24 | 7.35 | 7.46 | 8.02 |
| Phenolics (total) | mg/L | -- | <0.002 | <0.002 | <0.002 | 0.0011 | <0.001 | <0.0049 | <0.0023 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.0017 | <0.0012 | <0.0097 | <0.0029 | <0.002 | <0.002 | 0.003 |
| Sulfate | mg/L | 500 (AO) | 79 | 66 | 110 | 26.6 | 2.38 | 3.93 | 29.7 | 33 | 27 | 34 | 26 | 19 | 18 | 17 | 20 | 23 | 15 | 125 | 29.2 | 12.5 | 28 | 18 | 38 | 34 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | <0.5 | <0.5 | <0.5 | 0.36 | 0.4 | 1.91 | 0.27 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.24 | 0.61 | 0.34 | 0.52 | <0.5 | <0.5 | <0.5 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 1160 | 851 | 1130 | 636 | 636 | 431 | 878 | 1210 | 948 | 775 | 817 | 862 | 791 | 719 | 967 | 967 | 869 | 1180 | 1180 | 574 | 1240 | 1520 | 1230 | 990 |
| pH, field | s.u. | 6.5-8.5 (OG) | 7.42 | 7.64 | 7.54 | 7.6 | 7.6 | 7.2 | 6.89 | 7.49 | 6.91 | 7.34 | 7.11 | 6.85 | 7.13 | 7.26 | 7.56 | 7.56 | 7.91 | 7.56 | 7.56 | 6.93 | 6.79 | 7.27 | 7.26 | 7.07 |
| Temperature, field | Deg C | 15 (AO) | 7.32 | 8.97 | 7.83 | 9.7 | 9.7 | 9.11 | 9.74 | 8.29 | 4.89 | 11.7 | 8.69 | 8 | 9.63 | 10.8 | 6.43 | 6.43 | 6.38 | 9 | 9 | 8.71 | 9.16 | 8.02 | 7.97 | 10.9 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

OG Operation Guideline (water treatment and distribution).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
R Rejected.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW32-07 | OW32-07 | OW32-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | OW30-07 | GW-WARD 2-002 | GW-WARD2-010 | GW-WARD 2-001 | GW-WARD 2-002 | GW-WARD2-1222-014 | OW30-07 | GW-WARD2-041017-018 | GW-WARD2-112417-018 | GW-WARD2-051818-001 | GW-WARD2-110318-023 | GW-WARD2-19-027 | GW-WARD2-19-022 | GW-WARD 2-_19-008 | OW31-07 | GW-WARD 2-009 | GW-WARD2-008 | GW-WARD 2-015 | GW-WARD2-1222-001 | OW31-07 | OW31-07 | GW-WARD2-041017-016 | GW-WARD2-112417-016 | GW-WARD2-051818-013 |
| **Sample Date:** | | *ODWS* [1] | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/2/2022 | 7/2/2022 Duplicate | 12/5/2022 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/17/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/2/2022 | 12/6/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 106 | 122 | 122 | 118 | 119 | 122 | 113 | 62.5 | 94.4 | 128 | 92.1 | 109 | 111 | 119 | 106 | 127 | 114 | 111 | 129 | 112 | 110 | 177 | 28.9 | 26.4 |
| Iron (dissolved) | mg/L | 0.30 (AO) | 0.209 | 0.036 | **0.307** | 0.112 | 0.168 | 0.105 | 0.07 | 0.058 | **2.45** | 0.015 | **2.2** | **1.43** | **1.77** | **3.84** | **4.01** | **2.63** | **3.94** | **3.7** | **2.07** | **0.816** | **0.885** | **8.05** | 0.054 | 0.028 |
| Magnesium (dissolved) | mg/L | -- | 57.2 | 61.5 | 66.1 | 62.6 | 62.6 | 63.7 | 63.3 | 28.3 | 54.5 | 68 | 52.2 | 52.8 | 53.6 | 56.8 | 52.4 | 57.6 | 56.2 | 56.4 | 58.7 | 53.7 | 56.3 | 49.8 | 15.8 | 14.7 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | **0.06805** | 0.00085 | 0.0485 | **0.0926** | **0.0954** | 0.0205 | **0.113** | **0.107** | 0.0369 | 0.00198 | 0.0369 | **0.0644** | 0.0232 | **0.0522** | **0.05116** | 0.0496 | **0.0516** | **0.0512** | **0.0578** | **0.0804** | **0.0777** | **0.692** | 0.0287 | 0.00196 |
| Molybdenum (dissolved) | mg/L | -- | - | - | - | - | - | - | - | - | 0.00203 | 0.000423 | - | - | - | - | - | - | - | - | - | - | - | - | 0.00607 | 0.00631 |
| Phosphorus (dissolved) | mg/L | -- | <0.003 | 0.004 | <0.003 | <0.003 | <0.003 | 0.011 | 0.231 | <0.05 | <0.05 | <0.05 | <0.05 | <0.003 | 0.006 | 0.013 | 0.005 | 0.011 | 0.017 | 0.005 | 0.004 | 0.013 | 0.011 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | -- | 3.47 | 4.43 | 4.71 | 4.92 | 5.01 | 7.39 | 9.92 | 1.01 | 2.03 | 9.7 | 1.93 | 1.9 | 1.99 | 2.01 | 1.97 | 2.27 | 2.09 | 1.88 | 2.42 | 2 | 1.98 | 2.68 | 0.952 | 0.915 |
| Sodium (dissolved) | mg/L | 200 (AO) | 40.5 | 43.5 | 46.3 | 45.2 | 45.2 | 45.1 | 44.3 | 72.6 | 45.4 | 9.15 | 40.4 | 38.5 | 39 | 39.4 | 37.7 | 39.5 | 38.4 | 36.5 | 35.1 | 33.5 | 33.9 | 25 | 33.5 | 33.1 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 524 | 498 | 596 | 561 | 565 | 513 | 583 | 419 | 519 | 461 | 490 | 521 | 512 | 543 | 512 | 521 | 572 | 532 | 540 | 543 | 509 | 696 | 188 | 181 |
| Ammonia-N | mg/L | -- | 0.1 | <0.1 | 0.2 | 0.2 | 0.1 | 0.1 | <0.1 | <0.114 | 0.541 | <0.04 | 0.436 | 0.3 | 0.2 | 0.4 | 0.5 | 0.3 | 0.5 | 0.4 | 0.5 | 0.3 | 0.4 | 0.935 | <0.294 | <0.069 |
| Chloride | mg/L | 250 (AO) | 50 | 42 | 46 | 49 | 49 | 54 | 42 | 38.6 | 24.7 | 6.82 | 23.9 | 24 | 25 | 24 | 24 | 22 | 25 | 29 | 32 | 28 | 30 | 55.5 | 2.11 | 2.16 |
| Conductivity | uS/cm | -- | 1060 | 960 | 1140 | 1130 | 1130 | 1020 | 1150 | 794 | 971 | 1070 | 1240 | 939 | 933 | 959 | 969 | 884 | 996 | 1020 | 995 | 964 | 989 | 1380 | 369 | 355 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 4.2 | 4.7 | 2.1 | **7.02** | 3 | 4 | 4 | 4 | 3 | **12** | 4 | 4 | 4 | 4 | **7.5** | 1 | R |
| Hardness | mg/L | 80-100 (OG) | 500 | 559 | 576 | 553 | 555 | 568 | 543 | 272 | 460 | 598 | 445 | 488 | 498 | 531 | 480 | 555 | 517 | 510 | 564 | 502 | 507 | 648 | 137 | 126 |
| Nitrate (as N) | mg/L | 10 | <0.06 | 0.1 | <0.06 | <0.06 | <0.06 | 0.07 | 0.07 | <0.02 | <0.02 | 0.761 | <0.02 | <0.06 | 0.14 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.1 | 0.04 | 0.111 |
| Nitrite (as N) | mg/L | 1 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.05 | <0.01 | <0.01 |
| pH | s.u. | 6.5-8.5 (OG) | 7.87 | 7.97 | 8.05 | 8.01 | 7.99 | 7.86 | 7.82 | 7.9 | 7.91 | 7.81 | 7.03 | 7.91 | 7.68 | 7.89 | 7.81 | 8.01 | 8.02 | 8.11 | 7.68 | 7.73 | 7.8 | 7.04 | 8.24 | 8.2 |
| Phenolics (total) | mg/L | -- | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.0017 | <0.001 | <0.006 | <0.0044 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.0029 | <0.001 | <0.0091 |
| Sulfate | mg/L | 500 (AO) | 35 | 22 | 27 | 16 | 18 | 31 | 12 | <0.3 | 3.41 | 143 | 3.39 | 5 | 5 | 6 | 4 | 4 | 5 | 5 | 8 | 11 | 11 | 30.2 | 14.4 | 14.7 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | 0.6 | <0.5 | 0.7 | 0.49 | 0.99 | 0.19 | 0.78 | <0.5 | <0.5 | <0.5 | <0.5 | 0.6 | <0.5 | 0.9 | 1 | 0.7 | 1.4 | 2.78 | 0.66 | <0.15 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 1010 | 1180 | 1016 | 1070 | 1070 | 1410 | 1350 | 1010 | 1010 | 585 | 1130 | 1460 | 1150 | 1010 | 980 | 1090 | 1020 | 951 | 1310 | 985 | 1150 | 353 | 353 | 245 |
| pH, field | s.u. | 6.5-8.5 (OG) | 6.9 | 6.61 | 6.96 | 7.14 | 7.14 | 7.36 | 7.82 | 7.59 | 7.59 | 6.96 | 6.77 | 7.28 | 7.1 | 6.99 | 6.88 | 6.83 | 7.03 | 7.06 | 7.88 | 7.02 | 7.81 | 7.62 | 7.62 | 7.86 |
| Temperature, field | Deg C | 15 (AO) | 8.29 | 7.9 | 9.07 | 11.4 | 11.4 | 7.2 | 6.69 | 9.2 | 9.2 | 8.64 | 9.17 | 8.12 | 8.39 | 11.3 | 7.45 | 7.6 | 8.72 | 11.5 | 7.86 | 10.38 | 7.13 | 8.2 | 8.2 | 8.8 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

OG Operation Guideline (water treatment and distribution).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
R Rejected.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-110318-028 | GW-WARD2-19-031 | GW-WARD2-19-001 | GW-WARD2-19-005 | GW-WARD 2-_19-002 | GW-WARD 2-_19-005 | OW32-07 | GW-WARD 2-003 | GW-WARD2-006 | GW-WARD2-009 | GW-WARD 2-016 | GW-WARD2-1222-005 | OW32-07 | OW32-07 | GW-WARD2-041017-011 | GW-WARD2-112417-014 | GW-WARD2-112417-015 | GW-WARD2-051818-006 | GW-WARD2-051818-007 | GW-WARD2-110318-024 | GW-WARD2-19-017 | GW-WARD2-19-013 | GW-WARD 2-012 | GW-WARD2-011 |
| **Sample Date:** | | *ODWS* [1] | 11/3/2018 | 5/22/2019 | 12/6/2019 | 12/6/2019 Duplicate | 8/17/2020 | 8/17/2020 Duplicate | 11/28/2020 | 5/10/2021 | 11/16/2021 | 11/16/2021 Duplicate | 7/2/2022 | 12/6/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 11/24/2017 Duplicate | 5/18/2018 | 5/18/2018 Duplicate | 11/3/2018 | 5/22/2019 | 12/6/2019 | 5/10/2021 | 11/16/2021 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 26.6 | 28.8 | 30.8 | 30.6 | 29.7 | 30.4 | 32.1 | 30.6 | 31.5 | 31.5 | 28.9 | 31.1 | 29.6 | 30.2 | 142 | 167 | 168 | 103 | 130 | 128 | 181 | 175 | 180 | 167 |
| Iron (dissolved) | mg/L | 0.30 (AO) | 0.012 | <0.007 | <0.014 | <0.008 | <0.007 | 0.01 | <0.007 | <0.007 | <0.007 | <0.007 | 0.014 | 0.057 | <0.007 | 0.011 | 0.031 | <0.01 | <0.01 | 0.037 | <0.01 | <0.01 | <0.007 | 0.055 | 0.017 | 0.009 |
| Magnesium (dissolved) | mg/L | -- | 14.2 | 14.4 | 15.3 | 15.4 | 15.4 | 15.7 | 14.8 | 15 | 15.1 | 15.9 | 15.5 | 16.4 | 15.3 | 16.2 | 38.7 | 70.5 | 70.3 | 44.4 | 68.7 | 58.3 | 69.2 | 64.8 | 68.6 | 66.9 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | 0.0188 | 0.00022 | <0.00094 | <0.00074 | 0.00091 | 0.00119 | 0.00174 | <0.00019 | 0.00334 | 0.00329 | 0.00072 | 0.0162 | 0.00331 | 0.0037 | **0.0563** | 0.00087 | 0.00129 | 0.0201 | 0.00193 | 0.00265 | 0.00133 | 0.00998 | 0.0035 | 0.00337 |
| Molybdenum (dissolved) | mg/L | -- | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.000254 | 0.000253 | 0.000925 | 0.000383 | - | - | - | - | - |
| Phosphorus (dissolved) | mg/L | -- | <0.05 | 0.005 | 0.005 | 0.005 | 0.005 | 0.003 | <0.003 | 0.009 | <0.003 | <0.003 | <0.003 | 0.006 | 0.005 | 0.583 | 0.196 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.003 | 0.005 | 0.012 | 0.006 |
| Potassium (dissolved) | mg/L | -- | 0.872 | 0.868 | 0.974 | 0.95 | 0.913 | 0.955 | 0.875 | 0.927 | 0.948 | 0.94 | 0.874 | 0.971 | 0.928 | 0.999 | 2.38 | 10.7 | 10.5 | 1.6 | 9.61 | 8.93 | 10.1 | 9.91 | 9.85 | 8.61 |
| Sodium (dissolved) | mg/L | 200 (AO) | 31.3 | 31.6 | 32.2 | 32.6 | 33.4 | 34 | 32.9 | 33.2 | 31.7 | 33.2 | 33.6 | 32.1 | 31.8 | 35 | 6.6 | 9.16 | 8.93 | 10.3 | 9.17 | 9.09 | 8.09 | 7.84 | 9.44 | 9.55 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 179 | 195 | 193 | 193 | 187 | 186 | 196 | 187 | 199 | 199 | 188 | 181 | 191 | 190 | 483 | 578 | 580 | 349 | 498 | 457 | 594 | 584 | 450 | 526 |
| Ammonia-N | mg/L | -- | 0.063 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | 0.1 | <0.1 | 0.2 | <0.1 | 0.1 | <0.067 | <0.177 | <0.108 | <0.103 | <0.03 | <0.02 | <0.1 | <0.1 | <0.1 | <0.1 |
| Chloride | mg/L | 250 (AO) | 2.32 | 3 | <3 | <3 | 3 | 1 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 4.89 | 7.2 | 7.1 | 80.3 | 6.88 | 7.59 | 7 | 6 | 14 | 15 |
| Conductivity | uS/cm | -- | 351 | 385 | 364 | 367 | 371 | 366 | 368 | 358 | 378 | 377 | 382 | 366 | 376 | 395 | 920 | 1190 | 1180 | 855 | 1080 | 1050 | 1120 | 1100 | 951 | 1130 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | <1.95 | <1 | 1 | 1 | <1 | 1 | <1 | 1 | <1 | 1 | <1 | 1 | 1 | 1 | 2 | 1.8 | 2.3 | 1.2 | 1.9 | <4.3 | **6** | 2 | 2 | 2 |
| Hardness | mg/L | 80-100 (OG) | 125 | 131 | 140 | 140 | 138 | 140 | 141 | 138 | 141 | 144 | 136 | 145 | 137 | 142 | 515 | 707 | 710 | 440 | 607 | 559 | 736 | 704 | 730 | 693 |
| Nitrate (as N) | mg/L | 10 | 0.049 | 0.13 | 0.1 | 0.09 | 0.13 | 0.14 | 0.13 | 0.17 | 0.09 | 0.09 | 0.16 | <0.06 | 0.28 | 0.14 | 0.331 | 0.5 | 0.5 | 0.027 | 0.754 | 0.981 | 0.95 | 1.79 | 2.17 | 4.18 |
| Nitrite (as N) | mg/L | 1 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.01 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 (OG) | 7.93 | 8.32 | 8.23 | 8.31 | 8.33 | 8.3 | 8.26 | 8.39 | 8.15 | 8.07 | 8.22 | 8.14 | 8.24 | 8.03 | 7.33 | 7.92 | 7.81 | 7.93 | 7.75 | 7.25 | 7.48 | 7.29 | 7.97 | 7.9 |
| Phenolics (total) | mg/L | -- | <0.004 | <0.002 | <0.002 | <0.002 | <0.002 | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.002 | <0.001 | <0.001 | <0.0059 | <0.0051 | <0.0037 | <0.002 | <0.002 | <0.002 | <0.002 |
| Sulfate | mg/L | 500 (AO) | 14.8 | 16 | 13 | 14 | 17 | 17 | 14 | 12 | 15 | 15 | 17 | 19 | 22 | 20 | 64.7 | 133 | 126 | 16.5 | 144 | 117 | 150 | 100 | 130 | 130 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | <0.15 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.6 | 0.35 | <1.5 | 0.41 | 0.56 | 0.3 | 0.29 | <0.5 | <0.5 | <0.5 | <0.5 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 497 | 437 | 515 | 515 | 463 | 463 | 500 | 550 | 450 | 450 | 412 | 500 | 441 | 492 | - | 1160 | 1160 | 622 | 622 | 1150 | 1580 | 1200 | 1340 | 1610 |
| pH, field | s.u. | 6.5-8.5 (OG) | 7.61 | 8.12 | 7.74 | 7.74 | 7.85 | 7.85 | 7.79 | 7.21 | 7.75 | 7.75 | 7.68 | 7.69 | 7.91 | 7.99 | NM | 6.47 | 6.47 | 7.15 | 7.15 | 7.12 | 7.37 | 6.93 | 6.95 | 7.33 |
| Temperature, field | Deg C | 15 (AO) | 8.53 | 7.38 | 6.89 | 6.89 | 12.9 | 12.9 | 6.97 | 7.5 | 7.57 | 7.57 | 10.9 | 7.51 | 11.44 | 6.05 | - | 9.3 | 9.3 | 8.34 | 8.34 | 9.31 | 6.98 | 7.75 | 6.9 | 7 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

OG Operation Guideline (water treatment and distribution).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
R Rejected.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW36-09 | OW36-09 | OW36-09 | OW36-09 | OW36-09 | OW36-09 | OW36-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD 2-006 | GW-WARD2-1222-029 | OW33-07 | OW33-07 | GW-WARD2-041017-031 | GW-WARD2-112417-011 | GW-WARD2-051818-024 | GW-WARD2-110318-012 | GW-WARD2-19-007 | GW-WARD2-19-011 | GW-WARD 2-_19-029 | GW-WARD2-041017-005 | GW-WARD2-112417-008 | GW-WARD2-051818-019 | GW-WARD2-110318-005 | GW-WARD2-110318-008 | GW-WARD2-19-030 | GW-WARD2-19-025 | GW-WARD 2-_19-026 | OW37-09 | GW-WARD 2-026 | GW-WARD2-028 | GW-WARD 2-018 | GW-WARD2-1222-002 |
| **Sample Date:** | | *ODWS* [1] | 7/2/2022 | 12/6/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/18/2020 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 11/3/2018 Duplicate | 5/22/2019 | 12/6/2019 | 8/18/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/3/2022 | 12/6/2022 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 180 | 179 | 192 | 166 | 174 | 209 | 227 | 223 | 230 | 231 | 241 | 90.9 | 74.2 | 77.7 | <71 | 74.5 | 138 | 173 | 140 | 160 | 181 | 169 | 123 | 171 |
| Iron (dissolved) | mg/L | 0.30 (AO) | 0.101 | 0.021 | 0.127 | **0.86** | 0.056 | 0.035 | 0.252 | 0.13 | 0.247 | **0.742** | **0.576** | 0.25 | 0.2 | 0.13 | 0.17 | 0.16 | 0.16 | 0.17 | 0.156 | 0.272 | 0.201 | 0.233 | 0.007 | 0.272 |
| Magnesium (dissolved) | mg/L | -- | 71.5 | 69.8 | 72.4 | 58.8 | 40.6 | 51.1 | 45.2 | 45.7 | 46.9 | 43.9 | 51.9 | 25.3 | 26.3 | 26.6 | 24.7 | 25.3 | 23.9 | 24.6 | 25.9 | 24 | 26.2 | 25.6 | 25.8 | 26.8 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | 0.037 | 0.0214 | 0.00506 | **0.192** | **0.0778** | **0.125** | **0.159** | **0.196** | **0.232** | **0.21** | **0.241** | <0.005 | 0.0051 | <0.005 | <0.005 | 0.00396 | 0.00396 | 0.00399 | 0.00445 | 0.00475 | 0.0054 | 0.00518 | 0.00111 | 0.0046 |
| Molybdenum (dissolved) | mg/L | -- | - | - | - | - | - | 0.000452 | 0.000383 | - | - | - | - | - | 0.00683 | 0.00714 | - | - | - | - | - | - | - | - | - | - |
| Phosphorus (dissolved) | mg/L | -- | 0.468 | 0.041 | 0.021 | 0.132 | 0.107 | 0.571 | 0.238 | 0.218 | 0.271 | 0.124 | 0.105 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 |
| Potassium (dissolved) | mg/L | -- | 10.4 | 9.07 | 8.63 | 6.05 | 4.14 | 16.6 | 6.66 | 6.31 | 5.66 | 5.56 | 6.23 | 1.5 | 1.51 | 1.61 | 1.41 | 1.53 | 1.52 | 1.52 | 1.54 | 1.54 | 1.71 | 1.64 | 1.47 | 1.6 |
| Sodium (dissolved) | mg/L | 200 (AO) | 9.11 | 12.3 | 11.8 | 10.8 | 26.4 | 31.8 | 32.9 | 31.8 | 29.4 | 22.1 | 21 | 24.9 | 25.2 | 25.6 | 25 | 25.5 | 23.9 | 24.5 | 26.3 | 24.7 | 27.2 | 25.2 | 25.4 | 25.4 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 539 | 600 | 546 | 622 | 593 | 686 | 699 | 711 | 644 | 758 | 1010 | 203 | 197 | 178 | 174 | 171 | 188 | 191 | 185 | 184 | 176 | 188 | 178 | 178 |
| Ammonia-N | mg/L | -- | 0.2 | <0.1 | <0.1 | 0.3 | <0.069 | 3.41 | 0.979 | 2.11 | 2.2 | 0.5 | 0.2 | <0.151 | 0.413 | 0.175 | 0.132 | 0.119 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.2 |
| Chloride | mg/L | 250 (AO) | 15 | 16 | 14 | 20 | 34.2 | 45.2 | 51.1 | 55.4 | 40 | 25 | 16 | 12.5 | 12.6 | 12.5 | 12.9 | 13 | 13 | 13 | 13 | 13 | 12 | 17 | 17 | 17 |
| Conductivity | uS/cm | -- | 1250 | 1320 | 1140 | 1270 | 1190 | 1340 | 1330 | 1350 | 1150 | 1250 | 1320 | 619 | 616 | 599 | 564 | 568 | 614 | 602 | 584 | 604 | 579 | 608 | 622 | 579 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | 2 | 3 | 3 | 4 | 4 | 5 | 4.6 | **8.43** | **7** | **6** | 4 | <1 | 1.1 | 1.6 | <1.7 | <2.09 | <1 | 1 | <1 | <1 | <1 | <1 | <1 | 1 |
| Hardness | mg/L | 80-100 (OG) | 744 | 734 | 777 | 657 | 602 | 731 | 754 | 744 | 768 | 758 | 816 | 331 | 293 | 304 | <180 | 290 | 444 | 533 | 456 | 498 | 561 | 528 | 414 | 536 |
| Nitrate (as N) | mg/L | 10 | 2.27 | 3.33 | 3.6 | 1.04 | 0.39 | 0.76 | <0.1 | 0.051 | 1.19 | 0.25 | 0.86 | <0.02 | <0.02 | <0.02 | <0.02 | 0.04 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 |
| Nitrite (as N) | mg/L | 1 | 0.15 | <0.03 | <0.03 | 0.08 | <0.05 | <0.05 | <0.05 | <0.01 | 0.08 | <0.03 | <0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 (OG) | 8.03 | 7.3 | 7.9 | 7.63 | 7.25 | 7.72 | 7.43 | 7.03 | 7.1 | 7.19 | 7.11 | 7.87 | 8.18 | 8.12 | 7.7 | 7.74 | 8.19 | 7.98 | 8.04 | 8.08 | 8.19 | 8.1 | 8.25 | 8.01 |
| Phenolics (total) | mg/L | -- | <0.002 | <0.002 | <0.002 | 0.003 | 0.0029 | <0.0062 | <0.0062 | <0.0058 | 0.003 | <0.002 | <0.002 | 0.0018 | <0.001 | <0.0028 | <0.002 | <0.0024 | 0.004 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Sulfate | mg/L | 500 (AO) | 180 | 150 | 130 | 180 | 38.9 | 24.7 | 18.1 | 16.3 | 9 | 28 | 60 | 121 | 126 | 124 | 128 | 129 | 120 | 120 | 110 | 120 | 110 | 140 | 120 | 180 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | 0.6 | <0.5 | <0.5 | 0.6 | 0.56 | 4.7 | 2.08 | 2.87 | 2 | 0.5 | <0.5 | 0.22 | 0.47 | 0.25 | 0.2 | 0.19 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 1630 | 1720 | 1250 | 1190 | 1290 | 1400 | 788 | 1510 | 1640 | 1420 | 1250 | 980 | 521 | 354 | 741 | 741 | 606 | 742 | 670 | 716 | 715 | 666 | 588 | 787 |
| pH, field | s.u. | 6.5-8.5 (OG) | 7.77 | 5.99 | 7.31 | 7.04 | 6.63 | 7.75 | 6.77 | 7.02 | 7.02 | 7.64 | 6.74 | 7.29 | 7.69 | 7.14 | 7.31 | 7.31 | 7.5 | 7.02 | 7.34 | 7.24 | 6.81 | 7.19 | 7.93 | 7.57 |
| Temperature, field | Deg C | 15 (AO) | 12.3 | 7.88 | 10.63 | 8.85 | 11 | 9.5 | 11.48 | 9.35 | 10.93 | 8.01 | 12.6 | 7.9 | 8.7 | 9.9 | 8.55 | 8.55 | 9.59 | 8.41 | 11 | 7.7 | 9.6 | 9.35 | 13.7 | 7.77 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

| | |
|---|---|
| OG | Operation Guideline (water treatment and distribution). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| -- | No guideline. |
| < | Parameter detected below the laboratory method detection limit. |
| R | Rejected. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**Table 6.2**

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**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW37-09 | OW37-09 | OW43-09 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | OW37-09 | OW37-09 | GW-WARD2-041017-030 | GW-WARD2-041017-010 | GW-WARD2-041017-025 | GW-WARD2-112417-027 | GW-WARD2-051818-028 | GW-WARD2-110318-029 | GW-WARD2-19-032 | GW-WARD2-19-004 | GW-WARD 2-_19-019 | OW45-13 | GW-WARD 2-016 | GW-WARD2-022 | GW-WARD 2-022 | GW-WARD2-1222-007 | OW45-13 | OW45-13 | GW-WARD2-041017-027 | GW-WARD2-112417-029 | GW-WARD2-051818-018 | GW-WARD2-110318-014 | GW-WARD2-19-006 | GW-WARD2-19-023 |
| **Sample Date:** | | *ODWS* [1] | 5/18/2023 | 11/8/2023 | 4/10/2017 | 4/10/2017 | 4/10/2017 Duplicate | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/18/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/3/2022 | 12/6/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 119 | 116 | 228 | 70.1 | 68.4 | 74.3 | 68 | 59.4 | 62.8 | 87.1 | 87.8 | 84.9 | 71.2 | 74.8 | 58 | 69.8 | 54.9 | 73.5 | 31 | 31.2 | 33.2 | 30.5 | 36.5 | 33.9 |
| Iron (dissolved) | mg/L | 0.30 (AO) | 0.223 | 0.217 | <0.01 | 0.011 | 0.017 | 0.015 | 0.015 | <0.01 | <0.007 | <0.007 | 0.023 | 0.019 | 0.013 | 0.014 | <0.007 | 0.011 | <0.007 | 0.035 | 0.18 | 0.189 | 0.016 | 0.153 | <0.007 | 0.118 |
| Magnesium (dissolved) | mg/L | -- | 23.5 | 25.3 | 136 | 23.5 | 24.1 | 26.1 | 26.3 | 23.4 | 20.7 | 25.5 | 31.3 | 36.5 | 30.6 | 31.3 | 30.6 | 35.1 | 28.1 | 32.6 | 20 | 23 | 21.9 | 19.7 | 21.4 | 21.4 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | 0.0043 | 0.00404 | 0.031 | 0.00301 | 0.00434 | 0.0025 | 0.00185 | 0.00924 | 0.00138 | 0.00746 | 0.02363 | 0.02402 | 0.0043 | 0.00552 | 0.00451 | 0.00655 | 0.00858 | **0.0881** | 0.0112 | 0.0121 | 0.00664 | 0.0103 | 0.00161 | 0.0103 |
| Molybdenum (dissolved) | mg/L | -- | - | - | - | - | - | 0.000157 | 0.000196 | - | - | - | - | - | - | - | - | - | - | - | - | 0.00351 | 0.00379 | - | - | - |
| Phosphorus (dissolved) | mg/L | -- | 0.004 | <0.003 | 0.169 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.023 | 0.004 | 0.013 | 0.006 | 0.007 | 0.071 | <0.003 | 0.029 | 0.004 | 0.019 | <0.05 | <0.05 | <0.05 | <0.05 | <0.003 | 0.008 |
| Potassium (dissolved) | mg/L | -- | 1.51 | 1.5 | 5.53 | 0.636 | 0.645 | 0.779 | 0.807 | 0.908 | 0.693 | 0.932 | 1.19 | 1.18 | 1.05 | 1.27 | 0.941 | 1.27 | 1.33 | 2.4 | 1.17 | 1.22 | 1.22 | 1.1 | 1.23 | 1.15 |
| Sodium (dissolved) | mg/L | 200 (AO) | 22.2 | 24.4 | 48.9 | 17.1 | 16.9 | 6.02 | 17.1 | 13.3 | 12.1 | 13.5 | 24.2 | 35.4 | 27 | 25.1 | 18.6 | 23.6 | 18 | 22.2 | 18.1 | 19.6 | 19.6 | 18.4 | 19.1 | 19 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 182 | 181 | 844 | 259 | 265 | 284 | 246 | 245 | 484 | 358 | 605 | 352 | 250 | 284 | 249 | 280 | 245 | 279 | 213 | 200 | 202 | 199 | 206 | 209 |
| Ammonia-N | mg/L | -- | 0.1 | 0.2 | <0.057 | <0.029 | <0.032 | 0.424 | <0.083 | 0.095 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.316 | <0.328 | 0.181 | 0.276 | 0.1 | 0.2 |
| Chloride | mg/L | 250 (AO) | 15 | 17 | 68.1 | 28.6 | 28.6 | 19.4 | 30.4 | 30.1 | 26 | 38 | 47 | 65 | 35 | 41 | 37 | 49 | 16 | 48 | 0.72 | 0.72 | 0.78 | 0.82 | 1 | <2 |
| Conductivity | uS/cm | -- | 589 | 622 | 2030 | 557 | 553 | 553 | 559 | 523 | 546 | 598 | 702 | 862 | 601 | 698 | 601 | 639 | 474 | 682 | 384 | 380 | 353 | 356 | 395 | 375 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | 1 | <1 | **6.3** | 1.2 | 1.3 | 1.2 | 1.4 | <1.99 | <1 | 2 | 2 | 4 | 2 | 2 | 2 | 2 | 3 | 5 | <1 | <1 | R | <2.04 | <1 | 1 |
| Hardness | mg/L | 80-100 (OG) | 393 | 393 | 1130 | 272 | 270 | 293 | 278 | 245 | 242 | 322 | 348 | 362 | 304 | 316 | 271 | 319 | 253 | 318 | 160 | 173 | 173 | 157 | 179 | 173 |
| Nitrate (as N) | mg/L | 10 | <0.06 | <0.06 | 5.22 | 0.147 | 0.143 | <0.02 | 0.203 | 0.072 | 0.11 | <0.06 | 0.14 | 0.09 | 0.17 | 0.51 | 0.22 | <0.06 | 0.25 | 0.07 | 0.047 | 0.026 | 0.077 | 0.051 | 0.24 | 0.2 |
| Nitrite (as N) | mg/L | 1 | <0.03 | <0.03 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.024 | <0.01 | 0.03 | 0.019 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 (OG) | 8.16 | 7.95 | 7.26 | 7.83 | 7.91 | 8.11 | 8.09 | 7.61 | 7.81 | 7.91 | 7.99 | 8.03 | 8.27 | 8.08 | 8.19 | 7.71 | 8 | 7.85 | 8.1 | 8.24 | 8.18 | 7.92 | 8.28 | 8.13 |
| Phenolics (total) | mg/L | -- | <0.002 | <0.002 | 0.0391 | 0.002 | 0.0029 | <0.001 | <0.0022 | <0.0074 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.0015 | <0.001 | <0.0079 | <0.0026 | <0.002 | <0.002 |
| Sulfate | mg/L | 500 (AO) | 120 | 120 | 333 | 7.01 | 6.97 | 3.2 | 10.6 | 8.34 | 8 | 30 | 39 | 30 | 30 | 45 | 30 | 36 | 13 | 28 | 8.05 | 8.59 | 8.34 | 8.58 | 8 | 9 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | 0.6 | 0.6 | 0.93 | 2 | 0.35 | 2 | 0.67 | 1.38 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.32 | 0.71 | 0.26 | 0.34 | <0.5 | <0.5 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 648 | 787 | 1990 | 540 | 540 | 476 | 331 | 590 | 453 | 754 | 900 | 896 | 751 | 686 | 590 | 805 | 502 | 659 | 358 | 332 | 231 | 474 | 405 | 461 |
| pH, field | s.u. | 6.5-8.5 (OG) | 7.86 | 8.02 | 6.83 | 8.01 | 8.01 | 7.59 | 7.6 | 7.34 | 7.95 | 7.12 | 7.36 | 7.32 | 7.27 | 7.32 | 8.03 | 7.57 | 7.73 | 7.77 | 8.08 | 7.71 | 7.78 | 7.94 | 8.35 | 7.22 |
| Temperature, field | Deg C | 15 (AO) | 14.56 | 5.9 | 9.3 | 8.3 | 8.3 | 10.1 | 9.32 | 11.64 | 8.47 | 8.63 | 14.9 | 8.07 | 9.2 | 10.18 | **15.3** | 9.36 | 9.95 | 10.1 | 9.8 | 8.4 | 11.52 | 8 | 10.47 | 7.3 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

OG Operation Guideline (water treatment and distribution).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
R Rejected.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW47-13 | OW47-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD 2-_19-024 | OW46A-13 | GW-WARD 2-024 | GW-WARD2-026 | GW-WARD 2-023 | GW-WARD2-1222-003 | OW46A-13 | OW46A-13 | GW-WARD2-041017-026 | GW-WARD2-112417-030 | GW-WARD2-051818-020 | GW-WARD2-110318-020 | GW-WARD2-19-024 | GW-WARD2-19-024 | GW-WARD 2-_19-025 | OW46B-13 | GW-WARD 2-015 | GW-WARD2-027 | GW-WARD 2-025 | GW-WARD2-1222-006 | OW46B-13 | OW46B-13 | GW-WARD2-041017-029 | GW-WARD2-112417-031 |
| **Sample Date:** | | *ODWS* [1] | 8/18/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/3/2022 | 12/6/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/18/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/3/2022 | 12/6/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 34.4 | 35.3 | 36.4 | 36.3 | 32.6 | 34.2 | 33.4 | 35.2 | 103 | 87.6 | 97.4 | 84.2 | 130 | 157 | 141 | 158 | 160 | 150 | 154 | 195 | 176 | 171 | 153 | 187 |
| Iron (dissolved) | mg/L | 0.30 (AO) | 0.012 | 0.019 | <0.007 | 0.012 | <0.007 | 0.01 | 0.053 | <0.007 | <0.01 | <0.01 | <0.01 | 0.01 | <0.007 | <0.007 | <0.007 | <0.007 | 0.009 | <0.007 | <0.007 | 0.011 | <0.007 | <0.007 | 0.011 | 0.012 |
| Magnesium (dissolved) | mg/L | -- | 21.7 | 20.5 | 21.3 | 21.2 | 20.7 | 22.4 | 20.3 | 22.4 | 40.1 | 39.5 | 42.4 | 38.2 | 48 | 56.6 | 48.6 | 53 | 53.5 | 48.6 | 46.6 | 53.4 | 48.1 | 40.7 | 81 | 107 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | 0.00744 | 0.01013 | 0.00525 | 0.00757 | 0.00181 | 0.0125 | 0.0135 | 0.0125 | <0.0005 | 0.00243 | 0.00075 | 0.00257 | 0.00143 | 0.00392 | 0.00331 | 0.00977 | 0.00922 | 0.00477 | 0.00255 | 0.0077 | 0.0111 | 0.0446 | <0.0005 | 0.0154 |
| Molybdenum (dissolved) | mg/L | -- | - | - | - | - | - | - | - | - | - | 0.000104 | 0.000168 | - | - | - | - | - | - | - | - | - | - | - | - | 0.000151 |
| Phosphorus (dissolved) | mg/L | -- | 0.006 | <0.003 | 0.011 | <0.003 | <0.003 | 0.007 | 0.013 | 0.008 | <0.05 | <0.05 | <0.05 | 0.087 | 0.006 | 0.003 | 0.006 | 0.02 | 0.003 | <0.003 | <0.003 | 0.006 | 0.009 | 0.009 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | -- | 1.16 | 1.03 | 1.18 | 1.21 | 1.05 | 1.31 | 1.2 | 1.31 | 0.494 | 0.7 | 0.697 | 0.881 | 0.57 | 0.692 | 0.736 | 0.909 | 0.777 | 0.951 | 1 | 1.14 | 0.826 | 1.06 | 1.23 | 1.83 |
| Sodium (dissolved) | mg/L | 200 (AO) | 19.9 | 19.1 | 19.5 | 19.3 | 18.9 | 20.8 | 18.3 | 20.8 | 4.45 | 3.96 | 4.61 | 4.1 | 3.48 | 4.18 | 4.51 | 7.78 | 4.94 | 12.4 | 12.5 | 13.5 | 8.84 | 13.3 | 16.3 | 22.2 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 199 | 218 | 209 | 210 | 196 | 200 | 200 | 207 | 425 | 408 | 446 | 383 | 619 | 602 | 596 | 468 | 504 | 560 | 575 | 574 | 564 | 574 | 529 | 541 |
| Ammonia-N | mg/L | -- | <0.1 | 0.2 | 0.2 | 0.2 | <0.1 | 0.2 | 0.2 | 0.2 | <0.031 | <0.34 | <0.084 | 0.205 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 | 0.789 |
| Chloride | mg/L | 250 (AO) | <1 | 2 | 1 | <1 | <1 | <1 | <1 | <1 | 16.6 | 12.4 | 11.1 | 11 | 30 | 21 | 23 | 130 | 19 | 30 | 24 | 26 | 34 | 30 | 33.7 | 41 |
| Conductivity | uS/cm | -- | 359 | 386 | 361 | 379 | 382 | 333 | 383 | 394 | 759 | 724 | 785 | 701 | 945 | 1020 | 904 | 1500 | 844 | 1040 | 1180 | 1100 | 1040 | 1150 | 1400 | 1540 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | <1 | <1 | <1 | 2 | 1 | <1 | 2 | 3 | 2.1 | 1 | 1.5 | <3.11 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2.2 | 2.5 |
| Hardness | mg/L | 80-100 (OG) | 175 | 172 | 179 | 178 | 167 | 178 | 167 | 180 | 422 | 381 | 418 | 368 | 522 | 624 | 552 | 612 | 618 | 575 | 576 | 706 | 638 | 596 | 715 | 907 |
| Nitrate (as N) | mg/L | 10 | 0.2 | 0.07 | 0.16 | 0.12 | 0.27 | 0.15 | 0.13 | 0.08 | 0.671 | 0.837 | 0.691 | 0.653 | 0.88 | 2.9 | 3.68 | 3.42 | 1.4 | 1.96 | 7.19 | 3 | 5.05 | 5.41 | **10.2** | **10.8** |
| Nitrite (as N) | mg/L | 1 | <0.03 | <0.03 | <0.03 | 0.07 | <0.03 | 0.09 | 0.06 | <0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.05 | 0.076 |
| pH | s.u. | 6.5-8.5 (OG) | 8.13 | 8.32 | 8.12 | 8.14 | 8.19 | 8.11 | 8.07 | 7.9 | 7.71 | 7.97 | 7.79 | 7.25 | 7.53 | 7.48 | 7.34 | 7.81 | 7.83 | 7.87 | 7.79 | 7.43 | 7.55 | 7.54 | 7.54 | 7.92 |
| Phenolics (total) | mg/L | -- | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.0021 | <0.001 | <0.0064 | <0.0054 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.0033 | <0.0012 |
| Sulfate | mg/L | 500 (AO) | 9 | 8 | 7 | 11 | 10 | 14 | 12 | 15 | 9.62 | 11.1 | 9.96 | 16 | 12 | 33 | 36 | 30 | 19 | 35 | 49 | 40 | 41 | 36 | 207 | 303 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.6 | 0.7 | 0.67 | 1.28 | 0.19 | <1.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.9 | <0.5 | 0.65 | 2.12 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 458 | 482 | 473 | 399 | 405 | 583 | 470 | 570 | 705 | 582 | 445 | 823 | 899 | 1210 | 894 | 1070 | 1050 | 978 | 914 | 1460 | 1050 | 1310 | 1340 | 1580 |
| pH, field | s.u. | 6.5-8.5 (OG) | 8.11 | 7.73 | 7.12 | 7.61 | 7.82 | 7.86 | 7.6 | 8.06 | 7.55 | 7.56 | 7.15 | 7.43 | 7.36 | 6.59 | 6.99 | 6.66 | 6.49 | 6.68 | 6.92 | 7.3 | 6.81 | 7.77 | 7.07 | 7.61 |
| Temperature, field | Deg C | 15 (AO) | 12.3 | 6.86 | 9.6 | 8.45 | 12.6 | 8.19 | 12.38 | 7.22 | 7.2 | 10.1 | 8.48 | 10.83 | 8.06 | 8.62 | 12.9 | 7.82 | 8.6 | 10.23 | 12.2 | 7.72 | 12.52 | 7.87 | 9.3 | 8.8 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

OG Operation Guideline (water treatment and distribution).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
R Rejected.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-051818-022 | GW-WARD2-110318-034 | GW-WARD2-19-008 | GW-WARD2-19-026 | GW-WARD 2-_19-028 | OW47-13 | GW-WARD 2-025 | GW-WARD2-025 | GW-WARD 2-026 | GW-WARD2-1222-018 | OW47-13 | OW47-13 | GW-WARD2-041017-013 | GW-WARD2-112417-013 | GW-WARD2-051818-027 | GW-WARD2-110318-027 | GW-WARD2-19-029 | GW-WARD2-19-016 | GW-WARD 2-_19-015 | OW48-13 | GW-WARD 2-019 | GW-WARD2-020 | GW-WARD 2-021 | GW-WARD2-1222-023 |
| **Sample Date:** | | *ODWS* [1] | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/18/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/3/2022 | 12/6/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/17/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/3/2022 | 12/6/2022 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 173 | 145 | 204 | 173 | 144 | 111 | 83.3 | 75.2 | 83.2 | 108 | 111 | 105 | 109 | 74.5 | 94 | 18.5 | 115 | 117 | 107 | 96 | 132 | 98.4 | 109 | 122 |
| Iron (dissolved) | mg/L | 0.30 (AO) | 0.016 | 0.041 | <0.007 | <0.007 | 0.008 | <0.007 | 0.008 | 0.013 | 0.058 | 0.009 | 0.02 | <0.007 | <0.01 | <0.01 | <0.01 | <0.01 | <0.007 | <0.008 | 0.009 | 0.007 | <0.007 | <0.007 | <0.007 | 0.019 |
| Magnesium (dissolved) | mg/L | -- | 95 | 90.5 | 91.6 | 84.4 | 78.2 | 61.2 | 57.6 | 54.5 | 52.2 | 45.7 | 39.3 | 37.7 | 31.1 | 29 | 30.8 | 17 | 29.7 | 29.6 | 27 | 24.7 | 29 | 25.1 | 27.2 | 28.7 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | 0.00247 | 0.0113 | 0.00048 | 0.00126 | 0.00102 | 0.00128 | 0.00074 | 0.00157 | 0.00932 | 0.0013 | 0.00305 | 0.00052 | 0.00079 | 0.00116 | 0.00498 | 0.00115 | 0.00153 | 0.00245 | 0.0114 | 0.00085 | 0.00059 | 0.0006 | 0.00113 | 0.00138 |
| Molybdenum (dissolved) | mg/L | -- | 0.000309 | - | - | - | - | - | - | - | - | - | - | - | - | 0.000908 | 0.000642 | - | - | - | - | - | - | - | - | - |
| Phosphorus (dissolved) | mg/L | -- | <0.05 | <0.05 | <0.003 | 0.007 | <0.003 | <0.003 | 0.004 | 0.005 | 0.017 | <0.003 | 0.004 | 0.003 | <0.05 | <0.05 | <0.05 | <0.05 | <0.003 | <0.003 | <0.003 | <0.003 | 0.003 | 0.009 | <0.003 | <0.003 |
| Potassium (dissolved) | mg/L | -- | 1.64 | 1.4 | 1.41 | 1.34 | 1.3 | 1.55 | 1.65 | 3.3 | 8.02 | 11 | 8.83 | 7.55 | 0.966 | 1.2 | 1 | 1.93 | 0.909 | 0.858 | 1.07 | 0.69 | 0.785 | 0.756 | 0.603 | 0.681 |
| Sodium (dissolved) | mg/L | 200 (AO) | 22.6 | 20.4 | 21.7 | 22.5 | 25.1 | 18.8 | 8.05 | 5.93 | 22.5 | 12.6 | 4.3 | 3.8 | 5.84 | 33.1 | 21 | 86.3 | 11.1 | 4.47 | 11.3 | 2.63 | 5.24 | 3.92 | 4.31 | 4.71 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 486 | 466 | 611 | 966 | 808 | 455 | 403 | 383 | 371 | 416 | 416 | 370 | 433 | 367 | 392 | 284 | 464 | 537 | 604 | 305 | 467 | 317 | 337 | 390 |
| Ammonia-N | mg/L | -- | <0.056 | 0.165 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.043 | <0.295 | <0.069 | 0.101 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Chloride | mg/L | 250 (AO) | 38.3 | 37.3 | 40 | 31 | 19 | 20 | 10 | 10 | 18 | 13 | 7 | 9 | 15.8 | 13.6 | 10.5 | 25.7 | 9 | 17 | 17 | 16 | 12 | 13 | 16 | 14 |
| Conductivity | uS/cm | -- | 1350 | 1340 | 1420 | 1280 | 1080 | 902 | 694 | 714 | 770 | 783 | 750 | 746 | 761 | 694 | 693 | 619 | 718 | 692 | 628 | 679 | 968 | 639 | 681 | 710 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | **6.4** | <4.67 | 4 | 3 | 2 | 2 | 1 | 1 | 2 | 2 | 3 | 2 | <1 | <1 | R | <3.34 | <1 | 2 | <1 | <1 | <1 | 4 | <1 | 1 |
| Hardness | mg/L | 80-100 (OG) | 824 | 734 | 886 | 780 | 681 | 529 | 445 | 412 | 423 | 457 | 440 | 417 | 399 | 305 | 362 | 116 | 409 | 414 | 377 | 341 | 449 | 349 | 384 | 423 |
| Nitrate (as N) | mg/L | 10 | 10 | 9.75 | 9.04 | **10.4** | 2.72 | 1.34 | 0.47 | 0.98 | 0.83 | 0.98 | 4.13 | 4.2 | <0.02 | 4.26 | 0.915 | 2.64 | 1.76 | 9.95 | 9.65 | **14.1** | 3.52 | 8.74 | 5.01 | 4.82 |
| Nitrite (as N) | mg/L | 1 | <0.05 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.04 | <0.03 | <0.03 | <0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 (OG) | 7.85 | 7.34 | 7.43 | 7.66 | 7.56 | 8.07 | 8.07 | 8.14 | 8.11 | 7.98 | 7.96 | 7.89 | 7.67 | 8 | 7.87 | 7.48 | 7.47 | 7.55 | 7.79 | 8.03 | 7.79 | 8.04 | 8.02 | 7.9 |
| Phenolics (total) | mg/L | -- | <0.0122 | <0.0023 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.0014 | <0.001 | <0.0161 | <0.008 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Sulfate | mg/L | 500 (AO) | 256 | 250 | 270 | 220 | 100 | 67 | 32 | 34 | 56 | 36 | 32 | 34 | 5.67 | 4.18 | 6.88 | 5.99 | 5 | 6 | 7 | 8 | 3 | 8 | 6 | 8 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | 0.54 | 0.6 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1.5 | <1.5 | 0.39 | 1.13 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 774 | 1560 | 1850 | 1530 | 516 | 900 | 864 | 715 | 647 | 1050 | 730 | 781 | 718 | 603 | 416 | 739 | 1170 | 861 | 742 | 759 | 787 | 652 | 660 | 914 |
| pH, field | s.u. | 6.5-8.5 (OG) | 6.94 | 7.08 | 7.61 | 7.1 | 7.34 | 7.06 | 6.83 | 7.3 | 7.53 | 7.49 | 7.52 | 7.79 | 7.28 | 7.53 | 7.31 | 7.62 | 7.41 | 6.92 | 7.08 | 7 | 6.63 | 7.07 | 7.44 | 7.6 |
| Temperature, field | Deg C | 15 (AO) | 10 | 8.88 | 10.29 | 7.21 | 11.6 | 8.08 | 9.2 | 8.33 | 11.8 | 7.63 | 10.12 | 5.47 | 9 | 9.8 | 9.92 | 10.19 | 9.02 | 8.6 | 13.2 | 9.8 | 8.9 | 10.74 | 11.7 | 8.49 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

OG Operation Guideline (water treatment and distribution).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
R Rejected.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW48-13 | OW48-13 | OW48-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | OW48-13 | Field Duplicate | OW48-13 | GW-WARD2-041017-012 | GW-WARD2-112417-012 | GW-WARD2-051818-025 | GW-WARD2-110318-017 | GW-WARD2-19-023 | GW-WARD2-19-006 | GW-WARD 2-_19-014 | OW49-13 | GW-WARD 2-023 | GW-WARD2-019 | GW-WARD 2-017 | GW-WARD2-1222-024 | OW49-13 | OW49-13 | GW-WARD2-041017-006 | GW-WARD2-112417-026 | GW-WARD2-051818-030 | GW-WARD2-110318-033 | GW-WARD2-19-028 | GW-WARD2-19-027 | GW-WARD 2-_19-013 |
| **Sample Date:** | | *ODWS* [1] | 5/18/2023 | 5/18/2023 Duplicate | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/17/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/3/2022 | 12/6/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/17/2020 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 105 | 119 | 103 | 82.7 | 91.3 | 108 | 95.2 | 98.4 | 124 | 118 | 108 | 99.4 | 111 | 100 | 118 | 102 | 118 | 181 | 105 | 112 | 104 | 115 | 126 | 138 |
| Iron (dissolved) | mg/L | 0.30 (AO) | <0.007 | <0.007 | 0.019 | <0.01 | <0.01 | 0.181 | 0.057 | 0.09 | <0.039 | 0.028 | 0.017 | 0.04 | 0.025 | 0.044 | 0.051 | <0.007 | <0.007 | 15.6 | 0.016 | 0.023 | <0.01 | 0.015 | <0.007 | 0.01 |
| Magnesium (dissolved) | mg/L | -- | 26.5 | 28.9 | 28.5 | 30.5 | 33.9 | 37.9 | 32.4 | 32.4 | 34.1 | 31.8 | 30.3 | 25.2 | 28.1 | 28.1 | 32 | 29.8 | 34.4 | 44.3 | 19.6 | 21.5 | 19.4 | 19.7 | 19.1 | 22.9 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | 0.00067 | 0.00042 | 0.00227 | <0.0005 | 0.00087 | 0.0369 | 0.0144 | 0.0135 | 0.00581 | 0.0064 | 0.00445 | 0.00537 | 0.00219 | 0.00322 | 0.00616 | 0.00023 | 0.0011 | 1.17 | 0.00313 | 0.00558 | 0.00334 | 0.00337 | <0.00031 | 0.00197 |
| Molybdenum (dissolved) | mg/L | -- | - | - | - | - | 0.000148 | 0.000111 | - | - | - | - | - | - | - | - | - | - | - | - | 0.000081 | 0.000422 | - | - | - | - |
| Phosphorus (dissolved) | mg/L | -- | <0.003 | <0.003 | <0.003 | <0.05 | <0.05 | 0.056 | <0.05 | 0.024 | 0.074 | 0.046 | 0.061 | 0.037 | 0.02 | 0.013 | 0.031 | <0.003 | <0.003 | <0.05 | <0.05 | 0.105 | <0.05 | 0.019 | <0.003 | <0.003 |
| Potassium (dissolved) | mg/L | -- | 0.818 | 0.701 | 0.669 | 0.688 | 4.46 | 1.37 | 2.47 | 0.996 | 6.15 | 2.28 | 1.77 | 0.925 | 0.832 | 0.83 | 0.88 | 0.506 | 0.55 | 1.6 | 2.8 | 2.46 | 1.68 | 1.57 | 1.58 | 1.86 |
| Sodium (dissolved) | mg/L | 200 (AO) | 5.07 | 5.19 | 2.66 | 2.06 | 2.69 | 2.61 | 2.79 | 1.9 | <2.3 | 2.29 | 2.2 | 1.66 | <1.83 | 2.05 | 2.08 | 1.65 | 2.36 | 5.64 | 69.5 | 73.9 | 67.2 | 90.3 | 103 | 144 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 407 | 393 | 362 | 355 | 391 | 333 | 337 | 372 | 432 | 422 | 323 | 303 | 335 | 339 | 383 | 345 | 387 | 590 | 316 | 281 | 284 | 385 | 349 | 364 |
| Ammonia-N | mg/L | -- | <0.1 | <0.1 | <0.1 | <0.041 | <0.27 | <0.037 | 0.341 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.172 | <0.27 | <0.112 | 0.12 | <0.1 | <0.1 | <0.1 |
| Chloride | mg/L | 250 (AO) | 9 | 9 | 4 | 2.29 | 3.45 | 2.31 | 1.95 | 2 | <4 | 3 | 6 | 3 | 8 | 8 | 13 | 11 | 12 | 18.1 | 150 | 155 | 139 | 170 | 240 | 280 |
| Conductivity | uS/cm | -- | 760 | 690 | 681 | 635 | 727 | 623 | 616 | 625 | 692 | 691 | 703 | 569 | 686 | 702 | 725 | 656 | 780 | 1100 | 1010 | 984 | 902 | 1120 | 1290 | 1410 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | 1 | 1 | 1 | <1 | 1.3 | 1 | <2.54 | <1 | 2 | <1 | 1 | 1 | 1 | <1 | 1 | 2 | 1 | 4.3 | <1 | R | <2.31 | <1 | 1 | <1 |
| Hardness | mg/L | 80-100 (OG) | 372 | 416 | 376 | 332 | 367 | 426 | 371 | 379 | 450 | 425 | 394 | 352 | 394 | 366 | 427 | 379 | 438 | 635 | 342 | 368 | 339 | 368 | 394 | 439 |
| Nitrate (as N) | mg/L | 10 | 1 | 1.03 | 2.83 | 5.61 | 9.39 | 6.03 | 6.09 | 5.61 | 11.5 | 11.7 | 12.4 | 12.6 | 13 | 9.09 | 8.98 | 5.89 | 7.58 | <0.1 | 0.475 | 0.437 | 0.255 | 0.64 | 0.76 | 1.27 |
| Nitrite (as N) | mg/L | 1 | <0.03 | <0.03 | <0.03 | <0.01 | <0.01 | <0.01 | 0.017 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.05 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 (OG) | 7.89 | 7.93 | 7.86 | 7.76 | 7.99 | 7.97 | 7.33 | 7.73 | 7.87 | 7.81 | 8.08 | 8.17 | 8.04 | 8.1 | 7.6 | 7.94 | 7.77 | 6.92 | 8.05 | 8.04 | 7.39 | 7.46 | 7.69 | 7.77 |
| Phenolics (total) | mg/L | -- | <0.002 | <0.002 | <0.002 | 0.0015 | <0.001 | <0.0024 | <0.01 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.0039 | <0.001 | 0.0269 | <0.0057 | <0.002 | <0.004 | <0.002 |
| Sulfate | mg/L | 500 (AO) | 6 | 4 | 4 | 2.31 | 1.99 | 3.39 | 2.44 | 3 | 2 | 5 | 4 | 5 | 6 | 6 | 9 | 4 | 8 | <1.5 | 8.82 | 7.68 | 7.65 | 10 | 9 | 19 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | <0.5 | <0.5 | <0.5 | <1.5 | 2.6 | 0.33 | 1.7 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.67 | 0.42 | 0.24 | 0.33 | <0.5 | <0.5 | <0.5 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 707 | 707 | 689 | 606 | 628 | 371 | 765 | 1070 | 853 | 798 | 825 | 731 | 689 | 669 | 988 | 686 | 781 | 1080 | 1050 | 574 | 1070 | 1620 | 1390 | 1390 |
| pH, field | s.u. | 6.5-8.5 (OG) | 7.4 | 7.4 | 7.55 | 7.41 | 7.46 | 7.9 | 6.91 | 7.57 | 7.05 | 7.12 | 7.02 | 6.76 | 7.05 | 7.67 | 7.5 | 7.46 | 7.5 | 7.04 | 7.57 | 7.07 | 6.8 | 7.38 | 7.15 | 7.27 |
| Temperature, field | Deg C | 15 (AO) | 11.49 | 11.49 | 9.24 | 9.8 | 10.5 | 10.56 | 11.15 | 9.85 | 9.75 | 12.9 | 10.61 | 9 | 10.49 | 11.6 | 8.25 | 11.34 | 8.88 | 7.2 | 9.5 | 10.29 | 9.08 | 9.65 | 8.73 | 11.9 |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

OG Operation Guideline (water treatment and distribution).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
R Rejected.
NM Not Measured.
36.0 Parameter exceeds the ODWS.

**Table 6.2**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | **OW50-13** | **GW-WARD 2-008** | **GW-WARD2-017** | **GW-WARD 2-009** | **GW-WARD2-1222-016** | **OW50-13** | **OW50-13** | **GW-WARD2-041017-009** | **GW-WARD2-112417-010** | **GW-WARD2-051818-026** | **GW-WARD2-110318-004** | **GW-WARD2-19-003** | **GW-WARD2-19-028** | **GW-WARD 2-_19-016** | **FB** | **GW-WARD 2-017** | **GW-WARD2-018** | **GW-WARD 2-028** | **FB GW-WARD2-1222-030** | **Field Blank** | **Field Blank** |
| **Sample Date:** | | ***ODWS*** [1] | **11/28/2020** | **5/10/2021** | **11/16/2021** | **7/2/2022** | **12/5/2022** | **5/18/2023** | **11/8/2023** | **4/10/2017 Field Blank** | **11/24/2017 Field Blank** | **5/18/2018 Field Blank** | **11/3/2018 Field Blank** | **5/22/2019 Field Blank** | **12/6/2019 Field Blank** | **8/18/2020 Field Blank** | **11/28/2020 Field Blank** | **5/10/2021 Field Blank** | **11/16/2021 Field Blank** | **7/3/2022 Field Blank** | **12/6/2022 Field Blank** | **5/18/2023 Field Blank** | **11/8/2023 Field Blank** |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 106 | 80.7 | 86.8 | 86 | 149 | 131 | 131 | 0.088 | 0.232 | <0.05 | <0.05 | 0.02 | 0.36 | 0.35 | 0.03 | 0.08 | 0.13 | 0.08 | 0.07 | 0.02 | 0.06 |
| Iron (dissolved) | mg/L | 0.30 (AO) | <0.007 | 0.011 | <0.007 | <0.007 | <0.007 | <0.007 | <0.007 | <0.01 | <0.01 | <0.01 | <0.01 | <0.007 | 0.009 | <0.007 | <0.007 | <0.007 | <0.007 | <0.007 | <0.007 | <0.007 | <0.007 |
| Magnesium (dissolved) | mg/L | -- | 15.9 | 12.8 | 14.9 | 15.8 | 24.6 | 22.2 | 23.9 | <0.05 | <0.05 | <0.05 | <0.05 | 0.01 | 0.031 | 0.059 | 0.002 | 0.012 | 0.008 | 0.017 | 0.038 | 0.006 | 0.003 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | 0.00038 | 0.00066 | 0.00044 | 0.00062 | 0.00059 | 0.0028 | 0.00018 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.00003 | 0.00021 | 0.00003 | 0.00003 | 0.0001 | 0.00002 | 0.0001 | 0.00006 | <0.00001 | 0.00005 |
| Molybdenum (dissolved) | mg/L | -- | - | - | - | - | - | - | - | - | <0.00005 | <0.00005 | - | - | - | - | - | - | - | - | - | - | - |
| Phosphorus (dissolved) | mg/L | -- | <0.003 | 0.004 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.05 | <0.05 | <0.05 | <0.05 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 |
| Potassium (dissolved) | mg/L | -- | 1.75 | 1.51 | 1.31 | 1.29 | 1.92 | 1.56 | 1.76 | <0.05 | <0.05 | <0.05 | <0.05 | <0.009 | 0.032 | 0.041 | <0.009 | 0.011 | 0.033 | <0.009 | 0.009 | <0.009 | <0.009 |
| Sodium (dissolved) | mg/L | 200 (AO) | 119 | 66.8 | 47.1 | 58.4 | 192 | 106 | **248** | <0.5 | <0.5 | <0.5 | <0.5 | <0.01 | 0.79 | 0.79 | 0.03 | 0.25 | 0.39 | 0.42 | <0.01 | <0.01 | 0.3 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 316 | 280 | 287 | 270 | 336 | 302 | 349 | <10 | <10 | <10 | <10 | <2 | 4 | 3 | <2 | 2 | 2 | 2 | <2 | <2 | 3 |
| Ammonia-N | mg/L | -- | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.048 | 0.081 | 0.031 | <0.02 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Chloride | mg/L | 250 (AO) | 200 | 53 | 55 | 89 | **410** | **270** | **460** | <0.5 | <0.5 | <0.5 | <0.5 | <1 | 1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Conductivity | uS/cm | -- | 1160 | 655 | 684 | 776 | 1660 | 1260 | 1930 | <3 | <3 | <3 | <3 | <2 | 10 | 4 | <2 | 6 | 4 | 5 | 4 | 5 | 4 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | <1 | <1 | <1 | <1 | 1 | 2 | 2 | <1 | <1 | <1 | 1.17 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Hardness | mg/L | 80-100 (OG) | 329 | 254 | 278 | 280 | 474 | 418 | 426 | <10 | <10 | <10 | <10 | 0.1 | 1 | 1.1 | 0.08 | 0.25 | 0.35 | 0.26 | 0.34 | 0.06 | 0.17 |
| Nitrate (as N) | mg/L | 10 | 1.02 | 0.26 | 0.22 | 0.36 | 2.29 | 1.23 | 2.89 | <0.02 | <0.02 | <0.02 | <0.02 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 |
| Nitrite (as N) | mg/L | 1 | <0.03 | <0.03 | <0.03 | <0.03 | 0 | <0.03 | <0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 (OG) | 8.09 | 8.19 | 8.06 | 7.81 | 7.96 | 7.96 | 7.93 | 6.26 | 6.85 | 6.44 | 5.71 | 5.61 | 7.4 | 7.23 | 6.1 | 6.56 | 6.05 | 6.55 | 6.19 | 6.35 | 6.38 |
| Phenolics (total) | mg/L | -- | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.001 | 0.0011 | 0.0049 | 0.0075 | <0.002 | 0.006 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Sulfate | mg/L | 500 (AO) | 15 | 4 | 4 | 6 | 32 | 20 | 42 | <0.3 | <0.3 | <0.3 | <0.3 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.15 | <0.15 | <0.15 | <0.15 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.6 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 1150 | 817 | 696 | 761 | 2130 | 1280 | 2130 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pH, field | s.u. | 6.5-8.5 (OG) | 7.17 | 6.59 | 7.14 | 8 | 6.8 | 7.51 | 7.25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Temperature, field | Deg C | 15 (AO) | 8.72 | 9.6 | 9.3 | 12.6 | 7.73 | 14.12 | 6.44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

| | |
|---|---|
| OG | Operation Guideline (water treatment and distribution). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| -- | No guideline. |
| < | Parameter detected below the laboratory method detection limit. |
| R | Rejected. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**Table 6.3**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | Leachate Holding Tank | Leachate Holding Tank | Leachate Holding Tank | Leachate Holding Tank | Leachate Holding Tank | Leachate Holding Tank |
|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | LW-WARD2-041017-001 | LW-WARD2-051818-001 | LW-WARD2-19-001 | LW-WARD2-_19-001 | LW COLLECTION | Leachate Tank-Ward 2 |
| Sample Date: | | ODWS (1) | 4/10/2017 | 5/18/2018 | 5/22/2019 | 8/18/2020 | 7/3/2022 | 5/18/2023 |
| **Parameters** | **Units** | | | | | | | |
| **Metals** | | | | | | | | |
| Arsenic | mg/L | 0.010 (IMAC) (a) | **0.0365** | **0.0254** | 0.0073 | **0.0174** | 0.01 | **0.017** |
| Barium | mg/L | 1 | 0.181 | 0.14 | 0.105 | 0.202 | 0.124 | 0.128 |
| Boron | mg/L | 5 | 3.46 | **5.53** | 2.64 | 4.33 | 4.15 | 3.93 |
| Cadmium | mg/L | 0.005 | 0.00147 | 0.000179 | 0.000066 | 0.000075 | <0.00003 | <0.00003 |
| Calcium | mg/L | -- | 521 | 311 | 253 | 271 | 252 | 253 |
| Chromium | mg/L | 0.05 | **0.0615** | 0.0349 | 0.0167 | 0.0297 | 0.0296 | 0.0198 |
| Copper | mg/L | 1.0 (AO) | 0.014 | <0.01 | 0.0016 | 0.0036 | <0.002 | <0.002 |
| Iron | mg/L | 0.30 (AO) | **1.87** | **1.22** | **1.08** | **0.666** | **0.53** | **0.49** |
| Lead | mg/L | 0.01 | 0.00834 | 0.00648 | 0.00124 | 0.00252 | <0.0009 | <0.0009 |
| Magnesium | mg/L | -- | 170 | 125 | 90.9 | 110 | 122 | 100 |
| Manganese | mg/L | 0.05 (AO) | **1.98** | **0.957** | **0.958** | **1.07** | **0.871** | **0.751** |
| Mercury | mg/L | 0.001 | 0.00004 | <0.0001 | - | <0.00001 | - | - |
| Phosphorus | mg/L | -- | - | 4.87 | 2.31 | 3.57 | 3.39 | 2.48 |
| Potassium | mg/L | -- | 322 | 253 | 148 | 197 | 217 | 169 |
| Sodium | mg/L | 200 (AO) | **474** | **399** | **218** | **378** | **433** | **317** |
| Zinc | mg/L | 5.0 (AO) | 0.524 | 0.145 | 0.074 | 0.068 | 0.03 | 0.03 |
| **General Chemistry** | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | 3670 | 2560 | 1610 | 1990 | 2090 | 1880 |
| Ammonia-N | mg/L | -- | 194 | 171 | 138 | 189 | 184 | 163 |
| Biochemical oxygen demand (BOD) | mg/L | -- | 533 | 61.2 | 31 | 80 | 25 | - |
| Chemical oxygen demand (COD) | mg/L | -- | 1630 | 800 | 295 | 405 | 304 | - |
| Chloride | mg/L | 250 (AO) | **627** | **391** | **260** | **480** | **410** | **350** |
| Conductivity | uS/cm | -- | 7070 | 5680 | 3160 | 4680 | 4790 | 4110 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | **497** | **186** | **63** | **108** | **87** | **132** |
| Hardness | mg/L | 80-100 (OG) | 2000 | 1290 | 1010 | 1130 | 1130 | 1040 |
| Nitrate (as N) | mg/L | 10 | <0.4 | <0.4 | <0.06 | <0.06 | <0.06 | <0.06 |
| Nitrite (as N) | mg/L | 1 | <0.2 | <0.2 | <0.03 | <0.03 | <0.3 | <0.03 |
| pH | s.u. | 6.5-8.5 (OG) | 7.5 | 7.29 | 6.99 | 7.51 | 7.5 | 7.44 |
| Phenolics (total) | mg/L | -- | 0.591 | 0.0834 | 0.008 | 0.042 | 0.036 | 0.013 |
| Phosphorus | mg/L | -- | 15.5 | 4.61 | - | - | - | - |
| Sulfate | mg/L | 500 (AO) | 63.3 | 85.4 | 73 | 64 | 110 | 15 |
| Total dissolved solids (TDS) | mg/L | 500 (AO) | **4290** | **2960** | **1805** | **2600** | **2380** | - |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | 333 | 308 | 139 | 194 | 205 | 154 |
| Total suspended solids (TSS) | mg/L | -- | 68 | 25.8 | 122 | 25 | 7 | - |
| **Field Parameters** | | | | | | | | |
| Conductivity, field | uS/cm | -- | 2460 | 5210 | 3910 | 8210 | 4830 | 4170 |
| pH, field | s.u. | 6.5-8.5 (OG) | 6.81 | 7.12 | 7.17 | 7.01 | 7.04 | 6.93 |
| Temperature, field | Deg C | 15 (AO) | 8.3 | 13.86 | 13.46 | **15.06** | 14.89 | **15.41** |

Notes:

| | |
|---|---|
| (1) | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated. |
| (a) | Current criteria for arsenic is provided which came into affect 2018. Previous data is subjected to a limit of 0.025 mg/L. |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| -- | No guideline. |
| < | Parameter detected below the laboratory method detection limit. |
| **36.0** | Parameter exceeds the ODWS. |

**Table 6.4**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | GWIT | GWIT | GWIT | GWIT | GWIT | GWIT | GWIT | GWIT | GWIT | GWIT | GWIT | GWIT | GWIT | GWIT | GW Sump | GW Sump | GW Sump | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | SW-WARD2-041017-007 | SW-WARD2-112417-004 | SW-WARD2-051818-010 | SW-WARD2-110318-001 | SW-WARD 2-19-003 | SW-WARD 2-19-003 | SW-WARD 2-_19-002 | GW INTERCEPTOR | GWT_001 | GWS WARD 2-001 | SW-COLLECTION | GW INTERCEPTOR | GW Interceptor | GW Interceptor | SW-WARD2-041017-006 | SW-WARD2-112417-003 | SW-WARD2-051818-002 | SW-WARD2-041017-002 | SW-WARD2-112417-002 | SW-WARD2-051818-001 | SW-WARD2-110318-005 | SW-WARD 2-19-012 | SW-WARD 2-19-004 | SW-WARD 2-_19-009 |
| **Sample Date:** | | | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/18/2020 | 11/28/2020 | 5/10/2021 | 11/16/2021 | 7/3/2022 | 12/6/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/18/2020 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 117 | 131 | 123 | 125 | 123 | 53.6 | 97.3 | 65.9 | 238 | 149 | 116 | 135 | 122 | 79.2 | 126 | 156 | 110 | 145 | 75 | 75 | 78.6 | 80.2 | 76 | 87.5 |
| Iron | mg/L | 0.3 | <0.05 | 0.099 | 0.061 | **0.468** | 0.027 | 0.171 | 0.078 | 0.077 | **1.27** | 0.075 | 0.123 | 0.164 | 0.05 | 0.097 | **2.84** | **1.39** | **0.944** | **1.36** | **0.823** | **0.374** | **1.03** | 0.255 | 0.295 | **0.789** |
| Magnesium | mg/L | - | 27.4 | 27.4 | 28.1 | 31.4 | 24.8 | 11.4 | 20.6 | 10.4 | 96.5 | 35.1 | 31.2 | 29.6 | 27.6 | 17.8 | 51.3 | 67.1 | 59.2 | 43.4 | 21.3 | 21.6 | 23.5 | 21.8 | 21 | 27.4 |
| Manganese | mg/L | - | <0.0005 | 0.00415 | 0.00457 | 0.0211 | 0.00165 | 0.00539 | 0.0148 | 0.0124 | 0.685 | 0.0168 | 0.0643 | 0.015 | 0.00188 | 0.01 | 0.295 | 0.26 | 0.298 | 0.323 | 0.0233 | 0.0195 | 0.0213 | 0.025 | 0.0156 | 0.052 |
| Phosphorus | mg/L | 0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | 0.003 | 0.028 | **0.038** | **0.13** | **3.74** | **0.064** | 0.018 | 0.015 | 0.003 | **0.044** | **0.362** | <0.5 | **0.064** | <0.05 | **0.099** | **0.074** | **0.18** | **0.032** | **0.035** | **0.06** |
| Potassium | mg/L | - | 0.81 | 0.743 | 0.858 | 0.633 | 0.743 | 8.33 | 5.01 | 7.61 | 163 | 1.37 | 0.647 | 0.839 | 0.628 | 5.5 | 18.6 | 40 | 16.8 | 3.25 | 2.48 | 2.1 | 3.58 | 2.18 | 1.95 | 3.41 |
| Sodium | mg/L | - | 24.7 | 16.9 | 29.1 | 16 | 28.3 | 13.5 | 20.6 | 9.56 | 289 | 37.8 | 21.3 | 41.6 | 26.5 | 13.4 | 34.7 | 89.7 | 32.8 | 25.5 | 4.63 | 5.32 | 5.44 | 6.67 | 6.08 | 26.2 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | -- | 379 | 393 | 352 | 320 | 341 | 172 | 259 | 167 | 1660 | 385 | 358 | 332 | 370 | 241 | 469 | 699 | 437 | 509 | 250 | 230 | 234 | 248 | 249 | 171 |
| Ammonia-N | mg/L | - | <0.02 | 0.353 | 0.054 | 0.062 | <0.1 | <0.1 | <0.1 | <0.1 | 124 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1.62 | 20.1 | 1.57 | 1.61 | 0.201 | 0.129 | 0.026 | <0.1 | <0.1 | <0.1 |
| Chloride | mg/L | - | 50.1 | 32.1 | 58.3 | 30.1 | 59 | 36 | 42 | 22 | 340 | 51 | 34 | 88 | 44 | 31 | 66.2 | 120 | 51.7 | 30.8 | 11.4 | 11.4 | 14.9 | 11 | 14 | 35 |
| Conductivity | uS/cm | - | 850 | 838 | 846 | 735 | 824 | 452 | 649 | 406 | 3160 | 860 | 780 | 907 | 844 | 533 | 1110 | 1740 | 1050 | 1010 | 536 | 499 | 528 | 517 | 538 | 591 |
| Dissolved organic carbon (DOC) | mg/L | - | <1 | 1.6 | 2.3 | 2.95 | 1 | 4 | 4 | 4 | 67 | 2 | 2 | 2 | 1 | 7 | 15.4 | 41.6 | 12.8 | 4.8 | 6.2 | 6.4 | 14.9 | 3 | 4 | 5 |
| Hardness | mg/L | - | 406 | 439 | 422 | 443 | 409 | 181 | 328 | 181 | 990 | 516 | 418 | 460 | 419 | 271 | 527 | 666 | 520 | 542 | 275 | 276 | 293 | 290 | 276 | 331 |
| Nitrate (as N) | mg/L | - | 4.59 | 9.34 | 8.25 | 7.1 | 6.48 | 2.14 | 5.78 | 1.29 | 0.21 | 7.87 | 5.2 | 5.2 | 3.34 | 0.81 | 0.21 | 1.52 | 0.132 | 0.111 | 3.77 | 4.26 | 6.76 | 1.35 | 4.95 | 0.18 |
| Nitrite (as N) | mg/L | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.3 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.05 | <0.05 | 0.059 | <0.01 | <0.01 | 0.047 | 0.015 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 | 7.92 | 8.12 | 7.89 | 7.9 | 8.13 | 8.17 | 8.09 | 8.35 | 7.23 | 8.04 | 8.27 | 8.09 | 8.05 | 8.19 | 7.85 | 7.76 | 7.98 | 7.96 | 8.28 | 8.38 | 8.06 | 8.37 | 8.29 | 8.31 |
| Phenolics (total) | mg/L | 0.001 | **0.0013** | **0.0012** | **0.0089** | **0.0039** | **0.004** | <0.002 | **0.002** | <0.002 | **0.019** | <0.002 | <0.001 | <0.002 | <0.002 | <0.002 | **0.0036** | **0.0066** | **0.0061** | **0.0034** | <0.001 | **0.0061** | **0.0036** | **0.002** | <0.002 | 0.001 |
| Sulfate | mg/L | - | 8.33 | 9.73 | 8.64 | 15.5 | 8 | 7 | 14 | 8 | 6 | 17 | 8 | 16 | 7 | 7 | 80.5 | 107 | 104 | 25.8 | 13.2 | 15.6 | 15.2 | 24 | 30 | 89 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.7 | 0.68 | 0.49 | 0.44 | <0.5 | <0.5 | <0.5 | <0.5 | 135 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 3.76 | 27.1 | 3.37 | 1.86 | 1.02 | 1.12 | 1.09 | <0.5 | <0.5 | <0.5 |
| Un-ionized ammonia | mg/L | 0.02 (g) | <0.0001 | 0.0026 | 0.00012 | 0.00046 | <0.00057 | <0.00018 | <0.00062 | <0.00082 | **0.11656** | <0.00073 | <0.00319 | <0.00051 | <0.00126 | <0.00637 | 0.00716 | **0.13233** | 0.00898 | 0.016 | 0.00108 | 0.00147 | 0.00005 | <0.00049 | <0.00029 | <0.00308 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 798 | 719 | 495 | 918 | 1320 | 580 | 721 | 478 | 3900 | 888 | 753 | 1150 | 750 | 272 | 1130 | 1770 | 603 | 483 | 483 | 298 | 700 | 920 | 700 | 646 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | 8.38 | 8.93 | - | 5.54 | **0.1** | 6.68 | 5.18 | 8.1 | - | - | - | 6.09 | 7.1 | 4.43 | **3.38** | 8.58 | - | 8.9 | 11.6 | - | **3.84** | **1.97** | **1.6** | 6.21 |
| pH, field | s.u. | 6.5-8.5 | 7.42 | 7.53 | 7.04 | 7.51 | 7.45 | 7.03 | 7.24 | 7.59 | 6.61 | 7.48 | 7.91 | 7.46 | 7.63 | 8.48 | 7.27 | 7.55 | 7.26 | 7.59 | 7.59 | 7.57 | 7 | 7.34 | 7.12 | 7.85 |
| Temperature, field | Deg C | -- | 7.9 | 9.5 | 8.82 | 10.27 | 8.67 | 5.95 | 15.9 | 9.06 | 10.2 | 10.84 | 17.5 | 6.89 | 13.5 | 9.73 | 10.6 | 7.5 | 14.25 | 11.6 | 3.8 | 14.03 | 7.56 | 9.86 | 9.61 | 18.9 |

Notes:

(1) Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(b) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L

(c) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.

(d) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(g) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

(h) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

NM Not Measured.

**36.0** Parameter exceeds the PWQO.

**Table 6.4**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW3 | SW3 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | SW 1 | SW-WARD 2-007 | SW-WARD 2-008 | SW-WARD 2-002 | SW WARD2-12/5/22-01 | SW1 | SW1 | SW-WARD2-041017-005 | SW-WARD2-112417-008 | SW-WARD2-051818-005 | SW-WARD2-110318-009 | SW-WARD 2-19-002 | SW-WARD 2-19-007 | SW-WARD 2-_19-006 | SW 2 | SW-WARD 2-006 | SW-WARD 2-002 | SW-WARD 2-006 | SW WARD2-12/5/22-03 | SW2 | SW2 | SW-WARD2-041017-009 | SW-WARD2-112417-009 | SW-WARD2-051818-003 |
| **Sample Date:** | | | 11/29/2020 | 5/10/2021 | 11/17/2021 | 7/3/2022 | 12/5/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/18/2020 | 11/29/2020 | 5/10/2021 | 11/17/2021 | 7/3/2022 | 12/5/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 94.3 | 92.8 | 67 | 77.9 | 82.5 | 74.5 | 90.5 | 58.4 | 77.3 | 75.2 | 79.6 | 80.4 | 76.9 | 87.4 | 96.2 | 91.7 | 68.1 | 75.7 | 81.7 | 76.2 | 93.1 | 62.3 | 77.2 | 73.7 |
| Iron | mg/L | 0.3 | 0.383 | 0.462 | 0.494 | 0.354 | 0.694 | 0.124 | 1.02 | 1.2 | 0.923 | 0.362 | 0.948 | 0.198 | 0.387 | 0.559 | 0.271 | 0.22 | 0.506 | 0.288 | 0.955 | 0.104 | 0.626 | 1.19 | 0.707 | 0.344 |
| Magnesium | mg/L | - | 24.5 | 26 | 21.4 | 29.6 | 23.1 | 27.7 | 27.8 | 17.3 | 21.5 | 21.5 | 22.3 | 22.8 | 21.2 | 28.1 | 25.4 | 26.7 | 21.4 | 29.5 | 22.3 | 27.5 | 28.1 | 18.5 | 21.4 | 21.2 |
| Manganese | mg/L | - | 0.0133 | 0.0189 | 0.022 | 0.0406 | 0.0192 | 0.0114 | 0.02551 | 0.0281 | 0.0248 | 0.0191 | 0.0197 | 0.0228 | 0.0168 | 0.0513 | 0.0126 | 0.0137 | 0.0205 | 0.0445 | 0.0205 | 0.0129 | 0.0178 | 0.0295 | 0.0223 | 0.0187 |
| Phosphorus | mg/L | 0.03 (e) | 0.062 | 0.088 | 0.187 | 0.04 | 0.112 | 0.018 | 0.122 | 0.094 | 0.08 | 0.079 | 0.18 | 0.03 | 0.045 | 0.039 | 0.038 | 0.041 | 0.176 | 0.042 | 0.123 | 0.016 | 0.107 | 0.095 | 0.081 | 0.073 |
| Potassium | mg/L | - | 2.92 | 3.49 | 3.28 | 2.48 | 2.7 | 1.48 | 3.82 | 1.97 | 2.42 | 2.1 | 3.54 | 2.23 | 1.97 | 2.71 | 2.64 | 2.64 | 3.22 | 2.5 | 2.64 | 1.67 | 3.73 | 2.07 | 2.41 | 2.1 |
| Sodium | mg/L | - | 9.04 | 6.68 | 4.25 | 16.7 | 5.39 | 8.55 | 6.19 | 4.11 | 4.5 | 5.44 | 5.25 | 7.07 | 6.1 | 16.5 | 9.16 | 7.33 | 4.51 | 15.9 | 5.36 | 8.58 | 6.4 | 4.62 | 4.75 | 5.61 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | -- | 275 | 243 | 225 | 192 | 245 | 234 | 281 | 203 | 249 | 229 | 241 | 245 | 240 | 186 | 289 | 256 | 233 | 189 | 263 | 233 | 284 | 208 | 255 | 234 |
| Ammonia-N | mg/L | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.023 | 0.092 | 0.071 | 0.072 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.036 | 0.297 | 0.051 |
| Chloride | mg/L | - | 19 | 12 | 12 | 23 | 19 | 15 | 19 | 8.73 | 10.9 | 11.4 | 14.9 | 11 | 15 | 17 | 19 | 14 | 12 | 23 | 18 | 15 | 19 | 9.16 | 11.2 | 11.7 |
| Conductivity | uS/cm | - | 605 | 535 | 452 | 540 | 544 | 507 | 558 | 442 | 538 | 497 | 855 | 512 | 542 | 543 | 644 | 588 | 464 | 540 | 546 | 526 | 576 | 446 | 539 | 500 |
| Dissolved organic carbon (DOC) | mg/L | - | 5 | 6 | 6 | 4 | 6 | 4 | 5 | 5.6 | 5.8 | 6.5 | 11.3 | 4 | 4 | 5 | 5 | 6 | 6 | 5 | 6 | 4 | 5 | 5.4 | 6 | 6.8 |
| Hardness | mg/L | - | 336 | 339 | 255 | 316 | 301 | 300 | 340 | 217 | 281 | 276 | 291 | 295 | 279 | 334 | 345 | 339 | 258 | 310 | 296 | 303 | 348 | 232 | 281 | 271 |
| Nitrate (as N) | mg/L | - | 5.54 | 5.76 | 3.15 | 0.24 | 4.16 | 1.79 | 3.66 | 3.88 | 3.79 | 4.25 | 6.71 | 1.6 | 4.82 | 0.14 | 5.25 | 5.02 | 3.4 | 0.14 | 4.13 | 1.73 | 3.82 | 3.86 | 3.75 | 4.13 |
| Nitrite (as N) | mg/L | - | <0.03 | 0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.011 | <0.01 | 0.048 | 0.014 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.012 | <0.01 | 0.045 |
| pH | s.u. | 6.5-8.5 | 8.38 | 8.49 | 8.14 | 8.18 | 8.18 | 8.44 | 8.2 | 8.26 | 8.29 | 8.43 | 7.42 | 8.38 | 8.32 | 8.24 | 8.44 | 8.45 | 8.14 | 8.11 | 8.19 | 8.48 | 8.21 | 8.26 | 8.32 | 8.42 |
| Phenolics (total) | mg/L | 0.001 | 0.001 | <0.001 | <0.001 | 0.002 | <0.001 | <0.001 | <0.001 | 0.0023 | <0.001 | 0.006 | 0.0018 | 0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | <0.001 | 0.001 | <0.001 | 0.0023 | 0.0081 | 0.0033 |
| Sulfate | mg/L | - | 19 | 17 | 10 | 78 | 21 | 35 | 20 | 10.9 | 13.5 | 16.4 | 15.6 | 24 | 29 | 84 | 20 | 19 | 11 | 79 | 21 | 34 | 20 | 11.1 | 13.5 | 15.7 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.97 | 0.78 | 1.07 | 1.09 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 1.19 | 1.18 | 1.11 |
| Un-ionized ammonia | mg/L | 0.02 (g) | <0.0007 | <0.00013 | <0.00091 | <0.00238 | <0.0001 | <0.00535 | <0.00509 | 0.00074 | 0.00044 | 0.00317 | 0.00038 | <0.00364 | <0.00019 | <0.00225 | <0.00245 | <0.00106 | <0.00097 | <0.00463 | <0.00016 | <0.01017 | <0.00538 | 0.00123 | 0.00198 | 0.0036 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 710 | 682 | 632 | 619 | 536 | 491 | 623 | 416 | 465 | 289 | 672 | 498 | 703 | 595 | 710 | 678 | 499 | 608 | 535 | 488 | 614 | 418 | 459 | 299 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | 5.84 | 5.62 | 11.72 | - | 10.43 | 7.05 | 6.52 | 9.66 | 11.55 | - | 5.01 | 0.81 | 2.07 | 7.33 | 4.31 | 7.87 | 10.63 | - | 9.92 | 10.34 | 8.6 | 8.85 | 11.67 | - |
| pH, field | s.u. | 6.5-8.5 | 7.52 | 6.83 | 7.76 | 7.8 | 6.9 | 8.25 | 8.5 | 8.14 | 7.5 | 8.1 | 7.45 | 8.09 | 7.03 | 7.71 | 7.99 | 7.72 | 7.74 | 8.09 | 7.1 | 8.56 | 8.51 | 8.18 | 7.65 | 8.3 |
| Temperature, field | Deg C | -- | 9.19 | 8.2 | 5.59 | 16.9 | 2.73 | 14.21 | 6.18 | 10.6 | 4.9 | 16.27 | 7.67 | 13.8 | 7.12 | 18.9 | 11.52 | 8.6 | 6.89 | 17.1 | 2.81 | 13.83 | 6.62 | 10.3 | 4.8 | 16.54 |

Notes:

(1) Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(b) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L

(c) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.

(d) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(g) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

(h) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

NM Not Measured.

36.0 Parameter exceeds the PWQO.

**Table 6.4**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | SW-WARD2-110318-003 | SW-WARD 2-19-009 | SW-WARD 2-19-005 | SW-WARD 2-_19-007 | SW 3 | SW-WARD 2-003 | SW-WARD 2-001 | SW-WARD 2-008 | SW WARD2-12/5/22-04 | SW3 | SW3 | SW4-WARD2-041017-001 | SW4-WARD2-112417-007 | SW4-WARD2-051818-009 | SW4-WARD2-110318-004 | SW-WARD 2-19-006 | SW-WARD 2-19-006 | SW-WARD 2-_19-005 | SW 4 | SW-WARD 2-002 | SW-WARD 2-005 | SW-WARD 2-005 | SW WARD2-12/5/22-07 | SW4 |
| **Sample Date:** | | | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/18/2020 | 11/29/2020 | 5/10/2021 | 11/17/2021 | 7/3/2022 | 12/5/2022 | 5/18/2023 | 11/8/2023 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/22/2019 | 12/6/2019 | 8/18/2020 | 11/29/2020 | 5/10/2021 | 11/17/2021 | 7/3/2022 | 12/5/2022 | 5/18/2023 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 81.6 | 77.2 | 77.1 | 87.9 | 90.4 | 81.6 | 67.4 | 74.9 | 80.7 | 76.6 | 89.6 | 74.4 | 84.7 | 87.1 | 93.4 | 95 | 83.9 | 96.3 | 94.3 | 101 | 75.6 | 92.1 | 89.8 | 90.5 |
| Iron | mg/L | 0.3 | **0.98** | 0.171 | **0.351** | **0.457** | 0.215 | 0.232 | **0.483** | 0.253 | **0.887** | 0.136 | **0.797** | **1.19** | 0.063 | 0.167 | 0.062 | 0.087 | 0.06 | **0.458** | **0.868** | 0.038 | 0.074 | 0.089 | 0.038 | 0.053 |
| Magnesium | mg/L | - | 23.7 | 21.8 | 21.1 | 27.7 | 23.8 | 25.4 | 22 | 28.7 | 22.2 | 27.5 | 22.6 | 26.3 | 25.6 | 28.4 | 25.1 | 27.2 | 34.3 | 27.7 | 31.7 | 23.7 | 35.2 | 27.8 | 30 | |
| Manganese | mg/L | - | 0.0217 | 0.021 | 0.0163 | 0.0552 | 0.0116 | 0.0133 | 0.0262 | 0.0412 | 0.0197 | 0.0148 | 0.01877 | 0.11 | 0.0174 | 0.0176 | 0.0156 | 0.0137 | 0.00864 | 0.122 | 0.239 | 0.0129 | 0.017 | 0.022 | 0.0116 | 0.0116 |
| Phosphorus | mg/L | 0.03 (e) | **0.161** | 0.022 | **0.041** | **0.034** | **0.045** | **0.034** | **0.173** | **0.031** | **0.114** | 0.018 | **0.106** | <0.05 | <0.05 | <0.05 | <0.05 | 0.007 | <0.003 | 0.014 | 0.006 | 0.012 | 0.004 | 0.009 | <0.003 | 0.007 |
| Potassium | mg/L | - | 3.56 | 2.27 | 2.12 | 3.14 | 2.61 | 2.34 | 3.15 | 2.42 | 2.58 | 1.6 | 3.74 | 4.13 | 4.73 | 2.92 | 6.6 | 4.11 | 5.92 | 7.39 | 5.48 | 6.7 | 4.04 | 2.69 | 5.82 | 4.43 |
| Sodium | mg/L | - | 5.62 | 7.65 | 6.64 | 18.4 | 9.31 | 7.42 | 4.74 | 17 | 5.53 | 9 | 6.24 | 15.2 | 17.8 | 16.1 | 23.9 | 19.6 | 22.4 | 38.4 | 25.6 | 31.9 | 17 | 34.2 | 27 | 28.4 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | -- | 235 | 259 | 241 | 203 | 292 | 263 | 228 | 194 | 240 | 236 | 285 | 261 | 313 | 294 | 286 | 301 | 283 | 331 | 282 | 303 | 270 | 343 | 294 | 323 |
| Ammonia-N | mg/L | - | 0.028 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.028 | 0.129 | 0.044 | <0.02 | 0.1 | 0.5 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Chloride | mg/L | - | 15.3 | 14 | 16 | 23 | 19 | 15 | 13 | 23 | 19 | 16 | 20 | 31.9 | 33.8 | 32.7 | 56.5 | 40 | 53 | 72 | 52 | 49 | 29 | 49 | 51 | 42 |
| Conductivity | uS/cm | - | 532 | 527 | 546 | 624 | 645 | 597 | 470 | 539 | 545 | 487 | 573 | 593 | 687 | 624 | 705 | 663 | 728 | 798 | 724 | 754 | 578 | 741 | 734 | 712 |
| Dissolved organic carbon (DOC) | mg/L | - | 8.97 | 5 | 4 | 5 | 5 | 5 | 5 | 4 | 6 | 4 | 5 | 5.8 | 4.5 | 3.9 | 6.21 | 3 | 4 | 7 | 4 | 5 | 2 | 4 | 4 | 5 |
| Hardness | mg/L | - | 301 | 283 | 279 | 333 | 324 | 308 | 259 | 305 | 293 | 305 | 337 | 279 | 320 | 323 | 350 | 341 | 322 | 382 | 349 | 383 | 286 | 375 | 338 | 350 |
| Nitrate (as N) | mg/L | - | 6.63 | 1.2 | 4.77 | 0.12 | 5.2 | 4.9 | 3.35 | 0.13 | 4.11 | 1.68 | 3.77 | 1.5 | 1.55 | 0.434 | 1.51 | 0.45 | 2.38 | 0.07 | 0.76 | 0.58 | 2.16 | 0.11 | 0.71 | 0.11 |
| Nitrite (as N) | mg/L | - | 0.015 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 | 8.05 | 8.39 | 8.27 | 8.31 | **8.51** | 8.48 | 8.17 | 8.21 | 8.17 | 8.46 | 8.22 | 8.23 | 8.35 | 8.35 | 8.12 | 8.34 | 8.37 | 8.43 | **8.54** | 8.49 | 8.26 | 8.3 | 8.23 | 8.45 |
| Phenolics (total) | mg/L | 0.001 | **0.0024** | **0.002** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | <0.001 | <0.001 | <0.001 | **0.0017** | <0.001 | **0.0035** | **0.0021** | **0.002** | <0.001 | **0.002** | <0.001 | <0.001 | <0.001 | **0.002** | <0.001 | <0.001 |
| Sulfate | mg/L | - | 15.6 | 23 | 30 | 75 | 20 | 20 | 10 | 76 | 21 | 34 | 20 | 14.4 | 19.3 | 11.6 | 21.7 | 19 | 37 | 11 | 21 | 18 | 15 | <2 | 33 | 14 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 1.12 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.56 | 0.7 | 0.47 | 0.43 | 4.6 | 0.8 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Un-ionized ammonia | mg/L | 0.02 (g) | 0.00014 | <0.00223 | <0.00027 | <0.00149 | <0.00238 | <0.00107 | <0.00101 | <0.00279 | <0.00033 | <0.00559 | <0.00546 | 0.00089 | 0.00097 | 0.00082 | <0.00014 | 0.00136 | 0.00119 | <0.00513 | <0.00263 | <0.00091 | <0.00092 | <0.00297 | <0.00017 | <0.00609 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 670 | 513 | 692 | 655 | 905 | 705 | 481 | 577 | 537 | 501 | 629 | 560 | 574 | 363 | 887 | 636 | 902 | 846 | 806 | 876 | 598 | 673 | 304 | 812 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | 5 | **0.8** | **1.45** | 6.54 | 4.32 | 7.87 | 9.6 | - | 10.08 | 9.58 | 6.68 | 7.22 | 10.77 | - | 6 | **0.53** | **1.49** | 8.06 | **3.43** | 8.34 | 6.99 | - | 9.91 | 9.35 |
| pH, field | s.u. | 6.5-8.5 | 7.44 | 7.89 | 7.13 | 7.55 | 7.97 | 7.74 | 7.73 | 7.88 | 7.41 | 8.3 | **8.52** | 8.14 | 7.68 | 7.77 | 7.61 | 7.71 | 7.07 | 8.12 | 8.02 | 7.71 | 7.71 | 7.95 | 7.13 | 8.43 |
| Temperature, field | Deg C | -- | 7.45 | 13.27 | 8.53 | 18.2 | 11.73 | 8.2 | 7.74 | 16.6 | 2.8 | 13.3 | 6.54 | 10.5 | 5.4 | 14.49 | 6.33 | 12.15 | 8.51 | 17.6 | 11.56 | 6.9 | 7.14 | 15.3 | 2.37 | 10.59 |

Notes:

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(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(b) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L

(c) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.

(d) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(g) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

(h) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

NM Not Measured.

**36.0** Parameter exceeds the PWQO.

**Table 6.4**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SW4 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | **SW4** | **SW-WARD2-041017-010** | **SW-WARD2-112417-001** | **SW-WARD2-051818-007** | **SW-WARD2-110318-008** | **SW-WARD 2-19-008** | **SW-WARD 2-19-001** | **SW-WARD 2-_19-001** | **SW 5** | **SW-WARD 2-008** | **SW-WARD 2-007** | **SW-WARD 2-001** | **SW WARD2-12/5/22-02** | **SW5** | **SW-WARD2-041017-008** | **SW-WARD2-112417-010** | **SW-WARD2-051818-004** | **SW-WARD2-110318-006** | **SW-WARD 2-19-001** | **SW-WARD 2-19-002** | **SW-WARD 2-_19-008** | **SW 6** | **SW-WARD 2-005** | **SW-WARD 2-003** |
| **Sample Date:** | | | **11/8/2023** | **4/10/2017** | **11/24/2017** | **5/18/2018** | **11/3/2018** | **5/22/2019** | **12/6/2019** | **8/18/2020** | **11/29/2020** | **5/10/2021** | **11/17/2021** | **7/3/2022** | **12/5/2022** | **11/8/2023** | **4/10/2017** | **11/24/2017** | **5/18/2018** | **11/3/2018** | **5/22/2019** | **12/6/2019** | **8/18/2020** | **11/29/2020** | **5/10/2021** | **11/17/2021** |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 86.2 | 114 | 152 | 148 | 150 | 251 | 161 | 205 | 178 | 186 | 297 | 185 | 194 | 430 | 64.1 | 127 | 126 | 133 | 125 | 106 | 102 | 107 | 102 | 112 |
| Iron | mg/L | 0.3 | 0.06 | <0.05 | **4.11** | **2.85** | **5** | **3.97** | **3.44** | **5.3** | **5.3** | **2.9** | **17.9** | **7.7** | **9.33** | **118** | **1.1** | <0.05 | 0.034 | 0.032 | 0.06 | 0.143 | **0.357** | 0.164 | 0.088 | **1.39** |
| Magnesium | mg/L | - | 30.8 | 56.5 | 44.4 | 41.3 | 44.5 | 69.2 | 44.4 | 62 | 47 | 50.1 | 71.5 | 55.7 | 56.4 | 125 | 17.8 | 60.2 | 54.2 | 64.1 | 50.1 | 50.7 | 43.3 | 40.7 | 33.8 | 39.9 |
| Manganese | mg/L | - | 0.01652 | 0.0403 | 0.365 | 0.384 | 0.395 | 1.44 | 0.588 | 0.511 | 0.565 | 0.723 | 1.35 | 0.725 | 0.749 | 3.58 | 0.0269 | 0.00576 | 0.0167 | 0.00388 | 0.0879 | 0.0175 | 0.0655 | 0.0321 | 0.0277 | 0.219 |
| Phosphorus | mg/L | 0.03 (e) | 0.005 | <0.05 | **0.05** | **0.055** | **0.072** | **0.221** | **0.043** | **0.095** | 0.013 | 0.022 | **0.44** | **0.041** | **0.138** | **1.85** | **0.101** | <0.05 | <0.05 | <0.05 | 0.009 | 0.006 | **0.034** | 0.006 | 0.007 | **0.144** |
| Potassium | mg/L | - | 6.36 | 10.7 | 3.73 | 3.28 | 3.89 | 2.64 | 2.4 | 6.14 | 4.08 | 1.91 | 5.03 | 3.96 | 4.03 | 9.32 | 2.03 | 11.2 | 10.8 | 11.4 | 11.3 | 8.98 | 9.14 | 8.2 | 7.79 | 15.7 |
| Sodium | mg/L | - | 27.8 | 14.4 | 28.5 | 26.3 | 29.5 | 21.1 | 24.2 | 32.2 | 32 | 28.4 | 22.8 | 36.4 | 30.1 | 17.1 | 4.29 | 13.7 | 12.9 | 15.4 | 12.6 | 15.8 | 8.85 | 10.6 | 6.61 | 9.46 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | -- | 309 | 466 | 528 | 457 | 474 | 422 | 513 | 418 | 573 | 498 | 615 | 558 | 627 | 372 | 204 | 469 | 445 | 473 | 418 | 434 | 353 | 339 | 321 | 368 |
| Ammonia-N | mg/L | - | <0.1 | <0.02 | 1.92 | 0.572 | 1.81 | 0.3 | 0.9 | 0.7 | 2.2 | 0.4 | 3 | 1.9 | 2.5 | 1.1 | <0.023 | 0.03 | <0.02 | 0.033 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.2 |
| Chloride | mg/L | - | 47 | 16.4 | 45.3 | 40.9 | 53.7 | 36 | 47 | 59 | 57 | 44 | 34 | 59 | 56 | 37 | 8.93 | 15.1 | 13.8 | 16.8 | 12 | 11 | 10 | 10 | 7 | 15 |
| Conductivity | uS/cm | - | 670 | 981 | 1040 | 905 | 1020 | 932 | 1020 | 900 | 1180 | 1020 | 1060 | 1160 | 1180 | 796 | 445 | 1000 | 892 | 1000 | 861 | 897 | 738 | 763 | 687 | 680 |
| Dissolved organic carbon (DOC) | mg/L | - | 4 | 2.9 | 4.9 | 4 | 5.87 | 4 | 4 | 3 | 4 | 4 | 6 | 4 | 5 | 4 | 5.5 | 2.9 | 2.8 | 4.34 | 2 | 3 | 3 | 2 | 3 | 7 |
| Hardness | mg/L | - | 342 | 516 | 563 | 540 | 559 | 912 | 584 | 768 | 638 | 671 | 1030 | 692 | 716 | 1590 | 234 | 565 | 538 | 596 | 519 | 473 | 434 | 436 | 393 | 444 |
| Nitrate (as N) | mg/L | - | 0.3 | 1.5 | 0.272 | 0.244 | 0.2 | 0.13 | 0.22 | 0.2 | 0.18 | 0.2 | 0.17 | 0.19 | 0.18 | 0.17 | 4.02 | 1.64 | 2.81 | 2.03 | 2.25 | 2.81 | 1 | 1.65 | 1.32 | 1.65 |
| Nitrite (as N) | mg/L | - | <0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.012 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 | 8.21 | 8.22 | 8.1 | 8.14 | 7.81 | 8.06 | 7.82 | 8.15 | 8.06 | 8.24 | 7.67 | 8.03 | 7.98 | 8.01 | 8.24 | 8.27 | 8.27 | 8.05 | 8.26 | 8.33 | 8.41 | 8.38 | 8.45 | 8.21 |
| Phenolics (total) | mg/L | 0.001 | <0.001 | **0.0012** | **0.0031** | **0.0038** | **0.0069** | **0.002** | <0.001 | 0.001 | <0.001 | <0.001 | <0.001 | **0.003** | <0.001 | <0.001 | **0.0017** | **0.0095** | **0.0035** | **0.003** | 0.001 | <0.001 | **0.002** | <0.001 | <0.001 | **0.002** |
| Sulfate | mg/L | - | 20 | 88.6 | 26.8 | 24.3 | 24.6 | 39 | 38 | 19 | 35 | 48 | 51 | 31 | 53 | 72 | 10.7 | 84.1 | 70.9 | 86.3 | 68 | 88 | 70 | 74 | 39 | 51 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.6 | 0.29 | 3.35 | 1.24 | 2.64 | <0.5 | 0.8 | <0.5 | 2.1 | 0.7 | 2.8 | 2.8 | 2.4 | 1.5 | 0.96 | 0.38 | 0.42 | 0.27 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.5 |
| Un-ionized ammonia | mg/L | 0.02 (g) | <0.00465 | <0.00016 | 0.0095 | 0.00364 | 0.0042 | 0.00297 | 0.00245 | 0.01433 | **0.02544** | 0.00085 | 0.00727 | 0.01099 | - | 0.01399 | - | 0.00019 | <0.00017 | 0.00019 | <0.00292 | <0.00013 | <0.00284 | <0.00107 | <0.00031 | 0.00231 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 736 | 1070 | 1070 | 543 | 1190 | 1470 | 1380 | 1090 | 1180 | 1260 | 1040 | 1111 | NM | 1000 | - | 1080 | 556 | 1170 | 833 | 1200 | 786 | 891 | 790 | 646 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | 7.43 | 4.8 | 10.9 | - | 4.94 | **0.11** | **3.43** | 4.93 | 5.4 | 6.4 | 7.96 | - | - | 10.08 | - | 10.68 | - | 4.03 | **0.54** | **2.77** | 6.03 | 4.9 | 8.18 | 8.78 |
| pH, field | s.u. | 6.5-8.5 | **8.52** | 7.52 | 7.52 | 7.44 | 7.09 | 7.71 | 7.22 | 7.71 | 7.7 | 7.08 | 7.14 | 7.29 | NM | 7.96 | NM | 7.61 | 7.49 | 7.52 | 8.04 | 6.85 | 7.9 | 7.62 | 7.18 | 7.84 |
| Temperature, field | Deg C | -- | 4.47 | 10.9 | 4.8 | 10.27 | 7.65 | 8.01 | 5.9 | 17.6 | 10.31 | 6.9 | 6.77 | 13.5 | NM | 4.03 | - | 5.5 | 12.9 | 6.38 | 12.33 | 6.94 | 16.2 | 11.63 | 8.7 | 6.25 |

Notes:

(1) Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(b) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L

(c) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.

(d) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(g) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

(h) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

NM Not Measured.

**36.0** Parameter exceeds the PWQO.

**Table 6.4**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SW6 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-2 | SWP-2 | SWP-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | SW-WARD 2-007 | SW-WARD2-041017-003 | SW-WARD2-8/8/17-01 | SW-WARD2-112417-006 | SW-WARD2-051818-012 | SW-WARD2-082618-DD-002 | SW-WARD2-110318-002 | SW-WARD 2-19-011 | SW-4074-LFS Pond | SW-WARD 2-19-008 | SW-WARD 2-_19-004 | SWP LANDFILL | SW-WARD 2-001 | 2 | SW-WARD 2-004 | SW-WARD 2-004 | LF | SW WARD2-12/5/22-08 | SWP1 | SW-W4074-08/23-DD Sump 1 | SWP1 | SW-WARD2-041017-004 | SW-WARD2-8/8/17-02 | SW-WARD2-112417-005 |
| Sample Date: | | | 7/3/2022 | 4/10/2017 | 8/8/2017 | 11/24/2017 | 5/18/2018 | 8/26/2018 | 11/3/2018 | 5/22/2019 | 7/29/2019 | 12/6/2019 | 8/18/2020 | 11/29/2020 | 5/10/2021 | 8/29/2021 | 11/17/2021 | 7/3/2022 | 9/20/2022 | 12/5/2022 | 5/18/2023 | 8/31/2023 | 11/8/2023 | 4/10/2017 | 8/8/2017 | 11/24/2017 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 123 | 75 | 58.9 | 75.5 | 84.7 | 53.9 | 75.9 | 95.6 | 36.5 | 119 | 41 | 67.1 | 57 | 33.1 | 68.9 | 24.6 | 35.5 | 85.2 | 39.3 | 164 | 136 | 58 | 90.3 | 83.4 |
| Iron | mg/L | 0.3 | 0.554 | 0.088 | 0.108 | 0.208 | 0.336 | 0.098 | 0.203 | 0.23 | 0.052 | 0.448 | 0.187 | 0.21 | 0.118 | 0.039 | 0.183 | 0.063 | 0.066 | 0.131 | 0.184 | 0.447 | 1.59 | 0.307 | <0.5 | 0.26 |
| Magnesium | mg/L | - | 47.8 | 26.7 | 26.4 | 25.6 | 29.9 | 24.6 | 27.4 | 36.9 | 51.7 | 43.1 | 35.5 | 29.2 | 38 | 36.7 | 31 | 41.4 | 40.2 | 36.8 | 41.3 | 49.9 | 35.9 | 17.3 | 58.3 | 25.3 |
| Manganese | mg/L | - | 0.039 | 0.0151 | 0.0318 | 0.0274 | 0.159 | 0.0272 | 0.0381 | 0.0845 | 0.0117 | 0.279 | 0.0323 | 0.0139 | 0.0085 | 0.0581 | 0.0212 | 0.025 | 0.0226 | 0.00934 | 0.0265 | 0.223 | 0.344 | 0.0137 | 0.187 | 0.0235 |
| Phosphorus | mg/L | 0.03 (e) | 0.03 | <0.05 | <0.05 | <0.05 | 0.051 | <0.05 | <0.05 | 0.043 | 0.012 | 0.155 | 0.042 | 0.005 | 0.019 | 0.044 | 0.008 | 0.017 | 0.006 | 0.027 | 0.019 | 0.339 | 0.025 | <0.05 | <0.5 | <0.05 |
| Potassium | mg/L | - | 9.06 | 2.47 | 2.34 | 5.77 | 7.93 | 5.09 | 3.55 | 8.6 | 7.32 | 24 | 5.57 | 4.01 | 4.77 | 4.38 | 6.16 | 2.5 | 4.7 | 4.79 | 5.6 | 68 | 2.64 | 11.1 | 86 | 17.3 |
| Sodium | mg/L | - | 9.74 | 16.1 | 20.5 | 23.6 | 25 | 23 | 24.9 | 26.3 | 25.7 | 53.6 | 22.8 | 20.5 | 28.6 | 26.2 | 22.7 | 30.9 | 28 | 25 | 29.9 | 176 | 38.8 | 38.4 | 174 | 50.9 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | -- | 376 | 273 | 230 | 264 | 302 | 202 | 260 | 324 | 251 | 506 | 187 | 240 | 221 | 183 | 267 | 183 | 224 | 305 | 218 | 551 | 415 | 194 | 466 | 311 |
| Ammonia-N | mg/L | - | <0.1 | <0.026 | 0.049 | 0.749 | 0.607 | 0.038 | 0.266 | 0.5 | <0.1 | 19.4 | <0.1 | 0.2 | <0.1 | <0.1 | 0.7 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 | 1.1 | <0.042 | 0.045 | 0.365 |
| Chloride | mg/L | - | 13 | 38 | 44.5 | 46.2 | 42.8 | 49.4 | 54.8 | 51 | 47 | 87 | 40 | 39 | 41 | 47 | 36 | 51 | 50 | 48 | 45 | 250 | 78 | 76.9 | 255 | 88.9 |
| Conductivity | uS/cm | - | 773 | 636 | 584 | 664 | 698 | 555 | 637 | 798 | 711 | 1250 | 543 | 626 | 643 | 526 | 638 | 526 | 658 | 778 | 575 | 1890 | 968 | 649 | 1830 | 899 |
| Dissolved organic carbon (DOC) | mg/L | - | 3 | 4.1 | 9.3 | 7.7 | 9.6 | 11.6 | 5.54 | 8 | 10 | 21 | 5 | 3 | 4 | 5 | 7 | 6 | 9 | 4 | 8 | 29 | 3 | 8.2 | 31.9 | 11.6 |
| Hardness | mg/L | - | 503 | 297 | 256 | 294 | 335 | 236 | 302 | 391 | 304 | 474 | 248 | 288 | 299 | 233 | 300 | 232 | 254 | 364 | 268 | 614 | 488 | 216 | 466 | 312 |
| Nitrate (as N) | mg/L | - | 2.79 | 0.373 | <0.02 | 0.57 | 0.155 | 0.033 | 0.973 | 0.49 | <0.06 | <0.06 | <0.06 | 0.84 | 1.06 | <0.06 | 1.08 | <0.06 | <0.06 | 1.28 | 0.47 | 16 | 4.23 | 0.109 | <0.1 | 0.175 |
| Nitrite (as N) | mg/L | - | <0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.03 | <0.03 | <0.03 | 0.03 | <0.01 | <0.05 | 0.013 |
| pH | s.u. | 6.5-8.5 | 8.22 | 8.2 | 8.09 | 8.26 | 8.04 | 8.1 | 7.89 | 8.26 | 8.66 | 8.07 | 8.55 | 8.34 | 8.52 | 8.24 | 8.14 | 8.94 | 8.32 | 8.21 | 8.59 | 8.34 | 7.58 | 8.14 | 7.91 | 8.11 |
| Phenolics (total) | mg/L | 0.001 | <0.001 | 0.0029 | 0.0061 | 0.0038 | 0.0049 | 0.0024 | 0.0022 | 0.005 | 0.007 | 0.019 | 0.002 | <0.001 | <0.001 | <0.001 | 0.002 | 0.003 | <0.001 | <0.001 | 0.002 | <0.001 | <0.001 | 0.0024 | 0.0053 | <0.001 |
| Sulfate | mg/L | - | 52 | 17.9 | 12.9 | 23.1 | 26.8 | 16.6 | 17 | 56 | 71 | 72 | 48 | 41 | 42 | 33 | 43 | 42 | 50 | 49 | 49 | 93 | 24 | 22.7 | 67.2 | 39.4 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | <0.5 | 0.46 | 0.58 | 1.69 | 1.75 | 1 | 0.75 | 0.8 | 1.3 | 22.6 | <0.5 | <0.5 | <0.5 | <0.5 | 0.6 | <0.5 | 0.7 | 0.6 | 0.8 | 1.2 | 1.4 | 0.88 | 3.43 | 1.58 |
| Un-ionized ammonia | mg/L | 0.02 (g) | <0.00157 | 0.00052 | 0.00127 | 0.00252 | 0.00381 | 0.00052 | 0.00141 | 0.00605 | - | 0.01322 | <0.00107 | 0.00315 | <0.0006 | - | 0.00577 | <0.00238 | <0.00394 | 0.00064 | <0.00952 | <0.00065 | 0.00554 | 0.00024 | 0.00129 | 0.00214 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 806 | 596 | 2830 | 590 | 410 | 659 | 823 | 1220 | - | 1620 | 1200 | 778 | 777 | - | 640 | 619 | 866 | 751 | 602 | 2030 | 1070 | 622 | 850 | 910 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | - | 9.34 | - | 12.15 | - | - | 5.23 | 0.11 | - | 0.56 | 3.35 | 5.19 | 10.31 | - | 8.54 | - | 5.51 | 9.46 | 11.1 | 5.8 | 2.12 | 9.55 | - | 10.22 |
| pH, field | s.u. | 6.5-8.5 | 7.72 | 7.87 | 7.76 | 7.42 | 7.22 | 7.22 | 7.49 | 7.56 | NM | 6.79 | 7.32 | 7.78 | 7.33 | NM | 7.69 | 7.8 | 7.95 | 7.41 | 8.52 | 7.16 | 7.4 | 7.32 | 7.76 | 7.58 |
| Temperature, field | Deg C | -- | 13.7 | 12.4 | 19.3 | 2.9 | 16.72 | 27.61 | 6.5 | 15.09 | - | 1.09 | 20.9 | 11.96 | 12.7 | - | 6.3 | 16.9 | 19.2 | 2.51 | 14.09 | 19.08 | 8.46 | 12.3 | 20.7 | 5.2 |

Notes:

(1) Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(b) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L

(c) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.

(d) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(g) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

(h) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

NM Not Measured.

36.0 Parameter exceeds the PWQO.

**Table 6.4**

**General Chemistry and Dissolved Metals**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | SW-WARD2-051818-008 | SW-WARD2-082618-DD-001 | SW-WARD2-110318-010 | SW-WARD 2-19-005 | SW-4074-Scale Pond | SW-WARD 2-19-009 | SW-WARD 2-_19-003 | SWP ENTRANCE | SW-WARD 2-004 | 1 | SW-WARD 2-006 | SW-WARD 2-003 | FRT | SW WARD2-12/5/22-05 | SWP2 | SW-W4074-08/23-DD Sump 2 | SWP2 |
| Sample Date: | | | 5/18/2018 | 8/26/2018 | 11/3/2018 | 5/22/2019 | 7/29/2019 | 12/6/2019 | 8/18/2020 | 11/29/2020 | 5/10/2021 | 8/29/2021 | 11/17/2021 | 7/3/2022 | 9/20/2022 | 12/5/2022 | 5/18/2023 | 8/31/2023 | 11/8/2023 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 82.9 | 112 | 84.5 | 125 | 116 | 107 | 86.9 | 115 | 130 | 106 | 73.7 | 202 | 95.4 | 102 | 141 | 37.2 | 95.2 |
| Iron | mg/L | 0.3 | 0.258 | 0.109 | **0.377** | 0.225 | 0.101 | **0.327** | 0.247 | 0.188 | 0.166 | 0.065 | 0.153 | 0.18 | 0.209 | 0.252 | 0.175 | 0.201 | 0.183 |
| Magnesium | mg/L | - | 19.9 | 34.9 | 18.6 | 40.9 | 52.1 | 30.3 | 33.4 | 31.1 | 44.8 | 69.8 | 19.2 | 80.1 | 50.9 | 31.2 | 56.4 | 39.8 | 30.1 |
| Manganese | mg/L | - | 0.113 | 0.058 | 0.014 | 0.0546 | 0.431 | 0.144 | 0.0651 | 0.0381 | 0.0418 | 0.117 | 0.0393 | 0.229 | 0.247 | 0.0277 | 0.062 | 0.0898 | 0.03876 |
| Phosphorus | mg/L | 0.03 (e) | <0.05 | **0.061** | <0.05 | **0.152** | **0.188** | **0.063** | **0.081** | **0.067** | **0.11** | **0.162** | **0.114** | **1.06** | **0.428** | **0.044** | **0.198** | **0.038** | **0.048** |
| Potassium | mg/L | - | 6.19 | 45 | 9 | 50.6 | 69.6 | 25.1 | 42.6 | 24.4 | 52.8 | 104 | 10 | 138 | 73.6 | 34.7 | 79 | 5.04 | 28.7 |
| Sodium | mg/L | - | 38.8 | 99.2 | 31.9 | 106 | 153 | 69.1 | 123 | 79.8 | 145 | 253 | 40.2 | 329 | 194 | 100 | 185 | 26.9 | 93.1 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | -- | 213 | 326 | 222 | 408 | 455 | 328 | 241 | 329 | 376 | 497 | 224 | 723 | 473 | 359 | 553 | 223 | 358 |
| Ammonia-N | mg/L | - | 0.097 | 0.134 | <0.02 | 0.2 | 0.2 | 0.6 | 0.1 | 0.1 | 0.3 | <0.1 | <0.1 | 1.1 | 0.2 | 0.1 | 0.6 | <0.1 | 0.2 |
| Chloride | mg/L | - | 92.8 | 234 | 89.5 | 200 | 250 | 130 | 200 | 150 | 210 | 320 | 54 | 380 | 300 | 200 | 270 | 50 | 160 |
| Conductivity | uS/cm | - | 714 | 1370 | 727 | 1450 | 1830 | 1110 | 1150 | 1170 | 1550 | 2020 | 594 | 2570 | 1960 | 1290 | 1930 | 630 | 1040 |
| Dissolved organic carbon (DOC) | mg/L | - | 8.2 | 24.8 | 9.8 | 22 | 28 | 11 | 15 | 10 | 20 | 32 | 6 | 38 | 26 | 16 | 29 | 5 | 14 |
| Hardness | mg/L | - | 289 | 423 | 287 | 479 | 505 | 393 | 355 | 414 | 510 | 553 | 263 | 835 | 448 | 383 | 584 | 257 | 362 |
| Nitrate (as N) | mg/L | - | <0.02 | 0.559 | 0.178 | 1.31 | <0.06 | 0.24 | 0.25 | 0.42 | 1.16 | <0.06 | 0.7 | <0.06 | <0.06 | 1.61 | 1.8 | <0.06 | 0.74 |
| Nitrite (as N) | mg/L | - | <0.01 | 0.029 | <0.01 | 0.05 | <0.03 | 0.18 | 0.05 | <0.03 | 0.03 | <0.03 | <0.03 | <0.3 | <0.03 | <0.03 | 0.16 | <0.03 | 0.05 |
| pH | s.u. | 6.5-8.5 | 7.94 | 7.81 | 7.69 | 8.16 | 8.16 | 7.83 | 8.15 | 8.17 | 8.33 | 8.11 | 8.03 | 7.95 | 8.06 | 8.05 | 8.25 | 8.34 | 7.95 |
| Phenolics (total) | mg/L | 0.001 | **0.0091** | **0.005** | **0.0028** | **0.009** | **0.008** | <0.004 | **0.002** | <0.001 | <0.001 | 0.001 | <0.001 | **0.013** | **0.005** | **0.002** | **0.002** | <0.001 | <0.001 |
| Sulfate | mg/L | - | 30.3 | 57.3 | 42.3 | 80 | 110 | 87 | 69 | 46 | 68 | 130 | 28 | 130 | 140 | 80 | 140 | 52 | 61 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 1.37 | 2.59 | 1.03 | 1.1 | 3.2 | 1.5 | 1.2 | 0.7 | 2.8 | 2.9 | <0.5 | 5.6 | 2.6 | 1.9 | 4.6 | 0.7 | 1.9 |
| Un-ionized ammonia | mg/L | 0.02 (g) | 0.00026 | 0.00088 | <0.00019 | 0.00099 | - | 0.00069 | 0.00543 | 0.0012 | 0.00077 | - | <0.00052 | **0.26722** | 0.00279 | 0.00036 | 0.00466 | <0.0036 | 0.00292 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 426 | 1370 | 980 | 1860 | - | 1380 | 594 | 725 | 1560 | - | 655 | 810 | 2450 | 1280 | 1960 | 703 | 1130 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | - | - | 4.57 | **0.11** | - | 7.12 | 6.52 | 5.24 | 6.28 | - | 8.2 | - | **1.6** | 7.76 | **1.4** | 8.36 | **1.84** |
| pH, field | s.u. | 6.5-8.5 | 6.98 | 6.98 | 7.71 | 7.29 | NM | 6.98 | 7.91 | 7.72 | 7 | NM | 7.43 | **8.8** | 7.52 | 7.43 | 7.44 | 7.85 | 7.95 |
| Temperature, field | Deg C | -- | 12.59 | 24.98 | 7.47 | 11.53 | - | 2.21 | 25.1 | 10.21 | 11.5 | - | 7.88 | 19.9 | 18.25 | 3.47 | 12.86 | 21.07 | 6.03 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (a) | Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L. |
| (b) | Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L |
| (c) | PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L. |
| (d) | Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (g) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| (h) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| - | Parameter not analyzed / no information |
| -- | No guideline. |
| < | Parameter detected below the laboratory method detection limit |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the PWQO. |

**Table 6.5**

**Volatile Organic Compounds**
**Groundwater Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | MP01-13 | MP01-13 | MP01-13 | MP01-13 | MP02-13 | MP02-13 | MP02-13 | MP02-13 | MP03-13 | MP03-13 | MP03-13 | MP03-13 | MP04-13 | MP04-13 | MP04-13 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | GW(MP)-WARD2-041017-001 | GW(MP)-WARD2-112417-003 | GW(MP)-WARD2-110318-001 | MP1 | GW(MP)-WARD2-041017-002 | GW(MP)-WARD2-112417-004 | GW(MP)-WARD2-110318-002 | MP2 | GW(MP)-WARD2-041017-003 | GW(MP)-WARD2-112417-001 | GW(MP)-WARD2-110318-003 | MP3 | GW(MP)-WARD2-041017-004 | GW(MP)-WARD2-112417-002 | GW-WARD2-112417-022 | GW-WARD2-041017-023 | GW-WARD2-112417-025 | GW-WARD2-110318-032 | OW2-83 | GW-WARD2-1222-020 | GW-WARD2-041017-024 | GW-WARD2-112417-023 | GW-WARD2-110318-026 | OW3-83 |
| Sample Date: | | | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 | 4/10/2017 | 11/24/2017 | 11/24/2017 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 | 12/6/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 |
| **Parameters** | **Units** | ***ODWS*** [1] | | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | µg/L | 14 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | -- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 1,2-Dichlorobenzene | µg/L | 200/3 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | µg/L | 5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | µg/L | 5/1 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK) | µg/L | -- | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <200 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | µg/L | -- | <20 | <20 | <20 | - | <20 | <20 | <20 | - | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | - |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK) | µg/L | -- | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | µg/L | -- | <20 | <20 | <20 | <30 | <20 | <20 | <20 | <30 | **46** | <20 | **1110** | <30 | <20 | <20 | <20 | <20 | <20 | <20 | <30 | <30 | <20 | <20 | <20 | <30 |
| Benzene | µg/L | 1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | µg/L | -- | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 |
| Bromoform | µg/L | -- | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 |
| Bromomethane (Methyl bromide) | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | µg/L | -- | <1 | <1 | <1 | - | <1 | <1 | <1 | - | <1 | <1 | <1 | - | <1 | <1 | <1 | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - |
| Carbon tetrachloride | µg/L | 2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 |
| Chlorobenzene | µg/L | 80/30 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | µg/L | -- | <1 | <1 | <1 | - | <1 | <1 | <1 | - | <1 | <1 | <1 | - | <1 | <1 | <1 | <1 | <1 | <1 | - | <5 | <1 | <1 | <1 | - |
| Chloroform (Trichloromethane) | µg/L | -- | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 |
| Chloromethane (Methyl chloride) | µg/L | -- | <1 | <1 | <1 | - | <1 | <1 | <1 | - | <1 | <1 | <1 | - | <1 | <1 | <1 | <1 | <1 | <1 | - | <5 | <1 | <1 | <1 | - |
| cis-1,2-Dichloroethene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene/trans-1,3-Dichloropropene | µg/L | -- | - | - | - | <0.5 | - | - | - | <0.5 | - | - | - | <0.5 | - | - | - | - | - | - | <0.5 | - | - | - | - | <0.5 |
| Dibromochloromethane | µg/L | -- | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 |
| Dichlorodifluoromethane (CFC-12) | µg/L | -- | <1 | <1 | <1 | <2 | <1 | <1 | <1 | <2 | <1 | <1 | <1 | <2 | <1 | <1 | <1 | <1 | <1 | <1 | <2 | <2 | <1 | <1 | <1 | <2 |
| Ethylbenzene | µg/L | 140/1.6 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexane | µg/L | -- | <0.5 | <0.5 | <0.5 | <1 | <0.5 | <0.5 | <0.5 | <1 | <0.5 | <0.5 | <0.5 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 |
| m&p-Xylenes | µg/L | -- | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 |
| Methyl tert butyl ether (MTBE) | µg/L | -- | <0.5 | <0.5 | <0.5 | <2 | <0.5 | <0.5 | <0.5 | <2 | <0.5 | <0.5 | <0.5 | <2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <2 | <2 | <0.5 | <0.5 | <0.5 | <2 |
| Methylene chloride | µg/L | 50 | <2 | <2 | <2 | <0.5 | <2 | <2 | <2 | <0.5 | <2 | <2 | <2 | <0.5 | <2 | <2 | <2 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <0.5 |
| o-Xylene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | µg/L | 10 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | µg/L | 60/24 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.74** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **52.2** | <0.5 |
| trans-1,2-Dichloroethene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | µg/L | 5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11) | µg/L | -- | <1 | <1 | <1 | <5 | <1 | <1 | <1 | <5 | <1 | <1 | <1 | <5 | <1 | <1 | <1 | <1 | <1 | <1 | <5 | <5 | <1 | <1 | <1 | <5 |
| Trihalomethanes | µg/L | 100 | <2 | <2 | <2 | - | <2 | <2 | <2 | - | <2 | <2 | <2 | - | <2 | <2 | <2 | <2 | <2 | <2 | - | - | <2 | <2 | <2 | - |
| Vinyl chloride | µg/L | 1 | <0.5 | <0.5 | <0.5 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 |
| Xylenes (total) | µg/L | 90/20 (MAC/AO) | <1.1 | <1.1 | <1.1 | <0.5 | <1.1 | <1.1 | <1.1 | <0.5 | <1.1 | <1.1 | <1.1 | <0.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <0.5 | <0.5 | <1.1 | <1.1 | <1.1 | <0.5 |

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.5**

**Volatile Organic Compounds**
**Groundwater Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW3-83 | OW4-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW7-83 | OW7-83 | OW7-83 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW16-89 | OW16-89 | OW16-89 | OW18-89 | OW19-89 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW25R-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-1222-019 | GW-WARD2-1222-027 | GW-WARD2-041017-019 | GW-WARD2-112417-019 | GW-WARD2-110318-030 | OW6-83 | GW-WARD2-1222-004 | GW-WARD2-041017-017 | GW-WARD2-112417-017 | GW-WARD2-110318-015 | GW-WARD2-112417-020 | GW-WARD2-110318-021 | OW8-88 | GW-WARD2-1222-031 | GW-WARD2-041017-032 | GW-WARD2-110318-018 | OW16-89 | GW-WARD2-041017-015 | GW-WARD2-041017-001 | GW-WARD2-041017-014 | GW-WARD2-110318-031 | OW24-98 | GW-WARD2-1222-015 | GW-WARD2-041017-028 |
| **Sample Date:** | | | 12/6/2022 | 12/5/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 | 12/6/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/24/2017 | 11/3/2018 | 11/28/2020 | 12/5/2022 | 4/10/2017 | 11/3/2018 | 11/28/2020 | 4/10/2017 | 4/10/2017 | 4/10/2017 | 11/3/2018 | 11/28/2020 | 12/5/2022 | 4/10/2017 |
| **Parameters** | **Units** | ***ODWS*** [1] | | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | **0.51** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **1.3** | <0.5 | **0.8** | **0.56** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | µg/L | 14 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | -- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 1,2-Dichlorobenzene | µg/L | 200/3 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | µg/L | 5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | µg/L | 5/1 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK) | µg/L | -- | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | µg/L | -- | <20 | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | <20 | - | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK) | µg/L | -- | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | µg/L | -- | <30 | <30 | <20 | <20 | <20 | <30 | <30 | <20 | <20 | <20 | <20 | <20 | <30 | <30 | <20 | <20 | <30 | <20 | <20 | <20 | <20 | <30 | <30 | <20 |
| Benzene | µg/L | 1 | <0.5 | <0.5 | <0.5 | **1.64** | **1.54** | **1.8** | **1** | <0.5 | <0.5 | **0.54** | <0.5 | <0.5 | <0.5 | <0.5 | **2.45** | **1.76** | **0.7** | **1.68** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | µg/L | -- | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 |
| Bromoform | µg/L | -- | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 |
| Bromomethane (Methyl bromide) | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | µg/L | -- | - | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 | <1 | <1 | - | - | <1 | <1 | - | <1 | <1 | <1 | <1 | - | - | <1 |
| Carbon tetrachloride | µg/L | 2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 |
| Chlorobenzene | µg/L | 80/30 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | µg/L | -- | <5 | <5 | <1 | **2.8** | **2.5** | - | <5 | <1 | **2.2** | **3.2** | <1 | <1 | - | <5 | **4** | **2.4** | - | **3.4** | <1 | <1 | <1 | - | <5 | <1 |
| Chloroform (Trichloromethane) | µg/L | -- | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 |
| Chloromethane (Methyl chloride) | µg/L | -- | <5 | <5 | <1 | <1 | <1 | - | <5 | <1 | <1 | <1 | <1 | <1 | - | <5 | <1 | <1 | - | <1 | <1 | <1 | <1 | - | <5 | <1 |
| cis-1,2-Dichloroethene | µg/L | -- | <0.5 | <0.5 | <0.5 | **1.45** | **0.92** | **0.9** | <0.5 | <0.5 | **0.58** | **1.09** | <0.5 | <0.5 | <0.5 | <0.5 | **1.42** | <0.5 | **0.9** | **1.75** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene/trans-1,3-Dichloropropene | µg/L | -- | - | - | - | - | - | <0.5 | - | - | - | - | - | - | <0.5 | - | - | - | <0.5 | - | - | - | - | <0.5 | - | - |
| Dibromochloromethane | µg/L | -- | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 |
| Dichlorodifluoromethane (CFC-12) | µg/L | -- | <2 | <2 | <1 | <1 | <1 | <2 | <2 | <1 | <1 | <1 | <1 | <1 | <2 | <2 | <12 | <4.1 | <2 | <1 | <1 | <1 | <1 | <2 | <2 | <1 |
| Ethylbenzene | µg/L | 140/1.6 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **2.38** | **4.33** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexane | µg/L | -- | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 |
| m&p-Xylenes | µg/L | -- | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 |
| Methyl tert butyl ether (MTBE) | µg/L | -- | <2 | <2 | <0.5 | <0.5 | <0.5 | <2 | <2 | <0.5 | <0.5 | <0.5 | **0.56** | **0.6** | <2 | <2 | <0.5 | <0.5 | <2 | <0.5 | <0.5 | <0.5 | <0.5 | <2 | <2 | <0.5 |
| Methylene chloride | µg/L | 50 | <0.5 | <0.5 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <0.5 | <2 | <2 | <2 | <2 | <0.5 | <0.5 | <2 |
| o-Xylene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.89** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | µg/L | 10 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | µg/L | 60/24 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **4.39** | **5.02** | **3.28** | <0.5 | **0.6** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **1.47** | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | µg/L | 5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11) | µg/L | -- | <5 | <5 | <1 | <1 | <1 | <5 | <5 | <1 | <1 | <1 | <1 | <1 | <5 | <5 | <1 | <1 | <5 | <1 | <1 | <1 | <1 | <5 | <5 | <1 |
| Trihalomethanes | µg/L | 100 | - | - | <2 | <2 | <2 | - | - | <2 | <2 | <2 | <2 | <2 | - | - | <2 | <2 | - | <2 | <2 | <2 | <2 | - | - | <2 |
| Vinyl chloride | µg/L | 1 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | **0.2** | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 |
| Xylenes (total) | µg/L | 90/20 (MAC/AO) | <0.5 | <0.5 | <1.1 | <1.1 | <1.1 | <0.5 | <0.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <0.5 | <0.5 | <1.1 | <1.1 | <0.5 | <1.1 | <1.1 | <1.1 | <1.1 | <0.5 | <0.5 | <1.1 |

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.5**

**Volatile Organic Compounds**
**Groundwater Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-112417-028 | GW-WARD2-110318-016 | DUP | OW25R-13 | GW-WARD2-1222-022 | GW-WARD2-041017-022 | GW-WARD2-112417-024 | GW-WARD2-110318-022 | OW29-07 | GW-WARD2-1222-012 | GW-WARD2-041017-021 | GW-WARD2-112417-021 | GW-WARD2-110318-025 | OW30-07 | GW-WARD2-1222-014 | GW-WARD2-041017-018 | GW-WARD2-112417-018 | GW-WARD2-110318-023 | OW31-07 | GW-WARD2-1222-001 | GW-WARD2-041017-016 | GW-WARD2-112417-016 | GW-WARD2-110318-028 | OW32-07 |
| **Sample Date:** | | | 11/24/2017 | 11/3/2018 | 11/28/2020 | 11/28/2020 | 12/6/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 | 12/5/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 | 12/5/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 | 12/6/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 |
| **Parameters** | **Units** | ***ODWS*** [1] | | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | µg/L | 14 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | -- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 1,2-Dichlorobenzene | µg/L | 200/3 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | µg/L | 5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | µg/L | 5/1 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK) | µg/L | -- | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | µg/L | -- | <20 | <20 | - | - | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | - |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK) | µg/L | -- | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | µg/L | -- | <20 | <20 | <30 | <30 | <30 | <20 | <20 | <20 | <30 | <30 | <20 | <20 | <20 | <30 | <30 | <20 | <20 | <20 | <20 | <30 | <30 | <20 | <20 | <30 |
| Benzene | µg/L | 1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | µg/L | -- | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 |
| Bromoform | µg/L | -- | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 |
| Bromomethane (Methyl bromide) | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | µg/L | -- | <1 | <1 | - | - | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - |
| Carbon tetrachloride | µg/L | 2 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 |
| Chlorobenzene | µg/L | 80/30 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | µg/L | -- | <1 | <1 | - | - | <5 | <1 | <1 | - | <1 | <5 | <1 | <1 | <1 | - | <5 | <1 | <1 | <1 | - | <5 | **4.7** | <1 | <1 | - |
| Chloroform (Trichloromethane) | µg/L | -- | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 |
| Chloromethane (Methyl chloride) | µg/L | -- | <1 | <1 | - | - | <5 | <1 | <1 | <1 | - | <5 | <1 | <1 | <1 | - | <5 | <1 | <1 | <1 | - | <5 | <1 | <1 | <1 | - |
| cis-1,2-Dichloroethene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.74** | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene/trans-1,3-Dichloropropene | µg/L | -- | - | - | <0.5 | <0.5 | - | - | - | - | <0.5 | - | - | - | - | <0.5 | - | - | - | - | <0.5 | - | - | - | - | <0.5 |
| Dibromochloromethane | µg/L | -- | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 |
| Dichlorodifluoromethane (CFC-12) | µg/L | -- | <1 | <1 | <2 | <2 | <2 | <1 | <1 | <1 | <2 | <2 | <1 | <1 | <1 | <2 | <2 | <1 | <1 | <1 | <2 | <2 | <1 | <1 | <1 | <2 |
| Ethylbenzene | µg/L | 140/1.6 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.74** | <0.5 | <0.5 | <0.5 |
| Hexane | µg/L | -- | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 |
| m&p-Xylenes | µg/L | -- | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 |
| Methyl tert butyl ether (MTBE) | µg/L | -- | <0.5 | <0.5 | <2 | <2 | <2 | <0.5 | <0.5 | <0.5 | <2 | <2 | <0.5 | <0.5 | <0.5 | <2 | <2 | <0.5 | <0.5 | <0.5 | <2 | <2 | <0.5 | <0.5 | <0.5 | <2 |
| Methylene chloride | µg/L | 50 | <2 | <2 | <0.5 | <0.5 | <0.5 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <0.5 |
| o-Xylene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | µg/L | 10 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | µg/L | 60/24 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.97** | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | µg/L | 5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11) | µg/L | -- | <1 | <1 | <5 | <5 | <5 | <1 | <1 | <1 | <5 | <5 | <1 | <1 | <1 | <5 | <5 | <1 | <1 | <1 | <5 | <5 | <1 | <1 | <1 | <5 |
| Trihalomethanes | µg/L | 100 | <2 | <2 | - | - | - | <2 | <2 | <2 | - | - | <2 | <2 | <2 | - | - | <2 | <2 | <2 | - | - | <2 | <2 | <2 | - |
| Vinyl chloride | µg/L | 1 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 |
| Xylenes (total) | µg/L | 90/20 (MAC/AO) | <1.1 | <1.1 | <0.5 | <0.5 | <0.5 | <1.1 | <1.1 | <1.1 | <0.5 | <0.5 | <1.1 | <1.1 | <1.1 | <0.5 | <0.5 | <1.1 | <1.1 | <1.1 | <0.5 | <0.5 | <1.1 | <1.1 | <1.1 | <0.5 |

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.5**

**Volatile Organic Compounds**
**Groundwater Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW32-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW36-09 | OW36-09 | OW43-09 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | GW-WARD2-1222-005 | GW-WARD2-041017-011 | GW-WARD2-112417-014 | GW-WARD2-112417-015 | GW-WARD2-110318-024 | GW-WARD2-1222-029 | GW-WARD2-041017-031 | GW-WARD2-110318-012 | GW-WARD2-041017-030 | GW-WARD2-041017-010 | GW-WARD2-041017-025 | GW-WARD2-112417-027 | GW-WARD2-110318-029 | OW45-13 | GW-WARD2-1222-007 | GW-WARD2-041017-027 | GW-WARD2-112417-029 | GW-WARD2-110318-014 | OW46A-13 | GW-WARD2-1222-003 | GW-WARD2-041017-026 | GW-WARD2-112417-030 | GW-WARD2-110318-020 | OW46B-13 |
| Sample Date: | | | 12/6/2022 | 4/10/2017 | 11/24/2017 | 11/24/2017 Duplicate | 11/3/2018 | 12/6/2022 | 4/10/2017 | 11/3/2018 | 4/10/2017 | 4/10/2017 | 4/10/2017 Duplicate | 11/24/2017 | 11/3/2018 | 11/28/2020 | 12/6/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 | 12/6/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 |
| **Parameters** | **Units** | ***ODWS*** [1] | | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | µg/L | 14 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | -- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 1,2-Dichlorobenzene | µg/L | 200/3 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | µg/L | 5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | µg/L | 5/1 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK) | µg/L | -- | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | µg/L | -- | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | - |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK) | µg/L | -- | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | µg/L | -- | <30 | <20 | <20 | <20 | <20 | <30 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <30 | <30 | <20 | <20 | <20 | <30 | <30 | <20 | <20 | <20 | <30 |
| Benzene | µg/L | 1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | µg/L | -- | <0.5 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 |
| Bromoform | µg/L | -- | <0.5 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 |
| Bromomethane (Methyl bromide) | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | µg/L | -- | - | <1 | <1 | <1 | <1 | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - |
| Carbon tetrachloride | µg/L | 2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 |
| Chlorobenzene | µg/L | 80/30 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | µg/L | -- | <5 | <1 | <1 | <1 | <1 | <5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | - | <5 | <1 | <1 | <1 | - | <5 | <1 | <1 | <1 | - |
| Chloroform (Trichloromethane) | µg/L | -- | <0.5 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 |
| Chloromethane (Methyl chloride) | µg/L | -- | <5 | <1 | <1 | <1 | <1 | <5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | - | <5 | <1 | <1 | <1 | - | <5 | <1 | <1 | <1 | - |
| cis-1,2-Dichloroethene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene/trans-1,3-Dichloropropene | µg/L | -- | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.5 | - | - | - | - | <0.5 | - | - | - | - | <0.5 |
| Dibromochloromethane | µg/L | -- | <0.5 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 |
| Dichlorodifluoromethane (CFC-12) | µg/L | -- | <2 | <1 | **1.3** | **1.3** | <1 | <2 | **9.3** | <7.2 | <1 | <1 | <1 | <1 | <1 | <2 | <2 | <1 | <1 | <1 | <2 | <2 | <1 | <1 | <1 | <2 |
| Ethylbenzene | µg/L | 140/1.6 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexane | µg/L | -- | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 |
| m&p-Xylenes | µg/L | -- | <0.5 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 |
| Methyl tert butyl ether (MTBE) | µg/L | -- | <2 | <0.5 | <0.5 | <0.5 | <0.5 | <2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <2 | <2 | <0.5 | <0.5 | <0.5 | <2 | <2 | <0.5 | <0.5 | <0.5 | <2 |
| Methylene chloride | µg/L | 50 | <0.5 | <2 | <2 | <2 | <2 | <0.5 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <0.5 |
| o-Xylene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | µg/L | 10 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | µg/L | 60/24 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | µg/L | 5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11) | µg/L | -- | <5 | <1 | <1 | <1 | <1 | <5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <5 | <5 | <1 | <1 | <1 | <5 | <5 | <1 | <1 | <1 | <5 |
| Trihalomethanes | µg/L | 100 | - | <2 | <2 | <2 | <2 | - | <2 | <2 | <2 | <2 | <2 | <2 | <2 | - | - | <2 | <2 | <2 | - | - | <2 | <2 | <2 | - |
| Vinyl chloride | µg/L | 1 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 |
| Xylenes (total) | µg/L | 90/20 (MAC/AO) | <0.5 | <1.1 | <1.1 | <1.1 | <1.1 | <0.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <0.5 | <0.5 | <1.1 | <1.1 | <1.1 | <0.5 | <0.5 | <1.1 | <1.1 | <1.1 | <0.5 |

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.5**

**Volatile Organic Compounds**
**Groundwater Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | OW46B-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | Field Blank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-1222-006 | GW-WARD2-041017-029 | GW-WARD2-112417-031 | GW-WARD2-110318-034 | OW47-13 | GW-WARD2-1222-018 | GW-WARD2-041017-013 | GW-WARD2-112417-013 | GW-WARD2-110318-027 | OW48-13 | GW-WARD2-1222-023 | GW-WARD2-041017-012 | GW-WARD2-112417-012 | GW-WARD2-110318-017 | OW49-13 | GW-WARD2-1222-024 | GW-WARD2-112417-026 | GW-WARD2-110318-033 | OW50-13 | GW-WARD2-1222-016 | GW-WARD2-041017-009 |
| **Sample Date:** | | | 12/6/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 | 12/6/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 | 12/6/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 | 12/6/2022 | 11/24/2017 | 11/3/2018 | 11/28/2020 | 12/5/2022 | 4/10/2017 Field Blank |
| **Parameters** | **Units** | ***ODWS*** [1] | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | µg/L | 14 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | -- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 1,2-Dichlorobenzene | µg/L | 200/3 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | µg/L | 5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | µg/L | 5/1 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK) | µg/L | -- | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | µg/L | -- | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | - | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK) | µg/L | -- | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | µg/L | -- | <30 | <20 | <20 | <20 | <30 | <30 | <20 | <20 | <20 | <30 | <30 | <20 | <20 | <20 | <30 | <30 | <20 | <20 | <30 | <30 | <20 |
| Benzene | µg/L | 1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | µg/L | -- | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <1 |
| Bromoform | µg/L | -- | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <1 |
| Bromomethane (Methyl bromide) | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | µg/L | -- | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - | - | <1 | <1 | - | - | <1 |
| Carbon tetrachloride | µg/L | 2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 |
| Chlorobenzene | µg/L | 80/30 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | µg/L | -- | <5 | <1 | <1 | <1 | <5 | <1 | <1 | <1 | <1 | <5 | <5 | <1 | <1 | <1 | <5 | <5 | <1 | <1 | <5 | <5 | <1 |
| Chloroform (Trichloromethane) | µg/L | -- | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <1 |
| Chloromethane (Methyl chloride) | µg/L | -- | <5 | <1 | <1 | <1 | - | <5 | <1 | <1 | <1 | - | <5 | <1 | <1 | <1 | - | <5 | <1 | <1 | - | <5 | <1 |
| cis-1,2-Dichloroethene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene/trans-1,3-Dichloropropene | µg/L | -- | - | - | - | - | <0.5 | - | - | - | - | <0.5 | - | - | - | - | <0.5 | - | - | - | <0.5 | - | - |
| Dibromochloromethane | µg/L | -- | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <1 |
| Dichlorodifluoromethane (CFC-12) | µg/L | -- | <2 | <1 | <1 | <1 | <2 | <2 | <1 | <1 | <1 | <2 | <2 | <1 | <1 | <1 | <2 | <2 | <1 | <1 | <2 | <2 | <1 |
| Ethylbenzene | µg/L | 140/1.6 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexane | µg/L | -- | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <0.5 |
| m&p-Xylenes | µg/L | -- | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <1 |
| Methyl tert butyl ether (MTBE) | µg/L | -- | <2 | <0.5 | <0.5 | <0.5 | <2 | <2 | <0.5 | <0.5 | <0.5 | <2 | <2 | <0.5 | <0.5 | <0.5 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <0.5 |
| Methylene chloride | µg/L | 50 | <0.5 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <0.5 | <0.5 | <2 |
| o-Xylene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | µg/L | 10 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | µg/L | 60/24 (MAC/AO) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.6** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | µg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | µg/L | 5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11) | µg/L | -- | <5 | <1 | <1 | <1 | <5 | <5 | <1 | <1 | <1 | <5 | <5 | <1 | <1 | <1 | <5 | <5 | <1 | <1 | <5 | <5 | <1 |
| Trihalomethanes | µg/L | 100 | - | <2 | <2 | <2 | - | - | <2 | <2 | <2 | - | - | <2 | <2 | <2 | - | - | <2 | <2 | - | - | <2 |
| Vinyl chloride | µg/L | 1 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 |
| Xylenes (total) | µg/L | 90/20 (MAC/AO) | <0.5 | <1.1 | <1.1 | <1.1 | <0.5 | <0.5 | <1.1 | <1.1 | <1.1 | <0.5 | <0.5 | <1.1 | <1.1 | <1.1 | <0.5 | <0.5 | <1.1 | <1.1 | <0.5 | <0.5 | <1.1 |

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.6**

**Volatile Organic Compounds**
**Leachate Well Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | Leachate Holding Tank | Leachate Holding Tank | Leachate Holding Tank | Leachate Holding Tank | LW-COLLECTION |
|---|---|---|---|---|---|---|---|
| Sample ID: | | | LW-WARD2-041017-001 | LW-WARD2-051818-001 | LW-WARD2-19-001 | LW-WARD2-_19-001 | LW COLLECTION |
| Sample Date: | | | 4/10/2017 | 5/18/2018 | 5/22/2019 | 8/18/2020 | 7/3/2022 |
| **Parameters** | **Units** | ***ODWS*** [1] | | | | | |
| **Volatiles** | | | | | | | |
| 1,4-Dichlorobenzene | µg/L | 5/1 (MAC/AO) | **0.62** | **0.5** | **0.7** | **0.6** | <20 |
| Benzene | µg/L | 1 (MAC) | **3.32** | **2.77** | **3.5** | **3.6** | <20 |
| Methylene chloride | µg/L | 50 (MAC) | **10.7** | <2 | <0.5 | **1** | <20 |
| Toluene | µg/L | 60/24 (MAC/AO) | **47.2** | **24.2** | **3.5** | **41.8** | <20 |
| Vinyl chloride | µg/L | 1 (MAC) | **1.51** | **0.53** | <0.2 | **1.1** | <8 |

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
\- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
NM Not Measured.
**36.0** Parameter exceeds the ODWS.

**Table 6.7**

**Volatile Organic Compounds**
**Surface Water Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | GWIT | GWIT | GWIT | GWIT | GWIT | GW Sump | GW Sump | SW1 | SW1 | SW1 | SW1 | SW1 | SW2 | SW2 | SW2 | SW2 | SW2 | SW3 | SW3 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | SW-WARD2-041017-007 | SW-WARD2-112417-004 | SW-WARD2-110318-001 | GW INTERCEPTOR | GW INTERCEPTOR | SW-WARD2-041017-006 | SW-WARD2-112417-003 | SW-WARD2-041017-002 | SW-WARD2-112417-002 | SW-WARD2-110318-005 | SW 1 | SW WARD2-12/5/22-01 | SW-WARD2-041017-005 | SW-WARD2-112417-008 | SW-WARD2-110318-009 | SW 2 | SW WARD2-12/5/22-03 | SW-WARD2-041017-009 | SW-WARD2-112417-009 | SW-WARD2-110318-003 |
| Sample Date: | | | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/28/2020 | 12/6/2022 | 4/10/2017 | 11/24/2017 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/29/2020 | 12/5/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/29/2020 | 12/5/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | µg/L | 20 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | µg/L | 10 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | µg/L | 70 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | µg/L | 800 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | µg/L | 200 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | µg/L | 40 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 5 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | - | <0.2 | <0.2 | <0.2 | <0.2 | - | <0.2 | <0.2 | <0.2 |
| 1,2-Dichlorobenzene | µg/L | 2.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | µg/L | 100 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | µg/L | 0.7 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | µg/L | 2.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | µg/L | 4 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK) | µg/L | 400 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 |
| 2-Hexanone | µg/L | - | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | <20 | <20 | - | - | <20 | <20 | <20 | - | - | <20 | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK) | µg/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 |
| Acetone | µg/L | - | <20 | <20 | <20 | <30 | <30 | <20 | <20 | <20 | <20 | <20 | <30 | - | <20 | <20 | <20 | <30 | - | <20 | <20 | <20 |
| Benzene | µg/L | 100 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | µg/L | 200 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 |
| Bromoform | µg/L | 60 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 |
| Bromomethane (Methyl bromide) | µg/L | 0.9 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | µg/L | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 |
| Carbon tetrachloride | µg/L | - | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | - | <0.5 | <0.5 | <0.5 | <0.2 | - | <0.5 | <0.5 | <0.5 |
| Chlorobenzene | µg/L | 15 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| Chloroethane | µg/L | - | <1 | <1 | <1 | - | <5 | <1 | <1 | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 |
| Chloroform (Trichloromethane) | µg/L | - | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 |
| Chloromethane (Methyl chloride) | µg/L | 700 | <1 | <1 | <1 | - | <5 | <1 | <1 | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | µg/L | 200 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | µg/L | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene/trans-1,3-Dichloropropene | µg/L | - | - | - | - | - | <0.5 | - | - | - | - | - | <0.5 | - | - | - | - | <0.5 | - | - | - | - |
| Dibromochloromethane | µg/L | 40 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 |
| Dichlorodifluoromethane (CFC-12) | µg/L | - | <1 | <1 | <1 | <2 | <2 | <1 | <1 | <1 | <1 | <1 | <2 | - | <1 | <1 | <1 | <2 | - | <1 | <1 | <1 |
| Ethylbenzene | µg/L | 8 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.83** | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| Hexane | µg/L | - | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | - | <0.5 | <0.5 | <0.5 | <1 | - | <0.5 | <0.5 | <0.5 |
| m&p-Xylenes | µg/L | -- | <1 | <1 | <1 | <0.5 | <0.5 | <1 | **1.5** | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 |
| Methyl tert butyl ether (MTBE) | µg/L | 200 | <0.5 | <0.5 | <0.5 | <2 | <2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <2 | - | <0.5 | <0.5 | <0.5 | <2 | - | <0.5 | <0.5 | <0.5 |
| Methylene chloride | µg/L | 100 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 |
| o-Xylene | µg/L | 40 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.73** | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| Styrene | µg/L | 4 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | µg/L | 50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| Toluene | µg/L | 0.8 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **4.12** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | µg/L | 200 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | µg/L | 7 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| Trichloroethene | µg/L | 20 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11) | µg/L | - | <1 | <1 | <1 | <5 | <5 | <1 | <1 | <1 | <1 | <1 | <5 | - | <1 | <1 | <1 | <5 | - | <1 | <1 | <1 |
| Trihalomethanes | µg/L | - | <2 | <2 | <2 | - | - | <2 | <2 | <2 | <2 | <2 | - | - | <2 | <2 | <2 | - | - | <2 | <2 | <2 |
| Vinyl chloride | µg/L | 600 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 |
| Xylenes (total) | µg/L | -- | <1.1 | <1.1 | <1.1 | <0.5 | <0.5 | <1.1 | **2.3** | <1.1 | <1.1 | <1.1 | <0.5 | - | <1.1 | <1.1 | <1.1 | <0.5 | - | <1.1 | <1.1 | <1.1 |

Notes:

(1) Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) PWQO objectives for individual xylene isomers have been combined. PWQO objective for Xylene-m is 2 ug/L. The PWQO objective for Xylene-p is 30 ug/L.

(b) PWQO objectives for individual xylene isomers have been combined. PWQO objective for Xylene-m is 2 ug/L. The PWQO objective for Xylene-p is 30 ug/L. The PWQO objective for Xylene-o is 40 ug/L.

\- Parameter not analyzed / no information
-- No guideline.
< Parameter detected below the laboratory method detection limit
**36.0** Parameter exceeds the PWQO.

**Table 6.7**

**Volatile Organic Compounds**
**Surface Water Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SW3 | SW3 | SW4 | SW4 | SW4 | SW4 | SW4 | SW5 | SW5 | SW5 | SW5 | SW5 | SW6 | SW6 | SW6 | SW6 | SWP-1 | SWP-1 | SWP-1 | SWP-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | SW 3 | SW WARD2-12/5/22-04 | SW-WARD2-041017-001 | SW-WARD2-112417-007 | SW-WARD2-110318-004 | SW 4 | SW WARD2-12/5/22-07 | SW-WARD2-041017-010 | SW-WARD2-112417-001 | SW-WARD2-110318-008 | SW 5 | SW WARD2-12/5/22-02 | SW-WARD2-041017-008 | SW-WARD2-112417-010 | SW-WARD2-110318-006 | SW 6 | SW-WARD2-041017-003 | SW-WARD2-112417-006 | SW-WARD2-110318-002 | SWP LANDFILL |
| **Sample Date:** | | | 11/29/2020 | 12/5/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/29/2020 | 12/5/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/29/2020 | 12/5/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/29/2020 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/29/2020 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | µg/L | 20 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | µg/L | 10 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | µg/L | 70 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | µg/L | 800 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | µg/L | 200 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | µg/L | 40 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 5 | <0.2 | - | <0.2 | <0.2 | <0.2 | <0.2 | - | <0.2 | <0.2 | <0.2 | <0.2 | - | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 1,2-Dichlorobenzene | µg/L | 2.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | µg/L | 100 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | µg/L | 0.7 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | µg/L | 2.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | µg/L | 4 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK) | µg/L | 400 | <20 | - | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | µg/L | - | - | - | <20 | <20 | <20 | - | - | <20 | <20 | <20 | - | - | <20 | <20 | <20 | - | <20 | <20 | <20 | - |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK) | µg/L | - | <20 | - | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | µg/L | - | <30 | - | <20 | <20 | <20 | <30 | - | <20 | <20 | <20 | <30 | - | <20 | <20 | <20 | <30 | <20 | <20 | <20 | <30 |
| Benzene | µg/L | 100 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | µg/L | 200 | <0.5 | - | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <0.5 |
| Bromoform | µg/L | 60 | <0.5 | - | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <0.5 |
| Bromomethane (Methyl bromide) | µg/L | 0.9 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | µg/L | - | - | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - | <1 | <1 | <1 | - |
| Carbon tetrachloride | µg/L | - | <0.2 | - | <0.5 | <0.5 | <0.5 | <0.2 | - | <0.5 | <0.5 | <0.5 | <0.2 | - | <0.5 | <0.5 | <0.5 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 |
| Chlorobenzene | µg/L | 15 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | µg/L | - | - | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - | <1 | <1 | <1 | - |
| Chloroform (Trichloromethane) | µg/L | - | <0.5 | - | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <0.5 |
| Chloromethane (Methyl chloride) | µg/L | 700 | - | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - | - | <1 | <1 | <1 | - | <1 | <1 | <1 | - |
| cis-1,2-Dichloroethene | µg/L | 200 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | µg/L | - | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene/trans-1,3-Dichloropropene | µg/L | - | <0.5 | - | - | - | - | <0.5 | - | - | - | - | <0.5 | - | - | - | - | <0.5 | - | - | - | <0.5 |
| Dibromochloromethane | µg/L | 40 | <0.5 | - | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <0.5 |
| Dichlorodifluoromethane (CFC-12) | µg/L | - | <2 | - | <1 | <1 | <1 | <2 | - | <1 | <1 | <1 | <2 | - | <1 | <1 | <1 | <2 | <1 | <1 | <1 | <2 |
| Ethylbenzene | µg/L | 8 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexane | µg/L | - | <1 | - | <0.5 | <0.5 | <0.5 | <1 | - | <0.5 | <0.5 | <0.5 | <1 | - | <0.5 | <0.5 | <0.5 | <1 | <0.5 | <0.5 | <0.5 | <1 |
| m&p-Xylenes | µg/L | -- | <0.5 | - | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 | <0.5 | - | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <0.5 |
| Methyl tert butyl ether (MTBE) | µg/L | 200 | <2 | - | <0.5 | <0.5 | <0.5 | <2 | - | <0.5 | <0.5 | <0.5 | <2 | - | <0.5 | <0.5 | <0.5 | <2 | <0.5 | <0.5 | <0.5 | <2 |
| Methylene chloride | µg/L | 100 | <0.5 | <0.5 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <0.5 | <2 | <2 | <2 | <0.5 |
| o-Xylene | µg/L | 40 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | µg/L | 4 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | µg/L | 50 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | µg/L | 0.8 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | µg/L | 200 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | µg/L | 7 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | µg/L | 20 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11) | µg/L | - | <5 | - | <1 | <1 | <1 | <5 | - | <1 | <1 | <1 | <5 | - | <1 | <1 | <1 | <5 | <1 | <1 | <1 | <5 |
| Trihalomethanes | µg/L | - | - | - | <2 | <2 | <2 | - | - | <2 | <2 | <2 | - | - | <2 | <2 | <2 | - | <2 | <2 | <2 | - |
| Vinyl chloride | µg/L | 600 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 |
| Xylenes (total) | µg/L | -- | <0.5 | - | <1.1 | <1.1 | <1.1 | <0.5 | - | <1.1 | <1.1 | <1.1 | <0.5 | - | <1.1 | <1.1 | <1.1 | <0.5 | <1.1 | <1.1 | <1.1 | <0.5 |

Notes:

(1) Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) PWQO objectives for individual xylene isomers have been combined. PWQO objective for Xylene-m is 2 ug/L. The PWQO objective for Xylene-p is 30 ug/L.

(b) PWQO objectives for individual xylene isomers have been combined. PWQO objective for Xylene-m is 2 ug/L. The PWQO objective for Xylene-p is 30 ug/L. The PWQO objective for Xylene-o is 40 ug/L.

\- Parameter not analyzed / no information
-- No guideline.
< Parameter detected below the laboratory method detection limit
**36.0** Parameter exceeds the PWQO.

**Table 6.7**

**Volatile Organic Compounds**
**Surface Water Analytical Results**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SWP-1 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 |
|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | SW WARD2-12/5/22-08 | SW-WARD2-041017-004 | SW-WARD2-112417-005 | SW-WARD2-110318-010 | SWP ENTRANCE | SW WARD2-12/5/22-05 |
| Sample Date: | | | 12/5/2022 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/29/2020 | 12/5/2022 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | |
| **Volatiles** | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | µg/L | 20 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| 1,1,1-Trichloroethane | µg/L | 10 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| 1,1,2,2-Tetrachloroethane | µg/L | 70 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| 1,1,2-Trichloroethane | µg/L | 800 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| 1,1-Dichloroethane | µg/L | 200 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| 1,1-Dichloroethene | µg/L | 40 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 5 | - | <0.2 | <0.2 | <0.2 | <0.2 | - |
| 1,2-Dichlorobenzene | µg/L | 2.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| 1,2-Dichloroethane | µg/L | 100 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| 1,2-Dichloropropane | µg/L | 0.7 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| 1,3-Dichlorobenzene | µg/L | 2.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| 1,4-Dichlorobenzene | µg/L | 4 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK) | µg/L | 400 | - | <20 | <20 | <20 | <20 | - |
| 2-Hexanone | µg/L | - | - | <20 | <20 | <20 | - | - |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK) | µg/L | - | - | <20 | <20 | <20 | <20 | - |
| Acetone | µg/L | - | - | <20 | <20 | <20 | <30 | - |
| Benzene | µg/L | 100 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | µg/L | 200 | - | <1 | <1 | <1 | <0.5 | - |
| Bromoform | µg/L | 60 | - | <1 | <1 | <1 | <0.5 | - |
| Bromomethane (Methyl bromide) | µg/L | 0.9 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| Carbon disulfide | µg/L | - | - | <1 | <1 | <1 | - | - |
| Carbon tetrachloride | µg/L | - | - | <0.5 | <0.5 | <0.5 | <0.2 | - |
| Chlorobenzene | µg/L | 15 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| Chloroethane | µg/L | - | - | <1 | <1 | <1 | - | - |
| Chloroform (Trichloromethane) | µg/L | - | - | <1 | <1 | <1 | <0.5 | - |
| Chloromethane (Methyl chloride) | µg/L | 700 | - | <1 | <1 | <1 | - | - |
| cis-1,2-Dichloroethene | µg/L | 200 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| cis-1,3-Dichloropropene | µg/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| cis-1,3-Dichloropropene/trans-1,3-Dichloropropene | µg/L | - | - | - | - | - | <0.5 | - |
| Dibromochloromethane | µg/L | 40 | - | <1 | <1 | <1 | <0.5 | - |
| Dichlorodifluoromethane (CFC-12) | µg/L | - | - | <1 | <1 | <1 | <2 | - |
| Ethylbenzene | µg/L | 8 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| Hexane | µg/L | - | - | <0.5 | <0.5 | <0.5 | <1 | - |
| m&p-Xylenes | µg/L | -- | - | <1 | <1 | <1 | <0.5 | - |
| Methyl tert butyl ether (MTBE) | µg/L | 200 | - | <0.5 | <0.5 | <0.5 | <2 | - |
| Methylene chloride | µg/L | 100 | <0.5 | <2 | <2 | <2 | <0.5 | <0.5 |
| o-Xylene | µg/L | 40 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| Styrene | µg/L | 4 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| Tetrachloroethene | µg/L | 50 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| Toluene | µg/L | 0.8 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | µg/L | 200 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| trans-1,3-Dichloropropene | µg/L | 7 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| Trichloroethene | µg/L | 20 | - | <0.5 | <0.5 | <0.5 | <0.5 | - |
| Trichlorofluoromethane (CFC-11) | µg/L | - | - | <1 | <1 | <1 | <5 | - |
| Trihalomethanes | µg/L | - | - | <2 | <2 | <2 | - | - |
| Vinyl chloride | µg/L | 600 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 |
| Xylenes (total) | µg/L | -- | - | <1.1 | <1.1 | <1.1 | <0.5 | - |

Notes:

(1) Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) PWQO objectives for individual xylene isomers have been combined. PWQO objective for Xylene-m is 2 ug/L. The PWQO objective for Xylene-p is 30 ug/L.

(b) PWQO objectives for individual xylene isomers have been combined. PWQO objective for Xylene-m is 2 ug/L. The PWQO objective for Xylene-p is 30 ug/L. The PWQO objective for Xylene-o is 40 ug/L.

\- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

**36.0** Parameter exceeds the PWQO.

**Table 7.1**

**General Chemistry and Dissolved Metals**
**Groundwater Analytical Results with MABC**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | | | OW3-83 | OW19-89 | OW19-89 | OW19-89 | OW29-07 | OW30-07 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | | | OW3-83 | OW19-89 | OW19-89 | OW19-89 | OW29-07 | OW30-07 |
| Sample Date: | | *ODWS* [1] | MABC [2] | TLP [3] | 5/18/2023 | 5/18/2023 | 5/18/2023 | 11/8/2023 | 11/8/2023 | 11/8/2023 |
| **Parameters** | **Units** | | | | | | | | | |
| **Metals** | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | -- | -- | 122 | 59 | 59 | 61.9 | 68.8 | 113 |
| Iron (dissolved) | mg/L | 0.30 (AO) | 0.16 | 0.3 | 0.028 | 0.009 | 0.009 | 0.026 | 0.037 | 0.07 |
| Magnesium (dissolved) | mg/L | -- | -- | -- | 33.5 | 27.4 | 27.4 | 27.1 | 44.8 | 63.3 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | 0.03 | -- | 0.0263 | 0.00076 | 0.00076 | 0.00334 | 0.0136 | **0.113** |
| Molybdenum (dissolved) | mg/L | -- | -- | -- | - | - | - | - | - | - |
| Phosphorus (dissolved) | mg/L | -- | -- | 0.02 | 0.023 | 0.016 | 0.016 | 1.28 | 0.103 | 0.231 |
| Potassium (dissolved) | mg/L | -- | -- | -- | 0.706 | 10.8 | 10.8 | 9.96 | 1.38 | 9.92 |
| Sodium (dissolved) | mg/L | 200 (AO) | 101 | -- | 5.5 | 13.2 | 13.2 | 21.6 | 24.6 | 44.3 |
| **General Chemistry** | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | -- | -- | 467 | 311 | 311 | 300 | 394 | 583 |
| Ammonia-N | mg/L | -- | -- | -- | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Chloride | mg/L | 250 (AO) | 127 | -- | 3 | 13 | 13 | 16 | 1 | 42 |
| Conductivity | uS/cm | -- | -- | -- | 788 | 577 | 577 | 618 | 726 | 1150 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 (AO) | 3 | -- | 2 | 2 | 2 | 2 | <1 | 3 |
| Hardness | mg/L | 80-100 (OG) | -- | -- | 444 | 260 | 260 | 266 | 356 | 543 |
| Nitrate (as N) | mg/L | 10 | 9.37 | -- | <0.06 | <0.06 | <0.06 | 0.23 | <0.06 | 0.07 |
| Nitrite (as N) | mg/L | 1 | 0.3 | -- | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 (OG) | -- | -- | 7.76 | 8.08 | 8.08 | 7.88 | 7.88 | 7.82 |
| Phenolics (total) | mg/L | -- | -- | 0.005 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Sulfate | mg/L | 500 (AO) | 253 | -- | 4 | 11 | 11 | 17 | 15 | 12 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | -- | -- | <0.5 | <0.5 | <0.5 | 0.9 | <0.5 | 0.7 |
| Un-ionized ammonia | mg/L | -- | -- | 0.02 | - | - | - | - | - | - |
| **Field Parameters** | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | -- | -- | 737 | 590 | 590 | 851 | 869 | 1350 |
| pH, field | s.u. | 6.5-8.5 (OG) | -- | 6.5-8.5 | 7.12 | 7.53 | 7.53 | 7.98 | 7.91 | 7.82 |
| Temperature, field | Deg C | 15 (AO) | -- | -- | 12.7 | 9.8 | 9.8 | 5.17 | 6.38 | 6.69 |

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(3) Trigger Level concentrations (CRA, 2012).
OG Operation Guideline (water treatment and distribution).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
R Rejected.
NM Not Measured.
**36.0** Parameter exceedes the MABC
**36.0** Parameter exceeds the ODWS.

**Table 7.2**

**General Chemistry and Dissolved Metals**
**Groundwater Analytical Results with Trigger Levels**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | | OW3-83 | OW28-00 | OW28-00 | OW32-07 | OW32-07 | OW45-13 | OW45-13 | OW46A-13 | OW46A-13 | OW46B-13 | OW46B-13 | OW47-13 | OW47-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | OW3-83 | OW28-00 | OW28-00 | OW32-07 | OW32-07 | OW45-13 | OW45-13 | OW46A-13 | OW46A-13 | OW46B-13 | OW46B-13 | OW47-13 | OW47-13 |
| **Sample Date:** | | *ODWS* [1] | TLP[2] | 5/18/2023 | 5/18/2023 | 11/8/2023 | 5/18/2023 | 11/8/2023 | 5/18/2023 | 11/8/2023 | 5/18/2023 | 11/8/2023 | 5/18/2023 | 11/8/2023 | 5/18/2023 | 11/8/2023 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | -- | 122 | 90.8 | 114 | 29.6 | 30.2 | 54.9 | 73.5 | 33.4 | 35.2 | 176 | 171 | 111 | 105 |
| Iron (dissolved) | mg/L | 0.30 (AO) | 0.3 | 0.028 | 0.036 | 0.011 | <0.007 | 0.011 | <0.007 | 0.035 | 0.053 | <0.007 | <0.007 | <0.007 | 0.02 | <0.007 |
| Magnesium (dissolved) | mg/L | -- | -- | 33.5 | 21.4 | 25.6 | 15.3 | 16.2 | 28.1 | 32.6 | 20.3 | 22.4 | 48.1 | 40.7 | 39.3 | 37.7 |
| Manganese (dissolved) | mg/L | 0.05 (AO) | -- | 0.0263 | 0.00207 | 0.0006 | 0.00331 | 0.0037 | 0.00858 | **0.0881** | 0.0135 | 0.0125 | 0.0111 | 0.0446 | 0.00305 | 0.00052 |
| Molybdenum (dissolved) | mg/L | -- | -- | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Phosphorus (dissolved) | mg/L | -- | 0.02 | **0.023** | 0.004 | <0.003 | 0.005 | **0.583** | 0.004 | 0.019 | 0.013 | 0.008 | 0.009 | 0.009 | 0.004 | 0.003 |
| Potassium (dissolved) | mg/L | -- | -- | 0.706 | 3.04 | 4.05 | 0.928 | 0.999 | 1.33 | 2.4 | 1.2 | 1.31 | 0.826 | 1.06 | 8.83 | 7.55 |
| Sodium (dissolved) | mg/L | 200 (AO) | -- | 5.5 | 53.8 | 87.9 | 31.8 | 35 | 18 | 22.2 | 18.3 | 20.8 | 8.84 | 13.3 | 4.3 | 3.8 |
| **General Chemistry** | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 (OG) | -- | 467 | 248 | 291 | 191 | 190 | 245 | 279 | 200 | 207 | 564 | 574 | 416 | 370 |
| Ammonia-N | mg/L | -- | -- | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 | 0.2 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 |
| Chloride | mg/L | 250 (AO) | -- | 3 | 68 | 160 | 3 | 3 | 16 | 48 | <1 | <1 | 34 | 30 | 7 | 9 |
| Conductivity | uS/cm | -- | -- | 788 | 734 | 1130 | 376 | 395 | 474 | 682 | 383 | 394 | 1040 | 1150 | 750 | 746 |
| Dissolved organic carbon (D | mg/L | 5.0 (AO) | -- | 2 | 2 | 3 | 1 | 1 | 3 | 5 | 2 | 3 | 3 | 2 | 3 | 2 |
| Hardness | mg/L | 80-100 (OG) | -- | 444 | 315 | 389 | 137 | 142 | 253 | 318 | 167 | 180 | 638 | 596 | 440 | 417 |
| Nitrate (as N) | mg/L | 10 | -- | <0.06 | 1.81 | 7.39 | 0.28 | 0.14 | 0.25 | 0.07 | 0.13 | 0.08 | 5.05 | 5.41 | 4.13 | 4.2 |
| Nitrite (as N) | mg/L | 1 | -- | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.06 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 (OG) | -- | 7.76 | 8.05 | 7.79 | 8.24 | 8.03 | 8 | 7.85 | 8.07 | 7.9 | 7.55 | 7.54 | 7.96 | 7.89 |
| Phenolics (total) | mg/L | -- | 0.005 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Sulfate | mg/L | 500 (AO) | -- | 4 | 66 | 110 | 22 | 20 | 13 | 28 | 12 | 15 | 41 | 36 | 32 | 34 |
| Total kjeldahl nitrogen (TKN | mg/L | -- | -- | <0.5 | <0.5 | <0.5 | <0.5 | 0.6 | <0.5 | <0.5 | 0.6 | 0.7 | 0.9 | <0.5 | <0.5 | <0.5 |
| Un-ionized ammonia | mg/L | -- | 0.02 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Field Parameters** | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | -- | 737 | 851 | 1130 | 441 | 492 | 502 | 659 | 470 | 570 | 1050 | 1310 | 730 | 781 |
| pH, field | s.u. | 6.5-8.5 (OG) | 6.5-8.5 | 7.12 | 7.64 | 7.54 | 7.91 | 7.99 | 7.73 | 7.77 | 7.6 | 8.06 | 6.81 | 7.77 | 7.52 | 7.79 |
| Temperature, field | Deg C | 15 (AO) | -- | 12.7 | 8.97 | 7.83 | 11.44 | 6.05 | 9.95 | 10.1 | 12.38 | 7.22 | 12.52 | 7.87 | 10.12 | 5.47 |

Notes:

| | |
|---|---|
| (1) | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated. |
| (2) | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| -- | No guideline. |
| < | Parameter detected below the laboratory method detection limit. |
| R | Rejected. |
| NM | Not Measured. |
| 36.0 | Parameter exceeds the TLP |
| **36.0** | Parameter exceeds the ODWS. |

**Table 7.3**

**General Chemistry and Dissolved Metals**
**Groundwater Analytical Results with PWQOs**
**2023 Annual Monitoring Report**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SW1 | SW1 | OW48-13 | OW48-13 | OW49-13 | OW49-13 | OW3-83 | OW6-83 | OW19-89 | OW19-89 | OW27-00 | OW27-00 | OW28-00 | OW28-00 | OW46B-13 | OW46B-13 | OW47-13 | OW47-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | **SW1** | **SW1** | **OW48-13** | **OW48-13** | **OW49-13** | **OW49-13** | **OW3-83** | **OW6-83** | **OW19-89** | **OW19-89** | **OW27-00** | **OW27-00** | **OW28-00** | **OW28-00** | **OW46B-13** | **OW46B-13** | **OW47-13** | **OW47-13** |
| **Sample Date:** | | **PWQO[1]** | **5/18/2023** | **11/8/2023** | **5/18/2023** | **11/8/2023** | **5/18/2023** | **11/8/2023** | **5/18/2023** | **5/18/2023** | **5/18/2023** | **11/8/2023** | **5/18/2023** | **11/8/2023** | **5/18/2023** | **11/8/2023** | **5/18/2023** | **11/8/2023** | **5/18/2023** | **11/8/2023** |
| | | | **Upstream** | | | | **Upgradient** | | | | | | | | | | | | | |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | -- | 74.5 | 90.5 | 105 | 103 | 102 | 118 | 122 | 191 | 59 | 61.9 | 134 | 120 | 90.8 | 114 | 176 | 171 | 111 | 105 |
| Iron (dissolved) | mg/L | 0.3 | 0.124 | **1.02** | <0.007 | 0.019 | <0.007 | <0.007 | 0.028 | **17.8** | 0.009 | 0.026 | **3.9** | **2.81** | 0.036 | 0.011 | <0.007 | <0.007 | 0.02 | <0.007 |
| Magnesium (dissolved) | mg/L | -- | 27.7 | 27.8 | 26.5 | 28.5 | 29.8 | 34.4 | 33.5 | 67.2 | 27.4 | 27.1 | 47.9 | 48.2 | 21.4 | 25.6 | 48.1 | 40.7 | 39.3 | 37.7 |
| Manganese (dissolved) | mg/L | -- | 0.0114 | 0.02551 | 0.00067 | 0.00227 | 0.00023 | 0.0011 | 0.0263 | 0.415 | 0.00076 | 0.00334 | 2.84 | 2.38 | 0.00207 | 0.0006 | 0.0111 | 0.0446 | 0.00305 | 0.00052 |
| Molybdenum (dissolved) | mg/L | 0.04 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Phosphorus (dissolved) | mg/L | 0.03 (e) | 0.018 | **0.122** | <0.003 | <0.003 | <0.003 | <0.003 | 0.023 | **0.066** | 0.016 | **1.28** | 0.004 | <0.003 | 0.004 | <0.003 | 0.009 | 0.009 | 0.004 | 0.003 |
| Potassium (dissolved) | mg/L | -- | 1.48 | 3.82 | 0.818 | 0.669 | 0.506 | 0.55 | 0.706 | 17.7 | 10.8 | 9.96 | 0.443 | 0.385 | 3.04 | 4.05 | 0.826 | 1.06 | 8.83 | 7.55 |
| Sodium (dissolved) | mg/L | -- | 8.55 | 6.19 | 5.07 | 2.66 | 1.65 | 2.36 | 5.5 | 32.7 | 13.2 | 21.6 | 33.9 | 32.7 | 53.8 | 87.9 | 8.84 | 13.3 | 4.3 | 3.8 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | -- | 234 | 281 | 407 | 362 | 345 | 387 | 467 | 831 | 311 | 300 | 466 | 480 | 248 | 291 | 564 | 574 | 416 | 370 |
| Ammonia-N | mg/L | -- | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 16.1 | <0.1 | <0.1 | 0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Chloride | mg/L | -- | 15 | 19 | 9 | 4 | 11 | 12 | 3 | 42 | 13 | 16 | 56 | 58 | 68 | 160 | 34 | 30 | 7 | 9 |
| Conductivity | uS/cm | -- | 507 | 558 | 760 | 681 | 656 | 780 | 788 | 1450 | 577 | 618 | 976 | 1030 | 734 | 1130 | 1040 | 1150 | 750 | 746 |
| Dissolved organic carbon (DOC) | mg/L | -- | 4 | 5 | 1 | 1 | 2 | 1 | 2 | 11 | 2 | 2 | 6 | 6 | 2 | 3 | 3 | 2 | 3 | 2 |
| Hardness | mg/L | -- | 300 | 340 | 372 | 376 | 379 | 438 | 444 | 755 | 260 | 266 | 531 | 498 | 315 | 389 | 638 | 596 | 440 | 417 |
| Nitrate (as N) | mg/L | -- | 1.79 | 3.66 | 1 | 2.83 | 5.89 | 7.58 | <0.06 | 0.13 | <0.06 | 0.23 | <0.06 | <0.06 | 1.81 | 7.39 | 5.05 | 5.41 | 4.13 | 4.2 |
| Nitrite (as N) | mg/L | -- | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| pH | s.u. | 6.5-8.5 | 8.44 | 8.2 | 7.89 | 7.86 | 7.94 | 7.77 | 7.76 | 7.39 | 8.08 | 7.88 | 7.71 | 7.78 | 8.05 | 7.79 | 7.55 | 7.54 | 7.96 | 7.89 |
| Phenolics (total) | mg/L | 0.001 | <0.001 | <0.001 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Sulfate | mg/L | -- | 35 | 20 | 6 | 4 | 4 | 8 | 4 | 11 | 11 | 17 | 31 | 12 | 66 | 110 | 41 | 36 | 32 | 34 |
| Total kjeldahl nitrogen (TKN) | mg/L | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 16.2 | <0.5 | 0.9 | 0.7 | 0.8 | <0.5 | <0.5 | 0.9 | <0.5 | <0.5 | <0.5 |
| Un-ionized ammonia | mg/L | 0.02 (g) | <0.00535 | <0.00509 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | -- | 491 | 623 | 707 | 689 | 686 | 781 | 737 | 1240 | 590 | 851 | - | 1030 | 851 | 1130 | 1050 | 1310 | 730 | 781 |
| pH, field | s.u. | 6.5-8.5 | 8.25 | 8.5 | 7.4 | 7.55 | 7.46 | 7.5 | 7.12 | 7.18 | 7.53 | 7.98 | - | 7.35 | 7.64 | 7.54 | 6.81 | 7.77 | 7.52 | 7.79 |
| Temperature, field | Deg C | -- | 14.21 | 6.18 | 11.49 | 9.24 | 11.34 | 8.88 | 12.7 | 15.02 | 9.8 | 5.17 | - | 8.86 | 8.97 | 7.83 | 12.52 | 7.87 | 10.12 | 5.47 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (g) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| (h) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| - | Parameter not analyzed / no information |
| -- | No guideline. |
| < | Parameter detected below the laboratory method detection limit |
| NM | Not Measured. |
| R | Rejected. |
| **36.0** | Parameter exceeds the PWQO. |

# Appendices

# Appendix A

## Environmental Compliance Approval

Ministry of the Environment
Environmental Assessment and
Approvals Branch
2 St. Clair Avenue West
Floor 12A
Toronto ON M4V 1L5
Fax: (416) 314-8452
Telephone: (416) 314-8183

Ministère de l'Environnement
Direction des évaluations
environnementales et des autorisations
2, avenue St. Clair ouest
étage 12A
Toronto ON M4V 1L5
Télécopieur: (416) 314-8452
Téléphone : (416) 314-8183

Ontario

July 10, 2000

John deRosenroll, Chief Administrative Officer
Municipality of Kincardine
707 Queen St.
Kincardine-Bruce-Tiverton, Ontario
N2Z 1Z9

Dear Sir/Madam:

**Re: Application for Approval of Waste Disposal Sites**
**Municipality of Kincardine**
**Kincardine-Bruce-Tiverton Township, County Of Bruce**
**MOE Reference Number 4041-4J4QMS**

Enclosed is a Notice which amends Provisional Certificate of Approval No. A272702 for use and operation of a 12 hectare landfilling site. Approval is granted for the Township of Kincardine (now Municipality of Kincardine), Waste Disposal Site, Revised Plan of Development and Operation - Phase I and II, as required by Condition No. 2 of above-noted Certificate of Approval

If you have any questions regarding the above, please contact me at the above phone number.

Yours truly,

George W. Lai, P. Eng.
Senior Engineer

THIS IS A TRUE COPY OF THE ORIGINAL SIGNED BY ME
ON JUL 12
SIGNED

c: District Manager, MOE Owen Sound
Brad Pryde, Stantec Consulting Ltd.

Ontario

Ministry of the Environment | Ministère de l'Environnement

*AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL*
*WASTE DISPOSAL SITE*
*NUMBER A 272702*
*Notice No. 1*

JOHN DEROSENROLL, CAO
Municipality of Kincardine
707 Queen St.
Kincardine-Bruce-Tiverton, Ontario
N2Z 1Z9

Site Location: Pt. of Lot 15, Con. V
Township of Kincardine, County Of Bruce

*You are hereby notified that I have amended Provisional Certificate of Approval No. A 272702 issued on December 17, 1980 and as amended on May 26, 1987 and February 16, 1993 for for use and operation of a hectare landfilling site, as follows:*

**Change of Name**

The name "Township of Kincardine" on Page 1 of the above-noted Certificate of Approval is revoked and replaced by "Municipality of Kincardine".

**Plan of Operation**

Approval is granted, as required by Condition No. 2 of above-noted Certificate of Approval, for the Township of Kincardine (now Municipality of Kincardine), Waste Disposal Site, Revised Plan of Development and Operation - Phase I and II, in accordance with the documents listed in Schedule "A" of this Notice:

**SCHEDULE "A"**

1. Memorandum dated March 31, 1999 from Jeff Markel, Hydrogeologist, Technical Support to Phil Bye, Supervisor, Owen Sound Area Office, MOE, Re: Township of Kincardine Waste Disposal Site, C. of A. No. A272702, Waste Disposal Site, Township of Kincardine.

2. Letter dated May 18, 1999 from Larry Struthers, Owen Sound Area Office, MOE to John deRosenroll, Administrator, Township of Kincardine-Bruce-Tiverton regarding Mr. Markel's comments and necessary modifications to the Plan of Development and Operation - Phase I and II, Waste Disposal Site, former Township of Kincardine.

3. Letter dated June 15, 1999 from Brad R. Pryde, P. Eng., Vice President, Stantec Consulting Ltd. to Mr. Larry Struthers, Owen Sound District, MOE requesting from MOE for elimination of the existing service area boundaries for the three landfill sites which are now located within the amalgamated Municipality of the Township of Kincardine-Bruce-Tiverton.

4. Letter dated July 16, 1999 from Larry Struthers, Owen Sound Area Office, MOE to Stantec Consulting Ltd. regarding service boundaries for the three landfill sites within the Township of Kincardine-Bruce-Tiverton.

5. Revised Plan of Development and Operation - Phase I and II, Waste Disposal Site, Township of Kincardine, prepared for the Township of Kincradine-Bruce-Tiverton by Stantec Consulting Ltd., dated December, 1998, revised October, 1999

6. Application dated January 27, 2000 and signed by John deRosenroll, Chief Administrative Officer, Municipality of Kincardine

7. Letter dated February 11, 2000 from Brad R. Pryde, P. Eng., Branch Manager, Stantec Consulting Ltd. to Approvals Branch, MOE, requesting an amendment to the current Certificate of Approval No. A272702 to incorporate the report "Revised Plan of Development and Operation - Phase I and II".

All Conditions on the original Certificate of Approval and as amended, which are not affected by this Notice, remain in effect.

**This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No.A 272702 dated December 17, 1980..**

*In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, you may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. Section 142 of the Environmental Protection Act, provides that the Notice requiring the hearing shall state:*

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

*The Notice should also include:*

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

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

*This Notice must be served upon:*

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

AND

The Director
Section 39, *Environmental Protection Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

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

*The above noted waste disposal site is approved under Section 39 of the Environmental Protection Act.*

DATED AT TORONTO this 10th day of July, 2000

JUL 12

MA

(Signed)

Andrzej Dominski, P.Eng.
Director
Section 39, *Environmental Protection Act*

GL/

c: District Manager, MOE Owen Sound
Brad Pryde, Stantec Consulting Ltd.

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

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

250 Davisville Avenue
Toronto, Ontario
M4S 1H2

250, avenue D
Toronto (Ontar
M4S 1H2

February 16, 1993



Township of Kincardine
R.R. #5
Kincardine, Ontario
N2Z 2X6

ATTENTION: Mrs. Muriel Eskrick,
Clerk-Treasurer

Dear Mrs. Eskrick:

Re: WASTE DISPOSAL SITE
PROVISIONAL CERTIFICATE OF APPROVAL NO. A 272702
NOTICE OF AMENDMENT

Enclosed is a copy of the Notice of Amendment for the above mentioned Certificate of Approval. The Notice provides for the change of date within Condition 2 from "June 30, 1987" to "June 30, 1994" and the addition of Condition 7 to the Certificate of Approval which requires an annual report be submitted by the municipality to the Ministry of the Environment regarding the above waste disposal site.

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

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

Yours truly,

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

Encl.
JAK/es

cc: D. McTavish, Director, MOE Southwestern Region
W. Page, District Officer, MOE Owen Sound District Office

Ministry of the Environment / Ministère de l'Environnement

Ontario



TO: Township of Kincardine
R.R. #5
Kincardine, Ontario
N2Z 2X6

*You are hereby notified that the terms and conditions of Provisional Certificate of Approval No. A* 272702, *dated* May 26, 1987, are amended as follows:

i. The Provisional Certificate of Approval No. A 272702 is amended by deleting "to this Ministry by June 30, 1987" as contained within Condition 2 and replacing it with "to this Ministry by June 30, 1994"; and,

ii. The addition of the following condition:

7. The municipality shall submit an annual report prepared by their consultant to the Owen Sound District Officer, Ministry of the Environment, addressing the following requirements:

i) volumes of waste received, remaining capacity and site life expectancy;

ii) review of operating procedures, and any deficiencies therein;

iii) the results of any surface water or groundwater monitoring programs which may be initiated; and

iv) the extent and success of the recycling program established by the town.

This report is to be submitted each year by April 30th, commencing April 30, 1993.

*The reasons for these amendments are as follows:*

i. To provide the Township of Kincardine with time to complete and review their consultants report prior to submitting it to the Owen Sound District Office; and,

ii. The reason for condition (7) is to ensure that the necessary studies are completed in order to ensure the protection of the natural environment.

Ontario

Ministry of the Environment | Ministère de l'Environnement



*You may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. Section 142 of the Environmental Protection Act, R.S.O. 1990 c. E-19, provides that the Notice requiring the hearing shall state:*

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

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

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

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

*This Notice must be served upon:*

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

<u>AND</u>

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

*DATED AT TORONTO this* 16th *day of* February, 1993.

T.D. Armstrong, P. Eng.
Director
Section 39
Environmental Protection Act

Ministry of the Environment
Ministère de l'Environnement
Ontario

# Provisional Certificate of Approval for a Waste Disposal Site
# *Certificat provisoire d'autorisation du lieu d'élimination des déchets*

Provisional Certificate of Approval No. A 272702
*Certificat provisoire d'autorisation nº*

Page 1 of 1
*page de*

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

*Aux termes de la Loi sur la protection de l'environnement et des règlements y afférents et sous réserve des restrictions qui s'appliquent, ce Certificat provisoire d'autorisation est délivré à:*

Township of Kincardine
P.O. Box 14, R.R. #5
Kincardine, Ontario
N0G 2G0

COPY OF THE ORIGINAL CERTIFICATE MAILED ON May 27/87

(Signed)

for the use and operation of a 12 hectare landfilling site

all in accordance with the following plans and specifications:

Application dated November 18, 1970 and supporting documentation

Located: Part of Lot 15, Concession 5
Township of Kincardine
County of Bruce

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 "other" waste limited to metal wire, brush and tree stumps

and subject to the following conditions:

1. This certificate of approval shall be registered on the title to the lands comprising the waste disposal site. No operation shall be carried out at the site after sixty days from this condition becoming enforceable unless this Certificate including the reasons for this condition has been registered by the applicant as an instrument in the appropriate Land Registry Office against title to the site and a duplicate registered copy thereof returned by the applicant to the Director, Environmental Approvals and Land Use Planning Branch, Ministry of the Environment.

2. A plan of operation, satisfactory to the Ministry of the Environment, outlining the proposal for continued landfilling operations to the capacity of this waste disposal site, and ensuring that there will be no adverse environmental impacts off of the site, is to be completed by the Municipal operating authority and submitted to this Ministry by June 30, 1987 for approval.

3. No waste other than segregated brush, lumber and clean wood is to be burned at the site.

4. Access to the burning area by the public and other unauthorized personnel is prohibited when burning is in progress.

5. Burning is not to be carried out, at the site, unless proper supervision is provided by the operating authority.

6. All waste metals and waste metal products are to be segregated, from the other wastes, and maintained in a segregated state or landfilled by June 30, 1987.

26th May 87

Dated this day of 19
*date de jour de*

Director, Section 39
Environmental Protection Act
*Directeur, Section 39*

Ministry of the Environment
Ontario

# NOTICE

TO: Township of Kincardine
P.O. Box 14, R.R. #5
Kincardine, Ontario
N0G 2G0

You are hereby notified that Provisional Certificate of Approval No. A 272702 has been issued to you subject to the conditions outlined therein.

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

1. The reason for condition 1 requiring registration of the Certificate is that Section 45 of the Environmental Protection Act, prohibits any use being made of the lands after they cease to be used for waste disposal purposes within a period of twenty-five years from the year in which such land ceased to be used unless the approval of the Minister for the proposed use has been given. The purpose of this prohibition is to protect future occupants of the site and the environment from any hazards which might occur as a result of waste being disposed of on the site. This prohibition and potential hazard should be drawn to the attention of future owners and occupants by the Certificate being registered on title.

2. The reason for condition 2 is to ensure that the waste disposal site is operated and developed in an orderly manner.

3. The reason for condition 3 is to ensure no waste is burned which would result in unacceptable emissions of air contaminants and create a nuisance to the public.

4. The reason for conditions 4 and 5 is to ensure restricted access to the burning site and proper supervision of the burning activities, to ensure it is carried out in an acceptable manner under suitable conditions and that only approved types of waste are burned.

5. The reason for condition 6 is to ensure that the existing metal waste area does not contain non-metal wastes which restricts proper recycling of metal wastes and contributes to unacceptable site operations in terms of waste segregation.

The use and operation of the site without these conditions may create a danger to the health or safety of any person.

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

This Notice should be served upon:

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

AND

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

Dated at Toronto this 26th day of May, 1987.

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

THIS IS A TRUE COPY OF THE
ORIGINAL NOTICE MAILED
ON May 27/87

4074

Ontario

Ministry of the Environment
Ministère de l'Environnement

**AMENDED PROVISIONAL CERTIFICATE OF APPROVAL**
**WASTE DISPOSAL SITE**
NUMBER A272702
Issue Date: June 1, 2011

The Corporation of the Municipality of Kincardine
1475 Concession 5
Rural Route, No. 5
Kincardine, Ontario
N2Z 2X6

Rec'd. CRA
JUL 1 1 2011

Site Location: 437 Sideroad 15 N
R.R. # 5
Lot 15, Concession 5
Kincardine Municipality, County of Bruce
N2Z 2X6

*You have applied in accordance with Section 27 of the Environmental Protection Act for approval of:*

the use and operation of a 5.5 hectare landfilling site and a Materials Recovery Centre, within a total site area of 40.5 hectares.

*For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:*

"*Crown* " means Her Majesty the Queen in the Right of Ontario;

"*Certificate* " means this entire provisional Certificate of Approval document, issued in accordance with section 39 of the *EPA* , and includes any schedules to it, the application and the supporting documentation listed in schedule "A;

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

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

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

"*Ministry* " means the Ontario Ministry of the Environment;

"*Operator* " has the same meaning as "operator" as defined in s.25 of the *EPA* ;

"*Owner* " means the Corporation of the Municipality of Kincardine and its successors and assigns;

"*PA* " means the *Pesticides Act* , R.S.O. 1990, c. P-11, as amended from time to time;

"*Provincial Officer* " means any person designated in writing by the Minister as a provincial officer pursuant to section 5 of the *OWRA* or section 5 of the *EPA* or section 17 of *PA* .

"*Refrigerant Appliances* " means household appliances which use, or may use refrigerants, and which include, but is not restricted to, refrigerators, freezers and air-conditioning systems.

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

"*Regulation 232* " or "*Reg. 232* " means Ontario Regulation 232/98 made under the *EPA* , as amended from time to time;

"*Regulation 347* " or "*Reg. 347* " means Regulation 347, R.R.O. 1990, made under the *EPA* , as amended from time to time;

"*Site* " means the entire waste disposal site, including the buffer lands, and Material Recovery Centre, located at 437 Sideroad 15, R.R.5, comprised of Part Lot 15, Concession 5, Municipality of Kincardine, Bruce County, approved by this *Certificate* .

"*SVCA* " means Saugeen Valley Conservation Authority

"*Waste electrical and electronic equipment* " means devices listed in Schedules 1 through 7 of Ontario Regulation 393/04.

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

**TERMS AND CONDITIONS**

## 1. GENERAL

1.1 This *Certificate* revokes all previously issued Provisional Certificates of Approval issued under Part V of the *EPA* for this *Site* . The approval given herein including the terms and conditions set out replaces all previously issued approvals and related terms and conditions under Part V of the *EPA* for this *Site* .

1.2. The *Site* shall be developed, operated and maintained in accordance with all of the plans and specifications in the documents listed in Schedule "A". Should there be discrepancies between the documents listed in Schedule "A" and the conditions in this Certificate, the conditions shall take precedence. Should there be discrepancies between the documents listed in Schedule "A", the document bearing the most recent date shall take precedence.

1.3 Requirements specified in this *Certificate* are minimum requirements and do not abrogate the need to take all reasonable steps to avoid violating the provisions of other applicable legislation. The *Owner* shall ensure compliance with all the terms and conditions of this *Certificate* . Any non-compliance constitutes a violation of the *EPA* and is grounds for enforcement.

1.4 The requirements of this *Certificate* are severable. If any requirements of this *Certificate* to any circumstances is held invalid, the application of such requirement to other circumstances and the remainder of this Certificate shall not be affected thereby.

1.5 The *Owner* shall ensure that all communications/correspondence made pursuant to this *Certificate* includes reference to this Provisional Certificate of Approval number.

**Compliance**

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

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

**Other Legal Obligations**

1.8 The issuance of, and compliance with, this *Certificate* does not:

a. relieve any person of any obligation to comply with any provision of the *EPA* or any other applicable statute, regulation or other legal requirement; or
b. limit in any way the authority of the *Ministry* to require certain steps be taken or to request that any further information related to compliance with this *Certificate* be provided to the *Ministry* ;

unless a provision of this *Certificate* specifically refers to the other requirement or authority and clearly states that the other requirement or authority is to be replaced or limited by this *Certificate* .

**Adverse Effect**

1.9 The *Owner* and *Operator* shall take all reasonable steps to minimize and ameliorate any adverse effect or impairment of water quality resulting from the operation of the *Site* , including such accelerated or additional monitoring as may be necessary to determine the nature of the effect or impairment.

1.10 The *Owner* or *Operator* shall remain responsible for any contravention of any other condition of this *Certificate* or any applicable statute, regulation, or other legal requirement resulting from any act or omission that caused the adverse effect or impairment of water quality.

**Notification of changes**

1.11 The *Owner* shall notify the *Director* in writing of any of the following changes within thirty (30) days of the change occurring:

a. change of *Owner* or *Operator* of the *Site* or both;
b. change of address or address of the new *Owner* ;
c. change of partners where the *Owner* or *Operator* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Business Names Act* , 1991 shall be included in the notification to the *Director* ;
d. any change of name of the corporation where the *Owner* or *Operator* is or at any time becomes a corporation, and a copy of the most current "Initial Notice or Notice of Change" (Form 1 or 2 of O. Reg. 182, Chapter C-39, R.R.O. 1990 as amended from time to time), filed under the *Corporations Information Act* shall be included in the notification to the *Director* ; and
e. change in directors or officers of the corporation where the *Owner* or *Operator* is or at any time becomes a corporation, and a copy of the most current "Initial Notice or Notice of Change" as referred to in 1.11(d).

1.12 In the event of any changes in ownership of the *Site* , the *Owner* shall notify, in writing, the succeeding owner of the existence of this *Certificate* , and a copy of such written notice shall be forwarded to the *Director* and the *District Manager* .

**No Transfer or Encumbrance**

1.13 No portion of this *Site* shall be transferred or encumbered prior to or after closing of the *Site* unless the *Director* is notified in advance and is satisfied with the arrangements made to ensure that all conditions of this *Certificate* will be carried out. If the transfer is to be to a private corporation, sufficient financial assurance must be deposited with the *Ministry* to ensure that these conditions will be carried out.

**Inspections**

1.14 The *Owner* shall allow *Ministry* personnel, or a *Ministry* authorized representative(s), upon presentation of credentials, to:

a. carry out any and all inspections authorized by the *EPA* , the *Ontario Water Resources Act* , R.S.O. 1990, or the *Pesticides Act* , R.S.O. 1990, as amended from time to time, of any place to which this Certificate relates, and

b. without restricting the generality of the foregoing to:

i. enter upon the premises or the location where the records required by the conditions of this *Certificate* are kept;
ii. have access to and copy, at any reasonable time, any records required by the conditions of this *Certificate* ;
iii. inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices or operations required by the conditions of this *Certificate* , and

iv. sample and monitor, at reasonable times, for the purposes of assuring compliance with the conditions of this *Certificate* .

**Release of Information**

1.15 The *Owner* shall, forthwith upon request of the *Director* , *District Manager* , or Provincial Officer (as defined in the *EPA* ):

a. furnish any information requested by such persons with respect to compliance with the *Certificate* , including but not limited to, any records required to be kept under this *Certificate* ; and

b. in the event, the Owner provides the *Ministry* with information, records, documentation or notification in accordance with this Certificate (for the purposes of this Condition referred to as "Information"),

i. the receipt of Information by the *Ministry* ;
ii. the acceptance by the *Ministry* of the Information's completeness or accuracy; or
iii. the failure of the *Ministry* to prosecute the *Owner* , or to require the *Owner* to take any action, under this *Certificate* or any statute or regulation in relation to the Information shall not be construed as an approval, excuse or justification be the *Ministry* of any act omission of the Owner relating to the Information, amounting to non-compliance with this *Certificate* or any statute or regulation.

1.16 Any information relating to this *Certificate* and contained in *Ministry* files may be made available to the public in accordance with the provisions of the *Freedom of Information and Protection of Privacy Act* , R.S.O. 1990, C.F-31.

**Certificate of Requirement/Registration on Title - Site**

1.17 The *Owner* shall:

(a) Within sixty (60) days of the date of the issuance of this *Certificate,* submit to the *Director* for review, two copies of a completed Certificate of Requirement with a registerable description of the *Site;* and

(b) Within 10 calendar days of receiving the Certificate of Requirement authorized by the *Director,* register the Certificate of Requirement in the appropriate Land Registry Office on title to the *Site* and submit to the *Director* the duplicate registered copy immediately following registration.

1.18 Pursuant to Section 197 of the Environmental Protection Act, neither the *Owner* nor any person having an interest in the *Site* shall deal with the *Site* in any way without first giving a copy of this *Certificate* to each person acquiring an interest in the *Site* as a result of the dealing.

## 2. LANDFILL DESIGN AND DEVELOPMENT

**Base and Sidewall Construction**

2.1 The *Owner* shall ensure that all Phase 2 landfill sidewalls are constructed using clayey soils, placed and compacted with a minimum thickness of 2 metres.

2.2 The *Owner* shall ensure that for all areas within the Phase 2 landfill base, where sandy soils are observed to be present, these soils shall be excavated to full depth and replaced with clayey soils.

2.3 The *Owner* shall ensure that the Quality Assurance Quality Control plan for the landfill cell construction, as described in Appendix H of Item 11 of Schedule "A" is implemented.

**Approved Waste Types**

2.4 Only solid non-hazardous municipal waste as defined under *Reg. 347* shall be accepted at the *Site* for landfilling.

2.5 No liquid industrial waste or hazardous wastes as defined under *Reg. 347* shall be received at the *Site.*

2.6 The *Owner* shall ensure that all loads of waste are properly inspected by trained site personnel prior to acceptance at the *Site* and that the waste vehicles are directed to the appropriate areas for disposal or transfer of the waste. The *Owner* shall notify the *District Manager,* in writing, of load rejections at the *Site* within one (1) business day from their occurrence.

**Capacity**

2.7 The maximum amount of waste, daily cover and intermediate cover excluding final cover placed within the 5.5 hectare foot print shall not exceed 755,152 cubic metres.

**Service Area**

2.8 Only waste that is generated within the boundaries of the Municipality of Kincardine shall be accepted at the *Site.*

## 3. SITE OPERATION

**Operation**

3.1 The *Site* shall be operated and maintained at all time including management and disposal of all waste in accordance with the *EPA, Regulation 347,* and the conditions of this *Certificate.* At no time shall the discharge of a contaminant that causes or is likely to cause an adverse effect be permitted.

**Signs**

3.2 A sign shall be installed and maintained at the main entrance/exit to the *Site* on which is legibly

displayed the following information:

(a) the name of the *Site* and *Owner;*
(b) the number of the *Certificate;*
(c) the name of the *Operator;*
(d) the normal hours of operation;
(e) the allowable and prohibited waste types;
(f) the telephone number to which complaints may be directed;
(g) a warning against unauthorized access;
(h) a twenty-four (24) hour emergency telephone number (if different from above); and
(i) a warning against dumping outside the *Site.*

3.3 The *Owner* shall install and maintain signs to direct vehicles to the Materials Recovery Centre (recycling areas), and the bale wrap storage area.

3.4 The *Owner* shall provide signs at Materials Recovery Centre, informing users what materials are acceptable and directing users to appropriate storage area.

**Vermin, Vectors, Dust, Litter, Odour, Noise and Traffic**

3.5 The *Site* shall be operated and maintained such that the vermin, vectors, dust, litter, odour, noise and traffic do not create a nuisance.

**Burning Waste Prohibited**

3.6 The *Owner* shall ensure that:

(a) No burning of waste takes place at the *Site.*

(b) Burning of wood products approved to take place at the *Site* , is done in accordance with the procedure described in the Ministry Guideline "Burning at Landfill Sites" and in a supervised and controlled manner.

(c) Burning of wood products at the *Site* , as described in Condition 3.6(b) shall be discontinued once wood chipping equipment is installed and is operational, or 12 months after the date of this *Certificate* .

**Cover**

3.7 Cover material shall be applied as follows:

(a) Daily Cover - Weather permitting, deposited waste shall be covered daily with a minimum of 0.15 metres of cover soil in a manner acceptable to the *District Manager* so that no waste is exposed to the atmosphere;

(b) Intermediate Cover - In areas where landfilling has been temporarily discontinued for six (6) months or more, a minimum thickness of 0.3 metres of soil cover or an approved thickness of alternative cover material shall be placed; and

(c) Final Cover - In areas where landfilling has been completed to final contours, a minimum 1.0 metre thick layer of low permeability native soil and 0.15 metres of top soil (final cover) shall be placed. Fill areas shall be progressively completed and rehabilitated as landfill development reaches final contours.

3.8 Alternative materials to soil may be used as daily and interim cover material, based on an application with supporting information and applicable fee for a trial use or permanent use, submitted by the *Owner* to the *Director,* copied to the *District Manager* and as approved by the *Director* via an amendment to this *Certificate.* The alternative material shall be non-hazardous according to *Reg. 347* and will be expected to perform at least as well as soil in relation to the following functions:

(a) Control of blowing litter, odours, dust, landfill gas, gulls, vectors, vermin and fires;

(b) Provision for an aesthetic condition of the landfill during the active life of the *Site;*

(c) Provision for vehicle access to the active tipping face; and

(d) Compatibility with the design of the *Site* for groundwater protection, leachate management and landfill gas management.

**Waste Placement**

3.9 Waste shall be deposited in a manner that minimizes the exposure area at the landfill working face and shall be compacted before cover material is applied according to the procedures described in Item 10 of Schedule "A" attached to this *Certificate* .

3.10 Disposal of waste shall only occur within the areas as delineated on Drawing C-06, entitled "Landfill Sequencing" dated December 2009, included as Item 10 of Schedule "A" attached to this *Certificate* .

3.11 No waste shall be placed above the final contours shown on Drawing C-04, entitled "Top of Waste Contour Plan" dated December 2009, included as Item 10 on Schedule "A" attached to this *Certificate* .

**Site Access**

3.12 Waste shall only be accepted at the *Site:*

(a) from 8:00 am to 4:30 pm Monday to Friday, inclusive, and

(b) from 8:00 am to 2:00 pm on Saturday

(c) The *Owner* may provide alternative hours of operation providing that they are correctly posted at the *Site* gate, that suitable public notice is given of any change and that there are no objections or complaints from the public regarding the hours of operation.

3.13 On-site equipment used for daily site preparation and closing activities may be operated one (1) hour before and one (1) hour after the hours of operation approved by this *Certificate.*

3.14 With the prior written approval from the *District Manager,* the time periods may be extended to

ac commodate seasonal or unusual quantities of waste.

**Site Secu rity**

3.15 No waste shall be received, landfilled or removed from the *Site* unless a site supervisor or attendant is present and supervises the operations during operating hours. The *Site* shall be closed when a site attendant is not present to supervise landfilling operations.

3.16 The *Owner* may allow contractors to access the *Site* outside of working hours for specific circumstances such as maintenance, clean-ups, emergency work, etc.

3.17 The *Site* shall be operated and maintained in a safe and secure manner. During non-operating hours, the *Site* entrance and exit gates shall be locked and the *Site* shall be secured against access by unauthorized persons.

3.18 The *Owner* may allow the *Site* entrance at the bale wrap storage area to remain open for public access. This area shall be regularly inspected, as per Condition 5.1 c.

## 4. MATERIALS RECOVERY CENTRE

The *Owner* is authorized to operate a Materials Recovery Centre, in accordance with Item 10 of Schedule "A".

4.1 The *Owner* shall ensure that:

(a) all bins and waste storage areas are clearly labelled;

(b) all lids or doors on bins shall be kept closed during non-operating hours and during high wind events;

(c) if necessary to prevent litter, waste storage areas shall be covered during the high winds events;

(d) no putrescible waste shall be included as part of the waste diversion program;

(e) the maximum amount of cardboard and blue box recyclables that may be stored on site at any one time shall not exceed ten (10) storage bins, thirty cubic metres in size;

(f) the maximum volume of shingles, brush, lumber, concrete, yard waste (combined) that is stored within the Materials Recovery Centre area at any one time shall not exceed 3,000 cubic metres;

(g) The Materials Recovery Centre shall not contain more than 1000 tires at any time.

4.2 The Materials Recovery Centre shall not operate unless a *Site* attendant or designated person is present to supervise the operation.

4.3 The *Owner* shall provide a segregated area for the storage of *Refrigerant Appliances* so that the following are ensured:

(a) all *Refrigerant Appliances* have been tagged to indicate that the refrigerant has been removed by a licensed technician. The tag number shall be recorded in the log book and shall remain affixed to the appliance until transferred from the *Site;* or

(b) all *Refrigerant Appliances* accepted at the *Site,* which have not been tagged by a licensed technician to verify that the equipment no longer contains refrigerants, are stored segregated, in a clearly marked area, in an upright position and in a manner which allows for the safe handling and transfer from the *Site* for removal of refrigerants as required by O.Reg. 189; and

(c) all *Refrigerant Appliances* received on-site shall either have the refrigerant removed prior to being transferred from the *Site* or shall be shipped off-site only to facilities where the refrigerants can be removed by a licensed technician in accordance with O.Reg. 189.

4.4 Propane cylinders shall be stored in a segregated area in a manner which prevents cylinders from being knocked over or cylinder valves from breaking.

4.5 The *Owner* shall provide a segregated area for the storage of *waste electrical and electronic equipment;*

(a) All waste electrical and electronic equipment shall be stored in covered storage containers;

(b) No waste electrical and electronic equipment shall be disassembled, either manually or mechanically at the *Site* .

4.6 The *Owner* shall transfer waste and recyclable materials from the *Site* as follows:

(a) recyclable materials shall be transferred off-site once their storage containers are full;

(b) scrap metal and waste electrical and electronic equipment shall be transferred off-site at least twice a year;

(c) tires shall be transferred off-site as soon as a load for the contractor hired by the *Owner* has accumulated or as soon as the accumulated volume exceeds the storage capacity of its bunker; and

(d) immediately, in the event that waste is creating an odour or vector problem.

4.7 (a) The *Owner* shall ensure that all incoming and outgoing wastes are screened and inspected by trained personnel to ensure that wastes are being managed and disposed of in accordance with the *EPA* and O.Reg. 347.

(b) The *Owner* shall ensure that all outgoing wastes are shipped only to locations approved by the *Ministry* to receive such waste.

(c) The *District Manager* shall be notified for any planned inclusion of materials other than rubber tires, scrap metal, wood and brush, shingles, drywall, concrete materials, leaf and yard waste, bale wrap, waste electrical and electronic equipment, and refrigerant appliances into the waste diversion program.

(d) The *District Manager* shall be notified if the planned bale wrap recycling program is not included in the Site operations. The notification will include: reasons why the program is to be stopped, measures for proper disposal of any bale wrap material currently stored at the Site, and

plans for the existing or proposed bale wrap storage area.

## 5. INSPECTIONS

5.1 The *Owner* shall ensure that weekly *Site* inspections are undertaken by trained *Site* personnel and shall include, but not be limited to the following assessments:

a. condition of the active disposal areas
b. condition of the Materials Recovery Centre;
c. condition of the bale wrap facility;
d. condition of the surface water drainage works;
e. presence of any ponded water at the *Site* ;
f. condition of the on-site roads for evidence of excessive erosion and fugitive dust emissions;
g. presence of litter at the Site's perimeter and litter fences;
h. condition of the intermediate cover and of the final cover;
i. presence of vector, vermin and animals;
j. condition of the on-site facilities, the gate and its lock and the signs required by this *Certificate* ;
k. amount of the cover material to ensure that sufficient daily cover is available at all times that the *Site* is in operation; and
l. presence of leachate springs.

5.2 The *Owner* shall ensure that the groundwater monitoring wells required for the groundwater monitoring program are inspected at least twice per year (spring and fall).

## 6. EMPLOYEE TRAINING

6.1 All *Operators* of the *Site* shall be trained in the following areas:

a. terms, conditions and operating requirements of this *Certificate* ;
b. operation and management of the landfill, the Materials Recovery Centre and the other waste storage areas as described in the documents in Schedule "A" attached to this Certificate unless otherwise required by the conditions of this *Certificate* ;
c. outline of the responsibilities of the operators of the *Site* ;
d. any environmental concerns pertaining to wastes being handled at the *Site* ;
e. proper inspection, receiving and recording procedures and the activities to be undertaken during and after a load rejection;
f. occupational health and safety concerns pertaining to the wastes to be handled at the *Site* ;
g. relevant environmental legislation and regulations, including but not limited to the *EPA* and O. Reg. 347;
h. specific written procedures for the control of nuisance conditions; and
i. operation of equipment and procedures to be followed in the event of an emergency situation as described in the Emergency Response Manual required by this *Certificate* .

## 7. RECORD KEEPING AND REPORTING

7.1 Within six (6) months of date of issue of this *Certificate* , the *Owner* shall provide an updated Design and Operations plan to the *District Manager* and the *Director* for their records. The updated plan shall include all revisions that occurred during the review and approvals process, including updated *Site* layout and design drawings.

7.2 Within six (6) months of completion of development of the *Site* , the *Owner* shall provide a set of As-Constructed drawings to the *District Manager* and the *Director* for their records.

7.3 The *Owner* shall establish and maintain a written record of the *Site* inspections as required by this *Certificate* . This record shall be in the form of a log or a dedicated electronic file and it shall include, as a minimum, the following information:

a. date and time of inspection;
b. name, title and signature of trained personnel conducting the inspection;
c. a list of all the areas inspected and any deficiencies observed; and
d. recommendations for remedial action and the completion date of such action.

7.4 The *Owner* shall:
a. retain all documentation listed in Schedule "A" for as long as this *Certificate* is valid;
b. retain all records required by this *Certificate* , for the contaminating life span of the *Site* except for as otherwise authorized in writing by the *Director* ;
c. retain the employee training records for as long as the employee is working at the *Site* ; and,
d. make all of the above documents and records available for inspection upon request by the staff of the *Ministry* .

## 8. COMPLAINTS RESPONSE PROCEDURE

8.1 The *Owner* shall record the name and address of complaint, and the date, time and nature of complaint and the actions taken to address the cause of the complaint, in a log book or a computer file.

8.2 If at any time, the *Owner* receives complaints regarding the operation of the *Site* , the *Owner* shall respond to these complaints according to the following procedure:

a. The *Owner* shall record and number each complaint, either electronically or in a log book, and shall include the following information: the nature of the complaint, the name, address and the telephone number of the complainant if the complainant will provide this information and the time and date of the complaint;
b. The *Owner* , upon notification of the complaint, shall initiate appropriate steps to determine all possible causes of the complaint, proceed to take the necessary actions to eliminate the cause of the complaint and forward a formal reply to the complainant; and
c. The *Owner* shall complete and retain on-site a report written within one (1) week of the complaint date, listing the actions taken to resolve the complaint and any recommendations for remedial measures, and managerial or operational changes to reasonably avoid the recurrence of similar incidents.

8.3 The *Owner* shall designate a person to receive any complaints and to respond with a written notice of action as soon as possible. The *Owner* shall post the complaints procedure at the *Site* entrance. All complaints and the *Owner* 's actions taken to remedy the complaints shall be summarized in the Annual Report.

8.4 The *Owner* shall notify the *District Manager* within two (2) working days of receipt of a complaint.

## 9. LANDFILL MONITORING

### Groundwater

9.1 Groundwater monitoring wells at the *Site* shall be monitored twice annually (spring and fall), for the parameters as listed in Table C.1 of Appendix C-Revised Monitoring Program (Item 11 of Schedule "A").

9.2 Hydraulic monitoring (static water level measurement) shall be completed twice annually (spring and fall) at the monitoring wells as listed in Table C.1 of Appendix C-Revised Monitoring Program (Item 11 of Schedule "A").

9.3 The groundwater monitoring program shall include an assessment of the functioning of the groundwater interceptor trench. New monitoring wells (a minimum of two) shall be installed if existing monitoring wells are not suitable for this purpose.

9.4 A certified Professional Geoscientist or Engineer possessing appropriate hydrogeologic training and experience shall execute or directly supervise the execution of the groundwater monitoring and reporting program.

### Surface Water

9.5 Surface water monitoring shall be conducted in accordance with the OWRA Section 53 Approval for the *Site* .

### Leachate

9.6 During the first 2 years of operation of the leachate collection system, the *Owner* shall ensure that leachate sampling is conducted annually (during the spring) for the comprehensive list as per Table C.2 of Appendix C-Revised Monitoring Program (Item 11 of Schedule "A").

9.7 Commencing in the third year of operation, the *Owner* shall ensure that leachate sampling is conducted annually, during the spring, for the indicator parameters as listed in Table C.2 of Appendix C-Revised Monitoring Program (Item 11 of Schedule "A").

### Slope Stability

9.8 The *Owner* shall ensure that slope inclinometers and survey pins are established, as described in Item 14 of Schedule "A", and that quarterly slope inspections are carried out along the river slopes of the North Penetangore River, for the first year of *Site* operation.

a. The *Owner* shall ensure that slope inspections are subsequently carried out semi-annually for the next five years of *Site* operation;

b. The areas located north and west of the landfill, including areas A, B and C as described in Item 13 of Schedule "A" shall be included in the inspection;

c. These inspections shall be conducted or supervised by a qualified geotechnical engineer, experienced in slope assessments, and shall be carried out in the Spring season;

d. The assessment shall include both slope stability and toe erosion. An annual report shall be produced as described in Condition 7.3;

e. After five years of *Site* operation, the scope and frequency of the inspections shall be reviewed by the qualified geotechnical engineer. Any change to the inspection frequency shall require the approval of the District Manager.

## 10. TRIGGER LEVELS

10.1 The groundwater trigger levels and contingency plan shall be implemented as described in response 1c) in the report entitled "Response to Agency Comments", Item 11 of Schedule "A", and summarized as follows:

10.2 Tier I monitoring, consisting of regular semi-annual groundwater monitoring as described in Condition 9 shall be conducted by the *Owner* .

10.3 Within one year of the date of issue of this *Certificate* , the *Owner* shall provide the proposed additional trigger monitoring well installations and proposed trigger levels to the *District Manager* .

10.4 In the event of a confirmed exceedance of two or more trigger parameter concentrations at any single trigger location, the Tier II confirmation monitoring program will be implemented by the *Owner* .

10.5 In the event that one or both of the Tier II confirmation samples confirms the original exceedance, the *Owner* shall immediately notify the *District Manager* , and shall commence the evaluation of the degree, nature, and potential source(s) of trigger level impact, as described in Section 3 of the report entitled "Response to Agency Comments", Item 11 of Schedule "A" .

## 11. CHANGES TO MONITORING PROGRAM

11.1 The *Owner* must obtain written concurrence from the *District Manager* , or approval from the *Director* for any change to the *Site* monitoring programs.

## 12. ANNUAL OPERATIONS REPORT

12.1 The *Owner* shall prepare and submit an Annual Report to the *Regional Director* by April 30 of the year following the calendar year covered by the report which shall include at a minimum, the following:

a. calculations of the volume of waste landfilled, the daily and intermediate covers, the final cover and the overall volume of the *Site* capacity used during the reporting period;

b. a comparison of the actual capacity used to the estimates of the capacity;
c. an estimate of the remaining Site life;
d. a summary of the weekly, maximum daily and total annual quantity (tonnes) of waste received at the *Site* ;
e. a summary of quantities of all recyclables received, stored and transferred from the Material Recovery Centre;
f. any changes in operations, equipment, or procedures used at the Site, any operating problems encountered and corrective actions taken;
g. details of the monitoring program undertaken, outlining monitor locations, analytical parameters sampled, and frequency of sampling;
h. an analysis and interpretation of the surface water and groundwater monitoring data, a review of the adequacy of the monitoring program, conclusions of the monitoring data, and recommendations for any changes that may be necessary;
i. the quantity of leachate removed (daily and annually) from the *Site* ;
j. summary of inspections undertaken at the *Site* ;
k. a summary of the findings and any recommendations from geotechnical slope stability assessments;
l. an assessment of the functioning of the groundwater interceptor trench;
m. an assessment on whether a landfill gas monitoring program should be initiated;
n. summary of any public complaints received and the responses made;
o. a discussion of cover stockpile activities including use, timing, locations and erosion protection;
p. status update on the final cover placement, and seeding activities undertaken in the closed sections of the landfill;
q. a statement as to compliance with all conditions of this *Certificate* and the other relevant *Ministry* groundwater and surface water requirements;
r. recommendations respecting any proposed changes in the operation of the *Site* ;
s. a report on the status of all monitoring wells and a statement as to compliance with Ontario Regulation 903; and,
t. any other information that the *Regional Director* or the *District Manager* may require.

## 13. SITE REVEGETATION PLAN

13.1 Within one year of the date of issue of this *Certificate* , the *Owner* shall ensure that a site re-vegetation plan is developed and submitted to the *SVCA* , and copied to the *District Manager* .

## 14. EMERGENCY RESPONSE

14.1 Any spills, fires or other emergency situations shall be forthwith reported directly to the *Ministry* Spills Action Centre (1-800-268-6060) and the *District Manager* and shall be cleaned up immediately.

14.2 In addition, the *Owner* shall submit to the *District Manager* , a written report within three (3) days of any spill or incident, outlining the nature of the incident, remedial measures taken and the measures taken to prevent future occurrences at the Site.

14.3 The *Owner* shall ensure that adequate fire fighting and contingency spill clean-up equipment is available and that the emergency response personnel are familiar with the use of such equipment and its

location(s).

14.4 The *Owner* shall prepare an Emergency Response Manual for the site within ninety (90) days of issue of this Certificate, in consultation with local emergency response agencies. The Emergency Response Manual should indicate the responsibility of each of the stakeholders with respect to handling possible emergency situations.

14.5 The Emergency Response Manual shall be updated on a regular basis and be provided to the *District Manager* within one month of the revision date.

## 15. SITE CLOSURE

15.1 At least two (2) years prior to the anticipated date of closure of the landfill at this *Site* or the date when 90 per cent of the total waste disposal volume is reached, whichever occurs first, the *Owner* shall submit to the *Director* for approval, with a copy to the *District Manager* , a detailed Site Closure Plan pertaining to the termination of the landfilling operations at the *Site* , post-closure inspection, maintenance and monitoring and the end use. The plan shall include, but not be limited to the following:

a. a plan showing *Site* appearance after closure;

b. a description of the proposed end use for the *Site* ;

c. descriptions of the procedures for closure of the *Site* , including but not be limited to, the following:

   i. advance notification of the public of the *Site* closure;

   ii. posting a sign at the *Site* entrance indicating the landfill is closed and identifying any alternative waste disposal arrangements;

   iii. completion, inspection and maintenance of the final cover and landscaping;

   *iv.* *Site* security after closure;

   v. removal of unnecessary landfill-related structures, buildings and facilities; and

   vi. final construction of any necessary control, treatment, disposal and monitoring facilities for groundwater, surface water and landfill gas.

d. description of the procedures for post-closure care of the *Site* , including:

   i. operation, inspection and maintenance of the control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas, if applicable;

   ii. record keeping and reporting; and

   iii. complaint contact and response procedures.

e. an assessment of the adequacy of and need to implement the contingency plans; and

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

**Schedule "A"**

1. Memorandum dated March 31, 1999 from Jeff Markel, Hydrogeologist, Technical Support to Phil Bye, Supervisor, Own Sound Area Office, MOE, RE: Township of Kincardine Waste Disposal Site, C. of A. no. A272702, Waste Disposal Site Township of Kincardine
2. Letter dated May 18, 1999 from Larry Struthers, Owen Sound Area Office, MOE to John deRosenroll, Administrator, Thowship of Kincardine-Bruce-Tiverton regarding Mr. Markel's comments and necessary modifications to the Plan of Development and Operation - Phase I and II, Waste Disposal Site, former Township of Kincardine
3. Letter dated June 15, 1999 from Brad R. Pryde, P.Eng., vice-president, Stantec Consulting Ltd to Mr. Larry Struthers, Owen Sound District, MOE requesting from MOE for elimination of the existing service area boundaries for the three landfill sites which are now located within the amalgamated Municipality of the Township of Kincardine-Bruce-Tiverton.
4. Letter dated July 16, 1999 from Larry Struthers, Owen Sound Area Office, MOE to Stantec Consulting Ltd. regarding service boundaries for the three landfill sites within the Township of Kincardine-Bruce-Tiverton.
5. Revised Plan of Development and Operation - Phase I and II, Waste Disposal Site, Township of Kincardine, prepared for Township of Kincardine-Bruce-Tiverton by Stantec Consulting Ltd., dated December, 1998, revised October, 1999.
6. Application dated January 27, 2000 and signed by John deRosenroll, Chief Administration Officer, Municipality of Kincardine.
7. Letter dated February 11, 2000 from Brad R. Pryde, P.Eng. Branch Manager, Stantec Consulting Ltd. to Approvals Branch, MOE, requesting and amendment to the current Certificate of Approval No. A272702 to incorporate the report "Revised Plan of Development and Operation - Phase I and II".
8. Application for Amendment to a Provisional Certificate of Approval for a Waste Disposal Site, dated November 27, 2009 and signed by Jim O'Rourke, Public Works Manager, The Corporation of the Municipality of Kincardine, with supporting documentation.
9. Report entitled "Hydrogeologic Characterization and Design Assessment Report, Kincardine Waste Management Centre", prepared by Conestoga-Rovers & Associates, dated December 2009.
10. Report entitled "Design and Operations Plan, Kincardine Waste Management Centre, Certificate of Approval No. A272702, Kincardine, Ontario" prepared by Conestoga-Rovers & Associates, dated December 2009.
11. Report entitled " Response to Agency Comments Related to: Application to Amend EPA Part V Certificate of Approval A272702, Application for Certificate of Approval Section 53, OWRA, Application for SVCA Permission Under O.Reg. 169/06, Kincardine Waste Management Centre, Sideroad 15N, Municipality of Kincardine", prepared by Conestoga-Rovers & Associates, dated September 2010.
12. Letter dated March 10, 2010 from Candace Bross, Saugeen Valley Conservation Authority, to Greg Ferraro, Conestoga-Rovers & Associates, and copied to Ministry of the Environment.
13. Letter dated December 2, 2010 from Candace Hamm, Saugeen Valley Conservation Authority, to Jim

Yardley, Conestoga-Rovers & Associates, and copied to Ministry of the Environment

14. e-mail dated December 23, 2010, 11:27 a.m. from Jim Yardley, Conestoga-Rovers & Associates, to Lynda Mulcahy, Ministry of Environment, Subject: RE Draft Responses for Kincardine, with attachments, 4074-Draft Responses-SVCA.pdf, and 4074-Draft Responses-MOE.pdf
15. Letter dated May 11, 2011, from James Yardley, Conestoga-Rovers & Associates, to Lynda Mulcahy, Ministry of Environment, Re: Update - Alteration to Site Entrance Components, Kincardine Waste Management Centre, Municipality of Kincardine, Ontario, MOE Reference No. 4338-7Z7SDQ
16. e-mail dated May 18, 2011, 3:00pm, from Jim Yardley, Conestoga-Rovers & Associates, to Lynda Mulcahy, Ministry of Environment, Subject: RE: Kincardine WDS ~COR-004074~

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

**General, Compliance, Other Legal Obligations, Adverse Effect**
The reason for Conditions 1.1 through 1.10 inclusive is to clarify the legal rights and responsibilities of the Owner under this Certificate of Approval.

**Notification of Changes**
The reasons for Conditions 1.11 and 1.12 are to ensure that the Site is operated under the corporate name which appears on the application form submitted for this approval and to ensure that the Director is informed of any changes.

**No Transfer or Encumbrance**
The reasons for Condition 1.13 are to restrict potential transfer or encumbrance of the Site without the approval of the Director and to ensure that any transfer of encumbrance can be made only on the basis that it will not endanger compliance with this Certificate of Approval.

**Inspections**
The reason for Condition 1.14 is to ensure that appropriate Ministry staff have ready access to the Site for inspection of facilities, equipment, practices and operations required by the conditions in this Certificate of Approval. This condition is supplementary to the powers of entry afforded a Provincial Officer pursuant to the EPA and OWRA.

**Release of Information**
Conditions 1.15 and 1.16 are included to ensure that the appropriate Ministry staff have ready access to information and the operations of the Site, which are approved under this Certificate.

**Certificate of Requirement/Registration on Title -Site**
Conditions 1.17 and 1.18 are included, pursuant to subsection 197(1) of the EPA, to provide that any persons having an interest in the Site are aware that the land has been approved and used for the purposes of waste disposal.

**2. Landfill Design and Development**

**Base and Sidewall Construction**
The reason for Conditions 2.1 to 2.3 are to ensure the updated design and the QA/QC procedures are implemented.

**Approved Waste Types**
The reason for Conditions 2.4 to 2.6 is to clarify what wastes may be accepted at the Site.

**Capacity**

The reason for Condition 2.7 is to clarify what is the updated capacity for the Site.

**Service Area**

The reason for Condition 2.8 is to clarify what is the service area within which wastes may be disposed of at the Site

**3. Site Operation**

**Operation**

The reason for Condition 3.1 is to ensure that key applicable legislation is complied with.

**Signs**

The reason for Conditions 3.2 to 3.4 is to ensure that key information is provided to the public regarding the Site.

**Vermin, Vectors, Dust, Litter, Odour Noise, Traffic, Burning of Waste Prohibited**

The reasons for Conditions 3.5 and 3.6 are to ensure that a nuisance is not caused by Site operations, and that burning of wood products is done safely and is discontinued within 12 months of issue of this Certificate.

**Cover**

The reasons for Conditions 3.5 to 3.8 are to ensure that nuisance from the placing of wastes is prevented, and that wastes are placed in accordance with the manner approved by the Director.

**Site Access, Site Security, Employee Training**

The reason for Conditions 3.12 to 3.18, and 6.1 is to ensure that the Site is operated in a secure manner.

**4. Materials Recovery Centre**

The reasons for Conditions 4.1 to 4.7 is to ensure that the MRC is operated in a safe manner, to prevent adverse effects or nuisance, and that the District Manager is informed of any new materials to be managed at the Centre, or minor changes to the diversion program.

**5. Inspections**

The reasons for Conditions 5.1 and 5.2 is to ensure specific areas of the Site are checked on a regular basis, including the monitoring well network.

**7. Record Keeping and Reporting**

The reason for Conditions 7.1 and 7.2 is to ensure that updated information and as-constructed records are provided to the Ministry.

The reason for Conditions 7.3 and 7.4 is to ensure that records are kept and available for review by Ministry staff, to ensure conditions of this Certificate and applicable legislation are complied with.

**8. Complaints Response Procedure**

The reason for Conditions 8.1 to 8.4 is to ensure that public concerns or complaints regarding the Site are responded to promptly, and any needed improvements or changes to operations are implemented to prevent recurrence.

**9. Landfill Monitoring**

**Groundwater, Surface Water, Leachate, Slope Stability**

The reasons for Conditions 9.1 to 9.8 is to ensure that required monitoring and sampling of the Site is conducted, to prevent an adverse effect to the natural environment, and to monitor changes to the Site over time.

**10. Trigger Levels**

The reasons for Conditions 10.1 to 10.5 are to ensure that appropriate trigger levels, trigger monitoring wells and contingency plans are established and followed, for protection of the environment, and to ensure that the Ministry is informed of any impacts.

**11.Changes to Monitoring Program**

The reason for Condition 11.1 is to ensure that any changes to the monitoring program have Ministry review and approval.

**12. Annual Operations Report**

The reason for Condition 12.1 is to ensure that a record of site activities, capacity used, monitoring and inspection results are provided annually to the Ministry for review.

**13. Site Revegetation Plan**

The reason for Condition 13.1 is to ensure that a site revegetation plan is developed and submitted to SVCA and copied to the Ministry, this approach was agreed upon to offset vegetative loss for site development.

**14. Emergency Response**

The reason for Conditions 14.1 to 14.5 are to ensure that emergency planning is done, that adequate equipment is available, and procedures are documented and available to site staff and the Ministry for review.

**15. Site Closure**

The reason for Condition 15.1 is to ensure that planning for the site closure and post-closure care is conducted, with a record sent to the Ministry

**This Provisional Certificate of Approval revokes and replaces Certificate(s) of Approval No. A272702 issued on February 16, 1993**

*In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act, provides that the Notice requiring the hearing shall state:*

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

*The Notice should also include:*

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

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

*This Notice must be served upon:*

The Secretary*
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto, Ontario
M5G 1E5

AND

The Director
Section 39, *Environmental Protection Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

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

*The above noted waste disposal site is approved under Section 39 of the Environmental Protection Act.*

DATED AT TORONTO this 1st day of June, 2011

THIS CERTIFICATE WAS MAILED
ON June 8, 2011
SP
(Signed)

Tesfaye Gebrezghi, P.Eng.
Director
Section 39, *Environmental Protection Act*

LM/

c: District Manager, MOE Owen Sound
Gregory D. Ferraro, Conestoga-Rovers & Associates

Ontario

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

# AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 5194-9VTHQ4
Issue Date: May 29, 2015

The Corporation of the Municipality of Kincardine
1475 Concession 5
R.R. 5
Kincardine, Ontario
N2Z 2X6

Site Location: Kincardine Waste Management Centre
437 Sideroad 15 N
R.R. 45
Lot 15, Concession 5
Kincardine Municipality, County of Bruce

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

Extensions to the existing municipal sewage works at the Kincardine Waste management Centre for the collection, transmission, treatment and disposal of stormwater and landfill leachate, consisting of the following:

Proposed Works

Leachate Pumping Station

- a leachate holding tank (existing) adjacent to the landfill cell and equipped with one (1) submersible pump rated at 2.65 L/s at 52.4 TDH discharging via a 50 mm dia forcemain to the leachate tote at the leachate treatment system;

Leachate Treatment System

A leachate treatment and effluent disposal system for leachate, having a Rated Capacity of 55 $m^3$/d and consisting of works as described below:

Influent Works

- a 2,200 L leachate tote to receive landfill leachate from the leachate pumping station, equipped with a dosing pump rated at 0.64 L/s at 3.7 m TDH to transfer leachate to the splitter box for the anoxic tanks;

Anoxic Tanks

- two (2) 2.15 m x 2.15 m x 4.5 m SWD anoxic tanks with drop baffle entry, each equipped with one (1) submersible mixer, discharging to the corresponding aeration tank in the treatment train;

Aeration Tanks

- two (2) 5.6 m x 2.15 m x 4.5 m SWD aeration tanks, each equipped with coarse bubble aeration systems, discharging via the mixed liquor collection box to the secondary clarifier;
- two (2) mixed liquor pumps (one standby) rated at 1.89 L/s at 7.6 TDH to recirculate back to the influent splitter box for denitrification and oxygen recovery;
- two (2) air blowers each rated at 95 L/s at 44.8 kPa;

Clarifier

- one (1) 3.0 m dia x 4.5 m SWD clarifier equipped with sludge removal mechanism;
- two (2) activated sludge pumps (one standby) each rated at 0.93 L/s at 9.4 m TDH, returning activated sludge to the influent splitter box or disposing to the sludge storage tank;

Effluent Discharge

- a 100 mm dia effluent discharge pipe from the clarifier to the catchbasin manhole immediately upstream of the existing stormwater management wet pond (SWMP2);

Sludge Management System

- one (1) 76 $m^3$ waste activated sludge storage tank for transfer to the landfill as required;

Chemical Systems

- one (1) 1,000 L phosphoric acid supply tank and one (1) 5 L/d feed pump adding supplemental phosphorus source to the aerobic tanks as required;
- one (1) 5,000 L methanol storage tank and one (1) 150 L/d feed pump adding supplemental carbon source to the anoxic tanks as required;
- one (1) 1,800 L alum storage tank and one (1) 20 L/d feed pump adding solid settling chemical to the secondary clarifiers as required;

Previous Works

Stormwater Management System

A post-closure stormwater management system for the collection, transmission, treatment and disposal of stormwater runoff from a catchment area of approximately 12 ha, to provide Enhanced Level water quality protection and erosion control and to attenuate post-development peak flows to pre-development levels, discharging to an existing natural channel and ultimately to the North Penetangore River, for all storm events up to and including the 100-year return storm, consisting of perimeter ditches and two stormwater management ponds as described below:

- grassed/turf reinforcement matted perimeter drainage ditches adjacent to the limit of refuse of the landfill area to collect stormwater runoff from a catchment area of 8.4 ha including the landfill cap and upstream drainage areas around the landfill, discharging to Pond 1;

- an extended detention stormwater management wet pond (SWMP1) having a permanent storage volume of 1,500 $m^3$, an extended detention storage volume of 881 $m^3$ and a total active storage volume of 4,340 $m^3$, complete with inlet structure, a sediment forebay, an emergency overflow weir and a pond outlet outlet structure with orifice control allowing a maximum discharge of 0.46 $m^3$/s during a 100-year return storm to the existing natural channel and ultimately to the North Penetangore River;

- grassed lined drainage ditches around the site entrance/material recovery centre to collect stormwater runoff from a catchment area of 3.6 ha including the site entrance/material recovery centre, discharging to Pond 2;

- an extended detention stormwater management wet pond (SWMP2) having a permanent storage volume of 610 $m^3$, an extended detention storage volume of 335 $m^3$ and a total active storage volume of 2,722 $m^3$, complete with inlet structure, a sediment forebay, an emergency overflow weir and a pond outlet outlet structure with orifice control allowing a maximum discharge of 0.042 $m^3$/s during a 100-year return storm to the existing road side ditch and ultimately to the North Penetangore River;

Groundwater Interceptor System

- a 200 mm diameter perforated Groundwater Interceptor Drain (GID) discharging via a 200 mm diameter discharge pipe to the existing roadside ditch and ultimately to the North Penetangore River;

including all other controls, electrical equipment, instrumentation, piping, pumps, valves and appurtenances essential for the proper operation of the aforementioned sewage works;

all in accordance with the submitted supporting documents listed in Schedule A.

**This Approval shall be read in conjunction with the Approval A272702 for the Kincardine Waste Management Centre.**

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

"Annual Average Concentration" means the arithmetic mean of the Monthly Average Concentrations of a contaminant in the effluent calculated for any particular calendar year;

"Approval" means this entire document and any schedules attached to it, and the application;

"Average Daily Flow" means the cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year;

"BOD5"(also known as TBOD5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand;

"By-pass" means diversion of sewage around one or more unit processes within the Sewage Treatment Plant with the diverted sewage flows being returned to the Sewage Treatment Plant treatment train upstream of the Final effluent sampling location, and discharging to the environment through the Sewage Treatment Plant outfall;

"CBOD5" means five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample;

"Daily Concentration" means the concentration of a contaminant in the effluent discharged over any single day, as measured by a composite or grab sample, whichever is required;

"Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;

"District Manager" means the District Manager of the Owen Sound office;

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

"Emergency Situation" means a structural, mechanical or electrical failure that causes a temporary reduction in the capacity of the Sewage Treatment Plant or an unforeseen flow condition that may result in:

a) danger to the health or safety of any person; or,
b) injury or damage to any property, or serious risk of injury or damage to any property; or
c) treatment process biomass washout.

"Event" means an action or occurrence, at a given location within the Sewage Treatment Plant that causes a Plant Bypass or Plant Overflow. An Event ends when there is no recurrence of a Bypass or Overflow in the 12-hour period following the last Bypass or Overflow. Two Events are separated by at least 12 hours during which there has been no recurrence of a Bypass or Overflow;

"Final Effluent" means sewage discharge via the Sewage Treatment Plant outfall after undergoing the full train of unit processes as listed in the Approval;

"Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;

"Owner" means The Corporation of the Municipality of Kincardine and its successors and assignees;

"Plant Overflow" means a discharge to the environment from the Sewage Treatment Plant at a location other than the plant outfall or into the plant outfall downstream of the Final Effluent sampling location;

"Previous Works" means those portions of the sewage works previously constructed and approved under an Approval;

"Proposed Works" means the sewage works described in the Owner's application, this Approval, to the extent approved by this Approval;

"Rated Capacity" means the Average Daily Flow for which the Works are approved to handle;

"Regional Director" means the Regional Director of the Southwestern Region of the Ministry;

"Sewage Treatment Plant" means the entire sewage treatment and effluent discharge facility;

"Substantial Completion" has the same meaning as "substantial performance" in the *Construction Lien Act*;

"Works" means the sewage works described in the Owner's application, and this Approval, and includes both Proposed Works and Previous Works.

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

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

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

(2) Except as otherwise provided by these conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application for approval of the Works.

(3) Where there is a conflict between a provision of any document in the schedule referred to in this Approval and the conditions of this Approval, the Conditions in this Approval shall take precedence, and where there is a conflict between the documents in the schedule, the document bearing the most recent date shall prevail.

(4) Where there is a conflict between the documents listed in the Schedule A, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

(5) The Conditions of this Approval are severable. If any Condition of this Approval, or the application of any requirement of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.

2. EXPIRY OF APPROVAL

This Approval will cease to apply to those parts of the Works which have not been constructed within five (5) years of the date of this Approval.

3. CHANGE OF OWNER

(1) The Owner shall notify the District Manager and the Director,in writing, of any of the following changes within thirty (30) days of the change occurring:

(a) change of Owner;

(b) change of address of the Owner;

(c) change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Business Names Act*, R.S.O. 1990, c.B17 shall be included in the notification to the District Manager;

(d) change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the *Corporations Information Act*, R.S.O. 1990, c. C39 shall be included in the notification to the District Manager;

(2) In the event of any change in ownership of the Works, other than a change to a successor municipality, the Owner shall notify in writing the succeeding owner of the existence of this Approval, and a copy of such notice shall be forwarded to the District Manager and the Director.

4. UPON THE SUBSTANTIAL COMPLETION OF THE WORKS

(1) Upon the Substantial Completion of the Proposed Works,the Owner shall prepare a statement, certified by a Professional Engineer, that the works are constructed in accordance with this Approval, and upon request, shall make the written statement available for inspection by Ministry personnel.

(2) Within one (1) year of the Substantial Completion of the Proposed Works, a set of as-built drawings showing the works "as constructed" shall be prepared. These drawings shall be kept up to date through revisions undertaken from time to time and a copy shall be retained at the Works for the operational life of the Works.

5. BY-PASSES

(1) Any By-pass or Plant Overflow is prohibited, except:

(a) in an Emergency Situation;

(b) where the By-pass / Plant Overflow is a direct and unavoidable result of a planned maintenance procedure, the Owner notified the District Manager 15 days prior to the By-pass and the District manager has given written consent of the By-pass; and

(c) where the By-pass / Plant Overflow is planned for research or training purposes, the discharger notified the District manager 15 days prior to the By-pass / Plant Overflow and the District manager has given written consent of the By-pass / Plant Overflow.

(2) The Owner shall forthwith notify the Spills Action Centre (SAC) and the Medical Officer of Health of all By-pass and Plant Overflow Events. This notice shall include, at a minimum, the following information:

(a) the date, time, and duration of the Event;

(b) the location of the Event;

(c) the measured or estimated volume of the Event (unless the Event is ongoing);

(d) the reason for the Event; and

(e) the level of treatment the By-pass(es) and/or Plant Overflow(s) received and disinfection status of same.

(3) The Owner shall submit By-pass and Plant Overflow Event Reports to the Ministry's local office on a quarterly basis, no later than each of the following dates for each calendar year: February 14, May 15, August 14, and November 15. Event Reports shall be in an electronic format specified by the Ministry. In each Event Report the Owner shall include, at a minimum, the following information on any Events that occurred during the preceding quarter:

(a) the date of the Event(s);

(b) the measured or estimated volume of the Event(s);

(c) the duration of the Event(s);

(d) the location of the Event(s);

(e) the reason for the Event(s); and

(f) the level of treatment the By-pass(es) and/or Plant Overflow(s) received and disinfection status of same.

(4) The Owner shall use best efforts to collect a representative sample consisting of a minimum of two (2) grab samples of the By-pass / Plant Overflow and have it analyzed for parameters outlined in Condition 7, one at the beginning of the Event and the second approximately near the end of the Event, to best reflect the effluent quality of such By-pass or Plant Overflow.

(5) The Owner shall maintain a logbook of all Plant By-passes and Plant Overflows, which shall contain, at a minimum, the types of information set out in subsection 2 (a) to 2(e) in respect of each By-pass and Plant Overflow.

6. EFFLUENT OBJECTIVES

(1) The Owner shall use best efforts to design, construct and operate the Leachate Treatment System with the objective that the concentrations of the materials named below as effluent parameters are not exceeded in the effluent from the Leachate Treatment System.

**Table 1 - Effluent Objectives - Leachate Treatment System**

| Effluent Parameter | Annual Average Concentration (milligrams per litre unless otherwise indicated) |
|---|---|
| CBOD5 | 10.0 |
| Total Suspended Solids | 15.0 |
| Total Phosphorus | 0.5 |
| Total Ammonia Nitrogen | 1.0 |
| Nitrate Nitrogen | 35.0 |

(2) The Owner shall use best efforts to:

(a) maintain the pH of the effluent from the Leachate Treatment System within the range of 6.5 - 9.0, inclusive, at all times;

(b) operate the Leachate Treatment System within the Rated Capacity of the Leachate Treatment System;

(c) ensure that the effluent from the Leachate Treatment System is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film or sheen or foam or discolouration on the receiving waters;

(d) maintain the design minimum liquid retention volume(s) of the Stormwater Management System at all times;

(e) inspect the Stormwater Management System at least once a year and, if necessary, clean and maintain to prevent the excessive buildup of sediments and vegetation.

(3) The Owner shall include in all reports submitted in accordance with Condition 10 a summary of the efforts made and results achieved under this Condition.

7. EFFLUENT LIMITS

(1) The Owner shall design and construct, operate and maintain the Leachate Treatment System such that the concentrations of the materials named below as effluent parameters are not exceeded in the effluent discharged from the Leachate Treatment System and in the surface water at sample location SW4.

| Table 2 - Effluent Limits - Leachate Treatment System | |
|---|---|
| **Effluent Parameter** | **Daily Concentration** (milligrams per litre unless otherwise indicated) |
| Column 1 | Column 2 |
| CBOD5 | 15.0 |
| Total Suspended Solids | 20.0 |
| Total Phosphorus | 0.7 |
| Total Ammonia Nitrogen | 5.0 |

| Table 3 - Surface Water Limit - SW4 | |
|---|---|
| **Effluent Parameter** | **Daily Concentration** (milligrams per litre unless otherwise indicated) |
| Column 1 | Column 2 |
| Nitrate Nitrogen | 20.0 |

(2) For the purposes of determining compliance with and enforcing subsection (1):

(a) The Daily Concentration of a parameter named in Column 1 of subsection (1) shall not exceed the corresponding maximum concentration set out in Column 2 of subsection (1).

(3) Notwithstanding subsection (1), the Owner shall operate and maintain the Leachate Treatment System such that the pH of the effluent is maintained within the range of 6.0 - 9.5, inclusive, at all times.

(4) Subsections (1) and (3) shall apply upon Substantial Completion of the Proposed Works.

8. OPERATION AND MAINTENANCE

(1) The Owner shall exercise due diligence in ensuring that, at all times, the Works and the related equipment and appurtenances used to achieve compliance with this Approval are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate operator staffing and training, including training in all procedures and other requirements of this Approval and the Act and regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances used in the Works.

(2) The Owner shall prepare an operations manual within six (6) months of Substantial Completion of the Proposed Works, that includes, but not necessarily limited to, the following information:

(a) operating procedures for routine operation of the Works;

(b) inspection programs, including frequency of inspection, for the Works and the methods or tests employed to detect when maintenance is necessary;

(c) repair and maintenance programs, including the frequency of repair and maintenance for the Works;

(d) procedures for the inspection and calibration of monitoring equipment;

(e) a spill prevention control and countermeasures plan, consisting of contingency plans and procedures for dealing with equipment breakdowns, potential spills and any other abnormal situations, including notification of

the District Manager; and

(f) procedures for receiving, responding and recording public complaints, including recording any followup actions taken.

(3) The Owner shall maintain the operations manual current and retain a copy at the location of the Works for the operational life of the Works. Upon request, the Owner shall make the manual available to Ministry staff.

(4) The Owner shall provide for the overall operation of the Works with an operator who holds a licence that is applicable to that type of facility and that is of the same class as or higher than the class of the facility in accordance with Ontario Regulation 129/04.

(5) Prior to commencement of operation of the Stormwater Management System, the Owner shall ensure that a "Stormwater Management Contingency and Remedial Action Plan" is prepared, submitted to, and approved by the District Manager.

(6) Discharge of potentially leachate contaminated stormwater/surface water to the receiving surface water from the Works is prohibited, except where it is necessary to avoid loss of life, personal injury, danger to public health or severe property damage.

(a) The Owner shall maintain a record of each event when potentially contaminated stormwater/surface water is disposed off-site in a preapproved manner.

(b) The Owner shall notify the District Manager orally, as soon as possible, and in writing within seven (7) days of the discharge to receiving surface water of potentially leachate contaminated stormwater/surface water including an assessment of the relative extent of leachate contamination, estimated volume of stormwater/surface water discharged, and proposed or completed remedial actions.

9. MONITORING AND RECORDING

The Owner shall, upon commencement of operation of the Works, carry out the following monitoring program:

(1) All samples and measurements taken for the purposes of this Approval are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.

(2) For the purposes of this condition, the following definitions apply:

(a) Bi-weekly means once every two weeks;
(b) Monthly means once every month;
(c) Annually means once every twelve months; and
(d) Bi-annually means once every twenty-four months.

(3) Leachate Treatment System samples shall be collected at the following sampling points, at the frequency specified, by means of the specified sample type and analyzed for each parameter listed and all results recorded:

**Table 4 - Leachate Treatment System Influent Monitoring** - Influent Works

| Parameters | Sample Type | Frequency |
|---|---|---|
| BOD5 | Grab | Monthly |
| Total Suspended Solids | Grab | Monthly |
| Total Phosphorus | Grab | Monthly |
| Total Kjeldahl Nitrogen | Grab | Monthly |

| **Table 5 - Leachate Treatment System Effluent Monitoring** - Clarifier Discharge Pipe | | |
|---|---|---|
| **Parameters** | **Sample Type** | **Frequency** |
| CBOD5 | Grab | Biweekly |
| Total Suspended Solids | Grab | Biweekly |
| Total Phosphorus | Grab | Biweekly |
| Total Ammonia Nitrogen | Grab | Biweekly |
| Nitrate Nitrogen | Grab | Biweekly |
| pH | Grab | Biweekly |
| Temperature | Grab | Biweekly |
| VOCs (Table 6) | Grab | Annually (Spring) |
| Inorganics (Table 6) | Grab | Annually (Spring) |
| Other Organics (Table 6) | Grab | Annually (Spring) |
| *E. Coli* | Grab | Biweekly |

| **Table 6 - Leachate Treatment System Effluent Monitoring** - Clarifier Discharge Pipe | | | |
|---|---|---|---|
| **VOCs** | **Inorganics** | | **Other Organics** |
| Benzene | Alkalinity | Manganese | BOD |
| 1,4-dichlorobenzene | Ammonia Nitrogen | Mercury | COD |
| Dichloromethane | Arsenic | Nitrate Nitrogen | DOC |
| Toluene | Barium | Nitrite Nitrogen | Phenol |
| Vinyl chloride | Boron | Total Kjeldahl Nitrogen | |
| | Cadmium | Total Phosphorus | |
| | Calcium | Potassium | |
| | Chloride | Sodium | |
| | Chromium | Total Suspended Solids | |
| | Copper | Total Dissolved Solids | |
| | Iron | Sulphate | |
| | Lead | Zinc | |
| | Magnesium | | |

| **Table 7 - Leachate Treatment System Effluent Monitoring** - SW4 | | |
|---|---|---|
| **Parameters** | **Sample Type** | **Frequency** |
| Nitrate Nitrogen | Grab | Biweekly |

(3) Surface Water samples shall be collected at the sampling locations listed in Table 8, at a frequency listed in Table 9 and analyzed for the parameters listed in Table 10, by means of the specified sample type and analyzed for each parameter listed and all results recorded:

| Table 8 - Surface Water Sampling Locations | |
|---|---|
| **SW1** | The North Penetangore River (south-east corner of the site) |
| **SW2** | The North Penetangore River (upstream of the discharge location of the existing natural channel) |
| **SW3** | The North Penetangore River (downstream of the discharge location of the existing natural channel) |
| **SW4** | The existing natural channel (upstream of the discharge location to the North Penetangore River) |
| **SW5** | North of the Phase 1 Waste Disposal Trenches |
| **SW6** | North of area used for burning of clean wood, waste, etc. |

| Table 9 - Surface Water Sampling Type and Frequency | | |
|---|---|---|
| **Parameters** | **Sample Type** | **Frequency** |
| General Chemistry, Total Metals, Field Parameters (Table 10) | Grab | Twice Annually (spring and fall) |

| Table 10 - Surface Water Monitoring Parameters<br>Sampling Locations: **SW1, SW2, SW3, SW4, SW5 and SW6** | | |
|---|---|---|
| **General Chemistry Parameters** | **Total Metals Parameters** | **Field Parameters** |
| Alkalinity | Calcium | pH |
| Conductivity | Iron | Conductivity |
| Hardness | Magnesium | Temperature |
| pH | Manganese | Dissolved Oxygen |
| DOC | Phosphorus | |
| Total Ammonia | Potassium | |
| Un-ionized Ammonia | Sodium | |
| Total Kjeldahl Nitrogen | | |
| Total Phenolics | | |
| Chloride | | |
| Nitrite as Nitrogen | | |
| Nitrate as Nitrogen | | |
| Total Phosphorus | | |
| Sulphate | | |

(3) Stormwater samples shall be collected at the sampling locations listed in Table 11, at a frequency listed in Table 12 and analyzed for the parameters listed in Table 13, by means of the specified sample type and analyzed for each parameter listed and all results recorded:

| Table 11 - Stormwater Sampling Locations | |
|---|---|
| **SWMP1** | Discharge from outlet pipe of SWMP1 |
| **SWMP2** | Discharge from outlet pipe of SWMP2 |

| Table 12 - Stormwater Sampling Type and Frequency | | |
|---|---|---|
| **Parameters** | **Sample Type** | **Frequency** |
| General Chemistry, Total Metals, Field Parameters (Table 10) | Grab | Three (3) times a year between April 1 and November 30 after significant rainfall event, at least two (2) months between sampling events |

| Table 13 - Stormwater Monitoring Parameters<br>Sampling Locations: **SWMP1 and SWMP2** | | |
|---|---|---|
| **General Chemistry Parameters** | **Total Metals Parameters** | **Field Parameters** |
| Total Suspended Solids | Calcium | pH |
| Alkalinity | Iron | Conductivity |
| Conductivity | Magnesium | Temperature |
| Hardness | Manganese | |
| pH | Phosphorus | |
| DOC | Potassium | |
| Total Ammonia | Sodium | |
| Un-ionized Ammonia | | |
| Total Kjeldahl Nitrogen | | |
| Total Phenolics | | |
| Chloride | | |
| Nitrite as Nitrogen | | |
| Nitrate as Nitrogen | | |
| Total Phosphorus | | |
| Sulphate | | |

(3) Groundwater samples shall be collected at the sampling locations listed in Table 14, at a frequency listed in Table 15 and analyzed for the parameters listed in Table 16, by means of the specified sample type and analyzed for each parameter listed and all results recorded:

| Table 14 - Groundwater Sampling Locations | |
|---|---|
| **GID** | Discharge from the Groundwater Interceptor Drain |

| Table 15 -Groundwater Sampling Type and Frequency | | |
|---|---|---|
| General Chemistry, Total Metals, Field Parameters | Grab | Twice Annually (spring and fall) |
| Volatile Organic Compounds | Grab | Once Every Two (2) Years |

| Table 16 - Groundwater Monitoring Parameters<br>Sampling Locations: GID | | | |
|---|---|---|---|
| **General Chemistry Parameters** | **Total Metals Parameters** | **Volatile Organic Compounds** | **Field Parameters** |
| Alkalinity | Calcium | Benzene | pH |
| Conductivity | Iron | 1,4-Dichlorobenzene | Conductivity |
| Hardness | Magnesium | Dichloromethane | Temperature |
| pH | Manganese | Toluene | |
| Dissolved Organic Carbon | Phosphorus | Vinyl Chloride | |
| Total Ammonia | Potassium | | |
| Un-ionized Ammonia | Sodium | | |
| Total Kjeldahl Nitrogen | | | |
| Total Phenolics | | | |
| Chloride | | | |
| Nitrite Nitrogen | | | |
| Nitrate Nitrogen | | | |
| Sulphate | | | |

(4) The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

(a) the Ministry's Procedure F-10-1, “Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended from time to time by more recently published editions;

(b) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions;

(c) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition), as amended from time to time by more recently published editions;

(5) The temperature and pH of the effluent from the Works shall be determined in the field at the time of sampling for Total Ammonia Nitrogen. The concentration of un-ionized ammonia shall be calculated using the total ammonia concentration, pH and temperature using the methodology stipulated in "Ontario's Provincial Water Quality Objectives" dated July 1994, as amended, for ammonia (un-ionized).

(6) The Owner shall install and maintain (a) continuous flow measuring device(s), to measure the flowrate of the effluent from the Leachate Treatment System with an accuracy to within plus or minus 15 per cent (+/- 15%) of the actual flowrate for the entire design range of the flow measuring device, and record the flowrate at a daily frequency.

(7) The Owner shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this Approval.

10. REPORTING

(1) One (1) week prior to the start up of the operation of the Proposed Works, the Owner shall notify the District Manager (in writing) of the pending start up date.

(2) Fifteen (15) days prior to the date of a planned By-pass being conducted pursuant to Condition 5 and as soon as possible for an unplanned By-pass, the Owner shall notify the District Manager (in writing) of the pending start date, in addition to an assessment of the potential adverse effects on the environment and the duration of the By-pass.

(3) The Owner shall report to the District Manager or designate, any exceedence of any parameter specified in Condition 7 orally, as soon as reasonably possible, and in writing within seven (7) days of the exceedence.

(4) In addition to the obligations under Part X of the *Environmental Protection Act*, the Owner shall, within ten (10) working days of the occurrence of any reportable spill as defined in Ontario Regulation 675/98, bypass or loss of any product, by-product, intermediate product, oil, solvent, waste material or any other polluting substance into the environment, submit a full written report of the occurrence to the District Manager describing the cause and discovery of the spill or loss, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation.

(5) The Owner shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to Ministry staff.

(6) The Owner shall prepare and submit a performance report to the District Manager on an annual basis, before April 30 and incorporated into Kincardine Waste Management Centre Landfill Site Annual Report submitted to the District Manager on an annual basis. The reports shall contain, but shall not be limited to, the following information:

(a) a summary and interpretation of all monitoring data, and a comparison of the Leachate Treatment System effluent monitoring data to the effluent limits outlined in Condition 7, including an overview of the success and adequacy of the Works;

(b) a summary and interpretation of all monitoring data collected for stormwater/surface water, including an overview of the success and adequacy of the Works;

(c) a description of any operating problems encountered and corrective actions taken;

(d) a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works;

(e) a summary of any effluent quality assurance or control measures undertaken in the reporting period;

(f) a summary of the calibration and maintenance carried out on all effluent monitoring equipment; and

(g) a description of efforts made and results achieved in meeting the Effluent Objectives of Condition 6.

(h) a tabulation of the volume of sludge generated in the reporting period, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed;

(i) a summary of any complaints received during the reporting period and any steps taken to address the complaints;

(j) a summary of all By-pass, spill or abnormal discharge events; and

(k) any other information the District Manager requires from time to time.

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

1. Condition 1 is imposed to ensure that the Works are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the Approval and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review. The condition also advises the Owners their responsibility to notify any person they authorized to carry out work pursuant to this Approval the existence of this Approval.

2. Condition 2 is included to ensure that the Works are constructed in a timely manner so that standards applicable at the time of Approval of the Works are still applicable at the time of construction, to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to the approved works and to ensure that subsequent owners of the Works are made aware of the Approval and continue to operate the Works in compliance with it.

4. Condition 4 is included to ensure that the Works are constructed in accordance with the approval and that record drawings of the Works "as constructed" are maintained for future references.

5. Condition 5 is included to indicate that By-pass / Plant Overflows of untreated or partially treated sewage to the receiving watercourse is prohibited, save in certain limited circumstances where the failure to By-pass / Plant Overflow could result in greater injury to the public interest than the Bypass itself where a By-pass / Plant Overflow will not violate the approved effluent requirements, or where the By-pass / Plant Overflow can be limited or otherwise mitigated by handling it in accordance with an approved contingency plan. The notification and documentation requirements allow the Ministry to take action in an informed manner and will ensure the Owner is aware of the extent and frequency of By-pass / Plant Overflow events.

6. Condition 6 is imposed to establish non-enforceable effluent quality objectives which the Owner is obligated to use best efforts to strive towards on an ongoing basis. These objectives are to be used as a mechanism to trigger corrective action proactively and voluntarily before environmental impairment occurs and before the compliance limits of Condition 7 are exceeded.

7. Condition 7 is imposed to ensure that the effluent discharged from the Works to the receiving water body meets the Ministry's effluent quality requirements thus minimizing environmental impact on the receiver and to protect water quality, fish and other aquatic life in the receiving water body.

8. Condition 8 is included to require that the Works be properly operated, maintained, funded, staffed and equipped such that the environment is protected and deterioration, loss, injury or damage to any person or property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the Owner and made available to the Ministry. Such a manual is an integral part of the operation of the Works. Its compilation and use should assist the Owner in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for Ministry staff when reviewing the Owner's operation of the Works.

9. Condition 9 is included to enable the Owner to evaluate and demonstrate the performance of the Works, on a continual basis, so that the Works are properly operated and maintained at a level which is consistent with the design objectives and effluent limits specified in the Approval and that the Works does not cause any impairment to the receiving watercourse.

10. Condition 10 is included to provide a performance record for future references, to ensure that the Ministry is made aware of problems as they arise, and to provide a compliance record for all the terms and conditions outlined in this Approval, so that the Ministry can work with the Owner in resolving any problems in a timely manner.

## Schedule A

1. Application for Approval of Municipal and Private Sewage Works received on December 29, 2009, including stormwater management report, final plans and specifications prepared by Conestoga-Rovers & Associates;
2. Application for Environmental Compliance Approval submitted by Jim Yardley of Conestoga-Rovers & Associates received on November 17, 2014, including Technical Design Brief and engineering plans for the proposed Leachate Treatment System.

**Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 4431-87RGVW issued on March 31, 2011.**

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

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

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

*The Notice should also include:*

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

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

*This Notice must be served upon:*

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

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

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

DATED AT TORONTO this 29th day of May, 2015

Fariha Pannu, P.Eng.
Director
appointed for the purposes of Part II.1 of the
*Environmental Protection Act*

FL/
c: DWMD Supervisor, MOECC Owen Sound
District Manager, MOECC Owen Sound
Jim Yardley, Conestoga-Rovers & Associates

# AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 1731-B9ZKPU
Issue Date: March 15, 2019

The Corporation of the Municipality of Kincardine
1475 Concession 5
Rural Route, No. 5
Kincardine, Ontario
N2Z 2X6

Site Location: Kincardine Waste Management Centre (Ward 2 landfill)
437 Sideroad 15 North
Lot 15, Concession 5
Kincardine, Ontario

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

alteration usage and operation of existing municipal sewage works, for the treatment of sanitary sewage and disposal of effluent to the North Penetangore River via a Sewage Treatment Plant (Leachate Treatment Facility) and Final Effluent disposal facilities as follows:

Leachate Pumping Station

- a leachate holding tank (existing) adjacent to the landfill cell and equipped with one (1) submersible pump rated at 2.65 L/s at 52.4 TDH discharging via a 50 mm dia forcemain to the leachate tote at the leachate treatment system;

**Sewage Treatment Plant (Leachate Treatment Facility)**

A leachate treatment and effluent disposal system for leachate, having a

Rated Capacity of 55 $m^3$/d and consisting of works as described below:

Influent Works

- a 2,200 L leachate tote to receive landfill leachate from the leachate pumping station, equipped with a dosing pump rated at 0.64 L/s at 3.7 m TDH to transfer leachate to the splitter box for the anoxic tanks;

Anoxic Tanks

- two (2) 2.15 m x 2.15 m x 4.5 m SWD anoxic tanks with drop baffle entry, each equipped with one (1) submersible mixer, discharging to the corresponding aeration tank in the treatment train;

Aeration Tanks

- two (2) 5.6 m x 2.15 m x 4.5 m SWD aeration tanks, each equipped with coarse bubble aeration systems, discharging via the mixed liquor collection box to the secondary clarifier;

- two (2) mixed liquor pumps (one standby) rated at 1.89 L/s at 7.6 TDH to recirculate back to the influent splitter box for denitrification and oxygen recovery;

- two (2) air blowers each rated at 95 L/s at 44.8 kPa;

Chemical Systems

- one (1) 1,000 L phosphoric acid supply tank and one (1) 5 L/d feed pump adding supplemental phosphorus source to the aerobic tanks as required;

- one (1) 5,000 L methanol storage tank and one (1) 150 L/d feed pump adding supplemental carbon source to the anoxic tanks as required;

- one (1) 1,800 L alum storage tank and one (1) 20 L/d feed pump adding solid settling chemical to the secondary clarifiers as required;

- addition of freeze dried bacteria to the anoxic tanks as required;

- addition of a supplemental nitrogen source to the anoxic tanks as required

Sludge Management System

- one (1) 76 $m^3$ waste activated sludge storage tank for transfer to the landfill as required;

Clarifier

- one (1) 3.0 m dia x 4.5 m SWD clarifier equipped with sludge removal mechanism;

- two (2) activated sludge pumps (one standby) each rated at 0.93 L/s at 9.4 m TDH, returning activated sludge to the influent splitter box or disposing to the sludge storage tank;

Effluent Discharge

- a 100 mm dia effluent discharge pipe from the clarifier to the catchbasin manhole immediately upstream of the existing stormwater management wet pond (SWMP2);

**Final Effluent Disposal Facilities**

Stormwater Management System

A post-closure stormwater management system for the collection, transmission, treatment and disposal of stormwater runoff from a catchment area of approximately 12 ha, to provide Enhanced Level water quality protection and erosion control and to attenuate post-development peak flows to pre-development levels, discharging to an existing natural channel and ultimately to the North Penetangore River, for all storm events up to and including the 100-year return storm, consisting of perimeter ditches and two stormwater management ponds as described below:

- grassed/turf reinforcement matted perimeter drainage ditches adjacent to the limit of refuse of the landfill area to collect stormwater runoff from a catchment area of 8.4 ha including the landfill cap and upstream drainage areas around the landfill, discharging to Pond 1;

- an extended detention stormwater management wet pond (SWMP1) having a permanent storage volume of 1,500 $m^3$, an extended detention storage volume of 881 $m^3$ and a total active storage volume of 4,340 $m^3$, complete with inlet structure, a sediment forebay, an emergency overflow weir and a pond outlet outlet structure with orifice control allowing a maximum discharge of 0.46 $m^3/s$ during a 100-year return storm to the existing natural channel and ultimately to the North Penetangore River;

- grassed lined drainage ditches around the site entrance/material recovery centre to collect stormwater runoff from a catchment area of 3.6 ha including the site entrance/material recovery centre, discharging to Pond 2;

- an extended detention stormwater management wet pond (SWMP2) having a permanent storage volume of 610 $m^3$, an extended detention storage volume of 335 $m^3$ and a total active storage volume of 2,722 $m^3$, complete with inlet structure, a sediment forebay, an emergency overflow weir and a pond outlet outlet structure with orifice control allowing a maximum discharge of 0.042 $m^3/s$ during a 100-year return storm to the existing road side ditch and ultimately to the North Penetangore River;

Groundwater Interceptor System

- a 200 mm diameter perforated Groundwater Interceptor Drain (GID) discharging via a 200 mm diameter discharge pipe to the existing roadside ditch and ultimately to the North Penetangore River;

including all other controls, electrical equipment, instrumentation, piping, pumps, valves and appurtenances essential for the proper operation of the aforementioned sewage works;

all in accordance with the submitted supporting documents listed in Schedule A.

**This Approval shall be read in conjunction with the Approval A272702 for the Kincardine Waste Management Centre.**

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

1. "Annual Average Daily Influent Flow" means the cumulative total sewage flow of Influent to the Sewage Treatment Plant during a calendar year divided by the number of days during which sewage was flowing to the Sewage Treatment Plant that year;

2. "Approval" means this environmental compliance approval and any schedules attached to it, and the application;

3. "BOD5" (also known as TBOD5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demands;

4. "Bypass" means diversion of sewage around one or more unit processes within the Sewage Treatment Plant with the diverted sewage flows being returned to the Sewage Treatment Plant upstream of the Final effluent sampling location, and discharged to the environment through the Sewage Treatment Plant outfall;

5. "CBOD5" means five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample;

6. "Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;

7. "District Manager" means the District Manager of the appropriate local district office of the Ministry where the Works is geographically located;

8. "*E. coli* " refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius;

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

10. "Equivalent Equipment" means alternate piece(s) of equipment that meets the design requirements and performance specifications of the piece(s) of equipment to be substituted;

11. "Event" means an action or occurrence, at a given location within the Works that causes a Bypass or Overflow. An Event ends when there is no recurrence of Bypass or Overflow in the 12-hour period following the last Bypass or Overflow. Overflows and Bypasses are separate Events even when they occur concurrently;

12. “Existing Works” means those portions of the Works included in the Approval that have been constructed previously;

13. "Final Effluent" means effluent that is discharged to the environment through the approved effluent disposal facilities, including all Bypasses, that are required to meet the compliance limits stipulated in the Approval for the Sewage Treatment Plant at the Final Effluent sampling point(s);

14. "Influent" means flows to the Sewage Treatment Plant from the collection system and Imported Sewage but excluding process return flows;

15. "Limited Operational Flexibility" (LOF) means the conditions that the Owner shall follow in order to undertake any modification that is pre-authorized as part of this Approval;

16. "Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;

17. "Operating Agency" means the Owner or the entity that is authorized by the Owner for the management, operation, maintenance, or alteration of the Works in accordance with this Approval;

18. "Overflow" means a discharge to the environment from the Works at designed location(s) other than the approved effluent disposal facilities or via the effluent disposal facilities downstream of the Final Effluent sampling point;

19. "Owner" means The Corporation of the Municipality of Kincardine and its successors and assignees;

20. "OWRA" means the *Ontario Water Resources Act* , R.S.O. 1990, c. O.40, as amended;

21. "Rated Capacity" means the Annual Average Daily Influent Flow for which the Sewage Treatment Plant is designed to handle;

22. "Sewage Treatment Plant" means all the facilities related to Sewage treatment within the sewage plant site excluding the Final Effluent disposal facilities;

23. "Single Sample Result" means the test result of a parameter in the effluent discharged on any day, as measured by a probe, analyzer or in a composite or grab sample, as required;

24. "Works" means the approved sewage works, and includes Existing Works and modifications made under Limited Operational Flexibility.

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

## TERMS AND CONDITIONS

## 1. GENERAL PROVISIONS

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

2. The Owner shall design, construct, operate and maintain the Works in accordance with the conditions of this Approval.

3. Where there is a conflict between a provision of any document referred to in this Approval and the conditions of this Approval, the conditions in this Approval shall take precedence.

## 2. CHANGE OF OWNER AND OPERATING AGENCY

1. The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within thirty (30) days of the change occurring:

   a. change of address of Owner;

   b. change of Owner, including address of new owner;

   c. change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Business Names Act, R.S.O. 1990, c. B.17* , as amended, shall be included in the notification;

   d. change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the *Corporations Information Act, R.S.O. 1990, c. C.39* , as amended, shall be included in the notification.

2. The Owner shall notify the District Manager, in writing, of any of the following changes within thirty (30) days of the change occurring:

   a. change of address of Operating Agency;

   b. change of Operating Agency, including address of new Operating Agency.

3. In the event of any change in ownership of the Works, the Owner shall notify the succeeding owner in writing, of the existence of this Approval, and forward a copy of the notice to the District Manager.

4. The Owner shall ensure that all communications made pursuant to this condition refer to the environmental compliance approval number.

## 3. RECORD DRAWINGS

1. A set of record drawings of the Works shall be kept up to date through revisions undertaken from time to time and a copy shall be readily accessible for reference at the Works.

## 4. BY-PASSES / OVERFLOW

(1) Any By-pass or Plant Overflow is prohibited, except:

(a) in an Emergency Situation;

(b) where the By-pass / Plant Overflow is a direct and unavoidable result of a planned maintenance procedure, the Owner notified the District Manager 15 days prior to the By-pass and the District manager has given written consent of the By-pass; and

(c) where the By-pass / Plant Overflow is planned for research or training purposes, the discharger notified the District manager 15 days prior to the By-pass / Plant Overflow and the District manager has given written consent of the By-pass / Plant Overflow.

(2) The Owner shall forthwith notify the Spills Action Centre (SAC) and the Medical Officer of Health of all By-pass and Plant Overflow Events. This notice shall include, at a minimum, the following information:

(a) the date, time, and duration of the Event;

(b) the location of the Event;

(c) the measured or estimated volume of the Event (unless the Event is ongoing);

(d) the reason for the Event; and

(e) the level of treatment the By-pass(es) and/or Plant Overflow(s) received and disinfection status of same.

(3) The Owner shall submit By-pass and Plant Overflow Event Reports to the Ministry's local office on a quarterly basis, no later than each of the following dates for each calendar year: February 14, May 15, August 14, and November 15. Event Reports shall be in an electronic format specified by the Ministry. In each Event Report the Owner shall include, at a minimum, the following information on any Events that occurred during the preceding quarter:

(a) the date of the Event(s);

(b) the measured or estimated volume of the Event(s);

(c) the duration of the Event(s);

(d) the location of the Event(s);

(e) the reason for the Event(s); and

(f) the level of treatment the By-pass(es) and/or Plant Overflow(s) received and disinfection status of same.

(4) The Owner shall use best efforts to collect a representative sample consisting of a minimum of two (2) grab samples of the By-pass / Plant Overflow and have it analyzed for parameters outlined in Tables 2 and 3 of Schedule C, one at the beginning of the Event and the second approximately near the end of the Event, to best reflect the effluent quality of such By-pass or Plant Overflow.

(5) The Owner shall maintain a logbook of all Plant By-passes and Plant Overflows, which shall contain, at a minimum, the types of information set out in subsection 2 (a) to 2(e) in respect of each By-pass and Plant Overflow.

## 5. DESIGN OBJECTIVES

1. The Owner shall design and undertake everything practicable to operate the Sewage Treatment Plant in accordance with the following objectives:

   a. Final Effluent parameters design objectives listed in the table(s) included in Schedule B.

   b. Final Effluent is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film or sheen or foam or discolouration on the receiving waters.

   c. Annual Average Daily Influent Flow is within the Rated Capacity of the Sewage Treatment Plant.

## 6. COMPLIANCE LIMITS

1. The Owner shall operate and maintain the Sewage Treatment Plant such that compliance limits for the Final Effluent parameters listed in the table(s) included in Schedule C are met.

## 7. OPERATION AND MAINTENANCE

(1) The Owner shall exercise due diligence in ensuring that, at all times, the Works and the related equipment and appurtenances used to achieve compliance with this Approval are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate operator staffing and training, including training in all procedures and other requirements of this Approval and the Act and regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances used in the Works.

(2) The Owner shall update the operations manual within six (6) months of issuance of the Approval of the Proposed Works, that includes, but not necessarily limited to, the following information:

(a) operating procedures for routine operation of the Works;

(b) inspection programs, including frequency of inspection, for the Works and the methods or tests employed to detect when maintenance is necessary;
(c) repair and maintenance programs, including the frequency of repair and maintenance for the Works;

(d) procedures for the inspection and calibration of monitoring equipment;

(e) a spill prevention control and countermeasures plan, consisting of contingency plans and procedures for dealing with equipment breakdowns, potential spills and any other abnormal situations, including notification of the District Manager; and

(f) procedures for receiving, responding and recording public complaints, including recording any followup actions taken.

(3) The Owner shall maintain the operations manual current and retain a copy at the location of the Works for the operational life of the Works. Upon request, the Owner shall make the manual available to Ministry staff.

(4) The Owner shall provide for the overall operation of the Works with an operator who holds a licence that is applicable to that type of facility and that is of the same class as or higher than the class of the facility in accordance with Ontario Regulation 129/04.

(5) Prior to commencement of operation of the Stormwater Management System, the Owner shall ensure that a "Stormwater Management Contingency and Remedial Action Plan" is prepared, submitted to, and approved by the District Manager.

(6) Discharge of potentially leachate contaminated stormwater/surface water to the receiving surface water from the Works is prohibited, except where it is necessary to avoid loss of life, personal injury, danger to public health or severe property damage.

(a) The Owner shall maintain a record of each event when potentially contaminated stormwater/surface water is disposed off-site in a preapproved manner;

(b) The Owner shall notify the District Manager orally, as soon as possible, and in writing within seven (7) days of the discharge to receiving surface water of potentially leachate contaminated stormwater/surface water including an assessment of the relative extent of leachate contamination, estimated volume of stormwater/surface water discharged, and proposed or completed remedial actions.

(7) If because of an effluent exceedance the Sewage Treatment Facility is placed in a recirculation state the following procedure would apply to re-start:

(a) Provide notification to the District Manager prior to discharge at a concentration exceeding the Table 2 Effluent Limits;

(b) Increase effluent monitoring frequency to **weekly** for the Table 5 parameters normally sampled bi-weekly;

(c) Weekly samples to be collected from clarifier discharge and SWMP 2 discharge for the parameters that exceed Table 2 Effluent Limits;

(d) If any sample collected from the SWMP 2 discharge exceeds the associated Table 2 Effluent Limits, immediately cease discharge of effluent and notify the District Manager;

(e) Return to normal effluent (biweekly) monitoring in accordance with Table 5 after sampling indicates that the clarifier discharge meets the Table 2 Effluent Limits;

(f) Within two (2) weeks of returning to normal effluent (biweekly) monitoring, provide details of the sampling conducted under (c) and the effluent flow rates during the period to the District Office.

## 8. MONITORING AND RECORDING

The Owner shall, upon commencement of operation of the Works, carry out the following monitoring program:

(1) All samples and measurements taken for the purposes of this Approval are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.

(2) For the purposes of this condition, the following definitions apply:

(a) Bi-weekly means once every two weeks;
(b) Monthly means once every month;
(c) Annually means once every twelve months; and
(d) Bi-annually means once every twenty-four months.

(3) Leachate Treatment System samples shall be collected at the following sampling locations listed in Schedule D - Tables 4, 5, 6 and 7, at the frequency specified, by means of the specified sample type and analyzed for each parameter listed and all results recorded.

(4) Surface Water samples shall be collected at the sampling locations listed in Table 8, at a frequency listed in Table 9 and analyzed for the parameters listed in Table 10, by means of the specified sample type and analyzed for each parameter listed and all results recorded.

(5) Stormwater samples shall be collected at the sampling locations listed in Table 11, at a frequency listed in Table 12 and analyzed for the parameters listed in Table 13, by means of the specified sample type and analyzed for each parameter listed and all results recorded.

(6) Groundwater samples shall be collected at the sampling locations listed in Table 14, at a frequency listed in Table 15 and analyzed for the parameters listed in Table 16, by means of the specified sample type and analyzed for each parameter listed and all results recorded.

(7) The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

(a) the Ministry's Procedure F-10-1, “Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended from time to time by more recently published editions;

(b) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions;

(c) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition), as amended from time to time by more recently published editions;

(8) The temperature and pH of the effluent from the Works shall be determined in the field at the time of sampling for Total Ammonia Nitrogen. The concentration of un-ionized ammonia shall be calculated using the total ammonia concentration, pH and temperature using the methodology stipulated in "Ontario's Provincial Water Quality Objectives" dated July 1994, as amended, for ammonia (un-ionized).

(9) The Owner shall install and maintain (a) continuous flow measuring device(s), to measure the flowrate of the effluent from the Leachate Treatment System with an accuracy to within plus or minus 15 per cent (+/- 15%) of the actual flowrate for the entire design range of the flow measuring device, and record the flowrate at a daily frequency.

(10) The Owner shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this Approval.

(11) The Owner shall obtain written concurrence from the District Manager for any change to the site monitoring program.

## 9. REPORTING

(1) One (1) week prior to the start up of the operation of the Proposed Works, the Owner shall notify the District Manager (in writing) of the pending start up date.

(2) Fifteen (15) days prior to the date of a planned By-pass being conducted pursuant to Condition 5 and as soon as possible for an unplanned By-pass, the Owner shall notify the District Manager (in writing) of the pending start date, in addition to an assessment of the potential adverse effects on the environment and the duration of the By-pass.

(3) The Owner shall report to the District Manager or designate, any exceedence of any parameter specified in Condition 7 orally, as soon as reasonably possible, and in writing within seven (7) days of the exceedence.

(4) In addition to the obligations under Part X of the *Environmental Protection Act,* the Owner shall, within ten (10) working days of the occurrence of any reportable spill as defined in Ontario Regulation 675/98, bypass or loss of any product, by-product, intermediate product, oil, solvent, waste material or any other polluting substance into the environment, submit a full written report of the occurrence to the District Manager describing the cause and discovery of the spill or loss, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation.

(5) The Owner shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to Ministry staff.

(6) The Owner shall prepare and submit a performance report to the District Manager on an annual basis, before April 30 and incorporated into Kincardine Waste Management Centre Landfill Site Annual Report submitted to the District Manager on an annual basis. The reports shall contain, but shall not be limited to, the following information:

(a) a summary and interpretation of all monitoring data, and a comparison of the Leachate Treatment System effluent monitoring data to the effluent limits outlined in Condition 6, including an overview of the success and adequacy of the Works;

(b) a summary and interpretation of all monitoring data collected for stormwater/surface water, including an overview of the success and adequacy of the Works;

(c) a description of any operating problems encountered and corrective actions taken;

(d) a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works;

(e) a summary of any effluent quality assurance or control measures undertaken in the reporting period;

(f) a summary of the calibration and maintenance carried out on all effluent monitoring equipment; and

(g) a description of efforts made and results achieved in meeting the Effluent Objectives of Condition 5.

(h) a tabulation of the volume of sludge generated in the reporting period, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed;

(i) a summary of any complaints received during the reporting period and any steps taken to address the complaints;

(j) a summary of all By-pass, spill or abnormal discharge events; and

(k) any other information the District Manager requires from time to time.

## 10. LIMITED OPERATIONAL FLEXIBILITY

1. The Owner may make pre-authorized modifications to the sewage pumping stations and Sewage Treatment Plant in Works in accordance with the document "Limited Operational Flexibility - Protocol for Pre-Authorized Modifications to Municipal Sewage Works" (Schedule E), as amended, subject to the following:

   a. the modifications will not involve the addition of any new treatment process or the removal of an existing treatment process, including chemical systems, from the liquid or solids treatment trains as originally designed and approved.

   b. the scope and technical aspects of the modifications are in line with those delineated in Schedule E and conform with the Ministry's publication "Design Guidelines for Sewage Works 2008", as amended, Ministry's regulations, policies, guidelines, and industry engineering standards;

   c. the modifications shall not negatively impact on the performance of any process or equipment in the Works or result in deterioration in the Final Effluent quality;

   d. where the pre-authorized modification requires notification, a "Notice of Modifications to Sewage Works" (Schedule E), as amended shall be completed with declarations from a Professional Engineer and the Owner and retained on-site prior to the scheduled implementation date. All supporting information including technical memorandum, engineering plans and specifications, as applicable and appropriate to support the declarations that the modifications conform with LOF shall remain on-site for future inspection.

2. The following modifications are not pre-authorized under Limited Operational Flexibility:

   a. Modifications that involve addition or extension of process structures, tankages or channels;

   b. Modifications that involve relocation of the Final Effluent outfall or any other discharge location or that may require reassessment of the impact to the receiver or environment;

c. Modifications that involve addition of or change in technology of a treatment process or that may involve reassessment of the treatment train process design;

d. Modifications that require changes to be made to the emergency response, spill prevention and contingency plan; or

e. Modifications that are required pursuant to an order issued by the Ministry.

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

1. Condition 1 regarding general provisions is imposed to ensure that the Works are constructed and operated in the manner in which they were described and upon which approval was granted.

2. Condition 2 regarding change of Owner and Operating Agency is included to ensure that the Ministry records are kept accurate and current with respect to ownership and Operating Agency of the Works and to ensure that subsequent owners of the Works are made aware of the Approval and continue to operate the Works in compliance with it.

3. Condition 3 regarding record drawings is included to ensure that the Works are constructed in accordance with the Approval and that record drawings of the Works "as constructed" are updated and maintained for future references.

4. Condition 4 is included to indicate that By-pass / Plant Overflows of untreated or partially treated sewage to the receiving watercourse is prohibited, save in certain limited circumstances where the failure to By-pass / Plant Overflow could result in greater injury to the public interest than the Bypass itself where a By-pass / Plant Overflow will not violate the approved effluent requirements, or where the By-pass / Plant Overflow can be limited or otherwise mitigated by handling it in accordance with an approved contingency plan. The notification and documentation requirements allow the Ministry to take action in an informed manner and will ensure the Owner is aware of the extent and frequency of By-pass / Plant Overflow events.

5. Condition 5 regarding design objectives is imposed to establish non-enforceable design objectives to be used as a mechanism to trigger corrective action proactively and voluntarily before environmental impairment occurs.

6. Condition 6 regarding compliance limits is imposed to ensure that the Final Effluent discharged from the Works to the environment meets the Ministry's effluent quality requirements.

7. Condition 7 regarding operation and maintenance is included to require that the Works be properly operated, maintained, funded, staffed and equipped such that the environment is protected and deterioration, loss, injury or damage to any person or property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the Owner. Such a manual is an integral part of the operation of the Works. Its compilation and use should assist the Owner in staff training, in proper plant operation and in

identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for Ministry staff when reviewing the Owner's operation of the Works.

8. Condition 8 regarding monitoring and recording is included to enable the Owner to evaluate and demonstrate the performance of the Works, on a continual basis, so that the Works are properly operated and maintained at a level which is consistent with the design objectives and compliance limits.

9. Condition 9 regarding reporting is included to provide a performance record for future references, to ensure that the Ministry is made aware of problems as they arise, and to provide a compliance record for this Approval.

10. Condition 10 regarding Limited Operational Flexibility is included to ensure that the Works are constructed, maintained and operated in accordance with the Approval, and that any pre-approved modification will not negatively impact on the performance of the Works.

## Schedule A

1. Application for Environmental Compliance Approval submitted by Jim Yardley of GHD received on Novemeber 5, 2018 for the proposed amendments to the ECA, LTF Process Upset investigation.

## Schedule B

## Final Effluent Design Objectives

| Table 1 - Effluent Objectives - Leachate Treatment System | |
|---|---|
| **Effluent Parameter** | **Annual Average Concentration** (milligrams per litre unless otherwise indicated) |
| CBOD5 | 10.0 |
| Total Suspended Solids | 15.0 |
| Total Phosphorus | 0.5 |
| Total Ammonia Nitrogen | 1.0 |
| Nitrate Nitrogen | 35.0 |

# Schedule C

## Final Effluent Compliance Limits

| Table 2 - Effluent Limits - Leachate Treatment System | |
|---|---|
| **Effluent Parameter** | **Daily Concentration** (milligrams per litre unless otherwise indicated) |
| Column 1 | Column 2 |
| CBOD5 | 15.0 |
| Total Suspended Solids | 20.0 |
| Total Phosphorus | 0.7 |
| Total Ammonia Nitrogen | 5.0 |

| Table 3 - Surface Water Limit - SW4 | |
|---|---|
| **Effluent Parameter** | **Daily Concentration** (milligrams per litre unless otherwise indicated) |
| Column 1 | Column 2 |
| Nitrate Nitrogen | 20.0 |

## Schedule D - Monitoring

| **Table 4 - Leachate Treatment System Influent Monitoring** - Influent Works | | |
|---|---|---|
| **Parameters** | **Sample Type** | **Frequency** |
| BOD5 | Grab | Monthly |
| Total Suspended Solids | Grab | Monthly |
| Total Phosphorus | Grab | Monthly |
| Total Kjeldahl Nitrogen | Grab | Monthly |

| **Table 5 - Leachate Treatment System Effluent Monitoring** - Clarifier Discharge | | |
|---|---|---|
| **Parameters** | **Sample Type** | **Frequency** |
| CBOD5 | Grab | Biweekly |
| Total Suspended Solids | Grab | Biweekly |
| Total Phosphorus | Grab | Biweekly |
| Total Ammonia Nitrogen | Grab | Biweekly |
| Nitrate Nitrogen | Grab | Biweekly |
| pH | Grab | Biweekly |
| Temperature | Grab | Biweekly |
| VOCs (Table 6) | Grab | Annually (Spring) |
| Inorganics (Table 6) | Grab | Annually (Spring) |
| Other Organics (Table 6) | Grab | Annually (Spring) |
| *E. Coli* | Grab | Biweekly |

| **Table 6 - Leachate Treatment System Effluent Monitoring** - Clarifier Discharge | | | |
|---|---|---|---|
| **VOCs** | **Inorganics** | | **Other Organics** |
| Benzene | Alkalinity | Manganese | BOD |
| 1,4-dichlorobenzene | Ammonia Nitrogen | Mercury | COD |
| Dichloromethane | Arsenic | Nitrate Nitrogen | DOC |
| Toluene | Barium | Nitrite Nitrogen | Phenol |
| Vinyl chloride | Boron | Total Kjeldahl Nitrogen | |
| | Cadmium | Total Phosphorus | |
| | Calcium | Potassium | |
| | Chloride | Sodium | |
| | Chromium | Total Suspended Solids | |
| | Copper | Total Dissolved Solids | |
| | Iron | Sulphate | |
| | Lead | Zinc | |
| | Magnesium | | |

| **Table 7 - Leachate Treatment System Effluent Monitoring** - SW4 | | |
|---|---|---|
| **Parameters** | **Sample Type** | **Frequency** |
| Nitrate Nitrogen | Grab | Biweekly |

| **Table 8 - Surface Water Sampling Locations** | |
|---|---|
| **SW1** | The North Penetangore River (south-east corner of the site) |
| **SW2** | The North Penetangore River (upstream of the discharge location of the existing natural channel) |
| **SW3** | The North Penetangore River (downstream of the discharge location of the existing natural channel) |
| **SW4** | The existing natural channel (upstream of the discharge location to the North Penetangore River) |
| **SW5** | North of the Phase 1 Waste Disposal Trenches |
| **SW6** | North of area used for burning of clean wood, waste, etc. |

| **Table 9 - Surface Water Sampling Type and Frequency** | | |
|---|---|---|
| **Parameters** | **Sample Type** | **Frequency** |
| General Chemistry, Total Metals, Field Parameters (Table 10) | Grab | Twice Annually (spring and fall) |

| **Table 10 - Surface Water Monitoring Parameters**<br>Sampling Locations: **SW1, SW2, SW3, SW4, SW5 and SW6** | | |
|---|---|---|
| **General Chemistry Parameters** | **Total Metals Parameters** | **Field Parameters** |
| Alkalinity | Calcium | pH |
| Conductivity | Iron | Conductivity |
| Hardness | Magnesium | Temperature |
| pH | Manganese | Dissolved Oxygen |
| DOC | Phosphorus | |
| Total Ammonia | Potassium | |
| Un-ionized Ammonia | Sodium | |
| Total Kjeldahl Nitrogen | | |
| Total Phenolics | | |
| Chloride | | |
| Nitrite as Nitrogen | | |
| Nitrate as Nitrogen | | |
| Total Phosphorus | | |
| Sulphate | | |

## Schedule D - Monitoring

| Table 11 - Stormwater Sampling Locations | |
|---|---|
| **SWMP1** | Discharge from outlet pipe of SWMP1 |
| **SWMP2** | Discharge from outlet pipe of SWMP2 |

| Table 12 - Stormwater Sampling Type and Frequency | | |
|---|---|---|
| **Parameters** | **Sample Type** | **Frequency** |
| General Chemistry, Total Metals, Field Parameters (Table 10) | Grab | Three (3) times a year between April 1 and November 30 after significant rainfall event, at least two (2) months between sampling events |

| Table 13 - Stormwater Monitoring Parameters<br>Sampling Locations: **SWMP1 and SWMP2** | | |
|---|---|---|
| **General Chemistry Parameters** | **Total Metals Parameters** | **Field Parameters** |
| Total Suspended Solids | Calcium | pH |
| Alkalinity | Iron | Conductivity |
| Conductivity | Magnesium | Temperature |
| Hardness | Manganese | |
| pH | Phosphorus | |
| DOC | Potassium | |
| Total Ammonia | Sodium | |
| Un-ionized Ammonia | | |
| Total Kjeldahl Nitrogen | | |
| Total Phenolics | | |
| Chloride | | |
| Nitrite as Nitrogen | | |
| Nitrate as Nitrogen | | |
| Total Phosphorus | | |
| Sulphate | | |

## Schedule D - Monitoring

| Table 14 - Groundwater Sampling Locations | |
|---|---|
| **GID** | Discharge from the Groundwater Interceptor Drain |

| Table 15 -Groundwater Sampling Type and Frequency | | |
|---|---|---|
| General Chemistry, Total Metals, Field Parameters | Grab | Twice Annually (spring and fall) |
| Volatile Organic Compounds | Grab | Once Every Two (2) Years |

| Table 16 - Groundwater Monitoring Parameters<br>Sampling Locations: GID | | | |
|---|---|---|---|
| **General Chemistry Parameters** | **Total Metals Parameters** | **Volatile Organic Compounds** | **Field Parameters** |
| Alkalinity | Calcium | Benzene | pH |
| Conductivity | Iron | 1,4-Dichlorobenzene | Conductivity |
| Hardness | Magnesium | Dichloromethane | Temperature |
| pH | Manganese | Toluene | |
| Dissolved Organic Carbon | Phosphorus | Vinyl Chloride | |
| Total Ammonia | Potassium | | |
| Un-ionized Ammonia | Sodium | | |
| Total Kjeldahl Nitrogen | | | |
| Total Phenolics | | | |
| Chloride | | | |
| Nitrite Nitrogen | | | |
| Nitrate Nitrogen | | | |
| Sulphate | | | |

# Schedule E

## Limited Operational Flexibility

## Protocol for Pre-Authorized Modifications to Municipal Sewage Works

### 1. General

1. Pre-authorized modifications are permitted only where Limited Operational Flexibility has already been granted in the Approval and only permitted to be made at the pumping stations and sewage treatment plant in the Works, subject to the conditions of the Approval.

2. Where there is a conflict between the types and scope of pre-authorized modifications listed in this document, and the Approval where Limited Operational Flexibility has been granted, the Approval shall take precedence.

3. The Owner shall consult the District Manager on any proposed modifications that may fall within the scope and intention of the Limited Operational Flexibility but is not listed explicitly or included as an example in this document.

4. The Owner shall ensure that any pre-authorized modifications will not:

    a. adversely affect the hydraulic profile of the Sewage Treatment Plant or the performance of any upstream or downstream processes, both in terms of hydraulics and treatment performance;

    b. result in new Overflow or Bypass locations, or any potential increase in frequency or quantity of Overflow(s) or Bypass(es).

    c. result in a reduction in the required Peak Flow Rate of the treatment process or equipment as originally designed.

### 2. Modifications that do not require pre-authorization:

1. Sewage works that are exempt from Ministry approval requirements;

2. Modifications to the electrical system, instrumentation and control system.

### 3. Pre-authorized modifications that do not require preparation of "Notice of Modification to Sewage Works"

1. Normal or emergency maintenance activities, such as repairs, renovations, refurbishments and replacements with Equivalent Equipment, or other improvements to an existing approved piece of equipment of a treatment process do not require pre-authorization. Examples of these activities are:

a. Repairing a piece of equipment and putting it back into operation, including replacement of minor components such as belts, gear boxes, seals, bearings;

b. Repairing a piece of equipment by replacing a major component of the equipment such as motor, with the same make and model or another with the same or very close power rating but the capacity of the pump or blower will still be essentially the same as originally designed and approved;

c. Replacing the entire piece of equipment with Equivalent Equipment.

2. Improvements to equipment efficiency or treatment process control do not require pre-authorization. Examples of these activities are:

a. Adding variable frequency drive to pumps;

b. Adding on-line analyzer, dissolved oxygen probe, ORP probe, flow measurement or other process control device.

**4. Pre-Authorized Modifications that require preparation of "Notice of Modification to Sewage Works"**

1. Pumping Stations

a. Replacement, realignment of existing sewers including manholes, valves, gates, weirs and associated appurtenances provided that the modifications will not add new influent source(s) or result in an increase in flow from existing sources as originally approved.

b. Extension or partition of wetwell to increase retention time for emergency response and improve station maintenance and pump operation;

c. Replacement or installation of inlet screens to the wetwell;

d. Replacement or installation of flowmeters, construction of station bypass;

e. Replacement, reconfiguration or addition of pumps and modifications to pump suctions and discharge pipings including valve, gates, motors, variable frequency drives and associated appurtenances to maintain firm pumping capacity or modulate the pump rate provided that the modifications will not result in a reduction in the firm pumping capacity or discharge head or an increase in the peak pumping rate of the pumping station as originally designed;

f. Replacement, realignment of existing forcemain(s) including valves, gates, and associated appurtenances provided that the modifications will not reduce the flow capacity or increase the total dynamic head and transient in the forcemain.

2. Sewage Treatment Plant

1. Sewers and appurtenances

    a. Replacement, realignment of existing sewers (including pipes and channels) or construction of new sewers, including manholes, valves, gates, weirs and associated appurtenances within the a sewage treatment plant, provided that the modifications will not add new influent source(s) or result in an increase in flow from existing sources as originally approved and that the modifications will remove hydraulic bottlenecks or improve the conveyance of sewage into and through the Works.

2. Flow Distribution Chambers/Splitters

    a. Replacement or modification of existing flow distribution chamber/splitters or construction of new flow distribution chamber/splitters, including replacements or installation of sluice gates, weirs, valves for distribution of flows to the downstream process trains, provided that the modifications will not result in a change in flow distribution ratio to the downstream process trains as originally designed.

3. Imported Sewage Receiving Facility

    a. Replacement, relocation or installation of loading bays, connect/disconnect hook-up systems and unloading/transferring systems;

    b. Replacement, relocation or installation of screens, grit removal units and compactors;

    c. Replacement, relocation or installation of pumps, such as dosing pumps and transfer pumps, valves, piping and appurtenances;

    d. Replacement, relocation or installation of storage tanks/chambers and spill containment systems;

    e. Replacement, relocation or installation of flow measurement and sampling equipment;

    f. Changes to the source(s) or quantity from each source, provided that changes will not result in an increase in the total quantity and waste loading of each type of Imported Sewage already approved for co-treatment.

4. Preliminary Treatment System

    a. Replacement of existing screens and grit removal units with equipment of the same or higher process performance technology, including where necessary replacement or upgrading of existing screenings dewatering washing compactors, hydrocyclones, grit classifiers, grit pumps, air blowers conveyor system, disposal bins and other ancillary equipment to the screening and grit removal processes.

    b. Replacement or installation of channel aeration systems, including air blowers, air supply main, air headers, air laterals, air distribution grids and diffusers.

5. Primary Treatment System

    a. Replacement of existing sludge removal mechanism, including sludge chamber;

    b. Replacement or installation of scum removal mechanism, including scum chamber;

    c. Replacement or installation of primary sludge pumps, scum pumps, provided that:the modifications will not result in a reduction in the firm pumping capacity or discharge head that the primary sludge pump(s) and scum pump(s) are originally designed to handle.

6. Secondary Treatment System

    1. Biological Treatment

        a. Conversion of complete mix aeration tank to plug-flow multi-pass aeration tank, including modifications to internal structural configuration;

        b. Addition of inlet gates in multi-pass aeration tank for step-feed operation mode;

        c. Partitioning of an anoxic/flip zone in the inlet of the aeration tank, including installation of submersible mixer(s);

        d. Replacement of aeration system including air blowers, air supply main, air headers, air laterals, air distribution grids and diffusers, provided that the modifications will not result in a reduction in the firm capacity or discharge pressure that the blowers are originally designed to supply or in the net oxygen transferred to the wastewater required for biological treatment as originally required.

    2. Secondary Sedimentation

        a. Replacement of sludge removal mechanism, including sludge chamber;

        b. Replacement or installation of scum removal mechanism, including scum chamber;

        c. Replacement or installation of return activated sludge pump(s), waste activated sludge pump(s), scum pump(s), provided that the modifications will not result in a reduction in the firm pumping capacity or discharge head that the activated sludge pump(s) and scum pump(s) are originally designed to handle.

7. Post-Secondary Treatment System

    a. Replacement of filtration system with equipment of the same filtration technology, including feed pumps, backwash pumps, filter reject pumps, filtrate extract pumps, holding tanks associated with the pumping system, provided that the modifications will not result in a reduction in the capacity of

the filtration system as originally designed.

8. Disinfection System

    1. UV Irradiation

        a. Replacement of UV irradiation system, provided that the modifications will not result in a reduction in the design capacity of the disinfection system or the radiation level as originally designed.

    2. Chlorination/Dechlorination and Ozonation Systems

        a. Extension and reconfiguration of contact tank to increase retention time for effective disinfection and reduce dead zones and minimize short-circuiting;

        b. Replacement or installation of chemical storage tanks, provided that the tanks are provided with effective spill containment.

9. Supplementary Treatment Systems

    1. Chemical systems

        a. Replacement, relocation or installation of chemical storage tanks for existing chemical systems only, provided that the tanks are sited with effective spill containment;

        b. Replacement or installation of chemical dosing pumps provided that the modifications will not result in a reduction in the firm capacity that the dosing pumps are originally designed to handle.

        c. Relocation and addition of chemical dosing point(s) including chemical feed pipes and valves and controls, to improve phosphorus removal efficiency;

        d. Use of an alternate chemical provided that it is a non-proprietary product and is a commonly used alternative to the chemical approved in the Works, provided that the chemical storage tanks, chemical dosing pumps, feed pipes and controls are also upgraded, as necessary..

10. Sludge Management System

    1. Sludge Holding and Thickening

        a. Replacement or installation of sludge holding tanks, sludge handling pumps, such as transfer pumps, feed pumps, recirculation pumps, provided that modifications will not result in reduction in the solids storage or handling capacities;

    2. Sludge Digestion

a. Replacement or installation of digesters, sludge handling pumps, such as transfer pumps, feed pumps, recirculation pumps, provided that modifications will not result in reduction in the solids storage or handling capacities;

b. replacement of sludge digester covers.

3. Sludge Dewatering and Disposal

a. Replacement of sludge dewatering equipment, sludge handling pumps, such as transfer pumps, feed pumps, cake pumps, loading pumps, provided that modifications will not result in reduction in solids storage or handling capacities.

4. Processed Organic Waste

a. Changes to the source(s) or quantity from each source, provided that changes will not result in an increase in the total quantity already approved for co-processing.

11. Standby Power System

1. Replacement or installation of standby power system, including feed from alternate power grid, emergency power generator, fuel supply and storage systems, provided that the existing standby power generation capacity is not reduced.

12. Pilot Study

1. Small side-stream pilot study for existing or new technologies, alternative treatment process or chemical, provided:

a. all effluent from the pilot system is hauled off-site for proper disposal or returned back to the sewage treatment plant for at a point no further than immediately downstream of the location from where the side-stream is drawn;

b. no proprietary treatment process or propriety chemical is involved in the pilot study;

c. the effluent from the pilot system returned to the sewage treatment plant does not significantly alter the composition/concentration of or add any new contaminant/inhibiting substances to the sewage to be treated in the downstream process;

d. the pilot study will not have any negative impacts on the operation of the sewage treatment plant or cause a deterioration of effluent quality;

e. the pilot study does not exceed a maximum of two years and a notification of completion shall be submitted to the District Manager within one month of completion of the pilot project.

13. Lagoons

    a. installing baffles in lagoon provided that the operating capacity of the lagoon system is not reduced;

    b. raise top elevation of lagoon berms to increase free-board;

    c. replace or install interconnecting pipes and chambers between cells, provided that the process design operating sequence is not changed;

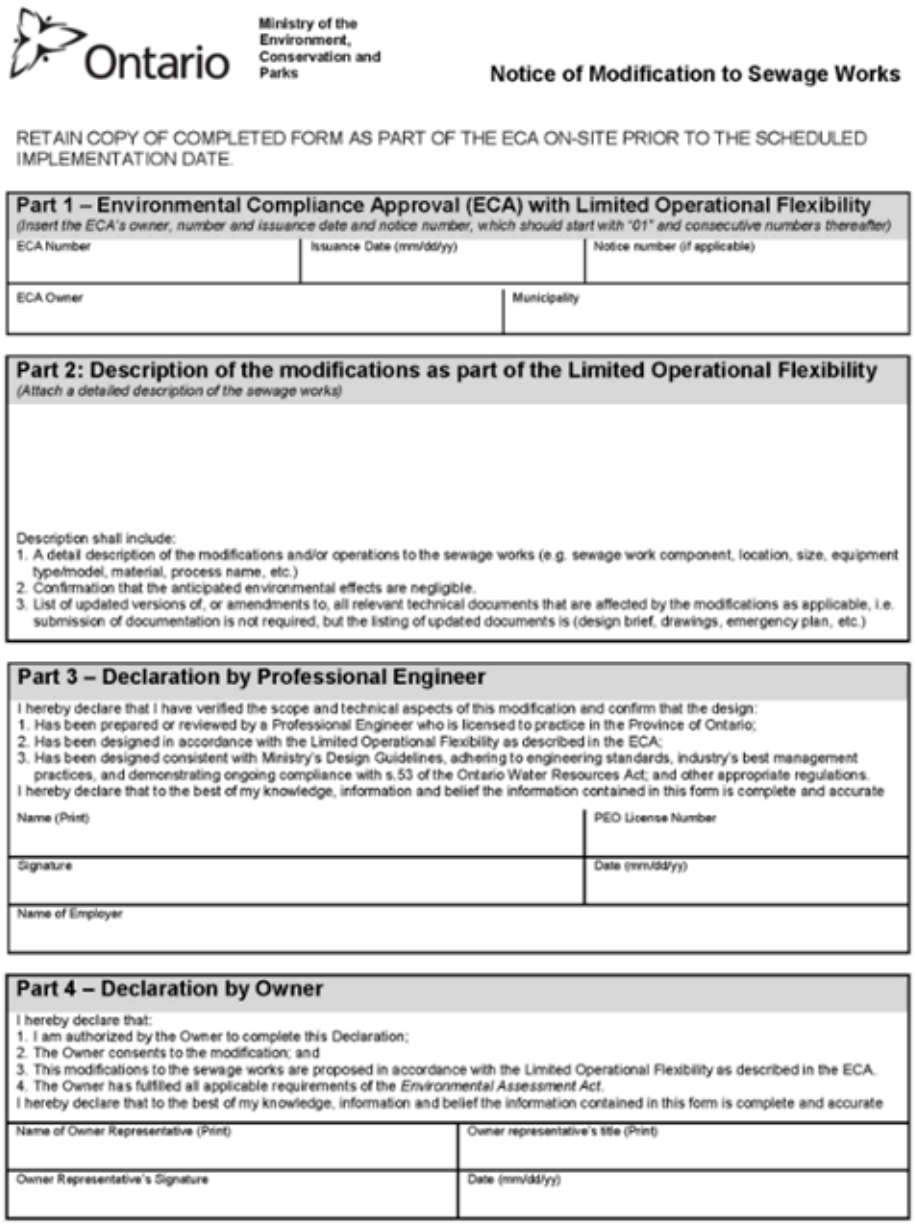
    d. replace or install mechanical aerators, or replace mechanical aerators with diffused aeration system provided that the mixing and aeration capacity are not reduced;

    e. removal of accumulated sludge and disposal to an approved location offsite.

3. Final Effluent Disposal Facilities

    a. Replacement or realignment of the Final Effluent channel, sewer or forcemain, including manholes, valves and appurtenances from the end of the treatment train to the discharge outfall section, provided that the sewer conveys only effluent discharged from the Sewage Treatment Plant and that the replacement or re-aligned sewer has similar dimensions and performance criteria and is in the same or approximately the same location and that the hydraulic capacity will not be reduced.

This page contains an image of the form entitled "Notice of Modification to Sewage Works". A digital copy can be obtained from the District Manager.



Ontario

Ministry of the Environment, Conservation and Parks

**Notice of Modification to Sewage Works**

RETAIN COPY OF COMPLETED FORM AS PART OF THE ECA ON-SITE PRIOR TO THE SCHEDULED IMPLEMENTATION DATE.

**Part 1 – Environmental Compliance Approval (ECA) with Limited Operational Flexibility**

*(Insert the ECA's owner, number and issuance date and notice number, which should start with "01" and consecutive numbers thereafter)*

| ECA Number | Issuance Date (mm/dd/yy) | Notice number (if applicable) |
|---|---|---|
| | | |

| ECA Owner | Municipality |
|---|---|
| | |

**Part 2: Description of the modifications as part of the Limited Operational Flexibility**

*(Attach a detailed description of the sewage works)*

Description shall include:
1. A detail description of the modifications and/or operations to the sewage works (e.g. sewage work component, location, size, equipment type/model, material, process name, etc.)
2. Confirmation that the anticipated environmental effects are negligible.
3. List of updated versions of, or amendments to, all relevant technical documents that are affected by the modifications as applicable, i.e. submission of documentation is not required, but the listing of updated documents is (design brief, drawings, emergency plan, etc.)

**Part 3 – Declaration by Professional Engineer**

I hereby declare that I have verified the scope and technical aspects of this modification and confirm that the design:
1. Has been prepared or reviewed by a Professional Engineer who is licensed to practice in the Province of Ontario;
2. Has been designed in accordance with the Limited Operational Flexibility as described in the ECA;
3. Has been designed consistent with Ministry's Design Guidelines, adhering to engineering standards, industry's best management practices, and demonstrating ongoing compliance with s.53 of the Ontario Water Resources Act; and other appropriate regulations.

I hereby declare that to the best of my knowledge, information and belief the information contained in this form is complete and accurate

| Name (Print) | PEO License Number |
|---|---|
| | |

| Signature | Date (mm/dd/yy) |
|---|---|
| | |

| Name of Employer |
|---|
| |

**Part 4 – Declaration by Owner**

I hereby declare that:
1. I am authorized by the Owner to complete this Declaration;
2. The Owner consents to the modification; and
3. This modifications to the sewage works are proposed in accordance with the Limited Operational Flexibility as described in the ECA.
4. The Owner has fulfilled all applicable requirements of the *Environmental Assessment Act*.

I hereby declare that to the best of my knowledge, information and belief the information contained in this form is complete and accurate

| Name of Owner Representative (Print) | Owner representative's title (Print) |
|---|---|
| | |

| Owner Representative's Signature | Date (mm/dd/yy) |
|---|---|
| | |

**Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 5194-9VTHQ4 issued on May 29, 2015**

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

a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;

b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

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

*The Notice should also include:*

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

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

*This Notice must be served upon:*

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

AND

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

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

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

DATED AT TORONTO this 15th day of March, 2019

Fariha Pannu.

Fariha Pannu, P.Eng.
Director
appointed for the purposes of Part II.1 of the
*Environmental Protection Act*

WS/
c: District Manager, DWECD, MECP Owen Sound
Jim Yardly and Dan Turner, GHD

# Appendix B

## MECP Correspondence

August 28, 2020 Reference No. 004074

Mr. Ian Mitchell
District Manager
Ministry of the Environment, Conservation and Parks
Owen Sound District Office
101 17th Street East, 3rd Floor
Owen Sound, Ontario
N4K 0A5

Dear Mr. Mitchell:

**Re: Response to Comments – 2019 Annual Monitoring Report – Surface Water**
**Kincardine Waste Management Centre**
**Municipality of Kincardine Landfills**

On behalf of the Municipality of Kincardine (Municipality), GHD has prepared this letter to respond to the Ministry of the Environment, Conservation and Parks (MECP) that related to surface water at the Kincardine's Waste Management Centre (KWMC) and with regard to the information presented in the 2019 Annual Report for KWMC. The MECP comment is provided followed by the GHD response.

### *Comment 1*

**Section 3.4 discusses the 2018 Leachate Treatment Facility (LTF) upsets and the 2019 upsets are not discussed.**

### *Response to Comment 1:*

Based on the comment, GHD reviewed the data for the LTF for the 2019 period. During this review, it was noted that for several subsections within Section 3 of the annual report were not updated prior to finalization. As such, a revised Section 3 for the report is provided in Attachment A.

With regard to the specific response to the several minor upsets, the plant was placed in temporary recirculation mode until the plant was stabilized and the parameter was within the normal operating requirement.

### *Comment 2*

***Reduction of Volatile Organic Compound testing for surface water samples to be proposed, but that key locations should remain.***

### *Response to Comment 2:*

Based on the annual report, MECP was officially requested for amendments to the monitoring program at the Site. The surface water amendment includes the removal of the VOC testing for the surface water. These samples are collected every second year (even year) at all locations. Given the comments, we

**GHD**
455 Phillip Street Unit #100A Waterloo Ontario N2L 3X2 Canada
**T** 519 884 0510 **F** 519 884 0525 **W** www.ghd.com

would propose to maintain VOC monitoring for the two surface water pond samples. This would allow the monitoring of the two primary locations for the release of surface water to the natural environment.

### *Comment 3*

***SW5 and SW6 has some minor influence and should be flagged for further review.***

### *Response to Comment 3:*

SW5 and SW6 will be flagged for further review and discussion over the next several years in the annual report.

### *Comment 4*

***Does an opportunity exist to divert the groundwater seepage systems to the LTF rather than rely on assimilative approaches.***

### *Response to Comment 4:*

Figure 6.20 shows the historical data for 6 indicator parameters for the main Groundwater Interceptor Trench (GWIT) and the Groundwater Sump that was replaced in 2019 with the new surface water/groundwater pump station. The LTF is designed to treat the leachate generated and collected from the landfill cell and has both capacity and treatment levels.

The GWIT is several metres above the base of the landfill and reflects water from the side road or the property to the east. The GWIT data has shown improvement since the initial installation of the trench. The chemical data is lower than the long-term average for SW1 and SW4, with the exception of chloride. Given the location of the trench and the source of water, the chloride levels show seasonal influence and are stable. Chloride levels are considered to reflect the impact of the road and not the landfill. Given the current trends, GHD is of the opinion that the GWIT should be connected to the leachate collection system and LTF given the analytical data and the potential negative impacts to the LTF with regard to flows and leachate quality.

The new surface water/groundwater pumping station was designed to be independent of the landfill and minimize the potential for landfill related impacts to the water quality. The amount of water that is involved would cause water capacity issues with the LTF due mainly to surface water. Given the limited information available and that the data does not indicate a long-term issue, GHD is of the opinion that the new pump station water should not be directed to the LTF.

Should you have any questions or concerns in regards to the above comments to the annual report, please do not hesitate to contact us.

Sincerely,

GHD

James R. Yardley, P. Eng.

JRY/mg/11

Encl.

cc: Hugh Geurts, MECP London
Laszlo Barti, MECP Owen Sound
Don Huston, Municipality of Kincardine
Adam Weishar, Municipality of Kincardine

# Attachment A

# Attachment A Revised Section 3.0 2019 Annual Monitoring Report, Kincardine Waste Management Centre, Municipality of Kincardine, Ontario

## 1. Leachate Treatment Facility

Prior to the LTF completion, leachate generated in the Stage 1 cell was collected in the sump at the southwest corner of the Phase 2 area and was pumped into a below-ground storage tank. The leachate was then transported, for treatment and disposal, from the KWMC to the Bruce Energy Centre Wastewater Treatment Plant (BEC WWTP) or the Ward 1 leachate pump station for transfer to the Kincardine Wastewater Treatment Plant (KWWTP).

Construction of the Leachate Treatment Facility (LTF) was completed in the spring of 2016, with commissioning of the LTF commencing on June 28, 2016. The LTF operated in accordance with Amended ECA No. 5194-9VTHQ4 until March 15, 2019 when Amended ECA No. 1731-B9ZKPU was issued, under which the LTF operated throughout the remainder of the current reporting period.

The LTF also operates with a Stormwater Contingency and Remedial Action Plan (SWMCRAP), included in Appendix E for reference, identified a formal monitoring program, detailed above, and remedial actions to be taken in the event of a spill. Both manuals continued to be used during the current reporting period.

### 1.1 Leachate Treatment Facility Performance

The LTF treats the leachate generated and collected by the leachate collection system. The leachate is transferred from the leachate collection system to the leachate holding tank. The leachate is then transferred by forcemain from the leachate holding tank to the leachate tote in the treatment building. The LTF consists of an anoxic/oxic biological nutrient removal process and a secondary clarifier. Effluent from the secondary clarifier is discharged into a manhole directly upstream of SWMP-2.

#### 1.1.1 Leachate Treatment Facility Flow Rate and Total Volume Treated

The LTF flow rates are selected by the Plant Operator based on the landfill leachate production rates as measured within the leachate collection sump located in the Stage 1 cell of the landfill. The table below presents a summary of average monthly LTF effluent flow rate and the monthly volume treated (influent).

| Month in Operation (2019) | Average Effluent Flow Rate (L/s) | Influent Volume Treated ($m^3$) |
|---|---|---|
| January | 0.176 | 577 |
| February | 0.132 | 394 |
| March | 0.242 | 684 |
| April | 0.267 | 793 |
| May | 0.284 | 862 |
| June | 0.180 | 540 |
| July | 0.165 | 491 |
| August | 0.140 | 426 |
| September | 0.134 | 407 |

| Month in Operation (2019) | Average Effluent Flow Rate (L/s) | Influent Volume Treated ($m^3$) |
|---|---|---|
| October | 0.133 | 413 |
| November | 0.156 | 490 |
| December | 0.155 | 497 |

The 2019 monthly average LTF effluent flow rates ranged from 0.133 liter per second (L/s) in October to 0.284 L/s in May, with an overall average of 0.181 L/s. The total volume treated during the reporting period was approximately 6,500 $m^3$ (17.99 $m^3$/day or 33% of the designed flow rate of 55 $m^3$/day).

As shown above the LTF was in operation throughout 2019.

### 1.1.2 Effluent Quality

Effluent from the LTF is required to meet the daily effluent limits and annual average effluent objectives specified in ECA No. 1731-B9ZKPU. Exceedance of the criteria is deemed to have occurred when the concentration of an effluent parameter exceeds the effluent limit or the annual average exceeds the effluent objective as listed below:

| Effluent Parameter | Annual Average Effluent Objectives (mg/L) | Daily Effluent Limits (mg/L) |
|---|---|---|
| Biological Oxygen Demand ($BOD_5$) | 10 | 15 |
| Total Suspended Solids (TSS) | 15 | 20 |
| Total Phosphorous (TP) | 0.5 | 0.7 |
| Ammonia ($NH_3$, expressed as nitrogen, N) | 1 | 5 |
| Nitrate | 35 | N/A |

In order to ensure compliance with the effluent criteria, ECA No. 1731-B9ZKPU requires bi-weekly monitoring of the effluent parameters as specified above. ECA No. 1731-B9ZKPU also requires bi-weekly sampling of pH, *E. Coli*, and temperature. Samples are required to be collected from the clarifier discharge pipe. Certain effluent parameters (particularly pH and TSS) may be measured on a more frequent basis in order to assist in the effective operation of the LTF. Annual effluent samples, taken in the spring, are required to be collected and analyzed for volatile organic compounds (VOCs), inorganics, and other organics (chemical oxygen demand (COD), dissolved organic carbon (DOC), and phenols).

In addition to effluent sampling, monthly monitoring of influent quality is required. Influent grab samples are to be analyzed for $BOD_5$, TSS, TP, and total kjeldahl nitrogen (TKN) in accordance with ECA No. 1731-B9ZKPU.

The influent and effluent sample results from this reporting period are presented in Table 3.1. Table 3.1 also provides the 2019 annual average concentrations for comparison to effluent objectives.

The following sections discuss the monitoring results for each of the effluent limit parameters ($BOD_5$, TSS, TP, ammonia, and nitrate). In addition to the effluent limit parameters listed above, pH, temperature, nitrite, and *E. Coli* samples collected from the clarifier discharge pipe were also monitored approximately bi-weekly, as presented in Table 3.1.

The following table summarizes the range and average effluent concentrations of each parameter reported during the current reporting year as well as the number of daily effluent limit exceedances and average removal efficiency.

| Parameter | Daily Effluent Limits (mg/L) | 2019 Range (mg/L) | 2019 Average (mg/L) | No. of Daily Effluent Limit exceedances | Average Removal Efficiency (%) | Annual Average (mg/L) |
|---|---|---|---|---|---|---|
| $BOD_5$ | 15 | 2 - 14 | 4.6 | 0 | 97 | 4.6 |
| TSS | 20 | 4 – **148** | 19.5 | 7 | 12% | **19.5** |
| TP | 0.7 | 0.04 – **1.63** | 0.3 | 2 | 83% | 0.3 |
| Ammonia | 5 | 0.1 – 0.6 | 0.2 | 0 | - | 0.2 |
| Nitrate | N/A | 0.1 – 0.6 | 0.2 | 0 | - | 6.0 |

Notes:

**Bold** – results is above the Daily Effluent Limit specified in ECA No. 1731-B9ZKPU ($BOD_5$ – 10 mg/L, TSS – 15 mg/L, TP – 0.5 mg/L, Ammonia – 1 mg/L, nitrate – 35))

**Bold** - annual average above the Annual Average Effluent Objective specified in ECA No. 1731-B9ZKPU ($BOD_5$ – 15 mg/L, TSS – 20 mg/L, TP – 0.7 mg/L, Ammonia – 5 mg/L, nitrate – no objective))

As shown in the table above, the annual average TSS concentration exceeded the Annual Average Effluent Objective.

Furthermore, a number of samples (in January, May, and July 2019) exceeded the Daily Effluent Limits for TSS, and samples in July 2019 exceeded the Daily Effluent Limit for TP. The operating measures employed for these occasions are discussed in Section 3.3.

The exceedance of the annual average TSS concentration is attributed to the elevated TSS concentrations in the samples collected July 3 and July 16, without which the remaining TSS concentrations would meet the Annual Average Effluent Objective.

### 1.2 Stormwater and Surface Water Monitoring Results

The ECA requires bi-weekly monitoring of nitrate from SW4, located within a tributary of the North Penetangore River located to the west of the Site. The daily effluent limit for nitrate at SW4 is 20.0 mg/L, as specified in ECA No. 1731-B9ZKPU.

The surface water from this reporting period are presented in Table 3.2. Table 3.2 also provides the 2019 annual average concentrations. Nitrate concentrations at SW4 ranged from 0.08 mg/L (several occasions) to 2.53 mg/L (December 30). All samples collected for nitrate during the reporting period were below the effluent limit of 20 mg/L.

### 1.3 Operating Conditions

During the reporting period, the LTF operated between January 1st and December 31st, 2019. When a sample result indicated an exceedance, the plant was put into short-term recirculation mode until the issue was corrected. In January of 2019, the plant was in recirculation mode for the January 12 to 23 period. The other recirculation periods last a few days.

### 1.4 ECA Amendment

As noted in the 2017 APR, in the fall of 2017, the LTF experienced a system upset. As a result of the process upset, GHD was retained to conduct an investigation into the cause and identify potential solutions/preventative measures. GHD prepared a Leachate Treatment Facility Process Upset

Investigation report on June 28, 2018 that detailed the results of this investigation. A series of recommendations were provided to prevent future upsets including:

- Implement a program to inspect water management infrastructure around the operating landfill cell to ensure that surface water and ground water management will not increase leachate generation and impact leachate strength.
- Regularly characterize influent quality, including phosphorus, TKN, and COD (as a surrogate for BOD) in-house to assess nutrient amendment requirements and verify suitability of chemical dosages.
- Regularly verify all sensors and chemical addition dose volumes.
- Implement an operating procedure for sludge wasting that ensures a target sludge age is achieved.
- Replace methanol backpressure valve.
- Implement a series of SOPs for starting up second treatment train, modifying the influent flow rate, characterizing influent, instrumentation and dosage verification, and adjusting the RAS, WAS, and recirculation flow rates.

In addition, an ECA amendment was submitted on November 11, 2018 to provide additional operational flexibility to assist with maintaining a healthy biomass and to provide a formal procedure for operations in the event of an effluent exceedance that will facilitate establishing conditions to prevent further exceedances.

On March 15, 2019, the Municipality received Amended ECA No. 1731-B9ZKPU. The amendments were made to:

1. Add Limited Operational Flexibility (LOF) to the ECA.
2. Allow the addition of freeze-dried bacteria in the event of reduced biological composition.
3. Add a nitrogen source if required to maintain nutrient balance.
4. Modify the effluent sample location to use clarifier discharge instead of clarifier discharge pipe, allowing samples to be collected from the top of the clarifier.
5. Add a procedure for re-starting the LTF discharge in the event of an upset.

### 1.5 Leachate Treatment Facility Maintenance

As reported by the Plant Operator, regular maintenance was performed throughout the operating period of the year.

### 1.6 Calibration and Maintenance on Effluent Monitoring Equipment

On December 6, 2019, the influent, recirculation, RAS, waste activated sludge (WAS), and effluent flow meters were verified by Endress and Hauser.

### 1.7 Sludge Production

Sludge at the LTF is generated from the secondary clarifier. A portion of sludge generated from the secondary clarifier is returned to the aeration basins as RAS on an ongoing basis to support the biological process. Sludge that is produced in excess of that required to support the biological process is wasted to the sludge storage tank as WAS. The WAS is the only sludge produced at the Plant. The WAS is pumped to a sludge holding tank prior to removal and disposal in the KWMC landfill cells.

The sludge was transported by a vacuum truck for disposal within the Stage 1 cell.

### 1.8 Complaints

GHD is unaware of any complaints made during the current reporting period (i.e., there were no complaints received by Municipal staff members in regards to odour, noise, or other operational aspects of the LTF).

### 1.9 Spills and Abnormal Discharge Events

There were no reported spills or abnormal discharge events during the reporting period related to the LTF operations.

# Appendix C

## Recycling Diversion Summary and Waste Tonnage Reports

# *Municipality of KINCARDINE*

*December 2023 BASWR Tons Diverted from Landfill*

| | TOTAL TONS | TOTAL TONS TO DATE | TOTAL MT TO DATE |
|---|---|---|---|
| Newspaper | 8.40 | 145.20 | 131.70 |
| Steel Cans | 2.68 | 46.27 | 41.97 |
| Aluminum | 1.81 | 31.38 | 28.46 |
| Mixed Glass | 8.53 | 147.51 | 133.79 |
| HDPE Plastic | 3.76 | 65.00 | 58.96 |
| PET Plastic | 5.57 | 96.33 | 87.37 |
| Boxboard | 6.57 | 113.56 | 103.00 |
| Cardboard | 33.85 | 426.35 | 386.70 |

| | | | |
|---|---|---|---|
| TOTAL | 71.15 | 1071.60 | 971.94 |
| TOTAL TO DATE | 1071.60 | | |

Tonnes

| | | Collected Curbside | | Collected Depot | | Marketed (even given away) | | Disposed (put in landfill) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Residential | IC&I | Residential | IC&I | Residential | IC&I | Residential | IC&I |
| **Other Recyclables** | White Goods | | | 198 Fridges | | | | | |
| | Small Appliances | | | N/A | | | | | |
| | e waste | | | 17.25 | | | | | |
| | hazardous waste | | | 10.79 | | | | | |
| | Tires | | | 1321 Tires | | | | | |
| | Bale Wrap | | | 15.27 | | | | | |
| | Textiles | | | 10.51 | | | | | |
| | Bulky Goods | | | N/A | | | | | |
| | Scrap Metal | | | 166.99 | | | | | |
| | Drywall | | | 61.41 | | | | | |
| | Wood | | | 266.13 | | | | | |
| | Brick & Concrete | | | 94.94 | | | | | |
| | Mattress | | | 976 mattresses | | | | | |
| | shingles/roofing | | | 473.85 | | | | | |
| | batteries | | | 1.57 | | | | | |
| | styrofoam | | | 3.09 | | | | | |
| | film plastic | | | 6.53 | | | | | |
| | other Propane Tanks | | | 48 2016 cylinders | | | | | |
| | other Light Bulbs | | | 5566 lamps | | | | | |
| | other | | | N/A | | | | | |
| | Other C&D Recyclables | | | N/A | | | | | |
| **Orgaincs** | Yard Waste | | | 120.57 | | | | | |
| | Leaves | | | N/A | | | | | |
| | Household Organics | | | N/A | | | | | |
| | Bulky/Oversized Yard Waste | | | 74.25 | | | | | |

All weights are very important here. if you had anything (ie white goods) picked up, disposted and sold are all very important weights for you to claim as diversion from landfill

# Waste Type Summary By Source Report

01/01/2023 to 12/31/2023

| Waste Type | Units | Weight (tn) | Weight (%) | Fees ($) | Fees (%) |
|---|---|---|---|---|---|
| APPLIANCES | 198 | 0.32 | 0.01% | $5,346.00 | 0.78% |
| ASBESTOS | 0 | 10.27 | 0.22% | $1,201.20 | 0.17% |
| BAG TAGS | 9,309 | 9.11 | 0.20% | $29,511.50 | 4.29% |
| BASWRA | 3 | 1,528.57 | 33.46% | $0.00 | 0.00% |
| BATTERIES | 88 | 0.29 | 0.01% | $377.50 | 0.05% |
| BLUE BOX | 5 | 0.00 | 0.00% | $70.65 | 0.01% |
| BRUSH | 297 | 6.16 | 0.13% | $6,932.85 | 1.01% |
| CLEAN FILL | 1 | 81.33 | 1.78% | $6,172.15 | 0.90% |
| COMMERCIAL SORTED WASTE | 94 | 224.80 | 4.92% | $29,708.29 | 4.32% |
| COMMERCIAL UNSORTED WASTE | 4 | 882.52 | 19.32% | $201,416.48 | 29.26% |
| COMPOST | 0 | 120.57 | 2.64% | $0.00 | 0.00% |
| CONTAMINATED FILL | 0 | 189.96 | 4.16% | $19,318.78 | 2.81% |
| COVER MATERIAL | 0 | 73.69 | 1.61% | $2,284.39 | 0.33% |
| DRYWALL | 58 | 39.32 | 0.86% | $6,334.17 | 0.92% |
| EWASTE | 0 | 0.76 | 0.02% | $0.00 | 0.00% |
| GREEN CONE | 8 | 0.00 | 0.00% | $505.50 | 0.07% |
| HOUSEHOLD SORTED WASTE | 26,239 | 555.67 | 12.16% | $223,795.10 | 32.51% |
| HOUSEHOLD UNSORTED WASTE | 9 | 121.45 | 2.66% | $27,849.81 | 4.05% |

# Waste Type Summary By Source Report

01/01/2023 to 12/31/2023

| Waste Type | | Units | Weight (tn) | Weight (%) | Fees ($) | Fees (%) |
|---|---|---|---|---|---|---|
| INTERDEPARTMENTAL | | | | | | |
| | | 0 | 0.00 | 0.00% | $0.00 | 0.00% |
| MATTRESS | | | | | | |
| | | 1,111 | 4.73 | 0.10% | $27,763.00 | 4.03% |
| OTHER | | | | | | |
| | | 2 | 0.01 | 0.00% | $160.00 | 0.02% |
| RUBBLE | | | | | | |
| | | 19 | 94.94 | 2.08% | $9,766.11 | 1.42% |
| SHINGLES | | | | | | |
| | | 15 | 408.72 | 8.95% | $52,719.57 | 7.66% |
| TIRES | | | | | | |
| | | 5 | 0.00 | 0.00% | $0.00 | 0.00% |
| WEIGHT ONLY | | | | | | |
| | | 8 | -51.05 | 1.12% | $245.09 | 0.04% |
| WOOD | | | | | | |
| | | 341 | 266.13 | 5.83% | $36,994.99 | 5.37% |
| | **GRAND TOTALS** | **37,814** | **4,568.27** | | **$688,473.13** | |

## Allan Molenhuis

**From:** Leslie Waites <lwaites@kincardine.ca>
**Sent:** Monday, April 15, 2024 1:52 PM
**To:** Allan Molenhuis
**Cc:** Mark Stopford; Mark O'Leary
**Subject:** RE: KWMC Interim Construction Report and Operational Details for 2023 Reports

Please see information below re: Terracycle. Unfortunately, items were not weighed, they were counted and diverted approximately:

Toothbrush/floss/toothpaste/individual flossers
Approximately 2000 pieces

Disposable razors
Approximately 500 pieces

Food pouches
Approximately 1500 pieces

Swiffer cloths
Approximately 200 pieces

Brita filters
Approximately 90 filters of various sizes

Cigarette butts (these i did weigh)
Approximately 30lbs

Pet food bags
Approximately 225 large bags

Contact lens packaging
Approximately 250 single use packets

Coffee bags
Approximately 725

Hasbro toys
Approximately 50 pieces of varying sizes (probably 40 lbs if I had to guess)

Pens and Markers
Approximately 750 pieces

Regards,

**Leslie Waites**
Environmental Services – Admin. Assistant

# Appendix D

## 2022 Slope Stability Monitoring

# Technical Memorandum

**April 24, 2023**

| | | | |
|---|---|---|---|
| **To** | Allan Molenhuis | | |
| **Copy to** | | | |
| **From** | Abdul H. Khan, P.Eng./Bruce Polan, M.A.Sc., P.Eng. | **Tel** | +1 519 884 0510 |
| **Subject** | **2022 Annual Geotechnical Instrumentation and Slope Monitoring<br>Kincardine Waste Management Centre<br>437 Sideroad 15 N, Kincardine, Ontario** | **Project no.** | 004074 |

## 1. Introduction

This memo summarizes the results of the annual geotechnical instrumentation and slope monitoring at the Kincardine Waste Management Centre (Landfill or Site) located at 437 Sideroad 15N in Kincardine, Ontario for 2022.

The purpose of the monitoring of the installed instrumentation and slope along the North Penetangore River is to fulfill the conditions outlined in Section 9.8 of the Certificate of Approval (C of A) No. A272702, dated June 1, 2011. This letter presents a description of the installed instruments and results and findings of the monitoring activities carried out during 2022, and site visit conducted by our Senior Geotechnical Engineer in January 2023.

## 2. Background

The Site is located within the North Penetangore River watershed and is currently operating as an approved solid waste disposal facility. Portions of the Site are within the Saugeen Valley Conservation Authority (SVCA) Regulated Area. The SVCA Regulated Area includes the North Penetangore River, their respective floodplains and adjacent valley slopes, all wetland features, and an appropriate setback from these features. As part of the EPA approval process, a slope stability evaluation of the North Penetangore River valley slope abutting the existing landfill and its proposed expanded footprint was conducted through a geotechnical borehole investigation and slope stability modeling in accordance with the SVCA guidelines. The findings of the study were provided in the Inspec-Sol Geotechnical Investigation and Slope Stability Evaluation Report # 004074-69 (62); dated July 19, 2010.

Based on the geotechnical borehole investigation, visual inspection of the slope, completion of a Slope Stability Rating in accordance with the requirements of the Ontario Ministry of Natural Resources and Forestry (MNRF)

Guidelines, toe erosion analysis, and results of the global slope stability evaluation, the following conclusions were made in the referenced Geotechnical Investigation and Slope Stability Evaluation Report:

- The proposed landfill expansion will not have an effect on the stability of the existing riverbank slope.
- There is the potential for the riverbed to continue its meandering pattern, which could cause further slope erosion.
- An annual monitoring program should be carried out, comprising annual inspection of the river valley slope in the spring season for signs of soil veneer instability, seeps, and river-induced toe erosion.
- The annual inspection should be conducted for a five-year period, and at the end of the five-year period, the Geotechnical Engineer should reassess the need for annual inspections.
- The initial monitoring program should also include an evaluation of historic air photography, if available, to assess the past shape of the river meanders, and the potential rate of progress of the meanders towards the landfill.

The Geotechnical Report was reviewed by the SVCA, and communicated their comments to Conestoga-Rovers and Associates (CRA) via letter dated December 2, 2010. CRA submitted responses to these comments via the "Response to Agency Comments" Report #004074 (CRA Report 59, Rev 1, dated May 2011, Section 4).

In order to address the SVCA comments, the following monitoring program for slope stability and toe erosion was established:

- Installation of four slope inclinometers at identified locations along the west and north slopes top of the landfill extending to at least 15 m depths.
- Installation of four survey pins at identified locations along the riverbank to monitor riverbank erosions and near surface slope toe movements, if any.
- Visual periodic inspection of the slopes to identify any obvious movements in the slopes, groundwater seepage, or erosion along the riverbank due to meandering.

The Ministry of Environment, Conservation and Parks (MECP) approved the periodic monitoring program comprising the following frequency, as provided in Condition 9.8 of the C of A No. A272702.

- Monitoring of the slope inclinometers and riverbank survey pins for the first year at least quarterly and then semi-annually for the next five years. After five years, the program could be reviewed.
- Carrying out visual inspection of the slope at least once a year (spring season) by the Geotechnical Engineer, and more frequently if the results of the instrumentation monitoring show the potential for slope movements/excessive toe erosion.
- Documentation of the results of the instrumentation readings, and visual slope inspections in the annual report.

# 3. Geotechnical Instrumentation Installation

The four slope inclinometers were installed along the crest of the slope during November and December 2012, and the four survey pins were installed along the North Penetangore River banks abutting the river valley slope toe during November 2012. The locations of the installed slope inclinometers and survey pins are shown on the attached Figure 1. The installation details of slope inclinometers are shown on the attached Figure 2.

Initially four survey pins (SP-1 through SP-4) were installed in 2012. The survey pins comprise of an installation of two steel T-bars installed at each location. Following the recommendations provided in the 2013 Annual Monitoring Summary Report, two sets of new survey pins (SP-5 and SP-6) were installed at the top of the slope adjacent to erosional features at the north and eastern corner of the site during January 2014. A new survey pin SP-7 was installed approximately 30 m southeast of slope inclinometer SI-03 during our monitoring event on May 31, 2022. The location of the survey pins is shown on Figure 1.

# 4. Slope Inclinometer and Survey Pin Data

Monitoring of the four slope inclinometers (SI-01 through SI-04) and six survey pins (SP-1 through SP-6) continued during 2022 in accordance with the approved monitoring program. Based on the observations of the slope instrumentation and visual inspections of the slope during 2018, GHD provided recommendations that the frequency of the monitoring be changed to an annual event in 2019. Based on the annual inspection carried out in 2020 and 2021, it was recommended to continue the annual monitoring event in 2022. The instrumentation monitoring and slope inspection for 2022 was carried out on May 31, 2022.

## 4.1 Slope Inclinometers

Baseline readings for the inclinometers were initially carried out following their installations during 2012 with subsequent monitoring events in November and December 2012. The results and finding of the instrument installations and previous monitoring events have been reported in annual monitoring reports prepared by GHD.

During our monitoring event on November 9, 2021, the slope inclinometer SI-01 casing was found to be damaged. The damaged casing for this inclinometer was repaired on May 31, 2022, and a baseline reading was recorded following its repair (Photos 24 and 25). The readings for the remaining three inclinometers SI-02, SI-03 and SI-04 were also recorded. The readings taken in the slope inclinometers during the 2022 monitoring event and previous monitoring events subsequent to their respective baseline readings are plotted on a graph to identify any soil/slope movement along the vertical profile of each individual inclinometer. The cumulative and incremental displacement graphs are provided in Attachment A. Where repairs or maintenance of inclinometer casings were previously conducted, the initial reading recorded after the inclinometer repair/maintenance is considered as the baseline reading. The graph for inclinometer SI-01 shows the baseline reading established on May 31, 2022 subsequent to its repair.

The results of the slope inclinometer readings during the monitoring events are summarized in Table 1 – Summary of Slope Inclinometer Readings. Based on the readings obtained in 2022, there has been no significant cumulative or incremental movement in the inclinometers, typically 1 mm or less has been observed. Movements of the inclinometer in the upper 3 m below ground surface is generally neglected, as it may be a result of instrument error or loose casing pipe, and not actual slope movements.

## 4.2 Survey Pins

Measurements at the survey pins were obtained using a measuring tape to measure the horizontal lateral distance between the tops and bottoms of the two T-bars at each survey pin location. The reading obtained on the May 29, 2014 monitoring event is treated as the Baseline Readings for SP-4. The baseline readings for SP-5 and SP-6 were recorded during the January 2014 monitoring event.

As per the recommendations provided in the 2013 monitoring summary report, the lateral distance between the two T-bars at their top and ground level of each survey pin set was measured initially on May 29, 2014. The initial measurement between the two T-bars at each location is termed as the Baseline Reading. The survey pin set at SP-2 was re-installed in 2016, after losing the front T-bar close to the riverbank in 2015 due to toe erosion caused by meandering action of the Penetangore River in its vicinity. The survey pin SP-2 was re-installed during our monitoring event on June 13, 2016, and a baseline reading was recorded following its installation. The western T-bar at the survey pin SP-3 was found washed down the river during our monitoring event in 2019. The survey pin was re-installed, and a baseline reading was recorded for our future events. During the 2020 monitoring event, it was observed that a tree had fallen into the river adjacent to the western SP-1 T-bar, and this dislodged the survey pin. The survey pin was straightened, and a new baseline reading was established.

During the 2021 monitoring event, it was observed that the west T-bar of survey pin SP-3 was washed down the river due to sloughing of the bank top at this location. A new T-bar was installed at this survey pin locations during the May 31, 2022 monitoring event, and a baseline reading recorded following its installation.

The baseline and previous annual readings are used to compare subsequent readings taken on the following monitoring events. The readings taken during our 2022 monitoring event were compared to the 2021 readings in Table 2.

A new survey pin SP-7 was installed on May 31, 2022, approximately 50 southeast of SI-03, close to monitoring well OW32-07, and a baseline reading was recorded.

The survey pin readings showed very little lateral displacement between the 2021 and 2022 readings. The relative movement recorded between the 2021 and 2022 readings was 10 mm or less.

# 5. Visual Slope Stability Assessment

An initial slope inspection was conducted on March 10, and April 19, 2010 to assess the stability of the North Penetangore River Valley slope adjacent to the Site. The findings of the slope reconnaissance are provided in the Inspec-Sol Report dated July 19, 2010. Slope inspections were also carried out on a semi-annual basis for the following six years, and then continued on an annual basis, and these findings have been provided in previous memos.

The 2022 visual slope inspection was carried out on May 31, 2022. Photographs were taken during the inspection near the survey pin locations for reference purposes, and selected photographs are presented in Attachment B.

Localized riverbank toe erosion was observed in the area close to survey pin SP-1, SP-2, and SP-3 locations (Photo 1, 5, 6, 7, 8, 9, 10 and 11). At these locations, the roots of some trees located near the river channel were partially exposed due to river erosion and undercutting. At survey pin SP-3, two large trees had fallen, and another twin rooted tree was tilted toward the river at this location (Photo 9, 10 and 11). One mature tree fell into the river in an area between survey pins SP-2 and SP-3 (Photo 8). This was also noted during our 2020 and 2021 inspection. Surface water sheet flow was noted near survey pin SP-5 (Photo 13). Flowing surface water was observed just north of survey pin SP-5. This surface water flow was also observed during the 2019, 2020 and 2021 inspections. This surface water flow has caused the formation of minor erosion gullies in this area.

The slope along the west riverbank near the northeastern corner of the Site, has historically shown signs of surficial erosion and bare soil, and this bare slope is shown in Photos 18 through 21. No new signs of any major slope instability, deep-seated failures, surficial sliding, or erosion were observed during our Site visit in 2022. The top of the slope in this area is densely treed, and these trees continue to grow and mature. Survey pin SP-6 installed at the top of the slope near the eroded portion of the slope in the northeast corner of the Site is almost hidden by these trees (Photos 17 and 18). The survey pin did not show any substantial displacement during the May 31, 2022 measurements.

An aerial drone survey of the site was completed on November 15, 2022. Figure 3 shows the contours from the aerial drone survey in the northeastern corner of the site. River bank related slope erosion in this area could be tracked over time by comparing future drone surveys.

# 6. Stockpiles on Historic Landfill Portion

During the excavation of the active cells to the south, excavated overburden soils have been placed over the old landfill cells- Phase 1 disposal cells, now known as the Stage 7 portion of the landfill. In the 2012 Design and Operations Plan Report (D&O Plan, Conestoga Rovers & Associates, Report 49 Rev 1), the Stage 7 area will eventually be raised to elevation 272 to 273 m amsl as the finished landfill cap. Side slopes of the cell will be finished at 4 horizontal to 1 vertical (4H:1V). However, based on the aerial drone survey contours, this area has already been filled to these maximum elevations with excess soil piles, and the side slopes are much steeper than 4H:1V. The over-steepened fill pile has also collapsed and flowed into the area to the west of the cell, as shown on Photos 26 to 30.

# 7. Conclusions and Monitoring Frequency Recommendations

The 2018 monitoring program completed the requirements of the initial six-year monitoring program required under Section 9.8 of the MECP C of A. Monitoring has continued on an annual basis since 2019. The conclusions and recommendations of the 2022 annual monitoring program are:

- The slope inclinometers have shown little movement over the period of 2012 to 2022. No indications of significant slope movements of the slope along North Penetangore River have been recorded over this period.
- Some movement has been recorded at the survey pin locations over the period of 2012 to 2022, including the loss of survey pins at some locations close to the toe of the river. The river is an active meandering river, and the river banks show signs of erosion and undercutting, which is typical of a meandering river. These minor erosional features are not a significant concern as they are well away from the top of the slope and the landfill features.
- The bare slope at the northeastern corner of the site, west of Sideroad 15N, has not significantly changed over the ten years of monitoring (2013 to 2022). The steepest eroded portion of the slope is located where the river flow bends to the north at SP-6 (Photos 18 to 21). It is expected that this area will erode over time to a flatter more stable slope. An aerial drone survey for the site was carried out on November 15, 2022. The image generated from this drone survey can be used to monitor slope movements over time. An additional drone survey will need to be carried out at a later date to make a comparison between the top of slope and determine erosion rates over time. It is recommended that the next drone survey be completed in

2027. A geotechnical engineer should review the erosion rates from the two drone surveys, and determine if any additional measures need to be undertaken to stabilize this area.

- The large stockpile of excavated soil on the historic landfill portion should be addressed, and the area should be cleaned up and regraded, to prevent additional sloughing and flowing of the stockpile.
- The annual monitoring program can be discontinued, as there are no current concerns with the meandering nature of the river, and with the slope inclinometer movements. This program can be re-instated at a future date if the meandering river becomes a concern.

Regards,

**Bruce Polan, M.A.SC., P.Eng.**
Engineering Leader, Materials Technology

**Abdul Hafeez Khan, B.Sc., P. Eng.**
Project Engineer

AK/bp/cd/124

SP-1
SP-2
SP-3
SP-4
SP-5
SP-6
SP-7
NORTH PENETANGORE RIVER
SI-01-12
SI-02-12
SI-03-12
SI-04-12
BH-7
BH-6
MW28-00
OW37-09
OW42-09
OW43-09
OW28-89
OW27-00
OW33-07
OW35-09
BH38-09
OW26-00
OW12-88
OW21-89
OW11-88
OW14-88
OW13-88
OW36-09
OW25-00
OW16-89
OW10-88
OW9-88
OW34-09
OW18-89
OW22-98
OW23-98
OW17-89
BH-3
BH-4
BH-5
BH44-09
OW41-09
OW39-09
OW40-09
SIDEROAD 15N
STORM WATER MANAGEMENT POND 1
ACTIVE DISPOSAL AREA
HISTORIC DISPOSAL AREA
OW32-07
OW6-83
OW31-07
OW7-83
OW30-07
OW19-89
OW8-88
OW4-83
OW3-83
OW29-07
OW2-83
OW24-98

LEGEND:

- EXISTING CONTOURS (LANDFILL SURVEY COMPLETED NOVEMBER 15 2022) (BANK SURVEY FROM AERIAL CONTOURS 2010)
- PROPERTY BOUNDARY
- LIMIT OF WASTE
- GRAVEL ACCESS ROADWAY
- SURFACE WATER STREAM
- SURFACE WATER DITCH
- STORMWATER MANAGEMENT POND
- GROUNDWATER INTERCEPTOR DITCH
- OW27-00 HISTORICAL BOREHOLES
- BH-1 BOREHOLES BY INSPEC-SOL (2010)
- SI-01-12 SLOPE INCLINOMETER (2012)
- SP-1 SURVEY PIN

SOURCE:

1. ALL STAGES LIDAR SURVEY BY GHD, DATED NOVEMBER 15, 2022, NAD 83 UTM ZONE 17.
   FILE NAME: V-TOPO-WARD 2-2023 EXISTING CONDITIONS FOR STAGE 2C CELL CONSTRUCTION REVISED 03-15-2023.
2. ADDITION STAGE SURVEY BY GHD, DATED DECEMBER 3, 2019.
   FILE NAME: 04074(SOURCE)B020 C3D FILES (60)(61) WARD 2 LANDFILLL UPDATE AS SURVEYED DECEMBER 3, 2019.
3. SITE TOPOGRAPHICAL CONTOURS OUTSIDE LIMIT OF WASTE, DATED JUNE 9, 2009.
   FILE NAME: 2009-06-09-EX-OBM-CONTOURS.
4. SITE FEATURES SURVEYED BY GHD, DATED APRIL 14, 2009.
   FILE NAME: 04074(SOURCE)AP013 FILE 35R36 EXISTING CONDITIONS WARD 2 LANDFILL SURVEYED APRIL 14, 2009.

0 20 40 60 80m

GHD

KINCARDINE WASTE MANAGEMENT CENTRE
2022 GEOTECHNICAL INSTRUMENTATION AND SLOPE MONITORING
437 SIDEROAD 15N, KINCARDINE, ONTARIO

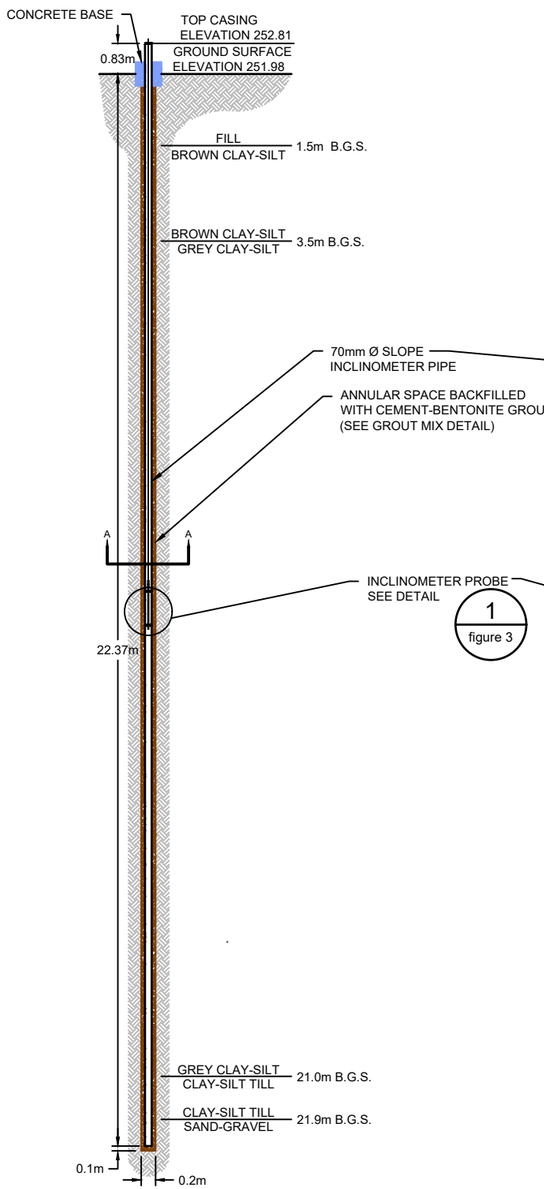
**SLOPE INCLINOMETER / SURVEY PIN LOCATION PLAN**

Project No. **4074**
Date **April 2023**

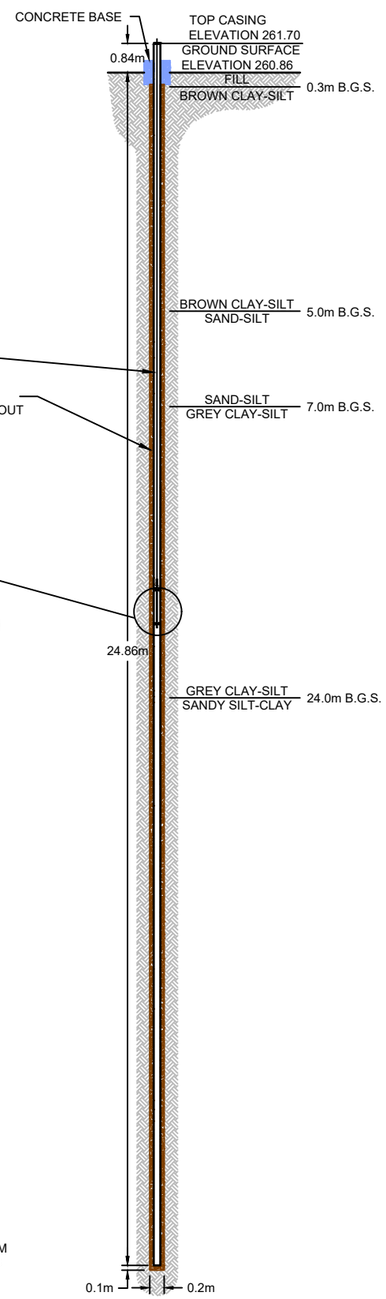
**figure 1**

Filename: I:\CAD\drawings\04000s\04074\04074-memo\04074-43(MEMO124)\04074-43(MEMO124)\004074-43(MEMO124)CI-WA001.dwg
Plot Date: 21 April 2023 3:56 PM

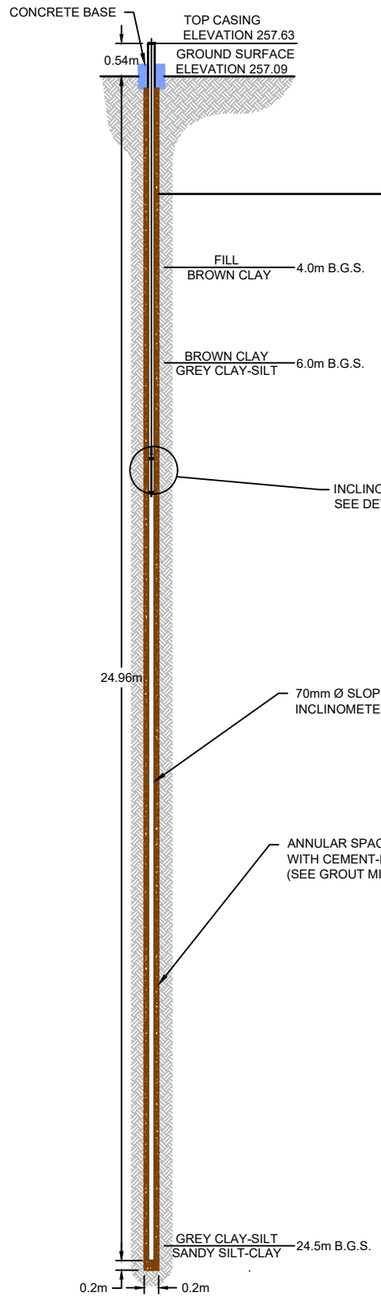
SLOPE INCLINOMETER No. SI-1-12
DATE OF INSTALLATION - NOV. 14, 2012



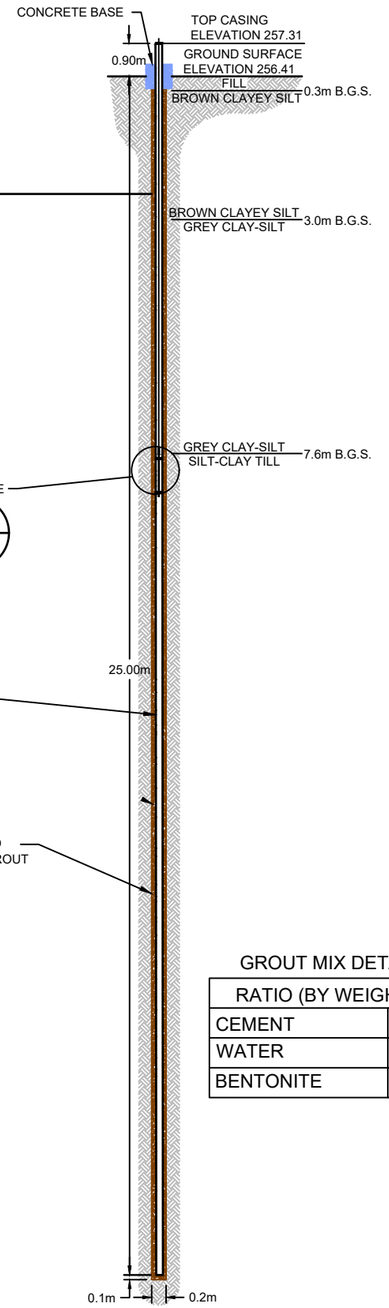

SLOPE INCLINOMETER No. SI-02-12
DATE OF INSTALLATION - NOV. 15, 2012



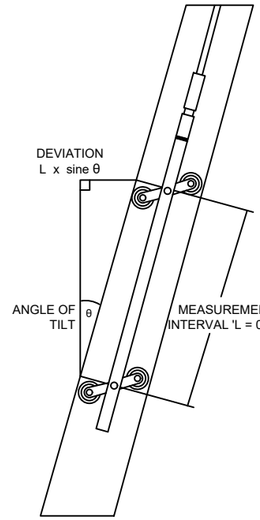

SLOPE INCLINOMETER No. SI-03-12
DATE OF INSTALLATION - DEC. 4, 2012



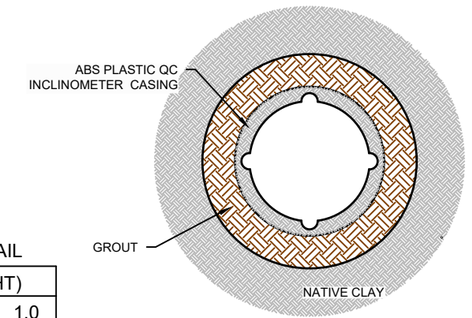

SLOPE INCLINOMETER No. SI-04-12
DATE OF INSTALLATION - DEC. 5, 2012




NOTE:
STRATIGRAPHIC SOIL UNITS ESTIMATED FROM VISUAL OBSERVATIONS OF AUGER CUTTINGS




DETAIL 1 INCLINOMETER PROBE
NTS figure 3




GROUT MIX DETAIL

| RATIO (BY WEIGHT) | |
|---|---|
| CEMENT | 1.0 |
| WATER | 6.6 |
| BENTONITE | 0.4 |

SECTION A-A CASING DETAIL
NTS figure 3

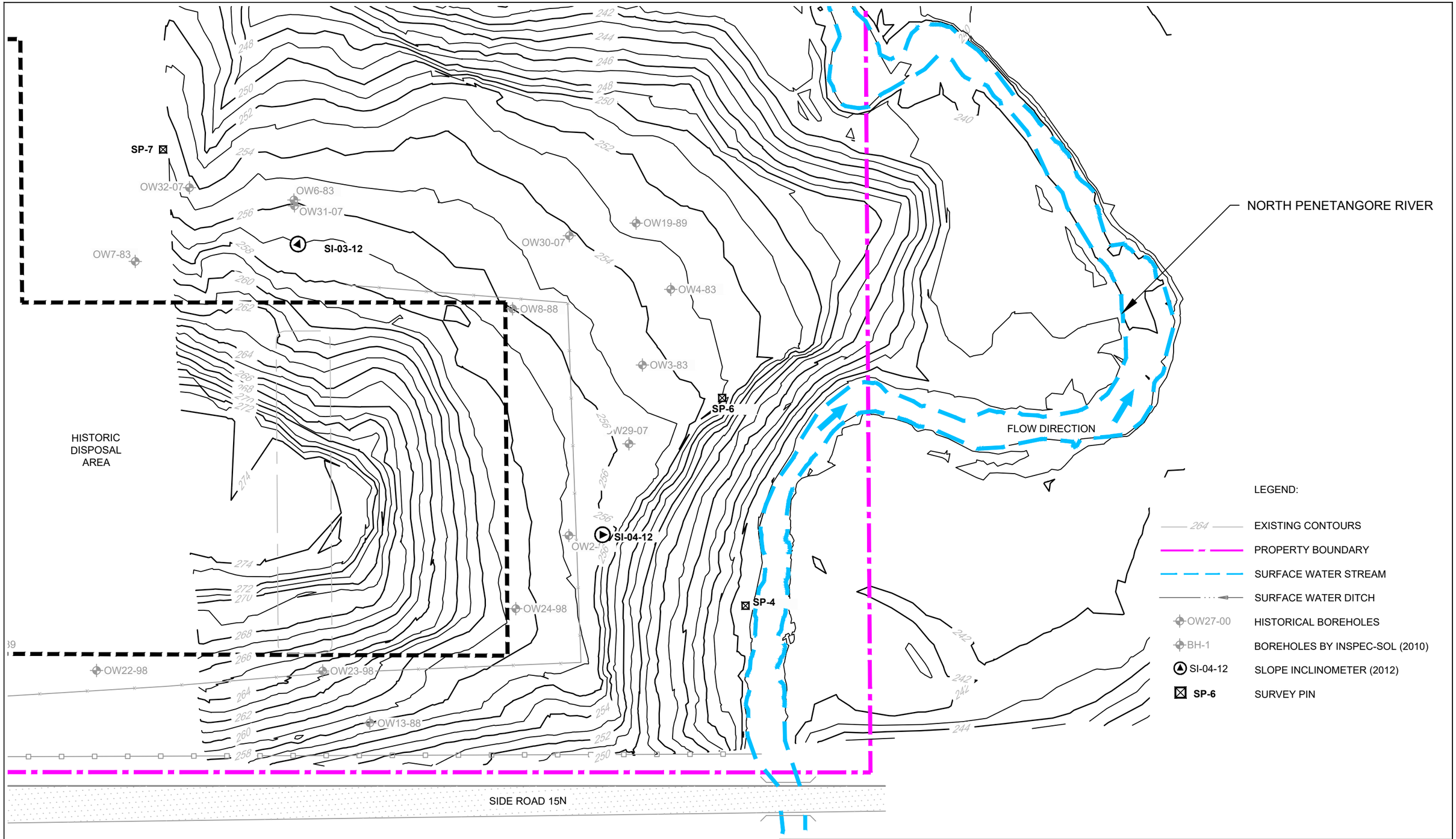
KINCARDINE WASTE MANAGEMENT CENTRE
2022 GEOTECHNICAL INSTRUMENTATION AND SLOPE MONITORING
437 SIDEROAD 15N, KINCARDINE, ONTARIO

**SLOPE INCLINOMETER INSTALLATION DETAILS**

Project No. **4074**
Date **April 2023**

**figure 2**

Filename: I:\CAD\drawings\04000s\04074\04074-memo\04074-43(MEMO124)\04074-43(MEMO124)\004074-43(MEMO124)CI-WA001.dwg
Plot Date: 21 April 2023 3:58 PM




SOURCE:

1. LIDAR SURVEY BY GHD, DATED NOVEMBER 15, 2022, NAD 83 UTM ZONE 17.
   FILE NAME: LIDAR-KINCARDINE-BASE NOVEMBER 15 2022-STAGE 6 TO 7

KINCARDINE WASTE MANAGEMENT CENTRE
2022 GEOTECHNICAL INSTRUMENTATION AND SLOPE MONITORING
437 SIDEROAD 15N, KINCARDINE, ONTARIO

**AERIAL DRONE SURVEY CONTOURS, NOVEMBER 15, 2022**

Project No. **4074**
Date **April 2023**

**figure 3**

Filename: I:\CAD\drawings\04000s\04074\04074-memo\04074-43(MEMO124)\04074-43(MEMO124)\004074-43(MEMO124)CI-WA002.dwg
Plot Date: 21 April 2023 3:56 PM

Summary of Slope Inclinometer Readings
2022 Geotechnical Instrumentation and Slope Monitoring Program
Kincardine Waste Management Centre
437 Sideroad 15 N, Kincardine, Ontario

| Slope Inclinometer | Monitoring Frequency | Baseline Reading Date | Date of Last Reading | Maximum Incremental Displacement (mm) | Comments |
|---|---|---|---|---|---|
| SI-01-12 | Annual | 31-May-22 | 31-May-22 | - | The SI casing was found damaged during our Site visit of November 9, 2021. The casing was repaired on May 31, 2022, and baseline readings recorded for future comparison. |
| SI-02-12 | Annual | 26-Nov-12 | 31-May-22 | Approx. 1 mm | |
| SI-03-12 | Annual | 15-Sep-15 | 31-May-22 | < 1 mm | Baseline reading on Sept. 15, 2015 subsequent to silt cleaning. |
| SI-04-12 | Annual | 29-Apr-13 | 9-Nov-21 | < 1 mm | Baseline reading on April 29, 2013 after repairing damaged casing. The field data recorded from the May 31, 2022 monitoring event was lost due to malfunctioning of data logger. |

Notes :
1. Inclinometer Probe Serial # 102667

Table 2

Survey Pin Readings Summary
Geotechnical Instrumentation and Slope Monitoring
Kincardine Waste Management Centre
437 Sideroad 15 N, Kincardine, ON

| Survey Pin/Point | Survey Pin Location | | | Baseline Measurement[1] | | 2021 Reading | | 2022 Reading | | Difference from Last Year's Reading | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 9-Nov-21 | | 31-May-22 | | Lateral Movement | | |
| | Northing (m) | Easting (m) | Baseline Date | Measurement At Top (m) | Measurement At Bottom (m) | Measurement At Top (m) | Measurement At Bottom (m) | Measurement At Top (m) | Measurement At Bottom (m) | Measurement At Top (mm) | Measurement At Bottom (mm) | |
| **Survey Pins along Slope Toe Close to North Penetangore River** | | | | | | | | | | | | |
| SP-1 | 4892290.044 | 457879.746 | May 7, 2020[2] | 1.932 | 2.010 | 1.935 | 2.008 | 1.938 | 2.010 | 3 | 2 | |
| SP-2 | 4892427.658 | 457920.168 | June 13, 2016[3] | 1.030 | 1.020 | 1.073 | 1.155 | 1.080 | 1.165 | 7 | 10 | |
| SP-3 | 4892491.779 | 458011.270 | May 31, 2022[4] | 1.050 | 0.970 | NA | NA | 1.050 | 0.970 | NA | NA | The west survey pin was gone due to sloughing of the bank top during November 9, 2021 monitoring event. A T-bar was installed on May 31, 2022 visit, and baseline reading recorded. |
| SP-4 | 4892525.326 | 458343.360 | May 29, 2014 | 2.015 | 2.055 | 2.005 | 2.025 | 2.005 | 2.027 | 0 | 2 | |
| SP-5 | 4892516.611 | 458114.984 | January 2014 | 1.398 | 1.430 | 1.360 | 1.410 | 1.360 | 1.415 | 0 | 5 | |
| SP-6 | 4892548.986 | 458290.107 | January 2014 | 0.825 | 0.870 | 0.828 | 0.872 | 0.828 | 0.870 | 0 | -2 | |
| SP-7 | NM | NM | 44712.000 | 0.825 | 0.870 | NA | NA | 1.010 | 1.010 | NA | NA | New survey Pin location. Base line established May 31, 2022 |

NOTES:

[1] "Baseline Measurement" refers to lateral measurement between the top and bottom of the Survey Pins (2 T-Bars at each survey pin location).

[2] Baseline measurement for SP-1 re-established on May 7, 2020 after the west bar was straightened, which was found tilted on May 7, 2020 probably due to a fallen tree.

[3] Baseline measurement for SP-2 re-established on June 13, 2016 after reinstallation of west bar, which was found washed down the River on June 17-2015.

[4] Baseline measurement for SP-3 re-established on May 31, 2022.

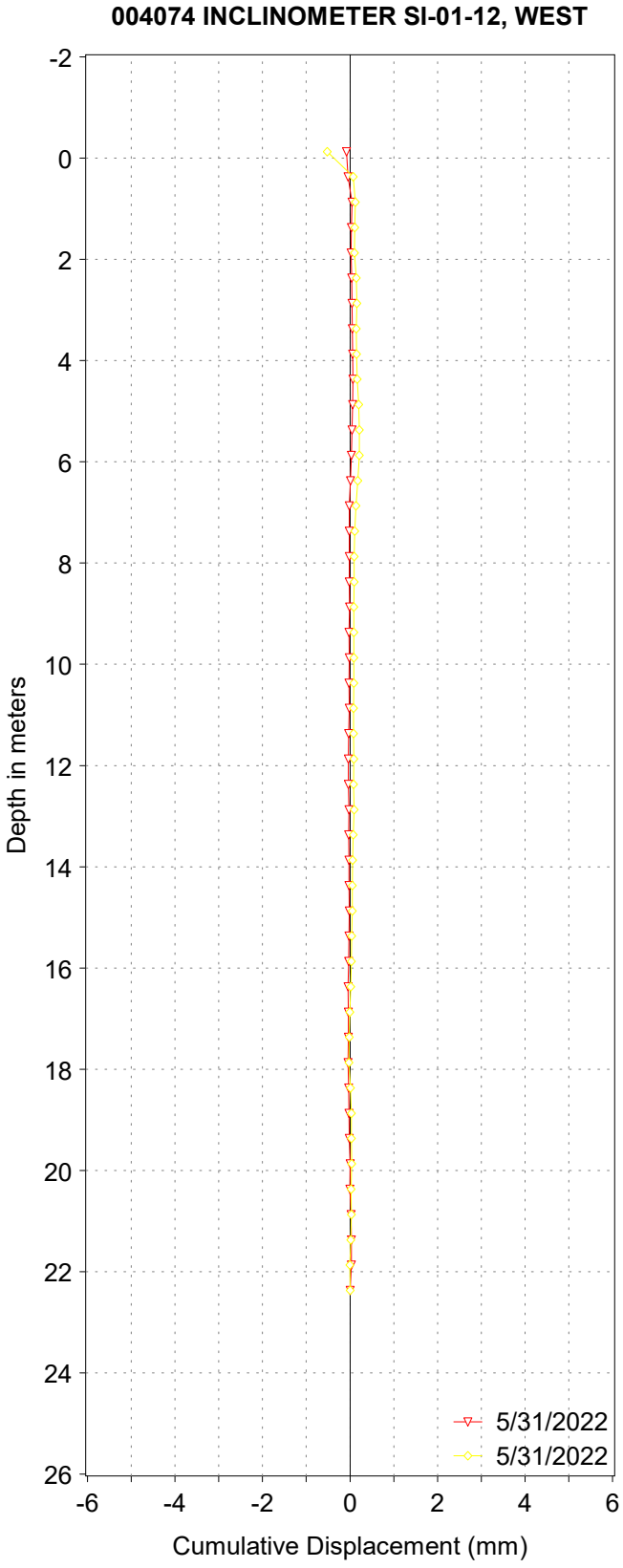
- a positive lateral movement indicates an increase and a minus lateral movement indicates a decrease in displacement compared to the baseline measurement.

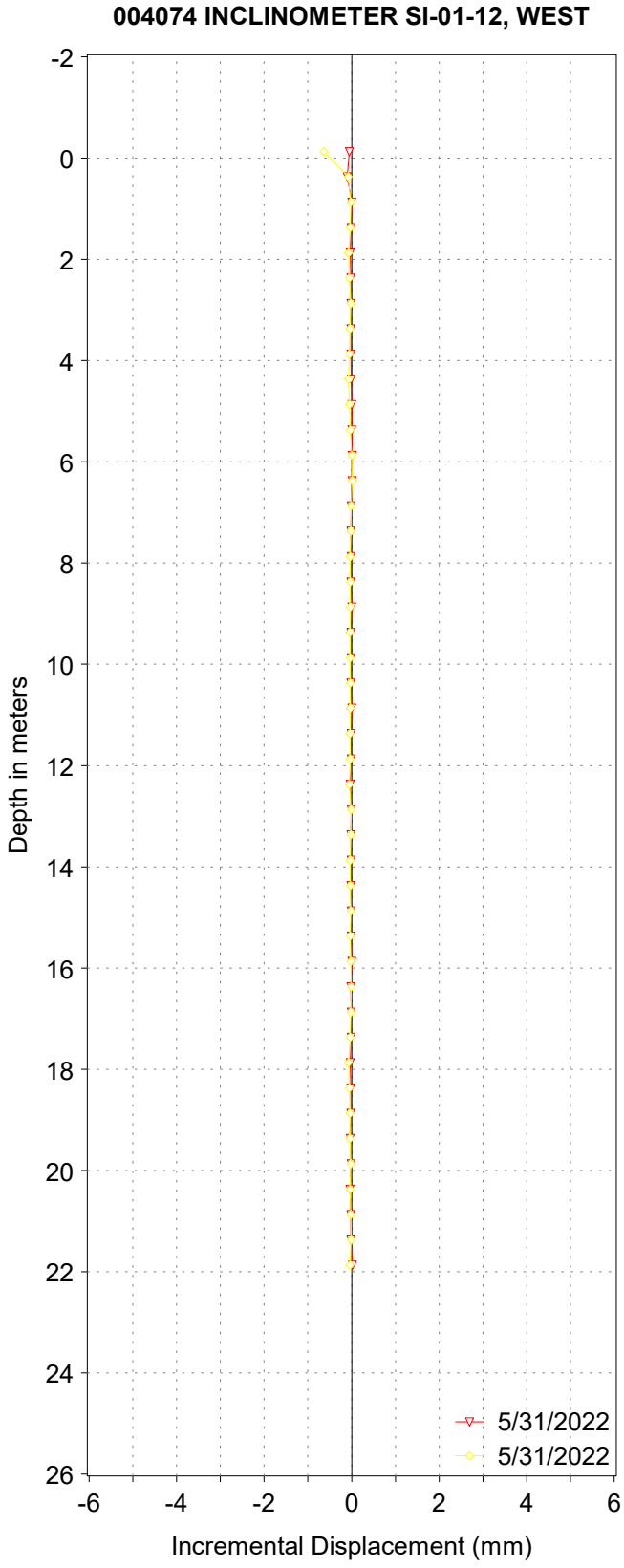
NM - refers to "Not Measured". Pin location not surveyed.

# Attachments

# Attachment 1

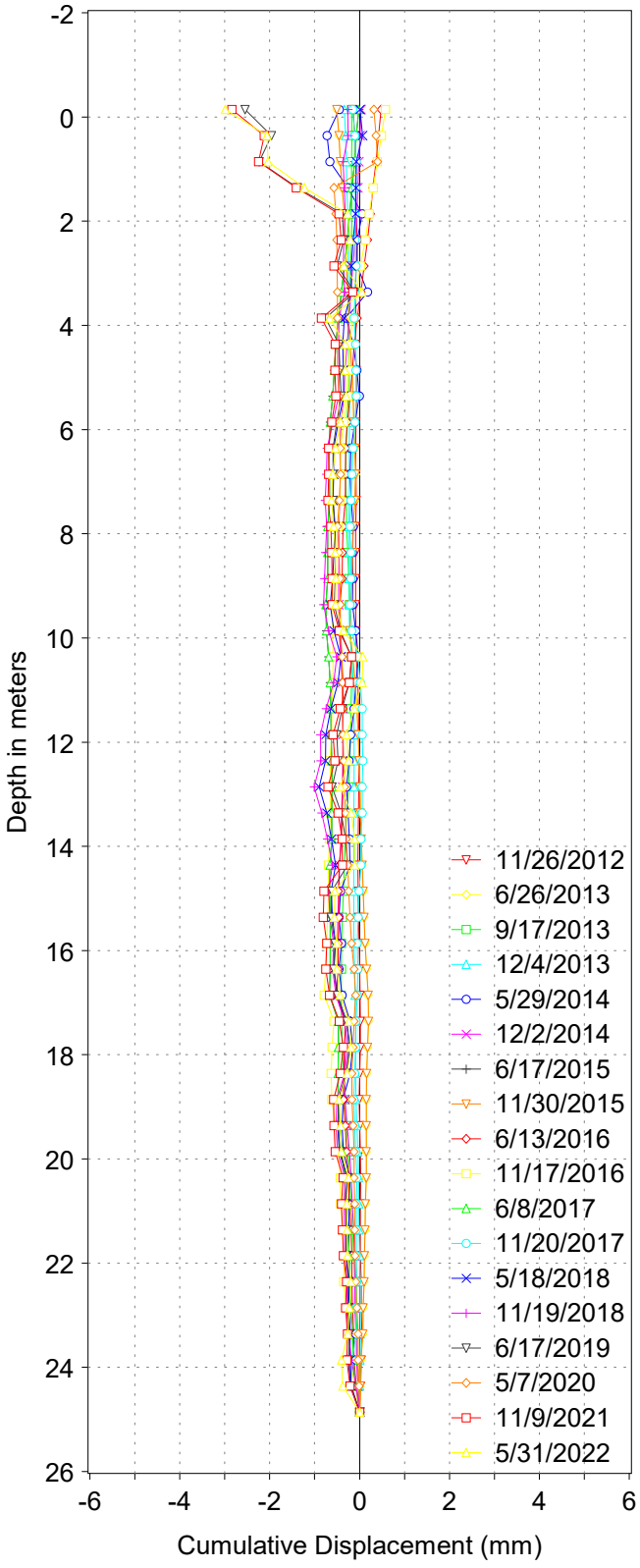
## Slope Inclinometer Graphs

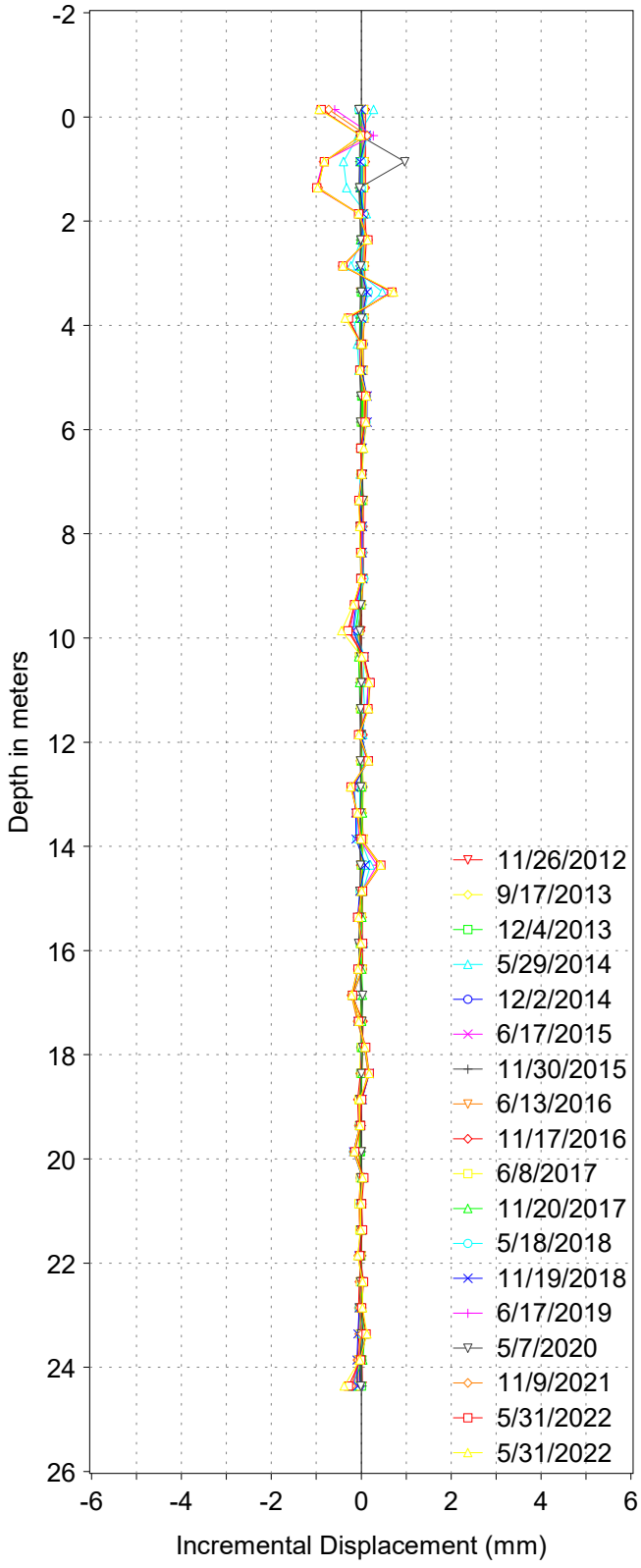



**Attachment 1-a**
**Inclinometer SI-01-12**

**SLOPE INCLINOMETER GRAPH**
**LANDFILL SLOPE MONITORING**
**KINDCARDINE WASTE MANAGEMENT**
***MUNICIPALITY OF KINCARDINE, ONTARIO***

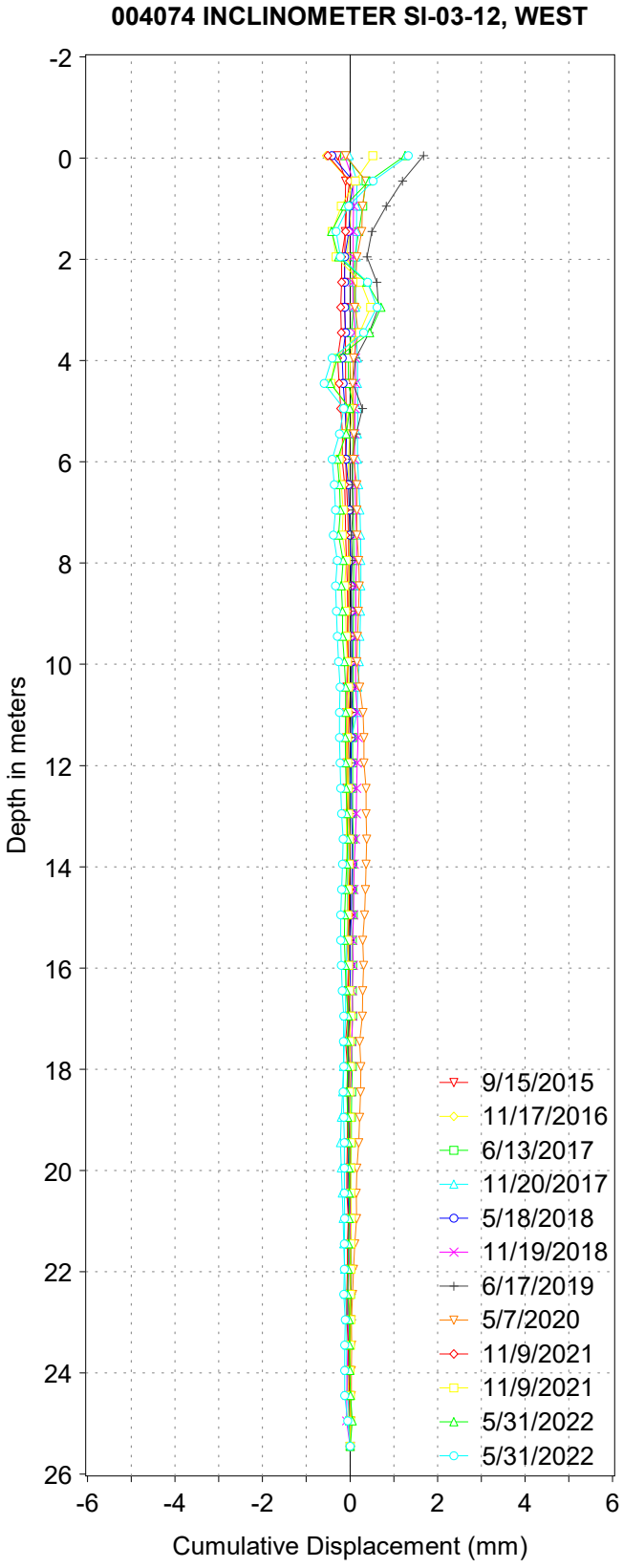


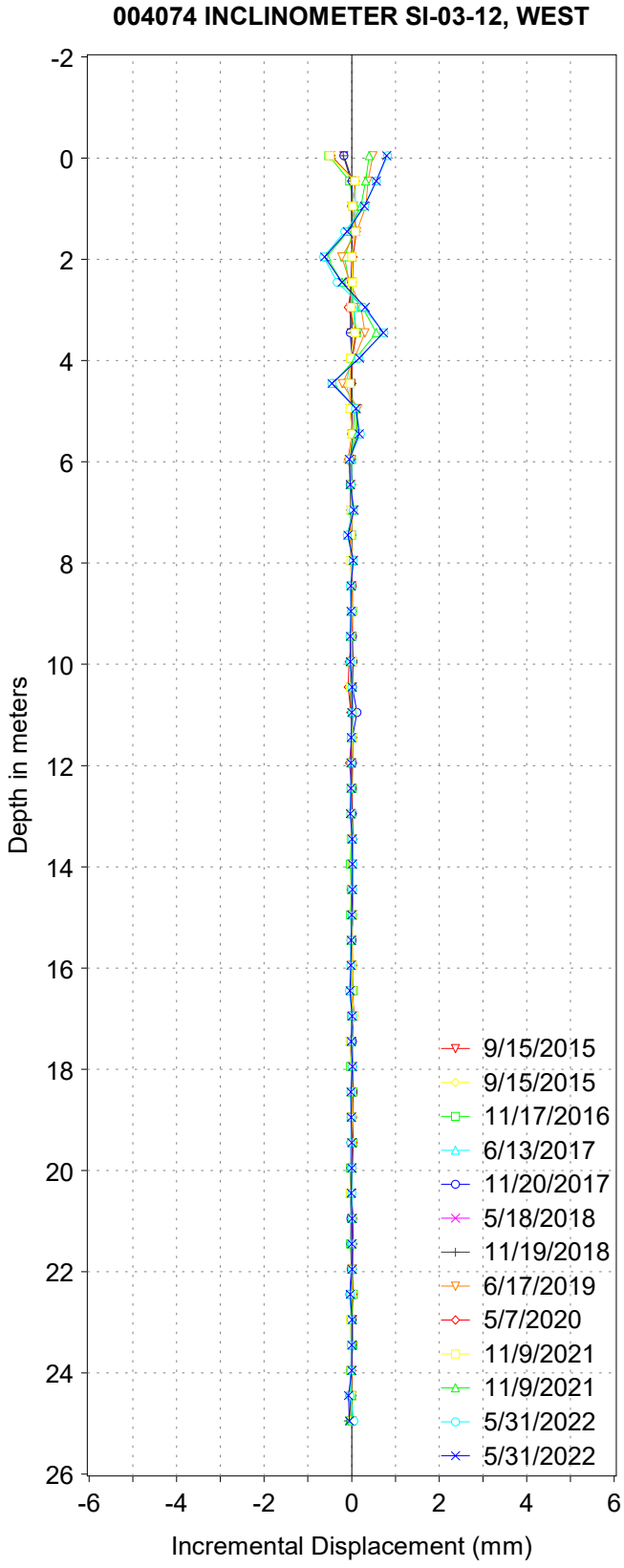




GHD

**Attachment 1-b**
**Inclinometer SI-02-12**

**SLOPE INCLINOMETER GRAPH**
**LANDFILL SLOPE MONITORING**
**KINCARDINE WASTE MANAGEMENT**
***MUNICIPALITY OF KINCARDINE, ONTARIO***

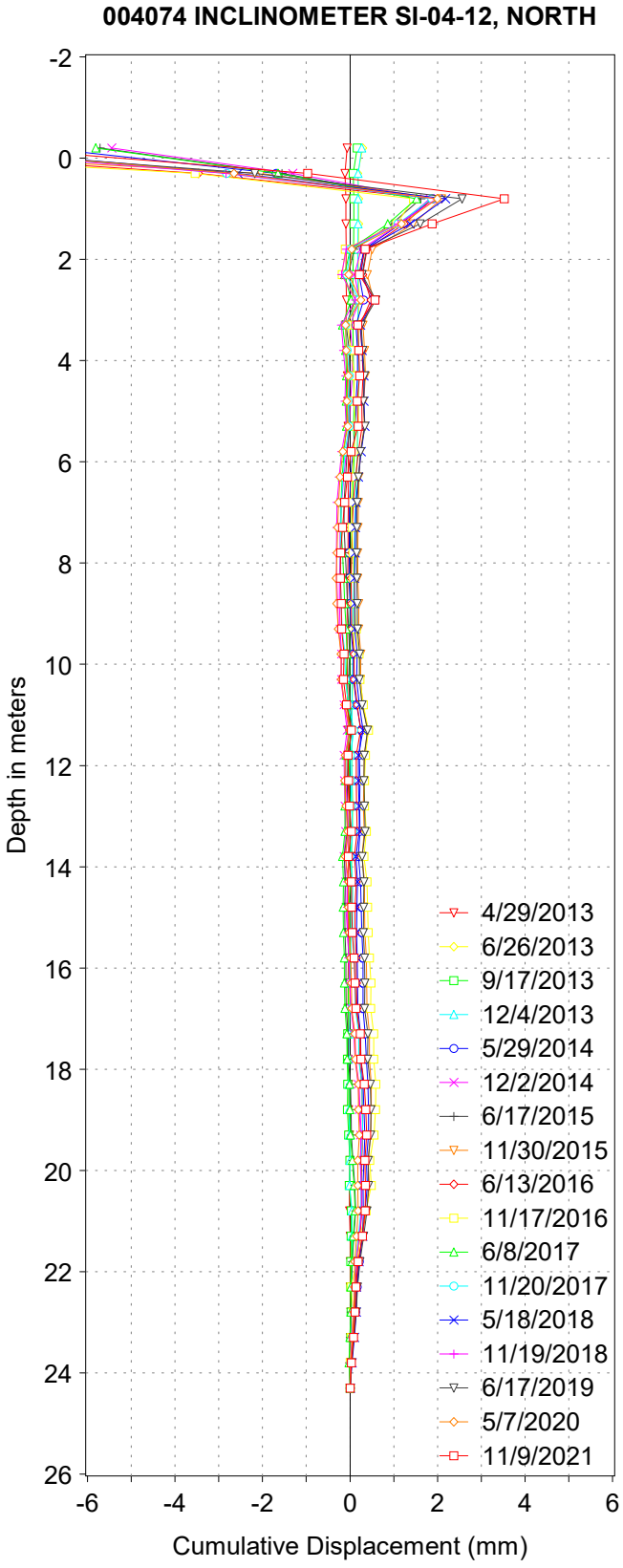


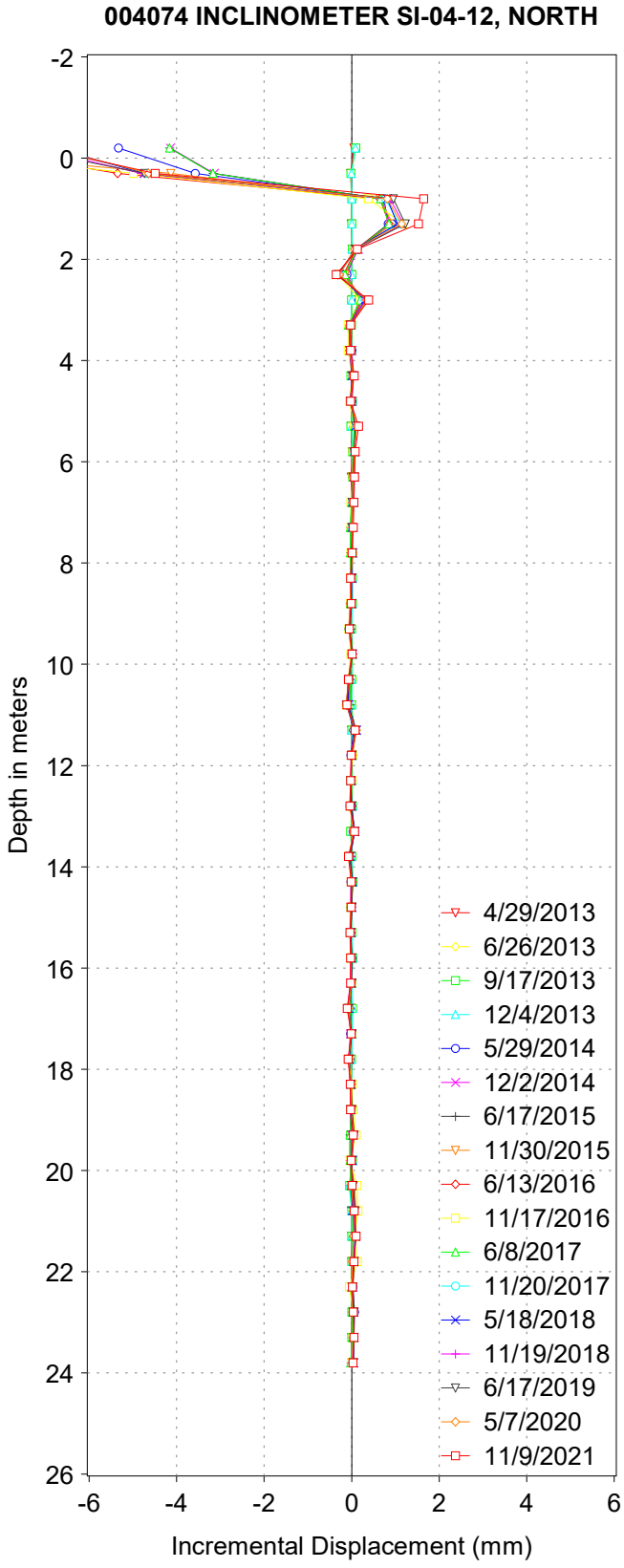




GHD

**Attachment 1-c**
**Inclinometer SI-03-12**

**SLOPE INCLINOMETER GRAPH**
**LANDFILL SLOPE MONITORING**
**KINCARDINE WASTE MANAGEMENT**
***MUNICIPALITY OF KINCARDINE, ONTARIO***




GHD

**Attachment 1-d**
**Inclinometer SI-04-12**

**SLOPE INCLINOMETER**
**LANDFILL SLOPE MONITORING**
**KINCARDINE WASTE MANAGEMENT**
***MUNICIPALITY OF KINCARDINE, ONTARIO***

# Attachment 2

## Photo Log

Photo 1 – Penetangore River near Survey Pin SP-1, and fallen tree near West SP-1. Looking southwest (May 31, 2022).

Photo 2 – Survey Pin SP-1, Looking northwest (May 31, 2022).

**Photo Log – 2022 Visual Slope Inspection**
**Kincardine Waste Management Centre**
**437 Sideroad 15 N, Kincardine, Ontario**

Photo 3 – Flat ground between Survey Pin SP-1 and SP-2, looking northeast (May 31, 2022)

Photo 4 – Flat ground in the vicinity of Survey Pin SP-2, looking northwest (May 31, 2022)

Photo 5 – Survey Pin SP-2, looking northwest (May 31, 2022)

Photo 6 – A fallen immature tree, and riverbank condition near Survey Pin SP-2, looking north (May 31, 2022)

Photo 7 – Undercutting of riverbank at Survey Pin SP-2, looking northwest (May 31, 2022)

Photo 8 – Fallen tree between Survey Pin SP-2 and SP-3, looking northwest (May 31, 2022)

Photo 9 – Survey Pin SP-3 East Bar, with bank erosion and fallen tree at the right corner, looking south (May 31, 2022)

Photo 10 – Fallen trees in front of Survey Pin SP-3, looking west (May 31, 2022)

Photo 11 – Newly installed Survey Pin SP-3 east bar, looking northwest (May 2022)

Photo 12 – Survey Pin SP-5 and riverbank, looking southwest (May 31, 2022)

Photo 13 – Surface water above Survey Pin SP-5, looking north (May 31, 2022)

Photo 14 – Erosion gully north of Survey Pin SP-5, looking northwest (May 31, 2022)

Photo 15 – Loss of tree roots and erosion gullies north of Survey Pin SP-5, looking southwest (May 31, 2022)

Photo 16 – Erosion gully north of Survey Pin SP-5, looking northwest (May 31, 2022)

Photo 17 – Survey Pin SP-6, looking northwest (May 31, 2022).

Photo 18 – Slope erosion near Survey Pin SP-6, looking northwest (May 31, 2022).

Photo 19 – Slope erosion near Survey Pin SP-6, looking west (May 31, 2022).

Photo 20 – Slope erosion near Survey Pin SP-6, looking west (May 31, 2022).

Photo 21 – Survey Pin SP-4, looking west (May 31, 2022).

Photo 22 – Slope Inclinometer SI-04, looking north (May 31, 2022).

Photo 23 – Slope Inclinometer SI-02, looking west (May 31, 2022).

Photo 24 – Repair of Slope Inclinometer SI-01 in progress (May 31, 2022).

Photo 25 – Slope Inclinometer SI-01, after completion of repair, looking west (May 31, 2022).

Photo 26 – West face of overburden stockpile on historic disposal area (Slope Inclinometer SI-03 in foreground) (May 31, 2022).

Photo 27– Sloughed stockpile near Slope Inclinometer SI-03, looking south (May 31, 2022)

Photo 28 – New Survey Pin SP-7 installed near OW32-07, looking east (May 31, 2022).

Photo 29 – New Survey Pin SP-7 near OW32-07, looking west (May 31, 2022).

Photo 30 – Sloughed silty soil in front of New Survey Pin SP-7, looking west (May 31, 2022).

# Appendix E

## Leachate Treatment Facility - Maintenance Log

| | | | |
|---|---|---|---|
| Reporting Year | 2023 | | |
| System Name | Leachate Treatment Facility | | |
| Site visit July 26, 2023 | | | |
| | | | |
| | | | |
| | | | |
| Notes | | | |
| Daily rounds include scraping down clarifier, hosing down green house, skimming sludge from both anox tanks | | | |
| | | | |
| Bypasses and spills | | | |
| | Date | Time | |
| Leachate spill | 5-Jan | 1330 | |
| Leachate spill | 12-Apr | 10:30-1200 | |
| | | | |
| | | | |
| Extra samples | | | |
| Effluent Resamples | 22-Sep-23 | 0900-0945 | |
| | | | |
| | | | |
| | | | |
| | | | |
| Alarms | | | |
| Issue | Date | Time | Cityworks work order |
| Low level alarm | Jan 12 and 13 | 2215 | 13950 |
| Low level alarm | 6-Mar-23 | 2213 | 14413 |
| LCH-PMP1/2 low level | 10-Mar-23 | 1030-1245 | 14450 |
| Low level alarm | 5-Apr-23 | 1100-1105 | None |
| Low level alarm | 5-Apr-23 | 2200-2212 | None |
| PLC failure alarm | 20-Apr-23 | 1403-1700 | 15620 |
| PLC failure alarm | 23-Aug-23 | 937 | 17043 |
| Power fail | 29-Nov-23 | 1954 | 18834 |
| Leachate Tote high level | 8-Dec-23 | 1019 | 18906 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| | | | |
|---|---|---|---|
| Maintenance | | | |
| Type | Date | Time | Cityworks Work order |
| Trash pump | 10-Jan | 1000-1100 | none |
| UV system maintenance | 12-Jan | 1032-1130 | none |
| Spliter box aerator | 16-Jan | 0945-1045 | none |
| Blower maintenance | 17-Jan | 0945-1115 | none |
| TSS meters | 21-Jan | 0955-1035 | none |
| Monthly Genset | 23-Jan-23 | 1500-1525 | 13767 |
| Phos maintenance | 24-Jan-23 | 1330-1515 | None |
| Phos maintenance | 25-Jan-23 | 1320-1440 | none |
| Phos maintenance | 1-Feb | 1330-1400 | None |
| HMI | 4-Feb | 1011-1035 | None |
| Phos maintenance | 7-Feb | 1330-1445 | none |
| UPS | 9-Feb | 1400-1445 | none |
| SCADA maintenance | 16-Feb | 1310-1415 | None |
| Aeration sensors | 18-Feb | 0839-1945 | None |
| Phos maintenance | 21-Feb | 1315-1445 | none |
| DO maintenance | 22-Feb | 1340-1400 | none |
| Methanol pump | 22-Feb | 1300-1530 | none |
| Blower maintenance | 22-Feb | 1300-1530 | none |
| Monthly Genset | 27-Feb-23 | 1510-1555 | 14018 |
| Blower maintenance | 1-Mar-23 | 1000-1055 | none |
| Lockout board | 7-Mar-23 | 1330-1445 | none |
| Leachate #2 pump | 14-Mar-23 | 0845-1145 | none |
| Recirc pump #2 | 29-Mar | 1000-1040 | none |
| Monthly Genset | 30-Mar-23 | 0810-0945 | 14353 |
| Anox pump | 4-Apr-23 | 0943-1125 | none |
| Recirc pump #2 | 4-Apr-23 | 1300 | none |
| Air relief valve on forcemain | 12-Apr-23 | 1028-1250 | none |

| | | | |
|---|---|---|---|
| Mixer for anox #2 | 18-Apr-23 | 0830-1240 | none |
| Discharge line | 18-Apr-23 | 0830-1240 | none |
| Anox mixer power supply | 19-Apr-23 | 1120-1145 | none |
| Monthly Genset | 25-Apr-23 | 1450-1540 | 14768 |
| Mixer for anox #2 | 28-Apr-23 | 0800-1015 | none |
| Monthly Genset | 16-May-23 | 1510-1535 | 15662 |
| UPS | 16-May-23 | 1330-1400 | none |
| Annual calibrations | 5-Jun-23 | 1000-1115 | none |
| Sludge pump setup for pilot | 5-Jun-23 | 1045-1230 | none |
| Started Leachate pilot | 6-Jun-23 | 0740-1140 | none |
| Chemical dosages confirmed | 8-Jun-23 | 0750-0940 | none |
| Aeration pipe | 12-Jun-23 | 0800-1030 | none |
| Blower maintenance | 12-Jun-23 | 0800-1030 | none |
| Analyzer sensors | 12-Jun-23 | 0800-1030 | none |
| MLSS sensor | 13-Jun-23 | 1430-1540 | none |
| Bug life | 14-Jun-23 | 0745-0910 | none |
| Bug life | 15-Jun-23 | 0955-1125 | none |
| TSS meters | 17-Jun-23 | 0850-0915 | none |
| TSS meters | 18-Jun-23 | 0846-0915 | none |
| TSS meters | 19-Jun-23 | 0955-1100 | none |
| TSS meters | 21-Jun-23 | 1040-1140 | none |
| Monthly Genset | 22-Jun-23 | 1504-1540 | 16005 |
| TSS meters | 25-Jun-23 | 0819-0900 | none |
| Raw Flows | 26-Jun-23 | 1500-1525 | none |
| Raw Flows | 27-Jun-23 | 1026-1140 | none |
| TSS meters | 7-Jul-23 | 1000-1040 | none |
| Monthly Genset | 14-Jul-23 | | 16342 |
| Methanol containment | 14-Jul-23 | 0945-1040 | none |
| TSS meters | 18-Jul-23 | 1057-1145 | none |
| TSS meters | 20-Jul-23 | 1045-1140 | none |
| TSS meters | 21-Jul-23 | 0917-1010 | none |
| TSS meters | 24-Jul-23 | 1000-1100 | none |
| TSS meters | 28-Jul-23 | 0936-1045 | none |
| TSS meters | 29-Jul-23 | 0938-1010 | none |
| TSS meters | 30-Jul-23 | 0900-0930 | none |
| TSS meters | 31-Jul-23 | 1025-1130 | none |
| TSS meters | 8-Aug-23 | 1025-1140 | none |
| TSS meters | 12-Aug-24 | 0835-0855 | none |
| TSS meters | 13-Aug-23 | 0845-0910 | none |
| TSS meters | 14-Aug-23 | 1015-1100 | none |

| | | | |
|---|---|---|---|
| TSS meters | 15-Aug-23 | 1030-1135 | none |
| Aeration | 18-Aug-23 | 1228-1253 | none |
| Monthly Genset | 24-Aug-23 | 0900-0915 | 16565 |
| TSS meters | 24-Aug-23 | 1008-1055 | none |
| Methanol containment | 24-Aug-23 | 1008-1055 | none |
| TSS meters | 25-Aug-23 | 0825-0945 | none |
| TSS meters | 28-Aug-23 | 1050-1145 | none |
| TSS meters | 29-Aug-23 | 0945-1055 | none |
| TSS meters | 1-Sep-23 | 1000-1040 | none |
| TSS meters | 2-Sep-23 | 0936-1010 | none |
| TSS meters | 3-Sep-23 | 0950-1015 | none |
| TSS meters | 4-Sep-23 | 0900-0940 | none |
| TSS meters | 9-Sep-23 | 1050-1115 | none |
| TSS meters | 13-Sep-23 | 0956-1100 | none |
| Alum line | 14-Sep-23 | 0945-1025 | none |
| Raw Flows | 15-Sep-23 | 0900-1000 | none |
| TSS meters | 16-Sep-23 | 0855-0920 | none |
| TSS meters | 17-Sep-23 | 0925-0950 | none |
| TSS meters | 18-Sep-23 | 1045-1136 | none |
| TSS meters | 19-Sep-23 | 1045-1140 | none |
| Raw Flows | 21-Sep-23 | 1020-1135 | none |
| TSS meters | 21-Sep-23 | 1020-1135 | |
| Methanol | 21-Sep-23 | 1300-1340 | none |
| TSS meters | 23-Sep-23 | 0958-1025 | none |
| TSS meters | 24-Sep-23 | 0940-1005 | none |
| TSS meters | 25-Sep-23 | 1000-1100 | none |
| Monthly Genset | 28-Sep-23 | 1045-1125 | 17048 |
| TSS meters | 29-Sep-23 | 1005-1040 | none |
| TSS meters | 30-Sep-23 | 0846-0914 | none |
| TSS meters | 1-Oct-23 | 1404-1440 | none |
| TSS meters | 6-Oct-23 | 0912-1000 | none |
| TSS meters | 10-Oct-23 | 1120-1158 | none |
| TSS meters | 11-Oct-23 | 1050-1130 | none |
| Raw Flows | 12-Oct-23 | 1035-1140 | none |
| TSS meters | 12-Oct-23 | 1035-1140 | none |
| TSS meters | 13-Oct-23 | 0910-0915 | none |
| TSS meters | 14-Oct-23 | 0900-0925 | None |
| TSS meters | 15-Oct-23 | 0815-0844 | None |
| TSS meters | 16-Oct-23 | 1030-1115 | none |
| TSS meters | 17-Oct-23 | 0920-1145 | None |
| Alum line | 17-Oct-23 | 0920-1145 | None |
| TSS meters | 18-Oct-23 | 1100-1150 | none |

| | | | |
|---|---|---|---|
| Recirc pump lines | 18-Oct-23 | 1445-1530 | none |
| TSS meters | 19-Oct-23 | 1045-1145 | None |
| TSS meters | 20-Oct-23 | 0850-1010 | None |
| TSS meters | 23-Oct-23 | 0955-1050 | none |
| TSS meters | 25-Oct-23 | 0930-1000 | none |
| Recirc pump lines | 25-Oct-23 | 0930-1000 | none |
| Monthly Genset | 25-Oct-23 | 1255-1540 | none |
| TSS meters | 27-Oct-23 | 0900-0945 | none |
| TSS meters | 29-Oct-23 | 0850-0918 | none |
| TSS meters | 30-Oct-23 | 1040-1140 | none |
| Recirc pump lines | 30-Oct-23 | 1040-1140 | none |
| TSS meters | 31-Oct-23 | 0955-1050 | none |
| Methanol containment | 31-Oct-23 | 0955-1050 | none |
| TSS meters | 1-Nov-23 | 1025-1130 | none |
| Alum line | 2-Nov-23 | 1017-1113 | none |
| Alum line | 3-Nov-23 | 1048-1430 | none |
| Alum line | 4-Nov-23 | 1000-1030 | none |
| Alum line | 5-Nov-23 | 0830-0905 | none |
| TSS meters | 6-Nov-23 | 0837-1100 | none |
| Methanol containment | 6-Nov-23 | 0837-1100 | none |
| Alum line | 6-Nov-23 | 0837-1100 | none |
| Phos line | 7-Nov-23 | 1020-1120 | none |
| TSS meters | 7-Nov-23 | 1020-1120 | none |
| Alum line | 7-Nov-23 | 1020-1120 | none |
| TSS meters | 8-Nov-23 | 0938-1055 | none |
| Alum line | 8-Nov-23 | 0938-1055 | none |
| Methanol containment | 8-Nov-23 | 0938-1055 | none |
| Alum line | 9-Nov-23 | 1055-1140 | none |

| | | | |
|---|---|---|---|
| Anox mixer #2 | 9-Nov-23 | 1455-1610 | none |
| TSS meters | 10-Nov-23 | 0930-1035 | none |
| Alum line | 10-Nov-23 | 0930-1035 | none |
| TSS meters | 11-Nov-23 | 0950-1025 | none |
| Alum line | 11-Nov-23 | 0950-1025 | none |
| TSS meters | 12-Nov-23 | 0945-1015 | none |
| Alum line | 12-Nov-23 | 0945-1015 | none |
| Alum line | 13-Nov-23 | 1030-1140 | none |
| Alum line | 14-Nov-23 | 1112-1156 | none |
| TSS meters | 15-Nov-23 | 1110-1110 | none |
| Alum line | 15-Nov-23 | 1110-1110 | none |
| TSS meters | 16-Nov-23 | 0907-1200 | none |
| TSS meters | 17-Nov-23 | 0930-1035 | none |
| alum line | 17-Nov-23 | 0930-1035 | none |
| Alum line | 18-Nov-23 | 0925-1005 | none |
| TSS meters | 18-Nov-23 | 0925-1005 | none |
| Alum line | 19-Nov-23 | 0459-0530 | none |
| TSS meters | 19-Nov-23 | 0459-0530 | none |
| Alum line | 20-Nov-23 | 1045-1150 | none |
| TSS meters | 20-Nov-23 | 1045-1150 | none |
| Alum line | 21-Nov-23 | 1022-1445 | none |
| TSS meters | 21-Nov-23 | 1022-1445 | none |
| Alum line | 22-Nov-23 | 0958-1115 | none |
| TSS meters | 22-Nov-23 | 0958-1115 | none |
| TSS meters | 23-Nov-23 | 1000-1140 | none |
| alum line | 23-Nov-23 | 1000-1140 | none |
| Methanol containment | 23-Nov-23 | 1000-1140 | none |
| Alum line | 24-Nov-23 | 0852-1010 | none |
| TSS meters | 24-Nov-23 | 0852-1010 | none |
| TSS meters | 25-Nov-23 | 0948-1020 | none |
| Alum line | 25-Nov-23 | 0948-1020 | none |
| TSS meters | 26-Nov-23 | 0914-1020 | none |
| Alum line | 26-Nov-23 | 0914-1020 | none |
| TSS meters | 27-Nov-23 | 1018-1140 | none |
| Alum line | 27-Nov-23 | 1018-1140 | none |
| Alum tank cleaning | 27-Nov-23 | 1300-1515 | none |
| TSS meters | 28-Nov-23 | 0900-1036 | none |
| Monthly Genset | 28-Nov-23 | 0900-1036 | 17439 |
| alum line | 28-Nov-23 | 0900-1036 | none |
| Alum line | 29-Nov-23 | 1000-1150 | none |

| | | | |
|---|---|---|---|
| TSS meters | 30-Nov-23 | 0945-1030 | none |
| Alum line | 30-Nov-23 | 0945-1030 | none |
| TSS meters | 1-Dec-23 | 0950-1030 | none |
| Alum line | 1-Dec-23 | 0950-1030 | none |
| Alum line | 3-Dec-23 | 1250-1320 | none |
| alum line | 4-Dec-23 | 1453-1540 | none |
| TSS meters | 5-Dec-23 | 0945-1045 | none |
| Alum line | 6-Dec-23 | 0715-0910 | none |
| alum line | 7-Dec-23 | 0945-1040 | none |
| Methanol containment | 7-Dec-23 | 0945-1040 | none |
| Clarifier | 7-Dec-23 | 1520-1600 | none |
| TSS meters | 8-Dec-23 | 0940-1035 | none |
| TSS meters | 11-Dec-23 | 1055-1200 | none |
| TSS meters | 13-Dec-23 | 1045-1130 | none |
| TSS meters | 15-Dec-23 | 1045-1145 | none |
| TSS meters | 16-Dec-23 | 1040-1100 | none |
| TSS meters | 18-Dec-23 | 0940-1110 | none |
| TSS meters | 19-Dec-23 | 1030-1130 | none |
| TSS meters | 19-Dec-23 | 0950-1100 | none |
| Monthly Genset | 20-Dec-23 | 0950-1100 | 18810 |
| SCADA maintenance | 20-Dec-23 | 1340-1440 | none |
| Aeration | 20-Dec-23 | 1340-1525 | none |
| TSS meters | 23-Dec-23 | 0833-0905 | none |
| TSS meters | 24-Dec-23 | 0835-0915 | none |
| TSS meters | 25-Dec-23 | 0945-0920 | none |
| TSS meters | 26-Dec-23 | 0851-0934 | none |
| Blower maintenance | 27-Dec-23 | 1330-1535 | none |
| TSS meters | 27-Dec-23 | 1330-1535 | None |
| TSS meters | 28-Dec-23 | 0913-1010 | None |
| Methanol containment | 28-Dec-23 | 0913-1010 | none |
| TSS meters | 29-Dec-23 | 0927-1030 | None |
| TSS meters | 30-Dec-23 | 1028-1055 | None |
| TSS meters | 31-Dec-23 | 1000-1050 | none |
| | | | |
| Site Issues not alarmed | Date | Time | Cityworks Work order |
| HMI | 14-Jan-23 | 0910-0935 | none |

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|---|---|---|---|
| HMI | 15-Jan | 0815-0850 | none |
| Methanol pump | 31-Jan-23 | 1015-1050 | None |
| Methanol pump | 1-Feb | 1040-1130 | None |
| Power interruption | 7-Feb | 1100-1145 | None |
| Aeration #1 | 11-Feb | 1005-1035 | none |
| Phos pump | 15-Feb | 1400-1500 | none |
| SCADA | 15-Feb | 1400-1500 | none |
| Leachate Pump #2 | 27-Feb | 1510-1555 | none |
| Leachate pump #2 | 11-Mar | 0850-0915 | none |
| Anox mixer | 12-Mar | 0908-0945 | none |
| Anox mixer | 17-Mar | 0915-1010 | none |
| Anox mixer #1 | 18-Mar-23 | 1615-1835 | none |
| Anox mixer #2 | 19-Mar-23 | 1035-1110 | none |
| Anox mixer #2 | 22-Mar-23 | 0918-1145 | none |
| Methanol and alum pump | 13-Apr-23 | 1030-1130 | none |
| PH meter | 13-Apr-23 | 1030-1130 | none |
| DO probe | 14-Apr-23 | 0940-1035 | none |
| Anox mixer #2 | 26-Apr-23 | 1140-1155 | none |
| Leachate Pump #2 | 5-May-23 | 1015-1130 | none |
| Methanol pump | 8-May-23 | 1039-1135 | none |
| UPS failure | 9-May-23 | 1025-1210 | none |
| Methanol pump | 13-May-23 | 0838-0915 | none |
| Sludge pumps | 13-May-23 | 0838-0915 | none |
| Waste totalizer | 13-May-23 | 0838-0915 | none |

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|---|---|---|---|
| Low WAS flow alarm | 13-May | 2218-2223 | none |
| Sludge pumps in manual | 14-May | 0517-0520 | none |
| Low WAS flow alarm | 14-May-23 | 1200-1225 | none |
| SCADA | 15-May-23 | 1030 | none |
| Alum transfer pump | 23-May-23 | 1115-1145 | none |
| Methanol pump | 24-May | 1050-1130 | none |
| methanol pump | 26-May | 0840-0940 | none |
| methanol pump | 31-May | 1105-1140 | none |
| methanol pump | 1-Jun | 1050-1130 | none |
| Leachate Pump #2 | 1-Jun | 1050-1130 | none |
| methanol pump | 2-Jun | 0923-1010 | none |
| Methanol pump | 3-Jun | 1100-1115 | none |
| Leachate Pump #2 | 4-Jun | 0900-0915 | none |
| Phos pump | 7-Jun | 0945-1000 | none |
| No bugs? | 10-Jun | 0905-0935 | none |
| Methanol pump | 11-Jun | 1000-1020 | none |
| methanol pump | 22-Jun | 0930-1055 | none |
| Methanol pump | 23-Jun | 0950-1030 | none |
| Methanol tank | 28-Jun | 0955-1130 | none |
| Methanol pump | 8-Aug | 1025-1140 | none |
| Aeration | 18-Aug | 1228-1253 | none |
| Sludge pump | 30-Aug | 1000-1130 | none |
| Low raw flow | 11-Sep | 1100-1150 | none |
| LCH#2 pump | 13-Sep | 0956-1100 | none |
| Leachate Pump #2 | 18-Sep | 1045-1136 | none |

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|---|---|---|---|
| Leachate Pump #2 | 19-Sep | 0920-0935 | none |
| Raw flows | 20-Sep | 1008-1125 | none |
| Leachate Pump #2 | 9-Oct | 0842-0922 | none |
| Phos pump | 20-Oct | 0850-1010 | none |
| Aerator #2 | 2-Nov | 1017-1113 | none |
| anox #2 mixer | 7-Nov | 1020-1120 | none |
| Sludge pump #1 | 7-Nov | 1020-1120 | none |
| anox #2 mixer | 8-Nov | 0938-1055 | none |
| anox #2 mixer | 9-Nov | 1055-1140 | none |
| Ras pump | 16-Nov-23 | 0907-1200 | none |
| No raw flow | 29-Nov-23 | 1000-1150 | none |
| Phos pump | 2-Dec-23 | 1146-1205 | none |
| alum line | 3-Dec-23 | 1016-1110 | none |
| Router | 11-Dec-23 | 1317-1330 | none |
| Router | 12-Dec-23 | 1137-1215 | none |
| Sludge pumps | 14-Dec-23 | 1050-1150 | none |
| Sludge pump | 24-Dec-23 | 0835-0915 | none |
| Sludge pump | 29-Dec-23 | 0927-1030 | none |
| anox mixer | 29-Dec-23 | 0927-1030 | none |
| Sludge pump | 31-Dec-23 | 1000-1050 | none |
| | | | |
| **Data Losses and issues** | **Date** | **Time** | **Cityworks Work order** |
| TSS exceedance | 3-Feb | | |
| Discharging stopped | March 11-14 | | |
| No leachate in cell | 4-Jun | | |
| Total Ammonia Nitrogen exceedance | 4-Jul | | |
| Ammonia and CBOD Exceedance | 28-Nov | | |
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| Date last updated | 27-Mar-24 |
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| Noted in log book | Notes |
| No | Raw leachate spill from cell-reported to SAC |
| | Air relief valve failure-raw leachate spill reported to SAC |
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| Noted in log book | |
| yes | Resampled for final effluent as bacti sample from Tuesday didn't get to the lab on time. |
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| Noted in log book | comments |
| No | No issue when reviewing-could have been power flicker |
| No | low alum tank level |
| Yes | leachate pump2 stopped working, left in manual and stopped on scada screen, see log book |
| yes | on site to reset low level alarm at cell due to power flicker |
| yes | on site to reset low level alarm at cell due to power flicker, aeration/recirc/sludge were all faulted and had to reset the vfd controller as scada wasn't resetting it |
| yes | Short power outage caused it, reset leachate pump #2 in pit |
| yes | Short power outage caused the alarm, called operator on site doing rounds, restarted blowers, recirc and sludge pumps |
| No | Win911 called with leachate power fail. Remotely restarted RAS and Resc pumps as well as LCH2 pump. |
| yes | High Ras flow alarm, operator was running both sludge pumps and both recirc pumps to flush lines, all ok |
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| Noted in log book | comments |
| yes | got trash pump from cell to fix |
| yes | UV system in alarm on arrival, sensor was red. Took apart and cleaned |
| yes | Pulled splitter box aerator and cleaned |
| yes | Replaced drive belt on Blower #2 |
| yes | Flushed both TSS meters |
| yes | |
| yes | Hooked up tubing to Phos hand pump and panel, cleaned injector, flushed line hand pump and panel ready for operation |
| yes | On site to look at Phos system. It was plugged. Flushed main panel, tested. Runs ok but once chamber is empty pump air locks |
| yes | Installed hose on air relief for Phos pump |
| yes | New HMI installed |
| yes | Phos sight glass empty. Lowered one end of pump intake line to try and take care of air locks. Filled sight glass to 1 litre and started pump |
| yes | Reset UPS, routers, splitters etc. all on line |
| yes | On site with Rick beer, fixed buttons on SCADA screen, all working now, plugged blue cord into proper spot and now have connection to water plant |
| yes | Noticed sensors in aeration were loose and not secured, resecured them using zip ties |
| yes | On site to switch manual Phos pump with another one. Seems to pump pretty good. Verified DO in tank 2 and its not the CO analyzer its Tank 1 |
| yes | On site to test DO in both aeration tanks. Tank 1 was low, calibrated. Tank 2 was ok. Used handheld DO from lagoons |
| yes | Put new diaphragm in spare methanol pump |
| yes | Changed oil in both blowers |
| yes | |
| yes | Greased blowers |
| yes | On site to install lock out board |
| yes | Found wires on leachate pump 2 burnt. Spliced wires and made new connections and put heat shrink over it. Pump back in service. Removed plug from clarifier, will be discharging again. |
| yes | Removed recirc #2 from service. Vbelt is bad |
| yes | Reset low level fault after power switched back |
| yes | small pump pump in anoxic 2 crapped out, put the other small one in. at 1330 put a 2 inch trash pump in anoxic cell #2, removed small submersible |
| yes | Replaced v belt on recirculating pump #2 |
| yes | Forcemain air relief valve was leaking-disassembled air relief valve, cleaned it and put back into service. Reported as a spill. |

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|---|---|
| yes | On site to hook up mixer in anox 2. Hooked it up, faulted on leakage, hooked other one up and same issue. |
| yes | Plum new discharge line for leachate day tank |
| yes | Tested anox 2 mixer on anox 1 power supply-no good |
| yes | |
| yes | on site to hook up mixer on anox 2. Mixer tripped on o/l couple times due to thick fluid. |
| Yes | |
| yes | Install new UPS for PLC no communication wire yet |
| yes | Indus control on site for annual flowmeter inspections |
| yes | On site to set up sludge pump for pilot test. |
| yes | See log book entry |
| yes | Calculated methanol pumping rate, reduced alum pump rate (felt we were overdosing) |
| yes | Pulled out and flushed collection aeration pipe |
| yes | Greased blowers 1 and 2 |
| yes | Cleaned RAS/WAS and wasting analyzer sensor |
| yes | Pulled out tank 2 MLSS sensor. Cleaned it, no luck with reading |
| yes | Not a lot of bug life this morning, wondering if related to phos acid not circulating throughout cycle |
| yes | Some free swimmers and stalked but mostly rotifers (all moving fairly quickly) |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both tss meters |
| yes | Flushed both TSS meters |
| yes | |
| yes | Flushed both TSS meters |
| yes | Increased raw flow due to more fluid in Leachate at cell. Adjusted valve to bring in approx 12m3/day |
| yes | Getting ready to do tie ins down in pit. Increased pumping rate off time from 90 min to 75 min to pull more from pit |
| yes | Flushed both TSS meters |
| No | |
| yes | pumped rainwater out of methanol containment |
| yes | Flushed Effluent TSs analyzer |
| yes | Flushed Effluent TSS analyzer |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |

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|---|---|
| yes | Flushed effluent Tss analyzer |
| yes | No air pattern in collection box, pulled sparger and cleaned it |
| yes | |
| yes | Flushed both TSS meters |
| yes | Pumped methanol containment |
| yes | Flushed both TSS meters |
| yes | Flushed effluent TSS analyzer |
| yes | Flushed both TSS meters |
| yes | Flushed effluent TSS anlyzer |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed Effluent TSs analyzer |
| yes | Flushed both TSS meters |
| yes | Flushed alum line from discharge of panel to injector with hot water |
| yes | Closed EQ tank valve a little to bring less to plant as per oro |
| yes | Flushed effluent tss analyzer |
| yes | Flushed effluent TSS anlyzer |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Increased flow by opening valve slightly on EQ tank |
| | |
| yes | Received load of methanol, |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| No | |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Increased raw flow to target 9m3 a day |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed Effluent TSs analyzer |
| yes | flushed effluent tss analyzer |
| yes | Flushed both TSS meters |
| yes | Flushed Effluent TSs analyzer |
| yes | alum was plugged, tried flushing water through and wont go, both ends are fine so pulled line and must be plugged in line. Back at 1400-1510 to replace alum line. Back online |
| yes | Flushed both TSS meters |

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|---|---|
| yes | Fan both sludge pumps as discharge was very thick and flow was down to 0.08l/s. Ran both recirc pumps to flush lines, returned everything to normal, discharge out of sludge pumps no longer black and thick. |
| yes | Flushed effluent TSS analyzer |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Ran 2nd recirc pump to flush line |
| yes | |
| yes | Flushed both TSS meters |
| yes | Flushed Effluent TSs analyzer |
| yes | Flushed Effluent TSs analyzer |
| yes | Ran 2nd recirc pump to flush line |
| yes | Flushed both TSS meters |
| yes | pumped precipitation from methanol containment |
| yes | Flushed both TSS meters |
| yes | Alum level same as yesterday. Tried running some hot water, no go. Pulled injector and tried again, still the same. At 1149-1435 unable to clear blockage in alum line. Replaced it with new stock, ran alum pumpto waste until it was chunk free and primed to injector |
| yes | Noticed alum level didn't change. Noticed pressure gauges higher than normal. Took discharge line off panel, no drip. Flushed panel with hose connection with hot water and still nothing. Took panel apart at different connections and scraped hardened alum out. Rinsed with hot water. Pump flow sensor had piece inside pvc that came out as it was part of the problem with blockage. Flow sensor no longer works but not needed. Pump was air locked, couldn't release air as it was also plugged. Replaced back piece of alum pump with new spare piece. Primed pump and alum line. Took injector out to confirm alum going through |
| yes | Flushed alum line with hot water to prevent buildup |
| yes | Flushed alum line with hot water to prevent buildup |
| yes | flushed both tss meters |
| yes | pumped precipitation from methanol containment |
| yes | Flushed alum line with hot water to prevent buildup |
| yes | Phos line was dripping at quill, found gasket on floor, put back in and tightened. |
| Yes | Flushed both TSS meters |
| yes | flushed alum line |
| Yes | Flushed both TSS meters |
| yes | flushed alum line |
| yes | pump precipitation out of methanol containment |
| yes | Flushed alum line with hot water |

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|---|---|
| yes | On site to pull anox mixer #2, took off impeller to see inspection port. There was no water in port so seals seem to be holding. Reassembled and put back in place. Running when left |
| yes | Flushed both TSS meters |
| yes | flushed alum line |
| yes | Flushed both TSS meters |
| yes | flushed alum line |
| yes | Flushed both TSS meters |
| yes | flushed alum line |
| yes | flushed alum line with hot water |
| yes | flushed alum line with hot water |
| yes | Flushed both TSS meters |
| yes | flushed alum line |
| yes | Flushed both TSS meters |
| yes | flushed both tss meters |
| yes | flushed alum line with hot water |
| yes | flushed alum line with hot water |
| yes | flushed both tss meters |
| yes | flushed alum line |
| yes | Flushed both TSS meters |
| yes | flushed alum line |
| yes | flushed tss meters |
| yes | flushed alum line with hot water. Issue with alum line, had build up, cleaned alum panel with hot water, cleaned back pressure valve, pulled alum injector and cleaned ball valve, reattached line, primed air out, all good |
| yes | flushed tss meters |
| yes | Flushed both TSS meters |
| yes | flushed alum line with hot water |
| yes | Flushed both TSS meters |
| yes | flushed alum line with hot water |
| yes | pumped water out of methanol containment |
| yes | flushed alum line with hot water |
| yes | Flushed both TSS meters |
| yes | flushed both tss meters |
| yes | flushed alum line |
| yes | Flushed both TSS meters |
| yes | flushed alum line |
| yes | Flushed both TSS meters |
| yes | flushed alum line. Noticed small leak on alum panel, took apart, cleaned and back together. |
| yes | Pumped out alum tank into a tote then cleaned out crystalized alum, after tank cleaned put alum from tote into tank |
| yes | flushed both tss meters |
| yes | |
| yes | flushed alum line |
| yes | flushed alum line |

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|---|---|
| yes | Flushed both TSS meters |
| yes | flushed alum line |
| yes | Flushed both TSS meters |
| yes | flushed alum line |
| yes | Found alum line plugged in am, in afternoon temp replaced alum line over top of floor and primed to injector. Left old line in place for today. Put bucked under lower end to catch residual alum, set alum pump at 50 % frequency |
| yes | started running water with alum feed |
| yes | Flushed effluent tss analyzer |
| yes | Removed alum line found it inserted into recirc line. Removed injector and have added alum to top of clarifier for now. Flushed line with water but not running water as changed now. Line is setup to be visible fornext few day. |
| yes | Flushed alum line with water |
| yes | Pumped melted snow out of methanol containment |
| yes | On site to look at alum, cleaned clarifier through and flush out resc pump discharge pipe |
| yes | Flushed effluent TSS analyzer |
| yes | Flushed both TSS meters |
| yes | Flushed Effluent TSs analyzer |
| yes | Flushed both TSS meters |
| yes | Flushed Effluent TSs analyzer |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed Effluent TSs analyzer |
| yes | |
| yes | Onsite to investigate SCADA remote connection. Determined white router box is not working, will look at getting a replacement. |
| yes | Noticed that collection aeration is plugged, took apart to flush, fitting broke, replaced broken fitting and aeration restored. |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Changed oil and greased blowers |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | pumped water out of methanol containment |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| yes | Flushed both TSS meters |
| | |
| Noted in log book | comments |
| yes | HMI wash't working (black screen) on arrival. Had to reset |

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|---|---|
| yes | Had to reset HMI screen again-Tried 6 resets and unplugging/plugging back in and still isn't working |
| yes | Methanol pump air locked-got it going |
| yes | Methanol pump air locked |
| yes | Power off on arrival, generator running, called hydro one, power is to be back on by 1500. (no alarm work order) |
| yes | Aeration #1 DO analyzer reading 0mg/L-Air looks good in aeration #1 but probe 519 failed and faulted out |
| yes | Could not get Phos to pump up. Manually sucked out |
| yes | Have no control of equipment through scada screen-will let Rick Beer know |
| yes | Had to reset leachate #2 pump by cell. Changed off setpoint to ensure it would pump, changed back afterwards |
| yes | Checked leachate level beside landfill cell, still lots of room-Still not pumpint leachate up as leachate pump#2 is not working. Not discharging |
| yes | Noticed solids in anox #2 and no movement. Checked anox mixer. It was off with high temp alarm. Tried to reset but wouldn't. Powered off mixer on panel and powered back on, mixer reset. Monitored |
| yes | Reset mixer for anox #2, had a high temp alarm on arrival, running again |
| yes | Anox mixer #1 would not start. Replaced it with spare |
| yes | Anox mixer #2 was off all night. Reset and is working now |
| yes | Anoxic #2 mixer tripped out on temp. could not reset. Pulled out mixer and put in small submersible sump pump |
| yes | Methanol and alum pump were both off. Restarted both. |
| yes | PH meter on aeration #2 not reading |
| yes | DO probe for aerator #2 does not function properly |
| yes | Noticed anox #2 mixer replacement (trash pump) tripped and not running-extension cord end plugged into receptical was black. Grabbed new cord and plugged into different plug |
| yes | Leachate pump #2 not operating. Ron Bram k has checked and could not fix. Rick to check scada system-fixed issue |
| yes | methanol pump off, cleared alarm and reset it. |
| yes | On arrival all treatment equipment not running, no power to plant control panel, determined with ORO that UPS failed. Unplugged and plugged panel directly into receptacle #2, had to reset several breakers in panel . |
| yes | Methanol pump not running on arrival, restarted and all good |
| yes | No sludge pumps were running. Sludge pump #1 was in manual and put back to auto, ORO got sludge pump to run remotely. |
| yes | Waste totalizer has error reading EMC interference, notified ORO and will be looked at next week. |

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|---|---|
| yes | Logged on remotely and saw low WAS flow alarm, placed sludge pump #2 in auto as it was in manual. Pressed alarm reset and sludge pump #1 started |
| yes | Logged on remotely, sludge pump #2 was in manual and not flow. Placed in auto and reset it. |
| yes | Low Was flow alarm again. Called ORO to keep sludge pump running, he placed both sludge pumps in manual and started sludge pump #2. Valve to wasting was placed in manual and left in off position. Recurc valve is in manual and in open position. |
| yes | Remotely had Rick make change to sludge pump. Logic was to look at pump flow. Rick removed this until flow meter is replaced. Pump will continue to run when wasting een though it doesn't see flow. |
| yes | Attempted to pump alum into day tank and trnasfer pump stopped working |
| yes | Methanol pump was tripped out. Reset and running now |
| yes | Methanol pump pumping more than normal. In auto at 93%, placed in manual at 32% |
| yes | Reset methanol pump it was tripped |
| yes | Methanol pump was tripped, reset and is running |
| yes | Leachate pump #2 was tripped, reset at panel |
| yes | Methanol pump was tripped, reset alarm and restarted |
| yes | Reset methanol pump |
| yes | Leachate pump #2 had tripped so reset it and now filling back up. At 10:30 notified ORO leachate pit too low to pump. At 1155 no leachate in cell. Adjustments made to minimum wasting |
| yes | Phos pump was air locked-bled it off into phos tank, started pumping |
| yes | Bugs-non existant? (noted lots of bugs on June 15) |
| yes | methanol pump tripped out on low flow. Reset and is working |
| yes | Methanol pump is alrmed, says its not pumping, manual guages say it pumping something. Tank sounds hollow |
| yes | methanol pump still in alarm. Methanol to be delivered June 27 |
| yes | Methanol tank filled without operator on site, tank reading 92.8% when operator came to site |
| yes | Reset methanol pump as it tripped out |
| yes | Cut back air to Train #1 and 2 aeration. No air pattern in collection box at all |
| yes | Reset sludge pump as it was tripped |
| yes | Raw flow only 2m3 since previous day, low level light on at pit. Reset and pumping raw flow now. |
| yes | LCH#2 pump was tripped out, reset, tank full |
| yes | Leachate pump #2 was tripped, reset at panel |

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|---|---|
| yes | Leachate pump #2 tripped, reset at panel, Collected raw, Sw4 and aeration 1 and 2 samples for biweekly. Not discharging as leachate pump 2 tripped and clarifier level went down, samples for final effluent will be taken when discharging. (took later that day 1350-1405) |
| yes | EQ tank empty on arrival, filled it from Lch2, Lch2 chamber is filling. Closed valve from EQ tank a little |
| yes | Reset leachate pump 2 at panel, likely due to power fail previous day, reset blower, recirc pump and sludge pump. |
| yes | Noticed phos pump was air locked, only pumped 50ml from previous day |
| yes | Reset aerator #2 high temp alarm |
| yes | Found anoxic #2 mixer tripped out-reset |
| yes | found sludge pump #1 off, turned back on. |
| yes | Reset anoxic #2 mixer |
| yes | Reset anoxic #2 mixer |
| yes | Noticed ras pump not working, no indicated reason, could not start remotely, was able to start pumps locally. Pump #1 noily, running on #2 ras pump |
| yes | Upon arirval levels were low and tank wasn't putting raw in as level too low, went to panel and reset it as believed to be tripped from generator being ran yesterday. |
| yes | Phos 0.14 mg/L, still 1000ml in sight tube from yesterday, primed phos pump and made a manual add of 400ml as well |
| yes | sight glass empty on arrival, tried to flush alum line, plugged, have to go into town and get replacement |
| yes | Rebooted router for SCADA connection |
| yes | Restarted router, unable to see leachate valves at water plant |
| yes | Both sludge pumps had tripped, reset |
| yes | Sludge pump was tripped, reset and ran both pumps |
| yes | Sludge pump was tripped, reset |
| yes | Anox #2 mixer was tripped, reset |
| yes | Noticed sludge pumps not running, could not get them to work using PCP controls, switched to local #1 pump, found wasting valve in manual, set to auto |
| | |
| **Noted in log book** | **comments** |
| | Reported exceedance to ministry |
| | Due to leachate pump #2 in cell not working |
| yes | No leachate in cell to pump to plant (increased pumping on June 26, more leachate in cell again) |
| | Reported exceedance to ministry |
| | Reported exceedance to ministry |
| | |
| | |

# Appendix F

## Stratigraphic and Instrumentation Logs

Client: Township of Kincardine Project No.: 8-575

Project: Hydrogeological Assessment Phase II

Borehole Location: See Map 2

Driller: _____ Date Drilled: Aug.16/88

Drilling Supervised By: Jim Scott

Drilling Method: Backhoe

Monitoring Well Data – Pipe: ABS, 40 mm diameter

– Screen: 40 mm diameter

Other Monitors: _____

PARAGON ENGINEERING LIMITED
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**BOREHOLE 8-88** Sheet 1 Of 1

Elevation:
- Datum: Sea Level
- Ground Surface: 254.90 masl
- Measuring Point: 255.41 masl

Sample Type
SS –Split Spoon Sample
WA –Wash Sample
AU –Auger Sample
CN –Continuous Sampler
RX –Rock Core

Well screen (water level elev. m, year/month/day)

Gas monitor screen (vapour reading, year/month/day)

| Elev. (m) / Depth (m) | Soil Description | Strat. Plot | Depth Scale (ft.) | Depth Scale (m) | Monitoring Details | Sample Number | Sample Interval | Sample Type | Sample "N" Value |
|---|---|---|---|---|---|---|---|---|---|
| 254.45 / 0.45 | TOPSOIL | | 1 | | | | | | |
| 253.93 / 0.97 | SAND, silty, red-brown | | 2 | 0.5 | 91/04/19 | | | | |
| 252.77 / 2.13 | CLAY TILL, silty, some stones | | 3<br>4<br>5<br>6<br>7 | 1.0<br>1.5<br>2.0 | | | | | |
| | | | 8<br>9<br>10 | 2.5<br>3.0 | | | | | |

Prepared By: Frank Colozza Checked By: Date Prepared: 05/02/91

Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by PARAGON ENGINEERING Ltd. personnel before use by others.

Client: Township of Kincardine Project No.: 8-575

Project: Hydrogeological Assessment Phase II

Borehole Location: See Map 2

Driller: Date Drilled: Aug.16/88

Drilling Supervised By: Jim Scott

Drilling Method: Backhoe

Monitoring Well Data – Pipe: ABS, 40 mm diameter

– Screen: 40 mm diameter

Other Monitors:

PARAGON ENGINEERING LIMITED
CONSULTING ENGINEERS

**BOREHOLE 9-88** Sheet 1 Of 1

Elevation:
- Datum: Sea Level
- Ground Surface: 258.00 masl
- Measuring Point: 258.98 masl

Sample Type
SS – Split Spoon Sample
WA – Wash Sample
AU – Auger Sample
CN – Continuous Sampler
RX – Rock Core

Well screen (water level elev. m, year/month/day)

Gas monitor screen (vapour reading, year/month/day)

| Elev. (m) / Depth (m) | Soil Description | Strat. Plot | Depth Scale (ft.) (m) | Monitoring Details | Sample Number | Sample Interval | Sample Type | Sample "N" Value |
|---|---|---|---|---|---|---|---|---|
| 257.65 | TOPSOIL | | 1 | WL at 258.57 on 91/04/19 | | | | |
| 0.35 | CLAY TILL, silty, brown, small stones | | 2 – 0.5 | | | | | |
| | | | 3 – 1.0 | | | | | |
| | | | 4 | | | | | |
| | | | 5 – 1.5 | | | | | |
| 255.95 | | | 6 – 2.0 | | | | | |
| 2.05 | | | 7 | | | | | |
| | | | 8 – 2.5 | | | | | |
| | | | 9 | | | | | |
| | | | 10 – 3.0 | | | | | |

Prepared By: Frank Colozza Checked By: Date Prepared: 05 / 02 / 91

Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by PARAGON ENGINEERING Ltd. personnel before use by others.

Client: Township of Kincardine Project No.: 8-575

Project: Hydrogeological Assessment Phase II

Borehole Location: See Map 2

Driller: _____ Date Drilled: Aug.16/88

Drilling Supervised By: Jim Scott

Drilling Method: Backhoe

Monitoring Well Data – Pipe: ABS, 40 mm diameter

– Screen: 40 mm diameter

Other Monitors: _____

PARAGON ENGINEERING LIMITED
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**BOREHOLE** 10-88 Sheet 1 Of 1

Elevation:
- Datum: Sea Level
- Ground Surface: 252.85 masl
- Measuring Point: 253.88 masl

Sample Type
SS –Split Spoon Sample
WA –Wash Sample
AU –Auger Sample
CN –Continuous Sampler
RX –Rock Core

Well screen (water level elev. m, year/month/day)

Gas monitor screen (vapour reading, year/month/day)

| Elev. (m) / Depth (m) | Soil Description | Strat. Plot | Depth Scale (ft.) | Depth Scale (m) | Monitoring Details | Sample Number | Sample Interval | Sample Type | "N" Value |
|---|---|---|---|---|---|---|---|---|---|
| 252.50 | TOPSOIL | | 1 | 0.5 | WL at 253.20 on 91/04/19 | | | | |
| 0.35 / 251.85 | CLAY TILL, brown, stones | | 2 3 | 1.0 | | | | | |
| 1.00 / 250.81 | GREY CLAY, dense, blocky | | 4 5 6 | 1.5 2.0 | | | | | |
| 2.04 | | | 7 8 9 10 | 2.5 3.0 | | | | | |

Prepared By: Frank Colozza Checked By: Date Prepared: 05/02/91

Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by PARAGON ENGINEERING Ltd. personnel before use by others.

Client: Township of Kincardine Project No.: 8-575

Project: Hydrogeological Assessment Phase II

Borehole Location: See Map 2

Driller: Date Drilled: Aug.16/88

Drilling Supervised By: Jim Scott

Drilling Method: Backhoe

Monitoring Well Data – Pipe: ABS, 40 mm diameter

– Screen: 40 mm diameter

Other Monitors:

PARAGON ENGINEERING LIMITED
CONSULTING ENGINEERS

# BOREHOLE 11-88 Sheet 1 Of 1

Elevation:
- Datum: Sea Level
- Ground Surface: 252.05 masl
- Measuring Point: 252.71 masl

Sample Type
SS –Split Spoon Sample
WA –Wash Sample
AU –Auger Sample
CN –Continuous Sampler
RX –Rock Core

Well screen (water level elev. m. year/month/day)

* Gas monitor screen (vapour reading, year/month/day)

| Elev. (m) / Depth (m) | Soil Description | Strat. Plot | Depth Scale (ft.) | Depth Scale (m) | Monitoring Details | Sample Number | Sample Interval | Sample Type | Sample "N" Value |
|---|---|---|---|---|---|---|---|---|---|
| 251.66 | TOPSOIL | | 1 | | 91/04/19 | | | | |
| 0.39 / 250.85 | SILT TILL, sandy, clayey, sand pockets, some stones | | 2 3 4 | 0.5 1.0 | | | | | |
| 1.20 / 250.57 | GREY CLAY, dense, blocky | | 5 6 | 1.5 | | | | | |
| 1.48 | | | 7 8 9 10 | 2.0 2.5 3.0 | | | | | |

Prepared By: Frank Colozza Checked By: Date Prepared: 05/02/91

Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by PARAGON ENGINEERING Ltd. personnel before use by others.

Client: Township of Kincardine Project No.: 8-575

Project: Hydrogeological Assessment Phase II

Borehole Location: See Map 2

Driller: _____ Date Drilled: Aug.15/88

Drilling Supervised By: Jim Scott

Drilling Method: Backhoe

Monitoring Well Data – Pipe: ABS, 40 mm diameter

– Screen: 40 mm diameter

Other Monitors: _____

PARAGON ENGINEERING LIMITED
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**BOREHOLE 12-88** Sheet 1 Of 1

Elevation:
- Datum: Sea Level
- Ground Surface: 250.05 masl
- Measuring Point: 250.73 masl

Sample Type
SS –Split Spoon Sample
WA –Wash Sample
AU –Auger Sample
CN –Continuous Sampler
RX –Rock Core

Well screen (water level elev. m, year/month/day)

Gas monitor screen (vapour reading, year/month/day)

| Elev. (m) / Depth (m) | Soil Description | Strat. Plot | Depth Scale (ft.) (m) | Monitoring Details | Sample: Number | Sample: Interval | Sample: Type | "N" Value |
|---|---|---|---|---|---|---|---|---|
| 249.60 | TOPSOIL | | | 91/04/19 | | | | |
| 0.45 / 248.70 | CLAY TILL, silty, some stones | | | | | | | |
| 1.35 / 248.08 | GREY CLAY, blocky | | | | | | | |
| 1.97 | | | | | | | | |

Depth Scale: (ft.) 1 2 3 4 5 6 7 8 9 10 — (m) 0.5 1.0 1.5 2.0 2.5 3.0

Prepared By: Frank Colozza Checked By: Date Prepared: 05/02/91

Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by PARAGON ENGINEERING Ltd. personnel before use by others.

Client: Township of Kincardine Project No.: 8-575

Project: Hydrogeological Assessment Phase II

Borehole Location: See Map 2

Driller: _____ Date Drilled: Aug.16/88

Drilling Supervised By: Jim Scott

Drilling Method: Backhoe

Monitoring Well Data – Pipe: ABS, 40 mm diameter

– Screen: 40 mm diameter

Other Monitors: _____

PARAGON ENGINEERING LIMITED
CONSULTING ENGINEERS

**BOREHOLE 13-88** Sheet 1 of 1

Elevation:
- Datum: Sea Level
- Ground Surface: 254.97 masl
- Measuring Point: 255.87 masl

Sample Type
SS –Split Spoon Sample
WA –Wash Sample
AU –Auger Sample
CN –Continuous Sampler
RX –Rock Core

Well screen (water level elev. m, year/month/day)

Gas monitor screen (vapour reading, year/month/day)

| Elev. (m) / Depth (m) | Soil Description | Strat. Plot | Depth Scale (ft.) (m) | Monitoring Details | Sample Number | Sample Interval | Sample Type | "N" Value |
|---|---|---|---|---|---|---|---|---|
| 254.67 | TOPSOIL | | | 91/04/19 | | | | |
| 0.30 | | | | | | | | |
| | SAND, fine, uniform | | 1 – 0.5 – 2 – 3 – 1.0 – 4 – 5 – 1.5 | | | | | |
| 253.37 | | | | | | | | |
| 1.60 | CLAY TILL, brown | | | | | | | |
| 253.23 | | | | | | | | |
| 1.74 | GREY CLAY, blocky | | 6 – 2.0 – 7 – 8 – 2.5 – 9 – 3.0 – 10 | | | | | |
| 252.97 | | | | | | | | |
| 2.00 | | | | | | | | |

Prepared By: Frank Colozza Checked By: Date Prepared: 05/02/91

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Client: Township of Kincardine Project No.: 8-575

Project: Hydrogeological Assessment Phase II

Borehole Location: See Map 2

Driller: _____ Date Drilled: Aug.16/88

Drilling Supervised By: Jim Scott

Drilling Method: Backhoe

Monitoring Well Data – Pipe: ABS, 40 mm diameter

– Screen: 40 mm diameter

Other Monitors: _____

PARAGON ENGINEERING LIMITED
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**BOREHOLE 14-88** Sheet 1 Of 1

Elevation:
- Datum: Sea Level
- Ground Surface: 256.64 masl
- Measuring Point: 257.45 masl

Sample Type
SS –Split Spoon Sample
WA –Wash Sample
AU –Auger Sample
CN –Continuous Sampler
RX –Rock Core

Well screen (water level elev. m, year/month/day)

Gas monitor screen (vapour reading, year/month/day)

| Elev. (m) / Depth (m) | Soil Description | Strat. Plot | Depth Scale (ft.) (m) | Monitoring Details | Sample Number | Sample Interval | Sample Type | Sample "N" Value |
|---|---|---|---|---|---|---|---|---|
| 256.44 | TOPSOIL | | | | | | | |
| 0.20 | SAND, silty, red-brown, fine to medium | | | 91/04/19 | | | | |
| 254.61 | | | | | | | | |
| 2.03 | | | | | | | | |

Prepared By: Frank Colozza Checked By: Date Prepared: 05/02/91

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Client: Township of Kincardine Project No.: 8-575

Project: Hydrogeological Assessment Phase II

Borehole Location: See Map 2

Driller: _____ Date Drilled: Aug.16/88

Drilling Supervised By: Jim Scott

Drilling Method: Backhoe

Monitoring Well Data – Pipe: ABS, 40 mm diameter

– Screen: 40 mm diameter

Other Monitors: _____

PARAGON ENGINEERING LIMITED
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**BOREHOLE 15-88** Sheet 1 Of 1

Elevation:
- Datum: Sea Level
- Ground Surface: 258.32 masl
- Measuring Point: 258.73 masl

Sample Type
SS –Split Spoon Sample
WA –Wash Sample
AU –Auger Sample
CN –Continuous Sampler
RX –Rock Core

Well screen (water level elev. m, year/month/day)

Gas monitor screen (vapour reading, year/month/day)

| Elev. (m) / Depth (m) | Soil Description | Strat. Plot | Depth Scale (ft.) | Depth Scale (m) | Monitoring Details | Sample Number | Sample Interval | Sample Type | Sample "N" Value |
|---|---|---|---|---|---|---|---|---|---|
| 257.93 | TOPSOIL | | 1 | | Well is dry | | | | |
| 0.39 | SAND, silty, fine, red-brown, some stones | | 2 | 0.5 | | | | | |
| | | | 3 | 1.0 | | | | | |
| | | | 4 | | | | | | |
| | | | 5 | 1.5 | | | | | |
| 256.22 | | | 6 | | | | | | |
| 2.10 | | | 7 | 2.0 | | | | | |
| | | | 8 | 2.5 | | | | | |
| | | | 9 | | | | | | |
| | | | 10 | 3.0 | | | | | |

Prepared By: Frank Colozza Checked By: Date Prepared: 05 / 02 / 91

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Client: Township of Kincardine Project No.: 8-575

Project: Hydrogeological Assessment Phase II

Borehole Location: See Map 2

Driller: _____ Date Drilled: Feb. 14/89

Drilling Supervised By: Jim Scott

Drilling Method: 4.25 inch Hollow Stem Auger

Monitoring Well Data – Pipe: PVC, 50 mm diameter

– Screen: No. 10, 50 mm diameter

Other Monitors: _____

PARAGON ENGINEERING LIMITED
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**BOREHOLE 16-89** Sheet 1 Of 1

Elevation:
- Datum: Sea Level
- Ground Surface: 263.73 masl
- Measuring Point: 264.56 masl

Sample Type
SS – Split Spoon Sample
WA – Wash Sample
AU – Auger Sample
CN – Continuous Sampler
RX – Rock Core

Well screen (water level elev. m, year/month/day)

Gas monitor screen (vapour reading, year/month/day)

| Elev. (m) / Depth (m) | Soil Description | Strat. Plot | Depth Scale (ft.) | Depth Scale (m) | Monitoring Details | Sample Number | Sample Interval | Sample Type | Sample "N" Value |
|---|---|---|---|---|---|---|---|---|---|
| 261.29 / 2.44 | SILT TILL, clayey, light brown, dry | | 5 | 1.0 | | 16 | | | |
| | | | | 2.0 | | 1 | | SS | 28 |
| 258.55 / 5.18 | CLAY TILL, silty, light brown, dense, becoming moist with depth | | 10 | 3.0 | | | | | |
| | | | | 4.0 | | 2 | | SS | 48 |
| | | | 15 | 5.0 | | | | | |
| | | | | 6.0 | | 3 | | SS | 55 |
| | | | 20 | 7.0 | | | | | |
| | | | | 8.0 | | 4 | | SS | 60 |
| | SAND, fine to medium, silty, brown, wet | | 25 | 9.0 | ▽ 91/04/19 | | | | |
| | | | | 10.0 | | 5 | | SS | 44 |
| | | | 30 | 11.0 | | | | | |
| | | | | 12.0 | | 6 | | SS | 71 |
| 250.93 / 12.80 | | | 35 | 13.0 | | | | | |
| | | | | 14.0 | | 7 | | SS | 50 |
| 249.56 / 14.17 | CLAY TILL, silty, grey, dense, dry | | 40 | 15.0 | | | | | |
| | | | | 16.0 | | 8 | | SS | 34 |
| | | | 45 | 17.0 | | | | | |
| | | | | 18.0 | | 9 | | SS | 68 |
| | | | 50 | 19.0 | | | | | |
| | | | | 20.0 | | | | | |
| | | | 55 | 21.0 | | | | | |
| | | | | 22.0 | | | | | |
| | | | 60 | 23.0 | | | | | |
| | | | | 24.0 | | | | | |
| | | | 65 | 25.0 | | | | | |
| | | | | 26.0 | | | | | |
| | | | 70 | | | | | | |
| | | | 75 | | | | | | |
| | | | 80 | | | | | | |
| | | | 85 | | | | | | |

Prepared By: Frank Colozza Checked By: Date Prepared: 05/02/91

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Client: Township of Kincardine Project No.: 8-575

Project: Hydrogeological Assessment Phase II

Borehole Location: See Map 2

Driller: _____ Date Drilled: Feb.14/89

Drilling Supervised By: Jim Scott

Drilling Method: 4.25 inch Hollow Stem Auger

Monitoring Well Data – Pipe: PVC, 50 mm diameter

– Screen: No. 10, 50 mm diameter

Other Monitors: _____

PARAGON ENGINEERING LIMITED
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**BOREHOLE** 17-89 Sheet 1 Of 1

Elevation:
- Datum: Sea Level
- Ground Surface: 263.77 masl
- Measuring Point: 264.14 masl

Sample Type
SS –Split Spoon Sample
WA –Wash Sample
AU –Auger Sample
CN –Continuous Sampler
RX –Rock Core

Well screen (water level elev. m. year/month/day)

Gas monitor screen (vapour reading, year/month/day)

| Elev. (m) / Depth (m) | Soil Description | Strat. Plot | Depth Scale (ft.) (m) | Monitoring Details | Sample Number | Sample Interval | Sample Type | Sample "N" Value |
|---|---|---|---|---|---|---|---|---|
| 260.72 | CLAY TILL, silty, brown | | 5 – 1.0; 10 – 2.0; 15 – 3.0 | | 17 | | | |
| 3.05 / 259.50 | SAND, fine to medium, brown | | 20 – 4.0 | ▽ 91/04/19 | 1 | | SS | 13 |
| 4.27 / 258.59 | SILT TILL, dense, light brown | | 25 – 5.0 | | 2 | | SS | 15 |
| 5.18 / 257.22 | CLAY TILL, silty, dense, grey | | 30 – 6.0; 35 – 7.0 | | 3 | | SS | 123 |
| 6.55 | | | 40 – 8.0; 45 – 9.0; 50 – 10.0; 55 – 11.0; 60 – 12.0; 65 – 13.0 | | 4 | | SS | 109 |

Prepared By: Frank Colozza Checked By: Date Prepared: 05 / 02 / 91

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Client: Township of Kincardine Project No.: 8-575

Project: Hydrogeological Assessment Phase II

Borehole Location: See Map 2

Driller: _____ Date Drilled: Feb.14/89

Drilling Supervised By: Jim Scott

Drilling Method: 4.25 inch Hollow Stem Auger

Monitoring Well Data – Pipe: PVC, 50 mm diameter

– Screen: No. 10, 50 mm diameter

Other Monitors: _____

PARAGON ENGINEERING LIMITED
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**BOREHOLE 18-89 Sheet 1 Of 1**

Elevation:
- Datum: Sea Level
- Ground Surface: 265.38 masl
- Measuring Point: 266.58 masl

Sample Type
SS – Split Spoon Sample
WA – Wash Sample
AU – Auger Sample
CN – Continuous Sampler
RX – Rock Core

Well screen (water level elev. m. year/month/day)

Gas monitor screen (vapour reading, year/month/day)

| Elev. (m) / Depth (m) | Soil Description | Strat. Plot | Depth Scale (ft.) | Depth Scale (m) | Monitoring Details | Sample Number | Sample Interval | Sample Type | Sample "N" Value |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 18 | | | |
| | CLAY TILL, silty, brown | | 5 | 1.0 | | 1 | | SS | 12 |
| 262.03 | | | 10 | 2.0 | | 2 | | SS | 12 |
| 3.35 | | | | 3.0 | | | | | |
| | SAND, fine to medium, brown becoming silty with depth | | 15 | 4.0 | ▽ 91/04/19 | 3 | | SS | 87 |
| | | | 20 | 5.0 | | 4 | | SS | 74 |
| 257.30 | | | 25 | 6.0 | | 5 | | SS | 57 |
| 8.08 | | | | 7.0 | | | | | |
| | | | 30 | 8.0 | | | | | |
| | | | | 9.0 | | | | | |
| | | | 35 | 10.0 | | | | | |
| | | | 40 | 11.0 | | | | | |
| | | | | 12.0 | | | | | |
| | | | | 13.0 | | | | | |

Prepared By: Frank Colozza Checked By: Date Prepared: 05/02/91

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Client: Township of Kincardine Project No.: 8-575

Project: Hydrogeological Assessment Phase II

Borehole Location: See Map 2

Driller: _____ Date Drilled: Feb. 14/89

Drilling Supervised By: Jim Scott

Drilling Method: 4.25 inch Hollow Stem Auger

Monitoring Well Data – Pipe: PVC, 50 mm diameter

– Screen: No. 10, 50 mm diameter

Other Monitors: _____

PARAGON ENGINEERING LIMITED
CONSULTING ENGINEERS

**BOREHOLE 19-89** Sheet 1 Of 1

Elevation:
- Datum: Sea Level
- Ground Surface: 252.69 masl
- Measuring Point: 253.82 masl

Sample Type
SS –Split Spoon Sample
WA –Wash Sample
AU –Auger Sample
CN –Continuous Sampler
RX –Rock Core

Well screen (water level elev. m, year/month/day)

Gas monitor screen (vapour reading, year/month/day)

| Elev. (m) / Depth (m) | Soil Description | Strat. Plot | Depth Scale (ft.) (m) | Monitoring Details | Sample Number | Interval | Type | "N" Value |
|---|---|---|---|---|---|---|---|---|
| | | | | | 19 | | | |
| | | | 5 / 1.0 | | 1 | ■ | SS | 28 |
| | | | 2.0 | | | | | |
| | | | 10 / 3.0 | | 2 | ■ | SS | 48 |
| | | | 4.0 | | | | | |
| | CLAY TILL, silty, brown changing to grey at 4 meters | | 15 / 5.0 | | 3 | ■ | SS | 55 |
| | | | 6.0 | | | | | |
| | | | 20 / 7.0 | | 4 | ■ | SS | 60 |
| | | | 8.0 | | | | | |
| 244.00 | | | 25 / 9.0 | | 5 | ■ | SS | 44 |
| 8.69 | | | 10.0 | | | | | |
| | | | 30 / 11.0 | ▽ 91/04/19 | 6 | ■ | SS | 71 |
| | CLAY TILL, grey, soft | | 12.0 | | | | | |
| | | | 35 / 13.0 | | 7 | ■ | SS | 50 |
| 238.97 | | | 14.0 | | | | | |
| | | | 40 / 15.0 | | 8 | ■ | SS | 34 |
| 13.72 | | | 16.0 | | | | | |
| | | | 45 / 17.0 | | 9 | ■ | SS | 68 |
| | | | 50 / 18.0 | | | | | |
| | | | 19.0 | | | | | |
| | | | 55 / 20.0 | | | | | |
| | | | 21.0 | | | | | |
| | | | 60 / 22.0 | | | | | |
| | | | 23.0 | | | | | |
| | | | 65 / 24.0 | | | | | |
| | | | 25.0 | | | | | |
| | | | 70 / 26.0 | | | | | |

Prepared By: Frank Colozza Checked By: Date Prepared: 05/02/91

Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by PARAGON ENGINEERING Ltd. personnel before use by others.

Client: Township of Kincardine Project No.: 8-575

Project: Hydrogeological Assessment Phase II

Borehole Location: See Map 2

Driller: Date Drilled: Feb. 14/89

Drilling Supervised By: Jim Scott

Drilling Method: 4.25 inch Hollow Stem Auger

Monitoring Well Data – Pipe: PVC, 50 mm diameter

– Screen: No. 10, 50 mm diameter

Other Monitors:

PARAGON ENGINEERING LIMITED
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**BOREHOLE 20-89** Sheet 1 Of 1

Elevation:
- Datum: Sea Level
- Ground Surface: 257.64 masl
- Measuring Point: 258.38 masl

Sample Type
SS –Split Spoon Sample
WA –Wash Sample
AU –Auger Sample
CN –Continuous Sampler
RX –Rock Core

Well screen (water level elev. m. year/month/day)

Gas monitor screen (vapour reading, year/month/day)

| Elev. (m) / Depth (m) | Soil Description | Strat Plot | Depth Scale (ft.) | Depth Scale (m) | Monitoring Details | Sample Number | Sample Interval | Sample Type | Sample "N" Value |
|---|---|---|---|---|---|---|---|---|---|
| | SAND, fine, brown | | 5 | 1.0 | | 20 | | | |
| | | | | 2.0 | | 1 | | SS | 13 |
| | | | 10 | 3.0 | | 2 | | SS | 27 |
| | | | | 4.0 | ▽ 91/04/19 | | | | |
| | | | 15 | 5.0 | | 3 | | SS | 35 |
| | | | 20 | 6.0 | | 4 | | SS | 30 |
| | | | | 7.0 | | | | | |
| 249.56 / 8.08 | | | 25 | 8.0 | | 5 | | SS | 38 |
| | | | 30 | 9.0 | | | | | |
| | | | | 10.0 | | | | | |
| | | | 35 | 11.0 | | | | | |
| | | | | 12.0 | | | | | |
| | | | 40 | 13.0 | | | | | |

Prepared By: Frank Colozza Checked By: Date Prepared: 05 / 02 / 91

Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by PARAGON ENGINEERING Ltd. personnel before use by others.

Client: Township of Kincardine Project No.: 8-575

Project: Hydrogeological Assessment Phase II

Borehole Location: See Map 2

Driller: _____ Date Drilled: Feb.14/89

Drilling Supervised By: Jim Scott

Drilling Method: 4.25 inch Hollow Stem Auger

Monitoring Well Data – Pipe: PVC, 50 mm diameter

– Screen: No. 10, 50 mm diameter

Other Monitors: _____

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**BOREHOLE 21-89** Sheet 1 Of 1

Elevation:
- Datum: Sea Level
- Ground Surface: 252.74 masl
- Measuring Point: 253.70 masl

Sample Type
SS – Split Spoon Sample
WA – Wash Sample
AU – Auger Sample
CN – Continuous Sampler
RX – Rock Core

Well screen (water level elev. m, year/month/day)

Gas monitor screen (vapour reading, year/month/day)

| Elev. (m) / Depth (m) | Soil Description | Strat. Plot | Depth Scale (ft.) (m) | Monitoring Details | Sample Number | Sample Interval | Sample Type | Sample "N" Value |
|---|---|---|---|---|---|---|---|---|
| 250.00 | SAND, fine, slightly silty | | 5 – 1.0 | ▽ 91/04/19 | 21 | | | |
| | | | | | 1 | | SS | 15 |
| | | | 10 – 3.0 | | 2 | | SS | 37 |
| | | | 15 – 5.0 | | 3 | | SS | 24 |
| 2.74 | CLAY TILL, silty, grey | | 20 – 6.0 | | 4 | | SS | 22 |
| | | | 25 – 8.0 | | 5 | | SS | 36 |
| 243.14 | | | 30 – 9.0 | | 6 | | SS | 55 |
| 9.60 | | | 35 – 11.0 | | | | | |
| | | | 40 – 12.0 | | | | | |
| | | | | | | | | |

Prepared By: Frank Colozza Checked By: Date Prepared: 05 / 02 / 91

Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by PARAGON ENGINEERING Ltd. personnel before use by others.

# LOG of BOREHOLE OW22-98

ENCL. No.: 1

| | | | |
|---|---|---|---|
| REF. NO. : | TK98-10-8 | | : DRILLING DATA |
| CLIENT : | Stanley Consulting Group | Field Supervisor: | S. Watling |
| PROJECT : | Monitoring Well Installation | Method : | HSA |
| LOCATION : | Kincardine Landfill | Diameter : | : 200 mm |
| DATUM : | | Date : | November 6th, 1998 |

| ATTERBURG LIMITS | | | UNDRAINED SHEAR STRENGTH | | | SAMPLES | | | SYMBOL | MATERIAL DESCRIPTION | DEPTH | ELEV. | WATER DATA | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PL % | NMC % | LL % | Field Pen. kPa | Field Vane kPa | Lab. Compr. kPa | No. | TYPE | N Value | | | m | m | | |
| | | | | | | | | | | GROUND SURFACE m | | | | |
| | | | | | | | | | | TOPSOIL | | | | well finished above ground with protective lockable steel casing |
| | | | | | | | | | | Dense, dark brown sandy silt FILL, trace cobbles and gravel | 1 | | | |
| | | | | | | | | | | Compact, orangy brown SILTY FINE SAND | 2 | | | bentonite seal |
| | | | | | | | | | | Compact, brown SILT | | | | |
| | | | | | | | | | | Compact, Fine SAND, some silt | 3 | | | |
| | | | | | | | | | | Dense, brown SILT | | | | |
| | | | | | | | | | | Compact to dense, brown Fine SAND, trace silt | 4 | | | |
| | | | | | | | | | | | 5 | | | |
| | | | | | | | | | | | 6 | | | silica sand pack |
| | | | | | | 1 | SS | 48 | | | 7 | | | |
| | | | | | | | | | | Hard, grey SILT, trace to some clay | 8 | | | |
| | | | | | | | | | | some saturated sandy seams | | | | 1.5 m slotted well screen |
| | | | | | | 2 | SS | 53 | | | 9 | | | |
| | | | | | | | | | | End of Borehole | | | | water level at 7.91 m from top of PVC pipe |
| | | | | | | | | | | | 10 | | | |
| | | | | | | | | | | | 11 | | | |

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Checked: EYC

# LOG of BOREHOLE OW23-98

ENCL. No.: 2

| | | | |
|---|---|---|---|
| REF. NO. : | TK98-10-8 | DRILLING DATA | |
| CLIENT : | Stanley Consulting Group | Field Supervisor: | S. Watling |
| PROJECT : | Monitoring Well Installation | Method : | HSA |
| LOCATION : | Kincardine Landfill | Diameter : | 200 mm |
| DATUM : | | Date : | November 6th, 1998 |

| ATTERBURG LIMITS PL % | NMC % | LL % | UNDRAINED SHEAR STRENGTH Field Pen. kPa | Field Vane kPa | Lab. Compr. kPa | SAMPLES No. | TYPE | N Value | SYMBOL | MATERIAL DESCRIPTION | DEPTH m | ELEV. m | WATER DATA | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | GROUND SURFACE m | | | | |
| | | | | | | | | | | TOPSOIL | | | | well finished above ground with protective lockable steel casing |
| | | | | | | | | | | Compact to dense, dark brown sandy silt FILL | 1 | | | |
| | | | | | | | | | | Compact to dense, brown Fine SAND, trace silt | 2 | | | bentonite seal |
| | | | | | | | | | | | 3 | | | |
| | | | | | | | | | | | 4 | | | silica sand pack |
| | | | | | | 1 | SS | 52 | | | 5 | | | |
| | | | | | | | | | | | 6 | | | |
| | | | | | | 2 | SS | 37 | | Hard, brown CLAYEY SILT | | | | 1.5 m slotted well screen |
| | | | | | | | | | | End of Borehole | 7 | | | |
| | | | | | | | | | | | 8 | | | |
| | | | | | | | | | | | 9 | | | |
| | | | | | | | | | | | 10 | | | water level at 6.24 m from top of PVC pipe |
| | | | | | | | | | | | 11 | | | |

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# LOG of BOREHOLE OW24-98

ENCL. No.: 3

| | | | |
|---|---|---|---|
| REF. NO. : | TK98-10-8 | DRILLING DATA | |
| CLIENT : | Stanley Consulting Group | Field Supervisor: | S. Watling |
| PROJECT : | Monitoring Well Installation | Method : | HSA |
| LOCATION : | Kincardine Landfill | Diameter : | 200 mm |
| DATUM : | | Date : | November 6th, 1998 |

| ATTERBURG LIMITS PL % | NMC % | LL % | UNDRAINED SHEAR STRENGTH Field Pen. kPa | Field Vane kPa | Lab. Compr. kPa | SAMPLES No. | TYPE | N Value | SYMBOL | MATERIAL DESCRIPTION | DEPTH m | ELEV. m | WATER DATA | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | GROUND SURFACE m | | | | |
| | | | | | | | | | | TOPSOIL | | | | well finished above ground with protective lockable steel casing |
| | | | | | | | | | | Compact, dark brown sandy silt FILL | | | | bentonite seal |
| | | | | | | | | | | Grey SANDY SILT | | | | |
| | | | | | | 1 | SS | 6 | | Soft, grey SILTY CLAYEY, some saturated sand seams | | | | silica sand pack |
| | | | | | | | | | | End of Borehole | | | | 1.5 m slotted well screen |
| | | | | | | | | | | | | | | water level at 2.52 m from top of PVC pipe |

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PAGE 1 of 1

# LOG of BOREHOLE OW 25-00

ENCL. No.: 1

| | | | |
|---|---|---|---|
| REF. NO. : | TK20-9-2 | DRILLING DATA | |
| CLIENT : | Twp. of Kincardine-Bruce-Tiverton | Field Supervisor: | S. Watling |
| PROJECT : | Overburden Observation Well Installations | Method : | Hollow Stem Auger |
| LOCATION : | Twp. of Kincardine-Bruce-Tiverton Waste Disposal Site | Diameter : | 200 mm |
| DATUM : | | Date : | 20 September 2000 |

| ATTERBURG LIMITS PL % | NMC % | LL % | UNDRAINED SHEAR STRENGTH Field Pen. kPa | Field Vane kPa | Lab. Compr. kPa | SAMPLES No. | TYPE | N Value | SYMBOL | MATERIAL DESCRIPTION | DEPTH m | ELEV. m | WATER DATA | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | GROUND SURFACE m | | | | |
| | | | | | | | | | | 300 mm TOPSOIL | | | | Concrete |
| | | | | | | 1 | SS | 2 | | Loose, orangy brown Silty fine SAND | | | | Bentonite seal |
| | | | | | | 2 | SS | 5 | | Loose to compact, light brown fine SAND, some silt | 1.0 | | | Native backfill |
| | | | | | | 3 | SS | 13 | | damp | 2.0 | | | |
| | | | | | | 4 | SS | 20 | | wet | | | | Bentonite seal |
| | | | | | | 5 | SS | 20 | | saturated | 3.0 | | | Water level measured at 3.05 m b g.s. |
| | | | | | | 6 | CT | 5 | | | 4.0 | | | #3 Silica Filter sand |
| | | | | | | 7 | CT | 29 | | | 5.0 | | | 50 mm diameter PVC Slot 10 well screen |
| | | | | | | 8 | CT | 40 | | | 6.0 | | | |
| | | | | | | 9 | SS | 16 | | Stiff to very stiff, grey Silty CLAY moist | 7.0 | | | |
| | | | | | | | | | | End of Borehole | 8.0 | | | |
| | | | | | | | | | | | 9.0 | | | |

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# LOG of BOREHOLE OW 26-00

ENCL. No.: 2

| | | | |
|---|---|---|---|
| REF. NO. : | TK20-9-2 | DRILLING DATA | |
| CLIENT : | Twp. of Kincardine-Bruce-Tiverton | Field Supervisor: | S. Watling |
| PROJECT : | Overburden Observation Well Installations | Method : | Hollow Stem Auger |
| LOCATION : | Twp. of Kincardine-Bruce-Tiverton Waste Disposal Site | Diameter : | 200 mm |
| DATUM : | | Date : | 20 September 2000 |

| ATTERBURG LIMITS PL % | NMC % | LL % | UNDRAINED SHEAR STRENGTH Field Pen. kPa | Field Vane kPa | Lab. Compr. kPa | SAMPLES No. | TYPE | N Value | SYMBOL | MATERIAL DESCRIPTION | DEPTH m | ELEV. m | WATER DATA | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | GROUND SURFACE m | | | | |
| | | | | | | | | | | 450 mm TOPSOIL | | | | Concrete |
| | | | | | | | | | | Black fiberous PEAT | | | | Silty Clay Backfill |
| | | | | | | 1 | SS | 1 | | Dark brown to black Silty SAND wet | 1.0 | | | Bentonite seal |
| | | | | | | | | | | Stiff, grey Silty CLAY wet | | | | |
| | | | | | | 2 | SS | 11 | | damp | | | | |
| | | | | | | | | | | Stiff to very stiff, grey Silty CLAY, some gravel TILL | 2.0 | | | #3 Silica Filter sand |
| | | | | | | 3 | SS | 13 | | | | | | 50 mm diameter PVC Slot 10 well screen |
| | | | | | | 4 | SS | 12 | | saturated gravelly seam at 3.0 m. | 3.0 | | | Water level measured at 3.0 m o g s. |
| | | | | | | | | | | moist | | | | |
| | | | | | | | | | | End of Borehole | 4.0 | | | |

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# LOG of BOREHOLE OW 27-00

ENCL. No.: 3

| | | | |
|---|---|---|---|
| REF. NO. : | TK20-9-2 | DRILLING DATA | |
| CLIENT : | Twp. of Kincardine-Bruce-Tiverton | Field Supervisor: | S. Watling |
| PROJECT : | Overburden Observation Well Installations | Method : | Hollow Stem Auger |
| LOCATION : | Twp. of Kincardine-Bruce-Tiverton Waste Disposal Site | Diameter : | 200 mm |
| DATUM : | | Date : | 19 September 2000 |

| ATTERBURG LIMITS PL % | INMC % | LL % | UNDRAINED SHEAR STRENGTH Field Pen. kPa | Field Vane kPa | Lab. Compr. kPa | SAMPLES No. | TYPE | N Value | SYMBOL | MATERIAL DESCRIPTION | DEPTH m | ELEV. m | WATER DATA | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | GROUND SURFACE m | | | | |
| | | | | | | | | | | 300 mm TOPSOIL | | | | Concrete |
| | | | | | | 1 | AS | | | Loose, brown Silty SAND<br>wet to saturated | | | | Bentonite seal |
| | | | | | | 2 | SS | 8 | | | | | | #3 Silica Filter sand |
| | | | | | | | | | | Stiff, mottled brown Silty CLAY<br>moist | 1.0 | | | 50 mm diameter PVC Slot 10 well screen |
| | | | | | | 3 | SS | 15 | | | | | | |
| | | | | | | | | | | End of Borehole | 2.0 | | | |
| | | | | | | | | | | | 3.0 | | | |
| | | | | | | | | | | | 4.0 | | | |

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# LOG of BOREHOLE OW 28-00

ENCL. No.: 4

| | | | |
|---|---|---|---|
| REF. NO. : | TK20-9-2 | DRILLING DATA | |
| CLIENT : | Twp. of Kincardine-Bruce-Tiverton | Field Supervisor: | S. Watling |
| PROJECT : | Overburden Observation Well Installations | Method : | Hollow Stem Auger |
| LOCATION : | Twp. of Kincardine-Bruce-Tiverton Waste Disposal Site | Diameter : | 200 mm |
| DATUM : | | Date : | 19 September 2000 |

| ATTERBURG LIMITS PL % | NMC % | LL % | UNDRAINED SHEAR STRENGTH Field Pen. kPa | Field Vane kPa | Lab. Compr. kPa | SAMPLES No. | TYPE | N Value | SYMBOL | MATERIAL DESCRIPTION | DEPTH m | ELEV. m | WATER DATA | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | GROUND SURFACE m | | | | |
| | | | | | | 1 | AS | | | Loose to compact, brown fine SAND, some silt | | | | Concrete |
| | | | | | | 2 | SS | 9 | | saturated | | | | Bentonite seal |
| | | | | | | | | | | | | | | Water level at completion |
| | | | | | | | | | | | 1.0 | | | #3 Silica Filter sand |
| | | | | | | 3 | SS | 16 | | | | | | 50 mm diameter PVC Slot 10 well screen |
| | | | | | | | | | | Compact, brown Silty fine SAND moist | | | | |
| | | | | | | 4 | SS | 10 | | Clay seam at 2.3-2.4 m | | | | |
| | | | | | | | | | | saturated SAND | 2.0 | | | |
| | | | | | | | | | | Stiff, grey Silty CLAY | | | | |
| | | | | | | 5 | SS | 9 | | moist | 3.0 | | | |
| | | | | | | | | | | End of Borehole | | | | |
| | | | | | | | | | | | 4.0 | | | |

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# RECORD OF MONITORING WELL No. OW29-07

amec

Project Number: SW1307072
Project Client: Municipality of Kincardine
Project Name: Monitoring Well Construction
Project Location: Kincardine, Ontario

Drilling Location: Ward 2 Landfill
Drilling Method: 150 mm Solid Stem Auger / Direct Push
Drilling Machine: Track Mounted Drill
Date Started: 13 Nov 07 Date Completed: 13 Nov 07

Logged by: LEC
Compiled by: LEC
Reviewed by: JS
Revision No.: 0, 03/01/0

| LITHOLOGY PROFILE | | SOIL SAMPLING | | | | | | FIELD TESTING | LAB TESTING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lithology Plot | DESCRIPTION | Sample Type | Sample Number | Recovery (%) | SPT 'N' Value | DEPTH (m) | ELEVATION (m) | Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80 | Atterberg Limits $W_p$ W $W_l$ Plastic Liquid; * Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80 | INSTRUMENTATION INSTALLATION | COMMENTS |
| | Local Ground Surface Elevation: 100.0 m | | | | | | | | | | |
| | 300mm Silty TOPSOIL 99.70 | | | | | | | | | | Observation well installation details: 10cm square above-ground lockabl steel protective casing 5.1cm PVC pipe construction Bentonite seal to 1.5m depth Filter sand from 1.5m to bottom at 7.9m Well riser to 6.4m depth Well screen from 6.4m to bottom at 7.9m |
| | Silty CLAY 0.3 some sand and gravel brown, weathered | CS | 1 | 100 | | 0 | 99 | | | | |
| | | AU | 2 | 100 | | 2 | 98 | | | | No water in observation well at completion. |
| | grey | AU | 3 | 100 | | 4 | 97 | | | | Continuous sampler tooling damage after first sample. Collected auger samples for remainder of borehole. |
| | | AU | 4 | 100 | | 6 | 96 | | | | |
| | | AU | 5 | 100 | | 8 | 95 | | | | |
| | 92.40 7.6 | | | | | | 94 | | | | |
| | END OF BOREHOLE | | | | | 10 | 93 | | | | |
| | | | | | | 12 | 92 | | | | |
| | | | | | | | 91 | | | | |
| | | | | | | | 90 | | | | |
| | | | | | | | 89 | | | | |
| | | | | | | | 88 | | | | |
| | | | | | | | 87 | | | | |

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No freestanding groundwater measured in open borehole on completion of drilling.



Scale: 1 : 68

# RECORD OF MONITORING WELL No. OW30-07

amec

Project Number: SW1307072
Project Client: Municipality of Kincardine
Project Name: Monitoring Well Construction
Project Location: Kincardine, Ontario

Drilling Location: Ward 2 Landfill
Drilling Method: 150 mm Solid Stem Auger / Direct Push
Drilling Machine: Track Mounted Drill
Date Started: 11/13/2007 Date Completed: 11/13/2007

Logged by: LEC
Compiled by: LEC
Reviewed by: JS
Revision No.: 0, 11/20/07

Local Ground Surface Elevation: 100.0 m

| Lithology Plot | DESCRIPTION | Sample Type | Sample Number | Recovery (%) | SPT 'N' Value | DEPTH (m) | ELEVATION (m) |
|---|---|---|---|---|---|---|---|
| | 400mm Silty TOPSOIL 99.6 | CS | 1A | 100 | | | |
| | 400mm Silty SAND 0.4 brown 99.2 | CS | 1B | 100 | | | |
| | Alternate layers of SILT and Clayey SILT 0.8 brown / grey, weathered 98.1 | CS | 1C | 100 | | 1 | 99 |
| | Silty CLAY 1.9 some sand and gravel occasional cobbles frequent to occasional silt lenses, decreasing with depth brown / grey | CS | 2 | 100 | | 2 | 98 |
| | | CS | 3 | 100 | | 3 | 97 |
| | | CS | 4 | 100 | | 4 | 96 |
| | | CS | 5 | 100 | | 5 | 95 |
| | 92.4 7.6 END OF BOREHOLE | | | | | 6 | 94 |
| | | | | | | 7 | 93 |
| | | | | | | 8 | 92 |
| | | | | | | 9 | 91 |
| | | | | | | 10 | 90 |
| | | | | | | 11 | 89 |
| | | | | | | 12 | 88 |
| | | | | | | 13 | 87 |

**FIELD TESTING**

Penetration Testing: ○ SPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
20 40 60 80

**LAB TESTING**

Atterberg Limits: $W_p$ W $W_l$ — Plastic — Liquid
Passing 75 um (%)
Moisture Content (%)
Unit Weight (KN/m3)
* Undrained Shear Strength (kPa)
20 40 60 80

**INSTRUMENTATION INSTALLATION**

**COMMENTS**

Observation well installation details:
10cm square above-ground lockable steel protective casing
5.1cm PVC pipe construction
Bentonite seal to 1.5m depth
Filter sand from 1.5m to bottom at 7.9m
Well riser to 6.4m depth
Well screen from 6.4m to bottom at 7.9m

No water in observation well at completion.

▽ No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 68

# RECORD OF MONITORING WELL No. OW31-07

amec

| | | | | | |
|---|---|---|---|---|---|
| Project Number: | SW1307072 | Drilling Location: | Ward 2 Landfill | Logged by: | LEC |
| Project Client: | Municipality of Kincardine | Drilling Method: | 150 mm Solid Stem Auger / Direct Push | Compiled by: | LEC |
| Project Name: | Monitoring Well Construction | Drilling Machine: | Track Mounted Drill | Reviewed by: | JS |
| Project Location: | Kincardine, Ontario | Date Started: | 11/13/2007 Date Completed: 11/13/2007 | Revision No.: | 0, 11/20/07 |

| LITHOLOGY PROFILE | | | SOIL SAMPLING | | | | | | FIELD TESTING | LAB TESTING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lithology Plot | DESCRIPTION<br>Local Ground Surface Elevation: 100.0 m | | Sample Type | Sample Number | Recovery (%) | SPT 'N' Value | DEPTH (m) | ELEVATION (m) | Penetration Testing: SPT, DCPT; MTO Vane* Intact/Remould; Nilcon Vane* Intact/Remould; 20 40 60 80 | Atterberg Limits: $W_p$ W $W_L$; Plastic Liquid; Passing 75 um (%); Moisture Content (%); Unit Weight (KN/m3); * Undrained Shear Strength (kPa); 20 40 60 80 | INSTRUMENTATION INSTALLATION | COMMENTS |
| | 460mm Coarse Fibrous PEAT with topsoil and roots | 99.5 | | | | | | | | | | Observation well installation details:<br>10cm square above-ground lockable steel protective casing<br>5.1cm PVC pipe construction<br>Bentonite seal to 1.5m depth<br>Filter sand from 1.5m to bottom at 7.9m<br>Well riser to 6.4m depth<br>Well screen from 6.4m to bottom at 7.9m<br><br>Water running into borehole during observation well installation.<br><br>Well pumped dry - approx. 5 litres removed at completion. |
| | Silty SAND<br>saturated<br>brown / grey | 0.5<br>98.4 | CS | 1 | 100 | | 1 | 99 | | | | |
| | Alternate Layer of Silty CLAY / Clayey SILT<br>frequent small roots<br>grey | 1.6<br>96.6 | CS | 2 | 100 | | 2 | 98 | | | | |
| | Silty CLAY<br>some sand and gravel<br>occasional cobbles<br>frequent to occasional silt lenses, decreasing with depth<br>grey | 3.4<br>92.4 | CS | 3 | 100 | | 3 | 97 | | | | |
| | | | CS | 4 | 100 | | 4 | 96 | | | | |
| | | | CS | 5 | 100 | | 5 | 95 | | | | |
| | | | | | | | 6 | 94 | | | | |
| | | | | | | | 7 | 93 | | | | |
| | END OF BOREHOLE | 7.6 | | | | | 8 | 92 | | | | |
| | | | | | | | 9 | 91 | | | | |
| | | | | | | | 10 | 90 | | | | |
| | | | | | | | 11 | 89 | | | | |
| | | | | | | | 12 | 88 | | | | |
| | | | | | | | 13 | 87 | | | | |

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

# RECORD OF MONITORING WELL No. OW32-07

amec

Project Number: SW1307072
Project Client: Municipality of Kincardine
Project Name: Monitoring Well Construction
Project Location: Kincardine, Ontario

Drilling Location: Ward 2 Landfill
Drilling Method: 150 mm Solid Stem Auger / Direct Push
Drilling Machine: Track Mounted Drill
Date Started: 11/12/2007 Date Completed: 11/12/2007

Logged by: LEC
Compiled by: LEC
Reviewed by: JS
Revision No.: 0, 11/20/07

Local Ground Surface Elevation: 100.0 m

| Lithology Plot | DESCRIPTION | Sample Type | Sample Number | Recovery (%) | SPT 'N' Value | DEPTH (m) | ELEVATION (m) |
|---|---|---|---|---|---|---|---|
| | Coarse Fibrous PEAT<br>some topsoil, organic silt | CS | 1 | 40 | | 1 | 99 |
| | 98.9<br>1.1<br>Clayey SILT<br>with numerous thin clay lenses<br>grey | CS | 2 | 100 | | 2 | 98 |
| | 96.6<br>3.4<br>Silty CLAY<br>some sand and gravel<br>frequent to occasional silt lenses, decreasing with depth | CS | 3 | 100 | | 3 | 97 |
| | | CS | 4 | 100 | | 4 | 96 |
| | | CS | 5 | 100 | | 5 | 95 |
| | 92.4<br>7.6<br>END OF BOREHOLE | | | | | 6 | 94 |
| | | | | | | 7 | 93 |
| | | | | | | 8 | 92 |
| | | | | | | 9 | 91 |
| | | | | | | 10 | 90 |
| | | | | | | 11 | 89 |
| | | | | | | 12 | 88 |
| | | | | | | 13 | 87 |

FIELD TESTING: Penetration Testing — SPT, DCPT; MTO Vane* Intact/Remould; Nilcon Vane* Intact/Remould; 20 40 60 80

LAB TESTING: Atterberg Limits $W_p$ W $W_L$ — Plastic — Liquid; Passing 75 um (%); Moisture Content (%); Unit Weight (KN/m3); * Undrained Shear Strength (kPa); 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS

Observation well installation details:
10cm square above-ground lockable steel protective casing
5.1cm PVC pipe construction
Bentonite seal to 2.1m depth
Filter sand from 2.1m to bottom at 7.9m
Well riser to 6.4m depth
Well screen from 6.4m to bottom at 7.9m

No water in observation well at completion.

Well remained dry when measured 13 Nov 07.


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▽ No freestanding groundwater measured in open borehole on completion of drilling.



Scale: 1 : 68

# RECORD OF MONITORING WELL No. OW33-07

| | | | |
|---|---|---|---|
| Project Number: | SW1307072 | Drilling Location: | Ward 2 Landfill |
| Project Client: | Municipality of Kincardine | Drilling Method: | 200 mm Hollow Stem Auger / Direct Push |
| Project Name: | Monitoring Well Construction | Drilling Machine: | Track Mounted Drill |
| Project Location: | Kincardine, Ontario | Date Started: | 11/12/2007 Date Completed: 11/12/2007 |

Logged by: LEC | Compiled by: LEC | Reviewed by: JS | Revision No.: 0, 11/20/07

| LITHOLOGY PROFILE | | | SOIL SAMPLING | | | | | | FIELD TESTING | LAB TESTING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lithology Plot | DESCRIPTION<br>Local Ground Surface Elevation: 100.0 m | | Sample Type | Sample Number | Recovery (%) | SPT 'N' Value | DEPTH (m) | ELEVATION (m) | Penetration Testing: O SPT, ● DCPT; MTO Vane*: △ Intact, ▲ Remould; Nilcon Vane*: ◇ Intact, ◆ Remould; 20 40 60 80 | Atterberg Limits: $W_p$ W $W_L$; Plastic, Liquid; ▣ Passing 75 um (%); O Moisture Content (%); ⊕ Unit Weight (KN/m3); * Undrained Shear Strength (kPa); 20 40 60 80 | INSTRUMENTATION INSTALLATION | COMMENTS |
| | 300mm Silty TOPSOIL | 99.7 | CS | 1A | 100 | | 0 | 100 | | | | Observation well installation details:<br>10cm square above-ground lockable steel protective casing<br>5.1cm PVC pipe construction<br>Bentonite seal to 5.2m depth<br>Filter sand from 5.2m to 8.8m<br>Well riser to 7.0m depth<br>Well screen from 7.0m to 8.5m<br>Bentonite from 8.8m to bottom at 12.2m<br><br>Water measured at 5.2m at completion.<br><br>Water measured in observation well at 5.2m on 13 Nov 07<br><br>Observation well pumped dry on 12 Nov 07 with approx. 20 litres removed.<br><br>Additional 20 litres pumped from observation well on 13 Nov 07. Well was not pumped dry. |
| | Silty SAND<br>rusty brown | 0.3 | CS | 1B | 75 | | 1 | 99 | | | | |
| | yellowish brown | 97.1 | CS | 2 | 100 | | 2 | 98 | | | | |
| | Alternate layers of Silty CLAY and Clayey SILT<br>brown<br>(80mm saturated brown fine sand seam) | 2.9 | CS | 3 | 100 | | 3 | 97 | | | | |
| | (150mm saturated brown fine sand seam) | 94.5 | CS | 4A | 100 | | 4 | 96 | | | | |
| | | | CS | 4B | 100 | | 5 | 95 | | | | |
| | Fine SAND<br>trace to some silt<br>occasional to frequent silt and clay lenses, increasing with depth<br>brown | 5.5 | CS | 4C | 100 | | 6 | 94 | | | | |
| | | 92.2 | CS | 5 | 100 | | 7 | 93 | | | | |
| | Clayey SILT<br>grey | 7.8 | CS | 6 | 100 | | 8 | 92 | | | | |
| | | 90.9 | | | | | 9 | 91 | | | | |
| | Silty CLAY<br>some sand and gravel<br>occasional thin silt lenses<br>grey | 9.1 | CS | 7 | 100 | | 10 | 90 | | | | |
| | | | CS | 8 | 100 | | 11 | 89 | | | | |
| | (13mm saturated sand lense) | 87.8 | | | | | 12 | 88 | | | | |
| | END OF BOREHOLE | 12.2 | | | | | 13 | 87 | | | | |


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▽ Groundwater depth on completion of drilling: 5.2 m.

▼ Groundwater depth observed on 11/13/2007 at a depth of: 5.2 m.

▣ Cave in depth recorded on completion of drilling: 5.2 m.

⊠ Cave in depth recorded 11/13/2007 at a depth of: n/a m.



Scale: 1 : 68

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: BH51-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: October 3, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0.5 | LOAMY TOPSOIL, silty sandy topsoil, loose, dark brown, dry; high organic content | 0.15 | | | | | |
| | SM - SILTY SAND, silty to with silt, loose to compact, fine to medium grained sand, orange/brown, dry | | | 1 | | 33 | 6 |
| 1.0 | - brown, wet at 0.76m BGS | | | 2 | | 25 | 13 |
| 1.5 | CI/ML - CLAY AND SILT, soft, moderate plasticity, brown, dry; oxidation staining present | 1.52 | | 3 | | 25 | 5 |
| 2.0 | | | | | | | |
| 2.5 | - compact, brown, wet at 2.74m BGS | | | 4 | | 33 | 20 |
| 3.0 | - with to clayey, moist at 3.35m BGS | | | 5 | | 50 | 9 |
| 3.5 | CI/ML - CLAYEY SILT (TILL), firm, moderate plasticity, grey, saturated with little available groundwater | 3.51 | | | | | |
| 4.0 | | | | 6 | | 42 | 12 |
| 4.5 | | | BENTONITE GRAVEL AND NATURAL COLLAPSE MATERIALS | | | | |
| 5.0 | - trace fine grained gravel, hard at 5.33m BGS | | | 7 | | 75 | 13 |
| 5.5 | | | | 8 | | 83 | 24 |
| 6.0 | | | | | | | |
| 6.5 | - 7.5 cm seam of compact, clayey silt, with to trace fine grained sand, some available groundwater at 6.40m BGS | | | 9 | | 83 | 20 |
| 7.0 | | | | | | | |
| | - 2.5 cm rock encountered at 7.32m BGS | | | 10 | | 92 | 24 |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 004074-32 2013 STRATIGRAPHIC LOGS -KWMC.GPJ CRA_CORP.GDT 1/17/14

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
PROJECT NUMBER: 004074-32
CLIENT: Municipality of Kincardine
LOCATION: Kincardine Waste Management Centre (Ward 2)
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

HOLE DESIGNATION: BH51-13
DATE COMPLETED: October 3, 2013
DRILLING METHOD: 4 1/4 HSA
FIELD PERSONNEL: Allan M.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 8.0 | | | | 11 | | 100 | 22 |
| 8.5 | | | | 12 | | 91 | 15 |
| 9.0 | END OF BOREHOLE @ 8.99m BGS | 8.99 | WELL DETAILS<br>Seal:<br>0.00 to 8.99m BGS<br>Material: BENTONITE GRAVEL | | | | |
| 9.5 | | | | | | | |
| 10.0 | | | | | | | |
| 10.5 | | | | | | | |
| 11.0 | | | | | | | |
| 11.5 | | | | | | | |
| 12.0 | | | | | | | |
| 12.5 | | | | | | | |
| 13.0 | | | | | | | |
| 13.5 | | | | | | | |
| 14.0 | | | | | | | |
| 14.5 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: BH52-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: October 7, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0.5 | LOAMY TOPSOIL, silty and sand, loose, dark brown, dry; high organic content | 0.46 | | 1 | | 63 | 8 |
| 1.0 | CL/ML - CLAYEY SILT (TILL), with to clayey, with sand, compact, low plasticity, brown, dry; some organic material present<br>- 7.5 cm seam of SM/ML - SILTY SAND, loose, fine grained sand, brown, dry at 0.61m BGS<br>- trace fine grained gravel present, low plasticity, no organics present at 0.76m BGS | | | 2 | | 67 | 21 |
| 1.5 | - moderate plasticity at 1.52m BGS | | | 3 | | 75 | 19 |
| 2.0 | | | | | | | |
| 2.5 | - poor recovery due to stone in sample - ML CLAYEY SILT (TILL) inferred from 2.29 to 2.90m BGS | | | 4 | | 4 | 24 |
| 3.0 | - grey at 3.05m BGS | | | 5 | | 67 | 17 |
| 3.5 | | | | | | | |
| 4.0 | - some medium grained gravel noted at 3.81m BGS | | | 6 | | 58 | 22 |
| 4.5 | | | 3/8" BENTONITE GRAVEL NATURAL COLLAPSE MATERIAL | | | | |
| 5.0 | - poor recovery due to rock stuck in sampler from 5.18 to 5.79m BGS | | | 7 | | 30 | 26 |
| 5.5 | | | | 8 | | 13 | 34 |
| 6.0 | GW/SW - SANDY GRAVEL, with silt, with clay, compact, fine to coarse grained gravel, fine grained sand, grey, brown, and reddish gravel, angular, dry | 5.89<br>6.14 | | | | | |
| 6.5 | SM - SILTY SAND, very dense, fine grained sand, dilatant, stratified, brown, wet | | | 9 | | 54 | 86 |
| 7.0 | - greyish brown at 6.86m BGS | | | 10 | | 67 | 60 |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: BH52-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: October 7, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 8.0 | - grey at 7.62m BGS | | | 11 | | 71 | 30 |
| 8.5 | | | | 12 | | 75 | 60 |
| 9.0 | END OF BOREHOLE @ 8.99m BGS | 8.99 | WELL DETAILS<br>Seal:<br>0.00 to 8.99m BGS<br>Material: BENTONITE GRAVEL | | | | |
| 9.5 | | | | | | | |
| 10.0 | | | | | | | |
| 10.5 | | | | | | | |
| 11.0 | | | | | | | |
| 11.5 | | | | | | | |
| 12.0 | | | | | | | |
| 12.5 | | | | | | | |
| 13.0 | | | | | | | |
| 13.5 | | | | | | | |
| 14.0 | | | | | | | |
| 14.5 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: BH53-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: September 26, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0.0 | LOAMY TOPSOIL, sandy, silty topsoil, loose, fine grained sand, dark brown, moist; high organic content | 0.15 | | 1 | | 92 | 10 |
| 0.5 | ML/SM - SILTY SAND, loose, stratified, fine to very grained sand, dark brown transitioning to brown, moist; traces of topsoil present, trace organic materials and rootlets present<br>- light brown at 0.46m BGS | | | | | | |
| 1.0 | | | | | | | |
| 1.5 | | | | 2 | | 58 | 17 |
| 2.0 | - dilatant, wet at 2.29m BGS | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | | | 3/8" BENTONITE GRAVEL AND NATURAL COLLAPSE MATERIALS | | | | |
| 3.5 | | | | 3 | | 63 | 30 |
| 4.0 | | | | | | | |
| 4.5 | CL/ML - CLAYEY SILT (TILL), with to trace sand, very stiff, low plasticity, grey, saturated with little available groundwater<br>- trace fine grained gravel, low to moderate plasticity at 5.03m BGS | 4.65 | | 4 | | 92 | 25 |
| 5.0 | | | | | | | |
| 5.5 | - hard, moderate plasticity, greyish brown at 5.33m BGS<br>- grey at 5.79m BGS | | | 5 | | 92 | 38 |
| 6.0 | END OF BOREHOLE @ 5.94m BGS | 5.94 | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |

WELL DETAILS
Seal:
0.00 to 5.94m BGS
Material: BENTONITE GRAVEL

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: BH54-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: September 26, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0.0 | LOAMY TOPSOIL, sandy, silty topsoil, loose, fine grained sand, dark brown, moist; high organic content | 0.08 | | 1 | | 67 | 13 |
| 0.5 | ML/SM - SILTY SAND, loose, fine grained sand, light brown, dry; occasional silty organic pockets present, ~ 1 cm thick | | | | | | |
| 1.0 | | | | | | | |
| 1.5 | - organic pockets no longer present at 1.52m BGS | | | 2 | | 25 | 7 |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | - poor recovery, hammer malfunctioning - ML/SM - SILTY SAND inferred from 3.05 to 3.66m BGS | | 3/8" BENTONITE GRAVEL AND NATURAL COLLAPSE MATERIALS | 3 | | 0 | 40 |
| 3.5 | - dilatant, wet at 3.81m BGS | | | | | | |
| 4.0 | | | | 4 | | 71 | 46 |
| 4.5 | ML - CLAYEY SILT, clayey to with clay, with sand, hard, low plasticity, very fine grained sand, brown, moist | 4.22 | | | | | |
| | CL/ML - CLAYEY SILT (TILL), trace sand, trace gravel, hard, low to moderate plasticity, very fine grained sand, fine grained gravel, grey, saturated with little to no groundwater available | 4.57 | | 5 | | 58 | 25 |
| 5.0 | | | | | | | |
| 5.5 | | | | 6 | | 83 | 27 |
| 6.0 | END OF BOREHOLE @ 5.94m BGS | 5.94 | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |

WELL DETAILS
Seal:
0.00 to 5.94m BGS
Material: BENTONITE GRAVEL

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 004074-32 2013 STRATIGRAPHIC LOGS -KWMC.GPJ CRA_CORP.GDT 1/17/14

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: BH55-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: September 26, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0.5 | LOAMY TOPSOIL, silty topsoil with sand, soft to firm, fine grained sand, dark brown, dry; organics present | 0.46 | | 1 | | 58 | 7 |
| | ML - SILT (POSSIBLY FILL), with clay, trace gravel, loose, moderate to low plasticity, fine grained gravel, dark brown, dry to moist | 0.61 | | | | | |
| 1.0 | ML/SM - SILTY SAND, loose, no plasticity, stratified, fine grained sand, brown, dry; occassional seams of ML/CL - CLAYEY SILT, loose, low plasticity, dark brown, dry | | | | | | |
| 1.5 | | | | | | | |
| 2.0 | - 5 cm seam of ML/CL - CLAYEY SILT, loose, low plasticity, dark brown, dry at 1.83m BGS<br>- 5 cm seam of ML/CL - CLAYEY SILT, loose, low plasticity, grey, dry at 1.98m BGS | | | 2 | | 75 | 18 |
| 2.5 | | | | | | | |
| 3.0 | | | | | | | |
| 3.5 | - moist to wet at 3.51m BGS | | 3/8" BENTONITE GRAVEL AND NATURAL COLLAPSE MATERIALS | 3 | | 83 | 35 |
| 4.0 | - dilatant, wet at 3.96m BGS | | | 4 | | 75 | 38 |
| 4.5 | | | | | | | |
| 5.0 | CL/ML - CLAYEY SILT (TILL), trace to with sand, hard, low plasticity, brown, dry | 5.08 | | 5 | | 67 | 34 |
| 5.5 | - trace sand, trace gravel, low to moderate plasticity, very fine grained sand, fine grained gravel at 5.18m BGS | | | 6 | | 58 | 26 |
| 6.0 | | | | | | | |
| 6.5 | | | | 7 | | 75 | 33 |
| | END OF BOREHOLE @ 6.71m BGS | 6.71 | | | | | |
| 7.0 | | | | | | | |

WELL DETAILS
Seal:
0.00 to 6.71m BGS
Material: BENTONITE GRAVEL

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 004074-32 2013 STRATIGRAPHIC LOGS -KWMC.GPJ CRA_CORP.GDT 1/17/14

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: BH56-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: September 27, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0.5 | LOAMY TOPSOIL, silty sandy topsoil, loose, dark brown, dry; high organic content | 0.15 | | 1 | | 75 | 7 |
| 1.0 | SILTY SAND (FILL), silty to with silt, loose, fine grained sand, brown, dry | | | | | | |
| 1.5 | SILT AND SAND (FILL), trace clay, trace gravel, loose, fine grained sand, brown, dry; styrofoam encountered | 1.52 | | 2 | | 25 | 5 |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | | | | 3 | | 25 | 3 |
| 3.5 | | | | | | | |
| 4.0 | poor recovery, rock stuck in sampler | 3.81 | | 4 | | 25 | 26 |
| 4.5 | SM - SILTY SAND, silty to with silt, compact, fine grained, brown, moist to wet | 4.57 | 3/8" BENTONITE GRAVEL AND NATURAL COLLAPSE MATERIALS | | | | |
| 5.0 | - dilatant, wet at 5.08m BGS | | | 5 | | 50 | 27 |
| 5.5 | | | | 6 | | 71 | 42 |
| 6.0 | ML - SILT, with sand, with to trace clay, hard, very fine grained sand, somewhat dilatant, brown, moist | 6.10 | | | | | |
| 6.5 | | | | 7 | | 75 | 57 |
| 7.0 | CL/ML - CLAYEY SILT (TILL), trace gravel, trace sand, hard, moderate plasticity, very fine | 7.16 | | 8 | | 75 | 59 |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: BH56-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: September 27, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 8.0 | grained sand, fine grained gravel, grey, saturated with little to no available groundwater<br><br>- 7.5 cm seam of ML - SILT, with sand, very fine grained sand, moist at 7.92m BGS | | | 9 | | 75 | 32 |
| 8.5 | | | | 10 | | 75 | 35 |
| 9.0 | END OF BOREHOLE @ 8.99m BGS | 8.99 | WELL DETAILS<br>Seal:<br>0.00 to 8.99m BGS<br>Material: BENTONITE GRAVEL | | | | |
| 9.5 | | | | | | | |
| 10.0 | | | | | | | |
| 10.5 | | | | | | | |
| 11.0 | | | | | | | |
| 11.5 | | | | | | | |
| 12.0 | | | | | | | |
| 12.5 | | | | | | | |
| 13.0 | | | | | | | |
| 13.5 | | | | | | | |
| 14.0 | | | | | | | |
| 14.5 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: BH57-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: September 27, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0.5 | LOAMY TOPSOIL, silty sandy topsoil, loose, dark brown, dry; high organic content | 0.15 | | 1 | | 63 | 8 |
| | ML/SM - SILTY SAND, loose, fine to very fine grained, stratified, brown, moist; occassional organic silt layers encountered, approx. 1 cm in thickness | | | | | | |
| 1.0 | | | | | | | |
| 1.5 | - trace silt, light brown, dry at 1.52m BGS | | | 2 | | 58 | 18 |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | - silty to with silt from 3.05 to 3.20m BGS | | | 3 | | 67 | 27 |
| 3.5 | | | | | | | |
| 4.0 | | | | | | | |
| 4.5 | - fine grained sand, damp to wet at 4.57m BGS | | 3/8" BENTONITE GRAVEL AND NATURAL COLLAPSE MATERIALS | 4 | | 63 | 42 |
| 5.0 | | | | | | | |
| 5.5 | - silty, very dense, dilatant, wet at 5.33m BGS | | | 5 | | 63 | 63 |
| 6.0 | | | | | | | |
| 6.5 | | | | 6 | | 67 | 51 |
| 7.0 | | | | 7 | | 67 | >50 |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: BH57-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: September 27, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 8.0 | | | | 8 | | 71 | 63 |
| 8.5 | CL/ML - SILT, with to clayey, with sand, hard, very fine grained sand, low plasticity, grey/brown, moist | 8.18 | | 9 | | 79 | 49 |
| 9.0 | END OF BOREHOLE @ 8.99m BGS | 8.99 | WELL DETAILS<br>Seal:<br>0.00 to 8.99m BGS<br>Material: BENTONITE GRAVEL | | | | |
| 9.5 | | | | | | | |
| 10.0 | | | | | | | |
| 10.5 | | | | | | | |
| 11.0 | | | | | | | |
| 11.5 | | | | | | | |
| 12.0 | | | | | | | |
| 12.5 | | | | | | | |
| 13.0 | | | | | | | |
| 13.5 | | | | | | | |
| 14.0 | | | | | | | |
| 14.5 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: BH58-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: September 30, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0.0 | SAND AND GRAVEL (FILL), road base materials, compact, fine to coarse grained sand and gravel, brown, dry | 0.30 | | 1 | | 58 | 17 |
| 0.5 | CI/ML - CLAYEY SILT (FILL), traces of topsoil, stiff, high plasticity, dark brown, moist | | | | | | |
| 1.0 | | | | | | | |
| 1.5 | - trace debris encountered, brick, plastic, wood from 1.52 to 3.35m BGS | | | 2 | | 25 | 8 |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | | | | | | | |
| 3.5 | SM - SILTY SAND, silty to with silt, loose, fine to meidum grained sand, brown, moist | 3.35 | | 3 | | 50 | 6 |
| 4.0 | | | 3/8" BENTONITE GRAVEL AND NATURAL COLLAPSE MATERIALS | | | | |
| 4.5 | | | | | | | |
| 5.0 | CL/ML - CLAYEY SILT (TILL), trace sand, trace gravel, hard, low plasticity, brown, dry | 5.08 | | 4 | | 42 | 42 |
| 5.5 | - increased plasticity; moderate, grey at 5.49m BGS | | | 5 | | 67 | 34 |
| 6.0 | | | | | | | |
| 6.5 | | | | 6 | | 79 | 49 |
| 7.0 | - with sand, very fine grained sand; occassional small pockets (<1 cm) of most to wet clayey silt with sand from 6.71 to 6.86m BGS | | | 7 | | 54 | 22 |
| 7.5 | END OF BOREHOLE @ 7.47m BGS | 7.47 | | | | | |
| 8.0 | | | | | | | |

WELL DETAILS
Seal:
0.00 to 7.47m BGS
Material: BENTONITE GRAVEL

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 004074-32 2013 STRATIGRAPHIC LOGS -KWMC.GPJ CRA_CORP.GDT 1/17/14

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: BH59-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: October 1, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0.5 | SAND AND GRAVEL (FILL), brown, dry | | | | | | |
| | SM - SAND, with to silty, loose to compact, fine grained sand, brown, dry | 0.61 | | | | | |
| 1.0 | | | | | | | |
| 1.5 | | | | | | | |
| 2.0 | | | | 1 | | | - |
| 2.5 | | | | | | | |
| 3.0 | | | | | | | |
| 3.5 | | | | | | | |
| 4.0 | | | | | | | |
| 4.5 | | | | | | | |
| 5.0 | | | 3/8" BENTONITE GRAVEL, GROUT, AND NATURAL COLLAPSE MATERIALS | 2 | | 33 | 24 |
| | - moist to wet at 5.33m BGS | | | | | | |
| 5.5 | - silty, dilatant, wet at 5.64m BGS | | | 3 | | 63 | 51 |
| 6.0 | | | | | | | |
| | ML - SILT, with sand, with clay, hard, very fine grained sand, low plasticity, brown, dry | 6.25 | | 4 | | 54 | 46 |
| 6.5 | CL/ML - CLAYEY SILT (TILL), with sand, with gravel, hard, very fine grained sand, fine grained gravel, low plasticity, grey, saturated with little to no available groundwater | 6.60 | | | | | |
| | | 6.86 | | | | | |
| 7.0 | ML - SILT, with sand, with clay, hard, very fine grained sand, low plasticity, grey, saturated with little to no available groundwater | | | 5 | | 75 | 43 |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
PROJECT NUMBER: 004074-32
CLIENT: Municipality of Kincardine
LOCATION: Kincardine Waste Management Centre (Ward 2)
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

HOLE DESIGNATION: BH59-13
DATE COMPLETED: October 1, 2013
DRILLING METHOD: 4 1/4 HSA
FIELD PERSONNEL: Allan M.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 8.0 | ML/SM - SILT AND SAND, compact, fine grained sand, dilatant, grey, wet; occassional grey, clayey silt pockets present with high plasticity, grey | 7.62 | | 6 | | 75 | 20 |
| 8.5 | ML/CL - CLAY AND SILT (TILL), with gravel, hard, moderate to high plasticity, fine grained gravel, grey, saturated with little to no available groundwater | 8.53 | | 7 | | 83 | 36 |
| 9.0 | | | | | | | |
| 9.5 | | | | 8 | | 75 | 33 |
| | END OF BOREHOLE @ 9.75m BGS | 9.75 | WELL DETAILS<br>Seal:<br>0.00 to 9.75m BGS<br>Material: BENTONITE GROUT AND GRAVEL | | | | |
| 10.0 | | | | | | | |
| 10.5 | | | | | | | |
| 11.0 | | | | | | | |
| 11.5 | | | | | | | |
| 12.0 | | | | | | | |
| 12.5 | | | | | | | |
| 13.0 | | | | | | | |
| 13.5 | | | | | | | |
| 14.0 | | | | | | | |
| 14.5 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: OW25R-13

PROJECT NUMBER: 004074-32
DATE COMPLETED: October 4, 2013

CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA

LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.

DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0.5 | TOPSOIL (FILL), loamy, silt and sand, dark brown, dry | 0.08 | CONCRETE | 1 | | 71 | 20 |
| | SM - SAND (FILL), with silt, loose to compact, fine grained sand, light brown, dry | 0.46 | | | | | |
| | ML - SILT (FILL), with clay, with sand, hard, brown, grey, dry | 0.81 | | | | | |
| 1.0 | SM - SAND (FILL), with silt, loose to compact, fine grained sand, light brown, dry | 0.91 | | 2 | | 46 | 16 |
| 1.5 | CL/ML - CLAYEY SILT (FILL), with to trace very fined grained sand, low plasticity, grey, dry | | | | | | |
| | SM - SILTY SAND, compact, fine to very fine grained, light brown, dry; some oxidation staining present, some stratification noted | 1.68 | | 3 | | 67 | 24 |
| 2.0 | | | | | | | |
| 2.5 | | | 3/8" BENTONITE GRAVEL | 4 | | 50 | 21 |
| 3.0 | | | 50 mm dia SCH 40 PVC RISER PIPE | | | | |
| 3.5 | | | | 5 | | 46 | 26 |
| | CH/ML - CLAY AND SILT (TILL), trace fine grained gravel, stiff, moderate to high plasticity, brown, dry; some oxidation staining present | 3.81 | | | | | |
| 4.0 | | | | 6 | | 63 | 13 |
| 4.5 | - grey at 4.72m BGS | | | | | | |
| 5.0 | - SM/ML - SILT AND SAND, compact, dilatant, very fine grained sand, grey, wet from 5.13 to 5.64m BGS | | | 7 | | 58 | 15 |
| 5.5 | | | | 8 | | 79 | 15 |
| 6.0 | | | #1 SILICA SANDPACK | | | | |
| 6.5 | | | 50 mm dia SCH 40 PVC SCREEN | 9 | | 81 | 21 |
| 7.0 | - SM/ML - SILT AND SAND, compact, dilatant, very fine grained sand, grey, wet from 6.91 to 7.16m BGS | | | 10 | | 67 | 18 |

WELL DETAILS
Screened interval:

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
PROJECT NUMBER: 004074-32
CLIENT: Municipality of Kincardine
LOCATION: Kincardine Waste Management Centre (Ward 2)
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

HOLE DESIGNATION: OW25R-13
DATE COMPLETED: October 4, 2013
DRILLING METHOD: 4 1/4 HSA
FIELD PERSONNEL: Allan M.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 8.0 | END OF BOREHOLE @ 8.23m BGS | 8.23 | 5.64 to 7.16m BGS<br>Length: 1.52m<br>Diameter: 51mm<br>Slot Size: 10<br>Material: SCH. 40 PVC<br>Seal:<br>0.30 to 5.03m BGS<br>Material: BENTONITE GRAVEL<br>Sand Pack:<br>5.03 to 7.16m BGS<br>Material: #1 SILICA SANDPACK | 11 | | 83 | 19 |
| 8.5 | | | | | | | |
| 9.0 | | | | | | | |
| 9.5 | | | | | | | |
| 10.0 | | | | | | | |
| 10.5 | | | | | | | |
| 11.0 | | | | | | | |
| 11.5 | | | | | | | |
| 12.0 | | | | | | | |
| 12.5 | | | | | | | |
| 13.0 | | | | | | | |
| 13.5 | | | | | | | |
| 14.0 | | | | | | | |
| 14.5 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: OW45-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: October 4, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0.5 | LOAMY TOPSOIL (FILL), silty sand, loose, fine grained sand, black, dry; high organic content | 0.30 | CONCRETE | 1 | | 58 | 3 |
| | SM - SAND (FILL), with silt, loose, fine grained sand, stratified, orange brown, dry | 0.76 | | | | | |
| | CH - CLAY (FILL), soft, high plasticity, grey | 0.91 | | | | | |
| 1.0 | LOAMY TOPSOIL, silty sand, loose, fine grained sand, black, dry; high organic content | 1.07 | | 2 | | 75 | 13 |
| 1.5 | SM - SAND, with silt to silty, loose, fine grained sand, light brown, dry<br>- compact, stratified at 1.52m BGS | | 3/8" BENTONITE GRAVEL 50 mm dia SCH 40 PVC RISER PIPE | 3 | | 67 | 18 |
| 2.0 | - dilatant, greyish brown, wet at 2.08m BGS | | | | | | |
| 2.5 | | | | 4 | | 63 | 29 |
| 3.0 | | | #1 SILICA SANDPACK | | | | |
| 3.5 | - 10 cm seam of ML - SILT, with sand, dense, little to no plasticity, brown, moist at 3.35m BGS | | 50 mm dia SCH 40 PVC SCREEN | 5 | | 75 | 27 |
| 4.0 | CI/ML - CLAYEY SILT (TILL), trace gravel, trace sand, fine grained gravel, very fine grained sand, very stiff to hard, moderate plasticitiy, grey, saturated with little to no available water<br>- no gravel present, low plasticity at 4.57m BGS | 3.91 | | 6 | | 67 | 20 |
| 4.5 | | | BENTONITE GRAVEL AND NATURAL COLLAPSE | 7 | | 75 | 23 |
| 5.0 | END OF BOREHOLE @ 5.18m BGS | 5.18 | | | | | |
| 5.5 | | | | | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |

WELL DETAILS
Screened interval:
2.74 to 4.27m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
0.30 to 4.27m BGS
Material: BENTONITE GRAVEL
Sand Pack:
2.13 to 4.27m BGS
Material: #1 SILICA SANDPACK

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: OW46A-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: October 2, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0.5 | LOAMY TOPSOIL, silty sandy topsoil, loose, dark brown, dry; high organic content | 0.46 | CONCRETE | 1 | | 67 | 7 |
| 1.0 | SM - SILTY SAND, compact, fine grained sand, brown, moist; some oxidation staining present<br>- trace silt to with silt, light brown to grey at 1.22m BGS | | | 2 | | 58 | 10 |
| 1.5 | - with to silty, brown, moist to wet at 1.52m BGS | | | | | | |
| 2.0 | - dilatant, wet at 1.83m BGS | | | 3 | | 58 | 17 |
| 2.5 | - stratification present at 2.29m BGS | | | 4 | | 58 | 26 |
| 3.0 | | | | | | | |
| 3.5 | | | | 5 | | 54 | 28 |
| 4.0 | CI/ML - CLAYEY SILT TO CLAY AND SILT (TILL), very stiff, moderate plasticity, brown, moist<br>- grey, moderate to high plasticity at 3.81m BGS | 3.61 | | 6 | | 54 | 12 |
| 4.5 | - 1 to 2 cm seam of SM/ML - SILT AND SAND, fine grained sand, dilatant, grey, wet at 4.27m BGS | | | | | | |
| 5.0 | | | BENTONITE GROUT | 7 | | 58 | 14 |
| 5.5 | - soft (possibly due to slough) from 5.18 to 5.49m BGS | | 50 mm dia SCH 40 PVC RISER PIPE | 8 | | 71 | 23 |
| 6.0 | | | | | | | |
| 6.5 | - SM - SILTY SAND, loose, fine to very fine grained, grey, wet from 6.40 to 6.55m BGS | | | 9 | | 75 | 30 |
| 7.0 | - 2.5 cm seam of SM - SILTY SAND, loose, fine to very fine grained, grey, wet at 7.01m BGS<br>- SM - SILTY SAND, loose, fine to very fine | | | 10 | | 58 | 23 |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: OW46A-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: October 2, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | grained, grey, wet from 7.32 to 7.47m BGS | | | 11 | | 54 | 23 |
| 8.0 | - moderate to high plasticity at 8.23m BGS | | | 12 | | 54 | 22 |
| 8.5 | | | | | | | |
| 9.0 | | | | 13 | | 83 | 25 |
| 9.5 | - trace fine grained gravel, saturated pockets of SILTY SAND, >1 cm, present at 9.75m BGS | | 3/8" BENTONITE GRAVEL | | | | |
| 10.0 | | | | 14 | | 83 | 25 |
| 10.5 | | | | | | | |
| 11.0 | | | | 15 | | 75 | 26 |
| 11.5 | | | | | | | |
| 12.0 | - soft, high slit content, with sand, wet; varving present at 12.19m BGS | | #1 SILICA SANDPACK<br>50 mm dia SCH 40 PVC SCREEN | 16 | | 83 | 22 |
| 12.5 | | | | 17 | | 83 | 18 |
| 13.0 | | | | | | | |
| 13.5 | | | | 18 | | 83 | 10 |
| | END OF BOREHOLE @ 13.72m BGS | 13.72 | | | | | |
| 14.0 | | | WELL DETAILS<br>Screened interval:<br>10.67 to 13.72m BGS<br>Length: 3.05m<br>Diameter: 51mm<br>Slot Size: 10<br>Material: SCH. 40 PVC<br>Seal:<br>0.30 to 10.06m BGS | | | | |
| 14.5 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: OW46A-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: October 2, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | MONITORING WELL | SAMPLE | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | NUMBER | INTERVAL | REC (%) | 'N' VALUE | |
| 15.5 | | | Material: BENTONITE GROUT AND GRAVEL<br>Sand Pack:<br>10.06 to 13.72m BGS<br>Material: #1 SILICA SANDPACK | | | | | |
| 16.0 | | | | | | | | |
| 16.5 | | | | | | | | |
| 17.0 | | | | | | | | |
| 17.5 | | | | | | | | |
| 18.0 | | | | | | | | |
| 18.5 | | | | | | | | |
| 19.0 | | | | | | | | |
| 19.5 | | | | | | | | |
| 20.0 | | | | | | | | |
| 20.5 | | | | | | | | |
| 21.0 | | | | | | | | |
| 21.5 | | | | | | | | |
| 22.0 | | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: OW46B-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: October 2, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0.5 | LOAMY TOPSOIL, silty sandy topsoil, loose, dark brown, dry; high organic content | | CONCRETE | | | | |
| | SM - SILTY SAND, compact, fine grained sand, brown, moist; some oxidation staining present | 0.46 | BENTONITE GROUT | | | | |
| 1.0 | - trace silt to with silt, light brown to grey at 1.22m BGS | | 50 mm dia SCH 40 PVC RISER PIPE | | | | |
| 1.5 | - with to silty, brown, moist to wet at 1.52m BGS | | | | | | |
| | - dilatant, wet at 1.83m BGS | | | | | | |
| 2.0 | - stratification present at 2.29m BGS | | 3/8" BENTONITE GRAVEL | 1 | | 0 | - |
| 2.5 | | | | | | | |
| 3.0 | | | #1 SILICA SANDPACK | | | | |
| 3.5 | | | 50 mm dia SCH 40 PVC SCREEN | | | | |
| | CI/ML - CLAYEY SILT TO CLAY AND SILT, very stiff, moderate plasticity, brown, moist | 3.61 | | | | | |
| 4.0 | - grey, moderate to high plasticity at 3.81m BGS | 3.96 | | | | | |
| | END OF BOREHOLE @ 3.96m BGS | | | | | | |
| 4.5 | | | | | | | |
| 5.0 | | | | | | | |
| 5.5 | | | | | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |

WELL DETAILS
Screened interval:
2.44 to 3.96m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
0.30 to 1.83m BGS
Material: BENTONITE GROUT AND GRAVEL
Sand Pack:
1.83 to 3.66m BGS
Material: #1 SILICA SANDPACK

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: OW47-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: October 3, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0.5 | LOAMY TOPSOIL, silty sandy topsoil, loose, dark brown, dry; high organic content | 0.46 | CONCRETE | 1 | | 38 | 5 |
| 1.0 | SM - SILTY SAND, loose, fine to very fine grained sand, medium brown, dry; some rootlets present<br>- poor recovcery due to roots, light brown SM - SILTY SAND inferred from 0.76 to 1.37m BGS | | | 2 | | 4 | 15 |
| 1.5 | - poor recovcery due to rock, light brown SM - SILTY SAND inferred from 1.52 to 2.13m BGS | | | 3 | | 4 | 13 |
| 2.0 | - SILT AND SAND, very light brown, moist at 2.29m BGS | | | | | | |
| 2.5 | | | | 4 | | 33 | 30 |
| 3.0 | CL/ML - CLAYEY SILT, with sand, hard, low plasticity, very fine grained sand, mottled greyish brown, moist; upper 0.4 m are brown | 3.05 | 3/8" BENTONITE GRAVEL<br>50 mm dia SCH 40 PVC RISER PIPE | 5 | | 54 | 31 |
| 3.5 | - grey at 3.81m BGS | | | | | | |
| 4.0 | | | | 6 | | 58 | 30 |
| 4.5 | | | | 7 | | 75 | 37 |
| 5.0 | - some varving present at 5.33m BGS | | | | | | |
| 5.5 | | | | 8 | | 71 | 27 |
| 6.0 | ML - SILT, with clay to clayey, with sand, hard, very fine grained sand, brown, dry; some oxidation staining present | 6.10 | | | | | |
| 6.5 | | | | 9 | | 83 | 21 |
| | SM/ML - SILTY SAND, loose to compact, fine to very fine grained sand, dilatant, brown, wet | 6.65 | | | | | |
| 7.0 | | | | 10 | | 54 | 14 |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: OW47-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: October 3, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 8.0 | | | NATURAL SANDPACK | 11 | | 71 | 22 |
| 8.5 | | | 50 mm dia SCH 40 PVC SCREEN | 12 | | 83 | 20 |
| 9.0 | END OF BOREHOLE @ 8.99m BGS | 8.99 | | | | | |
| 9.5 | | | | | | | |
| 10.0 | | | | | | | |
| 10.5 | | | | | | | |
| 11.0 | | | | | | | |
| 11.5 | | | | | | | |
| 12.0 | | | | | | | |
| 12.5 | | | | | | | |
| 13.0 | | | | | | | |
| 13.5 | | | | | | | |
| 14.0 | | | | | | | |
| 14.5 | | | | | | | |

WELL DETAILS
Screened interval:
7.32 to 8.84m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
0.30 to 6.71m BGS
Material: BENTONITE GRAVEL
Sand Pack:
6.40 to 8.84m BGS
Material: NATURAL SANDPACK

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: OW48-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: September 25, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | LOAMY TOPSOIL, sandy, silty topsoil, loose, fine grained sand, dark brown, moist; high organic content | 0.08 | CONCRETE | 1 | | 100 | - |
| 0.5 | SM - SILTY SAND, silt to with silt, loose, fine grained sand, brown, moist; varying degrees of silt | | | | | | |
| 1.0 | | | | 2 | | 67 | 12 |
| 1.5 | | | 3/8" BENTONITE GRAVEL | | | | |
| 2.0 | - golden coloured sand, trace silt, dry from 1.98 to 2.13m BGS | | 50 mm dia SCH 40 PVC RISER PIPE | 3 | | 58 | 15 |
| | - wet at 2.29m BGS | | | | | | |
| 2.5 | | | | 4 | | 50 | 27 |
| 3.0 | | | | | | | |
| 3.5 | - trace silt, medium grained from 3.35 to 3.51m BGS | | | 5 | | 67 | 22 |
| 4.0 | | | #1 SILICA SANDPACK | | | | |
| | | | 50 mm dia SCH 40 PVC SCREEN | 6 | | 71 | 30 |
| 4.5 | | | | | | | |
| 5.0 | | | | 7 | | 75 | 30 |
| 5.5 | - increased silt content; SILT AND SAND at 5.33m BGS | | | 8 | | 100 | 57 |
| 6.0 | - oxidation staining from 6.10 to 6.55m BGS | | | | | | |
| 6.5 | - SANDY SILT, grey at 6.55m BGS | | | 9 | | 83 | 47 |
| | | | BENTONITE GRAVEL AND NATURAL COLLAPSE | | | | |
| 7.0 | CL/ML - CLAYEY SILT (TILL), with to trace sand, very stiff, low plasticity, grey, saturated with little to no available water | 7.01 | | 10 | | 67 | 31 |
| | - trace to no sand, trace gravel, fine grained | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: OW48-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: September 25, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 8.0 | gravel, increase plasticity; moderate at 7.32m BGS | | | 11 | | 67 | 21 |
| | END OF BOREHOLE @ 8.23m BGS | 8.23 | WELL DETAILS<br>Screened interval:<br>3.35 to 4.88m BGS<br>Length: 1.52m<br>Diameter: 51mm<br>Slot Size: 10<br>Material: SCH. 40 PVC<br>Seal:<br>0.30 to 2.74m BGS<br>Material: BENTONITE GRAVEL<br>Sand Pack:<br>2.74 to 4.88m BGS<br>Material: #1 SILICA SANDPACK | | | | |
| 8.5 | | | | | | | |
| 9.0 | | | | | | | |
| 9.5 | | | | | | | |
| 10.0 | | | | | | | |
| 10.5 | | | | | | | |
| 11.0 | | | | | | | |
| 11.5 | | | | | | | |
| 12.0 | | | | | | | |
| 12.5 | | | | | | | |
| 13.0 | | | | | | | |
| 13.5 | | | | | | | |
| 14.0 | | | | | | | |
| 14.5 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

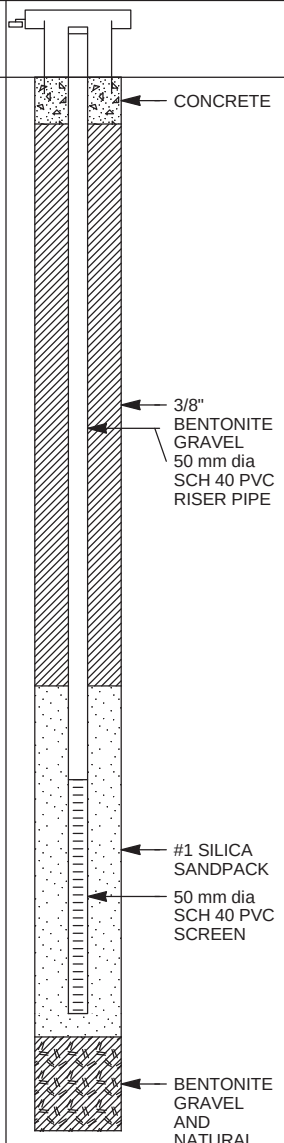
# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: OW49-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: September 27, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS |
|---|---|---|
| 0.0 | LOAMY TOPSOIL, silty sandy topsoil, loose, dark brown, moist; high organic content | |
| 0.46 | ML/SM - SILTY SAND, silty to with silt, loose to compact, stratified, brown, moist to dry; occassional ML - SILT seams with organic materials, dark brown, moist | |
| 3.05 | - trace to no silt at 3.05m BGS | |
| 4.77 | - ML - SANDY SILT, sandy to with sand, compact, dilatant, brown, moist to wet from 4.77 to 5.64m BGS | |
| 6.14 | CL/ML - CLAYEY SILT (TILL), trace sand, trace gravel, hard, low to moderate plasticity, very fine grained sand, fine grained gravel, brown, dry to moist<br>- moderate plasticity, grey, saturated with little to no available groundwater at 6.30m BGS | |
| 7.47 | END OF BOREHOLE @ 7.47m BGS | |

MONITORING WELL




WELL DETAILS
Screened interval:
4.57 to 6.10m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
0.30 to 3.96m BGS
Material: BENTONITE GRAVEL
Sand Pack:
3.96 to 6.10m BGS
Material: #1 SILICA SANDPACK

| SAMPLE NUMBER | INTERVAL | REC (%) | 'N' VALUE |
|---|---|---|---|
| 1 | | 63 | 6 |
| 2 | | 58 | 12 |
| 3 | | 67 | 29 |
| 4 | | 71 | 27 |
| 5 | | 67 | 40 |
| 6 | | 75 | 37 |
| 7 | | 75 | 31 |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: OW50-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: September 30, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0 | TOPSOIL, silty, sandy, dark brown, dry to moist; high organic content | 0.15 | CONCRETE | 1 | | 75 | 9 |
| 0.5 | ML - CLAYEY SILT, with to clayey, with very fine grained sand, hard, low to moderate plasticity, some stratification noted, dark brown, moist | 0.46 | | | | | |
| | SM/ML - SILT AND SAND, compact, very fine grained sand, stratified, light brown, dry | 0.76 | | | | | |
| 1.0 | CL/ML - CLAYEY SILT (TILL), with sand, trace gravel, hard, very fine grained sand, fine grained gravel, moderate plasticity, brown, dry | | | | | | |
| 1.5 | - poor recovery due to a rock stuck in the sampler at 1.52m BGS | | | 2 | | 38 | 42 |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | - rock jammed split spoon sampler at 3.05m BGS | | | 3 | | 17 | 55 |
| 3.5 | | | | | | | |
| | SM - SILTY SAND, with to silty, loose, fine grained sand, brown, wet to moist | 3.81 | | 4 | | 8 | 43 |
| 4.0 | | | BENTONITE GROUT | | | | |
| 4.5 | | | | | | | |
| 5.0 | | | 50 mm dia SCH 40 PVC RISER PIPE | 5 | | 58 | 32 |
| 5.5 | - dilatant, wet at 5.64m BGS | | | 6 | | 75 | 22 |
| 6.0 | - trace silt, medium grained sand at 6.10m BGS | | | | | | |
| 6.5 | | | | 7 | | 54 | 28 |
| 7.0 | - silty at 6.86m BGS | | | 8 | | 63 | 24 |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Municipality of Kincardine - KWMC
HOLE DESIGNATION: OW50-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: September 30, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Kincardine Waste Management Centre (Ward 2)
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 8.0 | - trace silt at 7.92m BGS | | | 9 | | 83 | 19 |
| 8.5 | | | | 10 | | 79 | 28 |
| 9.0 | - with silt at 9.14m BGS | | 3/8" BENTONITE GRAVEL | | | | |
| 9.5 | | | | 11 | | 33 | 21 |
| 10.0 | | | | 12 | | 58 | 53 |
| 10.5 | - 7.5 cm seam of ML - CLAY SILT, with to clayey, with sand, hard, very fine grained sand, low to no plasticity, brown, moist at 10.44m BGS | | | | | | |
| 11.0 | | | #1 SILICA SANDPACK | 13 | | 67 | 42 |
| 11.5 | | | 50 mm dia SCH 40 PVC SCREEN | | | | |
| 12.0 | | | | 14 | | 75 | 35 |
| 12.5 | - several 3 cm dark brown silty pockets noted at 12.50m BGS | | | 15 | | 75 | 58 |
| 13.0 | | | BENTONITE GRAVEL AND NATURAL COLLAPSE | | | | |
| 13.5 | CI/ML - CLAYEY SILT (TILL), with sand, trace gravel, very fine grained sand, fine grained gravel, moderate plasticity, grey, saturated with little to no available groundwater | 13.26 | WELL DETAILS<br>Screened interval: 9.75 to 12.80m BGS<br>Length: 3.05m<br>Diameter: 51mm<br>Slot Size: 10<br>Material: SCH. 40 PVC<br>Seal: 0.30 to 9.30m BGS<br>Material: BENTONITE GROUT AND GRAVEL<br>Sand Pack: 9.30 to 12.80m BGS<br>Material: #1 SILICA SANDPACK | 16 | | 83 | 50 |
| 14.0 | | | | 17 | | 75 | 25 |
| 14.5 | END OF BOREHOLE @ 14.33m BGS | 14.33 | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 004074-32 2013 STRATIGRAPHIC LOGS -KWMC.GPJ CRA_CORP.GDT 1/17/14

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
PROJECT NUMBER: 4074-28
CLIENT: Municipality of Kincardine
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
SUBCONTRACTOR: Noll Drilling

HOLE DESIGNATION: BH38-09
DATE COMPLETED: March 26, 2009
DRILLING METHOD: 108 mm HSA
FIELD PERSONNEL: Allan M.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | GROUND SURFACE | 261.08 | | | | | |
| 0.0 | TOPSOIL, silty, dark brown, moist; organics present | 260.93 | | | | | |
| | CL - SILTY CLAY, with sand, firm, low plasticity, low dilatancy, fine sand, brown, moist | | | 1 | | 0.33 | 5 |
| 0.5 | | | | | | | |
| | ML - SILT, with sand, with clay, low to no plasticity, low to no dilatancy, brown, moist | 260.32 | | | | | |
| 1.0 | | | | 2 | | 0.30 | 17 |
| | SP - SAND, trace silt, compact, stratified, fine to medium grained, moist to dry; wind blown (aeolian) | 259.76 | | | | | |
| 1.5 | - dense at 1.52m BGS | | | 3 | | 0.43 | 26 |
| 2.0 | - 5 cm seam of SILTY SAND, brown, dry to moist at 2.29m BGS | | | | | | |
| 2.5 | - 2.5 cm seam of SILTY SAND, brown, dry to moist at 2.74m BGS | | | 4 | | 0.46 | 42 |
| 3.0 | - 2.5 cm seam of SILTY SAND, brown, dry to moist at 3.35m BGS | | | 5 | | 0.43 | 52 |
| 3.5 | - increase silt content; with silt, moist to wet at 3.81m BGS | | | | | | |
| 4.0 | | | | 6 | | 0.43 | 49 |
| 4.5 | - saturated at 4.57m BGS<br>- 10 cm seam of SM - SILTY SAND, fine grained, brown, wet at 4.63m BGS | | | 7 | | 0.41 | 30 |
| 5.0 | - 2.5 cm seam of SM - SILTY SAND, fine grained, brown, wet at 5.03m BGS | | | | | | |
| 5.5 | CI - CLAY, trace sand, very stiff, fine sand, moderate plasticity, brown, moist; occasional > 1 mm fine sand seam | 255.60 | | 8 | | 0.38 | 28 |
| 6.0 | | | | | | | |
| 6.5 | - clay is becoming grey, dry at 6.65m BGS | | | 9 | | 0.38 | 38 |
| 7.0 | SP - SAND, trace to with silt, dense, fine to medium, grey, saturated; very faint hydrocarbon odor | 254.07<br>253.92 | | 10 | | 0.30 | 30 |
| | CI - CLAY, trace sand, trace silt, low to moderate | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
PROJECT NUMBER: 4074-28
CLIENT: Municipality of Kincardine
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
SUBCONTRACTOR: Noll Drilling

HOLE DESIGNATION: BH38-09
DATE COMPLETED: March 26, 2009
DRILLING METHOD: 108 mm HSA
FIELD PERSONNEL: Allan M.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | plasticity, grey, dry | | Bentonite grout backfill | | | | |
| | ML - SANDY SILT, hard, fine sand, brown/grey, saturated | 253.31 | | | | | |
| 8.0 | - 5 cm seam of CI, CLAY, grey, moist at 7.92m BGS<br>- 5 cm of green tinted silt, no odor at 8.10m BGS | 253.01 | | 11 | | 0.41 | 33 |
| 8.5 | CI - CLAY, trace sand, trace silt, low to moderate plasticity, grey, dry<br>- clay is becoming brown at 8.78m BGS | | | 12 | | 0.38 | 42 |
| 9.0 | SP - SAND, trace silt, compact, fine to medium grained, brown, saturated | 251.94 | | 13 | | | |
| 9.5 | - 10 cm seam of CL - CLAY, grey, moist at 9.75m BGS<br>- medium grained at 9.91m BGS | | | | | | |
| 10.0 | - 2.5 cm seam of CL - CLAY, brown, moist at 10.06m BGS | | | 14 | | 0.48 | 28 |
| 10.5 | - 2.5 cm seam of CL - CLAY, brown, moist at 10.36m BGS<br>- fine to medium grained at 10.52m BGS<br>- decreased density, very loose at 10.67m BGS | | | | | | |
| 11.0 | - 7.5 cm seam of CL - CLAY, brown, moist at 10.97m BGS<br>- medium grained sand at 11.13m BGS | | | 15 | | 0.48 | 4 |
| 11.5 | - dense, fine grained at 11.43m BGS<br>- 15 cm seam of medium grained sand at 11.73m BGS | | | 16 | | 0.51 | 44 |
| 12.0 | | | | | | | |
| 12.5 | | | | 17 | | 0.56 | 27 |
| 13.0 | - increased silt content; with silt at 13.11m BGS<br>- trace silt content at 13.31m BGS<br>- heavy oxidation staining present at 13.41m BGS | | | 18 | | 0.58 | 53 |
| 13.5 | CI - CLAY, trace sand, trace silt, hard, low to moderate plasticity, grey, dry to moist | 247.32 | | | | | |
| 14.0 | | | | 19 | | 0.49 | 45 |
| 14.5 | | | | 20 | | 0.46 | >50 |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
PROJECT NUMBER: 4074-28
CLIENT: Municipality of Kincardine
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
SUBCONTRACTOR: Noll Drilling

HOLE DESIGNATION: BH38-09
DATE COMPLETED: March 26, 2009
DRILLING METHOD: 108 mm HSA
FIELD PERSONNEL: Allan M.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 15.5 | END OF BOREHOLE @ 15.24m BGS | 245.69 | | | | | |
| 16.0 | | | | | | | |
| 16.5 | | | | | | | |
| 17.0 | | | | | | | |
| 17.5 | | | | | | | |
| 18.0 | | | | | | | |
| 18.5 | | | | | | | |
| 19.0 | | | | | | | |
| 19.5 | | | | | | | |
| 20.0 | | | | | | | |
| 20.5 | | | | | | | |
| 21.0 | | | | | | | |
| 21.5 | | | | | | | |
| 22.0 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: BH44-09
PROJECT NUMBER: 4074-28
DATE COMPLETED: April 8, 2009
CLIENT: Municipality of Kincardine
DRILLING METHOD: Direct Push (Geoprobe)
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Ben K.
SUBCONTRACTOR: Altech Drilling

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | GROUND SURFACE | 259.22 | | | | | |
| 0.0 | TOPSOIL | | | | | | |
| | SM/ML - SAND AND SILT, very fine grained, some fine stratification, brown, dilatant | 258.91 | | 1 | P/S | | |
| 0.5 | | | | | | | |
| 1.0 | - saturated at 0.91m BGS | | | | | | |
| 1.5 | | | | | | | |
| 2.0 | | | | 2 | P/S | | |
| 2.5 | | | | | | | |
| 3.0 | | | ← BENTONITE GRAVEL BACKFILL | | | | |
| 3.5 | | | | 3 | P/S | | |
| 4.0 | | | | | | | |
| 4.5 | CL - CLAY (TILL), with silt, trace sand, stiff to hard, massive, grey, little to no available moisture | 254.64 | | | | | |
| 5.0 | | | | 4 | P/S | | |
| 5.5 | | | | | | | |
| 6.0 | END OF BOREHOLE @ 6.10m BGS | 253.12 | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |
| 7.5 | | | | | | | |
| 8.0 | | | | | | | |
| 8.5 | | | | | | | |
| 9.0 | | | | | | | |
| 9.5 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: BH51-13
PROJECT NUMBER: 4074-28
DATE COMPLETED: October 3, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | LOAMY TOPSOIL, silty sandy topsoil, loose, dark brown, dry; high organic content | 0.15 | | 1 | | 10.06 | 6 |
| 1.0 | SM - SILTY SAND, silty to with silt, loose to compact, fine to medium grained sand, orange/brown, dry | 1.52 | | 2 | | 7.62 | 13 |
| 2.0 | - brown, wet at 0.76m BGS | | | 3 | | 7.62 | 5 |
| | CI/ML - CLAY AND SILT, soft, moderate plasticity, brown, dry; oxidation staining present | | | 4 | | 10.06 | 20 |
| 3.0 | - compact, brown, wet at 2.74m BGS | | | 5 | | 15.24 | 9 |
| | - with to clayey, moist at 3.35m BGS | 3.51 | | 6 | | 12.80 | 12 |
| 4.0 | CI/ML - CLAYEY SILT (TILL), firm, moderate plasticity, grey, saturated with little available groundwater | | | 7 | | 22.86 | 13 |
| 5.0 | - trace fine grained gravel, hard at 5.33m BGS | | BENTONITE GRAVEL AND NATURAL COLLAPSE MATERIALS | 8 | | 25.30 | 24 |
| 6.0 | | | | 9 | | 25.30 | 20 |
| | - 7.5 cm seam of compact, clayey silt, with to trace fine grained sand, some available groundwater at 6.40m BGS | | | 10 | | 28.04 | 24 |
| 7.0 | - 2.5 cm rock encountered at 7.32m BGS | | | 11 | | 30.48 | 22 |
| 8.0 | | | | 12 | | 27.74 | 15 |
| 9.0 | END OF BOREHOLE @ 8.99m BGS | 8.99 | | | | | |
| 10.0 | | | WELL DETAILS<br>Seal:<br>0.00 to 8.99m BGS<br>Material: BENTONITE GRAVEL | | | | |
| 11.0 | | | | | | | |
| 12.0 | | | | | | | |
| 13.0 | | | | | | | |
| 14.0 | | | | | | | |
| 15.0 | | | | | | | |
| 16.0 | | | | | | | |
| 17.0 | | | | | | | |
| 18.0 | | | | | | | |
| 19.0 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: BH52-13
PROJECT NUMBER: 4074-28
DATE COMPLETED: October 7, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0 | LOAMY TOPSOIL, silty and sand, loose, dark brown, dry; high organic content<br>- 7.5 cm seam of SM/ML - SILTY SAND, loose, fine grained sand, brown, dry at 0.61m BGS | 0.46 | | 1 | | 19.20 | 8 |
| 1.0 | | | | 2 | | 20.42 | 21 |
| 2.0 | CL/ML - CLAYEY SILT (TILL), with to clayey, with sand, compact, low plasticity, brown, dry; some organic material present<br>- trace fine grained gravel present, low plasticity, no organics present at 0.76m BGS | | | 3 | | 22.86 | 19 |
| 3.0 | - moderate plasticity at 1.52m BGS | | | 4 | | 1.22 | 24 |
| 4.0 | - poor recovery due to stone in sample - ML CLAYEY SILT (TILL) inferred from 2.29 to 2.90m BGS | | | 5 | | 20.42 | 17 |
| 5.0 | - grey at 3.05m BGS<br>- some medium grained gravel noted at 3.81m BGS | | 3/8" BENTONITE GRAVEL NATURAL COLLAPSE MATERIAL | 6 | | 17.68 | 22 |
| 6.0 | - poor recovery due to rock stuck in sampler from 5.18 to 5.79m BGS | 5.89 | | 7 | | 9.14 | 26 |
| | GW/SW - SANDY GRAVEL, with silt, with clay, compact, fine to coarse grained gravel, fine grained sand, grey, brown, and reddish gravel, angular, dry | 6.14 | | 8 | | 3.96 | 34 |
| 7.0 | SM - SILTY SAND, very dense, fine grained sand, dilatant, stratified, brown, wet | | | 9 | | 16.46 | 86 |
| 8.0 | - greyish brown at 6.86m BGS<br>- grey at 7.62m BGS | | | 10 | | 20.42 | 60 |
| 9.0 | END OF BOREHOLE @ 8.99m BGS | 8.99 | | 11 | | 21.64 | 30 |
| 10.0 | | | | 12 | | 22.86 | 60 |
| 11.0 | | | | | | | |
| 12.0 | | | | | | | |
| 13.0 | | | | | | | |
| 14.0 | | | | | | | |
| 15.0 | | | | | | | |
| 16.0 | | | | | | | |
| 17.0 | | | | | | | |
| 18.0 | | | | | | | |
| 19.0 | | | | | | | |

WELL DETAILS
Seal:
0.00 to 8.99m BGS
Material: BENTONITE GRAVEL

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: BH53-13
PROJECT NUMBER: 4074-28
DATE COMPLETED: September 26, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0 | LOAMY TOPSOIL, sandy, silty topsoil, loose, fine grained sand, dark brown, moist; high organic content | 0.15 | | 1 | | 28.04 | 10 |
| 1.0 | ML/SM - SILTY SAND, loose, stratified, fine to very grained sand, dark brown transitioning to brown, moist; traces of topsoil present, trace organic materials and rootlets present<br>- light brown at 0.46m BGS<br>- dilatant, wet at 2.29m BGS | | | 2 | | 17.68 | 17 |
| 2.0 | | | | | | | |
| 3.0 | | | 3/8" BENTONITE GRAVEL AND NATURAL COLLAPSE MATERIALS | 3 | | 19.20 | 30 |
| 4.0 | | | | | | | |
| 5.0 | CL/ML - CLAYEY SILT (TILL), with to trace sand, very stiff, low plasticity, grey, saturated with little available groundwater | 4.65 | | 4 | | 28.04 | 25 |
| 6.0 | - trace fine grained gravel, low to moderate plasticity at 5.03m BGS<br>- hard, moderate plasticity, greyish brown at 5.33m BGS<br>- grey at 5.79m BGS | 5.94 | | 5 | | 28.04 | 38 |
| 7.0 | END OF BOREHOLE @ 5.94m BGS | | | | | | |
| 8.0 | | | | | | | |
| 9.0 | | | | | | | |
| 10.0 | | | | | | | |
| 11.0 | | | | | | | |
| 12.0 | | | | | | | |
| 13.0 | | | | | | | |
| 14.0 | | | | | | | |
| 15.0 | | | | | | | |
| 16.0 | | | | | | | |
| 17.0 | | | | | | | |
| 18.0 | | | | | | | |
| 19.0 | | | | | | | |

WELL DETAILS
Seal:
0.00 to 5.94m BGS
Material: BENTONITE GRAVEL

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: BH54-13
PROJECT NUMBER: 4074-28
DATE COMPLETED: September 26, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | LOAMY TOPSOIL, sandy, silty topsoil, loose, fine grained sand, dark brown, moist; high organic content | 0.08 | 3/8" BENTONITE GRAVEL AND NATURAL COLLAPSE MATERIALS | 1 | X | 20.42 | 13 |
| 1.0 | ML/SM - SILTY SAND, loose, fine grained sand, light brown, dry; occasional silty organic pockets present, ~ 1 cm thick<br>- organic pockets no longer present at 1.52m BGS | | | 2 | X | 7.62 | 7 |
| 2.0 | | | | | | | |
| 3.0 | - poor recovery, hammer malfunctioning - ML/SM - SILTY SAND inferred from 3.05 to 3.66m BGS | | | 3 | X | 0.00 | 40 |
| 4.0 | - dilatant, wet at 3.81m BGS | 4.22 | | 4 | X | 21.64 | 46 |
| | ML - CLAYEY SILT, clayey to with clay, with sand, hard, low plasticity, very fine grained sand, brown, moist | 4.57 | | 5 | X | 17.68 | 25 |
| 5.0 | CL/ML - CLAYEY SILT (TILL), trace sand, trace gravel, hard, low to moderate plasticity, very fine grained sand, fine grained gravel, grey, saturated with little to no groundwater available | 5.94 | | 6 | X | 25.30 | 27 |
| 6.0 | END OF BOREHOLE @ 5.94m BGS | | | | | | |
| 7.0 | | | | | | | |
| 8.0 | | | | | | | |
| 9.0 | | | | | | | |
| 10.0 | | | | | | | |
| 11.0 | | | | | | | |
| 12.0 | | | | | | | |
| 13.0 | | | | | | | |
| 14.0 | | | | | | | |
| 15.0 | | | | | | | |
| 16.0 | | | | | | | |
| 17.0 | | | | | | | |
| 18.0 | | | | | | | |
| 19.0 | | | | | | | |

WELL DETAILS
Seal:
0.00 to 5.94m BGS
Material: BENTONITE GRAVEL

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: BH55-13
PROJECT NUMBER: 4074-28
DATE COMPLETED: September 26, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 1.0 | LOAMY TOPSOIL, silty topsoil with sand, soft to firm, fine grained sand, dark brown, dry; organics present | 0.46 | 3/8" BENTONITE GRAVEL AND NATURAL COLLAPSE MATERIALS | 1 | X | 17.68 | 7 |
| | | 0.61 | | | | | |
| 2.0 | ML - SILT (POSSIBLY FILL), with clay, trace gravel, loose, moderate to low plasticity, fine grained gravel, dark brown, dry to moist | | | 2 | X | 22.86 | 18 |
| 3.0 | ML/SM - SILTY SAND, loose, no plasticity, stratified, fine grained sand, brown, dry; occassional seams of ML/CL - CLAYEY SILT, loose, low plasticity, dark brown, dry | | | 3 | X | 25.30 | 35 |
| 4.0 | - 5 cm seam of ML/CL - CLAYEY SILT, loose, low plasticity, dark brown, dry at 1.83m BGS | | | 4 | X | 22.86 | 38 |
| | - 5 cm seam of ML/CL - CLAYEY SILT, loose, low plasticity, grey, dry at 1.98m BGS | | | | | | |
| 5.0 | - moist to wet at 3.51m BGS | 5.08 | | 5 | X | 20.42 | 34 |
| | - dilatant, wet at 3.96m BGS | | | | | | |
| 6.0 | - trace sand, trace gravel, low to moderate plasticity, very fine grained sand, fine grained gravel at 5.18m BGS | | | 6 | X | 17.68 | 26 |
| 7.0 | CL/ML - CLAYEY SILT (TILL), trace to with sand, hard, low plasticity, brown, dry | 6.71 | | 7 | X | 22.86 | 33 |
| | END OF BOREHOLE @ 6.71m BGS | | | | | | |
| 8.0 | | | | | | | |
| 9.0 | | | | | | | |
| 10.0 | | | | | | | |
| 11.0 | | | | | | | |
| 12.0 | | | | | | | |
| 13.0 | | | | | | | |
| 14.0 | | | | | | | |
| 15.0 | | | | | | | |
| 16.0 | | | | | | | |
| 17.0 | | | | | | | |
| 18.0 | | | | | | | |
| 19.0 | | | | | | | |

WELL DETAILS
Seal:
0.00 to 6.71m BGS
Material: BENTONITE GRAVEL

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 4074 - WARD 2 (MARCH 2009).GPJ CRA_CORP.GDT 4/17/14

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: BH56-13
PROJECT NUMBER: 4074-28
DATE COMPLETED: September 27, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | LOAMY TOPSOIL, silty sandy topsoil, loose, dark brown, dry; high organic content | 0.15 | | 1 | | 22.86 | 7 |
| 1.0 | SILTY SAND (FILL), silty to with silt, loose, fine grained sand, brown, dry | 1.52 | | | | | |
| 2.0 | SILT AND SAND (FILL), trace clay, trace gravel, loose, fine grained sand, brown, dry; styrofoam encountered | | | 2 | | 7.62 | 5 |
| 3.0 | | | | 3 | | 7.62 | 3 |
| 4.0 | poor recovery, rock stuck in sampler | 3.81 | | 4 | | 7.62 | 26 |
| | SM - SILTY SAND, silty to with silt, compact, fine grained, brown, moist to wet | 4.57 | 3/8" BENTONITE GRAVEL AND NATURAL COLLAPSE MATERIALS | 5 | | 15.24 | 27 |
| 5.0 | - dilatant, wet at 5.08m BGS | | | 6 | | 21.64 | 42 |
| 6.0 | ML - SILT, with sand, with to trace clay, hard, very fine grained sand, somewhat dilatant, brown, moist | 6.10 | | 7 | | 22.86 | 57 |
| 7.0 | CL/ML - CLAYEY SILT (TILL), trace gravel, trace sand, hard, moderate plasticity, very fine grained sand, fine grained gravel, grey, saturated with little to no available groundwater | 7.16 | | 8 | | 22.86 | 59 |
| 8.0 | - 7.5 cm seam of ML - SILT, with sand, very fine grained sand, moist at 7.92m BGS | | | 9 | | 22.86 | 32 |
| 9.0 | END OF BOREHOLE @ 8.99m BGS | 8.99 | | 10 | | 22.86 | 35 |
| 10.0 | | | WELL DETAILS<br>Seal:<br>0.00 to 8.99m BGS<br>Material: BENTONITE GRAVEL | | | | |
| 11.0 | | | | | | | |
| 12.0 | | | | | | | |
| 13.0 | | | | | | | |
| 14.0 | | | | | | | |
| 15.0 | | | | | | | |
| 16.0 | | | | | | | |
| 17.0 | | | | | | | |
| 18.0 | | | | | | | |
| 19.0 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: BH57-13
PROJECT NUMBER: 4074-28
DATE COMPLETED: September 27, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | LOAMY TOPSOIL, silty sandy topsoil, loose, dark brown, dry; high organic content | 0.15 | | 1 | | 19.20 | 8 |
| 1.0 | ML/SM - SILTY SAND, loose, fine to very fine grained, stratified, brown, moist; occassional organic silt layers encountered, approx. 1 cm in thickness | | | | | | |
| 2.0 | - trace silt, light brown, dry at 1.52m BGS | | | 2 | | 17.68 | 18 |
| 3.0 | - silty to with silt from 3.05 to 3.20m BGS | | | 3 | | 20.42 | 27 |
| 4.0 | | | | | | | |
| | - fine grained sand, damp to wet at 4.57m BGS | | 3/8" BENTONITE GRAVEL AND NATURAL COLLAPSE MATERIALS | 4 | | 19.20 | 42 |
| 5.0 | - silty, very dense, dilatant, wet at 5.33m BGS | | | 5 | | 19.20 | 63 |
| 6.0 | | | | 6 | | 20.42 | 51 |
| 7.0 | | | | 7 | | 20.42 | >50 |
| 8.0 | | | | 8 | | 21.64 | 63 |
| | CL/ML - SILT, with to clayey, with sand, hard, very fine grained sand, low plasticity, grey/brown, moist | 8.18 | | 9 | | 24.08 | 49 |
| 9.0 | END OF BOREHOLE @ 8.99m BGS | 8.99 | | | | | |
| 10.0 | | | WELL DETAILS<br>Seal:<br>0.00 to 8.99m BGS<br>Material: BENTONITE GRAVEL | | | | |
| 11.0 | | | | | | | |
| 12.0 | | | | | | | |
| 13.0 | | | | | | | |
| 14.0 | | | | | | | |
| 15.0 | | | | | | | |
| 16.0 | | | | | | | |
| 17.0 | | | | | | | |
| 18.0 | | | | | | | |
| 19.0 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: BH58-13
PROJECT NUMBER: 4074-28
DATE COMPLETED: September 30, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0.5 | SAND AND GRAVEL (FILL), road base materials, compact, fine to coarse grained sand and gravel, brown, dry | 0.30 | | 1 | | 17.68 | 17 |
| | CI/ML - CLAYEY SILT (FILL), traces of topsoil, stiff, high plasticity, dark brown, moist | | | | | | |
| 1.0 | | | | | | | |
| 1.5 | - trace debris encountered, brick, plastic, wood from 1.52 to 3.35m BGS | | | | | | |
| 2.0 | | | | 2 | | 7.62 | 8 |
| 2.5 | | | | | | | |
| 3.0 | | | | | | | |
| 3.5 | SM - SILTY SAND, silty to with silt, loose, fine to meidum grained sand, brown, moist | 3.35 | | 3 | | 15.24 | 6 |
| 4.0 | | | 3/8" BENTONITE GRAVEL AND NATURAL COLLAPSE MATERIALS | | | | |
| 4.5 | | | | | | | |
| 5.0 | CL/ML - CLAYEY SILT (TILL), trace sand, trace gravel, hard, low plasticity, brown, dry | 5.08 | | 4 | | 12.80 | 42 |
| 5.5 | - increased plasticity; moderate, grey at 5.49m BGS | | | 5 | | 20.42 | 34 |
| 6.0 | | | | | | | |
| 6.5 | | | | 6 | | 24.08 | 49 |
| | - with sand, very fine grained sand; occassional small pockets (<1 cm) of most to wet clayey silt with sand from 6.71 to 6.86m BGS | | | | | | |
| 7.0 | | | | 7 | | 16.46 | 22 |
| 7.5 | END OF BOREHOLE @ 7.47m BGS | 7.47 | | | | | |
| 8.0 | | | WELL DETAILS<br>Seal:<br>0.00 to 7.47m BGS<br>Material: BENTONITE GRAVEL | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 4074 - WARD 2 (MARCH 2009).GPJ CRA_CORP.GDT 4/17/14

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: BH59-13
PROJECT NUMBER: 4074-28
DATE COMPLETED: October 1, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH m BGS | BOREHOLE | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 0 | SAND AND GRAVEL (FILL), brown, dry | 0.61 | | | | | |
| 1.0 | SM - SAND, with to silty, loose to compact, fine grained sand, brown, dry | | | 1 | | | - |
| 2.0 | | | | | | | |
| 3.0 | | | | | | | |
| 4.0 | | | | | | | |
| 5.0 | - moist to wet at 5.33m BGS<br>- silty, dilatant, wet at 5.64m BGS | | 3/8" BENTONITE GRAVEL, GROUT, AND NATURAL COLLAPSE MATERIALS | 2 | | 10.06 | 24 |
| 6.0 | | 6.25 | | 3 | | 19.20 | 51 |
| | ML - SILT, with sand, with clay, hard, very fine grained sand, low plasticity, brown, dry | 6.60 | | 4 | | 16.46 | 46 |
| 7.0 | CL/ML - CLAYEY SILT (TILL), with sand, with gravel, hard, very fine grained sand, fine grained gravel, low plasticity, grey, saturated with little to no available groundwater | 6.86<br>7.62 | | 5 | | 22.86 | 43 |
| 8.0 | | | | 6 | | 22.86 | 20 |
| | ML - SILT, with sand, with clay, hard, very fine grained sand, low plasticity, grey, saturated with little to no available groundwater | 8.53 | | 7 | | 25.30 | 36 |
| 9.0 | ML/SM - SILT AND SAND, compact, fine grained sand, dilatant, grey, wet; occassional grey, clayey silt pockets present with high plasticity, grey | 9.75 | | 8 | | 22.86 | 33 |
| 10.0 | ML/CL - CLAY AND SILT (TILL), with gravel, hard, moderate to high plasticity, fine grained gravel, grey, saturated with little to no available groundwater | | | | | | |
| 11.0 | END OF BOREHOLE @ 9.75m BGS | | | | | | |
| 12.0 | | | | | | | |
| 13.0 | | | | | | | |
| 14.0 | | | | | | | |
| 15.0 | | | | | | | |
| 16.0 | | | | | | | |
| 17.0 | | | | | | | |
| 18.0 | | | | | | | |
| 19.0 | | | | | | | |

WELL DETAILS
Seal:
0.00 to 9.75m BGS
Material: BENTONITE GROUT AND GRAVEL

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW25R-13

PROJECT NUMBER: 4074-28
DATE COMPLETED: October 4, 2013

CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA

LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.

DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 256.00<br>255.21 | | | | | |
| 0 | TOPSOIL (FILL), loamy, silt and sand, dark brown, dry | 255.13<br>254.75 | CONCRETE | 1 | | 21.64 | 20 |
| 1.0 | SM - SAND (FILL), with silt, loose to compact, fine grained sand, light brown, dry | 254.40<br>254.30 | | 2 | | 14.02 | 16 |
| 2.0 | ML - SILT (FILL), with clay, with sand, hard, brown, grey, dry | 253.53 | | 3 | | 20.42 | 24 |
| | SM - SAND (FILL), with silt, loose to compact, fine grained sand, light brown, dry | | 3/8" BENTONITE GRAVEL 50 mm dia SCH 40 PVC RISER PIPE | 4 | | 15.24 | 21 |
| 3.0 | CL/ML - CLAYEY SILT (FILL), with to trace very fined grained sand, low plasticity, grey, dry | | | 5 | | 14.02 | 26 |
| 4.0 | SM - SILTY SAND, compact, fine to very fine grained, light brown, dry; some oxidation staining present, some stratification noted | 251.40 | | 6 | | 19.20 | 13 |
| 5.0 | CH/ML - CLAY AND SILT (TILL), trace fine grained gravel, stiff, moderate to high plasticity, brown, dry; some oxidation staining present | | | 7 | | 17.68 | 15 |
| | - grey at 4.72m BGS | | | 8 | | 24.08 | 15 |
| 6.0 | - SM/ML - SILT AND SAND, compact, dilatant, very fine grained sand, grey, wet from 5.13 to 5.64m BGS | | | 9 | | 24.69 | 21 |
| 7.0 | - SM/ML - SILT AND SAND, compact, dilatant, very fine grained sand, grey, wet from 6.91 to 7.16m BGS | | #1 SILICA SANDPACK 50 mm dia SCH 40 PVC SCREEN | 10 | | 20.42 | 18 |
| 8.0 | END OF BOREHOLE @ 8.23m BGS | 246.98 | | 11 | | 25.30 | 19 |
| 9.0 | | | | | | | |
| 10.0 | | | | | | | |
| 11.0 | | | | | | | |
| 12.0 | | | | | | | |
| 13.0 | | | | | | | |
| 14.0 | | | | | | | |
| 15.0 | | | | | | | |
| 16.0 | | | | | | | |
| 17.0 | | | | | | | |
| 18.0 | | | | | | | |
| 19.0 | | | | | | | |

WELL DETAILS
Screened interval:
249.57 to 248.05m
5.64 to 7.16m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
254.91 to 250.18m
0.30 to 5.03m BGS
Material: BENTONITE GRAVEL
Sand Pack:
250.18 to 248.05m
5.03 to 7.16m BGS
Material: #1 SILICA SANDPACK

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
PROJECT NUMBER: 4074-28
CLIENT: Municipality of Kincardine
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
SUBCONTRACTOR: Noll Drilling

HOLE DESIGNATION: OW34-09
DATE COMPLETED: March 19, 2009
DRILLING METHOD: 108 mm HSA
FIELD PERSONNEL: Allan M.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 258.92<br>258.25 | | | | | |
| | PT - PEAT/TOPSOIL, black, wet; highly organic | 258.20 | | | | | |
| 0.5 | SW - SAND, trace to with silt, compact, stratified, fine grained, medium brown with some grey, wet; occasional oxidation banding<br>- increased grain size, fine to medium, colour has become light brown; oxidation banding no longer present at 0.61m BGS<br>- fine grained, medium brown, saturated at 0.76m BGS | | CONCRETE | 1 | | 0.43 | 16 |
| 1.0 | | | | 2 | | 0.38 | 19 |
| 1.5 | | | | | | | |
| 2.0 | - fine to medium grained, light brown/grey at 1.98m BGS<br>- fine grained at 2.29m BGS | | BENTONITE GROUT | 3 | | 0.51 | 14 |
| 2.5 | | | 50 mm Ø SCH 40 PVC RISER PIPE | 4 | | 0.48 | 31 |
| 3.0 | - fine to medium grained, medium grain size is predominant at 3.05m BGS | | | | | | |
| 3.5 | | | | 5 | | 0.51 | 22 |
| 4.0 | | | 3/8" BENTONITE GRAVEL | 6 | | 0.48 | 31 |
| 4.5 | SM/ML - SILT, with sand to sandy, hard/very compact, fine grained, high dilatancy, moderate plasticity, brown, moist to wet | 253.88 | | | | | |
| 5.0 | - increased sand content SANDY SILT at 4.57m BGS | 253.27 | | 7 | | 0.56 | 55 |
| 5.5 | SW - SAND, trace to with silt, dense, fine grained, stratified, brown/grey, wet to saturated<br>- increased silt content; with silt at 5.33m BGS<br>- 10 cm seam of SM/ML, SILT AND SAND, fine grained sand at 5.64m BGS | | #2 SILICA SAND<br>50 mm Ø SCH 80 PVC SCREEN | 8 | | 0.53 | 51 |
| 6.0 | | | | | | | |
| 6.5 | - 2 cm coarse gravel, sandstone encountered at 6.40m BGS<br>- 15 cm seam of very fine sand, very dense at 6.53m BGS | | | 9 | | 0.56 | 73 |
| 7.0 | - 15 cm seam of very fine sand, very dense at 6.65m BGS | | | 10 | | 0.48 | 39 |
| 7.5 | - 2 cm seam of heavy oxidation staining at 7.29m BGS | | | | | | |
| 8.0 | - 2 cm seam of heavy oxidation staining at 7.42m BGS | | | 11 | | 0.61 | 52 |
| 8.5 | CI - CLAY, hard, moderate plasticity, grey, moist; some lamination patterns present | 249.61 | | 12 | | 0.35 | 33 |
| 9.0 | | | 3/8" BENTONITE GRAVEL | | | | |
| 9.5 | - decreased density, stiff to very stiff at 9.75m BGS | | | 13 | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (O)

OVERBURDEN LOG 4074 - WARD 2 (MARCH 2009).GPJ CRA_CORP.GDT 4/17/14

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
PROJECT NUMBER: 4074-28
CLIENT: Municipality of Kincardine
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
SUBCONTRACTOR: Noll Drilling

HOLE DESIGNATION: OW34-09
DATE COMPLETED: March 19, 2009
DRILLING METHOD: 108 mm HSA
FIELD PERSONNEL: Allan M.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 10.5 | | | | 14 | | 0.46 | 29 |
| 11.0 | | | | 15 | | 0.48 | 19 |
| 11.5 | END OF BOREHOLE @ 11.28m BGS | 246.97 | WELL DETAILS<br>Screened interval:<br>253.22 to 251.54m<br>5.03 to 6.71m BGS<br>Length: 1.68m<br>Diameter: 51mm<br>Slot Size: 10<br>Material: SCH. 40 PVC<br>Seal:<br>254.44 to 253.83m<br>3.81 to 4.42m BGS<br>Material: BENTONITE GRAVEL<br>Sand Pack:<br>253.83 to 251.69m<br>4.42 to 6.55m BGS<br>Material: #2 SILICA SAND | | | | |
| 12.0 | | | | | | | |
| 12.5 | | | | | | | |
| 13.0 | | | | | | | |
| 13.5 | | | | | | | |
| 14.0 | | | | | | | |
| 14.5 | | | | | | | |
| 15.0 | | | | | | | |
| 15.5 | | | | | | | |
| 16.0 | | | | | | | |
| 16.5 | | | | | | | |
| 17.0 | | | | | | | |
| 17.5 | | | | | | | |
| 18.0 | | | | | | | |
| 18.5 | | | | | | | |
| 19.0 | | | | | | | |
| 19.5 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW35-09
PROJECT NUMBER: 4074-28
DATE COMPLETED: March 16, 2009
CLIENT: Municipality of Kincardine
DRILLING METHOD: 108 mm HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
SUBCONTRACTOR: Noll Drilling

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 255.14<br>254.43 | | | | | |
| 0.5 | TOPSOIL, sandy, black; lots of organic material present | 254.27 | CONCRETE | 1 | | 0.15 | 2 |
| | SM - SILTY SAND, very loose, fine to medium grained, brown, moist; some organic material present<br>- no recovery, water table is inferred by cuttings at 0.76m BGS | | | 2 | | 0.00 | 2 |
| 1.5 | - no recovery, wet fine silty, sand is inferred at 1.52m BGS | | | 3 | | 0.00 | 6 |
| 2.5 | - increased density; compact, trace silt at 2.29m BGS | | | 4 | | 0.30 | 20 |
| 3.0 | | | BENTONITE GROUT | | | | |
| 3.5 | | | | 5 | | 0.38 | 14 |
| 4.0 | | | | 6 | | 0.10 | >50 |
| 4.5 | CI - CLAY, very stiff, moderate plasticity, brown, moist | 249.85<br>249.70 | | | | | |
| 5.0 | - clay becomes grey, soft to firm at 4.65m BGS<br>SP - SAND, trace to with silt, compact, fine grained sand, grey, saturated | 249.40 | | 7 | | 0.51 | 33 |
| 5.5 | CI - CLAY, very stiff, low to moderate plasticity, grey, moist to dry | | 50 mm Ø SCH 40 PVC RISER PIPE | 8 | | 0.51 | 45 |
| 6.5 | | | | 9 | | 0.43 | 53 |
| | SP - SAND, trace silt, compact, fine grained, grey, moist | 247.80<br>247.55 | | | | | |
| 7.0 | CI to CH - CLAY, trace to with fine sand, very stiff, low to high plasticity, grey, moist to dry; occasional fine to coarse gravel/cobble | | | 10 | | 0.36 | 49 |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW35-09
PROJECT NUMBER: 4074-28
DATE COMPLETED: March 16, 2009
CLIENT: Municipality of Kincardine
DRILLING METHOD: 108 mm HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
SUBCONTRACTOR: Noll Drilling

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 8.0 | | | | 11 | | | |
| 8.5 | | | | 12 | | 0.33 | 45 |
| 9.0 | | | | 13 | | 0.30 | 42 |
| 9.5 | | | | | | | |
| 10.0 | | | | 14 | | 0.46 | 31 |
| 10.5 | | | 3/8" BENTONITE GRAVEL | | | | |
| 11.0 | | | #2 SILICA SAND | 15 | | 0.51 | 49 |
| 11.5 | - trace fine sand included, increased plasticity; high, decreased density; stiff at 11.43m BGS | | | 16 | | 0.53 | 36 |
| 12.0 | - firm to stiff, lamination/banding patterns present at 12.19m BGS | | | | | | |
| 12.5 | | | | 17 | | | |
| 13.0 | | | 50 mm Ø SCH 80 PVC SCREEN | | | | |
| 13.5 | | | | 18 | | 0.53 | 11 |
| 14.0 | | | 3/8" BENTONITE GRAVEL | 19 | | 0.56 | 10 |
| 14.5 | END OF BOREHOLE @ 14.33m BGS | 240.10 | | | | | |

WELL DETAILS
Screened interval:
243.15 to 241.63m
11.28 to 12.80m BGS
Length: 1.52m

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 4074 - WARD 2 (MARCH 2009).GPJ CRA_CORP.GDT 4/17/14

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW35-09
PROJECT NUMBER: 4074-28
DATE COMPLETED: March 16, 2009
CLIENT: Municipality of Kincardine
DRILLING METHOD: 108 mm HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
SUBCONTRACTOR: Noll Drilling

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE | |
|---|---|---|---|---|---|---|---|---|
| 15.5 | | | Diameter: 51mm<br>Slot Size: 10<br>Material: SCH. 40 PVC<br>Seal:<br>244.37 to 243.45m<br>10.06 to 10.97m BGS<br>Material: BENTONITE GRAVEL<br>Sand Pack:<br>243.45 to 241.32m<br>10.97 to 13.11m BGS<br>Material: #2 SILICA SAND | | | | | |
| 16.0 | | | | | | | | |
| 16.5 | | | | | | | | |
| 17.0 | | | | | | | | |
| 17.5 | | | | | | | | |
| 18.0 | | | | | | | | |
| 18.5 | | | | | | | | |
| 19.0 | | | | | | | | |
| 19.5 | | | | | | | | |
| 20.0 | | | | | | | | |
| 20.5 | | | | | | | | |
| 21.0 | | | | | | | | |
| 21.5 | | | | | | | | |
| 22.0 | | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
PROJECT NUMBER: 4074-28
CLIENT: Municipality of Kincardine
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
SUBCONTRACTOR: Noll Drilling

HOLE DESIGNATION: OW36-09
DATE COMPLETED: March 23, 2009
DRILLING METHOD: 108 mm HSA
FIELD PERSONNEL: Allan M.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 263.69<br>262.83 | | | | | |
| | TOPSOIL, sandy, black, moist; contains wood and ash debris | | CONCRETE | 1 | | 0.38 | 12 |
| | | 262.27 | | | | | |
| 1.0 | SP - SAND, with silt, fine to medium grained, loose dark brown to black, moist; ash, wood and brick debris present<br>- no recovery due to a large stump at 0.76m BGS | | | 2 | | 0.00 | 0 |
| 2.0 | | | | 3 | | 0.25 | 3 |
| | | 260.14 | | 4 | | 0.30 | 13 |
| 3.0 | SP - SAND, compact, fine to medium grained, light brown to white, moist; aeolian (no refuse present) | 259.78 | BENTONITE GROUT | | | | |
| | SP - SAND, with silt, compact, fine grained, brown, moist | | | 5 | | 0.28 | 16 |
| 4.0 | - clay has a greenish tint and an hydrocarbon odor for the initial 15 cm at 3.89m BGS | 259.02 | | 6 | | 0.30 | 22 |
| | CL - CLAY, with fine gravel, trace fine grained sand, very stiff, low plasticity, brown, dry to moist<br>- sand is no longer present, trace to with gravel, increased density, hard at 4.57m BGS | | 50 mm Ø SCH 40 PVC RISER PIPE | 7 | | 0.33 | 42 |
| 5.0 | - cobble encountered resulting in poor recovery at 5.33m BGS | | | 8 | | 0.00 | 0 |
| 6.0 | | | | 9 | | 0.38 | 38 |
| 7.0 | | 255.67 | | 10 | | | |
| | SW - SAND, compact, fine to medium, brown, some stratification, saturated; heavy oxidation staining for the initial 15 cm | | 3/8" BENTONITE GRAVEL | 11 | | 0.51 | 12 |
| 8.0 | - trace silt at 8.38m BGS | | #2 SILICA SAND | 12 | | 0.25 | 8 |
| 9.0 | - 5 cm granite cobble encountered, angular at 9.14m BGS<br>- with silt, increased density; compact at 9.30m BGS | | | 13 | | 0.46 | 25 |
| 10.0 | - trace to with silt at 10.06m BGS | | 50 mm Ø SCH 80 PVC SCREEN | 14 | | 0.46 | 18 |
| 11.0 | | | | 15 | | 0.33 | 16 |
| | - increased grain size; medium with trace fine grained at 11.43m BGS<br>- 5 cm seam of fine grained sand at 11.84m BGS | | | 16 | | 0.48 | 9 |
| 12.0 | - no silt, fine to medium grained at 12.19m BGS | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
PROJECT NUMBER: 4074-28
CLIENT: Municipality of Kincardine
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
SUBCONTRACTOR: Noll Drilling

HOLE DESIGNATION: OW36-09
DATE COMPLETED: March 23, 2009
DRILLING METHOD: 108 mm HSA
FIELD PERSONNEL: Allan M.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 13.0 | | | | 17 | | 0.56 | 47 |
| | - 15 cm seam of ML/SP - SILTY SAND, very dense, laminated, very fine grained, brown, wet at 13.41m BGS | | | 18 | | 0.50 | >50 |
| 14.0 | - fine grained sand at 14.02m BGS | | NATIVE CAVE MATERIAL | 19 | | 0.51 | 28 |
| 15.0 | | | | 20 | | 0.51 | 33 |
| | - 7 cm seam of brown CI - CLAY, trace sand underlying a 1 cm seam of oxidation stained sand at 15.54m BGS | 247.21 | | 21 | | 0.46 | 41 |
| 16.0 | CI - CLAY, hard, some lamination patterns present, low to intermediate plasticity, grey, dry to moist | | 3/8" BENTONITE GRAVEL | 22 | | | |
| 17.0 | | | | 23 | | 0.38 | 38 |
| | END OF BOREHOLE @ 17.37m BGS | 245.46 | | | | | |
| 18.0 | | | WELL DETAILS<br>Screened interval:<br>253.68 to 252.16m<br>9.14 to 10.67m BGS<br>Length: 1.52m<br>Diameter: 51mm<br>Slot Size: 10<br>Material: SCH. 40 PVC<br>Seal:<br>255.82 to 254.60m<br>7.01 to 8.23m BGS<br>Material: BENTONITE GRAVEL<br>Sand Pack:<br>254.60 to 252.16m<br>8.23 to 10.67m BGS<br>Material: #2 SILICA SAND | | | | |
| 19.0 | | | | | | | |
| 20.0 | | | | | | | |
| 21.0 | | | | | | | |
| 22.0 | | | | | | | |
| 23.0 | | | | | | | |
| 24.0 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (21)

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
PROJECT NUMBER: 4074-28
CLIENT: Municipality of Kincardine
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
SUBCONTRACTOR: Noll Drilling

HOLE DESIGNATION: OW37-09
DATE COMPLETED: March 26, 2009
DRILLING METHOD: 108 mm HSA
FIELD PERSONNEL: Allan M.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 251.96<br>251.96 | | | | | |
| 0.0 | SP - SAND, loose, fine grained, light brown, dry | 251.89 | CONCRETE | 1 | | 0.33 | 9 |
| 0.5 | ML/SM - SILTY SAND, loose, fine grained, brown, dry to most | | | | | | |
| 1.0 | - saturated at 1.14m BGS | 250.90 | | 2 | | 0.30 | 12 |
| 1.5 | SP - SAND, trace silt, compact, fine to medium grained, brown, moist | | | 3 | | 0.43 | 15 |
| 2.0 | | | | | | | |
| 2.5 | | | | 4 | | 0.38 | 43 |
| 3.0 | - 18 cm seam of CI - CLAY, trace silt, with sand, hard, moderate to high plasticity, brown, moist at 2.69m BGS | | | | | | |
| 3.5 | - 2 cm seam of ML/SM - SILTY SAND, moist at 3.35m BGS<br>- 5 cm seam of CI - CLAY, brown, moist at 3.51m BGS | | | 5 | | 0.46 | 25 |
| 4.0 | | 248.15 | | 6 | | 0.43 | 19 |
| 4.5 | CH - CLAY,with silt, trace sand, occasional fine gravel, stiff to very stiff, high plasticity, brown, moist<br>- clay has become grey at 3.91m BGS | | | | | | |
| 5.0 | - occassional thin (1 mm to 2.5 cm), horizontal sandy seams from 4.95 to 8.14m BGS | | | 7 | | 0.33 | 10 |
| 5.5 | | | | 8 | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | 9 | | 0.43 | 24 |
| 7.0 | | | | 10 | | 0.38 | 31 |
| 7.5 | | | | | | | |
| 8.0 | | | | 11 | | 0.36 | 10 |
| 8.5 | | | | 12 | | 0.38 | 15 |
| 9.0 | | | | | | | |
| 9.5 | | | | 13 | | 0.32 | 17 |
| 10.0 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW37-09
PROJECT NUMBER: 4074-28
DATE COMPLETED: March 26, 2009
CLIENT: Municipality of Kincardine
DRILLING METHOD: 108 mm HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
SUBCONTRACTOR: Noll Drilling

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 10.5 | - 5 cm cobble encountered, subangular, brown, limestone at 12.80m BGS<br>- dark banding, followed by small, > 1 mm, CLAY with silt, with sand seams. bands are present every 2.5 to 3 cm and are in a horizontal pattern at 12.95m BGS<br>- 5 cm cobble encountered, subangular, brown, limestone; banding has become vertical in orientation at 13.72m BGS<br>- horizontal banding present at 13.87m BGS<br>- very stiff at 14.33m BGS<br>- bands have increased in size to approx. 2.5 cm at 14.48m BGS<br>- occassional thin, horizontal silty seams from 15.39 to 17.21m BGS | | 50 mm Ø SCH 40 PVC RISER PIPE<br>BENTONITE GROUT | 14 | | 0.15 | 19 |
| 11.0 | | | | 15 | | 0.33 | 8 |
| 11.5 | | | | 16 | | 0.41 | 30 |
| 12.0 | | | | | | | |
| 12.5 | | | | 17 | | 0.47 | 21 |
| 13.0 | | | | | | | |
| 13.5 | | | | 18 | | 0.51 | 18 |
| 14.0 | | | | 19 | | 0.48 | 11 |
| 14.5 | | | | | | | |
| 15.0 | | | | 20 | | 0.38 | 25 |
| 15.5 | | | | 21 | | 0.56 | 14 |
| 16.0 | | | | | | | |
| 16.5 | | | | 22 | | 0.53 | 11 |
| 17.0 | | | | 23 | | 0.59 | 11 |
| 17.5 | | | | | | | |
| 18.0 | | | | 24 | | 0.61 | 17 |
| 18.5 | | | | 25 | | 0.61 | 20 |
| 19.0 | | | | | | | |
| 19.5 | | | | 26 | | 0.58 | 11 |
| 20.0 | | | | 27 | | 0.56 | 24 |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (18)

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW37-09
PROJECT NUMBER: 4074-28
DATE COMPLETED: March 26, 2009
CLIENT: Municipality of Kincardine
DRILLING METHOD: 108 mm HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
SUBCONTRACTOR: Noll Drilling

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 20.5 | - 1 cm seam of SP - SAND, fine to medium grained, moist at 20.35m BGS | | | | | | |
| 21.0 | - 2 cm seam of coarse sand, red at 20.85m BGS | 231.09 | | 28 | | 0.30 | >50 |
| | CL - CLAY, with sand, with gravel, very hard, fine to coarse sand, fine to coarse gravel, low to no plasticity, grey, dry | | | | | | |
| 21.5 | - 7 cm cobble encountered, black, angular, shale at 21.34m BGS | | | 29 | | 0.08 | >50 |
| 22.0 | - clay has become gravelly, moist to wet at 22.10m BGS | | | | | | |
| 22.5 | | | | 30 | | 0.23 | >50 |
| 23.0 | | | | 31 | | 0.23 | >50 |
| 23.5 | - cobble encountered causing poor recovery at 23.47m BGS | | 3/8" BENTONITE GRAVEL | | | | |
| 24.0 | | | | 32 | | 0.15 | >50 |
| 24.5 | LIMESTONE (BEDROCK), brown, thinly bedded, highly fractured in both the horizontal and vertical planes, highly weathered | 227.58 | #2 SILICA SAND | 33 | | 0.10 | >50 |
| 25.0 | | | | | | | |
| 25.5 | | | | 34 | | 0.00 | >50 |
| 26.0 | | | 50 mm Ø SCH 80 PVC SCREEN | 35 | | 0.00 | >50 |
| 26.5 | | | | | | | |
| 27.0 | | | | 36 | | 0.00 | >50 |
| 27.5 | END OF BOREHOLE @ 27.43m BGS | 224.53 | | | | | |
| 28.0 | | | | | | | |
| 28.5 | | | | | | | |
| 29.0 | | | | | | | |
| 29.5 | | | | | | | |
| 30.0 | | | | | | | |

WELL DETAILS
Screened interval:
227.58 to 224.53m
24.38 to 27.43m BGS
Length: 3.05m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
229.10 to 228.19m
22.86 to 23.77m BGS
Material: BENTONITE GRAVEL
Sand Pack:
228.19 to 224.53m
23.77 to 27.43m BGS
Material: #2 SILICA SAND

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW39-09
PROJECT NUMBER: 4074-28
DATE COMPLETED: April 7, 2009
CLIENT: Municipality of Kincardine
DRILLING METHOD: Direct Push (Geoprobe)
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
SUBCONTRACTOR: Altech Drilling

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 257.38<br>257.38 | | | | | |
| 0.5 | TOPSOIL, sandy silt, soft, dark brown, wet to moist; organics present | | | | | | |
| | ML - SANDY SILT, soft, fine to medium sand, dark to medium brown, moist to wet | 256.87 | | | | | |
| 1.0 | - 7.5 cm cobble encountered, brown, subrounded at 0.66m BGS | 256.64 | | 1 | P/S | 1.10 | |
| 1.5 | SM - SILTY to with silt SAND, loose to very loose, fine to medium grained, brown, wet (saturated) | | 25 mm Ø SCH 40 PVC RISER PIPE | | | | |
| 2.0 | | | | | | | |
| 2.5 | | | NATIVE CAVE MATERIAL | 2 | P/S | 0.00 | |
| 3.0 | - compact to dense at 3.05m BGS | | | | | | |
| 3.5 | - 5 cm seam of CH - CLAY, brown, moist to dry at 3.66m BGS | | | | | | |
| 4.0 | | | 25 mm Ø SCH 40 PVC RISER PIPE | 3 | P/S | 1.09 | |
| | - 5 cm seam of CH - CLAY, brown, moist to dry at 4.16m BGS | 253.11 | | | | | |
| 4.5 | CL - CLAY, with silt, very stiff to stiff, low to moderate plasticity, slight dilatancy, brown, moist to dry | 252.81 | | | | | |
| 5.0 | CH - CLAY, very stiff, high plasticity, massive, grey, moist (saturated) | | | | | | |
| 5.5 | - 5 cm seam of SM - SILTY SAND, fine grained sand, moist to wet at 5.33m BGS | | | 4 | P/S | 1.37 | |
| 6.0 | - firm to stiff for at 5.38m BGS<br>- very stiff at 5.69m BGS | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | - firm to stiff, moist at 7.01m BGS | | | 5 | P/S | 1.52 | |
| 7.5 | | | | | | | |
| | END OF BOREHOLE @ 7.62m BGS | 249.76 | | | | | |
| 8.0 | | | | | | | |
| 8.5 | | | | | | | |
| 9.0 | | | | | | | |
| 9.5 | | | | | | | |

WELL DETAILS
Screened interval:
254.33 to 252.81m
3.05 to 4.57m BGS
Length: 1.52m
Diameter: 25mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
257.38 to 256.77m
0.00 to 0.61m BGS
Material: BENTONITE GRAVEL

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW40-09
PROJECT NUMBER: 4074-28
DATE COMPLETED: April 7, 2009
CLIENT: Municipality of Kincardine
DRILLING METHOD: Direct Push (Geoprobe)
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
SUBCONTRACTOR: Altech Drilling

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 260.22<br>260.22 | | | | | |
| 0 | TOPSOIL, sandy, loose, fine to medium grained, dark brown, moist | 259.97 | | | | | |
| 1.0 | ML - SANDY SILT, loose, fine to medium grained, reddish/orange brown, moist<br>- becoming brown at 0.41m BGS<br>- wet (saturated) at 1.07m BGS | 259.11 | | 1 | P/S | 1.16 | |
| 2.0 | SP - SAND, trace to with silt, loose, medium grained, brown, wet<br>- silty to with silt, fine to medium grained sand at 2.44m BGS | | 25 mm Ø SCH 40 PVC RISER PIPE | 2 | P/S | 1.52 | |
| 3.0 | | | NATIVE CAVE MATERIAL | | | | |
| 4.0 | | | | 3 | P/S | 0.00 | |
| 5.0 | - 30 cm of predominantly medium grained sand, with silt at 4.57m BGS<br>- 30 cm of ML/SP - SILT AND SAND, dense, fine grained, moist to wet at 4.88m BGS<br>- 2.5 cm CI - CLAY, very stiff, brown, moist at 5.64m BGS | | 25 mm Ø SCH 40 PVC RISER PIPE | 4 | P/S | 1.37 | |
| 6.0 | CI/CH - CLAY, very stiff, moderate to high plasticity, brown, moist | 254.13 | | | | | |
| 7.0 | - grey, massive, saturated with little available water at 6.40m BGS | | | 5 | P/S | 1.07 | |
| 8.0 | - 15 cm seam of SP - SAND, loose, fine to medium grained, grey, wet at 8.08m BGS | | | 6 | P/S | 1.52 | |
| 9.0 | | | | | | | |
| 10.0 | | | | 7 | P/S | 1.47 | |
| 11.0 | END OF BOREHOLE @ 10.67m BGS | 249.55 | | | | | |
| 12.0 | | | | | | | |
| 13.0 | | | | | | | |
| 14.0 | | | | | | | |

WELL DETAILS
Screened interval:
255.65 to 254.13m
4.57 to 6.10m BGS
Length: 1.52m
Diameter: 25mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
260.22 to 259.61m
0.00 to 0.61m BGS
Material: BENTONITE GRAVEL

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW41-09

PROJECT NUMBER: 4074-28
DATE COMPLETED: April 8, 2009

CLIENT: Municipality of Kincardine
DRILLING METHOD: Direct Push (Geoprobe)

LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Ben K.

SUBCONTRACTOR: Altech Drilling

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 262.73<br>261.91 | | | | | |
| 0 | TOPSOIL | 261.46 | | | | | |
| 1.0 | SM/ML - SAND AND SILT, very fine grained, dilatant, brown; fine stratification<br>- saturated at 1.52m BGS | | | 1 | P/S | | |
| 2.0 | - 5 cm seam of clay, brown at 2.13m BGS | | | 2 | P/S | | |
| 3.0 | | | 25 mm Ø SCH 40 PVC RISER PIPE | | | | |
| 4.0 | | | NATIVE CAVE MATERIAL | 3 | P/S | | |
| 5.0 | - becoming finer with depth at 5.49m BGS | | | 4 | P/S | | |
| 6.0 | | | 25 mm Ø SCH 40 PVC RISER PIPE | | | | |
| 7.0 | CL - CLAY (TILL), with silt, trace sand, stiff to hard, massive, grey, little to no available water | 254.75 | WELL DETAILS<br>Screened interval:<br>256.73 to 255.21m<br>5.18 to 6.71m BGS<br>Length: 1.52m<br>Diameter: 25mm<br>Slot Size: 10<br>Material: SCH. 40 PVC<br>Seal:<br>261.91 to 261.30m<br>0.00 to 0.61m BGS<br>Material: BENTONITE GRAVEL | 5 | P/S | | |
| 8.0 | | | | 6 | P/S | | |
| 9.0 | ML/SM - SILT AND SAND (WATERLAIN), firm to stiff, grey, dilatant, saturated | 253.23<br>252.92 | | | | | |
| 10.0 | CL - CLAY (TILL), with silt, trace sand, stiff to hard, massive, grey, little to no available water<br>- 5 cm seam of ML - SILT, dilatant, grey, saturated at 10.21m BGS | | | 7 | P/S | | |
| 11.0 | END OF BOREHOLE @ 10.67m BGS | 251.25 | | | | | |
| 12.0 | | | | | | | |
| 13.0 | | | | | | | |
| 14.0 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW42-09
PROJECT NUMBER: 4074-28
DATE COMPLETED: April 7, 2009
CLIENT: Municipality of Kincardine
DRILLING METHOD: Direct Push (Geoprobe)
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
SUBCONTRACTOR: Altech Drilling

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 253.05<br>252.24 | | | | | |
| 0.0 | TOPSOIL, sandy, brown, moist; organics | 252.16 | | | | | |
| 0.5 | SM - SAND, silty to with silt, fine to medium grained, brown, moist | 251.88 | | | | | |
| 1.0 | SP - SAND, with silt, loose to compact, fine to medium grained, light brown, moist<br>- 7.5 cm seam of SM/ML - SAND AND SILT, brown, moist to dry at 0.56m BGS<br>- saturated at 0.86m BGS | | | 1 | P/S | 1.19 | |
| 1.5 | CH - CLAY, trace sand, very stiff, high plasticity, brown, moist | 250.71 | 25 mm Ø SCH 40 PVC RISER PIPE | | | | |
| 2.0 | - grey at 1.68m BGS | | | | | | |
| 2.5 | - soft to firm, moist to wet at 2.44m BGS | | NATIVE CAVE MATERIAL | 2 | P/S | 1.40 | |
| 3.0 | - stiff to very stiff, moist at 3.05m BGS | | | | | | |
| 3.5 | | | | | | | |
| 4.0 | SM - SAND, silty to with silt, compact to dense, fine to medium grained, grey, saturated | 248.43 | 25 mm Ø SCH 40 PVC RISER PIPE | 3 | P/S | 1.45 | |
| 4.5 | CH - CLAY (TILL), hard, trace sand, occasional fine to medium gravel, moderate to high plasticity, grey, moist (saturated) | 247.72 | | | | | |
| 5.0 | | | | 4 | P/S | 1.52 | |
| 5.5 | | | | | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | 5 | P/S | 1.52 | |
| 7.5 | END OF BOREHOLE @ 7.62m BGS | 244.62 | | | | | |
| 8.0 | | | | | | | |
| 8.5 | | | | | | | |
| 9.0 | | | | | | | |
| 9.5 | | | | | | | |

WELL DETAILS
Screened interval:
249.19 to 247.67m
3.05 to 4.57m BGS
Length: 1.52m
Diameter: 25mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
252.24 to 251.63m
0.00 to 0.61m BGS
Material: BENTONITE GRAVEL

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW43-09
PROJECT NUMBER: 4074-28
DATE COMPLETED: April 8, 2009
CLIENT: Municipality of Kincardine
DRILLING METHOD: Direct Push (Geoprobe)
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Ben K.
SUBCONTRACTOR: Altech Drilling

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 256.62<br>255.84 | | | | | |
| 0.5 | TOPSOIL | | | | | | |
| | SM - SILTY SAND, fine to very fine grained, little stratification, light brown | 255.38 | | 1 | P/S | | |
| 1.0 | - wet at 1.22m BGS | | | | | | |
| 1.5 | | | | | | | |
| 2.0 | CL/ML - CLAY AND SILT, with sand, low to medium plasticity, some layering, saturated in coarser seams | 254.01 | | 2 | P/S | | |
| 2.5 | | | | | | | |
| 3.0 | SM - SAND, trace to with silt, poor gradation, brown, saturated | 252.94 | 25 mm Ø SCH 40 PVC RISER PIPE | 3 | P/S | | |
| 3.5 | | | | | | | |
| 4.0 | | | NATIVE CAVE MATERIAL | | | | |
| 4.5 | | | | | | | |
| 5.0 | | | | 4 | P/S | | |
| 5.5 | | | | | | | |
| 6.0 | - grey at 5.94m BGS | | | | | | |
| 6.5 | - light brown; some oxidation staining at 6.71m BGS | | | | | | |
| 7.0 | | | 25 mm Ø SCH 40 PVC RISER PIPE | 5 | P/S | | |
| 7.5 | | | | | | | |
| 8.0 | | | | | | | |
| 8.5 | | | | 6 | P/S | | |
| 9.0 | | | | | | | |
| 9.5 | | | | | | | |
| | CL - CLAY (TILL), with silt, trace sand, stiff to hard, | 246.09 | | | | | |

WELL DETAILS
Screened interval:
249.74 to 248.22m
6.10 to 7.62m BGS
Length: 1.52m
Diameter: 25mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
255.84 to 255.23m
0.00 to 0.61m BGS
Material: BENTONITE GRAVEL

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
PROJECT NUMBER: 4074-28
CLIENT: Municipality of Kincardine
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
SUBCONTRACTOR: Altech Drilling

HOLE DESIGNATION: OW43-09
DATE COMPLETED: April 8, 2009
DRILLING METHOD: Direct Push (Geoprobe)
FIELD PERSONNEL: Ben K.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| 10.5 | massive, grey, little to no available moisture | | | | | | |
| | END OF BOREHOLE @ 10.67m BGS | 245.17 | | | | | |
| 11.0 | | | | | | | |
| 11.5 | | | | | | | |
| 12.0 | | | | | | | |
| 12.5 | | | | | | | |
| 13.0 | | | | | | | |
| 13.5 | | | | | | | |
| 14.0 | | | | | | | |
| 14.5 | | | | | | | |
| 15.0 | | | | | | | |
| 15.5 | | | | | | | |
| 16.0 | | | | | | | |
| 16.5 | | | | | | | |
| 17.0 | | | | | | | |
| 17.5 | | | | | | | |
| 18.0 | | | | | | | |
| 18.5 | | | | | | | |
| 19.0 | | | | | | | |
| 19.5 | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW45-13
PROJECT NUMBER: 4074-28
DATE COMPLETED: October 4, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 255.25<br>254.62 | | | | | |
| 0.0 | LOAMY TOPSOIL (FILL), silty sand, loose, fine grained sand, black, dry; high organic content | 254.32 | CONCRETE | 1 | | 17.68 | 3 |
| 1.0 | SM - SAND (FILL), with silt, loose, fine grained sand, stratified, orange brown, dry | 253.86<br>253.71 | 3/8" BENTONITE GRAVEL 50 mm dia SCH 40 PVC RISER PIPE | 2 | | 22.86 | 13 |
| | CH - CLAY (FILL), soft, high plasticity, grey | 253.56 | | 3 | | 20.42 | 18 |
| 2.0 | LOAMY TOPSOIL, silty sand, loose, fine grained sand, black, dry; high organic content | | | 4 | | 19.20 | 29 |
| 3.0 | SM - SAND, with silt to silty, loose, fine grained sand, light brown, dry<br>- compact, stratified at 1.52m BGS | | #1 SILICA SANDPACK 50 mm dia SCH 40 PVC SCREEN | 5 | | 22.86 | 27 |
| 4.0 | - dilatant, greyish brown, wet at 2.08m BGS | 250.71 | | 6 | | 20.42 | 20 |
| | - 10 cm seam of ML - SILT, with sand, dense, little to no plasticity, brown, moist at 3.35m BGS | | BENTONITE GRAVEL AND NATURAL COLLAPSE | 7 | | 22.86 | 23 |
| 5.0 | CI/ML - CLAYEY SILT (TILL), trace gravel, trace sand, fine grained gravel, very fine grained sand, very stiff to hard, moderate plasticitiy, grey, saturated with little to no available water | 249.44 | | | | | |
| 6.0 | - no gravel present, low plasticity at 4.57m BGS | | | | | | |
| 7.0 | END OF BOREHOLE @ 5.18m BGS | | | | | | |
| 8.0 | | | | | | | |
| 9.0 | | | | | | | |
| 10.0 | | | | | | | |
| 11.0 | | | | | | | |
| 12.0 | | | | | | | |
| 13.0 | | | | | | | |
| 14.0 | | | | | | | |
| 15.0 | | | | | | | |
| 16.0 | | | | | | | |
| 17.0 | | | | | | | |
| 18.0 | | | | | | | |
| 19.0 | | | | | | | |

WELL DETAILS
Screened interval:
251.88 to 250.35m
2.74 to 4.27m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
254.32 to 250.35m
0.30 to 4.27m BGS
Material: BENTONITE GRAVEL
Sand Pack:
252.49 to 250.35m
2.13 to 4.27m BGS
Material: #1 SILICA SANDPACK

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW46A-13
PROJECT NUMBER: 4074-28
DATE COMPLETED: October 2, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 252.62<br>251.76 | | | | | |
| | LOAMY TOPSOIL, silty sandy topsoil, loose, dark brown, dry; high organic content | 251.30 | CONCRETE | 1 | | 20.42 | 7 |
| 1.0 | SM - SILTY SAND, compact, fine grained sand, brown, moist; some oxidation staining present<br>- trace silt to with silt, light brown to grey at 1.22m BGS | | | 2 | | 17.68 | 10 |
| 2.0 | - with to silty, brown, moist to wet at 1.52m BGS<br>- dilatant, wet at 1.83m BGS | | | 3 | | 17.68 | 17 |
| 3.0 | - stratification present at 2.29m BGS | | | 4 | | 17.68 | 26 |
| | | 248.16 | | 5 | | 16.46 | 28 |
| 4.0 | CI/ML - CLAYEY SILT TO CLAY AND SILT (TILL), very stiff, moderate plasticity, brown, moist<br>- grey, moderate to high plasticity at 3.81m BGS | | | 6 | | 16.46 | 12 |
| 5.0 | - 1 to 2 cm seam of SM/ML - SILT AND SAND, fine grained sand, dilatant, grey, wet at 4.27m BGS | | BENTONITE GROUT<br>50 mm dia SCH 40 PVC RISER PIPE | 7 | | 17.68 | 14 |
| 6.0 | - soft (possibly due to slough) from 5.18 to 5.49m BGS<br>- SM - SILTY SAND, loose, fine to very fine grained, grey, wet from 6.40 to 6.55m BGS | | | 8 | | 21.64 | 23 |
| 7.0 | - 2.5 cm seam of SM - SILTY SAND, loose, fine to very fine grained, grey, wet at 7.01m BGS | | | 9 | | 22.86 | 30 |
| 8.0 | - SM - SILTY SAND, loose, fine to very fine grained, grey, wet from 7.32 to 7.47m BGS<br>- moderate to high plasticity at 8.23m BGS | | | 10 | | 17.68 | 23 |
| 9.0 | | | | 11 | | 16.46 | 23 |
| | | | | 12 | | 16.46 | 22 |
| 10.0 | - trace fine grained gravel, saturated pockets of SILTY SAND, >1 cm, present at 9.75m BGS | | 3/8" BENTONITE GRAVEL | 13 | | 25.30 | 25 |
| 11.0 | | | | 14 | | 25.30 | 25 |
| | | | | 15 | | 22.86 | 26 |
| 12.0 | - soft, high slit content, with sand, wet; varving present at 12.19m BGS | | #1 SILICA SANDPACK<br>50 mm dia SCH 40 PVC SCREEN | 16 | | 25.30 | 22 |
| 13.0 | | | | 17 | | 25.30 | 18 |
| | | | | 18 | | 25.30 | 10 |
| 14.0 | END OF BOREHOLE @ 13.72m BGS | 238.05 | | | | | |
| 15.0 | | | | | | | |
| 16.0 | | | | | | | |
| 17.0 | | | | | | | |
| 18.0 | | | | | | | |
| 19.0 | | | | | | | |

WELL DETAILS
Screened interval:
241.09 to 238.05m
10.67 to 13.72m BGS
Length: 3.05m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
251.46 to 241.70m
0.30 to 10.06m BGS
Material: BENTONITE GROUT AND GRAVEL
Sand Pack:
241.70 to 238.05m
10.06 to 13.72m BGS
Material: #1 SILICA SANDPACK

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW46B-13

PROJECT NUMBER: 4074-28
DATE COMPLETED: October 2, 2013

CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA

LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.

DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 252.63<br>251.77 | | | | | |
| 0 | LOAMY TOPSOIL, silty sandy topsoil, loose, dark brown, dry; high organic content | 251.31 | CONCRETE<br>BENTONITE GROUT<br>50 mm dia SCH 40 PVC RISER PIPE<br>3/8" BENTONITE GRAVEL<br>#1 SILICA SANDPACK<br>50 mm dia SCH 40 PVC SCREEN | 1 | | 0.00 | - |
| 1.0 | SM - SILTY SAND, compact, fine grained sand, brown, moist; some oxidation staining present<br>- trace silt to with silt, light brown to grey at 1.22m BGS<br>- with to silty, brown, moist to wet at 1.52m BGS<br>- dilatant, wet at 1.83m BGS<br>- stratification present at 2.29m BGS | | | | | | |
| 2.0 | | | | | | | |
| 3.0 | | | | | | | |
| | | 248.17 | | | | | |
| 4.0 | CI/ML - CLAYEY SILT TO CLAY AND SILT, very stiff, moderate plasticity, brown, moist<br>- grey, moderate to high plasticity at 3.81m BGS | 247.81 | | | | | |
| 5.0 | END OF BOREHOLE @ 3.96m BGS | | | | | | |
| 6.0 | | | | | | | |
| 7.0 | | | | | | | |
| 8.0 | | | | | | | |
| 9.0 | | | | | | | |
| 10.0 | | | | | | | |
| 11.0 | | | | | | | |
| 12.0 | | | | | | | |
| 13.0 | | | | | | | |
| 14.0 | | | | | | | |
| 15.0 | | | | | | | |
| 16.0 | | | | | | | |
| 17.0 | | | | | | | |
| 18.0 | | | | | | | |
| 19.0 | | | | | | | |

WELL DETAILS
Screened interval:
249.33 to 247.81m
2.44 to 3.96m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
251.47 to 249.94m
0.30 to 1.83m BGS
Material: BENTONITE GROUT AND GRAVEL
Sand Pack:
249.94 to 248.11m
1.83 to 3.66m BGS
Material: #1 SILICA SANDPACK

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

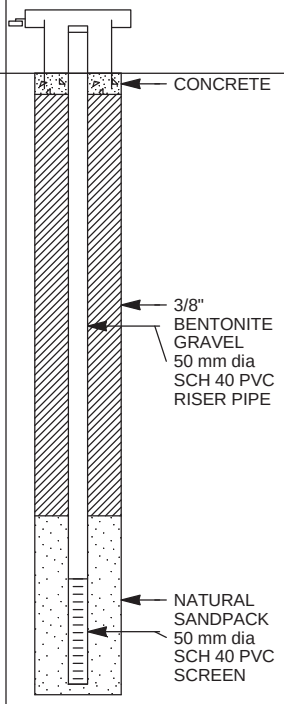
# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW47-13
PROJECT NUMBER: 4074-28
DATE COMPLETED: October 3, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m |
|---|---|---|
| | TOP OF RISER | 255.08 |
| | GROUND SURFACE | 254.24 |
| 0 | LOAMY TOPSOIL, silty sandy topsoil, loose, dark brown, dry; high organic content | 253.79 |
| 1.0 | SM - SILTY SAND, loose, fine to very fine grained sand, medium brown, dry; some rootlets present<br>- poor recovcery due to roots, light brown SM - SILTY SAND inferred from 0.76 to 1.37m BGS<br>- poor recovcery due to rock, light brown SM - SILTY SAND inferred from 1.52 to 2.13m BGS | |
| 2.0 | | |
| 3.0 | - SILT AND SAND, very light brown, moist at 2.29m BGS | 251.20 |
| 4.0 | CL/ML - CLAYEY SILT, with sand, hard, low plasticity, very fine grained sand, mottled greyish brown, moist; upper 0.4 m are brown<br>- grey at 3.81m BGS | |
| 5.0 | - some varving present at 5.33m BGS | |
| 6.0 | | 248.15 |
| | ML - SILT, with clay to clayey, with sand, hard, very fine grained sand, brown, dry; some oxidation staining present | 247.59 |
| 7.0 | SM/ML - SILTY SAND, loose to compact, fine to very fine grained sand, dilatant, brown, wet | |
| 8.0 | | |
| 9.0 | END OF BOREHOLE @ 8.99m BGS | 245.25 |
| 10.0 | | |
| 11.0 | | |
| 12.0 | | |
| 13.0 | | |
| 14.0 | | |
| 15.0 | | |
| 16.0 | | |
| 17.0 | | |
| 18.0 | | |
| 19.0 | | |

MONITORING WELL




WELL DETAILS
Screened interval:
246.93 to 245.40m
7.32 to 8.84m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
253.94 to 247.54m
0.30 to 6.71m BGS
Material: BENTONITE GRAVEL
Sand Pack:
247.84 to 245.40m
6.40 to 8.84m BGS
Material: NATURAL SANDPACK

SAMPLE

| NUMBER | INTERVAL | REC (m) | 'N' VALUE |
|---|---|---|---|
| 1 | | 11.58 | 5 |
| 2 | | 1.22 | 15 |
| 3 | | 1.22 | 13 |
| 4 | | 10.06 | 30 |
| 5 | | 16.46 | 31 |
| 6 | | 17.68 | 30 |
| 7 | | 22.86 | 37 |
| 8 | | 21.64 | 27 |
| 9 | | 25.30 | 21 |
| 10 | | 16.46 | 14 |
| 11 | | 21.64 | 22 |
| 12 | | 25.30 | 20 |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW48-13
PROJECT NUMBER: 4074-28
DATE COMPLETED: September 25, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 258.33<br>257.49 | | | | | |
| 0 | LOAMY TOPSOIL, sandy, silty topsoil, loose, fine grained sand, dark brown, moist; high organic content | 257.41 | CONCRETE | 1 | | 30.48 | - |
| 1.0 | SM - SILTY SAND, silt to with silt, loose, fine grained sand, brown, moist; varying degrees of silt<br>- golden coloured sand, trace silt, dry from 1.98 to 2.13m BGS | | 3/8" BENTONITE GRAVEL 50 mm dia SCH 40 PVC RISER PIPE | 2 | | 20.42 | 12 |
| 2.0 | | | | 3 | | 17.68 | 15 |
| | - wet at 2.29m BGS | | | 4 | | 15.24 | 27 |
| 3.0 | - trace silt, medium grained from 3.35 to 3.51m BGS | | | 5 | | 20.42 | 22 |
| 4.0 | | | #1 SILICA SANDPACK 50 mm dia SCH 40 PVC SCREEN | 6 | | 21.64 | 30 |
| 5.0 | - increased silt content; SILT AND SAND at 5.33m BGS | | | 7 | | 22.86 | 30 |
| 6.0 | - oxidation staining from 6.10 to 6.55m BGS<br>- SANDY SILT, grey at 6.55m BGS | | | 8 | | 30.48 | 57 |
| | | | | 9 | | 25.30 | 47 |
| 7.0 | CL/ML - CLAYEY SILT (TILL), with to trace sand, very stiff, low plasticity, grey, saturated with little to no available water | 250.48 | BENTONITE GRAVEL AND NATURAL COLLAPSE | 10 | | 20.42 | 31 |
| 8.0 | - trace to no sand, trace gravel, fine grained gravel, increase plasticity; moderate at 7.32m BGS | 249.26 | | 11 | | 20.42 | 21 |
| 9.0 | END OF BOREHOLE @ 8.23m BGS | | | | | | |
| 10.0 | | | | | | | |
| 11.0 | | | | | | | |
| 12.0 | | | | | | | |
| 13.0 | | | | | | | |
| 14.0 | | | | | | | |
| 15.0 | | | | | | | |
| 16.0 | | | | | | | |
| 17.0 | | | | | | | |
| 18.0 | | | | | | | |
| 19.0 | | | | | | | |

WELL DETAILS
Screened interval:
254.14 to 252.61m
3.35 to 4.88m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
257.19 to 254.75m
0.30 to 2.74m BGS
Material: BENTONITE GRAVEL
Sand Pack:
254.75 to 252.61m
2.74 to 4.88m BGS
Material: #1 SILICA SANDPACK

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW49-13
PROJECT NUMBER: 4074-28
DATE COMPLETED: September 27, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 261.50<br>260.66 | | | | | |
| 0.5 | LOAMY TOPSOIL, silty sandy topsoil, loose, dark brown, moist; high organic content | | CONCRETE | 1 | | 19.20 | 6 |
| | ML/SM - SILTY SAND, silty to with silt, loose to compact, stratified, brown, moist to dry; occassional ML - SILT seams with organic materials, dark brown, moist | 260.21 | | | | | |
| 1.0 | | | | | | | |
| 1.5 | | | | | | | |
| 2.0 | | | | 2 | | 17.68 | 12 |
| 2.5 | | | 3/8" BENTONITE GRAVEL<br>50 mm dia SCH 40 PVC RISER PIPE | | | | |
| 3.0 | - trace to no silt at 3.05m BGS | | | | | | |
| 3.5 | | | | 3 | | 20.42 | 29 |
| 4.0 | | | | | | | |
| 4.5 | | | | | | | |
| 5.0 | - ML - SANDY SILT, sandy to with sand, compact, dilatant, brown, moist to wet from 4.77 to 5.64m BGS | | #1 SILICA SANDPACK | 4 | | 21.64 | 27 |
| 5.5 | | | 50 mm dia SCH 40 PVC SCREEN | 5 | | 20.42 | 40 |
| 6.0 | | | | | | | |
| 6.5 | CL/ML - CLAYEY SILT (TILL), trace sand, trace gravel, hard, low to moderate plasticity, very fine grained sand, fine grained gravel, brown, dry to moist | 254.52 | BENTONITE GRAVEL AND NATURAL COLLAPSE | 6 | | 22.86 | 37 |
| 7.0 | - moderate plasticity, grey, saturated with little to no available groundwater at 6.30m BGS | | | 7 | | 22.86 | 31 |
| 7.5 | END OF BOREHOLE @ 7.47m BGS | 253.20 | | | | | |
| 8.0 | | | | | | | |
| 8.5 | | | | | | | |

WELL DETAILS
Screened interval:
256.09 to 254.57m
4.57 to 6.10m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
260.36 to 256.70m
0.30 to 3.96m BGS
Material: BENTONITE GRAVEL
Sand Pack:

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
PROJECT NUMBER: 4074-28
CLIENT: Municipality of Kincardine
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

HOLE DESIGNATION: OW49-13
DATE COMPLETED: September 27, 2013
DRILLING METHOD: 4 1/4 HSA
FIELD PERSONNEL: Allan M.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | NUMBER | INTERVAL | REC (m) | 'N' VALUE | |
| 9.5 | | | 256.70 to 254.57m<br>3.96 to 6.10m BGS<br>Material: #1 SILICA SANDPACK | | | | | |
| 10.0 | | | | | | | | |
| 10.5 | | | | | | | | |
| 11.0 | | | | | | | | |
| 11.5 | | | | | | | | |
| 12.0 | | | | | | | | |
| 12.5 | | | | | | | | |
| 13.0 | | | | | | | | |
| 13.5 | | | | | | | | |
| 14.0 | | | | | | | | |
| 14.5 | | | | | | | | |
| 15.0 | | | | | | | | |
| 15.5 | | | | | | | | |
| 16.0 | | | | | | | | |
| 16.5 | | | | | | | | |
| 17.0 | | | | | | | | |
| 17.5 | | | | | | | | |

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

# STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)



PROJECT NAME: Kincardine, Ward 2 Expansion
HOLE DESIGNATION: OW50-13
PROJECT NUMBER: 4074-28
DATE COMPLETED: September 30, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: 437 Sideroad 15 N., Kincardine, Ontario
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

| DEPTH m BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | ELEV. m | MONITORING WELL | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (m) | SAMPLE 'N' VALUE |
|---|---|---|---|---|---|---|---|
| | TOP OF RISER<br>GROUND SURFACE | 265.35<br>264.66 | | | | | |
| | TOPSOIL, silty, sandy, dark brown, dry to moist; high organic content | 264.51<br>264.21 | CONCRETE | 1 | | 22.86 | 9 |
| 1.0 | ML - CLAYEY SILT, with to clayey, with very fine grained sand, hard, low to moderate plasticity, some stratification noted, dark brown, moist | 263.90 | | | | | |
| 2.0 | SM/ML - SILT AND SAND, compact, very fine grained sand, stratified, light brown, dry | | | 2 | | 11.58 | 42 |
| 3.0 | CL/ML - CLAYEY SILT (TILL), with sand, trace gravel, hard, very fine grained sand, fine grained gravel, moderate plasticity, brown, dry | | | 3 | | 5.18 | 55 |
| | - poor recovery due to a rock stuck in the sampler at 1.52m BGS | 260.85 | | 4 | | 2.44 | 43 |
| 4.0 | - rock jammed split spoon sampler at 3.05m BGS | | BENTONITE GROUT<br>50 mm dia SCH 40 PVC RISER PIPE | | | | |
| 5.0 | SM - SILTY SAND, with to silty, loose, fine grained sand, brown, wet to moist | | | 5 | | 17.68 | 32 |
| | - dilatant, wet at 5.64m BGS | | | 6 | | 22.86 | 22 |
| 6.0 | - trace silt, medium grained sand at 6.10m BGS | | | 7 | | 16.46 | 28 |
| 7.0 | - silty at 6.86m BGS | | | 8 | | 19.20 | 24 |
| 8.0 | - trace silt at 7.92m BGS | | | 9 | | 25.30 | 19 |
| 9.0 | - with silt at 9.14m BGS | | 3/8" BENTONITE GRAVEL | 10 | | 24.08 | 28 |
| | | | | 11 | | 10.06 | 21 |
| 10.0 | - 7.5 cm seam of ML - CLAY SILT, with to clayey, with sand, hard, very fine grained sand, low to no plasticity, brown, moist at 10.44m BGS | | | 12 | | 17.68 | 53 |
| 11.0 | | | #1 SILICA SANDPACK<br>50 mm dia SCH 40 PVC SCREEN | 13 | | 20.42 | 42 |
| 12.0 | - several 3 cm dark brown silty pockets noted at 12.50m BGS | | | 14 | | 22.86 | 35 |
| 13.0 | | | | 15 | | 22.86 | 58 |
| | CI/ML - CLAYEY SILT (TILL), with sand, trace gravel, very fine grained sand, fine grained gravel, moderate plasticity, grey, saturated with little to no available groundwater | 251.40<br>250.34 | BENTONITE GRAVEL AND NATURAL COLLAPSE | 16 | | 25.30 | 50 |
| 14.0 | END OF BOREHOLE @ 14.33m BGS | | | 17 | | 22.86 | 25 |
| 15.0 | | | | | | | |
| 16.0 | | | | | | | |
| 17.0 | | | | | | | |
| 18.0 | | | | | | | |
| 19.0 | | | | | | | |

WELL DETAILS
Screened interval:
254.91 to 251.86m
9.75 to 12.80m BGS
Length: 3.05m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
264.36 to 255.37m
0.30 to 9.30m BGS
Material: BENTONITE GROUT AND GRAVEL
Sand Pack:
255.37 to 251.86m
9.30 to 12.80m BGS
Material: #1 SILICA SANDPACK

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 4074 - WARD 2 (MARCH 2009).GPJ CRA_CORP.GDT 4/17/14

# Appendix G

## QA/QC Data Verification Table

## Appendix G

### QA/QC Data Verification Table
### 2023 Annual Monitoring Report
### Kincardine Waste Management Centre
### Municipality of Kincardine, Ontario

| Sample Location: | | OW48-13 | OW48-13 | | OW25R-13 | OW25R-13 | | Field Blank | Field Blank |
|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | OW48-13 | Field Duplicate | RPD | OW25R-13 | Field Duplicate | RPD | Field Blank | Field Blank |
| Sample Date: | | 5/18/2023 | 5/18/2023 Duplicate | | 11/8/2023 | 11/8/2023 Duplicate | | 5/18/2023 Field Blank | 11/8/2023 Field Blank |
| **Parameters** | **Units** | | | | | | | | |
| **Metals** | | | | | | | | | |
| Calcium (dissolved) | mg/L | 105 | 119 | 12.5% | 68.7 | 67.9 | 1.2% | 0.02 | 0.06 |
| Iron (dissolved) | mg/L | <0.007 | <0.007 | 0.0% | 0.199 | 0.154 | 25.5% | <0.007 | <0.007 |
| Magnesium (dissolved) | mg/L | 26.5 | 28.9 | 8.7% | 30.5 | 31.7 | 3.9% | 0.006 | 0.003 |
| Manganese (dissolved) | mg/L | 0.00067 | 0.00042 | 45.9% | 0.119 | 0.111 | 7.0% | <0.00001 | 0.00005 |
| Phosphorus (dissolved) | mg/L | <0.003 | <0.003 | 0.0% | 0.009 | 0.015 | 50.0% | <0.003 | <0.003 |
| Potassium (dissolved) | mg/L | 0.818 | 0.701 | 15.4% | 1.25 | 1.28 | 2.4% | <0.009 | <0.009 |
| Sodium (dissolved) | mg/L | 5.07 | 5.19 | 2.3% | 8.79 | 9.2 | 4.6% | <0.01 | 0.3 |
| **General Chemistry** | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 407 | 393 | 3.5% | 256 | 258 | 0.8% | <2 | 3 |
| Ammonia-N | mg/L | <0.1 | <0.1 | 0.0% | 0.1 | 0.1 | 0.0% | <0.1 | <0.1 |
| Chloride | mg/L | 9 | 9 | 0.0% | 32 | 32 | 0.0% | <1 | <1 |
| Conductivity | µS/cm | 760 | 690 | 9.7% | 586 | 582 | 0.7% | 5 | 4 |
| Dissolved organic carbon (DOC) | mg/L | 1 | 1 | 0.0% | 1 | 1 | 0.0% | <1 | <1 |
| Hardness | mg/L | 372 | 416 | 11.2% | 297 | 300 | 1.0% | 0.06 | 0.17 |
| Nitrate (as N) | mg/L | 1 | 1.03 | 3.0% | 0.08 | 0.07 | 13.3% | <0.06 | <0.06 |
| Nitrite (as N) | mg/L | <0.03 | <0.03 | 0.0% | <0.03 | <0.03 | 0.0% | <0.03 | <0.03 |
| pH | s.u. | 7.89 | 7.93 | 0.5% | 7.89 | 7.98 | 1.1% | 6.35 | 6.38 |
| Phenolics (total) | mg/L | <0.002 | <0.002 | 0.0% | <0.002 | <0.002 | 0.0% | <0.002 | <0.002 |
| Sulfate | mg/L | 6 | 4 | 40.0% | 23 | 26 | 12.2% | <2 | <2 |
| Total kjeldahl nitrogen (TKN) | mg/L | <0.5 | <0.5 | 0.0% | 0.8 | 0.7 | 13.3% | <0.5 | 0.6 |
| Un-ionized ammonia | mg/L | - | - | nc | - | - | nc | - | - |
| **Field Parameters** | | | | | | | | | |
| Conductivity, field | µS/cm | 707 | 707 | nc | 588 | 588 | nc | - | - |
| pH, field | s.u. | 7.4 | 7.4 | nc | 7.84 | 7.84 | nc | - | - |
| Temperature, field | Deg C | 11.49 | 11.49 | nc | 10.14 | 10.14 | nc | - | - |

Notes:

- \- Not meaured
- nc Not calculated

# Appendix H

## Historical Water Quality Results

**Appendix C.1**

**Historic Groundwater Elevations**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Monitoring Location | Ground Surface Elevation (mAMSL) | Reference Elevation (mAMSL) | 28-Aug-88 (mAMSL) | 2-Jan-89 (mAMSL) | 17-Jul-89 (mAMSL) | 30-Nov-89 (mAMSL) | 19-Jun-90 (mAMSL) | 18-Jul-90 (mAMSL) | 19-Apr-91 (mAMSL) | 6-Nov-91 (mAMSL) | 15-Jun-92 (mAMSL) | 3-Nov-92 (mAMSL) | 12-Apr-93 (mAMSL) | 26-Oct-93 (mAMSL) | 11-Apr-94 (mAMSL) | 21-Oct-94 (mAMSL) | 7-Apr-95 (mAMSL) | 20-Oct-95 (mAMSL) | 12-Jun-96 (mAMSL) | 11-Nov-96 (mAMSL) | 6-May-97 (mAMSL) | 18-Nov-97 (mAMSL) | 12-May-98 (mAMSL) | 15-Dec-98 (mAMSL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OW2-83 [1] | 256.70 | 257.13 | <254.29 | - | 255.28 | 256.41 | 255.47 | 255.24 | 256.56 | 255.39 | 256.16 | 256.61 | 256.66 | 256.45 | 256.80 | 256.13 | 255.32 | - | 255.93 | 255.85 | 255.98 | 255.51 | 255.13 | 255.26 |
| OW3-83 | 256.86 | 257.88 | <252.05 | 253.74 | 253.08 | 253.78 | 253.24 | 252.99 | 253.47 | 252.67 | 254.09 | 253.50 | 253.72 | 253.65 | 253.53 | 253.48 | 252.62 | 252.6 | 252.9 | 253.03 | 252.81 | 252.69 | 252.59 | 252.61 |
| OW4-83 | 254.45 | 255.49 | <249.24 | 250.99 | <249.24 | 251.02 | <249.24 | <249.24 | 251.35 | 250.31 | dry | 251.99 | 252.44 | 252.15 | 252.07 | 251.29 | 249.13 | 248.87 | 250.35 | 250.09 | 250.02 | 249.3 | 248.98 | 249.51 |
| OW6-83 | 255.80 | 256.66 | 255.55 | 255.53 | - | 255.55 | 255.42 | 255.47 | 255.44 | 255.45 | 255.22 | 255.40 | 255.37 | 255.34 | 255.38 | 255.37 | 254.95 | 254.98 | 255.03 | 254.97 | 255.02 | 254.95 | 254.98 | 254.93 |
| OW7-83 | 257.76 | 258.40 | 257.15 | - | 257.33 | >257.64 | >257.64 | 257.54 | >257.64 | 257.29 | 257.36 | 257.50 | 257.77 | 257.32 | 257.60 | 257.30 | 256.69 | 256.23 | 256.84 | 256.4 | 256.97 | 256.35 | 256.56 | 256.23 |
| OW8-88 | 255.77 | 256.53 | 252.89 | - | 253.22 | 254.41 | 253.51 | 253.47 | 254.41 | 253.93 | 254.44 | 255.59 | 255.53 | 255.45 | 255.49 | 255.28 | 254.25 | 253.59 | 254.54 | 254.35 | 254.49 | 254.22 | 254.16 | 253.87 |
| OW9-88 | 258.13 | 259.01 | 258.04 | - | 258.09 | 257.96 | 258.28 | 258.23 | 258.57 | 258.03 | 258.35 | 258.02 | 258.27 | 258.17 | 258.22 | 258.02 | ICE@ 0.93 | 257.67 | 258.08 | 258.09 | 258.39 | 257.85 | 258.1 | 257.5 |
| OW10-88 [1] [2] | 252.85 | 253.88 | 251.63 | 253.22 | 252.64 | 253.14 | 253.17 | 253.17 | 253.20 | 253.12 | 253.44 | 253.12 | 253.16 | 253.07 | 253.19 | 253.16 | 252.82 | 252.32 | 252.87 | 252.86 | 252.87 | 252.65 | 252.78 | 252.15 |
| OW11-88 [1] [2] | 252.05 | 252.71 | 251.41 | - | - | NR | 251.78 | 251.87 | 251.97 | 251.95 | 252.09 | 251.75 | 251.78 | 251.74 | 251.78 | 251.74 | 251.54 | 251.32 | 251.5 | 251.5 | 251.52 | 251.48 | 251.46 | 251.23 |
| OW12-88 [1] [2] | 250.05 | 250.73 | 248.89 | 249.98 | - | 249.88 | 249.24 | 249.26 | 249.99 | 249.51 | dry | 249.69 | 249.82 | 249.69 | 249.82 | 249.64 | 249.5 | 248.92 | 249.62 | 249.5 | 249.53 | 249.17 | 249.3 | 248.78 |
| OW13-88 [1] [2] | 254.97 | 255.87 | 253.67 | 254.75 | 254.16 | 254.52 | 254.31 | 254.13 | 254.93 | 253.79 | 254.35 | 254.54 | 254.88 | 254.31 | 254.86 | 254.16 | 254.63 | - | 254.71 | 254.42 | 254.69 | DRY | 254.52 | dry |
| OW14-88 [2] | 256.66 | 257.70 | <254.82 | 255.15 | 255.47 | NR | 255.10 | <254.82 | 256.01 | 255.00 | 255.30 | dry | 255.81 | 254.93 | 255.46 | dry | 255.04 | - | 255.35 | DRY | 255.38 | DRY | 255 | dry |
| OW15-88 [1] | 258.32 | 258.73 | - | <256.28 | <256.28 | <256.28 | 256.49 | <256.49 | <256.49 | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed |
| OW16-89 | 263.66 | 264.63 | - | - | 259.06 | 258.31 | 259.46 | 257.46 | 256.42 | 260.07 | IA | 258.33 | 257.52 | 258.17 | 260.42 | 258.19 | 258.31 | 257.66 | 258.56 | 257.94 | 258.79 | 257.77 | 258.46 | 257.54 |
| OW17-89 | 263.77 | - | | | | | | | | | | | | | | | | | | | | | | |
| OW18-89 | 265.52 | 264.66 | - | - | <257.59 | NR | <257.59 | <257.59 | 260.28 | 257.59 | dry | dry | 259.65 | dry | 259.44 | dry | - | - | - | DRY | 259.38 | - | dry | dry |
| OW19-89 | 252.79 | 253.71 | - | - | 260.02 | 259.50 | 260.35 | 260.16 | 260.77 | 259.67 | 258.91 | 258.48 | 259.41 | 258.66 | 259.22 | 258.66 | 259.58 | 258.76 | 259.51 | 258.93 | 259.83 | 258.73 | 259.48 | dry |
| OW20-89 | 257.64 | 258.40 | - | - | 241.73 | 243.92 | 242.63 | 242.54 | 243.22 | 242.50 | 241.49 | 241.74 | 241.85 | 241.77 | 242.10 | 241.62 | 242.23 | 241.91 | 242.1 | 242.55 | 242.34 | 242.05 | 242.17 | 243.08 |
| OW21-89 | 252.84 | 253.74 | - | - | 252.26 | 250.98 | 252.70 | 252.36 | 253.53 | 251.22 | 252.60 | 251.46 | 252.92 | 251.56 | 252.35 | 251.66 | 252.35 | 251.05 | 252.73 | 251.54 | 253.08 | 251.13 | 252.47 | 250.72 |
| OW22-98 [1] | 265.41 | 266.38 | - | - | 251.88 | 252.15 | 252.12 | 252.04 | 252.46 | 252.08 | 251.98 | 252.02 | 252.24 | 252.12 | 252.17 | 252.04 | 251.83 | 251.45 | 251.79 | 251.83 | 252.17 | 251.96 | 252.05 | 251.29 |
| OW23-98 | 263.36 | 264.08 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 258.47 |
| OW24-98 | 258.62 | 259.50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 258.29 |
| OW25-00 [2] | 255.09 | 255.85 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 257.62 |
| OW25R-13 | 255.21 | 256.00 | | | | | | | | | | | | | | | | | | | | | | |
| OW26-00 [2] | 248.22 | 249.22 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW27-00 | 246.88 | 247.78 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW28-00 | 249.96 | 250.78 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW29-07 | 255.50 | 256.27 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW30-07 | 254.19 | 255.06 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW31-07 | 256.00 | 256.89 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW32-07 | 253.99 | 254.77 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW33-07 | 258.45 | 259.27 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW34-09 | 258.31 | 258.99 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW35-09 [2] | 254.49 | 255.20 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW36-09 | 262.90 | 263.75 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW37-09 | 252.03 | 252.90 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW39-09 [2] [3] | 257.44 | 258.33 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW40-09 [2] | 260.29 | 261.02 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW41-09 [2] | 261.98 | 262.80 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW42-09 [2] | 252.30 | 253.12 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW43-09 | 255.91 | 256.69 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW45-13 | 254.62 | 255.25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW46A-13 | 251.76 | 252.62 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW46B-13 | 251.77 | 252.63 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW47-13 | 254.24 | 255.08 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW48-13 | 257.49 | 258.33 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW49-13 | 260.66 | 261.50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW50-13 | 264.66 | 265.35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MP1-13 | ns | ns | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MP2-13 | ns | ns | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MP3-13 | ns | ns | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MP4-13 | ns | ns | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

[1] Elevation data was obtained from the 2008 Annual Monitoring Report (Pryde, 2008). The remaining data was surveyed by GHD in April 2009.
[2] Monitoring locations have been abandoned/destroyed (mid-2011) as part of the landfill expansion program.
[3] Monitoring well OW39-09 and OW34-09 were reportedly destroyed prior to the fall 2010 and 2013 sampling events.
mBTOR - metres below top of riser
mAMSL - metres Above Mean Sea Level.
- No Information available.
na No access.
ns Not surveyed.

**Appendix C.1**

**Historic Groundwater Elevations**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Monitoring Location | Ground Surface Elevation (mAMSL) | Reference Elevation (mAMSL) | 8-Jun-99 (mAMSL) | 14-Dec-99 (mAMSL) | 27-Jun-00 (mAMSL) | 23-Nov-00 (mAMSL) | 28-Jun-01 (mAMSL) | 13-Dec-01 (mAMSL) | 12-Jun-02 (mAMSL) | 29-Oct-02 (mAMSL) | 5-May-03 (mAMSL) | 14-Nov-03 (mAMSL) | 11-May-04 (mAMSL) | 9-Nov-04 (mAMSL) | 4-Jul-05 (mAMSL) | 17-Nov-05 (mAMSL) | 3-May-06 (mAMSL) | 3-Dec-06 (mAMSL) | 10-Jun-07 (mAMSL) | 14-Oct-07 (mAMSL) | 2-Aug-08 (mAMSL) | 28-Dec-08 (mAMSL) | Groundwater Elevation Gro 30-Apr-09 (mAMSL) | 19-Nov-09 (mAMSL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OW2-83 [1] | 256.70 | 257.13 | 254.99 | 255.38 | 254.99 | 254.39 | 254.84 | 254.59 | 255.09 | dry | 255.9 | 255.89 | 255.94 | 255.15 | dry | 254.61 | 254.78 | 256.14 | 254.54 | dry | dry | dry | 255.94 | 255.09 |
| OW3-83 | 256.86 | 257.88 | 252.54 | 252.8 | 252.53 | (10) | 252.46 | dry | 252.54 | 252.05 | 252.72 | 252.86 | 252.68 | 252.6 | dry | 252.77 | dry | 253.26 | 252.02 | dry | 252.37 | 252.59 | 256.81 | 256.62 |
| OW4-83 | 254.45 | 255.49 | 248.86 | 249.81 | 248.89 | 249.68 | 248.78 | 249.47 | 248.91 | 248.85 | 249.65 | 250.03 | 249.93 | 249.25 | dry | 249.24 | 249.04 | 250.25 | 248.89 | dry | dry | 250.45 | - | 253.18 |
| OW6-83 | 255.80 | 256.66 | 254.82 | 254.94 | 254.89 | (10) | (10) | 254.94 | 254.89 | 254.72 | 254.85 | 254.96 | 255.05 | 254.96 | 254.85 | 255.11 | 255.03 | 255.12 | 255.04 | 255.04 | 254.99 | 255 | 255.75 | 255.78 |
| OW7-83 | 257.76 | 258.40 | 256.27 | 256.32 | 256.27 | 256.25 | 256.45 | 256.41 | 256.63 | 256.2 | 256.65 | 256.59 | 256.73 | 256.42 | 256.02 | 256.44 | 256.75 | 256.66 | 256.38 | 256.14 | 256.41 | 257.09 | 257.71 | 257.28 |
| OW8-88 | 255.77 | 256.53 | 253.58 | 254.22 | 253.83 | 254.23 | 253.55 | 254.45 | 253.83 | 253.13 | 254.51 | 254.45 | 254.51 | 253.82 | 252.92 | 253.82 | 253.99 | 254.47 | 253.62 | 253.18 | 253.26 | 254.54 | 255.67 | 254.78 |
| OW9-88 | 258.13 | 259.01 | 257.56 | 257.34 | 257.62 | 257.31 | 257.88 | 257.73 | 257.99 | 257.28 | 257.84 | 257.9 | 257.89 | 257.78 | 257.49 | 257.6 | 258.24 | 257.97 | 257.4 | 257.63 | 257.15 | 258.33 | 258.56 | 258.18 |
| OW10-88 [1] [2] | 252.85 | 253.88 | 252.34 | 252.32 | 252.41 | 252.61 | 252.6 | 252.78 | 252.75 | 252.36 | 252.67 | 252.65 | 252.73 | 252.54 | 251.83 | 252.7 | 252.74 | 252.74 | 251.83 | 252.26 | 251.78 | 252.83 | 252.82 | 252.68 |
| OW11-88 [1] [2] | 252.05 | 252.71 | 251.17 | 251.35 | 251.24 | 251.42 | 251.4 | 251.46 | 251.47 | 251.15 | 251.39 | 251.43 | 251.02 | 251.42 | 251.36 | 251.5 | 251.51 | 251.52 | 251.39 | 251.2 | 250.99 | 251.55 | 251.56 | 251.45 |
| OW12-88 [1] [2] | 250.05 | 250.73 | 248.73 | 249.02 | 248.76 | 249.16 | 248.94 | 249.3 | 249.36 | dry | 249.41 | 249.35 | 249.44 | 249.14 | 248.82 | 249.23 | 249.18 | 249.55 | dry | dry | dry | 249.63 | 249.48 | 248.98 |
| OW13-88 [1] [2] | 254.97 | 255.87 | dry | dry | dry | dry | 254.07 | 254.29 | 254.48 | 254.24 | 254.29 | 254.39 | 254.61 | 253.79 | 253.62 | 254.07 | 254.55 | 254.47 | 253.69 | dry | dry | 254.73 | 254.74 | dry |
| OW14-88 [2] | 256.66 | 257.70 | dry | dry | dry | dry | 254.75 | dry | 254.88 | dry | dry | dry | 255.43 | dry | dry | dry | 255.28 | dry | dry | dry | dry | 255.14 | 255.99 | - |
| OW15-88 [1] | 258.32 | 258.73 | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed |
| OW16-89 | 263.66 | 264.63 | 257.53 | 257.29 | 257.46 | 257.27 | bent | 257.75 | 258.04 | 257.39 | 257.76 | 257.75 | damaged | damaged | 257.68 | 257.66 | 258.61 | 258.34 | 257.61 | 257.52 | 258.17 | 259.16 | 259.39 | 264.35 |
| OW17-89 | 263.77 | - | | | | | | | | | | | | | | | | | | | | | | |
| OW18-89 | 265.52 | 264.66 | dry | dry | dry | (10) | dry | dry | dry | dry | dry | dry | 259.18 | dry | dry | dry | dry | dry | dry | dry | dry | dry | dry | - |
| OW19-89 | 252.79 | 253.71 | 258.9 | dry | 259.07 | 258.57 | 259.29 | 258.98 | 259.45 | 258.66 | 259.18 | 259.08 | 259.8 | 258.97 | 258.89 | 258.68 | 259.75 | 259.13 | 258.8 | 258.67 | 259.14 | 259.36 | 247.47 | - |
| OW20-89 | 257.64 | 258.40 | 243.11 | 244.94 | 243.7 | 243.86 | 242.66 | 243.37 | 242.92 | 241.41 | 245.97 | 246.32 | 249.57 | 249.79 | 244.81 | NR | 249.75 | 250.96 | 247.27 | 241.76 | 245.41 | 251.91 | 256.97 | 248.71 |
| OW21-89 | 252.84 | 253.74 | 250.74 | 250.8 | 250.54 | 250.91 | 252.24 | 251.51 | 252.42 | dry | 251.65 | 251.33 | 253.02 | 251.33 | 250.93 | 250.81 | 253.1 | 251.79 | 251.85 | 251.05 | 252.13 | 252.02 | 249.09 | 246.82 |
| OW22-98 [1] | 265.41 | 266.38 | 251.45 | 251.78 | 251.47 | 251.69 | - | 251.72 | 251.72 | 251 | 251.55 | 251.78 | 251.81 | 251.6 | 251.91 | 252.51 | 252.49 | 251.91 | 251.98 | 251.14 | 251.2 | 251.9 | 264.82 | 264.64 |
| OW23-98 | 263.36 | 264.08 | 258.76 | 258.39 | 258.96 | 258.54 | 259.14 | 258.85 | 259.1 | 258.45 | 259.03 | 258.87 | 259.61 | 258.81 | 258.68 | 258.49 | 259.5 | 258.66 | 259.36 | 258.59 | 259.09 | 259 | 257.77 | 256.58 |
| OW24-98 | 258.62 | 259.50 | 258.45 | 257.63 | 258.6 | 258.31 | 258.67 | 258.56 | 258.77 | 258.34 | 258.81 | 258.6 | 259.03 | 258.49 | 258.21 | 258.44 | 259 | 258.58 | 258.12 | 258.32 | 258.52 | 259.15 | 254.28 | 253.45 |
| OW25-00 [2] | 255.09 | 255.85 | 257.83 | 257.81 | 257.91 | 257.66 | 257.78 | 258.03 | 257.9 | 257.14 | 258.13 | 258.05 | 258.68 | 257.58 | 257.26 | 257.23 | 258.23 | 257.89 | 257.92 | 257.14 | 257.82 | 258.47 | 254.39 | 253.79 |
| OW25R-13 | 255.21 | 256.00 | | | | | | | | | | | | | | | | | | | | | | |
| OW26-00 [2] | 248.22 | 249.22 | - | - | - | 252.14 | 252.5 | 252.5 | 252.66 | 250.99 | 252.74 | 252.49 | 253.17 | 252 | 251.74 | 251.59 | lock stuck | lock stuck | 251.75 | 251.17 | 252.22 | 252.65 | 246.73 | 245.34 |
| OW27-00 | 246.88 | 247.78 | - | - | - | 245.82 | 247.34 | 247.24 | 247.29 | 246.84 | 247.51 | 247.61 | 247.75 | 244.32 | 246.91 | 246.95 | 247.81 | 247.6 | 247.83 | 245.91 | 245.9 | 247.68 | 246.56 | 246.29 |
| OW28-00 | 249.96 | 250.78 | - | - | - | 246.88 | 246.82 | 246.92 | 246.9 | 246.72 | 246.93 | 246.92 | 246.94 | 245.5 | 246.27 | 245.99 | lock stuck | 246.94 | 246.94 | 246.85 | 246.88 | 246.88 | 249.88 | 249.86 |
| OW29-07 | 255.50 | 256.27 | - | - | - | 249.12 | 248.7 | 249.11 | 248.82 | 247.17 | 249.32 | 249.31 | 249.24 | 247.14 | 247.69 | 247.87 | 249.01 | 249.37 | 247.93 | 247.33 | 248.34 | 249.34 | 254.85 | 254.26 |
| OW30-07 | 254.19 | 255.06 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 252.09 | 250.67 |
| OW31-07 | 256.00 | 256.89 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 252.90 | 252.28 |
| OW32-07 | 253.99 | 254.77 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 253.40 | 253.39 |
| OW33-07 | 258.45 | 259.27 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 256.68 | 256.89 |
| OW34-09 | 258.31 | 258.99 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 255.48 | 253.77 |
| OW35-09 [2] | 254.49 | 255.20 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 254.51 | 254.07 |
| OW36-09 | 262.90 | 263.75 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 257.25 | 257.25 |
| OW37-09 | 252.03 | 252.90 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 248.44 | 247.25 |
| OW39-09 [2] [3] | 257.44 | 258.33 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 257.35 | 256.32 |
| OW40-09 [2] | 260.29 | 261.02 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 259.39 | 258.31 |
| OW41-09 [2] | 261.98 | 262.80 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 260.01 | 258.67 |
| OW42-09 [2] | 252.30 | 253.12 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 251.01 | 250.23 |
| OW43-09 | 255.91 | 256.69 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 254.68 | 252.95 |
| OW45-13 | 254.62 | 255.25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW46A-13 | 251.76 | 252.62 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW46B-13 | 251.77 | 252.63 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW47-13 | 254.24 | 255.08 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW48-13 | 257.49 | 258.33 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW49-13 | 260.66 | 261.50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OW50-13 | 264.66 | 265.35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MP1-13 | ns | ns | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MP2-13 | ns | ns | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MP3-13 | ns | ns | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MP4-13 | ns | ns | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

[1] Elevation data was obtained from the 2008 Annual Monitoring Report (Pryde, 2008). The remaining data was surveyed by GHD in April 2009.
[2] Monitoring locations have been abandoned/destroyed (mid-2011) as part of the landfill expansion program.
[3] Monitoring well OW39-09 and OW34-09 were reportedly destroyed prior to the fall 2010 and 2013 sampling events.
mBTOR - metres below top of riser
mAMSL - metres Above Mean Sea Level.
- No Information available.
na No access.
ns Not surveyed.

**Appendix C.1**

**Historic Groundwater Elevations**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Monitoring Location | Ground Surface Elevation (mAMSL) | Reference Elevation (mAMSL) | Groundwater Elevation 12-May-10 (mAMSL) | 1-Dec-10 (mAMSL) | 24-May-11 (mAMSL) | 22-Nov-11 (mAMSL) | 22-Apr-12 (mAMSL) | 26-Nov-12 (mAMSL) | 13-May-13 (mAMSL) | 22-Oct-13 (mAMSL) | 15-Jun-14 (mAMSL) | 30-Oct-14 (mAMSL) | 8-Jun-15 (mAMSL) | 16-Nov-15 (mAMSL) | 26-Apr-16 (mAMSL) | 3-Nov-16 (mAMSL) | 10-Apr-17 (mAMSL) | 24-Nov-17 (mAMSL) | 18-May-18 (mAMSL) | 3-Nov-18 (mAMSL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OW2-83 [1] | 256.70 | 257.13 | 255.07 | 256.16 | 256.15 | 255.42 | Blocked | 254.63 | 255.77 | 254.87 | 255.11 | 255.52 | 254.99 | 255.19 | 255.76 | 254.21 | 256.16 | 256.16 | 256.02 | 255.35 |
| OW3-83 | 256.86 | 257.88 | 256.62 | 256.93 | 257.42 | 256.74 | 256.64 | 256.64 | 256.63 | 256.68 | 256.28 | 256.64 | 256.54 | 256.66 | 256.63 | Dry | 256.88 | Dry | 256.72 | Dry |
| OW4-83 | 254.45 | 255.49 | 253.14 | 254.39 | 254.33 | 253.24 | 253.17 | 253.24 | 253.09 | 253.18 | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry |
| OW6-83 | 255.80 | 256.66 | 255.69 | 255.88 | 255.94 | 255.87 | 255.88 | 255.90 | 255.96 | 256.12 | 255.90 | 255.87 | 255.86 | 255.49 | 255.97 | 256.05 | 255.87 | 255.87 | 255.89 | 255.90 |
| OW7-83 | 257.76 | 258.40 | 257.28 | 257.74 | 257.87 | 257.37 | 257.52 | 257.40 | 257.65 | 257.44 | 257.56 | 257.37 | 256.85 | 257.30 | 257.79 | 257.06 | 257.64 | 257.64 | 257.86 | 257.60 |
| OW8-88 | 255.77 | 256.53 | 254.95 | 255.71 | 255.79 | 255.16 | 255.26 | 254.95 | 255.45 | 255.13 | 254.71 | 255.17 | 254.56 | 255.11 | 255.59 | 254.67 | 255.75 | 255.75 | 255.47 | 255.29 |
| OW9-88 | 258.13 | 259.01 | 258.02 | 258.27 | 258.49 | 257.75 | 257.59 | Dry | 256.53 | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry |
| OW10-88 [1] [2] | 252.85 | 253.88 | 252.63 | 252.80 | 252.80 | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned |
| OW11-88 [1] [2] | 252.05 | 252.71 | 251.49 | 251.54 | 251.54 | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned |
| OW12-88 [1] [2] | 250.05 | 250.73 | 248.95 | 249.55 | 249.57 | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned |
| OW13-88 [1] [2] | 254.97 | 255.87 | dry | 254.28 | dry | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned |
| OW14-88 [2] | 256.66 | 257.70 | dry | dry | 255.97 | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned |
| OW15-88 [1] | 258.32 | 258.73 | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed | destroyed |
| OW16-89 | 263.66 | 264.63 | 258.17 | 258.27 | 259.01 | 258.00 | 257.81 | 256.38 | 257.06 | 256.24 | 256.53 | 256.04 | 256.10 | 255.73 | 256.59 | 255.82 | 256.34 | 256.16 | 256.79 | 256.12 |
| OW17-89 | 263.77 | - | dry | dry | 4.82 mbtor | dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry |
| OW18-89 | 265.52 | 264.66 | 264.14 | 257.07 | 258.12 | dry | 257.56 | 256.89 | 258.24 | 257.13 | 258.02 | 257.21 | 257.47 | 256.87 | 258.33 | 256.94 | - | 257.42 | 258.38 | 257.27 |
| OW19-89 | 252.79 | 253.71 | 243.99 | 245.74 | 246.13 | 244.87 | 244.80 | 244.91 | 245.82 | 245.24 | 246.41 | 246.85 | 245.86 | 245.70 | 246.79 | 242.08 | 249.22 | 249.67 | 249.82 | 251.13 |
| OW20-89 | 257.64 | 258.40 | 251.83 | 251.21 | 253.22 | 251.96 | bent | destroyed | bent | destroyed | No Access | No access | No Access | No access | No access | No access | No access | No access | No access | No access |
| OW21-89 | 252.84 | 253.74 | 251.85 | 252.02 | 252.11 | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned |
| OW22-98 [1] | 265.41 | 266.38 | 258.84 | 258.75 | 259.78 | 258.96 | 259.26 | 258.63 | 259.91 | 260.35 | 259.69 | 258.93 | 259.20 | 258.61 | 260.01 | 258.71 | - | 260.67 | 260.03 | 258.97 |
| OW23-98 | 263.36 | 264.08 | 258.11 | 258.11 | 258.73 | 258.08 | 258.36 | 257.98 | 258.75 | 256.52 | 258.58 | 258.11 | 258.28 | 257.93 | 258.87 | 257.95 | 258.37 | 258.37 | 258.89 | 258.09 |
| OW24-98 | 258.62 | 259.50 | 257.61 | 257.63 | 258.00 | 257.68 | 257.75 | 257.50 | 257.92 | 257.15 | 257.75 | 257.56 | 257.62 | 257.31 | 257.98 | 257.30 | - | - | 258.02 | 257.44 |
| OW25-00 [2] | 255.09 | 255.85 | 252.22 | 252.20 | 253.29 | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned |
| OW25R-13 | 255.21 | 256.00 | | | - | - | - | - | - | 251.72 | 251.92 | 251.76 | 251.59 | 251.45 | 252.25 | 251.28 | 252.14 | 251.95 | 252.16 | 251.54 |
| OW26-00 [2] | 248.22 | 249.22 | 247.64 | 247.96 | 248.04 | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned |
| OW27-00 | 246.88 | 247.78 | 246.86 | 246.88 | 246.89 | 246.88 | 246.92 | 246.93 | 246.88 | 246.95 | 246.97 | 246.97 | 246.95 | 246.98 | 246.97 | 246.81 | 246.98 | 247.01 | 246.98 | 247.04 |
| OW28-00 | 249.96 | 250.78 | 248.82 | 249.59 | 249.53 | 249.00 | 248.94 | 248.47 | 249.08 | 248.69 | 248.59 | 249.01 | 248.40 | 248.75 | 249.18 | 247.97 | 249.47 | - | 249.28 | 248.91 |
| OW29-07 | 255.50 | 256.27 | 252.71 | 253.44 | 253.36 | 252.11 | 252.72 | 250.13 | 252.80 | 250.63 | 252.70 | 253.33 | 252.87 | 253.64 | 253.71 | 250.70 | 253.96 | 253.96 | 253.59 | 253.84 |
| OW30-07 | 254.19 | 255.06 | 250.66 | 250.97 | 251.38 | 250.06 | 250.81 | 247.21 | 249.65 | 249.97 | 250.78 | 251.27 | 251.15 | 251.72 | 252.02 | 249.02 | 253.20 | 253.20 | 252.92 | 252.62 |
| OW31-07 | 256.00 | 256.89 | 255.49 | 255.57 | 255.55 | 255.56 | 255.53 | 255.56 | 255.57 | 255.67 | 255.57 | 255.65 | 255.57 | 255.67 | 255.63 | 255.66 | 255.67 | 255.67 | 255.60 | 255.70 |
| OW32-07 | 253.99 | 254.77 | 252.14 | 252.47 | 252.19 | 252.46 | 252.18 | 252.39 | 252.12 | 252.47 | 252.16 | 252.50 | 252.18 | 252.48 | 251.21 | 252.51 | 252.53 | 252.53 | 252.16 | 252.54 |
| OW33-07 | 258.45 | 259.27 | 254.39 | 254.51 | 255.70 | 254.79 | 254.78 | 253.98 | 255.50 | 253.91 | 254.97 | 254.13 | 254.32 | 253.52 | 255.50 | 253.38 | - | 254.64 | 255.54 | 253.86 |
| OW34-09 | 258.31 | 258.99 | 257.76 | 257.94 | 258.31 | na | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned |
| OW35-09 [2] | 254.49 | 255.20 | 248.69 | 248.57 | 249.38 | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned |
| OW36-09 | 262.90 | 263.75 | 257.96 | 257.99 | 258.75 | 257.87 | 257.69 | 256.49 | 257.14 | 256.41 | 256.52 | 256.30 | 256.11 | 255.73 | 256.57 | 255.86 | 256.35 | 256.14 | 256.83 | 256.16 |
| OW37-09 | 252.03 | 252.90 | 244.23 | 245.43 | 244.61 | 244.24 | 244.41 | 244.25 | 244.51 | 244.42 | 244.43 | 243.92 | 244.37 | 244.31 | 244.55 | 244.10 | 244.56 | 244.48 | 244.45 | 244.29 |
| OW39-09 [2] [3] | 257.44 | 258.33 | 256.24 | Broken | damaged | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned |
| OW40-09 [2] | 260.29 | 261.02 | 258.22 | 258.32 | 259.15 | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned |
| OW41-09 [2] | 261.98 | 262.80 | 258.56 | 258.55 | 259.59 | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned |
| OW42-09 [2] | 252.30 | 253.12 | 250.22 | 250.65 | 250.97 | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned | abandoned |
| OW43-09 | 255.91 | 256.69 | 253.06 | 253.09 | 254.72 | 253.42 | 253.58 | 252.91 | 254.29 | 252.79 | 253.52 | 252.65 | 252.81 | 252.28 | 253.79 | 252.35 | 253.40 | - | gone/destroyed | gone/destroyed |
| OW45-13 | 254.62 | 255.25 | - | - | - | - | - | - | - | 252.08 | 251.79 | 251.97 | 251.75 | 251.97 | 252.00 | 251.85 | 252.25 | 252.15 | 252.05 | 252.06 |
| OW46A-13 | 251.76 | 252.62 | - | - | - | - | - | - | - | 246.06 | 246.65 | 246.44 | 245.89 | 246.19 | 247.10 | 245.94 | 246.98 | 246.70 | 247.03 | 246.39 |
| OW46B-13 | 251.77 | 252.63 | - | - | - | - | - | - | - | 249.65 | 250.27 | 250.00 | 250.37 | 249.68 | 251.14 | 249.10 | 251.00 | 250.47 | 251.02 | 249.97 |
| OW47-13 | 254.24 | 255.08 | - | - | - | - | - | - | - | 248.98 | 249.37 | 248.65 | 248.97 | 248.77 | 249.35 | 248.82 | 249.22 | 249.06 | 249.36 | 249.05 |
| OW48-13 | 257.49 | 258.33 | - | - | - | - | - | - | - | 254.55 | 254.95 | 254.72 | 254.88 | 254.54 | 255.01 | 254.40 | 255.01 | 254.95 | 255.03 | 254.90 |
| OW49-13 | 260.66 | 261.50 | - | - | - | - | - | - | - | 256.17 | 256.62 | 256.29 | 256.49 | 256.04 | 256.71 | 256.15 | 256.64 | 256.53 | 256.67 | 256.42 |
| OW50-13 | 264.66 | 265.35 | - | - | - | - | - | - | - | 257.86 | 258.63 | 257.93 | 258.11 | 257.57 | 258.75 | 257.78 | 258.00 | 258.00 | 258.95 | 258.11 |
| MP1-13 | ns | ns | - | - | - | - | - | - | - | 1.30 mBTOR | 1.34 mBTOR | 1.30 mBTOR | 1.35 mBTOR | 1.27 mBTOR | 1.12 mBTOR | nm | - | 1.2 mBTOR | 1.05 mBTOR | 1.13 mBTOR |
| MP2-13 | ns | ns | - | - | - | - | - | - | - | 1.10 mBTOR | 1.02 mBTOR | 1.10 mBTOR | 1.06 mBTOR | 1.13 mBTOR | 1.17 mBTOR | 1.2 mBTOR | - | 1.02 mBTOR | 0.92 mBTOR | 0.91 mBTOR |
| MP3-13 | ns | ns | - | - | - | - | - | - | - | 1.80 mBTOR | 1.21 mBTOR | Dry | 1.08 mBTOR | 1.14 mBTOR | nm | 1.18 mBTOR | - | 1.72 mBTOR | 0.58 mBTOR | 0.81 mBTOR |
| MP4-13 | ns | ns | - | - | - | - | - | - | - | 1.58 mBTOR | dry | Dry | 1.89 mBTOR | 1.36 mBTOR | 1.27 mBTOR | 1.32 mBTOR | - | 1.19 mBTOR | destroyed | destroyed |

Notes:

(1) Elevation data was obtained from the 2008 Annual Monitoring Report (Pryde, 2008). The remaining data was surveyed by GHD in April 2009.
(2) Monitoring locations have been abandoned/destroyed (mid-2011) as part of the landfill expansion program.
(3) Monitoring well OW39-09 and OW34-09 were reportedly destroyed prior to the fall 2010 and 2013 sampling events.

mBTOR - metres below top of riser
mAMSL - metres Above Mean Sea Level.
- No Information available.
na No access.
ns Not surveyed.

**Appendix C.2**

**OW2-83**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *30-Nov-89* | *18-Jul-90* | *6-May-91* | *15-Jun-92* | *3-Nov-92* | *12-Apr-93* | *26-Oct-93* | *11-Apr-94* | *24-Oct-94* | *10-Apr-95* | *13-Jun-96* | *13-Jun-96* | *7-May-97* | *20-Nov-97* | *12-May-98* | *12-May-98* | *16-Dec-98* | *16-Dec-98* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 266 | - | - | 425 | 515 | 566 | 305 | 482 | 444 | 411.0 | 506.0 | - | 473.0 | 534.0 | 492.0 | 491.0 | 294.0 | 296.0 |
| Calcium | 101 | 127 | 143 | 158 | 98.9 | 152 | 105 | 161 | 114 | 153.0 | 163.0 | 163.0 | 147.0 | 148.0 | 143.0 | 141.0 | 98.5 | 97.3 |
| Chloride | 5.7 | 6.5 | 4.3 | 4.6 | 3.7 | 4.3 | u*93.4 | 5.2 | 3.9 | 3.2 | 3.4 | 3.4 | 3.0 | 1.3 | 1.2 | 1.2 | 0.8 | 0.8 |
| Dissolved Organic Carbon (DOC) | 2.8 | 2.4 | 3.7 | 7.5 | 14.7 | 3.5 | 4.0 | 2.6 | 11.6 | 5.1 | 1.8 | - | 1.2 | 1.3 | 2.0 | 1.8 | 1.6 | 1.6 |
| Hardness | 380 | 483 | 542 | 611 | 500 | 599 | 483 | 603 | 503 | 582.0 | 590.0 | - | 525.0 | 552.0 | 518.0 | 513.0 | 355.0 | 353.0 |
| Iron | 0.88 | - | - | 0.03 | 0.67 | 0.5 | 0.26 | 0.20 | 0.73 | 0.7 | 0.4 | - | 0.0 | 0.0 | 0.2 | 0.2 | nd | nd |
| Magnesium | 31.0 | 40.1 | 44.9 | 52.5 | 61.4 | 52.7 | 53.2 | 49.0 | 52.4 | 48.2 | 44.5 | 44.1 | 39.9 | 44.5 | 39.3 | 39.2 | 26.6 | 26.7 |
| Manganese | - | - | - | 0.358 | 0.648 | 0.498 | 0.284 | 0.426 | 0.791 | 2.4 | 0.6 | - | 1.0 | 0.3 | 0.5 | 0.5 | nd | nd |
| Ammonia | 0.092 | - | - | 0.028 | 0.8 | 0.105 | 0.075 | 0.043 | 0.157 | 0.1 | 0.3 | - | 0.1 | 0.0 | 0.1 | 0.0 | nd | nd |
| Unionized Ammonia | | | | | | | | | | | | | | | | | | |
| Nitrite | 0.02 | - | - | <0.01 | 0.01 | <0.01 | <0.01 | 0.01 | 0.01 | 0.0 | <0.03 | <0.03 | - | - | nd | nd | nd | nd |
| Nitrate | 0.7 | - | - | <0.1 | <0.1 | 0.1 | <0.1 | 0.2 | 0.1 | <0.01 | 0.1 | 0.1 | 0.0 | - | 0.1 | 0.1 | 0.1 | 0.1 |
| Potassium | 1.1 | - | - | 0.7 | 1.2 | 0.4 | 0.7 | 0.5 | 0.87 | 0.5 | <1.0 | <1.0 | - | - | nd | nd | nd | nd |
| Sodium | 6.24 | - | - | 6.0 | 7.6 | 5.8 | 6.4 | 5.4 | 6.3 | 5.4 | 5.3 | 5.3 | 5.2 | 5.2 | 4.3 | 4.3 | 4.6 | 4.4 |
| Sulphate | 140 | - | - | 73.5 | 64.5 | 56.0 | 61.1 | 41.4 | 38.4 | 34.3 | 35.4 | - | 25.0 | 31.1 | 23.0 | 24.3 | 51.6 | 51.3 |
| Total Kjeldahl Nitrogen (TKN) | 0.65 | - | - | 0.27 | 1.39 | 0.33 | 0.25 | 0.26 | 0.72 | 0.6 | 2.0 | - | 0.5 | 0.1 | 2.5 | 2.4 | 0.2 | 0.2 |
| Total Phenolics | 0.0015 | <0.0010 | <1.0 | 2.5 | *0.087 | 0.002 | 0.0379 | 0.0071 | 0.0022 | 0.0 | 0.0 | - | 0.0 | 0.0 | nd | nd | nd | nd |
| Phosphorus (Dissolved) | - | - | - | 0.004 | 0.013 | 0.007 | 0.010 | 0.004 | 0.001 | <0.01 | - | - | - | - | 0.7 | 0.6 | nd | nd |
| Laboratory Conductivity (µmhos/cm) | 717 | 874 | 968 | 1073 | 1180 | 1100 | 1047 | 985 | 1092 | 954.0 | 866.0 | - | 827.0 | 946.0 | 855.0 | 862.0 | 619.0 | 620.0 |
| Laboratory pH (Std. Units) | 7.39 | 7.36 | 7.40 | 7.16 | 7.09 | 6.86 | 7.21 | 7.44 | 7.15 | 7.1 | 7.2 | 7.2 | 7.1 | 7.1 | 7.2 | 7.2 | 7.7 | 7.7 |
| Field pH (Std. Units) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Conductivity (µmhos/cm) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Temperature (°C) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.
(1) MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines
for AO, IMAC and MAC parameters.
(3) MOECC Provincial Water Quality Objectives
(PWQO), July 1994, reprinted February 1999.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
(b) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(c) Total phosphorus has no firm objective. Proposed objective is for protection against
aesthetic deterioration and excessive plant growth in rivers and streams.
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
[ ] Parameter exceeds the applicable ODWS.

**Appendix C.2**

**OW2-83**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *9-Jun-99* | *6-Sep-99* | *28-Jun-00* | *28-Jun-00* | *14-Jun-02* | *14-Jun-02* | *5-May-03* | *11-Nov-03* | *11-Nov-03* | *17-May-04* | *17-May-04* | *9-Nov-04* | *9-Nov-04* | *4-May-06* | *6-Dec-06* | *10-Jun-07* | *30-Apr-09* | *19-Nov-09* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | - | - | 495.0 | 495.0 | 474.0 | 491.0 | 234.0 | 541.0 | 532.0 | 490.0 | 484.0 | 593.0 | 594.0 | 360 | 530 | 520 | - | 478 |
| Calcium | 127.0 | 127.0 | 150.0 | 151.0 | 157.0 | 158.0 | 125.0 | 144.0 | 143.0 | 154.0 | 153.0 | 166.0 | 165.0 | 123 | 164 | 160 | - | 134 |
| Chloride | 2.5 | 2.8 | 3.2 | 3.1 | 3.6 | 3.4 | 2.4 | 2.0 | 2.0 | 4.6 | 4.6 | 1.3 | 1.4 | 2.5 | 10.0 | 5.0 | - | 2.4 |
| Dissolved Organic Carbon (DOC) | 2.4 | 2.5 | 2.9 | 2.7 | 3.4 | 3.6 | - | 4.6 | 4.5 | 2.4 | 2.8 | 7.4 | 7.1 | 1.5 | 2.3 | 2.2 | - | 3.4 |
| Hardness | 456.0 | 457.0 | 544.0 | 548.0 | - | - | 455.0 | 525.0 | 522.0 | 556.0 | 555.0 | 596.0 | 595.0 | 444 | 588 | 570 | - | 475 |
| Iron | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 0.2 | 0.2 | ND(0.01) | 0.04 | ND | - | 0.741 |
| Magnesium | 33.9 | 34.0 | 41.0 | 41.3 | 43.9 | 43.7 | 34.7 | 40.3 | 40.1 | 41.7 | 41.9 | 44.1 | 44.0 | 33.0 | 43.8 | 43.0 | - | 34.3 |
| Manganese | 0.3 | 0.3 | 0.4 | 0.4 | - | - | 0.1 | - | - | 0.1 | 0.1 | 0.1 | 0.1 | - | 0.087 | 0.082 | - | 0.171 |
| Ammonia | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | - | 0.1 | 0.1 | 0.0 | nd | 0.1 | 0.1 | 0.2 | 0.3 | 0.06 | - | 0.754 |
| Unionized Ammonia | | | - | #VALUE! | | | | | | | | | | - | - | - | - | - |
| Nitrite | nd | nd | nd | nd | nd | nd | nd | nd | nd | nd | nd | nd | nd | ND(0.06) | ND(0.06) | ND | - | ND(0.10) |
| Nitrate | nd | nd | nd | nd | nd | nd | 0.5 | nd | nd | nd | nd | nd | nd | 0.2 | 0.3 | ND | - | 0.34 |
| Potassium | nd | nd | nd | nd | 2.0 | 1.0 | nd | nd | nd | nd | nd | 2.0 | 2.0 | 0.54 | 0.77 | 0.5 | - | - |
| Sodium | 4.7 | 4.7 | 21.4 | 21.4 | 7.0 | 5.5 | 5.0 | 5.7 | 5.6 | 5.0 | 5.0 | 5.8 | 5.8 | 4.5 | 5.4 | 5.7 | | - |
| Sulphate | 28.7 | 29.8 | 37.8 | 37.5 | 34.2 | 33.4 | 58.4 | 49.8 | 49.5 | 39.6 | 40.2 | 55.7 | 53.8 | 45 | 42 | 40 | - | 56.2 |
| Total Kjeldahl Nitrogen (TKN) | 0.2 | 0.2 | 0.2 | 0.2 | 0.4 | 0.4 | - | - | - | 0.2 | 0.2 | - | - | - | - | - | - | 3.63 |
| Total Phenolics | 0.0 | 0.0 | nd | nd | nd | nd | - | - | - | nd | nd | - | - | 0.002 | ND(0.002) | ND | - | 0.006 |
| Phosphorus (Dissolved) | 0.8 | 0.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.220 |
| Laboratory Conductivity (µmhos/cm) | 733.0 | 732.0 | 840.0 | 841.0 | 899.0 | 895.0 | 496.0 | - | - | 766.0 | 765.0 | 1140.0 | - | - | - | 971 | - | 885 |
| Laboratory pH (Std. Units) | 7.3 | 7.3 | 7.4 | 7.5 | 7.6 | 7.5 | IS | nd | nd | 7.3 | 7.2 | 7.0 | - | - | - | 7.9 | - | 7.77 |
| | | | | | | | | | | | | | | | | | | |
| Field pH (Std. Units) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Conductivity (µmhos/cm) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Temperature (°C) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.
(1) MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines
for AO, IMAC and MAC parameters.
(3) MOECC Provincial Water Quality Objectives
(PWQO), July 1994, reprinted February 1999.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
(b) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(c) Total phosphorus has no firm objective. Proposed objective is for protection against
aesthetic deterioration and excessive plant growth in rivers and streams.
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW3-83**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOECC ODWS[1]* | | *MABC[2]* | *PWQO[3]* | OW3-83 *2-Jan-89* | *17-Jul-89* | *OW30-07 30-Nov-89* | *6-May-91* | *15-Jun-92* | *3-Nov-92* | *12-Apr-93* | *26-Oct-93* | *11-Apr-94* | *24-Oct-94* | *10-Apr-95* | *13-Jun-96* | *7-May-97* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 30 - 500 | OG | - | - | - | - | 285 | - | 333 | 394 | 356 | 251 | 333 | 358 | 295.0 | 376.0 | 342.0 |
| Calcium | - | - | - | - | 111.8 | 140 | 87.2 | 107 | 102 | 92.1 | 87.1 | 79.7 | 98.5 | 100 | 101.0 | 105.0 | 104.0 |
| Chloride | 250 | AO | 132.1 | - | 4.22 | 6.0 | 6.8 | 2.6 | 3.9 | 3.1 | 3.6 | 4.6 | 3.4 | 4.6 | 4.4 | 3.0 | 3.3 |
| Dissolved Organic Carbon (DOC) | 5 | AO | 3.95 | - | 2.6 | 9.7 | 2.9 | 2.3 | 5.1 | 15.4 | 18.0 | 4.2 | 7.7 | 18.4 | 19.0 | 2.9 | 1.1 |
| Hardness | 80 - 100 | OG | - | - | 417 | 528 | 315 | 389 | 378 | 381 | 326 | 336 | 359 | 393 | 369.0 | 370.0 | 372.0 |
| Iron | 0.3 | AO | 0.175 | 0.3 | 0.52 | 0.22 | 1.68 | - | 0.03 | 0.12 | 0.08 | 0.02 | 0.17 | <0.01 | 0.0 | 0.1 | 0.0 |
| Magnesium | - | - | - | - | 33.34 | 42.8 | 23.5 | 29.4 | 29.8 | 36.7 | 26.3 | 33.3 | 27.3 | 34.3 | 28.0 | 26.4 | 26.1 |
| Manganese | 0.05 | AO | 0.03675 | - | - | - | - | - | 0.3200 | 0.599 | 0.480 | 0.260 | 0.423 | 1.19 | 0.6 | 1.0 | 0.8 |
| Ammonia | - | - | - | - | - | - | 0.054 | - | 0.201 | 0.122 | 0.061 | 0.027 | 0.038 | 0.124 | 0.1 | 0.2 | 0.2 |
| Unionized Ammonia | - | - | - | 0.02 (b) | | | | | | | | | | | | | |
| Nitrite | 1 | MAC | 0.325 | - | - | - | 0.02 | - | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 | 0.0 | <0.03 | - |
| Nitrate | 10 | MAC | 3.13 | - | <0.1 | 0.1 | <0.1 | - | <0.1 | 0.1 | 0.1 | <0.1 | 0.2 | 0.1 | <0.01 | 0.1 | 0.2 |
| Sodium | 200 | AO | - | - | 3.14 | 5.47 | 3.60 | - | 3.9 | 4.0 | 3.0 | 4.1 | 3.5 | 4.6 | 3.4 | 3.4 | 3.4 |
| Potassium | - | - | - | - | 0.84 | 2.4 | 1.4 | - | 1.4 | 0.9 | 0.6 | 0.8 | 0.7 | 1.07 | 0.8 | <1.0 | - |
| Sulphate | 500 | AO | 252.55 | - | 26.0 | 17.5 | 32.0 | - | 17.0 | 16.5 | 12.5 | 15.5 | 9.6 | 9.8 | 9.4 | 6.0 | 8.2 |
| Total Kjeldahl Nitrogen (TKN) | - | - | - | - | - | - | 0.62 | - | 1.21 | 0.44 | 0.40 | 0.17 | 0.81 | 0.73 | 1.1 | 2.9 | 0.5 |
| Total Phenolics | - | - | - | 0.001 | 0.0015 | 0.0300 | 0.0015 | 0.0010 | 0.0015 | <0.0010 | 0.0075 | 0.0069 | 0.0062 | <0.0010 | * | <0.001 | - |
| Phosphorus (Dissolved) | - | - | - | 0.01 - 0.03 (c) | - | - | - | - | 0.002 | 0.005 | 0.001 | 0.010 | <0.001 | 0.002 | <0.01 | - | 0.0 |
| Laboratory Conductivity (µmhos/cm) | - | - | - | - | 784 | 812 | 571 | 686 | 701 | 815 | 637 | 751 | 618 | 810 | 636.0 | 630.0 | 607.0 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | OG | - | 6.5 - 8.5 | 7.45 | 7.49 | 7.31 | 7.54 | 7.19 | 7.24 | 7.24 | 7.30 | 7.72 | 7.39 | 7.4 | 7.1 | 7.2 |
| Field pH (Std. Units) | 6.5 - 8.5 | OG | - | 6.5 - 8.5 | | | | | | | | | | | | | |
| Field Conductivity (µmhos/cm) | - | - | - | - | | | | | | | | | | | | | |
| Field Temperature (°C) | - | - | - | - | | | | | | | | | | | | | |

Notes:

All concentrations in mg/L unless otherwise noted.
(1) MOECC Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(3) MOECC Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
(b) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(c) Total phosphorus has no firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
[ ] Parameter exceeds the applicable ODWS.

**OW3-83**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOECC ODWS[1]* | | *MABC[2]* | *PWQO[3]* | *20-Nov-97* | *12-May-98* | *16-Dec-98* | *9-Jun-99* | *28-Jun-00* | *14-Jun-02* | *5-May-03* | *5-May-03* | *17-May-04* | *OW3-83* *6-Dec-06* | *10-Jun-07* | *30-Apr-09* | *19-Nov-09* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 30 - 500 | OG | - | - | 399.0 | 360.0 | 247.0 | - | 379.0 | 381.0 | 321.0 | 330.0 | 411.0 | 486 | 403 | - | 431 |
| Calcium | - | - | - | - | 116.0 | 105.0 | 77.6 | 109.0 | 110.0 | 113.0 | 97.8 | 97.5 | 110.0 | 135 | 120 | - | 116 |
| Chloride | 250 | AO | 132.1 | - | 3.7 | 1.9 | 4.3 | 3.2 | 1.9 | 4.2 | 5.7 | 5.6 | 5.7 | 11 | 6 | - | 14.9 |
| Dissolved Organic Carbon (DOC) | 5 | AO | 3.95 | - | 1.7 | 5.2 | 1.5 | 5.5 | 18.4 | 10.1 | 7.5 | 7.7 | 6.5 | 1.9 | 6 | - | 2.3 |
| Hardness | 80 - 100 | OG | - | - | 418.0 | 374.0 | 278.0 | 381.0 | 395.0 | - | 355.0 | 354.0 | 397.0 | 484 | 450 | - | 412 |
| Iron | 0.3 | AO | 0.175 | 0.3 | 0.0 | 0.1 | nd | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | nd | 0.02 | ND | - | 0.06 |
| Magnesium | - | - | - | - | 31.5 | 27.4 | 20.6 | 26.8 | 29.4 | 30.0 | 26.8 | 26.8 | 29.4 | 35.7 | 35 | - | 29.9 |
| Manganese | 0.05 | AO | 0.03675 | - | 0.0 | 0.3 | nd | 0.1 | 0.1 | - | 0.1 | 0.1 | 0.2 | 0.088 | 0.11 | - | 0.081 |
| Ammonia | - | - | - | - | 0.0 | nd | nd | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | nd | ND(0.1) | - | - | 0.05 |
| Unionized Ammonia | - | - | - | 0.02 (b) | | | | | | | | | | - | - | - | 0.0001 |
| Nitrite | 1 | MAC | 0.325 | - | - | nd | nd | nd | nd | nd | nd | nd | nd | ND(0.06) | ND | - | ND(0.10) |
| Nitrate | 10 | MAC | 3.13 | - | - | 0.1 | nd | nd | nd | nd | 0.3 | 0.3 | 0.2 | 0.44 | 0.3 | - | 0.24 |
| Sodium | 200 | AO | - | - | 4.9 | 2.7 | 3.3 | 3.4 | 20.2 | 3.7 | 5.2 | 5.1 | 4.6 | 5 | 5.4 | - | - |
| Potassium | - | - | - | - | - | nd | nd | nd | nd | 2.0 | 2.0 | 1.0 | nd | 0.7 | 0.67 | - | ND(1.0) |
| Sulphate | 500 | AO | 252.55 | - | 15.2 | 11.3 | 17.0 | 13.0 | 10.3 | 5.4 | 13.5 | 13.2 | 5.2 | 20 | 7 | - | 5.5 |
| Total Kjeldahl Nitrogen (TKN) | - | - | - | - | 0.1 | 4.7 | 0.2 | 0.4 | 0.7 | 0.7 | 0.9 | 0.9 | 0.4 | - | - | - | 0.65 |
| Total Phenolics | - | - | - | 0.001 | 0.0 | nd | nd | 0.0 | nd | nd | nd | nd | 0.0 | ND(0.002) | ND | - | 0.003 |
| Phosphorus (Dissolved) | - | - | - | 0.01 - 0.03 (c | - | 1.0 | nd | 1.9 | - | - | - | - | - | - | - | - | ND(0.05) |
| Laboratory Conductivity (µmhos/cm) | - | - | - | - | 715.0 | 630.0 | 488.0 | 614.0 | 626.0 | 661.0 | - | - | 632.0 | - | 728 | - | 739 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | OG | - | 6.5 - 8.5 | 7.3 | 7.3 | 7.8 | 7.5 | 7.7 | 7.8 | 7.7 | 7.6 | 7.7 | - | 7.9 | - | 7.64 |
| Field pH (Std. Units) | 6.5 - 8.5 | OG | - | 6.5 - 8.5 | | | | | | | | | | - | - | - | 7 |
| Field Conductivity (µmhos/cm) | - | - | - | - | | | | | | | | | | - | - | - | 836 |
| Field Temperature (°C) | - | - | - | - | | | | | | | | | | - | - | - | 10.4 |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2] Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
[3] MOECC Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
(b) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(c) Total phosphorus has no firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW4-83**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOECC ODWS [1]* | | *MABC [2]* | *PWQO [3]* | OW4-83 *6-Dec-83* | *2-Jan-89* | *OW30-07 30-Nov-89* | | *3-Nov-92* | *12-Apr-93* | *26-Oct-93* | *11-Apr-94* | *24-Oct-94* | *10-Apr-95* | *12-Nov-96* | *20-Nov-97* | *16-Dec-98* | *28-Jun-00* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 30 - 500 | OG | - | - | - | - | 236 | | 374 | 269 | 234 | 238 | 335 | 314.0 | 294.0 | 380.0 | 273.0 | - |
| Calcium | - | - | - | - | 102 | 63.5 | 78.1 | | 88.7 | 68.2 | 73.6 | 70.5 | 84.3 | 94.4 | 86.8 | 102.0 | 83.4 | 115.0 |
| Chloride | 250 | AO | 132.1 | - | 107 | 25.91 | 65.9 | | 21.6 | 12.1 | 15.3 | 7.6 | 14.3 | 9.2 | 10.8 | 17.8 | 28.3 | - |
| Dissolved Organic Carbon (DOC) | 5 | AO | 3.95 | - | - | 1.7 | 2.2 | | 7.9 | 16.2 | 3.9 | 2.0 | 7.3 | 8.3 | 1.7 | 1.8 | 1.2 | - |
| Hardness | 80 - 100 | OG | - | - | 421 | 245 | 298 | | 356 | 254 | 292 | 256 | 350 | 348.0 | 311.0 | 376.0 | 306.0 | - |
| Iron | 0.3 | AO | 0.175 | 0.3 | 0.10 | 0.65 | 0.84 | | 0.04 | <0.001 | 0.02 | 0.02 | <0.01 | 0.1 | <0.005 | 0.0 | nd | 0.0 |
| Magnesium | - | - | - | - | 40.4 | 20.96 | 25.0 | | 32.5 | 20.3 | 26.2 | 19.4 | 33.7 | 27.3 | 24.0 | 29.6 | 23.7 | 31.5 |
| Manganese | 0.05 | AO | 0.03675 | - | - | - | - | | 0.391 | 0.007 | 0.072 | 0.004 | 0.131 | 0.0 | 0.0 | 0.2 | nd | 0.0 |
| Ammonia | - | - | - | - | - | - | 0.036 | | 0.067 | 0.037 | 0.036 | 0.009 | 0.085 | 0.2 | 0.1 | 0.0 | nd | - |
| Nitrite | 1 | MAC | 0.325 | - | <0.001 | - | 0.01 | | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 | 0.0 | <0.03 | - | nd | - |
| Nitrate | 10 | MAC | 3.13 | - | <0.01 | <0.1 | 0.1 | | 0.1 | 0.1 | <0.1 | 0.4 | 0.1 | <0.01 | <0.03 | - | nd | - |
| Sodium | 200 | AO | - | - | 51 | 16.3 | 19.7 | | 18.5 | 6.8 | 10.2 | 6.0 | 6.3 | 7.9 | 8.7 | 10.6 | 11.7 | 29.6 |
| Potassium | - | - | - | - | 12.5 | 2.43 | 2.4 | | 3.3 | 2.0 | 2.7 | 1.7 | 3.03 | 2.0 | <1.0 | - | 1.6 | nd |
| Sulphate | 500 | AO | 252.55 | - | 41.0 | 16.0 | 27.5 | | 10.5 | 7.0 | 8.5 | 5.8 | 8.5 | 11.6 | 5.4 | 8.0 | 10.9 | - |
| Total Kjeldahl Nitrogen (TKN) | - | - | - | - | - | - | 0.38 | | 0.14 | 0.17 | 0.23 | 0.11 | 0.32 | 0.2 | 0.6 | 0.1 | 0.2 | - |
| Total Phenolics | - | - | - | 0.001 | 0.0010 | 0.0015 | 0.0015 | | <0.0010 | <0.001 | <0.001 | 0.0018 | 0.0020 | 0.0 | <0.001 | - | nd | - |
| Phosphorus (Dissolved) | - | - | - | 0.01 - 0.03 (c) | - | - | - | | 0.006 | 0.006 | 0.003 | 0.001 | <0.001 | 0.2 | - | - | nd | - |
| Laboratory Conductivity (µmhos/cm) | - | - | - | - | 1020 | 557 | 673 | | 754 | 523 | 612 | 473 | 774 | 622.0 | 540.0 | 707.0 | 594.0 | - |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | OG | - | 6.5 - 8.5 | 7.34 | 7.61 | 7.43 | | 7.24 | 7.35 | 7.47 | 7.87 | 7.54 | 7.4 | 7.2 | 7.3 | 7.8 | - |
| Field pH (Std. Units) | 6.5 - 8.5 | OG | - | 6.5 - 8.5 | | | | | | | | | | | | | | |
| Field Conductivity (µmhos/cm) | - | - | - | - | | | | | | | | | | | | | | |
| Field Temperature (°C) | - | - | - | - | | | | | | | | | | | | | | |

Notes:

All concentrations in mg/L unless otherwise noted.
(1) MOECC Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(3) MOECC Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
(b) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(c) Total phosphorus has no firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**Appendix C.2**

**OW4-83**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOECC ODWS [1]* | | *MABC [2]* | *PWQO [3]* | *OW4-83* | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *24-Nov-00* | *24-Nov-00* | *14-Dec-01* | *14-Dec-01* | *14-Jun-02* | *5-May-03* | *14-Nov-03* | *17-May-04* | *9-Nov-04* | *21-Nov-05* | *6-Dec-06* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* |
| Alkalinity | 30 - 500 | OG | - | - | 347.0 | 354.0 | 381.0 | 385.0 | 375.0 | 278.0 | 342.0 | 384.0 | 407.0 | 305 | 364 | 253 | - | - |
| Calcium | - | - | - | - | 91.4 | 90.9 | 106.0 | 105.0 | 113.0 | 84.4 | 89.0 | 108.0 | 107.0 | 93 | 97.2 | 69 | - | - |
| Chloride | 250 | AO | 132.1 | - | 19.2 | 19.1 | 25.9 | 26.1 | 26.6 | 24.8 | 16.5 | 19.4 | 25.0 | 12 | 24 | 6 | - | - |
| Dissolved Organic Carbon (DOC) | 5 | AO | 3.95 | - | 4.2 | 4.0 | 4.9 | 5.0 | 4.8 | 2.6 | 3.5 | 2.0 | 2.7 | 3.9 | 2.2 | 1.2 | - | - |
| Hardness | 80 - 100 | OG | - | - | 332.0 | 330.0 | 381.0 | 379.0 | - | 307.0 | 325.0 | 381.0 | 384.0 | 320 | 349 | 250 | - | - |
| Iron | 0.3 | AO | 0.175 | 0.3 | 0.1 | 0.1 | nd | nd | 0.0 | 0.0 | nd | 0.0 | nd | ND | ND(0.01) | ND | - | - |
| Magnesium | - | - | - | - | 25.0 | 25.0 | 28.5 | 28.4 | 30.7 | 23.3 | 24.8 | 27.0 | 28.0 | 21 | 25.9 | 19 | - | - |
| Manganese | 0.05 | AO | 0.03675 | - | nd | nd | 0.2 | 0.2 | - | nd | - | nd | nd | 0.034 | 0.24 | 0.004 | - | - |
| Ammonia | - | - | - | - | nd | nd | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | nd | 0.0 | 0.23 | 0.3 | 0.08 | - | - |
| Nitrite | 1 | MAC | 0.325 | - | nd | nd | nd | nd | nd | nd | nd | nd | nd | 0.28 | ND(0.06) | ND | - | - |
| Nitrate | 10 | MAC | 3.13 | - | nd | nd | nd | nd | nd | nd | nd | nd | nd | 0.4 | 0.24 | ND | - | - |
| Sodium | 200 | AO | - | - | 18.3 | 18.2 | 13.7 | 13.5 | 10.9 | 21.5 | 19.8 | 16.3 | 26.5 | 19 | 18 | 11 | - | - |
| Potassium | - | - | - | - | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 | 2.0 | 2.0 | 1.0 | 2.0 | 1.7 | 1.72 | 1.3 | - | - |
| Sulphate | 500 | AO | 252.55 | - | 10.4 | 10.6 | 7.6 | 7.6 | 6.4 | 16.4 | 10.8 | 6.3 | 11.4 | 10 | 10 | 6 | - | - |
| Total Kjeldahl Nitrogen (TKN) | - | - | - | - | 0.2 | 0.2 | 0.2 | 0.2 | 0.4 | 0.3 | - | 0.1 | - | - | - | 1.8 | - | - |
| Total Phenolics | - | - | - | 0.001 | nd | nd | nd | nd | nd | nd | - | 0.0 | - | ND | ND(0.002) | ND | - | - |
| Phosphorus (Dissolved) | - | - | - | 0.01 - 0.03 (c | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Laboratory Conductivity (µmhos/cm) | - | - | - | - | 616.0 | 6.1 | 713.0 | 711.0 | 721.0 | 599.0 | - | 632.0 | 920.0 | 538 | - | 465 | - | - |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | OG | - | 6.5 - 8.5 | 7.4 | 7.4 | 7.6 | 7.7 | 8.0 | 7.6 | nd | 7.7 | 7.3 | 8.03 | - | 7.4 | - | - |
| Field pH (Std. Units) | 6.5 - 8.5 | OG | - | 6.5 - 8.5 | | | | | | | | | | - | - | - | - | - |
| Field Conductivity (µmhos/cm) | - | - | - | - | | | | | | | | | | - | - | - | - | - |
| Field Temperature (°C) | - | - | - | - | | | | | | | | | | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2] Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
[3] MOECC Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
(b) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(c) Total phosphorus has no firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**Appendix C.2**

**OW6-83**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOECC ODWS [1]* | | *PWQO [2]* | OW6-83 *3-Nov-92* | *12-Apr-93* | *OW30-07 26-Oct-93* | *24-Oct-94* | *10-Apr-95* | *20-Oct-95* | *20-Nov-97* | *16-Dec-98* | *9-Jun-99* | *29-Oct-02* | *29-Oct-02* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 30 - 500 | OG | - | ***372*** | 419 | 276 | 448 | 411.0 | 468.0 | 652.0 | 651.0 | - | - | - |
| Calcium | - | - | - | ***81.3*** | 94.0 | 82.3 | 135 | 129.0 | 143.0 | 151.0 | 146.0 | 160.0 | 200.0 | 199.0 |
| Chloride | 250 | AO | - | ***13.7*** | 3.0 | 28.8 | 97.2 | 90.1 | 79.2 | 89.0 | 98.3 | 98.7 | - | - |
| Dissolved Organic Carbon (DOC) | 5 | AO | - | ***11.2*** | 15.5 | 6.7 | 20.0 | 15.1 | 12.4 | 13.1 | 11.2 | 17.9 | - | - |
| Hardness | 80 - 100 | OG | - | ***365*** | 394 | 363 | 577 | 539.0 | 574.0 | 659.0 | 638.0 | 698.0 | 789.0 | 787.0 |
| Iron | 0.3 | AO | 0.3 | ***3.59*** | 3.88 | 3.38 | 7.15 | 9.0 | 4.5 | 10.7 | nd | 11.4 | 0.0 | 0.0 |
| Magnesium | - | - | - | ***39.2*** | 33.6 | 38.2 | 57.9 | 52.2 | 52.6 | 68.4 | 66.3 | 72.6 | 70.5 | 70.4 |
| Manganese | 0.05 | AO | - | ***0.546*** | 0.486 | 0.464 | 0.614 | 1.1 | 0.5 | 0.5 | 0.3 | 0.4 | 0.5 | 0.5 |
| Ammonia | - | - | - | ***0.360*** | 0.237 | 0.342 | 0.71 | 0.5 | 0.3 | 6.0 | 5.7 | 7.7 | - | - |
| Unionized Ammonia | - | - | 0.02 (b) | | | | | | | | | | | |
| Nitrite | 1 | MAC | - | ***<0.01*** | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | - | nd | nd | - | - |
| Nitrate | 10 | MAC | - | ***<0.1*** | 0.1 | <0.1 | 0.1 | <0.01 | <0.01 | - | nd | nd | - | - |
| Sodium | 200 | AO | - | ***9.7*** | 11.4 | 9.1 | 47.3 | 44.7 | 55.9 | 57.3 | 53.2 | 60.1 | 49.7 | 49.5 |
| Potassium | - | - | - | ***3.0*** | 2.0 | 2.7 | 4.50 | 3.3 | 3.3 | 7.3 | 8.9 | 11.5 | 18.0 | 18.0 |
| Sulphate | 500 | AO | - | ***3.5*** | 10.0 | 3.5 | 3.3 | 4.6 | 2.5 | 7.5 | 54.6 | 20.5 | - | - |
| Total Kjeldahl Nitrogen (TKN) | - | - | - | ***0.68*** | 0.58 | 0.80 | 3.95 | 1.8 | 2.6 | 6.3 | 6.2 | 8.7 | - | - |
| Total Phenolics | - | - | 0.001 | ***<0.0010*** | 0.0035 | 0.0033 | 0.0165 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Phosphorus (Dissolved) | - | - | 0.01 - 0.03 (c) | ***0.003*** | 0.003 | <0.001 | 0.005 | <0.01 | 0.0 | 0.0 | nd | 4.6 | - | - |
| Laboratory Conductivity (µmhos/cm) | - | - | - | ***749*** | 821 | 770 | 1270 | 1096.0 | 1170.0 | 1400.0 | 1380.0 | 1330.0 | - | - |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | OG | 6.5 - 8.5 | ***7.13*** | 7.11 | 7.30 | 7.23 | 7.1 | 7.2 | 7.0 | 7.5 | 7.1 | - | - |
| Field pH (Std. Units) | 6.5 - 8.5 | OG | 6.5 - 8.5 | | | | | | | | | | | |
| Field Conductivity (µmhos/cm) | - | - | - | | | | | | | | | | | |
| Field Temperature (°C) | - | - | - | | | | | | | | | | | |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
[2] MOECC Provincial Water Quality Objectives
(PWQO), July 1994, reprinted February 1999.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
(b) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(c) Total phosphorus has no firm objective. Proposed objective is for protection
against aesthetic deterioration and excessive plant growth in rivers and streams.
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**Appendix C.2**

**OW6-83**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOECC ODWS [1]* | | *PWQO [2]* | *5-May-03* | *14-Nov-03* | *17-May-04* | *OW6-83* *4-Jul-05* | *6-Dec-06* | *10-Jun-07* | *21-Oct-07* | *5-Aug-08* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 30 - 500 | OG | - | 701.0 | 747.0 | 662.0 | 700 | 645 | 739 | 734 | 717 | 729 | - | 666 |
| Calcium | - | - | - | 150.0 | 147.0 | 146.0 | 463 | 149 | 170 | 170 | 160 | 140 | - | 169 |
| Chloride | 250 | AO | - | 50.5 | 47.6 | 41.4 | 50 | 43 | - | 37 | 43 | 33 | - | 39 |
| Dissolved Organic Carbon (DOC) | 5 | AO | - | 8.5 | 12.9 | 7.0 | - | 31.2 | 42 | 8.5 | 8.7 | 6.4 | - | 7.2 |
| Hardness | 80 - 100 | OG | - | 691.0 | 654.0 | 636.0 | 642 | 620 | 720 | 740 | 680 | 580 | - | 685 |
| Iron | 0.3 | AO | 0.3 | 11.4 | 7.4 | 9.0 | 24.3 | 12 | 16 | 16 | 7.3 | 7.7 | - | 15.1 |
| Magnesium | - | - | - | 76.6 | 69.9 | 66.0 | 161 | 60.1 | 70 | 76 | 67 | 57 | - | 64.1 |
| Manganese | 0.05 | AO | - | 0.4 | - | 0.4 | 1.43 | 0.355 | 0.43 | 0.43 | 0.37 | 0.32 | - | 0.421 |
| Ammonia | - | - | - | 12.8 | 12.6 | 9.5 | - | 6.7 | IS | 10.7 | 17 | 8.5 | - | 8.75 |
| Unionized Ammonia | - | - | 0.02 (b) | | | | - | - | - | - | - | - | - | 0.0187 |
| Nitrite | 1 | MAC | - | nd | nd | nd | ND | ND(0.06) | 0.01 | ND | ND | ND | - | ND(0.10) |
| Nitrate | 10 | MAC | - | nd | nd | nd | 1.1 | 1.31 | ND | 0.2 | ND | 0.2 | - | 0.17 |
| Sodium | 200 | AO | - | 51.1 | 42.1 | 31.0 | 35.2 | 24.3 | 31 | 38 | 37 | 28 | | - |
| Potassium | - | - | - | 17.0 | 19.0 | 16.0 | 19.6 | 13.4 | 15 | 17 | 17 | 12 | - | ND(10.0) |
| Sulphate | 500 | AO | - | 29.1 | 8.0 | 17.1 | 11.6 | 5 | 2 | 2 | 4 | 5 | - | 3.6 |
| Total Kjeldahl Nitrogen (TKN) | - | - | - | 23.7 | - | 11.3 | - | - | - | - | - | 8.1 | - | 8.92 |
| Total Phenolics | - | - | 0.001 | nd | - | 0.0 | - | ND(0.002) | - | 0.002 | 0.002 | ND | - | 0.006 |
| Phosphorus (Dissolved) | - | - | 0.01 - 0.03 (c) | - | - | - | 1.42 | - | - | - | - | - | - | ND(0.50) |
| Laboratory Conductivity (µmhos/cm) | - | - | - | 1370.0 | - | 1020.0 | 1330 | - | 1350 | 1350 | - | 1300 | - | 1230 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | OG | 6.5 - 8.5 | 7.5 | nd | 7.4 | 8.04 | - | 8.0 | 8.0 | - | 7.0 | - | 7.45 |
| Field pH (Std. Units) | 6.5 - 8.5 | OG | 6.5 - 8.5 | | | | - | - | - | - | - | - | - | 7.0 |
| Field Conductivity (µmhos/cm) | - | - | - | | | | - | - | - | - | - | - | - | 1210 |
| Field Temperature (°C) | - | - | - | | | | - | - | - | - | - | - | - | 9.3 |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
[2] MOECC Provincial Water Quality Objectives
(PWQO), July 1994, reprinted February 1999.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
(b) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(c) Total phosphorus has no firm objective. Proposed objective is for protection
against aesthetic deterioration and excessive plant growth in rivers and streams.
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW7-83**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOECC ODWS[1]* | | *PWQO[2]* | OW7-83 *6-Dec-83* | *23-Aug-88* | *OW30-07 17-Jul-89* | *18-Jul-90* | *6-May-91* | *6-Nov-91* | *15-Jun-92* | *3-Nov-92* | *12-Apr-93* | *26-Oct-93* | *11-Apr-94* | *24-Oct-94* | *10-Apr-95* | *20-Oct-95* | *13-Jun-96* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 30 - 500 | OG | - | - | 283.67 | - | - | - | 231 | 243 | 249 | 241 | 246 | 531 | 664 | 689.0 | 521.0 | 462.0 |
| Calcium | - | - | - | ***98.0*** | 82.4 | 94.8 | 69.3 | 60.6 | 67.8 | 73.2 | 73.8 | 67.4 | 66.3 | 170 | 153 | 203.0 | 151.0 | 116.0 |
| Chloride | 250 | AO | - | ***8.0*** | 4.45 | 2.5 | 3.0 | 0.5 | 1.9 | 3.8 | 15.2 | 12.6 | 39.5 | 62.0 | 67.9 | 51.6 | 38.8 | 26.7 |
| Dissolved Organic Carbon (DOC) | 5 | AO | - | - | 2.9 | 1.3 | 0.9 | 1.5 | 4.2 | 1.4 | 14.8 | 19.0 | 11.3 | 21.2 | >20.0 | 22.5 | 70.0 | 10.6 |
| Hardness | 80 - 100 | OG | - | ***362*** | 303.1 | 354 | 260 | 228 | 251 | 274 | 290 | 253 | 282 | 809 | 673 | 819.0 | 606.0 | 458.0 |
| Iron | 0.3 | AO | 0.3 | ***0.02*** | 0.07 | 5.2 | - | - | <0.01 | <0.01 | 0.08 | <0.01 | 0.16 | 6.14 | 25.1 | 69.7 | 24.9 | 13.1 |
| Magnesium | - | - | - | ***28.4*** | 23.56 | 28.3 | 21.1 | 18.5 | 19.9 | 22.0 | 25.7 | 20.5 | 28.2 | 93.2 | 70.0 | 75.0 | 55.6 | 40.9 |
| Manganese | 0.05 | AO | - | - | 0.076 | - | - | - | 0.055 | 0.0220 | 0.426 | 0.223 | 0.578 | 0.494 | 0.568 | 1.1 | 0.3 | 0.2 |
| Ammonia | - | - | - | - | 0.206 | - | - | - | 0.042 | 0.029 | 0.092 | 0.090 | <0.005 | 0.011 | 0.026 | 0.2 | 1.2 | 0.8 |
| Unionized Ammonia | - | - | 0.02 (b) | | | | | | | | | | | | | | | |
| Nitrite | 1 | MAC | - | ***0.002*** | 0.02 | - | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 | 0.0 | 0.0 | <0.03 |
| Nitrate | 10 | MAC | - | ***0.04*** | <0.1 | 0.3 | - | - | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | 0.2 | 0.1 | <0.01 | <0.01 | <0.03 |
| Sodium | 200 | AO | - | ***2.8*** | 2.36 | 1.91 | - | - | 1.3 | 1.5 | 7.0 | 6.1 | 26.4 | 47.6 | 45.6 | 50.0 | 26.8 | 12.0 |
| Potassium | - | - | - | ***0.15*** | 0.94 | 1.0 | - | - | 0.5 | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 | 0.90 | 3.6 | 2.4 | 3.1 |
| Sulphate | 500 | AO | - | ***15.5*** | 13.0 | 10.5 | - | - | 22.0 | 21.5 | 35.5 | 22.5 | 11.3 | 1.2 | 2.7 | 1.4 | 4.5 | 2.8 |
| Total Kjeldahl Nitrogen (TKN) | - | - | - | ***0.13*** | - | - | - | - | 0.15 | 0.18 | 0.24 | 0.36 | 0.47 | 1.48 | 1.00 | 2.3 | 2.3 | 3.5 |
| Total Phenolics | - | - | 0.001 | ***<0.0010*** | 0.0065 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.005 | 0.003 | 0.0055 | 0.0038 | 0.195 | 0.0852 | 0.1 | 0.1 | 0.0 |
| Phosphorus (Dissolved) | - | - | 0.01 - 0.03 (c) | - | - | - | - | 0.002 | 0.002 | 0.001 | 0.004 | <0.001 | <0.001 | 0.011 | 0.012 | 2.3 | 0.0 | - |
| Laboratory Conductivity (µmhos/cm) | - | - | - | ***645*** | 545 | 447 | 463 | 443 | 471 | 519 | 596 | 507 | 699 | 1490 | 1340 | 1440.0 | 1076.0 | 799.0 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | OG | 6.5 - 8.5 | ***7.53*** | 7.83 | 7.31 | 7.53 | 7.58 | 7.65 | 7.48 | 7.50 | 7.52 | 7.62 | 7.75 | 7.03 | 6.8 | 7.0 | 7.2 |
| Field pH (Std. Units) | 6.5 - 8.5 | OG | 6.5 - 8.5 | | | | | | | | | | | | | | | |
| Field Conductivity (µmhos/cm) | - | - | - | | | | | | | | | | | | | | | |
| Field Temperature (°C) | - | - | - | | | | | | | | | | | | | | | |

Notes:
All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
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OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
(b) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(c) Total phosphorus has no firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
[ ] Parameter exceeds the applicable ODWS.

**OW7-83**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOECC ODWS [1]* | | *PWQO [2]* | *12-Nov-96* | *15-May-97* | *20-Nov-97* | *12-May-98* | *16-Dec-98* | *9-Jun-99* | *28-Jun-00* | *24-Nov-00* | *28-Jun-01* | *28-Jun-01* | *14-Dec-01* | *14-Jun-02* | *29-Oct-02* | *29-Oct-02* | *5-May-03* | *14-Nov-03* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 30 - 500 | OG | - | 506.0 | 235.0 | 515.0 | 496.0 | 488.0 | - | 666.0 | 590.0 | 632.0 | 623.0 | 791.0 | 473.0 | 481.0 | - | 637.0 | 710.0 |
| Calcium | - | - | - | 151.0 | 77.4 | 146.0 | 142.0 | 141.0 | 178.0 | 181.0 | 206.0 | 163.0 | 162.0 | 198.0 | 145.0 | 161.0 | - | 210.0 | 187.0 |
| Chloride | 250 | AO | - | 77.0 | 23.0 | 56.7 | 41.6 | 39.7 | 43.3 | 44.2 | 106.0 | 50.9 | 50.1 | 43.7 | 27.5 | 60.0 | 59.8 | 54.7 | 53.8 |
| Dissolved Organic Carbon (DOC) | 5 | AO | - | 3.9 | 0.6 | 2.9 | 3.0 | 2.3 | 9.5 | 4.2 | 8.2 | 6.6 | 6.7 | 9.9 | 4.2 | 5.4 | - | 13.1 | 14.1 |
| Hardness | 80 - 100 | OG | - | 592.0 | 286.0 | 574.0 | 556.0 | 547.0 | 672.0 | 675.0 | 786.0 | 623.0 | 618.0 | 753.0 | - | 606.0 | - | 789.0 | 711.0 |
| Iron | 0.3 | AO | 0.3 | 0.0 | 0.0 | 11.8 | 18.9 | 0.2 | 18.8 | 7.1 | 10.2 | 8.1 | 8.1 | 17.9 | 5.8 | 5.3 | - | 1.9 | 4.8 |
| Magnesium | - | - | - | 53.6 | 21.5 | 50.9 | 49.0 | 47.3 | 55.4 | 54.1 | 65.8 | 52.2 | 51.7 | 62.6 | 46.4 | 49.4 | - | 64.0 | 58.9 |
| Manganese | 0.05 | AO | - | 0.0 | 0.1 | 0.7 | 0.3 | 0.4 | 0.3 | 1.2 | 0.5 | 0.4 | 0.4 | 0.5 | - | 0.5 | - | 1.5 | - |
| Ammonia | - | - | - | 1.0 | 0.3 | 0.5 | 0.9 | 0.5 | 1.5 | 1.7 | 1.2 | 0.9 | 0.9 | nd | 0.6 | 0.6 | 0.6 | 0.7 | 0.7 |
| Unionized Ammonia | - | - | 0.02 (b) | | | | | | - | 0.0000 | | | | | | | | | |
| Nitrite | 1 | MAC | - | <0.03 | - | - | nd | nd | nd | nd | nd | nd | nd | nd | nd | nd | nd | nd | nd |
| Nitrate | 10 | MAC | - | <0.03 | 0.1 | - | 0.1 | nd | nd | nd | nd | nd | nd | nd | nd | nd | nd | nd | nd |
| Sodium | 200 | AO | - | 37.1 | 4.0 | 18.0 | 11.9 | 15.6 | 21.3 | 48.6 | 49.1 | 19.2 | 19.0 | 34.7 | 15.0 | 21.1 | - | 33.2 | 46.1 |
| Potassium | - | - | - | 3.4 | - | 2.5 | 1.1 | 3.2 | 3.9 | 3.0 | 4.0 | 4.0 | 4.0 | 3.0 | 3.0 | 2.0 | - | 2.0 | 3.0 |
| Sulphate | 500 | AO | - | 50.7 | 15.2 | 41.6 | 21.5 | 23.7 | 43.0 | 31.5 | 195.0 | 28.5 | 28.8 | 57.3 | 19.2 | 127.0 | 125.0 | 174.0 | 51.3 |
| Total Kjeldahl Nitrogen (TKN) | - | - | - | 2.3 | 0.6 | 0.8 | 2.8 | 0.8 | 1.8 | 2.3 | 1.6 | 1.5 | 1.5 | 1.4 | 1.3 | 1.2 | 1.2 | 2.7 | - |
| Total Phenolics | - | - | 0.001 | 0.0 | - | 0.0 | 0.0 | 0.0 | 0.0 | nd | nd | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | - | nd | - |
| Phosphorus (Dissolved) | - | - | 0.01 - 0.03 (c) | - | - | - | 0.1 | nd | 1.8 | - | - | - | - | - | - | - | - | - | - |
| Laboratory Conductivity (µmhos/cm) | - | - | - | 1030.0 | 511.0 | 1080.0 | 1010.0 | 991.0 | 1110.0 | 1130.0 | 1400.0 | 1080.0 | 1080.0 | 1360.0 | 914.0 | 1150.0 | - | 1450.0 | - |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | OG | 6.5 - 8.5 | 7.2 | 7.4 | 7.1 | 6.9 | 7.2 | 7.0 | 7.3 | 7.0 | 7.2 | 7.3 | 7.3 | 7.4 | 7.1 | - | 7.1 | nd |
| Field pH (Std. Units) | 6.5 - 8.5 | OG | 6.5 - 8.5 | | | | | | | | | | | | | | | | |
| Field Conductivity (µmhos/cm) | - | - | - | | | | | | | | | | | | | | | | |
| Field Temperature (°C) | - | - | - | | | | | | | | | | | | | | | | |

Notes:
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(b) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(c) Total phosphorus has no firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW7-83**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| Parameter (mg/L) | MOECC ODWS[1] | | PWQO[2] | OW7-83 17-May-04 | 9-Nov-04 | 4-Jul-05 | 4-May-06 | 6-Dec-06 | 10-Jun-07 | 21-Oct-07 | 5-Aug-08 | 29-Dec-08 | 30-Apr-09 | 19-Nov-09 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 30 - 500 | OG | - | 536.0 | 694.0 | 609 | 852 | 672 | 562 | 618 | 692 | 824 | 682 | 676 |
| Calcium | - | - | - | 148.0 | 224.0 | 466 | 158 | 201 | 160 | - | 210 | - | 218 | 198 |
| Chloride | 250 | AO | - | 58.4 | 121.0 | 75.8 | 63 | 79 | 75 | 82 | 93 | 26 | 102 | 111 |
| Dissolved Organic Carbon (DOC) | 5 | AO | - | 3.3 | 11.4 | 11.5 | 6.6 | 29.8 | 5.6 | - | - | 6.9 | 9.5 | 8.9 |
| Hardness | 80 - 100 | OG | - | 588.0 | 843.0 | 689 | 601 | 790 | 660 | 560 | 840 | 760 | 794 | 775 |
| Iron | 0.3 | AO | 0.3 | 4.7 | 14.1 | 32.3 | 16.4 | 8.22 | 18 | - | 23 | - | 19.8 | 14.6 |
| Magnesium | - | - | - | 52.8 | 68.5 | 147 | 50.4 | 70 | 61 | - | 73 | - | 60.8 | 68.5 |
| Manganese | 0.05 | AO | - | 1.2 | 1.1 | 1.46 | - | 0.802 | 0.57 | - | 0.71 | - | 0.593 | 0.708 |
| Ammonia | - | - | - | 0.5 | 0.7 | 1.16 | 1.2 | 1 | 1.46 | - | - | 1.2 | 1.23 | 1.23 |
| Unionized Ammonia | - | - | 0.02 (b) | | | - | - | - | - | - | | | 0.0012 | 0.0018 |
| Nitrite | 1 | MAC | - | nd | nd | ND | ND(0.06) | ND(0.06) | ND | ND | 0.04 | 0.01 | ND(0.10) | ND(0.10) |
| Nitrate | 10 | MAC | - | nd | nd | ND | ND(0.05) | 0.24 | ND | ND | 0.2 | ND | ND(0.10) | 0.18 |
| Sodium | 200 | AO | - | 12.3 | 57.7 | 46.8 | 23.3 | 34.5 | 28 | - | 48 | - | - | - |
| Potassium | - | - | - | nd | 5.0 | 3.1 | 2.23 | 3.14 | 2.5 | - | 5.9 | - | ND(10.0) | ND(10.0) |
| Sulphate | 500 | AO | - | 19.0 | 214.0 | 63.4 | 18 | 38 | 14 | 6 | 35 | 19 | 33.0 | 25.7 |
| Total Kjeldahl Nitrogen (TKN) | - | - | - | 0.9 | - | - | - | - | - | - | - | 3.1 | 2.92 | 2.22 |
| Total Phenolics | - | - | 0.001 | 0.0 | - | ND | 0.003 | 0.002 | ND | - | - | ND | 0.0056 | 0.006 |
| Phosphorus (Dissolved) | - | - | 0.01 - 0.03 (c) | - | - | 0.53 | - | - | - | - | - | - | ND(0.50) | ND(0.50) |
| Laboratory Conductivity (µmhos/cm) | - | - | - | 886.0 | 1720.0 | 1370 | - | - | 1190 | 1320 | - | 1410 | 1560 | 1500 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | OG | 6.5 - 8.5 | 7.2 | 6.8 | 7.72 | - | - | 7.8 | 8.1 | - | 6.9 | 7.25 | 7.24 |
| Field pH (Std. Units) | 6.5 - 8.5 | OG | 6.5 - 8.5 | | | - | - | - | - | - | | | 6.69 | 6.83 |
| Field Conductivity (µmhos/cm) | - | - | - | | | - | - | - | - | - | | | 1560 | 1450 |
| Field Temperature (°C) | - | - | - | | | - | - | - | - | - | | | 8.3 | 9.3 |

Notes:
All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2] MOECC Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
(b) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(c) Total phosphorus has no firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW8-88**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOECC ODWS [1]* | | OW8-83 *23-Aug-88* | *2-Jan-89* | *OW30-07 17-Jul-89* | *18-Jul-90* | *6-May-91* | *6-Nov-91* | *3-Nov-92* | *12-Apr-93* | *26-Oct-93* | *11-Apr-94* | *24-Oct-94* | *10-Apr-95* | *20-Oct-95* | *12-Nov-96* | *20-Nov-97* | *16-Dec-98* | *9-Jun-99* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 30 - 500 | OG | - | - | - | - | - | 525 | 523 | 534 | 388 | 502 | 460 | 431.0 | 662.0 | 495.0 | 628.0 | 529.0 | - |
| Calcium | - | - | *193.8* | *126.8* | 99.2 | 127 | 102 | 128 | 92.4 | 96.3 | 73.3 | 120 | 117 | 116.0 | 157.0 | 146.0 | 163.0 | 171.0 | 161.0 |
| Chloride | 250 | AO | *207.5* | *119.8* | 124 | 160 | 79.1 | 143 | 85.4 | 52.8 | 48.1 | 48.3 | 61.5 | 51.3 | 114.0 | 147.0 | 215.0 | 63.2 | 186.0 |
| Copper | 1 | AO | - | - | - | - | - | - | 0.0083 | - | - | - | - | 0.0 | - | <0.003 | - | nd | nd |
| Dissolved Organic Carbon (DOC) | 5 | AO | @ | *4.8* | 7.9 | 8.6 | 12.6 | 8.8 | 20.6 | 17.3 | 5.0 | 9.1 | 5.5 | 8.8 | 10.5 | 6.4 | 8.0 | 5.8 | 15.3 |
| Hardness | 80 - 100 | OG | *687.4* | *493* | 435 | 527 | 425 | 530 | 457 | 417 | 388 | 487 | 499 | 470.0 | 630.0 | 629.0 | 681.0 | 704.0 | 690.0 |
| Iron | 0.3 | AO | @ | *1.48* | 0.94 | - | - | 6.26 | 2.63 | 1.17 | 0.40 | 1.54 | 1.42 | 2.1 | 2.0 | <0.005 | 0.7 | nd | 0.1 |
| Magnesium | - | - | *49.25* | *42.80* | 45.3 | 50.8 | 41.3 | 51.0 | 54.8 | 42.7 | 49.6 | 45.2 | 50.2 | 43.6 | 57.5 | 59.8 | 66.9 | 67.2 | 69.8 |
| Manganese | 0.05 | AO | - | - | - | - | - | 1.830 | 1.547 | 1.09 | 0.902 | 1.26 | 1.35 | 3.6 | 2.0 | 1.7 | 2.5 | 0.1 | 0.8 |
| Ammonia | - | - | *0.330* | - | - | - | - | 0.780 | 0.70 | 0.50 | 0.372 | 0.366 | 0.460 | 0.5 | - | 0.9 | 0.7 | 0.1 | 5.5 |
| Nitrite | 1 | MAC | *0.03* | - | - | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.03 | - | nd | nd |
| Nitrate | 10 | MAC | *0.2* | *<0.1* | 0.1 | - | - | <0.1 | <0.1 | 0.1 | <0.1 | 0.2 | 0.1 | <0.01 | <0.1 | 0.2 | 0.8 | 29.7 | 5.6 |
| Sodium | 200 | AO | @ | *94.6* | 111 | - | - | 86.7 | 82.4 | 56.8 | 60.4 | 50.2 | 58.6 | 45.4 | 70.1 | 78.6 | 117.0 | 153.0 | 157.0 |
| Potassium | - | - | @ | *1.93* | 5.1 | - | - | 9.7 | 13.1 | 8.6 | 12.3 | 7.9 | 11.7 | 9.4 | 13.1 | 13.8 | 13.9 | 18.5 | 27.6 |
| Sulphate | 500 | AO | @ | *21.5* | 4.0 | - | - | 12.5 | 5.5 | 55 | 7.7 | 3.5 | 5.0 | 15.4 | 5.1 | 11.7 | 25.7 | 74.7 | 56.6 |
| Total Kjeldahl Nitrogen (TKN) | - | - | - | - | - | - | - | 1.4 | 1.42 | 1.06 | 0.77 | 0.68 | 1.04 | 1.4 | 2.0 | 2.7 | 1.6 | 0.6 | 6.4 |
| Total Phenolics | - | - | @ | *0.0020* | 0.0100 | <0.0010 | <0.0010 | 0.0015 | 0.0025 | 0.0025 | 0.0625 | 0.0029 | 0.0036 | 0.0 | 0.0 | <0.001 | 0.0 | nd | 0.0 |
| Phosphorus (Dissolved) | - | - | - | - | - | - | 0.002 | 0.002 | 0.001 | 0.001 | <0.001 | 0.001 | <0.001 | <001 | 0.0 | - | 0.0 | nd | 0.9 |
| Laboratory Conductivity (µmhos/cm) | - | - | *1600* | *1264* | 1390 | 1500 | 1107 | 1420 | 1330 | 1039 | 1131 | 1051 | 1171 | 994.0 | 1370.0 | 1280.0 | 1800.0 | 1930.0 | 1710.0 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | OG | *7.42* | *7.37* | 7.59 | 7.14 | 7.40 | ^7.21 | 7.24 | 7.03 | 7.18 | 7.29 | 7.05 | 7.1 | 6.9 | 7.0 | 7.0 | 7.4 | 7.3 |
| Field pH (Std. Units) | 6.5 - 8.5 | OG | | | | | | | | | | | | | | | | | |
| Field Conductivity (µmhos/cm) | - | - | | | | | | | | | | | | | | | | | |
| Field Temperature (°C) | - | - | | | | | | | | | | | | | | | | | |

Notes:
All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**Appendix C.2**

**OW8-88**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOECC ODWS [1]* | | *28-Jun-00* | *24-Nov-00* | *28-Jun-01* | *14-Dec-01* | *14-Jun-02* | *29-Oct-02* | *29-Oct-02* | *5-May-03* | *14-Nov-03* | *17-May-04* | *9-Nov-04* | *OW8-88* *21-Nov-05* | *4-May-06* | *6-Dec-06* | *10-Jun-07* | *5-Aug-08* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 30 - 500 | OG | 858.0 | 856.0 | 832.0 | 736.0 | 746.0 | 662.0 | 672.0 | 570.0 | 713.0 | 634.0 | 792.0 | 656 | 849 | 721 | 710 | 682 | 723 | 563 | 651 |
| Calcium | - | - | 148.0 | 147.0 | 148.0 | 123.0 | 115.0 | 122.0 | - | 131.0 | 125.0 | 118.0 | 127.0 | 130 | 108 | 123 | 120 | 130 | 120 | 111 | 113 |
| Chloride | 250 | AO | 146.0 | 155.0 | 103.0 | 112.0 | 100.0 | 116.0 | - | 78.5 | 92.6 | 98.8 | 79.6 | 87 | 72 | 83 | 57 | 61 | 59 | 42.3 | 67.6 |
| Copper | 1 | AO | 0.0 | nd | 0.0 | nd | - | nd | - | nd | - | - | - | - | - | - | - | - | - | - | - |
| Dissolved Organic Carbon (DOC) | 5 | AO | 16.5 | 18.5 | 26.2 | 14.8 | 14.0 | 17.2 | 16.9 | 11.7 | 12.0 | 11.2 | 12.0 | 12.4 | 10.6 | 6.7 | 9.6 | - | 6.4 | 7.6 | 7.1 |
| Hardness | 80 - 100 | OG | 657.0 | 658.0 | 675.0 | 566.0 | - | 577.0 | - | 574.0 | 580.0 | 540.0 | 628.0 | 670 | 518 | 602 | 620 | 610 | 560 | 500 | 569 |
| Iron | 0.3 | AO | 0.0 | 0.2 | 0.4 | nd | nd | 0.0 | - | 0.1 | 0.0 | 1.3 | 0.1 | ND | 0.88 | 0.06 | ND | 1.7 | 0.1 | 1.13 | 2.84 |
| Magnesium | - | - | 69.7 | 70.2 | 74.1 | 62.7 | 72.3 | 66.4 | - | 59.6 | 64.8 | 59.2 | 75.4 | 82 | 60.5 | 71.5 | 75 | 71 | 65 | 53.9 | 69.9 |
| Manganese | 0.05 | AO | 0.5 | 0.6 | 0.6 | 0.3 | - | 0.2 | - | 0.1 | - | 0.7 | 0.5 | 0.2 | - | 0.611 | 0.42 | 0.67 | 0.72 | 0.508 | 0.297 |
| Ammonia | - | - | 4.9 | 3.5 | 4.5 | nd | 10.1 | 2.3 | - | 0.5 | 1.0 | 2.2 | 2.3 | 0.7 | 2.6 | 3.2 | - | - | 1.8 | 1.53 | 2.91 |
| Nitrite | 1 | MAC | 0.2 | nd | 1.9 | 0.4 | nd | nd | - | nd | nd | nd | 0.6 | 0.3 | 0.13 | ND(0.06) | 0.01 | 0.11 | ND | ND(0.10) | ND(0.10) |
| Nitrate | 10 | MAC | 2.4 | 5.7 | 10.5 | 10.4 | 5.5 | 2.3 | - | 10.3 | 0.8 | 0.7 | 20.7 | 36 | 0.53 | 0.43 | 7 | 0.9 | ND | 0.22 | 17.9 |
| Sodium | 200 | AO | 181.0 | 162.0 | 126.0 | 119.0 | 107.0 | 121.0 | - | 100.0 | 115.0 | 94.4 | 98.6 | 99 | 80.2 | 90.4 | 75 | 89 | 81 | - | - |
| Potassium | - | - | 36.0 | 30.0 | 37.0 | 32.0 | 50.0 | 34.0 | - | 33.0 | 31.0 | 24.0 | 48.0 | 50 | 26.9 | 33.4 | 49 | 39 | 25 | 21.7 | 46.8 |
| Sulphate | 500 | AO | 35.0 | 36.1 | 26.4 | 33.6 | 17.0 | 27.3 | - | 87.0 | 42.2 | 21.4 | 17.1 | 23 | 16 | 14 | 15 | 14 | 13 | 14.8 | 7.3 |
| Total Kjeldahl Nitrogen (TKN) | - | - | 5.5 | 4.5 | 5.7 | 2.0 | 10.3 | 3.9 | - | 1.4 | - | 3.3 | - | - | - | - | - | - | 3.2 | 2.48 | 3.06 |
| Total Phenolics | - | - | nd | 0.0 | nd | nd | nd | nd | - | nd | - | 0.0 | - | - | 0.002 | ND(0.002) | ND | - | ND | 0.0017 | 0.084 |
| Phosphorus (Dissolved) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND(0.05) | 1.08 |
| Laboratory Conductivity (µmhos/cm) | - | - | 1620.0 | 1630.0 | 1660.0 | 1530.0 | 1530.0 | 1440.0 | - | 1410.0 | - | 1110.0 | 1208.0 | 1640 | - | - | 1440 | - | 1380 | 1170 | 1500 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | OG | 7.7 | 7.1 | 7.4 | 7.4 | 7.7 | 7.7 | - | 7.4 | nd | 7.3 | 7.3 | 8.13 | - | - | 8.0 | - | 7.2 | 7.61 | 7.58 |
| Field pH (Std. Units) | 6.5 - 8.5 | OG | | | | | | | | | | | | - | - | - | - | - | - | 7.04 | 7.9 |
| Field Conductivity (µmhos/cm) | - | - | | | | | | | | | | | | - | - | - | - | - | - | 1150 | 769 |
| Field Temperature (°C) | - | - | | | | | | | | | | | | - | - | - | - | - | - | 7.6 | 10.2 |

Notes:
All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW9-88**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOECC ODWS[1]* | | OW9-88 *17-Jul-89* | *30-Nov-89* | *OW30-07 19-Jul-90* | *6-Nov-91* | *15-Jun-92* | *3-Nov-92* | *12-Apr-93* | *26-Oct-93* | *11-Apr-94* | *24-Oct-94* | *10-Apr-95* | *20-Oct-95* | *13-Jun-96* | *12-Nov-96* | *7-May-97* | *20-Nov-97* | *12-May-98* | *16-Dec-98* | *9-Jun-99* | *28-Jun-00* | *24-Nov-00* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 30 - 500 | OG | - | 614 | - | 540 | 501 | 466 | 573 | 264 | 470 | 455 | 397 | 466 | 524 | 489 | 526 | 517 | 608 | 492 | - | 529 | 498 |
| Calcium | - | - | 3590* | 165 | 150 | 156 | 146 | 111 | 122 | 80.4 | 141 | 101 | 85.9 | 125 | 121 | 109 | 141 | 134 | 132 | 129 | 139 | 140 | 120 |
| Chloride | 250 | AO | 86.7 | 88.4 | 74.6 | 55.9 | 254 | 32.6 | 26.2 | 20.0 | 14.3 | 15.0 | 12.3 | 10.1 | 11.9 | 9.71 | 11 | 7.8 | 10.2 | 8.7 | 4.8 | 4.6 | 2.6 |
| Dissolved Organic Carbon (DOC) | 5 | AO | 5.4 | 4.4 | 4.5 | 12.2 | 8.0 | 12.5 | 16.3 | 42.0 | 4.9 | 4.0 | 9.8 | 10.5 | 2.2 | 2.4 | 2.8 | 2.3 | 3 | 2.6 | 4 | 9.1 | 8.4 |
| Hardness | 80 - 100 | OG | 12,988* | 919 | 874 | 893 | 843 | 777 | 793 | 710 | 863 | 732 | 656 | 730 | 691 | 674 | 779 | 743 | 735 | 690 | 708 | 716 | 605 |
| Iron | 0.3 | AO | 730* | 0.98 | - | 0.05 | 0.01 | 0.10 | 0.11 | 0.03 | 0.13 | 0.01 | 0.336 | 0.03 | 0.062 | 0.006 | | 0.097 | 0.158 | nd | 0.01 | 0.01 | 0.04 |
| Magnesium | - | - | 974* | 123 | 121 | 122 | 116 | 121 | 118 | 124 | 124 | 116 | 107 | 101 | 94.7 | 93.7 | 105 | 99.1 | 98.5 | 89.5 | 88.1 | 88.7 | 74.4 |
| Manganese | 0.05 | AO | - | - | - | 0.315 | 0.346 | 0.1100 | 0.425 | 0.238 | 0.219 | 0.105 | 0.2432 | 0.178 | 0.11 | 0.008 | 0.105 | 0.106 | 0.144 | 0.02 | 0.08 | 0.061 | 0.014 |
| Ammonia | - | - | - | 0.038 | - | 0.191 | 0.089 | 0.361 | 0.069 | 0.057 | 0.010 | 0.095 | 0.12 | 0.11 | 0.05 | 0.07 | 0.06 | | nd | nd | 0.05 | nd | 0.04 |
| Nitrite | 1 | MAC | - | 0.01 | - | 0.01 | 0.01 | <0.01 | <0.01 | 0.03 | 0.02 | 0.02 | 0.02 | 0.11 | <0.03 | <0.03 | | | nd | nd | nd | nd | nd |
| Nitrate | 10 | MAC | 0.4 | 0.2 | - | 6.8 | 7.2 | 5.8 | 5.1 | 3.1 | 3.1 | 2.2 | 2 | 1.3 | 2.17 | 1.78 | 2.68 | 2.38 | 1.81 | 1 | 2.5 | 2.1 | 0.8 |
| Sodium | 200 | AO | 87.2 | 64.8 | - | 57.7 | 42.8 | 42.6 | 33.0 | 31.2 | 28.2 | 24.0 | 21.7 | 21.2 | 18.8 | 17.7 | 22.6 | 18.2 | 13.6 | 25.6 | 12.2 | 30.6 | 18.6 |
| Potassium | - | - | 160* | 2.1 | - | 4.4 | 6.7 | 6.5 | 9.3 | 9.2 | 11.8 | 11.7 | 9.65 | 11.7 | 11.5 | 11.1 | 12.6 | 12.5 | 14.9 | 14.9 | 15.2 | 10 | 10 |
| Sulphate | 500 | AO | 350 | 310 | - | 389 | 352 | 261 | 254 | + | 354 | 258 | G100 | 161 | 188 | 180 | 252 | 249 | nd | 196 | 183 | 212 | 178 |
| Total Kjeldahl Nitrogen (TKN) | - | - | - | 0.38 | - | 0.84 | 1.22 | 1.19 | 1.47 | 1.49 | 0.42 | 0.55 | 1.64 | 0.47 | 0.79 | 1.83 | 0.54 | 0.21 | 1.42 | 0.3 | 0.29 | 0.45 | 0.4 |
| Total Phenolics | - | - | 0.0050 | 0.0015 | <0.0010 | 0.0025 | <0.0010 | <0.0010 | 0.002 | 0.0058 | 0.0040 | 0.0027 | 0.0046 | 0.0021 | <0.001 | <0.001 | | | nd | nd | 0.002 | nd | nd |
| Phosphorus (Dissolved) | - | - | | | | | | | | | | | | | | | | | | | | | |
| Laboratory Conductivity (µmhos/cm) | - | - | 1870 | 1760 | 1690 | 1770 | 1600 | 1480 | 1490 | 1440 | 1490 | 1400 | 1286 | 1187 | 1070 | 1030 | 1190 | 1260 | 1250 | 1160 | 1090 | 1080 | 971 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | OG | 7.03 | 7.35 | 7.45 | 7.57 | 7.35 | 7.76 | 7.24 | 8.00 | 7.62 | 7.33 | 7.76 | 7.45 | 7.45 | 7.3 | 7.34 | 7.21 | 7.15 | 7.55 | 7.32 | 7.63 | 7.36 |
| Field pH (Std. Units) | 6.5 - 8.5 | OG | | | | | | | | | | | | | | | | | | | | | |
| Field Conductivity (µmhos/cm) | - | - | | | | | | | | | | | | | | | | | | | | | |
| Field Temperature (°C) | - | - | | | | | | | | | | | | | | | | | | | | | |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW9-88**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| Parameter (mg/L) | MOECC ODWS[1] | | 28-Jun-01 | 14-Dec-01 | 14-Jun-02 | 29-Oct-02 | 5-May-03 | 14-Nov-03 | 17-May-04 | 9-Nov-04 | OW9-88 4-Jul-05 | 21-Nov-05 | 4-May-06 | 6-Dec-06 | 10-Jun-07 | 21-Oct-07 | 5-Aug-08 | 29-Dec-08 | 30-Apr-09 | 19-Nov-09 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 30 - 500 | OG | 554 | 620 | 572 | 477 | 494 | 403 | 435 | 455 | 437 | 415 | 18700 | 461 | 531 | 461 | 548 | 573 | 546 | 556 |
| Calcium | - | - | 141 | 137 | 148 | 122 | 118 | 92.4 | 107 | 100 | 109 | 91 | 104 | 124 | 130 | - | 160 | 140 | 172 | 152 |
| Chloride | 250 | AO | 2.4 | 4.2 | 6.6 | 5.6 | 6.5 | 9 | 13.8 | 13 | 24.4 | 16 | 46 | 96 | 110 | - | 110 | 88 | 85.0 | 68.8 |
| Dissolved Organic Carbon (DOC) | 5 | AO | 2.6 | 2.9 | 2.8 | 2.8 | 2.4 | 2.8 | 1.9 | 4.3 | 4.3 | 2.4 | 1.7 | 1.9 | - | 92 | 3 | 1.8 | 2.8 | 3 |
| Hardness | 80 - 100 | OG | 660 | 672 | - | 585 | 565 | 432 | 503 | 486 | 484 | 450 | 518 | 583 | 570 | 490 | 700 | 600 | 709 | 658 |
| Iron | 0.3 | AO | nd | nd | nd | nd | nd | 0.01 | nd | nd | ND | ND | 0.01 | ND(0.01) | ND | - | ND | ND | 0.170 | ND(0.05) |
| Magnesium | - | - | 74.7 | 80.1 | 87.8 | 68 | 65.4 | 48.8 | 57 | 57.2 | 66.9 | 54 | 62.8 | 66.4 | 58 | - | 74 | 62 | 68.1 | 67.6 |
| Manganese | 0.05 | AO | nd | 0.014 | - | 0.039 | 0.029 | - | 0.006 | nd | ND | 0.054 | - | 0.046 | 0.15 | - | 0.31 | 0.039 | 0.101 | 0.0288 |
| Ammonia | - | - | 0.06 | nd | 0.03 | 0.03 | 0.05 | nd | 0.05 | 0.04 | 0.13 | 0.46 | ND(0.1) | 0.2 | - | - | 0.44 | 0.45 | 0.474 | ND(0.05) |
| Nitrite | 1 | MAC | nd | nd | nd | nd | nd | nd | nd | nd | ND | 0.01 | ND(0.06) | ND(0.06) | 0.02 | 0.22 | 0.06 | ND | ND(0.001) | ND(0.10) |
| Nitrate | 10 | MAC | nd | 1 | 1.3 | 1.2 | 1.7 | 2 | 2.4 | 2 | 2.3 | 2.2 | 2.29 | 1.36 | 0.6 | 0.7 | 0.4 | 0.7 | 0.73 | 2.06 |
| Sodium | 200 | AO | 8.3 | 8.7 | 10.3 | 9.9 | 9 | 6.5 | 7 | 7.2 | 9.3 | 7.2 | 20.1 | 22.6 | 33 | - | 48 | 39 | - | - |
| Potassium | - | - | 21 | 18 | 20 | 17 | 16 | 16 | 18 | 18 | 20.8 | 17 | 16.8 | 15.7 | 15 | - | 19 | 16 | 15.6 | 12 |
| Sulphate | 500 | AO | 164 | 159 | 148 | 99.6 | 107 | 56 | 74.3 | 55 | 59.1 | 46 | 61 | 48 | 52 | 50 | 44 | 40 | 46.1 | 45 |
| Total Kjeldahl Nitrogen (TKN) | - | - | 0.28 | 0.2 | 0.31 | 0.25 | 0.42 | - | 0.24 | - | - | - | - | - | - | - | - | 1.5 | 0.61 | 0.38 |
| Total Phenolics | - | - | nd | nd | nd | nd | nd | - | 0.001 | - | ND | ND | ND(0.001) | ND(0.002) | ND | - | ND | ND | 0.0063 | 0.003 |
| Phosphorus (Dissolved) | - | - | | | | | | | | | - | - | - | - | - | - | - | - | ND(0.05) | ND(0.05) |
| Laboratory Conductivity (µmhos/cm) | - | - | 1030 | 1150 | 1150 | 922 | 1020 | 750 | 778 | 1030 | 932 | 720 | - | - | 1340 | 1210 | - | 1290 | 1330 | 1270 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | OG | 7.59 | 7.42 | 7.59 | 7.5 | 7.42 | nd | 7.38 | 7.33 | 8.11 | 8.05 | - | - | 8.0 | 8.0 | - | 7.3 | 7.60 | 7.69 |
| Field pH (Std. Units) | 6.5 - 8.5 | OG | | | | | | | | | - | - | - | - | - | - | - | - | 6.94 | 7.11 |
| Field Conductivity (µmhos/cm) | - | - | | | | | | | | | - | - | - | - | - | - | - | - | 1390 | 970 |
| Field Temperature (°C) | - | - | | | | | | | | | - | - | - | - | - | - | - | - | 10.3 | 8.7 |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW10-88**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOECC ODWS[1]* | | *2-Jan-89* | *30-Nov-89* | *OW30-07 18-Jul-90* | *15-Jun-92* | *3-Nov-92* | *12-Apr-93* | *26-Oct-93* | *11-Apr-94* | *24-Oct-94* | *10-Apr-95* | *20-Oct-95* | *12-Nov-96* | *20-Nov-97* | *OW10-88 10-Dec-06* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 30 - 500 | OG | - | 492 | - | 298 | 343 | 349 | 234 | 309 | 309 | 266 | 336 | 316 | 329 | 312 | 270 | - | - |
| Calcium | - | - | 112.0 | 130 | 99.6 | 80.7 | 88.2 | 86.1 | 60.7 | 86.8 | 93.3 | 90.8 | 118 | 89.4 | 94.6 | 97.9 | - | - | - |
| Chloride | 250 | AO | 8.76 | 6.9 | 7.7 | 11.2 | 9.4 | 7.6 | 10.2 | 6.2 | 10.5 | 8 | 9.8 | 9.95 | 8.2 | 28 | 23 | - | - |
| Dissolved Organic Carbon (DOC) | 5 | AO | 4.2 | 3.2 | 2.6 | 7.9 | 19.6 | 22.0 | 4.5 | 7.7 | 3.1 | 4.7 | 3.8 | 2.5 | 1.9 | 2.3 | 1.8 | - | - |
| Hardness | 80 - 100 | OG | 466 | 525 | 392 | 323 | 365 | 339 | 282 | 329 | 358 | 341 | 430 | 351 | 348 | 361 | 300 | - | - |
| Iron | 0.3 | AO | 0.82 | 0.88 | - | 1.30 | 2.66 | 2.65 | 3.79 | 2.93 | 2.34 | 3.135 | 1.01 | <0.005 | 1.73 | 0.06 | ND | - | - |
| Magnesium | - | - | 45.18 | 48.5 | 34.6 | 29.4 | 35.0 | 30.1 | 31.6 | 27.2 | 30.3 | 27.6 | 32.6 | 26.9 | 27.3 | 28.3 | 25 | - | - |
| Manganese | 0.05 | AO | - | - | - | 0.5500 | 0.589 | 0.678 | 0.876 | 0.645 | 1.20 | 0.8373 | 0.891 | 0.211 | 0.557 | 0.123 | 0.087 | - | - |
| Ammonia | - | - | - | 0.245 | - | 0.442 | 0.131 | 0.335 | 0.174 | 0.151 | 0.141 | 0.12 | 0.24 | 0.34 | 0.09 | 0.3 | 0.15 | - | - |
| Nitrite | 1 | MAC | - | 0.01 | - | 0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 | 0.01 | <0.01 | <0.03 | | ND(0.06) | 1.1 | - | - |
| Nitrate | 10 | MAC | <0.1 | 0.1 | - | <0.1 | <0.1 | 0.1 | <0.1 | 0.1 | 0.1 | <0.1 | <0.1 | <0.03 | | 0.15 | 0.1 | - | - |
| Sodium | 200 | AO | 8.84 | 8.56 | - | 4.1 | 5.3 | 3.9 | 3.3 | 3.0 | 3.2 | 3 | 4 | 3.03 | 2.79 | 8.71 | 11 | - | - |
| Potassium | - | - | 1.21 | 1.6 | - | 1.2 | 1.4 | 0.9 | 0.7 | 0.4 | 0.62 | 0.38 | 0.66 | <1.0 | | 0.63 | 0.8 | - | - |
| Sulphate | 500 | AO | 4.0 | 55.5 | - | 11.5 | 6.0 | 7.5 | 10.1 | 8.2 | 4.9 | 10.4 | 30.9 | 9.16 | 11.7 | 27 | 18 | - | - |
| Total Kjeldahl Nitrogen (TKN) | - | - | - | 0.57 | - | 3.78 | 1.30 | 0.74 | 0.50 | 0.32 | 0.46 | 1.03 | 1.15 | 2.01 | 0.23 | - | 8 | - | - |
| Total Phenolics | - | - | 0.0060 | 0.0010 | <0.0010 | <0.0010 | *0.0615 | 0.0015 | <0.0010 | 0.0012 | 0.0015 | 0.0039 | <0.0010 | <0.001 | | ND(0.002) | ND | - | - |
| Phosphorus (Dissolved) | - | - | | | | | | | | | | | | | | - | - | - | - |
| Laboratory Conductivity (µmhos/cm) | - | - | 894 | 931 | 725 | 629 | 681 | 626 | 629 | 588 | 677 | 606 | 717 | 581 | 616 | - | 563 | - | - |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | OG | 7.46 | 7.10 | 7.50 | 7.38 | 7.59 | 7.16 | 7.32 | 7.64 | 7.32 | 7.35 | 7.24 | 7.41 | 7.22 | - | 7.5 | - | - |
| Field pH (Std. Units) | 6.5 - 8.5 | OG | | | | | | | | | | | | | | - | - | - | - |
| Field Conductivity (µmhos/cm) | - | - | | | | | | | | | | | | | | - | - | - | - |
| Field Temperature (°C) | - | - | | | | | | | | | | | | | | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW11-88**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| | *MOECC ODWS [1]* | | *OW30-07* | | | *OW11-88* | | |
|---|---|---|---|---|---|---|---|---|
| | | | *12-Nov-96* | *18-Jul-90* | *11-Apr-95* | *6-Dec-06* | *30-Apr-09* | *19-Nov-09* |
| Alkalinity | 30 - 500 | OG | 318 | - | - | - | - | - |
| Calcium | - | - | 98.7 | 56.2 | - | - | - | - |
| Chloride | 250 | AO | 7.9 | 7.1 | - | 9.7 | - | - |
| Copper | 1 | AO | ND(0.003) | - | - | - | - | - |
| Dissolved Organic Carbon (DOC) | 5 | AO | 1.6 | - | 11.3 | - | - | - |
| Hardness | 80 - 100 | OG | 402 | 252 | - | 288 | - | - |
| Iron | 0.3 | AO | 0.006 | - | - | - | - | - |
| Magnesium | - | - | 33.6 | 27.1 | - | - | - | - |
| Manganese | 0.05 | AO | 0.011 | - | - | - | - | - |
| Ammonia | - | - | 0.46 | - | - | - | - | - |
| Nitrite | 1 | MAC | 0.03 | - | - | 1.18 | - | - |
| Nitrate | 10 | MAC | ND(0.03) | - | - | ND(0.06) | - | - |
| Sodium | 200 | AO | 3.09 | - | - | - | - | - |
| Potassium | - | - | ND(1.0) | - | - | - | - | - |
| Sulphate | 500 | AO | 67.5 | - | - | 60 | - | - |
| Total Kjeldahl Nitrogen (TKN) | - | - | 18.6 | - | - | - | - | - |
| Total Phenolics | - | - | ND(0.001) | 0.0020 | - | - | - | - |
| Phosphorus (Dissolved) | - | - | 9.62 | - | - | - | - | - |
| Laboratory Conductivity (µmhos/cm) | - | - | 644 | 479 | - | 570 | - | - |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | OG | 7.48 | 7.85 | - | - | - | - |
| | | | | | | | | |
| Field pH (Std. Units) | 6.5 - 8.5 | OG | - | | | - | - | - |
| Field Conductivity (µmhos/cm) | - | - | - | | | - | - | - |
| Field Temperature (°C) | - | - | - | | | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW12-88**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *2-Jan-89* | *30-Nov-89* | *18-Jul-90* | *11-Apr-94* | *24-Oct-94* | *10-Apr-95* | *20-Oct-95* | *13-Jun-96* | *12-Nov-96* | *7-May-97* | *20-Nov-97* | *12-May-98* | *14-Dec-01* | *6-Dec-06* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* | | *ODWS [1]* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | - | 186 | - | 163 | 296 | 221 | 356 | 201 | 238 | 209 | 278 | 257 | 295 | 293 | 229 | - | - | | 30 - 500 | OG |
| Calcium | 66.4 | 61.9 | 92.0 | 80.6 | 108 | 81.1 | 126 | 66 | 85.8 | 73.2 | 97.5 | 80 | 106 | - | 66 | - | - | | - | - |
| Chloride | 3.69 | 4.7 | 1.0 | 7.1 | 16.4 | 5.7 | 9.6 | 2.15 | 5.33 | 2.7 | 8.2 | 3.4 | 10 | 11 | 4 | - | - | | 250 | AO |
| Dissolved Organic Carbon (DOC) | 1.4 | 2.3 | 1.5 | - | 9.2 | * | 2.1 | 2.9 | 2.3 | 1.5 | 1.6 | 2.5 | 3.2 | 2.1 | 2.7 | - | - | | 5 | AO |
| Hardness | 254 | 231 | 340 | 276 | 420 | 306 | 475 | 236 | 313 | 261 | 379 | 304 | 413 | 369 | 270 | - | - | | 80 - 100 | OG |
| Iron | 1.00 | 1.76 | - | 0.15 | 0.32 | 0.115 | 0.02 | 0.083 | 0.019 | 0.029 | 0.046 | 0.108 | nd | - | ND | - | - | | 0.3 | AO |
| Magnesium | 21.29 | 18.4 | 26.7 | - | 36.5 | 25.1 | 38.9 | 17.3 | 26.4 | 21.7 | 33 | 25.4 | 35.7 | - | 25 | - | - | | - | - |
| Manganese | - | - | - | 0.231 | 0.564 | 0.1717 | 0.395 | 0.04 | <0.005 | 0.017 | 0.042 | 0.039 | 0.02 | - | 0.002 | - | - | | 0.05 | AO |
| Ammonia | - | 0.032 | - | 0.310 | 0.116 | 0.12 | 0.16 | 0.06 | 0.13 | 0.12 | | 0.04 | 0.04 | - | 0.11 | - | - | | - | - |
| Nitrite | <0.1 | 0.1 | - | 0.5 | 0.2 | 0.5 | <0.1 | 0.46 | 0.19 | 0.013 | 0.17 | 0.48 | 2.8 | 1.76 | 1.1 | - | - | | 1 | MAC |
| Nitrate | - | 0.01 | - | 0.03 | 0.01 | <0.01 | <0.01 | <0.03 | <0.03 | | | nd | nd | ND(0.06) | ND | - | - | | 10 | MAC |
| Sodium | 2.92 | 1.24 | - | 2.9 | 5.0 | 3.9 | 6.8 | 1.85 | 3.61 | 2.91 | 4.29 | 3.74 | 9.8 | - | 4.6 | - | - | | 200 | AO |
| Potassium | 1.56 | 1.3 | - | 2.6 | 0.46 | 0.61 | 0.82 | <1.0 | <1.0 | | | nd | nd | - | 0.91 | - | - | | - | - |
| Sulphate | 16.0 | 36.0 | - | 71.8 | 79.1 | * | 82.5 | 27.8 | 52.2 | 32.8 | 108 | 47.8 | 123 | 67 | 53 | - | - | | 500 | AO |
| Total Kjeldahl Nitrogen (TKN) | - | 0.26 | - | 3.38 | 0.27 | 0.33 | 0.29 | 7.66 | 6.4 | 0.7 | 0.13 | 7.8 | 0.26 | - | 7 | - | - | | - | - |
| Total Phenolics | 0.0010 | 0.0020 | <0.0010 | - | 0.0047 | 0.0045 | <0.0010 | <0.001 | <0.001 | | | nd | nd | - | ND | - | - | | - | - |
| Phosphorus (Dissolved) | - | 0.053 | - | 0.206 | 0.019 | 0.04 | <0.01 | 0.032 | 2.99 | 1.41 | 0.22 | 2.2 | 0.484 | - | 3 | - | - | | - | - |
| Laboratory Conductivity (µmhos/cm) | 492 | 415 | 613 | 497 | 786 | 554 | 778 | 425 | 522 | 450 | 695 | 551 | 751 | 670 | 512 | - | - | | - | - |
| Laboratory pH (Std. Units) | 7.85 | 7.43 | 7.73 | 8.65 | 7.29 | 7.66 | 7.5 | 7.18 | 7.39 | 7.42 | 7.31 | 7.38 | 7.72 | - | 7.5 | - | - | | 6.5 - 8.5 | OG |
| Field pH (Std. Units) | | | | | | | | | | | | | | | | - | - | | 6.5 - 8.5 | OG |
| Field Conductivity (µmhos/cm) | | | | | | | | | | | | | | | | - | - | | - | - |
| Field Temperature (°C) | | | | | | | | | | | | | | | | - | - | | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW13-88**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *18-Jul-90* | *10-Apr-95* | *12-Nov-96* | *12-May-98* | *6-Dec-06* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* | | *ODWS [1]* | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | - | - | 370 | 346 | 328 | 337 | - | - | 30 - 500 | | OG |
| Calcium | 86.7 | - | 114 | 124 | - | 110 | - | - | - | | - |
| Chloride | 12.5 | - | 16.1 | 18.7 | 19 | 12 | - | - | 250 | | AO |
| Dissolved Organic Carbon (DOC) | 2.3 | 5.2 | 2.3 | 1.6 | - | 1.3 | - | - | 5 | | AO |
| Hardness | 330 | - | 492 | 478 | 450 | 410 | - | - | 80 - 100 | | OG |
| Iron | - | - | 0.006 | 1.01 | - | ND | - | - | 0.3 | | AO |
| Magnesium | 27.4 | - | 39.6 | 40.6 | - | 36 | - | - | - | | - |
| Manganese | - | - | 0.029 | 0.639 | - | - | - | - | 0.05 | | AO |
| Ammonia | - | - | 0.6 | 0.1 | - | - | - | - | - | | - |
| Nitrite | - | - | 0.14 | 0.09 | 0.3 | 0.2 | - | - | 1 | | MAC |
| Nitrate | - | - | <0.03 | nd | ND(0.06) | 0.01 | - | - | 10 | | MAC |
| Sodium | - | - | 11.2 | 13.3 | - | 7.9 | - | - | 200 | | AO |
| Potassium | - | - | <1.0 | nd | - | 0.96 | - | - | - | | - |
| Sulphate | - | - | 96.6 | 125 | 110 | 101 | - | - | 500 | | AO |
| Total Kjeldahl Nitrogen (TKN) | - | - | 2.73 | 1.83 | - | - | - | - | - | | - |
| Total Phenolics | <0.0010 | - | <0.001 | nd | - | - | - | - | - | | - |
| Phosphorus (Dissolved) | - | - | 0.15 | 3.6 | - | - | - | - | - | | - |
| Laboratory Conductivity (µmhos/cm) | 620 | - | 746 | 859 | 780 | 774 | - | - | - | | - |
| Laboratory pH (Std. Units) | 8.04 | - | 7.51 | 7.36 | - | 7.6 | - | - | 6.5 - 8.5 | | OG |
| | | | | | | | | | | | |
| Field pH (Std. Units) | | | | | - | - | - | - | 6.5 - 8.5 | | OG |
| Field Conductivity (µmhos/cm) | | | | | - | - | - | - | - | | - |
| Field Temperature (°C) | | | | | - | - | - | - | - | | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW16-89**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *17-Jul-89* | *30-Nov-89* | *18-Jul-90* | *3-Nov-92* | *12-Apr-93* | *26-Oct-93* | *11-Apr-94* | *24-Oct-94* | *10-Apr-95* | *20-Oct-95* | *13-Jun-96* | *12-Nov-96* | *7-May-97* | *20-Nov-97* | *12-May-98* | *16-Dec-98* | *9-Jun-99* | *28-Jun-00* | *24-Nov-00* | *28-Jun-01* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | - | 460 | - | 213 | 437 | 217 | 305 | 307 | 299 | 333 | 409 | 388 | 383 | 390 | 401 | 322 | - | 345 | 410 | 429 |
| Calcium | 91.4 | 78.8 | 57.2 | 50.4 | 68.0 | 60.7 | 95.8 | 90.7 | 114 | 129 | 123 | 109 | 106 | 147 | 113 | 114 | 106 | 94.9 | 140 | 126 |
| Chloride | 12.5 | 13.5 | 13.7 | 4.5 | 9.7 | 19.2 | 14.3 | 15.8 | 14.3 | 12.8 | 19.8 | 18 | 20.5 | 16.6 | 24.3 | 60.2 | 56 | 70.5 | 142 | 80.5 |
| Copper | 0.0230 | - | - | 0.0029 | - | - | - | - | <0.002 | - | - | <0.003 | | | nd | nd | nd | nd | 0.004 | 0.006 |
| Dissolved Organic Carbon (DOC) | 10.4 | >20.0 | 41.0 | 15.2 | 15.2 | 20.0 | 13.3 | 1.7 | 1.2 | 1.7 | 1.1 | 1.7 | 1 | 1.3 | 0.6 | 0.6 | 0.6 | 0.7 | 3.3 | 1.6 |
| Hardness | 383 | 328 | 235 | 145 | 276 | 289 | 352 | 372 | 425 | 475 | 449 | 447 | 432 | 570 | 423 | 442 | 392 | 350 | 522 | 470 |
| Iron | 0.20 | 0.24 | - | ^0.27 | 0.16 | 0.11 | 0.10 | <0.01 | 0.026 | 0.02 | 0.049 | <0.005 | | 0.824 | 0.08 | nd | nd | 0.02 | nd | nd |
| Magnesium | 37.4 | 31.9 | 22.3 | 4.5 | 25.8 | 33.2 | 27.4 | 35.2 | 34 | 36.9 | 34.4 | 35 | 29 | 49.6 | 34.2 | 38.4 | 31.1 | 27.5 | 42 | 37.5 |
| Manganese | 0.0860 | - | - | 0.2500 | 0.332 | 0.030 | 0.067 | 0.266 | 0.0871 | 0.311 | 0.1 | 0.09 | 0.085 | 0.168 | 0.046 | 0.02 | 0.02 | 0.046 | 0.044 | 0.065 |
| Ammonia | - | 0.154 | - | 1.7 | 2.6 | 0.051 | 0.187 | 0.191 | 0.1 | 0.51 | 0.16 | 0.48 | 0.11 | 0.05 | nd | nd | 0.02 | 0.06 | - | 0.09 |
| Nitrite | 2.8 | <0.1 | - | 0.1 | 2.0 | 0.5 | 1.1 | 1.8 | 1.6 | 1.5 | 1.97 | 1.95 | 2.11 | 0.178 | 1.34 | 0.83 | 1.2 | nd | nd | 0.7 |
| Nitrate | - | 0.01 | - | 0.02 | <0.01 | <0.01 | 0.01 | 0.02 | <0.01 | 0.01 | 0.09 | <0.03 | | | nd | nd | nd | nd | 1 | nd |
| Sodium | 26.4 | 104 | - | 46.4 | 71.1 | 5.3 | 5.2 | 5.7 | 5.1 | 6.3 | 5.87 | 5.91 | 5.55 | 6.69 | 6.76 | 7 | 7.1 | 23.5 | 30.5 | 23.6 |
| Potassium | 3.4 | 6.6 | - | 6.0 | 4.1 | 1.6 | 2.7 | 1.66 | 1.28 | 1.32 | <1.0 | <1.0 | 3.6 | 1.4 | 1.1 | 2 | nd | nd | 2 | 4 |
| Sulphate | 52.5 | 135 | - | 5.5 | 24.0 | 18.7 | 19.3 | 17.7 | 20.9 | 22.7 | 24 | 23.8 | 24.8 | 23.4 | 21 | 18.5 | 16.2 | 17.9 | 21.3 | 21.1 |
| Total Kjeldahl Nitrogen (TKN) | - | 1.15 | - | 5.10 | 3.75 | 0.52 | 1.52 | 0.38 | 0.03 | 1.45 | 1.81 | 1.4 | 0.56 | 0.21 | 0.55 | 0.17 | 0.13 | 0.3 | 0.34 | - |
| Total Phenolics | 0.0055 | 0.0035 | 0.0040 | *0.0222 | 0.014 | <0.0010 | 0.0053 | 0.0021 | 0.0014 | 0.0028 | 0.002 | <0.001 | | | nd | nd | 0.002 | nd | nd | - |
| Phosphorus (Dissolved) | - | 0.007 | - | 0.435 | 0.029 | 0.074 | 0.072 | 0.007 | 0.03 | 0.03 | 0.006 | 0.38 | 0.17 | 0.17 | 0.65 | 0.03 | 0.15 | - | - | - |
| Laboratory Conductivity (µmhos/cm) | 779 | 1035 | 1072 | 457 | 811 | 698 | 634 | 767 | 766 | 797 | 767 | 710 | 726 | 771 | 799 | 772 | 714 | 783 | 1020 | 948 |
| Laboratory pH (Std. Units) | 7.51 | 7.53 | 7.89 | 7.38 | 7.33 | 7.63 | 7.88 | 7.35 | 7.41 | 7.34 | 7.05 | 7.27 | 7.3 | 7.3 | 7.36 | 7.73 | 7.51 | 7.72 | 7.31 | 7.65 |
| Field pH (Std. Units) | | | | | | | | | | | | | | | | | | | | |
| Field Conductivity (µmhos/cm) | | | | | | | | | | | | | | | | | | | | |
| Field Temperature (°C) | | | | | | | | | | | | | | | | | | | | |

Notes:
All concentrations in mg/L unless otherwise noted.
(1) MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**Appendix C.2**

**OW16-89**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *14-Dec-01* | *14-Jun-02* | *29-Oct-02* | *5-May-03* | *11-Nov-03* | *4-Jul-05* | *4-May-06* | *6-Dec-06* | *10-Jun-07* | *21-Oct-07* | *5-Aug-08* | *29-Dec-08* | *30-Apr-09* Duplicate | *30-Apr-09* | *30-Apr-09* Duplicate | *19-Nov-09* | | *ODWS* [1] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 483 | 410 | 472 | 449 | 453 | 526 | 446 | 430 | 476 | 432 | 340 | 321 | 353 | 353 | 350 | 350 | 30 - 500 | | OG |
| Calcium | 173 | 76.9 | 95.8 | 74.3 | 142 | 137 | 134 | 155 | 180 | 170 | 140 | 130 | 164 | 164 | 164 | 101 | - | | - |
| Chloride | 133 | 74.8 | 61.2 | 41.7 | 40.9 | 40.6 | 33 | 40 | 130 | 100 | 150 | 180 | 233 | 233 | 239 | 120 | 250 | | AO |
| Copper | 0.01 | - | nd | nd | - | 0.004 | - | - | - | - | - | - | - | - | - | - | 1 | | AO |
| Dissolved Organic Carbon (DOC) | 0.8 | 2.1 | 2 | 1.5 | 2 | 4 | 1.3 | 1 | 1.2 | 1 | 1.3 | 0.5 | 1.4 | 1.4 | 1.1 | ND(1.0) | 5 | | AO |
| Hardness | 291 | - | 345 | 265 | 520 | 486 | 498 | 571 | 660 | 610 | 530 | 500 | 575 | 575 | 575 | 363 | 80 - 100 | | OG |
| Iron | 0.65 | 0.02 | 0.02 | 0.01 | nd | 1.54 | 0.06 | 1.25 | 0.16 | ND | ND | ND | ND(0.050) | ND(0.05) | ND(0.05) | ND(0.05) | 0.3 | | AO |
| Magnesium | 50.8 | 20.3 | 25.6 | 19.2 | 39.7 | 43.1 | 39.6 | 44.8 | 51 | 46 | 41 | 39 | 40.1 | 40.1 | 40.3 | 26.9 | - | | - |
| Manganese | 0.063 | - | 0.069 | 0.073 | nd | 0.419 | - | 0.145 | 0.077 | 0.012 | ND | 0.018 | ND(0.0010) | ND(0.001) | ND(0.001) | 0.0038 | 0.05 | | AO |
| Ammonia | nd | 0.13 | 0.36 | 0.21 | 0.36 | 7.95 | 0.2 | 0.2 | ND | ND | 0.09 | 0.12 | ND(0.050) | ND(0.05) | ND(0.05) | ND(0.05) | - | | - |
| Nitrite | 1.7 | 2.2 | 1.5 | 2.8 | 3.4 | 0.4 | 0.98 | 2.12 | 2.6 | 2.9 | 2.7 | 1.3 | ND(0.10) | ND(0.10) | ND(0.10) | ND(0.10) | 1 | | MAC |
| Nitrate | nd | nd | nd | nd | nd | ND | 0.06 | ND(0.06) | ND | 0.05 | ND | ND | 1.17 | 1.17 | 1.18 | 0.85 | 10 | | MAC |
| Sodium | 44.1 | 13.9 | 22.9 | 11.4 | 11.2 | 15.9 | 11.4 | 15.4 | 24 | 35 | 43 | 41 | - | - | - | - | 200 | | AO |
| Potassium | 3 | 9 | 6 | 7 | 1 | 4 | 1.57 | 1.46 | 1.7 | 1.5 | 1.8 | 1.5 | 1.6 | 1.6 | 1.6 | 1.3 | - | | - |
| Sulphate | 35.7 | 40 | 40.6 | 36.1 | 36.1 | 8 | 25 | 23 | 35 | 31 | 24 | 23 | 25.6 | 25.6 | 25.6 | 16.8 | 500 | | AO |
| Total Kjeldahl Nitrogen (TKN) | 0.1 | 0.35 | 0.64 | 0.54 | - | - | - | - | - | - | - | 2 | ND(0.15) | ND(0.15) | ND(0.15) | 0.6 | - | | - |
| Total Phenolics | nd | nd | nd | nd | - | 0.003 | ND(0.001) | ND(0.002) | ND | ND | ND | ND | 0.0025 | 0.0025 | 0.0023 | 0.0020 | - | | - |
| Phosphorus (Dissolved) | 0.647 | - | - | - | - | - | - | - | - | - | - | 3.2 | ND(0.050) | ND(0.05) | ND(0.05) | 0.229 | - | | - |
| Laboratory Conductivity (µmhos/cm) | 1220 | 985 | 990 | 978 | 970 | 1010 | - | - | 1270 | 1120 | - | 1200 | 1390 | 1390 | 1390 | 575 | - | | - |
| Laboratory pH (Std. Units) | 7.53 | 7.77 | 7.36 | 7.42 | nd | 8.03 | 7.76 | 7.78 | 7.9 | 8.1 | - | 7.3 | 7.76 | 7.76 | 7.78 | 8.37 | 6.5 - 8.5 | | OG |
| Field pH (Std. Units) | | | | | | - | - | - | - | - | - | - | - | 7.08 | | 7.19 | 6.5 - 8.5 | | OG |
| Field Conductivity (µmhos/cm) | | | | | | - | - | - | - | - | - | - | - | 1360 | | 940 | - | | - |
| Field Temperature (°C) | | | | | | - | - | - | - | - | - | - | - | 10.8 | | 10.2 | - | | - |

Notes:
All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
[ ] Parameter exceeds the applicable ODWS.

**OW18-89**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *17-Jul-89* | *30-Nov-89* | *18-Jul-90* | *6-May-91* | *12-Apr-93* | *26-Oct-93* | *11-Apr-94* | *24-Oct-94* | *10-Apr-95* | *13-Jun-96* | *7-May-97* | *12-May-98* | *9-Nov-04* | *6-Dec-06* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* | | *ODWS [1]* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | - | 251 | - | - | 247 | 189 | 228 | 250 | 227 | 360 | 362 | 371 | 440 | - | 381 | - | - | 30 - 500 | | OG |
| Calcium | 202 | 68.3 | 77.2 | 77.7 | 61.6 | 55.2 | 69.9 | 71.6 | 76.2 | 97.9 | 103 | 94.4 | 130 | - | - | - | - | - | | - |
| Chloride | 14.9 | 14.5 | 2.0 | 0.9 | 3.3 | 2.3 | 4.6 | 1.7 | 2 | 1.49 | 2.48 | 1.42 | 2.1 | 14 | 17 | - | - | 250 | | AO |
| Dissolved Organic Carbon (DOC) | 1.2 | 2.1 | 1.3 | 3.6 | 5.8 | 2.9 | 6.6 | 11.4 | * | 1 | 0.7 | 1.3 | 7.8 | - | 3.3 | - | - | 5 | | AO |
| Hardness | 1333 | 264 | 294 | 295 | 236 | 246 | 258 | 294 | 288 | 362 | 384 | 351 | 455 | - | 330 | - | - | 80 - 100 | | OG |
| Iron | *214 | 1.40 | - | - | <0.01 | 0.03 | 0.01 | <0.01 | 0.017 | 0.018 | 0.01 | 0.105 | 0.41 | - | - | - | - | 0.3 | | AO |
| Magnesium | 201 | 22.7 | 24.4 | 24.4 | 20.0 | 26.2 | 20.3 | 28.0 | 23.7 | 28.7 | 29.9 | 28 | 31.9 | - | - | - | - | - | | - |
| Manganese | 0.1100 | - | - | - | <0.003 | 0.003 | <0.003 | 0.003 | 0.0018 | <0.005 | | 0.04 | 0.161 | - | - | - | - | 0.05 | | AO |
| Ammonia | - | 0.047 | - | - | 0.020 | 0.010 | 0.055 | 0.058 | 0.1 | 0.06 | 0.07 | nd | 0.04 | - | - | - | - | - | | - |
| Nitrite | 0.3 | 0.3 | - | - | 0.1 | <0.1 | 0.2 | 0.1 | <0.1 | 0.04 | | 0.28 | 0.2 | 0.2 | ND | - | - | 1 | | MAC |
| Nitrate | - | 0.01 | - | - | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 | <0.03 | | nd | nd | ND(0.06) | 0.01 | - | - | 10 | | MAC |
| Sodium | - | 8.09 | - | - | 1.2 | 1.4 | 1.2 | 1.6 | 1.2 | 1.53 | 1.73 | 1.29 | 1.7 | - | - | - | - | 200 | | AO |
| Potassium | 52 | 1.5 | - | - | 1.0 | 1.2 | 1.0 | 1.53 | 1.25 | 2.1 | 1.4 | nd | 1 | - | - | - | - | - | | - |
| Sulphate | 11.0 | 11.0 | - | - | 10.5 | 11.4 | 32.6 | 10.3 | 7.4 | 7.9 | 6.47 | 5.97 | 6.7 | 6.9 | 7 | - | - | 500 | | AO |
| Total Kjeldahl Nitrogen (TKN) | - | 0.20 | - | - | 0.09 | 0.13 | 0.25 | 0.14 | 0.12 | 0.23 | 0.46 | 0.63 | - | - | - | - | - | - | | - |
| Total Phenolics | 0.0030 | <0.0010 | <0.0010 | <0.0010 | 0.002 | 0.0047 | <0.0010 | 0.0059 | 0.0016 | <0.001 | | nd | - | - | - | - | - | - | | - |
| Phosphorus (Dissolved) | - | 0.028 | - | - | 0.004 | 0.011 | 0.007 | 0.023 | 0.02 | 0.006 | 0.17 | 0.46 | - | - | - | - | - | - | | - |
| Laboratory Conductivity (µmhos/cm) | 542 | 501 | 543 | 542 | 460 | 542 | 457 | 565 | 518 | 603 | 622 | 637 | 710 | - | 715 | - | - | - | | - |
| Laboratory pH (Std. Units) | 7.46 | 7.90 | 7.72 | 7.74 | 7.53 | 7.73 | 7.98 | 7.49 | 7.55 | 7.44 | 7.3 | 7.24 | 6.58 | - | 6.8 | - | - | 6.5 - 8.5 | | OG |
| Field pH (Std. Units) | | | | | | | | | | | | | | - | - | - | - | 6.5 - 8.5 | | OG |
| Field Conductivity (µmhos/cm) | | | | | | | | | | | | | | - | - | - | - | - | | - |
| Field Temperature (°C) | | | | | | | | | | | | | | - | - | - | - | - | | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW19-89**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *17-Jul-89* | *30-Nov-89* | *18-Jul-90* | *6-Nov-91* | *15-Jun-92* | *3-Nov-92* | *12-Apr-93* | *26-Oct-93* | *11-Apr-94* | *24-Oct-94* | *10-Apr-95* | *20-Oct-95* | *13-Jun-96* | *12-Nov-96* | *7-May-97* | *20-Nov-97* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | - | 245 | - | 253 | 248 | 233 | 240 | 221 | 205 | 236 | 227 | 203 | 207 | 196 | 193 | 191 |
| Calcium | 95.5 | 41.7 | 58.0 | 52.5 | 48.3 | 46.8 | 40.8 | 34.7 | 40.0 | 39.5 | 37.3 | 33 | 33.1 | 32.1 | 32.3 | 28.5 |
| Chloride | 46.2 | 55.5 | 101 | 90.7 | 76.0 | 62.3 | 58.7 | 46.7 | 49.3 | 44.8 | 40.1 | 33 | 35.4 | 29.1 | 27.6 | 26.6 |
| Dissolved Organic Carbon (DOC) | 3.4 | 2.8 | 2.1 | 2.7 | 2.9 | 11.0 | 16.7 | 3.4 | 7.1 | 1.7 | * | 1.5 | 1.3 | 1.1 | 0.9 | 1.3 |
| Hardness | 405 | 215 | 301 | 280 | 259 | 246 | 216 | 188 | 203 | 199 | 187 | 168 | 161 | 157 | 175 | 146 |
| Iron | *51.5 | 0.64 | - | 0.17 | 0.10 | 0.17 | 0.66 | 0.26 | 0.33 | 0.05 | 0.035 | 0.02 | 0.07 | 0.058 | 0.05 | 0.058 |
| Magnesium | 40.3 | 27.0 | 37.9 | 36.2 | 33.6 | 31.3 | 27.7 | 24.6 | 25.0 | 24.4 | 22.7 | 20.8 | 19.1 | 19 | 18.3 | 18.1 |
| Manganese | 0.0960 | - | - | 0.050 | 0.0440 | 0.037 | 0.041 | 0.024 | 0.019 | 0.011 | 0.0067 | 0.008 | 0.014 | <0.005 | 0.015 | 0.013 |
| Ammonia | - | 0.130 | - | 0.007 | 0.224 | 0.053 | 0.296 | 0.090 | 0.027 | 0.015 | 0.11 | 0.07 | 0.16 | 0.16 | 0.21 | 0.11 |
| Nitrite | 0.1 | 0.2 | - | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | 0.2 | 0.2 | 0.1 | 0.1 | 0.16 | 0.16 | 0.08 | 0.17 |
| Nitrate | - | 0.02 | - | <0.001 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 0.02 | <0.01 | <0.01 | <0.03 | <0.03 | | |
| Sodium | 51.7 | 48.9 | - | 63.3 | 57.3 | 61.1 | 53.9 | 52.9 | 52.4 | 52.4 | 52.6 | 53.2 | 48.1 | 47.6 | 46.3 | 44 |
| Potassium | 0.1 | 2.1 | - | 2.4 | 2.2 | 2.3 | 2.0 | 1.8 | 1.8 | 1.76 | 1.59 | 1.6 | 1.2 | <1.0 | 1.5 | |
| Sulphate | 24.0 | 34.0 | - | 43.5 | 32.0 | 27.0 | 27.5 | 21.9 | 32.3 | 18.4 | 20.9 | 18.5 | 16.2 | 16.5 | 16.5 | 14.9 |
| Total Kjeldahl Nitrogen (TKN) | - | 0.71 | - | 0.053 | 0.64 | 0.44 | 0.44 | 0.35 | 0.39 | 0.26 | 0.21 | 0.28 | 0.4 | 0.72 | 0.53 | 0.18 |
| Total Phenolics | 0.0040 | 0.0010 | <0.0010 | <0.0010 | 0.0075 | 0.0105 | <0.0010 | 0.0082 | <0.0010 | 0.0055 | 0.001 | <0.0010 | <0.001 | <0.001 | | |
| Phosphorus (Dissolved) | - | 0.056 | 0.005 | 0.019 | 0.019 | 0.024 | 0.040 | 0.037 | 0.041 | 0.023 | 0.03 | 0.02 | 0.006 | 0.14 | 0.17 | 0.06 |
| Laboratory Conductivity (µmhos/cm) | 534 | 655 | 891 | 815 | 750 | 687 | 656 | 579 | 585 | 564 | 551 | 512 | 486 | 462 | 469 | 459 |
| Laboratory pH (Std. Units) | 7.58 | 7.45 | 7.83 | 7.69 | 7.60 | 7.76 | 7.72 | 8.07 | 8.18 | 7.83 | 7.85 | 7.89 | 7.92 | 7.9 | 7.83 | 7.81 |
| Field pH (Std. Units) | | | | | | | | | | | | | | | | |
| Field Conductivity (µmhos/cm) | | | | | | | | | | | | | | | | |
| Field Temperature (°C) | | | | | | | | | | | | | | | | |

Notes:

All concentrations in mg/L unless otherwise noted.
(1) MOECC Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
[ ] Parameter exceeds the applicable ODWS.

**Appendix C.2**

**OW19-89**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *12-May-98* | *9-Jun-99* | *28-Jun-01* | *14-Dec-01* | *29-Oct-02* | *9-Nov-04* | *21-Oct-06* | *6-Dec-06* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* | *MABC [2]* | | *ODWS [1]* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 202 | - | 350 | 392 | 323 | 437 | 376 | 336 | 365 | - | - | - | 30 - 500 | OG |
| Calcium | 32.7 | 76.7 | 71.5 | 69.6 | 65.8 | 82.2 | 83 | 67.8 | 67 | - | - | - | - | - |
| Chloride | 28.4 | 72 | 48.8 | 38.7 | 54 | 34.6 | 37 | 31 | 13 | - | - | 132.1 | 250 | AO |
| Dissolved Organic Carbon (DOC) | 0.8 | 1.4 | 6.2 | 2.4 | 1.5 | 2.7 | 1.6 | 1.4 | 1.2 | - | - | 3.95 | 5 | AO |
| Hardness | 164 | 379 | 345 | 335 | 325 | 381 | 400 | 317 | 320 | - | - | - | 80 - 100 | OG |
| Iron | 0.252 | nd | nd | 0.02 | 0.02 | nd | ND | ND(0.01) | ND | - | - | 0.175 | 0.3 | AO |
| Magnesium | 20.1 | 45.7 | 40.3 | 39 | 38.9 | 42.7 | 47 | 35.8 | 36 | - | - | - | - | - |
| Manganese | 0.032 | 0.07 | 0.04 | 0.04 | 0.027 | 0.007 | 0.003 | 0.001 | 0.006 | - | - | 0.03675 | 0.05 | AO |
| Ammonia | 0.15 | 0.22 | 0.13 | 0.06 | 0.09 | nd | ND | ND(0.1) | ND | - | - | - | - | - |
| Nitrite | 0.09 | 0.48 | 0.4 | nd | 0.3 | nd | ND | 0.49 | ND | - | - | 0.325 | 1 | MAC |
| Nitrate | nd | nd | nd | nd | nd | nd | ND | ND(0.06) | ND | - | - | 3.13 | 10 | MAC |
| Sodium | 45.3 | 50.6 | 44.9 | 43.5 | 49.7 | 48.3 | 49 | 29.2 | 26 | - | - | - | 200 | AO |
| Potassium | nd | 4.8 | 11 | 11 | 8 | 14 | 15 | 16.6 | 16 | - | - | - | - | - |
| Sulphate | 16.3 | 35.3 | 37.1 | 38.6 | 38.2 | 32.9 | 36 | 26 | 23 | - | - | 252.55 | 500 | AO |
| Total Kjeldahl Nitrogen (TKN) | 0.37 | 0.36 | 0.33 | 0.19 | 0.36 | - | - | - | ND | - | - | - | - | - |
| Total Phenolics | nd | nd | nd | nd | nd | - | IS | ND(0.002) | ND | - | - | - | - | - |
| Phosphorus (Dissolved) | 0.24 | 0.16 | 0.064 | 0.308 | - | - | - | - | 0.18 | - | - | - | - | - |
| Laboratory Conductivity (µmhos/cm) | 493 | 844 | 761 | 814 | 746 | 1060 | 859 | - | 711 | - | - | - | - | - |
| Laboratory pH (Std. Units) | 7.83 | 7.63 | 7.75 | 7.78 | 7.76 | 7.31 | 8.2 | - | 7.6 | - | - | - | 6.5 - 8.5 | OG |
| Field pH (Std. Units) | - | - | - | - | - | - | - | - | - | - | - | - | 6.5 - 8.5 | OG |
| Field Conductivity (µmhos/cm) | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Temperature (°C) | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2] Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
[ ] Parameter exceeds the applicable ODWS.

**Appendix C.2**

**OW20-89**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *17-Jul-89* | *30-Nov-89* | *18-Jul-90* | *6-Nov-91* | *15-Jun-92* | *12-Apr-93* | *26-Oct-93* | *11-Apr-94* | *24-Oct-94* | *10-Apr-95* | *13-Jun-96* | *12-Nov-96* | *7-May-97* | *12-May-98* | *28-Jun-01* | *6-Dec-06* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* | *ODWS [1]* | *PWQO [2]* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | - | 293 | - | 261 | 233 | 254 | 196 | 260 | 221 | 227 | 275 | 265 | 259 | 258 | 264 | 250 | 283 | - | - | 30 - 500 | - | OG |
| Calcium | 68.7 | 71.3 | 68.4 | 71.9 | 69.2 | 60.4 | 56.2 | 78.6 | 57.7 | 73.2 | 76.8 | 65.7 | 73.9 | 71.8 | 68.8 | 66.8 | 66 | - | - | - | - | - |
| Chloride | 0.7 | 1.1 | 0.7 | 1.3 | 1.7 | 1.5 | 1.9 | 1.7 | 1.3 | 1.5 | 1.38 | 3.61 | 1.59 | 1.06 | 1.3 | 7.6 | 2 | - | - | 250 | - | AO |
| Dissolved Organic Carbon (DOC) | 1.2 | 1.3 | 0.8 | 2.0 | 2.8 | 16.0 | 26.0 | 2.2 | 5.2 | 2.3 | 0.8 | 1.1 | 1 | 1.1 | 1.7 | ND(1) | 0.8 | - | - | 5 | - | AO |
| Hardness | 267 | 279 | 265 | 278 | 280 | 248 | 249 | 303 | 253 | 293 | 289 | 291 | 282 | 276 | 263 | 262 | 270 | - | - | 80 - 100 | - | OG |
| Iron | 0.44 | 0.55 | - | <0.01 | <0.01 | <0.01 | 0.02 | 0.02 | 0.04 | 0.415 | 0.073 | <0.005 | 0.006 | 0.189 | nd | ND(0.01) | ND | - | - | 0.3 | 0.3 | AO |
| Magnesium | 23.6 | 24.4 | 22.8 | 23.9 | 26.0 | 23.6 | 26.3 | 25.9 | 26.3 | 26.6 | 23.7 | 25.6 | 22.5 | 23.7 | 22 | 23.1 | 25 | - | - | - | - | - |
| Manganese | 0.1100 | - | - | <0.003 | 0.0012<T | <0.003 | <0.003 | 0.004 | <0.003 | 0.0098 | <0.005 | <0.005 | 0.008 | 0.042 | 0.01 | ND(0.001) | 0.007 | - | - | 0.05 | - | AO |
| Ammonia | - | 0.033 | - | 0.020 | 0.042 | 0.028 | 0.016 | 0.035 | <0.005 | 0.09 | 0.06 | 0.07 | 0.08 | nd | 0.05 | 0.2 | 0.06 | - | - | - | - | - |
| Nitrite | 0.1 | 0.1 | - | <0.1 | <0.1 | 0.1 | 0.1 | 0.2 | 0.2 | <0.1 | 0.99 | 0.36 | 0.55 | 0.75 | 0.3 | 0.66 | 0.3 | - | - | 1 | - | MAC |
| Nitrate | - | 0.01 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 | <0.03 | <0.03 | - | nd | nd | ND(0.06) | ND | - | - | 10 | - | MAC |
| Sodium | 1.83 | 2.36 | - | 1.3 | 1.3 | 1.1 | 0.8 | 1.0 | 0.9 | 1.1 | 1.26 | 1.23 | 1.49 | 1.08 | 1 | 1.01 | 1.3 | - | - | 200 | - | AO |
| Potassium | 0.6 | 0.6 | - | 0.7 | 0.5 | 0.6 | 0.5 | 0.4 | 0.37 | 0.5 | <1.0 | <1.0 | 1.3 | nd | 2 | 0.54 | 0.65 | - | - | - | - | - |
| Sulphate | 11.0 | 12.5 | - | 12.5 | 13.0 | 14.5 | 14.0 | 8.1 | 14.2 | 12 | 10.9 | 8.64 | 12.5 | 9.71 | 7.8 | 11 | 9 | - | - | 500 | - | AO |
| Total Kjeldahl Nitrogen (TKN) | - | 0.23 | - | 0.08 | 0.22 | 0.28 | 0.18 | 0.21 | 0.15 | 0.16 | 0.24 | 0.84 | 0.45 | 1.34 | 0.2 | - | 1 | - | - | - | - | - |
| Total Phenolics | 0.0165 | <0.0010 | <0.0010 | <0.0010 | 0.0015 | <0.0010 | 0.0027 | <0.0010 | 0.0086 | 0.0023 | <0.001 | <0.001 | - | nd | nd | ND(0.002) | ND | - | - | - | 0.001 | - |
| Phosphorus (Dissolved) | - | 0.127 | - | 0.004 | 0.011 | 0.027 | 0.009 | 0.009 | 0.013 | 0.04 | 0.006 | 0.68 | 0.34 | 2.2 | 0.266 | - | 2.2 | - | - | - | 0.01 - 0.03 (c) | - |
| Laboratory Conductivity (µmhos/cm) | 494 | 523 | 493 | 495 | 525 | 495 | 518 | 529 | 499 | 530 | 461 | 473 | 468 | 476 | 445 | - | 509 | - | - | - | - | - |
| Laboratory pH (Std. Units) | 7.79 | 7.58 | 7.92 | 7.68 | 7.87 | 7.63 | 7.88 | 7.92 | 7.79 | 7.77 | 7.69 | 7.7 | 7.71 | 7.56 | 7.96 | - | 7.6 | - | - | 6.5 - 8.5 | 6.5 - 8.5 | OG |
| | | | | | | | | | | | | | | | | | | | | | | |
| Field pH (Std. Units) | | | | | | | | | | | | | | | | - | - | - | - | 6.5 - 8.5 | 6.5 - 8.5 | OG |
| Field Conductivity (µmhos/cm) | | | | | | | | | | | | | | | | - | - | - | - | - | - | - |
| Field Temperature (°C) | | | | | | | | | | | | | | | | - | - | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
[2] MOECC Provincial Water Quality Objectives
(PWQO), July 1994, reprinted February 1999.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
(b) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(c) Total phosphorus has no firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
ND - concentrations are below the laboratory's method detection limit.

**OW21-89**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *17-Jul-89* | *30-Nov-89* | *18-Jul-90* | *6-Nov-91* | *15-Jun-92* | *3-Nov-92* | *12-Apr-93* | *26-Oct-93* | *11-Apr-94* | *24-Oct-94* | *10-Apr-95* | *20-Oct-95* | *13-Jun-96* | *12-Nov-96* | *20-Nov-97* | *9-Jun-99* | *14-Dec-01* | *6-Dec-06* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* | | *ODWS [1]* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | - | 226 | - | 210 | 214 | 223 | 233 | 204 | 230 | 226 | 253 | 236 | 240 | 240 | 225 | - | 248 | 239 | 256 | - | - | 30 - 500 | | OG |
| Calcium | 42.9 | 36.8 | 34.3 | 33.6 | 34.5 | 40.9 | 36.0 | 40.4 | 45.1 | 43.6 | 45.2 | 43.7 | 46.2 | 44.8 | 43.8 | 44.5 | 51.9 | 42.8 | 40 | - | - | - | | - |
| Chloride | 4.0 | 2.7 | 1.8 | 1.3 | 1.7 | 1.0 | 1.3 | 1.9 | 1.8 | 1.7 | 1.4 | 1.1 | 1.44 | 0.98 | 1.2 | 0.95 | 1.2 | 13 | 2 | - | - | 250 | | AO |
| Dissolved Organic Carbon (DOC) | 2.3 | 7.1 | 1.3 | 2.7 | 1.4 | 11.4 | 17.3 | 3.6 | 6.3 | 2.8 | 1.9 | 1.8 | 0.7 | 1.1 | 0.7 | 1.2 | 1.1 | ND(1) | 0.6 | - | - | 5 | | AO |
| Hardness | 212 | 185 | 174 | 180 | 185 | 219 | 193 | 213 | 233 | 228 | 236 | 234 | 233 | 238 | 228 | 227 | 241 | 228 | 220 | - | - | 80 - 100 | | OG |
| Iron | 1.21 | 0.36 | - | 0.08 | 0.02 | 0.07 | <0.01 | 0.03 | 0.03 | 0.04 | 0.158 | 0.05 | 0.252 | 0.021 | 0.223 | 0.01 | 0.04 | ND(0.01) | ND | - | - | 0.3 | | AO |
| Magnesium | 25.4 | 22.6 | 21.5 | 23.4 | 24.0 | 28.4 | 24.9 | 27.3 | 29.1 | 29.0 | 29.8 | 30.2 | 28.6 | 30.2 | 29 | 28.4 | 27 | 29.4 | 29 | - | - | - | | - |
| Manganese | 0.1300 | - | - | 0.023 | 0.032 | 0.0110 | 0.004 | 0.009 | <0.003 | <0.003 | 0.0028 | 0.014 | 0.01 | <0.005 | 0.022 | nd | 0.011 | 0.009 | ND | - | - | 0.05 | | AO |
| Ammonia | - | 0.019 | - | 0.104 | 0.079 | <0.001 | 0.063 | 0.057 | 0.016 | 0.013 | 0.11 | <0.05 | 0.06 | 0.12 | 0.03 | 0.04 | 0.34 | 0.2 | 0.14 | - | - | - | | - |
| Nitrite | 0.3 | 0.3 | - | 0.1 | <0.1 | 0.2 | 0.2 | <0.1 | 0.3 | 0.3 | <0.1 | 0.1 | 0.23 | 0.09 | 0.19 | nd | nd | 0.92 | 0.1 | - | - | 1 | | MAC |
| Nitrate | - | 0.01 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.02 | <0.01 | 0.01 | <0.03 | <0.03 | | nd | nd | <0.06 | 0.01 | - | - | 10 | | MAC |
| Sodium | 24.2 | 22.6 | - | 24.5 | 23.8 | 26.6 | 25.3 | 27.3 | 23.7 | 22.7 | 23.6 | 25.5 | 22.4 | 22 | 21.1 | 21.1 | 19.2 | 17.2 | 20 | - | - | 200 | | AO |
| Potassium | 3.7 | 2.8 | - | 2.1 | 1.9 | 1.8 | 1.6 | 1.9 | 1.7 | 1.70 | 1.62 | 1.68 | 1.4 | 1.1 | | 1.1 | 1 | 1.35 | 1.3 | - | - | - | | - |
| Sulphate | 32.5 | 19.5 | - | 18.0 | 17.5 | 27.5 | 23.5 | 27.9 | 8.1 | 27.9 | 34.6 | 37 | 37.7 | 39.8 | 30.6 | 28 | 22 | 27 | 31 | - | - | 500 | | AO |
| Total Kjeldahl Nitrogen (TKN) | - | 0.54 | - | 0.20 | 0.44 | 0.14 | 0.19 | 0.41 | 0.17 | 0.22 | 0.13 | 1.11 | 0.51 | 0.57 | | 0.26 | 0.06 | - | 0.6 | - | - | - | | - |
| Total Phenolics | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.0110 | <0.0010 | <0.0010 | 0.0051 | <0.0010 | <0.0010 | * | <0.0010 | <0.001 | <0.001 | | nd | nd | ND(0.002) | ND | - | - | - | | - |
| Phosphorus (Dissolved) | - | 0.034 | - | 0.029 | 0.030 | 0.027 | 0.031 | 0.039 | 0.023 | 0.023 | 0.03 | 0.05 | 0.013 | 0.2 | 0.13 | 0.2 | 0.176 | - | 0.16 | - | - | - | | - |
| Laboratory Conductivity (µmhos/cm) | 475 | 440 | 427 | 422 | 437 | 470 | 448 | 460 | 497 | 468 | 493 | 496 | 440 | 480 | 482 | 465 | 458 | - | 503 | - | - | - | | - |
| Laboratory pH (Std. Units) | 7.62 | 7.71 | 8.00 | 8.05 | 7.78 | 7.81 | 7.86 | 7.99 | 8.10 | 7.90 | 7.93 | 7.83 | 8.08 | 7.78 | 7.78 | 7.94 | 8.06 | - | 7.8 | - | - | 6.5 - 8.5 | | OG |
| Field pH (Std. Units) | | | | | | | | | | | | | | | | | | - | - | - | - | 6.5 - 8.5 | | OG |
| Field Conductivity (µmhos/cm) | | | | | | | | | | | | | | | | | | - | - | - | - | - | | - |
| Field Temperature (°C) | | | | | | | | | | | | | | | | | | - | - | - | - | - | | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW22-89**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | 16-Dec-98 | 9-Jun-99 | 24-Nov-00 | 14-Dec-01 | 29-Oct-02 | 11-Nov-02 | 9-Nov-04 | *21-Nov-05* | *21-Oct-06* | *6-Dec-06* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* | | *ODWS [1]* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 274 | - | 252 | 248 | 232 | 232 | 232 | 231 | 229 | 226 | 237 | - | - | 30 - 500 | | OG |
| Calcium | 51.4 | 59.1 | 65.8 | 58.3 | 59.2 | 55.4 | 55.1 | 60 | 61 | 55.4 | 56 | - | - | - | | - |
| Chloride | 21.7 | 3.9 | 2 | 3.3 | 3 | 3.7 | 3.6 | 4 | 5 | 4 | 4 | - | - | 250 | | AO |
| Dissolved Organic Carbon (DOC) | 2.7 | 1.8 | 2.1 | 1.9 | 1.4 | 1.3 | 2.9 | 0.9 | 1 | ND(1) | 0.5 | - | - | 5 | | AO |
| Hardness | 301 | 269 | 270 | 246 | 248 | 233 | 234 | 240 | 260 | 231 | 230 | - | - | 80 - 100 | | OG |
| Iron | nd | nd | 0.13 | 0.01 | 0.01 | nd | 0.02 | ND | ND | <0.01 | ND | - | - | 0.3 | | AO |
| Magnesium | 42 | 29.5 | 25.6 | 24.2 | 24.2 | 23 | 23.2 | 21 | 27 | 22.4 | 23 | - | - | - | | - |
| Manganese | 0.2 | 0.13 | 0.115 | 0.096 | 0.013 | - | 0.167 | 0.006 | ND | 0.012 | ND | - | - | 0.05 | | AO |
| Ammonia | nd | 0.1 | 0.04 | 0.03 | nd | nd | 0.1 | ND | ND | 0.3 | 0.12 | - | - | - | | - |
| Nitrite | nd | nd | nd | nd | nd | nd | nd | ND | ND | 0.06 | ND | - | - | 1 | | MAC |
| Nitrate | nd | nd | nd | nd | nd | nd | nd | ND | ND | ND(0.06) | ND | - | - | 10 | | MAC |
| Sodium | 11.2 | 4.5 | 11.3 | 3.2 | 3 | 2.8 | 3 | 2.8 | 3.8 | 3.29 | 3.6 | - | - | 200 | | AO |
| Potassium | 5.8 | 3.5 | 1 | 1 | nd | nd | 1 | 0.89 | 0.97 | 0.94 | 0.94 | - | - | - | | - |
| Sulphate | 12.4 | 13.2 | 14.6 | 17.4 | 14.7 | 13.1 | 14.8 | 13 | 13 | 13 | 11 | - | - | 500 | | AO |
| Total Kjeldahl Nitrogen (TKN) | 0.2 | 0.18 | 0.16 | nd | 0.16 | - | - | - | - | - | 0.7 | - | - | - | | - |
| Total Phenolics | 0.001 | nd | nd | nd | nd | - | - | ND | ND | ND(0.002) | ND | - | - | - | | - |
| Phosphorus (Dissolved) | 0.01 | 1.73 | - | 1.66 | - | - | - | - | - | - | 1.8 | - | - | - | | - |
| Laboratory Conductivity (µmhos/cm) | 568 | 474 | 385 | 455 | 427 | 490 | 510 | 423 | 447 | - | 435 | - | - | - | | - |
| Laboratory pH (Std. Units) | 8.07 | 7.86 | 7.82 | 8.04 | 7.86 | 7.56 | 7.7 | 8.23 | 8.3 | - | 7.8 | - | - | 6.5 - 8.5 | | OG |
| Field pH (Std. Units) | | | | | | | | - | - | - | - | - | - | 6.5 - 8.5 | | OG |
| Field Conductivity (µmhos/cm) | | | | | | | | - | - | - | - | - | - | - | | - |
| Field Temperature (°C) | | | | | | | | - | - | - | - | - | - | - | | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW23-98**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *16-Dec-98* | *9-Jun-99* | *24-Nov-00* | *29-Oct-02* | *11-Nov-02* | *9-Nov-04* | *21-Nov-05* | *21-Oct-06* | *6-Dec-06* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* | | *ODWS [1]* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 740 | - | 717 | 702 | 660 | 740 | 775 | 641 | 657 | 675 | - | - | 30 - 500 | | OG |
| Calcium | 165 | 218 | 214 | 182 | 168 | 189 | 210 | 200 | 180 | 170 | - | - | - | | - |
| Chloride | 19 | 3.7 | 3.7 | 4.1 | 2.8 | 3.9 | 5 | 4 | 3.3 | 2 | - | - | 250 | | AO |
| Dissolved Organic Carbon (DOC) | 4.8 | 4.4 | 7.6 | 4.4 | 4.4 | 5.7 | 4 | 4.1 | 24.8 | 3.2 | - | - | 5 | | AO |
| Hardness | 735 | 860 | 840 | 724 | 660 | 736 | 790 | 760 | 679 | 650 | - | - | 80 - 100 | | OG |
| Iron | nd | 14.6 | 6.81 | 5.1 | 4.32 | 12.1 | 14 | 20 | 19.5 | 17 | - | - | 0.3 | | AO |
| Magnesium | 78.2 | 76.9 | 73.9 | 65.3 | 58.2 | 63.9 | 66 | 65 | 55.8 | 52 | - | - | - | | - |
| Manganese | 0.25 | 0.9 | 0.642 | 0.44 | - | 0.445 | 0.4 | 0.45 | 0.379 | 0.4 | - | - | 0.05 | | AO |
| Ammonia | 0.16 | 0.27 | 0.33 | 0.38 | 0.31 | 0.47 | 0.59 | 0.82 | 0.9 | 0.9 | - | - | - | | - |
| Nitrite | nd | nd | nd | nd | nd | nd | ND | ND | ND(0.05) | ND | - | - | 1 | | MAC |
| Nitrate | nd | nd | nd | nd | nd | nd | ND | ND | ND(0.06) | 0.01 | - | - | 10 | | MAC |
| Sodium | 21.2 | 7.2 | 15.5 | 6.4 | 5.3 | 6.1 | 6 | 4.8 | 3.84 | 3.8 | - | - | 200 | | AO |
| Potassium | 3.7 | 1.5 | 1 | nd | nd | 1 | 0.98 | 1.1 | 1.01 | 1.1 | - | - | - | | - |
| Sulphate | 50.2 | 190 | 155 | 61.1 | 52.3 | 75.9 | 62 | 25 | 32 | 26 | - | - | 500 | | AO |
| Total Kjeldahl Nitrogen (TKN) | 0.48 | 0.57 | 0.74 | 0.8 | - | - | - | - | - | 3 | - | - | - | | - |
| Total Phenolics | 0.001 | 0.002 | nd | 0.001 | - | - | ND | ND | ND(0.002) | ND | - | - | - | | - |
| Phosphorus (Dissolved) | nd | 1.16 | - | - | - | - | - | - | - | 3.9 | - | - | - | | - |
| Laboratory Conductivity (µmhos/cm) | 1290 | 1240 | 1190 | 1090 | 1180 | 1530 | 1190 | 1180 | - | 1140 | - | - | - | | - |
| Laboratory pH (Std. Units) | 7.23 | 6.91 | 6.84 | 6.81 | 7.34 | 6.72 | 7.67 | 7.5 | - | 6.8 | - | - | 6.5 - 8.5 | | OG |
| Field pH (Std. Units) | | | | | | | - | - | - | - | - | - | 6.5 - 8.5 | | OG |
| Field Conductivity (µmhos/cm) | | | | | | | - | - | - | - | - | - | - | | - |
| Field Temperature (°C) | | | | | | | - | - | - | - | - | - | - | | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW24-98**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *16-Dec-98* | *9-Jun-99* | *9-Jun-99* | *14-Dec-01* | *14-Jun-02* | *29-Oct-02* | *5-May-03* | *11-Nov-03* | *9-Nov-04* | *4-Jul-05* | *21-Nov-05* | *4-May-06* | *5-Dec-06* | *10-Jun-07* | *21-Oct-07* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 304 | - | 398 | 391 | 367 | 406 | 380 | 435 | 343 | 349 | 447 | 561 | 415 | 408 | 422 |
| Calcium | 87.4 | 135 | - | 107 | 107 | 106 | 110 | 89.6 | 87.6 | 181 | 93 | 77.7 | 69.4 | 78 | 81 |
| Chloride | 44 | 62.9 | 84.6 | 80.2 | 77 | 73.2 | 71.7 | 65.3 | 70.6 | 68.8 | 65 | 64 | 65 | 64 | 53 |
| Dissolved Organic Carbon (DOC) | 2.9 | 5.5 | - | 4.1 | 4.5 | 3.5 | 3.6 | 3.7 | 5.5 | 3.9 | 4.1 | 2.5 | 2.6 | 3.6 | 4.7 |
| Hardness | 391 | 562 | - | 454 | - | 453 | 454 | 381 | 377 | 388 | 390 | 333 | 291 | 330 | 350 |
| Iron | nd | 0.05 | - | 0.01 | 0.03 | 0.01 | 0.05 | 0.01 | 0.01 | 2.36 | 0.084 | ND(0.01) | 0.04 | ND | 1.9 |
| Magnesium | 42 | 55 | - | 45.2 | 47.1 | 45.7 | 43.5 | 38.1 | 38.4 | 64.8 | 39 | 33.8 | 28.7 | 34 | 35 |
| Manganese | 0.16 | 0.88 | - | 0.594 | - | 0.489 | 0.392 | - | 0.783 | 0.593 | 0.68 | - | 0.253 | 0.094 | 0.72 |
| Ammonia | 0.12 | 0.23 | - | 0.03 | 0.03 | 0.07 | 0.07 | 0.07 | 0.14 | 0.08 | 0.16 | 0.2 | ND(0.1) | 0.05 | 0.57 |
| Nitrite | nd | nd | - | nd | nd | nd | nd | nd | 0.2 | nd | 0.2 | ND(0.05) | 0.22 | ND | ND |
| Nitrate | nd | nd | - | nd | nd | nd | nd | nd | nd | nd | ND | ND(0.06) | ND(0.06) | ND | ND |
| Sodium | 11.5 | 31.7 | - | 77.3 | 66.2 | 70.7 | 63.7 | 88.1 | 67.2 | 83.1 | 84 | 83.4 | 96.3 | 87 | 96 |
| Potassium | 5 | 1.3 | - | 2 | 3 | 1 | 2 | 1 | 2 | 1.4 | 1.3 | 1.51 | 1.1 | 1.1 | 1.3 |
| Sulphate | 38 | 237 | - | 115 | 100 | 92.7 | 75.3 | 59.8 | 51.3 | 116 | 37 | 26 | 19 | 18 | 11 |
| Total Kjeldahl Nitrogen (TKN) | 0.41 | 0.53 | - | 0.26 | 0.55 | 0.31 | 0.57 | - | - | - | - | - | - | - | - |
| Total Phenolics | nd | 0.001 | - | nd | nd | nd | nd | - | - | 0.001 | ND | ND(0.001) | ND(0.002) | ND | 0.017 |
| Phosphorus (Dissolved) | 0.01 | 3.8 | - | 0.82 | - | - | - | - | - | - | - | - | - | - | - |
| Laboratory Conductivity (µmhos/cm) | 702 | 1010 | - | 1060 | 1010 | 979 | 1000 | 1090 | NA | 1050 | 905 | - | - | 934 | 929 |
| Laboratory pH (Std. Units) | 7.89 | 7.88 | - | 7.89 | 7.89 | 7.6 | 7.56 | 7.68 | NA | 7.95 | 8.08 | - | - | 8.1 | 8.2 |
| Field pH (Std. Units) | | | | | | | | | | | - | - | - | - | - |
| Field Conductivity (µmhos/cm) | | | | | | | | | | | - | - | - | - | - |
| Field Temperature (°C) | | | | | | | | | | | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.
(1) MOECC Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW24-98**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *16-Dec-98* | *9-Jun-99* | *9-Jun-99* | *14-Dec-01* | *14-Jun-02* | *29-Oct-02* | *5-Aug-08* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* | *MABC [2]* | | *ODWS [1]* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 304 | - | 398 | 391 | 367 | 406 | 397 | 415 | 398 | 394 | - | 30 - 500 | OG |
| Calcium | 87.4 | 135 | - | 107 | 107 | 106 | 79 | 68 | 75.3 | 57.9 | - | - | - |
| Chloride | 44 | 62.9 | 84.6 | 80.2 | 77 | 73.2 | 55 | 54 | 51.1 | 57.2 | 132.1 | 250 | AO |
| Dissolved Organic Carbon (DOC) | 2.9 | 5.5 | - | 4.1 | 4.5 | 3.5 | 3.7 | 3.0 | 4.5 | 3.9 | 3.95 | 5 | AO |
| Hardness | 391 | 562 | - | 454 | - | 453 | 340 | 300 | 313 | 251 | - | 80 - 100 | OG |
| Iron | nd | 0.05 | - | 0.01 | 0.03 | 0.01 | ND | ND | 0.564 | 0.086 | 0.175 | 0.3 | AO |
| Magnesium | 42 | 55 | - | 45.2 | 47.1 | 45.7 | 36 | 31 | 30.4 | 26 | - | - | - |
| Manganese | 0.16 | 0.88 | - | 0.594 | - | 0.489 | 1.0 | 0.21 | 0.628 | 0.261 | 0.03675 | 0.05 | AO |
| Ammonia | 0.12 | 0.23 | - | 0.03 | 0.03 | 0.07 | 0.18 | 0.08 | 0.121 | 0.124 | - | - | - |
| Nitrite | nd | nd | - | nd | nd | nd | 3.1 | ND | ND(0.10) | ND(0.10) | 0.325 | 1 | MAC |
| Nitrate | nd | nd | - | nd | nd | nd | ND | ND | ND(0.10) | 0.18 | 3.13 | 10 | MAC |
| Sodium | 11.5 | 31.7 | - | 77.3 | 66.2 | 70.7 | 87 | 90 | - | - | - | 200 | AO |
| Potassium | 5 | 1.3 | - | 2 | 3 | 1 | 1.5 | 1.1 | ND(1.0) | 7.8 | - | - | - |
| Sulphate | 38 | 237 | - | 115 | 100 | 92.7 | - | 8 | 7.5 | 4.5 | 252.55 | 500 | AO |
| Total Kjeldahl Nitrogen (TKN) | 0.41 | 0.53 | - | 0.26 | 0.55 | 0.31 | - | ND | 0.40 | 0.35 | - | - | - |
| Total Phenolics | nd | 0.001 | - | nd | nd | nd | - | ND | 0.0029 | 0.005 | - | - | - |
| Phosphorus (Dissolved) | 0.01 | 3.8 | - | 0.82 | - | - | - | 2.1 | ND(0.05) | 0.298 | - | - | - |
| Laboratory Conductivity (µmhos/cm) | 702 | 1010 | - | 1060 | 1010 | 979 | - | 875 | 859 | 831 | - | - | - |
| Laboratory pH (Std. Units) | 7.89 | 7.88 | - | 7.89 | 7.89 | 7.6 | - | 7.7 | 8.01 | 8.01 | - | 6.5 - 8.5 | OG |
| | | | | | | | | | | | | | |
| Field pH (Std. Units) | | | | | | | - | - | 7.48 | 7.48 | - | 6.5 - 8.5 | OG |
| Field Conductivity (µmhos/cm) | | | | | | | - | - | 757 | 751 | - | - | - |
| Field Temperature (°C) | | | | | | | - | - | 7.6 | 7.6 | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2] Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW25-00**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *24-Nov-00* | *29-Oct-02* | *11-Nov-03* | *10-Nov-04* | *21-Nov-05* | *21-Oct-07* | *30-Apr-09* | *19-Nov-09* | | *ODWS [1]* | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 216 | 226 | 220 | 221 | 250 | 241 | - | - | 30 - 500 | | OG |
| Calcium | 53.9 | 57.9 | 56.1 | 58.4 | 61 | 65 | - | - | - | | - |
| Chloride | 1.1 | 2.1 | 1.9 | 2.7 | 3 | 5 | - | - | 250 | | AO |
| Dissolved Organic Carbon (DOC) | 4 | 1.6 | 1.5 | 1.7 | 1.3 | 0.7 | - | - | 5 | | AO |
| Hardness | 215 | 235 | 222 | 233 | 260 | 280 | - | - | 80 - 100 | | OG |
| Iron | 0.04 | nd | nd | nd | ND | ND | - | - | 0.3 | | AO |
| Magnesium | | | | | - | - | - | - | - | | - |
| Manganese | | | | | - | - | - | - | 0.05 | | AO |
| Ammonia | 0.09 | nd | 0.03 | nd | 0.12 | ND | - | - | - | | - |
| Nitrite | nd | nd | nd | nd | ND | ND | - | - | 1 | | MAC |
| Nitrate | 1.1 | 0.2 | 1 | 0.2 | ND | ND | - | - | 10 | | MAC |
| Sodium | 8.4 | 2.6 | 2.1 | 2.2 | 5.5 | 5.2 | - | - | 200 | | AO |
| Potassium | nd | nd | nd | nd | 0.91 | 0.89 | - | - | - | | - |
| Sulphate | 29.4 | 13.1 | 10.4 | 9.7 | 15 | 15 | - | - | 500 | | AO |
| Total Kjeldahl Nitrogen (TKN) | 0.33 | 0.14 | - | - | - | - | - | - | - | | - |
| Total Phenolics | 0.002 | 0.004 | - | - | ND | ND | - | - | - | | - |
| Phosphorus (Dissolved) | - | - | - | - | - | - | - | - | - | | - |
| Laboratory Conductivity (µmhos/cm) | 449 | 412 | 430 | - | 428 | 471 | - | - | - | | - |
| Laboratory pH (Std. Units) | 7.65 | 7.82 | 7.98 | - | 8.16 | 8.1 | - | - | 6.5 - 8.5 | | OG |
| Field pH (Std. Units) | | | | | - | - | - | - | 6.5 - 8.5 | | OG |
| Field Conductivity (µmhos/cm) | | | | | - | - | - | - | - | | - |
| Field Temperature (°C) | | | | | - | - | - | - | - | | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW26-00**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *24-Nov-00* | *29-Oct-02* | *11-Nov-03* | *10-Nov-04* | *21-Nov-05* | *21-Oct-07* | *30-Apr-09* | *19-Nov-09* | | *ODWS [1]* | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 308 | 297 | 304 | 298 | 326 | 305 | - | - | 30 - 500 | | OG |
| Calcium | 101 | 127 | 103 | 90.3 | 90 | 85 | - | - | - | | - |
| Chloride | 2 | 5.2 | 4 | 4.3 | 3 | 6 | - | - | 250 | | AO |
| Dissolved Organic Carbon (DOC) | 6.6 | 4.1 | 2.7 | 2.9 | 2.5 | 1.9 | - | - | 5 | | AO |
| Hardness | 412 | 498 | 426 | 384 | 380 | 360 | - | - | 80 - 100 | | OG |
| Iron | 0.01 | nd | nd | 0.01 | ND | ND | - | - | 0.3 | | AO |
| Magnesium | | | | | - | - | - | - | - | | - |
| Manganese | | | | | - | - | - | - | 0.05 | | AO |
| Ammonia | 0.09 | nd | nd | 0.15 | 0.1 | 0.11 | - | - | - | | - |
| Nitrite | nd | nd | nd | nd | 0.2 | ND | - | - | 1 | | MAC |
| Nitrate | 0.3 | 1.7 | 0.2 | 0.2 | 0.03 | ND | - | - | 10 | | MAC |
| Sodium | 46.6 | 25 | 40.9 | 40.7 | 52 | 61 | - | - | 200 | | AO |
| Potassium | 3 | 1 | 2 | 2 | 2 | 1.8 | - | - | - | | - |
| Sulphate | 199 | 243 | 195 | 156 | 148 | 125 | - | - | 500 | | AO |
| Total Kjeldahl Nitrogen (TKN) | 0.39 | 0.41 | - | - | - | - | - | - | - | | - |
| Total Phenolics | 0.001 | nd | - | - | ND | ND | - | - | - | | - |
| Phosphorus (Dissolved) | - | - | - | - | - | - | - | - | - | | - |
| Laboratory Conductivity (µmhos/cm) | 806 | 895 | 890 | 930 | 793 | 818 | - | - | - | | - |
| Laboratory pH (Std. Units) | 7.59 | 7.56 | 7.78 | 7.53 | 8.11 | 8.0 | - | - | 6.5 - 8.5 | | OG |
| | | | | | | | | | | | |
| Field pH (Std. Units) | | | | | - | - | - | - | 6.5 - 8.5 | | OG |
| Field Conductivity (µmhos/cm) | | | | | - | - | - | - | - | | - |
| Field Temperature (°C) | | | | | - | - | - | - | - | | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW27-00**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *24-Nov-00* | *29-Oct-02* | *11-Nov-03* | *21-Nov-05* | *21-Oct-07* | *30-Apr-09* | *19-Nov-09* | | *ODWS [1]* | |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity | 412 | 456 | 363 | 411 | 469 | - | - | 30 - 500 | | OG |
| Calcium | 108 | 130 | 95.3 | 120 | 140 | - | - | - | | - |
| Chloride | 1.9 | 7.3 | 5.3 | 11 | 13 | - | - | 250 | | AO |
| Dissolved Organic Carbon (DOC) | 7.6 | 3.3 | 3.6 | 3.1 | 4.1 | - | - | 5 | | AO |
| Hardness | 402 | 479 | 357 | 430 | 520 | - | - | 80 - 100 | | OG |
| Iron | nd | 0.22 | nd | 0.17 | ND | - | - | 0.3 | | AO |
| Magnesium | | | | - | - | - | - | - | | - |
| Manganese | | | | - | - | - | - | 0.05 | | AO |
| Ammonia | 0.07 | nd | 0.03 | ND | ND | - | - | - | | - |
| Nitrite | nd | nd | nd | ND | ND | - | - | 1 | | MAC |
| Nitrate | nd | nd | nd | ND | ND | - | - | 10 | | MAC |
| Sodium | 24.6 | 13.9 | 14.9 | 15 | 8.4 | - | - | 200 | | AO |
| Potassium | nd | nd | nd | 0.39 | 0.57 | - | - | - | | - |
| Sulphate | 56 | 35.9 | 23.1 | 39 | 7 | - | - | 500 | | AO |
| Total Kjeldahl Nitrogen (TKN) | 0.43 | 0.28 | - | - | - | - | - | - | | - |
| Total Phenolics | nd | 0.001 | - | ND | ND | - | - | - | | - |
| Phosphorus (Dissolved) | - | - | - | - | - | - | - | - | | - |
| Laboratory Conductivity (µmhos/cm) | 713 | 791 | 690 | 712 | 847 | - | - | - | | - |
| Laboratory pH (Std. Units) | 7.42 | 7.53 | 7.23 | 7.99 | 8.1 | - | - | 6.5 - 8.5 | | OG |
| | 713 | 791 | 690 | | | | | | | |
| Field pH (Std. Units) | 7.42 | 7.53 | 7.23 | - | - | - | - | 6.5 - 8.5 | | OG |
| Field Conductivity (µmhos/cm) | | | | - | - | - | - | - | | - |
| Field Temperature (°C) | | | | - | - | - | - | - | | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW29-07**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *5-Aug-08* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* | *MABC [2]* | | *ODWS [1]* | |
|---|---|---|---|---|---|---|---|---|
| Alkalinity | 390 | 405 | 394 | 387 | - | 30 - 500 | | OG |
| Calcium | 84 | 71 | 76.7 | 67.8 | - | - | | - |
| Chloride | 3 | 2 | ND(2.0) | 11.8 | 132.1 | 250 | | AO |
| Dissolved Organic Carbon (DOC) | 3.5 | 1.3 | 2.3 | 2.2 | 3.95 | 5 | | AO |
| Hardness | 520 | 420 | 420 | 383 | - | 80 - 100 | | OG |
| Iron | ND | ND | 0.235 | 0.937 | 0.175 | 0.3 | | AO |
| Magnesium | - | - | 55.4 | 51.9 | - | - | | - |
| Manganese | - | - | 0.0319 | 0.0767 | 0.03675 | 0.05 | | AO |
| Ammonia | 0.25 | 0.16 | 0.17 | 2.91 | - | - | | - |
| Nitrite | ND | ND | ND(0.10) | ND(0.10) | - | 1 | | MAC |
| Nitrate | ND | ND | 0.18 | 17.9 | 3.13 | 10 | | MAC |
| Sodium | 24 | 19 | - | - | - | 200 | | AO |
| Potassium | 3.2 | 2.7 | 2.3 | 46.8 | - | - | | - |
| Sulphate | 120 | 70 | 46.3 | 7.3 | 252.55 | 500 | | AO |
| Total Kjeldahl Nitrogen (TKN) | - | 0.8 | 0.364 | 3.06 | - | - | | - |
| Total Phenolics | ND | ND | 0.0013 | 0.084 | - | - | | - |
| Phosphorus (Dissolved) | - | 0.23 | ND(0.05) | 1.08 | - | - | | - |
| Laboratory Conductivity (µmhos/cm) | - | 793 | 748 | 1500 | - | - | | - |
| Laboratory pH (Std. Units) | - | 7.6 | 7.89 | 7.58 | - | 6.5 - 8.5 | | OG |
| Field pH (Std. Units) | - | - | 7.36 | 8.01 | - | 6.5 - 8.5 | | OG |
| Field Conductivity (µmhos/cm) | - | - | 666 | 358 | - | - | | - |
| Field Temperature (°C) | - | - | 9.1 | 8.8 | - | - | | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
[2] Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW30-07**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *5-Aug-08* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* | *MABC [2]* | | *ODWS [1]* |
|---|---|---|---|---|---|---|---|
| Alkalinity | 299 | 319 | 326 | 300 | - | 30 - 500 | OG |
| Calcium | 83 | 77 | 88.8 | 71.9 | - | - | - |
| Chloride | 26 | 48 | 58.4 | 60.4 | 132.1 | 250 | AO |
| Dissolved Organic Carbon (DOC) | 6.7 | 2.8 | 2.7 | 2.6 | 3.95 | 5 | AO |
| Hardness | 450 | 410 | 437 | 372 | - | 80 - 100 | OG |
| Iron | ND | ND | ND(0.05) | 0.203 | 0.175 | 0.3 | AO |
| Magnesium | - | - | 52.3 | 46.6 | - | - | - |
| Manganese | - | - | 0.0227 | 0.065 | 0.03675 | 0.05 | AO |
| Ammonia | 0.4 | 0.24 | 0.141 | 0.237 | - | - | - |
| Nitrite | 0.01 | ND | ND(0.10) | ND(0.10) | - | 1 | MAC |
| Nitrate | ND | ND | 0.40 | 0.28 | 3.13 | 10 | MAC |
| Sodium | 30 | 25 | - | - | - | 200 | AO |
| Potassium | 5.2 | 2.5 | 2.2 | 1.8 | - | - | - |
| Sulphate | 160 | 94 | 67.8 | 57.5 | - | 500 | AO |
| Total Kjeldahl Nitrogen (TKN) | - | 0.6 | ND(0.15) | 0.39 | - | - | - |
| Total Phenolics | ND | - | 0.0012 | ND(0.001) | - | - | - |
| Phosphorus (Dissolved) | - | 0.18 | ND(0.05) | ND(0.05) | - | - | - |
| Laboratory Conductivity (µmhos/cm) | - | 847 | 872 | 767 | - | - | - |
| Laboratory pH (Std. Units) | - | 7.6 | 7.91 | 7.96 | - | 6.5 - 8.5 | OG |
| | | | | | | | |
| Field pH (Std. Units) | - | - | 7.39 | 7.66 | - | 6.5 - 8.5 | OG |
| Field Conductivity (µmhos/cm) | - | - | 780 | 769 | - | - | - |
| Field Temperature (°C) | - | - | 8.6 | 10.1 | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
[2] Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW31-07**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *5-Aug-08* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* | | *ODWS [1]* | |
|---|---|---|---|---|---|---|---|
| Alkalinity | 249 | 278 | 344 | 354 | 30 - 500 | | OG |
| Calcium | 18 | 42 | 71.3 | 59.8 | - | | - |
| Chloride | 21 | 24 | 17.3 | 29.3 | 250 | | AO |
| Dissolved Organic Carbon (DOC) | 5.6 | 4.1 | 3.5 | 3.9 | 5 | | AO |
| Hardness | 170 | 230 | 330 | 289 | 80 - 100 | | OG |
| Iron | ND | ND | 0.315 | 0.07 | 0.3 | | AO |
| Magnesium | - | - | 36.9 | 33.9 | - | | - |
| Manganese | - | - | 0.0447 | 0.0082 | 0.05 | | AO |
| Ammonia | 0.58 | 0.5 | 0.220 | 0.333 | - | | - |
| Nitrite | ND | 0.02 | ND(0.10) | ND(0.10) | 1 | | MAC |
| Nitrate | ND | 0.2 | 0.19 | 0.27 | 10 | | MAC |
| Sodium | 70 | 53 | - | - | 200 | | AO |
| Potassium | 10 | 6 | 2.3 | 2.2 | - | | - |
| Sulphate | 53 | 53 | 27.7 | 28.2 | 500 | | AO |
| Total Kjeldahl Nitrogen (TKN) | - | 1.2 | 0.990 | 0.48 | - | | - |
| Total Phenolics | ND | ND | 0.0018 | ND(0.001) | - | | - |
| Phosphorus (Dissolved) | - | 0.47 | ND(0.05) | ND(0.05) | - | | - |
| Laboratory Conductivity (µmhos/cm) | - | 654 | 706 | 687 | - | | - |
| Laboratory pH (Std. Units) | - | 7.8 | 7.95 | 7.98 | 6.5 - 8.5 | | OG |
| Field pH (Std. Units) | - | - | 7.48 | 7.41 | 6.5 - 8.5 | | OG |
| Field Conductivity (µmhos/cm) | - | - | 660 | 793 | - | | - |
| Field Temperature (°C) | - | - | 8.3 | 9.6 | - | | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW32-07**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *5-Aug-08* | *30-Apr-09* | *19-Nov-09* | *29-Dec-09* | | *ODWS [1]* | |
|---|---|---|---|---|---|---|---|
| Alkalinity | 184 | 181 | 186 | 198 | 30 - 500 | | OG |
| Calcium | 27 | 30.1 | 30.1 | 28 | - | | - |
| Chloride | 3 | 9.2 | 12.3 | 2 | 250 | | AO |
| Dissolved Organic Carbon (DOC) | 2.7 | 2.5 | 1.6 | 1.3 | 5 | | AO |
| Hardness | 130 | 137 | 138 | 140 | 80 - 100 | | OG |
| Iron | ND | ND(0.05) | ND(0.05) | ND | 0.3 | | AO |
| Magnesium | - | 15.0 | 15.4 | - | - | | - |
| Manganese | - | 0.0113 | 0.0068 | - | 0.05 | | AO |
| Ammonia | 0.15 | 0.122 | 0.083 | 0.12 | - | | - |
| Nitrite | ND | 0.14 | ND(0.1) | 0.04 | 1 | | MAC |
| Nitrate | ND | 0.52 | 0.26 | 0.2 | 10 | | MAC |
| Sodium | 37 | - | - | 39 | 200 | | AO |
| Potassium | 2.9 | 2.4 | 1.1 | 2.3 | - | | - |
| Sulphate | 41 | 23.4 | 20.9 | 29 | 500 | | AO |
| Total Kjeldahl Nitrogen (TKN) | - | ND(0.15) | ND(0.15) | 0.9 | - | | - |
| Total Phenolics | ND | 0.0013 | ND(0.001) | ND | - | | - |
| Phosphorus (Dissolved) | - | ND(0.050) | ND(0.05) | 0.27 | - | | - |
| Laboratory Conductivity (µmhos/cm) | - | 396 | 379 | 409 | - | | - |
| Laboratory pH (Std. Units) | - | 8.15 | 8.14 | 7.8 | 6.5 - 8.5 | | OG |
| Field pH (Std. Units) | - | 8.01 | 802 | - | 6.5 - 8.5 | | OG |
| Field Conductivity (µmhos/cm) | - | 358 | 514 | - | - | | - |
| Field Temperature (°C) | - | 8.8 | 10.3 | - | - | | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW33-07**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *5-Aug-08* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* | | *ODWS [1]* | |
|---|---|---|---|---|---|---|---|
| Alkalinity | 541 | 581 | 540 | 491 | 30 - 500 | | OG |
| Calcium | 180 | 180 | 206 | 141 | - | | - |
| Chloride | 28 | 28 | 23.6 | 33.7 | 250 | | AO |
| Dissolved Organic Carbon (DOC) | 2.7 | 1.8 | 3.1 | 3.2 | 5 | | AO |
| Hardness | 850 | 820 | 869 | 658 | 80 - 100 | | OG |
| Iron | ND | ND | ND(0.05) | 1.67 | 0.3 | | AO |
| Magnesium | - | - | 86.1 | 74.5 | - | | - |
| Manganese | - | - | 0.036 | 0.178 | 0.05 | | AO |
| Ammonia | 0.14 | 0.14 | 0.163 | 3.12 | - | | - |
| Nitrite | ND | 0.05 | ND(0.1) | ND(0.1) | 1 | | MAC |
| Nitrate | 0.4 | 0.3 | 0.7 | ND(0.5) | 10 | | MAC |
| Sodium | 15 | 14 | - | - | 200 | | AO |
| Potassium | 12 | 10 | 9.2 | 9.2 | - | | - |
| Sulphate | 240 | 292 | 257 | 199 | 500 | | AO |
| Total Kjeldahl Nitrogen (TKN) | - | 6 | 0.19 | 3.19 | - | | - |
| Total Phenolics | ND | ND | 0.0015 | 0.003 | - | | - |
| Phosphorus (Dissolved) | - | 22 | ND(0.05) | 0.293 | - | | - |
| Laboratory Conductivity (µmhos/cm) | - | 1450 | 1400 | 1260 | - | | - |
| Laboratory pH (Std. Units) | - | 7.8 | 7.61 | 7.68 | 6.5 - 8.5 | | OG |
| Field pH (Std. Units) | - | - | 7.01 | 718 | 6.5 - 8.5 | | OG |
| Field Conductivity (µmhos/cm) | - | - | 360 | 1150 | - | | - |
| Field Temperature (°C) | - | - | 9.4 | 10.5 | - | | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW34-09**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *30-Apr-09* | *19-Nov-09* | *ODWS [1]* | *PWQO [2]* | |
|---|---|---|---|---|---|
| Alkalinity | 327 | 325 | 30 - 500 | - | OG |
| Calcium | 103 | 93.9 | - | - | - |
| Chloride | 4.9 | 14.2 | 250 | - | AO |
| Dissolved Organic Carbon (DOC) | 2.3 | 2.9 | 5 | - | AO |
| Hardness | 397 | 354 | 80 - 100 | - | OG |
| Iron | 0.112 | ND(0.05) | 0.3 | 0.3 | AO |
| Magnesium | 34.0 | 28.9 | - | - | - |
| Manganese | 0.184 | 0.0235 | 0.05 | - | AO |
| Ammonia | ND(0.05) | ND(0.05) | - | - | - |
| Unionized Ammonia | <0.0003 | <0.0003 | - | 0.02 (b) | - |
| Nitrite | ND(0.1) | ND(0.10) | 1 | - | MAC |
| Nitrate | 1.59 | 0.84 | 10 | - | MAC |
| Potassium | ND(1.0) | ND(1.0) | - | - | - |
| Sulphate | 16.5 | 5.1 | 500 | - | AO |
| Total Kjeldahl Nitrogen (TKN) | ND(0.15) | ND(0.15) | - | - | - |
| Total Phenolics | 0.0047 | 0.003 | - | 0.001 | - |
| Phosphorus (Dissolved) | ND(0.05) | ND(0.05) | - | 0.01 - 0.03 (c) | - |
| Laboratory Conductivity (µmhos/cm) | 625 | 591 | - | - | - |
| Laboratory pH (Std. Units) | 7.93 | 7.94 | 6.5 - 8.5 | 6.5 - 8.5 | OG |
| Field pH (Std. Units) | 7.42 | 7.53 | 6.5 - 8.5 | 6.5 - 8.5 | OG |
| Field Conductivity (µmhos/cm) | 592 | 625 | - | - | - |
| Field Temperature (°C) | 10.6 | 8.7 | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
[2] MOECC Provincial Water Quality Objectives
(PWQO), July 1994, reprinted February 1999.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
(b) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(c) Total phosphorus has no firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
ND - concentrations are below the laboratory's method detection limit.

**OW35-09**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *30-Apr-09* | *19-Nov-09* | *ODWS [1]* | |
|---|---|---|---|---|
| Alkalinity | 240 | 192 | 30 - 500 | OG |
| Calcium | 81.7 | 51.9 | - | - |
| Chloride | 7.1 | 14.7 | 250 | AO |
| Dissolved Organic Carbon (DOC) | 10.2 | 5.0 | 5 | AO |
| Hardness | 312 | 210 | 80 - 100 | OG |
| Iron | ND(0.05) | ND(0.05) | 0.3 | AO |
| Magnesium | 26.3 | 19.4 | - | - |
| Manganese | 0.132 | 0.0402 | 0.05 | AO |
| Ammonia | 0.261 | ND(0.05) | - | - |
| Nitrite | ND(0.10) | ND(0.10) | 1 | MAC |
| Nitrate | ND(0.30) | 0.51 | 10 | MAC |
| Potassium | 1.6 | 1.7 | - | - |
| Sulphate | 220 | 133 | 500 | AO |
| Total Kjeldahl Nitrogen (TKN) | 0.77 | 0.18 | - | - |
| Total Phenolics | 0.0047 | 0.003 | - | - |
| Phosphorus (Dissolved) | ND(0.05) | ND(0.05) | - | - |
| Laboratory Conductivity (µmhos/cm) | 864 | 622 | - | - |
| Laboratory pH (Std. Units) | 7.92 | 8.06 | 6.5 - 8.5 | OG |
| Field pH (Std. Units) | 7.53 | 7.63 | 6.5 - 8.5 | OG |
| Field Conductivity (µmhos/cm) | 1010 | 717 | - | - |
| Field Temperature (°C) | 8.6 | 8.6 | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] MOECC Ontario Drinking Water Standards (ODWS),
August 2000, revised January 2001 and June 2003, where applicable.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
ND - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.
Parameter exceeds the applicable ODWS.

**OW36-09**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *30-Apr-09* |
|---|---|
| Alkalinity | 609 |
| Calcium | 152 |
| Chloride | 29.4 |
| Dissolved Organic Carbon (DOC) | 3.0 |
| Hardness | 742 |
| Iron | ND(0.05) |
| Magnesium | 87.9 |
| Manganese | 0.674 |
| Ammonia | 0.904 |
| Nitrite | ND(0.10) |
| Nitrate | 1.95 |
| Potassium | 28.3 |
| Sulphate | 97.3 |
| Total Kjeldahl Nitrogen (TKN) | 1.17 |
| Total Phenolics | 0.0059 |
| Phosphorus (Dissolved) | <0.050 |
| Laboratory Conductivity (µmhos/cm) | 1340 |
| Laboratory pH (Std. Units) | 7.60 |
| | |
| Field pH (Std. Units) | 6.89 |
| Field Conductivity (µmhos/cm) | 1290 |
| Field Temperature (°C) | 10.4 |

**OW37-09**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *30-Apr-09* | *19-Nov-09* |
|---|---|---|
| Alkalinity | 189 | 182 |
| Calcium | 81.6 | 62.2 |
| Chloride | 21.2 | 21.9 |
| Dissolved Organic Carbon (DOC) | 1.4 | 1.8 |
| Hardness | 320 | 256 |
| Iron | 0.164 | 0.295 |
| Magnesium | 28.2 | 24.6 |
| Manganese | 0.0208 | 0.0123 |
| Ammonia | 0.187 | 0.150 |
| Nitrite | 0.16 | ND(0.10) |
| Nitrate | 0.45 | ND(0.50) |
| Potassium | 1.9 | 1.4 |
| Sulphate | 78.1 | 127 |
| Total Kjeldahl Nitrogen (TKN) | 0.198 | 0.29 |
| Total Phenolics | 0.0057 | ND(0.001) |
| Phosphorus (Dissolved) | ND(0.05) | ND(0.05) |
| Laboratory Conductivity (µmhos/cm) | 645 | 606 |
| Laboratory pH (Std. Units) | 8.09 | 7.97 |
| | | |
| Field pH (Std. Units) | 7.82 | 7.54 |
| Field Conductivity (µmhos/cm) | 561 | 676 |
| Field Temperature (°C) | 9.9 | 8.8 |

**Notes**
**Historic Groundwater Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

Notes:

All concentrations in mg/L unless otherwise noted.
ND - concentrations are below the laboratory's method detection limit.
< - concentrations are below the laboratory's method detection limit.
- No information available/not analyzed.

# TABLE 6.2

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | | | | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP2-13 | MP2-13 | MP2-13 | MP2-13 | MP2-13 | MP2-13 | MP2-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-1013-028 | GW (MP)-WARD2-DD-061514-001 | GW/MP-WARD2-103014-001 | GW(MP)-WARD2-8/6/15-002 | GW/MP-WARD2-161115-001 | GW(MP)-WARD2-042616-001 | GW(MP)-WARD2-110316-001 | GW(MP)-WARD2-041017-001 | GW(MP)-WARD2-112417-003 | GW(MP)-WARD2-051818-001 | GW(MP)-WARD2-110318-001 | GW-WARD2-1013-024 | GW-(MP)-WARD2-DD-061514-002 | GW/MP-WARD2-103014-002 | GW(MP)-WARD2-8/6/15-003 | GW/MP-WARD2-161115-002 | GW(MP)-WARD2-042616-002 | GW(MP)-WARD2-110316-002 | GW(MP)-WARD2-041017-002 |
| **Sample Date:** | | | | | | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/26/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/26/2016 | 11/3/2016 | 4/10/2017 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 127 | - | 241 | 113 | 111 | 104 | 142 | 141 | 125 | 125 | 127 | - | - | 115 | 122 | 112 | 122 | - | 94 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | **4.7** | - | **1.97** | **1.32** | <0.1 | **1.54** | <0.1 | **0.55** | <0.1 | **0.87** | <0.1 | - | - | **9.58** | **6.6** | 0.016 | **3.68** | - | 0.022 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 44.7 | - | 43.8 | 39.5 | 37.3 | 41.9 | 52.4 | 50.8 | 47 | 46.1 | 43.9 | - | - | 60.2 | 60.6 | 63.8 | 64.7 | - | 57.4 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | **2.27** | - | **0.407** | **0.358** | **0.101** | **0.318** | **0.292** | **0.375** | **0.0829** | **0.239** | **0.0646** | - | - | **0.871** | **0.708** | **0.214** | **0.616** | - | **0.534** |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | 0.059 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | 0.165 | <0.05 | <0.05 | <0.05 | - | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 1.6 | - | <10 | <10 | 0.96 | 0.92 | 1.25 | 1.01 | 1.48 | 1.45 | 1.13 | - | - | 6.8 | 6.9 | 8.17 | 6.55 | - | 6.41 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 6.91 | - | 6.2 | 6.1 | 6 | 6.2 | 8.3 | 7.4 | 8.4 | 8.84 | 9.78 | - | - | 16.7 | 16.5 | 17.3 | 15.8 | - | 14.2 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | - | 383 | 347 | - | 377 | 397 | - | 401 | 419 | 366 | 379 | 561 | 503 | 348 | 451 | 491 | 438 | 465 | 487 |
| Ammonia-N | mg/L | - | - | - | - | 0.664 | - | 0.287 | - | 0.394 | 0.265 | <0.142 | 0.214 | <0.058 | 0.225 | 0.077 | 1.54 | 0.736 | 0.501 | 0.475 | 0.381 | 0.304 | <0.442 | 0.167 |
| Chloride | mg/L | 250 | AO | 126.50 | - | - | 11.5 | 11.8 | - | 17.6 | 19.4 | - | 23.4 | 25.2 | 26.1 | 34 | 29.2 | 27.2 | 15.3 | 17.9 | 20.6 | 16.8 | 14.6 | 14.3 |
| Conductivity | uS/cm | - | - | - | - | - | 771 | 716 | - | 761 | 774 | - | 913 | 860 | 760 | 765 | 1180 | 995 | 731 | 894 | 980 | 863 | 909 | 905 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | **24.3** | **8.3** | **7.5** | **9** | **6.2** | **8.3** | **6.2** | **5.2** | **6.5** | **7.5** | **7.32** | **27.8** | **14.8** | **11.2** | **15.9** | **10.5** | **10** | **10** | **7.9** |
| Hardness | mg/L | 80-100 | OG | - | - | 501 | - | 783 | 445 | 430 | 433 | 571 | 561 | 505 | 503 | 499 | - | - | 535 | 554 | 543 | 571 | - | 471 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | - | <0.1 | <0.1 | - | 0.081 | 0.026 | - | 0.1 | 0.041 | 0.045 | 0.026 | <0.1 | 0.13 | 1.14 | 0.321 | 0.156 | 0.235 | 0.313 | 0.203 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | - | <0.1 | <0.1 | - | <0.01 | <0.01 | - | 0.027 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | 0.037 | <0.01 | 0.015 | <0.01 | 0.081 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | - | 7.64 | 7.7 | - | 7.91 | 7.96 | - | 7.82 | 8.07 | 7.69 | 7.38 | 7.68 | 8.03 | 7.65 | 8.2 | 8.04 | 8.18 | 7.38 | 7.96 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | 0.0289 | - | 0.0024 | - | 0.0043 | <0.001 | <0.0049 | 0.0013 | <0.001 | 0.0042 | 0.0027 | <0.0071 | 0.0042 | 0.0025 | 0.0059 | 0.004 | <0.001 | <0.0027 | <0.001 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | - | 74.8 | 63.3 | - | 35.5 | 21.7 | - | 89.7 | 56.8 | 46.8 | 31.1 | 85.4 | 74.7 | 62.6 | 71 | 78.6 | 61.3 | 50.8 | 39.9 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 3.18 | - | 0.94 | - | 0.61 | 3.4 | 0.76 | 0.73 | 0.99 | 1.13 | 5.1 | 10.1 | 1.29 | 1.38 | 1.03 | 0.7 | 1.79 | 5.3 | 0.99 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | - | - | - | - | - | - | - | - | - | 0.00286 | - | - | - | - | - | - | - | - | - |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | - | NM | - | - | - | - | - | Insuf. | Insuf. | 394 | - | - | NM | - | - | - | - | - | Insuf. |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | - | 1.34 | - | - | - | - | - | Insuf. | Insuf. | 7.55 | - | - | 1.02 | - | - | - | - | - | Insuf. |
| Temperature, field | Deg C | 15 | AO | - | - | - | NM | - | - | - | - | - | Insuf. | Insuf. | **16.08** | - | - | NM | - | - | - | - | - | Insuf. |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | MP2-13 | MP2-13 | MP2-13 | MP3-13 | MP3-13 | MP3-13 | MP3-13 | MP3-13 | MP3-13 | MP3-13 | MP3-13 | MP3-13 | MP4-13 | MP4-13 | MP4-13 | MP4-13 | MP4-13 | MP4-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW(MP)-WARD2-112417-004 | GW(MP)-WARD2-051818-002 | GW(MP)-WARD2-110318-002 | GW-WARD2-1013-018 | GW-(MP)-WARD2-DD-061514-003 | GW(MP)-WARD2-8/6/15-001 | GW/MP-WARD2-161115-003 | GW(MP)-WARD2-042516-003 | GW(MP)-WARD2-110316-003 | GW(MP)-WARD2-041017-003 | GW(MP)-WARD2-112417-001 | GW(MP)-WARD2-051818-003 | GW(MP)-WARD2-110318-003 | GW-WARD2-1013-004 | GW(MP)-WARD2-8/6/15-004 | GW/MP-WARD2-161115-004 | GW(MP)-WARD2-042516-004 | GW(MP)-WARD2-110316-004 | GW(MP)-WARD2-041017-004 |
| **Sample Date:** | | | | | | 11/24/2017 | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/15/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 90.8 | 102 | 78.7 | 56.4 | 78.9 | 63.1 | 99.2 | 91.2 | 95.2 | 86.5 | 75.4 | 14.9 | - | 52.2 | - | 41.8 | 53.9 | 63.4 | 72.8 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | 0.147 | **3.89** | 0.098 | 0.133 | **3.24** | 0.105 | <0.01 | **0.664** | 0.032 | **0.429** | 0.081 | 0.1 | - | <0.05 | - | <0.01 | 0.023 | 0.011 | 0.104 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 57.8 | 60.1 | 53 | 28.8 | 39.2 | 46.2 | 40.8 | 41 | 42.9 | 36.1 | 37.7 | 3.65 | - | 39.2 | - | 54.6 | 38.4 | 62.6 | 47.6 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | **0.366** | **0.539** | **0.289** | **0.981** | **0.576** | **0.0986** | 0.0357 | **0.29** | **0.119** | **0.22** | **0.133** | **0.0654** | - | **0.145** | - | <0.0005 | 0.0389 | 0.0139 | 0.035 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | 0.054 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 6.81 | 6.15 | 6.51 | 5.4 | 4.7 | 6.1 | 4.65 | 3.84 | 4.77 | 3.64 | 4.12 | 0.97 | - | 2.8 | - | 2.79 | 1.75 | 2.92 | 1.84 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 15.2 | 12.8 | 12.5 | 43.4 | 41.3 | 49.2 | 39.6 | 37.4 | 43 | 33.6 | 37.3 | 3.59 | - | 24.5 | - | 17.7 | 15.4 | 20.8 | 16.8 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 476 | 478 | 444 | - | 384 | 391 | 451 | 388 | 438 | 384 | 415 | 167 | 304 | - | - | 184 | - | - | 227 |
| Ammonia-N | mg/L | - | - | - | - | 0.459 | 0.527 | 0.037 | - | - | 0.136 | 0.178 | 0.092 | <0.128 | 0.073 | <0.098 | 0.143 | 0.201 | 0.199 | 0.31 | 0.27 | - | <0.173 | 0.132 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 13.5 | 13.2 | 12.8 | - | 19.5 | 17.5 | 25.2 | 24.4 | 25.7 | 24 | 27 | 15.3 | 19.9 | - | - | 5 | - | - | 3.27 |
| Conductivity | uS/cm | - | - | - | - | 872 | 831 | 787 | - | 704 | 731 | 855 | 761 | 850 | 756 | 810 | 329 | <3 | - | - | 664 | - | - | 277 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | **8.7** | **8.9** | **15.4** | **23.1** | **9.4** | 4.7 | **5.5** | <6.8 | 4.4 | **5.1** | **7** | 3.6 | **7.29** | **9.1** | **12.9** | 4.1 | <3.6 | 2.2 | 1.1 |
| Hardness | mg/L | 80-100 | OG | - | - | 465 | 501 | 415 | 259 | 359 | 348 | 416 | 397 | 414 | 365 | 344 | 52 | - | 292 | - | 329 | 293 | 416 | 378 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 0.088 | 0.062 | 0.046 | - | <0.1 | 0.051 | <0.02 | <0.02 | <0.02 | 0.02 | 0.102 | 0.128 | <0.02 | - | - | 0.14 | - | - | 0.045 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.01 | 0.062 | <0.01 | - | 0.32 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | - | - | <0.01 | - | - | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 8.1 | 8.17 | 7.54 | - | 8.41 | 8.43 | 8.12 | 8.34 | 7.71 | 8.14 | 8.2 | 7.94 | 5.83 | - | - | 8.12 | - | - | 8.53 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.0027 | 0.0012 | 0.0023 | - | - | 0.0221 | 0.0053 | <0.001 | <0.0059 | 0.0012 | 0.0064 | 0.0159 | 0.0028 | <0.0054 | 0.0062 | 0.0121 | - | <0.0056 | 0.0015 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 32.3 | 29.5 | 24 | - | 25.4 | 22.8 | 27.4 | 23 | 25.8 | 22.4 | 21.1 | 10.7 | 12.4 | - | - | 177 | - | - | 88.9 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 1.41 | 1.54 | 0.64 | - | - | 0.47 | 0.23 | 1.12 | 1.13 | <0.15 | 1.99 | 1.62 | 1.46 | 0.98 | 1.01 | 0.21 | - | 0.61 | 2.4 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | - | 0.0065 | 0.00034 | - | - | - | - | - | - | - | - | 0.0007 | - | - | - | - | - | - | - |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | Insuf. | 480 | 970 | - | NM | - | - | - | - | Insuf. | Insuf. | 107 | - | - | - | - | - | - | Insuf. |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | Insuf. | 7.62 | 7.69 | - | 1.21 | - | - | - | - | Insuf. | Insuf. | 7.35 | - | - | - | - | - | - | Insuf. |
| Temperature, field | Deg C | 15 | AO | - | - | Insuf. | 13.54 | 7.77 | - | NM | - | - | - | - | Insuf. | Insuf. | 9.63 | - | - | - | - | - | - | Insuf. |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | MP4-13 | MP4-13 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW(MP)-WARD2-112417-002 | GW-WARD2-112417-022 | CRA-4074-02-WARD2-26 | GW-WARD2-1210-009 | GW-WARD2-0511-016 | GW-WARD2-1011-018 | GW-WARD2-0412-013 | GW-WARD2-1112-026 | GW-WARD2-0513-012 | GW-WARD2-1013-005 | GW-WARD2-DD-061514-020 | GW-WARD2-103014-026 | GW-WARD2-8/6/15-029 | GW-WARD2-161115-024 | GW-WARD2-042516-016 | GW-WARD2-041017-023 | GW-WARD2-112417-025 | GW-WARD2-051818-014 | GW-WARD2-110318-032 |
| **Sample Date:** | | | | | | 11/24/2017 | 11/24/2017 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 |
| **Parameters** | **Units** | *ODWS*[1] | *ODWS Source* | *MABC*[2] | *TLP*[3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 61.2 | 70.5 | 155 | 173 | 155 | 151 | 150 | 109 | 155 | 160 | 156 | 155 | 161 | 168 | 141 | 115 | 61.1 | 134 | 130 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | 0.028 | 0.073 | 0.287 | 0.161 | 0.234 | 0.091 | 0.213 | <0.05 | 0.222 | <0.05 | **0.438** | 0.135 | 0.131 | **0.362** | 0.147 | 0.014 | 0.085 | 0.109 | 0.262 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 52.7 | 51.3 | 40.8 | 40.9 | 38.1 | 34.3 | 37.8 | 28.6 | 44.2 | 42.7 | 49.3 | 42.4 | 43.9 | 41.9 | 35.7 | 31.7 | 27.9 | 37.1 | 37.8 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | 0.0151 | 0.0474 | **0.0899** | **0.158** | **0.145** | **0.0814** | **0.105** | 0.0023 | **0.0621** | 0.0019 | **0.0538** | **0.0572** | 0.0411 | **0.0764** | 0.0403 | **0.0989** | **0.193** | 0.0205 | **0.058** |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | 0.061 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.533 | 0.122 |
| Potassium (dissolved) | mg/L | - | - | - | - | 2.17 | 2.12 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 0.764 | 0.577 | 1.02 | 1.68 | 4.24 | 0.843 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 14 | 26.8 | 6.04 | 5.93 | 5.99 | 5.86 | 5.83 | 5.02 | 6.74 | 7.29 | 7.56 | 7.13 | 6.79 | 7.12 | 6.05 | 5.76 | 77.5 | 6.99 | 7.52 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 287 | 395 | 499 | 523 | 469 | 479 | 496 | 366 | 503 | 508 | 573 | 566 | 530 | 515 | 484 | 389 | 426 | 466 | 478 |
| Ammonia-N | mg/L | - | - | - | - | <0.888 | <0.286 | 0.064 | 0.101 | 0.15 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.057 | 0.251 | 0.184 | 0.152 | 0.131 | <0.02 | 0.535 | 0.063 | 0.092 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 4.23 | 0.55 | 3.5 | <2 | 5.3 | 2.2 | 4.1 | 2.2 | 2.9 | <2 | 3.3 | 2.7 | 3.8 | 3.22 | 5 | 2.31 | 34.4 | 4.48 | 3.21 |
| Conductivity | uS/cm | - | - | - | - | 600 | 757 | 946 | 1050 | 929 | 876 | 978 | 392 | 897 | 1010 | 993 | 1040 | 1020 | 1030 | 916 | 675 | 793 | 911 | 870 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | **13.6** | <1 | <1 | 2.3 | **6.5** | 2.7 | 3.6 | 1.6 | 2.4 | 2.8 | 1.9 | **38.3** | 2.6 | 2.8 | <4.8 | 1.6 | 4.8 | 2.1 | 4.01 |
| Hardness | mg/L | 80-100 | OG | - | - | 370 | 387 | 556 | 600 | 544 | 518 | 531 | 390 | 568 | 576 | 594 | 563 | 583 | 592 | 499 | 418 | 268 | 488 | 480 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 0.041 | <0.02 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.463 | <0.02 | <0.02 | <0.02 | 0.454 | 0.033 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 8.33 | 8.08 | 7.49 | 7.47 | 7.57 | 7.56 | 7.47 | 7.48 | 7.34 | 7.35 | 7.28 | 7.22 | 7.85 | 7.6 | 7.61 | 7.62 | 8.15 | 7.67 | 7.02 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.004 | <0.001 | <0.001 | 0.001 | 0.002 | <0.001 | 0.004 | <0.001 | <0.001 | <0.001 | 0.0064 | <0.001 | 0.0086 | 0.0021 | <0.0036 | 0.0012 | <0.001 | 0.0077 | 0.005 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 96.5 | 42.1 | 50.3 | 53.7 | 51.8 | 64.7 | 51.4 | 5.5 | 48.5 | 66.2 | 47.6 | 45.3 | 55.5 | 60.6 | 55.5 | 4.37 | <0.3 | 58.4 | 56.5 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 3.4 | 0.33 | 0.18 | <0.15 | 0.382 | <0.15 | <0.15 | 0.21 | 0.17 | <0.22 | 0.26 | 0.38 | 0.21 | 0.42 | 0.52 | <0.15 | 2.3 | 0.27 | 0.75 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | - | 0.00251 | 0.00021 | 0.00004 | 0.00015 | <0.0002 | <0.00006 | <0.00003 | <0.0001 | <0.00024 | 0.00026 | 0.00062 | 0.00055 | 0.00066 | 0.00026 | <0.00011 | 0.00302 | 0.00009 | 0.00009 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | Insuf. | 636 | 852 | 735 | 960 | 910 | 926 | 533 | 890 | 915 | 1430 | 1030 | 1010 | 813 | 862 | 660 | 660 | 517 | 1000 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | Insuf. | 7.6 | 7.21 | 6.31 | 6.7 | 7.29 | 6.81 | 6.45 | 7.05 | 7.3 | 7.3 | 7.03 | 7.09 | 7.26 | 7.05 | 7.49 | 7.49 | 6.86 | 6.66 |
| Temperature, field | Deg C | 15 | AO | - | - | Insuf. | 9.7 | 8.6 | 7.6 | 8.1 | 9 | 6.9 | 7.9 | 6.5 | 10.7 | 10.2 | 10.3 | 10.9 | 10.7 | 6.7 | 7.3 | 7.3 | 8.82 | 9.89 |

Notes:

| | |
|---|---|
| (1) | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| (2) | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| (3) | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW4-83 | OW4-83 | OW6-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | CRA-4074-02-WARD2-27 | GW-WARD2-1210-008 | GW-WARD2-0511-014 | GW-WARD2-1011-017 | GW-WARD2-0412-011 | GW-WARD2-0513-010 | GW-WARD2-1013-010 | GW-WARD2-DD-061514-018 | GW-WARD2-103014-021 | GW-WARD2-8/6/15-032 | GW-WARD2-161115-025 | GW-WARD2-042516-017 | GW-WARD2-041017-024 | GW-WARD2-112417-023 | GW-WARD2-051818-008 | GW-WARD2-110318-031 | GW-WARD2-1210-013 | GW-WARD2-0511-011 | CRA-4074-02-WARD2-28 |
| **Sample Date:** | | | | | | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 12/1/2010 | 5/24/2011 | 5/12/2010 |
| **Parameters** | **Units** | ***ODWS*[1]** | ***ODWS Source*** | ***MABC*[2]** | ***TLP*[3]** | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 103 | 132 | 103 | 104 | 101 | 106 | 132 | 120 | 112 | 126 | 153 | 99.9 | 68.7 | 146 | 94.9 | 59.8 | 102 | 103 | 148 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | 0.213 | 0.285 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.072 | <0.05 | <0.05 | **1.16** | 0.134 | <0.01 | 0.025 | 0.01 | 0.042 | <0.05 | <0.05 | **16.5** |
| Magnesium (dissolved) | mg/L | - | - | - | - | 28.3 | 34 | 28 | 26.3 | 26.8 | 28.9 | 34.6 | 34.3 | 31.8 | 33.2 | 41.9 | 28 | 52.1 | 41.6 | 31.2 | 26 | 25.8 | 27.6 | 58.8 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | **0.179** | **0.632** | **0.245** | 0.0307 | **0.0833** | **0.147** | <0.001 | **0.0913** | 0.0391 | **0.0942** | **0.847** | **0.318** | 0.00379 | 0.0326 | 0.045 | **0.134** | 0.004 | <0.001 | **0.475** |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | 0.146 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 1.27 | <0.05 | <0.05 | <0.05 | <0.05 | <0.5 |
| Potassium (dissolved) | mg/L | - | - | - | - | 1.4 | 4.1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 0.7 | 0.495 | 1.98 | 21.8 | 1.01 | 1.54 | 1.5 | 1.8 | 12 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 5 | 5.44 | 4.67 | 4.16 | 4.53 | 5.02 | 5.44 | 5.58 | 3.36 | 5.49 | 6.34 | 5.37 | 26 | 7.28 | 6.37 | 75.6 | 13 | 16.3 | 26.2 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 398 | 417 | 368 | 370 | 358 | 373 | 498 | 450 | 473 | 468 | 483 | 396 | 408 | 469 | 419 | 379 | 368 | 394 | 610 |
| Ammonia-N | mg/L | - | - | - | - | 0.105 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.068 | <0.05 | <0.05 | 0.167 | <0.05 | <0.02 | <0.021 | 0.516 | 0.064 | 0.285 | <0.05 | 0.058 | 3.21 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 3.9 | 2.9 | 2.6 | <2 | 2.6 | 2.1 | <2 | 2 | <2 | 3.51 | 1.85 | 2.22 | 0.63 | 3.95 | 2.65 | 32.2 | 6.4 | 9.8 | 30 |
| Conductivity | uS/cm | - | - | - | - | 703 | 737 | 648 | 631 | 621 | 602 | 843 | 723 | 788 | 771 | 870 | 683 | 791 | 968 | 707 | 727 | 669 | 691 | 1140 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | 1.4 | 4.2 | 2.6 | 2.1 | 1.4 | 1.5 | 2.9 | 1.4 | 1.3 | 3.1 | 3.3 | <3.8 | 1 | 2.2 | 1.6 | **5.89** | 1.4 | 2.5 | **6** |
| Hardness | mg/L | 80-100 | OG | - | - | 374 | 469 | 374 | 369 | 362 | 384 | 471 | 441 | 410 | 452 | 554 | 365 | 386 | 536 | 365 | 256 | 360 | 370 | 612 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 0.89 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.02 | 0.074 | 0.08 | 0.048 | 0.077 | <0.1 | <0.1 | 0.15 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.67 | 7.59 | 7.75 | 7.65 | 7.71 | 7.52 | 7.46 | 7.49 | 7.27 | 7.93 | 7.64 | 7.8 | 7.87 | 7.83 | 7.75 | 7.62 | 7.76 | 7.72 | 7.33 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.0021 | 0.0015 | 0.0032 | 0.0205 | 0.0034 | <0.0036 | 0.002 | <0.001 | 0.0042 | 0.0045 | <0.001 | 0.001 | <0.002 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 5 | 3.3 | 2.7 | 5.4 | 4 | 4 | 6.5 | 2.6 | 2.6 | 2.68 | 3.01 | 2.9 | 62.5 | 63.2 | 2.36 | <0.3 | 4.3 | 4.7 | 2.3 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 0.73 | 0.17 | <0.15 | <0.15 | 0.35 | <0.15 | <0.3 | 0.16 | <0.15 | 0.2 | 0.25 | <0.15 | <0.15 | 0.58 | 0.17 | 1.5 | <0.15 | <0.15 | 8.1 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00057 | <0.00003 | <0.00008 | <0.00023 | <0.00007 | <0.00008 | 0.00029 | <0.00034 | <0.00014 | 0.00008 | <0.00029 | <0.00009 | <0.00012 | 0.00302 | 0.00013 | 0.00124 | <0.00004 | 0.00008 | 0.00893 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 620 | 523 | 693 | 702 | 728 | 629 | 772 | 946 | 789 | 632 | 712 | 625 | 674 | 6.74 | 416 | 887 | 492 | 715 | 1320 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.43 | 6.51 | 6.88 | 7.35 | 6.88 | 6.96 | 7.27 | 7.44 | 7.08 | 6.31 | 7.38 | 7.39 | 7.46 | 7.46 | 6.95 | 7.27 | 6.65 | 6.83 | 7.14 |
| Temperature, field | Deg C | 15 | AO | - | - | 8.6 | 8.1 | 8.9 | 8.6 | 7.9 | 7.1 | 10.3 | 11.2 | 10.4 | 10 | 10.9 | 7.8 | 8.6 | 8.6 | 9.8 | 10.38 | 7.1 | 9.4 | 8.5 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

# TABLE 6.2

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | | | | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW7-83 | OW7-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-1210-015 | GW-WARD2-0511-010 | GW-WARD2-1011-012 | GW-WARD2-0412-007 | GW-WARD2-1112-023 | GW-WARD2-0513-009 | GW-WARD2-1013-017 | GW-WARD2-DD-061514-015 | GW-WARD2-103014-020 | GW-WARD2-8/6/15-013 | GW-WARD2-161115-031 | GW-WARD2-042516-004 | GW-WARD2-110316-006 | GW-WARD2-041017-019 | GW-WARD2-112417-019 | GW-WARD2-051818-002 | GW-WARD2-110318-030 | CRA-4074-02-WARD2-29 | GW-WARD2-1210-007 |
| **Sample Date:** | | | | | | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 165 | 165 | 182 | 143 | 176 | 175 | 188 | 174 | 178 | 184 | 151 | 183 | 180 | 27.4 | 189 | 97.6 | 165 | 182 | 133 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | **12.1** | **13.5** | **11.9** | **14.7** | **16.5** | **14** | **17.5** | **19.4** | **15.6** | **19.7** | **13** | **19.4** | **17.9** | <0.01 | **2.83** | **1.67** | **4.08** | **9.68** | <0.5 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 67 | 68.9 | 59.6 | 55.7 | 74.9 | 57.9 | 75.1 | 74.7 | 75.3 | 77.1 | 77.5 | 73.4 | 78.7 | 15.1 | 76.2 | 54 | 60.5 | 56.8 | 44 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | **0.284** | **0.454** | **0.368** | **0.458** | **0.356** | **0.418** | **0.354** | **0.432** | **0.322** | **0.357** | **0.268** | **0.325** | **0.348** | 0.00117 | **0.274** | **0.0539** | **0.498** | **0.533** | **0.119** |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.5 | 0.12 | <0.05 | 0.051 | <0.05 | 0.07 | 0.259 | 0.111 | <0.05 | 0.075 | 0.084 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.052 | <0.5 |
| Potassium (dissolved) | mg/L | - | - | - | - | 14 | 13.1 | 13.7 | 10.7 | 14 | 12.5 | 17 | 15.3 | 17.1 | 18.1 | 18.6 | 17.6 | 20 | 0.952 | 29.4 | 1.96 | 17.2 | 3.6 | <10 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 31.9 | 24.3 | 27.6 | 21.9 | 35 | 28.5 | 42 | 37.9 | 43.6 | 49.4 | 48.7 | 41.5 | 39.8 | 33.5 | 33.3 | 41.9 | 24.1 | 24.5 | 22.3 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 739 | 676 | 791 | 632 | 758 | 738 | 887 | 641 | 832 | 933 | 861 | 853 | 823 | 197 | 842 | 486 | 730 | 743 | 549 |
| Ammonia-N | mg/L | - | - | - | - | 4.94 | 4.44 | 2.76 | 2.43 | 6.22 | 5.68 | 12 | 10.2 | 9.29 | 12.1 | 14.4 | 12.7 | 12.8 | <0.023 | 10.9 | 0.348 | 8.93 | 0.513 | 0.338 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 42.4 | 37.2 | 43.5 | 34.3 | 40.3 | 42.8 | 57 | 52.4 | 65.8 | 68.5 | 78.4 | 49.1 | 49.5 | 2.04 | 31.7 | 23.7 | 28.6 | 48.2 | 46.2 |
| Conductivity | uS/cm | - | - | - | - | 1410 | 1260 | 1310 | 1220 | 1100 | 1250 | 1580 | 1440 | 1600 | 1700 | 1690 | 1600 | 1630 | 374 | 1510 | 939 | 1340 | 1410 | 1180 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | **8.2** | **16** | **9.6** | **8.5** | **8.6** | **13.2** | **12.2** | **11.7** | **12.8** | **13.9** | **13.9** | **13.7** | **10.4** | <1 | **8.6** | 3.8 | **11.3** | **5.9** | **5.6** |
| Hardness | mg/L | 80-100 | OG | - | - | 689 | 696 | 701 | 586 | 747 | 676 | 778 | 741 | 755 | 777 | 695 | 759 | 774 | 130 | 785 | 466 | 661 | 687 | 513 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 0.12 | 0.35 | <0.1 | 0.22 | <0.1 | <0.1 | <0.1 | 0.13 | <0.1 | 0.32 | <0.1 | 0.61 | 0.89 | 0.113 | <0.1 | <0.02 | 0.039 | <0.1 | 0.13 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.366 | <0.05 | <0.05 | <0.05 | <0.01 | <0.05 | <0.01 | <0.01 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.23 | 7.33 | 7.36 | 7.38 | 7.12 | 7.03 | 7.02 | 7.17 | 6.9 | 7.49 | 7.63 | 7.13 | 6.65 | 8.12 | 7.55 | 7.97 | 6.72 | 7.28 | 7.63 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | 0.004 | 0.001 | 0.001 | 0.004 | <0.001 | 0.001 | <0.0056 | 0.014 | 0.0028 | 0.0065 | 0.0071 | 0.0136 | <0.0082 | 0.0015 | <0.0026 | 0.0086 | 0.0097 | <0.002 | <0.005 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | 2.3 | <1.5 | 3.1 | 6.8 | 14.3 | <1.5 | 3.51 | 3.12 | 19.1 | 30.5 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 10.4 | 8.24 | 7.13 | 6.43 | 8.63 | 6.79 | 11.8 | 10.3 | 10.5 | 12.5 | 14 | 25.4 | 14.1 | 0.17 | 11.5 | 0.73 | 10.1 | 1.74 | 1.65 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00216 | 0.00471 | 0.00728 | 0.00187 | 0.00151 | 0.00638 | 0.03106 | 0.03054 | 0.08795 | 0.00259 | 0.04723 | 0.01105 | 0.03312 | <0.00017 | 0.07934 | 0.00025 | 0.00481 | 0.001 | 0.00015 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 1340 | 1440 | 1370 | 1240 | 1390 | 1480 | 1570 | 2150 | 1813 | 1600 | 1540 | 1670 | 1630 | 1570 | 15570 | 1480 | 1590 | 1500 | 1350 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 6.36 | 6.7 | 7.11 | 6.62 | 6.11 | 6.77 | 7.02 | 7.08 | 7.64 | 5.92 | 7.14 | 6.69 | 7.03 | 7.58 | 7.58 | 6.5 | 6.4 | 6.99 | 6.37 |
| Temperature, field | Deg C | 15 | AO | - | - | 7.8 | 9.1 | 8.7 | 7.4 | 7.6 | 7.8 | 11.1 | 11.2 | 9.5 | 11.6 | 10.6 | 6.9 | 10.8 | 7.9 | 7.9 | 9.85 | 9.25 | 8.3 | 7.8 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW8-88 | OW8-88 | OW8-88 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-0511-008 | GW-WARD2-1011-010 | GW-WARD2-0412-005 | GW-WARD2-1112-021 | GW-WARD2-0513-004 | GW-WARD2-1013-020 | GW-WARD2-DD-061514-013 | GW-WARD2-103014-019 | GW-WARD2-8/6/15-011 | GW-WARD2-161115-029 | GW-WARD2-042516-009 | GW-WARD2-110316-002 | GW-WARD2-041017-017 | GW-WARD2-112417-017 | GW-WARD2-051818-017 | GW-WARD2-110318-015 | CRA-4074-02-WARD2-30 | GW-WARD2-1210-014 | GW-WARD2-0511-013 |
| **Sample Date:** | | | | | | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 222 | 211 | 204 | 213 | 195 | 211 | 188 | 134 | 185 | 121 | 199 | 198 | 114 | 166 | 115 | 113 | 106 | 140 | 94.2 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | **20** | **1.58** | **17.6** | **0.978** | **12.6** | **13.8** | **22.6** | **7.58** | **21.1** | **1.65** | **15.7** | **9.31** | <0.01 | 0.015 | **4.22** | **1.57** | <0.05 | **2.36** | **0.97** |
| Magnesium (dissolved) | mg/L | - | - | - | - | 65.4 | 64.3 | 63.1 | 74.2 | 47.4 | 46.1 | 72.7 | 56 | 55.9 | 32.4 | 47.3 | 57 | 51.2 | 52.8 | 56.5 | 63.9 | 71.4 | 87.4 | 59.9 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | **0.737** | **0.437** | **0.759** | **0.625** | **0.537** | **0.536** | **0.679** | **0.514** | **0.731** | **0.303** | **0.823** | **0.798** | **0.429** | **0.185** | **0.341** | **0.249** | **0.117** | **0.942** | **0.761** |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | 0.123 | <0.05 | <0.05 | <0.05 | 0.101 | 0.064 | 0.072 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.051 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 2.8 | 5.1 | 3.1 | 3.1 | 2 | 2.6 | 4.6 | 4.9 | 3.1 | 6.07 | 3.07 | 3.04 | 31.6 | 3.12 | 3.17 | 2.48 | 43 | 44.9 | 39.8 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 28 | 44.7 | 39.8 | 54.1 | 21.5 | 28.3 | 57.3 | 49.9 | 40.8 | 24.8 | 18 | 28.2 | 35 | 33.5 | 51.7 | 59.1 | 63.3 | 71.7 | 48.3 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 744 | 781 | 742 | 700 | 658 | 676 | 709 | 643 | 681 | 549 | 667 | 689 | 516 | 725 | 859 | 650 | 706 | 813 | 538 |
| Ammonia-N | mg/L | - | - | - | - | 0.52 | 1.58 | 0.789 | 0.66 | 0.59 | 0.981 | 2.7 | 2.79 | 1.41 | 4.18 | 1.37 | 1.56 | 2.56 | 1.36 | 1.47 | 1.52 | 2.71 | 5.7 | 3.91 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 69.4 | 134 | 105 | 85.6 | 43.5 | 78 | 126 | 120 | 68.8 | 59.9 | 40.6 | 104 | 27.9 | 66.5 | 159 | 87.3 | 53.8 | 56.3 | 34.2 |
| Conductivity | uS/cm | - | - | - | - | 1440 | 1530 | 1530 | 1130 | 1150 | 1360 | 1420 | 1450 | 1400 | 1170 | 1310 | 1520 | 1060 | 1400 | 1830 | 1310 | 1370 | 1570 | 1070 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | **15** | **14** | **11.1** | **9.2** | **12.1** | **14.1** | **11.4** | **9.3** | **8** | **9.1** | **8.1** | **10.3** | **5.6** | **8.3** | **15.5** | **13.1** | **6.7** | **13** | **8.3** |
| Hardness | mg/L | 80-100 | OG | - | - | 824 | 792 | 770 | 837 | 681 | 718 | 770 | 565 | 691 | 435 | 691 | 729 | 494 | 633 | 520 | 545 | 559 | 710 | 482 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1.06 | <0.1 | <0.1 | 0.77 | 0.15 | <0.1 | <0.1 | 0.707 | <0.1 | <0.1 | 0.087 | 1.7 | 0.1 | <0.1 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | 0.108 | <0.05 | <0.05 | <0.01 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.24 | 7.51 | 7.21 | 7.27 | 7.03 | 7.07 | 7.14 | 7.07 | 7.48 | 7.44 | 7.21 | 6.83 | 7.5 | 7.63 | 7.14 | 6.76 | 7.57 | 7.56 | 7.63 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.001 | 0.002 | 0.007 | <0.001 | 0.001 | <0.0028 | 0.0046 | 0.0193 | 0.0038 | 0.0371 | 0.0021 | <0.0139 | 0.0023 | <0.0013 | 0.005 | 0.0055 | <0.002 | <0.0005 | <0.001 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 10.3 | 13.6 | 22.5 | 39 | 19.7 | 6.1 | 13.7 | 8.5 | 12.8 | 12.4 | 16.2 | 12 | 7.3 | 15.1 | 22.8 | 17.5 | 5.9 | <2 | 6.6 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 1.55 | 3.12 | 2.19 | 1.59 | 1.28 | 1.74 | 2.98 | 2.71 | 2.14 | 4.54 | 6.7 | 34 | 4.09 | 3.3 | 3.17 | 2.4 | 4.08 | 7.39 | 5.19 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00033 | 0.00366 | 0.00053 | 0.00032 | 0.00105 | 0.0026 | 0.00766 | 0.00543 | - | 0.01661 | 0.00388 | - | 0.02253 | 0.01197 | 0.00081 | 0.00088 | 0.01073 | 0.00363 | 0.00492 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 1640 | 1805 | 1740 | 1720 | 1380 | 1620 | 2220 | 1570 | - | 1240 | 1340 | - | 1490 | 1490 | 2020 | 1530 | 1388 | 1490 | 1120 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 6.49 | 7.04 | 6.58 | 6.5 | 7.01 | 7.02 | 7.08 | 6.92 | - | 7.2 | 7.21 | - | 7.67 | 7.67 | 6.43 | 6.44 | 7.28 | 6.54 | 6.75 |
| Temperature, field | Deg C | 15 | AO | - | - | 8.6 | 9.1 | 6.8 | 4.9 | 6.6 | 11.4 | 10.5 | 10.4 | - | 11.3 | 6.7 | - | 7.7 | 7.7 | 8.6 | 9.08 | 8.9 | 7.3 | 9.8 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

# TABLE 6.2

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | | | | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW9-88 | OW9-88 | OW9-88 | OW9-88 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | | | | GW-WARD2-1011-015 | GW-WARD2-0412-008 | GW-WARD2-1112-024 | GW-WARD2-0513-005 | GW-WARD2-1013-015 | GW-WARD2-DD-061514-016 | GW-WARD2-103014-022 | GW-WARD2-8/6/15-014 | GW-WARD2-161115-030 | GW-WARD2-042516-007 | GW-WARD2-110316-004 | GW-WARD2-041017-020 | GW-WARD2-112417-020 | GW-WARD2-051818-010 | GW-WARD2-110318-021 | CRA-4074-02-WARD2-31 | MW9 | GW-WARD2-0511-025 | GW-WARD2-1011-002 |
| Sample Date: | | | | | | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 130 | 108 | 136 | 121 | 139 | 98 | 123 | 115 | 132 | 89.6 | 136 | 55 | 130 | 105 | 135 | 152 | 151 | 169 | 161 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | 0.193 | **0.715** | <0.05 | <0.05 | 0.143 | 0.247 | 0.082 | **4.22** | **0.37** | **0.431** | <0.1 | <0.01 | **3.35** | **5.44** | **2.08** | <0.05 | <0.05 | <0.05 | <0.05 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 74.6 | 62.4 | 84.2 | 72 | 80.5 | 59.8 | 75 | 52.7 | 69.3 | 47 | 76.6 | 21.8 | 68.3 | 65.9 | 65.9 | 63.3 | 59 | 68.1 | 61.9 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | **0.761** | **0.675** | **0.542** | **0.449** | **0.599** | **0.349** | **0.478** | **1.02** | **0.82** | **0.71** | **0.505** | <0.0005 | **0.998** | **0.852** | **0.706** | **0.0767** | 0.01 | **0.0943** | 0.0284 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | 0.088 | 0.178 | 0.08 | <0.05 | <0.05 | 0.058 | 1.06 | <0.05 | <0.5 | <0.05 | 2.94 | 0.151 | 1.18 | <0.05 | 0.131 | <0.05 | 0.057 |
| Potassium (dissolved) | mg/L | - | - | - | - | 47 | 36 | 58 | 41 | 52 | 38.7 | 49.3 | 35.8 | 49.5 | 31 | 55.1 | 0.746 | 46 | 39.3 | 47.3 | 11.4 | 11.7 | 13.1 | 13.2 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 57.2 | 48.4 | 67.8 | 61.4 | 60.6 | 45.2 | 53.7 | 35.5 | 46.1 | 29.8 | 49.7 | 3.74 | 44.2 | 44.4 | 45.3 | 27.9 | 32.5 | 32.9 | 33.2 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 771 | 688 | 743 | 582 | 800 | 667 | 737 | 693 | 713 | 494 | 717 | 247 | 693 | 521 | 662 | 578 | 498 | 541 | 454 |
| Ammonia-N | mg/L | - | - | - | - | 7.54 | 3.16 | 5.44 | 3.42 | 5.88 | 3.82 | 5.63 | 6.75 | 10.5 | 4.89 | 13 | <0.036 | 8.16 | 5.62 | 6.14 | 0.397 | 0.085 | 0.734 | 0.11 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 51.7 | 46.4 | 53.4 | 32.5 | 48.1 | 39.1 | 42.4 | 31.6 | 36.3 | 25 | 39.5 | 5.66 | 31.1 | 27.4 | 37.1 | 82.1 | 84.2 | 121 | 119 |
| Conductivity | uS/cm | - | - | - | - | 1350 | 1330 | 1140 | 1070 | 1510 | 1180 | 1380 | 1290 | 1380 | 999 | 1470 | 442 | 1330 | 1020 | 1220 | 1350 | 1240 | 1350 | 1140 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | **10** | **7.9** | **5.5** | **7.3** | **10** | **8.7** | **8.3** | **10.8** | **11.8** | **8.7** | **9** | <1 | **8.8** | **7** | **10.5** | 2.5 | 2.1 | 2.9 | 2.4 |
| Hardness | mg/L | 80-100 | OG | - | - | 631 | 527 | 687 | 600 | 679 | 491 | 616 | 505 | 615 | 417 | 656 | 227 | 607 | 534 | 609 | 640 | 620 | 702 | 657 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 1.02 | 2.46 | 9.11 | 0.51 | 6.72 | 0.13 | 0.34 | 0.62 | 0.74 | 0.072 | 7.49 | 0.024 | 0.12 | 0.361 | 3.25 | 1.41 | 2.95 | 2.6 | 2.36 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | 0.14 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.01 | 0.752 | <0.01 | <0.05 | 0.03 | 0.028 | <0.1 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.62 | 7.59 | 7.48 | 7.38 | 7.2 | 7.31 | 7.21 | 7.74 | 7.77 | 7.55 | 6.95 | 8.02 | 7.68 | 7.6 | 7.06 | 7.49 | 7.9 | 7.51 | 7.8 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.0027 | 0.0063 | 0.0037 | 0.0149 | 0.0054 | <0.001 | 0.0721 | 0.0012 | <0.0014 | 0.0102 | 0.0106 | <0.002 | <0.005 | 0.004 | 0.004 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 2.4 | 2.1 | 2.4 | 7.2 | 3.7 | 3.5 | 3 | 8.3 | 5.5 | 10.9 | <1.5 | 8.34 | 1.9 | 4.43 | 2.24 | 50.3 | 54.3 | 39.2 | 42.3 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 7.89 | 5.6 | 6.69 | 4.64 | 5.86 | 3.76 | 6.47 | 7.88 | 9.39 | 16.2 | 27.5 | 0.63 | 13.3 | 7.73 | 9.9 | 0.78 | 0.36 | 1 | 0.2 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.03561 | 0.0043 | 0.00228 | 0.00369 | 0.07111 | 0.02515 | 0.01032 | 0.00747 | 0.05979 | 0.00975 | 0.05168 | <0.00023 | 0.05218 | 0.00828 | 0.00685 | 0.00151 | 0.00009 | 0.00096 | 0.00098 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 1490 | 1340 | 1420 | 1290 | 1460 | 1670 | 1440 | 1220 | 1240 | 1080 | 1510 | 1400 | 1400 | 591 | 1470 | 1180 | 1170 | 1390 | 12.3 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.35 | 6.87 | 6.33 | 6.78 | 7.72 | 7.41 | 6.88 | 6.6 | 7.35 | 7.04 | 7.19 | 7.52 | 7.52 | 6.84 | 6.69 | 7.27 | 6.81 | 6.79 | 7.66 |
| Temperature, field | Deg C | 15 | AO | - | - | 9.1 | 7.3 | 8.1 | 7 | 10.3 | 11.6 | 10.8 | 12.6 | 11.5 | 7.2 | 11.6 | 8 | 8 | 9.19 | 10.04 | 8.7 | 6.2 | 9.1 | 8.1 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

# TABLE 6.2

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | | | | OW9-88 | OW10-88 | OW11-88 | OW12-88 | OW13-88 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-0412-017 | GW-WARD2-1210-027 | GW-WARD2-1210-022 | GW-WARD2-1210-021 | GW-WARD2-1210-020 | CRA-4074-02-WARD2-32 | GW-WARD2-1210-004 | GW-WARD2-1210-005 | GW-WARD2-0511-003 | GW-WARD2-0511-004 | GW-WARD2-1011-022 | GW-WARD2-0412-020 | GW-WARD2-1112-029 | GW-WARD2-0513-021 | GW-WARD2-1013-034 | GW-WARD2-DD-061514-022 | GW-WARD2-103014-012 | GW-WARD2-8/6/15-002 | GW-WARD2-171115-013 |
| **Sample Date:** | | | | | | 4/22/2012 | 12/1/2010 | 12/1/2010 | 12/1/2010 | 12/1/2010 | 5/12/2010 | 12/1/2010 | 12/1/2010 Duplicate | 5/24/2011 | 5/24/2011 Duplicate | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/17/2015 |
| **Parameters** | **Units** | ***ODWS*[1]** | ***ODWS Source*** | ***MABC*[2]** | ***TLP*[3]** | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 136 | 92.4 | 112 | 93.1 | 111 | 101 | 122 | 124 | 126 | 122 | 108 | 118 | 132 | 160 | 185 | 181 | 151 | 199 | 210 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | <0.05 | **1.55** | **0.445** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.231 | <0.05 | 0.096 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 59.6 | 23.1 | 33.5 | 30.9 | 33.5 | 29.2 | 31.8 | 32 | 34.3 | 33.7 | 30.7 | 33 | 39.3 | 40.1 | 57.7 | 53.2 | 50.2 | 58.5 | 63 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | 0.0028 | **0.0687** | **0.184** | 0.0069 | 0.0023 | <0.001 | 0.0058 | 0.007 | 0.0021 | <0.001 | 0.0043 | 0.0018 | 0.0045 | 0.0086 | 0.0164 | 0.0254 | 0.0276 | 0.019 | 0.0304 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 10.9 | 1.9 | <1 | 1 | <1 | 1.3 | 1.3 | 1.3 | 1.5 | 1.4 | 1.3 | 1.2 | 1.2 | 1.5 | 1.8 | 8.1 | 4.9 | 3.5 | 3.3 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 30.4 | 9.27 | 6.09 | 6.41 | 7.58 | 70.6 | 66.6 | 58.7 | 62.7 | 56.3 | 46.7 | 37.5 | 26.8 | 37.4 | 47.6 | 25.4 | 27.6 | 26.1 | 51.7 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 462 | 367 | 422 | 251 | 331 | 376 | 366 | 369 | 377 | 379 | 374 | 392 | 472 | 496 | 623 | 590 | 490 | 618 | 707 |
| Ammonia-N | mg/L | - | - | - | - | 0.078 | 0.086 | <0.05 | 0.098 | 0.075 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.057 | <0.05 | <0.05 | <0.05 | 0.067 | 0.395 | 0.486 | 0.136 | 0.111 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 104 | 41.6 | 13.3 | 10.9 | 16.1 | 109 | 133 | 134 | 129 | 127 | 97.8 | 117 | 82.4 | 109 | 128 | 75.3 | 78.7 | 83.2 | 113 |
| Conductivity | uS/cm | - | - | - | - | 1250 | 782 | 788 | 652 | 764 | 1020 | 1110 | 1110 | 1070 | 1080 | 937 | 1040 | 900 | 1070 | 1470 | 1210 | 1240 | 1400 | 1620 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | 2.2 | **5.5** | 4.6 | 4.3 | 1.8 | <1 | 1 | 1 | 2.2 | 1.4 | 1.3 | <1 | 1.2 | 3.5 | 4.2 | 3.5 | 2.2 | 3.8 | **5.8** |
| Hardness | mg/L | 80-100 | OG | - | - | 584 | 326 | 417 | 359 | 415 | 374 | 435 | 440 | 455 | 442 | 395 | 431 | 492 | 566 | 701 | 671 | 584 | 738 | 783 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 3.09 | <0.1 | 0.14 | 1.11 | 0.48 | 0.69 | 0.76 | 0.75 | 0.83 | 0.81 | 0.59 | 0.43 | 0.17 | 0.17 | <0.1 | <0.1 | 0.11 | 0.18 | 0.14 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.75 | 7.9 | 7.84 | 7.89 | 7.97 | 7.86 | 7.78 | 7.81 | 7.84 | 7.83 | 7.75 | 7.76 | 7.44 | 7.47 | 7.32 | 7.55 | 7.26 | 7.67 | 7.4 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.005 | <0.005 | <0.001 | <0.001 | <0.005 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.0034 | 0.0093 | 0.002 | 0.0075 | 0.0049 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 70.2 | 14 | 12.2 | 82.2 | 74.3 | 16.7 | 18.6 | 17.3 | 18.7 | 18.4 | 16.1 | 14.7 | 14.2 | 25.6 | 33.8 | 65.7 | 57.8 | 65.8 | 77.8 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 0.37 | 0.19 | 0.23 | 1.1 | 0.75 | 0.21 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | 0.16 | 0.18 | 0.21 | <0.28 | 0.59 | 0.52 | 0.43 | 0.66 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | - | 0.00011 | - | 0.00016 | - | <0.00059 | <0.00005 | <0.00005 | <0.0001 | - | 0.00028 | <0.00009 | <0.00002 | <0.00011 | 0.00016 | 0.00198 | 0.00184 | 0.00005 | 0.00047 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | - | 6.86 | - | 6.96 | - | 7.73 | 6.69 | 6.69 | 6.95 | - | 7.38 | 6.91 | 6.33 | 7.02 | 7.03 | 7.29 | 7.24 | 6.13 | 7.3 |
| Temperature, field | Deg C | 15 | AO | - | - | - | 6.9 | - | 6.7 | - | 9.6 | 7.9 | 7.9 | 9.7 | - | 8.9 | 9.4 | 9.1 | 9 | 9.6 | 11.6 | 9.5 | 11.1 | 9.1 |
| Conductivity, field | uS/cm | - | - | - | - | - | 558 | - | 480 | - | 907 | 1050 | 1050 | 1130 | - | 990 | 1070 | 857 | 1300 | 1420 | 1740 | 1250 | 1280 | 1370 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | - | 6.86 | - | 6.96 | - | 7.73 | 6.69 | 6.69 | 6.95 | - | 7.38 | 6.91 | 6.33 | 7.02 | 7.03 | 7.29 | 7.24 | 6.13 | 7.3 |
| Temperature, field | Deg C | 15 | AO | - | - | - | 6.9 | - | 6.7 | - | 9.6 | 7.9 | 7.9 | 9.7 | - | 8.9 | 9.4 | 9.1 | 9 | 9.6 | 11.6 | 9.5 | 11.1 | 9.1 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW18-88 | OW18-88 | OW18-88 | OW18-88 | OW18-88 | OW18-88 | OW18-88 | OW18-88 | OW19-89 | OW19-89 | OW19-89 | OW19-89 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-042516-027 | GW-WARD2-110316-027 | GW-WARD2-041017-032 | GW-WARD2-112417-009 | GW-WARD2-051818-023 | GW-WARD2-110318-018 | GW-WARD2-0511-002 | GW-WARD2-0513-016 | GW-WARD2-061514-004 | GW-WARD2-8/6/15-026 | GW-WARD2-042516-013 | GW-WARD2-041017-015 | GW-WARD2-112417-005 | GW-WARD2-051818-003 | GW-WARD2-110318-006 | CRA-4074-02-WARD2-41 | GW-WARD2-1210-016 | GW-WARD2-0511-012 | GW-WARD2-1011-014 |
| **Sample Date:** | | | | | | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/24/2011 | 5/13/2013 | 6/15/2014 | 6/8/2015 | 4/25/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 235 | 235 | 222 | 219 | 208 | 184 | 128 | 244 | 191 | 175 | 168 | 171 | 163 | 168 | 164 | 52.2 | 48.5 | 72.4 | 73.7 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | 0.21 | 0.265 | 0.276 | 0.184 | 0.18 | 0.173 | 0.103 | **22.2** | **32.2** | **6.64** | **21.1** | **19.8** | **11.8** | **19.6** | **10.4** | <0.05 | <0.05 | <0.05 | <0.05 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 68.4 | 67.7 | 75.1 | 75.7 | 67 | 58.9 | 25 | 45.5 | 56.6 | 46.2 | 32.2 | 71.7 | 45.7 | 64.4 | 43.9 | 24.5 | 22.3 | 37.5 | 32.6 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | **0.0733** | **0.107** | **0.104** | **0.0883** | **0.0948** | **0.0846** | **0.133** | **1.82** | **1.04** | **1.33** | **0.658** | **0.37** | **0.935** | **0.421** | **1.13** | 0.0055 | 0.0201 | 0.0027 | 0.0038 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.163 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 2.32 | 1.92 | 1.58 | 1.48 | 1.3 | 1.14 | 1.6 | 1.5 | 1.7 | 2.3 | 1.26 | 15.6 | 1.51 | 15.8 | 1.58 | 11 | 8.5 | 16.7 | 12.4 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 73.7 | 70.5 | 38.7 | 41 | 30.3 | 27 | 16.5 | 11.8 | 5.44 | 3.35 | 11.6 | 32.7 | 8.14 | 24.1 | 6 | 19.6 | 18.9 | 24.6 | 21.9 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 765 | 799 | 811 | 777 | 734 | 700 | 463 | 725 | 1540 | 590 | 597 | 795 | 579 | 676 | 615 | 258 | 183 | 317 | 350 |
| Ammonia-N | mg/L | - | - | - | - | 0.088 | <0.142 | <0.054 | <0.105 | 0.085 | 0.179 | 0.103 | 0.214 | 0.196 | 0.261 | 0.478 | 9.82 | 0.457 | 7.59 | 0.339 | <0.05 | 0.145 | <0.05 | <0.05 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 131 | 95.6 | 65.5 | 49.9 | 33 | 40.3 | 33.4 | 10.8 | 4.1 | 10.2 | 18.4 | 35.7 | 14.1 | 26.2 | 4.01 | 12.8 | 9.7 | 10.5 | 15.2 |
| Conductivity | uS/cm | - | - | - | - | 1770 | 1740 | 1660 | 1520 | 1330 | 1250 | 867 | 1150 | 1160 | 1020 | 1120 | 1490 | 1050 | 1240 | 1050 | 568 | 422 | 622 | 666 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | **9.7** | **6.4** | 4.6 | 4.7 | 3.4 | **6.47** | 2.7 | **10.8** | **10** | **5.8** | **11.6** | **8.1** | 3.2 | **7.4** | **7.21** | 3.3 | 4.2 | 2.4 | 2.1 |
| Hardness | mg/L | 80-100 | OG | - | - | 869 | 867 | 863 | 860 | 796 | 701 | 424 | 796 | 711 | 628 | 552 | 721 | 595 | 683 | 591 | 231 | 213 | 335 | 318 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 | 0.24 | <0.02 | 0.3 | <0.02 | 1.38 | 2.03 | 0.27 | 0.18 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.1 | <0.1 | <0.1 | <0.05 | <0.01 | <0.05 | <0.01 | <0.05 | <0.01 | <0.1 | 0.43 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.1 | 6.66 | 7.16 | 7.41 | 7.37 | 6.69 | 7.35 | 6.88 | 6.89 | 7.53 | 7.23 | 7.05 | 7.35 | 7.36 | 6.53 | 7.97 | 7.69 | 7.88 | 7.83 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.0024 | <0.0119 | 0.0018 | <0.001 | 0.0102 | 0.0057 | 0.001 | 0.005 | 0.0062 | 0.0278 | <0.0043 | 0.0038 | <0.001 | 0.0067 | 0.0051 | 0.003 | 0.016 | <0.001 | <0.001 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 77.8 | 67.5 | 61.5 | 59.4 | 31 | 30.4 | 4.1 | 68.3 | <2 | 2.9 | 2.68 | 14.4 | 1.66 | 3.1 | 3.52 | 19.8 | 12.6 | 16.2 | 18.7 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 0.71 | 0.52 | 0.5 | 0.36 | 0.35 | 0.33 | 0.41 | 0.96 | 0.92 | 0.63 | 4.4 | 13.3 | 1.02 | 9.49 | 1.55 | 0.68 | 0.87 | <0.15 | <0.15 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00012 | <0.00034 | <0.00005 | 0.00118 | 0.00006 | 0.00019 | 0.00014 | 0.00018 | 0.00053 | 0.00005 | 0.00071 | - | 0.00359 | 0.00574 | 0.00021 | <0.00074 | 0.00011 | <0.0001 | <0.00035 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 1740 | 1740 | 1600 | 1540 | 781 | 1540 | 910 | 1470 | 1630 | 362 | 1160 | - | 970 | 605 | 1180 | 548 | 439 | 677 | 666 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 6.8 | 7.02 | 6.59 | 7.71 | 6.42 | 6.69 | 6.82 | 6.69 | 7.11 | 5.91 | 6.86 | - | 7.62 | 6.56 | 6.45 | 7.85 | 6.6 | 6.99 | 7.55 |
| Temperature, field | Deg C | 15 | AO | - | - | 9 | 10.2 | 10.7 | 9.6 | 11.07 | 9.42 | 8.9 | 6.2 | 9 | 11.1 | 8.7 | - | 7.7 | 8.89 | 9.35 | 9.1 | 8.3 | 8.9 | 8.4 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW20-89 | OW20-89 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-0412-010 | GW-WARD2-1112-001 | GW-WARD2-0513-007 | GW-WARD2-1013-011 | GW-WARD2-1013-012 | GW-WARD2-DD-061514-001 | GW-WARD2-103014-006 | GW-WARD2-8/6/15-031 | GW-WARD2-161115-001 | GW-WARD2-161115-002 | GW-WARD2-042516-001 | GW-WARD2-042516-005 | GW-WARD2-110316-007 | GW-WARD2-041017-001 | GW-WARD2-112417-001 | GW-WARD2-051818-011 | GW-WARD2-110318-002 | CRA-4074-02-WARD2-20-89 | GW-WARD2-0511-021 |
| **Sample Date:** | | | | | | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 10/22/2013 Duplicate | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 11/16/2015 Duplicate | 4/25/2016 | 4/25/2016 Duplicate | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 5/24/2011 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 60.1 | 78.9 | 64 | 75.7 | 76.4 | 61.9 | 76.3 | 71.9 | 78.3 | 80.8 | 68.5 | 67.9 | 68 | 85.3 | 77.4 | 63.2 | 69.7 | 65 | 76.2 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.05 | <0.05 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 27.6 | 37.3 | 33 | 37 | 37 | 33 | 37.8 | 35 | 36.1 | 37.3 | 32.4 | 32.7 | 34.4 | 53.7 | 37 | 30.1 | 34.1 | 24.6 | 27.5 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | 0.0032 | 0.0063 | <0.001 | 0.0068 | 0.0067 | 0.0011 | 0.0014 | <0.001 | 0.0014 | 0.00142 | 0.00057 | 0.00051 | 0.00099 | 0.00524 | <0.0005 | 0.00141 | <0.0005 | 0.002 | 0.0036 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 10.9 | 13.4 | 13 | 12.1 | 12.2 | 13 | 12.3 | 13.2 | 11.8 | 12.3 | 12 | 12.2 | 11.8 | 2.24 | 13.5 | 13 | 11.6 | <1 | <1 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 19 | 29.2 | 18.8 | 33.6 | 32.7 | 17.6 | 27.1 | 22.8 | 33.3 | 33 | 19 | 19.2 | 22.2 | 54.9 | 20.9 | 15.2 | 29.1 | 1.05 | 0.95 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 295 | 355 | 320 | 357 | 381 | 360 | 411 | 373 | 373 | 385 | 355 | 351 | 372 | 458 | 381 | 308 | 352 | 274 | 278 |
| Ammonia-N | mg/L | - | - | - | - | 0.056 | <0.05 | <0.05 | 0.061 | 0.115 | <0.05 | 0.051 | 0.098 | <0.05 | <0.05 | 0.025 | <0.02 | <0.079 | <0.02 | <0.02 | 0.037 | 0.042 | 0.075 | <0.05 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 12.2 | 18.3 | 10.1 | 28.1 | 28.3 | 12.5 | 15.5 | 11.9 | 19.4 | 21.2 | 9.34 | 9.4 | 16.3 | 39.5 | 8.62 | 8.8 | 13.6 | <2 | <2 |
| Conductivity | uS/cm | - | - | - | - | 588 | 444 | 594 | 765 | 777 | 652 | 738 | 697 | 736 | 758 | 674 | 669 | 725 | 1000 | 710 | 598 | 696 | 502 | 491 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | 2.2 | 1.7 | 1.8 | 1.6 | 1.8 | 1.1 | <1 | 1.2 | 1.6 | 1.6 | <4.4 | 4.3 | 1.8 | 2.5 | 1.6 | 1.8 | 2.79 | 1 | 1.5 |
| Hardness | mg/L | 80-100 | OG | - | - | 264 | 350 | 296 | 342 | 343 | 290 | 346 | 324 | 344 | 355 | 304 | 304 | 311 | 434 | 345 | 282 | 314 | 264 | 303 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 0.41 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.135 | 0.134 | 0.122 | 0.126 | 0.127 | 0.286 | 0.039 | 0.032 | 0.241 | 0.101 | 0.27 | <0.1 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.91 | 7.76 | 7.8 | 7.77 | 7.77 | 7.85 | 7.6 | 8.17 | 8.05 | 8 | 7.79 | 7.8 | 7.42 | 7.7 | 7.79 | 8.1 | 7.41 | 7.96 | 8.04 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.001 | <0.001 | <0.001 | <0.0015 | <0.0017 | 0.0016 | <0.001 | 0.0284 | 0.0018 | 0.0022 | <0.001 | 0.0024 | <0.0088 | 0.0022 | <0.001 | 0.001 | 0.003 | <0.002 | <0.001 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 14.9 | 21.2 | 17.6 | 29.7 | 30 | 17.3 | 19.6 | 20.3 | 25 | 26 | 16.4 | 16.4 | 23.2 | 43.9 | 13.6 | 13.9 | 16.4 | 8.1 | 5 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 0.32 | 0.33 | <0.15 | <0.17 | <0.15 | 0.21 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | 0.31 | 0.44 | 0.32 | <0.15 | <0.15 | 0.57 | 0.19 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00017 | <0.00004 | <0.00019 | 0.0004 | 0.00076 | <0.00064 | 0.0002 | 0.00021 | <0.0006 | <0.0006 | 0.0001 | <0.00008 | <0.00088 | <0.00015 | <0.00015 | 0.00014 | 0.00007 | 0.00084 | <0.00015 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 656 | 582 | 596 | 729 | 729 | 850 | 783 | 551 | 681 | 681 | 628 | 628 | 682 | 623 | 623 | 367 | 863 | 284 | 498 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.18 | 6.58 | 7.29 | 7.52 | 7.52 | 7.78 | 7.29 | 6.97 | 7.77 | 7.77 | 7.3 | 7.3 | 7.73 | 7.6 | 7.6 | 7.25 | 6.91 | 7.75 | 7.17 |
| Temperature, field | Deg C | 15 | AO | - | - | 8.6 | 8.3 | 8 | 8.4 | 8.4 | 9.2 | 8.5 | 10.2 | 8.7 | 8.7 | 8.6 | 8.6 | 8.9 | 8.1 | 8.1 | 8.98 | 8.09 | 8.4 | 8.6 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | OW20-89 | OW21-89 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-1011-001 | GW-WARD2-1210-024 | CRA-4074-02-WARD2-43 | GW-WARD2-1210-018 | GW-WARD2-0511-019 | GW-WARD2-1011-021 | GW-WARD2-0412-016 | GW-WARD2-1112-003 | GW-WARD2-1112-004 | GW-WARD2-0513-015 | GW-WARD2-1013-008 | GW-WARD2-DD-061514-003 | GW-WARD2-103014-003 | GW-WARD2-8/6/15-025 | GW-WARD2-161115-004 | GW-WARD2-042516-011 | GW-WARD2-110316-012 | GW-WARD2-112417-004 | GW-WARD2-051818-016 |
| **Sample Date:** | | *ODWS*[1] | *ODWS Source* | *MABC*[2] | *TLP*[3] | 11/22/2011 | 12/1/2010 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 11/26/2012 Duplicate | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 11/24/2017 | 5/18/2018 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 59.8 | 44.4 | 54.1 | 56 | 60 | 55.8 | 55.2 | 57 | 60 | 56.1 | 55.2 | 55.3 | 51.8 | 53.5 | 57.1 | 51.8 | 55.9 | 63.3 | 55.7 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.01 | 0.087 | 0.114 | 0.299 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 24.2 | 29.3 | 22.7 | 22.2 | 24.3 | 21 | 20.9 | 21.9 | 22.7 | 23.8 | 21.4 | 23.5 | 22.3 | 21.7 | 21 | 22.6 | 25.1 | 24.8 | 21.9 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | 0.0012 | 0.0039 | 0.0023 | 0.0011 | <0.001 | <0.001 | 0.0024 | <0.001 | 0.002 | <0.001 | <0.001 | 0.007 | 0.0089 | 0.017 | 0.0183 | 0.0113 | 0.0442 | 0.025 | 0.00725 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | <1 | 1.2 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1 | <1 | <1 | 0.639 | 0.867 | 0.801 | 0.74 | 0.853 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 1.24 | 19.7 | 3.53 | 3.12 | 3.58 | 3.05 | 3.3 | 3.44 | 3.5 | 3.85 | 3.37 | 4.16 | 3.63 | 3.75 | 3.34 | 3.74 | 3.94 | 4.09 | 3.82 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 261 | 239 | 230 | 219 | 231 | 232 | 227 | 229 | 248 | 233 | 237 | 247 | 221 | 233 | 227 | 231 | 241 | 248 | 227 |
| Ammonia-N | mg/L | - | - | - | - | 0.056 | <0.05 | <0.05 | <0.05 | 0.057 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.07 | 0.052 | 0.114 | <0.05 | <0.02 | <0.082 | 0.415 | 0.076 |
| Chloride | mg/L | 250 | AO | 126.50 | - | <2 | <2 | 4.6 | 5.3 | 4.7 | 4.6 | 4.5 | 3.9 | 3.9 | 4 | 3.6 | 3.6 | 3.3 | 4.09 | 4.39 | 4.38 | 4.57 | 5.76 | 6.14 |
| Conductivity | uS/cm | - | - | - | - | 409 | 495 | 436 | 427 | 424 | 372 | 419 | 294 | 292 | 356 | 434 | 395 | 407 | 427 | 421 | 431 | 434 | 443 | 408 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | 2 | 1.6 | <1 | **5.6** | 1.2 | 1.2 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 2 | **5.1** | <3 | <1 | 1.3 | <1 |
| Hardness | mg/L | 80-100 | OG | - | - | 249 | 232 | 228 | 231 | 250 | 226 | 224 | 233 | 243 | 238 | 226 | 235 | 221 | 223 | 229 | 222 | 243 | 260 | 229 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 0.17 | 0.14 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.029 | 0.054 | 0.043 | 0.03 | 0.032 | 0.027 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.83 | 8.2 | 8.12 | 8.05 | 8.05 | 7.95 | 8.04 | 7.93 | 8 | 7.95 | 7.98 | 8.09 | 7.96 | 8.26 | 8.13 | 8.07 | 7.71 | 8.14 | 8.09 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | 0.002 | <0.001 | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.0024 | 0.0028 | 0.0038 | 0.0103 | 0.0026 | <0.0028 | <0.0098 | <0.001 | 0.0158 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 5.1 | 28.2 | 10.4 | 8.9 | 10.5 | 8.4 | 10.7 | 9.2 | 9 | 11 | 9.4 | 10.5 | 8.9 | 9.04 | 8.58 | 9.29 | 8.17 | 8.98 | 8.56 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | <0.15 | <0.15 | 0.28 | <0.15 | <0.15 | <0.15 | <0.15 | 0.24 | 0.17 | <0.15 | <0.15 | 0.16 | 0.19 | <0.15 | <0.15 | <1.5 | 0.54 | 1.6 | 0.58 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00055 | <0.00021 | <0.0006 | <0.00007 | 0.00011 | <0.0003 | <0.00029 | <0.00006 | <0.00006 | <0.00019 | <0.00051 | 0.00086 | 0.00032 | 0.00033 | <0.00091 | <0.00009 | <0.00146 | 0.00342 | 0.00033 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 452 | 359 | 425 | 3.33 | 489 | 426 | 442 | 365 | 365 | 428 | 428 | 536 | 433 | 341 | 350 | 414 | 419 | 1140 | 273 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.69 | 7.32 | 7.75 | 6.79 | 6.95 | 7.44 | 7.42 | 6.75 | 6.75 | 7.27 | 7.69 | 7.71 | 7.42 | 7.06 | 7.88 | 7.32 | 7.86 | 7.61 | 7.28 |
| Temperature, field | Deg C | 15 | AO | - | - | 8.6 | 8.2 | 9.4 | 9.9 | 9.6 | 9.6 | 9.6 | 9.8 | 9.8 | 8.8 | 9 | 10.8 | 10.3 | 11.4 | 10.9 | 9.6 | 11.2 | 8.6 | 10.11 |

Notes:

| | |
|---|---|
| (1) | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| (2) | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| (3) | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | OW22-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-110318-011 | CRA-4074-02-WARD2-42 | GW-WARD2-1210-017 | GW-WARD2-0511-018 | GW-WARD2-1011-020 | GW-WARD2-0412-015 | GW-WARD2-1112-002 | GW-WARD2-0513-014 | GW-WARD2-1013-007 | GW-WARD2-061514-002 | GW-WARD2-103014-004 | GW-WARD2-8/6/15-027 | GW-WARD2-161115-003 | GW-WARD2-042516-010 | GW-WARD2-110316-011 | GW-WARD2-041017-002 | GW-WARD2-041017-003 | GW-WARD2-112417-003 | GW-WARD2-051818-015 |
| **Sample Date:** | | | | | | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 4/10/2017 Duplicate | 11/24/2017 | 5/18/2018 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 55.1 | 190 | 213 | 197 | 205 | 164 | 211 | 198 | 204 | 175 | 168 | 155 | 184 | 156 | 190 | 62.2 | 162 | 185 | 176 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | <0.01 | **26.5** | **21.1** | **30.8** | **26.1** | **26.1** | **27.6** | **22.6** | **32.1** | **30.7** | **29.6** | **27.5** | **17.2** | **15.4** | **10.5** | <0.01 | **9.53** | **28.4** | **18.4** |
| Magnesium (dissolved) | mg/L | - | - | - | - | 21.3 | 51.4 | 65 | 44.3 | 50.2 | 45.2 | 60.7 | 44.2 | 53.9 | 44.6 | 47.3 | 43.2 | 47.1 | 36.9 | 49 | 29.1 | 42.5 | 44 | 40.9 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | <0.0005 | **0.382** | **0.621** | **0.455** | **0.396** | **0.407** | **0.33** | **0.643** | **0.479** | **0.996** | **0.545** | **0.994** | **1.62** | **0.871** | **1.51** | <0.0005 | **0.746** | **0.532** | **0.944** |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 0.699 | <10 | <10 | <1 | <1 | <1 | 1.2 | <1 | 1 | <1 | <1 | 1.1 | 1.12 | 1.11 | 1.49 | 11.5 | 1.27 | 0.872 | 0.803 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 3.85 | <5 | 6.7 | 2.96 | 6.06 | 3.07 | 7.37 | 4.04 | 4.9 | 4.02 | 3.61 | 3.44 | 3.74 | 3.15 | 4.22 | 14.4 | 3.33 | 3.47 | 3.55 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 206 | 646 | 745 | 641 | 716 | 622 | 796 | 577 | 687 | 629 | 627 | 630 | 591 | 510 | 583 | 308 | 490 | 593 | 579 |
| Ammonia-N | mg/L | - | - | - | - | 0.082 | 0.551 | 0.416 | 0.492 | 0.506 | 0.384 | 0.662 | 0.718 | 0.795 | 0.968 | 1.42 | 1.07 | 1.06 | 1.42 | 1.47 | <0.02 | 0.973 | 0.893 | 0.969 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 6.55 | <2 | 4.1 | <2 | 4.2 | <2 | 4.4 | 6.6 | 4.2 | 3.6 | 2.7 | <2.5 | 2.35 | 1.25 | <2.5 | 9.89 | 0.91 | 1.51 | 1.24 |
| Conductivity | uS/cm | - | - | - | - | 409 | 1120 | 1310 | 1100 | 1150 | 1070 | 1040 | 1040 | 1190 | 1050 | 1050 | 1100 | 1080 | 976 | 1120 | 593 | 1040 | 1040 | 1050 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | 1.99 | 3.3 | 3.9 | **7.5** | 4.9 | 3.2 | 4.5 | 1.4 | 4 | 3.9 | 3.4 | 4.1 | 4.9 | <5 | 2.9 | 1.5 | 2.5 | 3.3 | 3.7 |
| Hardness | mg/L | 80-100 | OG | - | - | 225 | 686 | 800 | 676 | 720 | 597 | 776 | 676 | 731 | 621 | 614 | 566 | 654 | 541 | 677 | 275 | 581 | 643 | 607 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 0.059 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.1 | 0.046 | <0.02 | <0.02 | <0.02 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.01 | <0.01 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.81 | 7.21 | 7.19 | 7.11 | 7.05 | 7.13 | 6.81 | 6.85 | 6.91 | 6.94 | 6.84 | 7.46 | 7.24 | 7 | 7.59 | 7.78 | 6.97 | 7.51 | 7.43 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | 0.0035 | <0.005 | <0.005 | 0.002 | 0.001 | 0.008 | 0.002 | <0.001 | <0.0024 | 0.0016 | 0.0181 | 0.0131 | 0.0045 | <0.0023 | <0.0049 | 0.0017 | 0.0019 | <0.001 | 0.0055 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 8.93 | 16 | 33.2 | 10.2 | 21.5 | 8.1 | 24.9 | 64.8 | 18.7 | 44.9 | 24.2 | 18.3 | 19.9 | 30.8 | 16.5 | 14.7 | 37.1 | 17.2 | 30.3 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 2.1 | 1.9 | 1.07 | 1.27 | 1.17 | 1.21 | 1.31 | 1.24 | 1.11 | 1.14 | 1.3 | 1.54 | 1.55 | 3.3 | 2.74 | 0.2 | 1.72 | 1.6 | 1.93 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00015 | 0.00082 | 0.0001 | 0.0003 | 0.00086 | 0.0002 | 0.00014 | 0.00049 | 0.00124 | 0.0022 | 0.0029 | 0.00024 | 0.00306 | 0.0016 | 0.00305 | <0.00018 | 0.00853 | 0.00789 | 0.0014 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 565 | 1170 | 1190 | 1260 | 1130 | 1200 | 1330 | 1320 | 1160 | 1610 | 1080 | 911 | 841 | 1060 | 1160 | 1140 | 1140 | 1140 | 687 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 6.93 | 6.84 | 6.05 | 6.46 | 6.88 | 6.39 | 5.94 | 6.56 | 6.82 | 7 | 6.93 | 5.92 | 7.03 | 6.75 | 6.91 | 7.61 | 7.61 | 7.61 | 6.84 |
| Temperature, field | Deg C | 15 | AO | - | - | 9.7 | 9.3 | 9.8 | 8.9 | 9.9 | 9 | 10.5 | 7.6 | 10.5 | 10 | 10.7 | 12 | 12.2 | 8.4 | 11.5 | 9.4 | 9.4 | 9.5 | 8.96 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

# TABLE 6.2

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | | | | OW23-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW25-00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | | | | GW-WARD2-110318-003 | CRA-4074-02-WARD2-33 | GW-WARD2-1210-011 | GW-WARD2-0511-017 | GW-WARD2-1011-019 | GW-WARD2-0412-014 | GW-WARD2-1112-028 | GW-WARD2-0513-013 | GW-WARD2-1013-006 | GW-WARD2-061514-021 | GW-WARD2-103014-031 | GW-WARD2-8/6/15-028 | GW-WARD2-161115-023 | GW-WARD2-042516-015 | GW-WARD2-110316-010 | GW-WARD2-041017-014 | GW-WARD2-112417-002 | GW-WARD2-051818-012 | GW-WARD2-110318-026 |
| Sample Date: | | | | | | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 216 | 62.9 | 73.2 | 81.6 | 63.9 | 66.5 | 66.5 | 58.8 | 51.7 | 66.2 | 51.9 | 54.8 | 53 | 62 | 57.7 | 92 | 183 | 69.1 | 121 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | **34.8** | <0.05 | <0.05 | **0.633** | 0.158 | **0.301** | 0.068 | **1.79** | **1.91** | **1.26** | **0.398** | **1.77** | **0.465** | **0.494** | **1.07** | 0.226 | **28.5** | **4.16** | **7.07** |
| Magnesium (dissolved) | mg/L | - | - | - | - | 56.1 | 30.8 | 27.7 | 34.7 | 25.7 | 28 | 27 | 26.1 | 21.9 | 31.2 | 24.3 | 29 | 22.9 | 30.7 | 28.1 | 55 | 45.6 | 30.9 | 34.8 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | **0.521** | **0.296** | **0.396** | **0.571** | **0.332** | **0.441** | **0.277** | **0.241** | **0.192** | **0.372** | **0.172** | **0.302** | **0.164** | **0.221** | **0.19** | 0.034 | **0.492** | **0.197** | **1.39** |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | 0.386 | 0.069 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | 1.52 |
| Potassium (dissolved) | mg/L | - | - | - | - | 1.1 | 2.2 | 5.4 | 1.1 | 1.2 | <1 | 1 | <1 | 1 | <1 | 1.2 | 1.1 | 1.2 | 1.39 | 1.83 | 1.91 | 0.82 | 1.03 | 5.44 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 8.49 | 81.9 | 82.8 | 74.3 | 82.2 | 66.8 | 84.2 | 91.4 | 109 | 75.1 | 89.2 | 73.6 | 91.3 | 75.7 | 82.6 | 46 | <5 | 68.1 | 6.08 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 636 | 389 | 395 | 413 | 416 | 394 | 406 | 416 | 411 | 396 | 434 | 392 | 408 | 400 | 417 | 499 | 601 | 382 | 477 |
| Ammonia-N | mg/L | - | - | - | - | 0.872 | 0.085 | 0.081 | 0.11 | 0.063 | 0.095 | <0.05 | <0.05 | 0.105 | 0.087 | 0.111 | 0.224 | 0.106 | 0.059 | <0.152 | 0.314 | 0.925 | 0.278 | 0.414 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 3.32 | 53.9 | 48.6 | 52.4 | 41.5 | 51.3 | 37.4 | 44.3 | 35.9 | 49.8 | 36.6 | 47.5 | 40.1 | 44.4 | 32.8 | 22 | 1.53 | 40.8 | 1.06 |
| Conductivity | uS/cm | - | - | - | - | 1150 | 838 | 850 | 833 | 790 | 821 | 490 | 770 | 808 | 796 | 785 | 808 | 807 | 807 | 791 | 979 | 1060 | 777 | 752 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | **8.1** | 2.5 | 3.6 | 4.9 | 4.6 | 4.6 | 4 | 2.1 | 4.5 | 3.9 | 3.4 | **6.1** | **8.1** | <6.1 | 3.9 | 4.1 | 3.3 | 3.9 | **5.55** |
| Hardness | mg/L | 80-100 | OG | - | - | 769 | 284 | 297 | 347 | 266 | 281 | 277 | 254 | 219 | 294 | 229 | 256 | 227 | 281 | 260 | 456 | 643 | 300 | 444 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 0.045 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.039 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 6.55 | 8.06 | 8.01 | 8.02 | 7.98 | 7.98 | 7.97 | 7.93 | 7.89 | 7.98 | 7.81 | 8.16 | 8.06 | 8.07 | 7.52 | 7.66 | 7.34 | 8.01 | 6.91 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | 0.0068 | <0.001 | 0.003 | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.0067 | 0.0041 | 0.0128 | 0.0032 | <0.0063 | <0.0064 | 0.0021 | <0.001 | 0.007 | 0.053 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 56.2 | 5.7 | 3.1 | 4.1 | <2 | 3 | <2 | <2 | <2 | <2 | <2 | 0.98 | 0.38 | 0.31 | 0.93 | 2.95 | 17.1 | <0.3 | 2.11 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 1.6 | 0.35 | 0.18 | 0.15 | 0.15 | 0.41 | 0.38 | 0.34 | <0.34 | 0.33 | 0.24 | 0.37 | 0.72 | <1.5 | 0.73 | 0.65 | 3.1 | 1.04 | 6.1 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00032 | 0.00115 | 0.00011 | 0.00037 | 0.00094 | 0.00039 | <0.00007 | <0.0002 | 0.00105 | 0.00117 | 0.00153 | 0.00046 | 0.00223 | 0.00024 | <0.00184 | - | 0.00763 | 0.0007 | 0.00031 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 1440 | 760 | 620 | 849 | 785 | 873 | 619 | 773 | 740 | 1110 | 789 | 648 | 629 | 735 | 790 | - | 860 | 471 | 1020 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 6.21 | 7.85 | 6.81 | 7.21 | 7.86 | 7.36 | 6.82 | 7.35 | 7.61 | 7.77 | 7.77 | 6.89 | 7.93 | 7.36 | 7.69 | - | 7.6 | 7.12 | 6.54 |
| Temperature, field | Deg C | 15 | AO | - | - | 9.93 | 7.9 | 9 | 8.8 | 8.9 | 7.1 | 8.9 | 7 | 11.1 | 10.2 | 10.5 | 12.1 | 11.3 | 6.9 | 11.2 | - | 8.9 | 7.83 | 9.27 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

# TABLE 6.2

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | | | | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW26-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-1013-032 | GW-WARD2-DD-061514-029 | GW-WARD2-103014-028 | GW-WARD2-8/6/15-021 | GW-WARD2-171115-015 | GW-WARD2-042516-021 | GW-WARD2-110316-015 | GW-WARD2-110316-016 | GW-WARD2-041017-028 | GW-WARD2-112417-028 | GW-WARD2-051818-004 | GW-WARD2-110318-016 | GW-WARD2-1210-028 | CRA-4074-02-WARD2-27-00 | GW-WARD2-1210-023 | GW-WARD2-0511-024 | GW-WARD2-1011-007 | GW-WARD2-0412-018 | GW-WARD2-1112-008 |
| **Sample Date:** | | | | | | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/17/2015 | 4/25/2016 | 11/3/2016 | 11/3/2016 Duplicate | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 12/1/2010 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 68.9 | 60.2 | 56 | 78.3 | 71 | 97.9 | 83.1 | 81.8 | 85.1 | 89.8 | 132 | 86.9 | 72 | 88.4 | 113 | 108 | 105 | 101 | 165 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | <0.05 | **1.31** | **0.941** | **0.469** | **1.55** | 0.111 | **2.16** | **2.18** | 0.031 | **1.63** | **7.9** | **1.31** | <0.05 | <0.05 | <0.05 | **2.08** | <0.05 | <0.05 | 0.257 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 25.9 | 29 | 26.3 | 32.8 | 29 | 40.6 | 35.4 | 35.7 | 34.3 | 42.5 | 30.4 | 35.4 | 27.6 | 27.7 | 43.7 | 32.3 | 34.1 | 31.1 | 55.4 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | 0.0345 | **0.087** | **0.0615** | **0.386** | **0.0968** | **0.204** | **0.119** | **0.118** | 0.0103 | **0.211** | **0.592** | **0.175** | 0.0157 | 0.0396 | 0.0149 | **0.811** | 0.0178 | **0.0835** | **6.48** |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.088 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 4.4 | 2.3 | 1.8 | 1.9 | 1.54 | 1.73 | 1.69 | 1.67 | 1.66 | 1.71 | 1.37 | 1.47 | 1.3 | <1 | <1 | <1 | <1 | <1 | <1 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 8.47 | 4.89 | 4.86 | 4.09 | 4.52 | 4.69 | 5.36 | 5.28 | 5.85 | 7.26 | 17.6 | 9.87 | 55.5 | 8.65 | 7.33 | 7.24 | 6.46 | 3.98 | 7.53 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 271 | 288 | 303 | 324 | 306 | 366 | 323 | 316 | 327 | 338 | 560 | 297 | 320 | 371 | 419 | 340 | 397 | 461 | 621 |
| Ammonia-N | mg/L | - | - | - | - | 0.078 | 0.1 | 0.091 | 0.096 | 0.12 | 0.085 | <0.107 | <0.179 | <0.039 | <0.377 | 0.55 | 0.127 | 0.063 | <0.05 | 0.112 | 0.06 | <0.05 | <0.05 | <0.05 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 7.4 | 3.5 | 3.6 | 9.5 | 8.82 | 27.1 | 25 | 23.2 | 35.2 | 53.3 | 16.3 | 50.7 | 6.2 | 10.5 | 7.8 | 6.3 | 14.1 | 15.4 | 13.4 |
| Conductivity | uS/cm | - | - | - | - | 575 | 514 | 501 | 611 | 572 | 712 | 662 | 649 | 695 | 758 | 1020 | 682 | 755 | 695 | 889 | 620 | 703 | 826 | 913 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | 3.5 | 1.2 | <1 | 1.5 | 3 | <4.6 | <1 | 1 | 1 | <1 | 3.3 | 2.98 | 1.9 | 1.4 | 3.5 | 4.2 | 3.4 | 4.1 | **5.7** |
| Hardness | mg/L | 80-100 | OG | - | - | 279 | 270 | 248 | 331 | 297 | 412 | 353 | 351 | 354 | 399 | 455 | 363 | 293 | 335 | 462 | 402 | 402 | 381 | 641 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.02 | 0.03 | 0.03 | <0.02 | <0.02 | <0.02 | <0.02 | <0.1 | <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.72 | 8.14 | 7.93 | 8.17 | 8.02 | 8.01 | 7.4 | 7.47 | 7.85 | 8.04 | 7.19 | 7.47 | 8.07 | 7.72 | 7.95 | 7.76 | 7.7 | 7.72 | 7.47 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.0022 | 0.0046 | <0.001 | 0.0088 | 0.0026 | <0.0017 | <0.0029 | <0.0065 | 0.002 | <0.001 | 0.0049 | 0.0028 | <0.001 | <0.001 | 0.002 | 0.003 | <0.001 | <0.001 | <0.001 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 46.6 | 15 | 13.1 | 12.6 | 13.8 | 12.4 | 12.1 | 12.4 | 14.4 | 12.1 | 3.93 | 13.6 | 97.3 | 11.3 | 88.5 | 10.2 | 7.9 | 5.7 | <2 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | <0.34 | 0.18 | <0.15 | 0.25 | 0.19 | 1.9 | 0.32 | 0.46 | 0.35 | 0.67 | 1.91 | 0.25 | <0.15 | 0.27 | 1.13 | <0.15 | <0.15 | 0.24 | 0.42 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00072 | 0.00185 | 0.00108 | 0.00019 | 0.00185 | 0.00035 | <0.00146 | <0.00245 | <0.00021 | 0.00446 | 0.00184 | 0.00035 | 0.00003 | <0.0003 | 0.00016 | 0.00011 | <0.00026 | <0.00015 | <0.00002 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.54 | 7.91 | 7.68 | 6.94 | 7.78 | 7.3 | 7.7 | 7.7 | 7.41 | 7.68 | 7.2 | 7.02 | 6.38 | 7.5 | 6.93 | 6.85 | 7.43 | 7.17 | 6.41 |
| Temperature, field | Deg C | 15 | AO | - | - | 12.2 | 10.2 | 11.2 | 10 | 11.7 | 8.8 | 12.5 | 12.5 | 9.2 | 11.2 | 9.11 | 11.81 | 7.4 | 7.9 | 6.2 | 11.5 | 7.8 | 8.2 | 6.9 |
| Conductivity, field | uS/cm | - | - | - | - | 529 | 654 | 508 | 495 | 459 | 652 | 623 | 623 | 662 | 645 | 431 | 865 | 551 | 626 | 569 | 613 | 693 | 700 | 816 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW28-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-0513-019 | GW-WARD2-1013-030 | GW-WARD2-DD-061514-006 | GW-WARD2-103014-007 | GW-WARD2-8/6/15-020 | GW-WARD2-171115-005 | GW-WARD2-042516-019 | GW-WARD2-110316-017 | GW-WARD2-041017-008 | GW-WARD2-112417-006 | GW-WARD2-051818-031 | GW-WARD2-110318-001 | GW-WARD2-110318-009 | GW-WARD2-1210-025 | GW-WARD2-1011-006 | GW-WARD2-1112-007 | GW-WARD2-0513-020 | GW-WARD2-1013-029 | GW-WARD2-8/6/15-009 |
| **Sample Date:** | | | | | | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/17/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 11/3/2018 | 12/1/2010 | 11/22/2011 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/8/2015 |
| **Parameters** | **Units** | *ODWS*[1] | *ODWS Source* | *MABC*[2] | *TLP*[3] | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 111 | 88.6 | 115 | 124 | 145 | 129 | 123 | 118 | 123 | 131 | 108 | 139 | 131 | 84.5 | 87.9 | 129 | 57.8 | 102 | 69.1 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | 0.208 | **0.394** | **3.1** | **1.01** | **5.59** | 0.27 | **4.13** | 0.016 | **1.7** | 0.081 | 0.029 | 0.022 | <0.01 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 39.8 | 46.4 | 45.5 | 50 | 50.5 | 50.1 | 47.7 | 56.4 | 49 | 55.8 | 45.4 | 57.1 | 53.7 | 15.4 | 16.7 | 24.9 | 9.67 | 31.3 | 18.1 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | **4.51** | **0.527** | **5.45** | **4.23** | **4.79** | **2.75** | **3.84** | **1.58** | **4.07** | **0.265** | **3.42** | **0.745** | **0.615** | 0.0024 | <0.001 | 0.0011 | <0.001 | <0.001 | <0.001 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | <1 | <1 | <1 | <1 | <1 | 0.269 | 0.273 | 0.344 | 0.226 | 0.316 | 0.272 | 0.35 | 0.335 | <1 | <1 | <1 | <1 | <1 | <1 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 5.43 | 6.89 | 5.88 | 6.39 | 6.31 | 5.86 | 5.94 | 8.03 | 7.69 | 11.6 | 10.8 | 15.3 | 14.9 | 0.77 | 0.71 | 2.9 | 1.67 | 3.26 | 3.05 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 501 | 490 | 552 | 500 | 487 | 453 | 441 | 459 | 493 | 464 | 439 | 446 | 453 | 261 | 231 | 232 | 187 | 192 | 214 |
| Ammonia-N | mg/L | - | - | - | - | 0.18 | <0.05 | 0.057 | 0.098 | 0.152 | <0.05 | 0.094 | <0.11 | <0.06 | <0.159 | 0.073 | 0.028 | <0.02 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.053 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 18.4 | 27.8 | 26.4 | 27.5 | 40.7 | 40.1 | 57.8 | 64.1 | 54 | 55.6 | 49.6 | 71 | 71.2 | <2 | 29.7 | 97.2 | 22.8 | 150 | 21.2 |
| Conductivity | uS/cm | - | - | - | - | 833 | 913 | 940 | 913 | 1030 | 973 | 1060 | 1020 | 1040 | 996 | 951 | 1110 | 1010 | 482 | 456 | 455 | 328 | 856 | 462 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | 4.5 | **5.4** | 4.7 | 4.8 | **5.3** | **5.3** | <6.7 | 4.3 | 4 | 4.3 | 3.8 | **6.56** | **7.2** | 1.3 | 1.3 | <1 | <1 | 2.3 | <1 |
| Hardness | mg/L | 80-100 | OG | - | - | 441 | 412 | 473 | 515 | 571 | 529 | 502 | 528 | 508 | 557 | 456 | 582 | 549 | 274 | 288 | 425 | 184 | 383 | 247 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.1 | <0.1 | 0.53 | <0.1 | 2.19 | 0.49 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.47 | 7.43 | 7.43 | 7.4 | 7.89 | 7.88 | 7.65 | 7.16 | 7.45 | 7.91 | 7.8 | 7.14 | 7.17 | 7.93 | 7.84 | 7.82 | 7.84 | 7.84 | 8.17 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.001 | <0.001 | 0.0051 | 0.0032 | 0.0047 | 0.0024 | <0.0021 | <0.006 | 0.002 | <0.001 | 0.0067 | 0.0017 | 0.0019 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.0036 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 3.8 | <2 | 4.1 | 10.7 | 29.5 | 28 | 37.7 | 22.4 | 44.3 | 44.6 | 58.6 | 66 | 66.8 | <2 | 6.3 | 8.1 | 2.9 | 12.6 | 7.61 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 0.5 | <0.33 | 0.36 | 0.22 | 0.48 | 0.36 | 0.61 | 0.61 | 0.44 | 0.45 | 0.33 | 0.4 | 0.38 | <0.15 | <0.15 | 0.3 | <0.15 | <0.25 | 0.58 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00028 | <0.0006 | 0.00052 | 0.00055 | 0.00011 | <0.00047 | 0.00031 | <0.00084 | <0.00027 | 0.00118 | 0.00011 | 0.00005 | <0.00004 | <0.00006 | <0.00047 | <0.00003 | <0.00018 | <0.00067 | 0.00011 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 955 | 710 | 969 | 711 | 757 | 737 | 835 | 950 | 759 | 100 | 592 | 1160 | 1160 | 355 | 526 | 619 | 358 | 750 | 412 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 6.89 | 7.71 | 7.46 | 7.39 | 6.37 | 7.63 | 7.2 | 7.47 | 7.38 | 7.59 | 6.83 | 6.92 | 6.92 | 6.84 | 7.66 | 6.52 | 7.32 | 7.75 | 7 |
| Temperature, field | Deg C | 15 | AO | - | - | 8.2 | 10.4 | 14.3 | 10.2 | 13.9 | 9.6 | 9 | 11.8 | 7.7 | 7.9 | 10.18 | 9.58 | 9.58 | 7.5 | 8.7 | 8 | 6.6 | 10.8 | 8.9 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-171115-016 | GW-WARD2-042516-022 | GW-WARD2-110316-020 | GW-WARD2-041017-004 | GW-WARD2-112417-007 | GW-WARD2-051818-021 | GW-WARD2-110318-010 | CRA-4074-02-WARD2-34 | GW-WARD2-1210-010 | GW-WARD2-0511-015 | GW-WARD2-1011-016 | GW-WARD2-0412-012 | GW-WARD2-1112-027 | GW-WARD2-0513-011 | GW-WARD2-1013-009 | GW-WARD2-DD-061514-019 | GW-WARD2-103014-027 | GW-WARD2-8/6/15-030 | GW-WARD2-161115-026 |
| **Sample Date:** | | | | | | 11/17/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 66.3 | 53.3 | 64.2 | 48.1 | 88.6 | 63.4 | 90.2 | 64.6 | 64.9 | 60.4 | 67.5 | 65.6 | 80 | 74.9 | 72.6 | 76.6 | 69.9 | 70.6 | 70 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.133 | 0.197 | <0.05 | 0.22 | 0.113 | <0.05 | <0.05 | 0.078 | <0.05 | <0.05 | <0.05 | 0.261 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 11.9 | 10 | 19.9 | 8.98 | 15.1 | 11.1 | 16.3 | 55.6 | 55.2 | 63.5 | 48.6 | 47.4 | 59.1 | 43.4 | 56.2 | 59.3 | 51.5 | 54.1 | 49.4 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.00121 | 0.00118 | 0.0215 | **0.0809** | 0.006 | 0.0312 | 0.0133 | 0.0191 | 0.008 | **0.0879** | 0.0074 | **0.0597** | 0.0051 | **0.0647** |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 0.349 | 0.452 | 0.874 | 0.534 | 0.788 | 1 | 1.25 | 2.2 | 1.9 | 1.8 | 2 | 1.8 | 2.3 | 2.2 | 2.1 | 2 | 1.9 | 2.1 | 1.91 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 2.4 | 2.06 | 3.3 | 1.08 | 1.36 | 12.4 | 40 | 18.4 | 18.1 | 15.8 | 15.6 | 16.3 | 19.8 | 20.1 | 18.2 | 19.6 | 18.1 | 20.8 | 20 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 232 | 206 | 236 | 192 | 309 | 196 | 235 | 385 | 379 | 385 | 377 | 382 | 404 | 416 | 408 | 416 | 394 | 396 | 404 |
| Ammonia-N | mg/L | - | - | - | - | <0.05 | 0.036 | <0.134 | <0.1 | <0.162 | 0.078 | 0.041 | 0.097 | 0.138 | 0.119 | 0.068 | 0.073 | 0.109 | <0.05 | 0.202 | 0.159 | 0.11 | 0.068 | 0.122 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 3.94 | 10.9 | 10.4 | 2.97 | 0.62 | 18.5 | 39.3 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | 0.65 | 0.64 |
| Conductivity | uS/cm | - | - | - | - | 423 | 416 | 459 | 334 | 512 | 452 | 668 | 726 | 705 | 682 | 680 | 717 | 481 | 767 | 766 | 770 | 732 | 751 | 730 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | 2.5 | <2.7 | <1 | <1 | 1.3 | <1 | 2.71 | <1 | 1.9 | 1.8 | 1.3 | 1.3 | 1.5 | 1.7 | 1.9 | <1 | 1.2 | <1 | 1.4 |
| Hardness | mg/L | 80-100 | OG | - | - | 214 | 174 | 242 | 157 | 284 | 204 | 292 | 390 | 389 | 412 | 369 | 359 | 443 | 366 | 413 | 435 | 386 | 399 | 378 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 0.034 | 0.061 | <0.02 | <0.02 | <0.02 | 0.025 | 0.403 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.06 | <0.02 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.99 | 8.09 | 7.49 | 7.92 | 8 | 8.06 | 7.57 | 7.91 | 7.92 | 7.97 | 7.96 | 7.91 | 7.75 | 7.76 | 7.84 | 7.9 | 7.74 | 8.14 | 8.13 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | 0.0045 | <0.0011 | <0.0063 | 0.0019 | <0.001 | 0.0113 | 0.0064 | <0.001 | <0.001 | 0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.0015 | 0.0245 | <0.001 | 0.0078 | 0.0026 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 2.29 | 4.76 | 4.51 | 1.69 | 0.77 | 13.7 | 79.6 | 42 | 26 | 22 | 30.3 | 43.8 | 97.2 | 88.1 | 53.8 | 67 | 48 | 44.9 | 33.4 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 0.25 | 2.3 | 0.5 | <1.5 | <1.5 | 0.54 | <1.5 | 0.26 | 0.16 | <0.15 | <0.15 | 0.17 | 0.31 | <0.15 | <0.23 | 0.27 | <0.15 | 0.19 | <0.15 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | <0.00092 | 0.00022 | <0.00262 | <0.00098 | 0.00148 | 0.00024 | 0.00013 | 0.00103 | 0.00021 | 0.00032 | 0.00056 | 0.00023 | 0.00009 | <0.00015 | 0.00167 | 0.00123 | 0.00036 | 0.0001 | 0.00169 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 321 | 301 | 431 | 306 | 642 | 268 | 861 | 667 | 619 | 697 | 680 | 695 | 598 | 765 | 776 | 982 | 741 | 594 | 589 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.9 | 7.57 | 7.89 | 7.78 | 7.6 | 7.16 | 7.14 | 7.73 | 6.81 | 7.12 | 7.55 | 7.2 | 6.58 | 7.19 | 7.58 | 7.56 | 7.15 | 6.81 | 7.77 |
| Temperature, field | Deg C | 15 | AO | - | - | 10.5 | 5.9 | 11.5 | 5.9 | 10.2 | 9.32 | 10.06 | 8.4 | 10.5 | 8.5 | 10.3 | 8.5 | 10.1 | 7.9 | 9.5 | 9.3 | 10.2 | 10.6 | 10.6 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

# TABLE 6.2

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | | | | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-042516-014 | GW-WARD2-110316-009 | GW-WARD2-041017-022 | GW-WARD2-112417-024 | GW-WARD2-051818-005 | GW-WARD2-110318-022 | CRA-4074-02-WARD2-35 | GW-WARD2-1210-012 | GW-WARD2-0511-020 | GW-WARD2-1011-013 | GW-WARD2-0412-009 | GW-WARD2-1112-025 | GW-WARD2-0513-006 | GW-WARD2-1013-014 | GW-WARD2-DD-061514-017 | GW-WARD2-103014-015 | GW-WARD2-8/6/15-023 | GW-WARD2-161115-028 | GW-WARD2-042516-008 |
| **Sample Date:** | | | | | | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 |
| **Parameters** | **Units** | *ODWS*[1] | *ODWS Source* | *MABC*[2] | *TLP*[3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 63.8 | 64.2 | 133 | 133 | 64.7 | 60.1 | 72.6 | 76.4 | 79.6 | 83.8 | 80.1 | 88.6 | 88.8 | 89.2 | 99.7 | 91.5 | 95.8 | 91.2 | 88.8 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | 0.043 | **0.332** | <0.01 | 0.029 | 0.031 | 0.033 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.054 | <0.05 | 0.257 | 0.064 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 49.9 | 51.3 | 23.9 | 38.2 | 50.3 | 45.6 | 49.3 | 45 | 47.6 | 44.6 | 43.5 | 48.3 | 47.7 | 54.8 | 57.3 | 53.1 | 54.9 | 52.8 | 56.4 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | 0.0074 | 0.0498 | 0.00109 | **0.35** | 0.00395 | 0.0481 | 0.0189 | 0.0478 | 0.0246 | **0.0659** | 0.0197 | 0.0031 | 0.0401 | **0.0516** | 0.0097 | **0.0522** | 0.0246 | **0.0628** | 0.0161 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 2.06 | 2.17 | 1.52 | 2.55 | 2.09 | 2 | 3.8 | 1.8 | 2.6 | 2.6 | 1.9 | 2.3 | 3 | 2 | 2.3 | 2 | 2.2 | 2.19 | 2.47 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 26.1 | 28.1 | 118 | 5.87 | 29.4 | 28.8 | 26.3 | 23.8 | 31.7 | 24.3 | 24.9 | 27.7 | 25.4 | 29.3 | 69.8 | 59.5 | 68 | 57.2 | 60.4 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 412 | 426 | 351 | 443 | 395 | 389 | 305 | 299 | 333 | 312 | 329 | 315 | 354 | 350 | 474 | 429 | 479 | 470 | 474 |
| Ammonia-N | mg/L | - | - | - | - | 0.061 | <0.255 | <0.02 | <0.319 | 0.055 | 0.276 | 0.107 | 0.182 | 0.115 | 0.138 | 0.073 | <0.05 | 0.07 | 0.151 | 0.077 | 0.161 | 0.098 | 0.162 | 0.058 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 0.65 | 0.66 | **276** | 2.26 | 0.56 | 0.62 | 53.3 | 50.2 | 63.7 | 53.3 | 56.1 | 45.4 | 43.6 | 42.2 | 53.1 | 54.7 | 55.7 | 56.8 | 48.4 |
| Conductivity | uS/cm | - | - | - | - | 755 | 749 | 1460 | 768 | 728 | 726 | 795 | 768 | 823 | 747 | 817 | 458 | 889 | 926 | 1020 | 989 | 1080 | 1030 | 1050 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | <3.9 | <1 | <1 | 1.6 | 1 | 2.91 | <1 | 2.1 | 3.4 | 1.8 | 2.4 | 1.6 | 2.1 | 1.8 | 2.4 | 1.9 | 2.7 | 2.5 | 5 |
| Hardness | mg/L | 80-100 | OG | - | - | 365 | 372 | 430 | 489 | 369 | 338 | 384 | 376 | 395 | 393 | 379 | 420 | 418 | 448 | 485 | 447 | 465 | 445 | 454 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 0.057 | <0.02 | 2.45 | <0.02 | 0.056 | <0.02 | 0.11 | <0.1 | 0.11 | <0.1 | 0.12 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.19 | 0.051 | 0.096 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.01 | <0.01 | <0.05 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.92 | 7.38 | 7.76 | 7.84 | 8 | 7.51 | 8 | 7.95 | 7.97 | 7.87 | 7.94 | 7.8 | 7.7 | 7.77 | 7.8 | 7.64 | 8.08 | 7.99 | 7.8 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.0054 | <0.0089 | 0.0011 | <0.001 | 0.0052 | 0.0023 | <0.001 | <0.001 | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.0011 | 0.004 | 0.0046 | 0.0055 | 0.003 | 0.0035 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 35 | 27.8 | 26.6 | 2.38 | 36.6 | 29.7 | 49.4 | 42 | 42.3 | 38.8 | 52.3 | 42.7 | 137 | 122 | 91.8 | 78.7 | 47.5 | 51.3 | 34.1 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | <1.5 | 0.57 | 0.36 | 0.4 | 0.18 | 0.27 | 0.38 | 0.21 | 0.38 | 0.28 | 0.2 | <0.15 | 0.33 | <0.19 | 0.31 | 0.21 | 0.36 | 0.15 | <1.5 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00025 | <0.00286 | <0.00018 | 0.0028 | 0.00012 | 0.00048 | 0.0006 | 0.00029 | 0.00031 | 0.00082 | 0.00025 | <0.00004 | 0.00017 | 0.00127 | 0.00072 | 0.00056 | 0.00013 | 0.00162 | 0.00029 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 672 | 705 | 636 | 636 | 519 | 878 | 1040 | 579 | 850 | 763 | 821 | 629 | 1000 | 843 | 1490 | 1030 | 855 | 821 | 1070 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.3 | 7.69 | 7.6 | 7.6 | 7.02 | 6.89 | 7.43 | 6.86 | 7.13 | 7.44 | 7.24 | 6.6 | 7.12 | 7.6 | 7.65 | 7.21 | 6.78 | 7.65 | 7.38 |
| Temperature, field | Deg C | 15 | AO | - | - | 8.8 | 10.2 | 9.7 | 9.7 | 9.29 | 9.74 | 8.9 | 9.4 | 8.2 | 9.4 | 8 | 8.8 | 7.4 | 9.2 | 9 | 9.4 | 9.9 | 9.9 | 8.8 |

Notes:

| | |
|---|---|
| (1) | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| (2) | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| (3) | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-110316-008 | GW-WARD2-041017-021 | GW-WARD2-112417-021 | GW-WARD2-051818-009 | GW-WARD2-110318-025 | CRA-4074-02-WARD2-36 | GW-WARD2-1210-006 | GW-WARD2-0511-009 | GW-WARD2-1011-011 | GW-WARD2-0412-006 | GW-WARD2-1112-022 | GW-WARD2-0513-008 | GW-WARD2-1013-016 | GW-WARD2-DD-061514-014 | GW-WARD2-103014-018 | GW-WARD2-8/6/15-012 | GW-WARD2-161115-027 | GW-WARD2-042516-006 | GW-WARD2-110316-003 |
| **Sample Date:** | | | | | | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 86.4 | 148 | 98.7 | 91.8 | 97.8 | 65 | 64.3 | 70.3 | 78.6 | 78.5 | 85 | 79 | 80.7 | 96.8 | 90.6 | 94.7 | 97.4 | 89.1 | 93.3 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | 0.165 | <0.01 | 0.192 | 0.022 | 0.191 | **0.523** | 0.135 | **1.03** | 0.224 | **0.61** | 0.222 | **1.54** | **1.99** | **2.38** | **1.98** | **2.37** | **2.43** | **0.872** | **2.61** |
| Magnesium (dissolved) | mg/L | - | - | - | - | 57.3 | 64 | 71.4 | 62.9 | 61 | 37.5 | 36.6 | 41.7 | 40.7 | 39.7 | 45.8 | 47.8 | 46.1 | 49.6 | 47.6 | 49.6 | 51.3 | 50.3 | 55 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | 0.0487 | 0.00089 | **0.052** | **0.0509** | 0.0426 | **0.0637** | 0.0066 | 0.0422 | 0.0067 | 0.0368 | 0.0057 | 0.0368 | 0.0322 | 0.0359 | 0.0353 | 0.0372 | 0.0371 | 0.0408 | 0.0403 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 2.33 | 9.39 | 2.86 | 3.27 | 2.94 | 2 | 1.9 | 1.9 | 1.9 | 1.7 | 2 | 1.8 | 1.8 | 1.8 | 1.7 | 1.9 | 1.97 | 1.92 | 2.05 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 50.8 | 8.77 | 60.7 | 45.7 | 43.3 | 46 | 41.4 | 44.2 | 38 | 41.9 | 49.7 | 37 | 49.5 | 49.7 | 46.5 | 48.3 | 48 | 46.4 | 48.3 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 490 | 541 | 518 | 495 | 490 | 362 | 382 | 410 | 407 | 440 | 446 | 470 | 481 | 500 | 491 | 508 | 494 | 480 | 509 |
| Ammonia-N | mg/L | - | - | - | - | <0.272 | <0.02 | <0.38 | 0.07 | 0.264 | 0.184 | 0.202 | 0.276 | 0.077 | 0.186 | 0.218 | 0.307 | 0.359 | 0.343 | 0.374 | 0.369 | 0.333 | 0.309 | 0.459 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 44.1 | 8.6 | 43.3 | 36.3 | 44.1 | 17.9 | 18.4 | 18.4 | 19.9 | 20.1 | 18.8 | 20.9 | 20.9 | 22.6 | 22.2 | 24.8 | 24.7 | 25.7 | 24.7 |
| Conductivity | uS/cm | - | - | - | - | 998 | 1170 | 1100 | 988 | 1060 | 727 | 738 | 754 | 746 | 803 | 494 | 804 | 879 | 864 | 875 | 949 | 955 | 951 | 983 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | 2.3 | 1.7 | 3.7 | 3.5 | **6.13** | 2.2 | 2 | 4.5 | 3.9 | 3.1 | 3.3 | 3.3 | **5.7** | 4.2 | 3.7 | 4.7 | **5.1** | **6.8** | 5 |
| Hardness | mg/L | 80-100 | OG | - | - | 452 | 633 | 541 | 488 | 495 | 317 | 311 | 347 | 364 | 360 | 401 | 394 | 391 | 446 | 422 | 441 | 455 | 430 | 459 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 0.038 | 0.68 | <0.1 | 0.028 | <0.02 | <0.1 | <0.1 | <0.1 | 0.12 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.02 | <0.02 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.01 | <0.05 | <0.05 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.28 | 7.67 | 7.92 | 7.89 | 7.24 | 8.02 | 7.97 | 7.94 | 7.97 | 7.94 | 7.8 | 7.7 | 7.72 | 7.83 | 7.58 | 8.01 | 8.06 | 7.83 | 7.27 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.0098 | 0.0017 | <0.0012 | 0.0097 | 0.0029 | <0.001 | <0.001 | 0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.0021 | 0.0029 | <0.001 | 0.0064 | 0.0027 | 0.0018 | <0.0049 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 30.5 | 125 | 29.2 | 12.5 | 28 | 23.8 | 12.4 | 9 | 8.5 | 7.7 | 5.9 | 7.2 | 5.7 | 5.8 | 5.3 | 5.06 | 4.41 | 4.16 | 4.6 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 0.78 | 0.24 | 0.61 | 0.34 | 0.52 | 0.47 | 0.32 | 0.443 | 0.26 | 0.53 | 0.61 | 0.49 | <0.6 | 0.61 | 0.64 | 0.68 | 0.47 | 0.81 | 0.84 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | <0.0025 | <0.00015 | 0.00288 | 0.00012 | 0.00035 | 0.00204 | 0.00036 | 0.00072 | 0.00057 | 0.00051 | 0.00027 | 0.00082 | 0.00241 | 0.00246 | 0.00095 | 0.00034 | 0.00333 | 0.00116 | 0.00354 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 1030 | 1180 | 1180 | 574 | 1240 | 672 | 529 | 799 | 697 | 799 | 592 | 795 | 834 | 1170 | 911 | 733 | 786 | 980 | 947 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.62 | 7.56 | 7.56 | 6.93 | 6.79 | 7.74 | 6.94 | 7.1 | 7.54 | 7.17 | 6.77 | 7.16 | 7.47 | 7.55 | 7.04 | 6.59 | 7.65 | 7.29 | 7.53 |
| Temperature, field | Deg C | 15 | AO | - | - | 9.7 | 9 | 9 | 8.71 | 9.16 | 8.6 | 8.7 | 8.9 | 9.3 | 7.4 | 9 | 7.4 | 10.1 | 8.6 | 10.2 | 10.7 | 9.9 | 7.9 | 10.1 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

# TABLE 6.2

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | | | | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-041017-018 | GW-WARD2-112417-018 | GW-WARD2-051818-001 | GW-WARD2-110318-023 | CRA-4074-02-WARD2-37 | GW-WARD2-1210-001 | GW-WARD2-0511-007 | GW-WARD2-1011-009 | GW-WARD2-0412-002 | GW-WARD2-0412-003 | GW-WARD2-1112-020 | GW-WARD2-0513-002 | GW-WARD2-0513-003 | GW-WARD2-1013-019 | GW-WARD2-DD-061514-011 | GW-WARD2-DD-061514-012 | GW-WARD2-103014-014 | GW-WARD2-8/6/15-010 | GW-WARD2-161115-032 |
| **Sample Date:** | | | | | | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 4/22/2012 Duplicate | 11/26/2012 | 5/13/2013 | 5/13/2013 Duplicate | 10/22/2013 | 6/15/2014 | 6/15/2014 Duplicate | 10/30/2014 | 6/8/2015 | 11/16/2015 |
| **Parameters** | **Units** | ***ODWS*[1]** | ***ODWS Source*** | ***MABC*[2]** | ***TLP*[3]** | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 62.5 | 94.4 | 128 | 92.1 | 29.4 | 33.1 | 29 | 34.5 | 30.8 | 30.9 | 36.3 | 29 | 29 | 27.7 | 33.3 | 33.5 | 31.1 | 27.4 | 28 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | 0.058 | **2.45** | 0.015 | **2.2** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 28.3 | 54.5 | 68 | 52.2 | 15.7 | 16.3 | 15.7 | 15.4 | 14.3 | 14.2 | 16.8 | 16.2 | 16.1 | 15.3 | 15.9 | 16.1 | 15.3 | 15.3 | 15.3 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | **0.107** | 0.0369 | 0.00198 | 0.0369 | 0.0071 | 0.0085 | 0.0058 | 0.0018 | 0.0035 | 0.0034 | 0.0029 | 0.0014 | 0.0014 | 0.0022 | 0.0021 | 0.0018 | 0.0012 | 0.0013 | 0.00146 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 1.01 | 2.03 | 9.7 | 1.93 | 1.1 | 1.1 | 1 | 1 | <1 | <1 | 1.1 | 1 | 1 | <1 | <1 | <1 | <1 | <1 | 0.926 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 72.6 | 45.4 | 9.15 | 40.4 | 37.4 | 31.7 | 33.3 | 30.7 | 30.6 | 30.7 | 36.7 | 31.2 | 27.7 | 33.9 | 35.3 | 35.6 | 31.6 | 34.9 | 31.2 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 419 | 519 | 461 | 490 | 184 | 183 | 191 | 190 | 187 | 187 | 183 | 194 | 196 | 198 | 198 | 192 | 178 | 195 | 193 |
| Ammonia-N | mg/L | - | - | - | - | <0.114 | 0.541 | 0.04 | 0.436 | 0.089 | 0.116 | 0.149 | 0.061 | 0.107 | 0.102 | 0.107 | <0.05 | <0.05 | <0.05 | 0.079 | 0.096 | 0.056 | <0.05 | 0.11 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 38.6 | 24.7 | 6.82 | 23.9 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | 2 | <2 | <2 | 2 | 2.03 | 2.06 |
| Conductivity | uS/cm | - | - | - | - | 794 | 971 | 1070 | 1240 | 386 | 382 | 373 | 343 | 374 | 371 | 282 | 337 | 337 | 380 | 350 | 351 | 390 | 385 | 380 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | 4.2 | 4.7 | 2.1 | **7.02** | <1 | 1.5 | 1.4 | 1.3 | 1 | 1.2 | 1.5 | 1.2 | 1.4 | 1.9 | <1 | <1 | <1 | <1 | 1.5 |
| Hardness | mg/L | 80-100 | OG | - | - | 272 | 460 | 598 | 445 | 138 | 150 | 137 | 150 | 136 | 136 | 160 | 139 | 139 | 132 | 149 | 150 | 141 | 132 | 133 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | <0.02 | <0.02 | 0.761 | <0.02 | 0.12 | <0.1 | <0.1 | 0.11 | 0.11 | 0.13 | <0.1 | 0.12 | 0.13 | 0.12 | 0.12 | 0.13 | 0.17 | 0.132 | 0.128 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.9 | 7.91 | 7.81 | 7.03 | 8.23 | 7.94 | 8.18 | 8.09 | 8.01 | 8.1 | 8.07 | 8.05 | 8.07 | 8.06 | 8.16 | 8.2 | 8.03 | 8.29 | 8.36 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | 0.0017 | <0.001 | 0.006 | 0.0044 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.0031 | 0.0063 | 0.0032 | 0.0051 | 0.0063 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | <0.3 | 3.41 | 143 | 3.39 | 18.4 | 17.4 | 18.6 | 17.1 | 17.4 | 17.2 | 16.1 | 17.6 | 17.5 | 16.7 | 16.2 | 16.2 | 16.2 | 16.2 | 15.2 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 0.49 | 0.99 | 0.19 | 0.78 | 0.19 | <0.15 | <0.15 | <0.15 | 0.16 | 0.19 | 0.2 | 0.18 | 0.18 | <0.18 | <0.15 | 0.26 | <0.15 | 0.22 | <0.15 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | - | 0.00446 | 0.00007 | 0.00055 | 0.00332 | 0.00028 | 0.00062 | 0.00249 | 0.00124 | 0.00118 | 0.00037 | <0.00058 | <0.00058 | <0.00081 | 0.00325 | 0.00395 | 0.00117 | <0.00032 | 0.00641 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 1010 | 1010 | 585 | 1130 | 381 | 303 | 433 | 408 | 400 | 400 | 321 | 385 | 385 | 393 | 536 | 536 | 643 | 337 | 312 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.59 | 7.59 | 6.96 | 6.77 | 8.27 | 7.05 | 7.33 | 8.31 | 7.78 | 7.78 | 7.22 | 7.82 | 7.82 | 7.89 | 8.32 | 8.32 | 8.01 | 7.46 | 8.42 |
| Temperature, field | Deg C | 15 | AO | - | - | 9.2 | 9.2 | 8.64 | 9.17 | 8.8 | 9.3 | 8 | 8.8 | 8 | 8 | 8.8 | 6.9 | 6.9 | 9.1 | 8.6 | 8.6 | 8.9 | 9.6 | 10.3 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

# TABLE 6.2

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | | | | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-042516-002 | GW-WARD2-110316-005 | GW-WARD2-041017-016 | GW-WARD2-112417-016 | GW-WARD2-051818-013 | GW-WARD2-110318-028 | CRA-4074-02-WARD2-38 | GW-WARD2-1210-002 | GW-WARD2-0511-006 | GW-WARD2-1011-008 | GW-WARD2-0412-001 | GW-WARD2-1112-019 | GW-WARD2-0513-001 | GW-WARD2-1013-021 | GW-WARD2-DD-061514-010 | GW-WARD2-103014-016 | GW-WARD2-103014-017 | GW-WARD2-8/6/15-022 | GW-WARD2-161115-033 |
| **Sample Date:** | | | | | | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 10/30/2014 Duplicate | 6/8/2015 | 11/16/2015 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 26.3 | 25.7 | 177 | 28.9 | 26.4 | 26.6 | 158 | 153 | 174 | 155 | 159 | 167 | 178 | 155 | 171 | 156 | 151 | 163 | 143 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | <0.01 | <0.01 | **8.05** | 0.054 | 0.028 | 0.012 | <0.05 | **1.04** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 14.8 | 16.3 | 49.8 | 15.8 | 14.7 | 14.2 | 83.7 | 68.3 | 76.2 | 69.7 | 72.9 | 80.7 | 66.5 | 72.7 | 76.9 | 72 | 67.9 | 67.9 | 62.1 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | 0.00142 | 0.00316 | **0.692** | 0.0287 | 0.00196 | 0.0188 | **0.125** | **0.144** | **0.0608** | **0.0799** | 0.0422 | 0.0447 | 0.0103 | 0.0062 | 0.0021 | 0.0019 | 0.0017 | <0.001 | 0.0013 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.092 | 0.095 | <0.05 | 0.066 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 0.933 | 1.03 | 2.68 | 0.952 | 0.915 | 0.872 | 9 | 8.9 | 9.9 | 11.8 | 8.1 | 9.4 | 9.3 | 10.3 | 10.3 | 11.1 | 10.6 | 10.8 | 10.5 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 32.7 | 35.9 | 25 | 33.5 | 33.1 | 31.3 | 14.7 | 11.8 | 13.6 | 13.8 | 11.4 | 12.7 | 12.6 | 14.2 | 11.4 | 12.6 | 12.2 | 10.7 | 11.4 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 186 | 195 | 696 | 188 | 181 | 179 | 532 | 508 | 496 | 545 | 524 | 548 | 573 | 600 | 573 | 172 | 552 | 568 | 530 |
| Ammonia-N | mg/L | - | - | - | - | 0.057 | <0.136 | 0.935 | <0.294 | 0.069 | 0.063 | 0.285 | 0.64 | 0.093 | 0.148 | 0.084 | 0.055 | <0.05 | <0.05 | 0.066 | <0.05 | <0.05 | 0.064 | 0.072 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 1.97 | 1.98 | 55.5 | 2.11 | 2.16 | 2.32 | 20.5 | 20.2 | 20.2 | 19 | 18.7 | 18.2 | 20.6 | 21.2 | 13.2 | 12.2 | 12.5 | 11.7 | 9.8 |
| Conductivity | uS/cm | - | - | - | - | 373 | 379 | 1380 | 369 | 355 | 351 | 1280 | 1290 | 1270 | 1160 | 1250 | 979 | 1200 | 1260 | 1190 | 1220 | 1250 | 1180 | 1110 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | <3.5 | 1.2 | **7.5** | 1 | <1 | 1.95 | 1.6 | **7** | 3.8 | 2.7 | 2.1 | 1.6 | 2.2 | 2.6 | 2.1 | 1.6 | 1.5 | 2.5 | 2.8 |
| Hardness | mg/L | 80-100 | OG | - | - | 127 | 131 | 648 | 137 | 126 | 125 | 739 | 664 | 748 | 675 | 697 | 750 | 719 | 687 | 745 | 686 | 657 | 687 | 614 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 0.139 | 0.1 | <0.1 | 0.04 | 0.111 | 0.049 | 0.73 | 0.31 | 0.36 | 0.56 | 0.54 | 0.29 | 0.47 | 0.56 | 1.06 | 0.93 | 0.93 | 0.97 | 0.88 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.01 | <0.01 | <0.05 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 8.16 | 7.91 | 7.04 | 8.24 | 8.2 | 7.93 | 7.69 | 7.49 | 7.77 | 7.57 | 7.7 | 7.4 | 7.34 | 7.27 | 7.34 | 7.32 | 7.27 | 7.94 | 8.05 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.0044 | <0.0076 | 0.0029 | <0.001 | 0.0091 | 0.004 | <0.001 | <0.005 | 0.002 | 0.002 | 0.01 | <0.001 | <0.001 | <0.0011 | 0.0118 | 0.0059 | 0.0078 | 0.008 | 0.0025 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 15 | 14.1 | 30.2 | 14.4 | 14.7 | 14.8 | 223 | 200 | 204 | 170 | 180 | 157 | 167 | 144 | 164 | 152 | 158 | 152 | 109 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | <1.5 | 0.31 | 2.78 | 0.66 | <0.15 | <0.15 | 0.59 | 0.81 | <0.15 | 0.19 | 0.22 | 0.16 | 0.26 | <0.24 | 0.21 | 0.17 | <0.15 | 0.17 | <0.15 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00135 | <0.00956 | 0.00764 | 0.0024 | 0.00102 | 0.00052 | 0.00169 | 0.00053 | 0.00014 | 0.0007 | 0.00016 | 0.00002 | <0.00002 | <0.00018 | 0.00039 | <0.00039 | <0.00039 | 0.00006 | 0.00056 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 394 | 393 | 353 | 353 | 245 | 497 | 1210 | 1150 | 1470 | 1190 | 1350 | 943 | 1350 | 1240 | 1820 | 1240 | 1240 | 1110 | 861 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 8.09 | 8.54 | 7.62 | 7.62 | 7.86 | 7.61 | 7.45 | 6.58 | 6.86 | 7.35 | 7 | 6.28 | 6.45 | 7.22 | 7.48 | 7.52 | 7.52 | 6.58 | 7.48 |
| Temperature, field | Deg C | 15 | AO | - | - | 8.1 | 9.3 | 8.2 | 8.2 | 8.8 | 8.53 | 9.1 | 9.5 | 8.6 | 9.2 | 7.9 | 9.8 | 6.7 | 9.6 | 8.3 | 10.5 | 10.5 | 10.3 | 11.7 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW34-09 | OW34-09 | OW34-09 | OW35-09 | OW35-09 | OW35-09 | OW36-09 | OW36-09 | OW36-09 | OW36-09 | OW36-09 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-042516-003 | GW-WARD2-110316-001 | GW-WARD2-041017-011 | GW-WARD2-112417-014 | GW-WARD2-112417-015 | GW-WARD2-051818-006 | GW-WARD2-051818-007 | GW-WARD2-110318-024 | CRA-4074-02-WARD2-39 | GW-WARD2-1210-030 | GW-WARD2-0511-001 | CRA-4074-02-WARD2-40 | GW-WARD2-1210-026 | GW-WARD2-0511-023 | GW-WARD2-1112-006 | GW-WARD2-0513-017 | GW-WARD2-1013-033 | GW-WARD2-8/6/15-003 | GW-WARD2-171115-012 |
| **Sample Date:** | | | | | | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 11/24/2017 Duplicate | 5/18/2018 | 5/18/2018 Duplicate | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/8/2015 | 11/17/2015 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 150 | 142 | 142 | 167 | 168 | 103 | 130 | 128 | 123 | 87.4 | 89.5 | 34.6 | 33.8 | 34.2 | 118 | 152 | 161 | 145 | 154 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | <0.01 | <0.01 | 0.031 | <0.01 | <0.01 | 0.037 | <0.01 | <0.01 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.122 | 0.452 | <0.05 | 0.024 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 68.2 | 65.8 | 38.7 | 70.5 | 70.3 | 44.4 | 68.7 | 58.3 | 43.7 | 26.6 | 29.6 | 17.5 | 15.3 | 16.1 | 36.9 | 38.9 | 36 | 27.1 | 31.5 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | 0.00086 | 0.00201 | 0.0563 | 0.00087 | 0.00129 | 0.0201 | 0.00193 | 0.00265 | 0.0148 | 0.0028 | <0.001 | 0.0148 | 0.0206 | 0.0043 | 0.066 | 0.0797 | 0.161 | 0.0522 | 0.109 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | 0.196 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.055 | 0.147 | 0.068 | 0.246 |
| Potassium (dissolved) | mg/L | - | - | - | - | 9.82 | 10.5 | 2.38 | 10.7 | 10.5 | 1.6 | 9.61 | 8.93 | 1.4 | <1 | <1 | 1.6 | 1.4 | 1.5 | 14.5 | 12.4 | 8 | 4.8 | 6.13 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 9.56 | 10.2 | 6.6 | 9.16 | 8.93 | 10.3 | 9.17 | 9.09 | 18 | 8.68 | 2.04 | 63.9 | 53.8 | 58.9 | 58.6 | 38.6 | 29.8 | 14.8 | 15.3 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 539 | 540 | 483 | 578 | 580 | 349 | 498 | 457 | 372 | 335 | 338 | 190 | 172 | 175 | 357 | 538 | 483 | 467 | 484 |
| Ammonia-N | mg/L | - | - | - | - | 0.036 | <0.14 | <0.067 | <0.177 | <0.108 | 0.103 | 0.03 | <0.02 | 0.166 | <0.05 | <0.05 | 0.125 | 0.204 | 0.109 | 0.177 | <0.05 | 0.716 | 0.158 | 2.36 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 8.76 | 8.1 | 4.89 | 7.2 | 7.1 | 80.3 | 6.88 | 7.59 | 93.5 | 9.1 | 2.8 | 2.3 | <2 | <2 | 131 | 108 | 68.4 | 26.6 | 25.6 |
| Conductivity | uS/cm | - | - | - | - | 1170 | 1170 | 920 | 1190 | 1180 | 855 | 1080 | 1050 | 960 | 608 | 590 | 570 | 541 | 517 | 921 | 1120 | 1180 | 929 | 1010 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | <5.1 | 1.8 | 2 | 1.8 | 2.3 | 1.2 | 1.9 | 4.3 | <1 | 2.3 | 1.8 | 2.4 | 2.2 | 2.9 | 1.8 | 3.8 | 5.2 | 4.4 | 4.5 |
| Hardness | mg/L | 80-100 | OG | - | - | 656 | 625 | 515 | 707 | 710 | 440 | 607 | 559 | 486 | 328 | 345 | 159 | 147 | 151 | 447 | 540 | 551 | 473 | 513 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 0.723 | 0.87 | 0.331 | 0.5 | 0.5 | 0.027 | 0.754 | 0.981 | 0.64 | 0.23 | 0.44 | 0.24 | <0.1 | 0.36 | 0.38 | 0.11 | <0.1 | 1.08 | 0.212 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.01 | <0.05 | <0.01 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | 0.013 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.64 | 7.27 | 7.33 | 7.92 | 7.81 | 7.93 | 7.75 | 7.25 | 7.84 | 7.98 | 7.93 | 8.13 | 8.13 | 8.14 | 7.49 | 7.1 | 7.23 | 7.92 | 7.74 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.0029 | <0.0109 | 0.002 | <0.001 | <0.001 | 0.0059 | 0.0051 | 0.0037 | <0.002 | <0.001 | <0.001 | 0.007 | <0.005 | <0.001 | 0.003 | <0.001 | <0.0029 | 0.0072 | 0.0021 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 133 | 101 | 64.7 | 133 | 126 | 16.5 | 144 | 117 | 11.7 | <2 | <2 | 114 | 103 | 93.7 | 28.1 | 29.9 | 81.9 | 47.3 | 58.7 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | <1.5 | <1.5 | 0.35 | <1.5 | 0.41 | 0.56 | 0.3 | 0.29 | 0.24 | <0.15 | <0.15 | 0.52 | 0.25 | 0.23 | 0.5 | 0.33 | 1.07 | 0.49 | 3.1 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00068 | <0.00136 | - | 0.00011 | 0.00007 | 0.00029 | 0.00008 | <0.00006 | 0.00115 | <0.00011 | <0.0002 | 0.00248 | 0.0006 | 0.00055 | 0.00012 | <0.00009 | 0.00238 | 0.00016 | 0.02941 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 1240 | 1230 | - | 1160 | 1160 | 622 | 622 | 1150 | 854 | 445 | 564 | 522 | 396 | 524 | 832 | 1240 | 1130 | 710 | 783 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.99 | 7.62 | - | 6.47 | 6.47 | 7.15 | 7.15 | 7.12 | 7.55 | 7.06 | 7.22 | 8 | 7.19 | 7.4 | 6.49 | 6.92 | 7.16 | 6.62 | 7.74 |
| Temperature, field | Deg C | 15 | AO | - | - | 8.1 | 10.4 | - | 9.3 | 9.3 | 8.34 | 8.34 | 9.31 | 8.1 | 7.5 | 10.9 | 8.5 | 7.8 | 8.5 | 9.7 | 9.1 | 10.2 | 11.2 | 10.1 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

# TABLE 6.2

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | | | | OW36-09 | OW36-09 | OW36-09 | OW36-09 | OW36-09 | OW36-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-042616-031 | GW-WARD2-110316-026 | GW-WARD2-041017-031 | GW-WARD2-112417-011 | GW-WARD2-051818-024 | GW-WARD2-110318-012 | CRA-4074-02-WARD2-23 | CRA-4074-02-WARD2-24 | GW-WARD2-1210-019 | GW-WARD2-0511-022 | GW-WARD2-1011-003 | GW-WARD2-1011-004 | GW-WARD2-0412-019 | GW-WARD2-1112-009 | GW-WARD2-0513-018 | GW-WARD2-1013-025 | GW-WARD2-DD-061514-005 | GW-WARD2-103014-001 | GW-WARD2-8/6/15-006 |
| **Sample Date:** | | | | | | 4/26/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 5/12/2010 Duplicate | 12/1/2010 | 5/24/2011 | 11/22/2011 | 11/22/2011 Duplicate | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 204 | 216 | 174 | 209 | 227 | 223 | 71.2 | 70.4 | 78.2 | 70 | 368 | 371 | 281 | 355 | 63 | 65.8 | 348 | 331 | 79.8 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | 0.136 | 0.188 | 0.056 | 0.035 | 0.252 | 0.13 | <0.5 | <0.5 | 0.081 | 0.156 | 0.286 | 0.285 | **0.321** | **0.314** | 0.23 | 0.211 | <0.5 | <0.5 | <0.5 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 44.5 | 47.6 | 40.6 | 51.1 | 45.2 | 45.7 | 27.4 | 28.7 | 24.6 | 26.3 | 24.9 | 24.5 | 22.7 | 26.2 | 25.4 | 24.4 | 23.9 | 27.6 | 25.4 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | **0.095** | **0.0969** | **0.0778** | **0.125** | **0.159** | **0.196** | <0.01 | <0.01 | 0.0048 | 0.0055 | 0.0045 | 0.0044 | 0.0047 | 0.0053 | 0.0045 | 0.0045 | <0.01 | <0.01 | <0.01 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | 0.063 | 0.36 | 0.107 | 0.571 | 0.238 | 0.218 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.5 | <0.5 | <0.5 |
| Potassium (dissolved) | mg/L | - | - | - | - | 5.58 | 7.16 | 4.14 | 16.6 | 6.66 | 6.31 | <10 | <10 | 1.5 | 1.6 | 1.5 | 1.5 | 1.3 | 1.6 | 1.5 | 1.4 | <10 | <10 | <10 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 17.6 | 24.7 | 26.4 | 31.8 | 32.9 | 31.8 | 27.1 | 27.9 | 23.6 | 26.1 | 23.8 | 23.7 | 22 | 26.1 | 25.4 | 24.2 | 24.1 | 26.5 | 25.8 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 588 | 625 | 593 | 686 | 699 | 711 | 187 | 184 | 182 | 189 | 182 | 183 | 182 | 185 | 185 | 190 | 192 | 173 | 228 |
| Ammonia-N | mg/L | - | - | - | - | 0.598 | 3.39 | <0.069 | 3.41 | 0.979 | 2.11 | 0.113 | 0.115 | 0.132 | 0.168 | 0.101 | 0.095 | 0.111 | 0.125 | 0.141 | 0.242 | 0.17 | 0.193 | 0.158 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 39.9 | 40.9 | 34.2 | 45.2 | 51.1 | 55.4 | 12.5 | 12.5 | 12.7 | 12.7 | 12.8 | 12.8 | 13.1 | 12.3 | 12.9 | 12.7 | 13 | 12.6 | 13 |
| Conductivity | uS/cm | - | - | - | - | 1270 | 1310 | 1190 | 1340 | 1330 | 1350 | 615 | 615 | 620 | 619 | 599 | 598 | 621 | 404 | 575 | 624 | 611 | 591 | 623 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | <5.6 | **6.3** | 4 | 5 | 4.6 | **8.43** | <1 | 2 | 1.2 | 1.4 | <1 | <1 | <1 | <1 | 1.1 | 2 | <1 | <1 | <1 |
| Hardness | mg/L | 80-100 | OG | - | - | 694 | 735 | 602 | 731 | 754 | 744 | 291 | 294 | 297 | 283 | 1020 | 1030 | 794 | 994 | 262 | 265 | 967 | 941 | 304 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 0.47 | <0.1 | 0.39 | 0.76 | <0.1 | 0.051 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.56 | 6.79 | 7.25 | 7.72 | 7.43 | 7.03 | 8.05 | 8.08 | 8.03 | 8.07 | 7.96 | 7.98 | 7.92 | 7.96 | 7.93 | 7.95 | 7.99 | 7.92 | 8.21 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.0012 | <0.0112 | 0.0029 | <0.0062 | 0.0062 | 0.0058 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.0038 | 0.0011 | 0.0033 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 70.8 | 54.8 | 38.9 | 24.7 | 18.1 | 16.3 | 126 | 126 | 125 | 126 | 124 | 124 | 127 | 121 | 127 | 124 | 129 | 124 | 129 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 5.2 | 5.77 | 0.56 | 4.7 | 2.08 | 2.87 | 0.48 | 0.37 | <0.15 | 0.22 | <0.15 | <0.15 | 0.4 | 0.24 | 0.21 | <0.22 | 0.24 | 0.29 | 0.35 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00096 | 0.01087 | <0.00007 | 0.0415 | 0.00147 | 0.00476 | 0.00208 | 0.00212 | 0.0002 | 0.00064 | 0.00132 | - | 0.00179 | 0.00016 | 0.00077 | 0.00337 | 0.00331 | 0.00247 | 0.00075 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 1250 | 1370 | 1290 | 1400 | 788 | 1510 | 656 | 656 | 457 | 625 | 600 | - | 592 | 506 | 571 | 607 | 786 | 603 | 491 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 6.87 | 7.11 | 6.63 | 7.75 | 6.77 | 7.02 | 7.96 | 7.96 | 6.88 | 7.26 | 7.83 | - | 7.89 | 6.84 | 7.45 | 7.85 | 7.94 | 7.79 | 7.31 |
| Temperature, field | Deg C | 15 | AO | - | - | 9.4 | 11.2 | 11 | 9.5 | 11.48 | 9.35 | 8.7 | 8.7 | 8.3 | 8.9 | 8.1 | - | 9 | 7.7 | 8.1 | 8.3 | 10 | 9 | 10.4 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW43-09 | OW43-09 | OW43-09 | OW43-09 | OW43-09 | OW43-09 | OW43-09 | OW43-09 | OW45-13 | OW45-13 | OW45-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-171115-006 | GW-WARD2-042616-030 | GW-WARD2-110316-023 | GW-WARD2-041017-005 | GW-WARD2-112417-008 | GW-WARD2-051818-019 | GW-WARD2-110318-005 | GW-WARD2-110318-008 | GW-WARD2-1013-022 | GW-WARD2-061514-026 | GW-WARD2-103014-013 | GW-WARD2-8/6/15-004 | GW-WARD2-171115-019 | GW-WARD2-042616-028 | GW-WARD2-110316-025 | GW-WARD2-041017-030 | GW-WARD2-1013-031 | GW-WARD2-DD-061514-027 | GW-WARD2-103014-030 |
| **Sample Date:** | | | | | | 11/17/2015 | 4/26/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 11/3/2018 Duplicate | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/17/2015 | 4/26/2016 | 11/3/2016 | 4/10/2017 | 10/22/2013 | 6/15/2014 | 10/30/2014 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | <75 | <70 | <75 | 90.9 | 74.2 | 77.7 | <71 | 74.5 | 129 | 164 | 175 | 289 | 297 | 282 | 252 | 228 | 64.5 | 58.6 | 54.9 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | 0.21 | 0.24 | 0.21 | 0.25 | 0.2 | 0.13 | 0.17 | 0.16 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.05 | <0.05 | <0.05 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 26.2 | 25.3 | 26.6 | 25.3 | 26.3 | 26.6 | 24.7 | 25.3 | 71.4 | 80.7 | 89.1 | 136 | 142 | 144 | 147 | 136 | 21.5 | 19 | 17.4 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | <0.005 | <0.005 | <0.005 | <0.005 | 0.0051 | <0.005 | <0.005 | 0.00396 | 0.0018 | 0.0023 | 0.0023 | 0.0171 | 0.0262 | 0.0138 | 0.0238 | 0.031 | **0.0661** | 0.0072 | 0.0072 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.185 | 0.169 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 1.54 | 1.42 | 1.46 | 1.5 | 1.51 | 1.61 | 1.41 | 1.53 | 2.8 | 3.2 | 2.9 | 3.7 | 4.12 | 3.8 | 13 | 5.53 | 2.6 | 1 | <1 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 26.2 | 24.4 | 27 | 24.9 | 25.2 | 25.6 | 25 | 25.5 | 11.4 | 13 | 14.8 | 33.5 | 48.6 | 56.8 | 54.7 | 48.9 | 11 | 17.1 | 13.4 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 193 | 177 | 180 | 203 | 197 | 178 | 174 | 171 | 603 | 657 | 599 | 715 | 782 | 884 | 819 | 844 | 224 | 219 | 236 |
| Ammonia-N | mg/L | - | - | - | - | 0.207 | 0.149 | <0.222 | <0.151 | 0.413 | 0.175 | 0.132 | 0.119 | <0.05 | 0.094 | <0.05 | <0.05 | <0.05 | 0.032 | <0.02 | <0.057 | 0.072 | 0.104 | 0.058 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 12.7 | 12.6 | 12.3 | 12.5 | 12.6 | 12.5 | 12.9 | 13 | 15.4 | 44.7 | 66.5 | 74.7 | 60.6 | 59.8 | 66.5 | 68.1 | 25.3 | 42.1 | 28.8 |
| Conductivity | uS/cm | - | - | - | - | 617 | 624 | 622 | 619 | 616 | 599 | 564 | 568 | 1120 | 1450 | 1930 | 2290 | 2220 | 2120 | 2060 | 2030 | 543 | 520 | 496 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | 1.1 | <2.9 | <1 | <1 | 1.1 | 1.6 | 1.7 | 2.09 | 4.1 | 1.4 | 1.6 | 4.1 | **8.6** | **8.1** | **5.6** | **6.3** | 2.5 | <1 | <1 |
| Hardness | mg/L | 80-100 | OG | - | - | <190 | <170 | <190 | 331 | 293 | 304 | <180 | 290 | 616 | 743 | 805 | 1280 | 1330 | 1300 | 1230 | 1130 | 250 | 224 | 209 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.04 | 6.12 | **12.7** | **18.2** | **21.9** | **15.7** | 8.49 | 5.18 | 5.22 | 1.75 | <0.1 | 0.27 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.01 | <0.05 | <0.05 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 8.13 | 8.12 | 7.66 | 7.87 | 8.18 | 8.12 | 7.7 | 7.74 | 7.32 | 7.34 | 7.18 | 7.54 | 7.25 | 7.15 | 6.77 | 7.26 | 7.98 | 8.07 | 7.91 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | 0.0028 | <0.001 | <0.0082 | 0.0018 | <0.001 | 0.0028 | 0.002 | 0.0024 | <0.001 | 0.0522 | 0.0059 | 0.0074 | 0.0042 | <0.001 | <0.0203 | 0.0391 | <0.001 | 0.0086 | 0.0017 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 126 | 124 | 123 | 121 | 126 | 124 | 128 | 129 | 56.8 | 247 | 448 | **549** | **503** | 385 | 324 | 333 | 34.3 | 15.9 | 11.6 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 2.54 | 0.35 | 0.27 | 0.22 | 0.47 | 0.25 | 0.2 | 0.19 | <0.17 | 0.24 | <0.15 | 0.23 | 0.67 | 1.54 | 1.05 | 0.93 | <0.33 | 0.3 | <0.15 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00365 | 0.00049 | <0.00432 | <0.00057 | 0.00412 | 0.00054 | 0.00054 | 0.00049 | <0.00016 | 0.0005 | <0.00031 | <0.00002 | <0.00019 | 0.00004 | <0.00007 | <0.00008 | 0.0018 | 0.00401 | 0.00174 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 519 | 622 | 585 | 980 | 521 | 354 | 741 | 741 | 1100 | 1600 | 1090 | 1900 | 1970 | 2160 | 2090 | 1990 | 496 | 687 | 518 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.92 | 7.23 | 7.96 | 7.29 | 7.69 | 7.14 | 7.31 | 7.31 | 7.2 | 7.34 | 7.45 | 6.11 | 7.25 | 6.8 | 7.14 | 6.83 | 7.98 | 8.23 | 8.18 |
| Temperature, field | Deg C | 15 | AO | - | - | 9.3 | 8.1 | 9.4 | 7.9 | 8.7 | 9.9 | 8.55 | 8.55 | 8.6 | 11 | 9.8 | 10.9 | 9.4 | 6.8 | 10.6 | 9.3 | 12.1 | 10.4 | 8.6 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-8/6/15-019 | GW-WARD2-171115-014 | GW-WARD2-042516-020 | GW-WARD2-110316-018 | GW-WARD2-041017-010 | GW-WARD2-041017-025 | GW-WARD2-112417-027 | GW-WARD2-051818-028 | GW-WARD2-110318-029 | GW-WARD2-1013-026 | GW-WARD2-DD-061514-023 | GW-WARD2-103014-023 | GW-WARD2-8/6/15-008 | GW-WARD2-171115-018 | GW-WARD2-042616-023 | GW-WARD2-110316-021 | GW-WARD2-041017-027 | GW-WARD2-112417-029 | GW-WARD2-051818-018 |
| **Sample Date:** | | | | | | 6/8/2015 | 11/17/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 4/10/2017 Duplicate | 11/24/2017 | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/17/2015 | 4/26/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 65.4 | 67.1 | 60.9 | 63.2 | 70.1 | 68.4 | 74.3 | 68 | 59.4 | 35.9 | 38.9 | 35.8 | 32 | 34.3 | 32.2 | 32.7 | 31 | 31.2 | 33.2 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | <0.05 | 0.016 | <0.01 | 0.011 | 0.011 | 0.017 | 0.015 | 0.015 | <0.01 | <0.05 | <0.05 | 0.06 | <0.05 | 0.059 | 0.032 | 0.091 | 0.18 | 0.189 | 0.016 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 19.5 | 20.9 | 21.7 | 26.1 | 23.5 | 24.1 | 26.1 | 26.3 | 23.4 | 20.6 | 22.5 | 20.8 | 21.1 | 20.7 | 22.1 | 22.2 | 20 | 23 | 21.9 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | 0.0248 | **0.0629** | 0.00052 | 0.0402 | 0.00301 | 0.00434 | 0.0025 | 0.00185 | 0.00924 | 0.0126 | 0.0099 | 0.0156 | 0.0049 | 0.0194 | 0.00839 | 0.0128 | 0.0112 | 0.0121 | 0.00664 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | <1 | 0.894 | 0.72 | 0.861 | 0.636 | 0.645 | 0.779 | 0.807 | 0.908 | 3.3 | 1.5 | 1.4 | 1.3 | 1.39 | 1.17 | 1.34 | 1.17 | 1.22 | 1.22 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 17.4 | 16.9 | 15.1 | 17.1 | 17.1 | 16.9 | 6.02 | 17.1 | 13.3 | 19.7 | 19.4 | 18.1 | 18.8 | 18.3 | 18.9 | 19.3 | 18.1 | 19.6 | 19.6 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 228 | 248 | 255 | 244 | 259 | 265 | 284 | 246 | 245 | 200 | 208 | 182 | 206 | 209 | 201 | 208 | 213 | 200 | 202 |
| Ammonia-N | mg/L | - | - | - | - | 0.069 | <0.05 | 0.047 | <0.145 | <0.029 | <0.032 | 0.424 | 0.083 | 0.095 | 0.3 | 0.069 | 0.415 | 0.075 | 0.248 | 0.151 | 0.467 | 0.316 | <0.328 | 0.181 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 42.6 | 41.8 | 24.6 | 32 | 28.6 | 28.6 | 19.4 | 30.4 | 30.1 | <2 | <2 | <2 | 0.78 | 0.77 | 0.69 | 0.72 | 0.72 | 0.72 | 0.78 |
| Conductivity | uS/cm | - | - | - | - | 542 | 581 | 530 | 560 | 557 | 553 | 553 | 559 | 523 | 410 | 353 | 372 | 384 | 383 | 381 | 383 | 384 | 380 | 353 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | 1.3 | 2.2 | <2.8 | 1.5 | 1.2 | 1.3 | 1.2 | 1.4 | 1.99 | 3.8 | <1 | <1 | <1 | 2.6 | <2.2 | <1 | <1 | <1 | <1 |
| Hardness | mg/L | 80-100 | OG | - | - | 243 | 254 | 242 | 265 | 272 | 270 | 293 | 278 | 245 | 174 | 190 | 175 | 166 | 171 | 172 | 173 | 160 | 173 | 173 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | <0.02 | <0.02 | 0.079 | <0.02 | 0.147 | 0.143 | <0.02 | 0.203 | 0.072 | <0.1 | 0.24 | <0.1 | 0.216 | 0.025 | 0.109 | 0.069 | 0.047 | 0.026 | 0.077 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.01 | 0.024 | <0.01 | 0.03 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 8.2 | 8.05 | 8.06 | 7.58 | 7.83 | 7.91 | 8.11 | 8.09 | 7.61 | 8.05 | 8.24 | 8.05 | 8.28 | 8.23 | 8.2 | 7.79 | 8.1 | 8.24 | 8.18 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | 0.0023 | 0.0031 | <0.001 | <0.009 | 0.002 | 0.0029 | <0.001 | 0.0022 | 0.0074 | <0.001 | 0.0058 | 0.0024 | 0.0051 | 0.0033 | <0.0023 | <0.0072 | 0.0015 | <0.001 | 0.0079 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 7.02 | 7.79 | 5.9 | 4.33 | 7.01 | 6.97 | 3.2 | 10.6 | 8.34 | 31.9 | 9.4 | 9 | 8.87 | 9.25 | 8.92 | 7.92 | 8.05 | 8.59 | 8.34 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 0.35 | 0.15 | 3.6 | 1.01 | 2 | 0.35 | 2 | 0.67 | 1.38 | <0.48 | <0.15 | 0.39 | 0.47 | 0.48 | 1.6 | 0.54 | 0.32 | 0.71 | 0.26 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.00044 | <0.00116 | 0.00046 | <0.0035 | <0.00058 | <0.00064 | 0.00375 | 0.00071 | 0.00053 | 0.00831 | 0.0011 | 0.0123 | 0.00057 | 0.00835 | 0.001 | 0.0167 | 0.00832 | 0.00334 | 0.00276 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 418 | 442 | 479 | 491 | 540 | 540 | 476 | 331 | 590 | 389 | 543 | 388 | 306 | 314 | 346 | 365 | 358 | 332 | 231 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.42 | 7.96 | 7.71 | 7.93 | 8.01 | 8.01 | 7.59 | 7.6 | 7.34 | 8.13 | 7.84 | 8.16 | 7.5 | 8.2 | 7.53 | 8.22 | 8.08 | 7.71 | 7.78 |
| Temperature, field | Deg C | 15 | AO | - | - | 10.9 | 11.7 | 7.9 | 13.1 | 8.3 | 8.3 | 10.1 | 9.32 | 11.64 | 9 | 10.4 | 9 | 10.9 | 9.5 | 8.1 | 9.7 | 9.8 | 8.4 | 11.52 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

# TABLE 6.2

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | | | | OW46A-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-110318-014 | GW-WARD2-1013-027 | GW-WARD2-DD-061514-024 | GW-WARD2-103014-029 | GW-WARD2-8/6/15-007 | GW-WARD2-171115-017 | GW-WARD2-042616-026 | GW-WARD2-110316-022 | GW-WARD2-041017-026 | GW-WARD2-112417-030 | GW-WARD2-051818-020 | GW-WARD2-110318-020 | GW-WARD2-1013-023 | GW-WARD2-DD-061514-025 | GW-WARD2-103014-034 | GW-WARD2-8/6/15-005 | GW-WARD2-161115-022 | GW-WARD2-042616-029 | GW-WARD2-110316-024 |
| **Sample Date:** | | | | | | 11/3/2018 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/17/2015 | 4/26/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/26/2016 | 11/3/2016 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 30.5 | 77.7 | 89.4 | 69.1 | 83.9 | 88.7 | 96.4 | 107 | 103 | 87.6 | 97.4 | 84.2 | 217 | 184 | 156 | 157 | 166 | 172 | 158 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | 0.153 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.05 | <0.05 | <0.05 | 0.099 | 0.016 | 0.013 | 0.016 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 19.7 | 29 | 38.9 | 29.6 | 32.8 | 31.8 | 38.9 | 45.4 | 40.1 | 39.5 | 42.4 | 38.2 | 107 | 100 | 91.7 | 76.8 | 73.4 | 86.3 | 83 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | 0.0103 | 0.0108 | 0.0014 | <0.001 | 0.0015 | 0.00092 | 0.00088 | 0.00142 | <0.0005 | 0.00243 | 0.00075 | 0.00257 | **0.298** | **0.116** | 0.0251 | 0.0055 | 0.00205 | 0.0006 | 0.00142 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.087 | <0.05 | <0.05 | 0.058 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 1.1 | 1.6 | <1 | <1 | <1 | 0.619 | 0.615 | 0.859 | 0.494 | 0.7 | 0.697 | 0.881 | 4 | 2.4 | 1.9 | 1.5 | 1.17 | 1.31 | 1.14 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 18.4 | 2.32 | 1.79 | 3.57 | 4.12 | 4.16 | 4.91 | 5.69 | 4.45 | 3.96 | 4.61 | 4.1 | 28.1 | 23.6 | 18.8 | 15.9 | 14 | 17.1 | 15.9 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 199 | 305 | 343 | 321 | 342 | 339 | 391 | 431 | 425 | 408 | 446 | 383 | 583 | 532 | 484 | 467 | 461 | 500 | 472 |
| Ammonia-N | mg/L | - | - | - | - | 0.276 | 0.141 | <0.05 | 0.052 | 0.052 | <0.05 | 0.028 | <0.094 | <0.031 | <0.34 | 0.084 | 0.205 | 0.063 | <0.05 | 0.055 | <0.05 | <0.05 | <0.02 | <0.087 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 0.82 | 9.1 | 40.6 | 30.4 | 27.2 | 27.7 | 17.5 | 24.1 | 16.6 | 12.4 | 11.1 | 11 | 39.7 | 32 | 28.8 | 26.7 | 24.4 | 30.5 | 32.2 |
| Conductivity | uS/cm | - | - | - | - | 356 | 589 | 708 | 658 | 694 | 683 | 726 | 830 | 759 | 724 | 785 | 701 | 1640 | 1310 | 1300 | 1260 | 1210 | 1350 | 1290 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | 2.04 | 2.1 | <1 | <1 | 1 | 1.8 | <3.7 | 1 | 2.1 | 1 | 1.5 | 3.11 | 3.3 | 2.3 | 1.3 | 4.1 | **9.3** | <5.1 | 1.8 |
| Hardness | mg/L | 80-100 | OG | - | - | 157 | 314 | 383 | 294 | 344 | 353 | 401 | 454 | 422 | 381 | 418 | 368 | 982 | 872 | 767 | 708 | 718 | 786 | 737 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 0.051 | 2.21 | 1.31 | 1.1 | 0.566 | 0.703 | 0.367 | 1.05 | 0.671 | 0.837 | 0.691 | 0.653 | 8.79 | 8.84 | 8.55 | 8.29 | 7.98 | 7.94 | **10.1** |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | 0.019 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.01 | <0.05 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.92 | 7.97 | 7.95 | 7.79 | 8.1 | 7.94 | 7.87 | 7.26 | 7.71 | 7.97 | 7.79 | 7.25 | 7.4 | 7.59 | 7.6 | 7.92 | 7.81 | 7.71 | 7.16 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | 0.0026 | <0.0013 | 0.0051 | 0.0029 | 0.004 | 0.0066 | <0.001 | <0.0079 | 0.0021 | <0.001 | 0.0064 | 0.0054 | <0.001 | 0.0306 | 0.0056 | 0.007 | 0.0049 | <0.001 | <0.0068 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 8.58 | 25.7 | 11.7 | 12.5 | 13.2 | 10.7 | 8.72 | 10.7 | 9.62 | 11.1 | 9.96 | 16 | 340 | 272 | 232 | 203 | 173 | 218 | 201 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 0.34 | <0.3 | 0.21 | <0.15 | 0.25 | 0.33 | 2 | 0.74 | 0.67 | 1.28 | 0.19 | <1.5 | <0.32 | 0.15 | <0.15 | 0.39 | 0.37 | 1.01 | 0.97 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | 0.0046 | 0.00211 | <0.0007 | 0.00123 | 0.00025 | <0.00092 | 0.00012 | <0.00074 | <0.0002 | 0.00281 | 0.00024 | 0.00133 | 0.00025 | <0.00043 | 0.00016 | <0.00004 | <0.00049 | <0.00004 | <0.00056 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 474 | 545 | 845 | 541 | 455 | 394 | 601 | 701 | 705 | 582 | 445 | 823 | 1670 | 2160 | 1760 | 974 | 944 | 1360 | 1310 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.94 | 7.76 | 7.79 | 7.98 | 7.32 | 7.9 | 7.39 | 7.48 | 7.55 | 7.56 | 7.15 | 7.43 | 7.3 | 7.63 | 7.13 | 6.52 | 7.62 | 7.03 | 7.45 |
| Temperature, field | Deg C | 15 | AO | - | - | 8 | 11.9 | 10.1 | 11.3 | 10.3 | 10.5 | 6.4 | 11.9 | 7.2 | 10.1 | 8.48 | 10.83 | 8.4 | 8.7 | 9.03 | 11.1 | 10.5 | 7 | 10.2 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

# TABLE 6.2

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | | | | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-041017-029 | GW-WARD2-112417-031 | GW-WARD2-051818-022 | GW-WARD2-110318-034 | GW-WARD2-1013-001 | GW-WARD2-DD-061514-028 | GW-WARD2-103014-024 | GW-WARD2-8/6/15-018 | GW-WARD2-161115-021 | GW-WARD2-042516-024 | GW-WARD2-110316-013 | GW-WARD2-041017-013 | GW-WARD2-112417-013 | GW-WARD2-051818-027 | GW-WARD2-110318-027 | GW-WARD2-1013-002 | GW-WARD2-DD-061514-030 | GW-WARD2-103014-033 | GW-WARD2-8/6/15-017 |
| **Sample Date:** | | | | | | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 153 | 187 | 173 | 145 | 80.2 | 86.9 | 78.6 | 93.6 | 81.1 | 104 | 83.8 | 109 | 74.5 | 94 | 18.5 | 96.2 | 83.4 | 81.3 | 82.5 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | 0.011 | 0.012 | 0.016 | 0.041 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.05 | <0.05 | <0.05 | <0.05 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 81 | 107 | 95 | 90.5 | 30 | 25.7 | 21.1 | 23.8 | 21.8 | 30.6 | 26.3 | 31.1 | 29 | 30.8 | 17 | 28 | 33.5 | 25.6 | 22.7 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | <0.0005 | 0.0154 | 0.00247 | 0.0113 | **0.0666** | <0.001 | <0.001 | <0.001 | 0.00056 | 0.00058 | 0.00164 | 0.00079 | 0.00116 | 0.00498 | 0.00115 | 0.0084 | <0.001 | <0.001 | <0.001 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 1.23 | 1.83 | 1.64 | 1.4 | 3.3 | <1 | <1 | <1 | 0.789 | 0.927 | 0.922 | 0.966 | 1.2 | 1 | 1.93 | <1 | <1 | <1 | <1 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 16.3 | 22.2 | 22.6 | 20.4 | 10.6 | 5.66 | 4.47 | 5.3 | 9.09 | 5.92 | 4.23 | 5.84 | 33.1 | 21 | 86.3 | 1.91 | 1.97 | 1.75 | 1.58 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 529 | 541 | 486 | 466 | 338 | 348 | 297 | 318 | 322 | 373 | 341 | 433 | 367 | 392 | 284 | 363 | 384 | 304 | 306 |
| Ammonia-N | mg/L | - | - | - | - | <0.02 | 0.789 | 0.056 | 0.165 | <0.05 | <0.05 | <0.05 | 0.06 | <0.05 | 0.068 | <0.135 | <0.043 | <0.295 | 0.069 | 0.101 | 0.06 | <0.05 | <0.05 | 0.061 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 33.7 | 41 | 38.3 | 37.3 | 6.5 | 21.3 | 2.1 | 11.9 | 5.42 | 15.3 | 2.58 | 15.8 | 13.6 | 10.5 | 25.7 | 2.5 | 3.1 | 2.9 | 1.42 |
| Conductivity | uS/cm | - | - | - | - | 1400 | 1540 | 1350 | 1340 | 633 | 630 | 547 | 598 | 549 | 679 | 614 | 761 | 694 | 693 | 619 | 650 | 619 | 590 | 557 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | 2.2 | 2.5 | **6.4** | 4.67 | 2.3 | <1 | <1 | 1.2 | 1.3 | <2.3 | <1 | <1 | <1 | <1 | 3.34 | 1.4 | <1 | <1 | 2.5 |
| Hardness | mg/L | 80-100 | OG | - | - | 715 | 907 | 824 | 734 | 324 | 323 | 283 | 332 | 292 | 387 | 318 | 399 | 305 | 362 | 116 | 356 | 346 | 308 | 299 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | **10.2** | **10.8** | 10 | 9.75 | 2.56 | 0.12 | 2.24 | 0.446 | 0.969 | 0.036 | 1.23 | <0.02 | 4.26 | 0.915 | 2.64 | 4.76 | 3.47 | 6.3 | 2.71 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.05 | 0.076 | <0.05 | <0.01 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.54 | 7.92 | 7.85 | 7.34 | 7.71 | 7.69 | 7.77 | 8.04 | 8.02 | 7.74 | 7.32 | 7.67 | 8 | 7.87 | 7.48 | 7.65 | 7.83 | 7.72 | 8.14 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | 0.0033 | <0.0012 | 0.0122 | 0.0023 | <0.001 | 0.0028 | 0.0032 | 0.0033 | 0.0027 | <0.0017 | <0.0057 | 0.0014 | <0.001 | 0.0161 | 0.008 | <0.0012 | 0.003 | 0.0092 | 0.0032 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 207 | 303 | 256 | 250 | 13.1 | 8.7 | 3.9 | 6.23 | 4.1 | 6.73 | 3 | 5.67 | 4.18 | 6.88 | 5.99 | 2.2 | 2.7 | <2 | 1.81 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 0.65 | 2.12 | 0.54 | 0.6 | <0.32 | 0.16 | <0.15 | 0.29 | 0.16 | 2.8 | 0.97 | <1.5 | <1.5 | 0.39 | 1.13 | <0.15 | <0.15 | 0.3 | 0.22 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | <0.00005 | 0.0066 | 0.00011 | 0.00041 | <0.00066 | <0.00054 | <0.00048 | 0.00012 | <0.0007 | 0.00028 | <0.00164 | <0.00017 | 0.00222 | 0.00032 | 0.00096 | 0.00056 | <0.00104 | <0.00045 | 0.00011 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 1340 | 1580 | 774 | 1560 | 620 | 805 | 570 | 491 | 460 | 628 | 586 | 718 | 603 | 416 | 739 | 597 | 788 | 580 | 443 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.07 | 7.61 | 6.94 | 7.08 | 7.79 | 7.64 | 7.6 | 6.86 | 7.77 | 7.31 | 7.66 | 7.28 | 7.53 | 7.31 | 7.62 | 7.58 | 7.76 | 7.57 | 6.86 |
| Temperature, field | Deg C | 15 | AO | - | - | 9.3 | 8.8 | 10 | 8.88 | 9.4 | 11.2 | 10.8 | 12.2 | 10.7 | 8.5 | 12.1 | 9 | 9.8 | 9.92 | 10.19 | 11.1 | **16.3** | 11 | 11.3 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | GW-WARD2-161115-020 | GW-WARD2-042516-025 | GW-WARD2-110316-014 | GW-WARD2-041017-012 | GW-WARD2-112417-012 | GW-WARD2-051818-025 | GW-WARD2-110318-017 | GW-WARD2-1013-003 | GW-WARD2-DD-061514-031 | GW-WARD2-103014-032 | GW-WARD2-8/6/15-015 | GW-WARD2-8/6/15-024 | GW-WARD2-161115-034 | GW-WARD2-042516-012 | GW-WARD2-110316-019 | GW-WARD2-041017-006 | GW-WARD2-112417-026 | GW-WARD2-051818-030 | GW-WARD2-110318-033 |
| **Sample Date:** | | | | | | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 6/8/2015 Duplicate | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | ***TLP*** [3] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | 91.1 | 89.5 | 83.4 | 82.7 | 91.3 | 108 | 95.2 | 85.1 | 89.1 | 86.1 | 102 | 90.8 | 125 | 112 | 154 | 181 | 105 | 112 | 104 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | 0.02 | <0.01 | <0.01 | <0.01 | <0.01 | 0.181 | 0.057 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | **15.6** | 0.016 | 0.023 | <0.01 |
| Magnesium (dissolved) | mg/L | - | - | - | - | 27 | 32 | 30.1 | 30.5 | 33.9 | 37.9 | 32.4 | 21.1 | 21.8 | 19 | 19.9 | 20.2 | 22.9 | 21.3 | 27.8 | 44.3 | 19.6 | 21.5 | 19.4 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | 0.00265 | <0.0005 | <0.0005 | <0.0005 | 0.00087 | 0.0369 | 0.0144 | **0.0652** | 0.001 | <0.001 | <0.001 | <0.001 | 0.00256 | 0.00138 | 0.00375 | **1.17** | 0.00313 | 0.00558 | 0.00334 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.056 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.105 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | 0.926 | 0.647 | 0.823 | 0.688 | 4.46 | 1.37 | 2.47 | 2.2 | 1.5 | 1 | 1.2 | 1.2 | 1.25 | 1.39 | 1.45 | 1.6 | 2.8 | 2.46 | 1.68 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | 1.83 | 2.11 | 2.34 | 2.06 | 2.69 | 2.61 | 2.79 | 70.9 | 64.8 | 61.9 | 70.8 | 71.4 | 85.3 | 111 | 103 | 5.64 | 69.5 | 73.9 | 67.2 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | 327 | 332 | 350 | 355 | 391 | 333 | 337 | 277 | 307 | 284 | 297 | 295 | 311 | 311 | 319 | 590 | 316 | 281 | 284 |
| Ammonia-N | mg/L | - | - | - | - | <0.05 | 0.058 | <0.123 | <0.041 | <0.27 | 0.037 | 0.341 | <0.05 | 0.055 | <0.05 | 0.052 | 0.082 | <0.05 | 0.029 | <0.077 | <0.172 | <0.27 | 0.112 | 0.12 |
| Chloride | mg/L | 250 | AO | 126.50 | - | 1.69 | 2.14 | 2.74 | 2.29 | 3.45 | 2.31 | 1.95 | 87.6 | 143 | 120 | 141 | 155 | 227 | **251** | 249 | 18.1 | 150 | 155 | 139 |
| Conductivity | uS/cm | - | - | - | - | 585 | 612 | 660 | 635 | 727 | 623 | 616 | 794 | 939 | 882 | 1060 | 1010 | 1260 | 1350 | 1370 | 1100 | 1010 | 984 | 902 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | 1.3 | <2 | <1 | <1 | 1.3 | 1 | 2.54 | <1 | 1.1 | <1 | 1.5 | <1 | 1.4 | <3.2 | <1 | 4.3 | <1 | <1 | 2.31 |
| Hardness | mg/L | 80-100 | OG | - | - | 339 | 355 | 332 | 332 | 367 | 426 | 371 | 300 | 312 | 293 | 337 | 310 | 406 | 367 | 498 | 635 | 342 | 368 | 339 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | 5.41 | 4.45 | 5.53 | 5.61 | 9.39 | 6.03 | 6.09 | 1.66 | 0.95 | 0.34 | 0.44 | 0.48 | 1.34 | 1.94 | 2.1 | <0.1 | 0.475 | 0.437 | 0.255 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.017 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.88 | 7.9 | 7.42 | 7.76 | 7.99 | 7.97 | 7.33 | 7.91 | 7.93 | 7.79 | 8.02 | 8.02 | 8.13 | 7.82 | 7.23 | 6.92 | 8.05 | 8.04 | 7.39 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | 0.0068 | <0.001 | <0.0045 | 0.0015 | <0.001 | 0.0024 | 0.01 | <0.001 | 0.0117 | 0.0042 | 0.0035 | 0.0071 | 0.0028 | <0.0032 | <0.011 | 0.0039 | <0.001 | 0.0269 | 0.0057 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | 2.19 | 3.26 | 1.53 | 2.31 | 1.99 | 3.39 | 2.44 | 17.6 | 12.8 | 8.3 | 8.4 | 9.3 | 16.2 | 22.4 | 14.6 | <1.5 | 8.82 | 7.68 | 7.65 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | 0.21 | 3.2 | 2.12 | <1.5 | 2.6 | 0.33 | 1.7 | <0.19 | 1.08 | <0.15 | 0.34 | 0.42 | <0.15 | <1.5 | 0.41 | 0.67 | 0.42 | 0.24 | 0.33 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | <0.00075 | 0.00036 | <0.00156 | <0.00023 | 0.00183 | 0.00069 | 0.00069 | <0.00076 | 0.00078 | <0.0004 | 0.00022 | 0.00034 | <0.00073 | 0.00021 | <0.00069 | <0.00034 | 0.00218 | 0.00031 | 0.00016 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | 479 | 572 | 574 | 606 | 628 | 371 | 765 | 8.14 | 1260 | 867 | 762 | 762 | 921 | 1270 | 1440 | 1080 | 1050 | 574 | 1070 |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 7.82 | 7.46 | 7.67 | 7.41 | 7.46 | 7.9 | 6.91 | 7.85 | 7.78 | 7.57 | 7.21 | 7.21 | 7.78 | 7.5 | 7.6 | 7.04 | 7.57 | 7.07 | 6.8 |
| Temperature, field | Deg C | 15 | AO | - | - | 10.2 | 9.4 | 12.4 | 9.8 | 10.5 | 10.56 | 11.15 | 9.5 | 10.6 | 9.3 | 11.6 | 11.6 | 11 | 10.2 | 10 | 7.2 | 9.5 | 10.29 | 9.08 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| [3] | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.2**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | | CRA-4074-02-WARD2-25 | GW-WARD2-1210-003 | GW-WARD2-0511-005 | GW-WARD2-1011-005 | GW-WARD2-0412-004 | GW-WARD2-1112-005 | GW-WARD2-0513-022 | GW-WARD2-1013-013 | GW-WARD2-DD-061514-032 | GW-WARD2-103014-025 | GW-WARD2-8/6/15-016 | GW-WARD2-171115-007 | GW-WARD2-042516-018 | GW-WARD2-110316-028 | GW-WARD2-041017-009 | GW-WARD2-112417-010 | GW-WARD2-051818-026 | GW-WARD2-110318-004 |
| **Sample Date:** | | *ODWS*[1] | *ODWS Source* | *MABC*[2] | *TLP*[3] | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/17/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 |
| **Parameters** | **Units** | | | | | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | - | - | - | <0.5 | 2.99 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.113 | <0.05 | 0.231 | 0.088 | 0.232 | <0.05 | <0.05 |
| Iron (dissolved) | mg/L | 0.30 | AO | 0.16 | 0.3 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Magnesium (dissolved) | mg/L | - | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Manganese (dissolved) | mg/L | 0.05 | AO | 0.03 | - | <0.001 | 0.0027 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Phosphorus (dissolved) | mg/L | - | - | - | 0.03 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | - | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.05 | <0.05 | 0.093 | <0.05 | <0.05 | <0.05 | <0.05 |
| Sodium (dissolved) | mg/L | 20/200 | AO | 101.73 | - | <0.5 | 0.6 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.56 | <0.5 | <0.5 | <0.5 | <0.5 |
| **General Chemistry** | | | | | - | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | - | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | 10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Ammonia-N | mg/L | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.068 | <0.05 | <0.02 | 0.09 | 0.048 | 0.081 | 0.031 | <0.02 |
| Chloride | mg/L | 250 | AO | 126.50 | - | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Conductivity | uS/cm | - | - | - | - | 2.77 | 3.78 | 1.3 | 0.82 | <3 | 3.2 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.05 | - | <1 | <1 | <1 | <1 | 1.7 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1.5 | <1 | <1 | <1 | <1 | 1.17 |
| Hardness | mg/L | 80-100 | OG | - | - | <10 | <10 | <10 | <10 | <10 | <10 | - | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 4.82 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.33 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | 6.9 | 7.21 | 7.09 | 6.94 | 7.02 | 7.29 | 7.32 | 6.86 | 7.37 | 7.5 | 7.25 | 7.53 | 6.75 | 7.26 | 6.26 | 6.85 | 6.44 | 5.71 |
| Phenolics (total) | mg/L | - | - | - | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.0028 | 0.0041 | 0.0043 | 0.0036 | 0.0018 | 0.0062 | 0.0074 | <0.001 | 0.0011 | 0.0049 | 0.0075 |
| Sulfate | mg/L | 500 | AO | 251.57 | - | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | - | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | 0.18 | <0.15 | 0.17 | <0.15 | 0.99 | 0.24 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 |
| Un-ionized ammonia | mg/L | - | - | - | 0.02 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pH, field | s.u. | 6.5-8.5 | OG | - | 6.5-8.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Temperature, field | Deg C | 15 | AO | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| (1) | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| (2) | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| (3) | Trigger Level concentrations (CRA, 2012). |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.3**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**LEACHATE ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | | Leachate Holding Tank | Leachate Holding Tank | Leachate Holding Tank | Leachate Holding Tank | Leachate Holding Tank | Leachate Holding Tank | Leachate Holding Tank |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | | LW-WARD2-1112-001 | LW-WARD2-0613-001 | LW-WARD2-DD-061514-001 | LW-WARD2-8/6/15-001 | LW-WARD2-042616-001 | LW-WARD2-041017-001 | LW-WARD2-051818-001 |
| **Sample Date:** | | | | | 12/5/2012 | 6/3/2013 | 6/15/2014 | 6/8/2015 | 4/26/2016 | 4/10/2017 | 5/18/2018 |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | ***MABC*** [2] | | | | | | | |
| **Metals** | | | | | | | | | | | |
| Arsenic | mg/L | - | IMAC | - | - | **0.011** | 0.01 | <0.01 | 0.0047 | **0.0365** | **0.0254** |
| Barium | mg/L | 1.0 | MAC | - | 0.37 | 0.14 | 0.156 | 0.072 | 0.0912 | 0.181 | 0.14 |
| Boron | mg/L | 5.0 | IMAC | - | 3.04 | 1.41 | 1.46 | 0.68 | 1.13 | 3.46 | **5.53** |
| Cadmium | mg/L | 0.005 | MAC | - | <0.0009 | 0.00182 | 0.00113 | <0.0009 | 0.00075 | 0.00147 | 0.000179 |
| Calcium | mg/L | - | - | - | 472 | 394 | 637 | 206 | 218 | 521 | 311 |
| Chromium | mg/L | 0.05 | MAC | - | **0.0597** | 0.023 | 0.0309 | 0.0086 | 0.0114 | **0.0615** | 0.0349 |
| Copper | mg/L | 1.0 | AO | - | 0.026 | <0.01 | <0.01 | <0.01 | <0.01 | 0.014 | <0.01 |
| Iron | mg/L | 0.30 | AO | 0.175 | **2.92** | **9.08** | **1.9** | **9.22** | **1.28** | **1.87** | **1.22** |
| Lead | mg/L | 0.01 | MAC | - | <0.01 | <0.005 | <0.005 | <0.005 | 0.0018 | 0.00834 | 0.00648 |
| Magnesium | mg/L | - | - | - | 131 | 97.7 | 107 | 68.6 | 67.1 | 170 | 125 |
| Manganese | mg/L | 0.05 | AO | 0.03675 | **1.06** | **2.79** | **3.45** | **0.724** | **0.924** | **1.98** | **0.957** |
| Mercury | mg/L | 0.001 | MAC | - | - | <0.0001 | <0.0001 | <0.00001 | <0.00001 | 0.00004 | <0.0001 |
| Potassium | mg/L | - | - | - | - | 118 | 176 | 51 | 85.2 | 322 | 253 |
| Sodium | mg/L | 20/200 | AO | - | - | **216** | **205** | 97 | 131 | **474** | **399** |
| Zinc | mg/L | 5.0 | AO | - | 0.342 | 0.704 | 0.403 | 0.034 | 0.956 | 0.524 | 0.145 |
| **General Chemistry** | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | 30-500 | OG | - | 3070 | 2390 | 2350 | 1030 | 961 | 3670 | 2560 |
| Ammonia-N | mg/L | - | - | - | 215 | 102 | 113 | 49 | 66.8 | 194 | 171 |
| Biochemical oxygen demand (BOD) | mg/L | - | - | - | 1650 | 1680 | 1470 | 18 | 136 | 533 | 61.2 |
| Chemical oxygen demand (COD) | mg/L | - | - | - | 2870 | 3100 | 2630 | 119 | 500 | 1630 | 800 |
| Chloride | mg/L | 250 | AO | 132.1 | **459** | 175 | 226 | 116 | 144 | **627** | **391** |
| Conductivity | uS/cm | - | - | - | 6030 | 3470 | 3720 | 2180 | 2590 | 7070 | 5680 |
| Dissolved organic carbon (DOC) | mg/L | 5.0 | AO | 3.95 | **466** | **981** | **926** | **30.9** | **103** | **497** | **186** |
| Hardness | mg/L | 80-100 | OG | - | 1720 | 1390 | 2030 | 797 | 821 | 2000 | 1290 |
| Nitrate (as N) | mg/L | 10.0 | MAC | 3.13 | <0.1 | <2 | <2 | <0.4 | 2.46 | <0.4 | <0.4 |
| Nitrite (as N) | mg/L | 1.0 | MAC | 0.325 | <0.1 | <2 | <2 | <0.2 | **1.38** | <0.2 | <0.2 |
| Orthophosphate | mg/L | - | - | - | - | - | - | - | 1.99 | - | - |
| pH, lab | s.u. | 6.5-8.5 | OG | - | 7.6 | 6.6 | 7.05 | 7.25 | 7.66 | 7.5 | 7.29 |
| Phenolics (total) | mg/L | - | - | - | - | 0.979 | 1.6 | 0.0138 | 0.111 | 0.591 | 0.0834 |
| Phosphorus | mg/L | - | - | - | - | 5.7 | 10.4 | 1.48 | 2.39 | 15.5 | 4.61 |
| Sulfate | mg/L | 500 | AO | 252.55 | - | <40 | <40 | 70.4 | 82.3 | 63.3 | 85.4 |
| Total dissolved solids (TDS) | mg/L | 500 | AO | - | - | **3160** | **3440** | **1080** | **1420** | **4290** | **2960** |
| Total kjeldahl nitrogen (TKN) | mg/L | - | - | - | 236 | 111 | 121 | 50.5 | 88 | 333 | 308 |
| Total suspended solids (TSS) | mg/L | - | - | - | - | 36.3 | 22 | 17.1 | 32.6 | 68 | 25.8 |
| **Field Parameters** | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | - | 6230 | 1950 | 2460 | 2460 | 5210 |
| pH, field | s.u. | 6.5-8.5 | OG | - | - | - | 7.03 | 5.82 | 6.81 | 6.81 | 7.12 |
| Temperature, field | Deg C | 15 | AO | - | - | - | 11.6 | 12.2 | 8.3 | 8.3 | 13.86 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| [2] | Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters. |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.4**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**SURFACE WATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Sump | GW Sump | GW Sump | GW Sump | GW Sump | GW Sump | GW Sump | GW Sump | SW1 | SW1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | **PIPE** | **SW-WARD2-DD-061514-009** | **SW-WARD2-103014-009** | **SW-WARD2-8/6/15-009** | **SW-WARD2-161115-008** | **SW-WARD2-042516-008** | **SW-WARD2-110316-003** | **SW-WARD2-041017-007** | **SW-WARD2-112417-004** | **SW-WARD2-051818-010** | **SW-WARD2-110318-001** | **SW-WARD2-DD-061514-010** | **SW-WARD2-103014-006** | **SW-WARD2-8/6/15-010** | **SW-WARD2-161115-007** | **SW-WARD2-110316-008** | **SW-WARD2-041017-006** | **SW-WARD2-112417-003** | **SW-WARD2-051818-002** | **CRA-4074-02-WARD2-44** | **SW-WARD2-1210-003** |
| **Sample Date:** | | | **5/4/2014** | **6/15/2014** | **10/30/2014** | **6/8/2015** | **11/16/2015** | **4/25/2016** | **11/3/2016** | **4/10/2017** | **11/24/2017** | **5/18/2018** | **11/3/2018** | **6/15/2014** | **10/30/2014** | **6/8/2015** | **11/16/2015** | **11/3/2016** | **4/10/2017** | **11/24/2017** | **5/18/2018** | **5/12/2010** | **12/1/2010** |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 124 | 103 | 106 | 135 | 54.7 | 113 | 59.5 | 117 | 131 | 123 | 125 | 130 | 39.9 | 114 | 162 | 92.1 | 126 | 156 | 110 | 69.4 | 64.4 |
| Iron | mg/L | 0.3 | <0.05 | <0.05 | 0.057 | **1.48** | <0.05 | <0.05 | <0.05 | <0.05 | 0.099 | 0.061 | **0.468** | 0.08 | 0.109 | <0.05 | **5.16** | **0.529** | **2.84** | **1.39** | **0.944** | **0.313** | **4.47** |
| Magnesium | mg/L | - | 45.1 | 22.7 | 40.3 | 48.7 | 11 | 25.3 | 10 | 27.4 | 27.4 | 28.1 | 31.4 | 41.6 | 9.34 | 26.2 | 55.5 | 56.5 | 51.3 | 67.1 | 59.2 | 26.3 | 20.4 |
| Manganese | mg/L | - | 0.126 | 0.0075 | 0.0655 | 2.23 | 0.0018 | 0.00249 | 0.0096 | <0.0005 | 0.00415 | 0.00457 | 0.0211 | 0.159 | 0.0056 | 0.0028 | 0.385 | 0.291 | 0.295 | 0.26 | 0.298 | 0.0161 | 0.077 |
| Phosphorus | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | **0.194** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | **0.263** | **0.27** | **0.362** | <0.5 | **0.064** | **0.061** | <0.5 |
| Potassium | mg/L | - | 4.8 | <1 | 3.5 | 7.2 | 6.31 | 0.685 | 6.2 | 0.81 | 0.743 | 0.858 | 0.633 | 5.1 | 4.8 | <1 | 6.4 | 8.92 | 18.6 | 40 | 16.8 | 3.4 | <10 |
| Sodium | mg/L | - | 26.8 | 17.8 | 22.5 | 31.2 | 20.6 | 25.8 | 15.4 | 24.7 | 16.9 | 29.1 | 16 | 29.1 | 14.8 | 18.4 | 29.1 | 20.6 | 34.7 | 89.7 | 32.8 | 9.37 | <5 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 415 | 345 | 439 | 455 | 169 | 370 | 180 | 379 | 393 | 352 | 320 | 469 | 143 | 376 | 242 | 314 | 469 | 699 | 437 | 233 | 164 |
| Ammonia-N | mg/L | - | 0.117 | <0.05 | 0.264 | <0.05 | <0.05 | <0.02 | 0.114 | <0.02 | 0.353 | 0.054 | 0.062 | 0.058 | <0.05 | <0.05 | <0.05 | 0.177 | 1.62 | 20.1 | 1.57 | <0.05 | 0.069 |
| Chloride | mg/L | - | 74.4 | 36.7 | 45.9 | 78.8 | 40.6 | 50 | 37.7 | 50.1 | 32.1 | 58.3 | 30.1 | 87.3 | 24.5 | 37 | 66.3 | 35.5 | 66.2 | 120 | 51.7 | 13.2 | 7.6 |
| Conductivity | uS/cm | - | 1020 | 704 | 866 | 1090 | 467 | 817 | 464 | 850 | 838 | 846 | 735 | 1030 | 336 | 774 | 748 | 817 | 1110 | 1740 | 1050 | 522 | 387 |
| Dissolved organic carbon (DOC) | mg/L | - | 1.1 | 1 | 2.1 | 2.4 | 5.5 | 3.7 | 4.5 | <1 | 1.6 | 2.3 | 2.95 | 1.7 | 6.2 | 1.3 | 4.2 | 5.8 | 15.4 | 41.6 | 12.8 | 6.2 | 6.8 |
| Hardness | mg/L | - | 494 | 351 | 431 | 538 | 182 | 388 | 190 | 406 | 439 | 422 | 443 | 495 | 138 | 391 | 634 | 463 | 527 | 666 | 520 | 282 | 245 |
| Nitrate (as N) | mg/L | - | 2.53 | 3.03 | 2.66 | 0.95 | 0.613 | 2.4 | 0.374 | 4.59 | 9.34 | 8.25 | 7.1 | 1.32 | 0.36 | 3.66 | 0.486 | 0.817 | 0.21 | 1.52 | 0.132 | 0.93 | 4.06 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.01 | <0.01 | 0.014 | <0.05 | <0.05 | 0.059 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 7.78 | 7.99 | 7.8 | 8.11 | 7.89 | 7.95 | 7.9 | 7.92 | 8.12 | 7.89 | 7.9 | 7.99 | 8.08 | 8.18 | 7.62 | 7.54 | 7.85 | 7.76 | 7.98 | 8.4 | 8.14 |
| Phenolics (total) | mg/L | 0.001 | <0.001 | **0.0048** | **0.0025** | **0.0056** | **0.0011** | <0.001 | **0.0059** | **0.0013** | **0.0012** | **0.0089** | **0.0039** | **0.0036** | <0.001 | **0.0038** | **0.0029** | **0.0045** | **0.0036** | **0.0066** | **0.0061** | <0.001 | <0.001 |
| Phosphorus | mg/L | 0.01-0.03 (e) | 0.005 | 0.007 | 0.0052 | 0.0199 | **0.0341** | 0.0033 | **0.0325** | <0.003 | 0.0036 | 0.0031 | 0.0047 | 0.0079 | 0.0273 | 0.0071 | 0.025 | 0.0165 | **0.0961** | **0.187** | **0.0521** | 0.0228 | **0.438** |
| Sulfate | mg/L | - | 52.2 | 5 | 61.2 | 60.1 | 5.02 | 5.29 | 6.19 | 8.33 | 9.73 | 8.64 | 15.5 | 46.8 | <2 | 5.6 | 57 | 84.6 | 80.5 | 107 | 104 | 27.1 | 9.9 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.44 | 1.47 | 0.47 | 0.21 | 0.59 | 0.4 | 0.36 | 0.7 | 0.68 | 0.49 | 0.44 | 0.3 | 0.37 | <0.15 | 0.19 | 0.7 | 3.76 | 27.1 | 3.37 | 0.81 | 0.85 |
| Un-ionized ammonia | mg/L | 0.02 (d) | - | <0.00071 | 0.0019 | <0.00009 | <0.00003 | <0.00007 | 0.00301 | <0.0001 | 0.0026 | 0.00012 | 0.00046 | 0.00058 | - | <0.00012 | <0.01768 | 0.00346 | 0.00716 | **0.13233** | 0.00898 | <0.00453 | 0.00017 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | 917 | 859 | 850 | 370 | 725 | 441 | 798 | 719 | 495 | 918 | 1490 | NM | 602 | 576 | 755 | 1130 | 1770 | 603 | 472 | 292 |
| Dissolved oxygen (DO), field | mg/L | >4 (f) | - | 6.26 | NM | - | - | - | - | 8.38 | 8.93 | - | 5.54 | - | NM | - | - | - | **3.38** | 8.58 | - | 10.08 | 10.05 |
| pH, field | s.u. | 6.5-8.5 | - | 7.7 | 7.49 | 6.7 | **6.32** | 7.24 | 8.01 | 7.42 | 7.53 | 7.04 | 7.51 | 7.63 | NM | 6.94 | **9.24** | 7.87 | 7.27 | 7.55 | 7.26 | **8.62** | 7.2 |
| Temperature, field | Deg C | - | - | 12.9 | 10.4 | 16.6 | 10.7 | 8 | 11.9 | 7.9 | 9.5 | 8.82 | 10.27 | 10.5 | NM | 12.7 | 13 | 12.1 | 10.6 | 7.5 | 14.25 | 10.5 | 5.3 |

Notes:

[1] Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.

(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.

(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L

- Parameter not analyzed / no information

< Parameter detected below the laboratory method detection limit

**36.0** Parameter exceeds the PWQO.

**TABLE 6.4**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**SURFACE WATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW2 | SW2 | SW2 | SW2 | SW2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | SW-WARD2-0511-001 | SW-WARD2-1011-006 | SW-WARD2-0412-003 | SW-WARD2-1112-003 | SW-WARD2-0513-001 | SW-WARD2-1013-001 | SW-WARD2-DD-061514-003 | SW-WARD2-103014-005 | SW-WARD2-8/6/15-008 | SW-WARD2-161115-001 | SW-WARD2-042516-009 | SW-WARD2-110316-001 | SW-WARD2-041017-002 | SW-WARD2-112417-002 | SW-WARD2-051818-001 | SW-WARD2-110318-005 | CRA-4074-02-WARD2-45 | SW-WARD2-1210-005 | SW-WARD2-0511-006 | SW-WARD2-1011-001 | SW-WARD2-0412-005 |
| **Sample Date:** | | | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 75.6 | 79.9 | 61.4 | 83.4 | 68.2 | 67.1 | 115 | 91.6 | 77.6 | 81.2 | 66.9 | 118 | 145 | 75 | 75 | 78.6 | 66 | 64 | 75.7 | 75.4 | 65.2 |
| Iron | mg/L | 0.3 | **5.05** | 0.147 | 0.209 | 0.09 | 0.116 | **2.91** | 0.23 | **0.996** | 0.213 | **0.841** | 0.293 | **0.33** | **1.36** | **0.823** | **0.374** | **1.03** | 0.232 | **4.33** | **2.17** | 0.15 | 0.146 |
| Magnesium | mg/L | - | 23.1 | 23.1 | 22.9 | 26.9 | 24.6 | 19.4 | 24.9 | 27.1 | 28.1 | 24 | 23.3 | 28.6 | 43.4 | 21.3 | 21.6 | 23.5 | 25.9 | 17.7 | 22.3 | 20.3 | 23.9 |
| Manganese | mg/L | - | 0.0893 | 0.0108 | 0.017 | 0.0059 | 0.0193 | 0.0467 | 0.0209 | 0.0285 | 0.0227 | 0.0198 | 0.0188 | 0.0489 | 0.323 | 0.0233 | 0.0195 | 0.0213 | 0.0157 | 0.0797 | 0.0601 | 0.0098 | 0.0196 |
| Phosphorus | mg/L | 0.01-0.03 (e) | **0.367** | <0.05 | <0.05 | **0.12** | **0.069** | **0.306** | <0.05 | **0.209** | <0.05 | **0.1** | <0.05 | **0.342** | <0.05 | **0.099** | **0.074** | **0.18** | **0.061** | **0.267** | **0.249** | <0.05 | <0.05 |
| Potassium | mg/L | - | 6.1 | 2.4 | 1.9 | 2.5 | 1.9 | 4.9 | 1.8 | 4.8 | 2.3 | 3.17 | 1.81 | 5.77 | 3.25 | 2.48 | 2.1 | 3.58 | 3.3 | 4.7 | 3.8 | 2.1 | 1.9 |
| Sodium | mg/L | - | 4.37 | 7.05 | 9.39 | 8.62 | 7.87 | 4.17 | 12.9 | 6.16 | 15.9 | 5.26 | 6.84 | 13.7 | 25.5 | 4.63 | 5.32 | 5.44 | 9.3 | 3.02 | 4.27 | 6.39 | 9.74 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 197 | 236 | 223 | 244 | 231 | 216 | 237 | 338 | 227 | 272 | 232 | 251 | 509 | 250 | 230 | 234 | 228 | 166 | 204 | 237 | 209 |
| Ammonia-N | mg/L | - | 0.18 | <0.05 | 0.072 | <0.05 | <0.05 | 0.115 | <0.05 | <0.05 | <0.05 | <0.05 | 0.023 | 0.16 | 1.61 | 0.201 | 0.129 | 0.026 | <0.05 | 0.07 | 0.14 | <0.05 | 0.05 |
| Chloride | mg/L | - | 8.7 | 13 | 11.8 | 17 | 10.1 | 11.8 | 11.9 | 14.1 | 15.2 | 14.7 | 9.47 | 19.4 | 30.8 | 11.4 | 11.4 | 14.9 | 12.7 | 7.6 | 8 | 13.4 | 12.9 |
| Conductivity | uS/cm | - | 464 | 553 | 524 | 368 | 381 | 469 | 558 | 609 | 596 | 583 | 503 | 624 | 1010 | 536 | 499 | 528 | 515 | 394 | 473 | 548 | 528 |
| Dissolved organic carbon (DOC) | mg/L | - | 8.6 | 6.7 | 5 | 5.5 | 7.1 | 8.6 | 5.5 | 9 | 6 | 7.6 | 5.6 | 5.9 | 4.8 | 6.2 | 6.4 | 14.9 | 6.6 | 24.5 | 8.7 | 7.2 | 5 |
| Hardness | mg/L | - | 284 | 295 | 248 | 319 | 272 | 248 | 390 | 340 | 309 | 302 | 263 | 412 | 542 | 275 | 276 | 293 | 271 | 233 | 281 | 272 | 261 |
| Nitrate (as N) | mg/L | - | 6.7 | 3.06 | 0.46 | 5.17 | 1.38 | 5.13 | 0.19 | 2.37 | 0.157 | 5.35 | 1.33 | 0.144 | 0.111 | 3.77 | 4.26 | 6.76 | 0.8 | 4.01 | 6.62 | 2.91 | 0.46 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | 0.016 | <0.01 | <0.01 | <0.01 | <0.01 | 0.047 | 0.015 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 8.15 | 8.32 | 8.3 | 8.27 | 8.28 | 8.12 | 8.4 | 8.22 | 8.42 | 8.39 | 8.48 | 8.03 | 7.96 | 8.28 | 8.38 | 8.06 | 8.46 | 8.14 | 8.23 | 8.33 | 8.32 |
| Phenolics (total) | mg/L | 0.001 | 0.001 | <0.001 | <0.001 | **0.002** | **0.004** | <0.0018 | **0.0033** | 0.001 | **0.006** | **0.0026** | <0.001 | **0.0071** | **0.0034** | <0.001 | **0.0061** | **0.0036** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Phosphorus | mg/L | 0.01-0.03 (e) | **0.277** | 0.0086 | 0.0189 | **0.0342** | 0.0259 | **0.198** | 0.0241 | **0.241** | 0.0248 | **0.108** | **0.0356** | **0.0917** | 0.0108 | **0.0932** | **0.0599** | **0.158** | 0.0256 | **0.441** | **0.199** | 0.0093 | 0.018 |
| Sulfate | mg/L | - | 9.4 | 34.2 | 47.6 | 35.3 | 30.6 | 12.9 | 67 | 18 | 82 | 14.1 | 26.3 | 58.7 | 25.8 | 13.2 | 15.6 | 15.2 | 27.2 | 8.6 | 9.9 | 35 | 43.7 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 1.22 | 0.47 | 0.56 | 0.79 | 0.57 | 0.97 | 0.5 | 0.73 | 0.42 | 0.75 | 0.39 | 1.1 | 1.86 | 1.02 | 1.12 | 1.09 | 0.77 | 0.9 | 0.91 | 0.85 | 0.55 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.000002 | <0.00043 | 0.0009 | <0.0001 | <0.0000167 | 0.0025287 | <0.00061 | - | <0.00009 | <0.00026 | 0.00011 | 0.00388 | 0.016 | 0.00108 | 0.00147 | 0.00005 | <0.00617 | 0.00029 | 0.000002 | <0.00092 | 0.0007 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 13.6 | 565 | 522 | 487 | 470 | 462 | 744 | - | 784 | 449 | 478 | 611 | 483 | 483 | 298 | 700 | 465 | 290 | 14.2 | 552 | 574 |
| Dissolved oxygen (DO), field | mg/L | >4 (f) | - | - | 8.16 | 6.4 | 6.07 | 8.44 | 4.86 | - | 9.45 | - | - | - | 8.9 | 11.6 | - | **3.84** | 12.02 | 11.07 | - | - | 9.17 |
| pH, field | s.u. | 6.5-8.5 | **4.76** | 7.81 | 7.75 | 7.14 | **6.39** | 8.1 | 7.55 | 7.47 | 6.58 | 7.41 | 7.31 | 8.05 | 7.59 | 7.59 | 7.57 | 7 | **8.73** | 7.43 | **4.77** | 8.16 | 7.81 |
| Temperature, field | Deg C | - | 7.65 | 3.6 | 9.7 | 3.2 | 6.1 | 9.5 | 15.6 | - | 19 | 8.4 | 11 | 9.6 | 11.6 | 3.8 | 14.03 | 7.56 | 11.6 | 5.2 | 8.9 | 3 | 9.9 |

Notes:

[1] Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.

(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.

(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L

- Parameter not analyzed / no information

< Parameter detected below the laboratory method detection limit

**36.0** Parameter exceeds the PWQO.

**TABLE 6.4**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**SURFACE WATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | **SW-WARD2-1112-004** | **SW-WARD2-0513-004** | **SW-WARD2-1013-006** | **SW-WARD2-DD-061514-005** | **SW-WARD2-103014-002** | **SW-WARD2-8/6/15-004** | **SW-WARD2-161115-006** | **SW-WARD2-042516-001** | **SW-WARD2-110316-002** | **SW-WARD2-041017-005** | **SW-WARD2-112417-008** | **SW-WARD2-051818-005** | **SW-WARD2-110318-009** | **CRA-4074-02-WARD2-46** | **SW-WARD2-1210-006** | **SW-WARD2-0511-005** | **SW-WARD2-1011-002** | **SW-WARD2-0412-004** | **SW-WARD2-1112-006** | **SW-WARD2-0513-005** | **SW-WARD2-1013-004** |
| **Sample Date:** | | | **11/26/2012** | **5/13/2013** | **10/22/2013** | **6/15/2014** | **10/30/2014** | **6/8/2015** | **11/16/2015** | **4/25/2016** | **11/3/2016** | **4/10/2017** | **11/24/2017** | **5/18/2018** | **11/3/2018** | **5/12/2010** | **12/1/2010** | **5/24/2011** | **11/22/2011** | **4/22/2012** | **11/26/2012** | **5/13/2013** | **10/22/2013** |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 82.7 | 70.8 | 67.1 | 108 | 91.1 | 73.6 | 82.8 | 66.7 | 84 | 58.4 | 77.3 | 75.2 | 79.6 | 65 | 68.6 | 82 | 88.9 | 75 | 78.8 | 81.4 | 69.5 |
| Iron | mg/L | 0.3 | 0.094 | 0.087 | **2.19** | 0.139 | **0.775** | 0.22 | **0.788** | 0.244 | 0.204 | **1.2** | **0.923** | **0.362** | **0.948** | 0.243 | **3.92** | **1.52** | <0.05 | 0.062 | <0.05 | <0.05 | **2.21** |
| Magnesium | mg/L | - | 25.9 | 23.1 | 19.7 | 24.8 | 26.5 | 27.4 | 22.9 | 23.2 | 27.9 | 17.3 | 21.5 | 21.5 | 22.3 | 25.1 | 18.6 | 23 | 23.2 | 22.8 | 27.4 | 25.7 | 20.4 |
| Manganese | mg/L | - | 0.0062 | 0.0195 | 0.0344 | 0.0184 | 0.0208 | 0.0401 | 0.0191 | 0.0169 | 0.0194 | 0.0281 | 0.0248 | 0.0191 | 0.0197 | 0.0158 | 0.077 | 0.0611 | 0.0326 | 0.0218 | 0.0133 | 0.0135 | 0.0357 |
| Phosphorus | mg/L | 0.01-0.03 (e) | **0.11** | <0.05 | **0.265** | <0.05 | **0.189** | <0.05 | **0.099** | <0.05 | <0.05 | **0.094** | **0.08** | **0.079** | **0.18** | **0.058** | **0.235** | **0.232** | <0.05 | <0.05 | <0.1 | <0.05 | **0.277** |
| Potassium | mg/L | - | 2.4 | 1.9 | 4.6 | 1.8 | 4.4 | 2.2 | 3.19 | 1.83 | 4.64 | 1.97 | 2.42 | 2.1 | 3.54 | 3.2 | 4.2 | 3.9 | <1 | <1 | <1 | <1 | 4.7 |
| Sodium | mg/L | - | 8.46 | 7.29 | 4.34 | 12.9 | 5.9 | 14.9 | 5.23 | 6.77 | 12.6 | 4.11 | 4.5 | 5.44 | 5.25 | 8.64 | 3.61 | 4.49 | 6.83 | 5.94 | 10.4 | 8.92 | 4.61 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 244 | 228 | 222 | 230 | 322 | 221 | 263 | 228 | 252 | 203 | 249 | 229 | 241 | 233 | 179 | 205 | 304 | 287 | 284 | 293 | 218 |
| Ammonia-N | mg/L | - | 0.062 | <0.05 | 0.069 | <0.05 | <0.05 | 0.067 | <0.05 | <0.02 | 0.133 | <0.023 | 0.092 | 0.071 | 0.072 | <0.05 | 0.065 | 0.145 | <0.05 | <0.05 | <0.05 | <0.05 | 0.061 |
| Chloride | mg/L | - | 16.9 | 9.8 | 11.8 | 12.4 | 14 | 14.9 | 14.7 | 9.31 | 18.2 | 8.73 | 10.9 | 11.4 | 14.9 | 12.6 | 8 | 8 | 13.4 | 11.1 | 28.8 | 19.5 | 12 |
| Conductivity | uS/cm | - | 367 | 370 | 479 | 545 | 620 | 577 | 583 | 497 | 614 | 442 | 538 | 497 | 855 | 515 | 414 | 470 | 569 | 555 | 398 | 410 | 479 |
| Dissolved organic carbon (DOC) | mg/L | - | 5.4 | 5.1 | 8.4 | 5.5 | 8.8 | 5.1 | 7.5 | 6.4 | 6.3 | 5.6 | 5.8 | 6.5 | 11.3 | 7 | 12.5 | 8.8 | 3.1 | 2.9 | 2.8 | 3.1 | 8 |
| Hardness | mg/L | - | 313 | 272 | 249 | 371 | 337 | 297 | 301 | 262 | 325 | 217 | 281 | 276 | 291 | 265 | 248 | 299 | 318 | 281 | 310 | 309 | 257 |
| Nitrate (as N) | mg/L | - | 5.13 | 1.27 | 5.38 | 0.12 | 2.35 | 0.276 | 5.3 | 1.21 | 0.117 | 3.88 | 3.79 | 4.25 | 6.71 | 0.77 | 3.42 | 6.36 | 0.27 | 0.21 | 0.11 | 0.15 | 5.33 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | 0.018 | <0.01 | <0.01 | 0.011 | <0.01 | 0.048 | 0.014 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 8.3 | 8.33 | 8.17 | 8.45 | 8.23 | 8.41 | 8.14 | 8.5 | 7.93 | 8.26 | 8.29 | 8.43 | 7.42 | 8.44 | 8.17 | 8.23 | 8.27 | 8.32 | 8.2 | 8.35 | 8.16 |
| Phenolics (total) | mg/L | 0.001 | <0.001 | 0.001 | <0.0011 | **0.0012** | **0.0025** | **0.0077** | **0.0027** | <0.001 | **0.0075** | **0.0023** | <0.001 | **0.006** | **0.0018** | <0.002 | <0.001 | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.0024 |
| Phosphorus | mg/L | 0.01-0.03 (e) | **0.0312** | 0.024 | **0.157** | 0.0221 | **0.201** | 0.0205 | **0.106** | 0.0212 | 0.0192 | **0.0975** | **0.0902** | **0.0649** | **0.135** | 0.0253 | **0.337** | **0.216** | <0.003 | 0.0062 | <0.003 | 0.0051 | **0.164** |
| Sulfate | mg/L | - | 37 | 30.3 | 12.1 | 66.6 | 18.2 | 74.7 | 14.8 | 26.4 | 56.4 | 10.9 | 13.5 | 16.4 | 15.6 | 26.6 | 8.1 | 9.7 | 4.9 | 5.9 | 12.8 | 5.8 | 12.1 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.9 | 0.56 | 0.9 | 0.46 | 0.89 | 0.49 | 0.73 | 0.48 | 0.55 | 0.97 | 0.78 | 1.07 | 1.09 | 0.95 | 0.65 | 1.03 | <0.15 | 0.26 | 0.38 | 0.21 | 0.93 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.0002 | <0.0011611 | 0.0022535 | <0.00549 | <0.00103 | 0.00119 | <0.01288 | <0.00059 | 0.00568 | 0.00074 | 0.00044 | 0.00317 | 0.00038 | <0.00588 | 0.0003 | 0.000002 | <0.00095 | <0.0011 | <0.0001 | <0.0006553 | 0.0019923 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 452 | 470 | 443 | 737 | 645 | 464 | 470 | 439 | 573 | 416 | 465 | 289 | 672 | 363 | 297 | 14.2 | 561 | 533 | 488 | 408 | 443 |
| Dissolved oxygen (DO), field | mg/L | >4 (f) | 7.66 | 8.52 | 8.53 | 6.56 | 9.27 | 10.62 | - | - | - | 9.66 | 11.55 | - | 5.01 | 11.63 | 11.31 | - | - | 8.34 | 6.18 | 8.82 | 9.83 |
| pH, field | s.u. | 6.5-8.5 | 7.48 | 8.2 | 8.28 | 8.47 | 8.01 | 7.58 | **9.24** | 8.07 | 8.31 | 8.14 | 7.5 | 8.1 | 7.45 | **8.71** | 7.46 | **4.78** | 8.19 | 8 | 7.3 | 8.01 | 8.28 |
| Temperature, field | Deg C | - | 2.3 | 7.3 | 9.4 | 17.7 | 8.7 | 19.7 | 7.6 | 11.5 | 9.4 | 10.6 | 4.9 | 16.27 | 7.67 | 11.5 | 5.9 | 9 | 2.6 | 10.4 | 2.5 | 5.5 | 9.4 |

Notes:

[1] Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.

(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.

(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L

- Parameter not analyzed / no information

< Parameter detected below the laboratory method detection limit

**36.0** Parameter exceeds the PWQO.

**TABLE 6.4**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**SURFACE WATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | SW-WARD2-DD-061514-006 | SW-WARD2-103014-004 | SW-WARD2-8/6/15-002 | SW-WARD2-161115-005 | SW-WARD2-042516-002 | SW-WARD2-110316-006 | SW-WARD2-041017-009 | SW-WARD2-112417-009 | SW-WARD2-051818-003 | SW-WARD2-110318-003 | CRA-4074-02-WARD2-47 | SW-WARD2-1210-004 | SW-WARD2-0511-004 | SW-WARD2-1011-003 | SW-WARD2-0412-006 | SW-WARD2-1112-005 | SW-WARD2-0513-006 | SW-WARD2-1013-005 | SW-WARD2-DD-061514-004 | SW-WARD2-103014-003 | SW-WARD2-8/6/15-005 |
| **Sample Date:** | | | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 105 | 92.5 | 72 | 82.8 | 67.8 | 80.9 | 62.3 | 77.2 | 73.7 | 81.6 | 79.1 | 80.4 | 76.2 | 80.1 | 64.4 | 81.5 | 70.3 | 77.3 | 84.2 | 83.9 | 82.9 |
| Iron | mg/L | 0.3 | 0.108 | **0.792** | 0.145 | **0.81** | 0.252 | 0.198 | **1.19** | **0.707** | **0.344** | **0.98** | 0.071 | 0.147 | **0.772** | 0.191 | 0.202 | 0.099 | 0.075 | 0.078 | 0.116 | 0.099 | 0.162 |
| Magnesium | mg/L | - | 24.3 | 26.7 | 27.3 | 23.8 | 22.7 | 28.5 | 18.5 | 21.4 | 21.2 | 23.7 | 25.7 | 20.7 | 21.1 | 23.6 | 24.3 | 26 | 24.6 | 24.6 | 25.4 | 26.8 | 25.1 |
| Manganese | mg/L | - | 0.0164 | 0.0236 | 0.0216 | 0.0219 | 0.0173 | 0.0251 | 0.0295 | 0.0223 | 0.0187 | 0.0217 | 0.0123 | 0.0236 | 0.0452 | 0.012 | 0.0259 | 0.007 | 0.0201 | 0.0203 | 0.0285 | 0.0215 | 0.0271 |
| Phosphorus | mg/L | 0.01-0.03 (e) | <0.05 | **0.185** | <0.05 | **0.105** | <0.05 | <0.05 | **0.095** | **0.081** | **0.073** | **0.161** | <0.05 | <0.05 | **0.065** | <0.05 | <0.05 | **0.11** | **0.059** | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium | mg/L | - | 1.7 | 4.5 | 2.1 | 3.24 | 1.8 | 4.33 | 2.07 | 2.41 | 2.1 | 3.56 | <1 | 1.9 | <1 | 2.5 | 1.8 | 2.3 | 1.8 | 1.7 | <1 | 1.3 | <1 |
| Sodium | mg/L | - | 12.3 | 6.04 | 14.3 | 5.19 | 6.81 | 14.4 | 4.62 | 4.75 | 5.61 | 5.62 | 5.83 | 5.87 | 5.7 | 7.33 | 9.67 | 8.46 | 7.96 | 12.8 | 8.22 | 14.8 | 9.34 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 240 | 342 | 233 | 269 | 228 | 268 | 208 | 255 | 234 | 235 | 285 | 249 | 251 | 237 | 221 | 250 | 232 | 275 | 327 | 320 | 311 |
| Ammonia-N | mg/L | - | <0.05 | <0.05 | <0.05 | <0.05 | 0.031 | 0.2 | 0.036 | 0.297 | 0.051 | 0.028 | <0.05 | <0.05 | <0.05 | <0.05 | 0.055 | <0.05 | 0.053 | <0.05 | <0.05 | 0.067 | 0.052 |
| Chloride | mg/L | - | 12.4 | 14.2 | 14.8 | 15.3 | 9.56 | 24.6 | 9.16 | 11.2 | 11.7 | 15.3 | 8.5 | 8.9 | 8 | 13.4 | 12.6 | 17.3 | 10.6 | 42.7 | 11.8 | 45.5 | 12.8 |
| Conductivity | uS/cm | - | 545 | 617 | 577 | 584 | 497 | 634 | 446 | 539 | 500 | 532 | 536 | 500 | 470 | 551 | 537 | 430 | 371 | 607 | 567 | 657 | 564 |
| Dissolved organic carbon (DOC) | mg/L | - | 5.4 | 8.7 | 5.3 | 7.4 | 6.3 | 5.7 | 5.4 | 6 | 6.8 | 8.97 | 2.5 | 3.6 | 4.8 | 6.4 | 4.7 | 5.5 | 4.7 | 4.5 | 4.1 | 3.7 | 3.8 |
| Hardness | mg/L | - | 363 | 341 | 292 | 305 | 263 | 319 | 232 | 281 | 271 | 301 | 303 | 286 | 277 | 297 | 261 | 311 | 277 | 294 | 315 | 320 | 310 |
| Nitrate (as N) | mg/L | - | 0.11 | 2.33 | 0.072 | 5.31 | 1.18 | 0.088 | 3.86 | 3.75 | 4.13 | 6.63 | 0.19 | 0.29 | 0.15 | 2.84 | 0.44 | 5.04 | 1.17 | <0.1 | <0.1 | <0.1 | 0.06 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.01 | 0.015 | <0.01 | <0.01 | 0.012 | <0.01 | 0.045 | 0.015 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | 8.47 | 8.2 | 8.44 | 8.15 | **8.52** | 8.01 | 8.26 | 8.32 | 8.42 | 8.05 | 8.39 | 8.27 | 8.29 | 8.4 | 8.33 | 8.22 | 8.34 | 8.27 | 8.4 | 8.23 | 8.41 |
| Phenolics (total) | mg/L | 0.001 | **0.0012** | **0.0026** | **0.0072** | **0.0025** | **0.0014** | **0.0042** | **0.0023** | **0.0081** | **0.0033** | **0.0024** | <0.001 | <0.001 | **0.002** | <0.001 | <0.001 | <0.001 | **0.002** | <0.001 | **0.0022** | **0.0047** | **0.0054** |
| Phosphorus | mg/L | 0.01-0.03 (e) | **0.0514** | **0.198** | 0.0194 | **0.0968** | 0.0202 | 0.0184 | **0.104** | **0.0927** | **0.0592** | **0.144** | 0.0054 | 0.0108 | 0.0257 | 0.0101 | 0.0194 | **0.0336** | 0.0213 | 0.0042 | 0.0111 | <0.003 | 0.0071 |
| Sulfate | mg/L | - | 63.1 | 18.2 | 70.1 | 14.7 | 25.1 | 46.4 | 11.1 | 13.5 | 15.7 | 15.6 | 5.5 | 5.2 | 3.9 | 34.2 | 41.4 | 36.9 | 29 | 9.3 | <2 | 4.4 | 1.77 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.43 | 0.66 | 0.42 | 0.68 | 0.39 | 0.63 | 1.19 | 1.18 | 1.11 | 1.12 | <0.15 | <0.15 | 0.2 | 0.4 | 0.56 | 0.82 | 0.49 | <0.3 | 0.25 | 0.34 | 0.29 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.0066 | <0.00144 | <0.00079 | <0.00231 | 0.00117 | 0.00977 | 0.00123 | 0.00198 | 0.0036 | 0.00014 | <0.00398 | <0.00018 | <0.000001 | <0.00048 | 0.0011 | <0.0002 | 0.001377 | <0.0017636 | <0.00407 | 0.00221 | 0.00053 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 697 | 625 | 464 | 463 | 442 | 600 | 418 | 459 | 299 | 670 | 487 | 366 | 13.3 | 565 | 506 | 453 | 477 | 551 | 740 | 622 | 452 |
| Dissolved oxygen (DO), field | mg/L | >4 (f) | 7.28 | 8.33 | 10.23 | - | - | - | 8.85 | 11.67 | - | 5 | 10.58 | 11.4 | - | - | 10.03 | 6.86 | 8.85 | 7.09 | 6.21 | 8.47 | 10.36 |
| pH, field | s.u. | 6.5-8.5 | **8.53** | 8.16 | 7.52 | 8.41 | 8.17 | 8.36 | 8.18 | 7.65 | 8.3 | 7.44 | **8.56** | 7.41 | **4.78** | 7.87 | 7.97 | 7.44 | 8.25 | 8.38 | 8.45 | 8.25 | 7.47 |
| Temperature, field | Deg C | - | 18.6 | 8.6 | 20 | 7.5 | 11.9 | 9.7 | 10.3 | 4.8 | 16.54 | 7.45 | 10.5 | 4.3 | 8.87 | 3.3 | 10 | 2.3 | 7.3 | 7.5 | 14 | 7.8 | 15.5 |

Notes:

[1] Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.

(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.

(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L

- Parameter not analyzed / no information

< Parameter detected below the laboratory method detection limit

**36.0** Parameter exceeds the PWQO.

**TABLE 6.4**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**SURFACE WATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | SW-WARD2-161115-004 | SW-WARD2-042516-003 | SW-WARD2-110316-004 | SW-WARD2-041017-001 | SW-WARD2-112417-007 | SW-WARD2-051818-009 | SW-WARD2-110318-004 | CRA-4074-02-WARD2-48 | SW-WARD2-1210-001 | SW-WARD2-0511-003 | SW-WARD2-1011-005 | SW-WARD2-0412-002 | SW-WARD2-1112-002 | SW-WARD2-0513-003 | SW-WARD2-1013-002 | SW-WARD2-DD-061514-002 | SW-WARD2-103014-008 | SW-WARD2-8/6/15-007 | SW-WARD2-161115-003 | SW-WARD2-042516-005 | SW-WARD2-110316-007 |
| **Sample Date:** | | | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 84.7 | 75.2 | 82.9 | 74.4 | 84.7 | 87.1 | 93.4 | 128 | 147 | 138 | 129 | 120 | 127 | 238 | 143 | 146 | 142 | 136 | 347 | 212 | 150 |
| Iron | mg/L | 0.3 | <0.05 | 0.107 | **0.304** | **1.19** | 0.063 | 0.167 | 0.062 | **2.17** | **5.55** | 0.3 | **1.45** | **0.384** | **2.5** | **51.2** | **4.77** | **4.09** | **4.39** | **3.12** | **57.6** | **28.7** | **1.81** |
| Magnesium | mg/L | - | 27 | 22.1 | 30.3 | 22.6 | 26.3 | 25.6 | 28.4 | 45.7 | 46 | 44 | 38.3 | 40.3 | 42.7 | 78.3 | 43.9 | 44.5 | 45.8 | 42.4 | 114 | 67.2 | 47 |
| Manganese | mg/L | - | 0.0136 | 0.0114 | 0.0535 | 0.11 | 0.0174 | 0.0176 | 0.0156 | 0.0951 | 0.279 | 0.122 | 0.116 | 0.0608 | 0.174 | 1.42 | 0.433 | 0.517 | 0.462 | 0.289 | 1.65 | 1.15 | 0.37 |
| Phosphorus | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | **0.086** | <0.5 | **0.052** | **0.091** | <0.05 | **0.13** | **0.857** | **0.14** | **0.121** | **0.083** | **0.118** | **1.07** | **0.6** | <0.05 |
| Potassium | mg/L | - | 1.52 | 1.25 | 3.07 | 4.13 | 4.73 | 2.92 | 6.6 | 4.5 | <10 | 5.4 | 4.7 | 3.6 | 4.4 | 6.6 | 4.6 | 3.9 | 4.7 | 3.8 | 9.76 | 6.56 | 4.15 |
| Sodium | mg/L | - | 16 | 9.44 | 21.7 | 15.2 | 17.8 | 16.1 | 23.9 | 26.2 | 22.3 | 23.2 | 25 | 24 | 26.9 | 22.7 | 28.8 | 31.7 | 39.3 | 33.4 | 38.7 | 30.8 | 36 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 287 | 292 | 303 | 261 | 313 | 294 | 286 | 455 | 479 | 474 | 450 | 426 | 448 | 459 | 491 | 485 | 543 | 496 | 518 | 520 | 490 |
| Ammonia-N | mg/L | - | <0.05 | 0.026 | 0.13 | <0.028 | 0.129 | 0.044 | <0.02 | 0.717 | 0.708 | 0.782 | 1.74 | 0.686 | 1.08 | 1.39 | 1.49 | 1.5 | 2.23 | 0.844 | 1.9 | 1.72 | 1.28 |
| Chloride | mg/L | - | 51.4 | 21.7 | 47.8 | 31.9 | 33.8 | 32.7 | 56.5 | 45.1 | 31.8 | 30.8 | 51.7 | 42.4 | 46.3 | 46 | 64 | 60.4 | 70 | 57.4 | 64.5 | 37.2 | 54.4 |
| Conductivity | uS/cm | - | 672 | 564 | 697 | 593 | 687 | 624 | 705 | 933 | 928 | 903 | 908 | 896 | 796 | 844 | 1050 | 922 | 1080 | 924 | 1060 | 972 | 1090 |
| Dissolved organic carbon (DOC) | mg/L | - | 3.7 | 4.9 | 4.7 | 5.8 | 4.5 | 3.9 | 6.21 | 3.5 | 6.4 | 7.9 | 5.2 | 5.2 | 5.3 | 4.9 | 6.4 | 5.5 | 5.4 | 5 | 5.7 | 6.7 | 5 |
| Hardness | mg/L | - | 323 | 279 | 332 | 279 | 320 | 323 | 350 | 507 | 557 | 525 | 481 | 467 | 493 | 916 | 538 | 549 | 543 | 514 | 1340 | 807 | 568 |
| Nitrate (as N) | mg/L | - | 0.256 | 0.667 | 0.026 | 1.5 | 1.55 | 0.434 | 1.51 | 0.59 | 0.26 | 0.43 | 0.62 | 0.71 | 0.54 | 0.36 | 0.16 | 0.38 | 0.23 | 0.576 | 0.226 | 0.203 | 0.205 |
| Nitrite (as N) | mg/L | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.049 | <0.01 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | 8.19 | 8.42 | 8.09 | 8.23 | 8.35 | 8.35 | 8.12 | 8.25 | 8.04 | 8.3 | 8.1 | 8.13 | 8.06 | 7.9 | 7.99 | 8.04 | 7.98 | 8.13 | 8.03 | 7.98 | 7.9 |
| Phenolics (total) | mg/L | 0.001 | **0.0026** | <0.001 | **0.0039** | **0.0017** | <0.001 | **0.0035** | **0.0021** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.0019 | **0.003** | **0.0044** | **0.0063** | **0.0035** | 0.001 | **0.0022** |
| Phosphorus | mg/L | 0.01-0.03 (e) | <0.003 | 0.0054 | 0.0075 | 0.0235 | 0.0061 | 0.008 | 0.005 | **0.0782** | **0.378** | 0.03 | **0.124** | **0.0422** | **0.0725** | **2.01** | **0.0873** | **0.0955** | **0.0825** | **0.196** | **1.01** | **0.471** | **0.0408** |
| Sulfate | mg/L | - | 9.47 | 8.25 | 9.45 | 14.4 | 19.3 | 11.6 | 21.7 | 18.9 | 19.4 | 10.9 | 14.6 | 18.4 | 25.3 | 15.8 | 14.3 | 10.5 | 10.1 | 11.7 | 20.4 | 18.7 | 18.9 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | <0.15 | 0.39 | 0.41 | 0.56 | 0.7 | 0.47 | 0.43 | 1.52 | 1.5 | 1.2 | 1.86 | 1.46 | 1.88 | 1.94 | 1.6 | 1.78 | 2.22 | 1.9 | 2.36 | 8.1 | 1.87 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.00388 | 0.00074 | 0.00653 | 0.00089 | 0.00097 | 0.00082 | <0.00014 | **0.02634** | 0.00102 | **0.36822** | **0.03592** | 0.0062 | 0.0027 | 0.0079759 | **0.0352558** | **0.10119** | **0.02109** | 0.00515 | 0.00712 | **0.02734** | **0.05474** |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 538 | 503 | 649 | 560 | 574 | 363 | 887 | 869 | 976 | 11.2 | 1020 | 882 | 763 | 933 | 983 | 1420 | 1130 | 950 | 897 | 1050 | 1110 |
| Dissolved oxygen (DO), field | mg/L | >4 (f) | - | - | - | 7.22 | 10.77 | - | 6 | 8.52 | 9.49 | - | - | 8.49 | 5.31 | 5.14 | 8.51 | 6.08 | 6.43 | 11.17 | - | - | - |
| pH, field | s.u. | 6.5-8.5 | **8.69** | 8.11 | 8.38 | 8.14 | 7.68 | 7.77 | 7.61 | 8.3 | 6.95 | **9.6** | 8.17 | 7.73 | 7.25 | 7.62 | 8.16 | 8.47 | 7.66 | 7.29 | 7.28 | 7.95 | 8.29 |
| Temperature, field | Deg C | - | 6.3 | 9.9 | 9.5 | 10.5 | 5.4 | 14.49 | 6.33 | 7.8 | 5.8 | 8.01 | 4.2 | 6.3 | 4.2 | 6.3 | 8.7 | 10.8 | 8.9 | 14.2 | 8.2 | 7.1 | 10 |

Notes:

[1] Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.

(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.

(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L

- Parameter not analyzed / no information

< Parameter detected below the laboratory method detection limit

**36.0** Parameter exceeds the PWQO.

**TABLE 6.4**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**SURFACE WATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | SW5 | SW5 | SW5 | SW5 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | SW-WARD2-041017-010 | SW-WARD2-112417-001 | SW-WARD2-051818-007 | SW-WARD2-110318-008 | CRA-4074-02-WARD2-49 | SW-WARD2-1210-002 | SW-WARD2-0511-002 | SW-WARD2-1011-004 | SW-WARD2-0412-001 | SW-WARD2-1112-001 | SW-WARD2-0513-002 | SW-WARD2-1013-003 | SW-WARD2-DD-061514-001 | SW-WARD2-103014-010 | SW-WARD2-8/6/15-006 | SW-WARD2-161115-002 | SW-WARD2-042516-010 | SW-WARD2-110316-010 | SW-WARD2-041017-008 | SW-WARD2-112417-010 | SW-WARD2-051818-004 |
| **Sample Date:** | | | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 8/6/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 114 | 152 | 148 | 150 | 167 | 161 | 129 | 154 | 137 | 160 | 131 | 153 | 114 | 134 | 128 | 151 | 219 | 162 | 64.1 | 127 | 126 |
| Iron | mg/L | 0.3 | <0.05 | **4.11** | **2.85** | **5** | **0.418** | 0.173 | 0.285 | 0.085 | 0.208 | <0.05 | **0.396** | <0.05 | 0.126 | 0.189 | **2.57** | **2.83** | **2.32** | **0.61** | **1.1** | <0.05 | 0.034 |
| Magnesium | mg/L | - | 56.5 | 44.4 | 41.3 | 44.5 | 102 | 104 | 72.5 | 80.9 | 77.9 | 92.1 | 77.1 | 83.3 | 54.6 | 71.1 | 58.6 | 73.2 | 81.5 | 81.4 | 17.8 | 60.2 | 54.2 |
| Manganese | mg/L | - | 0.0403 | 0.365 | 0.384 | 0.395 | 0.0469 | 0.0371 | 0.0183 | 0.0099 | 0.0298 | 0.0151 | 0.0454 | 0.0083 | 0.0151 | 0.0125 | 0.26 | 0.14 | 0.403 | 0.0806 | 0.0269 | 0.00576 | 0.0167 |
| Phosphorus | mg/L | 0.01-0.03 (e) | <0.05 | **0.05** | **0.055** | **0.072** | **0.067** | <0.05 | **0.059** | <0.05 | <0.05 | <0.1 | **0.075** | <0.05 | <0.05 | <0.05 | **0.161** | **0.16** | **0.207** | **0.092** | **0.101** | <0.05 | <0.05 |
| Potassium | mg/L | - | 10.7 | 3.73 | 3.28 | 3.89 | 15 | 19 | 14.6 | 13.4 | 13.8 | 13.8 | 12.9 | 12.7 | 11.8 | 12.9 | 15.5 | 13.8 | 11.7 | 13.2 | 2.03 | 11.2 | 10.8 |
| Sodium | mg/L | - | 14.4 | 28.5 | 26.3 | 29.5 | 27.1 | 20.4 | 15 | 19.7 | 18.1 | 25.7 | 18.1 | 21.2 | 13.4 | 18.4 | 16.2 | 18.7 | 9.02 | 18.9 | 4.29 | 13.7 | 12.9 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 466 | 528 | 457 | 474 | 491 | 506 | 435 | 492 | 473 | 479 | 468 | 571 | 457 | 564 | 499 | 507 | 369 | 507 | 204 | 469 | 445 |
| Ammonia-N | mg/L | - | <0.02 | 1.92 | 0.572 | 1.81 | <0.05 | <0.05 | 0.083 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.071 | <0.05 | <0.05 | 0.056 | 0.111 | <0.023 | 0.03 | <0.02 |
| Chloride | mg/L | - | 16.4 | 45.3 | 40.9 | 53.7 | 41.8 | 36.7 | 21.4 | 33.7 | 33 | 43.2 | 28 | 36.3 | 19.2 | 27.7 | 22.8 | 5.35 | 11.2 | 22.3 | 8.93 | 15.1 | 13.8 |
| Conductivity | uS/cm | - | 981 | 1040 | 905 | 1020 | 1430 | 1360 | 1000 | 1170 | 1180 | 1050 | 943 | 1320 | 932 | 1170 | 1020 | 1180 | 770 | 1160 | 445 | 1000 | 892 |
| Dissolved organic carbon (DOC) | mg/L | - | 2.9 | 4.9 | 4 | 5.87 | 3.2 | 2.7 | 4.5 | 3.7 | 2.6 | 3.4 | 3 | 3.9 | 4.1 | 4.4 | 3.5 | 4.1 | 4.4 | 5.5 | 5.5 | 2.9 | 2.8 |
| Hardness | mg/L | - | 516 | 563 | 540 | 559 | 838 | 830 | 621 | 719 | 662 | 778 | 644 | 725 | 509 | 626 | 561 | 678 | 884 | 741 | 234 | 565 | 538 |
| Nitrate (as N) | mg/L | - | 1.5 | 0.272 | 0.244 | 0.2 | 5.47 | 2.21 | 4.14 | 4.61 | 4.51 | 5.3 | 3.91 | 4.57 | 3.36 | 2.97 | 0.52 | 0.56 | 1.61 | 2.38 | 4.02 | 1.64 | 2.81 |
| Nitrite (as N) | mg/L | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.01 | <0.01 | <0.05 | 0.012 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | 8.22 | 8.1 | 8.14 | 7.81 | 8.25 | 7.9 | 8.29 | 8.16 | 8.2 | 8.15 | 8.27 | 8.09 | 8.25 | 8.1 | 8.2 | 8.17 | 8.28 | 7.89 | 8.24 | 8.27 | 8.27 |
| Phenolics (total) | mg/L | 0.001 | **0.0012** | **0.0031** | **0.0038** | **0.0069** | <0.001 | <0.001 | 0.001 | <0.001 | <0.001 | <0.001 | **0.004** | <0.0017 | **0.005** | **0.0019** | **0.0065** | **0.0038** | **0.0012** | **0.0064** | **0.0017** | **0.0095** | **0.0035** |
| Phosphorus | mg/L | 0.01-0.03 (e) | 0.0094 | **0.0771** | 0.017 | **0.0697** | **0.18** | 0.015 | 0.0116 | 0.0115 | **0.035** | 0.0064 | **0.0439** | 0.0083 | 0.0119 | 0.0152 | **0.213** | 0.01 | **0.808** | **0.229** | **0.0952** | <0.003 | 0.0061 |
| Sulfate | mg/L | - | 88.6 | 26.8 | 24.3 | 24.6 | 301 | 210 | 122 | 184 | 163 | 204 | 135 | 185 | 108 | 145 | 85.1 | 28.6 | 52.5 | 122 | 10.7 | 84.1 | 70.9 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.29 | 3.35 | 1.24 | 2.64 | 0.87 | 0.31 | 0.2 | 0.34 | 0.18 | 0.47 | 0.38 | <0.34 | 0.33 | 0.55 | 0.29 | 0.28 | 4.9 | 0.71 | 0.96 | 0.38 | 0.42 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.00016 | 0.0095 | 0.00364 | 0.0042 | <0.00128 | <0.00004 | **0.08828** | <0.00051 | <0.0005 | <0.0001 | <0.0000759 | <0.0005631 | <0.00137 | 0.00042 | <0.00006 | <0.00003 | 0.00118 | 0.00182 | - | 0.00019 | <0.00017 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 1070 | 1070 | 543 | 1190 | 1370 | 1280 | 9.1 | 1300 | 1310 | 1200 | 1160 | 1300 | 1420 | 1260 | 823 | 929 | 705 | 1220 | - | 1080 | 556 |
| Dissolved oxygen (DO), field | mg/L | >4 (f) | 4.8 | 10.9 | - | 4.94 | 8.58 | 7.98 | - | - | 9.73 | 5.75 | 6.77 | 8.11 | 5.66 | 6.8 | 10.34 | - | - | - | - | 10.68 | - |
| pH, field | s.u. | 6.5-8.5 | 7.52 | 7.52 | 7.44 | 7.09 | 8.08 | 6.65 | **10.6** | 7.83 | 7.74 | 6.86 | 7.09 | 7.87 | 8.11 | 7.47 | 6.67 | **6.47** | 8.02 | 7.87 | - | 7.61 | 7.49 |
| Temperature, field | Deg C | - | 10.9 | 4.8 | 10.27 | 7.65 | 9.5 | 6.5 | 9.26 | 5 | 7.1 | 5.6 | 4.9 | 7.6 | 9.4 | 8.5 | 12.5 | 8.7 | 8.7 | 9.8 | - | 5.5 | 12.9 |

Notes:

[1] Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.
(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.
(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.
(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
**36.0** Parameter exceeds the PWQO.

**TABLE 6.4**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**SURFACE WATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | SW6 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-1 | SWP-1 | SWP-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | SW-WARD2-110318-006 | SW-WARD2-0713-002 | SW-WARD2-1013-008 | SW-WARD2-02 | SW-WARD2-DD-061514-008 | SW-WARD2-080514-001 | SW-WARD2-103014-007 | SW-WARD2-8/6/15-003 | SW-WARD2-081715-001 | SW-WARD2-161115-010 | SW-WARD2-042516-006 | SW-WARD2-110316-009 | SW-WARD2-041017-004 | SW-WARD2-8/8/17-02 | SW-WARD2-112417-005 | SW-WARD2-051818-008 | SW-WARD2-082618-DD-001 | SW-WARD2-110318-010 | SW-WARD2-0713-001 | SW-WARD2-1013-007 | SW-WARD2-01 |
| **Sample Date:** | | | 11/3/2018 | 7/11/2013 | 10/22/2013 | 12/28/2013 | 6/15/2014 | 8/5/2014 | 10/30/2014 | 6/8/2015 | 8/17/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 8/8/2017 | 11/24/2017 | 5/18/2018 | 8/26/2018 | 11/3/2018 | 7/11/2013 | 10/22/2013 | 12/28/2013 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 133 | 62.4 | 67.6 | 80.1 | 56.3 | 24.6 | 106 | 105 | 106 | 94.8 | 79.9 | 82.3 | 58 | 90.3 | 83.4 | 82.9 | 112 | 84.5 | 22.4 | 39 | 65.5 |
| Iron | mg/L | 0.3 | 0.032 | <0.05 | **0.657** | **0.502** | 0.139 | <0.05 | 0.117 | 0.269 | 0.052 | 0.29 | 0.228 | <0.5 | **0.307** | <0.5 | 0.26 | 0.258 | 0.109 | **0.377** | 0.056 | **0.667** | 0.139 |
| Magnesium | mg/L | - | 64.1 | 27.5 | 15.7 | 21.5 | 21 | 28.5 | 24.8 | 32.6 | 18.8 | 20.7 | 23.1 | 62 | 17.3 | 58.3 | 25.3 | 19.9 | 34.9 | 18.6 | 31 | 24.7 | 22.5 |
| Manganese | mg/L | - | 0.00388 | 0.0183 | 0.0228 | 0.06 | 0.0128 | 0.0061 | 0.0093 | 0.0135 | 0.0114 | 0.0126 | 0.0612 | 0.0376 | 0.0137 | 0.187 | 0.0235 | 0.113 | 0.058 | 0.014 | 0.0193 | 0.0183 | 0.0237 |
| Phosphorus | mg/L | 0.01-0.03 (e) | <0.05 | **0.055** | **0.06** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | <0.5 | <0.05 | <0.05 | **0.061** | <0.05 | **0.062** | **0.062** | <0.05 |
| Potassium | mg/L | - | 11.4 | 1.6 | 2.5 | 1.9 | <1 | 1.5 | 4.1 | 2.4 | 5.03 | 3.85 | 2.51 | 82.4 | 11.1 | 86 | 17.3 | 6.19 | 45 | 9 | 1.4 | 2 | 1.2 |
| Sodium | mg/L | - | 15.4 | 37.7 | 18.4 | 24 | 38.8 | 20.9 | 46.9 | 84.3 | 77.3 | 38.6 | 34.2 | 169 | 38.4 | 174 | 50.9 | 38.8 | 99.2 | 31.9 | 19.2 | 15.1 | 10.8 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 473 | 77 | 158 | 247 | 137 | 152 | 221 | 178 | 118 | 198 | 217 | 470 | 194 | 466 | 311 | 213 | 326 | 222 | 147 | 174 | 242 |
| Ammonia-N | mg/L | - | 0.033 | <0.05 | <0.05 | <0.05 | <0.05 | 0.072 | 0.065 | <0.05 | <0.05 | <0.05 | 0.061 | 0.233 | <0.042 | 0.045 | 0.365 | 0.097 | 0.134 | <0.02 | <0.05 | <0.05 | <0.05 |
| Chloride | mg/L | - | 16.8 | 165 | 76.2 | 63.5 | 122 | 50.9 | 175 | 276 | 306 | 129 | 102 | 197 | 76.9 | 255 | 88.9 | 92.8 | 234 | 89.5 | 45 | 40 | 28.1 |
| Conductivity | uS/cm | - | 1000 | 740 | 562 | 620 | 650 | 466 | 931 | 1240 | 1220 | 817 | 756 | 1730 | 649 | 1830 | 899 | 714 | 1370 | 727 | 440 | 448 | 512 |
| Dissolved organic carbon (DOC) | mg/L | - | 4.34 | 9.1 | 5 | 4.1 | 7.7 | 7.7 | 5.6 | 7.8 | 8.3 | 5.8 | 6.6 | 29.5 | 8.2 | 31.9 | 11.6 | 8.2 | 24.8 | 9.8 | 5.2 | 5.3 | 2.7 |
| Hardness | mg/L | - | 596 | 269 | 233 | 289 | 227 | 179 | 367 | 395 | 342 | 322 | 294 | 461 | 216 | 466 | 312 | 289 | 423 | 287 | 183 | 199 | 256 |
| Nitrate (as N) | mg/L | - | 2.03 | <0.1 | <0.1 | 0.18 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 | 0.046 | <0.02 | 10.1 | 0.109 | <0.1 | 0.175 | <0.02 | 0.559 | 0.178 | <0.1 | 0.14 | 1.03 |
| Nitrite (as N) | mg/L | - | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.01 | <0.01 | <0.01 | <0.05 | <0.01 | <0.05 | 0.013 | <0.01 | 0.029 | <0.01 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 8.05 | 8.09 | 8 | 7.39 | 8.22 | **8.63** | 7.98 | 8.18 | 7.96 | 7.82 | 8.13 | 8.23 | 8.14 | 7.91 | 8.11 | 7.94 | 7.81 | 7.69 | **8.66** | 8.28 | 7.45 |
| Phenolics (total) | mg/L | 0.001 | **0.003** | <0.001 | <0.001 | <0.001 | **0.0035** | **0.0103** | **0.0029** | **0.0057** | **0.0035** | **0.0027** | <0.001 | **0.0061** | **0.0024** | **0.0053** | <0.001 | **0.0091** | **0.005** | **0.0028** | <0.001 | <0.001 | <0.001 |
| Phosphorus | mg/L | 0.01-0.03 (e) | 0.0072 | 0.0131 | 0.0167 | **0.038** | 0.0193 | 0.0073 | 0.0108 | **0.043** | 0.0133 | 0.0292 | 0.0083 | **0.135** | 0.0231 | **0.0452** | 0.0278 | 0.0261 | **0.046** | **0.047** | 0.0142 | 0.021 | 0.019 |
| Sulfate | mg/L | - | 86.3 | 22.7 | 22 | 18.7 | 17.7 | 10 | 19.8 | 8.4 | 32.7 | 26.7 | 17.2 | 86.7 | 22.7 | 67.2 | 39.4 | 30.3 | 57.3 | 42.3 | 16.3 | 11 | 17.1 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.27 | 0.64 | <0.4 | 0.27 | 0.56 | 0.56 | 0.34 | 0.74 | 0.61 | 0.31 | 0.29 | 4.66 | 0.88 | 3.43 | 1.58 | 1.37 | 2.59 | 1.03 | 0.75 | <0.45 | 0.34 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00019 | <0.0000086 | <0.0009803 | <0.00034 | <0.00227 | 0.00203 | 0.00088 | <0.00021 | <0.00684 | <0.00002 | 0.00025 | 0.01139 | 0.00024 | 0.00129 | 0.00214 | 0.00026 | 0.00088 | <0.00019 | <0.0000379 | <0.0013967 | <0.00073 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 1170 | 689 | 515 | 615 | 834 | 2230 | 901 | 1160 | 364 | 757 | 671 | 1960 | 622 | 850 | 910 | 426 | 1370 | 980 | 463 | 419 | 574 |
| Dissolved oxygen (DO), field | mg/L | >4 (f) | 4.03 | - | 8.59 | 5.74 | 6.72 | 9.3 | 7.05 | 8.39 | 4.5 | - | - | - | 9.55 | - | 10.22 | - | - | 4.57 | - | - | 9.11 |
| pH, field | s.u. | 6.5-8.5 | 7.52 | **5.38** | 8.08 | 7.79 | 7.94 | 7.74 | 7.83 | 6.88 | 8.31 | **6.34** | 7.22 | 8.33 | 7.32 | 7.76 | 7.58 | 6.98 | 6.98 | 7.71 | **6.02** | 8.21 | 8.06 |
| Temperature, field | Deg C | - | 6.38 | 28.27 | 8.6 | 1.2 | 21.5 | 21.1 | 8.6 | 22 | 26.2 | 7.3 | 11.2 | 10.6 | 12.3 | 20.7 | 5.2 | 12.59 | 24.98 | 7.47 | 28.5 | 9.4 | 3 |

Notes:

[1] Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.

(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.

(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L

- Parameter not analyzed / no information

< Parameter detected below the laboratory method detection limit

**36.0** Parameter exceeds the PWQO.

**TABLE 6.4**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**SURFACE WATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | SW-WARD2-DD-061514-007 | SW-WARD2-080514-002 | SW-WARD2-103014-001 | SW-WARD2-8/6/15-001 | SW-WARD2-081715-002 | SW-WARD2-161115-009 | SW-WARD2-042516-007 | SW-WARD2-110316-005 | SW-WARD2-041017-003 | SW-WARD2-8/8/17-01 | SW-WARD2-112417-006 | SW-WARD2-051818-012 | SW-WARD2-082618-DD-002 | SW-WARD2-110318-002 |
| Sample Date: | | | 6/15/2014 | 8/5/2014 | 10/30/2014 | 6/8/2015 | 8/17/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 8/8/2017 | 11/24/2017 | 5/18/2018 | 8/26/2018 | 11/3/2018 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 20.5 | 203 | 46.9 | 30.7 | 32.4 | 49.5 | 77.7 | 59.5 | 75 | 58.9 | 75.5 | 84.7 | 53.9 | 75.9 |
| Iron | mg/L | 0.3 | 0.077 | 0.116 | <0.05 | 0.142 | 0.081 | <0.05 | 0.06 | 0.053 | 0.088 | 0.108 | 0.208 | 0.336 | 0.098 | 0.203 |
| Magnesium | mg/L | - | 26.8 | 42.1 | 26 | 28.8 | 28.8 | 25.9 | 25.9 | 29.7 | 26.7 | 26.4 | 25.6 | 29.9 | 24.6 | 27.4 |
| Manganese | mg/L | - | 0.0156 | 0.0188 | 0.0025 | 0.0475 | 0.0262 | 0.00303 | 0.0196 | 0.0107 | 0.0151 | 0.0318 | 0.0274 | 0.159 | 0.0272 | 0.0381 |
| Phosphorus | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | 0.106 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.051 | <0.05 | <0.05 |
| Potassium | mg/L | - | <1 | 5.7 | 1.8 | <1 | 1.41 | 1.79 | 2.04 | 1.9 | 2.47 | 2.34 | 5.77 | 7.93 | 5.09 | 3.55 |
| Sodium | mg/L | - | 17.2 | 163 | 18.1 | 20.9 | 22.3 | 18.7 | 15.2 | 24.3 | 16.1 | 20.5 | 23.6 | 25 | 23 | 24.9 |
| **General Chemistry** | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 135 | 99 | 202 | 173 | 163 | 211 | 276 | 237 | 273 | 230 | 264 | 302 | 202 | 260 |
| Ammonia-N | mg/L | - | <0.05 | <0.05 | 0.072 | <0.05 | <0.05 | <0.05 | 0.056 | 0.128 | <0.026 | 0.049 | 0.749 | 0.607 | 0.038 | 0.266 |
| Chloride | mg/L | - | 40.3 | 612 | 43 | 48.7 | 52.4 | 43 | 36 | 46.9 | 38 | 44.5 | 46.2 | 42.8 | 49.4 | 54.8 |
| Conductivity | uS/cm | - | 350 | 2230 | 494 | 466 | 475 | 530 | 632 | 596 | 636 | 584 | 664 | 698 | 555 | 637 |
| Dissolved organic carbon (DOC) | mg/L | - | 5.6 | 7.2 | 3.1 | 10.6 | 8.7 | 5.5 | 7.6 | 5.1 | 4.1 | 9.3 | 7.7 | 9.6 | 11.6 | 5.54 |
| Hardness | mg/L | - | 161 | 681 | 224 | 195 | 200 | 230 | 301 | 271 | 297 | 256 | 294 | 335 | 236 | 302 |
| Nitrate (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | 0.045 | <0.02 | 0.031 | 0.398 | 0.06 | 0.373 | <0.02 | 0.57 | 0.155 | 0.033 | 0.973 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | 8.9 | 7.98 | 8.23 | 8.61 | 8.48 | 7.9 | 8.27 | 8.13 | 8.2 | 8.09 | 8.26 | 8.04 | 8.1 | 7.89 |
| Phenolics (total) | mg/L | 0.001 | 0.0018 | 0.0068 | 0.0029 | 0.0042 | 0.0016 | 0.003 | <0.001 | 0.0038 | 0.0029 | 0.0061 | 0.0038 | 0.0049 | 0.0024 | 0.0022 |
| Phosphorus | mg/L | 0.01-0.03 (e) | 0.0145 | 0.0062 | 0.007 | 0.0226 | 0.0573 | 0.0067 | 0.0105 | 0.0888 | 0.0087 | 0.0112 | 0.0177 | 0.0201 | 0.0165 | 0.0184 |
| Sulfate | mg/L | - | 12.9 | 24.5 | 8.5 | 9.48 | 6.2 | 8.79 | 19.8 | 12.3 | 17.9 | 12.9 | 23.1 | 26.8 | 16.6 | 17 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.48 | 0.21 | 0.52 | 0.99 | 0.85 | 0.46 | 0.41 | 2.36 | 0.46 | 0.58 | 1.69 | 1.75 | 1 | 0.75 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.014 | <0.00828 | 0.00177 | <0.00112 | <0.00042 | <0.01086 | 0.00061 | 0.0078 | 0.00052 | 0.00127 | 0.00252 | 0.00381 | 0.00052 | 0.00141 |
| **Field Parameters** | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 485 | 455 | 528 | 377 | 1310 | 408 | 573 | 548 | 596 | 2830 | 590 | 410 | 659 | 823 |
| Dissolved oxygen (DO), field | mg/L | >4 (f) | 7.67 | 15.16 | 8.18 | 11.09 | 4.55 | - | - | - | 9.34 | - | 12.15 | - | - | 5.23 |
| pH, field | s.u. | 6.5-8.5 | 8.85 | 8.5 | 8.09 | 7.96 | 7.19 | 9.1 | 7.61 | 8.43 | 7.87 | 7.76 | 7.42 | 7.22 | 7.22 | 7.49 |
| Temperature, field | Deg C | - | 20.8 | 23.1 | 8.6 | 11.21 | 21.6 | 9 | 12.3 | 10.6 | 12.4 | 19.3 | 2.9 | 16.72 | 27.61 | 6.5 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (a) | Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L. |
| (b) | PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L. |
| (c) | Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| (g) | An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc. |
| (h) | Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| 36.0 | Parameter exceeds the PWQO. |

**TABLE 6.5**

**VOLATILE ORGANIC COMPOUNDS GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP2-13 | MP2-13 | MP2-13 | MP2-13 | MP2-13 | MP2-13 | MP3-13 | MP3-13 | MP3-13 | MP3-13 | MP4-13 | MP4-13 | MP4-13 | OW2-83 | OW2-83 | OW2-83 | OW2-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | | GW/MP-WARD2-103014-001 | GW/MP-WARD2-161115-001 | GW(MP)-WARD2-041017-001 | GW(MP)-WARD2-112417-003 | GW(MP)-WARD2-110318-001 | GW-(MP)-WARD2-DD-061514-002 | GW/MP-WARD2-103014-002 | GW/MP-WARD2-161115-002 | GW(MP)-WARD2-041017-002 | GW(MP)-WARD2-112417-004 | GW(MP)-WARD2-110318-002 | GW/MP-WARD2-161115-003 | GW(MP)-WARD2-041017-003 | GW(MP)-WARD2-112417-001 | GW(MP)-WARD2-110318-003 | GW(MP)-WARD2-041017-004 | GW(MP)-WARD2-112417-002 | GW-WARD2-112417-022 | GW-WARD2-1210-009 | GW-WARD2-1112-026 | GW-WARD2-DD-061514-020 | GW-WARD2-103014-026 |
| Sample Date: | | ODWS [1] | ODWS Source | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 4/10/2017 | 11/24/2017 | 11/24/2017 | 12/1/2010 | 11/26/2012 | 6/15/2014 | 10/30/2014 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | ug/L | 14 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide | ug/L | - | - | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichlorobenzene | ug/L | 200/3 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | ug/L | 5 | IMAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | ug/L | 5/1 | MAC/AO | **0.93** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.5** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <200 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | **46** | <20 | **1110** | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Benzene | ug/L | 1 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 |
| Bromoform | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 |
| Bromomethane (Methyl bromide) | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1.5 | <1 | <0.5 | <0.5 |
| Carbon disulfide | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 |
| Carbon tetrachloride | ug/L | 2 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chlorobenzene | ug/L | 80/30 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloroform (Trichloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 |
| Chloromethane (Methyl chloride | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Dibromochloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 |
| Dichlorodifluoromethane (CFC-12) | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Ethylbenzene | ug/L | 140/1.6 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexane | ug/L | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | - |
| m&p-Xylenes | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Methyl tert butyl ether (MTBE) | ug/L | 15 | AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Methylene chloride | ug/L | 50 | MAC | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 |
| N-Hexane (C6 and isomers) | ug/L | - | - | <0.5 | - | - | - | - | <0.5 | <0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.5 | <0.5 |
| o-Xylene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | ug/L | 10 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | ug/L | 60/24 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | ug/L | 5 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11 | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Trihalomethanes | ug/L | 100 | MAC | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Vinyl chloride | ug/L | 1 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Xylenes (total) | ug/L | 90/20 | MAC/AO | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.5 | <1.5 | <1.1 | <1.1 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable |
| OG | Operation Guideline (water treatment and distribution |
| IMAC | Interim Maximum Acceptable Concentration (health related |
| MAC | MAC - Maximum Acceptable Concentration (health related) |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.5**

**VOLATILE ORGANIC COMPOUNDS GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW4-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW7-83 | OW7-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | GW-WARD2-161115-024 | GW-WARD2-041017-023 | GW-WARD2-112417-025 | GW-WARD2-110318-032 | GW-WARD2-1210-008 | GW-WARD2-DD-061514-018 | GW-WARD2-103014-021 | GW-WARD2-161115-025 | GW-WARD2-041017-024 | GW-WARD2-112417-023 | GW-WARD2-110318-026 | GW-WARD2-1210-013 | GW-WARD2-1210-015 | GW-WARD2-1112-023 | GW-WARD2-DD-061514-015 | GW-WARD2-103014-020 | GW-WARD2-161115-031 | GW-WARD2-041017-019 | GW-WARD2-112417-019 | GW-WARD2-110318-030 | GW-WARD2-1210-007 | GW-WARD2-1112-021 |
| **Sample Date:** | | *ODWS* [1] | *ODWS Source* | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 12/1/2010 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 12/1/2010 | 12/1/2010 | 11/26/2012 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 12/1/2010 | 11/26/2012 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.67** | **0.76** | **0.87** | **0.77** | <0.5 | **0.51** | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | ug/L | 14 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide | ug/L | - | - | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 |
| 1,2-Dichlorobenzene | ug/L | 200/3 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | ug/L | 5 | IMAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | ug/L | 5/1 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Benzene | ug/L | 1 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **1.61** | **1.76** | **1.9** | **2.05** | **2.1** | <0.5 | **1.64** | **1.54** | <0.5 | <0.5 |
| Bromodichloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 |
| Bromoform | ug/L | - | - | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 |
| Bromomethane (Methyl bromide) | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 |
| Carbon disulfide | ug/L | - | - | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 |
| Carbon tetrachloride | ug/L | 2 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chlorobenzene | ug/L | 80/30 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | **2.4** | **3.7** | **3.3** | **3.2** | **3.3** | <1 | **2.8** | **2.5** | <1 | **1.2** |
| Chloroform (Trichloromethane) | ug/L | - | - | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 |
| Chloromethane (Methyl chloride | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **2.46** | **2.05** | **2.22** | **1.68** | **1.23** | <0.5 | **1.45** | **0.92** | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Dibromochloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 |
| Dichlorodifluoromethane (CFC-12) | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Ethylbenzene | ug/L | 140/1.6 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.93** |
| Hexane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - |
| m&p-Xylenes | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Methyl tert butyl ether (MTBE) | ug/L | 15 | AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Methylene chloride | ug/L | 50 | MAC | <2 | <2 | <2 | <2 | <0.5 | <2 | <2 | <2 | <2 | <2 | <2 | <0.5 | <0.5 | <0.5 | <0.5 | <2 | <2 | <2 | <2 | <2 | <0.5 | <0.5 |
| N-Hexane (C6 and isomers) | ug/L | - | - | - | - | - | - | - | <0.5 | <0.5 | - | - | - | - | - | - | - | <0.5 | <0.5 | - | - | - | - | - | - |
| o-Xylene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | ug/L | 10 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | ug/L | 60/24 | MAC/AO | <0.5 | <0.5 | **0.74** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **52.2** | <0.5 | <0.5 | <0.5 | <0.5 | **1.14** | **0.55** | <0.5 | <0.5 | <0.5 | **1.15** | **1.12** |
| trans-1,2-Dichloroethene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | ug/L | 5 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11 | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Trihalomethanes | ug/L | 100 | MAC | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Vinyl chloride | ug/L | 1 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.55** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Xylenes (total) | ug/L | 90/20 | MAC/AO | <1.1 | <1.1 | <1.1 | <1.1 | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.5 | <1.5 | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.5 | <1.5 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable |
| OG | Operation Guideline (water treatment and distribution |
| IMAC | Interim Maximum Acceptable Concentration (health related |
| MAC | MAC - Maximum Acceptable Concentration (health related) |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.5**

**VOLATILE ORGANIC COMPOUNDS GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW9-88 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW18-88 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | GW-WARD2-DD-061514-013 | GW-WARD2-103014-019 | GW-WARD2-161115-029 | GW-WARD2-041017-017 | GW-WARD2-112417-017 | GW-WARD2-110318-015 | GW-WARD2-1210-014 | GW-WARD2-1112-024 | GW-WARD2-DD-061514-016 | GW-WARD2-103014-022 | GW-WARD2-161115-030 | GW-WARD2-112417-020 | GW-WARD2-110318-021 | MW9 | GW-WARD2-1210-005 | GW-WARD2-1112-029 | GW-WARD2-DD-061514-022 | GW-WARD2-103014-012 | GW-WARD2-171115-013 | GW-WARD2-041017-032 | GW-WARD2-110318-018 | GW-WARD2-041017-015 |
| **Sample Date:** | | *ODWS* [1] | *ODWS Source* | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 12/1/2010 | 11/26/2012 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 11/24/2017 | 11/3/2018 | 12/1/2010 | 12/1/2010 Duplicate | 11/26/2012 | 6/15/2014 | 10/30/2014 | 11/17/2015 | 4/10/2017 | 11/3/2018 | 4/10/2017 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | ug/L | - | - | **0.51** | **0.61** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **1.35** | **1.3** | <0.5 | **0.56** |
| 1,1-Dichloroethene | ug/L | 14 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.2 |
| 1,2-Dichlorobenzene | ug/L | 200/3 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | ug/L | 5 | IMAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.58** | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | ug/L | 5/1 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.79** | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Benzene | ug/L | 1 | MAC | **0.77** | **0.51** | **0.5** | <0.5 | <0.5 | **0.54** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **2.45** | **1.76** | **1.68** |
| Bromodichloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromoform | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromomethane (Methyl bromide) | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 |
| Carbon tetrachloride | ug/L | 2 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chlorobenzene | ug/L | 80/30 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | ug/L | - | - | **3.3** | **2.2** | **1.6** | <1 | **2.2** | **3.2** | <1 | <1 | <1 | **1.4** | <2 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | **3** | **4** | **2.4** | **3.4** |
| Chloroform (Trichloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloromethane (Methyl chloride | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | ug/L | - | - | **2.22** | **1.23** | **0.8** | <0.5 | **0.58** | **1.09** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.95** | **1.42** | <0.5 | **1.75** |
| cis-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Dibromochloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 |
| Dichlorodifluoromethane (CFC-12) | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | **3.4** | **11.1** | **6.3** | **31.5** | <12 | <4.1 | <1 |
| Ethylbenzene | ug/L | 140/1.6 | MAC/AO | **1.55** | **4.78** | **3.14** | <0.5 | **2.38** | **4.33** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexane | ug/L | - | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | - | <0.5 | <0.5 | <0.5 | - | - | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 |
| m&p-Xylenes | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Methyl tert butyl ether (MTBE) | ug/L | 15 | AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.65** | **0.56** | **0.56** | **0.6** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Methylene chloride | ug/L | 50 | MAC | <2 | <2 | <2 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <2 | <2 | <0.5 | <0.5 | <0.5 | <2 | <2 | <2 | <2 | <2 | <2 |
| N-Hexane (C6 and isomers) | ug/L | - | - | <0.5 | <0.5 | - | - | - | - | - | - | <0.5 | **0.57** | - | - | - | - | - | - | <0.5 | <0.5 | - | - | - | - |
| o-Xylene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | ug/L | - | - | **0.6** | <0.5 | <0.5 | <0.5 | <0.5 | **0.89** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | ug/L | 10 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | ug/L | 60/24 | MAC/AO | **4.8** | **8.19** | **6.88** | <0.5 | **4.39** | **5.02** | <0.5 | **1** | <0.5 | **0.77** | **1.03** | **3.28** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | ug/L | 5 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11 | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Trihalomethanes | ug/L | 100 | MAC | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Vinyl chloride | ug/L | 1 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.7** | <0.5 | <0.5 | <0.5 |
| Xylenes (total) | ug/L | 90/20 | MAC/AO | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.5 | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.5 | <1.5 | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable |
| OG | Operation Guideline (water treatment and distribution |
| IMAC | Interim Maximum Acceptable Concentration (health related |
| MAC | MAC - Maximum Acceptable Concentration (health related) |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.5**

**VOLATILE ORGANIC COMPOUNDS GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | OW19-89 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW28-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | GW-WARD2-041017-001 | GW-WARD2-1210-011 | GW-WARD2-1112-028 | GW-WARD2-DD-061514-021 | GW-WARD2-103014-031 | GW-WARD2-161115-023 | GW-WARD2-041017-014 | GW-WARD2-110318-031 | GW-WARD2-DD-061514-029 | GW-WARD2-103014-028 | GW-WARD2-171115-015 | GW-WARD2-041017-028 | GW-WARD2-112417-028 | GW-WARD2-110318-016 | GW-WARD2-171115-016 | GW-WARD2-1210-010 | GW-WARD2-1112-027 | GW-WARD2-DD-061514-019 | GW-WARD2-103014-027 | GW-WARD2-161115-026 | GW-WARD2-041017-022 | GW-WARD2-112417-024 |
| **Sample Date:** | | *ODWS* [1] | *ODWS Source* | 4/10/2017 | 12/1/2010 | 11/26/2012 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/3/2018 | 6/15/2014 | 10/30/2014 | 11/17/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/17/2015 | 12/1/2010 | 11/26/2012 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | ug/L | 14 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide | ug/L | - | - | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 |
| 1,2-Dichlorobenzene | ug/L | 200/3 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | ug/L | 5 | IMAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | ug/L | 5/1 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Benzene | ug/L | 1 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | ug/L | - | - | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromoform | ug/L | - | - | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromomethane (Methyl bromide) | ug/L | - | - | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | ug/L | - | - | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 |
| Carbon tetrachloride | ug/L | 2 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chlorobenzene | ug/L | 80/30 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloroform (Trichloromethane | ug/L | - | - | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloromethane (Methyl chloride | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Dibromochloromethane | ug/L | - | - | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 |
| Dichlorodifluoromethane (CFC-12) | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Ethylbenzene | ug/L | 140/1.6 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexane | ug/L | - | - | <0.5 | - | - | - | - | <0.5 | <0.5 | <0.5 | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | - | <0.5 | <0.5 | <0.5 |
| m&p-Xylenes | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Methyl tert butyl ether (MTBE) | ug/L | 15 | AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Methylene chloride | ug/L | 50 | MAC | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <2 | <2 | <2 |
| N-Hexane (C6 and isomers) | ug/L | - | - | - | - | - | <0.5 | <0.5 | - | - | - | <0.5 | <0.5 | - | - | - | - | - | - | <0.5 | <0.5 | - | - | - | - |
| o-Xylene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | ug/L | 10 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | ug/L | 60/24 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **1.47** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | ug/L | 5 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11 | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Trihalomethanes | ug/L | 100 | MAC | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Vinyl chloride | ug/L | 1 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Xylenes (total) | ug/L | 90/20 | MAC/AO | <1.1 | <1.5 | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.5 | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable |
| OG | Operation Guideline (water treatment and distribution |
| IMAC | Interim Maximum Acceptable Concentration (health related |
| MAC | MAC - Maximum Acceptable Concentration (health related) |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.5**

**VOLATILE ORGANIC COMPOUNDS GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | OW29-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | GW-WARD2-110318-022 | GW-WARD2-1210-012 | GW-WARD2-1112-025 | GW-WARD2-DD-061514-017 | GW-WARD2-103014-015 | GW-WARD2-161115-028 | GW-WARD2-041017-021 | GW-WARD2-112417-021 | GW-WARD2-110318-025 | GW-WARD2-1210-006 | GW-WARD2-1112-022 | GW-WARD2-DD-061514-014 | GW-WARD2-103014-018 | GW-WARD2-161115-027 | GW-WARD2-041017-018 | GW-WARD2-112417-018 | GW-WARD2-110318-023 | GW-WARD2-1210-001 | GW-WARD2-1112-020 | GW-WARD2-DD-061514-011 | GW-WARD2-DD-061514-012 | GW-WARD2-103014-014 |
| **Sample Date:** | | *ODWS* [1] | *ODWS Source* | 11/3/2018 | 12/1/2010 | 11/26/2012 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 12/1/2010 | 11/26/2012 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 12/1/2010 | 11/26/2012 | 6/15/2014 | 6/15/2014 Duplicate | 10/30/2014 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | ug/L | 14 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide | ug/L | - | - | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichlorobenzene | ug/L | 200/3 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | ug/L | 5 | IMAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | ug/L | 5/1 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Benzene | ug/L | 1 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | ug/L | - | - | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 |
| Bromoform | ug/L | - | - | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 |
| Bromomethane (Methyl bromide) | ug/L | - | - | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | ug/L | - | - | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 |
| Carbon tetrachloride | ug/L | 2 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chlorobenzene | ug/L | 80/30 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloroform (Trichloromethane) | ug/L | - | - | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 |
| Chloromethane (Methyl chloride | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Dibromochloromethane | ug/L | - | - | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 |
| Dichlorodifluoromethane (CFC-12) | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Ethylbenzene | ug/L | 140/1.6 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexane | ug/L | - | - | <0.5 | - | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - |
| m&p-Xylenes | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Methyl tert butyl ether (MTBE) | ug/L | 15 | AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Methylene chloride | ug/L | 50 | MAC | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 |
| N-Hexane (C6 and isomers) | ug/L | - | - | - | - | - | <0.5 | <0.5 | - | - | - | - | - | - | <0.5 | <0.5 | - | - | - | - | - | - | <0.5 | <0.5 |
| o-Xylene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | ug/L | 10 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | ug/L | 60/24 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | ug/L | 5 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11 | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Trihalomethanes | ug/L | 100 | MAC | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Vinyl chloride | ug/L | 1 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Xylenes (total) | ug/L | 90/20 | MAC/AO | <1.1 | <1.5 | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.5 | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.5 | <1.5 | <1.1 | <1.1 | <1.1 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable |
| OG | Operation Guideline (water treatment and distribution |
| IMAC | Interim Maximum Acceptable Concentration (health related |
| MAC | MAC - Maximum Acceptable Concentration (health related) |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.5**

**VOLATILE ORGANIC COMPOUNDS GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW36-09 | OW36-09 | OW36-09 | OW43-09 | OW43-09 | OW43-09 | OW43-09 | OW45-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | GW-WARD2-161115-032 | GW-WARD2-041017-016 | GW-WARD2-112417-016 | GW-WARD2-110318-028 | GW-WARD2-1210-002 | GW-WARD2-1112-019 | GW-WARD2-DD-061514-010 | GW-WARD2-103014-016 | GW-WARD2-103014-017 | GW-WARD2-161115-033 | GW-WARD2-041017-011 | GW-WARD2-112417-014 | GW-WARD2-112417-015 | GW-WARD2-110318-024 | GW-WARD2-171115-012 | GW-WARD2-041017-031 | GW-WARD2-110318-012 | GW-WARD2-DD-061514-026 | GW-WARD2-103014-013 | GW-WARD2-171115-019 | GW-WARD2-041017-030 | GW-WARD2-DD-061514-027 |
| **Sample Date:** | | *ODWS* [1] | *ODWS Source* | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 12/1/2010 | 11/26/2012 | 6/15/2014 | 10/30/2014 | 10/30/2014 Duplicate | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/24/2017 Duplicate | 11/3/2018 | 11/17/2015 | 4/10/2017 | 11/3/2018 | 6/15/2014 | 10/30/2014 | 11/17/2015 | 4/10/2017 | 6/15/2014 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | ug/L | 14 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide | ug/L | - | - | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichlorobenzene | ug/L | 200/3 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | ug/L | 5 | IMAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | ug/L | 5/1 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Benzene | ug/L | 1 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromoform | ug/L | - | - | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromomethane (Methyl bromide) | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | ug/L | - | - | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Carbon tetrachloride | ug/L | 2 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chlorobenzene | ug/L | 80/30 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | ug/L | - | - | <1 | **4.7** | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloroform (Trichloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloromethane (Methyl chloride | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | ug/L | - | - | <0.5 | **0.74** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Dibromochloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <0.5 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Dichlorodifluoromethane (CFC-12) | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | **1.8** | **2.3** | **1.8** | **2.5** | **1.8** | <1 | **1.3** | **1.3** | <1 | **1.7** | **9.3** | <7.2 | <1 | <1 | <1 | <1 |
| Ethylbenzene | ug/L | 140/1.6 | MAC/AO | <0.5 | **0.74** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | <0.5 | <0.5 | - |
| m&p-Xylenes | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Methyl tert butyl ether (MTBE) | ug/L | 15 | AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Methylene chloride | ug/L | 50 | MAC | <2 | <2 | <2 | <2 | <0.5 | <0.5 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| N-Hexane (C6 and isomers) | ug/L | - | - | - | - | - | - | - | - | <0.5 | <0.5 | <0.5 | - | - | - | - | - | - | - | - | <0.5 | <0.5 | - | <0.5 |
| o-Xylene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | ug/L | 10 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | ug/L | 60/24 | MAC/AO | <0.5 | **0.97** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | ug/L | 5 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11 | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Trihalomethanes | ug/L | 100 | MAC | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Vinyl chloride | ug/L | 1 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Xylenes (total) | ug/L | 90/20 | MAC/AO | <1.1 | <1.1 | <1.1 | <1.1 | <1.5 | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable |
| OG | Operation Guideline (water treatment and distribution |
| IMAC | Interim Maximum Acceptable Concentration (health related |
| MAC | MAC - Maximum Acceptable Concentration (health related) |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.5**

**VOLATILE ORGANIC COMPOUNDS GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | | GW-WARD2-103014-030 | GW-WARD2-171115-014 | GW-WARD2-041017-010 | GW-WARD2-041017-025 | GW-WARD2-112417-027 | GW-WARD2-110318-029 | GW-WARD2-061514-023 | GW-WARD2-DD-061514-023 | GW-WARD2-103014-023 | GW-WARD2-171115-018 | GW-WARD2-041017-027 | GW-WARD2-112417-029 | GW-WARD2-110318-014 | GW-WARD2-DD-061514-024 | GW-WARD2-103014-029 | GW-WARD2-171115-017 | GW-WARD2-041017-026 | GW-WARD2-112417-030 | GW-WARD2-110318-020 | GW-WARD2-061514-025 | GW-WARD2-103014-034 | GW-WARD2-161115-022 | GW-WARD2-041017-029 |
| Sample Date: | | *ODWS* [1] | *ODWS Source* | 10/30/2014 | 11/17/2015 | 4/10/2017 | 4/10/2017 Duplicate | 11/24/2017 | 11/3/2018 | 6/15/2014 | 6/15/2014 | 10/30/2014 | 11/17/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 6/15/2014 | 10/30/2014 | 11/17/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | ug/L | 14 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide | ug/L | - | - | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.2 |
| 1,2-Dichlorobenzene | ug/L | 200/3 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | ug/L | 5 | IMAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | ug/L | 5/1 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Benzene | ug/L | 1 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromoform | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromomethane (Methyl bromide) | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Carbon tetrachloride | ug/L | 2 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chlorobenzene | ug/L | 80/30 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloroform (Trichloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloromethane (Methyl chloride | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Dibromochloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Dichlorodifluoromethane (CFC-12) | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Ethylbenzene | ug/L | 140/1.6 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexane | ug/L | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - | <0.5 | <0.5 |
| m&p-Xylenes | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Methyl tert butyl ether (MTBE) | ug/L | 15 | AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Methylene chloride | ug/L | 50 | MAC | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| N-Hexane (C6 and isomers) | ug/L | - | - | <0.5 | - | - | - | - | - | <0.5 | <0.5 | - | - | - | - | <0.5 | <0.5 | - | - | - | - | <0.5 | <0.5 | - | - |
| o-Xylene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | ug/L | 10 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | ug/L | 60/24 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | ug/L | 5 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11 | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Trihalomethanes | ug/L | 100 | MAC | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Vinyl chloride | ug/L | 1 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Xylenes (total) | ug/L | 90/20 | MAC/AO | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable |
| OG | Operation Guideline (water treatment and distribution |
| IMAC | Interim Maximum Acceptable Concentration (health related |
| MAC | MAC - Maximum Acceptable Concentration (health related) |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.5**

**VOLATILE ORGANIC COMPOUNDS GROUNDWATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | | OW47-13 | OW47-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | Field Blank | Field Blank | Field Blank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | | GW-WARD2-112417-031 | GW-WARD2-110318-034 | GW-WARD2-DD-061514-028 | GW-WARD2-103014-024 | GW-WARD2-161115-021 | GW-WARD2-041017-013 | GW-WARD2-112417-013 | GW-WARD2-110318-027 | GW-WARD2-DD-061514-030 | GW-WARD2-103014-033 | GW-WARD2-161115-020 | GW-WARD2-041017-012 | GW-WARD2-112417-012 | GW-WARD2-110318-017 | GW-WARD2-DD-061514-031 | GW-WARD2-103014-032 | GW-WARD2-161115-034 | GW-WARD2-112417-026 | GW-WARD2-110318-033 | GW-WARD2-DD-061514-032 | GW-WARD2-103014-025 | GW-WARD2-041017-009 |
| Sample Date: | | *ODWS* [1] | *ODWS Source* | 11/24/2017 | 11/3/2018 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 11/24/2017 | 11/3/2018 | 6/15/2014 Field Blank | 10/30/2014 Field Blank | 4/10/2017 Field Blank |
| **Parameters** | **Units** | | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | ug/L | 14 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide | ug/L | - | - | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.2 |
| 1,2-Dichlorobenzene | ug/L | 200/3 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | ug/L | 5 | IMAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | ug/L | 5/1 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | ug/L | - | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Benzene | ug/L | 1 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromoform | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromomethane (Methyl bromide) | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Carbon tetrachloride | ug/L | 2 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chlorobenzene | ug/L | 80/30 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloroform (Trichloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloromethane (Methyl chloride | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Dibromochloromethane | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Dichlorodifluoromethane (CFC-12) | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Ethylbenzene | ug/L | 140/1.6 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexane | ug/L | - | - | <0.5 | <0.5 | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - | <0.5 |
| m&p-Xylenes | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Methyl tert butyl ether (MTBE) | ug/L | 15 | AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Methylene chloride | ug/L | 50 | MAC | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| N-Hexane (C6 and isomers) | ug/L | - | - | - | - | <0.5 | <0.5 | - | - | - | - | <0.5 | <0.5 | - | - | - | - | <0.5 | <0.5 | - | - | - | <0.5 | <0.5 | - |
| o-Xylene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | ug/L | 10 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | ug/L | 60/24 | MAC/AO | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | ug/L | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | ug/L | 5 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11 | ug/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Trihalomethanes | ug/L | 100 | MAC | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Vinyl chloride | ug/L | 1 | MAC | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Xylenes (total) | ug/L | 90/20 | MAC/AO | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable |
| OG | Operation Guideline (water treatment and distribution |
| IMAC | Interim Maximum Acceptable Concentration (health related |
| MAC | MAC - Maximum Acceptable Concentration (health related) |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.6**

**VOLATILE ORGANIC COMPOUNDS**
**LEACHATE ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| **Sample Location:** | | | | **Leachate Holding Tank** | **Leachate Holding Tank** | **Leachate Holding Tank** | **Leachate Holding Tank** | **Leachate Holding Tank** | **Leachate Holding Tank** | **Leachate Holding Tank** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | | **LW-WARD2-1112-001** | **LW-WARD2-0613-001** | **LW-WARD2-DD-061514-001** | **LW-WARD2-8/6/15-001** | **LW-WARD2-042616-001** | **LW-WARD2-041017-001** | **LW-WARD2-051818-001** |
| **Sample Date:** | | | | **12/5/2012** | **6/3/2013** | **6/15/2014** | **6/8/2015** | **4/26/2016** | **4/10/2017** | **5/18/2018** |
| **Parameters** | **Units** | ***ODWS*** [1] | ***ODWS Source*** | | | | | | | |
| **Volatiles** | | | | | | | | | | |
| 1,4-Dichlorobenzene | ug/L | 5/1 | MAC/AO | <5 | <10 | **0.68** | <0.5 | <0.5 | **0.62** | **0.5** |
| Benzene | ug/L | 1 | MAC | **6.5** | <10 | **2.77** | **1.28** | **1.79** | **3.32** | **2.77** |
| Methylene chloride | ug/L | 50 | MAC | <5 | <100 | <100 | <2 | **2.7** | **10.7** | <2 |
| Toluene | ug/L | 60/24 | MAC/AO | **192** | **238** | **435** | **97.4** | **66.3** | **47.2** | **24.2** |
| Vinyl chloride | ug/L | 1 | MAC | <6 | <10 | **2.2** | **0.58** | <0.5 | **1.51** | **0.53** |
| | | - | - | | | | | | | |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. |
| OG | Operation Guideline (water treatment and distribution). |
| IMAC | Interim Maximum Acceptable Concentration (health related). |
| MAC | MAC - Maximum Acceptable Concentration (health related). |
| AO | Aesthetic Objective (non-health related, i.e. colour, taste, smell). |
| - | Parameter not analyzed / no information available |
| < | Parameter detected below the laboratory method detection limit. |
| NM | Not Measured. |
| **36.0** | Parameter exceeds the ODWS. |

**TABLE 6.7**

**VOLATILE ORGANIC COMPOUNDS SURFACE WATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Sump | GW Sump | GW Sump | GW Sump | GW Sump | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW2 | SW2 | SW2 | SW2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | PIPE | SW-WARD2-DD-061514-009 | SW-WARD2-103014-009 | SW-WARD2-161115-008 | SW-WARD2-041017-007 | SW-WARD2-112417-004 | SW-WARD2-110318-001 | SW-WARD2-DD-061514-010 | SW-WARD2-103014-006 | SW-WARD2-161115-007 | SW-WARD2-041017-006 | SW-WARD2-112417-003 | SW-WARD2-1112-003 | SW-WARD2-DD-061514-003 | SW-WARD2-103014-005 | SW-WARD2-161115-001 | SW-WARD2-041017-002 | SW-WARD2-112417-002 | SW-WARD2-110318-005 | SW-WARD2-1112-004 | SW-WARD2-DD-061514-005 | SW-WARD2-103014-002 | SW-WARD2-161115-006 |
| **Sample Date:** | | | 5/4/2014 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/26/2012 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/26/2012 | 6/15/2014 | 10/30/2014 | 11/16/2015 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ug/L | 20 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | ug/L | 10 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | ug/L | 70 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | ug/L | 800 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | ug/L | 200 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | ug/L | 40 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide | ug/L | 5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichlorobenzene | ug/L | 2.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | ug/L | 100 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | ug/L | 0.7 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | ug/L | 2.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | ug/L | 4 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK | ug/L | 400 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | ug/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK | ug/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | ug/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Benzene | ug/L | 100 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | ug/L | 200 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 |
| Bromoform | ug/L | 60 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 |
| Bromomethane (Methyl bromide) | ug/L | 0.9 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | ug/L | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 |
| Carbon tetrachloride | ug/L | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chlorobenzene | ug/L | 15 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | ug/L | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloroform (Trichloromethane) | ug/L | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 |
| Chloromethane (Methyl chloride | ug/L | 700 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | ug/L | 200 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | ug/L | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Dibromochloromethane | ug/L | 40 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 |
| Dichlorodifluoromethane (CFC-12 | ug/L | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 |
| Ethylbenzene | ug/L | 8 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.83** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexane | ug/L | - | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - | <0.5 | <0.5 | <0.5 | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.5 |
| m&p-Xylenes | ug/L | 32 (a) | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | **1.5** | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Methyl tert butyl ether (MTBE | ug/L | 200 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Methylene chloride | ug/L | 100 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <0.5 | <2 | <2 | <2 | <2 | <2 | <2 | <0.5 | <2 | <2 | <2 |
| N-Hexane (C6 and isomers | ug/L | - | <0.5 | <0.5 | <0.5 | - | - | - | - | <0.5 | <0.5 | - | - | - | <0.5 | <0.5 | <0.5 | - | - | - | - | - | - | - | - |
| o-Xylene | ug/L | 40 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **0.73** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | ug/L | 4 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | ug/L | 50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | ug/L | 0.8 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | **4.12** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | ug/L | 200 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | ug/L | 7 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | ug/L | 20 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11 | ug/L | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Trihalomethanes | ug/L | - | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Vinyl chloride | ug/L | 600 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Xylenes (total) | ug/L | 72 (b) | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | **2.3** | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.5 | <1.1 | <1.1 | <1.1 |

Notes:

(1) Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 199
(a) PWQO objectives for individual xylene isomers have been combined
PWQO objective for Xylene-m is 2 ug/L. The PWQO objective for Xylene-p is 30 ug/L
(b) PWQO objectives for individual xylene isomers have been combine
The PWQO objective for Xylene-o is 40 ug/L
\- Parameter not analyzed / no informatior
< Parameter detected below the laboratory method detection limi
**36.0** Parameter exceeds the PWQO.

**TABLE 6.7**

**VOLATILE ORGANIC COMPOUNDS SURFACE WATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | SW2 | SW2 | SW2 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | SW-WARD2-041017-005 | SW-WARD2-112417-008 | SW-WARD2-110318-009 | SW-WARD2-1112-006 | SW-WARD2-DD-061514-006 | SW-WARD2-103014-004 | SW-WARD2-161115-005 | SW-WARD2-041017-009 | SW-WARD2-112417-009 | SW-WARD2-110318-003 | SW-WARD2-1112-005 | SW-WARD2-DD-061514-004 | SW-WARD2-103014-003 | SW-WARD2-161115-004 | SW-WARD2-041017-001 | SW-WARD2-112417-007 | SW-WARD2-110318-004 | SW-WARD2-DD-061514-002 | SW-WARD2-103014-008 | SW-WARD2-161115-003 | SW-WARD2-041017-010 | SW-WARD2-112417-001 | SW-WARD2-110318-008 |
| **Sample Date:** | | | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/26/2012 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 11/26/2012 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ug/L | 20 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | ug/L | 10 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | ug/L | 70 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | ug/L | 800 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | ug/L | 200 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | ug/L | 40 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide | ug/L | 5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 |
| 1,2-Dichlorobenzene | ug/L | 2.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | ug/L | 100 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | ug/L | 0.7 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | ug/L | 2.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | ug/L | 4 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK | ug/L | 400 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | ug/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK | ug/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | ug/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Benzene | ug/L | 100 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | ug/L | 200 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromoform | ug/L | 60 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromomethane (Methyl bromide) | ug/L | 0.9 | <0.5 | <0.5 | <0.5 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | ug/L | - | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Carbon tetrachloride | ug/L | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chlorobenzene | ug/L | 15 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | ug/L | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloroform (Trichloromethane) | ug/L | - | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloromethane (Methyl chloride | ug/L | 700 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | ug/L | 200 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | ug/L | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Dibromochloromethane | ug/L | 40 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Dichlorodifluoromethane (CFC-12 | ug/L | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Ethylbenzene | ug/L | 8 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexane | ug/L | - | <0.5 | <0.5 | <0.5 | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | <0.5 | <0.5 | <0.5 |
| m&p-Xylenes | ug/L | 32 (a) | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Methyl tert butyl ether (MTBE | ug/L | 200 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Methylene chloride | ug/L | 100 | <2 | <2 | <2 | <0.5 | <2 | <2 | <2 | <2 | <2 | <2 | <0.5 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| N-Hexane (C6 and isomers | ug/L | - | - | - | - | - | <0.5 | <0.5 | - | - | - | - | <0.5 | <0.5 | <0.5 | - | - | - | - | <0.5 | <0.5 | - | - | - | - |
| o-Xylene | ug/L | 40 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | ug/L | 4 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | ug/L | 50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | ug/L | 0.8 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | ug/L | 200 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | ug/L | 7 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | ug/L | 20 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11 | ug/L | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Trihalomethanes | ug/L | - | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Vinyl chloride | ug/L | 600 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Xylenes (total) | ug/L | 72 (b) | <1.1 | <1.1 | <1.1 | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 |

Notes:

(1) Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 199

(a) PWQO objectives for individual xylene isomers have been combined
PWQO objective for Xylene-m is 2 ug/L. The PWQO objective for Xylene-p is 30 ug/L

(b) PWQO objectives for individual xylene isomers have been combine
The PWQO objective for Xylene-o is 40 ug/L

\- Parameter not analyzed / no informatior

< Parameter detected below the laboratory method detection limi

**36.0** Parameter exceeds the PWQO.

**TABLE 6.7**

**VOLATILE ORGANIC COMPOUNDS SURFACE WATER ANALYTICAL RESULTS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | SW-WARD2-DD-061514-001 | SW-WARD2-103014-010 | SW-WARD2-161115-002 | SW-WARD2-041017-008 | SW-WARD2-112417-010 | SW-WARD2-110318-006 | SW-WARD2-DD-061514-008 | SW-WARD2-080514-001 | SW-WARD2-103014-007 | SW-WARD2-161115-010 | SW-WARD2-041017-004 | SW-WARD2-112417-005 | SW-WARD2-110318-010 | SW-WARD2-DD-061514-007 | SW-WARD2-080514-002 | SW-WARD2-103014-001 | SW-WARD2-161115-009 | SW-WARD2-041017-003 | SW-WARD2-112417-006 | SW-WARD2-110318-002 |
| **Sample Date:** | | | 6/15/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 6/15/2014 | 8/5/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 | 6/15/2014 | 8/5/2014 | 10/30/2014 | 11/16/2015 | 4/10/2017 | 11/24/2017 | 11/3/2018 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ug/L | 20 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,1-Trichloroethane | ug/L | 10 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2,2-Tetrachloroethane | ug/L | 70 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1,2-Trichloroethane | ug/L | 800 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethane | ug/L | 200 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,1-Dichloroethene | ug/L | 40 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dibromoethane (Ethylene dibromide | ug/L | 5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.2 | <0.2 | <0.2 |
| 1,2-Dichlorobenzene | ug/L | 2.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloroethane | ug/L | 100 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,2-Dichloropropane | ug/L | 0.7 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,3-Dichlorobenzene | ug/L | 2.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 1,4-Dichlorobenzene | ug/L | 4 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 2-Butanone (Methyl ethyl ketone) (MEK | ug/L | 400 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | ug/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK | ug/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | ug/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Benzene | ug/L | 100 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Bromodichloromethane | ug/L | 200 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromoform | ug/L | 60 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromomethane (Methyl bromide) | ug/L | 0.9 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Carbon disulfide | ug/L | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Carbon tetrachloride | ug/L | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chlorobenzene | ug/L | 15 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chloroethane | ug/L | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloroform (Trichloromethane) | ug/L | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloromethane (Methyl chloride | ug/L | 700 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | ug/L | 200 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| cis-1,3-Dichloropropene | ug/L | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Dibromochloromethane | ug/L | 40 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Dichlorodifluoromethane (CFC-12 | ug/L | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Ethylbenzene | ug/L | 8 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexane | ug/L | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 |
| m&p-Xylenes | ug/L | 32 (a) | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Methyl tert butyl ether (MTBE | ug/L | 200 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Methylene chloride | ug/L | 100 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| N-Hexane (C6 and isomers) | ug/L | - | <0.5 | <0.5 | - | - | - | - | <0.5 | <0.5 | <0.5 | - | - | - | - | <0.5 | <0.5 | <0.5 | - | - | - | - |
| o-Xylene | ug/L | 40 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Styrene | ug/L | 4 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Tetrachloroethene | ug/L | 50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Toluene | ug/L | 0.8 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,2-Dichloroethene | ug/L | 200 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| trans-1,3-Dichloropropene | ug/L | 7 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichloroethene | ug/L | 20 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Trichlorofluoromethane (CFC-11 | ug/L | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Trihalomethanes | ug/L | - | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Vinyl chloride | ug/L | 600 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Xylenes (total) | ug/L | 72 (b) | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 |

Notes:

(1) Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 199

(a) PWQO objectives for individual xylene isomers have been combined
PWQO objective for Xylene-m is 2 ug/L. The PWQO objective for Xylene-p is 30 ug/L

(b) PWQO objectives for individual xylene isomers have been combine
The PWQO objective for Xylene-o is 40 ug/L

\- Parameter not analyzed / no information

< Parameter detected below the laboratory method detection limi

36.0 Parameter exceeds the PWQO.

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP1-13 | MP2-13 | MP2-13 | MP2-13 | MP2-13 | MP2-13 | MP2-13 | MP2-13 | MP2-13 | MP2-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-1013-028 | GW (MP)-WARD2-DD-061514-001 | GW/MP-WARD2-103014-001 | GW(MP)-WARD2-8/6/15-002 | GW/MP-WARD2-161115-001 | GW(MP)-WARD2-042616-001 | GW(MP)-WARD2-110316-001 | GW(MP)-WARD2-041017-001 | GW(MP)-WARD2-112417-003 | GW(MP)-WARD2-051818-001 | GW(MP)-WARD2-110318-001 | GW-WARD2-1013-024 | GW-(MP)-WARD2-DD-061514-002 | GW/MP-WARD2-103014-002 | GW(MP)-WARD2-8/6/15-003 | GW/MP-WARD2-161115-002 | GW(MP)-WARD2-042616-002 | GW(MP)-WARD2-110316-002 | GW(MP)-WARD2-041017-002 | GW(MP)-WARD2-112417-004 |
| **Sample Date:** | | | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/26/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/26/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 127 | - | 241 | 113 | 111 | 104 | 142 | 141 | 125 | 125 | 127 | - | - | 115 | 122 | 112 | 122 | - | 94 | 90.8 |
| Iron (dissolved) | mg/L | 0.3 | **4.7** | - | **1.97** | **1.32** | <0.1 | **1.54** | <0.1 | **0.55** | <0.1 | **0.87** | <0.1 | - | - | **9.58** | **6.6** | 0.016 | **3.68** | - | 0.022 | 0.147 |
| Magnesium (dissolved) | mg/L | - | 44.7 | - | 43.8 | 39.5 | 37.3 | 41.9 | 52.4 | 50.8 | 47 | 46.1 | 43.9 | - | - | 60.2 | 60.6 | 63.8 | 64.7 | - | 57.4 | 57.8 |
| Manganese (dissolved) | mg/L | - | 2.27 | - | 0.407 | 0.358 | 0.101 | 0.318 | 0.292 | 0.375 | 0.0829 | 0.239 | 0.0646 | - | - | 0.871 | 0.708 | 0.214 | 0.616 | - | 0.534 | 0.366 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | **0.059** | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | **0.165** | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 1.6 | - | <10 | <10 | 0.96 | 0.92 | 1.25 | 1.01 | 1.48 | 1.45 | 1.13 | - | - | 6.8 | 6.9 | 8.17 | 6.55 | - | 6.41 | 6.81 |
| Sodium (dissolved) | mg/L | - | 6.91 | - | 6.2 | 6.1 | 6 | 6.2 | 8.3 | 7.4 | 8.4 | 8.84 | 9.78 | - | - | 16.7 | 16.5 | 17.3 | 15.8 | - | 14.2 | 15.2 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | - | 383 | 347 | - | 377 | 397 | - | 401 | 419 | 366 | 379 | 561 | 503 | 348 | 451 | 491 | 438 | 465 | 487 | 476 |
| Ammonia-N | mg/L | - | 0.664 | - | 0.287 | - | 0.394 | 0.265 | <0.142 | 0.214 | <0.058 | 0.225 | 0.077 | 1.54 | 0.736 | 0.501 | 0.475 | 0.381 | 0.304 | <0.442 | 0.167 | 0.459 |
| Chloride | mg/L | - | - | 11.5 | 11.8 | - | 17.6 | 19.4 | - | 23.4 | 25.2 | 26.1 | 34 | 29.2 | 27.2 | 15.3 | 17.9 | 20.6 | 16.8 | 14.6 | 14.3 | 13.5 |
| Conductivity | uS/cm | - | - | 771 | 716 | - | 761 | 774 | - | 913 | 860 | 760 | 765 | 1180 | 995 | 731 | 894 | 980 | 863 | 909 | 905 | 872 |
| Dissolved organic carbon (DOC) | mg/L | - | 24.3 | 8.3 | 7.5 | 9 | 6.2 | 8.3 | 6.2 | 5.2 | 6.5 | 7.5 | 7.32 | 27.8 | 14.8 | 11.2 | 15.9 | 10.5 | 10 | 10 | 7.9 | 8.7 |
| Hardness | mg/L | - | 501 | - | 783 | 445 | 430 | 433 | 571 | 561 | 505 | 503 | 499 | - | - | 535 | 554 | 543 | 571 | - | 471 | 465 |
| Nitrate (as N) | mg/L | - | - | <0.1 | <0.1 | - | 0.081 | 0.026 | - | 0.1 | 0.041 | 0.045 | 0.026 | <0.1 | 0.13 | 1.14 | 0.321 | 0.156 | 0.235 | 0.313 | 0.203 | 0.088 |
| Nitrite (as N) | mg/L | - | - | <0.1 | <0.1 | - | <0.01 | <0.01 | - | 0.027 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | 0.037 | <0.01 | 0.015 | <0.01 | 0.081 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | - | 7.64 | 7.7 | - | 7.91 | 7.96 | - | 7.82 | 8.07 | 7.69 | 7.38 | 7.68 | 8.03 | 7.65 | 8.2 | 8.04 | 8.18 | 7.38 | 7.96 | 8.1 |
| Phenolics (total) | mg/L | 0.001 | **0.0289** | - | **0.0024** | - | **0.0043** | <0.001 | <0.0049 | **0.0013** | <0.001 | **0.0042** | **0.0027** | <0.0071 | **0.0042** | **0.0025** | **0.0059** | **0.004** | <0.001 | <0.0027 | <0.001 | <0.0027 |
| Sulfate | mg/L | - | - | 74.8 | 63.3 | - | 35.5 | 21.7 | - | 89.7 | 56.8 | 46.8 | 31.1 | 85.4 | 74.7 | 62.6 | 71 | 78.6 | 61.3 | 50.8 | 39.9 | 32.3 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 3.18 | - | 0.94 | - | 0.61 | 3.4 | 0.76 | 0.73 | 0.99 | 1.13 | 5.1 | 10.1 | 1.29 | 1.38 | 1.03 | 0.7 | 1.79 | 5.3 | 0.99 | 1.41 |
| Un-ionized ammonia | mg/L | 0.02 (d) | - | - | - | - | - | - | - | - | - | 0.00286 | - | - | - | - | - | - | - | - | - | - |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | NM | - | - | - | - | - | Insuf. | Insuf. | 394 | - | - | NM | - | - | - | - | - | Insuf. | Insuf. |
| pH, field | s.u. | 6.5-8.5 | - | **1.34** | - | - | - | - | - | Insuf. | Insuf. | 7.55 | - | - | **1.02** | - | - | - | - | - | Insuf. | Insuf. |
| Temperature, field | Deg C | - | - | NM | - | - | - | - | - | Insuf. | Insuf. | 16.08 | - | - | NM | - | - | - | - | - | Insuf. | Insuf. |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | MP2-13 | MP2-13 | MP3-13 | MP3-13 | MP3-13 | MP3-13 | MP3-13 | MP3-13 | MP3-13 | MP3-13 | MP3-13 | MP4-13 | MP4-13 | MP4-13 | MP4-13 | MP4-13 | MP4-13 | MP4-13 | MP4-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | GW(MP)-WARD2-051818-002 | GW(MP)-WARD2-110318-002 | GW-WARD2-1013-018 | GW-(MP)-WARD2-DD-061514-003 | GW(MP)-WARD2-8/6/15-001 | GW/MP-WARD2-161115-003 | GW(MP)-WARD2-042516-003 | GW(MP)-WARD2-110316-003 | GW(MP)-WARD2-041017-003 | GW(MP)-WARD2-112417-001 | GW(MP)-WARD2-051818-003 | GW(MP)-WARD2-110318-003 | GW-WARD2-1013-004 | GW(MP)-WARD2-8/6/15-004 | GW/MP-WARD2-161115-004 | GW(MP)-WARD2-042516-004 | GW(MP)-WARD2-110316-004 | GW(MP)-WARD2-041017-004 | GW(MP)-WARD2-112417-002 | GW-WARD2-112417-022 |
| Sample Date: | | | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/15/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 11/24/2017 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 102 | 78.7 | 56.4 | 78.9 | 63.1 | 99.2 | 91.2 | 95.2 | 86.5 | 75.4 | 14.9 | - | 52.2 | - | 41.8 | 53.9 | 63.4 | 72.8 | 61.2 | 70.5 |
| Iron (dissolved) | mg/L | 0.3 | **3.89** | 0.098 | 0.133 | **3.24** | 0.105 | <0.01 | **0.664** | 0.032 | **0.429** | 0.081 | 0.1 | - | <0.05 | - | <0.01 | 0.023 | 0.011 | 0.104 | 0.028 | 0.073 |
| Magnesium (dissolved) | mg/L | - | 60.1 | 53 | 28.8 | 39.2 | 46.2 | 40.8 | 41 | 42.9 | 36.1 | 37.7 | 3.65 | - | 39.2 | - | 54.6 | 38.4 | 62.6 | 47.6 | 52.7 | 51.3 |
| Manganese (dissolved) | mg/L | - | 0.539 | 0.289 | 0.981 | 0.576 | 0.0986 | 0.0357 | 0.29 | 0.119 | 0.22 | 0.133 | 0.0654 | - | 0.145 | - | <0.0005 | 0.0389 | 0.0139 | 0.035 | 0.0151 | 0.0474 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | **0.054** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 6.15 | 6.51 | 5.4 | 4.7 | 6.1 | 4.65 | 3.84 | 4.77 | 3.64 | 4.12 | 0.97 | - | 2.8 | - | 2.79 | 1.75 | 2.92 | 1.84 | 2.17 | 2.12 |
| Sodium (dissolved) | mg/L | - | 12.8 | 12.5 | 43.4 | 41.3 | 49.2 | 39.6 | 37.4 | 43 | 33.6 | 37.3 | 3.59 | - | 24.5 | - | 17.7 | 15.4 | 20.8 | 16.8 | 14 | 26.8 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 478 | 444 | - | 384 | 391 | 451 | 388 | 438 | 384 | 415 | 167 | 304 | - | - | 184 | - | - | 227 | 287 | 395 |
| Ammonia-N | mg/L | - | 0.527 | 0.037 | - | - | 0.136 | 0.178 | 0.092 | <0.128 | 0.073 | <0.098 | 0.143 | 0.201 | 0.199 | 0.31 | 0.27 | - | <0.173 | 0.132 | <0.888 | <0.286 |
| Chloride | mg/L | - | 13.2 | 12.8 | - | 19.5 | 17.5 | 25.2 | 24.4 | 25.7 | 24 | 27 | 15.3 | 19.9 | - | - | 5 | - | - | 3.27 | 4.23 | 0.55 |
| Conductivity | uS/cm | - | 831 | 787 | - | 704 | 731 | 855 | 761 | 850 | 756 | 810 | 329 | <3 | - | - | 664 | - | - | 277 | 600 | 757 |
| Dissolved organic carbon (DOC) | mg/L | - | 8.9 | 15.4 | 23.1 | 9.4 | 4.7 | 5.5 | <6.8 | 4.4 | 5.1 | 7 | 3.6 | 7.29 | 9.1 | 12.9 | 4.1 | <3.6 | 2.2 | 1.1 | 13.6 | <1 |
| Hardness | mg/L | - | 501 | 415 | 259 | 359 | 348 | 416 | 397 | 414 | 365 | 344 | 52 | - | 292 | - | 329 | 293 | 416 | 378 | 370 | 387 |
| Nitrate (as N) | mg/L | - | 0.062 | 0.046 | - | <0.1 | 0.051 | <0.02 | <0.02 | <0.02 | 0.02 | 0.102 | 0.128 | <0.02 | - | - | 0.14 | - | - | 0.045 | 0.041 | <0.02 |
| Nitrite (as N) | mg/L | - | 0.062 | <0.01 | - | 0.32 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | - | - | <0.01 | - | - | <0.01 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | 8.17 | 7.54 | - | 8.41 | 8.43 | 8.12 | 8.34 | 7.71 | 8.14 | 8.2 | 7.94 | **5.83** | - | - | 8.12 | - | - | **8.53** | 8.33 | 8.08 |
| Phenolics (total) | mg/L | 0.001 | **0.0012** | **0.0023** | - | - | **0.0221** | **0.0053** | <0.001 | <0.0059 | **0.0012** | **0.0064** | **0.0159** | **0.0028** | <0.0054 | **0.0062** | **0.0121** | - | <0.0056 | **0.0015** | <0.004 | <0.001 |
| Sulfate | mg/L | - | 29.5 | 24 | - | 25.4 | 22.8 | 27.4 | 23 | 25.8 | 22.4 | 21.1 | 10.7 | 12.4 | - | - | 177 | - | - | 88.9 | 96.5 | 42.1 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 1.54 | 0.64 | - | - | 0.47 | 0.23 | 1.12 | 1.13 | <0.15 | 1.99 | 1.62 | 1.46 | 0.98 | 1.01 | 0.21 | - | 0.61 | 2.4 | 3.4 | 0.33 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.0065 | 0.00034 | - | - | - | - | - | - | - | - | 0.0007 | - | - | - | - | - | - | - | - | 0.00251 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 480 | 970 | - | NM | - | - | - | - | Insuf. | Insuf. | 107 | - | - | - | - | - | - | Insuf. | Insuf. | 636 |
| pH, field | s.u. | 6.5-8.5 | 7.62 | 7.69 | - | **1.21** | - | - | - | - | Insuf. | Insuf. | 7.35 | - | - | - | - | - | - | Insuf. | Insuf. | 7.6 |
| Temperature, field | Deg C | - | 13.54 | 7.77 | - | NM | - | - | - | - | Insuf. | Insuf. | 9.63 | - | - | - | - | - | - | Insuf. | Insuf. | 9.7 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

**TABLE 6.8**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS WITH PWQOS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW2-83 | OW3-83 | OW3-83 | OW3-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | CRA-4074-02-WARD2-26 | GW-WARD2-1210-009 | GW-WARD2-0511-016 | GW-WARD2-1011-018 | GW-WARD2-0412-013 | GW-WARD2-1112-026 | GW-WARD2-0513-012 | GW-WARD2-1013-005 | GW-WARD2-DD-061514-020 | GW-WARD2-103014-026 | GW-WARD2-8/6/15-029 | GW-WARD2-161115-024 | GW-WARD2-042516-016 | GW-WARD2-041017-023 | GW-WARD2-112417-025 | GW-WARD2-051818-014 | GW-WARD2-110318-032 | CRA-4074-02-WARD2-27 | GW-WARD2-1210-008 | GW-WARD2-0511-014 |
| **Sample Date:** | | | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 155 | 173 | 155 | 151 | 150 | 109 | 155 | 160 | 156 | 155 | 161 | 168 | 141 | 115 | 61.1 | 134 | 130 | 103 | 132 | 103 |
| Iron (dissolved) | mg/L | 0.3 | 0.287 | 0.161 | 0.234 | 0.091 | 0.213 | <0.05 | 0.222 | <0.05 | **0.438** | 0.135 | 0.131 | **0.362** | 0.147 | 0.014 | 0.085 | 0.109 | 0.262 | 0.213 | 0.285 | <0.05 |
| Magnesium (dissolved) | mg/L | - | 40.8 | 40.9 | 38.1 | 34.3 | 37.8 | 28.6 | 44.2 | 42.7 | 49.3 | 42.4 | 43.9 | 41.9 | 35.7 | 31.7 | 27.9 | 37.1 | 37.8 | 28.3 | 34 | 28 |
| Manganese (dissolved) | mg/L | - | 0.0899 | 0.158 | 0.145 | 0.0814 | 0.105 | 0.0023 | 0.0621 | 0.0019 | 0.0538 | 0.0572 | 0.0411 | 0.0764 | 0.0403 | 0.0989 | 0.193 | 0.0205 | 0.058 | 0.179 | 0.632 | 0.245 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | **0.061** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | **0.533** | **0.122** | **0.146** | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 0.764 | 0.577 | 1.02 | 1.68 | 4.24 | 0.843 | 1.4 | 4.1 | <1 |
| Sodium (dissolved) | mg/L | - | 6.04 | 5.93 | 5.99 | 5.86 | 5.83 | 5.02 | 6.74 | 7.29 | 7.56 | 7.13 | 6.79 | 7.12 | 6.05 | 5.76 | 77.5 | 6.99 | 7.52 | 5 | 5.44 | 4.67 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 499 | 523 | 469 | 479 | 496 | 366 | 503 | 508 | 573 | 566 | 530 | 515 | 484 | 389 | 426 | 466 | 478 | 398 | 417 | 368 |
| Ammonia-N | mg/L | - | 0.064 | 0.101 | 0.15 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.057 | 0.251 | 0.184 | 0.152 | 0.131 | <0.02 | 0.535 | 0.063 | 0.092 | 0.105 | <0.05 | <0.05 |
| Chloride | mg/L | - | 3.5 | <2 | 5.3 | 2.2 | 4.1 | 2.2 | 2.9 | <2 | 3.3 | 2.7 | 3.8 | 3.22 | 5 | 2.31 | 34.4 | 4.48 | 3.21 | 3.9 | 2.9 | 2.6 |
| Conductivity | uS/cm | - | 946 | 1050 | 929 | 876 | 978 | 392 | 897 | 1010 | 993 | 1040 | 1020 | 1030 | 916 | 675 | 793 | 911 | 870 | 703 | 737 | 648 |
| Dissolved organic carbon (DOC) | mg/L | - | <1 | 2.3 | 6.5 | 2.7 | 3.6 | 1.6 | 2.4 | 2.8 | 1.9 | 38.3 | 2.6 | 2.8 | <4.8 | 1.6 | 4.8 | 2.1 | 4.01 | 1.4 | 4.2 | 2.6 |
| Hardness | mg/L | - | 556 | 600 | 544 | 518 | 531 | 390 | 568 | 576 | 594 | 563 | 583 | 592 | 499 | 418 | 268 | 488 | 480 | 374 | 469 | 374 |
| Nitrate (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.463 | <0.02 | <0.02 | <0.02 | 0.454 | 0.033 | 0.89 | <0.1 | <0.1 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 7.49 | 7.47 | 7.57 | 7.56 | 7.47 | 7.48 | 7.34 | 7.35 | 7.28 | 7.22 | 7.85 | 7.6 | 7.61 | 7.62 | 8.15 | 7.67 | 7.02 | 7.67 | 7.59 | 7.75 |
| Phenolics (total) | mg/L | 0.001 | <0.001 | 0.001 | **0.002** | <0.001 | **0.004** | <0.001 | <0.001 | <0.001 | **0.0064** | <0.001 | **0.0086** | **0.0021** | <0.0036 | **0.0012** | <0.001 | **0.0077** | **0.005** | <0.001 | <0.001 | <0.001 |
| Sulfate | mg/L | - | 50.3 | 53.7 | 51.8 | 64.7 | 51.4 | 5.5 | 48.5 | 66.2 | 47.6 | 45.3 | 55.5 | 60.6 | 55.5 | 4.37 | <0.3 | 58.4 | 56.5 | 5 | 3.3 | 2.7 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.18 | <0.15 | 0.382 | <0.15 | <0.15 | 0.21 | 0.17 | <0.22 | 0.26 | 0.38 | 0.21 | 0.42 | 0.52 | <0.15 | 2.3 | 0.27 | 0.75 | 0.73 | 0.17 | <0.15 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00021 | 0.00004 | 0.00015 | <0.0002 | <0.00006 | <0.00003 | <0.0001 | <0.00024 | 0.00026 | 0.00062 | 0.00055 | 0.00066 | 0.00026 | <0.00011 | 0.00302 | 0.00009 | 0.00009 | 0.00057 | <0.00003 | <0.00008 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 852 | 735 | 960 | 910 | 926 | 533 | 890 | 915 | 1430 | 1030 | 1010 | 813 | 862 | 660 | 660 | 517 | 1000 | 620 | 523 | 693 |
| pH, field | s.u. | 6.5-8.5 | 7.21 | **6.31** | 6.7 | 7.29 | 6.81 | **6.45** | 7.05 | 7.3 | 7.3 | 7.03 | 7.09 | 7.26 | 7.05 | 7.49 | 7.49 | 6.86 | 6.66 | 7.43 | 6.51 | 6.88 |
| Temperature, field | Deg C | - | 8.6 | 7.6 | 8.1 | 9 | 6.9 | 7.9 | 6.5 | 10.7 | 10.2 | 10.3 | 10.9 | 10.7 | 6.7 | 7.3 | 7.3 | 8.82 | 9.89 | 8.6 | 8.1 | 8.9 |

Notes:

| | |
|---|---|
| (1) | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW3-83 | OW4-83 | OW4-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-1011-017 | GW-WARD2-0412-011 | GW-WARD2-0513-010 | GW-WARD2-1013-010 | GW-WARD2-DD-061514-018 | GW-WARD2-103014-021 | GW-WARD2-8/6/15-032 | GW-WARD2-161115-025 | GW-WARD2-042516-017 | GW-WARD2-041017-024 | GW-WARD2-112417-023 | GW-WARD2-051818-008 | GW-WARD2-110318-026 | GW-WARD2-1210-013 | GW-WARD2-0511-011 | CRA-4074-02-WARD2-28 | GW-WARD2-1210-015 | GW-WARD2-0511-010 | GW-WARD2-1011-012 | GW-WARD2-0412-007 |
| **Sample Date:** | | | 11/22/2011 | 4/22/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 12/1/2010 | 5/24/2011 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 104 | 101 | 106 | 132 | 120 | 112 | 126 | 153 | 99.9 | 68.7 | 146 | 94.9 | 121 | 102 | 103 | 148 | 165 | 165 | 182 | 143 |
| Iron (dissolved) | mg/L | 0.3 | <0.05 | <0.05 | <0.05 | <0.05 | 0.072 | <0.05 | <0.05 | **1.16** | 0.134 | <0.01 | 0.025 | 0.01 | **7.07** | <0.05 | <0.05 | **16.5** | **12.1** | **13.5** | **11.9** | **14.7** |
| Magnesium (dissolved) | mg/L | - | 26.3 | 26.8 | 28.9 | 34.6 | 34.3 | 31.8 | 33.2 | 41.9 | 28 | 52.1 | 41.6 | 31.2 | 34.8 | 25.8 | 27.6 | 58.8 | 67 | 68.9 | 59.6 | 55.7 |
| Manganese (dissolved) | mg/L | - | 0.0307 | 0.0833 | 0.147 | <0.001 | 0.0913 | 0.0391 | 0.0942 | 0.847 | 0.318 | 0.00379 | 0.0326 | 0.045 | 1.39 | 0.004 | <0.001 | 0.475 | 0.284 | 0.454 | 0.368 | 0.458 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | **1.27** | <0.05 | **1.52** | <0.05 | <0.05 | <0.5 | <0.5 | **0.12** | <0.05 | **0.051** |
| Potassium (dissolved) | mg/L | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 0.7 | 0.495 | 1.98 | 21.8 | 1.01 | 5.44 | 1.5 | 1.8 | 12 | 14 | 13.1 | 13.7 | 10.7 |
| Sodium (dissolved) | mg/L | - | 4.16 | 4.53 | 5.02 | 5.44 | 5.58 | 3.36 | 5.49 | 6.34 | 5.37 | 26 | 7.28 | 6.37 | 6.08 | 13 | 16.3 | 26.2 | 31.9 | 24.3 | 27.6 | 21.9 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 370 | 358 | 373 | 498 | 450 | 473 | 468 | 483 | 396 | 408 | 469 | 419 | 477 | 368 | 394 | 610 | 739 | 676 | 791 | 632 |
| Ammonia-N | mg/L | - | <0.05 | <0.05 | <0.05 | 0.068 | <0.05 | <0.05 | 0.167 | <0.05 | <0.02 | <0.021 | 0.516 | 0.064 | 0.414 | <0.05 | 0.058 | 3.21 | 4.94 | 4.44 | 2.76 | 2.43 |
| Chloride | mg/L | - | <2 | 2.6 | 2.1 | <2 | 2 | <2 | 3.51 | 1.85 | 2.22 | 0.63 | 3.95 | 2.65 | 1.06 | 6.4 | 9.8 | 30 | 42.4 | 37.2 | 43.5 | 34.3 |
| Conductivity | uS/cm | - | 631 | 621 | 602 | 843 | 723 | 788 | 771 | 870 | 683 | 791 | 968 | 707 | 752 | 669 | 691 | 1140 | 1410 | 1260 | 1310 | 1220 |
| Dissolved organic carbon (DOC) | mg/L | - | 2.1 | 1.4 | 1.5 | 2.9 | 1.4 | 1.3 | 3.1 | 3.3 | <3.8 | 1 | 2.2 | 1.6 | 5.55 | 1.4 | 2.5 | 6 | 8.2 | 16 | 9.6 | 8.5 |
| Hardness | mg/L | - | 369 | 362 | 384 | 471 | 441 | 410 | 452 | 554 | 365 | 386 | 536 | 365 | 444 | 360 | 370 | 612 | 689 | 696 | 701 | 586 |
| Nitrate (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.02 | 0.074 | 0.08 | 0.048 | 0.039 | <0.1 | <0.1 | 0.15 | 0.12 | 0.35 | <0.1 | 0.22 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 7.65 | 7.71 | 7.52 | 7.46 | 7.49 | 7.27 | 7.93 | 7.64 | 7.8 | 7.87 | 7.83 | 7.75 | 6.91 | 7.76 | 7.72 | 7.33 | 7.23 | 7.33 | 7.36 | 7.38 |
| Phenolics (total) | mg/L | 0.001 | <0.001 | <0.001 | <0.001 | <0.0021 | **0.0015** | **0.0032** | **0.0205** | **0.0034** | <0.0036 | **0.002** | <0.001 | **0.0042** | **0.053** | <0.001 | 0.001 | <0.002 | **0.004** | 0.001 | 0.001 | **0.004** |
| Sulfate | mg/L | - | 5.4 | 4 | 4 | 6.5 | 2.6 | 2.6 | 2.68 | 3.01 | 2.9 | 62.5 | 63.2 | 2.36 | 2.11 | 4.3 | 4.7 | 2.3 | <2 | <2 | <2 | <2 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | <0.15 | 0.35 | <0.15 | <0.3 | 0.16 | <0.15 | 0.2 | 0.25 | <0.15 | <0.15 | 0.58 | 0.17 | 6.1 | <0.15 | <0.15 | 8.1 | 10.4 | 8.24 | 7.13 | 6.43 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.00023 | <0.00007 | <0.00008 | 0.00029 | <0.00034 | <0.00014 | 0.00008 | <0.00029 | <0.00009 | <0.00012 | 0.00302 | 0.00013 | 0.00031 | <0.00004 | 0.00008 | 0.00893 | 0.00216 | 0.00471 | 0.00728 | 0.00187 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 702 | 728 | 629 | 772 | 946 | 789 | 632 | 712 | 625 | 674 | 6.74 | 416 | 1020 | 492 | 715 | 1320 | 1340 | 1440 | 1370 | 1240 |
| pH, field | s.u. | 6.5-8.5 | 7.35 | 6.88 | 6.96 | 7.27 | 7.44 | 7.08 | **6.31** | 7.38 | 7.39 | 7.46 | 7.46 | 6.95 | 6.54 | 6.65 | 6.83 | 7.14 | **6.36** | 6.7 | 7.11 | 6.62 |
| Temperature, field | Deg C | - | 8.6 | 7.9 | 7.1 | 10.3 | 11.2 | 10.4 | 10 | 10.9 | 7.8 | 8.6 | 8.6 | 9.8 | 9.27 | 7.1 | 9.4 | 8.5 | 7.8 | 9.1 | 8.7 | 7.4 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW6-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-1112-023 | GW-WARD2-0513-009 | GW-WARD2-1013-017 | GW-WARD2-DD-061514-015 | GW-WARD2-103014-020 | GW-WARD2-8/6/15-013 | GW-WARD2-161115-031 | GW-WARD2-042516-004 | GW-WARD2-110316-006 | GW-WARD2-041017-019 | GW-WARD2-112417-019 | GW-WARD2-051818-002 | GW-WARD2-110318-030 | CRA-4074-02-WARD2-29 | GW-WARD2-1210-007 | GW-WARD2-0511-008 | GW-WARD2-1011-010 | GW-WARD2-0412-005 | GW-WARD2-1112-021 | GW-WARD2-0513-004 |
| **Sample Date:** | | | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 176 | 175 | 188 | 174 | 178 | 184 | 151 | 183 | 180 | 27.4 | 189 | 97.6 | 165 | 182 | 133 | 222 | 211 | 204 | 213 | 195 |
| Iron (dissolved) | mg/L | 0.3 | **16.5** | **14** | **17.5** | **19.4** | **15.6** | **19.7** | **13** | **19.4** | **17.9** | <0.01 | **2.83** | **1.67** | **4.08** | **9.68** | <0.5 | **20** | **1.58** | **17.6** | **0.978** | **12.6** |
| Magnesium (dissolved) | mg/L | - | 74.9 | 57.9 | 75.1 | 74.7 | 75.3 | 77.1 | 77.5 | 73.4 | 78.7 | 15.1 | 76.2 | 54 | 60.5 | 56.8 | 44 | 65.4 | 64.3 | 63.1 | 74.2 | 47.4 |
| Manganese (dissolved) | mg/L | - | 0.356 | 0.418 | 0.354 | 0.432 | 0.322 | 0.357 | 0.268 | 0.325 | 0.348 | 0.00117 | 0.274 | 0.0539 | 0.498 | 0.533 | 0.119 | 0.737 | 0.437 | 0.759 | 0.625 | 0.537 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | **0.07** | **0.259** | **0.111** | <0.05 | **0.075** | **0.084** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | **0.052** | <0.5 | <0.05 | **0.123** | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 14 | 12.5 | 17 | 15.3 | 17.1 | 18.1 | 18.6 | 17.6 | 20 | 0.952 | 29.4 | 1.96 | 17.2 | 3.6 | <10 | 2.8 | 5.1 | 3.1 | 3.1 | 2 |
| Sodium (dissolved) | mg/L | - | 35 | 28.5 | 42 | 37.9 | 43.6 | 49.4 | 48.7 | 41.5 | 39.8 | 33.5 | 33.3 | 41.9 | 24.1 | 24.5 | 22.3 | 28 | 44.7 | 39.8 | 54.1 | 21.5 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 758 | 738 | 887 | 641 | 832 | 933 | 861 | 853 | 823 | 197 | 842 | 486 | 730 | 743 | 549 | 744 | 781 | 742 | 700 | 658 |
| Ammonia-N | mg/L | - | 6.22 | 5.68 | 12 | 10.2 | 9.29 | 12.1 | 14.4 | 12.7 | 12.8 | <0.023 | 10.9 | 0.348 | 8.93 | 0.513 | 0.338 | 0.52 | 1.58 | 0.789 | 0.66 | 0.59 |
| Chloride | mg/L | - | 40.3 | 42.8 | 57 | 52.4 | 65.8 | 68.5 | 78.4 | 49.1 | 49.5 | 2.04 | 31.7 | 23.7 | 28.6 | 48.2 | 46.2 | 69.4 | 134 | 105 | 85.6 | 43.5 |
| Conductivity | uS/cm | - | 1100 | 1250 | 1580 | 1440 | 1600 | 1700 | 1690 | 1600 | 1630 | 374 | 1510 | 939 | 1340 | 1410 | 1180 | 1440 | 1530 | 1530 | 1130 | 1150 |
| Dissolved organic carbon (DOC) | mg/L | - | 8.6 | 13.2 | 12.2 | 11.7 | 12.8 | 13.9 | 13.9 | 13.7 | 10.4 | <1 | 8.6 | 3.8 | 11.3 | 5.9 | 5.6 | 15 | 14 | 11.1 | 9.2 | 12.1 |
| Hardness | mg/L | - | 747 | 676 | 778 | 741 | 755 | 777 | 695 | 759 | 774 | 130 | 785 | 466 | 661 | 687 | 513 | 824 | 792 | 770 | 837 | 681 |
| Nitrate (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | 0.13 | <0.1 | 0.32 | <0.1 | 0.61 | 0.89 | 0.113 | <0.1 | <0.02 | 0.039 | <0.1 | 0.13 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.366 | <0.05 | <0.05 | <0.05 | <0.01 | <0.05 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 7.12 | 7.03 | 7.02 | 7.17 | 6.9 | 7.49 | 7.63 | 7.13 | 6.65 | 8.12 | 7.55 | 7.97 | 6.72 | 7.28 | 7.63 | 7.24 | 7.51 | 7.21 | 7.27 | 7.03 |
| Phenolics (total) | mg/L | 0.001 | <0.001 | 0.001 | <0.0056 | **0.014** | **0.0028** | **0.0065** | **0.0071** | **0.0136** | <0.0082 | **0.0015** | <0.0026 | **0.0086** | **0.0097** | <0.002 | <0.005 | <0.001 | **0.002** | **0.007** | <0.001 | 0.001 |
| Sulfate | mg/L | - | <2 | <2 | <2 | <2 | <2 | 2.3 | <1.5 | 3.1 | 6.8 | 14.3 | <1.5 | 3.51 | 3.12 | 19.1 | 30.5 | 10.3 | 13.6 | 22.5 | 39 | 19.7 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 8.63 | 6.79 | 11.8 | 10.3 | 10.5 | 12.5 | 14 | 25.4 | 14.1 | 0.17 | 11.5 | 0.73 | 10.1 | 1.74 | 1.65 | 1.55 | 3.12 | 2.19 | 1.59 | 1.28 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00151 | 0.00638 | **0.03106** | **0.03054** | **0.08795** | 0.00259 | **0.04723** | 0.01105 | **0.03312** | <0.00017 | **0.07934** | 0.00025 | 0.00481 | 0.001 | 0.00015 | 0.00033 | 0.00366 | 0.00053 | 0.00032 | 0.00105 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 1390 | 1480 | 1570 | 2150 | 1813 | 1600 | 1540 | 1670 | 1630 | 1570 | 15570 | 1480 | 1590 | 1500 | 1350 | 1640 | 1805 | 1740 | 1720 | 1380 |
| pH, field | s.u. | 6.5-8.5 | **6.11** | 6.77 | 7.02 | 7.08 | 7.64 | **5.92** | 7.14 | 6.69 | 7.03 | 7.58 | 7.58 | 6.5 | **6.4** | 6.99 | **6.37** | **6.49** | 7.04 | 6.58 | 6.5 | 7.01 |
| Temperature, field | Deg C | - | 7.6 | 7.8 | 11.1 | 11.2 | 9.5 | 11.6 | 10.6 | 6.9 | 10.8 | 7.9 | 7.9 | 9.85 | 9.25 | 8.3 | 7.8 | 8.6 | 9.1 | 6.8 | 4.9 | 6.6 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW7-83 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-1013-020 | GW-WARD2-DD-061514-013 | GW-WARD2-103014-019 | GW-WARD2-8/6/15-011 | GW-WARD2-161115-029 | GW-WARD2-042516-009 | GW-WARD2-110316-002 | GW-WARD2-041017-017 | GW-WARD2-112417-017 | GW-WARD2-051818-017 | GW-WARD2-110318-015 | CRA-4074-02-WARD2-30 | GW-WARD2-1210-014 | GW-WARD2-0511-013 | GW-WARD2-1011-015 | GW-WARD2-0412-008 | GW-WARD2-1112-024 | GW-WARD2-0513-005 | GW-WARD2-1013-015 | GW-WARD2-DD-061514-016 |
| **Sample Date:** | | | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 211 | 188 | 134 | 185 | 121 | 199 | 198 | 114 | 166 | 115 | 113 | 106 | 140 | 94.2 | 130 | 108 | 136 | 121 | 139 | 98 |
| Iron (dissolved) | mg/L | 0.3 | **13.8** | **22.6** | **7.58** | **21.1** | **1.65** | **15.7** | **9.31** | <0.01 | 0.015 | **4.22** | **1.57** | <0.05 | **2.36** | **0.97** | 0.193 | **0.715** | <0.05 | <0.05 | 0.143 | 0.247 |
| Magnesium (dissolved) | mg/L | - | 46.1 | 72.7 | 56 | 55.9 | 32.4 | 47.3 | 57 | 51.2 | 52.8 | 56.5 | 63.9 | 71.4 | 87.4 | 59.9 | 74.6 | 62.4 | 84.2 | 72 | 80.5 | 59.8 |
| Manganese (dissolved) | mg/L | - | 0.536 | 0.679 | 0.514 | 0.731 | 0.303 | 0.823 | 0.798 | 0.429 | 0.185 | 0.341 | 0.249 | 0.117 | 0.942 | 0.761 | 0.761 | 0.675 | 0.542 | 0.449 | 0.599 | 0.349 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | **0.101** | **0.064** | **0.072** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | **0.051** | <0.05 | <0.05 | <0.05 | <0.05 | **0.088** | **0.178** | **0.08** | <0.05 |
| Potassium (dissolved) | mg/L | - | 2.6 | 4.6 | 4.9 | 3.1 | 6.07 | 3.07 | 3.04 | 31.6 | 3.12 | 3.17 | 2.48 | 43 | 44.9 | 39.8 | 47 | 36 | 58 | 41 | 52 | 38.7 |
| Sodium (dissolved) | mg/L | - | 28.3 | 57.3 | 49.9 | 40.8 | 24.8 | 18 | 28.2 | 35 | 33.5 | 51.7 | 59.1 | 63.3 | 71.7 | 48.3 | 57.2 | 48.4 | 67.8 | 61.4 | 60.6 | 45.2 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 676 | 709 | 643 | 681 | 549 | 667 | 689 | 516 | 725 | 859 | 650 | 706 | 813 | 538 | 771 | 688 | 743 | 582 | 800 | 667 |
| Ammonia-N | mg/L | - | 0.981 | 2.7 | 2.79 | 1.41 | 4.18 | 1.37 | 1.56 | 2.56 | 1.36 | 1.47 | 1.52 | 2.71 | 5.7 | 3.91 | 7.54 | 3.16 | 5.44 | 3.42 | 5.88 | 3.82 |
| Chloride | mg/L | - | 78 | 126 | 120 | 68.8 | 59.9 | 40.6 | 104 | 27.9 | 66.5 | 159 | 87.3 | 53.8 | 56.3 | 34.2 | 51.7 | 46.4 | 53.4 | 32.5 | 48.1 | 39.1 |
| Conductivity | uS/cm | - | 1360 | 1420 | 1450 | 1400 | 1170 | 1310 | 1520 | 1060 | 1400 | 1830 | 1310 | 1370 | 1570 | 1070 | 1350 | 1330 | 1140 | 1070 | 1510 | 1180 |
| Dissolved organic carbon (DOC) | mg/L | - | 14.1 | 11.4 | 9.3 | 8 | 9.1 | 8.1 | 10.3 | 5.6 | 8.3 | 15.5 | 13.1 | 6.7 | 13 | 8.3 | 10 | 7.9 | 5.5 | 7.3 | 10 | 8.7 |
| Hardness | mg/L | - | 718 | 770 | 565 | 691 | 435 | 691 | 729 | 494 | 633 | 520 | 545 | 559 | 710 | 482 | 631 | 527 | 687 | 600 | 679 | 491 |
| Nitrate (as N) | mg/L | - | 1.06 | <0.1 | <0.1 | 0.77 | 0.15 | <0.1 | <0.1 | 0.707 | <0.1 | <0.1 | 0.087 | 1.7 | 0.1 | <0.1 | 1.02 | 2.46 | 9.11 | 0.51 | 6.72 | 0.13 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | 0.108 | <0.05 | <0.05 | <0.01 | <0.1 | <0.1 | <0.1 | 0.14 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 7.07 | 7.14 | 7.07 | 7.48 | 7.44 | 7.21 | 6.83 | 7.5 | 7.63 | 7.14 | 6.76 | 7.57 | 7.56 | 7.63 | 7.62 | 7.59 | 7.48 | 7.38 | 7.2 | 7.31 |
| Phenolics (total) | mg/L | 0.001 | <0.0028 | **0.0046** | **0.0193** | **0.0038** | **0.0371** | **0.0021** | <0.0139 | **0.0023** | <0.0013 | **0.005** | **0.0055** | <0.002 | <0.0005 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.0027 | **0.0063** |
| Sulfate | mg/L | - | 6.1 | 13.7 | 8.5 | 12.8 | 12.4 | 16.2 | 12 | 7.3 | 15.1 | 22.8 | 17.5 | 5.9 | <2 | 6.6 | 2.4 | 2.1 | 2.4 | 7.2 | 3.7 | 3.5 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 1.74 | 2.98 | 2.71 | 2.14 | 4.54 | 6.7 | 34 | 4.09 | 3.3 | 3.17 | 2.4 | 4.08 | 7.39 | 5.19 | 7.89 | 5.6 | 6.69 | 4.64 | 5.86 | 3.76 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.0026 | 0.00766 | 0.00543 | - | 0.01661 | 0.00388 | - | **0.02253** | 0.01197 | 0.00081 | 0.00088 | 0.01073 | 0.00363 | 0.00492 | **0.03561** | 0.0043 | 0.00228 | 0.00369 | **0.07111** | **0.02515** |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 1620 | 2220 | 1570 | - | 1240 | 1340 | - | 1490 | 1490 | 2020 | 1530 | 1388 | 1490 | 1120 | 1490 | 1340 | 1420 | 1290 | 1460 | 1670 |
| pH, field | s.u. | 6.5-8.5 | 7.02 | 7.08 | 6.92 | - | 7.2 | 7.21 | - | 7.67 | 7.67 | **6.43** | **6.44** | 7.28 | 6.54 | 6.75 | 7.35 | 6.87 | **6.33** | 6.78 | 7.72 | 7.41 |
| Temperature, field | Deg C | - | 11.4 | 10.5 | 10.4 | - | 11.3 | 6.7 | - | 7.7 | 7.7 | 8.6 | 9.08 | 8.9 | 7.3 | 9.8 | 9.1 | 7.3 | 8.1 | 7 | 10.3 | 11.6 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW8-88 | OW9-88 | OW9-88 | OW9-88 | OW9-88 | OW9-88 | OW10-88 | OW11-88 | OW12-88 | OW13-88 | OW16-89 | OW16-89 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-103014-022 | GW-WARD2-8/6/15-014 | GW-WARD2-161115-030 | GW-WARD2-042516-007 | GW-WARD2-110316-004 | GW-WARD2-041017-020 | GW-WARD2-112417-020 | GW-WARD2-051818-010 | GW-WARD2-110318-021 | CRA-4074-02-WARD2-31 | MW9 | GW-WARD2-0511-025 | GW-WARD2-1011-002 | GW-WARD2-0412-017 | GW-WARD2-1210-027 | GW-WARD2-1210-022 | GW-WARD2-1210-021 | GW-WARD2-1210-020 | CRA-4074-02-WARD2-32 | GW-WARD2-1210-004 |
| **Sample Date:** | | | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 12/1/2010 | 12/1/2010 | 12/1/2010 | 12/1/2010 | 5/12/2010 | 12/1/2010 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 123 | 115 | 132 | 89.6 | 136 | 55 | 130 | 105 | 135 | 152 | 151 | 169 | 161 | 136 | 92.4 | 112 | 93.1 | 111 | 101 | 122 |
| Iron (dissolved) | mg/L | 0.3 | 0.082 | **4.22** | **0.37** | **0.431** | <0.1 | <0.01 | **3.35** | **5.44** | **2.08** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | **1.55** | **0.445** | <0.05 | <0.05 | <0.05 | <0.05 |
| Magnesium (dissolved) | mg/L | - | 75 | 52.7 | 69.3 | 47 | 76.6 | 21.8 | 68.3 | 65.9 | 65.9 | 63.3 | 59 | 68.1 | 61.9 | 59.6 | 23.1 | 33.5 | 30.9 | 33.5 | 29.2 | 31.8 |
| Manganese (dissolved) | mg/L | - | 0.478 | 1.02 | 0.82 | 0.71 | 0.505 | <0.0005 | 0.998 | 0.852 | 0.706 | 0.0767 | 0.01 | 0.0943 | 0.0284 | 0.0028 | 0.0687 | 0.184 | 0.0069 | 0.0023 | <0.001 | 0.0058 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | **0.058** | **1.06** | <0.05 | <0.5 | <0.05 | **2.94** | **0.151** | **1.18** | <0.05 | **0.131** | <0.05 | **0.057** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 49.3 | 35.8 | 49.5 | 31 | 55.1 | 0.746 | 46 | 39.3 | 47.3 | 11.4 | 11.7 | 13.1 | 13.2 | 10.9 | 1.9 | <1 | 1 | <1 | 1.3 | 1.3 |
| Sodium (dissolved) | mg/L | - | 53.7 | 35.5 | 46.1 | 29.8 | 49.7 | 3.74 | 44.2 | 44.4 | 45.3 | 27.9 | 32.5 | 32.9 | 33.2 | 30.4 | 9.27 | 6.09 | 6.41 | 7.58 | 70.6 | 66.6 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 737 | 693 | 713 | 494 | 717 | 247 | 693 | 521 | 662 | 578 | 498 | 541 | 454 | 462 | 367 | 422 | 251 | 331 | 376 | 366 |
| Ammonia-N | mg/L | - | 5.63 | 6.75 | 10.5 | 4.89 | 13 | <0.036 | 8.16 | 5.62 | 6.14 | 0.397 | 0.085 | 0.734 | 0.11 | 0.078 | 0.086 | <0.05 | 0.098 | 0.075 | <0.05 | <0.05 |
| Chloride | mg/L | - | 42.4 | 31.6 | 36.3 | 25 | 39.5 | 5.66 | 31.1 | 27.4 | 37.1 | 82.1 | 84.2 | 121 | 119 | 104 | 41.6 | 13.3 | 10.9 | 16.1 | 109 | 133 |
| Conductivity | uS/cm | - | 1380 | 1290 | 1380 | 999 | 1470 | 442 | 1330 | 1020 | 1220 | 1350 | 1240 | 1350 | 1140 | 1250 | 782 | 788 | 652 | 764 | 1020 | 1110 |
| Dissolved organic carbon (DOC) | mg/L | - | 8.3 | 10.8 | 11.8 | 8.7 | 9 | <1 | 8.8 | 7 | 10.5 | 2.5 | 2.1 | 2.9 | 2.4 | 2.2 | 5.5 | 4.6 | 4.3 | 1.8 | <1 | 1 |
| Hardness | mg/L | - | 616 | 505 | 615 | 417 | 656 | 227 | 607 | 534 | 609 | 640 | 620 | 702 | 657 | 584 | 326 | 417 | 359 | 415 | 374 | 435 |
| Nitrate (as N) | mg/L | - | 0.34 | 0.62 | 0.74 | 0.072 | 7.49 | 0.024 | 0.12 | 0.361 | 3.25 | 1.41 | 2.95 | 2.6 | 2.36 | 3.09 | <0.1 | 0.14 | 1.11 | 0.48 | 0.69 | 0.76 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.05 | <0.05 | <0.01 | 0.752 | <0.01 | <0.05 | 0.03 | 0.028 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 7.21 | 7.74 | 7.77 | 7.55 | 6.95 | 8.02 | 7.68 | 7.6 | 7.06 | 7.49 | 7.9 | 7.51 | 7.8 | 7.75 | 7.9 | 7.84 | 7.89 | 7.97 | 7.86 | 7.78 |
| Phenolics (total) | mg/L | 0.001 | **0.0037** | **0.0149** | **0.0054** | <0.001 | **0.0721** | **0.0012** | <0.0014 | **0.0102** | **0.0106** | <0.002 | <0.005 | **0.004** | **0.004** | <0.005 | <0.005 | <0.001 | <0.001 | <0.005 | <0.001 | <0.001 |
| Sulfate | mg/L | - | 3 | 8.3 | 5.5 | 10.9 | <1.5 | 8.34 | 1.9 | 4.43 | 2.24 | 50.3 | 54.3 | 39.2 | 42.3 | 70.2 | 14 | 12.2 | 82.2 | 74.3 | 16.7 | 18.6 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 6.47 | 7.88 | 9.39 | 16.2 | 27.5 | 0.63 | 13.3 | 7.73 | 9.9 | 0.78 | 0.36 | 1 | 0.2 | 0.37 | 0.19 | 0.23 | 1.1 | 0.75 | 0.21 | <0.15 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.01032 | 0.00747 | **0.05979** | 0.00975 | **0.05168** | <0.00023 | **0.05218** | 0.00828 | 0.00685 | 0.00151 | 0.00009 | 0.00096 | 0.00098 | - | 0.00011 | - | 0.00016 | - | <0.00059 | <0.00005 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 1440 | 1220 | 1240 | 1080 | 1510 | 1400 | 1400 | 591 | 1470 | 1180 | 1170 | 1390 | 12.3 | - | 558 | - | 480 | - | 907 | 1050 |
| pH, field | s.u. | 6.5-8.5 | 6.88 | 6.6 | 7.35 | 7.04 | 7.19 | 7.52 | 7.52 | 6.84 | 6.69 | 7.27 | 6.81 | 6.79 | 7.66 | - | 6.86 | - | 6.96 | - | 7.73 | 6.69 |
| Temperature, field | Deg C | - | 10.8 | 12.6 | 11.5 | 7.2 | 11.6 | 8 | 8 | 9.19 | 10.04 | 8.7 | 6.2 | 9.1 | 8.1 | - | 6.9 | - | 6.7 | - | 9.6 | 7.9 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW16-89 | OW18-88 | OW18-88 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | GW-WARD2-1210-005 | GW-WARD2-0511-003 | GW-WARD2-0511-004 | GW-WARD2-1011-022 | GW-WARD2-0412-020 | GW-WARD2-1112-029 | GW-WARD2-0513-021 | GW-WARD2-1013-034 | GW-WARD2-DD-061514-022 | GW-WARD2-103014-012 | GW-WARD2-8/6/15-002 | GW-WARD2-171115-013 | GW-WARD2-042516-027 | GW-WARD2-110316-027 | GW-WARD2-041017-032 | GW-WARD2-112417-009 | GW-WARD2-051818-023 | GW-WARD2-110318-018 | GW-WARD2-0511-002 | GW-WARD2-0513-016 |
| Sample Date: | | | 12/1/2010 | 5/24/2011 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/17/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/24/2011 | 5/13/2013 |
| **Parameters** | **Units** | ***PWQO*** [1] | **Duplicate** | | **Duplicate** | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 124 | 126 | 122 | 108 | 118 | 132 | 160 | 185 | 181 | 151 | 199 | 210 | 235 | 235 | 222 | 219 | 208 | 184 | 128 | 244 |
| Iron (dissolved) | mg/L | 0.3 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.231 | <0.05 | 0.096 | 0.21 | 0.265 | 0.276 | 0.184 | 0.18 | 0.173 | 0.103 | **22.2** |
| Magnesium (dissolved) | mg/L | - | 32 | 34.3 | 33.7 | 30.7 | 33 | 39.3 | 40.1 | 57.7 | 53.2 | 50.2 | 58.5 | 63 | 68.4 | 67.7 | 75.1 | 75.7 | 67 | 58.9 | 25 | 45.5 |
| Manganese (dissolved) | mg/L | - | 0.007 | 0.0021 | <0.001 | 0.0043 | 0.0018 | 0.0045 | 0.0086 | 0.0164 | 0.0254 | 0.0276 | 0.019 | 0.0304 | 0.0733 | 0.107 | 0.104 | 0.0883 | 0.0948 | 0.0846 | 0.133 | 1.82 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 1.3 | 1.5 | 1.4 | 1.3 | 1.2 | 1.2 | 1.5 | 1.8 | 8.1 | 4.9 | 3.5 | 3.3 | 2.32 | 1.92 | 1.58 | 1.48 | 1.3 | 1.14 | 1.6 | 1.5 |
| Sodium (dissolved) | mg/L | - | 58.7 | 62.7 | 56.3 | 46.7 | 37.5 | 26.8 | 37.4 | 47.6 | 25.4 | 27.6 | 26.1 | 51.7 | 73.7 | 70.5 | 38.7 | 41 | 30.3 | 27 | 16.5 | 11.8 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 369 | 377 | 379 | 374 | 392 | 472 | 496 | 623 | 590 | 490 | 618 | 707 | 765 | 799 | 811 | 777 | 734 | 700 | 463 | 725 |
| Ammonia-N | mg/L | - | <0.05 | <0.05 | <0.05 | 0.057 | <0.05 | <0.05 | <0.05 | 0.067 | 0.395 | 0.486 | 0.136 | 0.111 | 0.088 | <0.142 | <0.054 | <0.105 | 0.085 | 0.179 | 0.103 | 0.214 |
| Chloride | mg/L | - | 134 | 129 | 127 | 97.8 | 117 | 82.4 | 109 | 128 | 75.3 | 78.7 | 83.2 | 113 | 131 | 95.6 | 65.5 | 49.9 | 33 | 40.3 | 33.4 | 10.8 |
| Conductivity | uS/cm | - | 1110 | 1070 | 1080 | 937 | 1040 | 900 | 1070 | 1470 | 1210 | 1240 | 1400 | 1620 | 1770 | 1740 | 1660 | 1520 | 1330 | 1250 | 867 | 1150 |
| Dissolved organic carbon (DOC) | mg/L | - | 1 | 2.2 | 1.4 | 1.3 | <1 | 1.2 | 3.5 | 4.2 | 3.5 | 2.2 | 3.8 | 5.8 | 9.7 | 6.4 | 4.6 | 4.7 | 3.4 | 6.47 | 2.7 | 10.8 |
| Hardness | mg/L | - | 440 | 455 | 442 | 395 | 431 | 492 | 566 | 701 | 671 | 584 | 738 | 783 | 869 | 867 | 863 | 860 | 796 | 701 | 424 | 796 |
| Nitrate (as N) | mg/L | - | 0.75 | 0.83 | 0.81 | 0.59 | 0.43 | 0.17 | 0.17 | <0.1 | <0.1 | 0.11 | 0.18 | 0.14 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 | <0.1 | <0.1 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 7.81 | 7.84 | 7.83 | 7.75 | 7.76 | 7.44 | 7.47 | 7.32 | 7.55 | 7.26 | 7.67 | 7.4 | 7.1 | 6.66 | 7.16 | 7.41 | 7.37 | 6.69 | 7.35 | 6.88 |
| Phenolics (total) | mg/L | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.0034 | **0.0093** | **0.002** | **0.0075** | **0.0049** | <0.0024 | <0.0119 | **0.0018** | <0.001 | **0.0102** | **0.0057** | 0.001 | **0.005** |
| Sulfate | mg/L | - | 17.3 | 18.7 | 18.4 | 16.1 | 14.7 | 14.2 | 25.6 | 33.8 | 65.7 | 57.8 | 65.8 | 77.8 | 77.8 | 67.5 | 61.5 | 59.4 | 31 | 30.4 | 4.1 | 68.3 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | <0.15 | <0.15 | <0.15 | <0.15 | 0.16 | 0.18 | 0.21 | <0.28 | 0.59 | 0.52 | 0.43 | 0.66 | 0.71 | 0.52 | 0.5 | 0.36 | 0.35 | 0.33 | 0.41 | 0.96 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.00005 | <0.0001 | - | 0.00028 | <0.00009 | <0.00002 | <0.00011 | 0.00016 | 0.00198 | 0.00184 | 0.00005 | 0.00047 | 0.00012 | <0.00034 | <0.00005 | 0.00118 | 0.00006 | 0.00019 | 0.00014 | 0.00018 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 1050 | 1130 | - | 990 | 1070 | 857 | 1300 | 1420 | 1740 | 1250 | 1280 | 1370 | 1740 | 1740 | 1600 | 1540 | 781 | 1540 | 910 | 1470 |
| pH, field | s.u. | 6.5-8.5 | 6.69 | 6.95 | - | 7.38 | 6.91 | **6.33** | 7.02 | 7.03 | 7.29 | 7.24 | **6.13** | 7.3 | 6.8 | 7.02 | 6.59 | 7.71 | **6.42** | 6.69 | 6.82 | 6.69 |
| Temperature, field | Deg C | - | 7.9 | 9.7 | - | 8.9 | 9.4 | 9.1 | 9 | 9.6 | 11.6 | 9.5 | 11.1 | 9.1 | 9 | 10.2 | 10.7 | 9.6 | 11.07 | 9.42 | 8.9 | 6.2 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW18-88 | OW18-88 | OW18-88 | OW18-88 | OW18-88 | OW18-88 | OW18-88 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-DD-061514-004 | GW-WARD2-8/6/15-026 | GW-WARD2-042516-013 | GW-WARD2-041017-015 | GW-WARD2-112417-005 | GW-WARD2-051818-003 | GW-WARD2-110318-006 | CRA-4074-02-WARD2-41 | GW-WARD2-1210-016 | GW-WARD2-0511-012 | GW-WARD2-1011-014 | GW-WARD2-0412-010 | GW-WARD2-1112-001 | GW-WARD2-0513-007 | GW-WARD2-1013-011 | GW-WARD2-1013-012 | GW-WARD2-DD-061514-001 | GW-WARD2-103014-006 | GW-WARD2-8/6/15-031 | GW-WARD2-161115-001 |
| **Sample Date:** | | | 6/15/2014 | 6/8/2015 | 4/25/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 10/22/2013 Duplicate | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 191 | 175 | 168 | 171 | 163 | 168 | 164 | 52.2 | 48.5 | 72.4 | 73.7 | 60.1 | 78.9 | 64 | 75.7 | 76.4 | 61.9 | 76.3 | 71.9 | 78.3 |
| Iron (dissolved) | mg/L | 0.3 | **32.2** | **6.64** | **21.1** | **19.8** | **11.8** | **19.6** | **10.4** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 |
| Magnesium (dissolved) | mg/L | - | 56.6 | 46.2 | 32.2 | 71.7 | 45.7 | 64.4 | 43.9 | 24.5 | 22.3 | 37.5 | 32.6 | 27.6 | 37.3 | 33 | 37 | 37 | 33 | 37.8 | 35 | 36.1 |
| Manganese (dissolved) | mg/L | - | 1.04 | 1.33 | 0.658 | 0.37 | 0.935 | 0.421 | 1.13 | 0.0055 | 0.0201 | 0.0027 | 0.0038 | 0.0032 | 0.0063 | <0.001 | 0.0068 | 0.0067 | 0.0011 | 0.0014 | <0.001 | 0.0014 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | **0.163** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 1.7 | 2.3 | 1.26 | 15.6 | 1.51 | 15.8 | 1.58 | 11 | 8.5 | 16.7 | 12.4 | 10.9 | 13.4 | 13 | 12.1 | 12.2 | 13 | 12.3 | 13.2 | 11.8 |
| Sodium (dissolved) | mg/L | - | 5.44 | 3.35 | 11.6 | 32.7 | 8.14 | 24.1 | 6 | 19.6 | 18.9 | 24.6 | 21.9 | 19 | 29.2 | 18.8 | 33.6 | 32.7 | 17.6 | 27.1 | 22.8 | 33.3 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 1540 | 590 | 597 | 795 | 579 | 676 | 615 | 258 | 183 | 317 | 350 | 295 | 355 | 320 | 357 | 381 | 360 | 411 | 373 | 373 |
| Ammonia-N | mg/L | - | 0.196 | 0.261 | 0.478 | 9.82 | 0.457 | 7.59 | 0.339 | <0.05 | 0.145 | <0.05 | <0.05 | 0.056 | <0.05 | <0.05 | 0.061 | 0.115 | <0.05 | 0.051 | 0.098 | <0.05 |
| Chloride | mg/L | - | 4.1 | 10.2 | 18.4 | 35.7 | 14.1 | 26.2 | 4.01 | 12.8 | 9.7 | 10.5 | 15.2 | 12.2 | 18.3 | 10.1 | 28.1 | 28.3 | 12.5 | 15.5 | 11.9 | 19.4 |
| Conductivity | uS/cm | - | 1160 | 1020 | 1120 | 1490 | 1050 | 1240 | 1050 | 568 | 422 | 622 | 666 | 588 | 444 | 594 | 765 | 777 | 652 | 738 | 697 | 736 |
| Dissolved organic carbon (DOC) | mg/L | - | 10 | 5.8 | 11.6 | 8.1 | 3.2 | 7.4 | 7.21 | 3.3 | 4.2 | 2.4 | 2.1 | 2.2 | 1.7 | 1.8 | 1.6 | 1.8 | 1.1 | <1 | 1.2 | 1.6 |
| Hardness | mg/L | - | 711 | 628 | 552 | 721 | 595 | 683 | 591 | 231 | 213 | 335 | 318 | 264 | 350 | 296 | 342 | 343 | 290 | 346 | 324 | 344 |
| Nitrate (as N) | mg/L | - | <0.1 | <0.1 | <0.02 | 0.24 | <0.02 | 0.3 | <0.02 | 1.38 | 2.03 | 0.27 | 0.18 | 0.41 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.135 | 0.134 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.05 | <0.01 | <0.05 | <0.01 | <0.05 | <0.01 | <0.1 | 0.43 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | 6.89 | 7.53 | 7.23 | 7.05 | 7.35 | 7.36 | 6.53 | 7.97 | 7.69 | 7.88 | 7.83 | 7.91 | 7.76 | 7.8 | 7.77 | 7.77 | 7.85 | 7.6 | 8.17 | 8.05 |
| Phenolics (total) | mg/L | 0.001 | **0.0062** | **0.0278** | <0.0043 | **0.0038** | <0.001 | **0.0067** | **0.0051** | **0.003** | **0.016** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.0015 | <0.0017 | **0.0016** | <0.001 | **0.0284** | **0.0018** |
| Sulfate | mg/L | - | <2 | 2.9 | 2.68 | 14.4 | 1.66 | 3.1 | 3.52 | 19.8 | 12.6 | 16.2 | 18.7 | 14.9 | 21.2 | 17.6 | 29.7 | 30 | 17.3 | 19.6 | 20.3 | 25 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.92 | 0.63 | 4.4 | 13.3 | 1.02 | 9.49 | 1.55 | 0.68 | 0.87 | <0.15 | <0.15 | 0.32 | 0.33 | <0.15 | <0.17 | <0.15 | 0.21 | <0.15 | <0.15 | <0.15 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00053 | 0.00005 | 0.00071 | - | 0.00359 | 0.00574 | 0.00021 | <0.00074 | 0.00011 | <0.0001 | <0.00035 | 0.00017 | <0.00004 | <0.00019 | 0.0004 | 0.00076 | <0.00064 | 0.0002 | 0.00021 | <0.0006 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 1630 | 362 | 1160 | - | 970 | 605 | 1180 | 548 | 439 | 677 | 666 | 656 | 582 | 596 | 729 | 729 | 850 | 783 | 551 | 681 |
| pH, field | s.u. | 6.5-8.5 | 7.11 | **5.91** | 6.86 | - | 7.62 | 6.56 | **6.45** | 7.85 | 6.6 | 6.99 | 7.55 | 7.18 | 6.58 | 7.29 | 7.52 | 7.52 | 7.78 | 7.29 | 6.97 | 7.77 |
| Temperature, field | Deg C | - | 9 | 11.1 | 8.7 | - | 7.7 | 8.89 | 9.35 | 9.1 | 8.3 | 8.9 | 8.4 | 8.6 | 8.3 | 8 | 8.4 | 8.4 | 9.2 | 8.5 | 10.2 | 8.7 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW19-89 | OW20-89 | OW20-89 | OW20-89 | OW21-89 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-161115-002 | GW-WARD2-042516-001 | GW-WARD2-042516-005 | GW-WARD2-110316-007 | GW-WARD2-041017-001 | GW-WARD2-112417-001 | GW-WARD2-051818-011 | GW-WARD2-110318-002 | CRA-4074-02-WARD2-20-89 | GW-WARD2-0511-021 | GW-WARD2-1011-001 | GW-WARD2-1210-024 | CRA-4074-02-WARD2-43 | GW-WARD2-1210-018 | GW-WARD2-0511-019 | GW-WARD2-1011-021 | GW-WARD2-0412-016 | GW-WARD2-1112-003 | GW-WARD2-1112-004 | GW-WARD2-0513-015 |
| **Sample Date:** | | | 11/16/2015 | 4/25/2016 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 5/24/2011 | 11/22/2011 | 12/1/2010 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 11/26/2012 | 5/13/2013 |
| **Parameters** | **Units** | ***PWQO*** [1] | Duplicate | | Duplicate | | | | | | | | | | | | | | | | Duplicate | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 80.8 | 68.5 | 67.9 | 68 | 85.3 | 77.4 | 63.2 | 69.7 | 65 | 76.2 | 59.8 | 44.4 | 54.1 | 56 | 60 | 55.8 | 55.2 | 57 | 60 | 56.1 |
| Iron (dissolved) | mg/L | 0.3 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Magnesium (dissolved) | mg/L | - | 37.3 | 32.4 | 32.7 | 34.4 | 53.7 | 37 | 30.1 | 34.1 | 24.6 | 27.5 | 24.2 | 29.3 | 22.7 | 22.2 | 24.3 | 21 | 20.9 | 21.9 | 22.7 | 23.8 |
| Manganese (dissolved) | mg/L | - | 0.00142 | 0.00057 | 0.00051 | 0.00099 | 0.00524 | <0.0005 | 0.00141 | <0.0005 | 0.002 | 0.0036 | 0.0012 | 0.0039 | 0.0023 | 0.0011 | <0.001 | <0.001 | 0.0024 | <0.001 | 0.002 | <0.001 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 12.3 | 12 | 12.2 | 11.8 | 2.24 | 13.5 | 13 | 11.6 | <1 | <1 | <1 | 1.2 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Sodium (dissolved) | mg/L | - | 33 | 19 | 19.2 | 22.2 | 54.9 | 20.9 | 15.2 | 29.1 | 1.05 | 0.95 | 1.24 | 19.7 | 3.53 | 3.12 | 3.58 | 3.05 | 3.3 | 3.44 | 3.5 | 3.85 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 385 | 355 | 351 | 372 | 458 | 381 | 308 | 352 | 274 | 278 | 261 | 239 | 230 | 219 | 231 | 232 | 227 | 229 | 248 | 233 |
| Ammonia-N | mg/L | - | <0.05 | 0.025 | <0.02 | <0.079 | <0.02 | <0.02 | 0.037 | 0.042 | 0.075 | <0.05 | 0.056 | <0.05 | <0.05 | <0.05 | 0.057 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Chloride | mg/L | - | 21.2 | 9.34 | 9.4 | 16.3 | 39.5 | 8.62 | 8.8 | 13.6 | <2 | <2 | <2 | <2 | 4.6 | 5.3 | 4.7 | 4.6 | 4.5 | 3.9 | 3.9 | 4 |
| Conductivity | uS/cm | - | 758 | 674 | 669 | 725 | 1000 | 710 | 598 | 696 | 502 | 491 | 409 | 495 | 436 | 427 | 424 | 372 | 419 | 294 | 292 | 356 |
| Dissolved organic carbon (DOC) | mg/L | - | 1.6 | <4.4 | 4.3 | 1.8 | 2.5 | 1.6 | 1.8 | 2.79 | 1 | 1.5 | 2 | 1.6 | <1 | 5.6 | 1.2 | 1.2 | <1 | <1 | <1 | <1 |
| Hardness | mg/L | - | 355 | 304 | 304 | 311 | 434 | 345 | 282 | 314 | 264 | 303 | 249 | 232 | 228 | 231 | 250 | 226 | 224 | 233 | 243 | 238 |
| Nitrate (as N) | mg/L | - | 0.122 | 0.126 | 0.127 | 0.286 | 0.039 | 0.032 | 0.241 | 0.101 | 0.27 | <0.1 | 0.17 | 0.14 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Nitrite (as N) | mg/L | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 8 | 7.79 | 7.8 | 7.42 | 7.7 | 7.79 | 8.1 | 7.41 | 7.96 | 8.04 | 7.83 | 8.2 | 8.12 | 8.05 | 8.05 | 7.95 | 8.04 | 7.93 | 8 | 7.95 |
| Phenolics (total) | mg/L | 0.001 | **0.0022** | <0.001 | **0.0024** | <0.0088 | **0.0022** | <0.001 | 0.001 | **0.003** | <0.002 | <0.001 | **0.002** | <0.001 | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Sulfate | mg/L | - | 26 | 16.4 | 16.4 | 23.2 | 43.9 | 13.6 | 13.9 | 16.4 | 8.1 | 5 | 5.1 | 28.2 | 10.4 | 8.9 | 10.5 | 8.4 | 10.7 | 9.2 | 9 | 11 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | <0.15 | <0.15 | <0.15 | 0.31 | 0.44 | 0.32 | <0.15 | <0.15 | 0.57 | 0.19 | <0.15 | <0.15 | 0.28 | <0.15 | <0.15 | <0.15 | <0.15 | 0.24 | 0.17 | <0.15 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.0006 | 0.0001 | <0.00008 | <0.00088 | <0.00015 | <0.00015 | 0.00014 | 0.00007 | 0.00084 | <0.00015 | 0.00055 | <0.00021 | <0.0006 | <0.00007 | 0.00011 | <0.0003 | <0.00029 | <0.00006 | <0.00006 | <0.00019 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 681 | 628 | 628 | 682 | 623 | 623 | 367 | 863 | 284 | 498 | 452 | 359 | 425 | 3.33 | 489 | 426 | 442 | 365 | 365 | 428 |
| pH, field | s.u. | 6.5-8.5 | 7.77 | 7.3 | 7.3 | 7.73 | 7.6 | 7.6 | 7.25 | 6.91 | 7.75 | 7.17 | 7.69 | 7.32 | 7.75 | 6.79 | 6.95 | 7.44 | 7.42 | 6.75 | 6.75 | 7.27 |
| Temperature, field | Deg C | - | 8.7 | 8.6 | 8.6 | 8.9 | 8.1 | 8.1 | 8.98 | 8.09 | 8.4 | 8.6 | 8.6 | 8.2 | 9.4 | 9.9 | 9.6 | 9.6 | 9.6 | 9.8 | 9.8 | 8.8 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW22-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-1013-008 | GW-WARD2-DD-061514-003 | GW-WARD2-103014-003 | GW-WARD2-8/6/15-025 | GW-WARD2-161115-004 | GW-WARD2-042516-011 | GW-WARD2-110316-012 | GW-WARD2-112417-004 | GW-WARD2-051818-016 | GW-WARD2-110318-011 | CRA-4074-02-WARD2-42 | GW-WARD2-1210-017 | GW-WARD2-0511-018 | GW-WARD2-1011-020 | GW-WARD2-0412-015 | GW-WARD2-1112-002 | GW-WARD2-0513-014 | GW-WARD2-1013-007 | GW-WARD2-DD-061514-002 | GW-WARD2-103014-004 |
| **Sample Date:** | | | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 55.2 | 55.3 | 51.8 | 53.5 | 57.1 | 51.8 | 55.9 | 63.3 | 55.7 | 55.1 | 190 | 213 | 197 | 205 | 164 | 211 | 198 | 204 | 175 | 168 |
| Iron (dissolved) | mg/L | 0.3 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.01 | 0.087 | 0.114 | 0.299 | <0.01 | **26.5** | **21.1** | **30.8** | **26.1** | **26.1** | **27.6** | **22.6** | **32.1** | **30.7** | **29.6** |
| Magnesium (dissolved) | mg/L | - | 21.4 | 23.5 | 22.3 | 21.7 | 21 | 22.6 | 25.1 | 24.8 | 21.9 | 21.3 | 51.4 | 65 | 44.3 | 50.2 | 45.2 | 60.7 | 44.2 | 53.9 | 44.6 | 47.3 |
| Manganese (dissolved) | mg/L | - | <0.001 | 0.007 | 0.0089 | 0.017 | 0.0183 | 0.0113 | 0.0442 | 0.025 | 0.00725 | <0.0005 | 0.382 | 0.621 | 0.455 | 0.396 | 0.407 | 0.33 | 0.643 | 0.479 | 0.996 | 0.545 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | <1 | 1 | <1 | <1 | 0.639 | 0.867 | 0.801 | 0.74 | 0.853 | 0.699 | <10 | <10 | <1 | <1 | <1 | 1.2 | <1 | 1 | <1 | <1 |
| Sodium (dissolved) | mg/L | - | 3.37 | 4.16 | 3.63 | 3.75 | 3.34 | 3.74 | 3.94 | 4.09 | 3.82 | 3.85 | <5 | 6.7 | 2.96 | 6.06 | 3.07 | 7.37 | 4.04 | 4.9 | 4.02 | 3.61 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 237 | 247 | 221 | 233 | 227 | 231 | 241 | 248 | 227 | 206 | 646 | 745 | 641 | 716 | 622 | 796 | 577 | 687 | 629 | 627 |
| Ammonia-N | mg/L | - | <0.05 | 0.07 | 0.052 | 0.114 | <0.05 | <0.02 | <0.082 | 0.415 | 0.076 | 0.082 | 0.551 | 0.416 | 0.492 | 0.506 | 0.384 | 0.662 | 0.718 | 0.795 | 0.968 | 1.42 |
| Chloride | mg/L | - | 3.6 | 3.6 | 3.3 | 4.09 | 4.39 | 4.38 | 4.57 | 5.76 | 6.14 | 6.55 | <2 | 4.1 | <2 | 4.2 | <2 | 4.4 | 6.6 | 4.2 | 3.6 | 2.7 |
| Conductivity | uS/cm | - | 434 | 395 | 407 | 427 | 421 | 431 | 434 | 443 | 408 | 409 | 1120 | 1310 | 1100 | 1150 | 1070 | 1040 | 1040 | 1190 | 1050 | 1050 |
| Dissolved organic carbon (DOC) | mg/L | - | <1 | <1 | <1 | 2 | 5.1 | <3 | <1 | 1.3 | <1 | 1.99 | 3.3 | 3.9 | 7.5 | 4.9 | 3.2 | 4.5 | 1.4 | 4 | 3.9 | 3.4 |
| Hardness | mg/L | - | 226 | 235 | 221 | 223 | 229 | 222 | 243 | 260 | 229 | 225 | 686 | 800 | 676 | 720 | 597 | 776 | 676 | 731 | 621 | 614 |
| Nitrate (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | 0.029 | 0.054 | 0.043 | 0.03 | 0.032 | 0.027 | 0.059 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 7.98 | 8.09 | 7.96 | 8.26 | 8.13 | 8.07 | 7.71 | 8.14 | 8.09 | 7.81 | 7.21 | 7.19 | 7.11 | 7.05 | 7.13 | 6.81 | 6.85 | 6.91 | 6.94 | 6.84 |
| Phenolics (total) | mg/L | 0.001 | <0.0024 | **0.0028** | **0.0038** | **0.0103** | **0.0026** | <0.0028 | <0.0098 | <0.001 | **0.0158** | **0.0035** | <0.005 | <0.005 | **0.002** | 0.001 | **0.008** | **0.002** | <0.001 | <0.0024 | **0.0016** | **0.0181** |
| Sulfate | mg/L | - | 9.4 | 10.5 | 8.9 | 9.04 | 8.58 | 9.29 | 8.17 | 8.98 | 8.56 | 8.93 | 16 | 33.2 | 10.2 | 21.5 | 8.1 | 24.9 | 64.8 | 18.7 | 44.9 | 24.2 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | <0.15 | 0.16 | 0.19 | <0.15 | <0.15 | <1.5 | 0.54 | 1.6 | 0.58 | 2.1 | 1.9 | 1.07 | 1.27 | 1.17 | 1.21 | 1.31 | 1.24 | 1.11 | 1.14 | 1.3 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.00051 | 0.00086 | 0.00032 | 0.00033 | <0.00091 | <0.00009 | <0.00146 | 0.00342 | 0.00033 | 0.00015 | 0.00082 | 0.0001 | 0.0003 | 0.00086 | 0.0002 | 0.00014 | 0.00049 | 0.00124 | 0.0022 | 0.0029 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 428 | 536 | 433 | 341 | 350 | 414 | 419 | 1140 | 273 | 565 | 1170 | 1190 | 1260 | 1130 | 1200 | 1330 | 1320 | 1160 | 1610 | 1080 |
| pH, field | s.u. | 6.5-8.5 | 7.69 | 7.71 | 7.42 | 7.06 | 7.88 | 7.32 | 7.86 | 7.61 | 7.28 | 6.93 | 6.84 | **6.05** | **6.46** | 6.88 | **6.39** | **5.94** | 6.56 | 6.82 | 7 | 6.93 |
| Temperature, field | Deg C | - | 9 | 10.8 | 10.3 | 11.4 | 10.9 | 9.6 | 11.2 | 8.6 | 10.11 | 9.7 | 9.3 | 9.8 | 8.9 | 9.9 | 9 | 10.5 | 7.6 | 10.5 | 10 | 10.7 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW23-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | **GW-WARD2-8/6/15-027** | **GW-WARD2-161115-003** | **GW-WARD2-042516-010** | **GW-WARD2-110316-011** | **GW-WARD2-041017-002** | **GW-WARD2-041017-003** | **GW-WARD2-112417-003** | **GW-WARD2-051818-015** | **GW-WARD2-110318-003** | **CRA-4074-02-WARD2-33** | **GW-WARD2-1210-011** | **GW-WARD2-0511-017** | **GW-WARD2-1011-019** | **GW-WARD2-0412-014** | **GW-WARD2-1112-028** | **GW-WARD2-0513-013** | **GW-WARD2-1013-006** | **GW-WARD2-DD-061514-021** | **GW-WARD2-103014-031** | **GW-WARD2-8/6/15-028** |
| **Sample Date:** | | | **6/8/2015** | **11/16/2015** | **4/25/2016** | **11/3/2016** | **4/10/2017** | **4/10/2017 Duplicate** | **11/24/2017** | **5/18/2018** | **11/3/2018** | **5/12/2010** | **12/1/2010** | **5/24/2011** | **11/22/2011** | **4/22/2012** | **11/26/2012** | **5/13/2013** | **10/22/2013** | **6/15/2014** | **10/30/2014** | **6/8/2015** |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 155 | 184 | 156 | 190 | 62.2 | 162 | 185 | 176 | 216 | 62.9 | 73.2 | 81.6 | 63.9 | 66.5 | 66.5 | 58.8 | 51.7 | 66.2 | 51.9 | 54.8 |
| Iron (dissolved) | mg/L | 0.3 | **27.5** | **17.2** | **15.4** | **10.5** | <0.01 | **9.53** | **28.4** | **18.4** | **34.8** | <0.05 | <0.05 | **0.633** | 0.158 | **0.301** | 0.068 | **1.79** | **1.91** | **1.26** | **0.398** | **1.77** |
| Magnesium (dissolved) | mg/L | - | 43.2 | 47.1 | 36.9 | 49 | 29.1 | 42.5 | 44 | 40.9 | 56.1 | 30.8 | 27.7 | 34.7 | 25.7 | 28 | 27 | 26.1 | 21.9 | 31.2 | 24.3 | 29 |
| Manganese (dissolved) | mg/L | - | 0.994 | 1.62 | 0.871 | 1.51 | <0.0005 | 0.746 | 0.532 | 0.944 | 0.521 | 0.296 | 0.396 | 0.571 | 0.332 | 0.441 | 0.277 | 0.241 | 0.192 | 0.372 | 0.172 | 0.302 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | **0.386** | **0.069** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 1.1 | 1.12 | 1.11 | 1.49 | 11.5 | 1.27 | 0.872 | 0.803 | 1.1 | 2.2 | 5.4 | 1.1 | 1.2 | <1 | 1 | <1 | 1 | <1 | 1.2 | 1.1 |
| Sodium (dissolved) | mg/L | - | 3.44 | 3.74 | 3.15 | 4.22 | 14.4 | 3.33 | 3.47 | 3.55 | 8.49 | 81.9 | 82.8 | 74.3 | 82.2 | 66.8 | 84.2 | 91.4 | 109 | 75.1 | 89.2 | 73.6 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 630 | 591 | 510 | 583 | 308 | 490 | 593 | 579 | 636 | 389 | 395 | 413 | 416 | 394 | 406 | 416 | 411 | 396 | 434 | 392 |
| Ammonia-N | mg/L | - | 1.07 | 1.06 | 1.42 | 1.47 | <0.02 | 0.973 | 0.893 | 0.969 | 0.872 | 0.085 | 0.081 | 0.11 | 0.063 | 0.095 | <0.05 | <0.05 | 0.105 | 0.087 | 0.111 | 0.224 |
| Chloride | mg/L | - | <2.5 | 2.35 | 1.25 | <2.5 | 9.89 | 0.91 | 1.51 | 1.24 | 3.32 | 53.9 | 48.6 | 52.4 | 41.5 | 51.3 | 37.4 | 44.3 | 35.9 | 49.8 | 36.6 | 47.5 |
| Conductivity | uS/cm | - | 1100 | 1080 | 976 | 1120 | 593 | 1040 | 1040 | 1050 | 1150 | 838 | 850 | 833 | 790 | 821 | 490 | 770 | 808 | 796 | 785 | 808 |
| Dissolved organic carbon (DOC) | mg/L | - | 4.1 | 4.9 | <5 | 2.9 | 1.5 | 2.5 | 3.3 | 3.7 | 8.1 | 2.5 | 3.6 | 4.9 | 4.6 | 4.6 | 4 | 2.1 | 4.5 | 3.9 | 3.4 | 6.1 |
| Hardness | mg/L | - | 566 | 654 | 541 | 677 | 275 | 581 | 643 | 607 | 769 | 284 | 297 | 347 | 266 | 281 | 277 | 254 | 219 | 294 | 229 | 256 |
| Nitrate (as N) | mg/L | - | <0.1 | <0.02 | <0.02 | <0.1 | 0.046 | <0.02 | <0.02 | <0.02 | 0.045 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 |
| Nitrite (as N) | mg/L | - | <0.05 | <0.01 | <0.01 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | 7.46 | 7.24 | 7 | 7.59 | 7.78 | 6.97 | 7.51 | 7.43 | 6.55 | 8.06 | 8.01 | 8.02 | 7.98 | 7.98 | 7.97 | 7.93 | 7.89 | 7.98 | 7.81 | 8.16 |
| Phenolics (total) | mg/L | 0.001 | **0.0131** | **0.0045** | <0.0023 | <0.0049 | **0.0017** | **0.0019** | <0.001 | **0.0055** | **0.0068** | <0.001 | **0.003** | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | **0.0067** | **0.0041** | **0.0128** |
| Sulfate | mg/L | - | 18.3 | 19.9 | 30.8 | 16.5 | 14.7 | 37.1 | 17.2 | 30.3 | 56.2 | 5.7 | 3.1 | 4.1 | <2 | 3 | <2 | <2 | <2 | <2 | <2 | 0.98 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 1.54 | 1.55 | 3.3 | 2.74 | 0.2 | 1.72 | 1.6 | 1.93 | 1.6 | 0.35 | 0.18 | 0.15 | 0.15 | 0.41 | 0.38 | 0.34 | <0.34 | 0.33 | 0.24 | 0.37 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00024 | 0.00306 | 0.0016 | 0.00305 | <0.00018 | 0.00853 | 0.00789 | 0.0014 | 0.00032 | 0.00115 | 0.00011 | 0.00037 | 0.00094 | 0.00039 | <0.00007 | <0.0002 | 0.00105 | 0.00117 | 0.00153 | 0.00046 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 911 | 841 | 1060 | 1160 | 1140 | 1140 | 1140 | 687 | 1440 | 760 | 620 | 849 | 785 | 873 | 619 | 773 | 740 | 1110 | 789 | 648 |
| pH, field | s.u. | 6.5-8.5 | **5.92** | 7.03 | 6.75 | 6.91 | 7.61 | 7.61 | 7.61 | 6.84 | **6.21** | 7.85 | 6.81 | 7.21 | 7.86 | 7.36 | 6.82 | 7.35 | 7.61 | 7.77 | 7.77 | 6.89 |
| Temperature, field | Deg C | - | 12 | 12.2 | 8.4 | 11.5 | 9.4 | 9.4 | 9.5 | 8.96 | 9.93 | 7.9 | 9 | 8.8 | 8.9 | 7.1 | 8.9 | 7 | 11.1 | 10.2 | 10.5 | 12.1 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW24-98 | OW25-00 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 | OW25R-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-161115-023 | GW-WARD2-042516-015 | GW-WARD2-110316-010 | GW-WARD2-041017-014 | GW-WARD2-112417-002 | GW-WARD2-051818-012 | GW-WARD2-110318-031 | GW-WARD2-1210-029 | GW-WARD2-1013-032 | GW-WARD2-061514-029 | GW-WARD2-103014-028 | GW-WARD2-8/6/15-021 | GW-WARD2-171115-015 | GW-WARD2-042516-021 | GW-WARD2-110316-015 | GW-WARD2-110316-016 | GW-WARD2-041017-028 | GW-WARD2-112417-028 | GW-WARD2-051818-005 | GW-WARD2-110318-016 |
| **Sample Date:** | | | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 12/1/2010 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/17/2015 | 4/25/2016 | 11/3/2016 | 11/3/2016 Duplicate | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 53 | 62 | 57.7 | 92 | 183 | 69.1 | 59.8 | 64.9 | 68.9 | 60.2 | 56 | 78.3 | 71 | 97.9 | 83.1 | 81.8 | 85.1 | 89.8 | 64.7 | 86.9 |
| Iron (dissolved) | mg/L | 0.3 | **0.465** | **0.494** | **1.07** | 0.226 | **28.5** | **4.16** | 0.042 | <0.05 | <0.05 | **1.31** | **0.941** | **0.469** | **1.55** | 0.111 | **2.16** | **2.18** | 0.031 | **1.63** | 0.031 | **1.31** |
| Magnesium (dissolved) | mg/L | - | 22.9 | 30.7 | 28.1 | 55 | 45.6 | 30.9 | 26 | 23.1 | 25.9 | 29 | 26.3 | 32.8 | 29 | 40.6 | 35.4 | 35.7 | 34.3 | 42.5 | 50.3 | 35.4 |
| Manganese (dissolved) | mg/L | - | 0.164 | 0.221 | 0.19 | 0.034 | 0.492 | 0.197 | 0.134 | 0.0041 | 0.0345 | 0.087 | 0.0615 | 0.386 | 0.0968 | 0.204 | 0.119 | 0.118 | 0.0103 | 0.211 | 0.00395 | 0.175 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 1.2 | 1.39 | 1.83 | 1.91 | 0.82 | 1.03 | 1.54 | <1 | 4.4 | 2.3 | 1.8 | 1.9 | 1.54 | 1.73 | 1.69 | 1.67 | 1.66 | 1.71 | 2.09 | 1.47 |
| Sodium (dissolved) | mg/L | - | 91.3 | 75.7 | 82.6 | 46 | <5 | 68.1 | 75.6 | 3.33 | 8.47 | 4.89 | 4.86 | 4.09 | 4.52 | 4.69 | 5.36 | 5.28 | 5.85 | 7.26 | 29.4 | 9.87 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 408 | 400 | 417 | 499 | 601 | 382 | 379 | 246 | 271 | 288 | 303 | 324 | 306 | 366 | 323 | 316 | 327 | 338 | 395 | 297 |
| Ammonia-N | mg/L | - | 0.106 | 0.059 | <0.152 | 0.314 | 0.925 | 0.278 | 0.285 | 0.06 | 0.078 | 0.1 | 0.091 | 0.096 | 0.12 | 0.085 | <0.107 | <0.179 | <0.039 | <0.377 | 0.055 | 0.127 |
| Chloride | mg/L | - | 40.1 | 44.4 | 32.8 | 22 | 1.53 | 40.8 | 32.2 | 2.8 | 7.4 | 3.5 | 3.6 | 9.5 | 8.82 | 27.1 | 25 | 23.2 | 35.2 | 53.3 | 0.56 | 50.7 |
| Conductivity | uS/cm | - | 807 | 807 | 791 | 979 | 1060 | 777 | 727 | 478 | 575 | 514 | 501 | 611 | 572 | 712 | 662 | 649 | 695 | 758 | 728 | 682 |
| Dissolved organic carbon (DOC) | mg/L | - | 8.1 | <6.1 | 3.9 | 4.1 | 3.3 | 3.9 | 5.89 | 1.4 | 3.5 | 1.2 | <1 | 1.5 | 3 | <4.6 | <1 | 1 | 1 | <1 | 1 | 2.98 |
| Hardness | mg/L | - | 227 | 281 | 260 | 456 | 643 | 300 | 256 | 257 | 279 | 270 | 248 | 331 | 297 | 412 | 353 | 351 | 354 | 399 | 369 | 363 |
| Nitrate (as N) | mg/L | - | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.077 | 1.14 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.02 | 0.03 | 0.03 | <0.02 | <0.02 | 0.056 | <0.02 |
| Nitrite (as N) | mg/L | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | 8.06 | 8.07 | 7.52 | 7.66 | 7.34 | 8.01 | 7.62 | 8.09 | 7.72 | 8.14 | 7.93 | 8.17 | 8.02 | 8.01 | 7.4 | 7.47 | 7.85 | 8.04 | 8 | 7.47 |
| Phenolics (total) | mg/L | 0.001 | **0.0032** | <0.0063 | <0.0064 | **0.0021** | <0.001 | **0.007** | **0.0045** | <0.005 | <0.0022 | **0.0046** | <0.001 | **0.0088** | **0.0026** | <0.0017 | <0.0029 | <0.0065 | **0.002** | <0.001 | **0.0052** | **0.0028** |
| Sulfate | mg/L | - | 0.38 | 0.31 | 0.93 | 2.95 | 17.1 | <0.3 | <0.3 | 14.1 | 46.6 | 15 | 13.1 | 12.6 | 13.8 | 12.4 | 12.1 | 12.4 | 14.4 | 12.1 | 36.6 | 13.6 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.72 | <1.5 | 0.73 | 0.65 | 3.1 | 1.04 | 1.5 | <0.15 | <0.34 | 0.18 | <0.15 | 0.25 | 0.19 | 1.9 | 0.32 | 0.46 | 0.35 | 0.67 | 0.18 | 0.25 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00223 | 0.00024 | <0.00184 | - | 0.00763 | 0.0007 | 0.00124 | 0.00012 | 0.00072 | 0.00185 | 0.00108 | 0.00019 | 0.00185 | 0.00035 | <0.00146 | <0.00245 | <0.00021 | 0.00446 | 0.00012 | 0.00035 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 629 | 735 | 790 | - | 860 | 471 | 887 | 350 | 529 | 654 | 508 | 495 | 459 | 652 | 623 | 623 | 662 | 645 | 519 | 865 |
| pH, field | s.u. | 6.5-8.5 | 7.93 | 7.36 | 7.69 | - | 7.6 | 7.12 | 7.27 | 7.02 | 7.54 | 7.91 | 7.68 | 6.94 | 7.78 | 7.3 | 7.7 | 7.7 | 7.41 | 7.68 | 7.02 | 7.02 |
| Temperature, field | Deg C | - | 11.3 | 6.9 | 11.2 | - | 8.9 | 7.83 | 10.38 | 8.3 | 12.2 | 10.2 | 11.2 | 10 | 11.7 | 8.8 | 12.5 | 12.5 | 9.2 | 11.2 | 9.29 | 11.81 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW26-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 | OW27-00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-1210-028 | CRA-4074-02-WARD2-27-00 | GW-WARD2-1210-023 | GW-WARD2-0511-024 | GW-WARD2-1011-007 | GW-WARD2-0412-018 | GW-WARD2-1112-008 | GW-WARD2-0513-019 | GW-WARD2-1013-030 | GW-WARD2-061514-006 | GW-WARD2-103014-007 | GW-WARD2-8/6/15-020 | GW-WARD2-171115-005 | GW-WARD2-042516-019 | GW-WARD2-110316-017 | GW-WARD2-041017-008 | GW-WARD2-112417-006 | GW-WARD2-051818-031 | GW-WARD2-110318-001 | GW-WARD2-110318-009 |
| **Sample Date:** | | | 12/1/2010 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/17/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 11/3/2018 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 72 | 88.4 | 113 | 108 | 105 | 101 | 165 | 111 | 88.6 | 115 | 124 | 145 | 129 | 123 | 118 | 123 | 131 | 108 | 139 | 131 |
| Iron (dissolved) | mg/L | 0.3 | <0.05 | <0.05 | <0.05 | 2.08 | <0.05 | <0.05 | 0.257 | 0.208 | 0.394 | 3.1 | 1.01 | 5.59 | 0.27 | 4.13 | 0.016 | 1.7 | 0.081 | 0.029 | 0.022 | <0.01 |
| Magnesium (dissolved) | mg/L | - | 27.6 | 27.7 | 43.7 | 32.3 | 34.1 | 31.1 | 55.4 | 39.8 | 46.4 | 45.5 | 50 | 50.5 | 50.1 | 47.7 | 56.4 | 49 | 55.8 | 45.4 | 57.1 | 53.7 |
| Manganese (dissolved) | mg/L | - | 0.0157 | 0.0396 | 0.0149 | 0.811 | 0.0178 | 0.0835 | 6.48 | 4.51 | 0.527 | 5.45 | 4.23 | 4.79 | 2.75 | 3.84 | 1.58 | 4.07 | 0.265 | 3.42 | 0.745 | 0.615 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | 0.088 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 1.3 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 0.269 | 0.273 | 0.344 | 0.226 | 0.316 | 0.272 | 0.35 | 0.335 |
| Sodium (dissolved) | mg/L | - | 55.5 | 8.65 | 7.33 | 7.24 | 6.46 | 3.98 | 7.53 | 5.43 | 6.89 | 5.88 | 6.39 | 6.31 | 5.86 | 5.94 | 8.03 | 7.69 | 11.6 | 10.8 | 15.3 | 14.9 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 320 | 371 | 419 | 340 | 397 | 461 | 621 | 501 | 490 | 552 | 500 | 487 | 453 | 441 | 459 | 493 | 464 | 439 | 446 | 453 |
| Ammonia-N | mg/L | - | 0.063 | <0.05 | 0.112 | 0.06 | <0.05 | <0.05 | <0.05 | 0.18 | <0.05 | 0.057 | 0.098 | 0.152 | <0.05 | 0.094 | <0.11 | <0.06 | <0.159 | 0.073 | 0.028 | <0.02 |
| Chloride | mg/L | - | 6.2 | 10.5 | 7.8 | 6.3 | 14.1 | 15.4 | 13.4 | 18.4 | 27.8 | 26.4 | 27.5 | 40.7 | 40.1 | 57.8 | 64.1 | 54 | 55.6 | 49.6 | 71 | 71.2 |
| Conductivity | uS/cm | - | 755 | 695 | 889 | 620 | 703 | 826 | 913 | 833 | 913 | 940 | 913 | 1030 | 973 | 1060 | 1020 | 1040 | 996 | 951 | 1110 | 1010 |
| Dissolved organic carbon (DOC) | mg/L | - | 1.9 | 1.4 | 3.5 | 4.2 | 3.4 | 4.1 | 5.7 | 4.5 | 5.4 | 4.7 | 4.8 | 5.3 | 5.3 | <6.7 | 4.3 | 4 | 4.3 | 3.8 | 6.56 | 7.2 |
| Hardness | mg/L | - | 293 | 335 | 462 | 402 | 402 | 381 | 641 | 441 | 412 | 473 | 515 | 571 | 529 | 502 | 528 | 508 | 557 | 456 | 582 | 549 |
| Nitrate (as N) | mg/L | - | <0.1 | <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | 8.07 | 7.72 | 7.95 | 7.76 | 7.7 | 7.72 | 7.47 | 7.47 | 7.43 | 7.43 | 7.4 | 7.89 | 7.88 | 7.65 | 7.16 | 7.45 | 7.91 | 7.8 | 7.14 | 7.17 |
| Phenolics (total) | mg/L | 0.001 | <0.001 | <0.001 | 0.002 | 0.003 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.0051 | 0.0032 | 0.0047 | 0.0024 | <0.0021 | <0.006 | 0.002 | <0.001 | 0.0067 | 0.0017 | 0.0019 |
| Sulfate | mg/L | - | 97.3 | 11.3 | 88.5 | 10.2 | 7.9 | 5.7 | <2 | 3.8 | <2 | 4.1 | 10.7 | 29.5 | 28 | 37.7 | 22.4 | 44.3 | 44.6 | 58.6 | 66 | 66.8 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | <0.15 | 0.27 | 1.13 | <0.15 | <0.15 | 0.24 | 0.42 | 0.5 | <0.33 | 0.36 | 0.22 | 0.48 | 0.36 | 0.61 | 0.61 | 0.44 | 0.45 | 0.33 | 0.4 | 0.38 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00003 | <0.0003 | 0.00016 | 0.00011 | <0.00026 | <0.00015 | <0.00002 | 0.00028 | <0.0006 | 0.00052 | 0.00055 | 0.00011 | <0.00047 | 0.00031 | <0.00084 | <0.00027 | 0.00118 | 0.00011 | 0.00005 | <0.00004 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 551 | 626 | 569 | 613 | 693 | 700 | 816 | 955 | 710 | 969 | 711 | 757 | 737 | 835 | 950 | 759 | 100 | 592 | 1160 | 1160 |
| pH, field | s.u. | 6.5-8.5 | 6.38 | 7.5 | 6.93 | 6.85 | 7.43 | 7.17 | 6.41 | 6.89 | 7.71 | 7.46 | 7.39 | 6.37 | 7.63 | 7.2 | 7.47 | 7.38 | 7.59 | 6.83 | 6.92 | 6.92 |
| Temperature, field | Deg C | - | 7.4 | 7.9 | 6.2 | 11.5 | 7.8 | 8.2 | 6.9 | 8.2 | 10.4 | 14.3 | 10.2 | 13.9 | 9.6 | 9 | 11.8 | 7.7 | 7.9 | 10.18 | 9.58 | 9.58 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| 36.0 | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW28-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-1210-025 | GW-WARD2-1011-006 | GW-WARD2-1112-007 | GW-WARD2-0513-020 | GW-WARD2-1013-029 | GW-WARD2-8/6/15-009 | GW-WARD2-171115-016 | GW-WARD2-042516-022 | GW-WARD2-110316-020 | GW-WARD2-041017-004 | GW-WARD2-112417-007 | GW-WARD2-051818-021 | GW-WARD2-110318-010 | CRA-4074-02-WARD2-34 | GW-WARD2-1210-010 | GW-WARD2-0511-015 | GW-WARD2-1011-016 | GW-WARD2-0412-012 | GW-WARD2-1112-027 | GW-WARD2-0513-011 |
| **Sample Date:** | | | 12/1/2010 | 11/22/2011 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/8/2015 | 11/17/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 84.5 | 87.9 | 129 | 57.8 | 102 | 69.1 | 66.3 | 53.3 | 64.2 | 48.1 | 88.6 | 63.4 | 90.2 | 64.6 | 64.9 | 60.4 | 67.5 | 65.6 | 80 | 74.9 |
| Iron (dissolved) | mg/L | 0.3 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.133 | 0.197 | <0.05 | 0.22 | 0.113 | <0.05 | <0.05 |
| Magnesium (dissolved) | mg/L | - | 15.4 | 16.7 | 24.9 | 9.67 | 31.3 | 18.1 | 11.9 | 10 | 19.9 | 8.98 | 15.1 | 11.1 | 16.3 | 55.6 | 55.2 | 63.5 | 48.6 | 47.4 | 59.1 | 43.4 |
| Manganese (dissolved) | mg/L | - | 0.0024 | <0.001 | 0.0011 | <0.001 | <0.001 | <0.001 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.00121 | 0.00118 | 0.0215 | 0.0809 | 0.006 | 0.0312 | 0.0133 | 0.0191 | 0.008 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | <1 | <1 | <1 | <1 | <1 | <1 | 0.349 | 0.452 | 0.874 | 0.534 | 0.788 | 1 | 1.25 | 2.2 | 1.9 | 1.8 | 2 | 1.8 | 2.3 | 2.2 |
| Sodium (dissolved) | mg/L | - | 0.77 | 0.71 | 2.9 | 1.67 | 3.26 | 3.05 | 2.4 | 2.06 | 3.3 | 1.08 | 1.36 | 12.4 | 40 | 18.4 | 18.1 | 15.8 | 15.6 | 16.3 | 19.8 | 20.1 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 261 | 231 | 232 | 187 | 192 | 214 | 232 | 206 | 236 | 192 | 309 | 196 | 235 | 385 | 379 | 385 | 377 | 382 | 404 | 416 |
| Ammonia-N | mg/L | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.053 | <0.05 | 0.036 | <0.134 | <0.1 | <0.162 | 0.078 | 0.041 | 0.097 | 0.138 | 0.119 | 0.068 | 0.073 | 0.109 | <0.05 |
| Chloride | mg/L | - | <2 | 29.7 | 97.2 | 22.8 | 150 | 21.2 | 3.94 | 10.9 | 10.4 | 2.97 | 0.62 | 18.5 | 39.3 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Conductivity | uS/cm | - | 482 | 456 | 455 | 328 | 856 | 462 | 423 | 416 | 459 | 334 | 512 | 452 | 668 | 726 | 705 | 682 | 680 | 717 | 481 | 767 |
| Dissolved organic carbon (DOC) | mg/L | - | 1.3 | 1.3 | <1 | <1 | 2.3 | <1 | 2.5 | <2.7 | <1 | <1 | 1.3 | <1 | 2.71 | <1 | 1.9 | 1.8 | 1.3 | 1.3 | 1.5 | 1.7 |
| Hardness | mg/L | - | 274 | 288 | 425 | 184 | 383 | 247 | 214 | 174 | 242 | 157 | 284 | 204 | 292 | 390 | 389 | 412 | 369 | 359 | 443 | 366 |
| Nitrate (as N) | mg/L | - | <0.1 | <0.1 | 0.53 | <0.1 | 2.19 | 0.49 | 0.034 | 0.061 | <0.02 | <0.02 | <0.02 | 0.025 | 0.403 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 7.93 | 7.84 | 7.82 | 7.84 | 7.84 | 8.17 | 7.99 | 8.09 | 7.49 | 7.92 | 8 | 8.06 | 7.57 | 7.91 | 7.92 | 7.97 | 7.96 | 7.91 | 7.75 | 7.76 |
| Phenolics (total) | mg/L | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | **0.0036** | **0.0045** | <0.0011 | <0.0063 | **0.0019** | <0.001 | **0.0113** | **0.0064** | <0.001 | <0.001 | **0.002** | <0.001 | <0.001 | <0.001 | <0.001 |
| Sulfate | mg/L | - | <2 | 6.3 | 8.1 | 2.9 | 12.6 | 7.61 | 2.29 | 4.76 | 4.51 | 1.69 | 0.77 | 13.7 | 79.6 | 42 | 26 | 22 | 30.3 | 43.8 | 97.2 | 88.1 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | <0.15 | <0.15 | 0.3 | <0.15 | <0.25 | 0.58 | 0.25 | 2.3 | 0.5 | <1.5 | <1.5 | 0.54 | <1.5 | 0.26 | 0.16 | <0.15 | <0.15 | 0.17 | 0.31 | <0.15 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.00006 | <0.00047 | <0.00003 | <0.00018 | <0.00067 | 0.00011 | <0.00092 | 0.00022 | <0.00262 | <0.00098 | 0.00148 | 0.00024 | 0.00013 | 0.00103 | 0.00021 | 0.00032 | 0.00056 | 0.00023 | 0.00009 | <0.00015 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 355 | 526 | 619 | 358 | 750 | 412 | 321 | 301 | 431 | 306 | 642 | 268 | 861 | 667 | 619 | 697 | 680 | 695 | 598 | 765 |
| pH, field | s.u. | 6.5-8.5 | 6.84 | 7.66 | 6.52 | 7.32 | 7.75 | 7 | 7.9 | 7.57 | 7.89 | 7.78 | 7.6 | 7.16 | 7.14 | 7.73 | 6.81 | 7.12 | 7.55 | 7.2 | 6.58 | 7.19 |
| Temperature, field | Deg C | - | 7.5 | 8.7 | 8 | 6.6 | 10.8 | 8.9 | 10.5 | 5.9 | 11.5 | 5.9 | 10.2 | 9.32 | 10.06 | 8.4 | 10.5 | 8.5 | 10.3 | 8.5 | 10.1 | 7.9 |

Notes:

| | |
|---|---|
| (1) | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW29-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-1013-009 | GW-WARD2-DD-061514-019 | GW-WARD2-103014-027 | GW-WARD2-8/6/15-030 | GW-WARD2-161115-026 | GW-WARD2-042516-014 | GW-WARD2-110316-009 | GW-WARD2-041017-022 | GW-WARD2-112417-024 | GW-WARD2-051818-004 | GW-WARD2-110318-022 | CRA-4074-02-WARD2-35 | GW-WARD2-1210-012 | GW-WARD2-0511-020 | GW-WARD2-1011-013 | GW-WARD2-0412-009 | GW-WARD2-1112-025 | GW-WARD2-0513-006 | GW-WARD2-1013-014 | GW-WARD2-DD-061514-017 |
| **Sample Date:** | | | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 72.6 | 76.6 | 69.9 | 70.6 | 70 | 63.8 | 64.2 | 133 | 133 | 132 | 60.1 | 72.6 | 76.4 | 79.6 | 83.8 | 80.1 | 88.6 | 88.8 | 89.2 | 99.7 |
| Iron (dissolved) | mg/L | 0.3 | 0.078 | <0.05 | <0.05 | <0.05 | 0.261 | 0.043 | 0.332 | <0.01 | 0.029 | 7.9 | 0.033 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Magnesium (dissolved) | mg/L | - | 56.2 | 59.3 | 51.5 | 54.1 | 49.4 | 49.9 | 51.3 | 23.9 | 38.2 | 30.4 | 45.6 | 49.3 | 45 | 47.6 | 44.6 | 43.5 | 48.3 | 47.7 | 54.8 | 57.3 |
| Manganese (dissolved) | mg/L | - | 0.0879 | 0.0074 | 0.0597 | 0.0051 | 0.0647 | 0.0074 | 0.0498 | 0.00109 | 0.35 | 0.592 | 0.0481 | 0.0189 | 0.0478 | 0.0246 | 0.0659 | 0.0197 | 0.0031 | 0.0401 | 0.0516 | 0.0097 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 2.1 | 2 | 1.9 | 2.1 | 1.91 | 2.06 | 2.17 | 1.52 | 2.55 | 1.37 | 2 | 3.8 | 1.8 | 2.6 | 2.6 | 1.9 | 2.3 | 3 | 2 | 2.3 |
| Sodium (dissolved) | mg/L | - | 18.2 | 19.6 | 18.1 | 20.8 | 20 | 26.1 | 28.1 | 118 | 5.87 | 17.6 | 28.8 | 26.3 | 23.8 | 31.7 | 24.3 | 24.9 | 27.7 | 25.4 | 29.3 | 69.8 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 408 | 416 | 394 | 396 | 404 | 412 | 426 | 351 | 443 | 560 | 389 | 305 | 299 | 333 | 312 | 329 | 315 | 354 | 350 | 474 |
| Ammonia-N | mg/L | - | 0.202 | 0.159 | 0.11 | 0.068 | 0.122 | 0.061 | <0.255 | <0.02 | <0.319 | 0.55 | 0.276 | 0.107 | 0.182 | 0.115 | 0.138 | 0.073 | <0.05 | 0.07 | 0.151 | 0.077 |
| Chloride | mg/L | - | <2 | <2 | <2 | 0.65 | 0.64 | 0.65 | 0.66 | 276 | 2.26 | 16.3 | 0.62 | 53.3 | 50.2 | 63.7 | 53.3 | 56.1 | 45.4 | 43.6 | 42.2 | 53.1 |
| Conductivity | uS/cm | - | 766 | 770 | 732 | 751 | 730 | 755 | 749 | 1460 | 768 | 1020 | 726 | 795 | 768 | 823 | 747 | 817 | 458 | 889 | 926 | 1020 |
| Dissolved organic carbon (DOC) | mg/L | - | 1.9 | <1 | 1.2 | <1 | 1.4 | <3.9 | <1 | <1 | 1.6 | 3.3 | 2.91 | <1 | 2.1 | 3.4 | 1.8 | 2.4 | 1.6 | 2.1 | 1.8 | 2.4 |
| Hardness | mg/L | - | 413 | 435 | 386 | 399 | 378 | 365 | 372 | 430 | 489 | 455 | 338 | 384 | 376 | 395 | 393 | 379 | 420 | 418 | 448 | 485 |
| Nitrate (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | 0.06 | <0.02 | 0.057 | <0.02 | 2.45 | <0.02 | <0.02 | <0.02 | 0.11 | <0.1 | 0.11 | <0.1 | 0.12 | <0.1 | <0.1 | <0.1 | <0.1 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.05 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 7.84 | 7.9 | 7.74 | 8.14 | 8.13 | 7.92 | 7.38 | 7.76 | 7.84 | 7.19 | 7.51 | 8 | 7.95 | 7.97 | 7.87 | 7.94 | 7.8 | 7.7 | 7.77 | 7.8 |
| Phenolics (total) | mg/L | 0.001 | <0.0015 | 0.0245 | <0.001 | 0.0078 | 0.0026 | <0.0054 | <0.0089 | 0.0011 | <0.001 | 0.0049 | 0.0023 | <0.001 | <0.001 | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.0011 | 0.004 |
| Sulfate | mg/L | - | 53.8 | 67 | 48 | 44.9 | 33.4 | 35 | 27.8 | 26.6 | 2.38 | 3.93 | 29.7 | 49.4 | 42 | 42.3 | 38.8 | 52.3 | 42.7 | 137 | 122 | 91.8 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | <0.23 | 0.27 | <0.15 | 0.19 | <0.15 | <1.5 | 0.57 | 0.36 | 0.4 | 1.91 | 0.27 | 0.38 | 0.21 | 0.38 | 0.28 | 0.2 | <0.15 | 0.33 | <0.19 | 0.31 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00167 | 0.00123 | 0.00036 | 0.0001 | 0.00169 | 0.00025 | <0.00286 | <0.00018 | 0.0028 | 0.00184 | 0.00048 | 0.0006 | 0.00029 | 0.00031 | 0.00082 | 0.00025 | <0.00004 | 0.00017 | 0.00127 | 0.00072 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 776 | 982 | 741 | 594 | 589 | 672 | 705 | 636 | 636 | 431 | 878 | 1040 | 579 | 850 | 763 | 821 | 629 | 1000 | 843 | 1490 |
| pH, field | s.u. | 6.5-8.5 | 7.58 | 7.56 | 7.15 | 6.81 | 7.77 | 7.3 | 7.69 | 7.6 | 7.6 | 7.2 | 6.89 | 7.43 | 6.86 | 7.13 | 7.44 | 7.24 | 6.6 | 7.12 | 7.6 | 7.65 |
| Temperature, field | Deg C | - | 9.5 | 9.3 | 10.2 | 10.6 | 10.6 | 8.8 | 10.2 | 9.7 | 9.7 | 9.11 | 9.74 | 8.9 | 9.4 | 8.2 | 9.4 | 8 | 8.8 | 7.4 | 9.2 | 9 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| 36.0 | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW30-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-103014-015 | GW-WARD2-8/6/15-023 | GW-WARD2-161115-028 | GW-WARD2-042516-008 | GW-WARD2-110316-008 | GW-WARD2-041017-021 | GW-WARD2-112417-021 | GW-WARD2-051818-009 | GW-WARD2-110318-025 | CRA-4074-02-WARD2-36 | GW-WARD2-1210-006 | GW-WARD2-0511-009 | GW-WARD2-1011-011 | GW-WARD2-0412-006 | GW-WARD2-1112-022 | GW-WARD2-0513-008 | GW-WARD2-1013-016 | GW-WARD2-DD-061514-014 | GW-WARD2-103014-018 | GW-WARD2-8/6/15-012 |
| **Sample Date:** | | | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 91.5 | 95.8 | 91.2 | 88.8 | 86.4 | 148 | 98.7 | 91.8 | 97.8 | 65 | 64.3 | 70.3 | 78.6 | 78.5 | 85 | 79 | 80.7 | 96.8 | 90.6 | 94.7 |
| Iron (dissolved) | mg/L | 0.3 | 0.054 | <0.05 | 0.257 | 0.064 | 0.165 | <0.01 | 0.192 | 0.022 | 0.191 | **0.523** | 0.135 | **1.03** | 0.224 | **0.61** | 0.222 | **1.54** | **1.99** | **2.38** | **1.98** | **2.37** |
| Magnesium (dissolved) | mg/L | - | 53.1 | 54.9 | 52.8 | 56.4 | 57.3 | 64 | 71.4 | 62.9 | 61 | 37.5 | 36.6 | 41.7 | 40.7 | 39.7 | 45.8 | 47.8 | 46.1 | 49.6 | 47.6 | 49.6 |
| Manganese (dissolved) | mg/L | - | 0.0522 | 0.0246 | 0.0628 | 0.0161 | 0.0487 | 0.00089 | 0.052 | 0.0509 | 0.0426 | 0.0637 | 0.0066 | 0.0422 | 0.0067 | 0.0368 | 0.0057 | 0.0368 | 0.0322 | 0.0359 | 0.0353 | 0.0372 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 2 | 2.2 | 2.19 | 2.47 | 2.33 | 9.39 | 2.86 | 3.27 | 2.94 | 2 | 1.9 | 1.9 | 1.9 | 1.7 | 2 | 1.8 | 1.8 | 1.8 | 1.7 | 1.9 |
| Sodium (dissolved) | mg/L | - | 59.5 | 68 | 57.2 | 60.4 | 50.8 | 8.77 | 60.7 | 45.7 | 43.3 | 46 | 41.4 | 44.2 | 38 | 41.9 | 49.7 | 37 | 49.5 | 49.7 | 46.5 | 48.3 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 429 | 479 | 470 | 474 | 490 | 541 | 518 | 495 | 490 | 362 | 382 | 410 | 407 | 440 | 446 | 470 | 481 | 500 | 491 | 508 |
| Ammonia-N | mg/L | - | 0.161 | 0.098 | 0.162 | 0.058 | <0.272 | <0.02 | <0.38 | 0.07 | 0.264 | 0.184 | 0.202 | 0.276 | 0.077 | 0.186 | 0.218 | 0.307 | 0.359 | 0.343 | 0.374 | 0.369 |
| Chloride | mg/L | - | 54.7 | 55.7 | 56.8 | 48.4 | 44.1 | 8.6 | 43.3 | 36.3 | 44.1 | 17.9 | 18.4 | 18.4 | 19.9 | 20.1 | 18.8 | 20.9 | 20.9 | 22.6 | 22.2 | 24.8 |
| Conductivity | uS/cm | - | 989 | 1080 | 1030 | 1050 | 998 | 1170 | 1100 | 988 | 1060 | 727 | 738 | 754 | 746 | 803 | 494 | 804 | 879 | 864 | 875 | 949 |
| Dissolved organic carbon (DOC) | mg/L | - | 1.9 | 2.7 | 2.5 | 5 | 2.3 | 1.7 | 3.7 | 3.5 | 6.13 | 2.2 | 2 | 4.5 | 3.9 | 3.1 | 3.3 | 3.3 | 5.7 | 4.2 | 3.7 | 4.7 |
| Hardness | mg/L | - | 447 | 465 | 445 | 454 | 452 | 633 | 541 | 488 | 495 | 317 | 311 | 347 | 364 | 360 | 401 | 394 | 391 | 446 | 422 | 441 |
| Nitrate (as N) | mg/L | - | <0.1 | 0.19 | 0.051 | 0.096 | 0.038 | 0.68 | <0.1 | 0.028 | <0.02 | <0.1 | <0.1 | <0.1 | 0.12 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.05 | <0.01 | <0.01 | <0.01 | <0.05 | <0.05 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | 7.64 | 8.08 | 7.99 | 7.8 | 7.28 | 7.67 | 7.92 | 7.89 | 7.24 | 8.02 | 7.97 | 7.94 | 7.97 | 7.94 | 7.8 | 7.7 | 7.72 | 7.83 | 7.58 | 8.01 |
| Phenolics (total) | mg/L | 0.001 | **0.0046** | **0.0055** | **0.003** | **0.0035** | <0.0098 | **0.0017** | <0.0012 | **0.0097** | **0.0029** | <0.001 | <0.001 | **0.002** | <0.001 | <0.001 | <0.001 | <0.001 | <0.0021 | **0.0029** | <0.001 | **0.0064** |
| Sulfate | mg/L | - | 78.7 | 47.5 | 51.3 | 34.1 | 30.5 | 125 | 29.2 | 12.5 | 28 | 23.8 | 12.4 | 9 | 8.5 | 7.7 | 5.9 | 7.2 | 5.7 | 5.8 | 5.3 | 5.06 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.21 | 0.36 | 0.15 | <1.5 | 0.78 | 0.24 | 0.61 | 0.34 | 0.52 | 0.47 | 0.32 | 0.443 | 0.26 | 0.53 | 0.61 | 0.49 | <0.6 | 0.61 | 0.64 | 0.68 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00056 | 0.00013 | 0.00162 | 0.00029 | <0.0025 | <0.00015 | 0.00288 | 0.00012 | 0.00035 | 0.00204 | 0.00036 | 0.00072 | 0.00057 | 0.00051 | 0.00027 | 0.00082 | 0.00241 | 0.00246 | 0.00095 | 0.00034 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 1030 | 855 | 821 | 1070 | 1030 | 1180 | 1180 | 574 | 1240 | 672 | 529 | 799 | 697 | 799 | 592 | 795 | 834 | 1170 | 911 | 733 |
| pH, field | s.u. | 6.5-8.5 | 7.21 | 6.78 | 7.65 | 7.38 | 7.62 | 7.56 | 7.56 | 6.93 | 6.79 | 7.74 | 6.94 | 7.1 | 7.54 | 7.17 | 6.77 | 7.16 | 7.47 | 7.55 | 7.04 | 6.59 |
| Temperature, field | Deg C | - | 9.4 | 9.9 | 9.9 | 8.8 | 9.7 | 9 | 9 | 8.71 | 9.16 | 8.6 | 8.7 | 8.9 | 9.3 | 7.4 | 9 | 7.4 | 10.1 | 8.6 | 10.2 | 10.7 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW31-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-161115-027 | GW-WARD2-042516-006 | GW-WARD2-110316-003 | GW-WARD2-041017-018 | GW-WARD2-112417-018 | GW-WARD2-051818-001 | GW-WARD2-110318-023 | CRA-4074-02-WARD2-37 | GW-WARD2-1210-001 | GW-WARD2-0511-007 | GW-WARD2-1011-009 | GW-WARD2-0412-002 | GW-WARD2-0412-003 | GW-WARD2-1112-020 | GW-WARD2-0513-002 | GW-WARD2-0513-003 | GW-WARD2-1013-019 | GW-WARD2-DD-061514-011 | GW-WARD2-DD-061514-012 | GW-WARD2-103014-014 |
| **Sample Date:** | | | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 4/22/2012 Duplicate | 11/26/2012 | 5/13/2013 | 5/13/2013 Duplicate | 10/22/2013 | 6/15/2014 | 6/15/2014 Duplicate | 10/30/2014 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 97.4 | 89.1 | 93.3 | 62.5 | 94.4 | 128 | 92.1 | 29.4 | 33.1 | 29 | 34.5 | 30.8 | 30.9 | 36.3 | 29 | 29 | 27.7 | 33.3 | 33.5 | 31.1 |
| Iron (dissolved) | mg/L | 0.3 | **2.43** | **0.872** | **2.61** | 0.058 | **2.45** | 0.015 | **2.2** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Magnesium (dissolved) | mg/L | - | 51.3 | 50.3 | 55 | 28.3 | 54.5 | 68 | 52.2 | 15.7 | 16.3 | 15.7 | 15.4 | 14.3 | 14.2 | 16.8 | 16.2 | 16.1 | 15.3 | 15.9 | 16.1 | 15.3 |
| Manganese (dissolved) | mg/L | - | 0.0371 | 0.0408 | 0.0403 | 0.107 | 0.0369 | 0.00198 | 0.0369 | 0.0071 | 0.0085 | 0.0058 | 0.0018 | 0.0035 | 0.0034 | 0.0029 | 0.0014 | 0.0014 | 0.0022 | 0.0021 | 0.0018 | 0.0012 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 1.97 | 1.92 | 2.05 | 1.01 | 2.03 | 9.7 | 1.93 | 1.1 | 1.1 | 1 | 1 | <1 | <1 | 1.1 | 1 | 1 | <1 | <1 | <1 | <1 |
| Sodium (dissolved) | mg/L | - | 48 | 46.4 | 48.3 | 72.6 | 45.4 | 9.15 | 40.4 | 37.4 | 31.7 | 33.3 | 30.7 | 30.6 | 30.7 | 36.7 | 31.2 | 27.7 | 33.9 | 35.3 | 35.6 | 31.6 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 494 | 480 | 509 | 419 | 519 | 461 | 490 | 184 | 183 | 191 | 190 | 187 | 187 | 183 | 194 | 196 | 198 | 198 | 192 | 178 |
| Ammonia-N | mg/L | - | 0.333 | 0.309 | 0.459 | <0.114 | 0.541 | 0.04 | 0.436 | 0.089 | 0.116 | 0.149 | 0.061 | 0.107 | 0.102 | 0.107 | <0.05 | <0.05 | <0.05 | 0.079 | 0.096 | 0.056 |
| Chloride | mg/L | - | 24.7 | 25.7 | 24.7 | 38.6 | 24.7 | 6.82 | 23.9 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | 2 | <2 | <2 | 2 |
| Conductivity | uS/cm | - | 955 | 951 | 983 | 794 | 971 | 1070 | 1240 | 386 | 382 | 373 | 343 | 374 | 371 | 282 | 337 | 337 | 380 | 350 | 351 | 390 |
| Dissolved organic carbon (DOC) | mg/L | - | 5.1 | 6.8 | 5 | 4.2 | 4.7 | 2.1 | 7.02 | <1 | 1.5 | 1.4 | 1.3 | 1 | 1.2 | 1.5 | 1.2 | 1.4 | 1.9 | <1 | <1 | <1 |
| Hardness | mg/L | - | 455 | 430 | 459 | 272 | 460 | 598 | 445 | 138 | 150 | 137 | 150 | 136 | 136 | 160 | 139 | 139 | 132 | 149 | 150 | 141 |
| Nitrate (as N) | mg/L | - | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.761 | <0.02 | 0.12 | <0.1 | <0.1 | 0.11 | 0.11 | 0.13 | <0.1 | 0.12 | 0.13 | 0.12 | 0.12 | 0.13 | 0.17 |
| Nitrite (as N) | mg/L | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 8.06 | 7.83 | 7.27 | 7.9 | 7.91 | 7.81 | 7.03 | 8.23 | 7.94 | 8.18 | 8.09 | 8.01 | 8.1 | 8.07 | 8.05 | 8.07 | 8.06 | 8.16 | 8.2 | 8.03 |
| Phenolics (total) | mg/L | 0.001 | **0.0027** | **0.0018** | <0.0049 | **0.0017** | <0.001 | **0.006** | **0.0044** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | **0.0031** | **0.0063** | **0.0032** |
| Sulfate | mg/L | - | 4.41 | 4.16 | 4.6 | <0.3 | 3.41 | 143 | 3.39 | 18.4 | 17.4 | 18.6 | 17.1 | 17.4 | 17.2 | 16.1 | 17.6 | 17.5 | 16.7 | 16.2 | 16.2 | 16.2 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.47 | 0.81 | 0.84 | 0.49 | 0.99 | 0.19 | 0.78 | 0.19 | <0.15 | <0.15 | <0.15 | 0.16 | 0.19 | 0.2 | 0.18 | 0.18 | <0.18 | <0.15 | 0.26 | <0.15 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00333 | 0.00116 | 0.00354 | - | 0.00446 | 0.00007 | 0.00055 | 0.00332 | 0.00028 | 0.00062 | 0.00249 | 0.00124 | 0.00118 | 0.00037 | <0.00058 | <0.00058 | <0.00081 | 0.00325 | 0.00395 | 0.00117 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 786 | 980 | 947 | 1010 | 1010 | 585 | 1130 | 381 | 303 | 433 | 408 | 400 | 400 | 321 | 385 | 385 | 393 | 536 | 536 | 643 |
| pH, field | s.u. | 6.5-8.5 | 7.65 | 7.29 | 7.53 | 7.59 | 7.59 | 6.96 | 6.77 | 8.27 | 7.05 | 7.33 | 8.31 | 7.78 | 7.78 | 7.22 | 7.82 | 7.82 | 7.89 | 8.32 | 8.32 | 8.01 |
| Temperature, field | Deg C | - | 9.9 | 7.9 | 10.1 | 9.2 | 9.2 | 8.64 | 9.17 | 8.8 | 9.3 | 8 | 8.8 | 8 | 8 | 8.8 | 6.9 | 6.9 | 9.1 | 8.6 | 8.6 | 8.9 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

**TABLE 6.8**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS WITH PWQOS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW32-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-8/6/15-010 | GW-WARD2-161115-032 | GW-WARD2-042516-002 | GW-WARD2-110316-005 | GW-WARD2-041017-016 | GW-WARD2-112417-016 | GW-WARD2-051818-013 | GW-WARD2-110318-028 | CRA-4074-02-WARD2-38 | GW-WARD2-1210-002 | GW-WARD2-0511-006 | GW-WARD2-1011-008 | GW-WARD2-0412-001 | GW-WARD2-1112-019 | GW-WARD2-0513-001 | GW-WARD2-1013-021 | GW-WARD2-DD-061514-010 | GW-WARD2-103014-016 | GW-WARD2-103014-017 | GW-WARD2-8/6/15-022 |
| **Sample Date:** | | | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 10/30/2014 Duplicate | 6/8/2015 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 27.4 | 28 | 26.3 | 25.7 | 177 | 28.9 | 26.4 | 26.6 | 158 | 153 | 174 | 155 | 159 | 167 | 178 | 155 | 171 | 156 | 151 | 163 |
| Iron (dissolved) | mg/L | 0.3 | <0.05 | <0.01 | <0.01 | <0.01 | **8.05** | 0.054 | 0.028 | 0.012 | <0.05 | **1.04** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Magnesium (dissolved) | mg/L | - | 15.3 | 15.3 | 14.8 | 16.3 | 49.8 | 15.8 | 14.7 | 14.2 | 83.7 | 68.3 | 76.2 | 69.7 | 72.9 | 80.7 | 66.5 | 72.7 | 76.9 | 72 | 67.9 | 67.9 |
| Manganese (dissolved) | mg/L | - | 0.0013 | 0.00146 | 0.00142 | 0.00316 | 0.692 | 0.0287 | 0.00196 | 0.0188 | 0.125 | 0.144 | 0.0608 | 0.0799 | 0.0422 | 0.0447 | 0.0103 | 0.0062 | 0.0021 | 0.0019 | 0.0017 | <0.001 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | **0.092** | **0.095** | <0.05 | **0.066** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | <1 | 0.926 | 0.933 | 1.03 | 2.68 | 0.952 | 0.915 | 0.872 | 9 | 8.9 | 9.9 | 11.8 | 8.1 | 9.4 | 9.3 | 10.3 | 10.3 | 11.1 | 10.6 | 10.8 |
| Sodium (dissolved) | mg/L | - | 34.9 | 31.2 | 32.7 | 35.9 | 25 | 33.5 | 33.1 | 31.3 | 14.7 | 11.8 | 13.6 | 13.8 | 11.4 | 12.7 | 12.6 | 14.2 | 11.4 | 12.6 | 12.2 | 10.7 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 195 | 193 | 186 | 195 | 696 | 188 | 181 | 179 | 532 | 508 | 496 | 545 | 524 | 548 | 573 | 600 | 573 | 172 | 552 | 568 |
| Ammonia-N | mg/L | - | <0.05 | 0.11 | 0.057 | <0.136 | 0.935 | <0.294 | 0.069 | 0.063 | 0.285 | 0.64 | 0.093 | 0.148 | 0.084 | 0.055 | <0.05 | <0.05 | 0.066 | <0.05 | <0.05 | 0.064 |
| Chloride | mg/L | - | 2.03 | 2.06 | 1.97 | 1.98 | 55.5 | 2.11 | 2.16 | 2.32 | 20.5 | 20.2 | 20.2 | 19 | 18.7 | 18.2 | 20.6 | 21.2 | 13.2 | 12.2 | 12.5 | 11.7 |
| Conductivity | uS/cm | - | 385 | 380 | 373 | 379 | 1380 | 369 | 355 | 351 | 1280 | 1290 | 1270 | 1160 | 1250 | 979 | 1200 | 1260 | 1190 | 1220 | 1250 | 1180 |
| Dissolved organic carbon (DOC) | mg/L | - | <1 | 1.5 | <3.5 | 1.2 | 7.5 | 1 | <1 | 1.95 | 1.6 | 7 | 3.8 | 2.7 | 2.1 | 1.6 | 2.2 | 2.6 | 2.1 | 1.6 | 1.5 | 2.5 |
| Hardness | mg/L | - | 132 | 133 | 127 | 131 | 648 | 137 | 126 | 125 | 739 | 664 | 748 | 675 | 697 | 750 | 719 | 687 | 745 | 686 | 657 | 687 |
| Nitrate (as N) | mg/L | - | 0.132 | 0.128 | 0.139 | 0.1 | <0.1 | 0.04 | 0.111 | 0.049 | 0.73 | 0.31 | 0.36 | 0.56 | 0.54 | 0.29 | 0.47 | 0.56 | 1.06 | 0.93 | 0.93 | 0.97 |
| Nitrite (as N) | mg/L | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.05 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 |
| pH, lab | s.u. | 6.5-8.5 | 8.29 | 8.36 | 8.16 | 7.91 | 7.04 | 8.24 | 8.2 | 7.93 | 7.69 | 7.49 | 7.77 | 7.57 | 7.7 | 7.4 | 7.34 | 7.27 | 7.34 | 7.32 | 7.27 | 7.94 |
| Phenolics (total) | mg/L | 0.001 | **0.0051** | **0.0063** | <0.0044 | <0.0076 | **0.0029** | <0.001 | **0.0091** | **0.004** | <0.001 | <0.005 | **0.002** | **0.002** | **0.01** | <0.001 | <0.001 | <0.0011 | **0.0118** | **0.0059** | **0.0078** | **0.008** |
| Sulfate | mg/L | - | 16.2 | 15.2 | 15 | 14.1 | 30.2 | 14.4 | 14.7 | 14.8 | 223 | 200 | 204 | 170 | 180 | 157 | 167 | 144 | 164 | 152 | 158 | 152 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.22 | <0.15 | <1.5 | 0.31 | 2.78 | 0.66 | <0.15 | <0.15 | 0.59 | 0.81 | <0.15 | 0.19 | 0.22 | 0.16 | 0.26 | <0.24 | 0.21 | 0.17 | <0.15 | 0.17 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.00032 | 0.00641 | 0.00135 | <0.00956 | 0.00764 | 0.0024 | 0.00102 | 0.00052 | 0.00169 | 0.00053 | 0.00014 | 0.0007 | 0.00016 | 0.00002 | <0.00002 | <0.00018 | 0.00039 | <0.00039 | <0.00039 | 0.00006 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 337 | 312 | 394 | 393 | 353 | 353 | 245 | 497 | 1210 | 1150 | 1470 | 1190 | 1350 | 943 | 1350 | 1240 | 1820 | 1240 | 1240 | 1110 |
| pH, field | s.u. | 6.5-8.5 | 7.46 | 8.42 | 8.09 | **8.54** | 7.62 | 7.62 | 7.86 | 7.61 | 7.45 | 6.58 | 6.86 | 7.35 | 7 | **6.28** | **6.45** | 7.22 | 7.48 | 7.52 | 7.52 | 6.58 |
| Temperature, field | Deg C | - | 9.6 | 10.3 | 8.1 | 9.3 | 8.2 | 8.2 | 8.8 | 8.53 | 9.1 | 9.5 | 8.6 | 9.2 | 7.9 | 9.8 | 6.7 | 9.6 | 8.3 | 10.5 | 10.5 | 10.3 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW33-07 | OW34-09 | OW34-09 | OW34-09 | OW35-09 | OW35-09 | OW35-09 | OW36-09 | OW36-09 | OW36-09 | OW36-09 | OW36-09 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-161115-033 | GW-WARD2-042516-003 | GW-WARD2-110316-001 | GW-WARD2-041017-011 | GW-WARD2-112417-014 | GW-WARD2-112417-015 | GW-WARD2-051818-006 | GW-WARD2-051818-007 | GW-WARD2-110318-024 | CRA-4074-02-WARD2-39 | GW-WARD2-1210-030 | GW-WARD2-0511-001 | CRA-4074-02-WARD2-40 | GW-WARD2-1210-026 | GW-WARD2-0511-023 | GW-WARD2-1112-006 | GW-WARD2-0513-017 | GW-WARD2-1013-033 | GW-WARD2-8/6/15-003 | GW-WARD2-171115-012 |
| **Sample Date:** | | | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 11/24/2017 Duplicate | 5/18/2018 | 5/18/2018 Duplicate | 11/3/2018 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/8/2015 | 11/17/2015 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 143 | 150 | 142 | 142 | 167 | 168 | 103 | 130 | 128 | 123 | 87.4 | 89.5 | 34.6 | 33.8 | 34.2 | 118 | 152 | 161 | 145 | 154 |
| Iron (dissolved) | mg/L | 0.3 | <0.01 | <0.01 | <0.01 | 0.031 | <0.01 | <0.01 | 0.037 | <0.01 | <0.01 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.122 | **0.452** | <0.05 | 0.024 |
| Magnesium (dissolved) | mg/L | - | 62.1 | 68.2 | 65.8 | 38.7 | 70.5 | 70.3 | 44.4 | 68.7 | 58.3 | 43.7 | 26.6 | 29.6 | 17.5 | 15.3 | 16.1 | 36.9 | 38.9 | 36 | 27.1 | 31.5 |
| Manganese (dissolved) | mg/L | - | 0.0013 | 0.00086 | 0.00201 | 0.0563 | 0.00087 | 0.00129 | 0.0201 | 0.00193 | 0.00265 | 0.0148 | 0.0028 | <0.001 | 0.0148 | 0.0206 | 0.0043 | 0.066 | 0.0797 | 0.161 | 0.0522 | 0.109 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | **0.196** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | **0.055** | **0.147** | **0.068** | **0.246** |
| Potassium (dissolved) | mg/L | - | 10.5 | 9.82 | 10.5 | 2.38 | 10.7 | 10.5 | 1.6 | 9.61 | 8.93 | 1.4 | <1 | <1 | 1.6 | 1.4 | 1.5 | 14.5 | 12.4 | 8 | 4.8 | 6.13 |
| Sodium (dissolved) | mg/L | - | 11.4 | 9.56 | 10.2 | 6.6 | 9.16 | 8.93 | 10.3 | 9.17 | 9.09 | 18 | 8.68 | 2.04 | 63.9 | 53.8 | 58.9 | 58.6 | 38.6 | 29.8 | 14.8 | 15.3 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 530 | 539 | 540 | 483 | 578 | 580 | 349 | 498 | 457 | 372 | 335 | 338 | 190 | 172 | 175 | 357 | 538 | 483 | 467 | 484 |
| Ammonia-N | mg/L | - | 0.072 | 0.036 | <0.14 | <0.067 | <0.177 | <0.108 | 0.103 | 0.03 | <0.02 | 0.166 | <0.05 | <0.05 | 0.125 | 0.204 | 0.109 | 0.177 | <0.05 | 0.716 | 0.158 | 2.36 |
| Chloride | mg/L | - | 9.8 | 8.76 | 8.1 | 4.89 | 7.2 | 7.1 | 80.3 | 6.88 | 7.59 | 93.5 | 9.1 | 2.8 | 2.3 | <2 | <2 | 131 | 108 | 68.4 | 26.6 | 25.6 |
| Conductivity | uS/cm | - | 1110 | 1170 | 1170 | 920 | 1190 | 1180 | 855 | 1080 | 1050 | 960 | 608 | 590 | 570 | 541 | 517 | 921 | 1120 | 1180 | 929 | 1010 |
| Dissolved organic carbon (DOC) | mg/L | - | 2.8 | <5.1 | 1.8 | 2 | 1.8 | 2.3 | 1.2 | 1.9 | 4.3 | <1 | 2.3 | 1.8 | 2.4 | 2.2 | 2.9 | 1.8 | 3.8 | 5.2 | 4.4 | 4.5 |
| Hardness | mg/L | - | 614 | 656 | 625 | 515 | 707 | 710 | 440 | 607 | 559 | 486 | 328 | 345 | 159 | 147 | 151 | 447 | 540 | 551 | 473 | 513 |
| Nitrate (as N) | mg/L | - | 0.88 | 0.723 | 0.87 | 0.331 | 0.5 | 0.5 | 0.027 | 0.754 | 0.981 | 0.64 | 0.23 | 0.44 | 0.24 | <0.1 | 0.36 | 0.38 | 0.11 | <0.1 | 1.08 | 0.212 |
| Nitrite (as N) | mg/L | - | <0.05 | <0.01 | <0.05 | <0.01 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | 0.013 |
| pH, lab | s.u. | 6.5-8.5 | 8.05 | 7.64 | 7.27 | 7.33 | 7.92 | 7.81 | 7.93 | 7.75 | 7.25 | 7.84 | 7.98 | 7.93 | 8.13 | 8.13 | 8.14 | 7.49 | 7.1 | 7.23 | 7.92 | 7.74 |
| Phenolics (total) | mg/L | 0.001 | **0.0025** | <0.0029 | <0.0109 | **0.002** | <0.001 | <0.001 | **0.0059** | **0.0051** | **0.0037** | <0.002 | <0.001 | <0.001 | **0.007** | <0.005 | <0.001 | **0.003** | <0.001 | <0.0029 | **0.0072** | **0.0021** |
| Sulfate | mg/L | - | 109 | 133 | 101 | 64.7 | 133 | 126 | 16.5 | 144 | 117 | 11.7 | <2 | <2 | 114 | 103 | 93.7 | 28.1 | 29.9 | 81.9 | 47.3 | 58.7 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | <0.15 | <1.5 | <1.5 | 0.35 | <1.5 | 0.41 | 0.56 | 0.3 | 0.29 | 0.24 | <0.15 | <0.15 | 0.52 | 0.25 | 0.23 | 0.5 | 0.33 | 1.07 | 0.49 | 3.1 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00056 | 0.00068 | <0.00136 | - | 0.00011 | 0.00007 | 0.00029 | 0.00008 | <0.00006 | 0.00115 | <0.00011 | <0.0002 | 0.00248 | 0.0006 | 0.00055 | 0.00012 | <0.00009 | 0.00238 | 0.00016 | **0.02941** |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 861 | 1240 | 1230 | - | 1160 | 1160 | 622 | 622 | 1150 | 854 | 445 | 564 | 522 | 396 | 524 | 832 | 1240 | 1130 | 710 | 783 |
| pH, field | s.u. | 6.5-8.5 | 7.48 | 7.99 | 7.62 | - | **6.47** | **6.47** | 7.15 | 7.15 | 7.12 | 7.55 | 7.06 | 7.22 | 8 | 7.19 | 7.4 | **6.49** | 6.92 | 7.16 | 6.62 | 7.74 |
| Temperature, field | Deg C | - | 11.7 | 8.1 | 10.4 | - | 9.3 | 9.3 | 8.34 | 8.34 | 9.31 | 8.1 | 7.5 | 10.9 | 8.5 | 7.8 | 8.5 | 9.7 | 9.1 | 10.2 | 11.2 | 10.1 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW36-09 | OW36-09 | OW36-09 | OW36-09 | OW36-09 | OW36-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-042616-031 | GW-WARD2-110316-026 | GW-WARD2-041017-031 | GW-WARD2-112417-011 | GW-WARD2-051818-024 | GW-WARD2-110318-012 | CRA-4074-02-WARD2-23 | CRA-4074-02-WARD2-24 | GW-WARD2-1210-019 | GW-WARD2-0511-022 | GW-WARD2-1011-003 | GW-WARD2-1011-004 | GW-WARD2-0412-019 | GW-WARD2-1112-009 | GW-WARD2-0513-018 | GW-WARD2-1013-025 | GW-WARD2-DD-061514-005 | GW-WARD2-103014-001 | GW-WARD2-8/6/15-006 | GW-WARD2-171115-006 |
| **Sample Date:** | | | 4/26/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 | 5/12/2010 Duplicate | 12/1/2010 | 5/24/2011 | 11/22/2011 | 11/22/2011 Duplicate | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/17/2015 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 204 | 216 | 174 | 209 | 227 | 223 | 71.2 | 70.4 | 78.2 | 70 | 368 | 371 | 281 | 355 | 63 | 65.8 | 348 | 331 | 79.8 | <75 |
| Iron (dissolved) | mg/L | 0.3 | 0.136 | 0.188 | 0.056 | 0.035 | 0.252 | 0.13 | <0.5 | <0.5 | 0.081 | 0.156 | 0.286 | 0.285 | **0.321** | **0.314** | 0.23 | 0.211 | <0.5 | <0.5 | <0.5 | 0.21 |
| Magnesium (dissolved) | mg/L | - | 44.5 | 47.6 | 40.6 | 51.1 | 45.2 | 45.7 | 27.4 | 28.7 | 24.6 | 26.3 | 24.9 | 24.5 | 22.7 | 26.2 | 25.4 | 24.4 | 23.9 | 27.6 | 25.4 | 26.2 |
| Manganese (dissolved) | mg/L | - | 0.095 | 0.0969 | 0.0778 | 0.125 | 0.159 | 0.196 | <0.01 | <0.01 | 0.0048 | 0.0055 | 0.0045 | 0.0044 | 0.0047 | 0.0053 | 0.0045 | 0.0045 | <0.01 | <0.01 | <0.01 | <0.005 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | **0.063** | **0.36** | **0.107** | **0.571** | **0.238** | **0.218** | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.5 | <0.5 | <0.5 | <0.5 |
| Potassium (dissolved) | mg/L | - | 5.58 | 7.16 | 4.14 | 16.6 | 6.66 | 6.31 | <10 | <10 | 1.5 | 1.6 | 1.5 | 1.5 | 1.3 | 1.6 | 1.5 | 1.4 | <10 | <10 | <10 | 1.54 |
| Sodium (dissolved) | mg/L | - | 17.6 | 24.7 | 26.4 | 31.8 | 32.9 | 31.8 | 27.1 | 27.9 | 23.6 | 26.1 | 23.8 | 23.7 | 22 | 26.1 | 25.4 | 24.2 | 24.1 | 26.5 | 25.8 | 26.2 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 588 | 625 | 593 | 686 | 699 | 711 | 187 | 184 | 182 | 189 | 182 | 183 | 182 | 185 | 185 | 190 | 192 | 173 | 228 | 193 |
| Ammonia-N | mg/L | - | 0.598 | 3.39 | <0.069 | 3.41 | 0.979 | 2.11 | 0.113 | 0.115 | 0.132 | 0.168 | 0.101 | 0.095 | 0.111 | 0.125 | 0.141 | 0.242 | 0.17 | 0.193 | 0.158 | 0.207 |
| Chloride | mg/L | - | 39.9 | 40.9 | 34.2 | 45.2 | 51.1 | 55.4 | 12.5 | 12.5 | 12.7 | 12.7 | 12.8 | 12.8 | 13.1 | 12.3 | 12.9 | 12.7 | 13 | 12.6 | 13 | 12.7 |
| Conductivity | uS/cm | - | 1270 | 1310 | 1190 | 1340 | 1330 | 1350 | 615 | 615 | 620 | 619 | 599 | 598 | 621 | 404 | 575 | 624 | 611 | 591 | 623 | 617 |
| Dissolved organic carbon (DOC) | mg/L | - | <5.6 | 6.3 | 4 | 5 | 4.6 | 8.43 | <1 | 2 | 1.2 | 1.4 | <1 | <1 | <1 | <1 | 1.1 | 2 | <1 | <1 | <1 | 1.1 |
| Hardness | mg/L | - | 694 | 735 | 602 | 731 | 754 | 744 | 291 | 294 | 297 | 283 | 1020 | 1030 | 794 | 994 | 262 | 265 | 967 | 941 | 304 | <190 |
| Nitrate (as N) | mg/L | - | 0.47 | <0.1 | 0.39 | 0.76 | <0.1 | 0.051 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 |
| Nitrite (as N) | mg/L | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | 7.56 | 6.79 | 7.25 | 7.72 | 7.43 | 7.03 | 8.05 | 8.08 | 8.03 | 8.07 | 7.96 | 7.98 | 7.92 | 7.96 | 7.93 | 7.95 | 7.99 | 7.92 | 8.21 | 8.13 |
| Phenolics (total) | mg/L | 0.001 | <0.0012 | <0.0112 | **0.0029** | <0.0062 | **0.0062** | **0.0058** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | **0.0038** | **0.0011** | **0.0033** | **0.0028** |
| Sulfate | mg/L | - | 70.8 | 54.8 | 38.9 | 24.7 | 18.1 | 16.3 | 126 | 126 | 125 | 126 | 124 | 124 | 127 | 121 | 127 | 124 | 129 | 124 | 129 | 126 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 5.2 | 5.77 | 0.56 | 4.7 | 2.08 | 2.87 | 0.48 | 0.37 | <0.15 | 0.22 | <0.15 | <0.15 | 0.4 | 0.24 | 0.21 | <0.22 | 0.24 | 0.29 | 0.35 | 2.54 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00096 | 0.01087 | <0.00007 | **0.0415** | 0.00147 | 0.00476 | 0.00208 | 0.00212 | 0.0002 | 0.00064 | 0.00132 | - | 0.00179 | 0.00016 | 0.00077 | 0.00337 | 0.00331 | 0.00247 | 0.00075 | 0.00365 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 1250 | 1370 | 1290 | 1400 | 788 | 1510 | 656 | 656 | 457 | 625 | 600 | - | 592 | 506 | 571 | 607 | 786 | 603 | 491 | 519 |
| pH, field | s.u. | 6.5-8.5 | 6.87 | 7.11 | 6.63 | 7.75 | 6.77 | 7.02 | 7.96 | 7.96 | 6.88 | 7.26 | 7.83 | - | 7.89 | 6.84 | 7.45 | 7.85 | 7.94 | 7.79 | 7.31 | 7.92 |
| Temperature, field | Deg C | - | 9.4 | 11.2 | 11 | 9.5 | 11.48 | 9.35 | 8.7 | 8.7 | 8.3 | 8.9 | 8.1 | - | 9 | 7.7 | 8.1 | 8.3 | 10 | 9 | 10.4 | 9.3 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW37-09 | OW43-09 | OW43-09 | OW43-09 | OW43-09 | OW43-09 | OW43-09 | OW43-09 | OW43-09 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-042616-030 | GW-WARD2-110316-023 | GW-WARD2-041017-005 | GW-WARD2-112417-008 | GW-WARD2-051818-019 | GW-WARD2-110318-005 | GW-WARD2-110318-008 | GW-WARD2-1013-022 | GW-WARD2-DD-061514-026 | GW-WARD2-103014-013 | GW-WARD2-8/6/15-004 | GW-WARD2-171115-019 | GW-WARD2-042616-028 | GW-WARD2-110316-025 | GW-WARD2-041017-030 | GW-WARD2-1013-031 | GW-WARD2-DD-061514-027 | GW-WARD2-103014-030 | GW-WARD2-8/6/15-019 | GW-WARD2-171115-014 |
| **Sample Date:** | | | 4/26/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 11/3/2018 Duplicate | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/17/2015 | 4/26/2016 | 11/3/2016 | 4/10/2017 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/17/2015 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | <70 | <75 | 90.9 | 74.2 | 77.7 | <71 | 74.5 | 129 | 164 | 175 | 289 | 297 | 282 | 252 | 228 | 64.5 | 58.6 | 54.9 | 65.4 | 67.1 |
| Iron (dissolved) | mg/L | 0.3 | 0.24 | 0.21 | 0.25 | 0.2 | 0.13 | 0.17 | 0.16 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.05 | <0.05 | <0.05 | <0.05 | 0.016 |
| Magnesium (dissolved) | mg/L | - | 25.3 | 26.6 | 25.3 | 26.3 | 26.6 | 24.7 | 25.3 | 71.4 | 80.7 | 89.1 | 136 | 142 | 144 | 147 | 136 | 21.5 | 19 | 17.4 | 19.5 | 20.9 |
| Manganese (dissolved) | mg/L | - | <0.005 | <0.005 | <0.005 | 0.0051 | <0.005 | <0.005 | 0.00396 | 0.0018 | 0.0023 | 0.0023 | 0.0171 | 0.0262 | 0.0138 | 0.0238 | 0.031 | 0.0661 | 0.0072 | 0.0072 | 0.0248 | 0.0629 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | **0.185** | **0.169** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 1.42 | 1.46 | 1.5 | 1.51 | 1.61 | 1.41 | 1.53 | 2.8 | 3.2 | 2.9 | 3.7 | 4.12 | 3.8 | 13 | 5.53 | 2.6 | 1 | <1 | <1 | 0.894 |
| Sodium (dissolved) | mg/L | - | 24.4 | 27 | 24.9 | 25.2 | 25.6 | 25 | 25.5 | 11.4 | 13 | 14.8 | 33.5 | 48.6 | 56.8 | 54.7 | 48.9 | 11 | 17.1 | 13.4 | 17.4 | 16.9 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 177 | 180 | 203 | 197 | 178 | 174 | 171 | 603 | 657 | 599 | 715 | 782 | 884 | 819 | 844 | 224 | 219 | 236 | 228 | 248 |
| Ammonia-N | mg/L | - | 0.149 | <0.222 | <0.151 | 0.413 | 0.175 | 0.132 | 0.119 | <0.05 | 0.094 | <0.05 | <0.05 | <0.05 | 0.032 | <0.02 | <0.057 | 0.072 | 0.104 | 0.058 | 0.069 | <0.05 |
| Chloride | mg/L | - | 12.6 | 12.3 | 12.5 | 12.6 | 12.5 | 12.9 | 13 | 15.4 | 44.7 | 66.5 | 74.7 | 60.6 | 59.8 | 66.5 | 68.1 | 25.3 | 42.1 | 28.8 | 42.6 | 41.8 |
| Conductivity | uS/cm | - | 624 | 622 | 619 | 616 | 599 | 564 | 568 | 1120 | 1450 | 1930 | 2290 | 2220 | 2120 | 2060 | 2030 | 543 | 520 | 496 | 542 | 581 |
| Dissolved organic carbon (DOC) | mg/L | - | <2.9 | <1 | <1 | 1.1 | 1.6 | 1.7 | 2.09 | 4.1 | 1.4 | 1.6 | 4.1 | 8.6 | 8.1 | 5.6 | 6.3 | 2.5 | <1 | <1 | 1.3 | 2.2 |
| Hardness | mg/L | - | <170 | <190 | 331 | 293 | 304 | <180 | 290 | 616 | 743 | 805 | 1280 | 1330 | 1300 | 1230 | 1130 | 250 | 224 | 209 | 243 | 254 |
| Nitrate (as N) | mg/L | - | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.04 | 6.12 | 12.7 | 18.2 | 21.9 | 15.7 | 8.49 | 5.18 | 5.22 | 1.75 | <0.1 | 0.27 | <0.02 | <0.02 |
| Nitrite (as N) | mg/L | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.01 | <0.05 | <0.05 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | 8.12 | 7.66 | 7.87 | 8.18 | 8.12 | 7.7 | 7.74 | 7.32 | 7.34 | 7.18 | 7.54 | 7.25 | 7.15 | 6.77 | 7.26 | 7.98 | 8.07 | 7.91 | 8.2 | 8.05 |
| Phenolics (total) | mg/L | 0.001 | <0.001 | <0.0082 | **0.0018** | <0.001 | **0.0028** | **0.002** | **0.0024** | <0.001 | **0.0522** | **0.0059** | **0.0074** | **0.0042** | <0.001 | <0.0203 | **0.0391** | <0.001 | **0.0086** | **0.0017** | **0.0023** | **0.0031** |
| Sulfate | mg/L | - | 124 | 123 | 121 | 126 | 124 | 128 | 129 | 56.8 | 247 | 448 | 549 | 503 | 385 | 324 | 333 | 34.3 | 15.9 | 11.6 | 7.02 | 7.79 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.35 | 0.27 | 0.22 | 0.47 | 0.25 | 0.2 | 0.19 | <0.17 | 0.24 | <0.15 | 0.23 | 0.67 | 1.54 | 1.05 | 0.93 | <0.33 | 0.3 | <0.15 | 0.35 | 0.15 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00049 | <0.00432 | <0.00057 | 0.00412 | 0.00054 | 0.00054 | 0.00049 | <0.00016 | 0.0005 | <0.00031 | <0.00002 | <0.00019 | 0.00004 | <0.00007 | <0.00008 | 0.0018 | 0.00401 | 0.00174 | 0.00044 | <0.00116 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 622 | 585 | 980 | 521 | 354 | 741 | 741 | 1100 | 1600 | 1090 | 1900 | 1970 | 2160 | 2090 | 1990 | 496 | 687 | 518 | 418 | 442 |
| pH, field | s.u. | 6.5-8.5 | 7.23 | 7.96 | 7.29 | 7.69 | 7.14 | 7.31 | 7.31 | 7.2 | 7.34 | 7.45 | **6.11** | 7.25 | 6.8 | 7.14 | 6.83 | 7.98 | 8.23 | 8.18 | 7.42 | 7.96 |
| Temperature, field | Deg C | - | 8.1 | 9.4 | 7.9 | 8.7 | 9.9 | 8.55 | 8.55 | 8.6 | 11 | 9.8 | 10.9 | 9.4 | 6.8 | 10.6 | 9.3 | 12.1 | 10.4 | 8.6 | 10.9 | 11.7 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

**TABLE 6.8**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS WITH PWQOS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW45-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46A-13 | OW46B-13 | OW46B-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-042516-020 | GW-WARD2-110316-018 | GW-WARD2-041017-010 | GW-WARD2-041017-025 | GW-WARD2-112417-027 | GW-WARD2-051818-028 | GW-WARD2-110318-029 | GW-WARD2-1013-026 | GW-WARD2-DD-061514-023 | GW-WARD2-103014-023 | GW-WARD2-8/6/15-008 | GW-WARD2-171115-018 | GW-WARD2-042616-023 | GW-WARD2-110316-021 | GW-WARD2-041017-027 | GW-WARD2-112417-029 | GW-WARD2-051818-018 | GW-WARD2-110318-014 | GW-WARD2-1013-027 | GW-WARD2-DD-061514-024 |
| **Sample Date:** | | | 4/25/2016 | 11/3/2016 | 4/10/2017 | 4/10/2017 Duplicate | 11/24/2017 | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/17/2015 | 4/26/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/15/2014 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 60.9 | 63.2 | 70.1 | 68.4 | 74.3 | 68 | 59.4 | 35.9 | 38.9 | 35.8 | 32 | 34.3 | 32.2 | 32.7 | 31 | 31.2 | 33.2 | 30.5 | 77.7 | 89.4 |
| Iron (dissolved) | mg/L | 0.3 | <0.01 | 0.011 | 0.011 | 0.017 | 0.015 | 0.015 | <0.01 | <0.05 | <0.05 | 0.06 | <0.05 | 0.059 | 0.032 | 0.091 | 0.18 | 0.189 | 0.016 | 0.153 | <0.05 | <0.05 |
| Magnesium (dissolved) | mg/L | - | 21.7 | 26.1 | 23.5 | 24.1 | 26.1 | 26.3 | 23.4 | 20.6 | 22.5 | 20.8 | 21.1 | 20.7 | 22.1 | 22.2 | 20 | 23 | 21.9 | 19.7 | 29 | 38.9 |
| Manganese (dissolved) | mg/L | - | 0.00052 | 0.0402 | 0.00301 | 0.00434 | 0.0025 | 0.00185 | 0.00924 | 0.0126 | 0.0099 | 0.0156 | 0.0049 | 0.0194 | 0.00839 | 0.0128 | 0.0112 | 0.0121 | 0.00664 | 0.0103 | 0.0108 | 0.0014 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 0.72 | 0.861 | 0.636 | 0.645 | 0.779 | 0.807 | 0.908 | 3.3 | 1.5 | 1.4 | 1.3 | 1.39 | 1.17 | 1.34 | 1.17 | 1.22 | 1.22 | 1.1 | 1.6 | <1 |
| Sodium (dissolved) | mg/L | - | 15.1 | 17.1 | 17.1 | 16.9 | 6.02 | 17.1 | 13.3 | 19.7 | 19.4 | 18.1 | 18.8 | 18.3 | 18.9 | 19.3 | 18.1 | 19.6 | 19.6 | 18.4 | 2.32 | 1.79 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 255 | 244 | 259 | 265 | 284 | 246 | 245 | 200 | 208 | 182 | 206 | 209 | 201 | 208 | 213 | 200 | 202 | 199 | 305 | 343 |
| Ammonia-N | mg/L | - | 0.047 | <0.145 | <0.029 | <0.032 | 0.424 | 0.083 | 0.095 | 0.3 | 0.069 | 0.415 | 0.075 | 0.248 | 0.151 | 0.467 | 0.316 | <0.328 | 0.181 | 0.276 | 0.141 | <0.05 |
| Chloride | mg/L | - | 24.6 | 32 | 28.6 | 28.6 | 19.4 | 30.4 | 30.1 | <2 | <2 | <2 | 0.78 | 0.77 | 0.69 | 0.72 | 0.72 | 0.72 | 0.78 | 0.82 | 9.1 | 40.6 |
| Conductivity | uS/cm | - | 530 | 560 | 557 | 553 | 553 | 559 | 523 | 410 | 353 | 372 | 384 | 383 | 381 | 383 | 384 | 380 | 353 | 356 | 589 | 708 |
| Dissolved organic carbon (DOC) | mg/L | - | <2.8 | 1.5 | 1.2 | 1.3 | 1.2 | 1.4 | 1.99 | 3.8 | <1 | <1 | <1 | 2.6 | <2.2 | <1 | <1 | <1 | <1 | 2.04 | 2.1 | <1 |
| Hardness | mg/L | - | 242 | 265 | 272 | 270 | 293 | 278 | 245 | 174 | 190 | 175 | 166 | 171 | 172 | 173 | 160 | 173 | 173 | 157 | 314 | 383 |
| Nitrate (as N) | mg/L | - | 0.079 | <0.02 | 0.147 | 0.143 | <0.02 | 0.203 | 0.072 | <0.1 | 0.24 | <0.1 | 0.216 | 0.025 | 0.109 | 0.069 | 0.047 | 0.026 | 0.077 | 0.051 | 2.21 | 1.31 |
| Nitrite (as N) | mg/L | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.01 | 0.024 | <0.01 | 0.03 | 0.019 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 8.06 | 7.58 | 7.83 | 7.91 | 8.11 | 8.09 | 7.61 | 8.05 | 8.24 | 8.05 | 8.28 | 8.23 | 8.2 | 7.79 | 8.1 | 8.24 | 8.18 | 7.92 | 7.97 | 7.95 |
| Phenolics (total) | mg/L | 0.001 | <0.001 | <0.009 | **0.002** | **0.0029** | <0.001 | **0.0022** | **0.0074** | <0.001 | **0.0058** | **0.0024** | **0.0051** | **0.0033** | <0.0023 | <0.0072 | **0.0015** | <0.001 | **0.0079** | **0.0026** | <0.0013 | **0.0051** |
| Sulfate | mg/L | - | 5.9 | 4.33 | 7.01 | 6.97 | 3.2 | 10.6 | 8.34 | 31.9 | 9.4 | 9 | 8.87 | 9.25 | 8.92 | 7.92 | 8.05 | 8.59 | 8.34 | 8.58 | 25.7 | 11.7 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 3.6 | 1.01 | 2 | 0.35 | 2 | 0.67 | 1.38 | <0.48 | <0.15 | 0.39 | 0.47 | 0.48 | 1.6 | 0.54 | 0.32 | 0.71 | 0.26 | 0.34 | <0.3 | 0.21 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00046 | <0.0035 | <0.00058 | <0.00064 | 0.00375 | 0.00071 | 0.00053 | 0.00831 | 0.0011 | 0.0123 | 0.00057 | 0.00835 | 0.001 | 0.0167 | 0.00832 | 0.00334 | 0.00276 | 0.0046 | 0.00211 | <0.0007 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 479 | 491 | 540 | 540 | 476 | 331 | 590 | 389 | 543 | 388 | 306 | 314 | 346 | 365 | 358 | 332 | 231 | 474 | 545 | 845 |
| pH, field | s.u. | 6.5-8.5 | 7.71 | 7.93 | 8.01 | 8.01 | 7.59 | 7.6 | 7.34 | 8.13 | 7.84 | 8.16 | 7.5 | 8.2 | 7.53 | 8.22 | 8.08 | 7.71 | 7.78 | 7.94 | 7.76 | 7.79 |
| Temperature, field | Deg C | - | 7.9 | 13.1 | 8.3 | 8.3 | 10.1 | 9.32 | 11.64 | 9 | 10.4 | 9 | 10.9 | 9.5 | 8.1 | 9.7 | 9.8 | 8.4 | 11.52 | 8 | 11.9 | 10.1 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

**TABLE 6.8**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS WITH PWQOS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW46B-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 | OW47-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-103014-029 | GW-WARD2-8/6/15-007 | GW-WARD2-171115-017 | GW-WARD2-042616-026 | GW-WARD2-110316-022 | GW-WARD2-041017-026 | GW-WARD2-112417-030 | GW-WARD2-051818-020 | GW-WARD2-110318-020 | GW-WARD2-1013-023 | GW-WARD2-DD-061514-025 | GW-WARD2-103014-034 | GW-WARD2-8/6/15-005 | GW-WARD2-161115-022 | GW-WARD2-042616-029 | GW-WARD2-110316-024 | GW-WARD2-041017-029 | GW-WARD2-112417-031 | GW-WARD2-051818-022 | GW-WARD2-110318-034 |
| **Sample Date:** | | | 10/30/2014 | 6/8/2015 | 11/17/2015 | 4/26/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/26/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 69.1 | 83.9 | 88.7 | 96.4 | 107 | 103 | 87.6 | 97.4 | 84.2 | 217 | 184 | 156 | 157 | 166 | 172 | 158 | 153 | 187 | 173 | 145 |
| Iron (dissolved) | mg/L | 0.3 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.05 | <0.05 | <0.05 | 0.099 | 0.016 | 0.013 | 0.016 | 0.011 | 0.012 | 0.016 | 0.041 |
| Magnesium (dissolved) | mg/L | - | 29.6 | 32.8 | 31.8 | 38.9 | 45.4 | 40.1 | 39.5 | 42.4 | 38.2 | 107 | 100 | 91.7 | 76.8 | 73.4 | 86.3 | 83 | 81 | 107 | 95 | 90.5 |
| Manganese (dissolved) | mg/L | - | <0.001 | 0.0015 | 0.00092 | 0.00088 | 0.00142 | <0.0005 | 0.00243 | 0.00075 | 0.00257 | 0.298 | 0.116 | 0.0251 | 0.0055 | 0.00205 | 0.0006 | 0.00142 | <0.0005 | 0.0154 | 0.00247 | 0.0113 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | **0.087** | <0.05 | <0.05 | **0.058** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | <1 | <1 | 0.619 | 0.615 | 0.859 | 0.494 | 0.7 | 0.697 | 0.881 | 4 | 2.4 | 1.9 | 1.5 | 1.17 | 1.31 | 1.14 | 1.23 | 1.83 | 1.64 | 1.4 |
| Sodium (dissolved) | mg/L | - | 3.57 | 4.12 | 4.16 | 4.91 | 5.69 | 4.45 | 3.96 | 4.61 | 4.1 | 28.1 | 23.6 | 18.8 | 15.9 | 14 | 17.1 | 15.9 | 16.3 | 22.2 | 22.6 | 20.4 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 321 | 342 | 339 | 391 | 431 | 425 | 408 | 446 | 383 | 583 | 532 | 484 | 467 | 461 | 500 | 472 | 529 | 541 | 486 | 466 |
| Ammonia-N | mg/L | - | 0.052 | 0.052 | <0.05 | 0.028 | <0.094 | <0.031 | <0.34 | 0.084 | 0.205 | 0.063 | <0.05 | 0.055 | <0.05 | <0.05 | <0.02 | <0.087 | <0.02 | 0.789 | 0.056 | 0.165 |
| Chloride | mg/L | - | 30.4 | 27.2 | 27.7 | 17.5 | 24.1 | 16.6 | 12.4 | 11.1 | 11 | 39.7 | 32 | 28.8 | 26.7 | 24.4 | 30.5 | 32.2 | 33.7 | 41 | 38.3 | 37.3 |
| Conductivity | uS/cm | - | 658 | 694 | 683 | 726 | 830 | 759 | 724 | 785 | 701 | 1640 | 1310 | 1300 | 1260 | 1210 | 1350 | 1290 | 1400 | 1540 | 1350 | 1340 |
| Dissolved organic carbon (DOC) | mg/L | - | <1 | 1 | 1.8 | <3.7 | 1 | 2.1 | 1 | 1.5 | 3.11 | 3.3 | 2.3 | 1.3 | 4.1 | 9.3 | <5.1 | 1.8 | 2.2 | 2.5 | 6.4 | 4.67 |
| Hardness | mg/L | - | 294 | 344 | 353 | 401 | 454 | 422 | 381 | 418 | 368 | 982 | 872 | 767 | 708 | 718 | 786 | 737 | 715 | 907 | 824 | 734 |
| Nitrate (as N) | mg/L | - | 1.1 | 0.566 | 0.703 | 0.367 | 1.05 | 0.671 | 0.837 | 0.691 | 0.653 | 8.79 | 8.84 | 8.55 | 8.29 | 7.98 | 7.94 | 10.1 | 10.2 | 10.8 | 10 | 9.75 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.01 | <0.05 | <0.05 | 0.076 | <0.05 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | 7.79 | 8.1 | 7.94 | 7.87 | 7.26 | 7.71 | 7.97 | 7.79 | 7.25 | 7.4 | 7.59 | 7.6 | 7.92 | 7.81 | 7.71 | 7.16 | 7.54 | 7.92 | 7.85 | 7.34 |
| Phenolics (total) | mg/L | 0.001 | **0.0029** | **0.004** | **0.0066** | <0.001 | <0.0079 | **0.0021** | <0.001 | **0.0064** | **0.0054** | <0.001 | **0.0306** | **0.0056** | **0.007** | **0.0049** | <0.001 | <0.0068 | **0.0033** | <0.0012 | **0.0122** | **0.0023** |
| Sulfate | mg/L | - | 12.5 | 13.2 | 10.7 | 8.72 | 10.7 | 9.62 | 11.1 | 9.96 | 16 | 340 | 272 | 232 | 203 | 173 | 218 | 201 | 207 | 303 | 256 | 250 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | <0.15 | 0.25 | 0.33 | 2 | 0.74 | 0.67 | 1.28 | 0.19 | <1.5 | <0.32 | 0.15 | <0.15 | 0.39 | 0.37 | 1.01 | 0.97 | 0.65 | 2.12 | 0.54 | 0.6 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00123 | 0.00025 | <0.00092 | 0.00012 | <0.00074 | <0.0002 | 0.00281 | 0.00024 | 0.00133 | 0.00025 | <0.00043 | 0.00016 | <0.00004 | <0.00049 | <0.00004 | <0.00056 | <0.00005 | 0.0066 | 0.00011 | 0.00041 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 541 | 455 | 394 | 601 | 701 | 705 | 582 | 445 | 823 | 1670 | 2160 | 1760 | 974 | 944 | 1360 | 1310 | 1340 | 1580 | 774 | 1560 |
| pH, field | s.u. | 6.5-8.5 | 7.98 | 7.32 | 7.9 | 7.39 | 7.48 | 7.55 | 7.56 | 7.15 | 7.43 | 7.3 | 7.63 | 7.13 | 6.52 | 7.62 | 7.03 | 7.45 | 7.07 | 7.61 | 6.94 | 7.08 |
| Temperature, field | Deg C | - | 11.3 | 10.3 | 10.5 | 6.4 | 11.9 | 7.2 | 10.1 | 8.48 | 10.83 | 8.4 | 8.7 | 9.03 | 11.1 | 10.5 | 7 | 10.2 | 9.3 | 8.8 | 10 | 8.88 |

Notes:

| | |
|---|---|
| (1) | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

**TABLE 6.8**

**GENERAL CHEMISTRY AND DISSOLVED METALS**
**GROUNDWATER ANALYTICAL RESULTS WITH PWQOS**
**2018 ANNUAL MONITORING REPORT**
**KINCARDINE WASTE MANAGEMENT CENTRE**
**KINCARDINE, ONTARIO**

| Sample Location: | | | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW48-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 | OW49-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-1013-001 | GW-WARD2-DD-061514-028 | GW-WARD2-103014-024 | GW-WARD2-8/6/15-018 | GW-WARD2-161115-021 | GW-WARD2-042516-024 | GW-WARD2-110316-013 | GW-WARD2-041017-013 | GW-WARD2-112417-013 | GW-WARD2-051818-027 | GW-WARD2-110318-027 | GW-WARD2-1013-002 | GW-WARD2-DD-061514-030 | GW-WARD2-103014-033 | GW-WARD2-8/6/15-017 | GW-WARD2-161115-020 | GW-WARD2-042516-025 | GW-WARD2-110316-014 | GW-WARD2-041017-012 | GW-WARD2-112417-012 |
| **Sample Date:** | | | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 80.2 | 86.9 | 78.6 | 93.6 | 81.1 | 104 | 83.8 | 109 | 74.5 | 94 | 18.5 | 96.2 | 83.4 | 81.3 | 82.5 | 91.1 | 89.5 | 83.4 | 82.7 | 91.3 |
| Iron (dissolved) | mg/L | 0.3 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.05 | <0.05 | <0.05 | <0.05 | 0.02 | <0.01 | <0.01 | <0.01 | <0.01 |
| Magnesium (dissolved) | mg/L | - | 30 | 25.7 | 21.1 | 23.8 | 21.8 | 30.6 | 26.3 | 31.1 | 29 | 30.8 | 17 | 28 | 33.5 | 25.6 | 22.7 | 27 | 32 | 30.1 | 30.5 | 33.9 |
| Manganese (dissolved) | mg/L | - | 0.0666 | <0.001 | <0.001 | <0.001 | 0.00056 | 0.00058 | 0.00164 | 0.00079 | 0.00116 | 0.00498 | 0.00115 | 0.0084 | <0.001 | <0.001 | <0.001 | 0.00265 | <0.0005 | <0.0005 | <0.0005 | 0.00087 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 3.3 | <1 | <1 | <1 | 0.789 | 0.927 | 0.922 | 0.966 | 1.2 | 1 | 1.93 | <1 | <1 | <1 | <1 | 0.926 | 0.647 | 0.823 | 0.688 | 4.46 |
| Sodium (dissolved) | mg/L | - | 10.6 | 5.66 | 4.47 | 5.3 | 9.09 | 5.92 | 4.23 | 5.84 | 33.1 | 21 | 86.3 | 1.91 | 1.97 | 1.75 | 1.58 | 1.83 | 2.11 | 2.34 | 2.06 | 2.69 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 338 | 348 | 297 | 318 | 322 | 373 | 341 | 433 | 367 | 392 | 284 | 363 | 384 | 304 | 306 | 327 | 332 | 350 | 355 | 391 |
| Ammonia-N | mg/L | - | <0.05 | <0.05 | <0.05 | 0.06 | <0.05 | 0.068 | <0.135 | <0.043 | <0.295 | 0.069 | 0.101 | 0.06 | <0.05 | <0.05 | 0.061 | <0.05 | 0.058 | <0.123 | <0.041 | <0.27 |
| Chloride | mg/L | - | 6.5 | 21.3 | 2.1 | 11.9 | 5.42 | 15.3 | 2.58 | 15.8 | 13.6 | 10.5 | 25.7 | 2.5 | 3.1 | 2.9 | 1.42 | 1.69 | 2.14 | 2.74 | 2.29 | 3.45 |
| Conductivity | uS/cm | - | 633 | 630 | 547 | 598 | 549 | 679 | 614 | 761 | 694 | 693 | 619 | 650 | 619 | 590 | 557 | 585 | 612 | 660 | 635 | 727 |
| Dissolved organic carbon (DOC) | mg/L | - | 2.3 | <1 | <1 | 1.2 | 1.3 | <2.3 | <1 | <1 | <1 | <1 | 3.34 | 1.4 | <1 | <1 | 2.5 | 1.3 | <2 | <1 | <1 | 1.3 |
| Hardness | mg/L | - | 324 | 323 | 283 | 332 | 292 | 387 | 318 | 399 | 305 | 362 | 116 | 356 | 346 | 308 | 299 | 339 | 355 | 332 | 332 | 367 |
| Nitrate (as N) | mg/L | - | 2.56 | 0.12 | 2.24 | 0.446 | 0.969 | 0.036 | 1.23 | <0.02 | 4.26 | 0.915 | 2.64 | 4.76 | 3.47 | 6.3 | 2.71 | 5.41 | 4.45 | 5.53 | 5.61 | 9.39 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | 7.71 | 7.69 | 7.77 | 8.04 | 8.02 | 7.74 | 7.32 | 7.67 | 8 | 7.87 | 7.48 | 7.65 | 7.83 | 7.72 | 8.14 | 7.88 | 7.9 | 7.42 | 7.76 | 7.99 |
| Phenolics (total) | mg/L | 0.001 | <0.001 | 0.0028 | 0.0032 | 0.0033 | 0.0027 | <0.0017 | <0.0057 | 0.0014 | <0.001 | 0.0161 | 0.008 | <0.0012 | 0.003 | 0.0092 | 0.0032 | 0.0068 | <0.001 | <0.0045 | 0.0015 | <0.001 |
| Sulfate | mg/L | - | 13.1 | 8.7 | 3.9 | 6.23 | 4.1 | 6.73 | 3 | 5.67 | 4.18 | 6.88 | 5.99 | 2.2 | 2.7 | <2 | 1.81 | 2.19 | 3.26 | 1.53 | 2.31 | 1.99 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | <0.32 | 0.16 | <0.15 | 0.29 | 0.16 | 2.8 | 0.97 | <1.5 | <1.5 | 0.39 | 1.13 | <0.15 | <0.15 | 0.3 | 0.22 | 0.21 | 3.2 | 2.12 | <1.5 | 2.6 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.00066 | <0.00054 | <0.00048 | 0.00012 | <0.0007 | 0.00028 | <0.00164 | <0.00017 | 0.00222 | 0.00032 | 0.00096 | 0.00056 | <0.00104 | <0.00045 | 0.00011 | <0.00075 | 0.00036 | <0.00156 | <0.00023 | 0.00183 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 620 | 805 | 570 | 491 | 460 | 628 | 586 | 718 | 603 | 416 | 739 | 597 | 788 | 580 | 443 | 479 | 572 | 574 | 606 | 628 |
| pH, field | s.u. | 6.5-8.5 | 7.79 | 7.64 | 7.6 | 6.86 | 7.77 | 7.31 | 7.66 | 7.28 | 7.53 | 7.31 | 7.62 | 7.58 | 7.76 | 7.57 | 6.86 | 7.82 | 7.46 | 7.67 | 7.41 | 7.46 |
| Temperature, field | Deg C | - | 9.4 | 11.2 | 10.8 | 12.2 | 10.7 | 8.5 | 12.1 | 9 | 9.8 | 9.92 | 10.19 | 11.1 | 16.3 | 11 | 11.3 | 10.2 | 9.4 | 12.4 | 9.8 | 10.5 |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | OW49-13 | OW49-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | OW50-13 | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-051818-025 | GW-WARD2-110318-017 | GW-WARD2-1013-003 | GW-WARD2-DD-061514-031 | GW-WARD2-103014-032 | GW-WARD2-8/6/15-015 | GW-WARD2-8/6/15-024 | GW-WARD2-161115-034 | GW-WARD2-042516-012 | GW-WARD2-110316-019 | GW-WARD2-041017-006 | GW-WARD2-112417-026 | GW-WARD2-051818-030 | GW-WARD2-110318-033 | CRA-4074-02-WARD2-25 | GW-WARD2-1210-003 | GW-WARD2-0511-005 | GW-WARD2-1011-005 | GW-WARD2-0412-004 | GW-WARD2-1112-005 |
| **Sample Date:** | | | 5/18/2018 | 11/3/2018 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 6/8/2015 Duplicate | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 | 5/12/2010 Field Blank | 12/1/2010 Field Blank | 5/24/2011 Field Blank | 11/22/2011 Field Blank | 4/22/2012 Field Blank | 11/26/2012 Field Blank |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | 108 | 95.2 | 85.1 | 89.1 | 86.1 | 102 | 90.8 | 125 | 112 | 154 | 181 | 105 | 112 | 104 | <0.5 | 2.99 | <0.5 | <0.5 | <0.5 | <0.5 |
| Iron (dissolved) | mg/L | 0.3 | 0.181 | 0.057 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | **15.6** | 0.016 | 0.023 | <0.01 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Magnesium (dissolved) | mg/L | - | 37.9 | 32.4 | 21.1 | 21.8 | 19 | 19.9 | 20.2 | 22.9 | 21.3 | 27.8 | 44.3 | 19.6 | 21.5 | 19.4 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Manganese (dissolved) | mg/L | - | 0.0369 | 0.0144 | 0.0652 | 0.001 | <0.001 | <0.001 | <0.001 | 0.00256 | 0.00138 | 0.00375 | 1.17 | 0.00313 | 0.00558 | 0.00334 | <0.001 | 0.0027 | <0.001 | <0.001 | <0.001 | <0.001 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | **0.056** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | **0.105** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | 1.37 | 2.47 | 2.2 | 1.5 | 1 | 1.2 | 1.2 | 1.25 | 1.39 | 1.45 | 1.6 | 2.8 | 2.46 | 1.68 | <1 | <1 | <1 | <1 | <1 | <1 |
| Sodium (dissolved) | mg/L | - | 2.61 | 2.79 | 70.9 | 64.8 | 61.9 | 70.8 | 71.4 | 85.3 | 111 | 103 | 5.64 | 69.5 | 73.9 | 67.2 | <0.5 | 0.6 | <0.5 | <0.5 | <0.5 | <0.5 |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 333 | 337 | 277 | 307 | 284 | 297 | 295 | 311 | 311 | 319 | 590 | 316 | 281 | 284 | <10 | <10 | <10 | <10 | <10 | <10 |
| Ammonia-N | mg/L | - | 0.037 | 0.341 | <0.05 | 0.055 | <0.05 | 0.052 | 0.082 | <0.05 | 0.029 | <0.077 | <0.172 | <0.27 | 0.112 | 0.12 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Chloride | mg/L | - | 2.31 | 1.95 | 87.6 | 143 | 120 | 141 | 155 | 227 | 251 | 249 | 18.1 | 150 | 155 | 139 | <2 | <2 | <2 | <2 | <2 | <2 |
| Conductivity | uS/cm | - | 623 | 616 | 794 | 939 | 882 | 1060 | 1010 | 1260 | 1350 | 1370 | 1100 | 1010 | 984 | 902 | 2.77 | 3.78 | 1.3 | 0.82 | <3 | 3.2 |
| Dissolved organic carbon (DOC) | mg/L | - | 1 | 2.54 | <1 | 1.1 | <1 | 1.5 | <1 | 1.4 | <3.2 | <1 | 4.3 | <1 | <1 | 2.31 | <1 | <1 | <1 | <1 | 1.7 | <1 |
| Hardness | mg/L | - | 426 | 371 | 300 | 312 | 293 | 337 | 310 | 406 | 367 | 498 | 635 | 342 | 368 | 339 | <10 | <10 | <10 | <10 | <10 | <10 |
| Nitrate (as N) | mg/L | - | 6.03 | 6.09 | 1.66 | 0.95 | 0.34 | 0.44 | 0.48 | 1.34 | 1.94 | 2.1 | <0.1 | 0.475 | 0.437 | 0.255 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Nitrite (as N) | mg/L | - | <0.01 | 0.017 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| pH, lab | s.u. | 6.5-8.5 | 7.97 | 7.33 | 7.91 | 7.93 | 7.79 | 8.02 | 8.02 | 8.13 | 7.82 | 7.23 | 6.92 | 8.05 | 8.04 | 7.39 | 6.9 | 7.21 | 7.09 | 6.94 | 7.02 | 7.29 |
| Phenolics (total) | mg/L | 0.001 | **0.0024** | **0.01** | <0.001 | **0.0117** | **0.0042** | **0.0035** | **0.0071** | **0.0028** | <0.0032 | <0.011 | **0.0039** | <0.001 | **0.0269** | **0.0057** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Sulfate | mg/L | - | 3.39 | 2.44 | 17.6 | 12.8 | 8.3 | 8.4 | 9.3 | 16.2 | 22.4 | 14.6 | <1.5 | 8.82 | 7.68 | 7.65 | <2 | <2 | <2 | <2 | <2 | <2 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.33 | 1.7 | <0.19 | 1.08 | <0.15 | 0.34 | 0.42 | <0.15 | <1.5 | 0.41 | 0.67 | 0.42 | 0.24 | 0.33 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | 0.18 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00069 | 0.00069 | <0.00076 | 0.00078 | <0.0004 | 0.00022 | 0.00034 | <0.00073 | 0.00021 | <0.00069 | <0.00034 | 0.00218 | 0.00031 | 0.00016 | - | - | - | - | - | - |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | 371 | 765 | 8.14 | 1260 | 867 | 762 | 762 | 921 | 1270 | 1440 | 1080 | 1050 | 574 | 1070 | - | - | - | - | - | - |
| pH, field | s.u. | 6.5-8.5 | 7.9 | 6.91 | 7.85 | 7.78 | 7.57 | 7.21 | 7.21 | 7.78 | 7.5 | 7.6 | 7.04 | 7.57 | 7.07 | 6.8 | - | - | - | - | - | - |
| Temperature, field | Deg C | - | 10.56 | 11.15 | 9.5 | 10.6 | 9.3 | 11.6 | 11.6 | 11 | 10.2 | 10 | 7.2 | 9.5 | 10.29 | 9.08 | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

# TABLE 6.8

## GENERAL CHEMISTRY AND DISSOLVED METALS
## GROUNDWATER ANALYTICAL RESULTS WITH PWQOS
## 2018 ANNUAL MONITORING REPORT
## KINCARDINE WASTE MANAGEMENT CENTRE
## KINCARDINE, ONTARIO

| Sample Location: | | | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | GW-WARD2-0513-022 | GW-WARD2-1013-013 | GW-WARD2-DD-061514-032 | GW-WARD2-103014-025 | GW-WARD2-8/6/15-016 | GW-WARD2-171115-007 | GW-WARD2-042516-018 | GW-WARD2-110316-028 | GW-WARD2-041017-009 | GW-WARD2-112417-010 | GW-WARD2-051818-026 | GW-WARD2-110318-004 |
| **Sample Date:** | | | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/17/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/18/2018 | 11/3/2018 |
| **Parameters** | **Units** | ***PWQO*** [1] | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank | Field Blank |
| **Metals** | | | | | | | | | | | | | | |
| Calcium (dissolved) | mg/L | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.113 | <0.05 | 0.231 | 0.088 | 0.232 | <0.05 | <0.05 |
| Iron (dissolved) | mg/L | 0.3 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Magnesium (dissolved) | mg/L | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Manganese (dissolved) | mg/L | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Phosphorus (dissolved) | mg/L | 0.01-0.03 (e) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Potassium (dissolved) | mg/L | - | <1 | <1 | <1 | <1 | <1 | <0.05 | <0.05 | 0.093 | <0.05 | <0.05 | <0.05 | <0.05 |
| Sodium (dissolved) | mg/L | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.56 | <0.5 | <0.5 | <0.5 | <0.5 |
| **General Chemistry** | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | <10 | <10 | <10 | <10 | <10 | 10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Ammonia-N | mg/L | - | <0.05 | <0.05 | <0.05 | <0.05 | 0.068 | <0.05 | <0.02 | 0.09 | 0.048 | 0.081 | 0.031 | <0.02 |
| Chloride | mg/L | - | <2 | <2 | <2 | <2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Conductivity | uS/cm | - | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 |
| Dissolved organic carbon (DOC) | mg/L | - | <1 | <1 | <1 | <1 | <1 | <1 | 1.5 | <1 | <1 | <1 | <1 | 1.17 |
| Hardness | mg/L | - | - | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Nitrate (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| pH, lab | s.u. | 6.5-8.5 | 7.32 | 6.86 | 7.37 | 7.5 | 7.25 | 7.53 | 6.75 | 7.26 | **6.26** | 6.85 | **6.44** | **5.71** |
| Phenolics (total) | mg/L | 0.001 | <0.001 | **0.0028** | **0.0041** | **0.0043** | **0.0036** | **0.0018** | **0.0062** | **0.0074** | <0.001 | **0.0011** | **0.0049** | **0.0075** |
| Sulfate | mg/L | - | <2 | <2 | <2 | <2 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | <0.15 | 0.17 | <0.15 | 0.99 | 0.24 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 |
| Un-ionized ammonia | mg/L | 0.02 (d) | - | - | - | - | - | - | - | - | - | - | - | - |
| **Field Parameters** | | | | | | | | | | | | | | |
| Conductivity, field | uS/cm | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pH, field | s.u. | 6.5-8.5 | - | - | - | - | - | - | - | - | - | - | - | - |
| Temperature, field | Deg C | - | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| [1] | Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

**SW-1**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOE PWQO [1]* | *SW-1* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *6-Dec-83* | *23-Aug-88* | *2-Jan-89* | *17-Jul-89* | *30-Nov-89* | *18-Jul-90* | *6-May-91* | *6-Nov-91* | *15-Jun-92* | *3-Nov-92* | *12-Apr-93* | *26-Oct-93* |
| Alkalinity | - | - | 184.10 | - | - | 134 | - | - | 219 | 208 | 220 | 212 | 242 |
| Calcium | - | 81.5 | 67.9 | 68.4 | 71.0 | 55.0 | 59.8 | 69.1 | 77.5 | 66.2 | 71.7 | 60.7 | 89.5 |
| Chloride | - | 12.0 | 17.02 | 8.81 | 19.3 | 15.1 | 16.1 | 7.5 | 18.2 | 13.5 | 12.4 | 6.0 | 11.5 |
| Dissolved Organic Carbon (DOC) | - | 5.7 | 3.5 | 5.7 | 5.1 | 7.5 | 5.7 | 5.1 | 7.8 | 4.8 | 19.2 | *18.0 | 7.3 |
| Hardness | - | 303 | 305.7 | 256 | 305 | 208 | 257 | 266 | 296 | 290 | 272 | 225 | 331 |
| Iron | 0.3 | - | 0.36 | 0.98 | 0.42 | 0.92 | - | - | 0.54 | 0.44 | 0.07 | <0.01 | 0.03 |
| Magnesium | - | 24.0 | 33.00 | 20.68 | 31.0 | 17.1 | 26.2 | 22.6 | 24.8 | 30.3 | 22.5 | 17.7 | 26.0 |
| Manganese | - | - | 0.033 | - | - | - | - | - | 0.012 | 0.048 | 0.0082 | 0.010 | 0.008 |
| Nitrite | - | 0.010 | 0.02 | - | - | 0.06 | - | - | <0.01 | <0.01 | 0.02 | 0.01 | 0.02 |
| Nitrate | - | 4.14 | 0.1 | 3.2 | <0.1 | 7.5 | - | - | 2.9 | <0.1 | 2.7 | 2.3 | 3.4 |
| Potassium | - | - | 3.00 | 1.68 | 3.5 | 3.3 | - | - | 3.8 | 2.6 | 7.6 | 2.3 | 2.9 |
| Sodium | - | - | 27.3 | 3.99 | 19.4 | 3.86 | - | - | - | 18.0 | 4.6 | 3.1 | 5.7 |
| Sulphate | - | - | 175 | 28.0 | 121 | 35.0 | - | - | 10.3 | 114 | 16.5 | 15.0 | 32.0 |
| TKN | - | 0.75 | - | - | - | 1.05 | - | - | 0.77 | 0.61 | 1.22 | 0.60 | 0.81 |
| Total Ammonia | - | - | 0.071 | - | - | 0.042 | - | - | .043 | 0.094 | 0.144 | 0.047 | <0.005 |
| Unionized Ammonia | 0.02 (d) | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Phenolics | 0.001 | <0.0010 | 0.0025 | 0.0015 | <0.0010 | 0.0020 | <0.0010 | <0.0010 | <0.0010 | 0.0020 | 0.0110 | 0.0025 | 0.0043 |
| Total Phosphorus | 0.01 - 0.03 (e) | 0.22 | - | - | - | 0.119 | - | - | 0.036 | 0.037 | 0.149 | 0.057 | 0.030 |
| Laboratory Conductivity (µmhos/cm) | - | 560 | 705 | 497 | 659 | 444 | 570 | 523 | 589 | 626 | 493 | 428 | 587 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | 8.17 | 7.99 | 7.88 | 7.93 | 7.86 | 8.30 | 8.31 | 8.17 | 8.08 | 7.97 | 8.08 | 8.28 |
| Field pH (Std. Units) | 6.5 - 8.5 | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Conductivity (µmhos/cm) | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Temperature (°C) | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Dissolved Oxygen | (f) | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
- No information available/not sampled.
Parameer exceeds the applicable PWQO.

**SW-1**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

**SW-1**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOE* | *SW-1* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *PWQO [1]* | *11-Apr-94* | *24-Oct-94* | *12-Apr-95* | *20-Oct-95* | *12-Nov-96* | *12-Nov-96* | *12-May-98* | *16-Dec-98* | *9-Jun-99* | *9-Jun-99* | *28-Jun-00* | *28-Jun-00* |
| Alkalinity | - | 177 | 268 | 192 | 233 | 224 | 221 | 229 | 211 | - | - | 231 | 229 |
| Calcium | - | 54.6 | 78.7 | 53.5 | 78.5 | 71.8 | 71.7 | 65.5 | 84.4 | 64.7 | 63.8 | 73.7 | 68.7 |
| Chloride | - | 4.1 | 15.4 | 7.6 | 18.6 | 7.32 | 7.39 | 8.96 | 18.2 | 12.9 | - | 13.2 | 13.3 |
| Dissolved Organic Carbon (DOC) | - | 12.9 | 11.5 | 3.8 | 5.4 | 6 | - | 4.2 | 6.4 | 5 | - | 7.4 | 7.3 |
| Hardness | - | 202 | 321 | 236 | 321 | 261 | 261 | 266 | 323 | 280 | - | 304 | 304 |
| Iron | 0.3 | 0.04 | <0.01 | 0.028 | 0.32 | 0.38 | 0.387 | 0.194 | nd | 0.85 | 0.86 | 0.52 | 0.48 |
| Magnesium | - | 16.0 | 30.1 | 24.9 | 30.3 | 19.9 | 19.8 | 24.9 | 27.2 | 25.7 | 25.5 | 25.9 | 24.8 |
| Manganese | - | 0.013 | 0.011 | 0.0173 | 0.016 | <0.005 | <0.005 | 0.042 | nd | 0.05 | 0.05 | 0.025 | 0.023 |
| Nitrite | - | 0.01 | 0.02 | 0.02 | <0.01 | <0.03 | <0.03 | nd | nd | nd | - | nd | nd |
| Nitrate | - | 1.5 | 1.1 | 0.9 | <0.1 | 2.09 | 2.12 | 0.27 | 6.3 | 2.9 | - | 2.1 | 2.1 |
| Potassium | - | 1.8 | 4.09 | 2.12 | 6.77 | 2.1 | 2.1 | nd | 3.3 | 1.1 | 1.3 | 4 | 4 |
| Sodium | - | 3.0 | 9.1 | 6 | 16.8 | 3.39 | 3.38 | 7.77 | 9.7 | 9.6 | 9.4 | 13.3 | 11 |
| Sulphate | - | 15.2 | 37.7 | * | 91 | 15.4 | 15.3 | nd | 56.7 | 54.7 | - | 48.4 | 48.3 |
| TKN | - | 0.53 | 0.62 | 0.41 | 0.62 | 1.01 | - | 0.56 | 0.82 | 0.65 | - | 0.75 | 0.74 |
| Total Ammonia | - | 0.034 | 0.028 | 0.09 | <0.05 | 0.08 | - | 0.03 | 0.05 | 0.09 | - | 0.08 | 0.06 |
| Unionized Ammonia | 0.02 (d) | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Phenolics | 0.001 | <0.0010 | 0.0072 | 0.005 | 0.0037 | <0.001 | - | nd | nd | nd | - | nd | nd |
| Total Phosphorus | 0.01 - 0.03 (e) | 0.036 | 0.018 | 0.03 | 0.03 | 0.15 | - | 0.05 | 0.01 | 0.06 | - | - | - |
| Laboratory Conductivity (µmhos/cm) | - | 382 | 618 | 510 | 636 | 450 | 451 | 504 | 586 | 504 | - | 537 | 532 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | 8.43 | 8.24 | 8.5 | 8.08 | 7.94 | 7.94 | 8.19 | 8.24 | 8.15 | - | 8.09 | 8.06 |
| Field pH (Std. Units) | 6.5 - 8.5 | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Conductivity (µmhos/cm) | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Temperature (°C) | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Dissolved Oxygen | (f) | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.

[1] Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

- No information available/not sampled.

Parameer exceeds the applicable PWQO.

**SW-1**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | SV *MOE* | *SW-1* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *PWQO (1)* | *24-Nov-00* | *24-Nov-00* | *28-Jun-01* | *28-Jun-01* | *14-Dec-01* | *14-Dec-01* | *14-Jun-02* | *14-Jun-02* | *29-Oct-02* | *29-Oct-02* | *5-May-03* | *5-May-03* |
| Alkalinity | - | 279 | 276 | 194 | 197 | 289 | 286 | 202 | 204 | 208 | 208 | 198 | 201 |
| Calcium | - | 85.5 | 86.3 | 67.7 | 66.5 | 88.6 | 89.6 | 58.9 | 58.6 | 81.2 | 79.2 | 66.4 | 67.1 |
| Chloride | - | 12.5 | 12.4 | 10.7 | 10.6 | 9.7 | 9.4 | 10.7 | 10.7 | 14.2 | 14.2 | 13.2 | 13.1 |
| Dissolved Organic Carbon (DOC) | - | 5.1 | 5 | 14.1 | 13.9 | 6.9 | 6.5 | 8.9 | 8.8 | 3.3 | 3.1 | 5.3 | 5.2 |
| Hardness | - | 323 | 323 | 255 | 255 | 325 | 327 | - | - | 315 | 319 | 259 | 251 |
| Iron | 0.3 | 0.23 | 0.25 | 0.32 | 0.31 | 0.37 | 0.37 | 0.46 | 0.44 | 0.17 | 0.16 | 0.22 | 0.22 |
| Magnesium | - | 26.4 | 26.6 | 24.2 | 24.1 | 25.5 | 26 | 22 | 22.7 | 31.7 | 30.7 | 20.7 | 21 |
| Manganese | - | 0.011 | 0.011 | 0.022 | 0.022 | 0.02 | 0.019 | - | - | 0.014 | 0.013 | 0.012 | 0.012 |
| Nitrite | - | nd | nd | 0.3 | 0.3 | nd | nd | 0.2 | 0.2 | nd | nd | nd | nd |
| Nitrate | - | 6.9 | 7 | 6.3 | 6.4 | 2.7 | 2.7 | 3.5 | 3.5 | nd | nd | 5.7 | 5.7 |
| Potassium | - | 3 | 4 | 3 | 3 | 3 | 2 | 3 | 3 | 4 | 4 | 2 | 3 |
| Sodium | - | 5.1 | 5.2 | 6.4 | 6.3 | 6.1 | 6.2 | 5.6 | 5.6 | 21.5 | 20.5 | 5.8 | 6 |
| Sulphate | - | 23 | 24 | 27.9 | 27.6 | 26.8 | 26.9 | 21.5 | 21.1 | 138 | 136 | 32.1 | 31.7 |
| TKN | - | 1.09 | 1.07 | 1.53 | 1.47 | 0.48 | 0.47 | 0.88 | 0.87 | 0.35 | 0.35 | 0.83 | 0.85 |
| Total Ammonia | - | 0.13 | 0.14 | ND(0.050) | 0.06 | 0.03 | 0.03 | 0.3 | 0.3 | nd | nd | 0.03 | 0.03 |
| Unionized Ammonia | 0.02 (d) | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Phenolics | 0.001 | nd | nd | nd | nd | nd | nd | nd | nd | nd | nd | nd | nd |
| Total Phosphorus | 0.01 - 0.03 (e) | - | - | 0.104 | 0.104 | 0.039 | 0.038 | - | - | - | - | - | - |
| Laboratory Conductivity (µmhos/cm) | - | 572 | 572 | 486 | 487 | 591 | 591 | 472 | 468 | 664 | 662 | 504 | 505 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | 8.3 | 8.31 | 7.84 | 7.85 | 8.25 | 8.27 | 8.2 | 8.19 | 8.16 | 8.15 | 8.19 | 8.19 |
| Field pH (Std. Units) | 6.5 - 8.5 | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Conductivity (µmhos/cm) | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Temperature (°C) | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Dissolved Oxygen | (f) | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
- No information available/not sampled.
Parameer exceeds the applicable PWQO.

**SW-1**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOE PWQO* [1] | *SW-1* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *14-Nov-03* | *14-Nov-03* | *18-May-04* | *18-May-04* | *10-Nov-04* | *10-Nov-04* | *4-Jul-05* | *21-Nov-05* | *5-Mar-06* | *12-Oct-06* | *10-Jun-07* | *27-Oct-07* |
| Alkalinity | - | 241 | 244 | 245 | 240 | 255 | 259 | 182 | 177 | 208 | 265 | 221 | 206 |
| Calcium | - | 79.8 | 80.2 | 70.3 | 74.3 | 84.5 | 86.3 | 66 | 85 | 64.2 | 78.2 | 68 | 84 |
| Chloride | - | 9.2 | 9.2 | 11.2 | 11.1 | 13.5 | - | 13.2 | 19 | 9 | 8.8 | 13 | 39 |
| Dissolved Organic Carbon (DOC) | - | 7.3 | 7.4 | 5.5 | 5 | 6.5 | - | 4.5 | 6.1 | 4.6 | 4.2 | 6.6 | 4.3 |
| Hardness | - | 298 | 295 | 27 | 28 | 311 | - | 257 | 270 | 250 | 290 | 260 | 290 |
| Iron | 0.3 | 2.41 | 2.46 | 0.27 | 0.29 | 0.35 | 0.38 | 0.47 | 1.2 | 0.19 | 0.37 | 0.27 | 1.6 |
| Magnesium | - | 24.2 | 24.4 | 23 | 24.2 | 25.4 | 25.9 | 30 | 23 | 21.9 | 23.1 | 28 | 28 |
| Manganese | - | - | - | 0.019 | 0.02 | 0.011 | 0.012 | 0.028 | 0.033 | - | 0.017 | 0.014 | 0.051 |
| Nitrite | - | nd | nd | nd | nd | nd | - | ND | 0.04 | ND(0.06) | ND(0.06) | 0.07 | ND |
| Nitrate | - | 3.4 | 3.4 | 1.8 | 1.7 | 3.6 | - | 0.9 | 14 | 2.23 | 3.9 | 5 | ND |
| Potassium | - | 4 | 4 | 2 | 1 | 2 | 2 | 2.8 | 5.3 | 1.9 | 2.71 | 2.4 | 3.1 |
| Sodium | - | 4.1 | 4 | 6.2 | 6.6 | 6.7 | 6.9 | 18 | 6.2 | 6.62 | 4.77 | 7.5 | 34 |
| Sulphate | - | 15.6 | 15.6 | 24 | 23.4 | 27.9 | - | 106 | 35 | 29 | 19 | 29 | 112 |
| TKN | - | - | - | 0.58 | 0.63 | - | - | - | - | - | - | - | - |
| Total Ammonia | - | 0.04 | 0.04 | nd | nd | 0.04 | - | 0.06 | 0.06 | 0.1 | 0.5 | 0.09 | ND |
| Unionized Ammonia | 0.02 (d) | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Phenolics | 0.001 | - | - | 0.001 | 0.001 | - | - | 0.107 | ND | 0.002 | ND(0.002) | ND | ND |
| Total Phosphorus | 0.01 - 0.03 (e) | - | - | 0.039 | 0.038 | 0.055 | 0.056 | 0.03 | 0.117 | 0.02 | 0.06 | 0.03 | 0.023 |
| Laboratory Conductivity (µmhos/cm) | - | 520 | 520 | 373 | 372 | - | - | 595 | 555 | - | - | 524 | 721 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | 7.38 | 7.38 | 8.12 | 8.13 | - | - | 8.24 | 8.23 | - | - | 8.3 | 8.3 |
| Field pH (Std. Units) | 6.5 - 8.5 | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Conductivity (µmhos/cm) | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Temperature (°C) | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Dissolved Oxygen | (f) | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.

[1] Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

- No information available/not sampled.

Parameer exceeds the applicable PWQO.

**SW-1**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOE PWQO [1]* | *SW-1* | | | |
|---|---|---|---|---|---|
| | | *5-Aug-08* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* |
| Alkalinity | - | 198 | 71 | 236 | 257 |
| Calcium | - | 54 | 32 | 81.9 | 81.4 |
| Chloride | - | 13 | 3 | 8.5 | 27 |
| Dissolved Organic Carbon (DOC) | - | 6.7 | 3.4 | 6.1 | 5.1 |
| Hardness | - | 220 | 68 | 299 | 312 |
| Iron | 0.3 | 0.51 | 3.1 | 0.428 | 0.275 |
| Magnesium | - | 26 | 9.8 | 22.9 | 26.5 |
| Manganese | - | 0.028 | 0.092 | 0.0218 | 0.0156 |
| Nitrite | - | ND | 0.02 | ND(0.10) | ND(0.10) |
| Nitrate | - | ND | 0.9 | 2.56 | 1.81 |
| Potassium | - | 2 | 3.2 | 2.4 | 2.4 |
| Sodium | - | 12 | 1.2 | 5.77 | 8.97 |
| Sulphate | - | 52 | 2 | 14.4 | 36.8 |
| TKN | - | - | 1.1 | 0.69 | 0.6 |
| Total Ammonia | - | ND | 0.13 | 0.121 | <0.050 |
| Unionized Ammonia | 0.02 (d) | - | - | 0.0085 | 0.0015 |
| Total Phenolics | 0.001 | ND | ND | 0.0026 | 0.002 |
| Total Phosphorus | 0.01 - 0.03 (e) | 0.031 | 0.28 | 0.0591 | 0.052 |
| Laboratory Conductivity (µmhos/cm) | - | - | 149 | 486 | 575 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | - | 7.8 | 8.45 | 8.37 |
| Field pH (Std. Units) | 6.5 - 8.5 | - | - | 8.42 | 8.24 |
| Field Conductivity (µmhos/cm) | - | - | - | 429 | 643 |
| Field Temperature (°C) | - | - | - | 12.90 | 7.20 |
| Field Dissolved Oxygen | (f) | - | - | 10.21 | 9.89 |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
- No information available/not sampled.
Parameer exceeds the applicable PWQO.

**SW-2**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOE* | *SW-2* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | *PWQO [1]* | *11-Apr-94* | *24-Oct-94* | *12-Apr-95* | *20-Oct-95* | *12-May-98* | *16-Dec-98* | *9-Jun-99* | *28-Jun-00* | *24-Nov-00* | *28-Jun-01* | *14-Dec-01* |
| Alkalinity | - | 175 | 268 | 197 | 232 | 228 | 209 | - | 231 | 278 | 199 | 289 |
| Calcium | - | 54.5 | 84.1 | 63.5 | 78.9 | 65.1 | 80.5 | 63.7 | 74.9 | 89.1 | 69.5 | 89.5 |
| Chloride | - | 4.0 | 14.9 | 7.5 | 18.1 | 9.4 | 17.7 | 12.7 | 13 | 12.9 | 11.1 | 9.4 |
| Dissolved Organic Carbon (DOC) | - | 10.5 | 10.9 | 4.1 | 5.6 | 4.3 | 6 | 6.6 | 5.8 | 5.1 | 8.6 | 5.4 |
| Hardness | - | 201 | 335 | 260 | 321 | 264 | 307 | 274 | 309 | 318 | 253 | 319 |
| Iron | 0.3 | 0.05 | <0.01 | 0.021 | 0.4 | 0.176 | nd | 0.35 | 0.18 | 0.3 | 0.19 | 0.29 |
| Magnesium | - | 15.6 | 30.2 | 24.6 | 30 | 24.7 | 25.7 | 26.1 | 25.7 | 26.4 | 24.4 | 26 |
| Manganese | - | 0.012 | 0.013 | 0.0115 | 0.019 | 0.288 | nd | 0.02 | 0.019 | 0.018 | 0.022 | 0.016 |
| Nitrite | - | 0.01 | 0.02 | 0.03 | <0.01 | nd | nd | nd | nd | nd | 0.3 | nd |
| Nitrate | - | 1.5 | 1.0 | 0.9 | <0.1 | 0.3 | 5.8 | 2.9 | 2.1 | 8.4 | 6.3 | 2.8 |
| Potassium | - | 1.8 | 3.67 | 2.04 | 6.8 | nd | nd | nd | 4 | 4 | 3 | 2 |
| Sodium | - | 3.0 | 9.0 | 5.9 | 16.5 | 7.77 | 9.2 | 9.9 | 10.9 | 5.2 | 6.3 | 6.3 |
| Sulphate | - | 18.8 | 39.1 | * | 88.5 | nd | 59.4 | 54 | 50.6 | 24.5 | 28.3 | 27.9 |
| TKN | - | 0.50 | 0.60 | 0.42 | 0.57 | 0.6 | 0.65 | 0.63 | 0.68 | 1.14 | 1.48 | 0.43 |
| Total Ammonia | - | 0.035 | 0.041 | 0.08 | <0.05 | 0.02 | nd | 0.31 | 0.06 | 0.12 | 0.04 | nd |
| Unionized Ammonia | 0.02 (d) | - | - | - | - | - | - | - | - | - | - | - |
| Total Phenolics | 0.001 | <0.0010 | 0.0089 | * | 0.0055 | nd | nd | nd | nd | nd | nd | nd |
| Total Phosphorus | 0.01 - 0.03 (e) | 0.036 | 0.019 | 0.03 | 0.02 | 0.04 | nd | 0.02 | - | - | 0.058 | 0.046 |
| Laboratory Conductivity (µmhos/cm) | - | 382 | 624 | 510 | 633 | 507 | 588 | 501 | 538 | 574 | 488 | 590 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | 8.35 | 8.17 | 8.51 | 8.12 | 8.22 | 8.26 | 8.16 | 8.03 | 8.24 | 7.96 | 8.28 |
| Field pH (Std. Units) | 6.5 - 8.5 | - | - | - | - | - | - | - | - | - | - | - |
| Field Conductivity (µmhos/cm) | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Temperature (°C) | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Dissolved Oxygen | (f) | - | - | - | - | - | - | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

- No information available/not sampled.

Parameer exceeds the applicable PWQO.

**SW-2**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOE* | *SW-2* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | *PWQO [1]* | *PWQO [1]* | *29-Oct-02* | *5-May-03* | *14-Nov-03* | *18-May-04* | *10-Nov-04* | *4-Jul-05* | *21-Nov-05* | *5-Mar-06* | *12-Oct-06* | *10-Jun-07* |
| Alkalinity | - | 201 | 210 | 197 | 242 | 241 | 264 | 190 | 182 | 217 | 260 | 226 |
| Calcium | - | 57.9 | 83.1 | 67 | 74 | 72.3 | 83.5 | 64 | 83 | 63.4 | 75.2 | 72 |
| Chloride | - | 9.8 | 13.9 | 13.6 | 9.1 | 10.8 | 13.9 | 15.4 | 19 | 8.5 | 8.6 | 14 |
| Dissolved Organic Carbon (DOC) | - | 7.4 | 7.7 | 4.9 | 6.8 | 5.1 | 6.6 | 5.2 | 6.1 | 4.3 | 3.8 | 6.5 |
| Hardness | - | - | 320 | 268 | 279 | 28 | 310 | 251 | 270 | 247 | 279 | 260 |
| Iron | 0.3 | 0.26 | 0.11 | 0.22 | 1.1 | 0.24 | 0.36 | 0.12 | 0.85 | 0.11 | 0.34 | 0.21 |
| Magnesium | - | 22.2 | 31.2 | 21 | 22.1 | 24 | 24.8 | 29 | 22 | 21.6 | 22.2 | 28 |
| Manganese | - | - | 0.014 | 0.013 | - | 0.02 | 0.013 | 0.047 | 0.027 | - | 0.029 | 0.013 |
| Nitrite | - | nd | nd | nd | nd | nd | nd | ND | 0.04 | ND(0.06) | ND(0.06) | 0.07 |
| Nitrate | - | 4 | nd | 5.5 | 3.4 | 1.7 | 3.4 | 0.3 | 14 | 2.06 | 3.48 | 5.2 |
| Potassium | - | 3 | 2 | 3 | 3 | 2 | 3 | 2.8 | 4.8 | 1.81 | 2.6 | 2.5 |
| Sodium | - | 5.4 | 19.6 | 5.9 | 3.9 | 6.6 | 6.7 | 17 | 5.6 | 6.52 | 4.52 | 7.7 |
| Sulphate | - | 21 | 133 | 33.1 | 15.9 | 25.4 | 27.6 | 92.9 | 43 | 29 | 19 | 28 |
| TKN | - | 0.28 | 0.49 | 0.83 | - | 0.62 | - | - | - | - | - | - |
| Total Ammonia | - | nd | nd | nd | 0.05 | nd | nd | 0.08 | 0.09 | 0.3 | 0.1 | 0.07 |
| Unionized Ammonia | 0.02 (d) | - | - | - | - | - | - | - | - | - | - | - |
| Total Phenolics | 0.001 | nd | nd | nd | - | 0.001 | - | 0.001 | ND | ND(0.001) | ND(0.002) | ND |
| Total Phosphorus | 0.01 - 0.03 (e) | - | - | - | - | 0.031 | 0.052 | 0.02 | 0.129 | 0.01 | 0.07 | 0.030 |
| Laboratory Conductivity (µmhos/cm) | - | 474 | 671 | 501 | 500 | 372 | - | 572 | 567 | - | - | 532 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | 8.1 | 8.2 | 8.23 | 7.34 | 8.17 | - | 8.15 | 8.24 | - | - | 8.3 |
| Field pH (Std. Units) | 6.5 - 8.5 | - | - | - | - | - | - | - | - | - | - | - |
| Field Conductivity (µmhos/cm) | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Temperature (°C) | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Dissolved Oxygen | (f) | - | - | - | - | - | - | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.

[1] Ministry of Environment (MOE), Provinci [1] Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

- No information available/not sampled.

Parameer exceeds the applicable PWQO.

**SW-2**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOE* | *SW-2* | | SW-4 | | |
|---|---|---|---|---|---|---|
| Date | *PWQO [1]* | *27-Oct-07* | *PWQO [1]* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* |
| Alkalinity | - | 207 | 200 | 71 | 229 | 261 |
| Calcium | - | 76 | 53 | 33 | 86.1 | 80.7 |
| Chloride | - | 14 | 13 | 7 | 8.5 | 20.9 |
| Dissolved Organic Carbon (DOC) | - | 4.2 | 6.5 | 3.7 | 5.7 | 5.4 |
| Hardness | - | 280 | 230 | 69 | 310 | 308 |
| Iron | 0.3 | 0.23 | 0.4 | 2.7 | 0.448 | 0.256 |
| Magnesium | - | 29 | 27 | 10 | 23.0 | 25.8 |
| Manganese | - | 0.031 | 0.033 | 0.1 | 0.0233 | 0.0154 |
| Nitrite | - | ND | ND | 0.02 | ND(0.10) | ND(0.10) |
| Nitrate | - | ND | 0.2 | 0.8 | 2.46 | 2.09 |
| Potassium | - | 3.2 | 2 | 3 | 2.4 | 2.3 |
| Sodium | - | 19 | 13 | 1.4 | 5.94 | 8.94 |
| Sulphate | - | 115 | 53 | 1 | 14.6 | 37.5 |
| TKN | - | - | - | 1.2 | 0.51 | 0.52 |
| Total Ammonia | - | ND | ND | 0.14 | 0.103 | ND (0.050) |
| Unionized Ammonia | 0.02 (d) | - | - | - | 0.0082 | 0.0007 |
| Total Phenolics | 0.001 | ND | ND | ND | 0.0027 | 0.0020 |
| Total Phosphorus | 0.01 - 0.03 (e) | 0.035 | 0.023 | 0.31 | 0.0486 | ND(0.05) |
| Laboratory Conductivity (µmhos/cm) | - | 629 | - | 165 | 489 | 574 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | 8.2 | - | 7.6 | 8.41 | 8.37 |
| Field pH (Std. Units) | 6.5 - 8.5 | - | - | - | 8.43 | 7.96 |
| Field Conductivity (µmhos/cm) | - | - | - | - | 427 | 646 |
| Field Temperature (°C) | - | - | - | - | 14.4 | 5.9 |
| Field Dissolved Oxygen | (f) | - | - | - | 10.52 | 8.92 |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] Ministry of Environment (MOE), Provincial Water Quality [1] Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
- No information available/not sampled.
Parameer exceeds the applicable PWQO.

**SW-3**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOE* | *SW-3* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | *PWQO [1]* | *6-Dec-83* | *23-Aug-88* | *2-Jan-89* | *17-Jul-89* | *30-Nov-89* | *18-Jul-90* | *6-May-91* | *6-Nov-91* | *15-Jun-92* | *3-Nov-92* | *12-Apr-93* | *26-Oct-93* |
| Alkalinity | - | - | 180.35 | - | - | 136 | - | - | 219 | 204 | 229 | 209 | 232 |
| Calcium | - | 81.5 | 67.7 | 64.6 | 69.9 | 55.2 | 59.0 | 70.9 | 77.5 | 63.4 | 78.6 | 60.1 | 89.9 |
| Chloride | - | 12.5 | 16.42 | 8.82 | 19.5 | 14.8 | 16.2 | 7.1 | 17.9 | 13.1 | 12.8 | 6.0 | 11.1 |
| Dissolved Organic Carbon (DOC) | - | - | 3.4 | 5.5 | 5.7 | 7.0 | 6.0 | 5.0 | 7.8 | 5.1 | 19.8 | 3.3 | 7.7 |
| Hardness | - | 302 | 302.9 | 242 | 300 | 208 | 255 | 273 | 298 | 283 | 295 | 224 | 333 |
| Iron | 0.3 | - | 0.23 | 0.44 | 0.33 | 0.96 | - | - | 0.46 | 0.20 | 0.07 | <0.01 | 0.02 |
| Magnesium | - | 23.8 | 32.43 | 19.49 | 30.5 | 17.1 | 26.0 | 23.2 | 25.4 | 30.1 | 23.9 | 17.8 | 26.3 |
| Manganese | - | - | 0.032 | - | - | - | - | - | 0.014 | 0.028 | 0.0082 | 0.010 | 0.010 |
| Nitrite | - | 0.010 | 0.01 | - | - | 0.06 | - | - | <0.01 | 0.01 | 0.02 | 0.01 | 0.02 |
| Nitrate | - | 3.94 | 0.1 | 3.2 | <0.1 | 8.3 | - | - | 2.8 | 0.8 | 2.7 | 2.3 | 3.2 |
| Potassium | - | - | 2.65 | 1.66 | 3.4 | 3.3 | - | - | 3.8 | 2.5 | 8.0 | 2.5 | 3.0 |
| Sodium | - | - | 27.4 | 3.88 | 18.7 | 4.07 | - | - | - | 17.8 | 4.8 | 3.1 | 5.6 |
| Sulphate | - | - | 180 | 27.5 | 108 | 36.5 | - | - | 10.1 | 95.0 | 17.5 | 15.5 | 31.9 |
| TKN | - | 0.70 | - | - | - | 1.07 | - | - | 0.78 | 0.54 | 1.26 | 0.61 | 0.79 |
| Total Ammonia | - | - | 0.035 | - | - | 0.043 | - | - | 0.079 | 0.069 | 0.226 | 0.041 | <0.005 |
| Unionized Ammonia | 0.02 (d) | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Phenolics | 0.001 | 0.0015 | <0.0010 | 0.0015 | 0.0015 | 0.0015 | <0.0010 | <0.0010 | <0.0010 | 0.0020 | 0.0115 | 0.0020 | 0.0006 |
| Total Phosphorus | 0.01 - 0.03 (e) | 0.29 | - | - | - | 0.116 | - | - | 0.033 | 0.026 | 0.074 | 0.056 | 0.031 |
| Laboratory Conductivity (µmhos/cm) | - | 560 | 690 | 490 | 645 | 449 | 559 | 521 | 587 | 607 | 519 | 433 | 583 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | 8.24 | 8.00 | 7.85 | 7.98 | 7.81 | 8.33 | 8.25 | 8.12 | 8.18 | 7.96 | 8.08 | 8.26 |
| Field pH (Std. Units) | 6.5 - 8.5 | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Conductivity (µmhos/cm) | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Temperature (°C) | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Dissolved Oxygen | (f) | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.

[1] Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

- No information available/not sampled.

Parameer exceeds the applicable PWQO.

**SW-3**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOE* | *SW-3* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | *PWQO [1]* | *11-Apr-94* | *24-Oct-94* | *12-Apr-95* | *20-Oct-95* | *12-Nov-96* | *12-Nov-96* | *12-May-98* | *16-Dec-98* | *9-Jun-99* | *9-Jun-99* | *28-Jun-00* | *28-Jun-00* |
| Alkalinity | - | 180 | 276 | 240 | 241 | 192 | 227 | 235 | 210 | - | 234 | 278 | 198 |
| Calcium | - | 55.7 | 86.4 | 72.9 | 77.5 | 71.3 | 71.8 | 65.7 | 80.1 | 61.1 | 70.4 | 83.9 | 67.2 |
| Chloride | - | 4.1 | 14.9 | 7.6 | 16.2 | 9.39 | 7.33 | 9.6 | 17.4 | 12.9 | 13 | 12.4 | 10.8 |
| Dissolved Organic Carbon (DOC) | - | 10.3 | 10.0 | 4.8 | 5.4 | 7.7 | 6 | 3.9 | 6.6 | 5.7 | 5.6 | 5.1 | 7.6 |
| Hardness | - | 205 | 340 | 281 | 314 | 255 | 269 | 266 | 305 | 275 | 299 | 328 | 251 |
| Iron | 0.3 | 0.03 | 0.01 | 0.044 | 0.08 | 0.955 | 0.377 | 0.127 | ND | 0.24 | 0.21 | 0.24 | 0.16 |
| Magnesium | - | 16.0 | 30.0 | 23.9 | 29.2 | 18.8 | 19.7 | 24.7 | 25.5 | 23.6 | 25.2 | 26 | 23.7 |
| Manganese | - | 0.016 | 0.013 | 0.016 | 0.005 | 0.04 | <0.005 | 0.295 | ND | 0.02 | 0.016 | 0.011 | 0.02 |
| Nitrite | - | 0.01 | 0.01 | 0.02 | <0.01 | <0.03 | <0.03 | ND | ND | nd | nd | nd | 0.3 |
| Nitrate | - | 1.5 | 1.0 | 1 | <0.1 | 11 | 2.27 | 0.25 | 5.8 | 2.9 | 2.1 | 6.8 | 6.3 |
| Potassium | - | 1.9 | 3.62 | 1.89 | 5.41 | 4.6 | 2.3 | nd | nd | 3.4 | 4 | 3 | 2 |
| Sodium | - | 3.0 | 8.8 | 5.8 | 14.2 | 3.43 | 3.53 | 7.83 | 9.1 | 8.9 | 10.8 | 5.1 | 6.2 |
| Sulphate | - | 18.9 | 39.0 | 29.6 | 73.6 | 12.1 | 15.9 | nd | 59.4 | 53.3 | 50 | 24 | 28 |
| TKN | - | 0.49 | 0.60 | 0.87 | 0.48 | 1.28 | 0.91 | 0.27 | 0.68 | 0.75 | 0.69 | 0.31 | 1.41 |
| Total Ammonia | - | 0.040 | - | 0.17 | <0.05 | 0.13 | 0.08 | 0.03 | nd | 0.1 | 0.06 | 0.12 | 0.04 |
| Unionized Ammonia | 0.02 (d) | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Phenolics | 0.001 | <0.0010 | 0.0034 | 0.003 | 0.0019 | <0.001 | <0.001 | nd | nd | nd | nd | nd | nd |
| Total Phosphorus | 0.01 - 0.03 (e) | 0.033 | 0.018 | 0.02 | 0.01 | 0.136 | 0.15 | 0.03 | nd | 0.02 | - | - | 0.0610.01 |
| Laboratory Conductivity (µmhos/cm) | - | 387 | 615 | 510 | 614 | 478 | 462 | 415 | 589 | 499 | 545 | 572 | 489 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | 8.38 | 8.12 | 8.39 | 8.44 | 7.94 | 7.97 | 8.28 | 8.24 | 8.2 | 8.14 | 8.25 | 7.84 |
| Field pH (Std. Units) | 6.5 - 8.5 | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Conductivity (µmhos/cm) | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Temperature (°C) | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Dissolved Oxygen | (f) | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.

[1] Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

- No information available/not sampled.

Parameer exceeds the applicable PWQO.

**SW-3**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | SW | *MOE* | *SW-3* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | *PWQO [1]* | *24-Nov-00* | *4-Jul-05* | *21-Nov-05* | *5-Mar-06* | *12-Oct-06* | *10-Jun-07* | *27-Oct-07* | *5-Aug-08* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* |
| Alkalinity | | - | 284 | 198 | 186 | 205 | 263 | 229 | 218 | 204 | - | 232 | 298 |
| Calcium | | - | 89 | 67 | 81 | 63.4 | 79.2 | 68 | 76 | 57 | - | 80.7 | 84.9 |
| Chloride | | - | 9.3 | 13 | 18 | 8.5 | 8.4 | 13 | 13 | 12 | - | 18.8 | 23.2 |
| Dissolved Organic Carbon (DOC) | | - | 7.6 | 5 | 6 | 3.8 | 3.7 | 6.4 | 4.8 | 6.5 | - | 5.4 | 3.1 |
| Hardness | | - | 320 | 264 | 260 | 247 | 293 | 260 | 270 | 230 | - | 290 | 318 |
| Iron | | 0.3 | 0.28 | 0.15 | 0.91 | 0.11 | 0.43 | 0.2 | 0.58 | 0.41 | - | 0.349 | 0.12 |
| Magnesium | | - | 25.9 | 32 | 23 | 21.5 | 23.1 | 28 | 28 | 28 | - | 21.6 | 25.7 |
| Manganese | | - | 0.015 | 0.037 | 0.024 | - | 0.022 | 0.013 | 0.06 | 0.035 | - | 0.0195 | 0.0156 |
| Nitrite | | - | nd | ND | ND | 0.06 | ND(0.06) | 0.07 | ND | ND | - | ND(0.10) | ND(0.10) |
| Nitrate | | - | 2.8 | ND | 14 | 2.1 | 3.42 | 5.1 | 0.1 | ND | - | 2.37 | 0.47 |
| Potassium | | - | 2 | 2.9 | 4.5 | 1.79 | 2.62 | 2.4 | 3.1 | 2.1 | - | 2.3 | ND(1.0) |
| Sodium | | - | 6.2 | 19 | 5.9 | 6.46 | 4.63 | 7.4 | 15 | 13 | - | 5.91 | 6.28 |
| Sulphate | | - | 27.8 | 78.1 | 34 | 29 | 18 | 27 | 81 | 51 | - | 61.1 | 6 |
| TKN | | - | 0.5 | - | - | - | - | - | - | - | - | 0.53 | ND(0.15) |
| Total Ammonia | | - | nd | 0.06 | ND | 0.4 | 0.2 | 0.07 | ND | ND | - | 0.097 | ND (0.050) |
| Unionized Ammonia | | 0.02 (d) | - | - | - | - | - | - | - | - | - | 0.0072 | 0.0010 |
| Total Phenolics | | 0.001 | nd | 0.004 | ND | ND(0.001) | ND(0.002) | ND | ND | ND | - | 0.0027 | 0.0010 |
| Total Phosphorus | | 0.01 - 0.03 (e) | 0.043 | 0.02 | 0.105 | 0.01 | 0.07 | 0.027 | 0.022 | 0.022 | - | 0.0479 | ND(0.05) |
| Laboratory Conductivity (µmhos/cm) | | - | 590 | 560 | 563 | - | - | 536 | 589 | - | - | 484 | 565 |
| Laboratory pH (Std. Units) | | 6.5 - 8.5 | 8.29 | 8.2 | 8.19 | - | - | 8.2 | 8.3 | - | - | 8.43 | 8.33 |
| Field pH (Std. Units) | | 6.5 - 8.5 | - | - | - | - | - | - | - | - | - | 8.41 | 8.04 |
| Field Conductivity (µmhos/cm) | | - | - | - | - | - | - | - | - | - | - | 525 | 620 |
| Field Temperature (°C) | | - | - | - | - | - | - | - | - | - | - | 13.9 | 7.7 |
| Field Dissolved Oxygen | | (f) | - | - | - | - | - | - | - | - | - | 10.58 | 8.95 |

Notes:

All concentrations in mg/L unless otherwise noted.

[1] Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

- No information available/not sampled.

Parameer exceeds the applicable PWQO.

**SW-4**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOE* | *SW-4* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | *PWQO [1]* | *11-Apr-94* | *24-Oct-94* | *12-Apr-95* | *20-Oct-95* | *12-May-98* | *16-Dec-98* | *9-Jun-99* | *28-Jun-00* | *24-Nov-00* | *28-Jun-01* | *14-Dec-01* |
| Alkalinity | - | 275 | 287 | 334 | 235 | 294 | 116 | 418 | 345 | 403 | 307 | 462 |
| Calcium | - | 78.6 | 81.2 | 93 | 71 | 85 | 36 | 120 | 110 | 120 | 97 | 140 |
| Chloride | - | 7.8 | 8.1 | 5 | 13 | 11 | 5 | 45 | 59 | 50 | 13 | 25 |
| Dissolved Organic Carbon (DOC) | - | 2.6 | 1.8 | 3.4 | 6 | 3.4 | 2.2 | 5.3 | 12.5 | 11.4 | 4.1 | 3.1 |
| Hardness | - | 290 | 299 | 330 | 240 | 290 | 110 | 420 | 400 | 410 | 280 | 630 |
| Iron | 0.3 | 0.18 | 0.16 | 0.074 | 0.98 | 0.18 | 0.99 | 2.5 | 2.5 | 3 | 3.5 | 0.18 |
| Magnesium | - | 22.7 | 23.4 | 31 | 23 | 29 | 10 | 48 | 41 | 46 | 28 | 64 |
| Manganese | - | - | 0.111 | 0.03 | 0.17 | 0.029 | 0.067 | 0.17 | 0.19 | 0.18 | 0.22 | 0.37 |
| Nitrite | - | <0.06 | <0.06 | ND | ND | ND | ND | 0.12 | 0.03 | ND | 0.01 | ND |
| Nitrate | - | 0.76 | 1.09 | 0.3 | 0.1 | 0.3 | 0.9 | 1 | 0.6 | 2.8 | 0.4 | 4.8 |
| Potassium | - | 0.52 | 0.72 | 0.29 | 3.8 | 0.65 | 1.5 | 5.5 | 7.9 | 5 | 4.9 | 12 |
| Sodium | - | 4.14 | 4.31 | 4.5 | 4.2 | 6 | 2.8 | 23 | 25 | 25 | 9.9 | 13 |
| Sulphate | - | 8.1 | 9.5 | 3 | 12 | 2 | 3 | 14 | 37 | 14 | 11 | 172 |
| TKN | - | - | - | - | - | - | 0.5 | - | - | - | 2 | - |
| Total Ammonia | - | 0.3 | 0.2 | ND | ND | ND | 0.06 | 0.29 | 0.9 | 0.32 | 0.34 | 0.09 |
| Unionized Ammonia | 0.02 (d) | - | - | - | - | - | - | - | - | - | - | - |
| Total Phenolics | 0.001 | <0.001 | <0.002 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Total Phosphorus | 0.01 - 0.03 (e) | <0.01 | <0.01 | 0.005 | 0.019 | 0.005 | 0.073 | 0.097 | 0.22 | 2 | 0.24 | 0.014 |
| Laboratory Conductivity (µmhos/cm) | - | - | - | 592 | 481 | - | 238 | 871 | 859 | - | 586 | 1170 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | - | - | 8.3 | 8.3 | - | 7.8 | 8.3 | 8.2 | - | 7.8 | 7.8 |
| Field pH (Std. Units) | 6.5 - 8.5 | - | - | - | - | - | - | - | - | - | - | - |
| Field Conductivity (µmhos/cm) | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Temperature (°C) | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Dissolved Oxygen | (f) | - | - | - | - | - | - | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

- No information available/not sampled.

Parameer exceeds the applicable PWQO.

**SW-4**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOE* | *SW-4* | | | | | | *SW-4* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | *PWQO [1]* | *PWQO [1]* | *29-Oct-02* | *5-May-03* | *18-May-04* | *10-Nov-04* | *10-Nov-04* | *4-Jul-05* | *21-Nov-05* | *5-Mar-06* | *12-Oct-06* | *10-Jun-07* |
| Alkalinity | - | 373 | 419 | 361 | 320 | 307 | 301 | 296 | 306 | 258 | 274 | 280 |
| Calcium | - | 140 | 150 | 100 | 92.4 | 89.6 | 90.9 | 101 | 88.1 | 76.3 | 80.2 | 79 |
| Chloride | - | 31 | 36 | 17 | 7.5 | 1.7 | 9.7 | 2.2 | 10.8 | 12.4 | 10.3 | 8.4 |
| Dissolved Organic Carbon (DOC) | - | 7.8 | 3.3 | 3.2 | 2.7 | 3.8 | 3.1 | 3.7 | 3.2 | 2.5 | 3.1 | 3.1 |
| Hardness | - | 580 | 650 | 380 | 325 | 291 | 324 | - | 314 | 288 | 304 | 31 |
| Iron | 0.3 | ND | ND | 0.8 | 0.21 | 0.1 | 0.18 | 0.13 | 0.13 | 0.02 | 0.13 | 0.11 |
| Magnesium | - | 78 | 86 | 47 | 28.2 | 29.7 | 26.9 | 27.8 | 30.5 | 22.3 | 23.1 | 24.1 |
| Manganese | - | 0.008 | 0.009 | 0.035 | 0.07 | 0.014 | 0.044 | - | 0.018 | ND | - | 0.016 |
| Nitrite | - | ND | ND | ND | nd | nd | nd | ND | ND | ND | ND | ND |
| Nitrate | - | 3.7 | 4.4 | 2.1 | 0.5 | nd | 2.1 | ND | ND | 0.9 | 2.1 | 0.2 |
| Potassium | - | 11 | 14 | 11 | 1 | nd | nd | ND | 1 | 1 | 1 | ND |
| Sodium | - | 17 | 20 | 1.1 | 3.1 | 2.3 | 3.8 | 2.7 | 3.3 | 3.9 | 4.2 | 3.9 |
| Sulphate | - | 213 | 257 | 90 | 12 | 1.7 | 11.3 | 3.4 | 13.8 | 12.1 | 10 | 6 |
| TKN | - | - | - | 0.7 | 1.05 | 0.28 | 0.28 | 0.84 | 0.25 | 0.24 | - | 0.21 |
| Total Ammonia | - | ND | ND | ND | 0.04 | nd | nd | 0.16 | ND | ND | ND | ND |
| Unionized Ammonia | 0.02 (d) | - | - | - | - | - | - | - | - | - | - | - |
| Total Phenolics | 0.001 | ND | ND | ND | nd | nd | nd | ND | ND | ND | - | ND |
| Total Phosphorus | 0.01 - 0.03 (e) | 0.02 | 0.011 | 0.065 | - | - | 0.007 | - | - | - | - | 0.008 |
| Laboratory Conductivity (µmhos/cm) | - | 1130 | - | 827 | 551 | 525 | 575 | 533 | 574 | 523 | 540 | 375 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | 8.3 | - | 7.7 | 8.16 | 8.1 | 8.18 | 8.11 | 8.33 | 8.28 | 7.32 | 8.16 |
| Field pH (Std. Units) | 6.5 - 8.5 | - | - | - | - | - | - | - | - | - | - | - |
| Field Conductivity (µmhos/cm) | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Temperature (°C) | - | - | - | - | - | - | - | - | - | - | - | - |
| Field Dissolved Oxygen | (f) | - | - | - | - | - | - | - | - | - | - | - |

Notes:

All concentrations in mg/L unless otherwise noted.

[1] Ministry of Environment (MOE), Provincial Wat[1] Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

- No information available/not sampled.

Parameer exceeds the applicable PWQO.

**SW-4**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOE* | *SW-4* | | | | |
|---|---|---|---|---|---|---|
| Date | *PWQO [1]* | *27-Oct-07* | *5-Aug-08* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* |
| Alkalinity | - | 317 | 315 | 274 | 310 | 264 |
| Calcium | - | 92.2 | 91 | 86 | 102 | 82.8 |
| Chloride | - | 9.5 | 4 | 14 | 13.5 | 24.2 |
| Dissolved Organic Carbon (DOC) | - | 3 | 3.1 | 3.2 | 2.1 | 5.4 |
| Hardness | - | 331 | 323 | 280 | 362 | 312 |
| Iron | 0.3 | 0.02 | 0.1 | ND | 0.256 | 0.231 |
| Magnesium | - | 28.5 | 32 | 23 | 26.2 | 25.7 |
| Manganese | - | 0.006 | 0.016 | 0.012 | 0.0609 | 0.0171 |
| Nitrite | - | ND | ND | 0.04 | ND(0.10) | ND(0.10) |
| Nitrate | - | 0.9 | 2.1 | 2.8 | 1.38 | 1.76 |
| Potassium | - | ND | 0.5 | 1.1 | ND(1.0) | 2.3 |
| Sodium | - | 4.6 | 4.3 | 5.4 | 8.01 | 8.89 |
| Sulphate | - | 8.8 | ND | 18 | 4.0 | 36.6 |
| TKN | - | - | - | - | 0.17 | 0.61 |
| Total Ammonia | - | ND | ND | ND | 0.057 | ND (0.050) |
| Unionized Ammonia | 0.02 (d) | - | - | - | 0.0004 | 0.0007 |
| Total Phenolics | 0.001 | - | ND | ND | 0.0018 | 0.0010 |
| Total Phosphorus | 0.01 - 0.03 (e) | ND | ND | 0.003 | 0.0179 | 0.051 |
| Laboratory Conductivity (µmhos/cm) | - | - | 582 | 544 | 598 | 574 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | - | 8.19 | 8.36 | 8.02 | 8.37 |
| Field pH (Std. Units) | 6.5 - 8.5 | - | - | - | 7.52 | 7.96 |
| Field Conductivity (µmhos/cm) | - | - | - | - | 528 | 636 |
| Field Temperature (°C) | - | - | - | - | 9.4 | 5.8 |
| Field Dissolved Oxygen | (f) | - | - | - | 9.22 | 10.13 |

Notes:

All concentrations in mg/L unless otherwise noted.

[1] Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

- No information available/not sampled.

Parameer exceeds the applicable PWQO.

**SW-5**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOE* | *SW5* | | | | | |
|---|---|---|---|---|---|---|---|
| date | *PWQO [1]* | *10-Jun-07* | *27-Oct-07* | *5-Aug-08* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* |
| Alkalinity | - | 418 | 345 | 403 | 307 | 460 | 462 |
| Calcium | - | 120 | 110 | 120 | 97 | 155 | 132 |
| Chloride | - | 45 | 59 | 50 | 13 | 37.8 | 59.5 |
| Dissolved Organic Carbon (DOC) | - | 5.3 | 12.5 | 11.4 | 4.1 | 5.1 | 5 |
| Hardness | - | 420 | 400 | 410 | 280 | 577 | 513 |
| Iron | 0.3 | 2.5 | 2.5 | 3 | 3.5 | 3.31 | 3.16 |
| Magnesium | - | 48 | 41 | 46 | 28 | 46.2 | 44.6 |
| Manganese | - | 0.17 | 0.19 | 0.18 | 0.22 | 0.351 | 0.229 |
| Nitrite | - | 0.12 | 0.03 | ND | 0.01 | ND(0.10) | ND(0.10) |
| Nitrate | - | 1 | 0.6 | 2.8 | 0.4 | 0.70 | 0.64 |
| Potassium | - | 5.5 | 7.9 | 5 | 4.9 | 5.9 | 5.1 |
| Sodium | - | 23 | 25 | 25 | 9.9 | 24.8 | 26.7 |
| Sulphate | - | 14 | 37 | 14 | 11 | 16.3 | 15.1 |
| TKN | - | - | - | - | 2 | 1.62 | 2.22 |
| Total Ammonia | - | 0.29 | 0.9 | 0.32 | 0.34 | 1.08 | 1.69 |
| Unionized Ammonia | 0.02 (d) | - | - | - | - | 0.0199 | 0.0223 |
| Total Phenolics | 0.001 | ND | ND | ND | ND | ND(0.001) | 0.003 |
| Total Phosphorus | 0.01 - 0.03 (e) | 0.097 | 0.22 | 2 | 0.24 | 0.0846 | 0.127 |
| Laboratory Conductivity (µmhos/cm) | - | 871 | 859 | - | 586 | 916 | 950 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | 8.3 | 8.2 | - | 7.8 | 8.26 | 8.24 |
| Field pH (Std. Units) | 6.5 - 8.5 | - | - | - | - | 7.96 | 7.85 |
| Field Conductivity (µmhos/cm) | - | - | - | - | - | 7.88 | 930 |
| Field Temperature (°C) | - | - | - | - | - | 8.8 | 7.7 |
| Field Dissolved Oxygen | (f) | - | - | - | - | 9.44 | 6.61 |

Notes:

All concentrations in mg/L unless otherwise noted.

[1] Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

- No information available/not sampled.

Parameer exceeds the applicable PWQO.

**SW-6**
**Historic Surface Water Analytical Results - (1983 - 2009)**
**Kincardine Waste Management Center**
**Kincardine, Ontario**

| *Parameter (mg/L)* | *MOE* | *SW6* | | | | | |
|---|---|---|---|---|---|---|---|
| date | *PWQO [1]* | *10-Jun-07* | *27-Oct-07* | *5-Aug-08* | *29-Dec-08* | *30-Apr-09* | *19-Nov-09* |
| Alkalinity | - | 462 | 373 | 419 | 361 | 417 | 563 |
| Calcium | - | 140 | 140 | 150 | 100 | 150 | 193 |
| Chloride | - | 25 | 31 | 36 | 17 | 20.9 | 61.4 |
| Dissolved Organic Carbon (DOC) | - | 3.1 | 7.8 | 3.3 | 3.2 | 4.9 | 4.1 |
| Hardness | - | 630 | 580 | 650 | 380 | 653 | 902 |
| Iron | 0.3 | 0.18 | ND | ND | 0.8 | 0.117 | 2.48 |
| Magnesium | - | 64 | 78 | 86 | 47 | 67.5 | 102 |
| Manganese | - | 0.37 | 0.008 | 0.009 | 0.035 | 0.0112 | 0.351 |
| Nitrite | - | ND | ND | ND | ND | ND(0.10) | ND(0.10) |
| Nitrate | - | 4.8 | 3.7 | 4.4 | 2.1 | 3.57 | ND(0.5) |
| Potassium | - | 12 | 11 | 14 | 11 | 11.5 | 17.4 |
| Sodium | - | 13 | 17 | 20 | 1.1 | 15.3 | 29.9 |
| Sulphate | - | 172 | 213 | 257 | 90 | 147 | 260 |
| TKN | - | - | - | - | 0.7 | 0.22 | 0.54 |
| Total Ammonia | - | 0.09 | ND | ND | ND | 0.051 | ND (0.050) |
| Unionized Ammonia | 0.02 (d) | - | - | - | - | 0.0018 | 0.0002 |
| Total Phenolics | 0.001 | ND | ND | ND | ND | 0.0014 | 0.002 |
| Total Phosphorus | 0.01 - 0.03 (e) | 0.014 | 0.02 | 0.011 | 0.065 | 0.0175 | 0.167 |
| Laboratory Conductivity (µmhos/cm) | - | 1170 | 1130 | - | 827 | 1020 | 1530 |
| Laboratory pH (Std. Units) | 6.5 - 8.5 | 7.8 | 8.3 | - | 7.7 | 8.28 | 7.9 |
| Field pH (Std. Units) | 6.5 - 8.5 | - | - | - | - | 8.11 | 7.31 |
| Field Conductivity (µmhos/cm) | - | - | - | - | - | 1010 | 1520 |
| Field Temperature (°C) | - | - | - | - | - | 12.7 | 9.1 |
| Field Dissolved Oxygen | (f) | - | - | - | - | 9.39 | 4.43 |

Notes:

All concentrations in mg/L unless otherwise noted.
[1] Ministry of Environment (MOE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
- No information available/not sampled.
Parameer exceeds the applicable PWQO.

**Appendix C.3**

**General Chemistry and Total Metals**
**Surface Water Analytical Results**
**Historic Water Quality**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Sump | GW Sump | GW Sump | GW Sump |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | PIPE | SW-WARD2-DD-061514-009 | SW-WARD2-103014-009 | SW-WARD2-8/6/15-009 | SW-WARD2-161115-008 | SW-WARD2-042516-008 | SW-WARD2-110316-003 | SW-WARD2-041017-007 | SW-WARD2-112417-004 | SW-WARD2-DD-061514-010 | SW-WARD2-103014-006 | SW-WARD2-8/6/15-010 | SW-WARD2-161115-007 |
| **Sample Date:** | | | 5/4/2014 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 124 | 103 | 106 | 135 | 54.7 | 113 | 59.5 | 117 | 131 | 130 | 39.9 | 114 | 162 |
| Cobalt | mg/L | 0.0009 | - | - | - | - | - | - | - | - | <0.00010 | - | - | - | - |
| Iron | mg/L | 0.3 | <0.050 | <0.050 | 0.057 | **1.48** | <0.050 | <0.050 | <0.050 | <0.050 | 0.099 | 0.08 | 0.109 | <0.050 | **5.16** |
| Magnesium | mg/L | - | 45.1 | 22.7 | 40.3 | 48.7 | 11 | 25.3 | 10 | 27.4 | 27.4 | 41.6 | 9.34 | 26.2 | 55.5 |
| Manganese | mg/L | - | 0.126 | 0.0075 | 0.0655 | 2.23 | 0.0018 | 0.00249 | 0.0096 | <0.00050 | 0.00415 | 0.159 | 0.0056 | 0.0028 | 0.385 |
| Phosphorus | mg/L | 0.01-0.03 (e) | <0.050 | <0.050 | <0.050 | **0.194** | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | **0.263** |
| Potassium | mg/L | - | 4.8 | <1.0 | 3.5 | 7.2 | 6.31 | 0.685 | 6.2 | 0.810 | 0.743 | 5.1 | 4.8 | <1.0 | 6.4 |
| Sodium | mg/L | - | 26.8 | 17.8 | 22.5 | 31.2 | 20.6 | 25.8 | 15.4 | 24.7 | 16.9 | 29.1 | 14.8 | 18.4 | 29.1 |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 415 | 345 | 439 | 455 | 169 | 370 | 180 | 379 | 393 | 469 | 143 | 376 | 242 |
| Ammonia-N | mg/L | - | 0.117 | <0.050 | 0.264 | <0.050 | <0.050 | <0.020 | 0.114 | <0.020 | 0.353 | 0.058 | <0.050 | <0.050 | <0.050 |
| Chloride | mg/L | - | 74.4 | 36.7 | 45.9 | 78.8 | 40.6 | 50 | 37.7 | 50.1 | 32.1 | 87.3 | 24.5 | 37 | 66.3 |
| Conductivity | µS/cm | - | 1020 | 704 | 866 | 1090 | 467 | 817 | 464 | 850 | 838 | 1030 | 336 | 774 | 748 |
| Dissolved organic carbon (DOC) | mg/L | - | 1.1 | 1 | 2.1 | 2.4 | 5.5 | 3.7 | 4.5 | <1.0 | 1.6 | 1.7 | 6.2 | 1.3 | 4.2 |
| Hardness | mg/L | - | 494 | 351 | 431 | 538 | 182 | 388 | 190 | 406 | 439 | 495 | 138 | 391 | 634 |
| Nitrate (as N) | mg/L | - | 2.53 | 3.03 | 2.66 | 0.95 | 0.613 | 2.4 | 0.374 | 4.59 | 9.34 | 1.32 | 0.36 | 3.66 | 0.486 |
| Nitrite (as N) | mg/L | - | <0.10 | <0.10 | <0.10 | <0.050 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.10 | <0.10 | <0.010 | <0.010 |
| pH, lab | s.u. | - | 7.78 | 7.99 | 7.8 | 8.11 | 7.89 | 7.95 | 7.9 | 7.92 | 8.12 | 7.99 | 8.08 | 8.18 | 7.62 |
| Phenolics (total) | mg/L | 0.001 | <0.0010 | **0.0048** | **0.0025** | **0.0056** | **0.0011** | <0.0010 | **0.0059** | **0.0013** | **0.0012** | **0.0036** | <0.0010 | **0.0038** | **0.0029** |
| Phosphorus | mg/L | 0.01-0.03 (e) | 0.005 | 0.007 | 0.0052 | 0.0199 | **0.0341** | 0.0033 | **0.0325** | <0.0030 | 0.0036 | 0.0079 | 0.0273 | 0.0071 | 0.025 |
| Sulfate | mg/L | - | 52.2 | 5 | 61.2 | 60.1 | 5.02 | 5.29 | 6.19 | 8.33 | 9.73 | 46.8 | <2.0 | 5.6 | 57 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.44 | 1.47 | 0.47 | 0.21 | 0.59 | 0.4 | 0.36 | 0.70 | 0.68 | 0.3 | 0.37 | <0.15 | 0.19 |
| Un-ionized ammonia | mg/L | 0.02 (d) | - | <0.00071 | 0.0019 | <0.00009 | <0.00003 | - | - | <0.00010 | 0.00260 | 0.00058 | - | <0.00012 | <0.01768 |
| **Field Parameters** | | | | | | | | | | | | | | | |
| Conductivity, field | µS/cm | - | - | 917 | 859 | 850 | 370 | 725 | 441 | 798 | 719 | 1490 | - | 602 | 576 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | - | 6.26 | - | - | - | - | - | 8.38 | 8.93 | - | - | - | - |
| pH, field | s.u. | 6.5-8.5 | - | 7.7 | 7.49 | 6.7 | **6.32** | 7.24 | 8.01 | 7.42 | 7.53 | 7.63 | - | 6.94 | **9.24** |
| Temperature, field | Deg C | - | - | 12.9 | 10.4 | 16.6 | 10.7 | 8 | 11.9 | 7.9 | 9.5 | 10.5 | - | 12.7 | 13 |

Notes:

(1) Ministry of Environment and Energy (MOEE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.
(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.
(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.
(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
**36.0** Parameter exceeds the PWQO.

**Appendix C.3**

**General Chemistry and Total Metals**
**Surface Water Analytical Results**
**Historic Water Quality**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | GW Sump | GW Sump | GW Sump | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | SW-WARD2-110316-008 | SW-WARD2-041017-006 | SW-WARD2-112417-003 | CRA-4074-02-WARD2-44 | SW-WARD2-1210-003 | SW-WARD2-0511-001 | SW-WARD2-1011-006 | SW-WARD2-0412-003 | SW-WARD2-1112-003 | SW-WARD2-0513-001 | SW-WARD2-1013-001 | SW-WARD2-DD-061514-003 | SW-WARD2-103014-005 |
| Sample Date: | | | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 92.1 | 126 | 156 | 69.4 | 64.4 | 75.6 | 79.9 | 61.4 | 83.4 | 68.2 | 67.1 | 115 | 91.6 |
| Cobalt | mg/L | 0.0009 | - | - | **0.0019** | - | - | - | - | - | - | - | - | - | - |
| Iron | mg/L | 0.3 | **0.529** | **2.84** | **1.39** | **0.313** | **4.47** | **5.05** | 0.147 | 0.209 | 0.09 | 0.116 | **2.91** | 0.23 | **0.996** |
| Magnesium | mg/L | - | 56.5 | 51.3 | 67.1 | 26.3 | 20.4 | 23.1 | 23.1 | 22.9 | 26.9 | 24.6 | 19.4 | 24.9 | 27.1 |
| Manganese | mg/L | - | 0.291 | 0.295 | 0.260 | 0.0161 | 0.077 | 0.0893 | 0.0108 | 0.017 | 0.0059 | 0.0193 | 0.0467 | 0.0209 | 0.0285 |
| Phosphorus | mg/L | 0.01-0.03 (e) | **0.27** | **0.362** | <0.50 | **0.061** | <0.50 | **0.367** | <0.050 | <0.05 | **0.12** | **0.069** | **0.306** | <0.050 | **0.209** |
| Potassium | mg/L | - | 8.92 | 18.6 | 40.0 | 3.4 | <10 | 6.1 | 2.4 | 1.9 | 2.5 | 1.9 | 4.9 | 1.8 | 4.8 |
| Sodium | mg/L | - | 20.6 | 34.7 | 89.7 | 9.37 | <5.0 | 4.37 | 7.05 | 9.39 | 8.62 | 7.87 | 4.17 | 12.9 | 6.16 |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 314 | 469 | 699 | 233 | 164 | 197 | 236 | 223 | 244 | 231 | 216 | 237 | 338 |
| Ammonia-N | mg/L | - | 0.177 | 1.62 | 20.1 | <0.050 | 0.069 | 0.18 | <0.050 | 0.072 | <0.050 | <0.050 | 0.115 | <0.050 | <0.050 |
| Chloride | mg/L | - | 35.5 | 66.2 | 120 | 13.2 | 7.6 | 8.7 | 13 | 11.8 | 17 | 10.1 | 11.8 | 11.9 | 14.1 |
| Conductivity | µS/cm | - | 817 | 1110 | 1740 | 522 | 387 | 464 | 553 | 524 | 368 | 381 | 469 | 558 | 609 |
| Dissolved organic carbon (DOC) | mg/L | - | 5.8 | 15.4 | 41.6 | 6.2 | 6.8 | 8.6 | 6.7 | 5 | 5.5 | 7.1 | 8.6 | 5.5 | 9 |
| Hardness | mg/L | - | 463 | 527 | 666 | 282 | 245 | 284 | 295 | 248 | 319 | 272 | 248 | 390 | 340 |
| Nitrate (as N) | mg/L | - | 0.817 | 0.21 | 1.52 | 0.93 | 4.06 | 6.7 | 3.06 | 0.46 | 5.17 | 1.38 | 5.13 | 0.19 | 2.37 |
| Nitrite (as N) | mg/L | - | 0.014 | <0.050 | <0.050 | <0.10 | <0.10 | <0.1 | <0.10 | <0.1 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| pH, lab | s.u. | - | 7.54 | 7.85 | 7.76 | 8.4 | 8.14 | 8.15 | 8.32 | 8.3 | 8.27 | 8.28 | 8.12 | 8.4 | 8.22 |
| Phenolics (total) | mg/L | 0.001 | **0.0045** | **0.0036** | **0.0066** | <0.0010 | <0.0010 | 0.001 | <0.0010 | <0.001 | **0.002** | **0.004** | <0.0018 | **0.0033** | 0.001 |
| Phosphorus | mg/L | 0.01-0.03 (e) | 0.0165 | **0.0961** | **0.187** | 0.0228 | **0.438** | **0.277** | 0.0086 | 0.0189 | **0.0342** | 0.0259 | **0.198** | 0.0241 | **0.241** |
| Sulfate | mg/L | - | 84.6 | 80.5 | 107 | 27.1 | 9.9 | 9.4 | 34.2 | 47.6 | 35.3 | 30.6 | 12.9 | 67 | 18 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.7 | 3.76 | 27.1 | 0.81 | 0.85 | 1.22 | 0.47 | 0.56 | 0.79 | 0.57 | 0.97 | 0.5 | 0.73 |
| Un-ionized ammonia | mg/L | 0.02 (d) | - | 0.00716 | **0.13233** | <0.00453 | 0.00017 | 0.000002 | <0.00043 | 0.0009 | <0.0001 | <0.0000167 | 0.0025287 | <0.00061 | - |
| **Field Parameters** | | | | | | | | | | | | | | | |
| Conductivity, field | µS/cm | - | 755 | 1130 | 1770 | 472 | 292 | 13.6 | 565 | 522 | 487 | 470 | 462 | 744 | - |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | - | **3.38** | 8.58 | 10.08 | 10.05 | - | - | 8.16 | 6.4 | 6.07 | 8.44 | 4.86 | - |
| pH, field | s.u. | 6.5-8.5 | 7.87 | 7.27 | 7.55 | **8.62** | 7.2 | **4.76** | 7.81 | 7.75 | 7.14 | **6.39** | 8.1 | 7.55 | 7.47 |
| Temperature, field | Deg C | - | 12.1 | 10.6 | 7.5 | 10.5 | 5.3 | 7.65 | 3.6 | 9.7 | 3.2 | 6.1 | 9.5 | 15.6 | - |

Notes:

(1) Ministry of Environment and Energy (MOEE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.
(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.
(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.
(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
**36.0** Parameter exceeds the PWQO.

**Appendix C.3**

**General Chemistry and Total Metals**
**Surface Water Analytical Results**
**Historic Water Quality**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | **SW-WARD2-8/6/15-008** | **SW-WARD2-161115-001** | **SW-WARD2-042516-009** | **SW-WARD2-110316-001** | **SW-WARD2-041017-008** | **SW-WARD2-112417-002** | **CRA-4074-02-WARD2-45** | **SW-WARD2-1210-005** | **SW-WARD2-0511-006** | **SW-WARD2-1011-001** | **SW-WARD2-0412-005** | **SW-WARD2-1112-004** | **SW-WARD2-0513-004** |
| **Sample Date:** | | | **6/8/2015** | **11/16/2015** | **4/25/2016** | **11/3/2016** | **4/10/2017** | **11/24/2017** | **5/12/2010** | **12/1/2010** | **5/24/2011** | **11/22/2011** | **4/22/2012** | **11/26/2012** | **5/13/2013** |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 77.6 | 81.2 | 66.9 | 118 | 64.1 | 75.0 | 66 | 64 | 75.7 | 75.4 | 65.2 | 82.7 | 70.8 |
| Cobalt | mg/L | 0.0009 | - | - | - | - | - | 0.00040 | - | - | - | - | - | - | - |
| Iron | mg/L | 0.3 | 0.213 | **0.841** | 0.293 | **0.33** | **1.10** | **0.823** | 0.232 | **4.33** | **2.17** | 0.15 | 0.146 | 0.094 | 0.087 |
| Magnesium | mg/L | - | 28.1 | 24 | 23.3 | 28.6 | 17.8 | 21.3 | 25.9 | 17.7 | 22.3 | 20.3 | 23.9 | 25.9 | 23.1 |
| Manganese | mg/L | - | 0.0227 | 0.0198 | 0.0188 | 0.0489 | 0.0269 | 0.0233 | 0.0157 | 0.0797 | 0.0601 | 0.0098 | 0.0196 | 0.0062 | 0.0195 |
| Phosphorus | mg/L | 0.01-0.03 (e) | <0.050 | **0.1** | <0.050 | **0.342** | **0.101** | **0.099** | **0.061** | **0.267** | **0.249** | <0.050 | <0.05 | **0.11** | <0.050 |
| Potassium | mg/L | - | 2.3 | 3.17 | 1.81 | 5.77 | 2.03 | 2.48 | 3.3 | 4.7 | 3.8 | 2.1 | 1.9 | 2.4 | 1.9 |
| Sodium | mg/L | - | 15.9 | 5.26 | 6.84 | 13.7 | 4.29 | 4.63 | 9.3 | 3.02 | 4.27 | 6.39 | 9.74 | 8.46 | 7.29 |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 227 | 272 | 232 | 251 | 204 | 250 | 228 | 166 | 204 | 237 | 209 | 244 | 228 |
| Ammonia-N | mg/L | - | <0.050 | <0.050 | 0.023 | 0.16 | 0.023 | 0.201 | <0.050 | 0.07 | 0.14 | <0.050 | 0.05 | 0.062 | <0.050 |
| Chloride | mg/L | - | 15.2 | 14.7 | 9.47 | 19.4 | 8.93 | 11.4 | 12.7 | 7.6 | 8 | 13.4 | 12.9 | 16.9 | 9.8 |
| Conductivity | µS/cm | - | 596 | 583 | 503 | 624 | 445 | 536 | 515 | 394 | 473 | 548 | 528 | 367 | 370 |
| Dissolved organic carbon (DOC) | mg/L | - | 6 | 7.6 | 5.6 | 5.9 | 5.5 | 6.2 | 6.6 | 24.5 | 8.7 | 7.2 | 5 | 5.4 | 5.1 |
| Hardness | mg/L | - | 309 | 302 | 263 | 412 | 234 | 275 | 271 | 233 | 281 | 272 | 261 | 313 | 272 |
| Nitrate (as N) | mg/L | - | 0.157 | 5.35 | 1.33 | 0.144 | 4.02 | 3.77 | 0.8 | 4.01 | 6.62 | 2.91 | 0.46 | 5.13 | 1.27 |
| Nitrite (as N) | mg/L | - | <0.010 | 0.016 | <0.010 | <0.010 | 0.012 | <0.010 | <0.10 | <0.10 | <0.1 | <0.10 | <0.1 | <0.10 | <0.10 |
| pH, lab | s.u. | - | 8.42 | 8.39 | 8.48 | 8.03 | 8.24 | 8.28 | 8.46 | 8.14 | 8.23 | 8.33 | 8.32 | 8.3 | 8.33 |
| Phenolics (total) | mg/L | 0.001 | **0.006** | **0.0026** | <0.0010 | **0.0071** | **0.0017** | <0.0010 | <0.0010 | <0.0010 | <0.001 | <0.0010 | <0.001 | <0.0010 | 0.001 |
| Phosphorus | mg/L | 0.01-0.03 (e) | 0.0248 | **0.108** | **0.0356** | **0.0917** | **0.0952** | **0.0932** | 0.0256 | **0.441** | **0.199** | 0.0093 | 0.018 | **0.0312** | 0.024 |
| Sulfate | mg/L | - | 82 | 14.1 | 26.3 | 58.7 | 10.7 | 13.2 | 27.2 | 8.6 | 9.9 | 35 | 43.7 | 37 | 30.3 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.42 | 0.75 | 0.39 | 1.1 | 0.96 | 1.02 | 0.77 | 0.9 | 0.91 | 0.85 | 0.55 | 0.9 | 0.56 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.00009 | <0.00026 | - | - | - | 0.00108 | <0.00617 | 0.00029 | 0.000002 | <0.00092 | 0.0007 | 0.0002 | <0.0011611 |
| **Field Parameters** | | | | | | | | | | | | | | | |
| Conductivity, field | µS/cm | - | 784 | 449 | 478 | 611 | - | 483 | 465 | 290 | 14.2 | 552 | 574 | 452 | 470 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | 9.45 | - | - | - | - | 11.6 | 12.02 | 11.07 | - | - | 9.17 | 7.66 | 8.52 |
| pH, field | s.u. | 6.5-8.5 | 6.58 | 7.41 | 7.31 | 8.05 | - | 7.59 | **8.73** | 7.43 | **4.77** | 8.16 | 7.81 | 7.48 | 8.2 |
| Temperature, field | Deg C | - | 19 | 8.4 | 11 | 9.6 | - | 3.8 | 11.6 | 5.2 | 8.9 | 3 | 9.9 | 2.3 | 7.3 |

Notes:

(1) Ministry of Environment and Energy (MOEE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.
(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.
(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.
(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
**36.0** Parameter exceeds the PWQO.

**Appendix C.3**

**General Chemistry and Total Metals**
**Surface Water Analytical Results**
**Historic Water Quality**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW3 | SW3 | SW3 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | SW-WARD2-1013-006 | SW-WARD2-DD-061514-005 | SW-WARD2-103014-002 | SW-WARD2-8/6/15-004 | SW-WARD2-161115-006 | SW-WARD2-042516-001 | SW-WARD2-110316-002 | SW-WARD2-041017-005 | SW-WARD2-112417-008 | CRA-4074-02-WARD2-46 | SW-WARD2-1210-006 | SW-WARD2-0511-005 | SW-WARD2-1011-002 |
| Sample Date: | | | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 67.1 | 108 | 91.1 | 73.6 | 82.8 | 66.7 | 84 | 58.4 | 77.3 | 65 | 68.6 | 82 | 88.9 |
| Cobalt | mg/L | 0.0009 | - | - | - | - | - | - | - | - | 0.00040 | - | - | - | - |
| Iron | mg/L | 0.3 | **2.19** | 0.139 | **0.775** | 0.22 | **0.788** | 0.244 | 0.204 | **1.20** | **0.923** | 0.243 | **3.92** | **1.52** | <0.050 |
| Magnesium | mg/L | - | 19.7 | 24.8 | 26.5 | 27.4 | 22.9 | 23.2 | 27.9 | 17.3 | 21.5 | 25.1 | 18.6 | 23 | 23.2 |
| Manganese | mg/L | - | 0.0344 | 0.0184 | 0.0208 | 0.0401 | 0.0191 | 0.0169 | 0.0194 | 0.0281 | 0.0248 | 0.0158 | 0.077 | 0.0611 | 0.0326 |
| Phosphorus | mg/L | 0.01-0.03 (e) | **0.265** | <0.050 | **0.189** | <0.050 | **0.099** | <0.050 | <0.050 | **0.094** | **0.080** | **0.058** | **0.235** | **0.232** | <0.050 |
| Potassium | mg/L | - | 4.6 | 1.8 | 4.4 | 2.2 | 3.19 | 1.83 | 4.64 | 1.97 | 2.42 | 3.2 | 4.2 | 3.9 | <1.0 |
| Sodium | mg/L | - | 4.34 | 12.9 | 5.9 | 14.9 | 5.23 | 6.77 | 12.6 | 4.11 | 4.50 | 8.64 | 3.61 | 4.49 | 6.83 |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 222 | 230 | 322 | 221 | 263 | 228 | 252 | 203 | 249 | 233 | 179 | 205 | 304 |
| Ammonia-N | mg/L | - | 0.069 | <0.050 | <0.050 | 0.067 | <0.050 | <0.020 | 0.133 | 0.023 | 0.092 | <0.050 | 0.065 | 0.145 | <0.050 |
| Chloride | mg/L | - | 11.8 | 12.4 | 14 | 14.9 | 14.7 | 9.31 | 18.2 | 8.73 | 10.9 | 12.6 | 8 | 8 | 13.4 |
| Conductivity | µS/cm | - | 479 | 545 | 620 | 577 | 583 | 497 | 614 | 442 | 538 | 515 | 414 | 470 | 569 |
| Dissolved organic carbon (DOC) | mg/L | - | 8.4 | 5.5 | 8.8 | 5.1 | 7.5 | 6.4 | 6.3 | 5.6 | 5.8 | 7 | 12.5 | 8.8 | 3.1 |
| Hardness | mg/L | - | 249 | 371 | 337 | 297 | 301 | 262 | 325 | 217 | 281 | 265 | 248 | 299 | 318 |
| Nitrate (as N) | mg/L | - | 5.38 | 0.12 | 2.35 | 0.276 | 5.3 | 1.21 | 0.117 | 3.88 | 3.79 | 0.77 | 3.42 | 6.36 | 0.27 |
| Nitrite (as N) | mg/L | - | <0.10 | <0.10 | <0.10 | <0.010 | 0.018 | <0.010 | <0.010 | 0.011 | <0.010 | <0.10 | <0.10 | <0.1 | <0.10 |
| pH, lab | s.u. | - | 8.17 | 8.45 | 8.23 | 8.41 | 8.14 | 8.5 | 7.93 | 8.26 | 8.29 | 8.44 | 8.17 | 8.23 | 8.27 |
| Phenolics (total) | mg/L | 0.001 | <0.0011 | **0.0012** | **0.0025** | **0.0077** | **0.0027** | <0.0010 | **0.0075** | **0.0023** | <0.0010 | <0.0020 | <0.0010 | 0.001 | <0.0010 |
| Phosphorus | mg/L | 0.01-0.03 (e) | **0.157** | 0.0221 | **0.201** | 0.0205 | **0.106** | 0.0212 | 0.0192 | **0.0975** | **0.0902** | 0.0253 | **0.337** | **0.216** | <0.0030 |
| Sulfate | mg/L | - | 12.1 | 66.6 | 18.2 | 74.7 | 14.8 | 26.4 | 56.4 | 10.9 | 13.5 | 26.6 | 8.1 | 9.7 | 4.9 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.9 | 0.46 | 0.89 | 0.49 | 0.73 | 0.48 | 0.55 | 0.97 | 0.78 | 0.95 | 0.65 | 1.03 | <0.15 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.0022535 | <0.00549 | <0.00103 | 0.00119 | <0.01288 | - | - | 0.00074 | 0.00044 | <0.00588 | 0.0003 | 0.000002 | <0.00095 |
| **Field Parameters** | | | | | | | | | | | | | | | |
| Conductivity, field | µS/cm | - | 443 | 737 | 645 | 464 | 470 | 439 | 573 | 416 | 465 | 363 | 297 | 14.2 | 561 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | 8.53 | 6.56 | 9.27 | 10.62 | - | - | - | 9.66 | 11.55 | 11.63 | 11.31 | - | - |
| pH, field | s.u. | 6.5-8.5 | 8.28 | 8.47 | 8.01 | 7.58 | **9.24** | 8.07 | 8.31 | 8.14 | 7.50 | **8.71** | 7.46 | **4.78** | 8.19 |
| Temperature, field | Deg C | - | 9.4 | 17.7 | 8.7 | 19.7 | 7.6 | 11.5 | 9.4 | 10.6 | 4.9 | 11.5 | 5.9 | 9 | 2.6 |

Notes:

(1) Ministry of Environment and Energy (MOEE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.
(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.
(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.
(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
**36.0** Parameter exceeds the PWQO.

**Appendix C.3**

**General Chemistry and Total Metals**
**Surface Water Analytical Results**
**Historic Water Quality**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW3 | SW4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | SW-WARD2-0412-004 | SW-WARD2-1112-006 | SW-WARD2-0513-005 | SW-WARD2-1013-004 | SW-WARD2-DD-061514-006 | SW-WARD2-103014-004 | SW-WARD2-8/6/15-002 | SW-WARD2-161115-005 | SW-WARD2-042516-002 | SW-WARD2-110316-006 | SW-WARD2-041017-009 | SW-WARD2-112417-009 | CRA-4074-02-WARD2-47 |
| Sample Date: | | | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/12/2010 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 75 | 78.8 | 81.4 | 69.5 | 105 | 92.5 | 72 | 82.8 | 67.8 | 80.9 | 62.3 | 77.2 | 79.1 |
| Cobalt | mg/L | 0.0009 | - | - | - | - | - | - | - | - | - | - | - | 0.00036 | - |
| Iron | mg/L | 0.3 | 0.062 | <0.050 | <0.050 | **2.21** | 0.108 | **0.792** | 0.145 | **0.81** | 0.252 | 0.198 | **1.19** | **0.707** | 0.071 |
| Magnesium | mg/L | - | 22.8 | 27.4 | 25.7 | 20.4 | 24.3 | 26.7 | 27.3 | 23.8 | 22.7 | 28.5 | 18.5 | 21.4 | 25.7 |
| Manganese | mg/L | - | 0.0218 | 0.0133 | 0.0135 | 0.0357 | 0.0164 | 0.0236 | 0.0216 | 0.0219 | 0.0173 | 0.0251 | 0.0295 | 0.0223 | 0.0123 |
| Phosphorus | mg/L | 0.01-0.03 (e) | <0.05 | <0.10 | <0.050 | **0.277** | <0.050 | **0.185** | <0.050 | **0.105** | <0.050 | <0.050 | **0.095** | **0.081** | <0.050 |
| Potassium | mg/L | - | <1 | <1.0 | <1.0 | 4.7 | 1.7 | 4.5 | 2.1 | 3.24 | 1.8 | 4.33 | 2.07 | 2.41 | <1.0 |
| Sodium | mg/L | - | 5.94 | 10.4 | 8.92 | 4.61 | 12.3 | 6.04 | 14.3 | 5.19 | 6.81 | 14.4 | 4.62 | 4.75 | 5.83 |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 287 | 284 | 293 | 218 | 240 | 342 | 233 | 269 | 228 | 268 | 208 | 255 | 285 |
| Ammonia-N | mg/L | - | <0.05 | <0.050 | <0.050 | 0.061 | <0.050 | <0.050 | <0.050 | <0.050 | 0.031 | 0.2 | 0.036 | 0.297 | <0.050 |
| Chloride | mg/L | - | 11.1 | 28.8 | 19.5 | 12 | 12.4 | 14.2 | 14.8 | 15.3 | 9.56 | 24.6 | 9.16 | 11.2 | 8.5 |
| Conductivity | µS/cm | - | 555 | 398 | 410 | 479 | 545 | 617 | 577 | 584 | 497 | 634 | 446 | 539 | 536 |
| Dissolved organic carbon (DOC) | mg/L | - | 2.9 | 2.8 | 3.1 | 8 | 5.4 | 8.7 | 5.3 | 7.4 | 6.3 | 5.7 | 5.4 | 6.0 | 2.5 |
| Hardness | mg/L | - | 281 | 310 | 309 | 257 | 363 | 341 | 292 | 305 | 263 | 319 | 232 | 281 | 303 |
| Nitrate (as N) | mg/L | - | 0.21 | 0.11 | 0.15 | 5.33 | 0.11 | 2.33 | 0.072 | 5.31 | 1.18 | 0.088 | 3.86 | 3.75 | 0.19 |
| Nitrite (as N) | mg/L | - | <0.1 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.010 | 0.015 | <0.010 | <0.010 | 0.012 | <0.010 | <0.10 |
| pH, lab | s.u. | - | 8.32 | 8.2 | 8.35 | 8.16 | 8.47 | 8.2 | 8.44 | 8.15 | 8.52 | 8.01 | 8.26 | 8.32 | 8.39 |
| Phenolics (total) | mg/L | 0.001 | <0.001 | <0.0010 | <0.0010 | <0.0024 | **0.0012** | **0.0026** | **0.0072** | **0.0025** | **0.0014** | **0.0042** | **0.0023** | **0.0081** | <0.0010 |
| Phosphorus | mg/L | 0.01-0.03 (e) | 0.0062 | <0.0030 | 0.0051 | **0.164** | **0.0514** | **0.198** | 0.0194 | **0.0968** | 0.0202 | 0.0184 | **0.104** | **0.0927** | 0.0054 |
| Sulfate | mg/L | - | 5.9 | 12.8 | 5.8 | 12.1 | 63.1 | 18.2 | 70.1 | 14.7 | 25.1 | 46.4 | 11.1 | 13.5 | 5.5 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.26 | 0.38 | 0.21 | 0.93 | 0.43 | 0.66 | 0.42 | 0.68 | 0.39 | 0.63 | 1.19 | 1.18 | <0.15 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.0011 | <0.0001 | <0.0006553 | 0.0019923 | <0.00660 | <0.00144 | <0.00079 | <0.00231 | - | - | 0.00123 | 0.00198 | <0.00398 |
| **Field Parameters** | | | | | | | | | | | | | | | |
| Conductivity, field | µS/cm | - | 533 | 488 | 408 | 443 | 697 | 625 | 464 | 463 | 442 | 600 | 418 | 459 | 487 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | 8.34 | 6.18 | 8.82 | 9.83 | 7.28 | 8.33 | 10.23 | - | - | - | 8.85 | 11.67 | 10.58 |
| pH, field | s.u. | 6.5-8.5 | 8 | 7.3 | 8.01 | 8.28 | **8.53** | 8.16 | 7.52 | 8.41 | 8.17 | 8.36 | 8.18 | 7.65 | **8.56** |
| Temperature, field | Deg C | - | 10.4 | 2.5 | 5.5 | 9.4 | 18.6 | 8.6 | 20 | 7.5 | 11.9 | 9.7 | 10.3 | 4.8 | 10.5 |

Notes:

(1) Ministry of Environment and Energy (MOEE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.
(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.
(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.
(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
**36.0** Parameter exceeds the PWQO.

**Appendix C.3**

**General Chemistry and Total Metals**
**Surface Water Analytical Results**
**Historic Water Quality**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | **SW-WARD2-1210-004** | **SW-WARD2-0511-004** | **SW-WARD2-1011-003** | **SW-WARD2-0412-006** | **SW-WARD2-1112-005** | **SW-WARD2-0513-006** | **SW-WARD2-1013-005** | **SW-WARD2-DD-061514-004** | **SW-WARD2-103014-003** | **SW-WARD2-8/6/15-005** | **SW-WARD2-161115-004** | **SW-WARD2-042516-003** | **SW-WARD2-110316-004** |
| **Sample Date:** | | | **12/1/2010** | **5/24/2011** | **11/22/2011** | **4/22/2012** | **11/26/2012** | **5/13/2013** | **10/22/2013** | **6/15/2014** | **10/30/2014** | **6/8/2015** | **11/16/2015** | **4/25/2016** | **11/3/2016** |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 80.4 | 76.2 | 80.1 | 64.4 | 81.5 | 70.3 | 77.3 | 84.2 | 83.9 | 82.9 | 84.7 | 75.2 | 82.9 |
| Cobalt | mg/L | 0.0009 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Iron | mg/L | 0.3 | 0.147 | **0.772** | 0.191 | 0.202 | 0.099 | 0.075 | 0.078 | 0.116 | 0.099 | 0.162 | <0.050 | 0.107 | **0.304** |
| Magnesium | mg/L | - | 20.7 | 21.1 | 23.6 | 24.3 | 26 | 24.6 | 24.6 | 25.4 | 26.8 | 25.1 | 27 | 22.1 | 30.3 |
| Manganese | mg/L | - | 0.0236 | 0.0452 | 0.012 | 0.0259 | 0.007 | 0.0201 | 0.0203 | 0.0285 | 0.0215 | 0.0271 | 0.0136 | 0.0114 | 0.0535 |
| Phosphorus | mg/L | 0.01-0.03 (e) | <0.050 | **0.065** | <0.050 | <0.05 | **0.11** | **0.059** | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| Potassium | mg/L | - | 1.9 | <1 | 2.5 | 1.8 | 2.3 | 1.8 | 1.7 | <1.0 | 1.3 | <1.0 | 1.52 | 1.25 | 3.07 |
| Sodium | mg/L | - | 5.87 | 5.7 | 7.33 | 9.67 | 8.46 | 7.96 | 12.8 | 8.22 | 14.8 | 9.34 | 16 | 9.44 | 21.7 |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 249 | 251 | 237 | 221 | 250 | 232 | 275 | 327 | 320 | 311 | 287 | 292 | 303 |
| Ammonia-N | mg/L | - | <0.050 | <0.05 | <0.050 | 0.055 | <0.050 | 0.053 | <0.050 | <0.050 | 0.067 | 0.052 | <0.050 | 0.026 | 0.13 |
| Chloride | mg/L | - | 8.9 | 8 | 13.4 | 12.6 | 17.3 | 10.6 | 42.7 | 11.8 | 45.5 | 12.8 | 51.4 | 21.7 | 47.8 |
| Conductivity | µS/cm | - | 500 | 470 | 551 | 537 | 430 | 371 | 607 | 567 | 657 | 564 | 672 | 564 | 697 |
| Dissolved organic carbon (DOC) | mg/L | - | 3.6 | 4.8 | 6.4 | 4.7 | 5.5 | 4.7 | 4.5 | 4.1 | 3.7 | 3.8 | 3.7 | 4.9 | 4.7 |
| Hardness | mg/L | - | 286 | 277 | 297 | 261 | 311 | 277 | 294 | 315 | 320 | 310 | 323 | 279 | 332 |
| Nitrate (as N) | mg/L | - | 0.29 | 0.15 | 2.84 | 0.44 | 5.04 | 1.17 | <0.10 | <0.10 | <0.10 | 0.06 | 0.256 | 0.667 | 0.026 |
| Nitrite (as N) | mg/L | - | <0.10 | <0.1 | <0.10 | <0.1 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.010 | <0.010 | <0.010 | <0.010 |
| pH, lab | s.u. | - | 8.27 | 8.29 | 8.4 | 8.33 | 8.22 | 8.34 | 8.27 | 8.4 | 8.23 | 8.41 | 8.19 | 8.42 | 8.09 |
| Phenolics (total) | mg/L | 0.001 | <0.0010 | **0.002** | <0.0010 | <0.001 | <0.0010 | **0.002** | <0.0010 | **0.0022** | **0.0047** | **0.0054** | **0.0026** | <0.0010 | **0.0039** |
| Phosphorus | mg/L | 0.01-0.03 (e) | 0.0108 | 0.0257 | 0.0101 | 0.0194 | **0.0336** | 0.0213 | 0.0042 | 0.0111 | <0.0030 | 0.0071 | <0.0030 | 0.0054 | 0.0075 |
| Sulfate | mg/L | - | 5.2 | 3.9 | 34.2 | 41.4 | 36.9 | 29 | 9.3 | <2.0 | 4.4 | 1.77 | 9.47 | 8.25 | 9.45 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | <0.15 | 0.2 | 0.4 | 0.56 | 0.82 | 0.49 | <0.30 | 0.25 | 0.34 | 0.29 | <0.15 | 0.39 | 0.41 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.00018 | <0.000001 | <0.00048 | 0.0011 | <0.0002 | 0.001377 | <0.0017636 | <0.00407 | 0.00221 | 0.00053 | <0.00388 | - | - |
| **Field Parameters** | | | | | | | | | | | | | | | |
| Conductivity, field | µS/cm | - | 366 | 13.3 | 565 | 506 | 453 | 477 | 551 | 740 | 622 | 452 | 538 | 503 | 649 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | 11.4 | - | - | 10.03 | 6.86 | 8.85 | 7.09 | 6.21 | 8.47 | 10.36 | - | - | - |
| pH, field | s.u. | 6.5-8.5 | 7.41 | **4.78** | 7.87 | 7.97 | 7.44 | 8.25 | 8.38 | 8.45 | 8.25 | 7.47 | **8.69** | 8.11 | 8.38 |
| Temperature, field | Deg C | - | 4.3 | 8.87 | 3.3 | 10 | 2.3 | 7.3 | 7.5 | 14 | 7.8 | 15.5 | 6.3 | 9.9 | 9.5 |

Notes:

(1) Ministry of Environment and Energy (MOEE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.
(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.
(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.
(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
**36.0** Parameter exceeds the PWQO.

**Appendix C.3**

**General Chemistry and Total Metals**
**Surface Water Analytical Results**
**Historic Water Quality**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SW4 | SW4 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 | SW5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | SW-WARD2-041017-001 | SW-WARD2-112417-007 | CRA-4074-02-WARD2-48 | SW-WARD2-1210-001 | SW-WARD2-0511-003 | SW-WARD2-1011-005 | SW-WARD2-0412-002 | SW-WARD2-1112-002 | SW-WARD2-0513-003 | SW-WARD2-1013-002 | SW-WARD2-DD-061514-002 | SW-WARD2-103014-008 | SW-WARD2-8/6/15-007 |
| Sample Date: | | | 4/10/2017 | 11/24/2017 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 | 6/15/2014 | 10/30/2014 | 6/8/2015 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 74.4 | 84.7 | 128 | 147 | 138 | 129 | 120 | 127 | 238 | 143 | 146 | 142 | 136 |
| Cobalt | mg/L | 0.0009 | - | <0.00010 | - | - | - | - | - | - | - | - | - | - | - |
| Iron | mg/L | 0.3 | **1.19** | 0.063 | **2.17** | **5.55** | 0.3 | **1.45** | **0.384** | **2.5** | **51.2** | **4.77** | **4.09** | **4.39** | **3.12** |
| Magnesium | mg/L | - | 22.6 | 26.3 | 45.7 | 46 | 44 | 38.3 | 40.3 | 42.7 | 78.3 | 43.9 | 44.5 | 45.8 | 42.4 |
| Manganese | mg/L | - | 0.110 | 0.0174 | 0.0951 | 0.279 | 0.122 | 0.116 | 0.0608 | 0.174 | 1.42 | 0.433 | 0.517 | 0.462 | 0.289 |
| Phosphorus | mg/L | 0.01-0.03 (e) | <0.050 | <0.050 | **0.086** | <0.50 | **0.052** | **0.091** | <0.05 | **0.13** | **0.857** | **0.14** | **0.121** | **0.083** | **0.118** |
| Potassium | mg/L | - | 4.13 | 4.73 | 4.5 | <10 | 5.4 | 4.7 | 3.6 | 4.4 | 6.6 | 4.6 | 3.9 | 4.7 | 3.8 |
| Sodium | mg/L | - | 15.2 | 17.8 | 26.2 | 22.3 | 23.2 | 25 | 24 | 26.9 | 22.7 | 28.8 | 31.7 | 39.3 | 33.4 |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 261 | 313 | 455 | 479 | 474 | 450 | 426 | 448 | 459 | 491 | 485 | 543 | 496 |
| Ammonia-N | mg/L | - | 0.028 | 0.129 | 0.717 | 0.708 | 0.782 | 1.74 | 0.686 | 1.08 | 1.39 | 1.49 | 1.5 | 2.23 | 0.844 |
| Chloride | mg/L | - | 31.9 | 33.8 | 45.1 | 31.8 | 30.8 | 51.7 | 42.4 | 46.3 | 46 | 64 | 60.4 | 70 | 57.4 |
| Conductivity | µS/cm | - | 593 | 687 | 933 | 928 | 903 | 908 | 896 | 796 | 844 | 1050 | 922 | 1080 | 924 |
| Dissolved organic carbon (DOC) | mg/L | - | 5.8 | 4.5 | 3.5 | 6.4 | 7.9 | 5.2 | 5.2 | 5.3 | 4.9 | 6.4 | 5.5 | 5.4 | 5 |
| Hardness | mg/L | - | 279 | 320 | 507 | 557 | 525 | 481 | 467 | 493 | 916 | 538 | 549 | 543 | 514 |
| Nitrate (as N) | mg/L | - | 1.50 | 1.55 | 0.59 | 0.26 | 0.43 | 0.62 | 0.71 | 0.54 | 0.36 | 0.16 | 0.38 | 0.23 | 0.576 |
| Nitrite (as N) | mg/L | - | <0.010 | <0.010 | <0.10 | <0.10 | <0.1 | <0.10 | <0.1 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | 0.049 |
| pH, lab | s.u. | - | 8.23 | 8.35 | 8.25 | 8.04 | 8.3 | 8.1 | 8.13 | 8.06 | 7.9 | 7.99 | 8.04 | 7.98 | 8.13 |
| Phenolics (total) | mg/L | 0.001 | **0.0017** | <0.0010 | <0.0010 | <0.0010 | <0.001 | <0.0010 | <0.001 | <0.0010 | <0.0010 | <0.0019 | **0.003** | **0.0044** | **0.0063** |
| Phosphorus | mg/L | 0.01-0.03 (e) | 0.0235 | 0.0061 | **0.0782** | **0.378** | 0.03 | **0.124** | **0.0422** | **0.0725** | **2.01** | **0.0873** | **0.0955** | **0.0825** | **0.196** |
| Sulfate | mg/L | - | 14.4 | 19.3 | 18.9 | 19.4 | 10.9 | 14.6 | 18.4 | 25.3 | 15.8 | 14.3 | 10.5 | 10.1 | 11.7 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.56 | 0.70 | 1.52 | 1.5 | 1.2 | 1.86 | 1.46 | 1.88 | 1.94 | 1.6 | 1.78 | 2.22 | 1.9 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00089 | 0.00097 | **0.02634** | 0.00102 | **0.36822** | **0.03592** | 0.0062 | 0.0027 | 0.0079759 | **0.0352558** | **0.10119** | **0.02109** | 0.00515 |
| **Field Parameters** | | | | | | | | | | | | | | | |
| Conductivity, field | µS/cm | - | 560 | 574 | 869 | 976 | 11.2 | 1020 | 882 | 763 | 933 | 983 | 1420 | 1130 | 950 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | 7.22 | 10.77 | 8.52 | 9.49 | - | - | 8.49 | 5.31 | 5.14 | 8.51 | 6.08 | 6.43 | 11.17 |
| pH, field | s.u. | 6.5-8.5 | 8.14 | 7.68 | 8.3 | 6.95 | **9.6** | 8.17 | 7.73 | 7.25 | 7.62 | 8.16 | 8.47 | 7.66 | 7.29 |
| Temperature, field | Deg C | - | 10.5 | 5.4 | 7.8 | 5.8 | 8.01 | 4.2 | 6.3 | 4.2 | 6.3 | 8.7 | 10.8 | 8.9 | 14.2 |

Notes:

(1) Ministry of Environment and Energy (MOEE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.
(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.
(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.
(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
**36.0** Parameter exceeds the PWQO.

**Appendix C.3**

**General Chemistry and Total Metals**
**Surface Water Analytical Results**
**Historic Water Quality**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SW5 | SW5 | SW5 | SW5 | SW5 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | SW-WARD2-161115-003 | SW-WARD2-042516-005 | SW-WARD2-110316-007 | SW-WARD2-041017-002 | SW-WARD2-112417-001 | CRA-4074-02-WARD2-49 | SW-WARD2-1210-002 | SW-WARD2-0511-002 | SW-WARD2-1011-004 | SW-WARD2-0412-001 | SW-WARD2-1112-001 | SW-WARD2-0513-002 | SW-WARD2-1013-003 |
| **Sample Date:** | | | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 5/12/2010 | 12/1/2010 | 5/24/2011 | 11/22/2011 | 4/22/2012 | 11/26/2012 | 5/13/2013 | 10/22/2013 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 347 | 212 | 150 | 145 | 152 | 167 | 161 | 129 | 154 | 137 | 160 | 131 | 153 |
| Cobalt | mg/L | 0.0009 | - | - | - | - | **0.00097** | - | - | - | - | - | - | - | - |
| Iron | mg/L | 0.3 | **57.6** | **28.7** | **1.81** | **1.36** | **4.11** | **0.418** | 0.173 | 0.285 | 0.085 | 0.208 | <0.050 | **0.396** | <0.050 |
| Magnesium | mg/L | - | 114 | 67.2 | 47 | 43.4 | 44.4 | 102 | 104 | 72.5 | 80.9 | 77.9 | 92.1 | 77.1 | 83.3 |
| Manganese | mg/L | - | 1.65 | 1.15 | 0.37 | 0.323 | 0.365 | 0.0469 | 0.0371 | 0.0183 | 0.0099 | 0.0298 | 0.0151 | 0.0454 | 0.0083 |
| Phosphorus | mg/L | 0.01-0.03 (e) | **1.07** | **0.6** | <0.050 | <0.050 | **0.050** | **0.067** | <0.050 | **0.059** | <0.050 | <0.05 | <0.10 | **0.075** | <0.050 |
| Potassium | mg/L | - | 9.76 | 6.56 | 4.15 | 3.25 | 3.73 | 15 | 19 | 14.6 | 13.4 | 13.8 | 13.8 | 12.9 | 12.7 |
| Sodium | mg/L | - | 38.7 | 30.8 | 36 | 25.5 | 28.5 | 27.1 | 20.4 | 15 | 19.7 | 18.1 | 25.7 | 18.1 | 21.2 |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 518 | 520 | 490 | 509 | 528 | 491 | 506 | 435 | 492 | 473 | 479 | 468 | 571 |
| Ammonia-N | mg/L | - | 1.9 | 1.72 | 1.28 | 1.61 | 1.92 | <0.050 | <0.050 | 0.083 | <0.050 | <0.05 | <0.050 | <0.050 | <0.050 |
| Chloride | mg/L | - | 64.5 | 37.2 | 54.4 | 30.8 | 45.3 | 41.8 | 36.7 | 21.4 | 33.7 | 33 | 43.2 | 28 | 36.3 |
| Conductivity | µS/cm | - | 1060 | 972 | 1090 | 1010 | 1040 | 1430 | 1360 | 1000 | 1170 | 1180 | 1050 | 943 | 1320 |
| Dissolved organic carbon (DOC) | mg/L | - | 5.7 | 6.7 | 5 | 4.8 | 4.9 | 3.2 | 2.7 | 4.5 | 3.7 | 2.6 | 3.4 | 3 | 3.9 |
| Hardness | mg/L | - | 1340 | 807 | 568 | 542 | 563 | 838 | 830 | 621 | 719 | 662 | 778 | 644 | 725 |
| Nitrate (as N) | mg/L | - | 0.226 | 0.203 | 0.205 | 0.111 | 0.272 | 5.47 | 2.21 | 4.14 | 4.61 | 4.51 | 5.3 | 3.91 | 4.57 |
| Nitrite (as N) | mg/L | - | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.10 | <0.10 | <0.1 | <0.10 | <0.1 | <0.10 | <0.10 | <0.10 |
| pH, lab | s.u. | - | 8.03 | 7.98 | 7.9 | 7.96 | 8.10 | 8.25 | 7.9 | 8.29 | 8.16 | 8.2 | 8.15 | 8.27 | 8.09 |
| Phenolics (total) | mg/L | 0.001 | **0.0035** | 0.001 | **0.0022** | **0.0034** | **0.0031** | <0.0010 | <0.0010 | 0.001 | <0.0010 | <0.001 | <0.0010 | **0.004** | <0.0017 |
| Phosphorus | mg/L | 0.01-0.03 (e) | **1.01** | **0.471** | **0.0408** | 0.0108 | **0.0771** | **0.18** | 0.015 | 0.0116 | 0.0115 | **0.035** | 0.0064 | **0.0439** | 0.0083 |
| Sulfate | mg/L | - | 20.4 | 18.7 | 18.9 | 25.8 | 26.8 | 301 | 210 | 122 | 184 | 163 | 204 | 135 | 185 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 2.36 | 8.1 | 1.87 | 1.86 | 3.35 | 0.87 | 0.31 | 0.2 | 0.34 | 0.18 | 0.47 | 0.38 | <0.34 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00712 | - | - | - | 0.00950 | <0.00128 | <0.00004 | **0.08828** | <0.00051 | <0.0005 | <0.0001 | <0.0000759 | <0.0005631 |
| **Field Parameters** | | | | | | | | | | | | | | | |
| Conductivity, field | µS/cm | - | 897 | 1050 | 1110 | 483 | 1070 | 1370 | 1280 | 9.1 | 1300 | 1310 | 1200 | 1160 | 1300 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | - | - | - | 8.9 | 10.9 | 8.58 | 7.98 | - | - | 9.73 | 5.75 | 6.77 | 8.11 |
| pH, field | s.u. | 6.5-8.5 | 7.28 | 7.95 | 8.29 | 7.59 | 7.52 | 8.08 | 6.65 | **10.6** | 7.83 | 7.74 | 6.86 | 7.09 | 7.87 |
| Temperature, field | Deg C | - | 8.2 | 7.1 | 10 | 11.6 | 4.8 | 9.5 | 6.5 | 9.26 | 5 | 7.1 | 5.6 | 4.9 | 7.6 |

Notes:

(1) Ministry of Environment and Energy (MOEE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.
(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.
(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.
(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
**36.0** Parameter exceeds the PWQO.

**Appendix C.3**

**General Chemistry and Total Metals**
**Surface Water Analytical Results**
**Historic Water Quality**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SW6 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | SW-WARD2-DD-061514-001 | SW-WARD2-103014-010 | SW-WARD2-8/6/15-006 | SW-WARD2-161115-002 | SW-WARD2-042516-010 | SW-WARD2-110316-010 | SW-WARD2-041017-010 | SW-WARD2-112417-010 | SW-WARD2-0713-002 | SW-WARD2-1013-008 | SW-WARD2-02 | SW-WARD2-DD-061514-008 | SW-WARD2-080514-001 |
| **Sample Date:** | | | 6/15/2014 | 10/30/2014 | 6/8/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 11/24/2017 | 7/11/2013 | 10/22/2013 | 12/28/2013 | 6/15/2014 | 8/5/2014 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 114 | 134 | 128 | 151 | 219 | 162 | 114 | 127 | 62.4 | 67.6 | 80.1 | 56.3 | 24.6 |
| Cobalt | mg/L | 0.0009 | - | - | - | - | - | 0.00031 | - | <0.00010 | - | - | - | - | - |
| Iron | mg/L | 0.3 | 0.126 | 0.189 | **2.57** | **2.83** | **2.32** | **0.61** | <0.050 | <0.050 | <0.050 | **0.657** | **0.502** | 0.139 | <0.050 |
| Magnesium | mg/L | - | 54.6 | 71.1 | 58.6 | 73.2 | 81.5 | 81.4 | 56.5 | 60.2 | 27.5 | 15.7 | 21.5 | 21 | 28.5 |
| Manganese | mg/L | - | 0.0151 | 0.0125 | 0.26 | 0.14 | 0.403 | 0.0806 | 0.0403 | 0.00576 | 0.0183 | 0.0228 | 0.06 | 0.0128 | 0.0061 |
| Phosphorus | mg/L | 0.01-0.03 (e) | <0.050 | <0.050 | **0.161** | **0.16** | **0.207** | **0.092** | <0.050 | <0.050 | **0.055** | **0.06** | <0.050 | <0.050 | <0.050 |
| Potassium | mg/L | - | 11.8 | 12.9 | 15.5 | 13.8 | 11.7 | 13.2 | 10.7 | 11.2 | 1.6 | 2.5 | 1.9 | <1.0 | 1.5 |
| Sodium | mg/L | - | 13.4 | 18.4 | 16.2 | 18.7 | 9.02 | 18.9 | 14.4 | 13.7 | 37.7 | 18.4 | 24 | 38.8 | 20.9 |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 457 | 564 | 499 | 507 | 369 | 507 | 466 | 469 | 77 | 158 | 247 | 137 | 152 |
| Ammonia-N | mg/L | - | <0.050 | 0.071 | <0.050 | <0.050 | 0.056 | 0.111 | <0.020 | 0.030 | <0.050 | <0.050 | <0.050 | <0.050 | 0.072 |
| Chloride | mg/L | - | 19.2 | 27.7 | 22.8 | 5.35 | 11.2 | 22.3 | 16.4 | 15.1 | 165 | 76.2 | 63.5 | 122 | 50.9 |
| Conductivity | µS/cm | - | 932 | 1170 | 1020 | 1180 | 770 | 1160 | 981 | 1000 | 740 | 562 | 620 | 650 | 466 |
| Dissolved organic carbon (DOC) | mg/L | - | 4.1 | 4.4 | 3.5 | 4.1 | 4.4 | 5.5 | 2.9 | 2.9 | 9.1 | 5 | 4.1 | 7.7 | 7.7 |
| Hardness | mg/L | - | 509 | 626 | 561 | 678 | 884 | 741 | 516 | 565 | 269 | 233 | 289 | 227 | 179 |
| Nitrate (as N) | mg/L | - | 3.36 | 2.97 | 0.52 | 0.56 | 1.61 | 2.38 | 1.50 | 1.64 | <0.10 | <0.10 | 0.18 | <0.10 | <0.10 |
| Nitrite (as N) | mg/L | - | <0.10 | <0.10 | <0.050 | <0.010 | <0.010 | <0.050 | <0.010 | <0.010 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| pH, lab | s.u. | - | 8.25 | 8.1 | 8.2 | 8.17 | 8.28 | 7.89 | 8.22 | 8.27 | 8.09 | 8 | 7.39 | 8.22 | 8.63 |
| Phenolics (total) | mg/L | 0.001 | **0.005** | **0.0019** | **0.0065** | **0.0038** | **0.0012** | **0.0064** | **0.0012** | **0.0095** | <0.0010 | <0.0010 | <0.0010 | **0.0035** | **0.0103** |
| Phosphorus | mg/L | 0.01-0.03 (e) | 0.0119 | 0.0152 | **0.213** | 0.01 | **0.808** | **0.229** | 0.0094 | <0.0030 | 0.0131 | 0.0167 | **0.038** | 0.0193 | 0.0073 |
| Sulfate | mg/L | - | 108 | 145 | 85.1 | 28.6 | 52.5 | 122 | 88.6 | 84.1 | 22.7 | 22 | 18.7 | 17.7 | 10 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.33 | 0.55 | 0.29 | 0.28 | 4.9 | 0.71 | 0.29 | 0.38 | 0.64 | <0.40 | 0.27 | 0.56 | 0.56 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.00137 | 0.00042 | <0.00006 | <0.00003 | - | - | - | 0.00019 | <0.0000086 | <0.0009803 | <0.00034 | <0.00227 | 0.00203 |
| **Field Parameters** | | | | | | | | | | | | | | | |
| Conductivity, field | µS/cm | - | 1420 | 1260 | 823 | 929 | 705 | 1220 | 1070 | 1080 | 689 | 515 | 615 | 834 | 2230 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | 5.66 | 6.8 | 10.34 | - | - | - | 4.8 | 10.68 | - | 8.59 | 5.74 | 6.72 | 9.3 |
| pH, field | s.u. | 6.5-8.5 | 8.11 | 7.47 | 6.67 | **6.47** | 8.02 | 7.87 | 7.52 | 7.61 | **5.38** | 8.08 | 7.79 | 7.94 | 7.74 |
| Temperature, field | Deg C | - | 9.4 | 8.5 | 12.5 | 8.7 | 8.7 | 9.8 | 10.9 | 5.5 | 28.27 | 8.6 | 1.2 | 21.5 | 21.1 |

Notes:

(1) Ministry of Environment and Energy (MOEE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.

(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.

(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L

\- Parameter not analyzed / no information

< Parameter detected below the laboratory method detection limit

**36.0** Parameter exceeds the PWQO.

**Appendix C.3**

**General Chemistry and Total Metals**
**Surface Water Analytical Results**
**Historic Water Quality**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-1 | SWP-1 | SWP-1 | SWP-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | SW-WARD2-103014-007 | SW-WARD2-8/6/15-003 | SW-WARD2-081715-001 | SW-WARD2-161115-010 | SW-WARD2-042516-006 | SW-WARD2-110316-009 | SW-WARD2-041017-004 | SW-WARD2-8/8/17-02 | SW-WARD2-112417-005 | SW-WARD2-0713-001 | SW-WARD2-1013-007 | SW-WARD2-01 | SW-WARD2-DD-061514-007 |
| Sample Date: | | | 10/30/2014 | 6/8/2015 | 8/17/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 8/8/2017 | 11/24/2017 | 7/11/2013 | 10/22/2013 | 12/28/2013 | 6/15/2014 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | |
| Calcium | mg/L | - | 106 | 105 | 106 | 94.8 | 79.9 | 82.3 | 58.0 | 90.3 | 83.4 | 22.4 | 39 | 65.5 | 20.5 |
| Cobalt | mg/L | 0.0009 | - | - | - | - | - | - | - | - | 0.00052 | - | - | - | - |
| Iron | mg/L | 0.3 | 0.117 | 0.269 | 0.052 | 0.29 | 0.228 | <0.50 | **0.307** | <0.50 | 0.260 | 0.056 | **0.667** | 0.139 | 0.077 |
| Magnesium | mg/L | - | 24.8 | 32.6 | 18.8 | 20.7 | 23.1 | 62 | 17.3 | 58.3 | 25.3 | 31 | 24.7 | 22.5 | 26.8 |
| Manganese | mg/L | - | 0.0093 | 0.0135 | 0.0114 | 0.0126 | 0.0612 | 0.0376 | 0.0137 | 0.187 | 0.0235 | 0.0193 | 0.0183 | 0.0237 | 0.0156 |
| Phosphorus | mg/L | 0.01-0.03 (e) | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.50 | <0.050 | <0.50 | <0.050 | **0.062** | **0.062** | <0.050 | <0.050 |
| Potassium | mg/L | - | 4.1 | 2.4 | 5.03 | 3.85 | 2.51 | 82.4 | 11.1 | 86.0 | 17.3 | 1.4 | 2 | 1.2 | <1.0 |
| Sodium | mg/L | - | 46.9 | 84.3 | 77.3 | 38.6 | 34.2 | 169 | 38.4 | 174 | 50.9 | 19.2 | 15.1 | 10.8 | 17.2 |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 221 | 178 | 118 | 198 | 217 | 470 | 194 | 466 | 311 | 147 | 174 | 242 | 135 |
| Ammonia-N | mg/L | - | 0.065 | <0.050 | <0.050 | <0.050 | 0.061 | 0.233 | 0.042 | 0.045 | 0.365 | <0.050 | <0.050 | <0.050 | <0.050 |
| Chloride | mg/L | - | 175 | 276 | 306 | 129 | 102 | 197 | 76.9 | 255 | 88.9 | 45 | 40 | 28.1 | 40.3 |
| Conductivity | µS/cm | - | 931 | 1240 | 1220 | 817 | 756 | 1730 | 649 | 1830 | 899 | 440 | 448 | 512 | 350 |
| Dissolved organic carbon (DOC) | mg/L | - | 5.6 | 7.8 | 8.3 | 5.8 | 6.6 | 29.5 | 8.2 | 31.9 | 11.6 | 5.2 | 5.3 | 2.7 | 5.6 |
| Hardness | mg/L | - | 367 | 395 | 342 | 322 | 294 | 461 | 216 | 466 | 312 | 183 | 199 | 256 | 161 |
| Nitrate (as N) | mg/L | - | <0.10 | <0.10 | <0.020 | 0.046 | <0.020 | 10.1 | 0.109 | <0.10 | 0.175 | <0.10 | 0.14 | 1.03 | <0.10 |
| Nitrite (as N) | mg/L | - | <0.10 | <0.050 | <0.010 | <0.010 | <0.010 | <0.050 | <0.010 | <0.050 | 0.013 | <0.10 | <0.10 | <0.10 | <0.10 |
| pH, lab | s.u. | - | 7.98 | 8.18 | 7.96 | 7.82 | 8.13 | 8.23 | 8.14 | 7.91 | 8.11 | 8.66 | 8.28 | 7.45 | 8.9 |
| Phenolics (total) | mg/L | 0.001 | **0.0029** | **0.0057** | **0.0035** | **0.0027** | <0.0010 | **0.0061** | **0.0024** | **0.0053** | <0.0010 | <0.0010 | <0.0010 | <0.0010 | **0.0018** |
| Phosphorus | mg/L | 0.01-0.03 (e) | 0.0108 | **0.043** | 0.0133 | 0.0292 | 0.0083 | **0.135** | 0.0231 | **0.0452** | 0.0278 | 0.0142 | 0.021 | 0.019 | 0.0145 |
| Sulfate | mg/L | - | 19.8 | 8.4 | 32.7 | 26.7 | 17.2 | 86.7 | 22.7 | 67.2 | 39.4 | 16.3 | 11 | 17.1 | 12.9 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.34 | 0.74 | 0.61 | 0.31 | 0.29 | 4.66 | 0.88 | 3.43 | 1.58 | 0.75 | <0.45 | 0.34 | 0.48 |
| Un-ionized ammonia | mg/L | 0.02 (d) | 0.00088 | <0.00021 | <0.00684 | <0.00002 | - | - | 0.00024 | 0.00129 | 0.00214 | <0.0000379 | <0.0013967 | <0.00073 | <0.01400 |
| **Field Parameters** | | | | | | | | | | | | | | | |
| Conductivity, field | µS/cm | - | 901 | 1160 | 364 | 757 | 671 | 1960 | 622 | 850 | 910 | 463 | 419 | 574 | 485 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | 7.05 | 8.39 | 4.5 | - | - | - | 9.55 | - | 10.22 | - | - | 9.11 | 7.67 |
| pH, field | s.u. | 6.5-8.5 | 7.83 | 6.88 | 8.31 | **6.34** | 7.22 | 8.33 | 7.32 | 7.76 | 7.58 | **6.02** | 8.21 | 8.06 | **8.85** |
| Temperature, field | Deg C | - | 8.6 | 22 | 26.2 | 7.3 | 11.2 | 10.6 | 12.3 | 20.7 | 5.2 | 28.5 | 9.4 | 3 | 20.8 |

Notes:

(1) Ministry of Environment and Energy (MOEE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.
(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.
(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.
(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
**36.0** Parameter exceeds the PWQO.

**Appendix C.3**

**General Chemistry and Total Metals**
**Surface Water Analytical Results**
**Historic Water Quality**
**Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | | SW-WARD2-080514-002 | SW-WARD2-103014-001 | SW-WARD2-8/6/15-001 | SW-WARD2-081715-002 | SW-WARD2-161115-009 | SW-WARD2-042516-007 | SW-WARD2-110316-005 | SW-WARD2-041017-003 | SW-WARD2-8/8/17-01 | SW-WARD2-112417-006 |
| Sample Date: | | | 8/5/2014 | 10/30/2014 | 6/8/2015 | 8/17/2015 | 11/16/2015 | 4/25/2016 | 11/3/2016 | 4/10/2017 | 8/8/2017 | 11/24/2017 |
| **Parameters** | **Units** | **PWQO[1]** | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | |
| Calcium | mg/L | - | 203 | 46.9 | 30.7 | 32.4 | 49.5 | 77.7 | 59.5 | 75.0 | 58.9 | 75.5 |
| Cobalt | mg/L | 0.0009 | - | - | - | - | - | - | - | - | - | 0.00019 |
| Iron | mg/L | 0.3 | 0.116 | <0.050 | 0.142 | 0.081 | <0.050 | 0.06 | 0.053 | 0.088 | 0.108 | 0.208 |
| Magnesium | mg/L | - | 42.1 | 26 | 28.8 | 28.8 | 25.9 | 25.9 | 29.7 | 26.7 | 26.4 | 25.6 |
| Manganese | mg/L | - | 0.0188 | 0.0025 | 0.0475 | 0.0262 | 0.00303 | 0.0196 | 0.0107 | 0.0151 | 0.0318 | 0.0274 |
| Phosphorus | mg/L | 0.01-0.03 (e) | <0.050 | <0.050 | **0.106** | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| Potassium | mg/L | - | 5.7 | 1.8 | <1.0 | 1.41 | 1.79 | 2.04 | 1.9 | 2.47 | 2.34 | 5.77 |
| Sodium | mg/L | - | 163 | 18.1 | 20.9 | 22.3 | 18.7 | 15.2 | 24.3 | 16.1 | 20.5 | 23.6 |
| **General Chemistry** | | | | | | | | | | | | |
| Alkalinity, total (as CaCO3) | mg/L | - | 99 | 202 | 173 | 163 | 211 | 276 | 237 | 273 | 230 | 264 |
| Ammonia-N | mg/L | - | <0.050 | 0.072 | <0.050 | <0.050 | <0.050 | 0.056 | 0.128 | 0.026 | 0.049 | 0.749 |
| Chloride | mg/L | - | 612 | 43 | 48.7 | 52.4 | 43 | 36 | 46.9 | 38.0 | 44.5 | 46.2 |
| Conductivity | µS/cm | - | 2230 | 494 | 466 | 475 | 530 | 632 | 596 | 636 | 584 | 664 |
| Dissolved organic carbon (DOC) | mg/L | - | 7.2 | 3.1 | 10.6 | 8.7 | 5.5 | 7.6 | 5.1 | 4.1 | 9.3 | 7.7 |
| Hardness | mg/L | - | 681 | 224 | 195 | 200 | 230 | 301 | 271 | 297 | 256 | 294 |
| Nitrate (as N) | mg/L | - | <0.10 | <0.10 | 0.045 | <0.020 | 0.031 | 0.398 | 0.06 | 0.373 | <0.020 | 0.570 |
| Nitrite (as N) | mg/L | - | <0.10 | <0.10 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 |
| pH, lab | s.u. | - | 7.98 | 8.23 | 8.61 | 8.48 | 7.9 | 8.27 | 8.13 | 8.20 | 8.09 | 8.26 |
| Phenolics (total) | mg/L | 0.001 | **0.0068** | **0.0029** | **0.0042** | **0.0016** | **0.003** | <0.0010 | **0.0038** | **0.0029** | **0.0061** | **0.0038** |
| Phosphorus | mg/L | 0.01-0.03 (e) | 0.0062 | 0.007 | 0.0226 | **0.0573** | 0.0067 | 0.0105 | **0.0888** | 0.0087 | 0.0112 | 0.0177 |
| Sulfate | mg/L | - | 24.5 | 8.5 | 9.48 | 6.2 | 8.79 | 19.8 | 12.3 | 17.9 | 12.9 | 23.1 |
| Total kjeldahl nitrogen (TKN) | mg/L | - | 0.21 | 0.52 | 0.99 | 0.85 | 0.46 | 0.41 | 2.36 | 0.46 | 0.58 | 1.69 |
| Un-ionized ammonia | mg/L | 0.02 (d) | <0.00828 | 0.00177 | <0.00112 | <0.00042 | <0.01086 | - | - | 0.00052 | 0.00127 | 0.00252 |
| **Field Parameters** | | | | | | | | | | | | |
| Conductivity, field | µS/cm | - | 455 | 528 | 377 | 1310 | 408 | 573 | 548 | 596 | 2830 | 590 |
| Dissolved oxygen (DO), field | mg/L | <4 (f) | 15.16 | 8.18 | 11.09 | 4.55 | - | - | - | 9.34 | - | 12.15 |
| pH, field | s.u. | 6.5-8.5 | 8.5 | 8.09 | 7.96 | 7.19 | **9.1** | 7.61 | 8.43 | 7.87 | 7.76 | 7.42 |
| Temperature, field | Deg C | - | 23.1 | 8.6 | 11.21 | 21.6 | 9 | 12.3 | 10.6 | 12.4 | 19.3 | 2.9 |

Notes:

| | |
|---|---|
| [1] | Ministry of Environment and Energy (MOEE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (a) | Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L. |
| (b) | PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L. |
| (c) | Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| (g) | An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc. |
| (h) | Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| **36.0** | Parameter exceeds the PWQO. |

**Appendix C.3**

**Volatile Organic Compounds**
**Surface Water Analytical Results**
**Historic Water Quality Results Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Interceptor | GW Sump | GW Sump | GW Sump | GW Sump | GW Sump | SW1 | SW1 | SW1 | SW1 | SW1 | SW1 | SW2 | SW2 | SW2 | SW2 | SW2 | SW2 | SW3 | SW3 | SW3 | SW3 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | **PIPE** | **SW-WARD2-DD-061514-009** | **SW-WARD2-103014-009** | **SW-WARD2-161115-008** | **SW-WARD2-041017-007** | **SW-WARD2-112417-004** | **SW-WARD2-DD-061514-010** | **SW-WARD2-103014-006** | **SW-WARD2-161115-007** | **SW-WARD2-041017-006** | **SW-WARD2-112417-003** | **SW-WARD2-1112-003** | **SW-WARD2-DD-061514-003** | **SW-WARD2-103014-005** | **SW-WARD2-161115-001** | **SW-WARD2-041017-002** | **SW-WARD2-112417-002** | **SW-WARD2-1112-004** | **SW-WARD2-DD-061514-005** | **SW-WARD2-103014-002** | **SW-WARD2-161115-006** | **SW-WARD2-041017-005** | **SW-WARD2-112417-008** | **SW-WARD2-1112-006** | **SW-WARD2-DD-061514-006** | **SW-WARD2-103014-004** | **SW-WARD2-161115-005** | **SW-WARD2-041017-009** |
| **Sample Date:** | | | **5/4/2014** | **6/15/2014** | **10/30/2014** | **11/16/2015** | **4/10/2017** | **11/24/2017** | **6/15/2014** | **10/30/2014** | **11/16/2015** | **4/10/2017** | **11/24/2017** | **11/26/2012** | **6/15/2014** | **10/30/2014** | **11/16/2015** | **4/10/2017** | **11/24/2017** | **11/26/2012** | **6/15/2014** | **10/30/2014** | **11/16/2015** | **4/10/2017** | **11/24/2017** | **11/26/2012** | **6/15/2014** | **10/30/2014** | **11/16/2015** | **4/10/2017** |
| **Parameters** | **Units** | ***PWQO*** [1] | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | µg/L | 20 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,1,1-Trichloroethane | µg/L | 10 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,1,2,2-Tetrachloroethane | µg/L | 70 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,1,2-Trichloroethane | µg/L | 800 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,1-Dichloroethane | µg/L | 200 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,1-Dichloroethene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 5 | <0.50 | <0.50 | <0.50 | <0.50 | <0.20 | <0.20 | <0.50 | <0.50 | <0.50 | <0.20 | <0.20 | <0.50 | <0.50 | <0.50 | <0.50 | <0.20 | <0.20 | <0.50 | <0.50 | <0.50 | <0.50 | <0.20 | <0.20 | <0.50 | <0.50 | <0.50 | <0.50 | <0.20 |
| 1,2-Dichlorobenzene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,2-Dichloroethane | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,2-Dichloropropane | µg/L | 0.7 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,3-Dichlorobenzene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,4-Dichlorobenzene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 2-Butanone (Methyl ethyl ketone) (MEK) | µg/L | 400 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | µg/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK) | µg/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | µg/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Benzene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Bromodichloromethane | µg/L | 200 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 |
| Bromoform | µg/L | 60 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 |
| Bromomethane (Methyl bromide) | µg/L | 0.9 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <1.0 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <1.0 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <1.0 | <0.50 | <0.50 | <0.50 | <0.50 |
| Carbon disulfide | µg/L | - | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 |
| Carbon tetrachloride | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Chlorobenzene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Chloroethane | µg/L | - | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Chloroform (Trichloromethane) | µg/L | - | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 |
| Chloromethane (Methyl chloride) | µg/L | 700 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| cis-1,2-Dichloroethene | µg/L | 200 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| cis-1,3-Dichloropropene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Dibromochloromethane | µg/L | 40 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 |
| Dichlorodifluoromethane (CFC-12) | µg/L | - | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Ethylbenzene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | **0.83** | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Hexane | µg/L | - | - | - | - | <0.50 | <0.50 | <0.50 | - | - | <0.50 | <0.50 | <0.50 | - | - | - | <0.50 | <0.50 | <0.50 | - | - | - | <0.50 | <0.50 | <0.50 | - | - | - | <0.50 | <0.50 |
| m&p-Xylenes | µg/L | (a) | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | **1.5** | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Methyl tert butyl ether (MTBE) | µg/L | 200 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Methylene chloride | µg/L | - | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <0.50 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <0.50 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <0.50 | <2.0 | <2.0 | <2.0 |
| N-Hexane (C6 and isomers) | µg/L | - | <0.50 | <0.50 | <0.50 | - | - | - | <0.50 | <0.50 | - | - | - | - | <0.50 | <0.50 | - | - | - | - | <0.50 | <0.50 | - | - | - | - | <0.50 | <0.50 | - | - |
| o-Xylene | µg/L | 40 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | **0.73** | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Styrene | µg/L | 4 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Tetrachloroethene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Toluene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | **4.12** | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| trans-1,2-Dichloroethene | µg/L | 200 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| trans-1,3-Dichloropropene | µg/L | 7 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Trichloroethene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Trichlorofluoromethane (CFC-11) | µg/L | - | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Trihalomethanes | µg/L | - | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Vinyl chloride | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Xylenes (total) | µg/L | - | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | **2.3** | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 |

Notes:

(1) Ministry of Environment and Energy (MOEE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.
(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.
(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.
(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQC is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L and for alkalinity > 80 mg/L the PWQO is 25 µg/L.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.
(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
36.0 Parameter exceeds the PWQO.

**Appendix C.3**

**Volatile Organic Compounds**
**Surface Water Analytical Results**
**Historic Water Quality Results Kincardine Waste Management Centre**
**Kincardine, Ontario**

| Sample Location: | | | SW3 | SW4 | SW4 | SW4 | SW4 | SW4 | SW4 | SW5 | SW5 | SW5 | SW5 | SW5 | SW6 | SW6 | SW6 | SW6 | SW6 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-2 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 | SWP-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | | **SW-WARD2-112417-009** | **SW-WARD2-1112-005** | **SW-WARD2-DD-061514-004** | **SW-WARD2-103014-003** | **SW-WARD2-161115-004** | **SW-WARD2-041017-001** | **SW-WARD2-112417-007** | **SW-WARD2-DD-061514-002** | **SW-WARD2-103014-008** | **SW-WARD2-161115-003** | **SW-WARD2-041017-010** | **SW-WARD2-112417-001** | **SW-WARD2-DD-061514-001** | **SW-WARD2-103014-010** | **SW-WARD2-161115-002** | **SW-WARD2-041017-008** | **SW-WARD2-112417-010** | **SW-WARD2-DD-061514-008** | **SW-WARD2-080514-001** | **SW-WARD2-103014-007** | **SW-WARD2-161115-010** | **SW-WARD2-041017-004** | **SW-WARD2-112417-005** | **SW-WARD2-DD-061514-007** | **SW-WARD2-080514-002** | **SW-WARD2-103014-001** | **SW-WARD2-161115-009** | **SW-WARD2-041017-003** | **SW-WARD2-112417-006** |
| **Sample Date:** | | | **11/24/2017** | **11/26/2012** | **6/15/2014** | **10/30/2014** | **11/16/2015** | **4/10/2017** | **11/24/2017** | **6/15/2014** | **10/30/2014** | **11/16/2015** | **4/10/2017** | **11/24/2017** | **6/15/2014** | **10/30/2014** | **11/16/2015** | **4/10/2017** | **11/24/2017** | **6/15/2014** | **8/5/2014** | **10/30/2014** | **11/16/2015** | **4/10/2017** | **11/24/2017** | **6/15/2014** | **8/5/2014** | **10/30/2014** | **11/16/2015** | **4/10/2017** | **11/24/2017** |
| **Parameters** | **Units** | ***PWQO*** [(1)] | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Volatiles** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | µg/L | 20 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,1,1-Trichloroethane | µg/L | 10 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,1,2,2-Tetrachloroethane | µg/L | 70 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,1,2-Trichloroethane | µg/L | 800 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,1-Dichloroethane | µg/L | 200 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,1-Dichloroethene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 5 | <0.20 | <0.50 | <0.50 | <0.50 | <0.50 | <0.20 | <0.20 | <0.50 | <0.50 | <0.50 | <0.20 | <0.20 | <0.50 | <0.50 | <0.50 | <0.20 | <0.20 | <0.50 | <0.50 | <0.50 | <0.20 | <0.20 | <0.50 | <0.50 | <0.50 | <0.50 | <0.20 | <0.20 |
| 1,2-Dichlorobenzene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,2-Dichloroethane | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,2-Dichloropropane | µg/L | 0.7 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,3-Dichlorobenzene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,4-Dichlorobenzene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 2-Butanone (Methyl ethyl ketone) (MEK) | µg/L | 400 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 2-Hexanone | µg/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| 4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK) | µg/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Acetone | µg/L | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Benzene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Bromodichloromethane | µg/L | 200 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Bromoform | µg/L | 60 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Bromomethane (Methyl bromide) | µg/L | 0.9 | <0.50 | <1.0 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Carbon disulfide | µg/L | - | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Carbon tetrachloride | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Chlorobenzene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Chloroethane | µg/L | - | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Chloroform (Trichloromethane) | µg/L | - | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Chloromethane (Methyl chloride) | µg/L | 700 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| cis-1,2-Dichloroethene | µg/L | 200 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| cis-1,3-Dichloropropene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Dibromochloromethane | µg/L | 40 | <1.0 | <0.50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Dichlorodifluoromethane (CFC-12) | µg/L | - | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Ethylbenzene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Hexane | µg/L | - | <0.50 | - | - | - | <0.50 | <0.50 | <0.50 | - | - | <0.50 | <0.50 | <0.50 | - | - | <0.50 | <0.50 | <0.50 | - | - | - | <0.50 | <0.50 | <0.50 | - | - | - | <0.50 | <0.50 |
| m&p-Xylenes | µg/L | (a) | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Methyl tert butyl ether (MTBE) | µg/L | 200 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Methylene chloride | µg/L | - | <2.0 | <0.50 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| N-Hexane (C6 and isomers) | µg/L | - | - | - | <0.50 | <0.50 | - | - | - | <0.50 | <0.50 | - | - | - | <0.50 | <0.50 | - | - | - | <0.50 | <0.50 | <0.50 | - | - | - | <0.50 | <0.50 | <0.50 | - | - | - |
| o-Xylene | µg/L | 40 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Styrene | µg/L | 4 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Tetrachloroethene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Toluene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| trans-1,2-Dichloroethene | µg/L | 200 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| trans-1,3-Dichloropropene | µg/L | 7 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Trichloroethene | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Trichlorofluoromethane (CFC-11) | µg/L | - | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Trihalomethanes | µg/L | - | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Vinyl chloride | µg/L | - | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Xylenes (total) | µg/L | - | <1.1 | <1.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 |

Notes:

| | |
|---|---|
| [(1)] | Ministry of Environment and Energy (MOEE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999. |
| (a) | Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L. |
| (b) | PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L. |
| (c) | Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQC is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L and for alkalinity > 80 mg/L the PWQO is 25 µg/L. |
| (d) | Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration. |
| (e) | No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams. |
| (f) | Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota. |
| (g) | An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc. |
| (h) | Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L |
| - | Parameter not analyzed / no information |
| < | Parameter detected below the laboratory method detection limit |
| 36.0 | Parameter exceeds the PWQO. |

# Appendix I

## Annual Report Completion Checklist

# Appendix D-Monitoring and Screening Checklist
# General Information and Instructions

**General Information: The checklist is to be completed, and submitted with the Monitoring Report.**
**Instructions:** A complete checklist consists of:
(a) a completed and signed checklist, including any additional pages of information which can be attached as needed to provide further details where indicated.
(b) completed contact information for the Competent Environmental Practitioner (CEP)
(c) self-declaration that CEP(s) meet(s) the qualifications as set out below and in Section 1.2 of the Technical Guidance Document.

**Definition of Groundwater CEP:**
For groundwater, the CEP must have expertise in hydrogeology and meet one of the following:
(a) the person holds a licence, limited licence or temporary licence under the *Professional Engineers Act*; or
(b) the person holds a certificate of registration under the *Professional Geoscientists Act, 2000* and is a practicing member, temporary, member or limited member of the Association of Professional Geoscientists of Ontario. O. Reg. 66/08, s. 2..
**Definition of Surface water CEP:**
A CEP for surface water assessments is a scientist, professional engineer or professional geoscientist as described in (a) and (b) above with demonstrated experience and post-secondary education, either a diploma or degree, in hydrology, aquatic ecology, limnology, aquatic biology, physical geography with specialization in surface water, and/or water resource management.

The type of scientific work that a CEP performs must be consistent with that person's education and experience. If an individual has appropriate training and credentials in both groundwater and surface water and is responsible for both areas of expertise, the CEP may then complete and validate both sections of the checklist.

| Monitoring Report and Site Information | |
|---|---|
| **Waste Disposal Site (WDS) Name** | Kincardine Waste Management Centre<br>(Ward 2 Landfill Site) |
| **Location (e.g. street address, lot, concession)** | The Kincardine Waste Management Centre (KWMC or Site) is located on Lot 15, Concession V, 437 Sideroad 15 North in the Municipality of Kincardine, Bruce County, Ontario |
| **GPS Location (taken within the property boundary at front gate/ front entry)** | 4454012.687<br>2073747.339 |
| **Municipality** | Municipality of Kincardine |
| **Client and/or Site Owner** | Municipality of Kincardine |
| **Monitoring Period (Year)** | 2023 |
| This Monitoring Report is being submitted under the following: | |
| **Environmental Compliance Approval (ECA) Number (formerly "Certificate of Approval" (C of A)) :** | A272702 (landfill)<br>4431-87RGVW (stormwater ponds & GWIT discharge)<br>5194-9VTHQ4<br>1731-B9ZKPU |
| **Director's Order No.:** | none |
| **Provincial Officer's Order No.:** | none |

| | | | |
|---|---|---|---|
| **Other:** | none | | |
| **Report Submission Frequency** | ◉ **Annual**<br>○ **Other** | Specify (Type Here): | |
| **The site is:**<br>**(Operation Status)** | ◉ **Open**<br>○ **Inactive**<br>○ **Closed** | | |
| **Is there an active waste transfer station at the site?** | ○ **Yes**<br>◉ **No** | | |
| **Does this WDS have a Closure Plan?** | ◉ **Not yet submitted**<br>○ **Submitted and under review**<br>○ **Submitted and approved** | | |
| **Total Approved Capacity** | 604,500 | *Units* | $m^3$ |
| **Maximum Approved Fill Rate** | | *Units* | |
| **Total Waste Received within Monitoring Period (Year)** | 3,616 | *Units* | Tonnes |
| **Total Waste Received within Monitoring Period (Year)** *Describe the methodology used to determine this quantity* | Weighed | | |
| **Estimated Remaining Capacity** | 538,114 | *Units* | Cubic Metres |
| **Estimated Remaining Capacity** *Describe the methodology used to determine this quantity* | annual topographic survey of waste mound | | |
| **Estimated Remaining Capacity** *Date Last Determined* | late 2022 | | |
| **Non-Hazardous Approved Waste Types** | ☒ Domestic<br>☒ Industrial, Commercial & Institutional (IC&I)<br>☒ Source Separated Organics (Green Bin)<br>☒ Tires | ☒ Contaminated Soil<br>☒ Wood Waste<br>☒ Blue Box Material<br>☒ Processed Organics<br>☒ Leaf and Yard Waste | ☐ Food Processing/Preparation Operations Waste<br>☐ Hauled Sewage<br>Other: |
| **Subject Waste Approved Waste Classes: Hazardous & Liquid Industrial** *(separate waste classes by comma)* | | | |

| | | | |
|---|---|---|---|
| **Year Site Opened**<br>*(enter the Calendar Year only)* | | **Current ECA Issue Date** | 1/6/2011 |
| **Is your Site required to submit Financial Assurance?** | | ○ **Yes**<br>◉ **No** | |
| **Describe how your WDS is designed.** | | ○ Natural Attenuation only ○ Fully engineered Facility<br>◉ Partially engineered Facility | |
| **Does your Site have an approved Contaminant Attenuation Zone?** | | ○ **Yes**<br>◉ **No** | |
| **If closed, specify ECA, control or authorizing document closure date:** | | Select Date | |
| **Has the nature of the operations at the site changed during this monitoring period?** | ○ **Yes**<br>◉ **No** | | |
| **If yes, provide details:** | | | |

| | |
|---|---|
| **Have any measurements been taken since the last reporting period that indicate landfill gas volumes have exceeded the MOE limits for subsurface or adjacent buildings? (i.e. exceeded the LEL for methane)** | ○ Yes<br>◉ No |

## Groundwater WDS Verification:

**Based on all available information about the site and site knowledge, it is my opinion that:**

## Sampling and Monitoring Program Status:

| | | |
|---|---|---|
| **1) The monitoring program continues to effectively characterize site conditions and any groundwater discharges from the site. All monitoring wells are confirmed to be in good condition and are secure:** | ◉ **Yes**<br>○ **No** | Monitoring program continues to effectively characterize site conditions. Several redundancies have been noted in the monitoring program. As such, GHD has recommended to remove wells from the water quality monitoring portion of the monitoring program (awaiting MECP approval for removal) |
| **2) All groundwater, leachate and landfill gas sampling and monitoring for the monitoring period being reported on was successfully completed as required by ECA or other relevant authorizing/ control document(s):** | ○ **Yes**<br>◉ **No**<br>○ **Not Applicable** | If no, list exceptions below or attach information. |

| **Groundwater Sampling Location** | **Description/Explanation for change (change in name or location, additions, deletions)** | **Date** |
|---|---|---|
| Some wells were missed due to dry conditions, insufficient recharge, or unsafe access conditions.<br><br>See text. | Type Here | Select Date |
| Type Here | Type Here | Select Date |

| | | |
|---|---|---|
| Type Here | Type Here | Select Date |
| Type Here | Type Here | Select Date |

| | | |
|---|---|---|
| **3) a) Some or all groundwater, leachate and landfill gas sampling and monitoring requirements have been established or defined outside of a ministry ECA, authorizing, or control document.** | ◯ **Yes**<br>◉ **No**<br>◯ **Not Applicable** | |
| **b) If yes, the sampling and monitoring identified under 3(a) for the monitoring period being reported on was successfully completed in accordance with established protocols, frequencies, locations, and parameters developed as per the Technical Guidance Document:** | ◯ **Yes**<br>◯ **No**<br>◉ **Not Applicable** | If no, list exceptions below or attach additional information. |

| **Groundwater Sampling Location** | **Description/Explanation for change (change in name or location, additions, deletions)** | **Date** |
|---|---|---|
| Type Here | Type Here | Select Date |
| Type Here | Type Here | Select Date |
| Type Here | Type Here | Select Date |
| Type Here | Type Here | Select Date |

| | | |
|---|---|---|
| **4) All field work for groundwater investigations was done in accordance with Standard Operating Procedures (SOP) as established/outlined per the Technical Guidance Document (including internal/external QA/QC requirements) (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):** | ◉ **Yes**<br>○ **No** | If no, specify (Type Here): |
| **Sampling and Monitoring Program Results/WDS Conditions and Assessment:** | | |
| **5) The site has an adequate buffer, Contaminant Attenuation Zone (CAZ) and/ or contingency plan in place. Design and operational measures, including the size and configuration of any CAZ, are adequate to prevent potential human health impacts and impairment of the environment.** | ◉ **Yes**<br>○ **No** | If no, the potential design and operational concerns/exceptions are as follows (Type Here): |
| **6) The site meets compliance and assessment criteria.** | ◉ **Yes**<br>○ **No** | If no, list and explain exceptions (Type Here): |
| **7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.** | ◉ **Yes**<br>○ **No** | If no, list exceptions and explain reason for increase/change (Type Here): |

| | | | |
|---|---|---|---|
| **1) Is one or more of the following risk reduction practices in place at the site:**<br>***(a)*** **There is minimal reliance on natural attenuation of leachate due to the presence of an effective waste liner and active leachate collection/ treatment; or**<br>***(b)*** **There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or**<br>***(c)*** **The site meets the following two conditions (typically achieved after 15 years or longer of site operation):**<br>***i.*** **The site has developed stable leachate mound(s) and stable leachate plume geometry/ concentrations; and**<br>***ii.*** **Seasonal and annual water levels and water quality fluctuations are well understood.** | ◉ **Yes**<br>○ **No** | **Note which practice(s):** | ☒ **(a)**<br>☐ **(b)**<br>☒ **(c)** |
| **9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):** | ○ **Yes**<br>◉ **No**<br>○ **Not Applicable** | Tier I trigger monitoring is recommended at all locations | |

## Groundwater CEP Declaration:

**I am a licensed professional Engineer or a registered professional geoscientist in Ontario with expertise in hydrogeology, as defined in Appendix D under Instructions. Where additional expertise was needed to evaluate the site monitoring data, I have relied on individuals who I believe to be experts in the relevant discipline, who have co-signed the compliance monitoring report or monitoring program status report, and who have provided evidence to me of their credentials.**

**I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended), and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories,* or as amended from time to time by the ministry.**

**If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature and will be rectified for the next monitoring/reporting period. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:**

**Select Date**

## Recommendations:

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

| | |
|---|---|
| ○ **No changes to the monitoring program are recommended** | |
| ◉ **The following change(s) to the monitoring program is/ are recommended:** | Several redundancies have been noted in the monitoring program. As such, GHD has recommended to remove wells from the water quality monitoring portion of the monitoring program. The following wells should be removed.<br><br>a. North of Phase 1 - OW19-89, OW4-83, OW29-07,<br>b. East of Phase 2 (background) - OW49-13,<br>c. Central Portion of the Site (North of Phase 2) - OW16-89, OW9-88, and<br>d. West of Phase 2 - OW20-89, and OW43-09 (destroyed in early 2019).<br><br>VOC sampling should be limited to the following:<br>o North of Phase 1 – OW24-98 and OW8-88,<br>o West of Phase 1 – OW6-83, OW7-83, OW31-07, and OW32-07,<br>o Central portion of the Site - OW16-89, and OW33-07,<br>o West of Phase 2 – OW46B-13 and OW47-13, and<br>o South of Phase 2 – OW25R-13. |
| ◉ **No Changes to site design and operation are recommended** | |
| ○ **The following change(s) to the site design and operation is/are recommended:** | Type Here |
| **Name:** | Type Here |
| **Seal:** | Add Image |

| | | | |
|---|---|---|---|
| **Signature:** | | **Date:** | Select Date |
| **CEP Contact Information:** | Type Here | | |
| **Company:** | Type Here | | |
| **Address:** | Type Here | | |
| **Telephone No.:** | Type Here | Fax No. : | Type Here |
| **E-mail Address:** | Type Here | | |
| **Co-signers for additional expertise provided:** | | | |
| **Signature:** | | **Date:** | Select Date |
| **Signature:** | | **Date:** | Select Date |

## Surface Water WDS Verification:

| | |
|---|---|
| **Provide the name of surface water body/bodies potentially receiving the WDS effluent and the approximate distance to the waterbody (including the nearest surface water body/bodies to the site):** | |
| **Name (s)** | Unnamed On-Site Creeks<br>N. Penentangore Tributary<br>N. Penetangore River<br>Lake Huron<br>Surface Water Management Ponds 1 and 2 |

| | |
|---|---|
| **Distance(s)** | On-Site<br><br>Lake Huron is 8 km northwest |

**Based on all available information and site knowledge, it is my opinion that:**

## Sampling and Monitoring Program Status:

| | | |
|---|---|---|
| **1) The current surface water monitoring program continues to effectively characterize the surface water conditions, and includes data that relates upstream/background and downstream receiving water conditions:** | ◉ **Yes**<br>○ **No** | If no, identify issues (Type Here): |
| **2) All surface water sampling for the monitoring period being reported was successfully completed in accordance with the ECA or relevant authorizing/control document(s) (if applicable):** | ◉ **Yes**<br>○ **No**<br>○ **Not applicable** | If no, specify below or provide details in an attachment. |

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

| | | |
|---|---|---|
| **3) a) Some or all surface water sampling and monitoring program requirements for the monitoring period have been established outside of a ministry ECA or authorizing/control document.** | ○ **Yes**<br>◉ **No**<br>○ **Not Applicable** | |
| **b) If yes, all surface water sampling and monitoring identified under 3 (a) was successfully completed in accordance with the established program from the site, including sampling protocols, frequencies, locations and parameters) as developed per the Technical Guidance Document:** | ○ **Yes**<br>○ **No**<br>◉ **Not Applicable** | If no, specify below or provide details in an attachment. |

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

| | | |
|---|---|---|
| **4) All field work for surface water investigations was done in accordance with SOP, including internal/external QA/QC requirements, as established/outlined as per the Technical Guidance Document, MOE 2010, or as amended. (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):** | ◉ **Yes**<br>○ **No** | If no, specify (Type Here): |

## Sampling and Monitoring Program Results/WDS Conditions and Assessment:

| | |
|---|---|
| **5) The receiving water body meets surface water-related compliance criteria and assessment criteria: i.e., there are no exceedances of criteria, based on MOE legislation, regulations, Water Management Policies, Guidelines and Provincial Water Quality Objectives and other assessment criteria (e.g., CWQGs, APVs), as noted in Table A or Table B in the Technical Guidance Document (Section 4.6):** | ○ **Yes**<br>◉ **No** |

**If no, list parameters that exceed criteria outlined above and the amount/percentage of the exceedance as per the table on the following page or provide details in an attachment:**

| Parameter | Compliance or Assessment Criteria or Background | Amount by which Compliance or Assessment Criteria or Background Exceeded |
|---|---|---|
| e.g. Nickel | e.g. ECA limit, PWQO, background | e.g. X% above PWQO |
| See Table 6.4 for a complete listing of parameters found in excess of the PWQOs at specific sampling locations. | Type Here | Type Here |
| Type Here | Type Here | Type Here |
| Type Here | Type Here | Type Here |
| Type Here | Type Here | Type Here |
| **6) In my opinion, any exceedances listed in Question 5 are the result of non-WDS related influences (such as background, road salting, sampling site conditions)?** | (●) **Yes**<br>( ) **No** | Upgradient sources of impacts are present. |

| | | |
|---|---|---|
| **7) All monitoring program surface water parameter concentrations fall within a stable or decreasing trend. The site is not characterized by historical ranges of concentrations above assessment and compliance criteria.** | (●) **Yes**<br>( ) **No** | On-site drainage swales show increasing trends in chloride, hardness, and conductivity. Surface water locations within the North Penetangore River have shown consistent water quality with no increasing or decreasing trends. |
| **8) For the monitoring program parameters, does the water quality in the groundwater zones adjacent to surface water receivers exceed assessment or compliance criteria (e.g. , PWQOs, CWQGs, or toxicity values for aquatic biota (APVs)):** | (●) Yes<br>( ) No<br>( ) Not Known<br>( ) Not Applicable | Iron, manganese, dissolved phosphorus, and total phenolics have been found in excess of their respective PWQOs in various shallow groundwater monitors interpreted to represent groundwater that is discharging to surface. |
| **9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):** | ( ) **Yes**<br>( ) **No**<br>(●) **Not Applicable** | If yes, list value(s) that are/have been exceeded and follow-up action taken (Type Here) |

## Surface Water CEP Declaration:

**I, the undersigned hereby declare that I am a Competent Environmental Practitioner as defined in Appendix D under Instructions, holding the necessary level of experience and education to design surface water monitoring and sampling programs, conduct appropriate surface water investigations and interpret the related data as it pertains to the site for this monitoring period.**

**I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended) and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories,* or as amended from time to time by the ministry.**

**If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature or will be rectified for future monitoring events. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:**

Select Date

## Recommendations:

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

| | |
|---|---|
| ○ **No Changes to the monitoring program are recommended** | |
| ◉ **The following change(s) to the monitoring program is/are recommended:** | It is recommended that VOC analysis be discontinued at the surface water monitoring locations. |
| ◉ **No changes to the site design and operation are recommended** | |
| ○ **The following change(s) to the site design and operation is/ are recommended:** | Type Here |

| | |
|---|---|
| **CEP Signature** | |
| **Relevant Discipline** | Type Here |
| **Date:** | Select Date |
| **CEP Contact Information:** | Type Here |
| **Company:** | Type Here |
| **Address:** | Type Here |
| **Telephone No.:** | Type Here |
| **Fax No. :** | Type Here |
| **E-mail Address:** | Type Here |

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|---|---|---|
| **Save As** | | **Print Form** |